



# GEHL

## **R105 R105 (EU) R105 X-Series**

### **Skid-Steer Loader**

# **Operator's Manual**

50950260 Rev. C 02/19

**Original Instructions**

 **WARNING**

**This product can expose you to lead which is known to the State of California to cause cancer and birth defects or other reproductive harm.**

**For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

 **WARNING**

**Breathing diesel engine exhaust exposes you to chemicals known to the state of California to cause cancer and birth defects or other reproductive harm.**

- **Always start and operate the engine in a well-ventilated area.**
- **If in an enclosed area, vent the exhaust to the outside.**
- **Do not modify or tamper with the exhaust system.**
- **Do not idle the engine except as necessary.**

**For more information go to [www.P65warnings.ca.gov/diesel](http://www.P65warnings.ca.gov/diesel).**

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## **MANITOU EQUIPMENT AMERICA, LLC WARRANTY**

Manitou Equipment America, LLC under the Gehl brand (“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 XPRT parts and labor costs required to repair or replace equipment at the selling dealer’s business location.

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**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; ALL OTHER TERMS WILL CONTINUE TO APPLY.

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

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### **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 attachments; accident or other casualty.
6. Liability for incidental or consequential damages of any type, including, but not limited to lost profits or 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.

This agreement has been prepared in multiple languages, including but not limited to, English, Spanish, and French (Canada). In the event of any inconsistency, the English version shall apply and be binding upon the parties.

50940465/BP0218

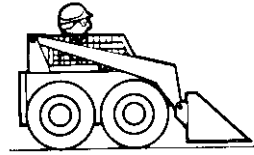
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Manitou Group, in cooperation with the American Society of Agricultural Engineers and the Society of Automotive Engineers, has adopted this Safety Alert Symbol to pinpoint precautions which, if not properly followed, can create a safety hazard. When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

WRONG



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



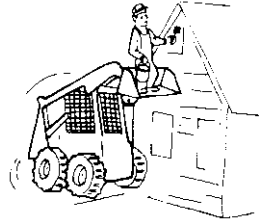
Operators must have instructions before running the machine. Untrained operators can cause injury or death.

CORRECT



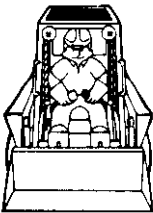
Read Operator's Manual before using machine.

WRONG



Never use the loader to lift personnel.

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.

# R105 Skid-Steer Loader

## Operator's Manual

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### TABLE OF CONTENTS

Introduction . . . . .	1
Safety . . . . .	5
Controls and Safety Equipment . . . . .	17
Operation . . . . .	41
Service . . . . .	61
Troubleshooting . . . . .	85
Maintenance Schedule . . . . .	97
Specifications . . . . .	101
Table of Common Materials and Densities . . . . .	105
Torque Specifications . . . . .	107
Index . . . . .	109

<b>Loader Model Number</b>	
<b>Loader Serial Number</b>	
<b>Engine Serial Number</b>	



## EC DECLARATION OF CONFORMITY

1. Manufacturer: **Manitou Americas, Inc.**
2. Address: **One Gehl Way  
West Bend, WI 53095-0179 U.S.A.**
3. Technical Construction File Location:  
**Manitou Interface and Logistics Europe  
Rue Des Andains 2  
Perwez, 1360 Belgium**
4. Authorized Representative: **Manitou Interface and  
Logistics Europe**
5. Address: **Rue Des Andains 2  
Perwez, 1360 Belgium**
6. **We hereby declare that the model(s) listed below  
conforms to EC Directives: 2004/108/EC (EMC),  
97/23/EC (Pressure Equipment), 2006/42/EC  
(Machinery) and 2000/14/EC (Noise Emission), as  
amended by 2005/88/EC.**
7. In accordance with EN/ISO Standards:  
**EN ISO 3450:1996, ISO 6165**
8. Category: **EARTH-MOVING MACHINERY/  
LOADERS/COMPACT**
9. Model(s): **R105**
10. Directive/Conformity Assessment Procedure/Notified Body:

<b>2004/108/EC</b>	<b>Type-test</b>	<b>Self-certification</b>
<b>97/23/EC</b>	<b>Self-certification</b>	-----
<b>2006/42/EC</b>	<b>Self-certification</b>	-----
<b>2000/14/EC</b>	<b>Annex VIII – Full Quality Assurance</b>	<b>TÜV Industrie Service GmbH – TÜV SÜD Group Westendst. 199, D-80686 München GERMANY</b>

# CHAPTER 1

## INTRODUCTION

This Operator's Manual provides the owner/operator information about maintaining and servicing the R105 skid-steer loader model. More importantly, 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.

We ask that you read and understand the contents of this manual completely and become familiar with your new machine before operating it. See your authorized Gehl dealer if you have any questions concerning information in the manual, require extra manuals or 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 your operating and maintenance efficiency, help avoid breakdowns and damage, and extend your machine's life.

A manual storage box in the operator's compartment 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, we recommend that these manuals be given to the new owner.

The attachments and equipment available for use with this machine have a wide variety of potential 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 Group, 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 you with any assistance you may require, 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 your machine. Record these numbers in the space provided on the Table of Contents page, as a handy reference.

Manitou Group 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 Company 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.

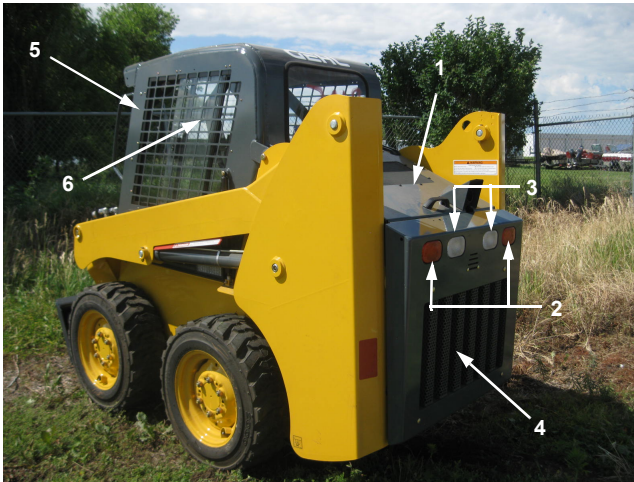
# Loader Identification

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- 1. Upright
- 2. Lift Cylinder
- 3. Tires
- 4. Front Work Lights
- 5. Handholds

- 6. Lift Arm
- 7. Auxiliary Hydraulic Couplers
- 8. Tilt Cylinders
- 9. Attachment Bracket











































- 1. Engine Cover
- 2. Tail Lights
- 3. Rear Work Lights
- 4. Rear Door

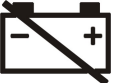






















- 5. Roll-Over/Falling Object Protective Structure (ROPS/FOPS)
- 6. Restraint Bar



# 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
<b>H-L</b> High - Low	<b>N</b> Neutral	<b>F</b> Forward	<b>R</b> Reverse	<b>(P)</b> 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

# Control/Indicator Symbols, cont.

 Battery Disconnect	 DPF Service	 Exhaust Gas Temperature	 DPF Regen Acknowledgement	 Service Interval
 Low Fuel Alarm	 Master Light Switch	 Position Lights	 Engine Speed Control	 DPF Regen Inhibited
 Self-Leveling	 Unlock	 Lift Point	 Windshield Washer	 Rear Washer
 Windshield Wiper	 Rear Wiper	 Fan	 Heater	 Temperature
 Beacon	 Lock	 Aftertreatment Error		

# CHAPTER 2

## 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 Group 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. Users must evaluate the work-site hazards and equip the machine and the operator as necessary. The information in this manual does not replace any applicable safety rules and laws. Before operating the machine, learn the rules and laws for the local area. Be sure the machine is equipped as required in accordance with these rules/laws.



**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.**

# Mandatory Safety Shutdown Procedure

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Before cleaning, adjusting, lubricating, 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 21).
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

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### 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 Group 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: the load being carried, the 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**

## **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.
- Operator visibility is limited in certain areas; ROPS/FOPS posts, attachments, the lift arm, items in the cab, etc., can obstruct the operator's view and could mask hazards or people in the area around the machine. It is very important the operator is aware of these masked visibility areas before operating the machine, especially on busy worksites.

To reduce the hazards posed by masked visibility areas:

- Use caution when raising or lowering attachments; masked visibility areas can change dramatically when attachments and/or the lift arm is moved.
- Look around the machine before operating. Objects near the machine and close to the ground can be difficult to see from the operator's position.
- Always look in the direction of travel, including reverse. A back-up alarm is not a substitute for looking behind you when operating the machine in reverse.
- Keep bystanders out of, and away from, the work area.

- Keep the lift arm as low as possible while traveling.
- Additional equipment may be installed on the machine to serve as visual aids (e.g., mirrors, CCTV systems) that provide visibility to areas masked by the machine structure. Keep all machine components that affect visibility in a clean, properly adjusted state and in good working order.

## Maintenance

- Never attempt to by-pass the keyswitch 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.

## Potential Hazards

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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!

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.

Exposure to crystalline silica (found in sand, soil and rocks) has been associated with silicosis, a debilitating and often fatal lung disease. Comply with all applicable rules and regulations for the workplace. Wear approved respiratory protection or use water spray or other means if there is no other way to control the dust.



A Silica rule “29 CFR 1929.1153” by the U.S. Occupational Safety and Health (OSHA) indicates a significant risk of chronic silicosis for workers exposed to inhaled crystalline silica over a working lifetime. Refer to the rule for more information regarding exposure limits and hazard prevention.

## **Safety Decals**

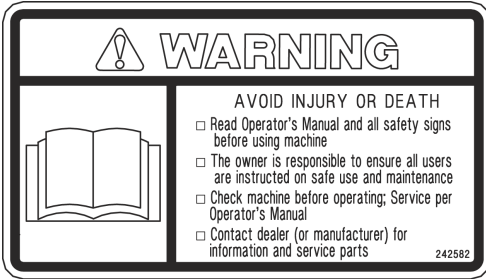
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The skid-steer loader has decals that provide safety information and precautions around the loader. These decals must be kept legible. If missing or illegible, they must be replaced promptly. Replacements can be obtained from your Gehl dealer. If there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

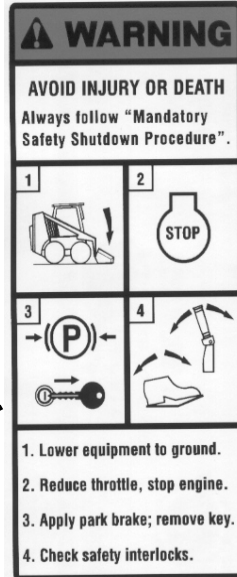
### **New Decal Application**

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 10; ISO-style no-text decals begin on page 13.

# Safety Decals inside the ROPS/FOPS



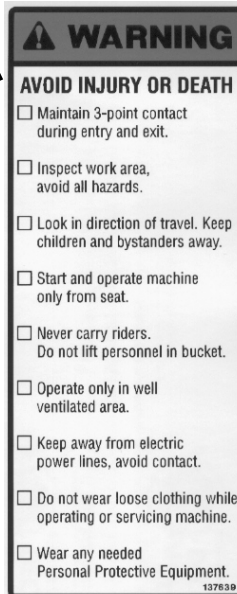
242582- Located behind the operator's seat



137683 - Located on ROPS left panel



137647 - Located on operator's lower left side



137639 - Located on ROPS left panel



# Safety Decals on the outside of the Skid Loader



<b>⚠ DANGER</b>		Hose removal or component failure can cause lift arm to drop. Always use lift arm support device when leaving lift arm raised for service.
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137637 – Lift arm support device, loader left side



<b>⚠ WARNING</b>	
	
	Be sure lock mechanism is securely engaged before working under ROPS/FOPS.
	Read instructions for use in Operator's Manual.
<small>184214</small>	

184214 – Under ROPS

<b>⚠ DANGER</b>		
<b>AVOID INJURY OR DEATH</b>		
	<input type="checkbox"/> Keep out from under work tool, unless lift arm is supported. <input type="checkbox"/> No riders! Never use work tool as work platform.	
<small>137655</small>		

137655 – Front of loader

<b>⚠ WARNING</b>	
	<b>AVOID INJURY OR DEATH</b> Before operating with attachment, check engagement of loader attachment bracket locking pin to the attachment.

50354117 and 50354121 – Front of loader

# Safety Decals in the Engine Compartment

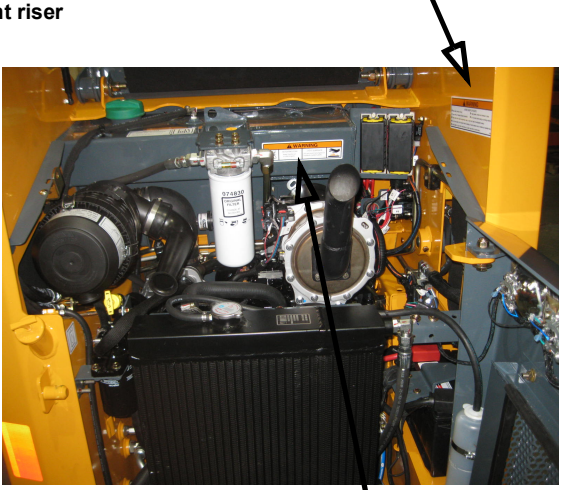
**⚠ WARNING**

**AVOID INJURY OR DEATH**

<input type="checkbox"/> Keep safety devices working.	<input type="checkbox"/> Keep guards, screens and windows in place.
<input type="checkbox"/> Jump start per Operator's Manual procedure.	<input type="checkbox"/> Do not smoke while fueling or servicing machine.
<input type="checkbox"/> Clean debris from engine compartment daily to avoid fire. Keep fire extinguisher nearby.	
<input type="checkbox"/> Do not use hands to find hydraulic leaks. Escaping oil under pressure can be invisible and penetrate skin.	
<input type="checkbox"/> Allow radiator to cool before removing cap. Loosen cap slowly to avoid burns.	

137657

**137657 – On right riser**



**⚠ WARNING**

<p><b>HOT SURFACE</b></p> <p>Do not touch hot engine or hydraulic system parts.</p> <p style="font-size: x-small;">50352528</p>	
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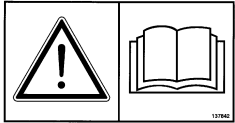
**50352528 – On fuel tank**

**⚠ WARNING**

	<p><b>ROTATING FAN</b></p> <p>Keep hands out or stop engine.</p> <p style="font-size: x-small;">50352529</p>
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**50352529 – On fan shroud inside engine compartment**

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



**242568 – Located behind the operator's seat**

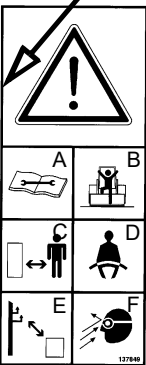
Safety alert: Read Operator's Manual and all safety signs before using machine. The owner is responsible to ensure all users are instructed on safe use and maintenance.



**137847 – Part of left instrument panel**

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.

**137849 – Part of 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.



**137843 – Located on operator's lower left side**

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

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

A		B	

**137844 – Located on front of loader**

**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.



	<p><b>137853 – Located on lift arm support device</b></p> <p>Crush hazard: Hose removal or component failure can cause lift arm to drop. Always use lift arm support device when leaving arm raised for service.</p>

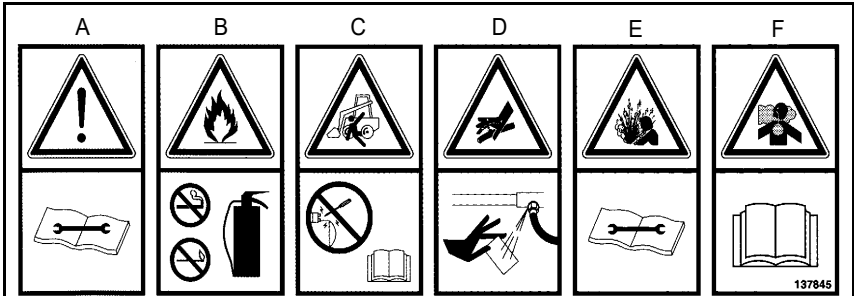
	<p>A </p> <p>B </p>	<p>C </p> <p>D </p>
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**137852 – Located on hitch (manual hitch loaders only)**

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

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

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



## 137845 – Located on 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.

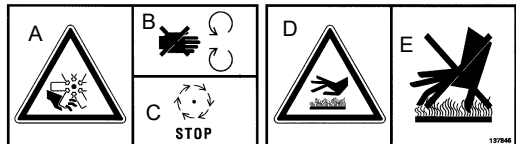
**D** – Oil injection hazard: Do not use hands to find hydraulic leaks. Escaping oil under pressure can be invisible and penetrate skin. Use a piece of cardboard to find leaks.

**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.



## 137846 – On fuel tank



**A** – Cutting Hazard, Fan: The fan rotates at extreme speed.

**B** – Keep hands away from the fan.

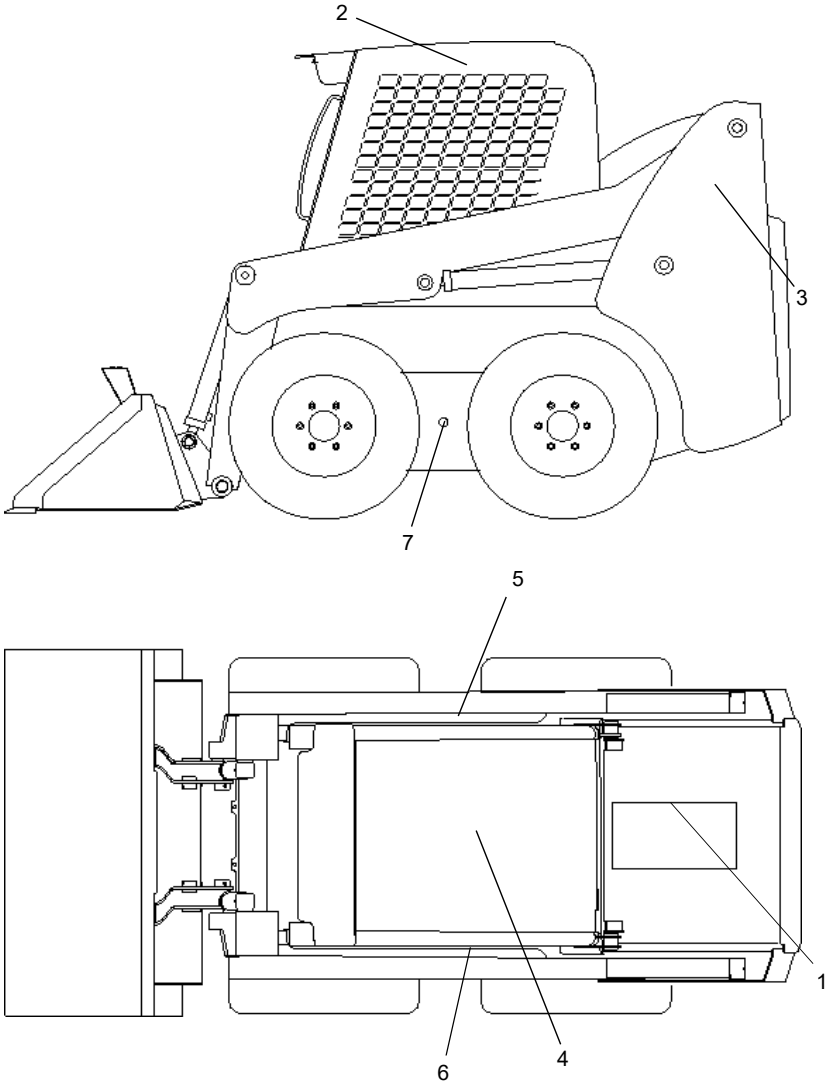
**C** – Stop the engine before working around the fan.

**D** – Hot surface hazard: The engine and its components generate temperatures that can burn skin.

**E** – Hot surface: Do not touch hot engine or hydraulic system parts.

# Product and Component Plate Locations

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## 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

## CONTROLS AND SAFETY EQUIPMENT

**⚠ CAUTION** 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 a Gehl attachment or a Manitou Group-approved referral attachments or accessories. Manitou Group cannot be responsible for operator safety if the loader is used with a non-approved attachment.

### Guards and Shields

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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.

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.

## Operator's Seat

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



**Figure 1 Operator's Seat**

1. Restraint Bar
2. Seatbelt
3. Seat Adjustment Level

## Upper-Torso Restraint

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### **WARNING**

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

The seat belt should always be fastened during operation.

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

## Safety Interlock System

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### **WARNING**

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

An interlock system is used 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 down.
- Disables the lift arm, attachment tilt and wheel drives when the operator leaves the seat, turns the keyswitch to OFF or raises the restraint bar.
- Disables auxiliary hydraulic system when the restraint bar is raised or the keyswitch is OFF.

***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 42.)*



## Testing the Safety Interlock System

Before leaving a parked machine, check the safety interlock system for proper operation:

### Restraint Bar

With the engine running, raise the restraint bar. Move each of the controls. There should be not more than a slight movement of the lift arm, attachment 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. Lift your weight up off the seat. Try to start the engine. If the engine starts, turn off the engine, and troubleshoot and correct the problem. Contact your dealer if necessary.

## ROPS/FOPS

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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 - DPF Models above, Non-DPF Models below**

# Horn

On 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.

# Rear Window Emergency Exit

The ROPS 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.



**Figure 3 Rear Window Emergency Exit**

1. Pull Tag

# 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:

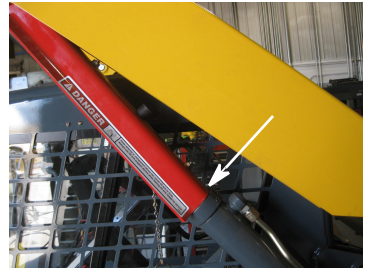
**⚠ WARNING** The safest method of engaging the lift arm support device requires two people - one person inside the loader and another person outside the loader to engage the support device.

*Note: 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 arm 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 4).
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.
6. Look to be sure the support device is secure against the cylinder end. Then, stop the loader engine, remove the key and exit the operator's compartment.



**Figure 4 Lift Arm Support Device Engaged**

## 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 arm 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 5).



**Figure 5 Lock Pin in storage Position**

## Accessory Plug

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

## Dome Light

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

## Work Lights

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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)

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Loaders with the optional heater have two control knobs on top of the heater unit for controlling fan speed and heater temperature.

1. **Fan Speed Control Knob:** Controls the fan speed and turns the heater system on or off.
2. **Temperature Control:** The rotary knob regulates the temperature of the heated air. Rotate clockwise to increase the temperature; counterclockwise to decrease the temperature.

## Lockable Fuel Cap

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Though not necessary to leave locked, the use of a locking fuel cap protects the loader from fuel theft or fuel system vandalism. The key to this lockable fuel cap should be secured to the loader's key ring. A torque override features aids in the proper installation of the fuel cap. It produces an audible click as the o-ring that seals the cap is properly compressed. To operate the lockable fuel cap:

1. Shut off the engine and remove the key. Insert the fuel cap key into the fuel cap lock.
2. Turn the key 45° clockwise to unlock the fuel cap and turn the cap off the fuel fill neck. When finished fueling the loader, replace the cap and tighten it. Holding the cap, insert the key and turn it 45° counterclockwise to lock the cap in place. Remove the key and check the lock by trying to open the cap.



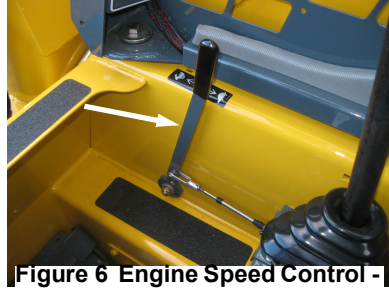
**In the event the key to the lockable fuel cap is lost, contact your dealer or a local locksmith to prevent damage to the cap.**

# Engine Speed Control

On DPF Models, 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 73 or the cold starting procedure on page 42.



On Non-DPF Models, a right-hand controlled throttle lever is provided on all models for adjusting the engine speed. Move the control forward to increase the engine speed and rearward to decrease the engine speed.



**Figure 6 Engine Speed Control - DPF Models above, Non-DPF Models below**

With 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 - DPF Models above, Non-DPF Models below**

## Float Control

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For hand/foot loaders, use your toes to push the left foot pedal all the way down to detent the float control. 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 hand/foot loaders, use your heel to push the left foot pedal up to horizontal 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.

 **WARNING** Never use the float mode with the attachment raised, because this will cause the lift arm to lower very rapidly. The float mode can be used where the engine has stopped, is unable to be started, and lowering the lift arm is necessary to allow the operator to exit the loader.

# Instrument Panel (DPF Models)

The instrument panel contains the following switches and indicators. Symbols on the panel represent various functions and conditions, and are visible only when indicator lamps are on.

1. **Keyswitch** – In a clockwise rotation, these 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.

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

2. **Information Center Electronic Display** – See page 34.
3. **Fuel Level Gauge** – Displays the amount of fuel in the tank.
4. **Fasten Seatbelt** – A momentary visual (and audible) indicator to remind the operator to fasten the seatbelt.
5. **Engine Oil Pressure** – Lights if the engine oil pressure drops too low, warning the operator to immediately stop the engine and determine the cause for the pressure drop. During normal operation, this indicator should be OFF.
6. **Battery** – Lights if the charging voltage is too high or too low. During normal operation, this indicator should be OFF.
7. **Preheat Indicator Lamp** – Lights when the (automatic) preheat is active. During normal operation this indicator should be OFF.

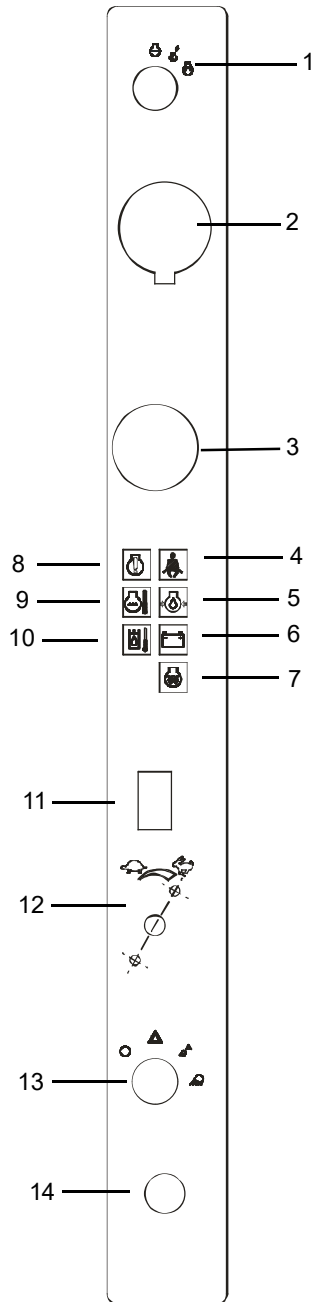


Figure 8 Instrument Panel



8. **Engine Malfunction Lamp** – Indicates the engine ECU has detected a malfunction of the engine.
9. **Engine Coolant Temperature** – Lights if the engine coolant becomes too hot, warning the operator to stop the engine. Allow the engine to cool, determine the cause for the high temperature and correct the problem before restarting the engine. During normal operation, this indicator should be OFF.
10. **Hydraulic Oil Temperature** – Lights if the hydraulic oil becomes too hot, warning the operator to stop engine. Allow the hydraulic system to cool and determine the cause of the high temperature. During normal operation, this indicator should be OFF.
11. **Parking Brake Switch** – Used to manually apply the parking brake. Lights when the parking brake is applied.
12. **Engine Speed Control** – Controls the engine speed. Move the control clockwise to increase and counter-clockwise to decrease the engine speed.
13. **Light Switch** – Controls all the lights on the loader. Symbols denote the four positions of the light switch. In a clockwise direction these are:
  - OFF
  - Tail Lights ON
  - Front Work Lights with Tail Lights ON
  - both Front and Rear Work LightsFor the lights to function, the keyswitch must be in the RUN position.
14. **Accessory Outlet** – 12-volt DC power outlet.

# Instrument Panel (Non-DPF Models)

The instrument panel contains the following switches and indicators. Symbols on the panel represent various functions and conditions, and are visible only when indicator lamps are on.

1. **Hourmeter** – Displays the total operating hours on the loader.
2. **Fuel Level Gauge** – Displays the amount of fuel in the tank.
3. **Engine Coolant Temperature Gauge** – Indicates the engine coolant temperature.

*Note: Items 4 through 9 are indicator lamps which display the following:*

4. **Fasten Seatbelt** – A momentary visual (and audible) indicator to remind the operator to fasten the seatbelt.
5. **Engine Oil Pressure** – Lights if the engine oil pressure drops too low, warning the operator to immediately stop the engine and determine the cause for the pressure drop. During normal operation, this indicator should be OFF.
6. **Battery** – Lights if the charging voltage is too high or too low. During normal operation, this indicator should be OFF.
7. **Preheat Indicator Lamp** – Lights when the preheat switch is pressed. During normal operation, this indicator should be OFF.
8. **Engine Coolant Temperature** – Lights if the engine coolant becomes too hot, warning the operator to stop the engine. Allow the engine to cool, determine the cause for the high temperature and correct the problem before restarting the engine. During normal operation, this indicator should be OFF.
9. **Hydraulic Oil Temperature** – Lights if the hydraulic oil becomes too hot, warning the operator to stop engine. Allow the hydraulic system to cool and determine the cause of the high temperature. During normal operation, this indicator should be OFF.

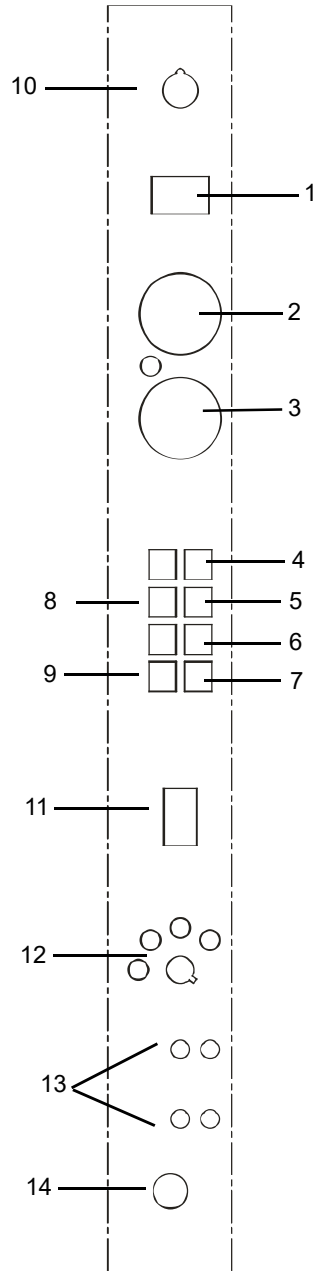


Figure 9 Instrument Panel

**10. Keyswitch** – In a clockwise rotation, these positions are:

**OFF Position** – With the key vertical, power from the battery is disconnected to the controls and instrument panel electrical circuits. This is the only position the key can be inserted or removed from the keyswitch.

**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 electrical circuits.

**START Position** – With the key turned fully clockwise, the electric starter energizes, start the engine. Release the key to the RUN position after the engine starts.

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

**11. Parking Brake Switch** – Used to manually apply the parking brake. The red indicator on the switch lights when the parking brake is applied.

**12. Light Switch** – Controls all the lights on the loader. Symbols denote the four positions of the light switch. In a clockwise direction these are:

- OFF
- Tail Lights ON
- Front Work Lights with Tail Lights ON
- both Front and Rear Work Lights

For the lights to function, the keyswitch must be in the RUN position.

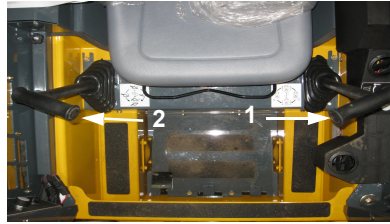
**13. Circuit Breakers** – Four circuit breakers on the instrument panel protect the loader's electrical circuits.

*Important: Do not attempt to defeat the circuit protection by jumping across a circuit breaker or by using a higher amperage circuit breaker.*

**14. Accessory Outlet** – 12-volt DC power outlet.

## T-Bar Controls

The loader may be equipped with T-bar controls (Figure 10). The left T-bar controls the drive and the right T-bar controls the lift/tilt.



**Figure 10 T-Bar Controls**

1. Drive Control
2. Lift/Tilt 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.

### 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 detent (“float”) position, push the right T-Bar all the way forward into the detent. This position allows the lowered lift arm to “float” while traveling over changing ground conditions.

**⚠ 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.

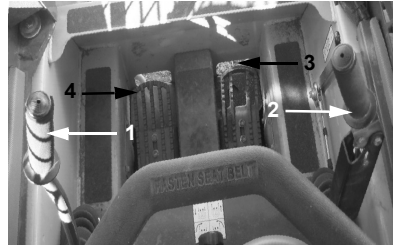
# Hand/Foot Controls

The loader may be equipped with hand/foot controls (Figure 11). The control grips control the drive and the foot pedals control the lift/tilt.

## Drive Controls

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

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



**Figure 11 Hand/Foot Controls**

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

**⚠ 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.

## 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 in the detent (“float”) position, use your toes to push the left pedal all the way down into the detent. This position allows the lowered lift arm to “float” while traveling over changing ground conditions.

**⚠ WARNING** Never push the left pedal into the float position with the attachment loaded or raised, because this will cause the lift arm to lower rapidly.

## Auxiliary Hydraulic Controls

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

**Important:** Always be sure the auxiliary hydraulic control is in neutral before starting the loader or removing the auxiliary hydraulic couplers.

**Note:** When ignition power is interrupted, auxiliary hydraulic function is reset to OFF.

Couplers are located on the left lift arm. “A” port is pressure, “B” port is return when the auxiliary control is in the detent position (refer to page 45).

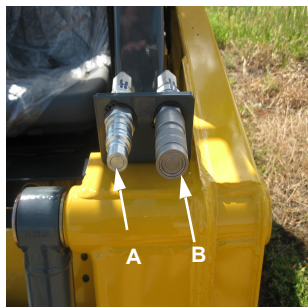


Figure 12 Auxiliary Couplers

## T-Bar Controlled Loaders

A foot pedal is used to control the direction of oil flow.



Figure 13 T-Bar Auxiliary Control

## Hand/Foot Controlled Loaders

The right handle controls the direction of oil flow. A locking pin locks it in the up position for continuous operation.



Figure 14 Hand/Foot Auxiliary Control

## Attachment Mounting

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The Gehl loader is equipped with a two-pin All-Tach™ attachment bracket for mounting a bucket or other attachment. Two latch levers secure the attachment. Rotate the levers until they are horizontal to engage the latch pins. Rotate the levers until they are vertical to disengage the latch pins.



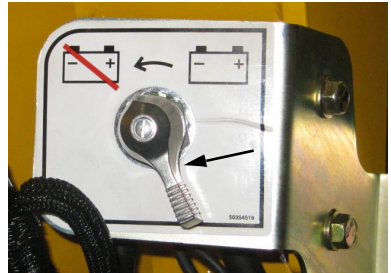
**Figure 15 All-Tach™ Attaching Mechanism (Hitch)**

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

## Electrical Battery Disconnect Switch (optional)

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An optional 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.

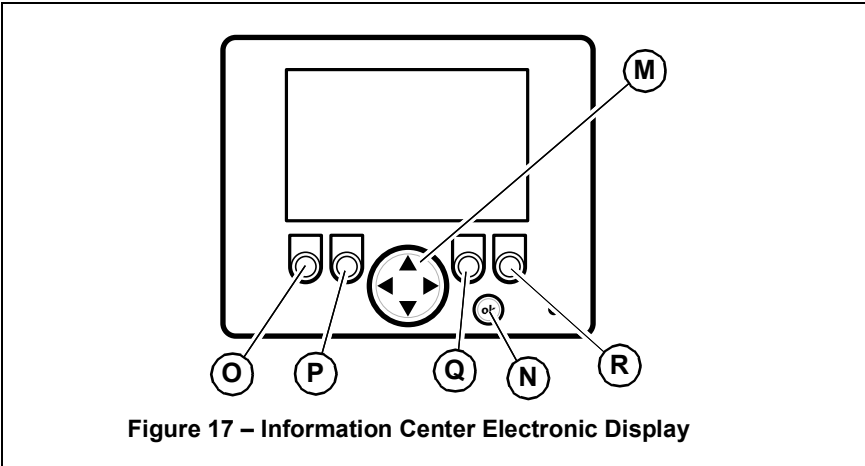


**Figure 16 Battery Disconnect Switch**

# Information Center Electronic Display (DPF Models)

The information center electronic display is located on the right door pillar. It provides the following functionality:

- Displays operational status such as engine RPM, coolant temperature and service hours.
- Displays error fault codes and input/output diagnostic data.
- Configures displays settings.






**Figure 17 – Information Center Electronic Display**

<p><b>M.</b> Navigation Rocker Button – Used for general screen navigation and other various functions, depending upon screen and context.</p>	<p><b>P.</b> Increase Brightness/Return Button – Used for different functions depending upon screen and context:</p> <ul style="list-style-type: none"> <li>• Used to increase display brightness. Corresponds to the ☀️ symbol on the display screen.</li> <li>• Used to return to previous screen. Corresponds to the ↻ symbol on the display screen.</li> </ul>
<p><b>N.</b> OK Button – Used for various functions, depending upon screen and context.</p>	<p><b>Q.</b> Decrease Brightness Button – Used to decrease display brightness. Corresponds to the 🌑 symbol on the display screen.</p>



**O. Regen/Return Button** – Used for different functions depending upon screen and context:

- Switches to the Regen display mode if the  symbol is displayed on the screen. Also initiates DPF regeneration if all appropriate conditions are met.
- Used to return to previous screen. Corresponds to the  symbol on the display screen.

**R. Regen Inhibit Button (DPF models)** – Press for 5 seconds to inhibit DPF reset regeneration. Displays the  symbol.









**! 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 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.

## Information Center Electronic Display Symbols






The following table describes symbols used in the information center electronic display.

*Note: Values may not display for all parameters, depending upon installed options and equipment.*

**Table 1: Symbols Descriptions**

Symbol	Description	Symbol	Description
 n/min	Engine crankshaft revolutions per minute.		Real-time fuel consumption rate. Displayed in gallons/hour (SAE) or liters/hour (METRIC).
	Accumulated operation time. Time is displayed in hours, and accumulates when the engine is running.		Display brightness increase. Press button (P, Figure 17) when this symbol is displayed to increase screen brightness.
	Battery charging circuit voltage.		Display brightness decrease. Press button (Q, Figure 17) when this symbol is displayed to decrease screen brightness.
	Coolant temperature.		Diesel Particulate Filter (DPF) regeneration (DPF Models). See “Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models)” on page 55.

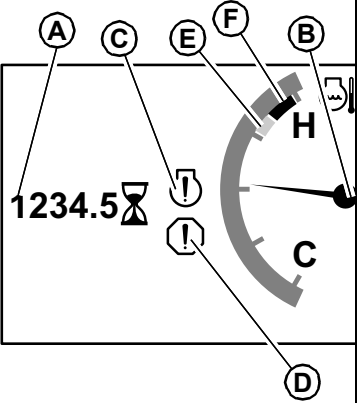
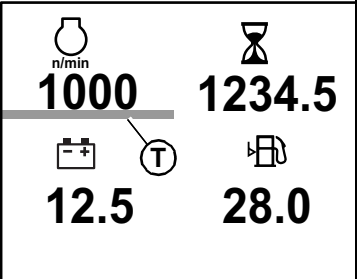
**Table 1: Symbols Descriptions**

Symbol	Description	Symbol	Description
	Percentage of engine power based on load.		<p>Diesel Particulate Filter (DPF) regeneration inhibit (DPF Models). See “Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models)” on page 55.</p> <p><i>Note: Strike-through line through the symbol is displayed in red when DPF regeneration is inhibited.</i></p>
	Ambient engine compartment temperature.		<p>Diesel Particulate Filter (DPF) regeneration in-progress (elevated temperature). See “Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models)” on page 55.</p>
	<p>Aftertreatment Error</p> <p>This icon is used to show that there is an error or fault with emission critical components. Note that there will be engine derate conditions if fault is not fixed in a timely manner.</p>		

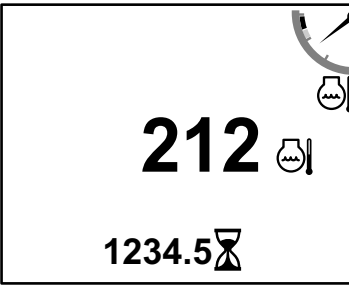
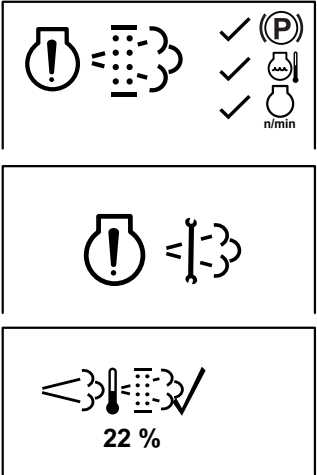
# Information Center Electronic Display Screens

*Note: Values may not display for all parameters, depending upon installed options and equipment.*

**Table 2: Status, Maintenance and Error Code Screens**

Display Mode	Description
<b>Status Screens</b>	
	<p style="text-align: center;"><b>Dual Gauge Display</b></p> <p>A. Accumulated operation time.</p> <p><i>Note: Time is displayed in hours, and accumulates when the engine is running.</i></p> <p>B. Engine coolant temperature.</p> <p>C. Amber error condition warning. Causes DM1/DM2 errors screen(s) to display. See page 39.</p> <p>D. Red critical error warning. Causes DM1/DM2 errors screen(s) to display. See page 39.</p> <p>E. Engine coolant temperature amber warning region. Indicates elevated coolant temperature.</p> <p>F. Engine coolant temperature red stop warning region. Indicates serious coolant overheating condition.</p> <p><i>Note: Running the engine in an overheated condition can damage the engine.</i></p>
	<p style="text-align: center;"><b>Quad Gauge Display</b></p> <p>Displays four different status parameters simultaneously. To change the displayed parameters, press and hold the ok button (N, Figure 17) until orange bar (T) displays. Press the left/right side of navigation rocker button (M, Figure 17) to select the parameter and press the top/bottom of navigation rocker button to change the selected parameter. Press the ok button again to dismiss orange bar (T).</p>

**Table 2: Status, Maintenance and Error Code Screens**

Display Mode	Description										
	<p style="text-align: center;"><b>Single Gauge Display</b></p> <p>Displays single real time operating parameters. Switch between parameters using the navigation button (M, Figure 17). Used for various functions, depending upon screen and context.</p>										
	<p style="text-align: center;"><b>Regeneration Screens (DPF Models)</b></p> <p>These screens are associated with Diesel Particulate Filter (DPF) regeneration procedures and maintenance. See “Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models)” on page 55.</p>										
<b>Secondary Screens</b>											
<p>All Secondary Screens</p>	<p>Secondary screens are accessed by holding down the ok button (N, Figure 17) for 10 seconds while the Dual Gauge Display screen is displayed. Press the left/right side of navigation rocker button (M, Figure 17) to switch between secondary screens.</p>										
<p style="text-align: center;"><b>REVISIONS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">DISPLAY</td></tr> <tr><td style="text-align: center;">04 14 2014</td></tr> <tr><td style="text-align: center;">MCU</td></tr> <tr><td style="text-align: center;">*****</td></tr> <tr><td style="text-align: center;">MAIN KEYPAD</td></tr> <tr><td style="text-align: center;">ABCDEFG</td></tr> <tr><td style="text-align: center;">ROAD LIGHTS KEYPAD</td></tr> <tr><td style="text-align: center;">*****</td></tr> <tr><td style="text-align: center;">HEATER/WIPER KEYPAD</td></tr> <tr><td style="text-align: center;">ABCDE</td></tr> </table>	DISPLAY	04 14 2014	MCU	*****	MAIN KEYPAD	ABCDEFG	ROAD LIGHTS KEYPAD	*****	HEATER/WIPER KEYPAD	ABCDE	<p style="text-align: center;"><b>Revision Screen</b></p> <p>Displays information center electronic display software information.</p>
DISPLAY											
04 14 2014											
MCU											
*****											
MAIN KEYPAD											
ABCDEFG											
ROAD LIGHTS KEYPAD											
*****											
HEATER/WIPER KEYPAD											
ABCDE											



**Table 2: Status, Maintenance and Error Code Screens**

Display Mode	Description																
<p style="text-align: center;"><b>DIAGNOSTICS INPUTS</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Float <input type="checkbox"/></td> <td style="width: 50%;">Alternator <input type="checkbox"/></td> </tr> <tr> <td>Hydro Glide <input type="checkbox"/></td> <td>KP Ignition Run <input type="checkbox"/></td> </tr> <tr> <td>High Gear <input type="checkbox"/></td> <td>KP Ignition Start <input type="checkbox"/></td> </tr> <tr> <td>Aux Detent <input type="checkbox"/></td> <td>KP Seat Switch <input type="checkbox"/></td> </tr> <tr> <td>Air Filter Clog <input type="checkbox"/></td> <td>KP Restraint Bar <input type="checkbox"/></td> </tr> <tr> <td>Hyd Filter Clog <input type="checkbox"/></td> <td></td> </tr> <tr> <td>High Hyd Temp <input type="checkbox"/></td> <td></td> </tr> <tr> <td>Engine Pressure <input type="checkbox"/></td> <td></td> </tr> </table>	Float <input type="checkbox"/>	Alternator <input type="checkbox"/>	Hydro Glide <input type="checkbox"/>	KP Ignition Run <input type="checkbox"/>	High Gear <input type="checkbox"/>	KP Ignition Start <input type="checkbox"/>	Aux Detent <input type="checkbox"/>	KP Seat Switch <input type="checkbox"/>	Air Filter Clog <input type="checkbox"/>	KP Restraint Bar <input type="checkbox"/>	Hyd Filter Clog <input type="checkbox"/>		High Hyd Temp <input type="checkbox"/>		Engine Pressure <input type="checkbox"/>		<p style="text-align: center;"><b>Input Status</b></p> <p>Displays input information from electronic control modules, showing real-time machine component/control state. Status colors indicate the following:</p> <ul style="list-style-type: none"> <li>• Green – Active</li> <li>• Black – Inactive</li> </ul>
Float <input type="checkbox"/>	Alternator <input type="checkbox"/>																
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<p style="text-align: center;"><b>DIAGNOSTICS OUTPUTS</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">High Gear <input type="checkbox"/></td> <td style="width: 50%;">Float <input type="checkbox"/></td> </tr> <tr> <td>Self Level <input type="checkbox"/></td> <td>Marker Lts <input type="checkbox"/></td> </tr> <tr> <td>Hydro Glide <input type="checkbox"/></td> <td>Rear Work Lts <input type="checkbox"/></td> </tr> <tr> <td>Fuel Pump <input type="checkbox"/></td> <td>Front Work Lts <input type="checkbox"/></td> </tr> <tr> <td>Glow Plug <input type="checkbox"/></td> <td>KP Beacon Lts <input type="checkbox"/></td> </tr> <tr> <td>Starter <input type="checkbox"/></td> <td>KP Dome Lt <input type="checkbox"/></td> </tr> <tr> <td>All Tach Lock <input type="checkbox"/></td> <td>Disable Park Brake <input type="checkbox"/></td> </tr> <tr> <td>All Tach Unlock <input type="checkbox"/></td> <td>Tilt/Lift <input type="checkbox"/></td> </tr> </table>	High Gear <input type="checkbox"/>	Float <input type="checkbox"/>	Self Level <input type="checkbox"/>	Marker Lts <input type="checkbox"/>	Hydro Glide <input type="checkbox"/>	Rear Work Lts <input type="checkbox"/>	Fuel Pump <input type="checkbox"/>	Front Work Lts <input type="checkbox"/>	Glow Plug <input type="checkbox"/>	KP Beacon Lts <input type="checkbox"/>	Starter <input type="checkbox"/>	KP Dome Lt <input type="checkbox"/>	All Tach Lock <input type="checkbox"/>	Disable Park Brake <input type="checkbox"/>	All Tach Unlock <input type="checkbox"/>	Tilt/Lift <input type="checkbox"/>	<p style="text-align: center;"><b>Output Status</b></p> <p>Displays output information from electronic control modules, showing real-time feedback state of machine components. Status colors indicate the following:</p> <ul style="list-style-type: none"> <li>• Green – Active</li> <li>• Black – Inactive.</li> <li>• Yellow – Standby or Not Applicable</li> <li>• Red – Short Circuit</li> </ul>
High Gear <input type="checkbox"/>	Float <input type="checkbox"/>																
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All Tach Unlock <input type="checkbox"/>	Tilt/Lift <input type="checkbox"/>																

## 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

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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

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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 7% (B7) 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 chirp will sound momentarily to remind users to fasten the seatbelt

4. Turn the key to the START position.

**Note:** If temperature is below 32° F (0° C), see Cold-Starting Procedure, on page 46.

**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

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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 preheat systems. An explosion can result which can cause engine damage, injury or death.

1. Turn the key to the RUN position. If the preheat light on the right instrument panel 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.

**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 (DPF Models), 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.

## 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.

## 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 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.

## Parking the Loader


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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 the Engine

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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.

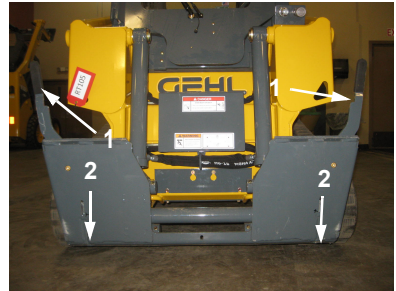
## Changing Attachments

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

The skid-steer loader features a All-Tach™ attaching mechanism for mounting a bucket or other attachment. Two latch levers engage the latch pins to secure the attachment.

### Connecting an Attachment

1. Rotate the latch levers to a vertical position to fully retract the latch pins.
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.
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. Exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (page 6).
8. With the loader engine OFF, leave the operator's compartment and rotate the latch levers all the way to the hitch to fully engage the latch pins.



**Figure 1 Hitch – disengaged**

1. Latch Levers
2. Latch Pins

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

## 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.

The hydraulic couplers are located on the left lift arm. “A” port is pressure, “B” port is return when the auxiliary control is in the detent position.

## Removing Attachments

1. Tilt the hitch back until the attachment is off the ground.
2. Exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (page 6).
3. Relieve any hydraulic pressure in the auxiliary and attachment lines.
  - a. Turn the key switch, but do not start the engine.
  - b. With the restraint bar down, move the auxiliary hydraulic control back and forth. This will relieve the pressure in the hydraulic system.
4. With the engine OFF, leave the operator’s compartment, disconnect the auxiliary hydraulic hoses and rotate the latch levers completely vertical to fully retract the latch pins.
5. Start the engine 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)

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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.

## Using a Bucket

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 **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 “Digger’s Hotline” or proper local authorities for utility line locations before starting to dig.

## Driving over Rough Terrain

When traveling over rough terrain, drive slowly with the bucket lowered.

## Driving on an Incline

When traveling up or down on an incline, travel with the heavy end pointing uphill. Try to avoid traveling on an incline, but always travel with the bucket as possible to maintain stability.

## 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, lifting the lift arm and tilting back the bucket to fill it. Back away from the pile.

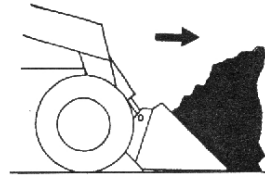


Figure 2 Loading

**⚠ 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.

## 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. Break the ground by driving forward and gradually lowering the lift arm.

With the bucket 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.

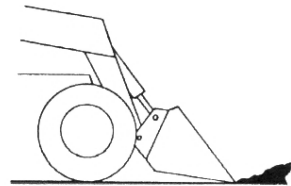


Figure 3 Digging

## Dumping the Load onto a Pile

Carry a loaded bucket as low as possible until reaching the pile. 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. Empty the bucket and back the loader away while tilting the bucket back and lowering the lift arm.

**⚠ WARNING** Never push the controls into the float position with the bucket or attachment loaded or raised, because this will cause the lift arm to lower rapidly.

## Dumping the Load Into a Box

Carry the loaded bucket low and approach the vehicle or bin. Stop your approach as close to the side of the box 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 box and move the loader ahead, to position the bucket over the inside of the box, slowly dump the bucket. After the material is dumped, back away from the box while tilting the bucket back and lowering the lift arm.

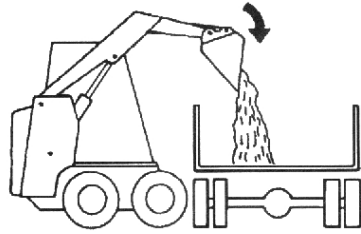


Figure 4 Dumping Into a Box

## 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. After the material is dumped, back away from the embankment while tilting the bucket back and lowering the lift arm.

## 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 to be scraped. While traveling slowly forward with the bucket in this position, material can flow over the cutting edge and collect inside the bucket.

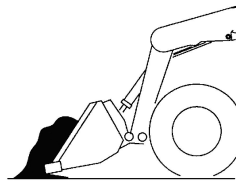


Figure 5 Scraping

## Leveling the Ground

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

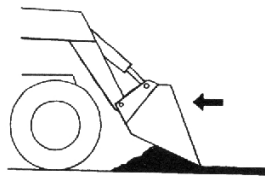



Figure 6 Leveling the Ground

*Note: The float (detent) position for T-Bar controlled loaders is reached by pushing the right handle all the way forward. For hand/foot controlled loaders, use your toes to push the front of the left pedal all the way down.*

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

## Vibration Information

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Compact construction equipment is generally used in harsh environments. This type of usage can expose an operator to uncomfortable levels of vibration. It is useful to understand exposure to vibration levels when operating compact equipment and what can be done to reduce vibration exposure. As a result, equipment operation can be more efficient, productive and safe.

An operator's exposure to vibration occurs in two ways:

- Whole-Body Vibration (WBV)
- Hand-Arm Vibration (HAV)

This section will cover primarily WBV issues, because evaluations have shown that operation of mobile compact construction equipment on jobsites typically results in HAV levels less than the allowed exposure limit of 2.5 m/s<sup>2</sup>.

Employers in Member States of the European Union must comply with the Physical Agents (vibration) Directive, 2002/44/EC.

Effective control of vibration exposure for an operator involves more than just vibration levels on the machine. The job site, how the machine is used, and proper training all play important roles in reducing vibration exposure.

Vibration exposure results from:

- worksite conditions
- how the machine is operated
- the machine characteristics

Common causes of high WBV vibration levels:

- Using a machine that is improper for the task
- Work site with potholes, ruts and debris
- Improper operating techniques, such as driving too fast
- Incorrect adjustment of the seat and controls
- Other physical activities while using the machine

# Vibration Measurement and Actions

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The vibration directive places the responsibility for compliance on employers. Actions that should be followed by employers include:

- Assess the levels of vibration exposure.
- Determine from this assessment if operators will be exposed to vibration levels above the limits stated in the directive.
- Take appropriate actions to reduce operator's exposure to vibration.
- Provide operators with information and training to reduce their exposure to vibration.
- Keep good records and update operations and training on a regular basis.

If the assessment concludes that vibration level exposure is too high, one or more of the following actions may be necessary:

1. Train operators
  - Perform operations (accelerating, steering, braking, etc.) in a smooth manner.
  - Adjust machine speed appropriately.
  - Adjust the controls, mirrors and seat suspension for comfortable operation.
  - Travel across the smoothest parts of the work site and avoid ruts and pot-holes.
2. Choose proper equipment for the job
  - Use machines with the proper power and capacity.
  - Select machines with good suspension seats.
  - Look for controls that are easy to use.
  - Ensure good visibility from the operator's position.
3. Maintain the work site
  - Smooth ruts and fill potholes in traffic areas whenever possible.
  - Clean up debris frequently.
  - Vary traffic patterns to avoid exposure to rough terrain.
4. Maintain the equipment
  - Ensure correct tire pressures.
  - Check that seat suspension and all controls work smoothly and properly.

## Vibration Levels

The following two tables show typical Whole-Body and Hand-Arm Vibration levels for the Gehl R105 servo-controlled skid-steer loaders with their different seat options.



## Servo Whole-Body and Hand-Arm Vibration Levels\*

Seat Option	Servo Whole-Body		Servo Hand-Arm	
	Vibration m/s <sup>2</sup>	Uncertainty m/s <sup>2</sup>	Vibration m/s <sup>2</sup>	Uncertainty m/s <sup>2</sup>
Mechanical Suspension	1.24	0.62	1.80	0.90
Standard Non-Suspension	1.12	0.56	1.70	0.85

\*Whole-Body Vibration levels in accordance with ISO 2631-1. Hand-Arm Vibration levels in accordance with ISO 5349-1.

## Highway Travel

If it becomes necessary to move the loader a long distance, use a properly rated trailer. (See “Transporting/Towing the Loader” on page 54.) 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.

## Lifting the Loader

---

The loader can be lifted using a single-point or four-point lift kit, which is 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.

**Important:** *As needed, use a spreader bar to prevent the slings or chains from rubbing the sides of the ROPS/FOPS. (Four-point lift only)*

**Note:** *The loader may 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.

## 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

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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.

# Transporting/Towing the Loader

**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. Towing the loader is not recommended as a means of transportation.

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. Use the tie down/retrieval points in situations where lifting the loader is not possible and the overall distance by which the loader is to be moved is less than 100 feet (30.5 m) at 6 mph (10 km/hr) or less. The optional brake release package (page 48) facilitates loader retrieval in such situations. When transporting a 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.
5. Fasten the loader to the hauling vehicle at the points indicated by the tie-down decals (Figure 7 and Figure 8).
6. Measure the clearance height of the loader and hauling vehicle. Post the clearance height in the cab of the vehicle.

When towing a loader:

1. Connect the towline to both tie down/retrieval points at the front or the rear of the loader. Use of only a single retrieval point or connecting the towline to any point on the loader other than the designated retrieval locations could result in loader damage.
2. The towline strength is at least 1.5 times the gross weight of the loader. The towline length is such that the maximum towing angle does not exceed 20°.



**Figure 7 Front Tie Down/Retrieval point**



**Figure 8 Rear Tie Down/Retrieval point**

# Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models)

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The Diesel Particulate Filter (DPF) treats exhaust emissions in compliance with Tier 4 / Stage 5 emission standards. The DPF filter relies on high exhaust temperatures. Periodic DPF maintenance (regeneration) is required, dependent upon machine operation load / temperature.

*Note: Machines operated primarily at high loads and operating temperatures require less frequent DPF maintenance. Extended periods of engine idling rapidly increases DPF soot levels, requiring more frequent regeneration operations.*


There are three modes of DPF regeneration:


- **Passive / Assist Regeneration:** Occurs automatically without operator input. Passive/assist regeneration does not affect machine operation.
- **Reset Regeneration:** Occurs automatically, but can be inhibited by the operator. Increases exhaust gas temperatures. Reset regeneration occurs approximately every 100 hours of operation. See “Reset Regeneration” on page 56.

*Note: Reset regeneration effectiveness is improved if the machine is operated at mid- to high-throttle settings when reset regeneration mode is in progress.*

- **Stationary Regeneration:** Requires operator action to initiate and takes approximately 25-30 minutes to complete. See “Stationary Regeneration” on page 57.

*Important: The machine cannot be operated and must be parked in a well-ventilated area away from flammable materials when stationary regeneration is in progress.*

 **WARNING** There is a possibility of carbon monoxide poisoning if stationary regeneration occurs in an enclosed space. Always perform stationary regeneration in a well-ventilated area.

 **WARNING** During regeneration, there will be high exhaust gas temperatures, even at low load. Stay clear of the DPF during regeneration.

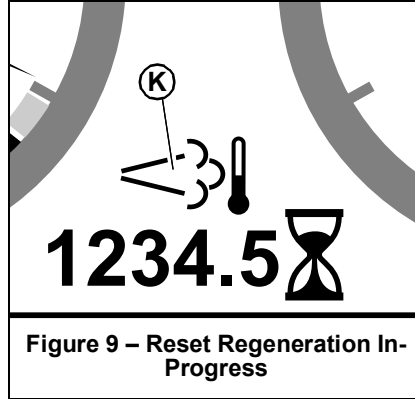
## Reset Regeneration

*Important: Reset regeneration can be prevented from occurring. See “Reset Regeneration Inhibit” on page 56.*

Reset regeneration occurs automatically (unless inhibited) approximately every 100 hours of operation.

*Note: Reset regeneration effectiveness is improved if the machine is operated at mid- to high-throttle settings while regeneration is in progress.*

When reset regeneration occurs, the DPF in-progress (elevated temperature) symbol  $\lessgtr\uparrow$  (K, Figure 9) displays on the screen.



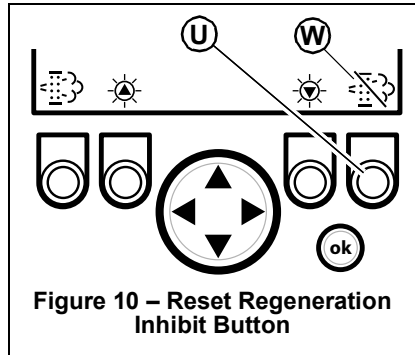
### Reset Regeneration Inhibit

DPF regeneration inhibit prevents reset regeneration from occurring.

**CAUTION** Permanently inhibiting regeneration is not recommended, as this will eventually cause significant reduction in engine power and will force premature DPF soot filter replacement.

To temporarily inhibit reset regeneration, hold down button (U, Figure 10) until the strikethrough in the Reset Regeneration symbol (W) turns to red.

*Note: DPF in-progress (elevated temperature) symbol  $\lessgtr\uparrow$  (K, Figure 9) will not be displayed when reset regeneration is inhibited.*



## Stationary Regeneration

Stationary regeneration may be periodically required to reduce DPF soot build-up. The frequency of stationary regeneration is dependent upon machine operation and engine load.

The machine cannot be used during stationary regeneration and cannot be moved without interrupting the stationary regeneration process.

When stationary regeneration needs to be performed, the regeneration request screen (Figure 11) displays on the information center electronic display.

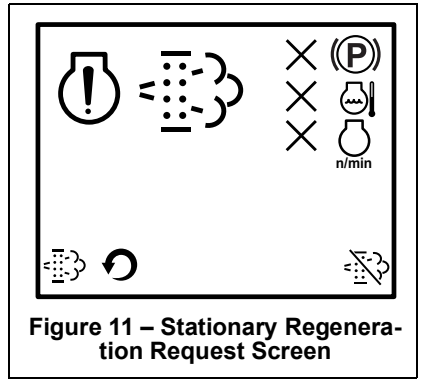


Figure 11 – Stationary Regeneration Request Screen

**Note:** The stationary regeneration request screen can be temporarily dismissed by pressing the reset regeneration inhibit button (U, Figure 10) for 3 seconds. Until the previous screen displays. The stationary regeneration request screen will return 1 minute after being dismissed, for as long as the request remains active.

**Important:** Perform stationary regeneration as soon as possible when the stationary regeneration request screen displays. Postponing stationary regeneration for extended periods will cause significant reduction in engine power and will force premature DPF filter core replacement.

To proceed with stationary regeneration (Figure 12):

1. Park the machine in a safe, well-ventilated location away from flammable materials.
2. The following conditions need to be met before stationary regeneration continues:
  - A. Press the (P) button on the control keypad (page 37) or lift the operator restraint bar to apply the parking brake. A checkmark is displayed next to the parking brake symbol (A).
  - B. When engine coolant has reached operating temperature (above 140° F / 60° C, a checkmark is displayed next to the coolant temperature symbol (B).

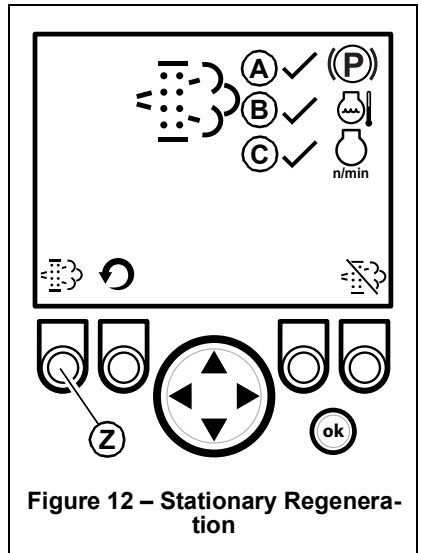


Figure 12 – Stationary Regeneration

C. Place throttle controls to the lowest speed setting. A checkmark is displayed next to the engine RPM symbol when the engine is running at low idle.

3. When all three checkmarks (A, B & C) are displayed on the Stationary Regeneration screen, press and hold the button (Z) until the Stationary Regeneration In-Progress screen displays (Figure 13).

**Note:** Stationary regeneration can be interrupted at any time by releasing the parking brake, advancing the throttle, or stopping the engine. Stationary regeneration must start again from the beginning if it is interrupted.

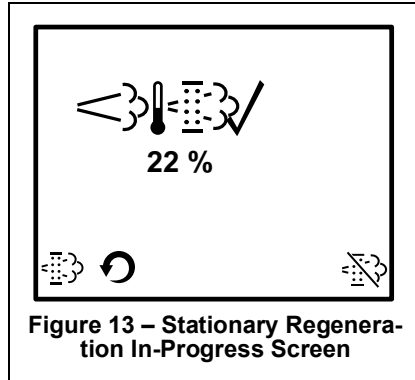


Figure 13 – Stationary Regeneration In-Progress Screen

Stationary regeneration completion percentage is displayed as during the stationary regeneration progresses. Progress percentage disappears when stationary regeneration completes.

**Note:** Stationary regeneration takes approximately 25-30 minutes.

**CAUTION** It is not necessary to stay in the machine during stationary regeneration. Keep the machine under observation while regeneration is in progress in case of malfunction. Keep bystanders away from the machine while regeneration is in progress.

## Forcing Stationary Regeneration

Stationary regeneration can be performed at any time after 50 operating hours following the previous stationary regeneration.

To perform stationary regeneration on-demand:

Press button (Y, Figure 14) associated with the DPF regeneration symbol (X), until the regeneration screen displays. Refer to “Stationary Regeneration” on page 57 to proceed with stationary regeneration.

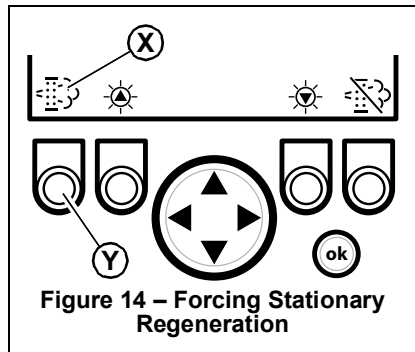


Figure 14 – Forcing Stationary Regeneration



## DPF Maintenance

DPF soot filter replacement is required when the DPF (Diesel Particulate Filter) Service Screen (Figure 15) displays.

*Note:* Contact your dealer when the DPF Service screen displays.

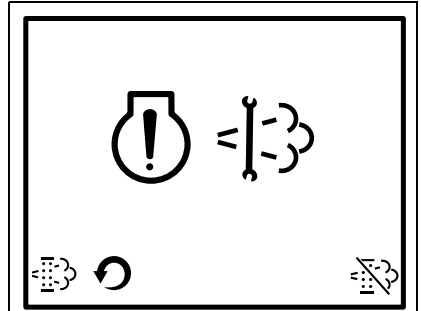


Figure 15 – DPF Service Screen

## Back-Up Alarm

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A back-up alarm system is optionally available which serves to warn people working in the area around the machine of the machine's rearward movement. The back-up alarm is installed within the engine compartment on the inside surface of the rear door. The alarm emits a tone whenever the machine begins to move in the rearward direction.



# CHAPTER 5

## 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 loader operation.

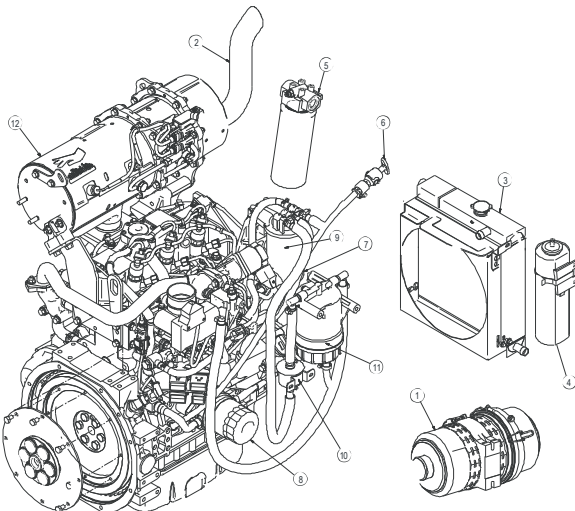
This *Service* chapter details procedures for performing routine maintenance checks, adjustments and replacements. Most procedures are referred to in the *Troubleshooting* and *Maintenance* chapters of this manual. Refer to the Maintenance Interval Chart (page 111) for service intervals. Refer to the 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

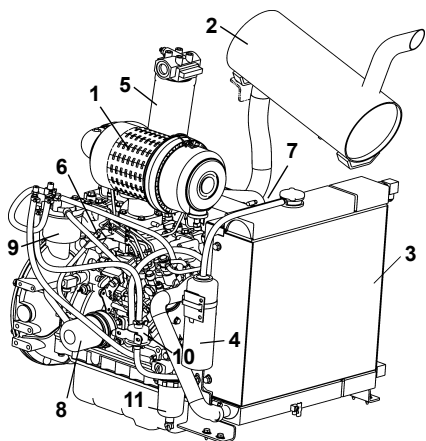
The following areas of component service, replacement and adjustments require special tools and knowledge for proper servicing and should be performed only by your authorized Gehl skid-steer loader dealer: hydrostatic drive components, hydraulic system pumps, valves, hydraulic cylinders, electrical components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



**Figure 1 Engine Compartment - DPF Models**

1. Air Cleaner
2. Exhaust Tube
3. Radiator/Cooler
4. Coolant Recovery Tank
5. Hydraulic Oil Filter
6. Engine Oil Dipstick
7. Engine Oil Fill Cap
8. Engine Oil Filter
9. Fuel Filter
10. Fuel Pump
11. Water Trap
12. DPF Cannister

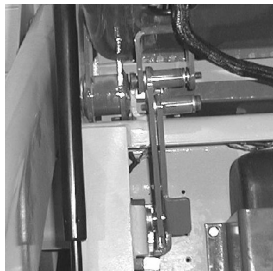
**Figure 2 Engine Compartment - Non-DPF Models**



1. Air Cleaner
2. Muffler
3. Radiator/Cooler
4. Coolant Recovery Tank
5. Hydraulic Oil Filter
6. Engine Oil Dipstick
7. Engine Oil Fill Cap
8. Engine Oil Filter
9. Fuel Filter
10. Fuel Pump
11. Water Trap

## Tilting Back the ROPS/FOPS

For service, unbolt the two anchor bolts at the front of the ROPS/FOPS and tilt it back slowly, moving the control handles out of the way. A gas-charged spring helps tilt it back. A self-actuating lock mechanism engages to lock the ROPS/FOPS in a rolled-back position. To lower the ROPS/FOPS, apply upward force on it while pulling the lock mechanism handle toward the front of the loader. Lower the ROPS slowly onto the chassis, moving the control handles out of the way. Reinstall the anchor bolts, washers and locknuts.



**Figure 3 ROPS Lock Mechanism**

**⚠ WARNING** Never operate the loader with the ROPS/FOPS removed or locked back. Be sure the lock is securely engaged when the ROPS/FOPS is tilted back. Properly support the ROPS/FOPS when unlatching the lock mechanism and lowering the ROPS/FOPS. Be sure to reinstall the anchor bolts, washers and locknuts before resuming loader operation.

## 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 skid-steer loader.**

1. 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.
2. Stack wooden blocks under the flat part of the loader chassis. They should run parallel with, but not touch, the rear tires (Figure 4).
3. 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.
4. Repeat Steps 1 through 3 for the front end. When the procedure is finished, all four tires will be off the ground so they can be removed.

## Loader Lowering Procedure

When service or adjustment procedures are complete, the skid-steer loader can be taken down 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.



**Figure 4 Blocked Loader**

## Replacement Parts

<b>Part Description</b>	<b>Gehl Part No.</b>
Air Cleaner Element, Primary	188814
Air Cleaner Element, Secondary	188817
Hydraulic Oil Filter Element	074830
Engine Oil Filter Element	195568
Fuel Filter Element - DPF Models	50352551
Fuel Separator Element - DPF Models	50352550
Fuel Filter Element - Non-DPF Models	137500
Fuel Separator Element - Non-DPF Models	182130

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

# Adjustments

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## Control Handles

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

## Fuel Sender

The fuel sender, located in the fuel tank, sends a signal to the fuel gauge indicating the amount of fuel left in the fuel tank.

Check the fuel sender periodically to ensure that the mounting screws are tight and that there is no fuel seepage around the gasket. If replacement is required, apply an RTV or gasket sealant around the gasket when restoring the fuel sender.

## Drive Chains

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

## Removing Foreign Material

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

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.*

# Lubrication

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

 <b>Hydraulic System</b>	Use Petro Canada HVI60, Mobil DTE 15M or equivalent, which contain anti-rust, anti-foam and anti-oxidation additives, and conforms to ISO VG46. <b>Capacity:</b> 8 U.S. gallons (30,0 liters)
 <b>Chaincase Oil</b>	Use SAE grade 10W-30 motor oil. <b>Capacity</b> (each side): 8 U.S. quarts (7,6 liters)
 <b>Grease Fittings</b>	Use lithium based grease
 <b>Engine Oil</b>	Tier 4/Stage 5 engines: 0W-40 Full Synthetic Oil  Interim Tier 4 and Non-Stage 5 Tier 4 engines: Refer to the Engine Operator's Manual for specific engine oil recommendations. Service Classification: API-CK-4 preferred, API-CJ-4 SM acceptable.  Capacity: 7.6 U.S. quarts (7,2 L)

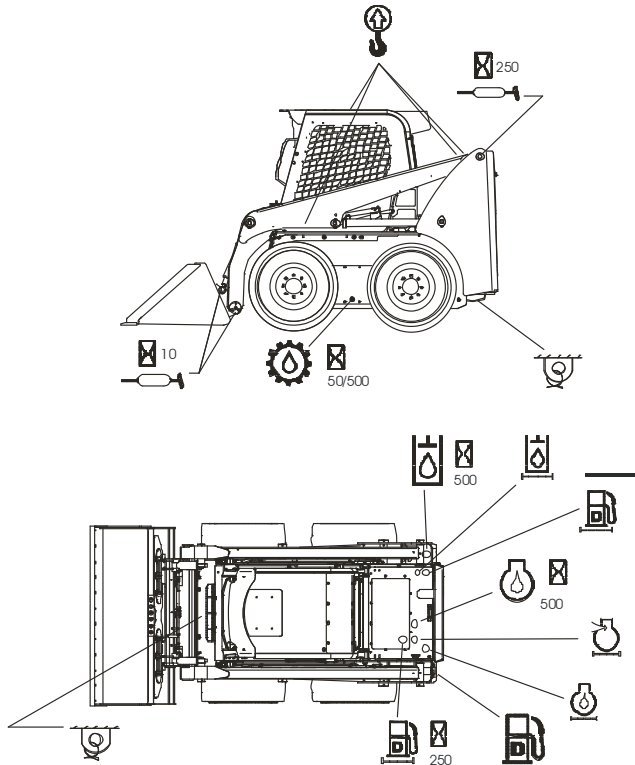
Refer to the following figure for grease fitting locations. Wipe dirt from the fittings before greasing them to prevent contamination. Replace any missing or damaged fittings. To minimize dirt build-up, avoid excessive greasing.



**Figure 5 Grease Every 10 Hours (or daily)**

1. Lift arm pivots (2)
2. Lift cylinder pivots (4)
3. Tilt cylinder pivots (2)
4. Attachment Bracket pivots (2)





**Figure 6 Service Locations (see Maintenance Chart on page 97.)**

Lubrication Procedure	10 Hours (or Daily)	50 Hours	250 Hours	500 Hours (or Yearly)
Check Engine Oil Level (page 70)	●			
Check Hydraulic Oil Level (page 79)	●			
Grease Hitch, Hitch-related Cylinder Pivots and Latch Pins (page 65)	●			
Grease Lift Arm Pins (page 65)	●		●	
Check Oil Level in Chaincases (page 81)			●	
Change Engine Oil and Filter (page 71)				●
Change Hydraulic Oil Filter (page 79)		◆		●
Change Hydraulic Oil (page 79)				●
Change Chaincase Oil (page 81)		◆		●
Check and Drain Water Separator (page 71)		●		
Replace Filter in Water Separator (page 71)				●

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

# Engine Air Cleaner

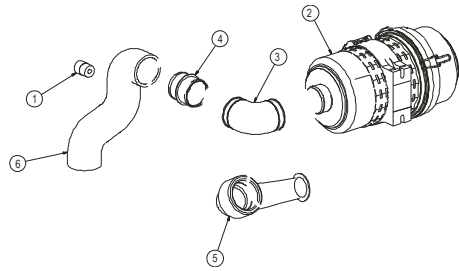
**Important:** Failure to follow proper filter servicing instructions could result in catastrophic engine damage.

The air cleaner consists of an outer (primary) filter element and an inner (secondary) filter element. An air filter restriction indicator for monitoring the condition of the elements is located on the right side of the front of the air cleaner. If the air filter becomes restricted, this indicator will turn red to warn the operator that the element(s) require service. Push the reset button located on the end of the indicator after fitting a clean element. For replacement elements, refer to the “Replacement Parts” topic (page 63).

**Note:** Before replacing the filter element(s), push the reset button on the indicator. Start the engine and adjust the throttle to full speed. If the indicator does not turn red, do **not** replace the element(s).

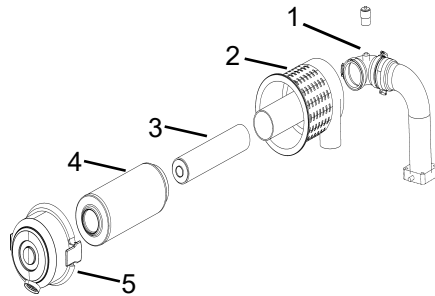
The outer element should be replaced only when the restriction indicator turns red. The inner element should be replaced every third time the outer element is replaced, unless the outer element is damaged or the inner element is dirty.

Along with a daily check of the restriction indicator, check the air cleaner intake hose and clamps, and the mounting bracket hardware to be sure they are properly tightened.



**Figure 7 Dual-Element Air Cleaner - DPF Models**

1. Restriction Indicator
2. Element Housing
3. Elbow Hose
4. Hose Connector
5. Sound Diffuser/Intake Suppressor
6. Air Intake Tube



**Figure 8 Dual-Element Air Cleaner - Non-DPF Models**

1. Restriction Indicator
2. Element Housing
3. Inner Filter Element
4. Outer Filter Element
5. Element Cover
6. Dust Ejector

## Access

1. Open the rear door and engine access cover.
2. Unlatch the clamps on the air cleaner and remove the cover. Clean out any dirt built up in the cover assembly.

## 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. Replace the outer element.

*Note: Manitou Group does not recommend cleaning the outer element.*

4. Use a trouble light inside the outer element to inspect for 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.

## Inner Element

*Note: Replace the inner element only if it is 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 clamps.
5. Check the hose connections and be sure they are all clamped and tightened properly.
6. Reset the restriction indicator by pressing the reset button.

# Engine Service

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## Check Engine Mounting Hardware

All bolts that secure the engine mounting brackets to the engine and the loader frame should be checked and re-tightened as necessary.

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

## Checking Engine Oil Level

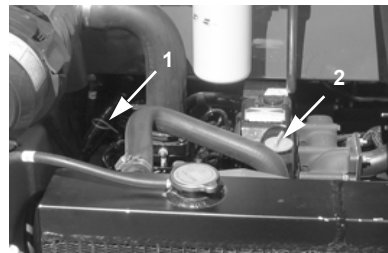
Open the rear door and engine access cover. Pull out the dipstick and check the oil level. Markings on the dipstick represent FULL and LOW (add oil) levels.

Refer to the *Maintenance Interval Chart* (page 97) for the service interval for replacing the engine oil and filter.



**Figure 9 Oil Dipstick and Fill Cap - DPF Models**

1. Oil Dipstick
2. Oil Fill Cap



**Figure 10 Oil Dipstick and Fill Cap - Non-DPF Models**

1. Oil Dipstick
2. Oil Fill Cap

## Changing Engine Oil and Filter

1. Run the engine until it is at operating temperature. Stop the engine. Remove the rear belly pan.
2. Remove the drain plug.
3. From the engine compartment, remove the oil filter. Clean the filter sealing surface.
4. Put clean oil on the new oil filter gasket. Install the filter and tighten  $3/4$  of a turn past the point where the gasket contacts the filter head.
5. Reinstall and tighten the drain plug.
6. Remove the oil cap and add the recommended oil. Refer to the “Lubrication” topic in this chapter for oil specifications and capacities.
7. Start the engine and let it run for several minutes at low idle. Stop the engine. Check for leaks at the oil filter, drain plug and remote oil drain hose. Check the oil level. Add oil if it is not at the top mark on the dipstick.



**Figure 11 Rear Belly Pan**

For a replacement element, refer to the “Replacement Parts” topic (page 63).

## Changing Fuel Filter

The engine has a fuel filter located on the left side of the engine. To change it:

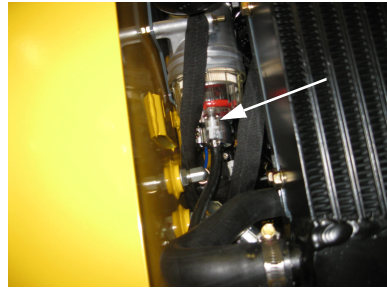
1. Shut off the fuel supply by turning the fuel shutoff valve on top of the water trap.
2. Non-DPF Models: Shut off the return line by turning the valve on the fuel tank.
3. Remove the fuel filter element.
4. Lubricate new fuel filter element gasket with diesel fuel.
5. Install and tighten the filter element one-half turn past point the where the gasket contacts the filter head.
6. Turn shutoff valve on water separator to ON.
7. Non-DPF Models: Turn on the fuel supply at the fuel tank.

The engine is self-priming. To remove air before starting, turn the ignition key to the ON position for 30 seconds.

For a replacement element, refer to the “Replacement Parts” topic (page 63).

## Servicing Water Separator (DPF Models)

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.



**Figure 12** Location of Water Separator

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

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.

## Servicing Water Separator (Non-DPF Models)

Periodically check for water in water separator by checking level of float in water separator bowl. If water is present:

1. Shut off the fuel supply by turning the fuel shutoff valve on top of the water separator.
2. Turn nut to release the bowl from the valve head. Dispose remaining fuel and water.
3. Clean bowl and filter element with warm water until all foreign material is removed. Replace fuel filter if damaged. Refer to Parts Manual for part number.
4. Place element onto valve head. Lubricate o-ring on bowl with diesel fuel and place on valve head. Turn nut to tighten.
5. Turn on fuel supply.

## Releasing Water from Separator

1. Check red float located in the water separator bowl. If red float is raised, open valve on the bottom of the bowl to drain water.
2. Close valve quickly after float reaches the bottom of the bowl.

## Spark Arrestor Muffler (Non-DPF Models)

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**Important:** The loader is factory-equipped with a spark arrestor type muffler. Muffler maintenance is required to keep it in working condition. Refer to local laws and regulations for spark arrestor requirements.

1. Stop the engine, open the rear door and engine cover.
2. Remove the plug from the bottom of the muffler.
3. Block the outlet of the muffler with a non-combustible material.
4. Start the engine and run it for 10-15 seconds.
5. Stop the engine and remove the blockage.
6. Put anti-seize coating on the plug.
7. Reinstall and tighten the plug.

## Alternator/Fan Belt

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

## Engine Diagnostic Chart (DPF Models)

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When detecting faults, the information center electronic display (page 37) 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 underneath an electrical cover, right of the seat.

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



**Figure 13 Data Port for the Engine**

# Engine Diagnostic Chart (DPF Models)

DTC code				Number of the lamp flashes	Part	Error item	
P code	SPN		FMI			State	
	Decima number	Hexadecimal 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 sensor	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 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 sensor	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	



# Engine Diagnostic Chart (DPF Models) (cont.)

DTC code					Error item	
P code	SPN		FMI	Number of the lamp flashes	Part	State
	Decima number	Hexadecimal 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
			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			3	MIL + RSL		DPF intermediate temperature sensor fault (High voltage)
P1435	3250	CB2	4	MIL + RSL	DPF intermediate temperature sensor	DPF intermediate temperature sensor fault (Low voltage)
P0420			1	MIL + AWL		DPF intermediate temperature sensor temperature abnormal low temperature
			0	MIL + RSL		DPF intermediate temperature sensor temperature abnormal high (Post-injection failure)
P2229			108	6C		3
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

# Engine Diagnostic Chart (DPF Models) (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	Injector 3 open circuit (Inherent location of the injector)	
P0262			6	MIL + RSL	3TNV: Cyl No. 1	Injector 3 coil short circuit	
P1262			3	MIL + RSL	Corresponding port 4TNV: 2 - 2 3TNV: 1 - 1	Injector 3 short circuit	
P0203	652	28C	5	MIL + RSL	Injector 4 4TNV: Cyl No. 3	Injector 4 open circuit (Inherent location of the injector)	
P0268			6	MIL + RSL	Corresponding port	Injector 4 coil short circuit	
P1268			3	MIL + RSL	4TNV: 1 - 1	Injector 4 short circuit	
P0611	4257	10A1	12	MIL + RSL		Injector drive IC error	
P1146	2797	AED	6	MIL + RSL	Injector (common)	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			3	MIL + RSL		High-pressure pump drive circuit (High side VB short-circuit)	
P1642	633	279	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 open valve		
P1666	523469	7FCCD	0	MIL + RSL	PLV (Common rail pressure limit valve)	Rail pressure fault (The times of PLV valve opening error)	
P1667	523470	7FCE0	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	

# Engine Diagnostic Chart (DPF Models) (cont.)

DTC code					Error item		
P code	SPN		FMI	Number of the lamp flashes	Part	State	
	Decima number	Hexadecimal 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_DPFI (CAN message) reception time out	
U010B	522610	7F972	9	MIL + AWL		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
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

SPN	FMI	P-CODE	PART	STATE
102	10	P1673	EGR Low Pres. Sensor Malfunction	Aftertreatment Error
105	10	P1676	Intake Air Temp. Sensor Malfunction	Aftertreatment Error
110	10	P1674	Coolant Temp. Sensor Malfunction	Aftertreatment Error
173	10	P1677	Exhaust Temp. Sensor Malfunction	Aftertreatment Error
412	10	P1675	EGR Gas Temp Sensor Malfunction	Aftertreatment Error
1209	10	P1679	EGR High Pres. Sensor Malfunction	Aftertreatment Error
3242	10	P167E	DPF Inlet Temp. Sensor Malfunction	Aftertreatment Error
3250	10	P167A	DPF Intermediate Temp Sensor Malfunction	Aftertreatment Error
3609	10	P167C	DPF High Pres. Sensor Malfunction	Aftertreatment Error
4795	31	P226D	DPF Substrate Removed	Aftertreatment Error

# Engine Diagnostic Chart (DPF Models) (end)

DTC code				Number of the lamp flashes	Error item	
P code	SPN		FMI		Part	State
	Decima number	Hexadecim-al 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 performed)	
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	

# Hydraulic System

## Checking Hydraulic Oil Level

The loader has a dipstick located in the engine compartment. Check the fluid level with the lift arm lowered and the attachment on the ground.

When hydraulic fluid is required, allow the system to cool. Slowly remove the oil fill cap, allowing the pressure to dispel before removing the cap completely.

Add hydraulic fluid as required. Refer to the *Lubrication* topic (page 65) for oil recommendations. Replace the cap.



Figure 14 Hydraulic Oil Service

## Changing Hydraulic Oil Filter

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

1. Open the rear door and engine cover to access the filter. Unscrew the filter.
2. Clean the surface of the filter housing where the element seal contacts the housing. Put clean oil on the rubber gasket of the new filter element.
3. Install and tighten the filter element 3/4 of a turn past the point where the gasket contacts the filter head.
4. For a replacement element, refer to the *Replacement Parts* topic (page 63).



Figure 15 Drain Plug

## Changing Hydraulic Oil

The hydraulic oil must be replaced if it becomes contaminated, after major repairs, and after 1000 hours or one year of use.

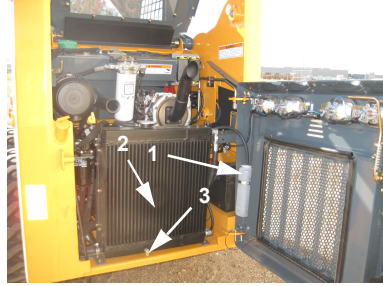
1. Remove the oil filler cap.
2. Install a catch pan of sufficient capacity under the oil reservoir (8 gallons [30 liters])
3. Remove the drain plug located on the bottom left of the oil reservoir.
4. Remove and replace the hydraulic oil filter.
5. Reinstall the drain plug.
6. Refill the reservoir until the oil is between the two lines on the dipstick gauge.
7. Start the engine and operate the hydraulic controls.
8. Stop the engine and check for leaks at the filter and reservoir drain plug.
9. Check the fluid level and add fluid if needed.

# Cooling Systems

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

## Checking Coolant Level

1. Open the rear door. Check the coolant level in the coolant recovery tank on the inside of the rear door. The coolant recovery tank must be 1/3 to 1/2 full with a cold engine and 2/3 to 3/4 full with a hot engine.
2. Allow the coolant to cool. Do not remove the cap when the coolant is hot. Serious burns may occur.
3. Add premixed coolant, 50% water and 50% ethylene glycol, to the recovery tank if the coolant level is low.



**Figure 16 Cooling System**

1. Recovery Tank
2. Radiator/Cooler
3. Drain Plug

## Cleaning Cooling System

1. Park the loader on a level surface, lower the lift arm and stop the engine. Allow the engine to cool.
2. Open the rear door. Lift the engine cover.
3. Clean the radiator and oil cooler by blowing through the fins with high pressure water or air.

**Note:** The radiator can be tipped out for cleaning by loosening and rotating the over-center links on each side. This will also help in cleaning the oil cooler.

## Draining/Flushing Cooling System

1. Open the rear door. Lift the engine cover.
2. Slowly remove the radiator cap, allowing pressure to dispel before removing completely.

**WARNING** Liquid cooling systems build up pressure as the engine becomes hot. Before removing the radiator cap, stop the engine and let the system cool. Remove the radiator cap only after the coolant has cooled. Remove the cap slowly or severe burns may result.

3. Remove the drain plug and drain the coolant into a suitable container.
4. Replace the drain plug.

**Note:** Protect the cooling system by adding premixed 50% water and 50% ethylene glycol to the system. This mixture will protect the cooling system to  $-34^{\circ}\text{F}$  ( $-36^{\circ}\text{C}$ ).

5. Fill the radiator fully and the recovery tank half full with the premixed coolant.
6. Reinstall the radiator cap.
7. Run the engine until it is at operating temperature. Stop the engine and let it cool. Check the coolant level. Add more coolant if required.

## Chaincases

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The chaincase contains the drive sprockets and drive chains. There are two plugs in each chaincase. One is to drain the fluid and the other is to check the fluid level. Refer to the *Maintenance Schedule* chapter (page 97) for change intervals. Refer to the *Lubrication* topic (page 65) for information on oil type and quantity.

### Checking and Adding Oil

1. Park the loader on a level surface. Stop the engine.
2. Remove the check plug from each chaincase housing. If the oil can be reached with the tip of your finger, the oil level is adequate.
3. If the level is low, add fluid through the check plug until the oil level reaches the edge of the hole. Reinstall the check plug.



Figure 17 Check Plug

### Draining Oil

1. Raise the rear of the machine to aid in draining the chaincases.
2. Remove the drain plug on each chaincase and drain the oil into a suitable container.
3. Reinstall and tighten the drain plugs.
4. Refill the chaincases at the check plugs.



Figure 18 Right side drain plug  
(left side same)

## Seat and Restraint Bar Switches

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Electrical switches in the seat and restraint bar must be closed (operator sitting in the seat and restraint bar lowered) to complete the circuit and start the engine.

## Bucket Cutting Edge

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

## Wheel Nuts

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Wheel nut torque must be checked before initial operation and every two hours thereafter until the wheel mounting hardware torque stabilizes at the recommended setting of 120-130 ft-lbs (161-175 N·m). When tires are removed and replaced, this procedure must be repeated.

## Tires


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Rear tires usually wear faster than the front ones. 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 or other damage. If different sizes are used, each tire will be turning at different speeds, causing excessive wear.

The tread bar of all tires must face the same direction.

## Mounting Tires

 **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.**

1. Be sure the rim is clean and free of rust.
2. Lubricate the tire beads and rim flanges with a soap solution. Do not use oil or grease.
3. Use a clip-on tire chuck with remote hose and gauge, allowing you to stand clear while inflating the tire. Do not place your fingers on the tire bead or rim during inflation.
4. 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.
5. After seating the beads, adjust the inflation pressure to the recommended operating pressure.
6. Do not weld, braze or otherwise attempt to repair and use a damaged rim.



## Checking Tire Pressure

Tire Size	Inflation Pressure	
	psi	kPa
10 x 16.5 8-ply Heavy-Duty Flotation	60	414
27 x 8.5 –15 8-ply Heavy-Duty	60	414
27 x 10.5 – 15 8-ply Heavy-Duty	60	414
6.5 x 16 – 5.50 Solid Rubber	-	-
7.00-15 SS Chevron Narrow 8-ply	60	414


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

When installing tires, be sure they are the same size and style on each side of the loader. Always replace tires with the same size as the original equipment.

## Electrical System


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### Battery

 **WARNING** Before servicing the battery or electrical system, be sure the battery disconnect switch (if equipped) is in the “OFF” position. If not equipped with a disconnect switch, disconnect the ground (-) terminal from battery.

The battery on the loader is a 12-volt, wet-cell battery. To access the battery, open the rear door and lift the engine cover.

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.

 **WARNING** Explosive gas is produced while a battery is in use or being charged. Keep flames or 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:

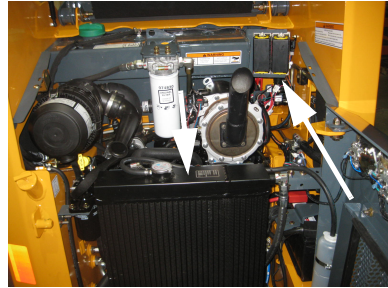
1. Immediately remove any clothing on which acid spills.

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**
  - b. **1 pint (0.5 L) of household ammonia in 1 gallon (4 L) of water**

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

## **Fuse Panels (DPF Models)**

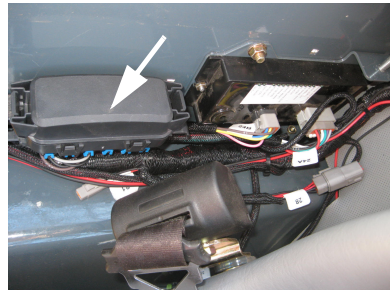
The fuse panels are located in the engine compartment near the chassis right riser and behind a panel in the ROPS/FOPS at the operator's right elbow area. The plastic covers are etched with the type of fuses and relays that can be found under that particular fuse cover.



**Figure 19 Fuse Panels  
in the Engine Compartment**

## **Fuse Panels (Non-DPF Models)**

There are no fuse panels located in the engine compartment or in the ROPS/FOPS at the operator's right elbow area. However, three relays can be found behind a panel in the FOPS/FOPS at the operator's right elbow area.



**Figure 20 Fuse Panel  
in the ROPS/FOPS  
Compartment**

# CHAPTER 6

## TROUBLESHOOTING

### Electrical System

Problem	Possible Cause	Corrective Action
Electrical system does not function	Battery disconnect switch is in OFF position.	Turn battery disconnect switch to the ON position.
	Battery terminals or cables loose or corroded.	Clean battery terminals and cables and retighten.
	Battery malfunction.	Test battery. Recharge/replace as necessary.
	Blown main fuse.	Correct over-current problem and replace main fuse.
	Main wiring harness connectors at rear of ROPS/FOPS not properly plugged in.	Check main harness connectors. Reconnect/repair as needed.
Control pad and information center display do not activate with ignition keyswitch in the ON/RUN position	Blown fuse.	Check circuit and replace fuse.
	Battery terminals/cables loose/corroded.	Clean battery terminals and cables and tighten.
	Main wiring harness connectors at rear of ROPS/FOPS not properly plugged in.	Check main harness connectors. Reconnect/repair as needed.
Starter does not engage when ignition keyswitch turned to the START position	Poor electrical connections in start circuit.	Check connections repair as necessary.
	Battery terminals/cables loose/corroded.	Clean battery terminals and cables and tighten.
	Starter relay malfunction.	Test relay; replace if necessary. Contact dealer.
	Battery discharged/malfunctioning.	Test battery. Recharge/replace if necessary.
	Starter solenoid malfunction.	Contact dealer.
	Starter or pinion malfunctioning.	Repair/replace as needed.
	Ignition wiring, seat switch, restraint bar switch, etc. loose or disconnected.	Check wiring for poor connections, broken leads; repair wiring or connection.
	Restraint bar raised.	Lower restraint bar.
	Engine fault code(s).	Contact dealer.

# Electrical System

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
Fuel gauge inoperative	Fuel level sender malfunction.	Replace fuel level sender.
	Loose wiring/terminal connections.	Check wiring connections.
	Blown fuse.	Check circuit and replace fuse.
	Fuel gage malfunction.	Replace gauge.
Coolant temperature gauge inoperative	Temperature sender malfunction.	Replace temperature sender.
	Loose wiring/terminal connections.	Check wiring connections.
	Blown fuse.	Check circuit and replace fuse.
	Coolant temperature gage malfunction.	Replace gauge.
Hour meter inoperative	Loose wiring/terminal connections.	Check wiring/connections.
	Alternator malfunction.	Repair/replace alternator.
	Hour meter malfunction.	Replace information center electronic display.
Work/road lights inoperative	Single light not working— light bulb burned out, faulty wiring.	Check and replace light bulb as needed, check wiring connections.
	No lights—blown fuse.	Check circuit and replace fuse.
	Light switch malfunction, poor ground or other wiring connection.	Check ground/wire connections, replace light switch.
Lift/tilt and/or drive lock solenoid malfunction	Solenoid wiring disconnected or faulty.	Check circuit; repair as necessary.
	Seat or restraint bar switch malfunction.	Contact dealer.

# Engine

Problem	Possible Cause	Corrective Action
Engine does not turn over	Blown fuse.	Check circuit and replace fuse.
	Dead battery.	Charge or replace battery.
	Battery disconnect switch in open position or malfunctioning.	Place battery disconnect switch into closed position— Repair or replace if necessary.
	Starter malfunction.	Contact dealer.
	Operator not in operator's seat.	Operator's seat must be occupied. for the engine to start.
	Malfunctioning seat/restraint bar/door switch.	Replace seat/restraint bar/door switch.
	Cab door open (if equipped).	Close cab door.
	Engine electronics logic error.	Contact dealer.
	Engine fault code(s) displayed.	Identify problem and correct.
Engine turns over but will not start	Engine cranking speed too slow.	Check battery and charge/replace as necessary— tighten battery terminals. In cold temperatures, pre-warm the engine.
	Fuel tank empty.	Fill tank and vent fuel system if necessary.
	Fuel filter plugged or restricted.	Change fuel filter.
	Fuel paraffin separation in winter.	Use winter grade diesel fuel.
	Fuel line leak.	Tighten all threaded connections and clamps; replace fuel line as necessary.
	Fuel shut-off solenoid not energizing. (interim Tier 4 engines only)	Check electrical connections/voltage to shut-off solenoid.
	Fuel filter restricted/fuel hose restriction.	Replace filter/check for pinched fuel hose.
	Fuel pump malfunction.	Contact dealer.
	Water in fuel filter.	Purge water from filter.
	Fuel valve on water separator in the OFF position.	Turn the valve to the ON position.
	Engine fault code(s) displayed.	Identify problem and correct.

# Engine

Problem	Possible Cause	Corrective Action
	Engine too cold/ambient temperature too low.	Pre-heating module malfunction; check connection and voltage and charge/replace as necessary. Install block heater.
Engine overheating	Crankcase oil level incorrect.	Adjust oil level.
	Cooling air circulation restricted.	With engine off, remove restriction.
	Fan shroud improperly positioned.	With engine off, reposition shroud/contact dealer.
	Improper oil grade or oil excessively dirty.	Change engine oil.
	Exhaust restricted.	Allow exhaust to cool; remove restriction.
	Air filter restricted.	Replace filter(s).
	Low coolant level.	Top off coolant.
	Loose fan belt.	Tighten fan belt.
	Dirty/restricted radiator.	Clean radiator.
Thermostat malfunction.	Replace thermostat.	

# Engine

Problem	Possible Cause	Corrective Action
Engine overheating	Crankcase oil level incorrect.	Adjust oil level.
	Cooling air circulation restricted.	With engine off, remove restriction.
	Fan shroud improperly positioned.	With engine off, reposition shroud/contact dealer.
	Improper oil grade or oil excessively dirty.	Change engine oil.
	Exhaust restricted.	Allow exhaust to cool; remove restriction.
	Air filter restricted.	Replace filter(s).
	Low coolant level.	Top off coolant.
	Loose fan belt.	Tighten fan belt.
	Dirty/restricted radiator.	Clean radiator.
	Thermostat malfunction.	Replace thermostat.

# Engine

Problem	Possible Cause	Corrective Action
Exhaust excessively smoky	Black smoke	<p>Black smoke indicates poor and incomplete diesel fuel combustion, which could be caused by:</p> <ul style="list-style-type: none"> <li>• Incorrect timing.</li> <li>• Dirty or worn injectors.</li> <li>• Incorrect valve clearance.</li> <li>• Incorrect air/fuel ratio.</li> <li>• Low cylinder compression.</li> <li>• Dirty air cleaner.</li> <li>• Restricted induction system.</li> <li>• Faulty engine tuning.</li> <li>• Poor quality fuel.</li> <li>• Carbon build-up in combustion and exhaust spaces.</li> <li>• Cool operating temperatures.</li> </ul>
	Blue smoke	<p>Blue smoke indicates engine oil combustion, which could be caused by:</p> <ul style="list-style-type: none"> <li>• Worn valve guides or seals.</li> <li>• Wear in cylinders, piston rings, ring grooves, etc.</li> <li>• Cylinder glaze.</li> <li>• Sticking piston ring.</li> <li>• Incorrect engine oil grade.</li> <li>• Fuel dilution in engine oil.</li> </ul>
	White smoke	<p>White smoke indicates incomplete diesel combustion, or coolant in the combustion chamber, which could be caused by:</p> <ul style="list-style-type: none"> <li>• Faulty or damaged injectors.</li> <li>• Incorrect injection timing.</li> <li>• Low cylinder compression.</li> <li>• Faulty head gaskets.</li> <li>• Cracked cylinder heads/blocks.</li> </ul>



# Hydrostatic System

Problem	Possible Cause	Remedy
<p><b>No response from either hydrostatic drive or the lift/tilt systems.</b></p>	<p>Hydraulic oil viscosity is too heavy.</p> <p>Hydraulic oil supply is too low.</p> <p>Drive coupling failure.</p>	<p>Allow longer warm-up or replace existing oil with the proper viscosity oil.</p> <p>Check for low oil level in reservoir. Add oil.</p> <p>Replace the coupling.</p>
<p><b>Traction drive will not operate in either direction.</b></p>	<p>Parking brake is engaged.</p> <p>Hydraulic oil supply is low.</p> <p>Control rod linkage disconnected.</p> <p>Low or no charge pressure.</p> <p>Hydrostatic pump(s) relief valves are malfunctioning.</p>	<p>Disengage parking brake.</p> <p>Check for low oil level in reservoir. Add oil.</p> <p>Check linkage connection at control levers and neutral centering mechanisms. Reconnect linkage.</p> <p>Contact your dealer.</p> <p>Contact your dealer.</p>
<p><b>Sluggish response to acceleration.</b></p>	<p>Air in hydraulic system.</p> <p>Automatic parking brake partially engaged.</p> <p>Hydraulic oil supply is too low.</p> <p>Low hydrostatic system charge pressure.</p> <p>Drive motor(s) or hydrostatic pump(s) have internal damage or leakage.</p>	<p>Cycle lift and tilt cylinders to maximum stroke and maintain pressure for a short time to clear air from system. Also check for low oil level in reservoir, fill as needed.</p> <p>Contact your dealer.</p> <p>Check for low oil level in reservoir. Add oil.</p> <p>Contact your dealer.</p> <p>Contact your dealer.</p>

# Hydrostatic System

Problem	Possible Cause	Remedy
<b>Hydrostatic drive is overheating.</b>	Drive system overloaded continuously. Lift/tilt or auxiliary system overloaded continuously. Drive motor(s) or hydrostatic pump(s) have internal damage or leakage. Oil cooler fins plugged with debris. Loader being operated in a high temperature area with no air circulation.	Improve efficiency of operation. Improve efficiency of operation. Contact your dealer. Clean oil cooler fins. Reduce duty cycle; improve air circulation.

# Hydrostatic System

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

## Hydraulic System

Problem	Possible Cause	Remedy
<p><b>Lift/Tilt controls fail to respond.</b></p>	<p>Hydraulic oil viscosity is too heavy.</p> <p>Hydraulic oil level is low.</p> <p>Solenoid valve(s) malfunctioning.</p> <p>Restraint bar or seat switch malfunction.</p>	<p>Allow longer warm-up or replace with proper viscosity oil.</p> <p>Check oil level in reservoir. If oil is low, check for an external leak. Repair and add oil.</p> <p>Check electrical connections to lift solenoid and repair.</p> <p>Check switches.</p>
<p><b>Auxiliary hydraulics do not function.</b></p>	<p>Restraint bar is raised.</p> <p>Lock solenoid malfunctioning</p> <p>Restraint bar switch malfunctioning.</p>	<p>Lower the restraint bar.</p> <p>Check electrical connections to lock solenoid and repair connections as needed. If lock solenoid is still not functioning properly, contact your dealer.</p> <p>Check electrical connections to restraint bar switch and repair connections as needed. If switch is still not functioning properly, contact your dealer.</p>
<p><b>Hydraulic cylinder action is slow for lift and/or tilt functions.</b></p>	<p>Low engine speed.</p> <p>Hydraulic oil viscosity is too heavy.</p> <p>Control linkage is restricted.</p> <p>Hydraulic oil leaking past cylinder piston seals.</p> <p>Worn gear pump.</p> <p>Solenoid valve(s) could be malfunctioning.</p> <p>Relief valve in control valve not functioning correctly. (Squealing noise should be evident while operating.)</p>	<p>Operate engine at higher speed.</p> <p>Allow longer warm-up or replace existing oil with proper viscosity oil.</p> <p>Check for control linkage restriction and adjust.</p> <p>Contact your dealer.</p> <p>Contact your dealer.</p> <p>Check electrical connections to lift solenoid and repair connections as needed. If lift solenoid valve is still not functioning properly, contact your dealer.</p> <p>Contact your dealer.</p>

## Hydraulic System

<b>Problem</b>	<b>Possible Cause</b>	<b>Remedy</b>
<b>Bucket does not level on the lift cycle.</b>	Self-leveling valve misadjusted or malfunctioning.	Contact your dealer.
<b>Jerky lift arm and bucket action.</b>	Seat or restraint bar switch malfunction.  Air in the hydraulic system.  Oil in hydraulic reservoir is low.	Check electrical connections to the switches. Replace as needed.  Cycle lift/tilt cylinders to maximum stroke and maintain pressure for short time to clear air from system.  Check and add oil.
<b>Bucket drifts downward with tilt control in neutral.</b>	Oil leaking past tilt cylinder seals (internal or external).  Self-leveling valve is malfunctioning.  Leaking hydraulic hoses, tubes, or fittings between control valve and cylinders.	Contact your dealer.  Contact your dealer.  Inspect hoses and tubes, tighten fittings. Replace hoses or tubes as needed.
<b>No down pressure on the bucket.</b>	Control valve in float position.  Tilt cylinders are malfunctioning.  Relief valve in control valve not functioning properly. (Squealing noise should be evident while operating.)	Take control out of float position.  Contact your dealer.  Contact your dealer.
<b>Bucket will not tilt, lift arms work properly.</b>	Tilt solenoid valve malfunctioning.    Tilt spool in control valve not actuated or leaking.	Check electrical connections to tilt solenoid and repair connections as needed. If tilt solenoid valves are still not functioning properly, contact your dealer.  Check valve control linkage and/or tube connections to valve.
<b>Slow or no response for bucket tilt, lift works properly (Hand/Foot units only).</b>	Pilot control lines have air in them.  Low charge pressure.  Linkage misadjusted between right foot pedal and pilot valve.	Bleed the pilot control line from the main control valve.  Contact your dealer.  Readjust for full travel without restriction.

## Hydraulic System

Problem	Possible Cause	Remedy
<p><b>Lift arm does not raise, bucket tilt works properly.</b></p>	<p>Lift solenoid valve could be malfunctioning.</p> <p>Lift spool in control valve not actuated or leaking.</p>	<p>Check electrical connections to lift solenoid and repair connections as needed. If lift solenoid valve is still not functioning properly, contact your dealer.</p> <p>Contact your dealer.</p>
<p><b>Lift arm doesn't maintain raised position with lift control in NEUTRAL.</b></p>	<p>Oil leading past lift cylinder seals (internal or external).</p> <p>Oil leaking past lift spool in control valve.</p> <p>Self-leveling valve malfunctioning.</p> <p>Leaking hydraulic hoses, tubes or fittings between control valve and cylinders.</p>	<p>Contact your dealer.</p> <p>Contact your dealer.</p> <p>Contact your dealer.</p> <p>Inspect hoses and tubes, tighten fittings as needed. Replace as needed.</p>
<p><b>Lift arm will not lower or raise.</b></p>	<p>Lift arm support device engaged.</p> <p>Lift solenoid valve malfunctioning.</p> <p>Restraint bar not lowered.</p> <p>Seat or restraint bar switch malfunction.</p>	<p>Raise lift arm and disengage support device.</p> <p>Check electrical connections to solenoid. Repair or replace as needed.</p> <p>Lower restraint bar.</p> <p>Check electrical connections to the switch. Replace switch as needed.</p>

# CHAPTER 7

## MAINTENANCE SCHEDULE

This Maintenance Interval Chart was developed to match the *Service* chapter of this manual. Detailed information on each service procedure can be found in the *Service* chapter. A Maintenance Log follows the chart for recording the maintenance performed. Recording the 10-hour (or daily) service intervals would be impractical and is therefore 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.

### Maintenance Interval Chart

Service Procedure	Maximum Interval		
	10 Hours (or Daily)	250 Hours	500 Hours (or Yearly)
Check Engine Air Cleaner Restriction Indicator (page 68)	●		
Check Engine Oil Level (page 70)	●		
Check Hydraulic Oil Level (page 79)	●		
Check Tire Pressures (page 83)	●		
Grease Lift Arm, Hitch and Cylinder Pivots (page 65)	●		
Check Bucket Cutting Edge (page 73)	●		
Check Seat and Restraint Bar Operation (page 81)	●		
Check Coolant Level (page 80)	●		
Replace Water Separator Filter (page 72)	●		
Clean Cooling System (page 80)		●	
Check Wheel Nuts Torque (page 82)	○	●	
Check Oil Level in Chaincases (page 81)		●	
Check Alternator/Fan Belt Tensions (page 73)		●	
Change Engine Oil and Filter (page 71)			●
Change Hydraulic Oil Filter (page 79)	□		●
Check Battery (page 83)			●
Check Engine Mounting Hardware (page 70)			●
Change Main Fuel Filter (page 71)		●*	●
Change Water Separator Filter (page 72)			●
Change Hydraulic Oil (page 79)			◆
Change Chaincase Oil (page 81)	□		◆
Drain/Flush Cooling System (page 80)			●

○ Perform the initial procedure at 2 hours then at "●" intervals.

□ Perform the initial procedure at 50 hours then at "●" intervals.

◆ Perform the maintenance at 1000 hours.

\* Non-DPF machines require a 250 hour main fuel filter change interval.









# CHAPTER 8

## SPECIFICATIONS

### Loader Specifications

Specification	R105
Operating Weight	4000 lbs. (1814 kg)
Shipping Weight <sup>2</sup>	3515 lbs. (1594 kg)
Rated Operating Load <sup>1</sup> (capacity)	1050 lbs. (476 kg)
Engine	
Make	Yanmar
Model (DPF Models)	3TNV88C-KMSV - EPA Tier 4 / EU Stage 5
Model (Non-DPF Models)	3TNV88-BKMS
Displacement	100 in <sup>3</sup> (1,64 L)
Power (net) (DPF Models)	35 hp (26 kW) @ 2800 rpm
Power (net) (Non-DPF Models)	35 hp (26 kW) @ 2600 rpm
Peak Torque (DPF Models)	80 ft.-lbs. (109 N·m) @ 1820 rpm
Peak Torque (Non-DPF Models)	80 ft.-lbs. (109 N·m) @ 1200 rpm
Hydraulic System (theoretical)	
Main Hydraulic System Pressure	2750 psi (190 bar)
Standard-Flow Rating	14.5 gpm (55 L/min)
Electrical	
Battery	12-Volt DC, 800 CCA
Starter	12-Volt DC (2.3 Kw)
Alternator (DPF Models)	55 amperes
Alternator (Non-DPF Models)	40 amperes
Capacities	
Chaincase (each)	7 U.S. qts. (6,62 L)
Engine Coolant	7 U.S. qts. (6,62 L)
Crankcase	7.6 U.S. qts. (7,2 L)
Fuel Tank (DPF Models)	9.5 U.S. gal. (36 L)
Fuel Tank (Non-DPF Models)	10.3 U.S. gal. (39 L)
Bare Hydraulic Reservoir	8.0 U.S. gal. (30 L)
Entire Hydraulic System	10 U.S. gal. (37,9 L)
Sound	
Pressure Level (Operator Ear)	85 dB(A)
Power Level (Environmental)	101 dB(A)
1. Operating load (capacity) rated for R105: 55 in. (1397 mm) 10.5 ft <sup>3</sup> , (0.3 m <sup>3</sup> ); dirt/construction bucket, in accordance with SAE J818.	
2. R105 shipped with 27.0 x 8.50 - 15 tires.	

## Standard Features

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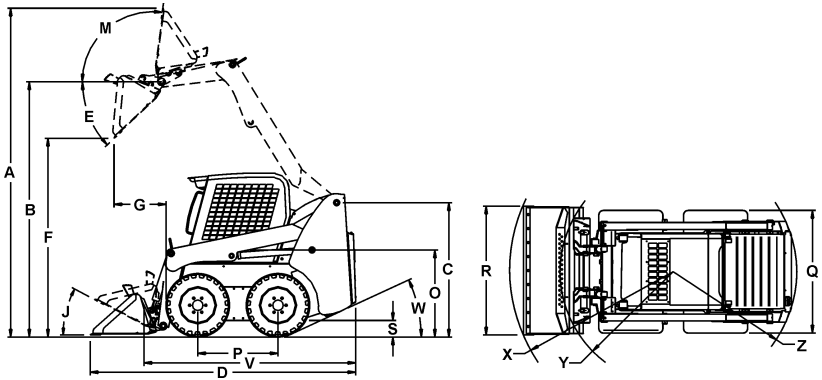
- Choice control types:  
T-Bar or Hand/Foot
- Fuel Gauge
- All-Tach™ Attachment System  
(Universal-Type)
- Warning Lamps and Buzzer –  
Engine and Hydraulic  
Oil Temperature
- Battery Charge Indicator Lamp
- Low Oil Pressure Light and Buzzer
- Seatbelt Indicator Lamp and  
Buzzer
- Coolant Temperature Gauge
- Hourmeter
- Manual-Control Hydrostatic Drive
- ROPS/FOPS- Level II – Approved  
Overhead Guard
- Independent Hydraulic Reservoir  
and Hydraulic Oil Cooler
- Foot (T-Bar Only) and Hand Throttle
- Operator Restraint Bar  
with Armrests
- Engine Intake Air Pre-Heater  
Starting Assist (Manual)
- Adjustable Seatbelt
- Lift Arm Support Device
- Hydraloc™ System – Brakes and  
Interlock for Starter, Lift/Tilt  
Cylinders, Auxiliary Hydraulics,  
and Wheel Drives
- Dual Front and Rear Work Lights
- Removable Belly Plate and  
Access Cover
- Dual-Element Air Cleaner with  
Visual Indicator
- Vandalism Lock Provisions
- Top and Rear Windows
- Spark Arrestor Muffler
- Headliner and Acoustical Interior
- Adjustable Seat
- Front Auxiliary Hydraulics with  
3/4-inch Flat-Faced Couplers
- Number 80K Drive Chain
- Powerview® Lift Arm
- Visual Hydraulic Filter Indicator
- Power Plug (12 V)

## Optional Features

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- Audible Back-Up Alarm
- Engine Block Heater
- Horn
- Suspension Seat
- Cab Door with Wiper and Dome  
Light
- Sliding Side Windows
- Heater/Defroster
- Deluxe Sound Package
- 3-inch Wide Seatbelt – When  
Required by Law
- Rear View Mirror
- Engine Auto-Shutdown System
- Interior Dome Light
- Centrifugal Pre-Cleaner
- Strobe Light
- Impact-Resistant Door
- Single-Point Lift Kit
- Four-Point Lift Kit
- Rear Counterweight
- Battery Disconnect Switch
- Fenders
- Bucket Bolt-On Cutting Edge
- Diesel Engine Exhaust Purifier
- Hydraulic Coupler Kit
- Self-Leveling Lift Action

# Dimensional Specifications



<b>R105</b>		<b>10.5 ft<sup>3</sup> (0.3 m<sup>3</sup>) Bucket w/27 x 8.5 x 15 Tires</b>	
		<b>inches</b>	<b>mm</b>
<b>A</b>	Overall Operation Height – Fully Raised	142	3607
<b>B</b>	Height to Hinge Pin – Fully Raised	107.5	2731
<b>C</b>	Overall Height – to ROPS	70.3	1786
<b>D</b>	Overall Length – Bucket Down	118	2997
<b>E</b>	Dump Angle at Full Height	40°	
<b>F</b>	Dump Height	82	2083
<b>G</b>	Dump Reach – Bucket Full Height	25.25	641
<b>J</b>	Rollback at Ground	31°	
<b>M</b>	Rollback Angle at Full Height	101°	
<b>O</b>	Seat to Ground Height	32.5	826
<b>P</b>	Wheel Base – Nominal	34.5	876
<b>Q</b>	Overall Width – Less Bucket	48.5/57	1232/1448
<b>R</b>	Bucket Width – Overall	55.3	1404
<b>S</b>	Ground Clearance – to Chassis (Between Wheels)	6.25	159
<b>V</b>	Overall Length (Less Bucket)	88.5	2248
<b>W</b>	Departure Angle	22°	
<b>X</b>	Clearance Circle – Front (With Bucket)	72	1829
<b>Y</b>	Clearance Circle – Front (Less Bucket)	42	1067
<b>Z</b>	Clearance Circle – Rear	54	1372

# Capacities and Ratings

*Note: Use the Table of Common Materials and Densities (page 105) for selecting the appropriate bucket.*

## Dirt/Construction Buckets

Description	Weight	Rated Operating Capacity
		R105
55 in./10.5 ft <sup>3</sup> (1397 mm/0.30 m <sup>3</sup> )	235 lbs. (107 kg)	1095 lbs. (497 kg)
60 in./10.0 ft <sup>3</sup> (1524 mm/0.28 m <sup>3</sup> )	252 lbs. (114 kg)	881 lbs. (340 kg)
61 in./11.7 ft <sup>3</sup> (1549 mm/0.33 m <sup>3</sup> )	253 lbs. (115 kg)	1082 lbs. (491 kg)

## Construction with High Back Buckets

55.5 in./9.5 ft <sup>3</sup> (1410 mm/0.27 m <sup>3</sup> )	254 lbs. (115 kg)	1061 lbs. (481 kg)
61.5 in./13.0 ft <sup>3</sup> (1562 mm/0.37 m <sup>3</sup> )	383 lbs. (174 kg)	975 lbs. (422 kg)

## Utility Buckets

55.5 in./13.5 ft <sup>3</sup> (1410 mm/0.38 m <sup>3</sup> )	313 lbs. (142 kg)	1061 lbs. (481 kg)
61.5 in./15.2 ft <sup>3</sup> (1562 mm/0.43 m <sup>3</sup> )	335 lbs. (152 kg)	826 lbs. (375 kg)
67 in./18.4 ft <sup>3</sup> (1701 mm/0.52 m <sup>3</sup> )	395 lbs. (179 kg)	795 lbs. (361 kg)

## Earth and Foundry Bucket

61.5 in./10.9 ft <sup>3</sup> (1562 mm/0.31 m <sup>3</sup> )	331 lbs. (150 kg)	1228 lbs. (557 kg)
--------------------------------------------------------------	----------------------	-----------------------

## Pallet Forks

15.75 in. (400 mm) Forks with Backrest Rating per EN474-3	470 lbs. (213 kg)	662 lbs. (300 kg)
19.68 in. (500 mm) Forks with Backrest Rating per EN474-3	470 lbs. (213 kg)	616 lbs. (279 kg)
24 in. (670 mm) Forks with Backrest Rating per SAE J1197	470 lbs. (213 kg)	575 lbs. (261 kg)

## Table of Common Materials and Densities

Material	Density	
	lbs/ft <sup>3</sup>	kg/m <sup>3</sup>
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.*

## Bucket Selections

---

To use the table, find the material name and see what its maximum density is. Then, multiply the loader rating of the attachment by the material density to determine if the attachment can safely be used. See page 104 for a listing of attachments and their loader ratings.

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

**Example 1:** If snow (density of 15-50 lbs./ft<sup>3</sup>) is to be hauled using a R105 model loader using Dirt/Construction Bucket, the bucket capacity is 10.5 ft<sup>3</sup> and the loader rating is 1050 lbs. Multiply the density of snow (50 lbs./ft<sup>3</sup>) by the capacity of the bucket (10.5 ft<sup>3</sup>) to achieve the weight being carried (50 lbs./ft<sup>3</sup> x 10.5 ft<sup>3</sup> = 525 lbs.). This number is less than the machine rating, so you could safely use this bucket in this application.

**Example 2:** If potash (density of 1088 kg/m<sup>3</sup>) is to be hauled using a R105 model loader using a 0.3 m<sup>3</sup> Dirt/Construction bucket, the bucket capacity is 0.3 m<sup>3</sup> and the loader rating is 612 kg. Multiply the density of potash (1088 kg/m<sup>3</sup>) by the capacity of the bucket (0.3 m<sup>3</sup>) to achieve the weight to be carried (1088 kg/m<sup>3</sup> x 0.3 m<sup>3</sup> = 326.4 kg). This number is less than the machine rating, allowing safe use of this bucket in this application.



# CHAPTER 9

## 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
<b>METRIC COARSE THREAD</b>						
	GRADE 8.8		GRADE 10.9		GRADE 12.9	
	DRY	LUBED	DRY	LUBED	DRY	LUBED
<b>M6-1</b>	8	6	11	8	13.5	10
<b>M8-1.25</b>	19	14	27	20	32.5	24
<b>M10-1.5</b>	37.5	28	53	39	64	47
<b>M12-1.75</b>	65	48	91.5	67.5	111.5	82
<b>M14-2</b>	103.5	76.5	145.5	108	176.5	131
<b>M16-2</b>	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-lbs.

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



# INDEX

<b>A</b>	
Accessory Plug . . . . .	22
Adjustments. . . . .	64
Control Handles . . . . .	64
Drive Chains. . . . .	64
Fuel Sender . . . . .	64
Alternator/Fan Belt . . . . .	73
Attachment Mounting . . . . .	33
Attachments . . . . .	33, 45
Auxiliary Hydraulic Controls . . . . .	32
Hand/Foot Controlled . . . . .	32
T-Bar Controlled. . . . .	32
<b>B</b>	
Back-Up Alarm . . . . .	59
Battery. . . . .	82
Jump Starting the Engine. . . . .	44
Before Starting the Engine . . . . .	41
Bucket Cutting Edge . . . . .	80
Bucket Selections . . . . .	106
Bucket, Usage	
Digging with a Bucket. . . . .	47
Driving on an Incline. . . . .	47
Driving over Rough Terrain . . . . .	46
Dumping Into a Box . . . . .	48
Dumping Onto a Pile . . . . .	47
Dumping the Load Over an Embankment. . . . .	48
Leveling the Ground. . . . .	48
Loading a Bucket. . . . .	47
Scraping with a Bucket. . . . .	48
<b>C</b>	
Capacities and Ratings . . . . .	104
Chaincases . . . . .	80
Checking and Adding Oil . . . . .	80
Draining Oil . . . . .	80
Changing Attachments . . . . .	45
Cold Starting Procedure . . . . .	42
Cold-Starting . . . . .	42
Control/Indicator Symbols. . . . .	3, 4
Controls . . . . .	37
CONTROLS and SAFETY EQUIPMENT. . . . .	17
Controls and Safety Equipment . . . . .	17
Cooling System. . . . .	79
Check Coolant Level . . . . .	79
Clean . . . . .	79
Drain/Flush . . . . .	79
Cooling Systems. . . . .	79
<b>D</b>	
Dealer Services. . . . .	61
Diesel Particulate Filter (DPF) Regeneration Procedures (DPF Models). . . . .	55
Dimensional Specifications. . . . .	103
Dome Light . . . . .	22
DPF Regeneration Procedures	
DPF Maintenance . . . . .	59
Forcing Stationary Regeneration. . . . .	58
Reset Regeneration. . . . .	56
Reset Regeneration Inhibit . . . . .	56
Stationary Regeneration . . . . .	57
<b>E</b>	
Electrical Battery Disconnect Switch (optional). . . . .	33
Electrical System . . . . .	82
Fuse Panel . . . . .	83, 84
Emergency Exit. . . . .	20
Engine Air Cleaner . . . . .	68
Engine Diagnostic Chart. . . . .	73
Engine Mounting Hardware . . . . .	70

Engine Service . . . . .	66, 70
Change Fuel Filter . . . . .	71
Change Oil and Filter . . . . .	71
Check Oil . . . . .	70
Engine Speed Control . . . . .	24

## F

Float Control . . . . .	25
Fuel . . . . .	41
Fuse Panel . . . . .	83, 84

## G

Guards and Shields . . . . .	17
------------------------------	----

## H

Hand/Foot Controls . . . . .	31
Drive Controls . . . . .	31
Lift/Tilt Controls . . . . .	31
Heater (optional) . . . . .	22
Highway Travel . . . . .	51
Horn . . . . .	20
Hydraulic System . . . . .	78
Change Oil . . . . .	78
Change Oil Filter . . . . .	78
Check Oil Level . . . . .	78

## I

Information Center Electronic Display (DPF Models) . . . . .	34
Instrument Panel . . . . .	26, 28
Instrument Panel (DPF Models) . . . . .	26
Instrument Panel (Non-DPF Models) . . . . .	28
INTRODUCTION . . . . .	1
ISO-Style (used Internationally) Safety Decals in the Engine Compartment . . . . .	15
ISO-Style (used Internationally) Safety Decals on the outside of the Skid-Steer Loader . . . . .	14

## J

Jump Starting the Engine . . . . .	44
------------------------------------	----

## L

Lift Arm Support Device . . . . .	21
Lifting the Loader . . . . .	52
Loader	
Lifting . . . . .	52
Lowering Procedure . . . . .	63
Raising Procedure . . . . .	62
Loader Identification . . . . .	2
Loader Lowering Procedure . . . . .	63
Loader Raising Procedure . . . . .	62
Loader Specifications . . . . .	101
Lockable Fuel Cap . . . . .	23
Lubrication . . . . .	65

## M

Maintenance Interval Chart . . . . .	97
Maintenance Schedule . . . . .	97
Mandatory Safety Shutdown Procedure . . . . .	6

## O

OPERATION . . . . .	41
Operator Restraint Bar . . . . .	17
Operator's Seat . . . . .	18
Optional Features . . . . .	102

## P

Parking Brake . . . . .	20
Parking the Loader . . . . .	44
Potential Hazards . . . . .	8
Product and Component Plate Locations . . . . .	16

## R

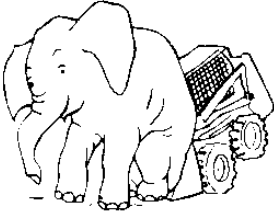
Rear Window Emergency Exit . . . . .	20
Removing Foreign Material . . . . .	64
Removing Loader from Storage . . . . .	53
Replacement Parts . . . . .	63
Road Lights . . . . .	86
ROPS/FOPS . . . . .	19

<b>S</b>	
SAFETY .....	5
Safety Decals .....	9
New Decal Application .....	9
No-Text Decals .....	13
Safety Decals in the Engine Compartment .....	12
Safety Decals inside the ROPS/FOPS .....	10
Safety Decals on the outside of the Skid Loader .....	11
Safety Interlock System .....	18
Testing .....	19
Safety Reminders .....	6
Seat and Restraint Bar Switches ..	80
Self-Leveling (optional) .....	46
SERVICE .....	61
Service Locations .....	67
SO-Style (used Internationally) Safety Decals inside the ROPS/FOPS ..	13
Spark Arrestor Muffler (Non-DPF Models) .....	73
SPECIFICATIONS .....	101
Accessories .....	102
Standard Features .....	102
Standard Features .....	102
Starting the Engine .....	41
Before Starting the Engine .....	41
Stopping the Loader .....	43
Storing the Loader .....	52
Switches, Seat and Restraint Bar .....	80
<b>T</b>	
Table of Common Materials and Densities .....	105
T-Bar Controls .....	30
Drive Controls .....	30
Lift/Tilt Controls .....	30
Tilting Back the ROPS/FOPS .....	62
Tires .....	81
Checking Tire Pressure .....	82
Mounting Tires .....	81
TORQUE SPECIFICATIONS .....	107
Transporting/Towing the Loader ..	54
TROUBLESHOOTING .....	85
Electrical System .....	85
Engine .....	87
Hydraulic System .....	94, 95, 96
Hydrostatic System .....	91, 93
<b>U</b>	
Upper-Torso Restraint .....	18
Using a Bucket .....	46
<b>V</b>	
Vibration Information .....	49
Vibration Levels Whole-Body and Hand-Arm ..	51
Vibration Measurement and Actions .....	50
<b>W</b>	
Wheel Nuts .....	81
Work Lights .....	22

## NOTES

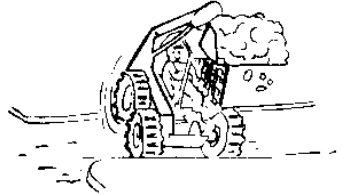
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WRONG



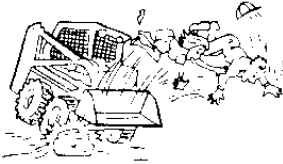
 **Never exceed rated operating load.**


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.**

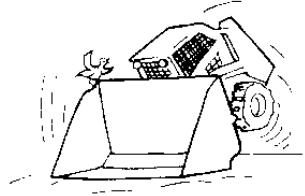
WRONG




 **Never carry riders.**

 **Keep bystanders away from work area.**

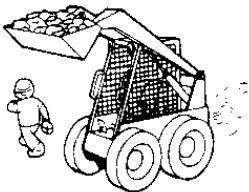
WRONG





 **Never modify equipment.**

 **Use only attachments approved for the 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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# GEHL

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