Operation and Maintenance Manual

SY16C Excavator

service@sanyamerica.com

SANY Part Number SSY005082390

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SANY

SY16C Excavator

Operation and Maintenance Manual

WARNING!

Read and understand all safety precautions and instructions in this manual and on the machine labels before operating or maintaining it. Failure to follow safety messages could result in death or serious injury. Keep this manual with the machine for future reference.

This manual is prepared by SANY Technical Publications,
while deemed to be accurate, is based upon technical information provided.

This manual provides safety and basic information for operation and maintenance of the machine.

It is the responsibility of the owner, user, properly trained operator, and lessor to be knowledgeable of, and comply with, all industry standards, government regulations, workplace rules, and other directives that may govern and/or apply to this equipment as well as its environment/conditions of use.

Contact a SANY dealer for additional information or assistance.

SANY
318 Cooper Circle
Peachtree City, Georgia 30269
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Phone: 470-552-SANY (7269)
www.sanyamerica.com/find-a-dealer

WARNING!

CALIFORNIA PROPOSITION 65 WARNING

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

WARNING!

CALIFORNIA PROPOSITION 65 WARNING

The battery posts, terminals, and related accessories contain chemical lead and lead compounds, chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. Wash hands after handling.

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Introduction

ABOUT THIS MANUAL

This manual provides operation and maintenance information for the SY16C excavator.

WARNING!

Unsafe operation and maintenance of this machine could result in death or serious injury. This machine must be operated and maintained by trained and experienced personnel. Do not operate or work on this machine without first reading and understanding this Operation and Maintenance Manual supplied with this machine.

It is important to read and understand this manual before beginning any operation or service. All personnel involved with this machine should read this manual periodically to remain knowledgeable on its operation and service.

Items addressed in this manual are designed to help operators and service personnel:

- Understand the controls and operation of the machine.
- Be aware of possible hazardous situations when operating or maintaining the machine.
- Increase machine efficiency during operation.
- Prolong the service life of the machine.
- Reduce maintenance costs.

Continuing improvements in the design of this machine can lead to changes which may not be covered in this manual. Contact a SANY dealer for the latest available information on the machine or to answer any questions regarding information in this manual.

DOCUMENTATION PACKAGE

This documentation applies only to this machine and should not be used with any other machine. The documentation for this machine includes the following items:

Operation and Maintenance Manual

A copy of the Operation and Maintenance Manual should remain in the machine at all times.

A copy of the Operation and Maintenance Manual should be made available to maintenance personnel when servicing the machine.

Parts Manual

The Parts Manual consists of parts lists and matching drawings used for ordering parts as needed. The parts manual must be made available to all service personnel. If it was not shipped with your machine, the parts manual for your machine is available directly from SANY dealer.

Maintenance Log

The Maintenance Log lists regularly scheduled maintenance that should be performed by operators or service personnel. All maintenance performed on the machine must be recorded in the Maintenance Log.

ORGANIZATION OF THIS MANUAL

Introduction

Contains an overview of this manual, serial number information, and SANY contact information.

Safety

Hazard alerts used throughout the manual are explained. General and product-specific safety information is provided for this manual.

Machine Controls

An overview of controls and the operating systems is provided in this section.

Machine Operation

Detailed prestart checks, operating procedures, end-of-day checks, general operating instructions, and storage information.

Maintenance

Provides routine maintenance procedures and fluid specifications.

Specifications

General dimensions and weight of the machine, and systems/components performance information.

Optional Equipment

Provides general hydraulic installation and removal information for optional equipment.

MACHINE APPLICATIONS

This excavator is a multipurpose construction machine used primarily for digging or loading earth and stones. It can also be used for grading, slope-trimming, lifting, breaking, demolishing, and trenching. It can perform the functions of a bulldozer, loader, and crane.

This excavator can also operate a variety of optional equipment.

SANY assumes no responsibility for any consequence caused by use outside this specified range.

Machine Directions

In this manual, the front, back, left, and right directions indicate the moving direction when viewed from the operator seat (see Fig. 1-1).

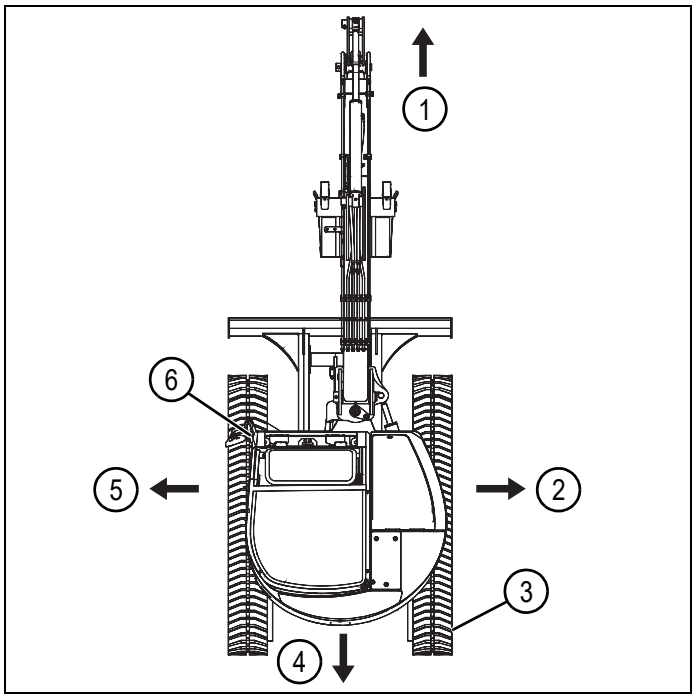

Fig. 1-1 0003784

1) Front
2) Right
3) Sprocket
4) Back
5) Left
6) Operator seat

SERIAL NUMBER LOCATION

Identification plates are located in various places on the excavator. These list model and serial numbers that will be needed by a SANY dealer when ordering replacement parts or providing assistance for your machine.

Product Identification Plate

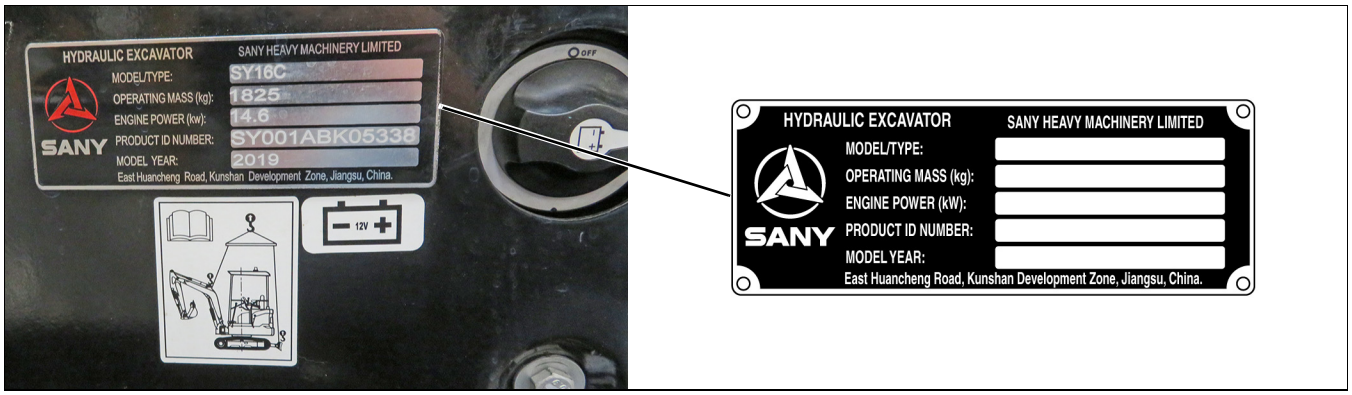

Fig. 1-2 0005124

The identification plate is on the lower front of the canopy.

Frame Serial Number

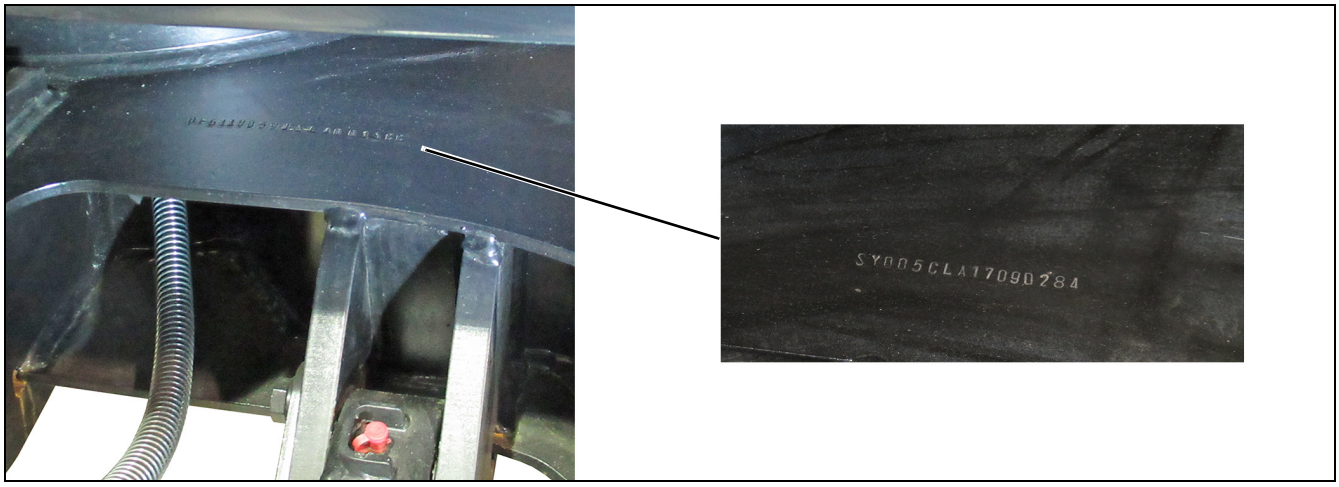

Fig. 1-3 0003170

The frame serial number is stamped on the front part of the frame.

Swing Motor Identification Plate

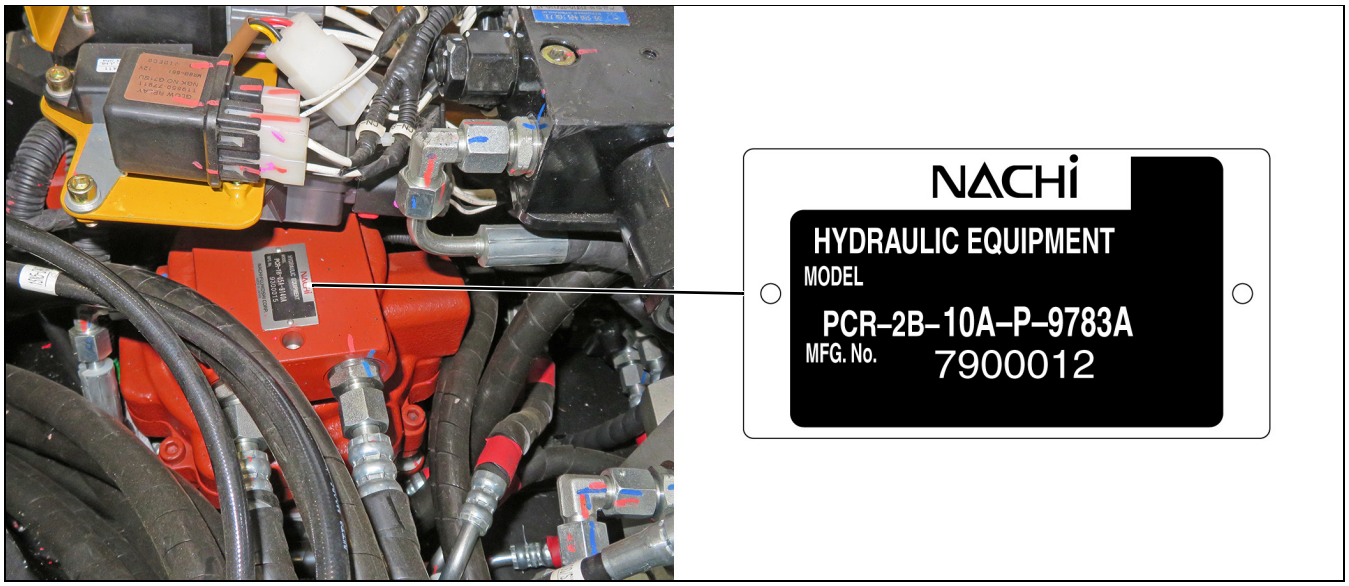

Fig. 1-4 0005125

The swing motor identification plate is on top of the swing motor.

Engine Identification Plate

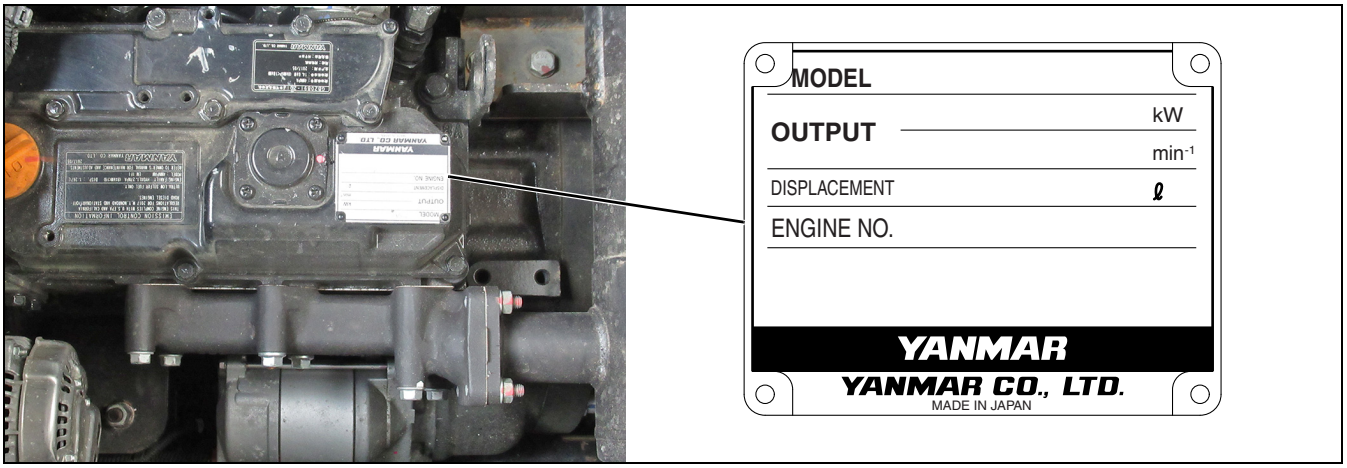

Fig. 1-5 0003187

The engine identification plate is on the top of the engine.

Hydraulic Pump Identification Plate

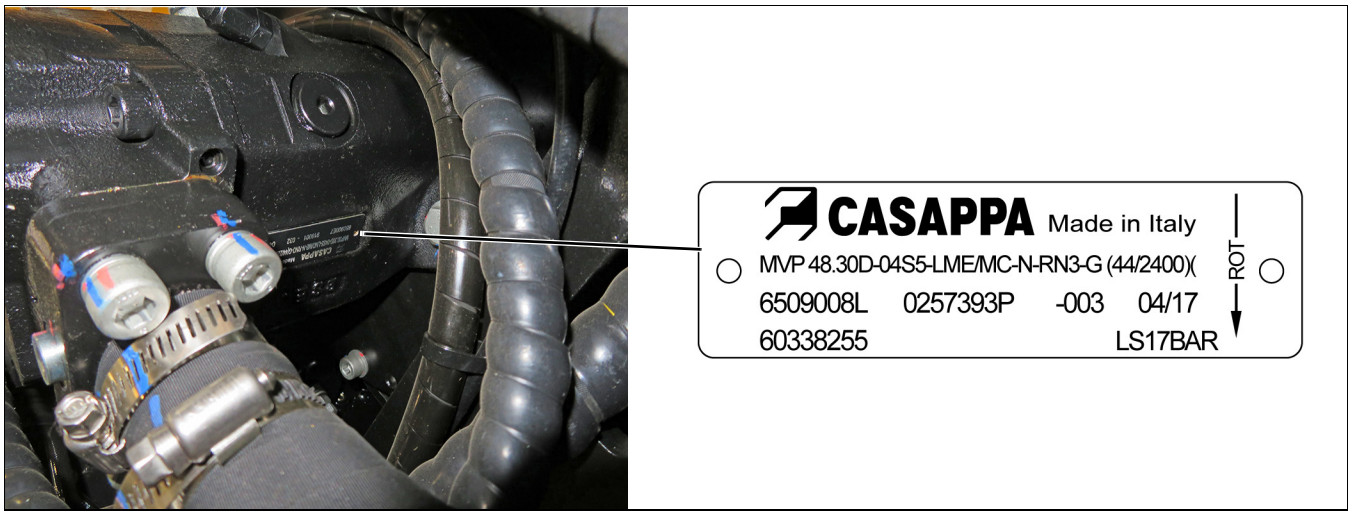

Fig. 1-6 0005155

The hydraulic pump identification plate is on the bottom of the hydraulic pump.

Travel Motor Identification Plate

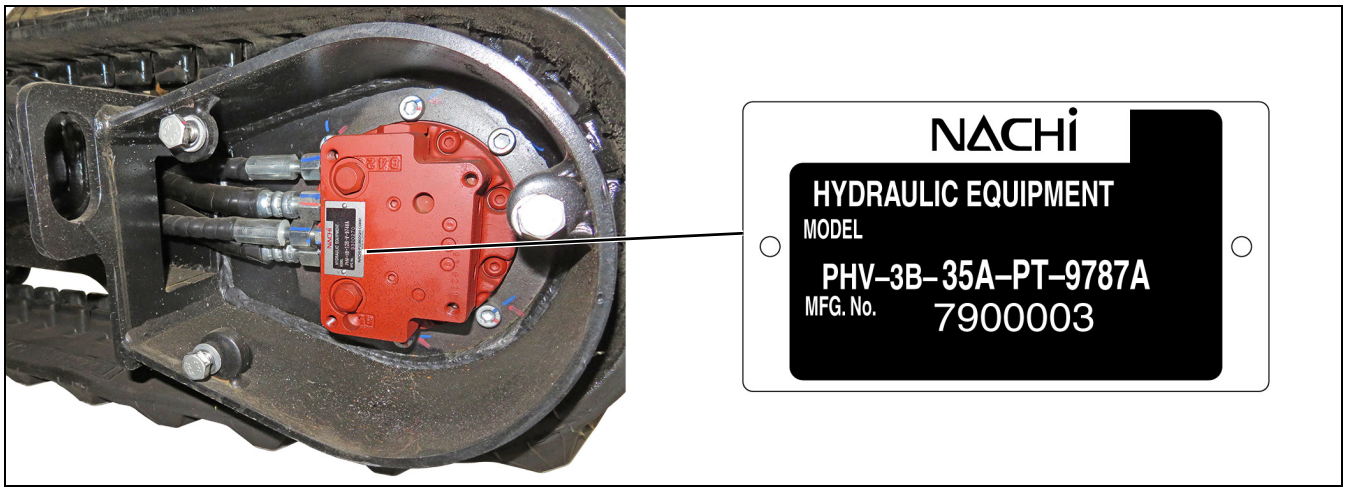

Fig. 1-7 0005123

An identification plate is on each travel motor. Remove the cover plates to access the travel motors.

SANY CONTACT INFORMATION

SANY
318 Cooper Circle
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Find a dealer: www.sanyamerica.com/find-a-dealer

RECORD OF SERIAL NUMBER AND DEALER INFORMATION

Use this table to record the product information related to this machine.	
Machine serial number	
Engine serial number	
Right travel motor serial number	
Left travel motor serial number	
Swing motor serial number	
Hydraulic pump serial number	
Dealer name: Address:	
Phone numbers:	

CORRECTION REQUEST FORM

If any problem is found with this manual, make a copy of this page, complete the information, and send it to SANY.

Correction Request Form
Date of this notification
Your name
Company name
Department
Street address
City, State, and ZIP/Postal Code
Phone
E-mail
Machine model and serial number
Description of problem (wrong information, unclear or erroneous procedure, etc.)
Corrective action taken (if any)

GLOSSARY OF ACRONYMS

ANSI – American National Standards Institute

BHL – Backhoe Loader

DEF – Diesel Exhaust Fluid

DPF – Diesel Particulate Filter

ECM – Engine Control Module

GPS – Global Positioning System

HEST – High Exhaust System Temperatures

HCU - Hydraulic Control Unit

ISO – International Organization for Standardization

LCD – Liquid Crystal Display

OEM – Original Equipment Manufacturer

OSHA – Occupational Safety and Health Administration

PPE – Personal Protective Equipment

PQR – Procedure Qualification Report

ROPS – Rollover Protective Structure

SAE – See SAE International (Formerly known as Society of Automotive Engineers)

SCA – Supplemental Coolant Additive

SDS – Safety Data Sheet

VDC – Volts Direct Current

WPS – Weld Procedure Specification

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Safety

GENERAL SAFETY

This section provides detailed information on basic safety precautions and preventive measures that should be followed during the operation and maintenance of this machine.

Hazard Alerts in This Manual

Hazard alerts in this manual are used to alert operators, job foreman, maintenance staff, and job-site workers to hazardous operating practices and maintenance procedures. Hazard alerts are used throughout this manual. Each hazard alert contains a hazard alert symbol and a signal word to identify the hazard's degree of consequence if the message is ignored.

The following American National Standards Institute (ANSI) and International Organization for Standardization (ISO) signal words are used to warn of a potentially hazardous situation that may lead to damage, personal injury, or even death. In this manual and on the machine decals, signal words or illustrations are used to express the potential level of hazard.

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

***NOTICE* is used to address practices not related to personal injury.**

This symbol is used within a graphic to alert the user not to do something.

Machine Decals

All safety and warning decals must be in place, undamaged, and visible. Become familiar with the location and content of all decals on the machine. Walk around the machine and review each of them. Decals provide important instructions and warnings and must be read and understood prior to any operational or maintenance function.

Contact a SANY dealer for replacement decals if needed.

NOTE: When replacing decals, make sure they are placed in the proper locations. Contact a SANY dealer if you have any questions about their meaning and placement.

OPERATOR SAFETY INFORMATION

It is impossible to compile a list of safety precautions that covers every situation. However, there are basic principles that must be followed when operating this machine:

- Only qualified personnel who have been specifically trained on this machine are permitted to operate and/or work on this machine.
- The seat belt must be worn by the operator at all times.
- Operator aids such as warning lights, horns, or buzzers, along with displays on the monitors, are designed to alert the operator to potential problems. Sole reliance on these operator aids in place of good operating practices can lead to an accident. Inspect the operator aids of this machine daily and make sure each operator aid is in normal working condition. Any faults found shall be reported to a SANY dealer. Stop all work immediately if any operator aid is not working properly.
- All accident prevention guidelines, operating instructions, etc., are based on the intended usage of the machine.
- Read and understand this manual and any accompanying manuals before operating this machine.
- This manual must be readily available to the operator at all times and must remain on the machine while it is in use.
- Make sure all personnel in the working area around the machine are thoroughly familiar with the safe operating practices stated in this manual.
- Review the local, state, and federal regulations and standards regarding this machine and its operation. Work practice requirements may vary among government regulations, industry standards, and employer policies. A thorough knowledge of all such relevant work rules is required before operating this machine or performing maintenance on it.
- Check the Maintenance Log before the start of each workday shift. Make sure routine maintenance has been performed as stated in this manual. Do not operate a damaged or improperly maintained machine.
- Only the operator should be on the machine while it is in operation.
- Be sure all underground utilities have been marked before excavating.

Mount and Dismount the Machine

Mounting or dismounting the machine presents hazards. Observe the following.

- Always make sure the hydraulic lockout control lever is in the locked (closed) position before unbuckling the seat belt and exiting the machine.
- Always make sure the machine is at a complete stop before entering or exiting the machine. Never jump on or off the machine.
- Never exit or enter the machine by any means other than the provided grab handles and steps.
- Always face the machine as you mount and dismount.

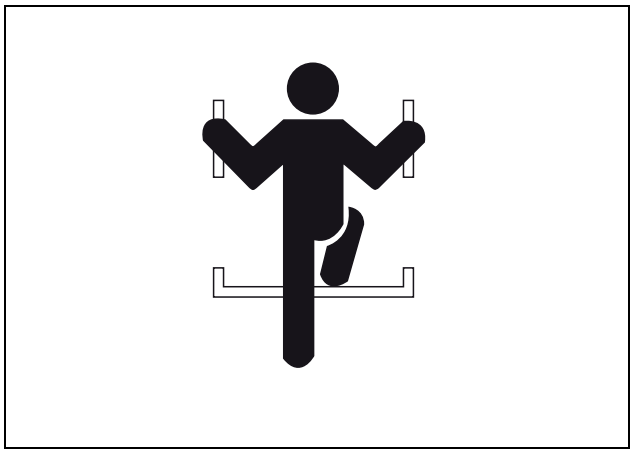

Fig. 2-1 0003054

- Always maintain three-point contact (both feet and one hand, or one foot and both hands) with the grab handles, steps, and deck for proper support.
- Wear safety shoes with slip-resistant soles.
- Do not walk on any surface of the machine if its slip-resistant material is missing or excessively worn. Do not step on surfaces of the machine that are not approved for walking or working. Keep all walking and working surfaces of the machine clean, dry, and slip-resistant.
- Always keep grab handles, steps, and walkway areas clean and clear of mud, oil, grease, or similar debris. If these areas are damaged, have them repaired or replaced immediately.

MACHINE SAFETY

Authorized Use of This Machine

This excavator is a multipurpose construction machine is used primarily for digging or loading earth and stones. It can also be used for grading, slope-trimming, lifting, breaking, demolishing, and trenching. It can perform the functions of bulldozer, loader, and crane. SANY assumes no responsibility for any consequence caused by use outside this specified range.

Unauthorized Use of This Machine

Unauthorized uses include, but are not limited to, the following:

- Transporting people on the machine.
- Overloading the machine beyond its capacity.

Unauthorized Machine Modifications

Do not perform any unauthorized machine modifications.

Do not add weight (attachments, etc.) to the machine. Do not exceed the gross weight.

Fire Safety

Fuel, oil, and some engine coolants are flammable. Observe the following:

- Keep open flames, airborne sparks, and burning embers away from the machine.
- Shut down the engine and do not smoke when refueling or servicing the machine.
- Add oil, fuel, or engine coolant in a well-ventilated area.
- Clean up any spilled fluids immediately.
- Check the machine daily for debris buildup.

Electrical Fires

Short circuits, damaged wiring, or overcharging batteries can cause fires. Observe the following:

- Check the wiring on the machine for damage when doing a prestart check. Contact a SANY dealer to repair or replace any damaged wiring.
- Make sure the battery is operating in its recommended range.
- Never install aftermarket electrical equipment without approval from a SANY dealer.

Fire Extinguisher (if equipped)

Keep a fire extinguisher on the machine if equipped.

Read the instructions on the fire extinguisher carefully and know how to use it in an emergency.

Inspect the condition of the fire extinguisher daily. If damaged, replace the extinguisher immediately.

Make sure the fire extinguisher is within the listed inspection period. Replace the fire extinguisher immediately if it has reached its expiration date.

The fire extinguisher must be at least a 2.5 lb. Class ABC rated fire extinguisher (National Fire Protection Association [NFPA] 10 Standard for Portable Fire Extinguishers).

In Case of Fire

If a fire occurs on the machine:

1. Immediately press the emergency stop located on the lower left of the seat to shut down the machine. Never continue operating the machine.

2. Get clear of the machine and immediately call for help. Always have a list of emergency phone numbers available.

3. Exit the area and remain clear of the machine until the fire response team gives permission to come near the machine.

4. If using a fire extinguisher, always aim the extinguisher nozzle at the base of the fire.

Crushing Hazard

Keep your body inside the canopy during operation or travel.

Keep all guards in place on the machine.

Block off the area where the machine is being operated and keep all unnecessary personnel out of the work area.

Diesel Engine Exhaust

WARNING!

CALIFORNIA PROPOSITION 65 WARNING

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

WARNING!

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, use an exhaust pipe extension to vent the exhaust to the outdoors. If an exhaust pipe extension is not available, open doors and use fans to supply fresh air into the area.

MAINTENANCE SAFETY

SANY cannot foresee every circumstance that might involve a hazard in operation or maintenance. Therefore, the hazard alerts in this manual and on the machine may not include all possible safety precautions.

Make sure all procedures and actions can be safely performed without damaging the machine or causing injury. When unsure about the safety of a procedure, contact a SANY dealer.

Before carrying out any repair, read all the safety messages on the machine associated with the procedure.

Wear and use the proper personal protective equipment (PPE), including (but not limited to) safety shoes, a hard hat, gloves, and goggles.

When carrying out any operation with two or more workers, always agree on the operating procedure before starting.

Park the machine on a hard, level surface, lower the work equipment, shut down the engine, and block the tracks to prevent the machine from moving before performing any maintenance or repairs.

Always perform the lockout/tagout procedure before servicing the machine.

Always inform fellow workers before starting any step of the operation.

Before disconnecting or removing components of the hydraulic system, relieve the system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.

Before disconnecting or removing components of the hydraulic system, relieve the system pressure to prevent fluids from spraying. See “Relieve Hydraulic System Pressure” on page 5-37.

The engine coolant and oil in the machine may be hot even after the engine is stopped. Wait for the engine coolant and oil systems to cool before working on them.

When checking the machine with the engine running (i.e., measuring oil pressure, rpm, or temperature), take extreme care to avoid rotating or moving parts.

NOTE: The electrical circuit remains active to a few components even when the battery disconnect is in the OFF position.

Turn the battery disconnect switch OFF unless it is needed for the procedure.

When removing hoses or lines, close all openings using caps and plugs. If any fuel or oil fluids leak, clean them up immediately.

When installing high-pressure hoses, make sure they are not twisted. Damaged hoses are dangerous and should be replaced. Take extreme caution when installing hoses for high-pressure circuits. Make sure fittings are correctly installed and tightened.

When assembling or installing parts, always tighten them to the specified torques. When installing protective parts (such as guards) or parts that vibrate or rotate at high speed, make sure they are installed correctly.

Lockout/Tagout Procedure

Always perform the lockout/tagout procedure before servicing the machine.

Cleaning the Machine

Always use hot water and mild, nonflammable, grease-cutting soaps or cleaning agents to clean the machine. Never use flammable or caustic cleaning agents.

Never use high-pressure steam cleaners to clean the machine.

Always lubricate the machine thoroughly after cleaning it to remove any water or soap residue.

Keep the canopy, mirrors, and lights clean.

Fluid Systems

Adding Fluids to the Machine

When adding fluids to the machine, be aware that fluid systems may be under pressure and hot.

Refueling

When adding fuel, shut down the machine before removing the fuel tank cap.

Fuel spills present a hazard if not cleaned up immediately.

Refuel only in a well-ventilated area. Never smoke or allow open flames nearby while refueling the machine.

Do not top off the fuel tank.

High-Pressure Fluid Lines

WARNING!

- **Never perform repairs to items while any system is under pressure.**
- **Never use your hands to check or feel for leaks. Always wear safety glasses and leather gloves, and use a piece of wood or cardboard to check for leaks.**
- **If high-pressure fluids penetrate skin, seek medical attention immediately.**

Failure to follow these warnings can result in death or serious injury.

Check for cracks in the lines or hoses and for swelling in the hoses.

NOTE: If there is any leakage from a line or hose, the surrounding area may be wet.

Replace lines and hoses immediately if leaks, swelling, or cracking are found or if failure occurs.

Accumulator

This machine is equipped with an accumulator charged with high-pressure nitrogen gas. Do not disassemble the accumulator.

Never expose the accumulator to temperatures above 140ºF (60ºC) or open flames.

Never weld on the accumulator.

Never strike the accumulator.

If the accumulator needs maintenance, contact a SANY dealer.

Electrical System

Always clean the electrical system using industry-approved electrical cleaners.

Never use caustic soaps, high-pressure water, or steam cleaners to clean the electrical system. These could damage the system or cause intermittent system failures.

Battery Safety

When working with batteries, always work in a well-ventilated area. Batteries present a hazard, especially when they have been in use for a long period of time. The following are some basic precautions for working around batteries:

- Always wear personal protective equipment (PPE).
- Battery gases are extremely explosive. Smoking, sparks, or open flames could cause an explosion. When opening a battery compartment, always allow ample time for battery gases to escape.
- If the battery is corroded, clean it with a mixture of warm water and baking soda.
- If battery acid gets on skin or in eyes, flush the area immediately with fresh water and seek medical attention.

Check the battery's condition only with proper test equipment.

Disconnect the Battery

When disconnecting the batteries, always disconnect the negative (-) cable first. Then disconnect the positive (+) cable.

NOTE: Disconnecting the cables between the batteries may not completely interrupt the electrical system.

JOB SAFETY

It is the owner's/operator's responsibility to replace any safety decals that are damaged or missing from the machine.

Never leave the machine running while it is unattended. Always park the machine in a safe, level area, lower any work equipment to the ground, lock the controls, and secure the machine to prevent tampering by unauthorized personnel. Shut down the engine before exiting the machine.

Before starting any work operations, travel, or maintenance procedures, make sure all personnel are a safe distance from all points of the machine. Never allow anyone to stand near the machine while it is in operation or under maintenance or repair.

It is the responsibility of the operator's employer to conduct periodic safety training and familiarize all personnel with emergency procedures.

If pedestrians are in the area, sound the horn and proceed slowly.

When working with another person on a job site, make sure that all personnel involved understand all industry-standard hand signals that are to be used.

The operator shall respond to operating signals from the proper signal person only, but shall obey a stop signal at any time from anyone.

The operator must always be able to see the work location. If this is not possible, then a signalman must be used. If visibility becomes blocked for any reason, stop operation immediately.

If the machine is equipped with operator aids, the Occupational Safety and Health Administration (OSHA) requires this equipment to be used when operating the machine.

Personal Protective Equipment (PPE)

Before using personal protective equipment (PPE), make sure it is in good working condition.

Hearing Protection

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection to protect against loud noise.

Travel and Operation Precautions

Confirm the relative positions of the undercarriage and operator before operating the machine.

Traveling with the machine may present hazards. When traveling with the machine, always travel in a safe, controlled manner, and remain alert at all times. Be sure the areas around the machine are clearly visible.

When traveling over rough ground, travel at a low speed and steer carefully. Whenever possible, avoid traveling over obstacles or raised areas. Traveling over obstacles or raised areas could result in loss of control or damage to the machine. When traveling over raised areas, always travel at a low speed.

During travel, always maintain a safe distance from people and surrounding objects. Always check to make sure areas such as bridges and roadways will support the weight of the machine before attempting to cross.

Before traveling in public areas, always gain approval from local authorities and follow their instructions.

Raise work equipment 8 in.–12 in. (20 cm–30 cm) above the ground when traveling.

When traveling or operating in shallow water, be aware of its depth and current.

Inclined Areas

Traveling on an incline can be dangerous. To prevent tipping, loss of control, or a rollover, it is important to follow these rules:

- Always check the firmness of the inclined surface before attempting to travel on it.
- Always travel straight up or straight down an incline.
- Avoid turning on an incline.
- Avoid sudden stops.

Snow or Frozen Surfaces

Be careful when traveling or operating the machine on frozen or snow-covered surfaces. The ability to maneuver the machine is seriously affected. The machine may not respond as expected when turning. Other precautions:

- Avoid any rapid movement, acceleration, or quick stopping. Always be aware of the increased stopping distance required on these surfaces.
- Avoid deep snow or frozen bodies of water.
- Even a slight incline may cause the machine to slip. Be extra careful when working on an inclined surface covered with snow or ice.
- When traveling or moving the machine on a snow-covered incline, allow the machine to come to a stop slowly.

Avoid Backover Accidents

Keep the mirrors and lights clean and in good condition.

Before moving the machine, make sure all bystanders are clear of the intended path.

Before moving the machine, warn others with the horn.

Use a signalman if the view is obstructed when backing up. Keep the signalman in view at all times.

Dust and Chemical Hazards

Hazardous dust or chemicals present a serious danger when they are released or mishandled. All workers involved should use approved personal protective equipment (PPE) and follow all environmental safety regulations.

Consult the Safety Data Sheet (SDS) for guidelines on personal protective equipment (PPE), proper handling and cleanup, and correct reporting agencies if needed.

Environmental Precautions

Oils and coolants poured onto the ground, into bodies of water, into storm drains, or tossed into trash cans (even in a sealed container) can contaminate and pollute the soil, groundwater, streams, and rivers.

Recycling used oil, coolants, and filters helps conserve natural resources and is good for the environment.

Obey all regulations when disposing of harmful items such as oil, fuel, filters, batteries, hydraulic oil, and used parts.

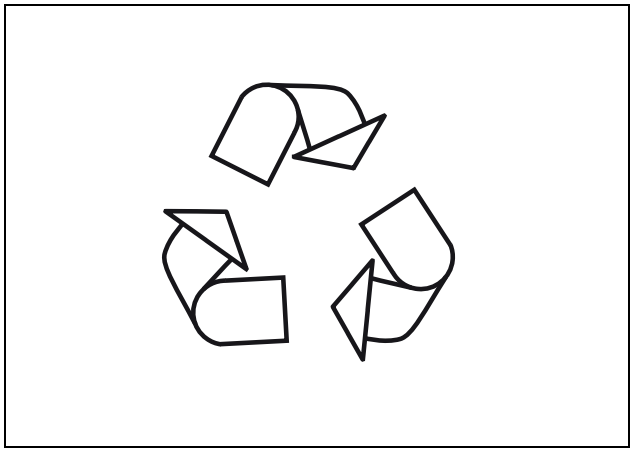

Fig. 2-2 0003055

Precautions in High-Voltage Areas

WARNING!

Overhead power lines carry high-voltage electricity that can discharge to the ground through the machine, even without direct contact with the machine's structure. Avoid direct contact with high-voltage power lines while operating. High-voltage contact could result in equipment damage, death, or serious injury.

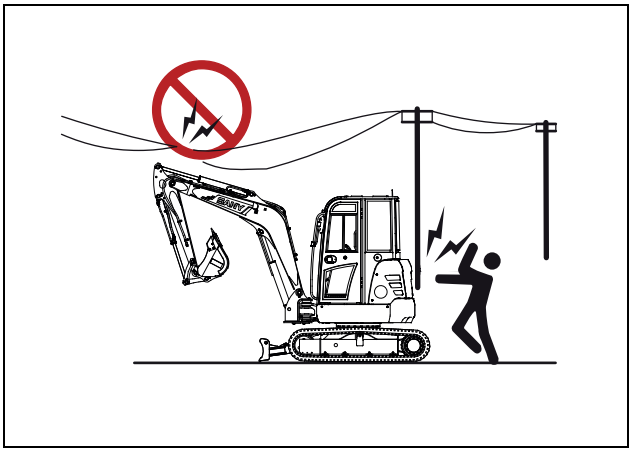

Fig. 2-3 0003056

Stay clear of overhead power lines. They are an electrical hazard. Treat all overhead power lines as being energized and not insulated.

Be sure all underground utilities have been marked before excavating.

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Machine Controls

MACHINE OVERVIEW

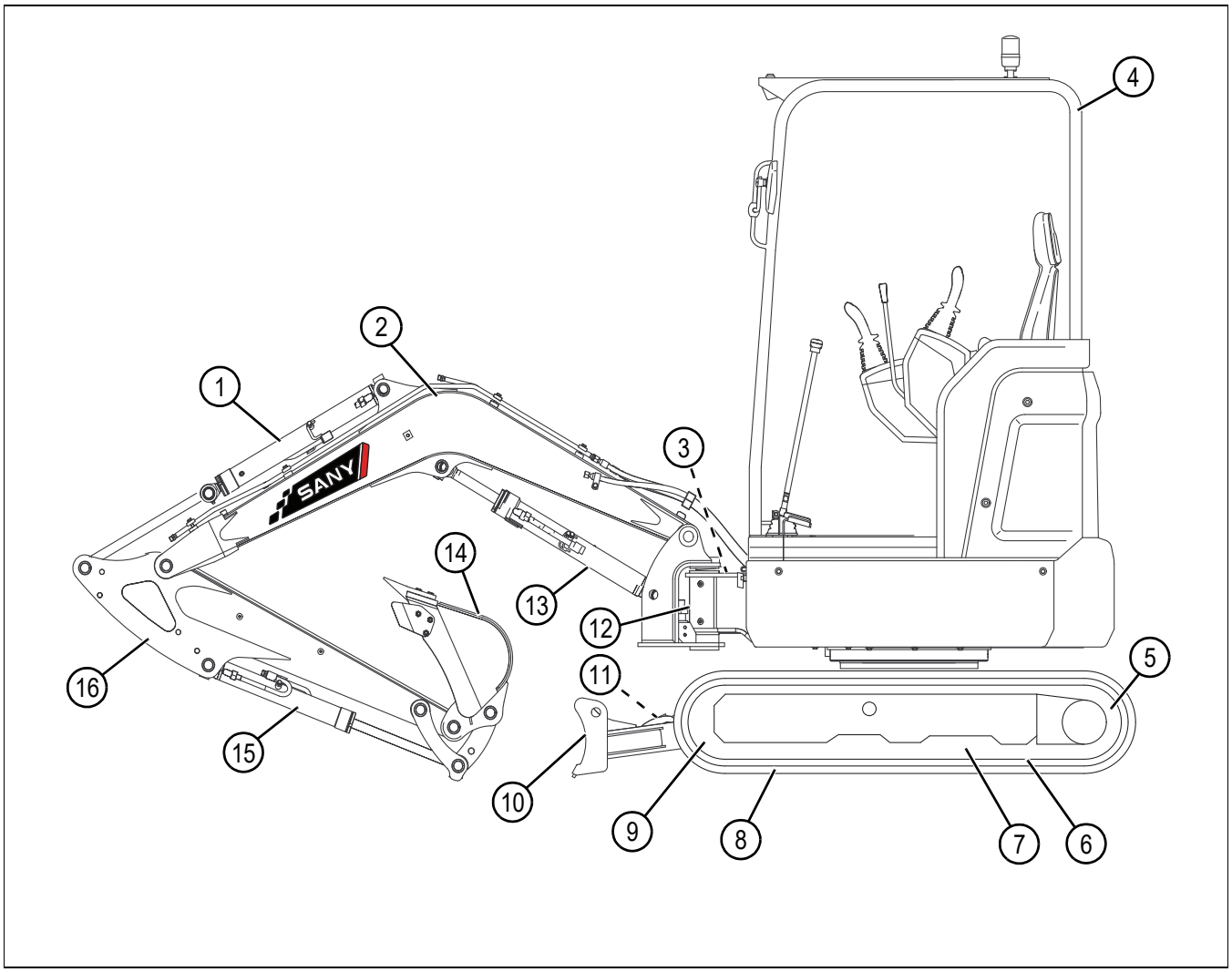

Fig. 3-1 0004963

1. Arm cylinder
2. Boom
3. Boom swing cylinder
4. Canopy
5. Drive sprocket
6. Track roller
7. Track frame
8. Track
9. Idler
10. Dozer blade
11. Blade cylinder
12. Boom pivot
13. Boom cylinder
14. Bucket
15. Bucket cylinder
16. Arm

OPERATOR CONTROLS

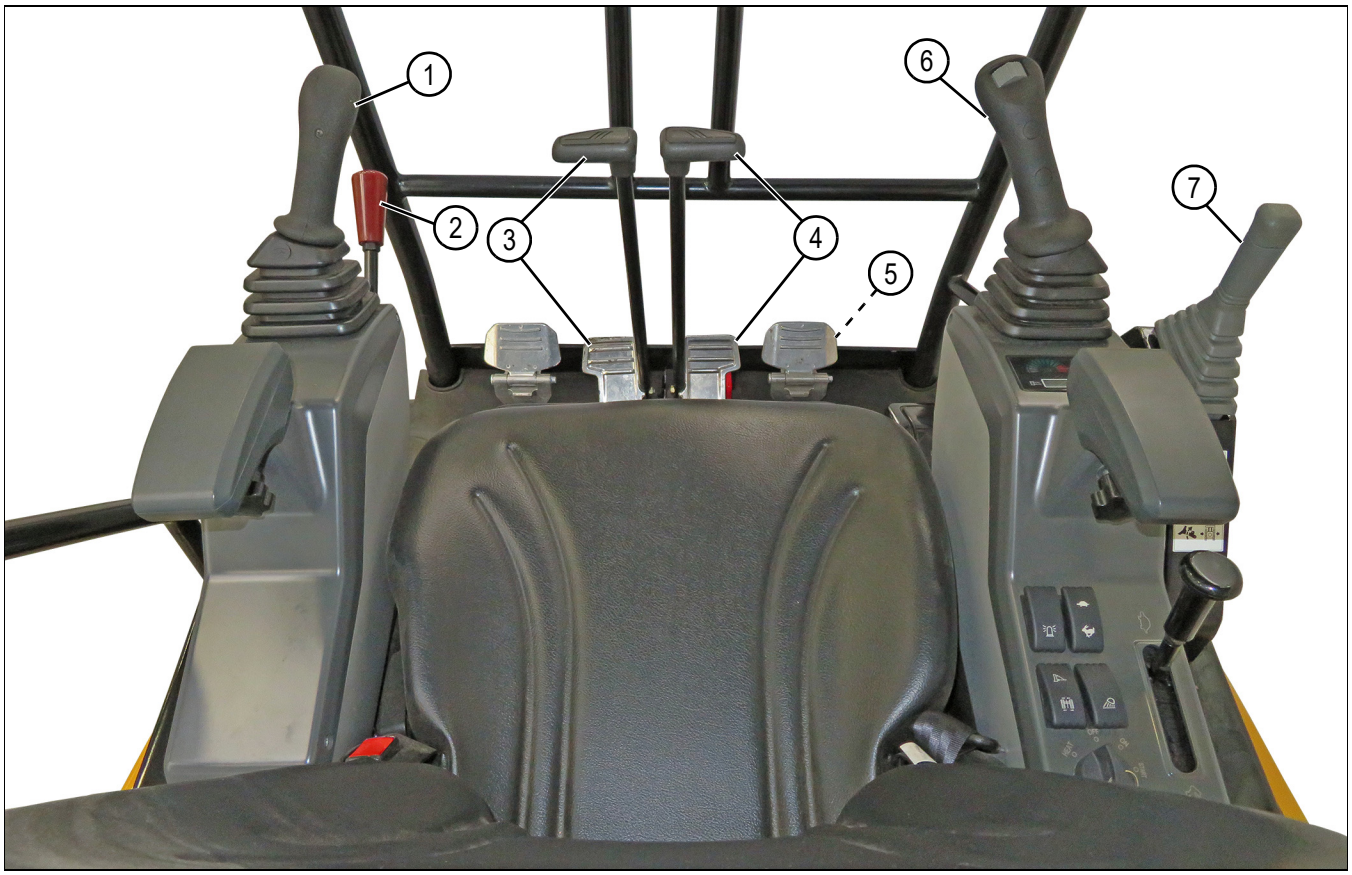

Fig. 3-2 0004986

1. Left joystick (page 3-6)
2. Hydraulic lockout control lever (page 3-5)
3. Left travel control lever/pedal (page 3-10)
4. Right travel control lever/pedal (page 3-10)
5. Boom swing control pedal (page 3-11)
6. Right joystick (page 3-6)
7. Dozer blade/track spread control lever (page 3-12)

Hydraulic Lockout Control Lever

WARNING!

- **Always place the hydraulic lockout control lever in the locked (closed) position before leaving the operator seat.**

- **The boom swing pedal, optional equipment pedal, and the dozer blade control are not disabled when the hydraulic lockout control lever is engaged. Make sure covers are in place over the pedals when not in use, and avoid unintentional movement of the dozer blade control while the engine is running.**

Failure to follow this warning, and unintended movement of the joysticks or travel control levers/pedals, could result in death or serious injury.

NOTICE!

If any part of the machine moves (except boom swing pedal, optional equipment pedal, and dozer blade control) when the hydraulic lockout control lever is in the locked (closed) position, shut down the engine immediately. Contact a SANY dealer to solve this problem.

The hydraulic lockout control lever disables or enables the controls for work equipment, swing, travel, and attachments (if equipped) to prevent accidental movement.

- Pull the hydraulic lockout control lever to the locked (closed) (1) position to disable some hydraulic controls.

NOTE: The boom swing pedal, optional equipment pedal, and the dozer blade control are not disabled when the hydraulic lockout control lever is engaged.

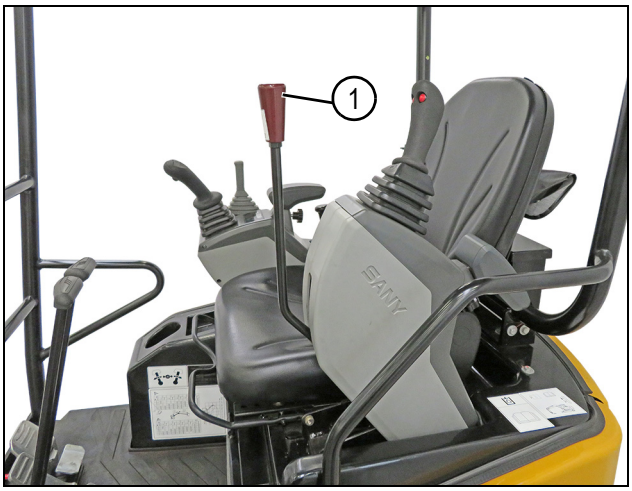

Fig. 3-3 0004987

- Push the hydraulic lockout control lever to the unlocked (open) (3) position to enable machine operation.

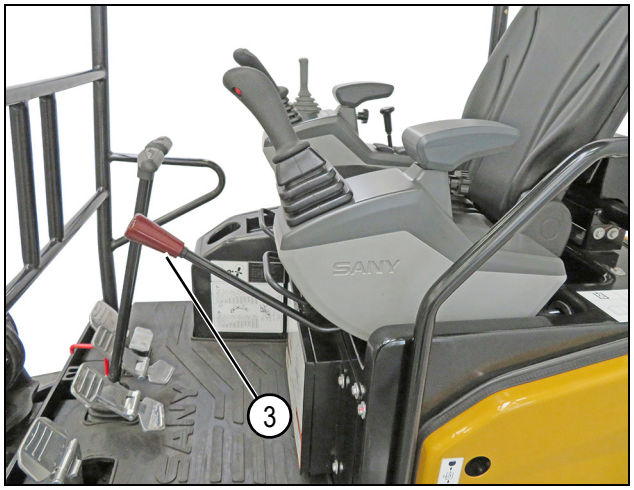

Fig. 3-4 0005078

Joystick Controls

WARNING!

Prevent unexpected movement of the machine. Know the positions and functions of the joysticks before operation. Failure to follow this warning could result in death or serious injury.

NOTE: There are two operating modes available for the joystick controls, the Society of Automotive Engineers (SAE) mode and the Backhoe Loader (BHL) mode. The swing and bucket functions are the same for SAE and BHL modes.

Joystick SAE Mode

Left Joystick–SAE Mode

The SAE mode uses the left joystick to control the arm and upper structure:

- Swing the upper structure to the left (1)
- Arm out (2)
- Swing the upper structure to the right (3)
- Arm in (4)
- Neutral (N)

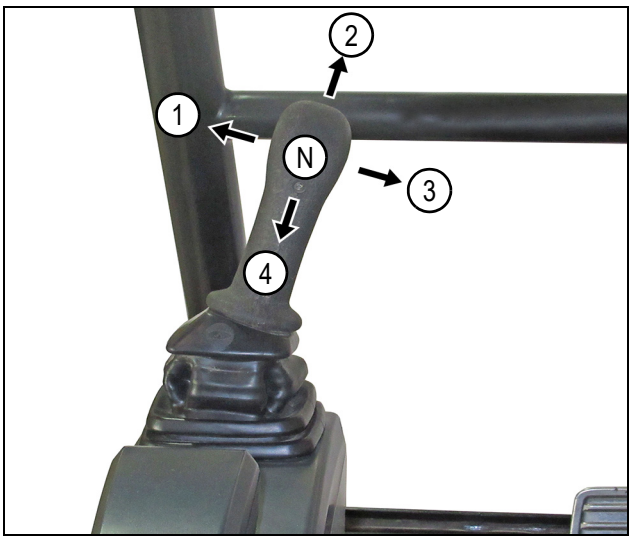

Fig. 3-5 0003156

Right Joystick–SAE Mode

The SAE mode uses the right joystick to control the boom and bucket:

- Bucket curl (1)
- Boom down (2)
- Bucket uncurl (3)
- Boom up (4)
- Neutral (N)

NOTE: The joystick controls return to the neutral position automatically when released, and the functions of the machine stop.

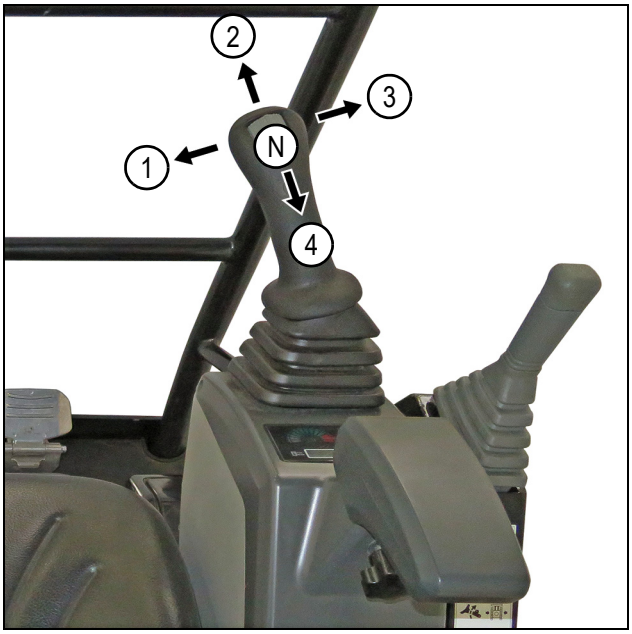

Fig. 3-6 0005112

NOTE: In longitudinal excavation, rotate the undercarriage so the travel motors are behind the upper structure to maximize the stability and lift capacity of the machine.

Joystick BHL Mode

Left Joystick–BHL Mode

The BHL mode uses the left joystick to control the boom and upper structure:

- Swing the upper structure to the left (1)
- Boom down (2)
- Swing the upper structure to the right (3)
- Boom up (4)
- Neutral (N)

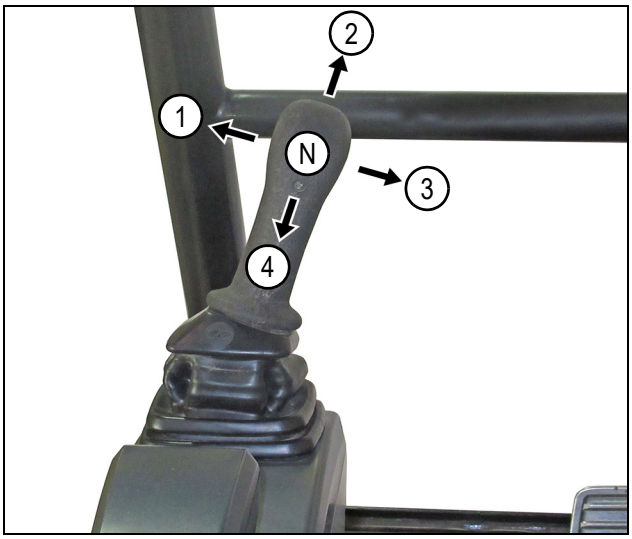

Fig. 3-7 0003156

Right Joystick–BHL Mode

The BHL mode uses the right joystick to control the arm and bucket:

- Bucket curl (1)
- Arm out (2)
- Bucket uncurl (3)
- Arm in (4)
- Neutral (N)

NOTE: The joystick controls return to the neutral position automatically when released, and the functions of the machine will stop.

NOTE: In longitudinal excavation, rotate the undercarriage so the travel motors are behind the upper structure to maximize the stability and lift capacity of the machine.

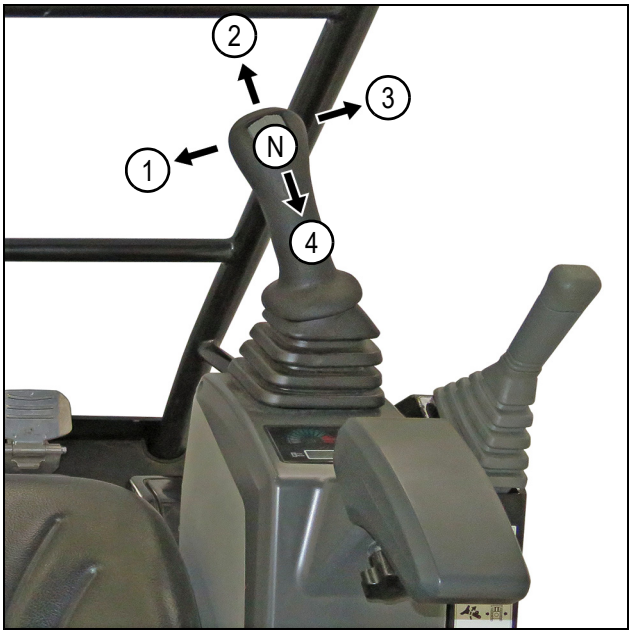

Fig. 3-8 0005112

Pattern Change (SAE/BHL) Valve

NOTICE!

Shut the engine down before adjusting the pattern change (SAE/BHL) valve. Failure to do so can damage the machine, personal property, or cause the machine to operate improperly.

The pattern change (SAE/BHL) valve changes control of the boom and arm from one joystick to the other:

- In SAE mode, the arm is controlled using the left joystick and the boom using the right joystick.
- In BHL mode, the boom is controlled using the left joystick and the arm using the right joystick.

To change the operating mode, perform the following steps:

1. Turn the engine off.

2. Open the engine hood to access the pattern change (SAE/BHL) valve (3).

3. Loosen the fastener (2) until it is free of the threaded hole.

4. Rotate the bar (1) counterclockwise until the stop is contacted for BHL mode, or clockwise until the stop is contacted for SAE mode.

   NOTE: The pattern change valve is shown in the SAE position.

5. Tighten the fastener into the threaded hole to lock the valve in position.

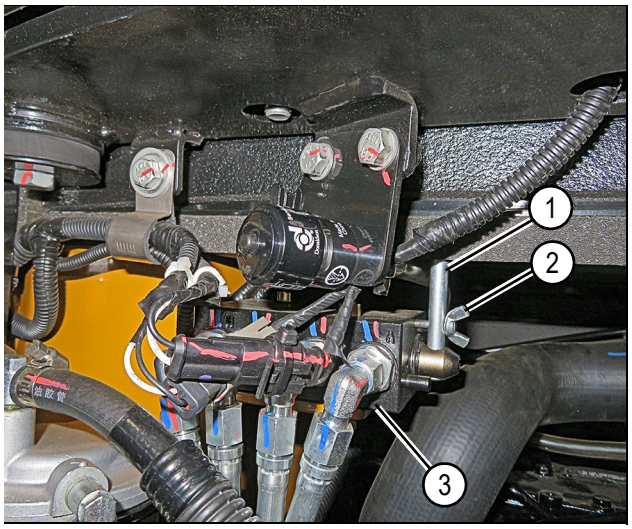

Fig. 3-9 0005103

Return Flow Selector Valve

The return flow selector valve (1) has a one-way (2) and a two-way (3) position for operating optional equipment. The return flow selector valve is behind the rear engine hood.

NOTE: The return flow selector valve is shown in the one-way flow position.

A variety of optional one-way and two-way flow equipment is available for use on this machine. A hydraulic breaker is an example of one-way flow equipment; a tilt bucket is an example of two-way flow equipment.

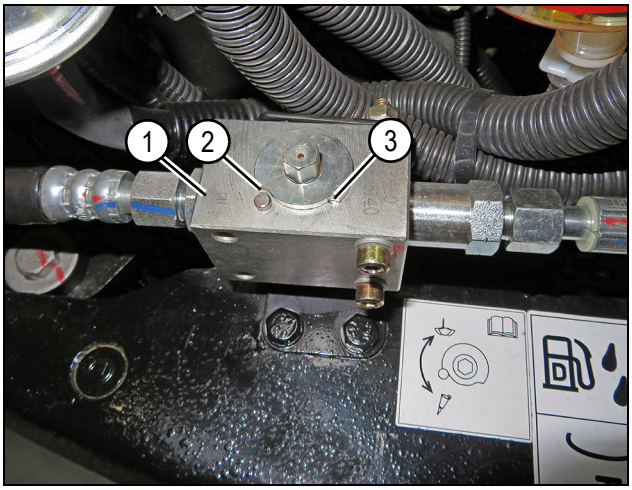

Fig. 3-10 0005079

Directional Arrows

The directional arrow (1) on each of the track frames indicates forward movement of the machine. Check these arrows before using the travel control levers/pedals. The track drive sprocket is at the rear of the track frame.

If the track frame is facing backward, the travel direction will be opposite the maneuvering direction of the travel control lever/pedal. The machine will move forward when you pull the control levers backward and backward when you push them forward. Left and right control directions are also reversed when the track frame faces backward.

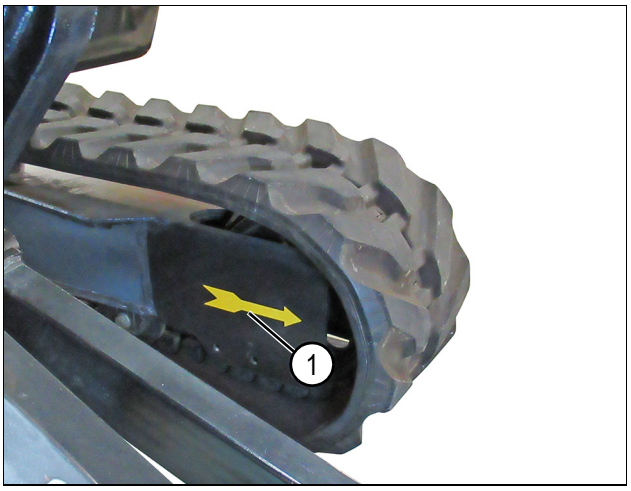

Fig. 3-11 0003794

Travel Control Levers/Pedals

WARNING!

- **Take extra care when using the travel control pedals to steer the machine.**
- **Never place your feet on the travel control pedals unless you are driving or steering the machine, which could cause unexpected movement.**

Failure to follow these warnings could result in death or serious injury.

NOTE: The track frame is facing the front if the dozer blade is forward or the drive sprocket is to the rear. See “Directional Arrows” on page 3-10.

The travel control levers (3) or pedals (4) are used to change the machine’s traveling direction:

- Forward travel: Push the travel control levers or pedals forward (1).
- Backward travel: Pull the travel control levers/pedals backward (2).
- Neutral position (N): The machine stops.

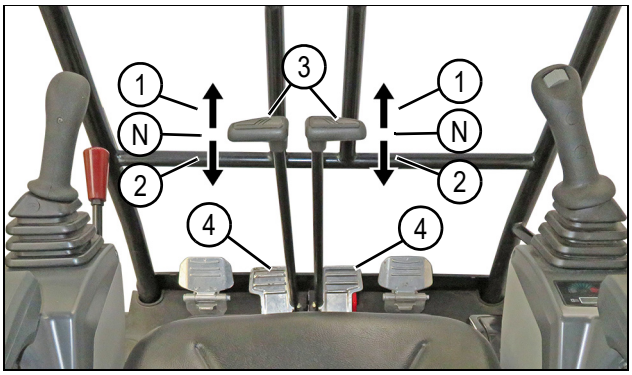

Fig. 3-12 0005144

Boom Swing Control Pedal

WARNING!

Do not place your foot on the boom swing control pedal except when using it for boom swing operation. Failure to follow this warning could result in death or serious injury.

Lift the right footrest (1) up to access the boom swing control pedal (2). Press the right side of the pedal to swing the boom right, and press the left side of the pedal to swing the boom left.

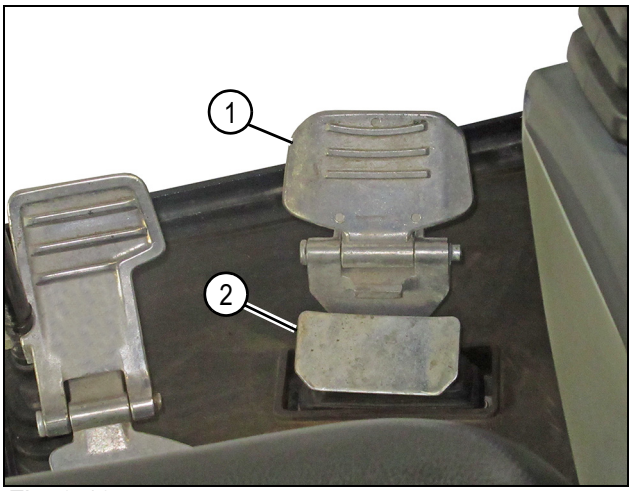

Fig. 3-13 0003159

Close the boom swing control pedal footrest (1) when boom swing operation is not used.

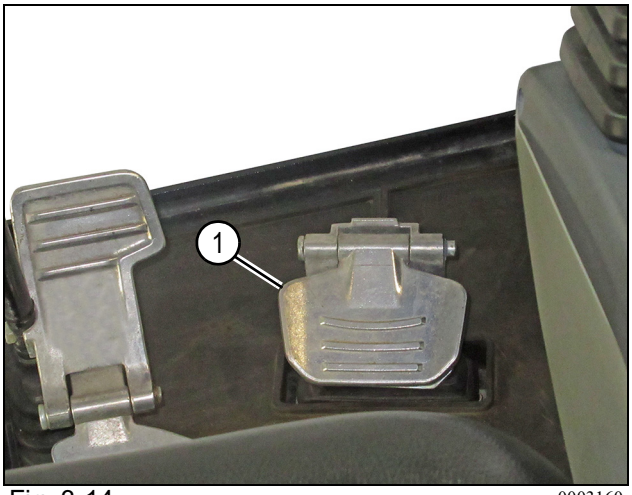

Fig. 3-14 0003160

Dozer Blade/Track Spread Control Lever

The dozer blade/track spread control lever (1) is on the right side of the operator seat.

This lever controls:

- Raising and lowering the dozer blade.
- Changing the track spread (gauge) from 2 ft. 6 in. (.75 m) to 3 ft. 8 in. (1.12 m).

Fig. 3-15 0005087

The dozer blade/track spread switch (3) selects the function of the dozer blade/track spread control lever.

With the dozer blade/track spread switch in the dozer blade position (2):

- Push the dozer blade/track spread control lever forward to lower the dozer blade.
- Pull the dozer blade/track spread control lever back (3) to raise the dozer blade.

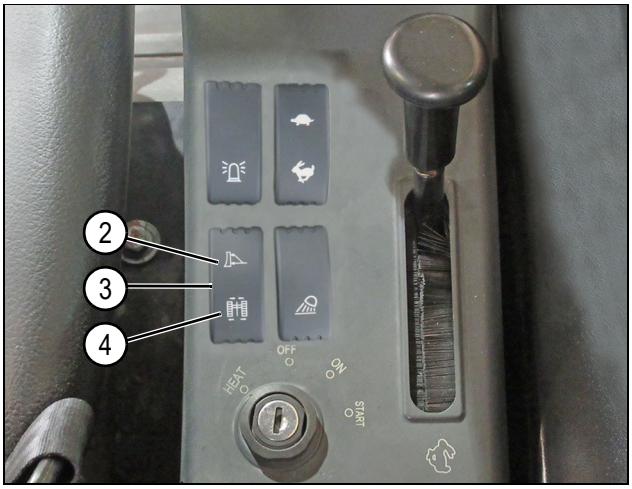

Fig. 3-16 0005095

With the dozer blade/track spread switch in the track spread position (4):

- Push the dozer blade/track spread control lever forward to increase the track spread.
- Pull the dozer blade/track spread control lever back to reduce the track spread.

NOTE: The dozer blade control lever returns to the neutral position when released.

SWITCHES

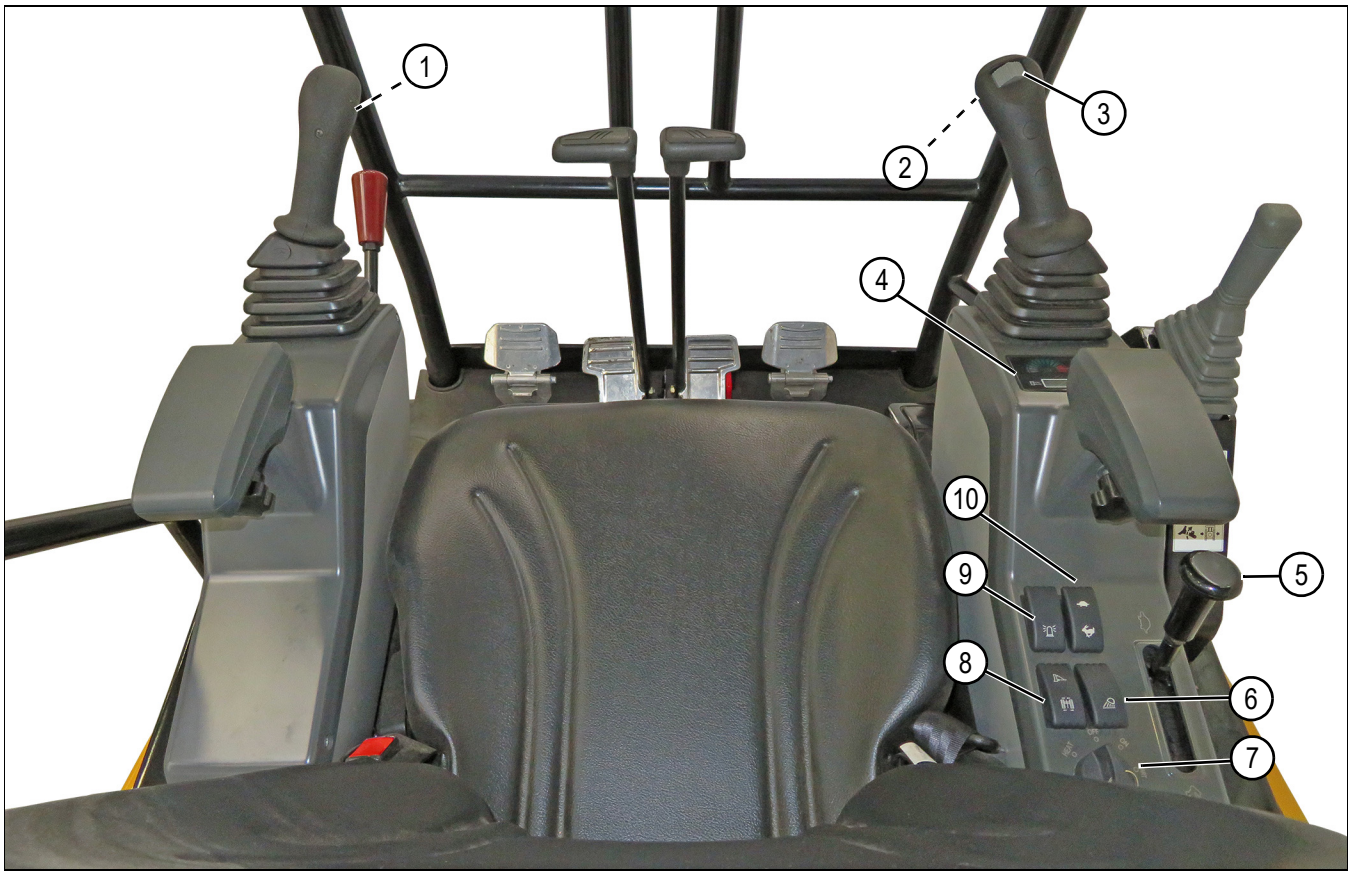

Fig. 3-17 0004986

1. Left joystick buttons (page 3-14)
2. Right joystick horn button (page 3-14)
3. Right joystick switch (page 3-15)
4. Monitor (page 3-20)
5. Throttle control lever (page 3-15)
6. Work light switch (page 3-18)
7. Key switch (page 3-16)
8. Dozer blade/track spread switch (page 3-18)
9. Travel alarm switch (page 3-16)
10. Travel speed switch

Left Joystick Buttons

The two buttons (1) on the bottom of the left joystick are currently not used.

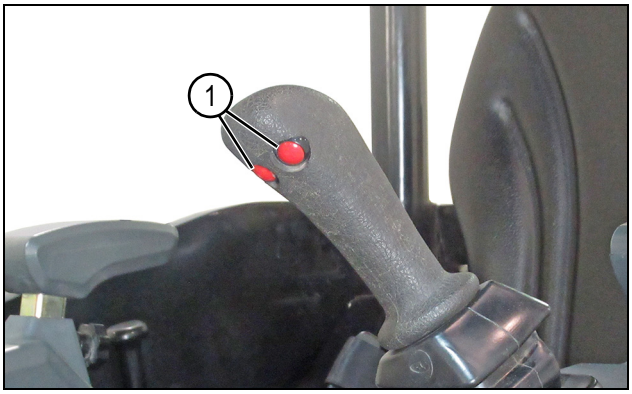

Fig. 3-18 0003279

Right Joystick Horn Button

The horn button (1) is on the bottom of the right joystick. Press and hold the button to sound the horn.

Fig. 3-19 0005093

Right Joystick Switch

Move the right joystick switch (1) to the left or right to control auxiliary work equipment having two-way hydraulic flow. This switch reverses hydraulic flow between the left and right switch positions. If the work equipment has one-way flow, keep the switch in the left position.

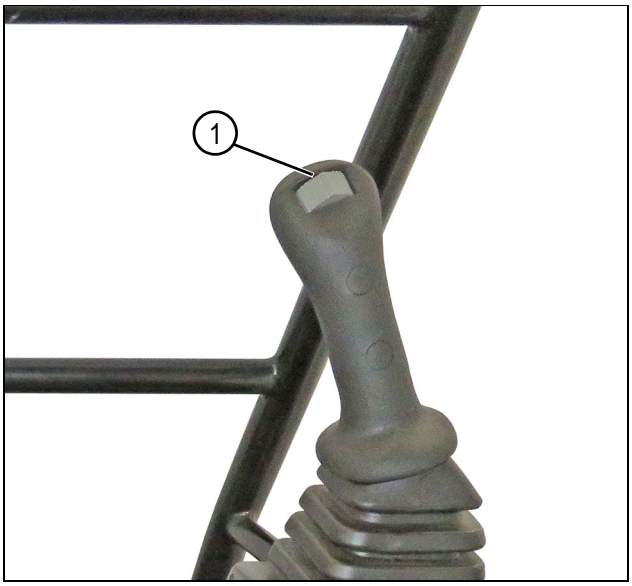

Fig. 3-20 0005116

Throttle Control Lever

Use the throttle control lever (1) to adjust engine speed:

- Pull the throttle control lever back (3) to increase engine speed (high idle).
- Push the throttle control lever forward (2) to decrease engine speed (low idle).

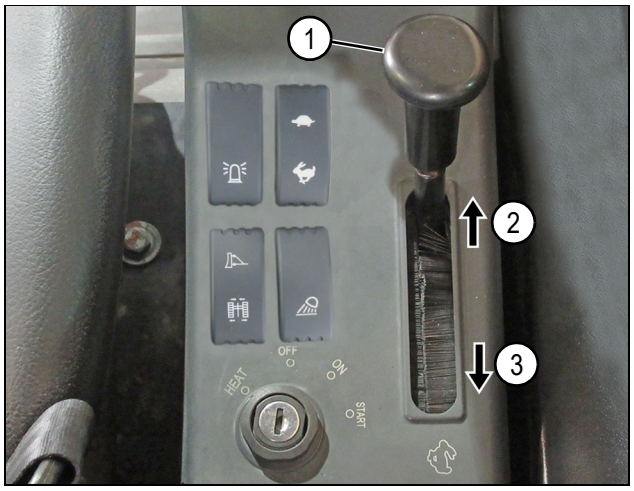

Fig. 3-21 0005118

Key Switch

The key switch (1) is used to start or stop the engine and has four positions:

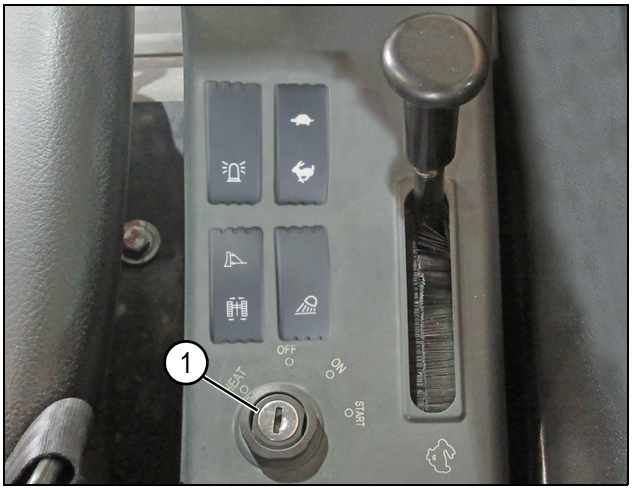

Fig. 3-22 0005095

- **OFF:** When the key switch is turned to OFF, the engine is shut down, power to the electrical system is shut off, and the key can be removed or inserted.
- **ON:** When the key switch is turned to ON, the electrical system is energized.
- **START:** When the key switch is turned to START, the starter motor will crank the engine. Release the key after the engine has started and the key switch will return to ON, allowing the engine to run and maintain power to the electrical systems.
- **HEAT:** Turn the key switch to HEAT, the preheat indicator will illuminate if preheat is activated for cold weather starting. The key switch returns to the OFF position when released.

Dozer Blade/Track Spread Control Switch

The dozer blade/track spread switch (1) selects the function of the dozer blade/track spread control lever.

Fig. 3-23 0005095

- With the switch in the upper (blade) position, the dozer blade/track spread control lever raises and lowers the dozer blade.
- With the switch in the lower (track) position, the dozer blade/track spread control lever spreads and retracts the tracks.

  NOTE: For operation of track spread, See “Track Spread (Gauge) Adjustment” on page 4-30.

Travel Alarm Switch

Use the travel alarm switch (1) to turn an audible alarm and beacon light on and off.

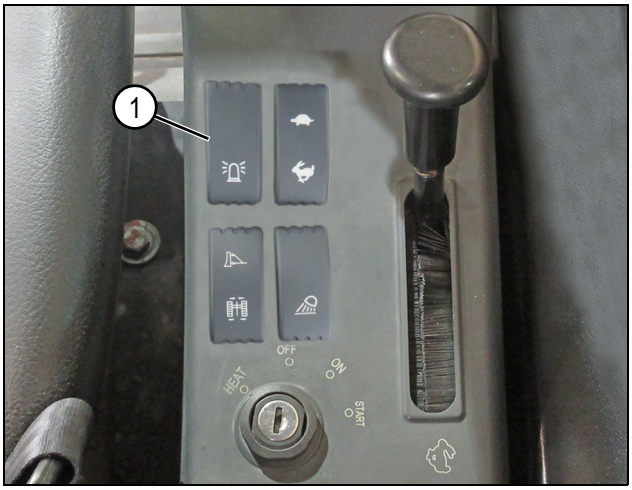

Fig. 3-24 0005095

Travel Speed Selector Switch

The travel speed selector switch (1) selects the speed of the machine travel motors:

- Slow (turtle) position for normal working operations.
- Fast (rabbit) position when moving the machine between work sites and traveling on a flat surface.

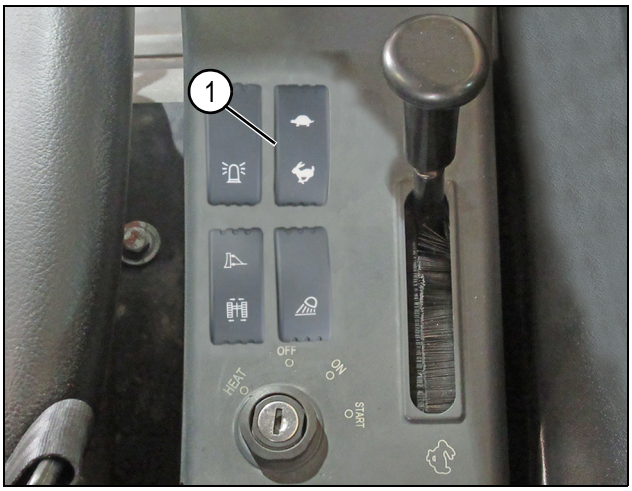

Fig. 3-25 0005095

Work Light Switch

Use the work light switch (1) to turn the work lights on and off.

Fig. 3-26 0005095

There are three work lights:

- Two work lights (2) are mounted on the top of the canopy.
- One work light (3) is mounted on the boom.

Fig. 3-27 0005119

Battery Disconnect Switch

NOTICE!

- **Never turn the battery disconnect switch to OFF while the engine is running. This can damage the electrical system or cause the machine to operate improperly.**
- **After machine shutdown, wait at least 1 minute for the engine control module (ECM) to complete its shutdown before turning the battery disconnect switch to OFF.**

Failure to follow this notice could damage the machine or cause it to operate improperly.

The battery disconnect switch (1) is on the front of the canopy. Turn the switch to OFF to isolate the battery from the electrical system when securing the machine for the day, or as needed for maintenance.

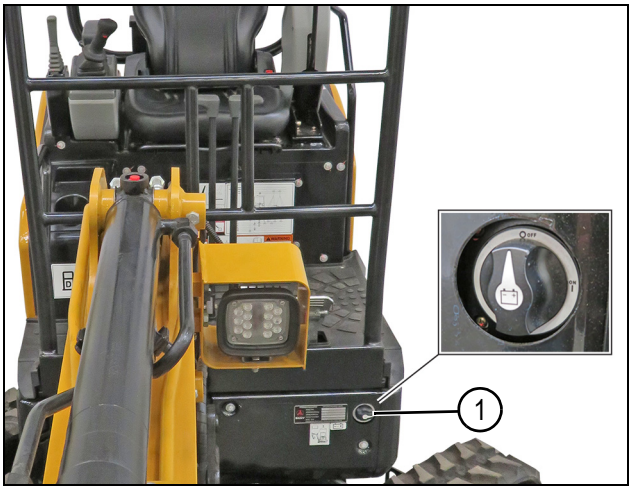

Fig. 3-28 0005121

MONITOR

The monitor is energized when the key switch is in the ON position. The monitor remains on while the machine is running and turns off when the engine is shut down or the battery disconnect switch is in the OFF position.

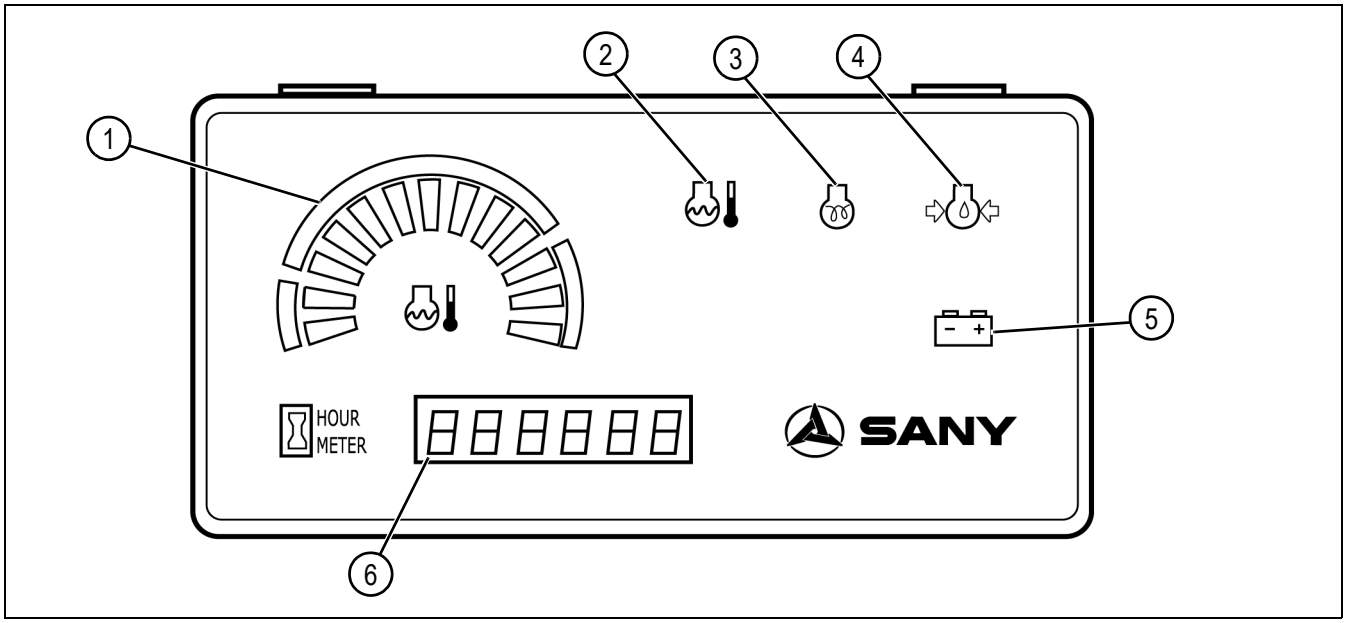

Fig. 3-29 0005122

1) Engine coolant temperature gauge
2) High coolant temperature warning indicator
3) Glow plug heating indicator
4) Low engine oil pressure indicator
5) Battery discharge indicator
6) Engine service hour meter/engine fuel level

Engine Coolant Temperature Gauge

Displays the engine coolant temperature range as a color display increasing from white to blue to red as the engine temperature increases. The temperature gauge should remain in the middle blue area when the machine is operating. A temperature indication in the red range indicates engine overheating. Shut down the engine and have service diagnostics performed to determine why the machine is overheating.

NOTICE!

A high coolant temperature indicates a severe problem that can result in engine damage. Shut down the engine immediately to diagnose and repair the problem.

High Coolant Temperature Warning Indicator

If the engine coolant temperature gauge reaches a red level, this warning indicator turns on to notify the operator of a serious engine overheating problem.

NOTICE!

A high coolant temperature indicates a severe problem that can result in engine damage. Shut down the engine immediately to diagnose and repair the problem.

Glow Plug Heating Indicator

Illuminates when the engine is first started but turns off in a few seconds. This indicator turns on when the key switch is turned to the HEAT position to start an engine preheat cycle. When the glow plug heating indicator turns off, the engine can be started.

Low Engine Oil Pressure Indicator

Illuminates when the engine is first started but turns off in a few seconds. This indicator turns on when the engine oil pressure drops below a preset level. Shut down the engine and have service diagnostics performed to determine why the engine oil pressure is low.

NOTICE!

A low engine oil pressure indicates a severe problem that can result in engine damage. Shut down the engine immediately to diagnose and repair the problem.

Charging System Fault Indicator

Illuminates when the engine is first started but turns off in a few seconds. This indicator turns on when there is a fault in the charging system or battery. Service diagnostics are required to determine the source of the problem and the corrective action.

Engine Service Hour/Engine Fuel Level

Toggles every 5 seconds to display the number of service hours on the machine and the current fuel level.

HOOD AND ACCESS PANELS

Engine Hood

Opening the Engine Hood

1. Insert the key into the lock (1) and turn the key counterclockwise to unlock the engine hood (2).

2. Pull the engine hood open.

Fig. 3-30 0005150

3. Position the support rod (4) in the support bracket (3) slot to prevent the engine hood from closing unexpectedly.

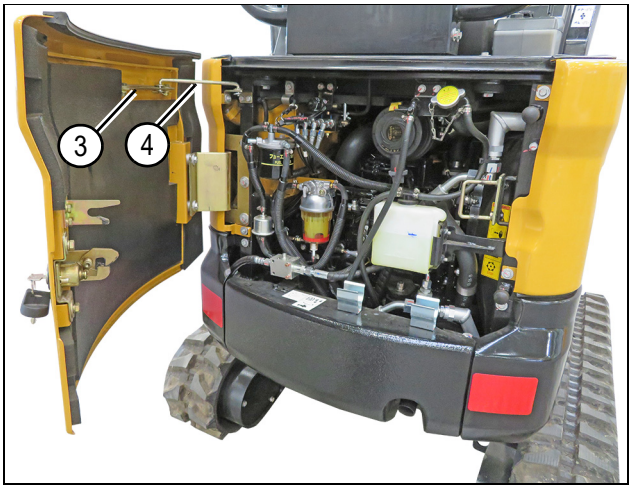

Fig. 3-31 0005153

Closing the Engine Hood

1. Pull the support rod out of the slot in the support bracket.

2. Close the engine hood and make sure it is firmly seated in the latch.

3. Insert the key into the lock, turn it clockwise to lock, and remove the key.

Right Access Panel

The right access panel (1) provides access to:

- Radiators
- Fuel tank

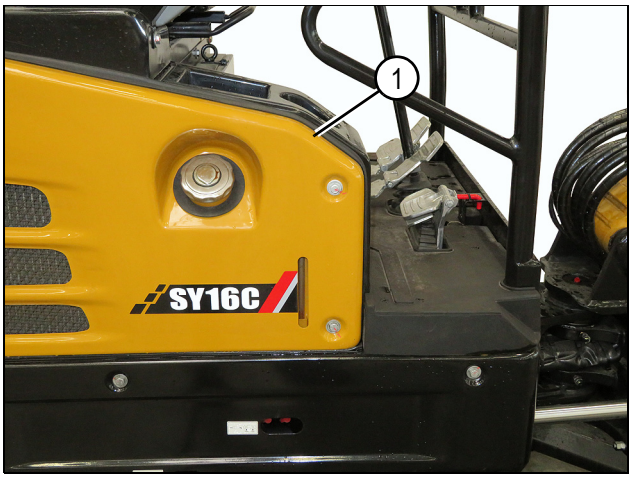

Fig. 3-32 0005165

Remove/Install the Right Access Panel

1. Open the engine hood.
2. Remove two fasteners (2) from the rear of the right access panel (1).

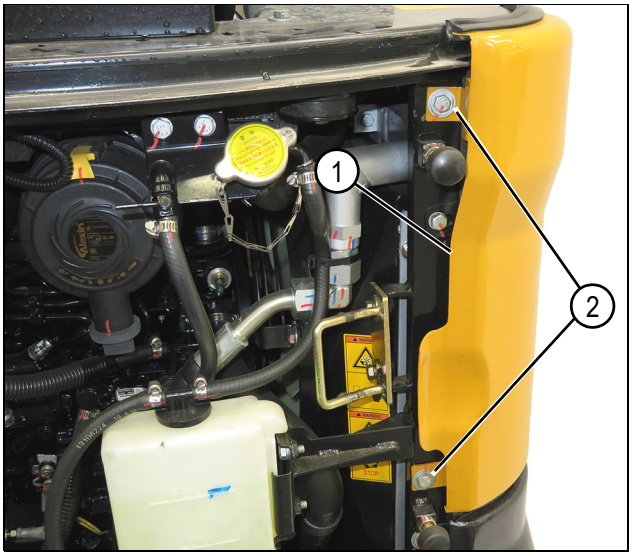

Fig. 3-33 0005164

3. Remove two fasteners (3) from the side of the right access panel (1).
4. Remove fuel tank filler cap (4) and the right access panel.
5. Install right access panel in reverse order of removal.

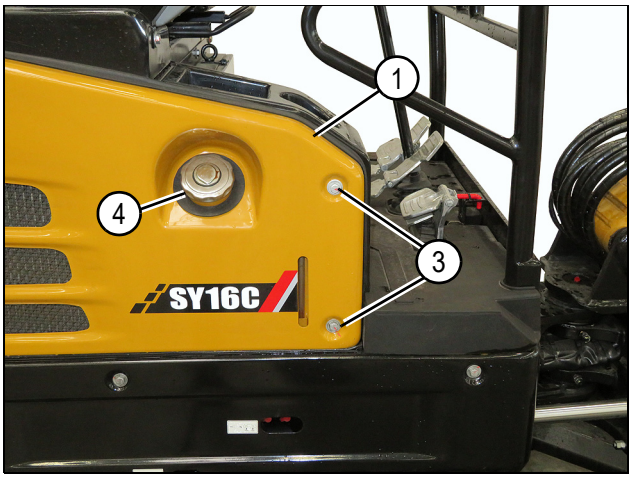

Fig. 3-34 0005165

Right Skirt Panel

The right side skirt panel (1) provides access to:

- Radiator drain valve
- Fuel tank drain valve

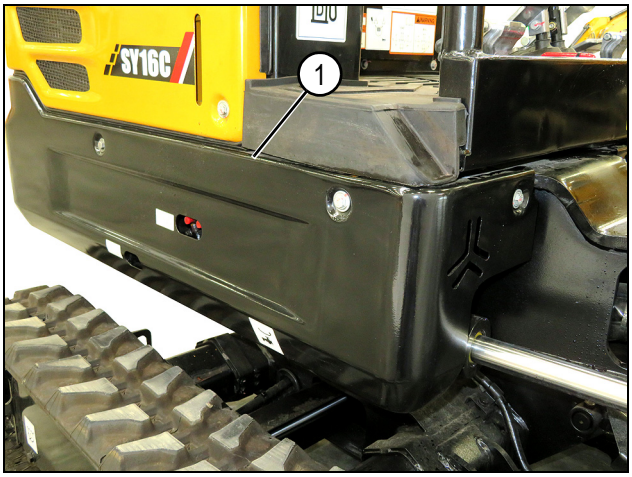

Fig. 3-35 0005168

Remove/Install the Right Skirt Panel

1. Open the engine hood.
2. Remove one fastener (2) from the rear of the right skirt panel (1).

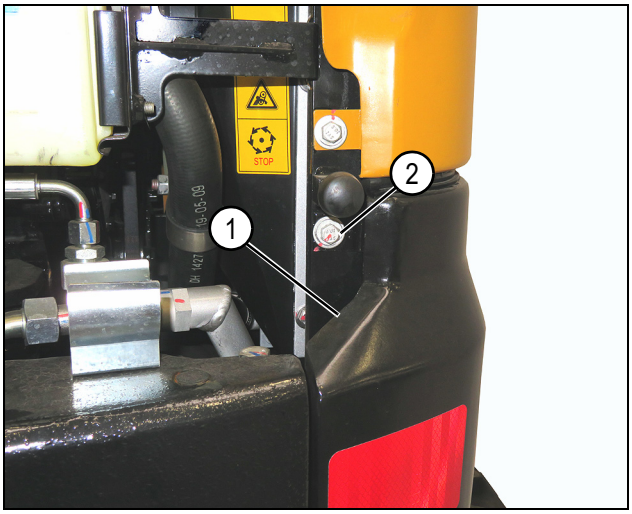

Fig. 3-36 0005167

3. Remove three fasteners (3) from the top of the right skirt panel (1).
4. Remove three fasteners (4) from the bottom of the right skirt panel and remove the panel.
5. Install the right skirt panel in reverse order of removal.

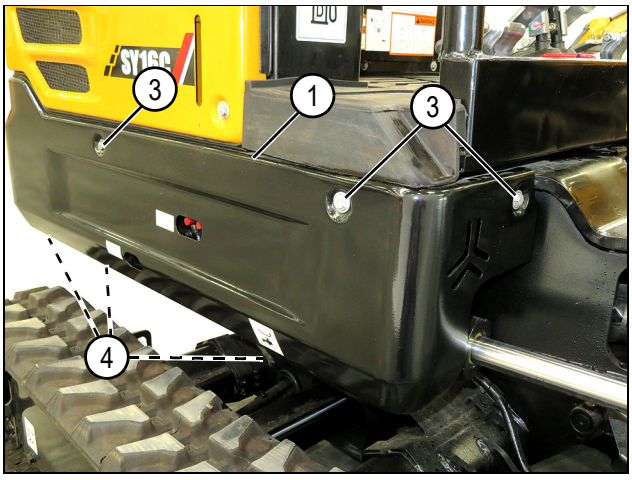

Fig. 3-37 0005168

Left Access Panel

The left access panel (1) provides access to:

- Hydraulic tank
- Hydraulic tank filler cover
- Hydraulic pump

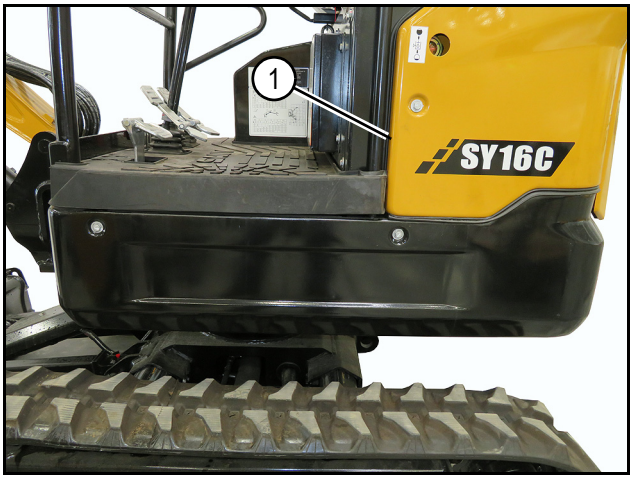

Fig. 3-38 0005170

Remove/Install the Left Access Panel

1. Open the engine hood.
2. Remove two fasteners (2) from the rear of the left access panel (1).

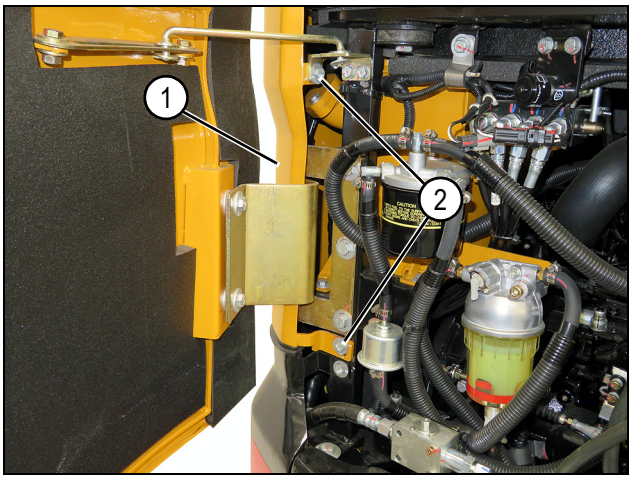

Fig. 3-39 0005169

3. Remove one fastener (3) from the side of the left access panel and remove the panel (1).
4. Install the left access panel in reverse order of removal.

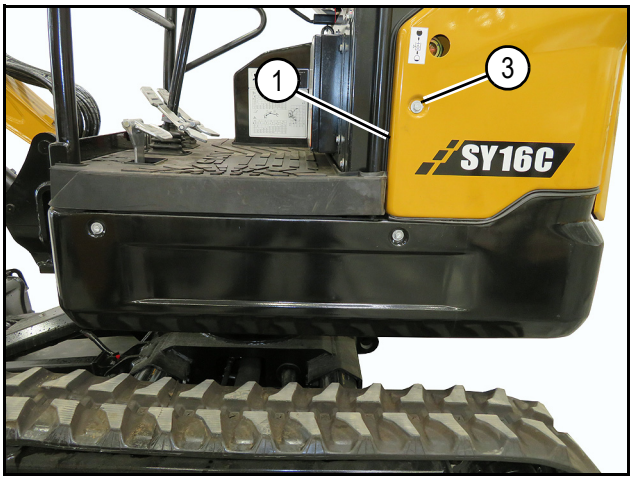

Fig. 3-40 0005170

Left Skirt Panel

The left side skirt panel (1) provides access to:

- Main control valve
- Hydraulic pump

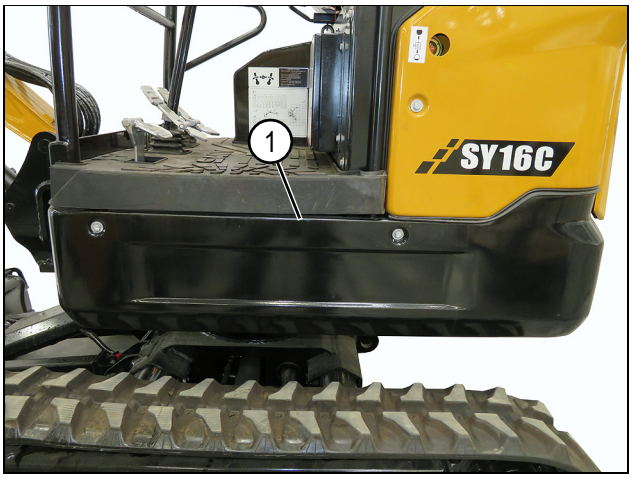

Fig. 3-41 0005170

Remove/Install the Left Skirt Panel

1. Open the engine hood.
2. Remove one fastener (2) at the rear of the left skirt panel (1).

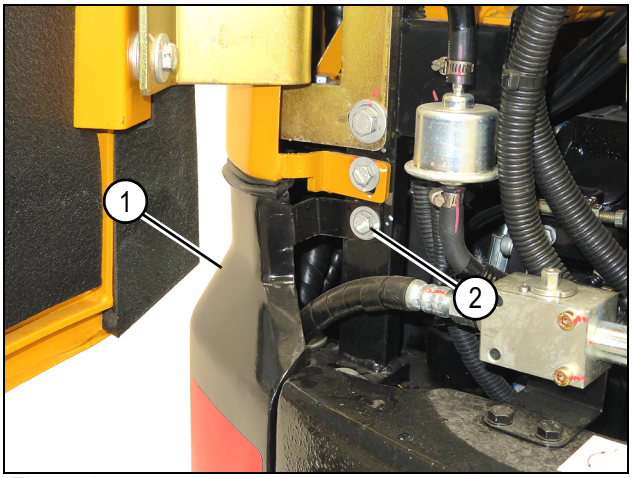

Fig. 3-42 0005171

3. Remove two fasteners (3) from the side of the left skirt panel (1).
4. Remove three fasteners (4) from the bottom of the left skirt panel and remove the left skirt panel.
5. Install the left skirt panel in reverse order of removal.

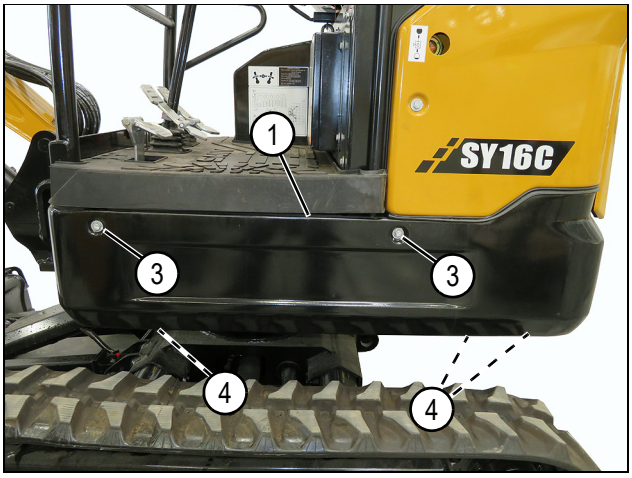

Fig. 3-43 0005170

Floor Access Panel

The floor access panel (2) provides access to:

- Accumulator
- Hydraulic control valve
- Swing motor
- Electronic engine controls

To remove the floor access panel:

1. Lift up and remove the floor mat (1).
2. Remove the floor panel to access hydraulic components and engine controls.
3. Install the floor access panel in reverse order of removal.

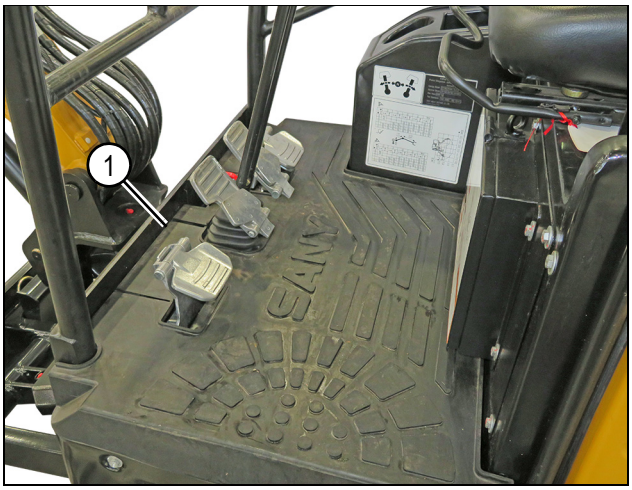

Fig. 3-44 0005151

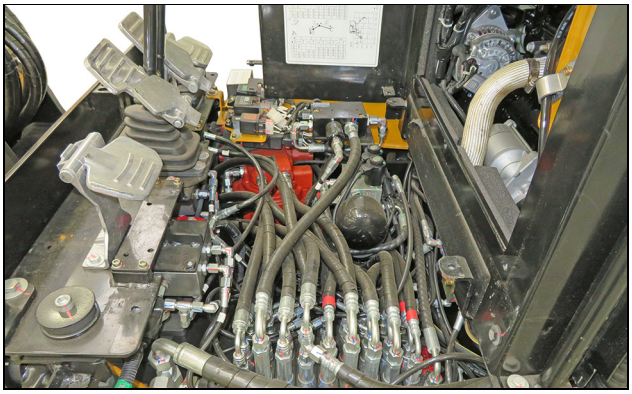

Fig. 3-45 0005154

Boom Swing Lock Handle

When the machine is being transported, pull up on handle and move the boom swing lock handle (1) to locked position (2).

To ready machine for operation, pull up on handle and move the boom swing lock handle (1) to the unlocked position (3).

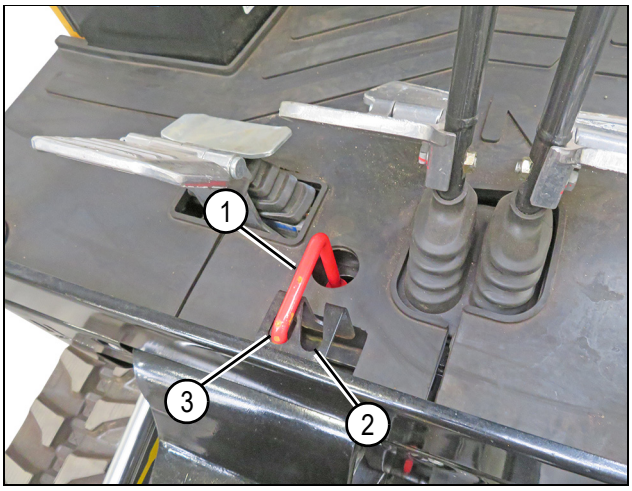

Fig. 3-46 0005084

STORAGE AND HOLDERS

Cup Holder Console

For operator convenience, a cup holder (1) and storage bin (2) are provided.

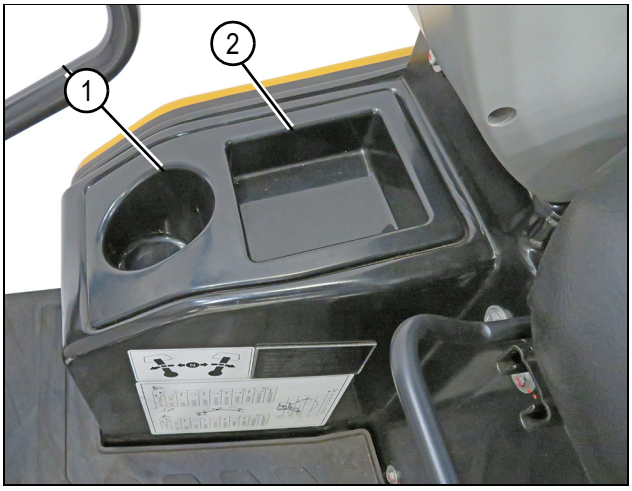

Fig. 3-47 0004984

Storage Box

A storage box (1) behind the operator seat provides a location to store personal or other important items.

The latch (2) may be secured with a padlock.

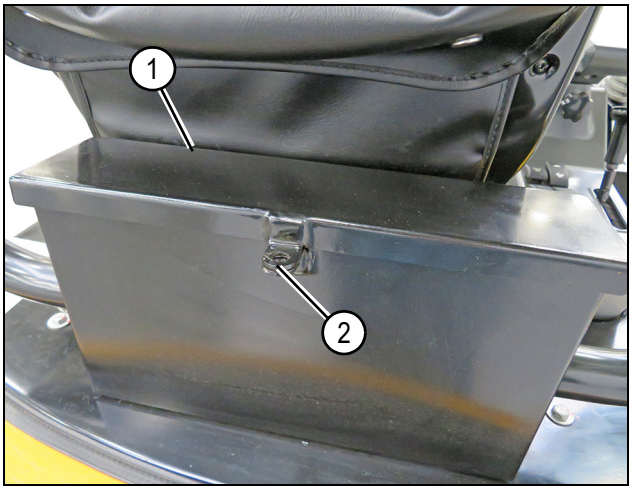

Fig. 3-48 0005083

Documentation Storage Compartment

In front of the operator seat is a documentation storage compartment (1) for operator manuals and other documentation.

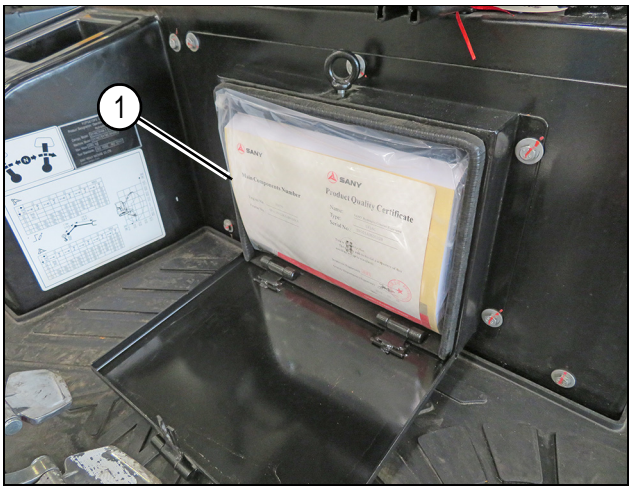

Fig. 3-49 0005142

FUSES

The fuse panel (1) is under the panel cover plate (3) on the right side of the machine.

Lift up or remove the floor mat to remove fasteners (2) and the fuse panel cover plate (3).

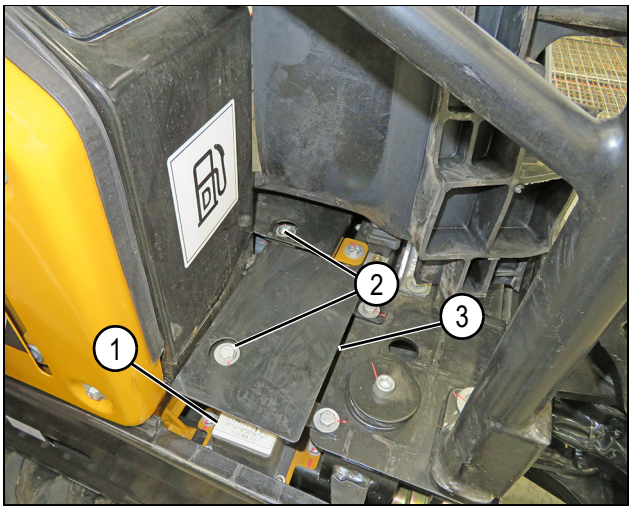

Fig. 3-50 0005157

NOTICE!

A fuse should be replaced if it is blown, corroded, or becomes loose in the fuse block.

Before replacing a fuse, make sure the key switch is in the OFF position and the batteries are disconnected.

Always replace a fuse with one of the same capacity. Never replace a fuse with one of a higher capacity which could damage the machine or cause it to operate improperly.

If an electrical component fails, check the fuse first.

Fuse	Amperage	Circuit
F1	20A	Starting circuit
F2	30A	Solenoid
F3	5A	Charging loop
F4	10A	Fuel pump
F5	15A	Monitor
F6	10A	Pilot loop
F7	15A	Work lights
F8	5A	Beacon light
F9	5A	Travel speed
F10	15A	Horn

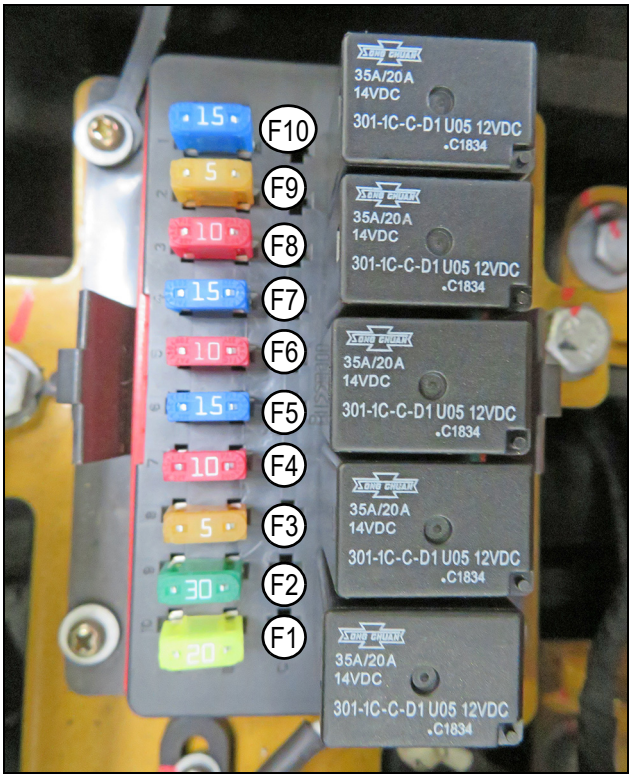

Fig. 3-51 0005129

Relays

Relay #	Rating	Circuit
K2	14V/35A	Horn
K3	14V/35A	Starting
K4	14V/35A	Work lights
K8	14V/35A	Engine
K9	14V/35A	Beacon light

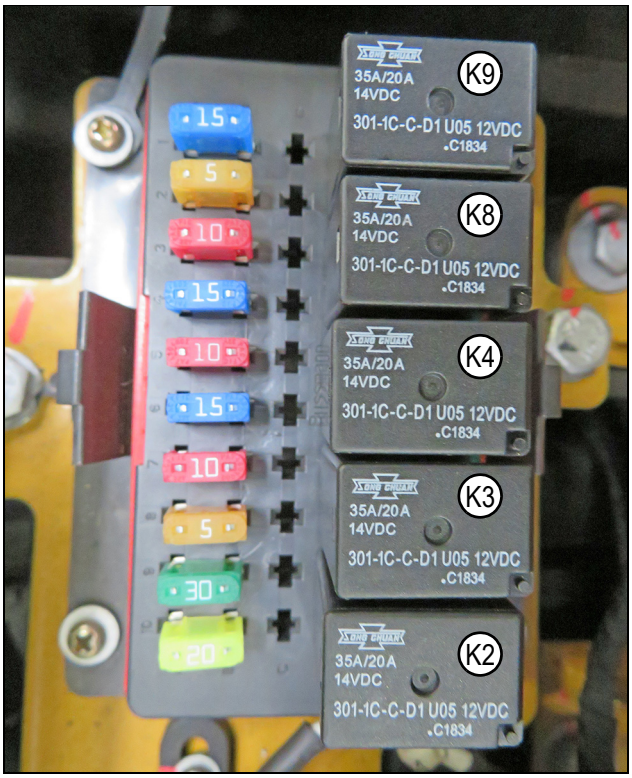

Fig. 3-52 0005129

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SANY

Machine Operation

WORK AREA

The work area is where the actual job is performed. Within the work area are hazard areas. Hazard areas immediately surround the machine where personnel may be at risk due to the machine's operation and movement.

All personnel within the work area must wear appropriate personal protective equipment (PPE).

The machine operator is responsible for the safety of all personnel within the hazard area.

GENERAL JOB SAFETY

See "Job Safety" on page 2-12 for additional information.

Operator Responsibilities

The machine operator must perform the following:

- Reject the job site if there are doubts regarding safety.
- Become familiar with the work area and surroundings before beginning work.
- Read and completely understand the instructions in this manual prior to operation.
- Know and obey all operating procedures, applicable laws, and regulations.
- Know and follow the requirements for safe operation.
- Know and use the required safety precautions and protective devices.
- Know and use the correct hand signals that will be used between the machine operator and a signalman.
- Stop machine operations immediately if any defects endangering safety are found.
- Maintain complete control over the machine at all times.
- Before leaving the canopy, make sure that all control devices are set to the neutral or low idle position and the engine is shut down.
- Give warning signals when necessary.

Daily Maintenance Record Check

Check the Maintenance Log to verify that all required maintenance checks have been performed before operating the machine. If these checks and actions have not been performed, notify your supervisor.

NOTE: See "Maintenance Log" on page 1-3, and "Maintenance Information" on page 5-4.

Cleaning the Machine

NOTE: Clean the grab handles and steps of any grease or debris to allow a firm grip when entering or exiting the operator area.

Make sure the following items are clean before operating the machine:

- Mirror (1)
- Grab handles (2)

Fig. 4-1 0004894

PRESTART CHECKS AND ADJUSTMENTS

Complete the following checks and adjustments before starting the engine each day:

- Check the Maintenance Log to verify that all required maintenance checks have been performed before operating the machine.
- Check the machine for loose hardware, fluid leaks, and any other signs of damage. Make repairs as necessary.
- Inspect the engine compartment for combustible debris that may come in contact with hot engine components. Clear all debris from the engine and engine compartment.
- Check the undercarriage (tracks, drive sprockets, rollers, and guards) for damage, wear, loose fasteners, and roller oil leaks. Make repairs as necessary.
- Check the bucket or optional equipment for damage. Clean and check the mirrors and side mirrors for damage. Repair if necessary. Adjust the mirrors so the area behind the machine is visible from the operator seat.
- Check the seat belt and buckle for damage or wear. Replace them if necessary.
- Check the monitor in the canopy. Repair or replace any malfunctioning parts and components.

FLUID LEVEL CHECKS

Complete the following procedures in this section before starting the engine.

Engine Coolant Level Check

WARNING!

- **Engine coolant is toxic. Avoid inhaling or ingesting engine coolant. If eyes or skin are contaminated by coolant, wash the affected area with plenty of water and seek medical treatment immediately.**
- **Engine coolant may be under pressure when the engine is hot. Avoid contact with hot engine coolant. Allow the engine to cool before removing the radiator cap.**

Failure to follow these warnings could result in death or serious injury.

1. Park the machine for maintenance. See “Maintenance Safety” on page 2-9.
2. Open the engine hood.

   NOTE: See “Recommended Lubricants, Fuels, and Coolant” on page 5-8.

3. Make sure the engine coolant level in the overflow tank (1) is between the FULL (2) and LOW (3) marks. If the engine coolant level is low, add engine coolant through the fill opening (4) of the overflow tank until the engine coolant is at the FULL mark.
4. Install the fill cap after refilling.

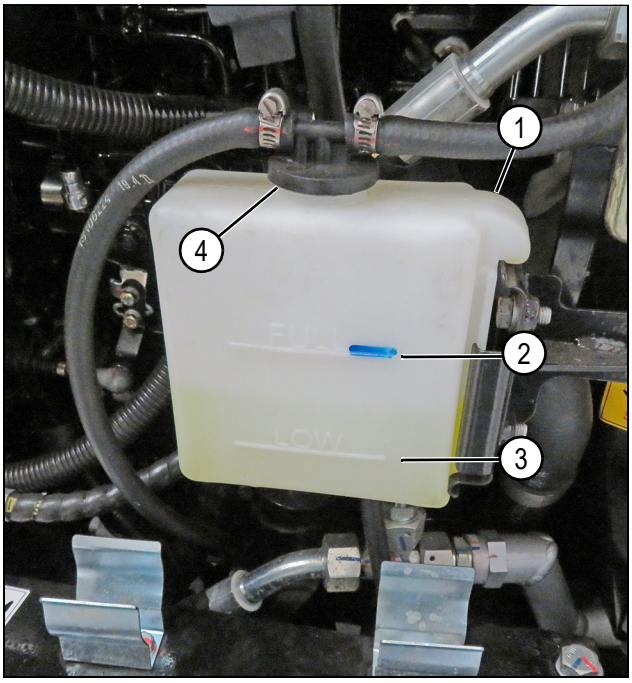


Fig. 4-1 0005082

NOTICE!

- **If the overflow tank is empty, there may be an engine coolant leak.**
- **Inspect for engine coolant leaks and repair if found. If a leak is not found, check for an internal leak.**

Contact a SANY dealer for additional information.

Engine Oil Level Check

WARNING!

Hot engine oil and components may cause burns or other serious injury. Allow the engine to cool before performing engine maintenance. Failure to follow this warning could result in death or serious injury.

1. Park the machine for maintenance. See “Maintenance Safety” on page 2-9.
2. Open the engine hood.
3. Remove the dipstick (1) and wipe the engine oil off with a clean cloth.
4. Fully insert the dipstick into the dipstick opening, then remove it and note the oil position on the dipstick.

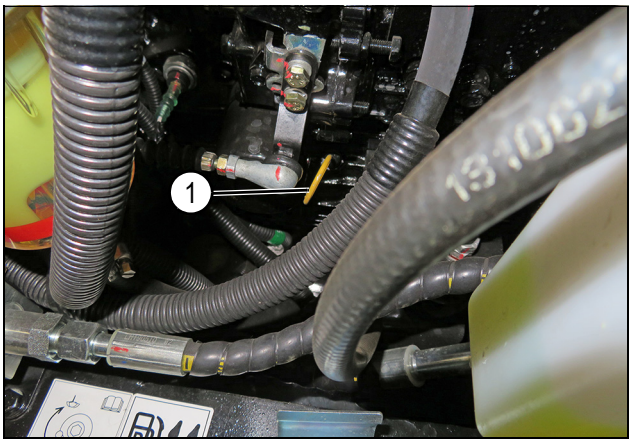


Fig. 4-2 0005086

NOTICE!

Do not add oil past the upper mark on the dipstick, as this may result in engine damage.

5. The engine oil level must be maintained between the upper mark (2) and lower mark (3) of the dipstick. Add clean engine oil until the oil level is at the upper mark of the dipstick.

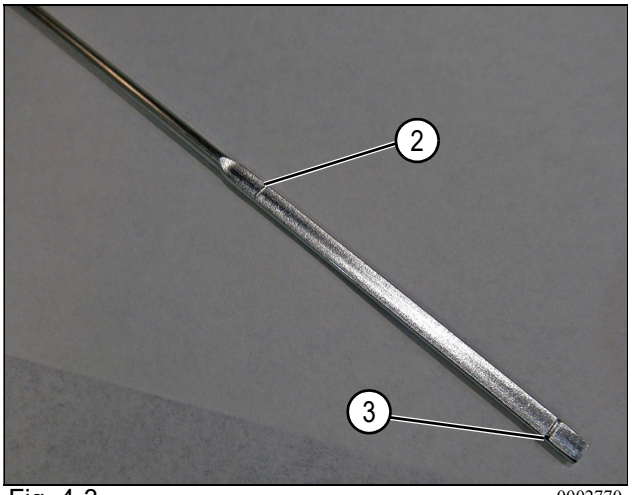


Fig. 4-3 0002770

6. The engine oil filler cap (4) is behind the coolant over flow tank. Add engine oil as needed. Always use SANY-recommended engine oil.

   NOTE: If the engine oil level is above the upper mark on the dipstick, drain the excess engine oil. See “Change the Engine Oil and Filter” on page 5-19.

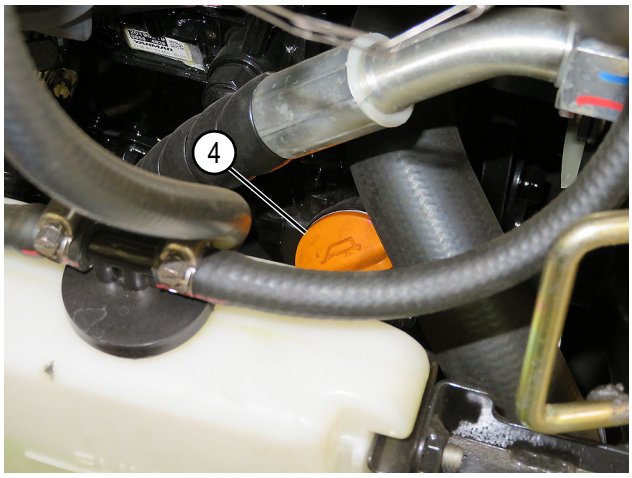


Fig. 4-4 0005166

Fuel Level Check

1. Turn the key switch to ON to activate the monitor.
2. Check the fuel level on the monitor. See “Engine Service Hour/Engine Fuel Level” on page 3-21.
3. Turn the key switch to OFF.

Add Fuel

WARNING!

- **Fuel or fuel vapors that come into contact with hot surfaces or electrical components can cause a fire.**
- **Never service the fuel system near an open flame or while smoking.**
- **Clean up spilled fuel immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Contaminated fuel can cause engine damage or improper machine operation. Fill the fuel tank with clean diesel fuel.

1. Remove the fuel tank filler cover. See “Fuel Tank Filler Cover” on page 4-10.
2. Fill the machine with clean diesel fuel as necessary.

   NOTE: Never overfill the fuel tank. Stop fueling if the fuel spills over the fuel fill strainer. Make sure the fuel gun nozzle does not damage the fuel fill strainer.

3. Install the fuel tank filler cover after refueling.

Fuel Tank Filler Cover

NOTICE!

Make sure the O-ring in the filler cover is clean. If the O-ring is contaminated by dirt or debris, the O-ring will be damaged, preventing the filler cover from sealing properly.

To remove the fuel tank filler cover (1), unlock and turn counterclockwise.

To replace the fuel tank filler cover, place the cover on the filler neck and turn clockwise. Lock the fuel tank filler cover.

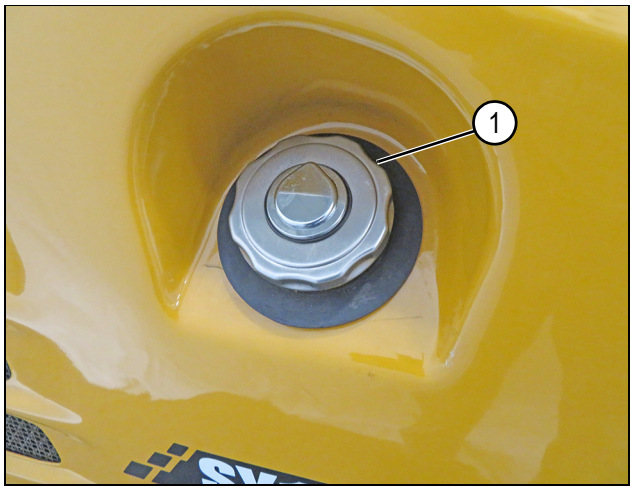


Fig. 4-5 0005092

Drain the Fuel/Water Separator

WARNING!

- **Fuel or fuel vapors that come into contact with hot surfaces or electrical components can cause a fire.**
- **Never service the fuel system near an open flame or while smoking.**
- **Clean up spilled fuel immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Dispose of contaminated fuel or water in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

A fuel/water separator separates water and sediment from diesel fuel. Complete the following steps to drain water and sediment from the fuel/water separator:

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9
2. Open the engine hood.
3. Route the drain hose (2) into a suitable container. Open the drain valve (1) and drain the water and sediment.
4. When only clean fuel flows through the drain valve, close and hand-tighten the valve.
5. Start the engine and check for leaks.

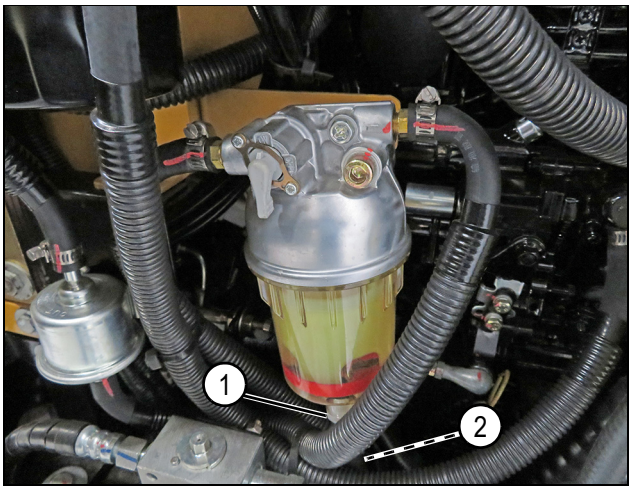


Fig. 4-6 0005080

Hydraulic Oil Level Check

1. Position the work equipment as shown on the hydraulic tank decal.
2. Park the machine for maintenance. See “Maintenance Safety” on page 2-9.

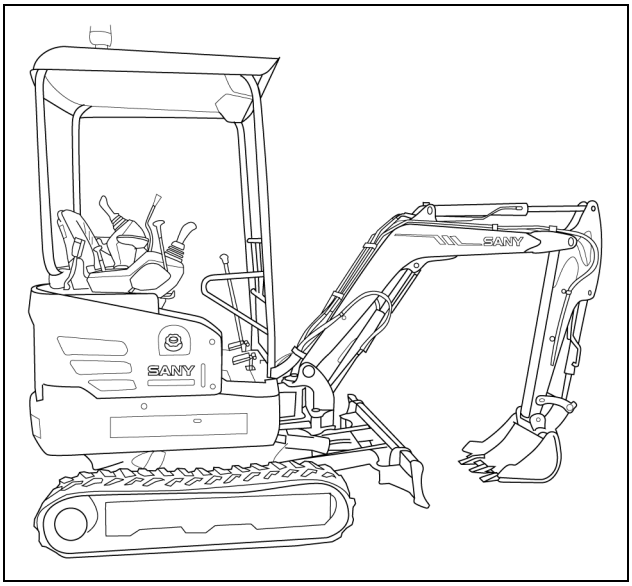


Fig. 4-7 0005096

3. The hydraulic oil level sight glass can be seen through the opening (1) in the left side access panel.
4. Check the hydraulic oil level in the hydraulic tank through the sight glass (2). The hydraulic oil level should be between the high (4) and low (3) levels as shown on the machine decal.
5. If the hydraulic oil level is below the low level, add hydraulic oil. See “Add Hydraulic Oil” on page 5-37.

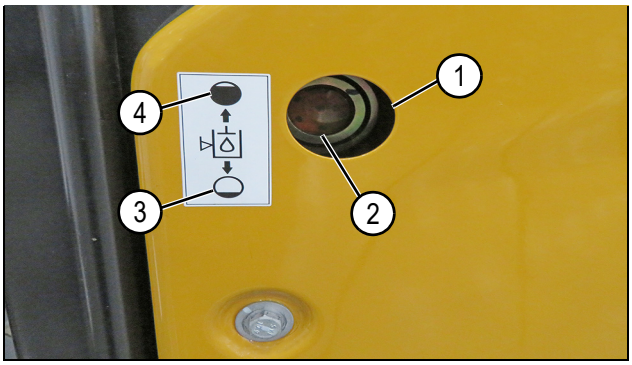


Fig. 4-8 0004983

MIRROR ADJUSTMENT

1. Loosen fasteners (2) that secure the mirror (1) to the arm and rail.

2. Adjust the mirror for the best visibility to the rear of the machine and tighten the fasteners.

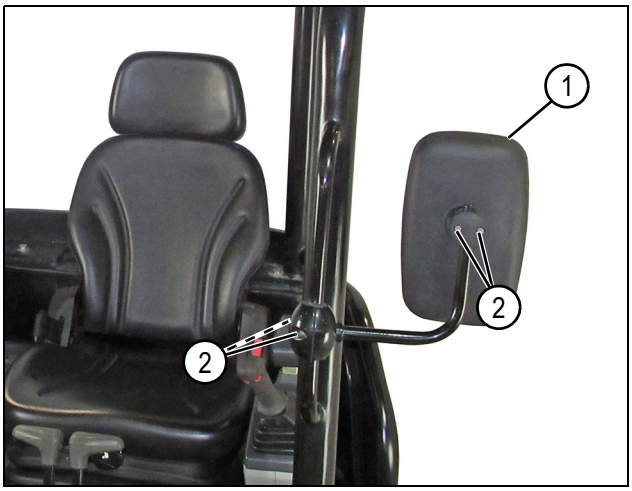


Fig. 4-9 0003251

ELECTRICAL COMPONENTS CHECK

NOTICE!

If fuses fail frequently, the wiring harness must be inspected for broken or damaged wire insulation or a component placing a high electrical load on the system. Contact a SANY dealer for additional information.

Failure to follow this notice could damage the machine or cause it to operate improperly.

Check the fuse panel for blown fuses, fuses of incorrect capacity, open or short circuits, and loose connections. Replace blown fuses and fuses of incorrect capacity, and tighten loose connections as necessary.

Make sure the battery cables and wires are clean and in good condition when inspecting the battery, starting motor, and alternator.

Clear the area around the battery of combustible materials. For more information about troubleshooting faults in the electrical system, contact a SANY dealer.

Horn Function Check

1. Turn the key switch to the ON position. See “Starting the Engine” on page 4-16.

2. The horn sounds when the horn button (1) is pressed. If the horn does not sound, check the horn fuse. See “Fuses” on page 3-30.

Fig. 4-10 0005093

SEAT AND SEAT BELT

This machine has an operator seat with seat position, seat weight suspension, and seat backrest adjustments.

Seat Forward/Backward Adjustment

When seated, lift the position adjustment lever (1) on the front of the seat. Slide the seat forward or backward to the desired position and release the lever to lock the seat in place.

Fig. 4-11 0005101

Seat Backrest Angle Adjustment

Lift the backrest angle adjustment lever (1) on the left side under the backrest and move the backrest forward or backward to the desired position. Release the lever. The backrest will lock in the desired position.

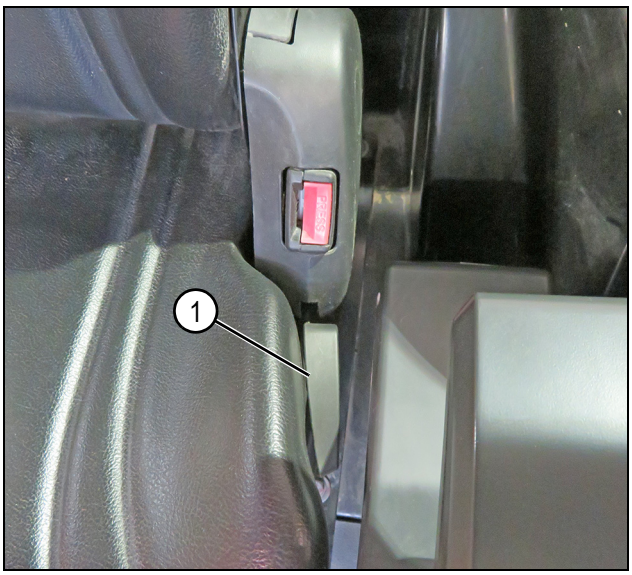


Fig. 4-12 0003835

Seat Belt

WARNING!

- **Inspect the seat belt. Replace the seat belt Immediately if the webbing is frayed or cut, if the buckle is damaged or malfunctions, or if the mounting hardware is loose. Replace according to the seat belt manufacturer's instructions.**
- **Always keep the seat belt fastened during machine operation. Never twist the seat belt when fastening it.**
- **Keep belt slack to no more than 1 in. (25 mm). Belt slack beyond this amount could significantly reduce your protection in an accident.**

Failure to follow these warnings could result in death or serious injury.

Buckle the Seat Belt

WARNING!

Keep seat belt slack to no more than 1 in. (25 mm). Belt slack beyond this amount could significantly reduce your protection in an accident. Failure to follow this warning could result in death or serious injury.

NOTE: A recoil assembly (1) is attached to the seat belt. It removes slack from the seat belt and locks to restrain the operator. It also retracts the seat belt when not in use.

Fig. 4-13 0005088

Grasp the latch plate (2) to pull the seat belt out of the recoil assembly, and insert the latch plate into the buckle (3) until it locks into place. Pull on the latch-plate end of the seat belt to make sure the seat belt is securely fastened.

Unbuckle the Seat Belt

Press the red button (4) on the buckle to release the latch plate.

STARTING THE ENGINE

WARNING!

- **Before starting the engine or leaving the operator seat, make sure the hydraulic lockout control lever is in the locked (closed) position. If the hydraulic system is not locked, unintentional machine operation may occur.**
- **Confirm that the surrounding area is clear of personnel and obstructions, and sound the horn before starting the engine.**
- **Always start the engine from the operator seat. Never start the engine by shorting the starter solenoid or starter relay.**
- **Never use ether starting fluid to start the engine. Ether is highly flammable and can cause a fire or an explosion.**
- **Exhaust gas contains carbon monoxide. Carbon monoxide is an invisible and odorless gas, and is toxic. Provide adequate ventilation when starting the engine in a confined space.**

Failure to follow these warnings could result in death or serious injury.

1. Turn the battery disconnect switch to ON. See “Battery Disconnect Switch” on page 3-19.
2. When in the operator seat, buckle the seat belt. See “Buckle the Seat Belt” on page 4-15.
3. Check that the emergency stop switch is in the RUN position. See “Battery Disconnect Switch” on page 3-19.
4. Pull the hydraulic lockout control lever (1) back and make sure it is in the locked (closed) position. If it is in the unlocked (open) position, the engine will not start. See “Hydraulic Lockout Control Lever” on page 3-5.

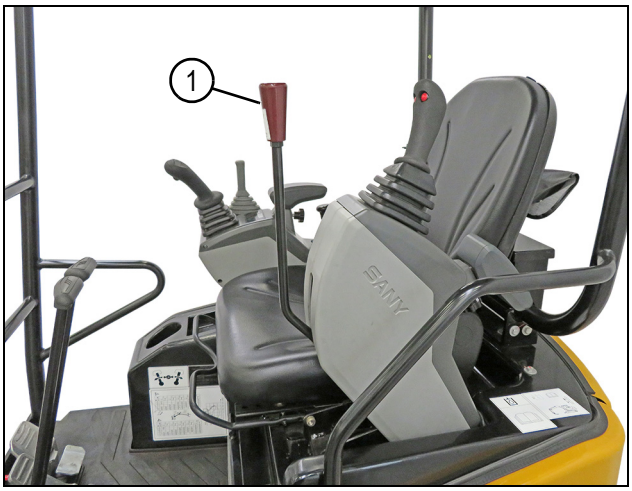


Fig. 4-14 0005094

WARNING!

The boom swing pedal, optional equipment pedal, and the dozer blade control are NOT disabled when the hydraulic lockout control valve is in the locked (closed) position. Make sure the covers are over the pedals when not in use, and avoid unintentional movement of the dozer blade control while the engine is running. Failure to follow these precautions could result in death or injury.

5. Make sure the control levers and pedals are in the neutral position, move freely, and return to the neutral position when released.

NOTICE!

Starting with the throttle control lever positioned to the rear (high Idle) will accelerate the engine and could damage it.

6. Push the throttle control lever (2) to the forward (low idle) position.

7. Turn the key switch (3) to ON (do not start the engine) and check the following items on the monitor display:

   - Engine coolant temperature
   - Fuel level

   NOTE: Sound the horn to warn personnel that the machine is being started. See "Horn Function Check" on page 4-13.

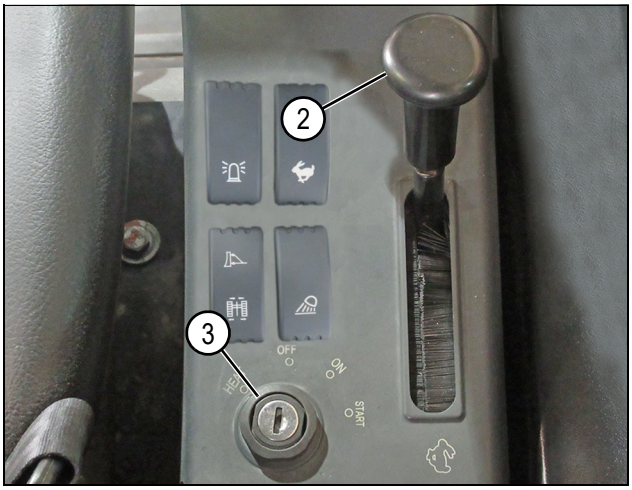


Fig. 4-15 0005095

NOTICE!

Never crank the engine for more than 15 seconds, as it could damage the machine or cause it to operate improperly. If the engine fails to start after 15 seconds, stop and allow the starter motor to cool for at least 2 minutes before attempting another start.

8. To start the engine, turn the key switch to START. When the engine starts, release the key immediately and it will return to ON.

Idling the Engine

Idling the engine for long periods wastes fuel and causes carbon formation, oil dilution, formation of lacquer or gummy deposits on the valves, pistons, and rings, and rapid accumulation of sludge in the engine. Allow the engine to idle until the engine coolant temperature reaches a normal operating temperature.

Cold Weather Engine Starting

WARNING!

- **Before starting the engine or leaving the operator seat, make sure the hydraulic lockout control lever is in the locked (closed) position. If the hydraulic system is not locked, unintentional machine operation may occur.**
- **Confirm that the surrounding area is clear of personnel and obstructions, and sound the horn before starting the engine.**
- **Always start the engine from the operator seat. Never start the engine by shorting the starter solenoid or starter relay.**
- **Never use ether starting fluid to start the engine. Ether is highly flammable and can cause a fire or an explosion.**
- **Exhaust gas contains carbon monoxide. Carbon monoxide is an invisible and odorless gas, and is toxic. Provide adequate ventilation when starting the engine in a confined space.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Never crank the engine for more than 15 seconds as it could damage the machine or cause it to operate improperly. If the engine fails to start after 15 seconds, stop and allow the starter motor to cool for at least 2 minutes before attempting another start.

Start the engine with the following procedures in cold temperatures:

1. Check the fluid levels before starting the engine. Drain the water and sediment from the fuel/water separator once a week. See “Drain the Fuel/Water Separator” on page 4-10.
2. Turn the battery disconnect switch to ON. See “Battery Disconnect Switch” on page 3-19.
3. When in the operator set, buckle the seat belt. See “Seat Belt” on page 4-15.

WARNING!

The machine should not move when the hydraulic lockout control lever is in the locked (closed) position. If it does, contact a SANY dealer. Failure to correct this could result in death or serious injury.

4. Move the hydraulic lockout control lever (1) to the locked (closed) position. If it is in the unlocked (open) position, the engine will not start.

5. Make sure the control levers/pedals and joysticks are in the neutral position, move freely, and return to the neutral position when released.

6. Push the throttle control lever (2) to the forward (low idle) position.

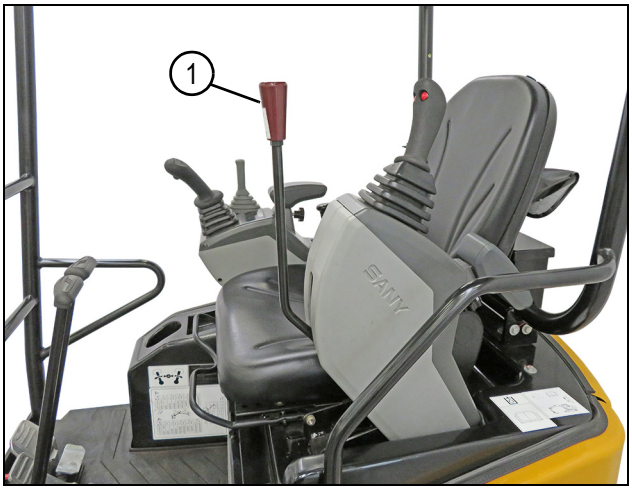


Fig. 4-16 0005094

NOTICE!

Before starting the engine, make sure that the throttle control lever (2) is in the low idle (turtle) position. Starting with the throttle control dial at the high idle (rabbit) position will accelerate the engine and could damage it.

7. Turn the key switch (3) to the HEAT position and release. The key switch returns to OFF. The preheat cycle begins if the coolant temperature is below a preset temperature. When the preheat cycle begins, a glow plug heating icon is illuminated on the monitor screen. (See “Glow Plug Heating Indicator” on page 3-21.) When the preheat cycle is complete, the glow plug heating icon will turn off.

8. Sound the horn to warn personnel that the machine is being started.

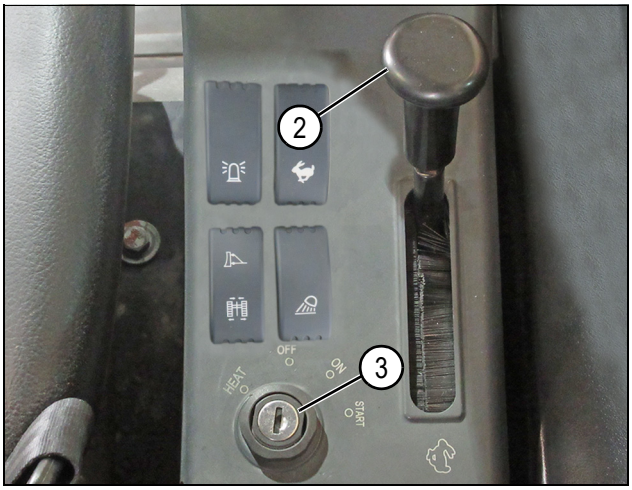


Fig. 4-17 0005095

NOTICE!

Never crank the engine for more than 15 seconds. If the engine fails to start after 15 seconds, stop and allow the starter motor to cool for at least 2 minutes before attempting another start. If the engine fails to start after five attempts, contact a SANY dealer. Failure to follow this notice could damage the machine or cause it to operate improperly.

9. Turn the key switch to START. When the engine starts, release the key. The key will return to ON.

   NOTE: If the engine fails to start after preheating, wait at least 5 seconds before repeating the process.

10. Allow the engine to idle until the engine coolant reaches a normal operating temperature.

Warm-up Operation

WARNING!

- **In case of emergency, irregular engine operation, or other faults, turn the key switch to OFF or press the emergency stop switch to stop the engine.**
- **Do not operate the machine immediately after starting the engine. Insufficient warm-up of the machine and hydraulic oil may cause slow control response or abrupt movement during operation, resulting in serious accidents. Warm-up is especially necessary in cold areas.**

Failure to follow these warnings could result in death or serious injury.

Perform the following warm-up steps:

1. After starting the engine, adjust the throttle control lever so the engine runs unloaded at about 1/4 throttle for 5 minutes.
2. Adjust the throttle control lever so the engine runs at 1/2 throttle, then slowly operate the bucket for 5 minutes.
3. Adjust the throttle control lever so the engine runs at a high rpm, then operate the boom, arm, and bucket for 5 to 10 minutes.

Repeat all movements several times to complete the warm-up process. Check the gauges and indicators for normal operating readings after the warm-up process.

New Machine Break-in

NOTICE!

Your machine has been thoroughly tested and adjusted before shipment. However, initial operation of the machine under severe conditions can adversely affect the performance of a machine or shorten its life. SANY recommends that you allow a break in period of 100 service hours for a new machine.

1. Start and run the engine and run at a low idle until it reaches proper operating temperatures. Do not move the controls or the throttle.
2. Avoid operating the machine under heavy loads or at high speeds during the break-in period. Operate as much as possible in the 1/2 to 3/4 throttle or load range. Do not operate this machine with a full load during the break-in period.
3. Avoid sudden starts, movements, or stops, except in an emergency.
4. Monitor the instruments frequently - especially the engine oil pressure and coolant temperature. Shut down the machine at the first indication of an abnormal reading.
5. Avoid running the engine at idle for long periods of time.

6. Manage engine power to allow acceleration to governed speed when conditions require more power. Do not over-rev the engine.

7. Always allow the engine to cool before shutting it off.

8. After shutting off the engine, check the fluid levels.

Engine Shutdown

NOTICE!

- **Stopping the engine before it cools can accelerate engine component wear. Never abruptly shut down the engine except in an emergency.**

- **Never stop the engine suddenly when it is overheated. Run the engine at low idle to allow it to cool down gradually before shutting it down.**

Failure to follow this notice could result in damage to the machine or cause it to operate improperly.

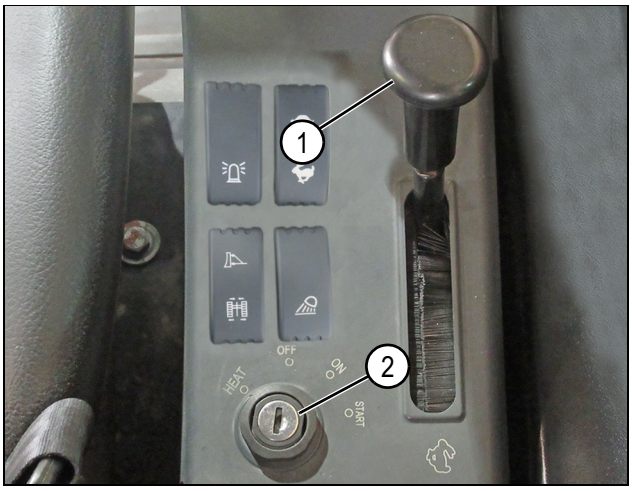


Fig. 4-18 0005095

1. Park the machine on a firm, level surface.

2. Lower the bucket or optional equipment to the ground.

3. Push the throttle control lever (1) forward (low idle) and allow the engine to idle for 5 minutes to cool down.

4. Turn the key switch (2) to OFF and remove the key. Pull the hydraulic lockout control lever (3) back to the locked (closed) position.

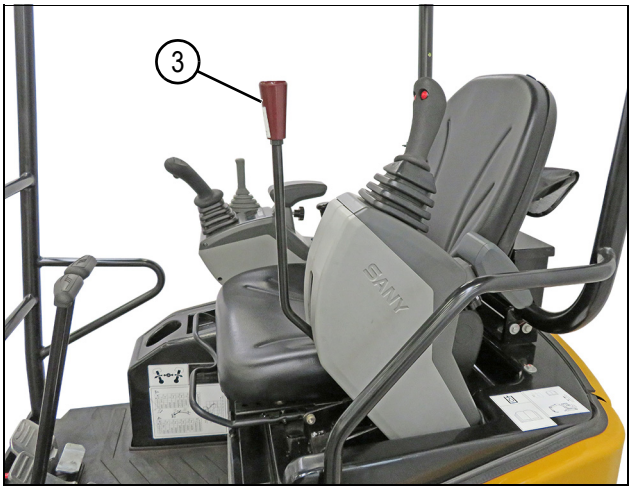


Fig. 4-19 0005094

Inspection after Engine Shutdown

1. After shutting down the engine, conduct a walk-around inspection. Check the work equipment, the exterior of the machine, and the undercarriage.

2. Check the engine coolant, engine oil, and hydraulic oil levels. See “Fluid Level Checks” on page 4-7.

3. Fill the fuel tank with diesel fuel. See “Add Fuel” on page 4-9.

4. Clear the engine compartment of combustible debris.

5. Clean mud from the tracks and undercarriage. See “Operation on Soft Ground” on page 4-41.

MOVING THE MACHINE

WARNING!

- **Check the surroundings and sound the horn before moving the machine.**
- **Personnel are not allowed to approach the machine without operator approval.**
- **The rear of the machine is a blind area. Use the mirrors and be extremely careful when backing the machine. Use a signalman as needed.**

Failure to follow these warnings could result in death or serious injury.

Directional Arrows

The directional arrow (1) on each of the track frames indicates forward movement of the machine. Check these arrows before using the travel control levers/pedals. The track drive sprocket is at the rear of the track frame.

If the track frame is facing backward, the travel direction will be opposite the maneuvering direction of the travel control lever/pedal. The machine will move forward when you pull the control levers backward and backward when you push them forward. Left and right control directions are also reversed when the track frame faces backward.

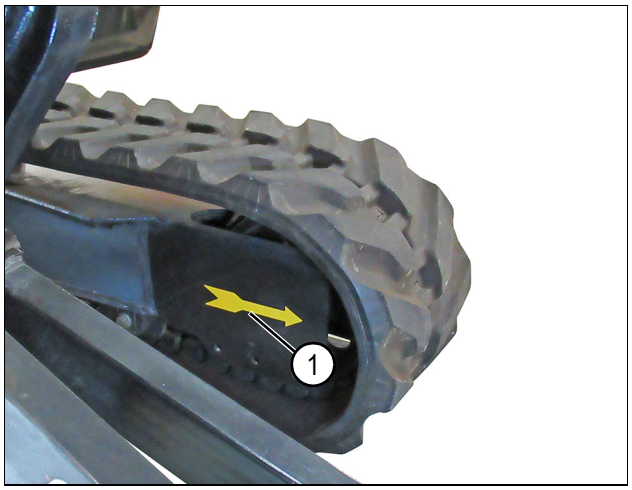


Fig. 4-20 0003794

NOTICE!

- **The idlers are in the front of the track frame, and the drive sprockets are at the rear of the track frame for forward movement. If the drive sprockets are at the front of the machine, the travel controls will operate in reverse. Check the position of the drive sprockets before traveling.**
- **Stop the machine for 5 minutes after every 20 minutes of traveling. Prolonged traveling may strain the travel motors.**

Pull the throttle control lever (1) to the rear (high idle).

Fig. 4-21 0005095

Travel Controls

Forward Travel

Push both travel control levers forward or press the top of both foot pedals equally to move the machine forward.

Backward Travel

Pull both travel control levers backward or press the bottom of both foot pedals equally to move the machine backward.

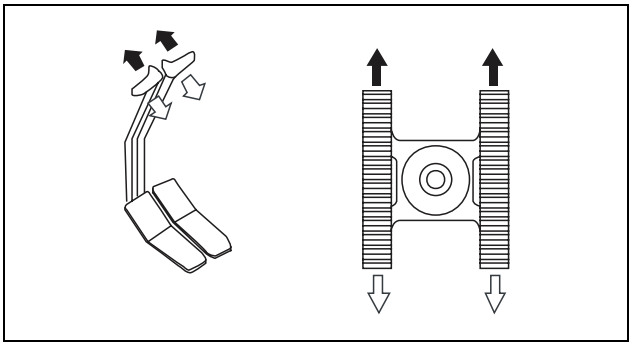


Fig. 4-22 0002835

Right Turn

Push the left travel control lever (1) forward or press the top of the left pedal and leave the right travel control lever in the neutral position to turn the machine to the right.

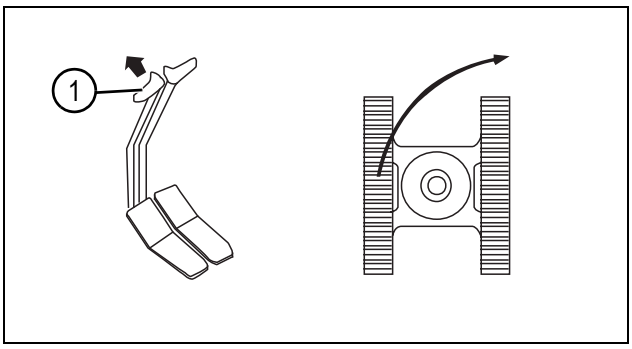


Fig. 4-23 0002836

Left Turn

Push the right travel control lever (1) forward or press the top of the right pedal and leave the left travel control lever in the neutral position to turn the machine to the left.

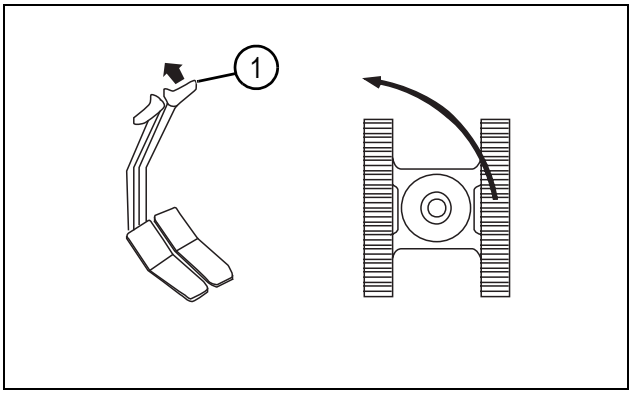


Fig. 4-24 0002837

Spot Turning

To the Left

Simultaneously push the right travel control lever (1) or press the top of the right foot pedal (2) and pull the left travel control lever (4) or press the bottom of the left foot pedal (3) to rotate the machine to the left.

To the Right

Simultaneously push the left travel control lever (4) or press the top of the left foot pedal (3) and pull the right travel control lever (1) or press the bottom of the right foot pedal (2) to rotate the machine to the right.

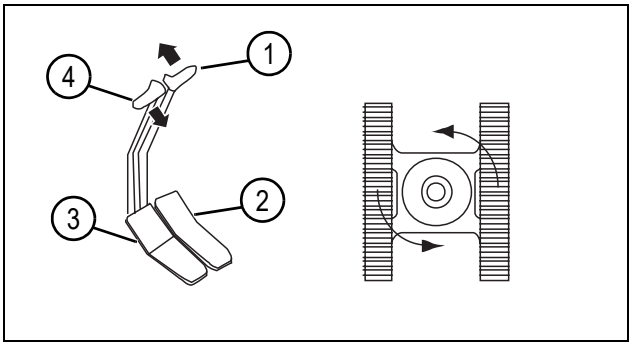


Fig. 4-25 0002838

Stopping the Machine

NOTICE!

Do not stop the machine suddenly, except in an emergency. Failure to follow this notice could result in damage to the machine.

The joysticks will return to the neutral position when released, and the work equipment will hold its position.

Slowly move the travel control levers/pedals to the neutral (N) position. The travel brake will stop and hold the machine automatically.

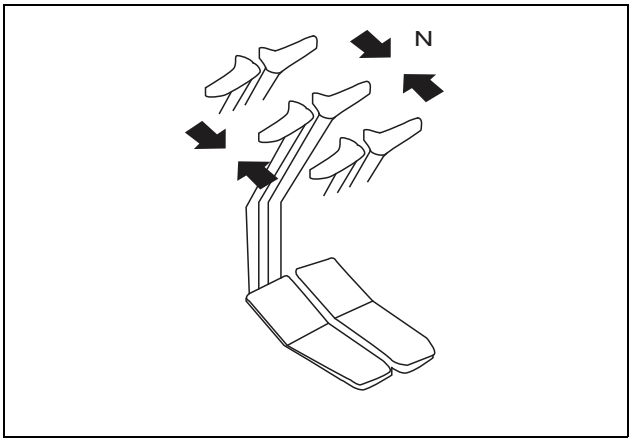


Fig. 4-26 0002839

WORK EQUIPMENT CONTROL AND OPERATION

NOTE:

- The joysticks will return to the neutral position when released, and the work equipment holds its position.
- There are two operating modes available for the joystick controls, the Society of Automotive Engineers (SAE) mode and the Backhoe Loader (BHL) mode. The swing and bucket functions are the same for SAE and BHL modes.

Arm Control–SAE Mode

To extend the arm, push the left joystick.

To retract the arm, pull the left joystick.

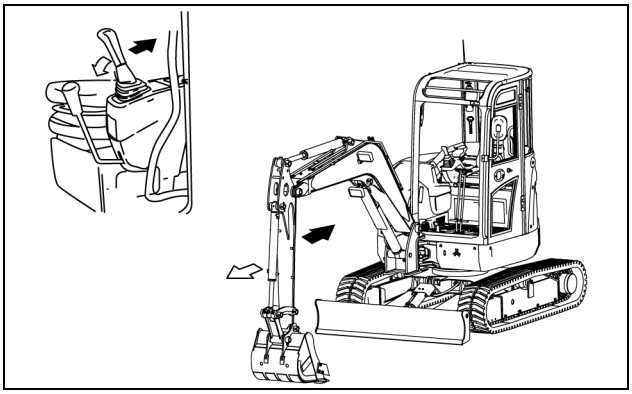


Fig. 4-27 0002840

Arm Control–BHL Mode

To extend the arm, push the right joystick.

To retract the arm, pull the right joystick.

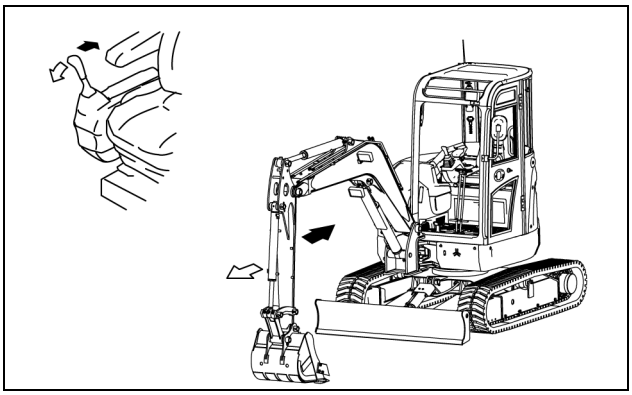


Fig. 4-28 0003057

Boom Control–SAE Mode

To raise the boom, pull the right joystick.

To lower the boom, push the right joystick.

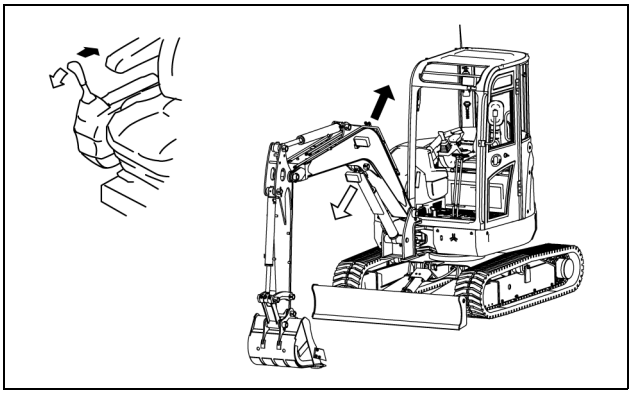


Fig. 4-29 0002842

Boom Control–BHL Mode

To raise the boom, pull the left joystick.

To lower the boom, push the left joystick.

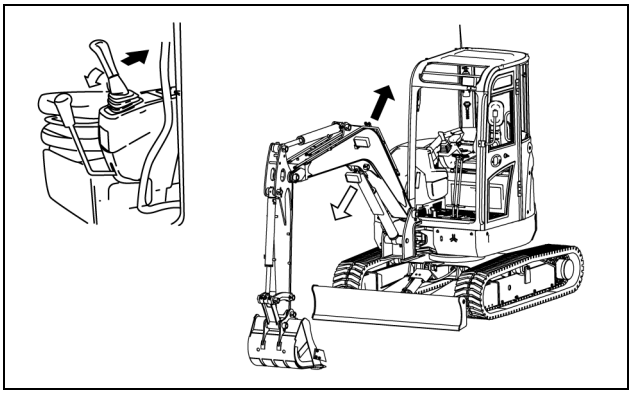


Fig. 4-30 0003058

Swing Control

To swing the upper structure to the right, move the left joystick to the right.

To swing the upper structure to the left, move the left joystick to the left.

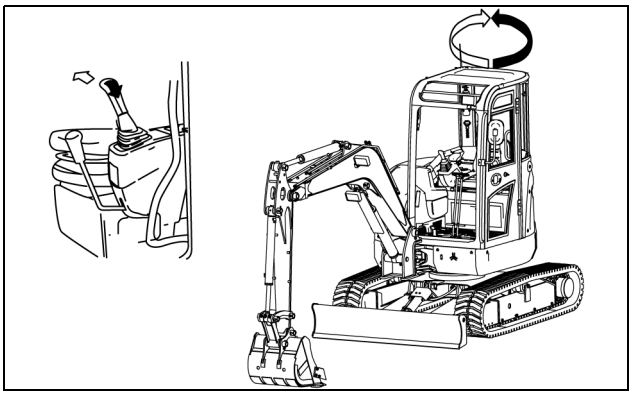


Fig. 4-31 0002841

Bucket Control

To uncurl the bucket, move the right joystick to the right.

To curl the bucket, move the right joystick to the left.

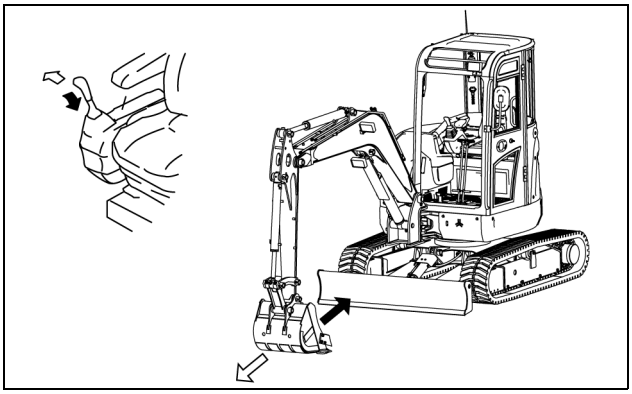


Fig. 4-32 0002843

Boom Swing Control Pedal

The boom swing control pedal is mounted on the canopy floor to the right of the travel controls. The boom swing control pedal swings the boom to the right or left. Press the right side of the pedal to swing the boom right, and press the left side of the pedal to swing the boom left.

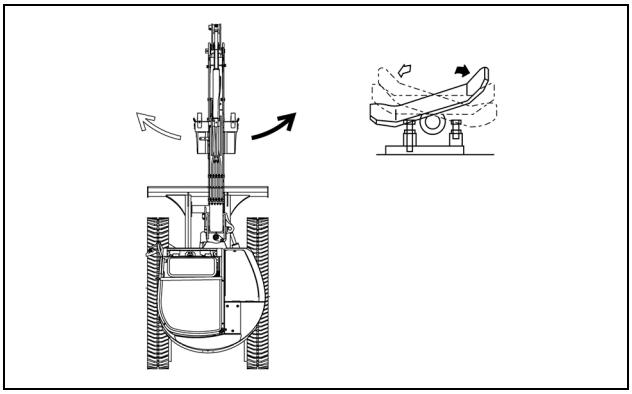


Fig. 4-33 0003793

Dozer Blade Control

NOTE: The dozer blade control/track spread lever is also used to increase or decrease track spread (gauge). See “Track Spread (Gauge) Adjustment” on page 4-30.

1. Place the dozer blade/track spread switch (2) to the dozer blade position.
2. Raise the dozer blade by pulling the dozer blade/track spread control lever (1) backward.
3. Lower the dozer blade by pushing the dozer blade/ track spread control lever forward.

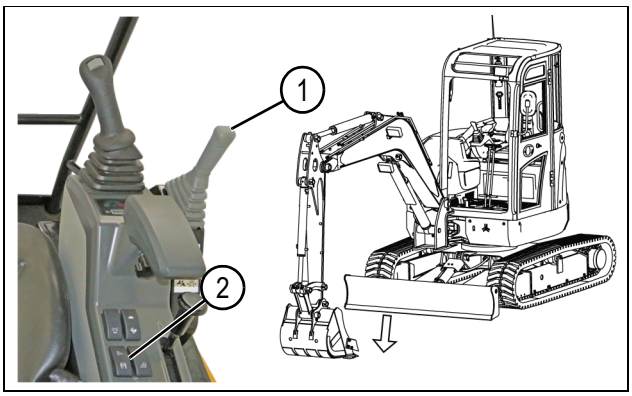


Fig. 4-34 0005143

Change Dozer Blade Width

Adjust the blade width by adding or removing blade extensions (2). The extension is secured with a pin (1).

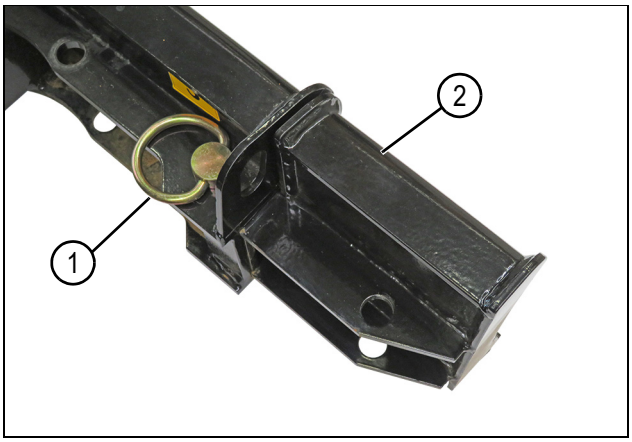


Fig. 4-35 0005127

When not in use, the blade extension (3) is stored on the back of the dozer blade (4) and secured with a pin (5).

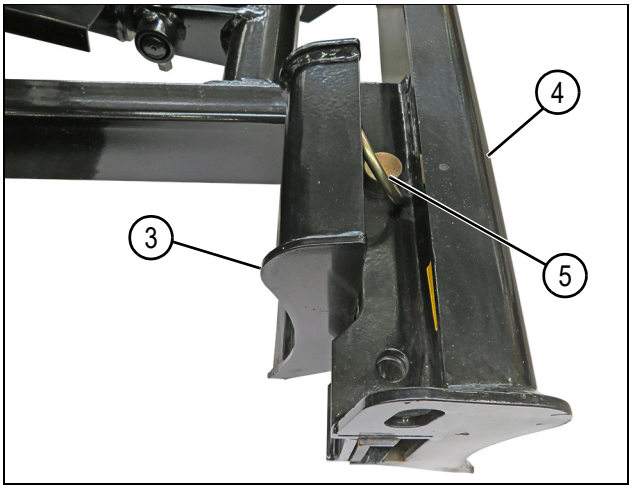


Fig. 4-36 0005128

TRACK SPREAD (GAUGE) ADJUSTMENT

The track gauge, the distance between the two tracks, can be adjusted from 2 ft. 5 in. to 3 ft. 8 in. (0.98 m to 1.35 m). Increase the track gauge to provide more stability. Decrease the track gauge to access areas with limited space.

NOTICE!

When adjusting the track gauge, the machine must either be moving or the tracks raised off the ground using the boom and dozer blade. Failure to follow this notice can damage the machine.

Fig. 4-37 0005095

To adjust the track gauge:

1. If the track gauge is being adjusted while the machine is moving, go to step 5. Otherwise, you will need to raise the tracks off the ground.
2. Position the boom opposite the dozer blade.
3. Use the dozer blade control to lift the front of the tracks slightly off the ground.
4. Lower the boom to lift the back of the tracks off the ground.
5. Place the dozer blade/track spread switch to the track spread position (1).
6. Increase the track gauge by pushing the dozer blade/ track spread control lever control lever (2) forward.
7. Decrease the track gauge by pulling the dozer blade/ track spread control lever (1) backward.
8. Lower the tracks to the ground and move the dozer blade/track spread switch (1) to the dozer blade position.

Fig. 4-38 0005087

RESTRICTED OPERATION

CAUTION!

- **Use caution when operating work equipment while the machine is traveling.**
- **When the engine auto idle is on, moving any control lever increases the engine speed.**
- **Avoid any working conditions that may cause the machine to tip over.**
- **Avoid moving any control lever or pedal to abruptly change the direction of the machine.**
- **Do not operate the machine on any ground that lacks sufficient support.**
- **Do not attempt work operations such as scraping, digging, etc., with the hydraulic cylinder fully extended.**

Failure to follow these precautions could result in injury or damage to the machine.

Never Operate with Bucket Force

Never use the force of the bucket for excavating, digging, breaking, or pile-driving operations. Such operations may considerably reduce the service life of the machine.

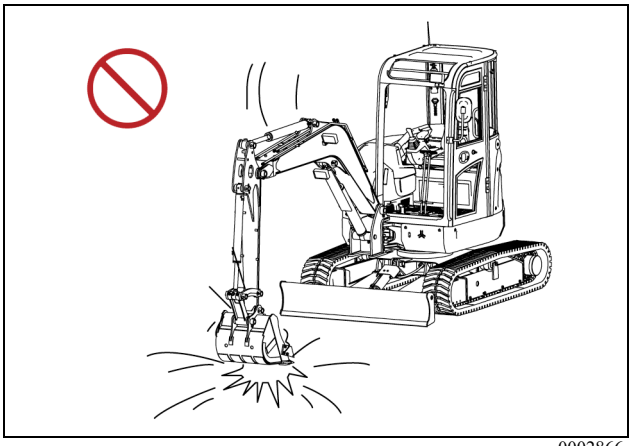


Fig. 4-39 0002866

To avoid cylinder damage, do not use the bucket to strike or compact the ground.

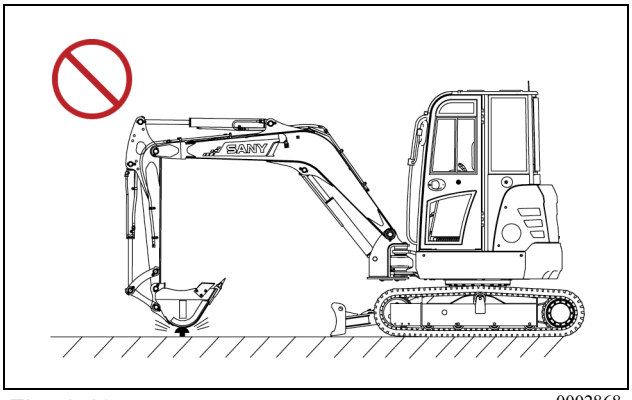


Fig. 4-40 0002868

Never Use Swing Force

Never use swing force to compact the ground or to break objects. Such operation is very dangerous and may reduce the service life of the machine.

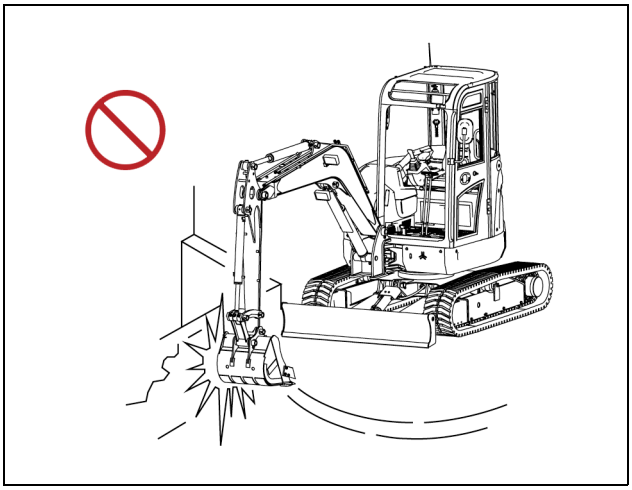


Fig. 4-41 0002846

Never Use Traveling Force

Never use the machine's traveling force to cut the bucket into the ground to excavate. Such an operation may damage the machine or the work equipment.

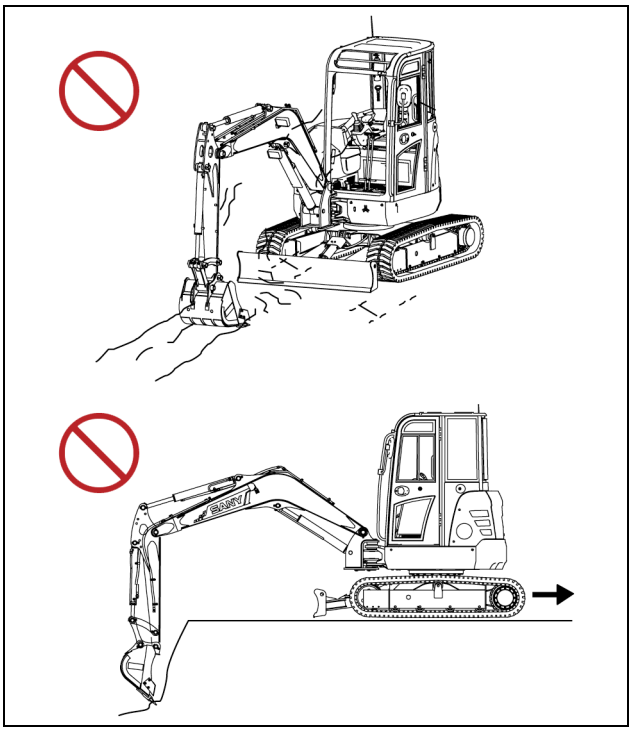


Fig. 4-42 0002864

Do Not Operate a Cylinder to the Stroke End

Avoid operating the machine with any cylinder fully retracted or extended.

If the cylinder piston reaches the end of its stroke, continued use of the work equipment could damage the cylinder.

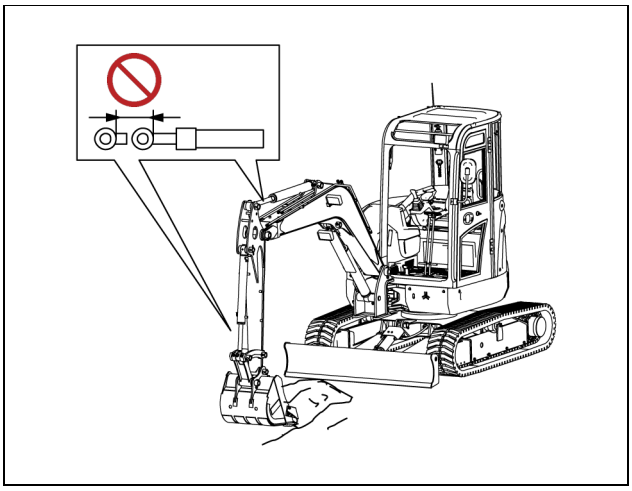


Fig. 4-43 0002848

Never Operate Using Machine Weight

Never raise the rear or front of the machine to use the machine's weight to excavate. Operating while using the machine's weight may damage the machine.

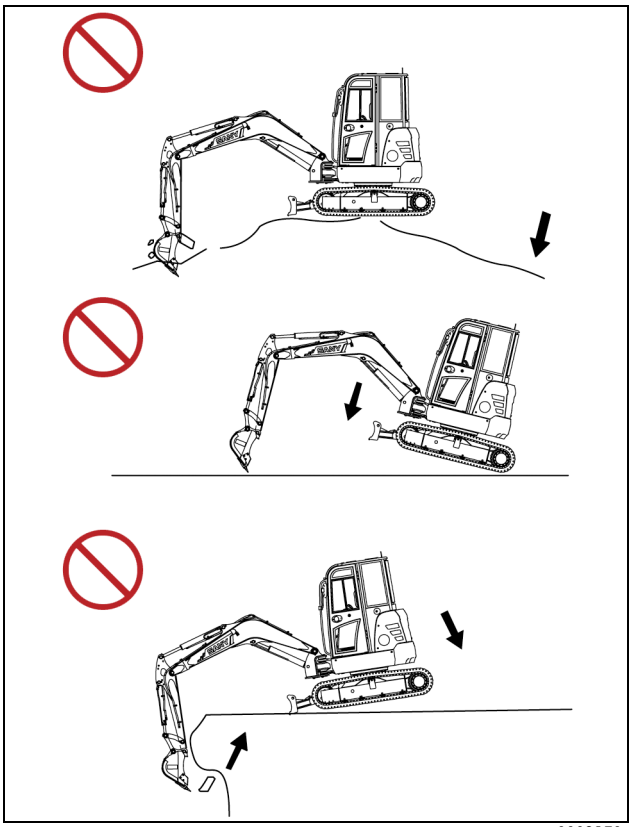


Fig. 4-44 0002870

Avoid Shifting Travel Directions Suddenly

- Never jerk the control levers. Jerking the control levers can cause travel motor strain and shorten the service life.
- Avoid moving the control levers quickly from forward travel to reverse travel.

Never quickly move the control levers from high speed to neutral.

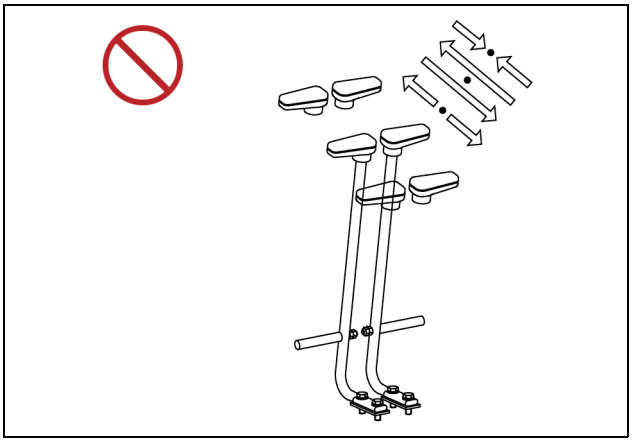


Fig. 4-45 0002872

Avoid Dozer Blade Impact

Do not strike rocks or other hard objects with the dozer blade. This can shorten the service life of the dozer blade or the hydraulic cylinder.

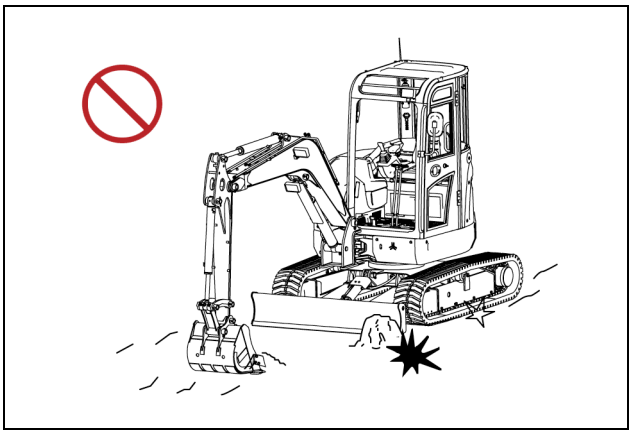


Fig. 4-46 0002874

Support the Dozer Blade

When the dozer blade is used as a stabilizer, never use one end of the blade to support the machine.

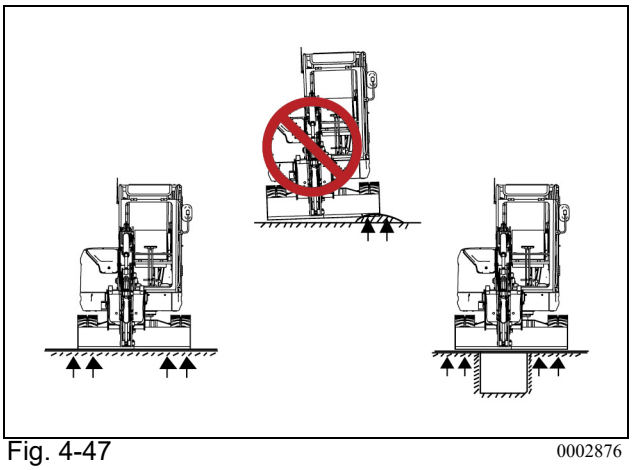


Fig. 4-47 0002876

Excavating Hard Ground

Use alternate work equipment to break up hard ground before excavation to prevent machine damage.

TRAVEL

General Travel Instructions

CAUTION!

Appoint a signalman when driving or operating the machine in confined areas. Use standard hand signals before starting the machine. Failure to follow this caution could result in injury.

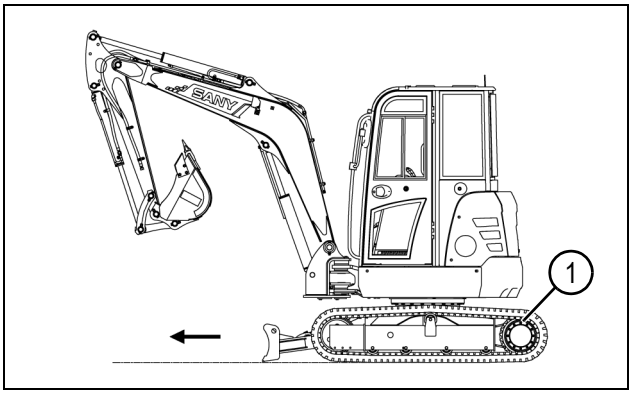


Fig. 4-48 0002878

- The machine's travel direction is controlled by the travel control levers/pedals and dictated by the location of the travel motors relative to the canopy.
- When the travel motors (1) are positioned behind the canopy, press the top of the travel control pedals or push the travel control levers to move the machine forward.
- Select a flat travel surface and travel in a straight line. If possible, turn the machine slowly and gradually.
- Never let the machine make contact with power lines or bridges (2).

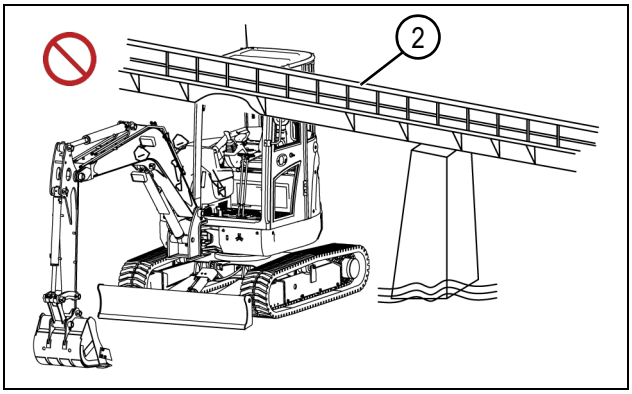


Fig. 4-49 0002880

- Do not drive or swing the machine on broken stones, rugged surfaces, steel bars, or scrap iron. This could cause personal injury or track damage.
- Do not perform operations where the rubber tracks may skid. This can cause early track wear.
- Slow the machine when traveling on uneven ground. A lower speed reduces the possibility of machine damage.

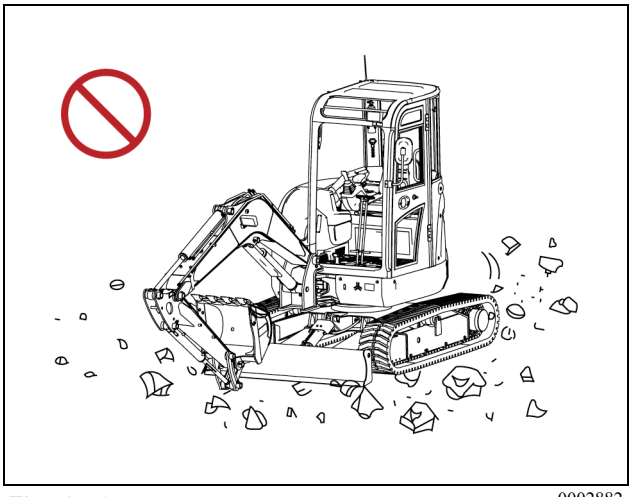


Fig. 4-50 0002882

- Do not operate the machine on a surface covered by small stones that could cause track skidding or damage.
- Avoid premature track wear or damage. Do not operate the machine on new asphalt or other hot surfaces.
- Do not allow fuels, oils, salt, or chemical solvents to make contact with the tracks. These substances will erode the track links and cause rusting and peeling. Wash these substances off the tracks immediately with clean water.
- Avoid operation of the machine in a marine environment. Salt in seawater can damage the tracks. Rinse the tracks if they were exposed to salt or salt water.

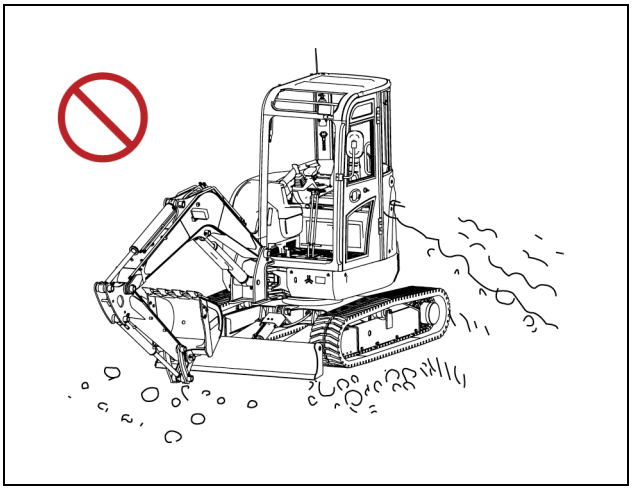


Fig. 4-51 0002884

Traveling at High Speed

When traveling at high speeds, position the idlers to the front of the canopy.

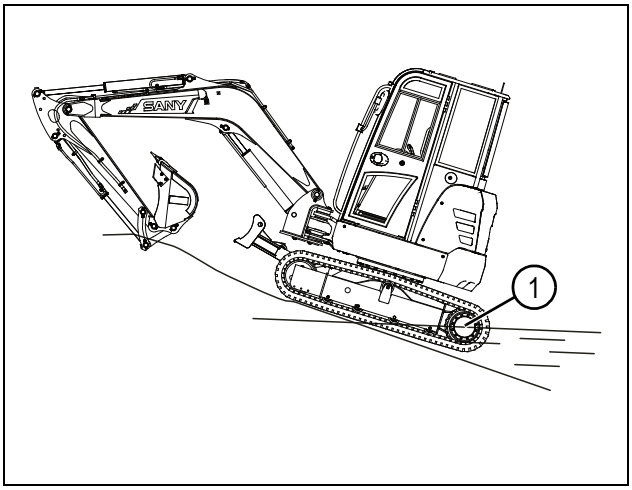
Operating in Water

NOTICE!

Operate the machine slowly when traveling through water. Check the depth of the water with the bucket. Do not operate the machine in a marine environment. Salt in seawater can damage the tracks.

When driving the machine out of water on a grade steeper than 15°, the rear of the upper structure may be submerged in water. The radiator fan may sustain water damage that can damage the machine or cause the equipment to operate improperly.

- Do not drive the machine into water where the depth is above the center of the final drive sprocket (1).
- Grease parts that have been submerged until the old grease has been displaced from the bearing (especially from the bucket pin).
- Make sure the job site surface is hard enough for the machine.

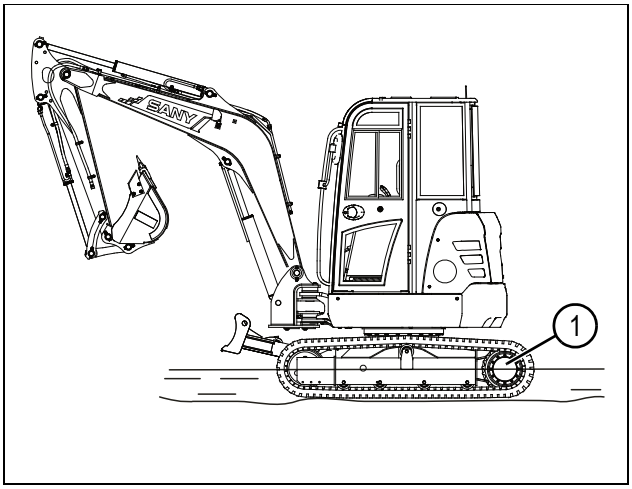


0002886

Fig. 4-52

- Continuously monitor the condition of the machine when operating in water. Move the machine to a different location if necessary.
- Make sure that the swing bearing, swing drive gear, and swivel do not become submerged in water.

  NOTE: If the swing bearing, swing drive gear, or swivel have been submerged in water, they must be cleaned. Lubricate the swing drive gear and swing bearing.



0002888

Fig. 4-53

Traveling on an Incline

Precautions When Traveling on an Incline

WARNING!

- **Operating on an incline may cause the machine to become unstable.**
- **Use caution when operating the machine on inclines, and use a lower engine speed.**
- **Operate the machine slowly and monitor its movement.**
- **Do not travel on an incline with the bucket loaded or with a lifted load.**
- **Do not swing a loaded bucket toward the downhill direction.**
- **Build a platform on an incline so the machine can operate on a level surface.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

The engine may be damaged if the machine is operated on an incline of more than 25°.

Tipping over may result if the machine is on uneven ground or on a slope. To avoid such accidents, follow these instructions when the machine is operated on uneven ground or on a slope:

- Keep the engine running at low idle.
- Choose low-speed travel mode.
- Operate slowly and observe the motion of the machine.
- Do not attempt to travel on a slope with the bucket loaded or with a load lifted.
- Never attempt to travel up or down a grade greater than 30°. Never attempt to cross a slope with a grade greater than 15°.
- Always keep the seat belt fastened.
- Keep the bucket pointed toward the traveling direction and 8 in.–12 in. (20 cm–30 cm) off the ground. Travel at low speed.
- Do not attempt to change direction on a slope or the machine may slip and tip over. Only change direction on an even and solid surface.
- If the engine stalls on a slope, lower the bucket to the ground immediately, neutralize all control levers, and restart the engine.
- Before traveling up a steep slope, allow the machine to warm up sufficiently so it can perform properly.

- Avoid crossing inclines as much as possible. Slipping or rolling over may occur.
- Do not swing (1) the upper structure on a slope.
- Do not swing the upper structure to the downhill direction; the machine may tip over. If such an operation is necessary, swing the upper structure and the boom with great care.
- Do not swing a loaded bucket to the downhill direction. Build a platform (2) on an incline so the machine can operate on a level surface.

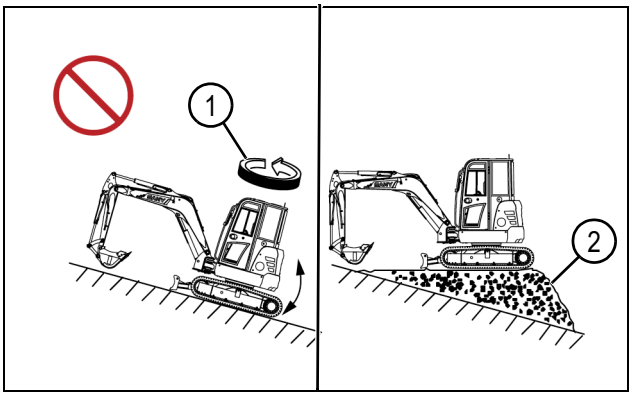


Fig. 4-54 0002890

- When traveling down a grade greater than 15°, the work equipment should be positioned in front of the canopy with the final drive sprockets (3) in the uphill direction. Keep the boom-arm angle between 90° and 110° (4), and the bucket 8 in.–12 in. (20 cm–30 cm) (5) above the ground.

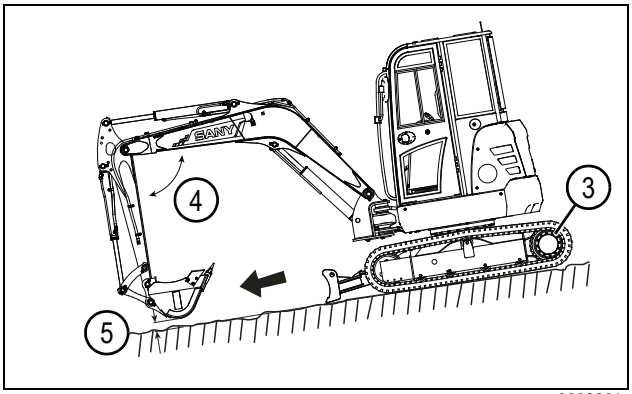


Fig. 4-55 0002901

- When traveling up a grade greater than 15°, the work equipment should be positioned in front of the canopy with the final drive sprockets (6) in the downhill direction. Keep the boom-arm angle between 90° and 110° (7), and the bucket 8 in.–12 in. (20 cm–30 cm) (8) above the ground.

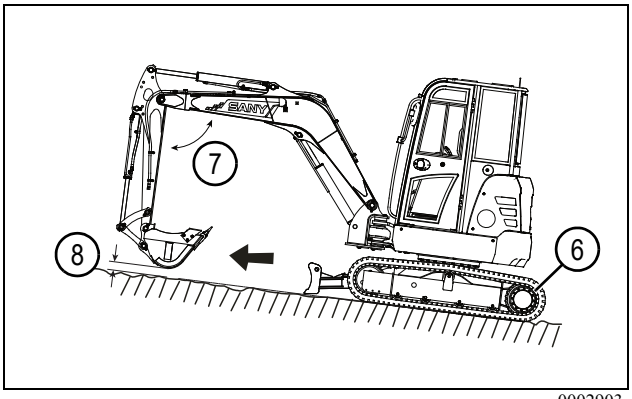


Fig. 4-56 0002903

NOTE: The tracks may slip when the machine is traveling uphill. Use the arm to help the machine travel uphill as necessary.

- To maintain machine balance on an incline, extend the boom and arm uphill and keep the bucket 8 in.–12 in. (20 cm–30 cm) (9) off the ground. Travel at low speed.
- When traveling uphill, keep the tracks in the forward direction.

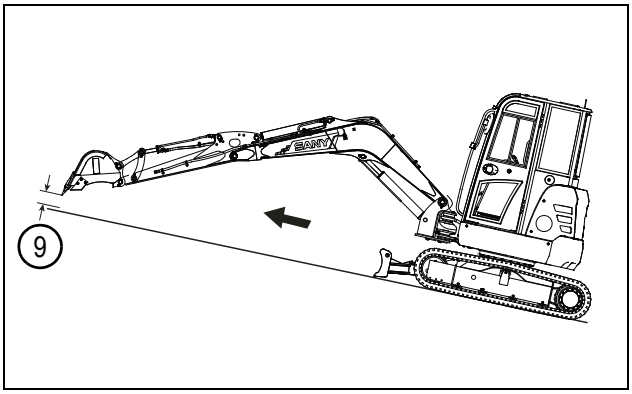


Fig. 4-57 0002905

- When traveling downhill, keep the bucket in the traveling direction and 8 in.–12 in. (20 cm–30 cm) (10) above the ground. Lower the bucket immediately if the machine slips or loses balance.

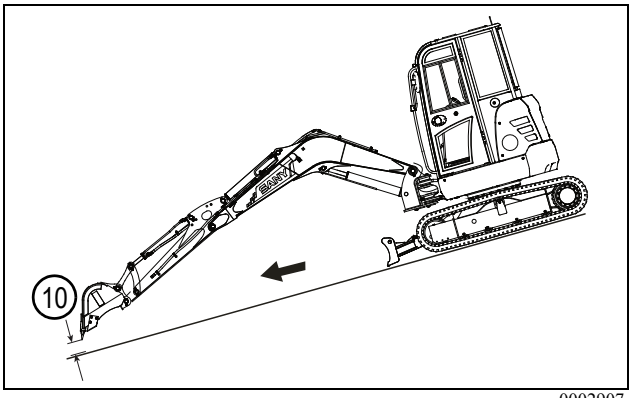


Fig. 4-58 0002907

Engine Stalls on an Incline

If the engine stalls when the machine is on an incline, lower the bucket to the ground immediately, move all control levers to the neutral position, and restart the engine.

When the engine stalls on an incline, do not use the left joystick to swing the machine. The upper structure will swing due to its weight.

Before traveling up a steep incline, allow the machine to warm up sufficiently to perform properly.

Operation on Soft Ground

NOTICE!

Wide tracks are intended for operation on soft ground. Inspect the tracks on a regular basis.

Choose the proper tracks when operating the machine on soft ground. Soft ground may cave in and cause the machine to roll over. Place steel plates on soft ground to support the machine.

The machine may get stuck in mud when operating on soft ground. To remove mud buildup from the tracks, use the following steps:

- Swing the upper structure sideways, lower the bucket to the ground, and lift one track off the ground. Keep the boom-arm angle between 90° and 110° (1) with the bottom of the bucket on the ground.
- Remove mud buildup by rotating the lifted track back and forth. Lower the track onto the ground and drive the machine to solid ground at low speed.

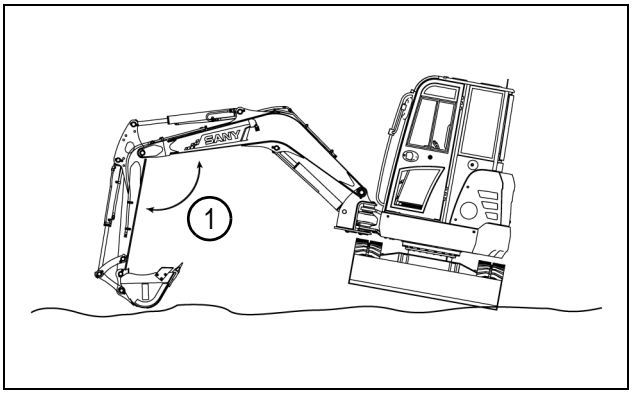


Fig. 4-59 0002909

- Pull the machine to solid ground using the boom, arm, and bucket.
- If the engine is still running when the machine is stuck, tow the machine with proper towing slings.

Removing a Stuck Machine

Be careful when operating on soft terrain to avoid becoming stuck. If stuck in soft ground, perform the following procedures to free the machine:

1. Swing the upper structure 90°, lower the bucket to the ground, and lift the track on one side off the ground.
2. Keep the boom-arm angle between 90° and 110° (1) and place the bottom of the bucket on the ground.

   NOTE: Never dig the bucket tips into the earth when the bucket is in the reversed position.

3. Place blocks under the track frame to support the machine.

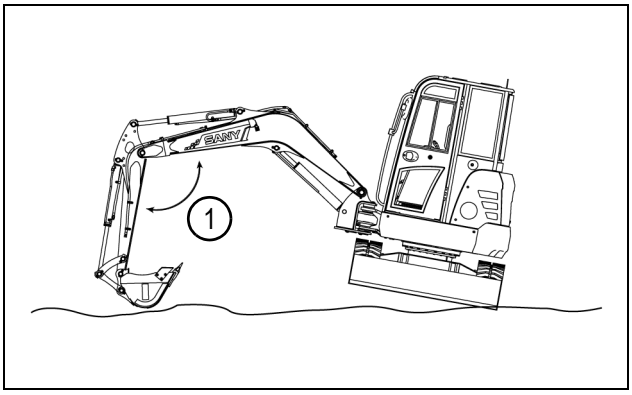


Fig. 4-60 0002909

One Track Stuck

1. Position the boom and arm at an angle (1) between 90° and 110°.
2. Pivot the upper structure to position the boom over the track that is stuck.
3. Curl the bucket so the back of the bucket touches the ground.
4. Lower the boom to raise the track.

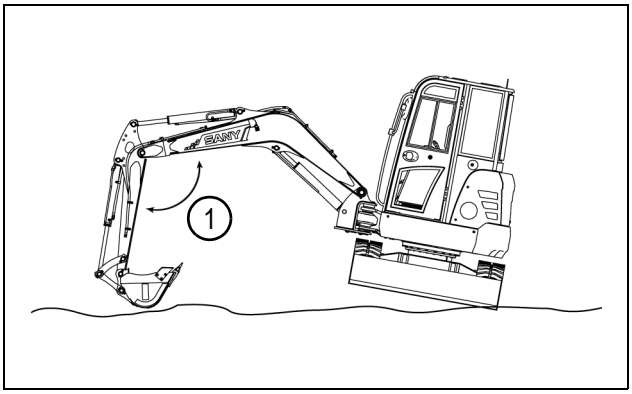


Fig. 4-61 0002909

WARNING!

Rotating tracks are dangerous. Stay away from rotating tracks. Failure to follow this warning could result in death or serious injury.

5. Remove mud buildup by rotating the lifted track forward and backward.
6. If necessary, place cribbing under the track to provide a firm surface.
7. Raise the boom to lower the track onto the cribbing.
8. Drive the machine out of the mud.

Two Tracks Stuck

1. Position the boom and arm at an angle between 90°and 110°(1).
2. Pivot the upper structure to position the boom over the front of the machine.
3. Curl the bucket so that the back of the bucket touches the ground.
4. Lower the boom to raise the front of the tracks off the ground.
5. If necessary, place cribbing under the tracks to provide a firm surface.

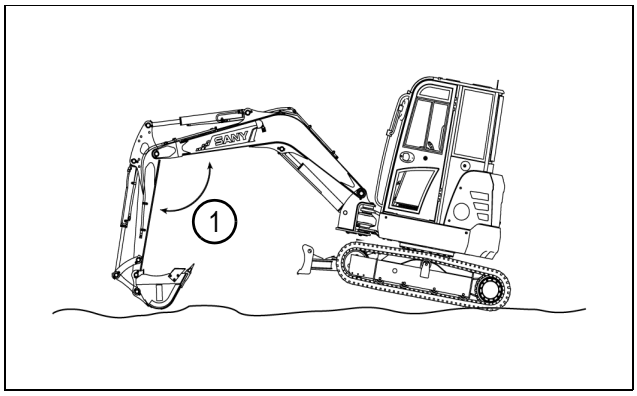


Fig. 4-62 0005177

6. Raise the boom to lower the tracks onto the cribbing.
7. Cut the bucket into the ground in front of the machine. Retract the arm (as with normal excavating) while driving the machine forward out of the mud.

NOTE: If the machine does not move, tow it. See “Towing the Machine” on page 4-43. If the machine is not operational, it may need to be moved using a lifting device. See “Lifting the Machine” on page 4-59.

Towing the Machine

WARNING!

- **Make sure the wire ropes used for towing the machine are strong enough.**
- **Never use a broken chain, worn wire rope, or a bent tow hook to tow the machine.**
- **Never jerk the wire rope.**

Failure to follow these warnings could result in death or serious injury.

If the machine is stuck in mud or soft terrain and is unable to get out under its own power, use wire rope(s) (2) attached to the frame towing hole (1) to assist in its removal.

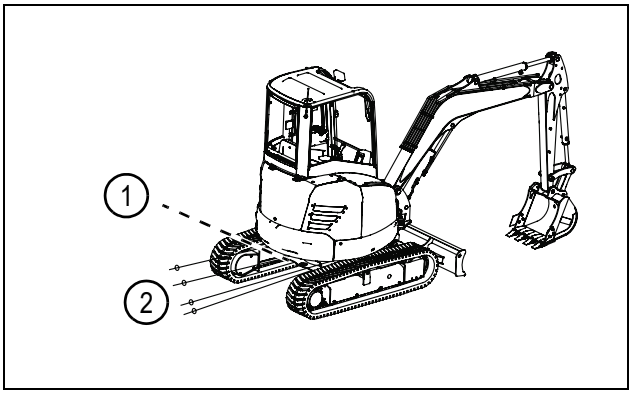


Fig. 4-63 0002911

Towing Point for a Light Load

NOTICE!

- **Make sure the wire ropes used for towing the machine are strong enough.**
- **A shackle must be used.**
- **Keep the wire ropes horizontal and parallel to the tracks.**
- **Drive the machine at low speed.**

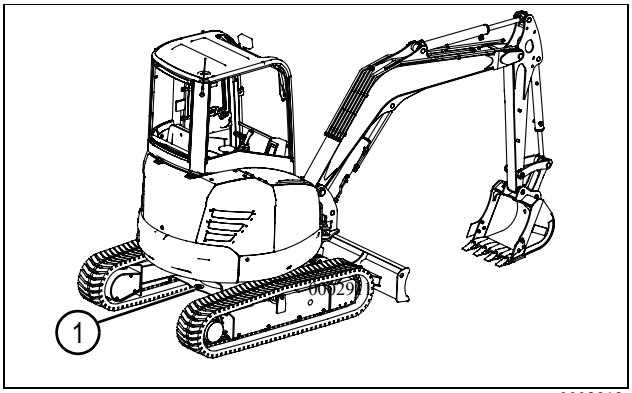


Fig. 4-64 0002913

The machine is equipped with a light-load towing point (1) on the frame that can be used to tow a light load.

RECOMMENDED OPERATIONS

NOTICE!

- **Avoid sudden stops when lowering the boom. Hydraulic shock can damage the hydraulic system.**
- **Avoid extending the arm cylinder while in full travel. This can damage the hydraulic cylinder.**
- **Do not allow the bucket to come in contact with the tracks when excavating at an angle.**
- **Do not allow the boom or arm hydraulic cylinder's hoses to contact the ground.**

Operate the machine using the following applications. The scope of application can also be expanded by using various optional attachments.

Trenching Work

When performing trenching work, install a bucket that matches the width of the trench. Keep the tracks parallel with the trench.

When excavating a trench, always start from the sides. Then remove the earth in the middle.

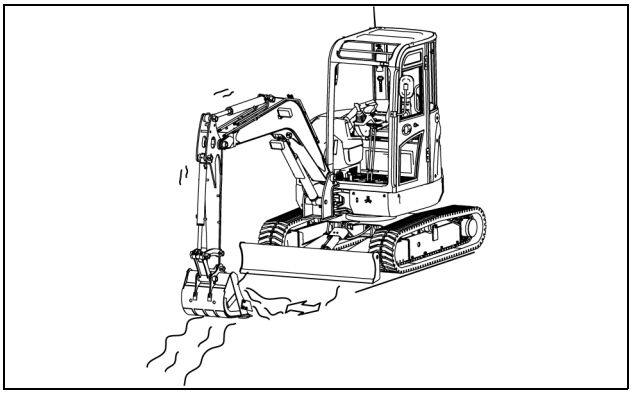


Fig. 4-65 0002915

Boom Swing Feature

The boom swing feature allows this excavator to perform trench work close to a wall.

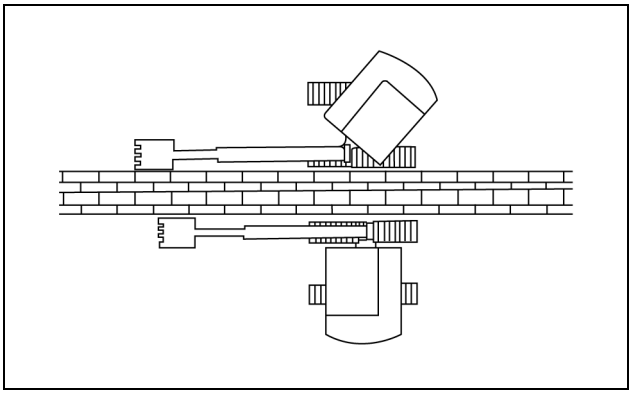


Fig. 4-66 0002917‘

Vehicle Loading

To increase efficiency, load the dump truck from behind instead of from the side.

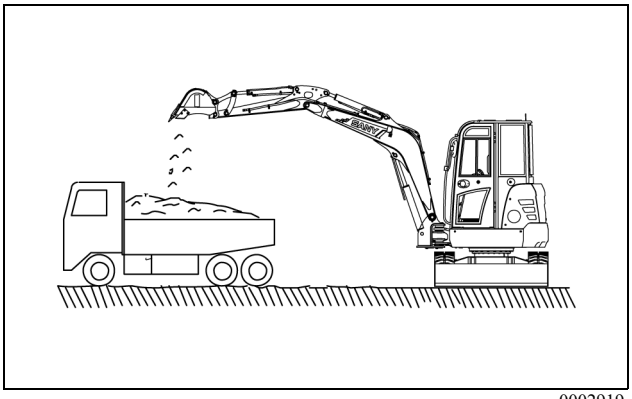


Fig. 4-67 0002919

Leveling Operation

1. Choose the light-load mode when performing a leveling operation. Roll the bucket out and hold it slightly ahead of the arm.

2. Raise the boom slowly and retract the arm at the same time. Once the arm passes the vertical position, lower the boom slowly and keep the bucket moving parallel to the ground.

   NOTE: Do not drag or push the bucket on the ground while the machine is traveling.

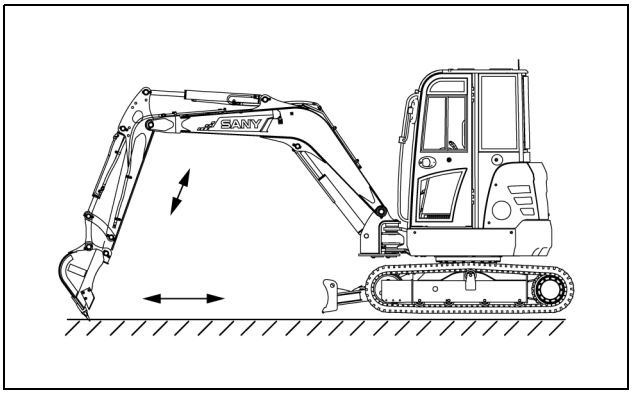


Fig. 4-68 0002921

Operating Precautions

WARNING!

- **Always wear appropriate personal protective equipment (PPE) and clothing during operation.**
- **Clear all personnel and obstacles around the machine and the work area. Inspect the machine and its surroundings during operation. Be careful not to allow the upper structure to hit any objects when operating the machine in narrow or confined spaces.**
- **When loading a dump truck, do not swing the bucket over the truck cab or any people on the job site.**
- **Operate the machine on a hard and level surface. When working in a ditch or on a road shoulder, keep the tracks perpendicular to the work face, and the travel motors at the rear of the machine. Placing the machine in this position helps facilitate escape if a collapse occurs.**
- **When working under a cliff or high embankment, make sure the work area is secure.**

Failure to follow these warnings could result in death or serious injury.

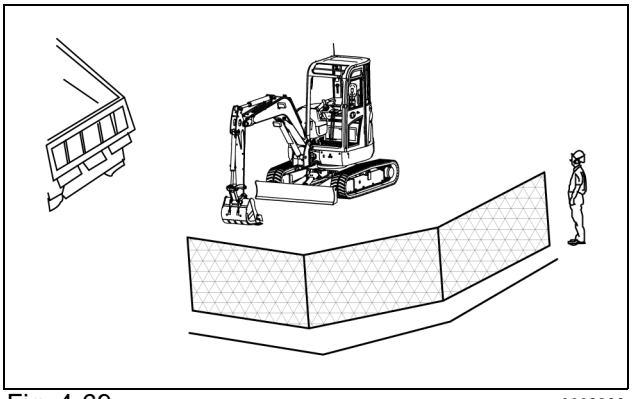


Fig. 4-69 0002923

NOTICE!

- **Do not allow the arm to interfere with the tracks during operation.**
- **Do not use the swinging force of the machine to move rocks or break walls.**
- **Adjust the length and depth of the cut so the bucket is full after each cycle.**
- **To improve efficiency, a full bucket is more important than loading speed.**
- **Do not use the side of the bucket to level materials or strike objects.**

Failure to follow these notices could damage the machine or cause it to operate improperly.

PARK THE MACHINE

1. Move the machine to a solid, level surface.
2. Lower the bucket and dozer blade to the ground.
3. Push the throttle control lever forward (low idle). Run the engine at idle for 5 minutes to cool it down.
4. Move the hydraulic lockout control lever to the locked (closed) position.
5. Turn the key switch to OFF and remove the key.
6. Turn the battery disconnect switch to OFF.

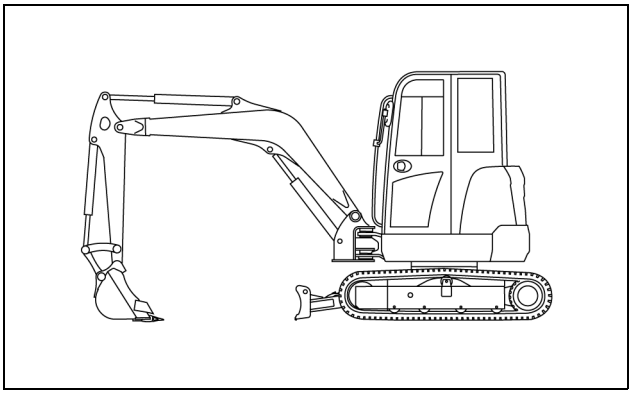


Fig. 4-70 0002525

Parking the Machine on a Grade

CAUTION!

Avoid parking the machine on a grade when possible. Machine rollover can cause injury.

If it is necessary to park the machine on a grade:

1. Firmly set the bucket teeth and dozer blade into the ground.
2. Move the hydraulic lockout control lever to the locked (closed) position.
3. Turn the key switch to OFF and remove the key.
4. Turn the battery disconnect switch to OFF.
5. Securely chock the tracks.

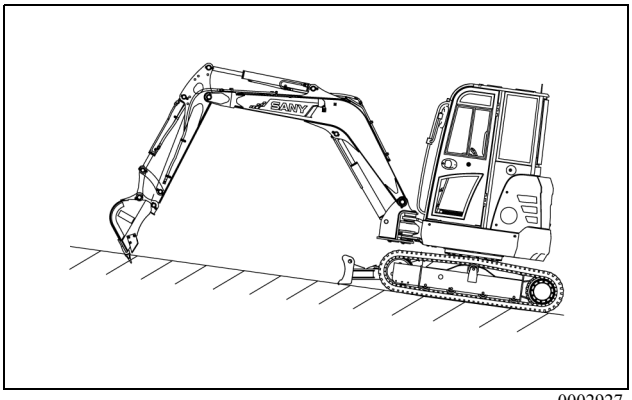


Fig. 4-71 0002927

COLD WEATHER OPERATION

Operation in Cold Weather

When operating the machine in low temperatures, the engine may be difficult to start, the fuel line may freeze, and oil may become more viscous. Select fuels and lubricants according to the air temperature.

Engine Coolant in Cold Weather

See “Recommended Lubricants, Fuels, and Coolant” on page 5-8.

Battery in Cold Weather

WARNING!

Before proceeding with any battery maintenance procedure, observe the following precautions:

- **The top of the battery must be kept clean to prevent plugging of the battery vents. Regularly wash the top of the battery to prevent the battery vents from plugging.**
- **Battery gases are explosive Never smoke around batteries or expose them to sparks or open flames. Work in a well-ventilated area.**
- **Wear personal protective equipment (PPE) when working with batteries.**
- **Battery acid can cause burns or injury. If battery acid makes contact with skin or eyes, flush the area immediately with fresh water and seek medical attention.**

Failure to follow this warning could result in death or serious injury.

In cold climates, battery efficiency will decline. Electrolyte can freeze if the battery charge is low. Keep the battery charged near 100% and keep the battery in a warm area if possible.

After Daily Operation

WARNING!

Rotating tracks are dangerous. Stay away from rotating tracks. Failure to follow this warning could result in death or serious injury.

NOTICE!

Fill the fuel tank to its maximum level after operation to prevent moisture in the fuel tank from condensing at low temperatures, which could result in fuel-line freeze.

Mud and water accumulation on the undercarriage can affect normal operation of the machine. After operating the machine in mud or water, make sure to perform the following actions after daily operation:

- Remove mud and water from the machine. Mud, dirt, and water can damage the seals. See “Operation on Soft Ground” on page 4-41.
- Park the machine on a firm, dry surface.
- If possible, park the machine on boards, which can prevent the tracks from sinking into soft ground. Normal operation can fail if the machine becomes stuck.
- Open the drain valve of the fuel/water separator to drain any water in the fuel system. See “Drain the Fuel/Water Separator” on page 4-10.

Machine Storage in Cold Weather

1. Clean the machine.
2. Check the engine coolant and engine oil levels, and check for leaks. The machine is normally filled to withstand a minimum low temperature of -40°F (-40°C). Change the fuel, hydraulic oil, and gear oil with new fluids that meet the air temperature requirements as necessary.
3. Check the machine for leaks. Check all cylinder rods for scratches and corrosion. Apply grease to exposed cylinder rods.
4. Remove and charge the battery. When the battery is fully charged, store it indoors.
5. Install the battery and start and run the machine on a monthly basis.
6. Clean the battery terminals as necessary. Apply a coat of dielectric grease to the terminals. Check the specific gravity of the electrolyte and add distilled water or electrolyte if necessary.

After Cold Season

- Replace the fuel and engine oil with fuel and oil of the specified viscosity.
- If permanent ethylene glycol coolant was not used and ethanol coolant is used as an alternative, or if no coolant was used, drain and flush the cooling system completely and add new ethylene glycol coolant to the cooling system.

Long-Term Storage

Before Long-Term Storage

NOTICE!

Extend the bucket and arm and lower the boom to prevent the cylinder rods from rusting.

Perform the following procedures before storing the machine:

1. Clean and wash all components and park the machine indoors. If indoor storage is not possible, park the machine on a firm, level surface. Cover the machine if possible.
2. Extend the bucket, arm, and boom.
3. Support the dozer blade on a block.
4. Fill the fuel tank, apply lubricant, and change the engine oil before storage.
5. Apply a thin coat of grease to any exposed surfaces of the hydraulic cylinder rods.

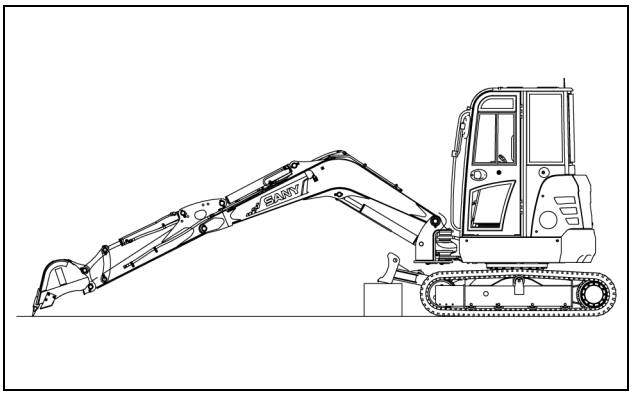


Fig. 4-72 0002929

6. Disconnect the negative battery cable or remove the battery and store it.
7. If the ambient temperature is expected to drop below 32°F (0°C), check the engine coolant mixture ratios and add concentrated engine coolant to the cooling system if necessary.
8. Place the hydraulic lockout control lever in the locked (closed) position.
9. Close and lock the engine hood.

During Storage

During the storage period, operate the machine on a monthly basis to prevent rust and seizing of moving parts and to lubricate the seals. Charge the battery at this time.

Removing from Storage

Follow the procedures below before using a machine that has been stored for a prolonged period of time:

- Clean the grease from the cylinder piston rods.
- Add oil or apply lubricant to all parts or components.

Starting the Engine After Long-Term Storage

1. Turn the key switch (2) to ON.
2. Pull the throttle control lever (1) backward (high idle) and pause for 3 seconds.
3. Push the throttle control lever forward (low idle) and start the engine. For additional starting information, see “Starting the Engine” on page 4-16.

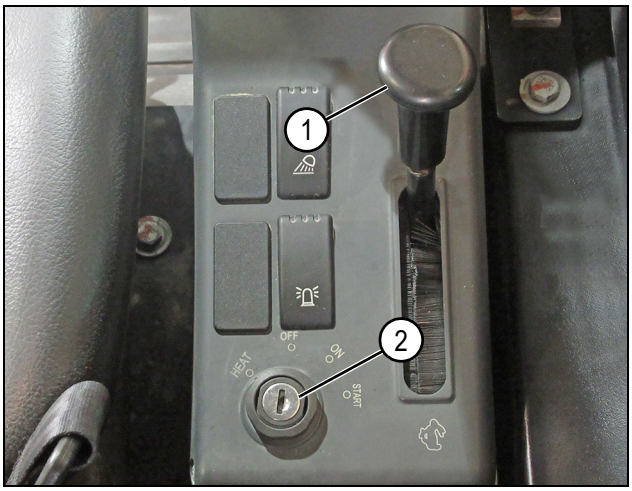


Fig. 4-73 0003147

TRANSPORTATION INFORMATION

Transportation Method

Applicable laws and regulations must be observed when transporting the machine.

- When transporting the machine with a trailer, confirm the length, width, height, and weight capacity of the trailer before loading.
- Investigate road conditions in advance (for example, dimension restrictions, weight restrictions, and traffic regulations).
- The machine may need to be disassembled to meet local dimension and/or weight limits.

NOTE: The machine's shipping weight and dimensions may vary, depending on its tracks and work equipment.

Loading and Unloading

WARNING!

- **To prevent the machine from tipping over, select a firm and level location that is a safe distance from any road or structure.**
- **Make sure the trailer is properly chocked to prevent any movement.**
- **Use an access ramp with enough length, strength, and width to properly support the machine. The ramp grade should not exceed 15°.**
- **Drive slowly at the junction of the ramp and the trailer. The machine may shift suddenly due to a change in its center of gravity.**
- **Use a signalman to alert the operator to any potential hazards.**

Failure to follow these precautions could result in death or injury.

- Push the throttle control lever forward (low idle). Operating the engine at high idle could result in sudden, unexpected movement.
- Use level, solid ground and keep the machine a safe distance away from roads during loading and unloading operations.

- Make sure the loading ramps have adequate width, length, thickness, and strength. The maximum angle of the ramps is 15° (1).

- Never change direction on the access ramp. If repositioning the machine is necessary, back up, re-orient the machine, and drive up or down the ramps.

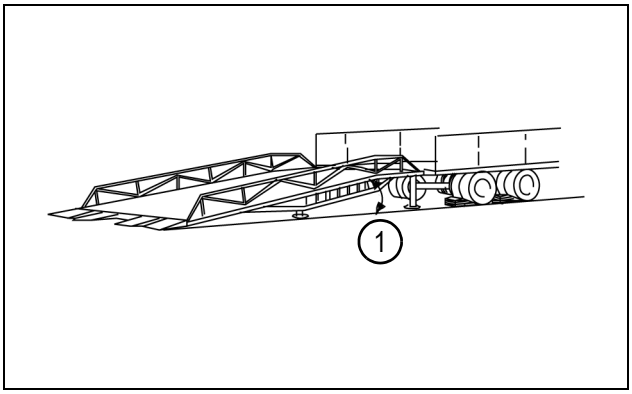


Fig. 4-74 0002935

- Use care when driving over the joints (2) between the trailer and the ramps.

- Swinging the upper structure may cause the machine to tip over and result in personal injury. Retract and lower the arm and swing the upper structure slowly to achieve the optimal balance.

- Never operate any control levers other than the travel levers when the machine is on a ramp.

- Clean the loading platform, ramps, and trailer floor before loading or unloading. Grease, mud, or ice on the trailer, loading platform, or ramps can cause the machine to slide and tip over.

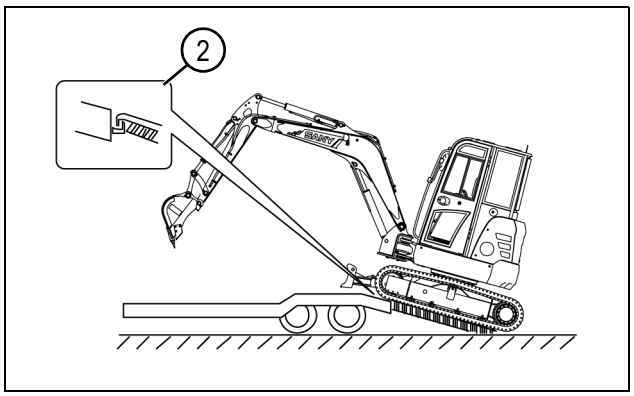


Fig. 4-75 0002933

Loading the Machine

Use a loading platform or ramps when loading or unloading the machine.

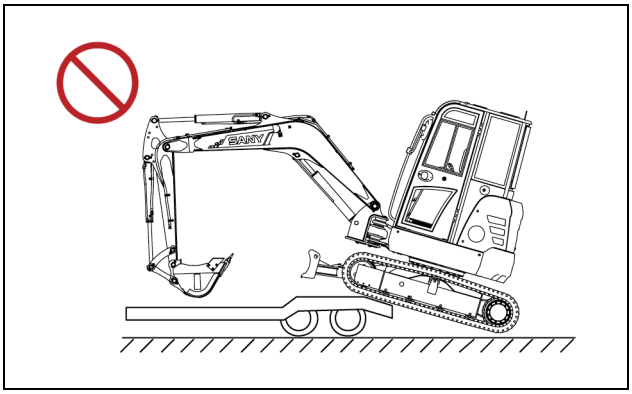


Fig. 4-76 0002931

When loading the excavator with work equipment installed, place the work equipment in the front and travel forward.

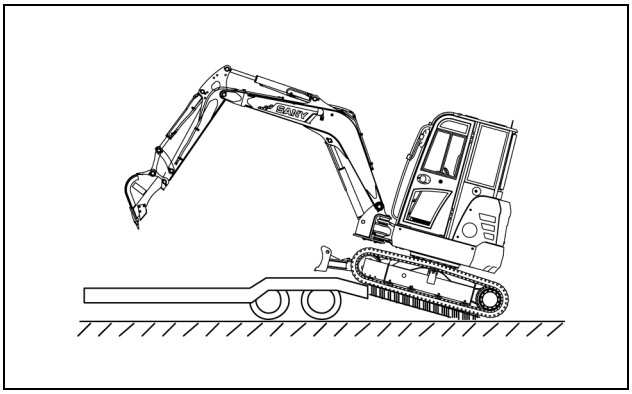


Fig. 4-77 0002937

When loading the excavator without equipment installed, travel in reverse up the ramps. Set the ramps at no more of an angle than 15° (1).

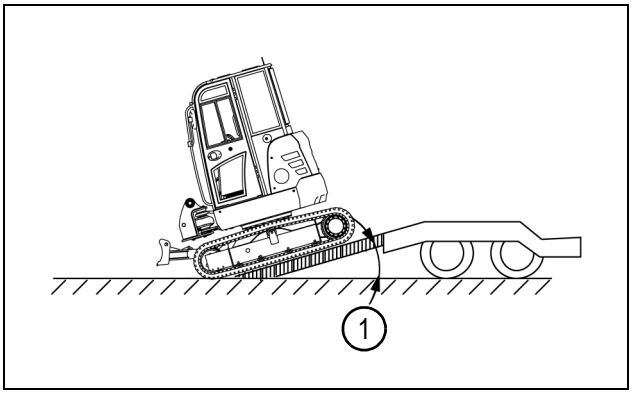


Fig. 4-78 0002939

Use the following procedures during loading:

1. Align the centerline of the machine with that of the trailer.
2. Slowly drive the machine up the ramps.
3. When the machine tilts toward the trailer side, lower the bucket close to the trailer floor. Drive slowly until the tracks are completely on the trailer.
4. Slightly raise the bucket. Retract the arm and keep it in a lower position. Slowly swing the upper structure 180°. Lower the dozer blade.
5. Fully curl the bucket and arm. Slowly lower the boom.

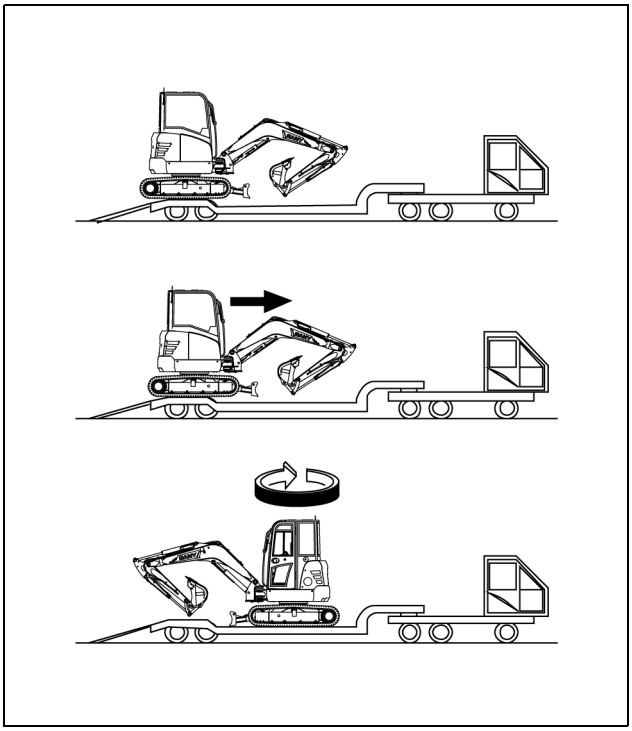


Fig. 4-79 0002941

NOTE: To prevent damage to the bucket cylinder, place a wood block (1) between the bucket cylinder and the trailer floor. Slowly lower the bucket cylinder onto the wood block.

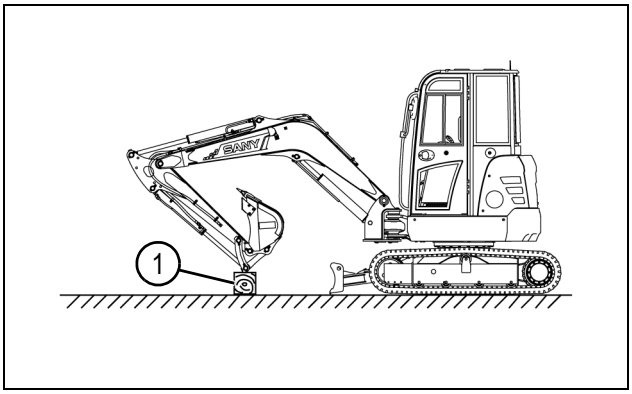


Fig. 4-80 0002943

6. Stop the engine, then turn the key to ON.
7. Operate the joysticks until the pressure inside the hydraulic cylinders is fully released.
8. Place the hydraulic lockout control lever in the locked (closed) position.
9. Turn the key to OFF and remove from the key switch.

NOTICE!

- **Never turn the battery disconnect switch to OFF while the engine is running. This can damage the electrical system or cause the machine to operate improperly.**
- **After machine shutdown, wait at least 1 minute for the engine control module (ECM) to complete its shutdown before turning the battery disconnect switch to OFF.**

Failure to follow this notice could damage the machine or cause it to operate improperly.

10. Turn the battery disconnect switch to OFF.
11. Lock right access door and engine hood.
12. Cover the exhaust opening to prevent contamination.
13. Lock the boom in position to prevent movement during transportation. See “Boom Swing Lock Handle” on page 3-27.

Securing the Machine

NOTICE!

- **Position the mirror inward toward the machine.**
- **Secure any removed parts to the trailer.**
- **Put a wood block between the bucket cylinder and the trailer floor to help prevent damage to the bucket cylinder.**
- **Secure chains and wire ropes to the machine frame.**
- **Prevent chains and wire ropes from crossing or pressing against the hydraulic lines or hoses, which could result in damage and leaks.**

When the machine has been loaded, follow these procedures to tie it down:

1. Prevent machine movement during transportation by placing chocks (1) at both ends of the tracks. Secure the machine with chains or wire ropes.
2. Make sure to secure the machine firmly in place to prevent it from sliding.

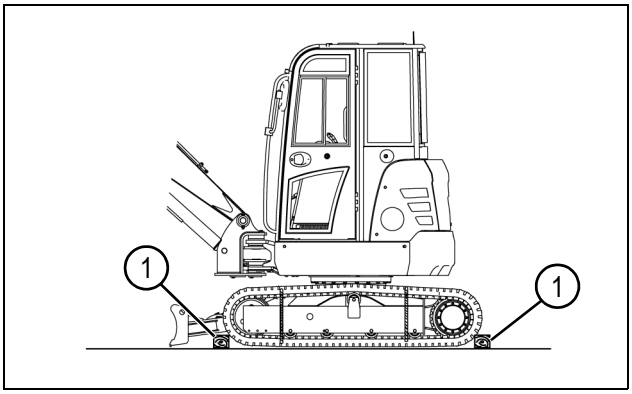


Fig. 4-81 0002945

Unloading the Machine

NOTICE!

Use extreme care when the machine drives over the joint area between the trailer and the ramps.

Prevent damage caused by unexpected movement of the work equipment. Maintain the boom-arm angle between 90° and 110°. Unloading the machine with the arm retracted may damage the machine.

1. Always load/unload the machine on firm, level ground and keep a safe distance away from roads.
2. Brake the trailer properly and chock (1) the trailer wheels. Place the ramps (2) between the trailer and the machine. Make sure the two ramps are on the same level and have an angle less than 15°. Adjust the distance between the ramps to match the distance between the tracks.
3. Remove chains or wire ropes that secure the machine.
4. Unlock the boom. See “Boom Swing Lock Handle” on page 3-27
5. Start the engine. See “Starting the Engine” on page 4-16.
6. Push the hydraulic lockout control lever to the unlocked (open) position.
7. Raise the work equipment and retract the arm toward the boom. Drive the machine slowly.
8. Stop the machine when it travels over the rear wheels of the trailer and toward the ramps.

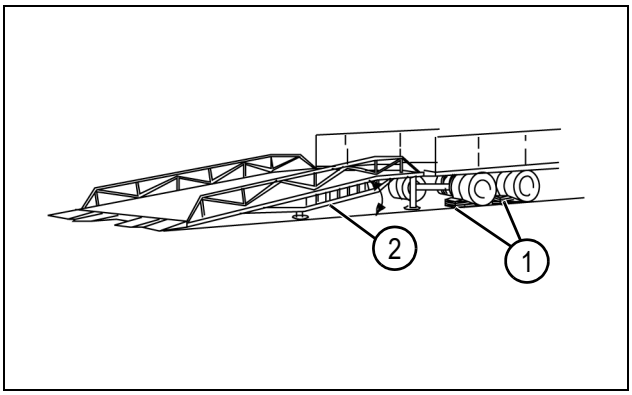


Fig. 4-82 0002935

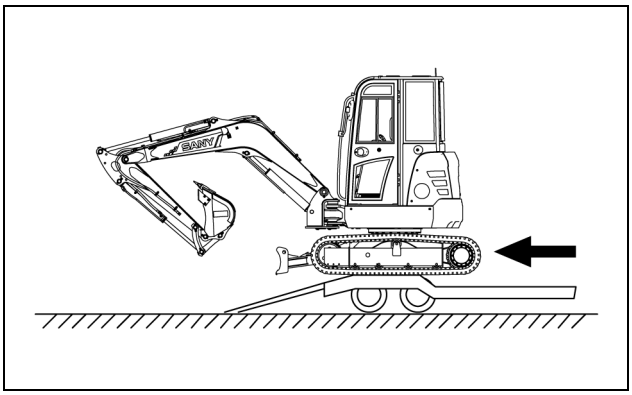


Fig. 4-83 0002947

9. Adjust the boom-arm to an angle of 90° to 110° (3) and lower the bucket so the back of the bucket is in contact with the ground. Drive the machine slowly onto the ramps.

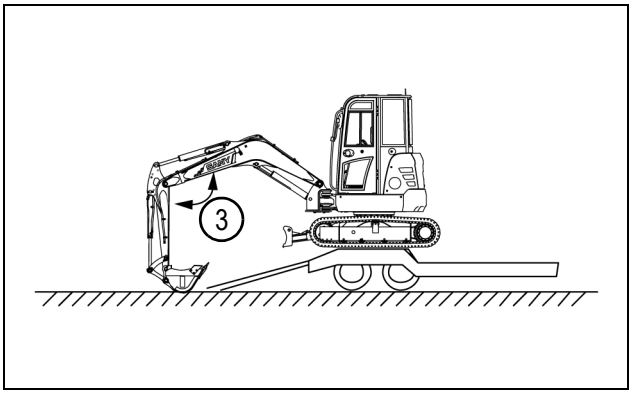


Fig. 4-84 0002949

10. Operate the boom and the arm slowly when the machine is on the ramps. Allow the machine to descend slowly until it comes in contact with the ground.

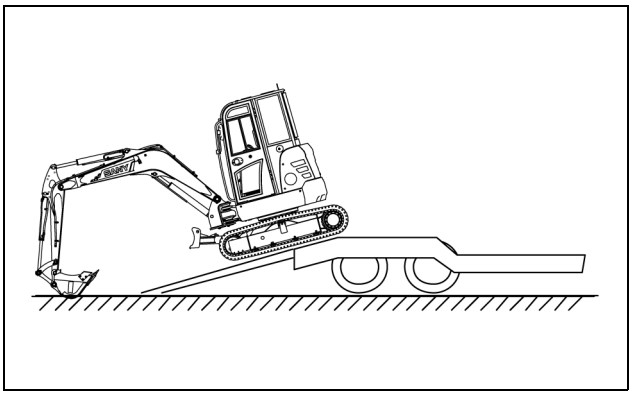


Fig. 4-85 0002951

NOTICE!

Use extreme care when the machine drives over the joint area between the trailer and the ramps.

Avoid damage caused by unexpected movement of the work equipment. Maintain the boom-arm between an angle of 90° and 110°. Unloading the machine with the arm retracted may damage the machine.

11. Shut down the engine. See “Engine Shutdown” on page 4-21.

Lifting the Machine

WARNING!

- **Never lift the machine with a person inside the canopy.**
- **Allow no one to stand close to or under a lifted machine.**
- **Make sure the wire ropes are rated to lift the machine.**
- **Always lift with the longitudinal centerlines of the upper structure and undercarriage parallel to each other.**
- **Keep the hydraulic lockout control lever in the locked (closed) position to prevent unexpected movement of the machine.**

Failure to follow these warnings could result in death or serious injury.

NOTE: This lifting procedure applies to standard machines. Check the operating weight of the machine, See "Lift Chart: Blade Down" on page 6-6.

1. Park the machine on firm, level ground, raise the dozer blade, and swing the upper structure to the rear of the machine.
2. Fully extend the arm cylinder and the bucket cylinder. Raise the boom.
3. Place the hydraulic lockout control lever in the locked (closed) position.
4. Turn the key to OFF and remove from the key switch.
5. Turn the battery disconnect switch to OFF and lock the engine hood.
6. Cover the exhaust opening to prevent contamination.
7. Use wire ropes and a container spreader bar that have adequate length to keep the machine free from damage.
8. Lift the machine 10 in.–12 in. (25 cm–30 cm) and check its balance. If it is not balanced, lower the machine to the ground and adjust the boom or dozer blade positions.

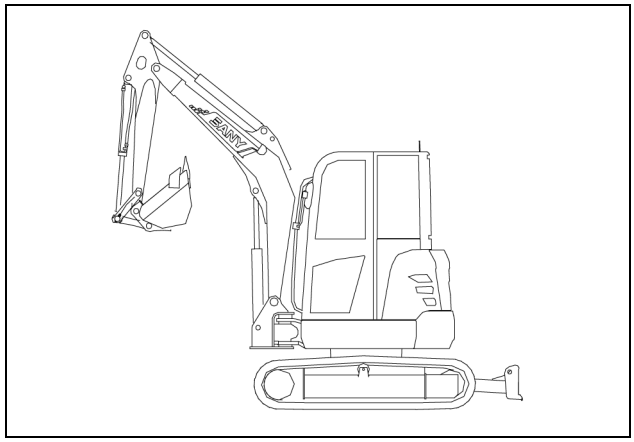


Fig. 4-86 0002953

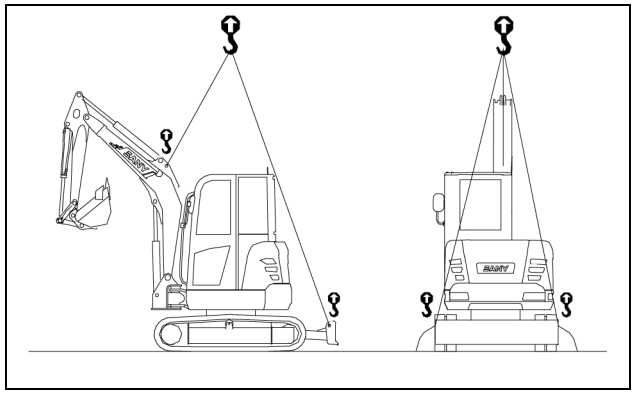


Fig. 4-87 0002955

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SANY

Maintenance

MAINTENANCE INFORMATION

Do not perform any maintenance and/or repairs unless the procedures are covered in this manual. Always follow all safety precautions. Read and understand the Safety section of this manual before proceeding with any inspection or maintenance procedures. See “Maintenance Safety” on page 2-9.

Checks Before Maintenance or Repairs

Before proceeding with any inspection or maintenance procedures, read and understand the safety section of this manual, including the lockout/tagout procedure.

- Perform only maintenance that is covered in this manual’s maintenance section for this machine.
- Avoid working on the machine while the engine is running unless required to do so in the procedure. If the engine must remain running during a procedure, always have a person in the cab who is visible at all times and can operate the machine correctly.
- Contact a SANY dealer if you are unable to perform the procedures listed in this manual or if additional procedures are required.
- Always use the proper tools when performing any maintenance procedures.

Checks After Maintenance or Repairs

Always perform the following after completing any maintenance to the machine.

- Make sure all of the steps listed in this book have been followed.
- If necessary, have a coworker inspect your work for correct and proper completion.
- Complete the Maintenance Log for this machine and return it to its storage location.
- Follow the lockout/tagout procedure for returning the unit to service.
- Check for leaks in the system that had maintenance or repairs.
- Make sure there are no abnormal sounds coming from the engine or hydraulic system.
- Check for any loose or abnormal movement in the system that has been serviced.
- Check for any overheating in the system that has been serviced.

After maintenance or machine repair, always take time to inventory your tools, parts used, and hardware to be sure none of these items were left on or inside the machine.

Hour Meter Reading

Record the hour meter reading on a daily basis. Compare meter readings with the required maintenance intervals listed in this manual.

Genuine SANY Parts

Use genuine SANY replacement parts when repairing or replacing machine components. Failure to do so may result in premature system or part failure.

SANY-Approved Lubricants

Always use SANY-approved lubricants and coolants. Never mix different lubricant brands or viscosities. The use of unapproved lubricants and coolants or mixing different lubricant brands or viscosities may result in shortened service life or system failure of the machine.

Collect Oil Sample

Collect and send an oil sample for testing in accordance with the maintenance schedule. Obtain and follow the instructions within an oil analysis sample kit from a SANY dealer.

Fuel Strainer

The fuel tank strainer should always be installed when fueling the machine. The fuel tank strainer prevents larger dirt and other contaminates from entering the fuel system. The fuel tank strainer does not filter out very small or nonsolid impurities.

Preventing Contamination

Clean dirt, dust, and debris from the hydraulic tank filler cover or cap before opening. Make sure objects do not fall into the tank and contaminate fluids during servicing. If any object falls into any tank, remove it immediately. Failure to do so could result in component malfunction, damage to the machine, or improper machine operation.

Weld, Drill, Cut, or Grind on the Machine

NOTICE!

Contact a SANY dealer before beginning any welding repairs. Any welding repairs on the machine must be performed by personnel who are qualified and certified to perform repairs that require welding. Owners are responsible for the structural integrity of any completed repair.

After turning off the key switch, wait 1 minute before disconnecting the battery. Remove the negative battery cable from the negative (-) post of the battery.

The welding ground cable must be connected no more than 3.3 ft (1 m) from the welding area. The welding cable must be connected directly to the part being welded. Do not ground through bearings, hydraulic cylinder pins, or work equipment pins.

Failure to disconnect the battery chassis ground could damage the machine or personal property, or cause the machine to operate improperly.

Clean Parts of the Machine

Never clean the machine with caustic chemicals or steam cleaners. Only use mild soaps and a pressure washer. Always protect electrical parts when cleaning the machine. Never flood or pressure-wash the inside of the cab. Use only nonflammable cleaning solvents. Never use flammable liquids to clean parts or any machine components.

NOTICE!

Failure to protect the electrical system when cleaning the machine may damage the machine or cause it to operate improperly.

Securing Access Covers and Compartment Doors

When servicing the machine with any access cover or compartment door open, use the lock bar to secure the cover or door in the open position. Covers and doors that are not locked open can close unexpectedly and cause injury.

Installation of Hydraulic Hoses

When disassembling parts sealed by O-rings or gaskets, clean the surfaces before installing the new parts. Always install new O-rings and gaskets.

Never kink or twist a hydraulic hose during removal or installation. Hydraulic hoses that have been kinked or twisted can be damaged internally, which can considerably shorten the service life of the hose.

Inspection and Maintenance in Adverse Environments

If the machine will be operating under adverse conditions:

- Check and clean all electrical components and connections. Clean electrical components and connections that show corrosion.
- Check and clean areas that are exposed to high levels of heat, such as the exhaust manifold and turbocharger, and keep them clear of combustible materials.

For heavy-load operation, add grease to the pins of the work equipment prior to each operation. Cycle the operation of all working parts several times before filling with additional grease.

Mud, Rain, or Snow Conditions

After operating the machine, clean the machine and inspect for missing or loose hardware. Add oil and lubricating grease as needed.

Near Ocean (Salt Air) Environments

Before operating the machine, inspect for any signs of corrosion. Apply grease where corrosion is found.

After operating the machine, thoroughly wash away any salt residue, apply grease where corrosion is found, and perform maintenance carefully on the electrical components to prevent corrosion.

Dusty Environments

Clean the following components:

- Immediately service the air filter and air filter housing if the air filter alarm indicates service is required.
- Clean the fins and other cooling system parts on a regular basis to avoid overheating.
- Replace the fuel filter on a regular basis or as required.
- Clean the electrical components, including the starter motor and the alternator, to prevent dust buildup, and check terminals for corrosion and loose connections.
- When servicing the machine, park the machine in a dust-free location to prevent contamination of open components.

Cold Environments

In cold environments with temperatures below 32°F (0°C), lubricate only with the oils and fuel shown in “Recommended Lubricants, Fuels, and Coolant” on page 5-8. Prior to starting the engine, make sure the battery is fully charged and the battery and its case and cables have not cracked.

Other Weather Environments

NOTE: If there is evidence of overheating of bearings or bushings, loose parts, or rust during regular inspection, increase the frequency of lubrication.

Based on experience and suggestions by lubricating oil suppliers, the lubricating intervals listed in the “Maintenance Schedule” on page 5-11 apply only to normal operating conditions. In harsh environments, including those with dusty and corrosive air, abnormal external temperature, extremely heavy overload, frequent operating times, longtime duty cycle, etc., lubricating intervals should be shortened. Always follow the “Maintenance Schedule” on page 5-11 until enough experience is obtained to establish a new schedule.

Check the Maintenance Log

The Maintenance Log lists regularly scheduled maintenance that should be performed by the operator or service personnel. All maintenance performed on the machine must be recorded in the Maintenance Log.

RECOMMENDED LUBRICANTS, FUELS, AND COOLANT

Always use SANY-approved lubricants, coolants, and filters. SANY is not responsible for damage caused by using unauthorized lubricants and coolants.

NOTICE!

Never mix lubricants of different types or viscosities (weights), and never overfill the system that is being serviced. Failure to follow these standards can damage the machine or may cause improper machine operation.

Component or System	Fluid Type	Ambient Temperature								
		-22°F	-4°F	14°F	32°F	50°F	68°F	86°F	104°F	122°F
		-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Engine	Engine oil					SAE 30				
				SAE 10W						
				SAE 10W-30						
					SAE 15W-40					
Swing machinery, idler, final drive	Gear oil			SAE 30						
				SAE 15W-40						
Hydraulic system	Hydraulic oil			SAE 10W						
				SAE 10W-30						
				SAE 15W-40						
			ISO VG32							
					ISO VG46					
						ISO VG68				
Fuel tank	Diesel fuel				ASTM D 975 No.2					
					GB252 Super-20 diesel fuel					
			GB252 Super-35 diesel fuel							
Grease fitting	Grease			NLGI No.2						
Cooling system	Engine coolant	Contact a SANY dealer for the recommended engine coolant.								

Fluid Capacities

NOTE: The following listed capacities are approximate only. For exact capacities, use the inspection points, inspection plugs, dipsticks, and sight glasses.

Model	Capacities				
	Fuel Tank	Hydraulic Tank	Engine Oil	Cooling System	Final Drive Lubricant
SY16C	5.3 gal. (20.0 L)	5.5 gal. (21.0 L)	0.5 gal. (2.0 L)	1.0 gal. (3.8 L)	0.16 gal. (0.6 L)

- When operating the machine in temperatures below 32°F (0°C), use SAE 10W, SAE 10W-30, or SAE 15W-40 engine oil.
- Sulfur oxide is a by-product of diesel fuel combustion. When sulfur oxide combines with water, sulphuric acid is created. Always use ultra-low-sulfur diesel (ULSD) that contains less than 0.2% sulfur to avoid potential engine damage from sulfur oxide.
- If low-quality fuels are used, the oil change interval must be decreased due to shortened engine oil life.

Hydraulic Oil Description

Hydraulic oil is an important part of the hydraulic system. Hydraulic oil lubricates hydraulic system components, carries heat away from components, and contains anti-corrosion additives and detergents. Hydraulic system malfunctions are often caused by poor machine maintenance practices. Following the guidelines below will result in proper hydraulic system maintenance:

- Do not use any additives with the hydraulic oil.
- Replace hydraulic oil that has been subjected to overheating or damaged components.
- Change the hydraulic filter as recommended.
- Keep the tank filled to the full level of hydraulic oil.
- Keep the oil cooler free of dust and debris.
- Cap and plug all openings after removing components for service or repair.

Lubrication and Grease

Always use clean extreme pressure (EP) grease when greasing the machine. Avoid using low-viscosity greases. SANY recommends EP 2 or equivalent grease designed for:

- Heavy-duty bearings and general industrial lubrication.
- Heavy-duty plain and rolling element bearings operating under severe conditions, including shock loading in wet environments.

Fuel

WARNING!

- **Fuel or fuel vapors that come into contact with hot surfaces or electrical components can cause a fire.**
- **Never service the fuel system near an open flame or while smoking.**
- **Clean up spilled fuel immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Never dilute fuels. Damage to the injection system can result, causing the machine to operate improperly.

Observe the following when adding fuel:

- Use #2 diesel fuel. In cold weather climates, use a mixture of #2 diesel and #1 diesel fuels. Use only ultra-low-sulfur fuel, with a limit of S<15 mg/kg for all normal operations. SANY does not recommend the use of any diesel fuel with a cetane level less than 40.
- Do not use gasoline, kerosene, or any unapproved fuels in the fuel system.
- Make sure there is no water or foreign material in the fuel. Take appropriate precautions to prevent fuel contamination during refueling. If fuel waxing or bacterial growth occurs in the fuel system, contact a SANY dealer.

Windshield Washer Fluid

Only use clean automotive windshield washer fluid. Donot mix concentrates into the washer fluid. In cold weather areas, use washer fluid with a low-temperature rating.

Engine Coolant

Engine coolant is an important fluid protecting against both engine coolant boiling and freezing. Anti-freezing engine coolant is also necessary in regions where freezing protection is unnecessary.

- If using concentrated engine coolant, use distilled water to dilute per instructions on engine coolant container. Natural water, such as river water and well water (hard water) contain large amounts of minerals (calcium, magnesium, etc.) which can form scale in the engine and radiator. Mineral scale is not easily removed and can cause overheating.
- Precautions in this manual must be followed when working with engine coolants.
- Some engine coolants are flammable. Keep them away from open fire.
- If the engine is overheating, wait for the engine to cool down before refilling engine coolant.

MAINTENANCE SCHEDULE

NOTICE!

Failure to perform the following procedures when and as directed can damage the machine and cause it to operate improperly.

NOTE: The lubricating intervals listed in the following tables apply only to normal operating conditions. In harsh environments, including dusty or corrosive air, extreme temperatures, heavy loads, frequent operating times, and long duty cycles, lubricating intervals should be shortened.

Daily Inspection and Maintenance

Do the following before operation with the engine off:

- Perform daily service as necessary.
- Inspect the machine for loose or missing components.
- Clean the operator area.
- Check all controls for smooth operation and make sure they return to the neutral position.
- Make sure all safety decals are in place and are legible.
- Make sure safety equipment is in place and in operating condition.
- Check for fluid leaks.

Check the following during operation with the engine running:

- Monitor the control panel for normal machine operating parameters.
- Make sure that the machine operates normally.
- Check for fluid leaks.

Check the following after operation with the engine off and cool:

- Check service points for wear or damage.
- Clean the operator station.
- Check for fluid leaks.
- Check for loose or missing fasteners and components.

When Required

- Replace the primary air filter according to the air filter restriction indicator. (See page 5-24.)
- Check the engine cooling system. (See page 5-29.)
- Check the track tension. (See page 5-43.)
- Inspect the bucket teeth. (See page 5-58.)
- Inspect/replace the bucket. (See page 5-59.)
- Apply grease to track spread slides. (See page 5-58.)

Daily or Every 8 Hours

- Lubricate the work equipment. (See page 5-51.)
- Inspect the machine for loose or missing components.
- Clean the operator area.
- Check all controls for smooth operation and make sure they return to the neutral position.
- Make sure all safety decals are in place and legible.
- Make sure safety equipment is in place and in operating condition.
- Check for fluid leaks.
- Check the fuel level. (See page 4-9.)
- Check the engine oil level. (See page 4-8.)
- Check the engine coolant level. (See page 4-7.)
- Check the hydraulic oil level. (See page 4-11.)
- Drain water from the fuel/water separator. (See page 4-10.)
- Check the air filters. (See page 5-24.)
- Check if the engine belt is loose or damaged. (See page 5-21.)

After the First 50 Hours

- Initial change of the engine oil and filter. (See page 5-19.)

Weekly or Every 50 Hours

- Check the battery. (See page 5-33.)

- Check the hydraulic hoses, lines, and connectors. (See page 5-42.)
- Check the final drive motor mounting fasteners. (See page 5-49.)
- Check and adjust the track tension. (See page 5-43.)

Every 100 Hours

- Lubricate the machine. (See page 5-16.)

After the First 150 Hours

- Initial replacement of the hydraulic oil return filter. (See page 5-38.)

After the First 250 Hours

- Change the engine oil and filter. (See page 5-19.)
- Collect final drive oil samples (both). (See page 5-49.)
- Change final drive oil in both sides. (See page 5-47.)

Every 250 Hours

- Change the engine oil and filter. (See page 5-19.)
- Check the track tension. (See page 5-43.)
- Inspect the engine coolant pump. (See page 5-28.)
- Check the engine belt. (See page 5-21.)
- Check the doors and hood. (See page 3-22.)
- With breaker operating above 50%, replace the hydraulic oil return filter. (See page 5-38.) Otherwise, see “Hydraulic Breaker Maintenance Interval” on page 5-15.

Every 3 Months or 500 Hours

- Clean and check the upper structure and undercarriage.
- Lubricate the swing gear and swing bearing. (See page 5-54.)
- Replace the secondary fuel filter. (See page 5-31.)
- Replace the primary fuel filter/water separator element. (See page 5-32.)
- Inspect and clean the cooling package. (See page 5-29.)
- Replace the secondary air filter. (See page 5-24.)

- Collect an oil sample from each final drive. (See page 5-49.)
- Collect an engine oil sample. (See page 5-20.)
- Collect a hydraulic oil sample. (See page 5-41.)

Every 6 Months or 1000 Hours

- Check the fuel tank strainer. (See page 5-5.)
- Check the fuel lines for leaks or damage. Replace as necessary.
- Check the accumulator function. (See page 5-36.)
- Check the swing drive fasteners. (See page 5-42.)

Annually or Every 2000 Hours

- Pressure wash and clean the entire machine. Do a complete machine structural inspection.
- Inspect the alternator. (See page 5-23.)
- Inspect the starter. (See page 5-23.)
- Change the engine coolant. (See page 5-26.)
- Check the engine valve clearance. (Contact a SANY dealer for more information.)
- Change the hydraulic oil. (See page 5-40.)
- Clean the hydraulic oil suction screen. (See page 5-38.)
- Change the final drive oil. (See page 5-47.)

NOTE: Record the completion of all maintenance tasks in the Maintenance Log. If authorized, remove all lockout/tagout warnings and machine-securing elements and fully activate the machine. Return the machine to operation.

Hydraulic Breaker Maintenance Interval

Hydraulic oil breaks down faster on machines equipped with a hydraulic breaker than on machines equipped with a bucket. Change the hydraulic oil and filters every 400 hours on breaker-equipped machines..

NOTICE!

The hydraulic oil filter must be replaced after 250 hours with a breaker operating rate above 50%. See “Change the Hydraulic Oil” on page 5-40.

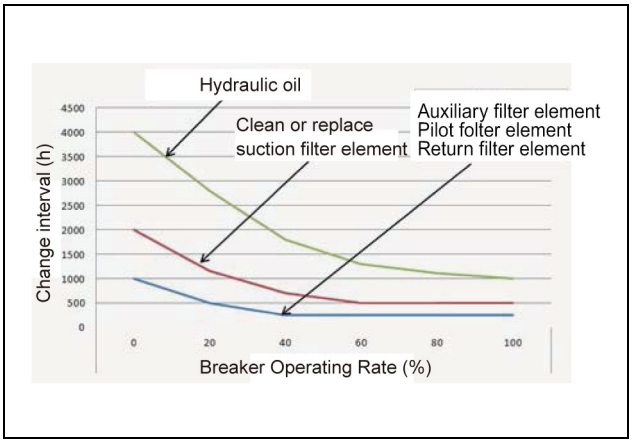

Fig. 5-1 0001636

After Maintenance is Completed

Record the completion of all of the maintenance tasks in the Maintenance Log. If authorized, remove all lockout/tagout warnings and machine-securing elements and fully activate the machine. Return the machine to operation.

Lubrication and Maintenance Charts

Lubricants minimize wear between moving parts. Insufficient lubrication leads to excessive wear and damage to components. Engine oil is critical for engine operation. Never use lubricants that are not SANY-approved.

Clean grease fittings before applying grease. Use a grease gun to pump grease into the fitting, and pump until old grease begins to escape. Clean off any grease that has been pushed out.

Shown below are the lubrication points that must be maintained according to the lubrication chart. See “Lubrication Points” on page 5-51.

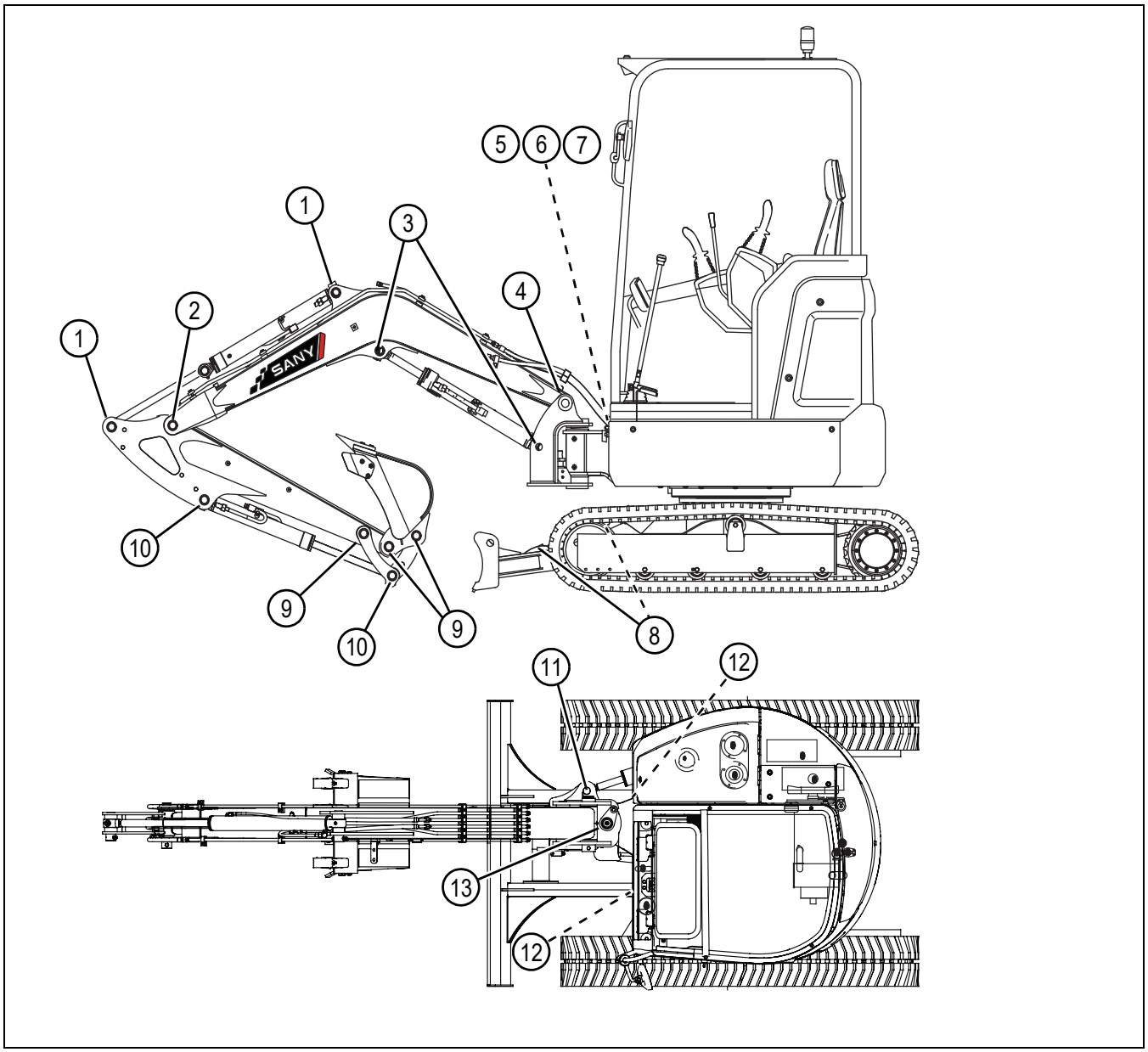

Fig. 5-2

0003217

Lubrication Chart						
Item	Maintenance Items	Qty.	Lubrication Interval			Lubricant
			Daily	50 hr.	100 hr.	
1	Arm cylinder pins	2		○		Grease
2	Boom-arm connecting pin	1		○		Grease
3	Boom cylinder pins	2		○		Grease
4	Boom pin	1		○		Grease
5	Swing bearing	1			○	Grease
6	Swing gear	1		○		Grease
7	Boom swing cylinder base end pin	1			○	Grease
8	Dozer blade cylinder pins	2		○		Grease
9	Bucket linkage pins	3	○			Grease
10	Bucket cylinder pin	4	○			Grease
11	Boom swing cylinder rod end pin	1		○		Grease
12	Dozer blade linkage pins	2		○		Grease
13	Boom swing pin	2			○	Grease

Replacement Item Intervals								
Replacement Items	When Required	8 hr.	50 hr.	100 hr.	250 hr.	500 hr.	1000 hr.	2000 hr.
Engine oil and filter		○	▲		△			
Engine coolant		○					△	
Fuel/water separator element		□				△		
Secondary fuel filter						△		
Primary air filter	△							
Secondary air filter						△		
Hydraulic suction screen	△						□	△
Hydraulic return filter				▲			△	
Hydraulic oil								△
Final drive oil								△

The charts indicate the service intervals for lubrication, maintenance, and replacement. The following symbols indicate the type of service:

- ○ Maintenance/Lubrication.
- △ Replacement.
- ▲ Initial replacement on new machine.
- □ Clean or drain as applicable.

MAINTENANCE PROCEDURES

Engine

WARNING!

Maintenance and service must be performed with the engine off unless otherwise indicated.

- **Shut off the engine before opening or removing the engine cover.**
- **Remove the key and turn the battery disconnect switch to OFF.**

Failure to follow these warnings could result in death or serious injury.

CAUTION!

Do not perform engine maintenance when the engine is hot. Hot engine oil or engine components may cause severe burns. Allow the engine to cool before performing engine maintenance. Failure to follow this caution could result in injury.

Engine Inspection

Always turn off the engine and turn the battery disconnect switch to OFF (unless otherwise specified) before inspecting the engine or performing maintenance or service procedures.

Regular inspection of the engine and engine compartment helps identify potential problems and prevents defects that may lead to service interruption and costly repair.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Shut the engine off and open the engine hood.
3. Inspect the engine and engine compartment for:
    - Oil, fuel, and engine coolant leaks.
    - Loose fasteners and connections.
    - Worn or loose engine belt.
    - Damaged hoses and wiring harnesses.

Prestart Inspection

For more information, see “Daily Inspection and Maintenance” on page 5-11.

Pre-start Check	Reference
Check the engine coolant level and top off as necessary.	“Engine Coolant Level Check” on page 4-7
Check the engine oil level.	“Engine Oil Level Check” on page 4-8
Check the fuel level and add as necessary.	“Fuel Level Check” on page 4-9
Drain water from the fuel/water separator.	“Drain the Fuel/Water Separator” on page 4-10
Check hydraulic oil level and add as necessary.	“Hydraulic Oil Level Check” on page 4-11
Check the electrical wires and connectors for damage.	“Electrical Components Check” on page 4-13
Check the horn operation.	“Horn Function Check” on page 4-13

Check the Engine Oil Level

See “Engine Oil Level Check” on page 4-8.

Change the Engine Oil and Filter

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

NOTICE!

Dispose of used oil and filter in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

NOTE: For engine oil capacity, see “Fluid Capacities” on page 5-9.

2. Place a suitable container under the drain plug (1).
3. Remove the drain plug and allow the oil to drain.
4. Install the drain plug.

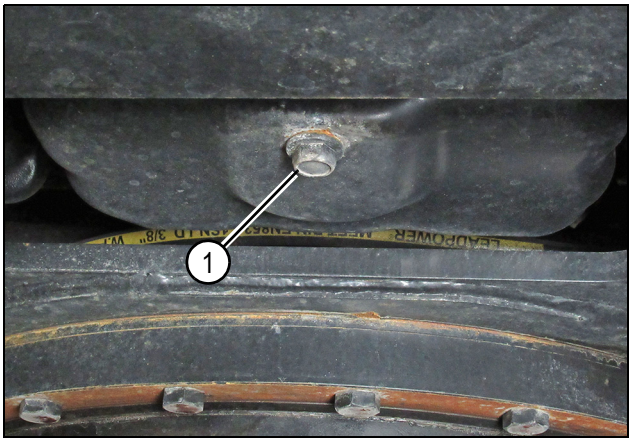

Fig. 5-3 0003218

5. Open the engine hood and remove the oil filter (2).

6. Clean the oil filter housing mating surface as necessary to remove O-ring residue and inspect the threads.

7. Apply a thin layer of engine oil to the new oil filter O-ring gasket.

8. Install the new oil filter by hand until the oil filter O-ring touches the oil filter housing.

9. Tighten the oil filter 3/4 to 1 full turn by hand to securely install the oil filter.

   NOTE: Overtightening the filter may damage the O-ring, resulting in an oil leak.

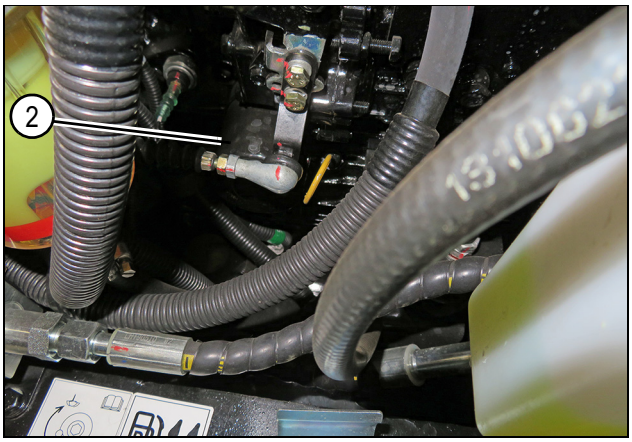

Fig. 5-4 0005086

10. Add engine oil until the oil level is at the upper mark on the dipstick. See “Engine Oil Level Check” on page 4-8.

11. Start and run the engine at low idle for 5 minutes.

12. Stop the engine and check the engine oil level. Add engine oil as necessary.

Collect Engine Oil Sample

1. Obtain an oil analysis sample kit from a SANY dealer.

2. Operate the machine until the engine oil is up to normal operating temperature.

3. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

NOTICE!

It is critical that all material used to collect the sample is absolutely clean. Failure to adhere to this warning can cause equipment damage and contaminate the sample.

4. Open the engine hood.

5. Clean the area around the engine oil dipstick and remove the dipstick.

6. Insert the sample tube into the dipstick tube and collect a sample of engine oil. Replace the dipstick.

7. Send the sample for testing in accordance with the instructions packaged with the sample kit.

Check and Adjust the Engine Belt Tension

NOTICE!

A loose engine belt may cause improper battery charging, engine overheating, or accelerated engine belt wear. An overtightened engine belt may cause damage to the belt, the bearings in the alternator, and the engine coolant pump.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Remove the four fasteners (1) securing the operator seat base plate. Remove the seat with base plate to access the engine compartment.

Fig. 5-5 0005101

3. Check the engine belt tension by pressing down on the engine belt between the fan pulley (2) and the alternator pulley (3). The engine belt must deflect (4) 0.35 in.–0.47 in. (9 mm–13 mm).

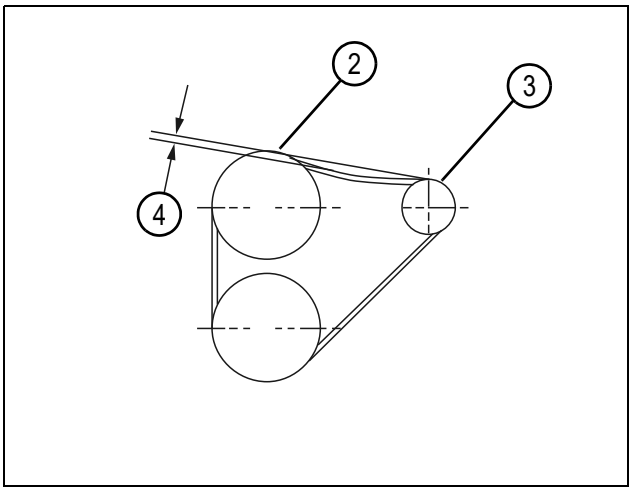

Fig. 5-6 0003092

4. Adjust the engine belt if it is outside of specification. Loosen the adjusting plate fastener (5) and alternator bracket fastener (6).

5. Use a lever between the alternator and adjusting plate bracket to properly tension the belt. Hold the alternator in this position and tighten the adjusting plate fastener.

6. Tighten the alternator bracket fastener.

7. Check the engine belt tension to confirm adjustment.

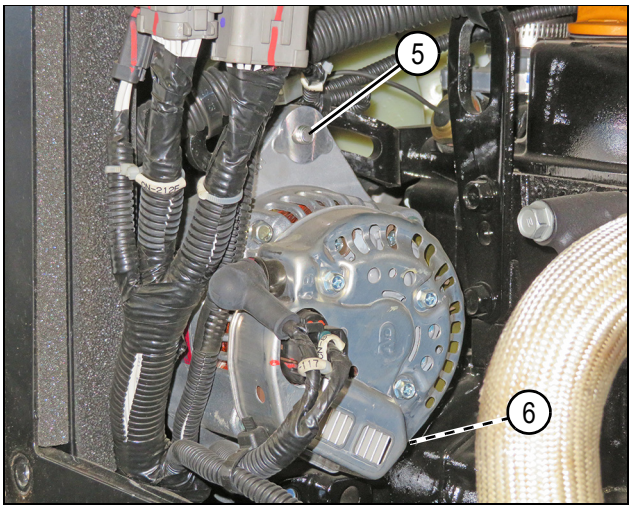

Fig. 5-7 0005158

Inspect/Replace the Engine Belt

Inspect the Engine Belt

Visually inspect the condition of the engine belt. An engine belt that has been exposed to oil or engine coolant, or shows signs of damage or wear, must be replaced.

- Abrasion: The belt appears shiny or glazed, or fabric is exposed. This is a sign that the engine belt is in contact with an object, such as a flange or fastener.

- De-lamination: Chunks of rubber material have broken from the engine belt. At this stage, the engine belt can fail at any moment. Heat, age, and stress are the primary contributors.

- Pulling: Belt material is sheared from the ribs. Lack of tension, misalignment, worn pulleys, or a combination of these factors can cause the following:

- Uneven rib wear: The engine belt shows damage to the side, with the possibility of breaks in the tensile cord or jagged-edged ribs. A thumping/grinding noise may also be heard when running.

- Improper installation: An engine belt rib begins separating from the strands. If left unattended, the cover will often separate, causing the belt to unravel.

- Cracking: Small visible cracks appear along the length of a rib or ribs. With continuous exposure to high temperatures, the stress of bending around the pulleys leads to cracking.

- Misalignment: The side walls of the engine belt may appear glazed, or the edge-cord may become frayed. A noticeable noise may result.

- Gravel penetration: Small pinholes are visible on the back side of the engine belt. Bumps may be visible, and fabric around the holes can be frayed, indicating damage from foreign objects such as dirt, gravel, or similar debris.

Replace the Engine Belt

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Open the engine hood.
3. Remove the four fasteners (1) securing the operator seat base plate. Remove the seat with base plate to access the engine compartment.

Fig. 5-8 0005101

4. Loosen the adjusting plate fastener (2) and alternator bracket fastener (3). Move the alternator toward the engine until the belt can be removed.
5. Install a new engine belt in the reverse order of removal. Adjust the belt tension. See “Check and Adjust the Engine Belt Tension” on page 5-21.
6. Run the engine at low idle for 5 minutes and then shut down the machine. Check the belt tension and adjust as needed.
7. Install the operator seat and base.

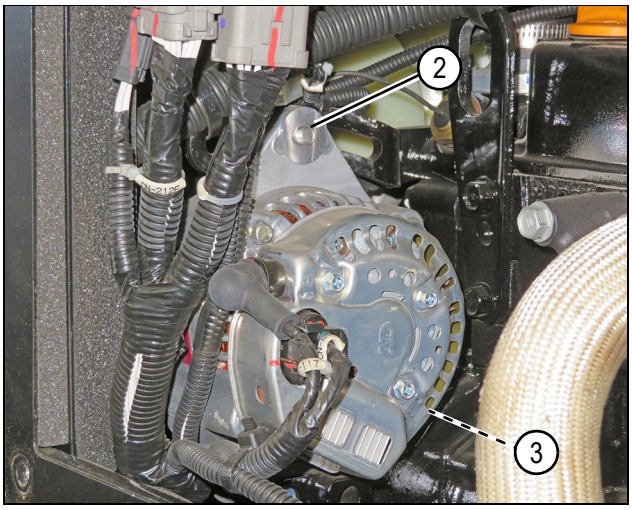

Fig. 5-9 0005158

Check the Alternator

Prepare the machine for service. See “Maintenance Safety” on page 2-9.

Check the alternator for abnormal noise and operation. If the alternator is malfunctioning, the brushes or bearings may have reached the end of their service life and may need to be replaced. Contact a SANY dealer for additional information.

Check the Starter

Prepare the machine for service. See “Maintenance Safety” on page 2-9.

Check the starter motor for abnormal noise and operation. If the starter is malfunctioning, contact a SANY dealer for additional information.

Check and Replace the Air Filters

NOTICE!

If you check or replace air filter elements when the engine is running, dirt may enter the engine and cause damage. It is necessary to shut off the engine before conducting this procedure.

Check the Air Filters

1. Open the engine hood.

2. Inspect the air filter restriction indicator (1).

   NOTE: When the service indicator window is red, airflow through the filter is restricted and the primary air filter element must be replaced. Reset the air filter restriction indicator after servicing by pressing the end (2) of the indicator body.

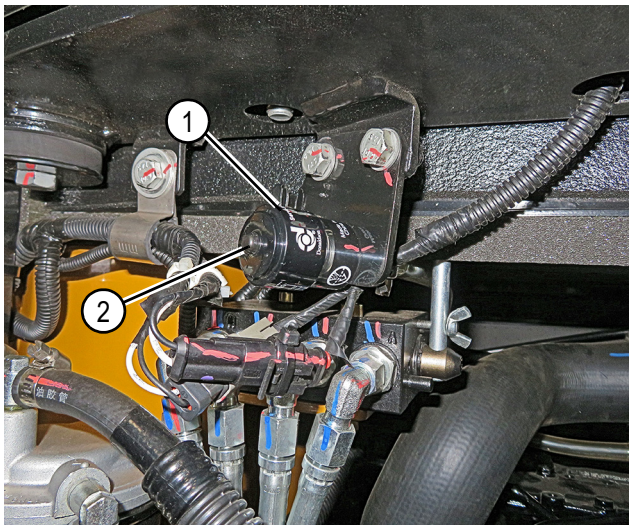

Fig. 5-10 0005103

3. Inspect the dust valve (4). The dust valve (4) is at the bottom of the end cover (3). When the engine is off, the dust valve should be closed.

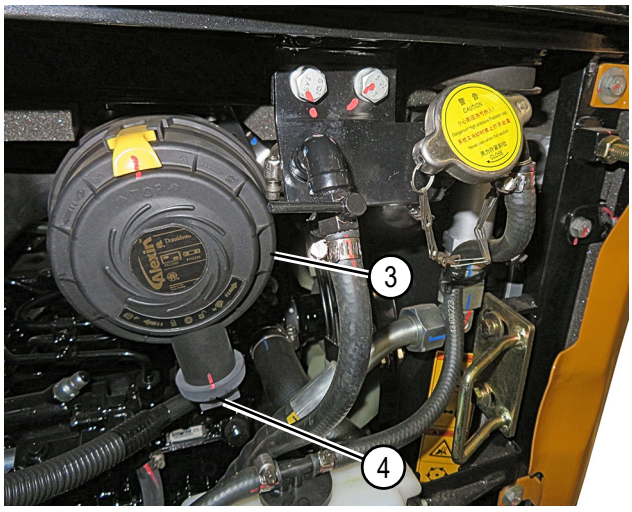

Fig. 5-11 0005102

NOTE: If the dust valve is cracked, torn, remains open, or is missing, dust particles that are normally expelled can reenter the filter housing and deposit themselves on the filter, shortening the air filter service life.

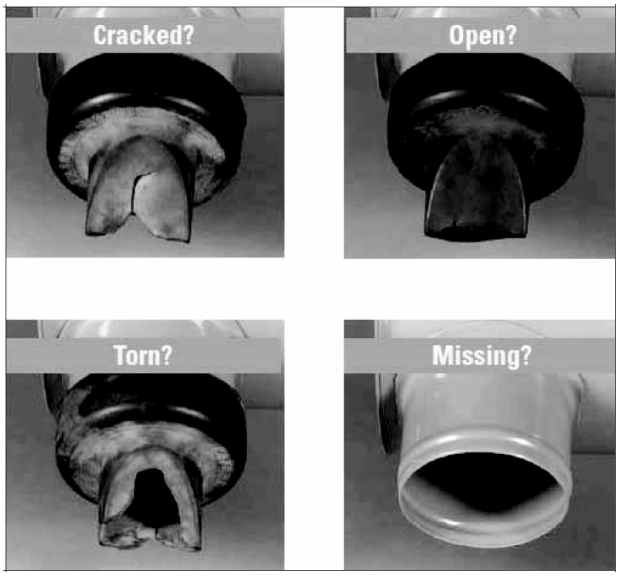

Fig. 5-12 0004113

Replace the Air Filters

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Open the engine hood.
3. Release the latch (1) and remove the end cover (2).

NOTE: Clean the interior of the housing before removing the primary filter element.

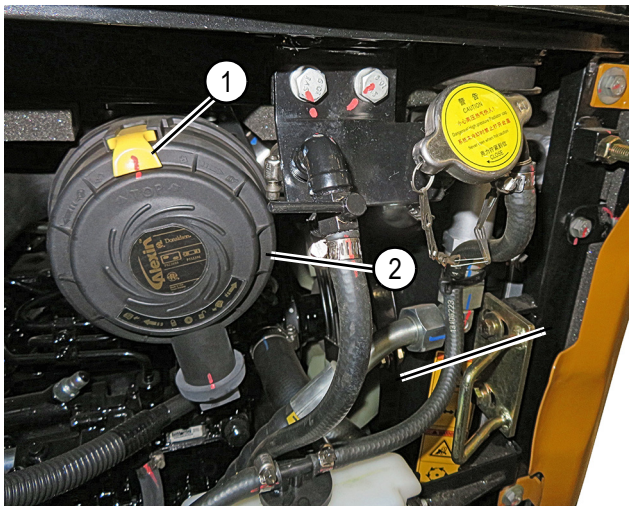

Fig. 5-13 0005102

4. Remove the primary filter element (4) and then the secondary filter element (3).

5. Installation is in the reverse order of removal.

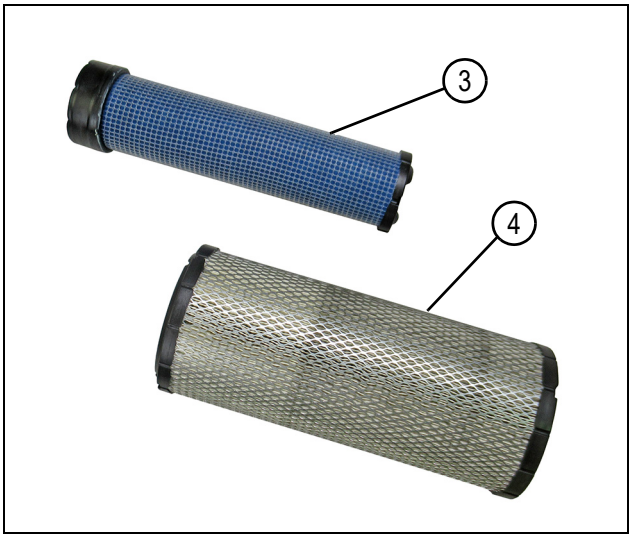

Fig. 5-14 0003093

Engine Cooling System

Check the Engine Coolant Level

See “Engine Coolant Level Check” on page 4-7.

Change the Engine Coolant

WARNING!

- **Engine coolant is toxic. Avoid inhaling or ingesting engine coolant.**
- **Do not remove the radiator cap while the engine is hot. Engine coolant is under pressure when hot and could spray out. Always wait for the engine to cool before removing the radiator cap.**

Failure to follow these warnings could result in death or serious injury.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Open the engine hood.

3. Open the radiator vent valve (1) to relieve pressure in the radiator.

4. Slowly loosen and remove the radiator cap (2).

   NOTE: For the engine cooling system capacity, see See “Fluid Capacities” on page 5-9.

5. Remove the right access panel. See “Remove/Install the Right Access Panel” on page 3-23.

6. Remove the right skirt panel. See “Remove/Install the Right Skirt Panel” on page 3-24.

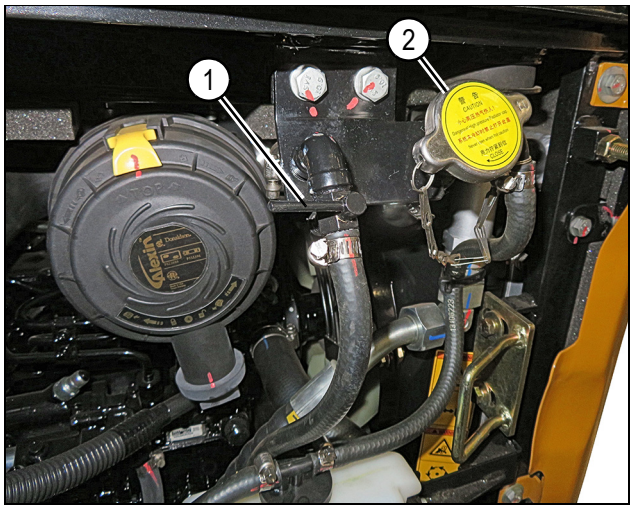

Fig. 5-15 0005102

7. Place an appropriate container under the engine coolant drain hose (3). Open the coolant drain valve (4) and allow the engine coolant to drain.

8. Close the drain valve. Add clean water to fill the radiator. Start the engine and run it at low speed until the temperature reaches 194ºF (90ºC). Run the engine for an additional 10 minutes.

9. Stop the engine. Allow the engine to cool and drain the water into an appropriately sized container.

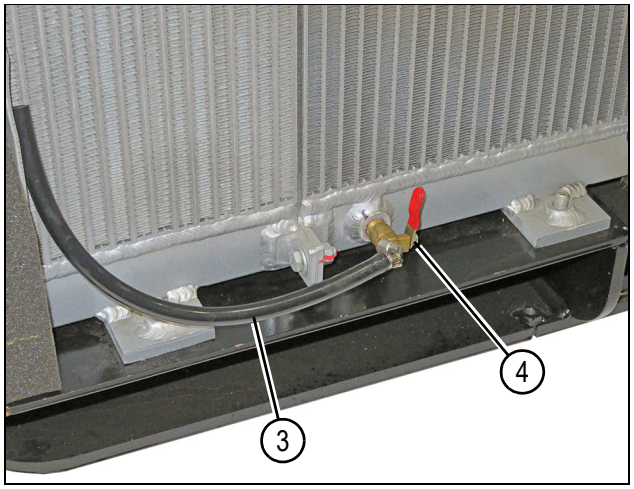

Fig. 5-16 0005146

NOTICE!

Dispose of engine coolant in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

10. Remove the overflow tank (4) from the machine.

11. Drain the coolant into an appropriate container and install the overflow tank.

12. Close the coolant drain valve. Add new engine coolant until the level reaches the radiator filler opening. With the radiator cap removed, run the engine at low idle for 5 minutes, and then at high speed for 5 minutes, to bleed air from the cooling system.

13. Top off the radiator and fill the overflow tank until the engine coolant is between the FULL (5) and LOW (6) marks.

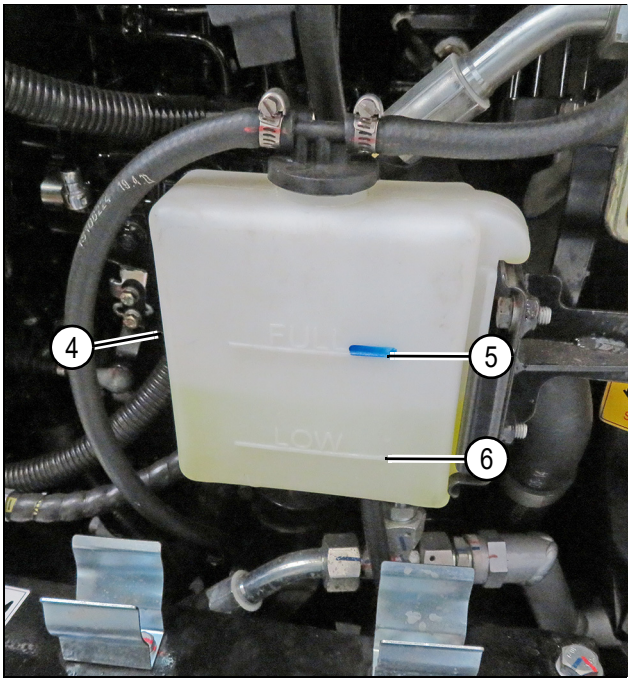

Fig. 5-17 0005082

Inspect the Engine Coolant Pump

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. The engine coolant pump is behind the engine cooling fan. Inspect the engine coolant pump for any signs of engine coolant leaks.

3. If the fan pulley has any play, the bearings inside the engine coolant pump may be worn and the engine coolant pump may need to be replaced.

Inspect and Clean the Cooling Package

WARNING!

- **Do not allow compressed air, pressurized water, or steam to come into contact with skin. Always wear goggles, gloves, and other personal protective equipment.**
- **Engine coolant is toxic. Avoid inhaling or ingesting engine coolant.**
- **Do not remove the radiator cap while the engine is hot. Engine coolant is under pressure when hot and could spray out. Always wait for the engine to cool before removing the radiator cap.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Compressed air, high-pressure water, or steam can damage the cooling fins if the nozzle is too close to the fins. To prevent cooling fin damage, keep the nozzle at a safe distance while cleaning.

Never direct compressed air, high-pressure water, or steam directly into the cooling fins. Damaged cooling fins may lead to leaks and overheating. In dusty environments, inspect the cooling fins daily regardless of the maintenance schedule.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Remove the fuel filler cap and open the engine hood.
3. Remove the right access panel. See “Remove/Install the Right Access Panel” on page 3-23.
4. Remove the right skirt panel. See “Remove/Install the Right Skirt Panel” on page 3-24.

   NOTE: Maintain a minimum distance of 12 in. (30 cm) from the cooling fins during cleaning.

5. Check the front and rear of the engine radiator (1) and hydraulic oil cooler (2) for dirt or debris. Use compressed air or pressurized water in the opposite direction of the airflow through the cooling package.

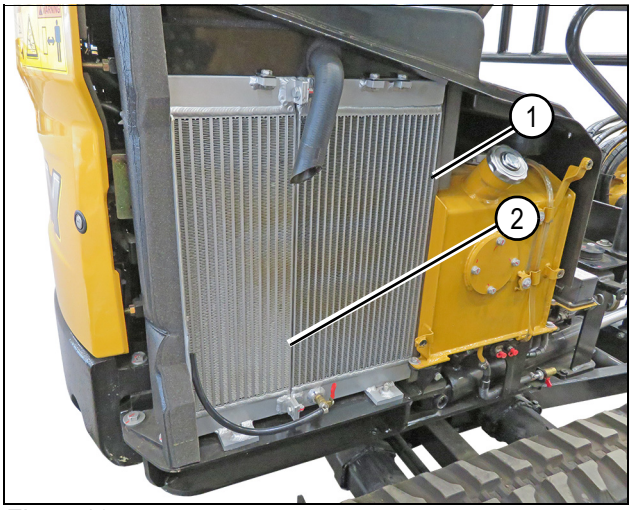

Fig. 5-18 0005156

6. Check the fins for deformation, corrosion, and cracks after cleaning. Repair the component immediately if damaged cooling fins are found.
7. Check the hose clamps. Tighten as necessary.
8. Install the right access panel and fuel filler cap.

Fuel System

Drain the Fuel Tank

WARNING!

- **Components and oil remain hot when the engine is stopped, which may cause severe burns. Wait until components and oil are cool before you proceed.**
- **Never service the fuel system near an open flame or while smoking.**
- **Fuel that comes into contact with hot surfaces or electrical components can cause a fire. Clean up any fuel spills immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Dispose of contaminated fuel or water in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

NOTE: Use diesel fuel to clean the inside of the fuel tank. Never use trichloroethane to clean the fuel tank.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

   NOTE: For fuel capacity, see “Fluid Capacities” on page 5-9.

2. Locate the fuel drain valve (2) under the right side of the machine. Place a suitable container under the valve to collect drained fuel.

3. Open the fuel drain valve to drain water and sediment accumulated on the bottom of the tank. Do not allow the fuel to splash out of the container.

4. Close the valve when only clean fuel drains from the fuel tank.

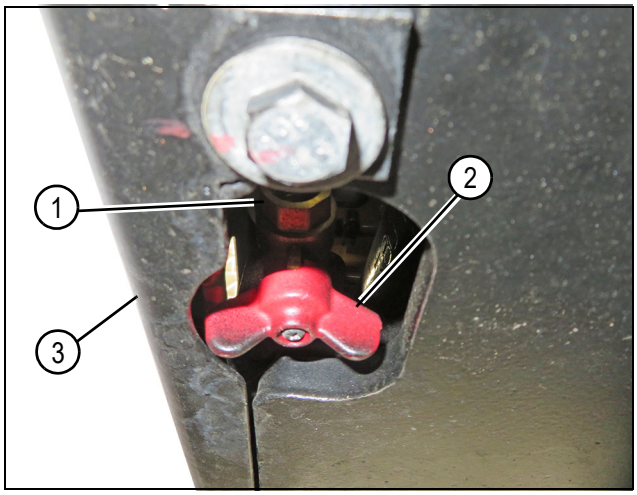

Fig. 5-19 0005133

5. If the fuel tank is completely drained, the system must be bled after refilling. See “Bleed the Fuel System” on page 5-30.

Bleed the Fuel System

NOTE: Air trapped in the fuel system may cause engine starting failure or abnormal running.

After servicing the fuel system or running out of fuel, the key switch should be turned to ON for 2 to 3 minutes before attempting to start the engine. The lift pump will bleed air from the system.

Replace the Secondary Fuel Filter

WARNING!

- **Components and oil remain hot when the engine is stopped, which may cause severe burns. Wait until components and oil are cool before you proceed.**
- **Never service the fuel system near an open flame or while smoking.**
- **Fuel that comes into contact with hot surfaces or electrical components can cause a fire. Clean up any fuel spills immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

- **Cleanliness is important when working with an open fuel system. Contaminated fuel can result in engine damage.**
- **Dispose of fuel and filter in accordance with all applicable environmental regulations. Failure to do so could damage the environment.**

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Open the engine hood. Place a container under the secondary fuel filter (1) to collect spilled fuel.
3. Remove the fuel filter with a filter wrench.
4. Clean the mounting base of the fuel filter and fill the new fuel filter with clean fuel. Apply a thin film of engine oil to the O-ring and install the new fuel filter onto the filter housing.
5. When the fuel filter O-ring touches the filter housing, turn the fuel filter an additional 1/2 turn. Overtightening the filter may damage the O-ring, resulting in a fuel leak.
6. Bleed trapped air from the fuel system. See “Bleed the Fuel System” on page 5-30.
7. Start the engine and check the fuel filter for leaks.

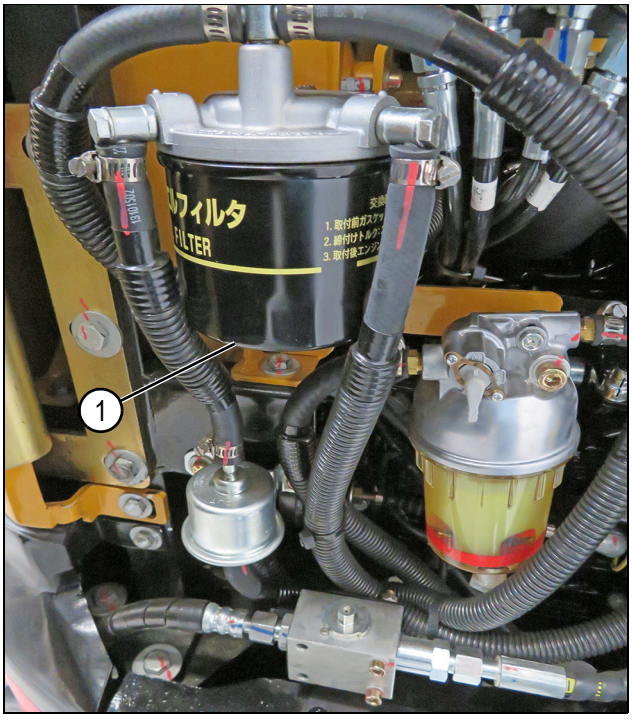

Fig. 5-20 0004985

Drain and Clean the Primary Fuel Filter/Water Separator

WARNING!

Components and oil remain hot when the engine is stopped, which may cause severe burns. Wait until components and oil are cool before you proceed.

- **Never service the fuel system near an open flame or while smoking.**
- **Fuel that comes into contact with hot surfaces or electrical components can cause a fire. Clean up any fuel spills immediately.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

- **Cleanliness is important when working with an open fuel system. Contaminated fuel can result in engine damage.**
- **Dispose of fuel and filter in accordance with all applicable environmental regulations.**

Failure to follow this notice could result in damage to the environment.

A fuel/water separator separates water and sediment from diesel fuel. Complete the following steps to drain water and sediment from the fuel/water separator:

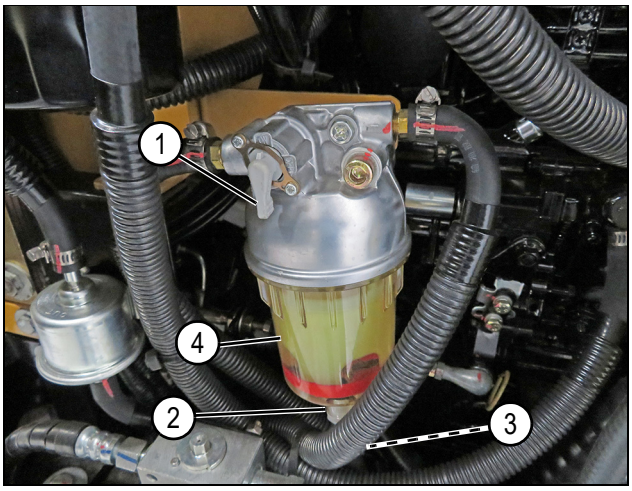

Fig. 5-21 0005080

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Open the engine hood.
3. Turn the fuel shutoff valve (1) 1/4 turn to the OFF position as indicated.
4. Route the drain hose (3) into a suitable container. Open the drain valve (2) and drain the water and sediment.
5. Close and hand-tighten the drain valve.
6. Remove the filter housing (4) and paper filter from the filter housing.
7. Clean the filter housing with clean fuel.
8. Replace the paper filter and make sure it is securely seated within the filter housing, then fill the filter housing with clean fuel.
9. Reinstall the filter housing and turn the fuel shutoff valve (1) 1/4 turn to the ON position.
10. Start the engine and check for leaks.

Battery

Check the Battery

WARNING!

Before proceeding with any battery maintenance procedure, follow and remember these points:

- **Battery gases are explosive. Never smoke around batteries or expose them to sparks or open flames.**
- **Wear personal protective equipment when working with batteries.**
- **Work in a well-ventilated area.**
- **If battery acid contacts skin or eyes, flush the area immediately with fresh water and seek medical attention.**

Failure to observe and follow these warnings could result in death or serious injury.

NOTICE!

After machine shutdown, wait at least 1 minute for the engine control module (ECM) to complete its shutdown before disconnecting the battery. Failure to observe and follow this notice can damage the machine or cause it to operate improperly.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Turn the battery disconnect switch to OFF. See “Battery Disconnect Switch” on page 3-19.
3. Remove fasteners (1) and the battery panel (2).

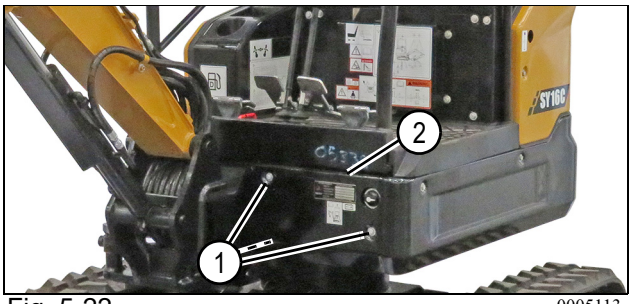

Fig. 5-22 0005113

4. Check the ground (1) and positive (2) terminals for corrosion or loose connections under the protective covers. Clean the area with a mixture of baking soda and warm water and tighten fasteners as needed.

5. Wipe down the battery and terminals with a clean cloth.

6. Use a corrosion-preventing coating on the battery terminals.

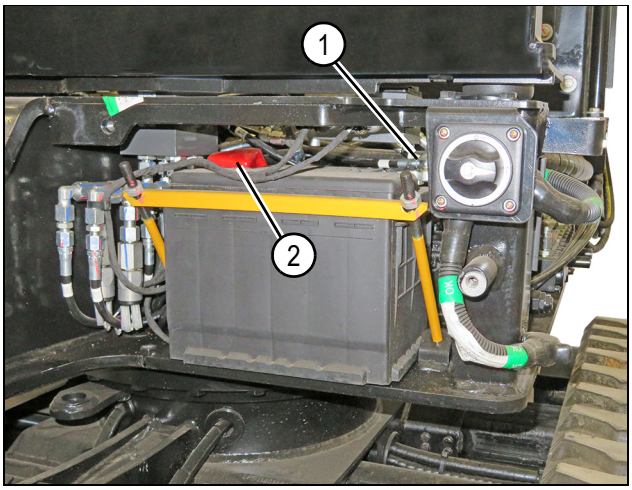

Fig. 5-23 0005148

Remove the Battery

WARNING!

Before proceeding with any battery maintenance procedure, follow and remember these points:

- **Battery gases are explosive. Never smoke around batteries or expose them to sparks or open flames.**
- **Wear personal protective equipment when working with batteries.**
- **Work in a well-ventilated area.**
- **If battery acid contacts skin or eyes, flush the area immediately with fresh water and seek medical attention.**

Failure to observe and follow this warning could result in death or serious injury.

NOTICE!

After machine shutdown, wait at least 1 minute for the engine control module (ECM) to complete its shutdown before disconnecting the battery. Failure to observe and follow this notice can damage the machine or cause it to operate improperly.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Turn the battery disconnect switch to OFF. See “Battery Disconnect Switch” on page 3-19.

3. Remove fasteners (1) and the battery panel (2).

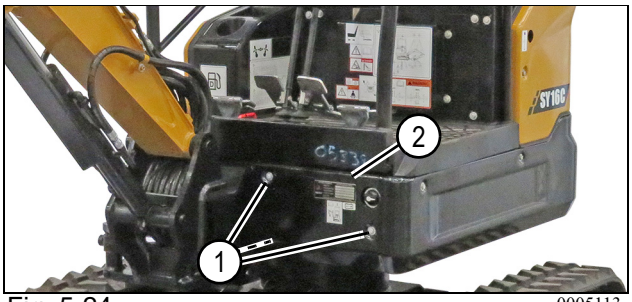

Fig. 5-24 0005113

4. Disconnect the ground (negative) terminal (1) first, followed by the positive terminal (2).

5. Remove the battery clamp fasteners (3) and battery clamp (4).

6. Check that all cables and parts are out of the way, then lift the battery out of the battery compartment.

7. Clean the battery tray.

8. Installation is in the reverse order of removal. Connect the positive terminal first, followed by the ground (negative) terminal.

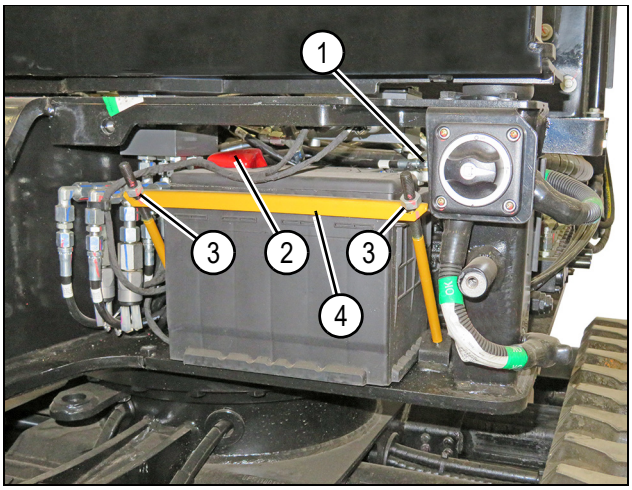

Fig. 5-25 0005148

Hydraulic System

Check the Accumulator Function

WARNING!

- **The accumulator contains pressurized nitrogen. Improper handling is extremely dangerous.**
- **Do not drill holes in the accumulator or place it close to fire or a high-heat source.**
- **Do not weld any part on the accumulator.**
- **Air in the accumulator must be released upon disposal.**
- **See “Accumulator” on page 2-6 for special precautions that need to be taken when working with or around the accumulator. Contact a SANY dealer for additional information.**

Failure to follow these warnings could result in death or serious injury.

The accumulator (1) stores hydraulic pressure that allows the operator to lower hydraulic equipment within 15 minutes of an engine shutdown with the key switch in the ON position.

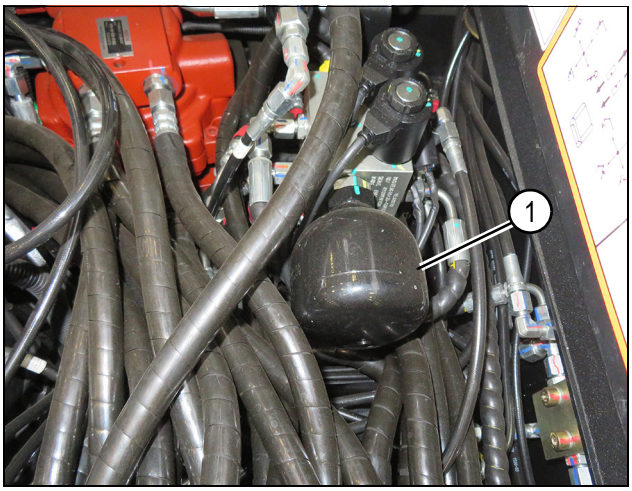

Fig. 5-26 0005126

1. Lower the work equipment to 18 in.–24 in. (0.45 m–0.6 m) from the ground.
2. Shut down the engine.
3. Turn the key switch to ON.
4. Move the hydraulic lockout control lever to the unlocked (open) position.
5. Use the joystick to lower the boom to the ground.
6. If the boom lowers to the ground, no further action is required.
7. If the boom does not lower to the ground, contact a SANY dealer for service.

Relieve Hydraulic System Pressure

Relieve pressure before disconnecting or servicing hydraulic system components.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Turn the key switch to ON. Do not start the engine.
3. Move the hydraulic lockout control lever to the unlocked (open) position.
4. Move all control levers to full stroke in all directions to release internal pressure.
5. Turn the key switch to OFF.

Check the Hydraulic Oil Level

See “Hydraulic Oil Level Check” on page 4-11.

Add Hydraulic Oil

WARNING!

- **Allow the hydraulic system to cool before servicing. Hot oil may cause burns or other serious injury.**
- **The hydraulic tank may be under pressure, and hydraulic oil may be present at the filler cover. Relieve any pressure to prevent injury.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Filling the hydraulic tank past the recommended maximum level may result in hydraulic system damage.

1. Position the work equipment as shown on the hydraulic tank decal. See “Hydraulic Oil Level Check” on page 4-11.
2. Relieve system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.
3. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
4. Remove the left access panel. See “Remove/Install the Left Access Panel” on page 3-25.

5. Remove two fasteners (1) and the hydraulic oil filler cover (2).

6. Slowly add hydraulic oil. Monitor the oil level as it is added using the sight glass (3). See “Hydraulic Oil Level Check” on page 4-11.

7. Install the hydraulic oil filler cover after the tank is full.

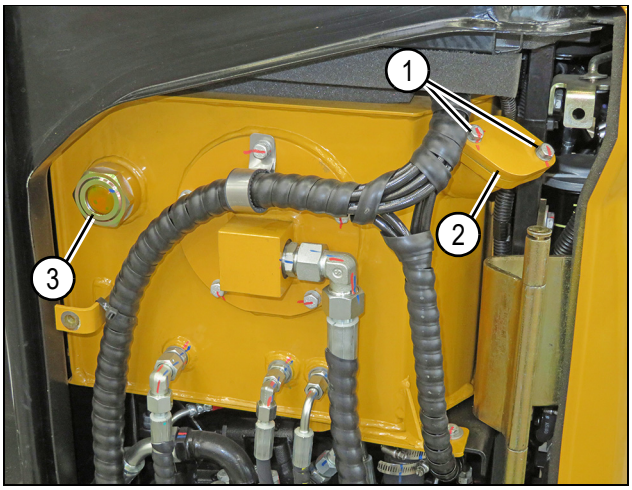

Fig. 5-27 0005145

Replace the Hydraulic Oil Return Filter

WARNING!

- **Allow the hydraulic system to cool before servicing. Hot oil may cause burns or other serious injury.**
- **The hydraulic tank may be under pressure, and hydraulic oil may be present at the filler cover. Remove the filler cover slowly to relieve any pressure and avoid injury.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

Examine the return filter for metal chips and debris. An excessive amount of bronze and steel chips indicates that the hydraulic pump or a hydraulic motor has been damaged. Rubber debris indicates seal and/or gasket damage. Inspect these components before filling the hydraulic tank and returning the machine to service.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Relieve system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.

3. Remove the left access panel. See “Remove/Install the Left Access Panel” on page 3-25.

4. Remove fasteners (4) and the hydraulic oil filler cover (3).

5. Place a funnel with a hose under the hydraulic tank drain plug (3).

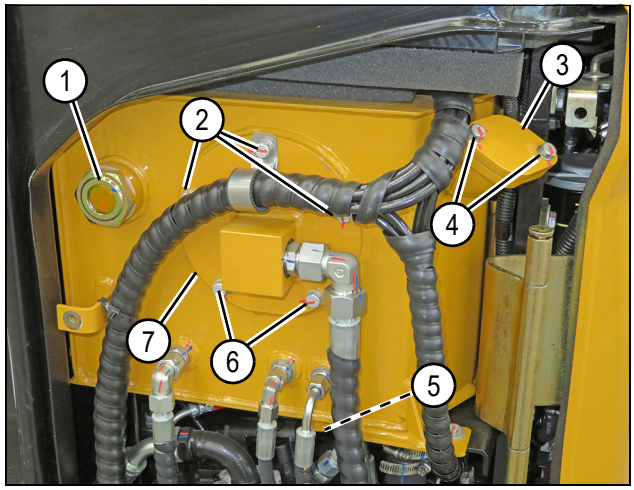

Fig. 5-28 0005145

NOTICE!

Dispose of used oil and filter in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

6. Remove the drain plug and drain the oil.

7. Obtain an oil sample for testing.

8. Replace the O-ring on the drain plug.

9. Reinstall and tighten the drain plug after the hydraulic tank has drained.

10. Remove fasteners (2) and the hydraulic tank cover plate (7) from the side of the hydraulic tank.

11. Remove and replace the hydraulic return filter attached to the back of the cover plate.

12. Remove and examine the screen inside of the tank.

    NOTE: Replace a clogged or damaged screen with a new one.

13. Reinstall the cover plate.

14. Add hydraulic oil to the hydraulic tank until the hydraulic oil level is between the marks on the hydraulic tank level sight glass (1).

15. Install the hydraulic oil filler cover (3) with fasteners (4).

16. Start the engine.

17. Place the hydraulic lockout lever in the unlocked (open) position and run the engine for 10 minutes.

18. Shut the engine down and check for leaks.

19. Tighten connections if leaks are found.

20. Dispose of the used hydraulic oil and filter.

21. Reinstall the left access panel.

Change the Hydraulic Oil

WARNING!

- **Allow the hydraulic system to cool before servicing. Hot oil may cause burns or other serious injury.**
- **The hydraulic tank may be under pressure, and hydraulic oil may be present at the filler cover. Relieve any pressure to avoid injury.**

Failure to follow these warnings could result in death or serious injury.

NOTICE!

- **If the hydraulic oil is contaminated (discolored or containing debris), find and correct the cause of the contamination before changing the hydraulic oil.**
- **Dispose of used hydraulic oil in accordance with all applicable environmental regulations. Failure to do so could damage the environment.**

NOTE:

- Always use the same type and grade of hydraulic oil.
- Hydraulic oil deteriorates faster on machines equipped with a hydraulic breaker than on machines equipped with a bucket. See “Hydraulic Breaker Maintenance Interval” on page 5-15 for additional information.

1. Swing the upper structure 90 degrees clockwise to position the hydraulic oil drain plug between the tracks.
2. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
3. Relieve system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.
4. Remove the left access panel. See “Remove/Install the Left Access Panel” on page 3-25

5. Remove fasteners (1) and the hydraulic oil filler cover (2).

6. Place a suitable container under the hydraulic tank drain plug (1).

   NOTE: For hydraulic tank capacity, see “Fluid Capacities” on page 5-9.

7. Remove the hydraulic tank drain plug (3) and allow the oil to drain.

8. Remove fasteners (4) and the cover plate (5).

   NOTE: The hydraulic return filter and screen are behind the cover plate and can be removed.

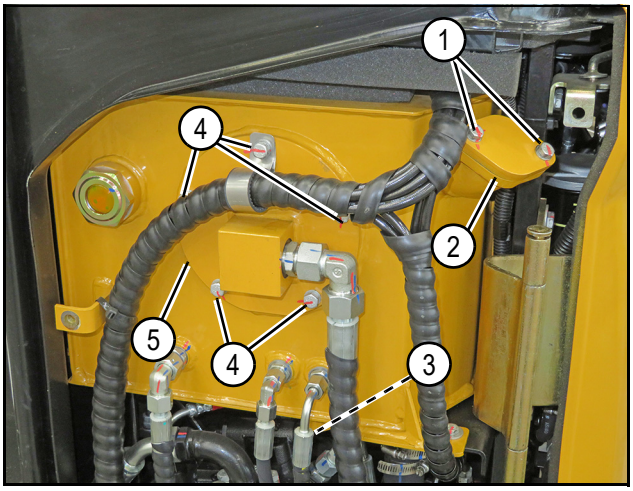

Fig. 5-29 0005145

9. Clean the inside of the hydraulic tank.

10. Reinstall the cover plate, return filter and screen.

11. Install and tighten the drain plug.

12. Fill the hydraulic tank to the specified level. See “Add Hydraulic Oil” on page 5-37.

Collect Hydraulic Oil Sample

1. Obtain an oil analysis sample kit from a SANY dealer.

2. Operate the machine until the hydraulic oil is up to normal operating temperature.

3. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

NOTICE!

It is critical that all material used to collect the sample is absolutely clean. Failure to adhere to this warning can cause equipment damage and contaminate the sample.

4. Remove the hydraulic tank breather assembly. See “Add Hydraulic Oil” on page 5-37.

5. Insert the sample tube into the hydraulic tank and collect a sample of hydraulic oil. Reinstall the hydraulic tank breather assembly.

6. Send the sample for testing in accordance with the instructions packaged with the sample kit.

Check the Hydraulic Hoses, Lines, and Connectors

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Remove the floor mat and floor plate to access control valve hoses. See “Floor Access Panel” on page 3-27.

3. Remove the left access panel and left skirt panel to access hydraulic pump lines and hoses. See “Remove/Install the Left Access Panel” on page 3-25 and “Remove/Install the Left Skirt Panel” on page 3-26.

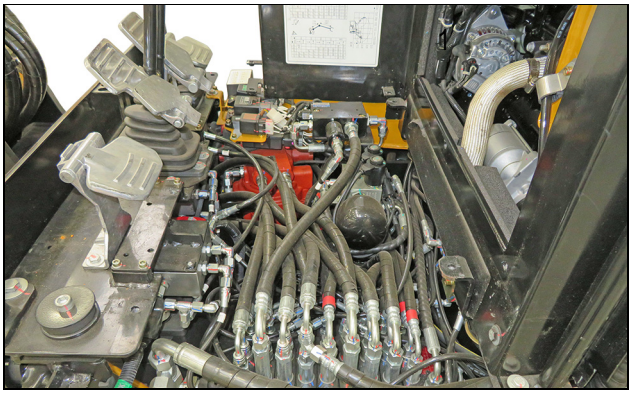
Fig. 5-30 0005154

Check all hoses and lines for leaks. Replace damaged or leaking hoses or lines immediately.

Make sure there is sufficient clearance between all hydraulic lines and hoses and the high-temperature engine components. Make sure there is no friction between them. Make sure no hydraulic lines contact each other.

Swing Drive

Check the Swing Drive Gearbox Mounting Fasteners

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Remove the floor mat and floor plate. See “Floor Access Panel” on page 3-27.

3. Check the swing drive gearbox (1) for missing or broken mounting fasteners (2).

   NOTE: If any fasteners are missing or broken, contact a SANY dealer for repair information.

4. Tighten any loose fasteners.

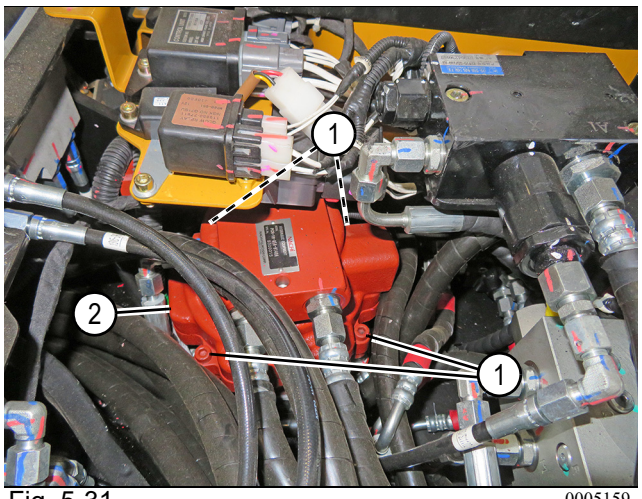

Fig. 5-31 0005159

Track Assembly

Check the Track Tension

NOTICE!

Remove gravel or mud buildup between the sprocket and the track before checking track tension.

1. Use the bucket as a support to lift the track on one side.
2. Rotate the track one full revolution.
3. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

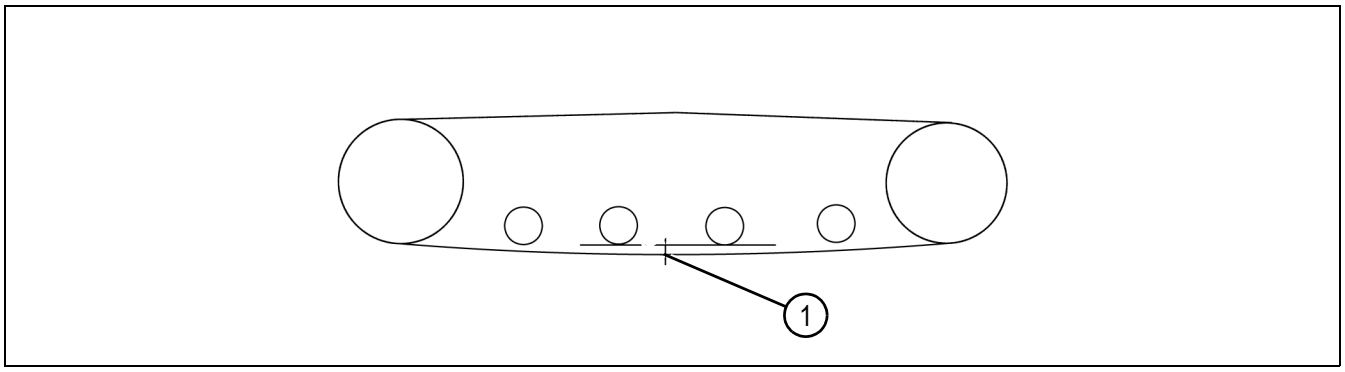

Fig. 5-32 0001642

4. Use a straightedge to measure track sag (1) between the tread of the track roller and the rail surface of the track.
5. Normal track sag is 0.4 in.–0.8 in. (10 mm–20 mm) for rubber tracks. If the track sag is outside of this range, the track tension must be adjusted.

Adjust the Track Tension

WARNING!

- **Do not loosen the grease fitting! The grease fitting is under extreme pressure and can exit the grease valve and cause serious injury.**
- **Do not stand directly in front of the grease valve when loosening the valve.**

Failure to follow these warnings could result in death or serious injury.

CAUTION!

If the track remains too tight after opening the grease valve, or if the track remains too loose after adding grease to the grease fitting, never attempt to remove the track or remove the track adjuster. Pressurized grease inside the track adjuster may cause serious injury if any component is disassembled before pressure is released. If this occurs, contact a SANY dealer for further instructions.

Increase the Track Tension

1. Use the bucket as a support to lift the track on one sid**e.**
2. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
3. Make sure that the grease valve (1) is closed tightly.
4. Remove the protective cap (2). Using a grease gun, pump grease into the grease fitting (3) while observing track idler movement.
5. Rotate the track one full revolution. Check the track tension to confirm adjustment.

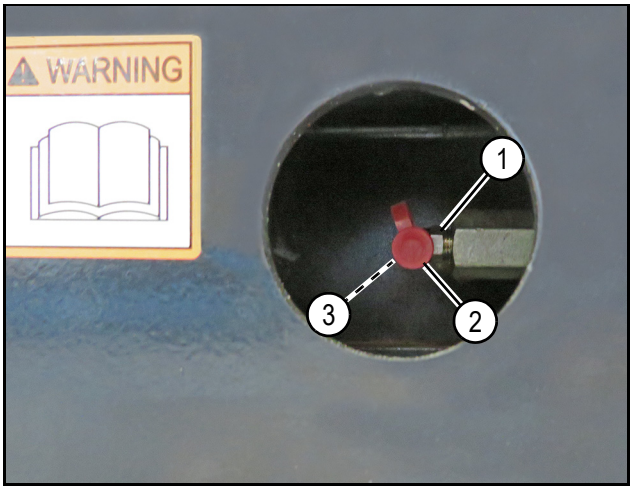

Fig. 5-33 0005130

Decrease the Track Tension

NOTICE!

Remove gravel or mud buildup between the sprocket and the track before reducing track tension.

1. Use the bucket as a support to lift the track on one side.
2. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
3. Slowly open the grease valve (1) 1 to 1-1/2 turns while observing idler movement. Grease should come out from behind the grease valve.

   NOTE: If grease does not come out, slowly rotate the track in both directions. When grease begins to flow, stop and continue the adjustment.
4. When the track sag is within specification, tighten the grease valve to 44 lb-ft to 59 lb-ft (60 N•m to 80 N•m).
5. Rotate the track one full revolution. Check the track tension to confirm adjustment.

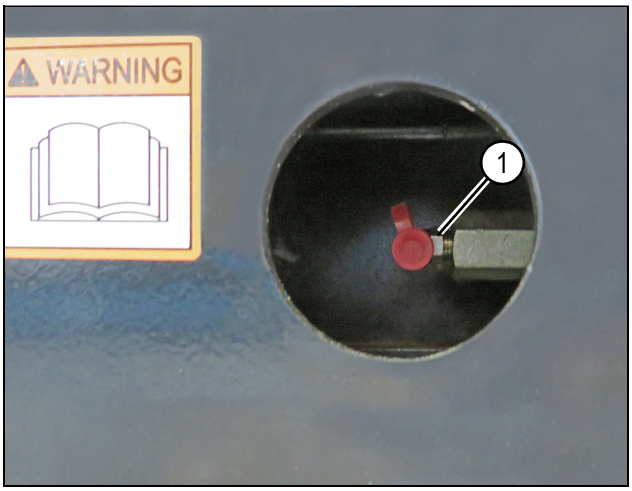

Fig. 5-34 0005130

Check and Add Final Drive Oil

CAUTION!

- **Allow the final drive to cool before servicing. Hot oil may cause burns or other serious injury.**
- **The final drive gear case may be under pressure. Remove the plugs slowly to prevent injury.**

Failure to follow these precautions could result in injury.

NOTICE!

Dispose of used oil in accordance with all applicable environmental regulations. Failure to do so could damage the environment.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Park the machine to position the drain plug (2) at the bottom of one of the final drives.
3. Wait 10 minutes for the gear oil to cool.
4. Slowly loosen the oil level plug (1) to relieve any internal pressure.
5. The oil should be at or near the lower edge of the oil level plug opening.

   NOTE: Refer to See “Recommended Lubricants, Fuels, and Coolant” on page 5-8 for recommended final drive oil.
6. If necessary, add oil.
7. Install the oil level plug and tighten to 12.5 lb-ft (17 N•m).
8. Repeat this procedure on the other final drive.

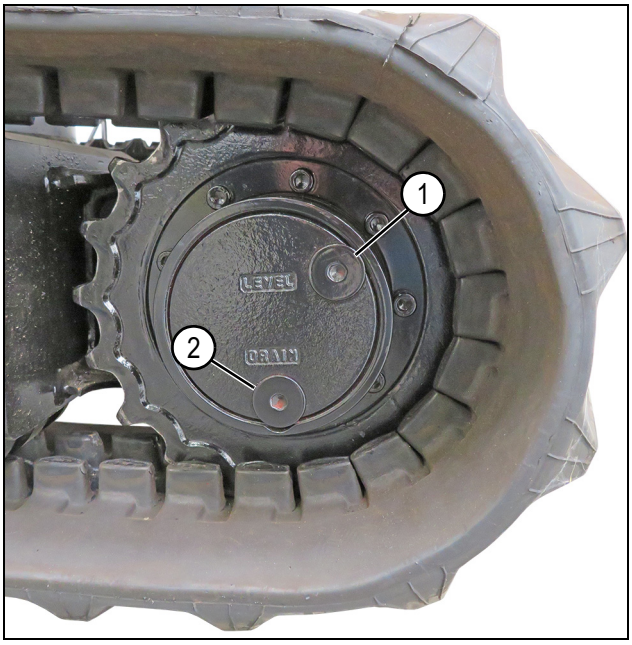

Fig. 5-35 0005105

Change the Final Drive Oil

CAUTION!

- **Allow the final drive to cool before servicing. Hot oil may cause burns or other serious injury.**
- **The final drive gear case may be under pressure. Remove the plugs slowly to prevent injury.**

Failure to follow these precautions could result in injury.

NOTICE!

Dispose of used oil n accordance with all applicable environmental regulations. Failure to do so could damage the environment.

NOTE: If the final drive oil is cold, it should be warmed prior to changing. Use the bucket as a support to lift the track on one side. Push the throttle control lever to MIN (low idle) and operate the raised track for 5 minutes. Lower the track.

1. Park the machine to position the drain plug (3) at the bottom of one of the final drives.
2. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
3. Wait 10 minutes for the gear oil to cool.
4. Collect a final drive oil sample. See “Collect a Final Drive Oil Sample” on page 5-49.
5. Place a suitable container under the final drive.
6. Slowly loosen and remove the oil level plug (1) to relieve any internal pressure.

   NOTE: For final drive oil capacity, see “Fluid Capacities” on page 5-9.
7. Remove the oil drain plug (2) and allow the oil to drain.

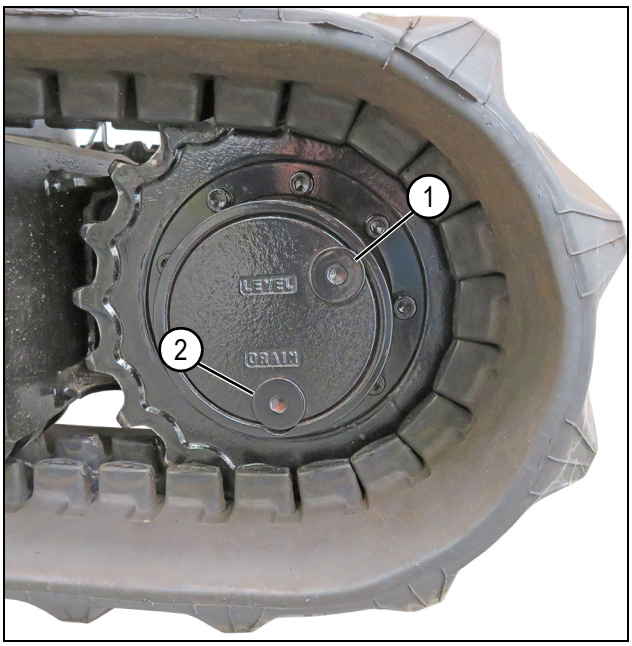

Fig. 5-36 0005105

8. Install the oil drain plug and tighten to 36 lb-ft (49 N•m).
9. Add new gear oil through the oil level plug opening. Fill until the gear oil is at the lower edge of the oil level plug opening.
10. Install the oil level plug. Tighten the plug to 12.5 lb-ft (17 N•m).

11. Repeat this procedure on the other final drive.

Collect a Final Drive Oil Sample

1. Obtain an oil analysis sample kit from a SANY dealer.
2. Operate the machine to normal operating temperature.
3. Park and prepare the machine for service. See “Maintenance Safety” on page 2-9.

NOTICE!

It is critical that all material used to collect the sample is absolutely clean. Failure to follow this notice can cause equipment damage and contaminate the sample.

4. Remove the final drive oil level plug. See “Check and Add Final Drive Oil” on page 5-46.
5. Insert the sample tube into the final drive and collect a sample of final drive oil. Reinstall the final drive oil level plug.
6. Send the sample for testing in accordance with the instructions packaged with the sample kit.

Check the Final Drive Motor Mounting Fasteners

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Remove three fasteners (1) and the final drive motor cover (2).

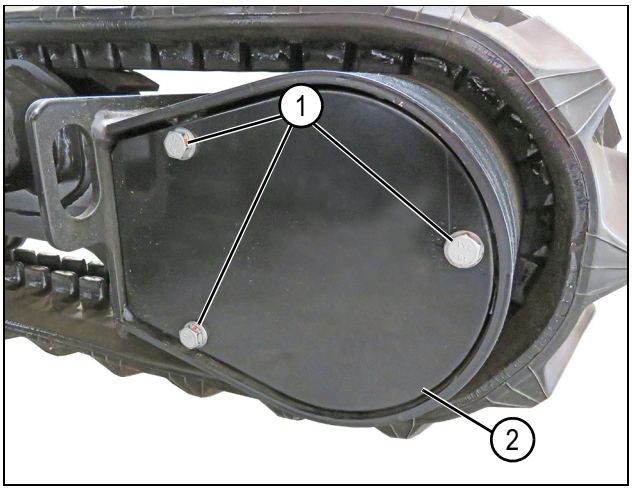

Fig. 5-37 0005107

3. Inspect all of the final drive mounting fasteners (3) for rust, damage, or looseness.

4. Replace any damaged fasteners and tighten any loose fasteners.

5. Inspect hoses (4) for leaks or signs of wear. Contact a SANY dealer to replace damaged or leaking hydraulic lines.

   NOTE: Use thread lock compound when tightening loose fasteners or installing new fasteners.

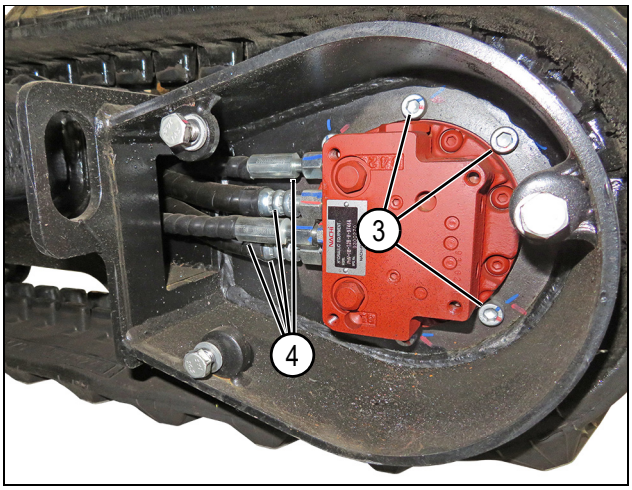

Fig. 5-38 0005106

Lubrication

Lubrication Points

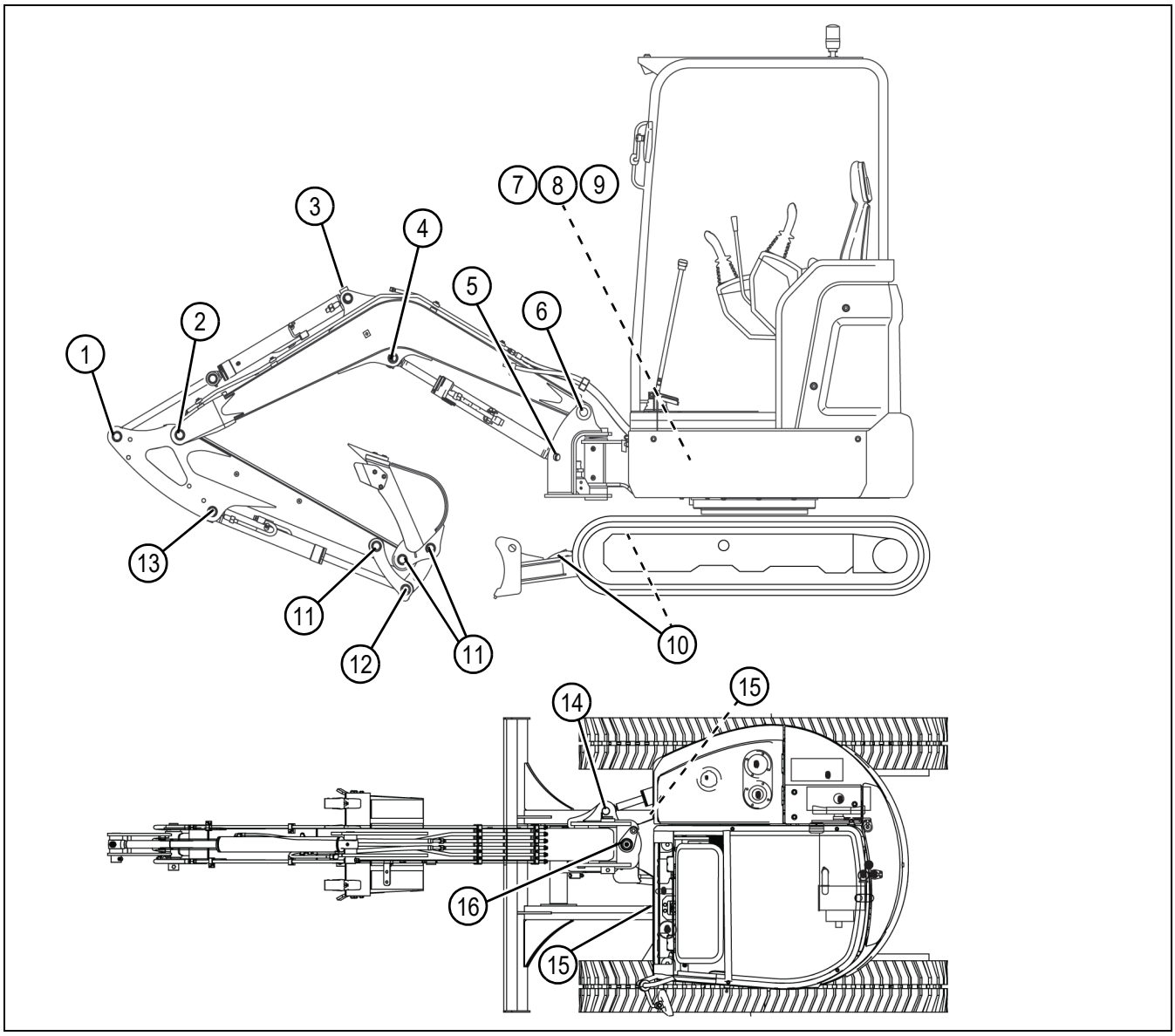

Fig. 5-39 0005160

1) Arm cylinder rod end pin (page 5-52)
2) Boom-arm connecting pin (page 5-52)
3) Arm cylinder base end pin (page 5-53)
4) Boom cylinder rod end pin (page 5-53)
5) Boom cylinder base end pin (page 5-53)
6) Boom pin (page 5-54)
7) Swing bearing (page 5-54)
8) Swing gear (page 5-54)
9) Boom swing cylinder base end pin (page 5-55)
10) Dozer blade cylinder end pins (page 5-55)
11) Bucket linkage pins (page 5-55)
12) Bucket cylinder rod end pin (page 5-56)
13) Bucket cylinder base end pin (page 5-56)
14) Boom swing cylinder rod end pin (page 5-57)
15) Dozer blade linkage pins (page 5-55)
16) Boom swing pin (page 5-57)

- See “Lubrication and Maintenance Charts” on page 5-16.
- A new machine must be greased every 8 hours within the initial 50 service hours.
- If the lubricated location produces abnormal noise, additional lubrication is required besides regular maintenance.
- More frequent lubrication is required when the machine is operated with heavy optional equipment (e.g., a hydraulic breaker).
- After operating in water, grease the machine to expel any water from the lubrication points.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Using a grease gun, pump grease into the grease fittings.
3. Clean off all excess grease and install the grease fitting cap.

Arm Cylinder Rod End Pin

1. Remove the grease fitting cap (1) from the arm cylinder rod end pin grease fitting (2).
2. Grease the arm cylinder rod end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

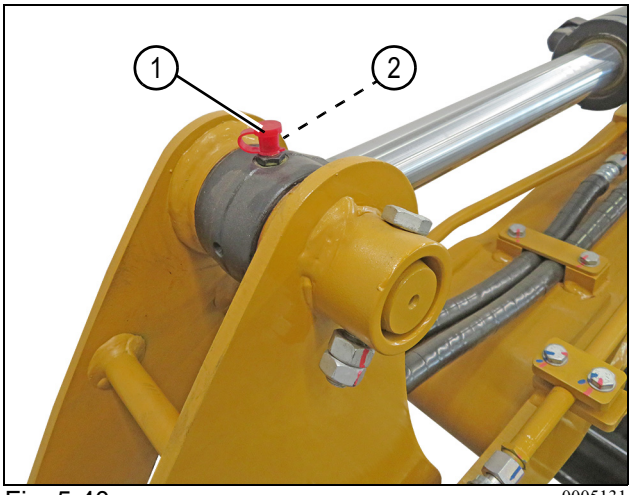

Fig. 5-40 0005131

Boom-Arm Connecting Pin

1. Remove the grease fitting cap (1) from the boom-arm connecting pin grease fitting (2).
2. Grease the boom-arm connecting pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting caps

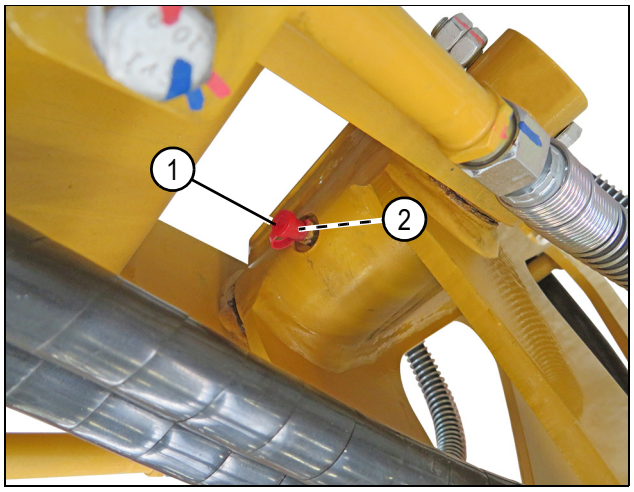

Fig. 5-41 0005135

Arm Cylinder Base End Pin

1. Remove the grease fitting cap (1) from the arm cylinder base end pin grease fitting (2).
2. Grease the arm cylinder base end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

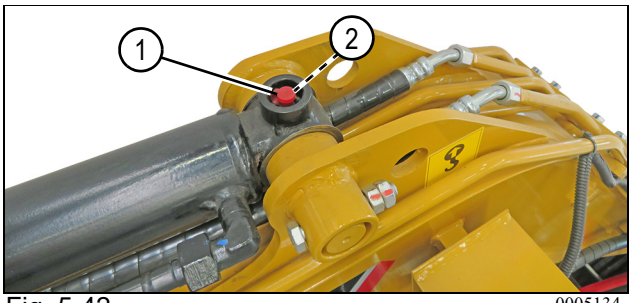

Fig. 5-42 0005134

Boom Cylinder Rod End Pin

1. Remove the grease fitting cap (1) from the boom cylinder rod end pin grease fitting (2).
2. Grease the boom cylinder rod end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

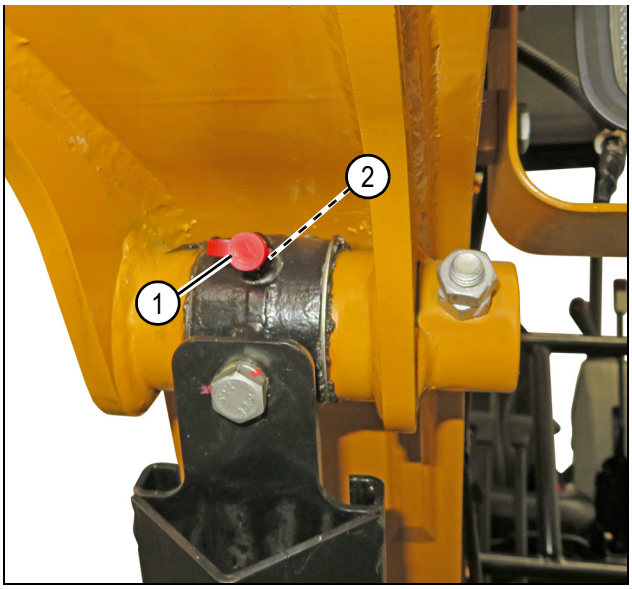

Fig. 5-43 0005108

Boom Cylinder Base End Pin

1. Remove the grease fitting cap (1) from the boom cylinder base end pin grease fitting (2).
2. Grease the boom cylinder base end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

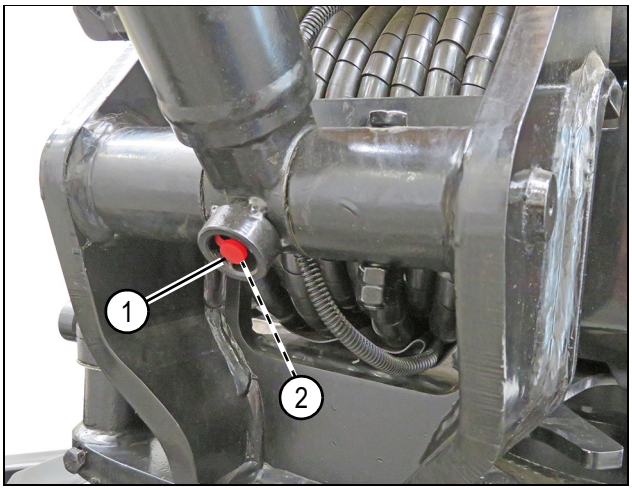

Fig. 5-44 0005109

Boom Pin

1. Remove the grease fitting cap (1) from the boom pin grease fitting (2).
2. Grease the boom pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

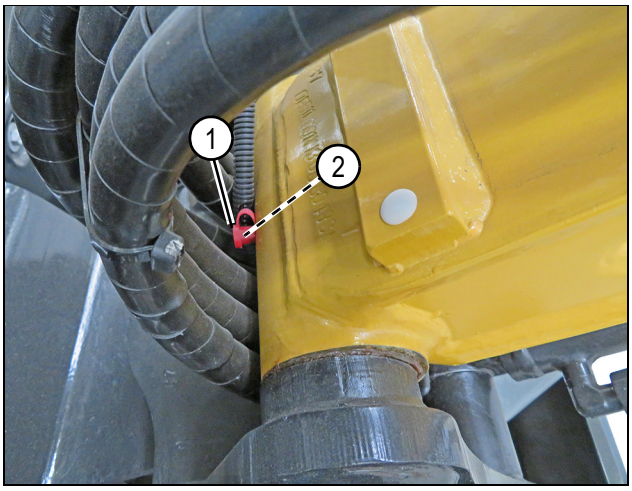

Fig. 5-45 0005136

Swing Bearing

1. Start the engine and raise the bucket 0.8 in.–1.2 in. (20 mm–30 mm) above the ground. Swing the upper structure 45 degrees (1/8 turn) in each direction.
2. Shut down the engine.
3. Remove the grease fitting caps (1) and grease the swing bearing (2).
4. Wipe excess grease from around the grease fitting and install the grease fitting cap.

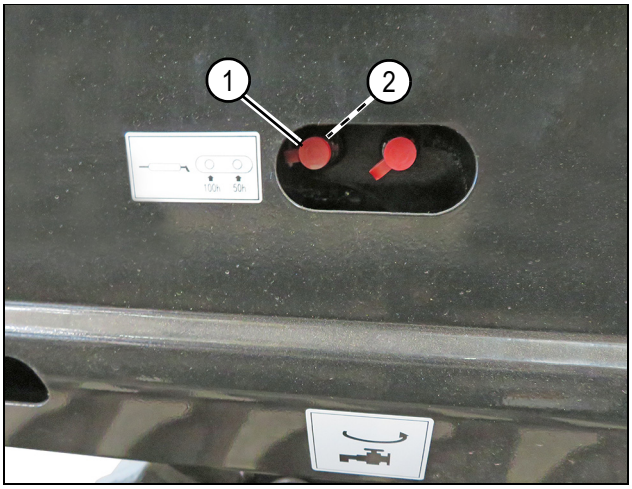

Fig. 5-46 0005141

Swing Gear

1. Start the engine and raise the bucket 0.8 in.–1.2 in. (20 mm–30 mm) above the ground. Swing the upper structure 45 degrees (1/8 turn) in each direction.
2. Shut down the engine.
3. Remove the grease fitting caps (1) and grease the swing gear (2).
4. Wipe excess grease from around the grease fitting and install the grease fitting cap.

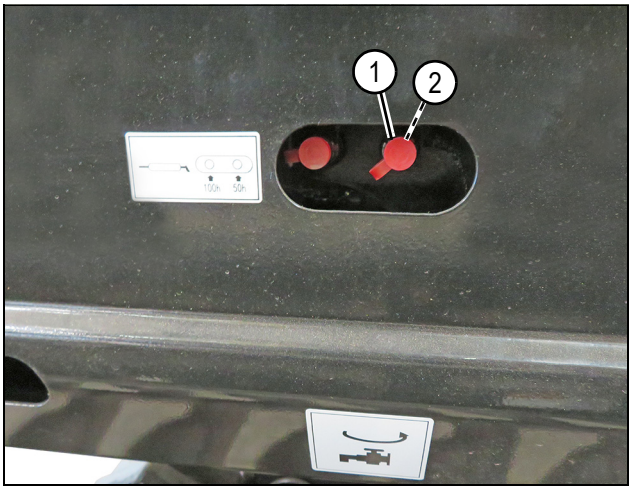

Fig. 5-47 0005141

Boom Swing Cylinder Base End Pin

1. Start the engine and raise the bucket 0.8 in.–1.2 in. (20 mm–30 mm) above the ground. Swing the upper structure 45 degrees (1/8 turn) in each direction..
2. Shut down the engine.
3. Remove the grease fitting caps (1) and grease the boom swing cylinder base end pin (2).
4. Wipe excess grease from around the grease fitting and install the grease fitting cap.

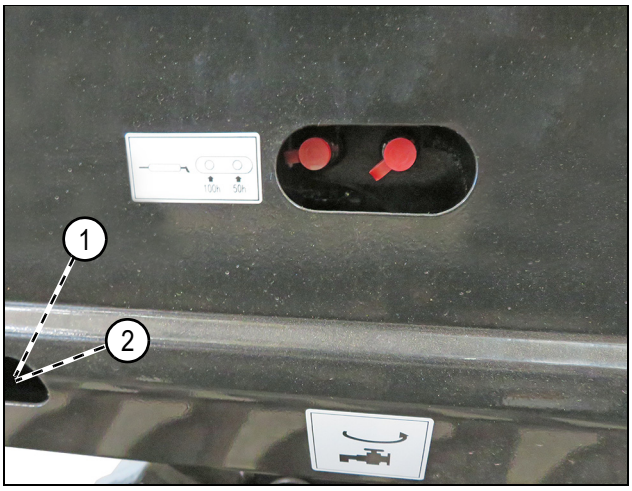

Fig. 5-48 0005141

Dozer Blade Cylinder End Pin and Blade Linkage Pins

NOTE: Only one dozer blade linkage pin grease fitting cap is shown.

1. Remove the grease fitting caps (1) from the dozer blade cylinder end pins (2) and the dozer blade linkage pins. (3)
2. Grease the dozer blade cylinder end pins and the dozer blade linkage pins grease fittings.
3. Wipe excess grease from around the grease fittings and install the grease fitting caps.

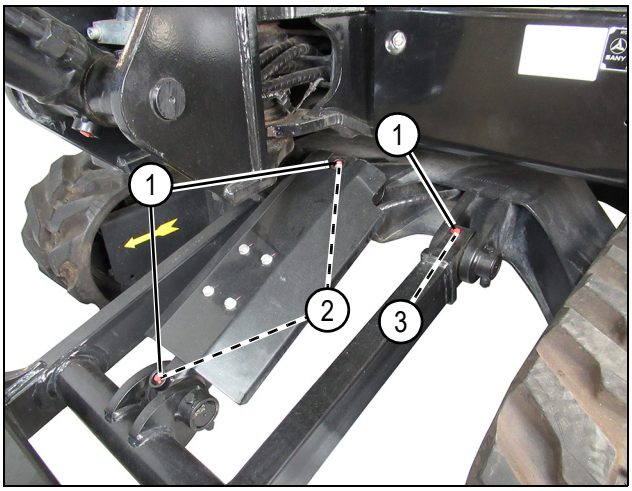

Fig. 5-49 0003245

Bucket Linkage Pins

1. Remove the grease fitting caps (2) from the bucket linkage pin grease fittings (1).
2. Grease the bucket linkage pin grease fittings.
3. Wipe excess grease from around the grease fittings and install the grease fitting caps.

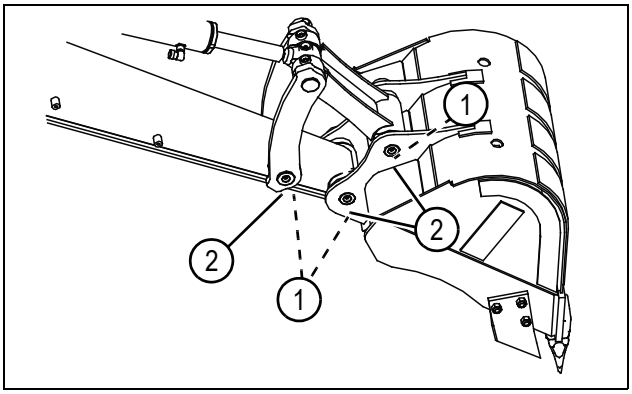

Fig. 5-50 0001677

Bucket Cylinder Rod End Pin

1. Remove the grease fitting caps (1) from the bucket cylinder rod end pin grease fittings (2).
2. Grease the bucket cylinder rod end pin grease fittings.
3. Wipe excess grease from around the grease fittings and install the grease fitting caps.

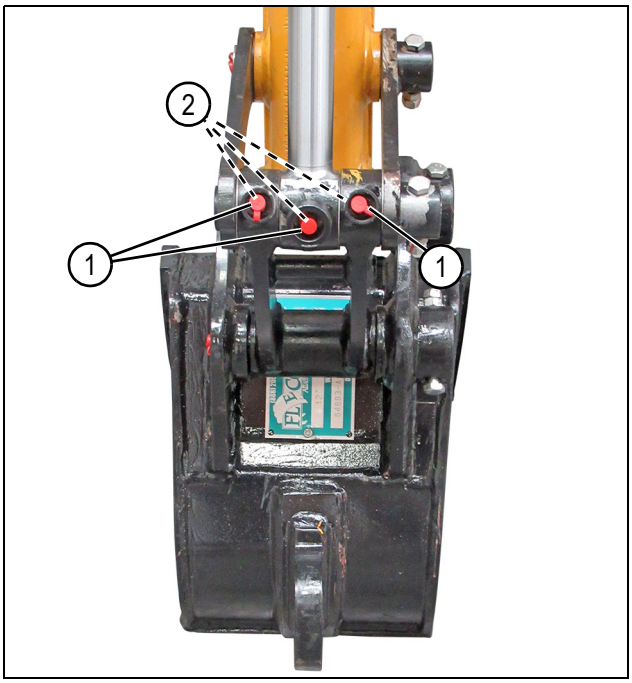

Fig. 5-51 0005110

Bucket Cylinder Base End Pin

1. Remove the grease fitting cap (1) from the bucket cylinder base end pin grease fitting (2).
2. Grease the bucket cylinder base end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

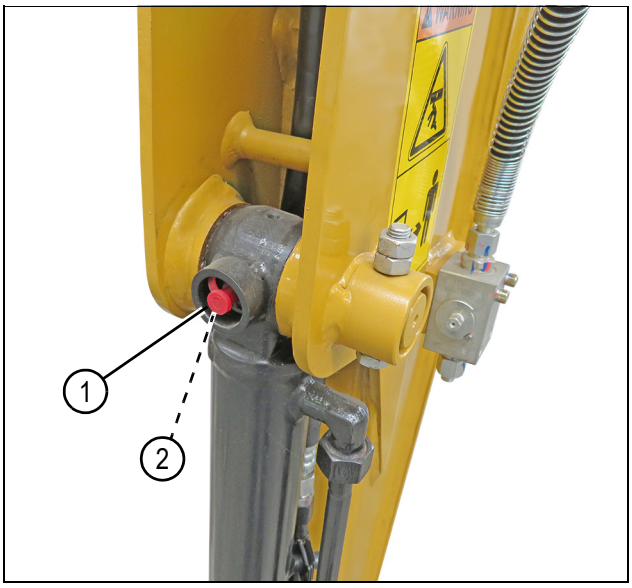

Fig. 5-52 0005132

Boom Swing Cylinder Rod End Pin

1. Remove the grease fitting cap (1) from the boom swing cylinder rod end pin grease fitting (2).
2. Grease the boom swing cylinder rod end pin grease fitting.
3. Wipe excess grease from around the grease fitting and install the grease fitting cap.

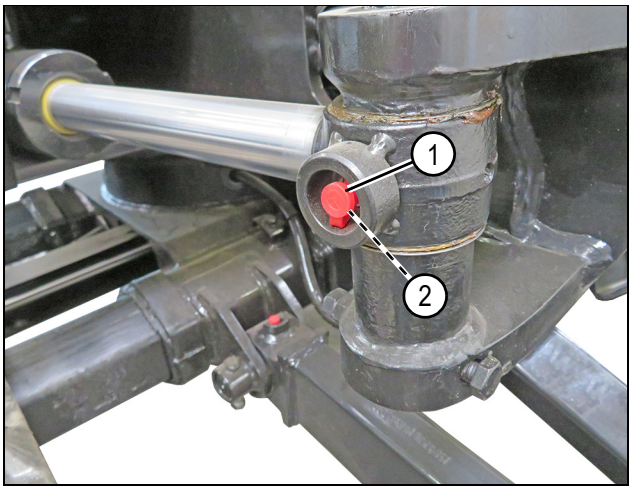

Fig. 5-53 0005137

Boom Swing Pin

NOTE: Only the upper boom swing pin grease fitting is shown. The fitting on the bottom of the boom swing pin is similar.

1. Remove grease fitting caps (1).
2. Grease the boom swing pin grease fittings (2).
3. Wipe excess grease from around the grease fittings and install the grease fitting caps.

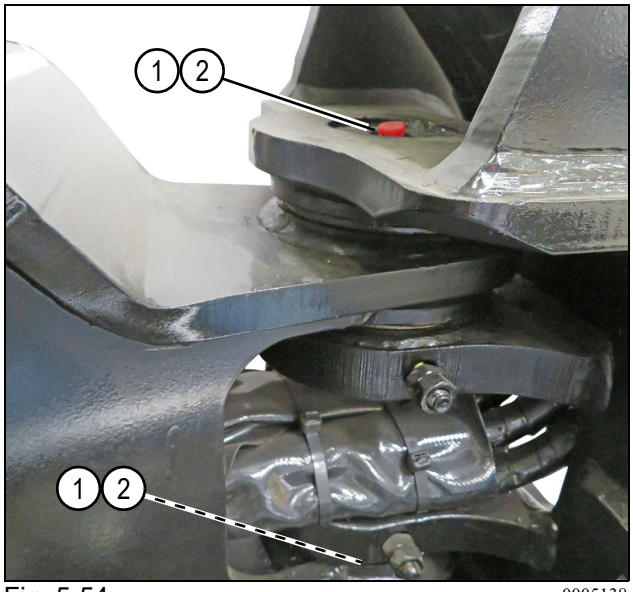

Fig. 5-54 0005138

Track Spread Slides

As required, spread tracks and apply grease to all four extender slides (1). Extend and retract tracks to spread grease on the slides.

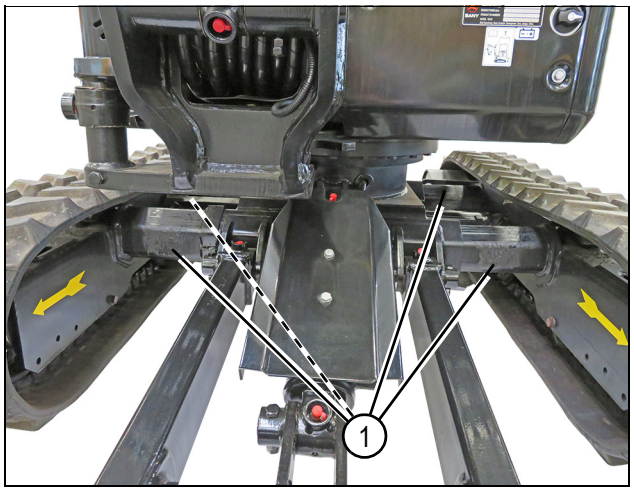

Fig. 5-55 0005149

Bucket

Replace the Bucket Teeth

WARNING!

- **Unexpected machine movement can be dangerous when replacing the bucket teeth. Place the bucket on a stable work surface. Shut down the engine and lock out the control levers.**
- **Roll pins may eject with extreme force when removed. Do not allow anyone to stand in front of the pins during pin removal.**
- **Metal fragments from roll pins and tools may break off during roll pin removal and installation. Wear safety goggles, gloves, and other personal protective equipment (PPE) to prevent serious injury.**

Failure to follow these warnings could result in death or serious injury.

NOTE: Bucket teeth must be replaced before the bucket tooth adapter wears out.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Measure the length (2) of the bucket teeth (1). If the bucket teeth are worn more than the service limit dimension, replace the bucket teeth.
   - The dimension of new bucket teeth is 3.5 in. (90 mm).
   - The minimum service limit of bucket teeth is 1.6 in. (40 mm).

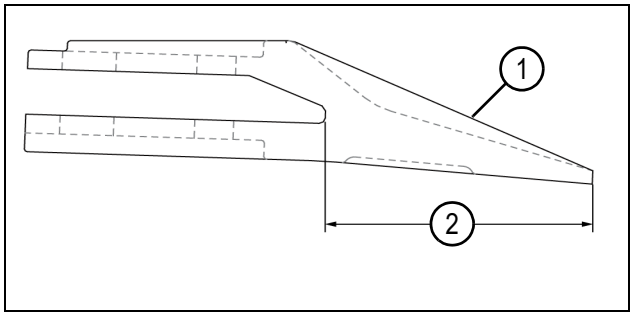

Fig. 5-56 0001277

3. Select a stable work surface. Move the hydraulic controls to the locked (closed) position. Keep the bottom of the bucket level on a wooden block (3).

4. Remove the roll pins and worn bucket teeth.

5. Install new bucket teeth and roll pins in the reverse order of removal.

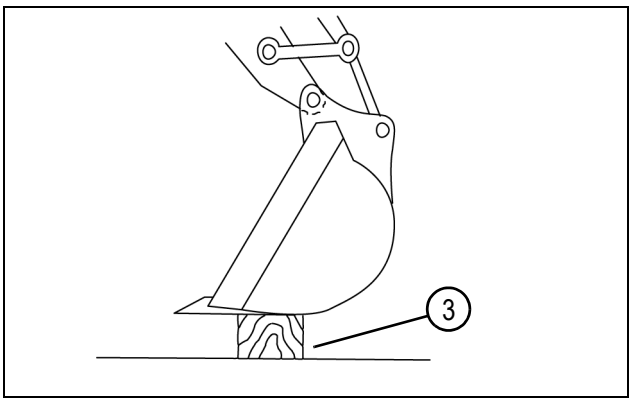

Fig. 5-57 0001284

Replace the Bucket

CAUTION!

- **Keep fingers and other body parts away from pinch points to prevent crushing injuries while removing or installing the bucket. Never put your finger into the pin bore during alignment.**
- **Secure buckets after removal and before servicing.**
- **Bucket pins may be ejected with extreme force when removed forcefully. Do not allow anyone to stand in front of the pins during removal.**
- **Never stand or place your feet or other body part under the bucket when removing bucket pins.**

Failure to follow these precautions could result in injury.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Support the bucket to prevent it from rolling over when the bucket pin is removed.

3. Remove the fasteners and bucket pins (1).

4. Remove the bucket from the arm. Clean the pins and pin bores.

5. Align the arm with a new bucket. Make sure the bucket is secured and will not move.

6. Install the bucket pins. Install the mounting fasteners and pins into the bucket pins.

7. Grease the bucket pins.

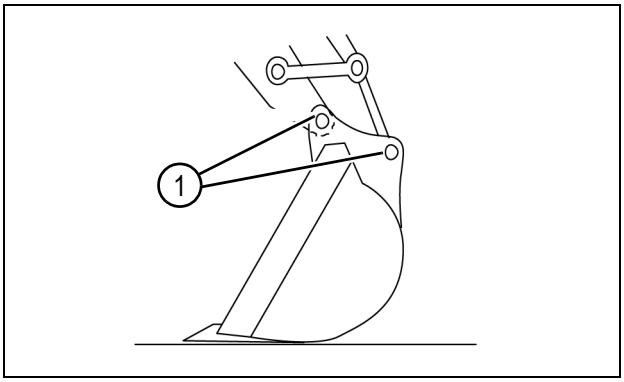

Fig. 5-58 0001650

8. Start the engine and run it at low idle. Operate the bucket slowly in both directions to check for binding.

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Specifications

MACHINE DIMENSIONS

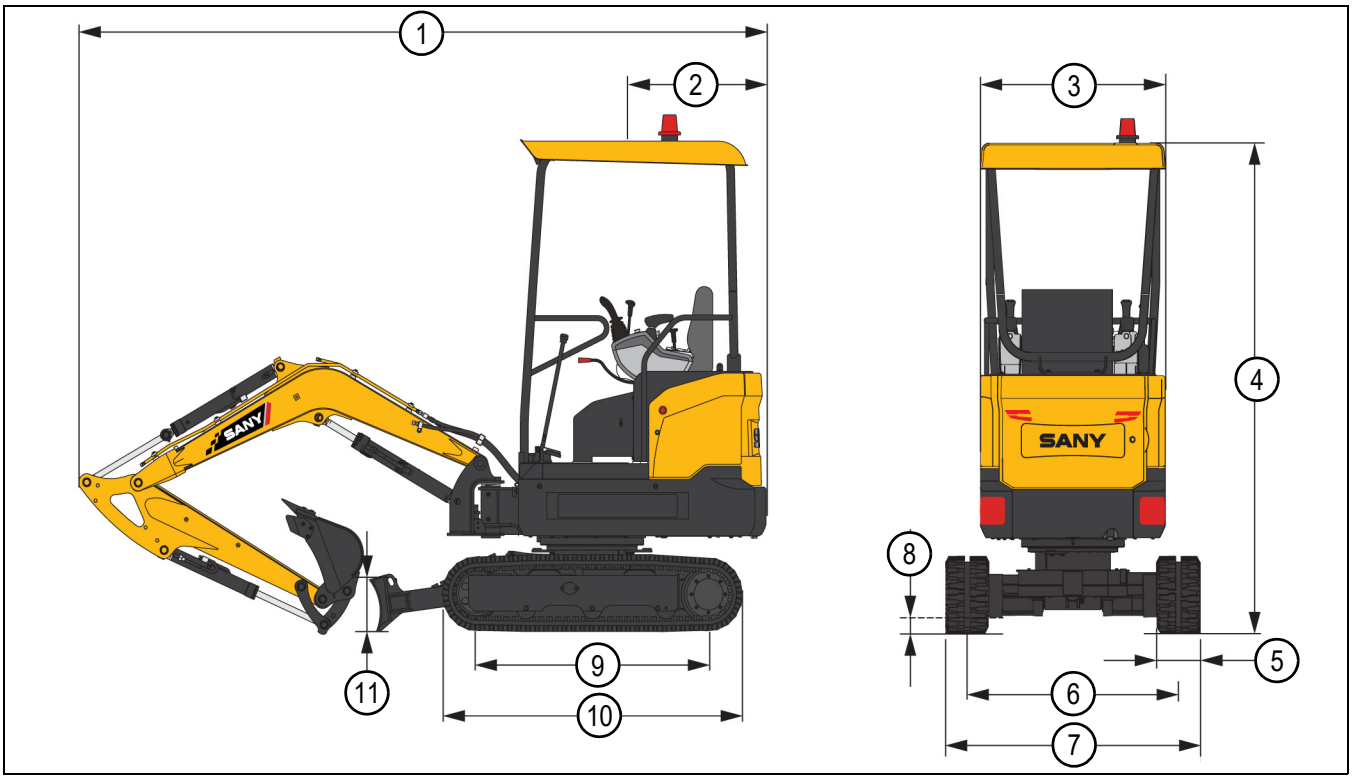
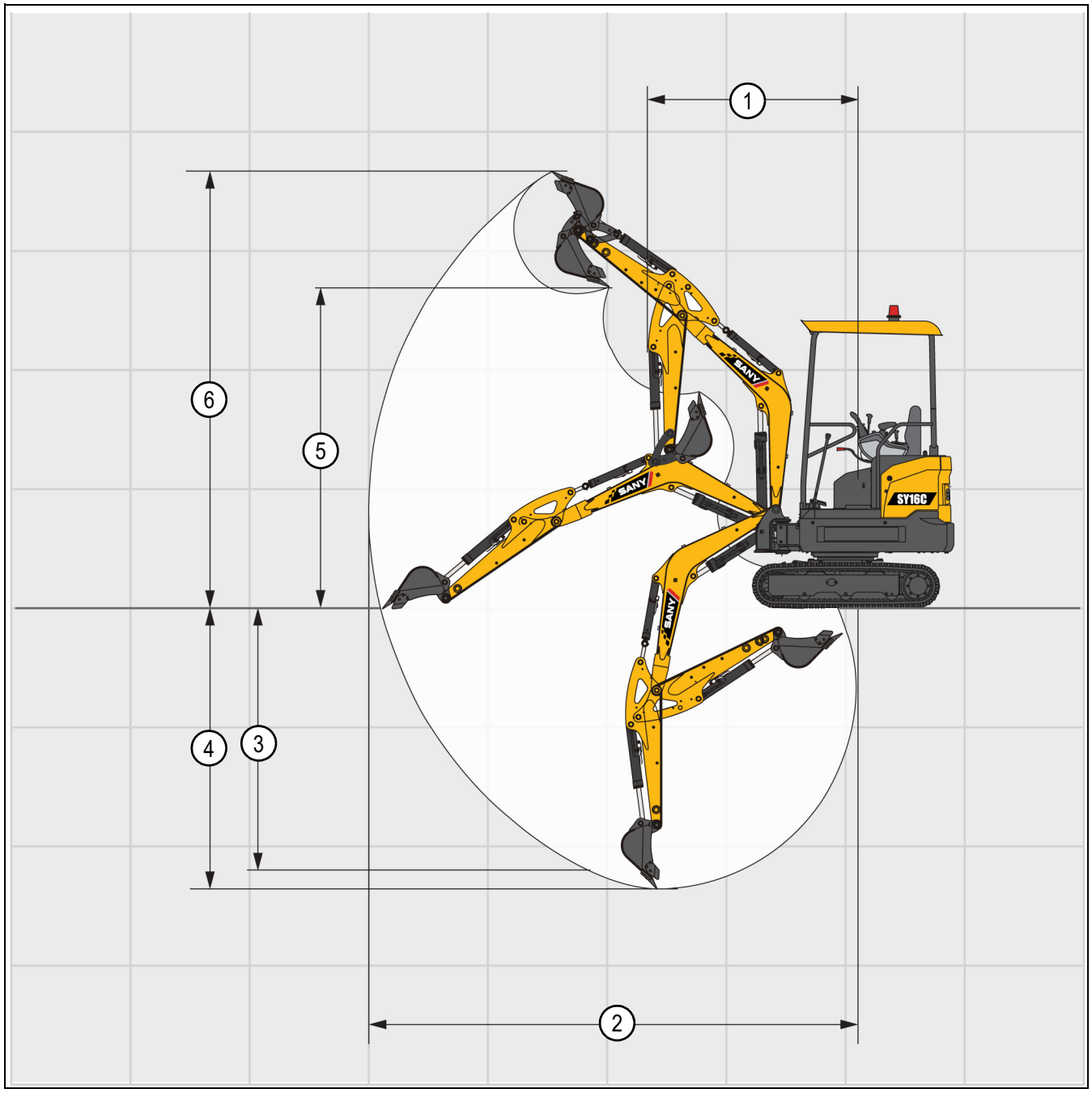


Fig. 6-1

0004831

Item	Description	Dimensions
1	Transport length	11 ft. 9 in. (3.575 m)
2	Tail swing radius	3 ft. (920 mm)
3	Upper structure width	3 ft. 3 in. (1.0 m)
4	Transport height (travel alarm removed)	7 ft. 11 in. (2.42 m)
5	Track width (standard shoe)	9 in. (320 mm)
6	Track gauge (tracks retracted)	2 ft. 6 in. (750 mm)
6	Track gauge (tracks extended)	3 ft. 8 in. (1.12 m)
7	Transport width (tracks retracted)	3 ft. 3 in. (0.98 m)
7	Transport width (tracks extended)	4 ft. 5 in. (1.35 m)
8	Minimum ground clearance	7 in. (180 mm)
9	Track length on ground	4 ft. (1.22 m)
10	Track length	5 ft. 2 in. (1.58 m)
11	Dozer blade height	11 in. (270 mm)

WORKING RANGE



0004832

Fig. 6-2

Item	Description	Dimensions
1	Minimum swing radius	5 ft. 5 in. (1.65 m)
2	Maximum reach at ground level	13 ft. 1 in. (4.00 m)
3	Maximum vertical wall digging depth	7 ft. 3 in. (2.21 m)
4	Maximum digging depth	7 ft. 9 in. (2.36 m)
5	Maximum dumping height	8 ft. 8 in. (2.63 m)
6	Maximum digging height	12 ft. (3.66 m)
*	Boom length	5 ft. 11 in. (1.81 m)
*	Arm length	3 ft. 8 in. (1.13 m)

LIFTING PERFORMANCE

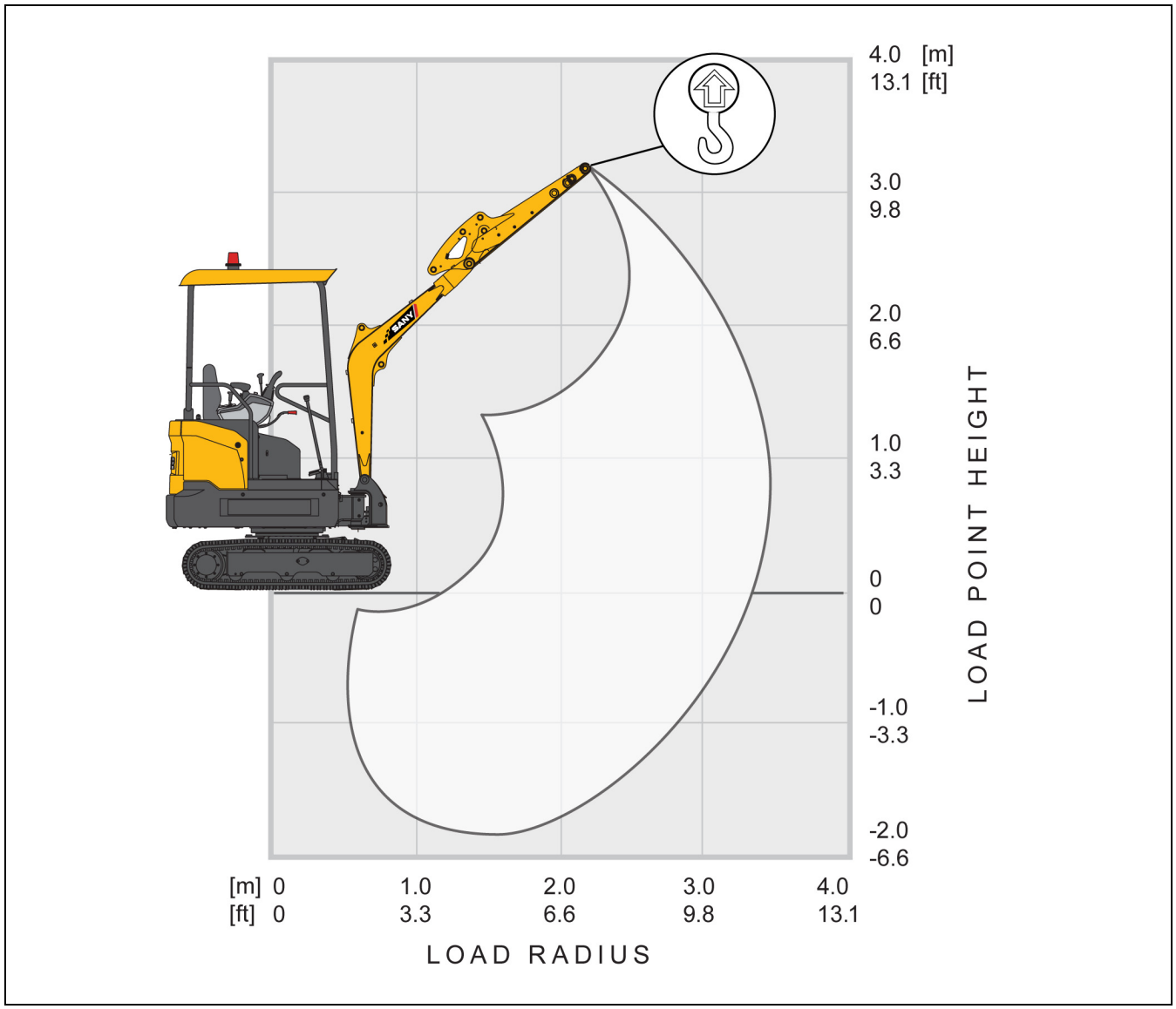


Fig. 6-3

0004833

Lift Chart: Blade Down

Load Point Height ft. (m)	Rated Capacity lb. (kg)									
	Load Point Radius ft. (m)									
	4.9 (1.5)		6.6 (2.0)		8.2 (2.5)		9.8 (3.0)		Lift capacity at max reach	
	End	Side	End	Side	End	Side	End	Side	End	Side
9.8 (3.0)									*628 (*285)	*628 (*285)
6.6 (2.0)					*587 (*267)	557 (253)	*597 (*271)	597 (271)	*613 (*278)	*613 (*278)
3.3 (1.0)			*1065 (*483)	*1065 (*483)	*818 (*371)	814 (370)	*697 (*316)	675 (306)	*634 (*288)	538 (244)
0.0 (0.0)	*1821 (*826)	*1821 (*826)	*1391 (*631)	1164 (528)	*1005 (*456)	843 (383)	787 (357)	650 (295)	*669 (*304)	554 (252)
-3.3 (-1.0)	*1805 (*819)	*1805 (*819)	*1241 (*563)	1166 (529)	*897 (*407)	840 (382)			*702 (*318)	*702 (*318)

* Indicates load limited by hydraulic lifting capacity.

NOTE: Lift capacities shown are without power boost feature and do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities. These capacities only apply to the machine as originally manufactured and normally equipped by SANY. Lift capacities do not include a bucket and are in compliance with ISO 10567:2007.

NOTE: Least stable position is over the side.

NOTE: The load point is the centerline of the bucket pivot mounting pin on the arm.

Lift Chart: Blade Up

Load Point Height ft. (m)	Rated Capacity lb. (kg)									
	Load Point Radius ft. (m)									
	4.9 (1.5)		6.6 (2.0)		8.2 (2.5)		9.8 (3.0)		Lift capacity at max reach	
	End	Side	End	Side	End	Side	End	Side	End	Side
9.8 (3.0)									*627 (*285)	*627 (*285)
6.6 (2.0)					557 (253)	557 (253)	*596 (*271)	*596 (*271)	594 (270)	*612 (*278)
3.3 (1.0)			*1063 (*483)	*1063 (*483)	814 (370)	814 (370)	651 (296)	673 (306)	517 (235)	537 (244)
0.0 (0.0)	1784 (811)	*1817 (*826)	1131 (514)	1162 (528)	816 (371)	843 (383)	627 (285)	649 (295)	535 (243)	554 (252)
-3.3 (-1.0)	*1802 (*819)	*1802 (*819)	1131 (514	1164 (529)	814 (370)	840 (382)			*700 (*318)	*700 (*318)

* Indicates load limited by hydraulic lifting capacity.

NOTE: Lift capacities shown are without power boost feature and do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities. These capacities only apply to the machine as originally manufactured and normally equipped by SANY. Lift capacities do not include a bucket and are in compliance with ISO 10567:2007.

NOTE: Least stable position is over the side.

NOTE: The load point is the centerline of the bucket pivot mounting pin on the arm.

TECHNICAL SPECIFICATIONS

Description	Specifications
Operating weight	4023 lb. (1825 kg)
Ground pressure	4.2 psi (29.1 kPa)
Engine	Yanmar 3TNV74F
Displacement	60.6 cu in (1.0 L)
Engine rated power	15.2 kN (11.2 kW)
Hydraulics	Load sensing with pilot control
Main hydraulic pump	Axial piston – variable displacement
Operating flow (maximum)	12.7 gal/min (48.0 L/min)
Operating pressure (maximum)	3553 psi (24.5 MPa)
Travel motor	Axial piston
Travel pressure (maximum)	3553 psi (24.5 MPa)
Travel speeds (maximum)	1.3 / 2.3 mph (2.1 / 3.7 km/hr)
Travel effort (maximum)	3507 lbf (15.6 kN)
Grade capability (maximum)	35°
Swing motor	Axial piston
Swing pressure (maximum)	2350 psi (16.2 MPa)
Swing speed	10 rpm
Undercarriage (standard)	Belted rubber track
Track shoe width (standard)	9 in. (230 mm)
Track rollers (per side)	3
Carrier rollers (per side)	0
Bucket capacity	No Bucket
Bucket Breakout Force (ISO)	3417 lbf (15.2 kN)
Stick (arm) digging force (ISO)	2068 lbf (9.2 kN)

SANY

Optional Equipment

OPTIONAL EQUIPMENT SELECTION

Consult a SANY dealer before installing any optional equipment to the machine. Depending on the type of optional equipment selected, protective structures (such as front guards or top guards) may need to be installed on the machine.

Only install SANY-approved optional equipment. SANY assumes no responsibility for accidents, loss, or failures caused by any optional equipment.

READ EQUIPMENT INSTRUCTION

Read and understand the optional equipment manual before installing and operating any optional equipment. Do not exceed the manufacturer's specifications for maximum flow and pressure of optional equipment.

If the optional equipment manual is missing or damaged, contact the manufacturer of the optional equipment to obtain a replacement.

Removal and Installation Precautions

NOTICE!

The following precautions must be strictly observed when selecting, installing, and operating optional equipment. Failure to observe and follow this notice can damage the machine or cause it to operate improperly

- Follow the instructions in this manual and in the optional equipment manual.
- Remove and install equipment only on a firm, level surface.
- Use an appropriate lifting device when handling objects weighing more than 55 lb. (25 kg).
- Never stand under a suspended load.
- Make sure the machine is well-balanced and supported whenever installing or removing optional equipment.

For additional information about removal and installation of optional equipment, consult a SANY dealer.

Equipment Operation Precautions

NOTICE!

The following precautions must be strictly observed when selecting, installing, and operating optional equipment. Failure to observe and follow this notice can damage the machine or cause it to operate improperly.

- Prior to the operation, move the machine to a safe area and test its operation.
- Be aware of how the machine will move with an optional piece of equipment, since the machine's center of gravity and working range may change.
- Make sure the machine is well-balanced.
- Maintain a safe distance from all surrounding barriers during machine operations.
- To prevent the machine from tipping over, never swing, lower, or stop the machine suddenly.
- To prevent impact that may cause the machine to tip over, never raise or lower the boom suddenly.

INSTALL OPTIONAL EQUIPMENT

WARNING!

Do not release the equipment unless it is on the ground or on a solid, supportive surface. Block or support the equipment to prevent rolling or tipping. Failure to follow these warnings could result in death or serious injury.

Hydraulic systems operate under extremely high pressure. Escaping hydraulic oil under pressure is dangerous. Always relieve pressure before disconnecting hoses. Failure to follow these warnings could result in death or serious injury.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.

2. Relieve system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.

NOTICE!

Dispose of hydraulic oil in accordance with local environmental regulations. Failure to do so could damage the environment.

3. Place a suitably sized container under the hydraulic connection to catch any residual hydraulic oil.

4. Remove the cap (1) from the hydraulic line.

   NOTE: Left side shown. Repeat for the right side hydraulic line.

5. Connect the optional equipment to the machine in accordance with the manufacturer’s instructions.

6. Connect the optional equipment hydraulic lines and bleed the hydraulic system in accordance with the manufacturer’s instructions.

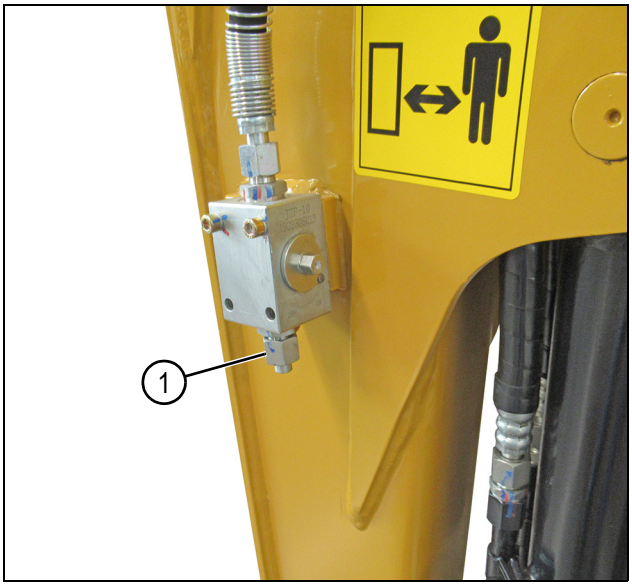


Fig. 7-4 0004806

7. Open the engine hood to adjust the return flow selector valve (3) according to the optional equipment being installed. The return flow selector valve regulates the direction of hydraulic oil flow. There are one-way or two-way positions for operating optional equipment.

   NOTE: A variety of optional one-way and two-way flow equipment is available for use on this machine. A hydraulic breaker is an example of one-way flow equipment. A bucket thumb or shear are examples of two-way flow equipment. The return flow selector valve is shown in the one-way flow position.

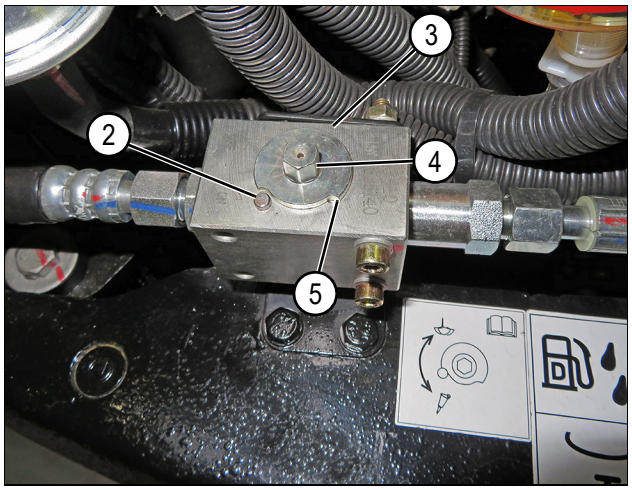


Fig. 7-5 0005079

8. Rotate the valve stem (4) counterclockwise until it contacts the one-way stop (2) for one-way flow. Rotate the valve stem clockwise until it contacts the two-way stop (5) for two-way flow.

9. Check the hydraulic oil level. See “Check the Hydraulic Oil Level” on page 5-37.

REMOVE OPTIONAL EQUIPMENT

WARNING!

Do not release the equipment unless it is on the ground or on a solid, supportive surface. Block or support the equipment to prevent rolling or tipping. Failure to follow these warnings could result in death or serious injury.

Hydraulic systems operate under extremely high pressure. Escaping hydraulic oil under pressure is dangerous. Always relieve pressure before disconnecting hoses. Failure to follow these warnings could result in death or serious injury.

1. Prepare the machine for service. See “Maintenance Safety” on page 2-9.
2. Relieve system pressure. See “Relieve Hydraulic System Pressure” on page 5-37.

NOTICE!

Dispose of hydraulic oil in accordance with local environmental regulations. Failure to do so could damage the environment.

3. Place a suitably sized container under the hydraulic connection to catch any residual hydraulic oil.
4. Disconnect the optional equipment hydraulic lines in accordance with the manufacturer’s instructions.
5. Install the cap (1) to the hydraulic line.

   NOTE: Left side shown. Repeat for the right-side hydraulic line.
6. Disconnect the optional equipment from the machine in accordance with the manufacturer’s instructions.
7. Adjust the return flow selector valve as necessary. See “Install Optional Equipment” on page 7-4.
8. Check the hydraulic oil level. See “Check the Hydraulic Oil Level” on page 5-37.

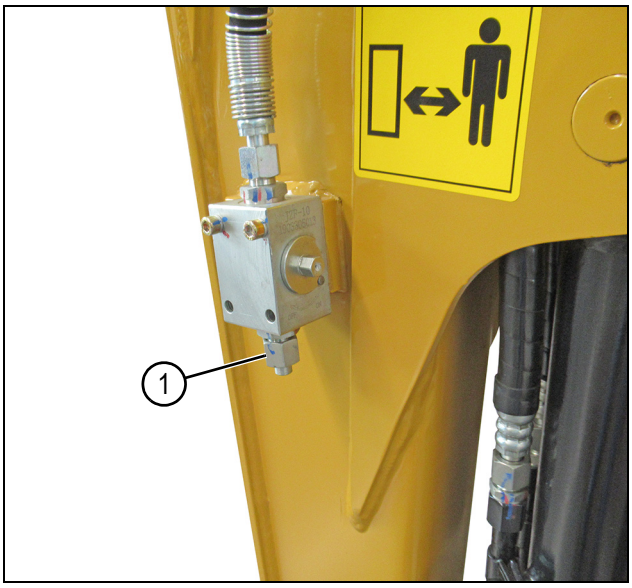


Fig. 7-6 0004806

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