

YANMAR

YANMAR CONSTRUCTION EQUIPMENT CO., LTD.

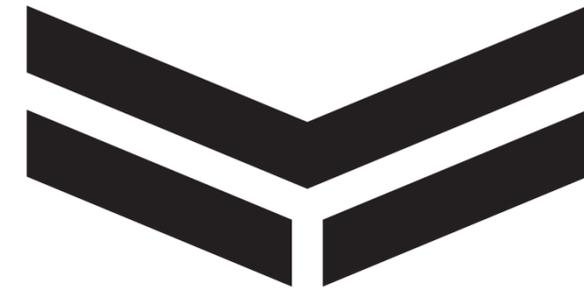
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OPERATION & MAINTENANCE MANUAL EXCAVATOR **Vi035-7B (US)**

YANMAR



OPERATION & MAINTENANCE MANUAL

EXCAVATOR

Vi035-7B (US)

(S/N 70501 & Above)

YANMAR

Read this manual carefully to learn how to operate and service your machine correctly. Failure to do so could result in personal injury or machine trouble.

This manual is the permanent part of your machine, when you sell your machine, hand it together with machine.

This machine had been designed by metric. Accordingly, dimensions mentioned in this manual are metric.

Discrimination of right side and left side for the machine are determined based on the machine posture, in where the blade is in front. i.e. Right side of the operator is machine's right side when the operator seats toward the blade.

The machine operated and serviced correctly has the warranty that is the YANMAR product support program. However, in case of the abuse or modification without permission of YANMAR, the warranty does not become the subject and also product improvement program may not become the subject.

All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

REFERENCE INFORMATION

Write the correct information for your YANMAR Excavator in the spaces below.

Always use these numbers when referring to your YANMAR Excavator.

Model name : _____
Serial Number : _____
Engine Serial Number : _____

Your YANMAR Excavator Dealer : _____
Address : _____
Phone : _____

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.

In case of exporting this product and providing the related technical material to non-residents in Japan or residents overseas, it is required to comply with the export and trade control laws and regulations of Japan and other relevant countries. Please be sure to follow the necessary procedure.

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101 International Parkway, Adairsville, GA 30103
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For Emissions or Warranty Information:

Website: <http://us.yanmar.com/>
E- mail: CS_support@yanmar.com
Toll Free Telephone Numbers:
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1-800-872-2867

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INTRODUCTION

SAFETY

OPERATION

MAINTENANCE

SPECIFICATIONS AND DIMENSIONAL DIAGRAMS

OPTIONAL PARTS AND ATTACHMENTS

APPENDIX TABLE

INDEX

CONTENTS

1	Introduction.....	1
2	Safety Information	2
3	Product Overview	4
	Intended uses	4
	Break in period	4
	Conditions to be met to assure compliance with EPA emission standards	5
	Emission system warranty	7
	Acquisition of Information on Machines in Operation and Handling of Acquired Information.....	14
4	Operation License	15
5	Ordering Replacement Parts and Service Calls.....	16
	Location of machine serial number plate.....	16
	Location of engine serial number plate.....	16
	Location of EPA emission control plates	17
	Ordering replacement parts and service calls	17

SAFETY 19

1	Basic Precautions.....	20
2	Operating Precautions.....	26
	Precautions before starting the engine.....	26
	Precautions for starting the engine, working and parking	28
	Precautions for transportation	34
	Precautions for the battery	35
	Precautions for towing	36
3	Precautions for Servicing.....	37
	Precautions before servicing	37
	Precautions during servicing	39
4	Safety Messages (Warning Labels).....	43
	Location of warning labels	43

OPERATION 59

1	Identification of Important Parts	61
	Overview of the machine	61
	Controls and switches.....	63
2	Description of Control Devices.....	64
	LCD Monitor.....	64
	Location and Function of Electrical Parts.....	84
	Control levers and pedals	90
	Rear hood	93
	Front cover (right)	94
	Right hood.....	94
	Operator's seat bottom cover.....	95
	Storage compartment for the operation & maintenance manual.....	95
	Storage space for tools and grease gun	95
	Windshield (Cabin spec.).....	96
	Hammer for emergency escape from operator's cab (Cabin spec.).....	98
	Operator's seat	98
	Headlight.....	99
	Right window glass (Cabin spec.).....	99
	Cabin side door (Cabin spec.)	100
	Replenishment of windshield washer fluid (Cabin spec.).....	100
	Handling Air Conditioner (Cabin spec.).....	101
	Fuse	104
	Handling of Rear View Monitor (Rear View Monitor spec.)	106
3	Operating Instructions.....	108
	Checking before starting the engine ..	108
	Starting up the engine.....	118
	Operating and checking instructions after starting the engine	120
	Starting and stopping the machine	121
	Steering.....	122
	Swinging the upperstructure	123

Operating the implement	123	Towing	174
Precautions for operating		If the battery is overdischarged	174
the implement	125	Troubleshooting	178
Precautions for working	127		
Precautions for going up and down		MAINTENANCE	181
a slope	128	1 Precautions for Servicing	182
Escaping from the mud.....	130	2 Basic Servicing Practices.....	184
Operations using the bucket.....	131	Diesel fuel	185
Parking the machine.....	132	Engine oil	187
Inspection requirements after completing		Engine cooling water.....	188
operation.....	133	Hydraulic oil and Reduction gear oil ..	189
Stopping the engine.....	133	Handling grease, oil, fuel and filters...	190
Inspection requirements after stopping		Electrical equipment.....	191
the engine	133	Hydraulic system.....	191
Locking	133	3 Consumables	193
Handling the rubber crawlers.....	134	4 Fueling, Oiling and Greasing Based on	
Replacing the bucket without the quick		Temperature Range.....	194
coupler.....	138	Fuel and oil	194
Reversing the bucket without the quick		Cooling water	194
coupler	139	5 Standard Tightening Torque for Bolts	
Handling quick coupler	141	and Nuts.....	195
How to handle AUX1	148	Torque table.....	195
How to handle AUX2 (AUX2 spec.)....	153	6 Replacing Essential Parts	
Handling the thumb bracket.....	160	Periodically.....	196
Handling accumulator.....	160	7 Maintenance Table	198
Handling SMARTASSIST-Remote	162	Table of service time intervals	198
4 Transportation	164	Service intervals when using	
Loading and unloading the machine...	164	the hydraulic breaker	200
Precautions for loading the machine ..	165	8 Procedures for Maintenance.....	201
Precautions for transporting		First services.....	201
the machine	166	Nonperiodic services.....	201
Suspending the machine	166	Checking before start-up.....	216
5 Care and Service in Cold Weather	169	Maintenance every	
Preparing for cold weather	169	50 service hours.....	216
Precautions after a day's work	170	Maintenance every	
After cold weather ends.....	170	100 service hours.....	217
6 Long-term Storage.....	171	Maintenance every	
Before storing	171	250 service hours.....	217
Storing	172	Maintenance every	
Using the machine again	172	500 service hours.....	221
7 Troubleshooting.....	173	Maintenance every	
Phenomena that do not constitute		1000 service hours.....	227
faults	173		

Maintenance every 1500 service hours	230
Maintenance every 2000 service hours	230
Maintenance every 3000 service hours	233

SPECIFICATIONS AND DIMENSIONAL DIAGRAMS 235

1 Specifications and Dimensional Diagrams	236
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OPTIONAL PARTS AND ATTACHMENTS 243

1 General Precautions	244
Safety precautions	244
Precautions for mounting an attachment (implement).....	245
Prohibitions while the Machine is mounted with an Attachment	246

APPENDIX TABLE 249

List of consumables	250
Fuel, oil and cooling water	251
Required tools	252
Torque table	253
List of essential parts	254
List of error codes displayed on LCD monitor.....	255

1. Introduction

This Operation and Maintenance Manual for the YANMAR ViO35-7B Excavator is designed to provide you with important information and suggestions necessary for using the machine with safety and efficiency. Please be sure to read through the manual before using the machine, to make yourself familiar with the procedures and instructions for operating, inspecting and servicing. Keep in mind that failure to observe the precautions given in the manual or using any procedures not prescribed in the manual may cause a serious accident.

WARNING

Improper use of the machine may lead to hazards which can result in death or serious injury.

Personnel engaged in operating and maintaining the machine are required to familiarize themselves with the contents of the manual before setting about their job.

- **Do not attempt to operate the machine before making yourself familiar with the contents of the manual.**
- **Personnel responsible for using the machine must keep the manual at hand and review it periodically.**
- **If the manual should be lost or damaged, promptly order a new copy from the dealer.**
- **When you transfer the machine to another user, always transfer the manual as well.**
- **We at YANMAR provide customers with products in compliance with applicable your country's regulations and industrial standards. If you are using a YANMAR machine purchased abroad, the machine may lack some safety devices. Please consult your dealer to confirm whether or not that machine is in compliance with applicable your country's regulations and industrial standards.**
- **Some machine specifications may differ from those which are described in this manual because of improvements in its design and performance. If you have any questions about the contents of the manual, don't hesitate to contact your dealer.**
- **Important safety instructions have been presented throughout this manual, and have been summarized in PART ONE : SAFETY. Be sure to review these pages and pay heed to those safety instructions before proceeding to operate the machine.**

2. Safety Information

The following Signal Words have been used in this Manual and on the Safety Signs to indicate the seriousness of the hazards that could be encountered by failing to comply with the applicable Product Warnings, as follows:

⚠ DANGER

The word "DANGER" indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. "DANGER" is limited to the most extreme situations.

⚠ WARNING

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

⚠ CAUTION

The word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT

The signal word "IMPORTANT" has been utilized in this Manual to denote those User Directions that must be followed to assure the safe operation and maintenance of the Excavator.

- **WARNING** : Never attempt to operate or service this Excavator until you have first read and understood all of the applicable Product Warnings and User Directions that are set forth in this Manual and on the Safety Signs that are affixed to this Excavator.

The failure to comply with all relevant Safety Instructions could result in bodily injury.

- **WARNING** : Never modify the design of this Excavator or its engine; never remove or disable any of the installed safety guards or devices; and never use any unauthorized attachments in the operation of this equipment.

The implementation of any unauthorized design modifications or the use of unauthorized attachments could result in bodily injury.

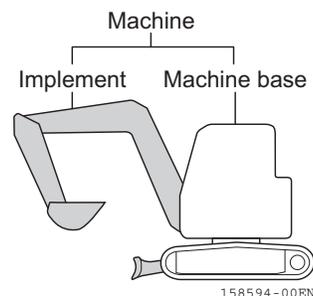
Furthermore, since those actions would expressly violate the terms of YANMAR's Product Warranty, the applicable Warranty would also be voided.

In this Manual, the major sections of the product are designated as follows:

Machine refers to the entire product.

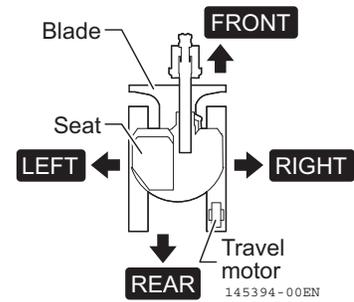
Machine base ... refers to the section consisting of the upperstructure and the undercarriage.

Implement..... refers to the filled-in sections (boom, arm, bucket, blade, etc.) in the figure on the right.



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Discrimination of right side and left side for the machine are determined based on the machine posture, in where the blade is in front. i.e. Right side of the operator is machine's right side when the operator seats toward the blade.



3. Product Overview

Intended uses

The ViO35-7B Excavator is intended to perform the following tasks:

- Digging
- Leveling of ground
- Shoveling
- Ditching and Guttering
- Loading

The machine should not be used for unintended tasks

For the details on how to work with the machine, refer to Section “Operations using the bucket“ on page 131.

Break in period

The machine should not be subjected to severe stresses and loads during the initial break in period although it has been prepared well and stringently inspected before shipping. Otherwise the machine's performance may be affected and its service life shortened. Thus it is essential to break in the machine for the first approx. 100 service hours (reading of the hour meter).

In breaking in the machine:

- You should warm up the engine by low idling for 5 minutes before starting operations.
- You should not operate the machine under heavy loads or at high speed.
- You should not start and accelerate the engine too abruptly, or stop it too abruptly.
- You should not change travel direction too abruptly.

The safety instructions for operation and maintenance that are presented in this Manual are applicable to each of the intended tasks. Never misuse this machine by violating the applicable safety instructions or by attempting to perform unintended tasks, because of the danger of serious bodily injury.

Conditions to be met to assure compliance with EPA emission standards

Conditions de conformité avec les standards d'émission EPA

An EPA approved engine has been installed in this machine. The following are the conditions that must be met to assure that emissions during operation will meet EPA standards. Always comply with all of these requirements.

- The prevailing atmospheric conditions should be as follows.
 - (1) Ambient temperature : -4 to 104°F (-20 to 40°C)
 - (2) Relative humidity : 80% or lower
- The fuel and lube oil used should be as follows.
 - (1) Fuel: Diesel light oil ASTM D975 No.1D S15 or No.2D S15 (ISO 8217 DMX)
 - The fuel cetane number should be equal to 45 or higher.
 - For electronically controlled engine, it is mandatory to use fuel that does not contain 0.1% or more sulfur content. Less than 0.05% is preferred.

In general, using a high sulfur fuel may possible result in corrosion inside the cylinder. Especially in U.S.A. and Canada, Ultra Low Sulfur fuel should be used.
 - (2) Lube oil: Type API, class CJ-4
 - The Water and sediment in the fuel should not exceed 0.05% by volume.
- (2) Lube oil: Type API, class CJ-4
 - Never remove the seals limiting the amount of fuel injected and the speed.
 - Always perform the required periodic maintenance.

Follow the basic guidelines outlined in Section "7. Maintenance Table" on page 198 of this manual, and keep a record of the results. Pay particular attention to these important points: replacing the lube oil and lube oil filter; cleaning the air cleaner element and the radiator fins.

Un moteur thermique agréé EPA est installé sur cette machine. A la suite figurent les conditions d'utilisation permettant de satisfaire au standard EPA; il est impératif de les respecter.

- *Environnement extérieur:*
 - (1) *Température ambiante : -4 à 104°F (-20 à 40°C)*
 - (2) *Humidité relative : 80 % au moins*
- *Carburant et huiles à utiliser*
 - (1) *Carburant : Diesel léger ASTM D975 N° 1D S15 ou N° 2D S15 (ISO 8217 DMX)*
 - *L'indice de cétane du carburant doit être égal ou supérieur à 45.*
 - *La teneur en soufre ne doit pas dépasser 0,1% par volume. Moins de 0,05% est préférable.*

En général, l'utilisation d'un carburant à teneur élevée en soufre peut entraîner une corrosion à l'intérieur du vérin.

Aux U.S.A. et au Canada notamment, l'utilisation d'un carburant à très basse teneur en soufre est recommandée.
- *L'eau et les sédiments présents dans le carburant ne doivent pas dépasser 0,05% par volume.*

(2) Huiles: type API, classe CJ-4

- *Ne pas retirer les joints limitant la quantité de carburant injecté et la vitesse*
- *Respecter les inspections périodiques*

Suivre les indications figurant dans ce manuel (Table de maintenance 7) et garder une trace des résultats. Faire très attention aux points importants suivant: remplacer l'huile et le filtre à huile, nettoyer l'élément de filtre à air et le radiateur.

Emission system warranty

Garantie du système antipollution

YANMAR POWER TECHNOLOGY CO., LTD. Emission Control System Warranty - USA Only

■ Your warranty rights and obligations

- California

The California Air Resources Board (CARB), the United State Environmental Protection Agency (EPA) and YANMAR POWER TECHNOLOGY CO., LTD. hereafter referred to as YANMAR, are pleased to explain the **emission control system warranty** on your 2023, 2024, or 2025 model year industrial compression-ignition engine.

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

Your emission control system may include parts such as the fuel injection system, the air induction system, the electronic control system, EGR (Exhaust Gas Recirculation) system and the exhaust gas after treatment (diesel particulate filter system, urea SCR system). Also included may be hoses, belts, connectors and other emission-related assemblies.

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

■ Manufacturer's Warranty Period

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

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

■ Warranty Coverage

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

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

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

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

■ Warranted Parts

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

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

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

■ Exclusions

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

■ Owner's Warranty Responsibilities

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

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

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

You are responsible for initiating the warranty process. You are responsible for presenting your engine to an authorized YANMAR dealer or distributor as soon as a problem exists. The warranty

repairs should be completed by the dealer as expeditiously as possible. If you have any questions regarding your warranty rights and responsibilities, or would like information on the nearest YANMAR dealer or authorized service center, you should contact YANMAR America Corporation.

Website: <http://us.yanmar.com/>

E-mail: CS_support@yanmar.com

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

YANMAR POWER TECHNOLOGY Co., Ltd. Garantie de conformité du système de contrôle des émissions - États-Unis seulement

■ *Votre garantie : vos droits et vos obligations*

• *Californie*

*Le California Air Resources Board (CARB), l'Agence américaine de protection de l'environnement (EPA) et YANMAR POWER TECHNOLOGY CO., LTD. ci-après appelée YANMAR, se font un plaisir de vous expliquer les conditions de la **garantie de conformité du système anti-pollution** de votre moteur industriel à allumage par compression des années-modèles 2023, 2024, ou 2025.*

Les nouveaux moteurs non routiers à allumage par compression certifiés en Californie doivent être conçus, construits et équipés de façon à satisfaire les normes antipollution strictes en vigueur dans cet État. Dans les quarante-neuf (49) autres États, les nouveaux moteurs non routiers à allumage par compression doivent être conçus, construits et équipés afin de respecter les normes strictes de réglementation antipollution de l'EPA. YANMAR doit garantir le système de contrôle des émissions de votre moteur pour les périodes indiquées ci-dessous, à la condition qu'ils n'aient pas fait l'objet d'un usage abusif, d'une négligence ou d'un manque d'entretien.

Votre système antipollution peut comporter des éléments tels que le système d'injection de carburant, le système d'induction d'air, le système de contrôle électronique, le système de recyclage des gaz d'échappement et le système d'échappement après traitement (filtre à particules diesel, système de RCS par injection d'urée). D'autres pièces antipollution peuvent être comprises, notamment des tuyaux, des courroies et des raccords.

Dans l'éventualité d'un problème couvert par la garantie, YANMAR réparera gratuitement le moteur non routier à allumage par compression, ce qui inclut les frais pour le diagnostic, les pièces et la main-d'œuvre.

■ Période de garantie par le fabricant

Les moteurs non routiers à allumage par compression des années-modèles 2023, 2024, ou 2025 sont garantis pendant les périodes indiquées ci-dessous. Si toute composante de votre moteur en lien avec les émissions est jugée défectueuse pendant la période de garantie applicable, cette pièce sera réparée ou remplacée par YANMAR.

<i>Si votre moteur est certifié</i>	<i>A une vitesse maximale de</i>	<i>Une vitesse nominale de</i>	<i>La période de garantie est de</i>
<i>Vitesse variable ou constante</i>	$kW < 19$	<i>Toutes les vitesses</i>	<i>2 000 heures ou deux (2) ans, selon l'éventualité qui survient en premier. S'il est impossible de déterminer le nombre d'heures d'utilisation du moteur, sa période de garantie est de deux (2) ans.</i>
<i>Vitesse constante</i>	$19 \leq kW < 37$	<i>3 000 t/m et plus</i>	<i>2 000 heures ou deux (2) ans, selon l'éventualité qui survient en premier. S'il est impossible de déterminer le nombre d'heures d'utilisation du moteur, sa période de garantie est de deux (2) ans.</i>
<i>Vitesse constante</i>	$19 \leq kW < 37$	<i>Moins de 3 000 t/m</i>	<i>3 000 heures ou cinq (5) ans, selon l'éventualité qui survient en premier. S'il est impossible de déterminer le nombre d'heures d'utilisation du moteur, sa période de garantie est de cinq (5) ans.</i>
<i>Vitesse variable</i>	$19 \leq kW < 37$	<i>Toutes les vitesses</i>	<i>3 000 heures ou cinq (5) ans, selon l'éventualité qui survient en premier. S'il est impossible de déterminer le nombre d'heures d'utilisation du moteur, sa période de garantie est de cinq (5) ans.</i>
<i>Vitesse variable ou constante</i>	$kW \geq 37$	<i>Toutes les vitesses</i>	<i>3 000 heures ou cinq (5) ans, selon l'éventualité qui survient en premier. S'il est impossible de déterminer le nombre d'heures d'utilisation du moteur, sa période de garantie est de cinq (5) ans.</i>

■ Couverture de la garantie

Cette garantie est transférable à tout acquéreur subséquent pour la durée de la garantie. YANMAR recommande que la réparation ou le remplacement de toutes les pièces sous garantie soit effectué chez un concessionnaire YANMAR agréé.

Toute pièce garantie, pour laquelle le guide du propriétaire ne prévoit aucun remplacement dans le calendrier des entretiens requis, est garantie pour la période de garantie précisée. Toute pièce garantie, pour laquelle le guide du propriétaire prévoit le remplacement dans le cadre d'un entretien requis, est garantie pour la période précédant le premier remplacement prévu. Toute pièce garantie, pour laquelle un remplacement est prévu dans le cadre d'un entretien requis, qui est réparée ou remplacée pendant la période de garantie, sera garantie pour la période de garantie restante avant le premier remplacement prévu. Toute pièce garantie, pour laquelle aucun remplacement n'est prévu et qui est réparée ou remplacée pendant la période de garantie, sera garantie pour la période de garantie restante.

Pendant la période de garantie, YANMAR est responsable des dommages causés aux autres éléments du moteur par le bris d'une pièce toujours garantie.

Toute pièce de remplacement dont la fonction est identique à la pièce originale peut être utilisée pour l'entretien ou la réparation de votre moteur sans réduire les obligations de YANMAR en fonction de la garantie. Les pièces ajoutées ou modifiées peuvent être utilisées à moins qu'il y ait contre-indication. L'utilisation de toute pièce ajoutée ou modifiée contre-indiquée sera un motif de révocation de la garantie.

■ **Pièces garanties**

Cette garantie couvre les composantes du moteur qui font partie du système antipollution du moteur tel que livré par YANMAR à l'acheteur original. Ces composantes peuvent comprendre les éléments suivants :

- *Système d'injection de carburant (y compris le système de compensation d'altitude)*
- *Système d'enrichissement pour démarrage à froid*
- *Tubulure d'admission et papillon de la soupape d'admission d'air*
- *Système de turbochargement*
- *Collecteur d'échappement et papillon d'échappement*
- *Système de ventilation positive du carter*
- *Systèmes de refroidissement de l'air de suralimentation*
- *Système de recirculation des gaz d'échappement*
- *Système de traitement des gaz d'échappement (système de filtres à particules pour le diesel)*
- *Boîtiers, capteurs, solénoïdes et faisceaux de câblage du boîtier de commande utilisés dans les systèmes indiqués ci-dessus*
- *Flexibles, courroies, connecteurs et autres ensembles utilisés dans les systèmes indiqués ci-dessus*
- *Étiquettes d'information sur le contrôle des émissions*

Comme les pièces du système antipollution peuvent varier légèrement d'un modèle à l'autre, elles peuvent avoir une fonction équivalente ou ne pas être présentes sur certains modèles.

■ **Exclusions**

Les défauts autres que celles qui résultent d'un vice de matière ou de fabrication ne sont pas couvertes par la présente garantie. La garantie ne couvre pas les mauvais fonctionnements découlant de tout usage abusif, mauvaise utilisation, ajustement inapproprié, modification, altération, trafiquage, déconnexion, entretien inapproprié ou inadéquat ou utilisation de carburants et d'huiles de graissage non recommandés, ainsi que tout accident ayant causé des dommages et exigé le remplacement d'articles de consommation en lien avec l'entretien prévu. YANMAR n'assume aucune responsabilité pour tout dommage incident ou conséquent, comme une perte de temps, des inconvénients, l'impossibilité d'utiliser l'équipement ou le moteur ou toute perte commerciale.

■ **Obligations du propriétaire**

En tant que propriétaire d'un moteur non routier à allumage par compression, vous êtes responsable d'effectuer l'entretien requis indiqué dans votre guide de propriétaire. YANMAR recommande que vous conserviez toute documentation, y compris les reçus, couvrant l'entretien de votre moteur non routier à allumage par compression, mais YANMAR ne pourra refuser d'effectuer les réparations couvertes par la garantie simplement du fait que vous n'avez pas conservé ces reçus ou en raison de votre manquement à effectuer tous les entretiens prévus.

YANMAR peut refuser d'effectuer les réparations couvertes par la garantie si votre moteur non routier à allumage par compression ou une pièce de celui-ci a arrêté de fonctionner en raison d'un usage abusif, d'une négligence, d'un entretien inapproprié ou de modifications non approuvées.

Votre moteur est conçu pour ne fonctionner qu'avec du carburant diesel. L'utilisation de tout autre carburant dans le moteur pourra entraîner un fonctionnement non conforme aux exigences émises par le CARB et l'EPA.

En tant que propriétaire, vous devez mettre en marche le processus de garantie. Vous avez la responsabilité de confier votre moteur à un concessionnaire ou un distributeur agréé YANMAR dès qu'un problème survient. Les réparations couvertes par la garantie seront effectuées par le concessionnaire aussi rapidement que possible. Pour toute question relative à vos droits et à vos obligations en fonction de la garantie, ou pour toute information relative au concessionnaire ou au centre d'entretien autorisé YANMAR le plus proche, contactez YANMAR America Corporation.

Site Internet: <http://us.yanmar.com/>

E-mail: CS_support@yanmar.com

Numéros verts: 1-855-416-7091, 1-800-872-2867

Acquisition of Information on Machines in Operation and Handling of Acquired Information

The controller of this machine stores main data on the operational status of the machine. For the engine, for example, the controller stores information of a purely mechanical nature including the cumulative engine operating time and does not record customer-related data such as audio clips or video footage of conversations or positional information.

Data stored can be acquired using YANMAR's failure diagnosis tool. YANMAR may acquire and use the data acquired for technical diagnosis or research and development aimed at the provision of better services.

With the exception of the cases listed below, neither YANMAR nor entities to which it outsources work will disclose stored data to third parties.

- Cases where the customer (the machine owner) has consented to the provision of data to third parties
- Cases where the provision of such data is required by an enforceable order such as a court order.
- Cases of the provision to public agencies of data that has been processed so that users of said data cannot identify the machine concerned for purposes such as statistical processing.

4. Operation License

Before you operate this machine, confirm the licensing requirements that are applicable to the operation of this machine.

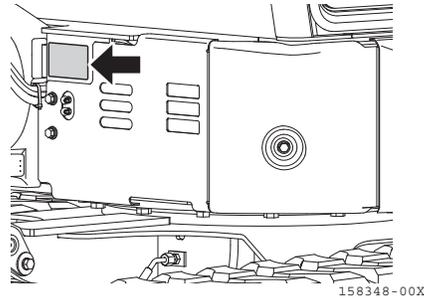
Comply with all applicable laws.

Ask your dealer about licensing requirements.

5. Ordering Replacement Parts and Service Calls

Location of machine serial number plate

The machine serial number plate is located on the turning frame as illustrated at right. Never remove the plate for any reason.

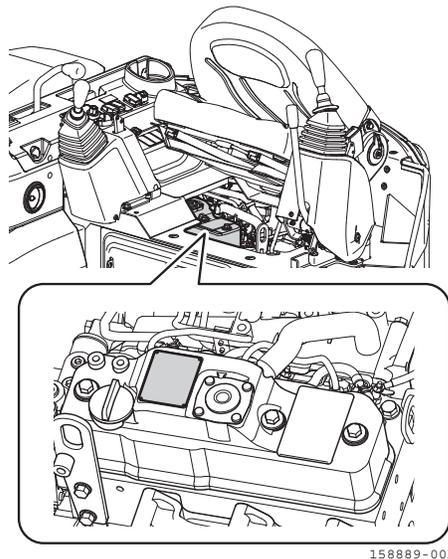


Location of engine serial number plate

The engine serial number plate is located on the surface of the head cover of the engine under the operator's seat bottom cover.

For how to open or close the operator's seat bottom cover, refer to "Operator's seat bottom cover" on page 95.

Never remove the plate for any reason.



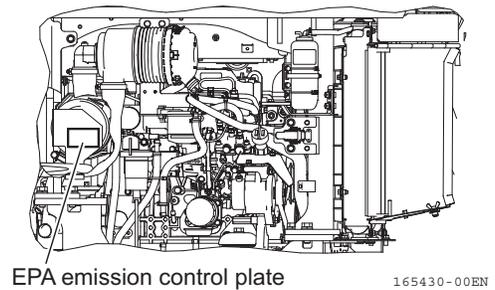
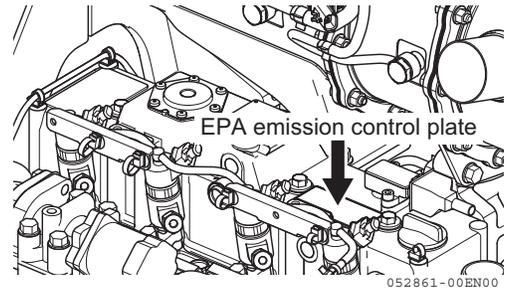
Location of EPA emission control plates

Localisation de la plaque signalétique EPA

The EPA emission control plates are located on the engine and muffler cover as illustrated at right. Never remove the plates for any reason.

La plaque signalétique est fixée sur le moteur (voir illustration à droite).

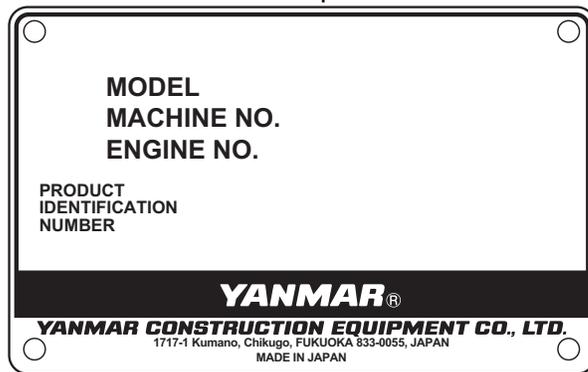
En aucun cas ne retirer cette plaque.



Ordering replacement parts and service calls

When ordering replacement parts or calling for service, let your dealer know the model designation, the machine serial number, and the engine serial number as well as the reading of the hour meter.

- Machine serial number plate



- Hour meter



MEMO

SAFETY

- 1. Basic Precautions 20**
- 2. Operating Precautions 26**
 - Precautions before starting
the engine 26
 - Precautions for starting the engine,
working and parking 28
 - Precautions for transportation 34
 - Precautions for the battery 35
 - Precautions for towing..... 36
- 3. Precautions for Servicing 37**
 - Precautions before servicing 37
 - Precautions during servicing 39
- 4. Safety Messages
(Warning Labels) 43**
 - Location of warning labels 43

 **WARNING**

Never attempt to operate or service this Excavator until you have first read and understood all of the applicable Safety Instructions that are set forth in this Manual. The failure to comply with all relevant Safety Instructions could result in bodily injury.

This “SAFETY” Part includes safety instructions for optional parts and attachments.

1. Basic Precautions

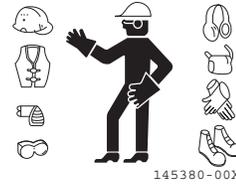
■ Follow safety rules at your workplace

- The operation and servicing of this machine is restricted to qualified persons.
- When operating or servicing the machine, follow all the safety rules, precautions and procedures.
- Any work performed by a team or with a signal person should be conducted in accordance with signals agreed on beforehand.

■ Install safety devices

- Make sure that all guards and covers are installed in their correct position. If any of them are damaged, repair them immediately.
- The proper use of all safety devices, such as lock lever, should be well understood by the machine operator.
- Never remove the safety devices. Always make sure that they operate properly.
For lock lever, refer to Section "Control levers and pedals" on page 90.
- Incorrect operation of the safety devices could cause serious bodily injury.

■ Wear proper clothing and safety items



- Do not wear loose clothing or jewelry that can be caught on the control levers and other machine parts. Also avoid wearing working clothes stained with oil as they can ignite.
- Be sure to wear a hard hat, safety goggles, safety shoes, a mask, gloves and other protective items, as appropriate.
Take particular precautions when generating metal debris, when striking metal objects with a hammer or when cleaning components with compressed air.
Also make sure there are no persons near the machine.
For driving the pins, refer to Section "Replacing the bucket without the quick coupler" on page 138.
For cleaning the fuel, oil and air filter elements, refer to Section "Nonperiodic services" on page 201.

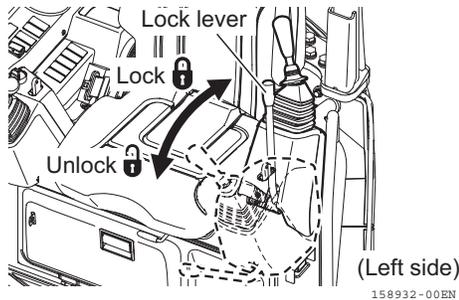
■ Alcohol

- Never operate the machine after consuming alcoholic beverages, or while you are under the influence of alcohol or if you feel ill or unwell, as that could result in accidental bodily injury to yourself or others.

■ **Avoid unauthorized modifications**

- Modifications not recommended by YANMAR may cause safety hazards.
- When you wish to modify your machine, contact your dealer. The implementation of unauthorized modifications or the use of unauthorized attachments could result in bodily injury. Since those actions would also violate the terms of YANMAR's Warranty, it would be voided.

■ **Always lock up your machine when leaving the operator's seat**

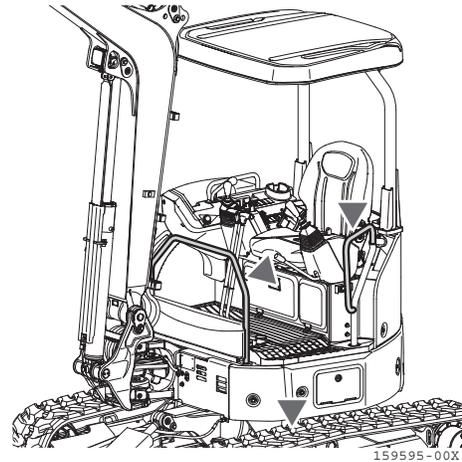


- When leaving the operator's seat, be sure to place the lock lever in the lock position, to prevent accidental machine movement which could result in bodily injury.
- When you leave the machine:
 - (1) Lower the bucket to the ground.
 - (2) Place the lock lever in the lock position.
 - (3) Stop the engine.
 - (4) Set all the locks in to the lock position.
 - (5) Be sure to take the starter switch key out of the starter switch.
- Be sure to store the key in a designated place so that unauthorized personnel cannot operate the machine.

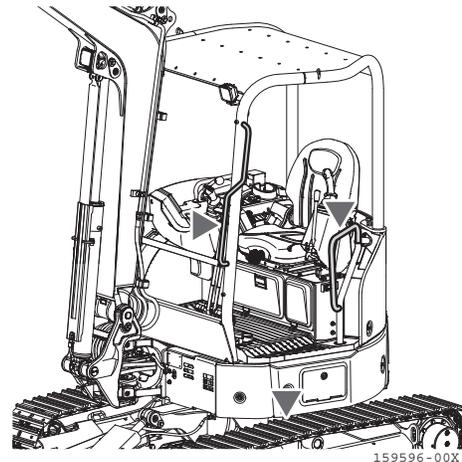
For information on parking the machine, refer to Section "Parking the machine" on page 132.

■ **Use handrails and steps when getting on and off**

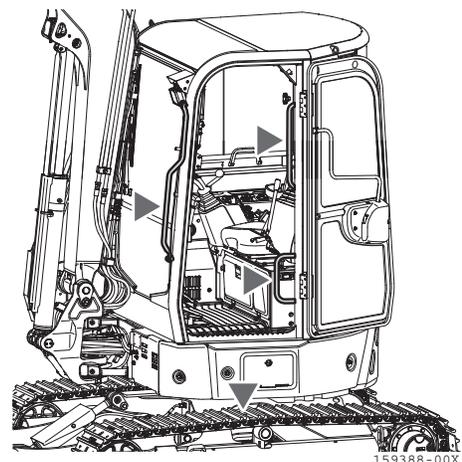
2-pole canopy type



4-pole canopy type



Cabin type



- Do not jump on or off the machine. Never get on or off a machine in motion as it may result in bodily injury.

- When getting on and off the machine, face the machine and use the handrails and steps.
- Do not grab the control levers or the front windshield opening and closing knobs when getting on and off the machine.
- Make sure that you maintain three point contact with the handrails or the steps.
- If the handrails and the steps are soiled with oil or dirt, clean them off immediately. Repair any damaged parts and retighten any loose bolts.
- When opening or closing the cabin side door from the outside, do not do so standing on the part of the machine; for example, on the crawler or the step. Be sure to open or close the door standing on the ground.

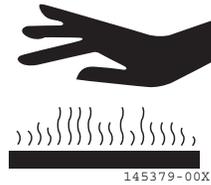
■ **Keep fuel and oil away from sources of ignition**



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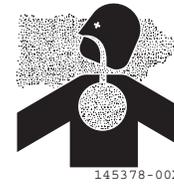
- Open flames can ignite fuel, oil, hydraulic oil or antifreeze solutions, which are flammable and dangerous. Special attention must be paid to the following matters:
 - Keep flammable materials away from lighted cigarettes or matches, or any other sources of ignition.
 - Never refuel while the engine is running. Smoking during refueling must be strictly prohibited.
 - Firmly tighten the caps on the fuel and oil tanks.
 - Store fuel and oil in a cool and well-ventilated place where they are not subjected to direct sunlight.
 - Fuel and oil must be stored in a place which meets all applicable safety regulations. Unauthorized persons should not be allowed entry.

■ **Avoid removing filler caps while temperatures are high**



- The engine coolant, engine oil and hydraulic oil are hot and under pressure immediately after the machine stops operation. Removing caps, draining coolant or oil, or replacing a filter at such a time may cause burns. Allow temperatures to cool down and follow the procedures in this manual.
- When removing the radiator cap, stop the engine and allow the coolant to cool down, then turn the cap slowly to relieve all pressure.
- Before removing the cap from the hydraulic oil tank, stop the engine and turn the cap slowly to relieve all pressure to prevent oil from spouting out.

■ **Avoid harmful asbestos dust**



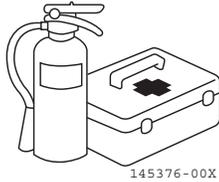
- Air containing asbestos dust is carcinogenic and is hazardous to humans. Inhalation of the air may cause lung cancer. When handling materials that may contain asbestos, keep in mind that:
 - Compressed air must not be used for cleaning.
 - Water must be used to clean the machine to prevent asbestos from scattering in the air.
 - You must work on the windward side when operating the machine in a place where there may be asbestos dust.
- You should wear an appropriate respirator as necessary.

■ **Prevent crush injuries by the implements**



- Keep hands, arms and all other parts of your body away from all the moving parts, particularly between the implements and the machine and between the hydraulic cylinder and the implements, as pinch points are created in those areas.

■ Keep a fire extinguisher and first aid kit handy



- The workplace must be provided with a fire extinguisher. Read instructions on the label to familiarize yourself with how to use it.
- Keep a first aid kit in a prescribed place.
- Advise what to do in the event of a fire or an accident.
- Indicate who to contact in an emergency and keep emergency telephone numbers in a prominent place.

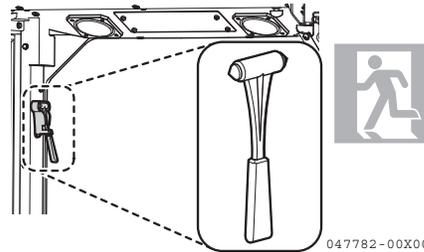
■ Precautions for installing optional parts and attachments

- When installing or using optional attachments, read the operating instructions for the attachments and the Manual Sections relating to the installation of attachments.
- Use only attachments authorized by YANMAR. The use of unauthorized attachments may affect not only the safety of the machine but also the proper operation and life of the machine.
- The use of unauthorized attachments would also violate the terms of YANMAR's Warranty, so that it would be voided.

■ Caution for broken cabin glass

- If the glass in a cabin window should be broken by accident, the jagged edges pose a danger to the operator. Immediately stop working and remove the broken glass, and replace it as soon as possible.

■ Emergency escape from operator's cab



- If the door of the cabin should not open, break the window glass with a hammer which is provided inside the cabin to escape from the operator's cab in an emergency.
- Remove the broken pieces of the window glass from the window frame to prevent any injury by those broken pieces. Besides, watch your step not to slip on the broken pieces of the window glass which dropped around your feet.

For instructions on how to escape, refer to Section "Hammer for emergency escape from operator's cab (Cabin spec.)" on page 98.

■ Keep the engine room clean

- Combustibles such as dry leaves, waste paper and wood chips accumulated as well as oil and fuel adhering to the surfaces of the engine room and around the battery present a risk of fire. Remove all combustibles.

■ Never start the engine while the "SERVICING IN PROGRESS" tag is attached

- Never start the engine or operate the machine with the "SERVICING IN PROGRESS" tag attached to any of its control levers, for example, until the tag is removed by the person who attached it or personnel who have completed the servicing.

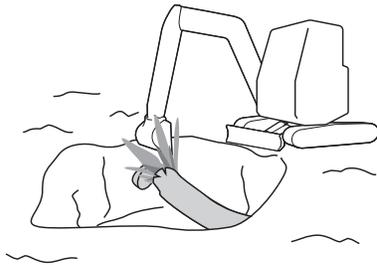
■ **Never use the machine without carrying out necessary repairs or maintenance**

- Use of an unserviced machine presents the risk of unforeseen accidents or failures. Never use the machine without carrying out necessary repairs or maintenance. Necessary repairs and maintenance must be carried out as soon as possible.

2. Operating Precautions

Precautions before starting the engine

■ Ensure the safety of your workplace



145782-00X

- Before starting the machine, check to see if there are any hazards in your working area.
- Examine the terrain and soil, and decide the best way to do the work.
- When working on the street, provide a signal person or fence for the safety of vehicles and pedestrians.
- If there are underground utilities at the work site, such as water pipes, gas pipes, high-voltage conduits or others, contact the responsible companies to locate them exactly, so as not to damage them.
- Before operating the machine in water, or crossing a creek, confirm the condition of the submerged ground, the water depth and the water flow speed, and make sure that the depth is within the allowable level.

For allowable water depth, refer to Section "Precautions for working" on page 127.

■ Prevent fire



145381-00X

- Wood chips, dead leaves, trash and other flammable materials in proximity to the engine are hazardous as they may cause fire.

Always check and keep your machine clear of these flammable materials.

- Check for any leaks from fuel, lube oil or hydraulic oil lines. Repair faults and clean spilled oil as necessary.

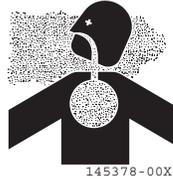
For additional information, refer to Section "Checking before starting the engine" on page 108.

- Check to see where fire extinguishers are located and know how to use them.

■ Inspect around the operator's seat

- Dirt, oil and snow on the floor, levers, handrails or steps are slippery and hazardous. Remove them all completely.
- Keep parts and tools away from the operator's seat as they may damage the control levers or switches or create other hazards.

■ **Provide adequate ventilation when working in an enclosed area**



Engine exhaust fumes are harmful to the human body and their inhalation is extremely hazardous. When starting the engine in an enclosed area, open the windows and doors for ventilation. Also do not idle the engine unnecessarily or leave the engine running while the machine is not in use.

■ **Keep the cabin window clean**

- Keep the surface of the cabin windows and the headlights clean for clear view.
- Make sure that your machine is equipped with headlights and all required working lamps, and that they all work properly.

■ **Fasten the seatbelt**

- For your safety, ROPS (Roll-Over Protective Structure)/FOPS (Falling Objects Protective Structures)/TOPS (Tip-Over Protective Structure) with a seatbelt is installed.
- Always fasten the seatbelt across the pelvic region and adjust it snugly before you operate the machine.
- The seatbelt must be replaced if the machine is involved in an accident.
- In addition, the seat and the seat mounting must also be checked by your dealer after an accident has occurred.
- If the seat and the seat mounting are damaged, they must be replaced immediately.

■ **ROPS/FOPS/TOPS**

- Never modify the structural member of ROPS/FOPS/TOPS.
- If ROPS/FOPS/TOPS is damaged, replace it immediately to prevent bodily injury. Never repair or modify it. Ask your dealer for replacing it.

■ **Caution for the protection of plants from hot wind and exhaust gases**

The wind and exhaust gases from the radiator and the muffler respectively are very hot. Plants directly exposed to hot wind or exhaust gases may die.

Erect a barrier to protect plants from hot wind and exhaust gases when working near them.

Precautions for starting the engine, working and parking

■ Signal before starting the engine

- Check the machine carefully before initial start up for the day.
- Make sure there are no persons near the machine before getting on it.
- Never start the engine when the "SERVICING IN PROGRESS" tag is attached to the control system.
- Sound the horn to alert people nearby before starting the engine.
- Be sure to start the engine and operate the machine from the operator's seat only.
- Do not allow any other persons to get on the machine.

■ Inspections to be performed after starting the engine

Do not operate the machine before performing specified inspections after engine start up.

Neglecting performance of such inspections can lead to failure to find abnormalities in the machine at an early stage, resulting in the risk of personal injury or damage to the machine.

For details of inspection procedures, refer to Section "Operating and checking instructions after starting the engine" on page 120.

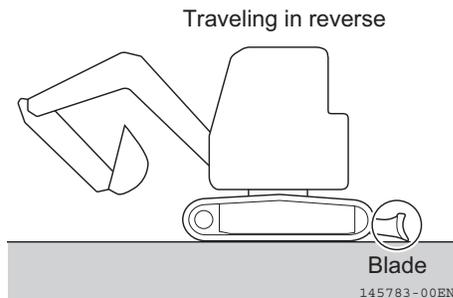
■ When an abnormality is detected in the machine

If an abnormality is detected during operation, immediately stop and inspect the machine and take necessary corrective measures.

■ Measures to be taken in case of fire

- Turn the key to the "OFF" position to stop the engine in the event of a fire.
- Use the handrails and steps when getting out of the machine. Do not jump down from the machine. Doing so may result in falls and injuries.

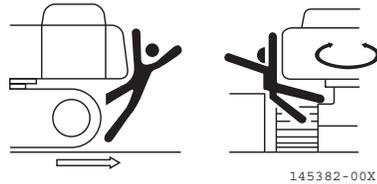
■ Check the position of the blade before operating the machine



- Check the position of the blade before operating the travel levers. When the blade is located in the back, the operation of the travel levers is reversed.

For instructions on How the machine travels, refer to Section "Starting and stopping the machine" on page 121.

■ Make sure there are no persons nearby when turning or reversing the machine



- A signal person should be provided for safety when the work site is hazardous or when visibility is poor.
- Keep all other persons away from the work site or the traveling path of the machine.
- Alert persons nearby with a horn or other signal before starting the machine.
- The machine permits a limited range of vision toward the rear. Make sure there are no persons behind the machine before reversing.

■ Take measures to prevent the machine from getting stuck before working on soft ground

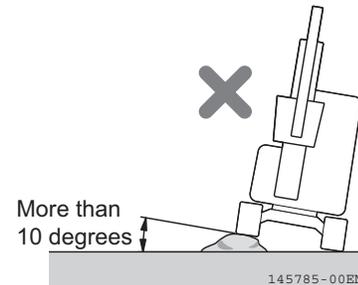
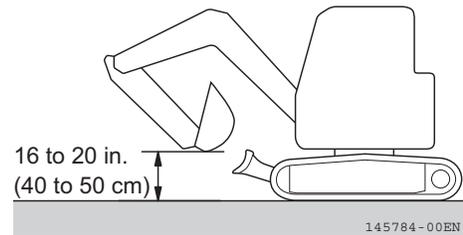
Working on soft ground or in swamps presents the risk of the machine becoming stuck in mud, resulting in possible immobilization.

Place logs, pieces of lumber or other appropriate bases horizontally on the surface of the soft ground or the swamp to prevent the machine from getting stuck.

Be careful when the ground is frozen because it becomes softer as the temperature rises.

■ Precautions for traveling

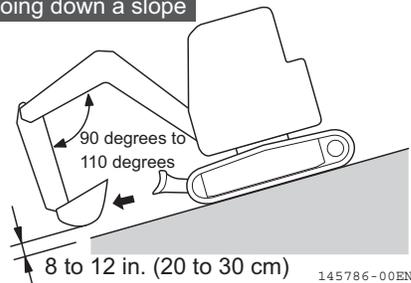
Orientation in travel



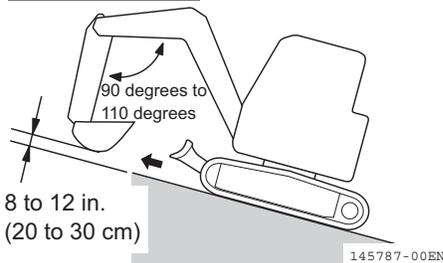
- When traveling with the machine, keep the bucket 16 to 20 in. (40 to 50 cm) above the ground with boom and arm folded as illustrated above.
- If you need to operate the control levers while traveling, never move them abruptly.
- Travel the machine at a low speed and slow down when turning on rough terrain.
- Avoid running over obstacles if possible. If unavoidable, run the machine at a low speed while keeping the implement close to the ground. Never run over obstacles that may cause the machine to tilt more than 10 degrees.

■ Running the machine on a slope

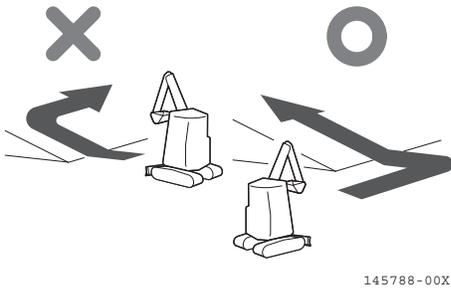
Going down a slope



Going up a slope



- Run the machine carefully on a slope to avoid overturning or skidding sideways.
- When running the machine on a slope, keep the bucket 8 to 12 in. (20 to 30 cm) above the ground so that you can immediately lower it to the ground and stop the machine in an emergency.



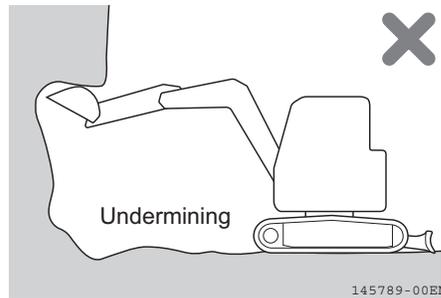
- Never turn the machine on a slope or run it across the slope. Move down to flat ground and then make a turn.
For instructions on how to run the machine on a slope, refer to Section "Precautions for going up and down a slope" on page 128.

- On grasses, dead leaves or a wet metal plate, even with a slight gradient, the machine will easily slip. Under those circumstances, run the machine carefully at low speed to prevent it from skidding.

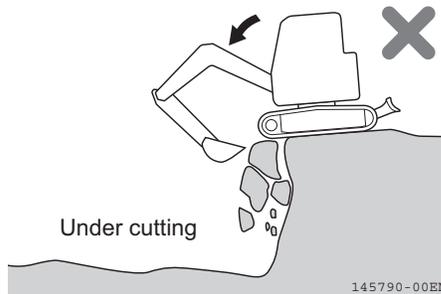
■ Level the ground of the work site and the area within which the machine travels

Rough ground can cause machine instability, resulting in increased vibration leading to accidents due to operational errors or damage to the machine caused by exposure to shock. Level the ground of the work site and the area within which the machine travels before working with the machine. Alternatively, avoid obstacles when operating the machine in the work area.

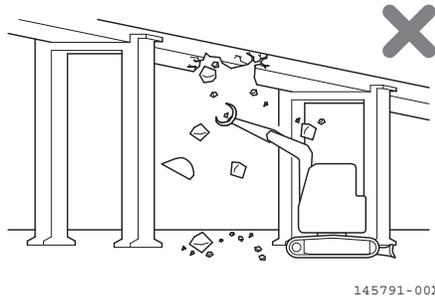
■ Avoid hazardous work



- Undermining a cliff is dangerous as it may cause a rockslide or landslide.

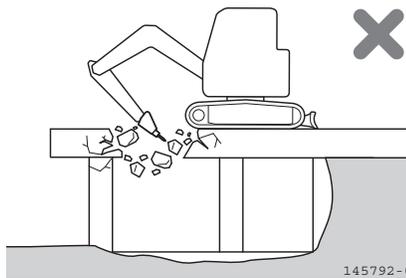


- Undercutting the machine is dangerous as it may cause a cave-in, resulting in the machine overturning and falling into the excavation.



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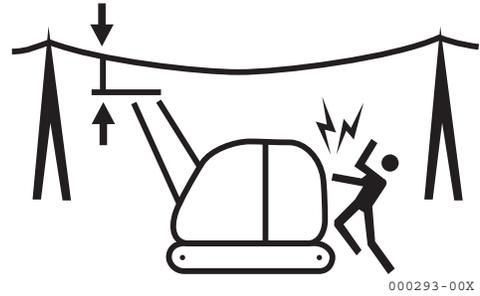
Overhead demolishing may cause personal injury due to falling of crushed objects or collapsing of building.



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Demolishing around feet may cause the machine to fall because of unstable ground.

■ Keep away from electric power lines



000293-00X

- Working in the vicinity of overhead electric power lines presents a very serious hazard and special precautions must be taken. For purposes of this manual you are considered to be working in the vicinity of overhead power lines when the attachment or load of your excavator, in any position, can reach to within the minimum safe distances shown below.

	Transmission voltage (V)	Minimum safe distance [ft. (m)]
Power distribution	100/200 or less	7 (2) or more
	6600 or less	7 (2) or more
Transmission line	22000 or less	10 (3) or more
	66000 or less	13.5 (4) or more
	154000 or less	16.5 (5) or more
	275000 or less	23 (7) or more

- The following procedures are effective in preventing accidents or injuries.
 - 1) Wear shoes with rubber or leather soles.
 - 2) Use a signal person to warn the operator when the machine is getting too close to a power line.
- If the machine should contact a wire, the operator must not leave the operator's seat.
- When working near power lines, caution all ground personnel to stand clear of the machine.
- To determine the transmission voltage at the working site, contact the electric utility concerned.

■ Prevent bumping the implements

When traveling through tunnels or under bridges, or working at a site near other overhead obstacles, operate the machine carefully so as not to bump the boom, arm, or the implement against those overhead obstacles.

■ Do not move the bucket over workers or the dump truck cabin

Do not move the bucket over workers or the dump truck cabin. Doing so may expose workers to risks such as falling loads including soil in the bucket or impact with the bucket, resulting in personal injury or damage to the machine.

■ Do not put feet or hands under the bucket

Do not put feet or hands under working devices such as the bucket and attachments. Doing so may result in limbs or appendages becoming trapped.

■ Work only where visibility is good

- When working in a dark place, light up the area with the work lights and head lights, and prepare extra lighting equipment as necessary.
 - Stop working when fog, snow or rain impedes your view.
-

■ Work carefully in snow-covered areas

- Snow-covered ground and icy roads are dangerous as they may cause the machine to skid even on a slight slope. Run the machine at low speed, and never start, stop or turn abruptly on such ground or under such road conditions.
- Be careful removing snow as road shoulders or other hazards may be buried under snow.

■ Traveling on narrow roads

Traveling on narrow roads may cause the machine to collide with other objects or topple. Check the external dimensions of the machine and the road width before driving the machine on narrow roads. When traveling on roads that present the risk of the machine hitting other objects or the shoulders collapsing, reinforcing or other appropriate measures should be taken and guides should be deployed to ensure safe travel of the machine.

■ Unstable ground creates a high possibility of overturn

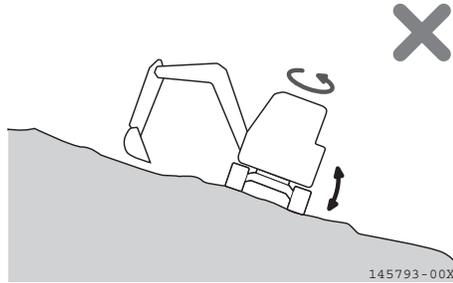
- Keep away from cliffs, road shoulders or trenches if possible as the ground near them is unstable. The ground may crumble due to the weight or vibrations of the machine, resulting in an overturn or fall of the machine. Be particularly careful when working immediately after a rainstorm or after blasting as the ground may be unstable.
 - Ground-fills or ground near a ditch may be unstable and may crumble due to the weight or vibrations of the machine, causing the machine to tilt. Much caution must be taken in working in these areas.
 - When working in an area where there is a high possibility of falling rocks, wear a hard-hat and stay under the canopy.
-

■ Using the quick coupler

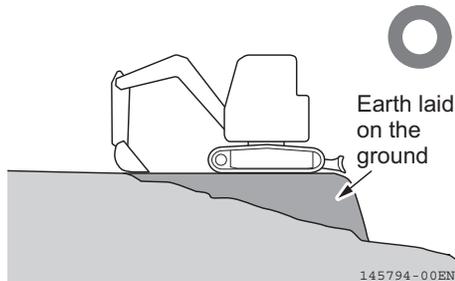
- Observe the procedures of mounting and dismounting the bucket.
- Check that the safety lock is correctly operating when the bucket is mounted on the quick coupler.

For information of handling the quick coupler, refer to Section "Handling quick coupler" on page 141.

■ Working on a slope

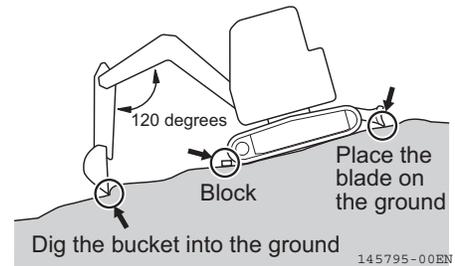


- Be aware that the machine may tip over when swinging the upperstructure or swinging the implement on a slope.
- Never swing the upperstructure toward the downward side of the slope with earth loaded in the bucket.
(See the illustration above.)



- If swinging is unavoidable, level off a work area to maintain the machine as horizontal as possible, then swing.
(See the illustration above.)
- For levelling off a work area, refer to Section "Precautions for going up and down a slope" on page 128.**

■ Parking the machine



- Park on level ground. If parking on a slope is unavoidable, block the tracks with solid pieces of wood and dig the bucket into the ground. (See the illustration above.)
- If necessary to park the machine on the side of a road, set up a warning flag, fence, or lamp that can be easily recognized by passing cars and pedestrians but does not impede them.

For parking procedures, refer to Section "Parking the machine" on page 132.

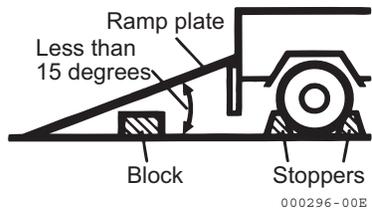
- When leaving the operator's seat, do the following:
 - (1) Be sure to place the bucket on the ground.
 - (2) Set the lock lever to the lock position.
 - (3) Stop the engine.
 - (4) Set all the locks to the lock position.
 - (5) Be sure to take the starter switch key out of the starter switch.

For information about parking procedures, refer to Section "Parking the machine" on page 132.

For information about the parts to be locked, refer to Section "Locking" on page 133.

Precautions for transportation

■ Precautions for loading and unloading the machine



- Be careful in loading and unloading the machine, because it is a job of high hazard potential.
- Load or unload the machine at a low engine speed, and low travel speed.
- Load or unload the machine on level, solid ground away from the shoulder of the road.
- Use ramp plates of adequate strength with hooks on their ends.

Check to see that the ramp plates are wide, long, and thick enough to sustain the load so that you can load or unload the machine safely. Support the ramp plates with blocks, to provide additional strength.

- Securely hook the ramp plates to the deck of the truck so that they will not come off.
- Remove grease, oil, and other slippery deposits from the ramp plates, and remove mud from the tracks to prevent the machine from skidding on the ramp plates.
- Do not load or unload the machine if the ramp plates are slippery because of rain, snow or ice.
- Never change travel direction while on the ramp plates. If you need to change travel direction, go down the ramp plates, and change direction on the ground.

- After loading the machine, block it with lumber and secure the machine with a chain or a wire rope so that the machine will not move during transit.

For instructions on loading and unloading the machine, refer to Section "4. Transportation" on page 164.

For instructions on securing the machine, refer to Section "4. Transportation" on page 164.

For instructions on securing the machine, refer to Section "4. Transportation" on page 164.

■ Precautions for transporting

- Transport the machine safely in accordance with local regulations and applicable law.
- Select a travel route consistent with the width, height and weight of the machine loaded on the truck.

Precautions for the battery

■ Be careful in handling the battery



154321-00X

- The battery electrolyte contains dilute sulfuric acid, which can severely burn the eyes or skin. Always wear safety goggles and protective clothing when servicing the battery. If contact with the eyes or skin should occur, flush with a large amount of water and obtain prompt medical treatment.
- Because flammable hydrogen gas is produced by the battery, ignition and explosion may occur. Keep flames and sparks away from the battery.
- Do not use or charge the battery if the battery electrolyte level is below the lower limit. Doing so may cause the battery to explode. Always check the battery electrolyte level before starting the engine. If the electrolyte level is low, add distilled water to the upper limit.
- If you swallow battery electrolyte by mistake, drink a large amount of water, milk, or fresh eggs, and obtain medical treatment immediately.
- Before checking or handling the battery, be sure to stop the engine and turn the key to the "OFF" position. Never disconnect the battery cable during engine operation.
- Be careful not to cause a short circuit by placing a tool across the terminals of the battery.
- If a terminal connection is loose, sparks may be generated due to contact failure, causing possible ignition and explosion. Be sure to connect the terminals securely.

- Do not use the machine with the battery which is short of battery electrolyte. The shortage of battery electrolyte not only will reduce the life of the battery but also could cause an explosion.
- If the battery electrolyte is frozen, do not charge the battery or start the engine from a different power source. Wait for the battery electrolyte to liquefy completely naturally in a room at normal temperature before charging and starting the engine.

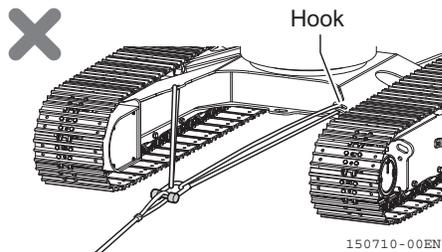
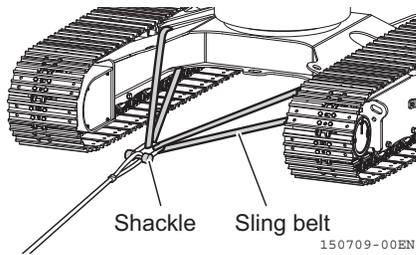
■ Observe the procedures for starting the engine using booster cables

- When you start the engine using booster cables, wear safety goggles.
- If you start the engine by taking electric power from another machine, do not allow your machine to contact the other machine.
- To connect the booster cables, begin with the positive terminal, and to disconnect them, begin with the negative terminal (ground side).
- If a tool simultaneously touches the positive terminal and the machine, potentially hazardous sparks may be generated.
- Do not connect the booster cables to the terminals in reverse polarity. In other words, never connect the negative terminal on one machine to the positive terminal on the other machine.
- As the last step, connect the negative booster cable terminal to the upper structure frame. At that time, sparks will be generated. Consequently, connect the terminal to a point as far away from the battery as possible.

For information about starting the engine using booster cables, refer to Section "If the battery is overdischarged" on page 174.

Precautions for towing

■ Hook the wire rope on the frame when towing



- Improper towing procedures can cause death or serious injury.
- When towing a machine with another machine, use a wire rope strong enough to sustain the machine weight.
- Never tow a machine on a slope.
- Do not use a towing rope that is kinked, distorted or damaged.
- Do not ride on the towing cable or on the wire rope.
- When connecting an object to be towed, make sure that no person enters the space between the machine and the object.
- To connect an object to be towed, hook the sling belt as illustrated above.
- The hook provided on the machine is intended for stabilizing the machine during transporting. Never use it for towing.

For information about towing the machine, refer to Section "Towing" on page 174.

3. Precautions for Servicing

Precautions before servicing

- **Attach the "SERVICING IN PROGRESS" tag to an implement control lever**



If another person should start the engine or operate the control levers while service is in progress, the service personnel can sustain serious bodily injury.

Attach the "SERVICING IN PROGRESS" tag indicating "Servicing in Progress" to one of the implement control levers.

The "SERVICING IN PROGRESS" tag is enclosed with the Operation Manual.

Article number: 172437-03252

- **When carrying out work involving multiple workers, follow the instructions given by the leader**

Misunderstandings in communication between workers during work carried out by multiple personnel may lead to unforeseen accidents. To avoid such risks, a leader should be designated when carrying out repairs to the machine or installing or removing working devices and other workers in the team should follow instructions given by the leader.

- **Provide adequate ventilation**

- Maintenance work performed indoors or in places with poor ventilation presents the risk of gas poisoning. Ensure adequate ventilation especially when running the engine or handling fuel, washing oil and paint.
- Ensure adequate ventilation when carrying out maintenance work or operating the machine indoors. Extend the exhaust pipe to the outside of the building and open doors and windows to let in adequate amounts of outdoor air. Install ventilation fans as required.

- **Perform inspections and servicing on a level surface**

- The performance of inspections and servicing with the machine parked on a slope may make it difficult to properly determine the condition of the machine. In addition, the machine may shift under its own weight on a slope, presenting the risk of personnel becoming trapped in the machine or other accidents.
- Perform machine inspections and servicing on a safe, hard, level surface. Rest implements including the bucket on the ground. Stop the engine and remove the starter switch key. Put wooden blocks under the tracks.

■ Use appropriate tools



Using damaged or worn tools or using tools inappropriate for the required application is very dangerous, and may also cause damage to the machine. Make sure to use the tools that are appropriate for the specific job.

■ Keep the work area well-organized

- Performing inspections and servicing in a cluttered work area can cause workers to stumble, fall or sustain injuries caused by detritus or other obstacles.
- Remove all obstacles in the work area and clear the area of all grease, oil, paint and detritus to ensure safety.

■ Periodically replace the parts essential to safety

- Aging or damage to the parts listed below can cause a fire.
Make sure that they are replaced periodically.
 - Fuel system: Fuel hose and fuel tube cap
 - Hydraulic system: Outlet hose of main pump
- The parts listed above must be replaced periodically even if no abnormality is found in them.
(They age with time.)
- If any abnormality is found in them, replace or repair the parts even though the suggested replacement time has not been reached.

For information about replacing essential safety parts, refer to Section "6. Replacing Essential Parts Periodically" on page 196.

■ Stop the engine before beginning the inspection and servicing

- Be sure to stop the engine before performing inspection and servicing.
- If necessary to perform service while running the engine, as when cleaning the inside of the radiator, be sure to set the lock lever to the lock position and do the job together with a partner.
(One should take the operator's seat so that he or she can stop the engine at any time.)
That person must be careful not to touch any levers in the cabin.
- Be extremely careful not to contact the moving fan or fan or fan belt, or any hot surfaces.

Precautions during servicing

■ Keep unauthorized persons away

Never admit any persons into the work area who are not taking part in the work. Be conscious of the safety of other persons.

Be especially careful when grinding, welding, or using a large hammer.

■ Removed attachments



When an attachment is placed on the ground or against a wall after removing it or prior to reinstalling it, be sure that it is stable to prevent it from falling down.

■ Working under the machine

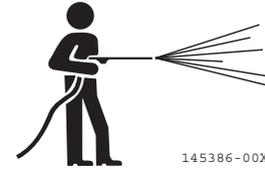


- Before performing service or repairs underneath the machine, place the implement on the ground in its lowest position.
- Be sure to apply blocks to the tracks to lock the tracks securely.
- Never perform service underneath the machine if it is not completely stable.

■ Support the implement

Replacement or repair of joints or hoses with the implement raised above the ground presents the risk of the implement descending. Always lower the implement to the ground or support it with safety props or wooden blocks. Never work under the implement unless it is securely supported.

■ Keep the machine clean



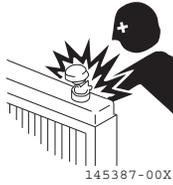
- Spilled oil or grease, or scattered parts are dangerous and can cause falls. Keep the machine clean.
- Getting water into the electrical system may cause it to malfunction, resulting in faulty operation of the machine. Also it may permit electrical leaks that could cause a fire or electric shocks.
- Never clean the sensors, connectors or the operator's seat with water or steam.

■ Precautions for fueling and oiling



- Spilled fuel and oil could cause a fire and they are dangerously slippery. Wipe up spills immediately.
- Close the fuel cap and oil cap securely.
- Never use fuel for cleaning.
- Provide good ventilation when replenishing fuel or oil.
- Extinguish fires that may cause fuel or oil to ignite.
- Do not smoke during refilling, inspection or servicing.
- Use non-flammable oil to clean components.

■ Radiator coolant level



- Before checking the radiator coolant level, stop the engine and wait until the engine and the radiator have cooled down.
- Slowly loosen the cap to release the inner pressure before removing the cap.

■ Use an explosion-proof lighting source



Use an explosion-proof lighting source when checking the fuel, the oil, the coolant, or the battery.

Failure to use an explosion-proof lighting source may cause ignition to occur, inducing an explosion.

■ Precautions for handling battery



When welding or repairing the electrical system, disconnect the negative terminal of the battery to interrupt the electric circuit.

■ Handling high-pressure hoses

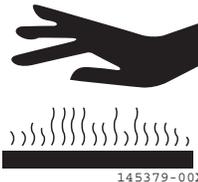
- Leaks of fuel and oil could cause a fire.
- Do not bend a high-pressure hose forcibly, or strike it with a hard object. Because abnormally bent or damaged piping, tubes, and hoses easily burst under high pressure, never use them.

■ Be careful of hot oil under high-pressure



- The hydraulic system for the implement operates under high pressure. When replenishing or draining hydraulic oil, be sure to first relieve the high pressure.
- The emission of hot oil under high-pressure from a small leak could result in serious bodily injury. Wear safety goggles and thick gloves when checking for leaks. Use a piece of cardboard or a plywood block to detect emissions of hot oil. If the hot oil should contact your body, obtain prompt medical treatment.

■ Be careful when servicing systems under high temperature and high pressure



The engine coolant and each lube oil system are still under high temperature and pressure immediately after the engine has stopped. Removing caps, draining oil and water, or replacing filter elements at that time may cause a burn. Wait until the temperature drops, then begin servicing in accordance with the procedures described in this manual.

For cleaning the inside of the cooling system, refer to Section "Replacing the engine cooling water" on page 230.

For checking the level of the coolant and the hydraulic oil, refer to Section "Checking before start-up" on page 109.

For checking the oil levels in various sys-

tems and replenishing the oil, refer to Section "8.3 to 8.6 Periodic services".

For replacing the oils in various systems and replacing the filter elements, refer to Section "8.6 to 8.8 Periodic services".

■ Lock the inspection cover

Carrying out servicing with the inspection cover open presents the risk of personnel sustaining injuries caused by sudden closure of the cover due, for example, to strong gusts of wind.

Be sure to lock the inspection cover securely with the cover lock.

After completion of inspection or servicing, always put the inspection cover back in place.

■ Hazards from the high-pressure grease when adjusting the track tension



High-pressure grease is enclosed in the track adjuster.

Failure to use the specified procedures for adjusting the track tension, could cause grease plugs or nipples to eject, which could result in bodily injury.

- Do not loosen the grease draining plug more than one turn.
- Never position your face, hands, legs, or body in line with the grease draining plug and valve.

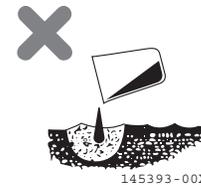
For information about adjusting track tension, refer to Section "Nonperiodic services" on page 201.

■ Rotating radiator fan and fan belt



- Never contact the rotating radiator fan or fan belt with any object.
- Contacting the rotating radiator fan or fan belt with any object can result in serious bodily injury.

■ Processing wastes



- Do not dispose of waste oil in the sanitary sewer system.
- Always drain the oil from the machine into a secure container, and never directly to the ground.
- When disposing of toxic wastes such as fuel, oil, coolant, solvent, filters, and spent batteries, comply with all applicable disposal regulation.

■ Servicing of air conditioner

- Never touch the air conditioning refrigerant as it may cause frostbite if it comes in contact with the skin or blindness if it gets into the eyes.
- Since it is a global warming substance, care must be taken to avoid the release of the refrigerant (HFC R134a) into the atmosphere when handling.

■ **Handling the accumulator and gas spring**

High-pressure nitrogen gas is contained in the accumulator and gas spring. Mistakes in handling these parts present the risk of rupturing, resulting in serious bodily injury. The instructions below must be followed:

- Do not disassemble these parts.
- Keep these parts away from fire. Do not throw them into the fire.
- Do not drill a hole in these parts or weld or cut them.
- Contact the nearest dealer when it becomes necessary to dispose of these parts since any remaining gas must be removed before disposal.

■ **When an abnormality is found during inspection**

Continued operation without eliminating any abnormalities discovered may exacerbate said abnormalities or result in accidents.

Immediately investigate causes and make necessary adjustments and repairs to prevent failures.

■ **Contact the nearest dealer in the event of machine failure**

Attempts by users to make difficult repairs to the machine may lead to unforeseen failures or accidents. In the event that such repairs become necessary, contact the nearest dealer for service in accordance with the instructions set forth in the operation manual.

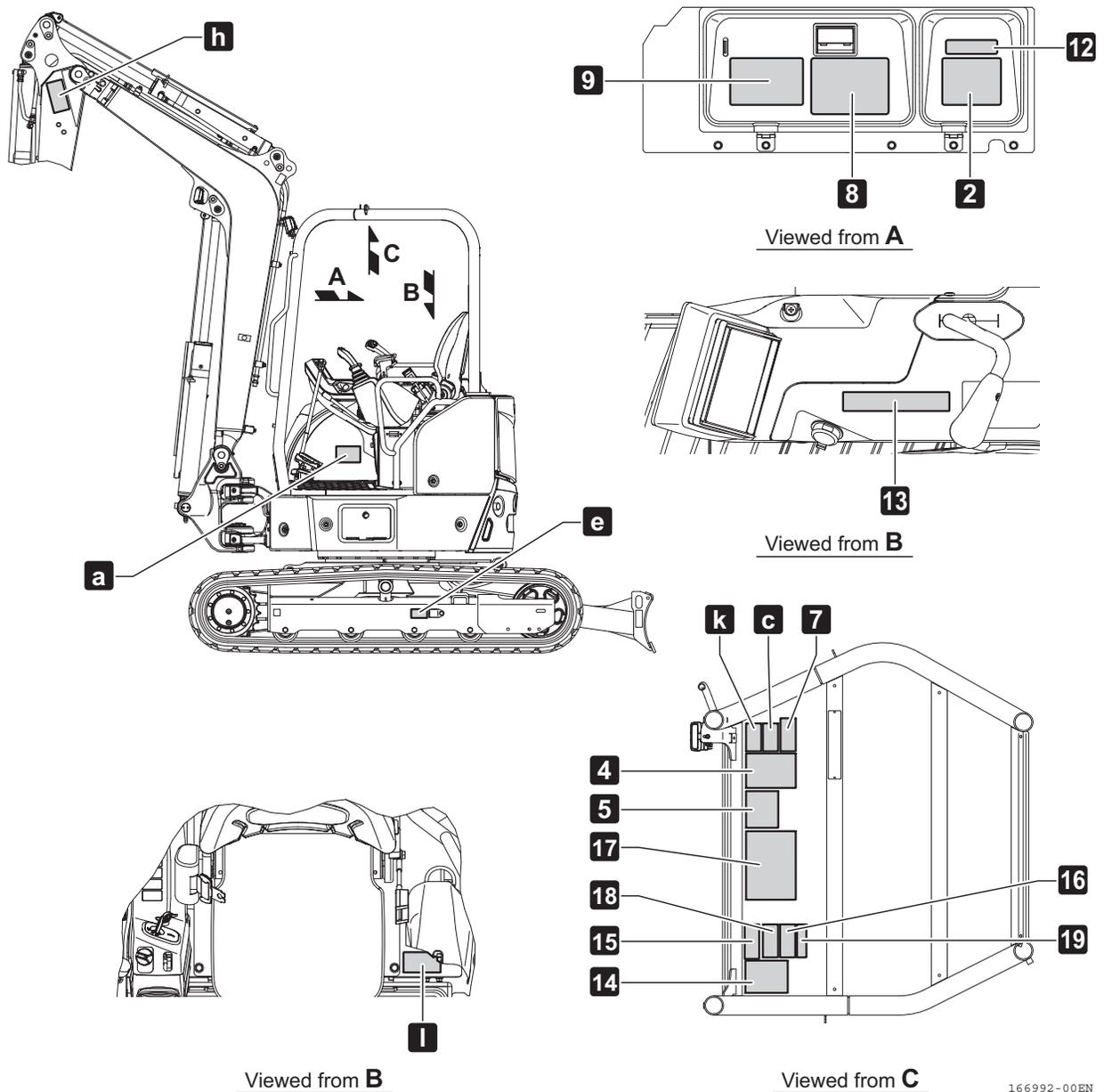
4. Safety Messages (Warning Labels)

There are a number of Warning Labels on the machine. Full descriptions of all Warning Labels and their locations are reviewed in this section. Periodically confirm whether all Warning Labels are still mounted in their correct locations and can be easily read.

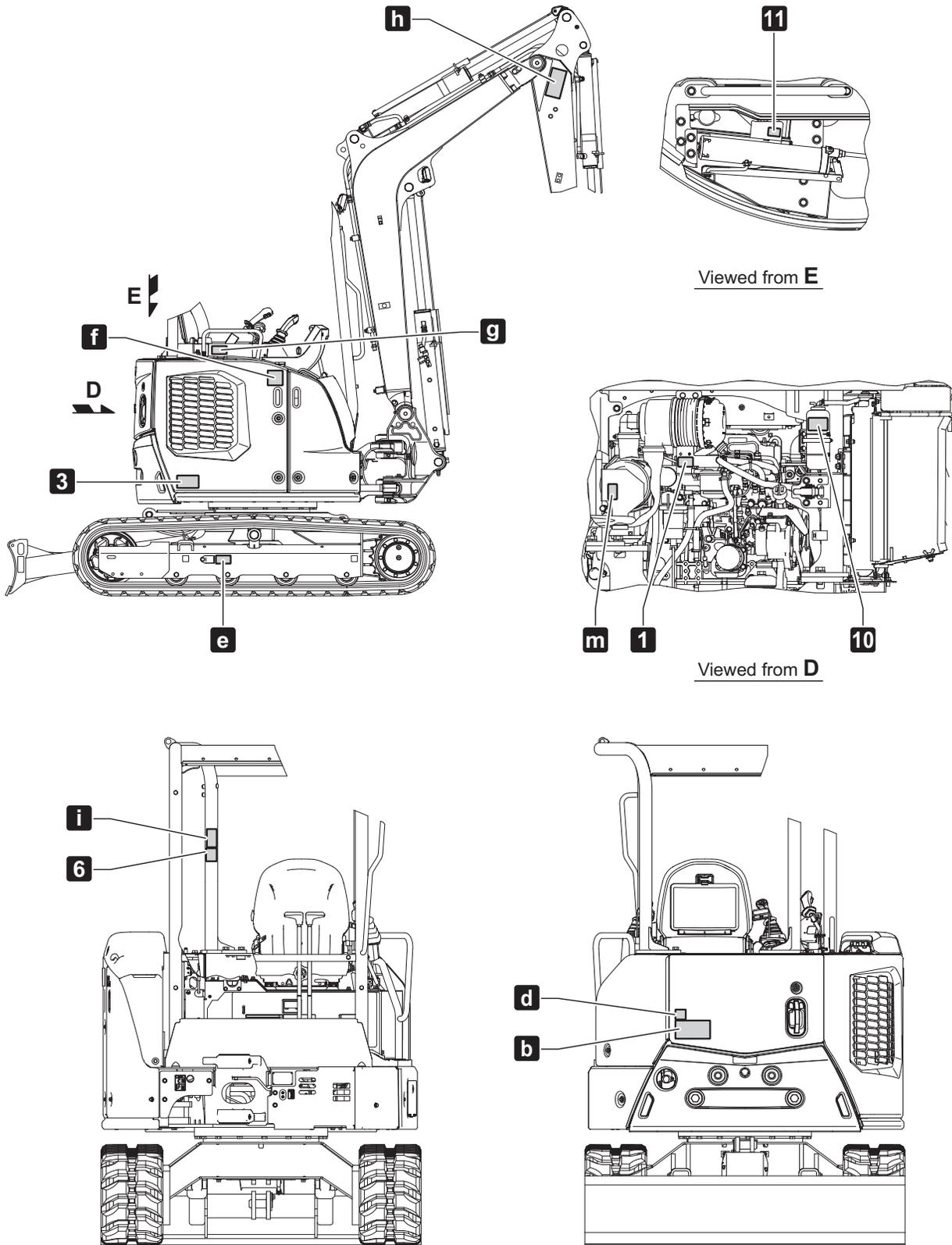
If a warning label is missing, damaged or cannot be read, it must be promptly replaced. Also, if a warning label was mounted on a part which is replaced, a new warning label must be installed on the replaced part.

Contact your dealer to obtain new labels. The part code number is shown on each warning label as well as on the reproductions in this manual.

Location of warning labels

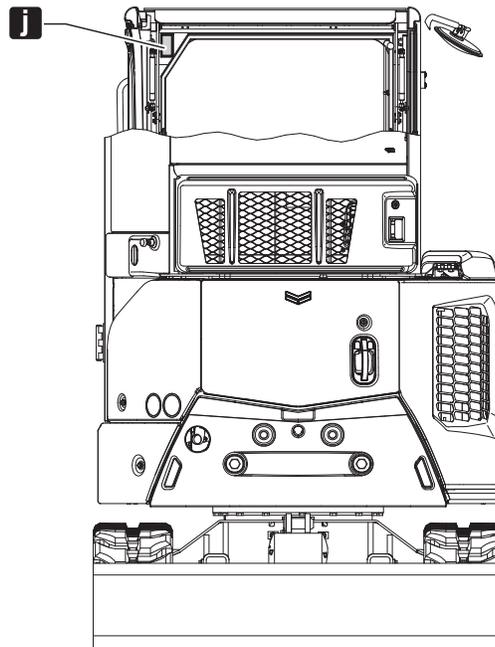
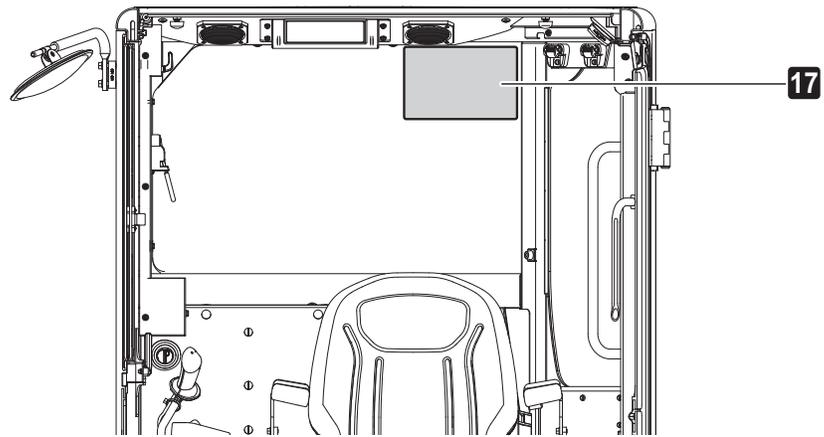
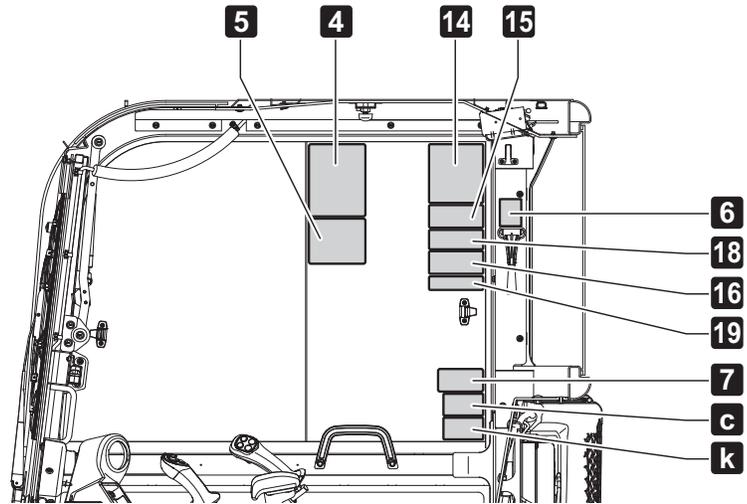


44 4.Safety Messages (Warning Labels) **⚠** WARNING These instructions should be strictly followed for the safety of you, others and your machine.

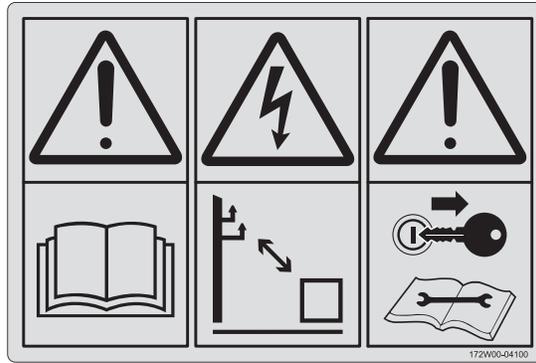


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Cabin spec.



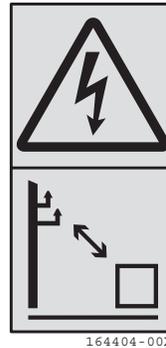
a 172W00-04100



General safety alert

Read operator's manual

Be sure to read the operation manual before operating, maintaining, servicing, disassembling, assembling, or transporting the machine.



Electrical shock or electrocution

Stay safe distance from electrical power lines

If the machine gets too close to the current, there is a risk of electric shock. Keep a safe distance from the electrical power lines.



General safety alert

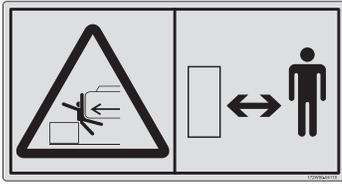
Shut off engine and remove key before performing maintenance or repair work

Before inspection or servicing, stop the engine and take the key out of the starter switch.

* Approximate distances are as follows:

	Transmission voltage (V)	Minimum safe distance (m)
Power distribution	100/200 or less	2 or more
	6600 or less	2 or more
Transmission line	22000 or less	3 or more
	66000 or less	4 or more
	154000 or less	5 or more
	275000 or less	7 or more

b 172W00-04110

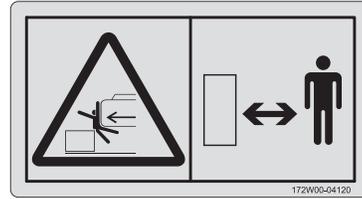


Crushing of whole body — Single directional pinned
Stay safe distance from hazard — General

When the machine is swinging or traveling, there is a risk of yourself being caught in the machine.

Clear all people from the working area.
Failure to comply will result in death or serious injury.

c 172W00-04120



Crushing of whole body — Single directional pinned
Stay safe distance from hazard — General

To prevent serious injury or death, observe the following before operating the machine or the implement.

- Make sure there are no people on or around the machine or within the working area.
- Sound the horn to alert people nearby.
- Swing the upperstructure as necessary to ensure sufficient visibility in the direction of travel.
- Keep an observer in areas where visibility is poor.

The above items must be strictly observed even if the travel alarm, mirrors or monitors are installed.

d 172W00-04130



Severing of fingers or hand
— Engine fan



Wait until all machine components have completely stopped before touching them

There is a risk of injury from being caught in rotating parts such as fans.
Be sure to stop the rotation completely before inspection and servicing.



Hand and arm entanglement
— Belt drive



Wait until all machine components have completely stopped before touching them

There is a risk of injury from being caught in rotating parts such as belts.
Be sure to stop the rotation completely before inspection and servicing.

e 172W00-04140



Thrown or flying objects — Read operator's manual
Full body exposure

The plug may jump out of the crawler adjustment device and cause injury.

Read the operation manual to loosen the crawler correctly.

Failure to comply will result in death or serious injury.

f 172W00-04150



Hot surface — Burn to finger or hand

Keep hands safe distance from hazard

The hydraulic oil tank is hot during and immediately after operation.
Do not touch the hydraulic oil tank with your hands or body to prevent burns.
Failure to comply may result in death or serious injury.



Hot fluid under pressure

Do not loosen cap until cool

If the hydraulic oil tank cap is opened in a high temperature immediately after operation, the hot hydraulic oil may spurt out and cause burns.
Do not open the hydraulic oil tank cap when hot.
Failure to comply may result in death or serious injury.

g 172W00-04160



Hot fluid under pressure Do not loosen cap until cool

If the radiator cap is opened in a high temperature immediately after operation, the hot cooling water may spurt out and cause burns. Do not open the cap when hot. Failure to comply may result in death or serious injury.

h 172W00-04170



Crushing of whole body — Single directional pinned

Stay safe distance from hazard — General

Stay away from the machine while operating to prevent injury from being hit or pinched by the implement of the machine. Failure to comply may result in death or serious injury.

i 172W00-04180



Crushing hazard due to machine rollover

Wear seat belt

To prevent serious injury or accidents, strictly observe the following:

- Always fasten the seatbelt when operating to avoid being thrown out from the machine in the event of a rollover.

j 172W00-04190

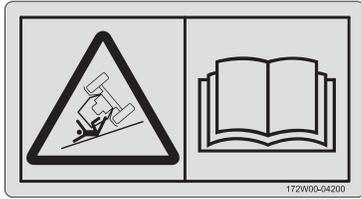


Crushing of whole body

Insert safety lock before entering hazardous area

Always lock the window securely to prevent the stored window from sliding out and causing injury. Failure to comply may result in death or serious injury.

k 172W00-04200

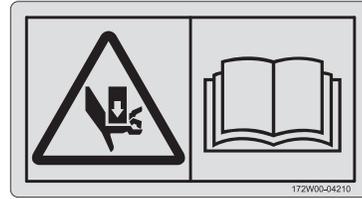


Machine roll-over — Crush
Read operator's manual

Traveling or working on a slope may cause the machine to fall over and result in death or injury. Observe the following.

- Slow down.
- When traveling, keep the implement facing forward with the bucket at a height of 20 to 30 cm above the ground.
- Do not turn on or drive across slopes. Failure to comply may result in death or serious injury.

l 172W00-04210



Crushing of fingers or hand — Force applied from above
Read operator's manual

To hold the lifted seat in a safe position, secure it with the stopper rod.

Read the operation manual to lift up the seat correctly.

Failure to comply will result in death or serious injury.

m 172W00-04220



Hot surface — Burn to finger or hand

Keep hands safe distance from hazard

Do not touch the muffler with your hands or body to prevent burns.

Failure to comply will result in death or serious injury.

52 4.Safety Messages (Warning Labels) ⚠️ **WARNING** These instructions should be strictly followed for the safety of you, others and your machine.

1 172B57-03520

CAUTION

Service, clean and replace air cleaner and filter element according to Operation and Maintenance Manual. Failure to comply may result in equipment damage.

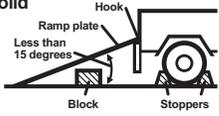
172B57-03520

2 172437-03343

⚠️ WARNING

TRANSPORTATION HAZARD!

- Set parking brake and block wheels of transporting vehicle.
- Use ramps of proper height, length, width and strength with non-skid surfaces.
- Ensure that ramps are secured to vehicle bed and properly aligned.
- Support ramps with blocks or struts for additional strength.
- NEVER exceed 15° ramp angle.
- ALWAYS load and unload on solid and level ground.
- ALWAYS securely fasten machine to transporting vehicle using chains and chain binders. See Operation Manual.
- Failure to comply could result in death or serious injury.



172437-03343

3 172437-03361

⚠️ DANGER



EXPLOSION HAZARD!
Improper connection or disconnection can cause an explosion.
ALWAYS follow Operation & Maintenance Manual when using booster cables.
Battery generates hydrogen gas which can explode if ignited.
NEVER smoke or introduce flames or sparks near battery.



BURN HAZARD!
Battery contains sulfuric acid which burns skin.
ALWAYS wear goggles and protective clothing when servicing battery.
Flush with water and get prompt medical treatment if contact should occur.



Failure to comply will result in death or serious injury.

172437-03361

4 172437-03372

⚠️ WARNING

PROPER OPERATING PROCEDURE:
ALWAYS wear seat belt.
NEVER start excavator unless all safety guards are in place and implement controls are in neutral.
NEVER operate with people on or near excavator.
Start from operator's seat only.
NEVER start engine standing on ground.
Inspect for overhead power lines, obstructions, holes and drop-offs and note location of underground utility lines before operation.
NEVER leave operator's seat until all implements are grounded, hydraulic pressure is relieved for all controls, lock levers are locked and ignition key has been removed.
NEVER attempt to raise chassis off ground with blade and attachment.

172437-03372

5 172437-03432

⚠️ WARNING

Travel levers

Blade

Travel levers

Blade

CRUSH HAZARD!
 Machine travels in direction of blade when travel levers are pushed away from operator.
NEVER move excavator before confirming location of blade and direction of travel.
 Failure to comply could result in death or serious injury.

172437-03432

6 172437-03441

⚠️ WARNING

NEVER repair or modify a ROPS.
ALWAYS replace ROPS if damaged.
 Failure to comply could result in death or serious injury.

172437-03441

7 172437-03471

⚠️ WARNING

LOCK LEVERS BEFORE LEAVING SEAT!
 Never leave operator's seat unless all lock levers are in locked position, and starter switch key has been removed.
 Failure to comply could result in death or serious injury.

172437-03471

8 172437-03601

⚠️ WARNING

OPERATING PATTERN

(A) STANDARD (ISO)

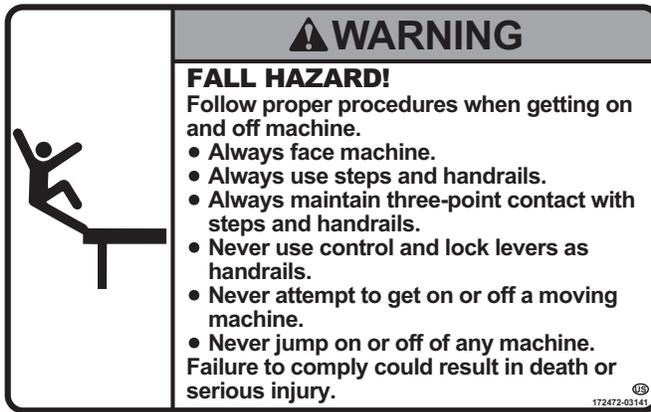
(B) OPTION

Confirm location of Pattern Change Lever before operating.
 Failure to comply could result in death or serious injury.

172437-03601

54 4.Safety Messages (Warning Labels) ⚠️ **WARNING** These instructions should be strictly followed for the safety of you, others and your machine.

9 172472-03141



10 172A38-03201



11 172A38-03211



12 172B03-03800



13 172B11-04850 (Rear view monitor spec.)

⚠ WARNING
<p>A rear-view monitor is a system for assisting the rear sight. To prevent serious injuries and accidents, please follow the item(s) below.</p> <ul style="list-style-type: none"> ● When operating the vehicle, pay close attention to the surrounding conditions and check directly with your eyes. <p style="text-align: right;"><small>US 172B11-04850</small></p>

14 172B69-03430

⚠ WARNING		
CRUSH HAZARD!		
<p>Failure to comply with following items could result in death, serious injury or accident. Comply with following items.</p> <ul style="list-style-type: none"> ● Before working, make sure the quick coupler is not deformed or broken, and can be operated normally. Repair if there is any problem. ● When using quick coupler, sufficiently confirm no obstacles or people within work area. Don't let other people enter the work area. ● When mounting attachment, curl attachment to level and mount attachment. It must be attached in position close to ground level. ● Always park on solid, level ground and place attachment on ground before dismounting attachment. 		
MOUNT	DISMOUNT	PROHIBITED
<ul style="list-style-type: none"> ● To prevent breakdown or sudden operation of attachment, never turn on the power switch except when dismounting and mounting attachment. <p style="text-align: right;"><small>172B69-03430</small></p>		

15 172B69-03440

⚠ WARNING
<p>CRUSH HAZARD! Remove soil and sand piled in quick coupler. Locks may not work properly and hoses may be damaged if soil and sand are not removed. Failure to comply could result in death or serious injury.</p> <p style="text-align: right;"><small>172B69-03440</small></p>

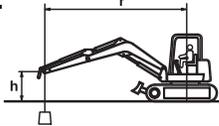
16 172B69-03450

⚠ WARNING
<p>LOAD COULD FALL! Never suspend load with quick coupler hook. Load could fall. Failure to comply could result in death or serious injury.</p> <p style="text-align: right;"><small>172B69-03450</small></p>

17 172B83-03140 (ViO35-7B) (Without Angle blade spec.)

⚠ WARNING

TIP-OVER HAZARD!
Never allow total lifting weight to exceed excavator lift capacity.



MODEL
ViO35-7 EXCAVATOR

Note where application specification conform to ISO standards. The weight of all lifting devices, including quick coupler, must be deducted from the value shown in the table to determine the net load that can be lifted.

- Genuine quick coupler (110lb [50 kg])
- Genuine utility hook (24lb [11 kg])
- Standard bucket (187lb [85 kg])
- Lift point is at the bucket hinge point.

Specifications subject to change without notice.
* Rated hydraulic lift capacity

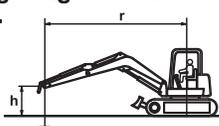
LIFT POINT HEIGHT h in. (mm)	(r) LIFT RADIUS · in. (mm)				(r) LIFT RADIUS · in. (mm)				(r) LIFT RADIUS · in. (mm)			
	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)
118.1 (3000)	*1675 (760)	*1609 (730)	*1653 (750)		1212 (550)	*1609 (730)	*1653 (750)		1058 (480)	1344 (610)	*1653 (750)	
78.7 (2000)	*1719 (780)	*1896 (860)	*2072 (940)	*2447 (1110)	1014 (460)	1477 (670)	*2072 (940)	*2447 (1110)	881 (400)	1278 (580)	1697 (770)	2226 (1010)
39.4 (1000)	*1829 (830)	*2336 (1060)	*2844 (1290)	*3725 (1690)	948 (430)	1388 (630)	1741 (790)	2270 (1030)	837 (380)	1234 (560)	1543 (700)	1962 (890)
Ground (0)	*1918 (870)	*2535 (1150)	*3152 (1430)	*3968 (1800)	970 (440)	1322 (600)	1653 (750)	2116 (960)	859 (390)	1168 (530)	1433 (650)	1785 (810)
-39.4 (-1000)	*2006 (910)	*2381 (1080)	*2932 (1330)	*3615 (1640)	1124 (510)	1300 (590)	1609 (730)	2072 (940)	992 (450)	1124 (510)	1388 (630)	1763 (800)
-59.1 (-1500)	*2006 (910)		*2579 (1170)	*3152 (1430)	1344 (610)		1609 (730)	2072 (940)	1168 (530)		1411 (640)	1807 (820)
-78.7 (-2000)	*1940 (880)			*2403 (1090)	1675 (760)			*2403 (1090)	1543 (700)			1851 (840)

172B83-03140

172B83-03150 (ViO35-7B) (Angle blade spec.)

⚠ WARNING

TIP-OVER HAZARD!
Never allow total lifting weight to exceed excavator lift capacity.



MODEL
ViO35-7 EXCAVATOR
Angle Blade Spec.

Note where application specification conform to ISO standards. The weight of all lifting devices, including quick coupler, must be deducted from the value shown in the table to determine the net load that can be lifted.

- Genuine quick coupler (110lb [50 kg])
- Genuine utility hook (24lb [11 kg])
- Standard bucket (187lb [85 kg])
- Lift point is at the bucket hinge point.

Specifications subject to change without notice.
* Rated hydraulic lift capacity

LIFT POINT HEIGHT h in. (mm)	(r) LIFT RADIUS · in. (mm)				(r) LIFT RADIUS · in. (mm)				(r) LIFT RADIUS · in. (mm)			
	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)	MAX	137.8 (3500)	118.1 (3000)	98.5 (2500)
118.1 (3000)	*1675 (760)	*1609 (730)	*1653 (750)		1190 (540)	*1609 (730)	*1653 (750)		1124 (510)	1411 (640)	*1653 (750)	
78.7 (2000)	*1719 (780)	*1896 (860)	*2072 (940)	*2447 (1110)	992 (450)	1455 (660)	*2072 (940)	*2447 (1110)	925 (420)	1344 (610)	1785 (810)	*2447 (1110)
39.4 (1000)	*1829 (830)	*2336 (1060)	*2844 (1290)	*3725 (1690)	925 (420)	1366 (620)	1719 (780)	2248 (1020)	881 (400)	1300 (590)	1631 (740)	2072 (940)
Ground (0)	*1918 (870)	*2535 (1150)	*3152 (1430)	*3968 (1800)	970 (440)	1322 (600)	1631 (740)	2072 (940)	925 (420)	1234 (560)	1499 (680)	1896 (860)
-39.4 (-1000)	*2006 (910)	*2381 (1080)	*2932 (1330)	*3615 (1640)	1102 (500)	1278 (580)	1587 (720)	2050 (930)	1058 (480)	1190 (540)	1477 (670)	1873 (850)
-59.1 (-1500)	*2006 (910)		*2579 (1170)	*3152 (1430)	1322 (600)		1587 (720)	2050 (930)	1234 (560)		1499 (680)	1918 (870)
-78.7 (-2000)	*1940 (880)			*2403 (1090)	1653 (750)			*2403 (1090)	1631 (740)			1940 (880)

172B83-03150

18 172Q04-03210

 **WARNING**

CHECK BOTH LOCKS!

Confirm front and rear locks are touched stopper properly when mounting attachment with quick coupler.
Failure to comply could result in death or serious injury.

172Q04-03210

19 172Q04-03240

CAUTION

Movement of quick coupler becomes slow under low temperature. Confirm locks are working properly.

172Q04-03240

MEMO

OPERATION

1. Identification of	
Important Parts	61
Overview of the machine	61
Controls and switches	63
2. Description of Control	
Devices	64
LCD Monitor	64
Location and Function of	
Electrical Parts	84
Control levers and pedals	90
Rear hood	93
Front cover (right)	94
Right hood.....	94
Operator's seat bottom cover.....	95
Storage compartment for the operation & maintenance manual	95
Storage space for tools and grease gun	95
Windshield (Cabin spec.)	96
Hammer for emergency escape from operator's cab (Cabin spec.)	98
Operator's seat.....	98
Headlight	99
Right window glass (Cabin spec.).....	99
Cabin side door (Cabin spec.)	100
Replenishment of windshield washer fluid (Cabin spec.)	100
Handling Air Conditioner (Cabin spec.)	101
Fuse	104
Handling of Rear View Monitor (Rear View Monitor spec.).....	106
3. Operating Instructions	108
Checking before starting the engine ...	108
Starting up the engine	118
Operating and checking instructions after starting the engine	120
Starting and stopping the machine	121
Steering	122
Swinging the upperstructure	123
Operating the implement	123
Precautions for operating the implement	125
Precautions for working	127
Precautions for going up and down a slope	128
Escaping from the mud	130
Operations using the bucket	131
Parking the machine	132
Inspection requirements after completing operation	133
Stopping the engine	133
Inspection requirements after stopping the engine	133
Locking	133

Handling the rubber crawlers	134		
Replacing the bucket without the quick coupler	138		
Reversing the bucket without the quick coupler	139		
Handling quick coupler	141		
How to handle AUX1	148		
How to handle AUX2 (AUX2 spec.)	153		
Handling the thumb bracket	160		
Handling accumulator	160		
Handling SMARTASSIST-Remote	162		
4. Transportation	164		
Loading and unloading the machine.....	164		
Precautions for loading the machine ...	165		
Precautions for transporting the machine	166		
Suspending the machine	166		
5. Care and Service in Cold Weather	169		
Preparing for cold weather	169		
Precautions after a day's work	170		
After cold weather ends	170		
6. Long-term Storage	171		
Before storing	171		
Storing	172		
Using the machine again	172		
7. Troubleshooting	173		
Phenomena that do not constitute faults	173		
Towing	174		
If the battery is overdischarged	174		
Troubleshooting	178		

1. Identification of Important Parts

Overview of the machine

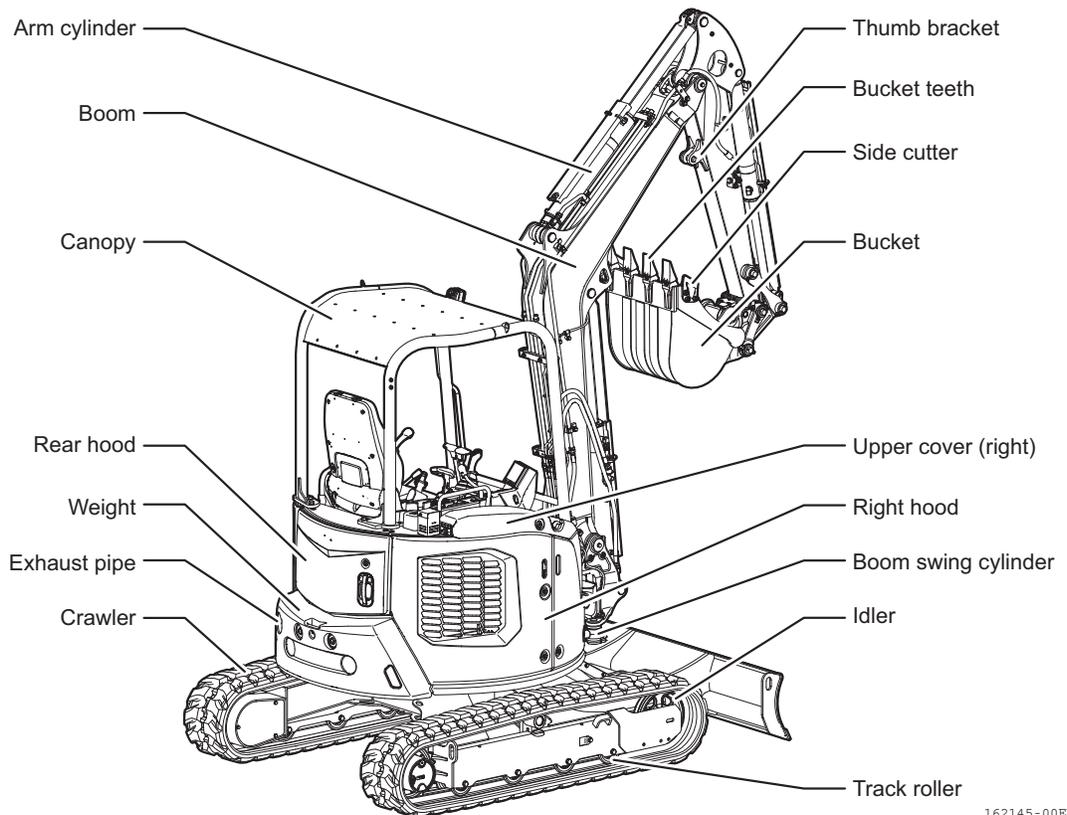
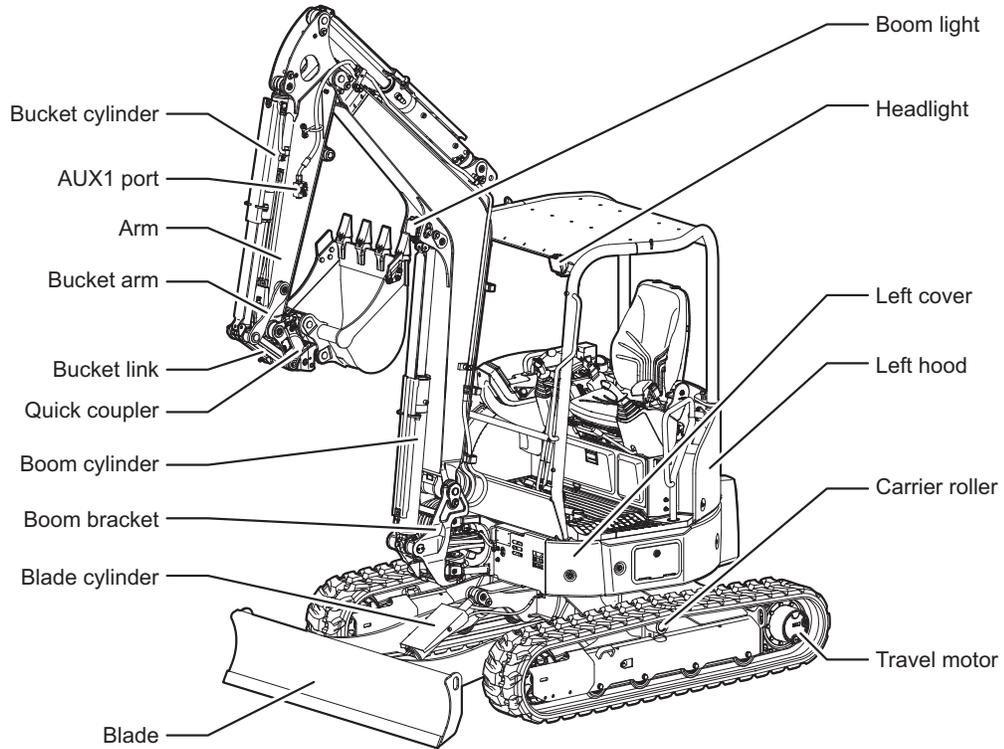
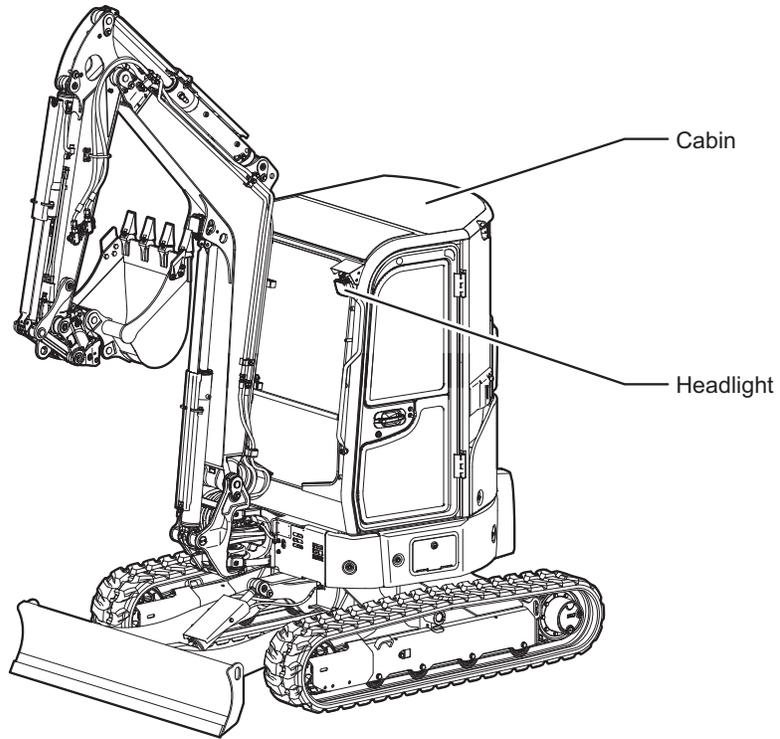


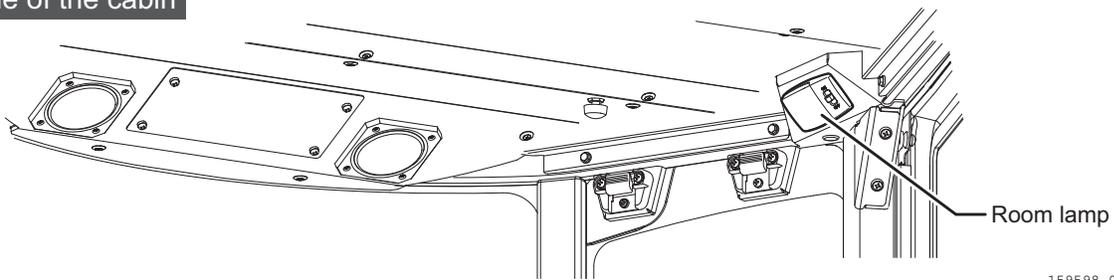
Fig. 1-1

Cabin type



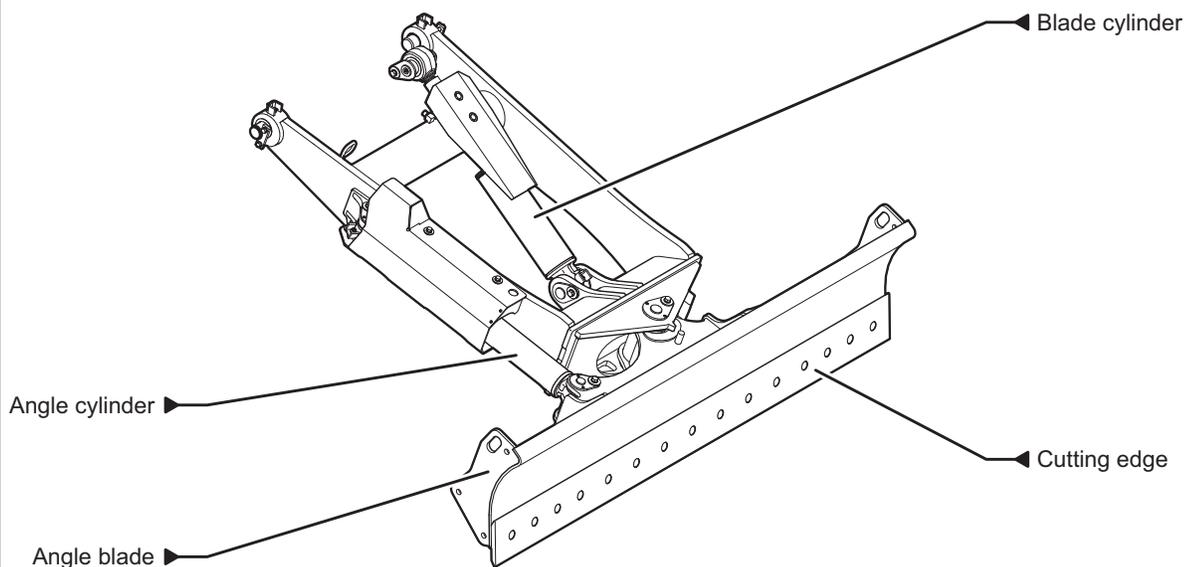
159391-00EN

Inside of the cabin



159598-00EN

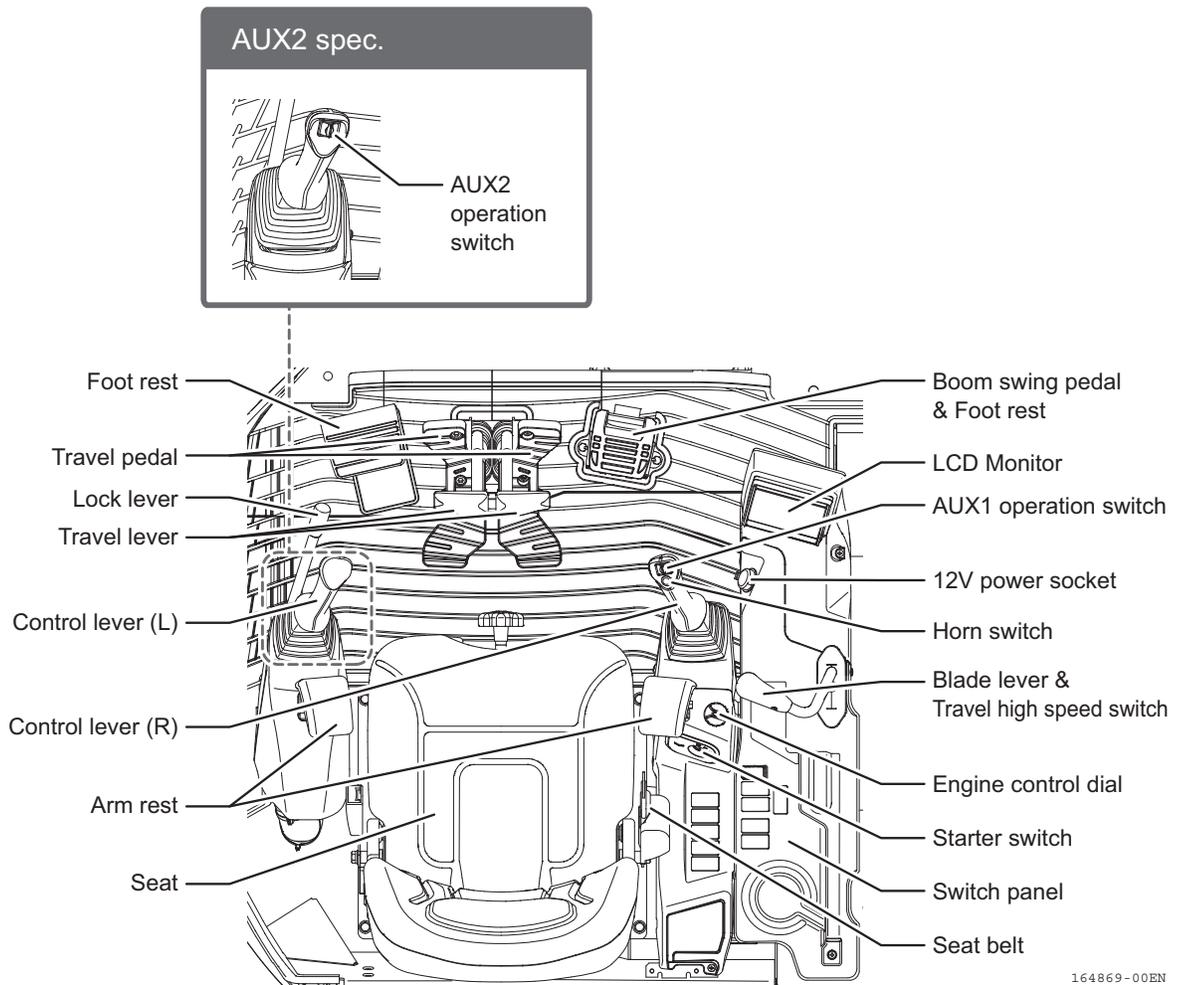
Detail of angle blade



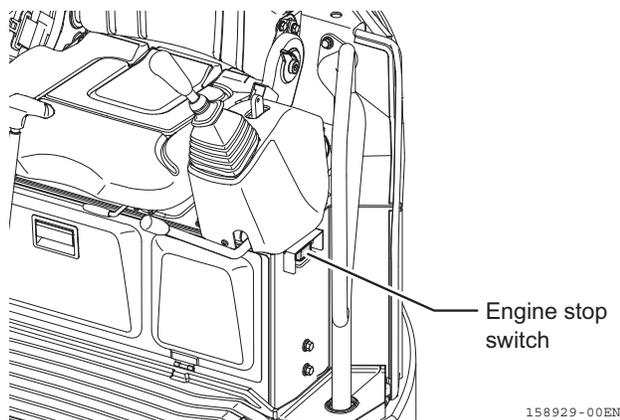
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Fig. 1-2

Controls and switches



164869-00EN



158929-00EN

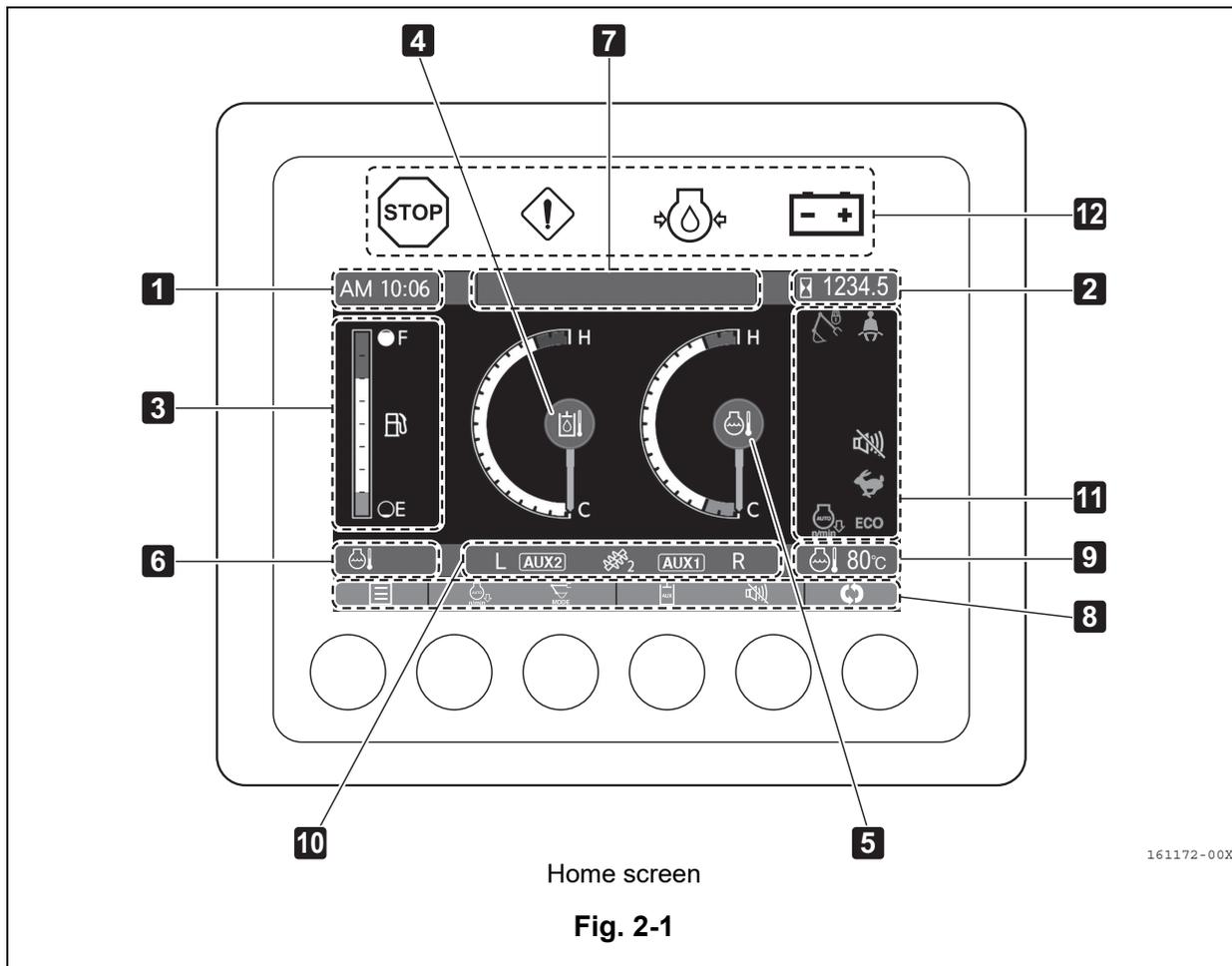
Fig. 1-3

2. Description of Control Devices

This section describes several of the control devices necessary to operate the machine. In order to ensure safety and comfort in working with the machine, it is imperative for you to fully understand how to operate and interact with these devices.

LCD Monitor

Identification of Important Parts and Function



1 Clock

The clock displays the current time. For the time setting method, refer to "Setting the Date and Time" on page 75.

Note:

Current time setting is retained for approximately 2 hours after the battery is removed.

2 Hour meter

The hour meter indicates the total accumulated hours of the machine operation. It accumulates the service hours of the engine, and the hour meter reading increases by "1" per hour. The digit at the far right registers "1" per 0.1 hours (6 minutes).

3 Fuel meter

The fuel meter indicates the amount of fuel remaining in the fuel tank.
If the fuel level is low, a message to refill the fuel tank is displayed in the warning indication area, and the notification buzzer sounds.

4 Hydraulic oil temperature gauge

This gauge indicates the hydraulic oil temperature.

5 Cooling water temperature gauge

This gauge indicates the temperature of the engine cooling water.
If the cooling water temperature reaches the red zone on the gauge, the "Error occurring" message is displayed in the warning display area, and the warning buzzer sounds.

Error code	Category	Contents
28.000110.00	Warning	Abnormal cooling water temperature (overheating)

While the error code described above is detected, the engine speed is automatically decreased to low idle.

Note:

If the cooling water temperature reaches the red zone on the gauge, immediately stop the operation, and reduce the engine speed to low idle. Wait until the meter indicates low temperature, stop the engine, and carry out inspections according to "Troubleshooting" on page 178.

6 Indication of cooling water temperature status icon

If the cooling water temperature reaches the red or blue zone on the gauge, the icon indicating cooling water temperature status is displayed.

Icon	Icon color	Contents
	Red	If the cooling water temperature exceeds 230 °F (110 °C), the red icon is displayed.
	Blue	If the cooling water temperature falls below 86 °F (30 °C), the blue icon is displayed.

7 Warning display area

When an error occurs to the machine or maintenance notice is issued, contents of those are displayed.

For the display when an error occurs to the machine, refer to "Warning and Display when Error Occurs" on page 70.

8 Function switch operation guidance

The guidance displays the functions of the function switches which change depending on the display screen and status of the machine. The operator can operate the LCD monitor by referring to this operation guidance.

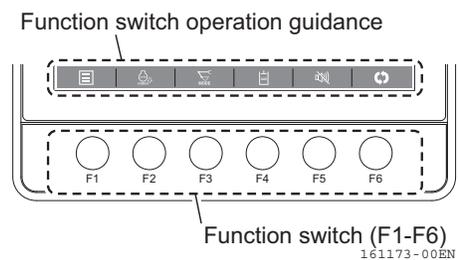


Fig. 2-2

Note:

Touching the function switch operation guidance on the LCD screen with a finger does not activate its corresponding function.

9 Switching display area

Each time F6 is pushed, the display switches among the engine speed, instantaneous fuel consumption, and cooling water temperature in this order.

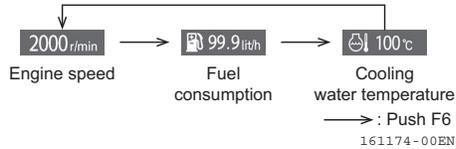


Fig. 2-3

Note:

When the function of the F6 button is changed, such as when an error occurs or a message is issued to notify that the maintenance time has passed, the display in the switching display area cannot be switched.

10 Option information display area

Icons are displayed when the AUX spec. is selected.

11 Icon display area

12 LED indicator

When the display condition of each icon is satisfied, each icon lights up or flashes. For the explanations of each icon, refer to "Icon Display" in the following section.

Icon Display

■ Error display icon

Icon	Display condition
	Displayed if a warning-level error occurs
	Displayed if a caution-level error occurs

This icon lights up on the LED indicator if an error occurs to the machine, and the warning buzzer sounds at the same time.

■ Engine oil pressure icon

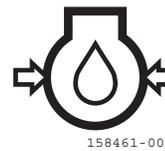


Fig. 2-4

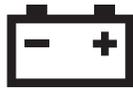
This icon lights up and the warning message is displayed in the warning display area if the engine oil pressure falls below the normal range, and the warning buzzer sounds at the same time.

If this icon lights up and the buzzer sounds, immediately stop the engine and carry out inspections according to "Troubleshooting" on page 178.

Note:

While the key is in the "ON" position and the engine is not started, the icon stays lit. This phenomenon is not a fault.

■ **Battery charge icon**



158462-00X

Fig. 2-5

This icon lights up and the warning message is displayed in the warning display area if the battery is not charged properly while the engine is running, and the caution buzzer sounds at the same time.

When this icon lights up and the buzzer sounds, inspect the battery charge circuit, and if any problems are found, take the necessary corrective measures according to "Troubleshooting" on page 178.

Note:

While the key is in the "ON" position and the engine is not started, the icon stays lit. This phenomenon is not a fault.

■ **Lock lever icon**



158466-00X

Fig. 2-6

This icon is displayed while the lock lever is raised.

■ **Seatbelt warning icon**



158467-00X

Fig. 2-7

This icon is displayed when the seatbelt is not fastened with the lock lever lowered. After the lock lever is lowered and the period without fastening the seatbelt continues for 5 seconds, this icon flashes for 5 seconds and the caution buzzer sounds. Then, the seatbelt icon remains lit.

• **Seatbelt warning**

Seatbelt fastening status	Time elapsed after lowering the lock lever (s)			
	5	10		
	Not fastened		Fastened	
Seatbelt warning icon	ON	Flashing	ON	OFF
Warning buzzer	-	Caution buzzer	-	-

163387-00EN

■ **Travel alarm function deactivation icon**



158463-00X

Fig. 2-8

This icon lights up when the travel alarm function is deactivated.

For how to set the travel alarm function, refer to "Machine Settings" on page 77.

Note:

With the travel alarm function deactivated, stop the engine and turn the key to the "ON" position again to automatically activate the travel alarm function.

■ High speed travel icon



This icon lights up while the traveling speed is set to the 2nd speed.

For how to set the traveling speed, refer to "Location and Function of Electrical Parts" on page 84.

■ Auto deceleration function working icon



This icon lights up when the auto deceleration function is turned ON and goes off when turned OFF.

For how to set the auto deceleration function, refer to "Home Screen Operation" on page 72 or "Machine Settings" on page 77.

■ ECO mode icon

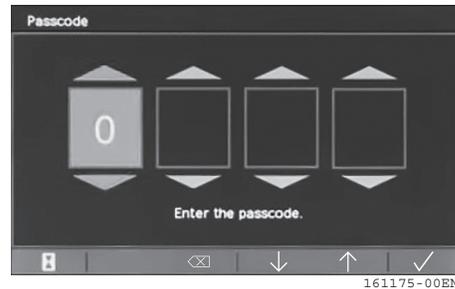


This icon is displayed while the ECO mode is set.

For how to set the ECO mode, refer to "Home Screen Operation" on page 72 or "Machine Settings" on page 77.

Operation at Start-up

1. When the starter switch is turned to the "ON" position, the start screen is displayed for 2 seconds and the buzzer sounds. Then, the passcode entry screen appears when the passcode set function is ON. The home screen appears when the passcode set function is OFF.



Passcode entry screen

Fig. 2-12

- How to enter passcode (when the passcode set function is ON)
Passcode can be entered into the LCD monitor by operating the function switch on the LCD monitor.

- F1: Moves to the hour meter display screen.
- F3: The highlighted area moves to the left.
- F4: The number of highlighted area decreases.
- F5: The number of highlighted area increases.
- F6: The highlighted area moves to the right, and pushing after entering the rightmost number determines the passcode.

The entered passcode is verified with the passcode stored in the machine, and if the verification is successful, the screen is switched to the home screen.

IMPORTANT

If the passcode verification fails five times consecutively, the horn keeps sounding for 1 minute. After the horn stops sounding, turn the key to the "OFF" position. If the key is turned to the "OFF" position before the horn stops sounding, turning the key back to the "ON" position activates the horn for 1 minute.

2. After confirming that the home screen is displayed, turn the key to the "START" position to start the engine.

IMPORTANT

In cold weather, the glow plug operates for a few seconds after the starter switch is turned to the "ON" position, making engine starting easier.

While the glow plug operates, the LCD monitor shows the screen indicating that the glow plug is operating.

When the engine has been warmed up, the screen changes to the home screen. After confirming that the home screen is displayed, start the engine.



159156-00X

Glow plugs activated screen

Fig. 2-13**Note:**

- When the key is set to the "START" position with the lock lever lowered, a notice to raise the lock lever is issued to the operator. The engine cannot be started while the lock lever is lowered. Raise the lock lever before starting the engine.



159169-00X

Lock lever notice screen

Fig. 2-14

- If there is an item whose maintenance time has passed, the home screen is displayed, then a notification buzzer sounds only once, and notifies you for 30 seconds that there are items that have passed the maintenance schedule in the warning display area of the home screen.

Warning and Display when Error Occurs

■ Operation when error occurs

If an error occurs to the machine, the "Error occurring" message is displayed in the warning display area on the LCD screen, the error display icon lights up on the LED indicator, and a buzzer sounds according to the error level.



When warning error occurs
(Background color: Red,
Character color: White)



When caution error occurs
(Background color: Yellow,
Character color: Black)

■ Warning display

⚠ WARNING

If a warning-level error occurs, immediately stop the operation and take the necessary corrective measures.

If a warning-level error occurs, the notice of error occurrence is displayed in the warning display area, and the F6 function operation guidance (switching display area) icon is switched to the warning icon. Pushing F6 in this state switches the screen to the error information screen, and selecting the displayed error allows you to check the details of the error information.

■ Caution display

⚠ CAUTION

If a caution-level error occurs, take the necessary corrective action as soon as possible.

If a caution-level error occurs, the notice of error occurrence is displayed in the warning display area, and the F6 function operation guidance (switching display area) icon is switched to the caution icon. Pushing F6 in this state switches the screen to the error information screen, and selecting the displayed error allows you to check the details of the error information.

■ Notification display

IMPORTANT

If a notification is displayed, take appropriate action according to the displayed content.

- Operation when a notification occurs
- If a notification event occurs in the machine, a notification message will be displayed in the warning display area of the LCD screen, and the confirmation buzzer sounds.



Notification display
(Background color: Gray, Character color: Black)

- Notification and action

Display	State	Measure
 Low Fuel	The remaining fuel in the fuel tank is less than 20%.	Refill fuel.
 High temperature state	The cooling water temperature is high. During the notification display, the output of the hydraulic pump is limited.	Suspend work or lower working load. The notification turns off when the temperature drops. If it happens again, clean and check the radiator and oil cooler.
 High temperature state	The hydraulic oil temperature is high. During the notification display, the output of the hydraulic pump is limited.	For cleaning and checking the radiator and oil cooler, refer to "Checking and cleaning the radiator and oil cooler" on page 224.
 Time for maintenance	There is an item whose maintenance time has passed.	Perform maintenance on the applicable items and reset the elapsed time. For information on how to check maintenance items and reset elapsed time, refer to "Checking the Maintenance Part Elapsed Time" on page 81.

Alarm patterns of buzzer

Five alarm patterns are available for the buzzer depending on each operation and error content. When multiple alarm conditions are met at the same time, the alarm in the category with a higher priority is issued.

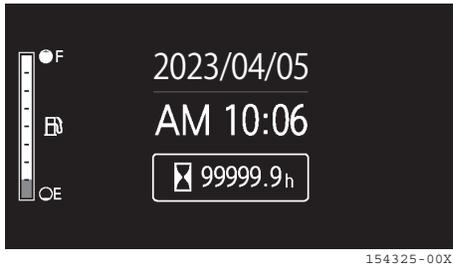
Priority	Category	Pattern
1	Warning buzzer	Continuous beep
2	Caution buzzer	Repeated beeps
3	Notification buzzer	Three short beeps
4	Stop buzzer	One long beep
5	Confirmation buzzer	One short beep

Warning and caution buzzers can be temporarily stopped by pushing F3 while the error information screen or error information detail screen is displayed.

Note:

While the warning buzzer is sounding, even when the buzzer is temporarily stopped, it sounds again when the screen returns to the home screen.

■ Operation when the starter switch is “OFF”



Hour meter display screen
(with the key “OFF”)

Fig. 2-15

1. Even when the starter switch is “OFF”, pushing and holding the F1 button displays the opening screen for two seconds and then brings up the hour meter display screen.

The hour meter display screen shows the date and time, hour meter, and residual quantity of fuel.

2. Pushing the F2 button on this screen brings up the “Check and reset the time” screen, and pushing the F3 button brings up the “Operation management” screen.

Note:

“Check and reset the time” screen and “Operation management” screen cannot be reset.

3. The display on the LCD monitor screen will disappear when 10 seconds or more have elapsed after the last button operation.

Home Screen Operation

Operate the function switches on the home screen to use the functions allocated to the function switches.

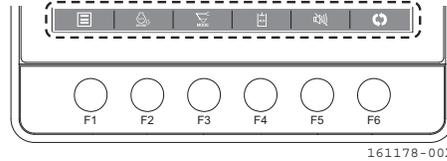


Fig. 2-16

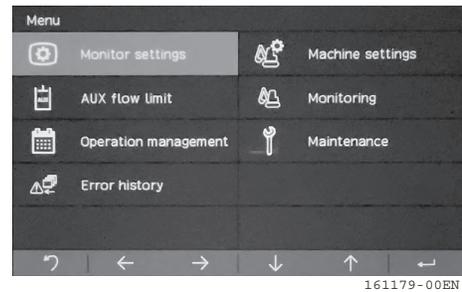
F1	Returns to the menu screen.
F2	Turns ON/OFF the auto deceleration function. For the explanations of the auto deceleration function, refer to "Machine Settings" on page 77.
F3	Changes the operation mode between ECO and NORMAL. For the explanations of the operation mode, refer to "Machine Settings" on page 77.
F4	Each time the switch is pushed, the five attachment flow rates set in the AUX flow rate setting are switched. For the explanations of the AUX flow rate setting, refer to "Changing the AUX Maximum Flow Rate and Switching the Attachments" on page 79.
F5	Turns ON/OFF the travel alarm stop function. For the explanations of the travel alarm stop function, refer to "Machine Settings" on page 77.
F6	The functions that can be used differ depending on the machine status. <ul style="list-style-type: none"> • Normal: Changes the display of the switching display area. • When an error code is issued: Moves to the error information screen. • During maintenance notice: Moves to the maintenance part elapsed time list screen.

Automatic change of display screen

When the LCD monitor shows other than the home screen, satisfying any of the following conditions will automatically brings up the home screen.

- No LCD monitor operation for 60 seconds or more
- Traveling operation

Menu Screen



Menu screen

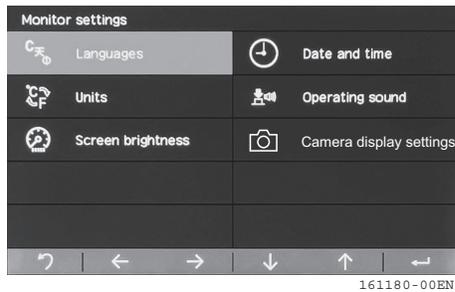
Fig. 2-17

Pushing F1 (menu) on the home screen brings up the menu screen.

On the menu screen, the following items can be displayed, set, and operated.

Display item	Explanation of display item
Monitor settings	Used to set the language, date and time, display units, monitor operation sound, and screen brightness.
Machine settings	Used to turn ON/OFF various functions or select the control mode.
AUX flow limit	Used to control the maximum flow rate for AUX operation. Five settings can be stored at the maximum.
Monitoring	Used to display the operating status of the machine, such as battery voltage and engine speed.
Operation management	Used to check and measure the service hours.
Maintenance	Used to check the maintenance time interval and the accumulated hours since the last maintenance, and reset the accumulated hours after performing maintenance.
Error history	Used to check the error code of the detected error. The history of up to 10 error codes including past error codes can be checked.

Monitor Settings



Monitor settings screen

Fig. 2-18

Selecting the "Monitor settings" on the menu screen and pushing F6 (Set) brings up the monitor settings screen. On the monitor settings screen, the following items can be set.

Monitor settings item

Setting item	Setting contents
Languages	Used to change the language to be displayed on the monitor.
Date and time	Used to set the display method of the date and time.
Units	Used to set each unit of volume, temperature, length, and pressure.
Operating sound	Used to set whether to emit the confirmation buzzer when a function switch is pushed.
Screen brightness	Used to set the brightness level of the monitor screen. Settings can be made for when the work light is on and when it is off.
Camera display settings*	Used to set the camera image display (large or small) when lock lever is in the unlock position.

*: Rear view monitor spec.

Setting the Language



Language setting screen

Fig. 2-19

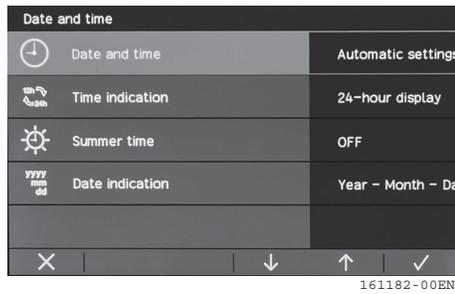
Selecting the language setting from the monitor settings and pushing F6 (Set) brings up the language setting screen. The available languages are as follows.

Japanese, Chinese (Traditional), Chinese (Simplified), Korean, English, French, French (Canadian), Italian, Spanish, Spanish (Mexico), Finnish, German, Portuguese, Portuguese (Brazil), Russian, Swedish, Dutch, Polish, Danish, Czech, Thai, Indonesian, Vietnamese, Malaysian, Turkish, Symbol

Note:

If the desired language is not available, select the "Symbol".

Setting the Date and Time



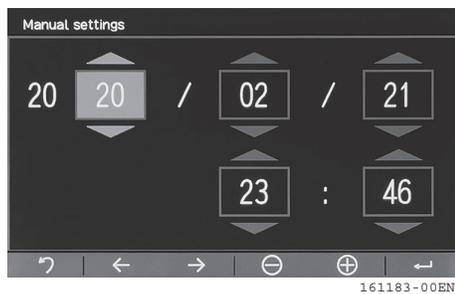
Date and time setting screen

Fig. 2-20

Selecting the "Date and time" from the monitor settings and pushing F6 (Set) brings up the date setting screen. Selecting the "Date and time" from the Date and time setting screen and pushing F6 (Set) brings up the automatic setting/manual setting selection screen.

- Automatic setting method
Date and time can be automatically set by obtaining the date and time information from SA-R (SMARTASSIST-Remote). Selecting the "Automatic setting" and pushing F6 (Set) brings up the time zone selection screen. Select the time zone of the area where this machine is used and push F6 (Set).

- Manual settings



Manual settings screen

Fig. 2-21

Selecting the "Manual settings" and pushing F6 (Set) brings up the manual date setting screen. Push the function switch to select the section to be changed, set the desired time, and push F6 (Set).

Changing the 12/24 Hours Display

Selecting the "Time indication" from the Date and time setting screen and pushing F6 (Set) brings up the time display setting screen. Select the desired display and push F6 (Set).

Setting Daylight Saving Time

Selecting the "Summer time" from the Date and time setting screen and pushing F6 (Set) brings up the daylight saving time setting screen.

Select "ON" to set the daylight saving time, and push F6 (Set). Select "OFF" and push F6 (Set) to restore the time set in the Date and time setting.

Note:

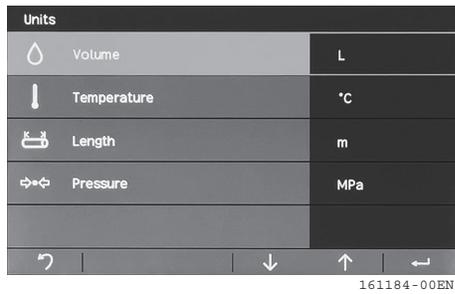
When the daylight saving time is set, the time is displayed one hour earlier.

Setting the Date Display

Selecting the "Date indication" from the Date and time setting screen and pushing F6 (Set) brings up the date display setting screen. Select the desired order and push F6 (Set).

Item	Explanation	Display example
Year-Month-Day	Displays in order of year, month, and day.	2023/12/23
Day-Month-Year	Displays in order of day, month, and year.	23/12/2023
Month-Day-Year	Displays in order of month, day, and year.	12/23/2023

Setting the Display Units



Unit setting screen

Fig. 2-22

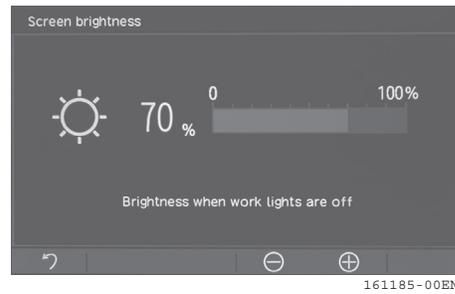
Selecting the "Units" from the monitor settings and pushing F6 (Set) brings up the unit setting screen. Selecting the desired item and pushing F6 (Set) brings up the screen to change the display unit. Select the desired display unit and push F6 (Set) to change the display unit. The available units are as follows.

Item	Display unit
Volume	- L - gal (US) - gal (UK)
Temperature	- °C - °F
Length	- m - ft
Pressure	- MPa - bar - PSI

Setting the Monitor Operating Sound

Selecting the "Monitor operating sound" from the monitor settings and pushing F6 (Set) brings up the setting screen of monitor operating sound. Select "ON" to set the monitor operating sound, and push F6 (Set). Selecting "OFF" and pushing F6 (Set) stops the operation sound when a function switch is operated.

Setting the Screen Brightness



Setting screen in work light OFF status

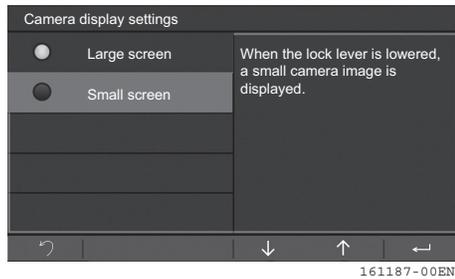
Fig. 2-23

Selecting the "Screen brightness" from the monitor settings and pushing F6 (Set) brings up the screen brightness setting screen. Operate F4 or F5 to change the brightness to the desired level.

Note:

When the work light is turned on and off, the screen changes between the screen brightness setting screen in work light ON status and that in work light OFF status.

Setting the camera image display when lock lever is in the unlock position (Rear view monitor spec.)



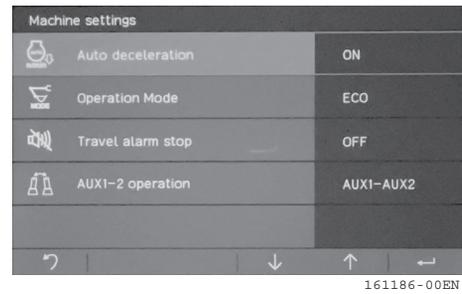
Camera display settings screen

Fig. 2-24

Selecting the "Camera display settings" from the monitor settings and pushing F6 (Set) brings up the camera display settings screen. When the lock lever is in the unlock position in the rear view monitor spec., the camera image to be displayed on the LCD monitor can be set from the large screen and the small screen. Select an item with F4 or F5 and push F6 (Set).

For how to operate the rear view monitor, refer to "Handling of Rear View Monitor (Rear View Monitor spec.)" on page 106.

Machine Settings



Machine settings screen

Fig. 2-25

Selecting the "Machine settings" on the menu screen and pushing F6 (Set) brings up the machine settings screen. On the machine settings screen, the current setting contents can be checked and various functions can be set. The current setting contents are displayed on the right side of each setting item.

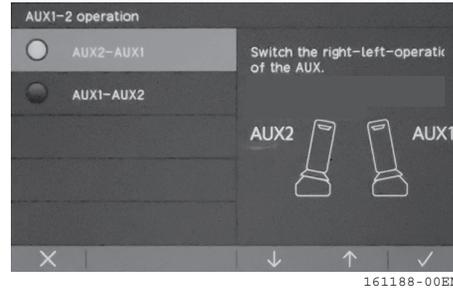
Setting item

Setting item	Setting contents
Auto deceleration	<p>Selecting the auto deceleration and pushing F6 (Set) turns ON/OFF the auto deceleration function. The auto deceleration function reduces the engine speed and fuel consumption when the engine power is not required. When the machine is not operated or traveled for more than 4 seconds, the engine speed decreases to low idle to reduce fuel consumption. While the auto deceleration function is activated, the engine speed returns to the speed originally set by the engine control dial when the machine is operated or traveled.</p> <p>Note: The auto deceleration function may not work until the hydraulic oil warms up. This phenomenon does not constitute a failure.</p>

Setting item	Setting contents
Operation Mode	Selecting the operation mode and pushing F6 (Set) changes the operation mode between ECO and NORMAL. When the ECO mode is set, the engine speed is decreased compared to that in the NORMAL mode for work with low fuel consumption.
Travel alarm stop	Selecting the travel alarm stop and pushing F6 (Set) turns ON/OFF the travel alarm stop function. Note: <i>Turning the key to the "OFF" position returns the alarm stop function setting to "OFF". To turn the alarm stop function to "ON", set it each time.</i>
AUX1-2 operation allocation*	Selecting the AUX1-2 operation allocation and pushing F6 (Set) brings up the AUX1-2 operation allocation setting screen, where you can change the allocation of the AUX control lever.

*: AUX2 spec.

Setting the AUX Operation Allocation



AUX1-2 operation screen
(When AUX2-AUX1 is selected)

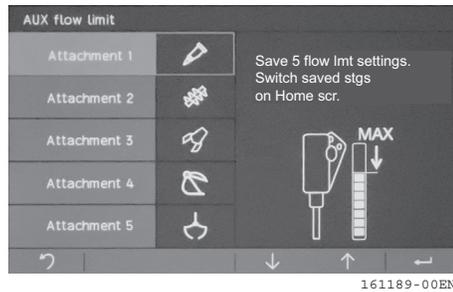
Fig. 2-26

Selecting the "AUX1-2 operation" from the machine settings and pushing F6 (Set) brings up the screen for setting the allocation of the control lever operating the AUX. Highlight the operation allocation to be selected and then push F6 (Set) to apply the allocation.

The currently selected AUX1-2 operation allocation can be confirmed in the option information display area on the home screen.

Item	Control lever (L)	Control lever (R)
AUX2 - AUX1	Operates the AUX2.	Operates the AUX1.
AUX1 - AUX2	Operates the AUX1.	Operates the AUX2.

Changing the AUX Maximum Flow Rate and Switching the Attachments



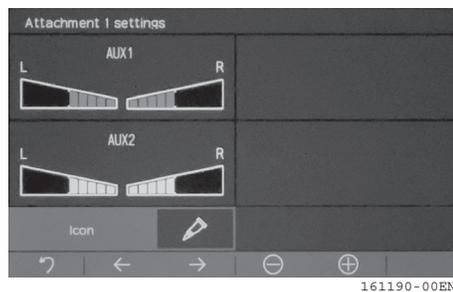
AUX flow limit screen

Fig. 2-27

Selecting the "AUX flow limit" on the menu screen and pushing F6 (Set) brings up the AUX flow limit screen. On this screen, the maximum of 5 AUX flow rates can be set for the attachments and the set flow rate of the attachment can be changed.

The icon of the selected attachment is displayed in the option information display area on the home screen.

[How to set AUX maximum flow rate]



AUX maximum flow limit setting screen

Fig. 2-28

1. On the AUX flow rate control screen, selecting the desired attachment and pushing F6 (Set) brings up the AUX maximum flow rate setting screen.
2. Push F2 or F3 to select the AUX port whose maximum flow rate is to be controlled, and push F4 or F5 to set the desired flow rate.

3. Selecting the icon and pushing F6 (Set) brings up the screen for changing the icon display. Select any icon and push F6 (Set).

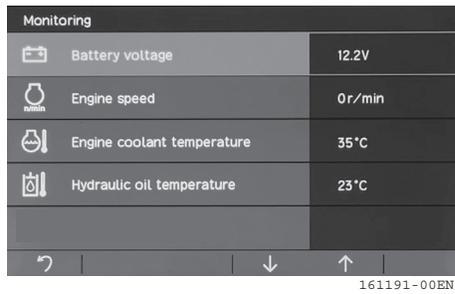
Note:

The AUX ports to be displayed on the AUX maximum flow rate setting screen varies depending on the specifications.

[Switching attachments]

On the AUX flow rate control screen, selecting the desired attachment and pushing F1 (Return) controls the maximum flow rate to the set value of the selected attachment.

Monitoring



Monitoring screen

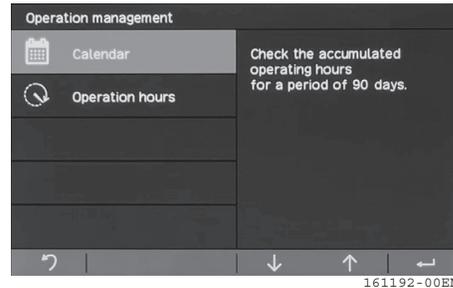
Fig. 2-29

Selecting the "Monitoring" on the menu screen and pushing F6 (Set) brings up the monitoring screen. On the monitoring screen, the voltage value, temperature, amount, etc. are displayed by reading them from the information of the sensors installed in this machine.

On the monitoring screen, the following items can be checked.

Display item
Battery voltage
Engine speed
Engine coolant temperature
Hydraulic oil temperature

Checking and Measuring the Operation Status of This Machine

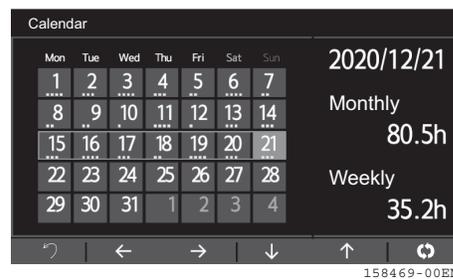
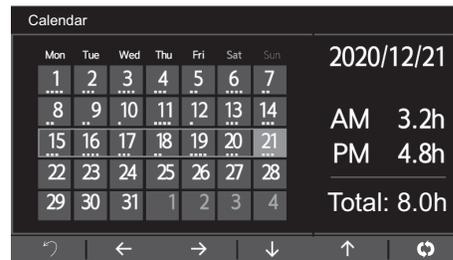


Operation management screen

Fig. 2-30

Selecting the "Operation management" on the menu screen and pushing F6 (Set) brings up the operation management screen. On the operation management screen, the service hours can be checked and measured.

• **Checking the operation status**



Calendar screen

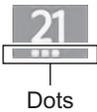
Fig. 2-31

Select the "Calendar" on the operation control screen and push F6 (Set) to check the service hours of 90 days at maximum.

Select the desired date on the calendar on the left side of the screen to display the service hours for the selected date on the right side of the screen, and push F6 (Set) to display the

total service hours for the week and month of the selected date.

The number of dots under the date on the calendar gives an estimate of the total service hours for the day.

	No. of dots	Service hour
	0	Less than 0.5 h
	1	0.5 or more and less than 2.0 h
	2	2.0 or more and less than 4.0 h
	3	4.0 or more and less than 8.0 h
	4	8.0 h or more

Note:

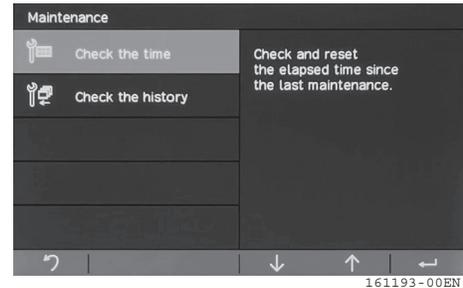
- Service hour is added every 0.1 hours (6 minutes).
- Pushing and holding F2/F3 (←/→) changes the date continuously at 5 days/s.
- Pushing and holding F4/F5 (↓/↑) changes the date continuously at 5 weeks/s.

• Measuring the Service Hours

Selecting the "Operation hours" on the operation management screen displays the date and time when the measurement is started and the service hours from the measurement start date and time.

Selecting the "Operation hours" and pushing F6 (Reset) and then F6 (Set) again indicates a time reset notice and resets the service hours. When the service hours are reset, the date and time when the service hours are reset are stored, and measurement is started again from the time of resetting.

Checking the Maintenance Part Elapsed Time



Maintenance screen

Fig. 2-32

Selecting the "Maintenance" on the menu screen and pushing F6 (Set) brings up the maintenance screen. On the maintenance screen, the elapsed time of maintenance parts can be checked, the elapsed time can be reset, and the replacement history of maintenance parts can be checked.

Maintenance parts for checking elapsed time

Hydraulic oil	Hydraulic oil return filter
Engine oil filter	Engine oil
Fuel filter element	Air cleaner element
Lube oil for travel reduction gearbox	

• Checking the elapsed time

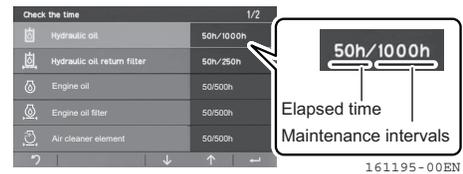


Fig. 2-33

Select the "Check the time" on the maintenance screen and push F6 (Set) to check the elapsed time after maintenance and maintenance time intervals.

• **Announcing the maintenance time**

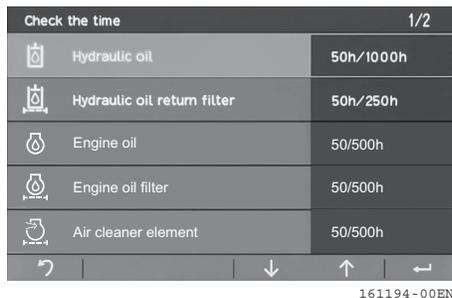
When the maintenance time has reached, a notification buzzer sounds only once and a notification message is displayed in the warning display area on the home screen for 30 seconds.

When the key is set to the "OFF" position and then to the "ON" position again after the maintenance time has passed, a notification buzzer sounds only once after the home screen is displayed, and the notice remains for 30 seconds. Pushing F6 (Maintenance icon) while the notification message is displayed brings up the maintenance screen.

Note:

If there is any item whose maintenance time has reached, the "Check the time" icon on the maintenance screen and icons for the items whose maintenance time has reached on the Check the time screen are displayed in yellow.

• **Resetting the elapsed time**



Check the time screen

Fig. 2-34



Elapsed time reset notice

Fig. 2-35

Selecting the maintenance performed item and pushing F6 (Reset) displays the elapsed time reset notice. Pushing F6 (Set) with the elapsed time reset notice displayed resets the elapsed time.

IMPORTANT

Make sure to reset the elapsed time for the maintenance performed item. If the elapsed time is not reset, the notification message will appear on the home screen each time the key is turned to the "ON" position after the maintenance time has passed.

• **Checking the replacement history of maintenance parts**

🛢️	Engine oil	2024.11.25	1490 h
		2024.05.12	998 h
🛢️	Engine oil filter	2024.11.25	1490 h
		2024.05.12	998 h
🛢️	Air cleaner element	2024.11.25	1490 h
		2024.05.12	998 h

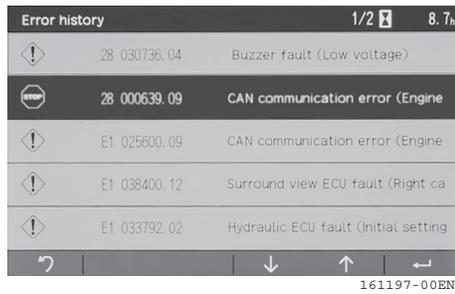
161196-00EN

Fig. 2-36

Selecting the "Check the history" on the maintenance screen and pushing F6 (Set) brings up the maintenance history screen.

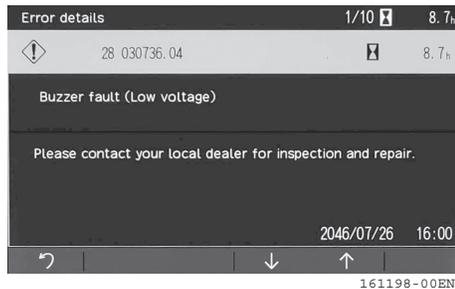
On the maintenance history screen, the date when the elapsed time of maintenance parts is reset and the hour meter at the time of reset are displayed for the past two times.

Checking the Error History



Error history screen

Fig. 2-37



Error details screen

Fig. 2-38

Selecting the "Error history" on the menu screen and pushing F6 (Set) brings up the error history screen. The error history screen displays up to 10 error codes including past error codes.

The display color of the error code is changed according to the warning level of the error code, and the currently occurring error display icon is blinked for display.

Warning level	Background color/ Character color
Warning	Red/White
Caution	Yellow/Black

Selecting the desired error code on the error history screen and pushing F6 (Set) brings up the error information detail screen. The details of the error code and service hours at the error occurrence can be checked.

Note:

- Warning and caution buzzers can be temporarily stopped by pushing F3 on the error information screen or error information detail screen.
- While the warning buzzer is sounding, even when the buzzer is temporarily stopped, it sounds again when the screen returns to the home screen.

Location and Function of Electrical Parts

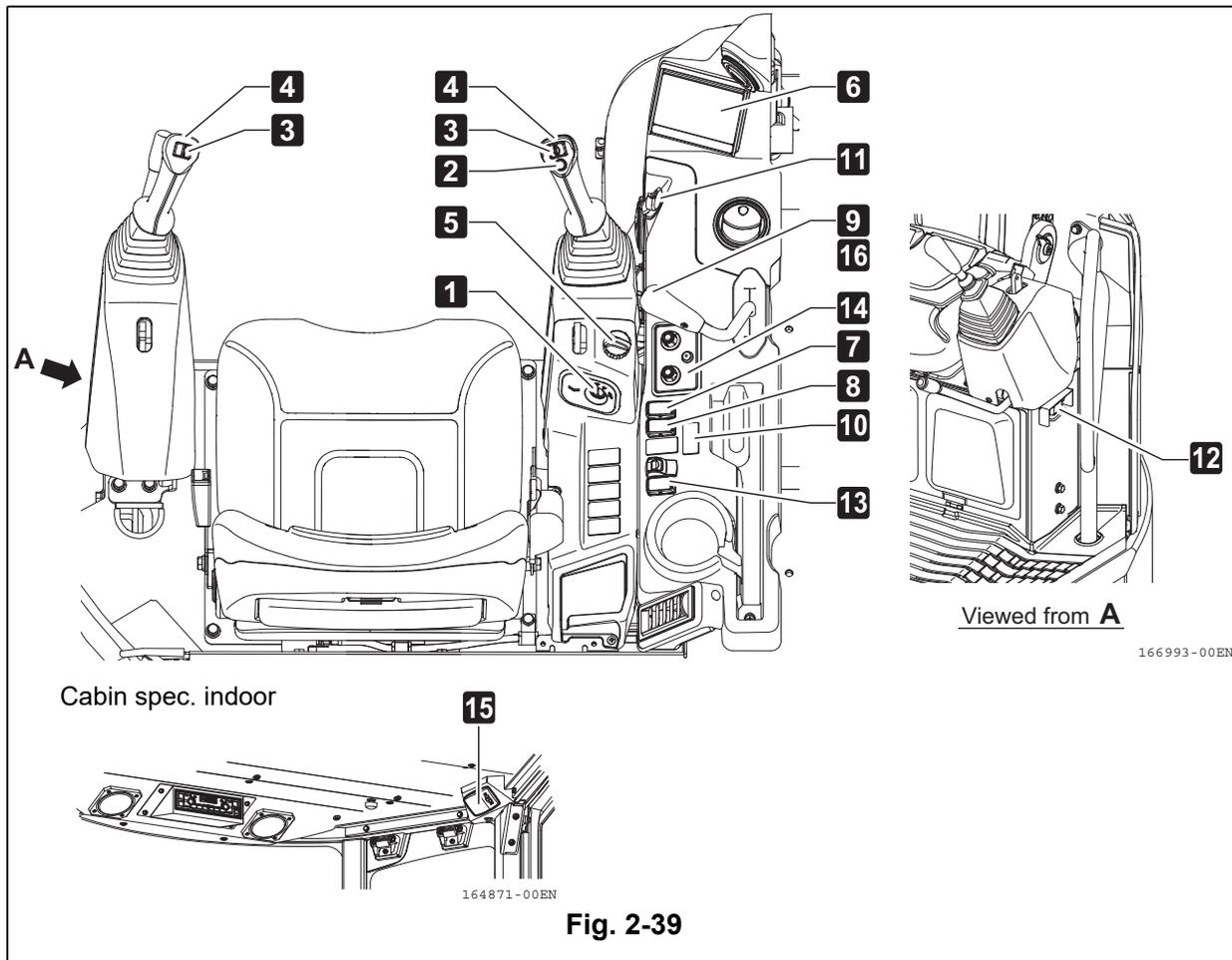


Fig. 2-39

- 1: Starter switch 2: Horn switch 3: AUX operation switch 4: AUX operation hold switch 5: Engine control dial 6: LCD monitor 7: Light switch 8: Wiper switch 9: High speed travel switch 10: USB port 11: 12V power socket 12: Engine stop switch 13: Quick coupler control switch 14: A/C control panel 15: Room lamp switch 16: Blade angling switch**

1 Starter switch

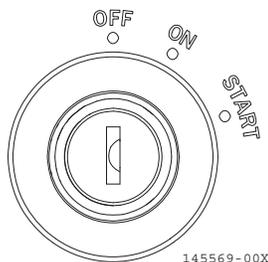


Fig. 2-40

This switch is used to start and stop the engine.

OPERATION

• OFF position

The key can be inserted or removed. Turning the key to this position disconnects the electrical circuit and stops the engine.

• ON position

Electric current flows to electrical switches. While the engine is running, electric current flows to the charging circuit. Keep the key in the "ON" position while the engine is running.

IMPORTANT

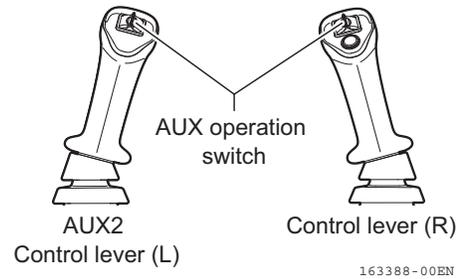
In cold weather, the glow plug operates for a few seconds after the starter switch is turned to the "ON" position, making engine starting easier. While the glow plug operates, the LCD monitor shows the screen indicating that the glow plug is operating. When the engine has been warmed up, the screen changes to the home screen. After confirming that the home screen is displayed, start the engine.

- START position

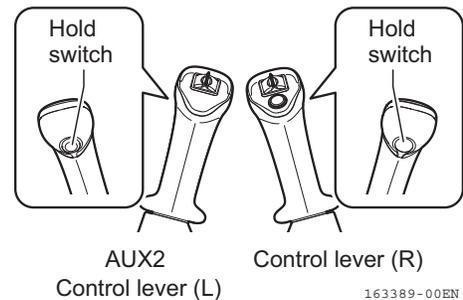
Turn the key to this position to start the engine. Keep the key in this position until the engine is started, and release it immediately after the engine is started. The key returns to the "ON" position.

2 Horn switch**Fig. 2-41**

Push the switch on the top of the right control lever to sound the horn.

3 AUX operation switch**Fig. 2-42**

Operate the switch on the top of the control lever to move the attachment connecting to the AUX circuit.

4 AUX operation hold switch**Fig. 2-43**

Use this switch to continuously operate the attachment connecting to the AUX circuit.

(How to use hold function)

- Operating the AUX operation switch to the left or right and operating the hold switch on the back side of the operated control lever activates the hold function.
- When the hold switch is operated without operating the AUX operation switch, the hold function is activated at the maximum flow rate for operating the AUX operation switch to the left.

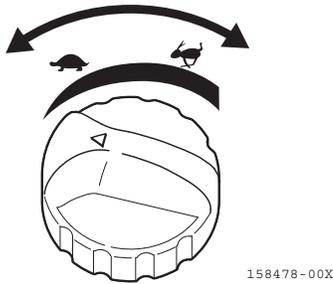
Note:

When the hold function is used, the icon using the hold function of the AUX allocation icons is highlighted on the LCD monitor.

(How to deactivate the hold function)

When the following operations are performed while the hold function is working, the hold function is deactivated.

- Operating the AUX operation switch
- Operating the AUX operation hold switch
- Turning the starter switch to "OFF"
- Raising the lock lever

5 Engine control dial**Fig. 2-44**

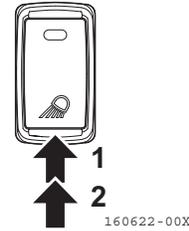
This dial is used to adjust the engine speed (output).

- High idle:
Turn the dial fully in the right direction (clockwise).
- Low idle:
Turn the dial fully in the left direction (counterclockwise).

6 LCD monitor

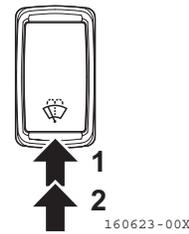
This monitor is used to display the machine status and perform the machine setting.

For how to display, set, and operate the LCD monitor, refer to "LCD Monitor" on page 64.

7 Light switch**Fig. 2-45**

While the key is in the "ON" position, pushing this switch turns on the front work light.

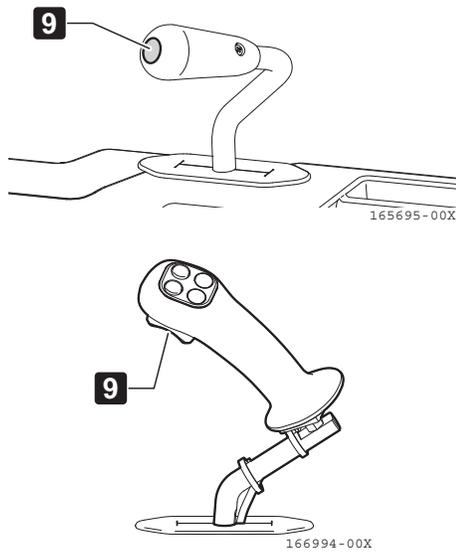
- 1: The boom light lights up and the LCD monitor brightness changes to the level set for when the light is on.
- 2: All the lights light up and the LCD monitor brightness changes to the level set for when the light is on.

8 Wiper switch (Cabin spec.)**Fig. 2-46**

This switch is used to operate the windshield wiper.

- 1: The wiper operates.
- 2: The washer operates.

9 High speed travel switch



(For the angle blade)

Fig. 2-47

This switch is used to select "High speed travel" for the traveling speed. The traveling speed between low speed and high speed can be switched using the switch at the end of the blade lever. During the high speed travel, the high speed travel icon is displayed on the LCD monitor.

Note:

- When the travel force is required on soft ground and slopes even during the high speed travel, it is not necessary to shift the switch, as it will automatically shift to the low speed travel. The indicator above the switch stays lit. When the travel force is no longer required, the high speed travel will be set again.
- Even when the traveling speed automatically shifts to the low speed travel during high speed travel, the engine speed remains the same.

10 USB port (Cabin spec.)

11 12 V power socket

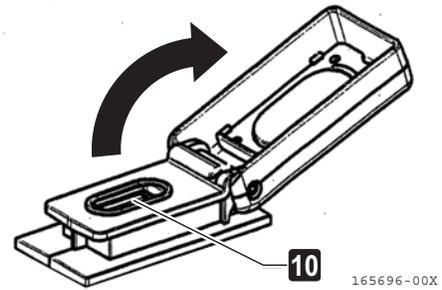


Fig. 2-48

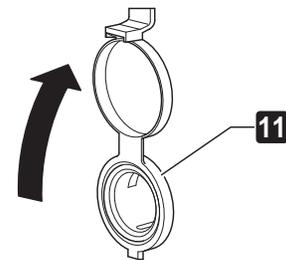


Fig. 2-49

It is the socket that can be used as a power for electronic products. It is available when the key is in the "ON" position.

Comply with the following conditions for use.

	USB port	12 V power socket
Voltage	5 V	12 V
Power consumption	Maximum of 10 W (2 A) or less	Maximum of 120 W (10 A) or less

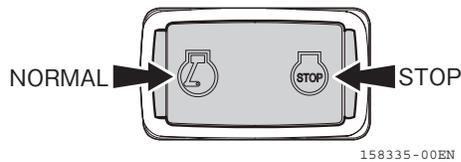
Note:

- The USB port cannot be used for charging in some connected device types.
- If an error occurs in the electrical circuit, an overcurrent flows into the USB port, which may destroy the data in the connected device. It is recommended to back up the data before connecting the device.

IMPORTANT

Water or other liquids entering the 12V power socket or USB port may cause a short circuit.

Always close the cap after use to prevent water or other liquids from entering.

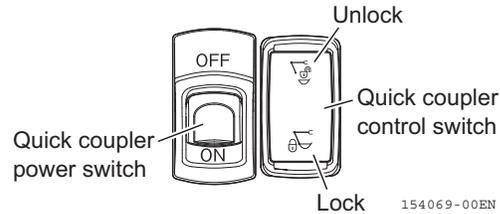
12 Engine stop switch**Fig. 2-50**

Pushing this switch to the STOP side while the engine is running stops the engine. This switch is used when the engine does not stop even when the key is in the "OFF" position due to machine failure or damage.

After stopping the engine, always return the engine stop switch to the "NORMAL" position.

- STOP : Stops the engine.
- NORMAL : Enables to start the engine.

When the switch is in the "STOP" position, the engine stop display is indicated on the LCD monitor and the engine does not start. Therefore, return it to the "NORMAL" position.

13 Quick coupler control switch**Fig. 2-51**

Turn on the quick coupler power with the quick coupler power switch and operate the quick coupler control switch to activate the quick coupler.

Pushing the quick coupler power switch to the ON side turns on the power of the quick coupler, and pushing it to the OFF side turns off the power of the quick coupler.

- Unlock:

With the quick coupler power turned ON, push the quick coupler control switch to the "Unlock" side.

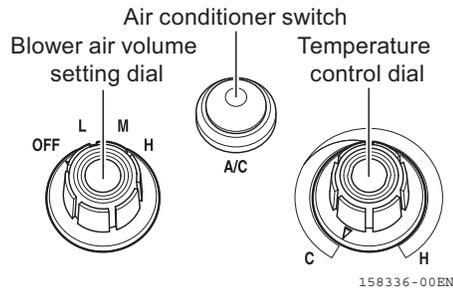
- Lock:

With the quick coupler power turned ON, push the quick coupler control switch to the "Lock" side.

Note:

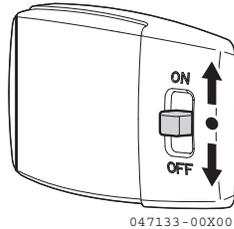
While the quick coupler power is ON, the message of "Quick coupler unlocking" is displayed on the LCD monitor, and the caution buzzer sounds.

For detailed operation method, refer to "Handling quick coupler" on page 141.

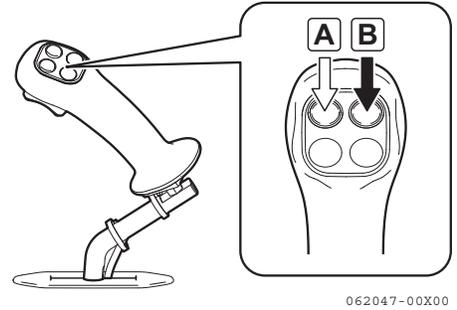
14 A/C control panel (Cabin spec.)**Fig. 2-52**

This panel is used to operate the automatic air conditioner.

For how to operate the air conditioner, refer to "How to use air conditioner" on page 103.

15 Room lamp switch (Cabin spec.)**Fig. 2-53**

- ON : The lamp is illuminated.
- OFF : The lamp is not illuminated.
- Intermediate position:
The lamp turns on for about 15 seconds when the door is opened. The lamp goes out immediately after the door is closed.

16 Blade angling switch (with angle blade)**Fig. 2-54**

Press either switch to angle the blade to right or left.

- A** : Press the switch to angle the blade to left.
 - B** : Press the switch to angle the blade to right.
- When no switch is pressed the blade angle is held as it is.

Control levers and pedals

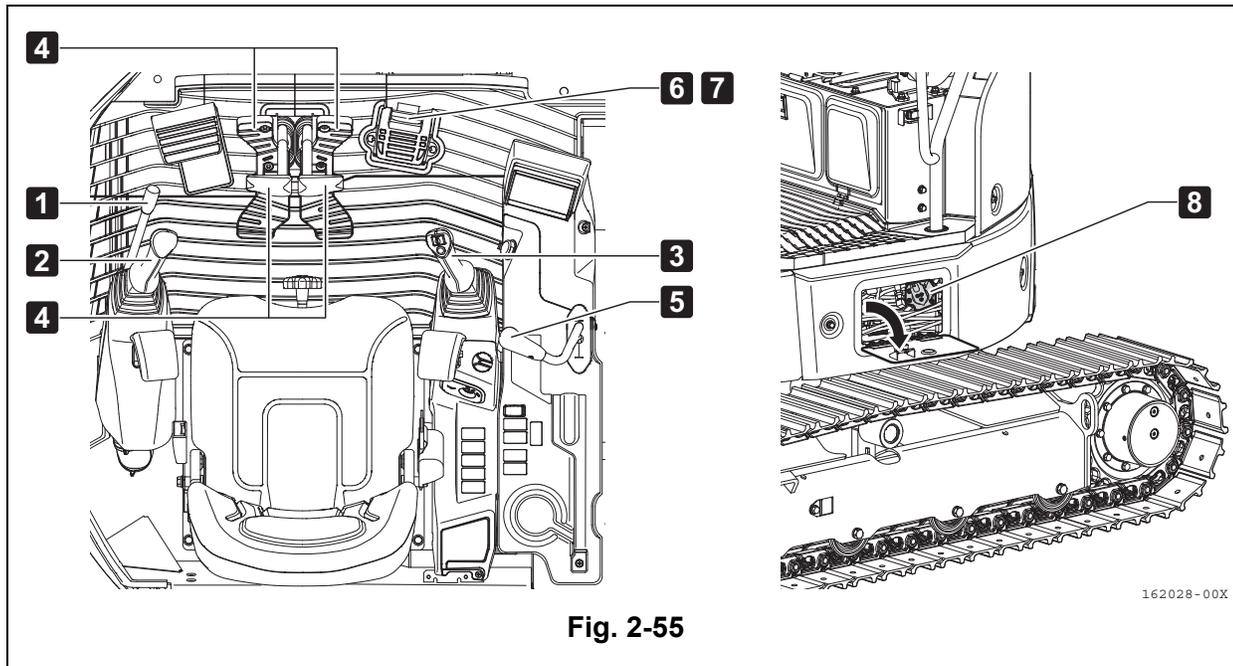


Fig. 2-55

1: Lock lever 2: Control lever (L) 3: Control lever (R) 4: Travel levers and pedals
5: Blade lever 6: Pedal guard 7: Boom swing pedal 8: Operating pattern change valve

1 Lock lever

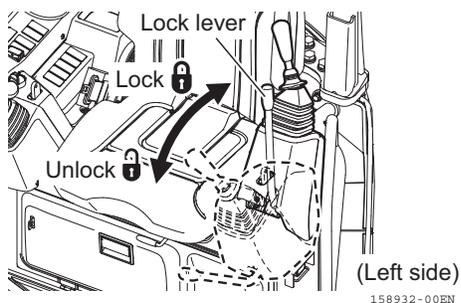


Fig. 2-56

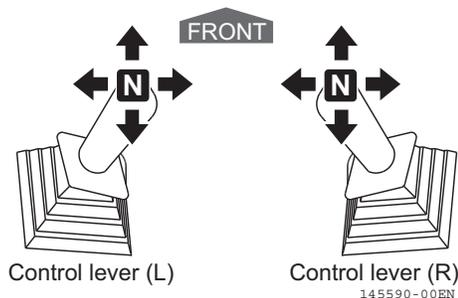
The lock lever locks the implement control levers, boom swing pedal and the travel levers.

⚠ WARNING

- When leaving the operator's seat, be sure to place the bucket on the ground and move lock lever to the lock position. Keep in mind that if you should touch an unlocked lever inadvertently, a serious accident could occur.
- Be sure to place the lock lever securely in the lock position. If not, they could slip out of the lock position. Thus always make sure that the lock lever is in the lock position as illustrated in the figure.
- When pulling the lock lever back, be careful not to touch the control lever. Remember that if the lock lever is not pulled back fully, the implement will not be locked.
- When pushing the lock lever forward, be careful not to touch the control lever.

IMPORTANT

The machine uses a hydraulic lock system. If the lock lever is in the lock position, the left and right control levers will operate, but all the hydraulic cylinders for the boom, arm, bucket, and boom swing, as well as the swing motor, travel motor and AUX will not operate.

2 Control lever (L)**3** Control lever (R)**Fig. 2-57**

Use these levers to control the implements and swinging of upperstructure.

Refer to Section "Operating the implement" on page 123.

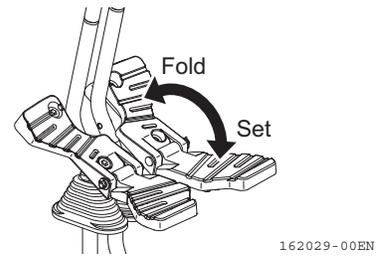
4 Travel levers and pedals

The travel levers and pedals control the traveling of the machine.

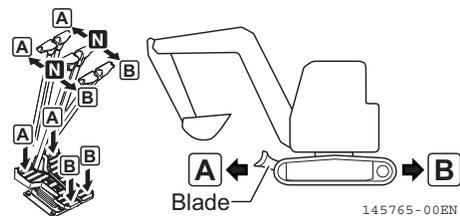
⚠ WARNING

- If the blade is in the reverse direction, the travel levers and pedals should also be operated in reverse for forward and backward travel.
- When operating the travel levers and pedals, you must check to see if the blade is in the normal position or in the reverse position. Note that the blade is in the normal position when the sprocket is in the rear. Refer to Section "Overview of the machine" on page 61.

When using the travel pedals, operate the machine after setting the pedals to "Set" position.

**Fig. 2-58**

When the blade is in the normal position:

**Fig. 2-59**

The pedal operation is in the parenthesis.

- A** (Forward) : Push the travel levers forward.
(Step on the front position of the pedals)
- B** (Reverse) : Pull the travel levers backward.
(Step on the rear position of the pedals)
- N** (Neutral) : The machine stops.

5 Blade lever

Use this lever to control the blade.

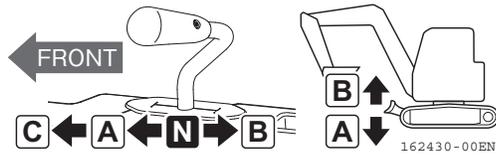


Fig. 2-60

- A** Blade down : Push the lever forward.
- B** Blade up : Pull the lever backward.
- N** Neutral : When released, the lever will return to the neutral position and the blade is held as it is.
- C** Blade float : Push the lever forward to its detent position.

The blade will be in the float condition and the lever is held as it is. The blade will drop to the ground by gravity and will stop. If this mode is used for operation on a concrete-covered ground or land-leveling operation, the bucket will follow the contour of the ground by using the weight of the blade, so the work can be performed efficiently.

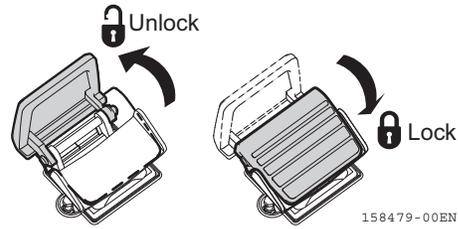
6 Pedal guard

Fig. 2-61

The boom swing pedal has a pedal guard.

Covering the boom swing pedal locks the boom swing pedal operation.

To prevent misuse, always set the pedal guard in the lock position whenever the boom swing pedal is not being operated. The pedal guard can be used as a foot rest.

⚠ WARNING

To avoid bodily injury, securely place the pedal guard in the lock position whenever the boom swing pedal is not being operated.

7 Boom swing pedal

Use this pedal to swing the boom to right and left.

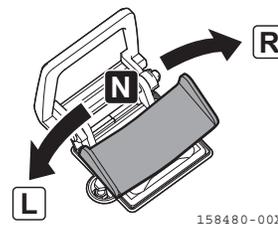
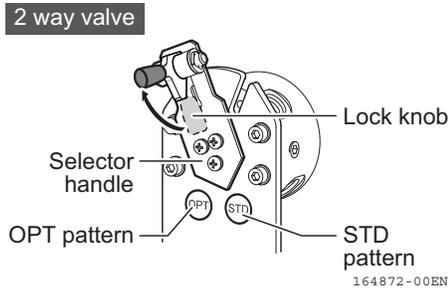


Fig. 2-62

- R** (Swing right): move to the right.
- L** (Swing left) : move to the left.
- N** (Neutral) : When released, the pedal will return to the neutral position and the boom is held as it is.

8 Operating pattern change valve**⚠ WARNING**

When changing the machine's operating pattern, stop the engine and make sure the lock lever is in the "lock" position before changing the operating pattern.

**Fig. 2-63**

This valve is used to switch between operating patterns for the right and left control levers. It is located inside the left cover.

For details of the operating patterns, refer to Section "Operating the implement" on page 123.

2 way valve

STD: YANMAR, ISO pattern

OPT: JOHN DEERE pattern

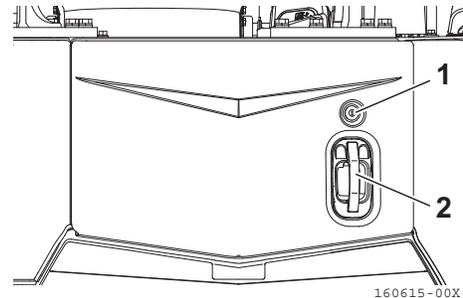
1. Stop the engine and make sure the lock lever is in lock position.
2. Open the left cover.
3. Unlock the selector handle to move it to suit-able position.
4. Securely lock the selector handle.
5. Close the left cover.

IMPORTANT

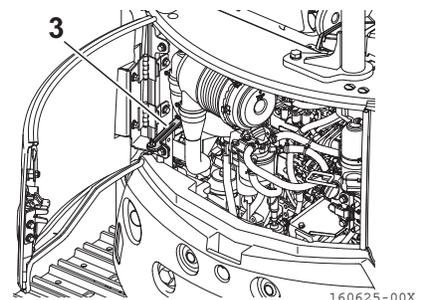
Be sure to place the lock plate in the lock position.

Rear hood**⚠ WARNING**

Do not open the rear hood while the engine is running. Check and service the engine after it has been stopped and temperatures have cooled.

■ Opening the rear hood**Fig. 2-64**

1. Insert the starter switch key into the key hole (**Fig. 2-64, 1**) in the rear hood and turn it counterclockwise to unlock the rear hood.
2. Pull the rear hood lever (**Fig. 2-64, 2**) to release the rear hood, and it will open.
3. When the rear hood is fully open, lock it in that position with the stopper rod (**Fig. 2-65, 3**).

■ Closing the rear hood**Fig. 2-65**

1. Lift up the stopper (**Fig. 2-65, 3**) slightly to disengage the lock.
2. Close the rear hood and push it until it is securely locked.
3. Turn the starter switch key clockwise to lock the rear hood.

Front cover (right)

■ Opening the front cover (right)

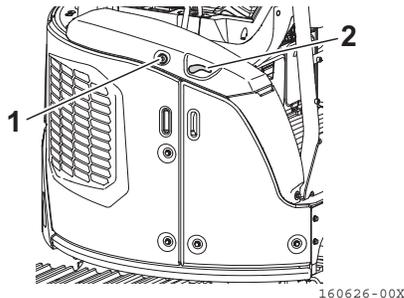


Fig. 2-66

1. Insert the starter switch key into the key hole (**Fig. 2-66, 1**) in the front cover (right) and turn it counterclockwise to unlock the front cover (right).
2. Pull the lever (**Fig. 2-66, 2**) up to unlock it, and open the front cover (right).
3. The front cover (right) fully opens to be locked with the stopper (**Fig. 2-67, 3**).

■ Closing the front cover (right)

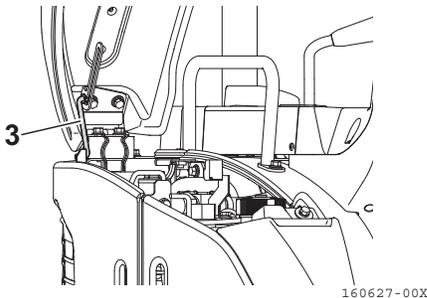


Fig. 2-67

1. Lift the front cover (right) slightly and pull the stopper (**Fig. 2-67, 3**) to disengage it.
2. Close the front cover (right) and push it down fully until it clicks.
3. Turn the starter switch key clockwise to lock the front cover (right).

Right hood

■ Opening the right hood

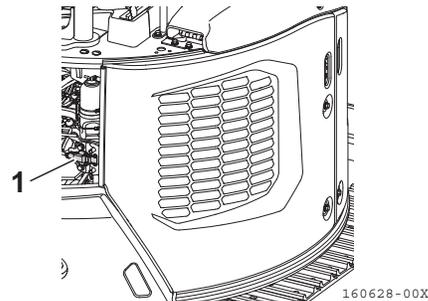


Fig. 2-68

1. Open the rear hood.
2. Pull the lock lever (**Fig. 2-68, 1**) back and open the right hood.
3. Hold the right hood with the stopper rod.

■ Closing the right hood

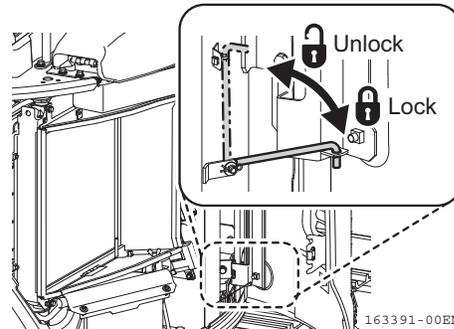


Fig. 2-69

1. Disengage the stopper rod from the right hood and put it back in the unlock position.
2. Lock the right hood with the lock lever.
3. Close the rear hood.

Operator's seat bottom cover

■ Opening the operator's seat bottom cover

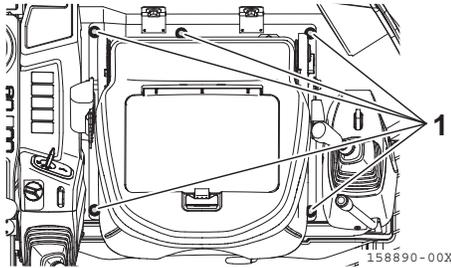


Fig. 2-70

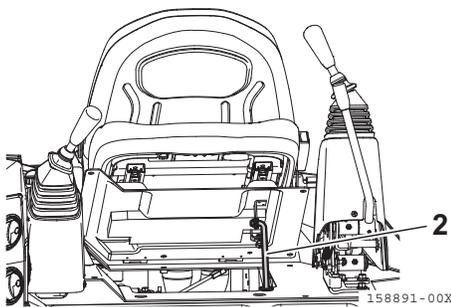


Fig. 2-71

1. Fold the seat backrest forward.
2. Remove the five bolts (Fig. 2-70, 1) of the operator's seat bottom cover.
3. Slide the seat forward.
4. Raise the operator's seat bottom cover and secure it with the stopper rod (Fig. 2-71, 2).

⚠ WARNING

Be sure to secure the operator's seat bottom cover with the stopper rod to hold it in its raised position.

■ Closing the operator's seat bottom cover

1. Lift the operator's seat bottom cover up slightly and disengage the stopper rod (Fig. 2-71, 2).
2. Put the operator's seat bottom cover down and then install and tighten the five bolts (Fig. 2-70, 1).

Storage compartment for the operation & maintenance manual

When you open the cover (Fig. 2-72, 1) at the seat section, you will find a storage space for the operation and maintenance manual (Fig. 2-72, 2).

When closing the cover (Fig. 2-72, 1), push it until it is securely locked.

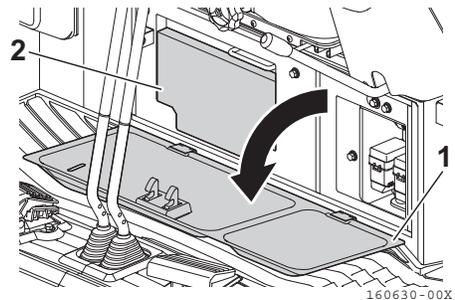


Fig. 2-72

Storage space for tools and grease gun

Storage space for tools and grease gun is located at the front of the cabin. Insert the key and turn it counterclockwise. Lock is released.

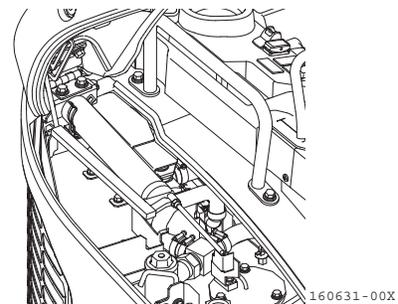


Fig. 2-73

When you open the cover at the front of the cabin, you will find a storage space for tools and grease gun.

Windshield (Cabin spec.)

⚠ WARNING

- When the side door or upper windshield is open, make sure that it is securely locked in place. If it is not securely locked, it may close unexpectedly due to the impact or vibrations generated while the machine is operating and the operator may get his/her hands caught in or hit his/her head on the door or windshield, resulting in hand or head injuries. In addition, do not stick the head or hands out of the open side door or upper windshield.
- Both the upper and lower windshields can be opened and closed. When housing or closing the upper and/or lower windshields, they may get down suddenly. To prevent this, lock them securely with the lock levers.
- Always open or close the upper windshield by holding the right and left knobs firmly with the corresponding hands while sitting in the operator's seat. Especially, holding parts other than the knobs with the hands may cause injury to the hands, for example, from being caught in the windshield.

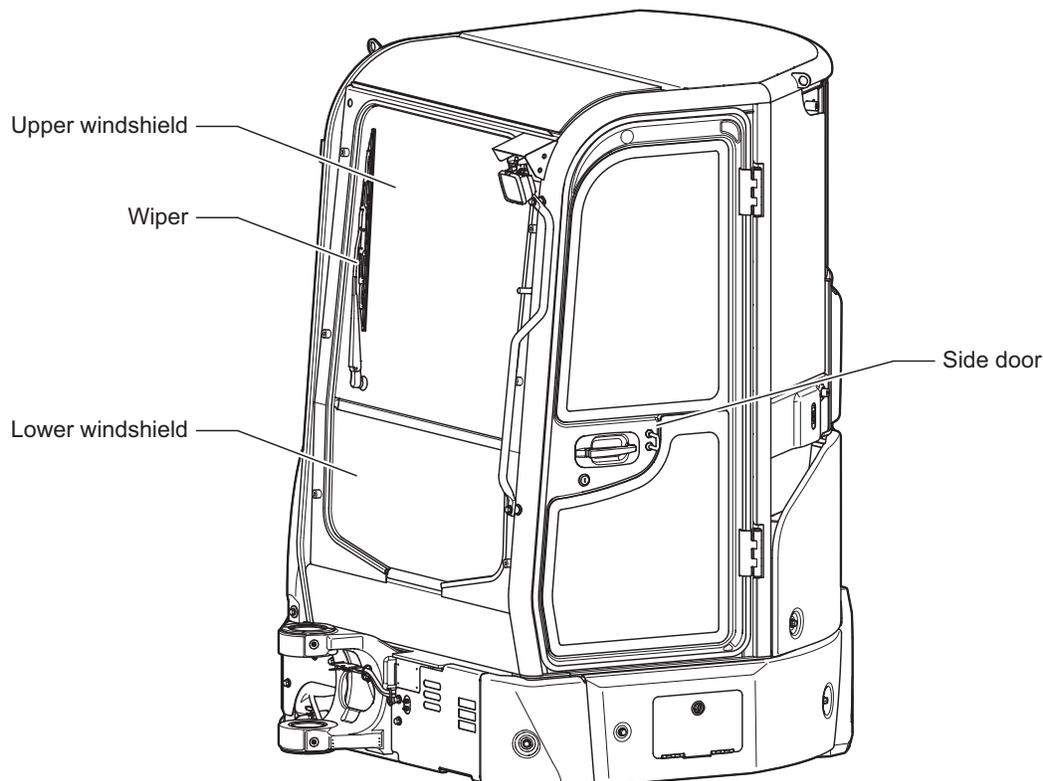


Fig. 2-74

160632-00EN

■ Opening the upper windshield

1. Hold the right and left knobs with the corresponding hands while sitting in the operator's seat and push the window lock lever downward to the arrowed direction to release the lock.

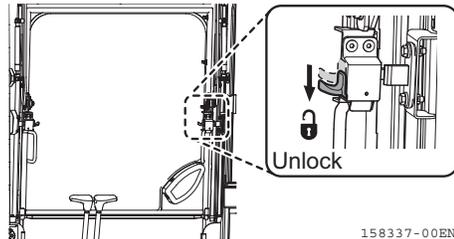


Fig. 2-75

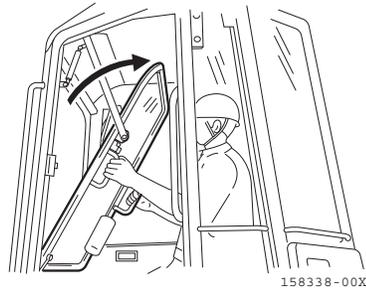


Fig. 2-76

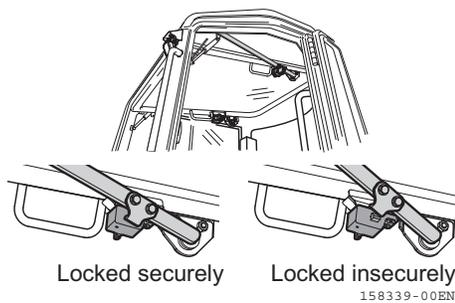


Fig. 2-77

2. After releasing the lock, slide the upper windshield up and backward while pulling it inward with both knobs, then lock the windshield securely by the locks on both the left and right sides of the windshield.

■ Closing the upper windshield

1. Hold the right and left knobs with the corresponding hands while sitting in the operator's seat and push the window lock lever in to release the lock.
2. After releasing the lock, hold the right and left knobs with the corresponding hands and slowly slide the upper windshield forward while pulling it downward.
3. Push the upper windshield forward with both knobs and secure it in place using the locks on both the left and right sides.

■ Opening and closing the lower windshield

⚠ CAUTION

Be sure to open and close the lower windshield while the upper windshield is open.

1. Hold the lower windshield with both hands to lift it up.
2. Lock the lower windshield securely by pressing it against the window locks in the storage area on the rear left in the cabin.
3. Push the upper side of each window lock to remove the windshield put in storage.

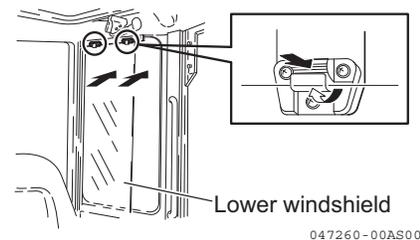


Fig. 2-78

Hammer for emergency escape from operator's cab (Cabin spec.)

If the door of the cabin should not open, hammer (Fig. 2-79, 1) is provided inside the cabin to escape from the operator's cab in an emergency.

The emergency exit is provided at the rear side of the cabin. However, break the adequate window for necessary escape.

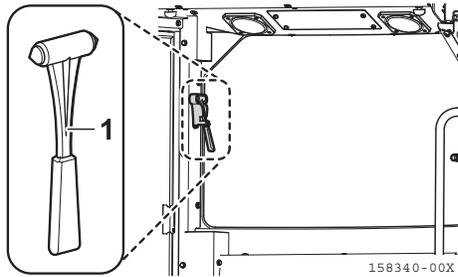


Fig. 2-79

Break the window glass with the hammer (Fig. 2-79, 1) to escape from the operator's cab.

IMPORTANT

- Remove the broken pieces of the window glass from the window frame to prevent any injury by those broken pieces.
- Watch your step not to slip on the broken pieces of the window glass which dropped around your feet.

Operator's seat

⚠ WARNING

- Be sure to adjust the seat slide to obtain the best operating position whenever you (or a new operator) starts operation.
- Do not place any foreign objects within the moving area of the operator's seat.
- Do not adjust the operator's seat while operating the machine.

Adjust the seat so that the operator can easily operate the control levers in good posture.

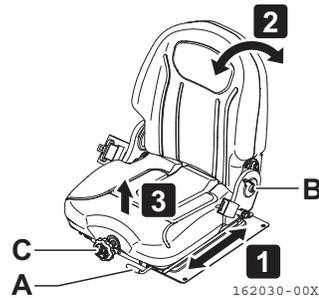


Fig. 2-80

1 Seat position control adjustment (forward and backward)

Pull the slide lever (Fig. 2-80, A) upward, to move the seat forward or backward. Adjust the seat to the best position for operating the control levers.

The adjustable amount of seat movement is 4.25 in. (108 mm).

2 Seat backrest control adjustment

Pull the lever (Fig. 2-80, B) upward to adjust the backrest to the desired position.

Adjust the backrest, keeping your back in contact with the backrest or pushing the backrest with your hand, to prevent the backrest from returning suddenly.

3 Weight adjustment

The weight adjustment dial (**Fig. 2-80, C**) is turned and it can adjust to the hardness of the bearing surface cushion with the operator's weight.

- Turn the weight adjuster dial (**Fig. 2-80, C**) clockwise the setting weight is increased.
- Turn the weight adjuster dial (**Fig. 2-80, C**) counterclockwise, the setting weight is decreased.

Headlight**⚠ WARNING**

The headlight gets hot when it is turned on. Do not touch it with your bare hand before it cools, to prevent burns.

Use to illuminate the lighting direction.

The light is located on the boom part, on the left front of the upperstructure for two-pole canopy type, on the left side of the canopy for the four-pole canopy type, and on the left side of the cabin for the cabin type.

Right window glass (Cabin spec.)

Open the right window glass in the arrowed direction.

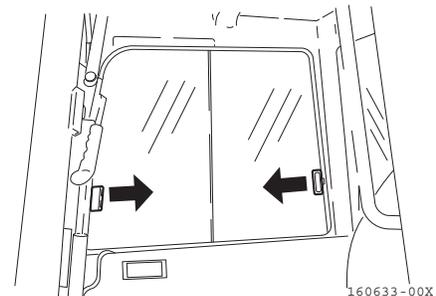


Fig. 2-81

Cabin side door (Cabin spec.)

Opening and closing the cabin side door

■ From outside

1. Insert the starter switch key into the key hole (**Fig. 2-82, 1**) and turn it counterclockwise (clockwise) to unlock the side door.
2. Pull the outer handle (**Fig. 2-82, 2**) to the side to open the side door.
3. Close the side door and turn the starter switch key clockwise (counterclockwise) to lock the side door.

■ From inside

1. Push the inner handle (**Fig. 2-82, 3**) forward to open the side door.

Door lock

The door lock is used to hold the side door open.

■ Lock the door

Push the side door into the lock section.

■ Unlock the door

Push down the lever (**Fig. 2-82, 4**) on the left side of the seat.

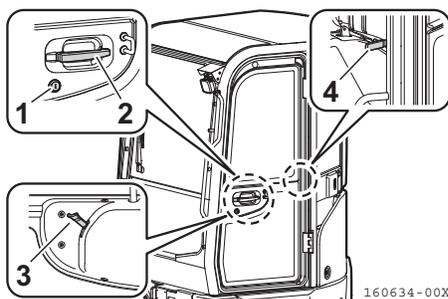


Fig. 2-82

Replenishment of windshield washer fluid (Cabin spec.)

The washer tank is located at the rear of the cabin.

If the washer fluid is insufficient, open the cabin rear cover, remove the cap (**Fig. 2-84, 2**) of the washer tank (**Fig. 2-84, 1**) and then add the washer fluid.

⚠ CAUTION

- When you fill the reservoir with windshield washer fluid, take care not to allow foreign matter to enter the reservoir.
- Determine the ratio of windshield washer fluid to water on the basis of the lowest past air temperature.

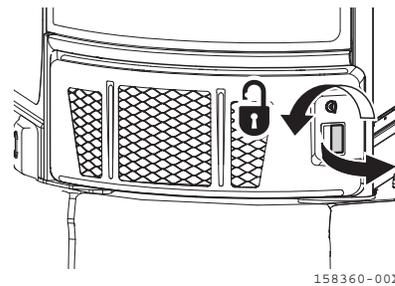


Fig. 2-83

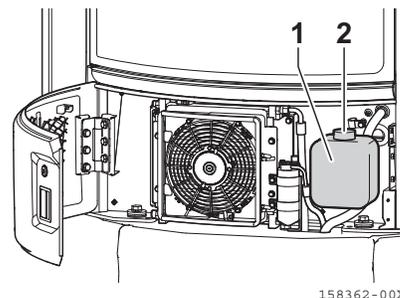


Fig. 2-84

Handling Air Conditioner (Cabin spec.)

Description of lever and switches for air conditioner

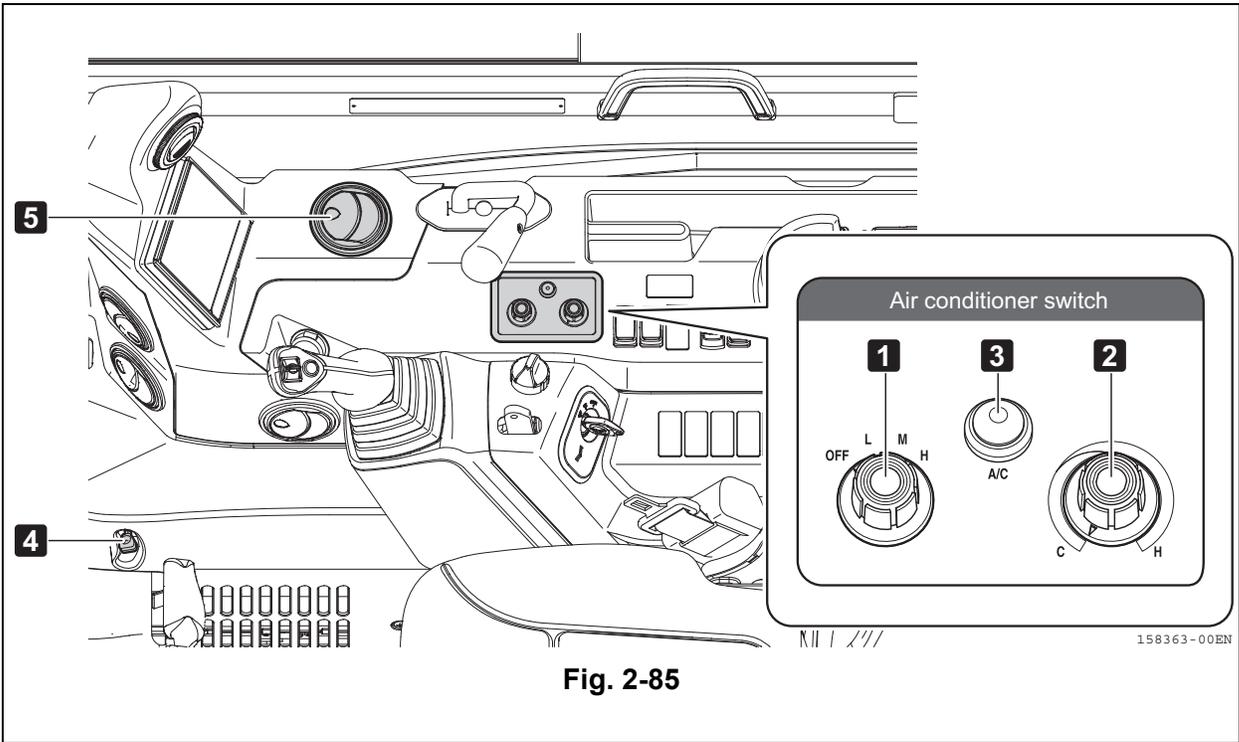


Fig. 2-85

1 Fan switch

Used to stop the fan or to switch the air volume.

- OFF : Stop
- L : Low
- M : Medium
- H : High

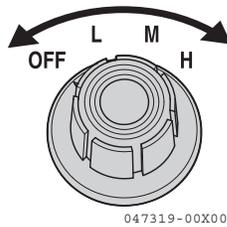


Fig. 2-86

2 Temperature control dial

Used to adjust the temperature of the blowing air.

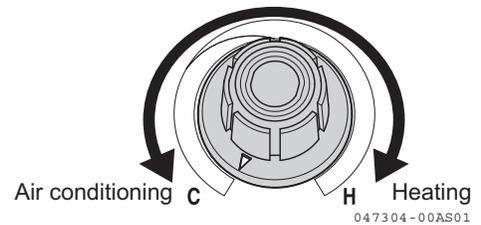


Fig. 2-87

3 Air conditioner switch

Used to turn the compressor ON or OFF.

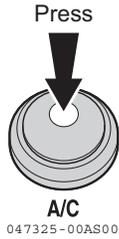


Fig. 2-88

-  The compressor is turned OFF.
(The lamp goes off.)
-  The compressor is turned ON.
(The lamp goes on.)

When the fan switch is in the OFF position, the lamp does not go on and the compressor does not work even if the air conditioner switch is turned ON.

4 Inner and outer air selector lever

● Outer air induction

Move the lever to the outer air induction mark position to induce the outer air to the cab. It is used when inducing the clean air from outside the cab or defogging the cab window.



Outer air induction mark

Fig. 2-89

● Inner air circulation

Move the lever to the inner air circulation mark position to circulate the air only in the cab. It is used when rapidly adjusting the temperature in the cab or the outer air is polluted.



Inner air induction mark

Fig. 2-90

5 Air outlet

The wind direction is adjusted by changing the grille direction.

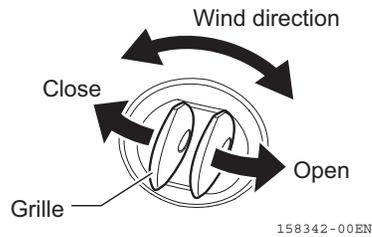


Fig. 2-91

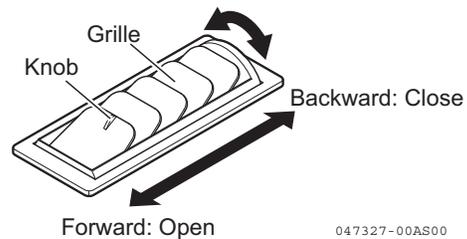


Fig. 2-92

How to use air conditioner

! CAUTION

- **The eyes might get sore from smoking when the air conditioner is being used in the cabin. Ventilate the cabin by opening the window slightly when smoking.**
- **Some mist might blow off with cooled air when the air conditioner is being used in the cabin. This occurs because the water particles in the wet air are frozen and blown out. It is not abnormal.**
- **When using the air conditioner after parking the machine in the hot weather, ventilate the cabin by opening the door and windows to let the hot air inside go out of the cabin so that the air-conditioning can work efficiently.**
- **Take care not to cool the inside of the cabin too long because it is not good for the operator's health. Control the air temperature properly.**
- **If the air conditioner blows no air, the air volume is too low or the cabin is not air conditioned well when the air conditioner is turned on, ask your dealer to check the air conditioner. If you keep using the air conditioner in such an abnormal state, it will cause damage to the fan motor or the compressor.**
- **Even in the seasons when the air conditioner is not used, operate the air conditioner for a few minutes once or twice every two or three weeks. That prevents the rotating parts such as the compressor from running out of oil, which prevents malfunction of the parts in turn.**

■ Air conditioning

1. Set the fan switch at any of the three levels (L, M or H).
2. Turn the temperature adjustment dial to the C position.
3. Turn the air conditioner switch ON.
4. When the room gets cold, use the temperature adjustment dial and the fan switch to adjust to the desired room temperature.
5. Adjust the air direction with the air outlet grille.

Note:

Set the fan switch for ventilation to apply pre-load to the inside of the cabin when the air conditioner is not used, so that no dust can come into the cabin easily during operation.

IMPORTANT

Be sure to turn on the air conditioner after starting the engine to prevent excessive force to the compressor etc.

■ Heating

1. Set the fan switch at any of the three levels (L, M or H).
2. Turn the temperature adjustment dial to the H position.
3. Turn the air conditioner switch OFF.

■ Heating for dehumidification

Used in the case that the window glass tends to get fogged in rainy weather in spring or autumn.

With the heating turned on, turn the air conditioner switch ON.

IMPORTANT

If the temperature inside the cabin is low, dehumidification might not work because the compressor does not operate even if the air conditioner switch is turned ON.

■ Stop

1. Turn the air conditioner switch OFF.
2. Turn the fan switch OFF.

Note:

The air conditioner also stops only by turning the fan switch OFF.

Fuse

⚠ CAUTION

- When replacing a fuse, be sure to turn off the power by turning the key to the OFF position.
- Using the wrong fuse or shorting out a fuse holder could damage the gauges, the electrical equipment and the wiring due to overheating.
- If a new fuse blows out immediately after replacement, there may be a problem with the electrical system. Ask your dealer for assistance.

■ The following two types of fuses are used in the electrical wiring circuit

Blade fuse

- Protect the electrical equipment from overcurrent which exceeds the allowable limit of the electrical equipment.
- Protect the wiring from overcurrent which exceeds the allowable limit of the wiring due to a problem with the electrical equipment.

Slow-blow fuse

- Protect the electrical equipment and the wiring from a burnout caused by overcurrent which flows in the circuit for large-capacity current when a problem occurs (such as short-circuit due to breaking of wire).

Position of the fuse

There are fuse boxes (Fig. 2-93, 1, 2) where the right hood is opened. A blade fuse is installed in fuse box 1 (Fig. 2-93, 1), and a slow-blow fuse is installed in fuse box 2 (Fig. 2-93, 2).

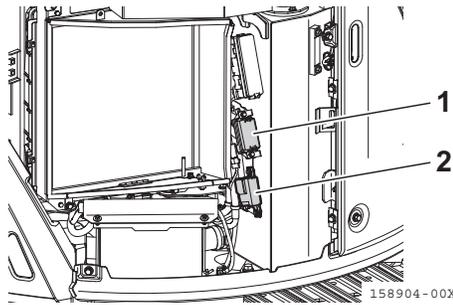


Fig. 2-93

Replacing the fuses

If the electrical equipment does not operate, the fuse may have been blown out. Follow the procedure below:

1. Turn the key to the "OFF" position and remove the - (negative) terminal of the battery.
2. Remove the fuse box cover and fuse inside.
3. If the fuse is blown out, replace it with a spare fuse of rated capacity.

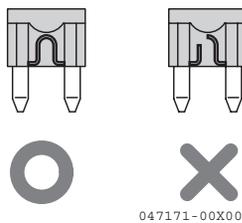


Fig. 2-94

Blade fuse

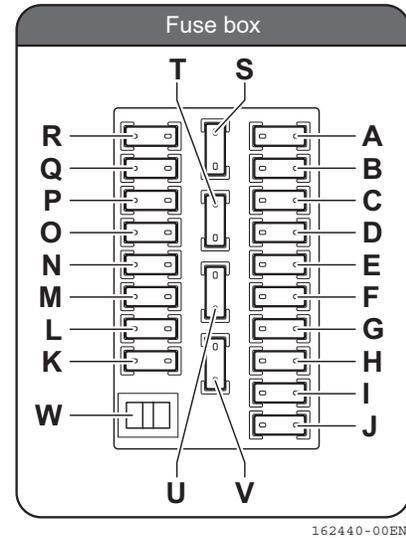


Fig. 2-95

Symbol	Fuse capacity (A)	Circuit name
A	20	A/C
B	20	Cabin-2
C	20	HYD
D	20	Work option
E	5	Security-1
F	5	Starter switch
G	-	-
H	20	A/C condenser
I	5	Cabin-1
J	10	Engine-1
K	10	Engine-2
L	5	Security-2
M	5	Alarm
N	5	LCD Monitor
O	1	Camera
P	10	Light
Q	-	-
R	20	Power Output
S	20	Spare
T	10	
U	5	
V	1	
W	-	Fuse Puller

■ Slow-blow fuse

If the starter does not operate even when the key is set to the “START” position, the slow blow fuse may have been blown.

When replacing a slow-blow fuse secured with a bolt, tighten the bolt to the specified torque after installing a new fuse.

- Tightening torques for bolts
M6: 3.6 to 4.4 ft•lbf (4.9 to 5.9 N•m)

Note:

When the slow-blow fuse is damaged, contact your dealer.

Handling of Rear View Monitor (Rear View Monitor spec.)

The rear view monitor is an auxiliary function for confirming the safety behind the excavator by using cameras to monitor the back of the upperstructure and displaying real-time images on the LCD monitor.

WARNING

- **The rear view monitor is an auxiliary function for confirming the safety behind the upperstructure. While operating the machine, make sure to check the safety of the surroundings directly.**
- **The reflected range and sense of distance may differ depending on the machine posture, the surrounding conditions, and the slope of the ground.**
- **Objects on the screen may be closer in reality than they appear on the screen.**
- **There are blind spots around the machine, and some areas are not displayed on the LCD monitor.**

Camera Image Display on LCD Monitor

■ Selecting the camera image display by operating the lock lever

- When the lock lever is in the lock position, the camera image is not displayed on the LCD monitor and the home screen is displayed.
- When the lock lever is set to the unlock position, the camera image is enlarged on the LCD monitor.

Note:

When the camera display settings is set to "Small screen", the camera image is not enlarged.

For the camera display settings, refer to "Setting the camera image display when lock lever is in the unlock position (Rear view monitor spec.)" on page 77.

Pressing any of the function switches during the magnified display of the camera image switches to the normal display. To change to the enlarged display again, return the lock lever to the lock position and then set it to the unlock position.

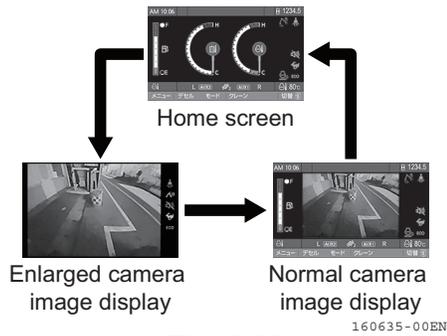


Fig. 2-96

Maintenance procedures

■ **Camera**

If the camera image is not clear, wipe off the camera lens.

Slightly dampen a soft cloth with clean water or a cleaner and clean the glass of the camera lens with the cloth.

IMPORTANT

Never use strong chemicals or abrasive cleaners.

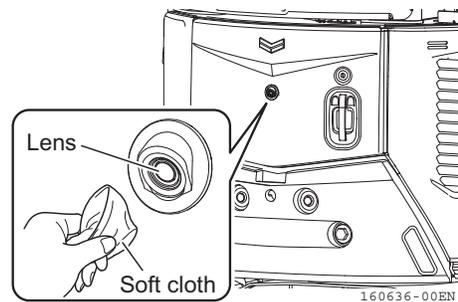


Fig. 2-97

3. Operating Instructions

Checking before starting the engine

⚠ WARNING

If there are any combustibles in any heat build-up areas, or if there are any fuel and/or oil leaks, a fire can result. Check for possible fire causes carefully. If there is anything abnormal, be sure to take corrective action or contact your local dealer.

Before starting the engine, visually check the outside and underside of the machine as follows: Check bolts and nuts for loose connections; check the fuel, oil, and water for leaks; and also check the implement and the hydraulic system to see that they are operating properly. In addition, check the electrical wiring for loose connections and for dust deposits in the heat build-up areas. Check the following points before initial start-up for the day.

Walking check (visual inspection) around the machine

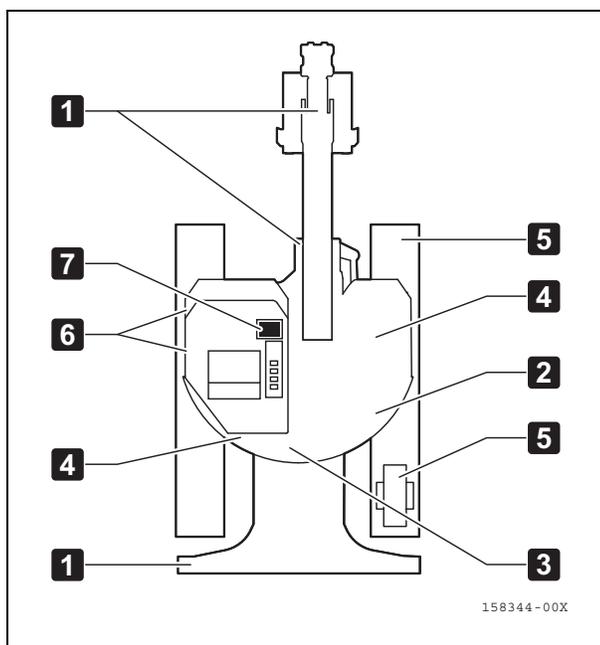


Fig. 3-1

1 Checking the implement, hydraulic cylinders, linkages, and hoses for damage, wear and loose connections

Check the implement, hydraulic cylinders, linkages, and hoses for damage, wear and loose connections. If any abnormality is found, take corrective action.

2 Removing dust deposits from around the engine, battery, and radiator

Check to confirm that there are no dust deposits or other combustibles around the engine, on the radiator, or in other heat build-up areas, such as the muffler. If there are any, remove them.

3 Checking the engine and its accessories for oil or water leakage

Check the engine for oil leakage and the cooling water system for water leakage. If oil or water leakage is found, take corrective action.

4 Checking the hydraulic system, hydraulic oil tank, hoses, and joints for oil leakage

Check for oil leakage. If oil leakage is found, take corrective action.

5 Checking the undercarriage (crawler, sprockets, and idlers) for breakage, wear, loose bolts, and oil leakage around the rollers

If any breakage or wear is found, correct it. Retighten the bolts if necessary.

If oil leakage is found, take corrective action.

6 Checking the handrails and steps for breakage and loose bolts

If any breakage is found, take corrective action. Retighten the bolts if necessary.

7 Checking the LCD monitor for breakage and loose bolts

Make sure the LCD monitor is not broken. If you find anything abnormal, contact your local dealer for repairs.

Checking before start-up

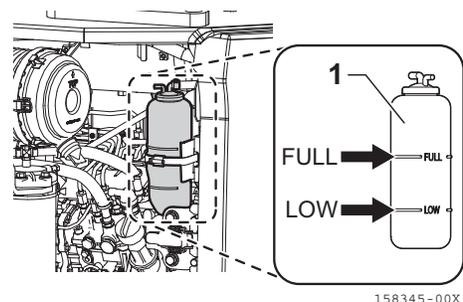
Check the following points before initial start-up for the day.

■ Checking and replenishing the cooling water**⚠ WARNING**

- Do not remove the fill cap from the radiator unless supplying the cooling water.
- Check the cooling water level in the sub-tank (Fig. 3-2, 1) when the engine is cool.

1. Open the rear hood. Then check that the cooling water level in the sub-tank (Fig. 3-2, 1) is between the FULL and LOW marks. If the water level is below the LOW mark, refill the sub-tank (Fig. 3-2, 1) up to the FULL mark through the water supply port of the sub-tank (Fig. 3-2, 1).

For the cooling water to be used, refer to Section "4. Fueling, Oiling and Greasing Based on Temperature Range" on page 194



158345-00X

Fig. 3-2

2. After replenishing, securely tighten the cap.

3. If the sub-tank (**Fig. 3-2, 1**) is empty, check it for water leakage, and then, check the water level in the radiator.

If the water level is low, refill the radiator first, then refill the sub-tank (**Fig. 3-2, 1**).

For refilling the radiator, refer to "Replacing the engine cooling water" on page 230.

4. If the cooling water level is appropriate, close the rear hood.

■ Checking and draining the water separator

⚠ WARNING

- Keep sparks flames and lit cigarettes away.
- Only after the engine has cooled down sufficiently, check and maintain the water separator.
- Fuel leaked or spilled onto hot surface or electrical components could cause a fire.

Things to prepare

- Container for fuel waste

1. Open the rear hood.
2. Check the water separator (**Fig. 3-3, 1**) to see whether the float (red ring) (**Fig. 3-4, 2**) has sunk down to the cup (**Fig. 3-4, 3**) bottom and a contamination has not mixed into the oil.

If the float (**Fig. 3-4, 2**) has sunk down to the cup (**Fig. 3-4, 3**) bottom, no water has mixed into the oil; if the float (**Fig. 3-4, 2**) is floating in the cup (**Fig. 3-4, 3**), water is mixed into the oil under the float (**Fig. 3-4, 2**).

If the water or the contamination is found in the cup (**Fig. 3-4, 3**), remove it as the procedure below.

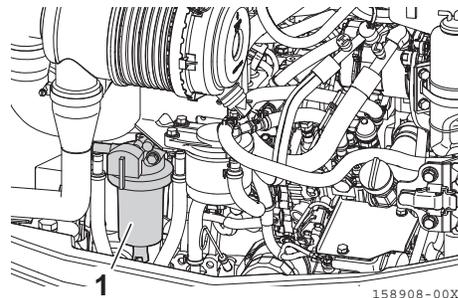


Fig. 3-3

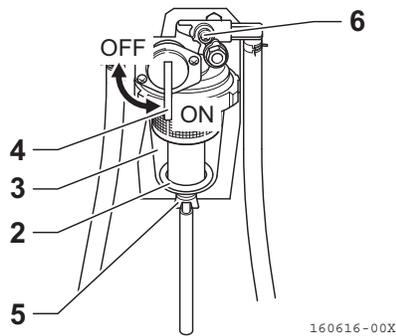


Fig. 3-4

3. Turn the fuel cock (**Fig. 3-4, 4**) to the OFF position.
 4. Place a container receiving fuel under the hose from the drain cock (**Fig. 3-4, 5**).
 5. Loosen the drain cock (**Fig. 3-4, 5**) about 4 turns, and drain the water and contamination.
If no water drips when the water separator drain cock (**Fig. 3-4, 5**) is opened, loosen the air bleeder bolt (**Fig. 3-4, 6**) on the top of the water separator by using a screwdriver to turn it counterclockwise 2 to 3 turns. After draining the water separator, be sure to tighten the air bleeder bolt (**Fig. 3-4, 6**).
- Tightening torque:
1.1 to 1.5 ft•lbf (1.5 to 2.0 N•m)
6. Hand-tighten the drain cock (**Fig. 3-4, 5**).
 7. Wipe off fuel and water adhering to the hose of the drain cock (**Fig. 3-4, 5**).
 8. Turn the fuel cock (**Fig. 3-4, 4**) to the ON position.
 9. After draining, release the air.
(Refer to page 223)
 10. Check the fuel leak.
 11. Close the rear hood.

■ Checking and replenishing the engine oil

⚠ WARNING

Immediately after stopping the engine, the engine oil, dipstick and its surroundings are very hot, and there is a risk of burns. Wait until the engine is cooled down before starting any work.

1. Open the rear hood and securely lock it in that position with the stopper rod.
2. Pick up the dipstick (**Fig. 3-5, G**) and wipe it with a rag to remove oil deposits.

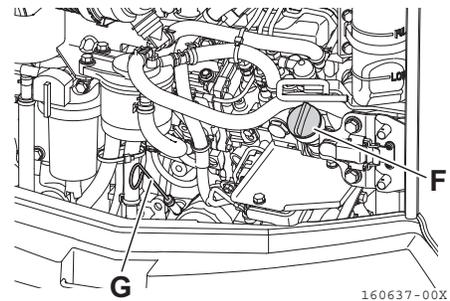


Fig. 3-5

3. Fully insert the dipstick (**Fig. 3-5, G**) into the dipstick tube, then draw it out.
4. If the dipstick (**Fig. 3-5, G**) is wet above the midpoint between the H and L marks, the engine oil level is appropriate.

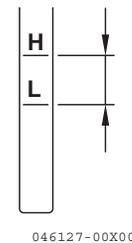


Fig. 3-6

- If the engine oil level is below the mid-point between the H and L marks

1-Open the supply port cap (Fig. 3-5, F).

2-Add engine oil through the oil supply port.

Refer to "Fueling, Oiling and Greasing Based on Temperature Range" on page 194.

3-Close the supply port cap (Fig. 3-5, F).

- If the engine oil level is above the H mark

1-Remove the bottom cover (Fig. 3-7, 1) of the upperstructure.

2-Remove the drain plug (Fig. 3-7, P) and drain the excessive amount of engine oil.

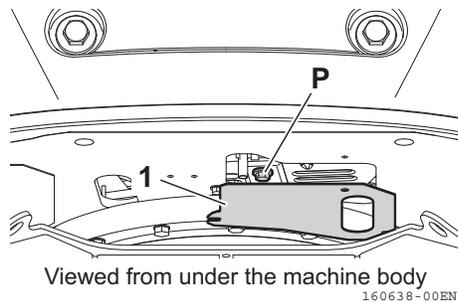


Fig. 3-7

3-Tighten the drain plug (Fig. 3-7, P).

4-Check the engine oil level again.

5. Insert the dipstick (Fig. 3-5, G) as original.

6. Fully close the supply port cap, and close the rear hood.

Note:

When checking the engine oil level after starting up the engine, stop the engine and allow more than 15 minutes for the engine to cool down.

If the machine is slanted, reposition the machine to ensure it is level before checking the engine oil level.

Keep in mind that the excess engine oil must not be disposed of on the ground or the road.

■ Checking and replenishing the fuel in the fuel tank

⚠ WARNING

Be careful not to overfill the fuel tank because it could cause a fire. If the tank is overfilled, completely wipe off the spilled fuel.

⚠ CAUTION

- Do not remove the strainer from the fuel supply port of the fuel tank when supplying fuel.
- Be careful not to allow any water that may be in the fuel container or dirt on the refueling equipment to enter the fuel tank.

1. When checking the fuel oil level, turn the key to the "ON" position and check the fuel meter on the LCD monitor.

LCD monitor operation: Refer to page 64.

Fuel tank capacity: 11.6 Gals. (44 L)

2. When the fuel meter pointer indicates close to E (empty), refill fuel soon.

If the message Fig. 3-8 is displayed on the LCD monitor, immediately refill fuel. At that time, approximately 2.4 Gals. (9 L) of fuel is left in the tank.



Fig. 3-8

3. Open the front cover (right) and then supply port cap (**Fig. 3-9, F**), and supply fuel to the fuel supply port.
4. After supplying fuel, fully close the supply port cap (**Fig. 3-9, F**) and close the front cover (right).

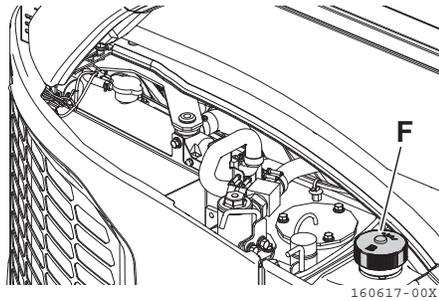


Fig. 3-9

Note:

*Clogging the breather (**Fig. 3-10, 1**) of fuel supply port cap (**Fig. 3-9, F**) may cause the pressure in the fuel tank to decrease, resulting in stoppage of fuel supply to the engine. If the fuel supply port cap is contaminated, clean the cap.*

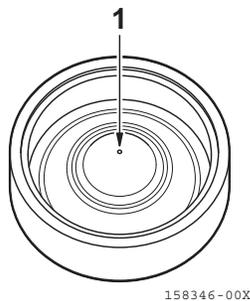


Fig. 3-10

■ Checking and replenishing the hydraulic oil tank

⚠ WARNING

When removing the plug of the oil supply port, slowly loosen it to gradually relieve the internal pressure in the tank, or oil may spurt from the tank.

1. Retract the arm and bucket cylinders and lower the boom until the bucket teeth and blade contact the ground, and stop the engine.

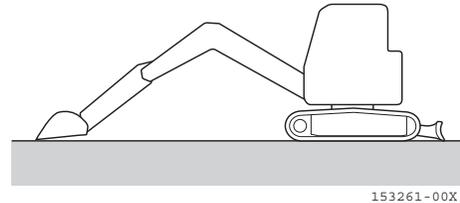


Fig. 3-11

2. Check the oil level by reading the oil level gauge (**Fig. 3-12, 1**). When the ball inside the gauge is located 0.39 in. (10 mm) above the midpoint between the upper and lower limit marks, the oil level is appropriate.

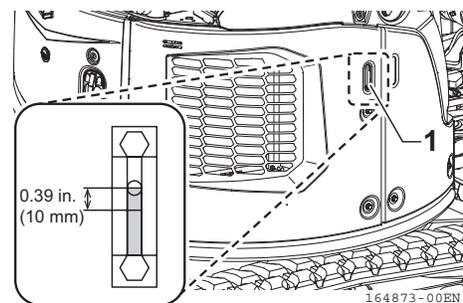


Fig. 3-12

3. If the ball is located below the midpoint, open the front cover (right) and then the supply port cap (**Fig. 3-13, F**), and refill the hydraulic oil.

For the quality of the oil to be used, refer to "Fueling, Oiling and Greasing Based on Temperature Range" on page 194.

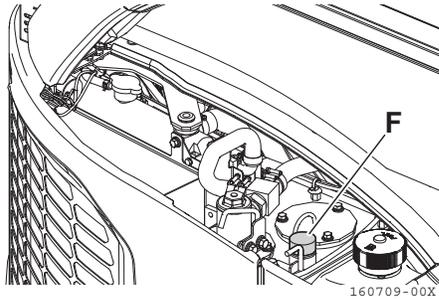


Fig. 3-13

Note:

Note that the oil level varies with the oil temperature.

When reading the oil level, follow these guidelines:

- *Appropriate level: Around 0.39 in. (10 mm) above the midpoint of the level gauge [oil temperature: 50 to 86 °F (10 to 30 °C)].*
- *During normal operation, the oil level gauge should read at the upper limit mark of the gauge scale [oil temperature: 122 to 176 °F (50 to 80 °C)]*

IMPORTANT

At the oil temperature of 50 to 86 °F (10 to 30 °C), do not refill more than the upper limit of the oil level gauge. An excessive amount of hydraulic oil may damage the hydraulic system by placing stress on its components, causing a dangerous high-pressure leak.

4. Clean the threaded section of the supply port cap, and check the O-ring. If any flaw is found on the O-ring, replace it with a new one.
O-ring (Part number: 24311-000380)
5. Close the supply port cap and then the front cover (right).

■ **Checking the fan belt tension**

For the checking the fan belt tension, refer to "Checking and adjusting the fan belt and air conditioner belt" on page 220.

■ **Checking and replenishing the battery electrolyte**

⚠ DANGER

- **The battery generates flammable gas and can cause a fire and an explosion. Keep sparks, flames and lit cigarettes away from the battery.**
- **Battery electrolyte is strong acid. To avoid serious injury, do not allow the electrolyte to contact your skin or splash into your eyes.**
- **Always wear safety goggles and protective clothing, when adding electrolyte.**
- **Do not use the machine with the battery which is short of battery electrolyte. The shortage of battery electrolyte not only will reduce the life of the battery but also could cause an explosion.**

1. Open the rear hood and the right hood, then lock it with the stopper.
2. Check the electrolyte level of the battery (**Fig. 3-14, 1**).
The level must be between the upper and lower limit marks.
If the level is lower than the lower limit mark, loosen the bolt (**Fig. 3-14, 2**), open the battery cover (**Fig. 3-14, 3**), and fix it

with stopper. Then, open the battery cap (Fig. 3-14, 4) and replenish the electrolyte.
3. Close the battery cover (Fig. 3-14, 3) and fix it with the bolt (Fig. 3-14, 2), then close the hoods.

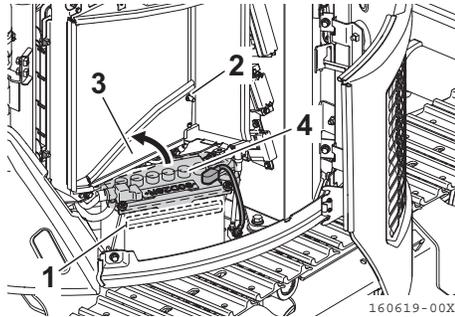


Fig. 3-14

■ **Greasing**

IMPORTANT

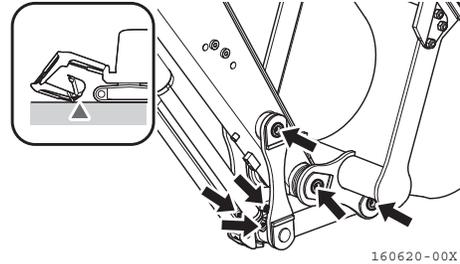
Grease the fittings thoroughly after washing the machine or after operation in rain, on soft ground, or in muddy water.

1. Put the bucket and the blade on the ground and stop the engine.
2. Clean the grease nipples indicated by arrows and grease them with a grease gun.
3. After greasing, wipe off any excess that remains.

Note:

For the greasing points around the bucket link in the case of quick coupler spec., refer to "Handling quick coupler" on page 141.

Around bucket link

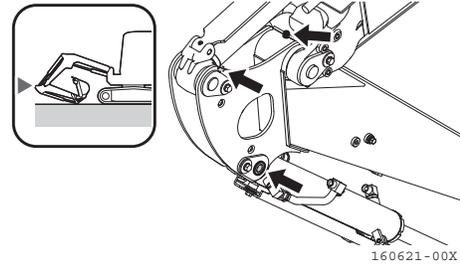


160620-00X

Bucket cylinder bottom pin

Arm cylinder rod pin

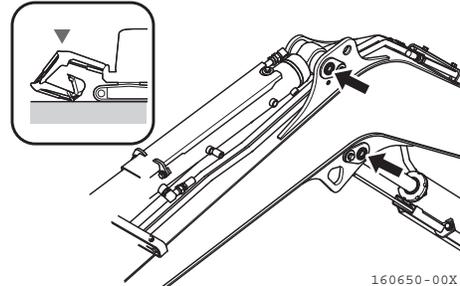
Arm pivot pin



160621-00X

Arm cylinder bottom pin

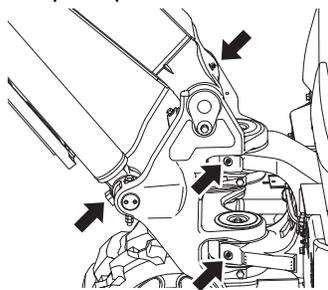
Boom cylinder rod pin



160650-00X

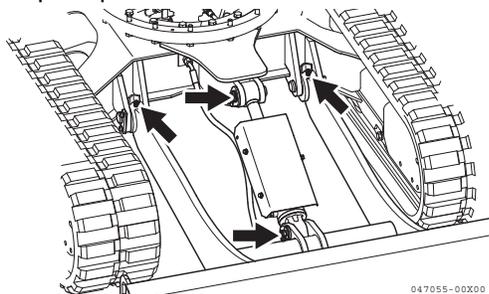
Fig. 3-15

Boom cylinder bottom pin
 Boom pivot pin
 Boom bracket pivot pin



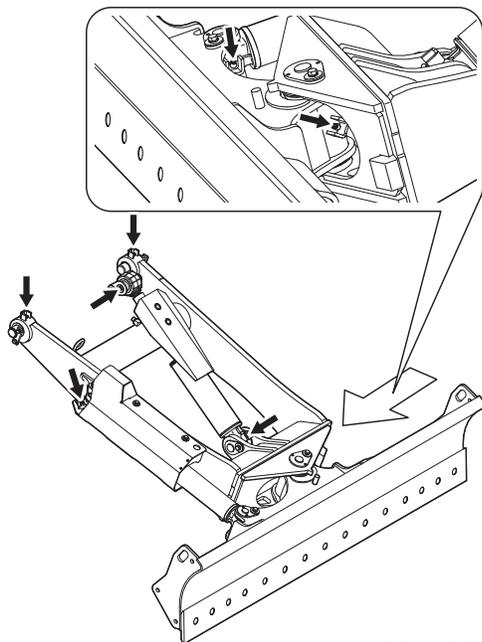
160640-00X

Swing cylinder rod pin
 Blade cylinder rod pin
 Blade cylinder bottom pin
 Blade pivot pin



047055-00X00

Angle blade (Angle blade spec.)



026411-01X00

Fig. 3-16

■ Checking the electrical equipment

⚠ CAUTION
If a fuse blows out frequently, contact your dealer for assistance.

Check fuses for damage, wiring for poor connections or short circuits, and battery terminals for corrosion or loose fits. Take corrective action.

Check the following items after the key is turned to the "ON" position.

- **Check the monitor functions.**
 Check the functions of LCD monitor (hour meter, water temp. meter and fuel meter).
- **Check the camera image indication.**
(Rear view monitor spec.)
 Make sure that the camera image is displayed on the LCD monitor, and if the camera image is not displayed properly, contact your local dealer for repairs.
- **Check that all switches function correctly and all lamps light correctly.**
 - Check the work lights.
 - Check the horn.
 - Check the auto deceleration function.
 - Check the operation mode function.
 - Check the wiper function. (Cabin spec.)
 - Check the room lamp for lighting. (Cabin spec.)
 - Check the air conditioner function. (Cabin spec.)
- **Check the travel alarm function.**
 - To check the travel alarm function, push or pull the travel levers after the lock lever have been unlocked.

Operating and checking instructions before starting up the engine

⚠ WARNING

- **Accidentally operating a control lever can cause the machine to move suddenly, possibly causing a serious accident.**
- **When leaving the operator's seat, be sure to place the lock lever securely in the lock position.**

1. Check that the lock lever is in the lock position.

Note:

When the lock lever is in the unlock position, the engine cannot be started. To start the engine, ensure to set the lock lever to the lock position.

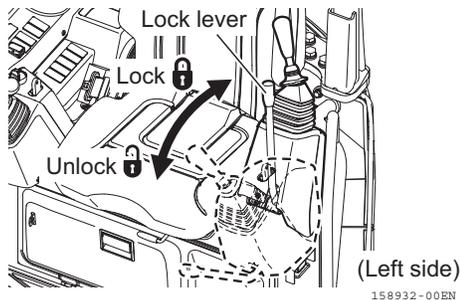


Fig. 3-17

2. Check that the control levers and control pedals are at the neutral position.
3. Fasten the seatbelt snugly.

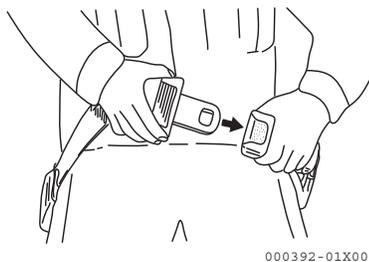


Fig. 3-18

4. Insert the key into the starter switch and set it to the "ON" position. Then check the following points:

The warning buzzer sounds and the opening screen appears on the LCD monitor. If nothing is displayed on the LCD monitor, or the warning buzzer does not sound, an error in the circuit is suspected. Ask your dealer to repair.

Starting up the engine

⚠ WARNING

- First check that there are no people or obstacles around the machine. Then sound the horn and start the engine.
- Be sure that you are seated on the operator's seat when starting the engine.
- When starting the engine in an enclosed place, be sure that there is adequate ventilation so that the exhaust gases can escape.

Normal start-up

1. Turn the engine control dial to around the midpoint.
2. Set the starter switch key in the starter switch to the "START" position. The engine will start.
3. After the engine has started, release the starter switch key. The starter switch key will return to the "ON" position by itself.

Note:

- Turning the key rapidly from "OFF" to "START" position may cause a slow operation when starting the engine.
- When the engine is warm, the engine can start up even if the accelerator lever is left in the "Low idle" position.

IMPORTANT

To protect the starter motor and the battery:

- Do not keep the key in the "START" position for more than 10 seconds.
- If the engine fails to start, do not attempt to start the engine immediately again, but set the key to the "OFF" position and wait for approximately 30 seconds, then start the engine again.

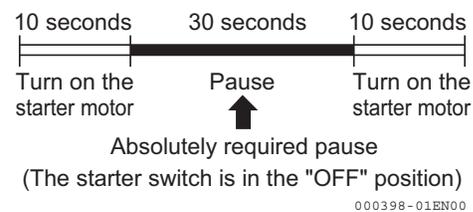


Fig. 3-19

Starting the engine in cold weather

To start the engine when the outside air temperature is low, follow the steps below:

1. Turn the engine control dial to around the midpoint.
2. Turn the key in the starter switch to the "ON" position and hold it in the position. The LCD monitor shows the screen indicating that the glow plug is operating. When the engine is warmed up, the screen changes to the home screen. After confirming that the home screen is displayed, start the engine.



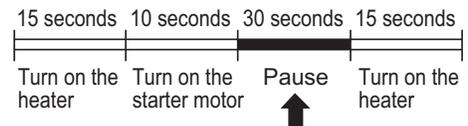
Fig. 3-20

3. Turn the starter switch key in the starter switch to the "START" position to start the engine.
4. After the engine has started, release the starter switch key. The starter switch key will return to the "ON" position by itself.
5. When the engine speed has increased, turn the engine control dial fully to the left to set the engine speed to low idle.

IMPORTANT

To protect the starter motor and the battery:

- Do not keep the key in the "START" position for more than 10 seconds.
- If the engine fails to start, do not start the engine immediately again, but set the key to the "OFF" position and wait for approximately 30 seconds, then start the engine again.
- Traveling or operating the machine without adequate warming in cold weather may adversely affect the machine performance.



Absolutely required pause

000402-01EN00

Fig. 3-21

Operating and checking instructions after starting the engine

WARNING

- **Emergency stop.**
If abnormal operation occurs, turn the key to the "OFF" position, to shut off the electrical system and the engine. Then ask your dealer to check the machine.
- **Be sure to warm up the engine. If you operate the implement without full warm-up, the machine may not respond or operate properly, especially in cold weather.**

IMPORTANT

- **The proper hydraulic oil temperature is between 122 °F and 176 °F (50 °C and 80 °C).**
If you have to operate the machine at a low hydraulic oil temperature, increase the hydraulic oil temperature to about 68 °F (20 °C) before operating the implement.
- **In the event that you have to operate any control lever at a temperature lower than 68 °F (20 °C), operate it gently.**
- **Do not accelerate the engine rapidly until the engine warms up.**

After starting the engine, do not start operating the machine immediately but follow this procedure:

1. Check that no warning is displayed in the warning display area on the LCD monitor, and that the engine oil pressure icon and battery charge icon are not displayed in the LED indicator.

2. Turn the engine control dial to the midpoint between the Low idle and High idle position, and run the engine with no load at medium speed for approximately five minutes.
3. Unlock the lock lever, and lift the bucket from the ground.
4. Operate the bucket and arm control levers slowly to move the bucket and arm cylinders to their stroke ends.
5. Operate the bucket for 30 seconds and the arm for 30 seconds alternately for approximately five minutes.

Warm up the engine until the hydraulic oil temperature reaches or exceeds 122 °F (50 °C) (approx. 1/4 of the hydraulic oil temperature gauge display).

IMPORTANT

When moving the implement, be careful not to bump it against the machine or the ground.

6. Check the exhaust gas color, the machine noise, and the vibration level for abnormality. If something is abnormal, take corrective action.

Note:

White smoke may be emitted from the exhaust pipe due to water vapor accumulation shortly after the engine starts but will normally disappear once the engine has warmed up.

7. Set the lock lever to the lock position to confirm that the implement cannot be operated and the upperstructure cannot be swung with the left and right control levers.
8. Unlock the lock lever and operate the control levers to check that the implement can be operated and the upperstructure can be swung normally. If something is abnormal, take corrective action.

9. While swinging, return the implement control lever to the neutral to check that the swing brake operates normally. If something is abnormal, take corrective action.
10. Check that no abnormal noise is heard from the hydraulic equipment. If any abnormal noise is heard, take corrective action.

Ask your dealer to resolve any problems identified in steps **1** to **10** above.

Starting and stopping the machine

Forward/backward/stop

WARNING

- **Always check the position of the blade before operating the travel levers and pedals.**
When the blade is in the rear, the travel levers and pedals operate in reverse of normal operation.
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Clear all people from the working area.**
- **Sound the horn before beginning travel, to alert the people near the machine.**
- **Clear obstacles from the path of the machine.**
- **Do not operate the travel levers rapidly while the engine is running at high speed. Otherwise, the machine may start suddenly, causing a serious accident. Operate the travel levers slowly.**

CAUTION

- **Check the current travel mode before starting a traveling operation.**
- **Do not stop the machine suddenly, but try to stop with a safety margin.**

1. Turn the engine control dial fully to the right to increase the engine speed.
2. Unlock the lock lever, and retract the implement to raise it 16 to 20 in. (40 to 50 cm) above the ground.

3. Operate the blade lever (Fig. 3-22, 1) to raise the blade.

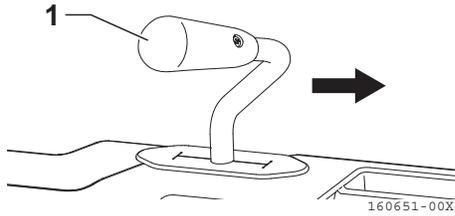


Fig. 3-22

4. Operate the left and right travel levers or pedals as follows:

- When the blade is in the front of the machine:

Operating the travel lever or travel pedal forward moves the machine forward, and operating backward moves the machine backward.

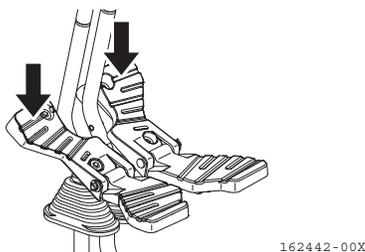
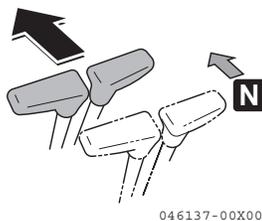


Fig. 3-23

- When the blade is in the rear of the machine:

Operating the travel lever or travel pedal backward moves the machine forward, and operating forward moves the machine backward.

5. Returning the travel lever or travel pedal to the neutral position stops traveling.

Steering

Steering (turning the machine)

⚠ WARNING

Always check the position of the blade before operating the travel levers.

When the blade is in the rear, the travel levers operate in reverse of normal operation.

Do not use the travel pedals to steer the machine, or the machine may not be controlled expectedly, causing a serious accident.

To steer the machine, operate the travel levers only.

Do not turn the machine too sharply. Before spin-turning, always stop the machine first. Operate the two travel levers as follows:

■ Steering the machine when it is not traveling

To turn left, push the right travel lever forward and start traveling forward to the left. Pull the right travel lever back and start traveling in reverse to the left.

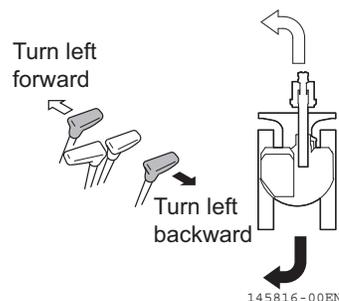


Fig. 3-24

Note:

To turn right, operate the left travel lever in the same manner as above.

■ **Steering the machine while traveling
(the left and right travel levers are
both tilted in the same direction)**

To turn left, return the left travel lever to the neutral position.

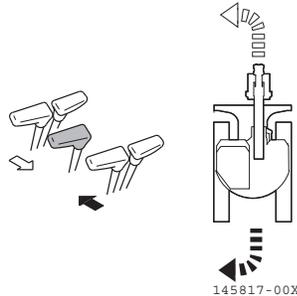


Fig. 3-25

Note:

To turn right, return the right travel lever to the neutral position.

■ **Spin-turning the machine when it is
not traveling**

To spin-turn left, push the right travel lever forward while pulling the left travel lever back.

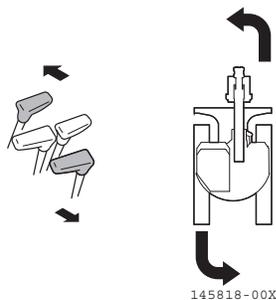


Fig. 3-26

Note:

To spin-turn right, push the left travel lever forward while pulling the right travel lever back.

Swinging the upperstructure

⚠ WARNING

- Before swinging, make sure that there are no people or obstacles within the swing range of the implement or the machine tail.
- Check the operating pattern of the machine before operation. In this section, the standard operation method (ISO pattern) is used.

Operating the left implement control lever to the right or left makes the upper implement swing.

Returning the left implement control lever to the neutral activates the swing brake to stop swinging.

Operating the implement

⚠ WARNING

- Check the area around the machine for safety and sound the horn before beginning to operate the machine.
- Check the operating pattern of the machine before operation. In this section, the standard operation method (ISO pattern) is used.

Operate the machine using the right and left control levers, the boom swing pedal and the blade lever.

- Control lever (L): Operates arm and upperstructure swing.
- Control lever (R): Operates boom and bucket.
- Boom swing pedal: Operates boom swing.
- Blade lever: Operates blade.

The relationships between the operation of the control levers, the boom swing pedal and the movement of the implement are shown in the illustrations on **Fig. 3-27**.

On releasing the control levers and the boom swing pedal, they will return to their neutral positions and the implement will stop moving.

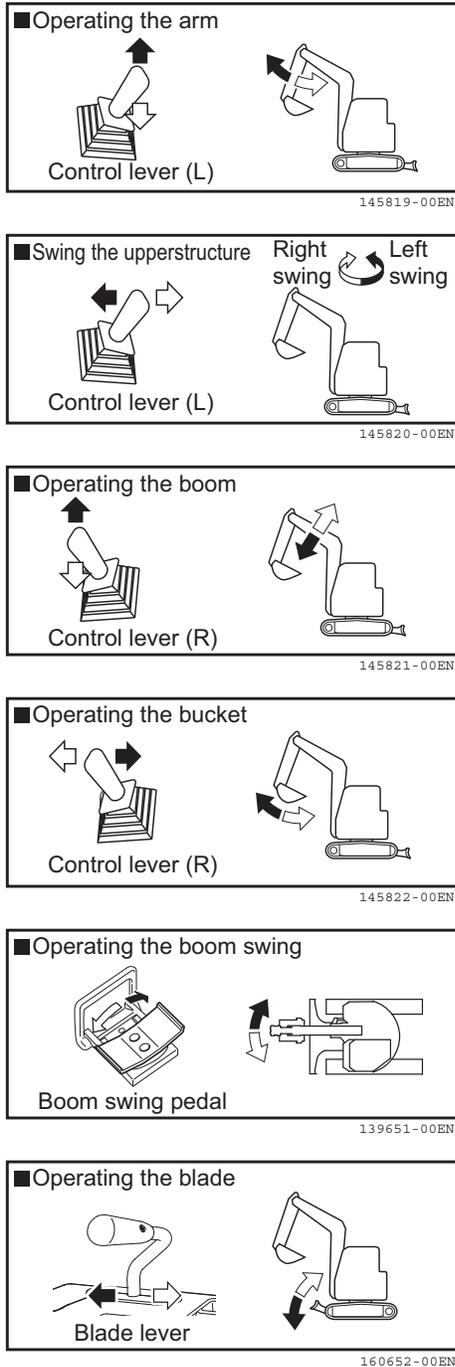


Fig. 3-27

With Operating pattern change valve

■ 2-way pattern change valve

⚠ WARNING

- Check the area around the machine for safety and sound the horn before beginning to operate the machine.
- To prevent accidental injury, never operate Excavator before confirming location of pattern change lever.
- When changing the machine's operating pattern, stop the engine and make sure the lock lever is in the lock position before changing the operating pattern.

According to the switching of pattern change lever, control lever operation can be chosen in two patterns.

For operating the pattern change valve, refer to Section "Operating pattern change valve" on page 93.

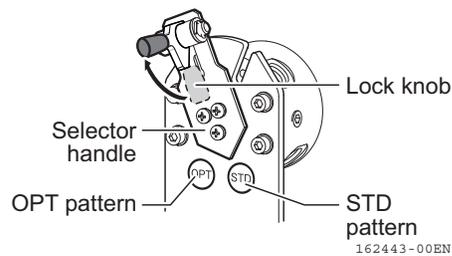


Fig. 3-28

<OPT: JOHN DEERE Pattern>

- Control lever (L): Operates boom and upper-structure swing.
- Control lever (R): Operates arm and bucket.
- Boom swing pedal: Operates boom swing.
- Blade lever: Operates blade.

The relationships between the operation of the control levers, the boom swing pedal and the movement of the implement are shown in the illustrations on **Fig. 3-29**.

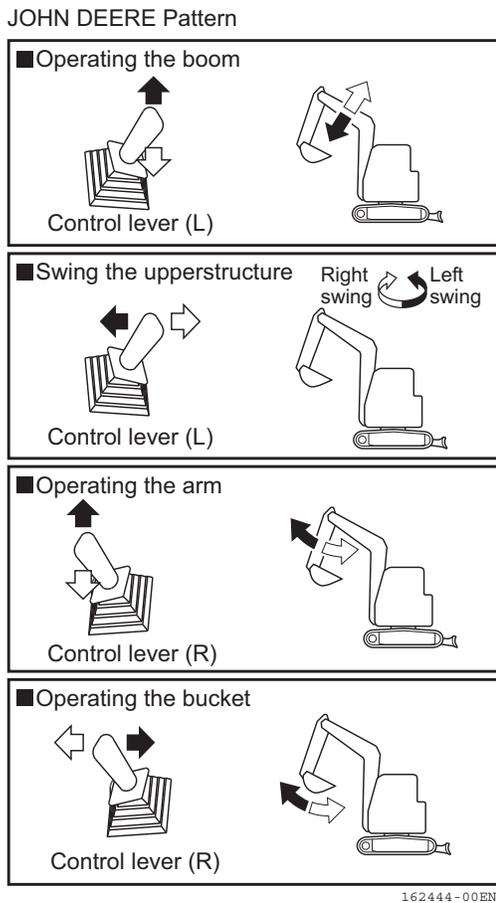


Fig. 3-29

Precautions for operating the implement

⚠ WARNING

- Do not operate the implement control levers while traveling. Stop traveling first and then operate the implement.
- Do not operate the implement on any rocky surface.

■ Do not use the implement's swing force

Do not level the ground or break down a wall by the use of swing force, and do not dig the bucket teeth into the ground while swinging. Doing these may cause the implement to be damaged.

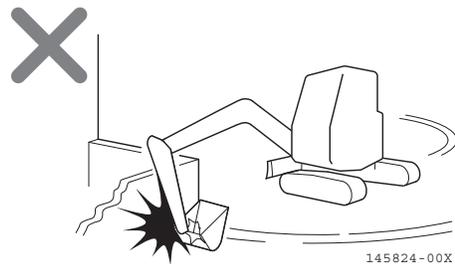


Fig. 3-30

■ Do not use the implement's travel force

Do not excavate the ground by the use of travel force with the bucket teeth in contact with the ground. Doing this may cause excessive force to be imposed on the rear of the machine, shortening the machine life.

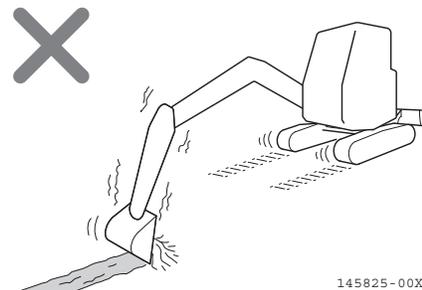


Fig. 3-31

Take care not to operate the hydraulic cylinder to the stroke end

Operating the hydraulic cylinder to the stroke end may impose an undue force on the stopper in the hydraulic cylinder, shortening the implement life. Operate with a small safety margin.

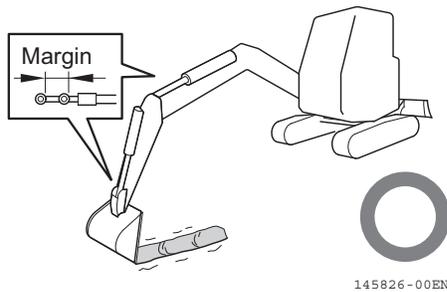


Fig. 3-32

Do not operate the implement by the using the dropping force of the bucket

Do not excavate the ground by using the dropping force of the bucket as a pickaxe or pile driver. Doing this may cause excessive force to be imposed on the rear of the machine, shortening the machine life and possibly causing a serious accident.

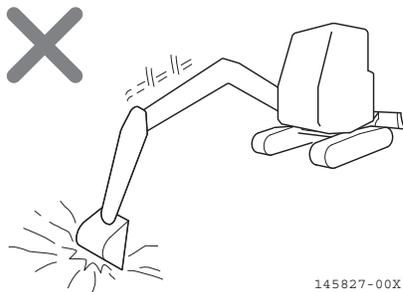


Fig. 3-33

Do not operate the implement by using the dropping force of the machine

Do not excavate the ground by using the dropping force of the machine.

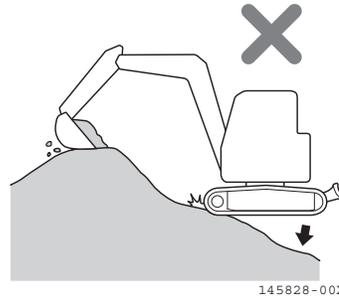


Fig. 3-34

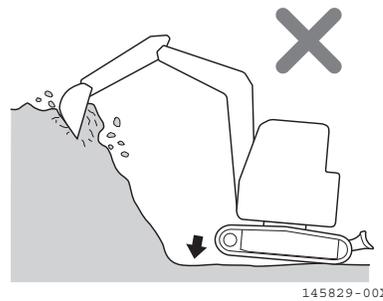


Fig. 3-35

Excavating a hard rock

It is recommended that a hard rock first be broken into small pieces by other means. Doing so will prevent damage to the machine and will increase economic efficiency.

Do not bump the blade against a large rock or boulder

Never bump the blade against a large rock or boulder. Doing so may cause the blade or the hydraulic cylinder to be damaged.

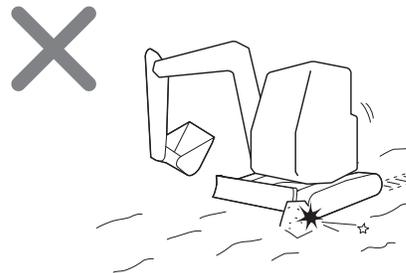


Fig. 3-36

■ **Be careful when retracting the implement**

When retracting the implement for travel or transport, be careful that the bucket and the blade never bump against each other.

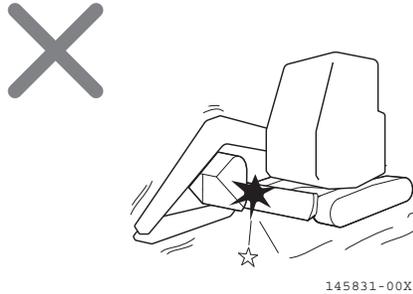


Fig. 3-37

■ **Support the blade on both sides**

When you use the blade as an outrigger, support the blade on both sides.

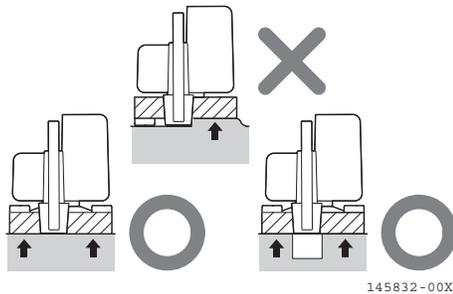


Fig. 3-38

■ **Be careful not to bump the blade when excavating**

When excavating the ground with the blade in front, never let the blade bump against the boom cylinder. Place the blade in the rear, when it is not being used.

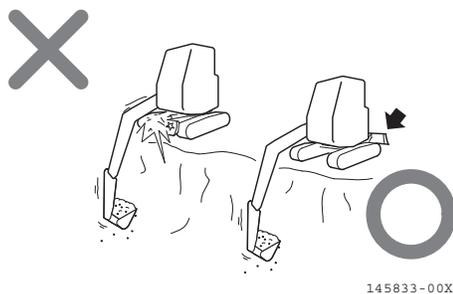


Fig. 3-39

Precautions for working

■ **Precautions for traveling**

Driving over a stone or a stump subjects the machine (especially undercarriage) to a shock, which may cause damage to the machine. Avoid such obstacles by driving around them, or removing them.

If driving over them is unavoidable, reduce speed, hold the implement close to the ground, and drive over the obstacles with the center of the track shoes.

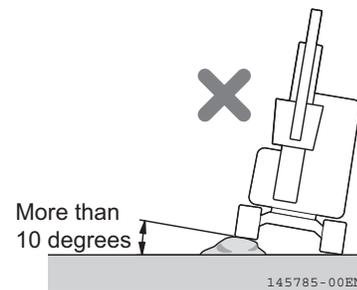


Fig. 3-40

■ Allowable water depth

IMPORTANT

When driving out of water, if the machine climbs a slope at an angle of more than 15 degrees, the rear of the upperstructure may submerge too deeply in the water, which may damage the radiator fan. Avoid this if possible when driving out of water.

The maximum water depth in which the machine can be used is up to the center of the carrier roller.

Apply a generous amount of grease to the moving parts that have been submerged in the water for a long time until the used grease is extruded out of the bearings.

Wipe away the extruded used grease.

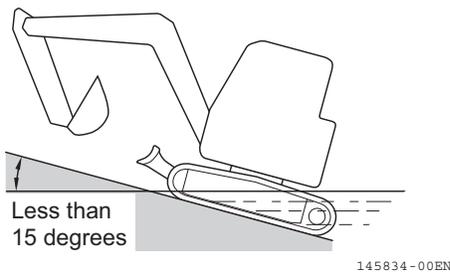


Fig. 3-41

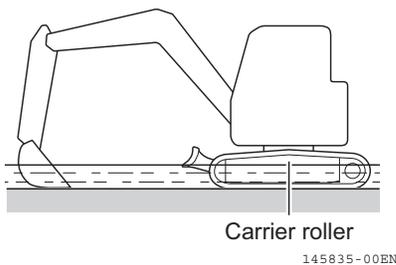


Fig. 3-42

Precautions for going up and down a slope

⚠ WARNING

- When traveling on a slope, place the implement in the direction of travel and raise the bucket 8 to 12 in. (20 to 30 cm) above the ground.
- When driving over obstacles such as foot paths, hold the implement close to the ground and drive the machine slowly.
- Never turn on or traverse a slope. Descend to flat ground to make a course change.
- If the machine is starting to slip or you feel that the machine is unstable, place the bucket on the ground and stop the machine at once.
- Recognize that the machine may roll over when swinging the upperstructure or operating the implement on a slope. Do not swing the upperstructure toward the downward side of the slope with a load in the bucket. If swinging is unavoidable, first lay earth on the slope to maintain the machine as horizontal as possible, then swing the upperstructure.
- Do not travel on a slope of 20 degrees or more, as the machine may upset.

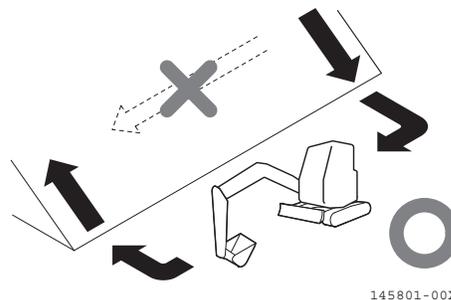


Fig. 3-43

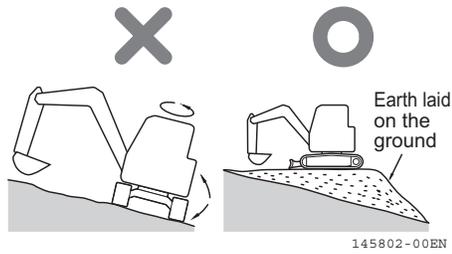


Fig. 3-44

1. Go down slopes at low speed, using the travel levers and accelerator lever to control your speed.

When going down a slope, drive the machine at low engine speed and position the implement as shown in the figure on

Fig. 3-45.

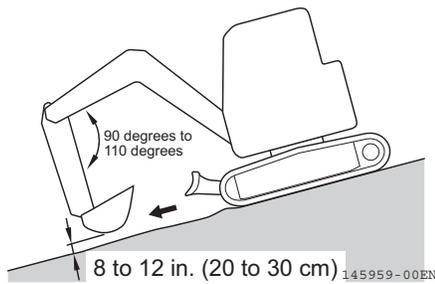


Fig. 3-45

2. When climbing a slope, drive the machine with the implement positioned as shown in the figure on **Fig. 3-46.**

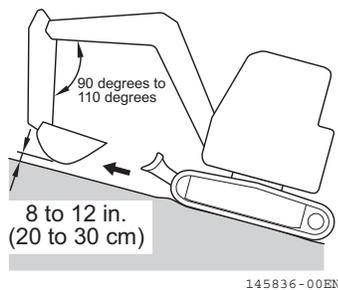


Fig. 3-46

■ **Braking when going down a slope**

When going down a slope, you can automatically brake the machine by setting the travel levers to the neutral position.

■ **When the crawler is slipping**

If you cannot climb a slope by operating the travel levers because the crawler is slipping, retract the arm and use the pull-back power of the implement to help you climb the slope.

■ **When the engine stops**

If the engine stops while climbing a slope, set the travel levers to the neutral position, stop the machine, and restart the engine.

■ **Precautions for traveling on a slope**

Do not open or close the cabin side door on a slope.

Doing this may cause the door to swing open or closed very rapidly.

Be sure to lock the cabin side door in either the open or closed position.

Escaping from the mud

Carefully operate the machine not to allow it to get mired in mud. If the machine is mired in mud, the machine can escape as follows:

If only one track is mired in the mud

If only one track is mired in the mud, place the bucket on the muddy side, lift the track above the ground, lay a log or a wood block under the track shoe, and raise the bucket to escape.

IMPORTANT

When lifting the machine above the ground with the boom or the arm, push on the ground with the bottom of the bucket. (Do not push on the ground with the bucket teeth.)

In doing this, the angle between the boom and the arm should be 90 degrees to 110 degrees.

The same procedure described above should be utilized when the bucket is in the reverse position.

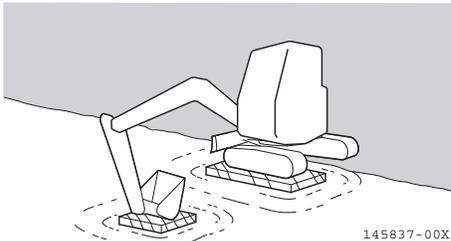
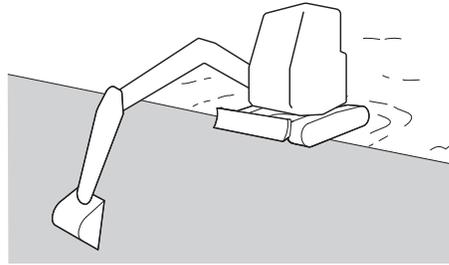


Fig. 3-47

If both tracks are mired in the mud

If both tracks are mired in the mud, lay a log or a wood block under the track shoes in the same manner as mentioned above, dig the bucket into the solid ground, retract the arm just as when excavating, and push the travel levers forward to escape from the mud.



145838-00X

Fig. 3-48

Operations using the bucket

You can greatly widen the range of work described here by using optional attachments.

Backhoe operation

Backhoe operation is suitable for digging the ground below the machine.

Suppose that the machine is operating as illustrated in the figure below: a maximum digging force of each cylinder can be obtained when the angle between the bucket cylinder and the bucket arm as well as between the arm cylinder and the arm is maintained at 90 degrees. When digging, make good use of this angle to increase the operating efficiency.

To excavate the ground efficiently by manipulating the arm, the arm needs to be operated within a range of angles between 45 degrees forward and 30 degrees backwards, as illustrated in the figure below. Though the range differs according to the depth of the work, do not move the implement to the cylinder stroke end.

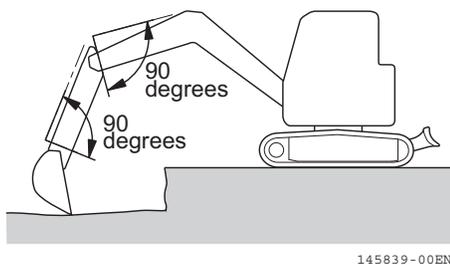


Fig. 3-49

145839-00EN

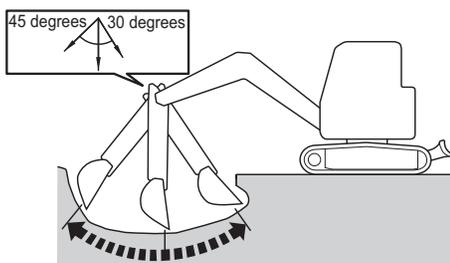


Fig. 3-50

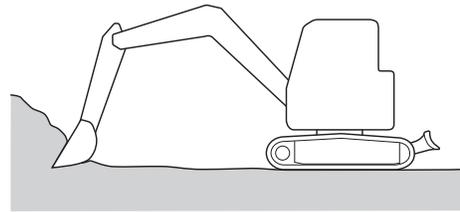
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Shoveling

Shoveling is suitable for excavating ground that is higher than the machine bottom.

Install the bucket in the reverse position before operating.

For the procedure for installing the bucket in the reverse position, Refer to Section "Reversing the bucket without the quick coupler" on page 139.



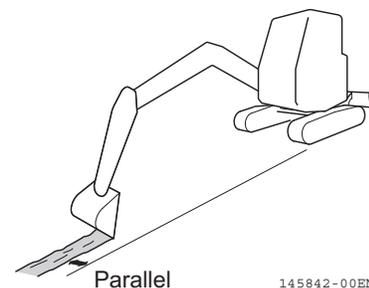
145841-00X

Fig. 3-51

Ditching

To increase work efficiency, install a suitable bucket for ditching and position the tracks parallel with the ditch to be made.

To make a wide ditch, first dig the two sides, and then dig the center.



Parallel

145842-00EN

Fig. 3-52

Loading

To increase work efficiency, locate the dump truck at a position where the swing angle of the machine will be minimized and the operator can clearly view the dump truck.

Load earth from the rear of the dump truck, because it can be loaded more easily and in larger amounts than from the side.

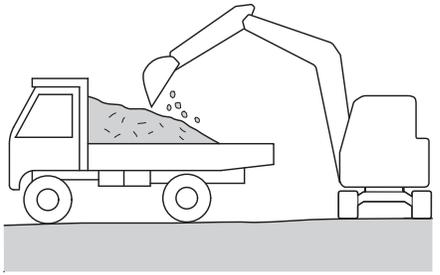


Fig. 3-53

145843-00X

Parking the machine

⚠ CAUTION

Do not stop the machine suddenly, but try to stop with a safety margin.

⚠ WARNING

- **Park on solid, level ground.**
- **Do not park on a slope. If it is unavoidable to park on a slope, place solid blocks of wood behind the crawlers, place the blade on the ground, and dig the bucket into the ground.**
- **Do not touch the control levers and pedals accidentally. Otherwise, the implement or the machine may move unexpectedly, causing a serious accident.**
- **When leaving the operator's seat, be sure to place the lock lever securely in the lock position and remove the starter switch key.**

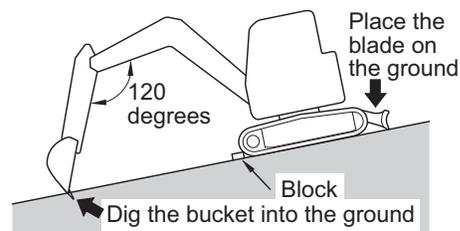


Fig. 3-54

145844-00EN

1. Set the left and right travel levers or pedals to the neutral position to stop the machine.
2. Turn the engine control dial to the Low idle direction.
3. Place the bucket on the ground with its bottom surface in contact with the ground.
4. Place the blade on the ground.
5. Set the lock lever to the lock position.

Inspection requirements after completing operation

Check the LCD monitor for indication of remaining fuel, and engine cooling water temperature. Make sure that there are no messages in the warning display area.

Stopping the engine

IMPORTANT

Stopping the engine after rotation at high speed may shorten the engine life. Do not stop the engine suddenly except in case of emergency.

1. Operate the engine at low idle speed for approximately five minutes with no load. (The engine cooling water temperature gradually lowers.)
2. To stop the engine, turn the key to the "OFF" position.
3. Take the key out of the starter switch.

Inspection requirements after stopping the engine

1. Check oil and water for leaks, and visually inspect the implement, the machine, and the undercarriage by walking around them. If there are any leaks of oil or water, or any observed abnormality, take corrective action.
2. Completely fill the fuel oil tank.
3. Confirm that the engine compartment is free of any foreign matter. Combustibles or dust in the engine compartment may cause a fire. Remove them, if any.
4. Remove mud adhering to the undercarriage of the machine.

Locking

Make sure that you lock the following parts:

1. Rear hood

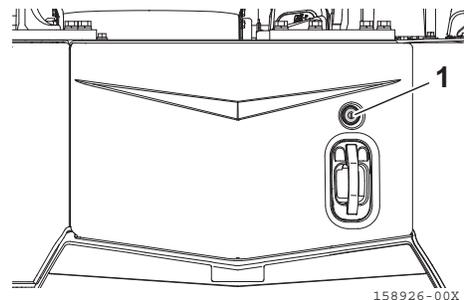


Fig. 3-55

2. Front cover (right)

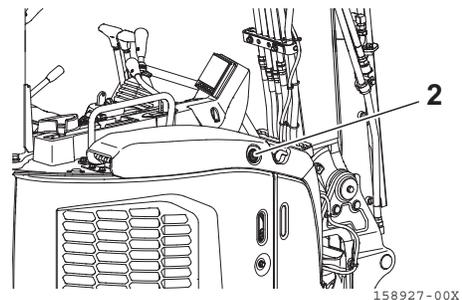


Fig. 3-56

3. Side door (Cabin spec.)

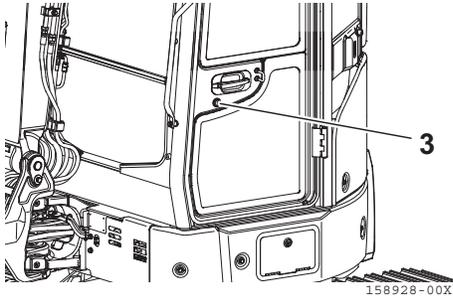


Fig. 3-57

Note:

The starter switch key is used to lock all of the items mentioned above.

Handling the rubber crawlers

Using the rubber crawlers properly

Rubber crawlers have some advantages over steel crawlers.

However, you cannot take full advantage of them if you use them in the same manner as steel ones. Use care in operating with rubber crawlers in accord with the conditions of the work site and the type of work.

Comparison Table of Rubber and Steel Crawlers

	Rubber	Steel
Low vibration	◇	□
Smooth travel	◇	○
Silent travel	◇	□
Less damage to paved roads	◇	□
Simple handling	◇	□
Susceptibility to damage (strength)	□	◇
Tractive force	◇	◇

- ◇ : Excellent
- : Good
- : Ordinary

Rubber crawlers have many advantages inherent in the unique properties of the material. On the other hand, however, they are low in strength. It is essential that you fully understand the properties of rubber crawlers, and observe the precautions for operating and handling them to prolong their life and get the most out of them. Be sure to read Section "Precautions for using the rubber crawlers" on page 135 before using them.

Warranty for rubber crawlers

The rubber crawlers are not warranted for free repair or replacement if they are damaged because of misuse by the customer, including the failure to comply with the prohibitions and the instructions for safe operation; (for example, the failure to check the tension of the rubber crawlers or service the rubber crawlers properly, or "using the rubber crawlers on surfaces and terrains which could physically damage them".)

Precautions for using the rubber crawlers

■ Prohibitions

Observe the following prohibitions:

- Do not operate or turn on surfaces or terrains that have sharp stones, a hard, uneven rock base, or that expose the crawlers to steel rods, scrap iron, or edges of iron plates. Failure to observe these prohibitions may damage the rubber crawlers.
- Do not operate the machine on a stony surface like a riverbed. Doing this may damage the rubber crawlers by catching gravel in the crawlers or may cause the crawlers to come off. Forcibly pushing obstacles will also shorten the life of the rubber crawlers.
- Prevent the rubber from getting exposed to oil, fuel, or chemical solvents. If they are exposed, immediately wipe them. Also, do not travel on roads which have oily surfaces.
- When storing the rubber crawlers for a long time period (more than three months), avoid placing them in a place subject to direct exposure to sunlight or rain.
- Do not operate the machine when the crawlers will be exposed to heat. (i.e., near an open-air fire, on a steel plate that has been exposed to the blazing sun, or on a hot asphalt road.)
- Never run on one rubber crawler track while the other is held above the ground with the implement. Doing this may damage the rubber crawler or cause it to come off.

Other precautions for using the rubber crawlers

Observe the following precautions when operating the machine:

- Never spin-turn on concrete or asphalt roads.
- Do not change course suddenly. Doing this will cause the rubber track to wear early or be damaged.
- Do not turn the machine across a large level gap while traveling. Remember that running over a level gap at a right angle will prevent the crawler from coming off.
- Slowly lower the machine after it has been lifted above the ground with the implement.
- It is not recommended that the machine be used to handle any materials that become oily after being crushed (e.g., soybeans, corn, rapeseed oil seeds, etc.). After unavoidably using the machine to handle such materials, clean the crawlers with water.
- It is not recommended that the machine be used to handle materials such as salt, ammonium sulfate, potassium chloride, potassium sulfate, or superphosphate of lime. Handling these materials may affect the core metal adversely. After using the machine to handle such materials, clean the crawlers with water.
- Do not operate the machine at the seashore. Doing this may affect the core metal adversely due to the salt content.
- If a rubber crawler is cracked, it could be easily damaged when exposed to salt, sugar, wheat, or soybeans. Be sure to repair any cracks in the rubber crawler to prevent rubber chips from getting into the materials being handled.
- Do not allow the rubber crawler to rub against a concrete wall.

- The rubber crawlers are prone to slipping on snow or on a frozen road. Be careful of skidding when traveling or operating on a slope in cold weather.
- Operating the machine in extremely cold weather will deteriorate the rubber crawlers, shortening their life.
- Use the rubber crawlers between -13 °F to +131 °F (-25 °C to +55 °C) because of the physical characteristics of rubber.
- Be careful not to damage the rubber crawlers with the bucket while operating the machine.
- Keep the crawlers in appropriate tension to prevent them from coming off. If the tension is too low, the rubber crawlers may come off under the following conditions. (Even if the tension is adequate, take care when operating the crawlers under these conditions.)

- Do not steer the machine at an angle other than 90 degrees across a large level gap created by a curbstone or a rock [approximately more than 8 in. (20 cm)]. Run over a level gap at a right angle only to prevent the crawlers from coming off.

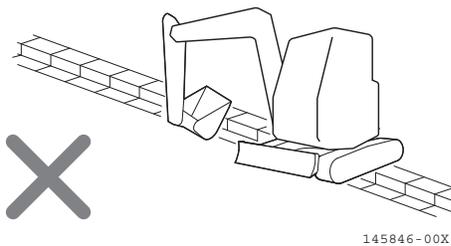


Fig. 3-58

- Do not steer the machine across a boundary between the flat ground and a slope, while moving backwards. If such travel is not avoidable, slow down the speed.

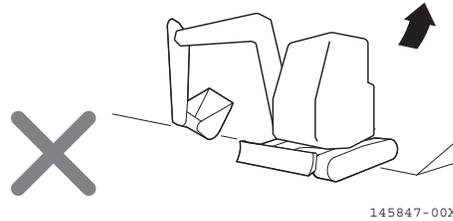


Fig. 3-59

- Do not travel with the crawler on one side on a slope or on convex ground (causing a machine angle of more than 10 degrees), and with the crawler on the other side on flat ground, to prevent the rubber crawler from being damaged. Be sure to travel with the crawlers on both sides on the same level surface.

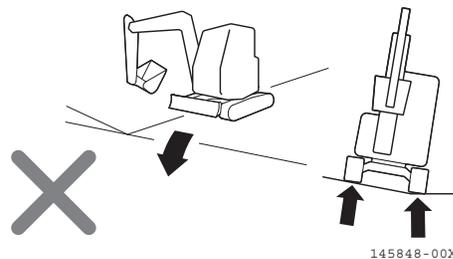


Fig. 3-60

- The three cases illustrated above are those which could cause the rubber crawlers to loosen. In addition, do not subject the machine to such ground conditions as are illustrated in the figure on Fig. 3-61.

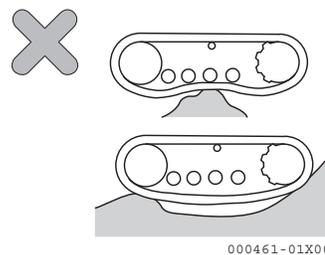


Fig. 3-61

[How the rubber crawlers come off]

- When running over a level gap, a clearance is created between the crawlers and the track rollers. At this point, the crawlers tend to come off.

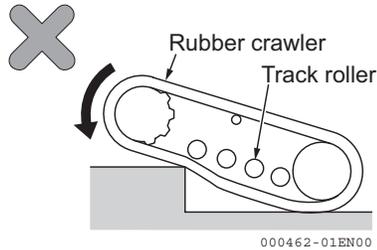


Fig. 3-62

- If the machine is traveling in reverse, clearance may also be created between the track rollers and the rubber crawlers, and between the idlers and the rubber crawlers, causing the rubber crawlers to come off.

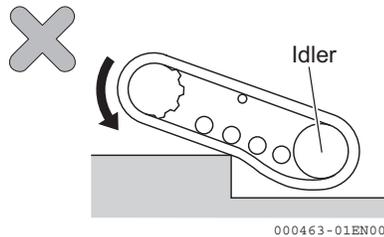


Fig. 3-63

- Other situations to be avoided.
 - When the machine changes the travel direction while the rubber crawlers are blocked sideways by an obstacle or the like.
 - When the idler and the track rollers are misaligned from the core metal, due to rubber crawler misalignment.

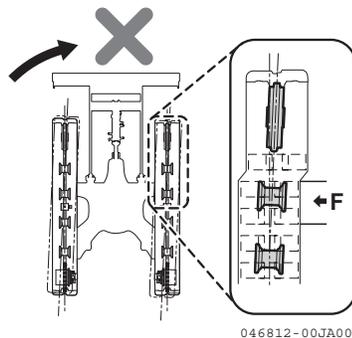


Fig. 3-64

- Traveling in reverse under the condition illustrated will cause the rubber crawlers to come off.

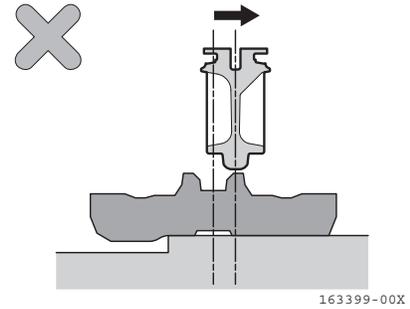


Fig. 3-65

- Changing the travel direction of the machine under the condition illustrated will cause the rubber crawlers to come off.

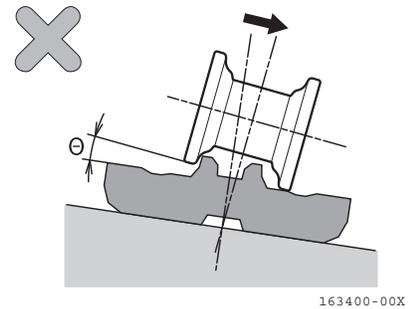


Fig. 3-66

Checking and servicing the machine with rubber crawlers

To check and service the machine with rubber crawlers, refer to and follow Section "Table of service time intervals" on page 198.

Replacing the bucket without the quick coupler

⚠ WARNING

- When driving pins into the bucket with a hammer, metal chips may fly. If metal chips should get into your eyes, they can cause serious injury. Use goggles, a hard hat, and gloves for safety when replacing the bucket.
- After removing the bucket, place it on solid ground in a stable position.
- When aligning the holes for pin A and pin B, be careful not to insert your fingers into those holes to prevent serious injury to your fingers. Visually check the alignment of the holes.

Work on level ground with good footing. If two or more persons work together, communicate with signals selected beforehand for safety.

■ Replacement procedure

Replace the bucket according to the following procedure:

1. Park the machine on level, flat ground, and lower the bucket onto the ground.

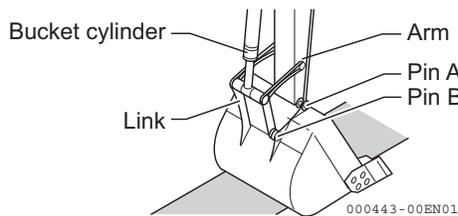


Fig. 3-67

2. Stop the engine.
3. Clean around the bucket pin to prevent foreign material from entering the pin holes.

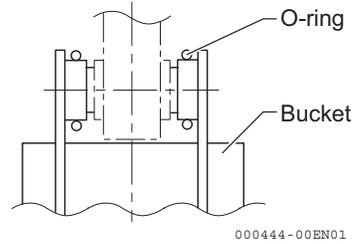


Fig. 3-68

4. Remove pins (Fig. 3-69, A) and (Fig. 3-69, B).

IMPORTANT

- Keep the pins away from dirt or mud.
- The machines have dust seals on either end of the bush. Be careful not to damage them.

5. Clean the bucket boss section and mount the O-ring.

IMPORTANT

- Check that the O-ring is not damaged. If it is damaged, replace it with a new one.
- It is recommended that the O-ring should be replaced when replacing the bucket. (It extends the implement life.)

6. Connect the arm to pin (Fig. 3-69, A), and then connect the link to pin (Fig. 3-69, B).
7. Install the O-ring in position.

IMPORTANT

Before mounting the bucket, clean the arm pin hole and grease it.

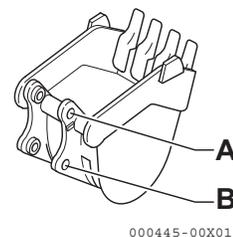
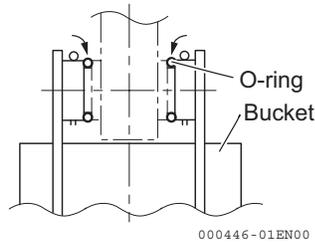
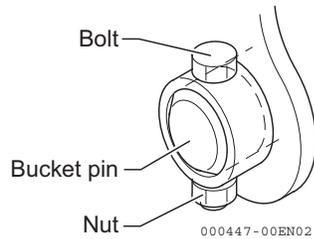


Fig. 3-69

**Fig. 3-70**

8. Install the collars and bolts into the bucket pins (**Fig. 3-69, A**) and (**Fig. 3-69, B**).

**Fig. 3-71**

9. Grease the connecting parts.

Reversing the bucket without the quick coupler

⚠ WARNING

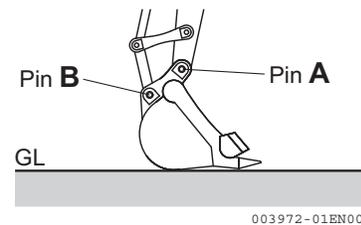
- When driving pins into the bucket with a hammer, metal chips may fly. If metal chips should get into your eyes, they can cause serious injury. Use goggles, a hard hat and gloves for safety when reversing the bucket.
- After removing the bucket, place it stably on solid ground in a stable position.
- When aligning the holes for pin A and pin B, be careful not to insert your fingers into the holes to prevent serious injury to your fingers. Visually check the alignment of the holes.

Work on level ground with good footing. If two or more persons work together, communicate with signals selected beforehand for safety.

■ Reversing procedure

Reverse the bucket according to the following procedure:

1. Park the machine on level, flat ground, and lower the bucket onto the ground.

**Fig. 3-72**

Note:

To remove the pins, place the bucket on the ground in such a way that it touches the ground lightly. Lowering the bucket down on the ground by its full weight will increase stresses on the pins and make the pins difficult to remove.

IMPORTANT

Keep the pins away from dirt or mud.

2. Stop the engine.
3. Clean the area around the bucket pins to prevent foreign material from entering the pin holes.
4. Remove pins (**Fig. 3-72, A**) and (**Fig. 3-72, B**).
5. Reverse the bucket.

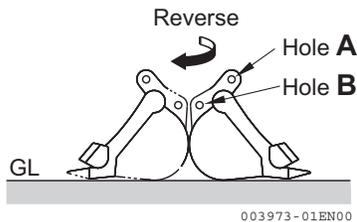


Fig. 3-73

6. Refer to Section "Replacing the bucket without the quick coupler" on page 138 for installation of the O-ring.
7. Connect the arm to hole (**Fig. 3-74, B**), and then the link to hole (**Fig. 3-74, A**).
[You can easily align the hole of the link and hole (**Fig. 3-74, A**) by lifting the bucket slightly.]

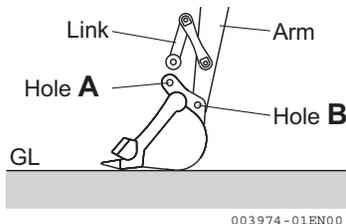


Fig. 3-74

8. Install the bolts into the bucket pins (**Fig. 3-72, A**) and (**Fig. 3-74, B**).
9. Grease the connecting parts.

IMPORTANT

When using a reversed bucket, the bucket and the boom cylinder can contact each other when the arm is curled or the boom is lowered beyond the positions indicated in the figure on Fig. 3-75. Never curl the bucket too much, and never allow it to contact the boom cylinder.

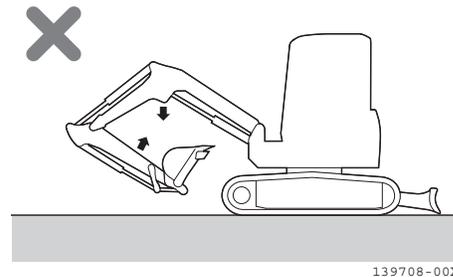


Fig. 3-75

Handling quick coupler

Features of quick coupler

The quick coupler is the device to simplify the replacement of a variety of attachments for hydraulic implement. The distance between pins is adjustable so that the attachments with different distances between pins are available.

Description of switches

■ Control switch of quick coupler

Use this switch to dismount or mount the attachment.

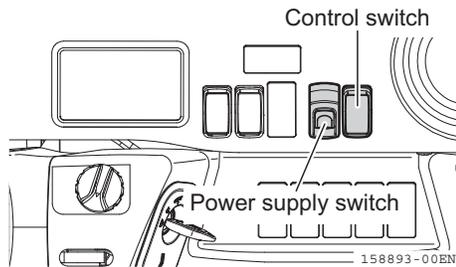


Fig. 3-76

Note:

If the machine has an error, the quick coupler operation disabled screen is displayed on the LCD monitor, and the quick coupler can no longer be operated. Ask your dealer to check.

How to operate the control switch	
Installing the attachments	Removing the attachments
<p>159161-00EN</p>	<p>159162-00EN</p>

How to operate the power switch	
Power ON	Power OFF
<p>159157-00EN</p> <p>When the power is turned ON, the quick coupler information is displayed on the LCD monitor, and the caution buzzer sounds.</p>	<p>159158-00EN</p>

LCD monitor display	
Quick coupler operation enable	Quick coupler operation disabled
<p>159159-00X</p>	<p>159160-00X</p>

Structure of quick coupler

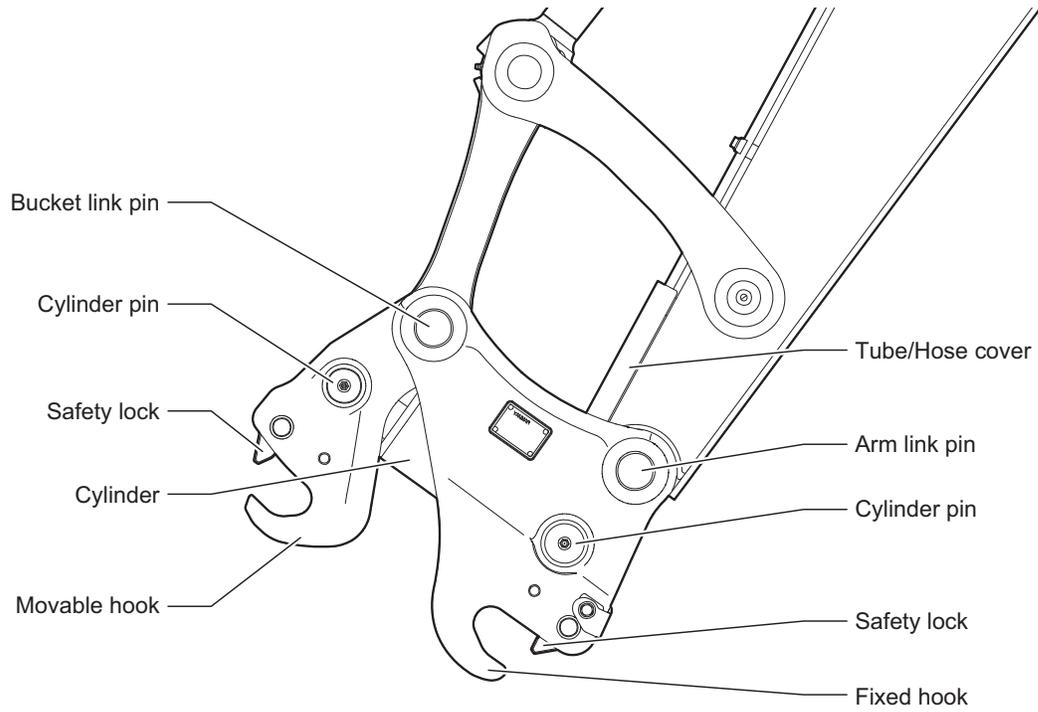


Fig. 3-77

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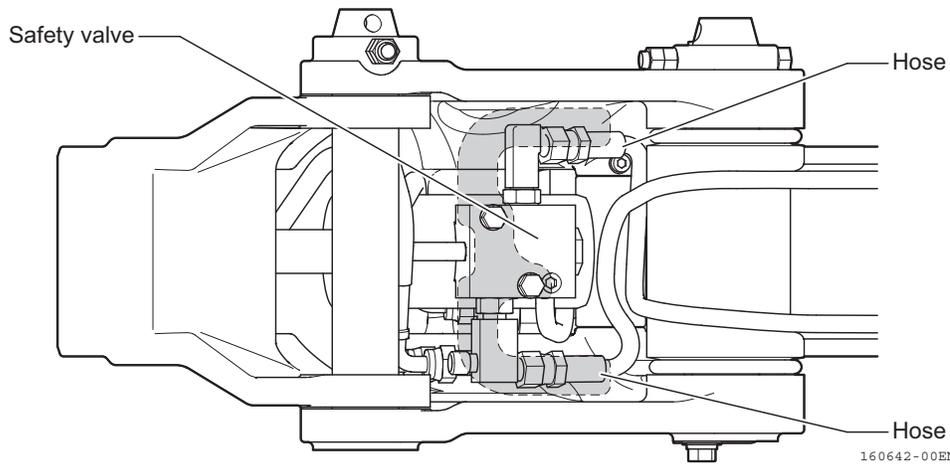


Fig. 3-78

160642-00EN

Attachment types

1. The attachments, which can be mounted on the machine with quick coupler, are only the same 2-pin type as the bucket. The 1-pin type such as clamshell cannot be mounted in the quick coupler.
2. The following 2-pin type of attachments exceptionally cannot be mounted in the quick coupler.
 - 1-Attachments much different from the standard bucket in shape of mounting part
 - 2-Attachments with excessively long or short pin pitch
3. Do not use any attachments improper for the machine with the quick coupler.

Allowable size of bucket

Allowable size of bucket to be mounted in the quick coupler

Unit: in. (mm)

Mark	Part	Size
A	Attachment width	4.72 (120) or more
B	Distance between pins	Pin diameter 6.50 (165) to 10.67 (271) Ø1.38 (35)
		Pin diameter 6.65 (169) to 10.94 (278) Ø1.50 (38)
		Pin diameter 6.73 (171) to 11.14 (283) Ø1.57 (40)
C	Operating radius of bucket	29.33 (745) or less
D	Pin diameter	Ø1.38 to 1.57 (35 to 40)

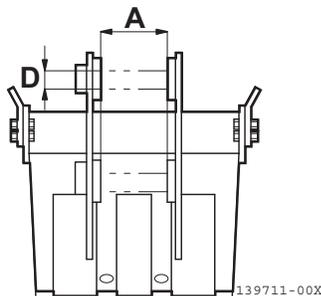


Fig. 3-79

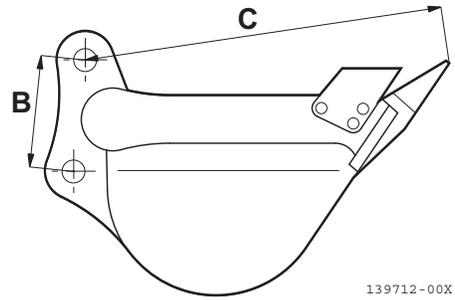


Fig. 3-80

Phenomena that are not break-downs

The quick coupler has a structure to open any-time when the control switch is not operated. Therefore, stop the engine with the removal side on the control switch pushed (quick coupler closed) and start the engine again to open the quick coupler.

Posture for storing the machine without attachment

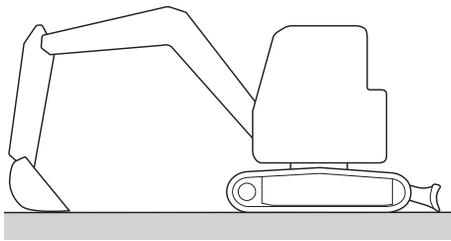
When no attachment is installed, make the fixed hook side of the quick coupler contact the ground. When the engine is stopped with the quick coupler being closed by the control switch, the movable hook may be opened upon restart of the engine, resulting in damage to the floor or failure of this machine.

Dismounting attachment

⚠ WARNING

- Never dismount the Attachment while it is still elevated, as it will drop to the ground and could cause bodily injury.
- Never dismount the Attachment unless it is resting on stable level ground, as it could otherwise fall over.

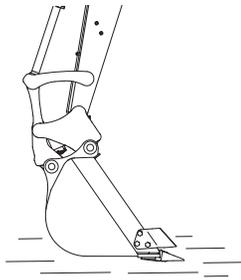
1. Park the machine on stable level ground.



145845-00X

Fig. 3-81

2. Lower the attachment onto the ground.

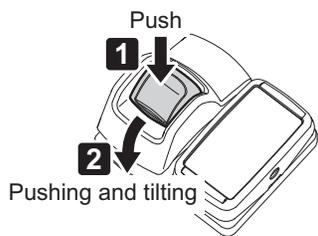


151652-00X

Fig. 3-82

3. Turn the power switch to ON.

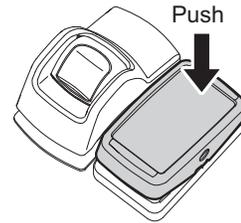
When the power is ON, the caution sound is issued.



159164-00EN

Fig. 3-83

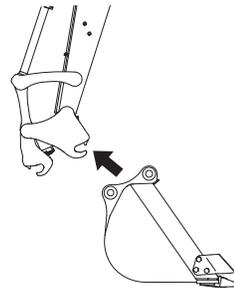
4. Pushing the control switch to the "Unlock" side detaches the attachment.



159163-00EN

Fig. 3-84

5. Remove the quick coupler from the attachment.



151653-00X

Fig. 3-85

Mounting attachment

⚠ WARNING

- **Never place your hands or any other part of your body between the quick coupler and the attachment to prevent bodily injury.**
- **Never stand near the attachment unless it is resting on stable level ground to avoid bodily injury.**
- **Never use a newly mounted attachment before confirming that it has been properly secured to the quick coupler, and that the lock pin has been correctly installed, as accidental detachment could otherwise result.**
- **Always replace the lock pin if damaged or lost.**

Failure to do so could result in death or serious injury.

1. Push the safety lock of the quick coupler with a finger to check the safety lock for error.
 If the safety lock can be pushed in by a light force, an error is suspected. In this event, stop the use and ask your dealer for repair.

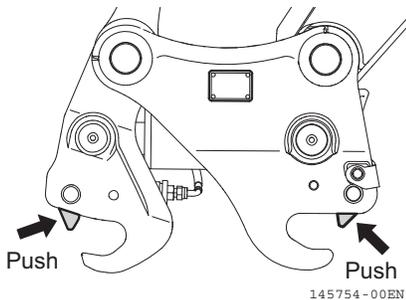


Fig. 3-86

2. Place the attachment on stable level ground.
 Be sure to install the pins into the attachment.

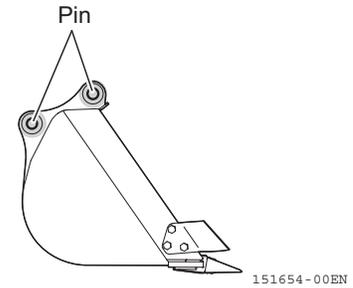


Fig. 3-87

3. Turn the power switch to ON.
 When the power is ON, the caution sound is issued.

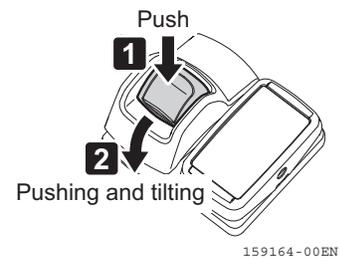


Fig. 3-88

4. Close the movable hook.
 5. Put the fixed hook onto the pin of the attachment on the arm side and set the quick coupler level with the ground as illustrated in Fig. 3-89.

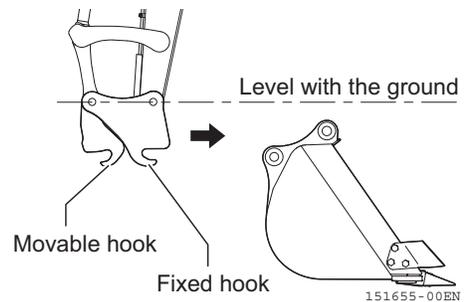


Fig. 3-89

6. Lift the attachment up in that state.

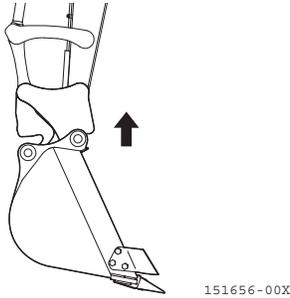


Fig. 3-90

7. Curl the attachment so that it is level.

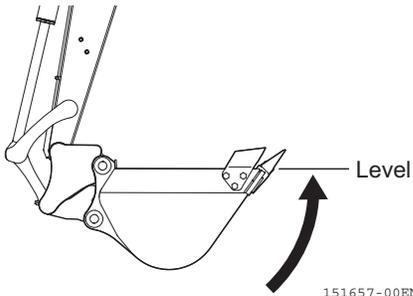


Fig. 3-91

8. Operating the control switch to the “Lock” side holds the attachment.

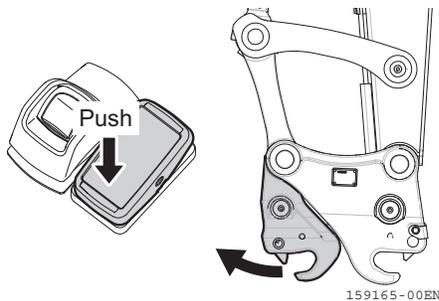


Fig. 3-92

9. Check that the quick coupler holds the attachment pin securely and the safety lock is operating.

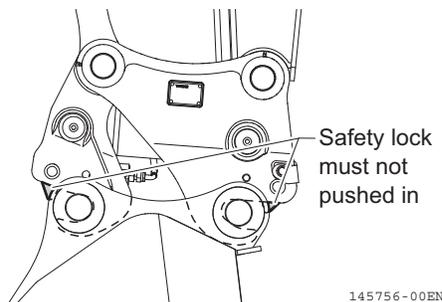


Fig. 3-93

10. Turn the power switch to OFF.

Maintenance

■ **Checking specifications**

- Check there are no cracks and plays.
- Check the bolts and nuts for looseness.
- Check the hydraulic piping for oil leak.

■ **Greasing**

IMPORTANT

Grease the fittings thoroughly after washing the machine or after operation in rain, on soft ground, or in muddy water.

1. Put the bucket and the blade on the ground and stop the engine.
2. Clean the grease nipples indicated with the arrows in the right figures and grease them using a grease gun.
3. After greasing, wipe off the excessive grease with waste cloth or the like.

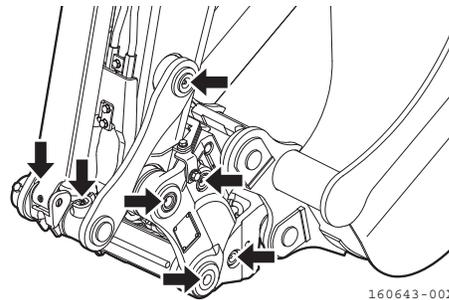


Fig. 3-94

■ **Nonperiodic inspection**

The pins in the attachment are free from rotation and cannot be worn. Apply antirust solvent or grease to them to prevent rust.

First aid for damaged quick coupler hose

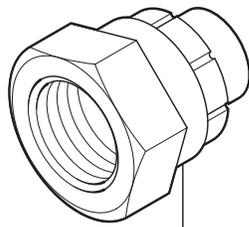
If oil leakage occurs from the quick coupler hose, immediately stop the operation and engine. Then perform the procedure below.

IMPORTANT

Avoid a long time operation with the plug installed, and immediately replace the hose with the specified one.

■ **First aid plug preparation**

Prepare first aid plugs (4 pcs).



Plug G (PF)1/4 (4 pcs)

165513-00EN

Fig. 3-95

■ **Installing the plug**

1. If oil leakage is caused by a broken hose, remove the cover at the front end of the arm, and disconnect the hose from the pipe. Install the plug to the pipe side.

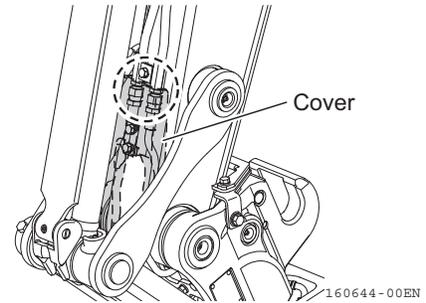


Fig. 3-96

2. Remove the cover on the upper side of the quick coupler, and disconnect the connector from the hose. Install the plug to the connector side.

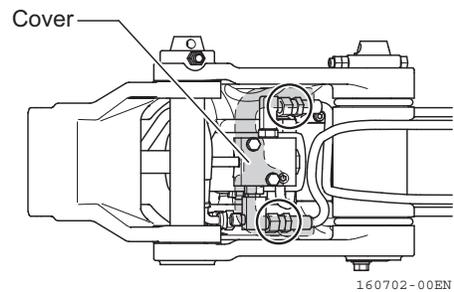


Fig. 3-97

3. Disconnect the hose.

How to handle AUX1

Description of devices

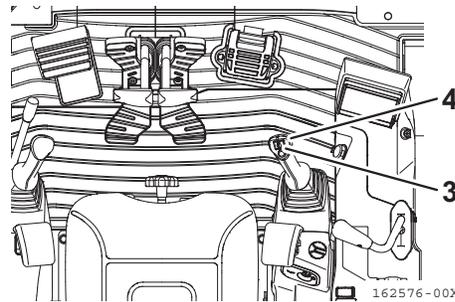
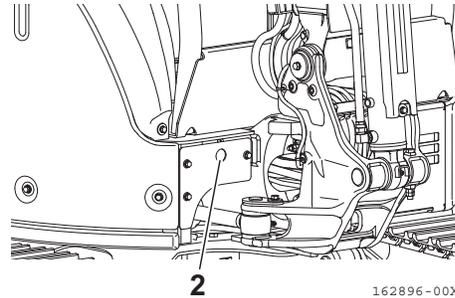
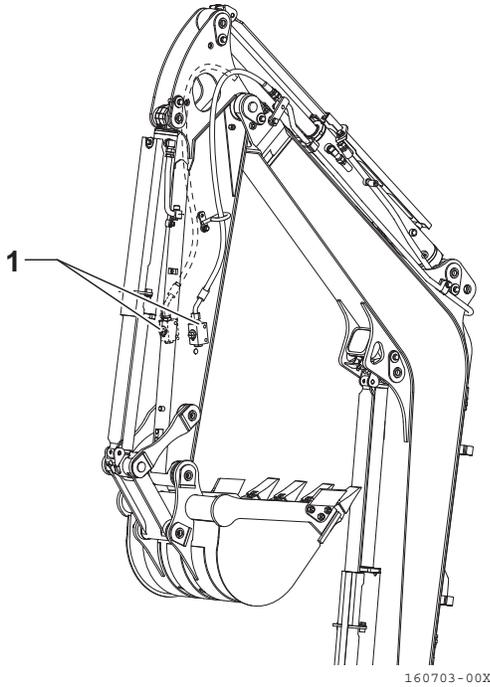


Fig. 3-98

1 Diverter valve

This valve can switch the flow of the hydraulic oil.

Position	Pattern mark		Oil flow
	L	R	
A			Hydraulic oil flows to port A
B			Hydraulic oil flows to port B

Switch this valve so that hydraulic oil flows to the port of the operating attachment.

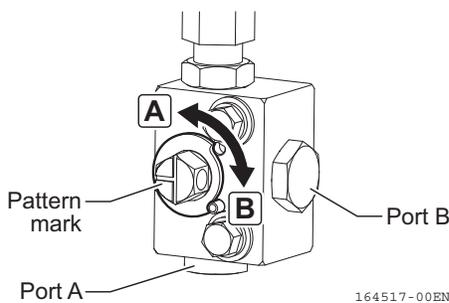


Fig. 3-99

2 AUX selector valve

This valve is used to select either single-acting or double-acting operation depending on the attachment to be operated. Switch using a tool such as a socket with a width across flats of 0.75 in. (19 mm).

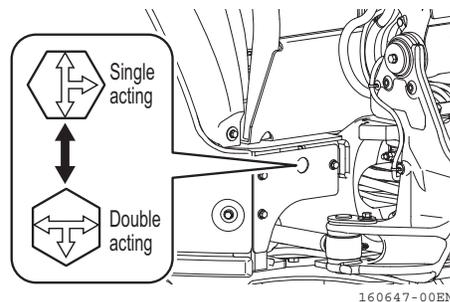
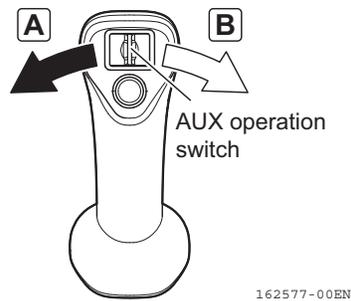


Fig. 3-100

3 AUX operation switch

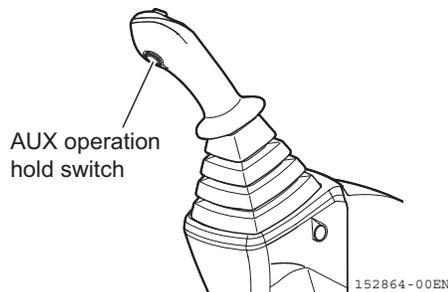
This switch is located on top of the right control lever and used to operate an attachment connected to the AUX1.

**Fig. 3-101**

- When operating a single-acting type attachment
Move the switch to **A** side.
[Example: Breaker]
- When operating a double-acting type attachment
Move the switch to **A** or **B** side.
[Examples: Tilt bucket, Clamshell, etc.]

4 AUX operation hold switch

Use this switch to continuously operate the attachment connecting to AUX circuit.

**Fig. 3-102****(How to use the hold function)**

- Operating the AUX operation switch to the left or right and operating the hold switch on the back side of the operated implement control lever activates the hold function.
- Operating the hold switch without operating the AUX operation switch activates the hold function at the maximum flow rate when operating the AUX operation switch to the left.

Note:

When the hold function is used, the icon using the hold function of the AUX allocation icons is highlighted on the LCD monitor.

(How to cancel the hold function)

When the following operations are performed while the hold function is working, the hold function is canceled.

- Operating the AUX operation switch
- Operating the AUX operation hold switch
- Setting the starter switch to “OFF”
- Moving the lock lever upward

Hydraulic circuit

To connect an attachment, observe the following procedure to connect the circuit.

■ Pressure release from AUX pipes

1. Stop the engine, and then turn the key to the "ON" position (do not start the engine).
2. Move the lock lever to the unlock position.
3. Move the switches on the right and left implement control levers alternately to the right and left a couple of times.

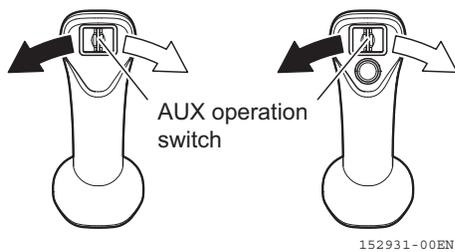


Fig. 3-103

■ Connection of the hydraulic circuit

1. To prevent hydraulic oil from flowing into the port where the circuit is attached, switch the divider valve first and then remove the plug. Take care not to lose or damage the removed parts.
2. Install the connectors supplied by the manufacturer of the attachment and connect the hoses.

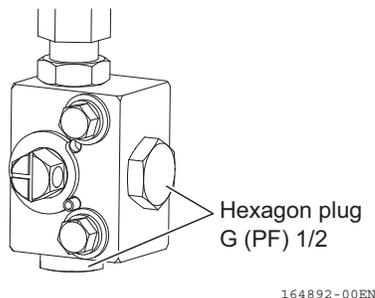


Fig. 3-104

■ Oil passage

The switch operating directions and oil passages are as shown in Fig. 3-105.

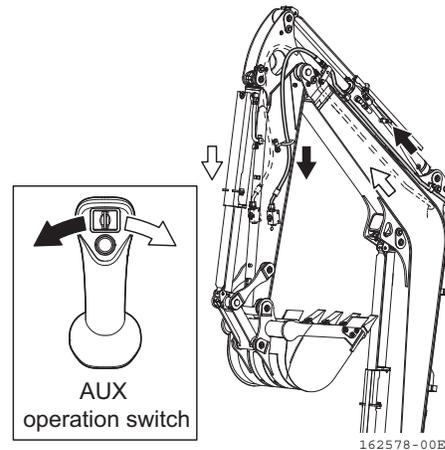


Fig. 3-105

Operation

WARNING

- **Emergency stop**
If the attachment unintentionally and erroneously operates, turn the key to the "OFF" position to stop the engine or move the lock lever to the lock position. Stop the attachment by cutting off the hydraulic pressure source. After that, ask your dealer to check.
- For how to handle an attachment, refer to the operation manual of the attachment, and use it correctly.

IMPORTANT

- Do not operate an attachment such as a breaker continuously for 1 minute or more. Otherwise, overheat or damage to the attachment may occur.
- To use the AUX circuit as a hydraulic source for hydraulic hand tools such as a hand breaker, set the AUX flow rate to the maximum flow rate position and lower the engine speed. If it is used at a high engine speed, overheat or damage to the hydraulic hand tool may occur.

To operate an attachment, observe the following.

■ **Switching the stop valve**

Place the stop valve in the open position.

■ **Switching the AUX selector valve**

Before operating an attachment, switch the AUX selector valve according to the attachment.

■ **To use breaker**

Operating the AUX operation switch for the left moves the breaker.

Note:

- Make sure that the AUX selector valve is in the single-acting type position.
- For other precautions in handling the breaker, refer to the operation manual of the breaker, and use it correctly.

■ **To use general attachment such as tilt bucket**

Check that the selector valve is located at the double-acting type position.

Operating the AUX operation switch for the right or left moves the attachment.

Note:

For other precautions in handling attachments, refer to the operation manual of the attachment, and use it correctly.

Long-term storage

When storing the machine for a long period, do the following:

- Remove the hoses from the diverter valves and check the O-rings. If the O-rings are damaged, replace them with new ones and then reinstall the plugs.
- If the AUX operation switch is operated when no general attachment such as a breaker is installed, overheat or other failure may occur.

Specifications

Circuit	Hydraulic pressure specifications	Flow rate [GPM (L/min)]
AUX1	Maximum flow rate (with no load)	17.0 (64.2)

Note:

AUX flow rate varies with load. If the load is high, the flow rate may decrease, but this is not a malfunction.

How to handle AUX2 (AUX2 spec.)

Description of devices

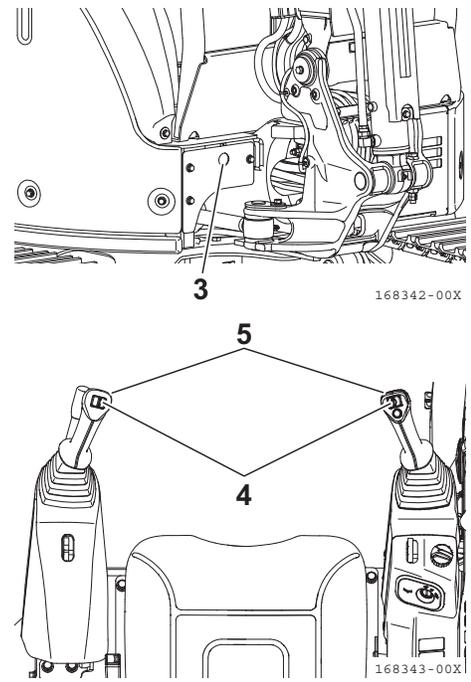
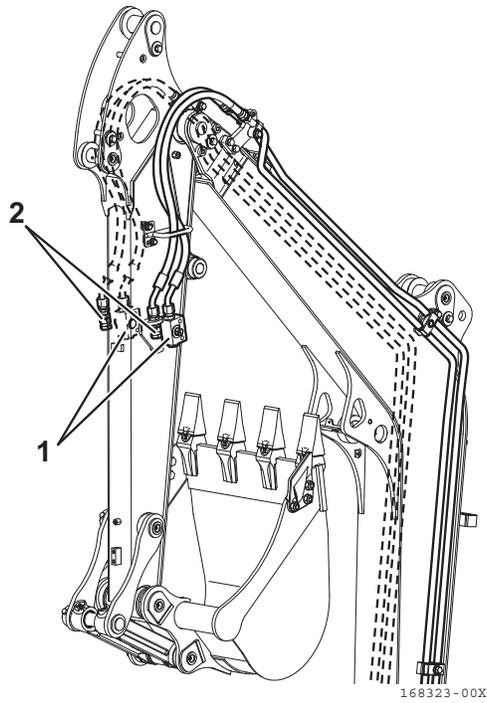


Fig. 3-106

1 Diverter valve

This valve can switch the flow of the hydraulic oil.

Position	Pattern mark		Oil flow
	L	R	
A			Hydraulic oil flows to port A
B			Hydraulic oil flows to port B

Switch this valve so that hydraulic oil flows to the port of the operating attachment.

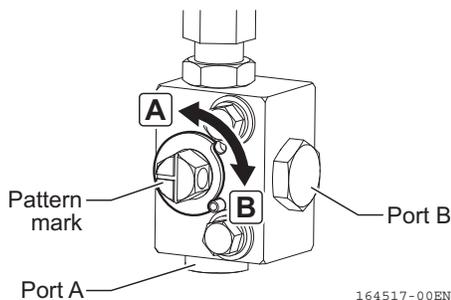


Fig. 3-107

2 Stop plug

This plug serves to stop the flow of hydraulic oil.

Remove this plug, and install an attachment to the AUX port to be used.

3 Single- and double-acting selector valve (for AUX1 circuit)

This valve switches the hydraulic oil pipe line between the single- and double-acting types depending on the type of attachment connecting to the AUX1 circuit.

Before starting the operation, switch the valve to the single- or double-acting type.

Note:

The AUX2 circuit is dedicated to double-acting type attachments, and cannot be applied to any single-acting type attachment. For single-acting type attachments such as a breaker, use the AUX1 circuit.

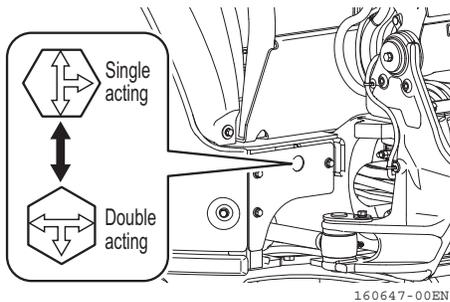


Fig. 3-108

4 AUX operation switch

Each switch is located above the right and left implement control levers, and used to operate an attachment connecting to the AUX circuit.

Note:

The allocation of the AUX circuit operated by the AUX operation switch can be changed from the machine settings on the LCD monitor.

To change the allocation of the AUX operation switch, refer to the "Setting the AUX Operation Allocation" on page 78.

- When operating a single-acting type attachment

Turn the selector valve to the single-acting type position, and move the AUX operation switch where the AUX1 circuit is allocated to the left to operate the attachment.

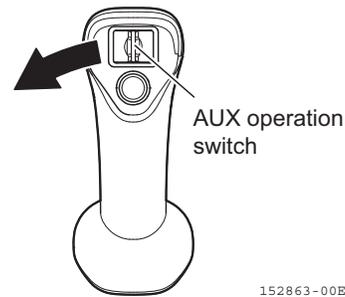


Fig. 3-109

- When operating a general attachment such as the tilt bucket

Turn the selector valve to the double-acting type position and move the AUX operation switch for the AUX circuit to be operated to the right and left to operate the attachment.

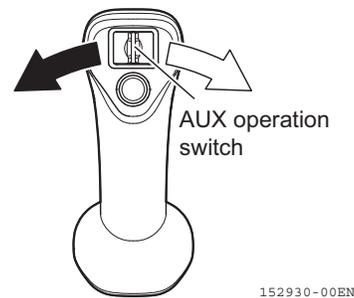
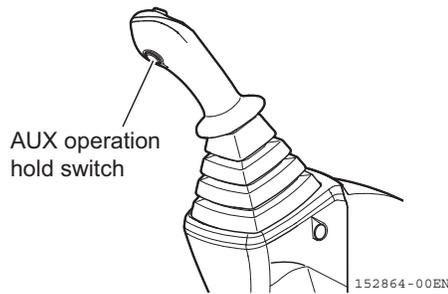


Fig. 3-110

5 AUX operation hold switch

Use this switch to continuously operate the attachment connecting to AUX circuit.

**Fig. 3-111****(How to use the hold function)**

- Operating the AUX operation switch to the left or right and operating the hold switch on the back side of the operated implement control lever activates the hold function.
- Operating the hold switch without operating the AUX operation switch activates the hold function at the maximum flow rate when operating the AUX operation switch to the left.

Note:

When the hold function is used, the icon using the hold function of the AUX allocation icons is highlighted on the LCD monitor.

(How to cancel the hold function)

When the following operations are performed while the hold function is working, the hold function is canceled.

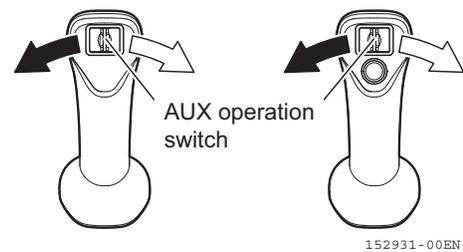
- Operating the AUX operation switch
- Operating the AUX operation hold switch
- Setting the starter switch to "OFF"
- Moving the lock lever upward

Hydraulic circuit

To connect an attachment, observe the following procedure to connect the circuit.

■ Pressure release from AUX pipes

1. Stop the engine, and then turn the key to the "ON" position (do not start the engine).
2. Move the lock lever to the unlock position.
3. Move the switches on the right and left implement control levers alternately to the right and left a couple of times.

**Fig. 3-112**

■ Connection of the hydraulic circuit

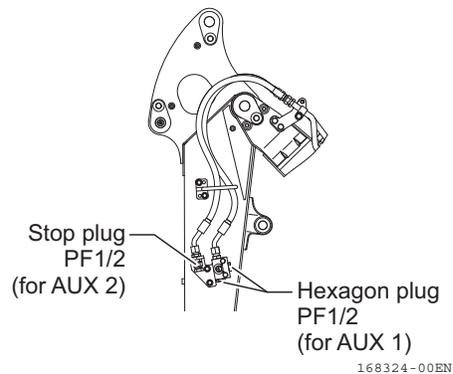
• AUX1

1. To prevent hydraulic oil from flowing into the port where the circuit is attached, switch the divider valve first and then remove the plug. Take care not to lose or damage the removed parts.
2. Install the connectors supplied by the manufacturer of the attachment and connect the hoses.

• AUX2

Remove the stop plug, connect the connectors prepared by the attachment manufacturer, and route the pipes.

Be careful not to lose or damage any removed part.

**Fig. 3-113**

■ **Oil passage**

When the AUX operation allocation is set to "AUX2-AUX1", the switch operating directions and oil passages are as shown in **Fig. 3-114** and **Fig. 3-115**.

AUX1

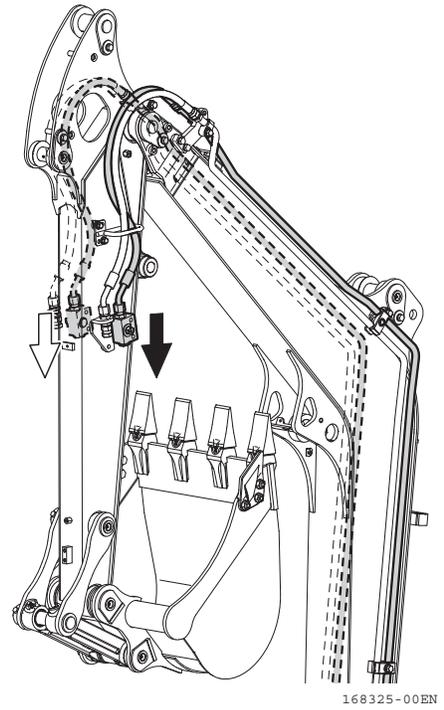
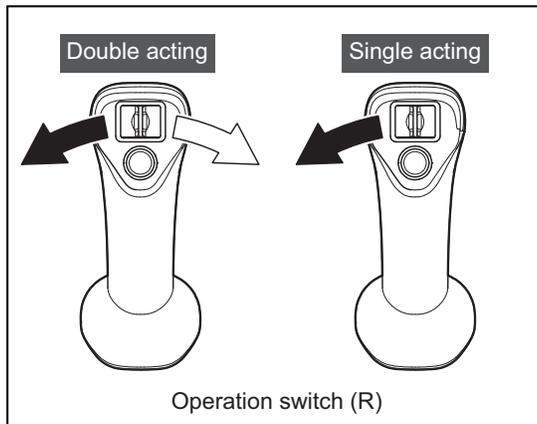


Fig. 3-114

AUX2

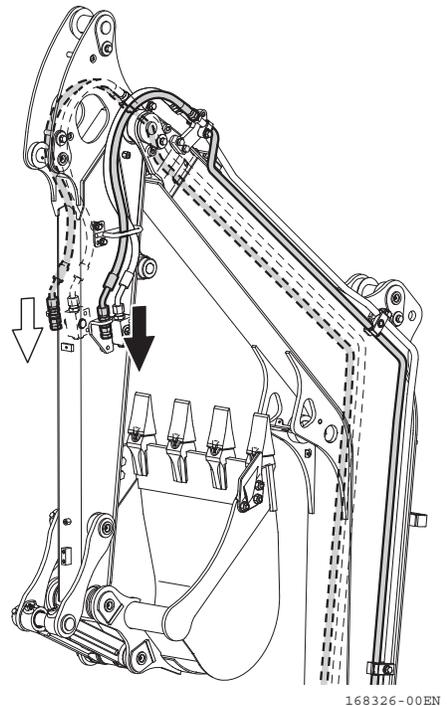
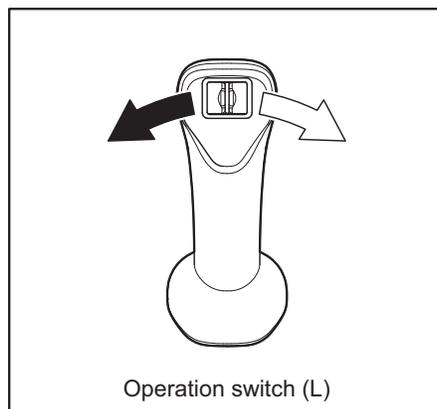


Fig. 3-115

Operation

⚠ WARNING

- **Emergency stop**
If the attachment unintentionally and erroneously operates, turn the key to the "OFF" position to stop the engine or move the lock lever to the lock position. Stop the attachment by cutting off the hydraulic pressure source. After that, ask your dealer to check.
- For how to handle an attachment, refer to the operation manual of the attachment, and use it correctly.

IMPORTANT

- Do not operate an attachment such as a breaker continuously for 1 minute or more. Otherwise, overheat or damage to the attachment may occur.
- To use the AUX circuit as a hydraulic source for hydraulic hand tools such as a hand breaker, set the AUX flow rate to the maximum flow rate position and lower the engine speed. If it is used at a high engine speed, overheat or damage to the hydraulic hand tool may occur.

To operate an attachment, observe the following.

■ AUX operation

Operate an attachment connected to the AUX circuit using the AUX operation switches and AUX operation hold switches located on the control levers.

1. Make sure the stop valve of the hydraulic circuit to be operated is in the open position.
2. To use breaker
 - Check that the selector valve is located at the single-acting type position.
For operating the selector valve, refer to 154.
Operating the AUX operation switch for the AUX1 circuit to the left moves the breaker.
3. To use general attachment such as tilt bucket
 - Check that the selector valve is located at the double-acting type position.
For operating the selector valve, refer to 154.
Operating the AUX operating switch for the AUX circuit to be operated to the right and left moves the attachment.
4. AUX operation flow rate adjustment
The flow rate shown on the LCD monitor can be set from the menu screen on the LCD monitor.
For how to adjust the AUX operation flow rate, refer to the "Changing the AUX Maximum Flow Rate and Switching the Attachments" on page 79.
5. AUX hold function
Operating the AUX operation hold switch can continuously move the attachment connected to the AUX circuit.

(How to use the hold function)

- Operating the AUX operation switch to the left or right and operating the hold switch on the back side of the operated implement control lever activates the hold function.
- Operating the hold switch without operating the AUX operation switch activates the hold function at the maximum flow rate when operating the AUX operation switch to the left.

Note:

When the hold function is used, the icon using the hold function of the AUX allocation icons is highlighted on the LCD monitor.

(How to cancel the hold function)

When the following operations are performed while the hold function is working, the hold function is canceled.

- Operating the AUX operation switch
 - Operating the AUX operation hold switch
 - Setting the starter switch to "OFF"
 - Moving the lock lever upward
- Flow rate adjustment
To adjust the flow rate to the AUX circuit when using the hold function, lower the engine speed with the engine control dial to adjust it to the appropriate flow rate. The lower the engine speed, also the lower the flow rate.

Long-term storage

When storing the machine for a long period, do the following:

- Remove the hoses from the diverter valves and check the O-rings. If the O-rings are damaged, replace them with new ones and then reinstall the plugs.
- Remove the attachment hose from the AUX port, and install a stop plug.
- If the AUX operation switch is operated when no general attachment such as a breaker is installed, overheat or other failure may occur.

Specifications

Circuit	Hydraulic pressure specifications	Flow rate [GPM (L/min)]
AUX1	Maximum flow rate (with no load)	17.0 (64.2)
AUX2	Maximum flow rate (with no load)	9.9 (37.4)

Note:

AUX flow rate varies with load. If the load is high, the flow rate may decrease, but this is not a malfunction.

Handling the thumb bracket

Description of thumb bracket

The thumb bracket is a bracket for attaching a thumb cylinder.

IMPORTANT

- Do not use the thumb bracket for unintended uses.
- For selecting and attaching a thumb cylinder, consult your dealer.

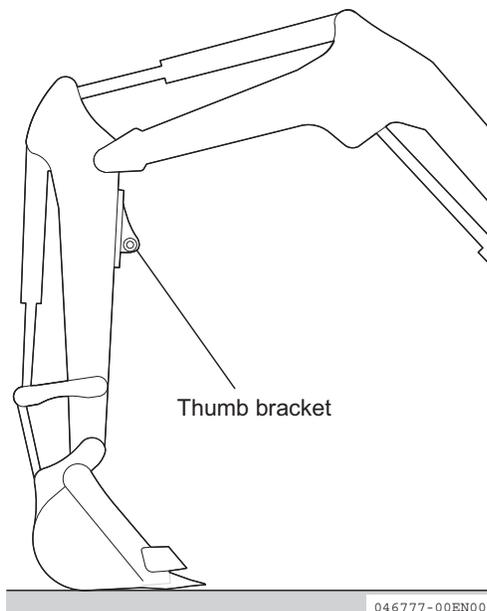


Fig. 3-116

Handling accumulator

⚠ WARNING

High-pressure nitrogen gas is charged in the accumulator.

Incorrect handling may cause an explosion, resulting in a serious personal injury. For handling, strictly observe the following items.

- Do not disassemble.
 - Keep flames away or avoid putting it into fire.
 - Do not drill, weld, and cut.
 - Do not give a shock by hitting or rolling.
 - The pressure in the hydraulic circuit cannot be released completely. To remove hydraulic equipment, do not work on the side where oil spouts out.
- In addition, slowly loosen the screws.
- The sealed gas must be released before disposal. Ask your dealer to dispose of it.

IMPORTANT

If the operation is continued after the charged nitrogen gas pressure of the accumulator has dropped, the residual pressure in the hydraulic circuit can no longer be released in case of a machine failure.

Function of accumulator

The accumulator accumulates the pressure in the operating circuit.

The operating circuit will operate for a while even after stopping the engine. This enables the following operations.

- The implement can be lowered to the ground by its weight as follows: Turn the key to the "ON" position, move the lock levers to the unlock position, and operate the control levers (implement and blade) to the implement lowering direction.
- The residual pressure in the hydraulic circuit can be released as follows: Turn the key to the "ON" position with the implement lightly contacting the ground, move the lock levers to the unlock position, and operate the control levers.

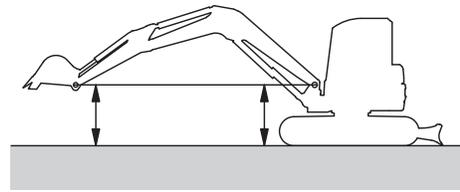
Accumulator functional check

! CAUTION

First check that there are no people or obstacles around the machine. Then start the engine.

Check the charged nitrogen gas pressure while starting the engine in the following procedure.

1. Stop the machine on a level ground in good footing conditions.
2. Keep the implement in the maximum reach configuration, and hold the bucket pivot pins and boom pivot pins at the same height.



140114-00X

Fig. 3-117

Perform the steps 3 to 5 within 15 seconds. After stopping the engine, the accumulator pressure will drop gradually. Therefore, perform the check immediately after stopping the engine.

3. Turn the starter switch to "OFF" to stop the engine while the implement is kept in the maximum reach configuration.
4. Turn the key to the "ON" position.
5. Move the lock lever to the unlock position and operate the control lever fully in the boom lowering direction to check that the implement contacts the ground.

6. When the implement is lowered and contacts the ground by its weight, the accumulator operates normally.

If the implement has not been lowered, or has stopped on its way, the charged gas pressure of the accumulator for the operating circuit may drop.

Ask your dealer to check.

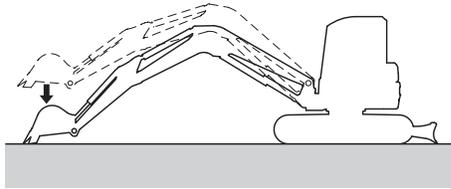


Fig. 3-118

7. After completing the checkup, move the lock lever to the lock position, and turn the key to the "OFF" position.

Handling SMARTASSIST-Remote

⚠ WARNING

- Under no circumstances must attempts be made to disassemble, repair, remodel, move or otherwise tamper with SMARTASSIST-Remote communication devices. Failure to observe this warning may result in malfunction of the machine or communication device or fire.
- Be careful to ensure that cables or cords are not damaged by, for example, becoming trapped or being subjected to excessive tugging. Failure to observe this warning may result in malfunction of the machine or communication device or fire due to short circuits or severed cables or cords.
- Persons with pacemakers must be careful to ensure that the implant is never less than 8.7 in. (22 cm) away from the antenna on the communication device. Failure to observe this warning may result in adverse effects on the operation of pacemakers caused by radio waves emitted by the communication device.

■ Overview of SMARTASSIST-Remote

SMARTASSIST-Remote is a system that uses communication devices mounted in machines to manage information pertaining to the location and operation of the machine. A contract must be signed for usage of SMARTASSIST-Remote. If interested, please contact your local YANMAR dealer for further information.

■ Regarding Use of Communication Devices

- Since SMARTASSIST-Remote uses mobile communications, use of the system may not be possible in places inaccessible by radio waves such as tunnels, underground locations or in buildings or in places with poor radio reception.
- Disassembling or removing the communication device may inhibit operation of the machine. In the event that the device needs to be removed or repaired, please contact your local YANMAR dealer.
- Although SMARTASSIST-Remote communication devices do not require any special operational procedures or inspections, please contact your local YANMAR dealer in the event of possible abnormalities.
- Communication devices mounted in machines use radio waves and, therefore, require approval in accordance with national and local laws and ordinances. Since measures such as the removal of communication devices before resale or export of machines in which they are mounted may be required, please contact your local YANMAR dealer in such cases.
- Some SMARTASSIST-Remote communication devices are mounted with a nickel metal hydride battery depending on the specification.
Disposal of communication devices mounted with a nickel metal hydride battery requires appropriate treatment. Please contact your local YANMAR dealer before disposing of such communication devices.

IMPORTANT

The SMARTASSIST-Remote communication device consumes minute amounts of power even when the starter switch of the machine in which it is mounted is in the "OFF" position. For details of long-term storage of machines, please refer to "Long-term Storage (Page 171)."

4. Transportation

Loading and unloading the machine

For safety in transporting the machine, comply with all applicable regulations and laws.

WARNING

- Be careful when loading and unloading the machine, because it is a job of high hazard potential.
- Load or unload the machine on level, solid ground far away from the shoulder of the road.
- Load or unload the machine at a low engine speed.
- Use ramp plates of adequate strength having hooks. Check to see that the ramp plates are wide, long, and thick enough to safely sustain the machine so that you can load or unload safely. To prevent the ramp plates from bending too much, support them with blocks.
- Securely hook the ramp plates to the deck of the truck so that they will not come off.
- Remove mud, grease, and other slippery deposits from the track shoes, and grease, oil, and ice deposits from the ramp plates to prevent the machine from skidding.
- Never change the travel direction on the ramp plates. If you need to change the travel direction, go back down the ramp plates.
- Swing slowly when on the truck bed, if it becomes necessary to do so, since the machine's position will be unstable.
- Make sure that the side door of the cabin is locked, either in the open or closed position. Never open or close the side door on the ramp plates, to prevent it from swinging violently.

To load or unload the machine, be sure to use the ramp plates and follow the procedures outlined below:

1. Firmly brake the truck and apply wheel stoppers to the tires. Securely install the ramp plates on the bed of the truck in a position where the center of the truck aligns with the center of the machine. Make sure that the left and right ramp plates are at the same level.

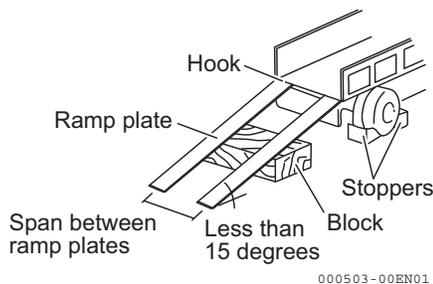


Fig. 4-1

The ramp plates should be set at an angle of less than 15 degrees.

Determine the span between the ramp plates on the basis of the centers of the track shoes.

Make sure that the travel automatic high speed switch is OFF.

2. Turn the engine control dial to the left to decrease the engine speed.
3. Travel toward the ramp plates at a low speed, and load or unload the machine with the implement lowered as close as possible to the deck of the truck. Do not operate any levers other than the travel levers while driving on the ramp plates.
4. Load the machine in a safe position on the truck.

Precautions for loading the machine

⚠ WARNING

Load or unload the machine on level, solid ground far away from the shoulder of the road.

After loading the machine in a safe position on the truck, secure the machine as follows:

1. Place the blade down on the bed of the truck.
2. Extend the bucket and arm cylinders to the maximum limit, and slowly lower the boom down on a block of wood.

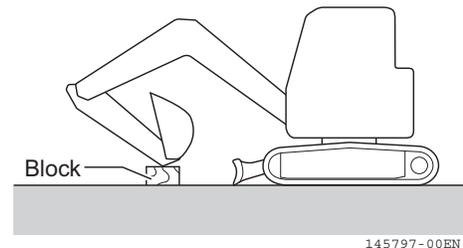


Fig. 4-2

3. Move the lock lever to the lock position.
4. Turn the key to the "OFF" position to stop the engine.
5. Remove the key from the starter switch.
6. Lock the bonnet, covers and cabin door with the key to prevent them from opening during transportation.
7. Provide wood blocks in the front and back of the track and hook the shackles to the machine's hook bores, and secure the machine with a sling belt or a wire rope so that the machine will not move during shipping. In particular, be sure to secure it to prevent skidding.

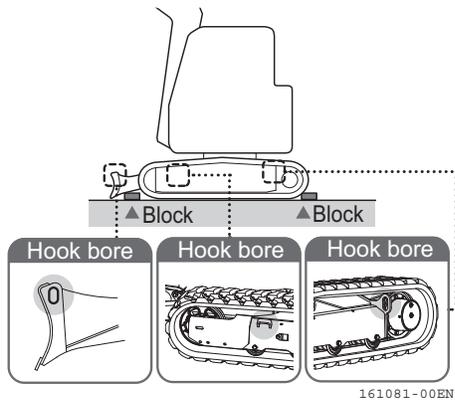
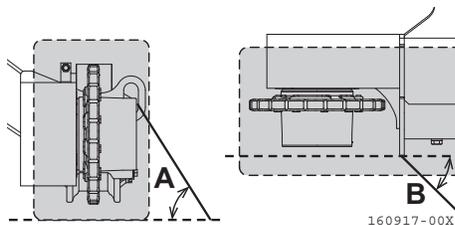


Fig. 4-3

IMPORTANT

- To protect the bucket cylinder from being damaged during shipping, place a wooden block under one end of the bucket to prevent it from directly touching the deck of the truck.
- Do not use the hook hole for the purpose other than stabilizing the machine during shipping. In particular, do not use the hook in the track frame section for lifting the machine.
- Secure the machine with a sling belt or a wire rope within the following angle.
 Blade side/Idler side
 A: 20 to 60 degrees B: 10 to 40 degrees
 Motor side
 A: 20 to 60 degrees B: 20 to 40 degrees



Precautions for transporting the machine

⚠ WARNING

- Select a route for transporting the machine based on the road width and clearance, and the height and weight of the machine.
- Make sure that the side door of the cabin is closed and locked before shipping.

For safe transportation, comply with all local regulations and laws.

Suspending the machine

⚠ WARNING

- Never suspend the machine if any person is on the machine or the implement.
- Use wire ropes strong enough for the weight of the machine.
- Do not suspend the machine in any way other than that explained on the following page.
 Failure to suspend the machine as prescribed will throw the machine off balance.
- Do not swing the machine being suspended.
- When suspending the machine, keep the machine in balance taking note of the center of gravity of the machine.
- Never stand near or under the suspended machine.

For safety in suspending the machine, comply with all applicable regulations.

Suspend the machine on the level ground as follows:

1. Swing the upperstructure so that the blade is behind the operator's seat.
2. Raise the blade to the highest limit.
3. Extend the hydraulic cylinders of the front implement (except for the boom swing cylinder) to the maximum.
4. Stop the engine, and make sure that nothing is left around the operator's seat before leaving the machine.
5. Pass a sling belt (or wire rope) through the portion (Fig. 4-4, A) on the boom.
6. Install the shackles to the suspending holes (two places) (Fig. 4-4, B) on the both sides of the blade, and then install the sling belt (or wire rope) securely.
7. Before tensioning the wire with a crane, place wooden blocks to portions where the wire rope contacts the machine body.

Note:

Determine the length of the sling belt (or wire rope) referring to the table below.

	Unit	a	b
Basic safe load	lb (t)	5952 (2.7) or more	5952 (2.7) or more
Length from suspending hole to lifting hook	in. (m)	70.9 (1.8)	153.5 (3.9)
Number of parts of line	pcs	1	2

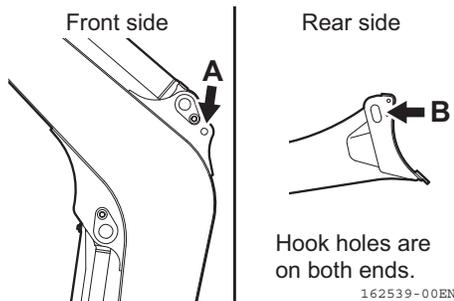


Fig. 4-4

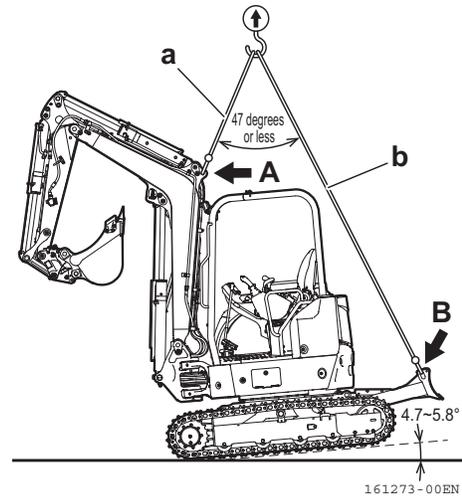


Fig. 4-5

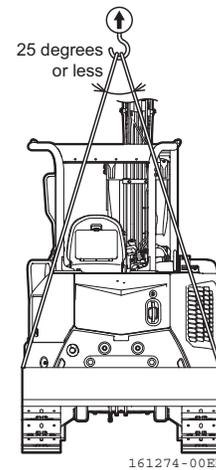


Fig. 4-6

8. Suspend the machine above the ground, wait until the machine is stable and then suspend it slowly.

IMPORTANT

- For a machine with a cabin, be sure to close the side door and the windshield.
- Be careful when lifting the machine, because the machine will be inclined during lifting.
- Set each lock lever at the lock position.

Shipping weight:

Unit: lbs. (kg)

Spec.			ViO35-7B
Quick coupler	Canopy	Rubber track	7540 (3420)
		Steel track	7782 (3530)
	Cabin	Rubber track	7882 (3575)
		Steel track	8124 (3685)
Without quick coupler	Canopy	Rubber track	7430 (3370)
		Steel track	7672 (3480)
	Cabin	Rubber track	7771 (3525)
		Steel track	8014 (3635)

5. Care and Service in Cold Weather

Preparing for cold weather

In cold weather, you may have difficulty in starting the engine or the cooling water may freeze. So take measures as follows.

Fuel and lube oil

Use low viscosity fuel and lube oil. For the specified viscosities, refer to Section "4. Fueling, Oiling and Greasing Based on Temperature Range" on page 194.

Cooling water

⚠ WARNING
Anti-freeze is flammable. When handling anti-freeze, keep away from any sources of ignition and do not smoke.

IMPORTANT
Never use an anti-freeze containing methanol, ethanol, or propanol.

For the timing of cooling water change and the mixing ratio of the anti-freeze, refer to Section "Replacing the engine cooling water" on page 230.

Battery

⚠ WARNING

- **The battery generates flammable gas and it can cause a fire and an explosion. Keep sparks or flames away from the battery.**
- **Battery electrolyte contains dilute sulfuric acid which is a strong acid. To avoid serious injury, do not allow the electrolyte to contact skin or splash into eyes.**
If the electrolyte contacts your skin or gets in your eyes, flush immediately with large amounts of water, and obtain medical treatment at once.

Battery performance deteriorates as the temperature goes down. When the battery voltage is low, battery electrolyte will easily freeze. Keep the charging rate close to 100% (full charging) and keep the battery warm for easy start the next day.

Note:
Measure the specific gravity of the electrolyte to determine the charge ratio using the conversion table given below.

Charging rate \ Electrolyte temperature	68 °F	32 °F	14 °F	-4 °F
	(20 °C)	(0 °C)	(-10 °C)	(-20 °C)
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

The specific gravity of the electrolyte varies with its temperature and recharged condition.

Precautions after a day's work

To prevent the machine from getting stuck in the morning due to frozen mud or water deposits on the undercarriage, be sure to observe the following precautions:

- Remove any mud or water adhering to the machine. If mud or water droplets adhering to the hydraulic cylinder rods should get into the seals, the seals could be damaged.
- Park the machine on solid, dry ground. If no solid, dry ground is available, lay plates on the ground and park the machine on the plates to prevent the frozen tracks from sticking to the ground.
- Drain the water accumulated in the fuel system by opening the drain cock, to prevent freezing.
- If the ambient temperature will be below 32 °F (0 °C), remove the battery from the machine, store it indoors, and reinstall it in the next morning.
- If the level of the battery electrolyte is low, add distilled water before starting operation on the next morning. To prevent the battery from freezing at night, do not add distilled water after completing operation.

After cold weather ends

When the temperature rises, do the following:

- Replace the lube oil and fuel with the specified viscosities according to Section "4. Fueling, Oiling and Greasing Based on Temperature Range" on page 194.
- Replace engine coolant with specified concentration. For the mixing ratio, refer to Section "Replacing the engine cooling water" on page 230.
- If you have added an AF-PT anti-freeze (for one winter season only), fully drain the cooling system, flush the inside of the cooling system well, and fill the cooling system with tap water.

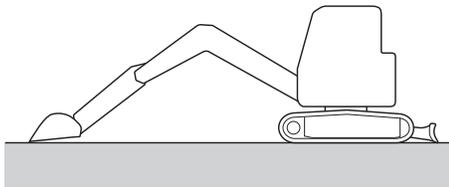
6. Long-term Storage

Before storing

IMPORTANT

When storing the machine, set up the machine as illustrated in the figure at the right, to protect the hydraulic cylinder rods from becoming corroded.

Retract the bucket and arm cylinders to place the bucket on the ground.



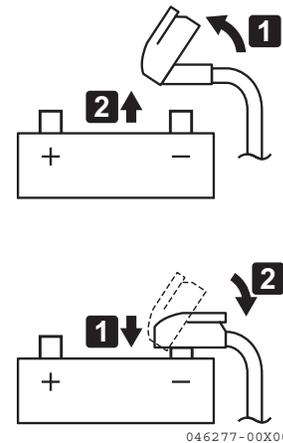
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Fig. 6-1

When storing the machine for a long period, do the following:

- Clean all parts and store the machine indoors. If you have to store the machine outdoors, park the machine on level ground and cover it with a protective sheet.
- Apply lube oil and grease to the machine and replace the engine oil.
- Apply a small amount of antirust to exposed parts of the hydraulic cylinder rods.
- After the battery has fully recharged, disconnect the negative terminal, and cover the battery or remove the battery from the machine to store it.

The negative terminal can be disconnected by lifting the terminal cover upward.



046277-00X00

Fig. 6-2

- Add an anti-freeze to the cooling water if the air temperature can fall below 32 °F (0 °C). For the mixing ratio of the anti-freeze, refer to Section "Replacing the engine cooling water" on page 230.
- Lock the control levers and pedals with the lock lever and pedal guards respectively.

- Antirust

When stored near the sea or in a place exposed to sea breezes, the machine easily becomes rusty. Carefully apply an antirust to all exposed parts of the piston rods and cover the machine with a polyethylene sheet or oil paper.

Recommended antirust	Manufacturer
P-1300 (Solvent cutback rust preventive oil)	JXTG Nippon Oil & Energy Corporation
P-3 (Solvent cutback rust preventive oil)	
P-300 (Solvent cutback rust preventive oil)	Cosmo Oil

Some antirust solvent damages rubber materials. Be sure to use the recommended antirust or its equivalent.

- To prevent condensation inside the fuel tank, either drain the fuel tank or fill the tank completely.

Storing

⚠ WARNING

When you have to operate the machine indoors for the antirust procedure, be sure to ventilate the area well by opening windows and doors to prevent asphyxiation.

Move the machine at least once a month to form new oil films on all the moving parts during long-term storage, and recharge the battery at the same time.

Using the machine again

IMPORTANT

When reusing a machine that has been stored for a long time without receiving antirust treatment once a month, consult your dealer.

To use the machine again after a long period of storage, follow the procedure below:

- Wipe antirust off the hydraulic cylinder rods.
- Apply generous amounts of grease or oil to the moving parts.
- Drain water from the fuel tank, the engine oil pan and the hydraulic oil tank by removing the drain plugs.
- After starting the engine, warm-up the machine before use.

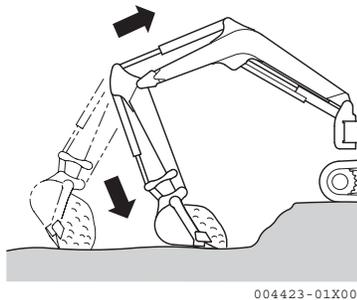
7. Troubleshooting

Phenomena that do not constitute faults

The following phenomena do not constitute faults:

- Shaking of the bucket

When the boom is raised immediately after extending the arm while curling the bucket, the bucket may shake. This phenomenon is not a fault.



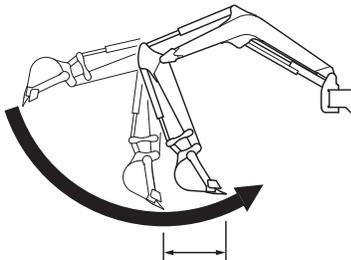
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Fig. 7-1

- Discontinuous arm movement

When digging the ground with the arm, the arm may slow down momentarily at the almost vertical position especially when the engine speed is low.

This phenomenon is not a fault.



Slow-down is remarkable over this range

000514-01EN00

Fig. 7-2

- Shift in upperstructure position

When turning the machine sharply as when spin-turning or pivot-turning, the upperstructure may slightly shift out of position.

This phenomenon is not a fault.

- Thermal shock of the travel motor

If, in cold weather, the temperature of the hydraulic oil elevates after start-up and becomes 140 °F (60 °C) higher than the outside temperature by relief operation without traveling, sometimes the machine cannot pivot-turn because of thermal shock. This phenomenon is not a fault.

- The boom swing cylinder is extended when digging

The swing cylinder may become extended in some digging situations or postures. This phenomenon is not a fault.

- Time lag in travel speed change response

At low engine speed, a time lag in response may occur when the travel speed is changed from high speed to low speed. This phenomenon is not a fault.

- Braking sound from the travel motor

When a sudden operation, such as a sudden stop or a change of direction during high speed travel, is performed, a sound may occur from the brake valve of the travel motor.

- Sluggishness when starting the engine

Regarding the starter switch, turning the key rapidly from "OFF" to "START" position may cause a slow operation when starting the engine.

Towing

⚠ WARNING

Always safely tow a disabled machine by using the proper equipment and procedures.

The use of incorrect methods or improper procedures could result in bodily injury.

Follow the recommendations below to properly perform the towing procedure.

If the machine becomes mired in muddy ground and must be towed out, or when it is necessary for the machine to tow a heavy object, attach the sling belt as illustrated below.

IMPORTANT

- Check to see that the wire ropes, sling belts, and shackles to be used are of sufficient strength and are free from cracks and damage.
- Never tow the machine with the wire rope attached only to the hook.
- The hook is only intended for stabilizing the machine during shipping.

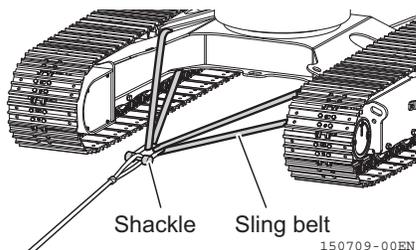


Fig. 7-3

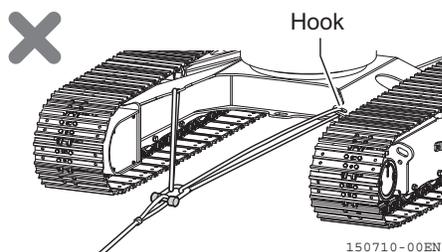


Fig. 7-4

If the battery is overdischarged

⚠ WARNING

- Stop the engine and turn the key to the "OFF" position before checking or servicing the battery.
- Flammable hydrogen gas is produced by the battery, which may cause ignition. Keep flames, sparks and lit cigarettes away from the battery.
- The battery electrolyte contains dilute sulfuric acid, which is a strong acid. If the battery electrolyte contacts your clothes, they may be damaged. If the battery electrolyte gets into your eyes or contacts your skin, flush immediately with large amounts of water, and obtain medical treatment at once.
- Be sure to wear safety goggles when handling a battery.
- To disconnect the terminals, begin with the negative terminal (ground side); to connect the terminals, begin with the positive terminal. If a tool touches both the positive terminal and the machine, hazardous sparks may be generated.
- If a terminal is loose, hazardous sparks may be generated due to poor contact, which could cause ignition and explosion. Be sure to securely connect the terminals.

To disconnect, begin with the negative terminal (ground side)

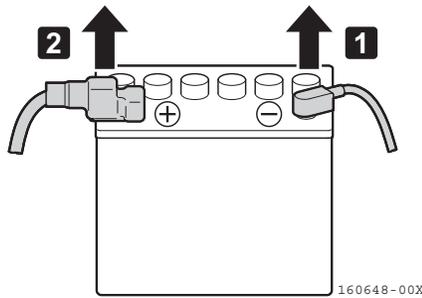


Fig. 7-5

To connect, begin with the positive terminal

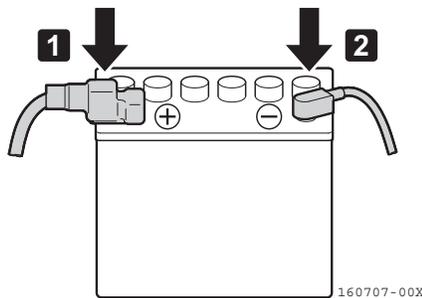


Fig. 7-6

■ Charging with the battery mounted on the machine

- Remove the battery cables from the positive and negative terminals of the battery before charging it. If this is not done, abnormal voltage may be applied to the generator which could damage it.
- While charging the battery, remove all plugs to release the gases generated by charging.
- If the battery overheats [the temperature of the battery exceeds 113 °F (45 °C)], interrupt charging.
- Stop charging as soon as the process has been completed. Overcharging could cause the following troubles:
 - Overheating of the battery
 - Decrease in battery electrolyte
 - Battery failure
- Do not reverse polarity of the cable connections to the battery (i.e., the negative cable to the positive terminal, or the positive cable to the negative terminal). Reversing the polarity of the connections will cause the generator to be damaged.
- Handling the battery (except for checking the electrolyte level and measuring the specific gravity of the electrolyte) should be performed after disconnecting the battery cables.

Starting the engine using booster cables

To start the engine using booster cables, do the following.

⚠ WARNING

- When you start the engine using booster cables, wear safety goggles.
- If you start the engine by taking electric power from another machine, do not allow contact between your machine and the other machine.
- To connect the booster cables, begin with the positive terminal, and to disconnect them, begin with the negative terminal (ground side).
- If a tool touches the positive terminal and the machine at the same time, hazardous sparks may be generated.
- Do not connect the booster cables to terminals of reverse polarity. That is, never connect a negative side cable on one machine to the positive terminal on the other machine.
- As the last step, connect the negative booster cable to the upperstructure. At this time, sparks will be generated. Connect the terminal to a point as far away from the battery as possible.

IMPORTANT

- The booster cable capacity and the clip size should be suitable for the battery current.
- The battery of the normal machine should be the same capacity as that of the machine in trouble.
- Check the booster cables and clips for an absence of damage, cracks, and corrosion.
- Securely connect the clips.

■ Connecting the booster cables

Turn the starter switch to the "OFF" position, and connect the booster cables as follows:

1. Turn the starter switches on both the normal machine and the machine in trouble to the "OFF" position.
2. Connect the clip of the booster cable (**Fig. 7-7, A**) (normally red) to the positive terminal on the machine in trouble.
3. Connect the other clip of the booster cable (**Fig. 7-7, A**) to the positive terminal on the normal machine.
4. Connect the clip of the booster cable (**Fig. 7-7, B**) (normally black) to the negative terminal on the normal machine.
5. Connect the other clip of the booster cable (**Fig. 7-7, B**) to the upperstructure frame of the machine in trouble.

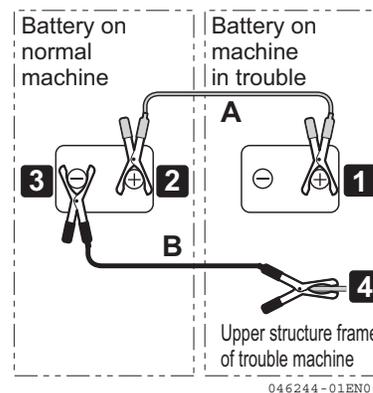


Fig. 7-7

■ Starting the engine

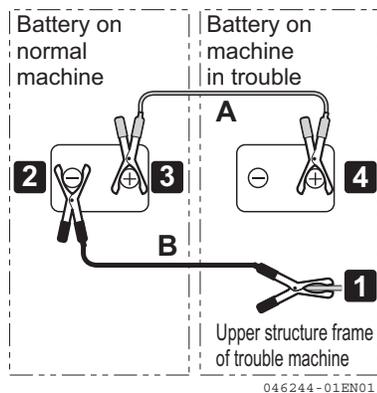
1. Make sure that the clips are securely connected to the battery terminals.
2. Start the engine on the normal machine, and increase the engine speed to high idle.
3. Turn the starter switch on the machine in trouble to the "START" position to start the engine.

If the engine does not start, wait for more than two minutes and retry starting. (At this point, do not stop the engine on the normal machine and keep engine speed at high idle.)

■ Disconnecting the booster cables

After the engine on the machine in trouble has started, disconnect the booster cables in the reverse order of the connecting procedure.

1. Remove the clip of the booster cable (**Fig. 7-8, B**) from the upperstructure frame on the machine in trouble.
2. Remove the clip of the booster cable (**Fig. 7-8, B**) from the negative terminal on the normal machine.
3. Remove the clip of the booster cable (**Fig. 7-8, A**) from the positive terminal on the normal machine.
4. Remove the clip of the booster cable (**Fig. 7-8, A**) from the positive terminal on the machine in trouble.

**Fig. 7-8**

Troubleshooting

Engine and electrical equipment

- Contact your dealer about the measures shown in parentheses in the list below.
- If there is any abnormality or trouble whose cause is unknown other than those shown below, ask your dealer for repair.

	Problem	Cause	Measure
Engine	Engine oil pressure error display	<ul style="list-style-type: none"> • Shortage of engine oil • Too much engine oil • Clogged engine oil filter • Defective engine oil pressure switch or wiring 	<ul style="list-style-type: none"> • Check engine oil level and replenish. • Check engine oil level and adjust. • Replace engine oil and engine oil filter. (• Check and repair.)
	Error indicating abnormal engine cooling water temp. is displayed.	<ul style="list-style-type: none"> • Insufficient amount of coolant • Clogged or broken radiator fin • Coolant leakage • Loose or broken fan belt • Internal contamination of cooling system • Defective coolant pump 	<ul style="list-style-type: none"> • Check coolant level and replenish. • Check radiator fin. Clean or repair. (• Check and repair.) <ul style="list-style-type: none"> • Adjust fan belt tension or replace. • Replace coolant. Clean inside of cooling system. (• Check and repair.)
	Battery charging error display	<ul style="list-style-type: none"> • Loose or broken fan belt • Defective battery • Insufficient power generation of alternator 	<ul style="list-style-type: none"> • Adjust fan belt tension or replace. • Check battery electrolyte level. Recharge or replace battery. • Adjust fan belt tension or replace.
	Turning on starter motor does not start engine.	<ul style="list-style-type: none"> • Shortage of fuel • Air mixed in fuel system • Improper fuel • Clogged fuel filter • Abnormal fuel injection • Improper compression 	<ul style="list-style-type: none"> • Refill fuel tank. Release the air. • Repair portion from which air enters fuel system. Release the air. • Replace fuel with specified one. • Replace fuel filter. (• Check and repair.) (• Check and repair.)
	Starter motor does not turn or turns slowly.	<ul style="list-style-type: none"> • Insufficient battery voltage • Defective wiring system • Defective starter switch • Blown out slow blow fuse • Defective starter motor 	<ul style="list-style-type: none"> • Recharge or replace battery. • Replace slow blow fuse (• Check and repair.) (• Check and repair.) (• Check and repair.)
	Dark fumes come out of machine.	<ul style="list-style-type: none"> • Overload • Clogged or contaminated air cleaner element. • Improper fuel • Abnormal fuel spray pattern of fuel injection valve • Improper compression 	<ul style="list-style-type: none"> • Lower working load. • Clean or replace air cleaner element. • Replace fuel with specified one. (• Check and repair.) (• Check and repair.)

Problem		Cause	Measure
Engine	Exhaust color is white or bluish white.	<ul style="list-style-type: none"> • Improper fuel • Abnormal fuel injection • Too much engine oil • Combustion or abnormal consumption of engine oil 	<ul style="list-style-type: none"> • Replace fuel with specified one. (• Check and repair.) • Check and adjust engine oil level. (• Check and repair.)
Electrical equipment	LCD monitor does not light up when starter switch is turned on.	• Defective LCD monitor or wiring system.	(• Check and repair.)
	While the engine is running, the charge warning icon is displayed on the LCD monitor.	<ul style="list-style-type: none"> • Defective wiring system • Defective alternator 	<ul style="list-style-type: none"> (• Check and repair.) (• Check and repair.)

Machine performance

- Contact your dealer about the measures shown in parentheses in the list below.
- If there is any abnormality or trouble whose cause is unknown other than those shown below, ask your dealer for repair.

Problem		Cause	Measure
Machine performance	Power or speed of moving part is low.	<ul style="list-style-type: none"> • Deteriorated function caused by worn hydraulic pump • Operating pressure of system relief valve or circuit relief valve in control valve is lower than set value. • Broken hydraulic cylinder • Insufficient amount of hydraulic oil • Clogged filter 	<ul style="list-style-type: none"> (• Replace hydraulic pump.) (• Check and repair control valve.) (• Check and repair.) • Check hydraulic oil level and replenish. (• Check filter. Clean or replace.)
	Upper structure does not swing or does not swing smoothly.	<ul style="list-style-type: none"> • Insufficient amount of grease • Defective swing brake valve • Defective swing motor • Swing brake is not released. 	<ul style="list-style-type: none"> • Check and grease. (• Check and repair.) (• Check and repair.) (• Check and repair.)
	Hydraulic oil temp. is too high.	<ul style="list-style-type: none"> • Insufficient amount of hydraulic oil • Overload • Clogged or inclined oil cooler fin 	<ul style="list-style-type: none"> • Check hydraulic oil level and replenish. • Lower working load. • Clean or repair.
	Machine does not travel straight.	<ul style="list-style-type: none"> • Improperly adjusted crawler or foreign material caught • Defective hydraulic motor • Defective hydraulic pump • Defective travel pilot or control valve • Broken sprocket, idler or track roller 	<ul style="list-style-type: none"> • Adjust or check. (• Check and repair.) (• Check and repair.) (• Check and repair.) (• Check and repair.)

Angle blade

- Contact your dealer about the measures shown in parentheses in the list below.
- If there is any abnormally or trouble whose cause is unknown other than those shown below, ask your dealer for repair.

Condition	Cause	Check item	Action
Angle speed is slow or it does not work	• Dust being caught in relief valve or malfunction	• Measure set pressure	• Adjust pressure after disassembly and washing or replace
	• Hydraulic oil leakage in the swivel joint	• Inspect swivel joint seal	• Replace seals after disassembly
	• Malfunction of control valve (solenoid valve)	• Inspect fuse • Inspect connection of couplers • Inspect solenoid operation • Inspect spool • Inspect control switch • Inspect solenoid valve-related harness	• Replace faulty parts • Wash spool
	• Hydraulic oil leakage in the cylinder	• Inspect seal in the cylinder	• Replace seals after disassembly
When the angle is operated while traveling, it does not work	• Dust being caught in shuttle valve or malfunction	• Overhaul shuttle valve	• Disassemble and wash • Replace faulty parts
Not floating in the float position	• Dust being caught in blade remote control valve or malfunction	• Inspect pilot pressure • Inspect blade remote control valve	• Disassemble and wash • Replace faulty parts
	• Dust being caught in control valve or malfunction	• Inspect control valve, blade, and spool	• Disassemble and wash • Replace faulty parts

MAINTENANCE

1. Precautions for Servicing ...	182	First services	201
2. Basic Servicing Practices ...	184	Nonperiodic services	201
Diesel fuel	185	Checking before start-up	216
Engine oil	187	Maintenance every 50 service hours ...	216
Engine cooling water	188	Maintenance every 100 service hours...	217
Hydraulic oil and Reduction gear oil	189	Maintenance every 250 service hours...	217
Handling grease, oil, fuel and filters	190	Maintenance every 500 service hours...	221
Electrical equipment	191	Maintenance every	
Hydraulic system	191	1000 service hours	227
3. Consumables	193	Maintenance every	
4. Fueling, Oiling and Greasing Based on Temperature Range	194	1500 service hours	230
Fuel and oil	194	Maintenance every	
Cooling water	194	2000 service hours	230
5. Standard Tightening Torque for Bolts and Nuts	195	Maintenance every	
Torque table	195	3000 service hours	233
6. Replacing Essential Parts Periodically	196		
7. Maintenance Table	198		
Table of service time intervals	198		
Service intervals when using the hydraulic breaker	200		
8. Procedures for Maintenance	201		

1. Precautions for Servicing

Do not use any inspection or servicing procedures that are not described and recommended in this manual.

Park the machine on solid, level ground to inspect and service it.

■ Check the hour meter

Read the hour meter every day to check if any service item has reached the time prescribed for implementation.

■ Use YANMAR genuine replacement parts

Use YANMAR genuine parts specified in the Parts Catalog.

■ Use YANMAR genuine lube oil and grease

Use YANMAR genuine lube oil and grease of specified viscosity for the operating temperature range.

■ Use clean lube oil and grease

Use clean lube oil, grease and containers and prevent dust from mixing into them.

■ Clean the machine

Clean the machine for easy isolation of faulty parts.

Particularly clean the grease nipple, breather, and the oil level gauge glass to prevent dust from entering into them.

■ Be careful of high water and oil temperatures

It is dangerous to replace the oil, the cooling water and the filter immediately after stopping the engine. Wait until their temperatures drop. When the engine oil is too cool, heat the oil to adequate temperature [approximately 68 °F to 104 °F (20 °C to 40 °C)] before draining oil to improve draining efficiency.

■ Check the drained oil and the old filter element

When replacing the engine oil, the hydraulic oil, or the filter element, check the drained oil and the old filter element for metallic dust and foreign solid deposits.

■ Observe precautions for replenishing oil

If a strainer is mounted on the oil port, do not remove the strainer to replenish oil.

■ Be careful of dust

When checking or replacing the oil, do this in a clean environment to prevent dust contamination.

■ Attach the warning tag

When the oil or the cooling water is being drained, attach the "SERVICING IN PROGRESS" tag to one of the control levers so that other persons will not start the engine.

■ Observe the warning labels

Observe the warning labels affixed to the machine.

■ Observe the precautions for welding

- Make sure to disconnect the battery cables (positive and negative terminals).
- Do not apply a voltage of 200 V or more continuously.
- Ground the machine within 3.3 ft. (1000 mm) from the welded part.
- Make sure that there is no seal or bearing between the welded part and the grounded part.
- Do not ground around the pins on the implement or the hydraulic cylinder.

■ Be careful of fire

Clean parts with noncombustible detergent.

■ Clean mating surfaces before assembly

When you have removed a part with an O-ring or a gasket seal, clean the mating surfaces before installing the new part.

At this point, do not fail to refit the O-ring or the gasket.

■ Do not drop anything from your breast pocket

When you open the cover and attempt to look down into the inside of the machine, remove loose items from your breast pocket to eliminate the risk that they may drop into the machine.

■ Check the undercarriage

After the machine is used at a rocky place, check the undercarriage for damage. Check for loose bolts and nuts, cracks, wear, and other damage. Loosen the tension of the crawlers more than usual.

■ Observe the precautions for cleaning the machine

- Do not spray steam directly at the connectors.
- Do not splash water on the monitors in the cabin.
- Do not spray high-pressure water directly at the radiator and the oil cooler.

■ Check before and after working

If the machine is to be used in mud, rain, snow, or on a beach, check for loose plugs and cocks before working. After working, clean the machine and check each part for cracks and damage and check for loose or missing bolts and nuts. Apply grease earlier than usual. Particularly apply grease every day to the pins on the implement which are submerged in mud.

■ Observe the precautions for working in a dusty place

If you use the machine in a dusty place, be careful of the following:

- Check the air cleaner for clogging.
- Clean the air cleaner element earlier than scheduled.
- Clean the radiator fin earlier to prevent it from clogging.
- Clean or replace the fuel filter element earlier than scheduled.
- Clean the electric equipment, especially the starter motor and the generator, to avoid dust deposits.

■ Do not mix oils

Never mix oils of different makes or types. If you have to replenish an oil with a different make or type than the one already in the tank, remove the remaining oil completely.

2. Basic Servicing Practices

- Use YANMAR genuine replacement parts.
- Do not mix oils of different makes and types when replacing or replenishing oil.
- The following types of oil, fuel and cooling water are used at the factory for shipping unless otherwise specified:

Item	Type
Engine oil	SAE10W30, CF
Travel reduction gear oil	Gear oil SAE90 (GL-4)
Hydraulic oil	ISO VG46
Fuel	Diesel light oil (Ultra low sulfur)
Engine cooling water	YANMAR genuine long-life coolant (LLC) 51 % + water

Diesel fuel

- Because the fuel injection pump is a precision device, using a fuel containing water or dust will cause problems.
- Be careful that impurities will not be mixed into the fuel especially after storing the machine and refueling.
- Be sure to use a fuel recommended in the Operation & Maintenance Manual. In addition, keep in mind that you should use a fuel appropriate for the operating temperature range because it will freeze at temperatures lower than 5 °F (-15 °C).
- Fully refuel every day after finishing the work so that the moisture in the fuel tank will not condense and water will not mix with the fuel.
- Before starting the engine, or ten minutes after refueling, drain any deposits and water through the drain plug on the fuel tank.
- If the fuel level becomes low or the filter element is replaced, the air should be bled from the fuel system.

Diesel Fuel Specifications

Diesel fuel should comply with the following specifications. The table lists several world-wide specifications for diesel fuels.

Diesel fuel specification	Location
ASTM D975 No. 1D S15 No. 2D S15	USA
EN590:96	European Union
ISO 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB19147-2016	China

Additional technical fuel requirements

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 0.5 % by volume. Less than 0.05 % is preferred. A higher sulfur content fuel may cause sulfuric acid corrosion in the cylinders of the engines. Especially in U.S.A. and Canada, Ultra Low Sulfur fuel must be used.
- Never mix kerosene, used engine oil, or residual fuels with the diesel fuel.
- Water and sediment in the fuel should not exceed 200 mg/kg.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Poor quality fuel can reduce engine performance and/or cause engine damage.
- Fuel additives are not recommended. Some fuel additives may cause poor engine performance. Fuel additives containing alcohol content, such as drainage agent etc. have adverse effects on the sealing section, and it will result in fuel leaks. Consult your dealer for more information.
- Ash content not to exceed 0.01 % by mass.
- Carbon residue content not to exceed 0.35 % by mass. Less than 0.1 % is preferred.
- Total aromatics content should not exceed 35 % by volume. Less than 30 % is preferred.
- PAH (Polycyclic Aromatic Hydrocarbons) content should be below 10 % by volume.
- Metal content of Mg, Si, and Al should be equal to or lower than 1 mass ppm. (Test analysis method JPI-5S-44-95)
- Lubricity: Wear mark of WS1.4 should be Max. 0.018 in. (460 μm) at HFRR test.
- Be sure to use fuel that does not contain zinc or sodium.

- Never use kerosene or fuel mixed with kerosene.
- Never use fuel that has been stored in a drum or the like for a long period of time.
- Be sure to use fuel purchased from authorized diesel fuel suppliers.

■ Bio-diesel fuels

In Europe and in the United States, as well as some other countries, non-mineral oil based fuel resources such as RME (Rapeseed Methyl Ester) and SOME (Soybean Methyl Ester), collectively known as FAME (Fatty Acid Methyl Esters), are being used as extenders for mineral oil derived diesel fuels.

YANMAR approves the use of bio-diesel fuels that do not exceed a blend of 7 % (by volume) of FAME with 93 % (by volume) of approved mineral oil derived diesel fuel. Such bio-diesel fuels are known in the marketplace as B7 diesel fuels.

These B7 diesel fuels must meet certain requirements.

1. The bio-fuels must meet the minimum specifications for the country in which they are used.
 - In Europe, bio-diesel fuels must comply with the European Standard for both EN14214 and EN590 (for Oxidation stability).
 - In the United States, bio-diesel fuels must comply with the American Standard for both ASTM D-6751 and ASTM D-7467 (for Oxidation stability).
2. Bio-fuels should be purchased only from recognized and authorized diesel fuel suppliers.

Precautions and concerns regarding the use of bio-fuels:

1. Free methanol in FAME may result in corrosion of aluminum and zinc FIE components.
2. Free water in FAME may result in plugging of fuel filters and increased bacterial growth.
3. High viscosity at low temperatures may result in fuel delivery problems, supply pump seizures, and poor injection nozzle spray atomization.
4. FAME may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.
5. Even bio-diesel fuels that comply with a suitable standard as delivered, will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain a supply of clean, fresh fuel. Regular flushing of the fuel system, and/or fuel storage containers, may be necessary.
6. Use bio diesel fuel within 2 months after filling it to the fuel tank, or within 3 months after its production at the manufacturer. The use of bio-diesel fuels that do not comply with the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or biodiesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine.

Engine oil

- Only use the engine oil specified. Other engine oils may affect warranty coverage, cause internal engine components to seize and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap/dipstick and the surrounding area before you remove the cap.
- Never mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil.
- Never overfill. Overfilling may result in white exhaust smoke, engine overspeed or internal damage.

⚠ WARNING



Burn Hazard!

- Wait until the engine cools before you drain the engine coolant. Hot engine coolant may splash and burn you.
- Failure to comply could result in death or serious injury.

Engine Oil Specifications

Use an engine oil that meets or exceeds the following guidelines and classifications:

■ Service categories

- API service categories CD, CF, CF-4, CL-4
- ACEA service categories E3, E4, E5
- JASO service category DH-1

■ Definitions

- API classification (American Petroleum Institute)
- ACEA classification (Association des Constructeurs Européens d'Automobilie)
- JASO (Japanese Automobile Standards Organization)

Note:

- Be sure the engine oil, engine oil storage containers, and engine oil filling equipment are free of sediments and water.
- YANMAR does not recommend the use of engine oil "additives."

■ Additional technical engine oil requirements:

The engine oil must be changed when the Total Base Number (TBN) has been reduced to 1.0 mgKOH/g. TBN (mgKOH/g) test method; JIS K-201-5.2-2 (HCl), ASTM D4739 (HCl).

Engine cooling water

- Because unpotable water may contain much calcium and impurities, using it will cause water scale to build up in the engine or the radiator, causing poor heat exchange and overheating.
Never use unpotable water for cooling purposes.
- When using an anti-freeze, observe the precautions described in the Operation & Maintenance Manual.
- A YANMAR machine is shipped with YANMAR genuine anti-freeze. The anti-freeze is anticorrosive to protect the cooling system. Because the anti-freeze can be used continuously over two years, you need not remove it in hot weather.

⚠ DANGER

Keep sources of ignition away from the antifreeze because it is flammable.

- The mixing ratio of anti-freeze to water differs based on air temperature.
For the mixing ratio, refer to Section "Replacing the engine cooling water" on page 230.
- If the engine is overheated, replenish the cooling water after the engine has cooled down.
- Shortage of cooling water will cause the cooling system not only to overheat but also to corrode, due to air which comes in the system.

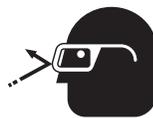
⚠ DANGER



Scald Hazard!

- **Never remove the radiator cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the radiator cap.**
- **Tighten the radiator cap securely after you check the radiator. Steam can spurt out during engine operation if the cap is loose.**
- **Always check the level of the engine coolant by observing the reserve tank.**
- **Failure to comply will result in death or serious injury.**

⚠ CAUTION



Engine Coolant Hazard!



- **Wear eye protection and rubber gloves when you handle long life or extended life engine coolant.**
If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.
- **Failure to comply may result in minor or moderate injury.**

- Only use the engine coolant specified. Other engine coolants may affect warranty coverage, cause an internal buildup of rust and scale and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine coolant. Carefully clean the radia-

tor cap and the surrounding area before you remove the cap.

- Never mix different types of engine coolants. This may adversely affect the properties of the engine coolant.

Engine Coolant Specifications

Use a Long Life Coolant (LLC) or an Extended Life Coolant (ELC) that meets or exceeds the following guidelines and specifications.

■ Alternative engine coolant

If an Extended or Long Life Coolant is not available, alternatively, you may use an ethylene glycol or propylene glycol based conventional coolant (green).

Note:

- *Always use a mix of coolant and water. Never use water only.*
- *Mix coolant and water per the mixing instructions on the coolant container.*
- *The mix ratio of Long Life Coolant or anti-freeze to water should be from 30 to 60 %.*
- *Water quality is important to coolant performance. YANMAR recommends that soft, distilled or demineralized water be used to mix with coolants.*
- *Never mix extended or long life coolants and conventional (green) coolants.*
- *Never mix different types and/or colors of extended life coolants.*
- *Replace the coolant every 2000 engine hours or every 2 years.*

■ Additional technical coolant specifications:

- ASTM D6210, D4985 (US)
- JIS K-2234 (Japan)
- SAE J814C, J1941, J1034 or J2036 (International)

Hydraulic oil and Reduction gear oil

- Because the oil is used in the machine under extreme conditions (high temperature and pressure), it deteriorates as time elapses. Be sure to use oils of the grades which are specified in the Operation & Maintenance Manual and suitable for the operating temperature range. Even if the oil is not contaminated, be sure to replace the oil within the specified service hours.
- Oil is equivalent to blood in a human body. Be careful in handling it so that impurities (water, metallic dust, and foreign solids) will not be mixed into it. Most machine failures are caused by impurities in the oils. Be careful not to mix impurities into the oils especially after storing the machine and replenishing oils.
- Do not mix oils of different makes and types.
- Use the specified amount of oil. Use of larger or smaller amounts of oil than specified may cause machine problems.
- If the oil becomes cloudy, it may suggest that water or air could have been mixed into the hydraulic system. If this event happens, ask your dealer for assistance.
- Be sure to replace the oil filter element with a new one when changing the oil.
- To know what condition the machine is in, it is recommended that you analyze the properties of the oil periodically. Ask your dealer for more information on this issue.

Handling grease, oil, fuel and filters

Grease

- Grease ensures smooth operation of moving parts such as connectors and prevents operating noises.
- The nipples not listed on the pages for periodic service are those used for overhaul purposes. Normally it is not necessary to refill them.
Grease them if any abnormal condition arises after long term use.
- Wipe away all excess grease after greasing. Carefully wipe the excess grease from all moving parts which might be easily worn by adhered sand or grit.

Storing the oil and fuel

- Store the oil and fuel indoors so that they are not be contaminated by impurities such as water or dust.
- When you store oil or fuel in drums for a long period, position them so that their outlets align in a straight line (to prevent moisture absorption).
When storing the oil or the fuel outdoors, cover the drums with a waterproof sheet.
- To avoid deterioration caused by long-term storage, use the oil on a first-in first-out basis.

Filter

- The filters are very important parts which prevent impurities from getting into critical devices through the lube oil, fuel and air systems.
Replace the filter elements periodically according to the instructions of the Operation & Maintenance Manual.
Under difficult conditions, you need to

replace the filter elements earlier than suggested in the Operation & Maintenance Manual depending on the type of oil and fuel (sulfur content).

- Never reuse the filter elements (cartridge type) by cleaning them.
- When replacing a filter element, confirm that no metallic dust or foreign solids are present on the old filter.
If they are found to be present, contact the nearest dealer.
- Do not unpack the filter element before use.
- Use YANMAR genuine filter elements.

Electrical equipment

- If electrical equipment gets wet or wiring insulation is broken, electric leaks may occur and the machine may malfunction.
- Check the fan belt for tension and damage, and also check the battery.
- Never disconnect or disassemble the electrical equipment mounted on the machine.
- Do not mount any electrical equipment other than those items provided by YANMAR.
- Be careful not to spray water on the electrical equipment when washing the machine or operating in the rain.
- After working near the sea, take necessary precautions to protect the electrical equipment from corrosion.

Hydraulic system

- The hydraulic system is hot during and immediately after operation. It is also under high pressure during operation. Therefore, check and service the hydraulic system carefully as follows:

Retract the bucket and arm cylinders to place the bucket on the ground.

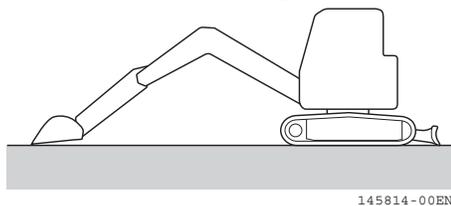


Fig. 2-1

- Put the bucket on level ground so that no pressure is applied to the hydraulic cylinder circuits.
- Be sure to stop the engine.
- Wait until the temperature drops sufficiently before starting maintenance.
- Release the pressure from the hydraulic circuit.

Handling accumulator: Refer to page 160.

- Do not suddenly remove any plugs, screws or connecting parts of the hoses. Otherwise oil may spout out due to residual internal pressure even when the oil temperature has lowered. Be careful not to stand in front of any plugs, screws or connecting parts when loosening them, to prevent injury. Loosen them gradually, to relieve the internal pressure.
- Always relieve the internal pressure before checking and servicing the hydraulic system.
- Check the hydraulic oil level, replace the filter element, and replace the hydraulic oil when necessary.
- After removing hydraulic hoses and piping, check the O-rings and the packing for damage before reinstalling them. Replace them if they are damaged.
- Bleed air after replacing or cleaning the hydraulic oil filter element or strainer, repairing or replacing the hydraulic equipment, or reinstalling the hydraulic cylinder or piping.

Bleed air according to the following procedure:

1. After operating the engine at low idle speed with no load for a couple of minutes, increase the engine speed to a middle speed.
 2. Slowly operate each cylinder 4 to 5 times to approximately 4 in. (100 mm) before both stroke ends.
 3. Operate the cylinder 4 to 5 times at full stroke.
- Failure to bleed air from the hydraulic cylinder and operating it suddenly to the stroke ends could cause piston seal damage.
 - If air is left in the hydraulic circuit, it will compress and expand and the hydraulic equipment will not operate smoothly. Air in the hydraulic circuit may shorten the service life of the hydraulic pump.

4. Check the hydraulic oil level and replenish hydraulic oil to the specified level if necessary.

Refer to Section "Checking and replenishing the hydraulic oil tank" on page 113.

3. Consumables

Replace consumable parts such as filter element and bucket teeth periodically or earlier than wear limit.

Replace consumable parts securely to use our product more economically.

When you replace a part, be sure to use a YANMAR genuine part.

When ordering consumables, let us know the part numbers given in the parts catalog.

■ List of consumables

Item	Parts No.	Q'ty	Replacing time interval
Engine oil filter	119005-35170	1	Every 500 service hours
Fuel filter	119802-55801	1	Every 500 service hours
Air cleaner element	1A8240-05110	1	Every 500 service hours
Hydraulic oil return filter element	172B82-73700	1	Every 500 service hours (At first 250 service hours)

4. Fueling, Oiling and Greasing Based on Temperature Range

Fuel and oil

Select fuel and oil based on to the air temperature range.

The prescribed amount of oil means the total amount of oil included in the piping and equipment.

The amount of oil to be changed means the amount of oil replaced in checking and servicing.

If you start the engine at air temperatures lower than 32 °F (0 °C), use SAE10W, SAE10W-30, or SAE15W-40 even if the temperature in the daytime rises to 50 °F (10 °C) or so.

Part to be refilled	Oil type	Recommendations with regard to temperature ranges						Prescribed amount of oil	Amount of oil to be changed	
		(°F)	-4	-14	32	50	68			86
		(°C)	(-20)	(-10)	(0)	(10)	(20)	(30)		
Engine oil pan	Engine oil	SAE 10W CF						7.7 Qts. (7.3 L)	7.7 Qts. (7.3 L)	
		SAE 10W-30 CF								
		SAE 15W-40 CF								
Travel reduction gear	Gear oil	SAE 90 (GL- 4)						0.5 Qts. (0.5 L) (For right and left each)	0.5 Qts. (0.5 L) (For right and left each)	
Hydraulic oil system	Hydraulic oil	ISO VG46						In the tank 8.5 Gals. (32 L) Other parts 5.8 Gals. (22 L)	8.5 Gals. (32 L)	
Fuel tank	Light oil	No. 1-D or No. 2-D diesel fuel						11.6 Gals. (44 L)	-	
Cooling system	Water	YANMAR genuine long-life coolant (LLC) added						Radiator	-	
								4.3 Qts. (4.1 L)		
								Subtank		
							0.4 Qts. (0.4 L)			

Cooling water

For the mixing ratio of the cooling water, refer to Section "Replacing the engine cooling water" on page 230.

5. Standard Tightening Torque for Bolts and Nuts

Torque table

Bolts or nuts in the metric system should be tightened at the torque described below unless otherwise specified.

Item		Thread size × pitch	Tightening torque ft·lbf (N·m)	Remarks
Hexagon bolt (8.8) Nut	Coarse threads	M6 × 1	7.23 to 8.68 (9.8 to 11.8)	<ul style="list-style-type: none"> • Apply 80 % tightening torque when tightened to aluminum. • Apply 60 % tightening torque for 4.8 bolt and lock nut. • Use fine threads for engine only.
		M8 × 1.25	16.6 to 21.0 (22.6 to 28.4)	
		M10 × 1.5	32.6 to 43.4 (44.1 to 58.8)	
		M12 × 1.75	57.9 to 72.3 (78.5 to 98.1)	
		M14 × 2	86.8 to 108.5 (117.7 to 147.1)	
		M16 × 2	123.0 to 151.9 (166.7 to 206.0)	
		M18 × 2.5	173.6 to 209.8 (235.4 to 284.4)	
	Fine threads	M14 × 1.5	94.0 to 108.5 (127.5 to 147.1)	
		M16 × 1.5	155.5 to 177.2 (210.8 to 240.3)	
Hexagon bolt (10.9)		M16 × 2	169.9 to 220.6 (230.4 to 299.1)	
PT plug		1/8	7.2 (9.8)	-
		1/4	14.5 (19.6)	
		3/8	21.7 (29.4)	
		1/2	43.4 (58.8)	
Pipe joint bolt		M8	9.4 to 12.3 (12.7 to 16.7)	-
		M12	18.1 to 25.3 (24.5 to 34.3)	
		M14	28.9 to 36.2 (39.2 to 49.0)	
		M16	36.2 to 43.4 (49.0 to 58.8)	

IMPORTANT

If a part to be tightened is made of resin like a panel board, excessive tightening torque may damage the tightened part. Be careful when tightening.

6. Replacing Essential Parts Periodically

For safe operation, the machine must be serviced periodically. To increase safety, be sure to periodically replace the parts listed in the table of safety parts on the next page. A fire could result if they deteriorate or are damaged.

These parts are vulnerable to age and wear or deterioration and it is difficult to determine the degree to which they have deteriorated on the occasion of periodic service. To maintain their proper function at all times, therefore, replace them with new ones after using them for a specific period of time even if no abnormality is found with the parts.

If you find abnormalities in these parts before their scheduled replacement time is reached, repair or replace them immediately.

If a hose clamp is deformed or cracked, replace it immediately.

Check the hydraulic hoses (which are not periodic replacement parts). If any abnormality is found in them, retighten them or replace them immediately.

When replacing the hydraulic hoses, replace the O-rings and seals at the same time.

For further information about replacing the safety parts, ask your dealer.

Check the fuel and hydraulic hoses according to the periodic schedule described below.

Check categories	Check points
Start-up check	Oil leak from the connections or bodies of the fuel and hydraulic hoses
Voluntary monthly check	Oil leak from the connections or bodies of the fuel and hydraulic hoses Damage (crack, wear, or peeling) of the fuel and hydraulic hoses
Prescribed annual check	Oil leak from the connections or bodies of the fuel and hydraulic hoses Interference, crushing, aging, torsion, or damage (crack, wear, or peeling) of the fuel and hydraulic hoses

■ **List of essential parts**

No.	Essential parts to be replaced periodically	Q'ty	Replacement time intervals
1	Fuel hose (fuel tank to water separator)	1	Earlier of either every 2 years or every 2000 service hours
2	Fuel hose (water separator to feed pump)	1	
3	Fuel hose (feed pump to fuel filter)	1	
4	Fuel hose (fuel filter to fuel injection pump)	2	
5	Fuel hose (fuel filter to fuel tank)	1	
6	Fuel hose (fuel injection pump to fuel injection valve)	1	
7	Fuel hose (fuel injection valve to fuel injection valve)	2	
8	Fuel tube cap	1	
9	Main pump outlet hose (P1, P2, P3 to C/V)	3	

7. Maintenance Table

Daily and periodic inspection are important to keep the machine in its best condition. The following is a summary of inspection and servicing requirements by inspection interval. Periodic inspection intervals vary depending on the use, loads, fuels and lube oils used and handling conditions, and are hard to establish definitively. The following should be treated only as a general standard. When the time for an inspection approaches, study the relevant pages in the Operation & Maintenance Manual. Keep a record of daily operation and the results of maintenance work.

Table of service time intervals

Check and service points	Page
--------------------------	------

■ Checking before start-up

Walking check (visual inspection) around the machine	108
Checking and replenishing the cooling water	109
Checking and draining the water separator	110
Checking and replenishing the engine oil	111
Checking and replenishing the fuel in the fuel tank	112
Checking and replenishing the hydraulic oil tank	113
Checking the fan belt tension	114
Checking and replenishing the battery electrolyte	114
Greasing	115
Checking the electrical equipment	116

■ Nonperiodic servicing

Checking, adjusting and replacing the rubber crawlers	201
Checking and adjusting the steel crawler	207
Replacing the bucket teeth and side cutter	210
Replacing the blade cutting edge (Angle blade spec.)	212
Maintenance, inspection and servicing of air conditioner (Cabin spec.)	212
Cleaning the cabin floor (Cabin spec.)	216

■ List of periodic inspection and servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items		Every 50 hrs	Every 100 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 2000 hrs	Every 3000 hrs	Page
Fuel oil	Fuel tank	□								217
	Water separator				□					221
	Fuel filter element				●					222
	Fuel hose							● (within two years)		
Lube oil	Engine oil				● (within one year)					223
	Engine oil filter				● (within one year)					
	Engine oil hose							◇ (within two years)		223
	Travel reduction oil		● (1st time)	◇		●				
Cooling water	Cooling water							● (within two years)		230
	Radiator				□					
	Cooling water hose							◇ (within two years)		
Hydraulic system	Hydraulic oil					●				228
	Suction filter					□				
	Return filter			● (1st time)	●					
	Oil cooler				□					
	Hydraulic hose							● (within two years)		
	Accumulator							◇		
Upper-structure	Swing gears and swing bearings	■								
Engine	Air cleaner			□	●					
	Compressor belt (Cabin spec.)	◇ (1st time)		□						
	Fan belt	◇ (1st time)		□						
	Valve clearance					□				
	Valve sheet							◇ (As required)		
	Crankcase breather system						◇			
	Breather hose							◇ (within two years)		
	Fuel injection valve						◇			
	Check, clean and test EGR valve									□

Note:

When machine is used at dusty worksites clean and replace filter element twice or more frequently than specified in the table.

Service intervals when using the hydraulic breaker

When a hydraulic breaker is used, the hydraulic oil deteriorates earlier than in usual bucket excavating work. Set up the service time intervals as follows:

- **Replacing the hydraulic oil return filter element**

Replace the hydraulic oil return filter element after 100 to 150 hours only at initial time for a new machine. After that, replace it in accordance with the chart at the **Fig. 7-1**.

- **Replacing the hydraulic oil in the hydraulic oil tank**

Replace the hydraulic oil in accordance with the chart at the **Fig. 7-1**.

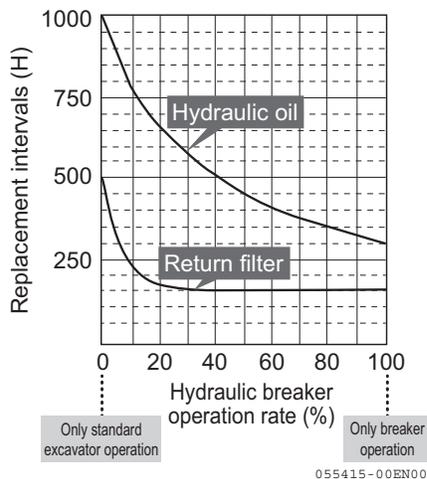


Fig. 7-1

8. Procedures for Maintenance

First services

Service it as follows only at the initial time for a new machine.

■ At first 100 hours

Replacing the lube oil for the travel reduction gearbox.

For this procedures, refer to Section "Maintenance every 1000 service hours".

■ At first 250 hours

Replacing hydraulic return filter element.

For this procedure, refer to Section "Maintenance every 500 service hours".

Nonperiodic services

Checking the rubber crawlers (for rubber crawler types)

Rubber crawlers in the following condition require repair or replacement. Ask your dealer to repair or replace them.

■ Height of lugs

- As the lug height "a" is reduced by wear, the tractive force decreases.

If "a" becomes 0.2 in. (5 mm) or less, replace the crawler with a new one.

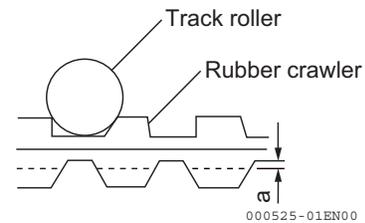


Fig. 8-1

- If two or more links of the steel cord inside the crawler are exposed due to wear of the lugs, replace the crawler with a new one.

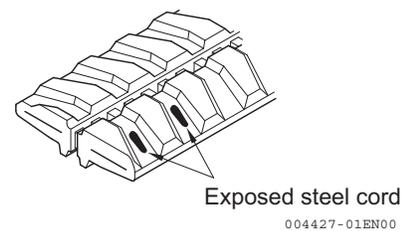


Fig. 8-2

■ Rubber crawler steel cord breakage

If half or more of either of the steel cords is broken, replace the rubber crawler with a new one.

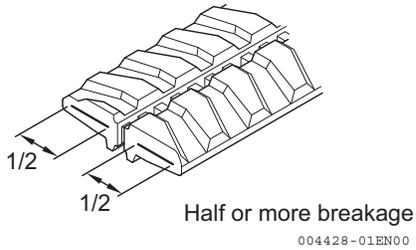


Fig. 8-3

■ Separation of the core metal of the rubber crawler

If the core metal of the rubber crawler separates even at one place, replace the rubber crawler with a new one.

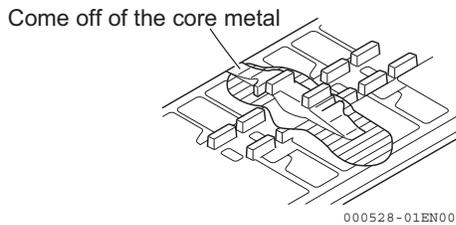


Fig. 8-4

■ Rubber crawler tension

If the rubber crawler tension is habitually loose even after grease is injected, the grease adjuster may be defective internally. Ask your dealer to repair the grease adjuster.

■ Crack in the rubber crawler

If a crack occurs between any lugs of the rubber crawler, repair it if the crack length reaches approximately 2.4 in. (60 mm). If the inside steel cord is exposed even though the crack is small, repair the rubber crawler immediately. If the crack length is less than 1.2 in. (30 mm) or the crack depth is less than 0.4 in. (10 mm), you do not need to repair the rubber crawler. For a decision on whether the rubber crawler should be replaced, repaired or should continue to be used, ask your dealer.

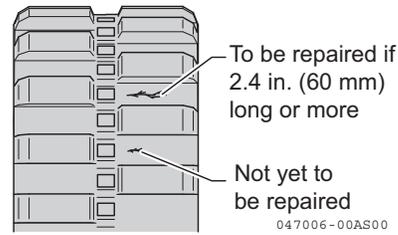


Fig. 8-5

Checking and adjusting the rubber crawler tension

⚠ WARNING

- When adjusting the rubber crawler tension while raising the machine, do not support the machine with the implement only.
The control levers could move or the hydraulic oil could flow out accidentally so that the machine would fall.
- When raising the machine, support it with safety blocks of sufficient strength.
When the machine is being checked or adjusted by two persons, one must operate the machine in response to signs from the other.

How a rubber crawler wears out depends on the working conditions and the nature of the ground. Be sure to check the rubber crawlers for wear and tension from time to time. When a new rubber crawler is mounted, perform the first check after 30 hours operation.

■ Checking the rubber crawler tension

1. Move the machine so that the joint ( mark) on the inside surface of the rubber crawler is positioned at the upper center of the track frame.

A : '  ' mark inside rubber crawler

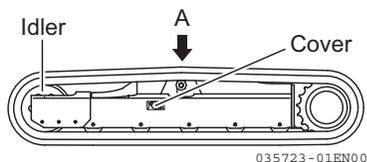


Fig. 8-6

2. Lift the machine with the implement and the safety blocks.
To do this, operate the control lever slowly.

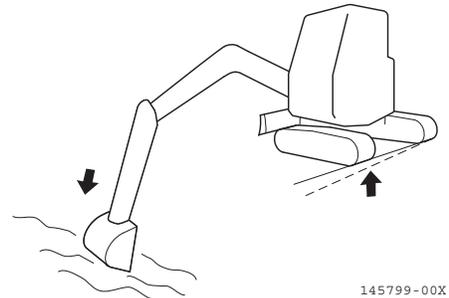


Fig. 8-7

3. The tension is proper if the clearance between the middle track roller rim and the rubber crawler is 0.3 to 0.5 in. (8 to 13 mm).

Working with the rubber crawler too loose will cause the rubber crawler to come off or the core metal to wear out earlier.

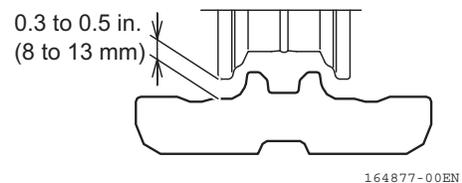


Fig. 8-8

■ Adjusting the rubber crawler tension

• To increase the tension

Prepare a grease gun.

1. Remove the cover (Fig. 8-9, 1).

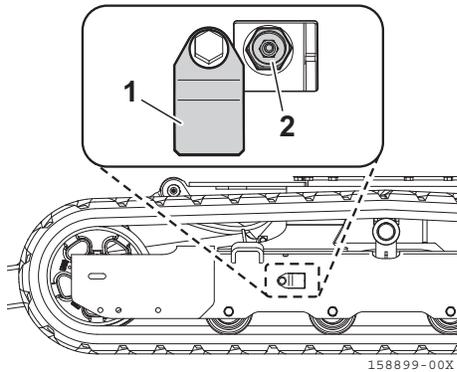


Fig. 8-9

2. Raise the machine using the implement and the safety blocks. Inject grease through the nipple valve (Fig. 8-9, 2) using a grease gun until the rubber crawler tension has achieved the proper clearance [0.3 to 0.5 in. (8 to 13 mm)].

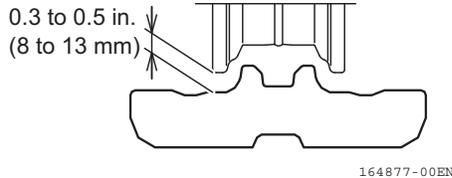


Fig. 8-10

3. To check that the tension is proper, lower the machine and move the machine back and forth slightly.
4. Check the rubber crawler tension again. If the tension is improper, adjust it again.
5. Install the cover (Fig. 8-9, 1).
6. The tension is adjustable until the clearance "a" is reduced to 0 in. (0 mm). If the tension is still loose, the rubber crawler may need repairing due to excessive wear. Contact your dealer and ask for repair.

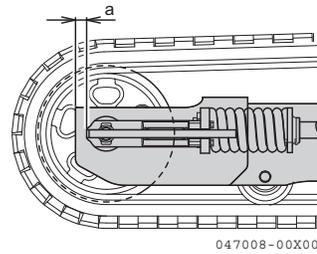


Fig. 8-11

7. If the tension is loose even after grease injection, it is necessary to replace either the rubber crawler or the grease adjuster. Contact your dealer for assistance.

- **Loosening the tension**

⚠ WARNING

- **Grease is under high pressure. If the nipple valve is opened suddenly, grease could be ejected or the valve could blow, which could cause bodily injury.**
 - **Do not rely on valve appearance alone to determine whether or not grease has been discharged, but check that by measuring the tension of the rubber crawler.**
 - **Do not open the nipple valve more than one turn.**
 - **It is very dangerous to discharge the grease by any procedure other than that described below.**
- If the tension of the rubber crawler cannot be loosened, contact your dealer and ask for repair.**

1. Remove the cover (Fig. 8-12, 1).

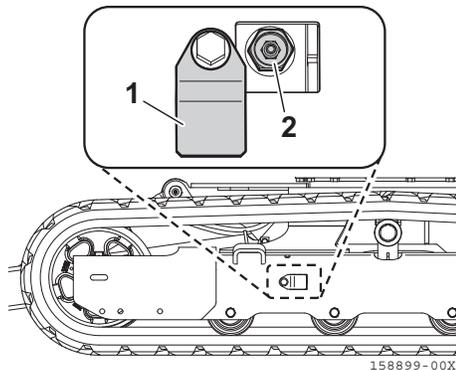


Fig. 8-12

2. Raise the machine with the implement and the safety blocks. Slowly loosen the nipple valve (Fig. 8-12, 2) and discharge the grease to adjust the rubber crawler tension and to achieve the proper clearance [0.3 to 0.5 in. (8 to 13 mm)].
Never loosen the nipple valve more than one turn.
(If the grease is not discharging properly,

lower the machine and move the machine back and forth slightly.)

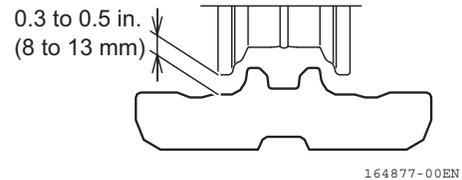


Fig. 8-13

3. Tighten the nipple valve (Fig. 8-12, 2).
Tightening torque:
36.1 to 38.4 ft•lbf (49 to 52 N•m)
4. To check that the tension is proper, lower the machine and move the machine back and forth slightly.
5. Recheck the rubber crawler tension and readjust it if necessary.
6. Completely wipe away all of the discharged grease.

IMPORTANT

The rubber crawler is not grease-resistant.

Completely wipe away all of the grease because grease will shorten its service life.

7. Install the cover (Fig. 8-12, 1).

Replacing the rubber crawler

⚠ WARNING

- To replace the rubber crawler with a new one, work with a partner. You must operate the machine in response to signs from your partner.
- When raising the machine, support it with safety blocks of sufficient strength.
- Because the rubber crawler is replaced with the machine in a raised position, there is a danger that the machine may accidentally fall. Do not move any parts other than the rubber crawler to be replaced in doing the job.
- The high internal pressure of the grease can cause the nipple valve to eject. When you loosen the nipple valve, do not loosen it more than one turn. At this point, do not loosen any parts other than the nipple valve. Also, do not turn your face toward the nipple valve.
- When removing the rubber crawler, make sure that all of the grease has been completely discharged before turning the sprocket.
- If the tension of the rubber crawler cannot be loosened by the procedure described here, ask your dealer to repair the rubber crawler.

■ Removing the rubber crawler

Prepare a grease gun and steel pipes.

1. Raise the machine with the implement and the safety blocks.
- To do this, slowly operate the control lever.
2. Remove the cover (**Fig. 8-14, 1**) and loosen the nipple valve (**Fig. 8-14, 2**) little by little to gradually discharge the grease. Never loosen the nipple valve (**Fig. 8-14, 2**) more than one turn.

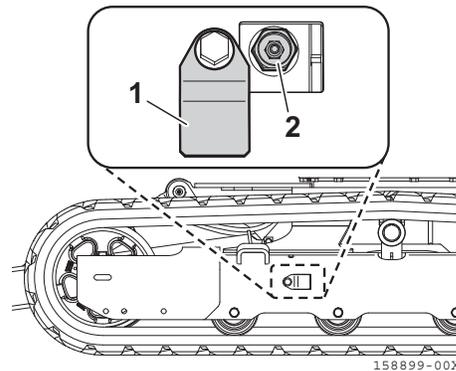


Fig. 8-14

3. Insert the steel pipes into the rubber crawler and turn the sprocket in the reverse direction. When the rubber crawler is separated from the idler by the steel pipes, slide the rubber crawler off.

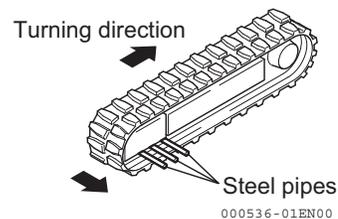
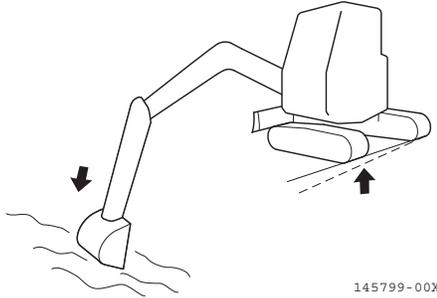


Fig. 8-15

■ Installing the rubber crawler

1. Raise the machine with the implement and the safety blocks.

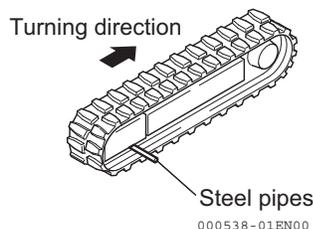
To do this, slowly operate the control lever.



145799-00X

Fig. 8-16

2. Engage the rubber crawler with the sprocket, and place the rubber crawler on the idler.
3. Rotate the sprocket in the reverse direction to push the rubber crawler in, and then stop rotating it.
4. Insert a steel pipe into the rubber crawler, and rotate the sprocket again to place the rubber crawler on the idler.
5. Stop rotating the sprocket, and confirm that the rubber crawler is securely positioned on both the sprocket and the idler.
6. Adjust the rubber crawler tension, referring to Section "Checking and adjusting the rubber crawler tension" on page 203.
7. Confirm that the rubber crawler is fully engaged with both the sprocket and the idler, and that the rubber crawler tension is sufficient. Then lower the machine to the ground.



000538-01EN00

Fig. 8-17

Checking and adjusting the steel crawler

⚠ WARNING

- When adjusting the steel crawler tension while raising the machine, do not support the machine with the implement only. The control levers could move or the hydraulic oil could flow out accidentally so that the machine would fall.
- When raising the machine, support it with safety blocks of sufficient strength.
- When the machine is being checked or adjusted by two persons, one must operate the machine in response to the signs from the other.

How the pins and bushings on the steel crawler will wear down depends on the working conditions and the ground conditions. Check the steel crawler tension from time to time to keep proper tension.

Check and adjust the steel crawler tension under the same conditions as in operation (for example, mud clogged condition if working in muddy ground.)

■ Checking the steel crawler tension

1. Raise the machine with the implement and the safety blocks. To do this, operate the control lever slowly.

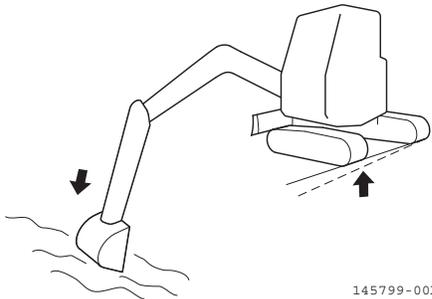


Fig. 8-18

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2. At a position that will be safe even if the machine should fall, measure the clearance between the bottom of the track frame center and the upper surface of the shoe plate.

The tension is proper if the clearance is 5.1 in. (130 mm) [4.7 to 5.1 in. (120 to 130 mm) when replacing with a new one].

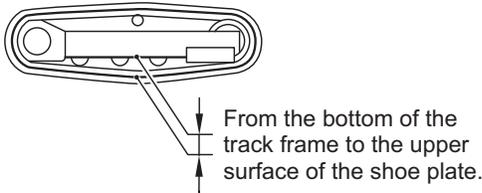


Fig. 8-19

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■ Adjusting the steel crawler tension

• To increase the tension

Prepare a grease gun.

1. Remove the cover (Fig. 8-20, 1).

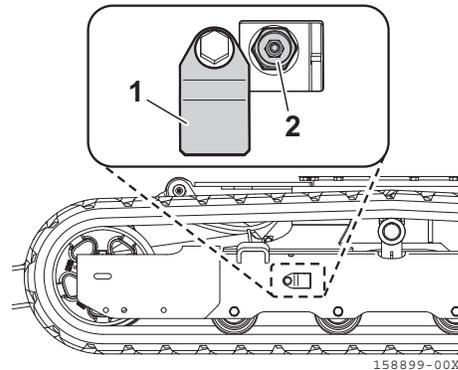


Fig. 8-20

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2. Raise the machine with the implement and the safety blocks.
3. Inject grease through the nipple valve (Fig. 8-20, 2) using a grease gun until the steel crawler tension is 5.1 in. (130 mm) [4.7 to 5.1 in. (120 to 130 mm) when replacing with a new one].
4. To check that the tension is proper, lower the machine and move the machine back and forth slightly.
5. Check the steel crawler tension again. If the tension is improper, adjust it again.
6. Install the cover (Fig. 8-20, 1).
7. The tension can be adjusted until the clearance "a" is reduced to 0 in. (0 mm). If the tension is still loose after adjustment, the pin and the bushing should be replaced because they are probably worn excessively.

Ask your dealer to repair the crawler.

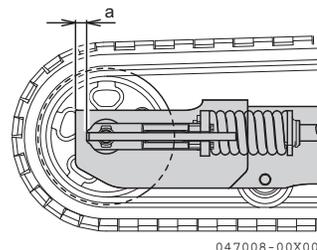


Fig. 8-21

047008-00X00

- **Loosening the tension**

⚠ WARNING

- **Grease is under high pressure. If the nipple valve is opened suddenly, grease could be ejected or the valve could blow, which could cause bodily injury.**
- **Do not rely on valve appearance alone to determine whether or not grease has been discharged, but check that by measuring the tension of the steel crawler.**
Do not open the nipple valve more than one turn.
- **It is very dangerous to discharge the grease by any procedure other than that described below. If the tension of the steel crawler cannot be loosened, ask your dealer to repair the steel crawler.**

1. Remove the cover (Fig. 8-22, 1).

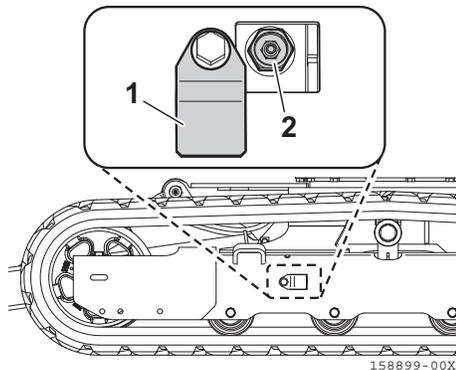


Fig. 8-22

2. Raise the machine with the implement and the safety blocks.
 3. Loosen the nipple valve (Fig. 8-22, 2) and discharge the grease until the steel crawler tension is 5.1 in. (130 mm) [4.7 to 5.1 in. (120 to 130 mm) when replacing with a new one].
- Never loosen the nipple valve (Fig. 8-22, 2) more than one turn.

- If the grease is not discharging properly, lower the machine and move the machine back and forth slightly.
4. Tighten the nipple valve (Fig. 8-22, 2).
Tightening torque:
36.1 to 39.8 ft·lbf (49 to 54 N·m)
 5. Completely wipe away all of the discharged grease.
 6. To check that the tension is proper, put down the machine and move the machine back and forth slightly.
 7. Recheck the steel crawler tension and readjust it if necessary.
 8. Install the cover (Fig. 8-22, 1).

Replacing the bucket teeth and side cutter

■ Replacing the bucket teeth

When the bucket teeth are worn, replace them in accordance with the following procedure:

⚠ WARNING

- When replacing the bucket teeth, be careful not to move the implement by mistake for safety. Place the implement in a stable position, stop the engine, and ensure to move the lock levers to the lock position.
- During replacement operations, always wear safety gear such as safety goggles.

IMPORTANT

Replace the teeth before the point (Fig. 8-23, 1) is worn to the adapter (Fig. 8-23, 4).

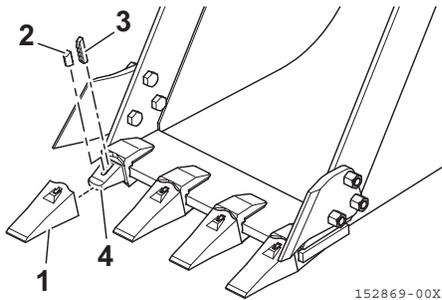


Fig. 8-23

1. Place wood blocks on a level ground and lower the bucket to the ground with its bottom kept level as shown in Fig. 8-24.

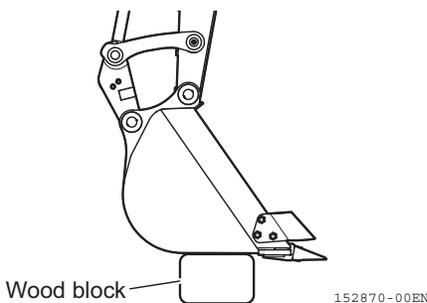


Fig. 8-24

2. Strike out the locking pin (Fig. 8-23, 3) installed on the bucket with a hammer and punch to remove the point (Fig. 8-23, 1).

IMPORTANT

Do not strike the punch toward the rubber pin lock (Fig. 8-23, 2). Otherwise the rubber pin lock (Fig. 8-23, 2) may be damaged. Strike the tool toward the back of the pin.

3. Remove the rubber pin lock (Fig. 8-23, 2).
4. Check the removed rubber pin lock (Fig. 8-23, 2) and locking pin (Fig. 8-23, 3).

Using the rubber pin lock (Fig. 8-23, 2) and locking pin (Fig. 8-23, 3) in the conditions below may cause the point (Fig. 8-23, 1) to come off during operation. Replace the applicable part with a new one.

- There is a crack in the rubber of the rubber pin lock (Fig. 8-23, 2) and the roller may come off.
- When pushed with a finger, the roller sinks in the rubber.
- With the lower side of the locking pin (Fig. 8-23, 3) aligned with the point bottom line, the dimension (Fig. 8-26, B) is equal to or more than 1/3 of the dimension (Fig. 8-26, A).

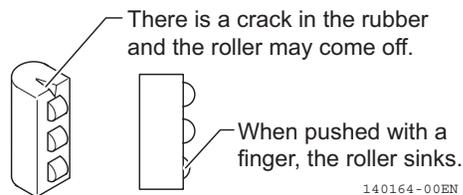


Fig. 8-25

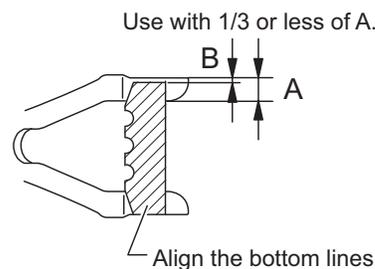


Fig. 8-26

5. Clean the surface of adapter (**Fig. 8-23, 4**) with a tool such as a putty knife to remove the hard mud fixed on it.
6. Push the rubber pin lock (**Fig. 8-23, 2**) into the hole on the adapter (**Fig. 8-23, 4**) by hand or by a hammer.

IMPORTANT

<p>Do not let the rubber pin lock (Fig. 8-23, 2) come out of the adapter (Fig. 8-23, 4) surface.</p>

7. Install the point (**Fig. 8-23, 1**) to the adapter (**Fig. 8-23, 4**) and check that the rear surface of the pin hole on the point (**Fig. 8-23, 1**) is almost aligned with the rear surface of the pin hole on the adapter (**Fig. 8-23, 4**) when the point (**Fig. 8-23, 1**) is pushed strongly onto the adapter (**Fig. 8-23, 4**).
8. Insert the locking pin (**Fig. 8-23, 3**) into the pin hole on the point (**Fig. 8-23, 1**) and strike it so that the upper end of the locking pin (**Fig. 8-23, 3**) will be flush with the surface of the point.
 - Replace the rubber pin lock (**Fig. 8-23, 2**) and locking pin (**Fig. 8-23, 3**) with new ones at the same time when replacing the point (**Fig. 8-23, 1**). This prevents the point (**Fig. 8-23, 1**) from coming off.

■ Replacing the side cutter

Delay in replacing the side cutter could damage the bucket.

Replace the side cutter before the bucket is damaged.

Tightening torque:

108.50 to 130.18 ft•lbf (147.1 to 176.5 N•m)

Screw lock agent: Loctite 262

- Replace the bolts, nuts and spring washers when replacing the side cutter.

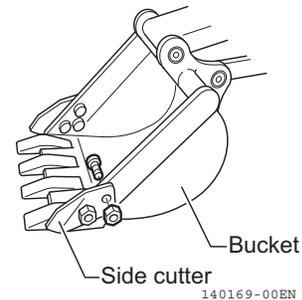


Fig. 8-27

Replacing the blade cutting edge (Angle blade spec.)

⚠ WARNING

When replacing the cutting edge, be careful not to move the blade by mistake for safety.
Place the blade in a stable position, stop the engine, and securely lock the lock levers.

When the cutting edge is worn, loosen the nuts as shown in the figure and replace the cutting edge.

When installing the cutting edge, apply adhesive to the bolts and tighten the nuts with the following tightening torque.

Tightening torque:

151.8 to 173.5 ft•lbf (205.8 to 235.2 N•m)

Adhesive: Loctite 262

- Replace the bolts, nuts and spring washers when replacing the cutting edge.

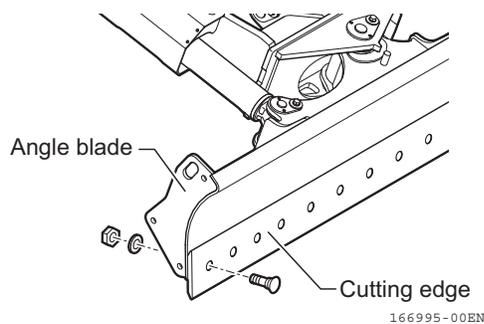


Fig. 8-28

Maintenance, inspection and servicing of air conditioner (Cabin spec.)

Daily maintenance and periodic inspection and servicing are required for the air conditioner to use it comfortably in the best condition.

Proper maintenance allows reduction in trouble and longer life of the air conditioner.

Exact inspection and servicing prevent trouble and reduce the cost for repair.

The air conditioner should also be checked and serviced at the time of a voluntary monthly inspection and a prescribed annual inspection of the machine.

It is recommended that the rubber hoses and electrical wires should be replaced every two years to use the air conditioner in the best condition.

Check points

- Abnormal sound and vibration of compressor
- Damage to compressor and condenser, and oil oozing in surrounding areas
- Abnormal sound and vibration of air conditioner unit
- Oil oozing on air conditioner hose and in unit connecting areas

The air conditioner should also be checked and serviced at the time of a voluntary monthly inspection and a prescribed annual inspection of the machine.

It is recommended that the rubber hoses and electrical wires should be replaced every two years to use the air conditioner in the best condition.

■ Cleaning the inner and outer air filters

1. Grab the knobs of the outer air filter (**Fig. 8-29, 1**) and the inner air filter (**Fig. 8-29, 2**), then pull them out.
2. Blow off the clogged dirt or the like with compressed air.
3. Reinstall the cleaned filters.

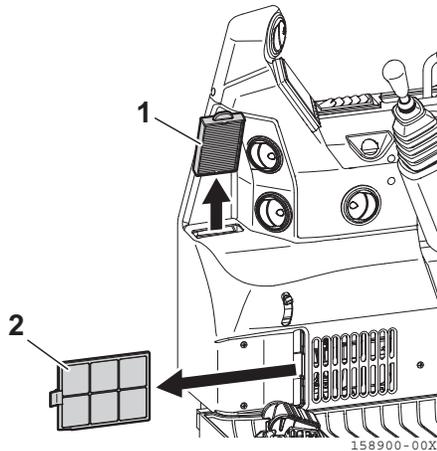


Fig. 8-29

Note:

- Inner air filter (**Fig. 8-29, 2**) can be washed off with water after removing dirt. Outer air filter (**Fig. 8-29, 1**) can NOT be washed off with water.
- If the function has not been recovered even after cleaning, replace the filter.
- When washing the cabin floor or other parts with water, be sure to cover the filters to protect them from muddy water splashes.

Checking and cleaning condenser

⚠ WARNING

- Be sure to stop the engine and remove the starter switch key before checking and servicing the condenser.
- Be sure to reinstall the cover and other parts, which have been removed for checking and servicing, to their original positions after completion of the work.

1. Open the cabin rear cover.

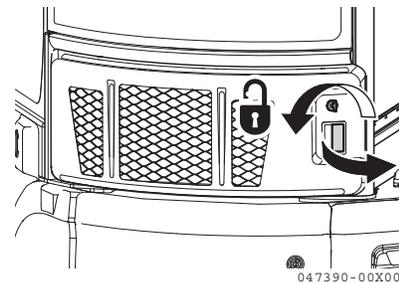


Fig. 8-30

2. If there is any mud or dirt on the condenser (**Fig. 8-31, 1**), wash it off with water.

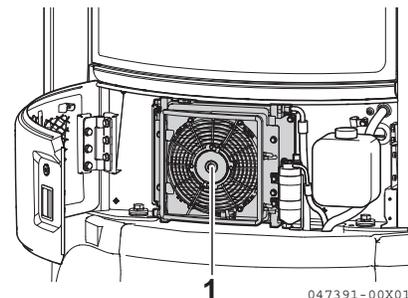


Fig. 8-31

- If there is some mud or dirt on the condenser fin, it will cause degradation of the air conditioner performance. Wash it off from the fin with water, using a soft brush.
- If the condenser fin is crushed or deformed, it will also cause degradation of the air conditioner performance. Repair it with a screwdriver or the like, taking care not to damage the condenser fin.

Checking the refrigerant quantity

Open the cabin rear cover and observe the flow of the refrigerant air bubble from the sight glass (inspection window) of the liquid tank according to the following procedure to check the refrigerant quantity.

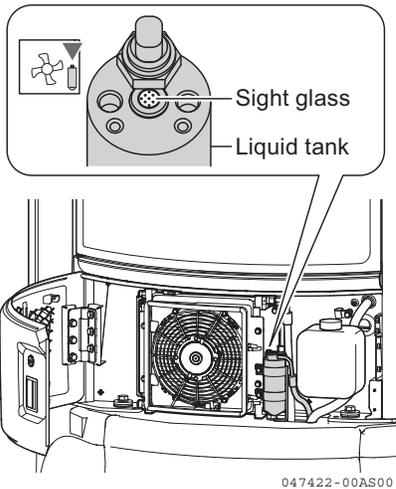


Fig. 8-32

1. Start the engine and run it at the maximum speed.
2. Set the fan switch (**Fig. 8-33, 1**) at the H level.
3. Set the temperature control dial (**Fig. 8-33, 2**) to the C position. (Full counterclockwise position.)
4. Turn the air conditioner switch (**Fig. 8-33, 3**) ON. (The lamp goes on.)

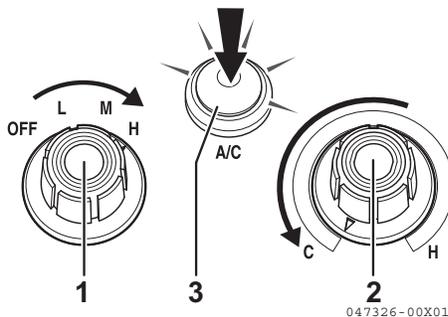


Fig. 8-33

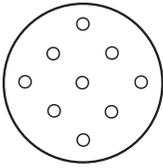
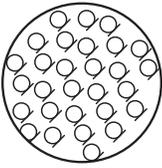
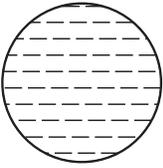
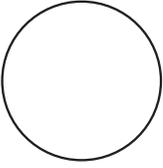
5. Check the refrigerant condition from the sight glass and compare it with the check list for the refrigerant quantity.

IMPORTANT

If the refrigerant quantity is not normal, ask your dealer for check and repair.

Refrigerant type: R134a
 Quantity: 1.54 lbs. (700 g)

Check list for the refrigerant quantity

Air conditioner condition	Normal		Abnormal	
	Temperatures of high and low pressure pipes	Temperature difference is big. High pressure pipe : hot Low pressure pipe : cold Compressor discharge side temperature : 158 °F (70 °C) Compressor intake side temperature : 41 °F (5 °C)	High pressure pipe is warm and low pressure pipe is rather cool. Temperature difference is not so big.	There is almost no difference in temperature between high and low pressure pipes.
Sight glass	Almost transparent. Even if air bubble flow is seen, it becomes transparent as the engine speed changes.  046691-00X00 <i>*1</i>	Air bubble flow is always seen. It is sometimes transparent or white.  046692-00X00	Flow of mist or the like is seen slightly.  046730-00X00	No air bubble flow is seen even cabin windows, idling engine, and rotating fan to the maximum.  046731-00X00 <i>*2</i>
Pipe connection	Normal	Some parts are contaminated by oil.	Some parts are badly contaminated by oil.	Normal
Refrigerant quantity	Refrigerant quantity is adequate and normal.	Refrigerant might leak in a small amount from some part.	Almost all refrigerant leaks and does not remain.	Refrigerant quantity is too large.

**1 : When the outside air temperature is low, air bubble might be seen even if the refrigerant quantity is adequate.*

**2 : When there is no refrigerant, no air bubble is seen, either. Therefore, be sure to check the difference in temperature between the high and low pressure pipes.*

Cleaning the cabin floor (Cabin spec.)

Clean the cabin floor periodically with a broom to remove dust and dirt, or wipe it off with a hard-wrung waste cloth.

Wash the floor with water around feet only. Do not throw water or use steam cleaning. Be careful not to get water especially onto the air conditioner duct, inner air filter, and engine stop switch, and place a cover over them if necessary.

Checking before start-up

Check the items described below before starting the engine first in a day.

For details of the following items, refer to Section "Checking before start-up" on page 109 of "OPERATION" PART.

- Checking and replenishing the cooling water
- Checking and draining the water separator
- Checking and replenishing the engine oil
- Checking and replenishing the fuel in the fuel tank
- Checking and replenishing the hydraulic oil tank
- Checking and adjusting the fan belt tension
- Checking and replenishing the battery
- Greasing
- Checking the electrical equipment

Maintenance every 50 service hours

Greasing the swing gear and the swing bearing

⚠ WARNING

Do not swing the upperstructure while greasing.

Swing the upperstructure after each stage of greasing is completed to avoid serious bodily injury.

1. Using a grease gun, apply grease through the grease nipples shown in **Fig. 8-34**.
2. Swing the upperstructure in small increments and grease after each stop, until the upperstructure has made a full revolution.

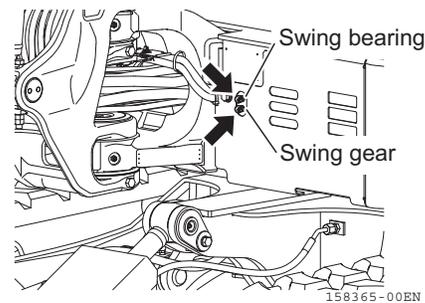


Fig. 8-34

Draining the water and deposits in the fuel tank

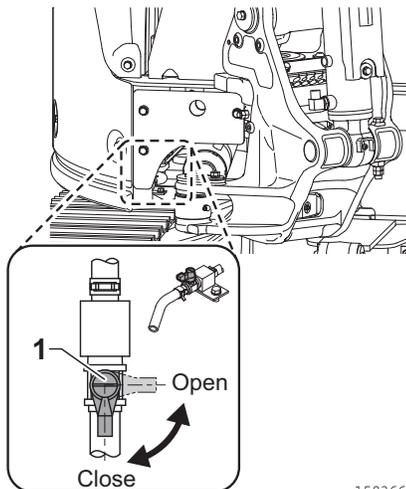
⚠ WARNING

Keep sparks, flames and lit cigarettes away.

■ Things to prepare

- Container for fuel waste

1. Swing the boom to left.
2. Swing the upperstructure so that the drain cock (Fig. 8-35, 1) at the side of the swing cylinder will be positioned in the middle of the right and left crawlers.
3. Put the container for fuel waste under the hose for the drain cock.
4. Open the drain cock (Fig. 8-35, 1) to discharge the water and dirt deposits in the fuel tank from the drain hose. Take care that the fuel does not contact your body.
5. After clean fuel flows out, set the drain cock (Fig. 8-35, 1) to the close position.



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Fig. 8-35

Maintenance every 100 service hours

Perform the same maintenance as indicated for every 50 service hours.

Maintenance every 250 service hours

Also perform the maintenance every 50 service hours.

Checking and cleaning the air cleaner

⚠ WARNING

- Never attempt to clean and replace the air cleaner while the engine is running. Always stop the engine and allow it to cool first.
- Compressed air is used to clean the element. Always wear safety goggles to prevent injury to your eyes.
- The maximum compressed air pressure should be less than 0.7 MPa for cleaning purposes.

■ Cleaning procedure for element

1. Open the rear hood.
2. Remove the clip (Fig. 8-36, 1) and then the dust cup (Fig. 8-36, 2).
3. Remove the air cleaner element (Fig. 8-36, 3).

Cover the connector side in the back of the air cleaner body with a waste cloth and tape to prevent dirt from entering.

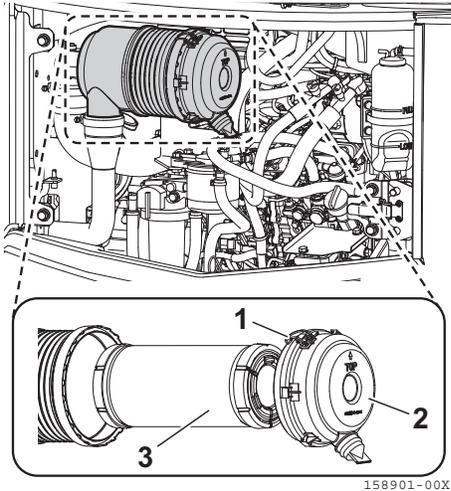


Fig. 8-36

4. Clean the dust cup (Fig. 8-36, 2) and the inside of the body.
5. Blow the dry, compressed air (0.7 MPa or less) from inside the element along the pleats to initially remove the dirt. Then blow compressed air from outside the element along the pleats to remove dirt. Blow compressed air again from inside the element, to complete the dirt removal.

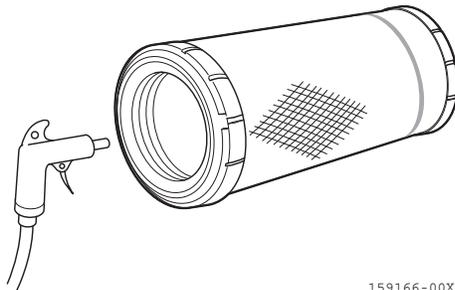


Fig. 8-37

6. After cleaning, illuminate the element from inside with a light bulb and check it. If there are any small holes or thin areas, replace the element with a new one.



Fig. 8-38

IMPORTANT

- When cleaning the element, do not tap it or strike it against other objects. Otherwise the element may be damaged.
- Do not reuse the element if the pleat, gasket or seal is damaged.
- If clogging occurs (air cleaner clogging error is issued) soon after cleaning of the elements, replace the inner element.

7. Remove the protective cloth and tape used to cover the inner element.
8. Install the cleaned elements (Fig. 8-36, 3) to the air cleaner case.
9. Install the dust cup (Fig. 8-36, 2) so that the arrow mark will come on the upper side and secure it with the clip (Fig. 8-36, 1).
10. Close the rear hood.

Checking and replenishing the lube oil for the travel reduction gearbox

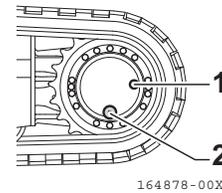
⚠ WARNING

- The gear oil and casing of the reduction gearbox are hot immediately after ceasing machine operation and can cause bodily injury.
Do not allow hot oil or the gearbox to contact your skin.
Replace oil after the oil and the gearbox have cooled sufficiently, if necessary.
- At operating temperature, the reduction gearbox is hot and its contents are under pressure.
In such condition, the oil or a plug may be ejected violently, causing bodily injury. Remove a plug slowly to gradually relieve the residual pressure.

■ Things to prepare

- Container for oil
- Oil jug

1. Set the level port (**Fig. 8-39, 1**) and the drain port (**Fig. 8-39, 2**) in position **Fig. 8-39**.
2. Place a container receiving waste oil under the level port (**Fig. 8-39, 1**).
3. Remove the level port plug using a hexagon wrench (8 mm). Make sure that the oil level reaches the lower end of the level port.
4. When the oil quantity is insufficient, replenish gear oil through the level port (**Fig. 8-39, 1**) until gear oil overflows from the level port (**Fig. 8-39, 1**).
Refer to Section "Fueling, Oiling and Greasing Based on Temperature Range" on page 194 for the oil to be used.



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Fig. 8-39

5. Reinstall the plug.

Tightening torque:

36.1 to 50.6 ft•lbf (49.0 to 68.6 N•m)

Checking and adjusting the fan belt and air conditioner belt

⚠ WARNING

- Stop the engine, take the key out of the starter switch, and then place “DO NOT USE” tag on the switch section.
- Immediately after the engine has stopped, the engine and surrounding area are very hot. After the engine has cooled down, perform the check and adjustment.

■ Checking

1. Open the rear hood.
2. Measure the belt tension by pushing the measurement point on each of the fan belt and air conditioner belt with a finger, etc.

	Fan belt	Air conditioner belt
Measurement point	Fig. 8-40 1	Fig. 8-40 2
Pushing load	22.1 lbf (98.1 N)	22.1 lbf (98.1 N)
Adequate tension	0.59 to 0.79 in. (15 to 20 mm)	0.79 to 0.98 in. (20 to 25 mm)

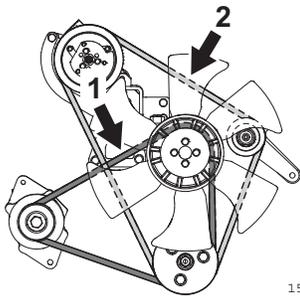


Fig. 8-40

3. Adjust the tension if necessary.
4. With the adequate tension, check that the belts do not contact the V-groove bottom of any pulley.

5. If any belt is elongated and cannot be adjusted, if damage such as a scratch and crack occurs, or if any belt contacts the V-groove bottom of any pulley, replace the belt with a new one.

Fan belt (Part number: 25152-004150)

Air conditioner belt (Part number: 172B82-18490)

6. When no abnormality is found on the belts and pulleys, close the rear hood.

■ Adjusting the fan belt

1. Remove the generator cover (**Fig. 8-41, 1**).

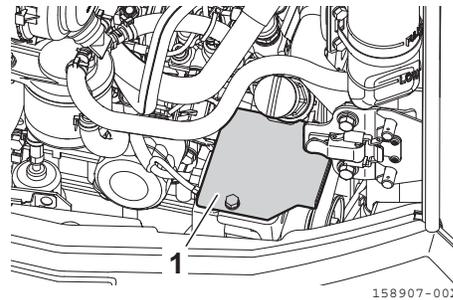


Fig. 8-41

2. Loosen the securing bolt (**Fig. 8-42, 2**) and nut (**Fig. 8-42, 3**) of the generator.
3. Place the bar between the generator and the gear case, and move the generator to the rear of the machine so that the tension of the fan belt is at the specified value.

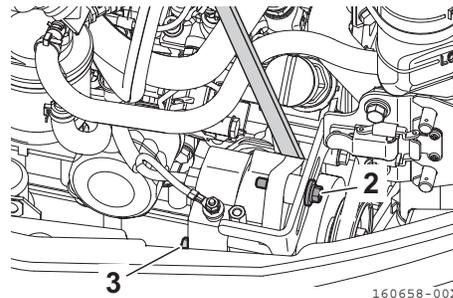


Fig. 8-42

4. With the belt tension at the specified value, tighten the securing bolt (**Fig. 8-42, 2**).
5. Check the belt tension again. If the tension is proper, tighten the securing nut (**Fig. 8-42, 3**) and install the generator cover (**Fig. 8-41, 1**).

■ Adjusting the air conditioner belt

1. Remove the floor mat.
2. Open the cover of the seat mount (**Fig. 8-43, 1**), remove the bolt and then the cover of the seat mount (**Fig. 8-43, 1**).
3. Tighten the tension pulley bolt (**Fig. 8-43, 2**).
4. Loosen the adjuster lock nut (**Fig. 8-43, 3**).
5. Turn the adjuster bolt (**Fig. 8-43, 4**) to adjust the belt tension to the specified value.

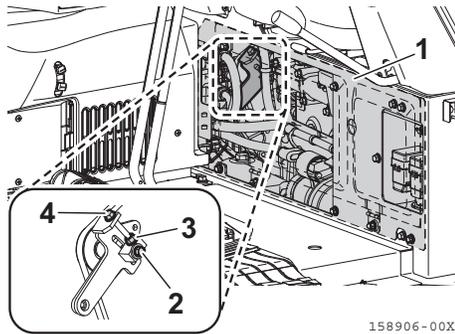


Fig. 8-43

6. When the adjustment is complete, tighten the tension pulley bolt (**Fig. 8-43, 2**), and then tighten the adjuster lock nut (**Fig. 8-43, 3**).
7. Check the belt tension again. If the tension is proper, install the cover of the seat mount (**Fig. 8-43, 1**).

Maintenance every 500 service hours

Also perform the maintenance every 50, 100, and 250 service hours.

Cleaning the water separator and replacing the filter element

⚠ WARNING

- Be sure to keep flames such as lit cigarettes away.
- Only after the engine has cooled down sufficiently, check and maintain the water separator.
- The fuel leaked or spilled onto hot surfaces or electrical components may cause a fire.
- Drain the fuel before removing the water separator cup.

■ Cleaning the water separator

Things to prepare

- Container for fuel wastes
- Filter wrench (Part number: 17130-92760)

1. Open the rear hood. Drain the fuel from the water separator (**Fig. 8-44, 1**).

Checking and draining the water separator:
Refer to page 110.

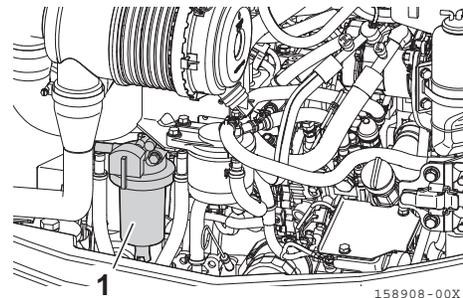


Fig. 8-44

2. After setting the fuel cock (Fig. 8-45, 2) to OFF (closed position), loosen the retainer ring (Fig. 8-45, 3) and remove the cup. Be careful not to loose the float (Fig. 8-45, 5) when removing the cup (Fig. 8-45, 4).
3. Remove the filter element (Fig. 8-45, 6) and clean the cup (Fig. 8-45, 4) and the filter element (Fig. 8-45, 6) using light oil or a washing oil.
4. Check the O-rings (Fig. 8-45, 7 and 8) and if either is damaged or deformed, replace it with a new one.
O-ring 7 (Parts No.: 24321-000650)
O-ring 8 (Parts No.: 24311-000160)
5. Attach the O-ring (Fig. 8-45, 8) and the filter element (Fig. 8-45, 6) to the water separator body.
6. Attach the O-ring (Fig. 8-45, 7) and the cup (Fig. 8-45, 4) containing the float (Fig. 8-45, 5) to the body of the water separator, and then attach the retainer ring (Fig. 8-45, 3).
Always tighten the retainer ring by hand, without using tools.
7. Bleed the air from the fuel.
How to bleed the air: Refer to page 223.
8. After air releasing, start the engine to check for leaking and other problems. Then, stop the engine and close the rear hood.

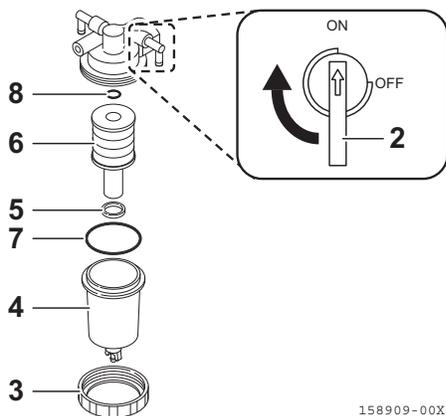


Fig. 8-45

158909-00X

Replacing the fuel filter and bleeding the air from the fuel passage

⚠ WARNING

- Be sure to keep flames such as lit cigarettes away.
- Immediately after the engine has stopped, the engine components are very hot. Only after the engine has cooled down, perform the operations.
- The fuel leaked or spilled onto hot surfaces or electrical components may cause a fire.

■ Replacing the fuel filter

Things to prepare

- Container for fuel wastes
- Filter wrench (Part number: 171301-92750)
- New fuel filter

List of consumables: Refer to page 193.

1. Open the rear hood.
2. Place the container for fuel under the fuel filter (Fig. 8-46, 1).
3. Turn the fuel filter (Fig. 8-46, 1) counter-clockwise to remove with a filter wrench.
4. Clean the fuel filter (Fig. 8-46, 1) mount. Fill up a new filter with fuel and install it with the engine oil applied to its seal surface.
5. After the fuel filter (Fig. 8-46, 1) has been replaced, bleed the air.
How to bleed the air: Refer to page 223.
6. After bleeding the air completely, start the engine to check for fuel leak and other problems.
If no problem is found, stop the engine and close the rear hood.

IMPORTANT

To prevent the fuel filter from being overtightened, turn it slightly until the mount contacts the seal surface, and then additionally tighten it 2/3 turns.

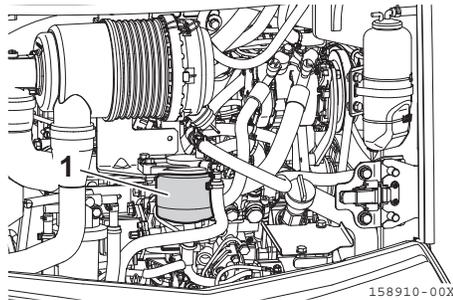


Fig. 8-46

How to bleed the air

The machine is equipped with the automatic air bleeding device (solenoid pump). Bleed the air in the procedure below.

1. Fill up the fuel tank.
2. Move the lock lever to the lock position, and fully turn the engine control dial clockwise.
3. Turn the key to the "ON" position to energize for approximately 25 to 30 seconds. (Normally, the air has been bled in 25 to 30 seconds.)
4. Turn the key to the "START" position to start the engine.

IMPORTANT

If starting fails, turn the key to the "OFF" position, and wait for 1 minute or longer. Then, turn the key again to the "START" position.

- Bleed the air in the same way also in case of run-out of fuel.
- After the engine starts, if it runs irregularly, turn the key to the "OFF" position, wait for one minute or more and turn the key to the "START" position again.

Replacing the engine oil and engine oil filter**⚠ WARNING**

Immediately after the engine has stopped, the engine components are very hot. Only after the engine has cooled down, replace the oil.

Things to prepare

- Engine oil: 7.7 Qts. (7.3 L)
- Container for waste oil
- Filter wrench (Part number: 119640-92750)
- New engine oil filter

List of consumables: Refer to page 193.

1. Swing the upperstructure so that the drain plug (Fig. 8-47, P) at the bottom of the engine will be positioned in the middle of the right and left crawlers.
2. Remove the cover (Fig. 8-47, 1) at the bottom of the machine body, and place the container for waste oil under the drain plug (Fig. 8-47, P) and hose (Fig. 8-47, 2).
3. Slowly remove the drain plug (Fig. 8-47, P) using a tool with a width across flats of 19 mm so that the oil will not splash your body, and drain the waste oil.

Check the waste oil, and contact your dealer if a lot of metallic particles or foreign objects are mixed in it.

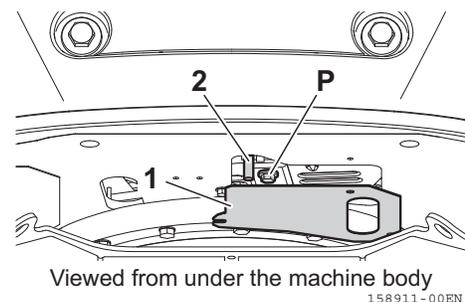


Fig. 8-47

4. Reinstall the drain plug (Fig. 8-47, P).

Tightening torque:

39.8 to 46.5 ft•lbf (54 to 63 N•m)

5. Turn the oil filter (cartridge) (Fig. 8-48, 3) counterclockwise with a filter wrench to remove.

After removing the oil filter (Fig. 8-48, 3), wait for 10 to 15 minutes.

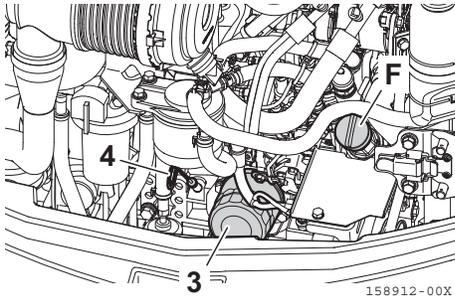


Fig. 8-48

6. Clean the filter mount and apply the engine oil (or apply grease lightly) to the seal surface of a new oil filter (Fig. 8-48, 3) and install the filter.
7. When installing the filter, additionally turn it 2/3 turns after the seal surface has contacted the filter mount.
8. After replacing the oil filter (Fig. 8-48, 3), add engine oil to the upper limit mark on the oil dipstick (Fig. 8-48, 4) through the oil supply port (Fig. 8-48, F).
9. Tighten the oil supply port cap securely, and allow the engine to run at low idle speed for a while and then stop the engine. After that, check that the oil level exceeds the midpoint between the upper and lower limit marks on the oil dipstick (Fig. 8-48, 4). Refer to "Checking before start-up" on page 109.
10. Check for oil leakage, then install the cover (Fig. 8-47, 1) at the bottom of the machine body and close the rear hood.

Replace the engine oil and oil filter 1 year after the previous replacement even if the service hours have not reached 500 hours.

Also replace them when the service hours have reached 500 hours, even if 1 year has not passed.

Checking and cleaning the radiator and oil cooler

⚠ WARNING

- Checking and cleaning these components while the engine is running are dangerous. Always stop the engine before checking and cleaning.
- Compressed air may scatter objects around these components and it is dangerous. Check that there are no other persons nearby, and always wear protective gear such as safety goggles.
- The maximum compressed air pressure should be less than 0.7 MPa.

1. Open the rear hood and then the light hood.
2. Clean off any mud, dirt or leaves clogged in the radiator fins (Fig. 8-49, 1) and the oil cooler fins (Fig. 8-49, 2) by blowing compressed air or by flushing with steam.

IMPORTANT

When compressed air is used for cleaning, blow it at a distance from the fins. A damaged fin will cause water and oil leaks and overheating.

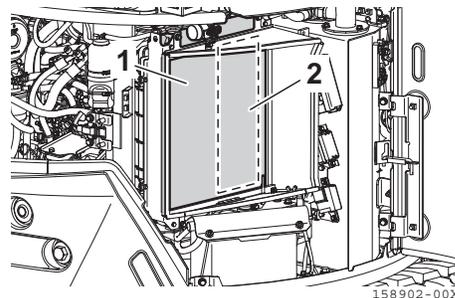


Fig. 8-49

3. Check whether the fins (**Fig. 8-49, 1, 2**) of the radiator and oil cooler have fallen over and whether dust has been removed cleanly.
4. Close the right hood and then the rear hood.

Replacing the air cleaner element

⚠ WARNING

Replacing components while the engine is running is dangerous. Be sure to stop the engine before replacing any component.

■ Things to prepare

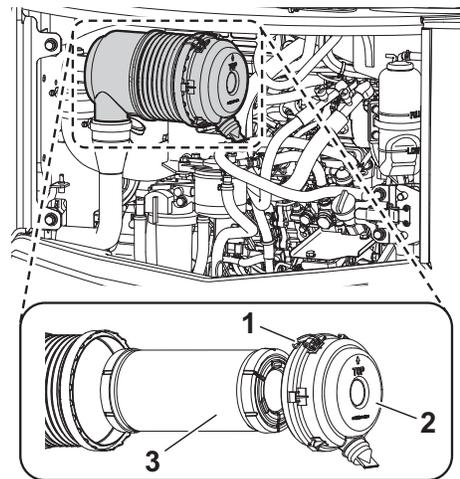
- New air cleaner element

List of consumables: Refer to page 193.

1. Open the rear hood.
2. Remove the clip (**Fig. 8-50, 1**) and then the dust cup (**Fig. 8-50, 2**).
3. Remove the air cleaner element (**Fig. 8-50, 3**).

Cover the connector side in the back of the air cleaner body with a waste cloth and tape to prevent dirt from entering.

4. Clean the inside of the dust cup (**Fig. 8-50, 2**) and the air cleaner body. Remove the waste cloth or tape used to cover the connector in the back side of the body.
5. Install a new element (**Fig. 8-50, 3**).
6. Reinstall the dust cup (**Fig. 8-50, 2**) with the arrow mark facing upward.
7. Close the rear hood.



158901-00X

Fig. 8-50

Replacing the hydraulic oil return filter

⚠ WARNING

- The hydraulic oil and the tank surface are very hot immediately after operations. Replacing the filter in such condition is dangerous, and may cause bodily injury such as a burn. Wait until the tank has cooled enough to permit you to touch its surface with your bare hand, and then start the operation.
- Removing the tank cap carelessly may cause the hydraulic oil to spout out because of the pressure inside the tank. Slowly and evenly loosen the 3 mounting bolts, and then remove the cap.

■ Things to prepare

- New hydraulic oil return filter element
List of consumables: Refer to page 193.
1. Open the front cover (right), and clean the hydraulic oil tank cover (**Fig. 8-51, 1**) and its surrounding area with a waste cloth or other.
 2. Loosen the hose bands (**Fig. 8-51, 3**) fixing the return hoses (**Fig. 8-51, 2**), and disconnect the return hoses (**Fig. 8-51, 2**).
 3. Slowly and evenly loosen the 3 bolts (**Fig. 8-51, 4**) on the hydraulic oil tank cap, release the internal pressure, and then remove the cover (**Fig. 8-51, 1**) and hydraulic oil return filter together.

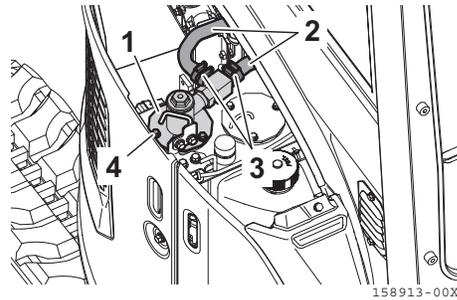


Fig. 8-51

4. Separate the return pipe (**Fig. 8-52, 5**) and return filter (**Fig. 8-52, 6**) using a spanner with a width across flats of 32 mm and 41 mm.

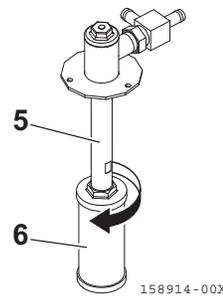


Fig. 8-52

5. Install a new filter to the return pipe (**Fig. 8-52, 5**).
6. Wipe the cap mount on the hydraulic oil tank with a waste cloth and check the O-ring. If the O-ring is damaged, replace it with a new one and then reinstall the cover (**Fig. 8-51, 1**).
O-ring (Part number: 24321-000900)
7. Reinstall the return hoses (**Fig. 8-51, 2**), and tighten the hose bands (**Fig. 8-51, 3**).
8. Bleed the air from the hydraulic circuit, and check the oil level in the hydraulic oil tank. Refer to "Hydraulic system" on page 191.
9. Close the front cover (right).

IMPORTANT

- Do not allow any dust or dirt to enter the hydraulic tank when installing the cap.
- Reinstall the hose bands to the return hose so that the fastened portions will face in the opposite directions.

Maintenance every 1000 service hours

Also perform the maintenance every 50, 100, 250 and 500 service hours.

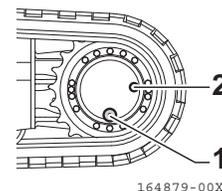
Replacing the lube oil for the travel reduction gearbox**⚠ WARNING**

- The oil and reduction gearbox case are very hot immediately after the operations. Replacing the oil immediately is dangerous, and may cause bodily injury such as a burn.
Wait until the reduction gearbox case has cooled enough to permit you to touch it with your bare hand, and then start the operation.
- Otherwise, the oil may spout out or plug may be ejected suddenly. Loosen the plug slowly to release the pressure inside the tank.

■ Things to prepare

- Container for waste oil
- Gear oil: 0.5 Qts. (0.5 L) for right and left each

1. The drain port (**Fig. 8-53, 1**) should come to the lower side.

**Fig. 8-53**

2. Put the container for waste oil under the drain port (**Fig. 8-53, 1**).
3. Remove the plugs from the drain port (**Fig. 8-53, 1**) and level port (**Fig. 8-53, 2**) with a hexagon socket screw key (8 mm) to drain the waste oil.

4. After draining the waste oil, reinstall the plug to the drain port (**Fig. 8-53, 1**).

Tightening torque:

36.1 to 50.6 ft•lbf (49.0 to 68.6 N•m)

5. Add the gear oil through the level port (**Fig. 8-53, 2**) to the specified level.

For the oil to be used, refer to "Fueling, Oiling and Greasing Based on Temperature Range" (page 194).

6. After the gear oil overflows from the level port (**Fig. 8-53, 2**), reinstall the plug to the level port (**Fig. 8-53, 2**).

Tightening torque:

36.1 to 50.6 ft•lbf (49.0 to 68.6 N•m)

Replacing the oil in the hydraulic oil tank and cleaning the suction filter

⚠ WARNING

- The oil and tank surface are very hot immediately after the operations. Replacing the oil immediately is dangerous, and may cause bodily injury such as a burn. Wait until the tank has cooled enough to permit you to touch its surface with your bare hand, and then start the operation.
- First slowly turn the oil supply port cap to release the internal pressure, and then remove the cap carefully.
- Removing the tank cap carelessly may eject the cap suddenly because of the spring force holding the filter. Also, the hydraulic oil may spout out because of the pressure inside the tank. Slowly and diagonally loosen the 3 mounting bolts and then remove the cap.

■ Things to prepare

- Container for waste oil
- Hydraulic oil 8.5 Gals. (32 L) (When the oil is drained completely from all of the hydraulic equipment, pipes and hoses, 14.3 Gals. (54 L)).
- O-ring for drain plug
(Part number: 24341-000300)

1. Swing the upperstructure so that the drain plug (**Fig. 8-55, P**) at the bottom of the hydraulic tank will be positioned in the middle of the right and left crawlers.
2. Retract the bucket and arm cylinders to their stroke ends, lower the boom and put the bucket teeth on the ground.

3. Put the blade on the ground and stop the engine.

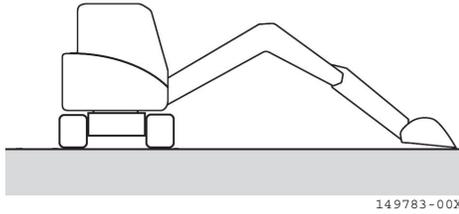


Fig. 8-54

4. Remove the cover (Fig. 8-55, 1) on the lower right side of the upperstructure.

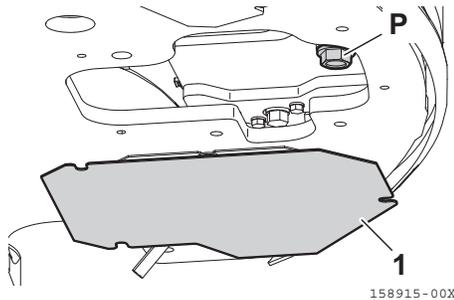


Fig. 8-55

5. Put the container for waste oil under the drain plug (Fig. 8-55, P).
6. Remove the drain plug (Fig. 8-55, P) and drain the waste oil.
- When removing the drain plug (Fig. 8-55, P), take care that the oil does not splash your body.
7. Degrease and wash the threads of the drain plug, and replace the O-ring with a new one.
8. After draining, tighten the drain plug (Fig. 8-55, P).
- Tightening torque:
79.7 to 87.8 ft•lbf (108 to 119 N•m)
9. Open the front cover (right), and clean the cover (Fig. 8-56, 1) mount on the upper side of the hydraulic tank with a waste cloth or other.
10. Slowly loosen the bolt (Fig. 8-56, 2) to remove the cover (Fig. 8-56, 1).

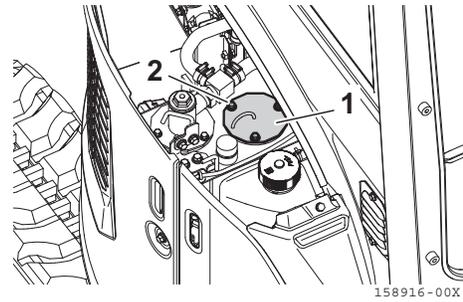


Fig. 8-56

11. Take out the filter (Fig. 8-57, 3).

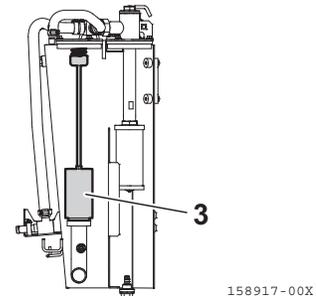


Fig. 8-57

12. Remove dust and dirt adhering to the filter, and wash it with cleaning oil or diesel oil.
13. Check the filter and the seal at the bottom of the filter, replace the filter with a new one if necessary, and install it to the hydraulic tank.

IMPORTANT

Do not allow any dust or dirt to enter the tank when installing the filter.

14. Add the oil to the specified level.
- At the oil temperature of 50 to 86 °F (10 to 30 °C), fill the oil around 0.39 in. (10 mm) above the midpoint of the level gauge. Do not fill more than the upper limit of the oil level gauge.
- Refer to "Fueling, Oiling and Greasing Based on Temperature Range" on page 194.

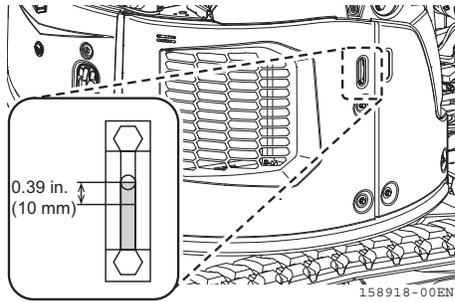


Fig. 8-58

15. Wipe the cap mount with a waste cloth or other and check the O-ring.
If any flaw is found, replace it with a new one.
O-ring (Part number: 24321-000900)
16. Reinstall the cap.
17. After replacing the oil, bleed the air from the hydraulic circuit, and check the oil level in the hydraulic oil tank.
Refer to "Hydraulic system" on page 191.
18. Close the front cover (right).

Checking and adjusting the intake/exhaust valve clearances

Ask your dealer for checking and adjusting.

Maintenance every 1500 service hours

Also perform the maintenance every 50, 100, 250 and 500 service hours.

Checking the crankcase breather system

Ask your dealer for checking.

Maintenance every 2000 service hours

Also perform the maintenance every 50, 100, 250, 500 and 1000 service hours.

Replacing the engine cooling water

⚠ WARNING

- The cooling water is very hot immediately after the engine has stopped. Draining the cooling water immediately after stop may cause burns. Only after the engine has cooled down, start the operation.
- Cleaning takes place while the engine is running. Therefore, it is very dangerous for persons staying behind the machine, if the machine starts moving. Also, with the rear hood being opened, these persons may contact the radiator fan.
Never step into the area behind the machine while the engine is running.
- Do not remove the radiator cap while the water temperature in the radiator is high. Hot water may spout out. After the cooling water has cooled down, first slowly turn the radiator cap to release the internal pressure, and then remove the cap.

■ Table of mixing ratio of anti-freeze to water

At the delivery from the factory, the concentration of anti-freeze is 51 %.

Lowest temperature [°F (°C)]	5 (-15)	-4 (-20)	-13 (-25)	-22 (-30)	-31 (-35)	-40 (-40)
Concentration of anti-freeze (%)	30	35	40	45	50	55

⚠ WARNING

- Anti-freeze is flammable. Keep flames away from anti-freeze.
- Wear the protective gear not to allow anti-freeze to get into your eyes or contact your skin. If the cooling water gets into your eyes or contacts your skin, flush with water to remove it completely.

IMPORTANT

- Use tap water to mix. To use water from a river, a well or a private water-supply system, consult your dealer.
- Though the mixing ratio of anti-freeze differs with the ambient temperature, at least 30 % of anti-freeze by volume is required to obtain anti-corrosive effect.
- Determine the mixing ratio of anti-freeze on the basis of the lowest temperature in the past, referring to the ratio table. Actually, set a temperature approximately 50 °F (10 °C) lower than the lowest temperature.
- Use a densitometer to control the mixing ratio.
- Park the machine on level ground to replace the cooling water.

■ Things to prepare

- Cooling water 1.2 Gals. (4.5 L) or more
- Container for waste fluid

1. Swing the upperstructure so that the drain plug (**Fig. 8-59, P**) will be positioned in the middle of the right and left crawlers.
2. Remove the cover (**Fig. 8-59, 1**) on the lower right side of the upperstructure.

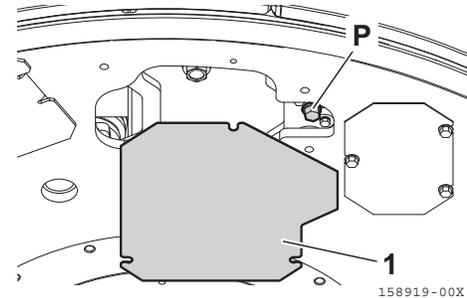


Fig. 8-59

3. Put the container for waste fluid under the drain plug (**Fig. 8-59, P**).
4. Slowly remove the drain plug (**Fig. 8-59, P**) using a tool with a width across flats of 0.47 in. (12 mm) to drain the cooling water.
5. Remove the storage space for tools. Then, open the front cover (right). Slowly turn the radiator cap (**Fig. 8-60, 2**) and remove the radiator cap.

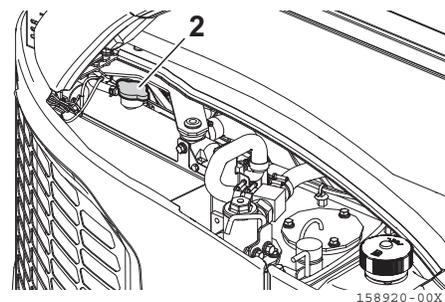


Fig. 8-60

6. After the cooling water has been drained, reinstall the drain plug (**Fig. 8-59, P**).
7. Open the rear hood, remove the cooling water sub-tank (**Fig. 8-61, 3**), and drain the cooling water from the sub-tank.

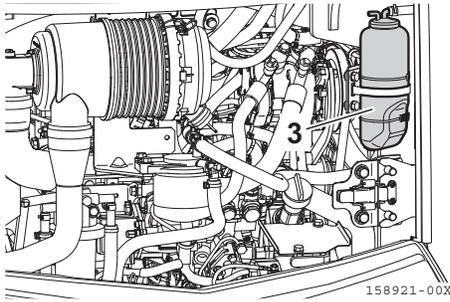


Fig. 8-61

8. Reinstall the cooling water sub-tank (**Fig. 8-61, 3**), and add the cooling water up to the FULL line.
9. Pour the cooling water into the radiator to fill it up.
10. To bleed the air from the cooling water system, allow the engine to run at low idle speed for 5 to 6 minutes and then at high speed without load for additional 5 to 6 minutes. [While the engine is running, keep the radiator cap (**Fig. 8-60, 2**) removed.]
11. Approximately 5 minutes after stopping the engine, pour the cooling water into the radiator through the water supply port up to almost the port opening, and securely tighten the radiator cap (**Fig. 8-60, 2**).
12. Check the level in the sub-tank (**Fig. 8-61, 3**), and if it is below the FULL line, pour the cooling water.
13. Reinstall the cover (**Fig. 8-59, 1**) and the storage space for tools. Then close the hoods.

Checking the accumulator

Refer to "Handling accumulator" on page 160.

Checking and replacing the fuel, cooling water, and lubricating oil hoses

Ask your dealer for checking and replacing.

Lapping the intake and exhaust valve seats

Ask your dealer for lapping.

Maintenance every 3000 service hours

Also perform the maintenance every 50, 100, 250, 500, 1000 and 1500 service hours.

Checking, cleaning and testing EGR valves

Ask your dealer for checking, cleaning and testing.

MEMO

SPECIFICATIONS AND DIMENSIONAL DIAGRAMS

1. **Specifications and Dimensional Diagrams 236**

1. Specifications and Dimensional Diagrams

■ Specifications

Items	Type	ViO35-7B			
		Quick coupler		Without quick coupler	
		Canopy	Cabin	Canopy	Cabin

• Weight

Operating mass	Rubber track	lbs. (kg)	7705 (3495)	8047 (3650)	7595 (3445)	7937 (3600)
	Steel track	lbs. (kg)	7948 (3605)	8289 (3760)	7837 (3555)	8179 (3710)

• Working range and performance

Bucket capacity, standard	cu.ft (cu.m)	-				
Bucket width, standard	in. (mm)	-				
Maximum digging depth <at down the blade>	in. (mm)	128 (3250) <135 (3430)>		121 (3070) <128 (3250)>		
Maximum vertical wall digging depth	in. (mm)	100 (2530)		99 (2510)		
Maximum cutting height	in. (mm)	204 (5180)		196 (4980)		
Maximum dumping height	in. (mm)	134 (3410)		141 (3590)		
Maximum digging radius of the ground	in. (mm)	209 (5300)		201 (5110)		
Front minimum swing radius <at swinging the boom>	in. (mm)	109 (2770) <93 (2360)>		97 (2470) <82 (2080)>		
Boom swing angle: left/right	degrees	71/52				
Maximum digging force (bucket)	lbs. (kN)	12027 (53.5)		15377 (68.4)		
Travel speed: high/low	Rubber track	MPH (km/h)	3.0 (4.8)/1.8 (2.9)			
	Steel track	MPH (km/h)	2.7 (4.4)/1.7 (2.7)			
Swing speed	rpm	9.4				
Average ground pressure, standard track	Rubber track	PSI (kPa)	4.4 (30.6)	4.6 (32.0)	4.4 (30.2)	4.6 (31.5)
	Steel track	PSI (kPa)	4.6 (31.7)	4.8 (33.1)	4.5 (31.3)	4.7 (32.7)
Hydraulic pump displacement	GPM (L/min)	9.9 (37.4)×2 <Variable displacement pump> 7.1 (26.8)×1, 2.6 (9.9)×1 <Gear pump>				
System relief set pressure	PSI (MPa)	3205 (22.1)×2, 2988 (20.6)×1				

• Engine

Type	-	Vertical three cylinder water-cooled direct injection diesel engine			
Model	-	3TNV88-1ESBV4			
Rated output, gross/revs	HP(kw)/rpm	23.2 (17.3)/2200			
Displacement	cu.in (cu.cm)	100.2 (1642)			
Compression pressure	PSI (MPa)	493 (3.4) at 250 rpm			
Nozzle injection pressure	PSI (MPa)	2843 to 2988 (19.6 to 20.6)			
Fan belt (V-belt) size	-	A41.5			
Generator capacity	V/A	12/55			

• Battery type and capacity.....90D26R, 55Ah (5 hours rate capacity)

Items	Type	ViO35-7B (Angle blade spec.)			
		Quick coupler		Without quick coupler	
		Canopy	Cabin	Canopy	Cabin

- Weight

Operating mass	Rubber track	lbs. (kg)	8014 (3635)	8356 (3790)	7904 (3585)	8245 (3740)
	Steel track	lbs. (kg)	8256 (3745)	8598 (3900)	8146 (3695)	8488 (3850)

- Working range and performance

Bucket capacity, standard	cu.ft (cu.m)	-				
Bucket width, standard	in. (mm)	-				
Maximum digging depth <at down the blade>	in. (mm)	128 (3250) <135 (3420)>		121 (3070) <128 (3240)>		
Maximum vertical wall digging depth	in. (mm)	100 (2530)		99 (2510)		
Maximum cutting height	in. (mm)	204 (5180)		196 (4980)		
Maximum dumping height	in. (mm)	134 (3410)		141 (3590)		
Maximum digging radius of the ground	in. (mm)	209 (5300)		201 (5110)		
Front minimum swing radius <at swinging the boom>	in. (mm)	109 (2770) <93 (2360)>		97 (2470) <82 (2080)>		
Boom swing angle: left/right	degrees	71/52				
Maximum digging force (bucket)	lbs. (kN)	12027 (53.5)		15377 (68.4)		
Travel speed: high/low	Rubber track	MPH (km/h)	3.0 (4.8)/1.8 (2.9)			
	Steel track	MPH (km/h)	2.7 (4.4)/1.7 (2.7)			
Swing speed	rpm	9.4				
Average ground pressure, standard track	Rubber track	PSI (kPa)	4.6 (31.8)	4.8 (33.2)	4.6 (31.4)	4.7 (32.7)
	Steel track	PSI (kPa)	4.8 (33.0)	5.0 (34.3)	4.7 (32.5)	4.9 (33.9)
Hydraulic pump displacement	GPM (L/min)	9.9 (37.4)×2 <Variable displacement pump> 7.1 (26.8)×1, 2.6 (9.9)×1 <Gear pump>				
System relief set pressure	PSI (MPa)	3205 (22.1)×2, 2988 (20.6)×1				

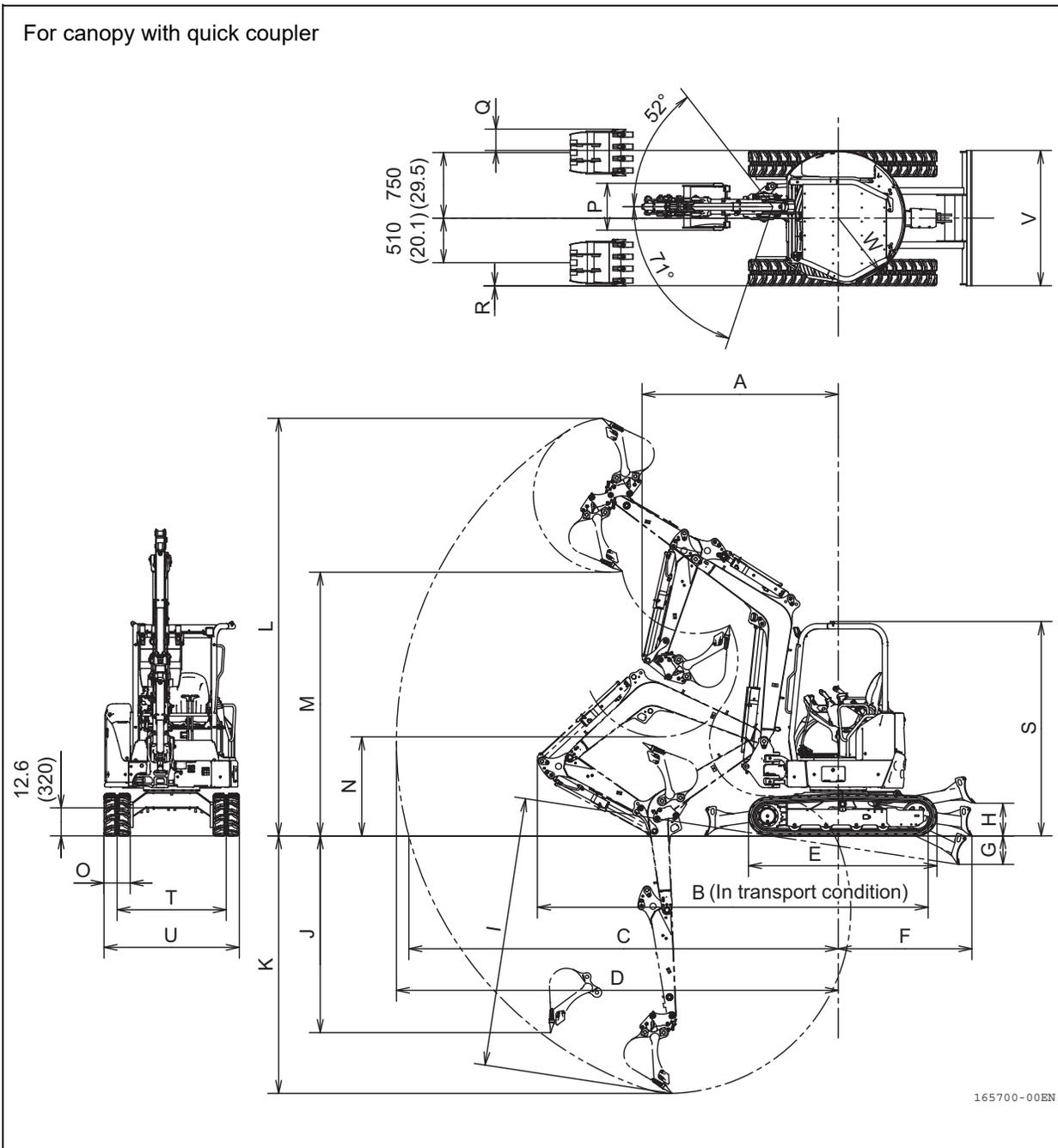
- Engine

Type	-	Vertical three cylinder water-cooled direct injection diesel engine
Model	-	3TNV88-1ESBV4
Rated output, gross/revs	HP(kw)/rpm	23.2 (17.3)/2200
Displacement	cu.in (cu.cm)	100.2 (1642)
Compression pressure	PSI (MPa)	493 (3.4) at 250 rpm
Nozzle injection pressure	PSI (MPa)	2843 to 2988 (19.6 to 20.6)
Fan belt (V-belt) size	-	A41.5
Generator capacity	V/A	12/55

- **Battery type and capacity.....90D26R, 55Ah (5 hours rate capacity)**

■ Model view and working range

Unit: in. (mm)

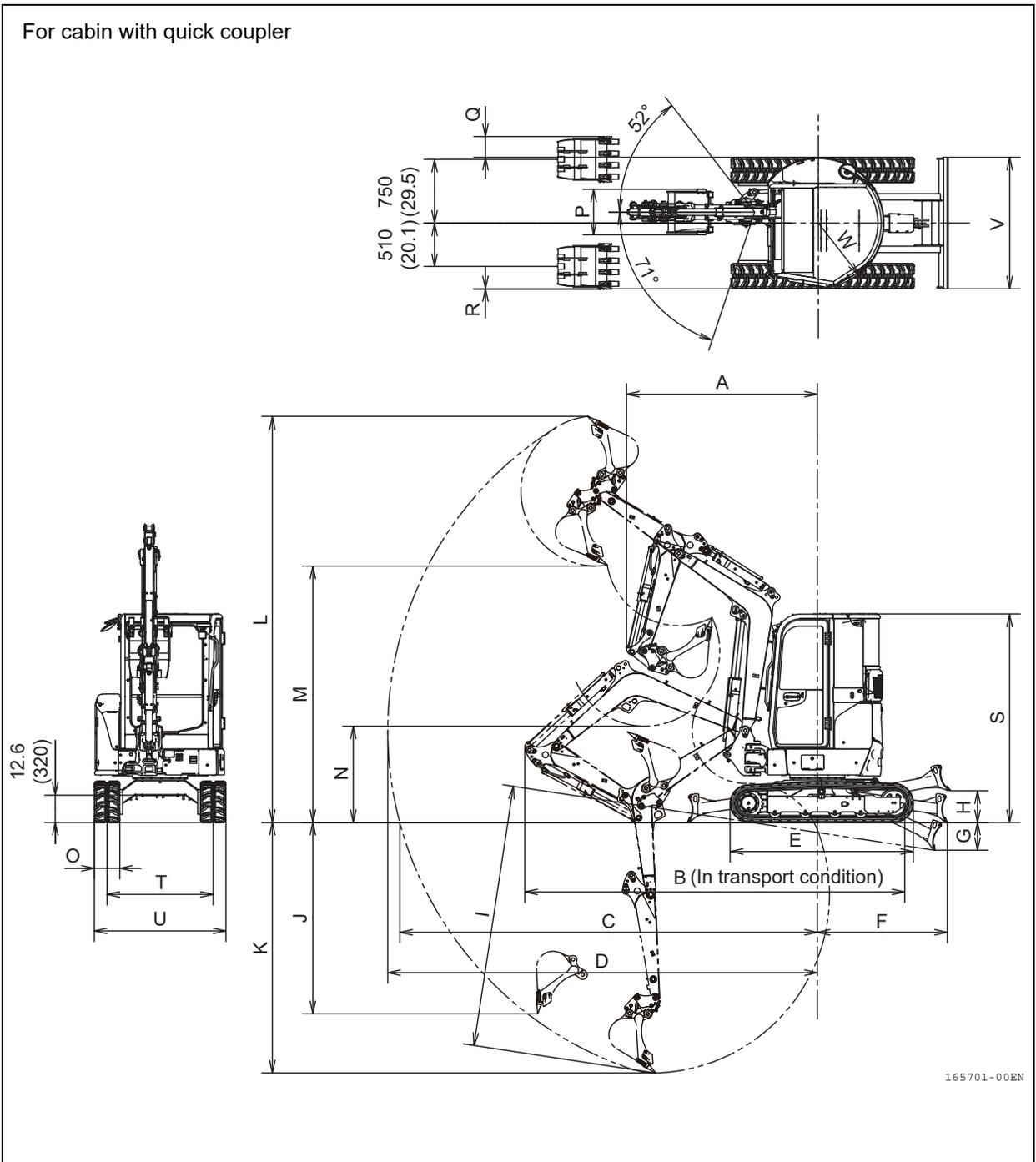


<> : Angle blade spec.

	A <at boom swing>	B	C	D	E	F	G	H	I	J	K
ViO35-7B	87.0 (2210) <69.3 (1760)>	185.8 (4720)	208.7 (5300)	213.8 (5430)	85.0 (2160)	66.1 (1680) <69.3 (1760)>	14.6 (370)	16.7 (425) <18.9 (480)>	135.0 (3430) <134.6 (3420)>	99.6 (2530) <95.7 (2430)>	128.0 (3250)

	L	M	N	O	P	Q	R	S	T	U	V	W
ViO35-7B	203.9 (5180)	134.3 (3410)	49.6 (1260)	11.8 (300)	23.6 (600)	7.09 (180)	-2.17 (-55)	96.9 (2460)	56.7 (1440)	68.5 (1740)	68.5 (1740)	34.3 (870)

Unit: in. (mm)

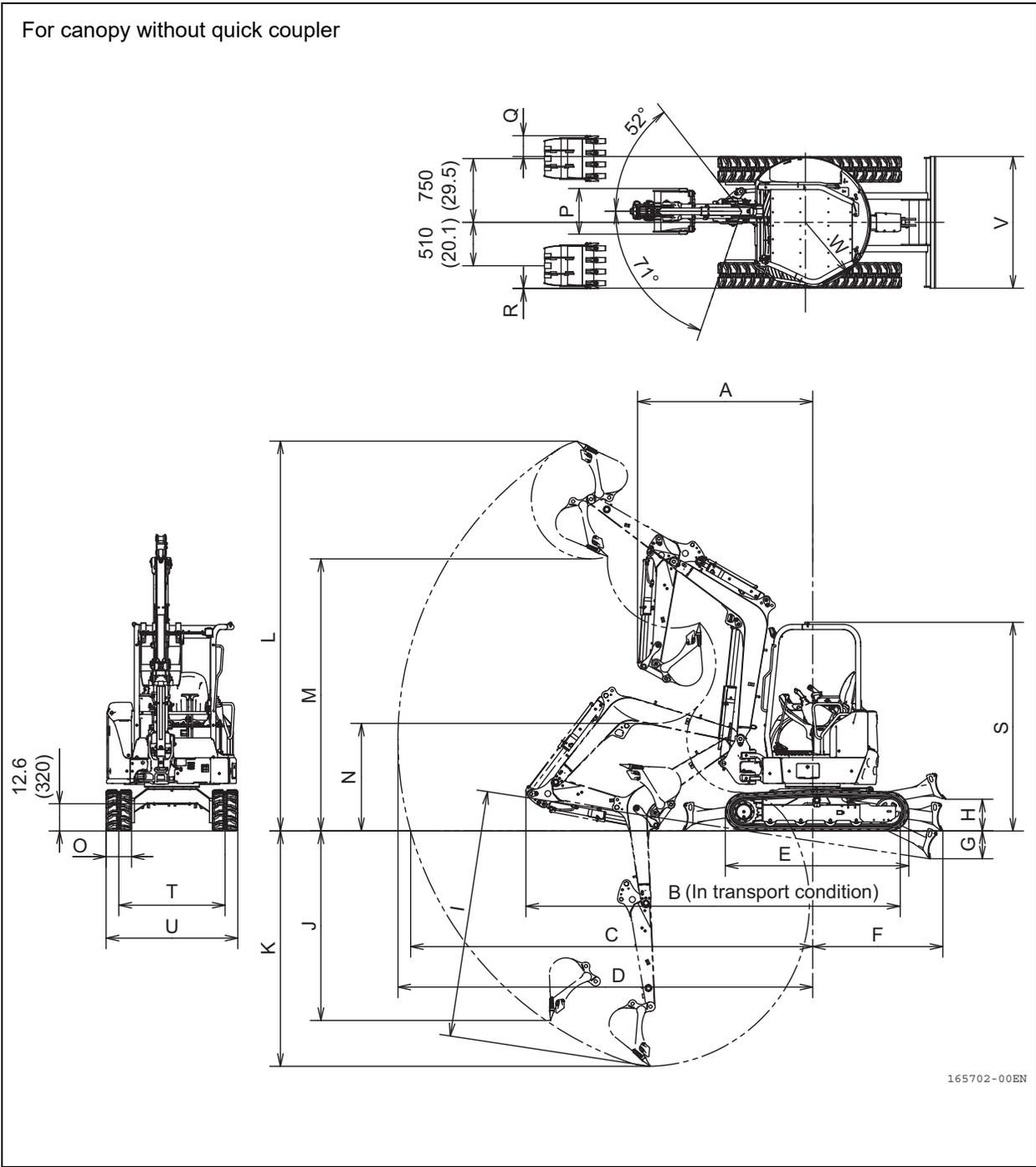


<> : Angle blade spec.

	A <at boom swing>	B	C	D	E	F	G	H	I	J	K
ViO35-7B	87.0 (2210) <69.3 (1760)>	185.8 (4720)	208.7 (5300)	213.8 (5430)	85.0 (2160)	66.1 (1680) <69.3 (1760)>	14.6 (370)	16.7 (425) <18.9 (480)>	135.0 (3430) <134.6 (3420)>	99.6 (2530) <95.7 (2430)>	128.0 (3250)

	L	M	N	O	P	Q	R	S	T	U	V	W
ViO35-7B	203.9 (5180)	134.3 (3410)	49.6 (1260)	11.8 (300)	23.6 (600)	7.09 (180)	-2.17 (-55)	96.9 (2460)	56.7 (1440)	68.5 (1740)	68.5 (1740)	34.3 (870)

Unit: in. (mm)



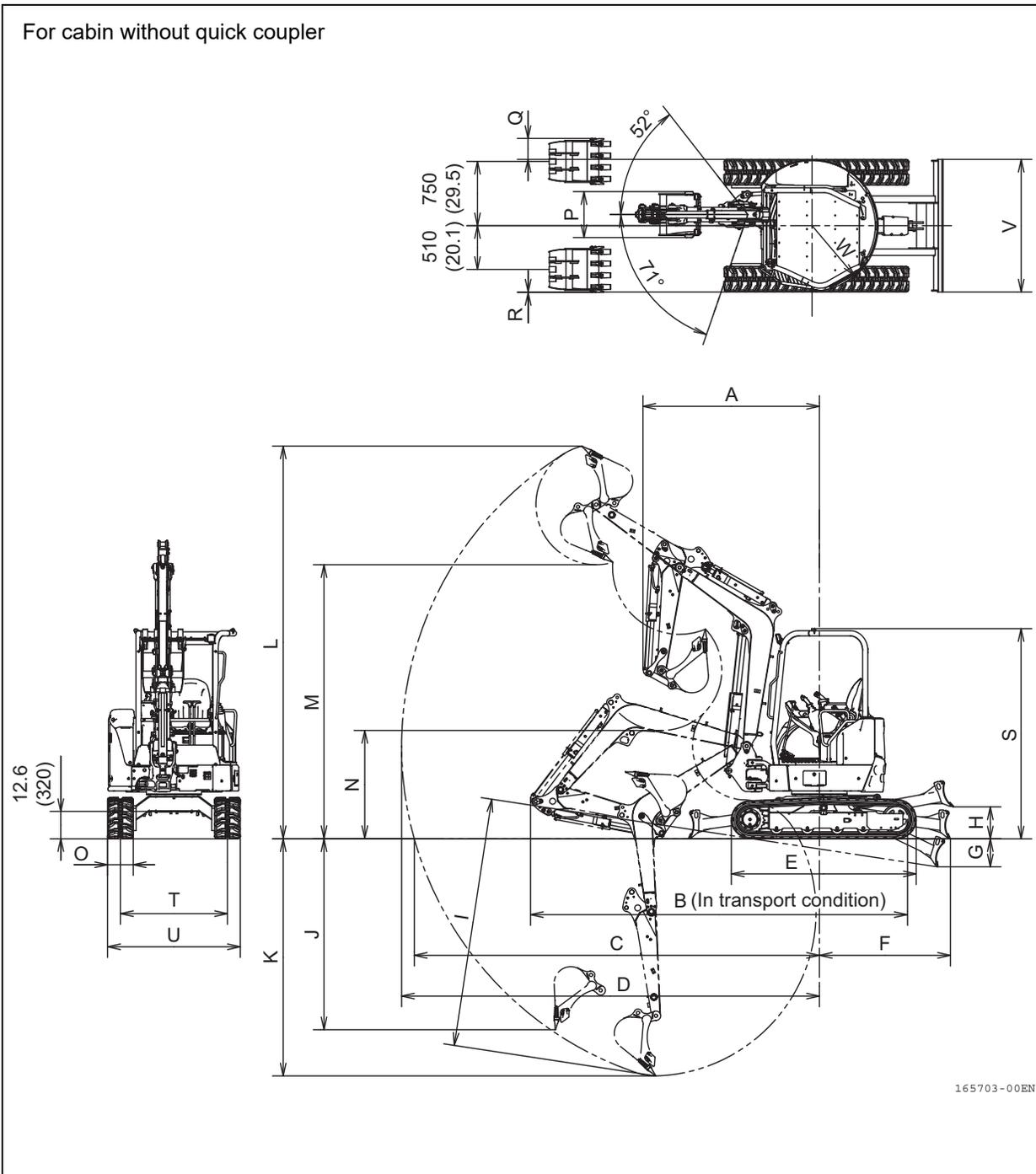
165702-00EN

<> : Angle blade spec.

	A <at boom swing>	B	C	D	E	F	G	H	I	J	K
ViO35-7B	80.3 (2040) <63.4 (1610)>	183.5 (4660)	201.2 (5110)	206.7 (5250)	85.0 (2160)	66.1 (1680) <69.3 (1760)>	14.6 (370)	16.7 (425) <18.9 (480)>	128.0 (3250) <127.2 (3230)>	98.8 (2510)	120.9 (3070)

	L	M	N	O	P	Q	R	S	T	U	V	W
ViO35-7B	196.0 (4980)	141.3 (3590)	54.7 (1390)	11.8 (300)	23.6 (600)	7.09 (180)	-2.17 (-55)	96.9 (2460)	56.7 (1440)	68.5 (1740)	68.5 (1740)	34.3 (870)

Unit: in. (mm)



<> : Angle blade spec.

	A <at boom swing>	B	C	D	E	F	G	H	I	J	K
ViO35-7B	80.3 (2040) <63.4 (1610)>	183.5 (4660)	201.2 (5110)	206.7 (5250)	85.0 (2160)	66.1 (1680) <69.3 (1760)>	14.6 (370)	16.7 (425) <18.9 (480)>	128.0 (3250) <127.2 (3230)>	98.8 (2510)	120.9 (3070)

	L	M	N	O	P	Q	R	S	T	U	V	W
ViO35-7B	196.0 (4980)	141.3 (3590)	54.7 (1390)	11.8 (300)	23.6 (600)	7.09 (180)	-2.17 (-55)	96.9 (2460)	56.7 (1440)	68.5 (1740)	68.5 (1740)	34.3 (870)

MEMO

OPTIONAL PARTS AND ATTACHMENTS

1. General Precautions	244
Safety precautions	244
Precautions for mounting an attachment (implement)	245
Prohibitions while the Machine is mounted with an Attachment	246

1. General Precautions

Safety precautions

The mounting of attachments and optional parts that are not authorized by YANMAR may cause accidents as well as shorten the machine life.

If you need to mount any attachments other than those described in this manual, contact your dealer. If you fail to do so, the installation and use of unauthorized attachments and parts may void your Warranty.

WARNING

Precautions for mounting and dismounting an attachment

When mounting or dismounting an attachment, observe the following precautions for safety.

- **When mounting or dismounting a heavy implement or attachment, place the machine on level, solid ground.**
- **To prevent clashing against cabin or canopy, never mount attachment over Max. wrist radius.**
- **When you work together with a partner, define hand signals and communicate in accordance with those signals.**
- **When moving a heavy load [more than 55 lbs. (25 kg)], use a crane.**
- **When removing a heavy part, be sure to support it adequately.**
When lifting such a part with a crane, take note of its center of gravity.
- **Do not mount or dismount a heavy part while suspending it with a crane.**
Be sure to support it securely on a stable base.
- **Securely support any attachment that has been removed or is to be installed, and take adequate precautions not to let it fall down.**
- **Never stand directly under a load suspended by a crane.**
Stand far enough away to be safe if the load should fall.

IMPORTANT

Comply with all licensing requirements before operating a crane.

Do not permit an unauthorized person to operate a crane.

For more information about the procedures for mounting and dismounting attachments, ask your dealer.

Precautions for mounting an attachment (implement)**⚠ WARNING**

A long implement may throw a machine off balance, and may cause the machine to roll over when the machine descends or swings on a slope.

The following operations are especially dangerous, and must never be done.

- Descending a slope with the implement raised
- Traversing across a slope
- Swinging on a slope
- If you mount an unusually heavy implement (attachment) on the machine, the inertia of the upperstructure will increase so that the upperstructure will continue to turn over a longer distance after it has been deactivated. This can mislead the operator about the safe distance between the swinging implement and an object nearby and could cause the implement to bump against the object. To avoid this type of accident, deactivate the upperstructure a little earlier than usual. Because of increased inertia, the implement will also drop a greater distance after it has been stopped in mid-air. (The unintentional drifting of the implement will be greater.)
- Be sure that the boom and the arm have been mounted correctly. Otherwise, serious accidents or damage may occur. If you do not know how to mount the boom or the arm correctly, ask your dealer.
- If you mount a long implement, you may misjudge the distance between the implement and a nearby object, and cause the implement to bump against the object.

Be sure to provide adequate clearance between long implements and nearby objects.

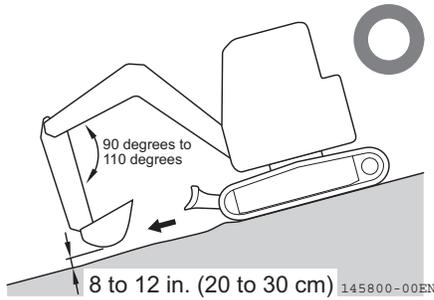


Fig. 1-1

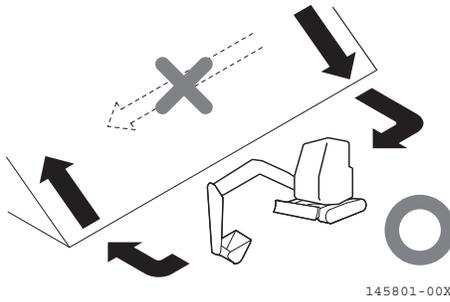


Fig. 1-2

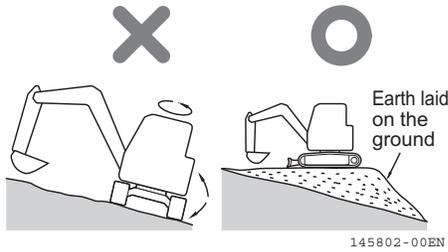


Fig. 1-3

Prohibitions while the Machine is mounted with an Attachment

- Do not operate the attachment with any hydraulic cylinder at the end of stroke

Do not operate the attachment with any hydraulic cylinder fully extended or retracted (i.e. at the end of stroke). Doing so may apply excessive load to the hydraulic cylinder, resulting in damage to the hydraulic cylinder or oil leaks.

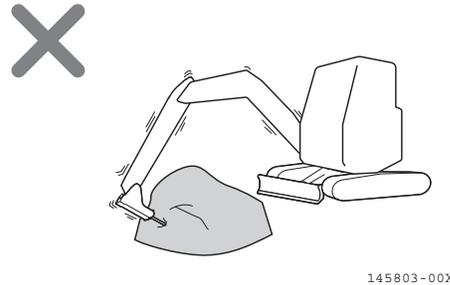


Fig. 1-4

- Do not raise the machine using the attachment mounted on the implement

Do not turn or raise the machine by pushing the attachment against the ground. Doing so may result in an accident or damage to the machine.

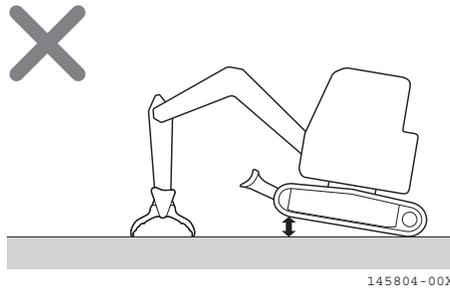


Fig. 1-5

■ **Do not strike an object with the attachment mounted on the implement by operating the implement**

Do not attempt to break an object by striking it or applying pressure to it with the attachment. Doing so may result in damage not only to the attachment, but also to the machine.

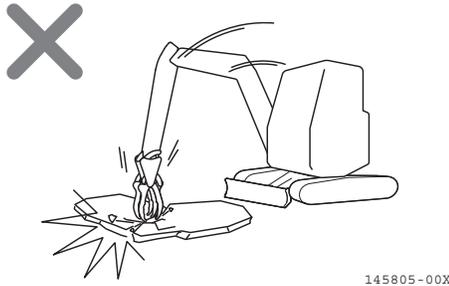


Fig. 1-6

■ **Do not grab an object with the attachment mounted on the implement at an oblique angle to the object**

Grabbing an object with the attachment oblique to the object is prohibited since doing so may result not only in reduced work efficiency, but also in damage to the machine.

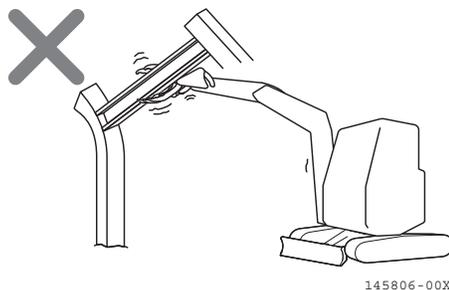


Fig. 1-7

■ **Do not twist, pull or drag an object by grabbing it using the attachment mounted on the implement**

Twisting, pulling or dragging an object forcibly with the object held by the attachment is prohibited since doing so may result in damage to the attachment or the machine.

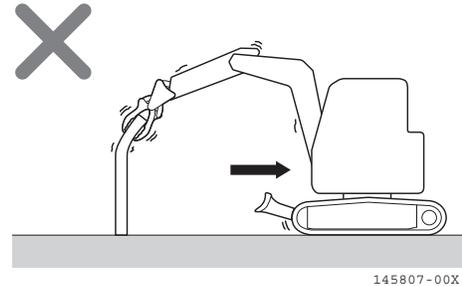


Fig. 1-8

■ **Do not turn the upperstructure with an object held by the attachment mounted on the implement**

Turning the upperstructure with an object held by the attachment is prohibited since doing so may result in an accident or damage to the attachment or the machine.

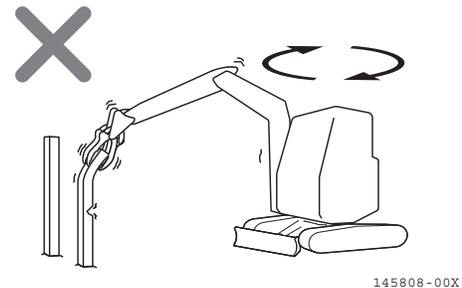


Fig. 1-9

■ **Do not run the machine with an object held by the attachment mounted on the implement**

Running the machine with an object held by the attachment is prohibited since doing so may result in an accident or damage to the attachment or the machine.

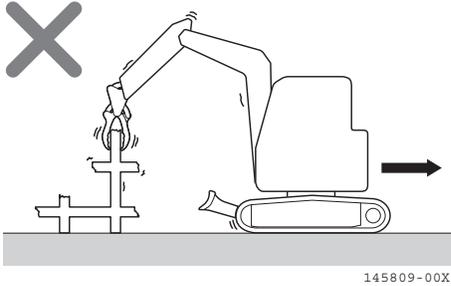


Fig. 1-10

■ **Do not lift a load using the attachment mounted on the implement**

Never lift a load with the attachment using lifting means such as wire ropes since doing so falls outside the scope of the intended use of the machine and can be dangerous.

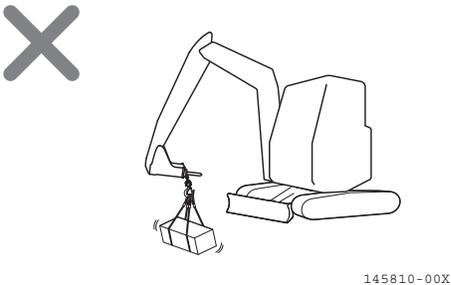


Fig. 1-11

■ **Be careful that the attachment does not come into contact with other parts**

It is possible that the attachment may come into contact with the machine body or the implement. Be careful to avoid such contact during operation.

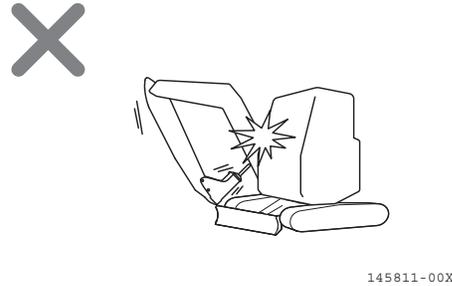


Fig. 1-12

■ **Do not rake up objects using the attachment mounted on the implement**

Do not rake up objects using the attachment since doing so may result in damage to the attachment or the machine.

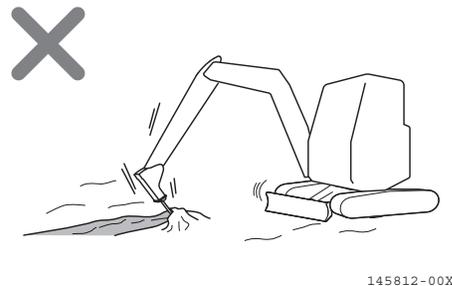


Fig. 1-13

APPENDIX TABLE

List of consumables	250
Fuel, oil and cooling water	251
Required tools	252
Torque table	253
List of essential parts	254
List of error codes displayed on LCD monitor	255

List of consumables

Item	Parts No.	Q'ty	Replacing time interval
Engine oil filter	119005-35170	1	Every 500 service hours
Fuel filter	119802-55801	1	Every 500 service hours
Air cleaner element	1A8240-05110	1	Every 500 service hours
Hydraulic oil return filter element	172B82-73700	1	Every 500 service hours (At first 250 service hours)

Fuel, oil and cooling water

Part to be refilled	Oil type	Recommendations with regard to temperature ranges						Prescribed amount of oil	Amount of oil to be changed		
		(°F)	-4	-14	32	50	68			86	
		(°C)	(-20)	(-10)	(0)	(10)	(20)	(30)			
Engine oil pan	Engine oil										
			SAE 10W CF								
			SAE 10W-30 CF						7.7 Qts. (7.3 L)	7.7 Qts. (7.3 L)	
			SAE 15W-40 CF								
Travel reduction gear	Gear oil								0.5 Qts. (0.5 L)	0.5 Qts. (0.5 L)	
			SAE 90 (GL- 4)						(For right and left each)	(For right and left each)	
Hydraulic oil system	Hydraulic oil								In the tank	8.5 Gals. (32 L)	
			ISO VG46						Other parts		
								5.8 Gals. (22 L)	8.5 Gals. (32 L)		
Fuel tank	Light oil	No. 1-D or No. 2-D diesel fuel						11.6 Gals. (44 L)	-		
Cooling system	Water	YANMAR genuine long-life coolant (LLC) added						Radiator	-		
								4.3 Qts. (4.1 L)			
								Subtank			
							0.4 Qts. (0.4 L)				

Required tools

The following tools are required for servicing:

No.	Name	Part number	Q'ty
1	Screwdriver (replaceable head)	104200-92350	1
2	Filter wrench 68	119332-92751	1
3	Filter wrench 80	119640-92750	1
4	Filter wrench LO	171301-92750	1
5	Pressure nozzle	172122-05101	1
6	Wrench 8×10	28110-080100	1
7	Wrench 12×14	28110-120140	2
8	Wrench 17×19	28110-170190	1
9	Wrench 22×24	28110-220240	2
10	Wrench 27×30	28110-270300	1
11	Wrench 32×36	28110-320360	1
12	Hexagon socket screw key 4	28150-040000	1
13	Hexagon socket screw key 5	28150-050000	1
14	Hexagon socket screw key 8	28150-080000	1
15	Box wrench 27×140	28227-271400	1
16	Turning handle 12×250	28230-120250	1
17	Grease hose	933110-09701	1
18	Grease injector 800	933110-09802	1
19	Pliers 200	933171-00470	1

Torque table

Bolts or nuts in the metric system should be tightened at the torque described below unless specified otherwise.

Item		Thread size × pitch	Tightening torque ft·lbf (N·m)	Remarks
Hexagon bolt (8.8) Nut	Coarse threads	M6 × 1	7.23 to 8.68 (9.8 to 11.8)	<ul style="list-style-type: none"> • Apply 80 % tightening torque when tightened to aluminum. • Apply 60 % tightening torque for 4.8 bolt and lock nut. • Use fine threads for engine only.
		M8 × 1.25	16.6 to 21.0 (22.6 to 28.4)	
		M10 × 1.5	32.6 to 43.4 (44.1 to 58.8)	
		M12 × 1.75	57.9 to 72.3 (78.5 to 98.1)	
		M14 × 2	86.8 to 108.5 (117.7 to 147.1)	
		M16 × 2	123.0 to 151.9 (166.7 to 206.0)	
		M18 × 2.5	173.6 to 209.8 (235.4 to 284.4)	
	M20 × 2.5	238.7 to 296.6 (323.6 to 402.1)		
		Fine threads	M14 × 1.5	
		M16 × 1.5	155.5 to 177.2 (210.8 to 240.3)	
Hexagon bolt (10.9)		M16 × 2	169.9 to 220.6 (230.4 to 299.1)	
PT plug		1/8	7.2 (9.8)	
		1/4	14.5 (19.6)	
		3/8	21.7 (29.4)	
		1/2	43.4 (58.8)	
Pipe joint bolt		M8	9.4 to 12.3 (12.7 to 16.7)	
		M12	18.1 to 25.3 (24.5 to 34.3)	
		M14	28.9 to 36.2 (39.2 to 49.0)	
		M16	36.2 to 43.4 (49.0 to 58.8)	

IMPORTANT

If a part to be tightened is made of resin like a panel board, excessive tightening torque may damage the tightened part. Be careful when tightening.

List of essential parts

No.	Essential parts to be replaced periodically	Q'ty	Replacement time intervals
1	Fuel hose (fuel tank to water separator)	1	Earlier of either every 2 years or every 2000 service hours
2	Fuel hose (water separator to feed pump)	1	
3	Fuel hose (feed pump to fuel filter)	1	
4	Fuel hose (fuel filter to fuel injection pump)	2	
5	Fuel hose (fuel filter to fuel tank)	1	
6	Fuel hose (fuel injection pump to fuel injection valve)	1	
7	Fuel hose (fuel injection valve to fuel injection valve)	2	
8	Fuel tube cap	1	
9	Main pump outlet hose (P1, P2, P3 to C/V)	3	

List of error codes displayed on LCD monitor

For items classified as warning, a warning notice is displayed on the LCD monitor. In such cases, immediately stop operation and take necessary corrective measures.

For items classified as caution, a caution notice is displayed on the LCD monitor. In such cases, take necessary corrective measures as soon as possible.

For error items with "Service" shown in the column of "Corrective measures," contact the nearest dealer for inspection and repair.

If an error code other than the ones listed in this table is displayed, contact the nearest dealer.

Error code	Classification	Error description	Corrective measures
00 000028.00	Caution	Accelerator sensor fault (Open position)	Service
00 000028.01	Caution	Accelerator sensor fault (Close position)	Service
00 000028.03	Caution	Accelerator sensor fault (High voltage)	Service
00 000028.04	Caution	Accelerator sensor fault (Low voltage)	Service
00 000029.00	Caution	Accelerator sensor fault (Open position)	Service
00 000029.01	Caution	Accelerator sensor fault (Close position)	Service
00 000029.02	Caution	Accelerator sensor intermittent fault	Service
00 000029.03	Caution	Accelerator sensor fault (High voltage)	Service
00 000029.04	Caution	Accelerator sensor fault (Low voltage)	Service
00 000029.08	Caution	Pulse accelerator sensor fault (Pulse communication)	Service
00 000029.15	Caution	Accelerator sensor fault (unavailable)	Service
00 000051.03	Caution	Intake throttle position sensor fault (Voltage high)	Service
00 000051.04	Caution	Intake throttle position sensor fault (Voltage low)	Service
00 000091.00	Caution	Accelerator sensor fault (Open position)	Service
00 000091.01	Caution	Accelerator sensor fault (Close position)	Service
00 000091.02	Caution	Accelerator sensor intermittent fault	Service
00 000091.03	Caution	Accelerator sensor fault (High voltage)	Service
00 000091.04	Caution	Accelerator sensor fault (Low voltage)	Service
00 000091.15	Caution	Accelerator sensor fault (unavailable)	Service
00 000100.01	Warning	Abnormal engine oil pressure (Pressure low)	Refer to "Troubleshooting"
00 000100.04	Warning	Engine oil pressure switch fault (OPEN)	Service
00 000102.03	Warning	EGR low pressure side pressure sensor fault (Excessive sensor output)	Service
00 000102.04	Warning	EGR low pressure side pressure sensor fault (Insufficient sensor output)	Service
00 000102.13	Warning	EGR low pressure side pressure sensor fault (Abnormal learning value)	Service
00 000102.10	Warning	EGR low pressure side pressure sensor fault (Detected value fault)	Service
00 000105.03	Warning	Intake manifold temperature sensor fault (Excessive sensor output)	Service
00 000105.04	Warning	Intake manifold temperature sensor fault (Insufficient sensor output)	Service
00 000105.10	Warning	Intake manifold temperature sensor fault (Detected value fault)	Service
00 000108.02	Caution	Atmospheric pressure sensor intermittent fault	Service
00 000108.03	Warning	Atmospheric pressure sensor fault (Excessive sensor output)	Service

Error code	Classification	Error description	Corrective measures
00 000108.04	Warning	Atmospheric pressure sensor fault (Insufficient sensor output)	Service
00 000108.10	Warning	Atmospheric pressure sensor fault (Characteristic fault)	Service
00 000110.00	Warning	Abnormal coolant temperature (Overheat)	Refer to "Troubleshooting"
00 000110.02	Warning	Coolant temperature sensor intermittent fault	Service
00 000110.03	Warning	Coolant temperature sensor fault (High voltage)	Service
00 000110.04	Warning	Coolant temperature sensor fault (Low voltage)	Service
00 000110.10	Warning	Coolant temperature sensor fault (Detected value fault)	Service
00 000157.00	Warning	Rail pressure too high	Service
00 000157.03	Warning	Rail pressure sensor fault (High voltage)	Service
00 000157.04	Warning	Rail pressure sensor fault (Low voltage)	Service
00 000157.15	Warning	Rail pressure deviation fault (High rail pressure)	Service
00 000157.16	Warning	PLV open valve	Service
00 000157.18	Warning	Rail pressure deviation fault (Low rail pressure)	Service
00 000158.00	Caution	Power supply voltage fault (High voltage)	Service
00 000158.01	Caution	Power supply voltage fault (Low voltage)	Service
00 000167.01	Caution	Battery charge alarm	Refer to "Troubleshooting"
00 000167.04	Caution	Battery charge switch fault	Service
00 000167.05	Caution	Battery charge switch open	Service
00 000172.03	Caution	Intake air temperature sensor fault (High voltage)	Service
00 000172.04	Caution	Intake air temperature sensor fault (Low voltage)	Service
00 000173.03	Warning	Exhaust manifold temperature sensor fault (Excessive sensor output)	Service
00 000173.04	Warning	Exhaust manifold temperature sensor fault (Insufficient sensor output)	Service
00 000173.10	Warning	Exhaust manifold temperature sensor fault (Detected value fault)	Service
00 000174.00	Warning	Fuel temperature high	Service
00 000174.03	Caution	Fuel temperature sensor fault (High voltage)	Service
00 000174.04	Caution	Fuel temperature sensor fault (Low voltage)	Service
00 000190.00	Warning	Engine overspeed	Service
00 000237.13	Caution	CAN communication fault (VI reception data fault)	Service
00 000237.31	Caution	CAN communication fault (VI reception timeout)	Service
00 000412.03	Warning	EGR gas temperature sensor fault (Excessive sensor output)	Service
00 000412.04	Warning	EGR gas temperature sensor fault (Insufficient sensor output)	Service
00 000412.10	Warning	EGR gas temperature sensor fault (Detected value fault)	Service
00 000628.02	Warning	ECU internal FlashROM error (Checksum)	Service
00 000628.12	Warning	ECU internal FlashROM error (Checksum A)	Service
00 000630.02	Caution	ECU internal EEPROM error (Checksum)	Service
00 000630.12	Caution	EEPROM memory deletion error	Service
00 000633.03	Warning	SCV (MPROP) Hside VB short circuit	Service
00 000633.05	Warning	SCV (MPROP) open	Service
00 000633.06	Warning	SCV (MPROP) H side GND short circuit	Service
00 000633.07	Warning	SCV (MPROP) fault (SCV sticking)	Service

Error code	Classification	Error description	Corrective measures
00 000638.02	Warning	Engine fault	Service
00 000638.03	Warning	Rack actuator fault (High current)	Service
00 000638.04	Warning	Rack actuator fault (Low current)	Service
00 000638.07	Warning	Rack actuator mechanical fault	Service
00 000638.12	Caution	CAN communication error	Service
00 000651.03	Caution	Injector (No.4 cylinder) short circuit	Service
00 000651.05	Caution	Injector (No.4 cylinder) open (Injector-specific)	Service
00 000651.06	Caution	Injector (No.4 cylinder) coil short circuit	Service
00 000652.03	Caution	Injector (No.3 cylinder) short circuit	Service
00 000652.05	Caution	Injector (No.3 cylinder) open (Injector-specific)	Service
00 000652.06	Caution	Injector (No.3 cylinder) coil short circuit	Service
00 000653.03	Caution	Injector (No.2 cylinder) short circuit	Service
00 000653.05	Caution	Injector (No.2 cylinder) open (Injector-specific)	Service
00 000653.06	Caution	Injector (No.2 cylinder) coil short circuit	Service
00 000654.03	Caution	Injector (No.1 cylinder) short circuit	Service
00 000654.05	Caution	Injector (No.1 cylinder) open (Injector-specific)	Service
00 000654.06	Caution	Injector (No.1 cylinder) coil short circuit	Service
00 001078.04	Warning/ Caution	Speed sensor fault	Service
00 001079.02	Caution	Sensor 5V intermittent fault	Service
00 001079.03	Caution	Sensor 5V fault (High voltage)	Service
00 001079.04	Caution	Sensor 5V fault (Low voltage)	Service
00 001136.00	Caution	ECU temperature rise alarm	Service
00 001136.02	Caution	ECU temperature sensor intermittent fault	Service
00 001136.03	Caution	ECU temperature sensor fault (High voltage)	Service
00 001136.04	Caution	ECU temperature sensor fault (Low voltage)	Service
00 001202.02	Caution	Immobilizer error (System)	Service
00 001209.03	Warning	EGR high pressure side pressure sensor fault (Excessive sensor output)	Service
00 001209.04	Warning	EGR high pressure side pressure sensor fault (Insufficient sensor output)	Service
00 001209.13	Warning	EGR high pressure side pressure sensor fault (Abnormal learning value)	Service
00 001209.10	Warning	EGR high pressure side pressure sensor fault (Detected value fault)	Service
00 001210.03	Warning	Rack position sensor fault (High voltage)	Service
00 001210.04	Caution	Rack position sensor fault (Low voltage)	Service
00 001347.00	Warning	High pressure pump fault (Pump sticking fail)	Service
00 001347.15	Warning	High pressure pump fault (Pump replacement fail)	Service
00 001485.02	Caution	Main relay early opening	Service
00 001485.04	Caution	Engine ECU main relay fault	Service
00 001485.07	Caution	Main relay contact sticking	Service
00 002791.00	Warning	EGR overvoltage error	Service
00 002791.01	Warning	EGR low voltage error	Service
00 002791.07	Warning	EGR feedback error	Service

Error code	Classification	Error description	Corrective measures
00 002791.09	Warning	EGR ECM data error	Service
00 002791.12	Warning	Open circuit in EGR motor coils	Service
00 002797.03	Caution	Injector drive circuit (Bank1) +B short circuit	Service
00 002797.05	Caution	Injector drive circuit (Bank1) open	Service
00 002797.06	Caution	Injector drive circuit (Bank1) short circuit	Service
00 002798.03	Caution	Injector drive circuit (Bank2) +B short circuit	Service
00 002798.05	Caution	Injector drive circuit (Bank2) open	Service
00 002798.06	Caution	Injector drive circuit (Bank2) short circuit	Service
00 002950.03	Caution	Power short circuit of throttle valve drive H bridge output 1	Service
00 002950.04	Caution	GND short circuit of throttle valve drive H bridge output 1	Service
00 002950.05	Caution	No-load of throttle valve drive H bridge circuit	Service
00 002950.06	Caution	Overload on the drive H bridge circuit of throttle valve	Service
00 002951.03	Caution	VB Power short circuit of throttle valve drive H bridge output 2	Service
00 002951.04	Caution	GND short circuit of throttle valve drive H bridge output 2	Service
00 003242.00	Caution	DP Filter inlet temperature sensor abnormal temperature (Abnormally high)	Service
00 003242.03	Warning	DP Filter inlet temperature sensor fault (Excessive sensor output)	Service
00 003242.04	Warning	DP Filter inlet temperature sensor fault (Insufficient sensor output)	Service
00 003242.10	Caution	DP Filter inlet temperature sensor fault (Detected value fault)	Service
00 003250.00	Warning	DP Filter Intermediate temperature sensor rise fault (post-injection fault)	Service
00 003250.01	Caution	DP Filter Intermediate temperature sensor fault (abnormally low)	Service
00 003250.03	Warning	DP Filter Intermediate temperature sensor fault (Excessive sensor output)	Service
00 003250.04	Warning	DP Filter Intermediate temperature sensor fault (Insufficient sensor output)	Service
00 003250.10	Caution	DP Filter Intermediate temperature sensor fault (Detected value fault)	Service
00 003251.00	Warning	DP Filter differential pressure sensor fault (Abnormal rise in differential pressure)	Service
00 003251.03	Warning	DP Filter differential pressure sensor fault (Excessive sensor output)	Service
00 003251.04	Warning	DP Filter differential pressure sensor fault (Insufficient sensor output)	Service
00 003251.13	Warning	DP Filter differential pressure sensor fault (Detected value fault)	Service
00 003609.03	Warning	DP Filter high pressure side pressure sensor fault (Excessive sensor output)	Service
00 003609.04	Warning	DP Filter high pressure side pressure sensor fault (Insufficient sensor output)	Service
00 003609.10	Caution	DP Filter high pressure side sensor fault (Detected value fault)	Service
00 003695.14	Caution	DP Filter reset regeneration is inhibited	Service

Error code	Classification	Error description	Corrective measures
00 003719.00	Warning	DP Filter backup mode	Service
00 003719.07	Warning	DP Filter recovery regeneration is inhibited	Service
00 003719.09	Warning	DPF regeneration fault (Recovery regeneration fault)	Service
00 003719.16	Caution	DP Filter stationary regeneration standby	Service
00 003720.00	Caution	DP Filter ash cleaning request 2	Service
00 003720.16	Caution	DP Filter ash cleaning request 1	Service
00 004257.12	Caution	Injector drive IC error	Service
00 004795.31	Caution	DP Filter substrate / DP Filter differential pressure sensor fault	Service
00 522241.02	Caution	Rack actuator relay intermittent fault	Service
00 522241.03	Caution	Rack actuator relay fault B	Service
00 522241.04	Caution	Rack actuator relay fault A	Service
00 522242.02	Caution	CSD solenoid valve intermittent fault	Service
00 522242.03	Caution	CSD solenoid valve fault B	Service
00 522242.04	Caution	CSD solenoid valve fault A	Service
00 522243.02	Caution	Start assist relay intermittent fault	Service
00 522243.03	Caution	Start assist relay fault B	Service
00 522243.04	Caution	Start assist relay fault A	Service
00 522243.05	Caution	Start assist relay disconnection	Service
00 522243.06	Caution	Start assist relay GND short circuit	Service
00 522251.03	Caution	EGR valve fault B (Step motor A-phase)	Service
00 522251.04	Caution	EGR valve fault A (Step motor A-phase)	Service
00 522252.03	Caution	EGR valve fault B (Step motor B-phase)	Service
00 522252.04	Caution	EGR valve fault A (Step motor B-phase)	Service
00 522253.03	Caution	EGR valve fault B (Step motor C-phase)	Service
00 522253.04	Caution	EGR valve fault A (Step motor C-phase)	Service
00 522254.03	Caution	EGR valve fault B (Step motor D-phase)	Service
00 522254.04	Caution	EGR valve fault A (Step motor D-phase)	Service
00 522314.00	Caution	Abnormal coolant temperature	Service
00 522323.00	Caution	Air cleaner restriction.	Service
00 522329.00	Caution	Water in fuel alarm	Service
00 522400.02	Caution	Crankshaft speed sensor signal error	Service
00 522400.05	Caution	Crankshaft speed sensor no signal	Service
00 522401.02	Caution	Camshaft speed sensor signal error	Service
00 522401.05	Caution	Camshaft speed sensor no signal	Service
00 522401.07	Caution	Camshaft speed sensor angle offset error	Service
00 522402.04	Warning/ Caution	Spare speed sensor fault	Service
00 522571.03	Warning	SCV (MPROP) L side VB short circuit	Service
00 522571.06	Warning	SCV (MPROP) L side GND short circuit	Service
00 522572.06	Warning	SCV (MPROP) drive current (high level)	Service
00 522572.11	Warning	SCV (MPROP) pump overload error	Service
00 522573.00	Caution	DP Filter excessive PM accumulation (Method C)	Service
00 522574.00	Caution	DP Filter excessive PM accumulation (Method P)	Service
00 522575.07	Caution	DP Filter regeneration fault (Stationary regeneration fault)	Service
00 522576.12	Caution	EEPROM memory reading error	Service

Error code	Classification	Error description	Corrective measures
00 522577.11	Caution	DP Filter regeneration fault (Stationary regeneration not performed)	Service
00 522578.12	Caution	EEPROM memory writing error	Service
00 522579.12	Warning	Short circuit in EGR motor coils	Service
00 522580.12	Warning	EGR position sensor fault	Service
00 522581.07	Warning	EGR valve sticking fault	Service
00 522582.07	Warning	EGR initialization error	Service
00 522583.01	Warning	EGR high temperature sensor fault	Service
00 522584.01	Warning	EGR low temperature sensor fault	Service
00 522585.12	Warning	ECU internal fault (CY146 SPI communication fault)	Service
00 522588.12	Warning	ECU internal fault (Excessive voltage of supply 1)	Service
00 522589.12	Warning	ECU internal fault (Insufficient voltage of supply 1)	Service
00 522590.12	Caution	ECU internal fault (Sensor supply voltage error 1)	Service
00 522591.12	Caution	ECU internal fault (Sensor supply voltage error 2)	Service
00 522592.12	Caution	ECU internal fault (Sensor supply voltage error 3)	Service
00 522596.09	Caution	CAN communication error (TSC1 (SA1) reception timeout)	Service
00 522597.09	Caution	CAN communication error (TSC1 (SA2) reception timeout)	Service
00 522599.09	Caution	CAN communication error (Y_ECR1 reception timeout)	Service
00 522600.09	Caution	CAN communication error (Y_EC reception timeout)	Service
00 522601.09	Caution	CAN communication error (Y_RSS reception timeout)	Service
00 522603.09	Caution	CAN communication error (VH reception timeout)	Service
00 522605.09	Caution	CAN communication error (Y_ECM3 reception timeout)	Service
00 522609.09	Caution	CAN communication error (Y_ETCP1 reception timeout)	Service
00 522610.09	Caution	CAN1 (for EGR): Reception timeout from the EGR valve	Service
00 522611.09	Warning	CAN1 (for exhaust throttle): Reception time out	Service
00 522617.12	Caution	EGR target value out of range	Service
00 522618.09	Warning	CAN communication error (EBC1 reception timeout)	Service
00 522619.09	Caution	CAN communication error (Y_DPFIF reception timeout)	Service
00 522623.07	Caution	Dual accelerator sensor fault (Open position)	Service
00 522624.07	Caution	Dual accelerator sensor fault (Closed position)	Service
00 522727.12	Caution	ECU internal fault with sub-CPU	Service
00 522728.12	Caution	ECU internal map format error	Service
00 522730.08	Warning	Immobilizer error (Pulse communication)	Service
00 522730.12	Caution	Immobilizer error (CAN communication)	Service
00 522744.04	Caution	ECU internal fault (Actuator drive circuit 1 short to ground)	Service
00 522746.12	Caution	Exhaust throttle fault (Voltage fault)	Service
00 522747.12	Caution	Exhaust throttle fault (motor fault)	Service
00 522748.12	Warning	Exhaust throttle fault (sensor system fault)	Service
00 522749.12	Warning	Exhaust throttle fault (MPU fault)	Service
00 522750.12	Caution	Exhaust throttle fault (PCB fault)	Service
00 522751.19	Caution	Exhaust throttle fault (CAN fault)	Service
00 522803.13	Caution	High pressure pump fault (Not learned)	Service
00 522993.12	Caution	ECU internal fault (CPU monitoring IC fault)	Service
00 522594.12	Caution	ECU internal fault (CPU fault)	Service
00 522994.04	Caution	ECU internal fault (Actuator drive circuit 2 short to ground)	Service
00 522995.12	Caution	Injector QR data correction input error	Service

Error code	Classification	Error description	Corrective measures
00 522996.04	Caution	Injector drive circuit fault (Low charge)	Service
00 522997.03	Warning	Injector drive circuit fault (Over charge)	Service
00 522998.12	Warning	ECU internal fault (Flash ROM garbled error, checksum error)	Service
00 523074.00	Warning	ECU internal fault (Sensor 5V circuit 1 high voltage fault)	Service
00 523074.01	Warning	ECU internal fault (Sensor 5V circuit 1 low voltage fault)	Service
00 523075.00	Warning	ECU internal fault (Sensor 5V circuit 2 high voltage fault)	Service
00 523075.01	Warning	ECU internal fault (Sensor 5V circuit 2 low voltage fault)	Service
00 523221.12	Warning	Injector QR data unwritten	Service
00 523221.13	Caution	Injector QR data error	Service
00 523249.05	Warning	Crankshaft/camshaft speed sensor non input (simultaneous)	Service
00 523460.07	Warning	Rail pressure fault (Operation time error during RPS limp home)	Service
00 523462.13	Warning	Injector (No.1 cylinder) correction value error	Service
00 523463.13	Warning	Injector (No.2 cylinder) correction value error	Service
00 523464.13	Warning	Injector (No.3 cylinder) correction value error	Service
00 523465.13	Warning	Injector (No.4 cylinder) correction value error	Service
00 523468.09	Warning	Rail pressure fault (Controlled rail pressure error after PLV valve opening)	Service
00 523469.00	Warning	Rail pressure fault (The times of PLV valve opening error)	Service
00 523470.00	Warning	Rail pressure fault (The time of PLV valve opening error)	Service
00 523471.06	Caution	ECU internal fault (Actuator drive circuit 3 short to ground)	Service
00 523473.12	Warning	ECU internal fault (AD converter fault 1)	Service
00 523474.12	Warning	ECU internal fault (AD converter fault 2)	Service
00 523475.12	Warning	ECU internal fault (External monitoring IC and CPU fault 1)	Service
00 523476.12	Warning	ECU internal fault (External monitoring IC and CPU fault 2)	Service
00 523477.12	Warning	ECU internal fault (ROM fault)	Service
00 523478.12	Warning	ECU internal fault (Shutoff path fault 1)	Service
00 523479.12	Warning	ECU internal fault (Shutoff path fault 2)	Service
00 523480.12	Warning	ECU internal fault (Shutoff path fault 3)	Service
00 523481.12	Warning	ECU internal fault (Shutoff path fault 4)	Service
00 523482.12	Warning	ECU internal fault (Shutoff path fault 5)	Service
00 523483.12	Warning	ECU internal fault (Shutoff path fault 6)	Service
00 523484.12	Warning	ECU internal fault (Shutoff path fault 7)	Service
00 523485.12	Warning	ECU internal fault (Shutoff path fault 8)	Service
00 523486.12	Warning	ECU internal fault (Shutoff path fault 9)	Service
00 523487.12	Warning	ECU internal fault (Shutoff path fault 10)	Service
00 523488.00	Warning	ECU internal fault (Recognition error of engine speed)	Service
00 523489.00	Warning	Rail pressure fault (The actual rail pressure is too high during PRV limp home)	Service

Error code	Classification	Error description	Corrective measures
00 523491.00	Warning	Rail pressure fault (Injector B/F temperature error during PLV4 limp home)	Service
28 000096.03	Caution	Fuel sensor fault (High voltage)	Service
28 000096.04	Caution	Fuel sensor fault (Low voltage)	Service
28 000639.09	Warning	CAN communication error (Engine ECU)	Service
28 520805.09	Warning	CAN communication error (Hydraulic ECU)	Service
28 030736.04	Caution	Buzzer fault	Service
28 026912.05	Caution	Camera signal interruption	Service
28 026912.12	Caution	Camera signal	Service
28 027424.02	Caution	Specification setting information is not set	Service
28 027168.12	Caution	LCD monitor fault	Service
E1 028928.07	Warning	Boom proportional solenoid valve fault	Service
E1 029184.00	Warning	Height limit control is abnormal (Over)	Service
E1 029440.05	Warning	Boom proportional solenoid valve fault (Low current)	Service
E1 029440.06	Warning	Boom proportional solenoid valve fault (High current)	Service
E1 029952.07	Warning	Arm solenoid valve fault	Service
E1 030208.00	Warning	Arm limit control is abnormal (Over)	Service
E1 030464.05	Caution	Pump proportional solenoid valve fault (Low current)	Service
E1 030464.06	Caution	Pump proportional solenoid valve fault (High current)	Service
E1 028944.05	Caution	AUX1 proportional solenoid valve fault (Low current)	Service
E1 028944.06	Caution	AUX1 proportional solenoid valve fault (High current)	Service
E1 029200.05	Caution	AUX2 proportional solenoid valve fault (Low current)	Service
E1 029200.06	Caution	AUX2 proportional solenoid valve fault (High current)	Service
E1 012544.04	Warning	Boom angle sensor fault (Low voltage)	Service
E1 012544.03	Warning	Boom angle sensor fault (High voltage)	Service
E1 013312.04	Warning	Arm angle sensor fault (Low voltage)	Service
E1 013312.03	Warning	Arm angle sensor fault (High voltage)	Service
E1 020736.04	Warning	Boom bottom pressure sensor fault (Low voltage)	Service
E1 020736.03	Warning	Boom bottom pressure sensor fault (High voltage)	Service
E1 031488.07	Warning	Cut-off valve fault	Service
E1 025600.09	Caution	CAN communication error (Engine ECU)	Service
E1 025856.09	Caution	CAN communication error (LCD monitor)	Service
E1 025104.09	Caution	CAN communication error (Immobilizer ECU)	Service
E1 025360.09	Caution	CAN communication error (Proportional solenoid valve driver 1)	Service
E1 026128.09	Caution	CAN communication error (Key pad)	Service
E1 026640.09	Caution	CAN communication error (Wiper ECU)	Service
E1 026896.09	Caution	CAN communication error (Outer display lamp)	Service
E1 033024.00	Caution	Abnormal controller power supply voltage (High)	Service
E1 033024.01	Caution	Abnormal controller power supply voltage (Slightly low)	Check battery or service
E1 033024.11	Caution	Abnormal controller power supply voltage (Low)	Check battery or service
E1 027152.12	Caution	Hydraulic ECU fault (NvM fault)	Service
E1 033792.02	Caution	Hydraulic ECU fault (Initial setting error)	Service
E1 035072.02	Caution	Hydraulic ECU fault (Specification setting information is not set)	Service
E1 000091.04	Caution	Accelerator sensor fault (Low voltage)	Service
E1 000091.03	Caution	Accelerator sensor fault (High voltage)	Service
E1 028176.02	Caution	Quick coupler operation switch error	Service

Error code	Classification	Error description	Corrective measures
E1 520777.03	Caution	Hydraulic oil temperature sensor fault (High voltage)	Service
E1 520777.04	Caution	Hydraulic oil temperature sensor fault (Low voltage)	Service
E1 015104.04	Caution	AUX1 switch error (Low voltage)	Service
E1 015104.03	Caution	AUX1 switch error (High voltage)	Service
E1 015360.04	Caution	AUX2 switch error (Low voltage)	Service
E1 015360.03	Caution	AUX2 switch error (High voltage)	Service
E1 024864.01	Caution	Proportional solenoid valve driver 1 fault (Power supply voltage fault)	Check battery or service
E1 025632.12	Caution	Proportional solenoid valve driver 1 fault (Internal fault)	Service
E1 027408.12	Caution	Hydraulic ECU fault (Arbitration port fault)	Service
E1 027664.12	Caution	Hydraulic ECU fault (ROM fault)	Service
E1 027920.12	Caution	Hydraulic ECU fault (RAM fault)	Service
E1 038400.12	Caution	Surround view ECU fault (Right camera error)	Service
E1 038656.12	Caution	Surround view ECU fault (Rear camera error)	Service
E1 038912.12	Caution	Surround view ECU fault (Left camera error)	Service
E1 039168.12	Caution	Surround view ECU fault (Model information error)	Service
E1 039424.12	Caution	Surround view ECU fault (ROM error)	Service

INDEX

A

- Air cleaner element
 - Checking and cleaning the air cleaner .. 217
 - Replacing the air cleaner element 225
- Air conditioner
 - Handling Air Conditioner 101
- Attachment
 - Precautions for mounting an attachment (implement) 245
 - Prohibitions while the Machine is mounted with an Attachment 246
- Attachment types 143
- Auto deceleration
 - Operation with LCD monitor 72, 77

B

- Battery
 - Checking and replenishing the battery electrolyte 114
 - If the battery is overdischarged 174
 - Precautions for the battery 35
- Bio-diesel fuels 186
- Blade lever 90, 92
- Boom swing pedal 90, 92
- Bucket
 - Replacing the bucket 138
 - Replacing the bucket teeth and side cutter 210
 - Reversing the bucket 139

C

- Cabin
 - Cabin side door 100
 - Headlight 99
 - Lower windshield 96
 - Side door 96
 - Upper windshield 96
- Care and Service in Cold Weather 169
- Checking before starting the engine 108
- Checking before start-up 109, 216
- Checking the accumulator 232
- Checking the electrical equipment 116
- Consumables 193
- Controls and switches 63
- Cooling water
 - Checking and replenishing the cooling water 109
 - Engine Coolant Specifications 189
 - Replacing the engine cooling water 230

- Type and amount of engine cooling water 184, 194

Crawlers

- Checking and adjusting the steel crawler 207
- Checking/adjusting/replacing the rubber crawlers 201, 203, 206

D

Diesel fuel

- Bleeding the air from the fuel passage 223
- Checking and replenishing the fuel in the fuel tank 112
- Diesel Fuel Specifications 185
- Draining the water and deposits in the fuel tank 217
- Replacing the fuel filter 222
- Type and amount of travel reduction fuel 184, 194

E

ECO mode

- Operation using LCD monitor 72, 77

Engine control dial 86

Engine oil

- Checking and replenishing the engine oil 111
- Engine Oil Specifications 187
- Replacing the engine oil and engine oil filter 223
- Type and amount of engine oil ... 184, 194

Engine stop switch 88

Error codes 255

Escaping from the mud 130

F

Foot rest (pedal guard) 90, 92

Fuse

- Blade fuse 105
- Slow-blow fuses 106

G

Grease

- Greasing 146
- Greasing the swing gear and the swing bearing 216
- Storage space for grease gun 95

- H**
- Hammer for emergency escape from operator's cab 98
- Handling the rubber crawlers 134
- Hood
- Front cover (right) 94
 - Rear hood 93
 - Right hood 94
- Horn switch 85
- How to handle AUX1
- Pressure release from AUX pipes 150
- How to handle AUX2
- Pressure release from AUX pipes 155
- Hydraulic oil
- Checking and replenishing the hydraulic oil tank 113
 - Replacing the hydraulic oil return filter .. 226
 - Replacing the oil in the hydraulic oil tank and cleaning the suction filter 228
 - Service intervals when using the hydraulic breaker 200
 - Type and amount of hydraulic oil 184, 194
- I**
- Implement
- Control levers 90, 91
 - Operating the implement 123
 - Precautions for operating the implement 125
 - Precautions for working 127
- L**
- LCD monitor
- Icon Display 66
 - Identification of Important Parts and Function 64
 - Menu Screen (various settings) 73
 - Operation at Start-up 68
 - Warning and Display when Error Occurs 70
- Light (work light)
- Light switch 86
- Locking 133
- Long-term storage 152, 159, 171
- M**
- Maintenance Table 198
- Measures to recovery from gas shortage (bleeding the air from the fuel passage) .. 223
- Monitor 64
- N**
- Nonperiodic servicing 198, 201
- O**
- Operating pattern change valve 90, 93
- Operator's seat 98
- P**
- Parking the machine 33, 132
- Pedal guard (foot rest) 90, 92
- Phenomena that are not breakdowns 143
- Precautions for engine
- Precautions before starting the engine ... 26
 - Precautions for starting the engine, working and parking 28
- Precautions for going up and down a slope 30, 128
- Precautions for loading the machine 165
- Precautions for Safety
- Basic Precautions 20
 - Operating Precautions 26
 - Precautions for Servicing 37
 - Safety Messages (Warning Labels) 43
- Precautions for transportation 34, 164
- Q**
- Quick coupler
- Allowable size of bucket 143
 - Attachment types 143
 - Dismounting attachment 144
 - Mounting attachment 145
- R**
- Rear view monitor 106
- ROPS/FOPS/TOPS 27
- S**
- Single- and double-acting selector valve 154
- SMARTASSIST-Remote 162
- Starter switch 84
- Suspending the machine 166
- Swinging the upperstructure 123
- T**
- Torque table 195
- Towing 36, 174
- Track roller 201
- Transportation
- Precautions for transportation 34, 164
- Travel motor
- Checking and replenishing the lube oil for the travel reduction gearbox 219

Replacing the lube oil for the travel reduction gearbox 227
Type and amount of travel reduction gear oil 184, 194
Traveling operation
High speed travel switch 87
Starting the machine 121
Steering (turning the machine) 122
Stopping the travel alarm 78
Travel levers (pedals) 90, 91
Travel pedals 90, 91
Troubleshooting 178

W

Walking check 108
Water separator
Checking and draining the water separator 110
Cleaning the water separator and replacing the filter element 221
Wiper
Washer tank 100
Wiper switch 86