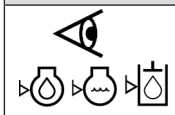
Symbol	Task	Reference
Every 10 Operating Hours (Daily)		
	Check the fluids and lubricants (engine oil, engine coolant, hydraulic oil).	[▷ 96] [▷ 91] [▷ 92]
	Check the engine air filter condition indicator for leaks and damaged components.	[▷ 88]
	Check the water separator.	[▷ 99]
	Lubricate the machine according to the lubrication plan.	[▷ 89]
	Check the exhaust system for damage.	[▷ 97]
	Check the service and parking brake function.	[▷ 88]
	Check the continuous flow shutoff system for proper function.	[▷ 98]
	Check access panels for dirt.	[▷ 88]
	Check the piston rods of the cylinders for damage.	[▷ 88]
	Check the line fixtures.	[▷ 88]
	Check the indicator lights and acoustic warning devices.	[▷ 88]
	Check the engine compartment for damage.	[▷ 88]
	Check the hydraulic couplings for dirt.	[▷ 88]
	Clean the lights/light system and signaling systems.	[▷ 88]
	Check the engine and hydraulic system.	[▷ 88]
	Check the fuel tank level and fill as needed.	[▷ 79]
	Check the tie-down points for damage.	[▷ 88]
	Check and clean the operator platform.	[▷ 88]
—	Check the interlocks for proper function.	[▷ 93]
—	Check for damaged safety labels. Replace damaged labels.	[▷ 88]
Only Once after the First 50 Operating Hours		
	Replace engine oil and filter.	[▷ 102]
	Check condition of all drive belts. Adjust or replace as needed.	[▷ 104]
	Replace the hydraulic filter.	[▷ 113]
Every 50 Operating Hours		
	Check the hydraulic fluid, hoses, and tubelines for damage and leaks. Repair or replace as needed.	[▷ 106]
	Check the tracks (damage, tension, profile).	Checking and Adjusting Track Tension
	Check the undercarriage for loose bolts and nuts.	[▷ 106]

Symbol	Task	Reference
—	Drain the water separator.	[▷ 99]
	Check battery for damage and recharge. Check cables, connections, and electrolyte level.	[▷ 116]
Every 250 Operating Hours		
	Replace engine oil and filter.	[▷ 102]
	Check lift arm support device for damage.	[▷ 81]
	Check condition of all drive belts. Adjust or replace as needed.	[▷ 104]
	Check and clean radiator fins.	[▷ 110]
Every 500 Operating Hours (Once a Year)		
	Replace the fuel filter.	[▷ 111]
—	Clean the water separator.	[▷ 99]
	Replace the hydraulic fluid and filter.	[▷ 113]
Every 1000 Operating Hours		
	Replace the hydraulic tank filler cap.	[▷ 115]
	Check and adjust the engine intake and exhaust valve clearance.[1)]	—
Every 2000 Operating Hours		
—	Change coolant. Check and replace coolant hoses.[2)]	—
—	Check fuel hoses and tubelines for damages and leaks. Repair or replace as needed.[2)]	—

1) This maintenance task should be performed by a qualified technician. Contact an authorized YANMAR industrial engine dealer or distributor for assistance.
2) This maintenance task should be performed by a qualified technician. Contact an authorized Wacker Neuson dealer or service center for assistance.

8.3 General Daily Checks

- Perform an overall visual check of the machine:
  - Clean dirt and debris from the operator platform.
  - Check for loose and broken parts, instrument operation, and oil leaks.
- Visually inspect the engine compartment, including the engine itself. If you find any problems during the visual check, take the necessary corrective action before operating the engine.
- Visually inspect all hydraulic system components. Check the hydraulic fluid level and check for leaks. For further information, see Checking and Filling the Hydraulic Oil on page 92 and see Checking for Leaks on page 95.
- With the key switch in position 1, check the following:
  - Indicator lights—if any indicator fails to illuminate when the key switch is in position 1, contact an authorized Wacker Neuson dealer or service center for assistance before operating the engine.
  - All other lights, such as work lights
- Check the parking brake for proper function.
- Check the lift arm piston rods for any signs of damage or leakage.
- Check the hydraulic couplings for dirt or debris that may prevent the lines from seating properly.
- Check the attachment coupler for damage.
- Make sure the attachment coupler pins engage and the lock levers move.
- Check all line fixtures, such as clamps, cable ties, brackets, or other components that secure lines and hoses.
- Check the tie-down points for any damage such as cracks in the weldment.
- Check for damaged safety labels. Replace any damaged safety labels.

8.4 Operating the Hood

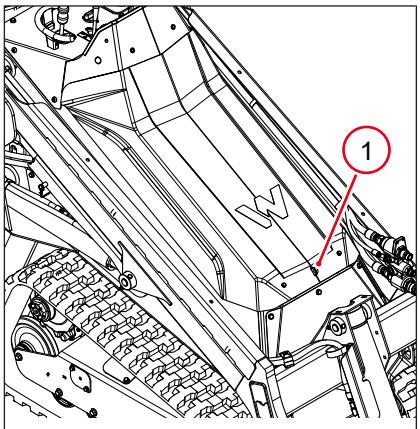


Fig. 76: Hood lock eye

Opening and closing

1. Remove the lock (if applicable).
2. Pull up to open. (The hood is held in place using rubber latches.) The hood remains open by itself with a gas strut at the left hood hinge.
3. Lower the hood slowly to make sure the lock eye **(1)** goes through the hole in the hood and the rubber latches engage properly.
4. Push down firmly to engage the rubber latches.
5. Install the lock (if applicable).

Adjusting the hood

There are two adjustment points for the hood—one at the right hood hinge **(2)**, and the other at the front bracket **(3)**. The bolt holes are slotted to provide a minimal amount of adjustment. Adjustments at both points are obtained in a similar fashion, as follows:

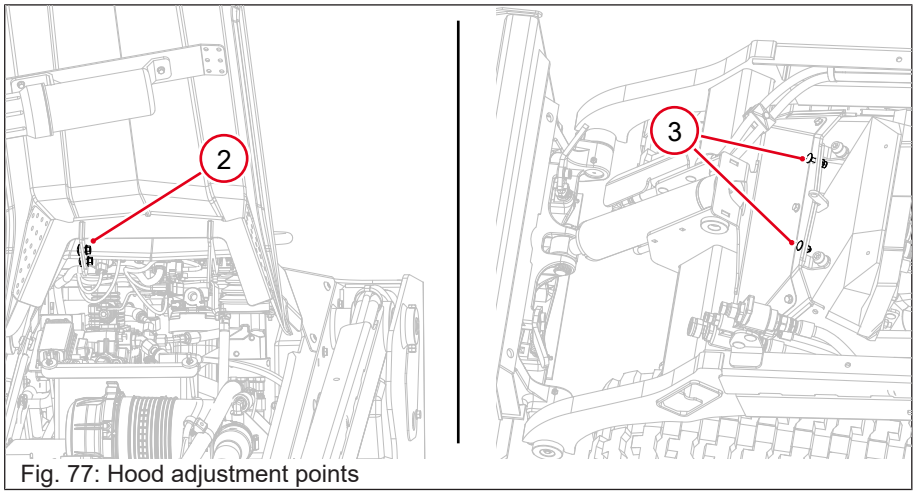


Fig. 77: Hood adjustment points

1. Loosen the carriage bolts that secure the bracket.
2. Adjust the bracket in the desired direction.
3. Tighten the bolts enough to hold the bracket in place and slowly lower the hood to check for proper adjustment.
4. Repeat the previous steps until the correct adjustment is obtained.
5. Tighten the bolts. For standard torque specifications, see Tightening Torques on page 130.

8.5 Lubrication Plan

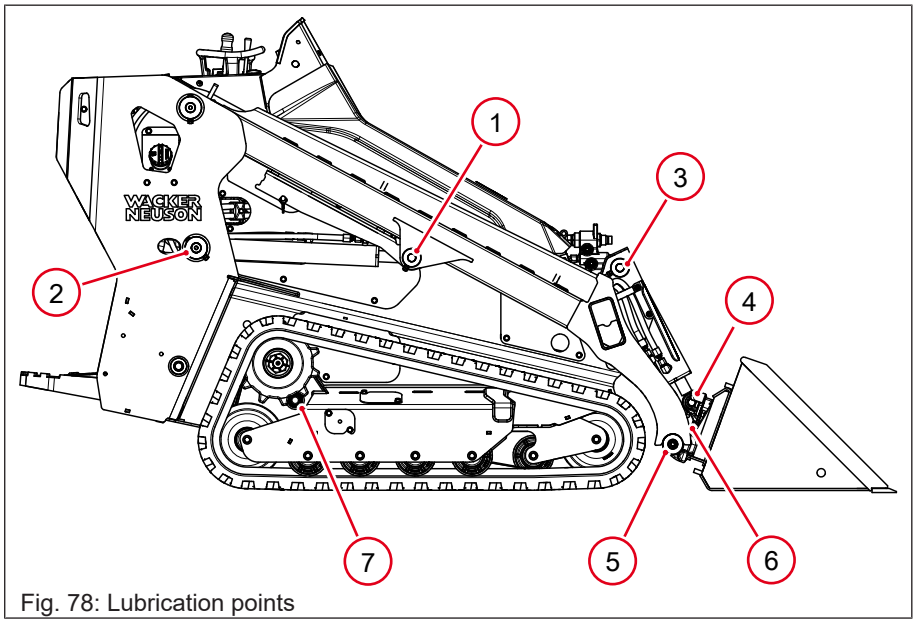
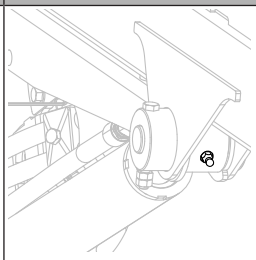
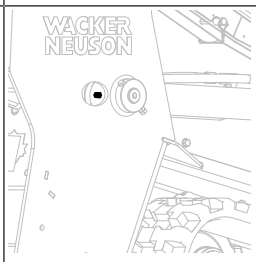
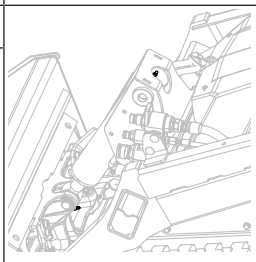
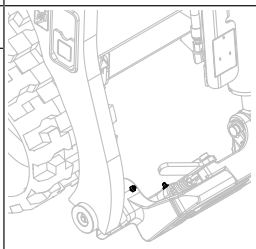
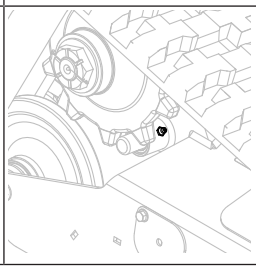


Fig. 78: Lubrication points

Lubricate the specified lubrication points once a day. For the recommended grease to order, see Maintenance Items on page 14.

Position	Location	Lubrication Point	Quantity
1		Lift cylinder (front)	2
2		Lift cylinder (back)	
3		Upper tilt cylinder	1
4		Lower tilt cylinder	
5		Coupler B-pin	2
6		Attachment coupler pin	
7		Brake pin	

8.6 Engine Oil Viscosity

⚠ WARNING

Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

- ► Take steps to avoid inhaling or ingesting used liquids.
- ► Wash skin thoroughly after exposure to used liquids.

The viscosity of the engine oil is an important factor when determining the correct engine oil to use in your machine. Use an engine oil of appropriate viscosity based on the expected outside air temperature. See the table below.

Oil capacity: 3.4 L (3.6 qt)

The engine oil must meet the API CD, CF, CF-4, CI-4, ACEA E-3, E-E, E-5, or JASO DH-1 standard.

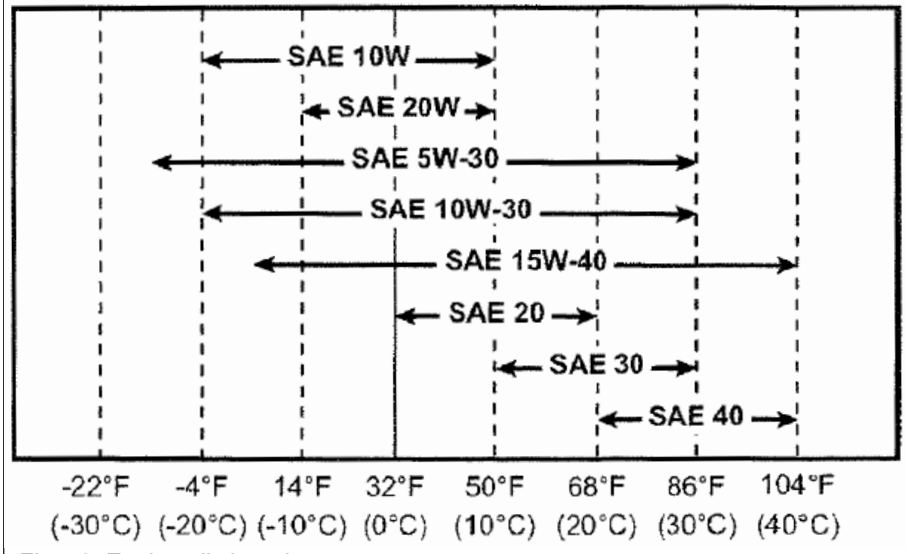


Fig. 79: Engine oil viscosity

In particularly hot environments where ambient temperatures stay near and over 38°C (100°F), use SAE 15W-40 engine oil.

8.7 Checking and Adding Engine Coolant

⚠ WARNING

Burn hazard

Engine coolant is hot and under pressure at operating temperature. It can cause severe personal injury.

- ► Check the engine coolant level only after the engine has been shut down and is cool.
- ► Do not add engine coolant directly to the radiator when hot.
- ► If you must drain the engine coolant while it is still hot, stay clear of the hot engine coolant to avoid being burned.
- ► Check the coolant level at the reserve tank and add coolant as needed.
- ► Wear eye protection when handling the engine coolant.
- ► Tighten the radiator cap securely after checking the radiator. Steam can escape during engine operation if the cap is loose.

8

⚠ WARNING

Burn hazard

Engine coolant can contain alkali.

► Avoid engine coolant contact with skin and eyes.

When

Every 10 hours or daily

Requirements

- Machine parked on a level surface
- Machine shut down and cool to the touch
- If needed, an equal mix (50/50) of distilled water and ethylene glycol coolant concentrate (see Fluids on page 127)

Overview

The engine coolant recovery reserve tank is located on the right side of the engine compartment.

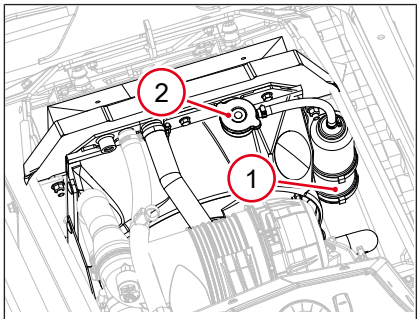


Fig. 80: Coolant bottle and fill cap

Procedure

1. Check that the engine coolant level is between the min and max lines **(1)**.
2. If the engine coolant level is below the min line or above the max line, remove the recovery reserve tank cap **(2)**.
   ⇨ If the engine coolant level is below the min line, fill the tank with coolant until the engine coolant level is between the min and max lines.
   ⇨ If the engine coolant level is above the max line, use a siphon to remove coolant from the recovery reserve tank until the level is just at or below the max line.
3. Install the recovery reserve tank cap.
4. Close the rear door.

8.8 Checking and Filling the Hydraulic Oil

NOTICE

Damage to the hydraulic system can occur if the hydraulic oil is drained and not refilled properly.

When draining and refilling the hydraulic system, see Replacing the Hydraulic Oil and Filter on page 113.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 10 hours or daily

Requirements

- Machine parked on a level surface
- Machine shut down
- Lift arm down
- New hydraulic oil as needed

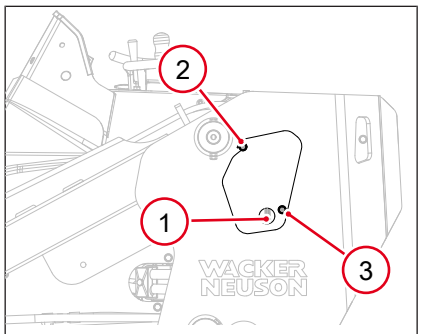


Fig. 81: Hydraulic oil sight glass and access plate

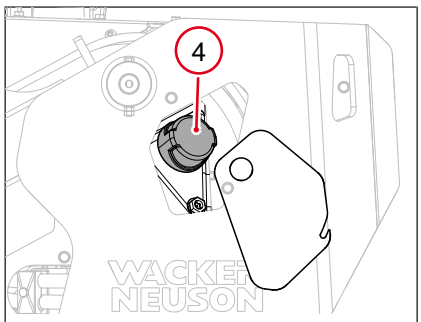


Fig. 82: Hydraulic oil filler cap

Overview

The hydraulic oil filler cap and sight glass are located on the left side of the machine.

Procedure

1. Observe the hydraulic oil level through the sight glass **(1)**. The hydraulic oil level should be half full in the sight glass.
2. If the oil level is low, remove the hydraulic fill access plate by removing the retaining bolt **(2)** and loosening the pivot bolt **(3)**.
3. Rotate the access plate out of the way.
4. Clean the area around the hydraulic tank filler cap **(4)**.
5. Remove the hydraulic tank filler cap and fill the hydraulic oil to a level half full in the sight glass.
6. Rotate the access plate into place and tighten the bolts.

8

8.9 Testing the Control Interlock System

When

Every 10 hours or daily

Procedure

To enable the ground drive, loader lift and tilt, and auxiliary hydraulics, the operator must complete all of the following actions:

1. Stand on the operator platform and engage the operator presence pedal.
2. Start the engine.

3. Disengage the parking brake.

To test the control interlock system, perform the following functions individually with the engine running and the controls enabled. A successful test means that the machine will not move after each of the following tests are performed:

- Disengage the operator presence pedal, wait 5 seconds, and move the ground drive joystick, workgroup joystick, and auxiliary hydraulic controls.
- With the operator presence pedal engaged, engage the parking brake and move the ground drive joystick only.

Note: After all controls are enabled, engaging the parking brake will only engage the brake itself and limit the ground drive controls to hold the machine stationary. This allows the machine to operate the lift arm controls or auxiliary controls while preventing the machine from moving—for example, drilling a post hole while working on a slope.

Testing the lift arm controls interlock

1. Stand on the operator platform with the operator presence pedal engaged and start the engine.
2. Raise the lift arm slightly off the ground.
3. Shut down the machine and wait for the engine to stop completely.
4. Make sure the area around the machine is clear.
5. Move the workgroup joystick forward to lower the lift arm.
   ⇨ The lift arm should not lower.
6. Move the workgroup joystick to the right to tilt the bucket or attachment forward.
   ⇨ The bucket or attachment should not tilt forward.

Testing the auxiliary controls interlock

Note: This procedure only applies to machines with standard controls.

1. Shut down the machine.
2. Make sure the area around the machine is clear.
3. Set the throttle to the low idle position.
4. Push the auxiliary hydraulic control lever forward and hold it in place.
5. Turn the key switch to position 2 to start the engine.
   ⇨ The starter should not engage.
6. Repeat steps 4 and 5 with the auxiliary hydraulic control lever pulled backward.

8.10 Checking for Leaks

⚠ WARNING

Fire hazard

Flammable liquids and residue can easily ignite when exposed to flame.

► Never use an open flame to inspect for leaks.

⚠ WARNING

Risk of injury due to pressure

A fine jet of hydraulic oil under high pressure can penetrate through the skin. This can cause serious injury.

► Wear protective gloves and safety glasses.

► Never search for leaks with your bare hands.

► Search for leaks using a piece of cardboard or paper on which the escaping oil can been seen.

► Seek medical attention immediately if hydraulic oil penetrates the skin or eyes.

When

Every 50 hours

Requirements

- Flashlight or shielded light (do not use an open flame)
- Protective gloves
- A piece of cardboard, wood, or a mirror

Overview

Regular checks for leaks are essential for keeping the machine in serviceable condition. It is important to identify and repair leaks as soon as possible to maintain proper machine operation and prevent slip and fall hazards, fire danger, and environmental contamination.

Procedure

When checking for leaks, use a flashlight or other shielded light.

1. Thoroughly inspect for damage.
   Note: Hardware should be replaced with OEM parts and should be tightened to the manufacturer's recommendations.
   ⇨ Check for cracks, dents, bends, or deformation of plates and welds.
   ⇨ Check for broken, loose, or missing parts, such as nuts, bolts, and brackets.
   ⇨ Inspect all hydraulic hoses for signs of wear or cracks and replace if needed.

2. Check for fuel, engine oil, hydraulic oil, and other leaks.
   ⇨ To locate a leak, pass a piece of cardboard, wood, or a mirror over the area of the suspected leak.
3. Fix the leak before operating the machine.
4. Secure all caps and filler plugs for all systems to prevent leaks from these areas.

8.11 Checking the Engine Oil

⚠ WARNING

Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

► Take steps to avoid inhaling or ingesting used liquids.

► Wash skin thoroughly after exposure to used liquids.

NOTICE

Engine damage can occur if the oil level is too high or if the incorrect oil is used.

► Oil must be removed from the engine if the oil level is above the max line.

► Use only the recommended oil.

NOTICE

Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap, dipstick, and the surrounding area before removing the cap.

Do not mix different types of engine oil. This can adversely affect the lubricating properties of the engine oil.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 10 hours or daily

Requirements

- Machine parked on a level surface
- Machine shut down and cool to the touch

- Recommended oil (for oil specifications, see Engine Oil Viscosity on page 90 and see Fluids on page 127)
- A clean, soft cloth

Overview

Maintaining the appropriate engine oil prevents excessive engine wear.

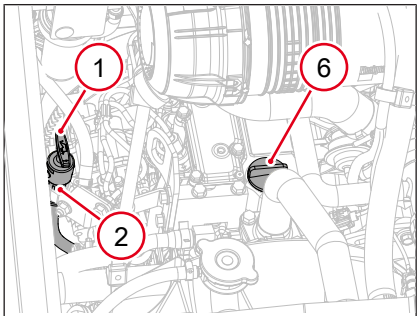


Fig. 83: Dipstick, dipstick tube, and oil cap

Procedure

1. Open the hood.
2. Carefully remove the dipstick **(1)** and wipe it clean.
3. Fully insert the dipstick into the dipstick tube **(2)** and remove it again to check the engine oil level.

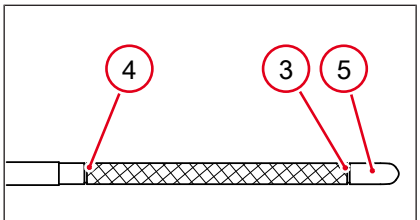


Fig. 84: Dipstick marks

4. If the engine oil level is between the min **(3)** and max **(4)** marks, the level is acceptable. Do not add engine oil.
5. If the oil level is below **(5)** the min mark, remove the engine oil cap **(6)** and add enough oil to raise the level within the min-max range.
   ⇨ Repeat steps 1, 2, and 3 to check engine oil level.
   ⇨ Install engine oil cap when engine oil level is sufficient.
6. Install the dipstick and close the hood.

8.12 Checking the Exhaust System

When

Every 10 hours or daily

Requirements

- Machine shut down
- Exhaust pipes and muffler cool to the touch

Overview

A leaky exhaust system adversely affects machine operation. Symptoms include increased noise and visible soot deposits. Leaking exhaust can also ignite surrounding materials and pipe insulation, causing a fire.

Procedure

1. Open the hood.

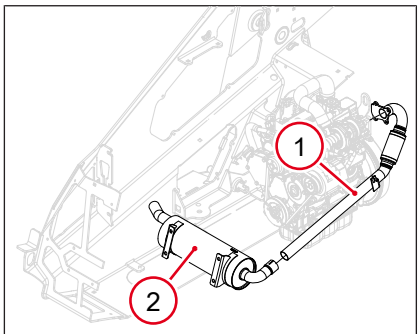


Fig. 85: Exhaust components

2. Inspect the exhaust pipes **(1)** and muffler **(2)**, looking for:
   - ⇨ Cracks or holes
   - ⇨ Loose or missing clamps
   - ⇨ Black soot deposits, especially around welds and joints
3. Start the engine. Listen carefully for:
   - ⇨ Excessive noise. Some noise is normal when the engine starts or shuts down as the engine mount contacts with stop blocks.
   - ⇨ Rumbling
   - ⇨ High-pitched whine
   - ⇨ Rattling
4. Repair or replace faulty components before putting the machine back into service.

8.13 Checking the Continuous Flow Shutoff System

When

Every 10 hours or daily

Requirements

- Machine running
- Area clear of bystanders

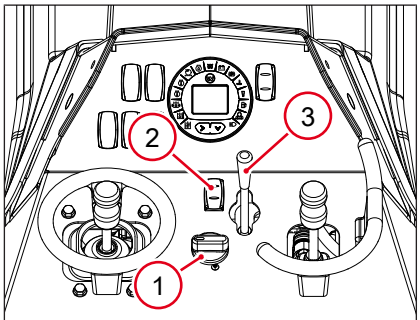


Fig. 86: Continuous flow system controls—standard

Procedure—standard controls

1. Set the throttle **(1)** to the high idle position.
2. Press the auxiliary hydraulics switch **(2)**. An icon appears on the display.
3. Push the auxiliary hydraulic control lever **(3)** fully forward.
4. Press the auxiliary hydraulics switch again.
   - ⇨ The auxiliary hydraulic control lever should return to the neutral position.
5. Repeat steps 3 and 4 with the auxiliary hydraulic control lever pulled fully backward.

If the continuous flow system does not function properly, contact an authorized Wacker Neuson dealer or service center for assistance.

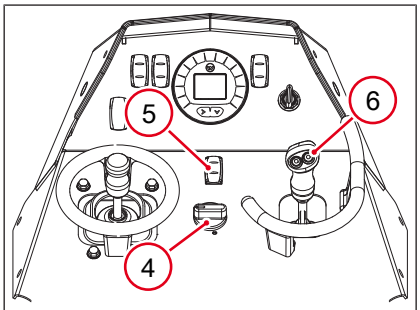


Fig. 87: Continuous flow system controls—EH aux

Procedure—EH aux controls

1. Set the throttle **(4)** to the high idle position.
2. Press the auxiliary hydraulics switch **(5)**. An icon appears on the display.
3. Rotate the hydraulic control wheel to the left and press the continuous flow button **(6)** on the workgroup joystick control.
4. Press the auxiliary hydraulics switch again.
   ⇨ Continuous flow should turn off.
5. Repeat steps 2–4 with the hydraulic control wheel rotated to the right.

If the continuous flow system does not function properly, contact an authorized Wacker Neuson dealer or service center for assistance.

8.14 Draining and Cleaning the Water Separator

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

- Every 10 hours or daily—check
- Every 50 hours—drain
- Every 500 hours—clean

Requirements

- Machine shut down
- Container of sufficient volume to collect drained fluid
- Filter wrench

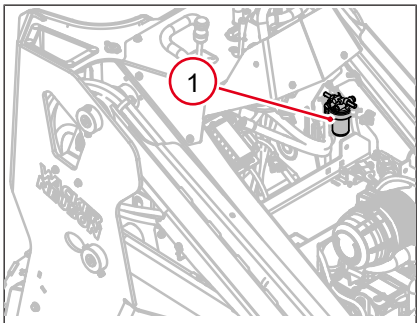


Fig. 88: Water separator location (battery and hood hidden for clarity)

Removing the water separator

The water separator **(1)** is located in the engine compartment.

1. Raise the lift arm and secure the lift arm support device. For further information, see Lift Arm Support Device on page 81.

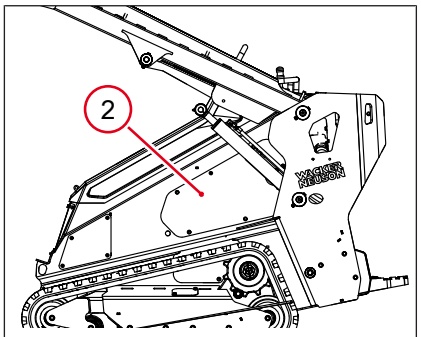


Fig. 89: Water separator panel

2. Remove the side panel **(2)** next to the water separator.
3. Place a container beneath the water separator.
4. Clean the area of the filter cartridge and housing.

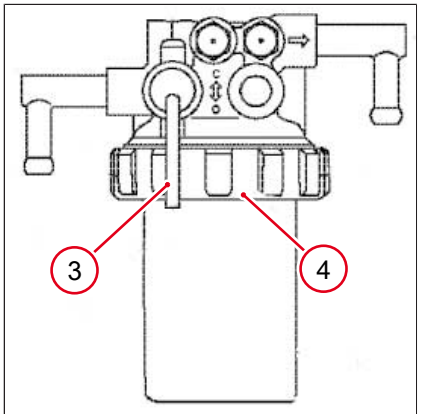


Fig. 90: Water separator exterior components

5. Interrupt the fuel supply by turning the fuel valve **(3)** 180° to the CLOSED (up) position.
6. Unscrew the threaded fitting **(4)** using an appropriate filter wrench, if necessary.
7. Carefully remove the cartridge. Clean up any spills immediately.

Draining the water separator

1. Pour the fuel and water mixture into an approved container and dispose of waste properly.
2. Wait until the indicator ring returns to the bottom of the water separator.
3. Install the cartridge and hand-tighten the threaded fitting.

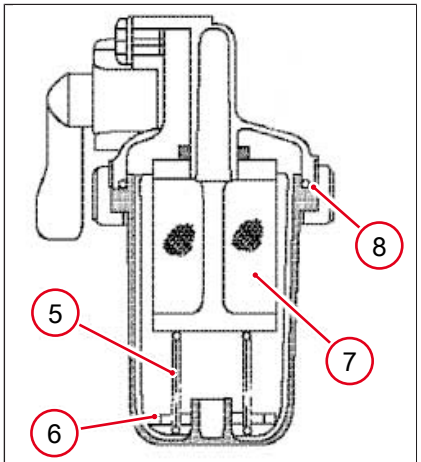


Fig. 91: Water separator interior components

Cleaning the water separator

1. Remove the retaining spring **(5)** and indicator ring **(6)** from the cartridge.
2. Pour the fuel and water mixture into an approved container and dispose of waste properly.
3. Clean the inside of the cartridge.
4. Check the filter **(7)** for debris. Clean the filter mesh if necessary.
5. Check the O-ring **(8)** for damage. Replace the O-ring if necessary.
6. Place the indicator ring and retaining spring back inside the cartridge.
7. Install the cartridge and hand-tighten the threaded fitting.
8. Open the fuel supply by turning the fuel valve to the OPEN (down) position.
9. Prime the fuel system by turning the key switch to the ON position (position 1) for 10 to 15 seconds.
10. Check for any fuel leaks.

8.15 Cleaning the Machine

⚠ CAUTION

Personal injury hazard

Using compressed air or high-pressure water may cause eye injuries due to flying debris, dust, and steam.

► Wear eye protection when using compressed air or high-pressure water.

NOTICE

A pressure washer can damage the electrical system, damage seals, and disable the controls.

► Do not clean the inside of the machine using a pressure washer.

NOTICE

Direct, high water pressure at close range will damage certain components on the machine. The following components should be wiped clean by hand using a damp, clean cloth. Do not apply high pressure spray to these components:

► Oil cooler, fan, and connecting hoses
► Hydraulic manifold
► Fuse boxes
► Electronic parts (controller, connectors, etc.)
► Alternator
► Radiator core
► Labels

When

- Daily after each use—entire machine
- Every 250 hours—radiator fins (see Checking and Cleaning the Radiator Fins on page 110)

Requirements

- Machine shut down and cool to the touch
- Clean water supply
- Pressure washer or water hose
- Clean, soft cloths

Overview

Regular cleaning is essential for keeping the machine in serviceable condition. It is important to remove dust and dirt from the machine as soon as possible after work has been completed.

Procedure

1. Use a pressure washer or water hose to remove dirt and debris from the machine's exterior.
   ⇨ To pressure wash areas with labels, direct the water stream at a 90° angle to the machine surface with the spray nozzle at least 1/3m (1 ft) away.
2. Keeping a minimum distance of 1m (3 ft) away, use the pressure washer to rinse the machine.
3. Clean interior and electronic machine components using a damp, clean cloth.

8.16 Changing the Engine Oil and Filter

⚠ WARNING

Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

► Take steps to avoid inhaling or ingesting used liquids.

► Wash skin thoroughly after exposure to used liquids.

NOTICE

Engine damage can occur if the oil level is too high or if the incorrect oil is used.

► Oil must be removed from the engine if the oil level is above the max line.

► Use only the recommended oil.

NOTICE

Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap, dipstick, and the surrounding area before removing the cap.

Do not mix different types of engine oil. This can adversely affect the lubricating properties of the engine oil.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

- After the first 50 hours
- Every 250 hours

Requirements

- Machine parked on a flat, level surface
- Machine shut down
- Replacement genuine Wacker Neuson oil filter
- Container of sufficient volume to collect drained fluid
- Recommended oil (for oil specifications, see Engine Oil Viscosity on page 90 and see Fluids on page 127)
- Filter wrench

Procedure

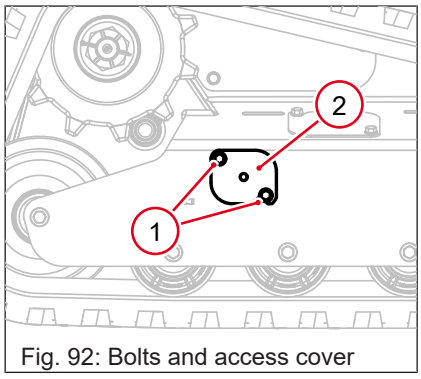


Fig. 92: Bolts and access cover

1. Loosen the two bolts **(1)** securing the access cover **(2)** on the right side of the machine.
2. Swivel the access cover out of the way and tighten the top left bolt if necessary to hold it in place.

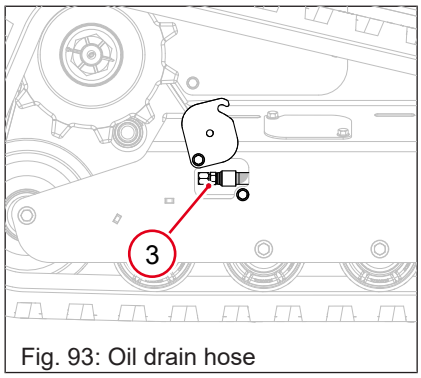


Fig. 93: Oil drain hose

3. Pull the oil drain hose **(3)** out from the access hole.
4. Drain the oil into a suitable container by removing the cap from the oil drain hose.

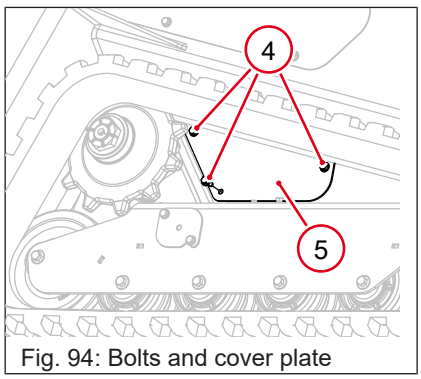


Fig. 94: Bolts and cover plate

5. Remove the three bolts **(4)** securing the cover plate **(5)**.
6. Place a suitable container under the oil filter to catch used oil.

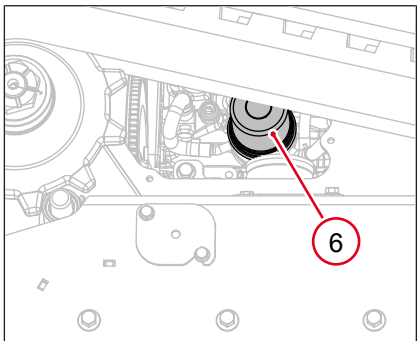


Fig. 95: Oil filter

7. Remove the oil filter **(6)**.
8. Install a new oil filter.
9. Install the cap on the oil drain hose.
10. Open the hood.

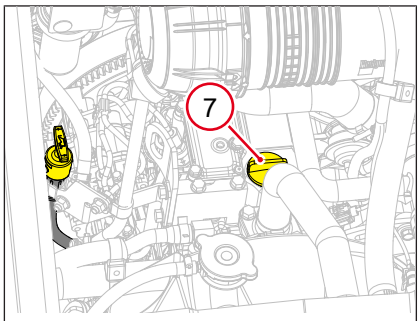


Fig. 96: Oil fill cap

11. Remove the oil fill cap **(7)** from the engine.
12. Fill the engine with the required amount of oil.
13. Install the oil fill cap.
14. Start the engine and check for leaks.
15. Stop the engine.
16. Install the cover plate **(5)**.
17. Push the oil drain hose **(3)** back into the access hole.
18. Place the access cover **(2)** in its closed position and tighten the bolts **(1)**.

8.17 Checking and Adjusting the Drive Belts

⚠ WARNING

Personal injury hazard

Checking the belt tension while the engine is running may cause personal injury.

► Shut off the engine before carrying out work in the engine compartment.
► Shut off the power supply.
► Let the engine cool down.

When

- After the first 50 hours
- Every 250 hours

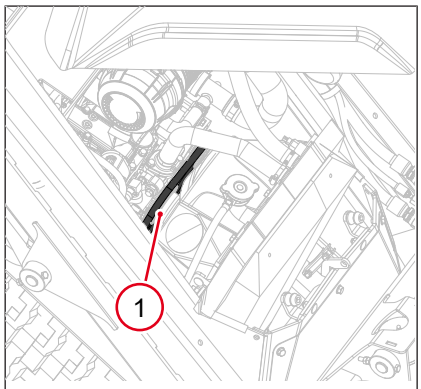


Fig. 97: V-belt location

Checking the cooling fan V-belt

1. Open the hood.
2. Check the belt **(1)** tension using a belt tension gauge or by pressing the belt down with your thumb. Check the tension in whichever position **(A, B, or C)** is most accessible.

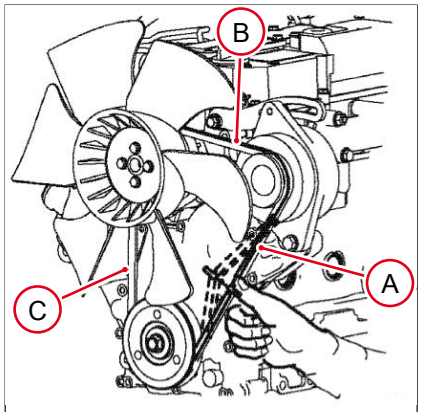


Fig. 98: Belt tension check positions

3. Check the tension values in the applicable table below.
   Note: A “used” V-belt is a belt that has been used on a running engine for five minutes or more.
4. Check the belt condition.
5. Adjust the tension or replace the belt as needed.

New V-belt Tension		
A	**B**	**C**
8–12 mm (5/16–7/16 in.)	5–8 mm (3/16–5/16 in.)	7–11 mm (1/4–7/16 in.)
Used V-belt Tension		
A	B	C
10–14 mm (3/8–1/2 in.)	7–10 mm (1/4–3/8 in.)	9–13 mm (5/16–1/2 in.)

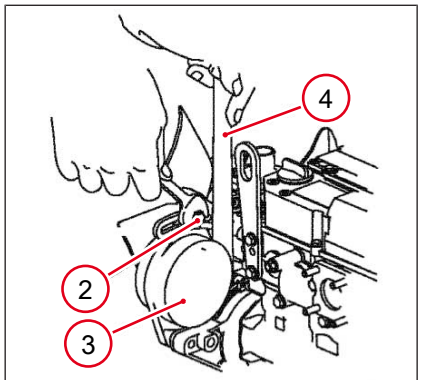


Fig. 99: Cooling fan V-belt adjustment

Adjusting the cooling fan V-belt

1. Loosen the alternator adjusting bolt **(2)** and any other related fasteners.
2. Adjust the belt tension by pivoting the alternator **(3)** in or out using a pry bar **(4)**.
3. Tighten the alternator adjusting bolt and related fasteners and check the belt tension.

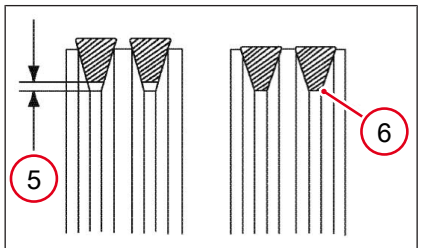


Fig. 100: Clearance between V-belt and pulley groove

4. Repeat these steps until you achieve the desired belt tension.
   ⇨ There must be clearance **(5)** between the V-belt and the bottom of the pulley groove. If there is no clearance **(6)** between the V-belt and the bottom of the pulley groove, replace the V-belt.
5. After adjusting the tension, run the engine for at least 5 minutes. Check the tension again using the specifications for a used V-belt.

8

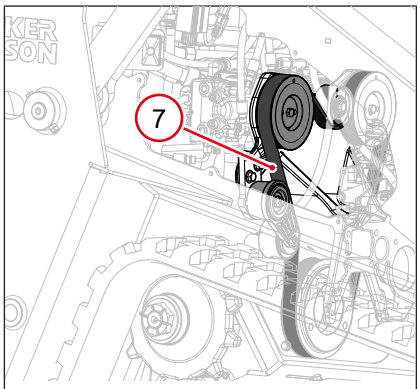


Fig. 101: Hydrostatic belt

Checking the hydrostatic drive belt

Over the life of the machine, the hydrostatic drive belt **(7)** will stretch in length and need to be adjusted. The hydrostatic drive belt may also slip during high hydraulic load events.

In these cases, follow the procedure below to add tension to the belt:

1. Raise the lift arm and install the lift arm support device. For further information, see Lift Arm Support Device on page 81.
2. Remove the right side panel.

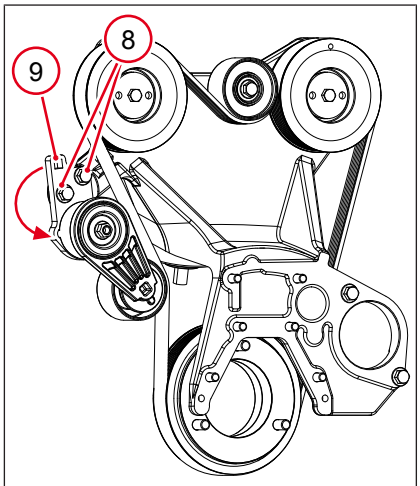


Fig. 102: Hydrostatic belt adjustment

3. Loosen but do not remove the two screws **(8)** securing the tensioner.
4. Using a standard 3/8 in. socket driver, rotate the adjustable tensioner spacer **(9)** counterclockwise until the end of travel is reached.
5. While holding the tensioner spacer in place, retighten the screws.

8.18 Checking the Undercarriage

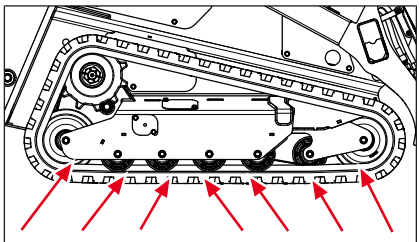


Fig. 103: Undercarriage bolts

When

Every 50 hours

Procedure

- Check for loose bolts and nuts as shown. For standard torque specifications, see Tightening Torques on page 130.
- Check the condition of the cotter pin on the sprocket castle nut.

8.19 Inspecting Hoses and Hard Lines

When

Every 50 hours

Procedure

Inspect hoses and lines periodically (at least weekly) for signs of wear. Observe the following:

- Look for leakage or seepage along the entire length of the hose/line, especially at the ends.
- Check hose clamps for damage.
- Look for rust on metal lines.
- Hoses should be firm and springy. Hoses that are cracked, soft, covered in oil, or otherwise obviously damaged should be replaced.

8.20 Servicing the Air Cleaner

⚠ WARNING

Fire hazard

Flammable liquids pose a fire hazard when cleaning.

► Do not use gasoline or other types of low flash point solvents to clean the air cleaner.

NOTICE

Foreign material entering the engine may damage it.

► Do not operate the engine with the air cleaner elements removed.

NOTICE

Compressed air can damage air filter elements.

► Do not use compressed air to clean the air filter elements.

8

When

Every 10 hours or daily, check the air filter restriction indicator on the display. Replace the air filter when the indicator is illuminated.

Requirements

- Machine parked on a level surface
- Machine shut down and cool to the touch
- Damp cloth

Overview

The air cleaner is located in the engine compartment.

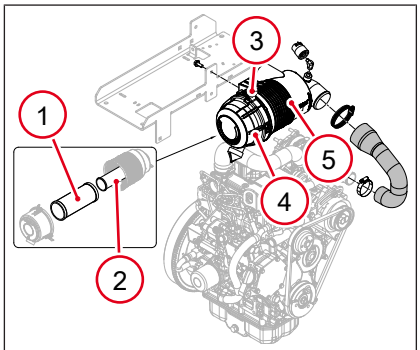


Fig. 104: Air cleaner components

Procedure

If the outer air filter element **(1)** is excessively dirty, replace it. Replace the inner air filter element **(2)** every third time the outer air filter element is replaced. Check for any signs of leaks or damaged components throughout this process.

1. Release the latch **(3)** and remove the cover **(4)** from the air cleaner housing **(5)**.
2. Remove the outer air filter element from the air cleaner housing. If necessary, also remove the inner air filter element.
3. Clean the inside of the air cleaner housing components with a damp cloth.
4. Install the air filter elements and the cap, making sure they are properly seated.
5. Install the cover and fasten the latch.

8.21 Checking and Adjusting Track Tension

⚠ WARNING

Personal injury hazard

Grease escaping under pressure can penetrate the skin and cause serious injury or death.

- ► Open the lubricating valve very carefully.
- ► Wear protective gloves and safety glasses.
- ► Release grease only as described below.
- ► Contact a Wacker Neuson service center if this does not reduce track tension.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 50 hours

Requirements

- Machine parked on a level surface
- Machine shut down
- Plastic sheet to protect work surface
- Floor jack and jack stands
- Wrench

- Grease gun
- Check tool

Overview

Track wear can vary depending on the type of work and ground conditions. Maintaining the correct track tension extends the life of the tracks by reducing wear.

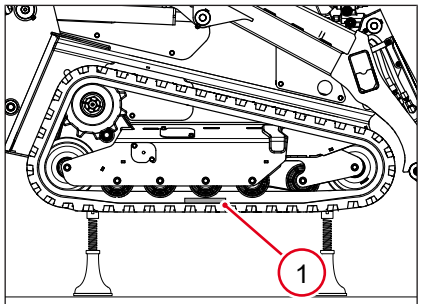


Fig. 105: Check tool location

Checking track tension

1. Raise the machine using a floor jack and jack stands.
   ⇨ Be careful not to position the jack stands under the belly pan cover.
2. Use a check tool **(1)** as shown to measure the sag distance between the indicated roller and the track.
   ⇨ If needed, make a check tool from metal, plastic, or wood stock.
   ⇨ The check tool should fit snugly between the track roller way and the bottom of the roller.
3. Adjust the track tension so the distance between the roller and track matches the specified value in the following table:

Model	Gap
SM100	18 mm (0.71 in.)
SM120	28 mm (1.1 in.)

Note: Follow the procedures below to increase or reduce track tension.

Increasing track tension

1. On the side of the machine that needs its track adjusted, loosen the screws **(2)** securing the grease valve cover and swing the cover **(3)** down.

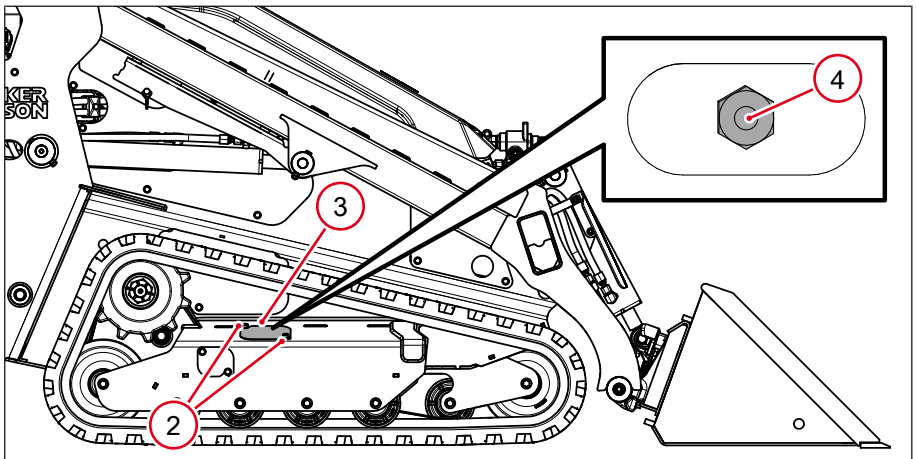


Fig. 106: Screws, cover, and valve

2. Apply grease into the valve **(4)** with a grease gun.
3. Referring to the previous table, check the track tension again. If the track tension is still out of specification, apply more grease into the valve.

8

4. If the track still does not have enough tension after applying more grease, do not put the machine into operation. Contact a Wacker Neuson dealer.
5. Lower the machine to the ground.
6. Install the cover.

Reducing track tension

1. On the side of the machine that needs its track adjusted, loosen the screws securing the grease valve cover and swing the cover down.
2. Slowly turn the valve counterclockwise to release the grease into a suitable container.
   ⇨ The grease flows out of the groove of the valve.
3. Tighten the valve until it is snug.
4. Referring to the previous table, check the track tension again. If the track tension is still out of specification, release more grease from the valve.
5. If the track still does not have enough tension after releasing more grease, do not put the machine into operation. Contact a Wacker Neuson dealer.
6. Lower the machine to the ground.
7. Install the cover.

8.22 Checking and Cleaning the Radiator Fins

⚠ CAUTION

Personal injury hazard

Using compressed air or high-pressure water may cause eye injuries due to flying debris, dust, and steam.

► Wear eye protection when using compressed air or high-pressure water.

NOTICE

Cleaning the radiator improperly will damage the radiator fins.

► Do not use high-pressure water or compressed air at a pressure greater than 28 psi (193 kPa).

► Do not use a wire brush.

When

Every 250 hours

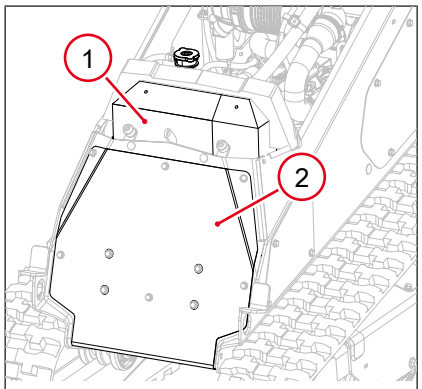


Fig. 107: Radiator and front panel

Checking and cleaning the radiator fins

1. Stop the engine.
2. Open the hood.
3. Use compressed air to clean loose dirt and debris from the radiator **(1)**. **Note:** The front panel **(2)** can be removed for easier and better access to the radiator. Before removing the panel, raise the lift arm and install the lift arm support device. For more information, see Lift Arm Support Device on page 81.
4. Use a low pressure water stream to clean dirt from the surface of the radiator.

8.23 Replacing the Fuel Filter

⚠ WARNING

Explosion and fire hazard when handling fuel!

Can cause serious burns or death.

- ► Bleed the fuel system only if the engine is cold.
- ► Wear protective equipment.
- ► Never perform work on the fuel system near open flames or sparks.
- ► Do not smoke.
- ► Keep the maintenance area clean.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 500 hours

Requirements

- Replacement genuine Wacker Neuson fuel filter
- Container of sufficient volume to collect drained fluid

Procedure

1. Raise the lift arm and install the lift arm support device. For more information, see Lift Arm Support Device on page 81.
2. Shut down the machine.
3. Allow the machine to cool for at least 5 minutes.
4. Lift the hood.

5. Interrupt the fuel supply by turning the fuel valve **(1)** 180° to the CLOSED (up) position on the water separator **(2)**.

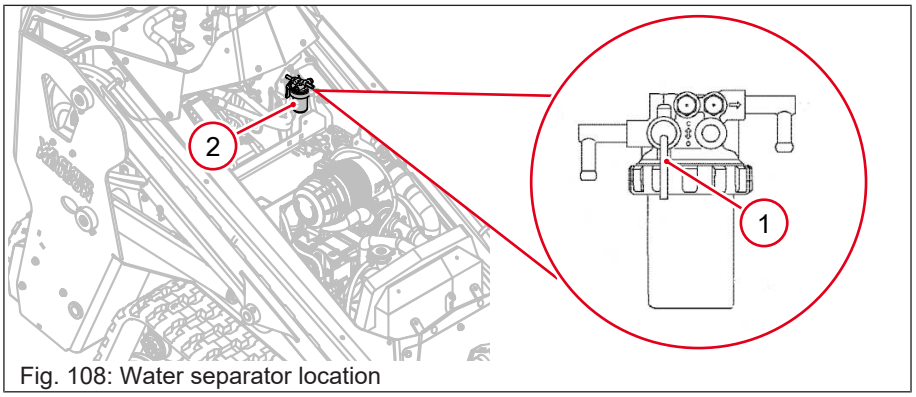


Fig. 108: Water separator location

6. Remove the side panel next to the fuel filter.
7. On the fuel filter **(3)**, unscrew the threaded fitting **(4)** using an appropriate filter wrench, if necessary.

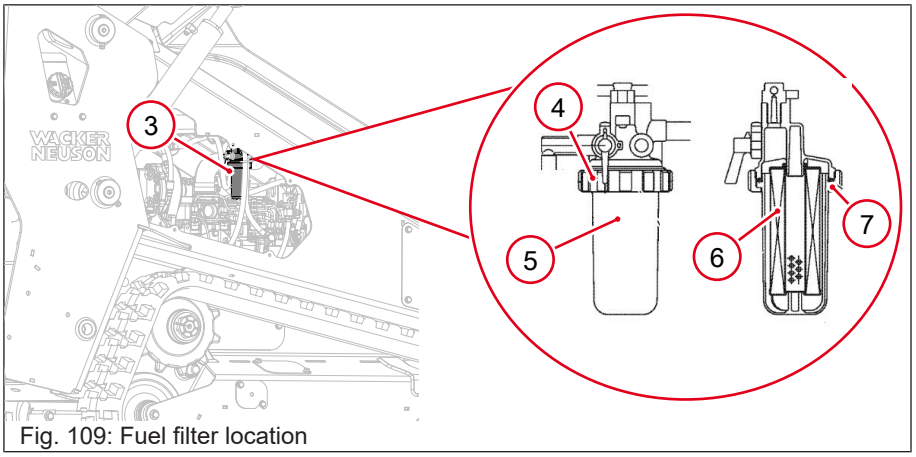


Fig. 109: Fuel filter location

8. Carefully remove the cartridge **(5)**. Clean up any spills immediately.
9. Pour the fuel into an approved container and dispose of waste properly.
10. Remove the fuel filter element **(6)**.
11. Install the new fuel filter element.
    Note: Do not fill the new fuel filter with fuel.
12. Clean the inside of the cartridge.
13. Check the O-ring **(7)** for damage. Replace the O-ring if necessary.
14. Install the cartridge and hand-tighten the threaded fitting.
15. Open the fuel supply fuel by turning the fuel valve to the OPEN (down) position on the water separator.
16. Prime the fuel system by turning the key switch to the ON position (position 1) for 10 to 15 seconds.
17. Check for any fuel leaks.

8.24 Replacing the Hydraulic Oil and Filter

When

Every 500 hours, or as indicated by the display

Requirements

- Machine parked on a flat, level surface
- All hydraulic cylinders retracted (lift arm down, coupler rolled in)
- Machine shut down
- Replacement oil
- Replacement filter

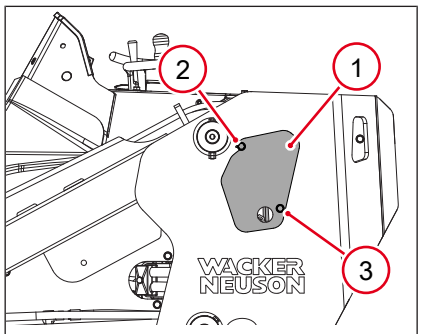


Fig. 110: Hydraulic fill access plate

Replacing the hydraulic oil

1. Move the hydraulic fill access plate **(1)** by removing the retaining bolt **(2)** and loosening the pivot bolt **(3)**.
2. Rotate the access plate out of the way.
3. Jack up the machine and place it on jack stands.

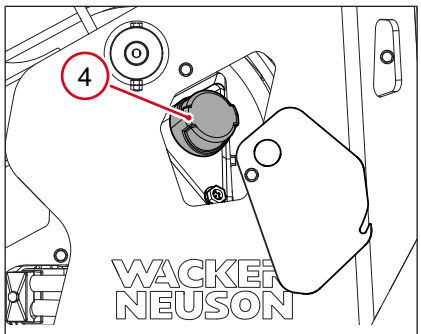


Fig. 111: Hydraulic tank filler cap

4. Remove the hydraulic tank filler cap **(4)**.

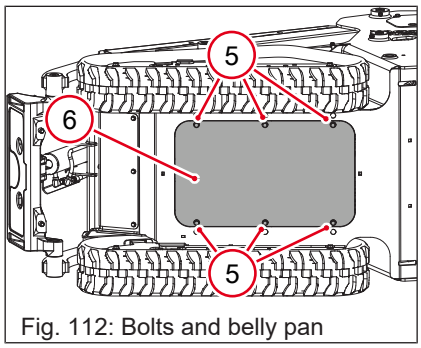


Fig. 112: Bolts and belly pan

5. Remove the bolts **(5)** that secure the belly pan **(6)** and remove the pan.

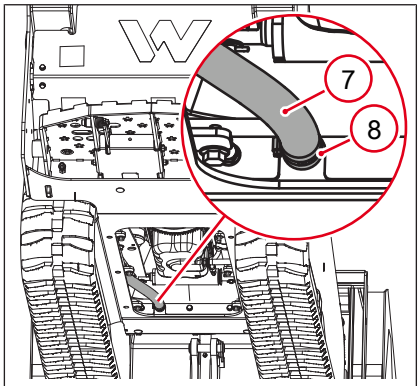


Fig. 113: Hose and clamp

6. Place a suitable container under the hydraulic oil hose **(7)** that runs to the oil cooler.
7. Loosen the hose clamp **(8)** and carefully remove the hose from the oil cooler.
8. Once all the hydraulic oil has drained, install the hose and secure it with the clamp.

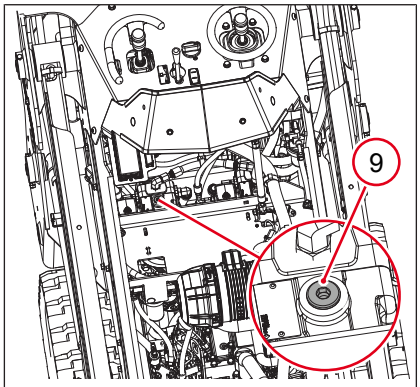


Fig. 114: Hydraulic pump port plug (some components removed for clarity)

9. Locate the hydraulic pump in the engine bay, and remove the port plug **(9)**.
10. Add replacement hydraulic oil to the reservoir until oil comes out of the port.
11. Install the plug and tighten it to 15 Nm (11 lb-ft).
12. Install the belly pan using the bolts previously removed.
13. Remove the machine from the jack stands.

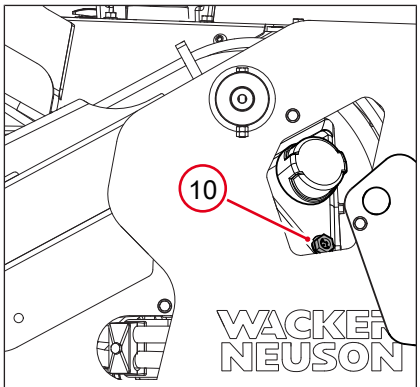


Fig. 115: Sight glass

14. Add replacement hydraulic oil to the reservoir until the fluid level is half full in the reservoir sight glass **(10)**.
15. Install the hydraulic tank filler cap.
16. Start the engine and operate the hydraulic controls.
17. Stop the engine and check for leaks.
18. Observe the hydraulic oil level through the sight glass and add fluid if necessary. For further information, see Checking and Filling the Hydraulic Oil on page 92.

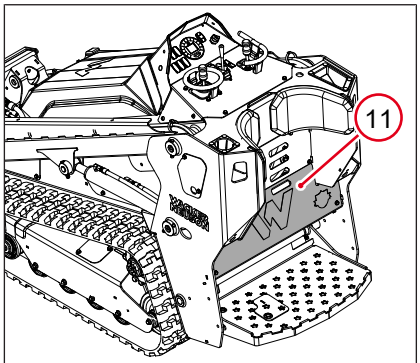


Fig. 116: Rear access panel

Replacing the hydraulic filter

1. While supporting the rear access panel **(11)**, remove the bolts that secure the panel to the machine.
2. Remove the panel from the machine.
3. Place a suitable container under the filter to catch any fluid.

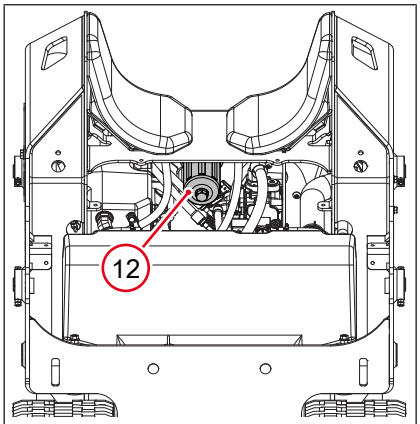


Fig. 117: Hydraulic filter housing

4. Remove the hydraulic filter housing **(12)**.
5. Remove the hydraulic filter element making sure the seal comes with the element.
6. Put clean oil on the new seal.
7. Install the new hydraulic filter element with seal.
8. Install the hydraulic filter housing.
9. Start the engine and operate the hydraulic controls.
10. Stop the engine and check for leaks.
11. Observe the hydraulic oil level through the sight glass and add fluid if necessary. For further information, see Checking and Filling the Hydraulic Oil on page 92.
12. Using the bolts removed earlier, install the rear access panel.

8.25 Replacing the Hydraulic Tank Filler Cap

When

Every 1000 hours

Requirements

- Machine parked on a flat, level surface
- Machine shut down
- Replacement hydraulic tank filler cap

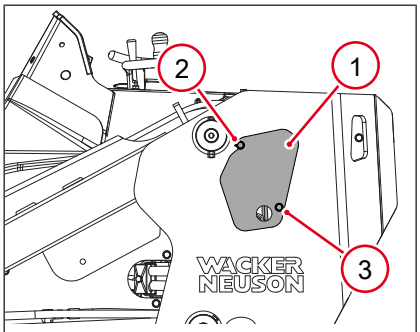


Fig. 118: Access plate and bolts

Procedure

1. Remove the hydraulic fill access plate **(1)** by removing the retaining bolt **(2)** and loosening the pivot bolt **(3)**.
2. Rotate the access plate out of the way.

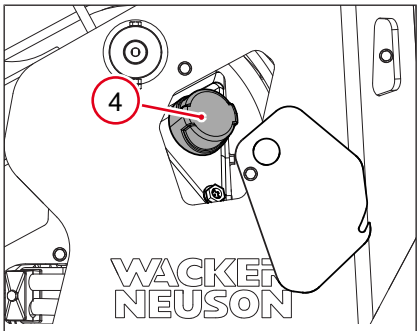


Fig. 119: Hydraulic tank filler cap

3. Remove the old hydraulic tank filler cap **(4)**.
4. Install the new hydraulic tank filler cap.
5. Rotate the access plate back into place.
6. Install the retaining bolt.
7. Tighten the pivot bolt.

8.26 Maintaining the Battery

⚠ DANGER

Explosion hazard

Batteries can emit explosive hydrogen gas.

- ► Keep all sparks, flames, and other ignition sources away from the battery.
- ► Do not short circuit battery posts.
- ► If the electrolyte is frozen, slowly warm the battery before recharging.

⚠ WARNING

Health hazard

Battery fluid is poisonous and corrosive.

- ► In the event of ingestion or contact with skin or eyes, wash skin or eyes with water and seek medical attention immediately.

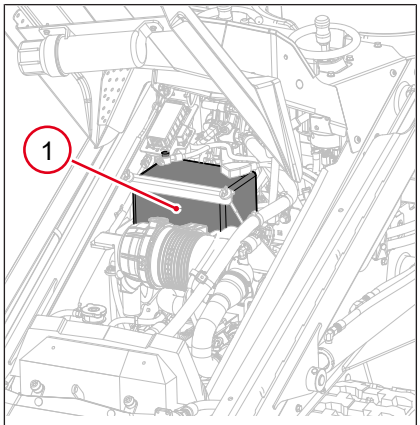


Fig. 120: Battery location

Precautions

To prevent serious damage to the electrical system:

- Do not disconnect the battery **(1)** while the machine is running.
- Do not reverse the positive (+) and negative (-) ends of the battery cable.
- Do not attempt to run the machine without a battery.
- Wear gloves and eye protection when working with batteries.
- When handling the battery, follow the battery manufacturer's safety instructions. Batteries contain caustic acids.
- A potentially combustible oxygen-hydrogen mixture forms in batteries during normal operation and especially when charging. Keep flames and sparks away from the battery.
- In the event that the machine has a discharged battery, either replace the battery with a fully charged battery or charge the battery using an appropriate battery charger.
- Dispose of discharged batteries in accordance with local environmental regulations.
- Agricultural or other chemicals, especially those with a high sulfur content, can adhere to the IC regulator. This will corrode the conductor and result in battery over-charging (boiling) and charging malfunctions. Consult YANMAR before using the equipment in such an environment or the warranty is voided.

When

- Every 50 hours—check the battery for damage; check cables and connections, and recharge

Maintaining

- Keep battery terminals clean and connections tight.
- When necessary, tighten the cables and grease the cable clamps with battery terminal grease or petroleum jelly.
- Maintain the battery at full charge to improve cold weather starting.

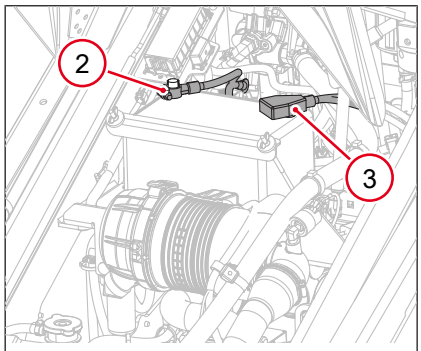


Fig. 121: Battery connections

Disconnecting

1. Stop the machine and shut down the engine.
2. Place all electrical switches in the OFF position.
3. Disconnect the negative battery cable **(2)** from the battery.
4. Disconnect the positive battery cable **(3)** from the battery.

Connecting

1. Connect the positive battery cable to the battery.
2. Connect the negative battery cable to the battery.

8.27 Engine—Jump-starting

⚠ WARNING

Personal injury hazard

Jump-starting a battery incorrectly can cause the battery to explode, resulting in severe personal injury or death.

- ► Keep all arcs, sparks, flames, and lighted tobacco away from the battery.
- ► Do not jump-start a frozen battery.
- ► Do not short circuit battery posts. Do not touch the frame or the negative terminal when working on the positive terminal.
- ► Wear safety glasses and gloves while using cables.

⚠ WARNING

Health hazard

Battery fluid is poisonous and corrosive.

- ► In the event of ingestion or contact with skin or eyes, wash skin or eyes with water and seek medical attention immediately.

⚠ CAUTION

Personal injury hazard

Electrical arcing can cause severe personal injury.

- ► Do not allow positive and negative cable ends to touch.

NOTICE

Observe the following precautions to prevent serious damage to the electrical system.

- ► Jump-starting a shorted or defective battery will cause the voltage regulator to supply higher than normal voltage. This can severely damage the digital electronics that control machine operation. If there is any doubt as to the battery's condition, a replacement battery should be used or an attempt should be made to charge the battery before starting the machine.
- ► Do not connect the negative clamp to a carburetor, fuel lines, or sheet metal body parts.
- ► Do not attempt to operate the machine without a battery.
- ► Dispose of waste batteries in accordance with local environmental regulations.

NOTICE

Extreme cold can cause the electrolytes inside the battery to freeze. Attempting to jump-start a frozen battery can cause it to rupture.

- ► When possible, do not allow the battery to sit in extreme cold.
- ► Slowly warm a frozen battery before trying to jump-start it.

NOTICE

Long cranking cycles can damage the starter.

- ► Do not crank the starter for more than 15 seconds.
- ► Wait 30 seconds before trying to crank the starter again so the battery can recover and the starter does not become overheated.

Overview

Jump-starting may be required if a battery is discharged. If jump-starting is needed, the following procedure is recommended to prevent starter damage, battery damage, and personal injuries.

Procedure

There are two procedures listed below. The first is for jump-starting a machine using another machine. The second is for jump-starting a machine with a jump pack.

Jump-starting the battery with another machine

1. In very cold weather, check the condition of the electrolytes. If it seems slushy or frozen, do not try jump-starting until it thaws.
2. Ensure all controls are in neutral and that the key switch is off.
3. Use a machine with a battery of the same voltage as is used with your engine system.

4. Attach one of the positive cable clamps (red) to the positive (+) terminal of the discharged battery. Attach the other positive cable clamp to the positive terminal of the donor battery.
5. Attach one of the negative cable clamps (black) to the negative (-) terminal of the donor battery. Attach the other negative cable clamp to a solid chassis ground on the engine or unpainted portion of the machine frame away from the discharged battery.
6. Start the engine on the machine with the donor battery.
7. Wait a minimum of 2 minutes while the discharged battery charges.
8. Turn the ignition key and hold it until the engine starts.
9. Immediately after the engine starts, disconnect the negative cable clamp first from the chassis ground (or unpainted portion of the machine frame) and then the negative cable clamp from the donor battery.
10. Disconnect the positive cable clamp from the donor battery and then the positive cable clamp from the discharged battery.

Jump-starting the battery with a jump pack

1. In very cold weather, check the condition of the electrolytes. If it seems slushy or frozen, do not try jump-starting until it thaws.
2. Ensure all controls are in neutral and that the key switch is off.
3. Use a jump pack rated to start the machine.
4. Attach the positive cable clamp (red) to the positive (+) terminal of the discharged battery.
5. Attach the negative cable clamp (black) to a solid chassis ground on the engine or unpainted portion of the machine frame away from the battery.
6. If required, turn the power switch to ON on the jump pack.
7. Wait a minimum of 2 minutes while the discharged battery charges.
8. Turn the ignition key switch and hold it until the engine starts.
9. Immediately after the engine starts, disconnect the negative cable clamp.
10. Disconnect the positive cable clamp.
11. When using light or high amperage draw accessories, idle the engine for a period of 20 minutes to bring the battery to charge state.

8.28 Fuse and Relay Box Layout

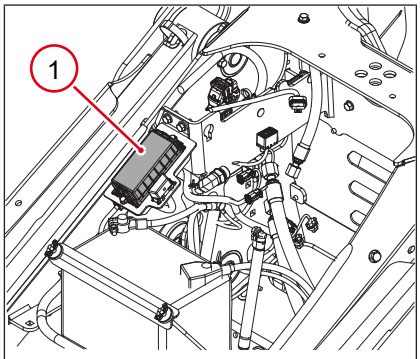


Fig. 122: Fuse and relay box

Location

The fuse and relay box **(1)** is located under the hood on the right side of the machine near the battery.

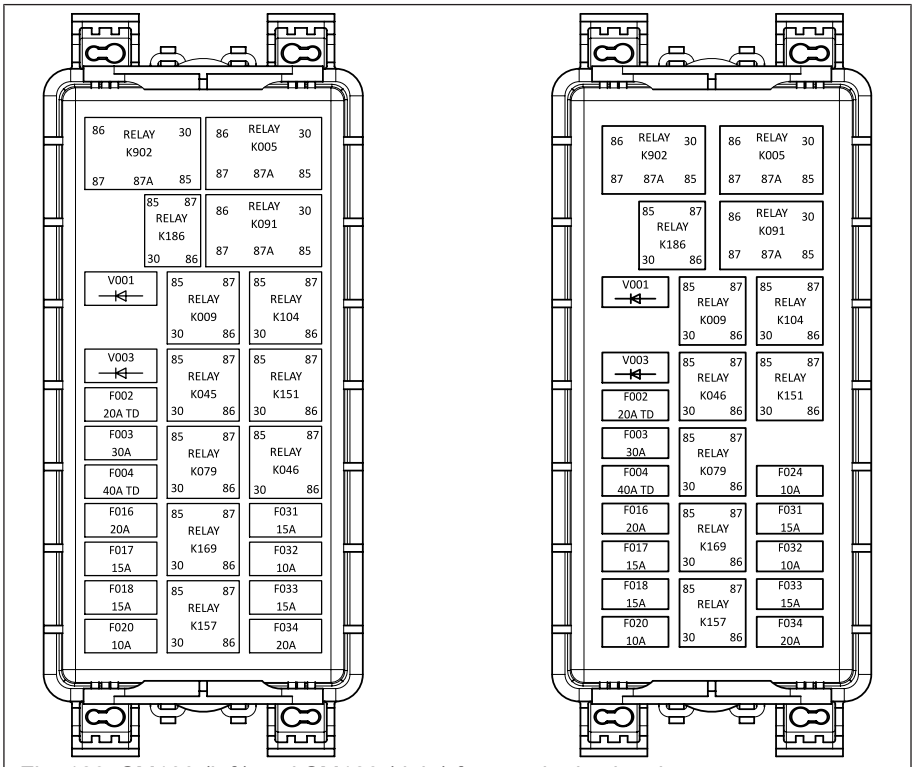


Fig. 123: SM100 (left) and SM120 (right) fuse and relay box layouts

ID	Description	Rating (A)
	Relays	
K005	Glow plug	35
K009	Fuel rack actuator	20
K045	Aux. hydraulic magnetic detent (SM100 only)	20
K046	Workgroup isolation	20
K079	Workgroup release	20
K091	Parking brake release	35
K104	Operator presence	20
K151	Aux. letdown	20
K157	ECU main	20
K169	Starter safety interlock	20
K186	Aux. electric “K”	20
K902	Main ignition	35
	Fuses	
F002	Starter solenoid	20
F003	Glow plugs	30
F004	Main ignition	40

ID	Description	Rating (A)
F016	Aux. electric key switch	20
F017	Aux. electric “A”	15
F018	Aux. electric “B”	15
F020	ECU and fuel rack actuator	10
F024	Option controller B+ supply (SM120 only)	10
F031	Key switch / operator presence / telematics / diagnostics / ECU	15
F032	Display / telematics / diagnostics	10
F033	12V outlet / work lights	15
F034	Parking brake / workgroup / fuel pump / miscellaneous	20
Diode		
V001	Parking brake-workgroup ISO	1
V003	ECU supply ISO	1

9 Troubleshooting

9.1 Engine and Engine Oil Warning Lights

Engine Warning	Engine Stop	Oil Pressure	Description
Yellow	Red	Red	
			—
On	On	On	All warning and indicator lights illuminate for a few seconds if the key is turned to position 1. If the engine stop or oil pressure light illuminates during operation, stop machine operation immediately and contact a Wacker Neuson service center.
Off	Off	Off	No malfunction.
On	On	On	Low oil pressure (if the oil pressure indicator light illuminates during operation). Check the oil level and add oil if needed. If the indicator light still indicates the malfunction, stop the engine and contact a Wacker Neuson service center.

9.2 Diagnostic Trouble Codes

SPN	FMI	Description
517006	26	Hydraulic Oil Temperature Sensor Out of Range
517000	26	Fuel Level Sensor Out of Range
519014	24	Parking Brake Push Button Logic Error

DTC (J1939 Format)			Description	J1939 Lamp Status			
SPN (Hex)	SPN (DEC)	FMI		MIL	RSL	AWL	PL
4BA	1210	4	Engine Fuel Rack Position Sensor : Shorted to low source			**X**	
		3	Engine Fuel Rack Position Sensor : Shorted to high source		**X** (Engine drive)	**X** (E-ECU start)	
5B	91	4	Accelerator Pedal Position Sensor "A" : Shorted to low source			**X**	
		3	Accelerator Pedal Position Sensor "A" : Shorted to high source			**X**	
		2	Accelerator Pedal Position Sensor "A" : Intermittent fault				
		1	Accelerator Pedal Position Sensor "A" : Below normal operational range (SAE J1843)			**X**	
		0	Accelerator Pedal Position Sensor "A" : Above normal operational range (SAE J1843)			**X**	
		15	Accelerator Pedal Position Sensor "A" : Not available (SAE J1843)			**X**	
1D	29	4	Accelerator Pedal Position Sensor "B" : Shorted to low source			**X**	

DTC (J1939 Format)			Description	J1939 Lamp Status			
SPN (Hex)	SPN (DEC)	FMI		MIL	RSL	AWL	PL
		3	Accelerator Pedal Position Sensor "B" : Shorted to high source			X	
		2	Accelerator Pedal Position Sensor "B" : Intermittent fault				
		1	Accelerator Pedal Position Sensor "B" : Below normal operational range (SAE J1843)			X	
		0	Accelerator Pedal Position Sensor "B" : Above normal operational range (SAE J1843)			X	
		8	Accelerator Pedal Position Sensor "B" : Communication fault			X	
		15	Accelerator Pedal Position Sensor "B" : Not available (SAE J1843)			X	
6C	108	4	Barometric Pressure Sensor : Shorted to low source	X			
		3	Barometric Pressure Sensor : Shorted to high source	X			
		2	Barometric Pressure Sensor : Intermittent fault				
470	1136	4	E-ECU Internal Temperature Sensor: Shorted to low source			X	
		3	E-ECU Internal Temperature Sensor : Shorted to high source			X	
		2	E-ECU Internal Temperature Sensor : Intermittent fault				
		0	E-ECU Internal Temperature : Too High				X
6E	110	4	Engine Coolant Temperature Sensor: Shorted to low source			X	
		3	Engine Coolant Temperature Sensor: Shorted to high source			X	
		2	Engine Coolant Temperature Sensor : Intermittent fault				
		0	Engine Coolant Temperature : Too High				X
437	1079	4	Sensor 5V : Shorted to low source			X	
		3	Sensor 5V : Shorted to high source			X	
		2	Sensor 5V : Intermittent fault				
9E	158	1	System Voltage : Too Low				X
		0	System Voltage : Too High				X
436	1078	4	Engine Fuel Injection Pump Speed Sensor : Shorted to low source		X (Both)	X (Either)	
7F8A2	522402	4	Auxiliary Speed Sensor : Shorted to low source [1)]				
7F801	522241	4	Engine Fuel Rack Actuator Relay : Circuit fault A [1)]		X		
		3	Engine Fuel Rack Actuator Relay : Circuit fault B		X		
		7	(Reserved)				
		2	Engine Fuel Rack Actuator Relay: Intermittent fault				
7F803	522243	4	Air Heater Relay : Circuit fault A [1)]	X			
		3	Air Heater Relay : Circuit fault B	X			
		2	Air Heater Relay : Intermittent fault				
7F802	522242	4	Cold Start Device : Circuit fault A [1)]	X			
		3	Cold Start Device : Circuit fault B	X			
		2	Cold Start Device : Intermittent fault				
64	100	4	Oil Pressure Switch : Shorted to low source			X	

DTC (J1939 Format)			Description	J1939 Lamp Status			
SPN (Hex)	SPN (DEC)	FMI		MIL	RSL	AWL	PL
		1	Oil Pressure : Too Low				X
A7	167	4	Battery Charge Switch : Shorted to low source			X	
		1	Charge warning				X
7F84A	522314	0	Engine Coolant Temperature : Abnormal temperature [1)]				X
BE	190	0	Engine speed : Over speed Condition		X		
27E	638	4	Engine Fuel Rack Actuator : Shorted to low source		X		
		3	Engine Fuel Rack Actuator : Shorted to high source		X		
		7	Engine Fuel Rack Actuator : Mechanical Malfunction		X		
		2	Engine : Malfunction		X		
27F	639	12	High Speed CAN Communication : Communication fault			X	
276	630	2	E-ECU internal fault : EEPROM Check Sum Error (Data Set 2)		X		
		12	E-ECU internal fault : EEPROM ReadWrite fault			X	
274	628	12	E-ECU internal fault : FlashROM Check Sum Error (Main Software)		X		
		2	E-ECU internal fault : FlashROM Check Sum Error (Data Set 1)		X		
		2	E-ECU internal fault : FlashROM Check Sum Error (Data Set 2)		X		
5CD	1485	4	E-ECU Main Relay : Shorted to low source			X	
7F9E7	522727	12	E-ECU internal fault : Sub-CPU Error A [1)]			X	
		12	E-ECU internal fault : Sub-CPU Error B			X	
		12	E-ECU internal fault : Sub-CPU Error C			X	
7F9E8	522728	12	E-ECU internal fault : Engine Map Data Version Error [1)]		X		
7F9EA	522730	12	Immobilizer : CAN Communication fault [1)]			X	
		8	Immobilizer : Pulse Communication fault			X	
4B2	1202	2	Immobilizer: System fault			X	

1) Yanmar original diagnostic trouble code

10 Shutdown

10.1 Long-Term Storage

NOTICE

Allowing the battery to freeze or completely discharge is likely to cause permanent damage.

► Periodically charge the battery while the machine is not in use.

► In cold climates, store and charge the battery indoors or in a warm location.

Introduction

Extended storage of equipment requires preventive maintenance. Performing these steps helps to preserve machine components and ensures the machine will be ready for future use. While not all of these steps necessarily apply to this machine, the basic procedures remain the same.

When

Prepare your machine for extended storage if it will not be operated for 30 days or more.

Preparing for storage

- Complete any needed repairs.
- Replenish or change oils (engine, hydraulic) per the intervals specified in the periodic maintenance schedule table.
- Grease all fittings.
- Inspect engine coolant. Replace coolant if it appears cloudy, is more than two seasons old, or does not meet the average lowest temperature for your area.
- Consult the engine owner's manual for instructions on preparing the engine for storage.

Stabilizing the fuel

After completing the procedures listed above, fill the fuel tank completely and add a high-quality stabilizer to the fuel.

- Choose a stabilizer that includes cleaning agents and additives designed to coat/protect the cylinder walls.
- Ensure the stabilizer you use is compatible with the fuel in your area, fuel type, grade, and temperature range.
- Use a stabilizer with a biocide to restrict or prevent bacteria and fungus growth.
- Add the correct amount of stabilizer per the manufacturer's recommendations.

Storing the machine

- Wash the machine and allow it to dry.
- Move the machine to a clean, dry, secure storage location. Block or chock the tracks to prevent machine movement.
- Use touch-up paint as needed to protect exposed metal against rust.
- If the machine has a battery, either remove or disconnect it.
- Cover the machine. To protect tracks and other exposed rubber items from the weather, either cover them or use a readily available protectant.

10.2 Machine Disposal and Decommissioning

This machine must be properly decommissioned at the end of its service life. Responsible disposal of recyclable components, such as plastic and metal, ensures these materials can be reused, conserving landfill space and valuable natural resources.

Responsible disposal also prevents toxic chemicals and materials from harming the environment. The operating fluids in this machine, including fuel, engine oil, and grease, may be considered hazardous waste in many areas. Before decommissioning this machine, read and follow local safety and environmental regulations pertaining to the disposal of construction equipment.

Preparation

- Move the machine to a protected location where it will not pose any safety hazards and cannot be accessed by unauthorized individuals.
- Ensure the machine cannot be operated from the time of final shutdown to disposal.
- Drain all fluids, including fuel, engine oil, and coolant.
- Seal any fluid leaks.

Disposal

- Disassemble the machine and separate all parts by material type.
- Dispose of recyclable parts as specified by local regulations.
- Dispose of all non-hazardous components that cannot be recycled.
- Dispose of waste fuel, oil, and grease in accordance with local environmental protection regulations.

11 Technical Data

11.1 Engine

Item	Units	SM100 / SM120
Engine make	—	Yanmar
Engine model	—	3TNV80FT
Emissions	—	Tier IV final
Number of cylinders	—	3
Displacement	L	1.266
Nominal bore and stroke	mm (in.)	Bore—80 (3.1); stroke—84 (3.3)
Output	kW (hp)	18.4 (24.7)
Gross torque	Nm (ft. lbs.)	85 (62.6)
Maximum engine speed without load	rpm	2,600
Idling speed	rpm	1,200
Fuel injection system	—	Mechanical indirect injection

11.2 Machine Speeds

Item	Units	SM100	SM120
Forward travel speed	km/h (mph)	8.4 (5.2)	8.1 (5.0)
Reverse travel speed	km/h (mph)	8.4 (5.2)	8.1 (5.0)

11.3 Fluids

Item	Units	SM100	SM120
Engine			
Oil type	—	10W-30	
Oil capacity	L (qt)	3.22 (3.41)	
Coolant type	—	50/50 ethylene glycol / water (OAT, ASTM D6210)	
Coolant capacity	L (qt)	6.88 (7.25)	
Fuel			
Tank capacity	L (gal)	53.5 (14.1)	

11.4 Electrical System

Item	Units	SM100 / SM120
Alternator	A	12V, 55A
Starter	kW	12V, 1.1 kW
Battery	CCA	12V, 650 CCA
12V adapter	A	20

11.5 Hydraulic System

Item	Units	SM100 / SM120	
Hydraulic oil type	—	10W-30	
Hydraulic oil capacity (system)	L (qt)	13.2 (14)	
Hydraulic oil capacity (reservoir)	L (qt)	5.0 (5.3)	
Aux hydraulic flow	L/min (gal/min)	49.3 (13.0)	
Aux hydraulic relief pressure	bar (psi)	210 (3,045)	227 (3,300)
Pump type	—	Gear	
Auxiliary flow rate	l/min (gpm)	49.3 (13.0)	
Lift and tilt port relief pressure	bar (psi)	230 (3,336)	
Charge/pilot pump flow rate	l/min (gpm)	14.5 (3.83)	
Charge/pilot pressure	bar (psi)	20 (290)	
Hydraulic function time:	seconds		
Raise lift arm		3.08	
Lower lift arm		2.03	
Bucket dump		1.59	
Bucket rollback		1.31	

11.6 Drive System

Item	Units	SM100 / SM120
Drive type	—	Hydrostatic
Relief pressure	bar (psi)	300 (4,351)

11.7 Controls

Item	SM100 / SM120
Type	Hydraulic pilot
Pattern	ISO
Workgroup type	ISO manual lever
Engine speed	Electronic dial
Service brake	Hydrostatic trans
Parking brake	Spring applied pressure release (SAPR)
Parking brake control	Automatic/switchable

11.8 Forces

Item	Units	SM100	SM120
Rated operating capacity (ROC) at 50% of tip load	kg (lb)	647 (1,428)	795 (1,753)
Rated operating capacity (ROC) at 35% of tip load	kg (lb)	453 (1,000)	556 (1,226)
Tip load	kg (lb)	1,295 (2,857)	1,589 (3,504)
Rated operating capacity (ROC) at 50% of tip load with counterweight	kg (lb)	708 (1,561)	—
Rated operating capacity (ROC) at 35% of tip load with counterweight	kg (lb)	495 (1,093)	
Tip load with counterweight	kg (lb)	1,416 (3,122)	
Breakout force—tilt	kN (lb)	1,467 (3,235)	
Breakout force—lift	kN (lb)	1,539 (3,393)	
Max tractive effort	N (lbf)	22,850 (5,137)	24,000 (5,396)

11.9 Weights and Ground Pressure

Item	Units	SM100	SM120
Operating weight	kg (lb)	1,497 (3,300)	1,703 (3,754)
Operating weight with 42 kg (93 lb) counterweight kit	kg (lb)	1,539 (3,393)	—
Ground pressure	kPA (psi)	28.8 (4.1)	26.9 (3.9)

Note: Add the weight of all subsequently installed equipment to the machine weight, which must be read off the label. Weight can vary by +/- 2%.

11.10 Vibration

Hand-arm vibrations

The hand-arm vibrations do not exceed 2.5 m/s².

Whole body vibrations

It is recommended to use the values given in the table when calculating the vibration values according to ISO/TR 25398: 2006. Actual conditions of use must be taken into account.

Loaders are classified according to their operating weight.

Vehicle Category	Typical Operating Condition	Average			Standard Deviation(s)		
		1.4*aw,eqx	1.4*aw,eqy	aw,eqz	1.4*sx	1.4*sy	sz
Compact skid steer loader with (rubber) tracks service weight ≤ 4,500 kg (9,921 lb)	V-shaped motion	1.21 m/s²	1.00 m/s²	0.82 m/s²	0.30 m/s²	0.84 m/s²	0.32 m/s²

11.11 Noise Values

Overview of Noise Parameters	dB(A)
Vehicle with engine 3TNV80FT	
Average sound power level LwA	100.8

Overview of Noise Parameters	dB(A)
Guaranteed sound power level LwA	102
Specified sound pressure level LpA	87.9

11.12 Tightening Torques

Property Class	8.8	10.9	12.9	8.8	10.9
	Screws According to DIN 912, DIN 933, etc.			Screws According to DIN 7984	
Screw Dimensions	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)	Nm (ft. lbs.)
M5	5.5 (4)	8 (6)	10 (7)	5 (4)	7 (5)
M6	10 (7)	14 (10)	17 (13)	8.5 (6)	12 (9)
M8	25 (18)	35 (26)	42 (31)	20 (15)	30 (22)
M10	45 (33)	65 (48)	80 (59)	40 (30)	59 (44)
M12	87 (64)	110 (81)	147 (108)	69 (51)	100 (74)
M14	135 (100)	180 (133)	230 (170)	110 (81)	160 (118)
M16	210 (155)	275 (203)	350 (258)	170 (125)	250 (184)
M18	280 (207)	410 (302)	480 (354)	245 (181)	345 (254)
M20	410 (302)	570 (420)	690 (509)	340 (251)	490 (361)
M22	550 (406)	780 (575)	930 (686)	460 (339)	660 (487)
M24	710 (524)	1,000 (738)	1,190 (878)	590 (435)	840 (620)
M27	1,040 (767)	1,480 (1,092)	1,770 (1,305)	870 (642)	1,250 (922)
M30	1,420 (1,047)	2,010 (1,482)	2,400 (1,770)	1,200 (885)	1,700 (1,254)
Fine-pitched Thread					
M8 x 1.0	25 (18)	37 (28)	43 (32)	22 (16)	32 (24)
M10 x 1.0	50 (37)	75 (55)	88 (65)	43 (32)	65 (48)
M10 x 1.25	49 (36)	71 (52)	83 (61)	42 (31)	62 (46)
M12 x 1.25	87 (64)	130 (96)	150 (111)	75 (55)	110 (81)
M12 x 1.5	83 (61)	125 (92)	145 (107)	72 (53)	105 (77)
M14 x 1.5	135 (100)	200 (148)	235 (173)	120 (89)	175 (129)
M16 x 1.5	210 (155)	310 (229)	360 (266)	180 (133)	265 (195)
M18 x 1.5	315 (232)	450 (332)	530 (391)	270 (199)	385 (284)
M20 x 1.5	440 (325)	630 (465)	730 (538)	375 (277)	530 (391)
M22 x 1.5	590 (435)	840 (620)	980 (723)	500 (369)	710 (524)
M24 x 2.0	740 (546)	1,070 (789)	1,250 (922)	630 (465)	900 (664)
M27 x 2.0	1,100 (811)	1,550 (1,143)	1,800 (1,328)	920 (679)	1,300 (959)
M30 x 2.0	1,500 (1,106)	2,150 (1,586)	2,500 (1,844)	1,300 (959)	1,850 (1,364)

YANMAR engine standard torque chart

The tightening torque in the following table should be applied only to bolts with a "7" head (JIS strength classification: 7T). Torque values shown are for clean, non-lubricated fasteners unless otherwise specified.

- For 4T bolts and locknuts, apply 60% of the torque listed in the table.
- If aluminum alloy is contained in the parts to be tightened, apply 80% of the torque listed in the table.

Thread Size x Pitch	mm	M6 x 1.0	M8 x 1.25	M10 x 1.5	M12 x 1.75	M14 x 1.5	M16 x 1.5
Tightening torque	in. lbs.	96.0 ± 9.0	—	—	—	—	—
	ft. lbs.	—	19.0 ± 2.0	36.0 ± 4.0	65.0 ± 7.0	101.0 ± 7.0	167.0 ± 7.0
	Nm	10.8 ± 1.0	25.5 ± 2.9	49.0 ± 4.9	88.3 ± 9.8	137.0 ± 9.8	226.0 ± 9.8
	kgf m	1 .1 ± 0.1	2.6 ± 0.3	5.0 ± 0.5	9.0 ± 1.0	14.0 ± 1.5	23.0 ± 2.0

11.13 Dimensions

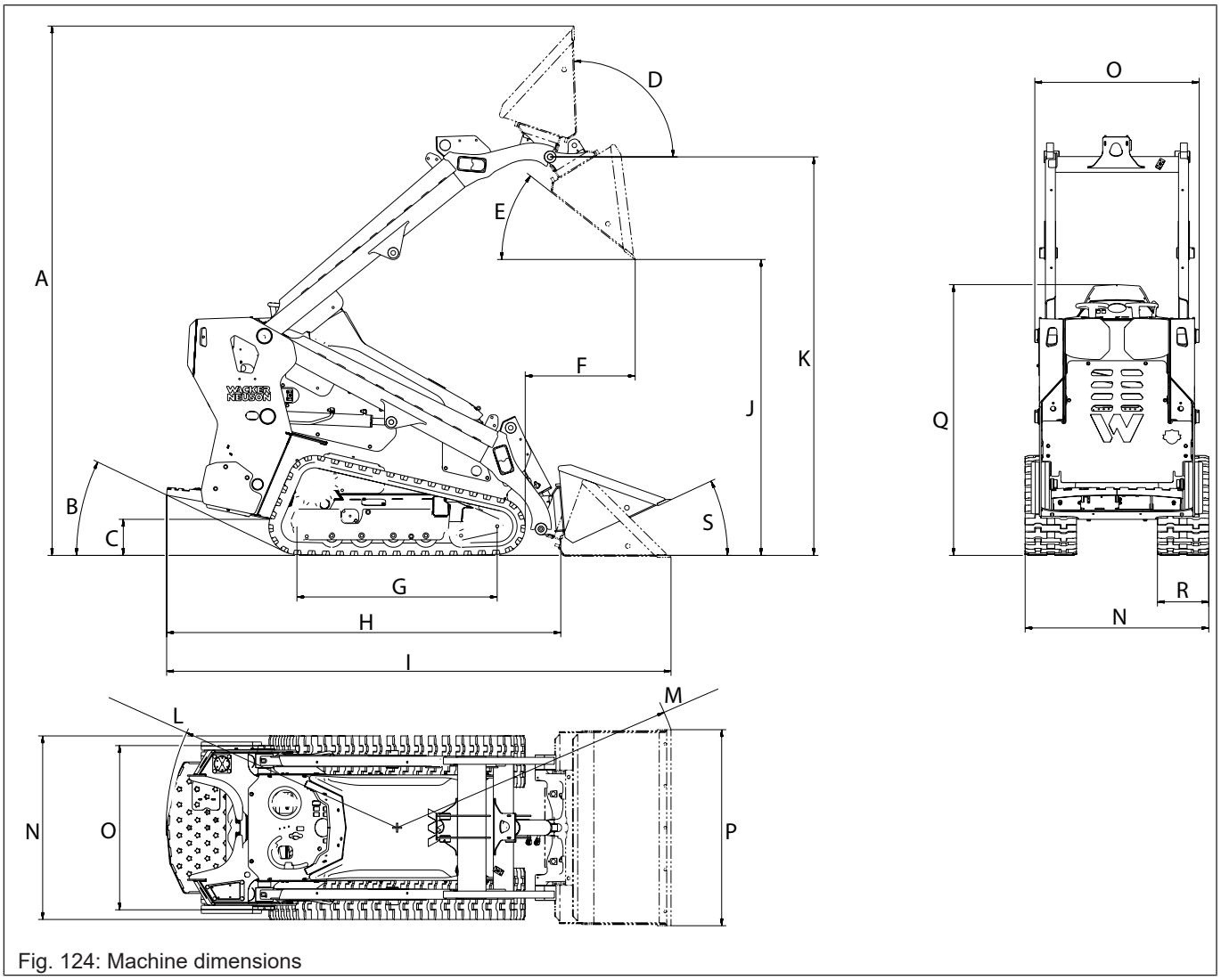


Fig. 124: Machine dimensions

DIM	Description	Units	Specification	
			SM100	SM120
A	Overall operating height, fully raised, with bucket	mm (in.)	2,892.2 (113.9)	2,889 (113.7)
B	Angle of departure	degrees	25.6	
C	Ground clearance, bottom of belly pan	mm (in.)	196.9 (7.8)	
D	Maximum rollback, fully raised	degrees	92	
E	Dump angle at maximum height	degrees	38.2	
F	Reach at maximum height	mm (in.)	604.1 (23.8)	599.9 (23.6)
G	Wheelbase	mm (in.)	1,092.5 (43)	
H	Overall length, without bucket, with coupler	mm (in.)	2,153.6 (84.8)	2,150.2 (84.7)
I	Overall length with bucket	mm (in.)	2,754.9 (108.5)	2,751.6 (108.3)
J	Dump height	mm (in.)	1,615.1 (63.6)	
K	Hinge pin height, fully raised	mm (in.)	2,175 (85.6)	
L	Clearance circle, rear	mm (in.)	1,260.2 (49.6)	
M	Clearance circle, bucket on ground	mm (in.)	1,564.5 (61.6)	1,587.1 (62.5)
N	Overall width	mm (in.)	901.74 (35.5)	1,041.4 (41)
O	Track gauge	mm (in.)	896.4 (35.3)	
P	Bucket width	mm (in.)	914.4 (36)	1,070 (42)
Q	Overall height	mm (in.)	1,478 (58.2)	
R	Track width	mm (in.)	230 (9.1)	280 (11)
S	Maximum rollback at ground	degrees	25	

12 Emission Control Systems Information and Warranty—Diesel

The Emission Control Warranty and associated information is valid only for the U.S.A., its territories, and Canada.

12.1 Emission Control System Background Information

Introduction

Wacker Neuson engines/equipment must conform with applicable Environmental Protection Agency (EPA) and California Air Resource Board (CARB) emissions regulations. These regulations require that manufacturers warrant the emission control systems for defects in materials and workmanship.

Furthermore, EPA and CARB regulations require all manufacturers to furnish written instructions describing how to operate and maintain the engines/equipment including the emission control systems. This information is provided with all Wacker Neuson engines/equipment at the time of purchase.

Exhaust emissions

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Problems that may affect emissions

If any of the following symptoms arise, have the engine/equipment inspected and repaired by a Wacker Neuson dealer/service center.

- Hard starting or stalling after starting
- Rough idling
- Misfiring or backfiring under load
- Afterburning (backfiring)
- Presence of black exhaust smoke during operation
- High fuel consumption

Tampering and altering

Tampering with or altering the emission control system may increase emissions beyond the legal limit. If evidence of tampering is found, Wacker Neuson may deny a warranty claim. Among those acts that constitute tampering are:

- Removing or altering of any part of the air intake, fuel, or exhaust systems.
- Altering or defeating the speed-adjusting mechanism causing the engine to operate outside its design parameters.

12.2 Limited Defect Warranty for Exhaust Emission Control System

See the supplied engine owner's manual for the applicable emission warranty statement.

12.3 Limited Defect Warranty for Wacker Neuson Emission Control Systems

The Emission Control Warranty is valid only for the U.S.A., its territories, and Canada.

Wacker Neuson America Corporation, N92 W15000 Anthony Avenue, Menomonee Falls, WI 53051, (hereinafter "Wacker Neuson") warrants to the initial retail purchaser and each subsequent owner, that this engine/equipment, including all parts of its emission control system, have been designed, built, and equipped to conform at the time of initial sale to all applicable evaporative emission regulations of the U.S. Environmental Protection Agency (EPA), and that the engine/equipment is free of defects in materials and workmanship which would cause this engine/equipment to fail to conform to EPA regulations during its warranty period.

Wacker Neuson is also liable for damages to other engine/equipment components caused by a failure of any warranted parts during the warranty period.

What is covered

Wacker Neuson recommends the use of genuine Wacker Neuson parts, or the equivalent, whenever maintenance is performed. The use of replacement parts not equivalent to the original parts may impair the effectiveness of the engine/equipment emission controls systems. If such a replacement part is used in the repair or maintenance of the engine/equipment, assure yourself that such part is warranted by its manufacturer to be equivalent to the parts offered by Wacker Neuson in performance and durability. Furthermore, if such a replacement part is used in the repair or maintenance of the engine/equipment, and an authorized Wacker Neuson dealer/service center determines it is defective or causes a failure of a warranted part, the claim for repair of the engine/equipment may be denied. If the part in question is not related to the reason the engine/equipment requires repair, the claim will not be denied.

For the components listed in the following table, an authorized Wacker Neuson dealer/service center will, at no cost to you, make the necessary diagnosis, repair, or replacement necessary to ensure the engine/equipment complies with the applicable EPA regulations. All defective parts replaced under this warranty become property of Wacker Neuson.

System Covered	Components
Exhaust system	Flex section of the exhaust pipe
	Tail pipe

What is not covered

- Failures other than those resulting from defects in material or workmanship.
- Any systems or parts which are affected or damaged by owner abuse, tampering, neglect, improper maintenance, misuse, improper fueling, improper storage, accident and/or collision; the incorporation of, or any use of, add-on or modified parts, or unsuitable attachments, or the alteration of any part.
- Replacement of expendable maintenance items made in connection with required maintenance services after the item's first scheduled replacement as listed in the maintenance section of the engine/equipment operator's manual, such as spark plugs and filters.
- Incidental or consequential damages such as loss of time or the use of the engine/equipment, or any commercial loss due to the failure of the engine/equipment.
- Diagnosis and inspection charges that do not result in warranty-eligible service being performed.
- Any non-authorized replacement part, or malfunction of authorized parts due to use of-non authorized parts.

Owner's warranty responsibility

The engine/equipment owner, is responsible for the performance of the required maintenance listed in the Wacker Neuson engine/equipment operator's manual. Wacker Neuson recommends that all receipts covering maintenance on the engine/equipment be retained, but Wacker Neuson cannot deny warranty coverage solely for the lack of receipts or for the failure to ensure the performance of all scheduled maintenance.

Normal maintenance, replacement, or repair of emission control devices and systems may be performed by any repair establishment or individual; however, warranty repairs must be performed by an authorized Wacker Neuson dealer/service center.

The engine/equipment must be presented to an authorized Wacker Neuson dealer/service center as soon as a problem exists. Contact Wacker Neuson Product Support Department (1-800-770-0957) or visit wackerneuson.com to find a dealer/service center in your area, or to answer questions regarding warranty rights and responsibilities.

How to make a claim

In the event that any emission-related part is found to be defective during the warranty period, you shall notify Wacker Neuson Product Support Department (1-800-770-0957, or technical.support@wackerneuson.com, or wackerneuson.com), and you will be advised of the appropriate dealer/service center where warranty repair can be performed. All repairs qualifying under this limited warranty must be performed by an authorized Wacker Neuson dealer/service center.

You must take your Wacker Neuson engine/equipment along with proof of original purchase date, at your expense, to the authorized Wacker Neuson dealer/service center during their normal business hours.

For owners located more than 100 miles from an authorized dealer/service center (excluding the states with high-altitude areas as identified in 40 CFR Part 1068, Appendix III), Wacker Neuson will pay for preapproved shipping costs to and from an authorized Wacker Neuson dealer/service center.

Claims for repair or adjustment found to be caused solely by defects in material or workmanship will not be denied because the engine/equipment was not properly maintained and used.

The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

Limited defect warranty period for Wacker Neuson emission control systems

The warranty period for this engine/equipment begins on the date of sale to the initial purchaser and continues for a period of 2 years or 2,000 hours of operation (whichever comes first). For the warranty terms for your specific engine/equipment, visit wackerneuson.com.

Any implied warranties are limited to the duration of this written warranty.

12.4 Yanmar Limited Warranty

What is covered by this warranty?

YANMAR warrants to the original retail purchaser that a new YANMAR TNV series industrial engine will be free from defects in material and/or workmanship for the duration of the warranty period.

Note: YANMAR engines may be equipped with external components including, but not limited to: wiring harnesses, electrical devices, control panels, radiators, air filters, fuel filters, and/or exhaust systems that are supplied and/or installed by manufacturers other than YANMAR. For warranty information on such external components, please contact the machine or component manufacturer directly or see your authorized YANMAR dealer or distributor

This warranty is provided in lieu of all other warranties, express or implied. YANMAR specifically disclaims any implied warranties of merchantability or fitness for a particular purpose, except where such disclaimer is prohibited by law. If such disclaimer is prohibited by law, then implied warranties shall be limited in duration to the life of the express warranty.

How long is the warranty period?

The YANMAR standard limited warranty period runs for a period of **twenty-four (24) months or two-thousand (2000) engine operation hours**, whichever occurs first. An extended limited warranty of thirty-six (36) months or three thousand (3000) engine operating hours, whichever occurs first, is provided for these specific parts only: the cylinder block, cylinder head, crankshaft forging, connecting rods, flywheel, flywheel housing, camshaft, timing gear, and gear case. The warranty period for both the standard limited warranty and the extended limited warranty (by duration or operation hours) begins on the date of delivery to the original retail purchaser and is valid only until the applicable warranted duration has passed or the operation hours are exceeded, whichever comes first.

What the engine owner must do

If you believe your YANMAR engine has experienced a failure due to a defect in material and/or workmanship, you must contact an authorized YANMAR industrial engine dealer or distributor within thirty (30) days of discovering the failure. You must provide proof of ownership of the engine, proof of the date of the engine purchase and delivery, and documentation of the engine operation hours. Acceptable forms of proof of delivery date include, but are not limited to: the original warranty registration or sales receipts or other documents maintained in the ordinary course of business by YANMAR dealers and/or distributors, indicating the date of delivery of the YANMAR product to the original retail purchaser. This information is necessary to establish whether the YANMAR product is still within the warranty period. Thus, YANMAR strongly recommends you register your engine as soon as possible after purchase in order to facilitate any future warranty matters.

You are responsible for the transportation of the engine to and from the repair location as designated by YANMAR.

To locate an authorized YANMAR industrial engine dealer or distributor

You can locate your nearest authorized YANMAR industrial engine dealer or distributor by visiting the YANMAR website at:

https://www.yanmar.com/global/ (The English language page will be displayed.)

- "Click" on "Dealer Locator" in the website heading to view the "Dealer Locator" menu.
- Choose the Country from the pull down menu.
- Choose the Product Category from the pull down menu.
- "Click" on "Search" to browse YANMAR dealer or distributor.

You may also contact YANMAR by clicking on "Contact" icon in the website heading and typing in your question or comment.

What YANMAR will do

YANMAR warrants to the original retail purchaser of a new YANMAR engine that YANMAR will make such repairs and/or replacements at YANMAR's option, of any part(s) of the YANMAR product covered by this warranty found to be defective in material and/or workmanship. Such repairs and/or replacements will be made at a location designated by YANMAR at no cost to the purchaser for parts or labor.

What is not covered by this warranty?

This warranty does not cover parts affected by or damaged by any reason other than defective materials or workmanship, including, but not limited to, accident, misuse, abuse, "Acts of God," neglect, improper installation, improper maintenance, improper storage, the use of unsuitable attachments or parts, the use of contaminated fuels, the use of fuels, oils, lubricants, or fluids other than those recommended in your YANMAR Operation Manual, unauthorized alterations or modifications, ordinary wear and tear, and rust or

corrosion. This warranty does not cover the cost of parts and/or labor required to perform normal/scheduled maintenance on your YANMAR engine. This warranty does not cover consumable parts such as, but not limited to, filters, belts, hoses, fuel injector nozzles, lubricants and cleaning fluids. This warranty does not cover the cost of shipping the product to or from the warranty repair facility.

Warranty limitations

The foregoing is YANMAR's only obligation to you and your exclusive remedy for breach of warranty. Failure to follow the requirements for submitting a claim under this warranty may result in a waiver of all claims for damages and other relief. **In no event shall YANMAR or any authorized industrial engine dealer or distributor be liable for incidental, special or consequential damages.** Such consequential damages may include, but not be limited to, loss of revenue, loan payments, cost of rental of substitute equipment, insurance coverage, storage, lodging, transportation, fuel, mileage, and telephone costs. The limitations in this warranty apply regardless of whether your claims are based on breach of contract, tort (including negligence and strict liability) or any other theory. Any action arising hereunder must be brought within one (1) year after the cause of action accrues or it shall be barred. Some states and countries do not allow certain limitations on warranties or for breach of warranties. **This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and country to country.** Limitations set forth in this paragraph shall not apply to the extent that they are prohibited by law.

Warranty modifications

Except as modified in writing and signed by the parties, this warranty is and shall remain the complete and exclusive agreement between the parties with respect to warranties, superseding all prior agreements, written and oral, and all other communications between the parties relating to warranties. **No person or entity is authorized to give any other warranty or to assume any other obligation on behalf of YANMAR, either orally or in writing.**

Questions

If you have any questions or concerns regarding this warranty, please call or write to the nearest authorized YANMAR industrial engine dealer or distributor or other authorized facility.

12.5 Yanmar Power Technology Co., Ltd. Emission Control System Warranty—USA Only

Your warranty rights and obligations

The California Air Resources Board (CARB), the United State Environmental Protection Agency (EPA) and YANMAR POWER TECHNOLOGY CO., LTD. hereafter referred to as YANMAR, are pleased to explain the **emission control system warranty** on your 2023, 2024, or 2025 model year industrial compression-ignition engine. California-certified, new off-road compression-ignition engines must be designed, built and equipped to meet the State's

stringent anti-smog standards. In the remaining forty nine (49) states, new non-road compression-ignition engines must be designed, built and equipped to meet the United States EPA emissions standards. YANMAR must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system, the air induction system, the electronic control system, and the EGR (Exhaust Gas Recirculation) system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, YANMAR will repair your off-road compression-ignition engine at no charge to you including diagnosis, parts and labor.

Manufacturer's warranty period

2023, 2024, or 2025 model year off-road compression-ignition engines are warranted for the periods listed below. If any emission-related part on your engine is found to be defective during the applicable warranty period, the part will be repaired or replaced by YANMAR.

If your engine is certified as	And its maximum power is	And its rated speed is	Then its warranty period is
Variable speed or constant speed	kW < 8	Any speed	2,000 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Variable speed or constant speed	8 ≤ kW < 19	Any speed	2,000 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19 ≤ kW < 37	3,000 rpm or higher	2,000 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19 ≤ kW < 37	Less than 3,000 rpm	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed	19 ≤ kW < 37	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed or constant speed	kW ≥ 37	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.

Warranty coverage

This warranty is transferable to each subsequent purchaser for the duration of the warranty period. YANMAR recommends that repair or replacement of any warranted part will be performed at an authorized YANMAR dealer.

Warranted parts not scheduled for replacement as required maintenance in the owner's manual shall be warranted for the warranty period. Warranted parts scheduled for replacement as required maintenance in the owner's manual are warranted for the period of time prior to the first scheduled replacement. Any warranted parts scheduled for replacement as required maintenance that are repaired or replaced under warranty shall be warranted for the remaining period of time prior to the first scheduled replacement. Any part not scheduled for replacement that is repaired or replaced under warranty shall be warranted for the remaining warranty period.

During the warranty period, YANMAR is liable for damages to other engine components caused by the failure of any warranted part during the warranty period.

Any replacement part which is functionally identical to the original equipment part in all respects may be used in the maintenance or repair of your engine, and shall not reduce YANMAR's warranty obligations. Add-on or modified parts that are not exempted may not be used. The use of any non-exempted add-on or modified parts shall be grounds for disallowing a warranty.

Warranted parts

This warranty covers engine components that are a part of the emission control system of the engine as delivered by YANMAR to the original retail purchaser. Such components may include the following:

- Fuel injection system (including Altitude compensation system)
- Cold start enrichment system
- Intake manifold and Air intake throttle valve
- Turbocharger systems
- Exhaust manifold and exhaust throttle valve
- Positive crankcase ventilation system
- Charge Air Cooling systems
- Exhaust Gas Recirculation (EGR) systems
- Exhaust gas after treatment (diesel particulate filter system, urea SCR system)
- Electronic Control units, sensors, solenoids and wiring harnesses used in above systems
- Hoses, belts, connectors and assemblies used in above systems
- Emission Control Information Labels

Since emissions related parts may vary slightly between models, certain models may not contain all of these parts and other models may contain the functional equivalents.

Exclusions

Failures other than those arising from defects in material or workmanship are not covered by this warranty. The warranty does not extend to the following: malfunctions caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance, or use of non-recommended fuels and lubricating oils; accident-caused damage and replacement of expendable items made in connection with scheduled maintenance. YANMAR disclaims any responsibility for incidental or consequential such as loss of time, inconvenience, loss of use of equipment/ engine or commercial loss.

Owner's warranty responsibilities

As the off-road compression-ignition engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. YANMAR recommends that you retain all documentation, including receipts, covering maintenance on your off-road compression-ignition engine, but YANMAR cannot deny warranty solely for the lack of receipts, or for your failure to ensure the performance of all scheduled maintenance.

YANMAR may deny your warranty coverage if your off-road compression-ignition engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with CARB and EPA emissions requirements.

You are responsible for initiating the warranty process. You are responsible for presenting your engine to an authorized YANMAR dealer or distributor as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible. If you have any questions regarding your warranty rights and responsibilities, or would like information on the nearest YANMAR dealer or authorized service center, you should contact YANMAR America Corporation.

Website: https://www.yanmar.com

E-mail: CS_support@yanmar.com

Toll free telephone number: 1-800-872-2867, 1-855-416-7091

What the emergency stationary type engine owner must do

The engines for emergency stationary type generators certified by Federal Law (40 CFR Part60) are limited to emergency use only, and the operation for maintenance checks and verification test for functions is required. The total operating hours for maintenance and verification test for functions should not exceed 100 hours per year. However, there is no limitation on the operating hours for emergency use. Keep a log of the number of hours the engine is operated for both emergency use and non-emergency use. Also, note the reason for the operation.

COMPACT TOOL CARRIER

AEM
Association of
Equipment Manufacturers

SAFETY MANUAL

FOR OPERATING AND MAINTENANCE PERSONNEL

Contents

Acknowledgment

We wish to acknowledge the contributions of the members of AEM's Compact Loader/Compact Excavator Council to the preparation of this Safety Manual.

Foreword

This safety manual is intended to point out some of the basic safety situations that may be encountered during the normal operation and maintenance of your machine and to suggest possible ways of dealing with these conditions. This manual is **NOT** a substitute for the compact tool carrier manufacturer's operator's manual(s).

Additional precautions may be necessary, or some instructions may not apply, depending on equipment, attachments and conditions at the worksite or in the service area. The manufacturer has no direct control over equipment application, operation, inspection or maintenance. Therefore, it is **YOUR** responsibility to use good safety practices in these areas.

The information provided in this manual supplements the specific information about your machine that is contained in the manufacturer's manual(s). Other information that may affect the safe operation of your machine may be contained on safety signs or in insurance requirements, employer's safety and training programs, safety codes, local, state/provincial and federal laws, rules and regulations.

IMPORTANT! Before you operate the compact tool carrier, make sure you have the manufacturer's manual(s) for this machine and all attachments. If the manufacturer's manuals are missing, obtain replacement manuals from your employer, equipment dealer or directly from the manufacturer. Keep this safety manual and the manufacturer's manuals with the machine at all times. Read and understand all manuals.

Safety videos are available from some manufacturers. Operators are encouraged to periodically review the safety video.

Safety Alerts

Symbol

This Safety Alert Symbol means: **"ATTENTION! STAY ALERT! YOUR SAFETY IS INVOLVED!"**

The Safety Alert Symbol identifies important safety messages on equipment, safety signs, in manuals or elsewhere. When you see this symbol, be alert to the possibility of death or personal injury. Follow instructions in the safety message.

Three Reasons Safety is Important to You:

1. Accidents disable and kill.
2. Accidents cost.
3. Accidents can be avoided.

Signal Words

Signal words are distinctive words that will typically be found on safety signs on the compact tool carrier and other worksite equipment. These words may also be found in this manual and the manufacturer's manuals. These words are intended to alert the operator to a hazard and the degree of severity of the hazard.

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

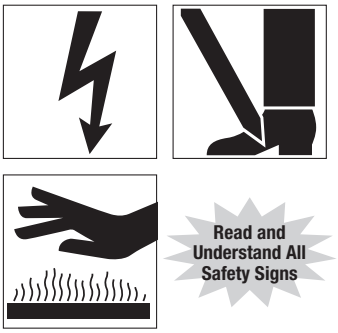
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE indicates a property damage message.

A Word to the User/Operator

It is **YOUR** responsibility to read and understand the safety manual and the manufacturer's manuals before operating this machine. This safety manual takes you step by step through your working day.

Graphics have been provided to help you understand the text.



Remember that **YOU** are the key to safety. Good safety practices not only protect you but also protect the people around you. Study this manual and the manufacturer's manuals for your specific machine. Make them a working part of your safety program. Keep in mind that this safety manual is written only for compact tool carriers.

Contact the manufacturer of your equipment to answer any questions about safe operation that remain after studying the manufacturer's manual(s) and this safety manual.

Practice all other usual and customary safe working precautions and above all:

REMEMBER — SAFETY IS UP TO YOU!

YOU CAN PREVENT SERIOUS INJURY OR DEATH CAUSED BY UNSAFE WORK PRACTICES!

The Compact Tool Carrier

This safety manual covers safe operating practices for compact tool carriers. Compact tool carriers can be equipped with either tracks or tires.

Wheeled Type

Track Type

IMPORTANT! This manual covers safe practices for compact tool carriers equipped with a bucket, pallet forks or simple attachments. If your compact tool carrier is equipped with complex attachments such as a snow blower or backhoe, read the manufacturer's operating and safety manuals for those attachments before using them.

The compact tool carrier is not intended to be used as an all-terrain vehicle.

One-Call First

Call Before You Dig
Dial 811 (USA only)

888-258-0808
(USA & Canada)

Call

Before starting any digging project, contact your local One-Call service by dialing 811 (USA only) to have underground utilities located. A One-Call referral number, **1-888-258-0808,** is also available for both USA and Canada.

One-Call will notify participating utility companies that you intend to dig. You must also call any utility companies which do not participate in the One-Call service. Always inspect the jobsite for evidence of unmarked utilities and contact others if necessary.

Plan Your Work

Be aware of the lead time for marking in your area. This time may vary from state to state and county to county. If you don't locate utilities, you may have an accident or suffer injuries, cause service interruptions, damage the environment or experience job delays.

Dig

Most utilities mark their underground facilities using American Public Works Association (APWA) underground color codes. Verify marks before digging.

In the United States, OSHA Standard 29 CFR 1926.651 requires that the estimated location of underground utilities be determined before beginning an excavation. When actual excavation approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable and dependable method. Other OSHA regulations may also apply to your jobsite.

Follow a Safety Program

Protect Yourself

Wear personal protective clothing and Personal Protective Equipment (PPE) issued to you or called for by job conditions.

You may need:
— Hard hat
— Safety shoes
— Safety glasses, goggles or face shield
— Heavy gloves
— Hearing protection
— Reflective clothing
— Wet weather gear
— Respirator or filter mask

Wear whatever is needed—don't take chances.

WARNING! Prevent death or serious injury from entanglement. **Do not wear loose clothing or accessories. Stay away from all rotating components when the engine is running.** Contact, wrapping or entanglement with rotating or moving parts could result in death or serious injury.

Follow a Safety Program

Be Alert!

Know where to get assistance. Know how to use a first aid kit and fire extinguisher/fire suppression system.

Be Aware!

Take advantage of training programs offered.

Be Careful

Human error is caused by many factors: carelessness, fatigue, overload, preoccupation, unfamiliarity of operator with the machine, drugs, and alcohol to name a few. Damage to the loader can be fixed in a short period of time, but injury, or death, has a lasting effect.

For your safety and the safety of others, encourage your fellow workers to act safely.

Never Use Drugs or Alcohol While Operating

For Safe Operation

You must be a qualified and authorized operator for safe operation of your machine. You must clearly understand the written instructions supplied by the manufacturer, be trained—including actual operation of the compact tool carrier—and know the safety rules and regulations for the worksite. It is a good safety practice to point out and explain safety signs and practices and ensure the crew understands the importance of following these instructions.

WARNING! Drugs and alcohol affect an operator's alertness and coordination and the operator's ability to safely operate the equipment. **Never use drugs or alcohol while operating the compact tool carrier. Never knowingly allow anyone to operate this compact tool carrier when their alertness or coordination is impaired.** An operator taking prescription or over-the-counter medication must consult a medical professional regarding any side effects of the medication that would hinder their ability to safely operate this equipment.

Follow a Safety Program

Know the Rules

Most employers have rules governing operation and maintenance of equipment. Before you start work at a new location, check with your supervisor or the safety coordinator. Ask about the rules you will be expected to obey.

The Occupational Safety and Health Administration (OSHA) enforces federal laws within the United States that apply to safe operation, application and maintenance of equipment on a worksite. It is the employer's responsibility to comply with these laws. An OSHA representative may periodically inspect a worksite to see that these laws are being followed.

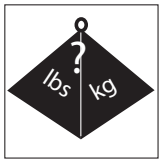
There may also be local or state/provincial laws or international regulations that apply to this equipment and its use, along with specific worksite or employer rules. It is important that you know and comply with all applicable laws and rules, including those requiring operator training and certification.

Know and Understand Rules of Operation

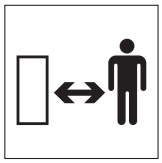
Follow a Safety Program

Some Rules You Must Work By

— Know the capacity and operating characteristics of your compact tool carrier. Do not overload it.
— Never modify or remove any part of the equipment (except for service—then make sure it is replaced).
— Keep bystanders away from the work area.
— Know the worksite before you use the compact tool carrier. Be aware of possible terrain hazards that you may encounter.
— Only use attachments that are approved by the compact tool carrier manufacturer.
— Carry the load as low as possible.
— **Never** operate the compact tool carrier on public roads.
— **Do not** allow riders.
— Make sure all attachments are lowered, set the parking brake, shut off the engine, cycle the control levers including the auxiliary hydraulic control. Remove the key before leaving the compact tool carrier.
— When transporting the compact tool carrier on a trailer, follow the manufacturer's detailed instructions for loading, tying down and unloading the compact tool carrier.



Know Weight of Load



Keep Bystanders Away

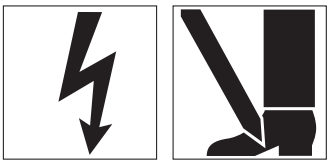
No Riders

Lower Attachments to the Ground

Follow a Safety Program

Know the Equipment

Read and understand the DANGER, WARNING, CAUTION and NOTICE safety signs and other informational signs on the compact tool carrier and in the manufacturer's operator's manual. Ask your supervisor to explain any information you do not understand. Failure to obey safety instructions could result in death or serious injury.



Read and Understand All Safety Signs

Make sure all the manufacturer's protective structures, guards, shields, screens and panels are in good repair, in place and securely fastened. Damaged, missing or weakened safety components can create a hazardous situation for you as the operator. **Never** remove or modify any safety components on your compact tool carrier.

Know the following about your compact tool carrier:
— How to operate all controls
— The functions of all gauges, lights, dials, switches
— How to operate the compact tool carrier on slopes and inclines
— Braking and steering characteristics
— Turning radius and clearances

Read and Understand Manuals Before Operating

Prepare for Safe Operation

Check the Machine

Before you begin your workday inspect your compact tool carrier and have all systems in good operational condition.

Do not operate the machine until all problems are corrected.

— Perform daily and periodic service procedures as instructed by the equipment manufacturer.
— Check and use all available protective and safety devices, such as parking brake, safety tread and grab handles.
— Check for broken, missing or damaged guards and shields. Make any necessary repairs.
— Check tires for cuts, bulges and correct inflation, or check tracks for cuts and proper tension.
— Check all safety signs for clarity. Consult the manufacturer for replacement or clarification.
— Check all fluid levels. Fill to the required level with the proper fluid as needed.
— Keep engine compartment clean and free of debris.

Maintain Machine

Maintain Proper Tire Pressure

Check the Radiator and Engine

Prepare for Safe Operation

Check the Machine (continued)

— Inspect all hoses and hose connections for wear, damage and leaks. Make all necessary repairs.
— Check the hydraulic system for leaks and damage. Repair or adjust as needed.

WARNING! Diesel fuel or hydraulic fluid under pressure can penetrate the skin or eyes and cause serious injury, blindness or death. Fluid leaks under pressure may not be visible. **Use a piece of cardboard or wood to find leaks, not your hand. Wear a face shield or safety goggles for eye protection.** If fluid is injected into the skin, it must be removed within a few hours by medical personnel familiar with this type of injury. (See page 39, **Hydraulic System Hazards.**)

— Keep the operator platform surface, if equipped, clean and free of grease, oil, dirt, snow or ice.
— Ensure all doors, safety devices, guards and covers are in place and secured properly.
— Ensure work lights are kept clean (if equipped). Check that all lights work properly.
— Ensure all tools or loose objects are removed or securely fastened while operating the compact tool carrier.

Inspect Hoses

High Pressure Fluid Can Inject into the Body

Put Away Tools

Prepare for Safe Operation

Know the Work Area

Before you operate the compact tool carrier, learn as much as possible about the work area. Walk around the worksite and inspect the surfaces you will travel on when using the compact tool carrier.

Locate and avoid:

- Holes
- Drop-offs
- Obstacles
- Excavations
- Standing water
- Deep mud
- Wet spots
- Soft soil
- Rough spots
- Slippery surfaces
- Oil spills
- Power lines and apparatus
- Gas lines or apparatus
- Other utilities
- Any conditions which could cause collision, loss of control or tipover
- Steep slopes

Correct unsafe conditions. Avoid operating in problem areas that cannot be corrected.

Check for weak spots when operating on docks, ramps or floors. Clear away trash and debris. Pick up anything that could puncture a tire.

Walk Around the Worksite

Know Weight Limits

WARNING! Avoid possible injury. The weight of your machine may cause the ground, dock, ramp or floor to give way causing loss of control, fall or tipover. **Know weight limits and stay clear of the edges of excavations or drop-offs.** Failure to know and observe weight limits and use caution could result in death or serious injury.

Prepare for Safe Operation

Know the Work Area (continued)

Plan travel routes for inside work in order to see and protect bystanders.

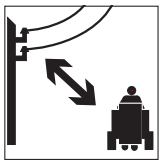
Plan your work. Make sure you know where you will make your pickups, lifts and turns. Before you raise a loaded bucket, know where you will dump it and always carry the load low.

Check for overhead obstructions. Check the clearances of doorways, canopies and overheads. Know exactly how much clearance you have under power and telephone cables.

Maintain minimum safe distance from power lines. If possible, have power to lines disconnected. If this is not possible, request a signal person to guide you while you work around power lines.

When working near power lines, always assume conductors are energized.

DANGER! Avoid electrocution or serious injury. **Do not allow load or any part of machine to approach or contact energized power lines or apparatus.** Death or serious injury will result from contact or inadequate clearance to energized power lines or apparatus.



Do Not Approach Energized Power Lines

One-Call First

WARNING! Avoid possible injury from contact with buried utilities. **Always contact your local One-Call center and any utility companies that do not subscribe to One-Call before digging.** Failure to locate existing utilities could result in death or serious injury. (See page 7, **One-Call First**.)

When excavating near underground services, expose the service by hand-digging or by using soft excavation, such as vacuum excavation when permitted by local utilities.

Prepare for Safe Operation

Plan Your Work

Before you operate, plan how and where you will travel, turn and pick up, lift and place loads.

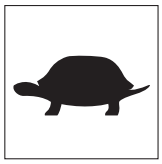
Choose a smooth level route to prevent possible tipover or loss of load. If possible, avoid crossing:
— Ruts
— Ditches
— Curbs
— Exposed Railroad Tracks

Watch Out for Obstacles

Watch for obstacles. Go around rocks and stumps. Avoid crossing ditches, curbs and other exposed raised obstacles. If obstacles are unavoidable, reduce speed, raise attachment for clearance. Check for hidden or buried obstacles that could cause a collision.

Never back off a curb or step with no load or with lift arms raised. Be careful of sudden machine movement when the loader climbs or is driven off a curb or step. Use caution when traveling on difficult terrain. Keep the load as low as possible and reduce speed.

Avoid Ruts and Ditches



Travel Slowly

Do Not Back Off Curbs with No Load

Prepare for Safe Operation

Watch Out for Obstacles (continued)

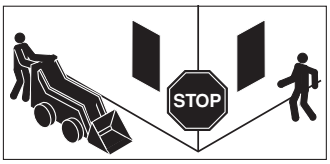
Know where there are blind corner conditions on the worksite. Before turning a blind corner, stop until your presence has been acknowledged by those in your path or the path is clear.

Always maintain a safe distance between your compact tool carrier and other equipment and obstacles at the worksite.

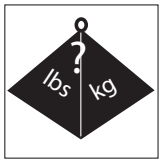
Know the weights of all loads you may be expected to transport before attempting to lift them. Secure loose loads. Check that loads are properly banded or strapped together.

If you are placing a load in an area where visibility is a problem, use a signal person near the point where the load will be landed.

Remember:
— **Be Alert**—Know that conditions can change.
— **Use Common Sense**—Show that you are a responsible operator.
— **Be a Defensive Operator**—Prevent accidents before they happen.



Avoid Blind Corners



Know Weight of Load

Use a Signal Person

Start Safely

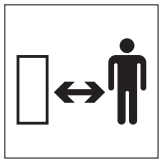
Start the Machine

Before starting the compact tool carrier and operating the machine, walk completely around the compact tool carrier and check that it is clear of personnel.

— Clean your footwear and wipe your hands before using the compact tool carrier.
— Use the handrails or handholds to mount the compact tool carrier if it is equipped with an operator platform. Never grab steering or control levers when mounting.
— Position yourself in the manufacturer's recommended operating position. The compact tool carrier must be operated only from the operating position.

Start the compact tool carrier following the specific procedures in the manufacturer's operator's manual. These procedures will normally include:

— Position all controls in NEUTRAL including the auxiliary hydraulic control.
— Be sure all brakes are set.
— Familiarize yourself with the warning devices, gauges and controls.
— Warn all others in the area that you are going to start the compact tool carrier.



Keep Bystanders Away

Three Point Contact Entry Process

Set Brake

Start Safely

Run an Operating Check

WARNING! Avoid possible injury from loss of control. **Know and understand the control pattern and control modes before operating the compact tool carrier. Do not modify manufacturer's control pattern.** Death or serious injury could result from loss of machine control.

WARNING! Avoid possible injury from fall, run over, entanglement, exposure to pinch points or tipover. **Never allow riders. This compact tool carrier is designed for ONE-PERSON operation only.** Death or serious injury could result from allowing riders on this machine.

Check before operating:

— All instruments, gauges and indicator lights
— Horn and backup alarms (if equipped)
— All control levers for proper operation
— Brakes for proper operation

If there is any indication that an abnormal condition exists or the controls do not respond correctly, shut down safely and correct the condition before operating.

Be sure you can control both the speed and direction before moving. Start, stop, travel and brake smoothly. Slow down for turns. Slow down for rough, slippery or soft terrain.

No Riders

Check Instruments and Controls

Start Safely

Check Attachment and Coupler Installation

When changing buckets or installing attachments follow the manufacturer's instructions for proper maintenance and coupling. Make sure all connectors are securely fastened. Tighten all bolts, nuts and screws to torques recommended.

Check the attachment coupler and the attachment for wear and hydraulic leaks before coupling the attachment to the machine.

Check to be sure that the coupler pins or wedges are fully engaged into the attachment and that the coupler is securely engaged to the attachment both mechanically and hydraulically before operating.

WARNING! Avoid possible crushing injury. **Failure to properly secure the attachment to the machine coupler can allow the attachment to come off and could result in death or serious injury.**

Read and Understand Manuals

Read and Understand Machine Signs

Never Lift or Swing a Load or Attachment Over Anyone

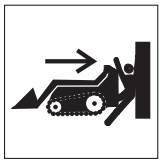
Operate Safely

Remember These Rules:

Read and Understand Manuals Before Operating

Read and Understand Machine Signs

Operate Only from Operator's Position



Always Look in the Direction of Travel

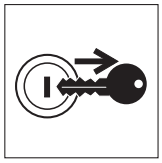
— Always read and understand manufacturer's manual and machine safety signs before operating.
— Always know where to get assistance in case of an emergency.
— Always check for utilities before digging.
— Always avoid distractions such as cell phones, headphones and horseplay.
— Always ensure the attachment is properly installed.

— Always operate the compact tool carrier from the operator's position. Keep your feet on the platform, if equipped, and your hands on handholds or controls. Stay away from tracks.
— Always look in the direction of travel, even when traveling in reverse.
— Always keep away from lift arms when raised. Lift arms left in the raised position **must be supported** by the approved lift arm support device(s).

Operate Safely

Remember These Rules: (continued)

— Always make sure the work area is clear of other machines and personnel. Warn others in area before starting. **Never** lift, swing or move a load or attachment over anyone.
— Always stay in control of your machine and load. Do not jerk controls. Travel and turn slowly and smoothly. Travel and turn with lift arms down. Carry load low. Keep load level while lifting. Keep heavy end uphill. Never drive over drop-offs.
— **Never permit riders.** Never use a bucket, forks or attachment as an elevated work platform.
— Never modify your equipment. Use only attachments approved by the manufacturer.
— Never exceed the rated operating capacity of your machine. Be aware of changed weight distribution when operating with heavy attachments.
— Never operate your compact tool carrier in an atmosphere with explosive dust, explosive gas or where exhaust can contact flammable material.
— Never leave the compact tool carrier unattended without lowering the lift arms, placing the attachment flat on the ground and safely shutting down the machine and attachment. (See page 32, **Safe Shut Down.**)



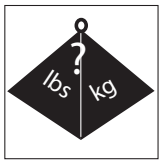
Operate Safely

Lift the Load Safely

Know the rated operating capacity of your compact tool carrier. Refer to the compact tool carrier capacity chart (if provided) to determine the operating range for safe lifting, transporting and placing of the load.

You, as the operator, should know, or be able to estimate, the weight and load center of the load you will be lifting. If you are unsure of the weight and load center of the load, check with your supervisor or with the material supplier.

Before picking up a load:
— Note the condition of the terrain. Adjust the travel speed and reduce the amount of the load if the conditions suggest an unstable path.
— Avoid lifting double-stacked loads—they are difficult to control. Separate the load into two or more loads.
— Make sure the load is clear of obstructions especially when handling long, tall or wide loads.
— Be sure the load center of gravity is in the center of the attachment. Approach the load slowly and squarely.
— Adjust spacing of forks to engage the pallet or load at maximum width. **Never use just one fork to lift a load.**



Operate Safely

Transporting Loads

After engaging the load, tilt the load back to position it for travel. Keep the load level when lifting.

Lift the load only high enough to clear obstacles that may be in the path of the compact tool carrier. Carry the load as close to the machine as possible to:

— Provide better stability of the compact tool carrier.
— Reduce the chance of spilling the load while traveling over rough terrain.
— Allow for better visibility over the load.
— Help to maintain control of steering.
— Prevent pitching the load when traveling over a bump or curb with a tracked machine. Excessive speed may cause the machine to become unstable.

WARNING! Avoid possible injury from loss of control or tipover. **Do not travel or turn with the lift arms raised.** Loss of control or tipover could cause death or serious injury.

Carry Load Low

Travel Slowly Over Rough Terrain

Do Not Travel with Lift Arms Raised

Operate Safely

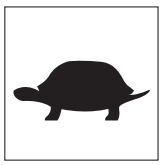
Transporting Loads (continued)

Remember that smooth, controlled actions on your part are important for safe transport. To avoid tipover or toppling a load, apply these actions at all times:

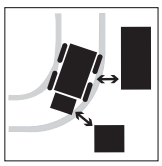
— Keep the load as low as possible.
— Do not lift load while traveling.
— Do not jerk the lift or travel controls.
— Accelerate and decelerate slowly.
— Avoid sudden starts and stops.
— Travel with **caution** and at the **slowest** possible speed.
— Come to a gradual, complete stop before reversing direction. Avoid obstacles and rough terrain.
— Travel up and down slopes, never across them.
— Avoid steep slopes.
— Avoid sharp turns.

Ensure there is adequate clearance in all directions when turning with a load to avoid injury to personnel or damage to nearby objects.

Operate Controls Smoothly



Travel Slowly



Check Clearances Before Travel

Operate Safely

Traveling on Slopes and Inclines

You must exercise additional care if operating on slopes or inclines. Driving on slopes and inclines can be dangerous and result in a tipover or loss of load.

WARNING! Do not travel on slopes or inclines with lift arms elevated. Loss of load or tipover could cause death or serious injury.

To avoid injury or damage follow these rules:
— Avoid steep slopes and unstable surfaces. If you must drive on a slope, keep the load low and proceed with extreme caution. **Do not drive across** excessively steep slopes under any circumstances. Travel straight up and down the slope.
— Avoid turning on inclines and slopes.
— Ascend or descend inclines and slopes with the **"heavy end"** of the compact tool carrier on the **uphill** side of the slope.

Normally, when **not carrying a load,** the **rear** of the compact tool carrier is the **"heavy end."** Normally, **when carrying a load,** the **front** of the compact tool carrier becomes the **"heavy end."**

Do Not Travel with Lift Arms Raised

Traveling with No Load, Attachment Downhill

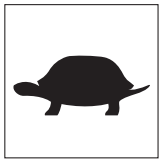
Traveling with a Load, Attachment Uphill

Operate Safely

Lifting and Placing/Emptying the Load

When the load has been transported to the location where it is to be placed, remember:
— The chosen landing location should be level, both front to back and side to side.
— While lifting and lowering the load, always make sure the path of the load is clear of obstacles.
— Approach the landing location slowly with the load as low as possible.
— Drive as close as possible to the landing location.
— Avoid a sudden stop.
— Place the compact tool carrier in NEUTRAL.
— Lift the load slowly and smoothly.
— After raising the load drive forward slowly to position where the load will be placed or emptied.
— Place or empty the load.
— Drive backwards slowly to clear the placed or emptied load.
— Lower the lift arms.

Know Weight Limits



Travel Slowly

Lift Loads Slowly and Smoothly

Operate Safely

Follow these important practices when lifting loads:
— The load must be centered when lifting. The likelihood for the compact tool carrier to tip is greatly increased if the load is not centered before lifting.
— Use extreme care when lifting items with an attachment. Keep the load level when raising the lift arms. Excessive tilt-back can cause the load to fall out of the bucket and back toward the operator.
— Raise load slowly at an even rate and be ready to lower the load quickly if the machine gets in an unstable situation.

Operate Controls Smoothly

High Loads May Shift

Operate Safely

Loose or Irregular Loads

Use extra care when carrying drums, cylinders, reels or other round objects. These and other loose, irregular-shaped loads are more likely to fall if not handled properly.
— Keep the attachment tilted back to hold the load.
— Secure loose loads to the attachment.

Watch clearances carefully when handling loads that are long, tall or wide. Load end-swing can be deceiving and could cause injury to personnel or damage to objects nearby.

Where the load will obstruct your vision, it is recommended that the compact tool carrier be operated in reverse. Look rearward in the direction of travel. Travel at a slower speed and have someone direct you.

Traveling with Heavy Attachments

Be aware that heavy attachments such as augers, trenchers, breakers, snowblowers, etc. change the weight distribution of your machine. Use extra care when loading/unloading, traveling and turning.

Some attachments require that lift arms and therefore the mass of the attachment be raised during operation. Return the attachment to the travel position, keeping the lift arms lowered and the mass of the attachment low while traveling.

Secure Loose Loads

Look Where You Are Traveling

Travel with Attachment Low

Operate Safely

Watch Out For Hazardous Working Conditions

Be alert for hazards. Know where you are at all times. Watch for branches, cables and doorways. Watch for unstable soil.

Use caution when working along docks, runways, banks and slopes. Keep away from the edge of drop-offs or gullies.

Use caution when working beneath an overhang or next to a high bank. Be careful not to undercut a high bank or overhang causing material to fall on your machine or a collapse of the bank.

WARNING! Extreme caution should be used when working along the top of banks or slopes. Watch for loose areas or overhangs. Keep away from the edge. The edges could collapse or a slide could occur causing serious injury or death.

Stay alert! Cave-ins are hazardous.

Use caution in backfilling or other activities near an excavation. Do not get too close to the wall. The combined weight of your machine and the load could cause the wall to collapse.

If necessary when working under hazardous conditions, use a second person to warn of dangers. Make certain they do not get too close to the loader.

Never Undercut a High Bank

Use Care Near Excavations

Use a Signal Person

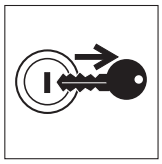
Shut Down Safely

Safe Shut Down

Properly shutting down a compact tool carrier can help prevent accidents from occurring when the compact tool carrier is left unattended. Shut down the compact tool carrier following the specific procedures in the manufacturer's operator's manual. These procedures will normally include:

— Come to a full stop on a level surface.
— Set the parking brake.
— Lower the lift arms and place the attachment flat on the ground.
— Place the controls in NEUTRAL (or PARK) including the auxiliary hydraulic control.
— Reduce engine speed.
— Shut off the engine.
— Cycle all hydraulic controls to relieve trapped pressure in the system.
— Remove the ignition key.

Lower Attachments Before Leaving the Machine



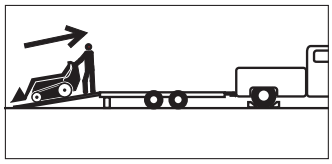
Shut Engine Off, Remove Key

Load and Unload Your Machine

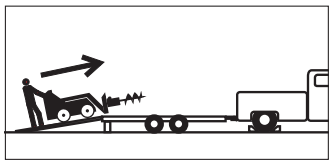
Loading and Unloading the Compact Tool Carrier

When transporting the compact tool carrier, follow the manufacturer's recommendations for loading and unloading.

Precautions
— Keep bystanders out of the loading and unloading area.
— Load and unload on a level surface.
— Block transport vehicle so it does not move.
— Use ramps of adequate size and strength, low angle and proper height.
— Block or support the rear of trailer.
— Keep trailer bed and ramps free of clay, oil, ice, snow and other materials that can become slippery.
— Keep heavy end uphill. (A heavy attachment may result in the need to travel up ramps in forward position.)
— Chain and block the compact tool carrier securely for transport. Use tie-down points as marked on the compact tool carrier by the manufacturer. Follow the manufacturer's instructions in the operator's manual for tie-down procedures.



Load and Unload Safely



Keep Heavy End Uphill

Perform Maintenance Safely

Maintain Your Equipment

Maintain Equipment

Be sure to maintain your equipment according to manufacturer's instructions. Regularly check the operation of the protective and safety devices.

Do not perform any work on a compact tool carrier unless you are authorized and qualified to do so.

If you have been authorized to do maintenance, **read the operator's and service manuals.** Study the instructions; check the lubrication charts; examine all the instruction messages on the compact tool carrier. Maintenance can be dangerous unless performed properly. Be sure you have the necessary skill, information, correct tools and equipment to do the job correctly.

IMPORTANT! Do not modify equipment or add components not approved by the manufacturer. Use parts, lubricants and service techniques recommended by the manufacturer.

Prepare Yourself

Wear personal protective clothing and Personal Protective Equipment (PPE) issued to you or called for by job conditions.

You may need:
— Hard hat
— Safety shoes
— Safety glasses, goggles or face shield
— Apron and gloves
— Hearing protection
— Welding helmet or goggles
— Respirator or filter mask

Wear whatever is needed—don't take chances.

Keep hands—and clothing—away from all moving parts. Don't tempt fate with dangling ties, loose sleeves, rings, watches, or long hair.

Perform Maintenance Safely

WARNING! Prevent death or serious injury from entanglement. **Do not wear loose clothing or accessories. Stay away from all rotating components when the engine is running.** Contact, wrapping or entanglement with rotating or moving parts could result in death or serious injury.

Wear a rubber apron and rubber gloves when working with corrosives. Wear gloves and safety shoes when handling wooden blocks or sharp-edged metal.

Always use safety glasses, goggles or a face shield. They provide eye protection from fluids under pressure, while grinding and servicing batteries. Protection is also needed from flying debris, liquids and loose material produced by equipment, tools and pressurized air/water.

Wear a face shield when you disassemble spring-loaded components or work with battery acids. Wear a welding helmet or goggles with a shaded filter when you weld or cut with a torch.

Do not sand, grind, flame-cut, braze or weld without a NIOSH-approved respirator or appropriate ventilation. If welding is required on this machine, refer to the manufacturer's manuals or consult your equipment dealer for proper procedures.

Keep pockets free of all objects that could fall out—and drop into machinery.

Handle tools and heavy parts sensibly—with regard for yourself and other persons. Lower items—don't drop them.

Avoid Rotating Parts

Avoid Pinch Points

Perform Maintenance Safely

Prepare the Work Area

— Position the compact tool carrier in a level area out of the way of other working equipment.
— Make sure there is adequate light, ventilation and clearance.
— Remove oil, grease or water to eliminate any slippery surfaces.
— Clean around the area to be serviced to minimize contamination.

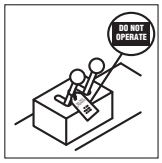
Prepare the Machine

— Attach a "DO NOT OPERATE" warning tag to the control levers and remove the ignition key if the compact tool carrier should not be started.
— Install the approved lift arm support device(s) when working under or near raised lift arms. Remove attachment before raising lift arms and before installing support device(s).

WARNING! Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause unsupported lift arms to drop. **Do not go under lift arms when raised unless supported by an approved lift arm support device(s).** Death or serious crushing injury could result from falling lift arms.

— Remove only guards or covers that provide access to the area being serviced. Replace all guards and covers when work is complete.

Clean Slippery Surfaces



Use Warning Tags

Use Approved Lift Arm Support Device

Perform Maintenance Safely

Use Proper Ventilation

If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension. If you do not have an exhaust pipe extension, make sure you open the doors and get outside air into the area.

WARNING! Prevent possible injury. **Never work on machinery with the engine running unless instructed by the manufacturer's manuals for specific service.**

WARNING! Never operate any type of engine without proper ventilation—EXHAUST FUMES CAN KILL.

Use Jacks and Hoists Carefully

If you must work beneath raised equipment, always use wood **(not concrete)** blocks, jack-stands or other rigid and stable supports. When using jacks or hoists always be sure they are adequately supported.

WARNING! Prevent possible crushing injury. **Never use concrete blocks for supports.** They can collapse under even light loads.

Make sure the hoists or jacks you use are in good repair. Never use jacks with cracked, bent, or twisted parts. Never use frayed, twisted or pinched cables. Never use bent or distorted hooks.

Remove Key and Read Maintenance Manual

Ventilate Work Area

Use Proper Support for Raised Equipment

Perform Maintenance Safely

Common Maintenance Safety Practices

Fuel Hazards

IMPORTANT! Always use approved fuel containers and/or dispensing equipment.

Fuels are flammable, so observe these practices to reduce the possibility of a serious accident.

— Shut off engine and ignition during refueling.
— Always ground the fuel nozzle against the filler neck to avoid sparks.
— Keep sparks and open flames away from fuel.
— Do not smoke while refueling or when handling fuel containers.
— Do not cut or weld on or near fuel lines, tanks or containers.
— Do not overfill the tank or spill fuel. Clean up spilled fuel immediately.

Engine Coolant Hazards

Liquid cooling systems build up pressure as the engine gets hot, so **use extreme caution before** removing the radiator cap.

Be sure to:

— Stop the engine and wait for the system to cool.
— Wear protective clothing and safety glasses.
— Turn the radiator cap slowly to the first stop to allow the pressure to escape before removing the cap completely.

No Smoking and No Open Flames

Remove Radiator Cap Slowly

Perform Maintenance Safely

Hydraulic System Hazards

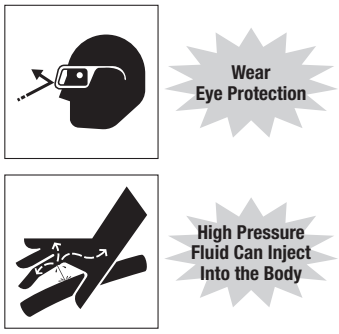
The hydraulic system is under pressure whenever the engine is running and may hold pressure even after the engine is shut off. Cycle all hydraulic controls including the auxiliary hydraulic control after the engine is shut down. Relieve trapped pressure in the lines after the attachments are shut down and resting on the ground.

During inspection of the hydraulic system:
— Wait for fluid to cool before disconnecting the lines. Hot hydraulic fluid can cause SEVERE BURNS.
— **Do not** use your hand to check for leaks. Instead, use a piece of cardboard or paper to search for leaks.
— Wear appropriate eye protection. Hydraulic fluid can cause permanent eye injury.

WARNING! Diesel fuel or hydraulic fluid under pressure can penetrate the skin or eyes and cause serious injury, blindness or death. Fluid leaks under pressure may not be visible. **Use a piece of cardboard or wood to find leaks, not your hand. Wear a face shield or safety goggles for eye protection.** If fluid is injected into the skin, it must be removed within a few hours by medical personnel familiar with this type of injury.

When venting or filling the hydraulic system, loosen the filler cap slowly and remove it gradually.

Never reset any relief valve in the hydraulic system to a pressure higher than recommended by the manufacturer.



Perform Maintenance Safely

Electrical System Hazards

Before working on the electrical system, disconnect the battery cable(s).
— Remove the battery negative (-) cable(s) first.
— When reconnecting the battery, connect the battery negative (-) cable(s) last.

The liquid in batteries is called “electrolyte.” Electrolyte contains sulfuric acid, which is a POISON and can cause SEVERE CHEMICAL BURNS.

Avoid Injury

— Wear a face shield to prevent contact with your eyes.
— Wear chemical-resistant gloves and clothing to keep this electrolyte off your skin and regular clothing.

WARNING! Electrolyte will damage eyes or skin on contact. **Always wear a face shield to avoid electrolyte in eyes.** If electrolyte contacts eyes, flush immediately with clean water and get medical attention. **Wear rubber gloves and protective clothing to keep electrolyte off skin.** If electrolyte contacts exposed skin or clothing, wash off immediately with clean water.

If electrolyte is ingested, seek MEDICAL ATTENTION IMMEDIATELY. NEVER give fluids that would induce vomiting.

Perform Maintenance Safely

Avoid Explosion

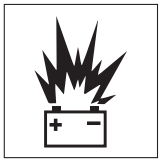
WARNING! Avoid possible serious injury from explosion. Lead-acid batteries produce extremely explosive gases especially when being charged. **Keep arcs, sparks, flames and lighted tobacco away.**

— **Do not** smoke near batteries.
— Keep arcs, sparks and open flames away from batteries.
— Provide adequate ventilation.

Never check the battery by placing a metal object across the battery posts — the resulting spark could cause an explosion.

WARNING! Avoid possible serious injury from battery explosion. **Do not charge a battery or boost start the engine if the battery is frozen.** Warm to 60°F (15.5°C) or the battery may explode and could cause serious injury.

Safety rules during battery boost starting:
— Follow the instructions for proper "battery boost starting" as specified in the manufacturer's manual.
— Be sure the vehicles are not touching.
— Observe the polarity of the batteries and connections.
— Make the final cable connection to the engine or the furthest ground point away from the battery. Never make the final connection at the starter or dead battery—sparks may ignite the explosive gases present at the battery.
— When disconnecting cables after jump starting, remove the cables in reverse order of connection (e.g., final connection first).



Avoid Sparks and Open Flames Near Batteries

For Boost Starting Observe Polarity and Make Final Connection at Ground Point

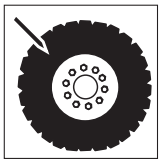
Perform Maintenance Safely

Tire, Wheel and Track Maintenance

Check your tires and wheels or tracks daily because the stability of the compact tool carrier can be dramatically affected by tire pressure or damage to tires, wheels or tracks.

Check tires for:
— Correct pressure.
— Cuts and bulges.
— Nails or other punctures.
— Uneven or excessive wear.
— Condition of valve stems and caps.

Check wheels for:
— Damage to the rims.
— Missing or loose lug nuts or bolts.
— Misalignment.



Check Tires and Wheels for Damage

Maintain Proper Tire Pressure

Perform Maintenance Safely

WARNING! Explosive separation of a tire and/or rim parts can cause serious injury or death. **Always follow the manufacturer's recommendations or see your tire supplier.**

Do not inflate the tires above the recommended pressure. Be sure to replace tire ballast if equipped. See manufacturer's specifications for ballast requirements.

Keep wheel lug nuts tightened to manufacturer's recommendations.

A rise in tire pressure during operation is normal, and should NOT be reduced.

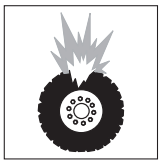
When adding air to a tire, do so from a distance. Use a long hose with self-attaching chuck. Always stand behind tread when adjusting tire pressure.

Do not inflate tires with flammable gases or from systems using an alcohol injector.

Never cut or weld on a wheel with an inflated tire mounted on it. This could cause explosive decompression.

WARNING! Explosive separation of a tire and/or rim parts can cause serious injury or death. **Always use a safety cage or cable restraints when inflating a repaired tire.** Inflate the tire from a distance, using a long hose with self-attaching chuck. Stand behind the tread; keep the area to the side of the tire clear of other people.

All tire service should be performed by a qualified tire service center or by an authorized service person who has been properly trained in the procedures and use of safety equipment designed for tire servicing.



Perform Maintenance Safely

Tire, Wheel and Track Maintenance (continued)

WARNING! The types of rims and tires usually found on this equipment require special care when servicing to prevent death or serious injury.

Important factors to remember:

— **Never** overinflate a tire—it could explode.
— Punctures that could have allowed the ballast in a tire to leak out must be repaired and the tire refilled with ballast (if required) before the compact tool carrier is put back into operation.
— **Never** reinflate a tire that has been run flat or seriously underinflated without removing the tire from the wheel. Have the tire and rim closely inspected for damage before remounting.
— Clean the area around all wheel lug nuts or bolts and periodically check the torque per the manufacturer's specifications until the torque value stabilizes, then check at regularly scheduled intervals.
— **Never** weld on a wheel or rim.
— Check that the tire size and rim are correctly matched.
— When replacing the tires, ensure the tires are of the appropriate rating specified by the manufacturer.

Perform Maintenance Safely

Check tracks, rollers and idlers for:
— Damaged or worn tracks.
— Correct tension according to manufacturer's instructions.
— Proper lubrication – track rollers and idlers. Refer to the manufacturer's manuals.

Track Adjustment

Track tension is important for good performance, reducing excessive track wear and preventing the tracks from coming off. Track and roller wear varies with the working conditions and soil conditions. Special tools and procedures may be needed to check or adjust track tension. Removing and installing tracks also requires following proper servicing procedures.

WARNING! Track tensioning systems have compressed springs or pressurized fluid (oil or grease). Improperly releasing track tension forces can cause serious injury or death. **Always follow the manufacturer's warnings and instructions for track adjustment and other maintenance and servicing procedures.**

Check for Track Damage

Follow Maintenance Instructions

Perform Maintenance Safely

Complete Service and Repairs Before Machine is Released

Tighten all bolts, fittings, and connections to torques specified by the manufacturer.

Install all guards, covers, and shields after servicing. Replace or repair any damaged ones. Refill and recharge pressure systems only with manufacturer approved or recommended fluids.

Start the engine and check for leaks. (See page 39, **Hydraulic System Hazards.**) Operate all controls to make sure the loader is functioning properly. Test the loader if necessary. After testing, shut down and check the work you performed. Are there any missing cotter pins, washers, locknuts, etc.? Recheck all fluid levels before releasing the loader for operation.

All parts should be inspected during repair and replaced if worn, cracked or damaged. Excessively worn or damaged parts can fail and cause injury or death.

Replace any damaged or illegible machine signs.

Verify Service Work When Completed

Final Word to the User

You have just finished reading the AEM Compact Tool Carrier Safety Manual. It is impossible for this manual to cover every safety situation that you may encounter on a daily basis. Your knowledge of these safety precautions and your application to the basic rules of safety will help to build good judgment in all situations. Our objective is to help you develop, establish and maintain good safety habits to make operating a Compact Tool Carrier easier and safer for you.

AEM
Association of
Equipment Manufacturers

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