Operator’s Manual

Skid Steer Loader

ST, SW

This Operator's Manual includes the AEM Safety Manual

AEM MEMBER

Machine Type	**SST/CTL**
Material Number	**5100026248 / 3300028953**
Version	**11**
Date	**03/2023**
Language	**[en-US]**

5 1 0 0 0 2 6 2 4 8

Imprint

Publisher and copyright holder:

Original operator's manual

California Proposition 65 Warning

⚠ WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

⚠ WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

⚠ WARNING

Cancer and Reproductive Harm

www.P65Warnings.ca.gov

⚠ WARNING

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.

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Table of Contents

1 Foreword

1.1 Information on This Operator's Manual

The document box for storing the operator's manual is located on the rear of the operator seat.

1.2 Machine Reference Information

Write the machine information for your machine on this page. Provide these numbers to your dealer when you need service parts or information about your machine.

Machine model	
Machine item number	
Machine serial number	
Engine serial number	
Wacker Neuson dealer	
Address	
Phone number	

Occasionally, machines are also referenced by their series numbers. These numbers are found embedded in each machine's serial number.

- S05 = Medium frame loader
- S06 = Large frame loader

1.3 Machine Identification

Save these instructions

This manual contains important instructions for the machine models below. These instructions have been written expressly by Wacker Neuson America Corporation and must be followed during installation, operation, and maintenance of the machines.

The following machines and variants/options are described:

Machine	Item Number
SW16	1000340735
SW17	1000340729
SW20	1000340723
SW21	1000340717
SW24	1000382875
SW28	1000382874
ST28	1000340710
ST31	1000340684

Machine	Item Number
SW32	1000382873
ST35	1000382877
ST40	1000382876
ST45	1000382871
ST50	1000382850

1.4 Machine Documentation

- From this point forward in this documentation, Wacker Neuson America Corporation will be referred to as Wacker Neuson or the manufacturer.
- Keep a copy of the operator's manual with the machine at all times.
- For spare parts information, please see your Wacker Neuson Dealer, or visit the Wacker Neuson website at http://www.wackerneuson.com/.
- When ordering parts or requesting service information, be prepared to provide the machine model number, item number, and serial number.

1.5 Expectations for Information in This Manual

This manual provides information and procedures to safely operate and maintain this machine. For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.

The manufacturer expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.

The information contained in this manual is based on machines manufactured up until the time of publication. The manufacturer reserves the right to change any portion of this information without notice.

The illustrations, parts, and procedures in this manual refer to the manufacturer's factory-installed components. Your machine may vary depending on the requirements of your specific region.

This operator's manual does not include information on attachments.

Please contact your dealer if you require more information on the machine or the operator's manual.

1.6 Laws Pertaining to Spark Arresters

State Health Safety Codes and Public Resources Codes specify that in certain locations spark arresters be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

1.7 Manufacturer's Approval

This manual contains references to approved parts, attachments, and modifications. The following definitions apply:

- Approved parts or attachments are those either manufactured or provided by the manufacturer.
- Approved modifications are those performed by an authorized service center according to written instructions published by the manufacturer.
- Unapproved parts, attachments, and modifications are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

1.8 Abbreviations

Term	Definition
AUX	Auxiliary
CTL	Compact track loader
DCU	Diesel control unit
DEF	Diesel exhaust fluid
DIA	Dealer-installed accessory
DOC	Diesel oxidation catalyst
DPF	Diesel particulate filter
DTC	Diagnostic trouble code
ECU	Engine control unit
EGR	Exhaust gas recirculation
EH	Electro-hydraulic
FOPS	Falling object protective structure
HF	High flow (hydraulics)
MCU	Machine control unit
PEL	Permissible exposure limits
PMC	Particle matter catalyst
PPE	Personal protective equipment
PTO	Power takeoff
ROC	Rated operating capacity
ROPS	Rollover protective structure
SCR	Selective catalyst reduction
SMV	Slow moving vehicle
SPN	Suspect parameter number

Term	Definition
SSL	Skid steer loader
ST	Tracked machine
STD	Standard (hydraulics)
SW	Wheeled machine
T4f	Tier four final
ULSF	Ultra low sulfur diesel

2 Usage

2.1 Intended Use

In accordance with this designated use, the machine may only be used for moving earth, gravel, coarse gravel or ballast, and rubble. It may also be operated with approved attachments for additional applications.

No other applications are designated for the use of the machine. Wacker Neuson will not be liable for damage resulting from use other than mentioned above. The operator alone will bear the risk.

Designated use includes following the instructions set forth in the operator's manual and following the maintenance schedule.

Machine safety can be negatively affected by performing machine modifications without proper authority and by using spare parts, equipment, attachments, and optional equipment which have not been approved by Wacker Neuson. Wacker Neuson will not be liable for damage resulting from unapproved parts or unauthorized modifications.

Wacker Neuson shall not be liable for personal injury and/or damage to property caused by failure to follow the safety instructions on labels and in this operator's manual, or by not exercising due care when:

- Transporting the machine
- Operating the machine
- Servicing the machine and performing maintenance work
- Repairing the machine

2.2 Unintended Use

The machine shall not be used for transport jobs on public roads unless it is in compliance with applicable regulations.

Using this machine for any other purpose than described above could permanently damage the machine or seriously injure the operator or other persons in the area. Machine damage caused by misuse is not covered under warranty.

The following are some examples of misuse:

- Using the machine as a ladder, support, or work surface
- Using the machine to carry or transport passengers or equipment
- Using the machine to tow other machines
- Operating the machine outside of factory specifications
- Operating the machine in a manner inconsistent with all warnings found on the machine and in the operator’s manual

2.3 Residual Risks

⚠ WARNING

Serious injury or death hazard

Improper operation of the machine can result in serious injury or death. Before operating this machine, make sure to:

- ► Read and understand the operator's manual.
- ► Read and understand all labels on the machine.
- ► Have training in the safe and proper use of the machine.
- ► Follow all applicable laws and regulations that pertain to this machine.

This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable and to increase operator safety through protective guards and labeling. However, some risks may remain even after protective measures have been taken. They are called residual risks.

On this machine, residual risks may include exposure to:

- Heat, noise, exhaust, and carbon monoxide from the engine
- Burns from hot hydraulic fluid or hot surfaces
- Fire hazards from improper refueling techniques
- Fuel and its fumes
- Personal injury from improper lifting techniques
- Crushing hazards from improper operation (feet, legs, or arms extending outside of the operator work station) and for other persons in the work zone

3 Safety

3.1 Signal Words Used in This Manual

This manual contains DANGER, WARNING, CAUTION, *NOTICE,* and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

⚠ DANGER

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

► To avoid death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ WARNING

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

► To avoid possible death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ CAUTION

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

► To avoid possible minor or moderate injury from this type of hazard, obey all safety messages that follow this signal word.

NOTICE

NOTICE identifies a situation that causes damage if it is not observed.

► To avoid possible damage from this type of hazard, obey all safety messages that follow this signal word.

Note: A Note contains additional information important to a procedure.

3.2 Safety Guidelines for Operating the Machine

Operator and service training, knowledge, and qualifications

Before operating, maintaining, or servicing the machine:

- Familiarize yourself with the location and proper use of all controls and safety devices.
- Know the rules for the jobsite.
- Contact Wacker Neuson for additional training if necessary.

When operating this machine:

- Do not allow improperly trained people to operate the machine.
- People operating the machine must be familiar with the potential risks and hazards associated with it.
- Follow legal and other mandatory regulations relevant to accident prevention and environmental protection. These may include handling hazardous substances, issuing and/or wearing personal protective equipment, or obeying traffic regulations.

The machine must not be accessed or operated by:

- Children
- People impaired by alcohol, drugs, or prescription drugs

Jobsite

The operator and any people in the jobsite are at risk if the machine is not operated correctly. Know the rules for the jobsite, which include but are not limited to the following:

- Remain aware of changing positions and the movement of other equipment and personnel in the jobsite.
- Remain aware of changing surface conditions and use extra care when operating over uneven ground, on hills, or over soft or coarse material. The machine could shift or slide unexpectedly.
- Use caution when operating the machine near the edges of pits, trenches or platforms. Check to be sure that ground surface is stable enough to support the weight of the machine with operator and that there is no danger of the machine sliding, falling or tipping.
- Do not operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.
- Keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.
- When operating the machine in contaminated areas, take appropriate measures to protect the operator and the machine.
- Familiarize yourself with the jobsite before beginning work, especially when operating in buildings or enclosed areas. Be aware of:
  - Obstacles in the operating and traveling area
  - Any necessary barriers separating the jobsite from public roads
  - Height of the ceiling/clearances
  - Width of entrances
  - Maximum load of ceilings and floors
  - Sufficient room ventilation to reduce the risk of carbon monoxide poisoning
- Observe the risk zone.

⚠ WARNING

Electric shock hazard

Electric shock can cause severe injury or death.

► Maintain a safe distance from overhead energized electric lines.

- Be aware of overhead electric lines. If the machine touches and energized electric line:
  - Do not leave the machine until the energized electric line has either been de-energized or removed from the machine.
  - While the machine is touching the energized electric lines, warn others against approaching and touching the machine.
  - Move the machine away from the energized electric lines.
  - Have the energized electric lines de-energized.

Dust precaution

Dust created by construction activities may cause lung disease, silicosis, or respiratory harm. Do not exceed permissible exposure limits (PEL) to silica dust as determined by OSHA or other jobsite rules and regulations. To reduce the risk of exposure:

- Work in a well ventilated area.
- Use a dust control system.
- Wear an approved dust/particle respirator.

Demolition or excavation work

- When working on roofs or similar structures, check the resistance and the structure itself before starting work. The building can collapse, causing serious injury, death, and damage.
- Do not place the machine directly under the workplace during demolition. Debris can fall onto the machine or the building can collapse, causing serious injury, death, and damage.
- Look out for hazards such as high-voltage lines, underground cables, buried utility lines (electrical, gas, water, communication, sewer), etc., during excavation work.

Before any digging begins:

- Have all local utility companies mark the location of their lines. There is a one-call service available in the United States—call 811. This will notify participating utility companies of a scheduled dig.
- Contact the person responsible for jobsite utilities. Follow their recommendations for support and securing of utility lines.

Risk zone awareness

- The risk zone is the area in which persons are at risk due to the movements of the machine, work equipment, additional equipment, or material.
- Stop work immediately if persons do not leave the risk zone in spite of warnings.
- The risk zone also includes areas affected by falling material, equipment, or constructions debris. For further information, see Risk of Injury or Death on page 51.

Before machine operation

The machine, including all components, safety devices, labels, and attachments must be in good condition before use.

- If the machine is functioning unpredictably or in event of malfunctions, turn off the machine immediately, remove the ignition key, lock the front door (if equipped), and report the malfunction to a qualified technician or supervisor. Safety-relevant damage or malfunctions of the machine must be repaired immediately.
- The operator must sit in the seat, fasten and adjust the seat belt, and check if all mirrors (if equipped) are adjusted correctly before putting the machine into operation.
- Inspect the seat belt for any damage. Replace worn or damaged components.
- Always adjust the seat position before starting work. Do not change the seat position during machine operation or machine travel.

Machine operation

- When entering and exiting the machine, face the machine and use three points of contact with the handholds and steps.
- Always keep the attachments or work equipment close to the ground. Keep the load low when moving on slopes—up, down, and across.
- Never get on or off a moving machine, and do not jump off the machine.
- The machine may have selectable ground drive and loader controls. Make sure to understand how the machine will operate with the selected control pattern.
- Remain aware of the machine’s moving parts. Keep hands, feet, and loose clothing away from the machine’s moving parts.
- Always remain seated and wear the seat belt at all times while operating the machine.
- Know the machine’s lifting capacity. Do not exceed the rated operating capacity (ROC) for the machine. For further information, see Forces on page 219.
- Keep all parts of the body inside the operator’s cabin at all times.
- Do not attempt to start the machine when standing alongside it. Only start the engine when seated in the driver's seat, with the seat belt fastened and with the controls in the neutral position.
- Do not use a mobile device while operating this machine.

- Do not allow anyone underneath a raised load.
- Do not leave the machine running unattended.
- Do not operate the machine before it has reached its operating temperature.
- Do not consume the operating fluids used in this machine.
- Do not use the machine as a crane. These loaders are not approved for craning applications. These craning applications include raising, transporting, and lowering point loads with the help of slings and load-securing devices (for example, ropes and chains). This applies, for example, to lifting and lowering pipes, shaft rings or containers.

Personal protective equipment (PPE)

Wear the following personal protective equipment (PPE) while operating this machine:

- Close-fitting work clothes that do not hinder movement
- Eye protection
- Hearing protection
- Safety-toed footwear

Tie back long hair and remove all jewelry (including rings).

Operator presence system

- This machine is equipped with an operator presence system that locks out machine travel and operation when the operator is not seated and secured properly in the operator’s seat.
- Do not operate the machine when the operator presence system or any safety device is malfunctioning. Contact a Wacker Neuson dealer.
- Start and operate the machine from the operator’s seat only.

Information on visibility

- Before putting the machine into operation, perform a visual check to make sure that there are neither persons nor objects or other sources of risk around the machine.
- When using the machine, check the surroundings constantly in order to identify potential hazards.
- Do not make any changes or modifications that reduce visibility. Reduced visibility can cause personal injury or death both for operator and other persons.
- Always use the work lights in conditions of poor visibility and after dark. However, make sure that users of public roads will not be temporarily blinded by the work lights.
- Provide additional lighting of the work area if necessary to perform work safely.

Emergency lift arm lowering

Do not exit the cab under a raised lift arm. Use the emergency lift arm lowering device to lower the lift arm to the ground.

Emergency exits

Possible emergency exits:

- Cab and enclosed cab version:
  - Back window removal
- Enclosed cab version only:
  - Front door glass removal

Traveling

- Before moving the machine, always check whether the attachments have been safely attached.
- Adjust your travel speed to the road/ground conditions, machine handling, and to the visibility conditions.
- Always look to the rear before moving the machine in reverse.
- Do not rely on mirrors (if equipped) to determine if there is anything in the travel path to the rear.
- Fasten your seat belt.
- Do not rely entirely on the rear camera (if equipped) when traveling in reverse. The camera is an aid and not a substitute for attentive and safe driving.
- Clean the camera lens before each use and if it becomes dirty while you are using the machine.
- Make sure the backup alarm is working properly when reversing the machine.
- When crossing underpasses, gates, bridges and tunnels, or when passing under overhead lines, make sure the clearance height and width are sufficient to avoid contact.
- In certain situations, use another person to direct movement of the machine on the jobsite safety.

On public roads:

- Safety equipment in compliance with the applicable regulations must be on board, for example: slow moving vehicle (SMV) sign, turn signals, strobe beacon.
- Empty the bucket and roll the bucket in.
- Perform a functional check of the lights (headlights, turn indicator lights etc.).
- Perform a functional check of the brake system.
- Make sure that the hydraulic system of the machine has no leaks.
- Close the door and the windows, if equipped.

3.3 Safety Guidelines for Attachments

Information regarding attachments

- Do not lift, lower, or transport people on the machine or in/on an attachment.
- Use approved attachments only. See your local Wacker Neuson dealer.
- Prior to traveling on public roads, remove all attachments which cannot be secured in compliance with the legal regulations of your country.
- Attachments and counterweights affect handling and the machine's steering capability.
- Lower the attachment to the ground before exiting the machine.

Installation and removal of attachments

- Follow attachment mounting instructions in this operator‘s manual.
- Before uncoupling or coupling an attachment with the hydraulic coupler:
  - Make sure the attachment is lowered to the ground and level.
  - Release the pressure in the auxiliary hydraulic system. For further information, see Auxiliary Hydraulic Connections on page 132.
- Check to ensure the attachment is securely attached and that it functions correctly.
- Connect all hydraulic and electrical devices for the attachment and check their function before operating the machine.
- Secure the attachments against unintentional movement.
- If an attachment requires additional options for safe machine operation, for example a polycarbonate front door, install the option before operating the machine.
- Keep others away from the machine when installing or removing an attachment.

3.4 Safety Guidelines for Maintenance

General maintenance notes

- Follow all instructions in the Maintenance chapter of this operator's manual. For instructions on adjustment, maintenance, and inspection activities and intervals, see Maintenance on page 153.
- Wacker Neuson requires the machine owner to have maintenance performed under all circumstances. Otherwise the warranty shall not be given in full.
- For inspection and maintenance work, make sure that all tools and service center equipment are capable of performing the tasks prescribed. Do not use malfunctioning or broken tools. Use certified measuring devices that are routinely calibrated for accuracy (for example torque wrench, pressure gauge, ammeter).
- Always retighten any screws, electrical connections, or hose connections that may have been loosened during maintenance and repair.

- Recycle scrapped parts and drained fluids according to environmental and hazardous material requirements. To avoid fire and health hazards, dispose of soiled shop towels by approved methods.
- If any lockout/support devices are removed for setup, maintenance, or repair purposes, they must be refitted and checked immediately upon completion of the maintenance/repair work.

Service training

Before servicing or maintaining the machine, see Safety Guidelines for Operating the Machine on page 16.

Replacing parts and labels

- Spare parts must comply with the technical requirements specified by Wacker Neuson. Contact your Wacker Neuson dealer for assistance.
- Replace worn or damaged components.
- Replace all missing and hard-to-read labels.
- When replacing electrical components, use components that are identical in rating and performance to the original components.
- When replacement parts are required for this machine, use only Wacker Neuson replacement parts or those parts equivalent to the original in all types of specifications, such as physical dimensions, type, strength, and material.

Cleaning

When cleaning and servicing the machine:

- Keep machine clean and free of debris such as leaves, paper, cartons, etc.
- Keep labels legible. When pressure washing decals, direct the stream at a 90 degree angle to the surface with the spray nozzle at least 12 inches away.
- Do not clean the machine while it is running.
- Never use gasoline or other types of fuels or flammable solvents to clean the machine. Fumes from fuels and solvents can become explosive.

3.5 Special Hazards

Electrical energy

- Work on the electric system and equipment, on the undercarriage, and the steering and brake systems may be performed only by authorized service centers and skilled individuals who have been specially trained for such work.
- Use only fuses with the specified current rating.
- Stop the machine immediately if an electrical system malfunction occurs. Disconnect the battery and contact a trained technician to perform troubleshooting procedures.

- Inspect the machine's electrical components at regular intervals. Defects such as loose connections, damaged or corroded connectors, or cracked or scorched cables must be repaired immediately.
- Attachments with electrical connections must be compatible with the machine's voltage specifications (12 volts).
- For specific safety precautions when working with batteries, see Maintaining the Battery on page 206.

Hydraulics

The hydraulic system of the machine may still be pressurized even when the engine is not running.

- Be careful operating the machine when the hydraulic oil is very cold. Proceed with caution even after the cold system restriction warning turns off. Cold hydraulic oil may still be present in certain circuits.
- Do not touch hydraulic components while the machine is operating. Wait until the machine is cool.
- Hydraulic fluid is flammable. Stop the engine immediately if a hydraulic leak is detected.
- Release the pressure in all hydraulic system sections and lines before performing any repair work. Set all controls in neutral, turn the engine off, and allow the fluids to cool before loosening hydraulic fittings/hoses or attaching test gauges.
- Hydraulic fluid escaping under high pressure may penetrate the skin, causing burns, blindness, or other serious injuries or infections. Contact a physician immediately for treatment if your skin has been penetrated by hydraulic fluid, even if the wound seems minor.
- Fluid leaks from small holes are often practically invisible. Do not use your bare hands to check for leaks. Check for leaks using a piece of paper, cardboard, or wood.
- After servicing the hydraulics, make sure all components are reconnected to the proper fittings and tightened to the proper torque. Failure to do so may result in damage to the machine and/or injury to a person on or near the machine.

Tires

⚠ WARNING

Serious injury or death hazard

Tire reinflation can pose a special hazard.

- ► Reinflation of any type or tire or rim assembly that has been operated in a run flat or underinflated condition (80% or less of recommended pressure) can result in serious injury or death. The tire may be damaged on the inside and can explode while you are adding air. The rim parts may be worn, damaged or dislodged and can explosively separate.
- ► Never rework, weld, heat, or braze the tire, wheel, or rim. Heating the rim of tire, wheel, and rim assembly can cause a tire to explode.
- ► The use of any flammable material during tire servicing is absolutely prohibited. Use of starting fluid, ether, gasoline or any other flammable material to lubricate, seal or seat the beads of a tubeless tire can cause the tire to explode or can cause the explosive separation of the tire and rim assembly.
- ► Never hammer, strike or pry on any type of tire and rim assembly when the tire contains inflation pressure. Do not attempt to seat any part when the tire contains any pressure.
- ► Do not inflate tires with flammable gas—explosion hazard

- Refer all tire and rim repair work to a qualified technician or to an authorized service center.
- Use specialized tools as recommended by tire suppliers for mounting and demounting of tires.
- Check the tires regularly for the prescribed tire pressure and for damage. Damaged tires or wrong tire pressures reduce the operational safety of the machine.
- Clean and inspect rims on a regular basis.
- Replace a worn or damaged tire with an approved replacement tire having the same size and tread pattern as the other tires on the machine.
- Inspect tire valves for proper air retention on a regular basis.
- Use sealing valve caps to prevent loss of air.
- Check the torque of the wheel nuts on a regular basis. After changing tires, check the torque of the wheel nuts after 10 service hours and tighten the wheel nuts if necessary.

3.6 Safety Guidelines when Using Internal Combustion Engines

Running the engine

- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine.
- Do not run the machine if fuel leaks are present or the fuel lines are loose.

- Engine exhaust can kill you in minutes. Engine exhaust contains carbon monoxide. Never run the machine indoors or in an enclosed area such as a deep trench unless there is adequate ventilation.
- Do not run the engine near open flames or in potentially explosive areas.
- Do not touch the engine or exhaust when the engine is running or immediately after it has been turned off.
- Do not operate a machine when its fuel cap is loose or missing.
- Do not remove the radiator cap when engine is running or hot. The radiator fluid is hot and under pressure, and may cause severe burns.

3.7 Disposal

All fluids, lubricants, materials, etc., used on the machine are subject to specific regulations regarding collection and disposal. Dispose of different materials and consumables separately and responsibly in accordance with environmental protection legislation.

The operating fluids in this machine, including fuel, engine oil, and grease, may be considered hazardous waste in many areas. Responsible disposal prevents toxic chemicals and materials from harming the environment. Follow the product-related safety regulations SDS (Safety Data Sheet – MSDS).

If the machine is no longer used according to its designated use, make sure that it is decommissioned or put out of operation and disposed of according to applicable regulations.

- Follow all applicable safety regulations during machine disposal.
- Machine disposal must be performed in accordance with state-of-the-art standards that apply at the time of disposal.

4 Vehicle Description

4.1 Machine Description

The Wacker Neuson skid steer and compact track loaders are self-propelled work machines.

These machines are versatile and powerful helpers for moving earth, gravel, and debris on construction sites and elsewhere. A wide range of attachments allow for numerous different applications of the machines in various environments. When using these attachments, observe the legal regulations of your country and equip the machine with all the safety equipment required.

4.2 Machine overview

Fig. 1: Machine components

Ref.	Component	Ref.	Component
1	Front lights	2	Handholds
3	Diesel fuel fill	4	Wheels (SW machines only)

Ref.	Component	Ref.	Component
5	Attachment (options available)	6	Hydraulic connectors
7	Machine information label	8	Hydraulic fluid fill
9	Tracks (ST machines only)	10	Counterweights (optional)
11	Rear lights	12	Rear door
13	Radiator cover	14	Exhaust pipe
15	Lift arm	16	Operator cab (rollover and falling object protection)
17	DEF fill (75 kW machines only)	—	—

- Machines shown with optional equipment.
- Not all options are available in all areas.

4.3 Machine Identification

⚠ WARNING

Injury hazard due to missing or damaged labels

Missing or incomplete warning and information labels can lead to situations with serious injury or death.

► Do not remove warning and information labels.

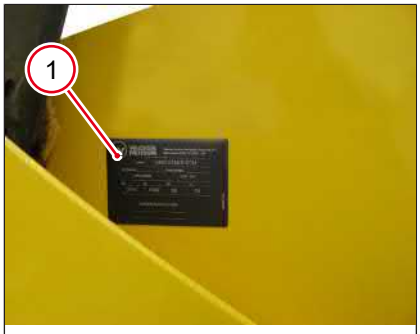
► Immediately replace damaged warning and information labels.

The type, quantity, and position of the labels depend on the options, country, and machine.

Type labels

Serial number

The serial number is located on the type label **(1)**.



wc_gr013847

Fig. 2: Type label

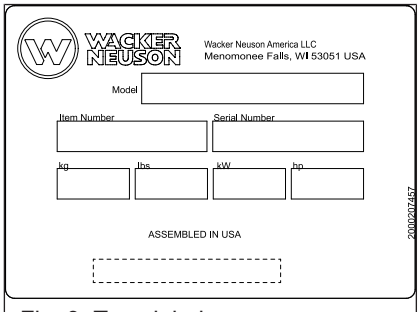


Fig. 3: Type label

Type label

The type label is located on the right rear side of the chassis. This includes technical information about the machine:

- Machine model number
- Machine item number
- Machine serial number
- Machine weight—kg
- Machine weight—lbs

wc_gr013980

Fig. 4: Engine nameplate

- Machine power—kw
- Machine power—hp

Engine nameplate

The engine nameplate identifies the:

- Engine type
- Engine serial number
- Peak RPM
- Engine version
- Approval data and “EC” directives

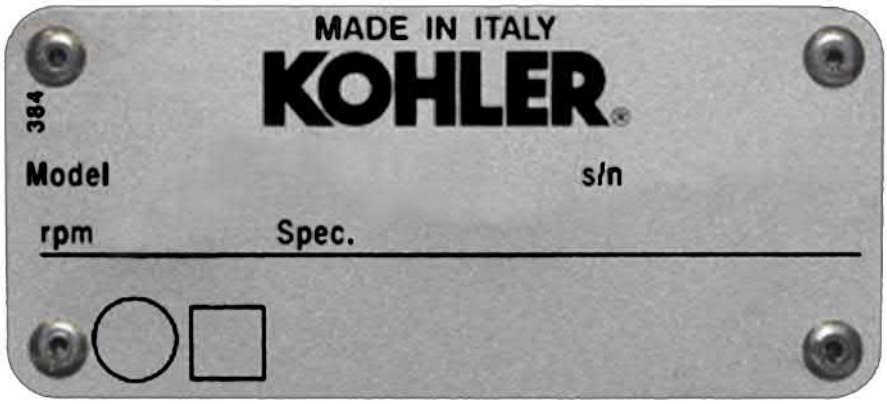


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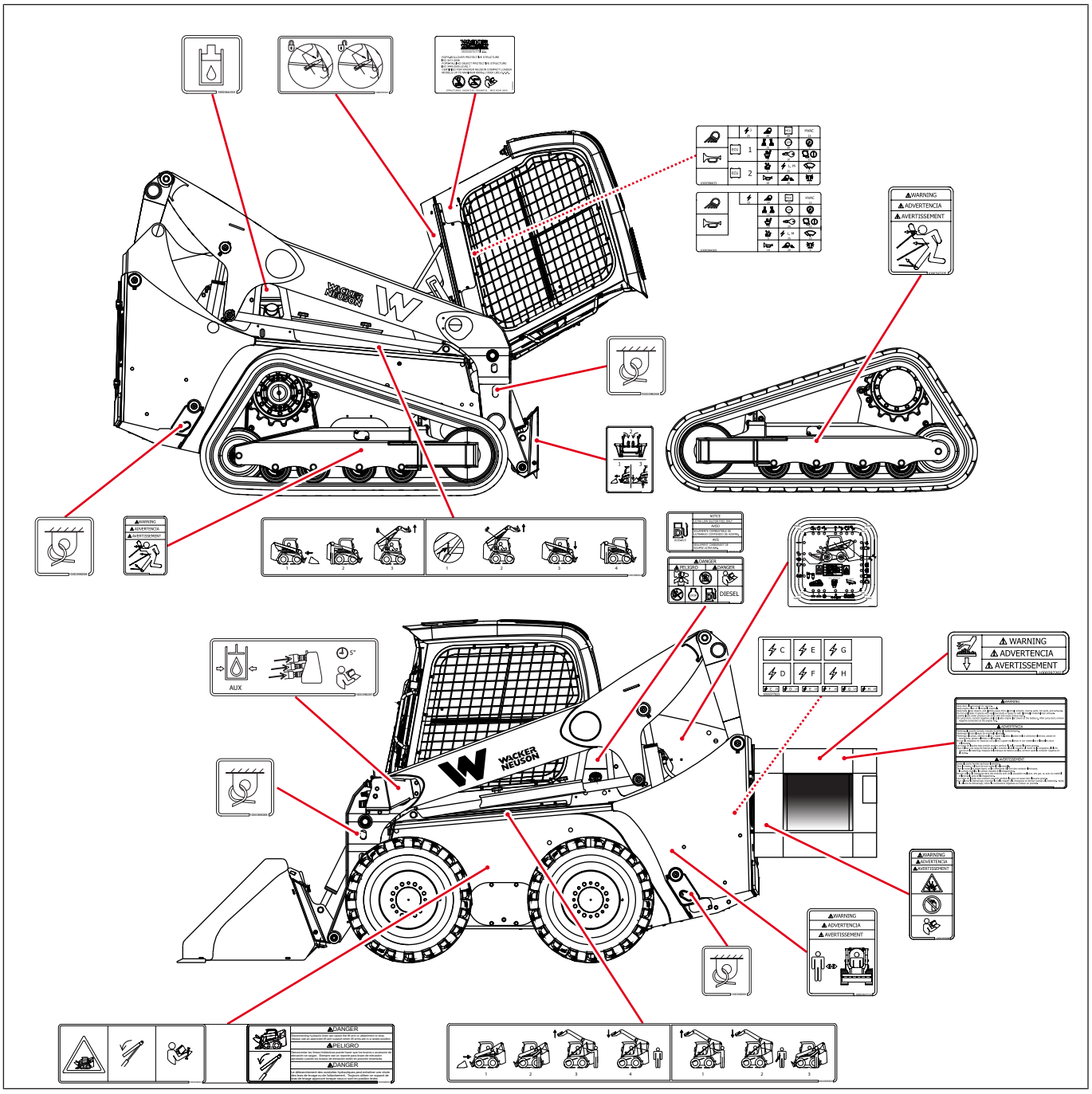
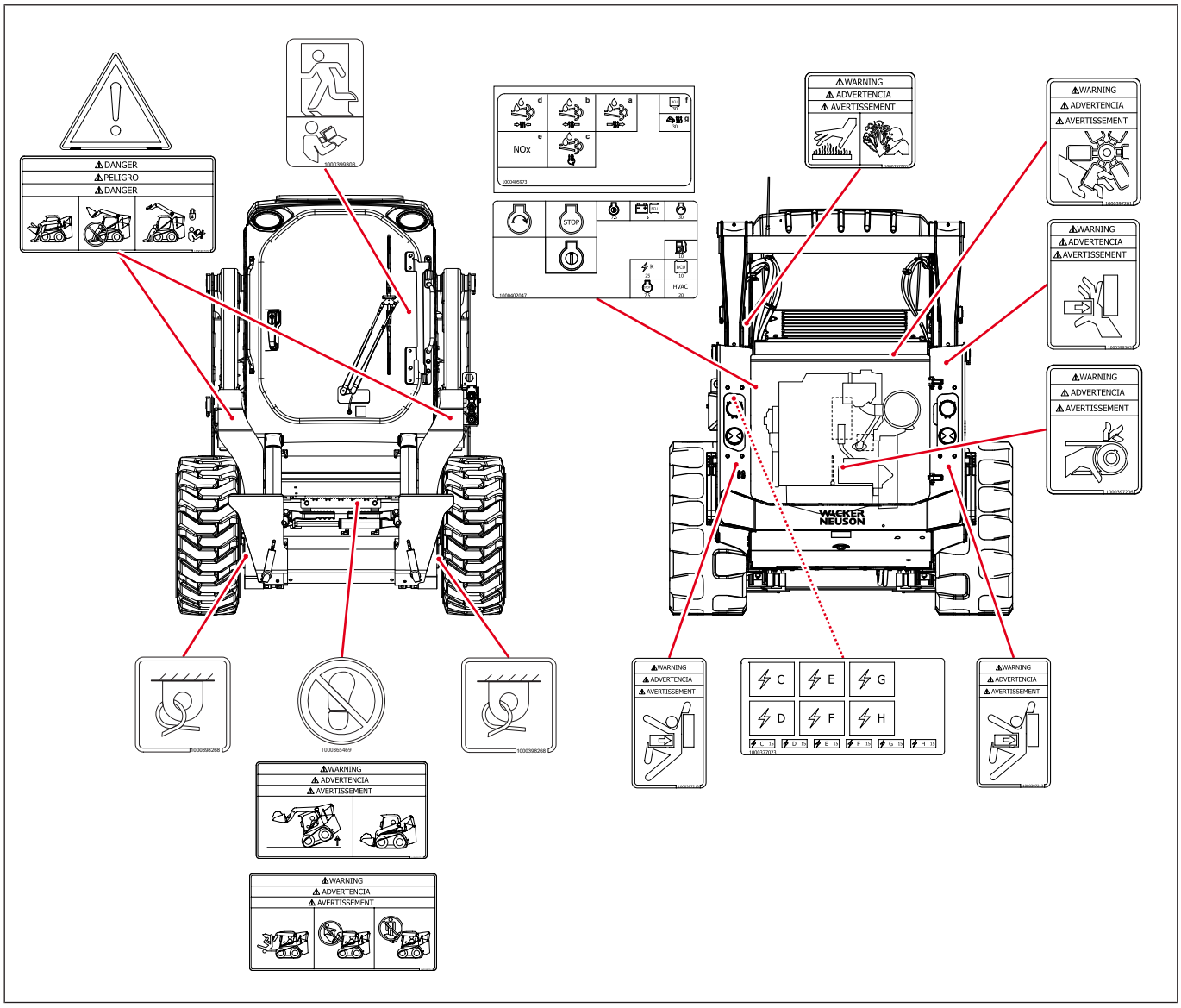
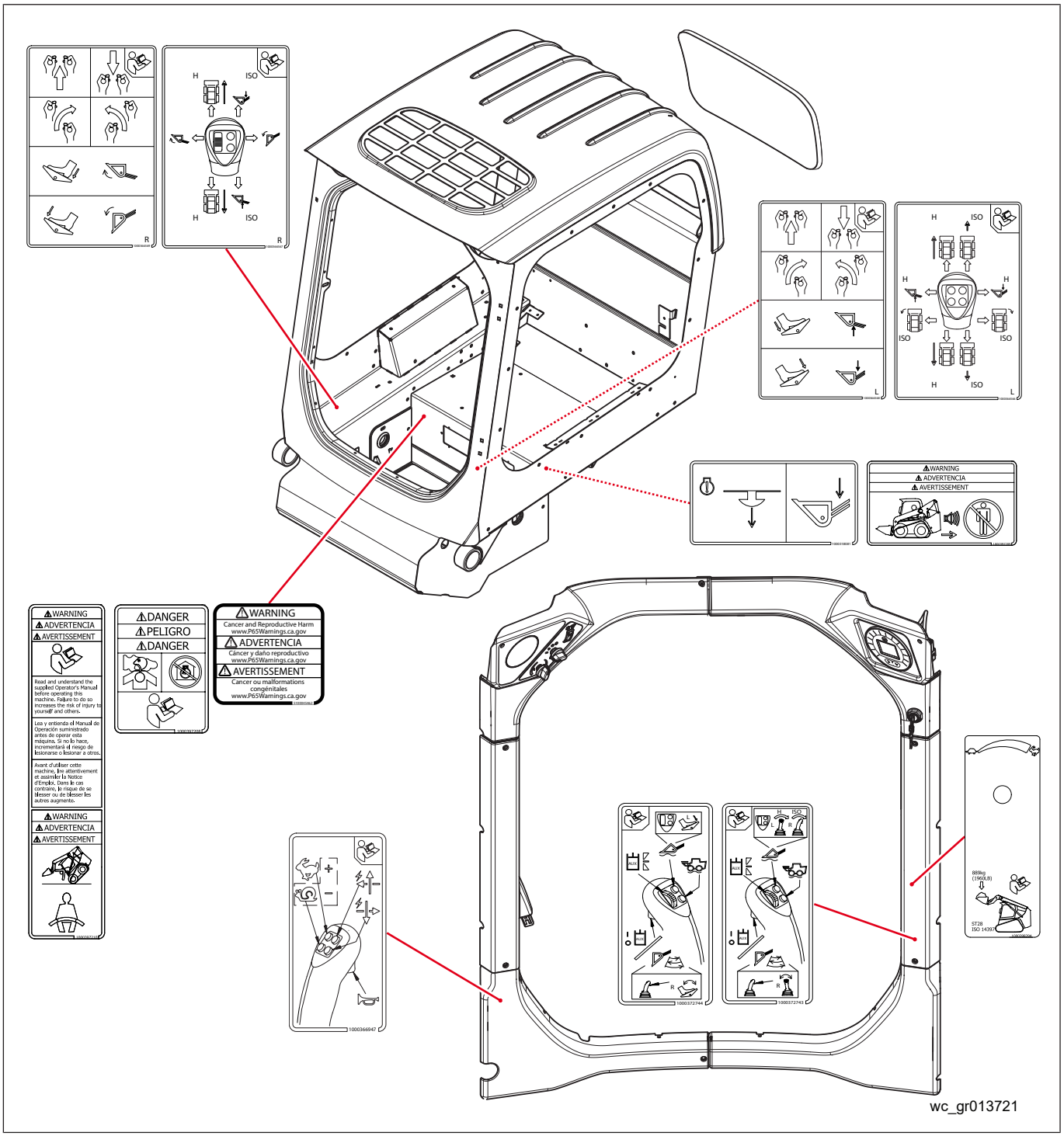
Fig. 5: Engine nameplate (close view)

4.4 Labels Overview




DANGER
PELIGRO
DANGER
WARNING
ADVERTENCIA
AVERTISSEMENT
NOx
STOP
HVAC
C
D
E
F
G
H
WACKER NEUSON

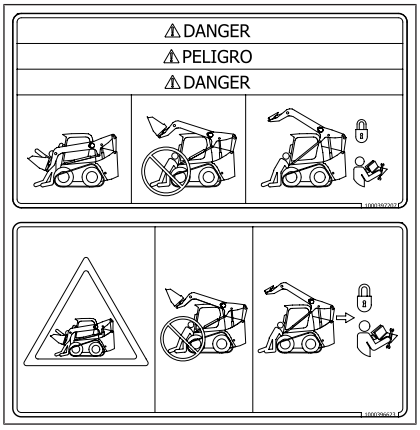

WARNING
ADVERTENCIA
AVERTISSEMENT
DANGER
PELIGRO
DANGER
WARNING
Cancer and Reproductive Harm
www.P65Warnings.ca.gov
ADVERTENCIA
Cancer y daño reproductivo
www.P65Warnings.ca.gov
AVERTISSEMENT
Cancer ou malformations congénitales
www.P65Warnings.ca.gov
wc_gr013721

4.5 Safety Labels

DANGER

Asphyxiation hazard

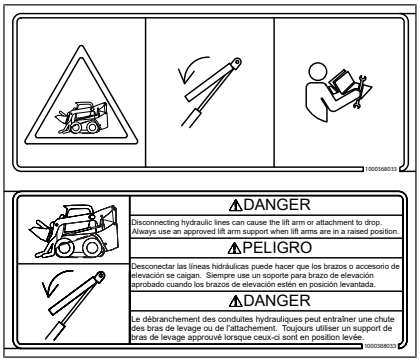
- Engines emit carbon monoxide.
- Do not run the machine indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.
- Read the Operator's Manual.
- No sparks, flames, or burning objects near the machine.
- Stop the engine before refueling.
- Use only clean, filtered diesel fuel



DANGER

Crushing hazard

Ensure lift arm support device is in place before working on raised lift arm. Do not work under a raised lift arm without securing the lift arm support device.



DANGER

Disconnecting the hydraulic line can cause the lift arm or attachment to drop. Always use an approved lift arm support when lift arms are in a raised position before disconnecting the hydraulic line.

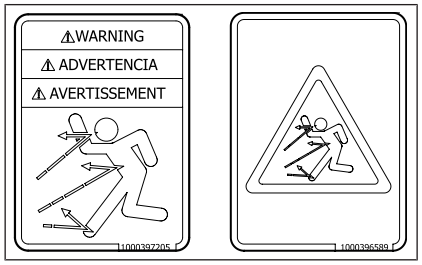
DANGER

Asphyxiation hazard

Engines emit carbon monoxide.

Do not run the machine indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.

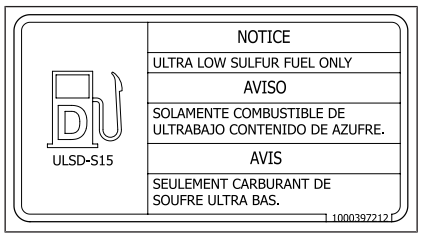
Read and understand the supplied operator's manual before operating the machine. Failure to do so increases the risk of injury to yourself or others.



WARNING

Injury hazard

High pressure contents of ride control can cause injury.



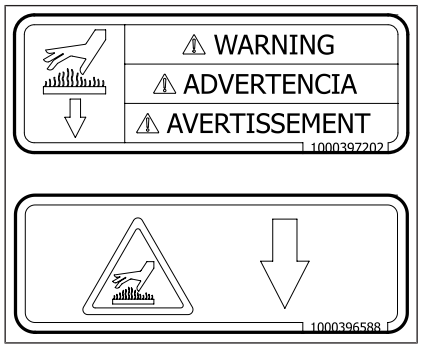
NOTICE

Ultra low sulfur fuel only

WARNING

Explosion hazard

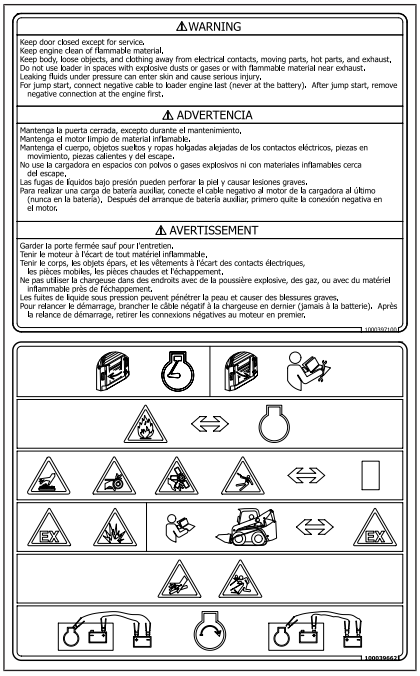
Do not use starter fluid to assist in starting diesel engine.



WARNING

Hot surface hazard

Hot surface below (machines with HVAC only)



WARNING

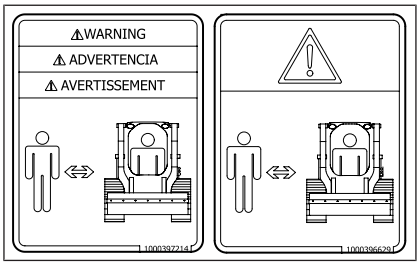
Keep door closed except for service.

Keep engine clean of flammable material.

Keep body, loose objects, and clothing away from electrical contacts, moving parts, hot parts, and exhaust.

Leaking fluids under pressure can enter skin and cause serious injury.

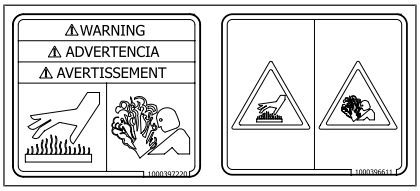
For jump start, connect negative cable to loader engine last (never at the battery). After jump start, remove negative connection at the engine first.



WARNING

Injury hazard

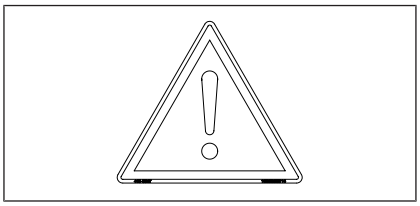
Do not stand within 2 m (6.6 ft) of the machine.



WARNING

Hot surface and explosion hazards

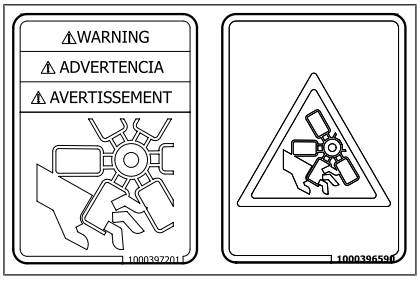
Dangerous heat and contents under pressure.



WARNING

Burn hazard

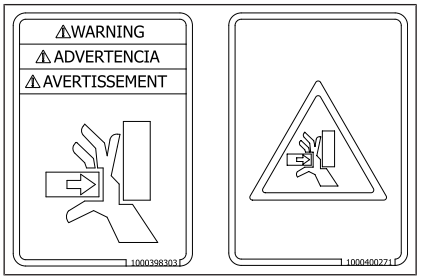
Beware of hot parts on the loader unit (lines, plug-and-socket connections, threaded fittings, hydraulic cylinders, couplings, etc.)



WARNING

Entanglement hazard

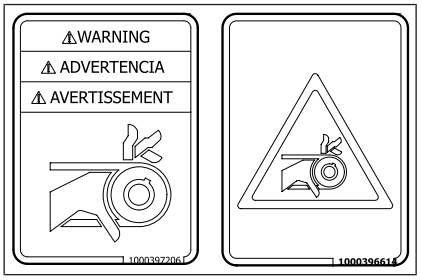
Avoid all moving parts while the engine is running.



WARNING

Pinching hazard

Pinch point



WARNING

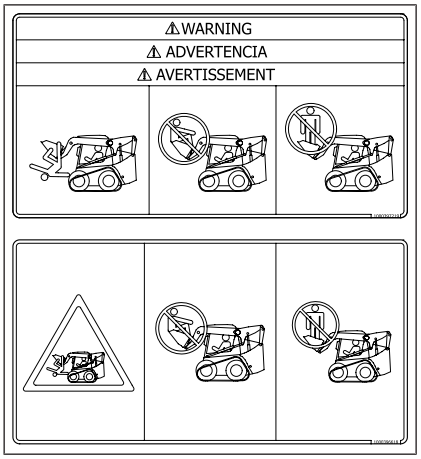
Entanglement hazard

Avoid all belts while the engine is running.

WARNING

Tipping hazard

Carry load low while traveling.

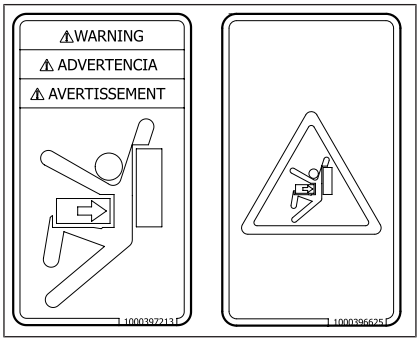


WARNING

Injury hazard

Do not carry passengers anywhere on the machine.

Do not use the machine as a person lift.

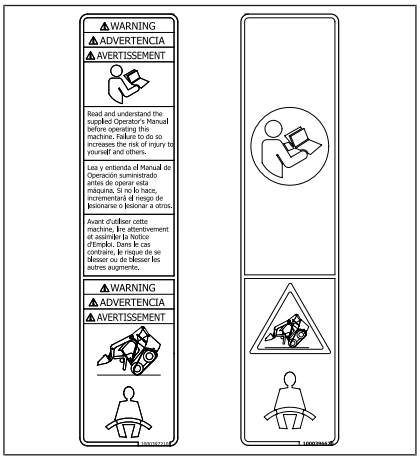


WARNING

Crushing hazard

Do not work under a raised lift arm without securing the lift arm support device.

A disconnected hydraulic line can result in the lift arm dropping.



WARNING

Read and understand the Operator's Manual before operating the machine.

Risk of injury to yourself and others.

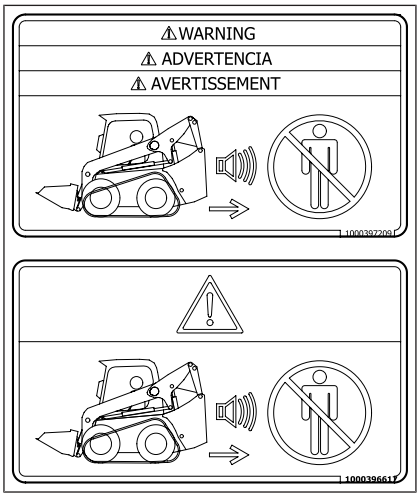
Fasten seat belt.

WARNING

California Proposition 65 Warning

Cancer and Reproductive Harm

www.P65Warnings.ca.gov.

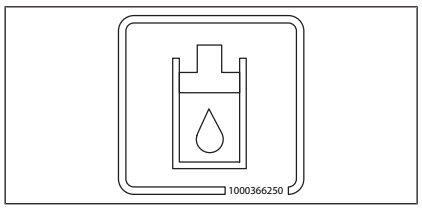


WARNING

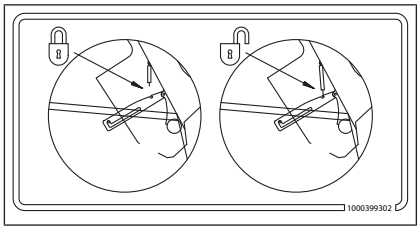
Injury hazard

Ensure backup alarm is working.

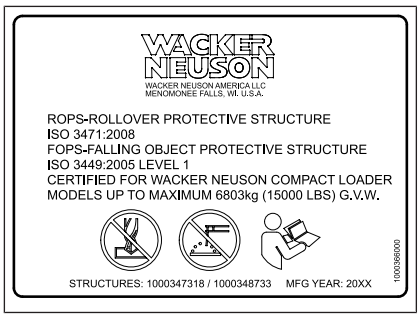
4.6 Information Labels



Hydraulic oil fill

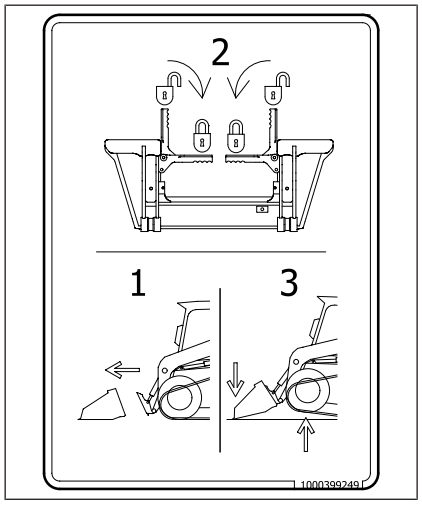


Use cab lock device when working on machine with a tipped cab.



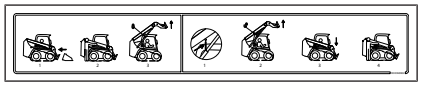
Rollover protection structure (ROPS) information Do not cut, drill, or weld on the machine unless instructed by the manufacturer.

Tie-down point

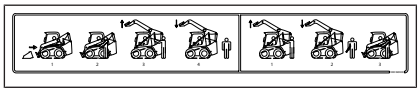


Attachment coupler operation

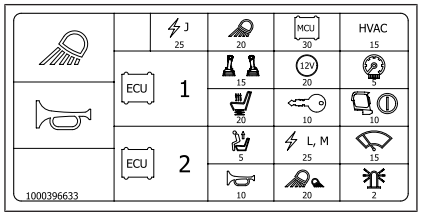
For further information, see Using the Manual Coupler on page 127.



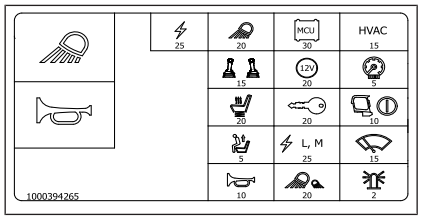
Instructions for using the lift arm support device—radial machines



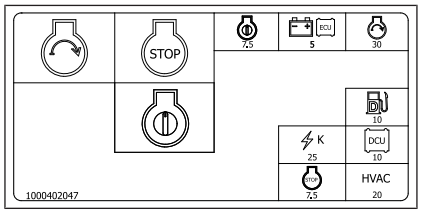
Instructions for using the lift arm support device—vertical machines



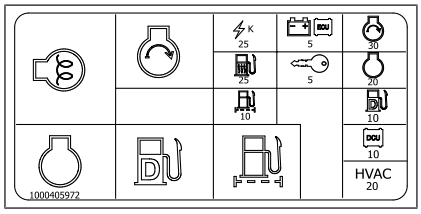
Fuse and relay box layout
First generation cab



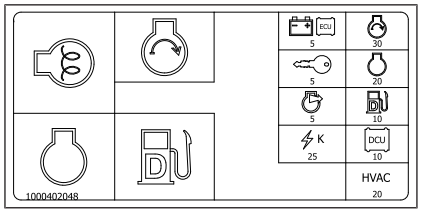
Fuse and relay box layout
Second generation cab



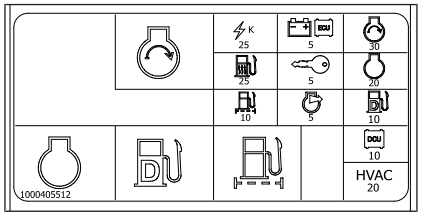
Fuse and relay box layout
Engine/chassis (S05 Tier III)



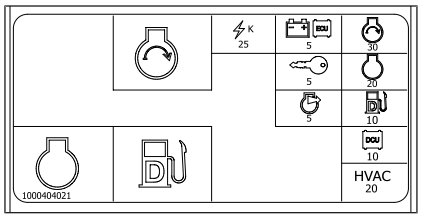
Fuse and relay box layout
Engine/chassis (S05 Tier III Decontent)



Fuse and relay box layout
Engine/chassis (S05 Tier IV)

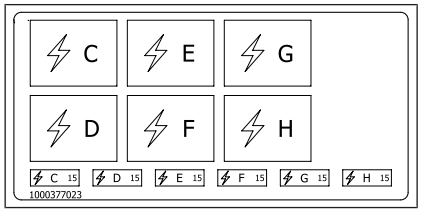


Fuse and relay box layout
Engine/chassis (S06 55 kW)

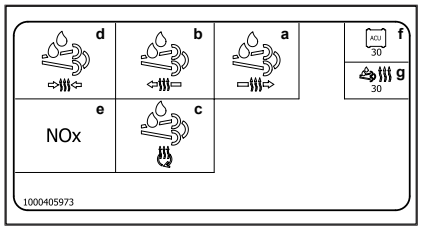


Fuse and relay box layout
Engine/chassis (S06 75 kW)

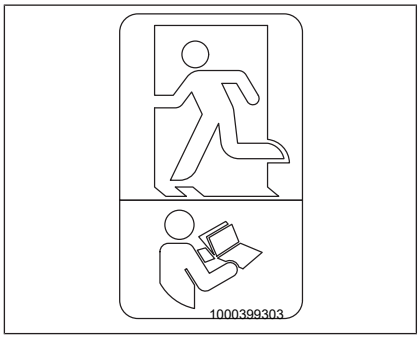
4



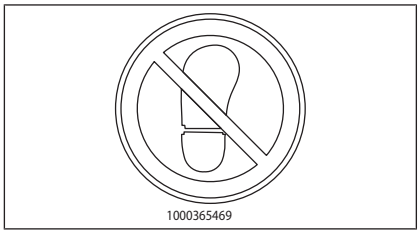
Fuse and relay box layout
14-pin (S05 and S06)



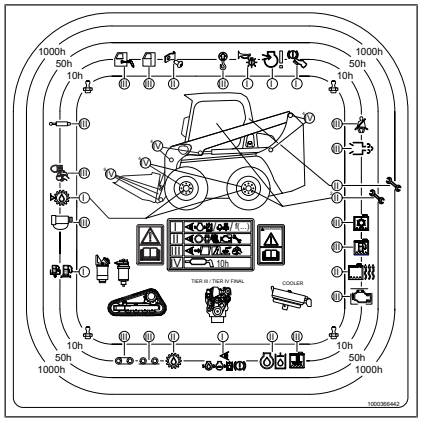
Fuse and relay box layout
SCR engine/chassis (S06 75 kW)



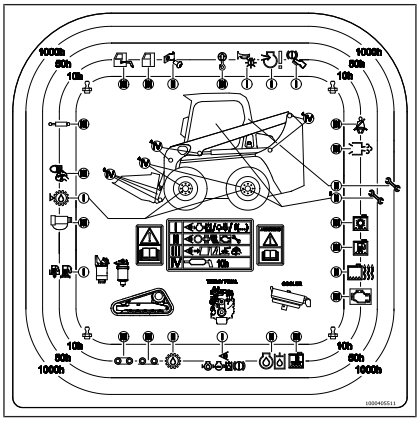
Emergency exit



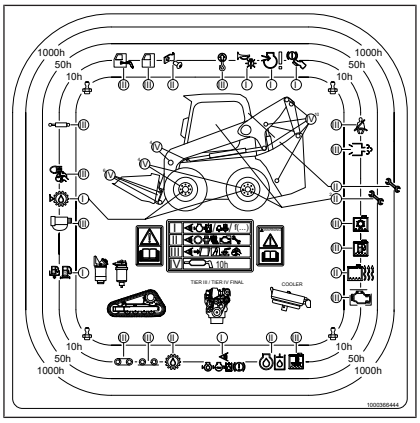
Do not step here.



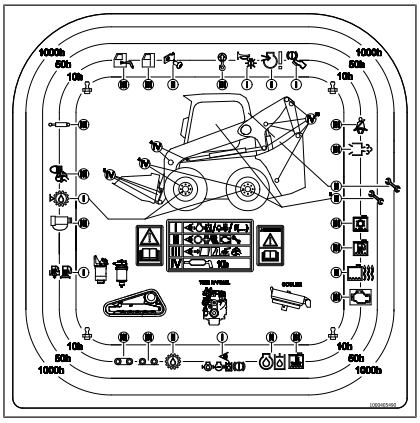
Maintenance for radial lift (S05)



Maintenance for radial lift (S06)

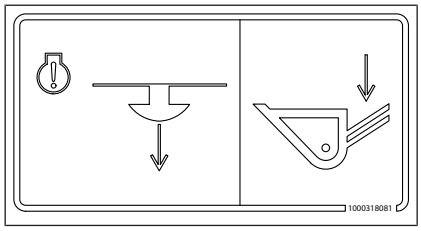


Maintenance for vertical lift (S05)

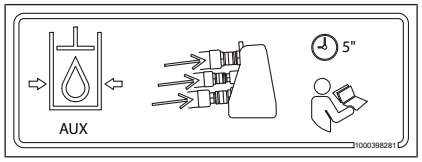


Maintenance for vertical lift (S06)

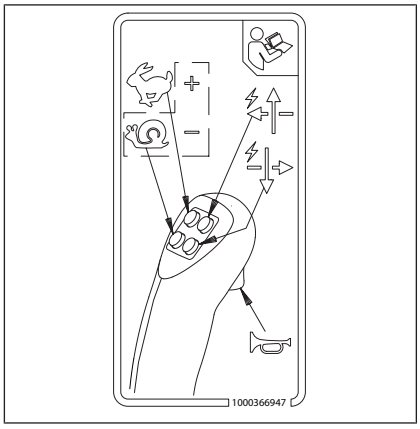
Industry Canada ICES-002 Compliance Label: CAN ICES-2/NMB-2



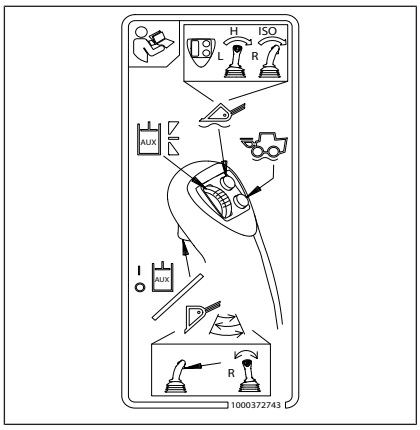
Lift arm manual override



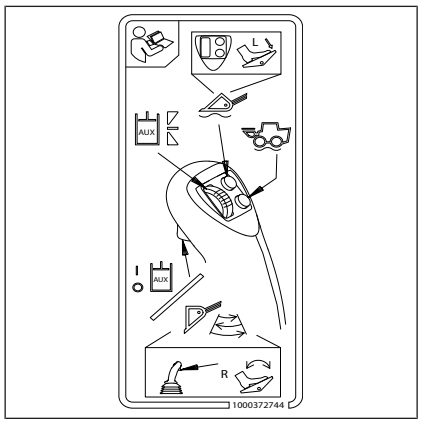
Push in the auxiliary hydraulic connector for 5 seconds to release the pressure in the auxiliary hydraulic circuit. For further information, see Auxiliary Hydraulic Connections on page 132.



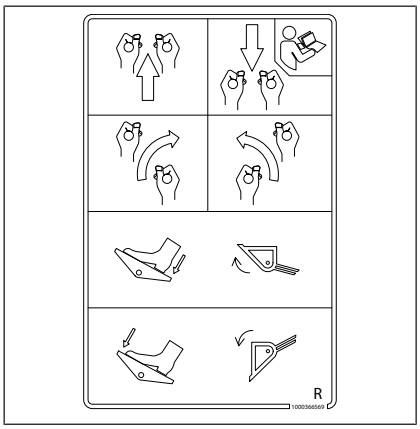
Handgrip controls (left)



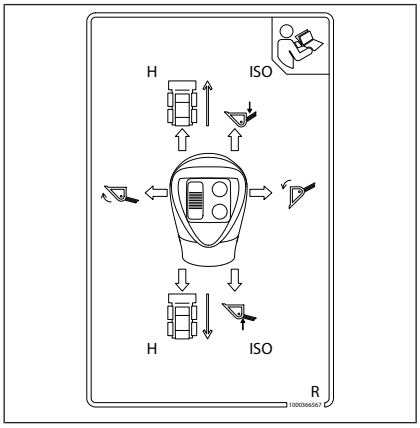
Handgrip controls (right) for electro-hydraulically controlled machine



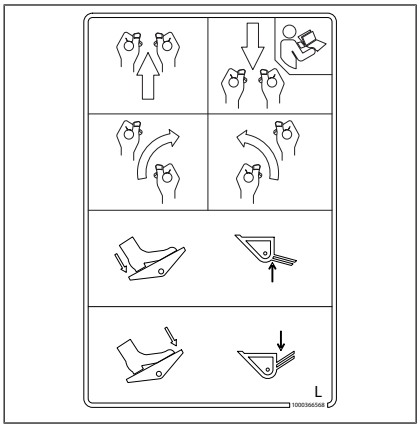
Handgrip controls (right) for mechanically controlled machine



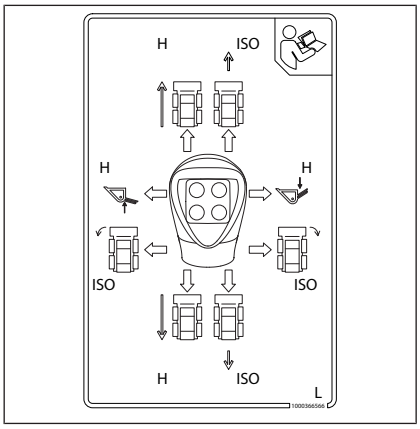
Lever and foot pedal machine operation (right)



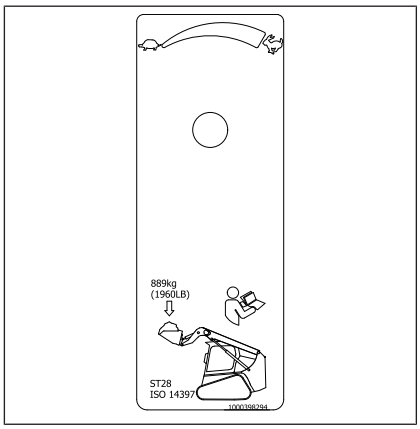
Electro-hydraulic joystick machine operation (right)



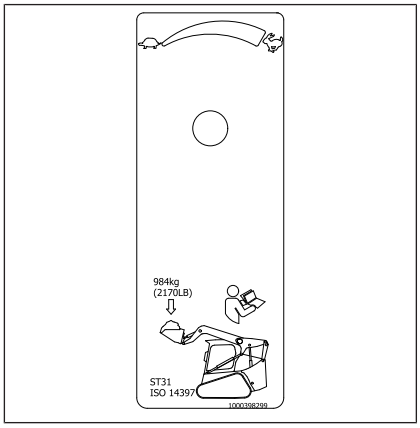
Lever and foot pedal machine operation (left)



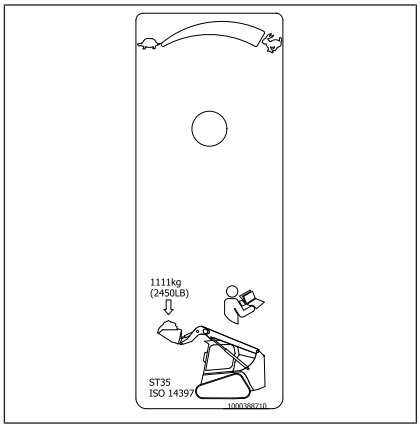
Electro-hydraulic joystick machine operation (left)



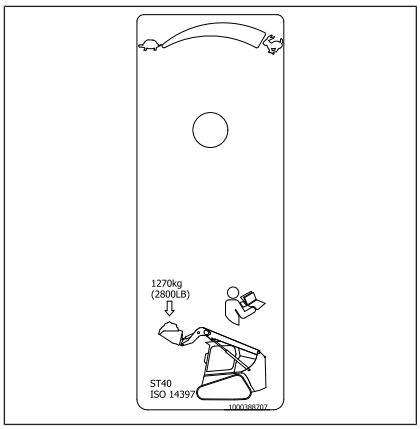
Rated operating capacity—model ST28



Rated operating capacity—model ST31



Rated operating capacity—model ST35



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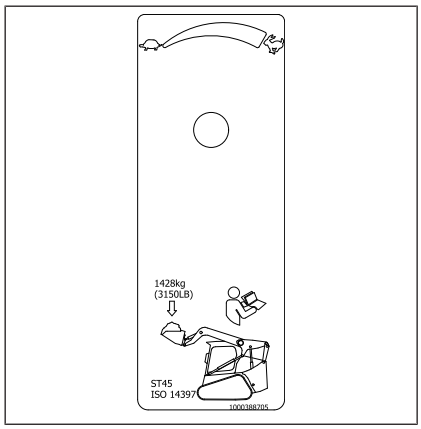

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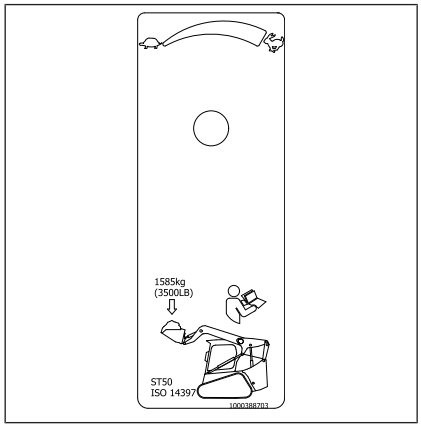

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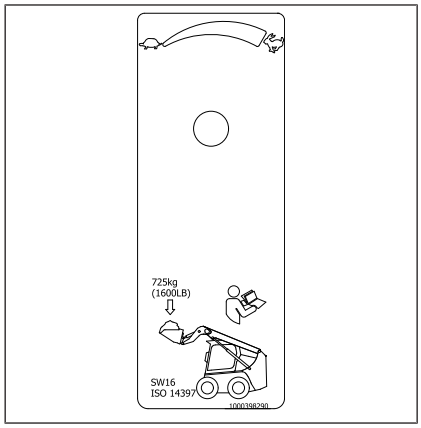
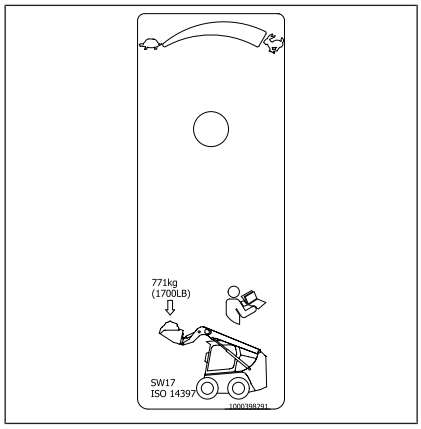


Rated operating capacity—model SW16



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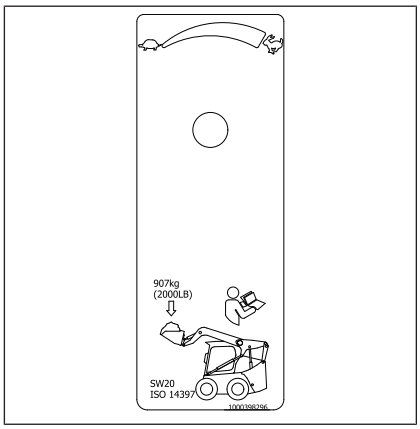
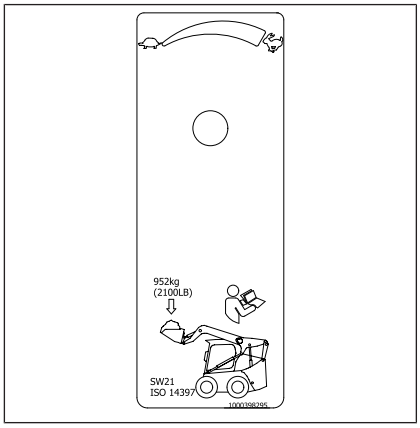
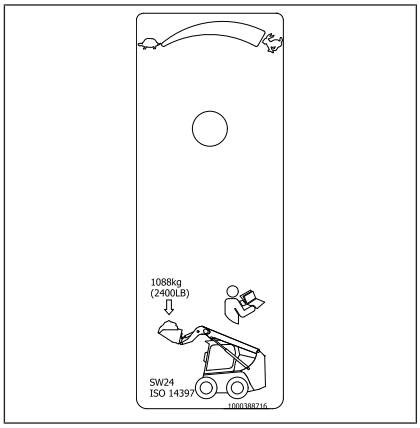


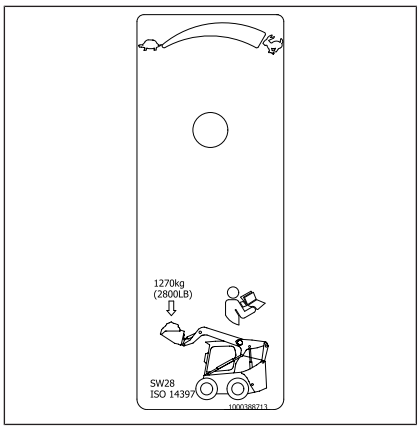
Rated operating capacity—model SW20



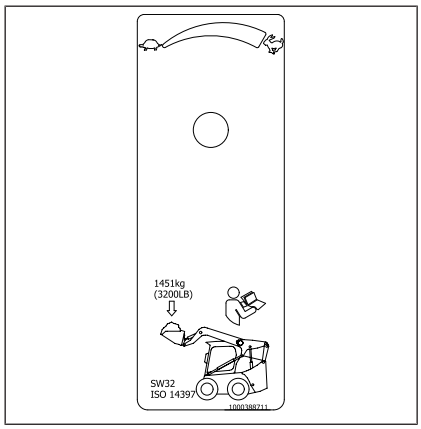
Rated operating capacity—model SW21



Rated operating capacity—model SW24



Rated operating capacity—model SW28



Rated operating capacity—model SW32

5 Transportation

5.1 Preparing the Machine for Transportation

⚠ WARNING

Personal injury hazard

Improper loading could result in serious injury or death.

- ► Keep others away from the loading area.
- ► Drive the machine off the transport vehicle with the help of a guide.

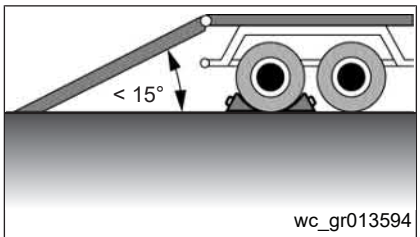


Fig. 6: Preparing for loading and unloading

Preparing transport vehicles for loading and unloading

1. Make sure the transport vehicle (trailer, truck) is capable of supporting the machine's weight. For the machine's operating weight, see Technical Data on page 215.
2. Secure the transport vehicle with chocks to prevent it from rolling.
3. If the trailer requires ramps, position the ramps at the smallest possible angle.
4. Use access ramps with an antiskid surface only.
5. Ensure that the loading area is clear and that access to it is not obstructed.

5.2 Loading and Unloading the Machine

Loading the machine

⚠ CAUTION

Machine damage hazard

Drive the machine onto the trailer with the heaviest end of the machine going up the ramp first.

NOTICE

Ensure that the driver of the transport vehicle knows the overall height, width, and weight of his transport vehicle (including the machine to be transported) before starting machine travel, and the legal transport regulations of the countries where transport is taking place.

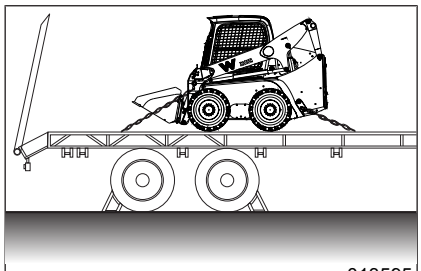

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Fig. 7: Loading the machine

1. Raise the lift arm so that the attachment (if equipped) does not contact the ramp or the ground.
2. Carefully back the machine onto the middle of the transport vehicle.
3. Lower the lift arm.
4. Stop the engine.
5. Remove the ignition key.
6. Leave the cab, and close and lock the door, windows, and covers.

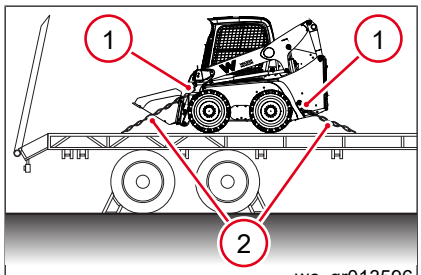

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Fig. 8: Tying the machine down

Tying the machine down

1. Secure the machine to the transport deck using the specified tie-down points **(1)** on the machine with certified straps, chains, or cables **(2)**.
2. Before transporting the machine through heavy rain, close the outlet of the exhaust pipe with a cap or suitable adhesive tape.

Unloading the machine

1. Ensure that the area behind the access ramp is clear and that access to it is not obstructed.
2. Drive slowly down the ramp. Raise the lift arm slightly so that the attachment does not touch the ramp or ground.

5.3 Towing the Machine

NOTICE

Machine damage hazard during towing

- ► The machine may only be towed out of the immediate risk zone. Then, load it on a truck or trailer.
- ► Towing the machine can cause excessive, uneven track wear.
- ► The manufacturer's warranty shall not apply to accidents or damage caused by towing.

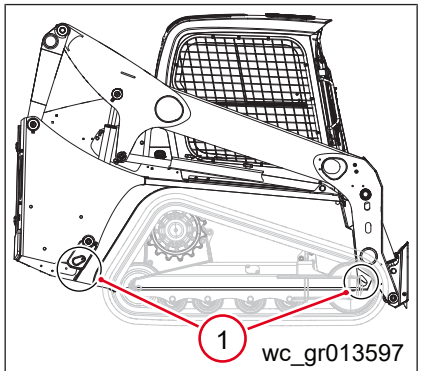

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Fig. 9: Towing the machine

Do not tow this machine, except out of an immediate risk zone or to load onto a transport vehicle. Do not tow another machine with this machine. Only use the points on the frame **(1)** designated for towing.

5.4 Lifting the Machine

⚠ WARNING

Personal injury hazard

Improper lifting could result in serious injury or death.

Do not lift the machine without the appropriate Wacker Neuson dealer-installed accessory (DIA) skid steer lifting kit.

Lifting the machine without the Wacker Neuson DIA skid steer lifting kit could damage the machine. The Wacker Neuson DIA skid steer lifting kit is available for purchase from your Wacker Neuson dealer.

Contact your local Wacker Neuson dealer for more information.

6 Operation

6.1 Risk of Injury or Death

Before putting the machine into operation, ensure that no one is at risk of injury or death. The risk zones are the areas in which persons can be seriously injured or killed if struck by, or caught by, the movements of the machine, attachment, load, or moving parts of the machine.

- The risk zone also includes the area that can be affected by falling material, equipment, or by parts that are thrown out.
- The risk zone on a slope is different from the one on a level surface (secure the load). Stop machine operation immediately as soon as someone enters the risk zone. For further information, see Operating on Slopes on page 125.
- Seal off the risk zone if it is not possible to keep a sufficiently safe distance.
- Extend the risk zone sufficiently in the immediate vicinity of buildings, scaffolds, or other elements of construction.

Avoid the following risks:

- Risk of cave-in—do not drive up to the edge of an unsecured pit or trench.
- Risk of collapse—do not undermine the foundations of walls.
- Risk of falling stones, earth, and debris—do not load under projecting earth.
- Risk of tipping over—Always keep the attachments or work equipment close to the ground.
- Risk of tipping over—Keep the load low when moving on slopes—up, down, and across. For further information, see Operating on Slopes on page 125.

Demolition or excavation work

- Do not use the impact force of the attachment to perform demolition work. This can cause serious injury, death, and damage.
- The machine can lose its balance and tip over if heavy attachments (demolition hammers, for example) are used. Proceed as follows when performing such work:
  - Never lower, turn, or set down the attachment abruptly.
  - Do not extend or retract the bucket cylinder abruptly. Otherwise, the machine can tip over.
  - Do not raise the loader unit and the attachment over the heads of other workers or over the seats of trucks or of other means of transport. The material can tip over, or the attachment can knock against the truck and cause serious injury, death, or damage.

Risk regarding hydraulic system

The hydraulic system of the machine is still pressurized even when the engine is not running.

Before starting setup or repair work (for example, installing or removing a hydraulic attachment), release the pressure in the sections of the system and pressure lines that are to be opened.

Avoid risk of injury or death

Before operating the machine, instruct all personnel in the area to stay away from the machine while it is being operated.

While operating the machine, remain aware of people moving in the work area. Be ready to react to these movements if necessary.

Lock the lift arm before servicing the machine. For further information, see Lift Arm Support Device on page 149.

Never allow someone to approach the machine while the machine is running or with the lift arm raised.

6.2 Break-in Period

Overview

New machines require a break-in period to ensure maximum efficiency. During the break-in period, the machine's moving parts stabilize.

This machine has a 50-hour break-in period.

Operating during the break-in period

Follow the recommendations below while operating the machine during the break-in period:

- Warm up the engine and hydraulic system by running the engine at lower speeds and operating the machine at low loads.
- Do not run a cold engine up to high idle or change engine speeds suddenly. For further information, see Operating the Machine in Extreme Weather Temperatures on page 69.
- Do not operate the machine at low idle for long periods of time.
- Avoid sudden machine acceleration, braking, and changing of travel directions.
- Avoid using the machine under heavy loads or at high speeds.
- Follow the machine maintenance schedule.

6.3 Operation Checklists

The checklists below are intended to assist you in checking and monitoring the machine before, during, and after operation. Additional details are found in this manual.

Start-up checklist

The following items should be checked daily before putting the machine into operation:

- Check cooler cores for debris. Clean if necessary.

- Check the fluid levels for fuel, engine oil, hydraulic oil, engine coolant, and windshield washer (if equipped).
- Check the tires for proper inflation pressure.
- Keep the machine clean. This reduces the risk of fire hazards, such as combustible material around the engine, and reduces the risk of injury or operational accidents that can be caused by dirt build-up on the accelerator pedal, mirrors (if equipped), or foot rests and steps.
- Make sure all covers and doors are closed.
- Check the seat belt for any damage.
- Adjust the seat position accordingly.
- Clear the steps and handholds.
- Make sure the attachment is securely locked in place. For further information, Testing the Attachment System.
- Make sure others are clear of the machine before starting the engine.
- Check the control interlock system for proper operation. The ground drive system and the loader control system should not operate without:
  - An operator in the seat
  - The parking brake applied
  - The seat belt fastened
- Check the parking brake for proper operation.

Operation checklist

The following items should be checked after the engine is started:

- Check that the indicator lights for engine oil pressure and alternator charge functions switch off within a few seconds after the engine is started.
- Check that the hydraulic oil filter light switches off once the hydraulic oil has warmed up.
- Monitor all other indicator lights for any malfunctions.
- Make sure that the ground drive and loader controls are working properly.

Parking checklist

- Park on level ground.
- Lower the attachment to the ground. If the lift arm is raised, make sure the lift arm support device is engaged.
- Stop the engine and remove the ignition key if the machine is being left unattended.
- If parking on a slope, check that the parking brake will prevent the machine from moving. Add chocks if necessary.

6.4 Entering and Exiting the Cab

⚠ WARNING

Crushing hazard

Do not enter or exit the machine with the lift arm in the raised position unless the lift arm is properly supported with the lift arm support device.

⚠ CAUTION

Injury hazard

Entering or exiting the cab incorrectly can cause injury.

- ► Keep the handholds and steps clean and use them for entering and exiting.
- ► Have damaged climbing aids replaced.
- ► Do not jump from the machine.

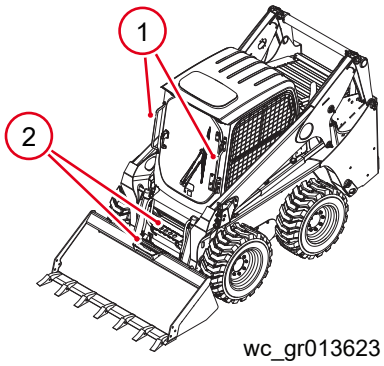

Fig. 10: Handholds and steps

Entering and exiting

Use the handholds **(1)** and steps **(2)** to safely enter and exit the operator's cab.

Always maintain "three point contact" with the machine when entering or exiting:

- Two hands and one foot
- One hand and two feet

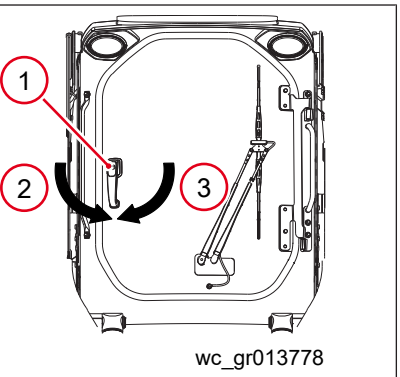

Fig. 11: Unlocking and locking door

Unlocking and locking the door (optional)

Unlocking the door:

1. Insert the starting key in the door lock **(3)**.
2. Turn the starting key counterclockwise **(4)**.

Locking the door:

1. Insert the starting key in the door lock **(3)**.
2. Turn the starting key clockwise **(5)**.

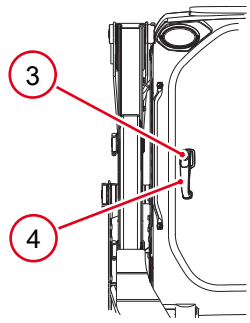

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Fig. 12: Opening the door from outside

Opening the door

The lift arm work function is disabled when the door is open.

From outside the machine:

Press the push button **(6)** on the door handle **(7)** and pull the door handle.

The door opens automatically and is held in its final position by a gas strut.

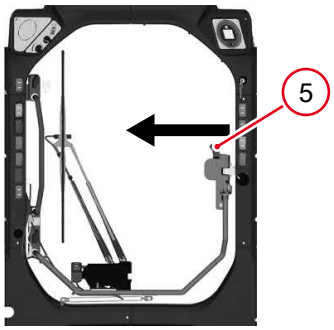

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Fig. 13: Opening the door from inside

From inside the machine:

Move the door lever **(8)** to the left and push the door open. The door is held in its final position by a gas strut.

6.5 Emergency Exits

There are two emergency exits from the cab—through the door opening or through the rear window frame.

⚠ WARNING

Burn hazard

The tail pipe and the radiator cover become hot during machine operation and can cause serious burns.

- ► Do not touch the tail pipe.
- ► Pay attention to the hot radiator cover.

⚠ WARNING

Injury hazard

Leaving the cab in an emergency can cause serious injury or death.

- ► The machine has neither footholds nor handles at the rear or on the sides.
- ► Protect your face and eyes from shattered glass.
- ► Pay attention to shattered glass during an emergency exit.

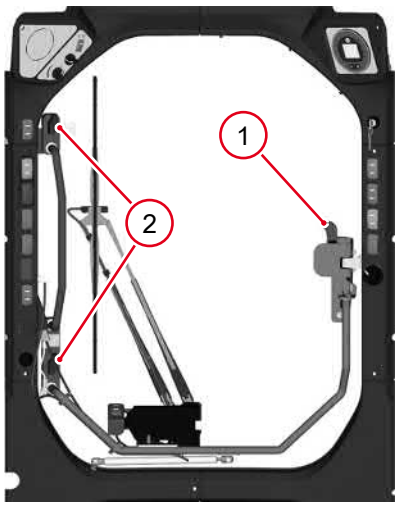

Fig. 14: Cab door emergency exit

Cab door emergency exit

Press the lever **(1)** of the door handle down and push the door open to exit the cab.

If the door does not open completely, remove the two knobs **(2)** on the hinge side of the door and push out to remove the glass. The windshield washer hoses and the gas strut break away as the door falls away.

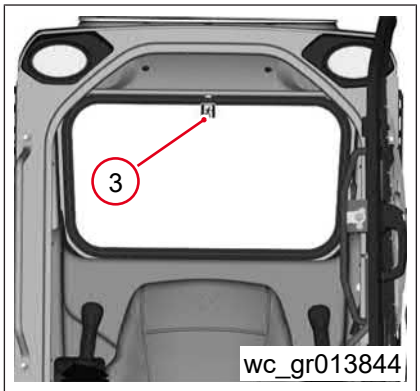

Fig. 15: Rear window emergency exit

Emergency exit by the rear window

1. Pull the emergency exit tag **(3)** hanging from the top of the rear window to release the rip cord around the window.
2. Push the window pane out of the window frame. (Push at the corner of the glass for easier removal.)
3. Crawl out of the cab through the open window frame.

6.6 Dome Light

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Fig. 16: Dome light

Location

The dome light **(1)** is located on the ceiling of the cab.

Procedure

1. Turn on the dome light **(1)** by pressing the left **(2)** or right **(3)** side of the dome light lens.
2. Turn off the dome light by returning the dome light lens to a level position.

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Fig. 17: Dome light operation

6.7 Adjusting the Operator's Seat

⚠ WARNING

Accident hazard

Adjusting the operator’s seat during machine operation can cause serious injury or death.

- ► Adjust the operator’s seat before putting the machine into operation.
- ► Ensure that the levers for seat and armrests adjustments are locked into place.
- ► Ensure that the seat is correctly adjusted to the operator’s weight before machine travel or operation.
- ► Machine operation is prohibited for operators weighing less than 54 kg (120 lbs) or more than 145 kg (320 lbs).

Information

It is normal for the air ride seat to deflate in extreme cold and may require filling more often.

- ► Check and adjust inflation, as needed, before operating.

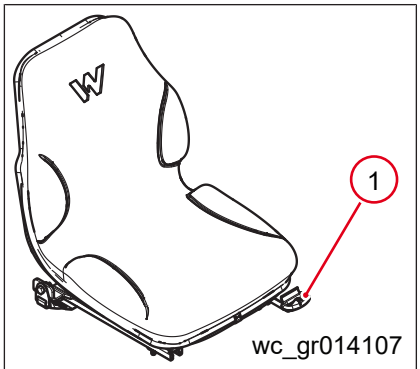


Fig. 18: Seat lever

Static seat adjustment

1. Sit on the operator’s seat.
2. Lift the lever **(1)** and slide seat, fore or aft, to the required position at the same time.
3. Release the lever.

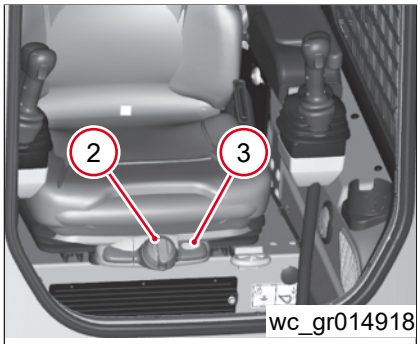


Fig. 19: Crank and indicating instrument

Weight adjustment

Mechanical Seat

1. Sit on the operator’s seat.
2. Fold out and turn the crank **(2)** until the red scale is in the middle of the indicating instrument **(3)** (between the arrows).

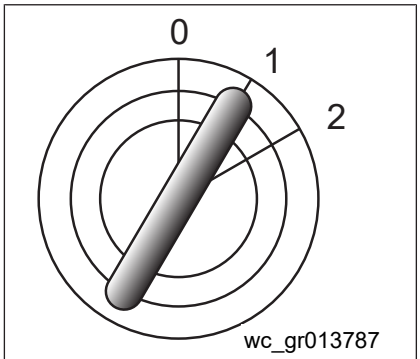


Fig. 20: Position 1

Air-ride seat

The weight for the air-ride seat can only be adjusted if the starter is switched on.

The standard seat and the air-ride seat (optional) are equipped with a seat sensor. If the operator leaves the seat for more than 5 seconds, all hydraulic functions are locked, and the parking brake is automatically enabled.

1. Sit on the operator’s seat.
2. Turn the starting key to Position 1.

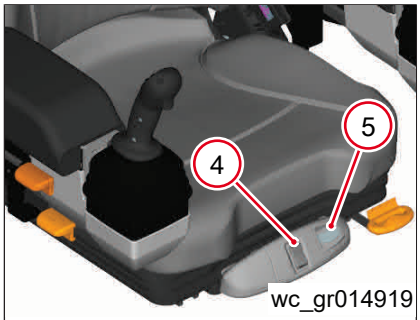


Fig. 21: Button and indicating instrument

3. To adjust a higher weight, press the top of the button **(4)** to pump air into the operator’s seat.
4. To adjust a lower weight, press the bottom of the button to release air from the operator’s seat.
5. When the adjustment is correct, the red scale is between the arrows of the indicating instrument **(5)**.

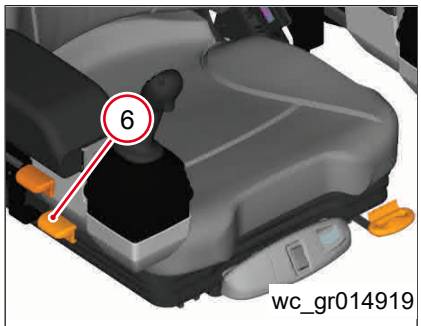


Fig. 22: Seat lever

Backrest adjustment

1. Sit on the operator's seat.
2. Lift the lever **(6)** and move the backrest to the required position at the same time.
3. Release the lever.

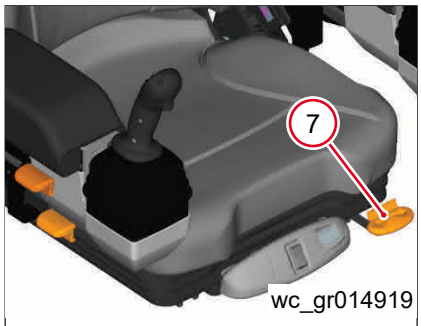


Fig. 23: Seat lever

Seat fore and aft adjustment

1. Sit on the operator's seat.
2. Lift the lever **(7)** and slide the seat fore or aft to the required position at the same time.
3. Release the lever.

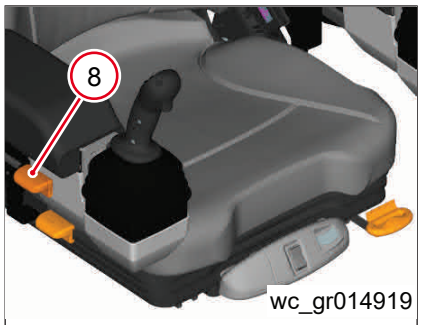


Fig. 24: Seat lever

Armrest adjustment

1. Sit on the operator's seat.
2. Lift the lever **(8)** and slide the armrest fore or aft to the required position at the same time. (There is a lever at the side of each armrest.)
3. Release the lever.

6.8 Seat Belt

⚠ WARNING

Injury hazard

Personal injury may occur if the seat belt is not fastened correctly, or not at all, or if the seat belt is dirty or damaged.

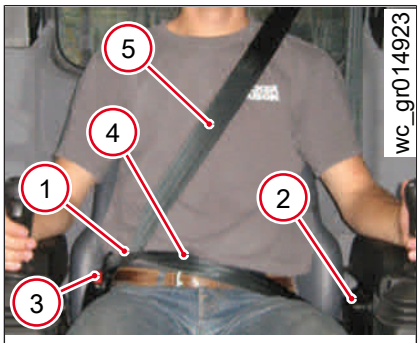


Fig. 25: Fastening the seat belt

Fastening the seat belt

To fasten the seat belt, pull the seat belt latch **(1)** away from the seat belt retractor **(2)**. Pull out more length than needed and insert the seat belt latch into the seat belt buckle **(3)** until it clicks. If more lap belt **(4)** length is needed, allow the seat belt to completely retract and then pull out more length and fasten the seat belt latch by inserting it into the seat belt buckle.

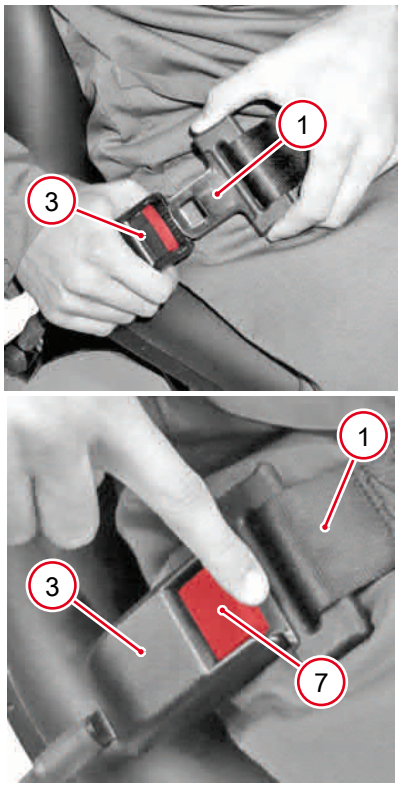
Adjust the lap belt below your belly and across your hips, and adjust the shoulder sash **(5)** away from your neck but across your chest.

Fastening the seat belt incorrectly, or not at all, can cause serious injury or death.

- Ensure the shoulder sash is not behind your back or under your arm.
- Fasten the seat belt before machine operation.
- Do not fasten a twisted seat belt.
- Do not place the seat belt over hard, fragile, or edged items in your clothes.
- Ensure that the seat belt latch is securely fastened (tug the seat belt latch after the click).
- Do not use seat belt extensions.

A damaged or dirty seat belt can cause serious injury or death.

- Keep the seat belt, seat belt latch and seat belt buckle clean, and check them for damage.
- Have a damaged seat belt, seat belt latch and seat belt buckle immediately replaced by a Wacker Neuson service center.
- Replace the seat belt immediately after every accident and the bearing capacity of the fastening points and seat fixtures checked by a Wacker Neuson service center.



wc_gr013830

Fig. 26: Unfastening the seat belt

Unfastening the seat belt

To unfasten the seat belt, push the red button **(7)** on the seat belt buckle. The seat belt automatically retracts.

Information

- The seat belt has a switch, which is part of the control interlock system. The seat belt must be fastened to activate the ground drive and the loader control systems.
- Local regulations, such as in California, may require the use of a 3-inch wide lap belt. See your Wacker Neuson dealer for parts.

6.9 Horn

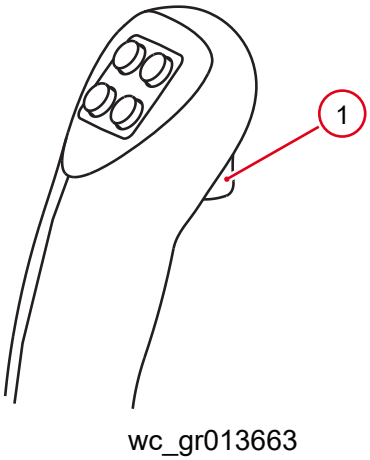


Fig. 27: Horn button

The horn is activated by pulling the trigger button **(1)** on the left handgrip.

6.10 Cab Controls

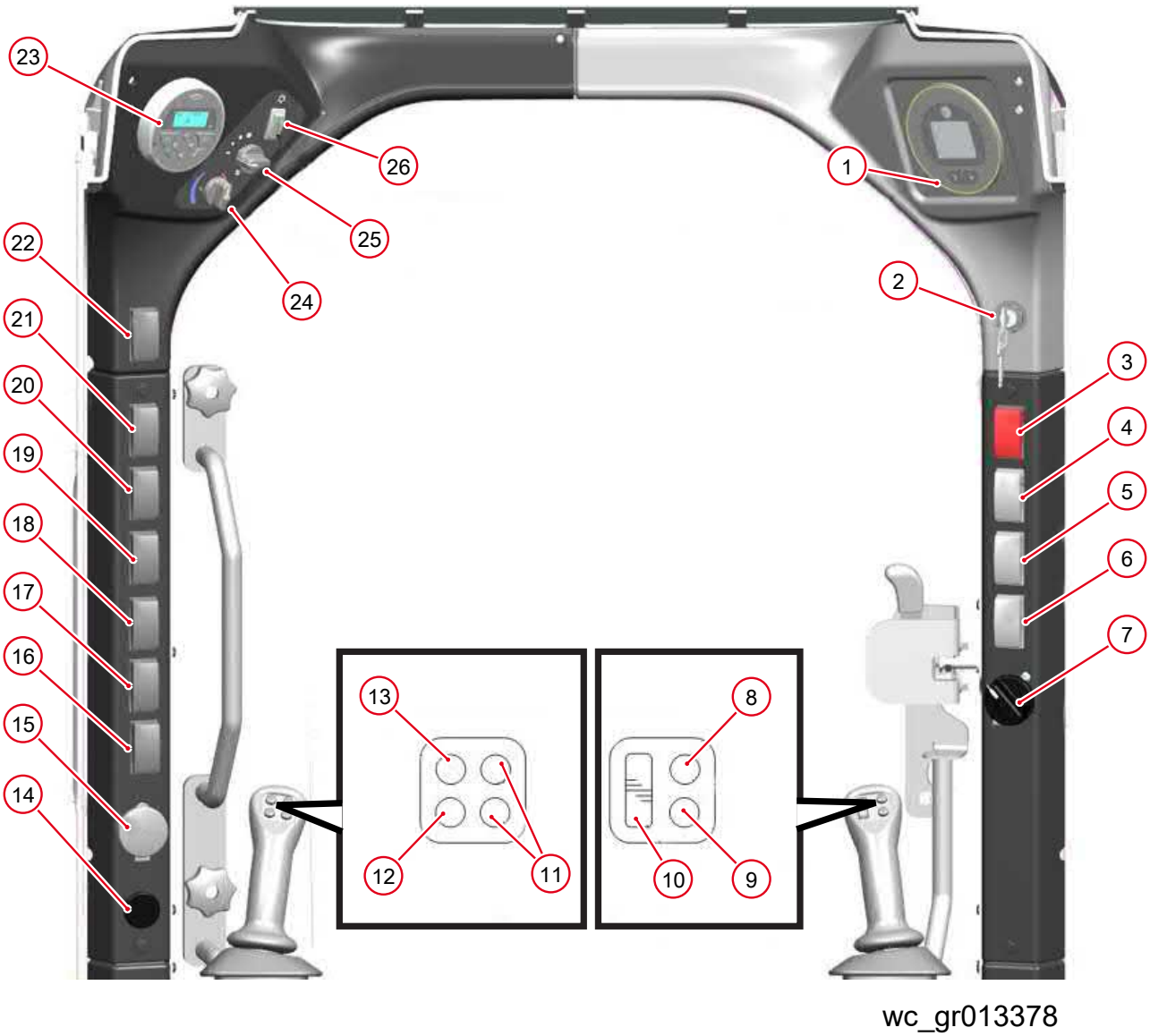


Fig. 28: Cab controls

Ref.	Control Switches	Function
1	Instrument display	Informs the operator of the machine's operation, required maintenance, and possible malfunctions
2	Key switch	Starts and stops the machine's diesel engine
3	Parking brake	Releases the parking brake
4	H / ISO	Selects "H" mode versus "ISO" mode for the operational joystick control pattern
5	A / B / C mode switch	Switches between the three different modes for the attachment control electrical system. Changes the functions of the upper right and lower right buttons on the left hand grip
6	Not used	—
7	Hand throttle	Controls engine speed

Ref.	Control Switches	Function
8	Float	Activates and deactivates the hydraulic float function for the lift arm
9	Ride control	Activates and deactivates the ride control function
10	Proportional hydraulics (+/-)	Turning the thumbwheel controls auxiliary hydraulic fluid flow through the front hydraulics quick disconnects
11	A / B / C attachment electrical	Two buttons which control the attachment's electrical system, based on the position of the A / B / C mode switch
12	Creep speed	Allows the machine to be maneuvered at a very slow travel speed for installing attachments, loading or unloading
13	Ground speed	Press button to switch hydraulic motor from low speed to high speed and from high speed to low speed
14	USB and headphone jack	USB jack for charging personal electronic devices and headphone jack for radio
15	12V adapter	12 volt power plug-in for accessories
16	Rotating beacon switch	Turns rotating beacon on and off
17	Auxiliary electric (L and M contacts)	Energizes the L and M contacts in the 14-pin auxiliary connector (momentary switch)
18	Auxiliary electric (K contact)	Energizes the K contact of the 14-pin auxiliary connector (latching switch)
19	Self-level	Keeps the bucket in the same approximate position, relative to the ground, as the lift arm is raised
20	Hydraulic coupler	Controls the hydraulic locking mechanism for mounting or removing attachments
21	Standard flow / high flow	Selects the use of auxiliary flow versus high flow hydraulics system
22	Work lights / tail lights	Selects exterior work lights and red tail lights, and turns them on and off
23	Radio	Controls for built-in radio
24	HVAC temperature	Controls air temperature for both heating and cooling
25	HVAC blower fan	Controls speed of the HVAC fan
26	AC switch	Turns air conditioning on and off

Not shown:

- Trigger button on left handgrip operates the horn.
- Trigger button on right handgrip turns the proportional hydraulic flow on and off and also activates the bucket shake function.

Some optional equipment shown.

Some equipment is market-specific; not all equipment is available in all areas.

Electro-hydraulic joystick machine shown for illustration purposes.

6.11 Parking Brake Control

Information

When the engine is started, the parking brake, which is part of the control interlock system, is applied. The ground drive, loader control, and auxiliary hydraulic functions are not activated until the operator is in the seat, the seat belt is fastened, and the parking brake is released.

wc_gr013802

Fig. 29: Parking brake button

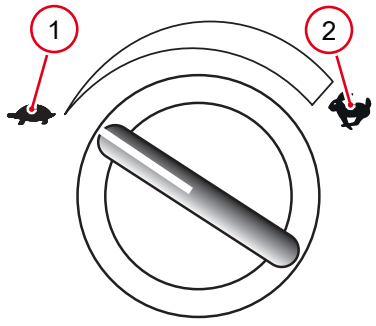
The parking brake icon is illuminated when the parking brake is engaged. Press the bottom of the parking brake switch to set the parking brake. Press the top of the parking brake switch to release the parking brake.

If the parking brake does not set after the switch is pressed, unfasten and then fasten the seat belt to cycle the system.

6.12 Using the Engine Throttles

Information

The hand throttle dial must be set to the low speed position each time the machine is started before a higher engine speed is attainable.



wc_gr013660

Fig. 30: Hand throttle

Hand throttle

Engine speed is set with the hand throttle dial located on the right side of the cabin:

- Turtle **(1)** is minimum speed
- Rabbit **(2)** is maximum speed

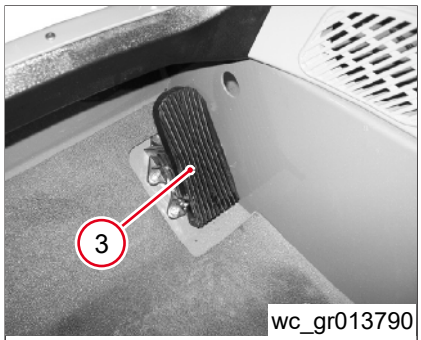


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Fig. 31: Accelerator pedal

Foot throttle (optional)

The foot throttle **(3)** (optional on electro-hydraulic joystick machines) is used to adjust engine speed.

If the hand throttle is not within 100 RPMs of full throttle, pressing the foot throttle increases engine speed.

If the hand throttle is within 100 RPMs of full throttle, pressing the foot throttle decreases engine speed. This deceleration feature works in all ground speeds/modes and can be used to better control the machine when moving piles of material or navigating around an obstacle. The deceleration lower limit is approximately 1650 RPMs.

6.13 Starting and Stopping the Engine

⚠ WARNING

Personal injury hazard

Personal injury may occur if certain conditions are not met. Before starting the engine, the operator must:

- ► Remain aware of bystanders.
- ► Make sure there is sufficient ventilation before operating the machine in enclosed areas.
- ► Start the machine from the operator's seat only.

NOTICE

Long cranking cycles may damage the starter.

- ► Do not crank the starter for more than 30 seconds.
- ► Wait 2 minutes before trying to crank the starter again so the battery can recover and the starter does not become overheated.

Information

The machine will only start when the operator is seated in the operator's seat. There is a 2.5 second time delay before the machine can be started after the operator sits in the operator's seat.

Information

Engine software RC9.3 includes a starter protection strategy to prevent catastrophic damage to the engine. The engine controller limits cranking time to 30 seconds. In cold-weather scenarios or when the battery is very low, if the cranking speed drops below 95 RPMs for 7 seconds, the engine stops.

Let the starter rest for 60 seconds to allow the engine to reset and resume normal cranking. Then, turn the ignition key to Position 0 and try again at step 3.

If the engine does not start after three attempts, see General Machine Troubleshooting on page 209 for possible causes.

Information

The hand throttle dial must be set to the low speed position each time the machine is started before a higher engine speed is attainable.

Starting the engine

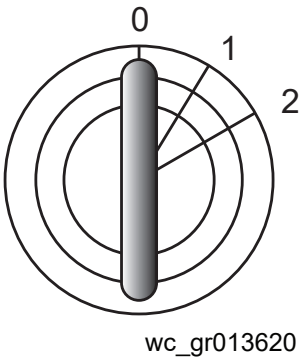


Fig. 32: Position 0

Position	Symbol	Function	
0		Stop position	Insert or remove the ignition key
1		Preheats the engine	Preheater active; all electric functions are enabled
2		Starts the engine	Starter is actuated

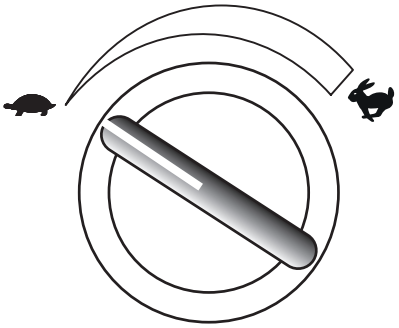


Fig. 33: Hand throttle

1. Sit in the operator's seat and fasten the seat belt. This closes the seat switch and the parking brake switch illuminates.
2. Set the throttle to the low idle position.
3. Turn the ignition key to Position 1.
   - ⇨ With a standard display, all of the display's status lights illuminate and the instrument display shows the Wacker Neuson logo for a few seconds.
   - ⇨ After a few seconds, most of the instrument display's status lights turn off. The exceptions are oil pressure, battery charge, and the parking brake. The instrument display shows machine information.
   - ⇨ With a 5.7-inch color display, the Wacker Neuson logo appears for a few seconds, and then the Passcode screen appears. Enter an authorized passcode to continue and the display shows the Main Operating screen.

Fig. 34: Engine preheat light

4. Wait until the engine preheat light **(1)** goes off.
5. Turn and hold the ignition key to Position 2 to crank the engine. When the engine starts, release the ignition key. The oil pressure and battery charge status lights turn off. The parking brake light continues to stay illuminated until the parking brake switch is pressed to release the brake.
   - ⇨ The machine enters idle delay mode when started. When in idle delay mode, the engine throttle will not respond for a minimum of 5 seconds.
   - ⇨ The idle delay is dependent on the temperature, as seen in the table below.
6. Press the parking brake switch. The control interlocks turn off and the machine is ready for operation.

Temperature °C (°F)	Crank Delay Seconds	Idle Delay Seconds
-25° (-13°)	2	60
-20° (-4°)	2	50
-15° (5°)	2	35

Temperature °C (°F)	Crank Delay Seconds	Idle Delay Seconds
-10° (14°)	2	20
-5° (23°)	2	15
0° (32°)	2	12
10° (50°)	2	8
20° (68°)	2	5
80° (176°)	2	5

If the machine has electro-hydraulic ground drive and loader controls, set the parking brake switch to the ON position and select the preferred control pattern—ISO or H mode—before operating the machine.

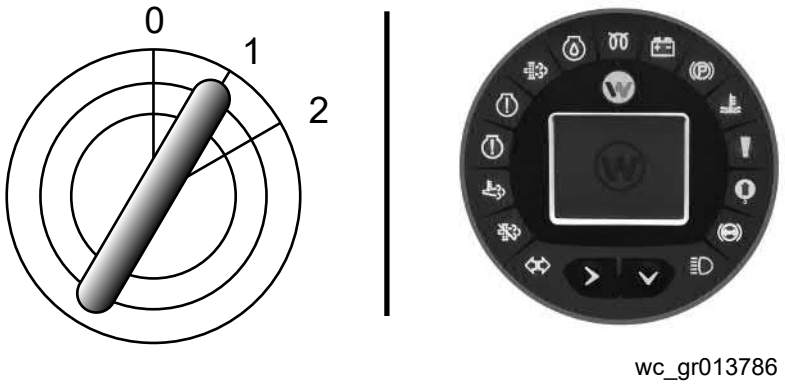


Fig. 35: Key position and screen

Warm-up phase

- Warm up the engine and hydraulic system by running the engine at half throttle before operating the machine.
- Cold System Restriction prevents the engine from running above the cold system engine speed. Cold System Restriction turns off once the hydraulic oil temperature is above 10°C (50°F).
- During the warm-up phase, check for unusual noise, exhaust color, leaks, malfunctions, or damage.
- In the case of any malfunctions or damage, do not operate the machine. Contact a Wacker Neuson dealer immediately for assistance.

Avoid excessive idling. This causes carbon deposits or an increased soot load in the diesel oxidation catalyst (DOC) in the machine's exhaust system.

Stopping the engine

NOTICE

Machine damage hazard

Run the engine at low idle before turning it off. This allows the turbocharger to wind down without losing lubrication to its bearings and allows the engine to cool down.

Information

If it is necessary to disconnect the battery after stopping the engine, wait two minutes in order to avoid damage to the control electronics.

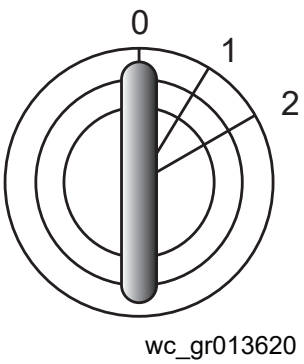


Fig. 36: Position 0

1. Allow the engine to cool down at low idle for 5 minutes without any load.
2. Turn the ignition key to Position 0.
3. Remove the ignition key before leaving the operator's seat.

6.14 Operating the Machine in Extreme Weather Temperatures

⚠ WARNING

Accident hazard

Cold hydraulic oil can lead to unpredictable machine movement and a possible loss of machine control.

► Operate the machine with extreme care.

⚠ WARNING

Explosion hazard

Evaporative starting fluids can cause unexpected explosions.

► Do not use evaporative starting fluids, such as ether, on this engine.

NOTICE

Operating the machine without warming it up first may render the machine ineffective and equipment damage may occur.

► Warm up the machine according to the information below.

Information

An engine block heater is required below -23°C (-10°F).

Do not use the machine in ambient temperatures above 45°C (113°F). The machine can operate in ambient temperatures less than -20.5°C (-5°F).

Carefully observe the recommendations in the following sections when operating the machine in extreme temperatures.

Cold temperatures

The following table gives the requirements when operating a machine in a cold climate.

Machine	Temperature	Battery	Engine Oil	Hydraulic Oil	Diesel Fuel
SW16 / SW17 / SW20 / SW21 / ST28 / ST31	To -20.5°C (-5°F)	950 cca Group 31	10W30 API CJ4	ISO 46	Winterized #2
	Below -20.5°C (-5°F)	950 cca Group 31	5W40 API CJ4 Full synthetic	ISO 46 Full synthetic	#1
SW24 / SW28 / SW32 / ST35 / ST40 / ST45 / ST50	To -17.7°C (0°F)	950 cca Group 31	10W30 API CJ4	ISO 46	Winterized #2
	To -20.5°C (-5°F)	950 cca Group 31	10W30 API CJ4	ISO 46	#1
	Below -20.5°C (-5°F)	Dual 950 cca Group 31	5W40 API CJ4 Full synthetic	ISO 46 Full synthetic	#1

Cold temperatures affect the starting capability of the engine, and the hydraulic systems will be sluggish until the system temperatures increase to the normal operating range. The following are actions that help minimize cold start effects.

Engine/electrical

- Use proper diesel fuel for the ambient temperature.
- Use engine oil with the proper viscosity. For further information, see Engine Oil Viscosity on page 164.
- Check the engine coolant mixture for proper antifreeze mix.
- Make sure the battery is fully charged.
- Check to see if the battery connections and the connections to the starter and engine block are clean.
- Start the engine. For further information, see Starting and Stopping the Engine on page 66.

Hydraulic system

- Use proper hydraulic oil.
- Prevent damage to the hydraulic system by operating the machine at low loads. Follow the warm-up procedures before using the machine at full load.

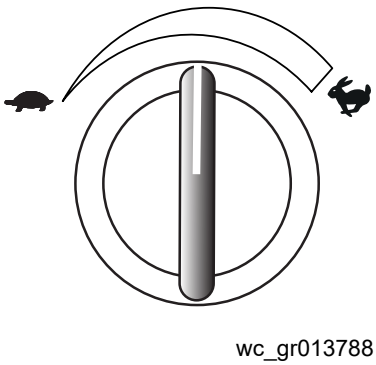


Fig. 37: Hand throttle

The following table gives minimum idle times based on temperature:

Ambient Temperature	Time
≤ -20°C	2 minutes
from -20°C to -10°C	1 minute
from -10°C to -5°C	30 seconds
from -5°C to 5°C	20 seconds
≥ 5°C	15 seconds

Hot temperatures

Hot temperatures affect the engine and the hydraulic cooling systems.

The following are actions that help minimize issues with overheating of the machine.

Engine/cooling

- Check the engine coolant mixture for proper antifreeze mix.
- Check the engine coolant level.
- Check the radiator cap for damage. Replace the cap if it is damaged.
- Keep the radiator core clean by removing dirt and debris.
- Use engine oil with the proper viscosity.

Hydraulic system

- Use proper hydraulic oil.
- Keep the oil cooler core clean by removing dirt and debris.
- Operate the machine at a lower load.
- When operating an attachment, avoid holding the right joystick in place when the attachment has been fully extended or retracted. Otherwise, the hydraulic system will run over a relief valve, resulting in excessive heat build-up in the hydraulic oil.
- When operating an attachment, avoid holding the auxiliary lever in place when an attachment stops moving. Otherwise, the hydraulic system will run over a relief valve, resulting in excessive heat build-up in the hydraulic oil.
- Avoid driving for excessive amounts of time.

6.15 Instrument Display (Tier IV)

Information

When the engine is started, the instrument display goes through a check procedure. For further information, see Starting and Stopping the Engine on page 66.

The instrument display informs the operator of the operating states, required maintenance, or possible machine malfunctions.

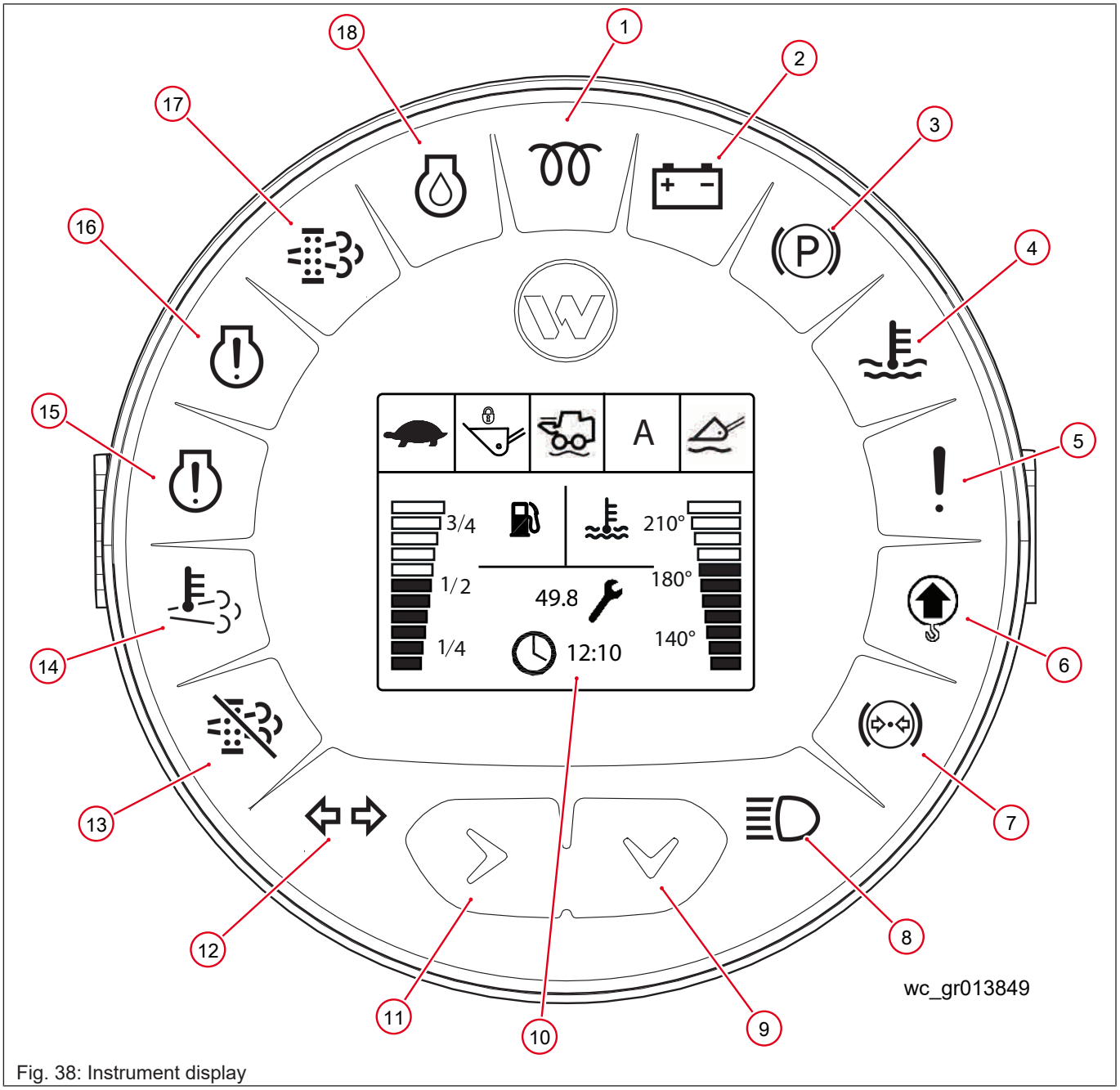
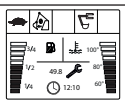


Fig. 38: Instrument display

Instrument display indicator lights (Tier IV)

Ref.	Symbol	Color	Function
1		Yellow	Engine preheating
2		Red	Battery charge indicator light
3		Red	Parking brake
4		Red	Engine coolant temperature
5		Red	General malfunction
6		Red	(not assigned)
7		Red	(not assigned)
8		Blue	Work lights
9		—	Selector button (instrument display)
10		—	To next menu page/set (instrument display)
11		—	Instrument display (for further information, see the next section.)
12		Green	Turn indicators (not available on this model)
13		Yellow	DPF regeneration disabled/interrupted (not used on this model)
14		Yellow	High exhaust-gas temperatures (not used on this model)
15		Red	Engine stop
16		Yellow	Engine warning
17		Yellow	DPF regeneration (not used on this model)
18		Red	Engine oil pressure

6.16 Instrument Display (Tier III)

The instrument display informs the operator of the operating states, required maintenance, or possible machine malfunctions.

Information

When the engine is started, the instrument display goes through a check procedure. For further information, see Starting and Stopping the Engine on page 66 for details.

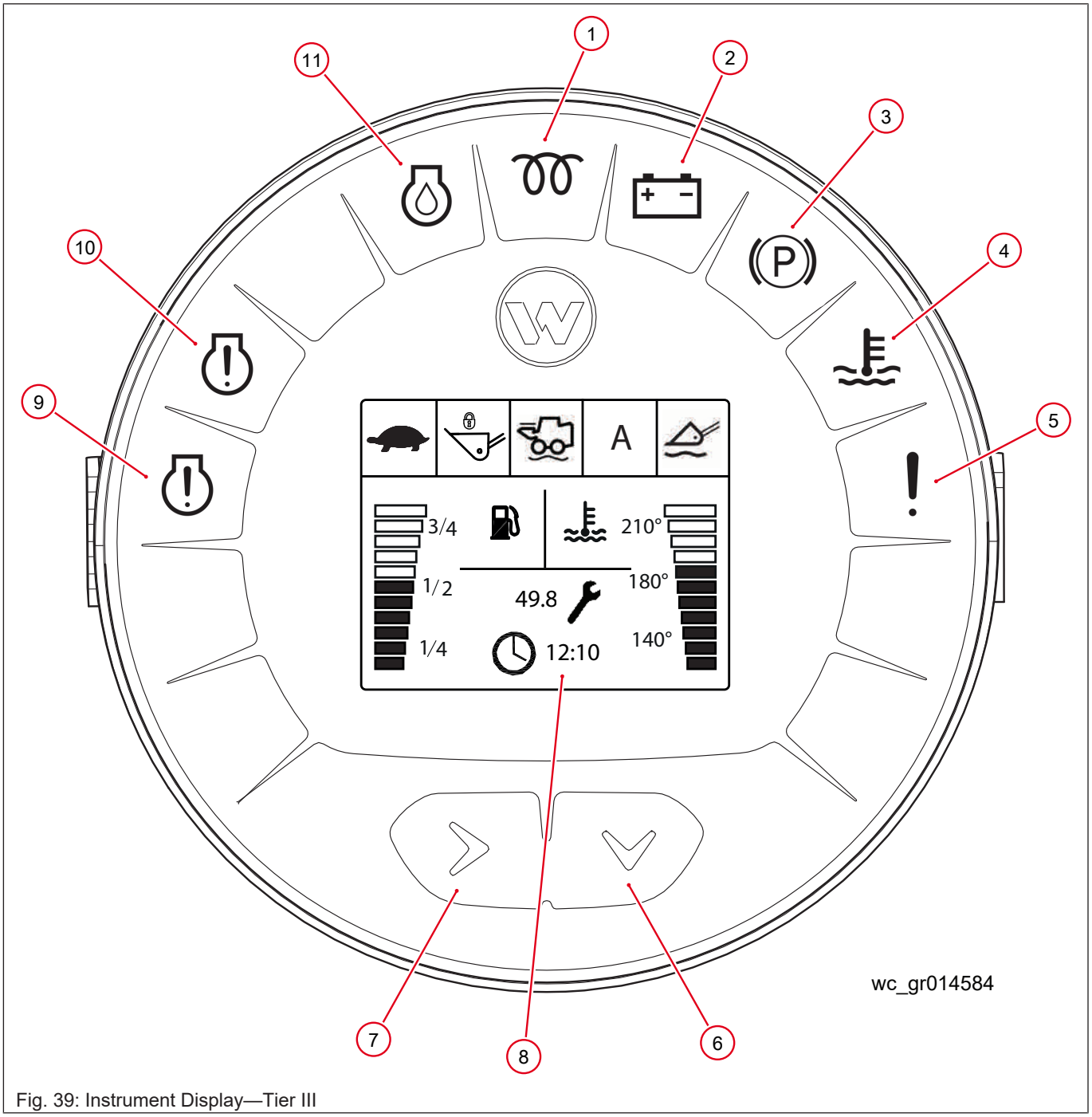
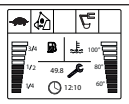


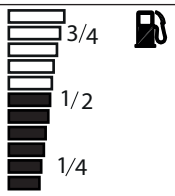
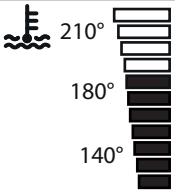
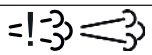
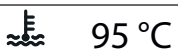
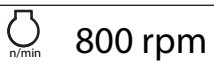
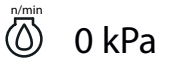
Fig. 39: Instrument Display—Tier III

Instrument display indicator lights (Tier III)

Ref.	Symbol	Color	Function
1		Yellow	Engine preheating
2		Red	Battery charge indicator light
3		Red	Parking brake
4		Red	Engine coolant temperature
5		Red	General malfunction
6		—	Selector button (instrument display)
7		—	To next menu page/set (instrument display)
8		—	Instrument display (for further information, [▷ 75])
9		Red	Engine stop
10		Yellow	Engine warning
11		Red	Engine oil pressure

6.17 Instrument Display Symbols and Functions

Symbol	Function
	Slow ground speed (1st speed)
	Fast ground speed (2nd speed)
	Cold system restriction warning
450.2 	Elapsed operating hours meter
49.8 	Operating hours to next maintenance
 12:10	Time

Symbol	Function
800 rpm	Engine speed
	Fuel tank capacity
	Engine coolant temperature
	Engine error
	Machine error
	Engine data
	Machine data
	Display settings
	DPF (not used on this model)
	No malfunction
	Detailed engine coolant temperature
	Detailed engine speed
	Detailed engine oil pressure
	Engine number
	Setting of display brightness
	Setting of display contrast
	Setting of time/date
	Auxiliary hydraulics (AUX I)
	High flow hydraulics
	Creep ground speed (very slow speed)

Symbol	Function
	Ride control
	Float engaged
	Hydraulic pilot control pressure
	Hydraulic oil filter
	Engine intake air filter
	Hydraulic oil temperature
	Battery charge indicator light
	Water-in-fuel indicator light

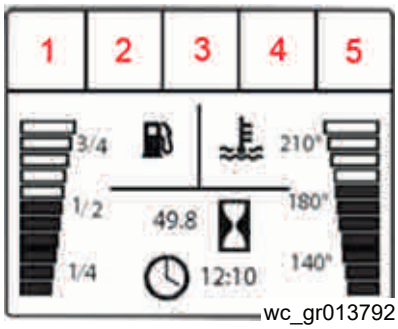


Fig. 40: Instrument display windows

Instrument display windows—symbols and functions

The instrument display shows the following major functions:

- Window 1: Slow ground speed (1st speed), fast ground speed (2nd speed), creep ground speed (very slow speed) controls
- Window 2: Workgroup controls lockout, workgroup controls unlock
- Window 3: Ride control engaged
- Window 4: Attachment electrical in “A” mode, attachment electrical in “B” mode, attachment electrical in “C” mode
- Window 5: Bucket float engaged

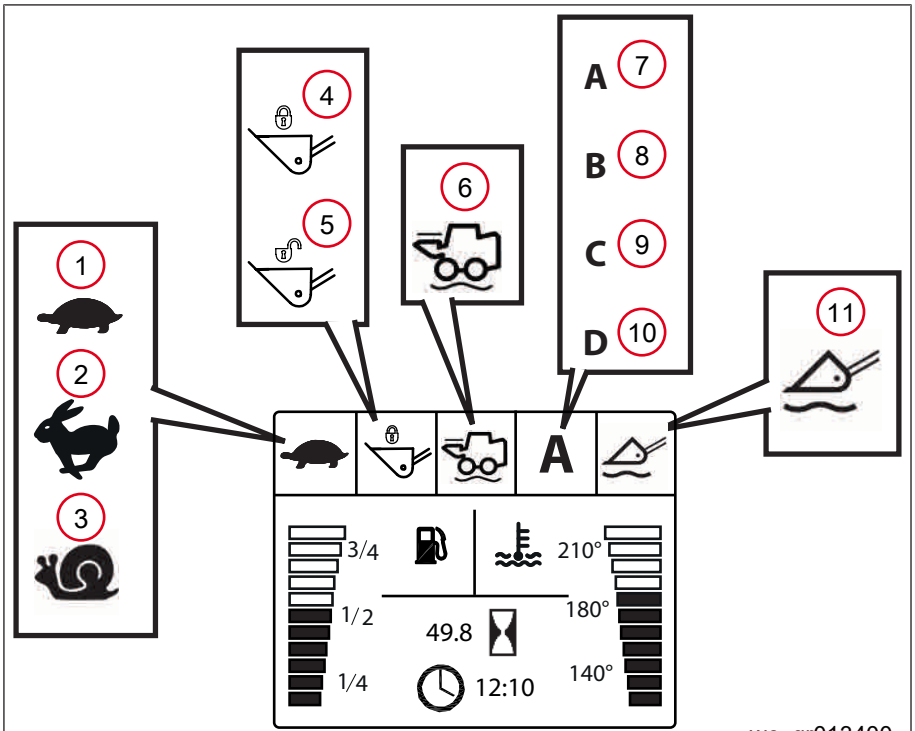


Fig. 41: Instrument display windows symbols

Ref.	Symbol	Function
1		Slow ground speed (1st speed)
2		Fast ground speed (2nd speed)
3		Creep ground speed (very slow speed)
4		Workgroup controls lockout
5		Workgroup controls unlocked
6		Ride control engaged
7	A	Attachment electrical “A” mode
8	B	Attachment electrical “B” mode
9	C	Attachment electrical “C” mode

Ref.	Symbol	Function
10	D	Attachment electrical “D” mode
11		Float engaged

In addition to these display symbols, the center window also displays the status of additional functions:

- Window 3: Drive control in “H” mode
- Window 3: Drive control in “ISO” mode
- Window 3: Self level
- Window 3: Standard auxiliary flow hydraulics
- Window 3: High flow hydraulics
- Window 3: Hydraulic filter maintenance

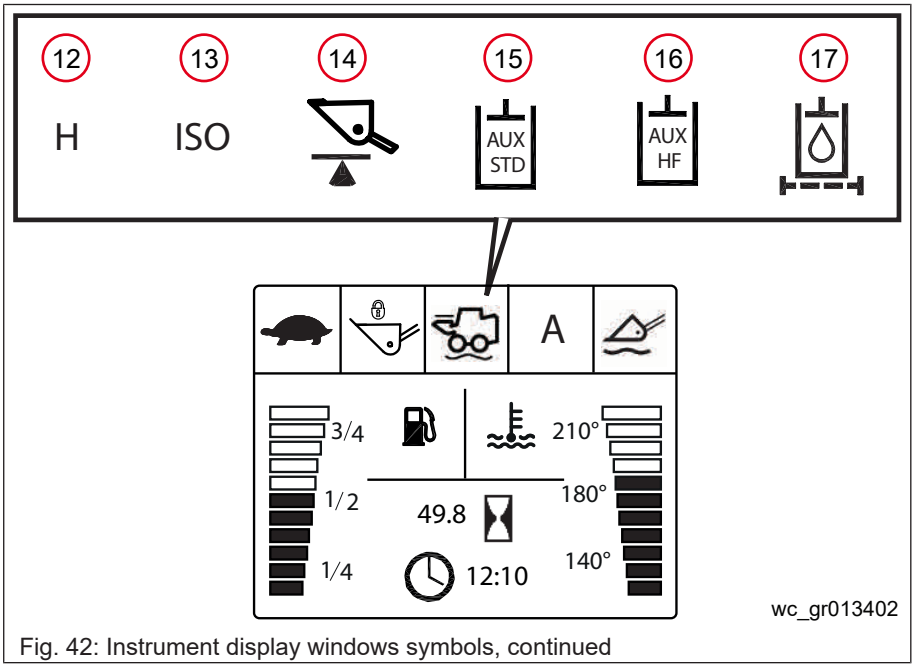
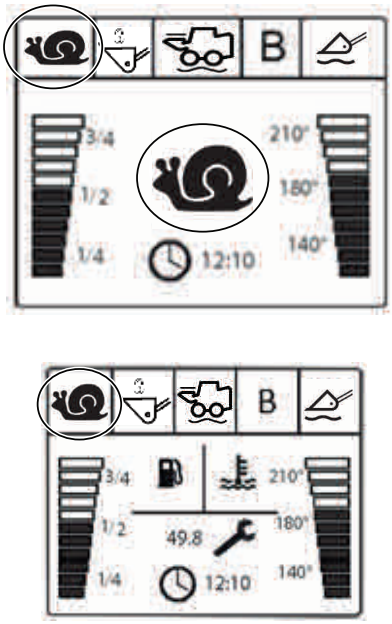


Fig. 42: Instrument display windows symbols, continued

Ref.	Symbol	Function
12	H	Drive control in “H” mode
13	ISO	Drive control in “ISO” mode
14		Self level
15		Standard auxiliary flow hydraulics

Ref.	Symbol	Function
16		High flow hydraulics
17		Hydraulic filter maintenance

6.18 Instrument Display Menu Behavior



wc_gr013399

Fig. 43: Instrument display menu behavior

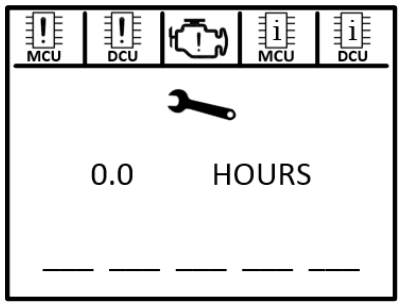
When a control is activated, the display shows the newly activated control symbol in the center of the instrument display for a few seconds and then return to the home display mode.

Most, but not all, of the new commands remain showing in one of the top five windows until it is changed.

6.19 Instrument Display Subpages Menus

Information

A subpage remains active for 5 seconds before returning to the main page.



wc_gr014600

Fig. 44: Subpage 0—Service hour reset

Subpage 0—Service hour reset

This page is only available when the service counter reaches 0.0 hours.

After counting down from 500 hours, the service icon flashes when the counter reaches 0.0 hours.

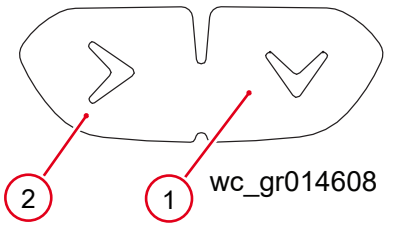
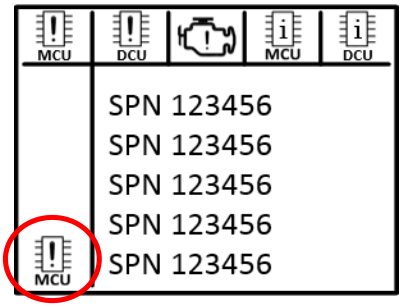


Fig. 45: Display arrows

To reset the service counter, use the selector button **(1)** and the next menu button **(2)** at the bottom of the instrument display to enter the reset code—12345. If the code is entered correctly, the service counter resets to 500.0 hours.

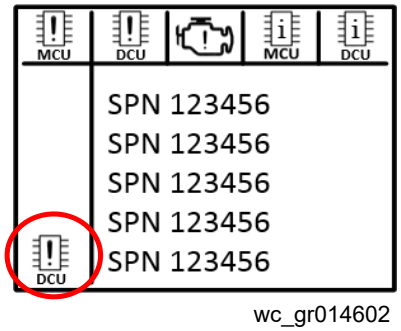


wc_gr014601

Fig. 46: Subpage 1—MCU error codes

Subpage 1—MCU error codes

Machine control unit error codes are displayed on this screen.

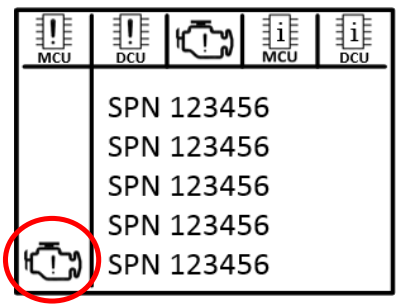


wc_gr014602

Fig. 47: Subpage 2—DCU error codes

Subpage 2—DCU error codes

Drive control unit error codes are displayed on this screen.

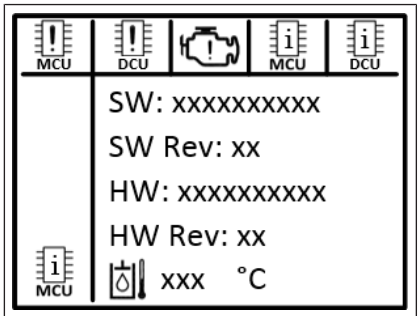


wc_gr014603

Fig. 48: Subpage 3—ECU error codes

Subpage 3—ECU error codes

Engine control unit error codes are displayed on this screen.



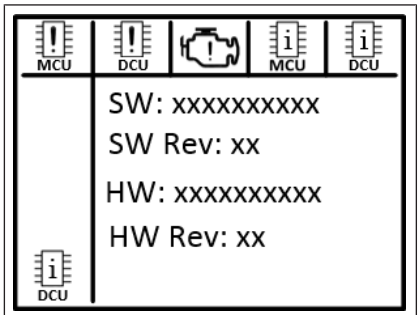
wc_gr014604

Fig. 49: Subpage 4—MCU Information

Subpage 4—MCU information

The following machine control unit information is displayed on this screen.

- SW: software material number
- SW Rev: software revision number
- HW: hardware material number
- HW Rev: hardware revision number
- Hydraulic fluid temperature



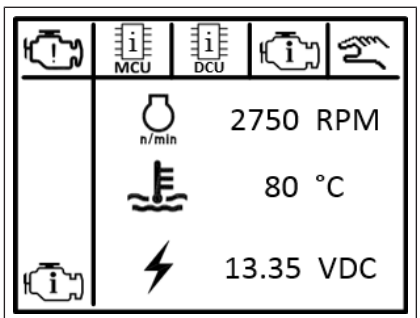
wc_gr014605

Fig. 50: Subpage 5—DCU information

Subpage 5—DCU information

The following drive control unit information is displayed on this screen.

- SW: software material number
- SW Rev: software revision number
- HW: hardware material number
- HW Rev: hardware revision number



wc_gr014606

Fig. 51: Subpage 6—ECU Information

Subpage 6—ECU information

The following engine control unit information is displayed on this screen.

- Engine RPMs
- Engine coolant temperature
- System voltage

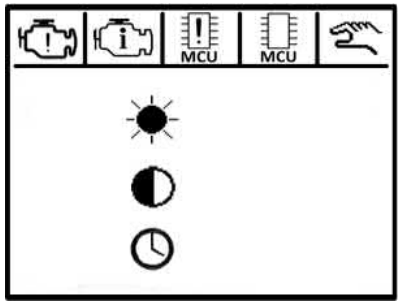


Fig. 52: Subpage 7—Display settings

Subpage 7—Display settings

The following display settings are accessible through this screen.

- Brightness
- Contrast
- Clock

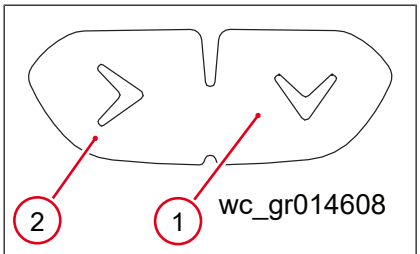


Fig. 53: Display arrows

Use the selector button **(1)** and the next menu button **(2)** at the bottom of the instrument display to scroll through the screens to get the screen shown to adjust the brightness, adjust the contrast, or set the time.

6.20 Instrument Display Menus (Tier IV)

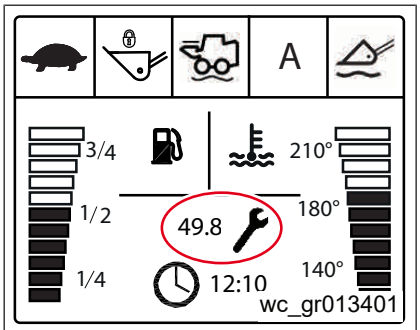


Fig. 54: Maintenance meter

Maintenance meter

This counts the engine operating hours until the next maintenance.

The maintenance meter starts at 500.0 hours and it counts down to 0.0 hours. The wrench symbol then starts to flash, but the maintenance meter continues to count down (−0.1 hours, −0.2 hours, etc.).

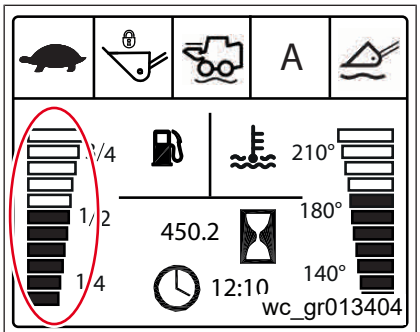


Fig. 55: Fuel level indicator

Fuel level indicator

This indicates the remaining amount of fuel in the tank.

Refuel before the segments reach the lower range. If the fuel level indicator reaches one bar, a refuel reminder tone sounds once, and the low fuel symbol slowly flashes on for five seconds and off for five seconds.

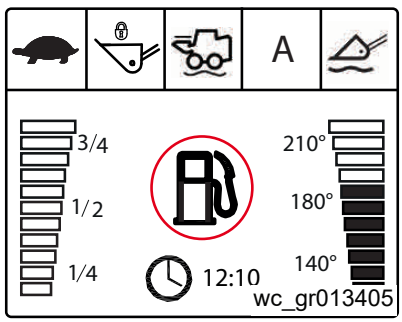


Fig. 56: Low fuel symbol

The low fuel symbol stays on the main menu screen when the fuel level indicator is down to zero bars (five gallons). Fuel must be added to the tank or risk running out of fuel and having to re-prime the fuel system.

6.21 Instrument Display Settings

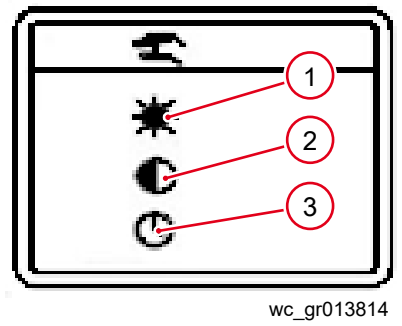


Fig. 57: Display settings

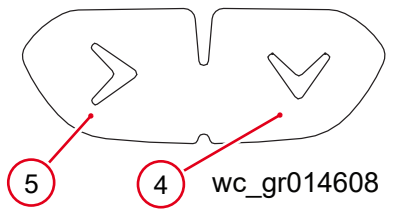


Fig. 58: Display arrows

This screen allows the operator to adjust the brightness **(1)** and contrast **(2)** of the display screen. The time can be adjusted by selecting the time clock **(3)**. Use the selector button **(4)** and the next menu button **(5)** at the bottom of the instrument display to scroll through the screens to get the screen shown to set the time, and adjust contrast and brightness.

6.22 5.7-inch Color Display Passcodes

When a machine is first commissioned, the 5.7-inch color display does not require a passcode to operate the machine. If no Owner profile is created, the display takes the user directly to the main operating screen.

A passcode is only required if passcodes are enabled in the Service Tool and an Owner passcode is created and stored.

An Owner passcode and up to ten operator passcodes can be created.

For each user, the following information is stored:

- Name (Owner is saved as Owner)
- Passcode
- Status (Owner cannot be disabled)
- Drive profile (propel, steer, accel)
- Drive Mode (H/ISO)
- Workgroup profile (lift arm, bucket, auxiliary hydraulics, response rate)
- Backup camera settings
- Creep percent
- Speed limit percent
- Reverse speed limit percent
- Auto idle settings
- Auto ride control settings
- Display brightness
- Display time format
- Display units
- Display language

There are three different types of passcodes. In order of priority, they are as follows:

- Master passcode
- Owner passcode
- Operator passcode

Information

If any profiles have been created, an authorized passcode is needed to operate the machine. An operator can start the machine, but if no passcode is entered within 30 seconds, the engine will shut down.

Master passcode

The master passcode is a six-digit code that is specific to each individual machine. This passcode is generated based on a proprietary algorithm and can only be provided by Wacker Neuson on an as needed basis. The master passcode cannot be changed.

Fig. 59: Owner passcode

Owner passcode

The owner passcode is a five-digit code that allows advanced access to create/edit/remove operator profiles. The owner passcode loads the following Owner profile settings:

- Drive response settings
- Workgroup response settings
- Rearview camera settings
- Creep percent
- Speed limit percent
- Reverse speed limit percent
- Auto idle settings
- Auto ride control settings
- Display brightness
- Display time format
- Display units
- Display language

Operator passcode

The operator passcode is a five-digit code that allows an operator to run the machine. Each operator passcode loads the following Operator profile settings, which are specific to that particular operator:

- Drive response settings
- Workgroup response settings
- Rearview camera settings
- Creep percent
- Speed limit percent
- Reverse speed limit percent
- Auto idle settings
- Auto ride control settings
- Display brightness
- Display time format
- Display units
- Display language

Fig. 60: Factory Reset Display

Passcode reset

To reset the display back to factory settings, perform the following:

1. On the operator menu, select "Factory Reset."
2. Long press the button asking if you are sure you want to reset the settings to confirm.

6.23 5.7-inch Color Display Main Operating Screen

Fig. 61: Main operating screen

Note: The screen shown is generic and for illustrative purposes only.

The main operating screen on the 5.7-inch color display can be broken down into four main sections as follows:

- Information bar
- Icons (including the center icons)
- Gauges
- Hot keys

6

Information

When the engine is started, the instrument display goes through a check procedure. For further information, see Starting and Stopping the Engine on page 66 for details.

6.23.1 Information Bar

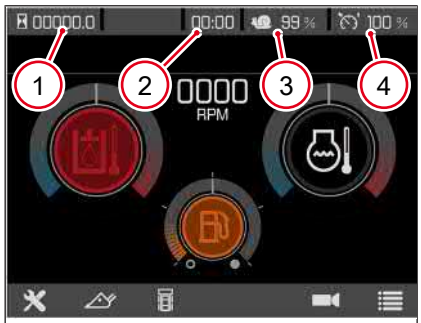


Fig. 62: Main screen information bar

The information bar is made up of four items, as follows:

- Machine hours **((1))**
- Time **((2))**
- Creep percent **((3))**
- Speed limit percent **((4))**

Machine hours

The Machine hours display shows the total number of hours that the machine has run.

Time

The Time display shows the current time in a 12- or 24-hour format based on user settings. To change the time, see Main Menu on page 95.

Creep percent

The Creep percent display shows the value as a percentage of the machine's top speed. To adjust the creep speed, see Creep Speed Ground Drive Control (Optional) on page 123. The icon and percentage flash when the creep speed changes.

Speed limit percent

The speed limit percent display shows the current speed limit percent.

6.23.2 Icon Bar

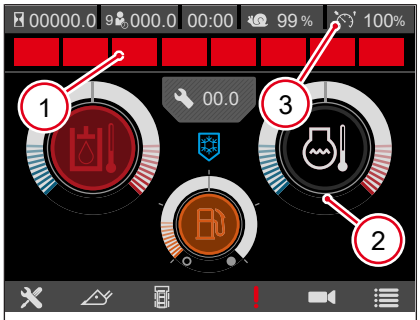


Fig. 63: Icon bar

The icon bar **(1)** is shown across the top of the display, above the main gauges **(2)** and below the information bar **(3)**. The icon bar is used for the following two primary purposes:

- To alert the operator of a machine/system warning
- To offer a visual reminder of what machine functions are active

Information

The screen shown is generic and for illustrative purposes only.

The icons shown in the icon bar have different priority levels, as follows:

- Priority 1—Operator alerts and warnings
- Priority 2—Machine functions

The following table shows how the icons are grouped into containers (Icon 0 through Icon 7) and priority levels (1 and 2). An icon that is a Priority 1 is always shown over an icon that is a Priority 2. For example, if the operator is operating in Speed 1, a turtle icon is displayed in the Icon 1 field. However, if a problem occurs in which the battery stops charging, the Battery Not Charging icon takes the place of the turtle icon and is present until the issue is resolved.

Icon Bar Containers								
	Icon 0	**Icon 1**	**Icon 2**	**Icon 3**	**Icon 4**	**Icon 5**	**Icon 6**	**Icon 7**
Priority 1	Park brake	Battery not charging	Grid heater	Engine oil pressure warning	Amber engine warning	Fasten seat belt	General warning (MIL)	Red engine warning
Priority 2	LH turn signal	Speed 2 (rabbit)	Workgroup locked	Ride control	14-pin front electric mode A	Float	DPF regen active	RH turn signal
	—	Speed 1 (turtle)	Workgroup unlocked	—	14-pin front electric mode B	—	DPF regen inhibit	Service due
	—	Creep speed (snail)	Roadway travel mode	—	14-pin front electric mode C	—	High exhaust gas temperature	—
	—				14-pin front electric mode D	—		

Symbol	Priority	Description	Symbol	Priority	Description
	1	Park brake		1	Battery not charging
	2	Speed 2—rabbit		2	Speed 1—turtle
	2	Creep speed—snail		1	Grid heater
	2	Workgroup locked		2	Workgroup unlocked
	1	Engine oil pressure warning		1	Ride control
	2	Amber engine warning	A	2	14-pin front electric mode A
B	2	14-pin front electric mode B	C	2	14-pin front electric mode C
D	2	14-pin front electric mode D		1	Fasten seatbelt
	2	Float	!	1	General warning
	2	DPF Regeneration active		1	DPF Regeneration inhibit

6

Symbol	Priority	Description	Symbol	Priority	Description
	2	High exhaust gas temperature		1	Red engine warning
	1	Service due orange		3	Service due red

Fig. 64: Center icons

Center icons

Center icons **(1)** are used to alert the operator of machine-related warnings (hydraulic oil filter, throttle delay, seatbelt) as well as machine function (with LEDs built into their switches) changes that do not require the use of the icon bar.

These icons appear in the center of the main screen, overlayed on top of the RPM gauge, much like a pop-up window.

Similar to icons in the icon bar, the center icons are prioritized as follows:

- Priority 1—Operator alerts and warnings
- Priority 2—Machine functions

Priority 1 icons always take precedence over Priority 2 icons.

The table on the following page gives an overview of each icon's symbol, its priority level, and its description.

Symbol	Priority	Description	Symbol	Priority	Description
	1	Throttle delay		1	Hydraulic filter warning
	1	Cold system restriction warning		1	Hydraulic pressure warning
	1	Air filter clogged	AUTO n/min	2	Auto-idle status
	2	Speed 1—turtle		2	Speed 2—rabbit
	2	Creep mode—snail		2	Ride control
	2	Workgroup locked		2	Workgroup unlocked
A	2	14-pin front electric mode A	B	2	14-pin front electric mode B
C	2	14-pin front electric mode C	D	2	14-pin front electric mode D
	2	Float	H	2	H-mode

Symbol	Priority	Description	Symbol	Priority	Description
ISO	2	ISO-mode		2	Self-level
	2	Auxiliary hydraulic standard flow		2	Auxiliary hydraulic high flow
	2	Two-speed restricted		2	Reset seat belt
	2	Service due	—	—	—

6.23.3 Main Gauges

The gauges shown on the display depend on the machine model. All machines have gauges for fuel level **(1)**, engine coolant temperature **(2)**, hydraulic oil temperature **(3)**, and engine RPMs **(4)**. Machines with 100 HP engines also have a diesel exhaust fluid (DEF) level gauge **(5)**.

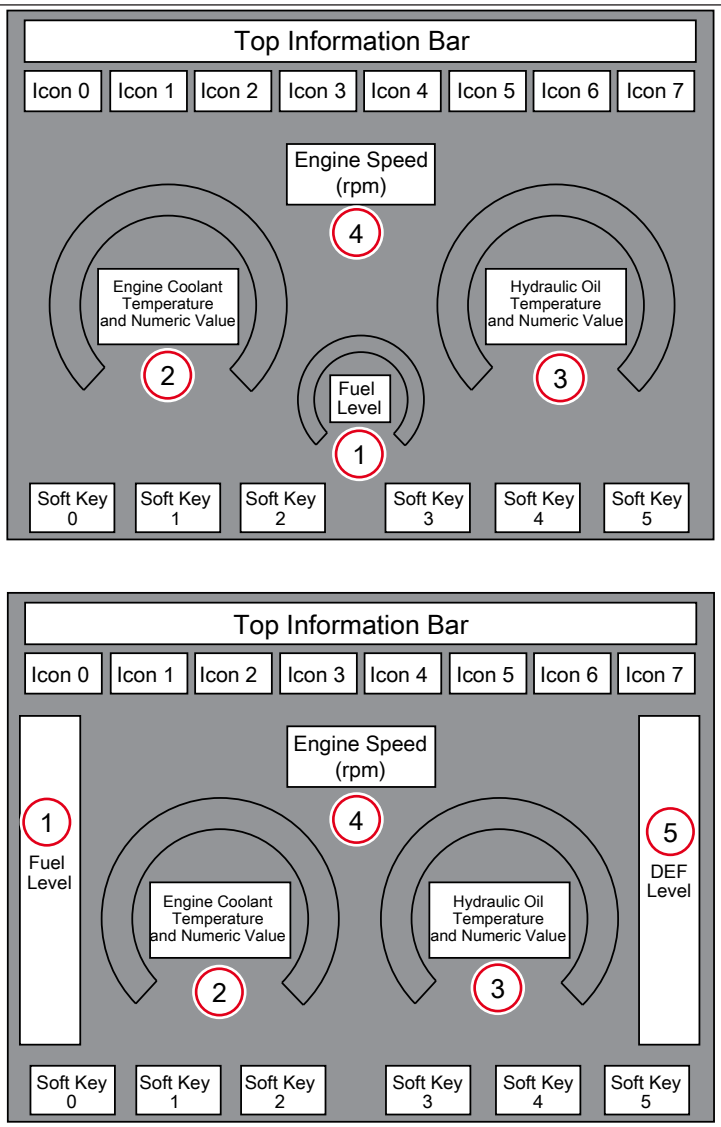


Fig. 65: Main gauges

Fuel level

The fuel level gauge is a rounded gauge in the center bottom part of the screen. The following low fuel warnings are associated with the fuel level:

- Low Fuel Level Warning 1: The gauge color changes to amber, and an audible alarm sounds once when the machine has approximately 3 gallons of fuel left.
- Low Fuel Warning Level 2: This warning occurs when there is essentially no fuel left. The gauge color flashes amber, and an audible alarm sounds once.

Engine coolant temperature

The engine coolant temperature gauge is the large rounded gauge on the left side of the screen. The following warnings are associated with coolant temperature:

- Coolant Temperature Warning 1: The gauge color is solid blue until the coolant temperature rises above 20°C (68°F).
- Coolant Temperature Warning 2: The gauge color changes to solid red if the temperature is above 102°C (215°F) but less than (or equal to) 108°C (226°F). An audible alarm sounds once.
- Coolant Temperature Warning 3: The gauge color is solid red if the temperature rises above 108°C (226°F). An audible alarm beeps on and off continuously.

Hydraulic oil temperature

The hydraulic oil temperature gauge is the large rounded gauge on the right side of the screen. The following warnings are associated with hydraulic oil temperature:

- Hydraulic Oil Temperature Warning 1: The gauge color is solid blue until the coolant temperature rises above 0°C (32°F).
- Hydraulic Oil Temperature Warning 2: The gauge color changes to solid red when the temperature is above 104°C (219°F) but less than (or equal to) 110°C (230°F). An audible sounds once.
- Hydraulic Oil Temperature Warning 3: The gauge color is solid red when the temperature is above 110°C (230°F) but less than (or equal to) 112°C (233°F). An audible alarm beeps on and off continuously.
- Hydraulic Oil Temperature Warning 4: The gauge color changes to flashing red when the temperature rises above 113°C (235°F). An audible alarm sounds continuously, and the engine shuts down immediately.

Engine RPMs

This gauge is in the middle of the screen, near the top, in between the engine coolant temperature gauge and the hydraulic oil temperature gauge.

DEF level

The DEF level gauge is a vertical bar gauge on the right side of the screen. There are three warnings associated with the DEF level, as follows:

- DEF Warning 1: The gauge color changes to solid amber when the DEF level is in between 2% and 10%. An audible alarm beeps once.
- DEF Warning 2: The gauge color is solid amber when the DEF level is in between 0% and 2%. An audible alarm beeps on and off continuously.
- DEF Warning 3: The gauge color changes to flashing amber until the tank level increases above 0%. An audible alarm sounds continuously.

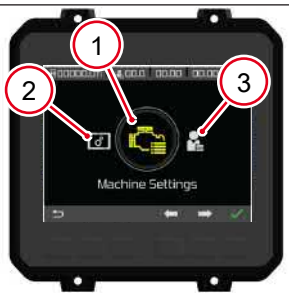
6.23.4 Hot Keys

The hot keys are the six keys at the bottom of the screen that change depending on what screen is displayed.

Hot Keys		
Symbol	**Name**	**Function**
	Main Menu	This button takes the operator to the Main Menu screen. For further information, [▷ 95].
	Service Menu	This button takes the operator to the Service Menu screen. For further information, [▷ 100].
	Rearview Camera	This button takes the operator to the Rearview Camera menu.
	Left	This button moves the selection left.
	Right	This button moves the selection right.
	Up	This button moves the selection up.
	Down	This button moves the selection down.
	OK	This button accepts the selection.
	Back	This button takes the operator back one screen.
	Workgroup profiles	This button takes the operator to the Workgroup Profile screen.
	Drive profiles	This button takes the operator to the Drive Profile screen.

Hot Keys		
Symbol	**Name**	**Function**
	Service due soon	This button takes the operator to the Service Meter screen.
	Service overdue	This button takes the operator to the Service Meter screen.
	Error	This button takes the operator to the error code list.
 	Increment/decrement (plus/minus)	These buttons adjusts the units up or down incrementally.

6.24 Main Menu



wc_gr015155

Fig. 66: Main menu

Pressing the Main Menu hot key brings up the Main Menu screen. The operator can choose from three sub-sections, as follows:

- Machine Settings **(1)**
- Display Settings **(2)**
- Owner Settings **(3)**

The Owner Settings option is not available unless the operator is using the machine with an owner passcode or the owner passcode has not been set yet.

6.24.1 Machine Settings

In the Machine Settings sub-menu, the operator can choose to make adjustments to the following configurations:

- Drive Profile
- Work Group Response
- Rearview Cam (available only on electro-hydraulic machines)
- Auto-idle (available only on electro-hydraulic machines)
- Auto ride control (available only on electro-hydraulic machines equipped with ride control)
- Reverse speed limit (available only on electro-hydraulic machines)

Drive profile

In the Drive Profile menu, the operator can choose to make adjustments to three different profiles, as follows:

- Propel
- Steer
- Accel

For each of these profiles, the operator can choose whether to set a Comfort, Standard, or Plus profile.

Work group response

In the Work Group Response menu, the operator can choose to make adjustments to four different machine operations, as follows:

- Lift Arm
- Auxiliary Hydraulic
- Bucket
- Response Rate

For each of these profiles, the operator can choose one of up to four settings —Comfort, Standard, Standard Plus, or Plus.

Rearview camera

The rearview camera is only available on electro-hydraulic machines.

In the Rearview Camera menu, the operator can choose when the rearview camera comes on, as follows:

- Automatic—The camera turns on automatically when the machine is put in reverse, or when turned on using the rearview camera hot key.
- Off—The Rearview Camera hot key is removed from the main menu, and the camera never turns on.

Auto-idle

Auto-idle is only available on electro-hydraulic machines.

In the Auto-idle menu, the operator can turn Auto-idle on and off and set the delay time in seconds, from 3 seconds to 60 seconds. When Auto Idle is turned on, the auto-idle icon appears on the main screen.

Auto ride control

Auto ride control is only available on electro-hydraulic machines equipped with ride control.

In the Auto Ride Control menu, the operator can adjust the drive activation from 25% to 75%.

Fig. 67: Reverse Speed Limit

Reverse speed limit

Reverse speed limit is only available on electro-hydraulic machines.

In the reverse speed limit menu, the operator can adjust the reverse speed limit from 70 to 100%. Owners only can also set a global lock to apply the change to all operators.

6.24.2 Display Settings

In the Display Settings sub-menu, the operator can choose to make adjustments to the following configurations:

- Brightness
- Time
- Units
- Language

Brightness

In the Brightness menu, the user can adjust the brightness level of the display from 20% to 100%.

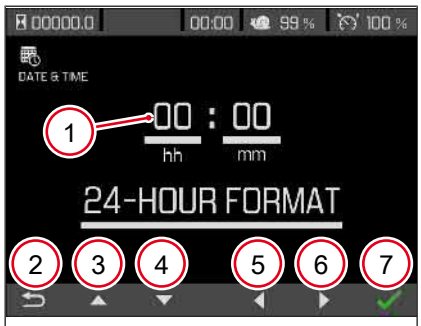


Fig. 68: Time menu

Time

In the Time menu, the display shows the current time in a 24-hour format.

Perform the following to change the time:

1. Starting with the Hours **((1))** field, use the Up **((3))** and Down **((4))** hot keys to adjust the value.
2. Use the Left **((5))** and Right **((6))** hot keys to toggle through the other values.
3. Adjust the values using the Up and Down hot keys.
4. Exit the Time window by pressing the OK **((7))** or Back **((2))** hot key.
5. Exit back to the main operating screen by pressing the Back hot key twice.

Units

In the Units menu, the user can choose either metric or imperial units.

Language

In the Language menu, the user can choose between English, French, or Spanish.

6.24.3 Owner Settings

Fig. 69: Owner Settings screen

On new or factory-reset machines, there are no passcodes required to access the machine. To create an owner passcode, navigate to Main Menu -> Owner Settings. The owner may then choose to add operators with new passcodes from the same sub-menu.

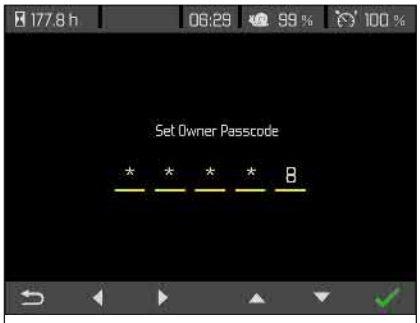


Fig. 70: Set owner passcode

Passcode entry works with each softkey acting as a “dual-entry” button. For each passcode digit, press the key with the corresponding number above it **once**. For example, if a passcode were “12345,” the user would press:

1. [1/2]
2. [1/2]
3. [3/4]
4. [3/4]
5. [5/6]

An asterisk then appears above the next yellow dash each time a number key is pressed, confirming that the digit has already been entered.

wc_gr015170

Fig. 71: Owner passcode

Owner settings

If the user selects this option, they are prompted to enter the Owner passcode as shown.

wc_gr015158

Fig. 72: Edit operator screen

After the owner enters a valid passcode, the Operator Menu screen appears as shown. The functions of this section are as follows:

- Edit operator profiles (Edit Operator screen)
- View operator profiles (Operator Overview screen)
- Add operators (Add Operator screen)

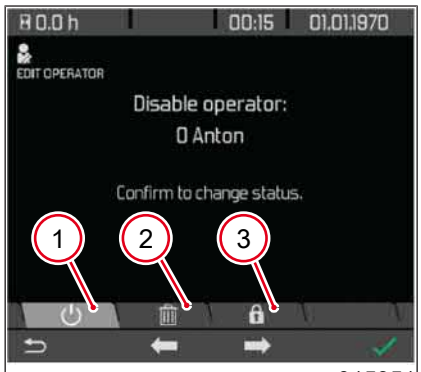
wc_gr015353

Fig. 73: Edit an existing operator

Edit operator screen

The Edit Operator screen allows the owner to edit any operator profile. To make an edit to an existing operator:

1. Select the operator from the list.



wc_gr015351

Fig. 74: Edit an existing operator

2. Select the desired action for the operator profile—enable/disable **((1))**, delete **((2))**, or reset passcode **((3))**.

- Enable/Disable Operator Access
  - This tab allows the owner to enable or disable access to the display for a specific operator profile.
  - When an operator is enabled, the display asks if the user would like to disable the operator. If an operator is disabled, the display asks if the user would like to enable the operator.
- Delete Operator Profile
  - This tab allows the owner to remove an operator profile (along with its stored settings) from the memory.
  - As confirmation that the deletion of an operator is intentional, the user is asked to perform a long button press of three seconds when selecting this function.
- Reset Operator Passcode
  - This tab allows the owner to reset the passcode for the selected operator profile.

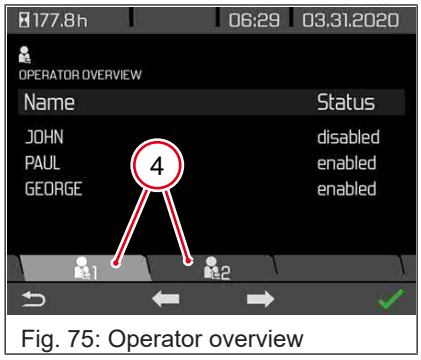


Fig. 75: Operator overview

Operator overview screen

The Operator Overview screen (shown below) consists of two tabs, each containing information on all operator profiles. The information for each operator includes the following:

- Name
- Status

There are two banks **((4))** of names for the operators. Use the arrow keys to switch between the banks.

Fig. 76: Add operator

Add Operator screen

The Add Operator screen allows the owner to add an operator profile. To add an operator:

1. Enter the desired name using the arrow keys.
2. Push the OK button.
3. Enter the desired passcode for the new operator.
4. Push the OK button.

6.25 Service Menu

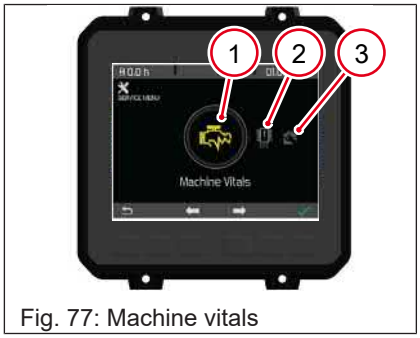


Fig. 77: Machine vitals

Pressing the Service Menu hot key brings up the Service Menu screen.

The operator can choose from three sub-sections, as follows:

- Machine Vitals **(1)**
- Failure Codes **(2)**
- Maintenance **(3)**

6.25.1 Machine Vitals

In the Machine Vitals sub-menu, there are four tabs that display values for available temperatures, pressures, and statuses of various machine parameters.

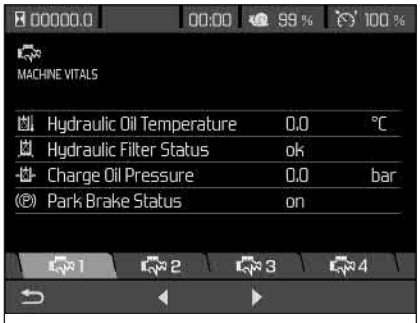


Fig. 78: Machine vitals tab 1

Machine Vitals Tab 1

On Machine Vitals Tab 1, the following information is displayed:

- Hydraulic Oil Temperature
- Hydraulic Filter Status
- Charge Oil Pressure
- Park Brake Status

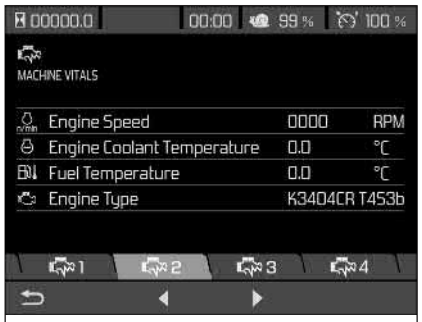


Fig. 79: Machine vitals tab 2

Machine Vitals Tab 2

On Machine Vitals Tab 2, the following information is displayed:

- Engine Speed
- Engine Coolant Temperature
- Fuel Temperature
- Engine Type

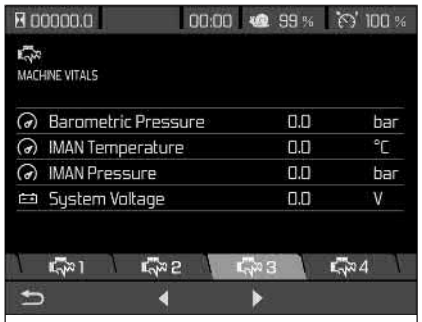


Fig. 80: Machine vitals tab 3

Machine Vitals Tab 3

On Machine Vitals Tab 3, the following information is displayed:

- Barometric Pressure
- Intake manifold (IMAN) Temperature
- Intake manifold (IMAN) Pressure
- System Voltage

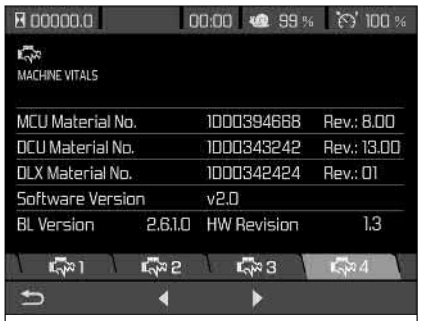


Fig. 81: Machine vitals tab 4

Machine Vitals Tab 4

On Machine Vitals Tab 4, the following information is displayed:

- MCU Material No.
- DCU Material No.
- DLX Material No.
- Software Version
- BL Version

6.25.2 Failure Codes

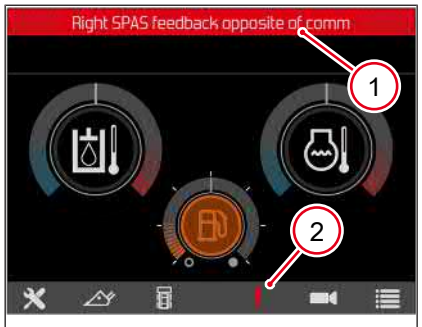


Fig. 82: Main screen

An active failure code displays in a red pop-up bar **((1))** on the top of the main screen. Use the red exclamation mark hot key **((2))** to access the Failure Codes screen.

The Failure Codes screen gives the operator access to all failure codes that are in effect for the following machine areas:

- Engine controller
- Aftertreatment controller
- Drive controller
- Joysticks
- Machine controller

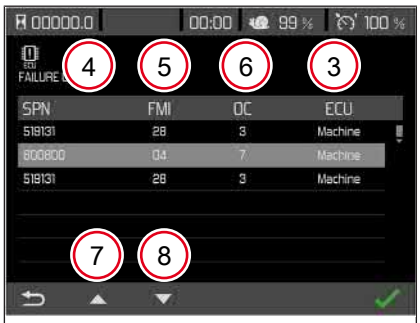


Fig. 83: Failure codes screen

These machine areas are indicated in the last column **((3))** on the Failure Codes screen. Each entry lists the suspect parameter number (SPN) **((4))**, failure mode indicator (FMI) **((5))** and number of occurrences, or occurrence count (OC) **((6))**.

Use the up **((7))** and down **((8))** arrow hot keys to scroll through the failure codes. Select a failure code to see detailed descriptions of the error.

6.25.3 Maintenance

The Maintenance screens provide information needed to properly maintain the machine.

Fig. 84: Service due soon message

When service is due soon, a message showing the remaining hours until service appears on the Main Operating screen when the machine starts up. The message remains on the screen for 15 seconds. The orange service wrench hot key takes the operator to the Service screen.

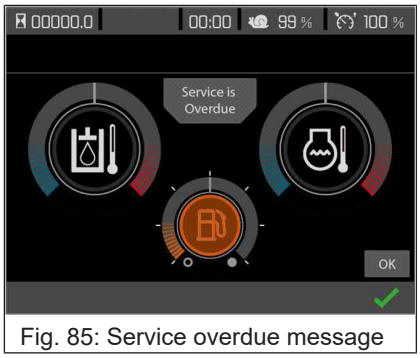


Fig. 85: Service overdue message

When service is overdue, a “Service is Overdue” message appears on the Main Operating screen. The operator must acknowledge the message using the OK button before continuing. A red service wrench hot key takes the operator to the Service screen.

There are five Maintenance tabs, as follows:

- Service Tab
- Fluids and Capacities Tab 1
- Fluids and Capacities Tab 2
- Fluids and Capacities Tab 3
- Dealer Information Tab

Fig. 86: Service tab

Service

The Service tab displays a service hour counter. This counter starts at 500 hours. When the counter reaches 0 hours, the Service icon displays on the Main Operating screen and remains there until the operator resets the service hour counter.

Fluids and Capacities

Fig. 87: Fluids and capacities tabs

The Fluids and Capacities tabs provide the operator with specifics on what types of fluids and how much of each fluid are needed for the machine.

The screen automatically populates the machine information based on serial number.

Fig. 88: Dealer information tab

Dealer Information

The Dealer Information tab displays the contact information for the dealer. This screen is blank by default. The owner has the option to populate this information using the service tool.

6.26 Creep Speed

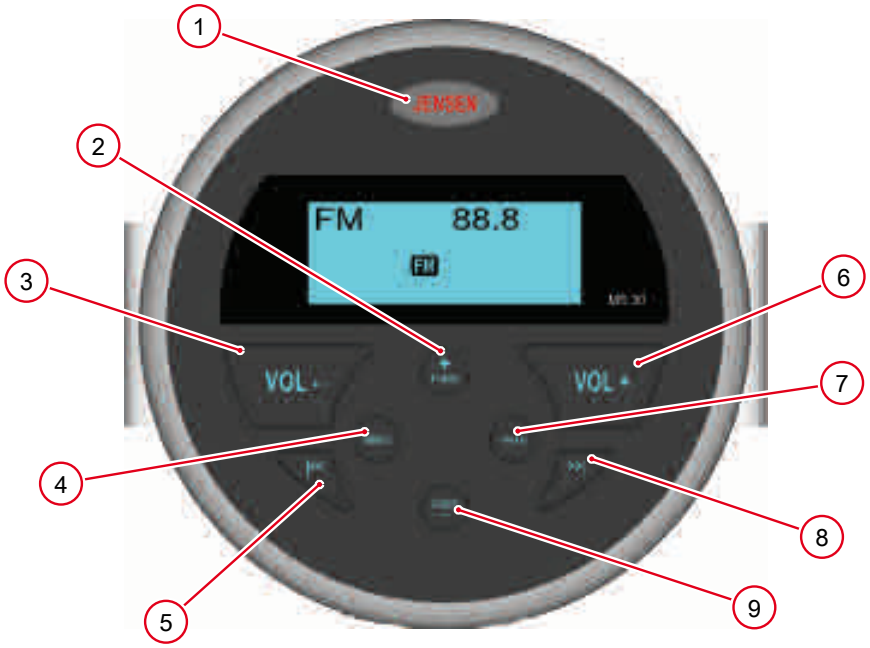
For information on how to enter Creep speed, see Creep Speed Ground Drive Control (Optional) on page 123.

When the operator initializes Creep speed, the Creep Speed screen appears, allowing the operator to adjust the Creep speed as a percentage between 3 and 99%. This is a percentage of the machine's top speed.

The Creep Speed screen remains active as long as there is input from the operator. If there is no input for three seconds, the display reverts back to the Main Operating screen. Pressing the increase or decrease buttons on the left joystick brings the Creep Speed screen back up so the operator can see the percentage at which the speed is adjusted.

6.27 Radio (Jensen, Optional)

The radio is located in the upper left corner of the cab next to the HVAC controls. Radio control buttons and their respective functions are listed below.



wc_gr014914

Ref.	Function	Description	
		Tuner Mode	USB Mode
1	Power	Press to turn the unit on and off.	
2	Folder increase	Press to increase the channel preset.	Press to advance the system to the next folder.
3	Volume decrease	Press to decrease the volume.	
4	Mode	Press to cycle the mode of operation. The modes of operation are: • FM tuner • AM tuner • Aux • USB Press and hold to bring up the audio settings. The audio settings are: • Bass • Treble • Balance • Fader • AS (auto store) • PS (preset scan) Use the volume buttons **(3** and **6)** to increase or decrease each setting.	

Ref.	Function	Description	
		Tuner Mode	USB Mode
5	Previous	Press to adjust the tuning down.	Press once to select the previous track. Press and hold to rewind the current track.
6	Volume increase	Press to increase the volume.	
7	Play/pause	—	Press to play and pause the current track.
8	Next	Press to adjust the tuning up.	Press to select the next track. Press and hold to fast forward the current track.
9	Folder decrease	Press to decrease the channel present.	Press to advance the system to the previous folder.

Tuner preset

To create a tuner preset, perform the following:

1. Tune the radio to the desired station.
2. Press and hold the Folder Increase **(2)** or Folder Decrease **(9)** button.
3. Press the Previous **(5)** or Next **(8)** button.
4. Wait approximately three seconds for the preset to save. The message “SAVED” appears when the preset is successfully stored.

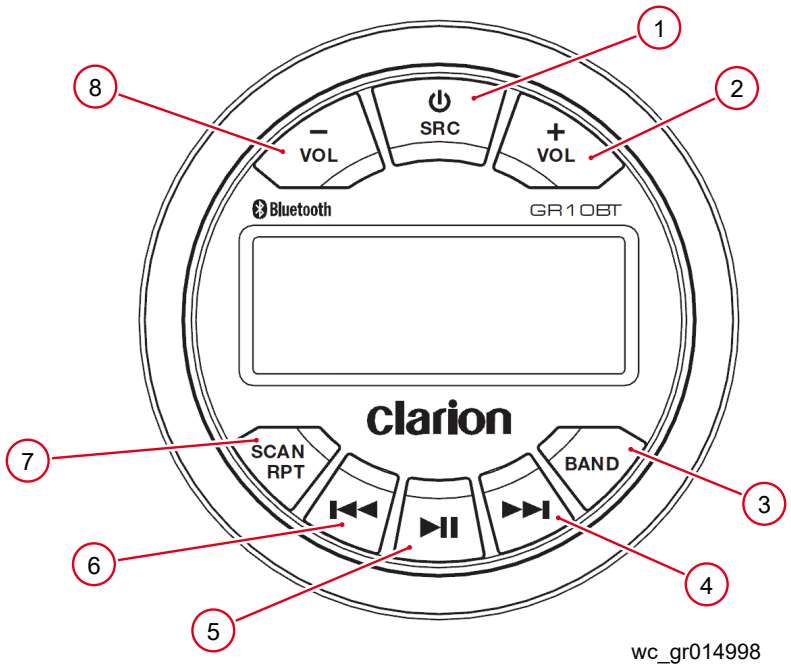
Auto store

The Auto Store (AS) function automatically stores the strongest radio stations to the preset memory. To use the Auto Store function, perform the following:

1. Press and hold the Mode **(4)** button.
2. Press the Mode button until AS appears on the screen.
3. Press the Next **(8)** button to begin the Auto Store process.

6.28 Radio (Clarion, Optional)

The radio is located in the upper left corner of the cab next to the HVAC controls. Radio control buttons and their respective functions are listed below.



Ref.	Function	Description	
		Tuner Mode	USB Mode
1	Power/source	Press and hold to turn the unit on and off. Press to toggle the audio source. The sources are: • Tuner • USB • AUX IN • BT	
2	Volume increase	Press to increase the volume.	
3	Band	Press to select the tuner band.	—
		Press and hold to enter the audio settings. The audio settings are: • EQ • Bass • Mid • Treble • Balance • Fader • Tone • Area • Rear Out	

Ref.	Function	Description	
		Tuner Mode	USB Mode
4	Next	Press to adjust the tuning up. Press and hold to advance the unit to the next strongest station.	Press to select the next track. Press and hold to fast forward the current track.
5	Play/pause	Press to mute and unmute the audio output.	Press to play and pause the current track.
6	Previous	Press to adjust the tuning down. Press and hold to advance the unit to the previous strongest station.	Press to select the previous track. Press and hold to rewind the current track.
7	Scan/repeat	Press to advance the unit through the presets. Press again to stop on a specific preset. Press and hold to initiate the auto memory store function.	Press to repeat the current folder. Press twice to repeat the current track. Press a third time to turn off the repeat feature. Press and hold to access the search mode. Use the volume increase and volume decrease buttons to select the desired track.
8	Volume decrease	Press to decrease the volume.	

Auto store

The Auto Store function automatically stores the six strongest radio stations to the preset memory on the current radio band (FM1, FM2, FM3, or AM).

To use the Auto Store function, press and hold the Scan **(7)** button. The new stations replace the stations already stored for that band.

Bluetooth

To use the Bluetooth feature, perform the following:

1. Press and hold SCAN.
2. Turn on Bluetooth on your device and search for other Bluetooth devices.
3. Select GR10BT.
4. The radio automatically enters your Bluetooth device.
   ⇨ If a passcode is needed, enter “000”.

6.29 HVAC (Optional)

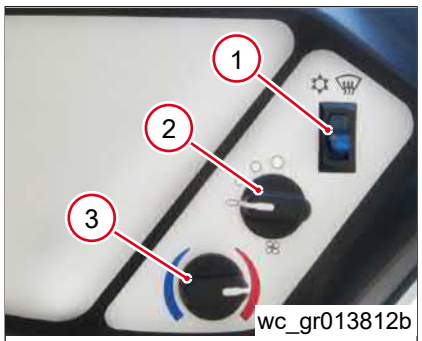


Fig. 89: HVAC controls

The heating and air conditioning (AC) controls are located in the upper left corner of the cab.

The HVAC switch **(1)** turns the AC on and off. Press the top of the switch to turn the AC on, or press the bottom to turn the AC off. A blue light illuminates the switch to indicate that the AC is on.

The HVAC blower fan switch **(2)** has three fan speed settings (low, medium, and high) and off. The Off position is shown.

The HVAC temperature control switch **(3)** adjusts the air temperature. Turn the dial clockwise to raise the temperature or counterclockwise to lower the cab temperature.

6.30 HVAC Vents

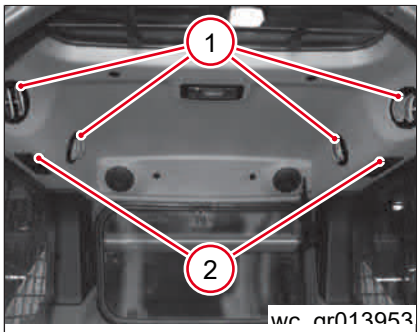


Fig. 90: Ceiling vents

Overview

Round **(1)** and rectangular **(2)** vents are located at the ceiling, and two round vents **(3)** are located near the floor.

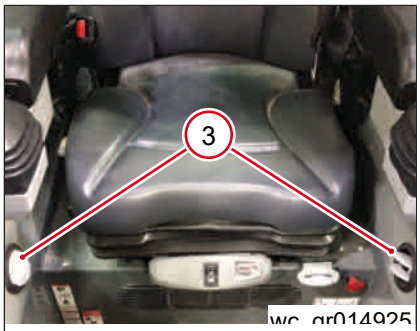


Fig. 91: Floor vents

Procedure

1. Open the vents to allow airflow throughout the cab.
   ⇨ Twist the round vents to direct airflow in the desired direction.

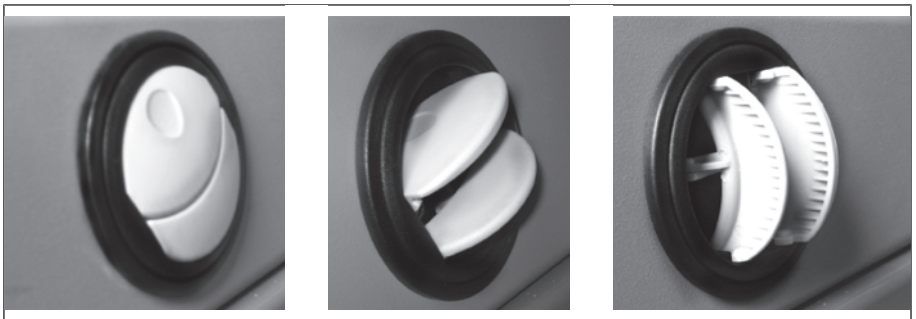


Fig. 92: Round vent operation

   ⇨ Use the wheel lever **(4)** to open or close the rectangle vents. These vents do not rotate.

2. Close vents to reduce the flow of air throughout the cab.

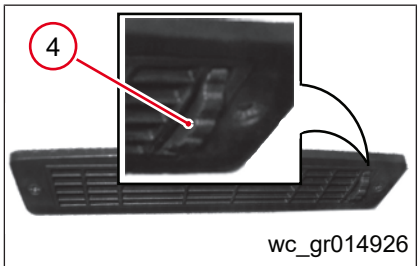


Fig. 93: Rectangle vent operation

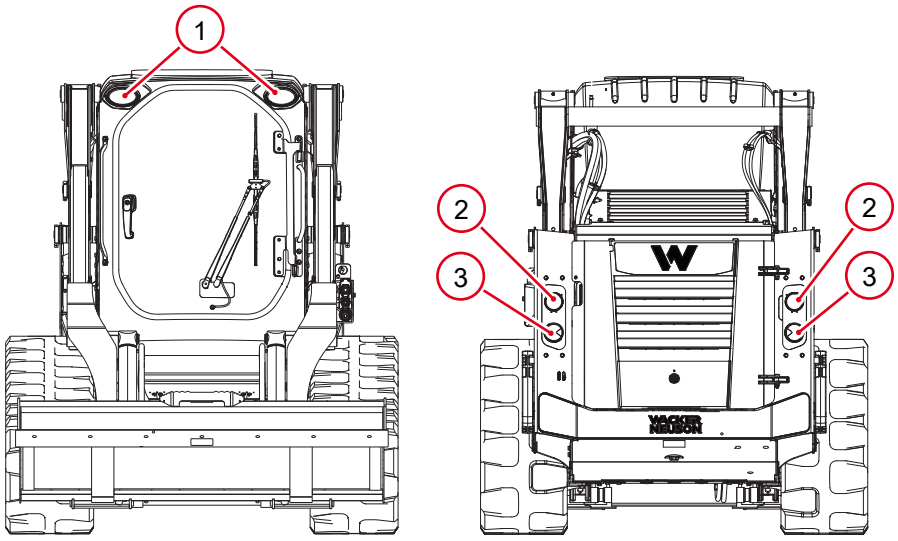
6.31 Work Lights

wc_gr013804

Fig. 94: Work lights button

This is a three-position switch:

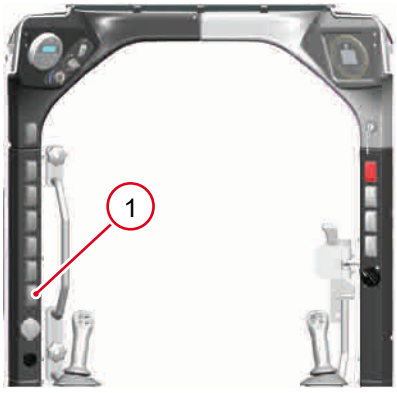
- Press the top of the switch to turn on all of the work lights—front work lights **((1))**, rear work lights **((2))**, and rear red tail lights **((3))**.
- Center the switch to turn off all the lights.
- Press the bottom of the switch to turn on the front work lights and the rear red tail lights. This is typically used while operating the machine on a public road.



wc_gr013805b

Fig. 95: Work lights on machine

6.32 Strobe Beacon (Optional)



wc_gr013817

Fig. 96: Strobe beacon button

Press the top of the strobe beacon switch **(1)** to turn the strobe beacon **(2)** on, and press the bottom of the switch to turn it off. The strobe beacon switch is the last (bottom) switch on the left column of the cab.

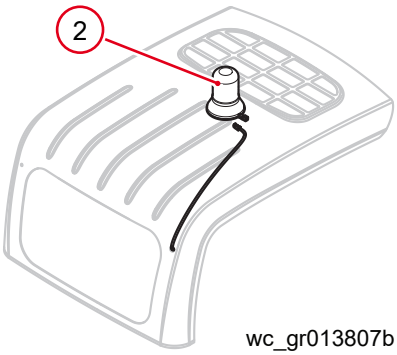


Fig. 97: Strobe beacon on machine

6.33 Using the Windshield Wiper and Washer (Optional)

The windshield may be equipped with a windshield wiper and washer. The windshield wiper and washer are controlled by a 3-position switch **(1)** located as shown.

- Position **(2)** is OFF.
- Position **(3)** is ON.
- Position **(4)** turns the windshield wiper on with fluid. Hold the switch in this position to spray the fluid.

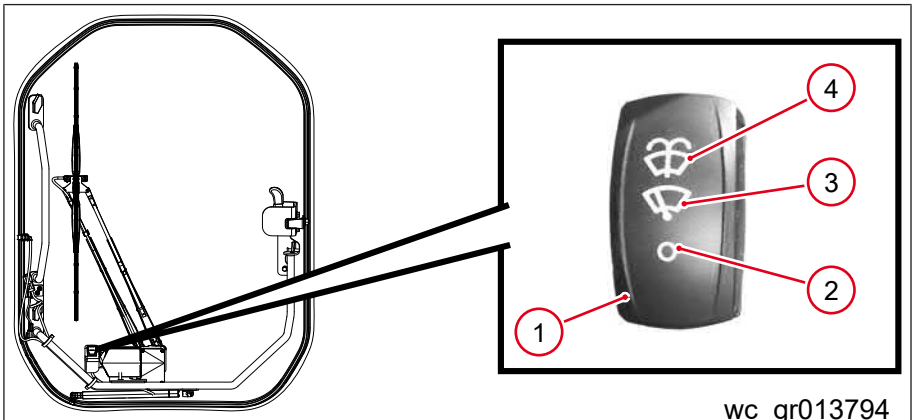


Fig. 98: Windshield wiper switch

The windshield washer reservoir is located to the left of the operator's seat. Remove the windshield washer fill cap **(5)** to add windshield washer fluid in the reservoir.

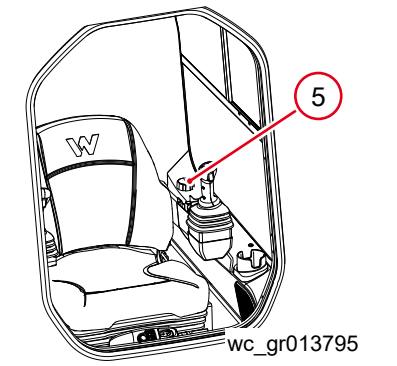


Fig. 99: Washer fluid cap

6.34 Operating the Windows

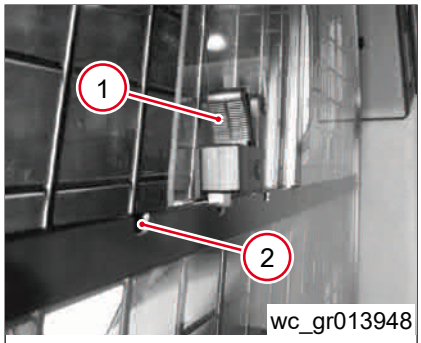


Fig. 100: Window lever and grooves

Inside the cab, squeeze the lever **(1)** on the window and slide the lever along the track to open or close the window. The bottom of the lever sinks into one of the four grooves **(2)** on the track to hold the window in place.

6.35 Ground Drive and Loader Controls

⚠ WARNING

Personal injury or death hazard

Improper operating procedures can cause personal injury or death.

- ► Keep seat belt fastened.
- ► Keep feet on floor or foot pedals while operating the machine.
- ► Always look in the direction of travel.
- ► Maintain control of the machine at all times by adjusting travel and loader movement speeds to match operating conditions.

Information

To have good control of the machine, move the levers smoothly.

For maximum power to the wheels, move the controls a short distance off neutral.

For maximum ground speed, move the controls to full stroke position.

All ground drive and loader controls are spring centered to neutral. This means when you let go of the controls, they will return to neutral.

wc_gr013784

Fig. 101: Parking brake and ISO-H buttons

Overview

The handgrips, along with integrated switches, are common with all three versions of the controls.

There are three versions of controls:

Mechanical controls - Two hand levers control the ground drive and two foot pedals control the loader lift arm and attachment tilt functions.

Electro-hydraulic ISO mode controls - The left hand joystick controls all of the ground drive functions and the right hand joystick controls all of the loader functions.

Electro-hydraulic H mode controls - The left hand joystick controls the ground drive on the left side and the raising and lowering of the lift arm. The right hand joystick controls the ground drive on the right side and the roll back and roll forward of the attachment.

Electro-hydraulic controls allow the operator to select either the ISO mode or the H mode. The selector switch is located on the right front panel of the cab under the parking brake switch.

ISO / H switch operation:

1. Apply the parking brake.
2. Press and hold the desired mode on the switch for 5 seconds.

The mode is backlit on the switch and the symbol shows in the third window at the top of the instrument display.

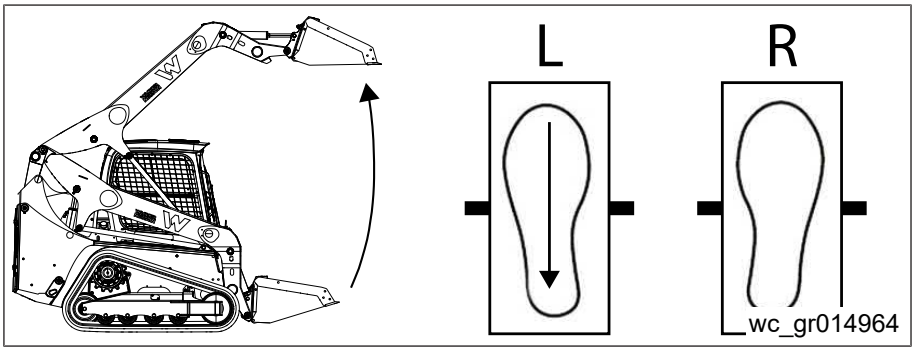
Mechanical controls (levers and pedals)

Using the lift arm and attachments

Two hand levers control the ground drive and two foot pedals control the loader lift and roll functions.

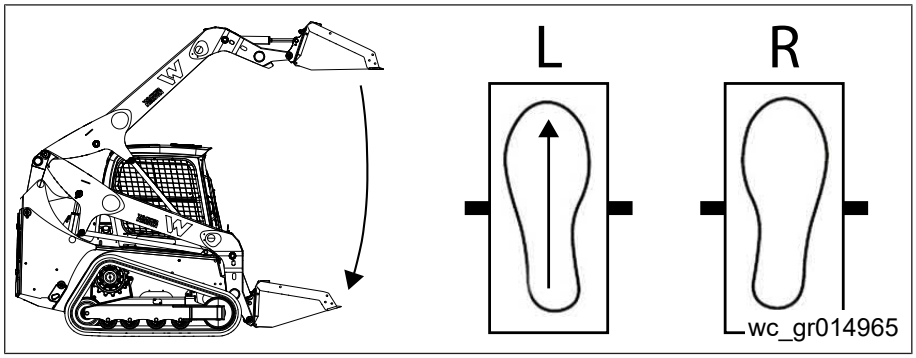
When operating the machine, keep your feet firmly on the pedals at all times.

- Push the left pedal back with the heel to raise the lift arm.

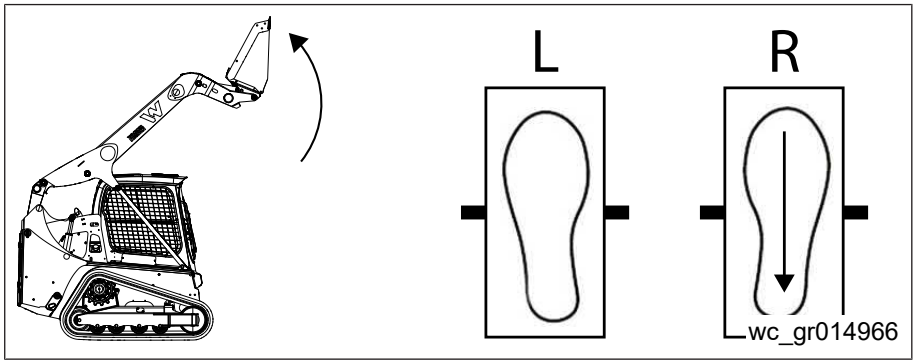


wc_gr014964

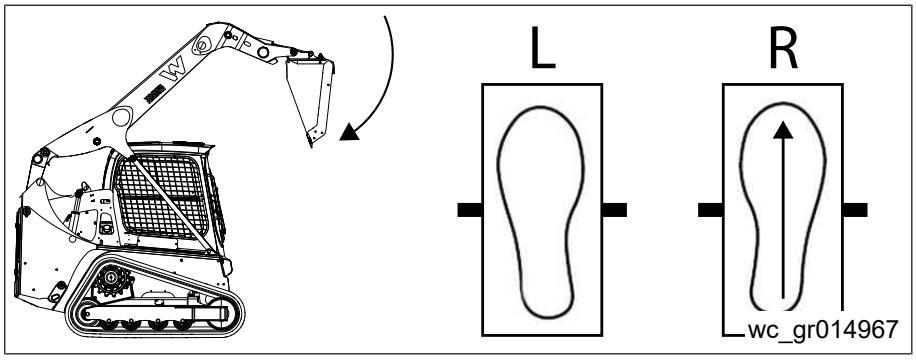
- Push the left pedal forward with the toe to lower the lift arm.



- Push the right pedal back with the heel to roll the attachment inward.

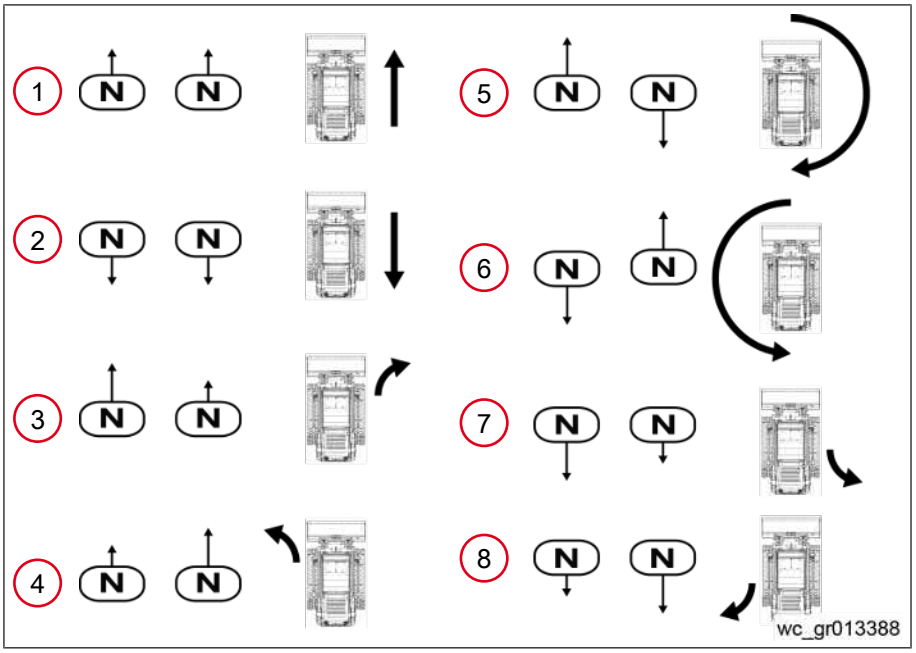


- Push the right pedal forward with the toe to roll the attachment outward



Ground drive lever functions (manual controls)

The left and right hand levers control wheels or track movement. The left handle controls the wheels or track on the left side, and the right lever controls the wheels or track on the right side.



Refer to the illustration for the necessary lever motions to move the machine as desired. Use both levers to move and turn the machine.

1—Forward

2—Reverse

3—Forward right turn

4—Forward left turn

5—Rotate right

6—Rotate left

7—Reverse right turn

8—Reverse left turn

N = Neutral

Electro-hydraulic controls (joysticks)

Driving the compact loader

Electro-hydraulic and EH hand-foot machines use joysticks to control speed and direction. The overall speed of the machine is controlled by the hand throttle knob on the right side of the control panel. Electro-hydraulic machines may also have an optional foot-operated accelerator pedal on the right side of the cab floor.

For machines with the optional two-speed motors, press the button on the top left of the left handgrip to switch the hydraulic motor from low speed to high speed and from high speed to low speed (see Two Speed Ground Drive Control (Optional) on page 122).

Using the lift arm and attachments

The lift arm and the attachments are controlled by the two joysticks. The functions of the joysticks in electro-hydraulic machines depend on whether the machine is in ISO mode or H mode. The machine can be switched between ISO mode and H mode for operator preference.

Basic control joystick functions (ISO and H controls)

The control levers shown below are symbolic representations.

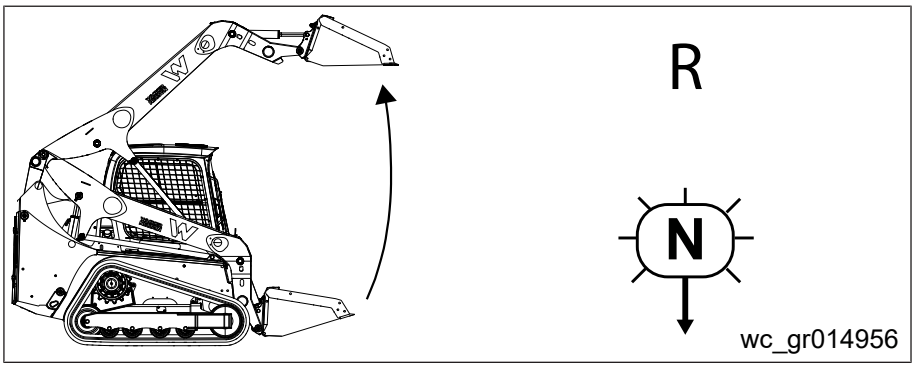
Control Mode	ISO Controls		H Controls	
	Control lever		Control lever	
Required Function	Left	Right	Left	Right
				
Travel forward		—		
Travel backward		—		
Front right turn		—		—
Front left turn		—	—	
Left turn		—		
Right turn		—		
Rear right turn		—		—
Rear left turn		—	—	
Raise loader unit	—			—
Lower loader unit	—			—
Tilt in the bucket	—		—	
Tilt out the bucket	—		—	
Float position*	—			—

*For further information on the Float position, see Float Controls on page 120.

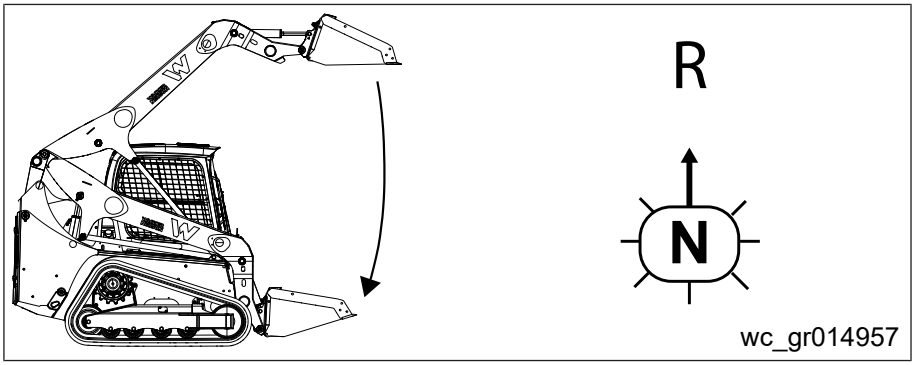
Electro-hydraulic ISO mode controls

The left joystick controls all of the ground drive functions (wheels or tracks), and the right joystick controls all of the loader functions (lift arm and bucket tilt).

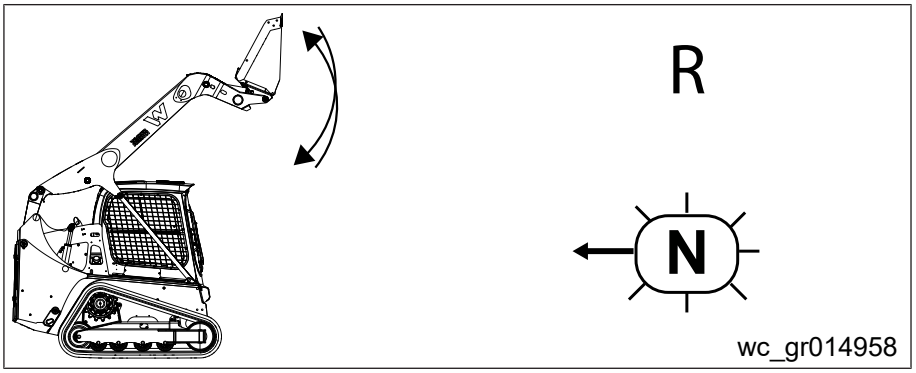
- Pull the right joystick back to raise the lift arm.



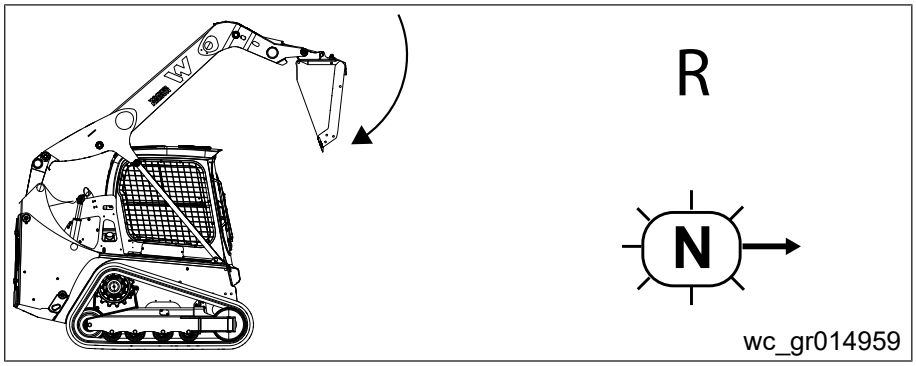
- Push the right joystick forward to lower the lift arm.



- Move the right joystick to the left to roll the attachment inward.

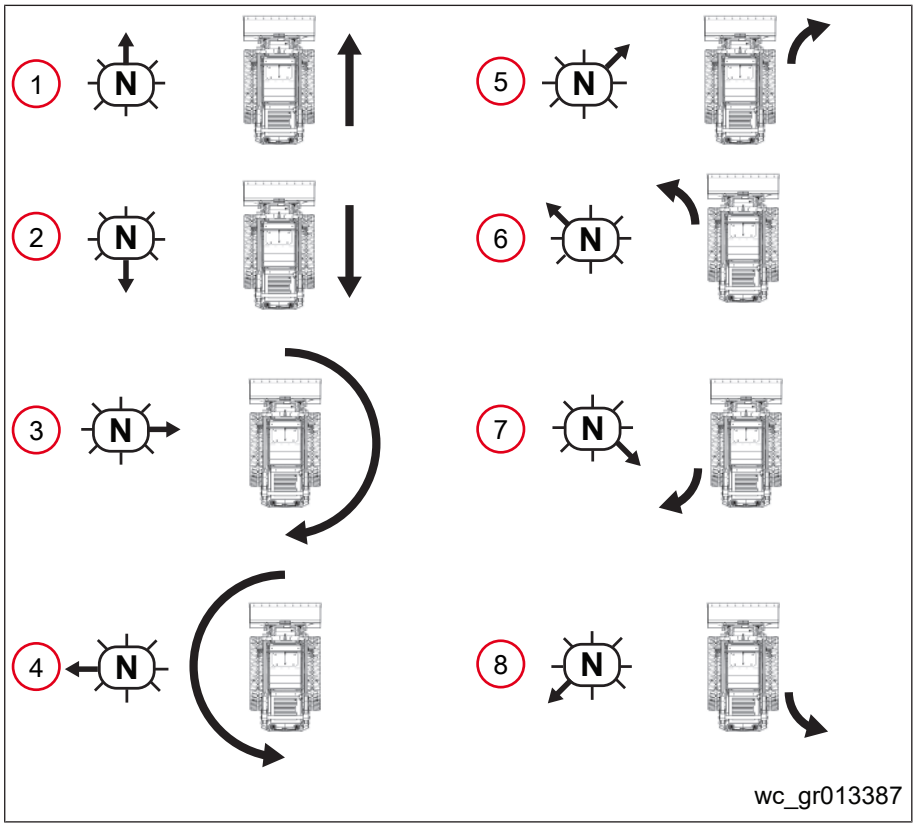


- Move the right joystick to the right to roll the attachment outward.



Ground drive control joystick functions

The left joystick controls all of the ground drive functions.
Note: Always use the handrail when operating the controls.



Refer to the illustration for the necessary joystick motions to move the machine as desired. Use the left joystick to move and turn the machine.

1—Forward

2—Reverse

3—Rotate right

4—Rotate left

5—Forward right turn

6—Forward left turn

7—Reverse right turn

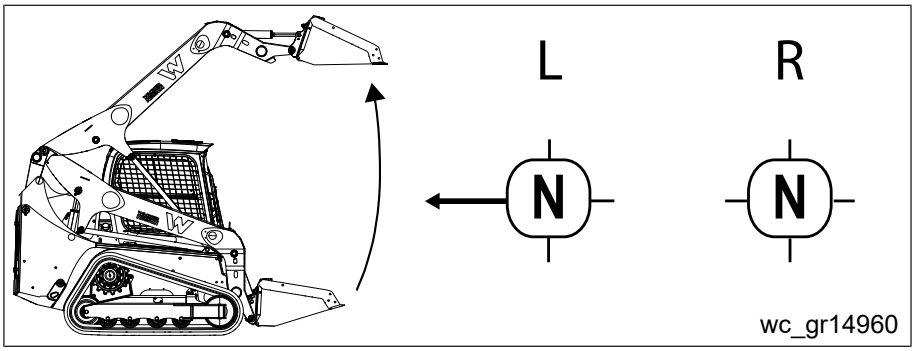
8—Reverse left turn

N = Neutral

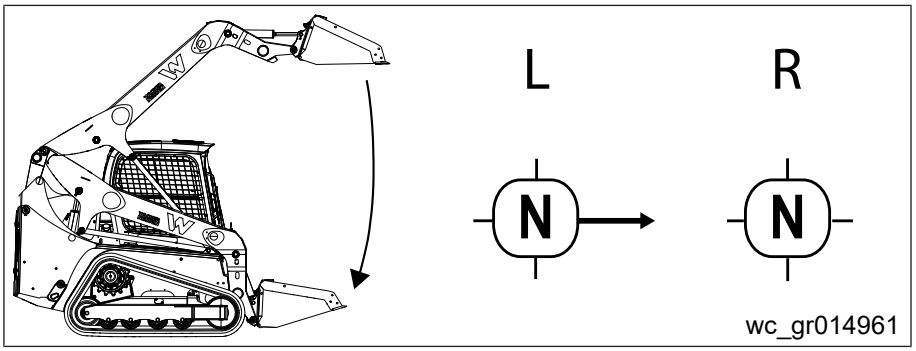
Electro-hydraulic H Mode controls

The left joystick controls the ground drive on the left side and the raising and lowering of the lift arm. The right joystick controls the ground drive on the right side and the roll in and roll out of the attachment.

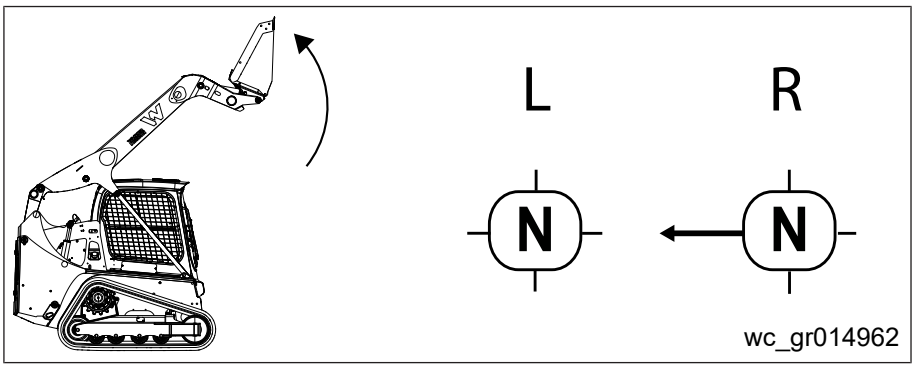
- Push the left joystick to the left to raise the lift arm.



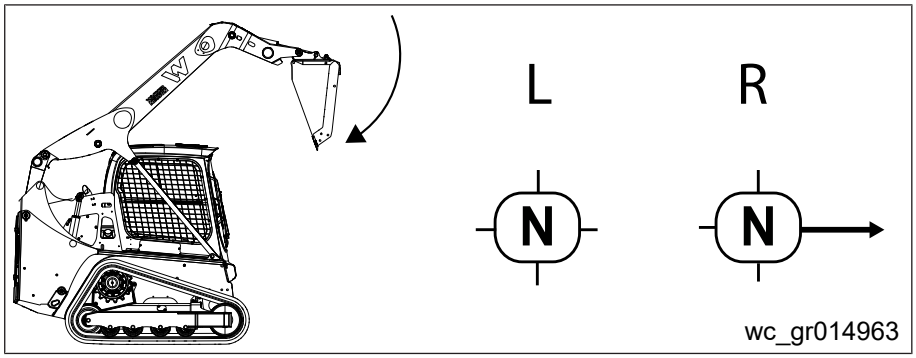
- Push the left joystick to the right to lower the lift arm.



- Push the right joystick to the left to roll the attachment inward.

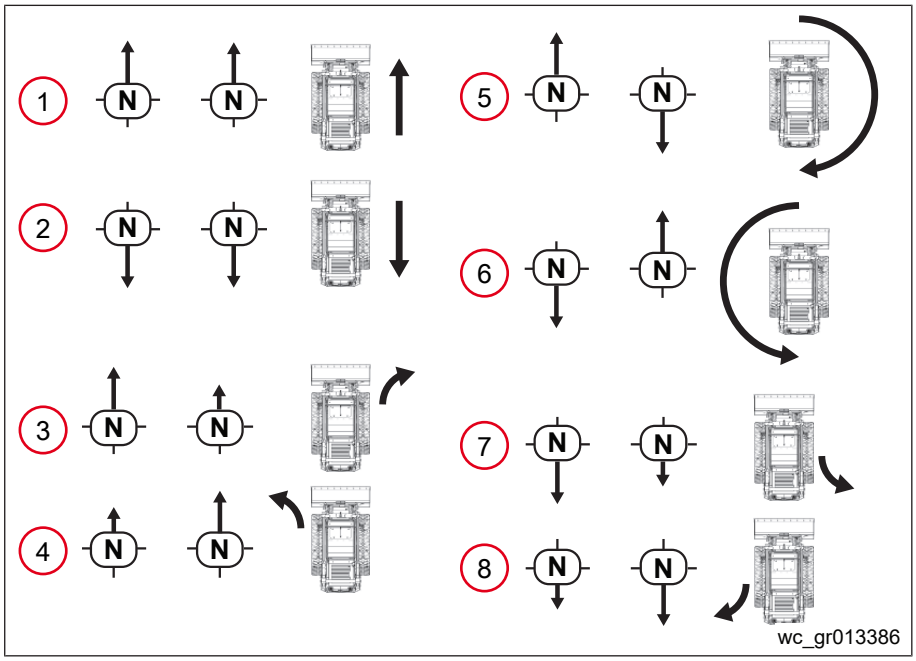


- Push the right joystick to the right to roll the attachment outward.



H Mode—Ground drive control joystick functions

The left and right joysticks move forward and backward to control ground drive movement.



Refer to the illustration for the necessary joystick motions to move the machine as desired. Use both joysticks to move and turn the machine.

1—Forward

2—Reverse

3—Forward right turn

4—Forward left turn

5—Rotate right

6—Rotate left

7—Reverse right turn

8—Reverse left turn

N = Neutral

6.35.1 Float Controls

⚠ WARNING

Personal injury hazard

With the lift arm in a raised position, the lift arm drops to the ground when float is activated.

► Keep others clear of the area.

The float position for the lift arm is used to level loose material while driving in reverse by allowing the bucket, or attachment, to follow the contour of the ground without moving the lift arm control (joysticks, in an electro-hydraulic controls machine, or lever and foot pedal, in a mechanical controls machine).

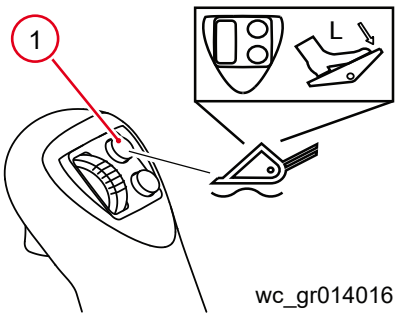


Fig. 102: Float controls—mechanical

Mechanical controls (lever and pedal)

Push the Float button **(1)** on the right handgrip and move the lift arm control (left foot pedal) forward to the lowering position to activate the float function. Once engaged, the lift arm control can go back to neutral, the Float button can be released, and the float function is still active. The tilt function can be used while the float function is active.

To return the lift arm to normal function, press and release the Float button or move the lift arm control to raise the lift arm.

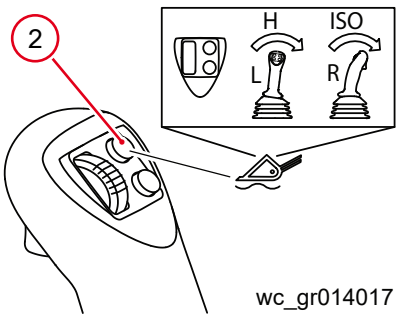


Fig. 103: Float controls—EH

Electro-hydraulic controls (joysticks)

Push the Float button **(2)** on the right handgrip and move the lift arm control to the lowering position to activate the float function.

- In H mode, the left joystick is the lift arm control. Tilt the left joystick to the right.
- In ISO mode, the right joystick is the lift arm control. Tilt the right joystick forward.

Once engaged, the lift arm control can go back to neutral, the Float button can be released, and the float function is still active. The tilt function can be used while the float function is active.

To return the lift arm to normal function, press and release the Float button or move the lift arm control to raise the lift arm.

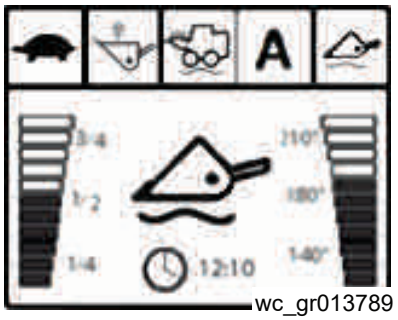


Fig. 104: Float icon

On the standard display, the float icon is displayed in the center of the display screen for 3 seconds. Then, the display screen returns to the home screen, and the float icon is shown in the upper right display field until changed.

With the 5.7-inch color display, the float icon appears in Icon Bar Container 5 and also appears in the center icon area for 3 seconds.

6.35.2 Leveling the Ground Using the Bucket Float

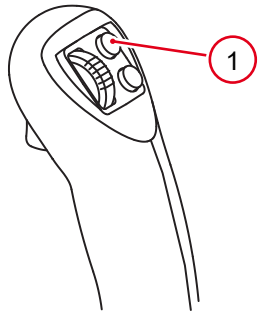


Fig. 105: Float button

1. Raise the lift arm.
2. Tilt the bucket to a horizontal position.
3. Push the Float button **(1)**.
4. Move the lift arm control to the lowering position to activate the float function.
5. Release the Float button and the lift arm control. The lift arm continues to lower until the bucket makes contact with the ground.
6. Adjust the bucket angle.
7. Look to the rear before operating the machine in reverse.
8. To disengage float, press and release the Float button or move the lift arm control to raise the lift arm.

6.35.3 Using the Brakes

Overview

This machine uses a hydrostatic transmission. The wheel or track movement is controlled by the movement of the hand levers or joysticks.
Note: The hand levers or joysticks are spring-loaded back to the neutral position. If you remove your hands from the hand levers or joysticks, the machine will stop.

Braking

Move the ground drive hand levers or joysticks back to the neutral position to stop the machine.

The ground drive system for the left side of the machine is separate from the ground drive system for the right side of the machine. Each ground drive system contains its own brake system. If one side of the machine were to fail, the other side can stop the machine's movement.

Parking brake

The parking brake activates when any of the following occur:

- The operator leaves the seat for more than 5 seconds.
- The seat belt is unlatched.
- The ignition key is turned to Position 0.
- The engine stops.
- The parking brake switch is pressed.

6.36 Using the Backup Alarm

⚠ WARNING

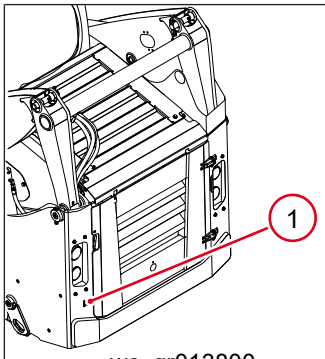
Crushing hazard

When operating the machine in reverse:

- ► Be sure the area is clear of all personnel and equipment before moving in reverse.
- ► Look to the rear of the machine before backing up.

Information

The controls for both sides of the ground drive must be in reverse to activate the backup alarm.



wc_gr013800

Fig. 106: Backup alarm

Overview

The backup alarm **((1))** is located on the rear of the machine. When the machine moves in reverse, the backup alarm makes a beeping sound. If the backup alarm does not sound, make the necessary repairs before operating the machine.

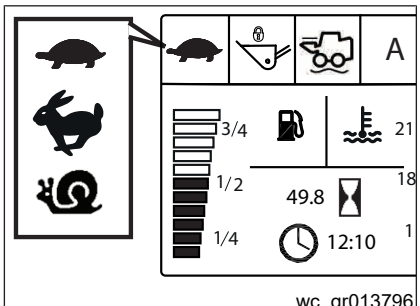
6.37 Two Speed Ground Drive Control (Optional)

⚠ WARNING

Personal injury hazard

Hitting an object at high speed may result in injury.

- ► Do not operate at high ground speeds with the edge of the bucket on the ground.



wc_gr013796

Fig. 107: Speed icons

The two speed ground drive control shifts the hydrostatic drive motor to produce two different ground speed ranges—Speed 1 (slow, turtle) and Speed 2 (fast, rabbit). Shifting speeds can be done while the machine is stopped or when the machine is moving. Control is better maintained by changing the speed range at low ground speeds.

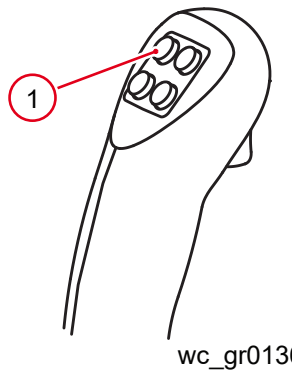


Fig. 108: Ground Speed button

When the engine is started, the ground speed is slow Speed 1. Speed 2 is engaged by a press and release of the Ground Speed button **(1)** on the left handgrip. Press and release the same button to return to Speed 1.

On the standard display, when Speed 2 is selected, a large rabbit icon appears in the center of the display screen for 3 seconds and then appears in the top left window. When Speed 1 is selected, a large turtle icon appears in the center of the display screen for 3 seconds and then appears in the top left window. An example of this is shown in the upper left image.

With the 5.7-inch color display, the rabbit icon appears in Icon Bar Container 1 and also appears in the center icon area for 3 seconds.

6.38 Speed Limiter (Optional)

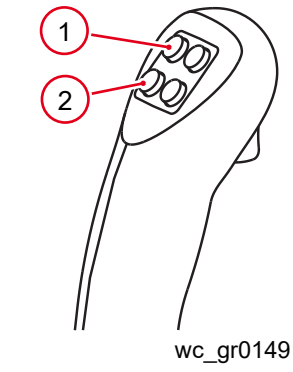


Fig. 109: Ground Speed button and Creep Speed button

Speed Limiter mode allows the operator to keep maximum hydraulic power while limiting top end speed of the machine. This limits ground speed only, not engine speed. The range of the speed limiter is 64 to 100%.

To activate Speed Limiter mode:

1. Set the parking brake.
2. Press and hold the Creep Speed button **(2)** on the left handgrip for 3 seconds.
   ⇨ The Speed Limiter indicator on the home screen has a flashing gray backlit background when the value can be changed.
3. Use the Ground Speed button **(1)** to increase the machine's top-end speed and the Creep Speed button **(2)** to decrease the machine's top end speed.

The flashing indicator times out or goes back to normal when the parking brake is released or the creep button is pressed and held again, and the selected value is displayed on the home screen.

Speed Limiter mode cannot be used in conjunction with Creep speed.

6.39 Cold System Restriction

Cold hydraulic fluid results in decreased driving performance. When Cold System Restriction is engaged, the Speed Limit is activated, and two-speed shifting is not allowed until the system comes up to temperature.

Temperature < 10°C (50°F)	10°C (50°F) – 25°C (77°F)	Temperature > 38°C (77°F)
Speed limit set to 64%	Speed limit returns to normal	Normal machine function
Two speed not allowed	Two speed not allowed	Auto-idle functional

6.40 Creep Speed Ground Drive Control (Optional)

Overview

Creep speed (snail icon) ground control allows the machine to be driven at slower travel speeds while using the full range of motion for the joystick.

This function can be used for applications requiring fine control for machine movement such as operating cold planers and trenchers, loading or stacking pallets, and mounting attachments.

The user can access Creep speed while the machine is in motion (in Speed 1).

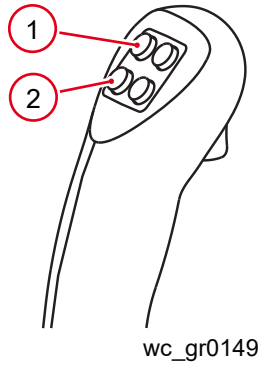


Fig. 110: Ground Speed and Creep buttons

To engage Creep speed:

1. Start in Speed 1 (low speed, turtle icon).
2. Press the Creep Speed button **(2)** on the left handgrip for 3 seconds.
   - ⇨ With the standard display, a snail icon appears in the center of the display screen for 3 seconds and then appears in the top left window until changed again. Examples of this are shown below.
   - ⇨ With the 5.7-inch color display, the operator is taken to the Creep Speed screen. The Creep Speed screen remains active as long as there is input from the operator. If there is no input for 3 seconds, the display reverts back to the Main Operating screen where the snail icon appears in Icon Bar Container 1. Pressing the increase or decrease buttons on the left joystick brings the Creep Speed screen back up so the operator can see the percentage at which the speed is adjusted.

The Creep speed range can be adjusted from 3 to 99% of Speed 1. Press the Ground Speed button **(1)** to increase Creep speed or press the Creep Speed button **(2)** to decrease Creep speed.

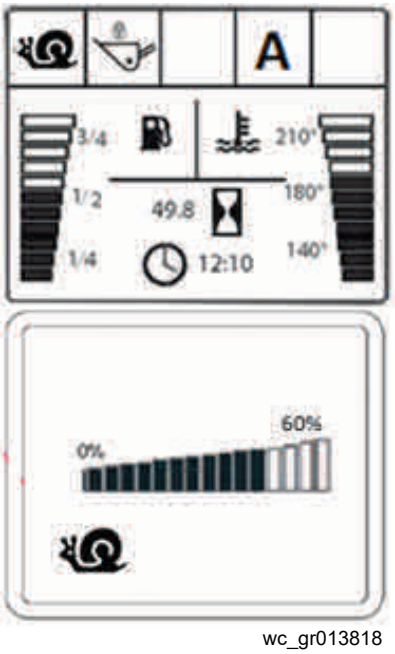


Fig. 111: Creep percentage

To return to Speed 1 (turtle):

- Start with the joysticks in neutral and press the Creep Speed button **(2)** on the left handgrip for 3 seconds.
  - ⇨ With the standard display, a turtle icon appears in the center of the display screen for 3 seconds and then appears in the top left window until changed again.
  - ⇨ With the 5.7-inch color display, the turtle icon appears in Display Field Icon 1 and also appears in the center icon area for 3 seconds.

6.41 Operating on Slopes

⚠ WARNING

Crushing hazard

Do not operate the machine sideways on slopes. The machine may tip or roll over, even on stable ground.

- ► Operate the machine straight up and down slopes with the heavy end of the machine uphill.
- ► Do not turn with the machine on a slope.
- ► Keep the lift arm low to the ground.
- ► Maintain control of the machine by adjusting the travel and movements speeds for the operating conditions.
- ► Engine starvation begins at 17.5° and will stall if the operating angle is not reduced. An engine stall at this angle can cause the machine to tip over or engine damage.

NOTICE

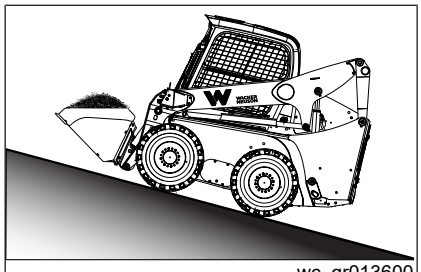
Engine damage will occur if the maximum operating angle (17.5°) is exceeded.

- ► Avoid traveling at angles nearing the maximum operating angle rating.

Overview

When operating on slopes or hills, special care must be taken to reduce the risk of personal injury or damage to the machine. The maximum operating angle rating is 17.5°.

The risk zone on a slope is different from the one on a level surface. Stop machine operation immediately as soon as someone enters the risk zone. For further information, see Safety Guidelines for Operating the Machine on page 16.

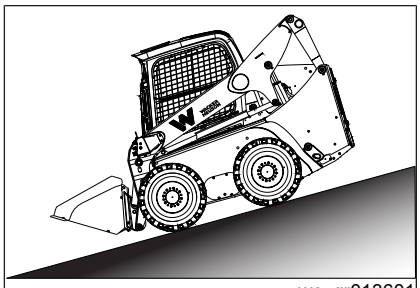


wc_gr013600

Fig. 112: Traveling with a load

Traveling with a load

- When loaded, point the load uphill on slopes.
- To avoid tipping, carry loads close to the ground, yet high enough to clear obstacles.
- Drive up and down slopes slowly.
- Do not drive diagonally across slopes.
- Do not make sharp turns on slopes, or the machine may roll over.


wc_gr013601
Fig. 113: Traveling without a load

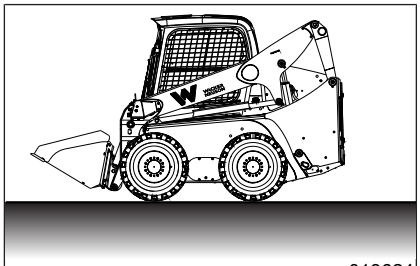
Traveling without a load

- When unloaded, point the back of the machine uphill on slopes.
- Keep the lift arm low to the ground, yet high enough to clear obstacles.
- Drive up and down slopes slowly.
- Do not drive diagonally across slopes.
- Do not make sharp turns on slopes, or the machine may roll over.

Surface conditions

- Pay attention to changing surface conditions while operating the machine. Adjust speed and travel direction as necessary to maintain safe operation.
- Machine stability and traction may be severely reduced when operating on uneven or rough terrain, rocky soils, or wet or loosely packed surface materials.
- The machine may suddenly tip, sink, or fall when moved onto surfaces that have newly filled earth.
- Drive slowly when operating on rough terrain.

6.42 Road Travel


wc_gr013624
Fig. 114: Lift arm down and attachment back

- Lower the lift arm completely and tilt the attachment back.
- Raise the bucket 20–30 cm (8–12 in.) from the ground.

wc_gr013804
Fig. 115: Work lights button

- When traveling on a roadway, turn the lights on by pressing the work lights switch **(1)** to the down position.
- Follow local road regulations for travel on public roads.

6.43 Coupler for Attachments

Overview

⚠ WARNING

Crushing hazard

- ► Keep others clear of the area while mounting or removing attachments.
- ► Keep hands clear of the area while mounting or removing attachments.
- ► After the attachment has been mounted, check the coupler lower pin engagement to make sure the attachment is secured. This will prevent the attachment from falling off during machine operation.
- ► Set the attachment on level ground when removing it to ensure stability.

Information

Use only attachments that are approved by Wacker Neuson.

Read and understand the instructions for use and operation of any attachment used on this machine.

Make sure the mounting pad on the attachment is clear of any debris to allow to proper mounting of the attachment.

A coupler is a device for mounting and removing attachments without the aid of tools. There are two options for the coupler, manual or hydraulic powered.

6.44 Using the Manual Coupler

Information

Tilting the attachment back reduces the force to set the lock levers in the locked and unlocked positions.

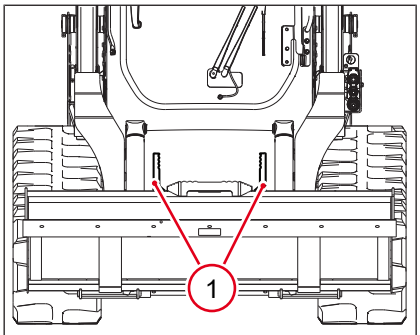


Fig. 116: Lock levers

Mounting an attachment

- Sit down in the operator's seat and fasten the seat belt.
- Press the parking brake switch to disengage the parking brake.

1. Lower the lift arm completely.
2. Stop the engine.
3. Set the lock levers **(1)** to the unlocked (up) position.
   Note: The attachment should be in a stable position on level ground.
4. Enter the cab, sit in the operator's seat, and fasten the seat belt.
5. Start the engine and release the parking brake.
6. Tilt the coupler forward.

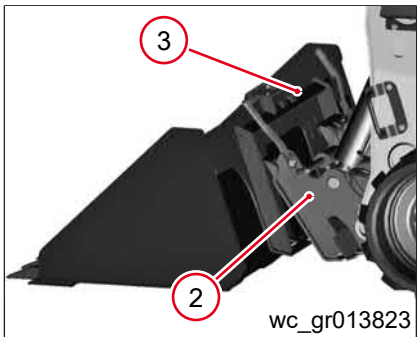


Fig. 117: Coupler and mount

7. Move the machine forward until the coupler **(2)** is under the attachment's upper mount **(3)**.

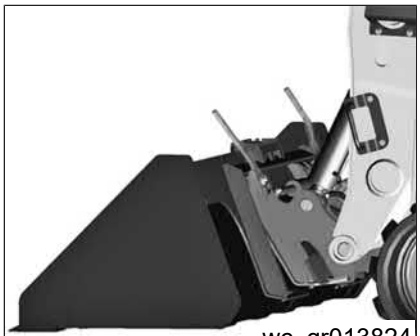


Fig. 118: Lifting the attachment

8. Raise the lift arm until the coupler begins to lift the attachment.

Fig. 119: Tilting the coupler back

9. Tilt the coupler back until the attachment mount is against the coupler frame.
10. Lower the lift arm completely with the attachment slightly rolled back.
11. Stop the engine.
12. Exit the cab.

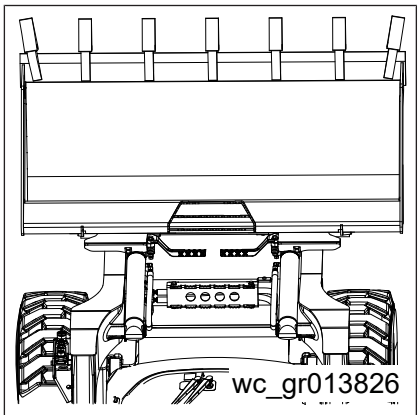


Fig. 120: Lock levers down

13. Set the lock levers down to the locked position.
14. Check the coupler to make sure the attachment is secure.

Testing the Attachment System

⚠ WARNING

Crushing hazard

The lower coupler pins must protrude through the holes in the attachment's lower mounting plate and the lock handles must be in the locked position to secure the attachment to the coupler.

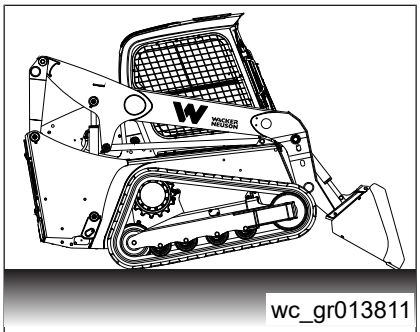


Fig. 121: Testing the attachment

For buckets, lower the lift arm fully and tilt the bucket down until the front of the machine lifts off of the ground.

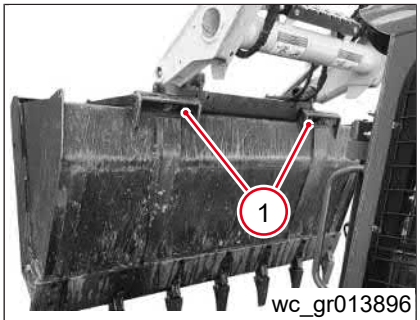


Fig. 122: Lower coupler pins

With any attachment, check to make sure you can see the lower coupler pins **(1)** protruding through the attachment's lower mounting plate.

Removing an attachment

1. Lower the lift arm completely. Then, tilt the attachment back slightly so that it is not touching the ground.
2. Stop the engine.

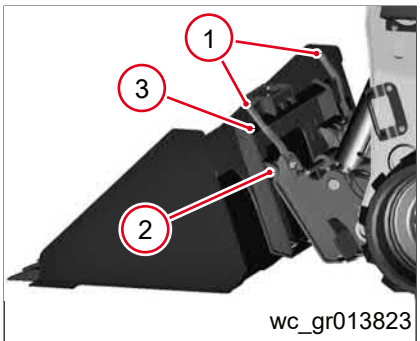


Fig. 123: Lock levers, guide, and mount

3. Set the lock levers **(1)** in the unlocked (up) position.
4. Enter the cab, sit in the operator's seat, and fasten the seat belt.
5. Start the engine and press the parking brake switch to disengage the parking brake.
6. Tilt the coupler forward until the upper guide **(2)** clears the attachment's upper mount **(3)**.
7. Move the machine in reverse away from the attachment.

6.45 Using the Hydraulic Coupler

Overview

The hydraulic coupler is used for mounting and removing attachments. It is operated from inside the cab.

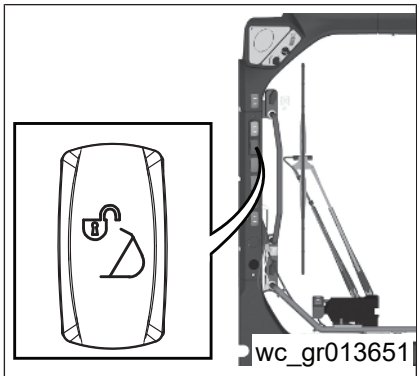


Fig. 124: Hydraulic coupler button

Mounting an attachment

1. Sit down in the operator's seat and fasten the seat belt.
2. Start the engine.
3. Press the parking brake switch to disengage the parking brake.
4. Lower the lift arm completely.

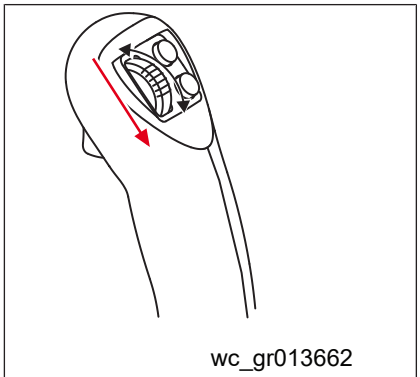


Fig. 125: Thumbwheel

5. To unlock the lock levers, press and hold the hydraulic coupler switch while moving the proportional hydraulics thumbwheel on the right handgrip downward, or activate any loader function to the end of its control stroke.

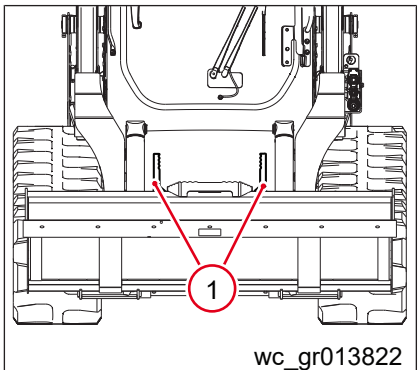


Fig. 126: Lock levers

6. When the lock levers **(1)** are set to the unlocked position, release the proportional hydraulics thumbwheel or loader control function and hydraulic coupler switch.
7. Make sure that the attachment is in a stable position on level ground.
8. Tilt the coupler forward.

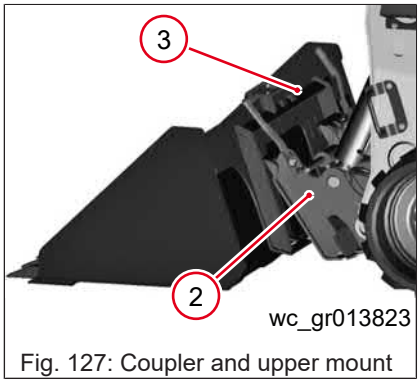


Fig. 127: Coupler and upper mount

9. Move the machine forward until the coupler **(2)** is under the attachment's upper mount **(3)**.

Fig. 128: Lifting the attachment

10. Raise the lift arm until the coupler begins to lift the attachment.

Fig. 129: Tilting the coupler back

11. Tilt the coupler back until the attachment mount is against the coupler frame.
12. Lower the lift arm completely with the attachment slightly rolled back.
13. Move the proportional hydraulics thumbwheel on the right handgrip downward, or activate any loader function to the end of its control stroke.

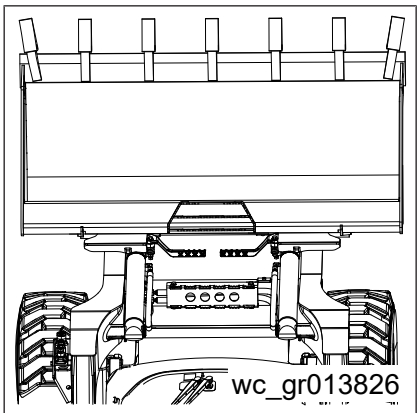


Fig. 130: Lock levers down

14. When the lock levers are set to the locked position, release the proportional hydraulics thumbwheel or loader function control.
15. Check the coupler to make sure the attachment is secure.

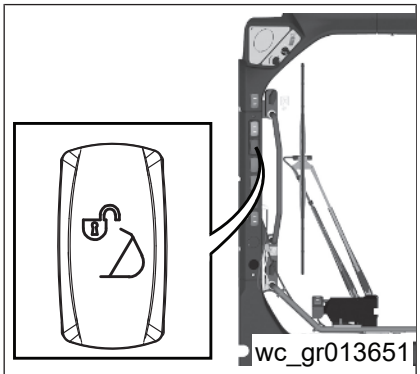


Fig. 131: Hydraulic coupler button

Removing an attachment

1. Lower the lift arm completely.
2. Tilt the attachment back slightly so that it is not touching the ground.
3. Press and hold the hydraulic coupler switch.
4. Move the proportional hydraulics thumbwheel downward, and release the thumbwheel and hydraulic coupler switch as soon as the lock levers unlock.

   Alternatively, hold the hydraulic coupler switch and lower the lift arm past the end of its control stroke to unlock the lock levers.

   If a hydraulically controlled attachment is connected, rolling the thumb-

wheel may only operate the attachment and not unlock the lock levers. In this case, perform one of the following methods to unlock the lock levers:

⇨ Lower the lift arm past the end of its control stroke.

⇨ Shut the machine down and disconnect the hydraulic lines from the auxiliary coupler (see Auxiliary Hydraulic Connections on page 132). Then, start the machine and continue the procedure at step 3.

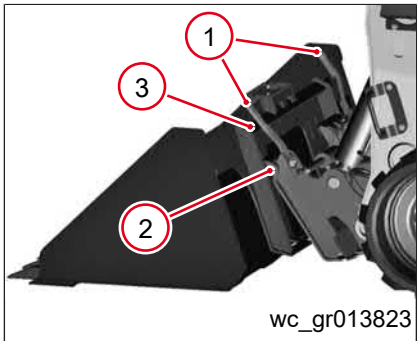


Fig. 132: Lock levers, upper guide, and upper mount

5. With the lock levers **(1)** in the unlocked position, tilt the coupler forward until the upper guide **(2)** clears the attachment's upper mount **(3)**.
6. Move the machine in reverse away from the attachment.

6.46 Auxiliary Hydraulic Connections

⚠ WARNING

Severe injury hazard

Hydraulic fluid, tubes, and hoses are under high pressure and become very hot during operation.

► Relieve the hydraulic system pressure before connecting or disconnecting any hydraulic components.

► Do not disconnect hydraulic system lines until components have cooled.

Overview

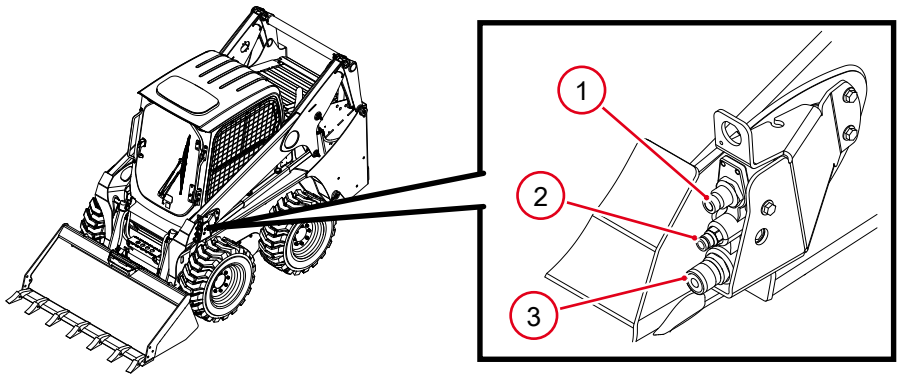


Fig. 133: Auxiliary hydraulic connections

Ref.	Function
1	Male auxiliary hydraulic connector (supply)
2	Case drain line
3	Female auxiliary hydraulic connector (return)

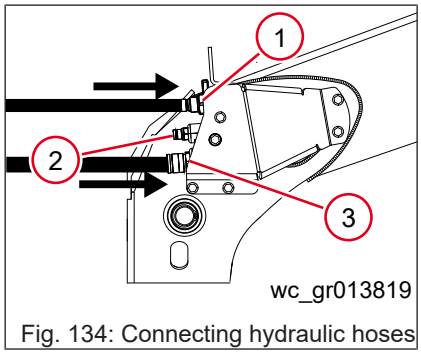


Fig. 134: Connecting hydraulic hoses

Connecting hydraulic hoses

1. Lower the lift arm.
2. Stop the engine.
3. Clean the couplers with a clean cloth.
4. Push in the top and bottom couplers (deluxe only) or move the auxiliary hydraulic control lever back and forth to relieve pressure in that auxiliary hydraulic hose circuit.
5. Push the male connector attachment to the female auxiliary hydraulic connector (bottom) **(3)**.
6. Push the female connector attachment to the male auxiliary hydraulic connector (top) **(1)**.
7. Push the case drain connector attachment (if present) onto the case drain line (middle) **(2)** connector (deluxe only).

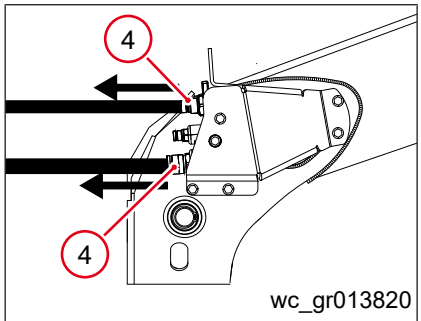


Fig. 135: Disconnecting hydraulic hoses

Disconnecting hydraulic hoses

1. Lower the lift arm.
2. Stop the engine.
3. Push in the top and bottom couplers (deluxe only) or move the auxiliary hydraulic control lever back and forth to relieve pressure in that auxiliary hydraulic hose circuit.

Pull the rings **(4)** on the female couplers to release the hoses from the machine.

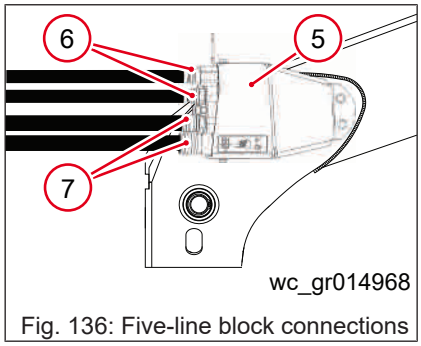


Fig. 136: Five-line block connections

Five-line Block (Optional)

With the high flow hydraulic system, there is five-line block **(5)** in place of the standard block. Functionally, the standard block and the five-line block are the same. The only difference is the five-line block has two supply **(6)** and two return **(7)** ports compared to the standard block which has one of each.

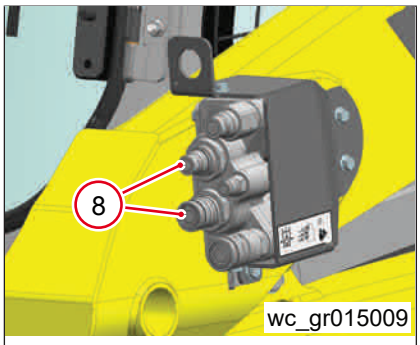


Fig. 137: Middle auxiliary hydraulic connectors

Pushing in the middle auxiliary hydraulic connectors **(8)** releases the pressure in the auxiliary hydraulics circuit.

The 5/8-inch flat face connectors found on the five-line block are standard. Optional 3/4-inch connectors are available from an authorized Wacker Neuson dealer.

6.47 Auxiliary and High Flow Hydraulics

Fig. 138: Hydraulics button

Selector switch—Auxiliary hydraulic and high flow hydraulics (optional)

Select standard auxiliary hydraulics **(1)** or, if equipped, high flow hydraulics **(2)** by pressing and holding the switch for 3 seconds. With both the standard and 5.7-inch color displays, the activated function's icon appears in the center of the display screen for 3 seconds before returning to the home screen. (An example of the standard display is shown below).

The switch is backlit to show which function is activated.

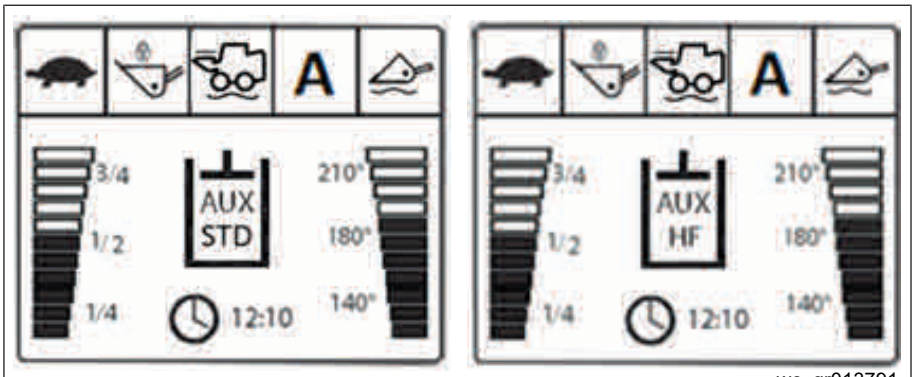


Fig. 139: Hydraulics screens

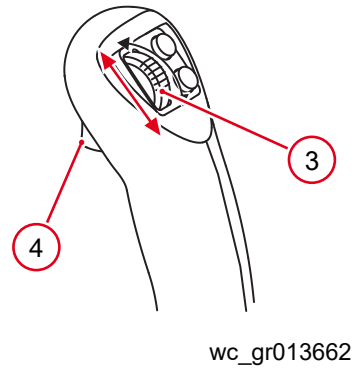


Fig. 140: Thumbwheel and trigger button

Proportional auxiliary hydraulics

Proportional auxiliary hydraulic flow is controlled, zero to full flow, by the thumbwheel **(3)** on the right handgrip.

- Rolling the thumbwheel upward results in the oil flowing out from the female hydraulic disconnect coupler.
- Rolling the thumbwheel downward results in the oil flowing out from the male hydraulic disconnect coupler.
- The thumbwheel is spring centered and returns to neutral when released.

For full flow, press and release the trigger button **(4)** on the right handgrip to provide full flow to the standard auxiliary hydraulic or high flow hydraulic system flowing out from the female quick disconnect coupler when in high flow mode. Press and release the trigger button to stop the flow.

To lock in the full flow position, roll the thumbwheel down and press and release the trigger button. The thumbwheel returns to neutral when released. Press and release the trigger button to stop the flow.

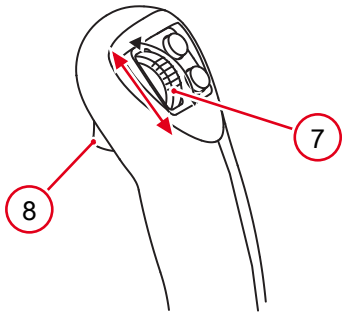
wc_gr013650

Fig. 141: Hydraulics button

Auxiliary operation outside the cab

For some attachments, the operator may want to operate the attachment outside the cab. To operate the attachment in this way, perform the following:

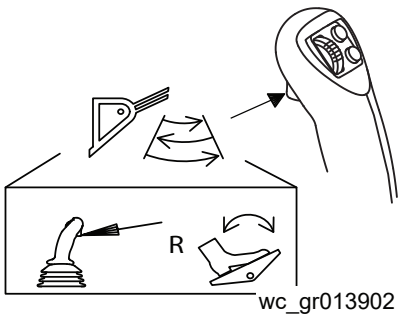
1. Start the machine with the seat belt off.
2. Press and hold the parking brake switch and either the standard flow switch **(5)** or high flow switch **(6)** simultaneously for 5 seconds.



wc_gr013662

Fig. 142: Hydraulics handgrip controls

3. On the right handgrip, roll the thumbwheel **(7)** down and press and release the trigger button **(8)** to lock the hydraulics in the full flow position.
4. Exit the cab and use the attachment as necessary.
5. Press and release the right handgrip trigger button again to stop the flow.



wc_gr013902

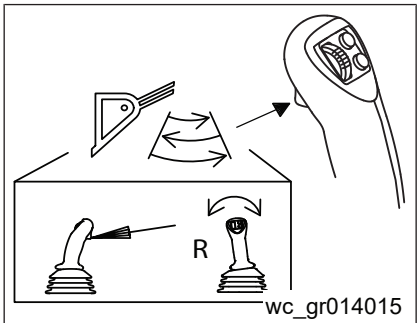
Fig. 143: Bucket shake-out—mechanical

Bucket shake-out

Mechanical controls (handgrip and foot pedal)

To shake out loose material from the bucket:

1. Raise the bucket at least two feet above the ground.
2. Tilt the bucket forward.
3. Press and hold the trigger button on the right handgrip.
4. Quickly press the right foot pedal fore and aft until the bucket is empty of loose material.



wc_gr014015

Fig. 144: Bucket shake-out—EH

Electro-hydraulic controls (joystick)

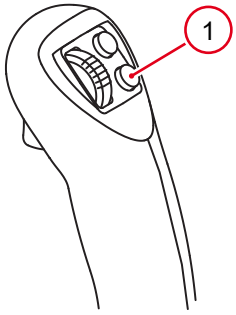
To shake out loose material from the bucket:

1. Raise the bucket at least two feet above the ground.
2. Tilt the bucket forward.
3. Press and hold the trigger button **((4))** on the right handgrip.
4. Tilt handgrip side to side (left and right) until the bucket is empty of loose material.

6.48 Ride Control (Optional)

Information

When ride control is activated, the base ends of the lift cylinders are connected to a nitrogen charged accumulator. The lift arm may rise or drop until a pressure balance is obtained.

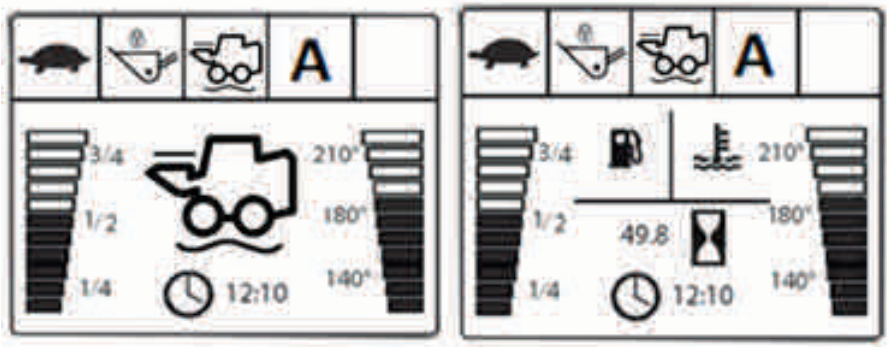


wc_gr013664

Fig. 145: Ride Control button

Ride control reduces the machine's pitching motion to provide a smoother ride and to prevent loss of material from the bucket while traveling. It also reduces wheel hop when making sharp turns on hard surfaces.

To use ride control, raise the lift arm at least 300 mm (12 in.), then press the Ride Control button **(1)** on the right handgrip for 2 seconds. With the standard display, a large ride control icon appears in the center of the display screen for 3 seconds and then appears in the top center window until changed again. Examples of this are shown below.



wc_gr013797

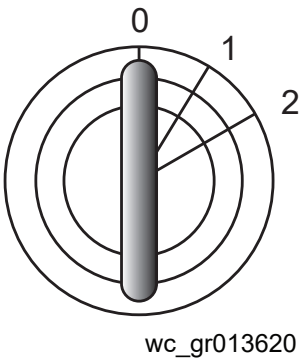
Fig. 146: Ride control screen

With the 5.7-inch color display, the ride control icon appears in Icon Bar Container 3 and also appears in the center icon area for 3 seconds.

To disengage ride control, press the Ride Control button for 2 seconds and release.

When ride control is active and the lift arm is lowered, ride control is disengaged until the joystick is returned to neutral. For mechanical machines, ride control resumes after 1-1/2 seconds. For electro-hydraulic machines, ride control only resumes if the drive output percentage is still above the threshold value after 1-1/2 seconds.

Ride control and self-level can be "ON" at the same time: however, they cannot be active at the same time. When both are active and the lift arm is raised, ride control is disengaged until the joystick is returned to neutral. For mechanical machines, ride control resumes after 1-1/2 seconds. For electro-hydraulic machines, ride control only resumes if the drive output percentage is still above the threshold value after 1-1/2 seconds.



wc_gr013620

Fig. 147: Key position 0

To relieve hydraulic pressure in the ride control accumulator:

1. Lower the lift arm to the ground.
2. Stop the engine and turn the key to Position 1.
3. Press the lower right button on the right handgrip for 2 seconds.
4. Turn the key to Position 0.

6.49 Self-level—One Way (Optional)

Information

Self-level and ride control cannot be operated simultaneously. If self-level is turned on, you cannot turn on ride control. If ride control is turned on and you turn self-level on, ride control is turned off.

wc_gr013799

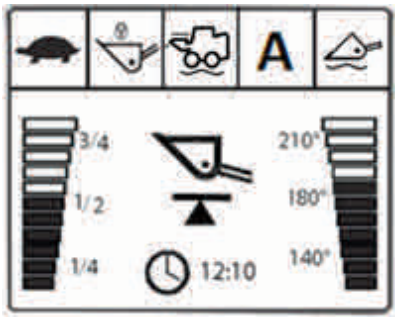
Fig. 148: Self-level button

The self-level is one-way, raise only. This feature keeps the bucket, or other attachment, in the same approximate angular position to the ground as the lift arm is raised. Self-level helps to prevent material from spilling over the back of the bucket, and keeps pallets relatively level, while raising the lift arm.

Press the top of self-level switch on the front left panel of the cab to activate. With the standard display, a large self-level icon appears in the center of the display screen for 3 seconds. Then, the center screen returns to the home screen. An example of this is shown below.

With the 5.7-inch color display, the ride control icon appears in Icon Bar Container 3 and also appears in the center icon area for 3 seconds.

To deactivate self-level, press the bottom of the self-level switch. As the lift arm is lowered back to the ground, the bucket or attachment does not self-level or maintain its angular position to the ground. Use the right joystick or the right foot pedal to roll the attachment backward.



wc_gr013801

Fig. 149: Self-level icon

Press the top of self-level switch on the left side of the operator's console to activate. A large self-level icon appears in the center of the display screen for 3 seconds. Then, the center screen returns to the home screen. An example of this is shown below.

To deactivate self-level, press the bottom of the self-level switch. As the lift arm is lowered back to the ground, the bucket or attachment does not self-level or maintain its angular position to the ground. Use the right joystick to roll the attachment backward.

6.50 Auxiliary Electric Controls

A/B/C momentary switch and control buttons

Press and release the top of the A/B/C momentary switch to cycle through the A, B, and C functions. The cycle starts with A, then to B, then to C, and then to A again.

The standard display shows which function is active in the fourth field of the top row.

With the 5.7-inch color display, the current icon (A, B, or C) appears in Icon Bar Container 4 and also appears in the center icon area for 3 seconds.

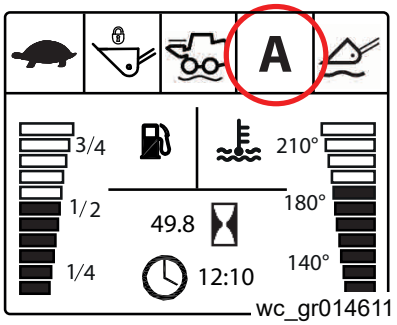


Fig. 150: Position A

A/B/C momentary switch—Position A

To activate the A function, press and release the top of the A/B/C momentary switch once.

When the A/B/C momentary switch is in Position A, buttons 2 and 4 on the left handgrip control the first switch function of the auxiliary electric system.

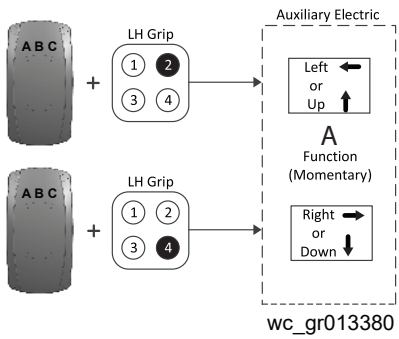


Fig. 151: Position A controls

- Button 2 controls left or up movement. Button 2 energizes Pin C of the 14-pin auxiliary connector.
- Button 4 controls right or down movement. Button 4 energizes Pin D of the 14-pin auxiliary connector.

The first switch function is momentary, i.e. the function only takes place as long as the operator is pressing one of the buttons.

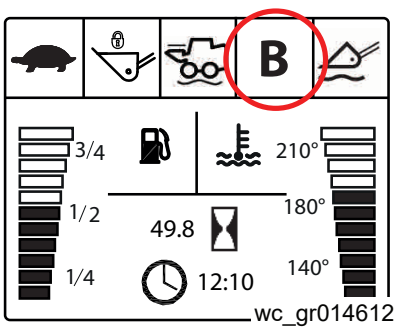


Fig. 152: Position B

A/B/C momentary switch—Position B

To activate the B function, press and release the top of the A/B/C momentary switch twice.

When the A/B/C momentary switch is in Position B, buttons 2 and 4 on the left handgrip control the second switch function of the auxiliary electric system.

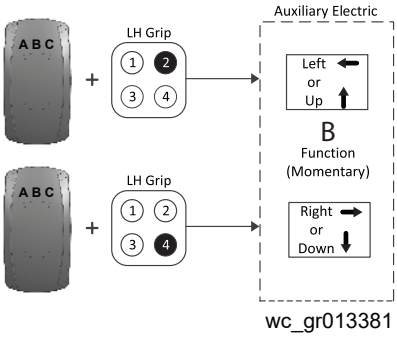


Fig. 153: Position B controls

- Button 2 controls left or up movement. Button 2 energizes Pin E of the 14- pin auxiliary connector.
- Button 4 controls right or down movement. Button 4 energizes Pin F of the 14-pin auxiliary connector.

The second switch function is momentary, i.e. the function only takes place as long as the operator is pressing one of the buttons.

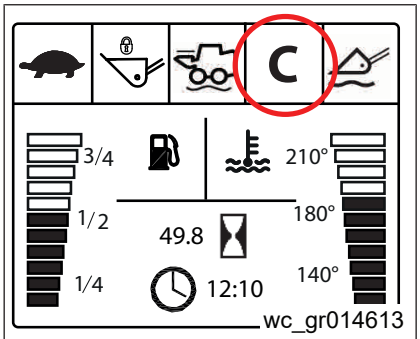


Fig. 154: Position C

A/B/C momentary switch—Position C

To activate the C function, press and release the top of the A/B/C momentary switch three times.

When the A/B/C momentary switch is in the Position C, buttons 2 and 4 on the left handgrip control the third switch function of the auxiliary electric system.

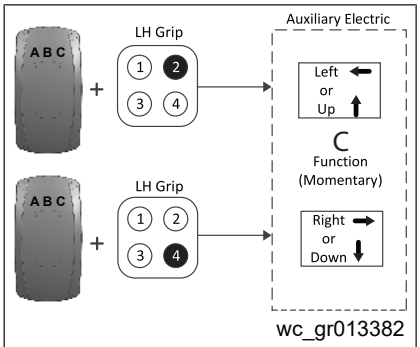


Fig. 155: Position C controls

- Button 2 controls left or up movement. Button 2 energizes Pin G of the 14- pin auxiliary connector.
- Button 4 controls right or down movement. Button 4 energizes Pin H of the 14-pin auxiliary connector.

The third switch function is momentary, i.e. the function only takes place as long as the operator is pressing one of the buttons.

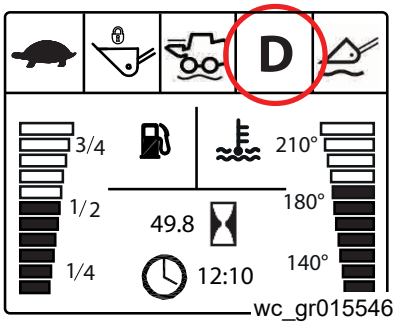


Fig. 156: Position D

A/B/C momentary switch—Position D

The D function allows operators to control two attachment functions without removing their hands from the controls. To activate the D function, press and hold the A/B/C momentary switch for six seconds.

When the A/B/C momentary switch is in Position D, Position A controls are activated on the left handgrip. The functions are the same as seen in A/B/C momentary switch—Position A.

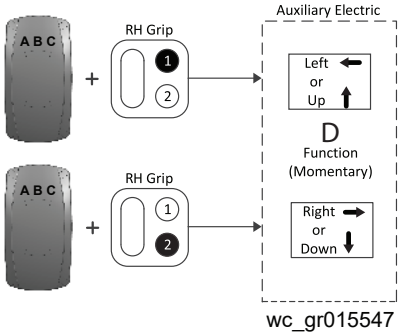


Fig. 157: Position D controls

Position D controls are activated on the right handgrip, replacing the float and ride control functionality. When in D mode, float and ride control are inactive. Button functions are as follows:

• Button 1 controls left or up movement. Button 1 energizes Pin E of the 14-pin auxiliary connector.

• Button 2 controls right or down movement. Button 2 energizes Pin F of the 14-pin auxiliary connector.

The switch functions are momentary, i.e. the functions only take place as long as the operator is pressing one of the buttons.

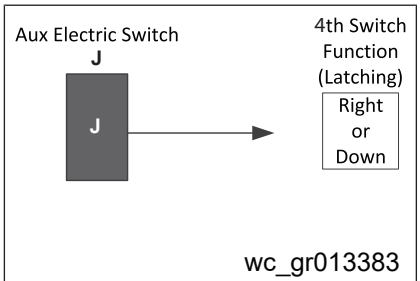


Fig. 158: J switch

J switch and L/M momentary switch

J switch

The J switch controls the fourth switch function of the auxiliary electric system.

The J switch controls right or down movement. The J switch energizes Pin J of the14-pin auxiliary connector.

This switch function is latching.

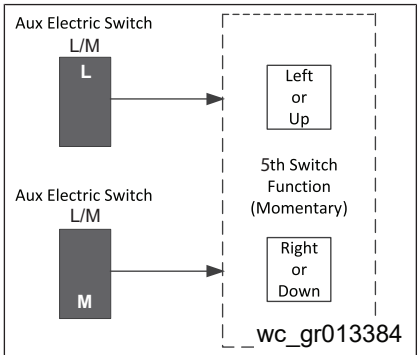


Fig. 159: L-M switch

L/M momentary switch

The L/M momentary switch controls the fifth switch function of the auxiliary electric system.

- Position L controls left or up movement. The L position energizes Pin L of the 14-pin auxiliary connector.
- Position M controls right or down movement. The M position energizes Pin M of the 14-pin auxiliary connector.

This switch function is momentary, i.e. the function only takes place as long as the operator is pressing the switch.

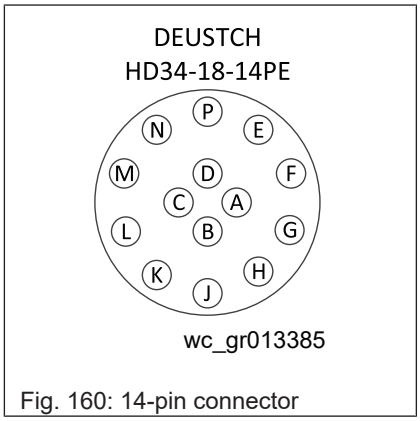


Fig. 160: 14-pin connector

Auxiliary electric 14-pin connector

This drawing illustrates the pinout of the auxiliary electrical 14-pin connector.

The ground pins are A and B.

6.51 Filling and Dumping the Bucket

⚠ WARNING

Accident hazard

Operate the machine with extreme care to avoid possible loss of machine control.

- ► Know the machine's lifting capacity. Do not exceed the rated operating capacity (ROC) for the machine. For further information, see Forces on page 219.
- ► Dump the load with the machine on level ground.

Filling the bucket

1. Lower the lift arm.
2. Tilt the bucket so it is flat on the ground.
3. Drive the machine slowly forward into the pile.
4. Tilt the bucket back and raise the lift arm at the same time while driving the machine into the pile to fill the bucket.
5. Drive the machine in reverse away from the pile, turn the machine around on level ground, then travel to the dumping location with the bucket low to the ground.

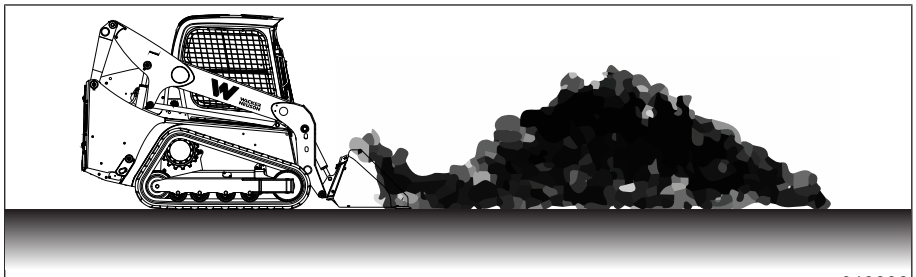


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Fig. 161: Filling the bucket

Dumping the bucket

1. Raise the lift arm while keeping the top edge of the bucket level to prevent spilling the load.
2. Dump the load.

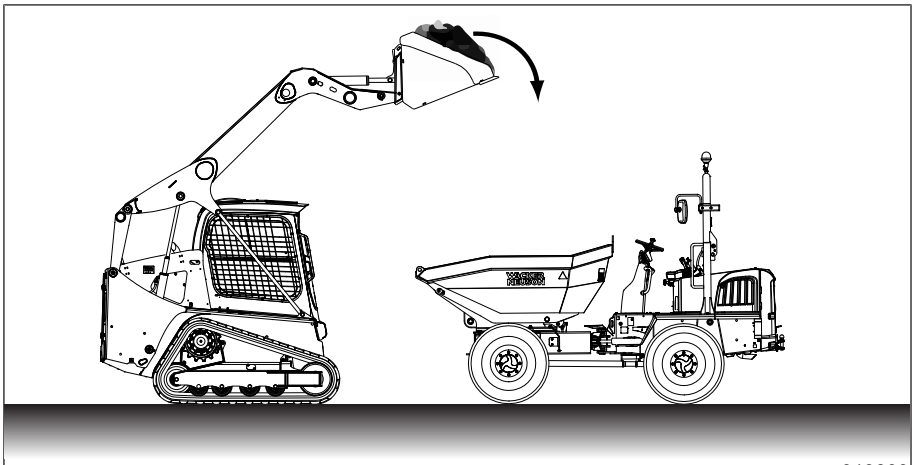


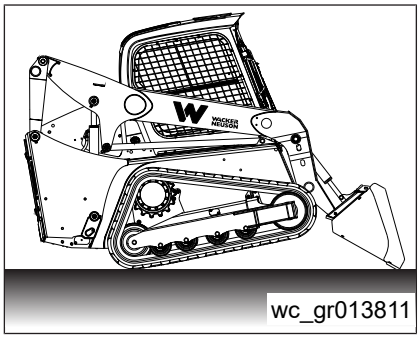
Fig. 162: Dumping the bucket

6.52 Digging Below Grade

Information

Maximum push force is achieved running the engine at high idle, using the low range if equipped with a two speed option, and moving the ground drive levers slightly forward.

Having the lift arm in the down position reduces the force on the lift structure.



1. Lower the lift arm with bucket angled toward the ground.
2. Drive the machine slowly forward. If the bucket does not dig into the ground, increase the bucket angle until the front wheels/tracks lift slightly off the ground. This gives the machine maximum force on the cutting edge of the bucket.

6.53 Recommended Fuels—Diesel and Biodiesel

⚠ CAUTION

Machine damage hazard

Do not use B20 biodiesel fuel in a machine with a Tier IV engine.

Use the same diesel fuel that is used in cars. Other types of fuel may damage the engine.

Fuel requirements

- Fuel must meet the ASTM D975, EN590:96, ISO 8217 DMX, BS 2869-A1 or A2, JIS K2204 Grade No. 2, KSM-2610, or GB252 standard.
- Biodiesel fuel for blending must meet the EN14214 or ASTM D-6751 and D7467, or JIS K2390 standard. (Blend ratios up to B20 are acceptable.)
- The sulfur content of fuel must not exceed 0.5% by volume. Less than 0.05% is preferred. In the U.S. and Canada, it is illegal to use greater than 0.0015% sulfur.
- Do not use kerosene or mix kerosene with fuel.
- Do not use fuel stored for an extended time.

Diesel fuel

Low temperatures cause diesel fuel to gel. Always use the proper fuel for the conditions. Follow the guidelines in the table below.

Lowest expected temperature °C (°F)	Recommended fuel Tier III	Recommended fuel Tier IV
Above 0 (32)	#2 diesel plus additives (ULSF only) OR High sulfur fuel less than 2000 ppm (<0.2%)	#2 diesel plus additives (ULSF only)
Above -20.5 (-5)	#1 diesel plus additives (ULSF only)	#1 diesel plus additives (ULSF only)

Biodiesel fuel

Use the following recommended biodiesel fuels.

Biodiesel fuel	Maximum % in fuel Tier III	Maximum % in fuel Tier IV
EN14214	10%	10%
ASTM D 6751-09a	30%	—

6.54 Refueling the Machine

⚠ WARNING

Fire and explosion hazard

Fuel and its vapors are extremely flammable and can be explosive. Burning fuel can cause severe burns.

- ► Keep all sources of ignition away from the machine while refueling.
- ► Store fuel containers in a well-ventilated area, away from any combustible materials or sources of ignition.
- ► Refuel only when the machine is outdoors.
- ► Clean up spilled fuel immediately.
- ► Do not smoke while refueling.
- ► To prevent static electricity buildup when transferring the fuel from the pump to the container, place the fuel container on the ground. Hold the hose nozzle firmly against the side of the container while filling it.

⚠ CAUTION

Fire and health hazard

Fuel expands when heated. Expanding fuel in an over-filled tank can lead to spills and leaks.

- ► Do not fill the fuel tank completely.

Requirements

- Engine stopped
- Machine and fuel tank supply level with the ground
- Fresh and clean fuel supply

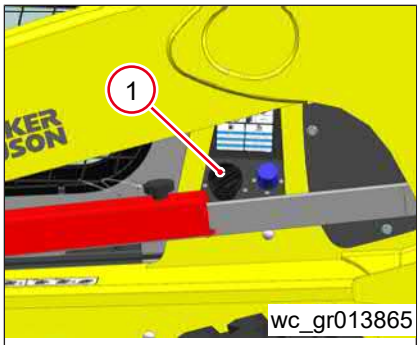


Fig. 163: Fuel cap

Procedure

1. Remove the fuel cap **(1)**.
2. Fill the fuel tank.
3. Install the fuel cap.
   Note: Replace the fuel cap if it is malfunctioning.

6.55 Refilling the Diesel Exhaust Fluid (DEF) (Optional)

⚠ WARNING

Personal injury hazard

Diesel exhaust fluid (DEF) is a harmful substance. Ingestion, excessive inhalation, or prolonged contact with the skin can cause injury or death.

► Do not ingest DEF or inhale DEF fumes excessively. If skin contact occurs, wash immediately with soap and water.

⚠ CAUTION

Contamination hazard

DEF is very susceptible to contamination. Only use equipment that is clearly specified to handle DEF. Do not use any equipment that does not specifically identify being compatible with DEF, as DEF can be corrosive to certain metals and can dissolve minerals from hoses and plastic fittings.

⚠ CAUTION

Machine damage hazard

Do not overfill the DEF tank. DEF expands when frozen. Expanding DEF can cause damage to the machine.

Requirements

- Stop the engine.
- Make sure the machine is level with the ground.
- Make sure the DEF supply is fresh and clean.

The shelf life of DEF depends on the conditions under which it is stored. Changes in temperature and the amount of exposure to sunlight can degrade the solution. The table below gives an approximate shelf life based on temperature. See the DEF manufacturer for more information.

Temperature Range	Minimum Shelf Life (Months)
≤ 10°C (≤ 50°F)	36
≤ 25°C (≤ 77°F)	18
≤ 30°C (≤ 86°F)	12
≤ 35°C (≤ 95°F)	6
≥ 35°C (≥ 95°F)	Check before use

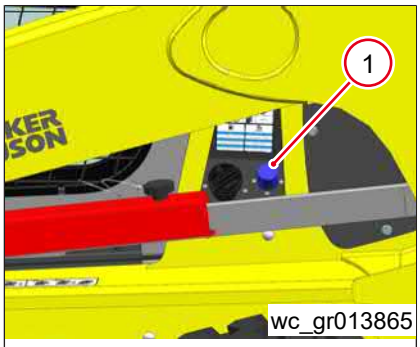


Fig. 164: DEF cap

Procedure

Some DEF nozzles have magnetic lockouts. If such a magnetic interface is encountered, insert a DEF mis-filling prevention device in the DEF tank filling neck to unlock the nozzle.

1. Remove the DEF cap **(1)**.
2. Fill the DEF tank.
3. Install the DEF cap.

6.56 Tilting the Cab

⚠ WARNING

Crushing hazard

A raised cab can fall, resulting in a serious injury or death.

► Secure the raised cab immediately using the cab lock device.

⚠ CAUTION

Machine damage hazard

An open cab door can be damaged when tilting or lowering the cab.

► Make sure the cab door is closed before tilting the cab.

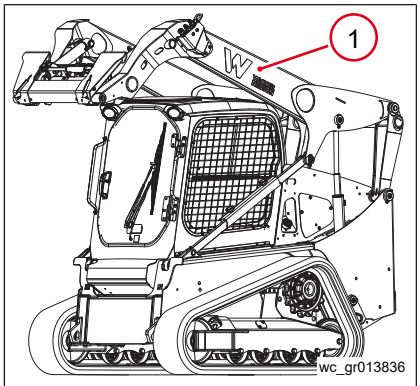


Fig. 165: Lift arm

1. Remove loose objects from the cab.
2. Ensure there is enough space in front of the machine for the cab to tilt forward.
3. Close the cab door.
4. Raise the lift arm **(1)**, if necessary, and install the lift arm support device. For further information, see Lift Arm Support Device on page 149.
   – The cab can be tilted forward with the lift arm in the down position.

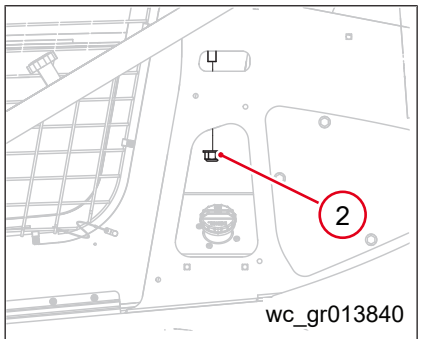


Fig. 166: Cab fastening nuts

1. Remove the cab fastening nuts **(2)**.

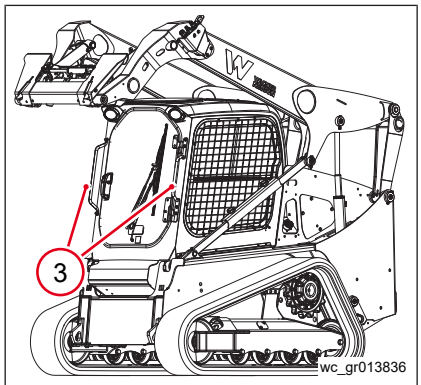


Fig. 167: Front handholds

2. Grab both front handholds **(3)** near the top of the cab and pull the cab all the way forward.

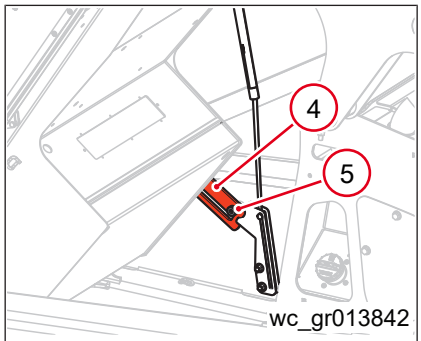


Fig. 168: Cab lock device and pin

3. Make sure the cab lock device **(4)** engages the pin **(5)** on the bottom-right side of the cab and drops into the locked position.

6.57 Lowering the Cab

⚠ WARNING

Crushing hazard

A cab being lowered can cause injury to personnel or damage to equipment.

► Make sure all personnel and equipment are clear of the area where the cab lowers.

⚠ WARNING

Crushing hazard

If the rear fastening nuts are not installed back on correctly, the cab can tilt forward on its own.

- ► Immediately install the fastening nuts again after lowering the cab.
- ► Do not use the machine if the fastening nuts are not installed.

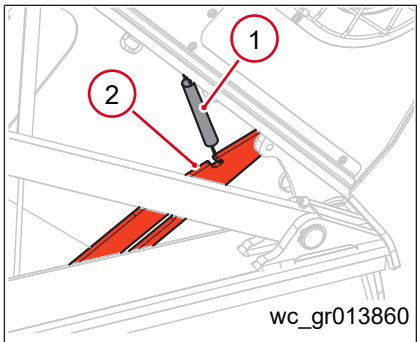


Fig. 169: Spring and cab lock device

1. Hook the spring **(1)** to the cab lock device **(2)**. Grab both of the front handholds **(3)** and pull the cab forward. The spring lifts the cab lock device to the unlocked position.

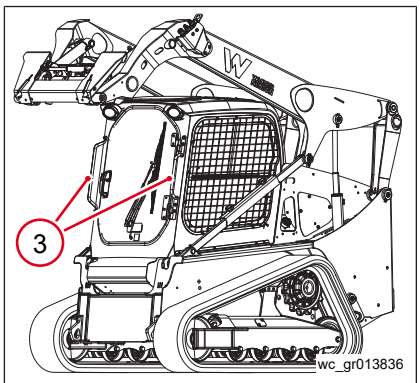


Fig. 170: Front handholds

2. Grab both of the front handholds **(3)** and slowly push to lower the cab.

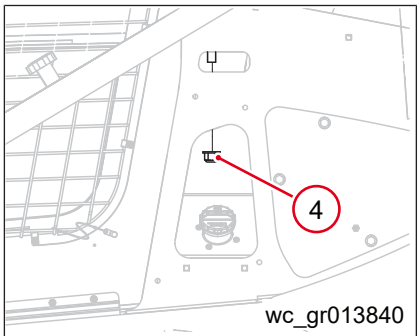


Fig. 171: Cab fastening nuts

3. Install the cab fastening nuts **(4)**.
4. Tighten the nuts to 65 Nm (48 ft. lbs.).

6.58 Lift Arm Manual Override

⚠ WARNING

Crushing hazard

Keep others clear of the area when lowering the lift arm.

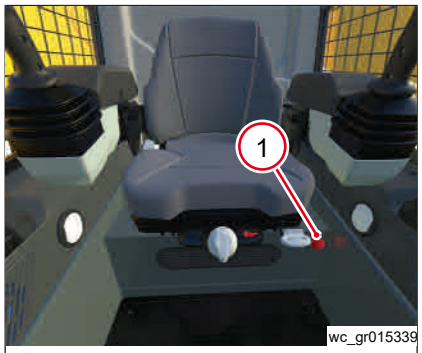


Fig. 172: Mechanical bypass valve

Overview

The lift arm manual override button **(1)** is a mechanical bypass valve. When installing the lift arm support device, use the lift arm manual override button to lower the lift arm.

The lift arm manual override button can also be used if the machine loses electrical power or if the engine stops working with the lift arm in the raised position.

Procedure

1. Sit in the operator's seat with the door closed.
2. Pull and hold the lift arm manual override button **(1)** until the lift arm lowers onto the lift arm support device or lowers completely to the ground, whichever is necessary.

6.59 Lift Arm Support Device

⚠ WARNING

Crushing hazard

A disconnected hydraulic line can result in the lift arm dropping, resulting in serious injury or death.

► Secure the lift arm support device before working under a raised lift arm.

Overview

There are two different types of lift arm support devices depending on the machine model—radial and vertical.

Radial lift machines

Installing the lift arm support device

For radial lift machines, the machine operator can install the lift arm support device without assistance.

1. Lower the lift arm to the ground and remove the attachment.
2. Stop the engine and exit the cab.
3. Remove the spring **(1)** from the pin **(2)**.

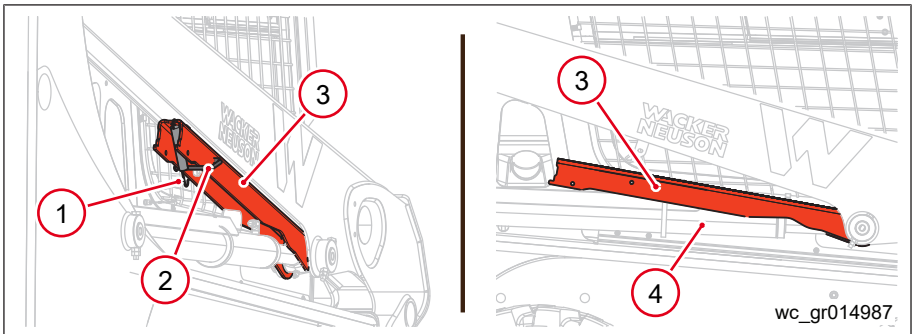


Fig. 173: Spring, pin, support device, and lift cylinder

4. Remove the pin from the lift arm support device **(3)** and lower the lift arm support device onto the lift cylinder **(4)**.
   ⇨ Keep the pin with you.
5. Enter the cab and start the engine.
6. Raise the lift arm until the lift arm support device drops down over the lift cylinder.

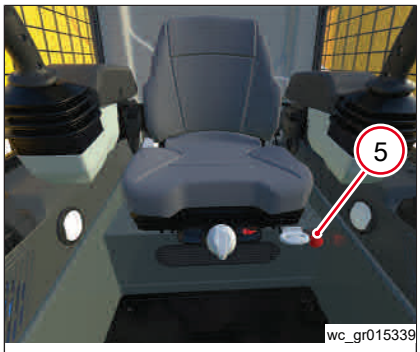


Fig. 174: Mechanical bypass valve

7. Use the mechanical bypass valve **(5)** to lower the lift arm and position the lift arm support device between the end of the lift cylinder and the lift arm.
8. Stop the engine and exit the cab.

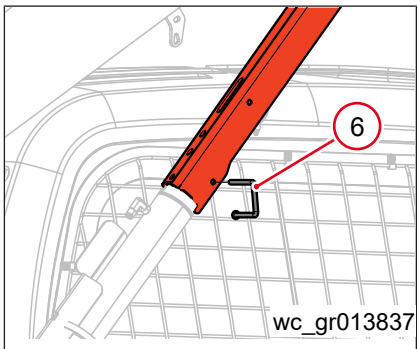


Fig. 175: Pin

9. Install the pin **(6)** to prevent the lift arm support device from moving upward.

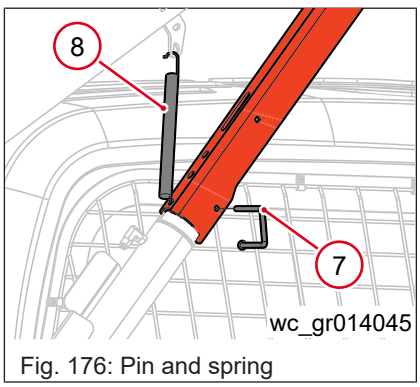


Fig. 176: Pin and spring

Removing the lift arm support device

1. Stop the engine and exit the cab.
2. Remove the pin **(7)** from the lift arm support device.
   ⇨ Keep the pin with you.
3. Attach the spring **(8)** to the lift arm support tab.
4. Enter the cab and start the engine.

5. Raise the lift arm until the lift arm support device disengages from the lift cylinder.
6. Slowly lower the lift arm to the ground.
7. Stop the engine and exit the cab.
8. Raise the lift arm support device to its storage position, insert the pin, and attach the spring to the pin.

Vertical lift machines

Installing the lift arm support device

For vertical lift machines, a second person is required to install the lift arm support device. The operator must remain in the operator's seat.

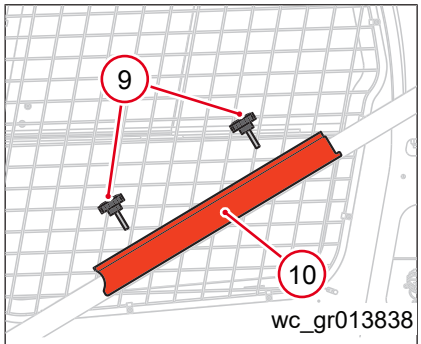


Fig. 177: Retaining knobs and support device

1. Lower the lift arm to the ground and remove the attachment.
2. Have the second person remove the two lift arm support device retaining knobs **(9)** from the lift arm support device **(10)**.
3. Remove the lift arm support device and re-install the retaining knobs on the lift arm lower link.
4. Raise the lift arm to its maximum height.

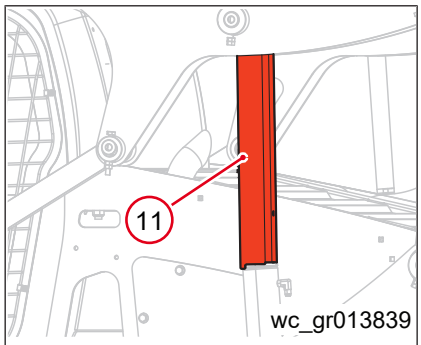


Fig. 178: Support device

5. Have the second person install the lift arm support device **(11)** with the curved end facing up.

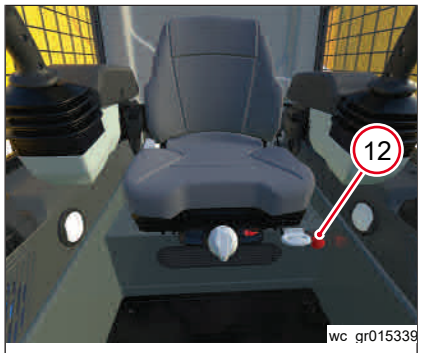


Fig. 179: Mechanical bypass valve

6. Use the mechanical bypass valve **(12)** to lower the lift arm and position the lift arm support device in place between the end of the lift cylinder and the lift arm.
7. Stop the engine and exit the machine.

Removing the lift arm support device

For vertical lift machines, a second person is required to remove the lift arm support device. The operator must remain in the operator's seat.

1. Enter the cab and start the engine.
2. Have the second person remove the two lift arm support device retaining knobs from the lift arm lower link.
3. Raise the lift arm and have the second person remove the lift arm support device.
4. Lower the lift arm.

5. Have the second person install the lift arm support device to its storage position on the lift arm lower link and secure it using the lift arm support device retaining knobs.
6. Stop the engine and exit the machine.

6.60 Parking the Machine

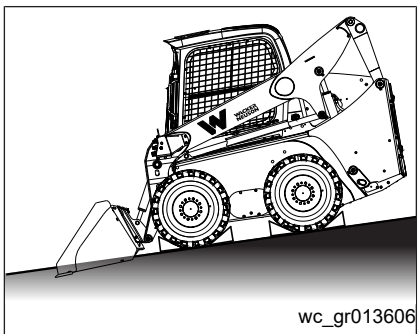


Fig. 180: Parking the machine

1. Park the machine on level ground with the lift arm completely lowered.
2. If the machine is parked on a slope, position the front of the machine downhill. If possible, tilt the bucket down so that it digs into the ground. Set the parking brake.
3. Allow the engine to cool down at low idle for 5 minutes without any load.
4. Turn the key to the OFF position to stop the engine.
5. Unlatch the seat belt and exit the machine properly.
6. Chock the wheels/tracks.

7 Maintenance

7.1 Maintenance

⚠ WARNING

Personal injury and machine damage hazard

A poorly maintained machine can malfunction, causing injuries or permanent damage to the machine.

- ► Keep the machine in safe operating condition by performing periodic maintenance and making repairs as needed.
- ► Do not make unathorized modifications to the machines. This includes structural, hydraulic, engine, and electrical systems.
- ► Before returning the machine to service, check the machine to make sure all covers and parts are installed, check for any fluid leaks, check all fluid levels, operate all controls, and test the loader interlock system functionality.

Maintenance items listed in this manual can be performed by the operator, unless otherwise specified. Other maintenance and repairs should be performed by a qualified technician. Repairs can be hazardous if not performed correctly.

Preparing for maintenance work

- Remove all attachments from the machine when service procedures require raising the lift arm. Always secure the lift arm with the lift arm support device.
- Prior to performing maintenance work on the machine, make sure that all interlock devices are engaged to prevent unintended movement on the machine.

Performing maintenance

- The engine block and exhaust system become very hot during operation and require cool-down time after the machine is shut off. Avoid contact with hot parts.
- After cleaning, examine all fuel, lubricant and hydraulic oil lines for leaks, chafe marks, and damage.
- Wear a safety harness when performing elevated maintenance work. Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow, and ice.
- Do not use the attachment or work equipment as lifting platforms for persons.

7.2 Maintenance Overview

Maintenance label—vertical machines (S05)

Maintenance that has to be performed by the operator is indicated on the maintenance label.

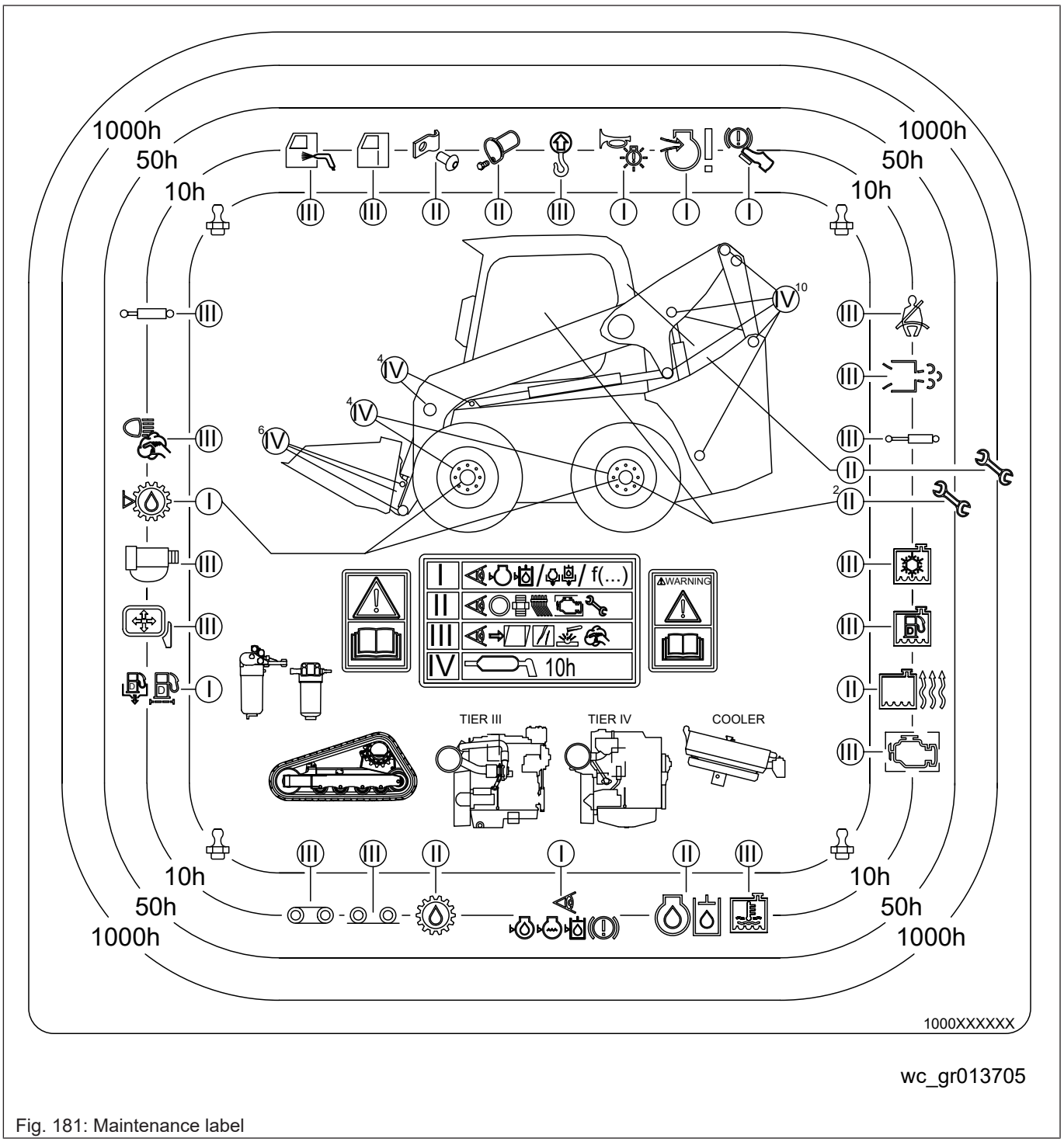


Fig. 181: Maintenance label

I Check the functions and fluid levels, filling up and draining.

II Check parts for wear, seals, hoses, and threaded fittings.

III Check for damage, corrosion, or dirt.

IV Lubricate daily after operation.

Maintenance label—vertical machines (S06)

Maintenance that has to be performed by the operator is indicated on the maintenance label.

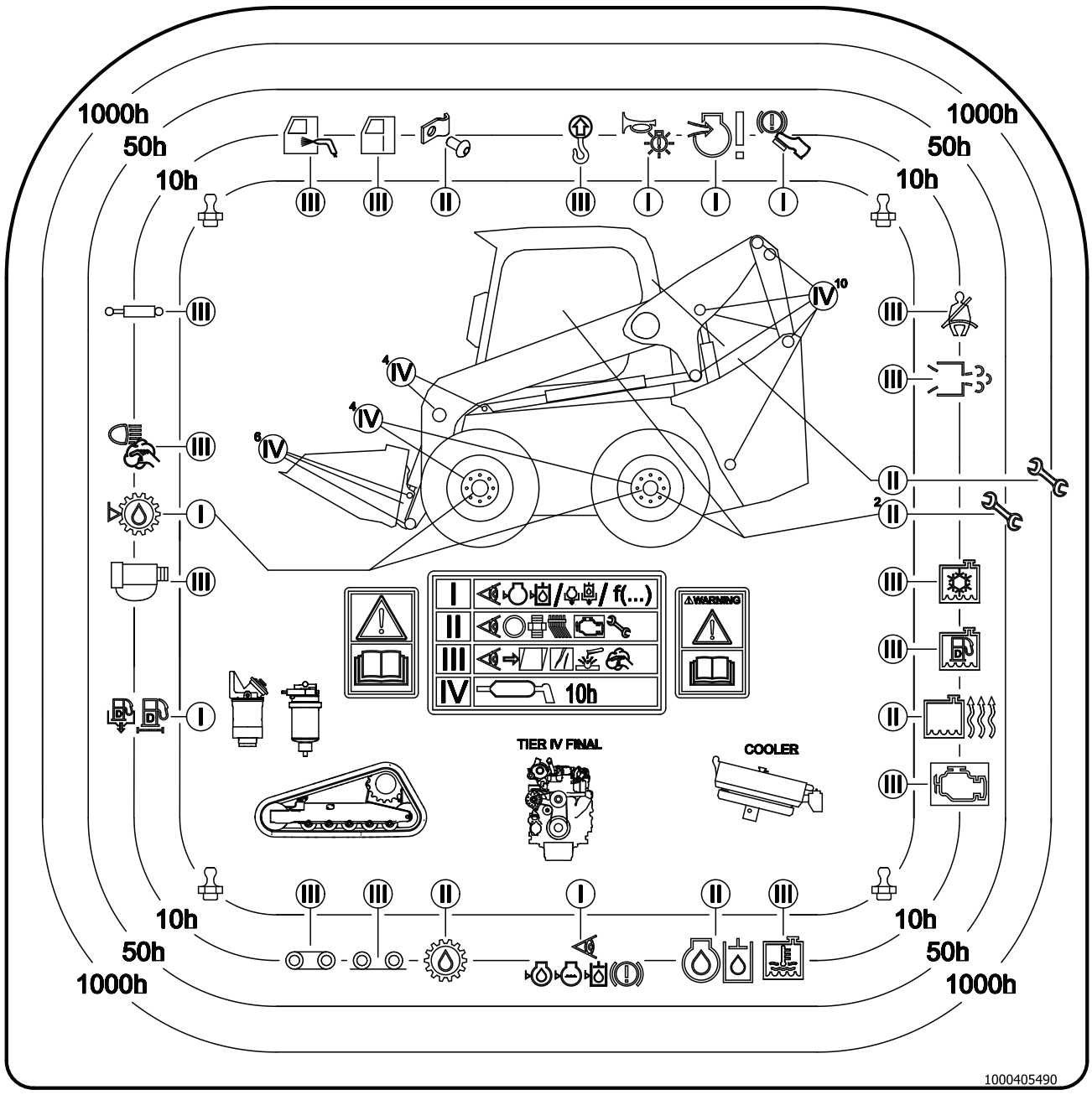


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Fig. 182: Maintenance label

I Check the functions and fluid levels, filling up and draining.

II Check parts for wear, seals, hoses, and threaded fittings.

III Check for damage, corrosion, or dirt.

IV Lubricate daily after operation.

Maintenance label—radial machines (S05)

Maintenance that has to be performed by the operator is indicated on the maintenance label.

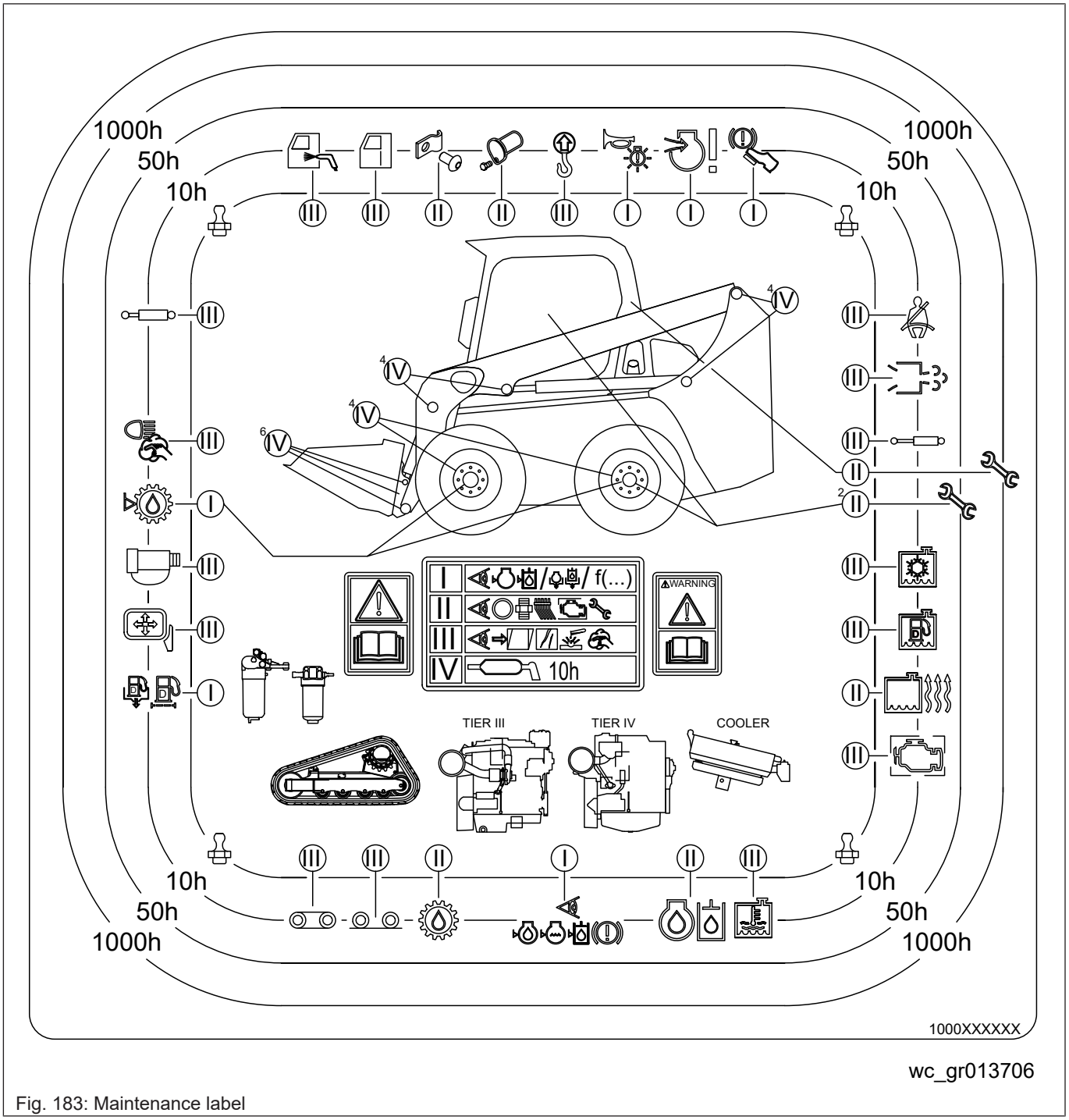

Fig. 183: Maintenance label

I Check the functions and fluid levels, filling up and draining.

II Check parts for wear, seals, hoses, and threaded fittings.

III Check for damage, corrosion, or dirt.

IV Lubricate daily after operation.

Maintenance label—radial machines (S06)

Maintenance that has to be performed by the operator is indicated on the maintenance label.

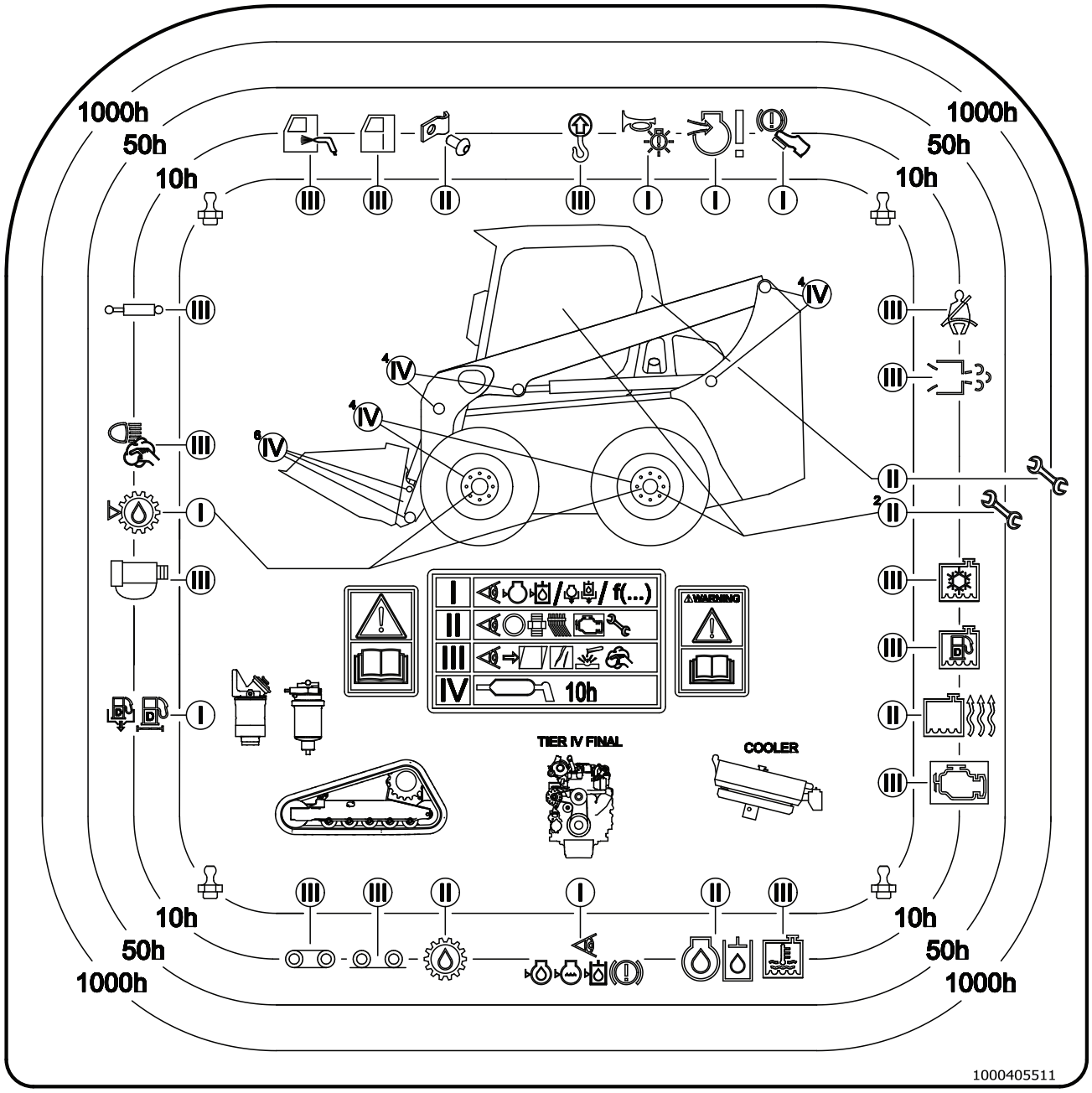

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Fig. 184: Maintenance label

I Check the functions and fluid levels, filling up and draining.

II Check parts for wear, seals, hoses, and threaded fittings.

III Check for damage, corrosion, or dirt.

IV Lubricate daily after operation.

Periodic maintenance schedule

Daily Maintenance	
Symbol	Inspection work (Check the following engine/machine fluids. Check the oil levels after a test turn and add oil if necessary.)
	Check the fluids and lubricants (engine oil, engine coolant, hydraulic oil).
	Check the radiator's water and hydraulic oil for dirt, and clean them if necessary.
	Check the fuel tank level and fill as needed.
	Lubricate the machine according to the lubrication plan.
	Check the (prefilter) fuel filter with water separator and drain water if necessary.
	Check the wheels and tire (damage, air pressure, tread depth).
	Check the tracks (damage, tension, profile).
	Check the engine air intake.
	Check the pin lock.
	Check the line fixtures.
	Check the indicator lights and acoustic warning devices.
	Check the service and parking brake function.
	Check the hydraulic couplings for dirt.
	Clean the lights/light system and signaling systems.
	Check the air conditioning condenser for dirt and clean it if necessary.
Leakage check	
Check for tightness, leaks and chafing: pipes, flexible lines and threaded fittings of the following assemblies and components. Have them repaired if necessary.	
	Check the engine and hydraulic system.
	Check the traveling drive, axles, and transfer gearbox.
	Check the cooling systems, heating systems, and hoses (visual check).
Visual check	
Correct function; deformations, damage, surface cracks, wear and corrosion.	
	Check the exhaust system for damage.
	Check the insulating mats in the engine compartment for damage.

Daily Maintenance	
	Check the cab and protective structures for damage (FOPS, for example).
	Check the seat belt for damage.
	Check accesses and exits for dirt.

Maintenance by Hours
Every 10 Operating Hours
Grease the lift arm and bucket pivot points.
Check the engine oil level.
Check the hydraulic oil level.
Check the hydraulic oil cooler core and clean it if necessary.
Check the engine coolant level.
Check the control interlock system.
Check the radiator core and clean it if necessary.
Check the charge air cooler and clean it if necessary.
Test the backup alarm.
Every 50 Operating Hours
Lubricate the machine according to the lubrication plan.
Check the axle mountings (SW16 / SW17 / SW20 / SW21 / SW24 / SW28).
Check the wheel nuts for tightness (SW16 / SW17 / SW20 / SW21 / SW24 / SW28).
Check the torque on the B-pins (the pins used to connect the coupler to the lift arm).
Only Once after the First 50 Operating Hours
Check the threaded fittings for tightness.
Check the pressure of the primary pressure limiting valves.
Check the drive chain oil level (SW16 / SW17 / SW 20 / SW21 / SW24 / SW28).
Check the drive chain tension (SW16 / SW17 / SW 20 / SW21 / SW24 / SW28).
Replace the hydraulic oil filter.
Every 250 Operating Hours (Tier III)
Change the engine oil and filter when using fuel with a high sulfur content.[1,2]
Every 500 Operating Hours or Once a Year
Change the engine oil and filter.[1]
Change the engine air filter.
Change the fuel filter.
Change lift pump filter.
Change the water pump belt (1.9 and 2.5 liter engines)[4]
Check the drive chain oil (SW16 / SW17 / SW20 / SW21 / SW24 / SW28) and change it if needed.
Check and adjust the drive chain tension (SW16 / SW17 / SW 20 / SW21 / SW24 / SW28).
Check the threaded fittings for tightness.
Clean the HVAC filter (replace it if necessary).
Check and adjust the track tension (ST28 / ST31 / ST35 / ST45).

Maintenance by Hours
Every 1000 Operating Hours
Replace the air cleaner.
Replace the hydraulic oil filter.
Replace the hydraulic oil reservoir breather filter.
Change the hydraulic oil.
Replace the HVAC filter.
Change the engine antifreeze.[3]
Change the water pump belt (3.4 liter engines)[4]
Replace the drive chain oil (SW16 / SW17 / SW20 / SW21 / SW24 / SW28).
Check the battery condition (charge condition, terminals, etc.).
Clean the case drain strainer.
Every 2000 Operating Hours
Replace the diesel exhaust fluid (DEF) filter.
Replace the hydraulic hoses.[4]
Every 5000 Operating Hours
Replace the coolant hoses.

[1] Change the engine oil after the first 50 hours of operation.

[2] Change after 12 months if hours are not reached.

[3] Change after 24 months if hours are not reached.

[4] Change after 36 months if hours are not reached.

7.3 Lubrication Plan

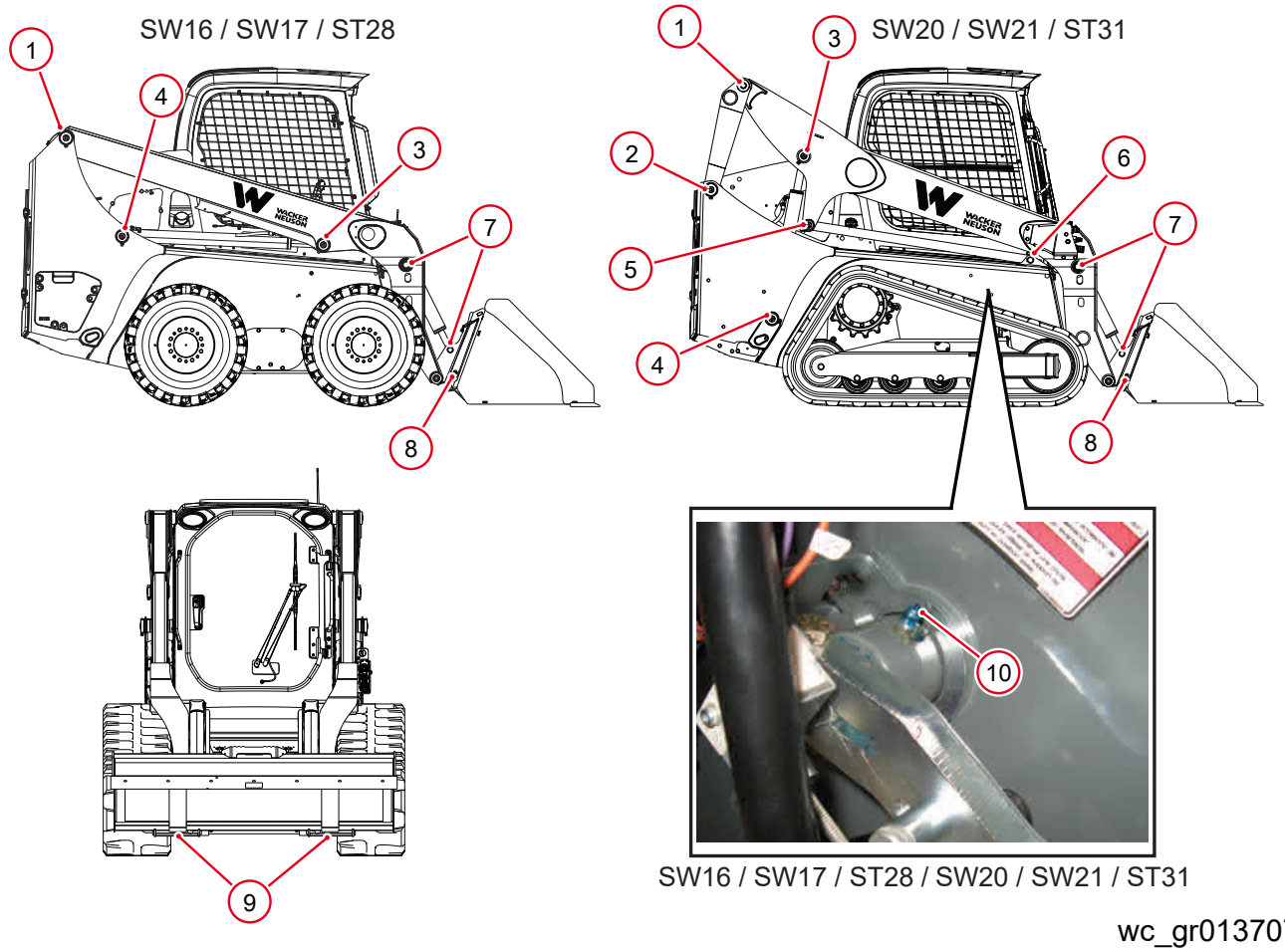

Fig. 185: Lubrication points

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

Position	Lubrication Point	SW16 / SW17 / SW24 / ST28 / ST35	SW20 / SW21 / SW28 / ST31 / ST45	Quantity
1	Loader unit	X	X	2
2	Loader unit swing arm	—	X	
3	Loader unit cylinder (front)	X	X	
4	Loader unit cylinder (back)	X	X	
5	Rear joint rod	—	X	
6	Front joint rod	—	X	
7	Upper and lower bucket cylinder	X	X	
8	B-pin	X	X	
9	Hydraulic coupler cylinder pin	X	X	
10	*Grease fitting for mechanical controls	X	X	

*To access the grease fitting, see Tilting the Cab on page 146.

7.4 Cleaning the Machine

NOTICE

Do not clean the inside of the machine using a pressure washer. A pressure washer can damage the electrical system, damage seals, and disable the controls.

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
- ► Operator's station including the seat, joysticks, control switches, key switch, indicator lights, and throttle control
- ► Foot pedal
- ► Hydraulic manifold
- ► Fuse boxes
- ► Electronic parts (controller, connectors, etc.)
- ► Radiator core

When

Clean the machine after each use. Every 250 hours, clean the radiator fins. For further information, Checking and Cleaning the Radiator Fins.

Requirements

- Machine shut down and cool to the touch
- Fresh, 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.

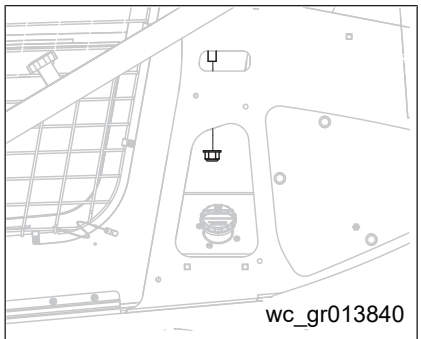

Fig. 186: Cab fastening nuts

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 stream of the water at a 90° angle to the surface of the machine with the spray nozzle at least 12 in. away.
2. Keeping a minimum distance of 1 m (3 ft) away, use the pressure washer to rinse the machine.
1. Clean the machine's undercarriage by removing the two retaining nuts and tilting the cab. For further information, see Tilting the Cab on page 146.
2. Clean the inside of the cab using a damp cloth, brush, vacuum cleaner, and/or water with a mild soap solution.

7.5 Priming the Fuel System

When

If the fuel tank has been run completely dry or drained from service, it is necessary to manually prime the fuel system.

Requirements

- Add fuel to the fuel tank
- Open engine door and hood

Fig. 187: Priming the fuel system

Procedure

1. Pump the priming button **(1)** on top of the fuel filter **(2)**.
2. Keep pumping the priming button until the priming button no longer moves.
3. Turn the ignition switch to Position 2 to crank the engine for at least 10 seconds to start the machine.
4. Run the engine at low idle until it runs smoothly.
5. If the engine does not start, repeat all of these steps.

7.6 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.

Refer to the following table when choosing engine oil:

	Engine		
	1903	**2504**	**3404**
Oil Viscosity ≥ -25°C	10W40	10W40	5W40
Oil Viscosity < -25°C	5W30	5W30	0W30
Oil Capacity	7.5 L (7.9 qt)	9.75 L (10.3 qt) -or- 7 L (7.4 qt)	15.6 L (16.5 qt)

Refer to the engine owner's manual for more information.

7.7 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 may 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.

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 for several minutes
- Recommended oil (for oil specifications, see Engine Oil Viscosity on page 164 and see Fluids on page 218)
- A clean, soft cloth

Overview

Maintaining the appropriate engine oil prevents excessive wear of the engine.

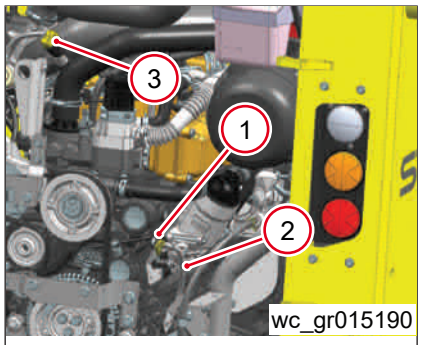

Fig. 188: Dipstick, dipstick tube, and oil cap

Procedure

1. Open the engine door and protect yourself from engine heat.
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.

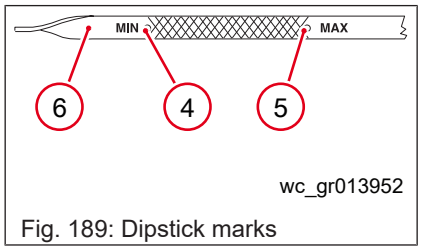

Fig. 189: Dipstick marks

4. If the engine oil level is between the MIN **(4)** and MAX **(5)** marks, the level is acceptable. Do not add engine oil.
5. If the oil level is below **(6)** the MIN mark, remove the engine oil cap **(3)** 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.

7.8 Changing the Engine Oil and Filter

⚠ DANGER

Personal injury hazard

Remove the key to avoid accidental engine start.

⚠ WARNING

Most used oil contains 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 engine oil.

► Wash skin thoroughly after exposure to used engine oil.

Environment

Collect, store, and dispose of drained fluids in accordance with current environmental protection regulations.

⚠ WARNING

Burn hazard

Hot oil draining from the engine can burn.

► Do not touch hot oil.

When

Every 500 hours of service under normal operating conditions with fluids meeting the recommended specifications.

Overview

Maintaining the engine oil and filter prevents excessive wear of the engine.

Requirements

- Engine oil (for oil specifications, see Engine Oil Viscosity on page 164 and see Fluids on page 218)
- Engine oil filter
- Three O-rings
- Plastic sheet to protect work surface
- Container of sufficient volume to collect drained oil
- Wrenches

Preparation

- Park the machine on a level surface.
- Stop the engine and apply the parking brake.
- Wait a few minutes for the warm engine oil to drain into the oil pan.

Changing the engine oil (all machines)

1. Loosen the engine oil cap **(1)**.
   ⇨ In the images below, the medium frame machine (S05) is shown on the left and the large frame (S06) is shown on the right.

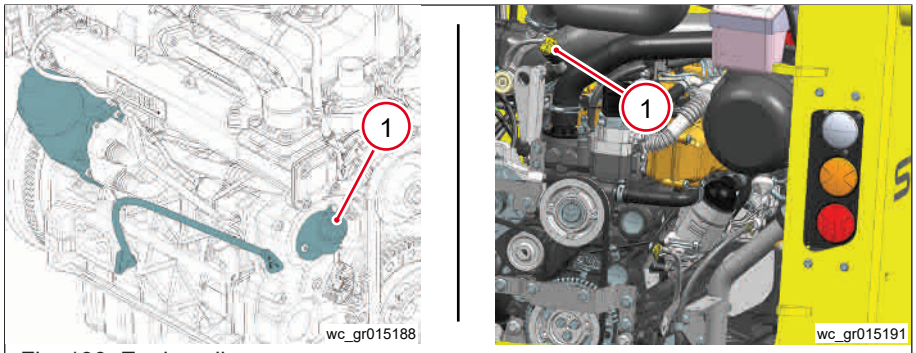

Fig. 190: Engine oil cap

2. Locate and remove the engine oil drain cover **(2)**.

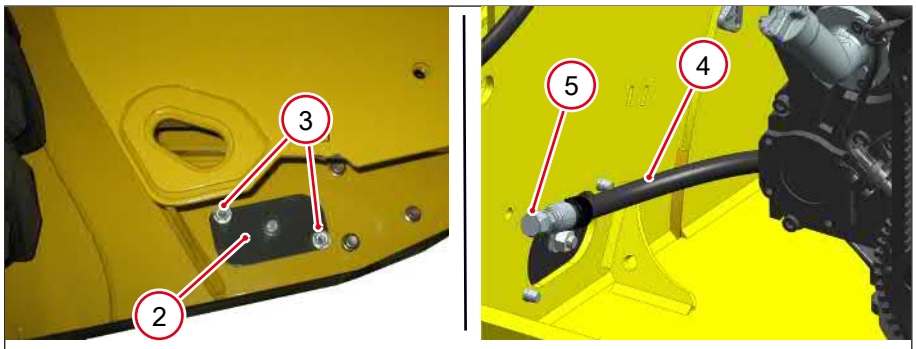

Fig. 191: Engine oil drain components

3. Remove the two outer bolts **(3)** on the engine oil drain cover (behind the left rear tire).
4. Twist to remove the cover. The oil drain hose **(4)** is attached to the inside of the cover.
5. Remove the oil drain plug **(5)** and drain the engine oil into an appropriate container placed on a plastic sheet.
6. Close the oil drain plug.
7. Install the engine oil drain cover.
8. Remove the engine oil cap and add the recommended type and amount of engine oil (see Checking the Engine Oil on page 164).
9. Install the engine oil cap.

Changing the engine oil filter (2504, 2504 Decontent, 3404)

Information

Always use the correct oil type. Do not use oil brands or grades that are not recommended.

1. Loosen the engine oil filter cap **(6)** and then wait two minutes for the oil to drain from the filter.
   ⇨ In the images to the left, the medium frame machine (S05) is shown on the left and the large frame (S06) is shown on the right.

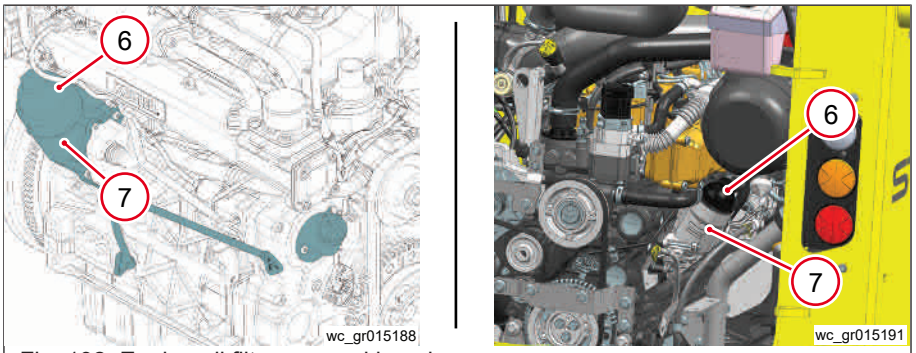

Fig. 192: Engine oil filter cap and housing

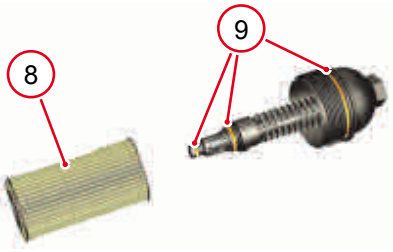

Fig. 193: Oil filter

2. Remove the engine oil filter **(8)** from the oil filter housing **(7)**.
3. Remove and replace the three O-rings **(9)**.
4. Replace the engine oil filter and tighten the engine oil filter cap with a torque wrench to 25 Nm (18 ft. lbs.).
5. Start and run the engine for a few minutes.
6. Check the engine oil pressure and the engine oil filter seal.
7. Stop the engine and make the following checks:
   ⇨ Make sure that the oil level is filled to recommended level.
   ⇨ Check for oil leaks and correct as needed.

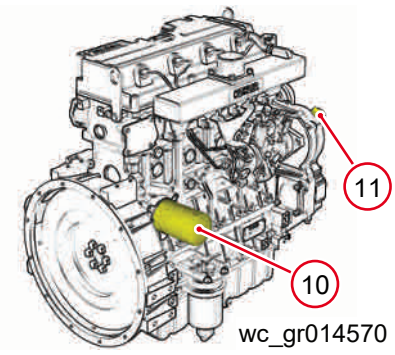

Fig. 194: Oil filter

Changing the engine oil filter (2504M)

1. Unscrew the engine oil filter **(10)** with an appropriate wrench.
2. Replace the engine oil filter and tighten it with a torque wrench to 25 Nm (18 ft. lbs.).

7.9 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.
- ► Check and add coolant to reserve tank.

⚠ WARNING

Burn hazard

Engine coolant can contain alkali.

- ► Avoid engine coolant contact with skin and eyes.

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Fig. 195: Coolant cap

When

Every 10 hours or daily

Requirements

- Machine shut down and cool to the touch
- If necessary, an equal mix (50/50) of distilled water and ethylene glycol long life coolant concentrate or propylene glycol long life coolant concentrate
  - – If ethylene glycol is used, make sure to use organic acid technology (OAT) low silicate or hybrid organic acid technology (HOAT) low silicate.

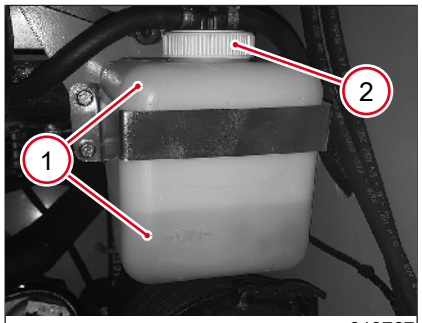

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Fig. 196: Coolant min and max lines, and fill cap

Procedure

1. Open the rear door. The engine coolant recovery reserve tank is located in the top-right corner of the engine compartment.
2. Check that the engine coolant level is between the “MIN” **(1)** and “MAX” lines.
3. If the engine coolant level is below the “MIN” line or above the “MAX” line, open the recovery reserve tank cap **(2)**.
4. 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.
5. 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.
6. Reinstall the recovery reserve tank cap.

7.10 Hydraulic Oil Requirements

Overview

Wacker Neuson recommends the use of a premium grade, synthetic-based, anti-wear hydraulic oil. It is designed to outperform conventional oils by flowing better at low temperatures while resisting viscosity loss at high temperatures.

When selecting hydraulic oil, be sure to specify anti-wear properties. Wacker Neuson offers a premium hydraulic oil for use in this machine.
Note: Avoid mixing different brands of hydraulic oil.

Oil viscosity

Most hydraulic oils are available in different viscosity grades (the fluid's weight). Different viscosity grades are recommended for use at different ambient temperatures for optimum machine performance. The oil's number does not indicate the type of oil (engine, hydraulic, gear, etc.). The oil's number is strictly used to identify the viscosity grade.

When selecting a hydraulic oil, be sure it matches the specified ISO viscosity rating and is intended to be used as a hydraulic oil.

7.11 Hydraulic Oil Specification

Hydraulic Oil Types		
Viscosity Grade	**Ambient Temperature**	
HVLP 46	**Minimum**	**Maximum**
ISO VG32	-20°C (-4°F)	30°C (86°F)
ISO VG46*	-5°C (23°F)	40°C (104°F)
ISO VG68	5°C (41°F)	50°C (122°F)

7.12 Checking the Hydraulic Oil Level

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 flat, level surface
- Machine shut down
- Lift arm down
- New, hydraulic oil as needed

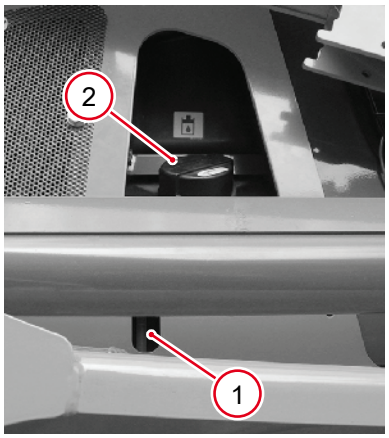

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Fig. 197: Hydraulic oil sight glass and cap

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. Open 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.

7.13 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

Compressed air can damage air filter elements.

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

When

Every 250 hours before operating the machine—check condition of elements

Every 500 hours or as needed—replace elements

Requirements

- Machine shut down
- Damp cloth

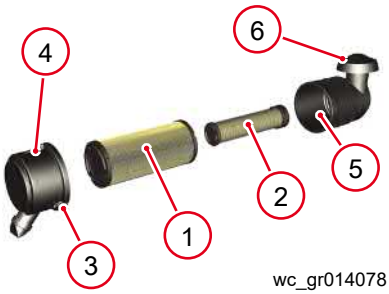

Fig. 198: Air cleaner components

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. Remove the cap **(6)**.
4. Clean the inside of the air cleaner housing components with a damp cloth.
5. Install the air filter elements and the cap.
6. Install the cover and fasten the latch.

7.14 Cleaning the Radiator, Charge Air Cooler, and Oil Cooler

When

Clean the radiator, charge air cooler, and oil cooler as needed when dirty.

Requirements

- Compressed air
- Water hose

Location

The radiator, charge air cooler, and oil cooler are located above the engine compartment at the back of the machine.

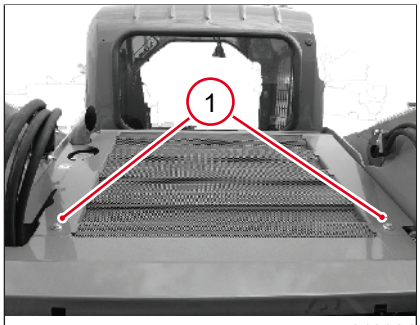

Fig. 199: Hood bolts

Procedure

1. Remove the hood by removing the two bolts **(1)**, lifting the front off the tabs, and pulling the hood rearward.

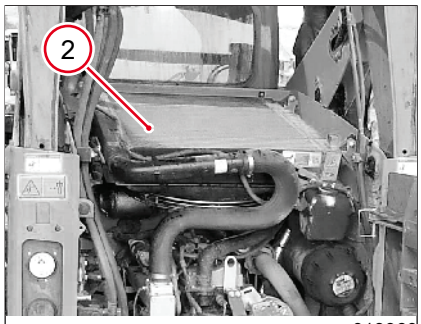

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Fig. 200: Radiator

2. Use compressed air from above to clean loose particles from the radiator, charge air cooler, and oil cooler **(2)**.
3. Spray the radiator, charge air cooler, and oil cooler from above with a water hose until the surface is free of dirt.
4. Install the hood.

7.15 Maintaining the Fuel Filter

NOTICE

Engine damage may occur if there is water in the fuel.

► If the water-in-fuel indicator light illuminates, the water separator should be drained as soon as possible. For further information, see Instrument Display Symbols and Functions on page 75.

Environment

Collect, store, and dispose of drained fluids in accordance with current environmental protection regulations.

When

- Drain the water separator daily.
- Change the fuel filter every 500 hours.

Requirements

- Machine shut down and secure
- Replacement water separator
- Container of sufficient volume to collect drained fluid
- Filter wrench

Overview

The 1903, 2504 DOC, and 3404 engines utilize a pre-filter attached to the lift pump and a fuel filter with a water separator element that removes water from the fuel supply. As fuel flows through the water separator element, removed water is collected within the fuel filter canister.

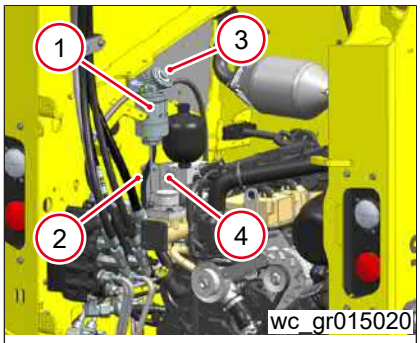


Fig. 201: Draining the water separator

Draining the water separator

The fuel filter **(1)** is located in the engine compartment.

1. Place a collection container beneath the water separator drain hose **(2)**.
2. Loosen the wing nut **(3)** at the bottom of the water separator without removing it.
3. Drain any water present.
4. Tighten the wing nut.

Replacing the pre-filter

Note: Do not fill the new fuel filter with fuel.

1. Remove the pre-filter using an appropriate filter wrench.
2. Install the new pre-filter.

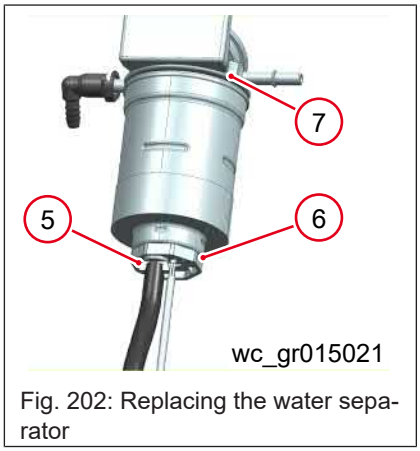


Fig. 202: Replacing the water separator

Replacing the water separator

1. Disconnect the cable **(4)** of the water presence sensor **(5)**.
2. Remove the water presence sensor from the fuel filter.
3. Loosen the cartridge with an appropriate filter wrench.
4. Lubricate the O-ring **(6)** at the top of the new fuel filter with some petroleum jelly or some clean diesel fuel.
5. Tighten the water presence sensor onto the new fuel filter, tightening to a torque of 5 Nm (44 in. lbs.).
6. Install the new fuel filter (with water separator) using the filter wrench, tightening to a torque of 17 Nm (13 ft. lbs.).
7. Connect the cable of the water presence sensor.
8. Press the priming button **(7)** repeatedly until it becomes stiff to fill the fuel filter with fuel.

7.16 Maintaining the Fuel Filter (2504M Engine)

Information

Do not fill the new fuel filter with fuel.

Environment

Dispose of used fuel filters in accordance with current environmental protection regulations.

When

- Change the fuel filter every 500 hours.

Requirements

- Shut down and secure machine
- Replacement fuel filter
- Filter wrench

Overview

The 2504M engine utilizes a pre-filter and a standard paper element filter, both of which are in-line before the lift pump.

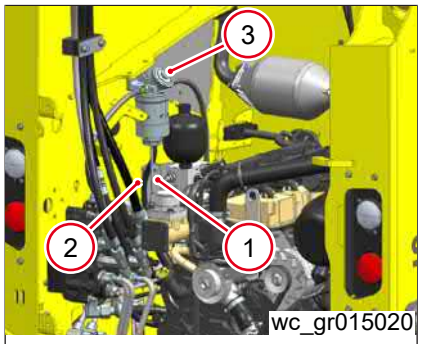


Fig. 203: Replacing the fuel filter

Replacing the fuel filter

1. Disconnect the cable of the water presence sensor **(1)**.
2. Remove the fuel filter **(2)** using an appropriate filter wrench.
3. Remove the water presence sensor from the fuel filter.
4. Lubricate the O-ring at the top of the new fuel filter with some petroleum jelly or some clean diesel fuel.
5. Tighten the water presence sensor onto the new fuel filter, tightening to a torque of 5 Nm (44 in. lbs.).
6. Install the new fuel filter using the filter wrench, tightening to a torque of 17 Nm (13 ft. lbs.).
7. Connect the cable of the water presence sensor.
8. Press the priming button **(3)** repeatedly until it becomes stiff to fill the fuel filter with fuel.

7.17 Maintaining the Fuel Filter (2504 Decontent Engine)

⚠ CAUTION

Machine damage hazard

Engine damage may occur if there is water in the fuel.

► If the water-in-fuel indicator light illuminates, the water separator should be drained as soon as possible. For further information, see Instrument Display Symbols and Functions on page 75.

Information

Do not fill the new fuel filter with fuel.

Environment

Collect, store, and dispose of drained fluids in accordance with current environmental protection regulations.

When

- Drain the water separator daily.
- Change the fuel filter every 500 hours.

Requirements

- Shut down and secure machine
- Replacement fuel filter
- Container of sufficient volume to collect drained fluid
- Filter wrench

Overview

The 2504 decontent engine utilizes a primary fuel filter canister with a heating element and a water separator element that removes water from the fuel supply. As fuel flows through the water separator element, removed water is collected within the fuel filter canister. It also utilizes another water separator.

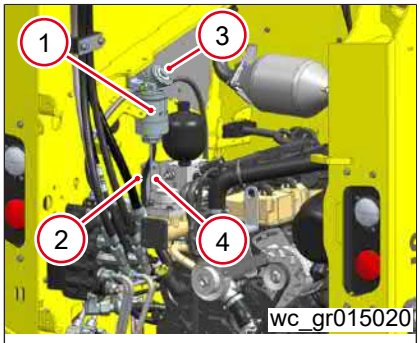


Fig. 204: Draining the water separator

Draining the water separator

The fuel filter **(1)** is located in the engine compartment.

1. Place a collection container beneath the water separator drain hose **(2)**.
2. Loosen the wing nut **(3)** at the bottom of the water separator without removing it.
3. Drain any water present.
4. Tighten the wing nut.

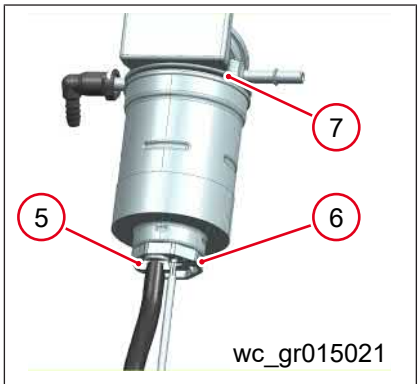


Fig. 205: Replacing the water separator

Replacing the water separator

1. Disconnect the cable **(4)** of the water presence sensor **(5)**.
2. Remove the water presence sensor from the fuel filter.
3. Loosen the cartridge with an appropriate filter wrench.
4. Lubricate the O-ring **(6)** at the top of the new fuel filter with some petroleum jelly or some clean diesel fuel.
5. Tighten the water presence sensor onto the new fuel filter, tightening to a torque of 5 Nm (44 in. lbs.).
6. Install the new fuel filter (with water separator) using the filter wrench, tightening to a torque of 17 Nm (13 ft. lbs.).

7. Connect the cable of the water presence sensor.
8. Press the priming button **(7)** repeatedly until it becomes stiff to fill the fuel filter with fuel.

7.18 Testing the Control Interlock System

When

Every 10 hours or daily

Overview

The intent of the machine's control interlock system is to ensure the operator is sitting in the seat and is ready to operate the machine before the controls are activated.

Testing the drive controls interlock

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

1. Sit in the seat.
2. Fasten the seat belt.
3. Close the front door, if equipped.
4. Start the engine.
5. Press the parking brake switch to release the 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:

- Lift up off the seat, wait 5 seconds, and move the ground drive controls, lift arm controls, and auxiliary hydraulic controls.
- Release the seat belt and move the ground drive controls, lift arm controls, and auxiliary hydraulic controls.
- If equipped, open the door a few inches and move the lift arm, raise only. Do this very slowly to prevent any damage to the door if the lift arm should move. Roll the coupler/attachment in and out, also.
- Press the brake switch and move the ground drive control only.
- **Note:** After all controls are enabled, pressing the brake switch will only set the parking brake 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.

7.19 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.

When

Every 10 hours or daily

Requirements

- Flashlight or shielded light (never 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, always use a flashlight or other shielded light.

- Thoroughly inspect for damage:
  - 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 necessary.
  - **Note:** Hardware should be replaced with original equipment manufacturer's (OEM) parts, and should be tightened to the recommendations of the manufacturer.
- Check for fuel, oil, hydraulic fluid, and other leaks.
  - To locate a leak, pass a piece of cardboard, wood, or a mirror over the area of the suspected leak.

1. Fix the leak before operating the machine.
2. Secure all caps and filler plugs for all systems to prevent leaks from these areas.

7.20 Inspecting and Repairing the Cab

⚠ WARNING

Crushing and rollover hazard

Do not make any unauthorized modifications to the cab structure, such as drilling, cutting, and welding. This may weaken the structure and put you at risk from falling objects or rollovers.

► See your Wacker Neuson dealer for information regarding a damaged cab.

When

Daily before operating the machine.

Procedure

Check the cab mounting hardware. If necessary, tighten the hardware to 65 Nm (48 ft. lbs.). Tighten the hardware each time the cab is tilted. For further information, see Tilting the Cab on page 146.

Check the cab daily for cracks and rust. If repairs are needed, see your Wacker Neuson dealer.

7.21 Maintaining the Seat and Seat Belt

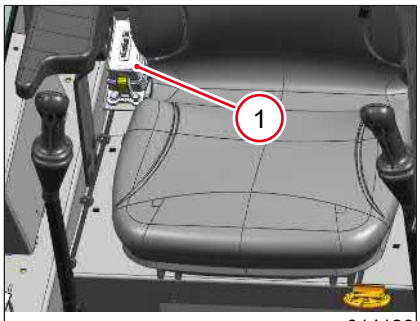
Overview

In order for the seat and seat belt to operate safely and properly over a long period of time, periodic maintenance and occasional repairs are necessary. Poorly maintained equipment can become a safety hazard.

Procedure

- Keep the seat clean. Dirt, dust, or harsh chemicals can damage the upholstery. Repair holes or tears immediately.
- If necessary, clean the seat belt with a mild soap solution. Do not use chemical cleaners, as they can damage the fabric.
- Replace the seat belt immediately if it becomes worn or damaged. Otherwise, replace the seat belt every three years.
- If the seat does not move smoothly during adjustment, apply a small amount of standard bearing grease (such as Shell Gadus® S2 V100 or equivalent) to the rails.

7.22 Fuse and Relay Box Layout—First Generation Cab (S05 Tier IV)



wc_gr014126

Fig. 206: Cab fuse and relay box

Location

The cab fuse and relay box **(1)** is located inside the cab on the operator's right side.

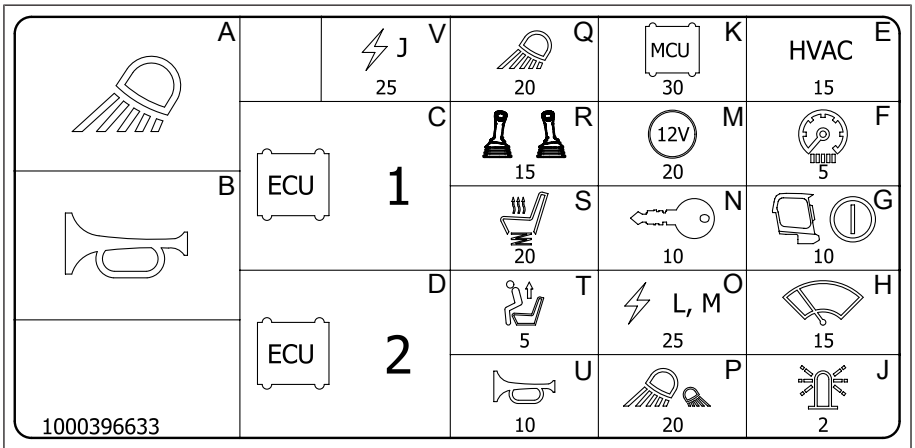
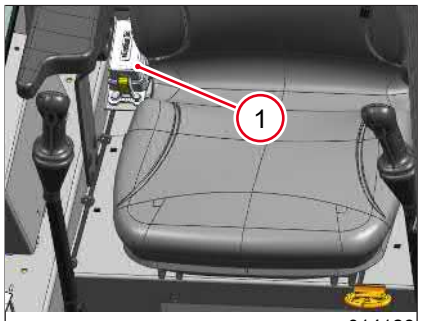


Fig. 207: PUM Labels SSL_CTL Fuses and relays 01_Callouts

Position	ID	Description	Rating (A)
Relays			
A	K047	Worklights relay	35
B	K130	Horn relay	35
C	K167	Latch relay #1	35
D	K168	Latch relay #2	35
Fuses			
E	F001	HVAC	15
F	F002	Display	5
G	F003	Cab power	10
H	F004	Wiper	15
J	F005	Beacon	2
K	F006	MCU	30
M	F007	Socket	20
N	F008	Key switch	10
O	F009	Aux electric (L and M)	25
P	F010	Lights: worklight rocker	20
Q	F011	Lights: front worklights	20
R	F012	Joysticks	15
S	F013	Seat: heat and compressor	20
T	F014	Seat: seat switch and seat belt switch	5
U	F015	Horn/dome light	10
V	F016	Aux electric (J)	25

7.23 Fuse and Relay Box Layout



wc_gr014126

Fig. 208: Cab fuse and relay box

Location

The cab fuse and relay box **(1)** is located inside the cab on the operator's right side.

Note: This is for machines with second generation cabs—S05 Tier III and Tier IV, and S06.

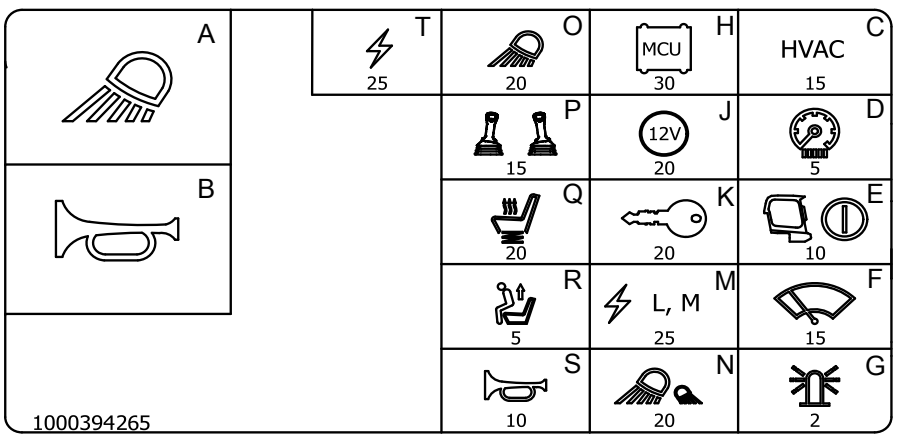
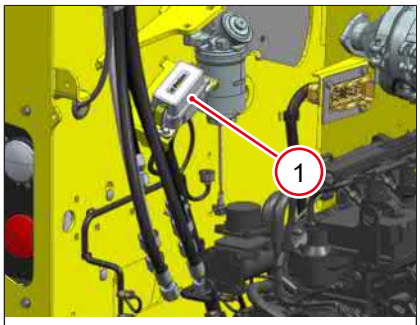


Fig. 209: PUM Labels SSL_CTL Fuses and relays 02_Callouts

Position	ID	Description	Rating (A)
		Relays	
A	K047	Worklights relay	35
B	K130	Horn relay	35
		Fuses	
C	F001	HVAC[1)]	15
D	F002	Display	5
E	F003	Cab power	10
F	F004	Wiper[1)]	15
G	F005	Beacon	2
H	F006	MCU	30
J	F007	Socket	20
K	F008	Key switch	20
M	F009	Aux electric (L and M)[1)]	25
N	F010	Lights: worklight rocker	20
O	F011	Lights: front worklights	20
P	F012	Joysticks	15
Q	F013	Seat: heat and compressor	20
R	F014	Seat: seat switch and seat belt switch	5
S	F015	Horn/dome light	10
T	F016	Aux electric (J)[1)]	25

1) Standard machines do not have fuses.

7.24 Fuse and Relay Box Layout—Engine/Chassis (S05 Tier III)

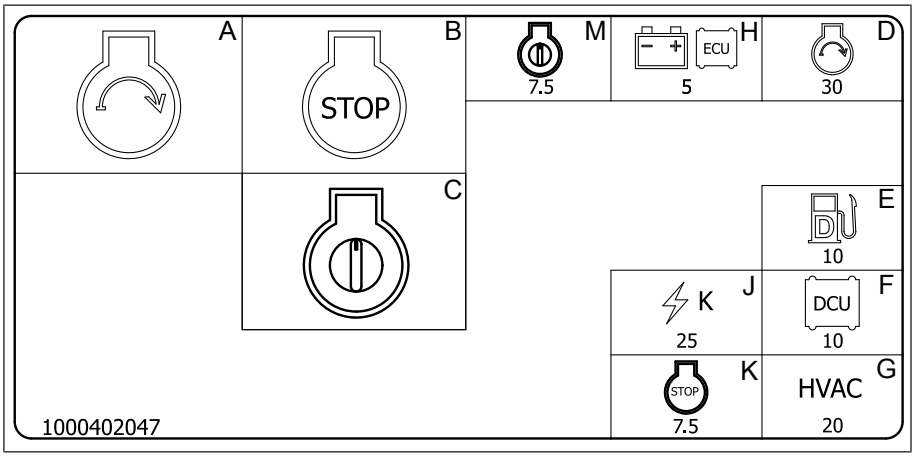


wc_gr014127

Fig. 210: Engine/chassis fuse and relay box

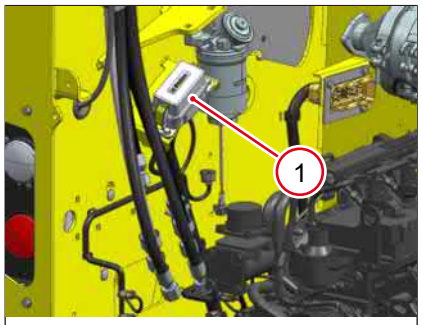
Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.



Position	ID	Description	Rating (A)
Relays			
A	K155	Starter	35
B	K171	Fuel cutoff	35
C	K176	Linear actuator	35
Fuses			
D	F017	Starter	30
E	F109	Lift pump	10
F	F020	DCU	10
G	F021	HVAC	20
H	F022	Engine—ECU power	50
J	F025	Aux electric (K)	25
K	F032	Fuel cutoff	7.5
M	F033	Linear actuator	7.5

7.25 Fuse and Relay Box Layout—Engine/Chassis (S05 Tier III Decontent)

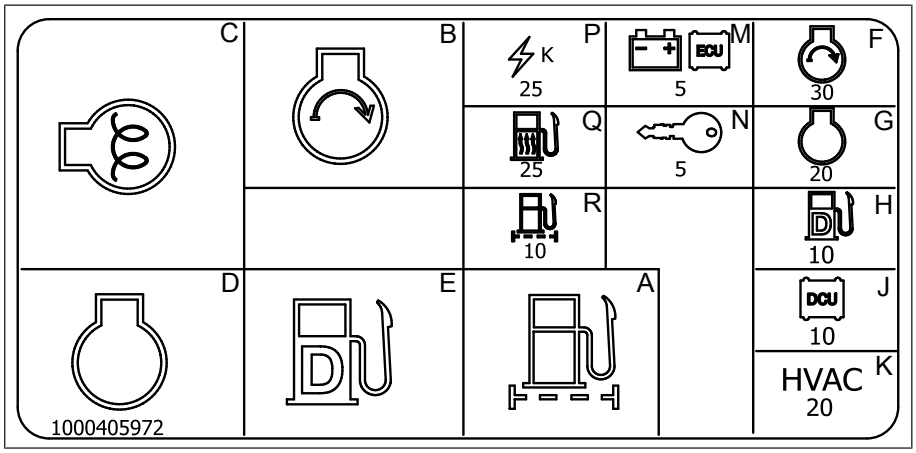


wc_gr014127

Fig. 211: Engine/chassis fuse and relay box

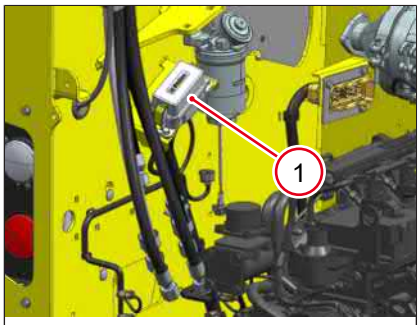
Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.



Position	ID	Description	Rating (A)
Relays			
A	K031	Fuel filter heater	35
B	K155	Starter	35
C	K156	Grid heater	50
D	K157	Engine power	35
E	K158	Lift pump	35
Fuses			
F	F017	Starter	30
G	F018	Engine	20
H	F019	Lift pump	10
J	F020	DCU	10
K	F021	HVAC	20
M	F022	Engine—ECU power	5
N	F023	Engine—ignition in	5
O	F024	Engine—EGR power	5
P	F025	Aux electric (K)	25
Q	F026	Fuel filter heater	25
R	F027	Fuel filter relay	10

7.26 Fuse and Relay Box Layout—Engine/Chassis (S05 Tier IV)



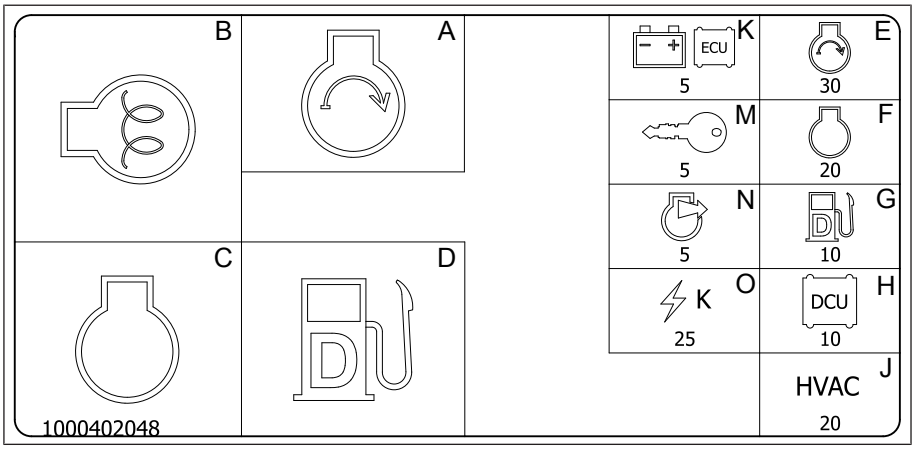
wc_gr014127

Fig. 212: Engine/chassis fuse and relay box

Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.

Note: This is for S05 Tier IV machines.



Position	ID	Description	Rating (A)
Relays			
A	K155	Starter	35
B	K156	Grid heater	50
C	K157	Engine power	35
D	K158	Lift pump	35
Fuses			
E	F017	Starter	30
F	F018	Engine	20
G	F019	Lift pump	10
H	F020	DCU	10
J	F021	HVAC	20
K	F022	Engine—ECU power	5
M	F023	Engine—ignition in	5
N	F024	Engine—EGR power	5
O	F025	Aux electric (K)	25

7.27 Fuse and Relay Box Layout—Engine/Chassis (S06 55 kW)

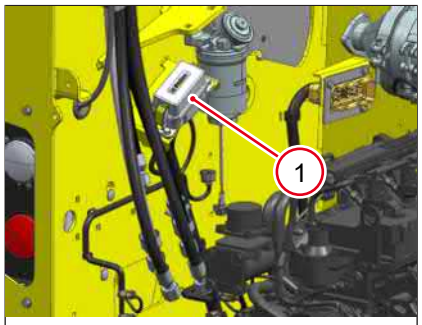


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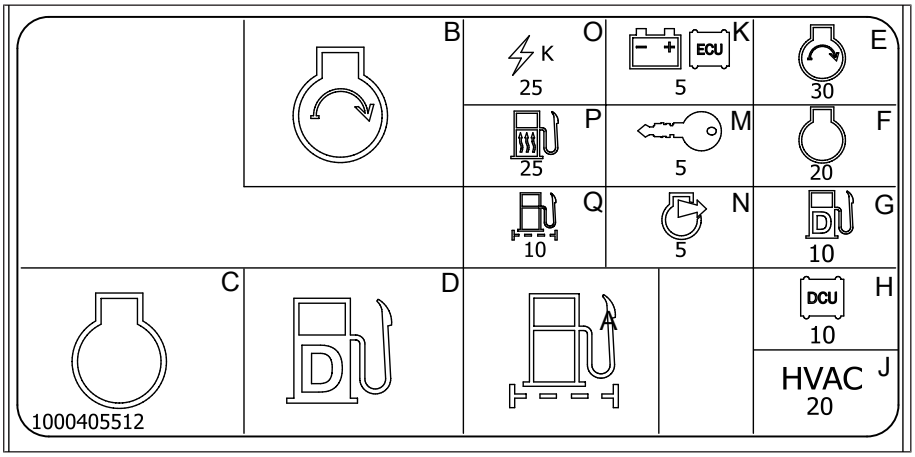
Fig. 213: Engine/chassis fuse and relay box

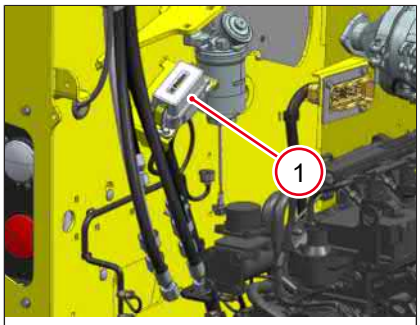
Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.



Position	ID	Description	Rating (A)
Relays			
A	K031	Fuel filter heater	35
B	K155	Starter	35
C	K157	Engine power	35
D	K158	Lift pump	35
Fuses			
E	F017	Starter	30
F	F018	Engine	20
G	F019	Lift pump	10
H	F020	DCU	10
J	F021	HVAC	20
K	F022	Engine—ECU power	5
M	F023	Engine—ignition in	5
N	F024	Engine—EGR power	5
O	F025	Aux electric (K)	25
P	F026	Fuel filter heater	25
Q	F027	Fuel filter relay	10

7.28 Fuse and Relay Box Layout—Engine/Chassis (S06 75 kW)

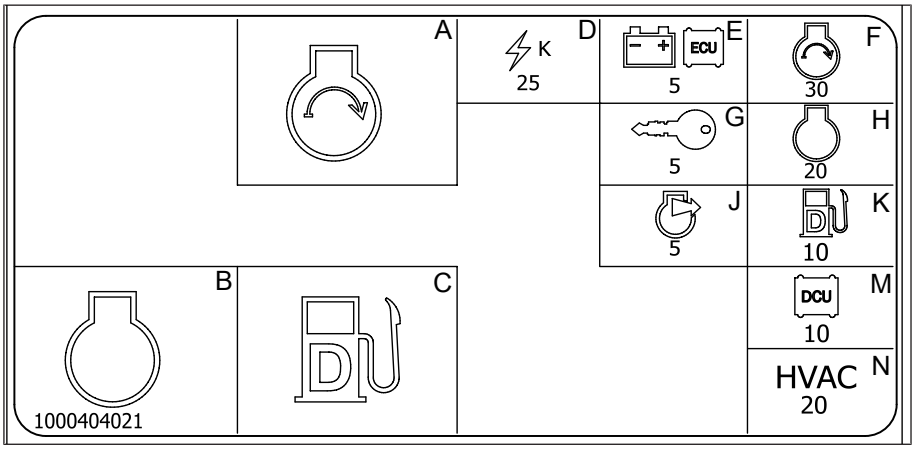


wc_gr014127

Fig. 214: Engine/chassis fuse and relay box

Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.



Position	ID	Description	Rating (A)
Relays			
A	K155	Starter	35
B	K157	Engine power	35
C	K158	Lift pump	35
Fuses			
D	F022	Engine—ECU power	5
E	F017	Starter	30
F	F023	Engine—ignition in	5
G	F018	Engine	20
H	F024	Engine—EGR power	J
J	F019	Lift pump	10
K	F025	Aux electric (K)	25
M	F020	DCU	10
N	F021	HVAC	20

7.29 Fuse and Relay Box Layout—SCR Engine/Chassis (S06 75 kW)

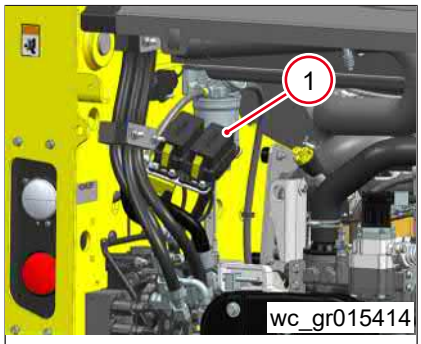
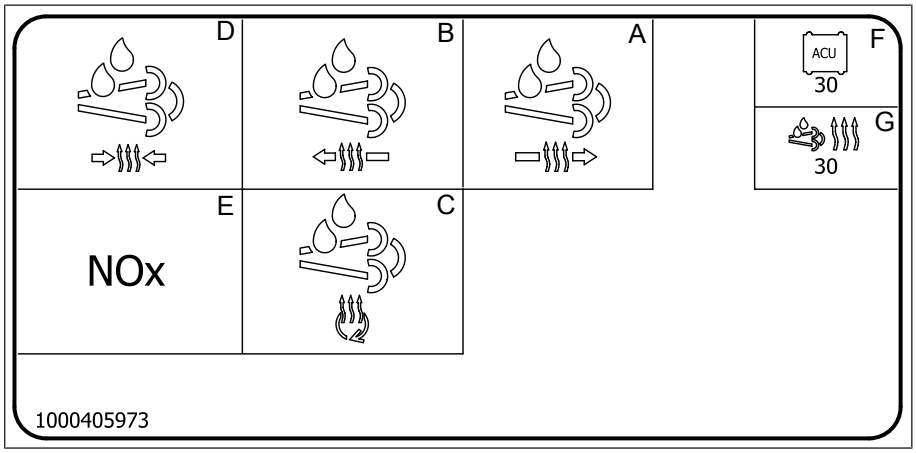


Fig. 215: SCR engine/chassis fuse and relay box

Location

Open the engine compartment to find the fuse and relay box **(1)** on the left side.



Position	ID	Description	Rating (A)
Relays			
A	K125	DEF line heater (feed)	35
B	K126	DEF line heater (return)	35
C	K127	DEF line heater (backflow)	35
D	K128	DEF line heater relay (pressure)	35
E	K129	NOx sensor relay	35
Fuses			
F	F017	ACU power	30
G	F018	Hose heater power	30

7.30 Fuse and Relay Box Layout—14-pin

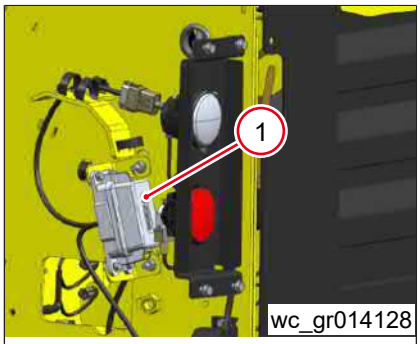
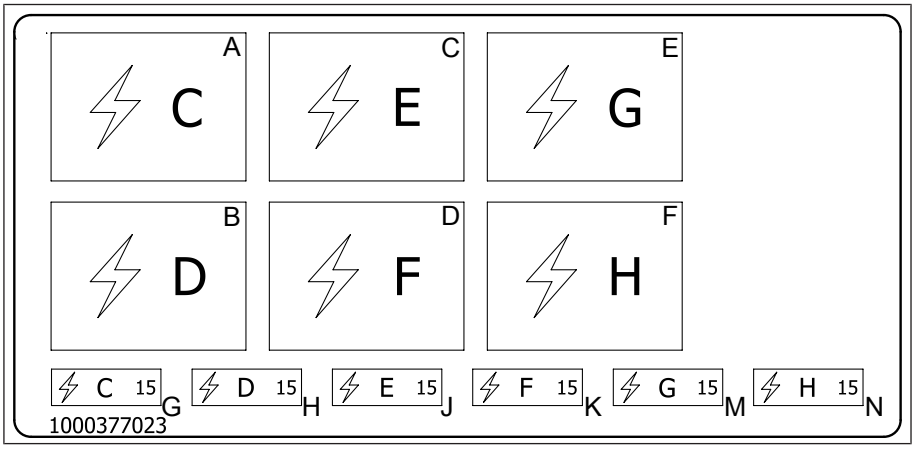


Fig. 216: 14-pin fuse and relay box

Location

Remove left tail lights to access the 14-pin fuse and relay box **(1)**.

Note: This is the fuse and relay box layout for S05 and S06 machines.



Position	ID	Description	Rating (A)
Relays			
A	K161	Auxiliary electric (C)	35
B	K162	Auxiliary electric (D)	35
C	K163	Auxiliary electric (E)	35
D	K164	Auxiliary electric (F)	35
E	K165	Auxiliary electric (G)	35
F	K166	Auxiliary electric (H)	35
Fuses			
G	F026	Auxiliary electric (C)	15
H	F027	Auxiliary electric (D)	15
J	F028	Auxiliary electric (E)	15
K	F029	Auxiliary electric (F)	15
M	F030	Auxiliary electric (G)	15
N	F031	Auxiliary electric (H)	15

7.31 Cab Front Door Switch

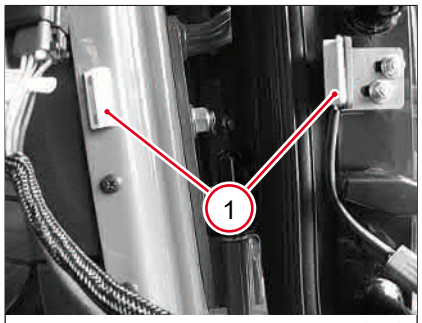


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Fig. 217: Cab front door switch

When

Daily

Overview

The machine is equipped with a door switch **(1)** to prevent incorrect operation. The door switch is located on the inside of the cab door near the hinges.

Functional check of the door switch

1. Start machine.
2. Drive on open and level terrain.
3. Secure the risk zone.
4. Stop machine.
5. Open door.
6. Carefully move lift arm controls in both (up and down) directions and attachment controls in both (tilt in and out) directions.
   Note: Machine travel is possible with an open door; however, all hydraulic workgroup (lift arm and attachment) functions are locked.
   ⇨ The workgroup must not move.
   ⇨ If the workgroup moves, stop machine operation immediately and contact a Wacker Neuson service center.

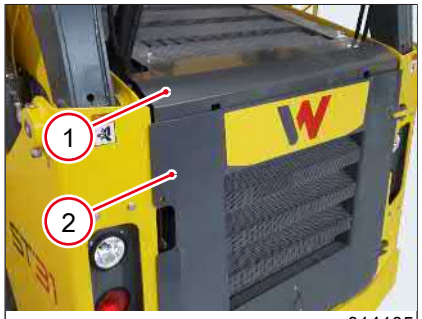
7.32 Locking the Rear Door

When

Apply a padlock when the machine is not needed at the end of each workday.

Requirements

- Machine shut down
- Padlock



wc_gr014105

Fig. 218: Hood and door

Procedure

1. Close the hood **(1)**.
   Note: The hood is locked in place by the rear door when the hood is down and the rear door is shut. The hood will not close if the rear door is closed before the hood is down.
2. Close the rear door **(2)**.

wc_gr014104
Fig. 219: Holes for padlock

3. Fasten the padlock through the holes **(3)** by the latch handle of the rear door.

7.33 Cleaning the Outside of the Side Window

When

Every 10 hours

Requirements

- Commercially available window cleaning solution
- Clean towels
- Allen wrenches

Overview

The cab side screens must be removed to access the side windows for cleaning. The side screens must be installed after cleaning the side windows.

The side window glass is tempered glass or a safety laminated glass. As such, it may or may not shatter if struck with an object. Take extreme care when working around the window with the side screen removed. See your Wacker Neuson dealer for replacement glass.

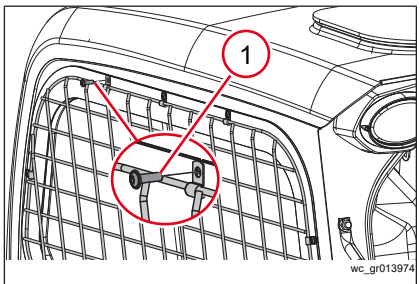


Fig. 220: Side screen fasteners

Procedure

1. Raise the lift arm and install the lift arm support device. For further information, see Lift Arm Support Device on page 149.
2. Use an Allen wrench to remove the fasteners that attach the side screens to the cab **(1)**.

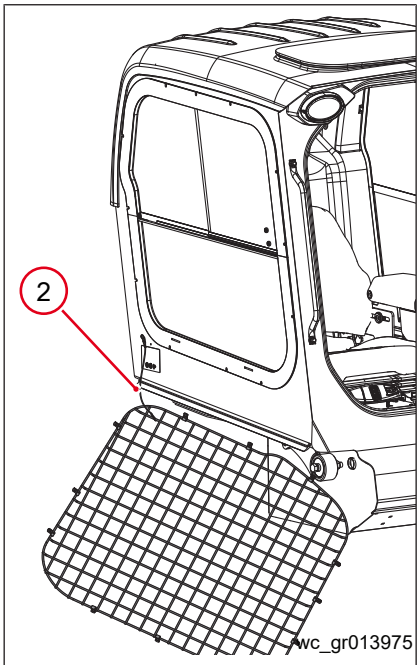


Fig. 221: Tethered cable

3. A tethered cable attaches the side screen to the cab **(2)**. Set the screen aside. Do not remove the tethered cable.
4. Clean the windows.
5. After cleaning, install the fasteners that hold the side screens to the cab.

7.34 Removing and Installing the Side Windows

If the side windows need to be removed or replaced, see your Wacker Neuson dealer.

The side window glass is tempered glass or a safety laminated glass. As such, it may or may not shatter if struck with an object. Take extreme care when working around the window with the side screen removed. See your Wacker Neuson dealer for replacement glass.

7.35 Servicing the Front Window Washer

⚠ CAUTION

Machine damage hazard

System damage can result if the washer fluid freezes.

► When operating in freezing temperatures, use nonfreezing window washer solvent or equivalent.

When

As needed

Requirements

- Machine shut down
- Windshield washer fluid tank level with the ground

Overview

The windshield washer tank filler inlet is located on the left inside of the cab. Only use glass cleaner, or nonfreezing windshield washer fluid, for refilling.

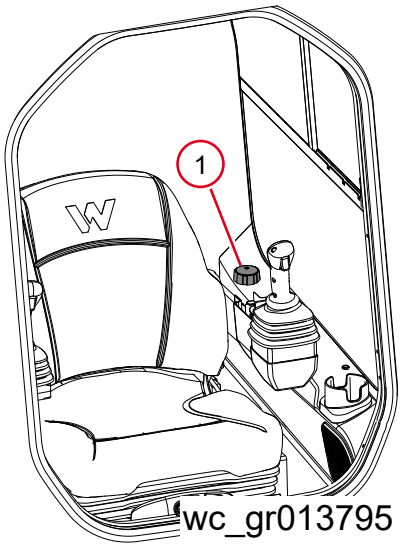


Fig. 222: Windshield washer tank cap

Procedure

1. Remove the windshield washer tank cap **(1)**.
2. Check the fluid level in the tank and add fluid if necessary.
   – The maximum capacity of the windshield washer tank is 1 L (0.3 gal).

▪ Inspect the condition of the front window wiper blade. Replace the window wiper blade if it is worn or damaged, or if it streaks the window.

7.36 Cleaning the Front Door Window

When

As needed

Requirements

- Commercially available window cleaning solution
- Clean towels

Procedure

1. Apply the cleaning solution liberally.
2. Wipe the surface.
3. Dry the surface in order to prevent spots.

7.37 Joystick and Lever Maintenance

Joysticks maintenance—Electro-hydraulic machines

Contact your Wacker Neuson dealer for service if:

- Joysticks react slowly.
- There is a delayed response.
- Joysticks do not return to neutral as quickly as they used to.
- There is a leak related to the joysticks.
- Joysticks are broken or malfunctioning in some way not listed here.

Levers maintenance—Mechanical machines

Contact your Wacker Neuson dealer for service if:

- Levers react slowly.
- There is a delayed response.
- Levers do not return to neutral as quickly as they used to.
- There is a lot of movement in the levers without any machine movement.
- Levers are broken or malfunctioning in some way not listed here.

7.38 Cleaning the Air Conditioner Condenser

When

Clean the air conditioner condenser when it becomes dirty, as needed.

Requirements

- Compressed air
- Water hose

wc_gr014113

Fig. 223: A/C condenser

Procedure

1. Open the rear door.
2. Use compressed air to clean loose particles from the air conditioner condenser **(1)**.
3. Spray the air conditioner condenser with a water hose until it is free of dirt.
4. Close the rear door.

7.39 Replacing the HVAC Filter

When

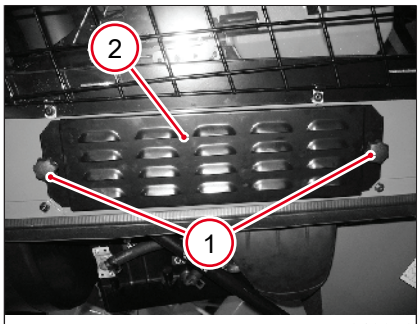
Replace the HVAC filter every 1000 hours or when the filter is dirty.

Requirements

New HVAC filter

Location

The HVAC filter is located behind the grille on the outside of the cab on the right side of the machine.

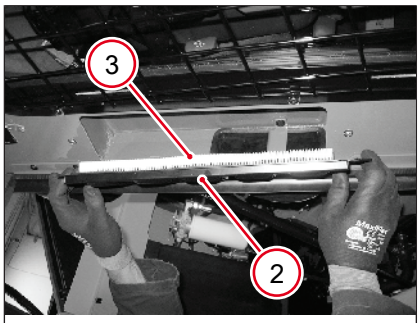


wc_gr013956

Fig. 224: Screws and grille

Procedure

1. Using the knobs, loosen the two screws **(1)** holding on the grille **(2)**.



wc_gr013957

Fig. 225: Grille and filter

2. Remove the grille and pull out the HVAC filter **(3)** behind it.
3. Replace with a new HVAC filter.
4. Replace the grille and tighten the screws.

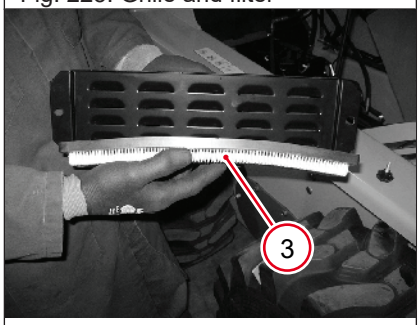


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Fig. 226: Filter

7.40 Changing the Dome Light Bulb

When

As soon as possible, after the burned out bulb is discovered

Requirements

- Machine shut down
- Dome light bulb
- Flathead screwdriver

Fig. 227: Dome light

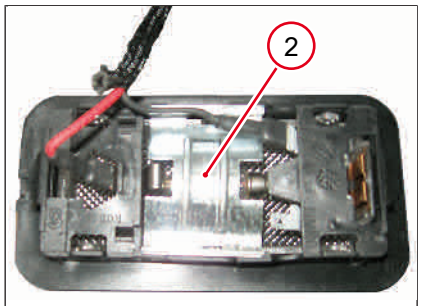


Fig. 228: Light bulb cover

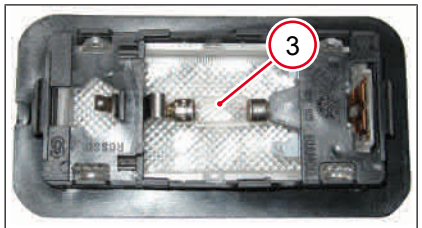


Fig. 229: Light bulb

Procedure

1. To remove the dome light, insert a flathead screwdriver into the tab on the left side of the dome light frame and carefully pry the clip **(1)** away from the ceiling.
2. Remove the light bulb cover **(2)**.
   ⇨ It is not necessary to remove the wires.
3. Replace the old light bulb **(3)** with a new one.
4. Replace the light bulb cover.
   ⇨ Attach the wires if disconnected.
5. Test the dome light for functionality.
6. Press the dome light into its housing until the clips are secured and the frame is flush with the ceiling.

7.41 Changing Work Light Bulbs

When

As soon as possible, after the burned out bulb is discovered.

Requirements

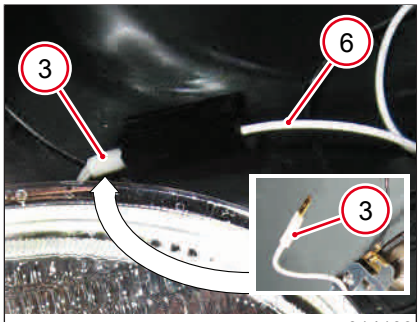
- Machine shut down
- Replacement work light bulbs
- Phillips screwdriver
- Gloves

wc_gr014103

Fig. 230: Screws and lens frame

Procedure

1. Loosen the two screws **(1)** to remove the lens frame **(2)**.



wc_gr014109

Fig. 231: Wire lead for bulb

2. Unplug **(3)** the light bulb.

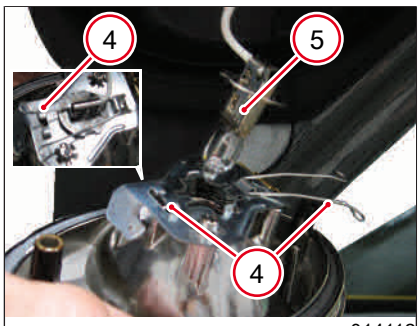


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Fig. 232: Clip, bulb, and wire

3. Unfasten the clip **(4)** holding the bulb **(5)** and remove the light bulb from the lamp.
   Note: Do not touch the glass of the new light bulb without gloves.
   Oil from a fingerprint will heat quickly and shorten the life of the bulb. In some cases, the oil will cause the bulb to burn out or explode within minutes of illumination.
4. Insert a new light bulb into the lamp and clip the new light bulb in place.
5. Plug the light bulb into the white wire **(6)**.
6. Install the lens frame.

7.42 Testing the Backup Alarm

⚠ WARNING

Personal injury hazard

Injuries can occur if the machine is put in reverse and there is no signal to alert nearby personnel.

► If the backup alarm does not sound, make necessary repairs before using the machine.

When

Every 10 hours of service or daily.

Overview

The backup alarm is located on the rear of the machine.

Procedure

1. Sit in the seat and fasten the seat belt.
2. Start the engine.
3. Press the parking brake switch to disengage the parking brake.
4. Move the machine controls to the Reverse position.

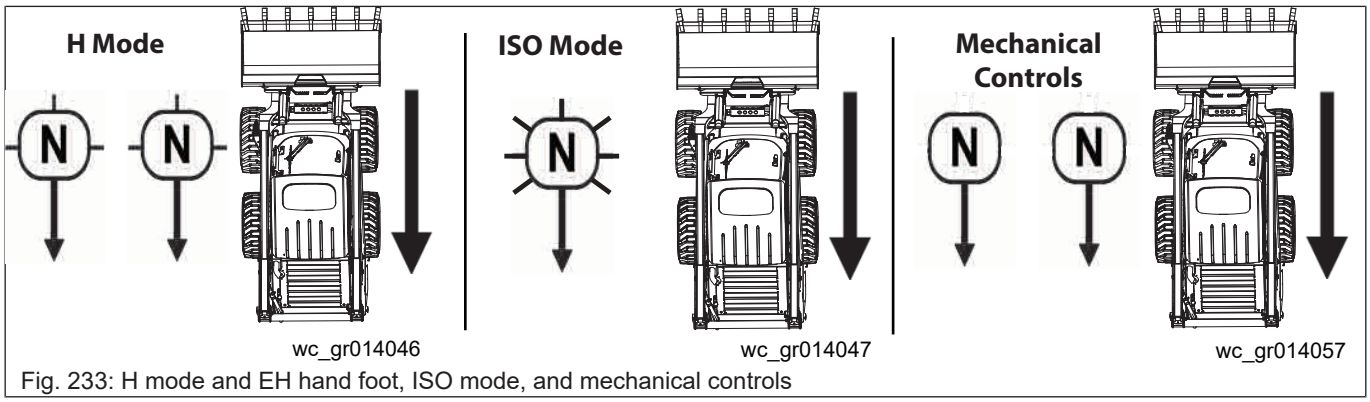

Fig. 233: H mode and EH hand foot, ISO mode, and mechanical controls

- H mode and EH Hand-foot
  - Tilt both joysticks backward to move in reverse.
- ISO mode
  - Tilt left joystick backward to move in reverse.
- Mechanical controls
  - Pull both levers backward to move in reverse.

The backup alarm should sound immediately. The backup alarm continues to sound until the forward/reserve control is returned to the Neutral or Forward position.

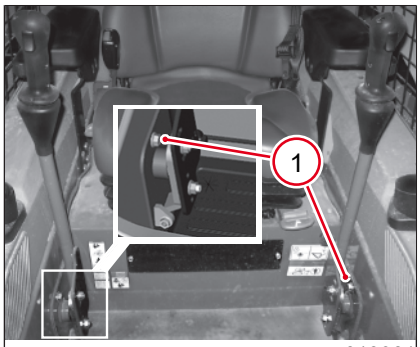

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Fig. 234: Bolts

Adjusting the backup alarm (mechanical machines only)

1. Loosen the bolt **(1)** located by the hand levers on each side of the machine.
2. Push and pull the hand lever until the contact switch clicks on the other side of the machine.
3. Repeat for the other hand lever.
4. Start the machine and test the backup alarm. Adjust accordingly until the backup alarm functions properly.

7.43 Replacing the Aftertreatment DEF Dosing Unit Filter (if equipped)

⚠ WARNING

Personal injury hazard

DEF contains urea. Do not get the substanace in your eyes.

► In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes.

⚠ WARNING

Personal injury hazard

The DEF line connecting the aftertreatment DEF dosing unit to the aftertreatment DEF dosing valve is under low pressure and should not be disconnected while the engine is running or before the system has completed the purge process after engine shutdown. Disconnecting the DEF line while under low pressure could cause DEF to spray.

► Do not disconnect the DEF line while under low pressure.

Environment

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

When

Replace the aftertreatment diesel exhaust fluid (DEF) dosing unit filter every 2000 hours.

Requirements

- Machine shut down
- Replacement filter element

- Strap wrench or filter wrench
- Warm water
- Clean cloth
- Container of suitable size to collect residual DEF in filter housing

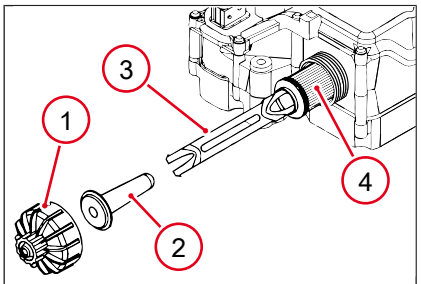


Fig. 235: Replacing the DEF filter

Procedure

1. Place a container under the filter cap to collect residual DEF liquid that may be in the filter housing.
2. Remove the filter cap **(1)**.
3. Remove the filter equalizing element **(2)**.
4. Use the disposable filter tool **(3)** to aid in removing the filter element **(4)**. Use the appropriate end of the tool, depending on the color of the plastic on the filter.
   ⇨ The disposable filter tool will make a “click” sound. This indicates that the filter element is properly engaged.
5. Clean the filter cap and threads with warm water and a clean cloth.
6. Inspect the filter cap for cracks or leaks. If the threads are damaged, replace the filter cap.

Installation

1. Insert the equalizing element into the new filter.
2. Insert the filter assembly into the aftertreatment dosing unit.
3. Install the filter cap and tighten it to 20 Nm (14.8 ft. lbs.).

7

7.44 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 only very carefully and do not unscrew it more than a revolution.
- ► 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 500 hours, or as necessary

Requirements

- Machine parked on a level surface and the lift arm completely lowered
- Machine shut down
- Plastic sheet to protect work surface
- Floor jack and jack stands
- Wrench
- Grease gun

Overview

Track wear can vary depending on the type of work and ground conditions.

Checking track tension

1. Raise the machine using a floor jack and jack stands.
2. Adjust the track tension if the track sag distance between the bottoms of the two middle idler rollers and the track is greater than the specified value in the following table:

Models	Gap
ST28 / ST31	25.4 mm (1 in.)
ST35 / ST40 / ST45 / ST50	31.75 mm (1.25 in.)

Increasing track tension

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

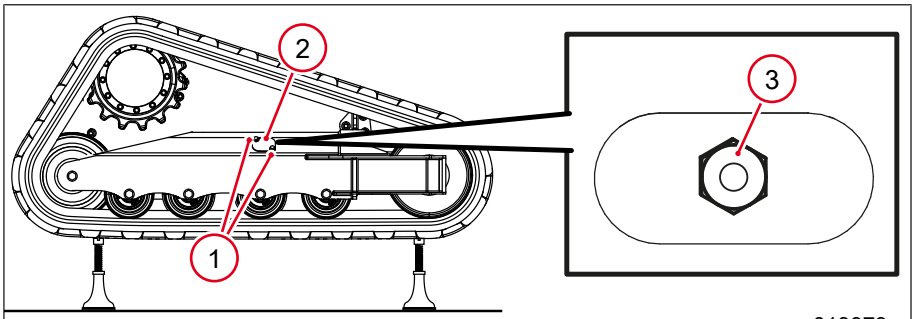


Fig. 236: Screws and cover

2. Apply grease into the valve **(3)** with a grease gun.
3. Check the track tension again. If the track tension is still out of specification, apply more grease into the valve.
4. If the track still does not have enough tension after applying grease again, 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 **(1)** securing the grease valve cover and swing the cover **(2)** down.
2. Slowly turn the valve **(3)** 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. Check the track tension again. If the track tension is still out of specification, repeat procedures for increasing or reducing track tension as needed.
5. If the track still does not have enough tension after applying grease again, do not put the machine into operation. Contact a Wacker Neuson dealer.
6. Lower the machine to the ground.
7. Install the cover.

7.45 Final Drive System

⚠ WARNING

Most used oil contains 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 engine oil.

► Wash skin thoroughly after exposure to used engine oil.

⚠ WARNING

Crushing hazard

The machine can fall if not supported properly.

► Support the machine with appropriate jack stands.

Environment

Collect, store, and dispose of drained fluids in accordance with current environmental protection regulations.

Chain tank oil specification

ISO 46 Hydraulic Oil

Checking, adding, and replacing drive chain oil

When

Check the drive chain oil every 500 hours and add as needed. Replace the drive chain oil every 1000 hours with the recommended oil.

Overview

Regular maintenance is essential for keeping the machine in serviceable condition and extending the life of the machine.

Requirements

- Machine parked on a level surface
- Machine shut down
- ISO 46 hydraulic oil
- Wrench
- Siphon pump and hose
- Plastic sheet to protect work surface
- Container of sufficient volume to collect drained oil
- Funnel

Fig. 237: Fill plug

Checking and adding drive chain oil

1. Remove the fill plug **(1)** for the left (or right) drive chain.
   ⇨ The oil level should come up to the bottom edge of the fill plug hole.
2. If the oil level is below the bottom edge of the fill hole, use a funnel to pour the recommended hydraulic oil into the fill hole until the oil reaches the bottom edge of the fill plug hole.
3. Repeat steps 1 and 2 for the right (or left) drive chain.

Replacing the drive chain oil

1. Place a container of sufficient volume to collect drained oil on a plastic sheet under the fill plug.
2. Remove the fill plug **(1)**.
3. Siphon out the oil into the container.
4. Use a funnel to pour the recommended hydraulic oil into the fill hole and fill until the oil reaches the bottom edge of the fill plug hole.
5. Repeat steps 1 through 4 for the right (or left) drive chain.

Checking drive chain tension

When

Check the drive chain tension every 500 hours and adjust as necessary.

Overview

Regular maintenance is essential for keeping the machine in serviceable condition throughout the life of the machine.

Requirements

- Machine parked on a level surface
- Attachment removed
- Machine shut down
- Chalk or other item to mark tires
- Jacks and jack stands

Procedure

1. Release the pressure in the hydraulic system.
2. Lock out the machine.
3. Use jacks to raise the machine and place it on jack stands **(1)**.
4. Mark the tires with a line of chalk **(2)**.
5. Rotate the wheels left and right.
   - ⇨ The wheels may move 9.525 – 12.7 mm (0.375 – 0.500 in.) left and right of chalk mark.
   - ⇨ If the wheels move more than 15 mm (0.59 in.), stop machine operation and have the tension corrected by a Wacker Neuson service center.
6. Use jacks to remove jack stands and lower machine to the ground.

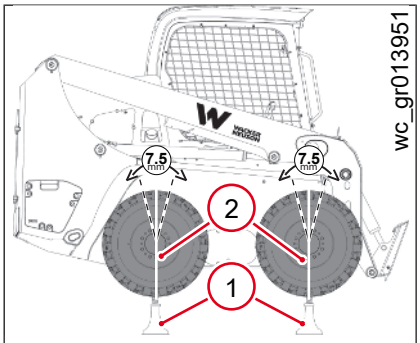


Fig. 238: Checking drive chain tension

7.46 Maintenance for Attachments

Important information regarding maintenance for attachments

Proper maintenance and service is absolutely necessary for smooth and continuous operation, and for an increased service life for attachments. Please observe the lubrication and maintenance instructions in the Operator's Manuals of the attachments.

7.47 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, 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 may 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

Cranking the engine for more than five seconds can cause starter damage.

► If the engine fails to start, release the key switch and wait 10 seconds before operating the starter again. If the engine still fails to start, Troubleshooting.

Overview

Jump-starting may occasionally be required if a battery is discharged. If jump-starting is necessary, 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. Make sure all controls are in neutral and that the key switch is in the OFF position.
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 your 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 for a minimum of two minutes while the discharged battery partially charges.
8. Turn the engine key switch and hold it until the engine starts.
9. Immediately after the engine starts, disconnect the negative cable clamp first from the machine with the discharged battery and then the negative cable clamp of the donor battery.
10. Disconnect the positive cable clamp from the donor battery and then the positive cable clamp from the discharged battery.
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.

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. Make sure all controls are in neutral and that the key switch is in the OFF position.
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 your engine or unpainted portion of the machine frame away from the discharged battery.
6. If required, turn the power switch to ON on the jump pack.
7. Wait for a minimum of two minutes while the discharged battery partially charges.
8. Turn the engine 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.

7.48 Maintaining the Battery

⚠ WARNING

Health hazard

Battery fluid is poisonous and corrosive.

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

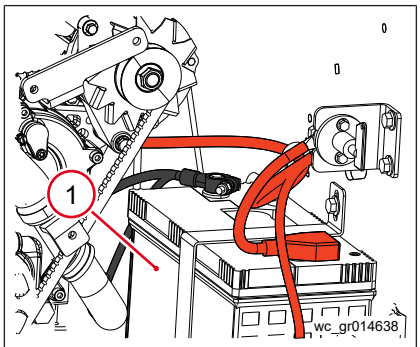


Fig. 239: Battery location

Precautions

Observe the following 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.
- Always 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.
- Keep the battery from freezing. In case of a frozen battery, do not try jump-starting the machine. Slowly warm the battery before jump-starting. If needed, follow the jump-start procedure in this manual.
- Dispose of discharged batteries in accordance with local environmental regulations.

Overview

If equipped, this machine has a single battery disconnect terminal which can be used to isolate the battery for maintenance purposes.

The instructions below cover the traditional method of disconnecting and connecting the battery, for example, if the battery is being removed or replaced.

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.

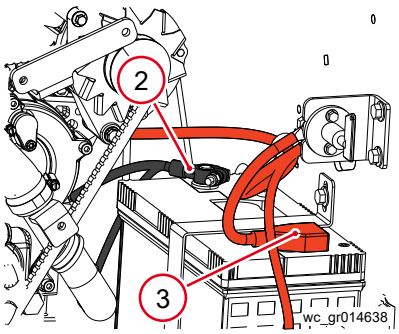


Fig. 240: Battery connections

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 Troubleshooting

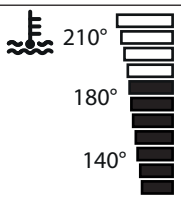
8.1 Engine Warning Lights (Tier IV)

Engine Warning	Engine Stop	Description
Yellow	Red	
		—
On	On	All warning and indicator lights illuminate for a few seconds if the ignition key is turned to Position 1.
Off	Off	No malfunction.
On	Off	The engine runs correctly, but there is an error in the electronic engine management. Contact a Wacker Neuson service center.
Flashes	Off	The engine runs correctly, but a diagnosis or error code is issued causing a reduction of engine output. Contact a Wacker Neuson service center.
Flashes	On	Engine is about to be shut down or is already shut down. Stop the engine immediately and contact a Wacker Neuson service center.
Flashes	Flashes	The engine runs but specific engine parameters are outside the permissible range. Stop the engine immediately and contact a Wacker Neuson service center.
On	On	Engine is about to be shut down or is already shut down. Stop the engine immediately and contact a Wacker Neuson service center.

8.2 Engine and Engine Oil Warning Lights (Tier IV)

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 ignition key is turned to Position 1. If the engine stop or oil pressure light does illuminate, 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 necessary. If the indicator light still indicates the malfunction, stop the engine and contact a Wacker Neuson service center.

8.3 Warning Lights (Display Element / Instrument Display)

Symbol		Description
Display Element	Instrument Display	
Red	—	
!		Buzzer sounds. Replace the hydraulic oil filter. Contact a Wacker Neuson service center.
!		Buzzer sounds. Dirty air filter. Contact a Wacker Neuson service center.
!		Buzzer sounds. Hydraulic oil too hot. If the malfunction is still indicated despite having cleaned the hydraulic oil radiator and added oil, stop the engine and contact a Wacker Neuson service center.
		The battery dropped below 12V. Possible alternator or V-belt malfunction. Increase the engine speed. The electrical system is in working order if the charge indicator light goes out after about one minute. If the malfunction is still indicated, stop the engine immediately and contact a Wacker Neuson service center.
		Buzzer sounds. Coolant temperature too high. Let the engine run at idling speed without any load. Wait until the temperature drops and the indicator light goes out. Stop the engine. Clean the radiator if necessary, or check the coolant level. If the malfunction is still indicated, stop the engine and contact a Wacker Neuson service center.

8.4 General Machine Troubleshooting

Problem / Symptom	Reason	Remedy
The engine does not start.	The fuel tank is empty.	Refill the fuel tank.
	The battery connections are loose or corroded, or the battery is dead.	Inspect the battery connections, and tighten or replace if necessary. If the battery is dead, replace the battery.
	There is a malfunctioning fuse.	Check and/or replace the fuse.
	There are loose or broken electrical connections.	Check the connections and tighten or repair them as needed.

Problem / Symptom	Reason	Remedy
The engine stops by itself.	The fuel tank is empty.	Refill the fuel tank.
	There is air in the fuel system.	Bleed the fuel system.
	The fuel filter is restricted or clogged.	Clean or replace the fuel filter.
	There are loose or broken fuel lines.	Check the connections and tighten or repair them as needed.
	There is an open circuit, short to power, or short to ground on any of the drive coils.	Check the electrical connections and tighten or repair them as needed.
	The hydraulic oil temperature has risen above 113°C (235°F) for more than 10 seconds.	Inspect the cooling system and repair if needed. Discontinue operation and allow machine to cool.
	The charge pressure drops below 182 PSI for more than 10 seconds.	Inspect the hydraulic oil line connections for leaks and tighten or repair them as needed.
The engine emits black smoke.	The air cleaner is plugged.	Check the connections and tighten or repair them as needed.
The machine pulls to the right or left.	The track tension is not set correctly.	Tighten the tracks correctly.
	The drive calibration is not set correctly.	Perform a drive calibration.
The throttle cannot be adjusted.	There is a malfunctioning fuse.	Check and/or replace the fuse.
Electrical components do not work.		
The fan does not run.		
There is reduced cool air ventilation.	The condenser is dirty.	Clean the condenser.
	The temperature controller is set to heating.	Set the temperature controller to ventilation.
	The A/C switch is not turned on.	Turn on the A/C switch.
There is reduced heat output or no heat.	The temperature controller is set to ventilation.	Set the temperature controller to heating.
	The A/C switch is turned on.	Turn off the A/C switch.

Engine derating

The engine experiences reduced performance (derates to 1500 RPM) under the following conditions:

- The hydraulic oil temperature is greater than 110°C.
- The charge pressure is less than 200 PSI. In addition, the machine automatically disables two speed, high flow, and continuous auxiliary hydraulic functions.
- The engine coolant temperature is greater than 105°C.
- The air filter is clogged.

Engine error messages

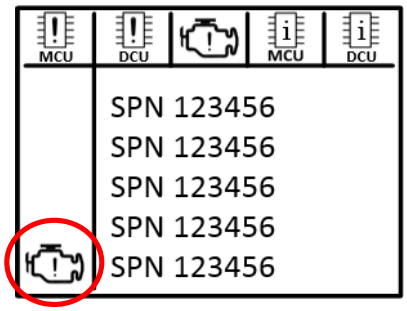
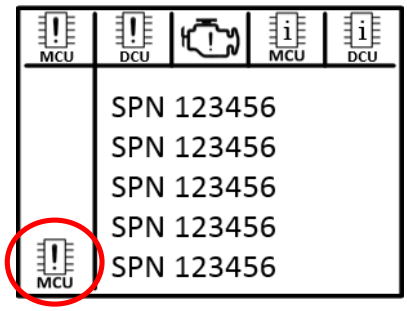
Possible errors are displayed in the instrument display for a few seconds when the machine is started.

Machine travel or operation is prohibited in case of major errors.

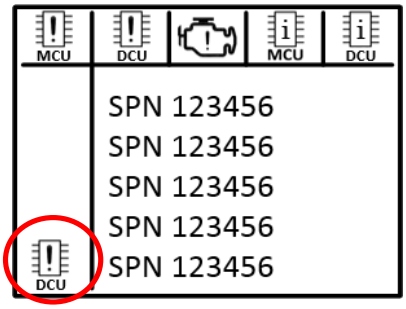
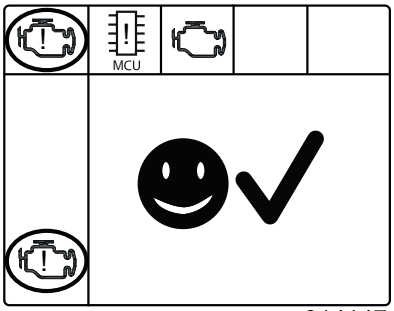
- Engine performance is reduced.
- Stop and park the machine.
- Contact a Wacker Neuson service center and have the malfunction rectified.

Machine travel and operation is possible in case of minor errors.

- Engine performance is not reduced.
- Contact a Wacker Neuson service center and have the malfunction rectified.

Symbol	Description
 wc_gr014603	**Engine control unit error** Indicates engine errors.
 wc_gr014601	**Machine control unit error** Indicates machine errors.

8

Symbol	Description
 wc_gr014602	**Drive control unit error** Indicates drive control errors.
 wc_gr014147	**No error** If there is no error, the marked symbol appears in the engine error memory. The corresponding symbol flashes and is displayed at the bottom in addition.

9 Shutdown

9.1 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.
- Make sure 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 wheels/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. Wheels/tracks and other exposed rubber items should be protected from the weather. Either cover them or use a readily available protectant.

9.2 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 that 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 that the machine cannot be operated from the time of final shut-down 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.

10 Technical Data

10.1 Engine

Wheeled and tracked loaders (Tier III)

Item	Units	SW16	SW17	SW20	ST28
Engine make	—	Kohler			
Engine model	—	2504M	2504 Decontent	2504M	2504 Decontent
Emissions	—	Tier III			
Number of cylinders	—	4			
Displacement	cm3 (in.3)	2,482 (151)			
Nominal bore and stroke	mm (in.)	Bore—88 (3.5) Stroke—102 (4)			
Output	kw (hp)	37 (50)	55.4 (74)	37 (50)	55.4 (74)
Gross torque	Nm (ft. lbs.) @ rpm	170 (125) @ 1,500	300 (221.2) @ 1,500	170 (125) @ 1,500	300 (221.2) @ 1,500
Maximum engine speed without load	rpm	2,750			
Idling speed	rpm	1,200			
Fuel injection system	—	Mechanical injection	Common rail	Mechanical injection	Common rail
Starting aid	—	Air grid heater			

Wheeled loaders (Tier IV)

Item	Units	SW16	SW17	SW20	SW21	SW24	SW28	SW32
Engine make	—	Kohler						
Engine model	—	1903 TCR	2504 TCR	1903 TCR	2504 TCR	3404 TCR		
Emissions	—	Tier IV final						
Number of cylinders	—	3	4	3	4			
Displacement	cm3 (in.3)	1,861 (114)	2,482 (151)	1,861 (114)	2,482 (151)	3,359 (205)		
Nominal bore and stroke	mm (in.)	Bore—88 (3.5) Stroke—102 (4)				Bore—96 (3.8) Stroke—116 (4.6)		
Output	kw (hp)	41.7 (56)	55 (73.8)	41.7 (56)	55 (73.8)	55 (73.8)	75 (100.6)	
Gross torque	Nm (ft. lbs.) @ rpm	225 (166) @ 1,500	300 (221.2) @ 1,500	225 (166) @ 1,500	300 (221.2) @ 1,500	375 (277) @ 1,400	490 (361) @ 1,400	
Maximum engine speed without load	rpm	2,750				2,500		
Idling speed	rpm	1,200				1,100		
Fuel injection system	—	Common rail						
Starting aid	—	Air grid heater						

Tracked loaders (Tier IV)

Item	Units	ST28	ST31	ST35	ST40	ST45	ST50
Engine make	—	Kohler					
Engine model	—	2504 TCR		3404 TCR			
Emissions	—	Tier IV final					
Number of cylinders	—	4					
Displacement	cm3 (in.3)	2,482 (151)		3,359 (205)			
Nominal bore and stroke	mm (in.)	88 (3.5) 102 (4)		96 (3.8) 116 (4.6)			
Output	kw (hp)	55 (73.8)	55 (73.8)	55 (73.8)	75 (100.6)	55 (73.8)	75 (100.6)
Gross torque	Nm (ft. lbs.) @ rpm	300 (221.2) @ 1,500		375 (277) @ 1,400	490 (361) @ 1,400	375 (277) @ 1,400	490 (361) @ 1,400
Maximum engine speed without load	rpm	2,750		2,500			
Idling speed	rpm	1,200		1,100			
Fuel injection system	—	Common rail					
Starting aid	—	Air grid heater					

10.2 Tires/Tracks

Wheeled loaders

Tire Type	Tire Size	SW16/SW17/ SW20/SW21	SW24/SW28	SW32	Tire pressure bar (PSI)	Wheel nut torque
Standard	10 x 16.5	X	—	—	5.2 (75.4)	290 Nm (214 ft. lbs.)
Standard	12 x 16.5	X	X	X	5.5 (79.8)	
Severe duty	10 x 16.5	X	—	—	5.2 (75.4)	
Severe duty	12 x 16.5	X	X	X	5.5 (79.8)	
Solid	10 x 16.5	X	—	—	—	
Solid	12 x 16.5	—	X	X	—	
Premium	10 x 16.5	X	—	—	5.2 (75.4)	
Premium	12 x 16.5	X	X	X	5.5 (79.8)	
Premium	14 x 17.5	—	—	X	5.5 (79.8)	
Premium, wide	12 x 16.5	—	—	X	5.5 (79.8)	

Tracked loaders

Tracks	Specification Width x Pitch x Number of Links	ST28	ST31	ST35	ST40	ST45	ST50
Medium Frame (S05)							
Standard	320 mm x 86 mm x 52 (12.60 in. x 3.39 in. x 52)	X	X	—	—	—	—
Wide	400 mm x 86 mm x 52 (15.75 in. x 3.39 in. x 52)	X	X	—	—	—	—
All season	400 mm x 86 mm x 52 (15.75 in. x 3.39 in. x 52)	X	X	—	—	—	—

Tracks	Specification Width x Pitch x Number of Links	ST28	ST31	ST35	ST40	ST45	ST50
Large Frame (S06)							
Standard	450 mm x 86 mm x 58 (17.72 in. x 3.39 in. x 58)	—	—	—	X	—	X
	450 mm x 86 mm x 56 (17.72 in. x 3.39 in. x 56)	—	—	X	—	X	—
All season	450 mm x 86 mm x 58 (17.72 in. x 3.39 in. x 58)	—	—	—	X	—	X
	450 mm x 86 mm x 56 (17.72 in. x 3.39 in. x 56)	—	—	X	—	X	—

10.3 Machine Speeds

Wheeled loaders

Drive Motor	Controls	Tires	Units	SW16	SW17	SW20	SW21	SW24	SW28	SW32
Single-speed	Manual	10 x 16.5	km/h (mph)	11.6					—	
		12 x 16.5		12.2					9.7 (6.0)	
		14 x 17.5		—						
	Joystick	10 x 16.5		11.6					—	
		12 x 16.5		12.2					11.6 (7.2)	
		14 x 17.5		—					10.9 (6.8)	
Two-speed	Manual	10 x 16.5		18.7					—	
		12 x 16.5		19.3					16.1 (10.0)	
		14 x 17.5		—						
	Joystick	10 x 16.5		18.7					—	
		12 x 16.5		19.3 (12.0)						
		14 x 17.5		—					18.1 (11.3)	

Tracked machines

Drive motor	Tracks	Units	ST28	ST31	ST35	ST40	ST45	ST50
Single-speed	52 pitch	km/h (mph)	11.3 (7)		—			
	56 pitch		—		10.1 (6.3)	—	10.1 (6.3)	—
	58 pitch		—			9.8 (6.1)	—	9.8 (6.1)
Two-speed	52 pitch		15.3 (9.5)		—			
	56 pitch		—		15.2 (9.5)	—	15.2 (9.5)	—
	58 pitch		—			15.7 (9.8)	—	15.7 (9.8)

10.4 Fluids

Wheeled machines

Item	Units	SW16	SW17	SW20	SW21	SW24	SW28	SW32
Engine								
Oil capacity	L (gal)	Tier III 11.5 (3) Tier IV 7.5 (2)	9.8 (2.6)	Tier III 11.5 (3) Tier IV 7.5 (2)	9.8 (2.6)	15.6 (4)		
Coolant type	—	ASTM 3306						
Coolant capacity	L (gal)	Tier III 12.5 (3.3) Tier IV 13.25 (3.5)	13.25 (3.5)	Tier III 12.5 (3.3) Tier IV 13.25 (3.5)	13.25 (3.5)	17 (4.5)		21 (5.5)
Hydraulics								
Hydraulic oil type	—	ISO VG 46*						
Synthetic hydraulic oil type	—	Synthetic ISO VG 46						
Hydraulic oil capacity	L (gal)	29.5 (7.8)				40 (10.6)		
Aux hydraulic flow - standard	L/min (gal/min)	76 (20)				83.8 (22.1)		95.2 (25.1)
Aux hydraulic flow - high	L/min (gal/min)	114 (30.1)				120 (31.7)		144 (38)
Aux hydraulic relief pressure	bar (psi)	241 (3,500)				240 (3,480)		
Fuel								
Standard tank capacity	L (gal)	114 (30)				151 (40)		
DEF tank capacity	L (gal)	—						16.5 (4.4)
Transmission								
Transmission oil type	—	ISO/VG 46						
Chain tank capacity	L (gal)	12 (3.2)				16 (4.2)		

*According to DIN 51524 section 3, ISO VG46

Tracked machines

Item	Units	ST28	ST31	ST35	ST40	ST45	ST50
Engine							
Oil capacity	L (gal)	9.8 (2.6)		15.6 (4)			
Coolant type	—	ASTM 3306					
Coolant capacity	L (gal)	13.25 (3.5)		17 (4.5)	21 (5.5)	17 (4.5)	21 (5.5)
Hydraulics							
Hydraulic oil type	—	ISO VG 46*					
Synthetic hydraulic oil type	—	Synthetic ISO VG 46					
Hydraulic oil capacity	L (gal)	29.5 (7.8)		40 (10.6)			

Item	Units	ST28	ST31	ST35	ST40	ST45	ST50
Aux hydraulic flow - standard	L/min (gal/min)	76 (20)		83.8 (22.1)	95.2 (25.1)	83.8 (22.1)	95.2 (25.1)
Aux hydraulic flow - high	L/min (gal/min)	114 (30.1)		120 (31.7)	141.5 (37.4)	120 (31.7)	141.5 (37.4)
Aux hydraulic relief pressure	bar (psi)	241 (3,500)		240 (3,480)			
Fuel							
Standard tank capacity	L (gal)	114 (30)		151 (40)			
Optional tank capacity	L (gal)	—		189 (50)			
DEF tank capacity	L (gal)	—			16.5 (4.4)	—	16.5 (4.4)

*According to DIN 51524 section 3, ISO VG46

10.5 Electrical System

Electrical Components	Tier III KDI 2504M	Tier IV KDI 1903 TCR	Tier IV KDI 2504 TCR	Tier IV KDI 3404 TCR
Alternator	100A			120A
Starter	3.2 kW	2.0 kW	3.2 kW	4.5 kW
Single battery*	12V 1,000 CCA			
Dual battery* (optional)	—			12V / 2 x 1,000 CCA
12V socket	20A maximum			

*According to DIN EN50342, DIN IEC 60095-2

10.6 Forces

Wheeled loaders

Item	Units	SW16 Radial	SW17 Radial	SW20 Vertical	SW21 Vertical	SW24 Radial	SW28 Vertical	SW32 Vertical
ROC @ 50% of tip load	kg (lb)	726 (1,600)	771 (1,700)	907 (2,000)	953 (2,101)	1,089 (2,400)	1,270 (2,800)	1,451 (3,200)
Tip load	kg (lb)	1,451 (3,200)	1,542 (3,400)	1,814 (4,000)	1,905 (4,200)	2,177 (4,800)	2,540 (5,600)	2,903 (6,400)
Breakout force - bucket	kN (lb)	23.58 (5,300)				30.88 (6,941)		31.11 (6,941)
Breakout force - boom	kN (lb)	22.24 (5,000)				33.36 (7,500)	36.48 (8,200)	36.75 (8,200)
Max tractive effort EH controls	N (lbf)	33,970 (7,637)				43,200 (9,712)		
Max tractive effort mechanical controls	N (lbf)	33,970 (7,637)				40,740 (9,159)		—

Tracked loaders

Item	Units	ST28 Radial	ST31 Vertical	ST35 Radial	ST40 Radial	ST45 Vertical	ST50 Vertical
ROC @ 50% of tip load	kg (lb)	1,270 (2,800)	1,406 (3,100)	1,588 (3,500)	1,841 (4,000)	2,041 (4,500)	2,268 (5,000)
ROC @ 35% of track loader tip load	kg (lb)	889 (1,960)	984 (2,170)	1,111 (2,450)	1,270 (2,800)	1,429 (3,150)	1,588 (3,500)
Tip load	kg (lb)	2,540 (5,600)	2,812 (6,200)	3,175 (7,000)	3,629 (8,000)	4,082 (9,000)	4,536 (10,000)
Breakout force - bucket	kN (lbs)	23.58 (5,300)		30.88 (6,924)	31.11 (6,941)	30.88 (6,924)	31.11 (6,941)
Breakout force – boom	kN (lbs)	22.24 (5,000)		33.36 (7,500)	33.62 (7,500)	36.48 (8,200)	
Max tractive effort EH controls	N (lbf)	43,920 (9,874)		49,280 (11,078)	50,759 (11,411)	49,280 (11,078)	50,759 (11,411)

10.7 Weights and Ground Pressure

Machine	Operating Weight (Tier III)[1)] kg (lb)	Operating Weight (Tier IV)[1)] kg (lb)	Ground Pressure bar (psi)
SW16	2,822 (6,221)	2,799 (6,170)	—
SW17	2,844 (6,271)	2,833 (6,245)	—
SW20	2,942 (6,486)	2,920 (6,437)	—
SW21	—	2,954 (6,512)	—
SW24	—	3,556 (7,840)	—
SW28	—	3,708 (8,175)	—
SW32	—	3,914 (8,629)	—
ST28	3,563 (7,855)	3,551 (7,829)	0.37 (5.4)
ST31	—	3,672 (8,095)	0.38 (5.5)
ST35	—	4,481 (9,879)	0.30 (4.4)
ST40	—	4,667 (10,289)	0.31 (4.4)
ST45	—	4,657 (10,267)	0.32 (4.6)
ST50	—	4,843 (10,677)	0.32 (4.6)

1) Operating weight with bucket, fuel, and 75 kg operator. Add the weight of all subsequently installed equipment to the actual machine weight, which must be read off the label. Weight indication can vary by +/- 2%.

10.8 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 (1770)	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)

10.9 Dimensions

SW16 / SW17 / SW24

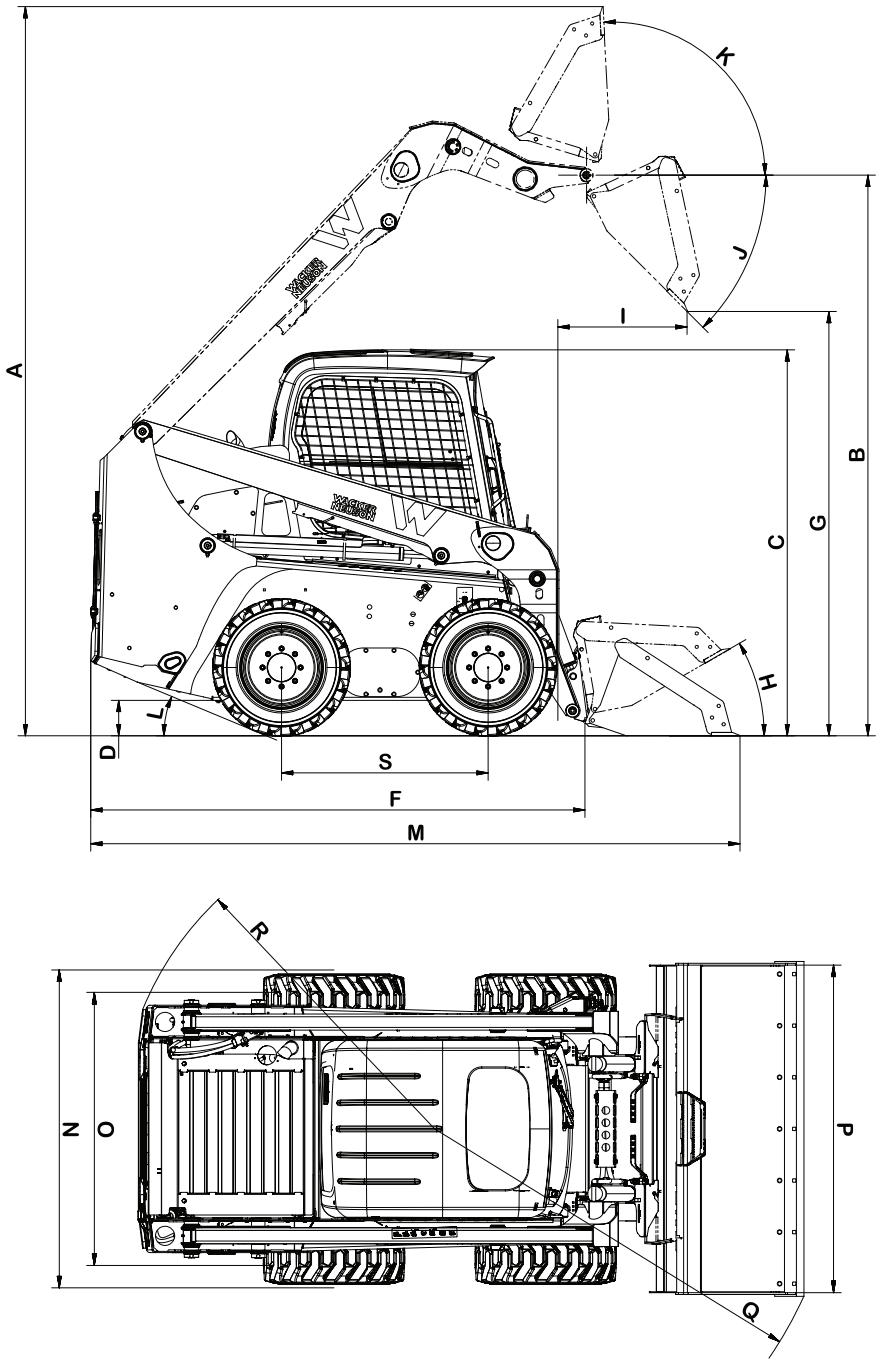


Fig. 241: Machine dimensions

DIM	Description	Units	Specification	
			SW16 / SW17	SW24
A	Overall operating height, fully raised, with bucket, 10 x 16.5 tires	mm (in.)	3,900 (153.5)	—
	Overall operating height, fully raised, with bucket, 12 x 16.5 tires	mm (in.)	3,923 (154.5)	4,132 (162.7)
	Overall operating height, fully raised, with bucket, 14 x 17.5 tires	mm (in.)	—	4,159 (163.7)
B	Hinge pin height, fully raised, 10 x 16.5 tires	mm (in.)	3,038 (119.6)	—
	Hinge pin height, fully raised, 12 x 16.5 tires	mm (in.)	3,038 (119.6)	3,258 (128.3)
	Hinge pin height, fully raised, 14 x 17.5 tires	mm (in.)	—	3,258 (128.3)
C	Overall height, 10 x 16.5 tires	mm (in.)	2,070 (81.5)	—
	Overall height, 12 x 16.5 tires	mm (in.)	192 (7.6)	192 (7.6)
	Overall height, 14 x 17.5 tires	mm (in.)	—	192 (7.6)
D	Ground clearance, bottom of belly pan, 10 x 16.5 tires	mm (in.)	192 (7.6)	—
	Ground clearance, bottom of belly pan, 12 x 16.5 tires	mm (in.)	231 (9.1)	227.7 (9.0)
	Ground clearance, bottom of belly pan, 14 x 17.5 tires	mm (in.)	—	266.7 (10.5)
F	Overall length, without bucket, with coupler	mm (in.)	2,708 (106.6)	2,984.8 (117.5)
G	Dump height, 10 x 16.5 tires	mm (in.)	2,270 (89.4)	—
	Dump height, 12 x 16.5 tires	mm (in.)	2,293 (90.3)	2,535 (99.8)
	Dump height, 14 x 17.5 tires	mm (in.)	—	2,560 (100.8)
H	Maximum rollback at ground	degrees	30	30
I	Reach at maximum height, 10 x 16.5 tires	mm (in.)	714 (28.1)	—
	Reach at maximum height, 12 x 16.5 tires	mm (in.)	647 (25.5)	754 (29.7)
	Reach at maximum height, 14 x 17.5 tires	mm (in.)	—	716 (28.2)
J	Dump angle at maximum height	degrees	42	44
K	Maximum rollback, fully raised	degrees	93	94
L	Angle of departure, 10 x 16.5 tires	degrees	24	—
	Angle of departure, 12 x 16.5 tires	degrees	24	23
	Angle of departure, 14 x 17.5 tires	degrees	—	25
M	Overall length with bucket	mm (in.)	3,469 (136.6)	3,694 (145.4)
N	Over the tire width	mm (in.)	1,675 (65.9)	1,825.5 (71.9)
	Overall width, 10 x 16.5 tires, standard	mm (in.)	1,604 (63.1)	—
	Overall width, 12 x 16.5 tires, standard	mm (in.)	1,637 (64.4)	1,820 (71.7)
	Overall width, 10 x 16.5 tires, severe duty	mm (in.)	1,611 (63.4)	—
	Overall width, 12 x 16.5 tires, severe duty	mm (in.)	1,653 (65.1)	1,836 (72.3)
	Overall width, 10 x 16.5 tires, solid	mm (in.)	1,630 (64.2)	—
	Overall width, 12 x 16.5 tires, solid	mm (in.)	—	1,837 (72.3)
	Overall width, 10 x 16.5 tires, premium	mm (in.)	1,614 (63.5)	—
	Overall width, 12 x 16.5 tires, premium	mm (in.)	1,644 (64.7)	1,827 (71.9)
O	Tread gauge	mm (in.)	1,402 (55.2)	1,585 (62.4)
P	Bucket width	mm (in.)	1,727 (68.0)	1,905 (75.0)
Q	Clearance circle, bucket on ground	mm (in.)	2,136 (84.1)	2,251 (88.6)
R	Clearance circle, rear	mm (in.)	1,573 (61.9)	1,811 (71.3)
S	Wheelbase	mm (in.)	1,104 (43.5)	1,267 (49.9)

SW20 / SW21 / SW28 / SW32

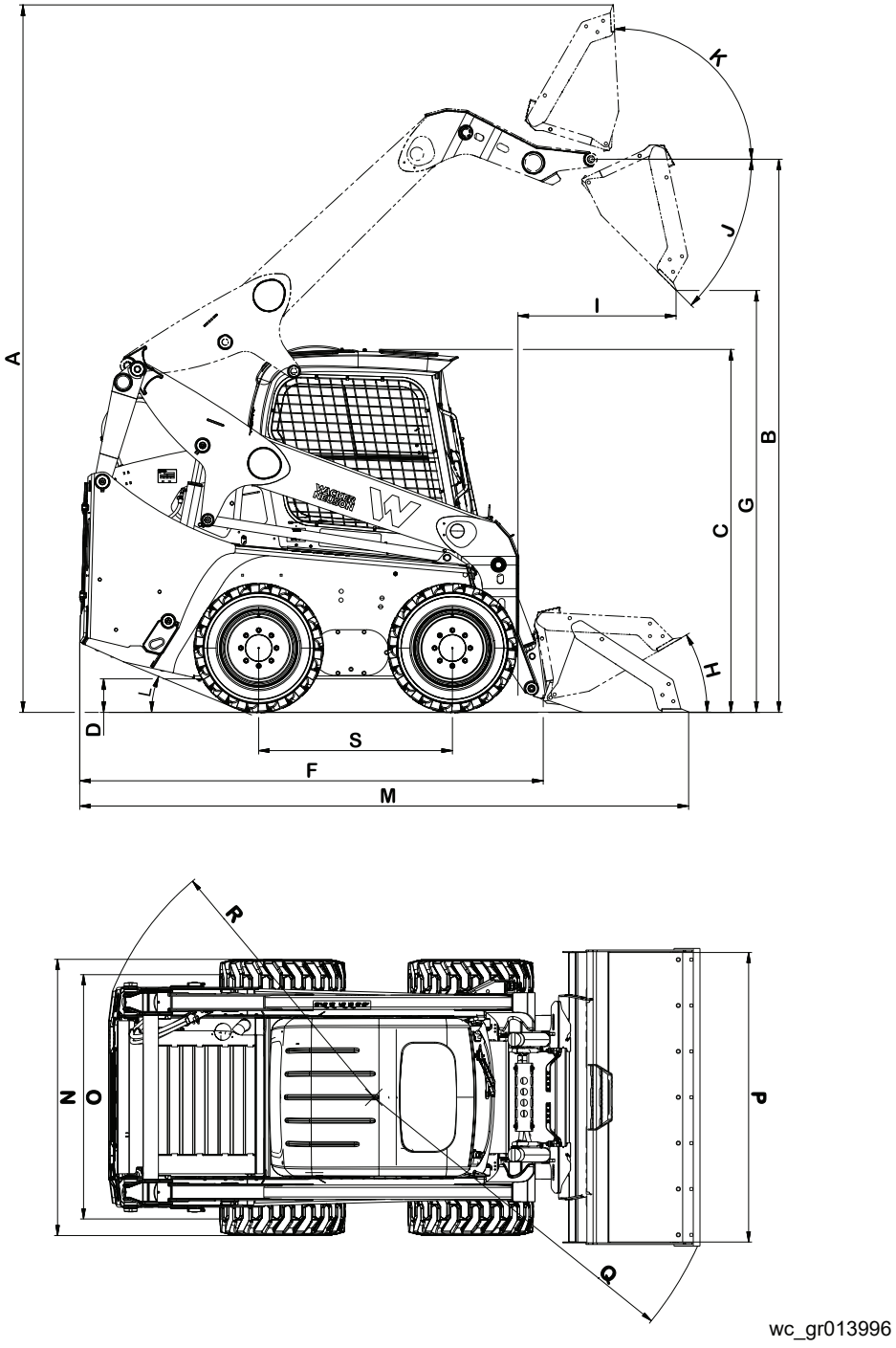


Fig. 242: Machine dimensions

DIM	Description	Units	Specification		
			SW20 / SW21	SW28	SW32
A	Overall operating height, fully raised, with bucket, 10 x 16.5 tires	mm (in.)	4,031 (158.7)	—	
	Overall operating height, fully raised, with bucket, 12 x 16.5 tires	mm (in.)	4,054 (159.6)	4,348 (171.2)	
	Overall operating height, fully raised, with bucket, 14 x 17.5 tires	mm (in.)	—	4,375 (172.2)	
B	Hinge pin height, fully raised, 10 x 16.5 tires	mm (in.)	3,151 (124.1)	—	
	Hinge pin height, fully raised, 12 x 16.5 tires	mm (in.)	3,188 (125.5)	3,425 (134.8)	
	Hinge pin height, fully raised, 14 x 17.5 tires	mm (in.)	—	3,463 (136.3)	
C	Overall height, 10 x 16.5 tires	mm (in.)	2,070 (81.5)	—	
	Overall height, 12 x 16.5 tires	mm (in.)	2,108 (83.0)	2,113 (83.2)	
	Overall height, 14 x 17.5 tires	mm (in.)	—	2,151 (84.7)	
D	Ground clearance, bottom of belly pan, 10 x 16.5 tires	mm (in.)	192 (7.6)	—	
	Ground clearance, bottom of belly pan, 12 x 16.5 tires	mm (in.)	231 (9.1)	227.7 (9.0)	
	Ground clearance, bottom of belly pan, 14 x 17.5 tires	mm (in.)	—	266.7 (10.5)	
F	Overall length, without bucket, with coupler	mm (in.)	2,708 (106.6)	2,984.8 (117.5)	
G	Dump height, 10 x 16.5 tires	mm (in.)	2,404 (94.7)	—	
	Dump height, 12 x 16.5 tires	mm (in.)	2,404 (94.7)	2,738 (107.8)	
	Dump height, 14 x 17.5 tires	mm (in.)	—	2,766 (108.9)	
H	Maximum rollback at ground	degrees	30		
I	Reach at maximum height, 10 x 16.5 tires	mm (in.)	964 (37.9)	—	
	Reach at maximum height, 12 x 16.5 tires	mm (in.)	897 (35.3)	950 (37.4)	
	Reach at maximum height, 14 x 17.5 tires	mm (in.)	—	912 (35.9)	
J	Dump angle at maximum height	degrees	42	44	
K	Maximum rollback, fully raised	degrees	93	94	
L	Angle of departure, 10 x 16.5 tires	degrees	24	—	
	Angle of departure, 12 x 16.5 tires	degrees	25	23	
	Angle of departure, 14 x 17.5 tires	degrees	—	25	
M	Overall length with bucket	mm (in.)	3,425 (134.8)	3,694 (145.4)	
N	Over the tire width	mm (in.)	1,675 (65.9)	1,825 (71.9)	
	Overall width, 10 x 16.5 tires, standard	mm (in.)	1,604 (63.1)	—	
	Overall width, 12 x 16.5 tires, standard	mm (in.)	1,637 (64.4)	1,820 (71.7)	
	Overall width, 10 x 16.5 tires, severe duty	mm (in.)	1,611 (63.4)	—	
	Overall width, 12 x 16.5 tires, severe duty	mm (in.)	1,653 (65.1)	1,836 (72.3)	
	Overall width, 10 x 16.5 tires, solid	mm (in.)	1,630 (64.2)	—	
	Overall width, 12 x 16.5 tires, solid	mm (in.)	—	1,837 (72.3)	
	Overall width, 10 x 16.5 tires, premium	mm (in.)	1,614 (63.5)	—	
	Overall width, 12 x 16.5 tires, premium	mm (in.)	1,644 (64.7)	1,827 (71.9)	
	Overall width, 12 x 16.5 tires, premium, wide	mm (in.)	—		1,940 (76.4)
	Overall width, 14 x 17.5 tires, premium	mm (in.)	—		1,919 (75.6)
O	Tread gauge	mm (in.)	1,402 (55.2)	1,585 (62.4)	

DIM	Description	Units	Specification		
			SW20 / SW21	SW28	SW32
P	Bucket width	mm (in.)	1,727 (68.0)	1,905 (75.0)	
Q	Clearance circle, bucket on ground	mm (in.)	2,136 (84.1)	2,251 (88.6)	
R	Clearance circle, rear	mm (in.)	1,573 (61.9)	1,811 (71.3)	
S	Wheelbase	mm (in.)	1,104 (43.5)	1,267 (49.9)	

ST28 / ST35 / ST40

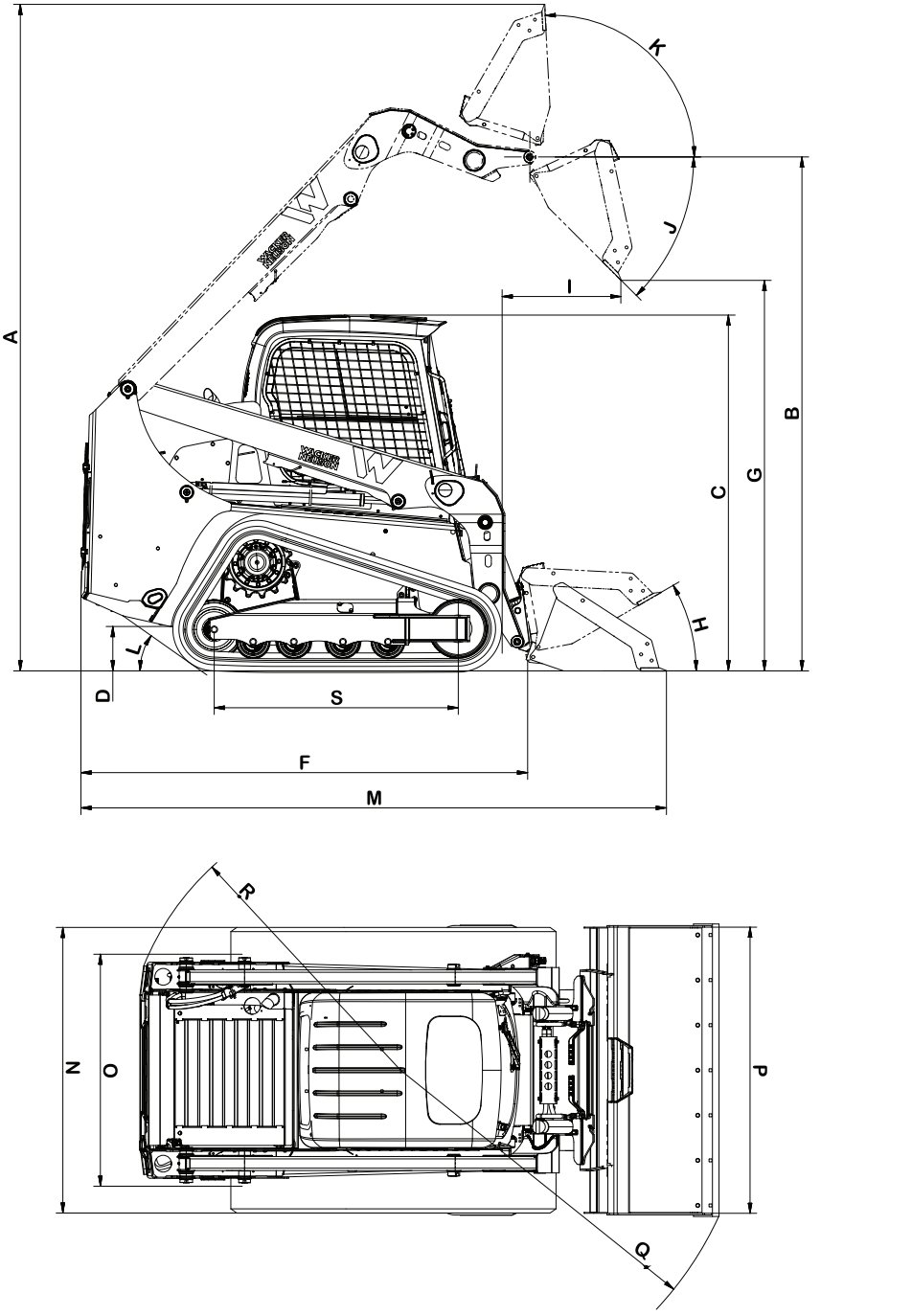
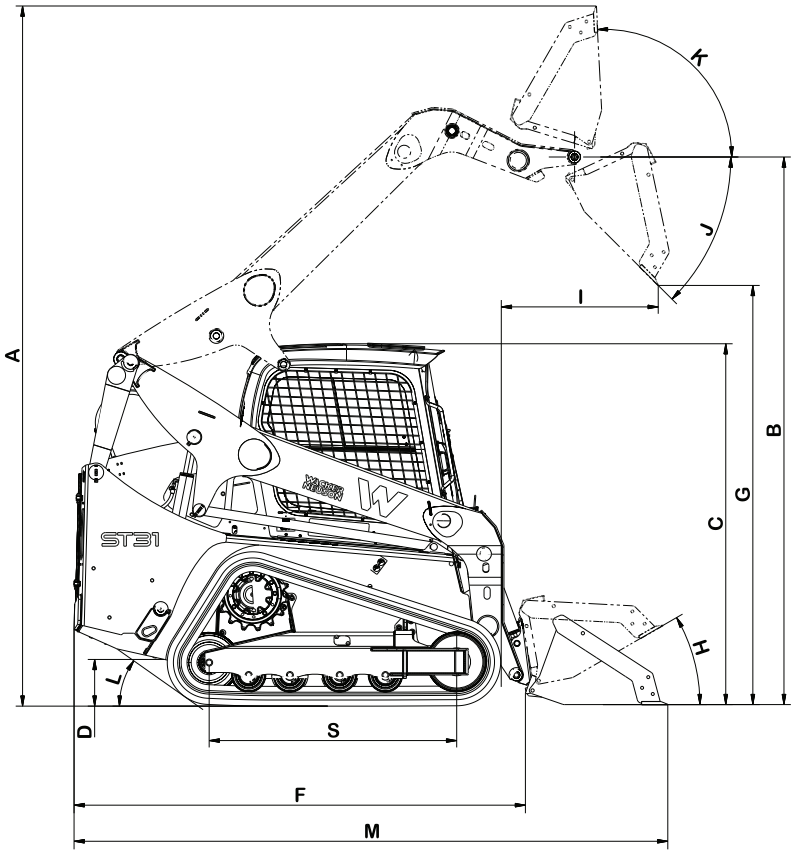


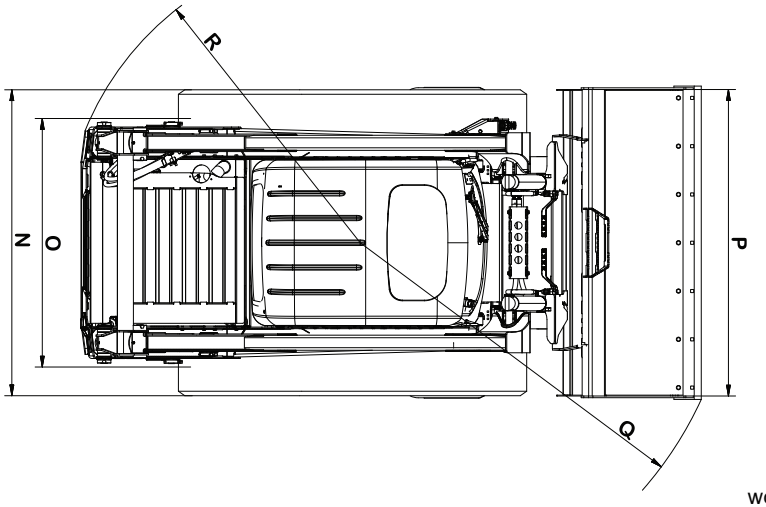
Fig. 243: Machine dimensions

DIM	Description	Units	Specification		
			ST28	ST35	ST40
A	Overall operating height, fully raised with bucket	mm (in.)	3,938 (155)	4,132 (162.7)	4,170 (164.2)
B	Height to hinge pin, fully raised	mm (in.)	3,038 (119.6)	3,220 (126.8)	3,258 (128.3)

DIM	Description	Units	Specification		
			ST28	ST35	ST40
C	Overall height with standard tracks	mm (in.)	2,103 (82.8)	2,113 (83.2)	2,151 (84.7)
D	Ground clearance, bottom of belly pan	mm (in.)	231 (9.1)	227.7 (9.0)	265.7 (10.5)
F	Overall length, without bucket, with coupler	mm (in.)	2,708 (106.6)	2,984.8 (117.5)	
G	Dump height	mm (in.)	2,308 (90.9)	2,534 (99.8)	2,560 (100.8)
H	Maximum rollback at ground	degrees	30		
I	Reach at maximum height with standard tracks	mm (in.)	709 (27.9)	774.4 (30.5)	735 (28.9)
J	Dump angle at maximum height	degrees	42	44	
K	Maximum rollback, fully raised	degrees	93	94	
L	Angle of departure	degrees	30.7	27	31
M	Overall length with bucket	mm (in.)	3,469 (136.6)	3,694 (145.4)	
N	Overall width with standard tracks	mm (in.)	1,705 (67.1)	1,982 (78)	
O	Track gauge	mm (in.)	1,385 (54.5)	1,532 (60.3)	
P	Bucket width	mm (in.)	1,727 (68.0)	1,982 (78)	
Q	Clearance circle, bucket on ground	mm (in.)	2,136 (84.1)	2,251 (88.6)	
R	Clearance circle, rear	mm (in.)	1,573 (61.9)	1,811 (71.3)	
S	Wheelbase	mm (in.)	1,452 (57.2)	1,606 (63.2)	1,667 (65.6)

ST31 / ST45 / ST50





wc_gr013939

Fig. 244: Machine dimensions

DIM	Description	Units	Specification		
			ST31	ST45	ST50
A	Overall operating height, fully raised with bucket	mm (in.)	4,069 (160.2)	4,348 (171.2)	4,386 (172.7)
B	Height to hinge pin, fully raised	mm (in.)	3,189 (125.6)	3,425 (134.8)	3,462 (136.3)
C	Overall height with standard tracks	mm (in.)	2,103 (82.8)	2,113 (83.2)	2,151 (84.7)
D	Ground clearance, bottom of belly pan	mm (in.)	235 (9.1)	229 (9.0)	265.7 (10.5)
F	Overall length, without bucket, with coupler	mm (in.)	2,708 (106.6)	2,984.8 (117.5)	
G	Dump height	mm (in.)	2,442 (96.1)	2,738 (107.8)	2,766 (108.9)
H	Maximum rollback at ground	degrees	30		
I	Reach at maximum height with standard tracks	mm (in.)	959 (37.8)	970 (38.2)	930 (36.6)
J	Dump angle at maximum height	degrees	42	44	
K	Maximum rollback, fully raised	degrees	93	94	
L	Angle of departure	degrees	30.7	27	31
M	Overall length with bucket	mm (in.)	3,469 (136.6)	3,694 (145.4)	
N	Overall width with standard tracks	mm (in.)	1,705 (67.1)	1,982 (78)	
O	Track gauge	mm (in.)	1,385 (54.5)	1,532 (60.3)	
P	Bucket width	mm (in.)	1,727 (68.0)	1,982 (78)	
Q	Clearance circle, bucket on ground	mm (in.)	2,136 (84.1)	2,251 (88.6)	
R	Clearance circle, rear	mm (in.)	1,573 (61.9)	1,811 (71.3)	
S	Wheelbase	mm (in.)	1,452 (57.2)	1,606 (63.2)	1,667 (65.6)

11 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.

11.1 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.

11.2 Limited Defect Warranty for Exhaust Emission Control System

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

11.3 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 LLC, 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 that 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 4 years or 4,000 hours of operation (whichever comes first). For the warranty terms for your specific engine/equipment, visit wackerneuson.com.

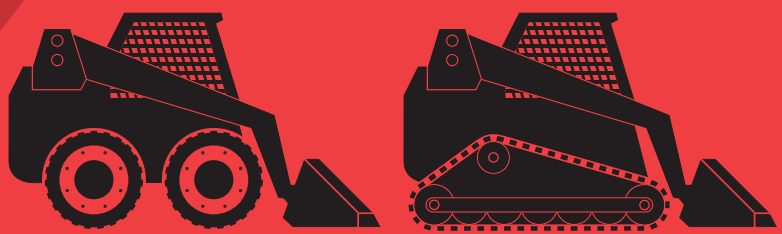
Any implied warranties are limited to the duration of this written warranty.

SKID STEER LOADER

www.aem.org

SAFETY MANUAL

FOR OPERATING AND MAINTENANCE PERSONNEL



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Acknowledgment

We wish to thank the members of the Association of Equipment Manufacturers for their invaluable contributions in preparing this Safety Manual.

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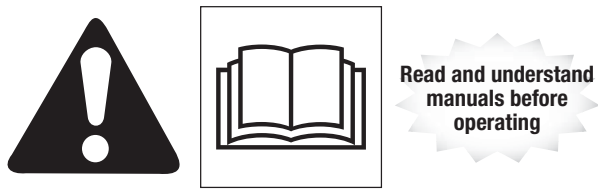
Revised 1/84, 9/89, 7/00, 11/01, 12/02, 12/04, 3/06, 3/13

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 instruct you in safety practices for dealing with these conditions. This manual is **NOT** a substitute for the 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 jobsite 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 operator'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 this machine, make sure you have the manufacturer's manual(s) for this machine and all attachments. If the manufacturer's manuals are missing, obtain replacements 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 and other training resources are available from some manufacturers and dealers. Operators are encouraged to periodically review these resources.

Safety Alerts

Safety Alert 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. Carefully read the message that follows and inform other operators. Follow instructions in the safety message.

Signal Words

Signal words are distinctive words that will typically be found on safety signs on the skid steer loader and other jobsite 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 that, if not avoided, will result in death or serious injury.

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

CAUTION indicates a hazardous situation that, 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 this safety manual and the manufacturer's manuals before operating this equipment. This safety manual takes you step by step through the working day.

Graphics have been provided to help you understand the text.

Hazard recognition and accident prevention depend upon you being alert, careful and properly trained in the inspection, operation, transport, maintenance and storage of this equipment.

Read and understand all safety signs – replace damaged signs

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 operating manuals for the specific machine. Make them a working part of your safety program. Keep in mind that this safety manual is written only for skid steer loaders with wheels and tracks.

After studying the manufacturer's operating manual(s) and this safety manual, please contact the equipment manufacturer with any remaining questions.

Practice all usual and customary safe working precautions and remember:

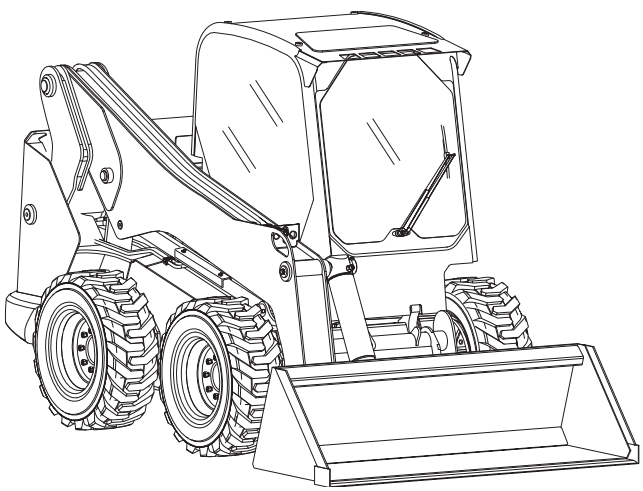
SAFE OPERATION IS UP TO YOU!

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

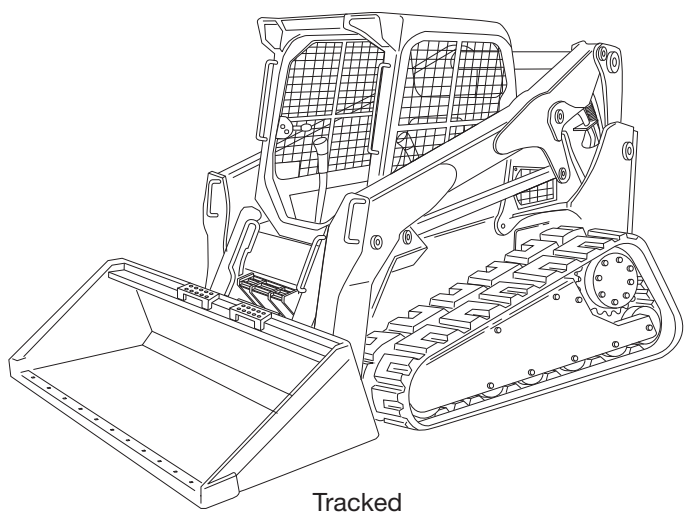
Types of Skid Steer Loaders

The skid steer loader is a self-propelled machine fitted with either wheels or tracks for use on different types of terrain. This highly maneuverable machine is often equipped with a bucket, pallet forks, or an approved attachment for specialized work. If your loader has a powered attachment, it is important to read the manufacturer's operating manuals pertaining to that attachment before operating.

When used normally, the skid steer loader excavates or loads through forward motion of the machine and lifts, transports and discharges material. To accommodate a wide range of conditions and personal preferences, some skid steer loaders have multiple control configurations, patterns and operating modes, each with unique operating characteristics.



Wheeled



Tracked

One-Call First

Call

Before starting any digging project, contact the 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.

Call before you dig—dial 811 (USA only) 1-888-258-0808 (USA & 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 the Work

Be aware of the lead time for marking in the work area. This time may vary from state to state and county to county. If you do not 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, The Occupational Safety and Health Administration (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 the jobsite.

APWA Underground Color Codes

Color	Description/Meaning
Red	Electric power lines, cables, conduit, lighting cables
Yellow	Gas, oil, steam, petroleum or gaseous materials
Orange	Communication, alarm or signal lines, cables or conduits
Blue	Potable water
Green	Sewers and drain lines
Purple	Reclaimed water, irrigation and slurry lines
White	Proposed excavation
Pink	Temporary survey markings

Follow a Safety Program

For Safe Operation

You must be a qualified and authorized operator for safe operation of this machine. You must clearly understand the written instructions supplied by the manufacturer, be trained — including actual operation — and know the safety rules and regulations for the jobsite. It is a good safety practice to point out and explain safety signs and practices to others, and to make sure they understand the importance of following these instructions.

Never operate while impaired by alcohol or drugs

⚠ **WARNING!** Drugs and alcohol affect operator alertness and coordination, and the ability to safely operate the equipment. **Never operate the machine while impaired by use of alcohol or drugs. Never knowingly allow anyone to operate the machine when their alertness or coordination is impaired.**

An operator taking prescriptions 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.

Be Alert!

Know where to get assistance. Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone. Know how to use a first aid kit and fire extinguisher/fire suppression system; know their location and practice getting to them. Ensure they have been properly tested and maintained.

Let others know where you will be working, and what time you will be returning. In case of an emergency, you want others to know where to find you.

Be Aware!

Take advantage of training programs offered.

Know the proper response to a fire or chemical spill on your machine.

Follow a Safety Program

Be Careful!

Human error is the result of many factors: carelessness, fatigue, sensory overload, preoccupation, unfamiliarity with the machine or attachments, or drugs and alcohol, to name a few. You can avoid death or serious injury caused by these and other unsafe work practices. Be careful; never assume accidents cannot happen to you.

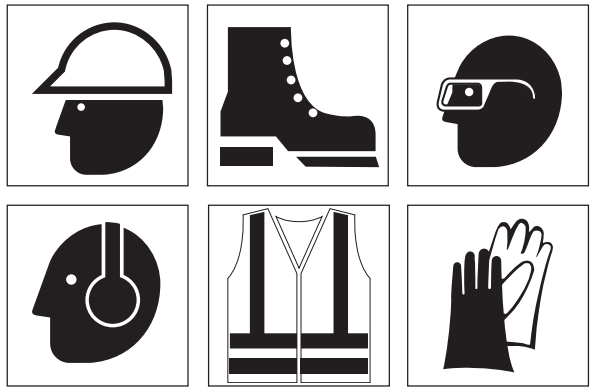
For your safety and the safety of others, act safely and encourage your fellow workers to act safely as well.

Protect Yourself

Wear all the 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 duty gloves.
- Hearing protection.
- Reflective clothing.
- Wet weather gear.
- Respirator or filter mask.



Wear whatever is needed to protect yourself — don't take chances.

⚠ **WARNING!** Avoid death or serious injury from entanglement. **Do not wear loose clothing or accessories that could catch on moving parts or controls.** Examples of items to avoid include flopping cuffs, dangling neckties and scarves, wallets attached to chains, jewelry and wrist watches.

Follow a Safety Program

Know the Rules

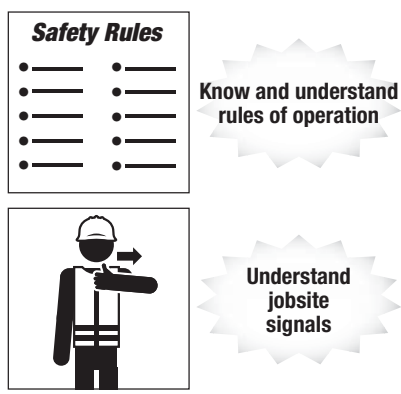
Most job sites have rules governing equipment use and maintenance. Before you start work at a new location, check with the supervisor or safety coordinator. Ask about the rules you will be expected to obey.

OSHA enforces federal laws within the United States that apply to the safe operation, application and maintenance of equipment on some jobsites. It is the employer's responsibility to comply with these laws. A federal representative may periodically inspect a jobsite to see that these laws are being followed.

There may be other local, state/provincial, federal laws or international organizations that regulate the use of this equipment, along with specific jobsite or employer rules. It is important that you know and comply with all applicable laws and rules, **including those requiring operator training and certification**.

These are some of the rules you must work by:

- Only qualified and authorized individuals may operate this equipment.
- Inspect your machine and attachments before each use as specified by the manufacturer and your employer.
- Know the capacity and operating characteristics of your equipment. Do not misuse it.
- Wear proper clothing and PPE. Check that others are also wearing appropriate clothing.
- All shields, guards, air filters, access panels and doors must be properly installed before each use.
- Know the rules regarding traffic at your jobsite. Know what all signs, flags, and markings mean. Know hand, flag, horn, whistle, siren, or bell signals, if used.
- Never modify or remove any part of the machine (except for service; then make sure the part is re-installed or replaced if defective or worn out).



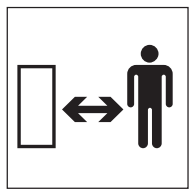
Follow a Safety Program

- **Never allow children to play near, ride on or operate the equipment.**
- Keep bystanders well clear of the operation.
- Know the work area before you use the equipment. Be aware of possible hazards.
- Only use attachments and parts that are approved by the manufacturer.
- Do not allow riders.
- Fasten seat belt or operator restraint before starting.
- Drive forward whenever possible.
- Always look in the direction of travel.
- Look before backing up.
- Carry the load low.
- Never leave the operator's seat without lowering the bucket or other attachment flat on the ground, or engaging the approved lift arm support device(s) and then stopping the engine and removing the ignition key, if equipped. (See page 33, **Safe Shutdown**.)
- Use three-point contact (handholds and steps) and face the equipment when mounting or dismounting. (See page 19, **Mount and Dismount Properly**.)
- Never use the loader bucket as a man lift/transport or work platform.

Fasten seat belt or operator restraint

Carry the load low

No riders



Keep bystanders away

Follow a Safety Program

Know the Equipment

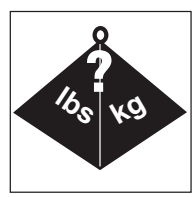
Read and understand the DANGER, WARNING, CAUTION and NOTICE safety labels and other informational signs on the machine and the attachments, and in the manufacturer's operating manuals. Ask your supervisor or dealer to explain any information you do not understand. Failure to obey safety instructions could result in death or serious injury.

Know the following about your equipment:

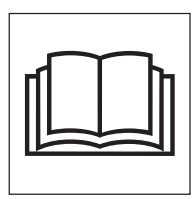
- Function, purpose and use of all controls.
- Correct operation speeds.
- Slope and uneven terrain capabilities and proper operation.
- Braking and steering characteristics.
- Turning radius and clearances.
- How to quickly stop equipment in an emergency.
- Rated operating capacity.

Keep in mind that rain, snow, ice, loose gravel, soft ground, slopes, and other site conditions can affect your machine's operating capabilities. Make sure you are thoroughly familiar with your machine's stability, braking, traction, and other handling characteristics under any conditions you are likely to encounter.

IMPORTANT: This manual covers safe practices for skid steer loaders equipped with a bucket, pallet forks, or simple attachments. If your machine is equipped with specialized or powered attachments, such as a snow blower, backhoe, stump grinder or others, it is important to read the manufacturer's operating and safety manuals pertaining to that attachment before using it.



Know machine capacity and operating characteristics



Read and understand manuals before operating

Prepare for Safe Operation

Check and Use All Available Safety Devices

To protect you and others around you, your machine may be equipped with the safety equipment listed below. Additional equipment may be required or some items may not apply, depending on attachments used, jobsite conditions or applicable jobsite rules. Check that each required item is securely in place and in operating condition:

- Falling Object Protective Structure (FOPS).
- Rollover Protective Structure (ROPS).
- Seat Belt.
- Operator seat/restraint bar(s)/interlock control system.
- Cab side-screens or windows.
- Special enclosures or accessories required for specific applications or jobsite conditions.
- Alternate exit (window).
- Grab handles.
- Lift-arm support device(s).
- Lights.
- Anti-skid tread/steps.
- Safety signs.
- Horn.
- Guards.
- Back-up alarm.
- Fire extinguisher.
- First aid kit.
- Rotating beacon.
- Windshield wiper/defroster.

Use them! Never remove or disconnect any safety device.

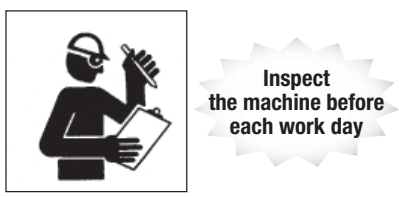
When using specialized attachments that may throw debris, such as a stump grinder or snow blower, make sure all cab openings are closed or covered with adequate protection, including impact-resistant glass, or polycarbonate (if required). Refer to the attachment's operating manual(s) for more specific information.

⚠ **WARNING! Never remove or modify a ROPS or FOPS, except when servicing the machine.** Serious injury or death could result.

Prepare for Safe Operation

Check the Machine

Before beginning your work day, inspect the machine and have all systems in good operational condition.



⚠ **WARNING!** Hydraulic system or part failure could cause unsupported equipment to fall. Avoid crushing injury from falling equipment. **Do not go under raised loader arm(s) unless it is properly supported according to the manufacturer's operating manual.**

- Perform daily and periodic service procedures as instructed by the equipment manufacturer.
- Check for broken, missing, loose, or damaged parts. Make necessary repairs.
- Check the tires or tracks for cuts, missing lugs, bulges, and correct pressure or track tension.
- Keep the steps and handholds clean and free of grease, oil, dirt, snow or ice.
- Check the parking brake for proper operation.
- Check condition and operation of attachment quick-coupling device. Perform daily cleaning and maintenance following manufacturer's instructions.
- Ensure shielding is properly installed and in good condition. Repair or replace if damaged or missing.
- Ensure work lights (if equipped) are kept clean. Check that all lights work properly.
- Ensure the horn and back-up alarm (if equipped) are operating correctly. Repair or replace if damaged.
- Ensure any Slow Moving Vehicle (SMV) signs, reflectors and warning lights are in good condition and can be clearly seen. Repair or replace if damaged.
- Ensure all tools or loose objects are removed or securely fastened while operating the machine.
- Check for damaged or leaky hydraulic systems. Repair or adjust as needed.

Hydraulic Fluid Injection Hazard

⚠ **WARNING!** Accidental injection of high-pressure oil into the hands or body is dangerous and could result in death or serious injury. **Use caution when checking hydraulic leaks as pressurized hydraulic fluid has enough force to penetrate skin, causing serious personal injury.**

If a leak is discovered:

- Ensure engine is turned off; relieve pressure in hydraulic circuit.
- Wear proper hand and eye protection.
- Visually examine the hydraulic hose or fluid lines in the vicinity of the leak for breaks or cracks. **Do not** use your hand to check for leaks.
- Repair or replace hydraulic lines per manufacturer's recommendation.

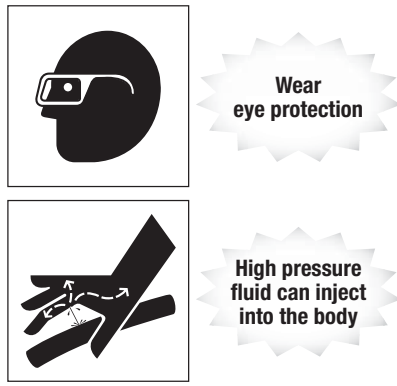
Fluid injection injuries are not always obvious. Victims have reported such injuries feel like a bee sting or splinter under the skin. If you suspect you have a fluid injection injury, do not take chances. Seek proper medical care immediately. If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury.

Check the Cooling System

When checking the cooling system, make sure the engine is turned off and is cool. Remove the key to prevent fans from unexpectedly starting. Ensure the coolers and engine compartment are clean and free from debris, which could ignite and cause a fire.

If the machine is air-cooled, be sure the cooling unit has an unobstructed air flow. If it is liquid-cooled, check coolant level (at overflow tank, if provided).

⚠ **WARNING! Allow the radiator to cool before checking the level**. Hot radiator fluids could escape as steam and burn you. (See page 39, **Engine Coolant Hazards.**)



Clean Up

⚠ **WARNING!** Avoid serious injury or death. **Always lower the lift arm(s) or secure with the approved lift arm support device(s) and stop engine before cleaning any part of the machine**.

Clean windows, lights, and safety signs.

Make sure the operator's area, steering levers, pedals, joysticks, steps, and grab handles are clean. Oil, grease, snow, ice, mud, or debris in these areas could cause you to slip and fall, or lose control of the machine. Clean your boots of excess mud before entering the machine.

Remove all personal items or other objects from the operator's area. Secure these items in a toolbox or remove them from the machine.

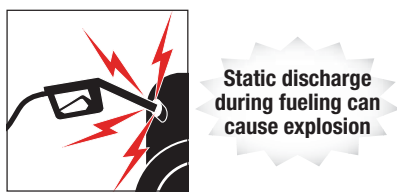
Use Caution When Fueling

⚠ **WARNING!** Avoid injury from fire or explosion. **Never fill the fuel tank with the engine running, while smoking or when near an open flame**.

Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately.

Be sure to use the correct type and grade of fuel.

Ground the fuel funnel or nozzle against the filler neck to prevent sparks that could ignite fuel vapors. Be sure to replace the fuel fill cap (if equipped) when you are done.



Ultra-Low Sulfur Diesel (ULSD) Fuel Hazard

Avoid Static Electricity Risk When Fueling

⚠ **WARNING!** Ultra-Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations. Avoid death or serious injury from fire or explosion; **consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices.**

Prepare for Safe Operation

Know the Working Area

Learn as much about your working area as possible.

Check at Ground or Floor Level

Inspect the surface over which you will travel. Look for holes, drop-offs and obstacles. Look for rough spots or hidden obstacles on surfaces which could cause a collision or loss of control. Look for weak spots on docks, ramps or floors. Look for oil spills, wet spots, and slippery surfaces. Look for soft soil, deep mud or standing water. Watch for anything that might make you lose control or cause the machine to roll over.

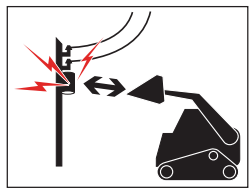
When operating inside a building, make certain you are within weight limitations of floors and ramps. Be aware of overhead clearances, doorways, aisles, etc. Plan travel routes ahead of time, in order to make sure you can see and protect bystanders. Pick up debris that can puncture tires or damage tracks.

Plan Your Work

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

Check Overhead

Check the clearances of doorways, canopies, and overheads. Know exactly how much clearance you have under power and telephone cables. (See chart below).



Stay away from energized power sources

Required Clearance for Operation Near High-Voltage Power Lines

Normal Voltage kV (Phase to Phase)	Minimum Approach Distance†	
	ft.	(m)
Up to 50 kV	10	(3.0)
Over 50 to 200 kV	15	(4.6)
Over 200 to 350 kV	20	(6.1)
Over 350 to 500 kV	25	(7.6)
Over 500 to 750 kV	35	(10.7)
Over 750 to 1,000 kV	45	(13.7)
Over 1,000 kV	*	*

†Environmental conditions such as fog, smoke or precipitation may require increased clearances.

*As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

Prepare for Safe Operation

⚠ **DANGER!** Contact with energized power lines will cause serious injury or death. **Never approach overhead power lines with any part of your machine unless all local, state/provincial and national (OSHA) required safety precautions have been taken**. Always use extreme caution around power lines.

Know your margin of safety. If possible, have power to lines disconnected. If not possible, request a signal person for guidance.

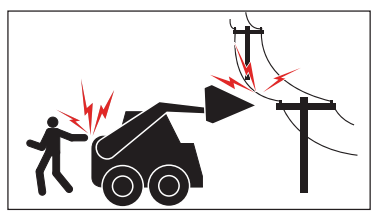
⚠ **DANGER!** Electrocution will result from touching or being near a machine that is in contact with, or near, an electrical source. **Stay away from any machine in contact with electrical wires until you are told it is safe to approach.**

Other Buried Hazards

CHECK UNDERGROUND. Know the location of gas lines and water pipes, or cables before digging.

⚠ **WARNING!** A cut fiber optic cable could cause serious eye injury if you look into the damaged end of the cable. **Do not look into damaged fiber optic cables!**

Always contact your local One-Call system and any utility companies that do not subscribe to One-Call before doing any digging. (See page 7, **One-Call First**.)



Avoid electrocution, stay clear of energized power lines

Locate all utilities, maintain a safe distance

Start Safely

Mount and Dismount Properly

⚠ **WARNING!** Avoid injury or death from being caught between the lift arm attachment and the machine. **Never mount or dismount a loader unless the lift arm(s) are lowered or secured by approved lift arm support device(s), and the engine is turned off.**

Always use three-point contact when mounting or dismounting the machine. Three-point contact means one hand and two feet, or two hands and one foot, in contact with the machine at all times.

Never mount or dismount while carrying tools or objects that prevent three-point contact. Put parts or tools down. Maintaining proper contact, climb or dismount, and then pick up the object.

Face the machine when you enter or leave the machine.

Clean shoes and wipe hands. Clean steps and handholds of chemical residue, snow, ice, mud or oil.

During mounting and dismounting:
- Use handholds and step plates.
- Never use steering wheels, joysticks or controls as handholds.
- Never jump on or off the machine.
- Never mount or dismount from a moving machine.

Warn Personnel Before Starting

Before starting, walk completely around the machine. **Make sure no one is under the machine, on it, or close to it**. Let others know you are starting up and don't start until everyone is completely clear of the machine. As the equipment operator, you are responsible for the safe use of the machine, so always make sure you have communicated your work plans to others on the site.

Use three points of contact when mounting or dismounting

Avoid falls, clean up slippery areas

Start Safely

Starting the Engine

⚠ **WARNING!** Start the engine from the operator's seat only. **Never attempt to start the engine by shorting across starter terminals.** The machine may move unexpectedly, which could cause serious injury or death to anyone in its path.

Know the exact starting procedure for your machine. See the manufacturer's operating manual(s) for starting.
- Sit in the operator's seat and adjust the seat so you can operate all the controls properly.
- Fasten the seat belt/operator restraint.
- Familiarize yourself with warning devices, gauges and operating controls.
- Lower the operator seat/restraint bar(s) (if equipped).
- Make sure controls are in the neutral/locked position.
- Clear the area of all persons.
- Start the engine following the instructions in the manufacturer's operating manual(s).
- If necessary to run the engine or operate the machine within an enclosed area, be sure there is adequate ventilation.

⚠ **WARNING!** Exhaust fumes can kill. **Do not breathe exhaust fumes!**

Starting Aids

If you have trouble starting the engine and need to use jumper cables, follow the instructions in manufacturer's operating manual(s). **Jump-starting is a two-person operation.** The operator must be in the operator's seat when jump-starting so the machine will be under control when the engine starts.

⚠ **WARNING!** A battery explosion or a run-away machine could result from improper jump-starting procedures. (See page 41, **Battery Hazards**.)

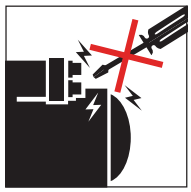
Before starting, walk completely around loader

To avoid explosion, follow proper jump-starting procedures

Start Safely

Ether/cold start fluid is HIGHLY FLAMMABLE. Before using it, always read the instructions on the ether/cold start fluid container and the instructions in the manufacturer's operating manual(s).

⚠ **WARNING!** Avoid injury from explosion or fire. If the engine is equipped with a glow plug pre-heater or other intake manifold type pre-heater, follow manufacturer's instructions before using ether/cold start fluid.



Never start engine by shorting across starter terminals

After Starting Engine

Observe gauges, instruments, and warning lights to assure that they are functioning and their readings are within the operating range.

Run an Operating Check

Do not use a machine that is not in proper operating condition. It is your responsibility to check the condition of all systems and to run the check in a safe area.

Test Controls

Loaders come equipped with various control configurations, patterns and operating modes, each with their own handling characteristics. Some have selectable or configurable controls, to suit personal preferences or specific applications. Make sure that you know which control pattern you have selected and that you understand how the machine will handle when using that control pattern.

Make sure the machine is operating properly by doing the following:

- With the control levers or joysticks in neutral, test engine speed control.
- Operate each pedal, lever or joystick to make sure all lift arm and tilt functions are correct.
- Operate the travel control lever(s) or joysticks to ensure correct operation in forward and reverse. Test steering to the right and to the left, while moving slowly in a clear, safe area.

⚠ **WARNING!** Before operating the machine under working conditions, **be certain you can control both the speed and direction of the machine.** Any loss of control could result in death or serious injury.

Operate Safely

Masked Visibility Areas

Machines have areas where the operator's visibility of the job site can be affected by the machine itself. ROPS posts, attachments, lift arms, even items in the cab, could limit your view of the surrounding area and possibly mask hazards or people around you. These masked visibility areas vary from machine to machine, and it is very important you be aware of these areas before operating your machine.

Follow these safety precautions to reduce the hazards posed by masked visibility areas:

- Pay particular attention when raising or lowering the bucket or other attachment, because masked visibility areas can change.
- Look around the machine before operating. Objects near the machine and close to the ground can be difficult to see from the cab.
- Always look in the direction of travel, including reverse. A back-up alarm is no substitute for looking behind you when operating the machine in reverse.
- Keep bystanders away, even if your machine is equipped with a back-up alarm.
- Keep the lift arm(s) low while traveling.

Remember These Rules

Do not overload the bucket or attachment, or carry a load which could fall from the bucket or attachment. Keep loaded bucket level as lift arm(s) are moved and as loader moves up or down, on slopes and on ramps.

Different attachments can change the weight distribution of the loader. They can also affect its stability and handling response. Be sure you can keep the loader under complete control.

Install Attachments Properly

When changing buckets or installing attachments follow the manufacturer's instructions. Make sure all connectors are securely fastened. Tighten all bolts, nuts and screws to torque values recommended by the manufacturer.

Avoid crushing injuries

Operate Safely

⚠ **WARNING!** Failure to properly attach the machine coupler could result in serious crushing injury or death. **Properly secure the attachment to the machine coupler to prevent it from falling off.**

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 and locked to the attachment, both mechanically and hydraulically, before operating.

⚠ **WARNING! Never modify your loader's ROPS**. To do so could result in serious injury or death. (See page 13, **Check and Use All Available Safety Devices**.)

Know the pinch points and rotating parts on the loader; awareness on your part can prevent accidents.

Remember the Other Person

Never allow an untrained or unqualified person to operate the machine. If operated improperly, this machine can cause serious injury or death.

Never use the bucket as a work platform

⚠ **WARNING!** The loader is a one-person machine. Avoid death or serious injury — **never permit riders! Never use the bucket, forks, or other attachments as a work platform or personnel carrier**.

⚠ **WARNING!** To avoid serious injury or death, never lift, swing, or move a load over anyone. **Keep others away from your operation.**

Back up Safely

Check that the back-up alarm, if equipped, is working properly. Remember, **a back-up alarm is not a substitute for looking to the rear when operating the machine in reverse**. Always look around before you back up the machine. Be sure that everyone is in the clear. Drive forward whenever possible. **ALWAYS LOOK IN THE DIRECTION OF TRAVEL**.

Operate Safely

Follow Safe Operating Practices

Make these safe practices part of your daily routine:

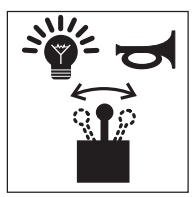
- Keep your seat belt/operator restraint fastened.
- Never leave the operator's seat without lowering the bucket or other attachment flat on the ground, or engaging the approved lift arm support device(s) and then stopping the engine and removing the ignition key, if equipped. (See page 33, **Safe Shutdown**.)
- Operate the controls smoothly — don't jerk the steering levers or joysticks.
- Carry the load low.
- Avoid sudden stops, starts or turns.
- Use care and good judgment.
- Never attempt to operate the controls unless properly seated in the cab.

⚠ **WARNING!** Avoid Serious injury or death! **Keep your entire body inside the operator's cab while operating the machine.** Never work with your head, arms, feet or legs beyond the operator's compartment.

Use Attachments Safely

Most loaders can be operated with a wide variety of attachments. These include buckets, pallet forks, augers, snow plows and many others. Make sure the attachment is approved by the manufacturer for use on the machine you are operating. If you are not sure, ask your supervisor or contact your dealer. Be sure to read the manufacturer's operating manuals pertaining to that attachment before using it. Make sure the attachment is properly coupled to the machine before using it.

Stay alert! Should something break, come loose, or fail to operate on your machine, stop work. Lower the lift arm(s), shut off the engine and inspect the machine.



Operate instruments and controls smoothly

Make sure attachment is properly coupled

Watch Out for Hazardous Working Conditions

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

⚠ **WARNING!** Avoid death or serious injury! **Never undercut a high bank**.

Extreme caution should be used when working along the tops of banks or slopes. Always operate the loader perpendicular to the bank. Keep away from the edge.

⚠ **WARNING! Never operate the machine close to the edge of an overhang or gully.** The edges could collapse or a slide could occur causing serious injury or death.

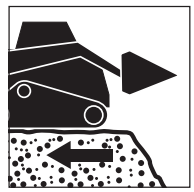
Use caution when working along docks, runways, banks and slopes. Keep away from the edges of drop-offs.

Stay alert! Cave-ins can be hazardous!

Use caution when working beneath an overhang.

Use caution when backfilling. Do not get too close to the trench wall. The combined weight of the equipment and the load could cause the trench wall to give way.

Never undercut a high bank



Operate perpendicular to banks – stay back from the edge

When working near hazardous conditions, have a spotter work with you to look for dangers. Make certain they stay a safe distance from your machine.

Be careful when handling materials such as rocks, gas cylinders, barrels, etc. Lifting too high and rolling the bucket too far back could result in these materials falling into the operator's compartment. Special enclosures to restrict material from entering cab openings (with a polycarbonate door, for example) may be available for use with certain attachments. Check with your dealer.

Operate Safely

Traveling on Jobsite

Take it slow and easy when traveling through congested areas. Traffic courtesy pays off.

Give the right-of-way to loaded machines. Maintain a safe distance from other machines. Pass cautiously.

Don't obstruct your vision when traveling or working. (See page 22, **Masked Visibility Areas**.) Carry the bucket LOW for maximum stability and visibility while traveling. Operate at speeds slow enough so you have complete control at all times. If possible, avoid travel over rough, slippery or uneven terrain, and on hillsides.

Travel Safely

Always have the lift arm(s) down when traveling or turning. Plan the operation to load, unload and turn on flat, level ground.

Never ram the bucket into a material pile. Skid steer loaders have more force at slow speeds.

When traveling over rough terrain, **SLOW DOWN** to prevent losing control.

Use caution – stay safely away from bank or excavation edge

Keep loads low when traveling

Both tracked and wheeled loaders can drop down suddenly if you are traveling over uneven surfaces like curbs, ramps or similar types of surfaces. If you cannot avoid these types of operating conditions, drive slowly when you approach these types of uneven surfaces to avoid spilling your load or tipping the machine. **ALWAYS CARRY THE LOAD LOW.**

Raise loads slowly and at an even rate, and be ready to lower the load quickly if the machine becomes unstable.

Avoid steep slopes or unstable surfaces. If you must drive on a slope, keep the load low and proceed with extreme caution. Do not drive across an excessively steep slope under any circumstances. Travel straight up and down the slope. Before operating on slopes, check the surface conditions for adequate traction. Loss of traction can cause the machine to slide and tip.

⚠ **WARNING!** Avoid death or serious injury. **Travel up and down slopes with the heavy end of the machine pointed uphill.**

Loaders are heavier on the rear end when unloaded and heavier on the front end when fully loaded, so remember this simple rule:

- **Loaded** bucket: Machine pointed uphill.
- **Empty** bucket: Machine pointed downhill.

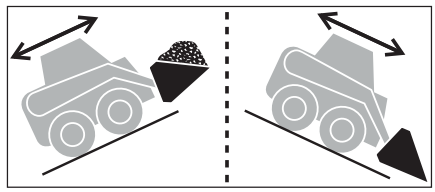
Check machine manufacturer's recommendations.

A skid steer loader's center of gravity will shift as loads are raised and lowered, so do not assume it will handle the same way when the load's elevation or position has changed. Avoid changing direction of travel, making sharp turns or traveling on steep slopes with a raised load. If you are working on a ramp or slope, locate a flat, level area so you can turn, load and unload safely.

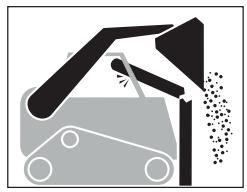
⚠ **WARNING!** Avoid death or serious injury. **Keep the load as low as possible** for maximum stability AND VISIBILITY.

⚠ **WARNING!** Avoid death or serious injury. **Make sure you can see where you are going**. Never travel with a load obstructing your vision.

⚠ **WARNING! Never unload material over an obstruction**, such as a post, that could enter the operator cab. This could cause the machine to tip forward or flip, causing serious injury or death.



Keep heavy end of loader uphill



Never unload over objects that can enter cab

Rules of the Road

When traveling on public roads or streets, obey all traffic regulations applicable to loader use and classification.

Make sure lights and warning signs are in place and visible. Make sure a Slow Moving Vehicle (SMV) emblem is installed and visible to any vehicle approaching from the rear.

Find out if you must use an escort vehicle. Place the bucket in the transport position. Approach intersections with caution; observe speed and traffic control signs. Avoid panic stops and sharp turns.

Like any responsible operator, be considerate of other drivers. If traffic backs up behind you, it is a good idea to pull over periodically and allow traffic to pass when it is safe to do so.

Stop at all railroad crossings and look both ways before proceeding. Never park in traffic areas. If it is necessary to stop at night, pull off the road and set up flares or reflectors. When driving at night, use appropriate lights.

Watch Out for Obstacles

Adjust your speed to conditions. Go around rocks and stumps. Avoid crossing ditches, curbs or exposed railroad tracks. If obstacles are unavoidable, reduce speed, raise bucket or attachment a short distance (if needed for clearance) and cross at an angle. If the loader bucket is being used to scrape pavement, check for hidden obstacles that could cause a collision.

Keep your skid steer loader under control. Keep speed to a minimum when visibility is poor.

Before entering underpasses, tunnels or bunkers, check for oncoming traffic or obstructions.

Obey traffic regulations

Operate Safely

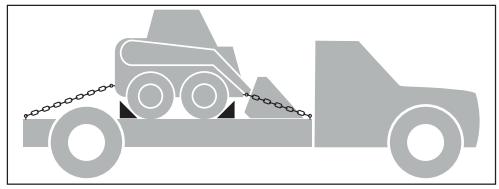
Loader Transporting Safety Tips

Always wear your seat belt/operator restraint when loading or unloading your machine from a transport device, such as a flatbed truck.

When transporting a loader, follow the manufacturer's recommended loading and unloading procedures.

Several precautions are applicable to all machines:

- Keep bystanders away.
- Load and unload on a level surface.
- Maintain proper visibility by loading or unloading in well-lit areas, and away from other vehicles, equipment or buildings.
- Block transport vehicle so it cannot move.
- Ensure trailer bed and ramps are in good condition.
- Use ramps of adequate size and strength, with a low angle and proper height.
- Rear of trailer must be blocked or supported.
- Keep trailer bed and ramps free of clay, oil, ice, snow, and other materials which can become slippery.
- Back the machine up the ramp onto the transport vehicle. If the machine is equipped with a heavy attachment it may be necessary to drive forward onto the transport vehicle.
- Cover or remove rear-facing SMV sign on the skid steer loader, if equipped, to avoid confusing drivers following the transport vehicle.
- Chain and block the machine securely for transport. Use tie-down points as marked on the machine by the manufacturer. Follow the manufacturer's instructions in the operator's manual for tying down.
- Unload the machine by driving off in the opposite direction; do not turn the machine around.



Chain and block loader securely for transport

Operate Safely

Exhaust Fumes in a Closed Space Can Kill

Vent exhaust and assure a flow of fresh air when an internal combustion engine is used in a closed space.

⚠ **WARNING!** Exhaust fumes from diesel, gasoline or LP gas engines can kill. **Do not breath exhaust fumes from any kind of engine.**

Operating in Flammable/Explosive Atmospheres

⚠ **WARNING!** A standard loader or loader equipped with a spark arrestor/spark arresting muffler cannot be operated in flammable or explosive atmospheres. Using them in explosive atmospheres can result in fires and/or explosions which could cause serious injury or death.

Use only an approved skid steer loader with a label designation of G, GS, D, DS, DY, LP, LPS, G/LP, or GS/LPS. See Code of Federal Regulations (OSHA) 29 CFR Part 1910.178 to determine permissible areas where these machines can be operated.

Do not operate in explosive/flammable atmosphere

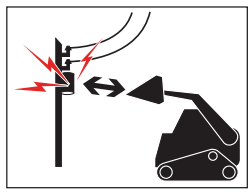
Ventilate work area

Electrical Hazards Overhead and Underground

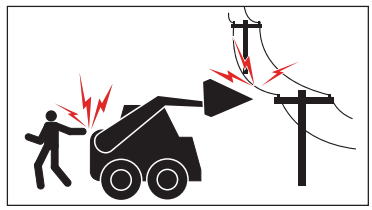
⚠ **DANGER!** Contact with energized power lines will cause serious injury or death. **Never approach overhead power lines with any part of your machine unless all local, state/provincial and national (OSHA) required safety precautions have been taken**. Always use extreme caution around power lines.

Know your margin of safety. (See **chart** on page 17.) If possible, have power to lines disconnected. If not possible, request a signal person for guidance.

⚠ **DANGER!** Electrocution will result from touching or being near a machine that is in contact with, or near, an energized electrical source. **Stay away from any machine in contact with electrical wires until you are told it is safe to approach.**



Stay away from energized power sources



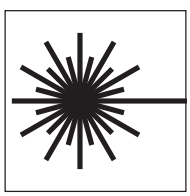
Avoid electrocution, stay clear of energized power lines

Locate all utilities, maintain a safe distance

Other Buried Hazards

CHECK UNDERGROUND. Know the locations of gas lines, water pipes, and cables before digging.

Always contact your local One-Call system and any utility companies which do not subscribe to One-Call before doing any digging. (See page 7, **One-Call First**.)



Do not look into fiber optic cables

⚠ **WARNING!** Fiber optic cables are often made of glass which can be very sharp when broken. They frequently carry infrared or laser light, which may not be visible, but is still very dangerous. To avoid serious injury, **do not handle or look directly into the exposed ends of damaged fiber optic cables!**

Call before you dig—dial 811 (USA only) 1-888-258-0808 (USA & Canada)

Shut Down Safely

Select a Proper Parking Site

When shutting down, select level ground whenever possible. If you must park on a slope or incline, position the loader at right angles to the slope, engage the parking brake, lower the bucket (and other attachments) to the ground and block the wheels or tracks.

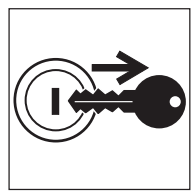
If arm(s) need to be in the raised position for maintenance, remove attachments as specified in the manufacturer's operating manual and secure the arm(s) using the approved lift arm support device(s).

⚠ **WARNING!** Avoid death or serious injury. **Never leave the loader unattended with the engine running or the lift arm(s) raised**.

Safe Shutdown

The detailed shutdown procedure is given in your manufacturer's manual(s). In general, this includes:

- Stop loader.
- Lower bucket or other attachment flat on the ground.
- Ensure all wheels or front of tracks are on the ground.
- Position controls in neutral or locked position.
- Engage parking brake.
- Idle engine for short cool-down period.
- Stop engine and remove ignition key (if equipped.)
- Cycle hydraulic controls to eliminate pressure.
- Raise operator seat/restraint bar(s) (if equipped).
- Make sure controls are locked in neutral (if equipped).
- Unbuckle seat belt/restraint.
- Lock covers and enclosures.
- Shut off master electric switch (if equipped).
- When you leave the loader, always maintain three-point contact with the steps and grab handles. Face the loader as you dismount. Never jump off machine.
- Block wheels or tracks if on a slope or incline.



Perform Maintenance Safely

Know What You're Doing

Maintenance on this type of machine is not for inexperienced or untrained personnel. It can be hazardous unless performed properly. Be sure you have the necessary skill, information, correct tools and proper equipment to do the job safely.

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

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

If you have been authorized to perform maintenance, **read the manufacturer's operating and service manuals.** Study the instructions: check the lubrication charts, examine all the instruction messages on the machine.

Protect Yourself

Wear all the personal protective clothing and PPE issued to you or called for by job conditions.

You may need:

- Hard hat.
- Safety shoes.
- Safety glasses, goggles or face shield.
- Heavy duty gloves.
- Hearing protection.
- Reflective clothing.
- Wet weather gear.
- Respirator or filter mask.

Wear whatever is needed to protect yourself. Do not take chances.

Perform Maintenance Safely

⚠ **WARNING!** Avoid 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, during grinding and while 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 and follow manufacturer's instructions when you disassemble spring-loaded components or work with battery acids. Keep pockets free of all objects that could fall out and drop into machinery.

Handle tools and heavy parts sensibly, with regard for the safety of yourself and others. Lower items; don't drop them.

Avoid rotating parts

Wear eye protection

Do not loosen radiator cap until cool

Perform Maintenance Safely

Prepare the Work Area

- Position the machine 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

Stored energy sources (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, etc.) must be controlled or reduced to a practical minimum before performing any maintenance, repair or service procedures.

Safety practices to prevent potential injuries from energy-releasing sources include:

- Place controls in NEUTRAL or LOCKED position before shutting off engine.
- Set parking brake or block wheels.
- Allow all moving parts to stop.
- Shut off engine.
- Relieve hydraulic system pressure by moving controls several times in all directions.
- Lock ignition, remove key (if equipped) and take it with you.
- Look and listen for evidence of moving parts before dismounting.
- Shut off master electrical switch (if equipped).
- Securely support or block up machine before working underneath machine or other lifted components.
- Securely support, block up, or lock up other components with approved locking devices before working near or underneath them.
- Relieve pressure before disconnecting or disassembling any pressurized system.
- Block or relieve spring pressure before disassembling any spring-loaded mechanism.
- Avoid flames, sparks, or smoking near any fuel, hydraulic fluid or other flammable material such as spraying debris.

Avoid falls, clean slippery surfaces

Attach a “DO NOT OPERATE” warning tag to the control levers. Lock out the unit according to the manufacturer’s operating manual. If there is a key, remove it and take it with you.

Install approved support device(s) when working under or near raised equipment.

⚠ **WARNING!** Unsupported raised machines or other equipment may drop unexpectedly. **Never go under equipment when raised unless supported by an approved support device(s).** Death or serious crushing injury could result from falling equipment.

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

⚠ **WARNING!** Avoid injury or death. **Never work on machinery with the engine running unless instructed by the manufacturer’s manuals for specific service.**

Use a “DO NOT OPERATE” tag

Common Maintenance Safety Practices

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.

Ventilate work area

If you do not have an exhaust pipe extension, make sure you open doors and windows to get plenty of outside air into the area.

⚠ **WARNING!** Exhaust fumes contain carbon monoxide which could be deadly if inhaled. **Never operate any type of engine without proper ventilation.** EXHAUST FUMES CAN KILL.

Perform Maintenance Safely

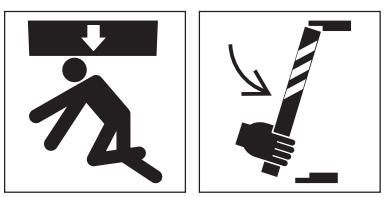
Use Jacks and Hoists Carefully

Safety stands or blocks must be located on a rigid part of the machine. Do not position stands under axles or wheel supports that may rotate.

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

If you must work beneath raised equipment, always use wood blocks, jack-stands or other rigid and stable supports. When using jacks or hoists always be sure they are adequately supported.

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.



Avoid crushing, use proper support for raised equipment

No smoking and no open flames

Fuel Hazards

⚠ **WARNING!** Avoid serious injury or death. **Always use approved fuel containers and/or fuel dispensing equipment to reduce the risk of explosion or fire.**

Always 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.

Perform Maintenance Safely

Ulra-Low Sulfur Diesel (ULSD) Hazard

⚠ **WARNING!** Ultra-Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations. Avoid death or serious injury from fire or explosion; **consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices.**

Engine Coolant Hazards

⚠ **WARNING!** Avoid serious injury or death. Liquid cooling systems build up pressure as the engine gets hot, so **use extreme caution before removing the radiator cap.**

- 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 completely.

Remove radiator cap slowly

Hydraulic System Hazards

Be sure to follow manufacturer's instructions for relieving fluid pressure before performing any maintenance. The hydraulic system is pressurized whenever the engine is on and may hold pressure even after the engine is shut off. Cycle hydraulic controls, including auxiliary hydraulic control (if equipped), after the engine is shut off.

Check for leaks and inspect hoses

During inspection of the hydraulic system:

- Wait for fluid to cool before disconnecting the lines. Hot hydraulic fluid can cause SEVERE BURNS.
- Wear appropriate eye protection. Hydraulic fluid can cause permanent eye 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

Hydraulic Fluid Injection Hazard

⚠ **WARNING!** Accidental injection of high-pressure oil into the hands or body is dangerous and could result in death or serious injury. **Use caution when checking hydraulic leaks as pressurized hydraulic fluid has enough force to penetrate skin, causing serious personal injury.**

If a leak is discovered:

- Ensure engine is turned off; relieve pressure in hydraulic circuit.
- Wear proper hand and eye protection.
- Visually examine the hydraulic hoses or fluid lines in the vicinity of the leak for breaks or cracks. **Do not** use your hand to check for leaks.
- Repair or replace hydraulic lines according to the manufacturer's recommendations.

High pressure fluid can inject into the body

Fluid injection injuries are not always obvious. Victims have reported such injuries feel like a bee sting or splinter under the skin. If you suspect you have a fluid injection injury, do not take chances. Seek proper medical care immediately. If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury.

Electrical System Hazards

Light Bulbs and Illumination

Some machines are equipped with High-Intensity Discharge (HID) Xenon light bulbs which operate at very high voltage. Do not begin installation of HID-Xenon lamps unless the lamps are turned off, the engine is turned off, the key is removed (if equipped), and you are wearing appropriate eye protection.

⚠ **WARNING! Do not look directly into HID-Xenon lamps.** Eye damage could occur.

Wear gloves and safety glasses when handling bulbs. Dangerous voltage sparks may occur and cause injury or damage to the connector. See manufacturer's warnings packaged with replacement bulbs.

Perform Maintenance Safely

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.

Battery Hazards

The liquid in batteries contains acid, which is a POISON and could cause SEVERE CHEMICAL BURNS.

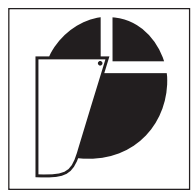
Avoid injury:

- Wear a face shield to prevent contact with your eyes.
- Wear chemical-resistant gloves and clothing to keep 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 chemical-resistant 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,** drink large quantities of water or milk. DO NOT induce vomiting. Seek medical attention immediately.

Wear hand protection



Wear face protection

Perform Maintenance Safely

Avoid Explosion

⚠ **WARNING!** Avoid 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 them away from arcs, sparks and open flames.
- Provide adequate ventilation.

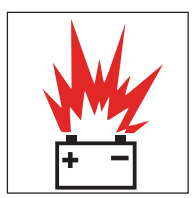
Never check the battery by placing a metal object across the battery posts. The resulting spark could cause an explosion.

⚠ **WARNING!** Avoid serious injury from battery explosion. **Do not charge a battery or jump-start the engine if the battery is frozen.**

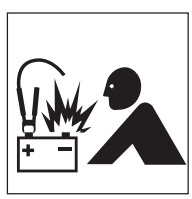
Warm to 60°F (15.5°C) or the battery may explode and could cause serious injury.

Safety rules during battery jump-starting:

- Follow the instructions for proper battery jump-starting, as specified in the manufacturer's manual.
- Be sure the machines 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, remove the cables in reverse order of connection (e.g., final connection first).



Avoid sparks and open flames near batteries



When jump-starting, observe polarity and make final connection at ground point

Perform Maintenance Safely

Tire and Wheel Maintenance

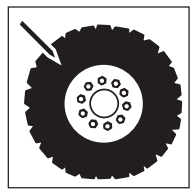
Check your tires and wheels daily because the stability of the machine can be dramatically affected by tire pressure or damage to tires or wheels.

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.

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.

⚠ **WARNING!** The types of wheels and tires usually found on this equipment require special care when servicing to prevent death or serious injury. **Do not inflate the tires above the recommended pressure.**



Check tires and wheels for damage

Maintain proper tire pressure

Perform Maintenance Safely

Keep wheel lug nuts tightened to manufacturer's recommendations.

An increase in tire pressure during operation is normal, and should NOT be reduced.

Never reinflate a tire that has been run flat or seriously under-inflated without removing the tire from the wheel. Have the tire and wheel closely inspected for damage before remounting.

Avoid tire explosion

When adding air to a tire, do so from a distance. Always use a long hose with a self-attaching chuck; stand away from the tire sidewall and to one side as far as possible.

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

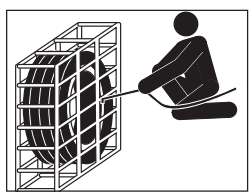
Never cut or weld on a wheel with an inflated tire mounted on it. This could cause explosive decompression.

Check that the tire size and wheel are correctly matched.

When replacing the tires, ensure the tires are of the appropriate rating specified by the manufacturer.

⚠ **WARNING!** Avoid death or serious injury. **Always use a safety cage or cable restraints when reinflating a repaired tire.**

Tires should not be operated at speeds higher than their rated speed.



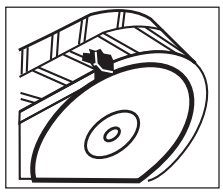
Use safety devices when reinflating tires

Perform Maintenance Safely

Track Maintenance

Track tension is important for good track performance, reducing excessive track wear and preventing tracks from derailing.

Tracks under tension can store an incredible amount of energy, and although some machines have automatic track tensioners, special tools and procedures may be required to check or adjust track tension.



Removing and installing tracks also requires following safe and proper servicing procedures. Always follow the manufacturer's instructions for track maintenance and servicing, including adjusting track tension.

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

Roll-Over Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) Safety Precautions

Do not remove the ROPS/FOPS except for service. Reinstall them correctly before allowing the machine back into service.

Do not modify ROPS/FOPS in any manner. Unauthorized modifications such as welding, drilling, cutting or adding attachments could weaken the structure and reduce your protection. Replace ROPS/FOPS if subjected to rollover or damage. Do NOT attempt to repair them. See the manufacturer's manual(s) for complete instructions and inspection requirements.

Perform Maintenance Safely

Complete Service and Repairs Before Machine is Released

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

Are there any missing cotter pins, washers, locknuts, etc.? Are there any parts left over?

Start the engine and check for leaks. (See page 39, **Hydraulic System Hazards**.) Operate all controls to make sure the machine is functioning properly. Test the machine if necessary. After testing, shut down and check the work you performed.

Recheck all fluid levels before releasing the equipment for operation.

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

Install all guards, covers, and shields after servicing. Refill and recharge pressure systems only with manufacturer-approved or recommended fluids.

Final Word to the User

You have just finished reading the AEM Skid Steer Loader 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 skid steer loader easier and safer for you.

Many pictorials in this safety manual can be downloaded at http://pictorials.aem.org.

For additional publications, visit our website at www.safetymaterials.org.

AEM
ASSOCIATION OF
EQUIPMENT MANUFACTURERS

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