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GEHL

Form No.
50950106
AP0313
English

R190
R220
R260

Skid-Steer Loaders

Operator's Manual

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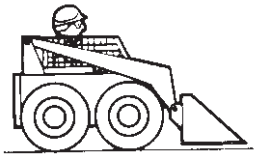
Manitou Americas, Inc., in cooperation with the Society of Automotive Engineers, has adopted this Safety Alert Symbol to pinpoint precautions which, if not properly followed, can create a safety hazard. When you see this symbol in this manual or on the machine itself, you are reminded to BE ALERT! Your personal safety is involved!

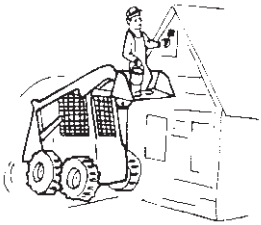
Operators must have instructions before running the machine. Untrained operators can cause injury or death.

WRONG



Never use loader without ROPS/FOPS. Never modify the ROPS/FOPS structure.

WRONG

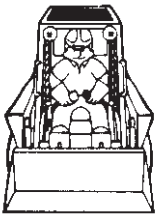


Never use the loader to lift personnel.

CORRECT

Read Operator's Manual before using machine.

CORRECT



Always fasten seatbelt snugly. Always keep feet on the floor/pedals when operating loader.

WRONG

Do not use loader around explosive dust or gas, or where exhaust can contact flammable material.

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R190, R220, R260 Skid-Steer Loader Operator's Manual

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Loader Model Number	
Loader Serial Number	
Engine Serial Number	

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CHAPTER 1

INTRODUCTION

This Operator's Manual provides the owner/operator with information for operating, maintaining and servicing models R190, R220 and R260 skid-steer loaders. More important, this manual provides an operating plan for safe and proper use of the machine. Major points of safe operation are detailed in the *Safety* chapter of this manual.

Users should read and understand the contents of this manual completely and become familiar with the machine before operating it. Contact your authorized Gehl dealer if you have any questions concerning information in this manual, require extra manuals, and for information concerning the availability of manuals in other languages.

Throughout this manual information is provided set in *italic* type and introduced by the word ***Note*** or ***Important***. Read carefully and comply with those messages – it will improve operating and maintenance efficiency, help avoid breakdowns and damage, and extend the machine's life.

A manual storage box in the operator's compartment behind the seat holds the Operator's Manual and AEM Safety Manual (also available in Spanish). Please return the manuals to this box and keep them with the unit at all times. If this machine is resold, these manuals should be given to the new owner.

The attachments and equipment available for use with this machine have a wide variety of applications. Read the manual provided with the attachment to learn how to safely maintain and operate the equipment. Be sure the machine is suitably equipped for the type of work to be performed.

Do not use this machine for any applications or purposes other than those described in this manual or those applicable for approved attachments. If the machine is to be used with special attachments or equipment other than those approved by Manitou Americas, consult your Gehl dealer. Any person using non-approved attachments or making unauthorized modifications is responsible for the consequences.

The Gehl dealership network stands ready to provide any assistance that may be required, including providing genuine Gehl service parts. All service parts should be obtained from your Gehl dealer. Provide complete information about the part and include the model and serial numbers of the machine. Record these numbers in the space provided on the Table of Contents page as a handy reference.

Please be aware that Manitou Americas strives to continuously improve its products and reserves the right to make changes and improvements in the design and construction of any part without incurring the obligation to install such changes on any previously delivered unit.

If this machine was purchased "used," or if the owner's address has changed, please provide your Gehl dealer or Gehl Service Department with the owner's name and current address, along with the machine model and serial number. This will allow the registered owner information to be updated, so that the owner can be notified directly in case of an important product issue, such as a safety update program.

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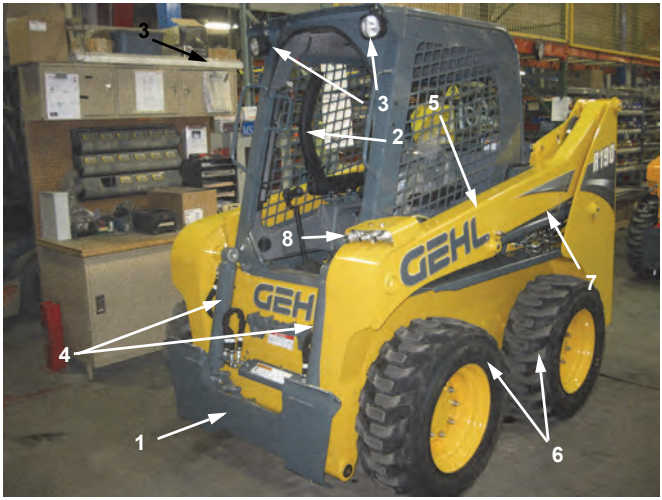
Loader Identification



1. Attachment Bracket
2. Restraint Bar
3. Front Work Lights
4. Tilt Cylinders
5. Lift Arm
6. Tires
7. Lift Arm Support Device (in stowed position inside loader arm)
8. Auxiliary Couplers

1. Roll-Over/Falling Object Protective System (ROPS/FOPS)
2. Lift Cylinder
3. Engine Cover
4. Rear Work Lights
5. Tail Lights (Position Lights)
6. Rear Grille
7. Fuel Cap

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Control/Indicator Symbols

Power Off	Power On	Engine Start	Battery Charge	Electrical Power
Worklight w/Tail Lights	Worklight	Safety Alert	Hazard Flasher	Fasten Seatbelt
Horn	Read Operator's Manual	Volume – Full	Volume – Half Full	Volume – Empty
H-L High – Low	N Neutral	F Forward	R Reverse	Parking Brake
Engine Air Filter	Engine Oil	Engine Oil Filter	Engine Oil Pressure	Fuel Filter
Engine Temperature	Hydraulic System	Hydraulic Oil Temperature	Hydraulic Oil Filter	Grease Lubrication Point
Glow Indicator Lamp	Diesel Fuel	Chaincase Oil	Clockwise Rotation	Counterclockwise Rotation
Fast	Slow	Ride Control	Engine Malfunction Shutdown	Bucket – Float
Bucket – Rollback	Bucket – Dump	Lift Arm – Lower	Lift Arm – Raise	Service Hours
Lift Point	Tie-Down	Diesel Water Separator	Power-A-Tach®	Air Circulating Fan

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Control/Indicator Symbols, cont.

DPF Service	Exhaust Gas Temperature	DPF Regen Acknowledgement

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SAFETY

This safety alert symbol means Attention! Become alert! Your safety is involved! It stresses an attitude of safety consciousness and can be found throughout this Operator's Manual and on the decals on the machine.

Before operating this machine, read and study the following safety information. Be sure that everyone who operates or works with this machine, whether family member or employee, is familiar with these safety precautions. It is essential to have competent and careful operators, who are not physically or mentally impaired, and who are thoroughly trained in the safe operation of the machine and the handling of loads. It is recommended that the operator be capable of obtaining a valid motor vehicle operator's license.

The use of skid-steer loaders is subject to certain hazards that cannot be eliminated by mechanical means, but only by exercising intelligence, care and common sense. Such hazards include, hillside operation, overloading, instability of the load, poor maintenance and using the equipment for a purpose for which it is not intended or designed.

Manitou Americas ALWAYS considers the operator's safety when designing its machinery, and guards exposed moving parts for the operator's protection. However, some areas cannot be guarded or shielded in order to assure proper operation. This Operator's Manual and decals on the machine warn of additional hazards, and they should be read and observed closely.

Some photographs in this manual may show doors, guards or shields open or removed for illustrative purposes only. Be sure that all doors, guards and shields are in their proper operating positions before starting the engine to operate the unit.

Different applications may require optional safety equipment, such as a back-up alarm, mirror, strobe light or an impact-resistant front door. Be sure you know the job site hazards and equip the machine as needed.

DANGER **"DANGER" indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.**

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

CAUTION **"CAUTION" indicates a potentially hazardous situation, which, if not avoided may result in minor or moderate injury. May also alert against unsafe practices.**

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Mandatory Safety Shutdown Procedure

Before cleaning, adjusting, lubricating or servicing the unit, or leaving it unattended:

1. Move the drive control handle(s) to the neutral position.
2. Lower the lift arm and attachment completely. If the lift arm *must* be left in the raised position, BE SURE to properly engage the lift arm support device (page 22).
3. Move the throttle to the low idle position, shut off the engine and remove the key.
4. Before exiting, move the lift/tilt control(s) to verify that the controls do not cause movement of the lift arm and hitch.

Safety Reminders

Before Starting

- Do not modify the ROPS/FOPS unless instructed to do so in installation instructions. Modifications such as welding, drilling or cutting can weaken the structure and reduce the protection it provides. A damaged ROPS/FOPS cannot be repaired – it must be replaced.
- To ensure safe operation, replace damaged or worn-out parts with genuine Gehl service parts.
- Gehl loaders are designed and intended to be used only with Gehl attachments and approved attachments. To avoid possible personal injury, equipment damage and performance problems, use only attachments that are approved for use on and within the operating capacity of the machine. Contact your dealer or Gehl Service Department for information on attachment approval and compatibility with specific machine models. Manitou Americas cannot be responsible if the machine is used with a non-approved attachment.
- Remove all trash and debris from the machine each day, especially in the engine compartment, to minimize the risk of fire.
- Always face the loader and use the handholds and steps when getting on and off the loader. Do not jump off the loader.
- Never use starting fluid (ether).
- Walk around the machine and warn all nearby personnel before starting the machine.
- Always perform a daily inspection of the machine before using it. Look for damage, loose or missing parts, leaks, etc.

During Operation

- Machine stability is affected by: load being carried, height of the load, machine speed, abrupt control movements and driving over uneven terrain. **DISREGARDING ANY OF THESE FACTORS CAN CAUSE THE LOADER TO TIP, THROWING THE OPERATOR OUT OF THE**

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SEAT OR LOADER, RESULTING IN DEATH OR SERIOUS INJURY. Therefore: ALWAYS operate with the seatbelt fastened and the restraint bar lowered. Do not exceed the machine's Rated Operating Capacity. Carry the load low. Move the controls smoothly and gradually, and operate at speeds appropriate for the conditions.

- When operating on inclines or ramps, always travel with the heavier end of the loader toward the top of the incline for additional stability.
- Do not raise or drop a loaded bucket or fork suddenly. Abrupt movements under load can cause serious instability.
- Never activate the float function with the bucket or attachment loaded or raised, because this will cause the lift arm to lower rapidly.
- Do not drive too close to an excavation or ditch; be sure that the surrounding ground has adequate strength to support the weight of the loader and the load.
- Never carry riders. Do not allow others to ride on the machine or attachments, because they could fall or cause an accident.
- Always look to the rear before backing up the skid-steer loader.
- Operate the controls only from the operator's seat.
- Always keep hands and feet inside the operator's compartment while operating the machine.
- New operators must operate the loader in an open area away from bystanders. Practice with the controls until the loader can be operated safely and efficiently.
- Wear safety goggles and head protection while operating the machine. Operator must wear protective clothing when appropriate.
- Exhaust fumes can kill. Do not operate this machine in an enclosed area unless there is adequate ventilation.
- When parking the machine and before leaving the seat, check the restraint bar for proper operation. The restraint bar, when raised, deactivates the lift/tilt control and auxiliary hydraulics, and applies the parking brake.

Maintenance

- Never attempt to by-pass the key switch to start the engine. Use only the jump-starting procedure detailed in the *Operation* chapter of this manual.
- Never use your hands to search for hydraulic fluid leaks. Instead, use a piece of paper or cardboard. Escaping fluid under pressure can be invisible and can penetrate the skin and cause serious injury. If any fluid is injected into your skin, see a doctor at once. Injected fluid must be surgically removed by a doctor or gangrene may result.
- Always wear safety glasses with side shields when striking metal against metal. In addition, it is recommended that a softer (chip-resistant) material be used to cushion the blow. Failure to heed could lead to serious injury to the eyes or other parts of the body.
- Do not smoke or have any spark-producing equipment in the area while filling the fuel tank or while working on the fuel or hydraulic systems.

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Potential Hazards

A skid-steer loader operator must ALWAYS be conscious of the working environment. Operator actions, the environmental conditions and the job being preformed require the full attention of the operator so that safety precautions can be taken.

ALWAYS maintain a safe distance from electric power lines and avoid contact with any electrically charged conductor or gas line. Accidental contact or rupture can result in electrocution or an explosion. Contact the North American One-Call Referral System at 8-1-1 in the U.S., or 1-888-258-0808 in the U.S and Canada, for the local “Digger's Hotline” number or the proper local authorities for utility line locations BEFORE starting to dig!

Exposure to crystalline silica (found in sand, soil and rocks) has been associated with silicosis, a debilitating and often fatal lung disease. A Hazard Review (Pub. No. 2002-129) by the U.S. National Institute for Occupational Safety and Health (NIOSH) indicates a significant risk of chronic silicosis for workers exposed to inhaled crystalline silica over a working lifetime. NIOSH recommends an exposure limit of 0.05 mg/m^3 as a time-weighted average for up to a 10-hr. workday during a 40-hr. workweek. NIOSH also recommends substituting less hazardous materials when feasible, using respiratory protection and regular medical examinations for exposed workers.

Static electricity can produce dangerous sparks at the fuel-filling nozzle. Do not wear polyester, or polyester-blend clothing while fueling. Before fueling, touch the metal surface of the machine away from the fuel fill to dissipate any built-up static electricity. Do not re-enter the machine but stay near the fuel filling point during refueling to minimize the build-up of static electricity. Do not use cell phones while fueling. Make sure the static line is connected from the machine to the fuel truck before fueling begins.

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 entire fuel delivery system is in compliance with fueling standards for proper grounding and bonding practices.

Safety Decals

The skid-steer loader has decals that provide safety information and precautions around the loader. These decals must be kept legible. If missing or illegible, they must be replaced promptly. Replacements can be obtained from your Gehl dealer. If there is a decal on a part that is to be replaced, be sure that the decal is applied to the replacement part.

New Decal Application

Surfaces must be free of dirt, dust, grease and foreign material before applying the decal. Remove the smaller portion of the decal backing paper and apply the exposed adhesive to the clean surface, maintaining proper position and alignment. Peel the rest of the backing paper and apply hand pressure to smooth out the decal surface. Refer to the following pages for proper decal location. ANSI-style text decals begin on page 9; ISO-style no-text decals begin on page 13.

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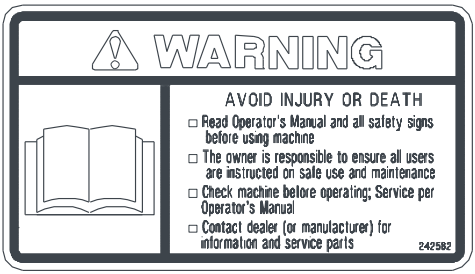
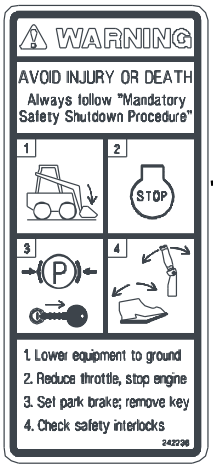
ANSI-Style Safety Decals inside the ROPS/FOPS

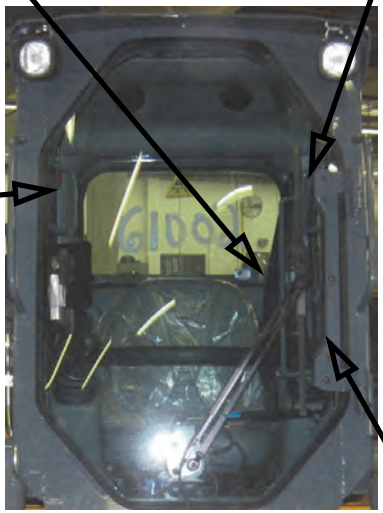


242582 – Located behind operator's left shoulder

242260 – Located on upper left instrument panel



242236 – Located on upper right instrument panel



242397 – Located on lower left instrument panel

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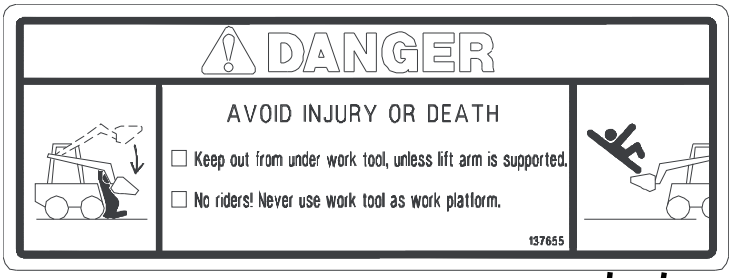
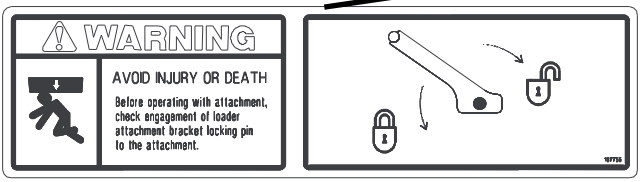
ANSI-Style Safety Decals on the outside of the Loader



137655 – Located on front of loader and crossmember

132166 – Located on rear window emergency exit



137755 – Located on attachment bracket (manual hitch loaders only)

139101 – Located on attachment bracket (power hitch loaders only)

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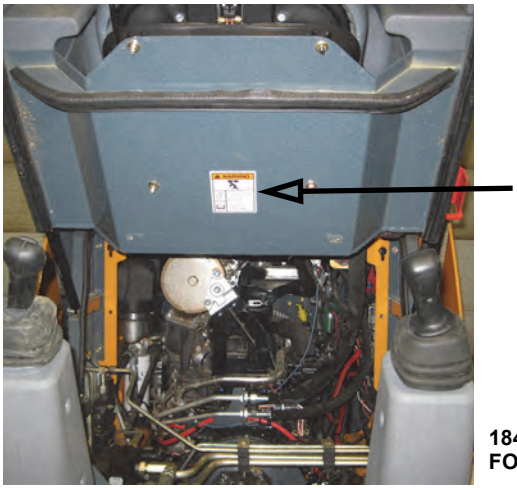
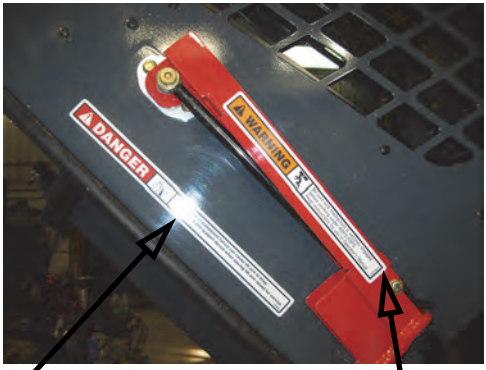
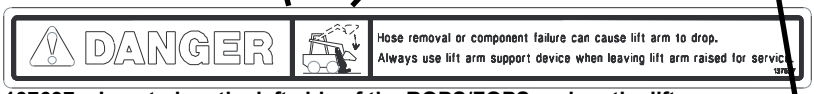
ANSI-Style Safety Decals on the outside of the Loader



184214 – Located under the ROPS/ FOPS





137637 – Located on the left side of the ROPS/FOPS and on the lift arm support device

50352637 – Located on the ROPS/FOPS locking mechanism

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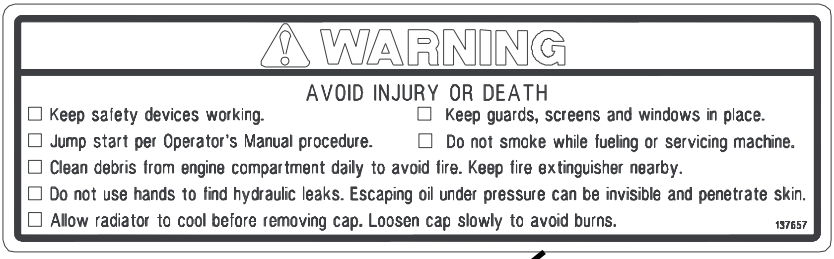
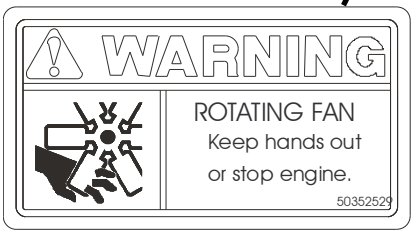
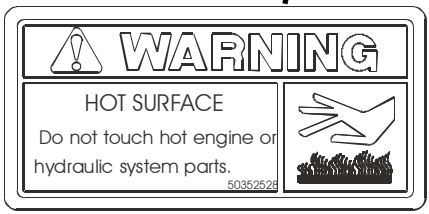
ANSI-Style Safety Decals in the Engine Compartment



137657 – Located on the right riser



50352529 – Located on fan shroud inside engine compartment



50352528– Located on fan shroud inside engine compartment

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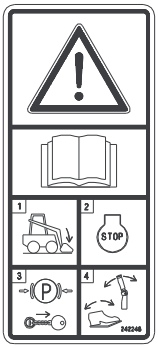
ISO-Style (used Internationally) Safety Decals inside the ROPS/FOPS

242568 – Located behind operator's left shoulder

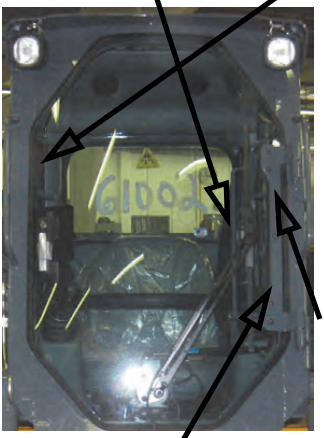
Safety alert: Read Operator's Manual and all safety signs before using machine. The owner is responsible to ensure all users are instructed on safe use and maintenance.

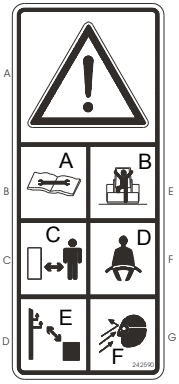


Safety alert: Always follow "Mandatory Safety Shutdown Procedure" in Operator's Manual.

1 – Lower equipment to ground.
2 – Reduce throttle, stop engine.
3 – Apply parking brake; remove key.
4 – Check safety interlocks.

242246 – Located on right instrument panel





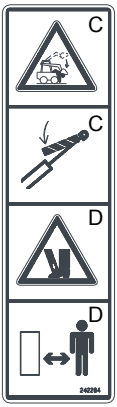
242590 – Located on left instrument panel

Safety alert:

A – Check machine before operating; Service per Operator's Manual. Contact dealer (or manufacturer) for information and service parts.
B – Maintain 3-point contact during entry and exit.
C – Inspect work area. Avoid all hazards. Look in direction of travel. Keep children and bystanders away.
D – Start and operate machine only from seat.
E – Keep away from power lines; avoid contact.
F – Wear any needed Personal Protective Equipment. Do not wear loose clothing while operating or servicing machine.

242408 – Located on operator's lower left side

A – Forward tip hazard: Fasten seat belt. Carry load low. Do not exceed Rated Operating Load.
B – Side tip hazard: Avoid steep slopes and high speed turns. Travel up and down slopes with heavy end uphill.
C – Crush hazard: Keep out from under lift arm unless lift arm is supported.
D – Crush hazard: Keep hands, feet and body inside cab when operating.



242284 – Located on operator's lower right side

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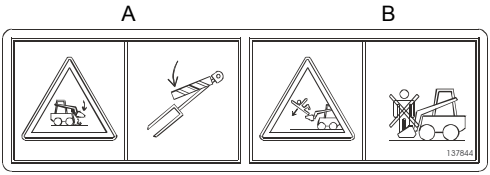
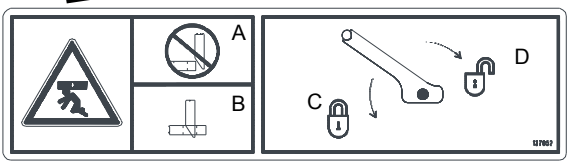
ISO-Style (used Internationally) Safety Decals on the outside of the Loader



137844 – Located on front of loader and crossmember

A – Crush hazard: Keep out from under work tool unless lift arm is supported.
B – Fall hazard: No riders. Never use work tool as work platform.

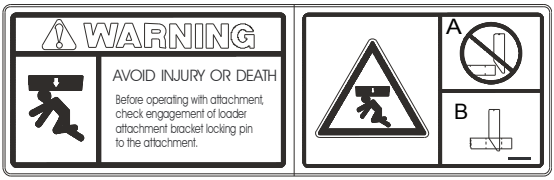
132166 – Located on rear window emergency exit



137852 – Located on hitch (manual hitch loaders only)

Crush hazard: Before operating with attachment, check engagement of hitch locking pin to the attachment:

A – Incorrect attachment engagement
B – Correct attachment engagement
C – Lock hitch lever
D – Unlock hitch lever



139101 – Located on hitch (power hitch loaders only)

Crush hazard: Before operating with attachment, check engagement of hitch locking pin to the attachment:

A – Incorrect attachment engagement
B – Correct attachment engagement

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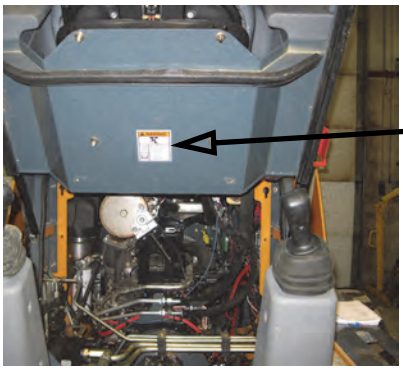
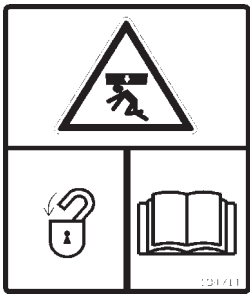
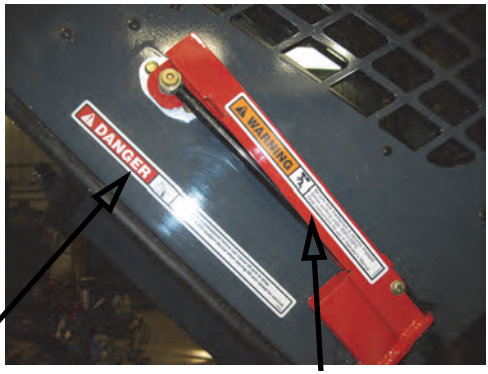
ISO-Style (used Internationally) Safety Decals on the outside of the Loader

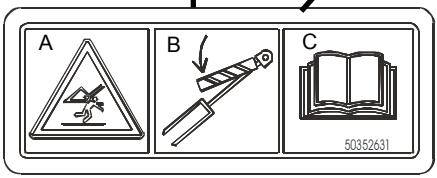




184711 – Located under the ROPS/FOPS

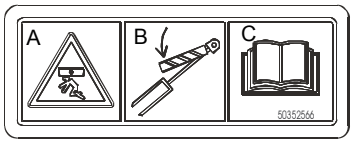
Crush hazard: Be sure lock mechanism is securely engaged before working under ROPS/FOPS. Read instructions for use in Operator's Manual.





50352631 – Located on the left side of the ROPS/FOPS and on the lift arm support device

A – Crush hazard: Keep out from under lift arm unless lift arm is supported.
B – Secure lift arm support device.
C – Read instructions for use in Operator's Manual.



50352566 – Located on the ROPS/ FOPS locking mechanism

A – Crush hazard: Be sure lock mechanism is securely engaged before working under ROPS/ FOPS.
B – Secure lift arm support device.
C – Read instructions for use in Operator's Manual.

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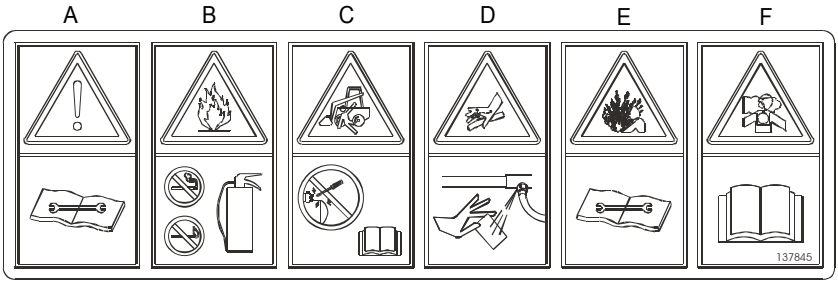
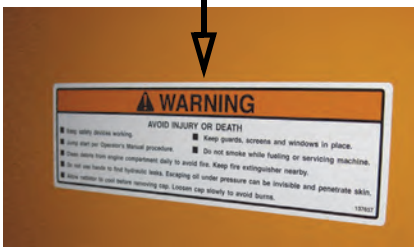
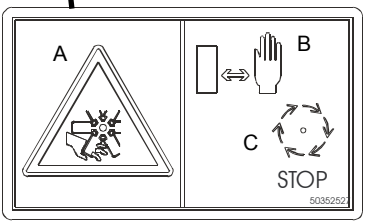
ISO-Style (used Internationally) Safety Decals in the Engine Compartment



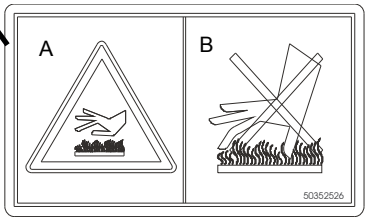
137845 – Located on the right riser

A – Safety alert: Keep safety devices in place and in working order. Keep guards, screens and windows in place.
B – Fire hazard: Do not smoke while fueling or servicing machine. Clean debris from engine compartment daily to avoid fire. Keep fire extinguisher nearby.
C – Run-over hazard: Jump-start per Operator's Manual procedure.
D – Oil injection hazard: Do not use hands to find hydraulic leaks. Escaping oil under pressure can be invisible and penetrate skin. Use a piece of cardboard to find leaks.
E – Burn hazard: Allow radiator to cool before removing cap. Loosen cap slowly to avoid burns.
F – Suffocation hazard: Operate only in a well-ventilated area.





50352527 – Located on the fan shroud inside engine compartment



50352526 – Located on the fan shroud inside engine compartment

A – Cutting Hazard, Fan: The fan rotates at extreme speed.
B – Keep hands away from the fan.
C – Stop the engine before working around the fan.

A – Hot surface hazard: The engine and its components generate temperatures that can burn skin.
B – Hot surface: Do not touch hot engine or hydraulic system parts.

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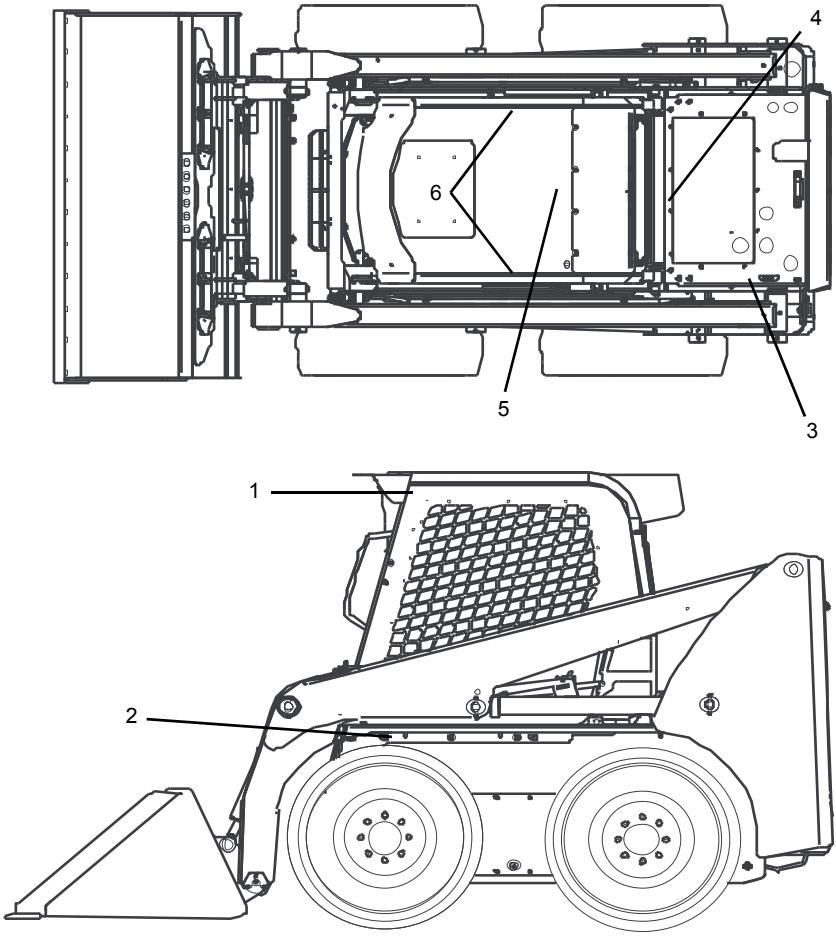
Product and Component Plate Locations



Product and Component Plates

1. Operator protective system plate: with, e.g., model, certification and operator protective system serial number
2. Seat plate according to ISO 7096
3. Product plate: with Product Identification Number and, e.g., model/type designation
4. Engine plate: with, e.g., type designation, product and serial numbers
5. Component plate hydrostatic pump: with, e.g., product and serial numbers
6. Component plate drive motor: with, e.g., product and serial numbers

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Notes

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CONTROLS AND SAFETY EQUIPMENT

WARNING **Become familiar with and know how to use all safety devices and controls on the skid-steer loader before operating it. Know how to stop loader operation before starting it. This Gehl loader is designed and intended to be used only with Gehl attachments or Manitou Americas-approved referral attachments or accessories. Manitou Americas cannot be responsible for operator safety if the loader is used with non-approved attachments.**

Guards and Shields

Whenever possible and without affecting loader operation, guards and shields are provided to protect against potentially hazardous areas. In many places, safety decals are also provided to warn of potential hazards and/or to display special operating procedures.

WARNING **Read and thoroughly understand all safety decals on the loader before operating it. Do not operate the loader unless all factory-installed guards and shields are properly secured in place.**

Operator Restraint Bar

Lower the operator restraint bar after entering the operator's compartment and sitting in the seat. The restraint bar is securely anchored to the ROPS/FOPS. The operator must be seated with the restraint bar in its lowered position to start or operate the skid-steer loader. Refer to *Safety Interlock System* on page 20 for more information.

Dual Joystick and Hand/Foot controlled loaders are equipped with a restraint bar that provides fore-aft adjustment, allowing the operator to determine the most comfortable position for the restraint bar. The right and left portions of the restraint bar system can be adjusted independent of one another by pushing the locking lever on the lower inside of either pad. The restraint pads can then be adjusted to the desired position. The restraint pads lock in place when the locking lever is released.

WARNING **Never defeat the operator restraint bar or seat switch electrically or mechanically. Always wear the seatbelt.**

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Operator's Seat

The seat is mounted on rails for rearward and forward repositioning. A spring-loaded lever unlocks the seat position adjustment mechanism.

Suspension seat (optional): A weight adjustment knob is provided for individual operator adjustment.

Air Suspension Seat (optional): Adjust air suspension seat by pushing in the knob on the air seat to increase the amount of suspension. Pull knob out to release air and decrease the suspension level.

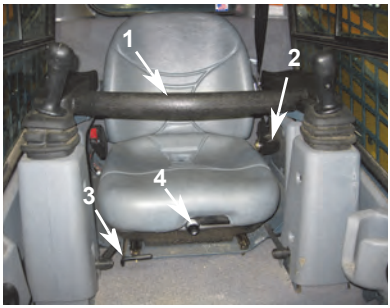

Figure 1 Operator's Seat

1. Restraint Bar
2. Seatbelt
3. Seat Position Adjustment Lever
4. Suspension Seat Weight Adjustment Knob (optional)

Upper-Torso Restraint

WARNING **Always wear the upper-torso restraint when operating in High speed.**

The seatbelt should always be fastened during operation.

Important: *Inspect the seatbelt(s) for damage before use, and replace if damaged. Keep seatbelt(s) clean. Use only soap and water to wash seatbelt(s). Cleaning solvents can cause damage to seatbelt(s).*

Safety Interlock System

Hydraloc™

WARNING **NEVER defeat the safety interlock system by mechanically or electrically bypassing any switches, relays or solenoid valves.**

An interlock system is provided on the loader for operator safety. Together with solenoid valves, switches and relays, the interlock system:

- Prevents the engine from starting unless the operator is sitting on the seat and the operator restraint bar is lowered.
- Disables the lift arm, auxiliary hydraulics, attachment tilt and wheel drives whenever the operator leaves the seat, turns the keyswitch to OFF or raises the restraint bar.

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Note: *The auxiliary hydraulic circuit can be detented in the "ON" position for continuous operation with the restraint bar raised and operator out of the seat.* *(See Auxiliary Hydraulic Controls, page 43.)*

Testing the Safety Interlock System

Before exiting the machine, check the safety interlock system for proper operation:

Restraint Bar

With the engine running, raise the restraint bar. Test each of the controls. There should be no more than a slight movement of the lift arm, hitch and machine. If there is any significant movement, troubleshoot and correct the problem immediately. Contact your dealer if necessary.

Seat Switch

With the engine off and the restraint bar lowered, unfasten the seatbelt, and lift your weight off the seat. Try to start the engine. If the engine starts, turn off the engine, troubleshoot and correct the problem. Contact your dealer if necessary.

ROPS/FOPS

The ROPS/FOPS (Roll-Over/Falling Object Protective Structure) is designed to provide protection for the operator from falling objects and in a tip over accident, if the operator is secured inside the operator's compartment by the seatbelt and restraint bar.

WARNING **Never operate the loader with the ROPS/FOPS removed or locked back.**

Parking Brake

This skid-steer loader is equipped with a spring-applied, hydraulic-released parking brake. The parking brake engages when the operator lifts the restraint bar, exits the seat or shuts off the engine. The brake can also be applied manually by using the switch located on the right instrument panel. A red indicator in the switch lights when the parking brake is applied.

Figure 2 Parking Brake Switch

Horn

On dual joystick and hand/foot loaders, pressing the right button on the left control handle sounds the horn. On T-bar loaders, pressing the bottom button on the left control handle sounds the horn.

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Rear Window Emergency Exit

The ROPS/FOPS rear window has three functions: noise reduction, flying objects barrier and emergency exit.

To use the emergency exit, pull on the yellow warning tag at the top of the window and remove the seal. Push or kick out the window and then exit.

See your local automotive glass specialist to reinstall the window.

Lift Arm Support Device

The lift arm support device is used as a cylinder lock to prevent the raised lift arm from lowering unexpectedly. Be sure to install the support device when the lift arm is raised for service. When the support device is not being used, return it to its storage position. The support device is a safety device, which must be kept in proper operating condition at all times. The following steps ensure correct usage:

WARNING **The safest method of engaging the lift arm support device requires two people - one person inside the loader and another person outside the loader to engage the support device.**

Important: *With the key switch OFF and the solenoid valve working properly, the lift arm will stay raised when the lift control is moved to lower the lift arm. If the valve does not hold the lift am and it begins to lower do not leave the operator's compartment. Instead, lower the lift arm and exit the machine. Then, contact your Gehl dealer immediately to determine why the lift arm lowers while the key switch is OFF.*

Engagement

To engage the lift arm support device:

1. Lower the lift arm fully.
2. Stop the engine.
3. Have an assistant remove the lift arm support device from its storage location (Figure 4) on the left side of the machine. Remove the lynch pin holding the support device up against the lift arm. Allow the support device to come down into contact with the lift cylinder (Figure 3).
4. Restart the engine.
5. Use the lift control to raise the lift arm until the support device drops over the end of the lift cylinder and around the cylinder rod. Slowly lower the lift arm until the free-end of the support device contacts the top end of the lift cylinder.

Figure 3 Lift Arm Support Device Engaged

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6. Look to be sure the support device is secure against the cylinder end. Then, stop the loader engine, remove the key and leave the operator's compartment.
7. Stop the engine, and exit the machine.

Disengagement

WARNING **The safest method of installing and removing the lift arm support device requires two people – one person inside the loader and another person outside the loader to disengage the support device.**

Important: *With the key switch OFF and the solenoid valve working properly, the lift arm will stay raised when the lift control is moved to lower the lift arm. If the valve does not hold the lift am and it begins to lower do not leave the operator's compartment. Instead, lower the lift arm and exit the machine. Then, contact your Gehl dealer immediately to determine why the lift arm lowers while the key switch is OFF.*

To return the lift arm support device to its storage position:

1. Start the engine;
2. Raise the lift arm fully;
3. Stop the engine;
4. Verify that the lift arm is being held in the raised position by the safety interlock system.
5. To store the support device, have an assistant raise it up until it contacts the lift arm. Reinstall the lynch pin through the welded steel post on the lift arm (Figure 4).

Figure 4 Lift Arm Support Device Storage Location

ACCESSORY Plug

The 12-V accessory plug is located at the bottom of the right instrument panel.

Dome Light

The dome light is located on the right side of the ROPS/FOPS headliner. Push on the dome light to switch it on.

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Work Lights

Loaders have two sets of work lights. The front work lights are located at the top of the ROPS/FOPS. The rear work lights are located at the top of the rear grille.

Heater (optional)

Loaders with the optional heater have two control knobs on the left instrument panel for controlling fan speed and heater temperature (see Figure 5).

1. **Fan Speed Control:** Controls the air flow.
2. **Temperature Control:** The potentiometer switch is a rotary dial for control of heat functions.

Heater and Air Conditioner (optional)

Loaders with the combination heater/air conditioner have two control knobs on the left instrument panel for controlling fan speed and heater/air conditioner temperature.

1. **Fan Speed Control:** Controls the air flow.
2. **Temperature Control:** The potentiometer switch is a rotary dial for control of heat and air conditioning functions.

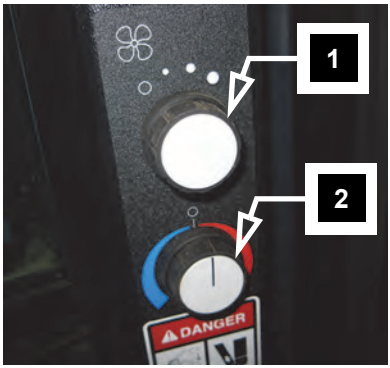

Figure 5 Heater/ Air Conditioner Controls

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Engine Speed Control

An engine speed control (Figure 6) is provided for setting the engine speed. Move the control clockwise to increase the engine speed, and counter-clockwise to decrease the engine speed. Engine speed may be limited while diagnostic trouble codes (DTC's) are active or during a cold start. See the engine diagnostic chart for the DTC's on page 81 or the cold starting procedure on page 48.

Figure 6 Engine Speed Control

With dual joystick and T-bar controls, a foot pedal (Figure 7) is provided as a secondary throttle, which can be used to override the engine speed control. If the foot throttle is released, the engine will return to the speed set by the engine speed control.

Figure 7 Foot Throttle (Joystick and T-Bar controls)

Two-Speed Drive (Travel Mode Only) (optional)

Dual joystick and hand/foot loaders use the left button on the left control handle for shifting between High (H) and Low (L). T-Bar loaders use the top button on the left control handle. Shifting to High allows the machine to exceed 7.5 mph (12,0 km/h), up to a maximum speed of 12.5 mph (20 km/h). When the loader is in High (H) an H icon on the Indicator and Warning Light Display (page 27) will illuminate. Press the button once to activate, and again to deactivate.

Note: *Speed varies slightly with tire size.*

WARNING **When two-speed drive is activated, down shifting to single-speed drive while traveling at full speed is not recommended and damage may result.**

WARNING

Hydraglide™ Ride Control System

Standard equipment on dual joystick and hand/foot loaders, use the right button on the right control handle for shifting between normal mode and ride control mode. Optional equipment on T-bar loaders, use the top button on the right control handle. The ride control system provides a smoother ride over uneven surfaces. Press the button once to activate the system, and again to deactivate. The ride control system is automatically deactivated when the machine is shut off.

WARNING **When ride control is activated, the lift arm may drop slightly without a load, or several inches with a heavy load.**

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Float Control

Dual joystick and hand/foot loaders use the left button on the right control handle for shifting between normal mode and float mode. For T-Bar loaders push the right control handle fully forward to detent the float control. This mode allows the lowered lift arm to follow the ground contour while traveling over changing ground conditions. For dual joystick and hand/foot loaders, press and hold the button for three seconds or longer to detent, and press again to deactivate. For T-bar loaders, pull the right control handle rearward to deactivate. The float mode is automatically deactivated when the machine is shut off.

Attachment Mounting

The skid-steer loader is equipped with either the standard manual All-Tach® hitch or optional Power-A-Tach® hitch for mounting a bucket or other attachments (Figure 8).

All-Tach® Hitch

A manual latch lever engages the latch pins. While standing outside the machine, rotate the lever all the way to the left to engage the latch pins. Rotate the lever (as viewed from the front) all the way to the right to disengage the latch pins. (Refer to page 51 for more information.)

Figure 8 All-Tach® Hitch

WARNING **To prevent unexpected release of the attachment from the hitch, be sure to secure the latch pins by rotating the lever all the way to the hitch.**

Power-A-Tach® System

A three-position momentary rocker switch is used to operate the Power-A-Tach System hitch. The Power-A-Tach System is equipped with a warming circuit. The warming circuit reduces the amount of time required to operate the hydraulic cylinder. It is recommended to use this circuit when the temperature is below 32°F (0°C), see the Cold-Starting Procedure on page 48. Continuous use of the warming circuit is recommended when the temperature is below 0° F (-18° C). The hitch will not operate if the parking brake switch is activated or if the restraint bar is in its vertical (open) position. (Refer to page 51 for more information.)

To retract the hitch pins:

Press up and hold the switch until the pins are fully retracted on the Power-A-Tach switch in the right instrument panel. The switch will return to neutral (middle position) when released.

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To extend the hitch pins:

Press down on the Power-A-Tach switch in the right instrument panel and the switch will detent to the ‘on’ position.

WARNING **To prevent unexpected release of the attachment from the hitch, be sure the latch pins are secure by verifying that the pin flags have moved fully to the outside of the hitch.**

Activating The Warming Circuit

Press down the Power-A-Tach switch in the right instrument panel. The switch will detent “on”, illuminating the lamp and notifying the operator that the warming circuit is on.

To deactivate the warming circuit, push the switch to the neutral (middle) position. Also, when retracting the pins, the warming circuit will deactivate and stay off until activated again.

Note: *It is safe to operate the loader with the warming circuit on or off, it won't affect the performance of the loader.*

Indicator and Warning Lamp Display

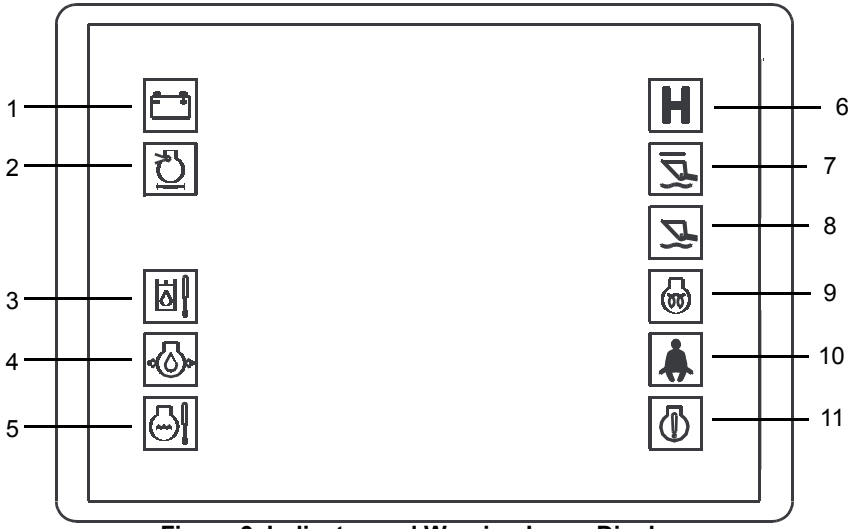

Figure 9 Indicator and Warning Lamp Display

The instrument panels and the indicator and warning lamp display (Figure 9) contain the switches and indicator lamps. Symbols on the indicator lamps are visible only when the indicator lamps are on.

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Indicator and Warning Lamp Display

1. **Battery** – Lights if the charging voltage is too high or too low. During normal operation this indicator should be OFF.
2. **Engine Air Filter** – Lights when a restriction in the engine air filter is detected, warning the operator to clean or replace the element in the engine air cleaner. During normal operation this indicator should be OFF.
3. **Hydraulic Oil Temperature** – Lights if the hydraulic oil is too hot, warning the operator to reduce the hydraulic load and determine the cause of the high temperature. During normal operation this indicator should be OFF.
4. **Engine Oil Pressure Warning** – Lights if the engine oil pressure is too low, warning the operator to immediately stop the engine and determine the cause for the low pressure. During normal operation this indicator should be OFF.
5. **Engine Coolant Temperature** – Lights if the engine coolant is too hot, warning the operator to stop the engine and determine and correct the cause of the high temperature. During normal operation this indicator should be OFF.
6. **High-Speed** – Lights when two-speed (optional) is engaged.
7. **Hydraglide™ Ride Control System** – Lights when the ride control system is activated.
8. **Float Indicator** – Lights when the lift arm “float” function is activated.
9. **Pre-heat Indicator** – Lights when the (automatic) pre-heat is active. During normal operation this indicator should be OFF.
10. **Fasten Seatbelt** – A momentary visual (and audible) indicator to remind the operator to fasten the seatbelt(s).
11. **Engine Malfunction Shutdown Indicator** – Lights when the engine electronic control unit (E-ECU) has detected a failure warranting an automatic shutdown. Review the electronic display for error code details. See Engine Diagnostics chart on page 81.

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Information Center Electronic Display

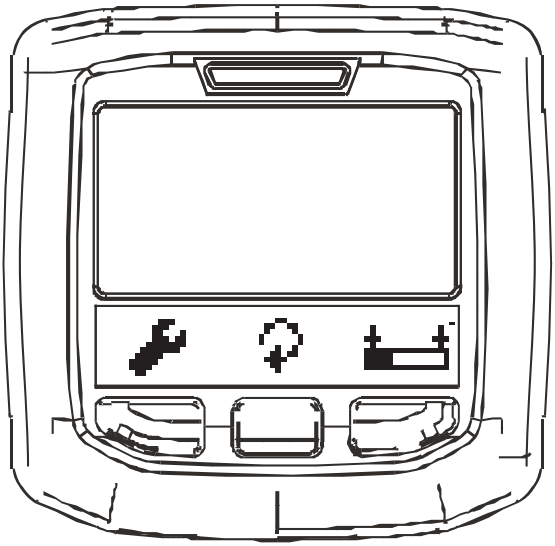

Figure 10 Information Center Electronic Display

The information center electronic display module is a three-button liquid crystal display (LCD) display located above the right instrument panel and it affords the operator a real time informational display of numerous engine, coolant, fuel, battery and environmental parameters. The diagnostic trouble codes (DTC) for this system are shown in the Engine Diagnostic Chart (page 81).

During normal operation, the buttons have no specific functions, the display is used exclusively to provide diagnostic codes and show icons associated with the DPF modes. When pressing any button once, a dynamic pop-up menu appears. The menu contains function icons aligned above the associated button. The user selects the required function from the displayed menu. After a few seconds, the menu will be hidden.

WARNING **If the LCD is broken, care must be taken with any leaking fluid. If LCD fluid gets onto your skin, wipe with a cloth and wash the area with mild soap and water. If LCD fluid gets into your eyes, thoroughly rinse your eyes with clean water for several minutes and seek medical assistance. If the LCD fluid is swallowed, rinse your mouth thoroughly with clean water, then drink a substantial volume of water and induce vomiting. Then seek medical assistance.**

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Display Modes - Information Center Electronic Display

The information center is used to display live parameters and diagnostic trouble codes available on the J1939 bus. By pressing the center button the user can scroll through the available parameters on the vehicle's network. A complete list of supported parameters can be found in the Supported Parameters section.

At any time in any display mode, the user can select the tool icon (left button) to access the setting menu and change the current display mode. See Settings Menu section.

Single Screen

This mode is used to monitor one parameter at a time. The screen also displays the associated parameter icon, the description, the units and a bar graph.

Bar Graph Limits Adjust

The Single Screen mode has a special function for bar graph limits minimum and maximum adjustment. This can be done by selecting the related parameter and then pressing the limits button (right button). The unit should now display the bar graph limits adjust mode. Use +/- for adjustment and select Exit when finished.

Dual Screen

The Dual Screen mode is used to monitor two parameters at a time. The screen also displays the associated parameter icon and units. To change to dual screen mode press the left “wrench” button. This will bring up an option screen with the top line “display mode” will be highlighted. Press the center “arrow” button to change the screen display to dual, multi or DTC screen. Press the left “wrench” button to return to the main display.

Multi-Screen

The Multi-Screen mode is used to monitor a list of four parameters selected by the user. Every item is listed with its associated icon and units.

DTC Screen

The DTC Screen mode is used to display Data Trouble Codes according to SAE J1939-73. The main screen displays all vehicle active faults (DM1) and occurs faults (DM2). A bright bulb means that the current fault is active while a dark bulb means that the current fault has occurred. The header contains the total active/inactive faults, the associated SPN and FMI and the numbers of occurrences as well.

DTC Detailed Information

For a given DTC, the user may select the ? function from the menu. A detailed screen of the selected DTC including the SPN description (Header), the FMI Description (Header), the fault status (Status), the SPN Number (SPN), the FMI Number (FMI), the total number of occurrences (OCC) and the related node source address (SRC) will then appear.

Display Mode

This setting is used to select the current display mode: Single, Dual, Multi or DTC.

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Language

The user can select various supported languages for interface display.

Fuel Level Source

With Input mode selected, the device reads the fuel level signal from the discrete sensor input. In this mode, the local information is also broadcast on the J1939 network to other nodes. In Network mode, the device reads the fuel signal from the associated PGN on the J1939 network.

Contrast /Backlight

Contrast and backlight commands according to the user's preferences.

Supported Parameters

The following three pages list the supported parameters of the information center electronic display.

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Information Center Electronic Display (cont.)

SPN #	PGN #	Description	Icon
46	65198	Pneumatic Supply Pressure	
52	65262	Engine Intercooler Temperature	
84	65265	Wheel-Based Vehicle Speed	
91	61443	Accelerator Pedal Position 1	
92	61443	Engine Percent Load At Current Speed	
94	65263	Engine Fuel Delivery Pressure	
96	65276	Fuel Level 1	
98	65263	Engine Oil Level	
100	65263	Engine Oil Pressure	

SPN #	PGN #	Description	Icon
102	65270	Engine Intake Manifold #1 Pressure	
105	65270	Engine Intake Manifold #1 Temperature	
106	65270	Engine Air Inlet Pressure	
107	65270	Engine Air Filter 1 Differential Pressure	
108	65269	Barometric Pressure	
109	65263	Engine Coolant Pressure	
110	65262	Engine Coolant Temperature	
111	65263	Engine Coolant Level	
114	65271	Net Battery Current	
115	65271	Alternator Current	
127	65272	Transmission Oil Pressure	

SPN #	PGN #	Description	Icon
158	65271	Keyswitch Battery Potential	
167	65271	Charging System Potential (Voltage)	
168	65271	Battery Potential / Power Input 1	
172	65269	Engine Air Inlet Temperature	
173	65270	Engine Exhaust Gas Temperature	
174	65262	Engine Fuel Temperature 1	
175	65262	Engine Oil Temperature 1	
176	65262	Engine Turbocharger Oil Temperature	
177	65272	Transmission Oil Temperature	
183	65266	Engine Fuel Rate	
184	65266	Engine Instantaneous Fuel Economy	

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Information Center Electronic Display (cont.)

SPN #	PGN #	Description	Icon
185	65266	Engine Average Fuel Economy	
190	61444	Engine Speed	
191	61442	Transmission Output Shaft Speed	
246	65255	Total Vehicle Hours	
247	65253	Engine Total Hours of Operation	
441	65164	Auxiliary Temperature 1	1
512	61444	Driver's Demand Engine - Percent Torque	
513	61444	Actual Engine - Percent Torque	
517	65256	Navigation-Based Vehicle Speed	
523	61445	Transmission Current Gear	
524	61445	Transmission Selected Gear	

SPN #	PGN #	Description	Icon
975	65213	Estimated Percent Fan Speed	
1032	65201	Total ECU Distance	ECU
1081	65252	Engine Wait to Start Lamp	
1387	65164	Auxiliary Pressure #1	1
1761	65110	Catalyst Tank Level	DEF
1762	61448	Hydraulic Pressure	H
3031	65110	Catalyst Tank Temperature	DEF
3241	64948	Aftertreatment 1 Exhaust Gas Temperature 1 (upstream)	
3245	64947	Aftertreatment 1 Exhaust Gas Temperature 3 (downstream)	
3697*	64892	Particulate Trap Lamp Command	R
3700*	64892	Particulate Trap Active Regeneration Status	R

SPN #	PGN #	Description	Icon
3701*	64892	Particulate Trap Status	R
3703*	64892	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch	R

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Engine Stop

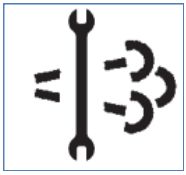
The engine stop icon is used to notify the operator that the engine is in “backup” or “limp” mode. See the backup mode description on page 60 for more details.

Engine Water Temp Overheat Warning

The engine water temperature overheat icon is used to notify the operator of high engine coolant temperature. The operator should take action to reduce load on the engine and allow the engine to cool.

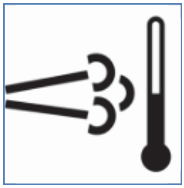
DPF (Diesel Particulate Filter) Service

The DPF service icon is used to notify the operator that the engine is in an emergency condition where ash cleaning is required. See the ash cleaning mode description on page 60 for more details.



Elevated EGT (Exhaust Gas Temperature)

The EGT icon is used to notify the operator of high exhaust temperatures during an active reset/stationary regeneration.



Parking Brake

The parking brake icon is used to remind the operator that the parking brake switch must be engaged prior to a stationary regeneration.

DPF Regeneration Acknowledgement

The DPF regeneration acknowledgement icon is used to notify the operator that the E-ECU has received the stationary regeneration request. It is used to prompt the operator to start a stationary regeneration request or to allow a reset regeneration.

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Instrument Panels

Left Panel

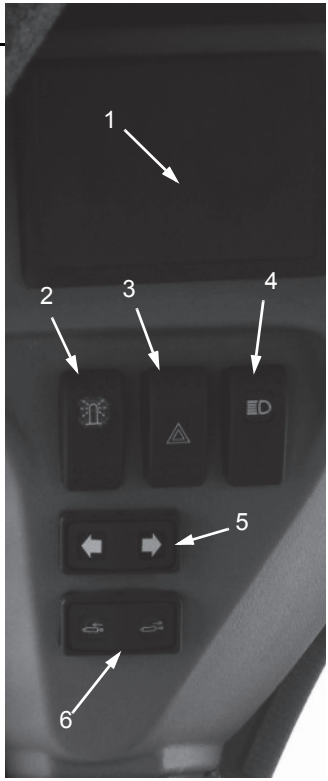

Figure 11 Left Panel

1. **Indicator and Warning Lamp Display** – See page 27.
2. **Rotating Beacon/Strobe Switch (optional)** – Controls the warning lamp (strobe or beacon).
3. **Hazard/Flasher Switch (optional)** – Controls hazard/flasher.
4. **High/Low Beam Switch (optional)** – Controls road head lights between main/upper beams and dimmed/lower beams. Switch does not turn lights on or off.
5. **Turn Signal Switch (optional)** – Used to turn on turn indicator lights. Directional indicator lights are the same lights as the flashers. The flashers will override the turn signals.
6. **High-Flow Auxiliary Switch (optional)** – Controls the direction of hydraulic oil flow. Push the right side of the rocker switch for forward flow, or the left side for reverse flow. To disengage, push and release either side of the switch, or raise the restraint bar. Turning off the machine and restarting the engine will also reset the high-flow to neutral.
7. **Light Switch** – Master control of the lights. Push the right side of the rocker switch to activate front and rear lights, or to the left side for deactivation of the front and rear lights. It also provides power to a machine equipped with flashers.
8. **Light Switch** – Controls all the lights on the loader. Push the rocker switch to the middle detent for front work lights and rear position lights. Push the rocker switch fully to the right for front work lights and rear work lights operation.
9. **Self-Leveling Cancel (optional)** – Press the top of the switch to deactivate self-leveling. Press the bottom of the switch to restore the self-leveling function.

Figure 12 Lower Left Panel

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Right Panel

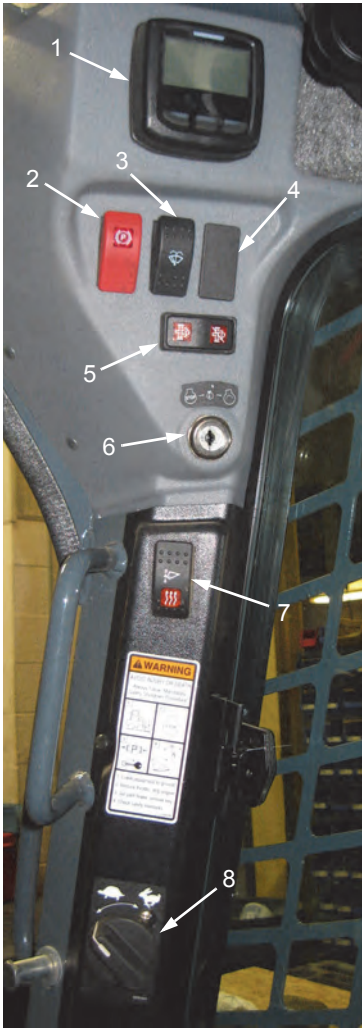

Figure 13 Right Panel

1. **Information Center Electronic Display** – See page 29.
2. **Parking Brake Switch** – Used to manually apply the parking brake. Lights when the parking brake is applied.
3. **Front Wiper/Washer (optional)**
4. **Rear Wiper/Washer (optional)**
5. **DPF (Diesel Particulate Filter) Regeneration Switch** – The DPF switch operates in this manner:

Regen Auto: The neutral center AUTO position of the switch allows the E-ECU to perform low-level DPF regeneration as required, without operator input.

Regen Request (Allow): The left side of the switch is a momentary switch used for starting a stationary regeneration.

Regen Request (Allow) Lamp: The lamp prompts the operator to implement a stationary regeneration. It is used for notifying the operator that the regen request (allow) switch is being activated.

Regen (Cancel): The right side of the toggle switch is used for delaying or cancelling a reset or stationary regeneration.

Regen (Cancel) Lamp: The lamp is used for notifying the operator that the reset/stationary regeneration is in a “standby” mode.

6. **Keyswitch** – In a clockwise rotation, the positions are:
   - **OFF Position** – With the key vertical, power from the battery is disconnected from the controls and instrument panel electrical circuits. This is the only position from which the key can be inserted or removed.
   - **ON (or RUN) Position** – With the key turned one position clockwise from vertical, power from the battery is supplied to all control and instrument panel circuits.
   - **START Position** – With the key turned fully clockwise, the electric starter engages, to start the engine. Release the key to RUN position after the engine starts.

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Note: *The engine cannot be started unless the operator is sitting in the seat and the restraint bar is lowered.*

7. **Power-A-Tach® System Switch** – A three-position momentary rocker switch is used to actuate the Power-A-Tach® System. Press the top of the switch to retract (release) the hitch pins; press the bottom of the switch to extend (engage) the hitch pins and activate the warming circuit. Set the switch to the neutral position (middle) to turn off the warming circuit (see page 26).
8. **Engine Speed Control** – Controls the engine speed. Move the control clockwise to increase and counter-clockwise to decrease the engine speed.

Joystick Controls

The loader may be equipped with dual joystick controls, (Figure 14). The left joystick controls the drive, and the right joystick controls the lift/tilt.

Figure 14 Dual Joystick Controls
1. Lift/Tilt Control
2. Drive Control

Drive Controls

Forward, reverse, speed and turning maneuvers are accomplished by movement of the left joystick. To go **forward**, push the drive control forward; for **reverse**, pull the control rearward. To turn **right**, push the control right; to turn **left**, push the control left. To go **forward and left**, move the control forward and left. To go **forward and right**, move the control forward and right. To move **back and left**, move the control back and to the right. To move **back and right**, move the control back and to the left.

WARNING **Be sure the joystick controls are in neutral before starting the engine. Operate the controls gradually and smoothly. Excessive speed and quick control movements without regard for conditions and circumstances are hazardous and could cause an accident.**

Moving the joystick farther from neutral increases the speed steadily to the maximum travel speed. Tractive effort decreases as speed increases. For maximum tractive effort, move the joystick only slightly away from the neutral position. The engine may stall if the control is moved too far forward when loading the bucket.

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Lift/Tilt Control

Moving the lift arm and tilting the attachment are accomplished by movement of the right joystick. To **raise** the lift arm, pull the control straight rearward; to **lower** the lift arm, push the control straight forward. To **tilt the attachment forward and downward**, move the control to the right; to **tilt the attachment up and back**, move the control to the left.

Note: *The speed of the lift/tilt motion is directly proportional to the amount of joystick movement and engine speed.*

To place the lift arm into the "float" position, push and hold the left button on the right joystick. This mode allows the lowered lift arm to follow the ground contour while traveling over changing ground conditions. An indicator lamp in the indicator and warning lamp display will blink when float is activated.

WARNING **Never push the float control button with the attachment raised, because this will cause the lift arm to lower very rapidly.**

Releasing the float button will cancel the float mode if the button was pressed less than five seconds. If the float mode button is pressed longer than five seconds, the float feature will remain on and the float indicator lamp will remain lit until the button is pressed again or the machine is turned off.

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Hand/Foot Controls

The loader may be equipped with hand/foot controls (Figure 15). The handles control the drive and the foot pedals control the lift/tilt.

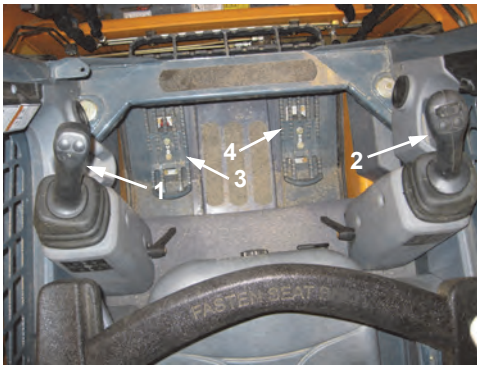

Figure 15 Hand/Foot Controls

1. Left Drive Control Handle
2. Right Drive Control Handle
3. Lift Control Pedal
4. Tilt Control Pedal

Drive Controls

Forward, reverse, speed and turning maneuvers are accomplished by movement of the control handles. To go **forward**, push both handles forward; for **reverse**, pull both handles rearward. For **turning**, move one handle farther forward or rearward than the other handle. Turn direction is determined by which handle is moved farther forward. To turn left, move the right handle farther forward than the left handle; to turn right, move the left handle farther forward than the right handle. For sharp turns, move the handles in opposite directions.

WARNING **Be sure the controls are in neutral before starting the engine. Operate the controls gradually and smoothly. Excessive speed and quick control movements without regard for conditions and circumstances are hazardous and could cause an accident.**

Moving the handles farther from neutral increases the speed steadily to the maximum travel speed. Tractive effort decreases as speed increases. For maximum tractive effort, move the handles only slightly away from the neutral positions. The engine will stall if the handles are moved too far forward when loading the bucket.

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Lift/Tilt Controls

Moving the lift arm and tilting the attachment are accomplished by movement of the foot pedals. The left pedal raises and lowers the lift arm; the right pedal tilts the attachment. To **raise** the lift arm, push down on the back of the left pedal with your left heel; to **lower** the lift arm, push down on the front of the left pedal with the toes of your left foot. To **tilt the attachment forward and down**, push down on the front of the right pedal with the toes of your right foot; to **tilt the attachment up and back**, push down on the back of the right pedal with your right heel.

Note: *The speed of the lift/tilt motion is directly proportional to the amount of pedal movement and engine speed.*

To place the lift arm into the "float" position, push and hold the left button on the right-hand control. This mode allows the lowered lift arm to follow the ground contour while traveling over changing ground conditions. An indicator lamp in the indicator and warning lamp display will blink when float is activated.

WARNING **Never push the float control button with the attachment raised, because this will cause the lift arm to lower very rapidly.**

Releasing the float button will cancel the float mode if the button was pressed less than five seconds. If the float mode button is pressed longer than five seconds, the float feature will remain on and the float indicator lamp will remain lit until the button is pressed again or the machine is turned off.

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T-Bar Controls

The loader may be equipped with T-bar controls (Figure 16). The left T-bar controls the drive, and the right T-bar controls the lift/tilt.

Figure 16 T-Bar Controls
1. Lift/Tilt Control
2. Drive Control

Drive Controls

Forward, reverse, speed and turning maneuvers are accomplished by movement of the left T-bar. To go **forward**, push the control forward; for **reverse**, pull the control rearward. To turn **right**, turn the control clockwise; to turn **left**, turn the control counterclockwise. For gradual turns, move the T-bar slightly forward or rearward. For sharp turns, turn the control clockwise or counterclockwise.

Moving the T-bar farther from neutral increase the speed steadily to the maximum travel speed. Tractive effort decreases as speed increases. To get maximum tractive effort, move the T-bar only slightly away from the neutral position. The engine will stall if the control is moved too far forward when loading the bucket.

WARNING **Be sure the controls are in neutral before starting the engine. Operate the controls gradually and smoothly. Excessive speed and quick control movements without regard for conditions and circumstances are hazardous and could cause an accident.**

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Lift/Tilt Control

Moving the lift arm and tilting the attachment are accomplished by movement of the right T-bar. To raise the lift arm, pull the control straight rearward; to **lower** the lift arm, push the control straight forward. To **tilt the attachment forward and downward**, twist the control clockwise; to **tilt the attachment up and back**, twist the control counterclockwise.

Note: *The speed of the lift/tilt motion is directly proportional to the amount of T-bar movement and engine speed.*

To place the lift arm into the "float" position, push the right control handle fully forward to detent. This mode allows the lowered lift arm to follow the ground contour while traveling over changing ground conditions. An indicator lamp in the indicator and warning lamp display will blink when float is activated.

WARNING **Never push the right control handle fully forward to detent the float control with the attachment raised, because this will cause the lift arm to lower very rapidly.**

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Auxiliary Hydraulic System

Auxiliary hydraulics are used with attachments that have a mechanism requiring hydraulic power.

Note: *When ignition power is interrupted, auxiliary hydraulic function (both standard and high-flow) are reset to OFF.*

Standard-Flow Auxiliary Hydraulic Control

Loaders are equipped with a standard-flow auxiliary hydraulic system with flat-face couplers. The couplers are located on top or inside of the lift arm on the left side.

Loaders Equipped with Electric Auxiliary: The black rocker switch located on the right-hand control controls the direction and amount of flow. The farther the switch is moved from center, the higher the flow to the auxiliary circuit. The direction of flow is reversed when the rocker switch is moved in the opposite direction from the center. Pushing the switch to the right (or up on T-bar controls) will pressurize the standard auxiliary male coupler. For continuous operation, move the switch in either direction and push the trigger button, located on the front of the grip for five seconds, and release. To cancel continuous operation, push the button or move the black switch in either direction.

Figure 17 Joystick Electric Auxiliary Control

High-Flow Auxiliary Hydraulic Control (Optional)

In addition to a standard-flow auxiliary hydraulic system, loaders may be equipped with a reversible high-flow auxiliary hydraulic system. The couplers are located on top or inside of the right lift arm. The high-flow auxiliary hydraulic system is used for operating certain hydraulic attachments (e.g., cold planer, snowblower) that require higher flows.

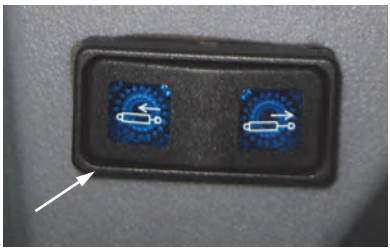

Figure 18 High-Flow Auxiliary Switch

The high-flow auxiliary switch controls the direction of hydraulic oil flow. The switch is located on the upper left side instrument panel. Push the right side of the rocker switch for forward flow, or the left side for reverse flow. Pushing the switch to the right will pressurize the high-flow male coupler. To disengage, push and release either side of the switch. Turning off the machine, raising the restraint bar, or restarting the engine will also reset the high-flow to neutral. A lamp on

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either side of the switch will illuminate when the high-flow auxiliary hydraulic system is engaged.

DPF (Diesel Particulate Filter) Regeneration

The Gehl R190, R220 and R260 series skid-steer loaders utilize a DPF (diesel particulate filter) regeneration system on the engine to meet the Tier 4 emission requirements. The information center electronic display will automatically alert the user when a regeneration of the engine is required. To begin a DPF regeneration procedure go to page 59.

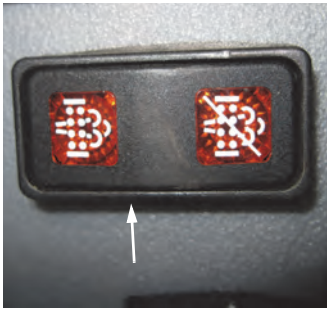

Figure 19 DPF Switch

All DPF regenerative functions are controlled by the E-ECU (Engine-Electronic Control Unit) and the DPF switch.

The DPF switch operates in this manner.

1. Regen Auto: The neutral center AUTO position of the switch allows the E-ECU to perform low-level DPF regeneration as required, without operator input.
2. Regen Request (Allow): The left side of the switch is a momentary switch used for starting a stationary regeneration.
3. Regen Request (Allow) Lamp: The lamp prompts the operator to implement a stationary regeneration. It is used for notifying the operator that the regen request (allow) switch is being activated.
4. Regen (Cancel): The right side of the toggle switch is used for delaying or cancelling a reset or stationary regeneration.
5. Regen (Cancel) Lamp: The lamp is used for notifying the operator that the reset/stationary regeneration is in a “standby” mode.

Note: *During regeneration, there may be a change in sound due to the intake throttle and the EGR (Exhaust Gas Recirculation) valve opening changes, but normal regeneration should otherwise be transparent to the operator. The exhaust may also smell different from non-DPF equipped diesel engines.*

WARNING **There is a possibility of carbon monoxide poisoning if the regeneration occurs in enclosed spaces. Be sure to allow for an outside air source or park the loader outside during a regeneration.**

WARNING **During regeneration there will be high exhaust gas temperatures, even at low load. Be sure to stay clear of the DPF during a regeneration.**

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Electrical Battery Disconnect Switch

An electrical battery disconnect switch is located inside the engine compartment on the left side and forward of the fuse panel. Turn the switch to the OFF position to disconnect the battery from the electrical system.

Figure 20 Battery Disconnect Switch

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Notes

OPERATION

WARNING **Before starting the engine and operating the loader, review and comply with all safety recommendations in the *Safety* chapter of this manual. Know how to stop the loader before starting it. Also, be sure to fasten and properly adjust the seatbelt(s) and lower the operator restraint bar.**

Before Starting the Engine

Before starting the engine and running the loader, refer to the *Controls and Safety Equipment* chapter and become familiar with the various operating controls, indicators and safety devices on the loader.

Fuel

Use only ultra-low sulfur diesel fuel to maintain proper engine performance. Use of diesel fuel with more than 15 ppm of sulfur can potentially damage the engine. BioDiesel mixtures of up to a 5% (B5) are acceptable. Ultra-Low Sulfur Diesel (ULSD) fuel lubricity must have a maximum scar diameter of 0.45 mm, as measured by ASTM D6079 or ISO 12156-1, or a minimum of 3100 grams, as measured by ASTM D6078. Contact your fuel supplier for details.

Static electricity can produce dangerous sparks at the fuel-filling nozzle. Do not wear polyester, or polyester-blend clothing while fueling. Before fueling, touch the metal surface of the machine away from the fuel fill to dissipate any built-up static electricity. Do not re-enter the machine but stay near the fuel filling point during refueling to minimize the build-up of static electricity. Do not use cell phones while fueling. Make sure the static line is connected from the machine to the fuel truck before fueling begins.

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 entire fuel delivery system is in compliance with fueling standards for proper grounding and bonding practices.

Starting the Engine

The following procedure is recommended for starting the engine:

1. Carefully step up onto the back of the bucket or attachment and grasp the handholds to enter the operator's compartment.
2. Close the door, fasten the seatbelt(s) and lower the restraint bar.
3. Verify the following:
   - the lift/tilt, drive and auxiliary hydraulic controls are in their neutral positions,
   - the parking brake switch is ON.

Note: *When the key is turned to the RUN position, an indicator lamp will light on the instrument panel and a buzzer will sound momentarily to remind users to fasten the seatbelt.*

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4. Turn the key to the START position.

Note: *If temperature is below 32°F (0°C), see Cold-Starting Procedure, on page 48.*

Important: *Do not engage the starter for longer than 15 seconds at a time. Longer use can overheat and damage the starter. If the engine fails to start within 15 seconds, return the key to the OFF position or check for engine error codes. Allow the starter to cool for 20 seconds and repeat step 4.*

After the engine starts, allow a five minute low idle warm-up period before operating the controls.

Important: *Avoid extended engine idling after the engine reaches normal operating temperature to prevent frequent DPF regenerations. If the indicator warning lamps do not go off, stop the engine and investigate the cause.*

Cold-Starting

If the temperature is below 32°F (0°C), the following is recommended to make starting the engine easier:

- Replace the engine oil with API-CJ-4/SAE 5W-30 oil as recommended by the viscosity chart;
- Make sure the battery is fully charged;
- Install a block heater on the engine.

Let the engine run for a minimum of five minutes to warm the engine and hydraulic fluid before operating the loader. A block heater is recommended for starting in temperatures of 14°F (-10°C) or lower. See your dealer for heater options.

Cold-Starting Procedure

WARNING **Do not use starting fluid (ether) with pre-heat systems. An explosion can result, which can cause engine damage, injury or death.**

1. Turn the key to the RUN position. If the preheat lamp symbol on the indicator and warning lamp display comes on, wait for this symbol to go out.
2. Immediately turn the key to the START position.
3. If engine does not start, return key to OFF position and repeat steps 1 and 2.
4. If equipped with the optional Power-A-Tach System, activate the warming circuit.

Important: *During cold start conditions, the recommended limit of continuous starter engagement is 15 seconds and the starter must never be energized for more than 30 seconds. If the starter is energized for 20-30 seconds, the loader should be turned off for one minute or longer. To protect the starter, the E-ECU system turns off the starter circuit if it is energized for 30 seconds or longer. The starter will remain de-energized for 30 seconds more before the loader can be restarted.*

Upon a successful start, let the engine run for a minimum of five minutes to warm the engine and hydraulic fluid before operating the loader.

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Cold Start Aids

- At an ambient temperature of 32° F (0° C) or below, no starting aids are required. However, as with any diesel vehicle, using the recommended engine oil, maintaining a healthy battery and installing an engine block heater are sound practices to improve cold-starting performance and prolonging starter life.
- At an ambient temperature of 14° F (-10° C) or below, a healthy battery is essential as glow cycles and cranking cycles can induce a substantial load on the battery during start. An engine block heater is recommended at this temperature to reduce starter load and improve the engine warm-up period prior to loader operation. Attempting to start the loader without a block heater will result in multiple glow/crank cycles or possible extended cranking time approaching 20 seconds.
- At an ambient temperature of 5° F (-15° C) or below, a healthy battery is imperative. A recommended battery charger/maintainer applied before or during a start cycle will help maintain 12 V to the starter circuit during a potential long crank cycle of 20 seconds or more. A required block heater will reduce starter load, reduce crank time and improve the overall engine warm-up time during extreme cold starts.

Speed Limit Protection During A Cold Start

- Depending upon coolant temperature, 14° F (-10° C) or below, the maximum engine speed allowable is 1500 rpm. This 1500 rpm limit remains in effect for approximately 10 seconds or less. If a throttle command above 1500 rpm is requested during this 10 second time frame, the operator must return the throttle to a command less than 1500 rpm before returning to a desired throttle position above 1500 rpm.

Stopping the Loader

The following procedure is the recommended sequence for stopping the loader:

1. Check that the drive control handle(s) is (are) in neutral position.
2. Lower the lift arm and rest the attachment on the ground.
3. Turn throttle knob back to the low idle position (and release the throttle pedal for joystick and T-bar control machines). Allow the engine to idle for five minutes if the engine was operated under full load.
4. Turn the keyswitch to the OFF position and remove the key.
5. Move the lift/tilt control to verify that the safety interlock system is preventing movement.
6. Raise the restraint bar, unfasten the seatbelt(s) and grasp the handholds while climbing out of the operator's compartment.

Note: *The skid-steer loader is equipped with a spring-applied automatic parking brake. The parking brake is applied when the operator lifts the restraint bar, leaves the operator's seat or shuts off the engine, or actuates the parking brake switch.*

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Parking the Loader

Park the loader away from traffic on level ground. If this is not possible, park the loader across the incline and block the tires to prevent movement.

Jump-starting

If the battery becomes discharged or does not have enough power to start the engine, use jumper cables and the following procedure to jump-start the engine.

WARNING **The ONLY safe method for jump-starting a discharged battery is for TWO PEOPLE to perform the following procedure. The second person removes the jumper cables so that the operator does not have to leave the operator's compartment with the engine running. NEVER make jumper cable connections directly to the starter solenoid of either engine. DO NOT start the engine from any position other than on the operator's seat and then ONLY after being sure ALL controls are in "neutral."**

Closely follow the procedure, in order, to avoid personal injury. In addition, to protect your eyes wear safety glasses and avoid leaning over the batteries while jump-starting.

DO NOT jump-start the battery if it is frozen, because it may rupture or explode.

Note: *BE SURE the jumper battery is a 12-volt D.C. battery.*

1. Turn the keyswitches of both vehicles to OFF, be sure the vehicles are in "neutral" and NOT touching each other.
2. Connect the positive (+) jumper cable to the positive (+) battery terminal on the disabled loader first. DO NOT allow the positive clamps to touch any metal other than the positive (+) battery terminals.
3. Connect the other end of the positive jumper cable to the jumper vehicle's battery positive (+) terminal.
4. Connect the negative (-) jumper cable to the jumper vehicle's battery negative (-) terminal.
5. Make the final negative (-) jumper cable connection to the disabled loader's engine block or loader frame (ground), such as the rear grille latch post – NOT to the disabled battery's negative post. If connected to the engine, keep the jumper clamp away from the battery, fuel lines and moving parts.
6. Start the loader. If it does not start at once, start the jumper vehicle engine to avoid excessive drain on the booster battery.
7. After the disabled loader is started and running smoothly, have the second person remove the jumper cables (negative [-] jumper cable first) from the jumper vehicle's battery and then from the disabled loader while being sure NOT to short the two cables together.

Allow sufficient time for the skid-steer loader alternator to build-up a charge in the battery before attempting to operate the loader or shut the engine off.

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WARNING **To prevent unexpected release of the attachment from the hitch, be sure to properly secure the hitch latch pins by rotating the latch lever fully (manual All-Tach® hitch), or by verifying that the pin flags moved fully to the outside of the hitch. (Power-A-Tach® hitch.) Locking pins must be fully engaged through the holes in the attachment frame before using the attachment. The attachment could fall off if it is not locked on the hitch and cause serious injury or death.**

On a manual hitch (Figure 21), one latch lever engages the latch pins to secure the attachment.

Connecting Attachments

1. **Manual hitch:** Rotate the latch lever to the right as viewed from the front to fully retract the latch pins.

   Power hitch: Activate the switch to unlock the hitch and fully retract the latch pins. (See page 26 for a detailed description of this procedure.)
2. Start the loader engine and be sure the lift arm is lowered and in contact with the loader frame.
3. Align the loader squarely with the back of the attachment.

Figure 21 Manual Hitch
1. Latch Lever
2. Latch Pins

4. Tilt the hitch forward until the top edge of the hitch is below the flange on the back side of the attachment and centered between the vertical plates.
5. Slowly drive the loader forward and, at the same time, tilt the hitch back to engage the flange on the back side of the attachment.
6. Stop forward travel when the flange is engaged, but continue to tilt the hitch back to lift the attachment off the ground.
7. **Manual hitch:** Exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (page 6). Leave the operator's compartment and rotate the latch lever to the left when viewed from the front to fully engage the latch pins.

   Power hitch: Press the Power-A-Tach switch in the right instrument panel to extend the hitch pins and to lock the hitch and fully engage the latch pins. After the pins are fully engaged, set the switch back to neutral (middle) to turn off the warming circuit. If the temperature is below 0° F (-18° C) it is recommended to leave the warming circuit on.

Note: *It is safe to operate the loader with the warming circuit on or off, it won't affect the performance of the loader.*

Important: *To check that the attachment is properly installed tilt the attachment forward slightly, apply downward pressure to the attachment prior to operating.*

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Connecting Auxiliary Hydraulic Couplings

Note: *With the engine off, key in the ON position and the restraint bar down, the auxiliary hydraulic control can be moved to relieve any pressure in the hydraulic system. Because the auxiliary hydraulics system is controlled using pilot pressure stored in an accumulator, the engine must have been run recently.*

Standard-Flow Auxiliary Hydraulics

Couplers are located on the left lift arm. When the auxiliary control switch is activated in either direction, the inside and outside couplers can be “pressure,” or “return” depending on which direction the switch is activated. The smaller center coupler is for the case drain.

High-Flow Auxiliary Hydraulics (optional)

Couplers are located on the right lift arm. When the auxiliary control switch is activated in either direction, the inside and outside couplers can be “pressure,” or “return” depending on which direction the switch is activated. The smaller center coupler is for the case drain.

WARNING **Only connect high-flow attachment couplers to the high-flow auxiliary couplers.**

Removing Attachments

1. Tilt the hitch back until the attachment is off the ground.
2. Exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (page 6).
3. With the engine off, leave the operator’s compartment and disconnect the auxiliary hydraulic hoses.
4. **Manual hitch:** Rotate the latch lever to the right when viewed from the front to fully retract the latch pins.

   Power hitch: Start the engine, press the top edge of Power-A-Tach switch on the right instrument panel to retract the hitch pins to unlock the hitch and fully retract the latch pins. Release the switch.
5. Start the engine (if it is not already on) and be sure that the lift arm is fully lowered and in contact with the loader frame.
6. Tilt the hitch forward and slowly back the loader away until the attachment is free from the loader.

Self-Leveling (optional)

The self-leveling feature is intended to automatically keep the attachment level while the lift arm is being raised. Self-leveling operates only when the lift arm is raised; when the lift arm is lowered, self-leveling is not activated.

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Self-Leveling Cancel (optional)

The self-leveling cancel option allows for the deactivation of the self-leveling feature. To deactivate self-leveling, press the top of the self-leveling cancel switch. To restore self-leveling, press the bottom of the self-leveling cancel switch.

Using a Bucket

WARNING **Always maintain a safe distance from electric power lines and avoid contact with any electrically charged conductor or gas line. Accidental contact or rupture can result in electrocution or an explosion. Contact the "Call Before You Dig" referral system at 8-1-1 in the U.S., or 888-258-0808 in the U.S. and Canada or proper local authorities for utility line locations before starting to dig.**

Driving over Rough Terrain

When traveling over rough terrain, activate the ride control system and drive slowly with the bucket lowered.

Driving on an Incline

When traveling on an incline, travel with the heavy end pointing uphill.

Digging with a Bucket

Approach the digging site with the lift arm slightly raised and the bucket tilted forward until the edge contacts the ground. Dig into the ground by driving forward and gradually lowering the lift arm (Figure 22).

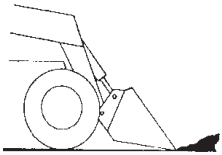

Figure 22 Digging

When the bucket is filled, tilt the bucket back and back the loader away from the material. Rest the lift arm against the loader frame before proceeding to the dumping area.

WARNING **Always carry the loaded bucket with the lift arm resting on the loader frame. For additional stability when operating on inclines, always travel with the heavier end of the loader toward the top of the incline.**

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Loading a Bucket

Approach the pile with the lift arm fully lowered and the bucket tilted slightly forward until the edge contacts the ground. Drive forward into the pile, lifting the lift arm and tilting back the bucket to fill it. Back away from the pile (Figure 23).

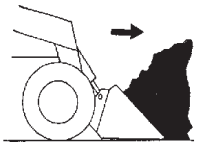

Figure 23 Loading

Dumping the Load onto a Pile

Carry a loaded bucket as low as possible until the pile is reached. Gradually stop forward motion and raise the lift arm high enough so that the bucket clears the top of the pile. Then, slowly move the loader ahead to position the bucket to dump the material on top of the pile. Dump the material and then back the loader away while tilting the bucket back and lowering the lift arm.

WARNING **Never use the "float" control with the bucket or attachment raised, because this will cause the lift arm to lower rapidly. For more information, see page 26.**

Dumping the Load into a Truck (or Hopper)

Carry the loaded bucket low and approach the vehicle (or hopper.) Stop as close to the side of the truck (or hopper) as possible while allowing for clearance to raise the lift arm and loaded bucket. Next, raise the lift arm until the bucket clears the top of the truck (or hopper) and move the loader ahead to position the bucket over the inside of the truck (or hopper.) Dump the material and then back away while tilting the bucket back and lowering the lift arm (Figure 24).

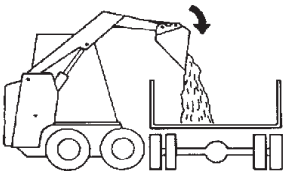

Figure 24 Dumping into a Truck (or Hopper)

Dumping the Load over an Embankment

WARNING **Do not drive too close to an excavation or ditch. Be sure the surrounding ground has adequate strength to support the weight of the loader and the load.**

Carry the loaded bucket as low as possible while traveling to the dumping area. Stop the loader where the bucket extends half-way over the edge of the embankment. Tilt the bucket forward and raise the lift arm to dump the material. Dump the material, and then back away from the embankment while tilting the bucket back and lowering the lift arm.

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Scraping with a Bucket

For scraping, the loader should be operated in the forward direction. Position the lift arm down against the loader frame. Tilt the bucket cutting edge forward at a slight angle to the surface being scraped. While traveling slowly forward with the bucket in this position, material can flow over the cutting edge and collect inside the bucket (Figure 25).

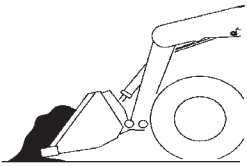

Figure 25 Scraping

Leveling the Ground

Drive the loader to the far edge of the area to be leveled. Tilt the bucket forward to position the bucket cutting edge at a 30 to 45 degree angle to the surface being leveled. Then place the lift arm into "float" position and drive the loader rearward, dragging the dirt and, at the same time, leveling it (Figure 26).

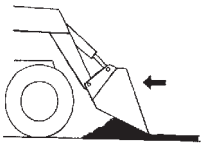

Figure 26 Leveling the Ground

Note: *For information on how the "float" detent is activated, see page 26.*

WARNING **Check that the work area is clear of people and obstacles. Always look in the direction of travel.**

Highway Travel

If it becomes necessary to move the loader a long distance, use a properly rated trailer. (See *Transporting the Loader* on page 57.) For short distance highway travel, attach an SMV (Slow-Moving Vehicle) emblem (purchased locally) to the back of the loader. For highway operation, install the optional amber strobe light. Check state and local laws and regulations.

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Storing the Loader

If the skid-steer loader is to be stored for a period in excess of two months, the following procedures are suggested:

1. Fully inflate the tires.
2. Lubricate all grease zerks.
3. Check all fluid levels and replenish as necessary. (Review and follow the engine manufacturers recommendations from the Engine Operator's Manual.)
4. Add stabilizer to the fuel per the fuel supplier's recommendations. If the fuel has a mixture of BioDiesel, empty the fuel tank before storing.
5. Turn the electrical battery disconnect switch to its OFF position and remove the battery, charge it fully and store in a cool, dry location.
6. Protect against extreme weather conditions such as moisture, sunlight and temperature.

Removing Loader from Storage

1. Check the tire air pressure and inflate the tires if they are low.
2. Connect the battery and check that the electrical battery disconnect switch is turned to its ON position.
3. Check all fluid levels (engine oil, transmission/hydraulic oil, engine coolant and any attached implements). (Review and follow the engine manufacturers recommendations from the Engine Operator's Manual.)
4. Start the engine. Observe all gauges. If all gauges are functioning properly and reading normal, move the machine outside.
5. Once outside, park the machine and let the engine idle for at least five minutes.
6. Shut the engine off and walk around machine. Make a visual inspection looking for evidence of leaks.

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WARNING **Park the truck or trailer on a level surface. Be sure the vehicle and its ramps have the weight capacity to support the loader. Make sure the vehicle surface and its ramps are clear of debris and slippery material that may reduce traction. Move the loader on and off the vehicle ramp slowly and carefully. Failure to follow these instructions could result in an overturn accident.**

Observe all local regulations governing the loading and transporting of equipment (Reference: U.S. Federal Motor Carrier Safety Regulations, Section 392). Ensure that the hauling vehicle meets all safety requirements before loading the skid-steer loader.

1. Block the front and rear of the hauling vehicle's tires.
2. If the loader has an attachment, lift it slightly off the ground.
3. Back the loader slowly and carefully up the ramp onto the vehicle.
4. Lower the loader attachment to the vehicle deck, turn off the engine and remove the key.

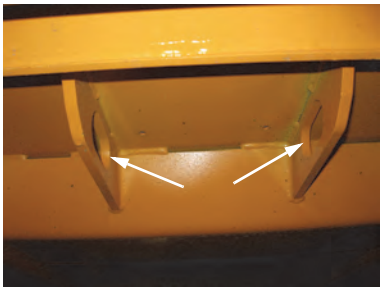

Figure 27 Front Tie-Downs / Retrieval Points

5. Fasten the loader to the hauling vehicle at the points indicated by the tie-down decals (Figure 27 and Figure 28).
6. Measure the clearance height of the loader and hauling vehicle. Post the clearance height in the cab of the vehicle.

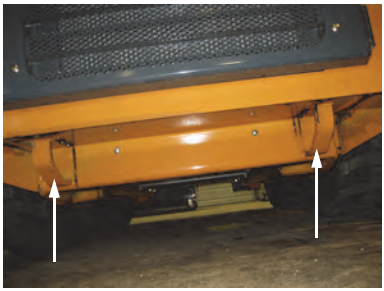

Figure 28 Rear Tie-Downs / Retrieval Points

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Lifting the Loader

The loader can be lifted using a single-point or four-point lift kit, which are available from your Gehl dealer.

WARNING

- **Before lifting, check the lift kit for proper installation.**
- **Never allow riders in the operator's compartment while the loader is lifted.**
- **Keep everyone a safe distance away from the loader while it is lifted.**
- **Loader may only be lifted with an empty bucket or empty pallet forks, or with no attachment. Never lift the loader with attachments other than those stated.**

Lift equipment used and its installation is the responsibility of the party conducting the lift. All rigging MUST comply with applicable regulations and guidelines.

1. Using suitable lift equipment, hook into the lift eyes. Adjust the length of the slings or chains to lift the loader level.

Note: *The loader my be slightly off level (10 degrees max.) when lifted.*

2. Center the hoist over the ROPS/FOPS. To prevent shock loading of the equipment and excessive swinging, slowly lift the loader off the ground. Perform all movements slowly and gradually. As needed, use a tag line to help position the loader and keep it from swinging.

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DPF (Diesel Particulate Filter) Regeneration

The Gehl R190, R220 and R260 series skid-steer loaders utilize a DPF (diesel particulate filter) regeneration system on the engine to meet the Tier 4 emission requirements. The information center electronic display will automatically alert the user when a regeneration of the engine is required.

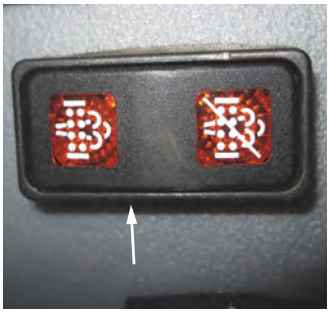

Figure 29 DPF Switch

All DPF regenerative functions are controlled by the E-ECU (Engine-Electronic Control Unit) and the DPF switch.

The DPF switch operates in this manner.

1. Regen Auto: The neutral center AUTO position of the switch allows the E-ECU to perform low-level DPF regeneration as required, without operator input.
2. Regen Request (Allow): The left side of the switch is a momentary switch used for starting a stationary regeneration.
3. Regen Request (Allow) Lamp: The lamp prompts the operator to implement a stationary regeneration. It is used for notifying the operator that the regen request (allow) switch is being activated.
4. Regen (Cancel): The right side of the toggle switch is used for delaying or cancelling a reset or stationary regeneration.
5. Regen (Cancel) Lamp: The lamp is used for notifying the operator that the reset/stationary regeneration is in a “standby” mode.

Note: *During regeneration, there may be a change in sound due to the intake throttle and the EGR (Exhaust Gas Recirculation) valve opening changes, but normal regeneration should otherwise be transparent to the operator. The exhaust may also smell different from non-DPF equipped diesel engines.*

WARNING **There is a possibility of carbon monoxide poisoning if the regeneration occurs in enclosed spaces. Be sure to allow for an outside air source or park the loader outside during a regeneration.**

WARNING **During regeneration there will be high exhaust gas temperatures, even at low load. Be sure to stay clear of the DPF during a regeneration.**

Before executing a regeneration procedure, it is recommended that operators become familiar with some terms and definitions related to a DPF (Diesel Particulate Filter) regeneration.

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Regeneration Terms and Definitions

DPF: Diesel Particulate Filter

Regen: Typically refers to the reset or stationary regeneration mode of the DPF, but could also refer to other regeneration modes, such as an assist or passive regeneration.

PM: Particulate matter in the DPF

Hours: Refers to the engine run-time hours

E-ECU: Refers to the Engine-ECU Control Unit

DTC: Diagnostic Trouble Codes

EGT: Exhaust Gas Temperature

Passive regeneration and assist regeneration: These automatic DPF regen modes occur without any operator input and without affecting machine operation.

Reset regeneration: This DPF regen mode intentionally increases exhaust gas temps to remove PM. Review all precautions regarding high exhaust temps. The operator can continue to operate all skid-steer loader functions. Reset regeneration is initiated by the E-ECU, but the operator has the option to delay this function. A reset-regeneration is a 100 hour recurring event unless other factors, such as engine load and effective PM levels determine otherwise.

Note: The operator can improve the effectiveness of the reset regen by operating the skid-steer loader at a middle to high throttle position during the reset regen.

Stationary Regeneration: This DPF regen mode includes engine speed control for a more effective and complete DPF regen. When the DPF regen-required lamp illuminates, the operator should move the skid-steer loader to a safe place without flammable material nearby before operating the stationary regen. For operation and other details, refer to the flow chart and stationary regen operating procedures.

Backup Mode: In the backup mode, the engine has reduced revolutions per minute (RPM) and power. A number of DTC's are to be expected. Refer to the DTC listing (page 81) for a complete summary and troubleshooting techniques. To cancel the backup mode, the service tool (Smart Assist) is required. Contact your dealer for full details.

Ash Cleaning Mode: The ash cleaning mode details are under development. Contact your dealer for information.

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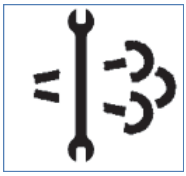
Engine Stop

The engine stop icon is used to notify the operator that the engine is in “backup” or “limp” mode. See the backup mode description on page 60 for more details.

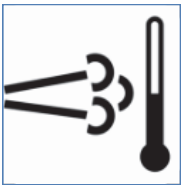
DPF (Diesel Particulate Filter) Service

The DPF service icon is used to notify the operator that the engine is in an emergency condition where ash cleaning is required. See the ash cleaning mode description on page 60 for more details.



Elevated EGT (Exhaust Gas Temperature)

The EGT icon is used to notify the operator of high exhaust temperatures during an active reset/stationary regeneration.



Parking Brake

The parking brake icon is used to remind the operator that the parking brake switch must be engaged prior to a stationary regeneration.

DPF Regeneration Acknowledgement

The DPF regeneration acknowledgement icon is used to notify the operator that the E-ECU has received the stationary regeneration request. It is also used to prompt the operator to start a stationary regeneration request or to allow a reset regeneration.

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Stationary Regeneration Safety

Before beginning a stationary regen operation there are several safety precautions to be aware of:

- Do not do a stationary regeneration in a poorly ventilated location. There is the danger of carbon monoxide poisoning.
- Be sure that there are no flammables near the exhaust pipes to avoid fires.
- Do not touch the exhaust pipes during stationary regen to avoid injury. Be sure there are no people close to the exhaust pipes.
- After stationary regeneration starts, white smoke may be discharged from the exhaust pipe. This is not a fault, but steam discharged when the exhaust temperature is low. As the exhaust temperature increases, the white smoke should disappear.
- Stationary regen may not operate while the engine is cold. Start it after the engine has warmed to normal operating temperature, 140° F (60° C) or above.
- The exhaust gas has a different odor from that of a conventional diesel engine. This is not a fault. The different odor is generated because the exhaust gas is purified by the catalyst integrated in the DPF.

Other Stationary Regeneration Topics

Besides the safety concerns listed above, the operator must also be aware of these additional stationary regen topics:

- **Extended duration of engine idling will rapidly increase soot levels in the DPF, requiring more frequent regen operations.**

- It is not a good practice to keep the DPF switch depressed in the CANCEL position for extended periods of time, as this could reduce the standby-time allowed prior to some of the regen modes.
- It is advised to not perform any additional machine functions during the stationary regen.
- The operator does not have to be in the operator's seat during the stationary or reset regen modes.
- Inadvertent pressing of the DPF regen switch does not harm the DPF system, since the DPF will not execute a regen request until all the requirements in the operating procedures are met.
- The stationary regen procedure consumes approximately 1 gal. (3,8 L) of diesel fuel.

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Stationary Regeneration Procedure

Take the following steps when performing a stationary regeneration. Refer to the DPF regen flowcharts (page 64) for a further understanding of this procedure.

1. Move to a safe location that is well-ventilated.
2. Set the acceleration of the engine to its lowest position and run the engine at idle speed. Ensure the engine's coolant temperature is above 140° F (60° C).
3. Engage the parking brake.
4. When the DPF regen request switch is pressed:
   - Operator Initiated: Press and hold for 10 seconds, release, then hold for an additional three seconds and the stationary regen starts. The engine speed will gradually increase to a high idle speed.
   - E-ECU Initiated: Press and hold for three seconds and the stationary regen starts. The engine speed will gradually increase to a high idle speed.
5. The stationary regen procedure takes approximately 25 to 30 minutes to perform.
6. When the above time has passed, the engine speed gradually decreases to the low idle speed and the DPF regen acknowledgement lamp and the EGT lamp turn off. Stationary regen is completed.

Note: *When stationary regen starts, the DPF regen-required lamp turns off, the DPF acknowledge lamp briefly appears and the EGT lamp illuminates.*

Stationary Regeneration Abort Procedure

To abort a stationary regen, perform any one of the following steps.

1. Set the DPF switch to its inhibit/cancel state.
2. Command the accelerator to a position above its lowest position.
3. Turn the manual parking brake switch to its OFF position.
4. Turn the keyswitch to the OFF position.

Note: *Depending upon the PM levels and which switch was used to abort the stationary regen, the E-ECU will either go back to normal operation or stationary regen standby mode.*

Note: *Interrupting a reset or stationary regen will require a full reset or stationary regen process in the future. The E-ECU does not command partial reset or stationary regens.*

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DPF Regen Flowcharts

If a **Stationary** Regen Mode is requested by **Machine Operator**:

How many hours since last Stationary Regen?

< 50 Hours

Stationary Regen is not allowed.

E– ECU returns to Normal Operation

> 50 Hours

Stationary Regen is allowed.

Stationary Regen

See Stationary Regen Procedure for complete details.

DPF SWITCH

Press and hold Stationary Regen Request switch for 10 seconds, release, then hold for an additional three seconds.

These icons will appear on the Electronic display during the Stationary Regen mode.

E– ECU returns to Normal Operation

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DPF Regen Flowcharts, cont.

If a **Reset** Regen Mode is initiated by the **ENGINE— ECU:**

Exhaust Gas Temp icon appears on the electronic display.

Reset Regen is now active

See Reset Regen Description for complete details.

DPF SWITCH

Keeping the DPF Switch in the center AUTO position, the E-ECU will complete the Reset Regen in about 25-30 minutes.

E– ECU returns to Normal Operation

How can the operator cancel Reset Regen? Press the CANCEL side of the DPF switch.

DPF SWITCH

Cancelling a Reset Regen transfers the E-ECU to a Reset Standby mode for three hours.

DPF SWITCH

During the three hour Reset Standby mode, setting the DPF switch back to the center AUTO position allows the Reset Regen mode to become available and then active as necessary depending upon PM.

E– ECU returns to Normal Operation

DPF SWITCH

Keeping the DPF switch in the CANCEL position for three hours or if there is excessive soot levels in the DPF, the E-ECU automatically prompts the E-ECU to request a Stationary Regen.

See next page.

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DPF Regen Flowcharts, cont.

If a **Stationary** Regen Mode is requested by the **ENGINE— ECU**

DPF REGEN ACKNOWLEDGE (Electronic Display)

DPF SWITCH

When these icons are active, the E-ECU is requesting a Stationary Regen.

A Stationary Regen Procedure is required within 10 hours.

Stationary Regen

See Stationary Regen Procedure for complete details.

DPF SWITCH

Press and hold Stationary Regen Request switch for three seconds.

These icons will appear on the Electronic display during the Stationary Regen mode.

E– ECU returns to Normal Operation

What happens if a Stationary Regen Procedure is not performed within 10 hours?

DPF SWITCH

DPF SWITCH

Keeping the DPF switch in the CANCEL position for more than 10 hours

OR

Keeping the DPF switch in the center AUTO position for more than 10 hours automatically transfers the E-ECU to Backup mode.

Backup Mode (Limp Mode)

SERVICE

WARNING **Before servicing the machine, unless expressly instructed to the contrary, exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (page 6).**

After service has been performed, be sure to restore all guards, shields and covers to their original positions before resuming operation.

This *Service* chapter details procedures for performing routine maintenance checks, adjustments and replacements. Most procedures are referred to in the *Troubleshooting* and *Maintenance* chapters of this manual. Refer to the *Maintenance Interval Chart* (page 103) for service intervals. Refer to the separate engine manual for engine-related adjustments, lubrication and service procedures.

Note: *All service procedures, except those described under the Dealer Services topic are owner-operator responsibilities.*

Important: *Always dispose of waste lubricating oils and hydraulic fluids according to local regulations or take to a recycling center for disposal. Do not pour onto the ground or down the drain.*

Dealer Services

The following areas of component service, replacement and adjustments require special tools and knowledge for proper servicing and should be performed only by your authorized Gehl skid-steer loader dealer: hydrostatic drive components, hydraulic system pumps, valves, hydraulic cylinders, electrical components (other than battery, fuses or relays).

Sliding Side Window Removal Procedure

The sliding side windows inside the ROPS/FOPS can be removed for cleaning. To begin, open the cab door and slide one of the side windows to the rear. Using a non-marring tool, separate the front plastic rail underneath the sliding window from the window frame. Pull the plastic rail forward until it releases from the window frame. Then slide the side window to the front and separate the rear plastic rail from the window frame in the same manner, pulling the rail rearward to release it from the window frame. The sliding side window may now be removed from the ROPS/FOPS. To reinstall the window, reverse the removal steps.

Figure 30 Rail removed from window frame.

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Replacement Parts

Part Description	Gehl Part No.
Air Cleaner Element, Primary (outer) - R190	184146
Air Cleaner Element, Secondary (inner) - R190	184195
Air Cleaner Element, Primary (outer) - R220/ R260	50352454
Air Cleaner Element, Secondary (inner) - R220/ R260	50352455
Hydraulic Oil Filter Element - All Models	074830
Engine Oil Filter Element - All Models	195568
Fuel Filter Element - All Models	50352551
Fuel Separator Element - All Models	50352550
Fresh Air Intake Filter (heater option)	195660
Recirculation Air Filter (heater option)	242832 (2 per)
Belt, Alternator/Fan - R190	50350094
Belt, Alternator/Fan - R220/R260	241477
Belt, AC Compressor - All Models	242274

Note: *Part numbers may change. Your Gehl dealer will always have the latest part numbers.*

Important: *To ensure continued warranty coverage, use only genuine Gehl replacement filters.*

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Loader Raising Procedure

To raise the skid-steer loader so all four tires are off the ground, use the procedure below:

WARNING **Do not rely on a jack or hoist to maintain the raised position without additional blocking and supports. Serious personal injury could result from improperly raising or blocking the loader.**

1. To block the loader, obtain enough suitable blocks (solid wood, hard plastic or metal) so all of the tires are raised off the ground.

Figure 31 Loader Properly Blocked

2. Using a jack or hoist capable of lifting the fully-equipped weight of the loader (with all attached options), lift the rear of the loader until the rear tires are off the ground.
3. Stack wooden, hard plastic or metal blocks under the flat part of the loader chassis. They should run parallel with, but not touch, the rear tires.
4. Slowly lower the loader until its weight rests on the blocks. If the tires still touch the ground, raise the loader again, add more blocks and lower again.
5. Repeat steps 2 through 4 for the front end. When the procedure is finished, all four tires are off the ground, so they could be removed.

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Loader Lowering Procedure

When service or adjustment procedures are complete, the loader can be lowered from the raised position. To lower the loader onto its tires:

1. Using a jack or hoist, raise the front of the loader until its weight no longer rests on the front blocks.
2. Carefully remove the blocking under the front of the loader.
3. Slowly lower the loader until the front tires are resting on the ground.
4. Repeat steps 1 through 3 for the rear of the loader. When the procedure is finished, all four tires will be on the ground and the blocks removed from under the loader.

Engine Compartment Access

To open the engine compartment, lift the engine cover. Then pull the rear grille latch up (Figure 32) and carefully swing open the rear grille. There is another rear grille latch near the top hinge pin of the grille to secure the grille in an open position.

Figure 32 Rear Grille Latch Location

Figure 33 Engine Compartment Access Door and Cover

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Tilting Back the ROPS/FOPS

A manual lock mechanism is used as a gas spring lock to prevent the raised ROPS/FOPS from lowering unexpectedly. The manual lock mechanism engages to lock the ROPS/FOPS in a tilted-back position.

To tilt back the ROPS/FOPS, remove two hex nuts on two anchor bolts at the front of the ROPS/FOPS. Tilt it back slowly, moving the control handles out of the way. Two gas-charged springs help tilt it back. A self-actuating lock mechanism will engage to lock when the ROPS/FOPS is in a rolled-back position. To lower the ROPS/FOPS, return the lock mechanism to the unlocked position (flipper up). Lower the ROPS/FOPS slowly onto the chassis. Reinstall the anchor bolts, washers and locknuts. Refer to the Torque Specifications chart (page 119) for torque information.

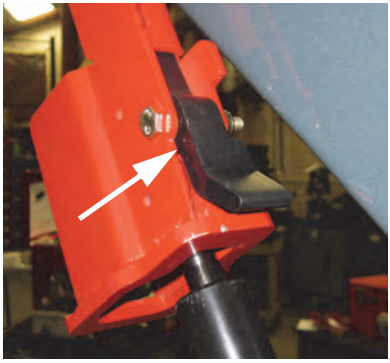

Figure 34 ROPS/FOPS Lock Mechanism – Engaged

Figure 35 ROPS/FOPS Lock Mechanism – Disengaged

WARNING **Never operate the loader with the ROPS/FOPS removed or tilted back. Be sure the lock mechanism is securely engaged when the ROPS/FOPS is tilted back. Be sure to reinstall the anchor bolts, washers and locknuts before resuming operation. Additionally, DO NOT raise or lower the lift arm with the ROPS/FOPS rolled back.**

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Adjustments

Control Handles

The control handles do not require routine adjustment. Refer to the *Service Manual* for the initial setup procedure.

Removing Foreign Material

The loader should be cleared daily of dirt and other foreign materials in the following areas:

- around the lift cylinders
- at the front of the loader
- on the hitch, especially around tilt cylinder
- around the hydraulic oil reservoir breather
- in the engine compartment
- in the operator's compartment

Important: *Build-up of foreign materials in these areas can interfere with the operation of the loader, cause component damage or become a fire hazard.*

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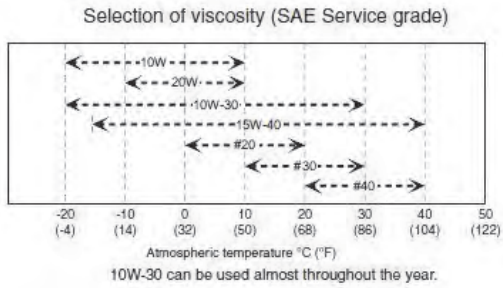
Lubrication

Listed below are the temperature ranges and types of lubricants for this machine. Refer to the separate engine manual for more information regarding engine lubricants, quantities and grades required.

Note: *Refer to the specific service sections for detailed information on periodic checking and replenishing of lubricants.*

Refer to Figure 36 for grease fitting locations. Wipe dirt from the fittings before greasing them to prevent contamination. Replace any missing or damaged fittings. To minimize dirt build-up, avoid excessive greasing.

Important: *Always dispose of waste lubricating oils and hydraulic fluids according to local regulations or take to a recycling center for disposal. Do not pour onto the ground or down the drain.*

System	Lubricant
Hydraulic System Oil	Use Petro Canada HVI60, Mobil DTE 15M or equivalent, which contain anti-rust, anti-foam and anti-oxidation additives, and conforms to ISO VG46. **Entire System Capacity, R190:** 11 U.S. gallons (41,6 L) **Entire System Capacity, R220:** 12 U.S. gallons (45,4 L) **Entire System Capacity, R260:** 12 U.S. gallons (45,4 L) **Bare Reservoir Capacity:** 8.0 U.S. gal. (30,3) L
Chaincase Oil	Use SAE grade 10W-30 motor oil. **R190 Capacity** (each side): 9.5 U.S. quarts (9,0 L) **R220 Capacity** (each side): 10 U.S. quarts (9,5 L) **R260 Capacity** (each side): 11 U.S. quarts (10,4 L)
Grease Fittings	Use lithium-based grease.
Engine Oil	Important: Refer to the Engine Operator's Manual for specific engine oil recommendations. Service Classification: API-CJ-4 SM **R190 Capacity:** 9.5 U.S. quarts (9,0 L) **R220/R260 Capacity**: 11.0 U.S. quarts (10,4 L) 

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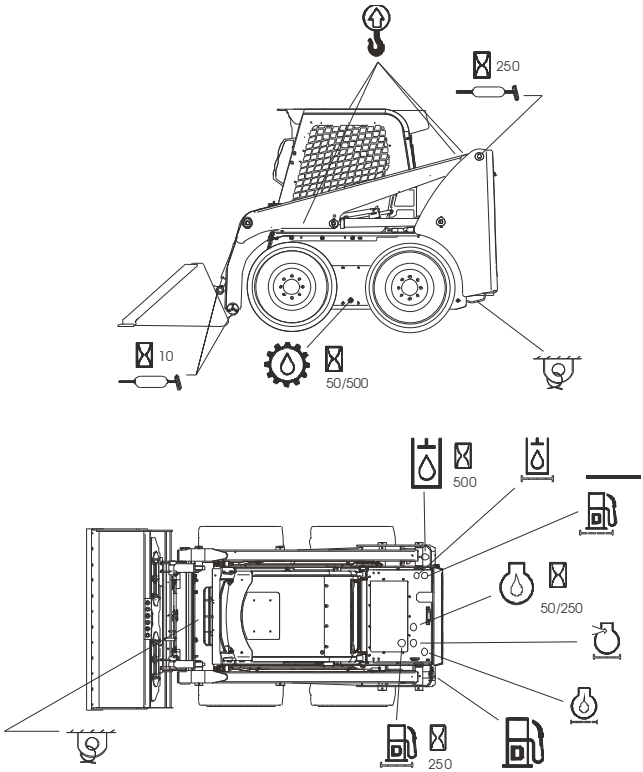

Figure 36 Service Locations (see Maintenance Chart on page 103.)

Lubrication Procedure	10 Hours (or Daily)	50 Hours	250 Hours	500 Hours (or Yearly)
Check Engine Oil Level (page 80)	●			
Check Hydraulic Oil Level (page 87)	●			
Grease Hitch, Hitch-related Cylinder Pivots and Latch Pins (page 73)	●			
Grease Lift Arm Pins (page 73)	●		●	
Check Oil Level in Chaincases (page 75)			●	
Change Engine Oil and Filter (page 80)	◆		●	
Change Hydraulic Oil Filter (page 87)	◆			●
Change Hydraulic Oil (page 88)				●
Change Chaincase Oil (page 75)	◆			●
Check and Drain Water Separator (page 81)		●		
Replace Filter in Water Separator (page 81)				●

◆ Perform the initial procedure at 50 hours, then at the indicated intervals.

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Chaincases

There is a chaincase on each side of the loader. Refer to the *Maintenance Interval Chart* (page 103) for change intervals. Refer to the *Lubrication* chart (page 74) for the type of lubricant.

Checking and Adding Oil

1. Park the loader on a level surface and raise the lift arm, refer to the *Lift Arm Support Device Engagement Procedure* (page 22). Shut off the engine and remove the key.
2. On each chaincase cover, between the axles, is a fill and check plug (Figure 37). Remove this plug. The oil level should be at the plug level or no more than 1/4 in. (6 mm) below the plug.
3. If the oil level is low, add oil through the check and fill plug until the oil level reaches the check plug hole. Reinstall the plug.

Figure 37 Fill and Check Plug

Draining Oil

1. Park the loader on a level surface, or on a sloping surface with the loader facing downhill and the tires blocked.
2. At the front of the loader, remove the chaincase drain plug (Figure 38) on each chaincase and drain the oil into a suitable container.
3. Reinstall and tighten the drain plugs.
4. Refill the chaincases at the fill plugs per the procedure above.

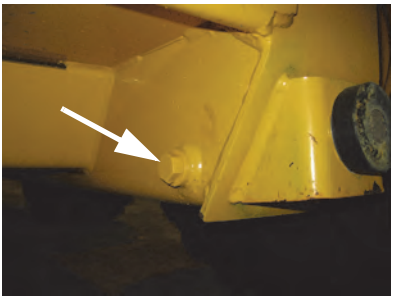

Figure 38 Drain Plug (R190 Shown)

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Drive Chains

Drive chains are located in the chaincase on each side of the machine. Refer to the *Maintenance Interval Chart* (page 103) for tension check interval.

Checking Chain Tension

1. Raise the loader following the *Loader Raising Procedure* (page 69).
2. Rotate each tire by hand. The proper amount of chain defection should be 1/8 inch to 1 inch (3 to 25 mm) forward and rearward tire movement. If the chain defection is more than 1 inch (25 mm) or less than 1/8 inch (3 mm) in either direction, the chains should be adjusted.

Adjusting Chain Tension

1. Raise the loader following the *Loader Raising Procedure* (page 69).
2. Remove the tire from the axle to be adjusted.
3. Loosen (but **DO NOT** remove) the bolts holding the axle to the chaincase.
4. **Front Chain Tension** – To tighten the front chain, move the front axle assembly toward the front of the loader. To loosen the chain, move the front axle assembly toward the rear of the loader.

   Rear Chain Tension – To tighten the rear chain, move the rear axle assembly rearward. To loosen the chain, move the rear axle assembly toward the front of the loader.
5. After proper tension is achieved, retighten the bolts.

Important: *Be careful not to over-tighten the drive chains. Over-tightening will cause premature drive chain and axle sprocket wear.*

6. Reinstall the tire.
7. Repeat steps 2 through 6 for any other axle requiring adjustment.
8. Lower the loader following the *Loader Lowering Procedure* (page 70).

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Engine Air Cleaner

Important: *Failure to follow proper filter servicing instructions could result in catastrophic engine damage.*

The air cleaner assembly consists of an outer (primary) filter element and an inner (secondary) filter element. There is an electrical air filter restriction indicator for monitoring the condition of the elements. If the air filter becomes restricted, this indicator will trigger a lamp light in the indicator and warning lamp display to warn the operator that the air cleaner requires service. For replacement elements, refer to the *Replacement Parts* chart (page 68).

The outer element should be replaced only when the restriction indicator lamp lights. The inner element should be replaced every third time the outer element is replaced, unless the outer element is damaged or the inner element is visibly dirty.

Along with a daily check of the restriction indicator, check that the air cleaner intake hose and clamps, and the mounting bracket hardware are properly secured.

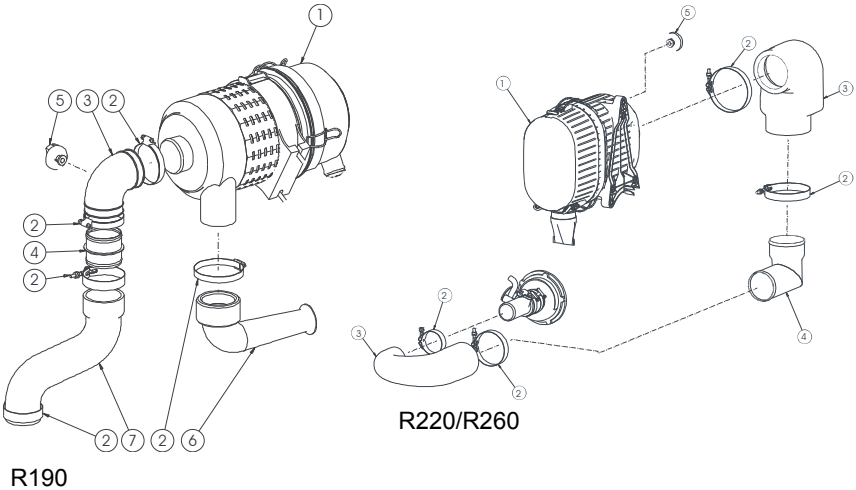

Figure 39 Dual-Element Air Cleaner

1. Element Housing (includes filters)
2. Hose Clamp
3. Elbow Hose
4. Reducer/Adapter
5. Restriction Indicator
6. Sound Diffuser
7. Air Intake Tube

Access

1. Open the engine cover and then the rear grille (page 70).
2. Unlatch the three clamps on the air cleaner cover and remove the cover. Clean out any dirt built up in the cover assembly.

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Outer Element

1. Carefully pull the outer element out of the housing. Never remove the inner element unless it is to be replaced.
2. Clean out any dirt built up in the housing. Leave the inner element installed during this step to prevent debris from entering the engine intake manifold.
3. Use a trouble light inside the outer element to inspect for bad spots, pinholes or ruptures. Replace the outer element if any damage is noted. The outer element must be replaced if it is oil- or soot-laden.

Note: *Cleaning the outer element is not recommended.*

Inner Element

Note: *Replace the inner element only if it is visibly dirty or if the outer element has been replaced three times.*

1. Before removing the inner element from the housing, clean out any dirt built up in the housing. Leave the inner element installed during this step to prevent debris from entering the engine intake manifold.
2. Remove the inner element.

Reinstallation

1. Check the inside of the housing for any damage that may interfere with the elements.
2. Be sure that the element sealing surfaces are clean.
3. Insert the element(s), making sure that they are seated properly.
4. Secure the cover to the housing with the three clamps.
5. Check the hose connections and make sure they are all fitted and tightened properly.

Note: *Periodically inspect intake system tubes, rubber elbows and connections. Inspect for cracks, loose fits and loose clamps. Tighten or replace as needed. Intake system must be air tight.*

Note: Refer to the *Maintenance Interval* chart (page 103) for change intervals. Refer to the *Replacement Parts* chart (page 68) for filter part numbers.

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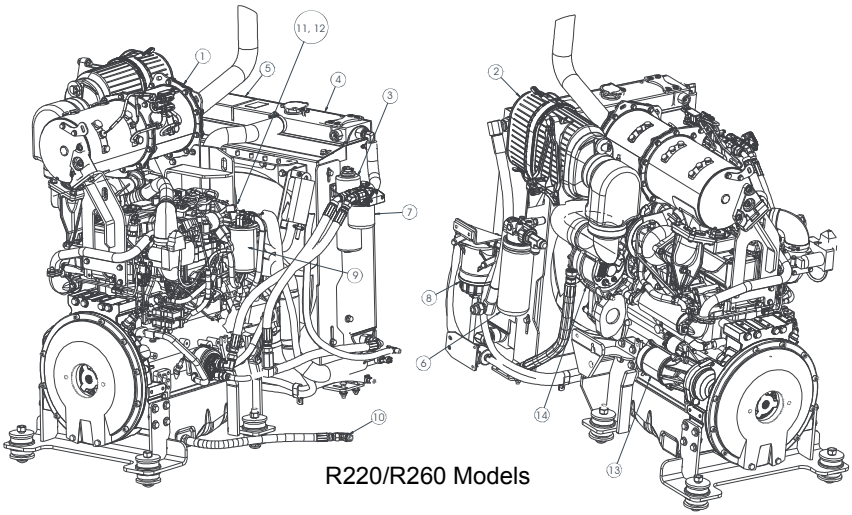
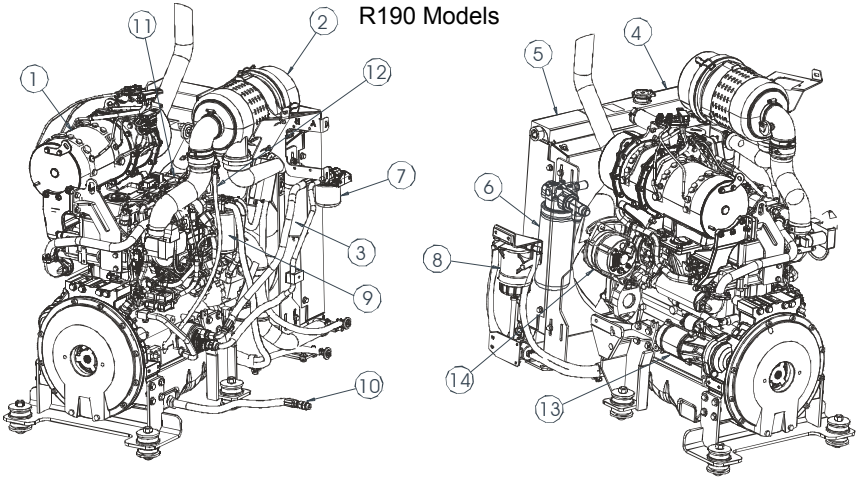


R220/R260 Models

Figure 40 Engine Service Components

1. Muffler
2. Air Cleaner
3. Coolant Bottle
4. Engine Radiator
5. Hydraulic Cooler
6. Hydraulic Filter
7. Remote Engine Oil Filter
8. Water Separator
9. Fuel Filter
10. Remote Engine Oil Drain
11. Engine Oil Fill Cap
12. Engine Oil Dipstick
13. Starter
14. Alternator

R190 Models



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Refer to the *Maintenance Interval* chart (page 103) for change intervals. Refer to the *Replacement Parts* chart (page 68) for filter part numbers. Refer to the Engine Operator's Manual for detailed engine information.

Checking Engine Mounting Hardware

All bolts that secure the engine mounting brackets to the engine and the loader frame should be checked and re-torqued as necessary. Refer to the *Torque Specifications Chart* (page 119) for torque information.

WARNING **Allow hot engine and hydraulic system components to cool before servicing.**

Checking Engine Oil Level

Open engine cover (page 70), pull out the dipstick and check the oil level. Markings on the dipstick represent FULL and LOW (add oil) levels.

Changing Engine Oil and Filter

Note: *For new units, the initial oil change should be after the first 50 hours.*

Important: *Always dispose of waste lubricating oil according to local regulations or take to a recycling center for disposal; do not pour onto the ground or down the drain.*

The remote engine oil filter is located behind the engine, above the battery. Raise the engine cover and lock open the rear grille to access the oil filter (Figure 41).

Figure 41 Remote Engine Oil Filter

Access for draining the engine oil is located behind the left rear tire (Figure 42).

To add new oil, open the engine access cover. Remove the oil fill cap and add the recommended type and quantity of oil. Refer to the *Lubrication* chart, page 73. Visually inspect the remote oil drain hose for damage or leaks.

Figure 42 Remote Engine Oil Drain Cap

Important: *It is recommended that the engine oil change occur after every five engine DPF (diesel particulate filter) regenerations, if five stationary regenerations occur during the duration of the 250 hour oil change interval. See page 44 for more information on the engine regeneration process.*

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Changing Fuel Filter

The fuel filter is located on the left side of the engine. To begin, turn the plastic petcock located on top of the water separator (Figure 43) a 1/4 turn to stop fuel flow. Clean dirt from around the filter head. Remove the spin-on filter cartridge. Replace with a new filter cartridge. Lubricate the seal on the new filter element with fuel before installing. Return the fuel line petcock on the water separator to the open position. Start the engine and check for leaks. See page 79 for location on the engine.

Checking the Water Separator

The water separator is located between the fuel tank and the main fuel filter and is used to remove finely dispersed water in diesel fuel. Check on a daily basis and drain if necessary. Water can be drained from the separator by opening the valve located at the bottom of the separator bowl.

Important: *Water in the fuel system can cause severe engine damage. Drain water from the water separator anytime water is present.*

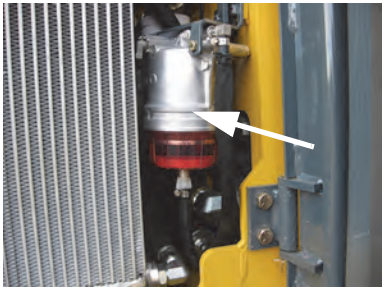

Figure 43 Location of Water Separator

To change the water separator filter, turn the plastic petcock located on top of the water separator a 1/4 turn to stop fuel flow. Unscrew the separator bowl from the housing and pull down on the existing filter to release it from the housing. Replace with a new filter and reinstall the bowl. Return the petcock on the water separator to the open position. Start the engine and check for leaks.

Engine Diagnostic Chart

When detecting faults, the information center electronic display (page 29) uses a diagnostic trouble code (DTC) screen to alert the operator to the occurrence of the fault conditions.

The data port for accessing the diagnostic trouble codes can be found behind a swell latch panel at the operator's left foot.

The following pages list descriptions, diagnostic trouble codes and fault codes for the engine.

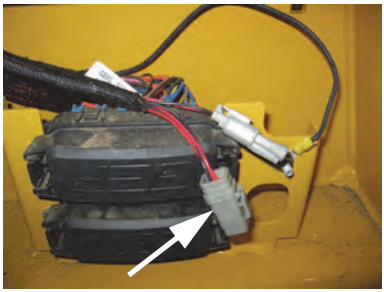

Figure 44 Data Port for the Engine

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Engine Diagnostic Chart

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadec-imal number	Decima number			
P0336	522400	7F8A0	2	MIL + AWL	Crank speed sensor	Crank signal malfunction
P0337			5	MIL + AWL		No crank signal
P0341	522401	7F8A1	2	MIL + AWL	Cam speed sensor	Cam signal malfunction
P0342			5	MIL + AWL		No cam signal
P1341			7	MIL + AWL		Angle offset failure
P0008	523249	7FBF1	5	MIL + RSL	Crank speed, Cam speed sen-sor	No signal on both crank and cam speed sensor
P0123	91	5B	3	MIL + AWL	Accelerator sensor 1	Accelerator sensor 1 (Excessive sensor output)
P0122			4	MIL + AWL		Accelerator sensor 1 (Insufficient sensor output)
P0223	28	1C	3	MIL + AWL	Accelerator sensor 2	Accelerator sensor 2 (Excessive sensor output)
P0222			4	MIL + AWL		Accelerator sensor 2 (Insufficient sensor output)
P1646	522624	7F980	7	MIL + AWL	Accelerator sensor 1 + 2	Dual accelerator sensor (closed position) failure
P1647	522623	7F97F	7	MIL + AWL		Dual accelerator sensor (open position) failure
P0228	29	1D	3	MIL + AWL	Accelerator sensor 3	Accelerator sensor 3 (Excessive sensor output)
P0227			4	MIL + AWL		Accelerator sensor 3 (Insufficient sensor output)
P1227			8	MIL + AWL	Pulse sensor	Pulse sensor failure (Pulse communication)
P1126	28	1C	0	MIL + AWL	Accelerator sensor 3	Accelerator sensor 3 failure (Foot pedal in open position)
P1125			1	MIL + AWL		Accelerator sensor 3 failure (Foot pedal in closed position)
P02E9	51	33	3	MIL + RSL	Intake throttle opening sensor	Intake throttle opening sensor fault (High voltage)
P02E8			4	MIL + RSL		Intake throttle opening sensor fault (Low voltage)
P0238	102	66	3	MIL + RSL	EGR low pressure side sensor	EGR low pressure side sensor fault (High voltage)
P0237			4	MIL + RSL		EGR low pressure side sensor fault (Low voltage)
P0236			13	MIL + RSL		EGR low pressure side sensor (Abnormal learning value)
P0473	1209	4B9	3	MIL + RSL	EGR high pressure side sensor	EGR high pressure side sensor fault (High voltage)
P0472			4	MIL + RSL		EGR high pressure side sensor fault (Low voltage)
P0471			13	MIL + RSL		EGR high pressure side sensor (Abnormal learning value)
P0118	110	6E	3	MIL + AWL	Cooling water temperature sen-sor	Cooling water temperature sensor fault (High voltage)
P0117			4	MIL + AWL		Cooling water temperature sensor fault (Low voltage)
P0217			0	Select by application		Cooling water temperature sensor temperature abnormal high (Overheat)
P0113	172	AC	3	MIL + AWL	New air temperature sensor	New air temperature sensor fault (High voltage)
P0112			4	MIL + AWL		New air temperature sensor fault (Low voltage)
P0183	174	AE	3	MIL + AWL	Fuel temperature sensor	Fuel temperature sensor fault (High voltage)
P0182			4	MIL + AWL		Fuel temperature sensor fault (Low voltage)
P0168			0	Select by application		Fuel temperature sensor temperature abnormal high

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Engine Diagnostic Chart (cont.)

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadec-imal number	Decima number			
P0193	157	9D	3	MIL + RSL	Rail pressure sensor	Rail pressure sensor fault (High voltage)
P0192			4	MIL + RSL		Rail pressure sensor fault (Low voltage)
P2455	3251	CB3	3	MIL + RSL	DPF differential pressure sensor	DPF differential pressure sensor fault (High voltage)
P2454			4	MIL + RSL		DPF differential pressure sensor fault (Low voltage)
P2452			0	MIL + RSL		DPF differential pressure sensor differential pressure abnormal high
P2453			13	MIL + RSL		DPF differential pressure sensor (Abnormal learning value)
P1455	3609	E19	3	MIL + RSL	DPF high pressure side sensor	DPF high pressure side sensor fault (High voltage)
P1454			4	MIL + RSL		DPF high pressure side sensor fault (Low voltage)
P1428	3242	CAA	3	MIL + RSL	DPF inlet temperature sensor	DPF inlet temperature sensor fault (High voltage)
P1427			4	MIL + RSL		DPF inlet temperature sensor fault (Low voltage)
P1436			0	MIL + AWL		DPF inlet temperature sensor temperature abnormal high
P1434	3250	CB2	3	MIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor fault (High voltage)
P1435			4	MIL + RSL		DPF intermediate temperature sensor fault (Low voltage)
P0420			1	MIL + AWL		DPF intermediate temperature sensor temperature abnormal low temperature
P1426			0	MIL + RSL		DPF intermediate temperature sensor temperature abnormal high (Post-injection failure)
P2229	108	6C	3	MIL + AWL	Atmospheric pressure sensor	Atmospheric pressure sensor fault (High voltage)
P2228			4	MIL + AWL		Atmospheric pressure sensor fault (Low voltage)
P1231			10	MIL + AWL		Atmospheric pressure sensor characteristic fault
P041D	412	19C	3	MIL + AWL	EGR gas temperature sensor	EGR gas temperature sensor fault (High voltage)
P041C			4	MIL + AWL		EGR gas temperature sensor fault (Low voltage)
P040D	105	69	3	MIL + RSL	Intake manifold temperature sensor	Intake manifold temperature sensor fault (High voltage)
P040C			4	MIL + RSL		Intake manifold temperature sensor fault (Low voltage)
P0546	173	AD	3	MIL + AWL	Exhaust manifold temperature sensor	Exhaust manifold temperature sensor fault (High voltage)
P0545			4	MIL + AWL		Exhaust manifold temperature sensor fault (Low voltage)
P068B	1485	5CD	7	MIL + AWL	Main relay	Main relay contact stuck
P068A			2	MIL + AWL		Main relay early opening
P0543	522243	7F803	5	MIL + AWL	Startup assist relay	Startup assist relay interrupted
P0541			6	MIL + AWL		Startup assist relay GND interrupted
P0204 (4TNV), P0203 (3TNV)	651 (4TNV), 652 (3TNV)	28B (4TNV), 28C (3TNV)	5	MIL + RSL	Injector 1 4TNV: Cyl No. 4 3TNV: Cyl No. 3 Corresponding port 4TNV: 1 - 2 3TNV: 1 - 3	Injector 1 open circuit (Inherent location of the injector)
P0271 (4TNV), P0268 (3TNV)			6	MIL + RSL		Injector 1 coil short circuit
P1271 (4TNV), P1262 (3TNV)			3	MIL + RSL		Injector 1 short circuit
P0202	653	28D	5	MIL + RSL	Injector 2 4TNV: Cyl No. 2 3TNV: Cyl No. 2 Corresponding port 4TNV: 2 - 1 3TNV: 1 - 2	Injector 2 open circuit (Inherent location of the injector)
P0265			6	MIL + RSL		Injector 2 coil short circuit
P1265			3	MIL + RSL		Injector 2 short circuit

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Engine Diagnostic Chart (cont.)

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadecimal number	Decima number			
P0201	654	28E	5	MIL + RSL	Injector 3 4TNV: Cyl No. 1 3TNV: Cyl No. 1 Corresponding port 4TNV: 2 - 2 3TNV: 1 - 1	Injector 3 open circuit (Inherent location of the injector)
P0262			6	MIL + RSL		Injector 3 coil short circuit
P1262			3	MIL + RSL		Injector 3 short circuit
P0203	652	28C	5	MIL + RSL	Injector 4 4TNV: Cyl No. 3 Corresponding port 4TNV: 1 - 1	Injector 4 open circuit (Inherent location of the injector)
P0268			6	MIL + RSL		Injector 4 coil short circuit
P1268			3	MIL + RSL		Injector 4 short circuit
P0611	4257	10A1	12	MIL + RSL	Injector (common)	Injector drive IC error
P1146	2797	AED	6	MIL + RSL		Injector drive circuit (Bank1) short circuit (4TN: Common circuit for No. 1, No. 4 and all 3TN cylinders)
P1149	2798	AEE	6	MIL + RSL		Injector drive circuit (Bank 2) short circuit (4TN: Circuit for No. 2 and No. 3 cylinders)
P1648	523462	7FCC6	13	MIL + RSL	Injector (correction value)	IQA corrected injection amount for injector 1 error
P1649	523463	7FCC7	13	MIL + RSL		IQA corrected injection amount for injector 2 error
P1650	523464	7FCC8	13	MIL + RSL		IQA corrected injection amount for injector 3 error
P1651	523465	7FCC9	13	MIL + RSL		IQA corrected injection amount for injector 4 error
P1641	522571	7F94B	3	MIL + RSL	SCV (MPROP)	High-pressure pump drive circuit (Low side VB short-circuit)
P1643			6	MIL + RSL		High-pressure pump drive circuit (Low side GND short-circuit)
P0629	633	279	3	MIL + RSL		High-pressure pump drive circuit (High side VB short-circuit)
P1642			6	MIL + RSL		High-pressure pump drive circuit (High side GND short-circuit)
P0627			5	MIL + RSL		High-pressure pump drive circuit (Open circuit)
P062A	522572	7F94C	6	MIL + RSL		High-pressure pump drive circuit (Drive current (high level))
P1645			11	MIL + RSL		High-pressure pump drive circuit (Pump overload error)
P0088	157	9D	0	MIL + RSL	Abnormal rail pressure	Actual rail pressure rise error
P0094			18	MIL + RSL		Rail pressure deviation error during the actual rail pressure drop
P0093			15	MIL + RSL		Rail pressure deviation error during the actual rail pressure rise
P000F			16	MIL + RSL	PLV (Common rail pressure limit valve)	PLV open valve
P1666	523469	7FCCD	0	MIL + RSL		Rail pressure fault (The times of PLV valve opening error)
P1667	523470	7FCCE	0	MIL + RSL		Rail pressure fault (The time of PLV valve opening error)
P1668	523489	7FCE1	0	MIL + RSL		Rail pressure fault (The actual rail pressure is too high during PRV limp home)
P1665	523468	7FCCC	9	MIL + RSL		Rail pressure fault (Controlled rail pressure error after PLV valve opening)
P1669	523491	7FCE3	0	MIL + RSL	Rail pressure control	Rail pressure fault (Injector B/F temperature error during PLV4 limp home)
P1670	523460	7FCC4	7	MIL + RSL		Rail pressure fault (Operation time error during RPS limp home)
P0219	190	BE	16	MIL + RSL	Overspeed	Overspeed
P0660	2950	B86	5	MIL + AWL	Intake throttle drive circuit	No-load of throttle valve drive H bridge circuit
P1658			3	MIL + AWL		Power short circuit of throttle valve drive H bridge output 1
P1659			4	MIL + AWL		GND short circuit of throttle valve drive H bridge output 1
P1660			6	MIL + AWL		Overload on the drive H bridge circuit of throttle valve
P1661	2951	B87	3	MIL + AWL		VB Power short circuit of throttle valve drive H bridge output 2
P1662			4	MIL + AWL		GND short circuit of throttle valve drive H bridge output 2

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Engine Diagnostic Chart (cont.)

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadec-imal number	Decima number			
U0292	522596	7F964	9	MIL + AWL	CAN2	TSC1 (CAN message) reception time out (SA1)
U1301	522597	7F965	9	MIL + AWL		TSC1 (CAN message) reception time out (SA2)
U1292	522599	7F967	9	MIL + AWL		Y_ECR1 (CAN message) reception time out
U1293	522600	7F968	9	MIL + AWL		Y_EC (CAN message) reception time out
U1294	522601	7F969	9	MIL + AWL		Y_RSS (CAN message) reception time out
U1296	522603	7F96B	9	MIL + AWL		VH (CAN message) reception time out
U1298	522605	7F96D	9	MIL + AWL		Y_ECM3 (CAN message) reception time out
U0168	237	ED	31	MIL + AWL		VI (CAN message) reception time out
U3002			13	MIL + AWL		VI (CAN message) reception data fault
U1300	522609	7F971	9	MIL + AWL		Y_ETCP1 (CAN message) reception time out
U1302	522618	7F97A	9	MIL + AWL		EBC1 (CAN message) reception time out
U1303	522619	7F97B	9	MIL + AWL		Y_DPFIF (CAN message) reception time out
U010B	522610	7F972	9	MIL + AWL	CAN1	CAN1 (for EGR): Reception time out
U1107	522611	7F973	9	TBD		Exhaust throttle (CAN message from the exhaust throttle time out)
P0404	2791	AE7	0	MIL + AWL	EGR valve	EGR over-voltage fault
P1404			1	MIL + AWL		EGR under-voltage fault
P1409			7	MIL + AWL		EGR feedback malfunction
U0401			9	MIL + AWL		EGR ECM data fault
P0403			12	MIL + AWL		Open circuit between the EGR motor coils
P1405	522579	7F953	12	MIL + AWL		Short circuit between the EGR motor coils
P0488	522580	7F954	12	MIL + AWL		EGR position sensor malfunction
P148A	522581	7F955	7	MIL + RSL		EGR stuck open valve malfunction
P049D	522582	7F956	7	MIL + RSL		EGR initialization malfunction
P1410	522183	7F957	1	MIL + AWL		EGR high temperature thermistor malfunction
P1411	522184	7F958	1	MIL + AWL		EGR low temperature thermistor malfunction
U1401	522617	7F979	12	MIL + AWL		EGR target value out of range
P1438	522746	7F9FA	12	TBD	Exhaust throttle	Exhaust throttle (Voltage fault)
P1439	522747	7F9FB	12	TBD		Exhaust throttle (Motor fault)
P1440	522748	7F9FC	12	TBD		Exhaust throttle (Sensor system fault)
P1441	522749	7F9FD	12	TBD		Exhaust throttle (MPU fault)
P1442	522750	7F9FE	12	TBD		Exhaust throttle (PCB fault)
P1443	522751	7F9FF	19	TBD		Exhaust throttle (CAN fault)
P0601	630	276	12	MIL + RSL	EEPROM	EEPROM memory deletion error
P160E	522576	7F950	12	MIL + RSL		EEPROM memory read error
P160F	522578	7F952	12	MIL + RSL		EEPROM memory writing error

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Engine Diagnostic Chart (cont.)

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadec-imal number	Decima number			
P1613	522585	7F959	12	MIL + RSL	ECU internal fault	CY146 SPI communication fault
P1608	522588	7F95C	12	MIL + RSL		Excessive voltage of supply 1
P1617	522589	7F95D	12	MIL + RSL		Insufficient voltage of supply 1
P1609	522590	7F95E	12	None		Sensor supply voltage error 1
P1618	522591	7F95F	12	None		Sensor supply voltage error 2
P1619	522592	7F960	12	None		Sensor supply voltage error 3
P1626	522744	7F9F8	4	MIL + AWL		Actuator drive circuit 1 short to ground
P1633	522994	7FAF2	4	MIL + AWL		Actuator drive circuit 2 short to ground
P1467	523471	7FCCF	6	MIL + AWL		Actuator drive circuit 3 short to ground
P1469	523473	7FCD1	12	MIL + RSL		AD converter fault 1
P1470	523474	7FCD2	12	MIL + RSL		AD converter fault 2
P1471	523475	7FCD3	12	MIL + RSL		External monitoring IC and CPU fault 1
P1472	523476	7FCD4	12	MIL + RSL		External monitoring IC and CPU fault 2
P1473	523477	7FCD5	12	MIL + RSL		ROM fault
P1474	523478	7FCD6	12	MIL + RSL		Shutoff path fault 1
P1475	523479	7FCD7	12	MIL + RSL		Shutoff path fault 2
P1476	523480	7FCD8	12	MIL + RSL		Shutoff path fault 3
P1477	523481	7FCD9	12	MIL + RSL		Shutoff path fault 4
P1478	523482	7FCDA	12	MIL + RSL		Shutoff path fault 5
P1479	523483	7FCDB	12	MIL + RSL		Shutoff path fault 6
P1480	523484	7FCDC	12	MIL + RSL		Shutoff path fault 7
P1481	523485	7FCDD	12	MIL + RSL		Shutoff path fault 8
P1482	523486	7FCDE	12	MIL + RSL		Shutoff path fault 9
P1483	523487	7FCDF	12	MIL + RSL		Shutoff path fault 10
P1484	523488	7FCE0	0	MIL + RSL		Recognition error of engine speed
P1101	522323	7F853	0	Select by application	Air cleaner switch	Air cleaner clogged alarm
P1151	522329	7F859	0	Select by application	Oil/water separator switch	Oil/water separator alarm
P1562	167	A7	5	Select by application	Charge switch	Charge switch open circuit
P1568			1	Select by application		Charge alarm
P1192	100	64	4	Select by application	Oil pressure switch	Oil pressure switch open circuit
P1198			1	Select by application		Low oil pressure fault alarm
P2463	522573	7F94D	0	Not turned on	DPF	Overaccumulation (Method C)
P1463	522574	7F94E	0	Not turned on		Overaccumulation (Method P)
P2458	522575	7F94F	7	Not turned on		Regeneration defect (Stationary regeneration failure)
P2459	522577	7F951	11	Not turned on		Regeneration defect (Stationary regeneration not per-formed)
P242F	3720	E88	16	MIL + AWL	DPF OP interface	Ash cleaning request 1
P1420			0	MIL + RSL		Ash cleaning request 2
P1421	3719	E87	16	MIL + AWL		Stationary regeneration standby
P1424			0	MIL + RSL		Backup mode
P1425	3695	E6F	14	Not turned on		Reset regeneration prohibited
P1445	3719	E87	9	MIL + RSL		Recovery regeneration failure
P1446			7	MIL + RSL		Recovery regeneration prohibition

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Hydraulic System

Refer to the *Maintenance Interval Chart* (page 103) for service intervals. Refer to the *Replacement Parts* chart (page 68) for filter part numbers.

WARNING **Before servicing the hydraulic system, be sure the lift arm is lowered.**

Checking Hydraulic Oil Level

Inside the engine compartment, the loader has a sight gauge located at the right rear of the chassis. Check the fluid level with the lift arm lowered and attachment bracket on the ground (Figure 45).

Add hydraulic oil as required in the hydraulic oil fill tube. Refer to the *Lubrication* chart (page 73). Replace the fill cap.

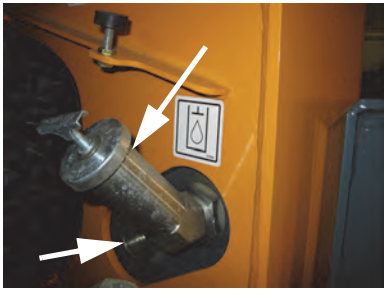

Figure 45 Sight Gauge and Fill Tube

Changing Hydraulic Oil Filter

The hydraulic filter element is located to the right of the radiator/cooler, against the side of the chassis. To change hydraulic filter element:

1. Park the loader on a level surface. Shut off the engine and remove the key.
2. Open the reservoir drain plug, located on the inside bottom of the right riser (Figure 47).
3. Drain the hydraulic oil out to a level below the point where the filter attaches to the reservoir.

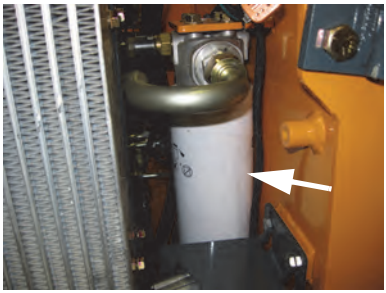

Figure 46 Hydraulic Oil Filter Location

Note: *Unbolt the water separator from the chassis for greater access to the hydraulic filter, if needed.*

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4. Replace the reservoir drain plug.
5. Clean any dirt/debris off the surface of the filter housing.
6. Spin off the old hydraulic filter element and spin on the new filter element.
7. Lubricate the seal on the new filter element with hydraulic oil before installing.
8. Refill the hydraulic oil reservoir with oil (if needed). Refer to the *Lubrication* chart (page 73).

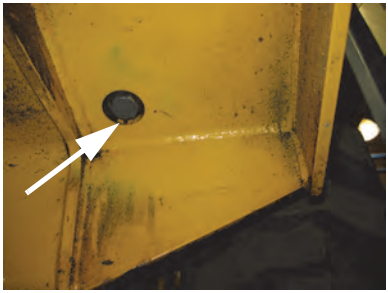

Figure 47 Hydraulic Oil Drain Plug

Changing Hydraulic Oil

The hydraulic oil must be replaced if it becomes contaminated, after major repairs and after 500 hours or one year of use.

1. Install a catch pan of sufficient capacity under the oil reservoir. See page 73.
2. Open the reservoir drain plug (Figure 47), and allow the oil to drain.
3. Reinstall the drain plug.
4. Change the oil filter.
5. Refill the reservoir. Refer to the *Lubrication* chart (page 73).
6. Start the engine and operate the hydraulic controls.
7. Stop the engine and check for leaks at the filter and reservoir drain plug.
8. Check the fluid level and add fluid, if needed.

Bucket Cutting Edge

The bucket cutting edge should be replaced when it is worn to within 1 in. (25 mm) of the bucket body.

Alternator Belt

Refer to the separate engine manual for setting proper belt tension. If the belt is worn, cracked or otherwise deteriorated, replace the belt following the procedure in the engine manual.

Wheel Nuts

Wheel nut torque must be checked before initial operation and every two hours thereafter until the wheel mounting hardware torque remains at 180 ft.-lbs. (244 N·m). When wheels are removed and reinstalled this procedure must be repeated.

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Cooling System

Important: *Check the cooling system daily to prevent overheating, loss of performance and engine damage. Drain, flush and refill coolant every year or 1,000 hours.*

Checking Coolant Level

1. With the engine at operating temperature, open the engine cover. Looking at its plastic coolant recovery tank, check that the coolant tank fluid is half way up on the recovery tank, between full and low markings on the coolant tank (Figure 48).
2. Allow the coolant to cool. Do not remove the fill tube cap when the coolant is hot. Serious burns may occur.
3. Add premixed coolant, 50% water and 50% ethylene glycol, to the tank if the coolant level is low.

Figure 48 Coolant Recovery Tank

Cleaning the Cooling System

WARNING **Allow sufficient time for the oil radiator to cool before working on or near it. Parts get extremely hot during operation and can burn you.**

The radiator assembly is mounted between the engine and the hinged rear grille. When operating correctly, air is blown through the openings between the fins by the engine fan. During operation dust and debris can build up on the engine side of the radiator and restrict air flow through the fins. To remove this restriction, use compressed air and direct the flow through the fins from the rear of the radiator toward the engine.

1. Lower the lift arm and stop the engine. Allow the machine to cool.
2. Raise the engine cover and open the rear grille (page 70).
3. As necessary, clean the radiator and air cooler by blowing compressed air through the fins from the rear, toward the engine.

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Draining/Flushing the Cooling System

1. Drain, flush and refill once every year or at 1,000 operating hours.
2. Lower the lift arm and stop the engine. Allow the machine to cool.
3. Raise the engine cover and open the rear grille (page 70).
4. Remove the radiator cap on the coolant tank.
5. Open the drain cock on the radiator (Figure 49) and drain the coolant into a suitable container.

Note: *Coolant must be drained from the radiator and the engine.*

6. Close the drain cock.

Note: *Protect the cooling system by adding premixed 50% water and 50% ethylene glycol to the system.*

Figure 49 Radiator Drain Cock

7. Fill the radiator fully and the coolant tank to half full.
8. Reinstall the radiator cap and run the engine until it is at operating temperature.
9. Stop the engine and let it cool. Check the coolant level. Add more fluid, if necessary.

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WARNING **Inflating or servicing tires can be dangerous. When possible, trained personnel should service and mount tires. To avoid possible death or serious injury, follow the safety precautions below.**

To keep tire wear even, rotate the tires from front to rear and rear to front.

It is important to keep the same size tire on each side of the loader to prevent excessive wear on tires, chains, or other damage. If different sizes are used, tires will be turning at different speeds, causing excessive wear.

Note: *The tread bars of all tires should point the same direction.*

- BE SURE the rim is clean and free of rust.
- Lubricate the tire beads and rim flanges with a soap solution. Do NOT use oil or grease.
- Use a clip-on tire chuck with remote hose and gauge, allowing you to stand clear while inflating the tire.
- NEVER inflate beyond 35 psi (240 kPa) to seat the beads. If the beads have not seated by the time the pressure reaches 35 psi (240 kPa), deflate the assembly, reposition the tire on the rim, lubricate both parts and re-inflate. Inflation pressure beyond 35 psi (240 kPa) with unseated beads may break the bead or rim with explosive force sufficient to cause death or serious injury.
- After seating the beads, adjust the inflation pressure to the recommended operating pressure.
- Do NOT weld, braze or otherwise attempt to repair and use a damaged rim.

Checking Tire Pressure

Correct tire pressure should be maintained to enhance operating stability and extend tire life. Refer to the chart below for proper inflation pressures.

Tire Size	Inflation Pressure	
	psi	kPa
10 x 16.5 8-ply HD Flotation	60	415
10 x 16.5 10-ply Severe-Duty	65	450
12 x 16.5 10-ply HD Flotation	65	450
12 x 16.5 12-ply Severe-Duty	65	450
33 x 15.5 x 16.5 Extra-Wide Flotation	60	415
14 x 17.5 12-ply HD Flotation	65	450
14 x 17.5 14-ply HD Flotation	65	450
14 x 17.5 14-ply Severe-Duty	65	450

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Heater/Air Conditioner Filters

The optional heater and heater/air conditioner include two filters: fresh air intake and recirculation air.

Refer to the *Replacement Parts* topic (page 68) for filter part numbers. Filters should be replaced as needed.

Fresh Air Intake Filter: Located directly behind the cover on the HVAC (heating, ventilating and air conditioning) housing mounted on the upper rear corner of the cab. Remove the threaded knobs on both sides of the cover to access the filter.

Recirculation Air Filters: Located behind the covers in the headliner directly above the rear window. The access, remove the screws on either side of the covers.

Important: *Keeping the cab clean will reduce need for service and help ensure proper air conditioner and heater operation. Failure to do so can cause evaporator and heater core plugging, fan noise, vibration and failure.*

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Fuse Panels

The fuse panels (Figure 50) are located in the engine compartment on the chassis left riser, as well as behind a swell latch panel at the operator's left foot area.

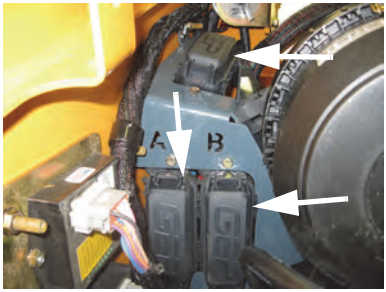


Figure 50 Fuse Panels in the Engine Compartment

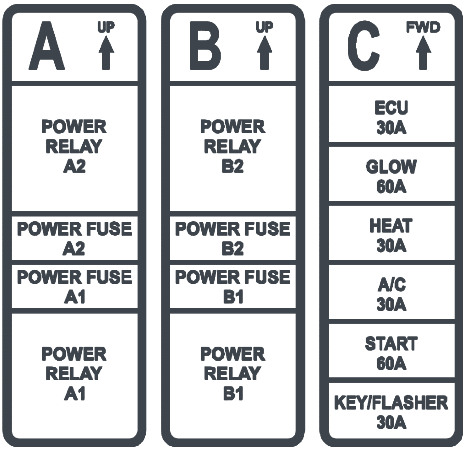
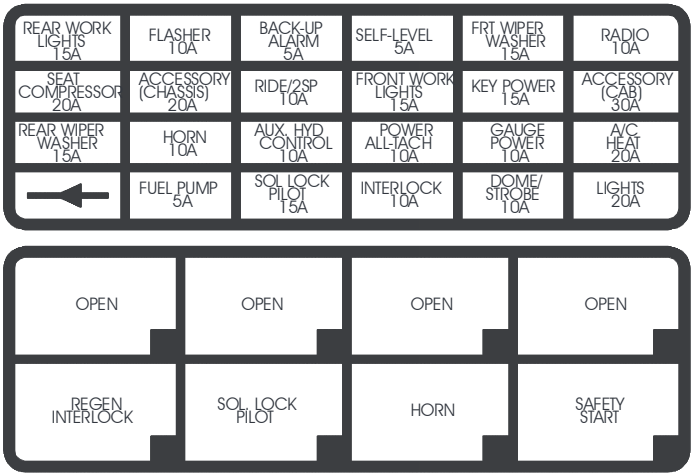


Figure 51 Fuse Panels in the Operator's Compartment



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Battery

WARNING **Before servicing the batteries or electrical system, be sure the electrical battery disconnect switch is in the OFF position or disconnect the negative (ground) battery cable.**

The battery on the loader is a 12-volt, group 24, wet-cell battery. To access the battery, open the engine access cover and lock open the rear grille.

The battery top must be kept clean. Clean it with an alkaline solution (ammonia or baking soda and water). After foaming has stopped, flush the battery top with clean water. If the terminals and cable connection clamps are corroded or have a build-up, disconnect the cables and clean the terminals and clamps with the same alkaline solution. Apply protective spray to prevent corrosion.

WARNING **Explosive gas is produced when a battery is in use or being charged. Keep flames and sparks away from the battery area. ALWAYS charge the battery in a well-ventilated area.**

Never lay a metal object on top of a battery, because a short circuit can result.

Battery acid is harmful on contact with skin or fabrics. If acid spills, follow these first-aid tips:

1. **Immediately remove any clothing on which acid spills.**
2. If acid contacts the skin, rinse the affected area with running water for 10 to 15 minutes.
3. If acid contacts the eyes, flood the eyes with running water for 10 to 15 minutes. See a doctor at once. Never use any medication or eye drops unless prescribed by the doctor.
4. To neutralize acid spilled on the floor, use one of the following mixtures:
   a. **1 pound (0.5 kg) of baking soda in 1 gallon (4 L) of water, or**
   b. **1 pint (0.5 L) of household ammonia in 1 gallon (4 L) of water**

Whenever a battery is removed, be sure to disconnect the negative (-) battery terminal connection first.

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TROUBLESHOOTING

Electrical System

Problem	Possible Cause	Remedy
Entire electrical system does not function.	Battery disconnect switch is in OFF position.	Turn battery disconnect switch to ON.
	Main wiring harness connectors at rear of ROPS/ FOPS not properly plugged in.	Check main harness connectors.
	Faulty keyswitch.	Replace keyswitch.
	15 amp fuse blown (key switch).	Replace keyswitch.
	Battery terminals or cables loose or corroded.	Clean battery terminals and cables and retighten them.
	Battery is faulty.	Test battery, replace as needed.
No instrument panel lamps with keyswitch turned to "ON."	Fuse has blown.	Replace fuse.
	Main wiring harness connectors at rear of ROPS/ FOPS not properly plugged in.	Check main harness connectors.
	Battery terminals or cables are loose or corroded.	Clean battery terminals and cables and retighten them.
Starter will not engage when key is turned to START.	Battery terminal or cables loose or corroded.	Clean terminal, cables and retighten
	Battery discharged or defective.	Recharge or replace battery.
	Seat or restraint bar switch malfunctioning or not actuated.	Contact your dealer.
	Ignition wiring, seat switch, restraint bar switch, etc. loose or disconnected.	Check wiring for poor connections, broken leads; repair wiring or connection.
	Start safety relay malfunction located in fuse panel.	Verify proper operation.
	Starter solenoid not functioning.	Contact your dealer.
	Starter relay malfunctioning.	Verify relay is working properly, replace.
	Starter or pinion faulty.	Remove starter; repair/ replace as needed.
	Engine fault code: (E-ECU will not allow crank if certain faults are present).	Contact your dealer.

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Electrical System

Problem	Possible Cause	Remedy
Work lights not functioning properly.	Single light not working; light bulb burned out, faulty wiring.	Check and replace light bulb as needed. Check wiring connection to light.
	No lights; light fuse blown.	Check circuit and locate trouble before replacing fuse.
	Faulty light switch(es) or poor ground.	Check ground wire connections. Replace light switch.
Lift/Tilt and/or drive solenoids do not work.	Wiring to solenoids disconnected or faulty.	Troubleshoot circuit, repair.
	Restraint bar or seat switch malfunction.	Contact your dealer.
	Faulty solenoid valve coil.	Contact your dealer.
	Solenoid relay malfunctioning.	Verify relay is working properly, replace.
	Faulty fuse.	Verify relay is working properly if not, replace.

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Engine

Problem	Possible Cause	Remedy
Engine turns over but will not start.	Engine cranking speed too slow.	Battery requires recharging or replacing, or, in cold temperatures, pre-warm the engine.
	Auxiliary valve engaged.	Return control valves to neutral.
	Fuel tank empty.	Refill fuel tank.
	Water in fuel filter.	Purge water from filter.
	Engine fault codes displayed.	Identify problem and correct.
	Engine not warm enough.	Install block heater.
	Ambient temperature too low.	Install block heater.
	Fuel filter plugged.	Replace filter.
	Fuel pump not working.	Contact your dealer.
Engine overheats.	Crankcase oil level too low or too high.	Add or remove oil as required.
	Fan air circulation blocked or restricted.	With engine off, remove blockage or restriction.
	Fan belt loose.	Tighten fan belt.
	Grade of oil improper or excessively dirty.	Drain and replace with proper grade new oil.
	Exhaust restricted.	Allow exhaust to cool, remove restriction.
	Air filter restricted.	Replace filter(s).
	Low coolant level.	Add coolant.

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Hydrostatic Drive System

Problem	Possible Cause	Remedy
No response from either hydrostatic drive or the lift/tilt systems.	Hydraulic oil viscosity too heavy.	Allow longer warm-up or replace oil with proper viscosity oil.
	Hydraulic oil too low.	Check for low oil level in reservoir, add oil.
	Drive coupling failure.	Replace coupling.
Traction drive will not operate in either direction.	Parking brake is engaged.	Disengage parking brake.
	Hydraulic oil level low.	Check for low oil level in reservoir, add oil.
	Low or no charge pressure.	Contact your dealer.
	Hydrostatic pump(s) relief valves malfunctioning.	Contact your dealer.
	Restraint bar raised.	Lower restraint bar.
	Restraint bar or seat switch malfunctioning.	Contact your dealer.
Sluggish acceleration.	Air in hydraulic system.	Cycle lift and tilt cylinders to maximum stroke and maintain pressure for short time to clear air from system. Also check for low oil level in reservoir, fill as needed.
	Hydraulic oil level too low.	Check for low oil level in reservoir, add oil.
	Hydrostatic system charge pressure low.	Contact your dealer.
	Drive motor(s) or hydrostatic pump(s) have internal damage or leakage.	Contact your dealer.
Hydrostatic drive overheating.	Drive system overloaded continuously.	Improve efficiency of operation.
	Lift/tilt or auxiliary system overloaded continuously.	Improve efficiency of operation.
	Drive motor(s) or hydrostatic pump(s) have internal damage or leakage.	Contact your dealer.
	Oil cooler fins plugged with debris.	Clean oil cooler fins.
	Hydrostatic oil filter plugged or restricted.	Replace filter.
	Loader being operated in high temperatures with no air circulation.	Reduce duty cycle; improve air circulation.

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Hydraulic System

Problem	Possible Cause	Remedy
Hydrostatic (drive) system is noisy.	Hydraulic oil viscosity too heavy.	Allow longer warm-up or replace oil with proper viscosity oil.
	Air in hydraulic system.	Cycle lift and tilt cylinders to maximum stroke and maintain pressure for short time to clear air from system. Also check for low oil level in reservoir, fill as needed.
	Drive motor(s) or hydrostatic pump(s) have internal damage or leakage.	Contact your dealer.
Right side doesn't drive in either direction. Left side operates normally.	Relief valves on rear hydrostatic pump malfunctioning.	Contact your dealer.
	Rear hydrostatic pump arm control lever loose.	Tighten control lever.
	Control rod linkage to rear hydrostatic pump disconnected.	Attach control rod linkage.
Right side doesn't drive in one direction.	Relief valve on rear hydrostatic pump malfunctioning.	Contact your dealer.
	Rear hydrostatic pump malfunctioning.	Contact your dealer.
Left side doesn't drive in either direction. Right side operates normally.	Relief valves on front hydrostatic pump malfunctioning.	Contact your dealer.
	Front hydrostatic pump arm control lever loose.	Tighten control lever.
	Control rod linkage to front hydrostatic pump disconnected.	Attach control rod linkage.
Left side doesn't drive in one direction.	Relief valve on front hydrostatic pump malfunctioning.	Contact your dealer.
	Front hydrostatic pump malfunctioning.	Contact your dealer.

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Hydraulic System

Problem	Possible Cause	Remedy
Lift/Tilt controls fail to respond.	Restraint bar raised.	Lower restraint bar.
	Hydraulic oil viscosity too heavy.	Allow longer warm-up or replace with proper viscosity oil.
	Hydraulic oil level low.	Check oil level in reservoir. If oil is low, check for external leak, repair and add oil.
	Solenoid valve malfunctioning.	Check electrical connections to pilot solenoid and repair.
	Restraint bar or seat switch malfunctioning.	Contact your dealer.
Hydraulic cylinder action is slow for lift and/or tilt functions.	Low engine speed.	Operate engine at higher speed.
	Hydraulic oil viscosity too heavy.	Allow longer warm-up or replace with proper viscosity oil.
	Hydraulic oil level low.	Check oil level in reservoir. If oil is low, check for an external leak. Repair and add oil.
	Hydraulic oil leaking past cylinder piston seals.	Contact your dealer.
	Worn pump.	Contact your dealer.
	Solenoid valve malfunctioning or one of the two cartridges on solenoid valve malfunctioning.	Check electrical connections to pilot solenoid and repair connections as needed. If solenoid valve is still not functioning properly, contact your dealer.
	Control linkage restricted.	Readjust linkage for full spool travel.
Bucket does not level on the lift cycle.	Self-leveling valve (optional) in its cancel position, misadjusted or malfunctioning.	Restore self-leveling at the cancel switch or contact your dealer.
Jerky lift arm and bucket action.	Seat or restraint bar switch malfunctioning.	Contact your dealer.
	Air in hydraulic system.	Cycle/lift and tilt cylinders to maximum stroke and maintain pressure for short time to clear air from system.
	Oil in hydraulic reservoir low.	Check and add oil.

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Hydraulic System

Problem	Possible Cause	Remedy
No down pressure on the bucket.	Float or Hydraglide activated.	Turn off float and Hydraglide.
	Tilt cylinders malfunctioning.	Contact your dealer.
	Malfunctioning relief valve in main control valve.	Contact your dealer.
Bucket drifts down with tilt control in neutral.	Oil leaking past tilt cylinder seals (internal or external).	Contact your dealer.
	Self-leveling valve malfunctioning.	Contact your dealer.
	Leaking hydraulic hoses, tubes or fittings between control valve and cylinders.	Check oil level in reservoir. If oil is low, check for external leaks, repair and add oil.
Bucket will not tilt, lift arm works properly.	Tilt spool in control valve not actuated or leaking.	Check tube connections to valve.
Lift arm does not raise, bucket tilt works properly.	Lift spool in control valve not actuated or leaking.	Check tube connections to valve.
Lift arm does not maintain raise position with left control in NEUTRAL.	Oil leading past lift cylinder seals (internal or external).	Contact your dealer.
	Oil leaking past lift spool in control valve.	Contact your dealer.
	Self-leveling valve malfunctioning.	Contact your dealer.
	Leaking hydraulic hoses, tubes or fittings between control valve and cylinders.	Inspect hoses and tubes, tighten fittings as needed. Replace as needed.
Lift arm will not lower or raise.	Lift arm support device engaged.	Raise lift arm and remove support device.
	Restraint bar not lowered.	Lower restraint bar.
	Seat or restraint bar switch malfunction.	Contact your dealer.
Power-A-Tach slow.	Hydraulic oil viscosity too heavy.	Allow longer warm-up time or replace oil with proper viscosity oil.

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Hydraulic System

Problem	Possible Cause	Remedy
Auxiliary hydraulics do not function.	Restraint bar raised.	Lower the restraint bar.
	Pilot solenoids malfunctioning.	Check electrical connections to pilot solenoids, repair connections as needed. If still not functioning properly, contact your dealer.
	Control handle malfunctioning.	Contact your dealer.
	Auxiliary hydraulic control module malfunctioning (located behind swell latch panel at operator's right foot area).	Contact your dealer.
	Restraint bar or seat switch malfunctioning.	Contact your dealer.
High-flow auxiliary functions slowly.	Low engine speed.	Operate engine at higher speed.
	Hydraulic oil level low.	Add oil.
	Hydraulic oil viscosity too heavy.	Allow longer warm-up, or replace oil with proper viscosity oil.
	Control linkage misadjusted.	Readjust linkage for full spool travel.
High-flow auxiliary does not function.	Restraint bar raised.	Lower the restraint bar.
	Pilot solenoids malfunctioning.	Check electrical connections to solenoid, repair connections as needed. If still not functioning properly, contact your dealer.
	Switch malfunctioning.	Contact your dealer.
	Module malfunctioning.	Contact your dealer.
	Solenoid malfunctioning.	Contact your dealer.
	Restraint bar or switch malfunctioning.	Contact your dealer.

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MAINTENANCE

This *Maintenance Interval* chart was developed to match the *Service* chapter of this manual. Detailed information on each service procedure is in the *Service* chapter. A *Maintenance Log* follows this chart for recording maintenance performed. Recording 10-hour (or daily) service intervals is impractical and is not recommended.

Important: *Under severe operating conditions, more frequent service than the recommended intervals may be required. You must decide, based on your use, if your operation requires more frequent service.*

Service Procedure	Maximum Interval			
	10 Hours (or Daily)	50 Hours	250 Hours	500 Hours (or Yearly)
Remove Foreign Material (page 72)	●			
Check Engine Air Cleaner Restriction Indicator (page 77)	●			
Check Engine Oil Level (page 80)	●			
Check Hydraulic Oil Level (page 87)	●			
Check Tire Pressures (page 91)	●			
Grease Hitch, Hitch-related Cylinder Pivots and Latch Pins (page 73)	●			
Check Bucket Cutting Edge (page 88)	●			
Test Safety Interlock System (page 20)	●			
Check Coolant Level (page 89)	●			
Clean Cooling System (page 89)	●			
Grease Lift Arm Pins (page 73)			●	
Check Drive Chain Tension (page 76)			●	
Check Wheel Nuts Torque (page 88)	❍		●	
Check Oil Level in Chaincases (page 75)			●	
Check Alternator/Fan Belt Tensions (page 88)			●	
Change Engine Oil and Filter (page 80)	❑		●	
Change Hydraulic Oil Filter (page 87)	❑			●
Check Battery (page 94)				●
Check Engine Mounting Hardware (page 80)				●
Change Fuel Filter (page 81)			●	
Change Hydraulic Oil (page 88)				●
Check and Drain Water Separator (page 81)	●			
Change Chaincase Oil (page 75)	❑			◆
Change Engine Coolant (page 90)				◆

❍ Perform the initial procedure at 2 hours then at "●" intervals.
☐ Perform the initial procedure at 50 hours then at "●" or "◆" intervals.
❖ Severe operating conditions.
◆ Perform the procedure at 1000 hours.

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Maintenance Log

Date	Hours	Service Procedure

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Maintenance Log

Date	Hours	Service Procedure

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Maintenance Log

Date	Hours	Service Procedure

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SPECIFICATIONS

Loader Specifications

Specification	R190
Operating Weight (approx)	6880 lbs. (3121 kg)
Shipping Weight (approx)	6250 lbs. (2835 kg)
Rated Operating Load[1]	1900 lbs. (862 kg)
Rated Operating Load[1] w/ optional 315 lb counterweight	2110 lbs. (957 kg)
Engine	
Make	Yanmar
Model	4TNV98C-NMS
Displacement	202.6 cu. in. (3,319 L)
Power (net)	68.4 hp (51,0 kW) @ 2500 rpm
Peak Torque	169-178 ft.-lb. (229-241 N·m) @ 1625 rpm
Hydraulic System (theoretical)	
Main Hydraulic System Pressure	3000 psi (207 bar)
Standard-Flow Rating	18.5 gpm (70,03 L/min)
High-Flow System Pressure	2900 psi (200 bar)
High-Flow Rating	31.5 gpm (119,24 L/min)
Electrical	
Battery	12-Volt DC, 950 CCA, Group 31
Starter	12-Volt DC (3.0 kW)
Alternator	95-amperes
Capacities	
Chaincase (each)	9.5 U.S. qts. (9,0 L)
Engine Oil	9.5 U.S. qts. (9,0 L)
Engine Coolant - entire system	6.0 U.S. qts. (5,7 L)
Fuel Tank	16.5 U.S. gal. (62,5 L)
Bare Hydraulic Reservoir	8.0 U.S. gal. (30,3 L)
Entire Hydraulic System	11.0 U.S. gal. (41,6 L)
Maximum Travel Speed - Low	7.5 mph (12 kph)
Maximum Travel Speed - High	12.5 mph (20,0 kph)
Sound Levels (with Sound Attenuation Package)	
Sound Pressure Level (Operator Ear)	85 dB(A)
Sound Power Level (Environmental)	101 dB(A)

1. Operating load rated with an 66 in. (1676 mm) 15.1 cu. ft. (0.43 m3) Dirt/Construction bucket and 10 x 16.5 NHS tires in accordance with SAE J818 and ISO 14397-1.

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Loader Specifications

Specification		R220
Operating Weight (approx)		7980 lbs. (3620 kg)
Shipping Weight (approx)		7250 lbs. (3289 kg)
Rated Operating Load[1]		2200 lbs. (998 kg)
Rated Operating Load[1] w/ optional 315 lb counterweight		2370 lbs. (1075 kg)
Engine		
Make		Yanmar (Turbocharged)
Model		4TNV98CT-NMS
Displacement		202.6 cu. in. (3,319 L)
Power (net)		70.7 hp (52,7 kW) @ 2500 rpm
Peak Torque		196-217 ft.-lb. (266-294 N·m) @ 1625 rpm
Hydraulic System (theoretical)		
Main Hydraulic System Pressure		3300 psi (227,5 bar)
Standard-Flow Rating		23.5 gpm (89 L/min)
High-Flow System Pressure		3200 psi (220,6 bar)
High-Flow Rating		35.0 gpm (132,5 L/min)
Electrical		
Battery		12-Volt DC, 950 CCA, Group 31
Starter		12-Volt DC (3.0 kW)
Alternator		95-amperes
Capacities		
Chaincase (each)		10.0 U.S. qts. (9,5 L)
Engine Oil		11.0 U.S. qts. (10,4 L)
Engine Coolant - entire system		6.8 U.S. qts. (6,4 L)
Fuel Tank		18.0 U.S. gal. (68,1 L)
Bare Hydraulic Reservoir		8.0 U.S. gal. (30,3 L)
Entire Hydraulic System		12.0 U.S. gal. (45,4 L)
Maximum Travel Speed - Low	T-Bar	8.0 mph (12,9 kph)
Maximum Travel Speed - Low	Joystick	7.4 mph (11,9 kph)
Maximum Travel Speed - High	T-Bar	11.9 mph (19,1 kph)
Maximum Travel Speed - High	Joystick	11.4 mph (18,3 kph)
Sound Levels (with Sound Attenuation Package)		
Sound Pressure Level (Operator Ear)		85 dB(A)
Sound Power Level (Environmental)		101 dB(A)

1. Operating load rated with an 70 in. (1778 mm) 16.1 cu. ft. (0.46 m3) Dirt/Construction bucket and 12 x 16.5 NHS tires in accordance with SAE J818 and ISO 14397-1.

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Loader Specifications

Specification		R260
Operating Weight (approx)		8200 lbs. (3719 kg)
Shipping Weight (approx)		7500 lbs. (3402 kg)
Rated Operating Load[1]		2600 lbs. (1179 kg)
Rated Operating Load[1] w/ optional 315 lb counterweight		2780 lbs. (1261 kg)
Engine		
Make		Yanmar (Turbocharged)
Model		4TNV98CT-NMS
Displacement		202.6 cu. in. (3,319 L)
Power (net)		70.7 hp (52,7 kW) @ 2500 rpm
Peak Torque		196-217 ft.-lb. (266-294 N·m) @ 1625 rpm
Hydraulic System (theoretical)		
Main Hydraulic System Pressure		3300 psi (227,5 bar)
Standard-Flow Rating		23.5 gpm (89 L/min)
High-Flow System Pressure		3200 psi (220,6 bar)
High-Flow Rating		35.0 gpm (132,5 L/min)
Electrical		
Battery		12-Volt DC, 950 CCA, Group 31
Starter		12-Volt DC (3.0 kW)
Alternator		95-amperes
Capacities		
Chaincase (each)		11 U.S. qts. (10,4 L)
Engine Oil		11.0 U.S. qts. (10,4 L)
Engine Coolant - entire system		6.8 U.S. qts. (6,4 L)
Fuel Tank		21.5 U.S. gal. (81,3 L)
Bare Hydraulic Reservoir		8.0 U.S. gal. (30,3 L)
Entire Hydraulic System		12.0 U.S. gal. (45,4 L)
Maximum Travel Speed - Low	T-Bar	8.0 mph (12,9 kph)
Maximum Travel Speed - Low	Joystick	7.4 mph (11,9 kph)
Maximum Travel Speed - High	T-Bar	11.9 mph (19,1 kph)
Maximum Travel Speed - High	Joystick	11.4 mph (18,3 kph)
Sound Levels (with Sound Attenuation Package)		
Sound Pressure Level (Operator Ear)		85 dB(A)
Sound Power Level (Environmental)		101 dB(A)

1. Operating load rated with an 70 in. (1778 mm) 16.1 cu. ft. (0.46 m3) Dirt/Construction bucket and 12 x 16.5 NHS tires in accordance with SAE J818 and ISO 14397-1.

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Standard Features

- Information Center Electronic Display
- Indicator and Warning Lamp Display
- Hydraulic Oil Temperature Indicator Lamp
- Battery Charge Indicator Lamp
- Seatbelt Indicator Lamp and Buzzer
- Choice of three control types: Hand/Foot, Dual Joystick or T-Bar
- Hand Throttle
- Acoustical Cab Material and Headliner
- Adjustable Operator Restraint Bar with Armrests (Dual Joystick and Hand/Foot)
- ROPS/FOPS (ISO 3471, ISO 3449 Level II)
- Skid Plate for Clean Out
- Hydraloc™ System – Brakes and Interlock for Starter, Lift Cylinders, Tilt Cylinders, Auxiliary Hydraulics, Wheel Drives
- Pilot-Controlled Hydrostatic Drive (Dual Joystick and Hand/Foot)
- Dual-Element Air Cleaner with Electrical Indicator
- Anti-Vandalism Rear Grille
- Pre-Heat Starting Assist
- Servo-Controlled Hydrostatic Drive (T-Bar)
- Lift Arm Support Device
- Dual Front and Rear Halogen Work Lights and Dual Tail Lights
- Bi-directional Auxiliary Hydraulics with Flat-Faced Couplers
- All-Tach® Attachment Mounting System: Single-Lever (manual)
- Engine Auto-Shutdown System
- Emergency Exit Rear Window
- Hydraglide™ Ride Control System (Dual Joystick and Hand/Foot)
- Foot Throttle/Dual Joystick and T-Bar
- Electrical Battery Disconnect Switch
- Horn
- Float Control
- Interior Dome Light

Optional Features

- Self-Leveling Lift Action with OFF button
- 3-inch Wide Seatbelt – where required by law
- Sliding Side Windows
- Rear-View Mirror
- Front Door with Wiper
- Operator’s Compartment Heater/Defroster/Air Conditioner with Filters
- Audible Back-Up Alarm
- Strobe Light
- Bucket Bolt-On Cutting Edge Kits
- Engine Block Heater
- Two-Speed Drive
- Bi-directional High-Flow Auxiliary Hydraulics with Flat-Faced Couplers
- Impact-Resistant Front Door Window
- Engine Air Pre-Cleaner (R190 Only)
- Single and Four-Point Lift
- Power-A-Tach®
- Adjustable Air or Mechanical Suspension Seats
- Upper-torso Restraint
- Hydraglide™ Ride Control System (T-Bar)

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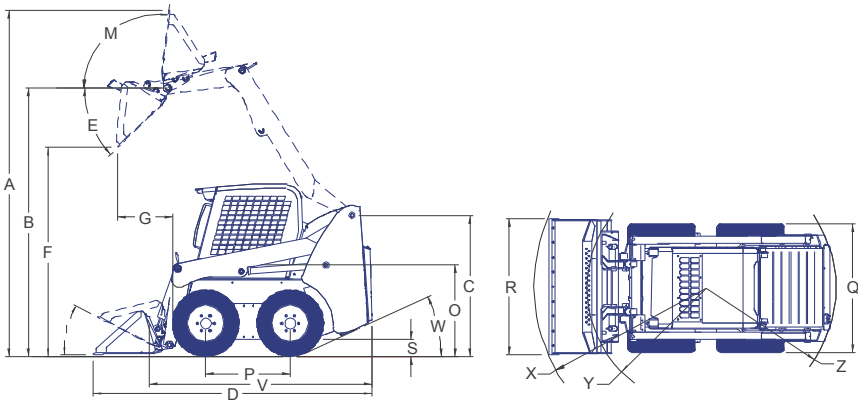
Dimensional Specifications



R190		15.1 ft³ (0.43 m³) Bucket w/10 x 16.5 Tires	
		inches	mm
A	Overall Operation Height – Fully Raised	158	4013
B	Height to Hinge Pin – Fully Raised	120.5	3061
C	Overall Height – Top of ROPS	80	2032
D	Overall Length – Bucket Down	127	3226
E	Dump Angle at Full Height	42°	
F	Dump Height	91	2311
G	Dump Reach – Bucket Full Height	22.5	572
J	Rollback at Ground	26°	
M	Rollback Angle at Full Height	96°	
O	Seat to Ground Height	39	991
P	Wheel Base – Nominal	42	1067
Q	Overall Width – Less Bucket[1]	64.5	1638
R	Bucket Width – Overall	66	1676
S	Ground Clearance – to Chassis (Between Wheels)	6.5	165
V	Overall Length (Less Bucket)	94	2388
W	Departure Angle	25°	
X	Clearance Circle – Front (With Bucket)	79	2007
Y	Clearance Circle – Front (Less Bucket)	44.5	1130
Z	Clearance Circle – Rear	58.5	1486

1. Overall width (Q) is dependent upon the amount of wheel offset.

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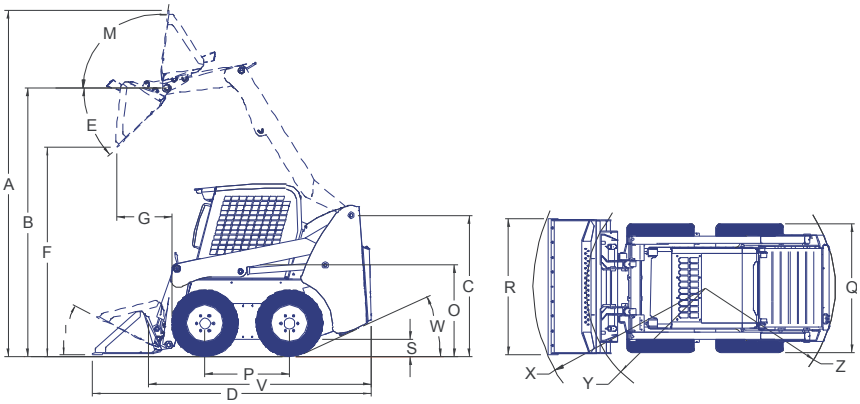
Dimensional Specifications



R220		16.1 ft³ (0.46 m³) Bucket w/12 x 16.5 Tires	
		inches	mm
A	Overall Operation Height – Fully Raised	161	4089
B	Height to Hinge Pin – Fully Raised	123	3124
C	Overall Height – Top of ROPS	81	2057
D	Overall Length – Bucket Down	136.5	3467
E	Dump Angle at Full Height	40°	
F	Dump Height	94	2388
G	Dump Reach – Bucket Full Height	27	686
J	Rollback at Ground	28°	
M	Rollback Angle at Full Height	95°	
O	Seat to Ground Height	40	1016
P	Wheel Base – Nominal	43	1092
Q	Overall Width – Less Bucket[1]	65.5	1664
R	Bucket Width – Overall	70	1778
S	Ground Clearance – to Chassis (Between Wheels)	8.0	203
V	Overall Length (Less Bucket)	105	2667
W	Departure Angle	25°	
X	Clearance Circle – Front (With Bucket)	87.5	2223
Y	Clearance Circle – Front (Less Bucket)	52	1321
Z	Clearance Circle – Rear	60	1524

1. Overall width (Q) is dependent upon the amount of wheel offset.

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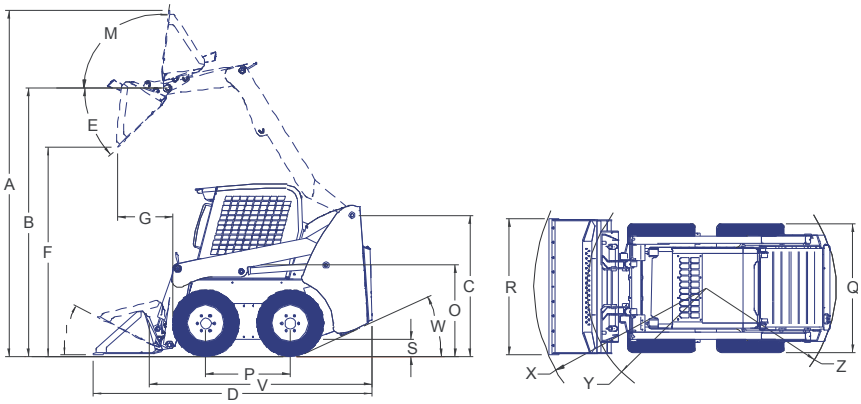
Dimensional Specifications



R260		16.1 ft³ (0.46 m³) Bucket w/12 x 16.5 Tires	
		inches	mm
A	Overall Operation Height – Fully Raised	161	4089
B	Height to Hinge Pin – Fully Raised	123	3124
C	Overall Height – Top of ROPS	81	2057
D	Overall Length – Bucket Down	143	3632
E	Dump Angle at Full Height	40°	
F	Dump Height	94	2388
G	Dump Reach – Bucket Full Height	27	686
J	Rollback at Ground	28°	
M	Rollback Angle at Full Height	95°	
O	Seat to Ground Height	40	1016
P	Wheel Base – Nominal	49.5	1257
Q	Overall Width – Less Bucket[1]	65.5	1664
R	Bucket Width – Overall	70	1778
S	Ground Clearance – to Chassis (Between Wheels)	8.0	203
V	Overall Length (Less Bucket)	111.5	2832
W	Departure Angle	25°	
X	Clearance Circle – Front (With Bucket)	90	2286
Y	Clearance Circle – Front (Less Bucket)	56	1422
Z	Clearance Circle – Rear	64	1626

1. Overall width (Q) is dependent upon the amount of wheel offset.

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R190, R220, R260

Note: *Use the Common Materials and Densities table (page 116) for selecting the appropriate bucket.*

Dirt/Construction Buckets

Description	Weight	R190 Rating	R220 Rating	R260 Rating
66 in./15.1 ft.^{3} (1676 mm/0.43 m^3)	415 lbs. (188 kg)	1835 lbs. (832 kg)	N/A	N/A
70 in./16.1 ft.^{3} (1778 mm/0.46 m^3)	471 lbs. (214 kg)	1800 lbs. (816 kg)	2050 lbs. (930 kg)	2450 lbs. (1111 kg)
74 in./19.2 ft^3 (1880 mm/0.54 m^3)	547 lbs. (248 kg)	N/A	1890 lbs. (857 kg)	2109 lbs. (957 kg)
74 in./22.8 ft^3 (1880 mm/0.64 m^3)	672 lbs. (305 kg)	N/A	1730 lbs. (785 kg)	2035 lbs. (923 kg)

Dirt/Construction with Spill Guard Buckets

Description	Weight	R190 Rating	R220 Rating	R260 Rating
70 in./16.1 ft.^{3} (1778 mm/0.46 m^3)	505 lbs. (229 kg)	1900 lbs. (862 kg)	2200 lbs. (998 kg)	2600 lbs. (1179 kg)

Low Profile/Grading Bucket

Description	Weight	R190 Rating	R220 Rating	R260 Rating
70 in./19.4 ft.^{3} (1778 mm/0.55 m^3)	527 lbs. (239 kg)	1605 lbs. (728 kg)	1770 lbs. (803 kg)	2105 lbs. (955 kg)
74 in./20.6 ft^3 (1879 mm/0.58 m^3)	562 lbs. (255 kg)	N/A	1755 lbs. (796 kg)	2110 lbs. (957 kg)

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Utility (Light Material) Buckets

Description	Weight	R190 Rating	R220 Rating	R260 Rating
66 in./19.0 ft.^{3} (1676 mm/0.43 m^3) Utility	476 lbs. (216 kg)	1740 lbs. (789 kg)	N/A	N/A
70 in./20.3 ft.^{3} (1778 mm/0.46 m^3) Utility	502 lbs. (227 kg)	1705 lbs. (773 kg)	1930 lbs. (875 kg)	2245 lbs. (1018 kg)
74 in./27.2 ft^3 (1880 mm/0.54 m^3) Utility	675 lbs. (306 kg)	N/A	1755 lbs. (796 kg)	2030 lbs. (921 kg)

Pallet Forks - 42 in. (1067 mm)

Description	Weight	R190 Rating	R220 Rating	R260 Rating
15.75 in. (400 mm) Load Center per EN 474-3	500 lbs. (227 kg)	1405 lbs. (637 kg)	1653 lbs. (750 kg)	1928 lbs. (875 kg)
19.68 in. (500 mm) Load Center per EN 474-3	500 lbs. (227 kg)	1330 lbs. (603 kg)	1541 lbs. (699 kg)	1818 lbs. (825 kg)

Pallet Forks - 48 in. (1219 mm)

Description	Weight	R190 Rating	R220 Rating	R260 Rating
24 in. (610 mm) Load Center per SAE 1197	520 lbs. (236 kg)	1260 lbs. (572 kg)	1473 lbs. (668 kg)	1723 lbs. (782 kg)

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Common Materials and Densities

Material	Density	
	lbs./cu. ft.	kg/m³
Ashes	35-50	560-800
Brick-common	112	1792
Cement	110	1760
Charcoal	23	368
Clay, wet-dry	80-100	1280-1600
Coal	53-63	848-1008
Concrete	115	1840
Cinders	50	800
Coal-anthracite	94	1504
Coke	30	480
Earth-dry loam	70-90	1121-1442
Earth-wet loam	80-100	1281-1602
Granite	93-111	1488-1776
Gravel-dry	100	1602
Gravel-wet	120	1922
Gypsum-crushed	115	1840
Iron ore	145	2320
Lime	60	960
Lime stone	90	1440
Manure-liquid	65	1040
Manure-solid	45	720
Peat-solid	47	752
Phosphate-granular	90	1440
Potash	68	1088
Quartz-granular	110	1760
Salt-dry	100	1602
Salt-rock-solid	135	2160
Sand-dry	108	1728
Sand-wet	125	2000
Sand-foundry	95	1520
Shale-crushed	90	1440
Slag-crushed	70	1120
Snow	15-50	240-800
Taconite	107	1712

Note: *The densities listed are average values and intended only as a guide for bucket selection. For a material that is not in the table, obtain its density value before selecting the appropriate bucket.*

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Bucket Selection

To use the table, find the material to be loaded and its maximum density. Then multiply the volumetric rating of the attachment by the material density to determine if the attachment can safely be used. See page 114 for a listing of attachments and their ratings.

Where the material density is listed as a range (snow at 15-50 lbs./ft^3, for example), always use the maximum density (50 lbs./ft^3 in this example) for making calculations. Also, see the following examples.

Example 1: Clay (density of 80-100 lbs./cu. ft.) is to be hauled with a R220 model skid loader using a 70 in. dirt/construction bucket (SAE-rated heaped capacity of 16 cu. ft.). With this bucket, the R220 has a rating of 2200 lbs. Multiplying the maximum density of the material by the bucket capacity (100 x 16) yields a load that weighs 1600 lbs. This number is less than the machine rating and thus indicates that the loader/bucket combination is safe to use in this application.

Example 2: Granite (density of 1488-1776 kg/m3) is to be hauled with a R260 model skid loader using a 1778 mm dirt/construction bucket (SAE-rated heaped capacity of 0.46 m3). With this bucket, the R260 has a rating of 1179 kg. Multiplying the maximum density of the material by the bucket capacity (1776 x 0.46) yields a load that weighs 817 kg. This number is less than the machine rating and thus indicates that the loader/bucket combination is safe to use in this application.

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Notes

TORQUE SPECIFICATIONS

Use these torque values when tightening hardware (excluding locknuts, and self-tapping, thread-forming, and sheet metal screws) unless otherwise specified.

UNIFIED NATIONAL THREAD	GRADE 2		GRADE 5		GRADE 8	
	DRY	LUBED	DRY	LUBED	DRY	LUBED
8-32	19*	14*	30*	22*	41*	31*
8-36	20*	15*	31*	23*	43*	32*
10-24	27*	21*	43*	32*	60*	45*
10-32	31*	23*	49*	36*	68*	51*
1/4-20	66*	50*	9	75*	12	9
1/4-28	76*	56*	10	86*	14	10
5/16-18	11	9	17	13	25	18
5/16-24	12	9	19	14	25	20
3/8-16	20	15	30	23	45	35
3/8-24	23	17	35	25	50	35
7/16-14	32	24	50	35	70	55
7/16-20	36	27	55	40	80	60
1/2-13	50	35	75	55	110	80
1/2-20	55	40	90	65	120	90
9/16-12	70	55	110	80	150	110
9/16-18	80	60	120	90	170	130
5/8-11	100	75	150	110	220	170
5/8-18	110	85	180	130	240	180
3/4-10	175	130	260	200	380	280
3/4-16	200	150	300	220	420	320
7/8-9	170	125	430	320	600	460
7/8-14	180	140	470	360	660	500
1-8	250	190	640	480	900	680
1-12	270	210	710	530	1000	740
METRIC COARSE THREAD	**GRADE 8.8**		**GRADE 10.9**		**GRADE 12.9**	
	DRY	**LUBED**	**DRY**	**LUBED**	**DRY**	**LUBED**
M6-1	8	6	11	8	13.5	10
M8-1.25	19	14	27	20	32.5	24
M10-1.5	37.5	28	53	39	64	47
M12-1.75	65	48	91.5	67.5	111.5	82
M14-2	103.5	76.5	145.5	108	176.5	131
M16-2	158.5	117.5	223.5	165.5	271	200

*All torque values are in ft.-lbs., except those marked with an *, which are in in.-lbs.

For metric torque value (N·m), multiply ft.-lbs. value by 1.355, or the in.-lbs. value by 0.113.

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GEHL COMPANY

WARRANTY

GEHL COMPANY, hereinafter referred to as Gehl, warrants new Gehl equipment to the Original Retail Purchaser to be free from defects in material and workmanship for a period of twelve (12) months from the Warranty Start Date.

GEHL WARRANTY SERVICE INCLUDES:

Genuine Gehl parts and labor costs required to repair or replace equipment at the selling dealer's business location.

GEHL MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE), EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY STATEMENT.

ANY OF THESE LIMITATIONS EXCLUDED BY LOCAL LAW SHALL BE DEEMED DELETED FROM THIS WARRANTY STATEMENT; ALL OTHER TERMS WILL CONTINUE TO APPLY.

SOME STATES DO NOT PERMIT THE EXCLUSION OF LIMITATION OF THESE WARRANTIES AND YOU MAY HAVE GREATER RIGHTS UNDER YOUR STATE LAW.

GEHL WARRANTY DOES NOT INCLUDE:

1. Transportation to selling dealer's business location or, at the option of the Original Retail Purchaser, the cost of a service call.
2. Used equipment.
3. Components covered by their own non-Gehl warranties, such as tires, batteries, trade accessories and engines.
4. Normal maintenance service and expendable, high-wear items.
5. Repairs or adjustments caused by: improper use; failure to follow recommended maintenance procedures; use of unauthorized parts or attachments; accident or other casualty.
6. Liability for incidental or consequential damages of any type, including, but not limited to lost profits and expenses of acquiring replacement equipment.

No agent, employee or representative of Gehl has any authority to bind Gehl to any warranty except as specifically set forth herein.

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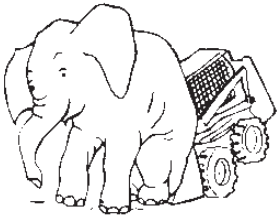
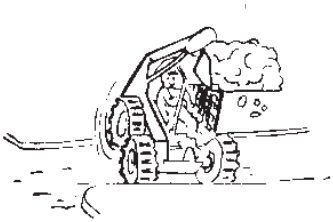
WRONG



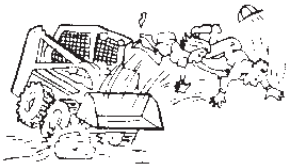
Never exceed rated operating load.

WRONG



Always carry attachment as low as possible. Do not travel or turn with the lift arm raised. Load, unload and turn on flat level surface.

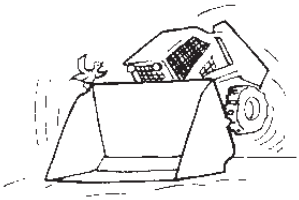
WRONG



Never carry riders.

Keep bystanders away from work area.

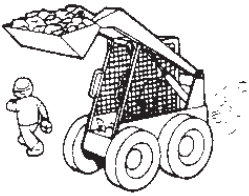
WRONG



Never modify equipment.

Use only attachments approved for model loader.

WRONG



Never leave loader with engine running or with lift arm up. To park, engage parking brake and put attachment flat on the ground.

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⚠ WARNING ⚠

THIS OPERATOR'S MANUAL IS PROVIDED FOR OPERATOR USE

DO NOT REMOVE FROM THIS MACHINE

Do not start, operate or work on this machine until you carefully read and thoroughly understand the contents of this Operator's Manual.

Failure to follow safety, operating and maintenance instructions can result in serious injury to the operator or bystanders, poor operation, and costly breakdowns.

If you have any questions on proper operation, adjustment or maintenance of this machine, contact your dealer or the Gehl Service Department before starting or continuing operation.

California Proposition 65 Warnings

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer and birth defects or other reproductive harm.
Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling battery.

GEHL®

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www.gehl.com

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