

Operation & Maintenance Manual

WA430-6

WHEEL LOADER

SERIAL NUMBERS **WA430-6** **A41001** and up

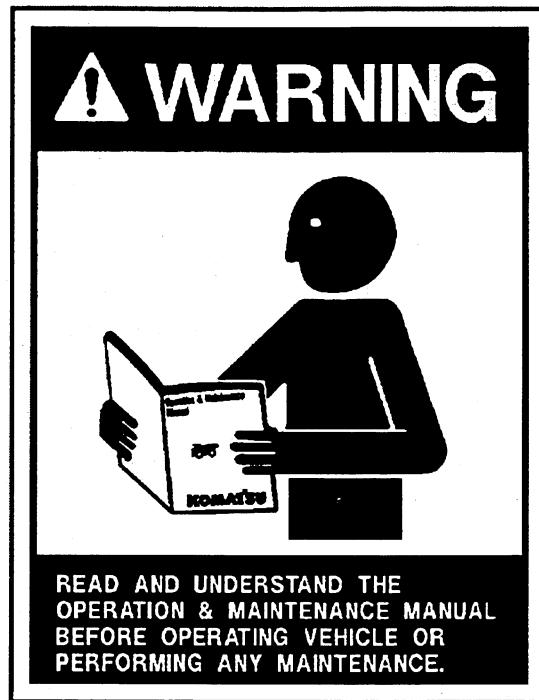
Engine **6D114E-3**

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! WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept near the machine for reference and periodically reviewed by all personnel who come in contact with it.

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.

CALIFORNIA

Proposition 65 Warning

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer, birth defects and reproductive harm. Wash hands after handling.

INTRODUCTION

INTRODUCTION

FOREWORD

This manual describes procedures for operation, handling, lubrication, maintenance, checking, and adjustment. It will help the operator and maintenance personnel achieve peak performance through effective, economical, and safe machine operation and maintenance.

Komatsu cannot predict every circumstance that might involve a potential hazard when the machine is used. The safety messages in this manual and on the machine may not include all possible safety precautions. If you carry out any operation, inspection, or maintenance under conditions that are not described in this manual, understand that it is your responsibility to take the necessary precautions to ensure safety. In no event should you or others engage in the prohibited uses or actions described in this manual. Improper operation and maintenance of the machine can be hazardous and could result in serious injury or death.

Keep this manual handy and have all personnel read it periodically. If this manual is lost, damaged, or becomes dirty and can not be read, request a replacement manual from your local distributor.

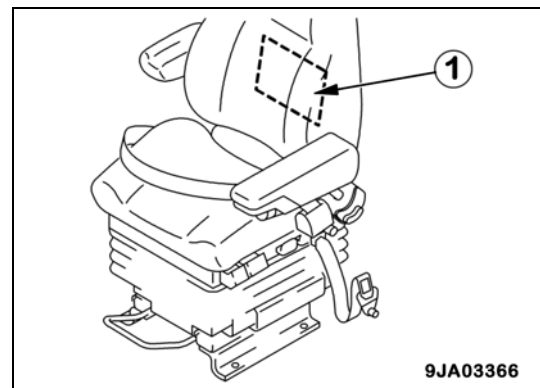
- ★ Storage location for *Operation & Maintenance Manual* is in the pocket (1) at the rear of the operator's seat back rest.

If you sell the machine, be sure to give this manual to the new owner.

The explanations, values, and illustrations in this manual have been prepared based on the latest information available at the date of its publication. Continuing improvements in the design of this machine may lead to additional changes that are not reflected in this manual. Consult Komatsu or your Komatsu distributor for the latest available information concerning your machine or with questions regarding information contained in this manual.

This manual may contain attachments and optional equipment that are not available in your area. Consult your local Komatsu distributor for items that you may require.

The numbers in the illustrations correspond to the numbers in parenthesis () in the text.



WARNING

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

- Operators and maintenance personnel must read this manual thoroughly before operating or maintaining this machine.
- This manual should be kept near, or with, the machine for reference. All personnel who operate the machine should periodically review the manual.
- Some actions involved in operation and maintenance can cause a serious accident if they are not performed in the manner described in this manual.
- The procedures and precautions given in this manual apply only to the intended uses of this machine. If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for you and others. You or others should never engage in prohibited uses or actions described in this manual.
- Komatsu delivers machines that comply with all applicable regulations and standards of the country to which they are shipped. If this machine has been purchased in another country, or purchased from someone in another country, it may lack certain safety features and specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult your local distributor or Komatsu before operating the machine.
- The safety description is given in "SAFETY INFORMATION" on page 0-3 and in Section 1, *SAFETY*.

SAFETY INFORMATION

Most accidents are caused by failure to follow fundamental safety rules for the operation and maintenance of the machine. To avoid accidents, read, understand, and follow all precautions and warnings in this manual and on the machine before performing maintenance and machine operations. Failure to do so may result in serious injury or death.

The following signal words are used to inform you that there is a potentially hazardous situation that may lead to personal injury or damage. In this manual and on machine labels, different signal words are used to express the potential level of hazard.

The Safety Alert Symbol identifies important safety messages on machines, in manuals, and elsewhere. When you see this symbol, be alert to the risk of personal injury or death. Follow the instructions in the safety message.



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to most extreme situations.



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



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Remark

This word is used for precautions that must be taken to avoid actions which could shorten the life of the machine. It is also used to indicate information that is useful to know.

Safety precautions are described in the **SAFETY** section (Section 1).

KOMATSU AMERICA CORP. cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore the safety message in this manual and on the machine may not include all possible safety precautions. If any procedures or actions not specifically recommended or allowed in this manual are used, you must be sure that you and others can do such procedures and actions safely and without damaging the machine. If you are unsure about the safety of some procedures, contact your local distributor or KOMATSU AMERICA CORP.

APPROVED AND NON-APPROVED USES

The Komatsu WHEEL LOADER described in this manual has been designed and constructed to be used mainly for the following functions. Any non-approved use may void the warranty, damage the machine, or possibly injure the operator.

Approved Functions

- Loading operations
- Excavating
- Grading
- Pushing

Installation of optional equipment can also be used in the following applications. Use only **Komatsu** approved equipment.

- Handling of materials (bucket - pallet forks)
- Lifting of materials (extendable boom)

★ For details about the operating procedure, see “Operation of Work Equipment” on page 2-118.

Non-Approved Functions

This paragraph describes some of the improper or unauthorized uses of the machine.

It is impossible to predict all the possible improper uses. If the machine is used for any particular application other than those listed in the Approved Functions list, it is important to contact your authorized Komatsu distributor before carrying out the work operations.

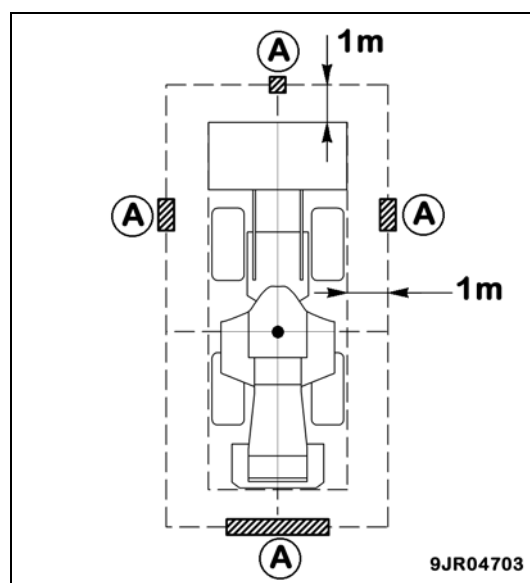
- Use of machine for lifting or transporting personnel in any manner
- Transportation of flammable liquids
- Lifting, moving, or transporting other machines with the front-end loader
- Towing other equipment with the tractor unit or work equipment
- Using the loader as a hammer or for striking or driving objects
- Towing the machine at high speeds
- Traveling at high speeds

VISIBILITY STANDARD

The visibility standards (ISO 5006) for this machine require a view shown in this diagram.

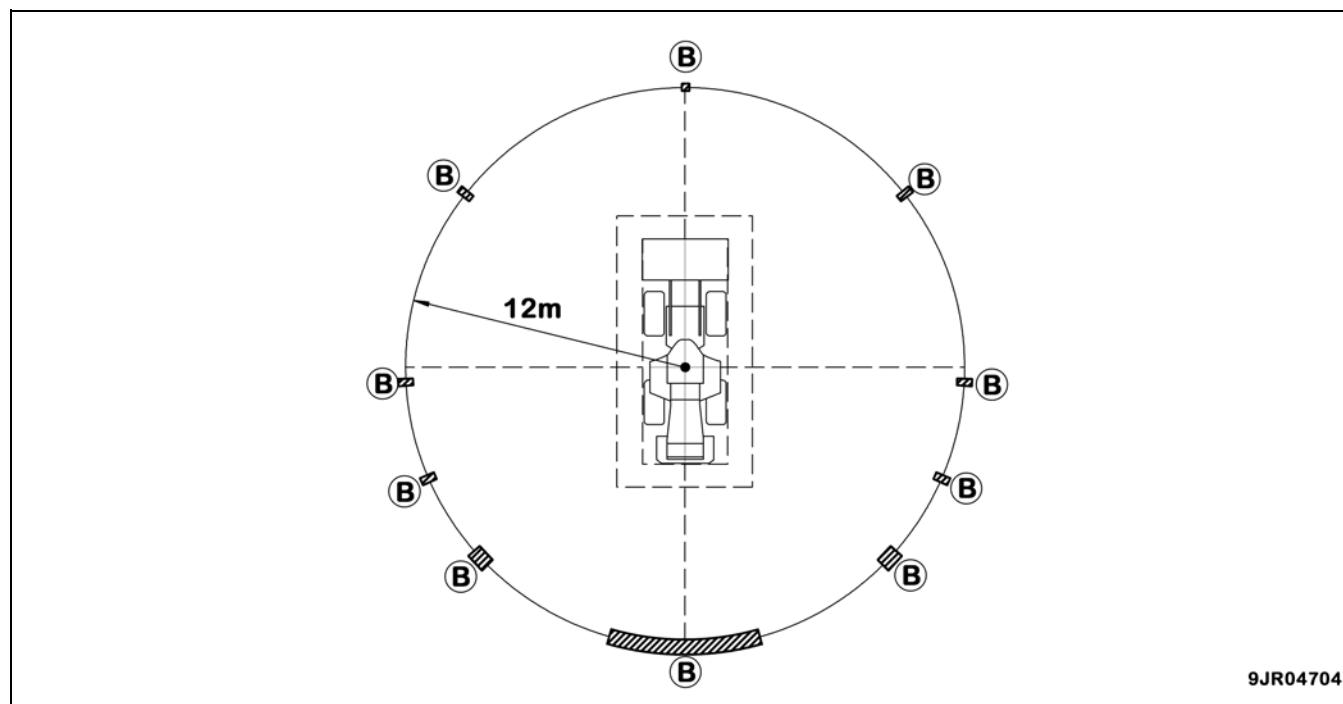
Visibility in Immediate Area

The visibility of this machine in the area 1 meter (1.1 yd) from the outside surface of the machine at a height of 1.5 m (1.6 yd) is shown in the diagram. The hatched area (A) shows the area where the view is blocked by part of the machine when mirrors or other aids to visibility are installed as standard. Be careful; there are places around the machine that cannot be seen when operating the machine.



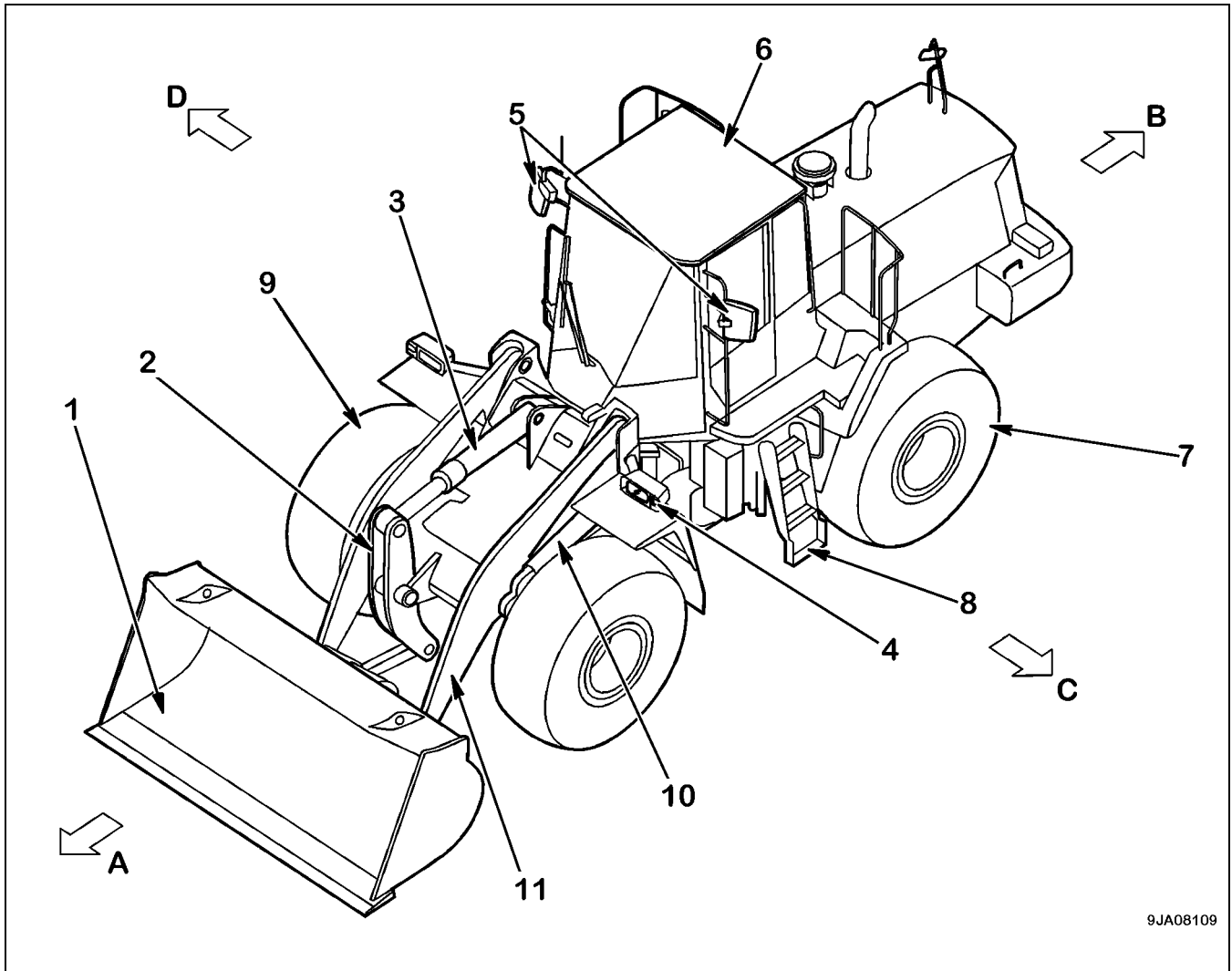
12-M Radius Visibility

The visibility at a radius of 12 meters (13.1 yd) from the machine is shown in the following diagram. The hatched areas (B) show the areas where the view is blocked when mirrors or other aids to visibility are installed as standard. Be careful; there are places around the machine that cannot be seen when operating the machine.



PRODUCT IDENTIFICATION

Machine

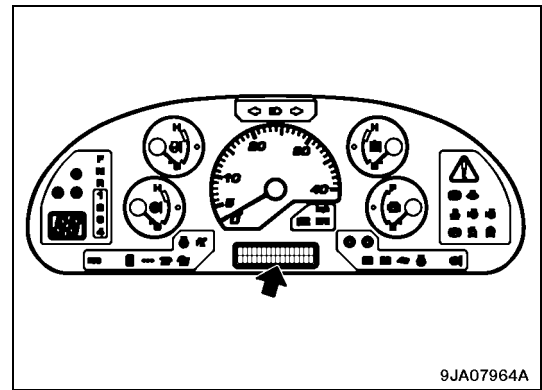


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- | | |
|---------------------|-------------------|
| 1. Bucket | 7. Rear wheel |
| 2. Bellcrank | 8. Step |
| 3. Bucket cylinder | 9. Front wheel |
| 4. Turn signal lamp | 10. Lift cylinder |
| 5. Mirror | 11. Lift arm |
| 6. ROPS cab | |
| A. Front | C. Left |
| B. Rear | D. Right |

Service Meter Location

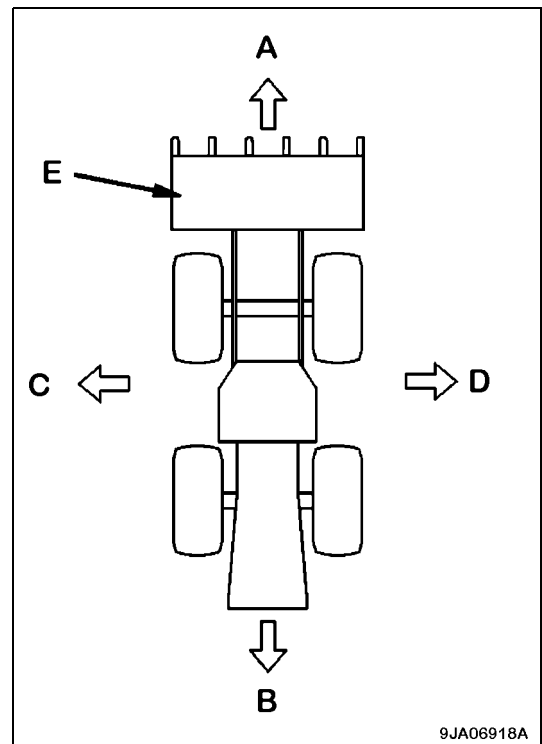
The service meter is located on the character display at the bottom, center of the machine monitor.



Directions of Machine

In this manual, the direction of the machine is determined according to the view from the operator's seat, in the direction of travel (front) of the machine.

- A. Front
- B. Rear
- C. Left
- D. Right
- E. Bucket



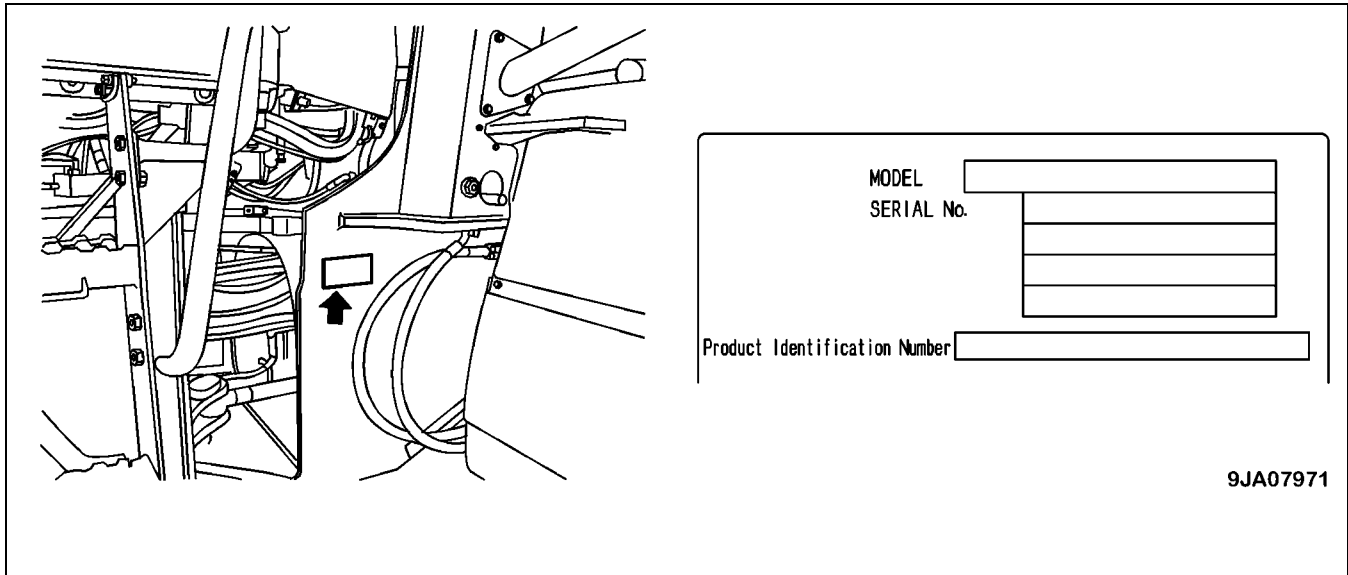
INTRODUCTION

Machine Serial Number/Product Identification Number (PIN)

The serial numbers and model numbers on the components are the only numbers that your distributor needs when you require assistance or order replacement parts. It is a good idea to record this information in this manual. See “SERIAL NUMBERS AND DISTRIBUTOR INFORMATION” on page 0-9.

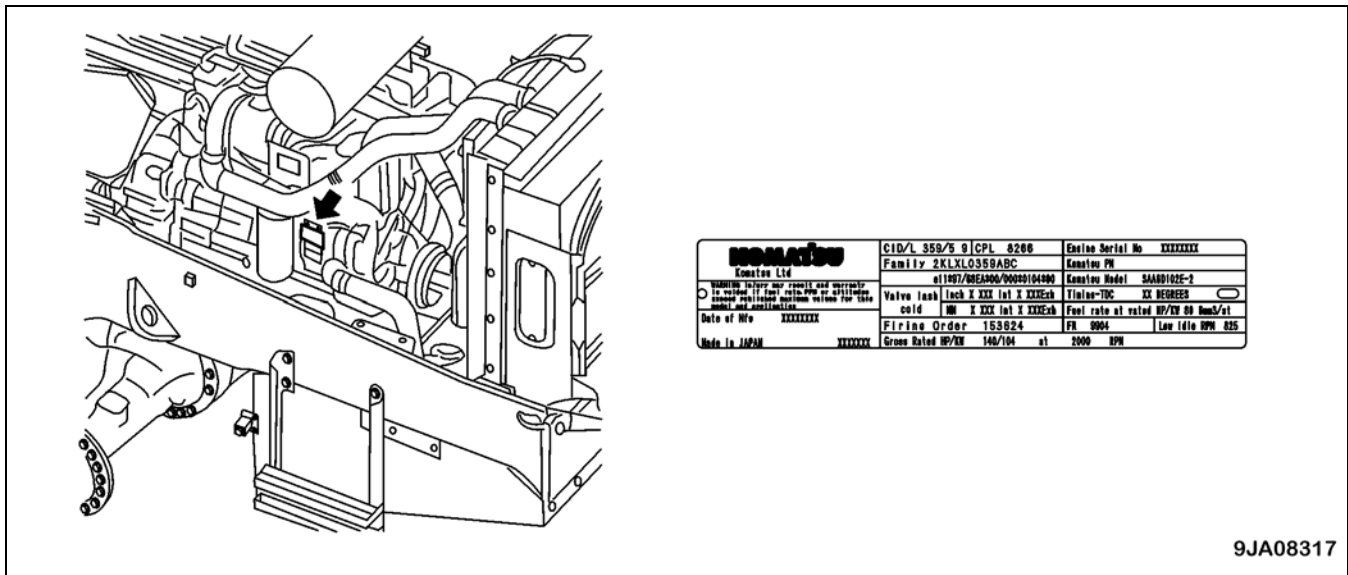
The machine serial number is stamped on the center right of the front frame.

★ The design of the name plate differs according to the territory.



Engine Serial Number, EPA Regulations

The engine serial number is on a plate at the top, rear of the engine, on the right side of the machine.



★ EPA: Environmental Protection Agency, USA

SERIAL NUMBERS AND DISTRIBUTOR INFORMATION

Model: WA430-6

Machine Serial Number	
Engine Serial Number	

Distributor:

Address:

Phone #

Contacts:

NOTES:

MEMORANDUM

TABLE OF CONTENTS

INTRODUCTION

FOREWORD	0-2
SAFETY INFORMATION	0-3
APPROVED AND NON-APPROVED USES	0-4
Approved Functions	0-4
Non-Approved Functions	0-4
VISIBILITY STANDARD	0-5
Visibility in Immediate Area	0-5
12-M Radius Visibility	0-5
PRODUCT IDENTIFICATION	0-6
Machine	0-6
Service Meter Location	0-7
Directions of Machine	0-7
Machine Serial Number/Product Identification Number (PIN)	0-8
Engine Serial Number, EPA Regulations	0-8
SERIAL NUMBERS AND DISTRIBUTOR INFORMATION	0-9
Model: WA430-6	0-9
TABLE OF CONTENTS	0-11

SAFETY

SAFETY AND WARNING DECALS	1-2
Location of the Safety Labels	1-2
Safety Labels	1-3
GENERAL SAFETY RULES AND PRECAUTIONS	1-10
General Safety Rules	1-10
Seat Belt Inspection	1-11
Safety at Job Site	1-12
Safety Features	1-12
Clothing and Protective Equipment	1-12
Keep Machine Clean	1-13
Fire and Explosion Prevention	1-13
Fire Caused by Fuel, Oil, Antifreeze, or Window Washer Fluid	1-13
Fire Caused by Accumulation of Flammable Material	1-14
Fire Caused by Electrical Wiring	1-14
Fire Caused by Piping	1-14
Explosion Caused by Lighting Equipment	1-14
Action if Fire Occurs	1-15
Fire Extinguisher and First Aid Kit	1-15
Mounting and Dismounting	1-16
Inside Operator's Compartment	1-17
Emergency Escape from Operator's Cab	1-17
Precautions When Standing Up from Operator's Seat	1-18
Parking the Machine	1-19
Leaving the Machine	1-20
Transporting the Machine	1-21

INTRODUCTION

Loading and Unloading	1-21
Towing	1-22
Precautions When Using ROPS	1-23
Unauthorized Modification	1-23
Precautions for Attachments and Options	1-23
Precautions When Cleaning Cab Glass	1-24
Asbestos Hazard Alert	1-24
Crush or Pinch-Point Dangers	1-25
Precautions for Ventilation Exhaust Gas	1-25
PRECAUTIONS BEFORE STARTING OPERATIONS	1-26
Pre-Operational Checks	1-26
Ensure Good Visibility	1-26
Signs and Signals	1-26
Precaution for Warning Tag	1-27
Checks Before Starting Engine, Adjustments	1-27
PRECAUTIONS WHEN STARTING	1-29
Precautions in Cold Areas	1-29
PRECAUTIONS FOR JOB SITE	1-30
Work Site Hazards	1-30
Working on Loose or Unstable Ground	1-30
Prohibited Operations	1-31
Avoiding Dangerous Situations	1-31
Working Near High Voltage Cables	1-33
RULES FOR ROAD TRAVEL	1-34
Travel Precautions	1-34
Traveling on Slopes	1-35
Using the Brakes	1-36
Traveling in Reverse	1-36
Operating on Snow or Frozen Surfaces	1-37
PRECAUTIONS DURING INSPECTION AND MAINTENANCE	1-38
Warning Tags	1-38
Workplace Environment	1-38
Systems Equipped with ECSS	1-38
Equipment Storage	1-39
Working Under the Machine	1-39
Using Drop Lamps	1-40
Using Proper Tools	1-40
Keeping the Machine Clean	1-40
Precautions When Welding	1-40
Precautions When Using Hammer	1-41
Noise	1-41
Stopping Engine During Inspection and Maintenance	1-42
Running the Machine During Maintenance	1-44
Rules for Refueling the Machine	1-45
Cooling System Precautions	1-45
Window Washer Fluid	1-45
Battery Information	1-45
Precautions	1-45
Hazards	1-46

Using Booster Cables	1-47
Starting the Machine with Booster Cables	1-47
High-Pressure Precautions	1-48
Precautions for High-Pressure Oil	1-48
Safe Handling of High-Pressure Hoses	1-48
Precautions for High-Pressure Fuel	1-48
High-Temperature Precautions	1-49
High-Temperature Areas	1-49
High-Temperature Coolant	1-49
High-Temperature Oil	1-49
High Voltage	1-49
Accumulator and Gas Spring	1-50
Tires	1-50
Storing Tires	1-51
Using Compressed Air	1-51
Disposal of Waste Materials	1-51
Critical Parts	1-51
Maintenance of Air Conditioner	1-52

OPERATION

GENERAL VIEW	2-2
General View of Machine	2-2
General View of Controls and Gauges	2-3
Machine Monitor	2-4
Switch Panel	2-6
EXPLANATION OF COMPONENTS	2-7
Machine Monitor	2-7
Types of Warnings	2-8
Emergency Stop	2-8
Caution	2-8
Mistaken Operation	2-8
Inspection and Maintenance	2-8
Central Warning Lamp	2-8
Character Display Portion	2-9
Service Meter	2-10
Action Code Display	2-10
Failure Code Display	2-11
Filter, Oil Replacement Time Display	2-12
Emergency Stop Items	2-15
Brake Oil Pressure Caution Lamp	2-16
Engine Oil Pressure Caution Lamp	2-16
Battery Charge Circuit Caution Lamp	2-17
Steering Oil Pressure Caution Lamp (if equipped)	2-17
Caution Items	2-18
Brake Oil Temperature Caution Lamp	2-19
Torque Converter Oil Temperature Caution Lamp	2-19
Engine Coolant Temperature Caution Lamp	2-20
Hydraulic Oil Temperature Caution Lamp	2-20

INTRODUCTION

Fuel Level Caution Lamp	2-20
Inspection and Maintenance Items	2-21
Radiator Coolant Level Caution Lamp	2-21
Engine Oil Level Caution Lamp	2-22
Battery Electrolyte Level Caution Lamp (if equipped)	2-22
Maintenance Caution Lamp	2-22
Air Cleaner Clogging Caution Lamp	2-23
Water Separator Caution Lamp	2-23
Transmission Oil Filter Clogging Caution Lamp	2-23
Pilot Display Portion	2-24
Parking Brake Pilot Lamp	2-25
Cooling Fan Reverse Rotation Pilot Lamp	2-25
Emergency Steering Pilot Lamp (if equipped)	2-25
Power Mode Pilot Lamp (P Mode)	2-26
Preheating Pilot Lamp	2-26
Semi-Auto Digging Pilot Lamp	2-26
Auto-Greasing Pilot Lamp (if equipped)	2-26
Joystick Pilot Lamp (if equipped)	2-26
Directional Selector Pilot Lamp	2-26
Economy Operation Display Lamp	2-27
Shift Indicator	2-27
Auto-Shift Pilot Lamp	2-27
Torque Converter Lockup Pilot Light	2-27
Shift Hold Pilot Lamp	2-28
Shift Lever Position Pilot Lamp	2-28
Turn Signal Pilot Lamp	2-28
Head Lamp High-Beam Pilot Lamp	2-28
Meter Display Portion	2-29
Torque Converter Oil Temperature Gauge	2-29
Engine Coolant Temperature Gauge	2-30
Hydraulic Temperature Gauge	2-30
Fuel Gauge	2-30
Speedometer	2-31
Meter Display Pilot Lamp	2-31
OTHER FUNCTIONS OF MACHINE MONITOR	2-32
Overall Menu	2-32
Displaying Odometer	2-34
Resetting Filter, Oil Replacement Time	2-34
Entering Telephone Number	2-35
Selecting Language	2-36
Adjusting Monitor Brightness	2-38
Switching Travel Speed/Engine Speed Display	2-40
Switching Travel Speed/Engine Speed Display/Non-Display	2-41
SWITCHES AND CONTROLS	2-42
General View	2-42
Starting Switch	2-44
Power Mode Selector Switch	2-44
Transmission Shift Mode Selector Switch	2-45
Transmission Cutoff Switch	2-45

Transmission Cutoff Set Switch	2-46
Lamp Switch	2-46
Turn Signal Lever	2-46
Dimmer Switch	2-47
Horn Button	2-47
Hazard Lamp Switch	2-47
Parking Brake Switch	2-48
Front Working Lamp Switch	2-48
Rear Working Lamp Switch	2-49
Machine Monitor Mode Selector Switch 1	2-49
Machine Monitor Mode Selector Switch 2	2-49
Kickdown Switch	2-50
Hold Switch	2-51
Front Wiper Switch	2-51
Rear Wiper Switch	2-52
Cigarette Lighter	2-52
Room Lamp Switch	2-52
Rear Heated Wire Glass Switch	2-52
ECSS Switch	2-53
Emergency Steering Switch (if equipped)	2-53
Cooling Fan Auto-Reverse Rotation Switch	2-54
Torque Converter Lockup Switch	2-57
CONTROL LEVERS, PEDALS	2-58
General View	2-58
Gearshift Lever	2-59
Directional Lever	2-60
Gearshift Lever Stopper	2-61
Work Equipment Lock Lever	2-61
Bucket Control Lever	2-62
Lift Arm Control Lever	2-62
Brake Pedals	2-63
Accelerator Pedal	2-63
SECURITY LOCKS AND SAFETY FEATURES	2-64
Steering Tilt Lock Lever	2-64
Frame Lock Bar	2-65
Locking Caps	2-65
Fuel Tank Filler Port Cap	2-65
Hydraulic Tank Filler Port Cap	2-66
Backup Alarm	2-66
MACHINE FEATURES	2-67
Towing Pin	2-67
Grease Pump	2-67
Cab Door	2-68
Emergency Escape Right Door	2-68
Left Cab Door, Door Open Lock	2-70
Left Cab Door, Knob	2-71
Left Cab Door, Handle	2-71
Left Cab Sliding Window (Lock Release Knob)	2-71
Cab Wiper	2-72

INTRODUCTION

Dust Indicator	2-72
Fire Extinguisher (if equipped)	2-72
ELECTRICAL	2-73
Power Outlet	2-73
Fuses	2-73
Fuse Capacity and Name of Circuit	2-74
Slow-Blow Fuse	2-75
WORK OPERATIONS	2-76
Walk-Around Check	2-76
Precautions Before Starting Work Operations	2-76
Check Before Starting Engine	2-80
Check Machine Monitor	2-80
Check Coolant Level, Add Coolant	2-81
Check Oil Level in Engine Oil Pan, Add Oil	2-82
Drain Water, Sediment from Fuel Tank	2-82
Check Water Separator, Drain Water	2-83
Check Additional Water Separator, Drain Water	2-84
Check Air Cleaner	2-86
Check Fuel Level, Add Fuel	2-87
Check Electric Wiring	2-88
Check Inflation Pressure of Tires	2-88
Check Condition of Window Washer Spray	2-88
Check Wiping Efficiency of Wiper	2-88
Check Horn	2-88
Check Defroster Function	2-88
Check Locks	2-89
Check Emergency Exit	2-89
Adjustments	2-90
Adjusting Seat	2-90
Removing or Installing Headrest	2-92
Adjusting Seat Belt	2-93
Adjusting Lever Stand	2-94
Adjusting Mirrors	2-95
Final Checks Before Starting Engine	2-96
Starting Engine	2-98
Normal Starting	2-98
Starting in Cold Weather	2-100
Automatic Warming-Up Operation	2-101
Operations and Checks After Starting Engine	2-102
Checks After Starting Engine	2-102
Breaking in the Machine	2-103
Normal Operation	2-103
Stopping Engine	2-105
Check After Stopping Engine	2-105
Moving the Machine (Directional, Speed), Stopping the Machine	2-106
Moving the Machine	2-106
Changing Gear Speed	2-109
Changing Direction	2-110
Stopping the Machine	2-112

Transmission Cutoff Function	2-113
Turning	2-115
Emergency Steering (if equipped)	2-116
Emergency Steering Self-Check Function	2-117
Operation of Work Equipment	2-118
Work Equipment Lock Lever	2-118
Lift Arm Control Lever	2-118
Bucket Control Lever	2-119
Work Possible Using Wheel Loader	2-120
Digging Operations	2-120
Loading Piled Soil or Blasted Rock	2-120
Digging and Loading on Level Ground	2-122
Leveling Operations	2-123
Pushing Operations	2-123
Load-and-Carry Operations	2-123
Loading Operations	2-124
Cross-Drive Loading	2-124
V-Shape Loading	2-124
Precautions for Piling Up Loads	2-124
Preparations for Loading, Gathering Rocks	2-125
Approaching Facing	2-125
Digging	2-126
Traveling in Reverse After Excavation	2-128
Approaching Dump Truck	2-129
Loading Dump Truck	2-130
Reversing Away From Dump Truck	2-131
Precautions During Work Operations	2-132
Piling Up Loads	2-132
Handling Blasted Rock	2-132
Loosened Boulders	2-136
Pit Excavation	2-136
Cutting Face Operations	2-136
Switching Between Forward and Reverse	2-136
Turning When Tires Are Stationary	2-137
Wheel Brake Does Not Work	2-137
Permissible Water Depth	2-137
Lower the Center of Gravity when Turning	2-137
Driving Up or Down Slopes	2-137
Driving the Machine	2-138
Braking Function	2-139
Adjusting Work Equipment	2-140
Adjusting Boom Kickout	2-140
Adjusting Bucket Positioner	2-141
Bucket Level Indicator	2-142
Measuring Dump Angle	2-143
Measuring Bucket Dump Angle	2-143
Measuring Coupler Dump Angle	2-146
Parking the Machine	2-149
Checks After Completion of Operation	2-151

INTRODUCTION

Before Stopping Engine	2-151
After Stopping Engine	2-151
Locking the Machine	2-152
HANDLING TIRES	2-154
Precautions When Handling Tires	2-154
Tire Pressure	2-155
Air Pressure Chart	2-156
Precautions for Using Load-and-Carry Method	2-156
TRANSPORTATION	2-157
Transportation Procedure	2-157
Loading and Unloading Trailers	2-158
Loading Machine	2-158
Securing the Machine	2-159
Unloading the Machine	2-161
LIFTING THE MACHINE	2-162
Lifting Position	2-162
Lifting Procedure	2-163
COLD WEATHER OPERATION	2-164
Precautions for Low Temperature	2-164
Fuel and Lubricants	2-164
Coolant	2-164
Battery	2-165
Precautions After Completion of Work	2-165
After Cold Weather	2-165
LONG-TERM STORAGE	2-166
Before Storage	2-166
During Storage	2-166
After Storage	2-166
AUTOMATIC AIR CONDITIONER	2-167
Control Panel	2-167
Main Power Switch	2-168
Fan Switch	2-168
Air Conditioner Switch	2-169
Auto Switch	2-170
Temperature Switch	2-170
FRESH/RECIRC Selector Switch	2-170
Mode Selector Switch	2-171
Method of Operation	2-172
Cooling Operation	2-172
Heating Operation	2-172
Drying-Heating and Demisting Operation	2-173
When Not Using the Air Conditioner Regularly	2-173
Precautions When Using Air Conditioner	2-173
Inspection and Maintenance	2-174
Cool Box	2-174
KOMTRAX	2-175
Basic Precautions	2-175
TROUBLESHOOTING	2-176
When Machine Runs Out of Fuel	2-176

Towing the Machine	2-176
When Engine Can Be Used	2-177
When Engine Cannot Be Used	2-177
Releasing Parking Brake	2-178
Emergency Travel Operation	2-180
Discharged Battery	2-181
Precautions	2-181
Removal and Installation of Battery	2-181
Precautions for Charging Battery	2-182
Starting Engine with Booster Cables	2-183
Precautions When Connecting or Disconnecting Booster Cable	2-183
Connecting Booster Cable	2-183
Starting Engine	2-184
Disconnecting Booster Cable	2-184
Lowering Work Equipment When Engine Has Stopped	2-185
Other Troubleshooting	2-186
Electrical System	2-186
Chassis	2-187
Engine	2-189

MAINTENANCE

GUIDES TO MAINTENANCE	3-2
Check Service Meter	3-2
Komatsu Genuine Replacement Parts	3-2
Komatsu Genuine Oils	3-2
Always Use Clean Washer Fluid	3-2
Always Use Clean Oil and Grease	3-2
Checking for Foreign Materials in Drained Oil and on Filters	3-2
Fuel Strainer	3-2
Welding Instructions	3-3
Do Not Drop Things Inside the Machine	3-3
Dusty Work Sites	3-3
Avoid Mixing Oil	3-3
Locking Inspection Covers	3-3
Bleeding Air from Hydraulic Circuit	3-3
Precautions When Installing Hydraulic Hoses	3-4
Checks After Inspection and Maintenance	3-4
Checks After Operation (with engine stopped)	3-4
Checks When Engine is Running	3-4
SERVICE OUTLINE	3-5
Handling Oil, Fuel, Coolant, and Performing Oil Clinic	3-5
Oil	3-5
Fuel	3-6
Coolant and Water for Dilution	3-6
Grease	3-7
Storing Oil and Fuel	3-7
Filters	3-7
Performing KOWA (Komatsu Oil Wear Analysis)	3-8

INTRODUCTION

KOWA Analysis Items	3-8
Oil Sampling	3-8
Outline of Electric System	3-9
WEAR PARTS	3-10
Wear Parts List	3-10
RECOMMENDED FUEL, COOLANT, AND LUBRICANTS	3-12
Fuel, Coolant, and Lubricant Ambient Temperature Chart	3-13
Recommended Brands, Other Than Komatsu Genuine Oil	3-14
Biodiesel Usage	3-15
Biodiesel Recommendation for Komatsu Engines	3-15
Biodiesel Terminology	3-15
Certification and Standards	3-16
Warranty and Use of Biodiesel Fuel in Komatsu Engines	3-16
Requirements for Using Biodiesel Fuel in Komatsu Engines	3-16
Properties of Biodiesel	3-17
Komatsu Biodiesel Blend Specification for B5 to B20	3-18
Summary of Recommendations	3-19
STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS	3-20
Torque List	3-20
PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS	3-22
Safety Critical Parts List	3-23
MAINTENANCE SCHEDULE CHART	3-25
SERVICE PROCEDURE	3-27
Initial 10 Hours Service	3-27
Initial 250 Hours Service	3-27
Initial 1000 Hours Service	3-27
When Required	3-28
Clean, Replace Air Cleaner Element	3-28
Check Additional Water Separator, Clean Inside Case	3-32
Clean Inside of Cooling System	3-33
Check Transmission Oil, Add Oil	3-37
Check Axle Oil Level, Add Oil	3-38
Clean Axle Case Breather	3-40
Clean Air Conditioner Condenser	3-41
Check Window Washing Fluid Level, Add Fluid	3-41
Clean Radiator Fins and Cooler Fins	3-42
Turn, Replace Bolt-On Cutting Edge	3-45
Replace Bucket Teeth (if equipped)	3-46
Check Air Conditioner	3-49
Replace Slow-Blow Fuse	3-51
Check Function of Accumulator	3-52
Select Tires	3-53
Check Tire Pressure	3-54
Clean, Replace Fuel Breather Filter	3-55
Check Before Starting	3-57
Every 50 Hours Service	3-58
Drain Water, Sediment from Fuel Tank	3-58
Every 100 Hours Service	3-59
Lubricate Rear Axle Pivot Pin	3-59

Check Oil Level in Hydraulic Tank, Add Oil	3-59
Clean Element in Air Conditioner Fresh Air Filter	3-60
Every 250 Hours Service	3-61
Check Battery Electrolyte Level	3-61
Check Parking Brake	3-62
Check Air Conditioner Compressor Belt Tension, Adjust	3-63
Check for Loose Wheel Hub Nuts, Tighten	3-64
Clean Element in Air Conditioner Recirculation Filter	3-64
Check Function of Brake Accumulator	3-65
Lubricating	3-66
Every 500 Hours Service	3-67
Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge	3-67
Replace Fuel Prefilter Cartridge	3-69
Every 1000 Hours Service	3-72
Replace Fuel Main Filter Cartridge (Standard Specification)	3-72
Replace Fuel Main Filter Cartridge (Poor Fuel Arrangement Specification)	3-74
Change Oil in Transmission Case, Replace Oil Filter Cartridge, Clean Strainer	3-76
Clean Transmission Case Breather	3-77
Lubricating	3-77
Check Engine Air Intake Piping Clamps for Looseness	3-78
Check Alternator Drive Belt Tension, Replace	3-78
Replace Corrosion Resistor Cartridge (Standard Specification)	3-78
Replace Corrosion Resistor Cartridge (Poor Fuel Arrangement Specification)	3-78
Every 2000 Hours Service	3-79
Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element	3-79
Replace Hydraulic Tank Breather Element	3-82
Change Axle Oil	3-83
Replace Element in Air Conditioner Recirculation Filter, Fresh Air Filter	3-84
Check Brake Disc Wear	3-85
Check Function of PPC Accumulator	3-87
Check Alternator	3-88
Check Engine Valve Clearance, Adjust	3-88
Check Vibration Damper	3-88
Every 4000 Hours Service	3-89
Lubricating	3-89
Check Water Pump	3-91
Check Starting Motor	3-91
Check Air Conditioner Compressor, Adjust	3-91
Check for Loose Engine High-Pressure Piping Clamps, Hardening of Rubber	3-91
Check for Missing Fuel Spray Prevention Cap, Hardening of Rubber	3-92
Every 8000 Hours Service	3-93
Replace High-Pressure Piping Clamps	3-93
Replace Fuel Spray Prevention Cap	3-93

SPECIFICATIONS

SPECIFICATIONS	4-2
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OPTIONS, ATTACHMENTS

INTRODUCTION

JOYSTICK STEERING SYSTEM	5-2
Structure and Function	5-2
Components	5-3
Shift UP, Shift DOWN Switches	5-4
Directional Selector Switch	5-4
Joystick Steering Lever	5-4
Joystick ON/OFF Switch	5-4
HI/LOW Selector Switch	5-5
Horn Switch	5-5
Console Tilt Lever	5-5
Console Fore-and-Aft Adjustment Lever	5-5
Joystick Pilot Lamp	5-6
Armrest Adjustment Lever	5-6
Steering with Joystick Lever or Steering Wheel	5-7
Precautions for Steering with Joystick	5-8
Operating the Joystick Steering System	5-9
Getting In and Out of Operator's Cab	5-12
Adjustments	5-13
Adjusting Joystick Console	5-13
Adjusting Seat	5-14
TORQUE CONVERTER LOCKUP	5-17
Components	5-17
Torque Converter Lockup Switch	5-18
Torque Converter Lockup Pilot Lamp	5-18
Shift Indicator	5-18
Character Display	5-18
Method of Operation	5-19
Warning/Limit Functions for Travel Speed	5-20
Travel Speed Warning Function	5-20
Travel Speed Limit Function	5-20
AM/FM RADIO CASSETTE STEREO SOUND SYSTEM	5-21
Sound System Components	5-23
Power Switch/Volume	5-23
Auto-Store/Preset Scan Button	5-23
Bass Control Knob	5-23
Treble Control Knob	5-24
Loudness Button	5-24
Time/Radio Display Selector Button	5-24
Tape Eject Button	5-25
Cassette Door	5-25
Fast-Forward, Rewind Buttons	5-25
Preset Buttons	5-25
Metal Tape Button	5-26
Manual Tuning Buttons	5-26
Seek Tuning Buttons	5-26
Band Selector Button	5-26
Method of Operation	5-27
Setting Preset Buttons	5-27
Using Auto-Preset	5-27

Using Manual Preset	5-27
Listening to Radio	5-28
Listening to Cassette Tape	5-28
Reversing the Tape	5-29
Precautions When Using	5-29
Handling Cassette Tape	5-29
MULTI-FUNCTION LEVER	5-30
Components	5-30
Work Equipment Lever	5-31
Kickdown Switch	5-31
Hold Switch	5-32
FNR Switch	5-32
Directional Selector Switch Actuation Switch	5-33
Directional Selector Pilot Lamp	5-33
Work Equipment Lock Switch	5-34
Using FNR Switch to Change Between Forward and Reverse	5-35
CENTRAL LUBRICATION SYSTEM	5-37
Automatic Greasing Circuit Diagram	5-37
WHEEL CHOCKS	5-39
BATTERY DISCONNECT SWITCH	5-40
Operation	5-40
BUCKET AND TIRES	5-41

MEMORANDUM

SAFETY

WARNING

Read and follow all safety precautions. Failure to do so may result in serious injury or death.

This safety section also contains precautions for optional equipment and attachments.

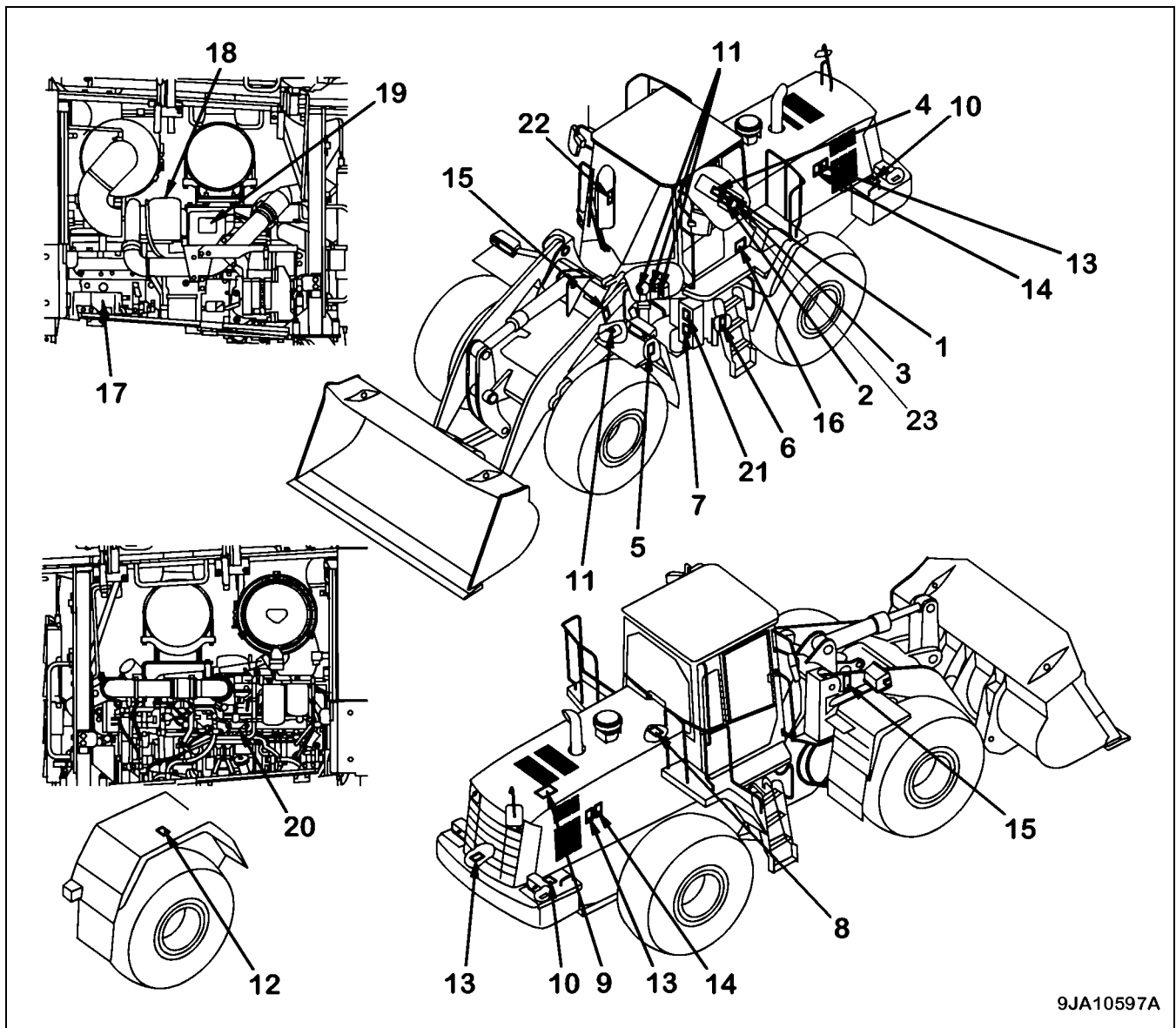
SAFETY

SAFETY AND WARNING DECALS

It is important that all safety and warning decals are in place, not damaged, covered up, or removed. It is also important for the operator to be aware of the decal content and location.

Location of the Safety Labels

- To ensure that the content of these safety decals can be read properly, be sure that they are placed correctly and always keep them clean.
- When cleaning any decal, use soap and water. **NEVER** use organic solvents or gasoline; these solutions may cause the decal to peel off.
- Your **Komatsu** distributor can provide new replacement decals if the ones on the machine are damaged or missing.
- For part numbers of the safety decals, see this manual or check the actual decal then order the new decals from your Komatsu distributor.
- When replacing damaged or missing decals, be sure that they are placed in the proper location.
- Additional safety or warning decals may be added to your machine, if desired.



Safety Labels

1. Caution before starting (09651-03001)

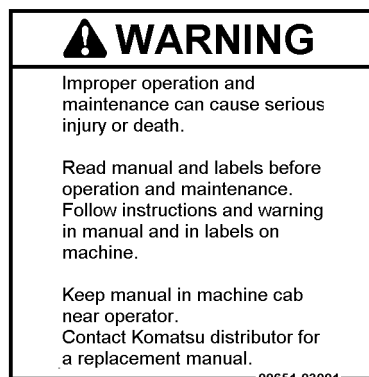
Improper operation and maintenance can cause serious injury or death.

Read manual and labels before operation and maintenance.

Follow instructions and warning in manual and in labels on machine.

Keep manual in machine cab near operator.

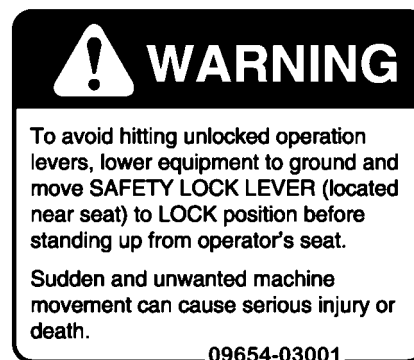
Contact Komatsu distributor for a replacement manual.



2. Caution for lock lever (09654-03001)

To avoid hitting unlocked operation levers, lower work equipment to ground and move SAFETY LOCK LEVER (located near seat) to LOCK position before standing up from operator's seat.

Sudden and unwanted machine movement can cause serious injury or death.

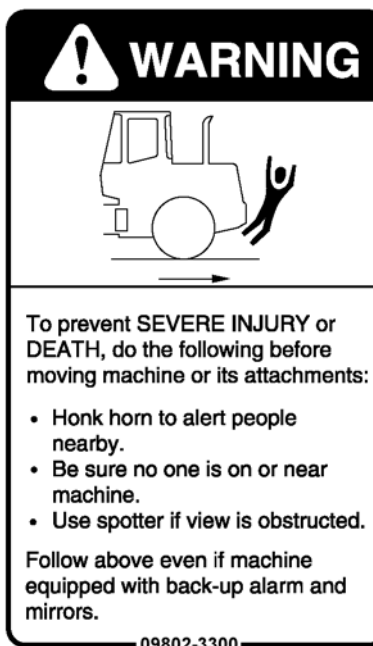


3. Caution when travelling in reverse (09802-33000)

To prevent SEVERE INJURY or DEATH, do the following before moving machine or its attachments:

- Honk horn to alert people nearby.
- Be sure no one is on or near machine.
- Use spotter if view is obstructed.

Follow above even if machine is equipped with back-up alarm and mirrors.



SAFETY

4. Caution for going close to electric cables (09801-13001)

Hazardous voltage hazard

Serious injury or death can occur if machine or attachments are not kept safe distance away from electric lines.

	Voltage	Safe Distance
Low Voltage	100V - 200V	2 m (7 ft)
	6,600V	2 m (7 ft)
Special High Voltage	22,000V	3 m (10 ft)
	66,000V	4 m (13 ft)
	154,000V	5 m (16 ft)
	187,000V	6 m (20 ft)
	275,000V	7 m (23 ft)
	500,000V	11 m (36 ft)

DANGER

Hazardous voltage hazard
Serious injury or death can occur if machine or attachments are not kept safe distance away from electric lines.

	Voltage	Safe Distance
Low Voltage	100V-200V	2m
	6,600V	2m
Special High Voltage	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

09801-13001

5. Caution for crush hazard between the articulating parts of the vehicle (09162-23000)

Crush Hazard. Can cause severe injury or death.

When machine is being operated, never place yourself in articulated area of machine.

DANGER

Crush Hazard. Can cause severe injury or death.
When machine is being operated, never place yourself in articulated area of machine.

09162-23000

6. Caution for frame lock bar (09161-23000)

If safety bar is unlocked, machine can jackknife unexpectedly when it is being transported or hoisted.

Jackknifing can cause serious injury or death to bystanders.

- Always lock safety bar when machine is being transported or hoisted.
- If necessary, lock safety bar during servicing or maintenance.

WARNING

If safety bar is unlocked, machine can jackknife unexpectedly when it is being transported or hoisted.

Jackknifing can cause serious injury or death to bystanders.

- Always lock safety bar when machine is being transported or hoisted.
- If necessary, lock safety bar during servicing or maintenance.

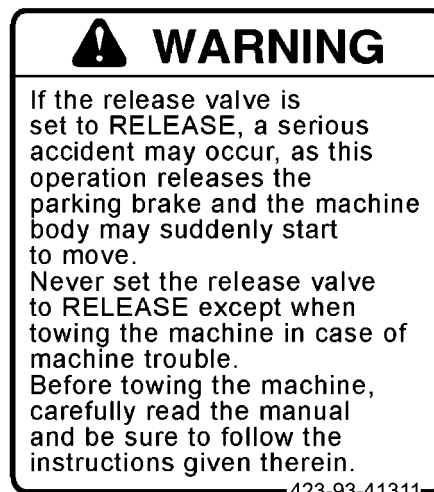
09161-23000

7. Caution when canceling parking brake emergency (423-93-41311)

If the release valve is set to **RELEASE**, a serious accident may occur, as this operation releases the parking brake and the machine body may suddenly start to move.

Never set the release valve to **RELEASE** except when towing the machine in case of machine trouble.

Before towing the machine, carefully read the manual and be sure to follow the instructions given therein.



8. Caution when oil is at high temperature (09653-03001)

Hot oil hazard.

To prevent hot oil from spurting out:

- Turn engine off.
- Allow oil to cool.
- Slowly loosen cap to relieve pressure before removing.



9. Caution when coolant is at high temperature (09668-03001)

Hot water hazard.

To prevent hot water from spurting out:

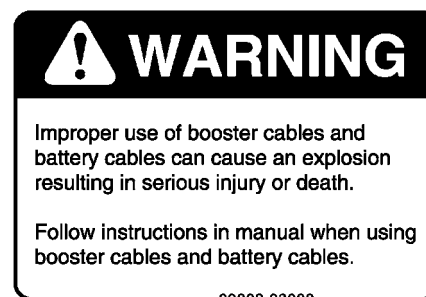
- Turn engine off.
- Allow water to cool.
- Slowly loosen cap to relieve pressure before removing.



10. Caution when handling battery cables (09808-03000)

Improper use of booster cables and battery cables can cause an explosion resulting in serious injury or death.

Follow instructions in manual when using booster cables and battery cables.



SAFETY

11. Caution to prevent explosion (09659-53000)

Explosion hazard

- Keep away from flame.
- Do not weld or drill.



12. Do not climb on fender (09805-03000)

- ★ Machine equipped with rear fender
NEVER be on this fender.



13. Do not open when the engine is running (09667-03001)

While engine is running:

1. Do not open cover.
2. Keep away from fan and fan-belt.



14. Do not come near the machine (09812-13000)

Keep a safe distance.



15. Do not go under work equipment (09807-C0883)

- Sign indicates a crush hazard from a falling working device.
- Keep away when the working device is raised.



16. Do not modify ROPS (09620-A2000)

WARNING

- If some modification is applied to the ROPS or FOPS, it might not have enough strength and might not comply with the standard. Consult Komatsu Distributor before altering.
- ROPS or FOPS may provide less protection if it has been structurally damaged or involved in a rollover. Consult Komatsu Distributor in that case.
- Always wear seat belt when moving.

KOMATSU ROPS/FOPS CERTIFICATION			
This protective structure complies with the standard provided that it is properly equipped on the machine which mass is less than the specified maximum mass.			
ROPS - ISO 2441:1994, SAE J1043/NA194	FOPS - ISO 3449:1992		
MODEL: _____	MACHINE MODEL: _____	FOPS LEVEL No: _____	
SERIAL No: _____	MAX. MASS: _____	kg (lb)	
WARNING	<ul style="list-style-type: none"> • If some modification is applied to the ROPS or FOPS, it might not enough strength and might not be complied with the standard. Consult Komatsu Distributor before altering. • ROPS or FOPS may provide less protection if it has been structurally damaged or involved roll-over. Consult Komatsu Distributor in that case. • Always wear seat belt when moving. 		
	Komatsu Ltd. 2-3-6 Akasaka, Minato-ku, Tokyo, Japan 09620 A2000		

17. Jump start prohibited (09842-A0481)

- Start the engine only after sitting in the operator's seat.
- Do not attempt to start the engine by jumping across the starter circuit. Such an act may cause a serious injury or fire.



18. Caution for high-temperature turbocharger (09817-A0753)

Sign indicates a burn hazard from touching heated parts such as engine, motor, or muffler during or immediately after operation.

Never touch when hot.



SAFETY

19. Caution for high-temperature exhaust pipe (09817-A0753)

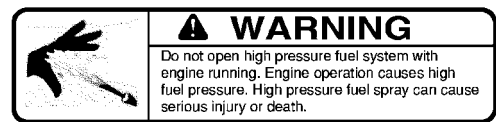
Sign indicates a burn hazard from touching heated parts such as engine, motor, or muffler during or immediately after operation.

Never touch when hot.



20. Caution for common rail high pressure (6754-71-1991)

Do not open high pressure fuel system with engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.



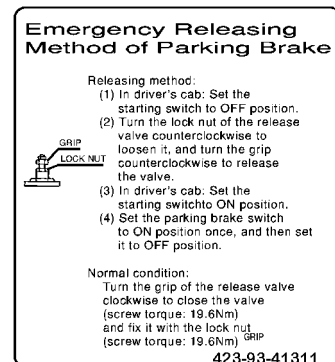
21. Parking brake emergency cancel switch (423-93-41311)

Releasing method:

- (1) In driver's cab: Set the starting switch to OFF position.
- (2) Turn the lock nut of the release valve counterclockwise to loosen it, and turn the grip counterclockwise to release the valve.
- (3) In driver's cab: Set the starting switch to ON position.
- (4) Set the parking brake switch to ON position once, and then set it to OFF position.

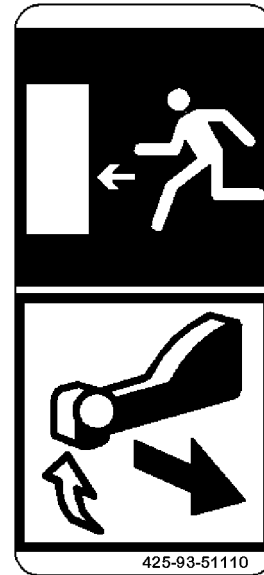
Normal condition:

Turn the grip of the release valve clockwise to close the valve (screw torque: 19.6 N·m) and fix it with the lock nut (screw torque: 19.6 N·m).



22. Emergency escape (425-93-51110)

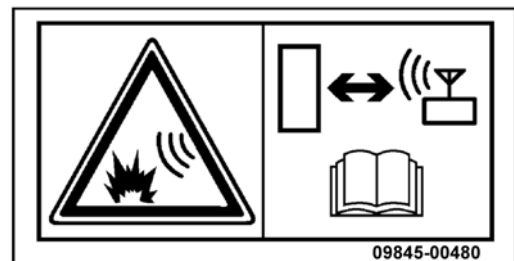
- Sign indicates the door on the machine through which you can escape in an emergency.
- Sign indicates the lock knob on the emergency escape door.



23. Komtrax blast zone Warning (09845-00480)

Sign indicates an explosion hazard caused by active radio transmitter at a blast zone.

Keep machine at a safe distance from a blast zone and detonators.



GENERAL SAFETY RULES AND PRECAUTIONS

General Safety Rules

- Only trained and authorized personnel are allowed to operate and service this machine.
- Before operating this machine, it is important to study the operator's manual thoroughly and become familiar with all controls and safety decals. Keep this manual with your machine at all times for easy and quick reference.
- Safety must always be the operator's most important concern. Never operate a machine that is unsafe or in poor operating condition.
- Follow all safety precautions and instructions when operating or performing inspection or maintenance on the machine.
- It is the owner and/or operator's responsibility to replace any safety or warning decals if they are defaced or removed from the machine.
- Think before you act; study the job carefully. Careful operators and service personnel are the best insurance against accidents.
- The operator of this machine must be alert, physically fit, and free from the influence of alcohol, drugs, or medications that might affect their eyesight, hearing, or reactions.
- The machine is equipped with a seat belt and rollover protective structure. Komatsu requires that the operator is within the confines of the rollover protective structure, with the seat belt fastened snugly around their waist, before operating the machine. See "Seat Belt Inspection" on page 1-11 for more details.
- Always perform a pre-operational check on your machine before operating it.
- If you find any problems in the machine during operation or maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc., or any abnormal display on the warning devices or monitor), report to the person in charge and have the necessary action taken. Do not operate the machine until the problem has been corrected.
- Komatsu requires that if your equipment is designed for operation by one person, it is for one person only. Never allow other personnel to ride on your machine in any manner.
- Be sure that all personnel are at least 12 m (40 ft) away from any point on the machine before moving or operating the machine. Never allow anyone to stand near the machine while it is in operation. Remember that the larger the machine, the more restricted is your visibility.
- If pedestrians are in the area, proceed slowly and sound your horn. Keep in mind that pedestrians have the right-of-way. A loaded or smaller machine has the right-of-way over an unloaded machine.
- Never use your machine for tasks for which it was not designed; damage to the machine or injury to the operator may result.
- When working with another person on a work site, or during traffic control, be sure that all personnel involved understand all hand signals that are to be used.
- Never drive up to anyone standing in your path of travel. Always be sure all personnel are standing to the side when you approach them and that they acknowledge your approach.
- Follow all rules relating to safety as outlined in this manual and by your company. Never get involved in horseplay.
- Never leave your machine running and unattended. Always park the machine in a level area; lower any work equipment to the ground; set the parking brake; lock the controls; and turn the engine off before exiting the operator's compartment.
- When leaving a job site for long periods of time, always lower all work equipment to the ground; neutralize work equipment controls; and lock and secure your machine properly to avoid tampering by other personnel.

Seat Belt Inspection

WARNING

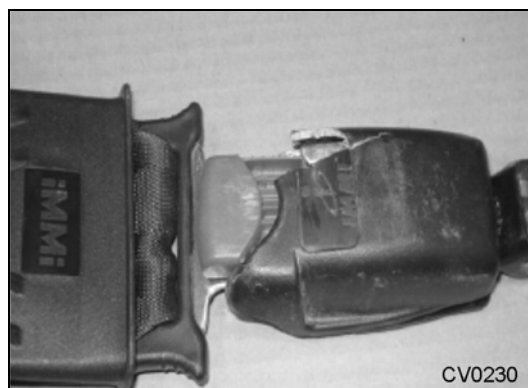
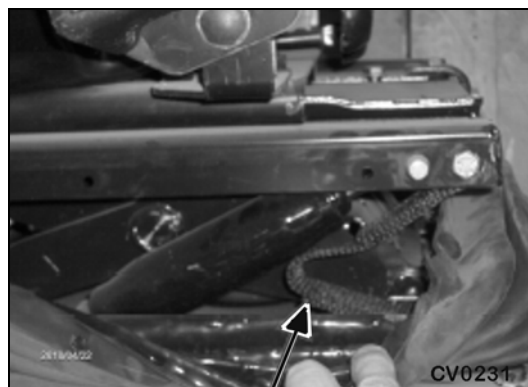
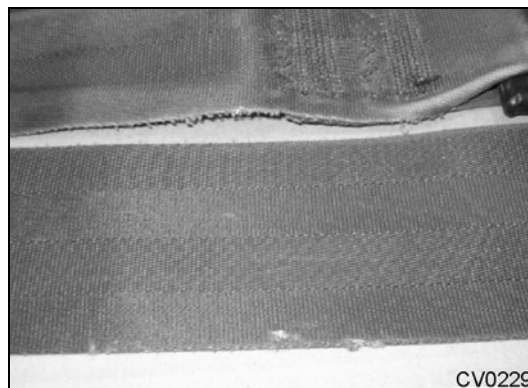
Seat belts must be replaced immediately if there are any signs of wear or damage, no matter how recently they were last replaced.

A thorough inspection of the entire seat belt system should occur before starting the engine.

- Inspect the full length and both sides of the seat belt webbing for wear, abrasion, dirt, oil, mildew, paint or other damage. Replace immediately if worn or damaged.
 - If the webbing is cut, fraying, snagging, kinking, or roping, the seat belt must be replaced. Any of these conditions may limit belt retraction.

- There may be internal and/or external tethers mounted on the suspension mechanism. Inspect these for fatigue as well as the integrity of the mounting hardware.

- Inspect the seat belt attachment and adjustment hardware for wear or damage.
 - Retractable and non-retractable buckle housings with damage from abrasions, rubbing, forceful impacts and age, must be replaced. These conditions may weaken the strength of the buckle.
 - Examine the seat belt buckle and retractor housing(s) for proper function.
 - Dirt, debris, lint, leaves, etc. may become encased inside of the retractor housing. With time, this condition may cause a seat belt malfunction.
- Check the mounting structure integrity. Verify that the mounting bolts are secure. Tighten to specified torque, if necessary.
- Check your records or the seat belt “Date of Installation” label (if equipped). Even if there are no signs of damage, the seat belt must be replaced either five years after the date of manufacture, or every three years after the start of usage, whichever comes first.
 - The manufactured date and “Install By” (if equipped) date may be found on the back of the buckle housing and/or on the seat belt webbing.
 - The location of the “Date of Installation” label (if equipped) may vary slightly, but most frequently it will be found on the plastic molding of the seat belt.



If your machine is equipped with a shoulder harness also, inspect the webbing, the shoulder loop web guide and the height adjuster for wear, damage and proper function capabilities

SAFETY

Safety at Job Site

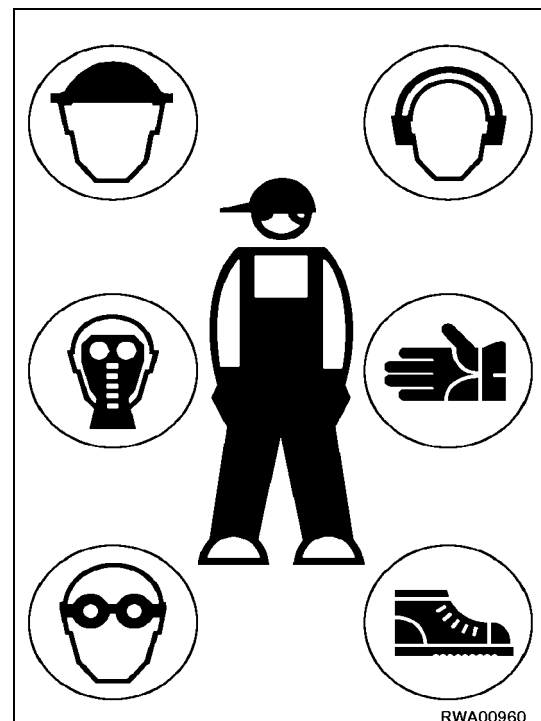
- Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.
- Check the terrain and condition of the ground at the work site, and determine the safest method of operation.
- Make sure that you know if there are any buried utility lines under the work site.
- When working on public roads, position flagmen and erect barriers to ensure the safety of passing traffic and pedestrians.
- Be careful when operating around or near open burning operations.
- Know where to report an accident or fire. In case of an emergency, have a local emergency phone number available.
- Maintain the fire extinguisher on the machine and a second one at the job site.
- Keep all safety equipment in good working condition.
- Take action to prevent unauthorized people from approaching the job site.
- For additional precautions, see “PRECAUTIONS FOR JOB SITE” on page 1-30.

Safety Features

- Be sure that all guards, covers, and mirrors are in their proper place.
- Have guards or covers repaired immediately, if they are damaged.
- Use safety equipment such as safety locks and seat belt properly.
- Never remove any safety features. Always keep them in good operating condition.
- Always secure the machine in a safe position. See “Parking the Machine” on page 2-149.
- Seat belt: See “Seat Belt Inspection” on page 1-11.
- Improper use of safety features could result in serious bodily injury or death.
- Be sure the machine has the correct equipment required by local rules and regulations.

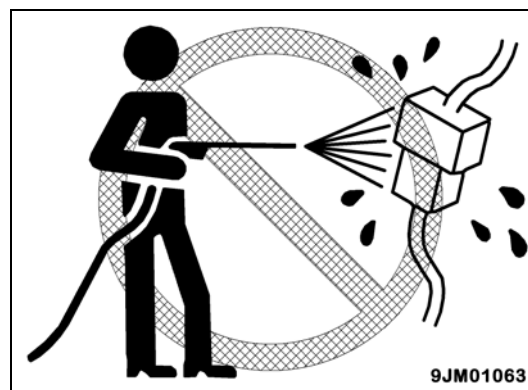
Clothing and Protective Equipment

- If your machine is equipped with safety equipment, Komatsu requires this equipment to be used when operating your machine.
- Do not wear loose clothes or any accessories. If these catch on the control levers or protruding parts, there is danger that it may cause the machine to move unexpectedly.
- Always wear a hard hat and safety shoes. If the nature of the work requires it, wear safety glasses, mask, gloves, ear plugs, and safety belt when operating or maintaining the machine.
- If you have long hair and it hangs out from your hard hat, there is a danger that it may get caught up in the machine. Tie your hair up and be careful not to let it get caught.
- Check to be sure all personal protective equipment is in good condition before using it.
- If you will be subject to loud noise, always wear ear protection.



Keep Machine Clean

- Keep the machine clean, especially from flammable materials such as trash, grease, oil, or fuel.
- If you get on or off the machine or carry out inspection and maintenance when the machine is dirty with mud or oil, there is a danger that you will slip and fall. Wipe off any mud or oil from the machine. Always keep the machine clean.
- If water gets into the electrical system, there is a danger that it will cause malfunctions or misoperation. If there is any accidental operation, there is danger that the machine may move unexpectedly and cause serious personal injury or death. When washing the machine with water or steam, do not allow the water or steam to come into direct contact with electrical components.



Fire and Explosion Prevention

Fuel and oil are flammable. Fuel is particularly flammable and can be hazardous.

Always observe the following precautions:

- Keep any open flames, airborne sparks, or burning embers away from flammable fluids.
- Stop the engine and do not smoke when refueling.
- Tighten all fuel and oil caps securely.
- Refueling or adding oil should be done in well-ventilated areas.
- Clean up any fluid spills.

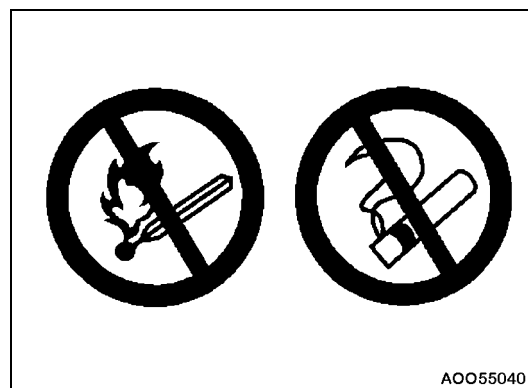


Fire Caused by Fuel, Oil, Antifreeze, or Window Washer Fluid

Fuel and oils are particularly flammable and can be hazardous. Do not bring any flame or fire close to flammable substances such as fuel, oil, antifreeze, or window washer fluid. There is danger that they may catch fire.

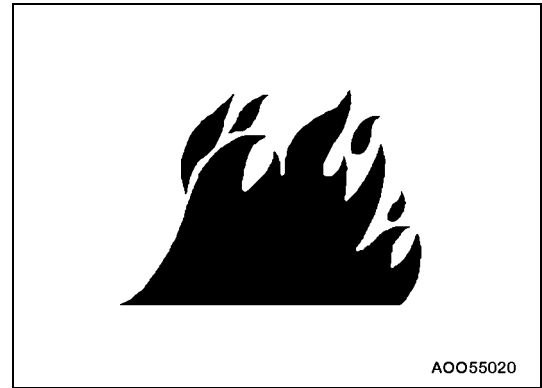
To prevent fire, always observe the following precautions:

- Do not smoke or use any flame near fuel or other flammable substances.
- Stop the engine before adding fuel.
- Do not leave the machine when adding fuel or oil.
- Do not spill fuel on overheated surfaces or on parts of the electrical system.
- Tighten all fuel and oil caps securely.
- After adding fuel or oil, wipe up any spilled fuel or oil.
- Always inspect around the entire fuel tank for leaks; clean or repair, if required.
- Inspect fuel system for leaks.
 - This includes fuel lines, filters, and injection system.
 - Clean or repair, if required.



SAFETY

- Use well-ventilated areas for adding or storing oil and fuel.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.
- When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline. There is danger that they may catch fire.
- Put greasy rags and other flammable materials into a safe container to maintain safety at the work place.
- Do not weld or use a cutting torch to cut any pipes or tubes that contain flammable liquids.
- Move flammable materials to a safe place before doing grinding or welding work on the machine.



Fire Caused by Accumulation of Flammable Material

- Remove any dry leaves, chips, pieces of paper, coal dust, or any other flammable materials accumulated or affixed around the engine, exhaust manifold, muffler, air cleaner, battery, or inside the undercovers.
- Operations such as logging, mulching, clearing, and landfill work may cause trash and debris to accumulate on the machine. Remove accumulated trash and debris on a daily basis.
- Clean the machine after servicing the hydraulic system, engine, or fuel system.
- Working near burn piles or other open burning may cause airborne sparks or glowing embers to cause a fire on the machine.

Fire Caused by Electrical Wiring

Short circuits in the electrical system can cause a fire.

Observe the following precautions:

- Keep all electric wiring connections clean and securely tightened.
- Check the wiring every day for looseness or damage to the wire insulation.
 - Tighten any loose connectors or wiring clamps.
 - Repair or replace any damaged, pinched, or chaffed wiring.

Fire Caused by Piping

- Check that all the hose and tube clamps, guards, and cushions are securely fixed in position.
 - If they are loose, they may vibrate during operation and rub against other parts. There is danger that this may lead to damage to the hoses and cause high-pressure oil to squirt out, leading to fire, serious injury, or death.
- Check for oil leaks daily and repair them immediately.

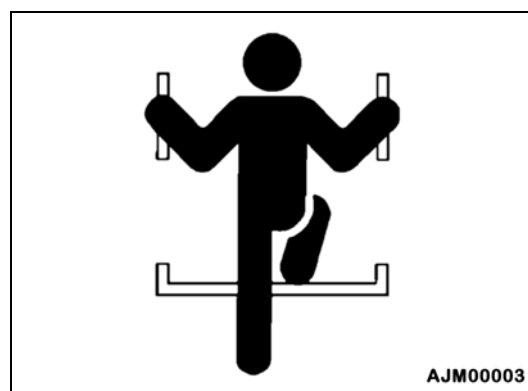
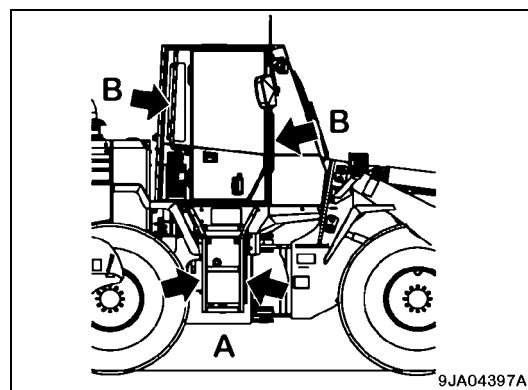
Explosion Caused by Lighting Equipment

- When checking fuel, oil, battery electrolyte, or coolant, always use lighting with anti-explosion specifications.
- When taking the electrical power for the lighting from the machine itself, follow the instructions in this manual.

Action if Fire Occurs

If a fire occurs, escape from the machine and take the following actions:

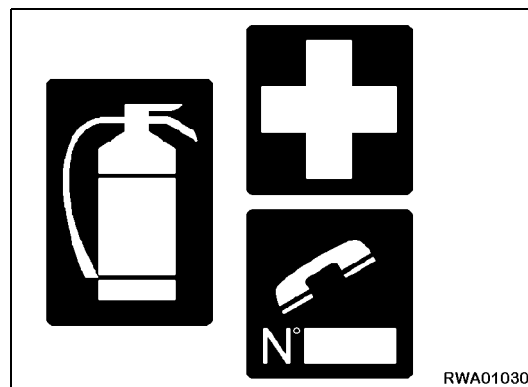
- Do not attempt to move the machine or continue operations.
- Turn the start switch OFF to stop the engine.
- The door on the right side of the cab is provided as an emergency escape door for use when it is impossible to exit from the door on the left side.
 - ★ See “Emergency Escape Right Door” on page 2-68 for further details.
- Use the handrails and steps to get off the machine. See “Mounting and Dismounting” on page 1-16.
- Immediately call for help.
- When using a fire extinguisher, always aim the extinguisher at the base of the fire.
- If an optional fire extinguishing system is in place, be familiar with its operating procedures.



Fire Extinguisher and First Aid Kit

As a precaution in case a fire or an injury occurs, always keep a fire extinguisher and first aid kit on your machine and take the following precautions:

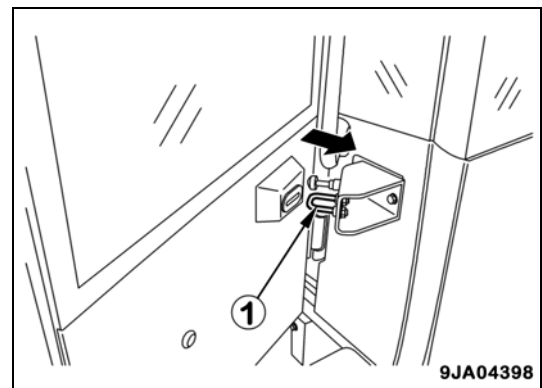
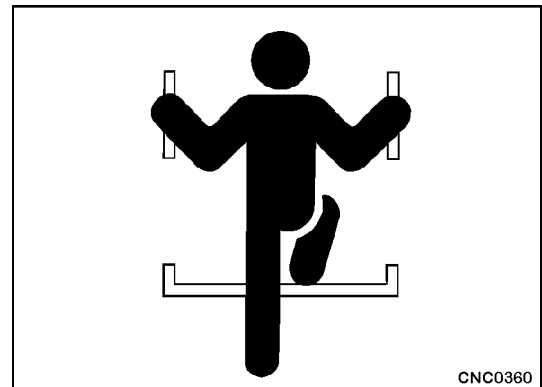
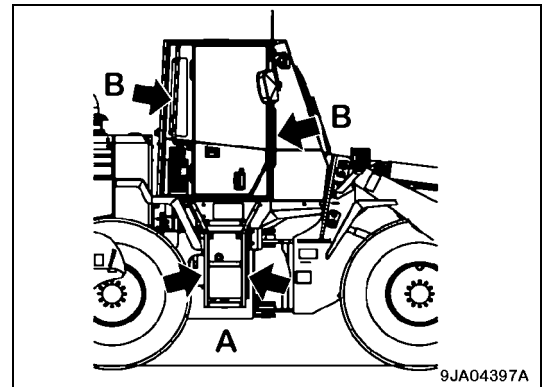
- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them in emergencies.
- Carry out periodic inspection and maintenance to ensure that the fire extinguisher can always be used.
- Keep a first aid kit in the storage area. Check the kit periodically and make any additions, if necessary.
- Keep a list of emergency phone numbers in case of an accident.



SAFETY

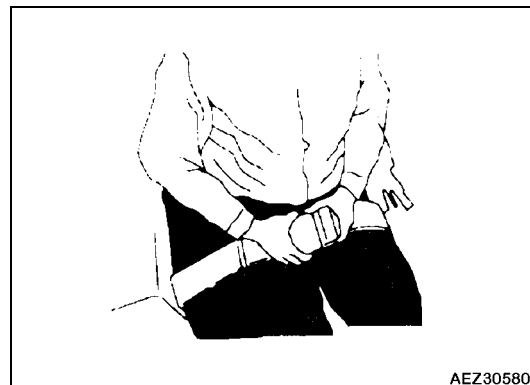
Mounting and Dismounting

- When getting on or off the machine, always be sure the work equipment is fully lowered to the ground; the engine is OFF; and the parking brake is set.
- Use the hand rails and step marked by arrows in the graphic when getting on or off the machine.
- (A) is the emergency escape step.
 - Use this step to escape from the machine in a fire or other emergencies when you cannot exit by the left door. Hold the handrails (B). Do not use this exit during normal situations.
- Never climb on the engine hood or covers where there are no non-slip pads.
- Never jump off or on to the machine.
- If the machine starts to move when there is no operator on the machine, do not jump on to the machine and try to stop it.
- Never move from the step at the rear of the machine or the step at the side of the cab to stand on top of the tire.
- Do not get on or off the machine while holding tools in your hand.
- If there is any oil, grease, or mud on your shoes, wipe it off immediately before getting on the machine.
- Before getting on or off the machine, check the handrails and steps. If there is any oil, grease, or mud on them, wipe it off immediately. In addition, repair any damage and tighten any loose bolts.
 - Always keep these areas clean and in good condition.
- Never get on or off a moving machine.
 - These actions may lead to serious injury.
 - Always bring the machine to a full stop.
- When entering the cab, stand on the top step before opening the door.
- When getting on or off the machine, always face the machine and maintain a **Three-Point Contact** (both feet and one hand, or one foot and both hands) with the handrails, steps, and platforms to ensure that you support yourself properly.
- Never let anyone ride on the work equipment or other attachments. There is danger of falling and suffering serious personal injury or death.
- When entering the cab and opening the cab door, push the door open until it is securely into door latch (1) and held in position.
- Use the handrails on the inside of the door while entering or exiting the cab.
- Do not grip the control levers or work equipment lock lever when getting on or off the machine.



Inside Operator's Compartment

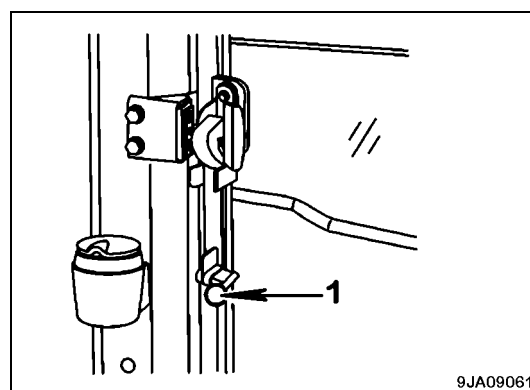
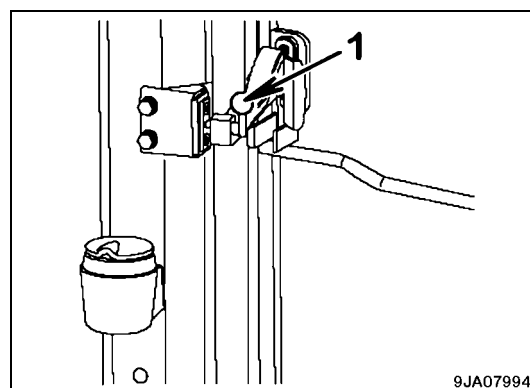
- When entering the operator's compartment, always remove mud and oil from the soles of your shoes. If you operate the brake pedal with mud or oil on your shoes, your foot may slip and may cause a serious accident.
- Always use the seat belt installed in your machine. Be sure the seat belt is fastened snugly around your waist before operating the machine. See "Seat Belt Inspection" on page 1-11.
- Never bring any dangerous objects, such as flammable or explosive items, into the operator's cab.
- After using the ashtray, make sure matches or cigarettes are properly extinguished and be sure to close the lid. If the ashtray is left open, there is danger of fire.
- Do not leave lighters or aerosol cans lying around the operator's compartment. If the temperature inside the operator's compartment gets too high, there is danger that the lighter or aerosol can may explode.
- Do not leave tools or machine parts lying around inside the operator's compartment. If a tool or part gets into the control devices, it may obstruct operation and cause the machine to move unexpectedly, resulting in serious personal injury or death.
- Do not stick suction pads to the window glass. Suction pads may act as a lens and could cause a fire.
- Do not use a cell phone when driving or operating the machine. This may lead to mistakes in operation, which could cause serious personal injury or death.
- After-market radios or other electrically-operated equipment in the cab must be fused close to the power supply.
- To ensure safety, do not use the radio or music headphones when operating the machine.
- Keep the operator's compartment clean. Never allow trash or tools to accumulate; these may hinder the operation of the controls or pedals.
- When operating the machine, do not put your hands or head out of the window or beyond the protection of the ROPS.



Emergency Escape from Operator's Cab

If the left door of the cab does not open or if it is dangerous to get off the machine from the left side, release the open lock of the right door (emergency door) and use the right door as an emergency escape route.

- Lift open lock knob (1) up.
 - Grip open lock knob (1) and pull it towards the rear of the machine.
 - Remove the open lock guide rail from the window pillar guide to free the right door lock.
- ★ See "Emergency Escape Right Door" on page 2-68.

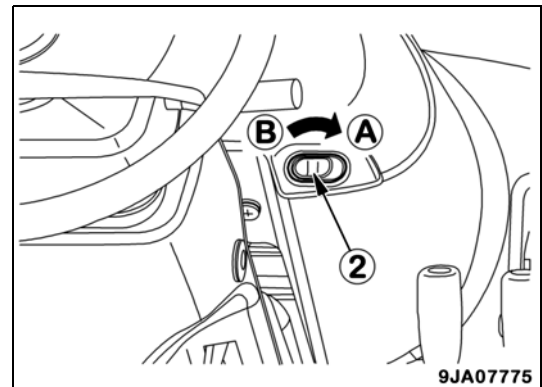
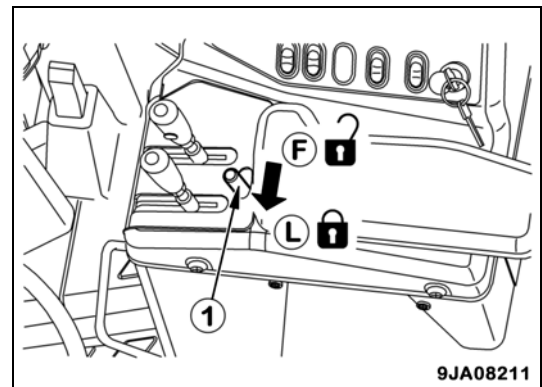
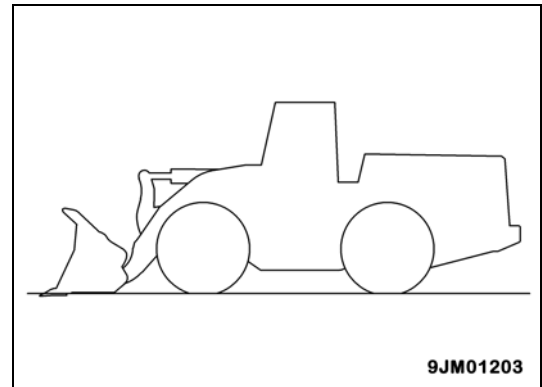


SAFETY

Precautions When Standing Up from Operator's Seat

Before standing up from the operator's seat, such as when adjusting the position of the seat:

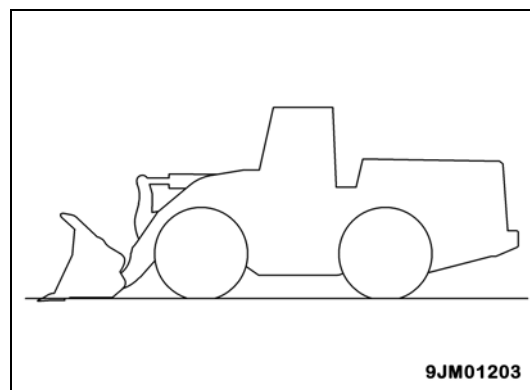
- Lower the work equipment completely to the ground.
- Set work equipment lock lever (1) to the LOCK position (L).
- Set parking brake switch (2) to the ON position (A).
- Stop the engine.
 - ★ If you accidentally touch the control levers when they are not locked, the machine may suddenly move and cause serious personal injury or death.



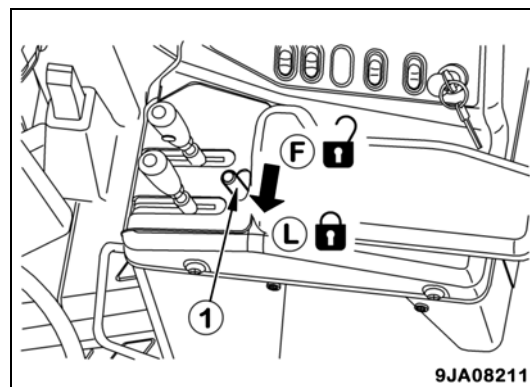
Parking the Machine

When parking the machine, it is important to follow several basic safety rules. You are responsible for the security of the machine when it is parked.

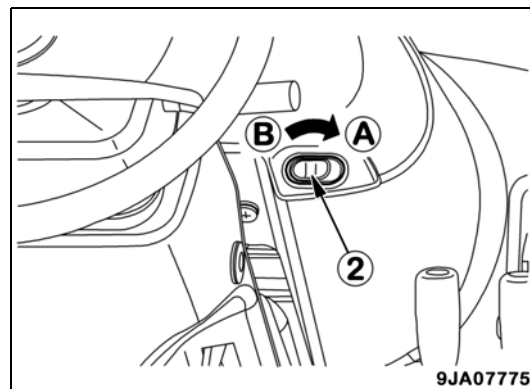
- Always park the machine on firm, level ground away from moving equipment, pedestrians, or traffic.
- Select a place where there is no hazard of landslides, falling rocks, or flooding.
- Lower all work equipment completely to the ground.



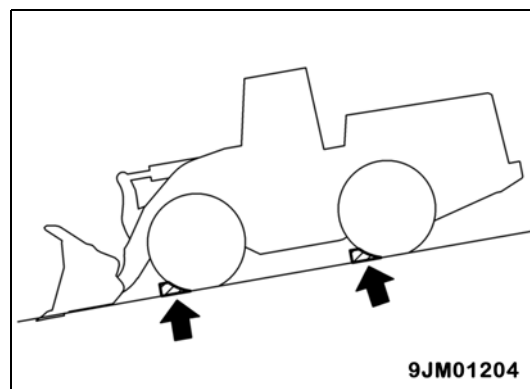
- Set work equipment lock lever (1) to the LOCK position (L).



- Set parking brake switch (2) to the ON position (A).
- Turn the engine OFF and remove the starting key.
- Close the operator's cab door.
 - See "Leaving the Machine" on page 1-20.
- Use the key to lock and secure all the equipment locks.
 - Be sure all access panels, cab, fuel and oil tanks are locked and secure to prevent tampering with the machine while unattended. See "Locking the Machine" on page 2-152.



- Avoid parking the machine on a slope of any kind.
 - If you must park on a slope, park with the bucket facing down the slope and put blocks under the wheels to prevent the machine from moving.

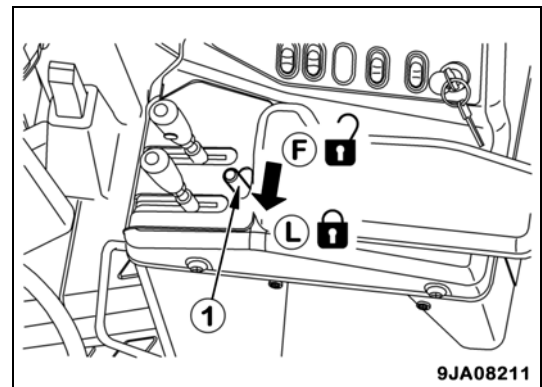
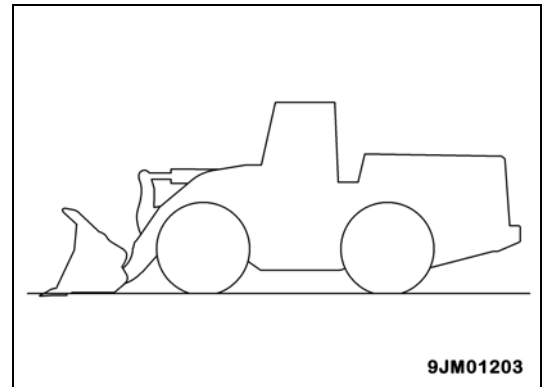


SAFETY

Leaving the Machine

If the proper procedures are not taken when parking the machine, the machine may suddenly move off by itself. This may lead to serious personal injury or death. The following procedure must be followed when exiting the operator's cab.

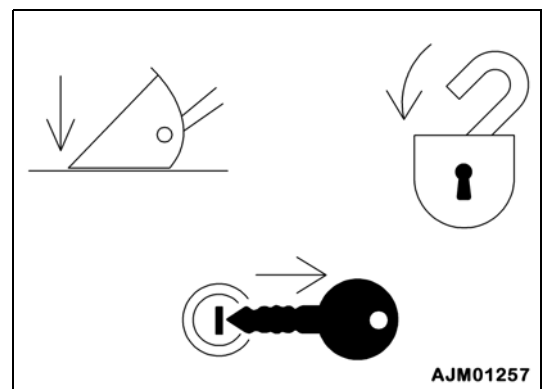
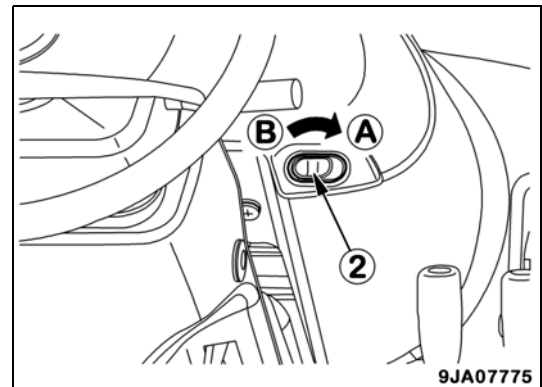
- Park the machine in a level area.
 - ★ See "Parking the Machine" on page 1-19.
- Lower the work equipment completely to the ground.
 - ★ For details about work equipment posture, see "Parking the Machine" on page 2-149.
- Set work equipment lock lever (1) to the LOCK position (L).
- Set parking brake switch (2) to the ON position (A).
- Turn the engine OFF.



- Remove the starting key.
- Close the operator's cab door.
- Use the key to lock and secure all the equipment locks.
 - This will prevent unauthorized personnel from tampering with your machine.
 - You are responsible for securing your machine.
- ★ See "Locking the Machine" on page 2-152.

Remark

Never leave your machine running and unattended, even for a moment.

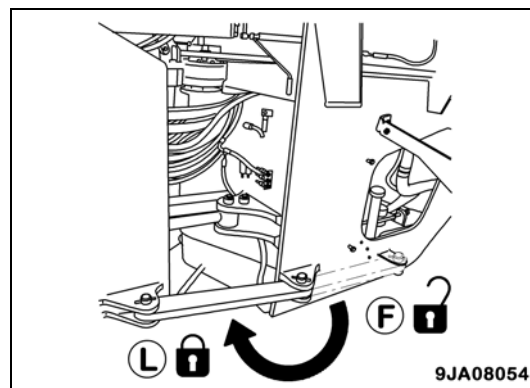


Transporting the Machine

When the machine is transported on a trailer, there is danger of serious personal injury or death during transportation.

Always respect the following precautions when transporting the machine:

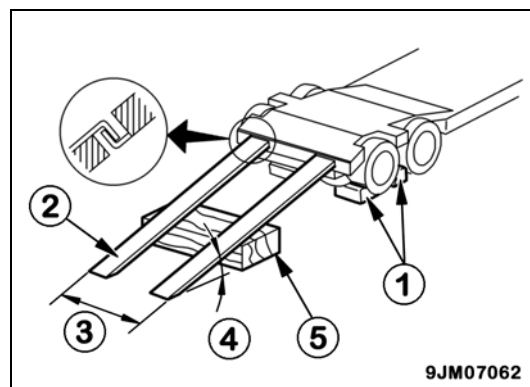
- Always check the machine dimensions carefully. Depending on the work equipment installed, the machine weight, transportation height, and overall length may differ.
 - Check beforehand that all bridges and other structures on the transportation route are strong enough to withstand the combined weight of the transporter and the machine being transported.
 - The machine can be divided into parts for transportation. When transporting the machine, contact your Komatsu distributor to have the work carried out.
 - Lock the frame with the frame lock bar to prevent the machine from articulating.
 - Fit chains to the front frame and the rear frame to hold the machine securely in position.
- ★ For details about transporting the machine, see “TRANSPORTATION” on page 2-157.



Loading and Unloading

Always respect the following precautions when loading or unloading the machine:

- When loading or unloading the machine, mistaken operation may cause the machine to tip over or fall. Be very careful!
 - (1) Blocks
 - (2) Ramp
 - (3) Width of ramps: Same width as tires
 - (4) Angle of ramps: Max. 15°
 - (5) Block
 - Perform loading and unloading on firm, level ground only. Maintain a safe distance from the edge of the road or cliff.
 - Always use ramps of adequate strength. Be sure that the ramps are wide, long, and thick enough to provide a safe loading slope. Take suitable steps to prevent the ramps from moving out of position or coming off.
 - Be sure the ramp surface is clean and free of grease, oil, ice, and loose materials. Remove dirt from the tires of the machine. On a rainy day, in particular, be extremely careful since the ramp surface is slippery.
 - Run the engine at low idling and drive the machine slowly at low speed.
 - Never correct your steering on the ramps. If necessary, drive off the ramps; correct the direction; then enter the ramps again.
 - When loading or unloading to an embankment or platform, make sure that it has suitable width, strength, and grade.
 - For machines equipped with a cab, always lock the door after boarding the machine. If this is not done, the door may suddenly open during transportation.
- ★ See “Loading and Unloading Trailers” on page 2-158.



SAFETY

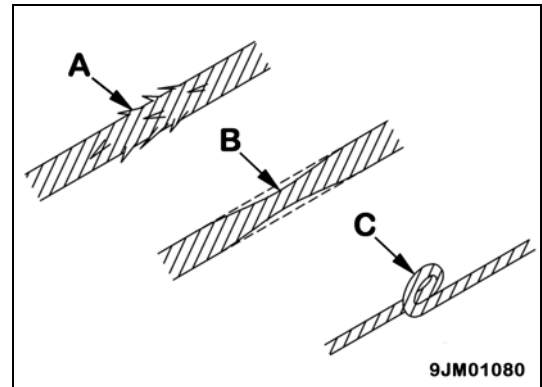
Towing

! WARNING

- When using a chain or cable, be sure that it is strong enough for the expected load and that it is properly secured to the drawbar pins or tow hooks (if equipped).
- When pulling with a chain or cable, take up the slack slowly to avoid jerking. A chain or cable which fails under load can whip and cause serious injury or death. Stand clear.
- Do not pull or tow unless the operator's compartment is guarded against, or out of reach of, a whipping chain or cable.
- Attach only to the machine tow hook or drawbar. Failure to follow these instructions could cause serious injury or death.

Always respect the following precautions when towing the machine:

- Always use the correct towing equipment and towing method. Any mistake in the selection of the wire rope or towing bar or in the method of towing a disabled machine may lead to serious personal injury or death.
 - Always confirm that the wire rope or drawbar used for towing has ample strength for the weight of the machine being towed.
 - Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.
 - Always wear leather gloves when handling wire rope.
 - Never tow a machine on a slope.
 - During the towing operation, never stand between the towing machine and the machine being towed.
- ★ For details about towing, see the “Towing the Machine” on page 2-176.



Precautions When Using ROPS

WARNING

Never modify, weld, cut, or drill on any part of a ROPS structure. Doing so may weaken the structure which could lead to possible failure in a rollover situation.

The operator's compartment is equipped with a Roll Over Protective Structure (ROPS) to protect the operator. ROPS is designed to support the load if the machine rolls over and also to absorb the impact of the energy. The ROPS fulfills all the regulations and standards for all countries.

If the machine weight (mass) exceeds the certified value (shown on the Roll Over Protective Structure (ROPS) certification plate), ROPS will not be able to fulfill its function. Do not increase machine weight beyond the certified value by modifying the machine or by installing attachments to the machine.

If the function of the protective equipment is impeded, the protective equipment will not be able to protect the operator and the operator may suffer injury or death.

Always observe the following rules:

- Do not remove the protective structure and carry out operations without it.
- If the protective structure is welded, or holes are drilled in it, or if it is modified in any other way, its strength may decrease. Never drill, cut, weld on, or modify the ROPS structure.
- If the protective structure is damaged or deformed by falling objects or by rolling over, its strength will be reduced and it will not be able to fulfill its function properly. If the ROPS structure is damaged in any way, replace it immediately. Do not make repairs to the ROPS structure itself.
- Even if the protective structure is installed, always fasten your seat belt properly when operating the machine. If you do not fasten your seat belt properly, it cannot provide full protection. See "Seat Belt Inspection" on page 1-11.



Unauthorized Modification

- Komatsu will not be responsible for any injuries, accidents, product failures, or other property damages resulting from modifications made without authorization from Komatsu.
- Any modification made without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor.

Precautions for Attachments and Options

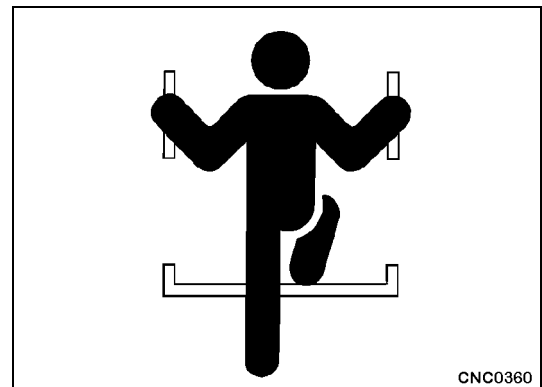
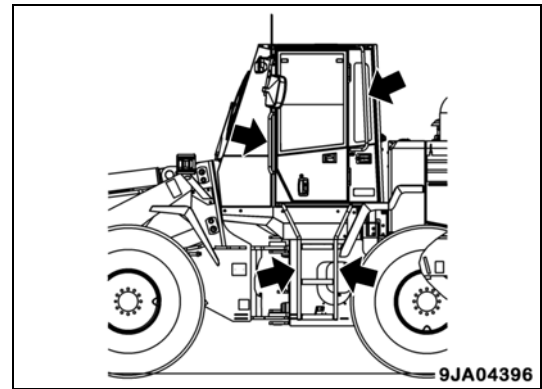
- Any injuries, accidents, product failures, or other property damages resulting from the use of unauthorized attachments or parts will not be the responsibility of Komatsu.
- When installing optional parts or attachments, there may be problems with safety or legal restrictions. Contact your Komatsu distributor for advice.
- When installing and using optional attachments, read the instruction manual for the attachment and the general information related to attachments in this manual.

SAFETY

Precautions When Cleaning Cab Glass

Always keep the cab glass clean to ensure good visibility when operating the machine.

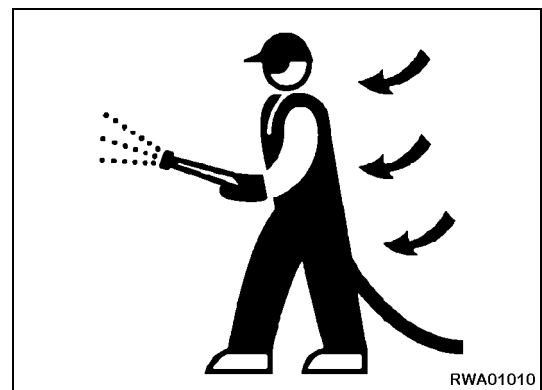
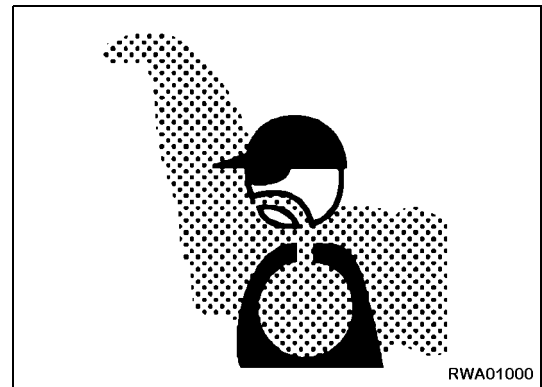
- When cleaning the cab glass, use the handrail and step to reach the glass.
 - Make sure that your footing is secure before reaching to clean the glass.
 - Do not overextend your reach; there is a danger that you will lose your balance and fall.
-
- Be sure to maintain three-point contact (two feet and one hand, or one foot and two hands) with the handrail and step while climbing to reach the glass.
- ★ Do not damage the wiper arm bracket. See “Cab Wiper” on page 2-72.



Asbestos Hazard Alert

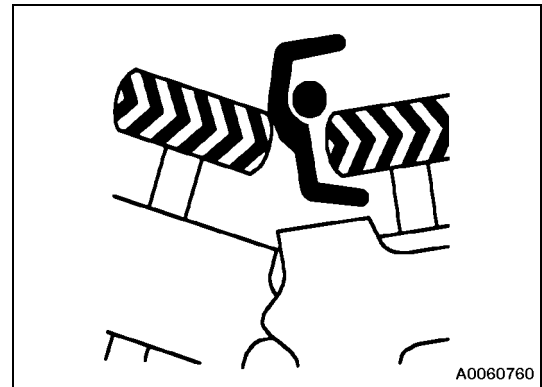
Asbestos dust in the air can cause lung cancer, if it is inhaled. There is danger of inhaling asbestos materials when working on job sites handling demolition work or industrial waste. Always observe the following precautions.

- Spray water to keep down the dust when cleaning.
 - Do not use compressed air for cleaning.
 - If there is danger that there may be asbestos dust in the air, always operate the machine from an upwind position.
 - All workers should use approved respirators.
 - Do not allow other people to approach during the operation.
 - Always observe the rules and regulations for the work site and environmental standards.
- ★ The machine does not contain asbestos but there is a possibility that imitation parts may contain asbestos. Use Komatsu genuine parts.



Crush or Pinch-Point Dangers

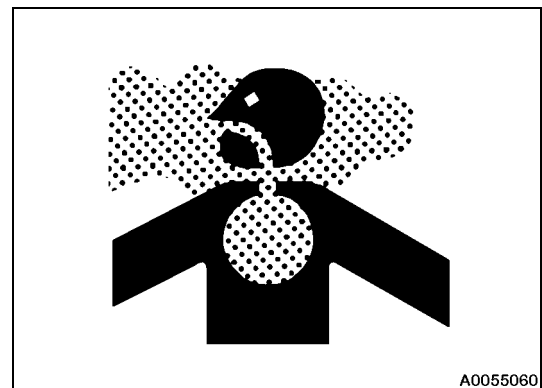
- If the clearance at the articulating portion changes and you get caught in it, you will suffer serious personal injury or death. Do not enter this area. Do not allow anyone to come inside the articulation range.
- The clearance in the area around the work equipment changes according to the movement of the link. If you get caught, you will suffer serious personal injury or death. Do not get close to any rotating or extending/retracting portion and do not allow anyone enter this area.
- Never drive up to anyone standing in front of a solid object or in your path of travel.
 - The brakes could fail or the machine could slide on a slippery surface causing injury or even death.



Precautions for Ventilation Exhaust Gas

The engine exhaust gas contains substances that may damage your health or even cause death.

- Start or operate the engine in a place where there is good ventilation.
- If the engine or machine must be operated inside a building or underground where the ventilation is poor, take steps to ensure that the engine exhaust gas is removed and that ample fresh air is brought in.



PRECAUTIONS BEFORE STARTING OPERATIONS

The operator is responsible for the safe operation of this machine at all times, regardless of the situation. Although Komatsu cannot cover all operating conditions that pose a major hazard, here are a few basic situations to avoid when using the loader during work or travel operations. It is advisable to study these and always be aware of them before starting work operations. Failure to do so may result in damage to the machine or injury to the operator and other personnel.

Pre-Operational Checks

Before starting your work operations, it is important to perform a **Pre-operational Check** to be sure your equipment is in safe operating condition. If any problems are found during your pre-operational check, have them repaired immediately. Never operate a machine that is unsafe, damaged, or in need of repair. Failure to perform a pre-operational check before starting work operations may result in damage to the machine or injury to the operator and other personnel.

Remark

It is important that a pre-operational check be performed at the beginning of your work shift. Even if you are taking the machine operations over from another operator, always perform a pre-operational check before you start work.

Ensure Good Visibility

This machine is equipped with mirrors to improve visibility but, even with mirrors, there are blind spots which cannot be seen from the operator's seat. Always be careful when operating the machine.

When operating or traveling in places with poor visibility, it is impossible to check for obstacles in the area around the machine and to check the condition of the job site. This leads to danger of serious personal injury or death.

When traveling or carrying out operations in places with poor visibility, always observe the following rules:

- If visibility is not sufficient, position a flagman. The operator should pay close attention to the signs and follow all of the flagman's instructions.
- Signals should be given by only one flagman.
- When working in dark places, turn the machine's working and front lamps on and, if necessary, set up additional lighting in the area.
- Stop operations if the poor visibility is due to fog, snow, rain, or dust.
- Clean the windows and mirrors on the machine then adjust all mirrors to ensure good visibility before starting operations every day.

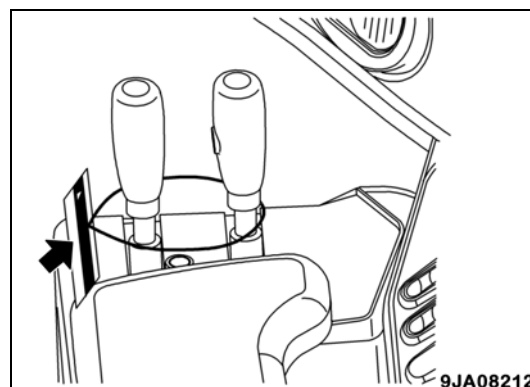
Signs and Signals

- On road shoulders or soft ground, set up signs to inform personnel of conditions.
- Make sure all personnel understand the meaning of all the signs.
- If the operators do not know the condition of a job site, the machine may tip over or fall, resulting in injury to the operator.
- If the visibility is not good, position a signalman. Operators should pay careful attention to the signs and follow the instructions from the signalman.
- Only one signalman should give signals.

Precaution for Warning Tag

If there is any “DANGER! Do NOT operate!” warning tag displayed, it means that someone is carrying out inspection and maintenance of the machine. If the warning sign is ignored and the machine is operated, there is danger that the person carrying out inspection or maintenance may be caught in the rotating or moving parts and suffer serious personal injury or death.

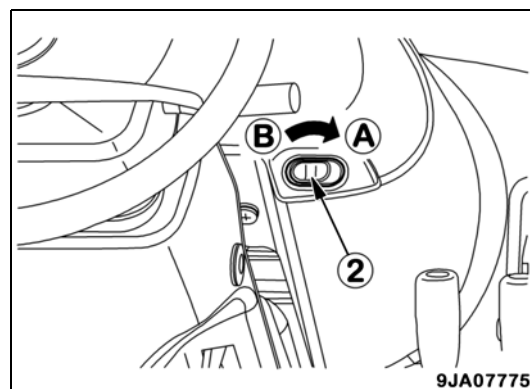
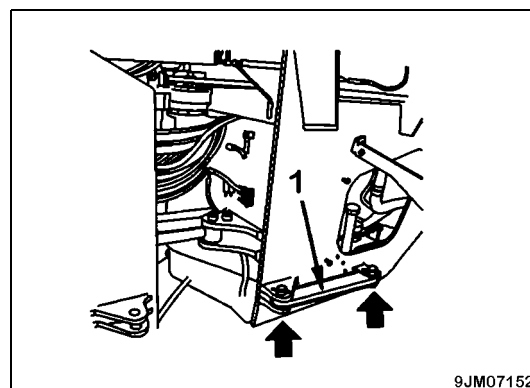
- Do not start the engine, touch the levers, or operate any of the controls.
- **ALWAYS** follow the warning sign.



Checks Before Starting Engine, Adjustments

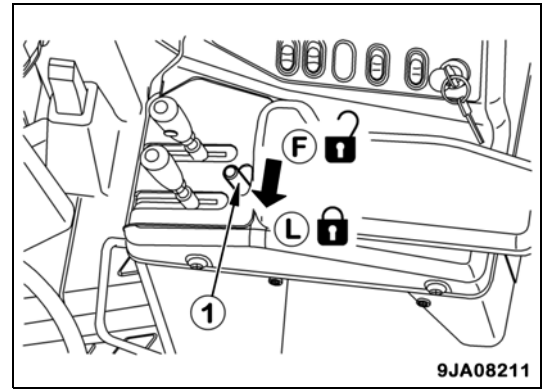
Before starting the engine, perform the following checks and adjustments to confirm that there is no problem with operating the machine. If this step is not performed properly, there is a danger of serious personal injury to the operator or damage to the machine during operation.

- Check that the frame lock bar (1) is securely fixed at the FREE position.
- Clean all windows and mirrors on the machine.
- Check the angle of the mirrors and adjust all mirrors to prevent any reduction in visibility. Adjust the mirrors so the rear of the machine can clearly be seen from the operator's seat. See “Adjusting Mirrors” on page 2-95.
- Remove all dirt from the front lamps, work lamps, and rear combination lamp. Check that they function properly.
- Remove mud, dust, and debris accumulated around the movable parts of the accelerator and brake pedals. Check and make sure the pedals work properly.
- Walk around the machine and make sure that there are no persons or obstacles above, below, or around the machine.
- Check the coolant level, fuel level, and oil level in the engine oil pan.
- Check for clogging of the air cleaner.
- Check for damage to the electric wiring.
- Make sure that parking brake switch (2) is at the ON position (A).



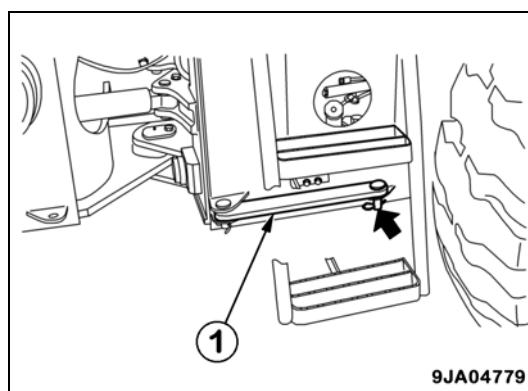
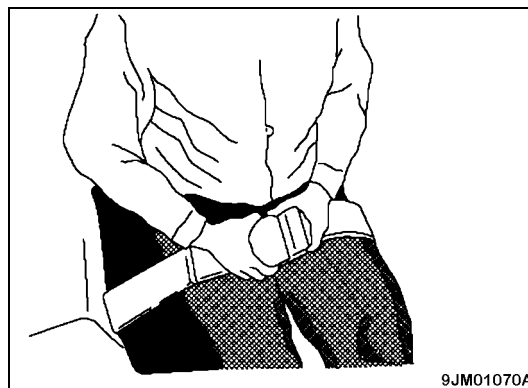
SAFETY

- Adjust the operator's seat so that it is easy to carry out operations.
- Check for damage or wear to the seat belt or seat belt mounts. See "Seat Belt Inspection" on page 1-11.
- Check that the gauges and meters work properly.
- Check that the control levers are at the Neutral position.
- Check that the work equipment lock lever (1) is in the LOCK position (L).
- Perform pre-operational checks of the machine. See "Check Before Starting Engine" on page 2-80.



PRECAUTIONS WHEN STARTING

- Do not start the engine if warning tags have been attached to the steering wheel or control levers.
- Before starting the machine, always be in a seated position.
 - It will be impossible to stop operations if a problem occurs and you are not seated, with the seat belt secured.
 - There is a danger of serious personal injury if you are not seated, with the seat belt secured.
- Fasten your seat belt snugly around your waist. See “Seat Belt Inspection” on page 1-11.
- Sound your horn to warn others in the area before starting the engine or moving the machine. There is a danger of serious injury when the machine moves.
- Before driving the machine or starting operations, make sure that the frame lock bar (1) is securely fixed at the FREE position.
- Check that the backup alarm (alarm buzzer when machine travels in reverse) works properly.
- Do not allow anyone in the cab, or on the machine, during operations.
- Be sure all personnel are clear from your work site before starting any work operations.
- DO NOT attempt to start the engine by jumping across the engine starting circuit.
 - ★ This may cause a fire, serious personal injury, or death.
 - If necessary, use jumper cables. See “Using Booster Cables” on page 1-47.



Precautions in Cold Areas

- Carry out the warming-up operation thoroughly. If the machine is not thoroughly warmed up before the control levers are operated, the reaction of the machine will be slow; this may lead to unexpected accidents.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is danger that this will ignite the battery and cause the battery to explode.
- Before charging or starting the engine with a different power source, melt the battery electrolyte and check that there is no leakage of electrolyte before starting.

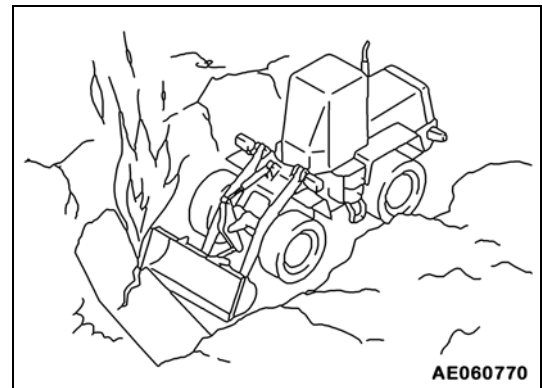
SAFETY

PRECAUTIONS FOR JOB SITE

On the job site, there are hidden dangers that may lead to personal injury or death. Before starting operations, always check the following conditions to confirm that there is no danger on the job site.

Work Site Hazards

- Before starting any excavating or grading operations, contact all utility departments in your area and have them identify and mark any underground system locations (gas lines, water lines, electrical lines, sewer lines, etc.). Do not sever or damage any of these lines.
- Check the terrain and condition of the ground at the work site, and determine the safest method of operation. Do not operate where there is a hazard of landslides or falling rocks.
- Make sure your work area is as level as possible and that you will be able to maneuver your work equipment or machine easily.
- When traveling or operating in water or on soft ground, check the water depth, speed of the current, bedrock, and shape of the ground beforehand and avoid any place that will obstruct travel.
- Maintain the travel path on the job site so that there is no obstruction to travel operations.
- If you will be working near a high-traffic area (pedestrians or cars), have a dedicated worker available to direct traffic or install safety fencing around your work site.
- Take necessary measures to prevent any unauthorized person from entering the operating area.
- Always be aware of all your work site dangers or distractions.
- Operations such as logging, mulching, land clearing, or landfill operations may cause trash and debris to accumulate on the machine. Remove debris or trash on a daily or more frequent basis (as necessary) to prevent fire.
- Always clean trash from the exhaust system compartments. The hot exhaust compartments may cause fire from contact with flammable material.
- Remove any leaves, wood chips, paper, wood dust, or anything accumulated around the engine that could catch fire.



Working on Loose or Unstable Ground

To limit the risk when working in areas with loose or unstable ground:

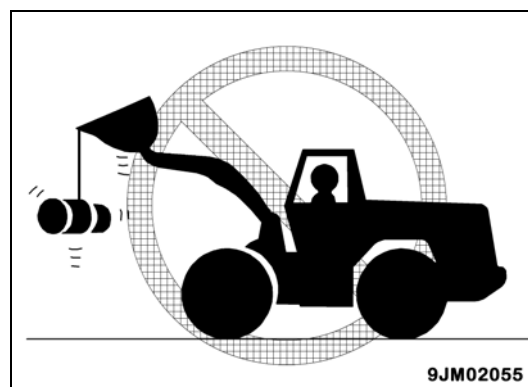
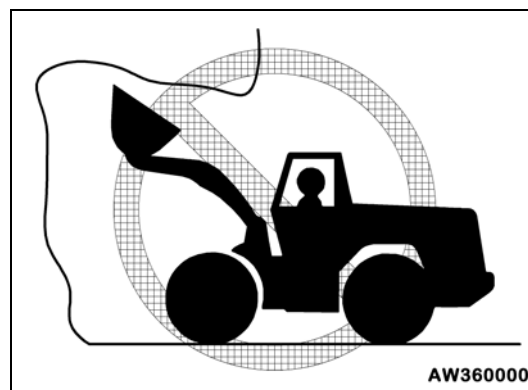
- Avoid traveling or operating your machine too close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse under the weight or vibration of the machine, there is a danger that the machine may fall or tip over causing serious damage to the machine or injury to the operator. The soil after heavy rain or blasting or after earthquakes is weak in these areas.
- When working on embankments or near excavated ditches, there is a danger that the weight and vibration of the machine will cause the soil to collapse. Before starting operations, take steps to ensure that the ground is safe and to prevent the machine from rolling over or falling.
- After a heavy rain or thaw, the surface conditions may become unstable.

Prohibited Operations

If the machine rolls over or falls, or the ground at the working point collapses, it may lead to serious personal injury or death.

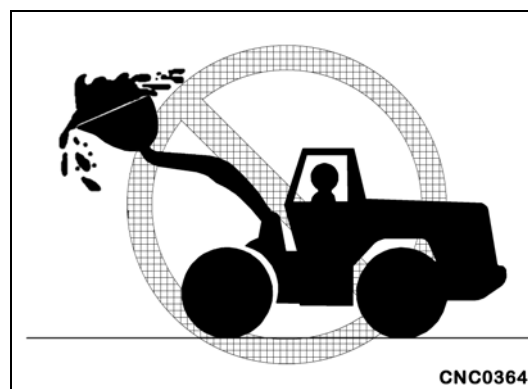
Always observe the following precautions:

- Do not excavate the work face under an overhang. There is danger that the work face will collapse.
- When digging, never thrust the bucket into a load at an angle. This will bring an excessive load to bear on the machine and will reduce the service life of the machine.
- It is dangerous to apply drive force when excavating a rock face. In addition, an excessive load will be brought to bear on the machine and damage the machine.
- Never carry out digging operations on a downhill slope. An excessive load will be brought to bear on the machine and damage the machine.
- Do not use the bucket or lift arm for crane operations. There is danger that the machine will tip over and that the load will fall.
- Do not pass the bucket over the head of other workers or over the operator's seat of dump trucks or other hauling equipment. The load may spill or the bucket may hit the dump truck and cause serious personal injury or death.



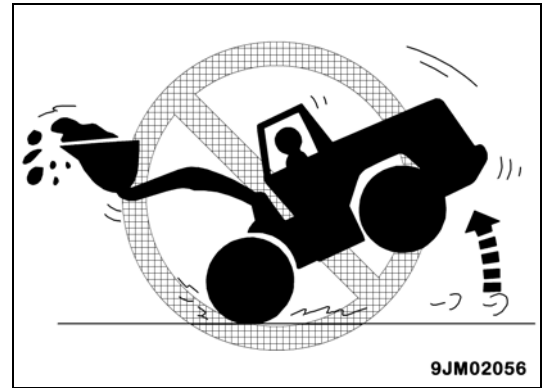
Avoiding Dangerous Situations

- When using the machine, to prevent personal injury caused by damage to the work equipment or by the machine overturning due to overloading, do not exceed the permitted performance of the machine or the maximum permitted load for the structure of the machine.
- If the engine cannot be started again after it has stopped, immediately operate the work equipment control levers to lower the work equipment to the ground. (After the engine stops, the accumulator allows the work equipment to be operated for a limited time.)
- Be careful not to approach too close to the edge of cliffs. When making embankments or landfills, or when dropping soil over a cliff, dump one pile, then use the next pile of soil to push the first pile. The load suddenly becomes lighter when the soil is pushed over a cliff or when the machine reaches the top of a slope. When this happens, there is danger that the travel speed will suddenly increase. Be sure to reduce the speed.
- Avoid traveling with the bucket raised.
 - Raising the bucket raises the center of gravity on the machine. Traveling with a raised bucket, especially a loaded bucket, may result in loss of control or a rollover situation.
 - Never raise the bucket unless the machine is stopped.

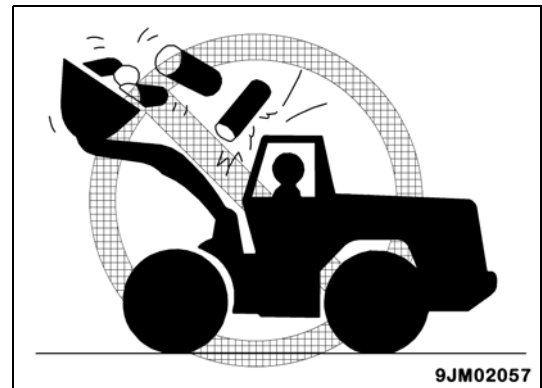


SAFETY

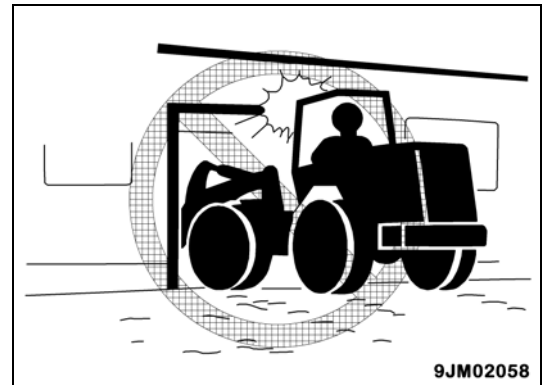
- When the bucket is raised and loaded, never make sharp turns or start or stop the machine suddenly.
 - This may cause the machine to tip forward.



- When handling unstable loads, such as round or cylindrical objects, or piled sheets, if the work equipment is raised high, there is danger that the load may fall on top of the operator's compartment and cause serious injury or death.
- When handling unstable loads, be careful not to raise the work equipment too high or tip the bucket back too much.
- If the work equipment is suddenly lowered or suddenly stopped, the reaction may cause the machine to tip over. Particularly when carrying a load, be sure to operate the work equipment carefully.
- Keep the load as close to the ground as possible.



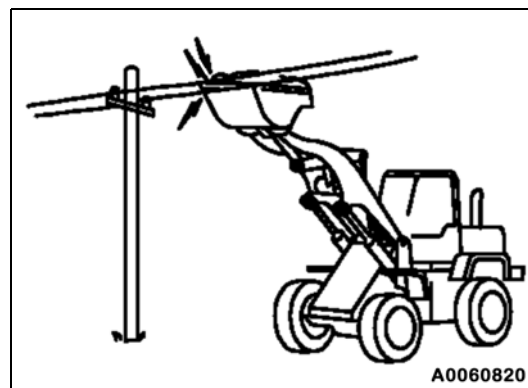
- When operating in tunnels, under bridges, under electric wires, or other places where the height is limited, be extremely careful not to let the machine body or work equipment hit anything.
- To prevent accidents caused by hitting other objects, always operate the machine at a speed which is safe for operation, particularly in confined spaces, indoors, and in places where there are other machines.
- If you are not sure of your clearances, request the aid of another person who can guide or warn you if you get too close to objects.



Working Near High Voltage Cables

⚠ WARNING

- Electrocution can result from contacting or approaching underground or overhead power cables.
 - NEVER approach overhead power lines with any part of the machine.
 - ALWAYS use extreme caution.
-
- Before starting work in the vicinity of electric cables, inform the local power company of the work to be performed. Have them take the necessary steps to ensure safety.
 - Be aware of the dangers when working around overhead electrical lines. High humidity may pose an electrical hazard even if your machine clears the overhead power lines.
 - Even going close to high-voltage cables can cause electric shock, which may cause serious burns or even death. Always maintain a safe distance (see the table) between the machine and the electric cable. Check with the local power company about safe operating procedure before starting operations.
 - Know your margin of safety. If possible, have power to the lines disconnected.
 - If disconnection is not possible, request a signal person for guidance to maintain at least the minimum distance required by law from the overhead lines.
 - See the table at the bottom of the page for the safety margins.
 - Be prepared for any possible emergency.
 - Wear rubber shoes and gloves.
 - Lay a rubber sheet on top of the seat,
 - Do not touch the chassis with any exposed part of your body.
 - When working near high-voltage power lines, **NEVER** let anyone near the machine.
 - If your machine should come to close or touch electrical lines, stop the machine and remain on the machine until the power company clears the lines and it is safe to get off or move the machine.
 - Do not let anyone near the machine.
 - If low power lines pose a greater hazard, have the power company remove the lines until your work is finished.



Cable Voltage	Minimum Safe Distance	
	m	ft
100 - 200V	2 m	7 ft
6,600V	2 m	7 ft
22,000V	3 m	10 ft
66,000V	4 m	13 ft
154,000V	5 m	16 ft
187,000V	6 m	20 ft
275,000V	7 m	23 ft
500,000V	11 m	36 ft

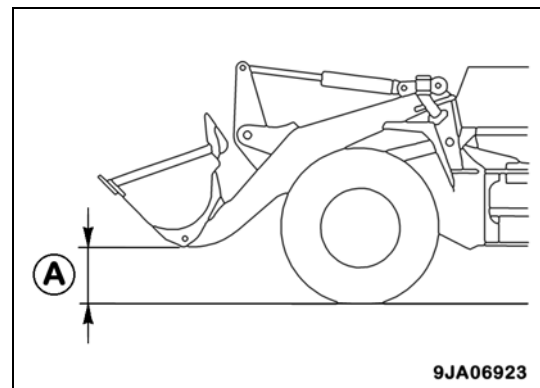
SAFETY

RULES FOR ROAD TRAVEL

Traveling with your machine may pose some hazards. When traveling, always travel in a safe manner and remain alert at all times. A safety-conscious operator is the most important insurance when traveling with the machine. The operator should be aware of the following situations and information.

Travel Precautions

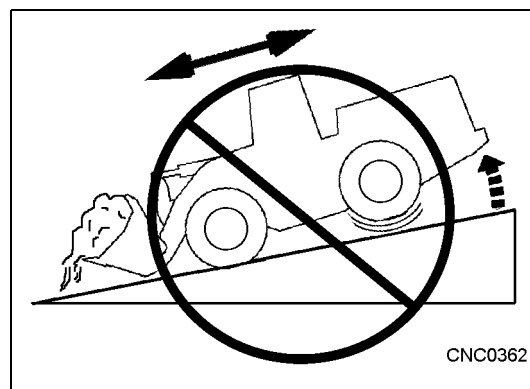
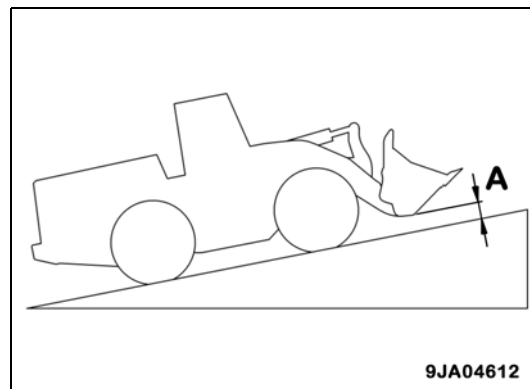
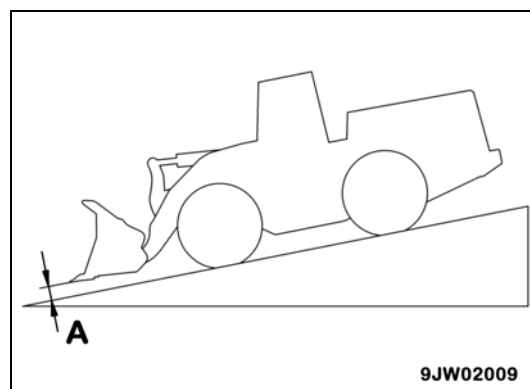
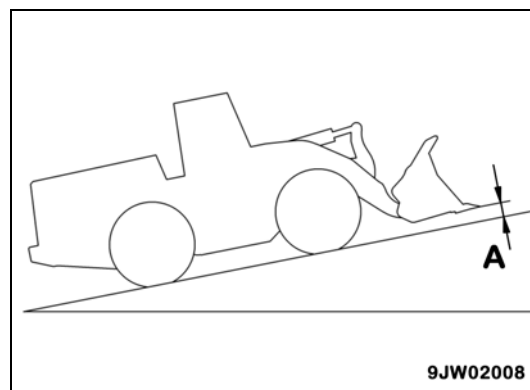
- Lock the work equipment control lever using the safety lock. If it is necessary to operate the work equipment control lever, stop the machine first, then operate the control lever.
- Obey all traffic rules when traveling on local and state roads.
- Always travel at a safe, controllable speed.
- Never turn the key in the starting switch to the OFF position while traveling.
 - It is dangerous if the engine stops when the machine is traveling because the steering becomes stiff and difficult to control. The danger is that this may cause a steering wheel malfunction and could lead to serious personal injury or death. If the engine stops, depress the brake pedal immediately to stop the machine.
- When traveling or carrying out operations, always keep a safe distance from people, structures, or other machines to avoid coming into contact with them.
- When passing over bridges or structures, check first that the structure is strong enough to support the weight of the machine.
- When operating in tunnels, under bridges, under electric wires, or other places where the height is limited, operate slowly and be extremely careful not to let the machine body or work equipment hit anything.
- Avoid traveling over obstacles when possible. Do not travel over obstacles which make the machine tilt exceptionally to the left or right side. There is more danger of the machine tipping over to the left or right than tipping over to the front or rear.
 - If the machine must travel over an obstacle, keep the work equipment close to the ground and travel at low speed.
- When traveling on flat ground, keep the work equipment at a safe travel height (A) of 40 to 50 cm (16 to 20 in) above the ground.
 - If the work equipment is too close to the ground, the work equipment may contact the ground and cause the machine to tip over.
- When traveling on rough ground, travel at low speed and do not operate the steering suddenly. There is danger that the machine may turn over. The work equipment may hit the ground surface and cause the machine to lose its balance, or may damage the machine or structures in the area.
- Plan your route in advance. If necessary, obtain the aid of an escort to lead or prepare your travel route.
- Do not exceed the permitted performance of the machine or the maximum permitted load for the structure of the machine, to prevent personal injury caused by damage to the work equipment or by the machine overturning due to overloading,.
- Never travel at high speeds.
 - If you drive the machine at high speed continuously for a long time, the tires will overheat and the internal pressure will become abnormally high. This may cause the tires to burst. If a tire bursts, it produces a large destructive force; this may cause serious injury or death. Consult your Komatsu distributor regarding continuous travel.
- When the machine is traveling on flat ground or down a slope, NEVER set the directional lever to the Neutral position. Always set it to a transmission speed range.
 - If the transmission is at neutral, the engine brakes will not work and the steering becomes hard to control, creating a dangerous situation.
 - It may also damage the transmission or other parts of the power train; this may lead to serious personal injury or death.



Traveling on Slopes

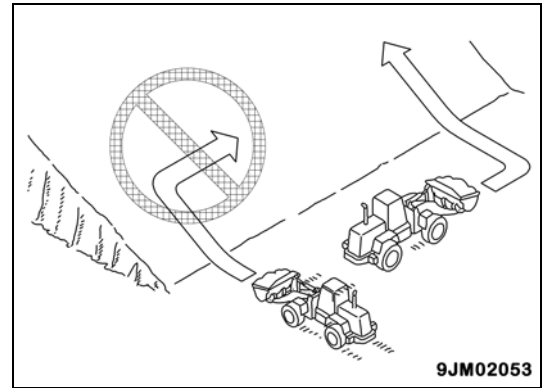
Traveling on slopes may pose a hazard. In order to prevent tipping the machine or losing control, it is important to follow some basic simple rules.

- When traveling over rough ground, travel at a slow, controllable speed.
- Never turn the starting key off when traveling up or down a slope.
 - If the engine stops, apply the brakes and lower the bucket to the ground to stop the machine immediately.
- When traveling up or down slopes with an empty bucket, it is important to travel at a safe, controllable speed with the bucket set in position (A), 20 to 30 cm (8 to 12 in) above the ground.
 - In case of emergency, quickly lower the bucket to the ground to help the machine to stop.
- When traveling up or down a slope with a load, always keep the bucket 20 to 30 cm (8 to 12 in) above the ground and the load facing the top of the hill.
- Never travel up or down a slope with the load facing the bottom of the hill.
 - Loss of control may result when the brakes are applied and the machine may tip over.



SAFETY

- Always travel straight up or straight down a slope.
 - Traveling at an angle on a slope may cause the machine to tip or possibly roll over.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change the position of the machine then travel on to the slope again.
- Travel at low speed when traveling on grass, fallen leaves, or wet steel plates.
 - Even with slight slopes, there is a danger that the machine may slip.
- If the engine stops, depress the brake pedal immediately; lower the bucket to the ground; and apply the parking brake to stop the machine.
- When traveling downhill:
 - Never shift gear or place the transmission at neutral.
 - It is dangerous not to use the braking force of the engine.
 - Always place the transmission in a low gear before starting to travel down hill.
 - Travel slowly.
 - If necessary, use the braking force of the engine together with the brake pedal to control the travel speed.



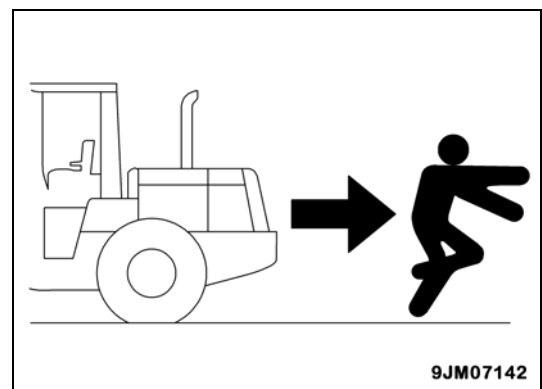
Using the Brakes

- When the machine is traveling, do not rest your foot on the brake pedal.
 - If you travel with your foot resting on the pedal, the brake will always be applied; this will cause the brakes to overheat and fail.
- Do not depress the brake pedal repeatedly, if not necessary.
- When traveling downhill, use the braking force of the engine and always use the right brake pedal at the same time.
- Set to the lockup and use the braking force of the engine.

Traveling in Reverse

Traveling in reverse may pose several hazards. Always observe the following cautions before traveling.

- Always operate the machine only when you are seated.
- Lock the cab door and windows securely, both when they are open and when they are closed.
- Do not allow anyone except the operator to ride on the machine.
- If there are any persons in the area around the machine, there is danger that they may be hit or caught by the machine; this may lead to serious personal injury or death. Be sure that the area behind the machine is clear of people.
- Be sure that there are no objects in the way.
- Before moving your machine, sound the horn to warn others in your area that you are moving.
- Check that the backup alarm (alarm buzzer when machine travels in reverse) works properly.
- When operating in areas that may pose a hazard or where there is poor visibility, designate a person to direct your movements.
- Do not rely totally on the mirrors on your machine. There are blind spots when using the mirrors.



Operating on Snow or Frozen Surfaces

It is extremely important to be careful when traveling or operating the machine on icy surfaces. Snow-covered or frozen surfaces are slippery. Your ability to maneuver is seriously affected. The machine may not respond as you expect when turning the steering wheel.

When frozen ground begins to thaw, the ground becomes soft and could cause a machine to get stuck or tip over.

When traveling on frozen surfaces, proceed in the following manner.

- Travel at a slow, safe speed.
- Gently operate the levers.
- Avoid rapid acceleration or braking.
- Stopping distance is increased during slippery conditions. Give yourself sufficient distance to stop the machine.
- When traveling on snow-covered roads, always use tire chains.
- Avoid deep snow. Be careful not to get trapped in a snow drift.
- When clearing snow, it may be difficult to determine where the road shoulder ends. Be careful not to slide off the shoulder and get stuck or tip over. Proceed cautiously.
- When clearing snow, you may not see objects buried in the snow. Proceed cautiously.
- Even a slight slope may cause the machine to slip out of control. Be particularly careful when working on slopes.
- When traveling on snow-covered slopes, apply the brakes gently.
 - Reduce the speed and use the engine as a brake while applying the foot brake intermittently (depress the brake intermittently several times). If necessary, lower the work equipment to the ground to stop the machine.

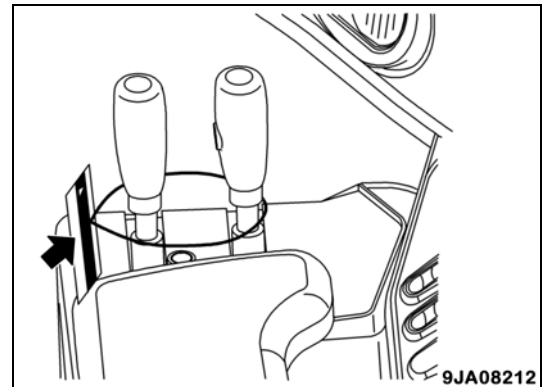
SAFETY

PRECAUTIONS DURING INSPECTION AND MAINTENANCE

All maintenance performed on this machine must be performed only by trained and authorized personnel. When performing maintenance it is important to follow the outlined maintenance procedures and safety information outlined in this manual and in the *Shop Manual* for this machine.

Warning Tags

- Before performing any maintenance operations on this machine, position the machine on a level and firm surface.
- Lock the equipment controls; remove the starting key; and tag the steering wheel.
 - ★ Warning tag part number: 09963-03001
 - When not using this warning tag, keep it in the toolbox. If there is no toolbox, keep it in the pocket on the seat back.
- Alert all personnel in your area that the machine is down for maintenance. If necessary, tag the machine around specific points to warn others that this machine is down for maintenance.
- If the machine will be down for maintenance for a long period of time, be sure to check and see if the warning tags are still in place before you start your repair procedures the next day.
- If there is any “DANGER! Do NOT operate!” warning tag displayed, it means that someone is carrying out inspection and maintenance of the machine. If the warning sign is ignored and the machine is operated, there is danger that the person carrying out inspection or maintenance may be caught in the rotating or moving parts and suffer serious personal injury or death. Do not start the engine or touch the levers.



Workplace Environment

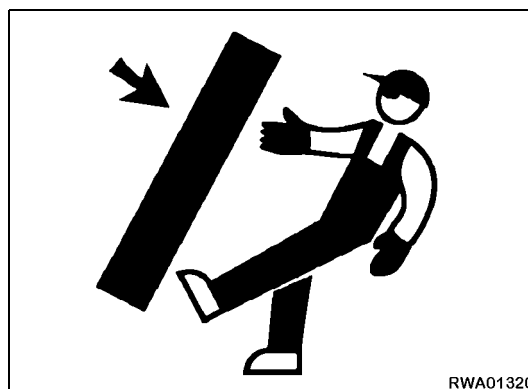
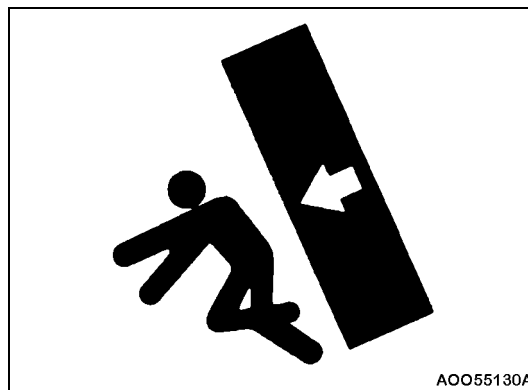
- Do not leave hammers or other tools lying around in the work place.
- Wipe up all grease, oil, or other substances that may cause you to slip.
- Always keep the work place clean and tidy to enable you to carry out operations safely.
 - If the work place is not kept clean and tidy, there is the danger that you may trip, slip, or fall over and injure yourself.
- Select a suitable place for inspection and maintenance.
 - Stop the machine on firm, level ground.
 - Select a place where there is no hazard of landslides, falling rocks, or flooding.
- Do not allow any unauthorized personnel into the area when servicing the machine. If necessary, employ a guard.
- When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.
- When working at high places, use a stepladder or other stand to ensure that work can be carried out safely.

Systems Equipped with ECSS

- For machines equipped with ECSS (Electronically Controlled Suspension System), lower the bucket to the ground; turn the ECSS switch OFF; and stop the engine before starting inspection or maintenance.
- Never turn the switch ON during inspection or maintenance.

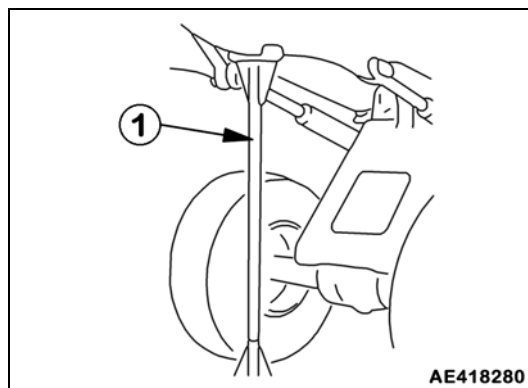
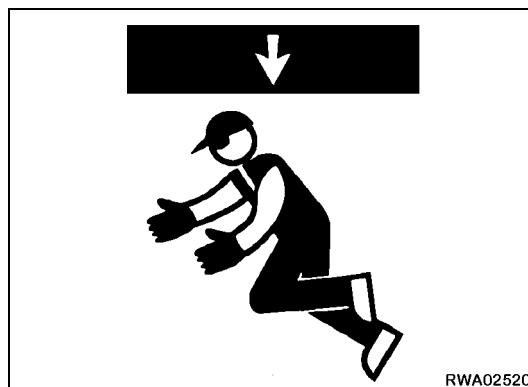
Equipment Storage

- Appoint a leader before starting removal or installation operations for attachments.
 - Always store optional or extra work equipment in a safe and secure location.
 - Restrict access to the area to authorized personnel only.
 - Do not store flammable liquids or materials for any length of time.
-
- Store equipment in such a way that it cannot fall or cause injury to anybody.



Working Under the Machine

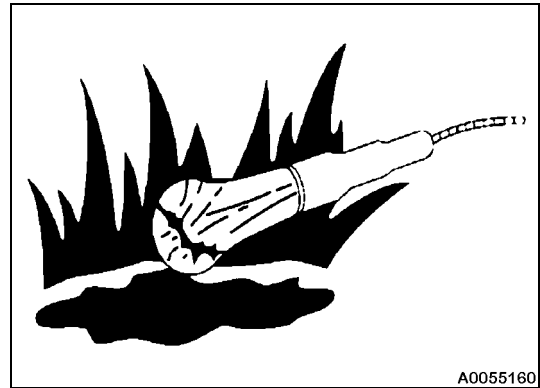
- Always use approved jack stands to support the machine when performing maintenance under the chassis.
- Make sure the hoists or jacks you use are in good repair and strong enough to handle the weight of the component. Never use jacks at places where the machine is damaged, bent, or twisted. Never use frayed, twisted, or pinched wire rope. Never use bent or distorted hooks.
- Never rely on hydraulic jacks or the machine's work equipment to support the machine when working under or on the machine.
- Always lower the work equipment to the ground **before** raising the machine for repairs.
- If it is necessary to raise the work equipment or a component and then go under it to carry out inspection or maintenance, support the work equipment or component securely with blocks and stands (1) strong enough to support the weight of the work equipment or component.
- If the work equipment or component is not supported, there is a danger that it may come down; this may lead to serious personal injury or death.
- ★ Never use concrete blocks for supports. They can collapse under even light loads.



SAFETY

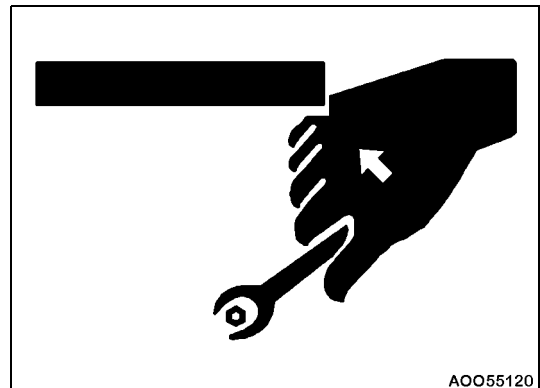
Using Drop Lamps

- Use only approved anti-explosion-proof lamps when checking fuel, oil, or batteries.
 - Non-approved lamps can cause an explosion or fire.



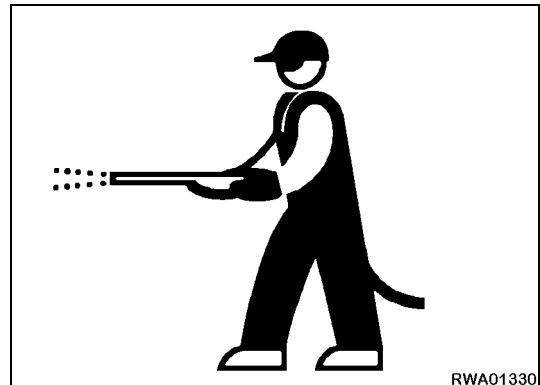
Using Proper Tools

- Use only tools suited to the task.
- Use the tools correctly.
- Using damaged, deformed, or low quality tools, or making improper use of the tools may cause serious personal injury.



Keeping the Machine Clean

- Never use flammable liquids to clean your machine. Use only approved non-flammable cleaning solvents to clean parts or the machine itself.
- Do not use high-pressure steam cleaners or caustic soaps to wash the machine. Steam cleaning or using caustic soaps may damage paint, wiring, or sensitive electrical components.
- Never use high-pressure water to flood the inside of the operator's cab. Doing so may damage sensitive electrical components.
- When pressure washing, use high-pressure hot water and mild grease-cutting soaps.
- Always grease the machine after cleaning to push any water out of the pivot-point connections.
- Remove trash daily or more often as necessary. Never allow trash to accumulate on the machine.

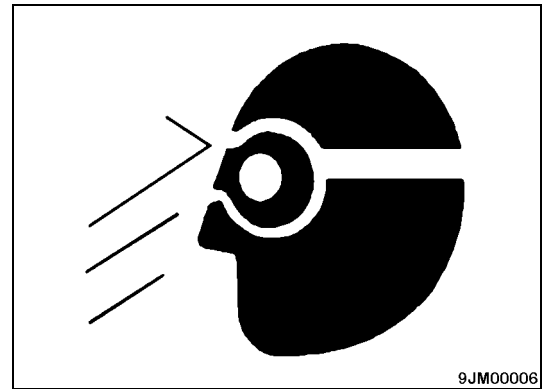


Precautions When Welding

- Welding operations must always be carried out by a qualified welder and in a place equipped with proper equipment.
- There is a danger of gas, fire, or electrocution when carrying out welding.
- Never allow any unqualified personnel to carry out welding.
- Before carrying out electric welding, turn the starting switch OFF and wait over one minute. If the machine is equipped with a battery disconnect switch, turn the battery disconnect switch to turn off ALL power and remove the key. Then remove the negative (-) battery cable.

Precautions When Using Hammer

- When using a hammer, pins may fly out or metal particles may be scattered. This may lead to serious personal injury or death.
- Observe the following precautions:
 - When hitting pins or bucket teeth, there is a danger that broken pieces might be sent flying and injure people in the surrounding area. Always check that there is no one in the surrounding area.
 - If hard metal parts such as pins, bucket teeth, cutting edges, or bearings are hit with a hammer, there is a danger that pieces might be scattered and cause serious personal injury or death. Always wear safety glasses and gloves.
 - If the pin is hit with strong force, there is a danger that it may fly out and injure people in the surrounding area. Do not allow anyone to enter the surrounding area.



Noise

- When carrying out maintenance of the engine, you may be exposed to noise for long periods of time. Wear ear covers or ear plugs while working.
- If the noise from the machine is too loud, it may cause temporary or permanent hearing problems.

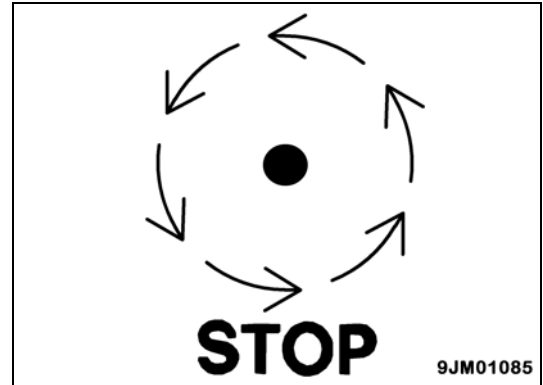
SAFETY

Stopping Engine During Inspection and Maintenance

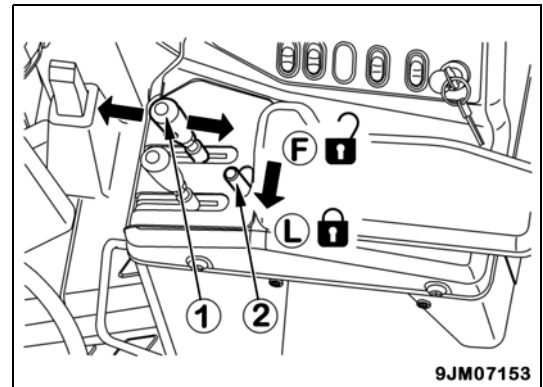
To prevent personal injury, do not carry out maintenance with the engine running.

★ If maintenance must be carried out with the engine running, follow the procedure described by “Running the Machine During Maintenance” on page 1-44.

1. Lower the work equipment completely to the ground and stop the engine before performing any inspection and maintenance.



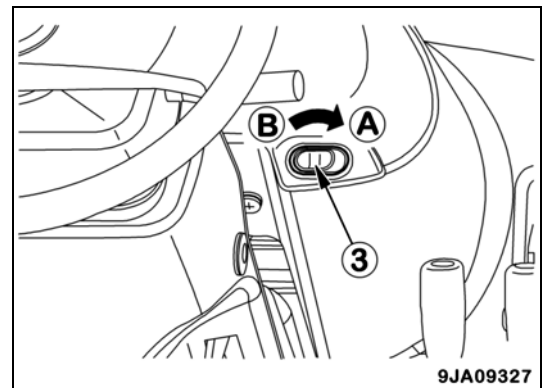
2. After stopping the engine, turn the starting switch to the ON position and operate work equipment control lever (1) fully in the RAISE and LOWER directions two to three times to release the remaining pressure in the hydraulic circuit.



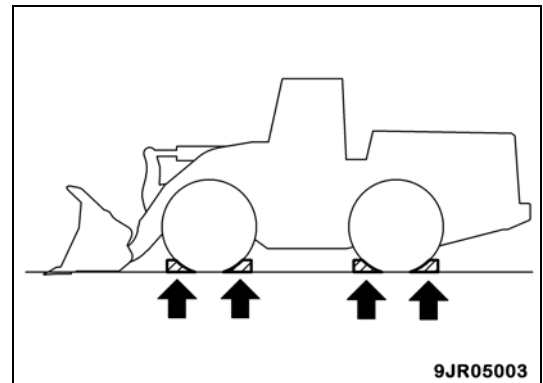
3. Set work equipment lock lever (2) to the LOCK position (L).

After releasing the remaining pressure in the hydraulic circuit, turn the starting switch to the OFF position.

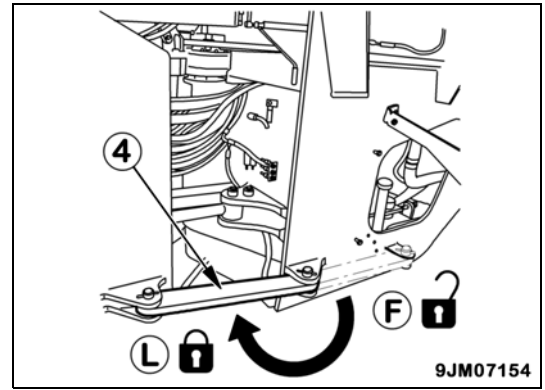
4. Set parking brake switch (3) to the ON position (A) to apply the parking brake.



5. Put blocks in front of and behind the tires to prevent the machine from moving.



6. Set frame lock bar (4) to the LOCK position (L) to lock the front and rear frames.



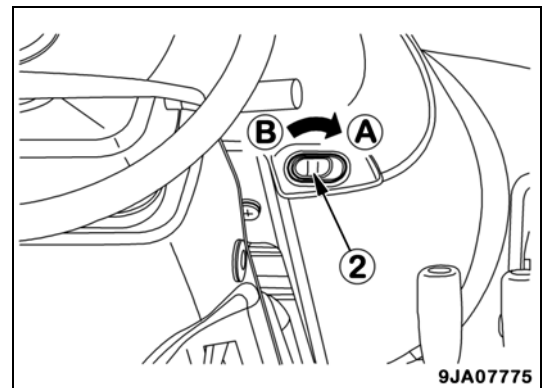
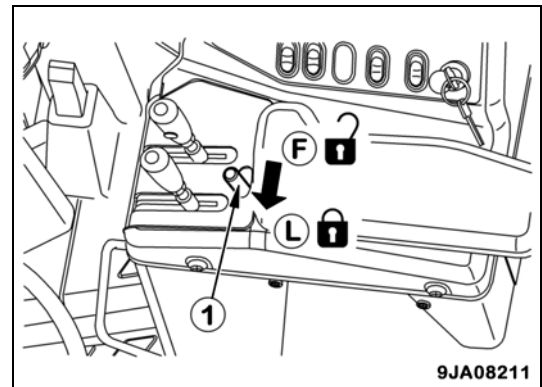
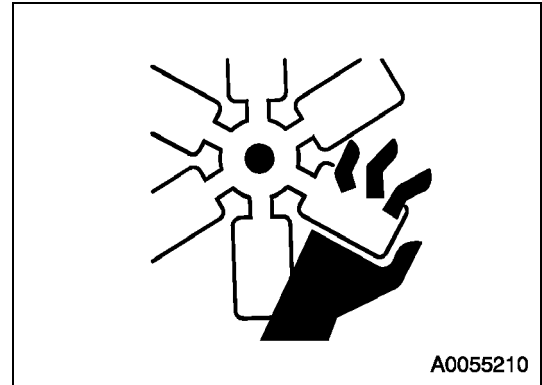
SAFETY

Running the Machine During Maintenance

To prevent personal injury, do not carry out maintenance with the engine running.

- ★ If maintenance must be carried out with the engine running, carry out the operation with at least two workers and follow this procedure.
 - One worker must always sit in the operator's seat and be ready to stop the engine at any time.
 - All workers must maintain contact with the other workers.
 - Instruct the person sitting in the cab not to operate any controls unless instructed to do so.
 - When carrying out operations near the fan, fan belt, or other rotating parts, there is a danger of being caught in the parts. Be very careful not to get close to these parts.
 - Never drop or insert tools or other objects into the fan, fan belt, or other rotating parts. There is danger that these objects may contact the rotating parts and break, or be sent flying.
 - For machines equipped with ECSS (Electronically Controlled Suspension System), be sure the system is **OFF** before proceeding with any maintenance procedures.
 - Lower the work equipment completely to the ground, then set work equipment lock lever (1) to the LOCK position (L) to prevent the work equipment from moving.

- Set parking brake switch (2) to the ON position (A) to apply the parking brake, then put blocks in front of and behind the tires to prevent the machine from moving.
- Be careful not to touch the control levers or steering equipment.
 - If the control levers must be operated, always give a signal to your partner and have your partner withdraw to a safe place.



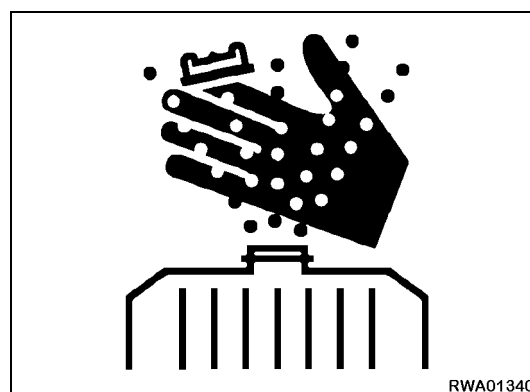
Rules for Refueling the Machine

- Always clean up any spills.
 - Grease, fuel, oil, or coolant spills can pose a trip hazard if not mopped up immediately.
- Be sure you are adding the correct fluids to the proper location.
 - Mixing fluids or adding fluids to the wrong tank can cause damage to internal components.
- When refueling or adding any fluids, be sure you are in a well-ventilated area.
- Never smoke or allow open flames near you while you are refueling the machine.
- Never mix gasoline with diesel fuel.
 - Gasoline is extremely flammable and could cause an explosion.
- Do not fill the fuel tank completely; leave room for the fuel to expand.



Cooling System Precautions

- Never add coolant to a hot or warm engine.
 - Always allow the engine time to cool down completely before opening the radiator cap.
- Never dump used coolant on the ground, in a lake, stream, or in a sewer system.
 - Komatsu requires these fluids to be captured and recycled properly.



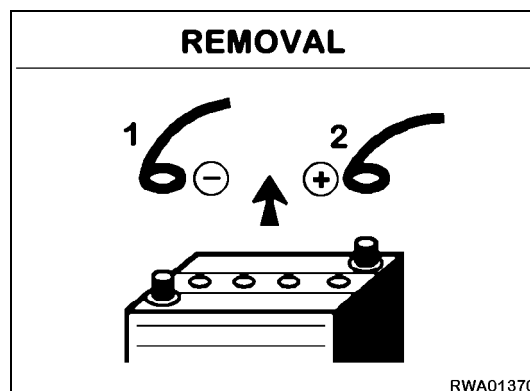
Window Washer Fluid

- Use an ethyl alcohol base washer liquid.
- Methyl alcohol base washer liquid may irritate your eyes; do not use it.

Battery Information

Precautions

- When working on the electrical system, disconnect the negative (-) battery cable first then the positive (+) battery cable last.
- On completion of work, reconnect the positive (+) cable **first** then the negative (-) cable **last**.



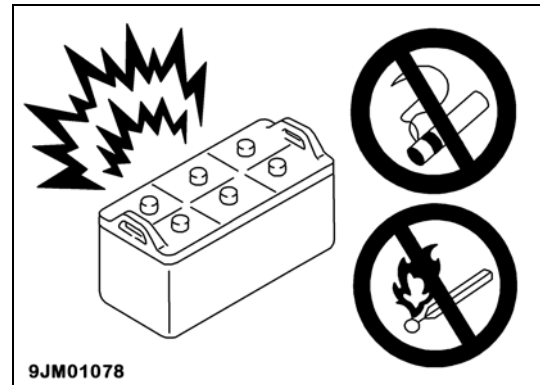
SAFETY

Hazards

Danger of Battery Exploding

Batteries generate flammable hydrogen gas. If the gas ignites, it may explode and cause serious injury or fire. Any mistake in handling may cause serious personal injury, explosion, or fire, so always observe the following.

- Keep all sparks, flame and cigarettes away from the battery.
- Do not wipe the battery with a dry cloth as this may result in static electricity, which could result in a fire or explosion.
- **DO NOT** use or charge a battery if the electrolyte is below the LOWER LEVEL mark.
 - Check the electrolyte level periodically and add distilled water **only** to the UPPER LEVEL mark, when required.
- When charging the battery, remove it from the machine and take it to a well-ventilated area. Follow the manufacturer's instructions for safe charging. Unplug the charger and remove the cables.
- See "Using Booster Cables" on page 1-47 for information about jump starting batteries.

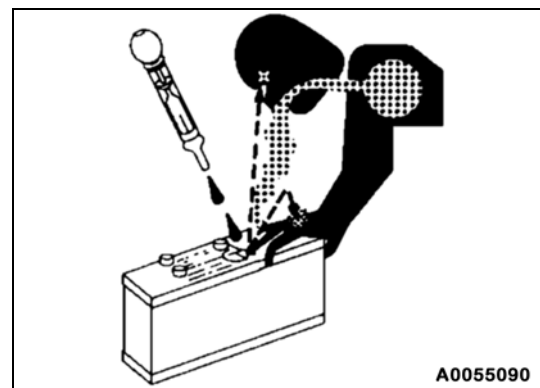


Danger of Sulfuric Acid

Battery electrolyte includes sulfuric acid. If sulfuric acid gets on your skin or in your eyes, you may suffer serious injury.

Always do the following when handling batteries.

- **ALWAYS** wear protective goggles and rubber gloves.
- Work in well-ventilated areas. Do not inhale sulfuric acid mist.
- Swallowing electrolyte may cause severe burns to the respiratory and digestive tract, and fatal or harmful lead poisoning.
- If battery electrolyte gets into your eyes:
 - Immediately wash your eyes with a large amount of fresh water for at least 15 minutes.
 - Be sure to wash behind your eyelids.
 - Get immediate medical attention.
- If battery electrolyte gets on your skin or clothes:
 - Immediately wash it off with a large amount of water.
 - Do not use any alkaline fluid as a neutralizer.
 - If you suffer any chemical burn, get immediate medical attention.
 - Wash hands after handling.



Do not allow electrolyte to enter sewers or waterways. Dispose of materials in accordance with local, state or federal regulations.

Danger of Sparks

If sparks are generated, they may fly and cause serious personal injury.

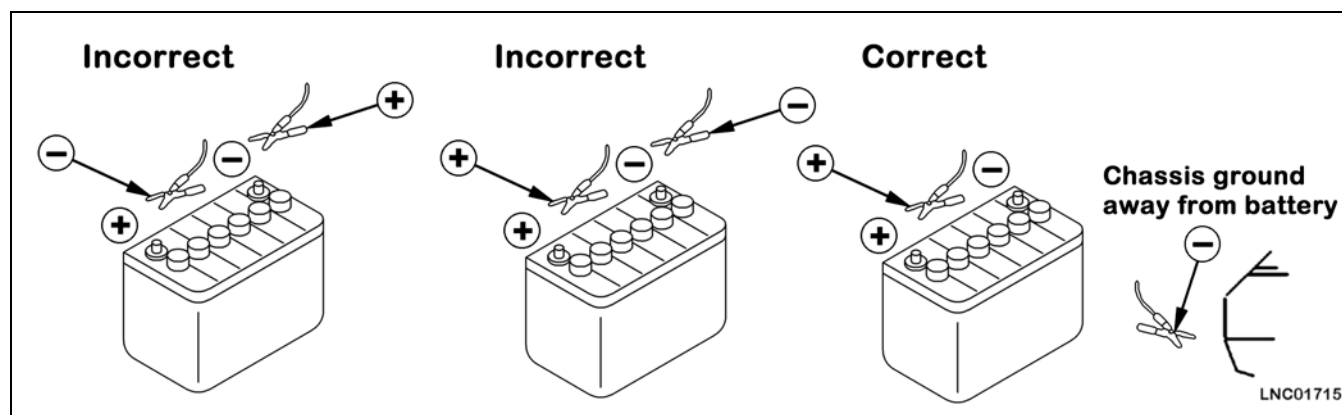
- **DO NOT** short-circuit the battery terminals through contact with metal objects, such as tools across the terminals. **DO NOT** leave tools lying around near the battery.
- Loose terminals may generate sparks and cause the battery to explode. Check that the battery terminals are secure.
- When removing the battery cables, remove the ground cable (negative (-) cable) first. When installing battery cables, connect the positive (+) cable first.
- Secure the battery firmly in the specified position.

Using Booster Cables

- ★ If any mistake is made in the method of connecting the booster cables, it may cause the battery to explode. Read all battery “Hazards” on page 1-46.

Always heed the following precautions:

- Wear safety goggles and rubber gloves when starting the engine with booster cables.
- When connecting a normal machine to a problem machine with booster cables, always use a normal machine with the same battery voltage as the problem machine. Do not allow the two machines to touch.
- When starting with a booster cable, carry out the starting operation with two workers (one worker sitting in the operator’s seat and the other working with the battery).
- When connecting the booster cables, turn the starting switch to the OFF position for both the normal machine and problem machine. There is a danger that the machine will move when the power is connected.
- When using booster cables to start the machine, attach the positive (+) jumper **first** then the negative (-) jumper **last** to a remote location on the chassis, as shown in the following figure. For additional information, see “Starting Engine with Booster Cables” on page 2-183.
- When removing the booster cables, be careful not to let the booster cable clips touch each other or to let the clips touch the machine.



Starting the Machine with Booster Cables

- Never try to start the machine by tampering or jumping across the starter terminals.
 - Accidental movements of the machine could cause injury or even death.
- Always use the starting switch key to start the machine while you are seated in the operator’s cab.

! WARNING

- Never use a welder or a machine with a higher voltage system to jump-start the machine.
 - Using a higher voltage to jump-start a machine may damage the machine’s electrical system or cause an unexpected explosion or fire.
- Always jump-start a machine with one of equal voltage.
- Never allow the machines to touch each other when jump-starting a machine.



SAFETY

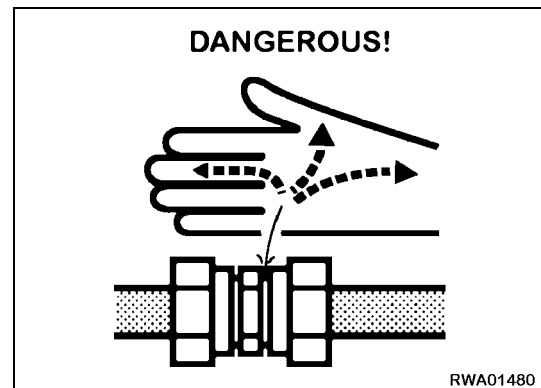
High-Pressure Precautions

The hydraulic system is always under internal pressure. In addition, the fuel piping is also under internal pressure when the engine is running and immediately after the engine is stopped. When carrying out inspection or replacement of the piping or hoses, check that the internal pressure in the circuit has been released. If this is not done, it may lead to serious personal injury or death.

- ★ Do not carry out any inspection or replacement work when the hydraulic system is under pressure.
 - Always release the pressure before starting. For details, see “Stopping Engine During Inspection and Maintenance” on page 1-42.
- ★ On machines equipped with an ECSS system, the pressure in the ECSS circuit is stored by an accumulator.
 - Do not remove the ECSS piping or components. If it is necessary to remove them, ask your Komatsu distributor to carry out the removal operation.

Precautions for High-Pressure Oil

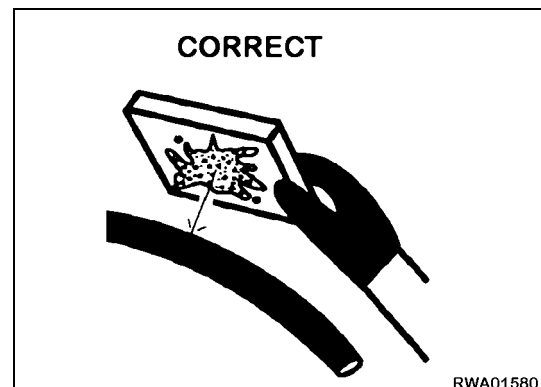
- If there is any leakage from the piping or hoses, the surrounding area will be wet. Check for cracks in the piping and hoses and for swelling in the hoses.
- When carrying out inspection, wear safety glasses and leather gloves.
- There is a danger that high-pressure oil leaking from small holes may penetrate your skin or cause blindness if it contacts your eyes directly.
 - ★ If you are hit by a jet of high-pressure oil and suffer injury to your skin or eyes, wash the area with clean water and consult a doctor immediately for medical attention.



Safe Handling of High-Pressure Hoses

If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation which may lead to serious injury or death.

- If hose or piping mounts are loose or fuel is leaking from the mount, stop operations and tighten to the specified torque.
- If any damaged or deformed hoses or piping are found, stop operations immediately and contact your Komatsu distributor.
- Replace the hose if any of the following problems are found:
 - Damaged hose or deformed hydraulic fitting
 - Frayed or cut covering or exposed reinforcement wire layer
 - Covering swollen in places
 - Twisted or crushed movable portion
 - Foreign material embedded in covering



Precautions for High-Pressure Fuel

When the engine is running, high pressure is generated in the engine fuel piping.

- When carrying out inspection or maintenance of the fuel piping system, stop the engine and wait for at least 30 seconds to allow the internal pressure to go down before starting inspection or maintenance.
- Never loosen a fuel injector line while the engine is running. Severe injury may result from the high-pressure fuel spray.

High-Temperature Precautions

High-Temperature Areas

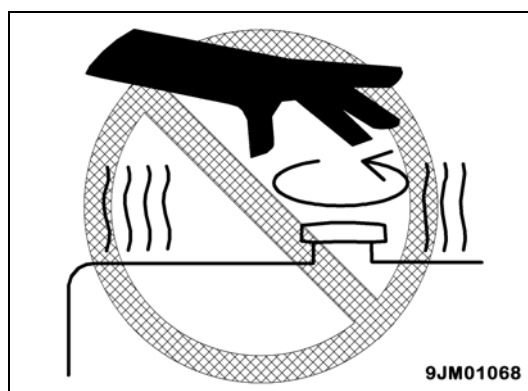
When you stop the machine at the end of a job, the engine coolant, oil, all engine parts, exhaust stack, and the hydraulic system are still hot and under pressure. If you attempt to drain engine coolant, hydraulic fluid, or engine oil under these conditions, you expose yourself to various dangers, including the risk of serious burns.

- Perform maintenance procedures described in this manual only when the machine has had time to cool down.



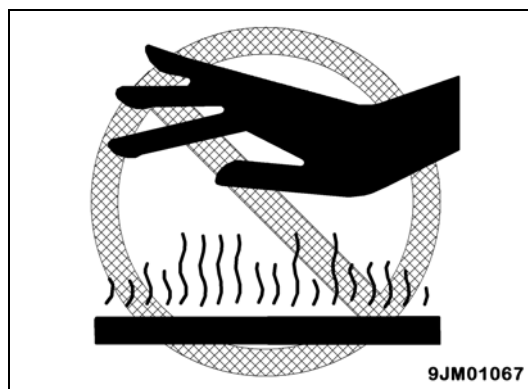
High-Temperature Coolant

- To prevent burns from boiling water or steam spurting out when checking or draining the coolant, wait for the coolant to cool down to a temperature where the radiator cap can be touched by hand.
- When the radiator cap is no longer hot, loosen the cap slowly to release the pressure inside the radiator and remove the cap.



High-Temperature Oil

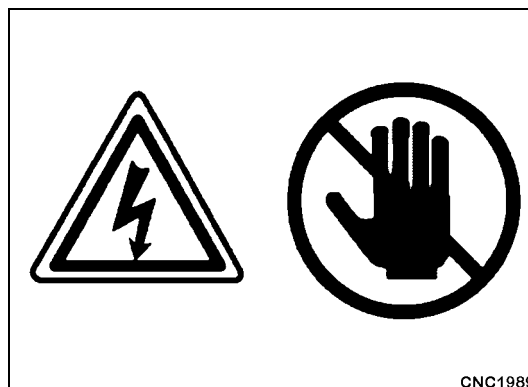
- To prevent burns from hot oil spurting out or from touching high-temperature parts when checking or draining the oil, wait for the oil to cool down to a temperature where the cap or plug can be touched by hand.
- When the components are no longer hot, loosen the cap or plug slowly to release the internal pressure and remove the cap or plug.



High Voltage

When the engine is running or immediately after it has stopped, high voltage is generated at the injector terminal and inside the engine controller. **There is danger of electrocution.**

- Never touch the injector terminal or inside the engine controller.
 - If it is necessary to touch the injector terminal or the inside of the engine controller, please contact your Komatsu distributor.



SAFETY

Accumulator and Gas Spring

This machine is equipped with an accumulator which makes it possible to operate the work equipment lever in the LOWER direction for a short time even after the engine has stopped. This allows the work equipment to go down under its own weight.

After stopping the engine, set the work equipment lock lever to the LOCK position.

- ★ The accumulator is charged with high-pressure nitrogen gas. When handling the accumulator, a careless procedure may cause an explosion which could lead to serious personal injury or death.

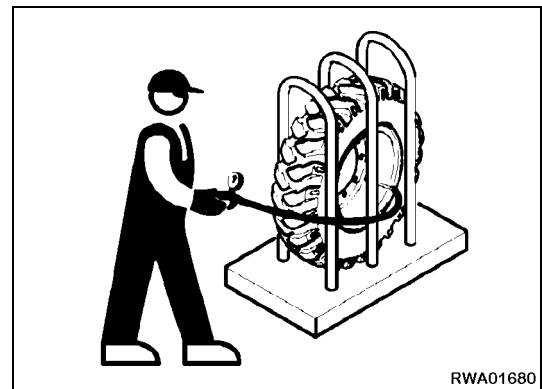
Always observe the following precautions.

- Do not disassemble the accumulator.
- Do not bring it near flame or dispose of it in fire.
- Do not make holes in it, weld it, or use a cutting torch.
- Do not hit or roll the accumulator, or subject it to any impact.
- When disposing of the accumulator, the gas must be released. Contact your Komatsu distributor to have this work performed.



Tires

If handled improperly, tires can explode, causing the rim to fly off; resulting in possible serious personal injury, death, and property damage. Maintenance, repair, disassembly and assembly of the tires and rims require special equipment and technology, so always ask your Komatsu distributor to perform those tasks.



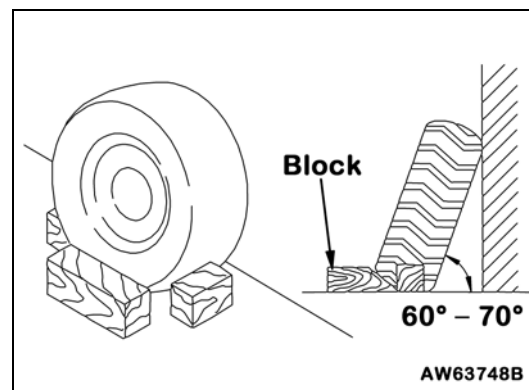
Observe the following precautions for safety.

- Only use tires recommended by Komatsu. It is very important to maintain the proper inflation pressure. See “Air Pressure Chart” on page 2-156.
- If the tire pressure deflates abnormally or the rim parts do not fit the tire, there is a problem with the tire or rim parts. Contact your Komatsu distributor for repairs.
- Never carry out welding or light a fire near the tire.
- Do not adjust tire inflation pressure immediately after traveling at high speed or operations under heavy load.
- Always release all pressure from a single tire, or from both tires of a dual assembly, prior to removing any rim components.
- Before removing the tire from the machine for repairs, remove the valve partially to release the air from the tire, then remove the tire.
- Make sure that there is nobody in the vicinity before starting to inflate a tire.
- Before inflating tires, always check the wheel rims, tire walls, and tread for cuts, broken cords, or other damage.
- If the rim parts are not fitted properly when the tire is being inflated, the rim parts may fly off, possibly causing serious injury, death or damage to property. Use a protective cage and do not stand directly in front of the rim. Stand beside the tread when inflating tire.
- When inflating tires use a compressed air gun with extension hose and pressure gauge. Check the pressure occasionally to prevent over inflation.
- Refer to “Check Tire Pressure” on page 3-54 for additional information about inflating tires.
- Refer to “HANDLING TIRES” on page 2-154 for information about the safe handling of tires and rims.



Storing Tires

- Tires for construction equipment are extremely heavy. Mishandling of these tires may lead to serious personal injury or death. To maintain safety, always respect these precautions.
 - As a basic rule, store the tires in a warehouse with restricted access to authorized personnel only.
 - If the tires must be stored outside, always erect a fence and put up “No Entry” signs.
 - Stand the tire on level ground at a 60° - 70° angle, and block it securely so that it cannot roll or fall over if any person should touch it.
 - Do not lay the tire on its side. This will deform the tire and cause it to deteriorate.
 - If the tire should fall over, do not attempt to stop it. Get out of the way quickly.

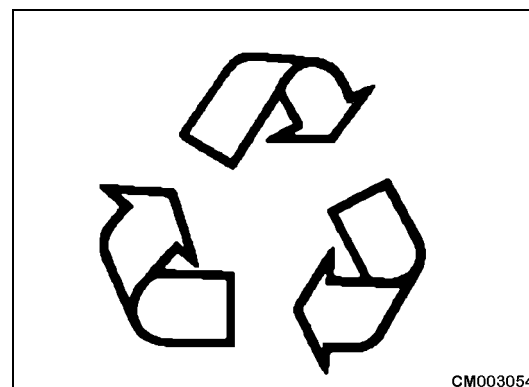
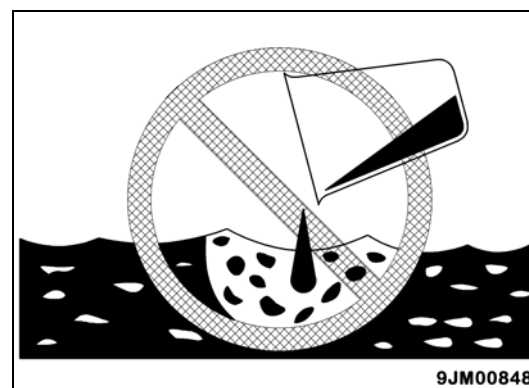


Using Compressed Air

- When cleaning with compressed air, there is a danger of serious personal injury caused by flying dust or particles.
- When using compressed air to clean the filter element or radiator, wear safety glasses, anti-dust mask, gloves, and other protective equipment.

Disposal of Waste Materials

- Never dump waste fluids in a sewer system, on the ground, in rivers, etc.
- Always drain fluids from your machine into the appropriate containers.
- Never drain fluids directly onto the ground.
- Obey appropriate laws and regulations when disposing of harmful objects such as oil, fuel, filters, batteries, coolant, brake fluid, and hydraulic oil.



Critical Parts

The material of these components naturally changes over time. Repeated use causes deterioration, wear, and fatigue. As a result, there is a danger that these components may fail and cause serious personal injury or death. It is difficult to judge the remaining life of these components from external inspection or the feeling when operating. These parts must be replaced at the specified interval.

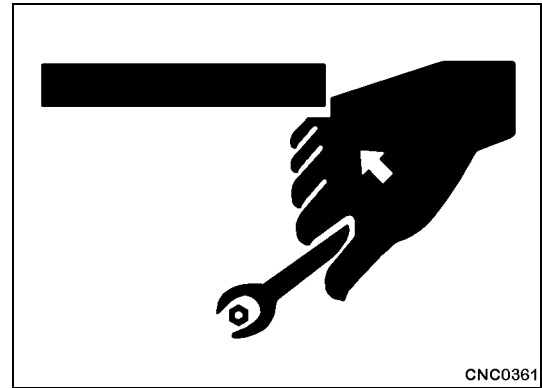
SAFETY

Replace or repair safety-critical parts if any defect is found, even when they have not reached the specified replacement time.

Some of the following systems contain components that may fail under extended use:

- Seat belts (see “Seat Belt Inspection” on page 1-11)
- Fuel supply and delivery hoses
- Hydraulic system: main delivery hoses and tubing
- Hydraulic hoses: all the hoses that feed and return the hydraulic fluid to and from the work equipment

For additional information, see “PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS” on page 3-22.



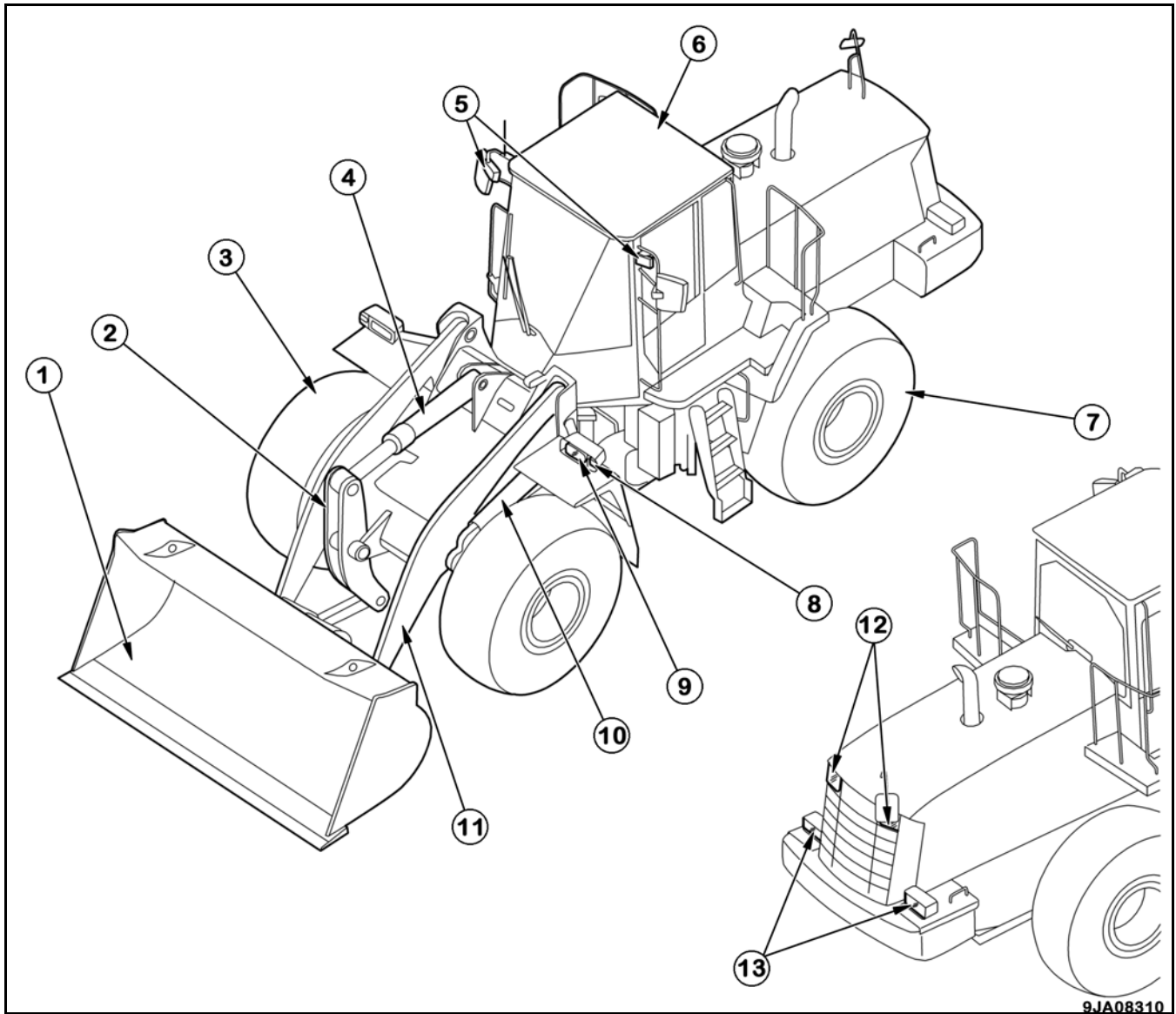
Maintenance of Air Conditioner

- ★ If air conditioner refrigerant gets into your eyes, it may cause loss of sight; if it contacts your skin, it may cause frostbite.
- **NEVER** touch the refrigerant.
- **NEVER** loosen any part of the refrigerant circuit.
- **NEVER** release any refrigerant into the atmosphere.

OPERATION

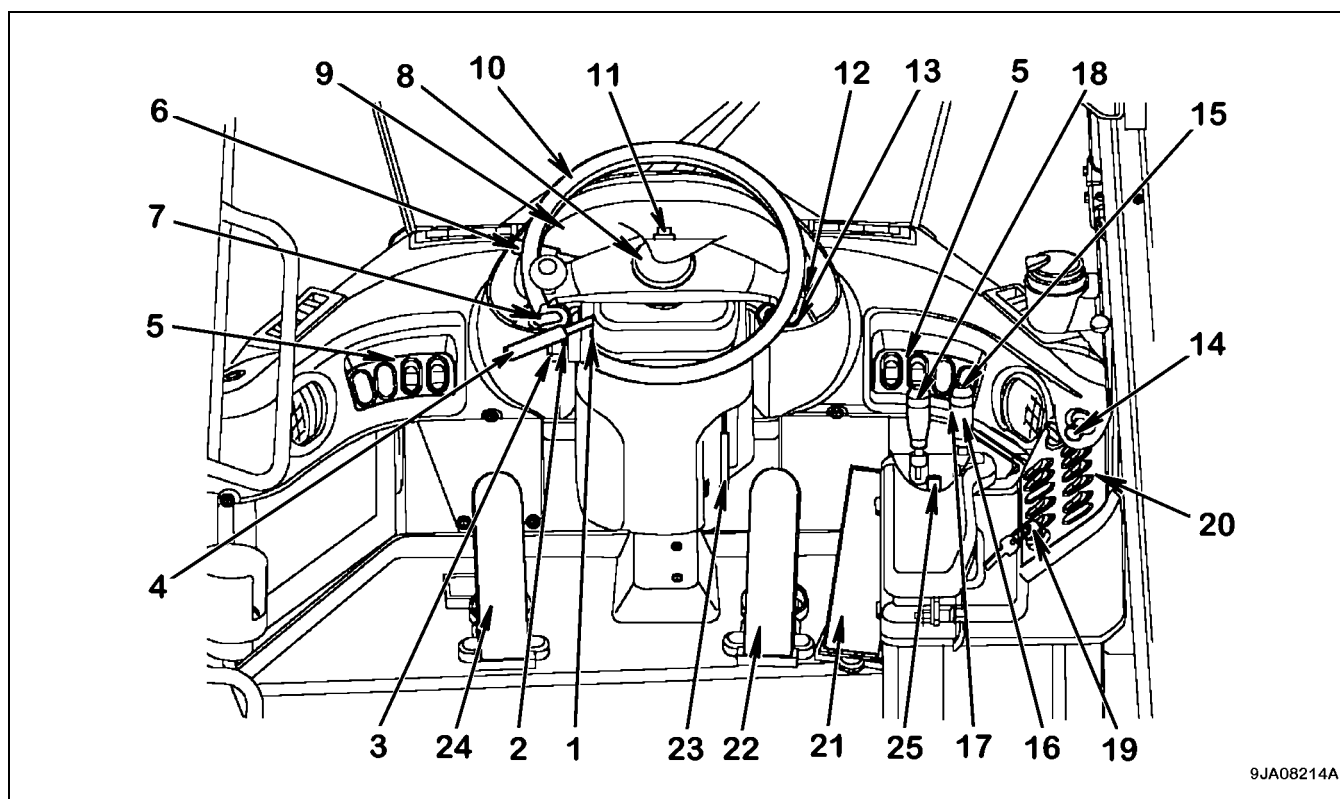
GENERAL VIEW

General View of Machine



- | | |
|-----------------------|---------------------------|
| 1. Bucket | 8. Turn signal lamp |
| 2. Bellcrank | 9. Head lamp |
| 3. Front wheel | 10. Lift cylinder |
| 4. Bucket cylinder | 11. Lift arm |
| 5. Front working lamp | 12. Rear working lamp |
| 6. ROPS cab | 13. Rear combination lamp |
| 7. Rear wheel | |

General View of Controls and Gauges



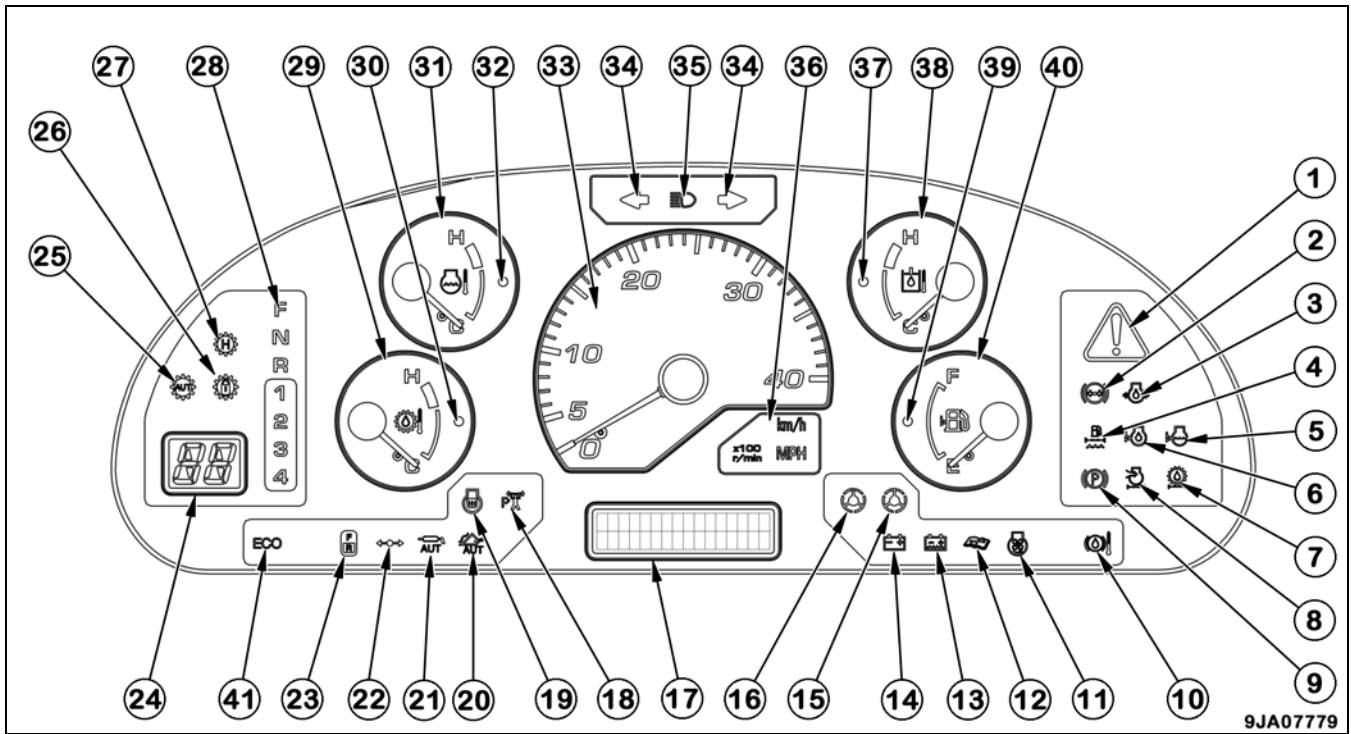
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- | | |
|----------------------------|-------------------------------|
| 1. Gearshift lever stopper | 13. Parking brake switch |
| 2. Rear wiper switch | 14. Cigarette lighter |
| 3. Front wiper switch | 15. Kickdown switch |
| 4. Gearshift lever | 16. Lift arm control lever |
| 5. Front switch panel | 17. Hold switch |
| 6. Directional lever | 18. Bucket control lever |
| 7. ECSS switch* | 19. Starting switch |
| 8. Horn button | 20. Right switch panel |
| 9. Machine monitor | 21. Accelerator pedal |
| 10. Steering wheel | 22. Right brake pedal |
| 11. Hazard lamp switch | 23. Steering tilt lock lever |
| 12. Lamp switch | 24. Left brake pedal |
| Turn signal lever | 25. Work equipment lock lever |
| Dimmer switch | |

* ECSS = Electronic Controlled Suspension System

OPERATION

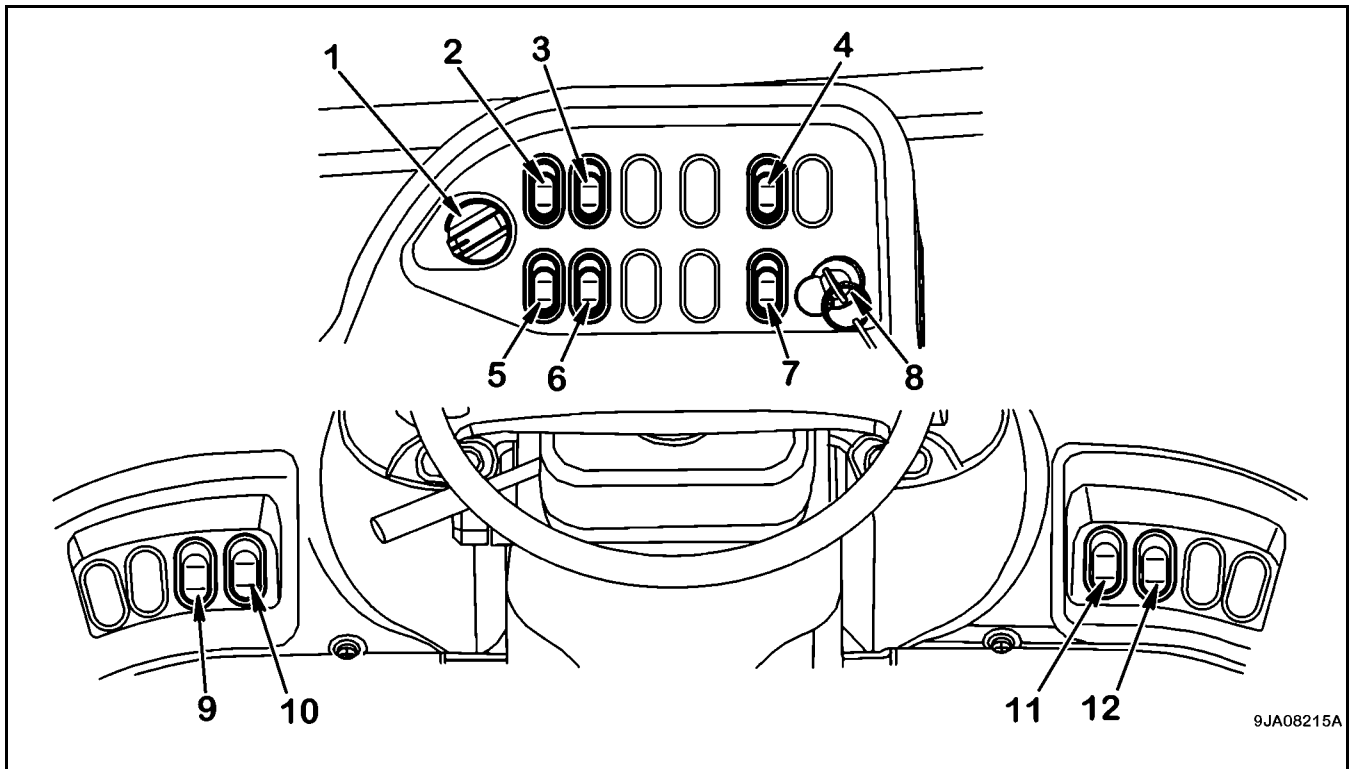
Machine Monitor



1. Central warning lamp
2. Brake oil pressure caution lamp
3. Engine oil pressure caution lamp
4. Water separator caution lamp
5. Radiator coolant level caution lamp
6. Engine oil level caution lamp
7. Transmission oil filter clogging caution lamp
8. Air cleaner clogging caution lamp
9. Parking brake pilot lamp
10. Brake oil temperature caution lamp
11. Cooling fan reverse rotation pilot lamp
12. Maintenance caution lamp
13. Battery electrolyte level caution lamp (if equipped)
14. Battery charge circuit caution lamp
15. Steering oil pressure caution lamp (if equipped)
16. Emergency steering pilot lamp (if equipped)
17. Character display portion
18. Power mode pilot lamp (P mode)
19. Preheating pilot lamp
20. Semi-auto digging pilot lamp (if equipped)
21. Auto-greasing pilot lamp (if equipped)
22. Joystick pilot lamp (if equipped)
23. Directional selector pilot lamp
24. Shift indicator
25. Auto-shift pilot lamp
26. Torque converter lockup pilot lamp
27. Shift hold pilot lamp
28. Shift lever position pilot lamp
29. Torque converter oil temperature gauge
30. Torque converter oil temperature caution lamp
31. Engine coolant temperature gauge
32. Engine coolant temperature caution lamp
33. Speedometer
34. Turn signal pilot lamp
35. Head lamp high beam pilot lamp
36. Meter display pilot lamp
37. Hydraulic oil temperature caution lamp
38. Hydraulic oil temperature gauge
39. Fuel level caution lamp
40. Fuel gauge
41. Economy operation display lamp

OPERATION

Switch Panel



Right Switch Panel

1. Transmission shift mode selector switch
2. Transmission cutoff switch
3. Transmission cutoff set switch
4. Emergency steering switch (if equipped)
5. Power mode selector switch
6. Torque converter lockup switch
7. Cooling fan reverse rotation switch
8. Starting switch

Front Switch Panel

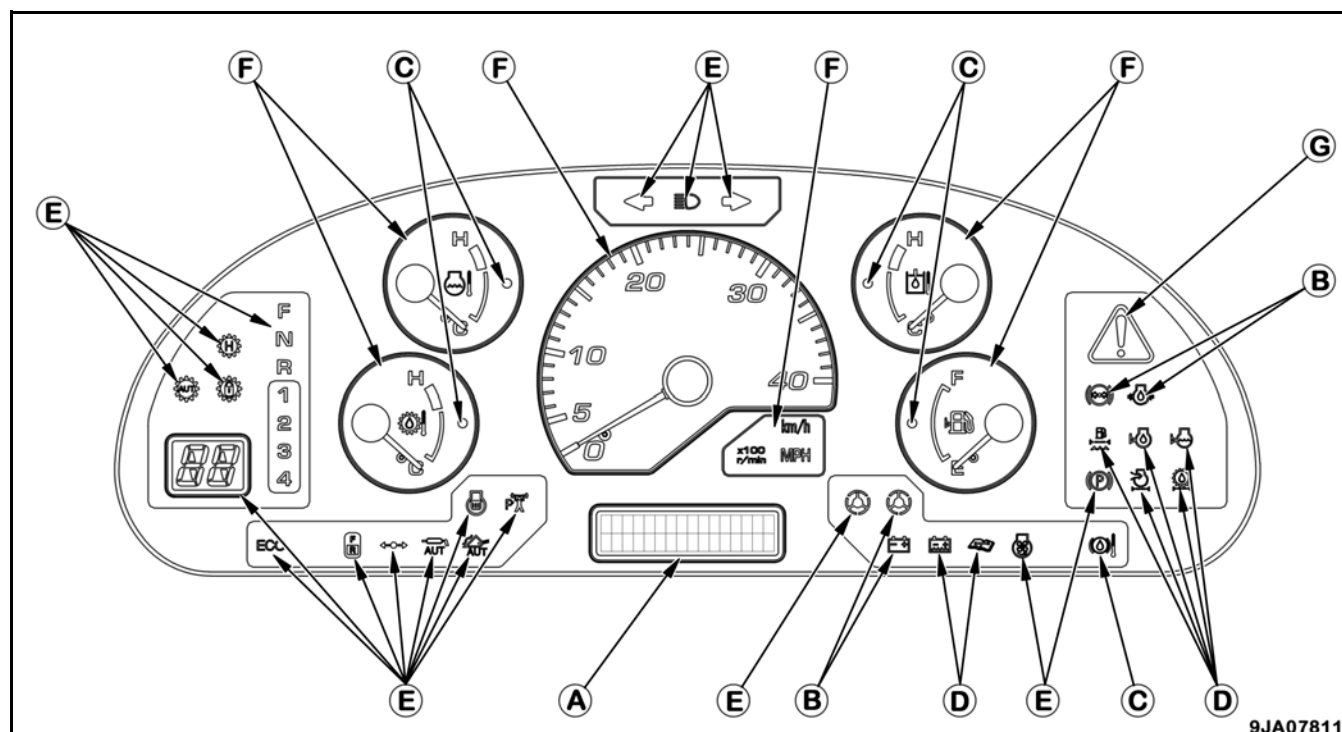
9. Machine monitor mode selector switch 1
10. Machine monitor mode selector switch 2
11. Front working lamp switch
12. Rear working lamp switch

EXPLANATION OF COMPONENTS

This section provides an explanation of the devices needed for operating the machine.

To perform suitable operations correctly and safely, it is important to completely understand the methods of operating the equipment and the meaning of the displays.

Machine Monitor



- | | |
|-------------------------------------|--------------------------|
| A. Character display portion | E. Pilot display portion |
| B. Emergency stop items | F. Meter display portion |
| C. Caution items | G. Central warning lamp |
| D. Inspection and maintenance items | |

Remark

Before the engine is started and when the starting switch is turned to the ON position, a system check is carried out. The central warning lamp, caution lamps, and pilot lamps light up for two seconds.

After the alarm buzzer sounds for two seconds, it stops to indicate that everything is normal.

The shift indicator displays "88" for two seconds.

The indicator gauges and meters start to work after the system check is completed.

The character display shows "KOMATSU" for three seconds.

If the lamps do not light up, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.

OPERATION

Types of Warnings

If an abnormality occurs on the machine or if any switch or lever is operated accidentally, the monitor display and buzzer give a warning to inform the operator.

The types of warnings are explained in the following paragraphs. These warnings are divided into different danger levels.

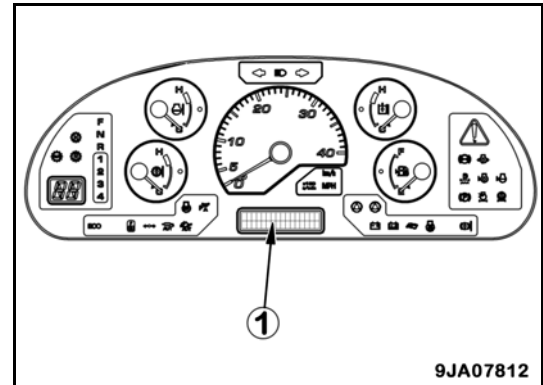
Remark

For details of action codes E03 to E01, see "Action Code Display" on page 2-10.

Emergency Stop

This warning is given if there is a serious failure that affects the normal operation of the machine or if the setting is incorrect.

The central warning lamp on the monitor and the caution lamp for the location of the abnormality illuminate. At the same time, the alarm buzzer sounds and action code E03 is displayed on character display (1).



Caution

This warning is given if the coolant or oil overheats.

The central warning lamp on the monitor and the individual caution lamps illuminate. At the same time, the alarm buzzer sounds and action code E02 is displayed on character display (1).

Mistaken Operation

This warning is given if any switch or lever is operated by mistake.

The central warning lamp on the monitor illuminates and the alarm buzzer sounds at the same time.

Inspection and Maintenance

This warning is given if it is necessary to carry out inspection and maintenance of wear parts, or if it is necessary to check the oil or coolant level.

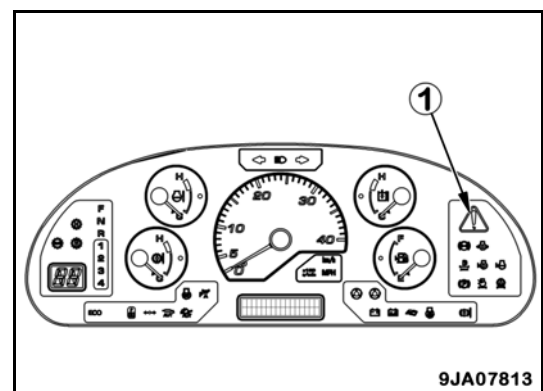
The individual caution lamp on the monitor illuminates. At the same time, action code E01 is displayed on character display (1).

In the case of this warning, the central warning lamp does not illuminate and the alarm buzzer does not sound.

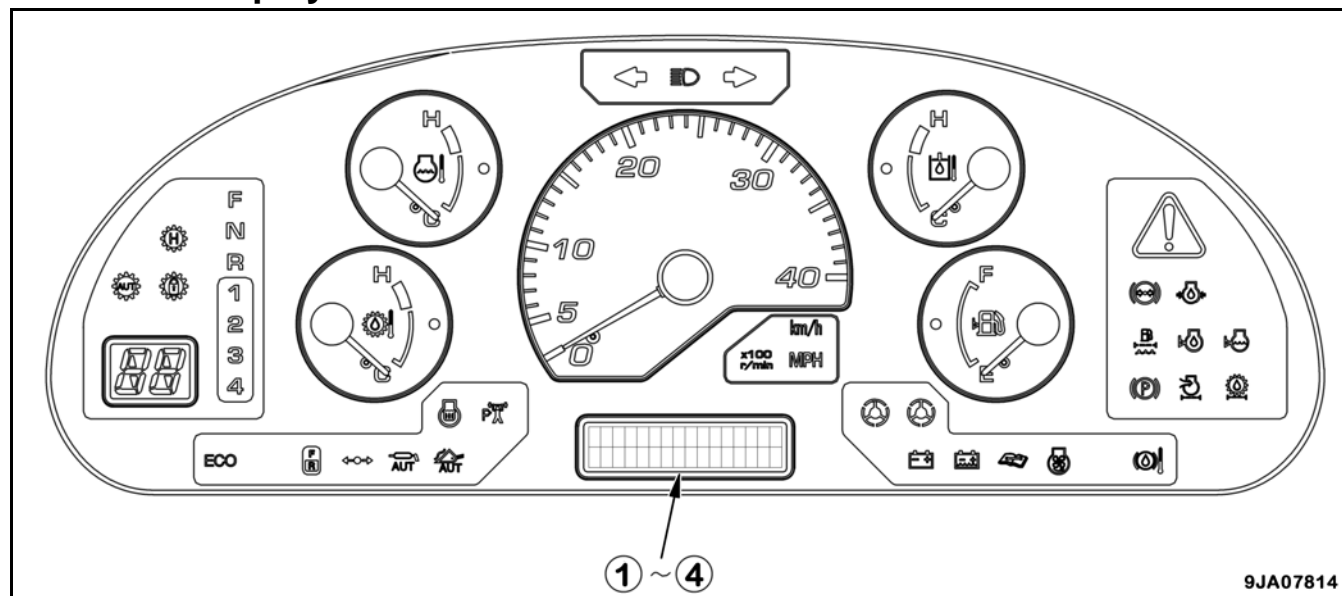
Central Warning Lamp

The central warning lamp (1) illuminates if there is any emergency stop item or caution item, or if mistaken operation of any switch or lever occurs. At the same time, the alarm buzzer sounds.

Check the content of the display and carry out the specified action for that item.



Character Display Portion



1. Service meter
2. Action code display
3. Failure code display
4. Filter, oil replacement time display

Normally, the service meter is displayed on the character display.

An action code is displayed to recommend suitable action in any of the following circumstances:

- There is a failure on the machine.
- There has been an excessive load on the machine.
- It is necessary to carry out inspection and maintenance.

When the time for replacing the filter or changing the oil is reached, the appropriate caution lamp on the maintenance monitor indicates the filter or oil that must be replaced.

Remark

Information regarding the failure of the machine or maintenance is displayed on the character display when the starting switch is at the ON position.

Check the display to confirm that there is no abnormality before starting to travel.

OPERATION

Service Meter

The service meter (1) shows the total number of hours that the machine has been working.

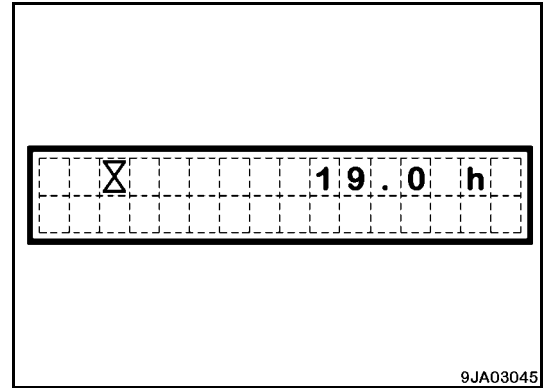
If the engine is running, the service meter advances even if the machine is not being operated.

The service meter advances one for every hour of operation, regardless of the engine speed.

Even if the starting switch is OFF, the service meter is displayed on the top line if the top (◇) portion of the machine monitor mode selector switch 1 is kept pressed.

Remark

When the starting switch is at the OFF position and if the service meter is displayed even though the top (◇) of machine monitor mode selector switch 1 is not pressed, there is probably a failure in the machine. Contact your Komatsu distributor for inspection.



Action Code Display



- If action code E03 is displayed, stop the machine immediately and check the failure code. For details, see "Failure Code Display" on page 2-11.
- Inform your Komatsu distributor of the failure code and ask for repairs.

If there is a failure on the machine, or if it is necessary to change the method of operation, or if inspection or maintenance must be carried out, action code E01, E02, or E03 is displayed on the character display in display portion (2).

If different failures occur at the same time, the action code for the more serious problem is displayed.

Level of seriousness:

- E03 = most serious
- E02 = less serious
- E01 = least serious

In the case of action codes E02 and E03, the alarm buzzer sounds intermittently and the central warning lamp illuminates.

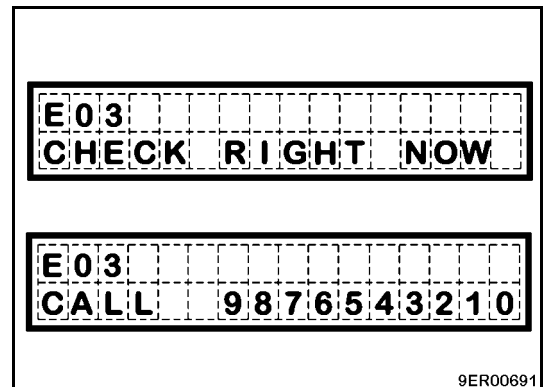
If action code E01, E02, or E03 is displayed on the character display, stop operations; check the content of the display; and take the following action.

E03: When this code is displayed, stop the machine immediately; check the failure code; and contact your Komatsu distributor for repairs.

Remark

"E03" is displayed on the top line of the character display and "CHECK RIGHT NOW" and "CALL" are displayed in turn on the bottom line for three seconds each.

The telephone number is displayed to the right of the "CALL" display. If no telephone number has been set, the display is blank. For instructions on setting the telephone number, see "Entering Telephone Number" on page 2-35.

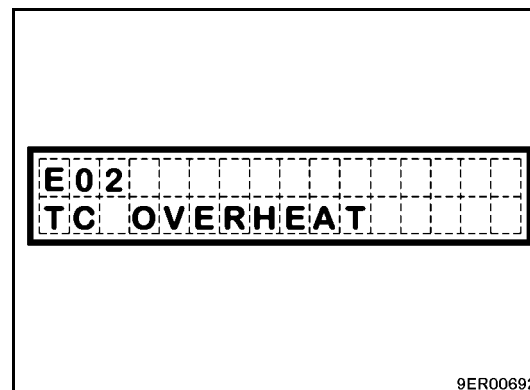


E02: If this code is displayed, stop the machine and run the engine under no load at a mid-range speed.

- If an action code is still displayed after taking the necessary action, check the failure code and contact your Komatsu distributor for repairs.

Remark

The top line of the character display displays “E02” and the bottom line displays the condition of the machine related to overheating.

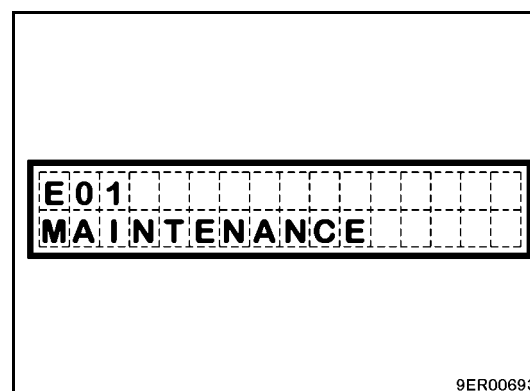


E01: If there is any problem on the machine, such as a drop in the engine coolant level, the location for maintenance is displayed.

- If the maintenance caution lamp illuminates at the same time, inspect and perform maintenance of the item indicated after completion of the day’s work or when changing shifts.
- If “E01” and “MAINTENANCE” are displayed, check the failure code and ask for repairs to be carried out.

Remark

“E01” is displayed on the top line of the character display and “MAINTENANCE” or the part of the machine requiring inspection, filling of fluid, or replacement is displayed on the bottom line.



Failure Code Display

If an action code is displayed on the character display, check the failure code according to the failure code display method described below.

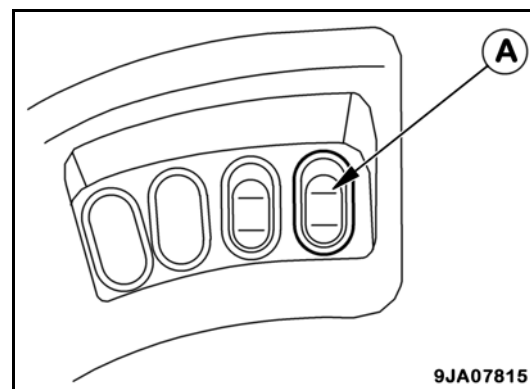
When contacting your Komatsu distributor to request repairs, inform your distributor of the failure code.

Method of Displaying Failure Code

1. If an action code is displayed on the character display of display portion (3), press the top (>) portion of machine monitor mode selector switch 2 (A).

The screen changes from the action code to the failure code.

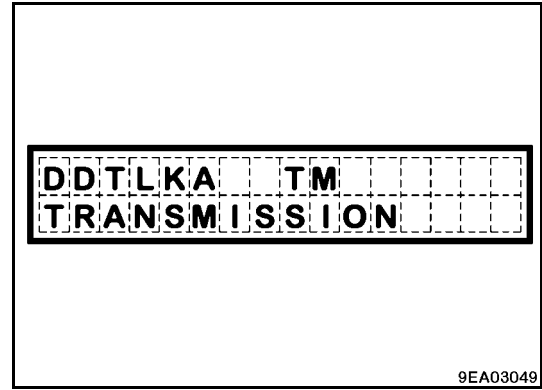
- The failure code is displayed with the first six digits on the left of the top line of the character display.
- The code displayed after the space on the right side of the failure code indicates the controller that detected the failure code.



OPERATION

- The component causing the failure is displayed on the bottom line of the character display.

Top Right Code	Controller Detecting Failure Code
MON	Machine monitor
TM	Transmission controller
WRK	Work equipment controller
ENG	Engine controller

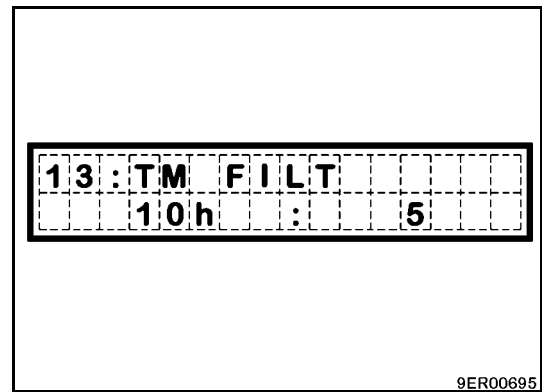


- Press the top (>) of machine monitor mode selector switch 2 (A).
 - If the condition is normal, the service meter is displayed for several seconds and then the display returns to the action code display.
 - If more than one failure has occurred at the same time, the next failure code is displayed.

Filter, Oil Replacement Time Display

After the starting switch is turned ON and the system check is completed, the filter, oil replacement time display (4) displays (for approximately 30 seconds) the filter and oil items that are near to the replacement time. The maintenance caution lamp also flashes or lights up at this time.

- After replacing the filter or changing the oil, reset the replacement interval.
- ★ For details, see “Resetting Filter, Oil Replacement Time” on page 2-34.



Remark

The ID number and item name of the item needing replacement are displayed on the top line of the character display. The time remaining until replacement and the total number of times that replacement was carried out are displayed on the bottom line.

If the replacement time has already passed, a minus (-) sign appears before the time.

After the display appears for 30 seconds, it does not appear again until the starting switch is turned to the ON position.

The message in the illustration is not shown on the character display if an action code is being displayed.

If there are two or more items to be displayed, the display changes repeatedly every three seconds. If there are more than 10 items, all the items are displayed once each and then the display returns to the normal display.

The display appears when there are 30 hours remaining until the filter or oil replacement time. If the replacement time has passed, a minus (-) sign appears before the time for the first 30 hours. When more than 30 hours have passed, the display is no longer given.

The maintenance caution lamp flashes as the replacement time approaches; after the replacement time has passed, it illuminates.

Items for Display of Filter, Oil Replacement Time

Item	Replacement Interval (H)	Character Display	ID Number
Engine oil	500	ENG OIL	01
Engine oil filter	500	ENG FILT	02
Fuel prefilter	500	FUEL P FILT	41
Transmission oil filter	1000	TM FILT	13
Fuel filter	1000	FUEL FILT	03
Transmission oil	1000	TM OIL	12
Corrosion resistor	1000	CORR RES	06
Hydraulic tank breather element	2000	HYD BREATH	05
Hydraulic filter	2000	HYD FILT	04
Hydraulic oil	2000	HYD OIL	10
Axle oil	2000	AXLE OIL	15

Remark

See the following sections for the procedures for replacing the oil and filters.

Engine Oil

See “Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge” on page 3-67.

Engine Oil Filter

See “Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge” on page 3-67.

Fuel Prefilter

See “Replace Fuel Prefilter Cartridge” on page 3-69.

Fuel Main Filter

See “Replace Fuel Main Filter Cartridge (Standard Specification)” on page 3-71.

See “Replace Fuel Main Filter Cartridge (Poor Fuel Arrangement Specification)” on page 3-73.

Corrosion Resistor

See “Replace Corrosion Resistor Cartridge (Standard Specification)” on page 3-77.

See “Replace Corrosion Resistor Cartridge (Poor Fuel Arrangement Specification)” on page 3-77.

Transmission Oil

See “Change Oil in Transmission Case, Replace Oil Filter Cartridge, Clean Strainer” on page 3-75.

Transmission Oil Filter

See “Change Oil in Transmission Case, Replace Oil Filter Cartridge, Clean Strainer” on page 3-75.

OPERATION

Hydraulic Oil Filter

See “Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element” on page 3-78.

Hydraulic Tank Breather Element

See “Replace Hydraulic Tank Breather Element” on page 3-81.

Hydraulic Oil

See “Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element” on page 3-78.

Axle Oil

See “Change Axle Oil” on page 3-82.

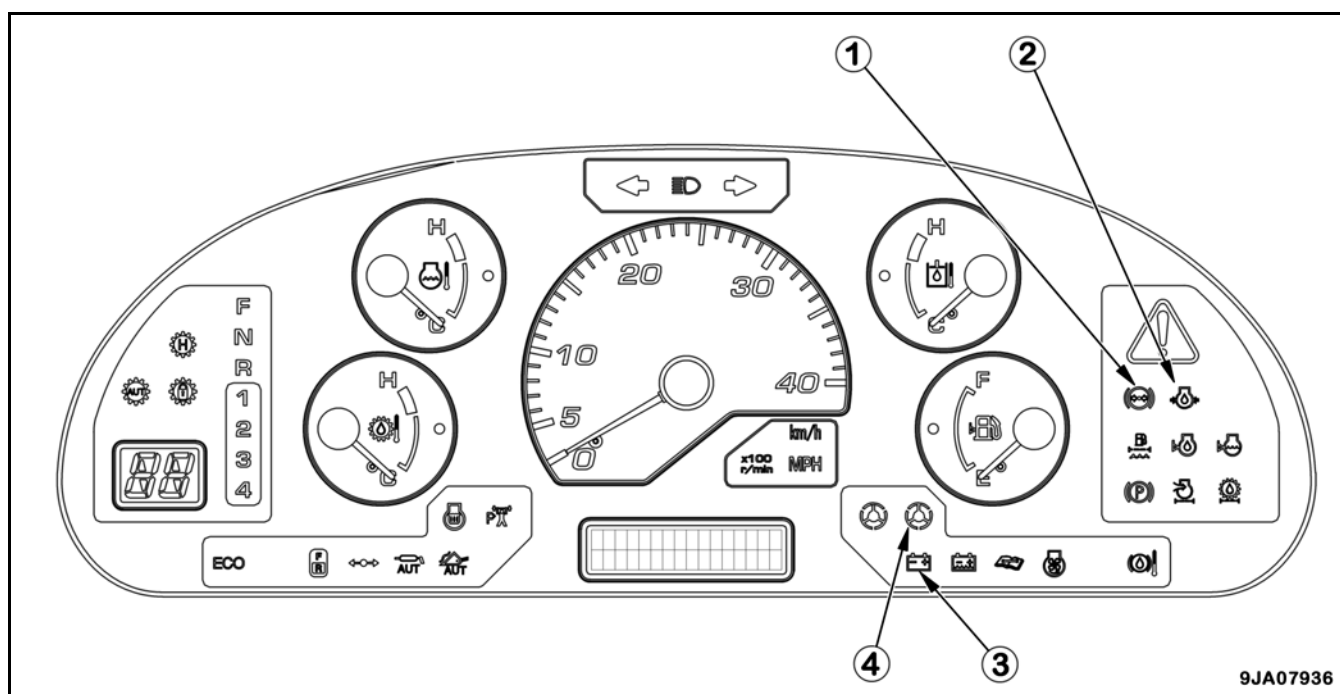
Emergency Stop Items

WARNING

If these lamps light up and the buzzer sounds, stop operations immediately and carry out inspection and maintenance of the applicable location.

If there is any abnormality in any emergency stop item, the alarm buzzer sounds intermittently and the caution lamp for the location of the abnormality and the central warning lamp light up.

At the same time, “E03” is displayed on the top line of the character display and “CHECK RIGHT NOW” and “CALL” on the bottom line alternately for three seconds. Stop the machine immediately in a safe place; stop the engine; and carry out inspection.



1. Brake oil pressure caution lamp
2. Engine oil pressure caution lamp
3. Battery charge circuit caution lamp
4. Steering oil pressure caution lamp (if equipped)

OPERATION

Brake Oil Pressure Caution Lamp

The brake oil pressure caution lamp (1) illuminates when the brake oil pressure goes below the specified value.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

Because the brake circuit is not actuated, the brake oil pressure caution lamp and central warning lamp do not illuminate and the alarm buzzer does not sound.

- During operation (engine running)

If the brake oil pressure goes down during operation, the brake oil pressure caution lamp and central warning lamp illuminate and the alarm buzzer sounds intermittently.

At the same time, “E03” is displayed on the top line of the character display and “CHECK RIGHT NOW” and “CALL” alternately on the bottom line for three seconds each.

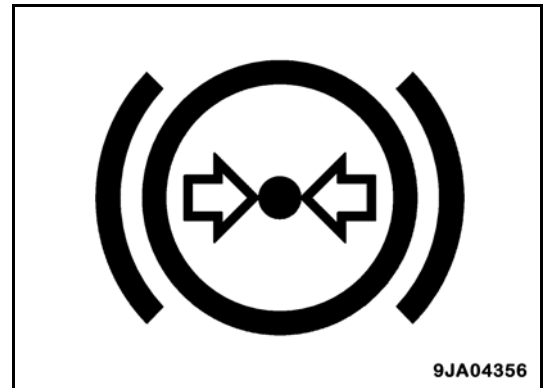
- ★ Stop the machine immediately in a safe place; stop the engine; and carry out inspection.

When the brake oil pressure caution lamp illuminates, it may be impossible to operate the brakes.

- ★ Leave the parking brake applied to prevent the machine from moving.

Immediately after the engine starts, the accumulator is in the process of storing pressure. The brake oil pressure caution lamp illuminates but the central warning lamp does not illuminate and the alarm buzzer does not sound.

- ★ Do not move the machine until the brake pressure becomes normal and the brake oil pressure caution lamp goes out.
Keep the parking brake applied.



Engine Oil Pressure Caution Lamp

The engine oil pressure caution lamp (2) illuminates to warn the operator that the engine lubricating oil pressure has dropped.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

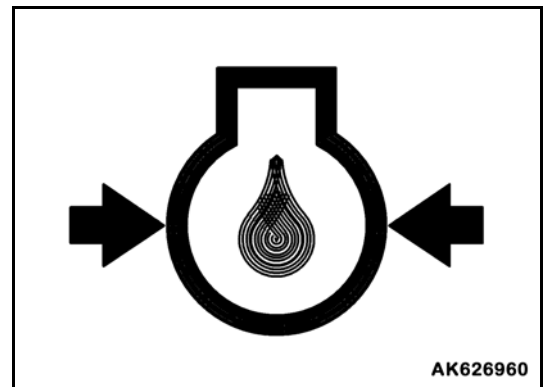
This lamp does not illuminate.

- During operation (engine running)

If the engine lubricating oil pressure goes down during operation, the engine lubricating oil pressure caution lamp and central warning lamp illuminate and the alarm buzzer sounds intermittently.

At the same time, “E03” is displayed on the top line of the character display and “CHECK RIGHT NOW” and “CALL” alternately on the bottom line for three seconds each.

- ★ Stop the machine immediately in a safe place; stop the engine; and carry out inspection.



Battery Charge Circuit Caution Lamp

The battery charge circuit caution lamp (3) illuminates when the engine is running. The lamp warns the operator that an abnormality has occurred in the charging circuit.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

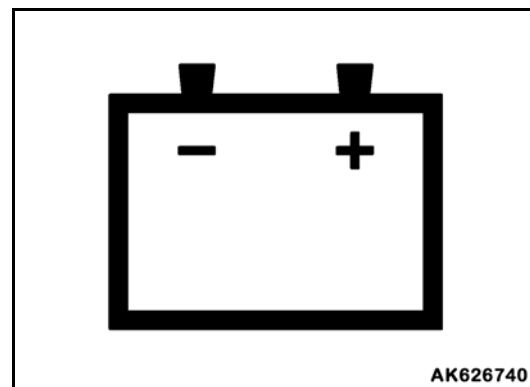
The lamp does not illuminate.

- During operation (engine running)

If an abnormality occurs in the charging circuit during operation, the battery charge circuit caution lamp and central warning lamp illuminate and the alarm buzzer sounds intermittently.

At the same time, “E03” is displayed on the top line of the character display and “CHECK RIGHT NOW” and “CALL” alternately on the bottom line for three seconds each.

- ★ Stop the machine immediately in a safe place; stop the engine; and carry out inspection.



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Steering Oil Pressure Caution Lamp (if equipped)

The steering oil pressure caution lamp (4) illuminates (glows red) if the steering oil pressure has dropped.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

The lamp does not illuminate. However, it lights up during the self-check of the emergency steering.

- During operation (engine running)

If the steering oil pressure drops, the steering oil pressure caution lamp illuminates; the central warning lamp lights up; and the alarm buzzer sounds intermittently.

At the same time, “E03” is displayed on the top line of the character display and “CHECK RIGHT NOW” and “CALL” alternately on the bottom line for three seconds each.

- ★ Stop the machine immediately in a safe place; stop the engine; and carry out inspection.



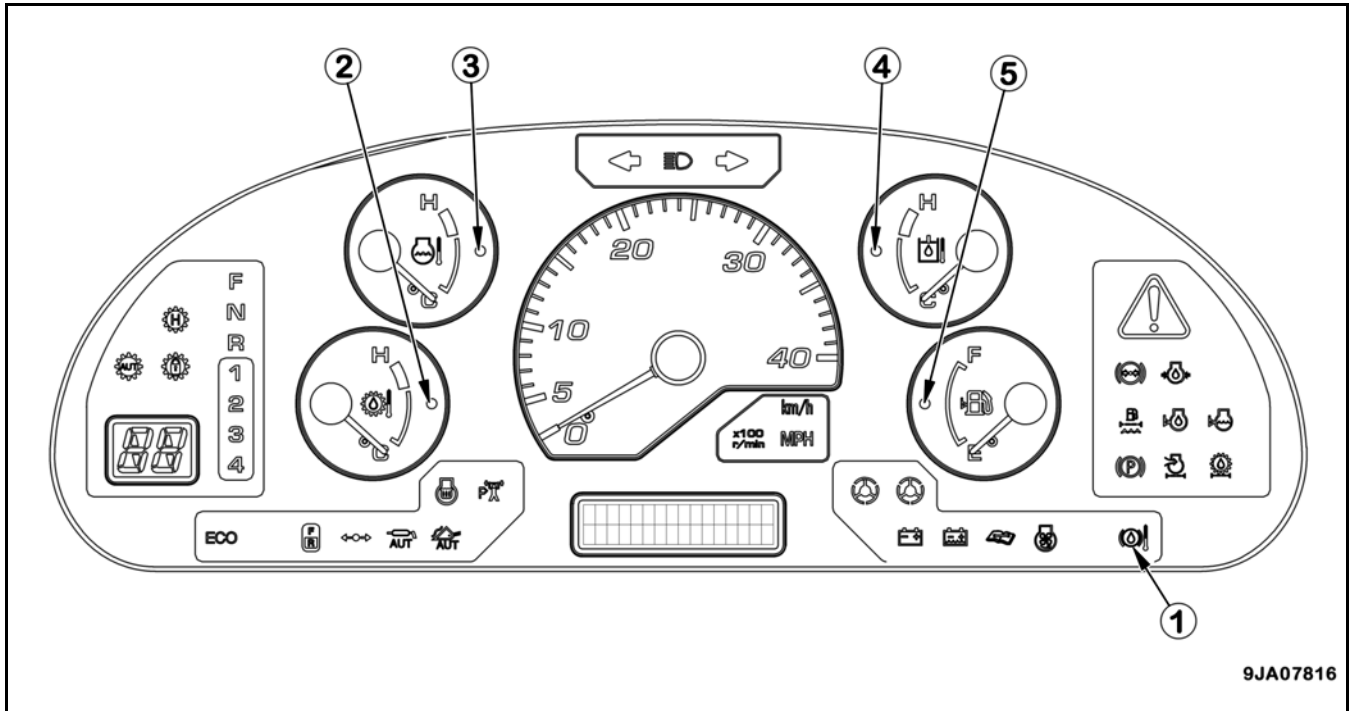
AK626750

OPERATION

Caution Items

! WARNING

If these lamps illuminate, stop operations quickly and carry out inspection and maintenance of the applicable location.



1. Brake oil temperature caution lamp
2. Torque converter oil temperature caution lamp
3. Engine coolant temperature caution lamp
4. Hydraulic oil temperature caution lamp
5. Fuel level caution lamp

Brake Oil Temperature Caution Lamp

The brake oil temperature caution lamp (1) illuminates to warn the operator that the brake oil temperature has increased.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

The lamp does not illuminate.

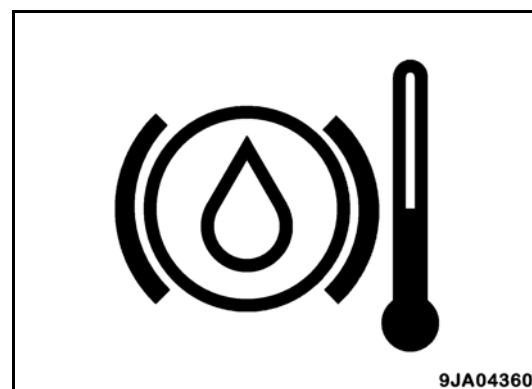
- During operation (engine running)

In continuous heavy-duty operations or when traveling long distances downhill where the brake is used frequently, the brake oil temperature increases. The brake oil temperature caution lamp illuminates; the central warning lamp illuminates; and the alarm buzzer sounds intermittently.

At the same time, “E02” is displayed on the top line of the character display and “BRAKE OVERHEAT” on the bottom line.

Take the following action.

- ★ Release the accelerator pedal and move the gearshift lever down one range to reduce the travel speed.
- ★ Avoid using the brake.
 - Do not keep the brake pedal depressed continuously; use the brake only intermittently.
 - Set the transmission cutoff switch to the ON position when carrying out operations.
 - If use of the brake is reduced for a short time in this manner, the brake oil temperature decreases and the caution lamp goes out.



Torque Converter Oil Temperature Caution Lamp

The torque converter oil temperature caution lamp (2) illuminates to warn the operator that the torque converter oil temperature has increased.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

The lamp does not illuminate.

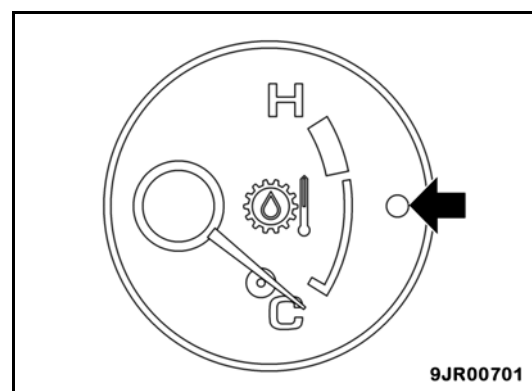
- During operation (engine running)

If the torque converter oil temperature increases, the torque converter oil temperature caution lamp illuminates.

If the oil temperature increases further, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

At the same time, “E02” is displayed on the top line of the character display and “TC OVERHEAT” on the bottom line.

- ★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



OPERATION

Engine Coolant Temperature Caution Lamp

The engine coolant temperature caution lamp (3) illuminates to warn the operator that the engine coolant temperature has increased.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

The lamp does not illuminate.

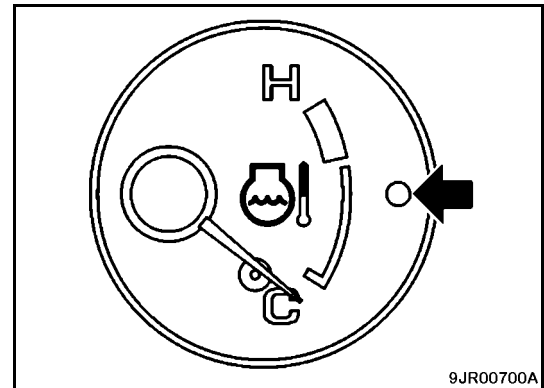
- During operation (engine running)

If the engine coolant temperature increases, the engine coolant temperature caution lamp illuminates.

If the coolant temperature increases further, the central warning lamp illuminates and the alarm buzzer sounds intermittently.

At the same time, “E02” is displayed on the top line of the character display and “ENGINE OVERHEAT” on the bottom line.

- ★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



Hydraulic Oil Temperature Caution Lamp

The hydraulic oil temperature caution lamp (4) illuminates to warn the operator that the hydraulic oil temperature has increased.

- When carrying out the check before starting (starting switch at the ON position, engine stopped)

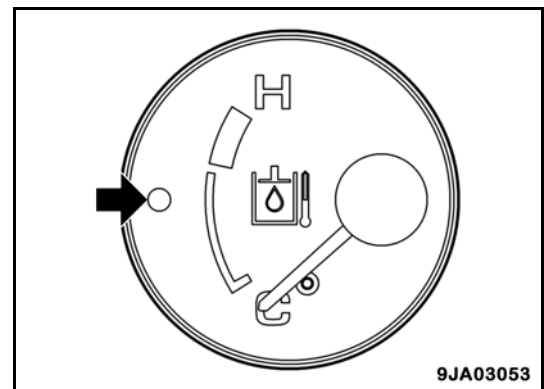
The lamp does not illuminate.

- During operation (engine running)

If the hydraulic oil temperature increases, the hydraulic oil temperature caution lamp and the central warning lamp illuminate; the alarm buzzer sounds intermittently.

At the same time, “E02” is displayed on the top line of the character display and “HYD OVERHEAT” on the bottom line.

- ★ Stop the machine and run the engine under no load at a mid-range speed until the lamp goes out.



Fuel Level Caution Lamp

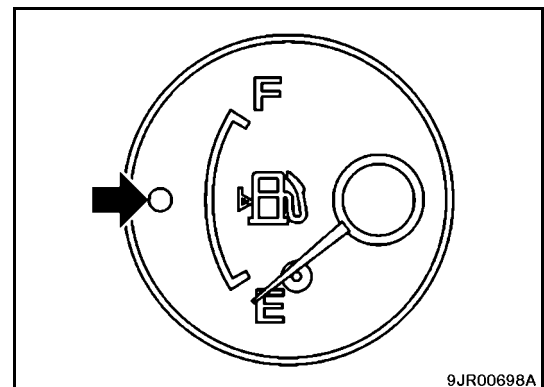
The fuel level caution lamp (5) illuminates when the amount of fuel remaining in the fuel tank goes below 35 ℓ (9.25 gal).

If the lamp illuminates, check the fuel level immediately and add fuel.

- ★ For details, see “Check Fuel Level, Add Fuel” on page 2-87.

Remark

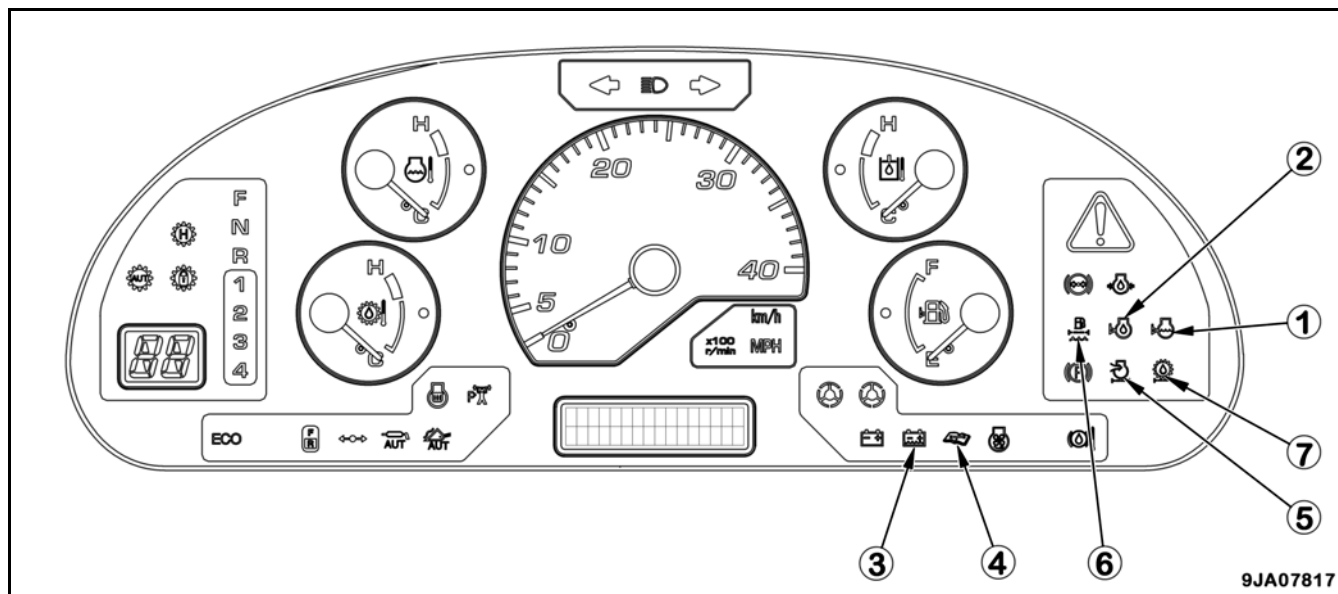
Even if the caution lamp illuminates, action code E02 is not displayed on the character display.



Inspection and Maintenance Items

WARNING

If these lamps illuminate, stop operations quickly and carry out inspection and maintenance of the applicable location.



- | | |
|---|--|
| 1. Radiator coolant level caution lamp | 5. Air cleaner clogging caution lamp |
| 2. Engine oil level caution lamp | 6. Water separator caution lamp |
| 3. Battery electrolyte level caution lamp (if equipped) | 7. Transmission oil filter clogging caution lamp |
| 4. Maintenance caution lamp | |

Radiator Coolant Level Caution Lamp

The radiator coolant level caution lamp (1) illuminates to warn the operator that the water level in the radiator has decreased.

- During checks before starting (starting switch at the ON position, engine stopped)

This monitor illuminates if the coolant level in the radiator is low.

At the same time, “E01” is displayed on the top line of the character display and “COOLANT LOW” on the bottom line.

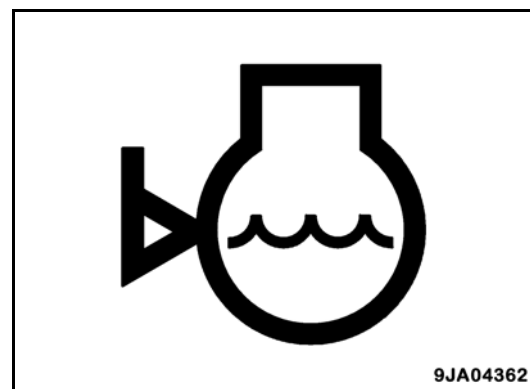
★ Check the coolant level in the radiator subtank and add water.

- During operation (engine running)

If the water level in the radiator drops too low, the radiator coolant level caution lamp illuminates.

At the same time, “E01” is displayed on the top line of the character display and “COOLANT LOW” on the bottom line.

★ Stop the engine; check the water level in the radiator subtank; and add water.



OPERATION

Engine Oil Level Caution Lamp

The engine oil level caution lamp (2) illuminates to warn the operator that the oil level in the engine oil pan has dropped.

- During checks before starting (starting switch at the ON position, engine stopped)

This monitor lights up if the oil level in the engine oil pan is low.

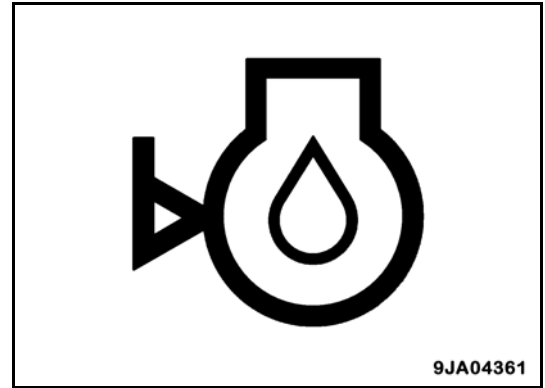
At the same time, “E01” is displayed on the top line of the character display and “COOLANT LOW” on the bottom line.

- ★ Do not start the engine. Check the oil level in the engine oil pan and add oil.

Remark

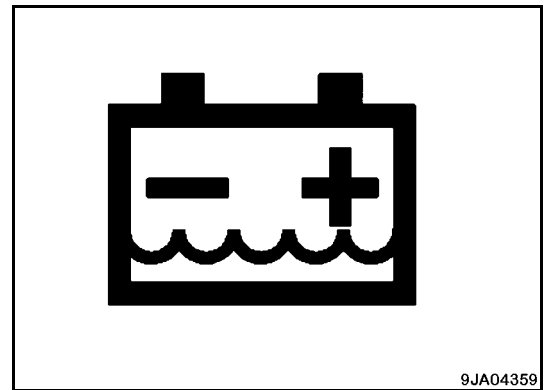
During checks before starting, if the engine is started with the engine oil level caution lamp illuminated, the lamp will stay lit.

Stop the engine; check the oil level in the engine oil pan; and add oil.



Battery Electrolyte Level Caution Lamp (if equipped)

The battery electrolyte level caution lamp (3) is not used.



Maintenance Caution Lamp



If the caution monitor lamp illuminates, repair the problem as soon as possible. If the problem is not repaired, a failure will occur.

When the time for an oil change is reached, the maintenance caution lamp (4) flashes or illuminates for approximately 30 seconds after completion of the system check when the starting switch is at the ON position.

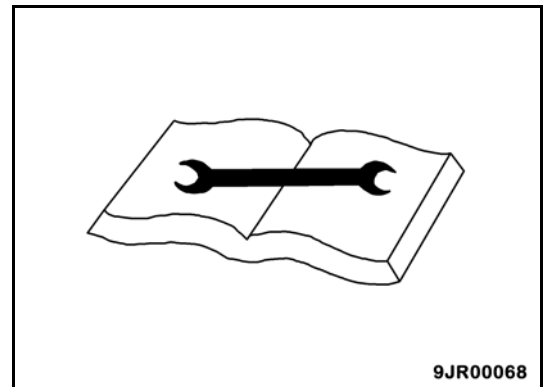
Remark

The maintenance caution lamp flashes when there is less than 30 hours to the replacement time. After the replacement time has passed, it stays on.

- ★ For details about the items included in the filter and oil replacement, see “Filter, Oil Replacement Time Display” on page 2-12.

After replacing the filter or changing the oil, reset the replacement time.

- ★ For details, see “Resetting Filter, Oil Replacement Time” on page 2-34.



Air Cleaner Clogging Caution Lamp

The air cleaner clogging caution lamp (5) illuminates to warn the operator that the air cleaner element is clogged.

- During checks before starting (starting switch at ON position, engine stopped)

The lamp does not illuminate.

- During operation (engine running)

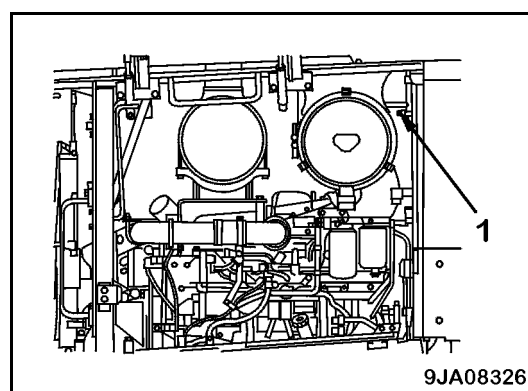
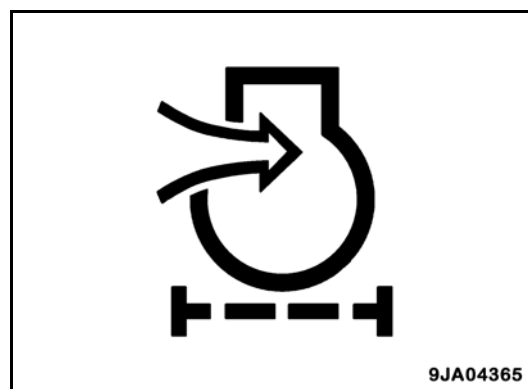
The air cleaner clogging caution lamp illuminates if the air cleaner element is clogged.

At the same time, “E01” is displayed on the top line of the character display and “AIR FILTER” on the bottom line.

- ★ Stop the engine and clean or replace the element.

Remark

It is possible to check whether the air cleaner is clogged by using the dust indicator (1) installed at the side of the air cleaner.

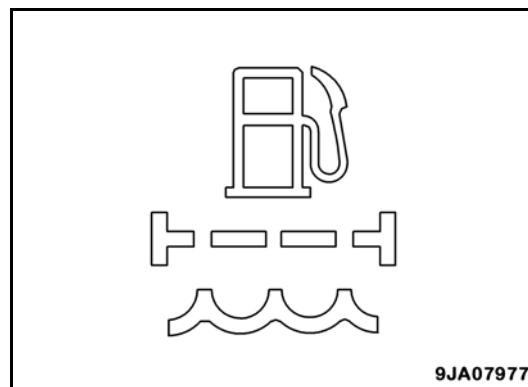


Water Separator Caution Lamp

The water separator caution lamp (6) illuminates if water accumulates in the water separator installed to the fuel prefilter.

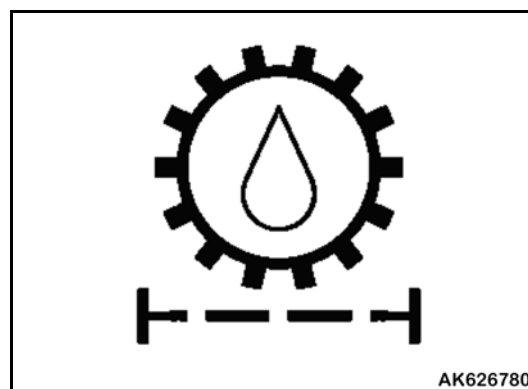
If the lamp lights up, check the prefilter.

- ★ For details, see “Replace Fuel Prefilter Cartridge” on page 3-69.



Transmission Oil Filter Clogging Caution Lamp

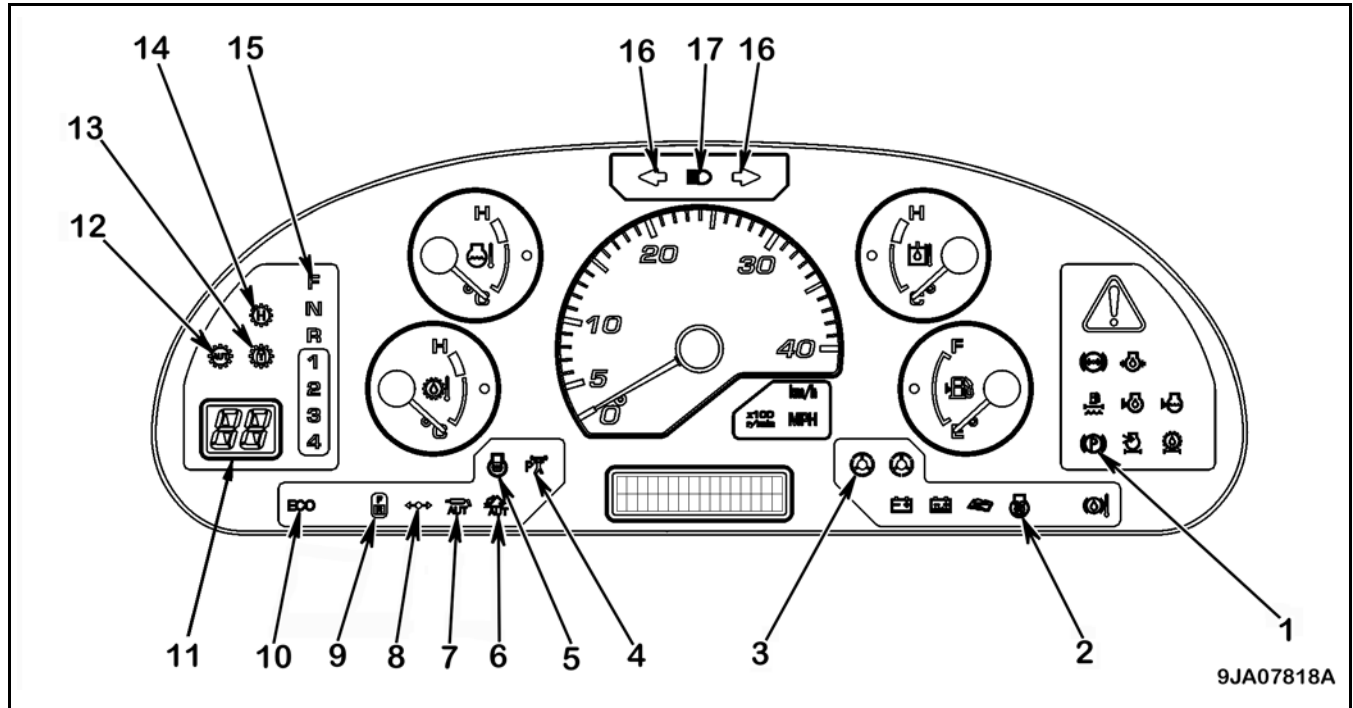
The transmission oil filter clogging caution lamp (7) is not used.



OPERATION

Pilot Display Portion

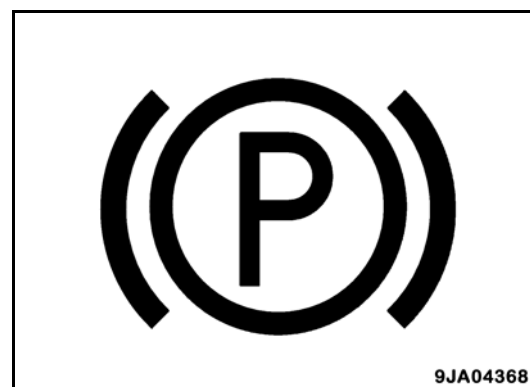
When the starting switch is ON, the pilot display illuminates when the display items are functioning.



1. Parking brake pilot lamp
2. Cooling fan reverse rotation pilot lamp
3. Emergency steering pilot lamp (if equipped)
4. Power mode pilot lamp (P mode)
5. Preheating pilot lamp
6. Semi-auto digging pilot lamp (if equipped)
7. Auto-greasing pilot lamp (if equipped)
8. Joystick pilot lamp (if equipped)
9. Directional selector pilot lamp
10. Economy operation display lamp
11. Shift indicator
12. Auto-shift pilot lamp
13. Torque converter lockup pilot lamp
14. Shift hold pilot lamp
15. Shift lever position pilot lamp
16. Turn signal pilot lamp
17. Head lamp high beam pilot lamp

Parking Brake Pilot Lamp

The parking brake pilot lamp (1) illuminates when the parking brake is applied.

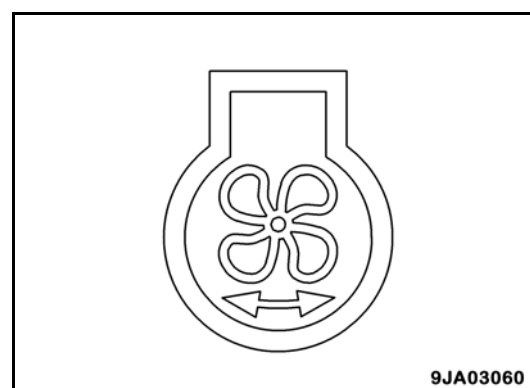


Cooling Fan Reverse Rotation Pilot Lamp

The cooling fan reverse rotation pilot lamp (2) illuminates when the direction of rotation of the cooling fan is reversed.

At the same time, “COOLING FAN REVERSE” is displayed on the character display.

★ For details, see “Cooling Fan Auto-Reverse Rotation Switch” on page 2-54.



Emergency Steering Pilot Lamp (if equipped)

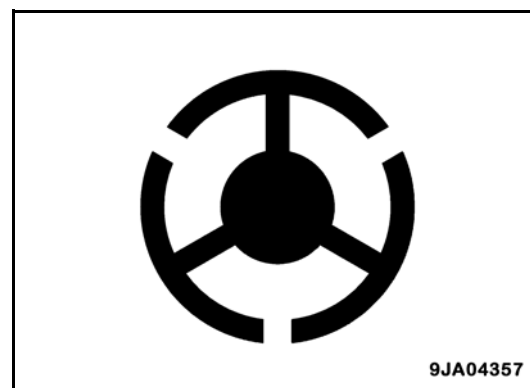
The emergency steering pilot lamp (3) lights up (glows green) when the emergency steering is actuated.

If the engine stops when the machine is traveling or if any abnormality occurs in the steering oil pressure circuit and the machine is traveling at a speed of more than 2 km/h (1.2 mph), the emergency steering is automatically actuated and the lamp illuminates. The lamp flashes if the emergency steering is actuated continuously for one minute.

If the lamp illuminates and “E02 EMR S/T OVERRUN” is displayed on the character display, move the machine immediately to a safe place; stop the engine; and check the condition.

For details, see “Emergency Steering (if equipped)” on page 2-116.

- There is an emergency steering self-check function.
 - ★ For details, see “Emergency Steering Self-Check Function” on page 2-117.



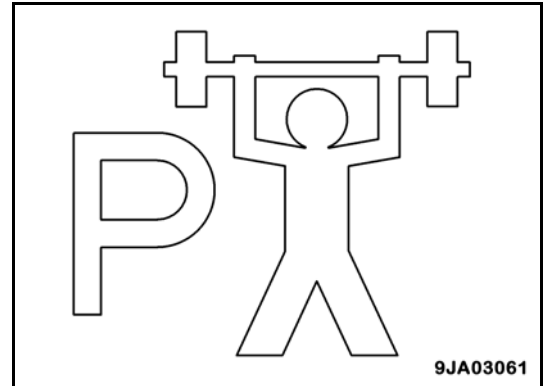
OPERATION

Power Mode Pilot Lamp (P Mode)

The power mode pilot lamp (4) illuminates when the P mode has been selected.

Use the power mode selector switch to select the P mode.

★ For details, see “Power Mode Selector Switch” on page 2-44.



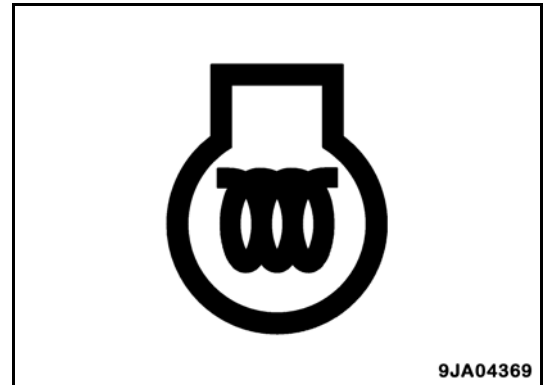
Preheating Pilot Lamp

The preheating pilot lamp (5) illuminates when the engine preheating electric heater is actuated.

In cold weather, when the starting switch is turned to the ON position, this lamp illuminates; when the preheating is completed, it goes out.

The preheating time differs dependent on the ambient temperature.

★ For details, see “Starting Engine” on page 2-98.



Semi-Auto Digging Pilot Lamp

The semi-auto digging pilot lamp (6) is not active.

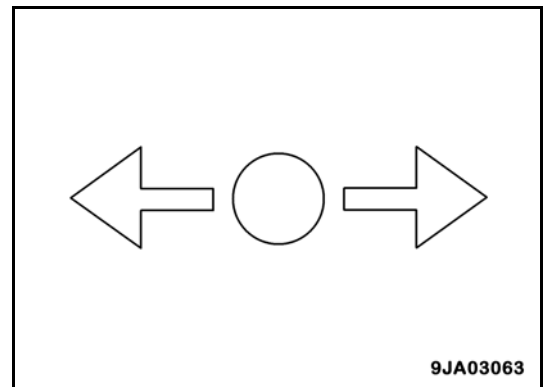
Auto-Greasing Pilot Lamp (if equipped)

The auto-greasing pilot lamp (7) is not used.

Joystick Pilot Lamp (if equipped)

The joystick pilot lamp (8) illuminates when the joystick ON/OFF switch is at the ON position and the joystick console is tilted to the front.

For more details about the joystick steering system, see “JOYSTICK STEERING SYSTEM” on page 5-2.

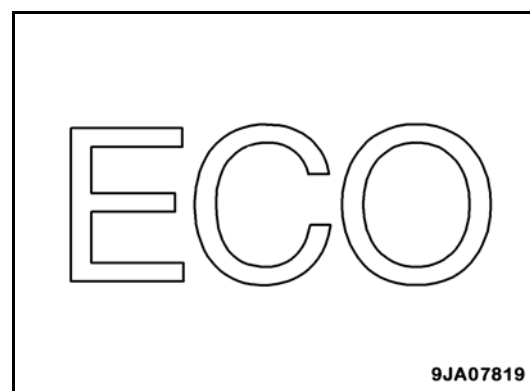


Directional Selector Pilot Lamp

The directional selector pilot lamp (9) is not used.

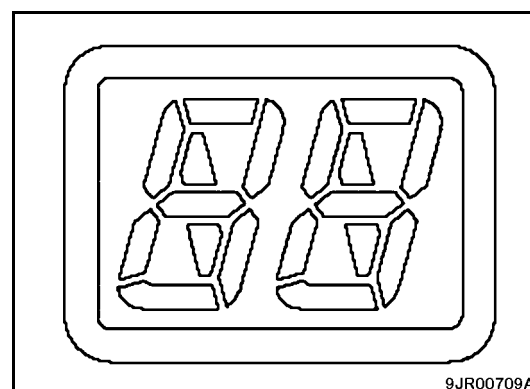
Economy Operation Display Lamp

The economy operation display lamp (10) illuminates when the economy mode is used (economy operation).



Shift Indicator

The shift indicator (11) shows the transmission gear range (actual travel speed range).

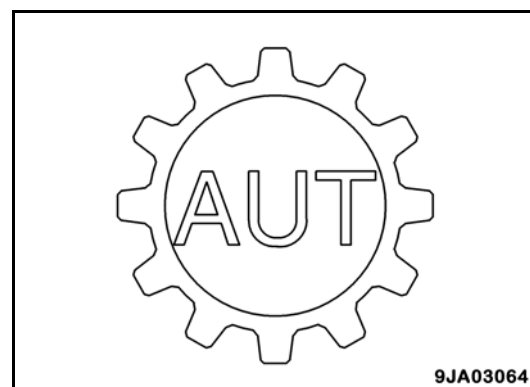


Auto-Shift Pilot Lamp

The auto-shift pilot lamp (12) illuminates when the auto-shift function has been selected.

Use the transmission shift mode selector switch to select the shift mode.

- ★ For details, see “Transmission Shift Mode Selector Switch” on page 2-45.

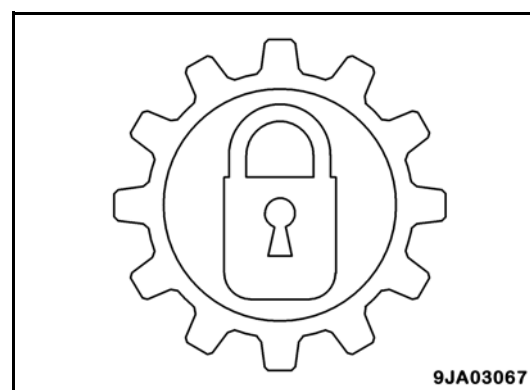


Torque Converter Lockup Pilot Light

The torque converter lockup pilot lamp (13) indicates that the torque converter has entered the lockup.

When the torque converter lockup switch is turned ON, the pilot lamp illuminates. (It illuminates when the transmission actually enters direct drive.)

- ★ For details, see “Torque Converter Lockup Switch” on page 2-57 and “TORQUE CONVERTER LOCKUP” on page 5-17.



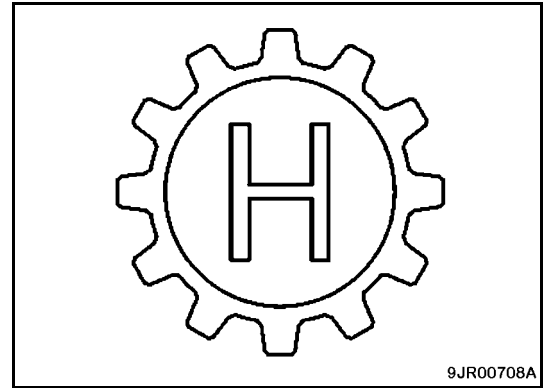
OPERATION

Shift Hold Pilot Lamp

The shift hold pilot lamp (14) illuminates when the shift hold is actuated.

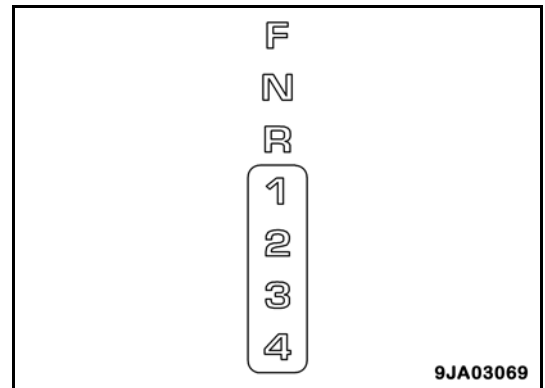
When the hold switch is pressed, the pilot lamp illuminates. When the switch is pressed again, the pilot lamp goes out.

★ For details, see “Hold Switch” on page 2-51.



Shift Lever Position Pilot Lamp

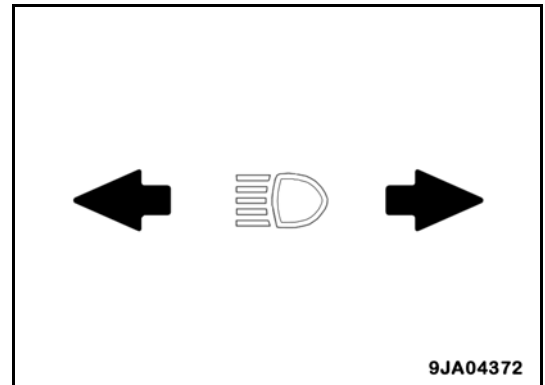
The shift lever position pilot lamp (15) shows the transmission position of the gearshift lever.



Turn Signal Pilot Lamp

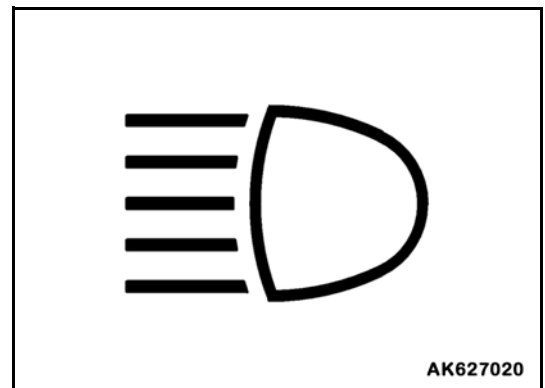
The turn signal pilot lamp (16) flashes at the same time as the turn signal pilot lamp flashes.

If there is a disconnection in the turn signal lamp, the flashing interval becomes shorter.

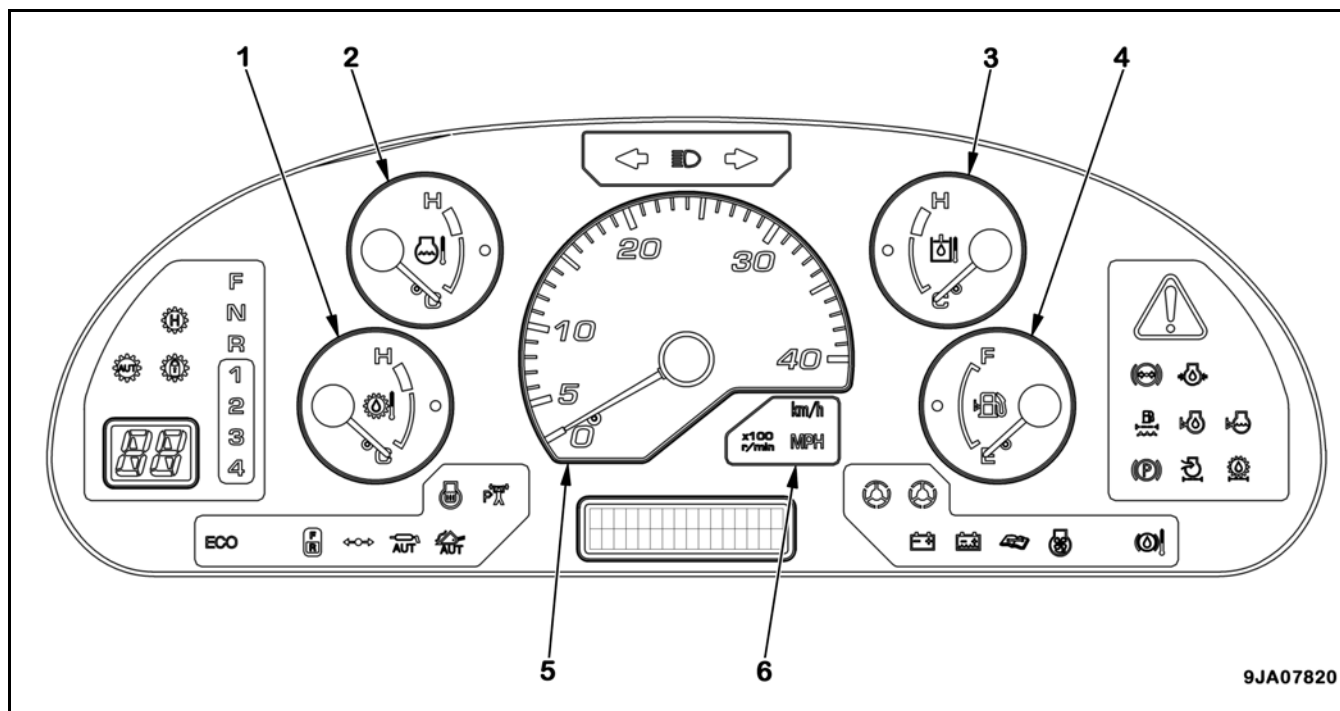


Head Lamp High-Beam Pilot Lamp

The head lamp high-beam pilot lamp (17) illuminates when the head lamps are on high beam.



Meter Display Portion



1. Torque converter oil temperature gauge
2. Engine coolant temperature gauge
3. Hydraulic oil temperature gauge
4. Fuel gauge
5. Speedometer
6. Meter display pilot lamp

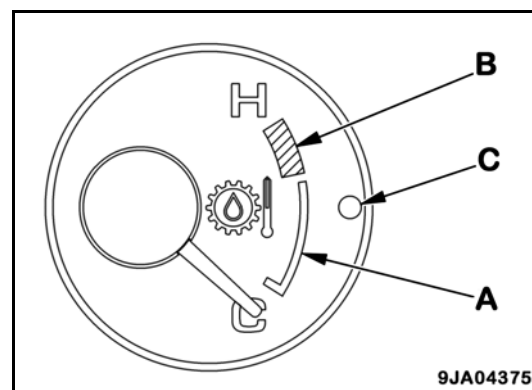
Torque Converter Oil Temperature Gauge

The torque converter oil temperature gauge (1) shows the torque converter oil temperature.

During normal operations, the indicator should be in the white range (A).

If it enters the red range (B) during operations, caution lamp (C) inside the torque converter oil temperature gauge will light up. At the same time, the central warning lamp lights up and the alarm buzzer sounds intermittently. In addition, “E02” is displayed on the top line of the character display and “TC OVERHEAT” on the bottom line.

- ★ Run the engine under no load at a mid-range speed and wait until the indicator returns to the white range (A).



OPERATION

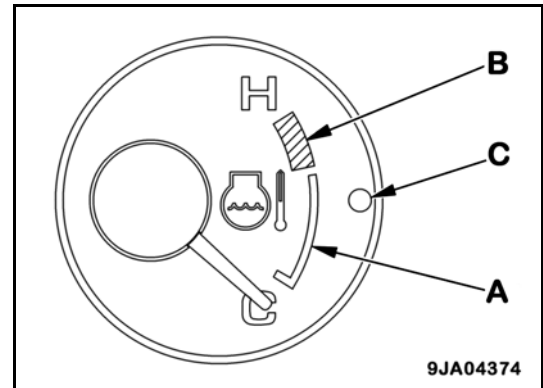
Engine Coolant Temperature Gauge

The engine coolant temperature gauge (2) shows the engine coolant temperature.

During normal operations, the indicator should be in the white range (A).

If the indicator enters the red range (B) during operations, caution lamp (C) inside the engine coolant temperature gauge lights up. At the same time, the central warning lamp lights up and the alarm buzzer sounds; “E02” is displayed on the top line of the character display and “ENGINE OVERHEAT” on the bottom line.

Run the engine under no load at a mid-range speed and wait until the indicator returns to the white range (A).



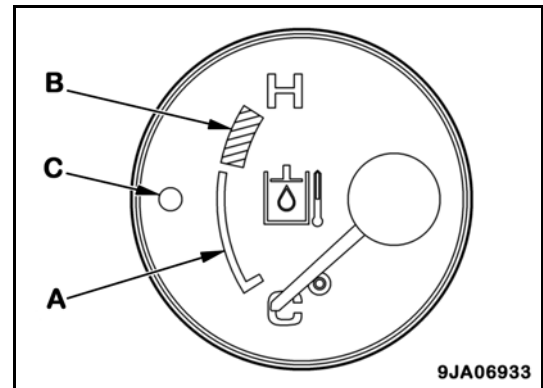
Hydraulic Temperature Gauge

The hydraulic temperature gauge (3) shows the hydraulic oil temperature.

During normal operations, the indicator should be in the white range (A).

If it enters the red range (B) during operations, caution lamp (C) inside the hydraulic oil temperature gauge will light up. At the same time, the central warning lamp lights up and the alarm buzzer sounds intermittently. In addition, “E02” is displayed on the top line of the character display and “HYD OVERHEAT” on the bottom line.

Run the engine under no load at a mid-range speed and wait until the indicator returns to the white range (A).



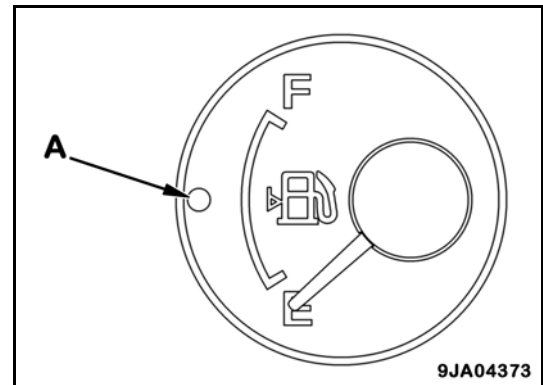
Fuel Gauge

The fuel gauge (4) indicates the amount of fuel remaining in the fuel tank.

- F position: Tank is full.
- E position: Fuel level is low.

When the amount of remaining fuel goes below 35 l (9.25 gal), the caution lamp (A) inside the fuel gauge illuminates.

- ★ If the caution lamp illuminates, check the fuel level and add fuel.



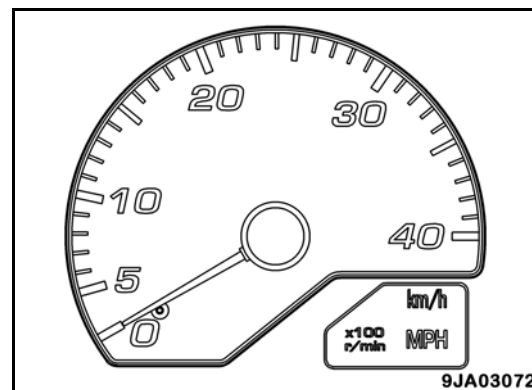
Speedometer

The speedometer (5) shows the travel speed or engine speed.

The display unit is indicated on meter display pilot lamp (6).

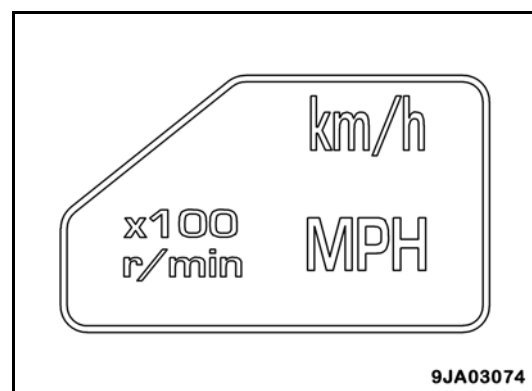
It is also possible to display the engine speed by switching the meter (5).

If you wish to switch between the speedometer and tachometer, contact your Komatsu distributor to have the meter switched.



Meter Display Pilot Lamp

The meter display pilot lamp (6) displays the unit for the travel speed or engine tachometer.



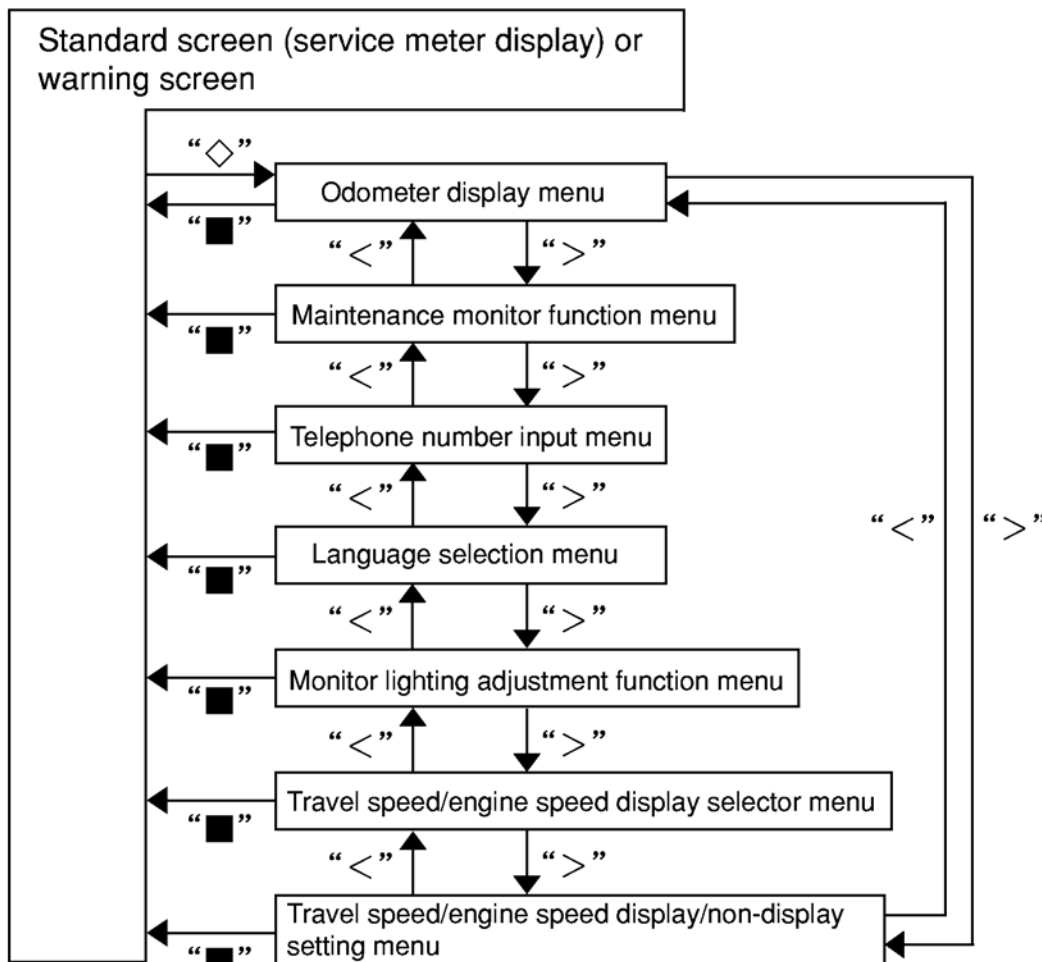
OTHER FUNCTIONS OF MACHINE MONITOR

Overall Menu

The machine monitor has the following functions:

- Odometer display
- Maintenance monitor function
- Filter/oil replacement time reset
- Telephone number input
- Language selection
- Monitor brightness adjustment
- Travel speed/engine speed display selection
- Travel speed/engine speed display/non-display selection

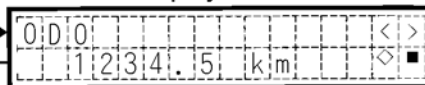
Overall menu



Standard screen
(service meter display)



Odometer display menu



- ◊、■ : Machine monitor mode selector switch 1
- >、< : Machine monitor mode selector switch 2

AJA00700

OPERATION

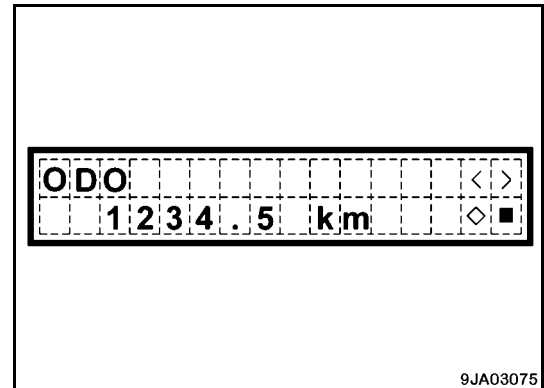
Displaying Odometer

Use this function to check the total distance that the machine has traveled.

1. Check that the character display is displaying the service meter or an action code.

If there is any other display, turn the starting switch OFF; turn the starting switch ON again; and wait for the service meter display or action code display to appear.

2. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
3. After checking the screen, press (■) of machine monitor mode selector switch 1 or turn the starting switch OFF.

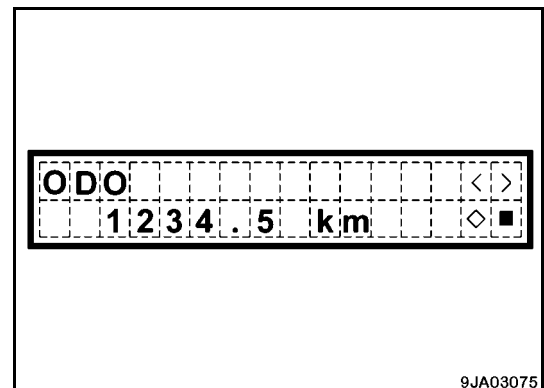


Resetting Filter, Oil Replacement Time

Use this function to reset the oil and filter replacement time.

The filter and oil replacement time is displayed on the character display. If the filter and oil have been replaced, reset the filter and oil change time.

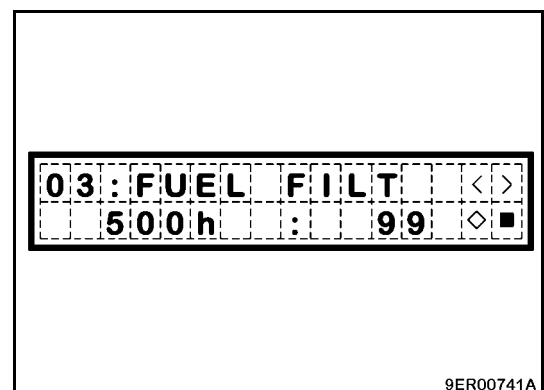
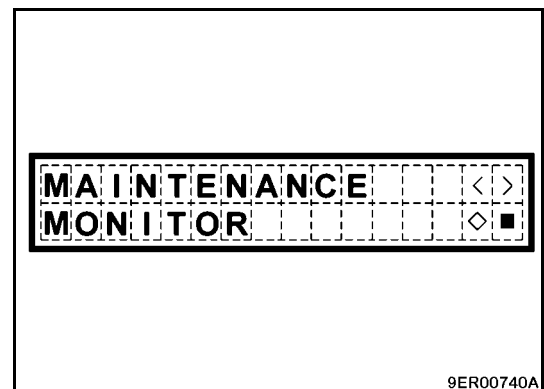
1. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
2. Press (>) or (<) of machine monitor mode selector switch 2 to display “MAINTENANCE MONITOR.”



3. Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

The replacement interval is shown on the bottom line at the left and the total number of replacement times is shown on the right.

4. Press (>) or (<) of machine monitor mode selector switch 2 to display the item (filter or oil) that has reached the replacement time.



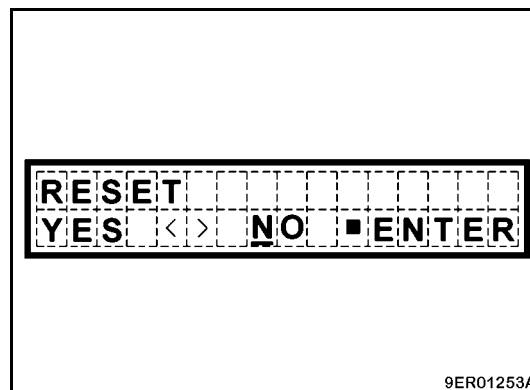
- Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

“RESET” and “ITEM TO RESET” are displayed on the top line in turn.

★ For details of the items to reset, see “Filter, Oil Replacement Time Display” on page 2-12.

- When resetting the replacement interval, press (>) or (<) of machine monitor mode selector switch 2; set the cursor on YES; then press (■) of machine monitor mode selector switch 1. The time is reset and the screen returns to the previous screen.

To abort the operation, set the cursor on NO and then press (■) of machine monitor mode selector switch 1.



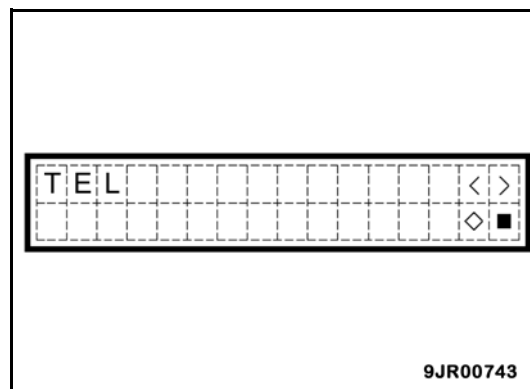
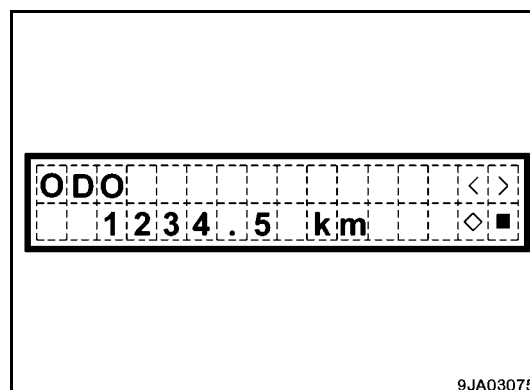
- When resetting the replacement interval for another item, repeat the procedure from Step 4. After completing the resetting operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.

Entering Telephone Number

Use this function to input the telephone number.

It is possible to display the telephone number on the right side of “CALL” displayed on the character display when action code E03 is generated.

- Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
- Press (>) or (<) of machine monitor mode selector switch 2 to display “TEL.”



OPERATION

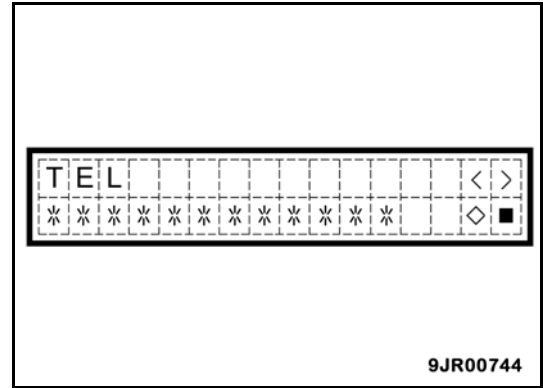
- Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right.

Once the telephone number has been input, the number will always be displayed on the screen.

- The telephone number can be displayed up to 12 digits. Input in order, starting from the first digit on the left.

The cursor is displayed at the input position. Press (>) or (<) of machine monitor mode selector switch 2 to input “0 - 9.” To leave a blank, input an asterisk (*).

After selecting the input value, press (◇) of machine monitor mode selector switch 1. The input value is accepted and the cursor moves to the next digit.



- Repeat the procedure in Step 4 until the last digit has been input.
 - At the last digit, press the (◇) portion of the machine monitor mode selector switch 1. The input values are accepted and the screen returns to the previous screen.
 - If the wrong number is input or the input operation is to be aborted, press (■) of machine monitor mode selector switch 1. The screen returns to the previous screen.
- After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.

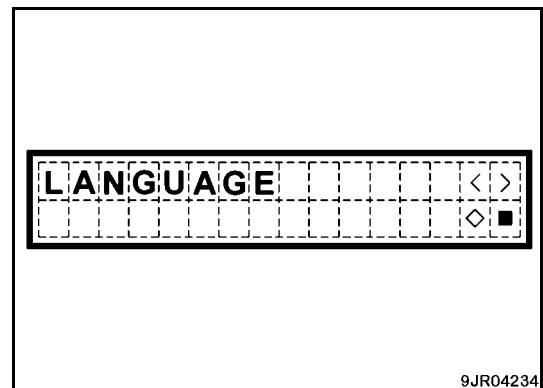
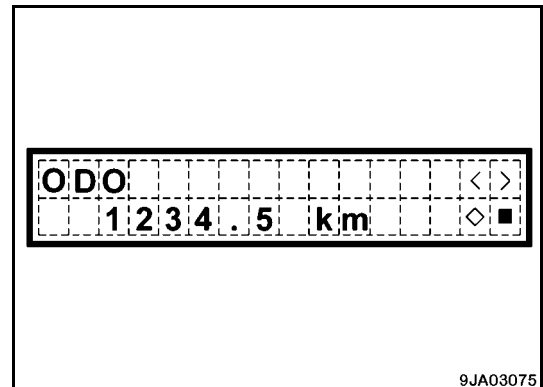
Selecting Language

Use this function to switch the language displayed on the character display.

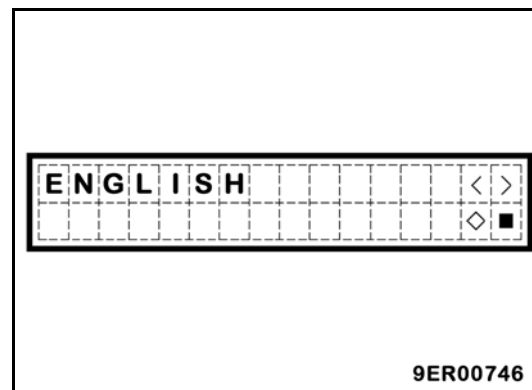
Remark

The following explanation is for when English is set as the language for the character display.

- Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
- Press (>) or (<) of machine monitor mode selector switch 2 to display “LANGUAGE.”



3. Press (◇) of machine monitor mode selector switch 1. The presently selected language is displayed.
4. Press (>) or (<) of machine monitor mode selector switch 2 to select the desired language.



★ The available languages are English, Japanese, German, French, Italian, Spanish, and Swedish.

Language	Display
English	ENGLISH
Japanese	日本語
German	DEUTSCH
French	FRANCAIS
Italian	ITALIANO
Spanish	Español
Swedish	SVENSKA

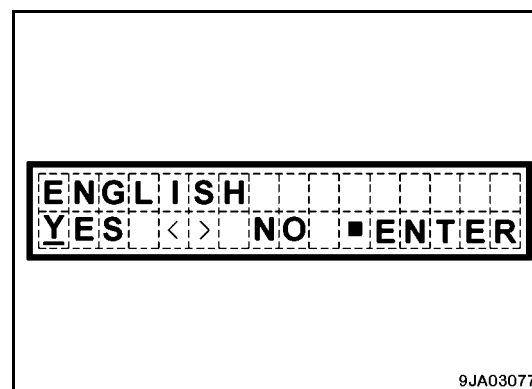
AJM00810

5. After selecting the desired language, press (◇) of machine monitor mode selector switch 1.

To accept the selected language, set the cursor on YES and then press (■) of machine monitor mode selector switch 1. The language is set and the screen returns to the previous screen.

To abort the operation, set the cursor on NO and then press (■) of machine monitor mode selector switch 1.

6. After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.



OPERATION

Adjusting Monitor Brightness

Use this function to adjust the brightness of the monitor.

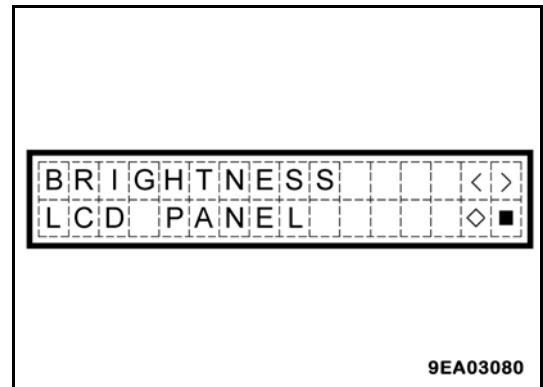
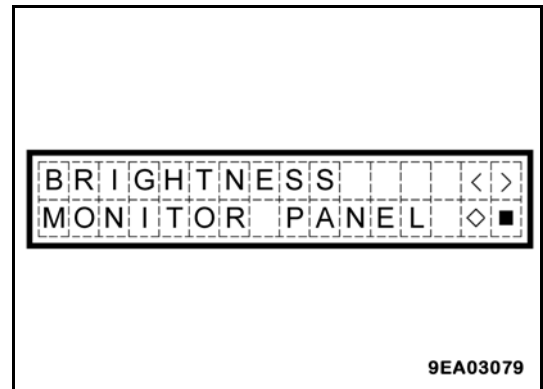
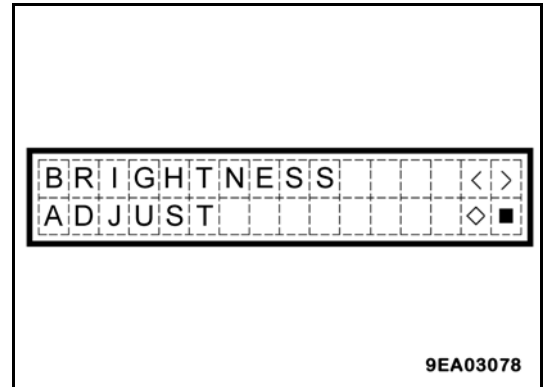
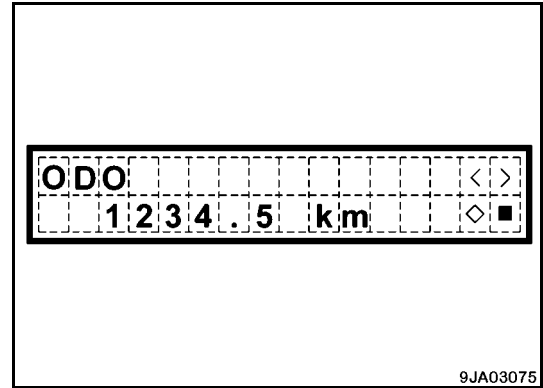
Remark

The starting switch must be ON and the headlamps turned ON.

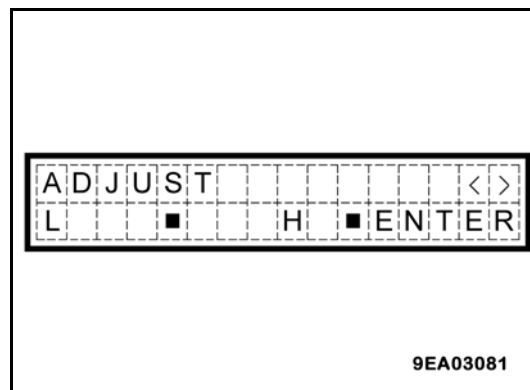
1. Press (◇) of machine monitor mode selector switch 1 to display “ODO” (odometer).
2. Press (>) or (<) of machine monitor mode selector switch 2 to display “BRIGHTNESS ADJUST.”
3. Press (◇) of machine monitor mode selector switch 1. “MONITOR PANEL” is displayed on the bottom line and it is now possible to adjust the monitor brightness.

The brightness can be adjusted separately for the monitor overall (excluding the liquid crystal display) and for the liquid crystal display (LCD).

If you want to adjust only the liquid crystal display (LCD), press (>) or (<) of machine monitor mode selector switch 2 to switch to the “LCD PANEL” display.



4. Press (◇) of machine monitor mode selector switch 1. The screen switches to the display shown on the right and it becomes possible to adjust the brightness.
5. Press (>) or (<) of machine monitor mode selector switch 2 to adjust the brightness between L and H (seven levels).
6. After selecting the desired brightness, press (■) of machine monitor mode selector switch 1.
The brightness is set and the screen returns to the previous screen.
7. After completing the operation, press (■) of machine monitor mode selector switch 1 twice or turn the starting switch OFF.

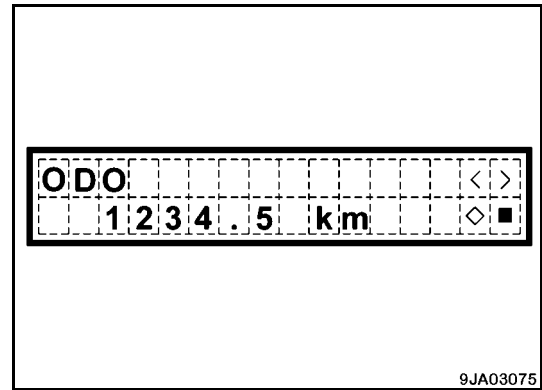


OPERATION

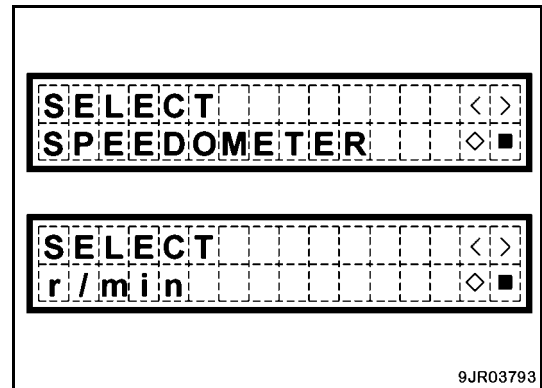
Switching Travel Speed/Engine Speed Display

Use this function to switch between the travel speed (km/h, mph) and the engine speed display.

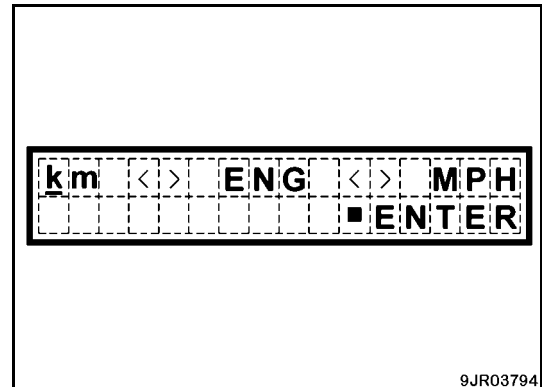
1. Press (◊) of machine monitor mode selector switch 1 to display “ODO” (odometer).



2. Press (>) or (<) of machine monitor mode selector switch 2 to display “SELECT SPEED” or “SELECT r/min.”



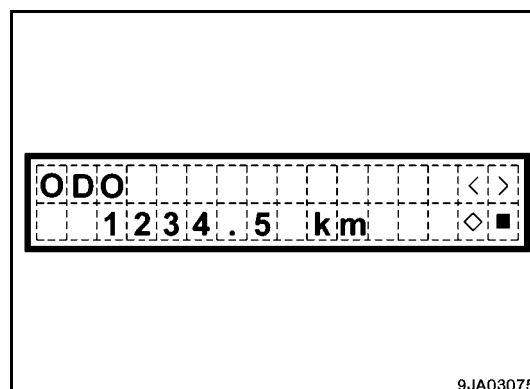
3. Press (◊) of machine monitor mode selector switch 1.
The display changes and returns to the service meter display.



Switching Travel Speed/Engine Speed Display/Non-Display

Use this function to display the travel speed or engine speed, or to have no display on the character display.

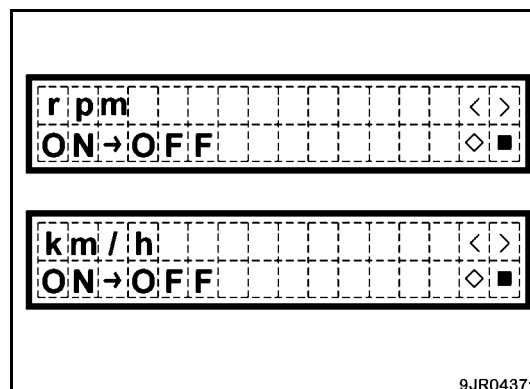
1. Press (◇) of machine monitor mode selector switch 1 to display "ODO" (odometer).



9JA03075

2. Press (>) or (<) of the machine monitor mode selector switch 2 to display "rpm ON → OFF" or "km/h ON → OFF."

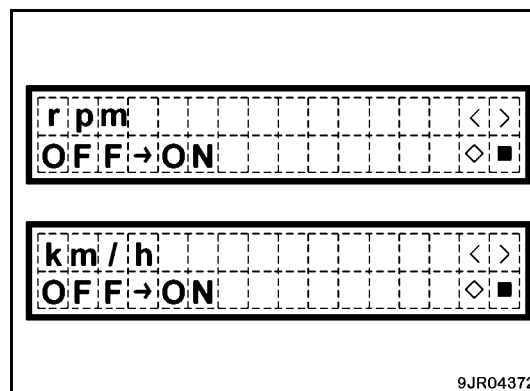
To set so that there is no display for the travel speed or engine speed on the character display, press to display "rpm OFF → ON" or "km/h OFF → ON."



9JR04371

3. Press (◇) of the machine monitor mode selector switch 1.

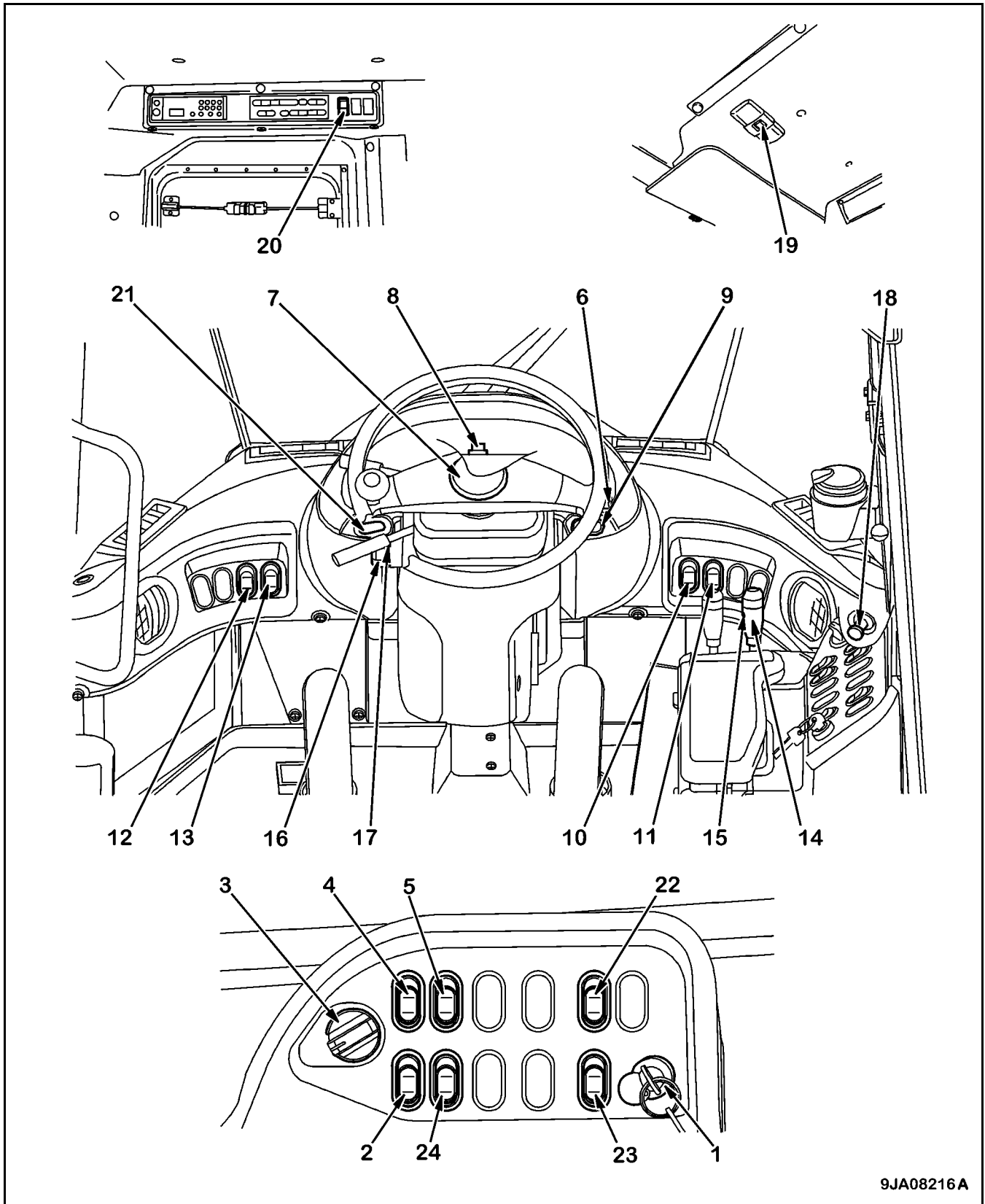
The item that was being displayed changes to non-display and the item that was not displayed is displayed. The screen returns to the service meter display.



9JR04372

SWITCHES AND CONTROLS

General View



1. Starting switch
2. Power mode selector switch
3. Transmission shift mode selector switch
4. Transmission cutoff switch
5. Transmission cutoff set switch
6. Lamp switch
 - Turn signal lever
 - Dimmer switch
7. Horn button
8. Hazard lamp switch
9. Parking brake switch
10. Front working lamp switch
11. Rear working lamp switch
12. Machine monitor mode selector switch 1
13. Machine monitor mode selector switch 2
14. Kickdown switch
15. Hold switch
16. Front wiper switch
17. Rear wiper switch
18. Cigarette lighter
19. Room lamp switch
20. Rear heated wire glass switch
21. ECSS* switch
22. Emergency steering switch (if equipped)
23. Cooling fan auto-reverse rotation switch
24. Torque converter lockup switch

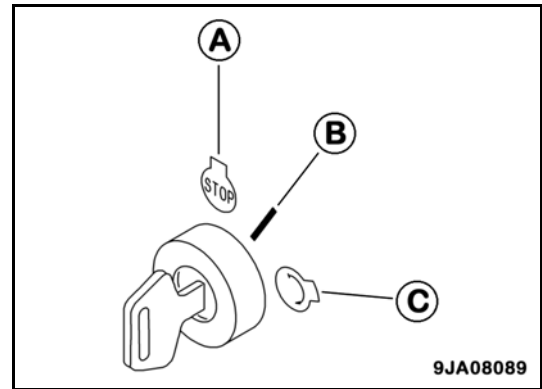
* ECSS: Electronic Controlled Suspension System

OPERATION

Starting Switch

Use the starting switch (1) to start or stop the engine.

- (A): OFF position
 - It is possible to insert and remove the starting switch key at this position.
 - When the key is turned to this position, all electrical system circuits are turned off and the engine stops. In addition, the parking brake is automatically applied.
- (B): ON position
 - In this position, electric current flows to the charging circuit and lamp circuits.
 - Keep the starting switch key at the ON position while the engine is running.
 - If the ambient temperature is low when the engine is started, the preheating pilot lamp illuminates automatically and preheating starts.
 - The preheating time differs dependent on the ambient temperature when the engine is started.
 - If the preheating pilot lamp illuminates, wait for it to go out and then turn the key to the START position.
- (C): START position
 - This is the position to start the engine.
 - Hold the key at this position while cranking the engine. Release the key immediately after the engine has started. The key returns to the ON position (B).

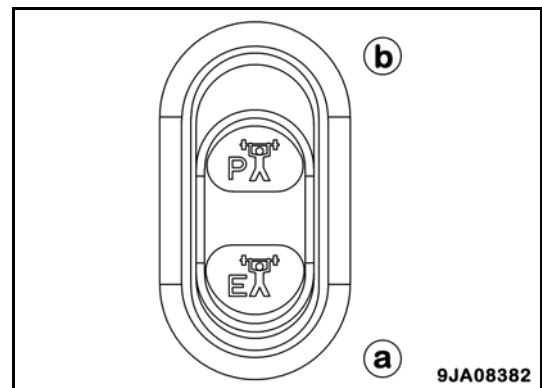


Power Mode Selector Switch

Use the engine power mode selector switch (2) to switch the engine output to match the purpose of the operation.

When the P mode is selected, the power mode pilot lamp (P mode) on the machine monitor illuminates. In addition, the economy mode pilot lamp (ECO) goes out.

- Position (a): E (economy) mode (low engine output):
Operations with emphasis on fuel economy, such as operations on level ground where a maximum output is not needed.
- Position (b): P (power mode) (high engine output):
Operations with emphasis on production



Remark

To carry out operations with effective fuel consumption, normally set the power mode selector switch to the E mode. The maximum engine speed is set lower than in the P mode but, except for hard operations such as heavy-duty digging of rock, it provides ample power and good fuel consumption. By pressing the accelerator pedal lightly, it is possible to reduce the fuel consumption.

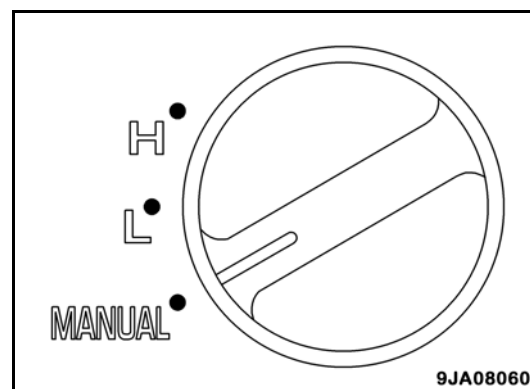
Set to the P mode when carrying out heavy-duty digging operations of rock or operations where speed is required, or when traveling at high speed on flat ground.

Transmission Shift Mode Selector Switch

Use the transmission shift mode selector switch (3) to switch the transmission between auto-shift and manual shift, and to set the shift point for auto-shift.

At the L and H positions, the transmission shifts to auto-shift and the auto-shift pilot lamp on the machine monitor illuminates. The switch is normally set to auto-shift.

- **MANUAL position:**
Transmission is set to manual shift and speed range is a position selected by the gearshift lever.
- **L position:**
Travel speed when shifting up is low (normal travel, travel on flat ground).
- **H position:**
Travel speed when shifting up is high (travel on slope, full speed travel).



Remark

If the switch is set to the L position when the work is mainly operations on flat ground, it is possible to shift up when the engine speed is low. This is effective in reducing fuel consumption.

- ★ For details about the manual shift, see “Manual Shift” on page 2-59.
- ★ For details about the auto-shift, see “Automatic Shift” on page 2-59.

Transmission Cutoff Switch



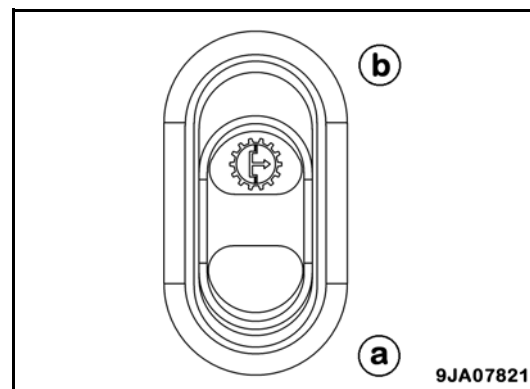
When moving the machine off up a hill, set the transmission cutoff switch to the OFF position; depress the brake pedal; then gently depress the accelerator pedal and release the brake slowly to allow the machine to move. In this manner, the machine can be prevented from rolling backwards.

Use the transmission cutoff switch (4) to turn the transmission cutoff system ON or OFF.

When the switch is pressed, the pilot lamp illuminates and the switch is turned ON. When the brake pedal is depressed to the set position, the transmission is shifted to neutral. For normal operations, keep this switch at the ON position.

For details about adjusting the cutoff position, see “Adjusting Transmission Cutoff Position” on page 2-114.

- **Position (a): OFF**
The brake pedal acts in the normal manner.
- **Position (b): ON**
The brake pedal acts in the normal manner and, at the same time, sets the transmission to neutral.



Remark

The brake pedal position where the cutoff system is actuated can be adjusted by using the transmission cutoff set switch on the right switch panel.

OPERATION

Transmission Cutoff Set Switch



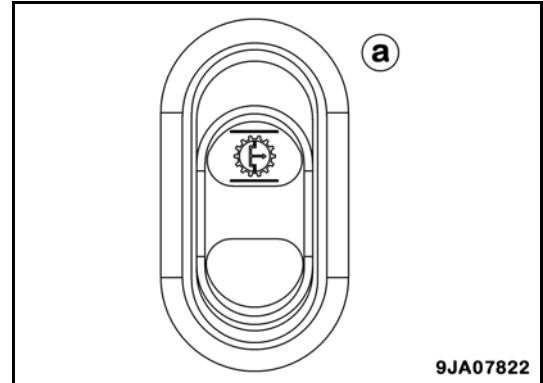
Apply the parking brake before adjusting the transmission cutoff position.

Use the transmission cutoff set switch (5) to adjust the brake pedal position where the transmission is automatically shifted to neutral.

- Position (a): ON
Cutoff position can be adjusted.

When the switch is released, it automatically returns to its original position.

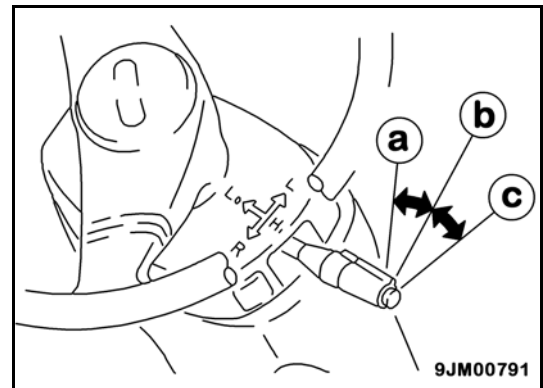
- ★ For details about adjusting the cutoff position, see “Adjusting Transmission Cutoff Position” on page 2-114.



Lamp Switch

Use the lamp switch (6) to turn on (illuminate) the front lamps, side clearance lamps, tail lamps, and instrument panel.

- Position (a): OFF
Lamps go out.
- Position (b):
Side clearance lamps, tail lamps, and instrument panel illuminate.
- Position (c):
Head lamps illuminate in addition to lamps at (b) position.



Remark

The lamp switch can be operated regardless of the position of the lever.

Turn Signal Lever

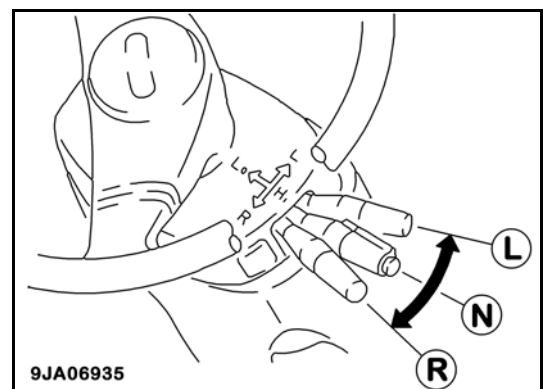
Use the turn signal lever (6) to operate the turn signal lamp.

- Position (L): LEFT TURN
Push lever FORWARD.
- Position (N): OFF
- Position (R): RIGHT TURN
Pull lever BACK.

Remark

When the lever is operated, the turn signal pilot lamp also flashes.

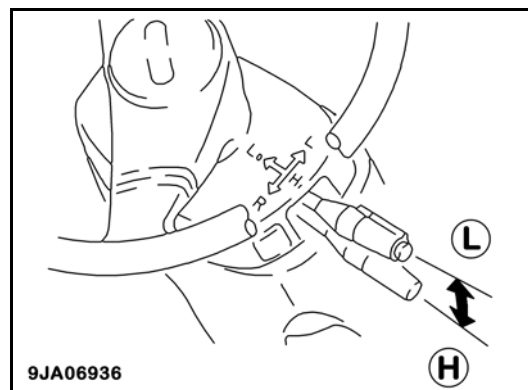
When the steering wheel is turned back, the lever automatically returns to its original position. If it does not return, return it manually.



Dimmer Switch

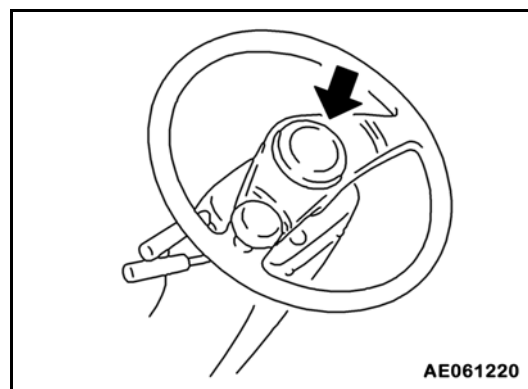
Use the dimmer switch (6) to switch the head lamps between high beam and low beam.

- Position (L): Low beam
- Position (H): High beam



Horn Button

Press the horn button (7) in the center of the steering wheel to sound the horn.



Hazard Lamp Switch



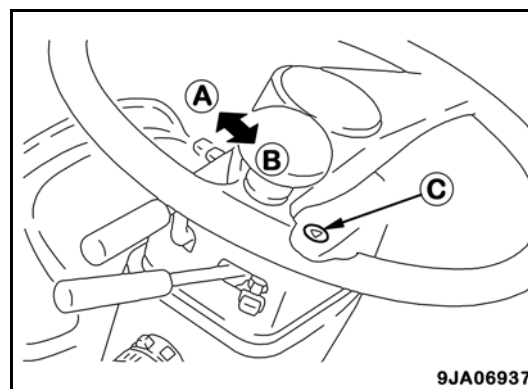
WARNING

Use the hazard lamp only in emergencies. Using the hazard lamp when traveling may cause confusion for other machine operators.

Use the hazard lamp switch (8) to put all the signal lamps in the flashing mode.

Use this switch in emergencies, such as when the machine breaks down and has to be parked on the road.

- Position (A): Turn signal lamps, turn signal pilot lamp, and pilot lamp (C) light up at same time.
- Position (B): Lamps are OFF.



OPERATION

Parking Brake Switch



- Always apply the parking brake when leaving the machine or when parking it.
- Even if the parking brake switch is turned ON, there is danger until the parking brake pilot lamp illuminates. Keep the brake pedal depressed.

Remark

Do not use the parking brake switch to apply the brake when traveling, except in emergencies. The parking brake may be damaged, resulting in a serious accident. Stop the machine first and then apply the parking brake.

If the parking brake must be used as an emergency brake when the machine is traveling at high speed, ask your Komatsu distributor to carry out inspection to check that there is no damage to the parking brake.

The parking brake switch (9) operates the parking brake.

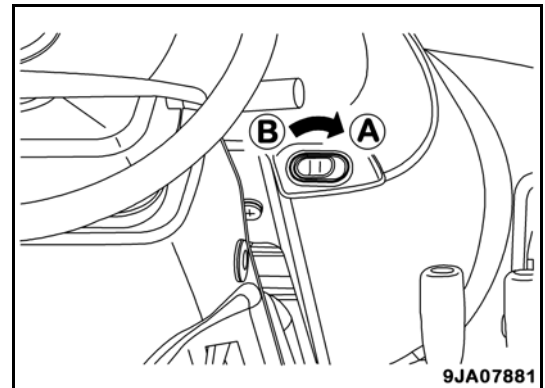
- Position (a): ON
Parking brake is actuated and the parking brake pilot lamp illuminates.
- Position (b): OFF
The parking brake is released.

Remark

When the parking brake is applied, the machine will not move off even if the directional lever is operated.

If the directional lever is placed at the F or R position with the parking brake still applied, the central warning lamp will light up and the buzzer will sound.

Before starting the engine, turn the parking brake switch ON.



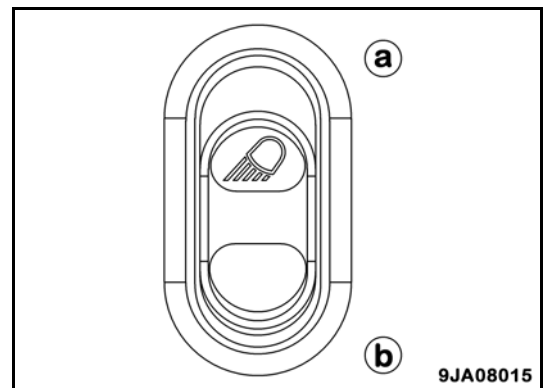
Front Working Lamp Switch



Always turn the working lamp OFF before traveling on public roads.

Use the front working lamp switch (10) to illuminate the front working lamp.

- Position (a): Working lamp illuminates.
- Position (b): Working lamp goes out.
- ★ If position (a) is pressed, the pilot lamp will illuminate and the working lamp circuit will be switched ON.



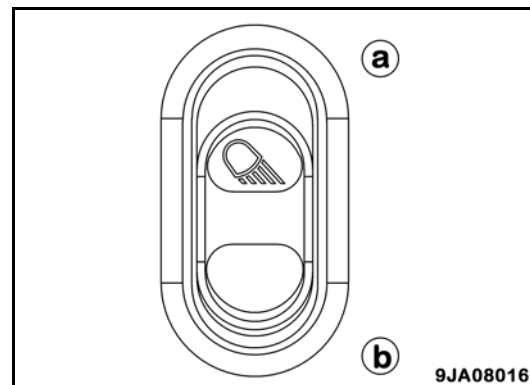
Rear Working Lamp Switch



Always turn the working lamp OFF before traveling on public roads.

Use the rear working lamp switch (11) to illuminate the rear working lamp.

- Position (a): Working lamp illuminates.
- Position (b): Working lamp goes out.
- ★ If position (a) is pressed, the pilot lamp will illuminate and the working lamp circuit will be switched ON.

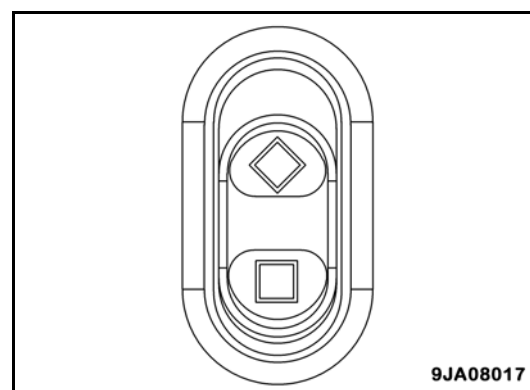


Machine Monitor Mode Selector Switch 1

Use the machine monitor mode selector switch 1 (12) to switch the function of the character display.

When the switch is released, it automatically returns to its original position.

- Position (◇)
Press here to select (confirm) each mode or operation.
- Position (■)
Press here to cancel each mode or operation.

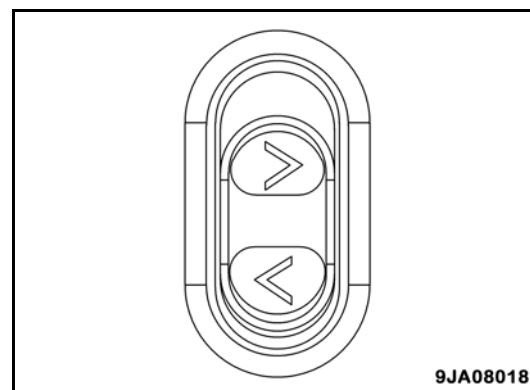


Machine Monitor Mode Selector Switch 2

Use machine monitor mode selector switch 2 (13) to switch the function of the character display.

When the switch is released, it automatically returns to its original position.

- Position (>)
Press here to:
 - Go on to the next screen.
 - Move the cursor forward.
 - Increases the number when entering numerals.
- Position (<)
Press here to:
 - Return to the previous screen.
 - Move the cursor back.
 - Reduces the number when entering numerals.



OPERATION

Kickdown Switch

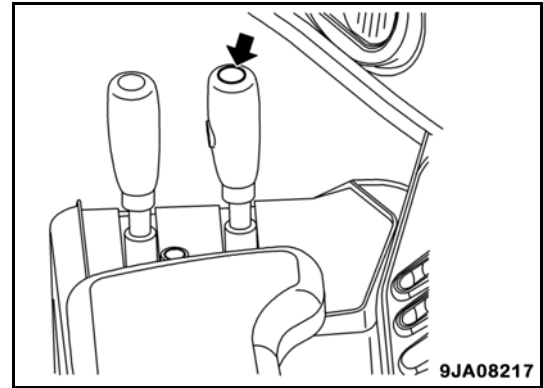
Use the kickdown switch (14) to shift down the transmission.

When the gearshift lever is at F2 and the switch at the head of the lift arm control lever is pressed, the transmission shifts down one range.

- ★ Use this function when you need to increase the drawbar pull in digging operations.

When the transmission shift range is in FORWARD 1st (F1) and the power mode selector switch is at E mode and switch (14) is pressed, it is possible to switch to P mode.

- ★ Use this function during scraping-up operations or during digging operations when it is necessary to increase the lifting force.



When using E mode:

2nd E mode → 1st E mode → 1st P mode

When using P mode:

2nd P mode → 1st P mode

If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or in reverse, the kickdown switch is actuated; it is now possible to shift down to 1st.

Even if the travel speed is more than 10.5 km/h (6.5 mph), this switch can be used to shift the transmission down. Each time the kickdown switch is pressed, the speed range shifts down one range at a time (F4 → F3 → F2).

Remark

When canceling the kickdown, operate the directional lever. In manual shift, the kickdown can be canceled by operating the gearshift lever to any position other than 2nd. It is also possible to cancel the kickdown by turning the starting switch OFF.

In auto-shift, if the travel speed increases after the kickdown, the auto-shift shifts the gear up by the auto-shift.

In auto-shift, when traveling at more than 18 km/h (11.2 mph) in 3rd or at more than 28 km/h (17.4 mph) in 4th and the kickdown switch is pressed, the transmission does not shift down. This prevents the engine from overrunning.

Hold Switch

Use the hold switch (15) to fix the speed range in automatic transmission.

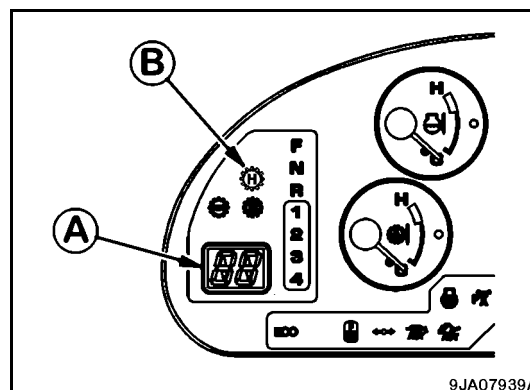
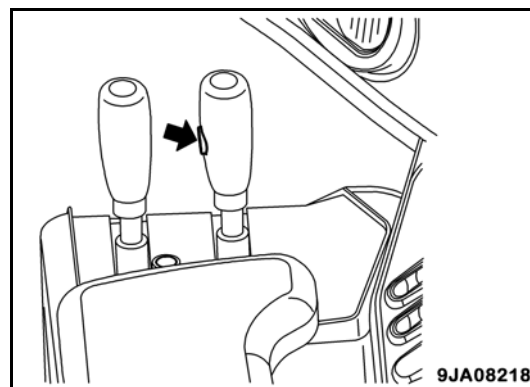
Press the switch on the side of the lift arm control lever knob. The transmission is fixed in the speed range displayed on shift indicator (A) on the machine monitor and shift hold pilot lamp (B) illuminates.

If the switch is pressed again, the HOLD condition is cancelled and the display goes out.

Use this switch to set the desired speed range when carrying out operations such as traveling uphill, traveling downhill, driving in reverse, or grading.

Remark

When canceling the shift hold, operate the directional lever or gearshift lever, or operate the transmission shift mode selector switch to MANUAL. It is also possible to cancel the shift hold by turning the starting switch OFF.



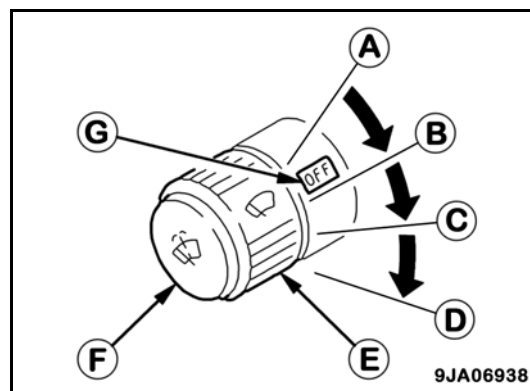
Front Wiper Switch

Turn rotary switch (E) of the front wiper switch (16) to operate the front wiper.

If pushbutton (F) is pressed, washer liquid sprays out onto the front glass while the button is being pressed.

It is possible to check the position of the switch in display window (G).

- Position (A): (OFF) Stop
- Position (B): (INT) Intermittent wiper
- Position (C): Low-speed wiper
- Position (D): High-speed wiper

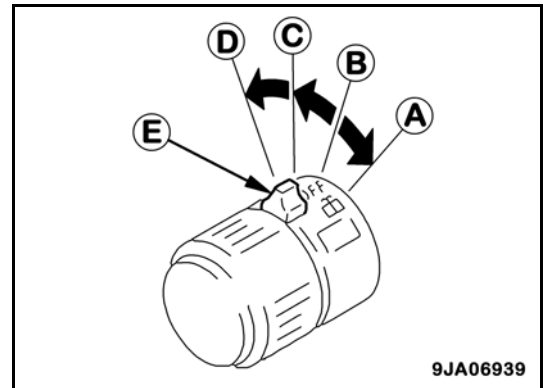


OPERATION

Rear Wiper Switch

Use lever (E) on rear wiper switch (17) to operate the rear wiper.

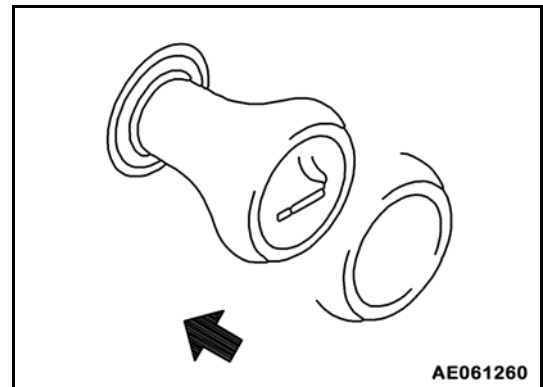
- Position (A): Washer liquid is sprayed out.
- Position (B): OFF
- Position (C): Wiper is operated.
- Position (D): Washer liquid is sprayed out; wiper is operated.



Cigarette Lighter

Use the cigarette lighter (18) to light cigarettes.

After the cigarette lighter is pushed in, it returns to its original position after a few seconds. At that time, you may pull it out and light a cigarette.



Room Lamp Switch

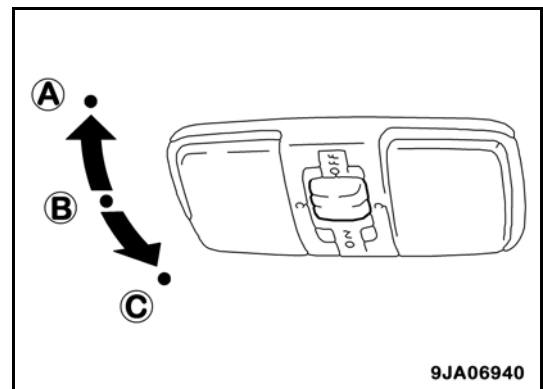
The room lamp switch (19) turns on the room lamp.

- Position (A): OFF
- Position (B): Lights up when cab door is opened.
- Position (C): ON

Remark

The room lamp illuminates even when the starting switch is OFF. When leaving the operator's cab, check that the switch is at position (A) or (B).

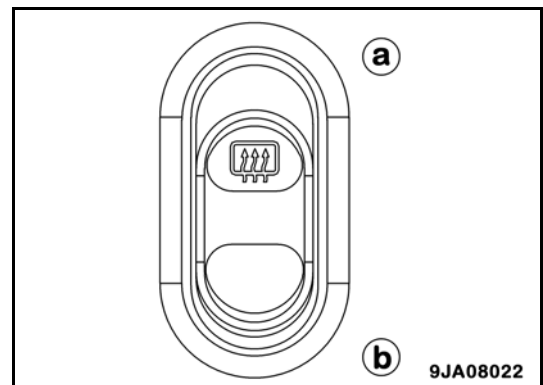
When operating with the cab door fully open, set the switch to position (A).



Rear Heated Wire Glass Switch

Use the rear heated wire glass switch (20) to turn the electricity to the heated wire glass ON and OFF in order to remove mist from the window glass at the rear of the operator's compartment.

- Position (a): ON
Removes mist from glass.
- Position (b): OFF



ECSS Switch

* ECSS: Electronic Controlled Suspension System

WARNING

- If the machine is traveling or the work equipment is raised, the moment the ECSS switch is turned ON, the work equipment moves.
- If operations are carried out with the ECSS switch at the ON position, the moment the ECSS switch is operated, the work equipment may move.
- Never turn the ECSS switch ON during inspection or maintenance. The work equipment will move; this will create a dangerous situation.

Remark

Always stop the machine and lower the work equipment to the ground before operating the ECSS switch.

When carrying out inspection and maintenance, first lower the work equipment to the ground and then turn the ECSS switch OFF before starting the inspection and maintenance operation.

When carrying out leveling work, turn the ECSS switch OFF.

The ECSS switch (21) is used to turn the ECSS ON and OFF.

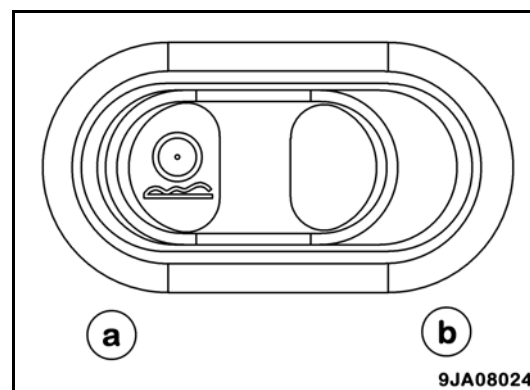
- Position (a): ON
The pilot lamp inside the switch illuminates and the ECSS is actuated.
- Position (b): OFF
The ECSS is not actuated.

Remark

The ECSS (Electronic Controlled Suspension System) is a device that uses the hydraulic spring effect of an accumulator to absorb the vibration of the chassis during travel, allowing the machine to travel smoothly at high speeds.

When traveling in 1st, the ECSS is not actuated.

When the speed range is 2nd to 4th and the travel speed exceeds 5 km/h (3.1 mph), the ECSS is automatically actuated; when the travel speed drops below 3 km/h (1.9 mph), it is automatically disengaged.

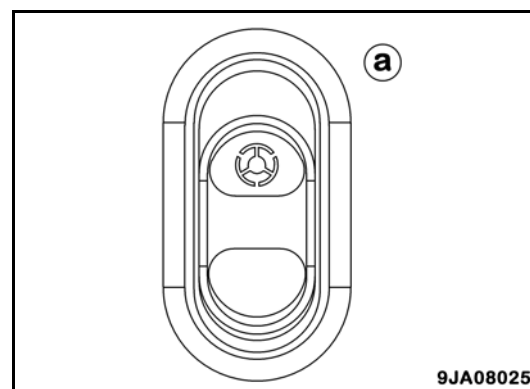


Emergency Steering Switch (if equipped)

The emergency steering switch (22) is the manual control switch for the emergency steering function.

Even when the engine has stopped, steering operations are possible by pressing this switch.

- Position (a): ON
The pilot lamp inside the switch and the emergency steering pilot lamp on the machine monitor light up. It is now possible to operate the steering.
- ★ Actuate the emergency steering only in cases of emergency or when checking the function.



OPERATION

When the switch is released, it automatically returns to its original position.

The maximum time for continuous operation of the emergency steering is 60 seconds.

When using the emergency steering, travel at a speed of less than 5 km/h (3.1 mph).

★ For details, see “Emergency Steering (if equipped)” on page 2-116.

Cooling Fan Auto-Reverse Rotation Switch

Use the cooling fan 3-position, rocker switch (23) to rotate the hydraulic-controlled cooling fan in the reverse direction when cleaning the radiator.

Since this is a spring-loaded switch, when it is set to ON, the switch will return to the neutral position (c) when the switch is released. It is not necessary for the operator to hold the switch in the ON position.

★ Run the engine at idling when operating the switch.

- Position (a): Auto-reverse rotation function ON

The fan automatically rotates in reverse for two minutes every two hours. The pilot lamp inside the switch and the cooling fan reverse rotation pilot lamp on the machine monitor light up.

- Position (b): Manual reverse rotation switch ON

- When the fan is rotating in the normal direction and the switch is pressed once, the fan will rotate in reverse; if the switch is pressed again, the fan will rotate in the normal direction.

- When the fan is rotating in the reverse direction, the cooling fan reverse rotation pilot lamp on the machine monitor lights up. Reverse rotation continues for approximately ten minutes after the switch is pressed.

- Position (c): Normal (OFF)

- The cooling fan is constantly set to normal rotation.

★ For details about cleaning the radiator, see “Clean Radiator Fins and Cooler Fins” on page 3-42.

It is possible to adjust the following the automatic reverse rotation functions:

- Cycle fan automatic reverse rotation (Standard: two hours)
- Continuous time fan automatic reverse rotation (Standard: two minutes)

★ Ask your Komatsu distributor to carry out the adjustment

Remark

When the fan rotation direction is switched, the reverse rotation pilot lamp flashes.

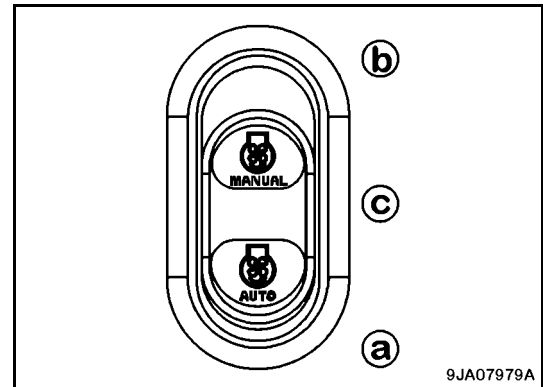
To protect the machine, the fan rotation direction cannot change when the fan is operating under high load or in low temperatures. For details, see “Conditions for Switching Fan Rotation” on page 2-55.

When the engine is stopped, the fan rotation direction returns to the normal direction.

If the switch is set to position (b) (manual reverse rotation ON), the switch returns to position (c) (Neutral) when the switch is released.

Even if position (b) of the switch is not kept pressed, the fan will rotate in the reverse direction for a fixed time. It is not necessary to keep the switch pressed at position (b).

During reverse rotation of the fan, if the engine cooling water, hydraulic oil, or torque converter oil overheat (the caution lamp for the oil temperature gauge on the machine monitor lights up), the reverse rotation of the fan is forcibly stopped and the fan switches to rotation in the normal direction.



Conditions for Switching Fan Rotation

You can switch from normal rotation to reverse rotation manually or automatically.

Using Manual Reverse Rotation Function

You can switch from normal rotation to reverse rotation and from reverse rotation to normal rotation.

Switching from Normal Rotation to Reverse Rotation

The fan will switch from normal rotation to reverse rotation only if **all** the following conditions are fulfilled. If **all** the conditions are not fulfilled, the fan direction will not change.

Conditions:

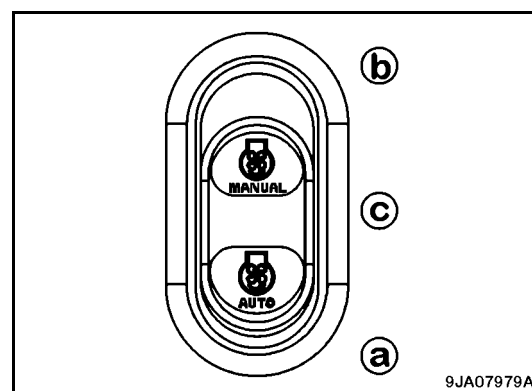
- Portion (b) of the cooling fan automatic reverse rotation switch is pressed once.
- The engine speed is between Lo and 1,200 rpm.
- The engine water temperature is less than 90°C (194°F). (The indicator on the engine water temperature gauge is below horizontal.)
- The hydraulic oil temperature is less than 90°C (194°F). (The indicator on the hydraulic oil temperature gauge is below horizontal.)
- The torque converter oil temperature is below 100°C (212°F). (The indicator on the torque converter oil temperature gauge is below horizontal.)
- At least 30 seconds have passed since the engine was started.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from flashing and will remain illuminated.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will continue to flash.

Switching from Reverse Rotation to Normal Rotation

The fan will switch from reverse rotation to normal rotation if **any** of the following conditions are fulfilled. If **none** of the conditions are fulfilled, the fan direction will not change.

Conditions:

- More than ten minutes have passed after the fan started to rotate in reverse and the engine speed has dropped to less than 1,200 rpm.
- When portion (b) of the cooling fan automatic reverse rotation switch is pressed again when the fan is rotating in reverse, and the engine speed has dropped to less than 1,200 rpm.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change in this manner: Lighted up → flashing → OFF.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from being illuminated to flashing and will continue to flash.



OPERATION

Using Automatic Reverse Rotation Function

The fan automatically switches from normal rotation to reverse rotation and from reverse rotation to normal rotation according to the programmed time intervals. This allows the wheel loader to have the optimum heat balance (cooling). The automatic reverse mode is factory-programmed with a default time interval. When activated, the fan reverses every two SMR (service meter reading) hours for two minutes. The ability to modify both the reverse time interval and the amount of time the fan rotates in reverse is described in the *Shop Manual*.

Reversing interval information:

	Fan Reverse Interval	Reverse Rotation Time
Factory Setting	2 hr	2 min
Adjustment Range	0.1 hr to 200 hr	0.5 min to 10 min

The heat balance (cooling) of the wheel loader is extremely important to ensure that the machine operates to its maximum ability within the design criteria. To make sure this is possible, the hydraulic-driven cooling fan has an operating temperature range that it must work in. If the wheel loader is outside of these parameters then the reversing fan function (both manual and automatic reverse) will not occur until the wheel loader gets within these parameters.

If the reversing happens when the machine is at low idle, it will not automatically spin at full speed in the reverse direction. To spin at full speed, the operator must take the machine to high idle.

Switching from Normal Rotation to Reverse Rotation

The fan will switch from normal rotation to reverse rotation only if **all** the following conditions are fulfilled. If **all** the conditions are not fulfilled, the fan direction will not change.

Conditions:

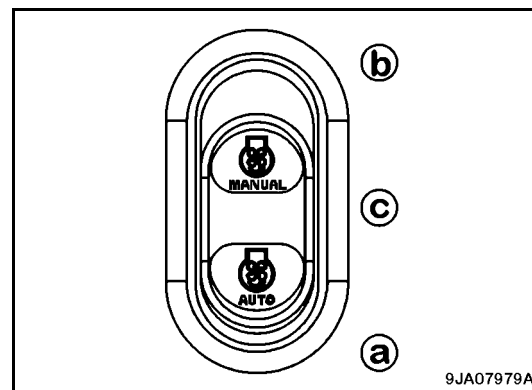
- The cooling fan automatic reverse rotation switch is at position (a).
- The engine water temperature is less than 90°C (194°F). (The indicator on the engine water temperature gauge is below horizontal.)
- The hydraulic oil temperature is less than 90°C (194°F). (The indicator on the hydraulic oil temperature gauge is below horizontal.)
- The torque converter oil temperature is below 100°C (212°F). (The indicator on the torque converter oil temperature gauge is below horizontal.)
- At least 30 seconds have passed since the engine was started.
- The set time for switching has passed.
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from flashing and will stay illuminated.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from OFF to flashing and will continue to flash.

Switching from Reverse Rotation to Normal Rotation

The fan will switch from reverse rotation to normal rotation if **both** of the following conditions are fulfilled. If **neither** of the conditions are fulfilled, the fan direction will not change.

Conditions:

- When the cooling fan automatic reverse rotation switch is set to any position other than portion (a) when the fan is rotating in reverse, and the hydraulic oil temperature has gone above 50°C (122°F) (the indicator on the hydraulic oil temperature gauge is in the green range).
- When the continuous time for fan automatic reverse rotation has passed and the hydraulic oil temperature has gone above 50°C (122°F) (the indicator on the hydraulic oil temperature gauge is in the green range).
- If the direction is switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change in this manner: Lighted up → flashing → OFF.
- If the direction is not switched, the cooling fan reverse rotation pilot lamp on the machine monitor will change from being illuminated to flashing and will continue to flash.

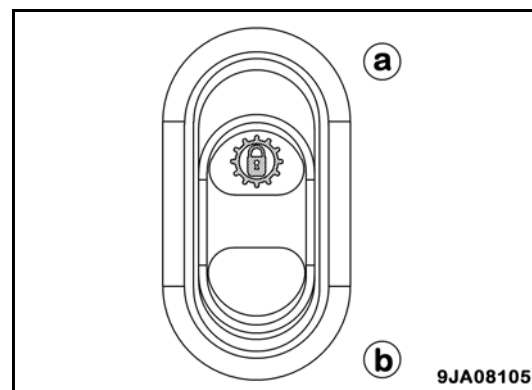


Torque Converter Lockup Switch

The torque converter lockup switch (24) controls the torque converter lockup function.

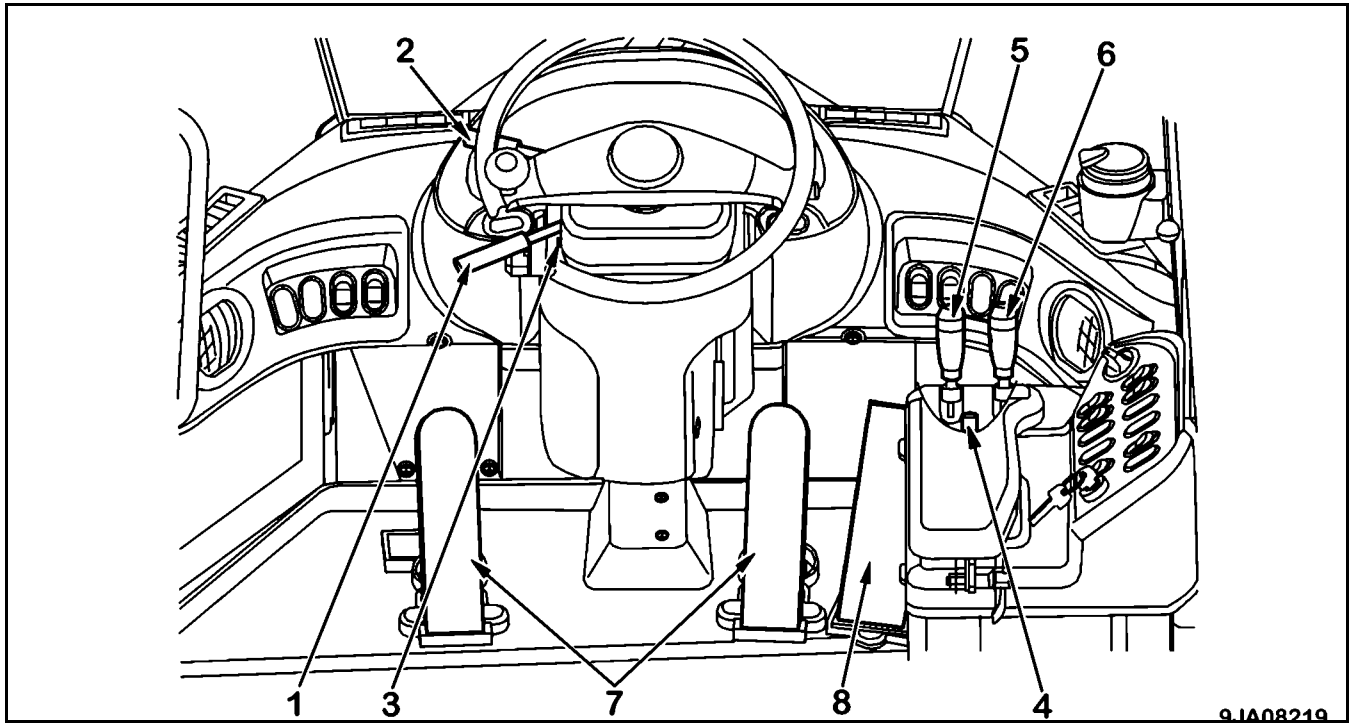
★ For further information about the torque converter, see:

- “Torque Converter Oil Temperature Caution Lamp” on page 2-19
- “Torque Converter Lockup Pilot Light” on page 2-27
- “TORQUE CONVERTER LOCKUP” on page 5-17



CONTROL LEVERS, PEDALS

General View



1. Gearshift lever
2. Directional lever
3. Gearshift lever stopper
4. Work equipment lock lever
5. Bucket control lever
6. Lift arm control lever
7. Brake pedals
8. Accelerator pedal

Gearshift Lever

The gearshift lever (1) changes the speed range of the transmission.

Manual Shift

This machine has a 4-FORWARD, 4-REVERSE speed transmission.

Place the gearshift lever in a suitable position to obtain the desired speed range.

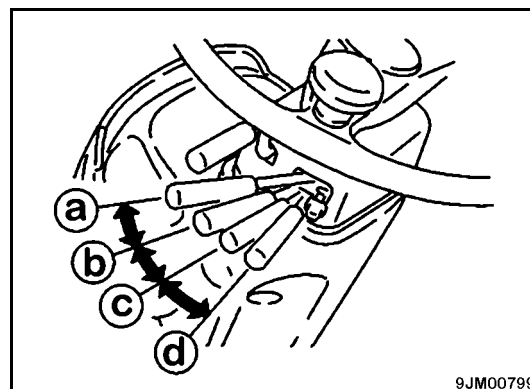
- 1st and 2nd speeds are used for working.
- 3rd and 4th speeds are used for traveling.

When the gearshift lever stopper is being used, it is impossible to shift to 3rd or 4th. Disengage the gearshift lever stopper before trying to shift gear.

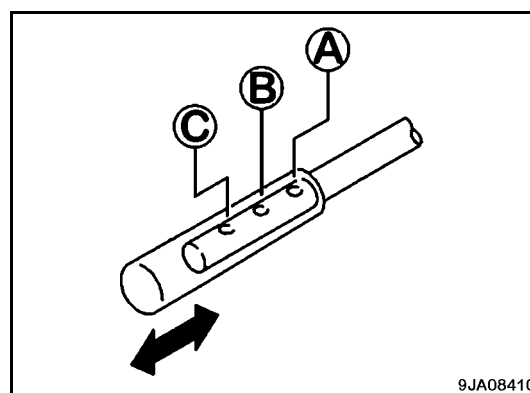
- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th

Remark

The lever length can be set to three levels (A), (B) or (C). For adjustment, consult your Komatsu distributor. The lever is installed to position (B) when delivered.



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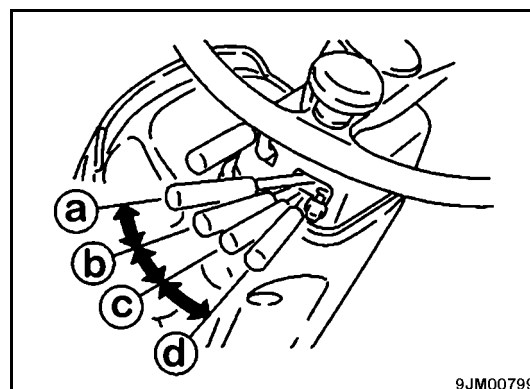
Automatic Shift

Automatic gear shifting can be carried out in the 2nd through 4th speed range of the four forward and reverse speeds, depending on the travel conditions.

- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th

The range of speeds during automatic gear shifting is determined by the position of the gearshift lever as shown in the following table.

Gear Shift Lever Positions	Speed Range
2nd	2nd
3rd	2nd <-> 3rd
4th	2nd <-> 3rd <-> 4th



9JM00799

OPERATION

Remark

The 1st position for the gearshift lever fixes the transmission in 1st. There is no automatic shifting of the transmission.

When shifting down from 2nd to 1st, press the kickdown switch on the lift arm control lever.

If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or in reverse, the kickdown switch is actuated and it is possible to shift down to 1st. This makes it easy to carry out load-and-carry operations.

If the travel speed is more than 10.5 km/h (6.5 mph) in auto-shift, each time the kickdown switch is pressed, the transmission shifts down one range. (If the gear shift lever is at F4, the transmission will shift down F4 → F3 → F2; if it is at F3, the transmission will shift down F3 → F2.)

To set to the desired speed range when traveling uphill or downhill, or when carrying out grading:

- When fixing the speed range:
Press the HOLD switch on the lift arm control lever.
 - The speed range is fixed at the speed range displayed on the transmission indicator on the machine monitor.
- When shifting up or down from set speed range:
Shift gear with the gearshift lever.

Remark

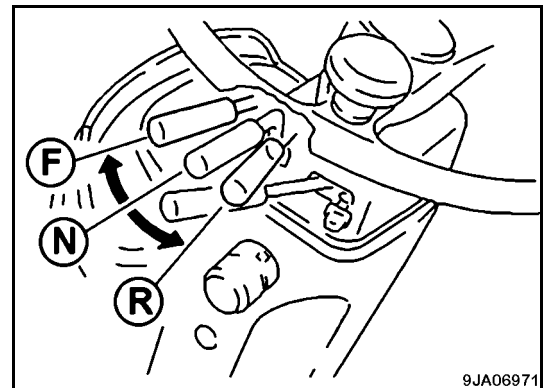
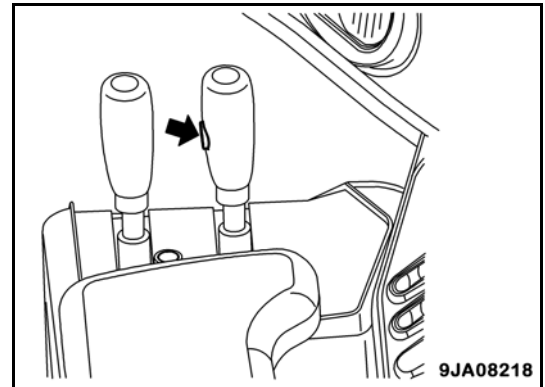
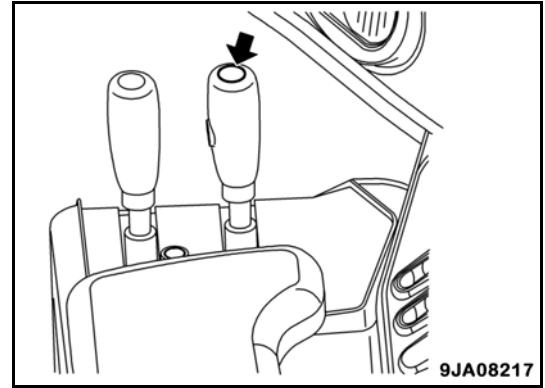
When the transmission has been shifted down from 2nd to 1st with the kickdown switch, it will shift up from 1st to 2nd when the travel speed increases.

Directional Lever

Use the directional lever (2) to change the machine's travel direction between forward and reverse.

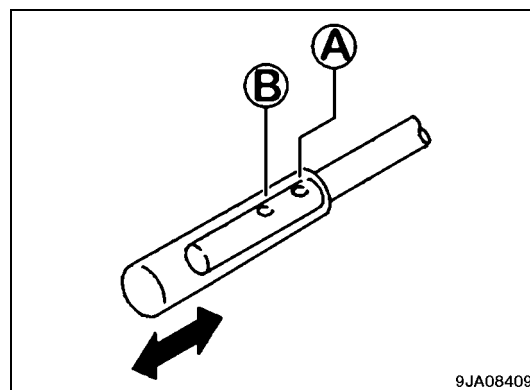
When starting the engine, if the directional lever is not at the N position, the engine will not start. In this case, the central warning lamp will light up and the buzzer will sound.

- Position (a): FORWARD
- Position (N): NEUTRAL
- Position (b): REVERSE



Remark

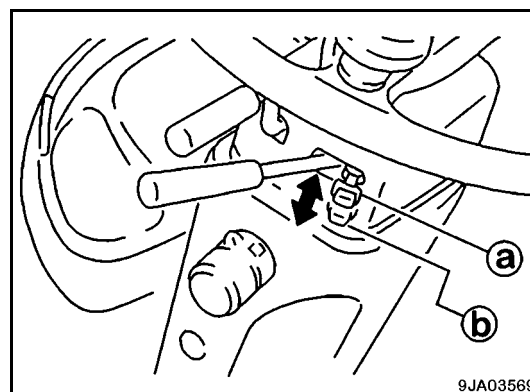
The lever length can be set to two levels, position (A) or (B). For adjustment, consult your Komatsu distributor. The lever is installed to position (A) when delivered.



Gearshift Lever Stopper

The gearshift lever stopper (3) prevents the gearshift lever from entering the 3rd or 4th positions when working.

- Position (a): Stopper actuated.
- Position (b): Stopper released.



Work Equipment Lock Lever

! WARNING

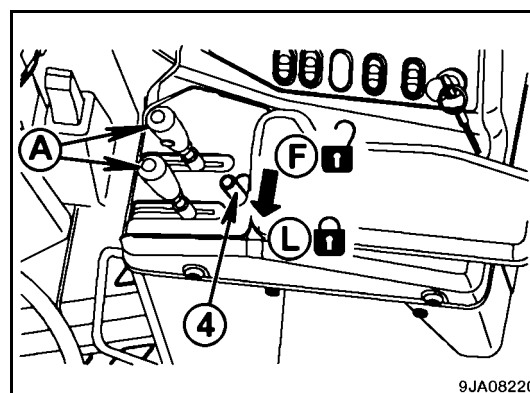
- Before leaving the operator's seat, set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not at the LOCK position and the work equipment control lever (A) is touched by mistake, it may cause serious personal injury.
- If the work equipment lock lever is not set securely to LOCK position (L), the work equipment may move and cause serious personal injury. Check that the lever is at the position shown in the graphic.
- When operating the work equipment lock lever, check that work equipment control lever (A) is at the HOLD position.
- When operating the work equipment lock lever, be careful not to touch the work equipment control lever (A).

The work equipment lock lever (4) is a device to lock the work equipment control levers and prevent operation of the work equipment.

Pull the work equipment lock lever towards the center of the machine to set it to LOCK position (L).

Remark

This lever shuts off the hydraulic circuit for the work equipment. If the lever is at LOCK position (L), the work equipment does not move even if work equipment control lever (A) is operated.

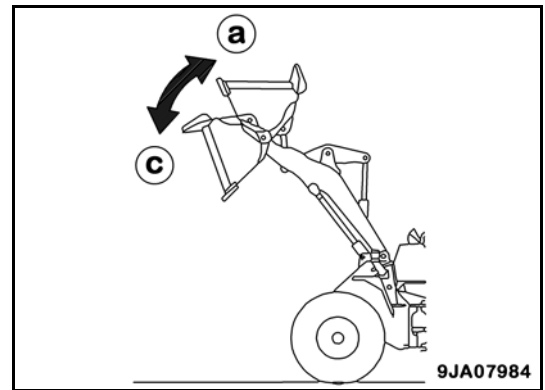
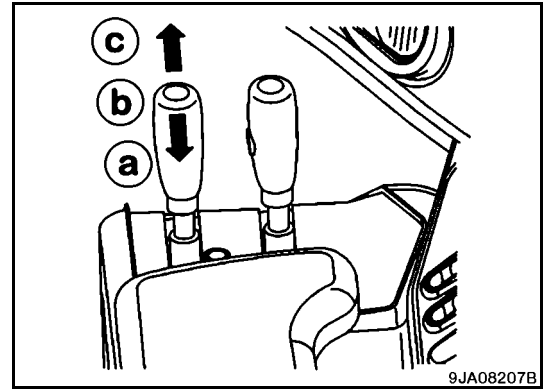


OPERATION

Bucket Control Lever

The bucket control lever (5) operates the bucket.

- Position (a): TILT
When the bucket control lever is pulled further from the TILT position, the lever stops in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the HOLD position.
- Position (b): HOLD
The bucket is stopped and held in position.
- Position (c): DUMP



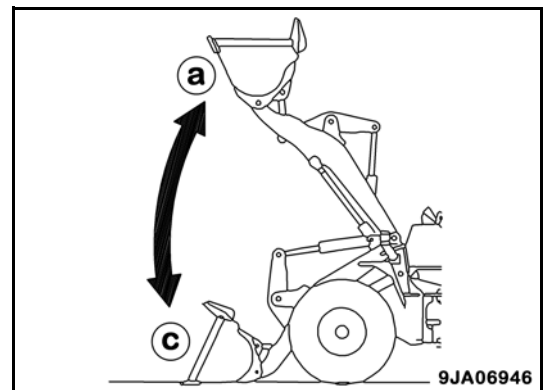
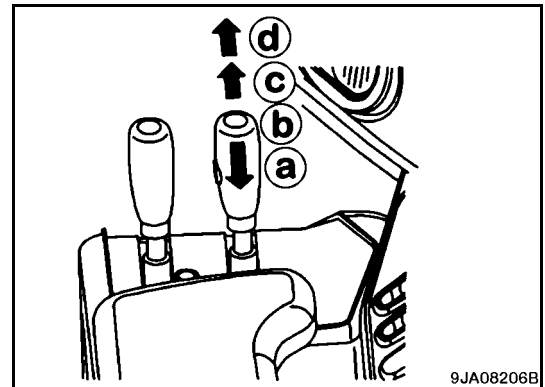
Lift Arm Control Lever

The lift arm control lever (6) is used to operate the lift arm.

- Position (a): RAISE
When the lift arm control lever is pulled further from the RAISE position, the lever stops in this position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.
- Position (b): HOLD
The lift arm is kept in the same position.
- Position (c): LOWER
- Position (d): FLOAT
The lift arm moves freely under external force.

Remark

Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling, see "Leveling Operations" on page 2-123.



Brake Pedals

WARNING

- When traveling downhill, always use the right brake pedal. Use the braking force of the engine together with the brake.
- Do not use the brake pedal excessively. If the brake is used too frequently, the brake will overheat. If this happens, the brakes will not work and may lead to a serious accident.
- Do not put your foot on the brake pedal unless necessary.

The brake pedals (7) operate the brakes.

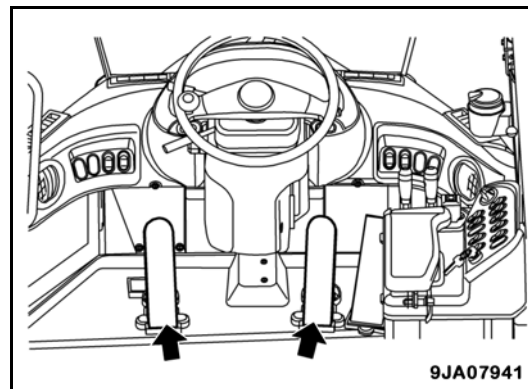
Right and Left Brake Pedals

The right brake pedal operates the wheel brakes. Use the right brake pedal for normal braking operations.

When the transmission cutoff switch is at the ON position, the brakes are applied and the transmission is set to the neutral position at the same time. When the transmission cutoff switch is at the OFF position, the brakes are applied but the transmission is not returned to neutral.

Remark

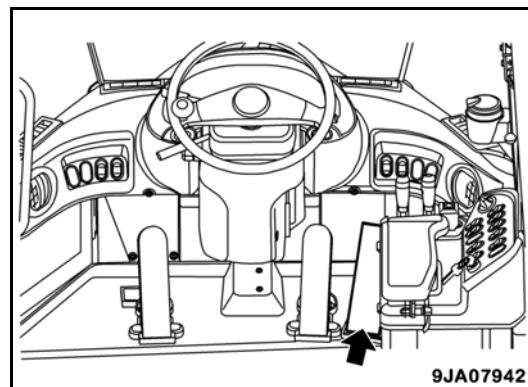
When using the brake and accelerator together to reduce the machine travel speed or to stop the machine while carrying out operations, set the transmission cutoff switch to the ON position and use the brake pedal.



Accelerator Pedal

The accelerator pedal (8) controls the engine speed and output.

The engine speed can be freely controlled between low idling and full speed.



OPERATION

SECURITY LOCKS AND SAFETY FEATURES

This machine is equipped with several security locks and safety features designed to protect the operator, persons performing service, repair, or inspections on the machine, as well as the general public when the machine is not in use and unattended. It is important for the operator of the machine to know where these features are located and when to use them.

Failure to do so may result in damage to the machine or injury to personnel.

Steering Tilt Lock Lever



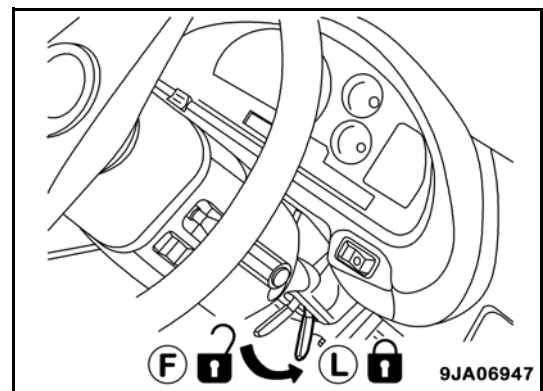
Stop the machine before adjusting the tilt of the steering wheel. If this operation (adjustment) is carried out while the machine is moving, it may lead to a serious accident or personal injury.

The steering tilt lock lever is used to hold the steering wheel in position.

- (F) position: FREE
Steering wheel can be moved to front, rear, up, and down.
- (L) position: LOCK
Steering wheel is held in position.

The amount of adjustment is shown in the following table.

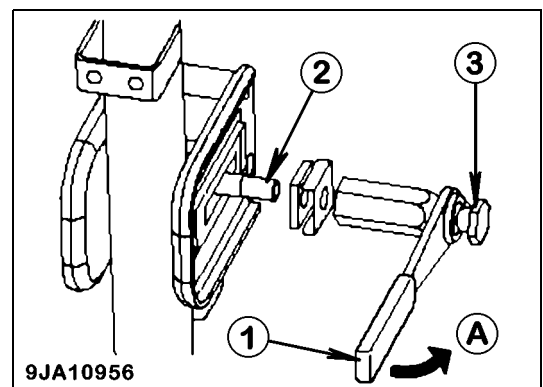
Up-Down Movement	When at 0 mm (0 in)	When Moved up to 40 mm (1.6 in)
Tilt amount	0 - 105 mm (0 - 4.1 in)	0 - 130 mm (0 - 5.1 in)



Remark

Do not operate lever (1) continuously by excessive force. The lever (1) may become loose or get out of angle. In this case, please ask your Komatsu distributor to carry out repairs.

Bolts (2) and (3) on the steering column are left hand screws. If they are screwed counterclockwise, it is not a loosening direction but a tightening direction (A).



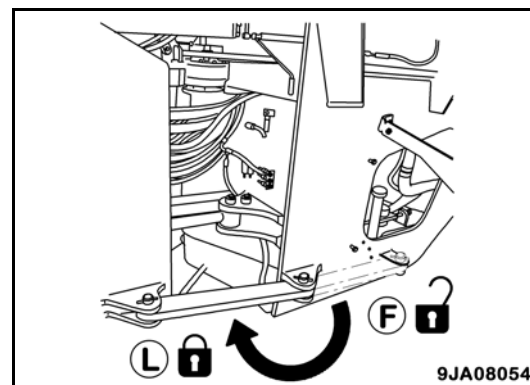
Frame Lock Bar

WARNING

- Always set the frame lock bar to the LOCK position when transporting or lifting the machine, or when carrying out maintenance.
- If the machine is transported or lifted when the frame lock bar is not locking the frame, the machine may suddenly articulate. If the machine articulates, it may cause serious personal injury to people in the surrounding area.
- Make sure that the frame lock bar is set to the FREE (F) position for travel operations. If it is not removed, the steering wheel cannot be used for steering. This may lead to serious damage or injury.

The frame lock bar is a device used to lock the front and rear frames so that the machine does not articulate.

- (L) position: LOCK
Front and rear frames are locked and machine cannot articulate. Set to this position when carrying out inspection and maintenance.
- (F) position: FREE
Set to this position for normal operation.



Locking Caps

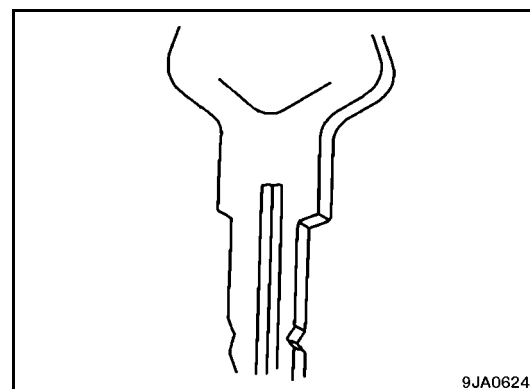
This machine is equipped with caps with locks for the fuel tank filler port and hydraulic tank filler port.

- ★ Use the starting switch key when opening or closing the cap.

Fuel Tank Filler Port Cap

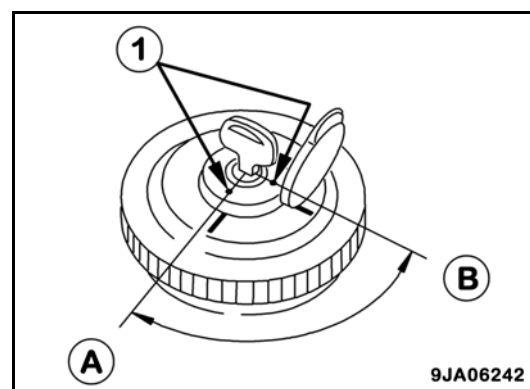
Opening the Cap

1. Insert the key into the key slot.
2. Turn the key clockwise; align the key groove with mark (1) on the cap; then open the cap.
 - Position (A): OPEN
 - Position (B): LOCK



Locking the Cap

1. Screw the cap into place until it is tight.
2. Insert the key in the key slot until the shoulder contacts the keyhole.
 - ★ If the key is not inserted fully into the cap and is turned, the key may break.
3. Turn the key to LOCK position (B), then remove the key.

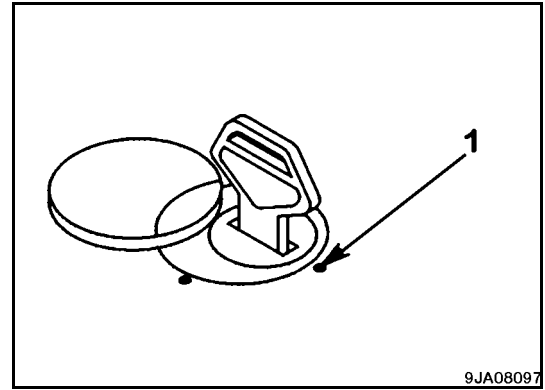


OPERATION

Hydraulic Tank Filler Port Cap

Opening the Cap

1. Insert the key into the key slot.
2. Turn the starting switch key counterclockwise and bring the rotor groove in line with the aligning mark (1) on the cap.
3. Turn the cap slowly until you hear a clicking sound. This releases the lock and allows the cap to be opened.
 - Position (A): OPEN
 - Position (B): LOCK



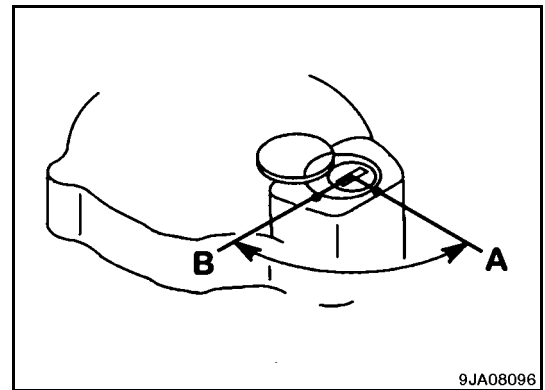
Locking the Cap

1. Screw the cap into place.
2. Turn the starting switch key to LOCK position (B), then remove the key.

Backup Alarm

This safety feature warns people that the machine will travel in reverse.

The backup alarm sounds when the directional lever is set to the R (reverse) position.



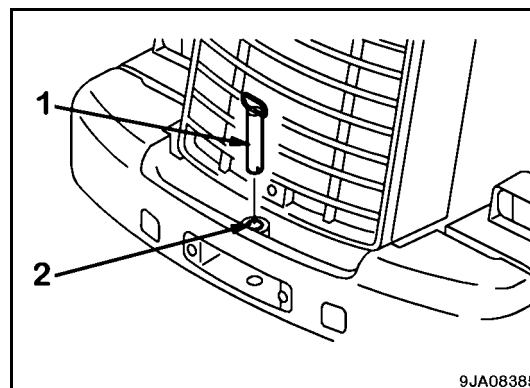
MACHINE FEATURES

Towing Pin

The towing pin is installed to the counterweight and is used when towing the machine.

Installing the Towing Pin

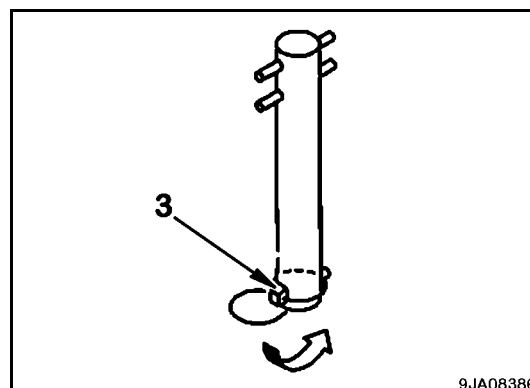
1. Insert towing pin (1) into hole (2) in the counterweight.



2. Insert linchpin (3) into the towing pin so that the towing pin does not come out.

Removing the Towing Pin

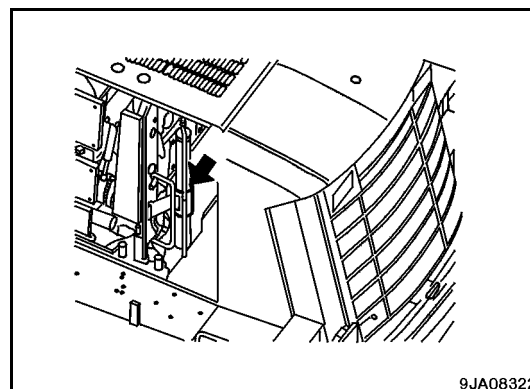
1. Remove linchpin (3) from the towing pin.
2. Remove the towing pin (1) from the counterweight.



Grease Pump

The grease pump is installed in the holder on the left radiator side of the engine bulkhead at the rear of the machine.

1. Unhook the chain attaching the grease pump to the hook at the bottom of the holder.
2. Remove the grease pump from the rubber band then remove it from the holder.
3. After using the grease pump, wipe off the grease from its outside and install it in position.
4. When stowing the grease pump, insert it into the holder and fix it with the rubber band.
5. Hitch the tail chain of the grease pump to the hook at the bottom of the holder.



OPERATION

Cab Door

Emergency Escape Right Door



- The door on the right side of the cab is provided as an emergency escape door for use when it is impossible to exit from the door on the left side. Do not use it as the door for normal entry and exit from the cab.
- Never operate the machine with the door open to around 90°. The door may extend beyond the maximum width of the machine or it may suddenly close if the brakes are applied. This is extremely dangerous; never operate the machine in this condition.
- Operate the machine with the door on the right side fully closed (lock) or partially opened (quarter lock).

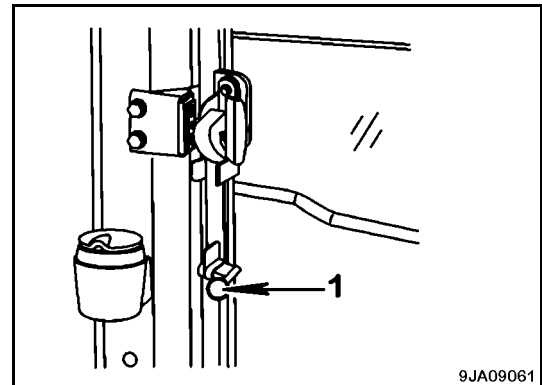
Remark

The right window of the cab cannot be opened or closed from the outside.

Normal Condition of Right Door During Operation

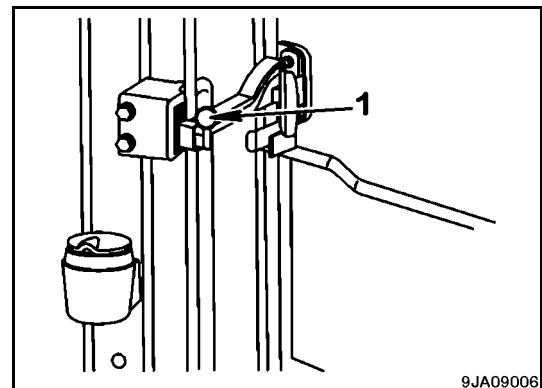
When the lock release knob (1) is pushed down securely, the lock is applied.

- When using the air conditioner or heater, carry out operations with the knob in this position.



If lock release knob (1) is lifted up, the right door will partially open (quarter lock).

- When letting outside air in on the right side, carry out operations with the knob in this position.

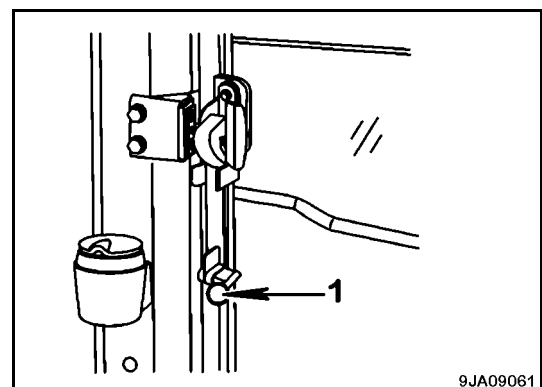


Door Operating as Emergency Escape

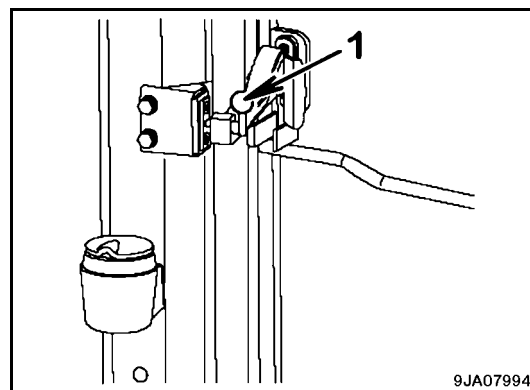
If the left door of the cab does not open or if it is dangerous to get off the machine from the left side, use the right emergency door.

- ★ Release the open lock of the right door to open the door fully and use it as an emergency escape route.

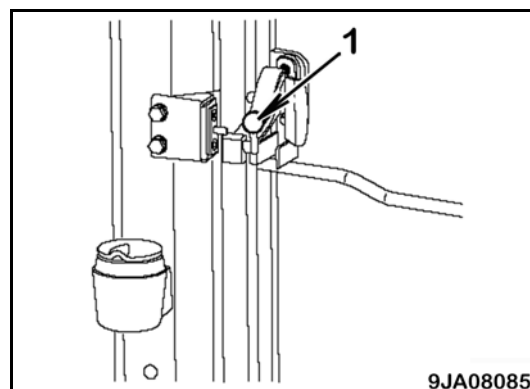
1. Lift lock release knob (1) up.



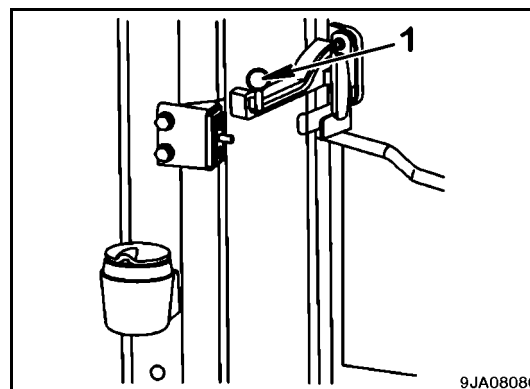
- Grip lock release knob (1) and pull it towards the rear of the machine.



- Remove the open lock guide rail from the window pillar guide to free the right door lock.

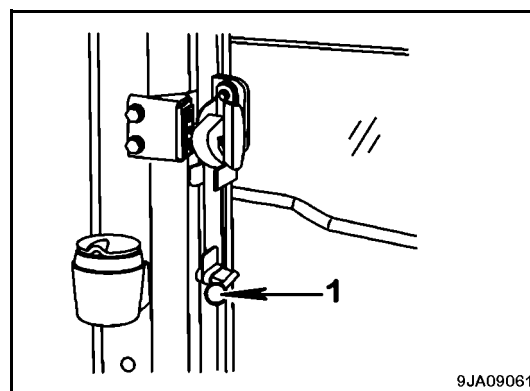


- Open the right door fully and escape through the door.



- To return the open lock to its original position, use your hand to hold lock release knob (1) open and pull it gradually to align the open lock guide rail with the guide and then push the open lock knob to the front.

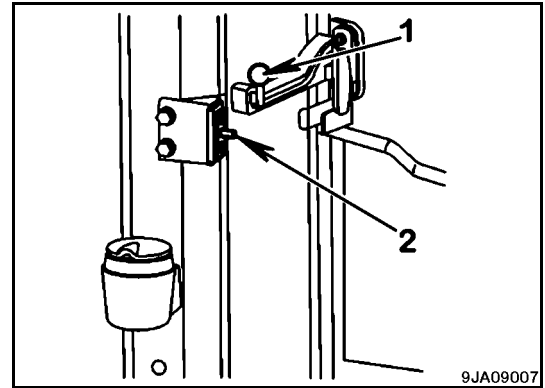
- Check that the rail is completely fitted into the guide and then push lock release knob (1) down to set it securely to the LOCK position.



OPERATION

WARNING

- If the door is closed without holding the open lock knob (1) by hand, the plastic part of the lock lever will hit pin (2) at the cab side; this may break the plastic part.
- Always use your hand to hold the lock knob (1) open when closing the door.



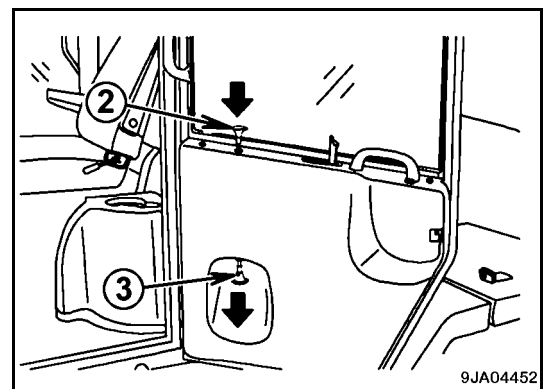
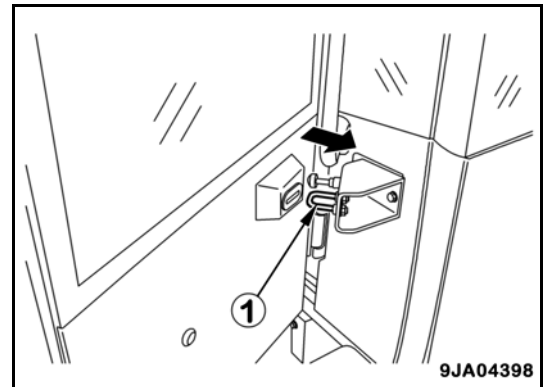
WARNING

- Always check that the cab door is locked, both when it is open and when it is closed.
- Always stop the machine on level ground before opening or closing the door.
- Avoid opening or closing the door on a slope. There is danger that the operating effort may suddenly change.
- When opening or closing the door, always use the door handle and knob.
- Be careful not to get your hands caught by the front pillar or center pillar.
- When there is any person inside the cab, always call out a warning before opening or closing the door.

Left Cab Door, Door Open Lock

When getting in or out of the operator's compartment, or when operating with the door open, use this lock to hold the door in position.

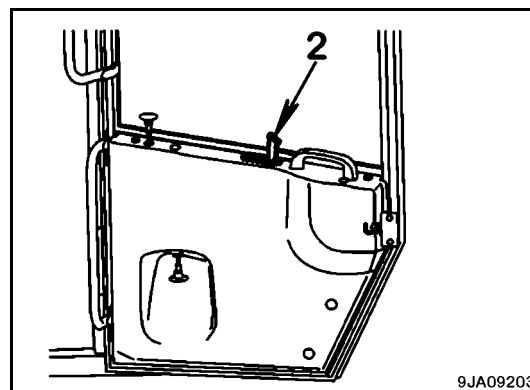
1. Push the door against catch (1) to lock it in position.
2. When attaching the door in position, lock it firmly to the catch.
3. When getting on or off the machine, hold the handrail on the inside.
4. When closing the door from the operator's seat, push knob (2) to release the catch.
5. When closing the door after getting off the machine, pull knob (3) to release the catch.



Left Cab Door, Knob

- Pull door open knob (2) up to open the door fully.

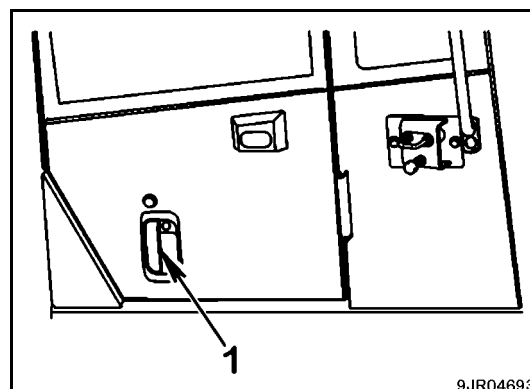
It is possible to open the door in this manner even when the door is locked with the key.



Left Cab Door, Handle

- Pull door handle (1) and open the door fully.

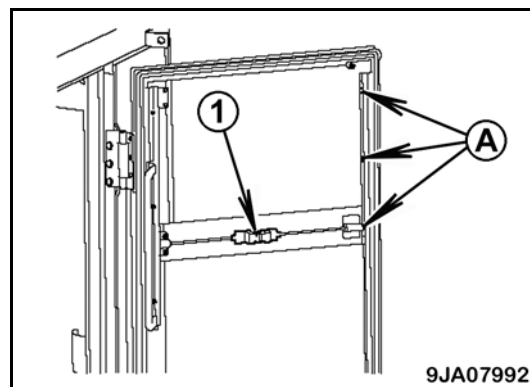
It is possible to open the door in this manner if the door has not been locked with the key.



Left Cab Sliding Window (Lock Release Knob)

Use this knob when you want to move the glass in the window of the left door up or down to open or close it.

1. Grip lock release knob (1) to release the lock, then move the glass down to a lower lock position.
 2. Release lock release knob (1).
- ★ There are three points for lock position (A).



OPERATION

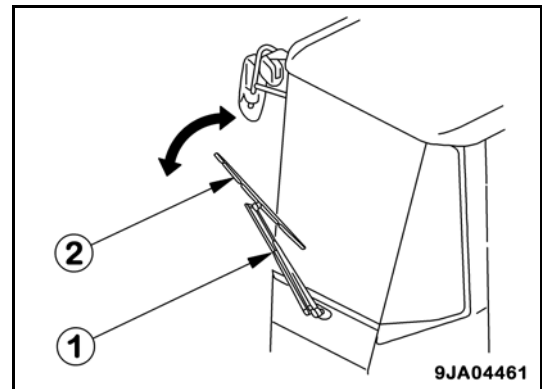
Cab Wiper

Preventing Wiper Arm Bracket Damage

Remark

When angling the wiper arm (1) to the front, check that the wiper blade is hanging free.

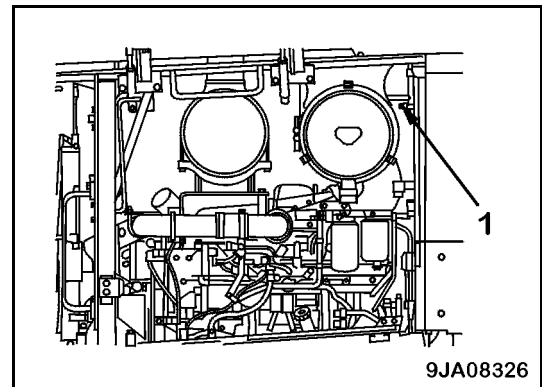
If, when angling the wiper arm (1) to the front, the wiper arm is angled with the wiper blade (2) locked to the arm (the bottom of the blade is caught on the arm), abnormal force is brought to bear on the mounting bracket. This force may break the bracket.



Dust Indicator

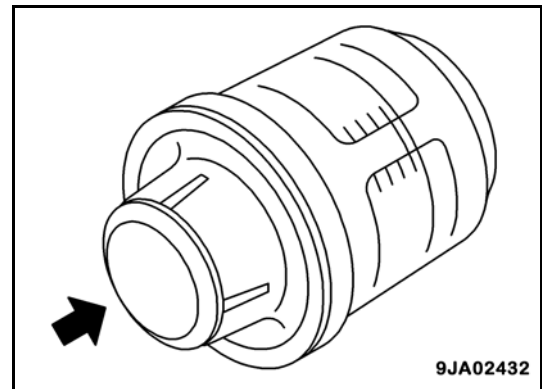
The dust indicator (1) is located inside the engine side cover on the right side of the chassis.

If the air cleaner is clogged, the air cleaner clogging caution lamp on the machine monitor illuminates to inform the operator that the air cleaner needs to be cleaned.



After cleaning, press the reset button to cancel the lamp.

For details about cleaning the dust indicator, see “Clean, Replace Air Cleaner Element” on page 3-28.

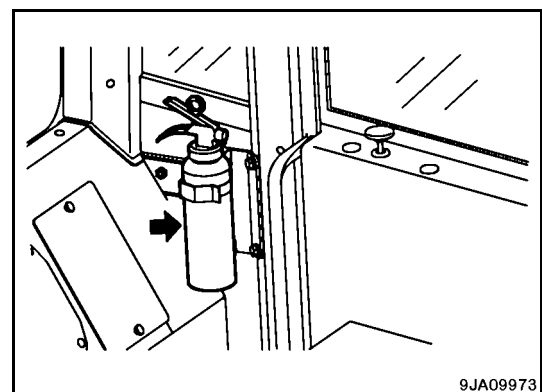


Fire Extinguisher (if equipped)

A fire extinguisher may be located inside the operator's cab.

The directions are marked on the nameplate affixed to the fire extinguisher. You should be prepared to use the extinguisher.

- ★ Read the instructions carefully and understand them before you encounter an emergency situation where it is necessary to use the extinguisher.



ELECTRICAL

Power Outlet

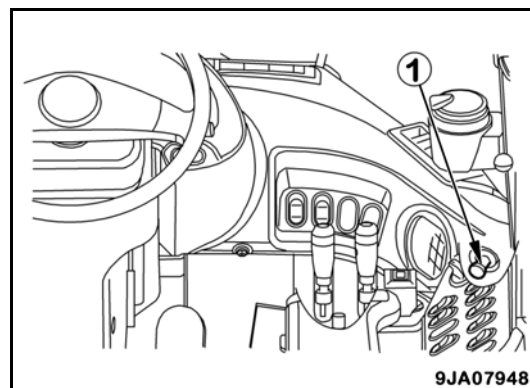
Remark

There are two power sources: 12V (if equipped) and 24V.

Check the voltage of the electrical equipment and select the appropriate power source.

Mistaken use, such as using 24V as the power source for 12V equipment, will cause failure of the equipment.

When using the electric power source, do not install any equipment which exceeds the maximum amperage.

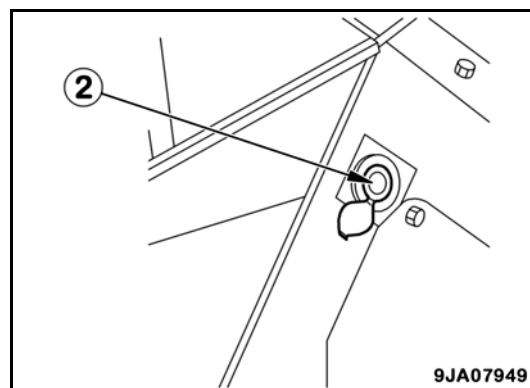


When cigarette lighter (1) is removed, the lighter socket can be used as a 24V power source.

Maximum amperage: 9A (216W)

Electric power source (2) (if equipped) can be used as a 12V power source.

Maximum current: 10A (120W)



Fuses

Remark

Before replacing a fuse, be sure to turn off the starting switch.

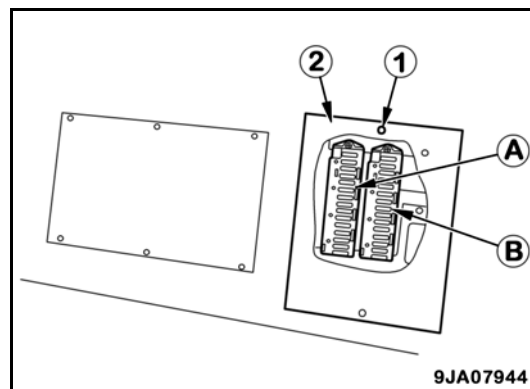
The fuses protect the electrical equipment and wiring from burning out.

- Replace the fuse if **ANY** of the following conditions occur:
 - The fuse is corroded.
 - You can see white powder near the fuse.
 - The fuse is loose in the fuse holder.

Remark

Replace the fuse with another of the same capacity.

- ★ The fuses are inside the rear console box.
- Loosen knob (1) at two places and remove cover (2).
The fuse boxes are designated A and B.

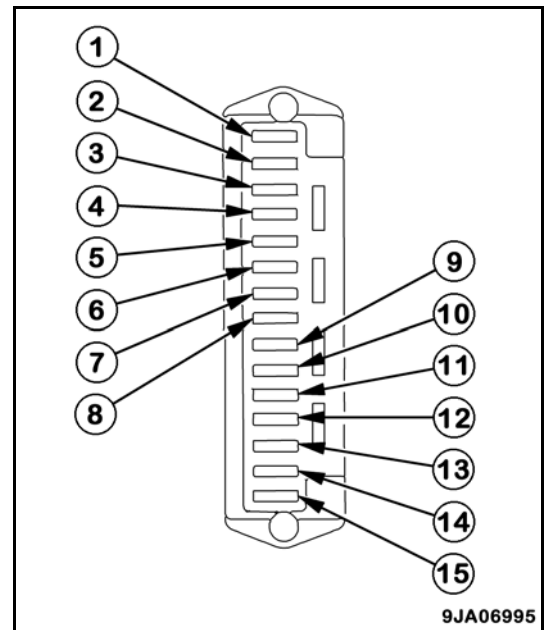


OPERATION

Fuse Capacity and Name of Circuit

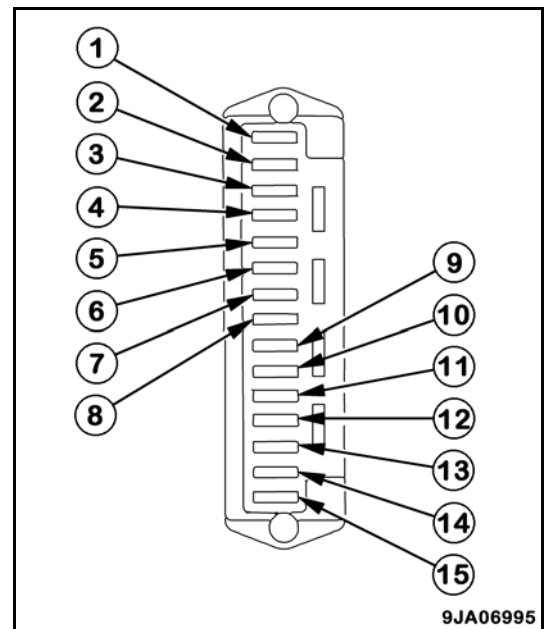
Fuse Box A

No.	Fuse Capacity	Name of Circuit
(1)	10A	Left front lamp
(2)	10A	Right front lamp
(3)	10A	Left clearance lamp
(4)	10A	Right clearance lamp
(5)	20A	Main lamp circuit
(6)	10A	Instrument panel B Load meter printer (if equipped)
(7)	5A	Air conditioner B
(8)	20A	Air conditioner A
(9)	20A	Wiper, washer
(10)	10A	Backup lamp, brake lamp
(11)	10A	Work equipment positioner Work equipment controller A (if equipped)
(12)	5A	Emergency steering (if equipped)
(13)	5A	Parking brake
(14)	10A	Transmission control A
(15)	10A	Horn



Fuse Box B

No.	Fuse Capacity	Name of Circuit
(1)	5A	Engine control B
(2)	20A	Rear heated wire glass
(3)	10A	Air suspension seat
(4)	20A	Yellow rotating lamp (if equipped)
(5)	10A	Turn signal indicator
(6)	20A	Car radio, cigarette lighter, 12V power source
(7)	10A	Rear working lamp
(8)	10A	Front working lamp
(9)	10A	Spare 1
(10)	30A	Engine control A
(11)	5A	Transmission control B Work equipment controller B (if equipped)
(12)	10A	Room lamp
(13)	10A	Instrument panel A KOMTRAX
(14)	10A	Hazard lamp
(15)	20A	Starting switch



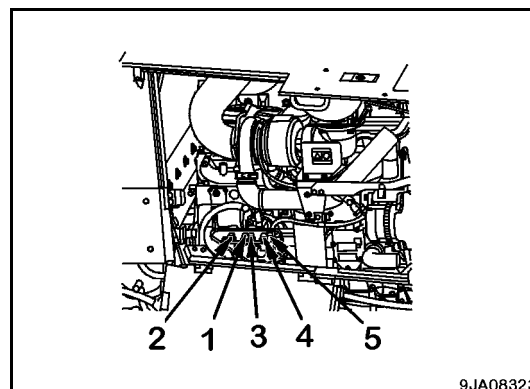
Slow-Blow Fuse

There are five slow-blow fuses. They are located at the left side of the machine, at the side of the engine.

If the power does not come on when the starting switch is turned to the ON position, a slow-blow fuse may be blown. Check and replace it, if necessary.

Slow-Blow Fuses

(1)	50A	Permanent power source
(2)	50A	Main power A
(3)	50A	Main power B
(4)	120A	Charging circuit
(5)	120A	Heater relay (electrical air intake heater)



WORK OPERATIONS

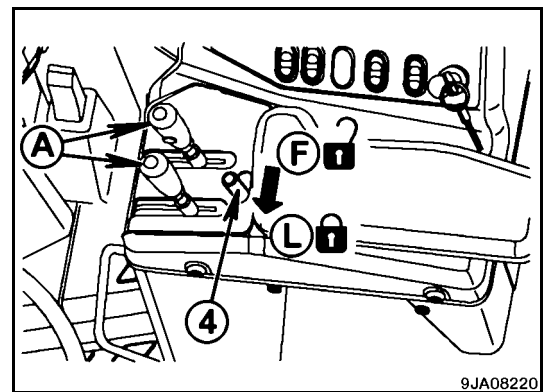
WARNING

- Always hang a warning sign on the work equipment control levers (A) and set the work equipment lock lever (4) to the LOCK position (L).
- Accumulation of flammable materials and leakage of fuel or oil around the battery or high-temperature parts of the engine, such as the engine muffler and turbocharger, may cause fire on the machine. Check thoroughly and repair any problems that are found, or contact your Komatsu distributor.
- Always repair any damage to the handrails and steps, and tighten any loose bolts. Failure to do this may cause workers to fall and suffer serious personal injury.

Walk-Around Check

Before starting your machine and proceeding with any work operations:

- Check the area around and under the machine.
- Check for loose nuts and bolts, damage to any parts, leakage of fuel, oil, or coolant.
- Check the condition of the work equipment and the hydraulic systems.
- Check for looseness or play in electric wiring.
- Check that there is no dust accumulated around high-temperature parts.



Precautions Before Starting Work Operations

Before starting work operations, it is important to perform several procedures to be sure your equipment is in a safe operating condition. It is also important to be aware of the hazards involved when operating your machine.

If the machine is at an angle, reposition it so that it is level before starting your check.

Perform the following inspections and cleaning every day before starting the engine for the day's work.

1. Check for damage, wear, play in the work equipment, cylinders, linkage, and hoses.
 - Check that there are no cracks, excessive wear, or play in the work equipment, cylinders, linkage, or hoses.
 - Repair any abnormality.
2. Remove dirt and dust from around engine, battery, and radiator.
 - Check if there is any dirt or dust accumulated around the engine or radiator.
 - Check for flammable material (dead leaves, twigs, etc.) accumulated around the battery, engine muffler, turbocharger, or other high-temperature engine parts.
 - Remove all such dirt, dust, or flammable material.
3. Check for coolant or oil leaks around the engine.
 - Check that there are no oil leaks from the engine or coolant leaks from the cooling system.
 - If there are any leaks, repair it or replace the damaged parts.

4. Check for leaks from fuel line.
 - Check that there are no fuel leaks or damage to the hoses and tubes.
 - If there is a leak, repair it or replace the damaged parts.
5. Check for oil leaks from the transmission case, axle, hydraulic tank, hoses, joints.
 - Check that there is no oil leakage or damage to the hoses and tubes.
 - If there is a problem, repair it or replace the damaged parts.
6. Check for oil leaks from the brake line.
 - Check that there is no oil leakage or damage to the hoses and tubes.
 - If there is a leak, repair it or replace the damaged parts.
7. Check for damage to the lamps.

Remark

Before starting operations, clean all dirt from the surface of the lamps.

If the lamps are used with mud stuck to the surface, the lamps may overheat and be damaged.

If the lamp is cleaned when it is overheated, the sudden change in temperature may cause the lens to crack. Turn the lamp off and wait for the temperature to go down before cleaning the lamp.

8. Check for damaged or worn tires, wheels, wheel hub bolts, and nuts. Check for loose wheel hub bolts and nuts.
 - Check for cracks or peeling of the tires and for cracks or wear to the wheels (side rim, rim base, lock ring).
 - If there is an abnormality, repair or replace the part.
 - Tighten any loose wheel hub bolts or nuts.
 - If any valve caps are missing, install new caps.

**WARNING**

If worn or damaged tires are used, they may burst and cause serious injury or death.

To ensure safety, do not use tires exhibiting the following characteristics.

- Wear:
 - Tires with a tread groove of less than 15% of that of a new tire
 - Tires with extreme uneven wear or with stepped-type wear
- Damage:
 - Tires with damage which has reached the cords (4), or with cracks in the rubber (3)
 - Tires with cut or pulled cords
 - Tires with peeled (separated) surface
 - Tires with damaged bead (5)
 - Leaking or improperly repaired tubeless tires
- Deteriorated, deformed, or abnormally damaged tires which do not seem usable.

Do not install a tire protector (mesh chain) to the rear tires.

Maintenance, disassembly, assembly and repair of the tires and rims requires special equipment and technology, so always contact your Komatsu distributor to perform these operations.

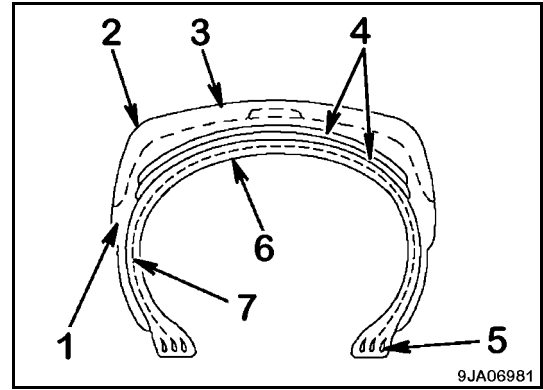
OPERATION

- (1) Side wall
- (2) Shoulder
- (3) Tread
- (4) Breaker or belt (cord layer)
- (5) Bead
- (6) Inner liner
- (7) Carcass

9. Inspect rims.



- Check the rims (wheels) and rings to confirm that there is no deformation, corrosion, or cracks.
- In particular, check the side rings, lock rings, and rim flanges thoroughly.
- Maintenance, disassembly, assembly and repair of the tires and rims requires special equipment and technology, so always contact your Komatsu distributor to perform these operations.



10. Check for loose battery terminals.

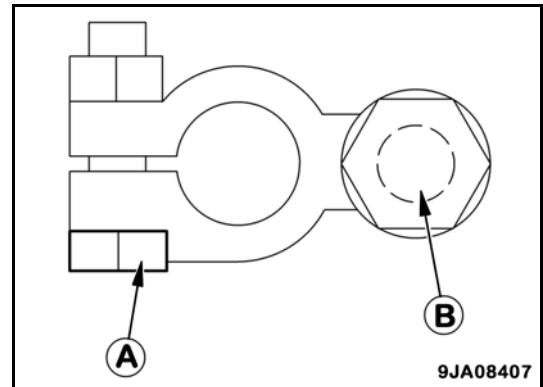
- Tighten any loose terminal.
- Tightening torque:

Portion A: 5.9 – 9.8 N•m (52 – 87 lbf in)

Portion B: 11.8 – 19.6 N•m (9 – 15 lbf ft)

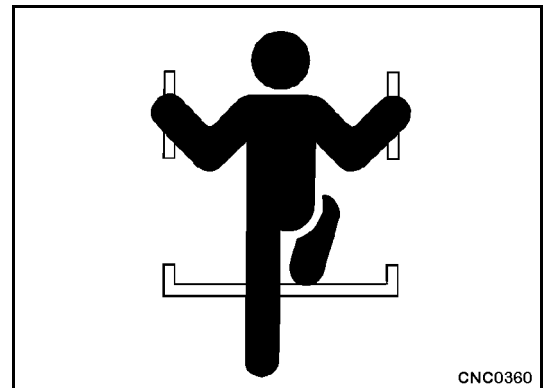
11. Check for loose air cleaner mounting bolts.

- Check for loose bolts.
- Tighten any loose bolts.



12. Clean the cab window.

- To ensure good visibility through the cab window during operations, always keep the glass clean.
- It is extremely dangerous to cross from the side of the cab to the step on the front fender. Always articulate the machine fully to the side, then cross on that side from the side of the cab to the step. When crossing, grip the handrail on top of the cab and pay careful attention to the safety of your footing on the platform on the left or right to move to the step on the front fender.
- When cleaning the cab glass, use the handrail and step, and always be sure to maintain three-point contact (two feet and one hand, or one foot and two hands) with the handrail and step to ensure that your body is supported properly.
- Clean the cab glass only on the side to which the machine is articulated.
- When cleaning the glass on the other side, articulate the machine in the opposite direction before starting.
- ★ See “Precautions When Cleaning Cab Glass” on page 1-23.



13. Check rear view mirror, underview mirror.

- Check that the mirrors are not damaged. Replace them if they are damaged.
- Clean the surface of the mirrors and adjust the angle so that the operator can see the area to the rear and under the machine from the operator's seat.
- When cleaning the mirrors, use a mop with a long handle.

14. Check for loose ROPS mounting bolts.

- If there are loose bolts, contact your Komatsu distributor to obtain the tightening torque.
- If any bolts are damaged, contact your Komatsu distributor to obtain genuine Komatsu bolts. Check for damage and loose bolts on the handrail and steps.
- Repair any damage and tighten any loose bolts.

15. Check for damage to gauges, lamps on the instrument panel, and loose bolts.

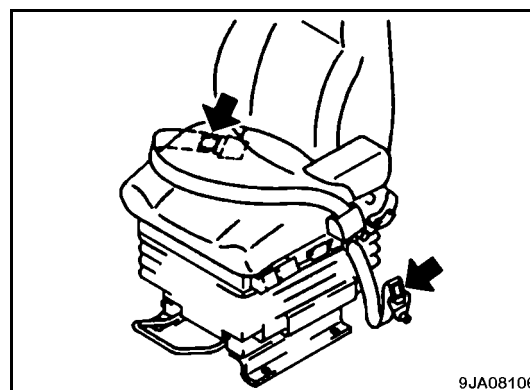
- Check for damage to the panel, gauges, and lamps. If there is a problem, replace the parts.
- Clean off any dirt on the surface.
- Tighten any loose bolts.

16. Check for damage to the seat belt and mounting clamps. See “Seat Belt Inspection” on page 1-11.

- Check that there are no loose bolts on the equipment mounting the seat belt to the machine.
- Tighten the bolts if necessary.

Tightening torque: 24.5 ±4.9 N•m (217 ±43 lbf in)

- If the belt is damaged or fluff is starting to form, or if there is any damage or deformation of the seat belt holders, replace the seat belt.



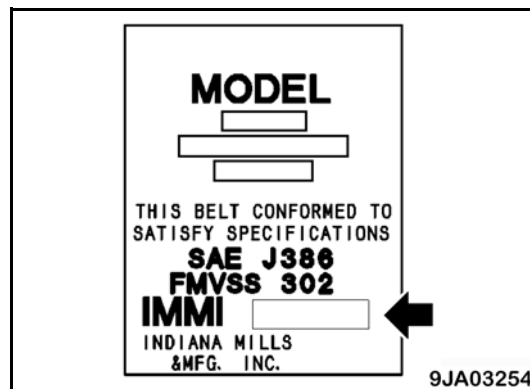
9JA08106

! WARNING

The seat belt should be replaced at the first sign of wear or damage. It should also be replaced every three years after the start of usage, or five years after the date of manufacture even if there appears to be no abnormality.

Remark

The date of manufacture of the seat belt is marked on the belt at the place indicated by the arrow in the figure to the right.



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OPERATION

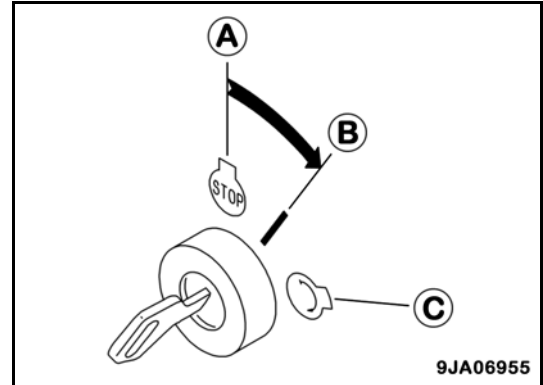
Check Before Starting Engine

Remark

Perform the checks in this section before starting the engine each day.

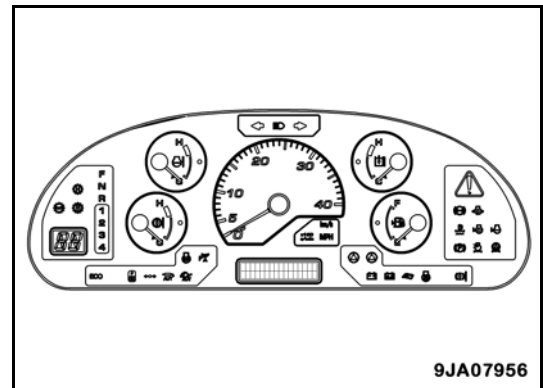
Check Machine Monitor

1. Turn the starting switch to the ON position (B).



2. Check that all the monitors, gauges, and the central warning lamp illuminate for approximately two seconds, and that the alarm buzzer sounds for approximately two seconds.

If the lamps do not illuminate, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.

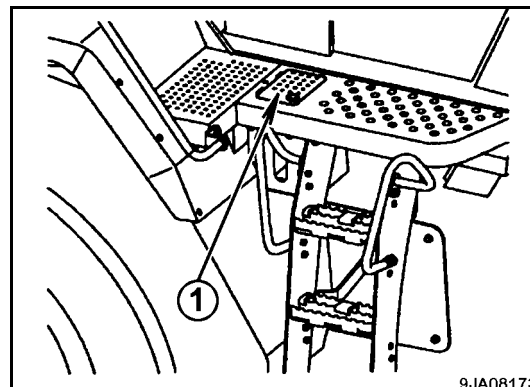


Check Coolant Level, Add Coolant

WARNING

- Do not open the radiator cap unless necessary.
- Wait for the engine to cool down before checking the coolant in the subtank. The coolant remains at high temperature and the radiator is under high internal pressure immediately after the engine has stopped. If the cap is removed to check the coolant level in this condition, there is a hazard of burns.
- Wait for the temperature to go down and then turn the cap slowly to release the pressure before removing it.
- When adding coolant, use the step and handrail on your machine to support yourself securely.

1. Open cover (1) of the platform on the right side of the machine.



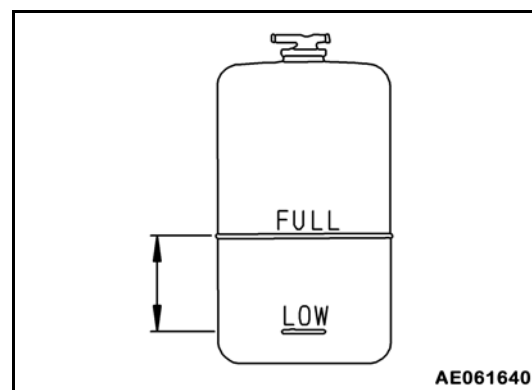
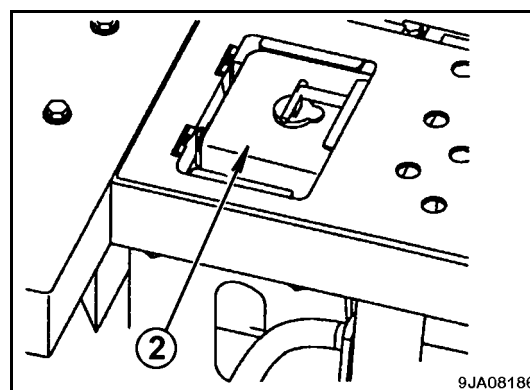
2. Check that the coolant level is in the range between the FULL and LOW marks on radiator subtank (2)

- If the coolant level is low, add coolant through the coolant filter of subtank (2) to the FULL level.

3. After adding coolant, tighten the cap securely.

4. If subtank (2) is empty, check for coolant leakage, then check the coolant level in the radiator. If the coolant level is low, add coolant to the radiator, then add coolant to subtank (2).

- If the volume of coolant added is more than usual, check for possible leakage.
- Confirm that there is no oil in the coolant.



OPERATION

Check Oil Level in Engine Oil Pan, Add Oil



The parts and oil are at high temperature immediately after the engine is stopped and may cause serious burns. Wait for the temperature to go down before starting the operation.

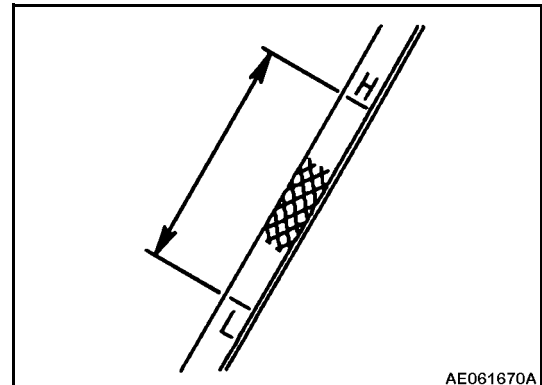
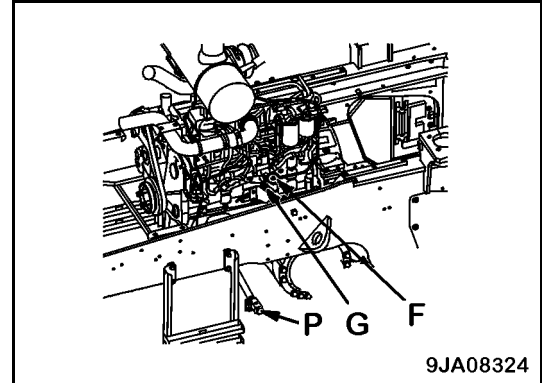
★ Make sure that the machine is in a horizontal position before you check the oil level.

1. Stop the engine and wait at least 15 minutes for the temperature of all parts to go down.

Remark

After the engine has been operated, wait for at least 15 minutes after stopping the engine before checking the oil level.

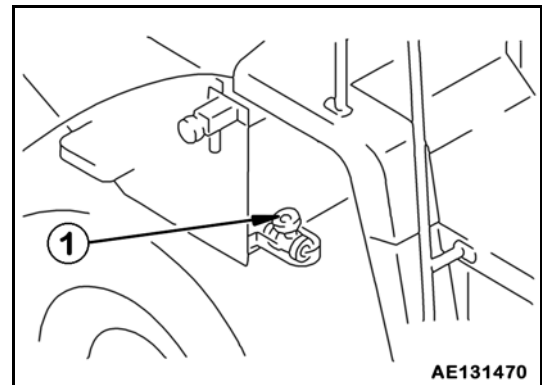
2. Open the inspection cover of the right side at the rear of the machine.
3. Take out the dipstick (G) and use a cloth to wipe off the oil.
4. Fully insert dipstick (G) into filler pipe (F) and then remove it.
5. The oil level should be between the H and L marks on dipstick (G).
 - If the oil level is below the L mark, add oil through oil filler port (F).
 - If the oil is above the H mark, drain the excess engine oil from drain plug (P) and check the oil level again.
 - If the oil level is correct, tighten oil filler cap (F) securely and close the inspection window.



Drain Water, Sediment from Fuel Tank

★ Only poor fuel arrangement specification

Loosen valve (1) on the right side of the tank so that the sediment and water is drained together with the fuel.



Check Water Separator, Drain Water



- Each part of the engine is very hot immediately after the engine is stopped. Do not attempt to drain cooling water or remove the filter element cup.
- High pressure is generated inside the engine fuel piping while the engine is running. Wait for more than 30 seconds after the engine stops for the engine to cool down sufficiently. Then start by draining the cooling water or removing the filter element cup.
- Do not bring fire close.

★ Check water separator, drain water and sediment.

1. Open the engine side cover on the right side of the machine.
The water separator (1) forms one unit with the fuel prefilter and is at the bottom.

2. It is possible to judge the condition of water and sediment through transparent cap (3). If water or sediment is accumulated, set a container under drain hose (4) to collect the discharged water.

3. Loosen plug (2) and drain the water.

4. Tighten plug (2) as soon as fuel starts to be discharged from drain hose (4).

If plug (2) is stiff, coat O-ring (5) of plug (2) with grease.

Tightening torque:..... 0.2 – 0.45 N•m (2 – 4 lbf in)

5. Because the sensor can detect if water is accumulated at the bottom of the fuel prefilter, the water separator caution lamp on the machine monitor lights up. Do Steps 2 - 4 to drain the water.

★ If transparent cap (3) is dirty and the contents cannot be easily seen, clean transparent cap (3) when replacing the filter.

★ When washing, if plug (2) is removed, coat the O-ring with grease, then tighten by hand until it contacts the bottom.

- A. Set a fuel container under drain hose (4).

- B. Loosen plug (2), then drain all the sediment together with the fuel from drain hose (4).

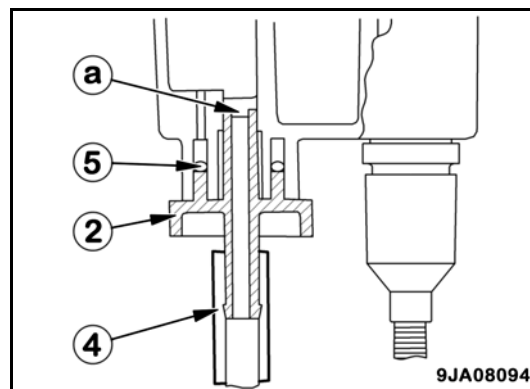
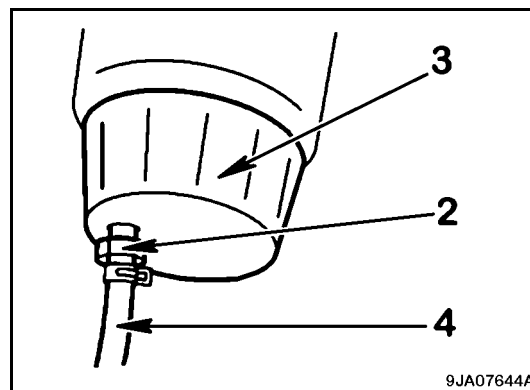
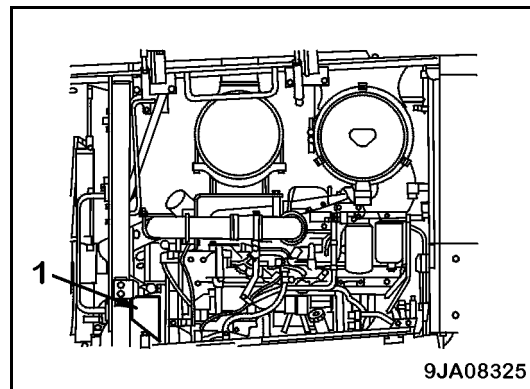
- C. Check that nothing comes out from drain hose (4), then remove plug (2).

- D. Coat O-ring portion (5) with a suitable amount of grease.

★ When doing this, be careful not to let the grease get on the drain valve water drain port (a) or the plug thread.

- E. Screw in plug (2) by hand until it contacts the bottom.

- F. Remove the fuel container.



OPERATION

Check Additional Water Separator, Drain Water

- ★ Only poor fuel arrangement specification

WARNING

- The engine fuel piping system is under high internal pressure when the engine is running. Always reduce the internal pressure before draining water or replacing the element cup.
- This engine consists of higher precision parts than on the conventional fuel injection pump and nozzle, If dirt gets in, it will cause problems. If there is any dirt stuck to the fuel line, use fuel to wash it off completely.
- Fuel is highly flammable and a dangerous substance. Never bring fire or flames near fuel.

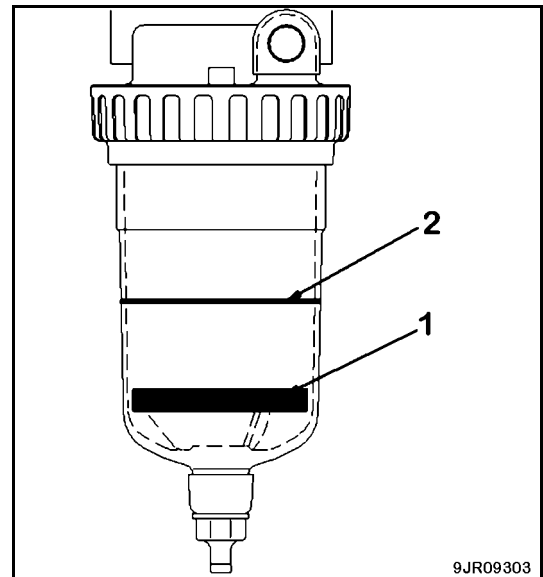
- ★ The water separator separates moisture mixed in the fuel.

Remark

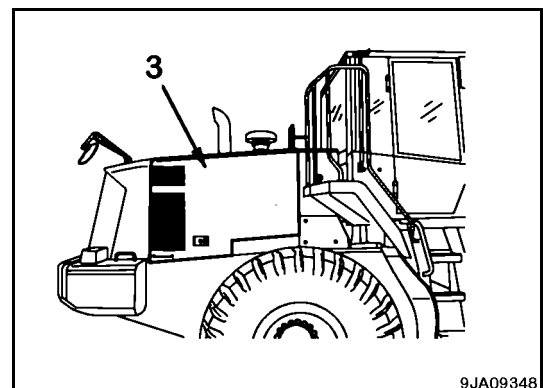
If float (1) goes above level line (2), there is danger that the separated water may be sucked into the engine.

Always drain the water before float (1) reaches level line (2).

1. Prepare a container to catch the water.



2. Open engine side cover (3) on the right side of the machine.



3. Check if there is any water accumulated in water separator (4).
4. If there is any water accumulated, loosen air bleeding plug (5) (width across flats: 13 mm (0.5 in)), then loosen drain valve (6) of the water separator and drain the water.

5. Tighten air bleeding plug (5) and drain valve (6).

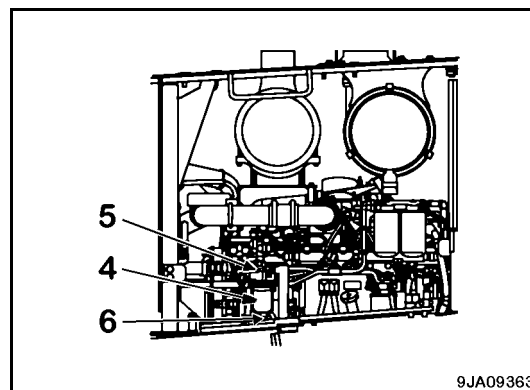
Tightening torque:

Air bleeding plug: 8.0 – 12.0 N•m (71 – 106 lbf in)

Drain valve: 2.0 – 3.0 N•m (18 – 27 lbf in)

- ★ When the engine is started after adding fuel, the water separator and fuel prefilter cup may become filled with water. If they become full of water, drain the water.

- ★ See “Check Water Separator, Drain Water” on page 2-83.



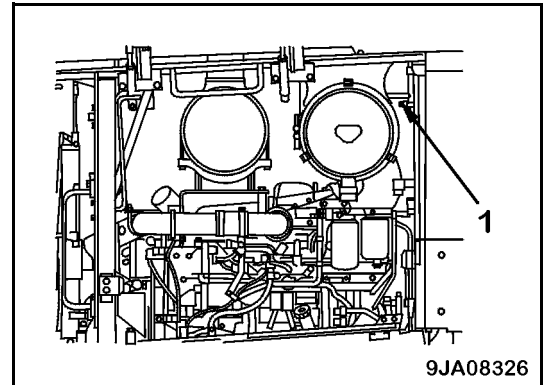
OPERATION

Check Air Cleaner

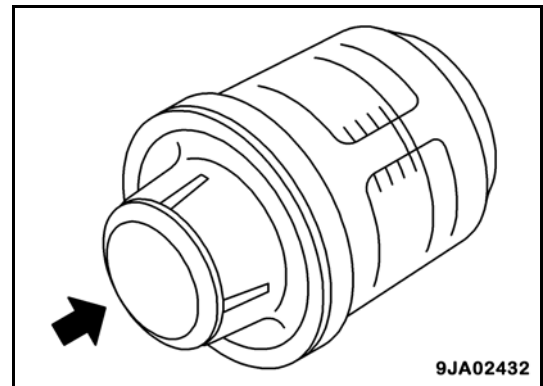
WARNING

- If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and damage it. Always stop the engine before carrying out these operations.
- When using compressed air, there is danger that dirt may be blown around and cause serious injury.
- Always use protective glasses, dust mask, and other protective equipment.

1. Open the engine side cover on the right side of the chassis.
2. If the yellow piston in the display portion of dust indicator (1) installed to the air cleaner enters the red range (7.5 kPa {1.09 psi}), clean the element.



3. After cleaning, press the button of the dust indicator to reset it.
 4. If the yellow piston enters the red range (7.5 kPa {1.09 psi}) soon after the dust indicator is reset, it is necessary to replace the element.
- ★ For details about replacing the element, see “Clean, Replace Air Cleaner Element” on page 3-28.



Electric Air Cleaner Clogging Sensor

If the yellow piston in the display portion of dust indicator (1) enters the red range (7.5 kPa {1.09 psi}) or air cleaner clogging caution lamp (2) on the machine monitor lights up, clean the air cleaner element.

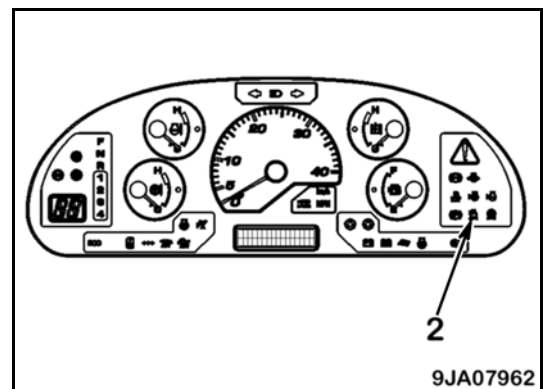
- ★ Do not clean the element until the air cleaner clogging caution lamp lights up.

Remark

If the element is cleaned frequently before the air cleaner becomes clogged, the air cleaner will not be able to provide its expected performance and the cleaning efficiency will become poor.

In addition, dirt stuck to the element will drop inside the inner element more frequently during the cleaning operation.

- ★ For details about the air cleaner clogging caution lamp, see “Air Cleaner Clogging Caution Lamp” on page 2-23.
- ★ For details about the dust indicator, see “Dust Indicator” on page 2-72.



Check Fuel Level, Add Fuel

! WARNING

- When filling with fuel, do not add more fuel after the fuel supply has automatically stopped. If too much fuel is added, there is danger that the fuel may expand because of the rise in the ambient temperature and cause the fuel to overflow.
- Spilled fuel may cause a fire. Always wipe off any spilled fuel completely.
- Fuel is highly flammable and a dangerous substance. Never bring fire or flames near fuel.

Remark

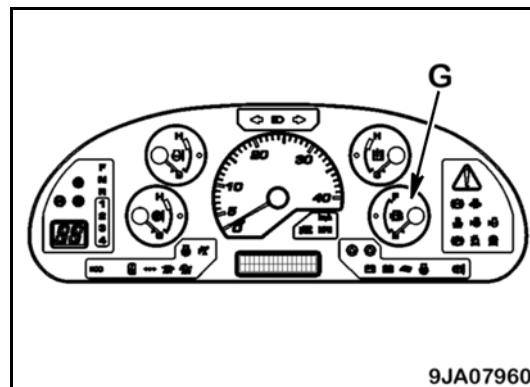
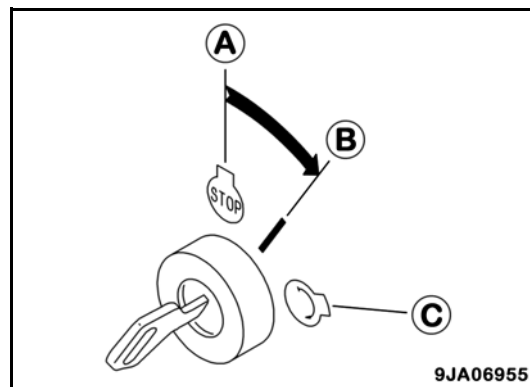
If the engine has run out of fuel and has stopped, it is necessary to bleed all the air from the fuel line before starting the engine again.

Be careful not to let the engine stop because of lack of fuel.

If the engine has run out of fuel, the air bleeding operation can be carried out more quickly when the fuel tank is full.

★ For details about the bleeding air procedure, see “Replace Fuel Main Filter Cartridge (Standard Specification)” on page 3-72.

1. Turn the engine starting switch to the ON position (B) and check the fuel level with fuel level gauge (G).
2. After checking, turn the switch back to the OFF position (A).

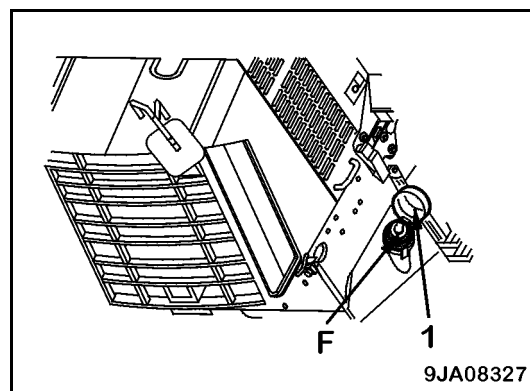


3. After completing daily operations, refill fuel through fuel filler port (F) until the fuel tank is full.

For details about opening and closing the cap, see “Locking Caps” on page 2-65.

For precautions when handling fuel, see “Rules for Refueling the Machine” on page 1-45.

4. After adding fuel, tighten the cap securely.
Fuel capacity: 325 liters (86 gal)



OPERATION

Check Electric Wiring



- If fuses frequently blow or if there are traces of short circuits on the electrical wiring, locate the cause and repair immediately, or contact your Komatsu distributor for repairs.
 - Keep the top surface of the battery clean and check the breather hole in the battery cap. If it is clogged with dirt or dust, wash the battery cap to clear the breather hole.
-

- Check that the fuses are not damaged, that the fuses are of the correct capacity, and that there are no signs of short circuits or disconnections in the electric wiring.
- Check that there are no loose terminals or connectors. Tighten any loose parts.
- Check the wiring of the battery, starting motor, and alternator carefully.
- Be sure to check that there is no flammable material accumulated around the battery. Remove all flammable material.
- Consult your Komatsu distributor about repairs and causes of problems.

Check Inflation Pressure of Tires

- Measure the inflation pressure with a tire pressure gauge while the tires are cool, before starting work. The appropriate inflation pressure differs dependent on the type of work. See “HANDLING TIRES” on page 2-154.
- Check for damage or wear to the tires and the rims.
- Check for loose wheel hub nuts (bolts).
- Maintenance, disassembly, assembly and repair of the tires and rims requires special equipment and technology, so always contact your Komatsu distributor to perform these operations.

Check Condition of Window Washer Spray

- Operate the window washer and check that the washer fluid is sprayed out properly.
- If the fluid does not spray out properly, clean the washer nozzle with a safety pin or thin wire.
- If the condition is still not improved, ask your Komatsu distributor to carry out inspection and repair.

Check Wiping Efficiency of Wiper

- Operate the wiper and check that it wipes the window properly under each operating speed (intermittent, low speed, high).
- Operate the window washer to make the glass wet when checking.
- If the wiping condition is poor, it is necessary to clean the surface of the glass or replace the rubber wiper blade.
- If the condition is still not improved, ask your Komatsu distributor to carry out inspection and repair.

Check Horn

- Press the horn button and check that the horn sounds.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.

Check Defroster Function

- Operate the air conditioner and check that the air blows out properly onto the front glass.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.
- Operate the rear heated wire glass switch and check that the rear glass surface is heated properly.
- If there is any abnormality, ask your Komatsu distributor to carry out inspection and repair.

Check Locks

- Check that all places can be locked properly.
- For details about the locations that can be locked, see “Locking the Machine” on page 2-152.
- If any abnormality is found, ask your Komatsu distributor to carry out inspection and repair.

Check Emergency Exit

- Operate the knob for opening and closing the emergency exit, and check that it works properly.
- If any abnormality is found, ask your Komatsu distributor to carry out inspection and repair.

OPERATION

Adjustments

Adjusting Seat



WARNING

- Park the machine in a safe place and stop the engine when adjusting the operator's seat.
- When adjusting the position of the operator's seat, always set the work equipment lock lever to the LOCK position to prevent accidental contact with the control levers.
- Always adjust the operator's seat before starting each operation or when the operator changes shift.
- When adjusting the seat, put your back against the backrest and adjust to a position where the brake pedal can be fully depressed.

Remark

When pulling up levers (2) and (3), be careful not to pull up the switch box at the front by mistake. There is danger that the switch box may be damaged.

When the left armrest is at the raised position, do not push down on the tip of the armrest with your hand to support your weight. There is danger that the armrest mount may be damaged.

- ★ Adjustments (E), (J), and (K) use the air compressor built into the seat. Turn the engine starting switch to the ON position when carrying out the adjustment.

(A) Fore-and-aft adjustment

- Pull lever (1) up; set the seat to the desired position; then release the lever.

Adjustment range: 180 mm (7.1 in)
..... (10 mm (0.4 in) x 18 stages)

(B) Adjusting seat angle

- Move lever (2) up and, while sitting, push down on the rear of the seat to tilt it backward.
- Move lever (3) up and push down on the front of the seat to tilt it forward.

Adjustment range: 24° (front and rear tilt)
..... (three stages each)

(C) Adjusting height of seat

- Move levers (2) and (3) up and move the seat up or down to the desired position.

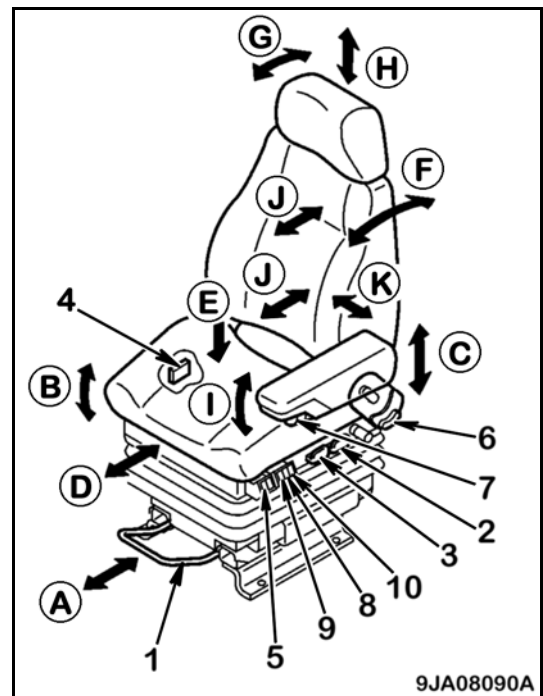
These levers are also used to adjust the seat angle. Adjust the seat angle to set the seat to the desired height.

Adjustment range: 65 mm (2.6 in)

(D) Adjusting fore-and-aft position of seat cushion

- Push in lever (4); set the seat cushion to the desired position; then release the lever.

Adjustment range: 60 mm (2.4 in)



(E) Setting seat for weight

- Sit on the seat; raise your body slightly; then operate switch (5) to adjust the strength of the suspension.

Adjustment range: 50 - 130 kg (110 - 287 lb) (target)

- When + is pressed: Suspension becomes stronger.
- When - is pressed: Suspension becomes weaker.

(F) Adjusting reclining angle

- Move lever (6) up and move the backrest to the front or rear.

Push your back against the backrest when carrying out this adjustment. If your back is not pressing against the backrest, the backrest may suddenly spring forward.

Adjustment range:

Front tilt: Free

Rear tilt: 40° (2° x 20 stages)

(G) Adjusting headrest angle (if equipped)

- Rotate the headrest to the front or rear.

Adjustment range:

Front tilt: 13°

Rear tilt: 13°

(H) Adjusting headrest height (if equipped)

- Move the headrest up or down.

Adjustment range: 80 mm (3.2 in)

Remark

If the seat back is reclined too far, the headrest may hit the rear glass. Move it to a position where it does not contact the glass.

(I) Adjusting armrest angle

- Rotate knob (7) and adjust the angle of the armrest (left side only).

Adjustment range: 73°

Front: 54°

Rear: 19°

- ★ If the arm rest is turned, it will spring up (both left and right sides).

(J) Lumbar support

- Operate switch (8) to provide suitable tension to the lower lumbar region.
- Operate switch (9) to provide suitable tension to the upper lumbar region.
 - When + is pressed: Tension becomes stronger.
 - When - is pressed: Tension becomes weaker.

(K) Side support

- Operate switch (10) to provide suitable tension to the left and right lumbar region.
 - When + is pressed: Tension becomes stronger.
 - When - is pressed: Tension becomes weaker.

OPERATION

Removing or Installing Headrest

Follow these instructions if it is necessary to remove or install the headrest.

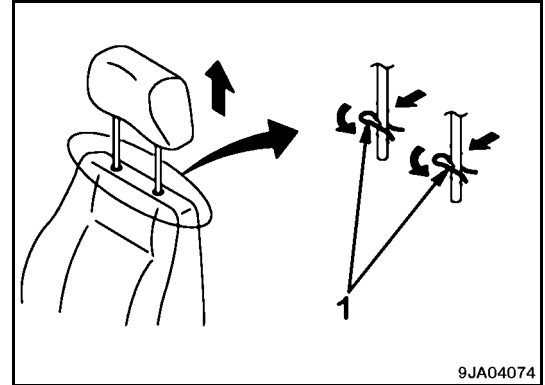
Removal

1. Pull up the headrest to the position where it stops.
2. From the top of the seat back, turn stopper (1) (under the material at the top of the seat) of the headrest bar on one side in the direction of the arrow and pull up the headrest.

When stopper (1) is turned, it comes out of groove (2).

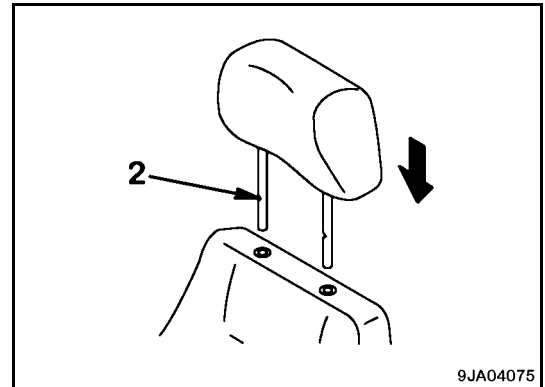
3. Turn stopper (1) on the other side in the direction of the arrow and pull up the headrest.

When both stoppers (1) come out of groove (2), the headrest can be removed.



Installation

1. Insert the bars into the holes in the top of the seat.
2. Push down on the headrest.



Adjusting Seat Belt

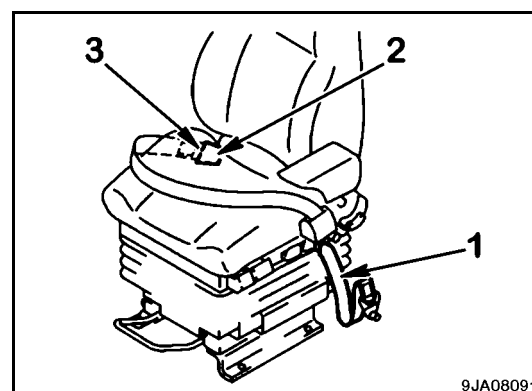
WARNING

- Before fastening the seat belt, check that there is no abnormality in the seat belt or the seat belt mounting bracket. If the belt is worn or damaged, replace it. See "Seat Belt Inspection" on page 1-11.
- Fasten the seat belt before starting operations.
- Always wear the seat belt during operations.
- Make sure that the seat belt is not twisted when fastening it.

Fastening Seat Belt

Fasten the belt so that it is tight without being too tight.

1. Sit on the seat; depress the brake pedal fully; and adjust the seat so that your back is pressed against the backrest.
2. After adjusting the seat position, adjust tether belt (1). Tense the tether belt and install it when there is no one sitting on the seat.
3. Sit on the seat; hold buckle (2) and tongue (3) with your left and right hands; insert tongue (3) into buckle (2); then pull the belt to check that it is securely locked.
 - Fasten the belt along your body without kinking it.
 - Adjust the lengths of the belt on both the buckle and the tongue sides so that the buckle is located at the front, mid-point of your body.

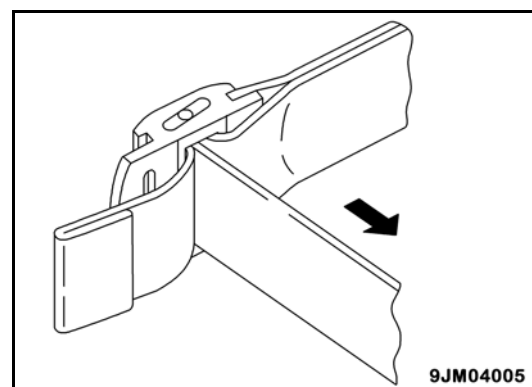
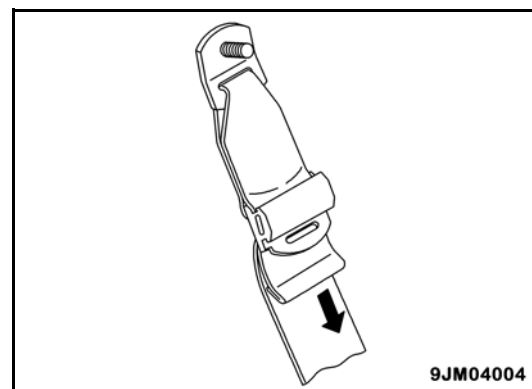


Removing Seat Belt

- When removing the belt, press the red button in buckle (2) to free the belt.

Adjusting Belt Length

- To make the seat belt shorter: Pull the free end of the tether belt.
- To make the seat belt longer: Position the fixed end of the tether belt at 90° to the holder, and pull.



OPERATION

Adjusting Lever Stand



- When adjusting the lever stand, check that the work equipment lock lever is securely at the LOCK position.
- If the work equipment lock lever is not at the LOCK position and the work equipment control levers are touched by accident when adjusting the lever stand, the work equipment may suddenly move and cause serious personal injury.

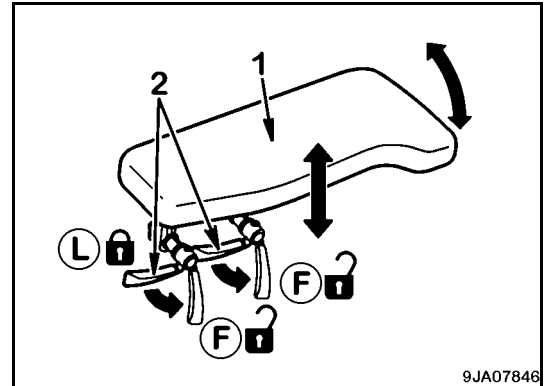
Adjusting Height and Angle of Wrist Rest

The height and angle of armrest (1) can be adjusted by loosening lock lever (2).

Height adjustment amount: 30 mm (1.18 in)

Angle adjustment amount: 44°

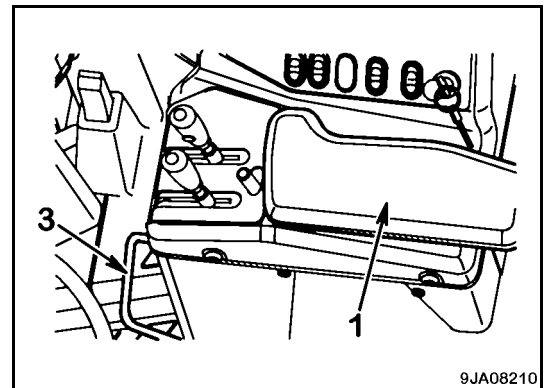
1. Set lock lever (2) to the FREE position (F). The lock lever is loosened.
2. Hold the armrest at the desired position and move the lock lever to the LOCK position (L) to secure the armrest in position.



Adjusting Lever Stand Forward and Backward

1. Pull lever (3) up with your left hand.
2. Grip armrest (1) with your right hand and move it to the front or rear.
3. Release lever (3).

Amount of adjustment: 180 mm (7.09 in)



Adjusting Mirrors

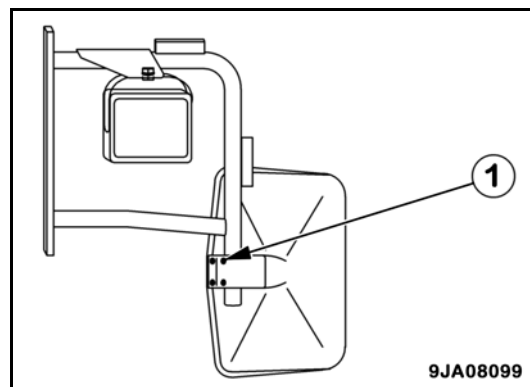
WARNING

Be sure to adjust the mirrors before starting work. If the mirrors are not adjusted properly, you cannot ensure good visibility. The lack of adequate visibility could result in serious injury to you or anybody in the vicinity of the machine.

Mirrors A, B

Loosen bolt (1) of the mirror, then adjust the mirror to a position which gives the best view from the operator's seat of the blind spot at the left and right sides at the rear of the machine.

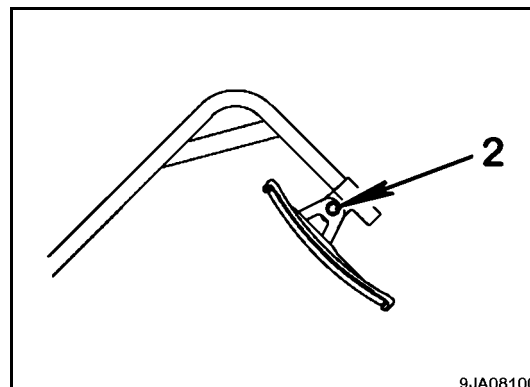
- When installing the mirror, adjust so that it is possible to see any person (or any object of a height of 1 m (3 ft 3 in) and diameter of 30 cm (11.8 in)) at the rear left or right of the machine.



Mirrors C

Adjust so that it is possible to see the ground around the machine at a range of 1 m (3 ft 3 in) from the operator's seat.

- ★ If the movement of the mirror is stiff when adjusting it, loosen bolt (2) of the mirror.



Install the mirrors at the position and dimensions shown in the diagram. The following values are reference values for the range of visibility.

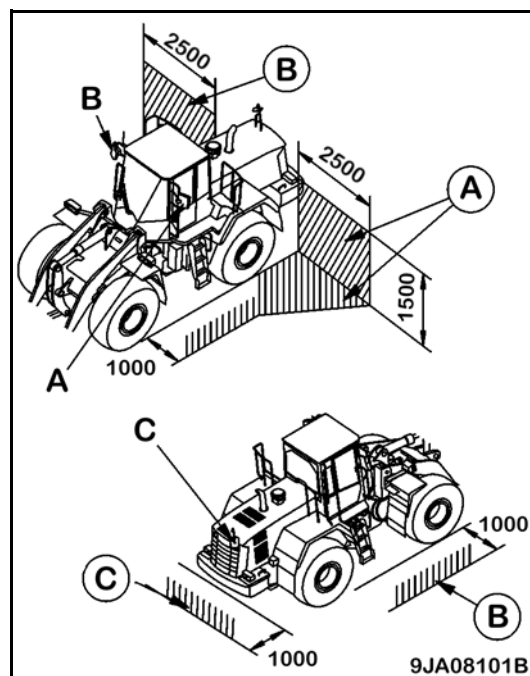
- Range of view (left):2500 mm (8.20 ft)
- Range of view (right):2500 mm (8.20 ft)
- Mirror A: Must be possible to see hatched portion (A)
- Mirror B: Must be possible to see hatched portion (B)
- Mirror C: Must be possible to see hatched portion (C)

Tighten the mirror mounting bolts securely so that they do not loosen and the mirrors do not come off.

Tightening torque:

- Mirrors A, B:2.0 – 2.5 N•m (17.70 – 22.13 lbf in)
- Mirrors C:8.8 – 9.8 N•m (77.89 – 86.74 lbf in)

- ★ If the tightening torque cannot be controlled, ask your Komatsu distributor to tighten the bolts.

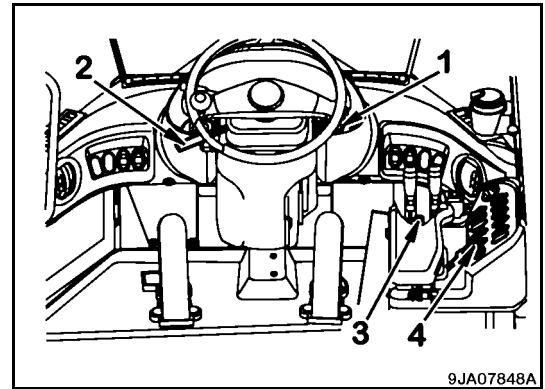


OPERATION

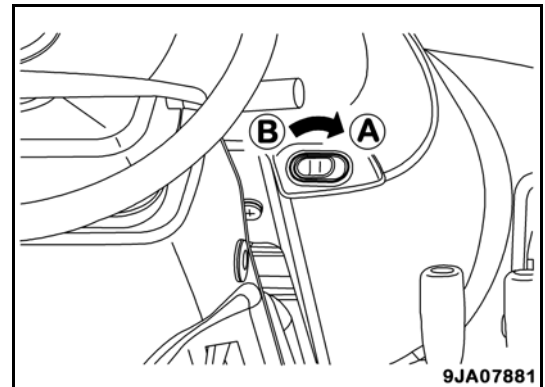
Final Checks Before Starting Engine

WARNING

Before starting the engine, check that the work equipment lock lever is securely at the LOCK position. If the work equipment control lever is touched by mistake when the engine starts, the work equipment or machine may move unexpectedly, leading to serious personal injury.



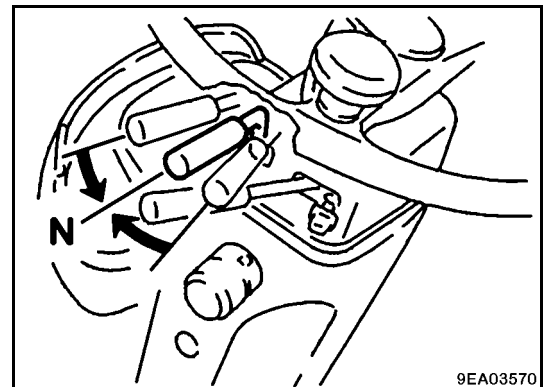
1. Check that parking brake switch (1) is at the ON position (A).



2. Check that directional lever (2) is at the neutral position (N).

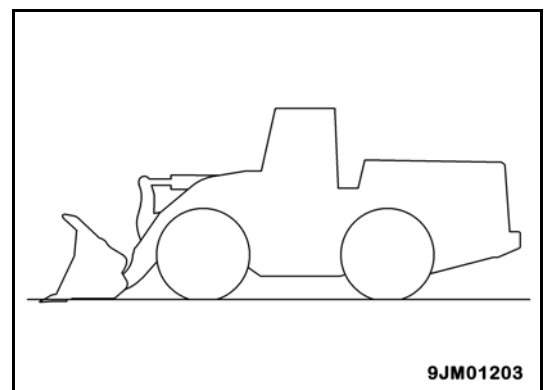
Remark

If the directional lever is not at the N position, the engine will not start.

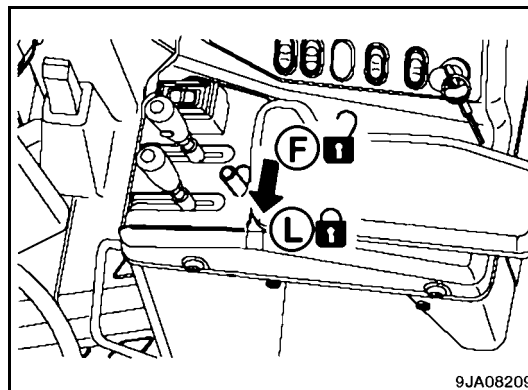


3. Check that the bucket is completely lowered to the ground. If not, do these steps to lower the bucket.

- A. Set the work equipment control lever to the HOLD position, then set the work equipment lock lever to the FREE position.
- B. Operate the work equipment control lever to lower the bucket to the ground.
- C. Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the LOCK position.

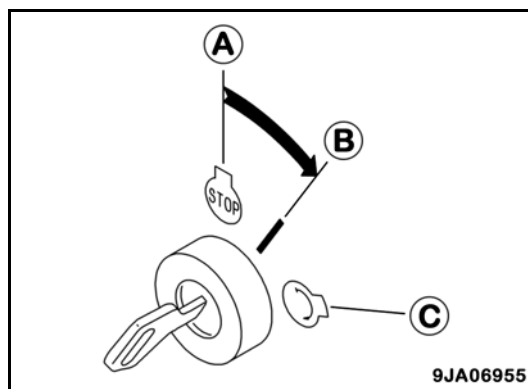


4. Check that work equipment lock lever (3) is at the LOCK position (L).



5. Insert the key in starting switch (4); turn the key to the ON position (B); and check that the machine monitor system works.

- When the starting switch is turned to the ON position before starting the engine, the monitors, gauges, and central warning lamp light up for approximately two seconds; the alarm buzzer sounds for approximately two seconds.
- If any monitor does not light up, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.
- In addition, after all the monitors, gauges, and central warning lamp light up, a self-check is carried out to check that the emergency steering function works properly. For details about the self-check function, see “Emergency Steering Self-Check Function” on page 2-117.
- If any monitor does not illuminate, there is probably a failure or disconnection. Contact your Komatsu distributor for inspection.



OPERATION

Starting Engine

Normal Starting

! WARNING

- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by jumping across the engine-starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area and then sound the horn and start the engine.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.

Remark

Do not accelerate the engine suddenly before completing the warming-up operation.

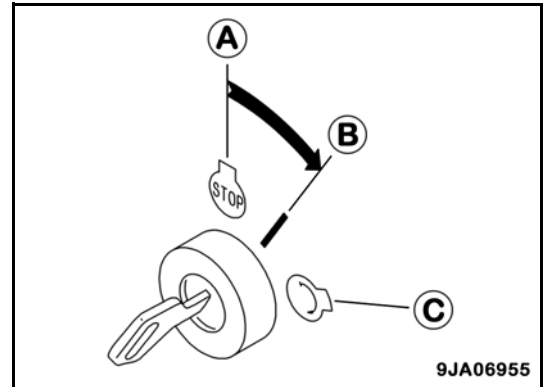
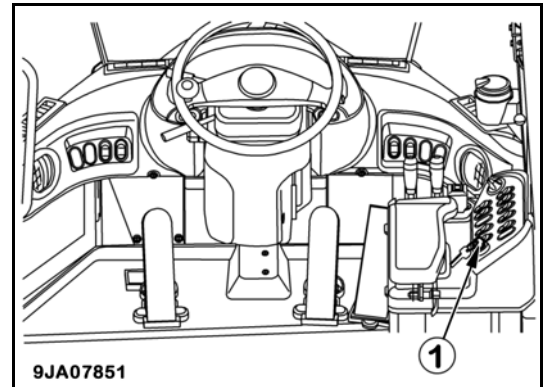
Do not keep the starting motor rotating continuously for more than 20 seconds.

If the engine does not start, wait for at least two minutes before trying to start the engine again.

- ★ This machine is equipped with an engine automatic preheating device that starts the engine preheating automatically.
- ★ If the ambient temperature is low, the preheating monitor will light up when the key in starting switch (1) is turned to the ON position to indicate that preheating has been started automatically.

1. Turn the key in starting switch (1) to the ON position (B).

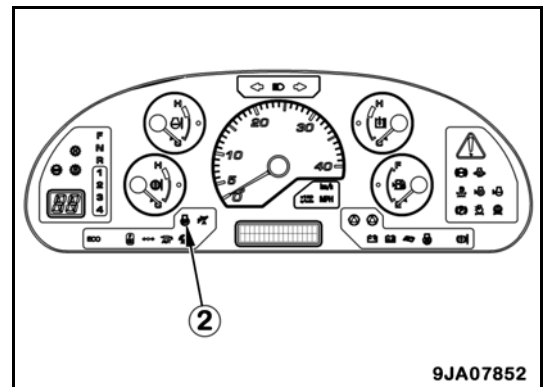
If the ambient temperature is low, the preheating pilot lamp (2) lights up and automatic preheating is carried out. Keep the key in starting switch (1) at the ON position until the preheating pilot lamp (2) goes out.



The time that the preheating pilot lamp (2) stays lit varies dependent on the ambient temperature.

Lighting times are shown in the following table.

Ambient Temperature	Lighting Time
-2°C to -28°C (28.4°F to -18.4°F)	5 seconds to 45 seconds
-28°C or less (-18.4°F or less)	45 seconds



- If the preheating pilot lamp (2) does not light up, or it lights up and then goes out to indicate that the engine preheating has been completed, turn the key in starting switch (1) to the START position (C).

The starting motor will continue to turn and the engine will start.

- Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

Remark

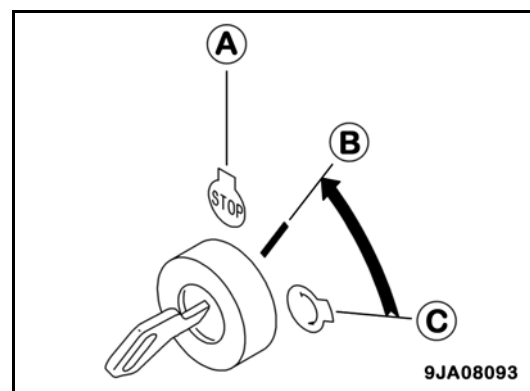
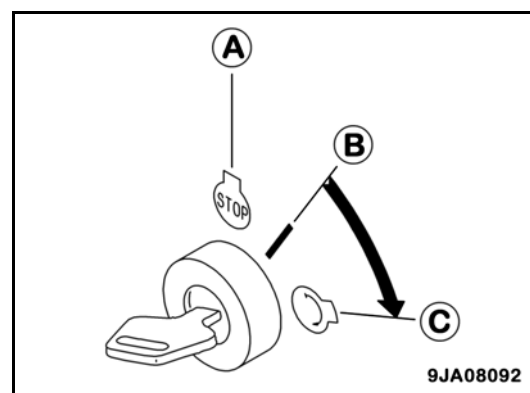
In low temperatures, to ensure lubrication of the engine and to improve the durability, no fuel is supplied to the engine for three seconds after the key in starting switch (1) is turned to the START position (C); the engine does not start during this time.

Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

- After the engine starts, release the key in starting switch (1). The key automatically returns to the ON position (B).
- After the engine starts, if the engine water temperature is low (below 20°C (68°F)), the warming-up operation (engine speed: 1,000 rpm) is automatically carried out.

- The warming-up operation is cancelled when the engine water temperature goes above 30°C (86°F) (engine speed: 850 rpm).

- ★ For details, see “Automatic Warming-Up Operation” on page 2-101.



OPERATION

Starting in Cold Weather

WARNING

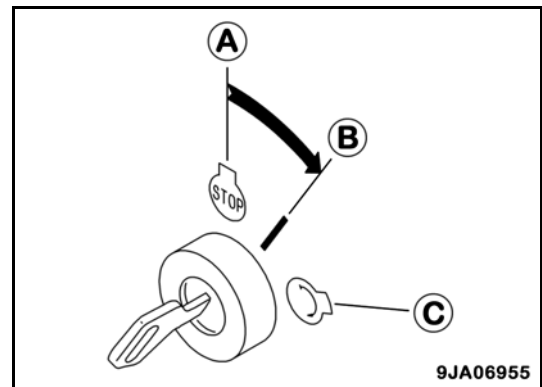
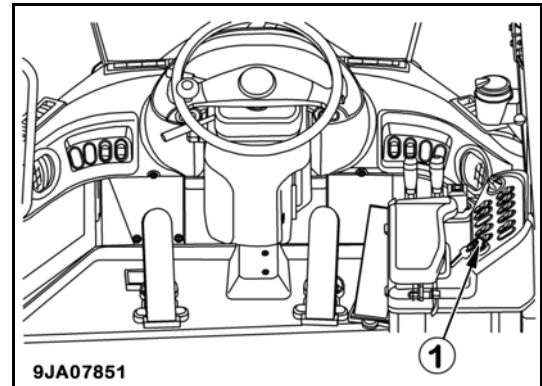
- Sit down in the operator's seat before starting the engine.
- Do not attempt to start the engine by short-circuiting the engine-starting circuit. Such an act may cause serious bodily injury or fire.
- Check that there are no persons or obstacles in the surrounding area and then sound the horn and start the engine.
- Exhaust gas is toxic. When starting the engine in confined spaces, be particularly careful to ensure good ventilation.

Remark

Do not suddenly accelerate the engine before the warming-up operation is completed.

- ★ When starting the engine after the machine has been left for more than half a day in temperatures near -20°C (-4°F), it will take time for the engine to achieve complete combustion. Do the following procedure to start the engine.

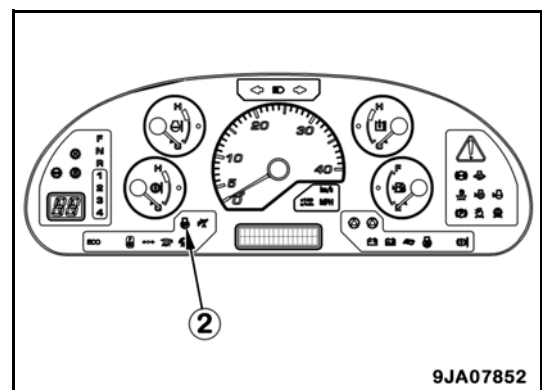
1. Turn the key in starting switch (1) to the ON position (B).



If the ambient temperature is low, the preheating pilot lamp (2) lights up and automatic preheating is carried out. Keep the key in starting switch (1) at the ON position until the preheating pilot lamp (2) goes out.

The time that the preheating pilot lamp (2) stays lit varies dependent on the ambient temperature as shown in the table to the right.

Ambient Temperature	Lighting Time
-2°C to -28°C (28.4°F to -18.4°F)	5 seconds to 45 seconds
-28°C or less (-18.4°F or less)	45 seconds

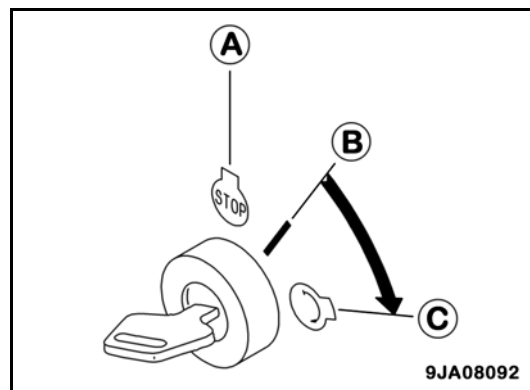


2. When preheating pilot lamp (2) goes out, turn the key in starting switch (1) to the START position (C).

Keep the key in starting switch (1) at the START position (C) to keep the starting motor running until the engine starts.

The starting motor will continue to turn and the engine will start.

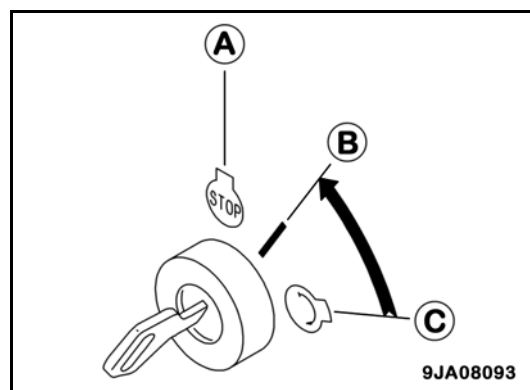
3. Starting engine in temperatures of approximately -20°C (-4°F).
 - A. Keep the engine starting motor running for a maximum of 20 seconds, holding the key of engine starting switch (1) in the START position (C) until the engine starts up.



- B. If the engine fails to start even after running the engine starting motor for about 20 seconds, stop the engine starting motor once (release the engine starting switch (1) key), and try the same process again after a pause for a minute or so.

- C. If the engine still fails to start after the second attempt, try the same process for the third time after a pause for a minute or so.

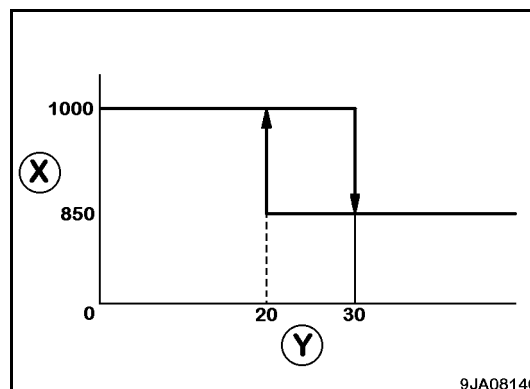
4. When the engine has started and the engine speed rises, release the key of engine starting switch (1). The key will automatically return to the ON position (B).



Automatic Warming-Up Operation

- ★ When the engine water temperature is below 20°C (68°F), the automatic warming-up operation (engine speed: 1,000 rpm) is automatically actuated after the engine starts. It is cancelled when the engine water temperature rises over 30°C (86°F) (engine speed: 850 rpm).

- X: Engine speed (rpm)
- Y: Water temperature ($^{\circ}\text{C}$)



Operations and Checks After Starting Engine



- Emergency stop: If the operation is abnormal or any other trouble occurs, turn the key in the starting switch to the OFF position.
- If the work equipment is operated without warming up the machine sufficiently, the response of the work equipment to the movement of the control lever will be slow. The work equipment may not move as the operator desires. Do all warm-up procedures.
- In cold areas, make sure to warm up the machine properly.

Checks After Starting Engine

Check Parking Brake

- Check that the parking brake works properly.
 - If there is any abnormality in the operation of the parking brake or the brake does not provide the proper braking effect, contact your Komatsu distributor for adjustment.

Check Brake Pedal

- Set the machine on level ground with no obstacles in the surrounding area. Drive the machine slowly forward and in reverse and check the braking effect of the brakes.
 - If there is any abnormality in the operation of the brakes, ask your Komatsu distributor to carry out adjustments.

Check Travel of Brake Pedal

- Depress the brake pedal fully and check the distance from the floor. Check that the pedal is not too close to the floor and that there is no abnormal feeling when operating the brake pedal.
 - If any abnormality is found, ask your Komatsu distributor to carry out adjustments.

Check for Ease of Starting Engine, Abnormal Noise

- When starting the engine, check that the engine does not make an abnormal noise and that it starts up easily and smoothly.
- Check that there is no abnormal noise when the engine is idling or when the revolutions rise slightly.
 - If there is an abnormal noise when the engine starts and that condition continues, the engine may be damaged. In that case, ask your Komatsu distributor to check the engine as soon as possible.

Check Engine at Low Speed and When Accelerating

- Check that there is no irregularity in the engine speed and that the engine does not suddenly stop when the machine is stopped during normal travel.
- Check that the engine accelerates smoothly when the accelerator pedal is depressed.
 - Carry out the inspection in a safe place and check that there is no one in the surrounding area.
 - If the condition at low speed or when accelerating is extremely poor and that condition continues, there is danger that the engine may be damaged, that the operation of the machine may become erratic, that the braking effect may deteriorate, or that an unexpected accident may happen.
 - Ask your Komatsu distributor to carry out repairs as soon as possible.

Check Location of Abnormalities from Previous Days

- Check the places where problems occurred when using the machine on previous days.
 - If any abnormality is found, contact your Komatsu distributor for inspection and repair.

Breaking in the Machine

WARNING

- Your Komatsu machine has been thoroughly adjusted and tested before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance and shorten the life of the machine.
- Be sure to break in the machine for the initial 100 hours (as indicated by the service meter).
- During breaking-in operations, follow the precautions described in this manual.

- ★ Idle the engine for five minutes after starting.
- ★ Avoid operation with heavy loads or at high speeds.
- ★ Immediately after starting the engine, avoid sudden starts, sudden acceleration, unnecessary sudden stops, and sudden changes in direction.

Normal Operation

After starting the engine, do not immediately start operations. First, carry out the following operations and checks.

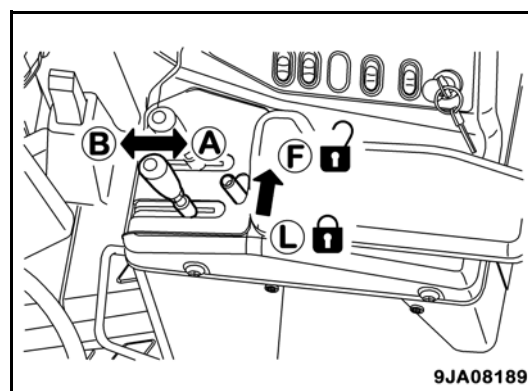
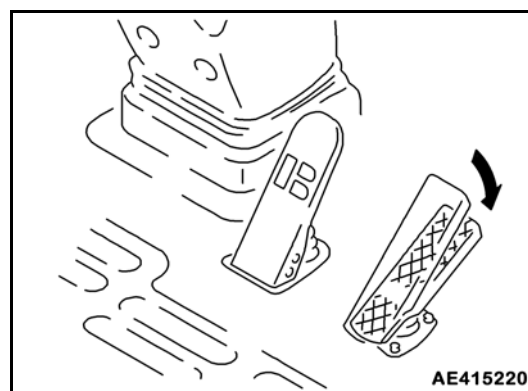
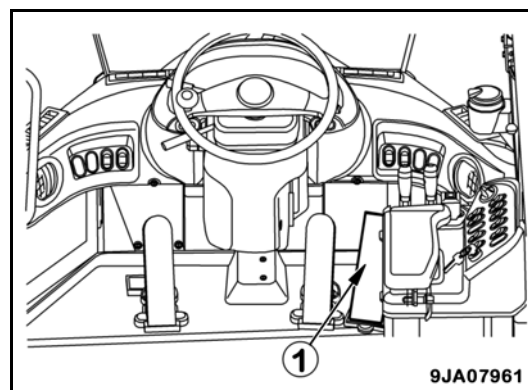
Remark

Do not suddenly accelerate the engine before the warming-up operation is completed.

Do not run the engine at low idle or high idle continuously for more than 20 minutes.

If it is necessary to run the engine at idle, apply a load from time to time or run the engine at a mid-range speed.

1. Depress accelerator pedal (1) lightly and run the engine with no load at mid-range speed for about five minutes.
2. Carry out the following operation to warm up the hydraulic oil in cold areas.
 - A. Operate the bucket control lever to the TILT position (A) and return it to the HOLD position (B) repeatedly to warm up the hydraulic oil.
 - B. Relieve the circuit at the TILT position (A) for a maximum of 10 seconds.
 - This brings the oil to the relief pressure and makes it faster to warm up the oil.
 - C. Slowly operate the steering wheel to the left and the right about ten times to warm up the hydraulic oil inside the steering valve.



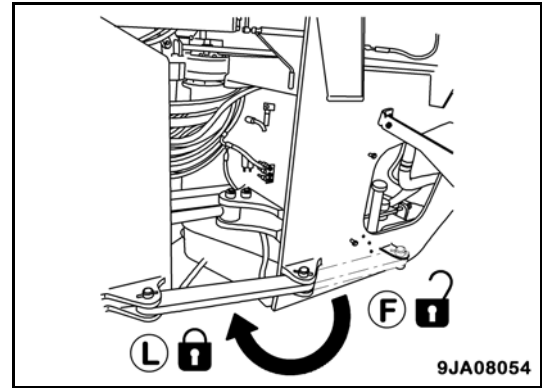
OPERATION

WARNING

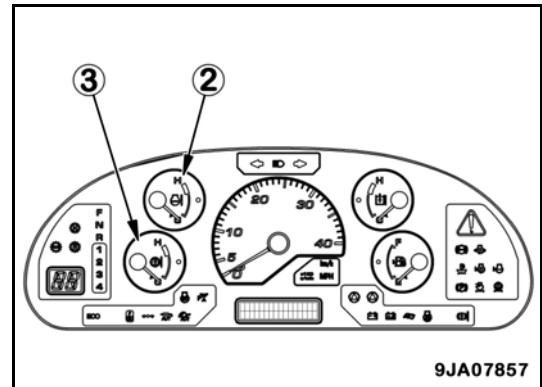
- If the steering wheel is operated and stopped while the oil temperature is low, there may be a time lag before the machine stops turning.
- In this case, use the frame lock bar to ensure safety, and perform the warm-up operation in a wide place.
- Do not relieve the hydraulic oil in the circuit continuously for more than five seconds.

Remark

Turn the steering wheel a little and stop in that position. Confirm that the machine turns by an angle equivalent to the amount that the steering wheel is turned.



3. After carrying out the warming-up operation:
 - Check that the engine rotation is smooth.
 - Set the work equipment lock lever to the FREE position (F).
 4. After carrying out the warming-up operation, check that the meters, gauges, and pilot lamps work properly. If any abnormality is found, carry out maintenance or repair.
 5. Run the engine under a light load until engine coolant temperature gauge (2) and torque converter oil temperature gauge (3) are in the green range.
 6. Check for abnormal exhaust gas color, noise, or vibration. If any problem is found, contact your Komatsu distributor.
- ★ The rotating speed of the cooling fan changes according to the following conditions; this does not indicate any abnormality.
- If the hydraulic oil temperature, engine coolant temperature, or transmission oil temperature are high, the rotating speed of the cooling fan increases.
 - When the cooling fan is rotating in reverse, it rotates at a fixed speed proportional to the engine speed, regardless of any oil or coolant temperature.



Stopping Engine

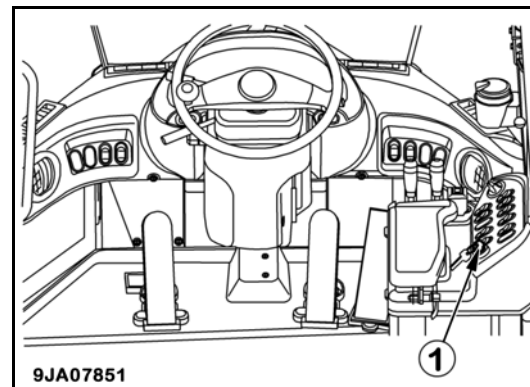
Remark

If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened.

Do not abruptly stop the engine except for an emergency.

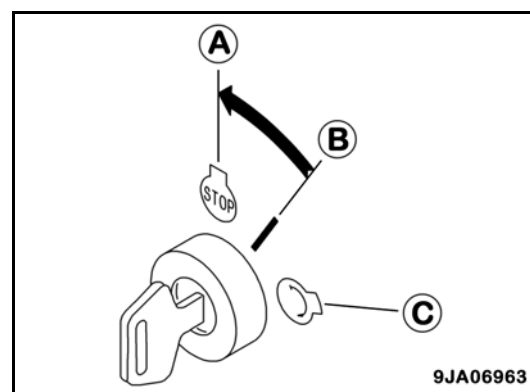
If the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually and then stop it.

1. Run the engine at low idle for about five minutes to cool it down gradually.
2. Turn the key of starting switch (1) to the OFF position (A) to stop the engine.
3. Remove the key from starting switch (1).



Check After Stopping Engine

1. Walk around the machine and check the work equipment, bodywork, and undercarriage.
2. Check for oil and water leakage.
3. Fill the fuel tank. See "Check Fuel Level, Add Fuel" on page 2-87.
4. Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
5. Remove any mud stuck to the undercarriage.



OPERATION

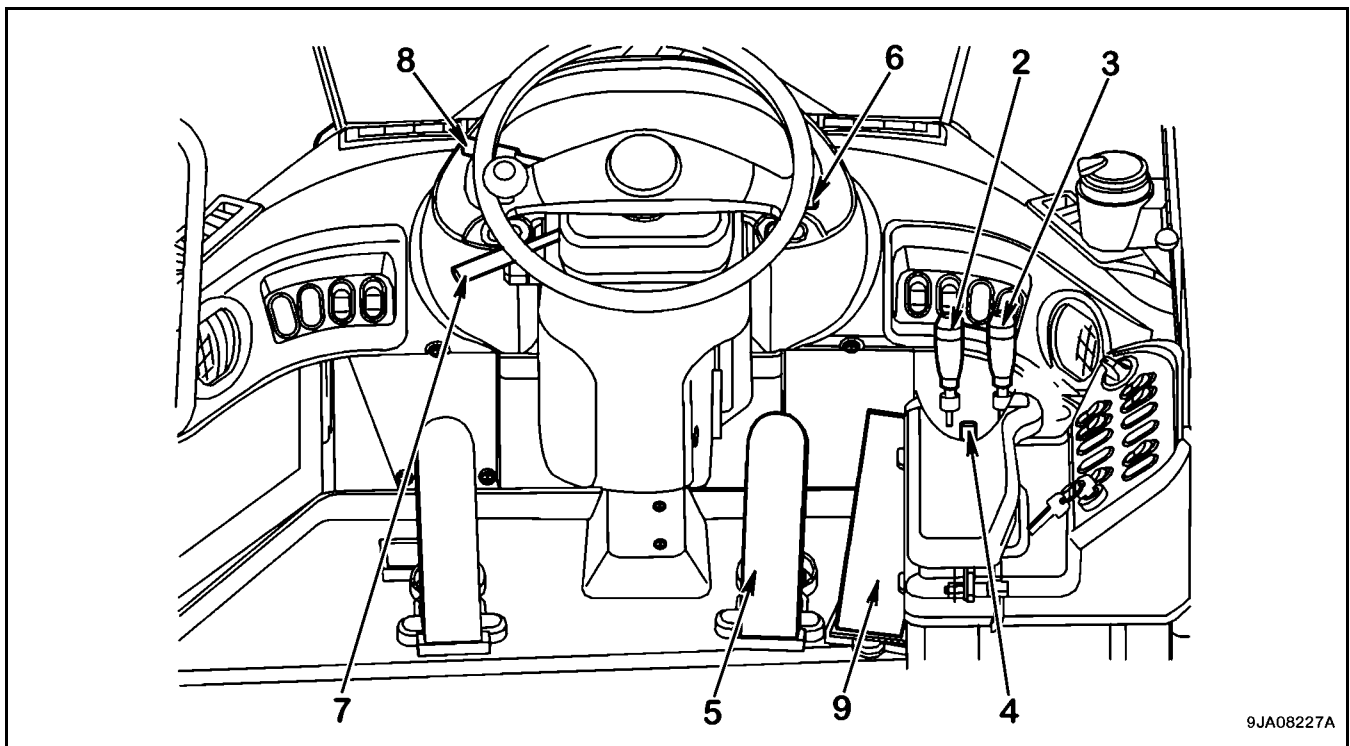
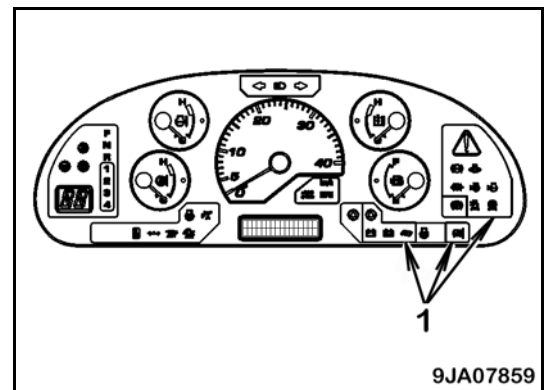
Moving the Machine (Directional, Speed), Stopping the Machine

WARNING

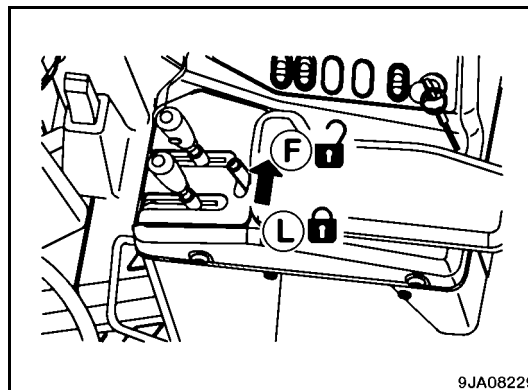
- Always remove the frame lock bar for travel operations. If it is not removed, the steering wheel cannot be used for steering. This may lead to serious damage or injury.
- When moving the machine, check that the area around the machine is safe and then sound the horn before starting.
- Do not allow people to get near the machine.
- Clear obstacles from the machine's travel path.
- The engine hood creates a blind spot at the rear of the machine. Be very careful when traveling in reverse.
- When starting the machine on a slope, set the transmission cutoff switch to the OFF position and depress the left brake pedal. Then depress the accelerator pedal and gradually release the brake pedal to start the machine. This makes it possible to prevent the machine from rolling back.

Moving the Machine

1. Check that caution lamp (1) is not illuminated.

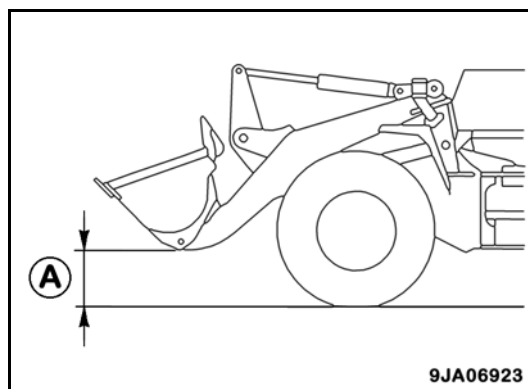


2. Check that the bucket control lever (2) and lift arm control lever (3) are at the HOLD position, then set the work equipment lock lever (4) to the FREE position (F).



3. Operate lift arm control lever (3) to set the work equipment to the travel posture (A) shown in the graphic.

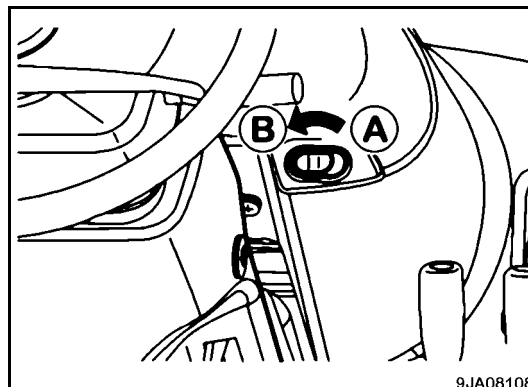
(A): 40 – 50 cm (16 – 20 in)



4. Depress right brake pedal (5) and then turn parking brake switch (6) to the OFF position (B) to release the parking brake. Keep the right brake pedal depressed.

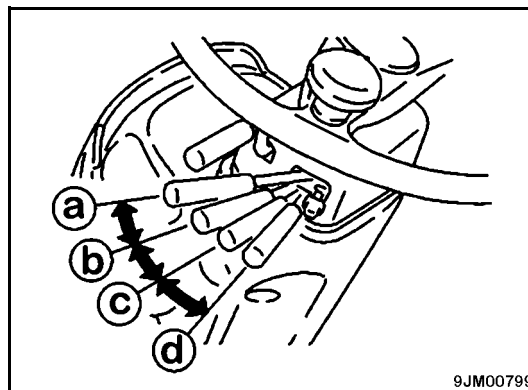
Remark

If the parking brake is still actuated when parking brake switch (6) is at the OFF position (B), turn the parking brake switch ON and then turn it OFF again.



5. Set gearshift lever (7) to the desired speed range position.

- Position (a): 1st
- Position (b): 2nd
- Position (c): 3rd
- Position (d): 4th

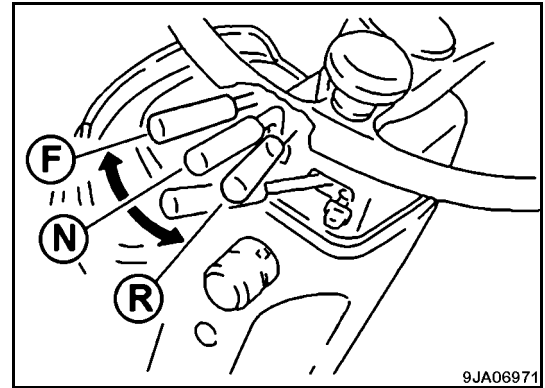


OPERATION

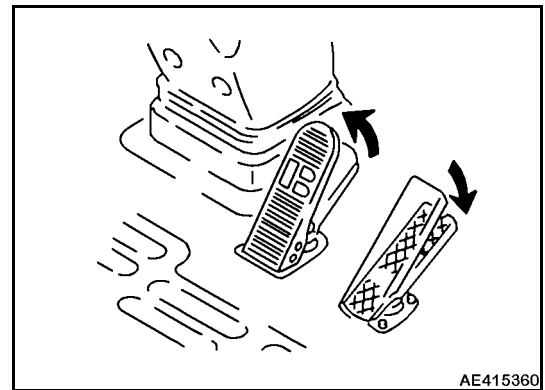
6. Set directional lever (8) to the desired position.

- Position (F): Forward
- Position (N): Neutral
- Position (R): Reverse

Check that the backup alarm sounds when the directional lever is set to REVERSE. If the backup alarm does not sound, contact your Komatsu distributor for repairs.



7. Release right brake pedal (5) and then depress accelerator pedal (9) to move the machine off.

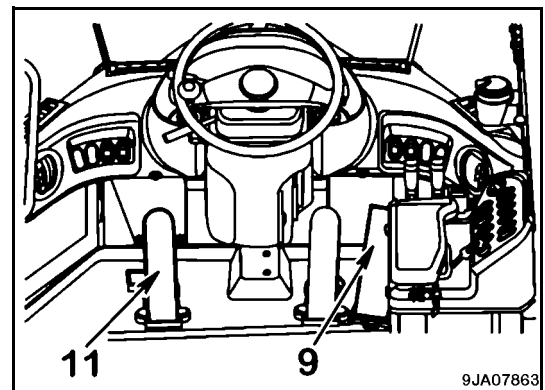
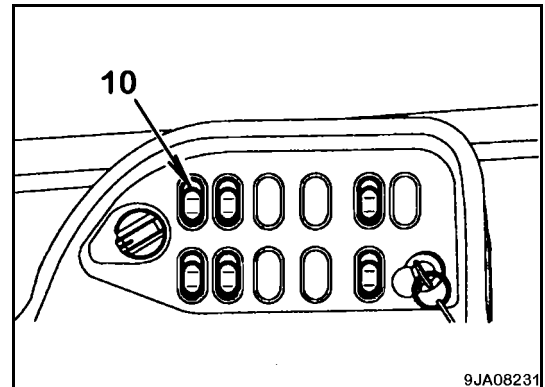


Remark

When starting off on a hill, turn the transmission cutoff switch (10) OFF; depress left brake pedal (11); and operate the gearshift lever to the low speed range.

Depress accelerator pedal (9) and gradually release left brake pedal (11) to let the machine move.

This makes it possible to prevent the machine from rolling back.



Changing Gear Speed

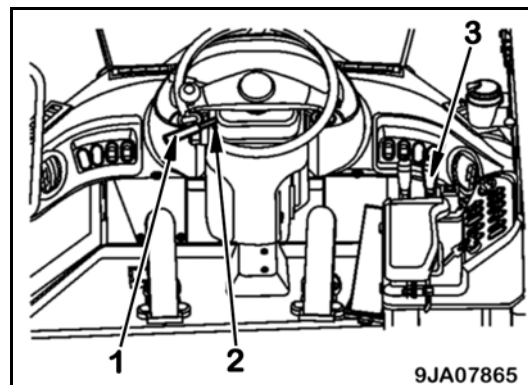
WARNING

When traveling at high speed, do not shift gear suddenly. Use the brake to reduce the travel speed before shifting gear.

★ Shifting gear

- Move the gearshift lever (1) to the desired position to shift gear.
 - Position (a): 1st
 - Position (b): 2nd
 - Position (c): 3rd
 - Position (d): 4th

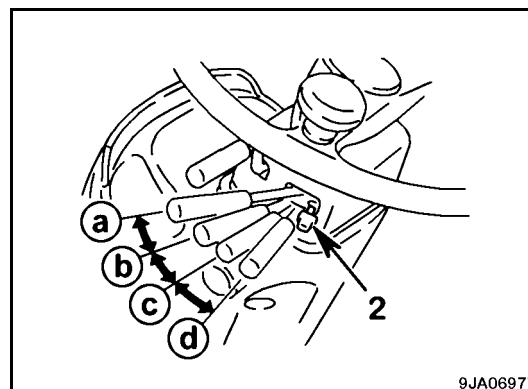
When carrying out digging and loading operations, 1st and 2nd gears are used. Use the gearshift lever stopper (2).



- ★ This machine is equipped with a kickdown switch (3) that shifts the gear down to 1st if the kickdown switch (3) is pressed when the machine is traveling in 2nd gear. We recommend the use of the kickdown switch when carrying out digging or loading operations in 1st or 2nd gear.

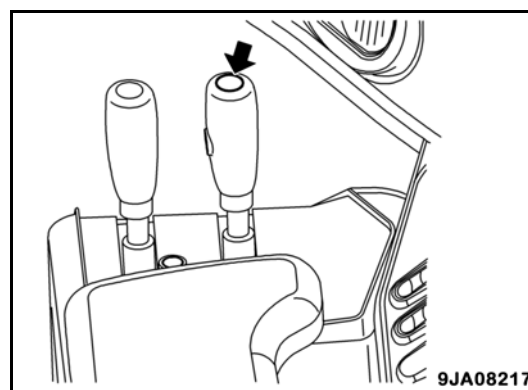
For details, see “Kickdown Switch” on page 2-50.

- ★ This machine is equipped with an auto-shift function that automatically shifts the gear. For details about this function, see “Transmission Shift Mode Selector Switch” on page 2-45 and “Automatic Shift” on page 2-111.



- When traveling at high speed with the accelerator pedal depressed, even if the transmission is shifted down from 4th → 3rd or 4th → 2nd in order to protect the engine from overrunning, the transmission does not shift down. In this case, the central warning lamp illuminates and the alarm buzzer sounds. At the same time, “OVERRUN PROTECT” is displayed on the character display.

If the alarm buzzer sounds, release the accelerator pedal immediately; depress the brake pedal to reduce the travel speed; then shift gear.



OPERATION

Changing Direction

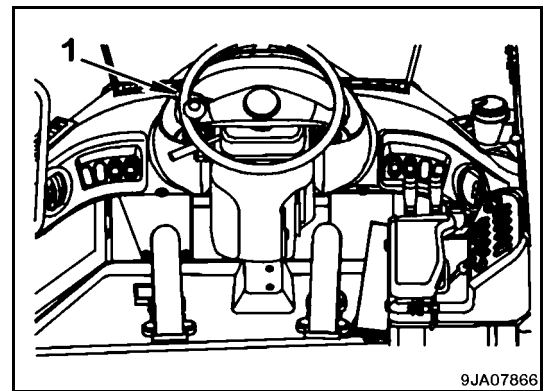
WARNING

- When changing direction between FORWARD and REVERSE, check that the new direction of travel is safe. There is a blind spot behind the machine. Be particularly careful when changing direction to travel in reverse.
- Do not switch between FORWARD and REVERSE when traveling at high speed.
- When switching between FORWARD and REVERSE, depress the brake to reduce the travel speed sufficiently and then change the direction of travel. (Maximum speed for changing direction: 13 km/h (8.1 mph))
- When coasting down a slope, set the directional lever to match the direction of travel of the machine. If the directional lever is in the opposite direction to the direction of travel, there is danger that the engine may stall. This condition is extremely dangerous.

★ There is no need to stop the machine even when switching between FORWARD and REVERSE.

- Place directional lever (1) in the desired position.
 - Position (F): Forward
 - Position (N): Neutral
 - Position (R): Reverse
- Check that the backup alarm sounds when the directional lever is set to REVERSE.

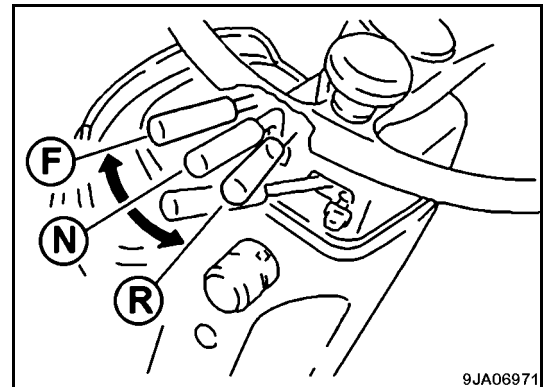
If the backup alarm does not sound, contact your Komatsu distributor for repairs.



Remark

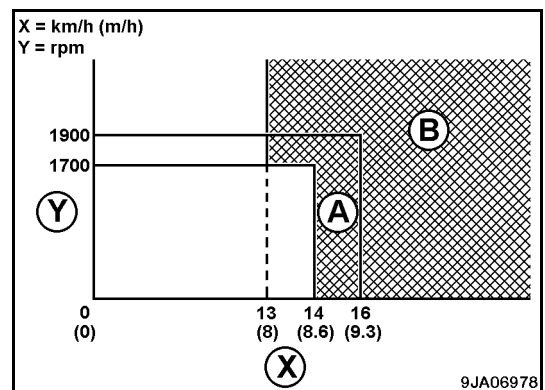
If the directional lever is operated slowly or is stopped midway between the forward and reverse directions, "E01 MAINTENANCE" may be displayed on the character display. In this case, there is no failure. Try to operate the directional lever so that the change in direction is completed within two seconds.

- If an attempt is made to switch the direction between FORWARD and REVERSE while traveling at high speed (when using 3rd or 4th) when the travel speed and engine speed are in ranges (A) or (B) in the chart, the central warning lamp will light up and the alarm buzzer will sound.



At the same time, "OVERRUN PROTECT" is displayed on the bottom line of the character display.

- If the alarm buzzer sounds, depress the brake pedal immediately to reduce speed, then operate the directional lever to switch between FORWARD and REVERSE.
 - (X): Travel speed (km/h)
 - (Y): Engine speed (rpm)

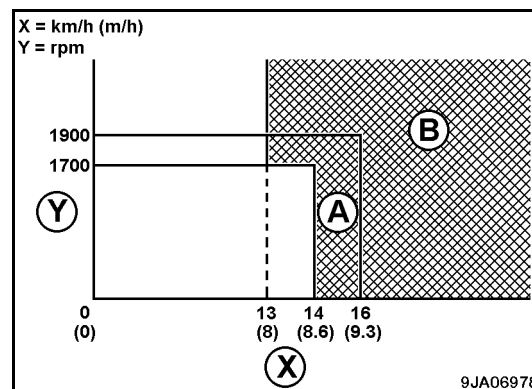


Automatic Shift

If an attempt is made to switch the direction between forward and reverse when the auto-shift is ON, the gearshift range will switch F3 → R2, F4 → R2, or R3 → F2, R4 → F2 to make it possible to move the machine quickly.

If an attempt is made to shift between forward and reverse when the machine is traveling at high speed, such as shown in ranges (A) or (B) in the chart, the central warning lamp will light up and the buzzer will sound. At the same time, “OVERRUN PROTECT” is displayed on the bottom line of the character display.

If the alarm buzzer sounds, depress the brake immediately to reduce speed and operate the directional lever to switch between FORWARD and REVERSE.



In particular, if an attempt is made to switch between forward and reverse in range (B), the speed range will not shift to 2nd but will switch F3 → R3, F4 → R4, or R3 → F3, R4 → F4. As a result, the reduction in speed will be less than in range (A).

OPERATION

Stopping the Machine

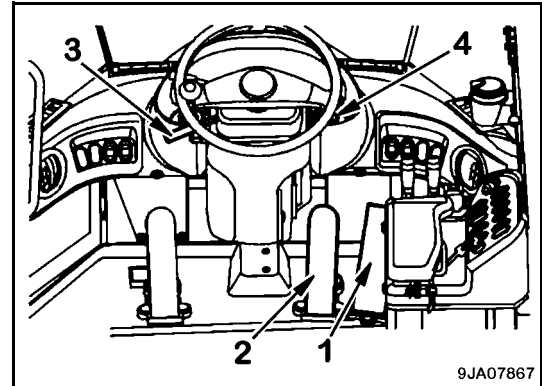
WARNING

- Avoid sudden stopping. As far as possible, always leave a margin when stopping the machine.
- Even if the parking brake switch is turned ON, there is a danger that the machine may move until the parking brake pilot lamp lights up; keep the brake pedal depressed.

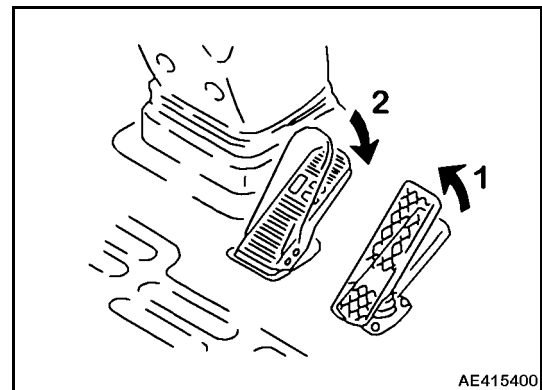
Remark

Never use the parking brake switch to brake the machine when traveling, except in an emergency.

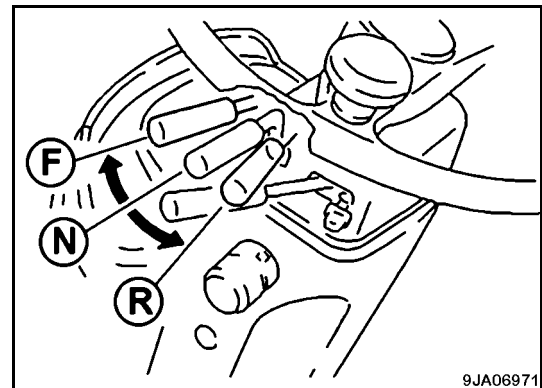
Apply the parking brake only after the machine has stopped.



1. Release accelerator pedal (1) and then depress brake pedal (2) to stop the machine.



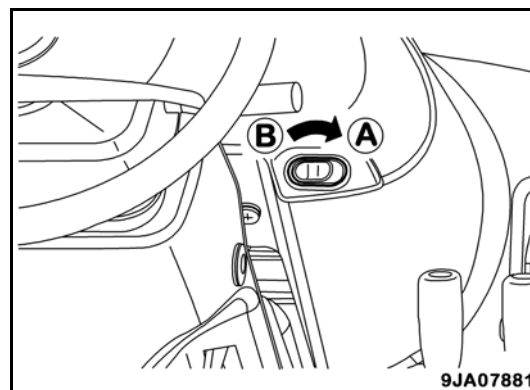
2. Place directional lever (3) in the neutral position (N).



- Turn parking brake switch (4) to the ON position (A) to apply the parking brake.

Remark

When the parking brake is applied, the transmission is automatically returned to neutral.

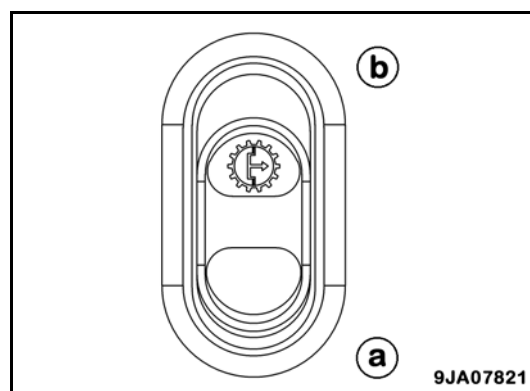


Transmission Cutoff Function

When the transmission cutoff switch is turned ON, the pilot lamp illuminates and the following transmission cutoff function is actuated.

- Position (a): OFF
- Position (b): ON

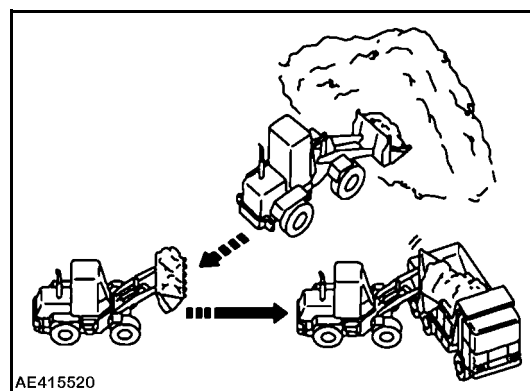
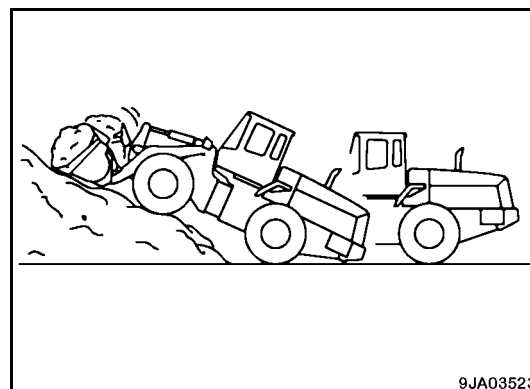
When the brake pedal is depressed, the brakes are actuated and the transmission is shifted to neutral when the brake pedal is depressed to the set position.



- ★ For details about adjusting the set position for the amount that the brake pedal is depressed, see “Adjusting Transmission Cutoff Position” on page 2-114.

To match the following type of work, adjust the set position to cut off the transmission at a smaller or larger angle.

- When carrying out scooping-up work, lower the brake pedal depression position for the cutoff (transmission shifted to neutral). In this setting, the transmission driving force is cut at a point where there is ample braking force. This prevents the machine from slipping down.
- When approaching dump trucks during loading operations, raise the brake pedal depression position for the cutoff (transmission shifted to neutral). In this setting, the fine control of the braking immediately before dumping the load can be carried out with the brake only. This makes it easy to control and allows the machine to be brought to a soft stop.



OPERATION

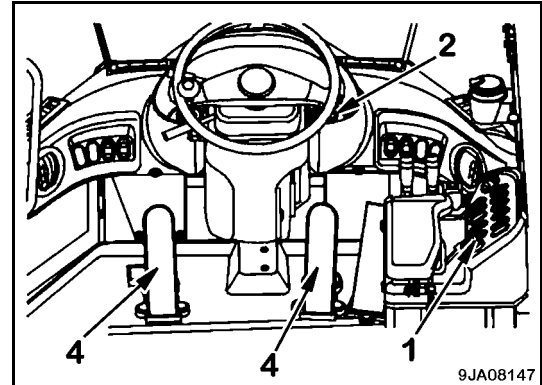
Adjusting Transmission Cutoff Position



Apply the parking brake before adjusting the transmission cutoff position.

Adjust the amount that the brake pedal is depressed.

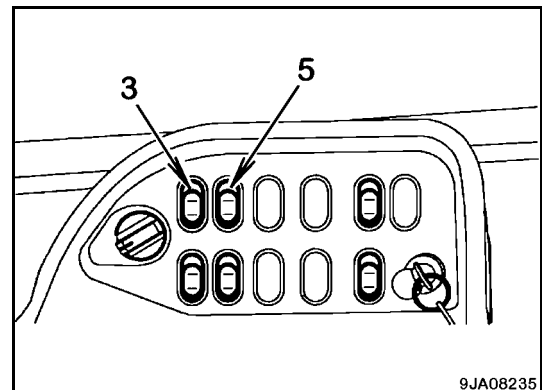
1. Start the engine with starting switch (1) and then set parking brake switch (2) to the ON position.
2. Set transmission cutoff switch (3) to the ON position.
3. Depress brake pedal (4) and adjust the set position to return the transmission to neutral.
4. Press transmission cutoff set switch (5) and then release it. When the switch is released, the buzzer sounds with a repeated short sound and the cutoff position is set.



Canceling Cutoff Position

After the buzzer sounds in Step 4 of the adjustment procedure, the transmission cutoff switch flashes for two seconds.

- While it is flashing, press transmission cutoff set switch (5) again and release it.
The buzzer sounds with a long sound and the adjusted cutoff position is canceled.



Stopping When Transmission Cutoff Is On

When the transmission cutoff switch is at the ON position and the left brake pedal is depressed, the transmission is returned to neutral when the brake pedal is depressed to the set position.

Remark

When the transmission cutoff switch is OFF, the transmission is not shifted to neutral.

Turning

WARNING

- Turning the steering wheel quickly at high speed or on steep slopes is dangerous. Turn the steering wheel smoothly in such situations. Never jerk the steering wheel.
- If the engine stops when the machine is traveling, the emergency steering is actuated. This system is only for steering in emergencies; never stop the engine.
- It is particularly dangerous if the engine stops when the machine is traveling on slopes. Never let the engine stop when traveling on slopes.
- If the engine stops, stop the machine immediately at a safe place.

- When traveling, use steering wheel (1) to turn the machine.

With this machine, the front frame is joined to the rear frame at the center of the machine by the center pin. The front and rear frames bend at this point, and the rear wheels follow in the same track as the front wheels when turning.

- Turn the steering wheel smoothly; do not attempt to make tight turns.

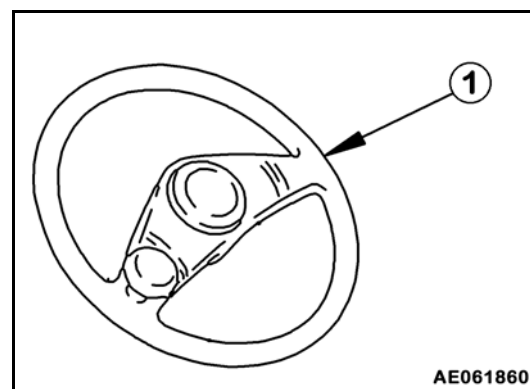
Remark

When the steering wheel is turned completely and reaches the end of its stroke, do not try to turn it further.

Check that there is a play of 50 to 100 mm (2 to 4 in) in the steering wheel.

Check that the steering works properly.

If any abnormality is found, contact your Komatsu distributor for inspection.



OPERATION

Emergency Steering (if equipped)

WARNING

- Do not actuate the emergency steering except in emergencies.
- The emergency steering does not work when the machine is stopped.
- The emergency steering can be used continuously for a maximum of 60 seconds. Operating it continuously for more than 60 seconds may damage the system.
- When using the emergency steering, travel at less than 5 km/h (3.1 mph).
- If the steering becomes stiff, keep the emergency steering switch pressed; move the machine immediately to a safe place; then stop the machine.

★ On machines equipped with an emergency steering function, the emergency steering switch (1) is installed at the position shown in the graphic.

During emergencies or when stopping the engine to check the function, press emergency steering switch (1). Emergency steering pilot lamp (green) (2) illuminates to indicate that the emergency steering system has been actuated. It is now possible to operate the emergency steering. This system enables the machine to be steered under the following conditions:

- The starting switch is at the ON position.
- The steering oil pressure is low or there is no pressure. (When the engine has stopped or there is a failure in the steering oil pressure pump, etc.)

When the starting switch is turned to the ON position, the emergency steering automatically carries out a self-check for three seconds. For details, see “Emergency Steering Self-Check Function” on page 2-117.

When the emergency steering controller detects a lack of oil pressure in the steering system, steering oil pressure caution lamp (red) (3) and central warning lamp (4) illuminate, and the alarm buzzer sounds intermittently.

If this happens and the machine is traveling at a speed of more than 2 km/h (1.2 mph), the emergency steering pump is automatically actuated and emergency steering pilot lamp (green) (2) illuminates.

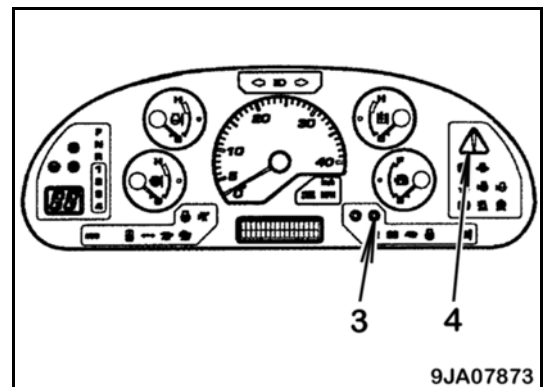
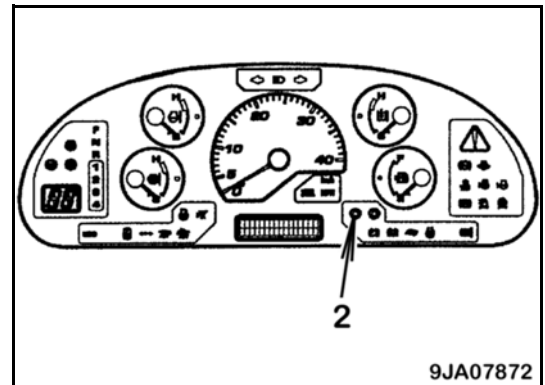
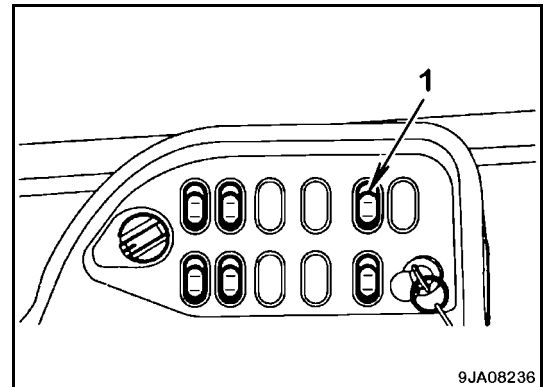
Steering oil pressure caution lamp (red) (3) illuminates to indicate that the steering system has failed. If the steering oil pressure caution lamp (red) (3) illuminates, move the machine immediately to a safe place; stop the machine; stop the engine; and carry out inspection.

★ Do not operate the machine until the problem has been removed.

Remark

If any function of the oil pressure system is used when the engine is running at low speed, steering oil pressure caution lamp (red) (3) may light up momentarily. This is only for a moment and does not indicate a problem.

When the emergency steering controller detects that the oil pressure in the steering circuit has been restored, the actuation of the emergency steering system is stopped.



Emergency Steering Self-Check Function

WARNING

- If the machine is steered during the steering self-check, it may move.
- Do not steer the machine during the steering self-check.

When the starting switch is turned ON, the emergency steering is automatically actuated for approximately three seconds to check that the emergency steering is functioning properly.

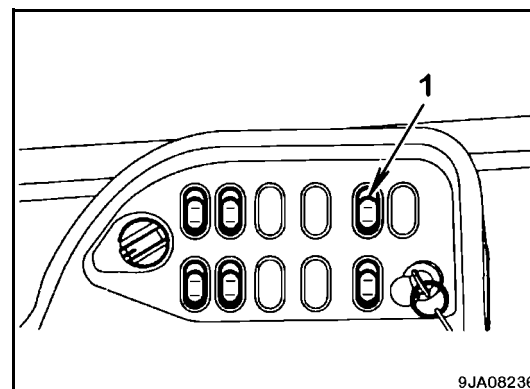
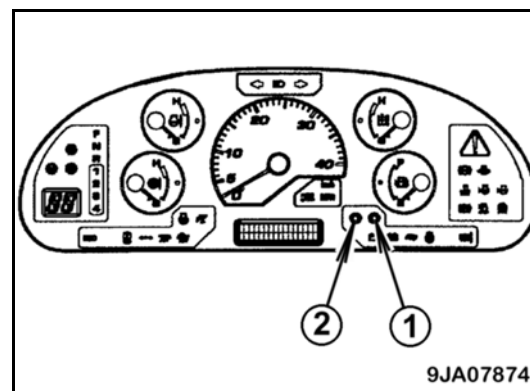
When this happens, steering oil pressure caution lamp (red) (1) and emergency steering pilot lamp (green) (2) light up.

The emergency steering function check is not carried out in the following cases:

- If the starting switch is turned ON, turned OFF again without starting the engine, and is then turned ON again.
- If the starting switch is turned ON again immediately after stopping the engine when the steering oil pressure has not gone down completely.
- If the engine is being preheated.

When preheating is being carried out, the emergency steering self-check function is not actuated.

- ★ To check the emergency steering function, press the emergency steering switch (1) after completing the warming-up operation.



OPERATION

Operation of Work Equipment

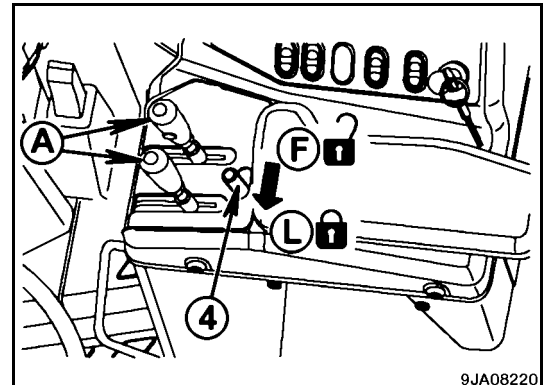
WARNING

- When standing up from the operator's seat, always set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not locked and work equipment control lever (A) is touched by mistake, this may lead to serious personal injury.
- If the work equipment lock lever is not set securely to LOCK position (L), the work equipment may move and cause serious personal injury. Check that the work equipment lock lever is at the position shown in the graphic.
- When pulling the work equipment lock lever up or pushing

Work Equipment Lock Lever

Work equipment lock lever (4) is a lock device for work equipment control levers (A).

- Pull the work equipment lock lever towards the center of the machine to set it to the LOCK position (L).



Lift Arm Control Lever

Lift arm control lever (1) is used to operate the lift arm.

Set the work equipment lock lever to the FREE position (F) before operating the control lever.

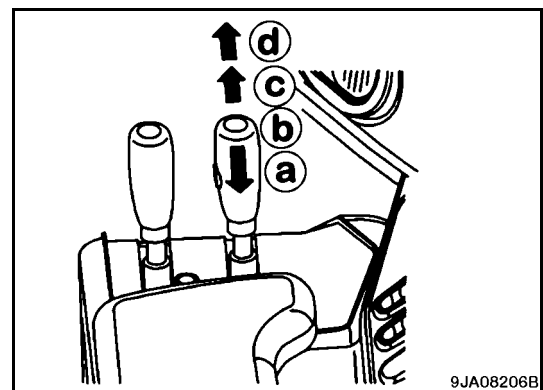
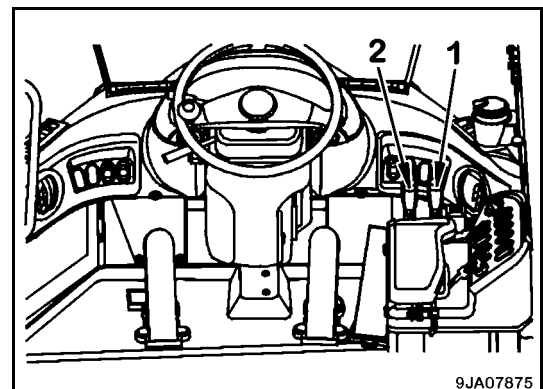
- Position (a): RAISE

When the lift arm control lever is pulled further from the RAISE position, the lever stops at that position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.

- Position (b): HOLD

The lift arm is held in the same position.

- Position (c): LOWER



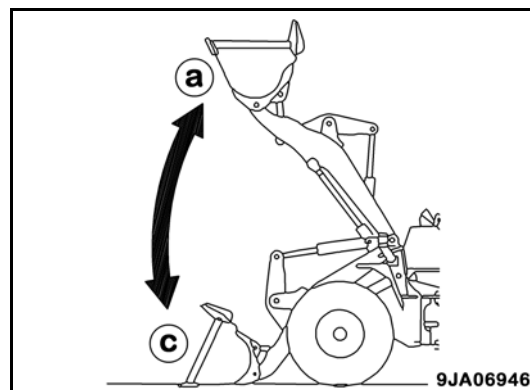
- Position (d): FLOAT

The lift arm moves freely under external force.

Remark

Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling, see “Leveling Operations” on page 2-123.

- ★ For additional information about the lift arm control lever, see “Lift Arm Control Lever” on page 2-62.



Bucket Control Lever

The bucket control lever is used to operate the bucket.

Set the work equipment lock lever to the FREE position (F) before operating the control lever.

- Position (a): TILT

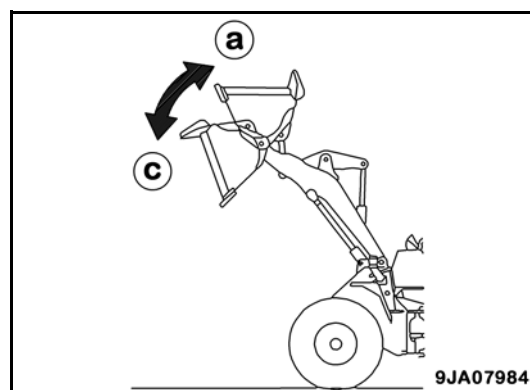
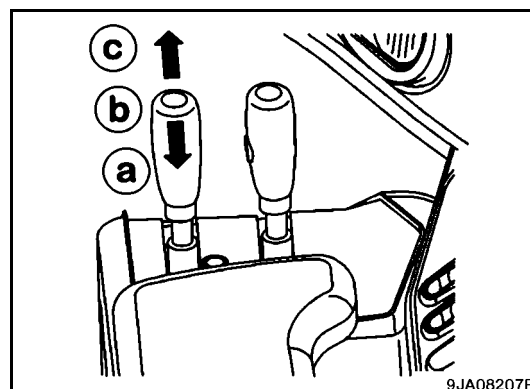
When the bucket control lever is pulled further from the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner and the lever is returned to the HOLD position.

- Position (b): HOLD

The bucket is held in the same position.

- Position (c): DUMP

- ★ For additional information about the bucket control lever, see “Bucket Control Lever” on page 2-62.



OPERATION

Work Possible Using Wheel Loader

Before you start operations, read the information in this section about the type of work you want to do. The information in this section will help you use the machine correctly. If you intend to do loading operations, read the information in “Loading Operations” on page 2-124.

- ★ Make sure that you read the “Precautions During Work Operations” on page 2-132 so that you can operate the machine safely.

In addition to the operations described in this section, it is possible to further increase the range of applications by using various attachments.

Digging Operations

WARNING

- Never dig or scoop with the machine articulated. There is danger that the machine may tip over. Always set the machine facing directly to the front.
- Never raise the boom with the bucket fully loaded when the machine is articulated. There is danger that the machine may tip over.
- When the machine is traveling or the work equipment is raised, the moment that the ECSS switch is turned ON, the work equipment will move.
- If operations are carried out with the ECSS switch left at the ON position, the moment that the ECSS switch is turned ON, the work equipment will move.

Remark

If the tires slip, the tire life will be reduced. Do not allow the tires to slip during operation.

Loading Piled Soil or Blasted Rock

When loading piled soil or blasted rock, drive the machine forward to load. To prevent cutting of the tires caused by the tires slipping, be careful of the following points during the operation.

- Always keep the operating job site flat.
 - Remove any fallen rocks.
 - When working with stockpiles, operate the machine in 1st or 2nd gear.
 - When loading blasted rock operate the machine in 1st gear.
1. When driving the machine forward and lowering the bucket, stop the bucket at height (A), about 30 cm (12 in) from the ground, and then lower it slowly.

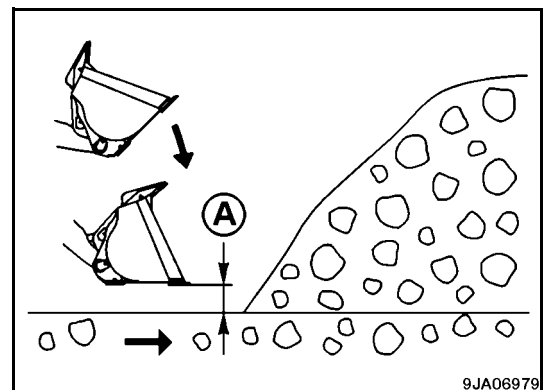
Remark

If the bucket hits the ground, the front tires will come off the ground and the tires will slip.

2. Shift down immediately in front of the material to be loaded. When completing the shift down, depress the accelerator pedal at the same time and thrust the bucket into the material.

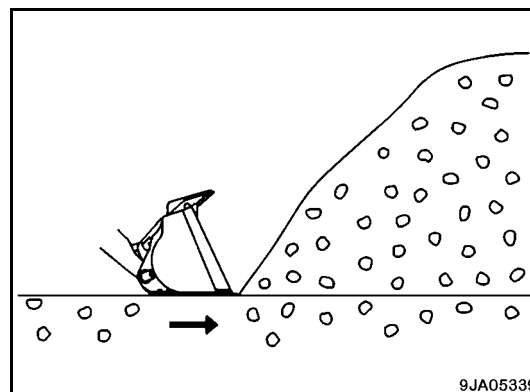
Remark

To reduce fuel consumption, depress the accelerator pedal the minimum possible amount. If it is depressed fully, the fuel consumption will increase but there will be no increase in the amount loaded.



★ Stockpile

3. When the material is in a stockpile, keep the cutting edge of the bucket horizontal; when loading blasted rock, have the bucket tilting slightly down.
 - Be careful not to get blasted rock under the bucket. This will make the front tires come off the ground and slip.
 - Try to keep the load in the center of the bucket; if the load is on one side of the bucket, the load will be unbalanced.



9JA05339

★ Blasted rock

4. At the same time as thrusting the bucket into the material, raise the lift arm to prevent the bucket from going in too far. By raising the lift arm, ample traction is produced by the front tires.

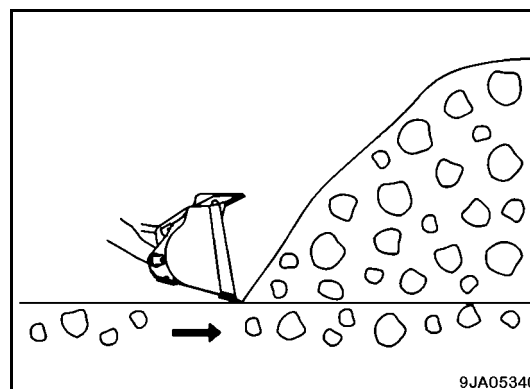
Remark

If the bucket is thrust too much and the lift arm stops rising or the machine stops moving forward, release the accelerator pedal a little. Proper operation of the accelerator pedal for each type of soil is effective for saving fuel and preventing tire wear.

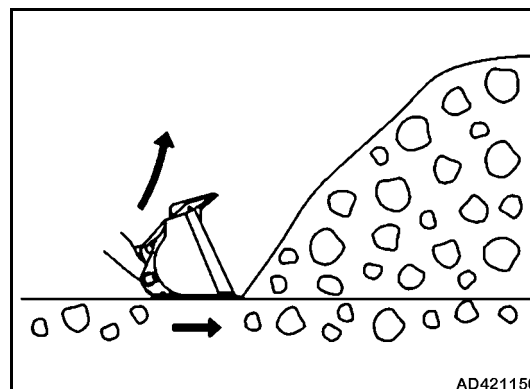
5. Check that there is enough material loaded into the bucket and then operate the bucket control lever to tilt the bucket and load the bucket fully.

Remark

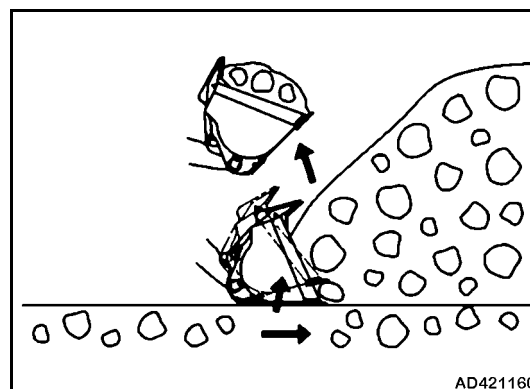
If the bucket edge is moved up and down while pushing in the bucket and digging, the front tires will come off the ground. This will cause the tires to slip.



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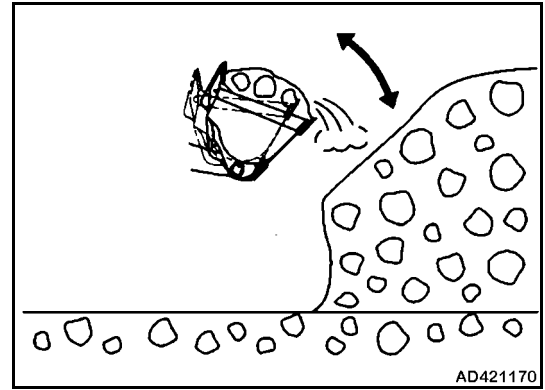
AD421150



AD421160

OPERATION

6. If there is too much material loaded in the bucket, dump and tilt the bucket quickly to remove the excessive load. This prevents spillage of the load during hauling.



Digging and Loading on Level Ground

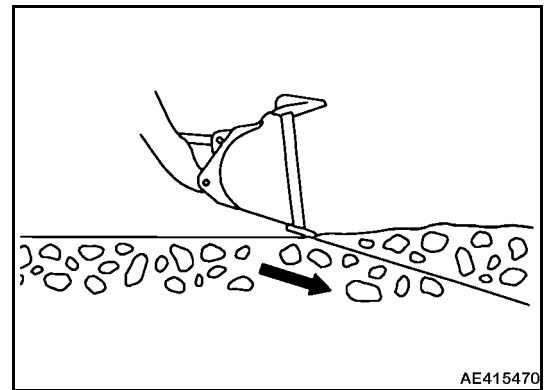
When digging and loading on level ground, set the bucket edge facing down slightly and drive the machine forward.

- ★ Be careful not to load the bucket on one side and cause an unbalanced load.
- ★ This operation should be carried out in 1st gear.



WARNING

Do not set the bucket facing down more than 8°.



1. Set the edge of the bucket facing slightly down.

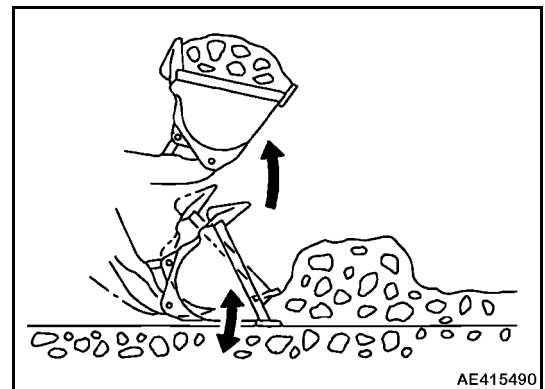
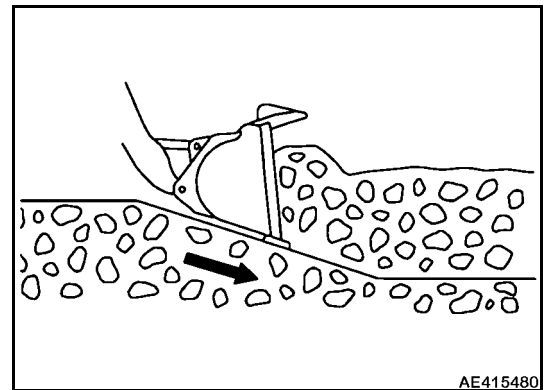


WARNING

If the bucket hits rocks in the ground first, a large shock is generated; this may damage the machine.

2. Drive the machine slowly forward; push the lift arm control lever slightly to the front; and dig in to scoop up the load, a little at a time.
3. Operate the lift arm control lever slightly up and down to reduce the resistance when driving the machine forward.

When digging with the bucket, avoid putting the digging force on one side of the bucket.



Leveling Operations

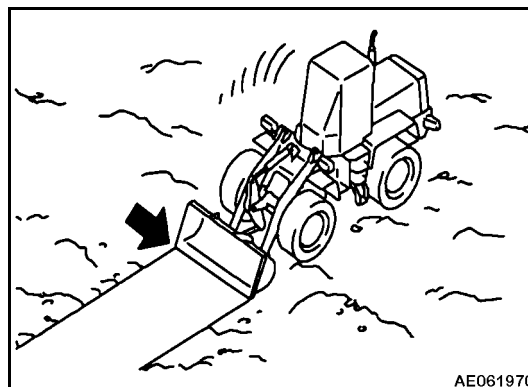
Remark

Always operate the machine in reverse when carrying out leveling operations.

If it is necessary to carry out leveling operations when traveling forward, do not set the bucket dumping angle to more than 8°.

Turn the ECSS switch OFF when carrying out leveling operations.

1. Scoop soil into the bucket. Move the machine backward while spreading soil from the bucket little by little.
2. Go over the spread soil with the bucket teeth touching the ground and level the ground by back-dragging.
3. Scoop some more soil into the bucket; put the lift arm control lever in FLOAT position; level the bucket at ground level; and smooth the ground by moving backward.



Pushing Operations

WARNING

Never set the bucket to the DUMP position when carrying out pushing operations.

- ★ When carrying out pushing operations, set the bottom of the bucket parallel to the ground surface.

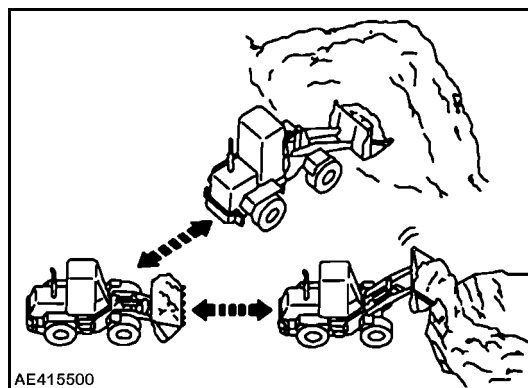
Load-and-Carry Operations

WARNING

- When carrying a load, lower the bucket to keep the center of gravity as low as possible when traveling.
- When the machine is traveling or the work equipment is raised, the work equipment will move the moment that the ECSS switch is turned ON.
- If operations are carried out with the ECSS switch left at the ON position, the work equipment will move the moment that the ECSS switch is turned ON.

The load-and-carry method for wheel loaders consists of a cycle of scooping → hauling → loading (into a hopper, truck, etc.).

- Always keep the travel path properly maintained.
- When using the load-and-carry method, see “Tire Pressure” on page 2-155.



OPERATION

Loading Operations

WARNING

- Always keep the job site flat. Do not operate the steering wheel suddenly or apply the brakes suddenly while the lift arm is raised with a loaded bucket. This is dangerous.
- While loading, never thrust the bucket in soil or crushed rock when traveling at high speed. This is dangerous.
- When the machine is traveling or the work equipment is raised, the work equipment will move the moment that the ECSS switch is turned ON.
- If operations are carried out with the ECSS switch left at the ON position, the work equipment will move the moment that the ECSS is actuated. Operate carefully.

Select the method of operation which will give the minimum amount of turning and travel in order to provide the most efficient method for the job site.

Remark

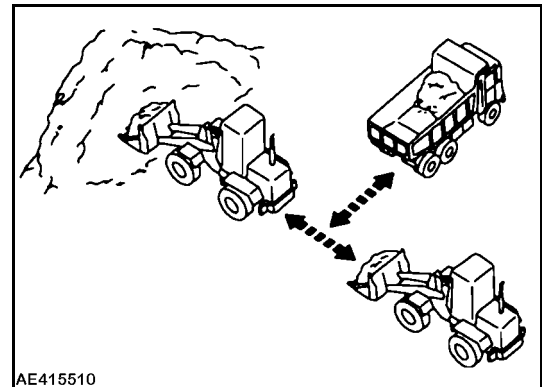
If the tires slip, the tire life will be reduced. Do not allow the tires to slip during operation.

Avoid excessive bucket shaking.

Cross-Drive Loading

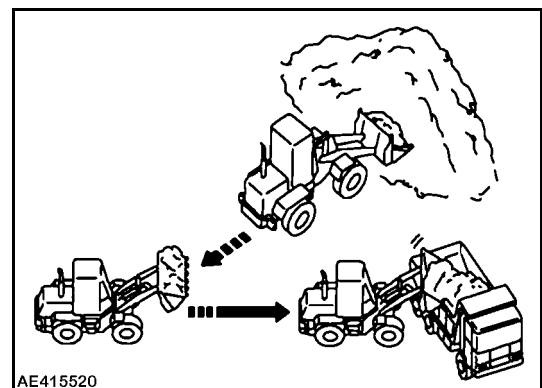
This method requires the least time for loading and is extremely effective in reducing the cycle time.

- Always set the wheel loader facing at a right angle to the stockpile.
- After digging in and scooping up the load, drive the machine straight back in reverse and then bring the dump truck in between the stock pile and the wheel loader.



V-Shape Loading

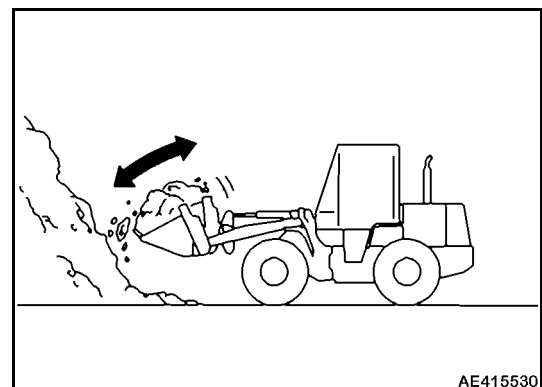
- Position the dump truck so that the direction of approach of the wheel loader is approximately 60° from the direction of approach to the stockpile.
- After loading the bucket, drive the wheel loader in reverse; turn it to face the dump truck; and travel forward to load the dump truck.
 - The smaller the turning angle of the wheel loader, the more efficient the operation becomes.
- When loading a full bucket and raising it to the maximum height, first shake the bucket to stabilize the load before raising the bucket.
 - This prevents the load from spilling to the rear.



Precautions for Piling Up Loads

When forming a pile, do not drive up the pile high enough to cause the rear counterweight to drag on the ground.

Do not set the bucket to the DUMP position when piling up loads. Keep bucket perpendicular to ground when pushing material into a pile.

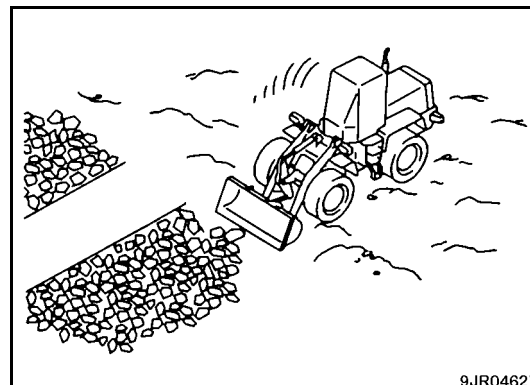


Remark

When using the transmission cutoff function, lower the cutoff position so that the cutoff function is actuated when the brake pedal is pressed hard, while ensuring ample braking force.

Preparations for Loading, Gathering Rocks

- ★ Always keep the job area level and remove any rocks or boulders.
 - When gathering rocks, if the operation is carried out over an area longer than the length of the machine, there is danger that the machine will ride up on boulders and incur cuts to the tires. When gathering rocks, always carry out the operation in an area shorter than the length of the machine.
 - When carrying out operations with the bucket in contact with the ground, do not articulate the machine. Articulation will cause tire slippage and damage to the machine.
1. Put the bucket horizontally in contact with the ground; drive forward; and gather the rocks that have been scattered after loading and after splitting or blasting.



2. After collecting the rocks in an area the length of the machine, change the direction of the machine to gather rocks and increase the area of level ground.

Approaching Facing

- When approaching the facing and lowering the bucket to the ground, do not drop the bucket suddenly into contact with the ground.

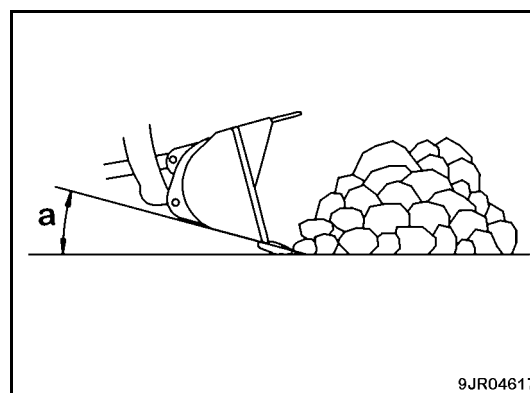
If the bucket is dropped suddenly, the bucket, work equipment, area around the pins, and the machine frame will be subjected to excessive shock. This will lead to damage or deformation of various parts of the machine. In addition, the front wheels will come off the ground and cause the machine to slip.

- When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.
- Do not set the cutting edge of the bucket at a large angle to the ground surface when digging or lowering the roadbed. Keep the angle between the bucket and the ground surface to a maximum of 8° .

If the angle between the cutting edge of the bucket and the ground surface is more than 8° when digging or lowering the roadbed, there is danger of damage to the work equipment.

- Do not load the bucket or scoop up the load with the load on the corner of the bucket or on one side of the bucket. This will cause the machine to twist and will reduce the service life of the work equipment and the frame.

1. Set the machine to the travel posture.
2. Set the shift position to F2; gradually depress the accelerator pedal; and raise the travel speed.
3. When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.
4. Make angle (a) between the bucket and the ground surface a maximum of 8° . Operate the tilt and dump so that only the cutting edge comes in contact with the ground.



OPERATION

5. Drive forward at right angles to the rock and change the direction that the machine is facing.
6. Operate the accelerator to match the condition of the road surface so that the tires do not slip.
7. Scoop up the gathered rock. Load hard-cutting rock or boulders in the middle of the bucket.

Digging

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train.

- When thrusting the bucket in, shift down to 1st.

If the bucket is thrust in at high speed, there will be an impact load on the machine. This will reduce the service life of the machine.

- When shifting down, release the accelerator pedal to reduce the engine speed before shifting down and then gradually depress the accelerator pedal.

If the accelerator is operated suddenly after shifting down, there will be an excessive load placed on the engine and power train.

- Do not carry out operations with the machine articulated.

If the machine is articulated, the direction of force will be different on the front wheels and rear wheels. As a result, the power, when traveling, will not be transmitted fully to the front wheels. This will reduce the digging force and place an excessive load on the center hinge pin. In addition, even with the front wheels, the power will not be transmitted uniformly to the left and right wheels. The load will be placed on one wheel thus reducing the service life of the tire on one side.

- Do not push the bucket in too far.

If it is pushed in too far, a heavy load will be placed on the machine. This will reduce the service life of the work equipment and frame.

- Operate the control lever slowly near the end of the bucket tilt operation.

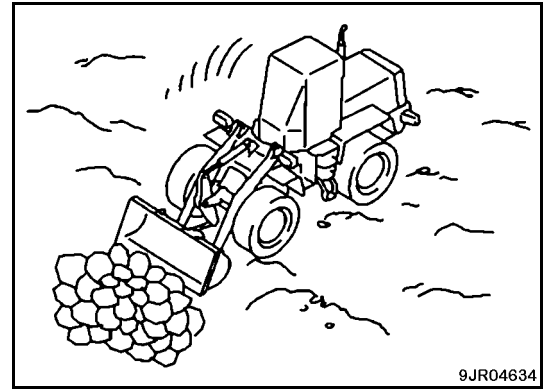
If the control lever is operated suddenly, an impact load will be placed on the tilt cylinder. There is danger that the cylinder may be damaged.

- When close to a pit excavation, do not let the front wheels rise up on the cutting face. The rocks will cut the tires.

1. Immediately in front of the rock, let the accelerator pedal back and shift down from 2nd to 1st.
2. After shifting down, depress the accelerator pedal gradually and push the rock.
3. Raise the lift arm slightly and increase the driving force of the front wheels. When doing this, do not push the bucket in too far.

Remark

When digging up large rocks, in some cases it may be better not to raise the lift arm too high. If the lift arm is raised too high, the rear wheels may come off the ground.

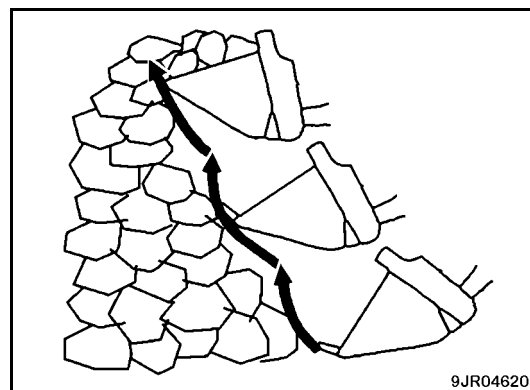


4. After loading the rock completely into the bucket, operate the bucket tilt and lift two to three times repeatedly to fill the bucket.
5. Let back the accelerator pedal; operate the control levers slowly; and tilt the bucket back fully.
6. To prevent the load from falling out of the bucket, after completing the scooping-up operation operate in the dump and tilt direction when the bucket is near the full tilt in order to stabilize the load.

Remark

If the brakes are operated lightly before traveling in reverse, it is possible to stabilize the load in the bucket.

To prevent generation of heat in the torque converter, keep the standard time for digging to within 10 seconds from the start of pushing the bucket in to the completion of scooping up.



OPERATION

Traveling in Reverse After Excavation

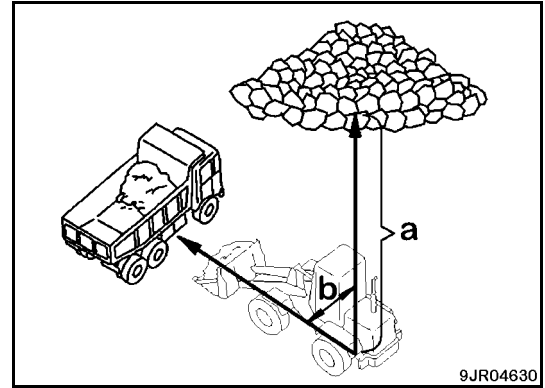
- Do not operate the steering immediately after starting to travel in reverse. The bucket is still thrust into the rock.
If the steering is operated, excessive force will be placed on the bucket or frame. There is danger of damage to the frame.
- After shifting the transmission, operate the accelerator pedal slowly.
If the accelerator pedal is operated suddenly, the tires will slip and cause wear or cutting of the tires.

1. After completing the excavation, shift to R2 and travel in reverse without operating the steering.
2. As a guideline, reverse travel distance (a) should be 1.2 to 1.5 times the length of the machine. At this distance, the rolling of the tires can prevent wear to the tires.

In addition, keep an angle (b) of 60° at the intersection between the straight line from the dilution and the straight line from the dump truck.

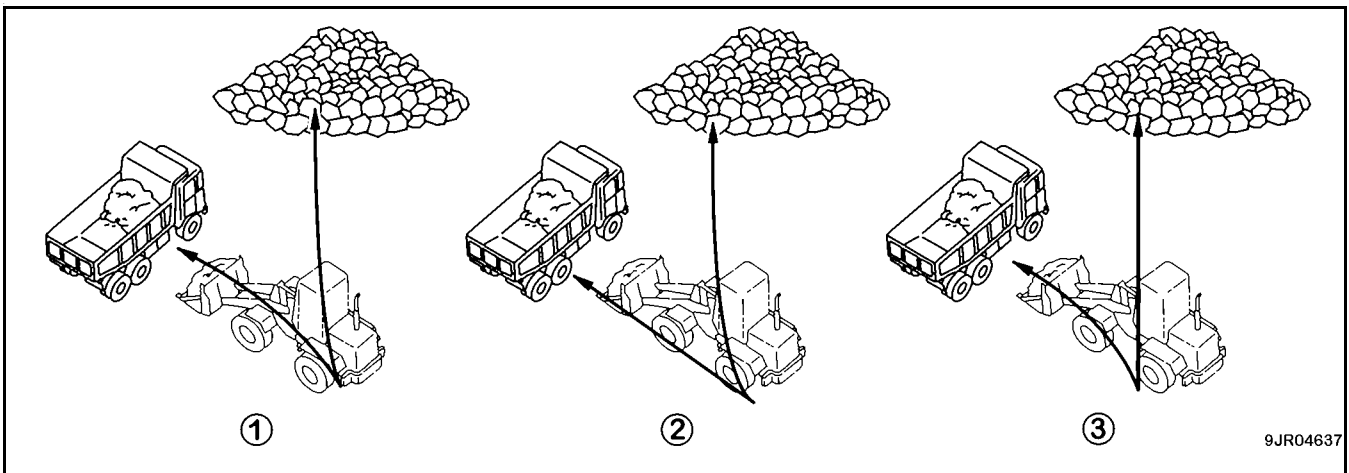
Remark

Decide the steering procedure to match the stopping point of the dump truck and the condition of the dilution. When doing this, decide the stopping point for the dump truck so that the operating angle for the steering is less than 20° .



3. When driving in reverse, do not raise the bucket more than necessary.

Consider the position of the dump truck, the condition of the road surface, the travel speed, and the speed of the work equipment when deciding the height of the bucket. However, do not raise the bucket so that the top of the load is higher than the horizontal line of sight from the operator.



1. Gradual steering to left or right
2. Gradual steering to dilution
3. Direct line to dilution

Approaching Dump Truck

WARNING

Do not operate the steering suddenly when the bucket is raised. If the steering is operated when the bucket is raised, there is danger that the machine may tip over and cause serious personal injury.

Remark

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train. In addition, the tires will slip; this will cause wear of the tires.

- Do not operate the steering immediately after switching between forward and reverse (when the machine is stationary).

If the steering is operated when the machine is stationary, it will cause wear or cuts to the tires.

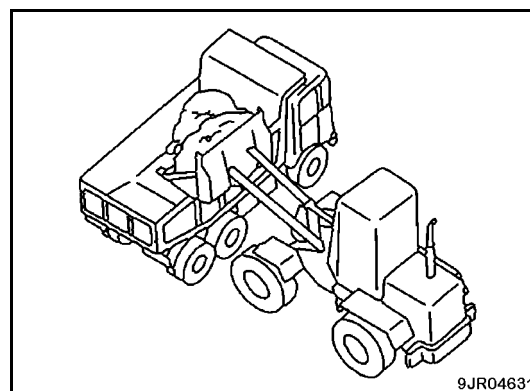
- If a transmission cutoff system is installed, turn the transmission cutoff switch to the OFF position and depress the brake, but do not raise the bucket.

In this condition, the brake is operated. Heat is generated in the brake chamber; this heat will cause heat fatigue to parts inside the axle.

- Let the accelerator pedal back to reduce the engine speed and then depress the parking brake pedal to stop the machine.
- Shift gear from R2 to F2.
- Operate the steering to set the load at right angles to the dump truck and then drive forward.

Remark

Operate the steering in the following order: let accelerator pedal back → switch between forward and reverse → depress accelerator pedal to drive forward → approach dump truck. If these operations are carried out at the same time, the engine acceleration will be poor resulting in poor fuel consumption.



- Raise the bucket to adjust the bucket height so that when the bucket is tilted down, the cutting edge of the bucket does not hit the bottom face of the dump body or the existing load.

OPERATION

Loading Dump Truck

- Do not load the dump truck suddenly from a high position.

If the dump truck is loaded in this manner, the dump truck will suffer impact load. There is danger that this may damage the body.

- Do not operate the dump or stop operations when the engine is running at high speed.

There is danger of impact pressure being generated in the hydraulic equipment and causing damage to the hydraulic equipment.

- Do not shake the bucket violently to dump the load inside the bucket.

The machine will sway and there is danger of damage to the machine. In addition, there is danger of impact pressure being generated in the hydraulic equipment resulting in damage to the hydraulic equipment.

- When loading the dump truck, do not push forcibly with the bucket.

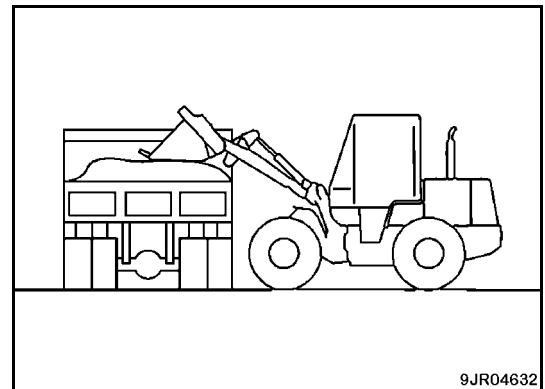
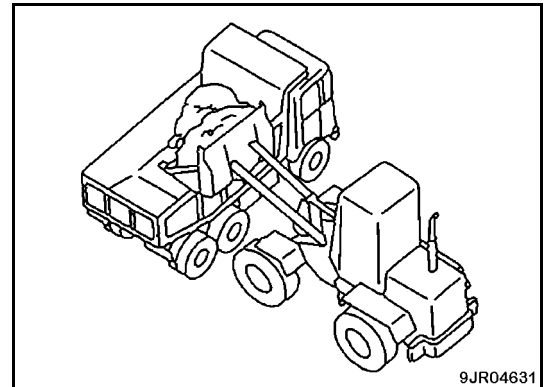
The machine and the dump truck will suffer impact shock, resulting in damage. When pushing the load with the bucket to prevent rocks from falling, carry out the operation gently.

- When loading large rocks, first load with sand or soil to act as a cushion and then load the large rocks on top.

If large rocks are loaded directly, they will cause deformation or damage to the dump body.

1. When loading the dump truck, load at a low point that does not hit the dump truck or existing load.

2. After completing the loading, if there is danger of rocks falling off, push the load softly with the bucket.



Reversing Away From Dump Truck

- Do not shift down with the accelerator pedal depressed (with the engine speed raised).

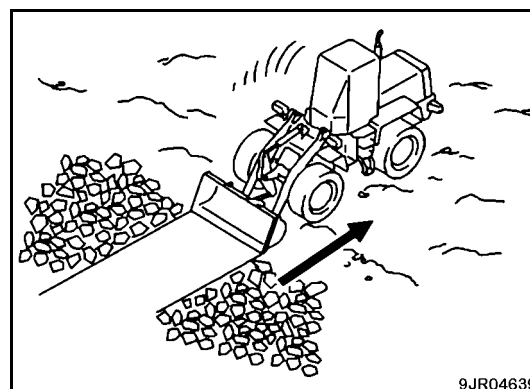
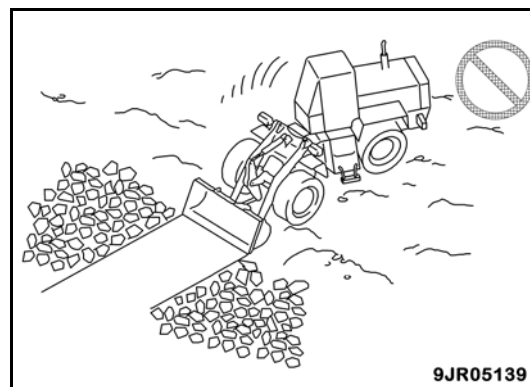
If the transmission is shifted down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train. In addition, the tires will slip and cause wear of the tires.

- Do not operate the steering immediately after switching between forward and reverse (when the machine is stationary).

If the steering is operated when the machine is stationary, it will cause wear or cuts to the tires.

- Switch to R2 and drive in reverse.
- While driving in reverse, lower the lift arm and operate the steering to face the position for scooping up.
- Depress the brake pedal and stop the machine.
- Let back the accelerator pedal to reduce the engine speed and then switch from R2 to F2.
- Lower the bucket to the ground and drive forward to clear the surface (remove all boulders).

Do not operate the steering when carrying out the leveling operation. Travel forward with the machine facing directly to the front.



OPERATION

Precautions During Work Operations

Piling Up Loads

- When forming products into a pile, be careful not to let the rear counterweight come into contact with the ground.
- Do not set the bucket to the DUMP position when piling up loads.

Remark

As much as possible, do not use the transmission cutoff function during scraping-up operations. This will prevent the machine from rolling back. When using the transmission cutoff function, lower the cutoff position so that the cutoff function is actuated when the brake pedal is pressed hard, while ensuring ample braking force.

Handling Blasted Rock

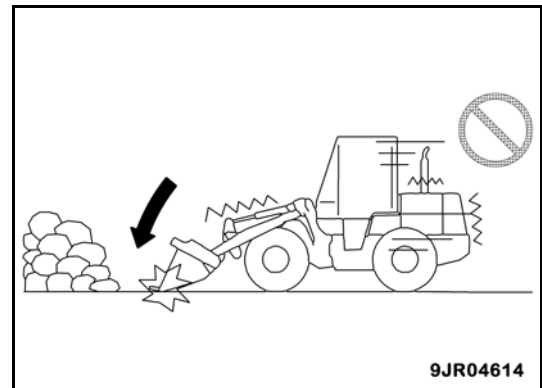
If the target load is blasted rock, pay careful attention to the following items when carrying out the operation in order to extend the service life of the machine.

Handling Bucket

- When approaching the facing and lowering the bucket to the ground, do not drop the bucket suddenly into contact with the ground.

If the bucket is dropped suddenly, the bucket, work equipment, area around the pins, and the machine frame will be subjected to excessive shock. This will lead to damage or deformation of various parts of the machine. In addition, the front wheels will come off the ground and cause the machine to slip.

- When lowering the bucket to the ground, reduce the lowering speed of the bucket when it is close to the ground and bring it slowly into contact with the ground.



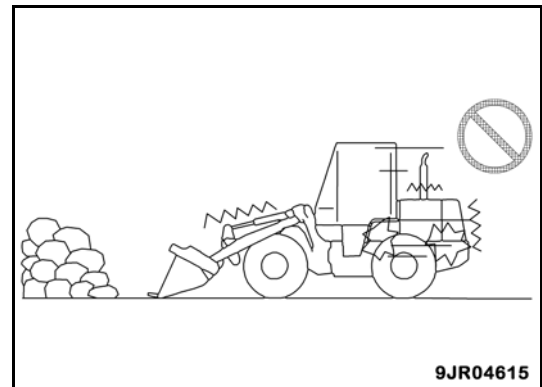
Shifting Transmission When Thrusting Bucket Into Facing

- When thrusting the bucket into the facing to carry out excavation, do not shift down with the accelerator pedal depressed (with the engine speed raised).

If the transmission shifts down when the engine speed is high, there will be an excessive load on the engine, torque converter, transmission, axles, final drive, and the whole power train.

- When shifting down to 1st and thrusting the bucket into the facing, release the accelerator pedal to reduce the engine speed before shifting down and then gradually depress the accelerator pedal.

If the accelerator is operated suddenly after shifting down, there will be excessive load brought to bear on the engine and power train.



Articulating Machine During Digging Operations

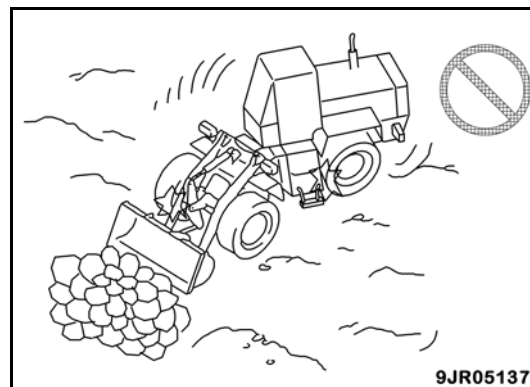
- Do not carry out operations with the machine articulated.

If the machine is articulated, the direction of force will be different for the front wheels and rear wheels. As a result, the power, when traveling, will not be transmitted fully to the front wheels. This will reduce the digging force and bring an excessive load to bear on the center hinge pin. In addition, even with the front wheels, the power will not be transmitted uniformly to the left and right wheels. The load will be brought to bear on one wheel thus reducing the service life of the tire on one side.

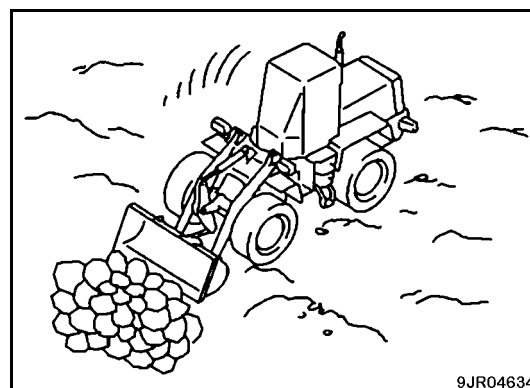
If digging work is carried out with the machine articulated, the overall stability of the machine will be poor. There is danger of the machine tipping over.

- When carrying out operations, do not articulate the machine. Drive straight forward and thrust the bucket in.

If this is done, the load on the bucket will be uniform. This makes it possible to avoid load on one side and makes it easier to load the bucket.



9JR05137

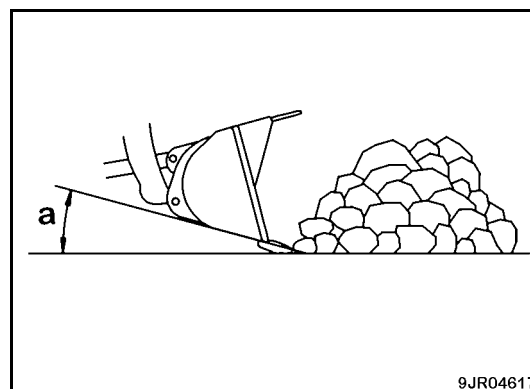


9JR04634

Bucket Dump Angle When Digging or Lowering Roadbed

- Do not set the cutting edge of the bucket at a large angle to the ground surface when digging or lowering the roadbed. Keep angle (a) between the bucket and the ground surface to a maximum of 8° .

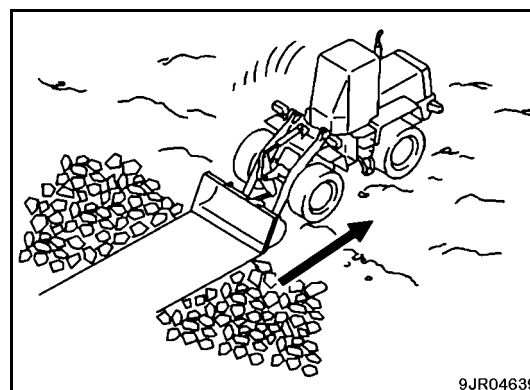
If angle (a) between the cutting edge of the bucket and the ground surface is more than 8° when digging or lowering the roadbed, there is danger of damage to the work equipment.



9JR04617

Bucket Dump Angle When Leveling

- Drive the machine in reverse when carrying out leveling operations.

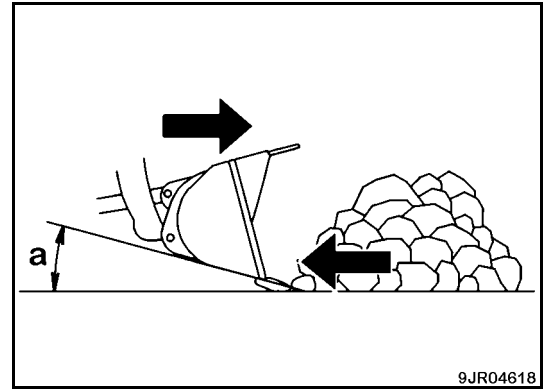


9JR04639

OPERATION

- If leveling operations are carried out with the machine traveling forward, do not make angle (a) between the cutting edge of the bucket and the ground surface facing down more than 8° .

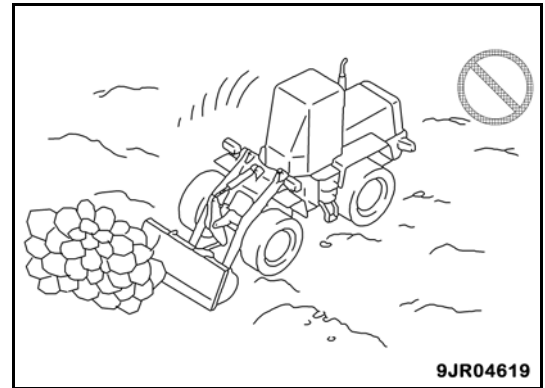
If leveling operations are carried out when driving forward with angle (a) between the cutting edge of the bucket and the ground surface facing down more than 8° , the bucket cylinder will be pushed by the pushing force of the machine. This will cause the cylinder to retract and the bucket will face down at a greater angle. There is danger of the work equipment breaking.



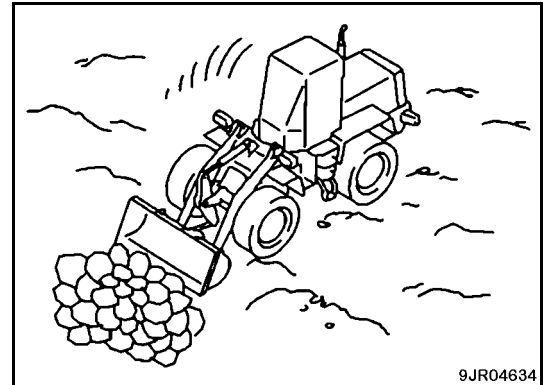
Loading Bucket

- Do not load the bucket or scoop up the load with the load on the corner of the bucket or on one side of the bucket.

This will cause the machine to twist and will reduce the service life of the work equipment and the frame.



- When carrying out digging or scooping-up operations, thrust the center of the bucket into the load.



Bucket Dump Operation When Digging

- Do not operate the bucket in the DUMP direction when digging.

If the bucket control lever is operated to the DUMP position during digging, the machine will not be able to travel forward; the tires will slip; and an excessive load will be brought to bear on the work equipment.

Carry out the scooping-up operations as follows.

1. When thrusting the bucket in, raise the lift arm slightly at the same time. Ample driving force will work on the front wheels.

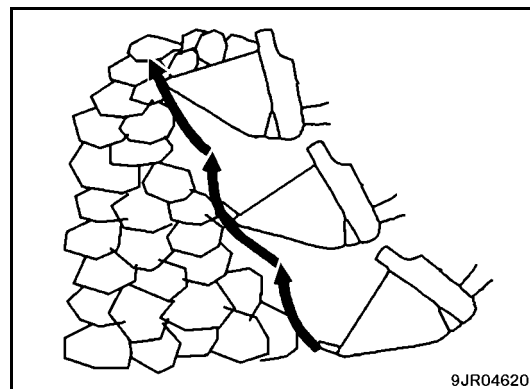
2. To fill the bucket, operate the bucket tilt and lift two to three times repeatedly when thrusting the bucket in.

Operate the control lever slowly near the end of the bucket tilt.

3. When the bucket reaches the end of the tilt stroke, depress the brake pedal to stop the machine.

When doing this, do not push the bottom of the bucket against the pile. If the bucket is pushed against the pile, the bucket, cylinders, and work equipment will be damaged.

4. When the scooping-up operation is completed, operate the bucket tilt and dump. Apply the brakes when traveling in reverse to stabilize the load inside the bucket and prevent spillage of the load.



Remark

To reduce the generation of heat by the torque converter, keep the target time for the digging operation within 10 seconds from the start of thrusting in to the completion of scooping up.

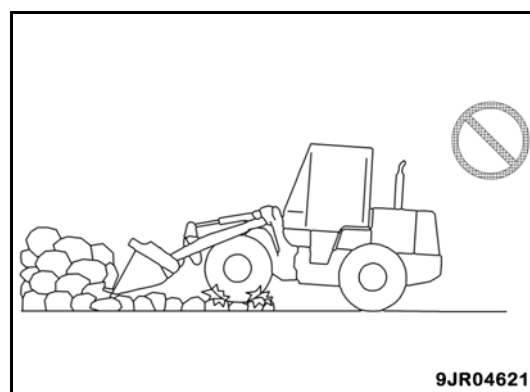
The fuel consumption increases during digging work. Fuel cost is saved by shortening the digging time.

Front Wheels Going on Blasted Rock

- Do not carry out operations that make the front wheels ride up on blasted rock.

If the front wheels go on top of blasted rock, there is danger that the sharp parts of the blasted rock will cut the tires.

- In particular, avoid pushing the bucket in too far. When operating near natural rock after blasting (roots), do not let the front wheels ride up on the natural rock (roots). For scooping-up operations near natural rock (roots), do not use a wheel loader. Use a bulldozer or hydraulic excavator.



OPERATION

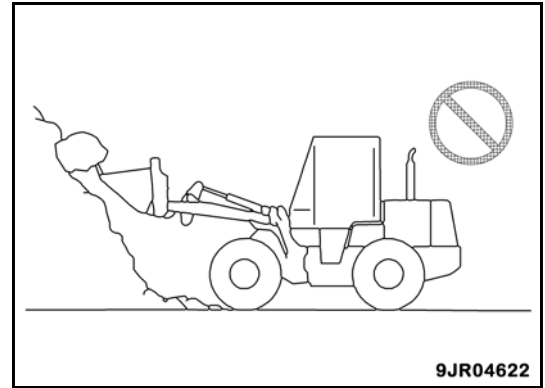
Loosened Boulders

WARNING

Do not use this machine to deal with loosened boulders. If the boulder is dropped by mistake when handling it, there is danger that it may fall on top of the operator's compartment and cause serious personal injury.

- Do not use this machine to handle hanging rocks. There is danger that the rock will fall while moving it and hit the machine or operator's cab.

If dropped boulders hit the work equipment cylinders, there is danger that the cylinder will bend and be unable to move. If the boulder is dropped on the operator's compartment, there is danger of serious personal injury.

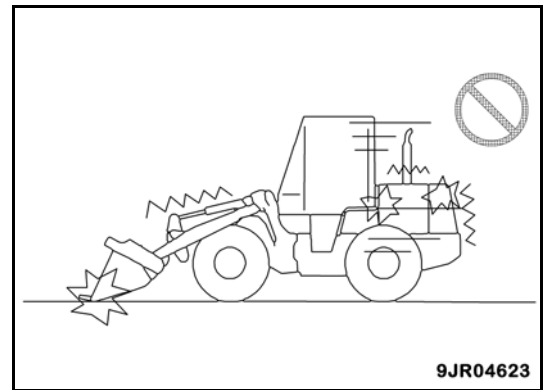


Pit Excavation

- Do not try to shave off natural rock (roots) remaining from blasting.

Excessive force will be applied to the machine and there is danger that this may damage the work equipment or frame.

- For pit excavation operations, do not use a wheel loader. Use a bulldozer or hydraulic excavator.

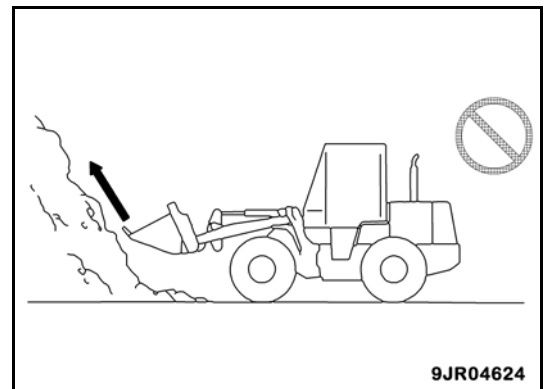


Cutting Face Operations

- Do not excavate cutting faces.

If the cutting face is excavated, excessive force will be applied to the machine. There is danger that this may damage the bucket, work equipment, or frame.

- In particular, do not excavate with the bucket raised to a height above the travel posture. For excavation of cutting faces, use a hydraulic excavator.

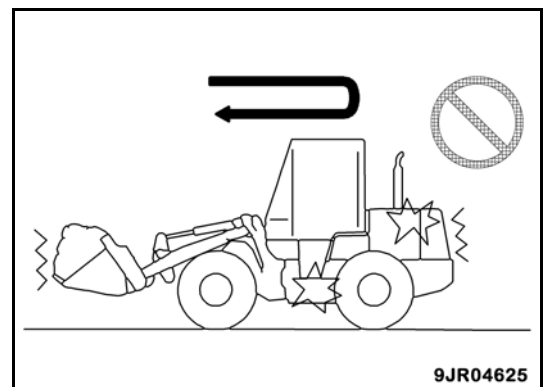


Switching Between Forward and Reverse

- Do not switch the direction of travel of the machine between forward and reverse when traveling at high speed or when the accelerator pedal is depressed.

When the machine is traveling at high speed or when the accelerator pedal is depressed, the engine speed is high. If the direction of travel is switched between forward and reverse, an excessive load is applied to the engine, torque converter, transmission, and other parts of the power train. This will reduce the service life of the machine.

- When switching between forward and reverse, travel at low speed; reduce the engine speed; then stop the machine and switch the direction of travel.



Turning When Tires Are Stationary

- Do not operate the steering when the machine is stationary.

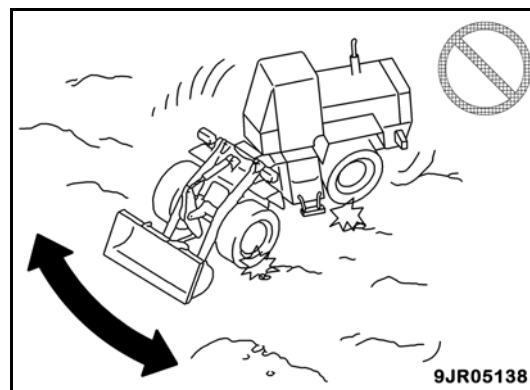
If the steering is operated when the machine is stationary, it will cause wear or cuts in the tires. In addition, it will reduce the durability of the frame and the undercarriage.

Wheel Brake Does Not Work

If the machine does not stop when you depress the brake pedal, use the parking brake to stop the machine.

Remark

If the parking brake has been used as an emergency brake, contact your Komatsu distributor to have the parking brake checked for any abnormality.



Permissible Water Depth

- When working in water or on swampy ground, do not let the water come above the bottom of the axle housing (1).
- After finishing the operation, wash and check the lubricating points.

Lower the Center of Gravity when Turning

- When turning on slopes, lower the work equipment to lower the center of gravity before turning. It is dangerous to turn the machine suddenly on slopes.

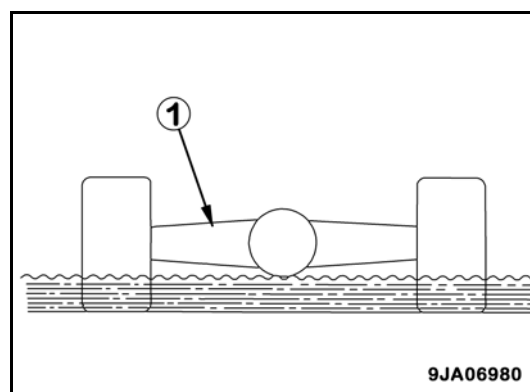
Driving Up or Down Slopes

Braking on Downhill Slope

- If the foot brake is used frequently when traveling downhill, the brake will overheat and may be damaged. To prevent this, place the gearshift lever at a low speed range and use the braking force of the engine to reduce the speed when traveling downhill. Normally, the most suitable speed range when traveling down a slope is the speed range needed when traveling up that slope.
- When braking, use the right brake pedal.
- If the correct speed range is not used, the torque converter oil may overheat. If this happens, shift down one gear to reduce the oil temperature.
- If the torque converter oil temperature indicator does not return to the white range even when the gearshift is in 1st gear, stop the machine; place the directional selector lever at the N position; and run at the engine at a mid-range speed until the gauge enters the white range.

Remark

If there is danger of the engine over-running, the central warning lamp illuminates and the buzzer sounds intermittently. At the same time, the engine speed flashes on the meter display. Limit the engine speed and machine travel speed when operating. See "Brake Oil Pressure Caution Lamp" on page 2-16 for further information.



OPERATION

If Engine Stops

If the engine stops on a slope:

- Apply the parking brake immediately.
- Lower the work equipment to the ground.
- Stop the machine.
- Put the directional lever in the neutral position.
- Start the engine again.

Driving the Machine

When the machine travels at high speed for a long distance, the tires become extremely hot. This causes early wear of the tires. Avoid traveling at high speed for a long distance. If the machine must be driven for a long distance, take the following precautions.

- Follow the regulations related to this machine and drive carefully.
- Before driving the machine, carry out the checks before starting; see “Check Before Starting Engine” on page 2-80.
- The most suitable tire pressure, travel speed, or tire type differ according to the condition of the travel surface. Contact your Komatsu distributor or tire dealer for information.
- The following table is a guide to suitable tire inflation pressures and appropriate speeds when traveling on a paved surface with the standard tires (23.5-25-16PR(L3)).

Tire pressure and speed

Front wheel	350 kPa (3.5 kg/cm ²) [51 psi]
Rear wheel	310 kPa (3.1 kg/cm ²) [45 psi]
Travel Speed	14 km/h (8.7 mph)

- Check the tire pressure before starting, when the tire is cool.
- After traveling for one hour, stop the machine for 30 minutes. Check the tires and other parts for any abnormality.
- Check the oil and coolant levels.
- Always travel with the bucket empty.
- Never put “calcium chloride” or “dry ballast” in the tires when traveling.

Braking Function

When traveling long distances continuously downhill, the frequency of using the brake may increase. As a result, depending on the weight of the machine and the grade of the slope, the machine's braking capacity may be exceeded and the brakes may overheat.

The values in the following table is a guideline for this machine.

Machine Weight (t)	Slope Grade (%)	Braking Capacity Limit	
		Average Travel Speed Limit km/h (mph)	Downhill Distance Limit (continuous) km (mile)
18 – 20.1 (unloaded)	10	40 (24.85)	2.6 (1.62)
	20	17 (10.56)	0.9 (0.56)
23.7 – 25.7 (loaded)	10	37 (22.99)	2.1 (1.30)
	20	12 (7.46)	0.7 (0.43)

- ★ If the braking capacity limit is exceeded, a forced cooling system for the brakes is needed. Consult your Komatsu distributor.

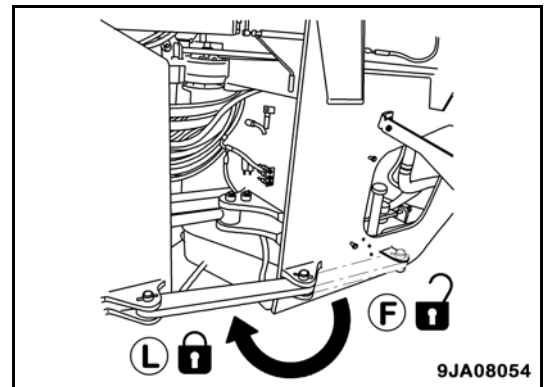
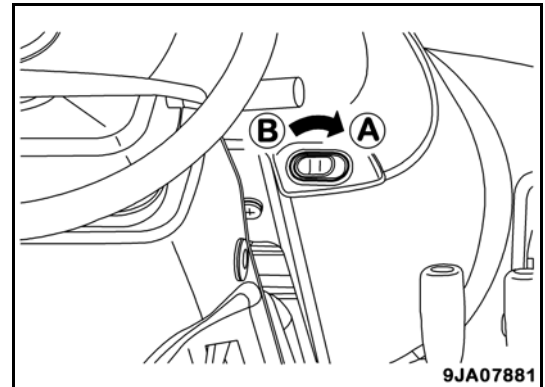
OPERATION

Adjusting Work Equipment

WARNING

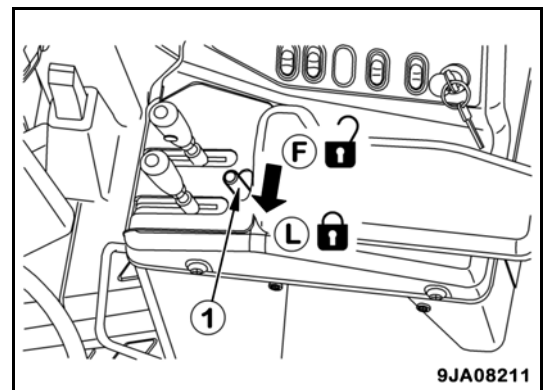
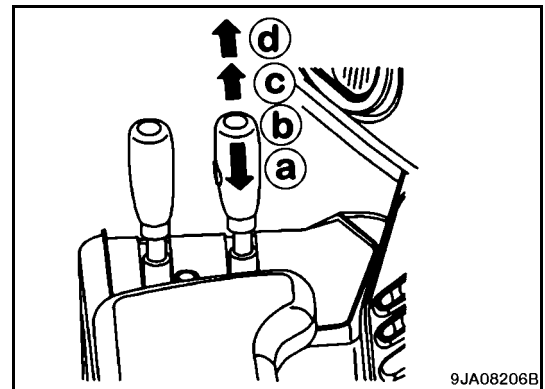
- Stop the machine on flat ground and put blocks in front of and behind the tires.
- Set the parking brake switch to the ON position (A) to apply the parking brake.
- Set the frame lock bar to LOCK position (L) to lock the front and rear frames.
- Always attach a warning sign to the work equipment control levers.
- Do not go under the work equipment when the arm is raised.

- ★ The boom kickout makes it possible to set the bucket so that it automatically stops at the desired lifting height (lift arm higher than horizontal).
- ★ The bucket positioner makes it possible to set the bucket so that it automatically stops at the desired digging angle.
- ★ The setting can be adjusted to match the working conditions.



Adjusting Boom Kickout

1. Raise the bucket to the desired position and return the lift arm control lever to the HOLD position (b).
2. Set the work equipment lock lever (1) to the LOCK position (L) and stop the engine.

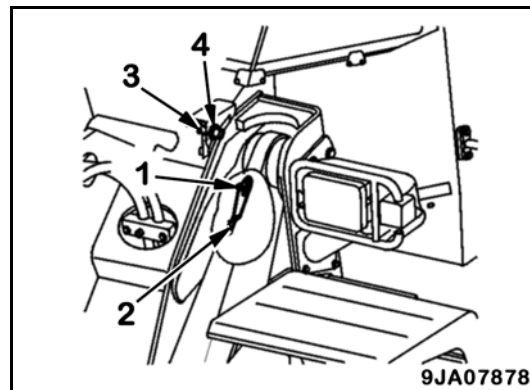


- Loosen two bolts (1) and adjust plate (2) so that the bottom edge is in line with the center of the sensing surface of proximity switch (3). Then tighten the bolts to hold the plate in position.

- Loosen two nuts (4) to make a clearance of 3 to 5 mm (0.118 to 0.197 in) between plate (2) and the sensing surface of proximity switch (3). Then tighten the nuts to hold in position.

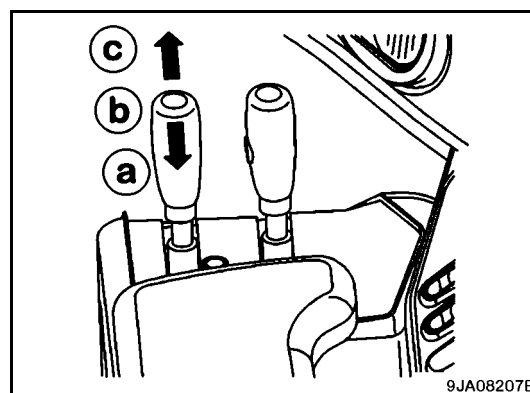
Tightening torque: 17.2 ±2.5 N•m (152 ±22 lbf in)

- After adjusting, start the engine and operate the lift arm control lever. Check that the lever is automatically returned to HOLD when the bucket reaches the desired height.



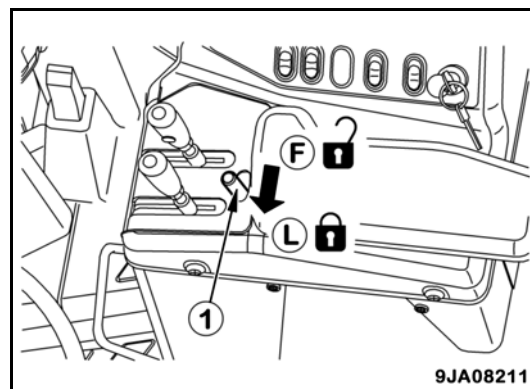
Adjusting Bucket Positioner

- Lower the bucket to the ground; set it to the desired digging angle; and return the bucket control lever to the HOLD position (b).



- Set the work equipment lock lever (1) to the LOCK position (L), then stop the engine.

- Loosen two bolts (1); adjust the position of mounting bracket (4) of the proximity switch so that the rear tip of bar (2) is in line with the center of the sensing surface of proximity switch (3); then tighten bolts to hold the bracket in position.

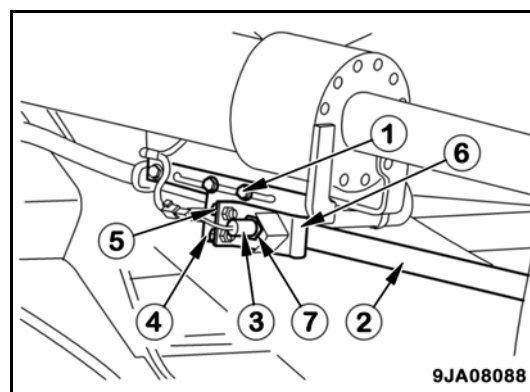


- Loosen two bolts (5); adjust so that the clearance between bar (2) and support (6) is 0.5 to 2 mm (0.020 to 0.079 in); then tighten bolts (5) to hold in position.

- Loosen two nuts (7); adjust so that the clearance between bar (2) and the sensing surface of proximity switch (3) is 3 to 5 mm (0.118 to 0.197 in); then tighten the nuts to hold in position.

Tightening torque: 17.2 ±2.5 N•m (152 ±22 lbf in)

- After adjusting, start the engine and raise the lift arm. Operate the bucket control lever to the DUMP position, then operate it to the TILT BACK position and check that the lever is automatically returned to the HOLD position when the bucket reaches the desired digging angle.

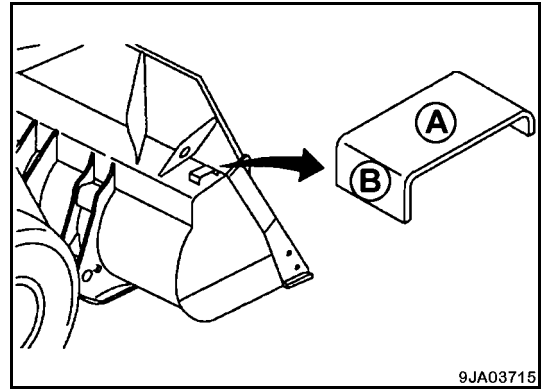


OPERATION

Bucket Level Indicator

There are two level indicators at the top rear of the bucket. They check the bucket angle during operations.

- (A): Parallel with cutting edge
- (B): 90° to cutting edge



Measuring Dump Angle

This procedure describes how to measure the dump angle for the bucket and the coupler. Komatsu does not suggest measuring the coupler dump angle but, if it is necessary to do so, the instructions are provided.

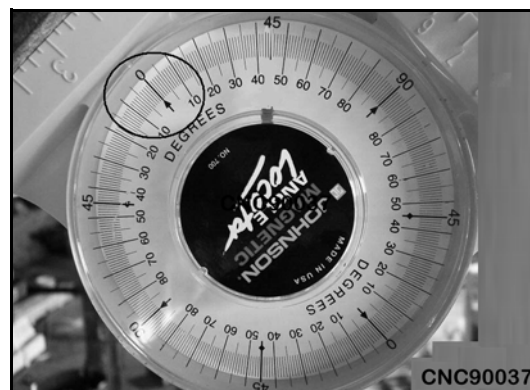
Measuring Bucket Dump Angle



- Always stop the machine on level ground before opening or closing the door.
- Before leaving the operator's seat, set the work equipment lock lever securely to the LOCK position. If the work equipment lock lever is not at the LOCK position and the work equipment control lever is touched by mistake, this may lead to a serious accident.
- When operating the work equipment lock lever, check that the work equipment control lever is at the HOLD position.
- When operating the work equipment lock lever, be careful not to touch the work equipment control lever.
- If using the optional multi-function lever:
 - Before standing up from the operator's seat, set the work equipment lock switch securely to the LOCK position. If the work equipment lock switch is not at the LOCK position and the work equipment lever is touched by mistake, it may lead to a serious accident.
 - When operating the work equipment lock switch, check that the work equipment lever is at the HOLD position.
 - When operating the work equipment lock switch, be careful not to touch the work equipment lever.

Required

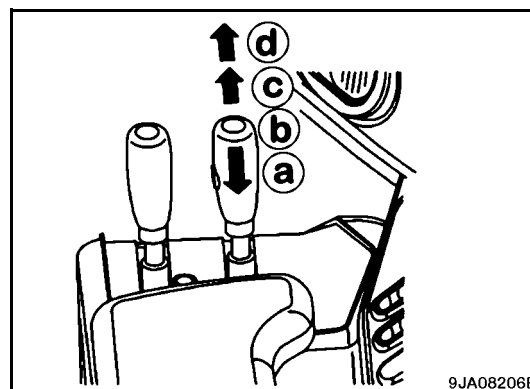
- Inclinometer
1. Park the machine on level ground and check the surface flatness.
 - Open the cab door and place the inclinometer on the cab floor.
 - The reading must be 0°.
 2. Check that the tire pressure is the same for all four tires.
 - The pressure must be within specification for the tires.
 - See "Tire Pressure" on page 2-155.
 3. Raise the bucket about one foot from the ground.
 4. Place the inclinometer on the bottom of the bucket cutting edge.



Remark

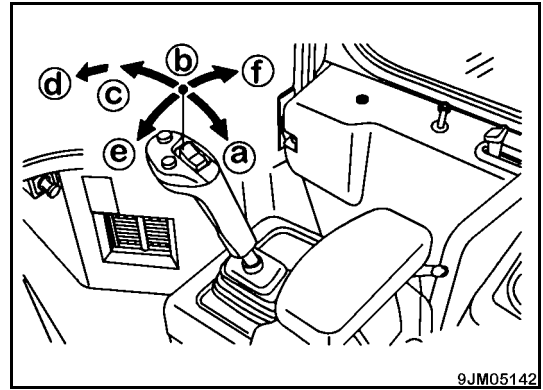
When the bucket is level with the ground, the bucket dump angle is 0°.

5. Move the lift arm control lever to the RAISE position (a) and lift the boom to its maximum height.
 - ★ You can only measure the bucket dump angle at maximum boom height.
 - ★ Make sure that the lift arm control lever is at the HOLD position (b) once the boom is at maximum height.

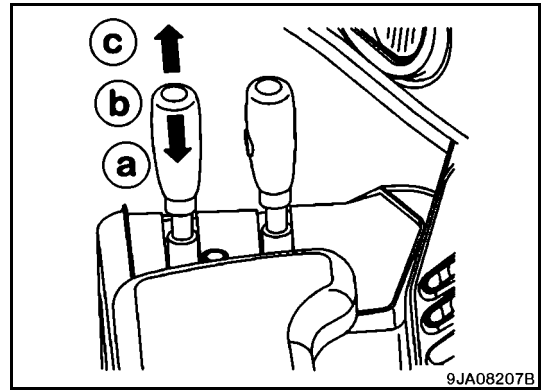


OPERATION

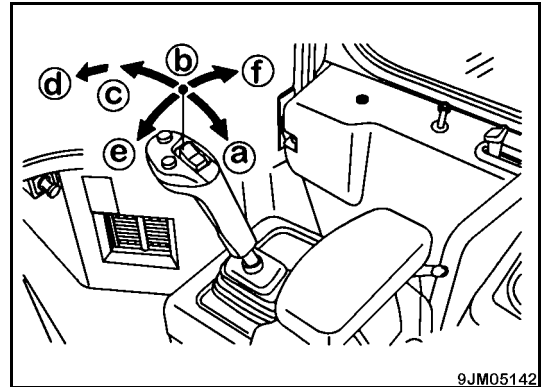
- ★ If you are using the multi-function lever, move the work equipment lever to the RAISE position (a).
 - Make sure that the work equipment lever is at the HOLD position (b) once the boom is at maximum height.



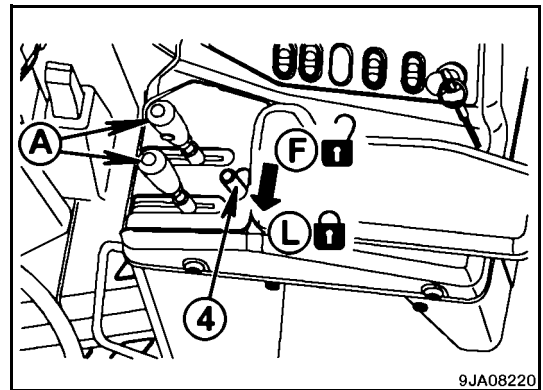
6. Use the bucket control lever and tilt the bucket to the DUMP position (c).
 - ★ Make sure that the bucket control lever is at the HOLD position (b) once the bucket tilts.



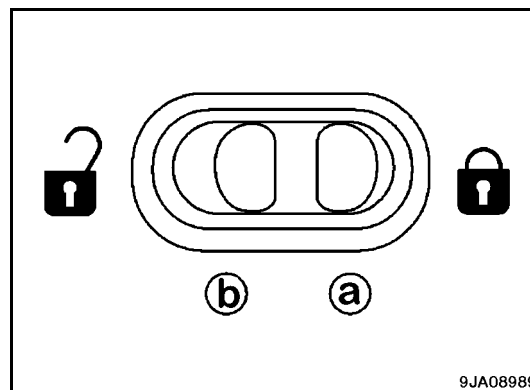
- ★ If you are using the optional multi-function lever, move the work equipment lever to the TILT position (e).
 - The work equipment lever must be at the HOLD position (b) once the bucket tilts.



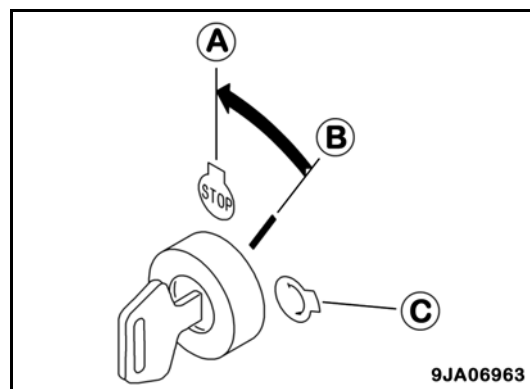
7. Set the work equipment lock lever (4) to the LOCK position (L) so that the work equipment levers (A) cannot move.



- ★ If you are using the optional multi-function lever, set the work equipment lock switch to the LOCK position (a).



8. Turn the key in the starting switch to the OFF position (A) and remove the key.



9. Read the inclinometer and record the bucket dump angle.
 - ★ Read the measurement while facing the left side of the machine.
 - ★ Measure the dump angle of a bucket with a Komatsu-approved bucket only.

Dump angle: 50°



OPERATION

Measuring Coupler Dump Angle

Required

- Inclinometer
1. Park the machine on level ground and check the surface flatness.
 - Open the cab door and place the inclinometer on the cab floor.
 - The reading must be 0°.
 2. Check that the tire pressure is the same for all four tires.
 - The pressure must be within specification for the tires.
 - See “Tire Pressure” on page 2-155.
 3. Raise the coupler about one foot from the ground.

Remark

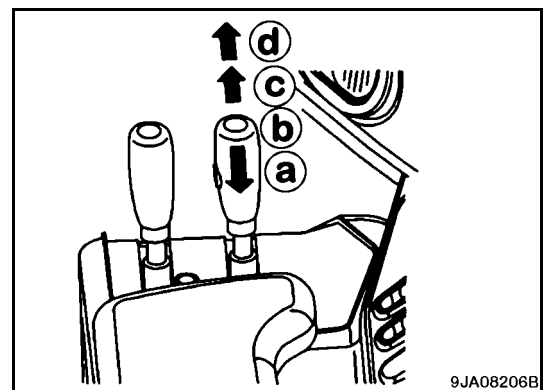
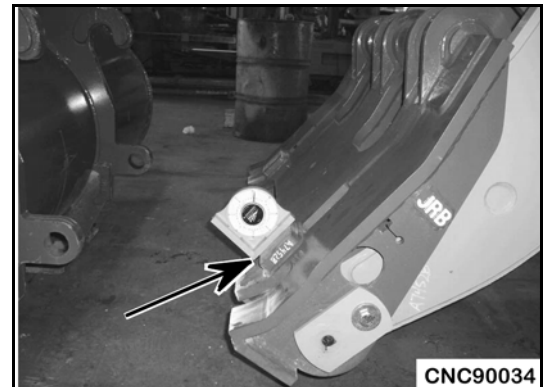
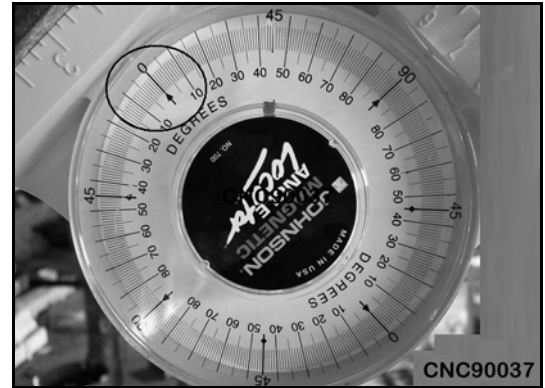
When the bucket is parallel with the ground, the coupler dump angle is 90°.

4. Place the inclinometer on the coupler at the location indicated by the arrow in the graphic.

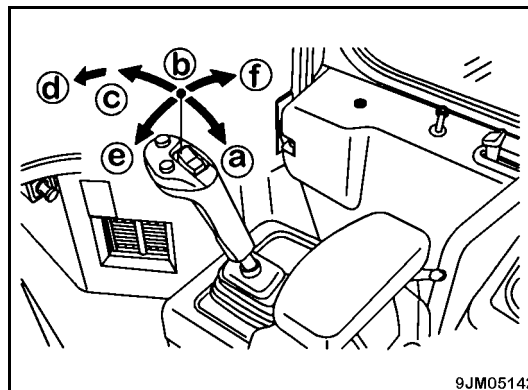
- ★ This is the only location to place the inclinometer where you can get a reasonably accurate coupler dump angle measurement.

5. Move the lift arm control lever to the RAISE position (a) and lift the boom to its maximum height.

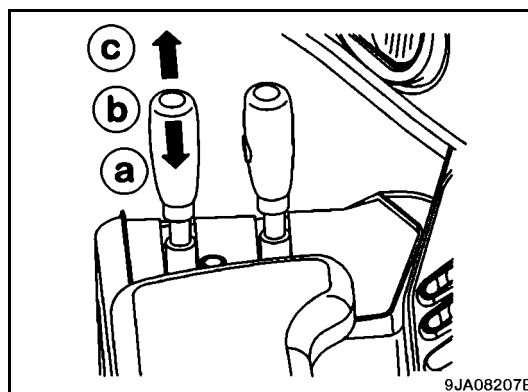
- ★ You can only measure the coupler dump angle with the boom at maximum height.
- ★ Make sure that the lift arm control lever is at the HOLD position (b) once the boom is at maximum height.



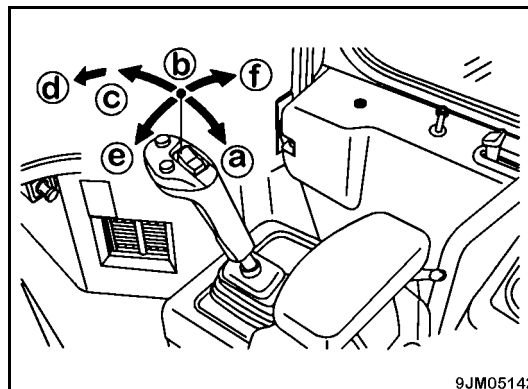
- ★ If you are using the multi-function lever, move the work equipment lever to the RAISE position (a).
 - Make sure that the work equipment lever is at the HOLD position (b) once the boom is at maximum height.



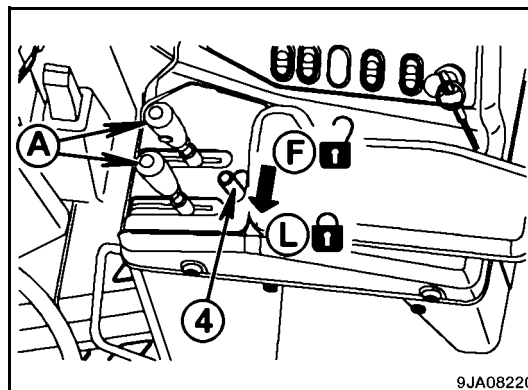
6. Use the bucket control lever and tilt the coupler to the DUMP position (c).
 - ★ You can only measure the coupler dump angle with the coupler at maximum dump angle.
 - ★ Make sure that the bucket control lever is at the HOLD position (b) once the coupler tilts.



- ★ If you are using the optional multi-function lever, move the work equipment lever to the TILT position (e).
 - The work equipment lever must be at the HOLD position (b) once the coupler tilts.

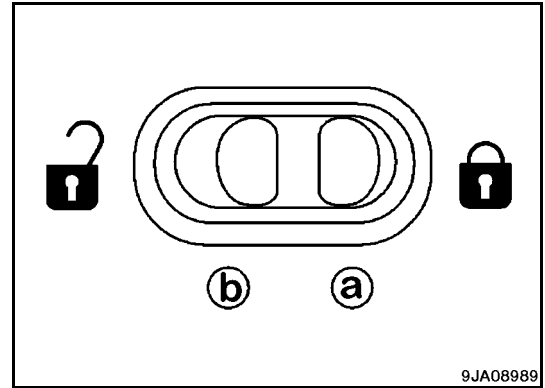


7. Set the work equipment lock lever (4) to the LOCK position (L) so that the work equipment levers cannot move.

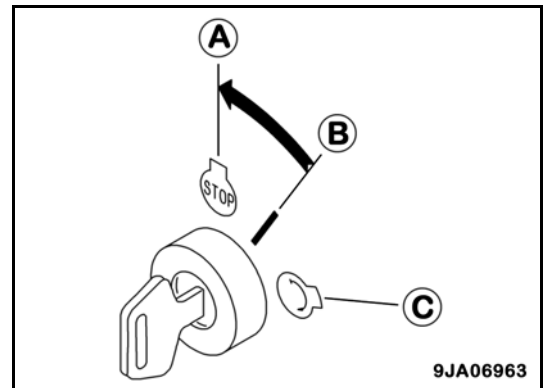


OPERATION

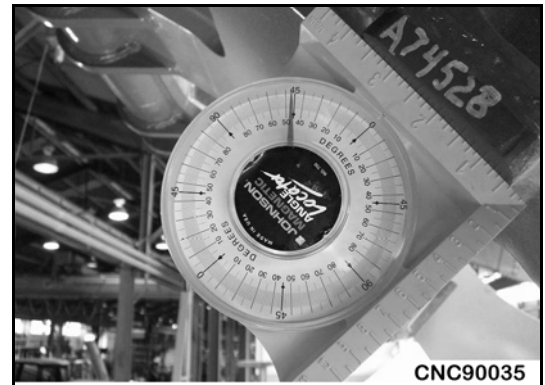
- ★ If you are using the optional multi-function lever, set the work equipment lock switch to the LOCK position (a).



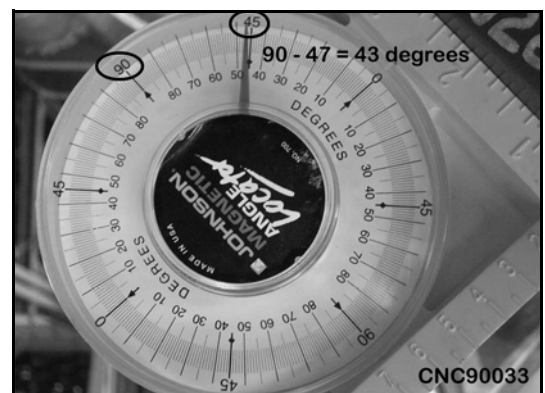
8. Turn the key in the starting switch to the OFF position (A) and remove the key.



9. Read the inclinometer and record the coupler dump angle.
- ★ The coupler angle is 90° when the bucket is parallel to the surface. So the 90° on the inclinometer is actually 0° ; measure the dump angle from 90° to the needle.



- Example: if the needle reads 47° , then the coupler dump angle is $90^\circ - 47^\circ = 43^\circ$.



Parking the Machine

WARNING

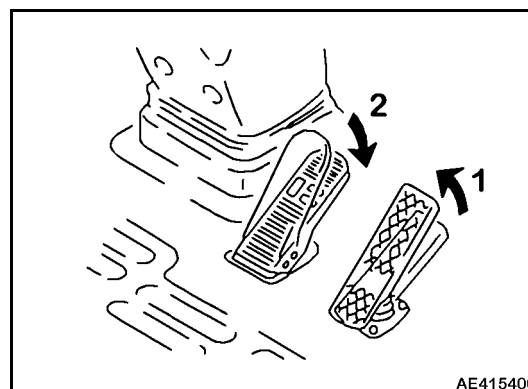
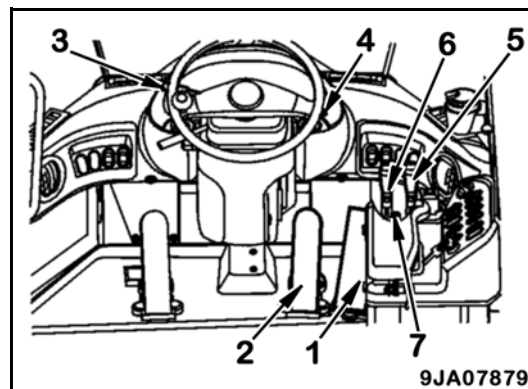
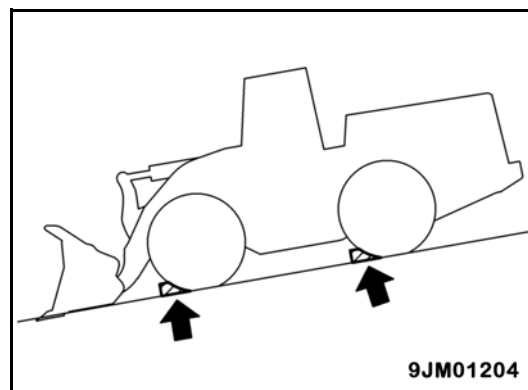
- Avoid stopping suddenly. Give yourself ample room when stopping.
- Do not park the machine on a slope. If the machine must be parked on a slope, set it facing directly down the slope; dig the bucket into the ground; and put blocks under the tires to prevent the machine from moving.
- If the work control lever is touched by accident, the work equipment or the machine may move suddenly. This may lead to a serious accident. Before leaving the operator's compartment, always set the work equipment lock lever securely to the LOCK position.
- When the parking brake switch is turned ON, it is dangerous to release the brake pedal immediately. Always keep the brake pedal depressed until the parking brake pilot lamp illuminates.

Remark

Never use the parking brake switch to brake the machine when traveling, except in an emergency.

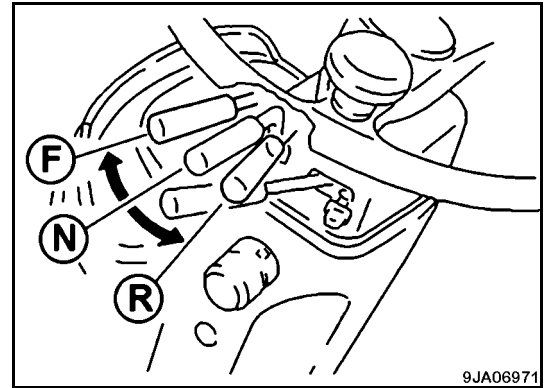
Apply the parking brake only after the machine has stopped.

- ★ Park the machine on firm, level ground. If the machine must be parked on a slope, set it facing directly down the slope; dig the bucket into the ground; and put wheel chocks (see "WHEEL CHOCKS" on page 5-39) under the tires to prevent the machine from moving.
 - ★ Select a place where there is no hazard of landslides, falling rocks, or flooding.
1. Release accelerator pedal (1) and then depress brake pedal (2) to stop the machine.



OPERATION

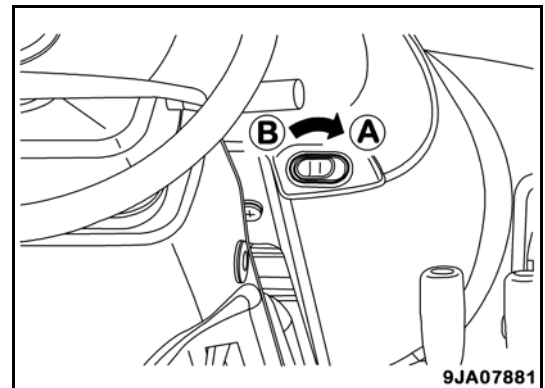
- Place directional lever (3) in the neutral position (N).



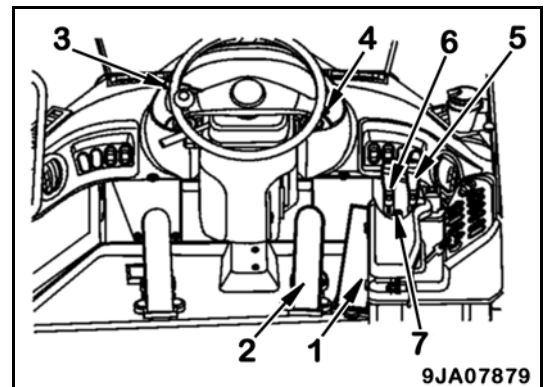
- Turn parking brake switch (4) to the ON position (A) to apply the parking brake.

Remark

When the parking brake is applied, the transmission is automatically returned to neutral.



- Operate lift arm control lever (5) to lower the bucket to the ground.
★ Always lower the work equipment completely to the ground.
- Check that the lift arm control lever (5) and bucket control lever (6) are at the HOLD position

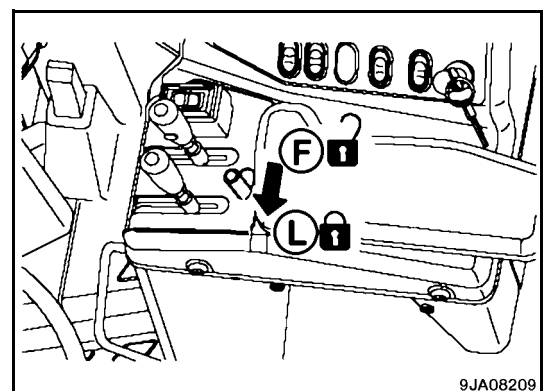


- Set the work equipment lock lever (7) to the LOCK position (L).

- Stop the engine.

Always close the operator's cab door and use the key to lock all the equipment in order to prevent any unauthorized person from moving the machine.

- Remove the key; take it with you; and leave it in the specified place.



Checks After Completion of Operation

Before Stopping Engine

- Use the meters and lamps on the machine monitor to check the engine water temperature, engine oil pressure, torque converter oil temperature, and fuel level.
- If the engine has overheated, do not stop it suddenly. Run the engine at a mid-range speed to allow the engine time to cool down before stopping it.

After Stopping Engine

- Walk around the machine and check the work equipment, chassis, and undercarriage.
- Check that there are no loose bodywork mounting bolts.
- Check that there are no cracks in the work equipment or bucket.
- Check for oil and water leakage.
- Fill the fuel tank; see “Rules for Refueling the Machine” on page 1-45.
- Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
- Remove any mud stuck to the undercarriage.

OPERATION

Locking the Machine

★ The starting switch key is used for locks (1) to (7).

Always lock the following parts.

(1) Fuel tank filler cap

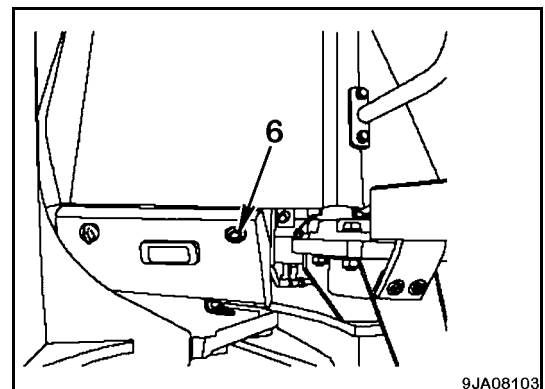
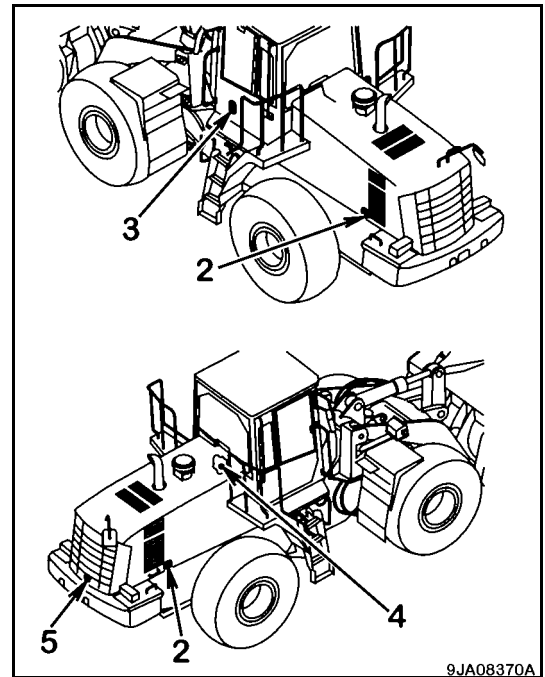
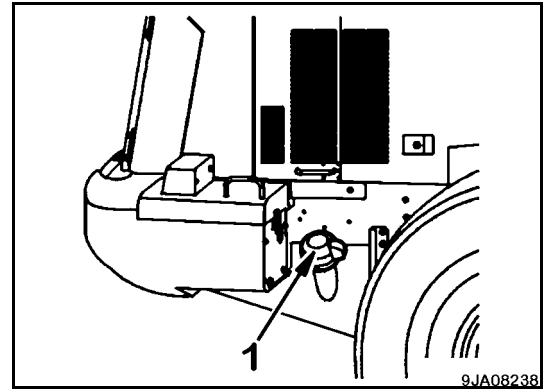
(2) Engine side panel (two places)

(3) Cab door

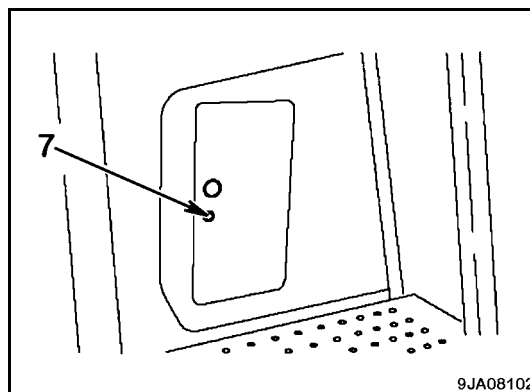
(4) Hydraulic tank

(5) Rear grille

(6) Air conditioner fresh air filter



(7) Transmission filter cover



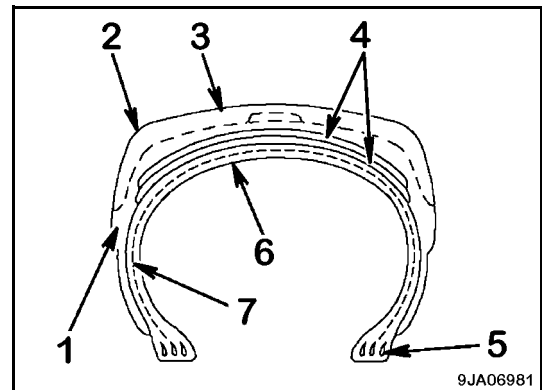
HANDLING TIRES

Precautions When Handling Tires

WARNING

- If a tire has reached any of the following service limits, there is danger that the tire may burst or cause an accident. To ensure safety, replace it with a new tire.
- Service limits for wear:
 - When the remaining depth of the groove on construction equipment tires (at a point approximately 1/4 of the tread width) is 15% of the groove depth on a new tire.
 - When the tire shows marked uneven wear, stepped wear, or other abnormal wear, or when the cord layer is exposed.
- Service limits for damage:
 - When there is external damage extending to the cord or when the cord is broken.
 - When the cord is cut or there is dragging.
 - When the tire is peeling (there is separation).
 - When the bead is damaged.
 - For tubeless tires, when there is air leakage or improper repair.

1. Side wall
2. Shoulder
3. Tread
4. Breaker or belt (cord layer)
5. Bead
6. Inner liner
7. Carcass



Remark

It is dangerous to jack up the machine without taking proper care.

Contact your Komatsu distributor when replacing the tires.

After replacing the tires, carry out the breaking-in operation for approximately 30 hours (the time displayed on the service meter) until the tires and rims are settled.

Pay particular attention to the following points when operating the machine.

- Avoid heavy loads (heavy digging operations) and operations at high speed.
- Immediately after starting the engine, avoid sudden starts, sudden acceleration, unnecessary sudden stops, and sudden changes in direction.

Tire Pressure

- Measure the tire pressure before starting operations, when the tires are cool.

If the tire inflation pressure is too low, there will be overload; if it is too high, it will cause tire cuts and shock burst. To prevent these problems, adjust the tire inflation pressure according to the “Air Pressure Chart” on page 2-156.

$$\text{Deflection ratio} = \frac{H - h}{H} \times 100$$

- When checking the tire inflation pressure, check also for small scratches or peeling of the tire, for nails or pieces of metal which may cause punctures, and for any abnormal wear.
- Clearing fallen stones and rocks from the operating area and maintaining the surface will extend the tire life and give improved economy.

For operations on normal road surfaces, rock digging operations:

..... High end of range in Air Pressure chart

Stockpile operations (loading of sand and other loose materials) on soft ground:

..... Average pressure in Air Pressure chart

Operations on sand (operations not using much digging force):

..... Low end of range in Air Pressure chart

As a guideline that can be checked visibly, the deflection ratio of the front tire (deflection/free height) is as follows:

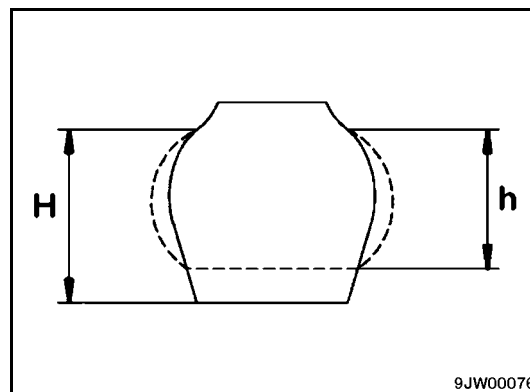
When carrying normal load (lift arm horizontal):

..... Approximately 15 to 25%

When digging (rear wheels off ground):

..... Approximately 25 to 35%

- If the deflection of the tire is excessive, raise the inflation pressure within the limits given in the Air Pressure chart in order to get a suitable deflection.

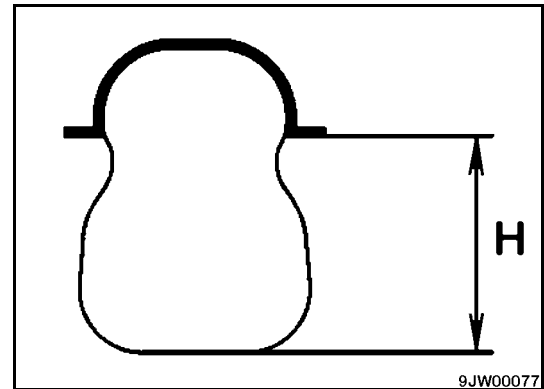


OPERATION

Air Pressure Chart

Tire Size (Pattern)	H Free Height (mm)	Inflation Pressure kPa (psi)			
		Soft Ground (sandy ground)	Normal Road		When Shipped from Factory
		Stockpile	Stockpile	Digging	
23.5-25-16PR (L3: Rock) (Standard)	424(BS) 423(TOYO)	240 – 360 (35 – 52)	240 – 360 (35 – 52)	240 – 360 (35 – 52)	Front tire: 350 (51) Rear tire: 310 (45)
23.5-25-20PR (L3: Rock) (if equipped)					
23.5-25-16PR (L2: Traction) (if equipped)	434(BS) 422(TOYO)				
23.5-25-20PR (L2: Traction) (if equipped)					

- ★ Stockpile operations = the loading of sand and other loose materials



Precautions for Using Load-and-Carry Method

- When traveling continuously with load-and-carry operations, choose the correct tires to match the operating conditions, or choose the operating conditions to match the tires. If this is not done, the tires will be damaged.
- Contact your Komatsu distributor or tire dealer when selecting tires.

TRANSPORTATION

When transporting the machine, observe all applicable laws and regulations and be careful to assure safety.

Transportation Procedure

As a general rule, always transport the machine on a trailer.

When selecting a trailer and transporting the machine, choose the optimum transportation method in reference to the weight and dimensions shown in “SPECIFICATIONS” on page 4-2. Note that machine specifications (weight and dimensions) vary depending on the kind of tires and bucket.

WARNING

- When loading or unloading the machine, run the engine at low speed; travel at low speed; and operate slowly.
- When loading or unloading the machine, stop the trailer on firm, level ground. Keep well away from the road shoulder.
- Use ramps of ample width, length, thickness, and strength. Install them securely at an angle of less than 15°. When using an embankment, compact the fill soil thoroughly and make sure that the slope face does not collapse.
- Remove the mud stuck to the undercarriage to prevent the machine from slipping to the side on the ramps. Remove any water, snow, ice, grease, or oil from the ramps.
- Never change direction on the ramps. There is danger that the machine may tip over. If it is necessary to change direction, return to the ground surface or the trailer platform; correct the direction; and start again.
- The position of the center of gravity of the machine will change suddenly at the connection of the ramp and trailer. At this point, there is danger of the machine losing its balance. Always drive slowly over the connection point.

★ When the machine is transported on a trailer, there is danger of serious personal injury or death during transportation.

Observe the following rules:

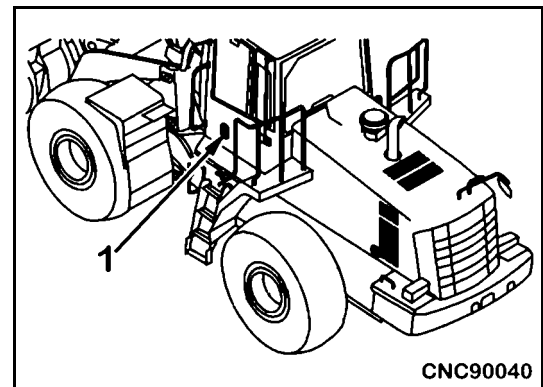
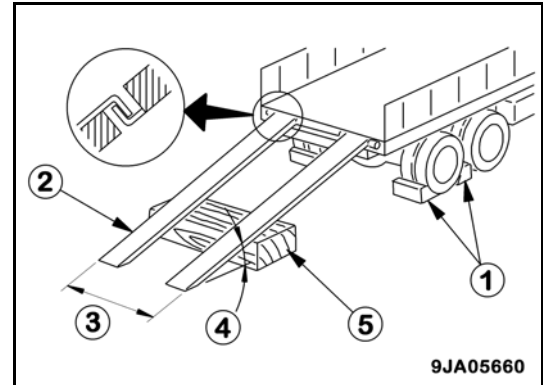
- Always check the machine dimensions carefully. Depending on the work equipment installed, the machine weight, transportation height, and overall length may differ.
- Check beforehand that all bridges and other structures on the transportation route are strong enough to withstand the combined weight of the transporter and the machine being transported.
- When traveling on public roads, ask the local authorities for permission to transport the machine.
- The machine can be divided into parts for transportation. Contact your Komatsu distributor to have the work done.
- Be sure the loading equipment and transportation equipment are in good condition and rated for your load.
- When loading or unloading, always use ramps or a platform.
- Check the ramps and support surfaces for damage, weak spots, missing boards, or excess wear. If these surfaces look unsafe, too weak, or unstable, do not load the machine.
- Be sure the ramp surface is clean and free of grease, oil, ice, and loose materials. On rainy or snowy days, the ramp may be slippery, use extreme caution.
- Remove dirt from the tires of the machine.
- Be sure the area you use to load the machine is flat and dry.

OPERATION

Loading and Unloading Trailers

Loading Machine

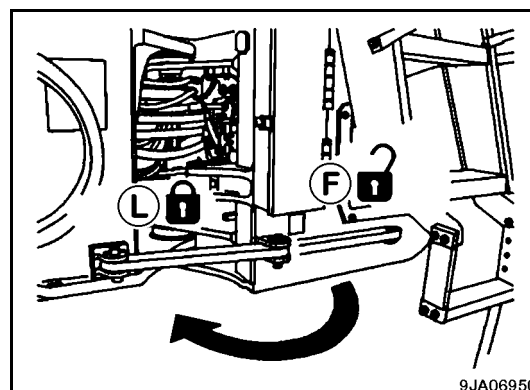
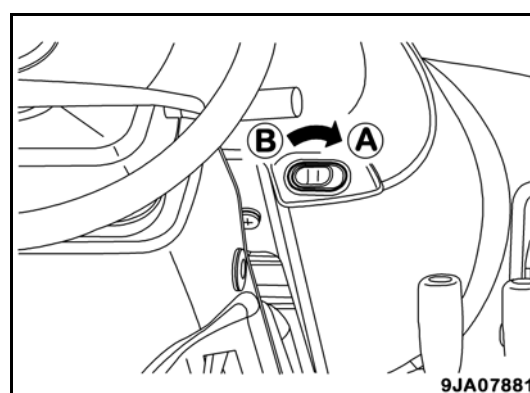
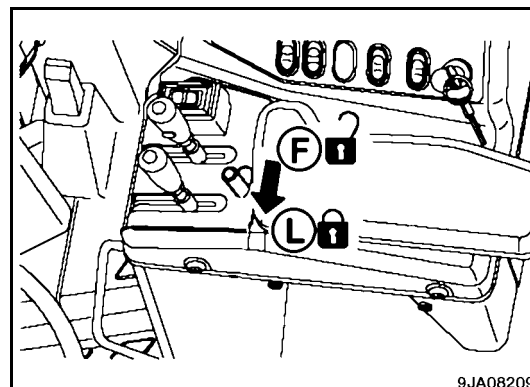
1. Load on firm, level ground. Keep away from the edge of roads and ditches.
2. Always use ramps of adequate strength. Be sure that the ramps are wide, long, and thick enough to provide a safe loading slope. Take suitable steps to prevent the ramps from moving out of position or coming off the trailer.
3. Apply the brakes on the trailer and insert blocks (1) under the tires to keep the trailer in position.
4. Set the distance (3) between the ramps (2) to match the distance between the left and right tires, and make the angle (4) of the ramps a maximum of 15° .
5. If the ramps (2) sag appreciably under the weight of the machine, put a wooden block (5) under the ramps to support them.
6. Run the engine at low idling and drive the machine slowly at low speed.
7. Raise the bucket high enough to clear all surfaces.
8. Determine the direction of the ramp, then slowly load the machine. Load the machine correctly in the specified position on the trailer.
9. Never correct your steering on the ramps. If necessary, drive off the ramps; correct the direction; then enter the ramps again.
10. Position the machine squarely on the deck.
11. For machines equipped with a cab, always lock the door (1) after boarding the machine. If this is not done, the door may suddenly open during transportation.
12. Once the machine has been loaded, secure the machine by following the instructions in "Securing the Machine" on page 2-159.



Securing the Machine

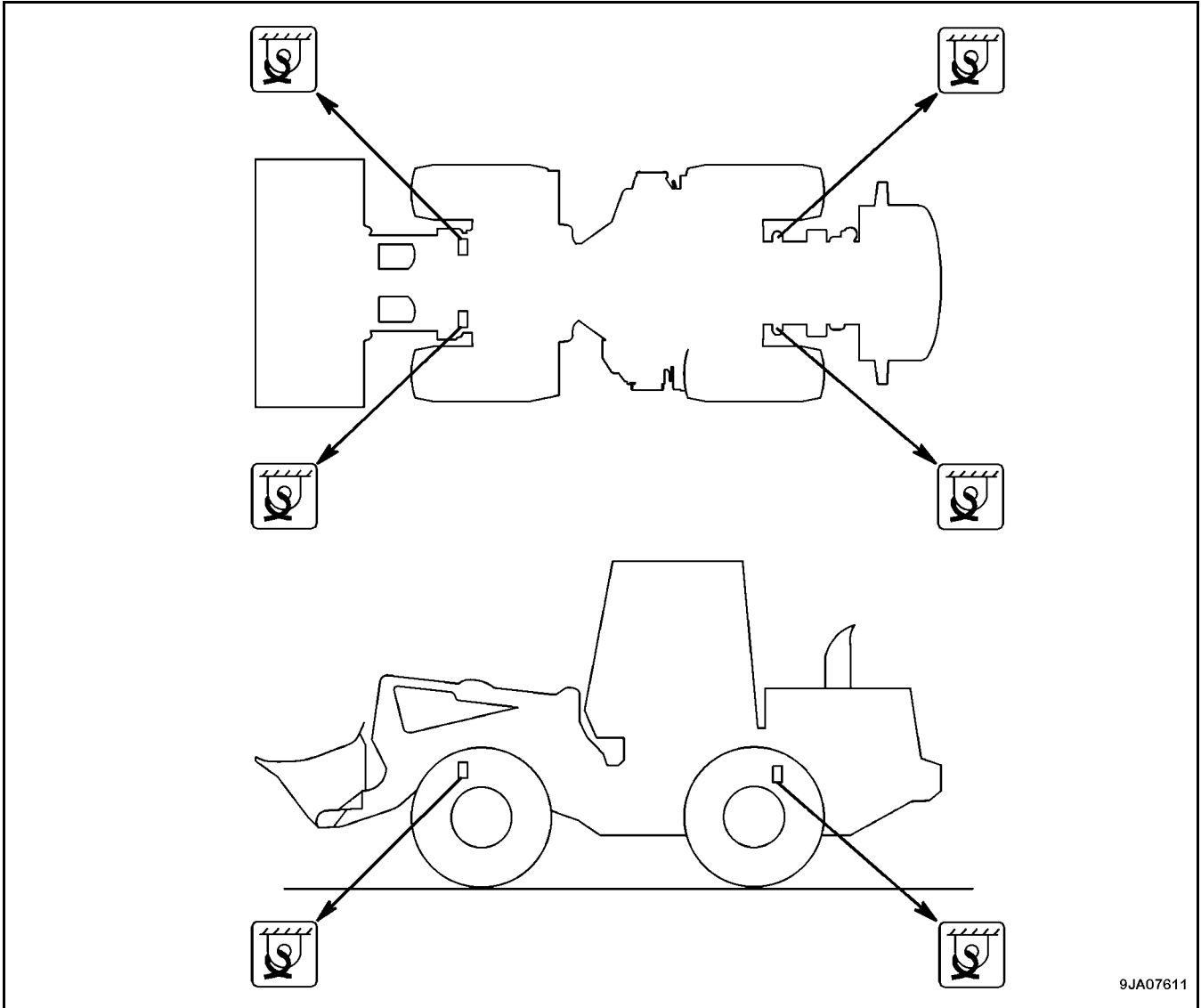
Secure the machine to the trailer in the following manner.

1. Lower the work equipment slowly.
2. Set the work equipment control lever at the HOLD position.
3. Set the work equipment lock lever to the LOCK position (L).
4. Set the parking brake switch to the ON position (A) to apply the parking brake securely.
5. Retract the antenna fully.
6. Turn the starting switch to the OFF position to stop the engine.
7. Remove the key from the starting switch.
8. Set the frame lock bar to the LOCK position (L) to lock the front frame and rear frame.
9. To help keep the machine in position, place blocks in front and behind the front and rear wheels for extra support.
10. Locate the tie down and transportation brackets on the machine; see "Fastening Positions" on page 2-160.
11. Secure the machine with chains or wire rope to prevent the machine from moving during transportation.
 - ★ In particular, attach the machine securely to prevent it from slipping sideways.
12. Adjust the mirrors so that they will be within the width of the trailer.
13. Protect the exhaust stack from moisture, if necessary.



OPERATION

Fastening Positions



Unloading the Machine

- ★ When unloading the machine, always use ramps or a platform.
- ★ Be sure the unloading area is flat and dry.

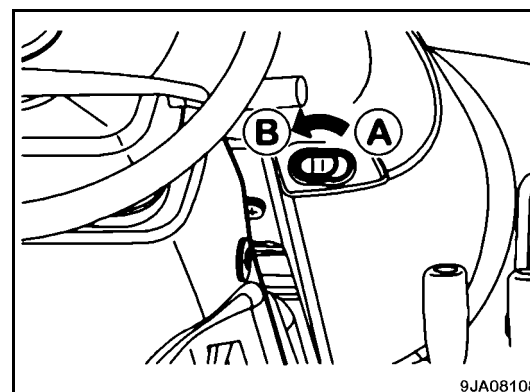
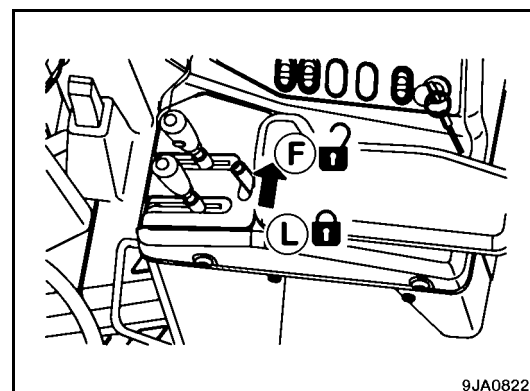
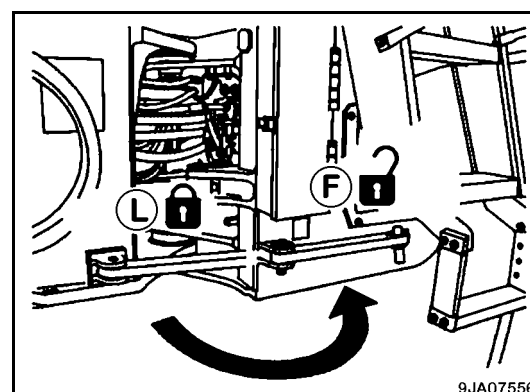
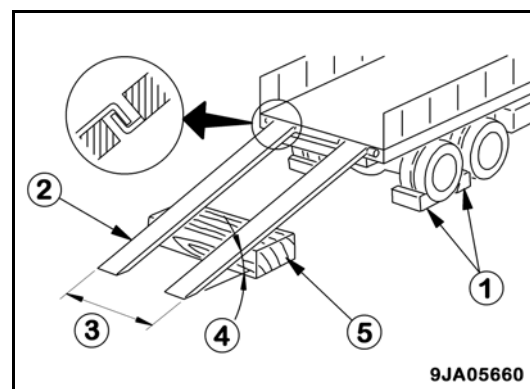
1. Unload on firm, level ground. Maintain a safe distance from the edge of the road.
2. Apply the brakes on the trailer and insert blocks (1) under the tires to ensure that the trailer does not move.
3. Set the distance (3) between the ramps (2) to match the distance between the left and right tires, and make the angle (4) of the ramps a maximum of 15°.

If the ramps (2) sag appreciably under the weight of the machine, put a wooden block (5) under the ramps to support them.

- Be sure that the two sides are at the same height.

4. Remove the chains and wire ropes fastening the machine to the trailer.
5. Set the frame lock bar to the FREE position (F).
6. Start the engine. Warm up the engine completely.
7. Check that the work equipment control lever is at the HOLD position, then set the work equipment lock lever to the FREE position (F).

8. Depress the right brake pedal, then set the parking brake switch to the OFF position (B) to cancel the parking brake.
9. Determine the direction of the ramps, then drive the machine slowly down the ramps.



OPERATION

LIFTING THE MACHINE

WARNING

- The person using the crane to carry out lifting operations **MUST** be a qualified crane operator.
- Never carry out lifting operations if any person is on the machine being lifted.
- Always use a wire rope that has ample strength for the weight of the machine being lifted.
- Keep the machine horizontal when lifting it.
- Never enter the area under or around a raised machine. There is danger that the machine may lose its balance.
- Before lifting the machine, do the following steps to prevent the machine from moving unexpectedly.
 - Set the parking brake switch to the ON position.
 - Set the work equipment lock lever to the LOCK position.
 - Set the frame lock bar to the LOCK position.
- When lifting the machine, the wire rope must be fitted correctly or the machine may fall and cause serious injury or even death.

Remark

The lifting procedure applies to machines with standard specifications.

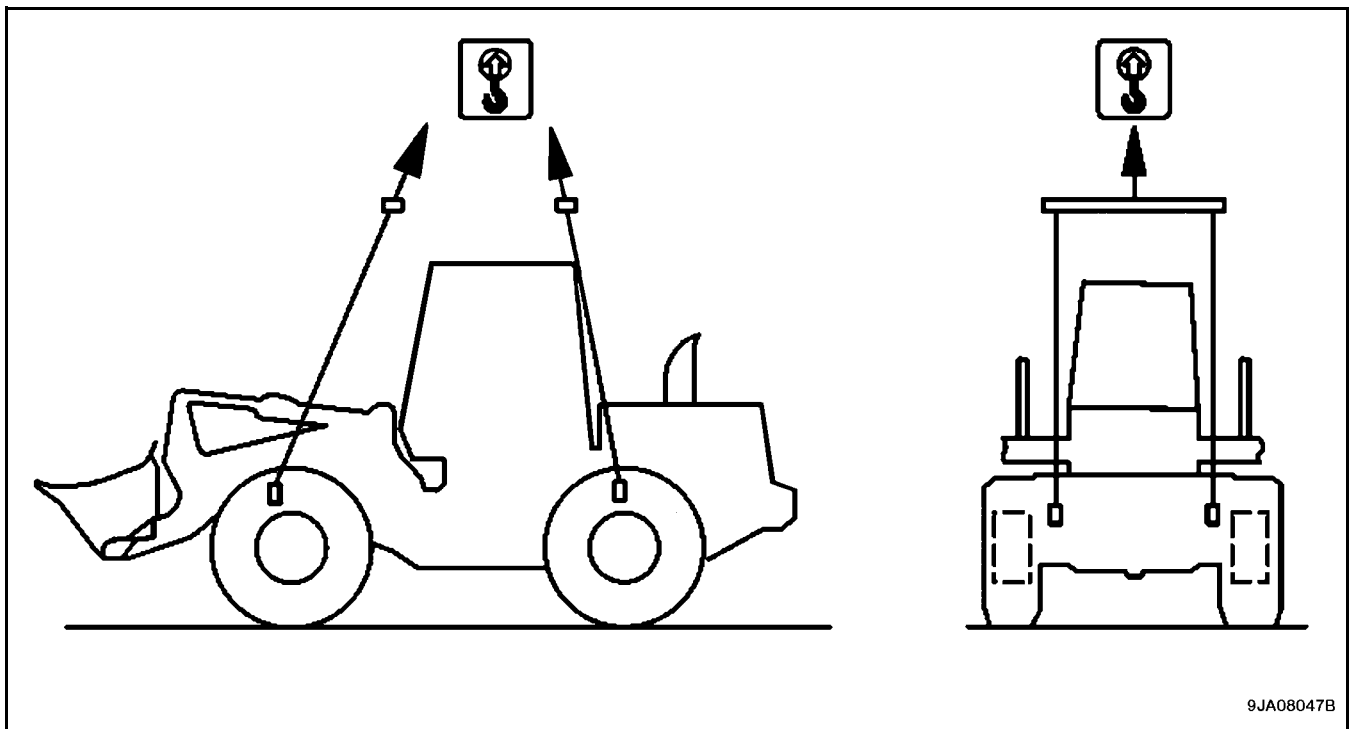
The method of lifting may differ depending on the attachments and options installed.

For details about lifting a machine that does not conform to standard specifications, contact your Komatsu distributor.

Remark

For details about the weight of the machine, see "SPECIFICATIONS" on page 4-2.

Lifting Position



Lifting Procedure

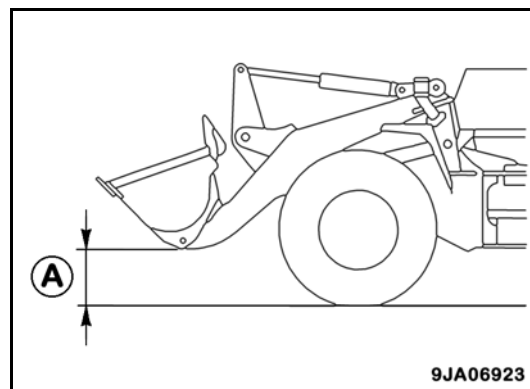
- ★ Lifting work can be carried out only for machines with hook mark labels (lifting points).
- ★ Before starting the lifting operation, stop the machine on level ground.

Use the following procedure to set the machine in the proper posture and use the lifting equipment when lifting the machine.

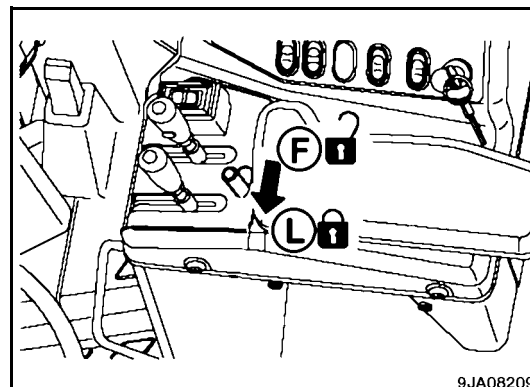
1. Start the engine; make sure that the machine is horizontal; then set the work equipment to the travel posture (A).

For details, see “Moving the Machine (Directional, Speed), Stopping the Machine” on page 2-106.

(A): 40 – 50 cm (16 – 20 in)



2. Check that the work equipment control lever is at the HOLD position and then set the work equipment lock lever to the LOCK position (L).



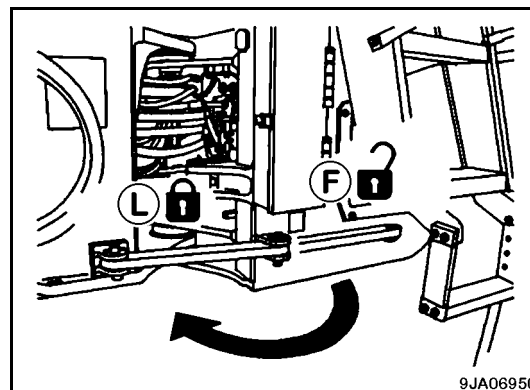
3. Stop the engine; check that the area around the operator's compartment is safe; then set the frame lock bar to the LOCK position (L) so that the front frame and rear frame do not articulate.
4. Use wire ropes and slings that match the weight of the machine. Wind the wire rope and fix it to the lifting points as shown in “Lifting Position” on page 2-162.

Remark

Use protectors, etc. so that the wire ropes do not break at sharp edges or narrow places.

Use threaders and bars having sufficient width so that the slings and wire ropes do not touch the machine.

For machines equipped with a rear full fender, remove the rear full fender before carrying out the operation.



5. Lift the machine so that it floats about 100 mm – 200 mm (4 to 8 in) above the ground.
6. Make sure that the wire ropes are not slack and that the machine is level.
7. If the wire ropes are taut and the machine is level, continue to lift the machine slowly.

COLD WEATHER OPERATION

Precautions for Low Temperature

If the temperature drops, it becomes difficult to start the engine. The coolant may freeze.

For additional precautions when operating in cold temperature, see the following topics:

- “Precautions in Cold Areas” on page 1-29
- “Operating on Snow or Frozen Surfaces” on page 1-37
- “Starting in Cold Weather” on page 2-100
- “After Cold Weather” on page 2-165

Fuel and Lubricants

Change to fuel and oil with low viscosity for all components.

For details of the specified viscosity, see “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-12.

Coolant



- Antifreeze is toxic. Be careful not to get it into your eyes or on your skin. If it should get into your eyes or on your skin, wash it off with a large amount of fresh water and see a doctor immediately.
- Contact your Komatsu distributor for information regarding handling coolant that contains antifreeze (as when draining and changing coolant or repairing the radiator).
- Antifreeze is toxic. Do not let it flow into drainage ditches or spray it on the ground surface.
- Antifreeze is flammable. Do not bring any flame close to the antifreeze. Do not smoke when handling antifreeze.

Remark

Use Komatsu Supercoolant (AF-NAC). We do not recommend the use of any coolant other than Komatsu genuine supercoolant.

When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor; see “Clean Inside of Cooling System” on page 3-33.

Never use methanol-, ethanol-, or propanol-based antifreeze.

Do not use any leak-preventing agent, regardless of whether it is sold separately or in antifreeze.

Do not mix one brand of antifreeze with that of a different brand.

- ★ For details about the antifreeze mixture when changing the coolant, see “Clean Inside of Cooling System” on page 3-33.

Battery



- The battery generates flammable gas. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor immediately.
- Battery electrolyte dissolves paint. If it gets on the bodywork, wash it off immediately with water.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. There is danger that the battery may explode.
- Battery electrolyte is toxic. Do not let it flow into drainage ditches or spray it on the ground surface.

When the ambient temperature drops, the battery capacity will drop also. If the battery charge ratio is low, the battery electrolyte may freeze.

- Maintain the battery charge as close as possible to 100%.
- Insulate the battery against cold temperature so that the machine can be started easily the next morning.

Remark

Measure the specific gravity and calculate the rate of charge from the following conversion table.

Charging Rate (%)	Electrolyte Temperature			
	20°C (68°F)	0°C (32°F)	-10°C (14°F)	-20°C (-4°F)
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

- As the battery capacity drops drastically in low temperatures, cover the battery or remove it from the machine; keep it in a warm place; and install it again the next morning.
- If the electrolyte level is low, add distilled water in the morning before beginning work.
- Do not add water after the day's work. Diluted electrolyte in the battery may freeze during the night.

Precautions After Completion of Work

Mud and water on the undercarriage can freeze overnight and make machine movement difficult the following morning.

Observe the following precautions.

- Remove all mud and water from the machine body. In particular, wipe the hydraulic cylinder rods clean to prevent damage to the seals caused if mud, dirt, and/or water on the rod surface gets inside the seal.
- Park the machine on hard, dry ground. If this is impossible, park the machine on wooden boards. The boards help protect the tires from freezing to the ground so the machine can be moved the next morning.
- Open the drain valve and drain any water collected in the fuel system to prevent it from freezing.
- Fill the fuel tank to capacity. This minimizes moisture condensation in the tank when the temperature drops.

After Cold Weather

When the season changes and the weather becomes warmer, do the following procedure.

- Replace all oil and fuel with fuel and oil of the specified viscosity.
 - ★ For details, see "RECOMMENDED FUEL, COOLANT, AND LUBRICANTS" on page 3-12.

LONG-TERM STORAGE

Before Storage

When putting the machine in storage for a long period (more than one month), do the following procedure.

- Clean and wash all parts and then store the machine indoors.
If the machine must be stored outdoors, select level ground and cover the machine with a sheet.
- Completely fill the fuel tank; this prevents moisture from collecting inside the tank.
- Lubricate and change the oil before storage.
- Apply a thin coat of grease to the exposed portion of the hydraulic cylinder piston rods.
- Disconnect the negative terminals of the battery. Cover the battery or remove it from the machine and store it separately.
- Lock each control lever with the lock lever.
- To prevent rust, fill the cooling system with Komatsu genuine Supercoolant (AF-NAC) (density between 30% and 68%).

During Storage



- If it is necessary to perform the rust-prevention operation while the machine is indoors, open doors and windows for ventilation since the engine will be running.
 - Be sure to provide adequate ventilation in order to prevent gas poisoning.
-
- During storage, operate and move the machine for a short distance once a month so that a new film of oil coats the moving parts. At the same time, also charge the battery.
 - When operating the work equipment, wipe off all the grease from the hydraulic cylinder rods.
 - Run the air conditioner for three to five minutes once a month to lubricate all parts of the air conditioner compressor. Always run the engine at low idle when doing this.
 - Check the refrigerant level twice a year.

After Storage

Remark

If the machine has been stored without carrying out the monthly rust-prevention operation, contact your Komatsu distributor before returning the machine to operation.

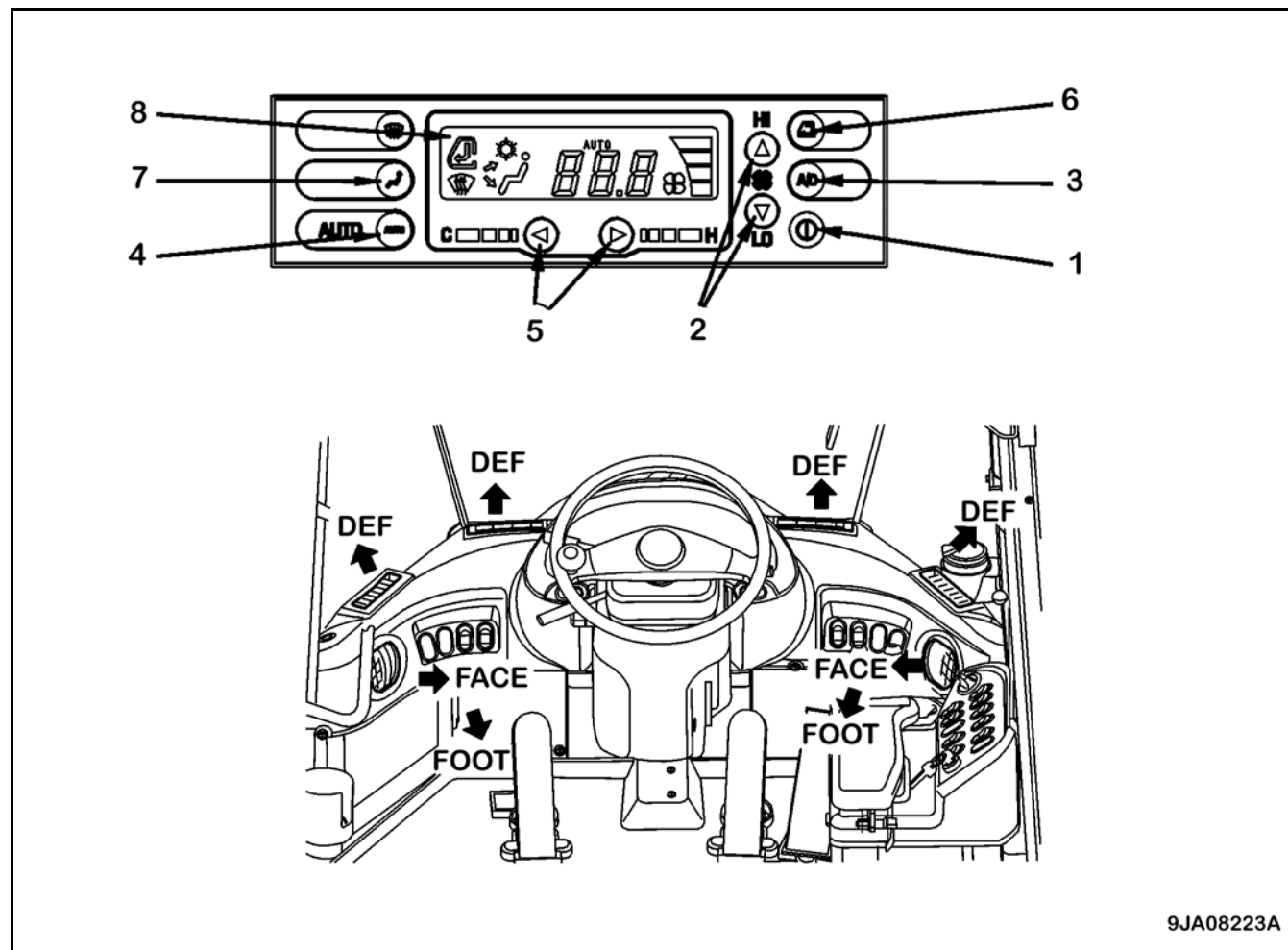
Before returning the machine to operation after a long-term period of storage, do the following procedure.

- Wipe off the grease from the hydraulic cylinder rods.
- Add oil and grease at all lubrication points.
- When a machine is stored for a long period, moisture in the air mixes with the oil. Check the oil before and after starting the engine.
If there is water in the oil, change the oil.
- Check that there is no rust on the engine pulley and no abnormality in the alternator belt.
If there is excessive rust on the belt contact surface of the pulley, remove it with a wire brush.
- If the alternator belt is loose, adjust the belt tension to ensure that there is no slipping.
 - ★ For details about adjusting the belt tension, see “Check Alternator Drive Belt Tension, Replace” on page 3-78.

AUTOMATIC AIR CONDITIONER

★ Your machine is equipped with an automatic air conditioner.

Control Panel



9JA08223A

1. Main power switch
2. Fan switch
3. Air conditioner switch
4. Auto switch
5. Temperature control switch
6. FRESH/RECIRC selector switch
7. Mode selector switch
8. Display monitor

OPERATION

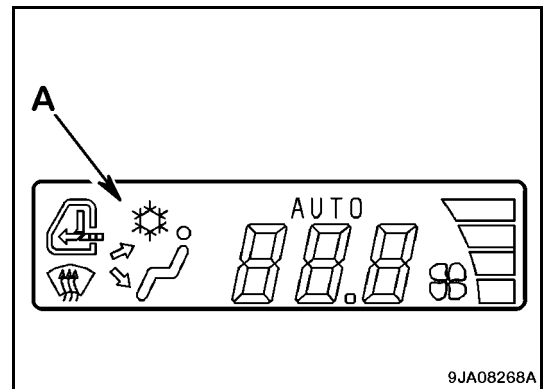
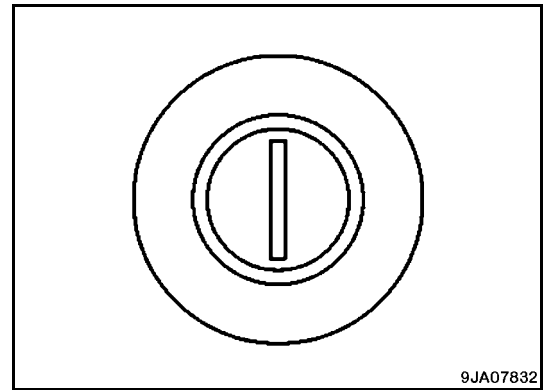
Main Power Switch

The main power switch (1) is used to turn the main power of the air conditioner ON and OFF.

- When the switch is pressed, display monitor (A) lights up. The fan begins operation.
- When the switch is pressed again, the air conditioner is turned OFF and the display monitor goes out. The fan stops.

Remark

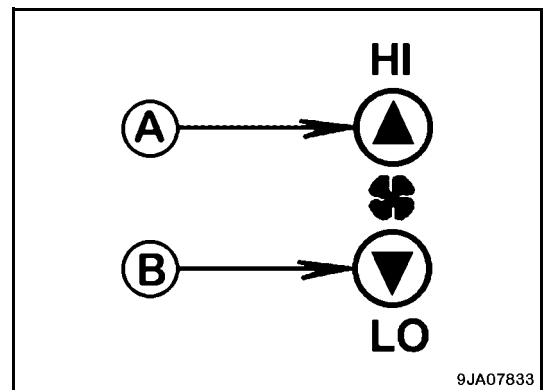
When the switch is turned ON, the setting displayed is the same as when the air conditioner was turned OFF.



Fan Switch





The fan switch (2) is used to adjust the airflow from the fan. The air flow can be adjusted to four levels.

- When switch (A) is pressed, the air flow increases.
- When switch (B) is pressed, the air flow decreases.



The setting for the air flow is displayed on the display monitor.

- A: Monitor display
- B: Air flow
- a: Air flow: Lo
- b: Air flow: M1
- c: Air flow: M2
- d: Air flow: Hi

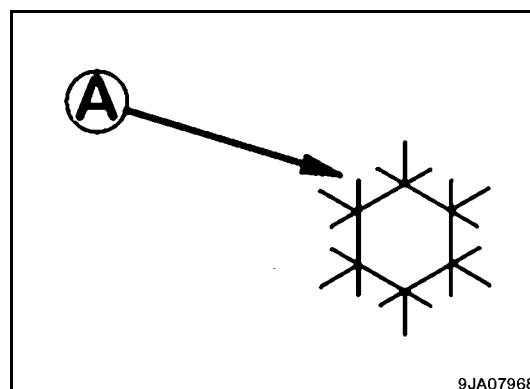
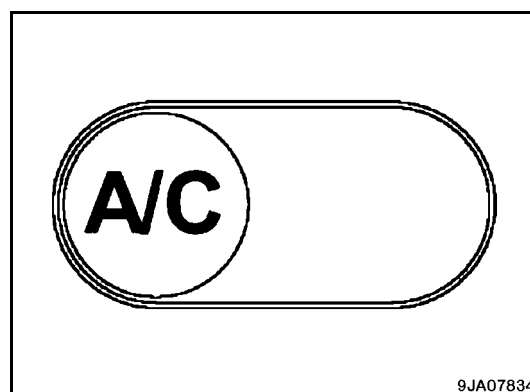
A	B
	a
	b
	c
	d

9JA07951

Air Conditioner Switch

The air conditioner switch (3) is used to start or stop the cooling or dehumidifying/heating function.

- If the main power switch is ON and the air conditioner switch is pressed, the air conditioner is turned ON and (A) is displayed on the display monitor.
- If the switch is pressed again, the switch is turned OFF and display monitor (A) goes out.

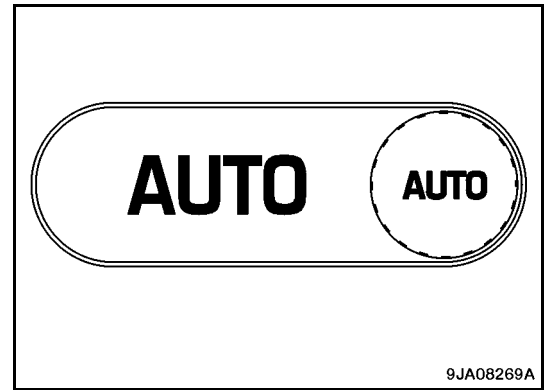


OPERATION

Auto Switch

The auto switch (4) is used for automatic operation of the air conditioner (actuation of the cooling and dehumidifying/heating functions, stopping operation).

- When the main power switch is turned ON and the AUTO air conditioner switch is pressed, the air conditioner is turned ON and the display monitor shows “AUTO.”
- If the switch is pressed again, the air conditioner is turned OFF and the “AUTO” sign on the display monitor goes out.

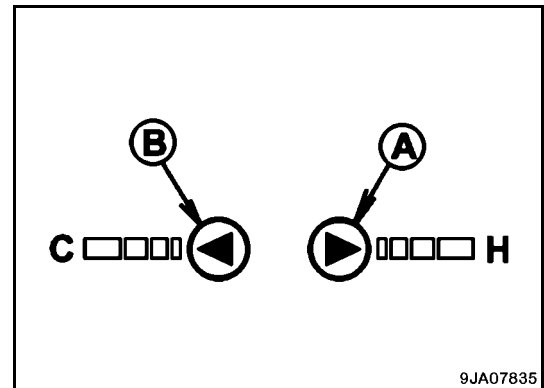


Temperature Switch

The temperature switch (5) is used to adjust the temperature.

- When switch (A) is pressed, the temperature of the air blowing out the vents increases.
- When switch (B) is pressed, the temperature of the air blowing out the vents decreases.

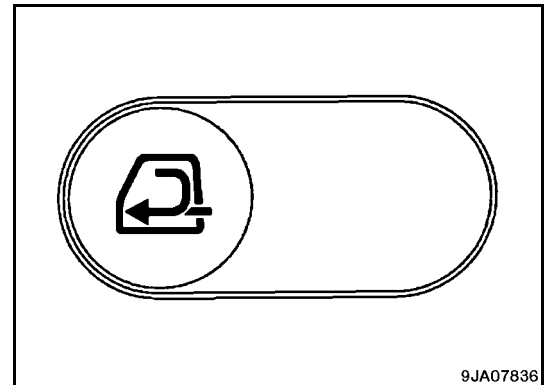
The set temperature is displayed on the display monitor.



FRESH/RECIRC Selector Switch

The FRESH/RECIRC switch (6) is used to select between recirculating air inside the cab or taking in fresh air from outside.

- When this switch is pressed, recirculation of inside air is selected and (A) lights up on the display monitor.
- If the switch is pressed again, intake of fresh air is selected and (B) lights up on the display monitor.

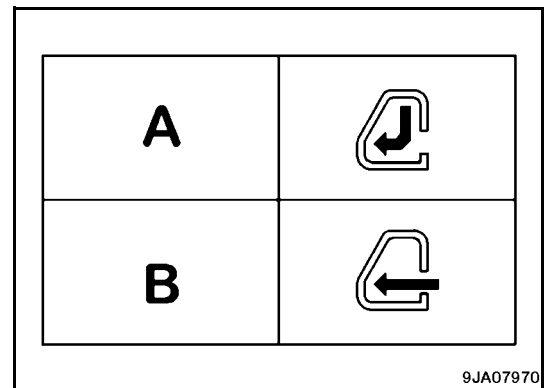


- Recirculation of air inside cab

Only the air inside the cab is circulated. Use this setting when carrying out quick cooling or heating of the cab, or when the outside air is dirty.

- Intake of fresh air from outside

Air from the outside is taken into the cab. Use this setting when taking in fresh air from outside or when removing the mist from the windows.

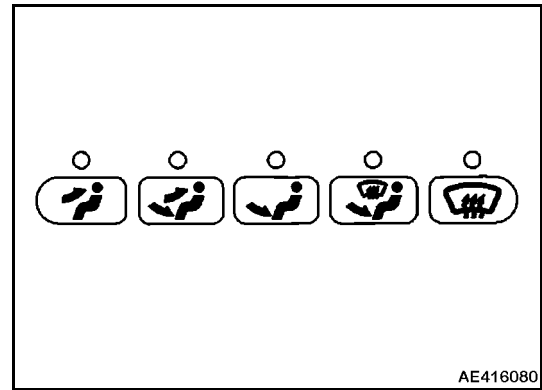


Mode Selector Switch

The mode selector switch (7) is used to select the vents.

The following five vent modes are available:

- FACE
- FACE/FOOT
- FOOT
- FOOT/DEF
- DEF



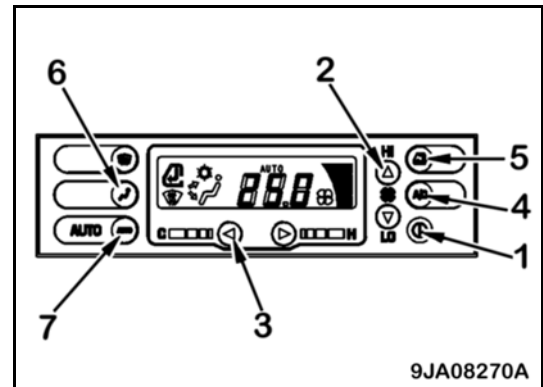
When the switch is pressed, the indicator lamp above the switch lights up and displays the vent mode.

OPERATION

Method of Operation

Cooling Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
 2. Press fan switch (2) and set the air flow to Hi.
 3. Press temperature control switch (3) to set to the desired temperature.
 4. Press air conditioner switch (4) to turn the air conditioner switch ON.
 5. Press RECIRC/FRESH selector switch (5) to select RECIRC.
 6. Press mode selector switch (6) to set the vents to FACE.
 7. When the temperature inside the cab decreases, use the temperature control switch and the fan switch to set to the desired temperature.
- ★ When the AUTO switch is pressed, the temperature and location of the vents are automatically selected.



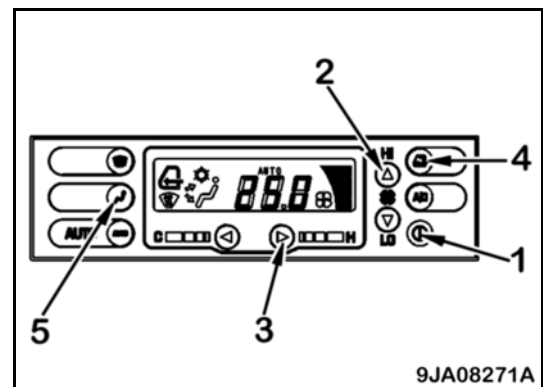
Remark

If the temperature control switch is pressed to set the temperature to the lowest position and the air conditioner is run for a long time with the air flow at Lo, in rare cases, the evaporator may freeze.

If the evaporator freezes and no cold air comes out, turn the air conditioner switch OFF; raise the temperature setting; run it for a short time with the air flow at Hi; then turn the air conditioner switch ON again.

Heating Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
2. Press fan switch (2) and set the air flow to Hi.
3. Press temperature control switch (3) to set to the desired temperature.
4. Press RECIRC/FRESH selector switch (4) to select FRESH.
5. Press mode selector switch (5) to set the vents to FOOT.
6. When the temperature inside the cab increases, use the temperature control switch and the fan switch to set to the desired temperature.



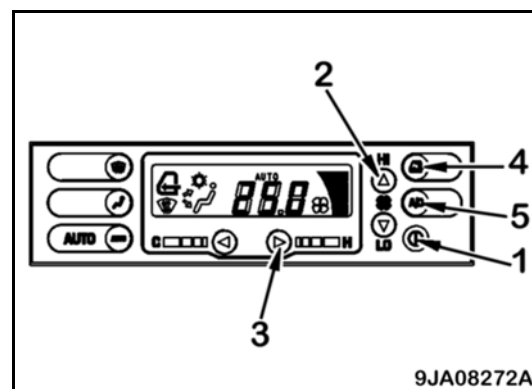
- ★ When the AUTO switch is pressed, the temperature and location of the vents are automatically selected.

Remark

Heating is carried out using the engine cooling water; it can be carried out when the cooling water temperature is high.

Drying-Heating and Demisting Operation

1. Press main power switch (1) of the air conditioner to turn the power ON.
2. Press fan switch (2) and set the air flow to the desired setting.
3. Press temperature control switch (3) and set to the desired temperature.
4. Press RECIRC/FRESH selector switch (4) to select FRESH.
5. Press air conditioner switch (5) to turn the air conditioner ON.



Remark

When the outside temperature is below 0°C (32°F), the air conditioner (compressor) may not operate.

When Not Using the Air Conditioner Regularly

To prevent leakage of the refrigerant from the air conditioner cooling circuit, operate the air conditioner for several minutes two or three times a month during the off-season. If the air conditioner is left for a long time when the refrigerant is leaking, it may cause internal rust.

Run the air conditioner in cooling or dehumidification plus heating mode for several minutes from time to time to prevent the loss of the oil film in various parts of the compressor.

If the temperature inside the cab is low, the air conditioner may not work. In such cases, use the recirculated air to warm up the inside of the cab, then turn the air conditioner switch on. The air conditioner will run.

Precautions When Using Air Conditioner

- To prevent an excessive load on the engine or compressor, use the air conditioner only when the engine is running.
- If the machine is used in places where there is dust or a bad odor, recirculate the air inside the cab when using the air conditioner.
- When turning the cooling on, if the temperature inside the cab is high, open the doors and windows to bring in fresh air before starting the air conditioner.
- If you smoke when using the cooling function, your eyes may sting. If this happens, switch temporarily to cooling and ventilation to remove the smoke.
- When using the air conditioner for a long time, carry out ventilation and cooling once every hour.
- For reasons of health, the optimum setting for cooling is the temperature at which you feel slightly cool (5 or 6°C (9 or 10.8°F) lower than the ambient temperature) when you enter the cab. Do not make the temperature inside the cab too low or direct the air flow directly onto your skin.

OPERATION

Inspection and Maintenance

To prevent loss of the oil film at various parts of the compressor when the air conditioner is not being used, run the compressor at low speed for several minutes once a week.

- ★ Run the engine at low speed and set the temperature to a medium temperature.

For information about cleaning the air filter and inspecting the refrigerant, see the following procedures:

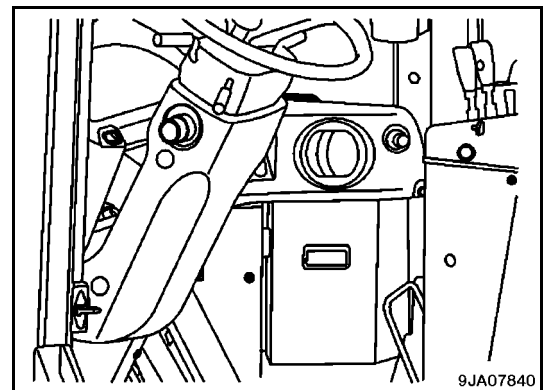
- “Check Air Conditioner” on page 3-49
- “Clean Element in Air Conditioner Fresh Air Filter” on page 3-60
- “Clean Element in Air Conditioner Recirculation Filter” on page 3-64
- “Check Air Conditioner Compressor Belt Tension, Adjust” on page 3-63
- “Clean Air Conditioner Condenser” on page 3-41

To allow the air conditioner to deliver its full performance and provide a comfortable environment, have inspection and maintenance carried out periodically.

When adding refrigerant or carrying out other maintenance, special tools and instruments are needed. Ask your Komatsu distributor to carry out inspection and repair.

Cool Box

- When the cooling is being used, this box can be used for keeping drinks and other things cool.
- When the heating is being used, it can be used to keep things warm.
- Do not use the cool box for things which smell, leak water, or break easily.
- Do not use it as a holder for tools or other small objects.



KOMTRAX

- ★ Your machine is equipped with the KOMTRAX system.
- KOMTRAX is a machine management system that uses wireless communications.
- A contract with your Komatsu distributor is necessary before the KOMTRAX system can be used. A customer who wishes to use the KOMTRAX system should consult his/her Komatsu distributor.
- The KOMTRAX equipment is a wireless device using radio waves. It is necessary to obtain authorization and conform to the laws of the country or territory where the machine equipped with KOMTRAX is being used. Always contact your Komatsu distributor before selling or exporting any machine equipped with KOMTRAX.
- When selling or exporting the machine, or at other times when your Komatsu distributor considers it necessary, it may be necessary for your Komatsu distributor to remove the KOMTRAX equipment or to carry out action to stop communications.
- If you do not obey the above precautions, neither Komatsu nor your Komatsu distributor can take any responsibility for any problem that is caused or for any loss that results.
- For operating instructions for the KOMTRAX system, see *Operation of KOMTRAX Terminal System* in the *Shop Manual*.

Basic Precautions

WARNING

- Never disassemble, repair, modify, or move the communications terminal, antenna, or cables. This may cause failure or fire on the KOMTRAX equipment or the machine itself. (Your Komatsu distributor will carry out removal and installation of KOMTRAX.)
- Do not allow cables or cords to become caught; do not damage or pull cables or cords by force. Short circuits or disconnected wires may cause failure or fire on the KOMTRAX equipment or the machine itself.
- For anyone wearing a pacemaker, make sure that the communications antenna is at least 22 cm (8.7 in) from the pacemaker. The radio waves may have an adverse effect on the operation of the pacemaker.

Remark

Even when the key in the starting switch of the KOMTRAX system is at the OFF position, a small amount of electric power is consumed.

When putting the machine into long-term storage, follow the directions given in "LONG-TERM STORAGE" on page 2-166.

Contact your Komatsu distributor before installing a top guard or other attachment that covers the cab roof.

Be careful not to get water on the communications terminal or wiring.

- The KOMTRAX system uses wireless communications. It cannot be used inside tunnels, underground, inside buildings, or in mountainous areas where radio waves cannot be received.
- Even when the machine is outside, it cannot be used in areas where the radio signal is weak or in areas outside the wireless communications service area.
- There is absolutely no need to inspect or operate the KOMTRAX communications terminal. If any abnormality is found, consult your Komatsu distributor.

TROUBLESHOOTING

When Machine Runs Out of Fuel

Always watch the fuel level and be careful not to run out of fuel.

WARNING

When starting the engine after running out of fuel, check carefully that the area around the engine is safe before cranking the engine.

When starting the engine after running out of fuel, fill with fuel and bleed the air from the fuel system before starting the engine.

For details about the air bleeding procedure, see “Replace Fuel Main Filter Cartridge (Standard Specification)” on page 3-72.

Towing the Machine

WARNING

- Serious injury or death could result if there is any mistake in the selection of wire rope or method of towing a disabled machine.
- Always be sure to check carefully that the capacity of the wire rope used for towing is ample for the weight of the towed machine.
- Never use a wire rope which has cut strands (A), reduced diameter (B), or kinks (C). There is danger that the rope may break during the towing operation.
- Always wear leather gloves when handling wire rope.
- Never tow a machine on a slope.
- During the towing operation, never stand between the towing machine and the machine being towed.
- Move the machine slowly and do not to apply any sudden load on the wire rope.
- If there is a failure in the brake line, the brakes cannot be used. Be extremely careful when towing.

Remark

Towing is to be used only for moving the machine a short distance to a place where inspection and maintenance can be carried out. The machine must not be towed for long distances.

For details of the permissible towing load for this machine, see “SPECIFICATIONS” on page 4-2.

For details about towing a machine when it has broken down, contact your Komatsu distributor.

- ★ This machine must not be towed except in emergencies.

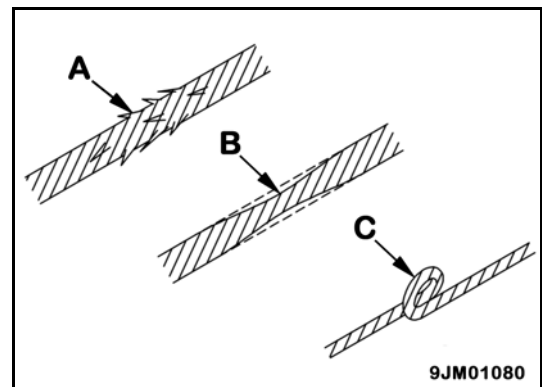
When towing the machine, take the following precautions.

- Before releasing the brakes, put blocks under the wheels to prevent the machine from moving.

If the wheels are not blocked, the machine may move suddenly.

- When towing a machine, tow it at a low speed of less than 2 km/h (1.2 mph) and for a distance of a few meters, to a place where repairs can be carried out.

If the machine must be moved long distances, use a transporter.



- If it is impossible to operate the steering and brakes of the machine being towed, do not let anyone ride on the machine.
- Keep the angle of the tow rope as small as possible. Keep the angle between the center lines of the two machines to within 30°.

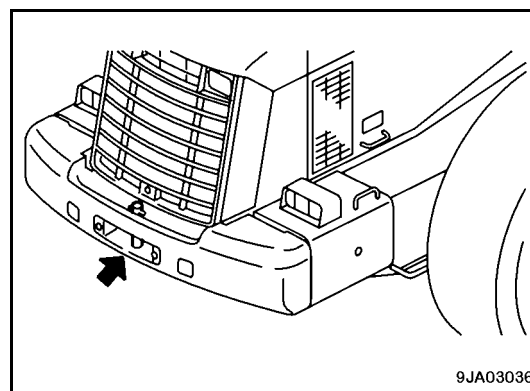
WARNING

- When using a chain or cable, be sure that it is strong enough for the expected load and it is properly secured to the drawbar pins or tow hooks (if equipped).
- When pulling with a chain or cable, take up the slack slowly to avoid jerking. A chain or cable which fails under load can whip and cause serious injury. Stand clear. Do not pull or tow unless the operator's compartment is guarded against or out of reach of a whipping chain or cable. Failure to follow these instructions could cause serious injury.

- The towing machine should normally be of the same class as the machine being towed.

Check that the towing machine and the towed machine both have ample braking power and that the towing machine has ample rimpull to control both machines on a slope or on the tow road.

- When towing a machine downhill, it may be necessary to connect another machine to the rear of the machine being towed in order to provide ample rimpull and braking power. This makes it possible to prevent the machine from losing control.
- Towing may be carried out under different conditions; it is impossible to determine beforehand the requirements for towing. Towing on flat horizontal roads requires the minimum rimpull; towing on slopes or on uneven road surfaces requires the maximum rimpull.
- Connect a wire rope to the part indicated by the arrow in the graphic.



When Engine Can Be Used

- If the transmission and steering wheel can be operated and the engine is running, it is possible to tow the machine out of mud or to move it for a short distance to the edge of the road.
- The operator should sit in the cab of the machine being towed and operate the steering in the direction that the machine is towed.

When Engine Cannot Be Used

When towing a machine with the engine stopped, use the following procedure.

1. The transmission oil does not lubricate the system; remove the front and rear drive shafts. If necessary, block the tires to prevent the machine from moving.
2. The steering cannot be operated; remove the steering cylinder.

Even if the brakes are in good condition, the brakes can only be used a limited number of times. There is no change in the operating force for the brake pedal but the braking force is reduced each time the pedal is depressed.

3. Connect the towing equipment securely. When carrying out towing operations, use two machines of at least the same class as the machine being towed. Connect one machine to the front and one to the rear of the machine being towed; remove the blocks from the tires; and tow the machine.
4. The parking brake cannot be turned OFF.

Release the parking brake; see "Releasing Parking Brake" on page 2-178.

OPERATION

Releasing Parking Brake

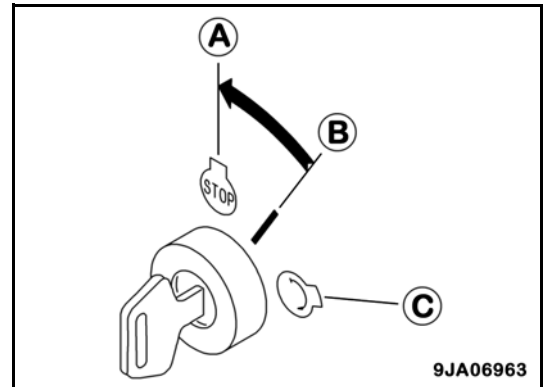
WARNING

- When releasing the parking brake, stop the machine on level ground and check that the surrounding area is safe. If the machine is on a slope and it is necessary to release the brake in an emergency, block the tires before starting the operation.
 - If the parking brake is released, the brake cannot be used. Pay particular attention to safety when moving the machine.
-
- ★ If the engine does not run for some reason, use the following methods to release the parking brake and tow the machine.

Releasing Parking Brake by Using Emergency Parking Brake Cancel Valve

If the pressure in the brake accumulator is high, do the following steps.

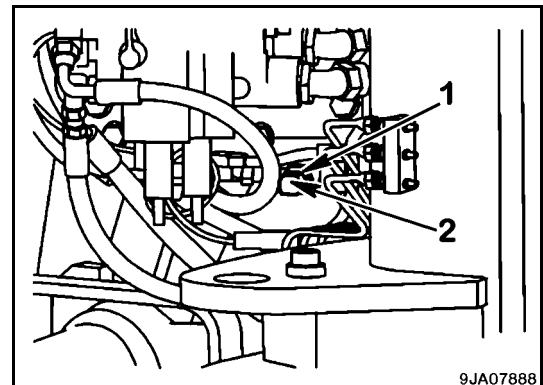
1. Turn the starting switch to the OFF position (A).



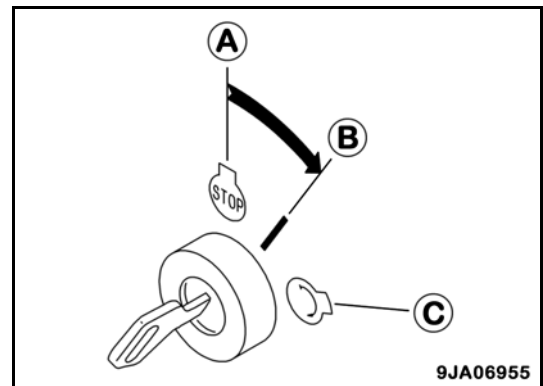
2. Turn locknut (1) of the release valve counterclockwise, then turn grip (2) counterclockwise to open the release valve.

Remark

The relief valve is located on the left front portion inside the rear frame and secured to the accumulator mounting bracket.

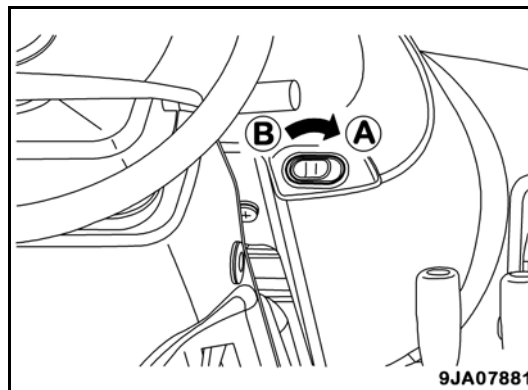


3. Turn the starting switch to the ON position (B).



4. Move the parking brake switch to the ON (A) position (actuated), then move it to the OFF (B) position (released).

The parking brake is released.



5. To restore the function of the parking brake, turn grip (2) of the release valve clockwise to close the release valve, then turn locknut (1) clockwise to lock it.

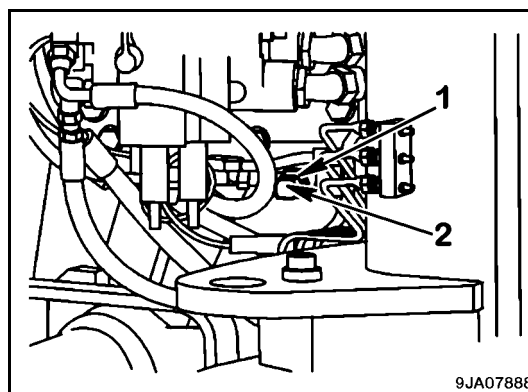
Tightening torque:

Grip (2): 20 ±5 N•m (177 ±44 lbf in)

Locknut (1): 20 ±5 N•m (177 ±44 lbf in)

6. Move the parking brake switch to the ON (A) position. The parking brake is applied.

To release the parking brake again, repeat the procedure in Steps 1 to 4.



Remark

If the brake accumulator pressure is low, the parking brake warning lamp may not go out and the alarm buzzer may make a continuous high-pitched sound.

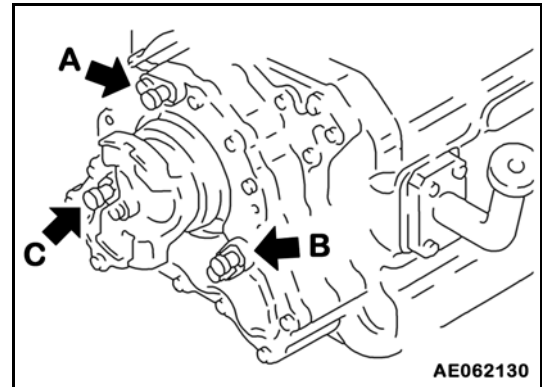
If this happens, release the brake. For details, see "Releasing Parking Brake Mechanically" on page 2-180.

OPERATION

Releasing Parking Brake Mechanically

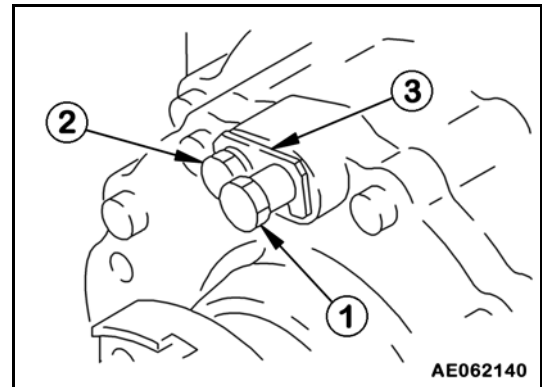
If the brake accumulator pressure is low, release the parking brake mechanically.

1. Loosen bolt (2) and adjustment screw (1) at three places (A, B, C) at the front of the transmission case.



2. Rotate lock plate (3) to release the lock, then tighten adjustment screw (1) until it stops.

If this operation is carried out at the same time at A, B, and C, the parking brake can be released.



Emergency Travel Operation

The normal gearshifting operation is carried out by electric signals.

If there is a failure in the electrical system and the machine does not move, contact your Komatsu distributor to have the machine moved.

Remark

Always ask your Komatsu distributor to carry out the emergency travel operation.

Discharged Battery

Precautions

WARNING

- It is dangerous to charge a battery when it is mounted on a machine. Make sure that it is removed before charging.
- When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position.
- The battery generates hydrogen gas; there is a hazard of explosion. Do not smoke nor bring lighted cigarettes near the battery, or do anything that will cause sparks.
- Battery electrolyte is dilute sulfuric acid; it will attack your clothes and skin.
 - If it gets on your clothes or on your skin, immediately wash it off with a large amount of water.
 - If it gets in your eyes, wash your eyes with copious amounts of fresh water and consult a doctor immediately.
- When handling batteries, always wear safety glasses and rubber gloves.
- When removing the battery, first disconnect the cable from the negative (-) terminal). When installing, connect the positive (+) terminal first.
- If a tool touches the positive terminal and the chassis, there is danger that it will cause a spark. Be extremely careful.
- If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.
- When removing or installing the terminals, check which is the positive (+) terminal and which is the negative (-) terminal.

Removal and Installation of Battery

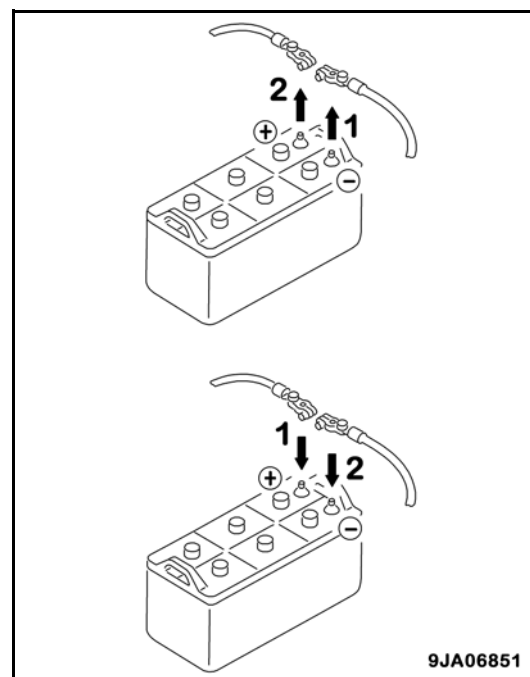
1. Before removing the battery, remove the ground cable (normally connected to the negative (-) terminal).
 - If any tool touches between the positive terminal and the chassis, there is danger of sparks being generated.
 - Loosen the nuts of the terminal and remove the cables from the battery.
2. After installing the battery, fix it securely with the battery hold-down.

Tightening torque: 2.0 – 2.9 N•m (18 – 26 lbf in)
3. When installing the battery, connect the ground cable last.
 - Insert the hole of the terminal on the battery and tighten the nut.

Tightening torque: 5.9 – 9.8 N•m (52 – 87 lbf in)

Remark

The batteries are on both sides at the rear of the machine. The battery used for the ground is on the left side of the machine.



OPERATION

Precautions for Charging Battery



If you do not handle the battery correctly when charging it, there is danger that the battery may explode.

- ★ Always follow the instructions in “Discharged Battery” on page 2-181 and the instruction manual accompanying the charger.

Observe the following rules.

- Do not use or charge the battery if the battery electrolyte level is below the LOWER LEVEL line. This may cause an explosion.

Check the battery electrolyte level periodically and add distilled water to bring the electrolyte level to the UPPER LEVEL line.

- Set the voltage of the charger to match the voltage of the battery to be charged.

If the voltage is not selected correctly, the charger may overheat and cause an explosion.

- Connect the positive (+) charger clip of the charger to the positive (+) terminal of the battery. Connect the negative (-) charger clip of the charger to the negative (-) terminal of the battery.

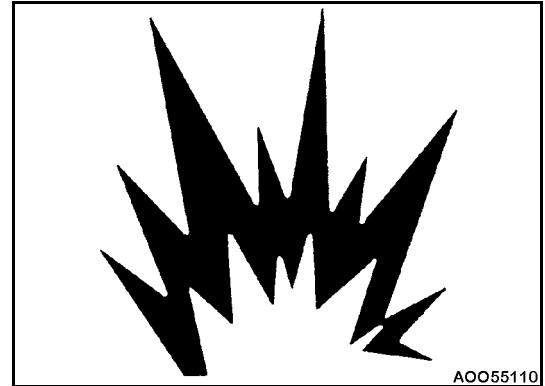
Be sure to fix the clips securely.

- Set the charging current to 1/10 of the value of the rated battery capacity. When carrying out rapid charging, set it to less than the rated battery capacity.

If the charger current is too high, the electrolyte will leak or dry up; this may cause the battery to catch fire and explode.

- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source.

There is danger that this may ignite the battery electrolyte and cause the battery to explode.



Starting Engine with Booster Cables

When starting the engine with a booster cable, follow these instructions.

Precautions When Connecting or Disconnecting Booster Cable

WARNING

- When connecting the cables, never contact the positive (+) and negative (-) terminals.
- When starting the engine with a booster cable, always wear safety glasses and rubber gloves.
- Be careful not to let the normal machine and the problem machine contact each other. This prevents sparks from generating near the battery which could ignite the hydrogen gas given off by the battery.
- Make sure that there is no mistake in the booster cable connections.
- The final connection is to the engine block of the problem machine. Sparks will be generated when this is done, so connect to a place as far as possible from the battery.
- When disconnecting the booster cable, be careful not to bring the clips in contact with each other or with the machine body.

Remark

The size of the booster cable and clips should be suitable for the battery size.

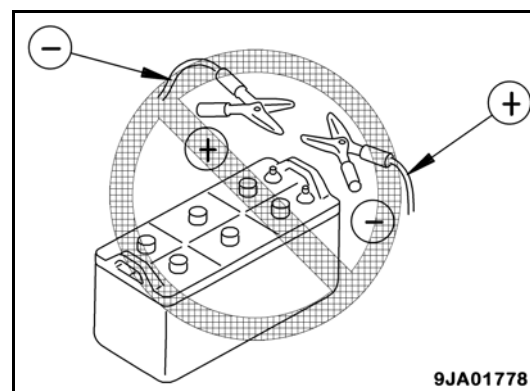
The battery of the normal machine must be the same capacity as the battery on the machine to be started.

Check the cables and clips for damage or corrosion.

Make sure that the cables and clips are firmly connected.

Check that the work equipment lock lever and the parking brake on both machines are at the LOCK position.

Check that all levers are in the NEUTRAL position.

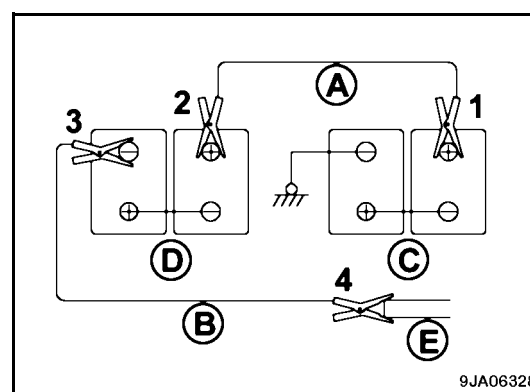


Connecting Booster Cable

To prevent damage to the electrical system, first turn the problem machine's starting switch and battery disconnect switch (if applicable) to the OFF position, then turn the normal machine's starting switch and battery disconnect (if applicable) to the OFF position. Take out the keys to the battery disconnect switch(es).

Connect the booster cable as follows, in the order of the numbers marked in the diagram.

1. Connect the clip of booster cable (A) to the positive (+) terminal of battery (C) on the problem machine.
2. Connect the clip at the other end of booster cable (A) to the positive (+) terminal of battery (D) on the normal machine.
3. Connect the clip of booster cable (B) to the negative (-) terminal of battery (D) on the normal machine.
4. Connect the clip at the other end of booster cable (B) to engine block (E) on the problem machine.



OPERATION

Starting Engine



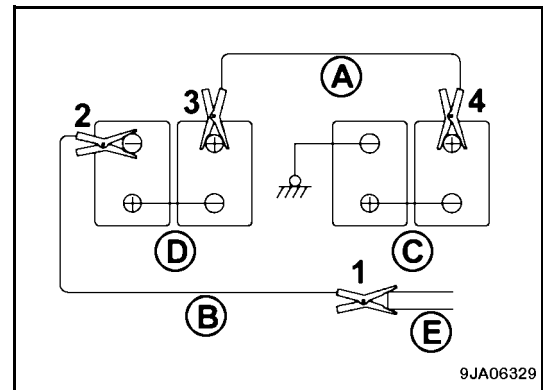
- Always check that the work equipment lock lever is set to the LOCK position, regardless of whether the machine is working normally or has failed.
- Check that all the control levers are at the HOLD or neutral position.

1. Make sure the clips are firmly connected to the battery terminals. If not, a spark may occur.
2. Turn the battery disconnect switch in the good machine to restore power. Start the engine of the good machine.
3. If the problem machine has a battery disconnect switch, turn the key to allow power to return.
4. Turn the starting switch of the problem machine to the START position and start the engine. If the engine does not start at first, wait for at least two minutes before trying again.

Disconnecting Booster Cable

After the engine has started, disconnect the booster cables in the reverse order in which they were connected.

1. Remove the clip of booster cable (B) from engine block (E) on the problem machine.
2. Remove the clip of booster cable (B) from the negative (-) terminal of battery (D) on the normal machine.
3. Remove the clip of booster cable (A) from the positive (+) terminal of battery (D) on the normal machine.
4. Remove the clip of booster cable (A) from the positive (+) terminal of battery (C) on the problem machine.

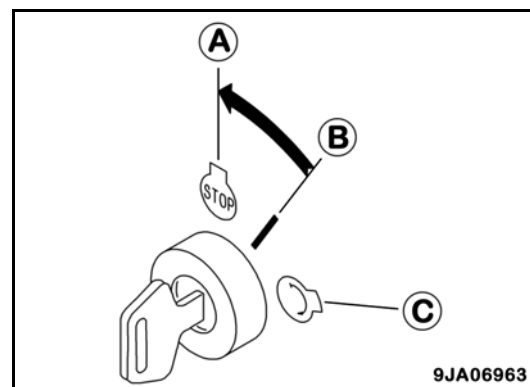
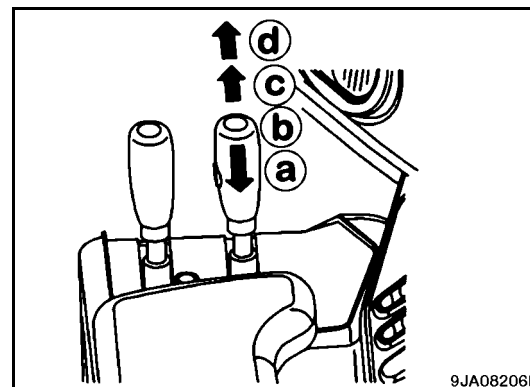
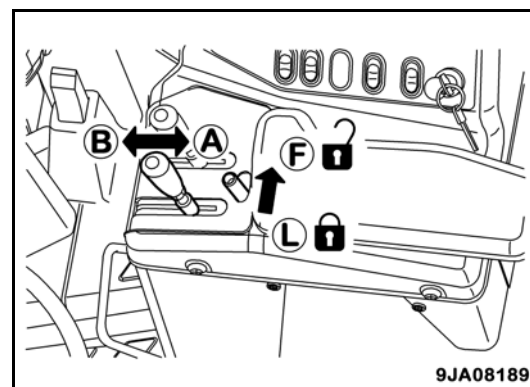
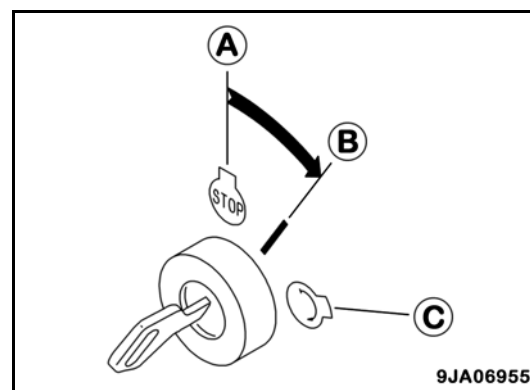


Lowering Work Equipment When Engine Has Stopped

WARNING

Check that the surrounding area is safe and then lower the work equipment.

1. Turn starting switch key to the ON position (B).
2. Set the work equipment lock lever to the FREE position (F).
3. Operate the lift arm control lever to the LOWER position (c) to lower the bucket to the ground.
4. Set the work equipment lock lever to the LOCK position (L) securely.
5. Turn the key in the starting switch to the OFF position (A) and stop the engine.



OPERATION

Other Troubleshooting

Electrical System

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main Causes	Remedy
Lamp does not glow brightly even when the engine runs at high speed. Lamp flickers while engine is running.	<ul style="list-style-type: none">• Defective wiring• Defective adjustment of belt tension	<ul style="list-style-type: none">• (Check, repair loose terminals, disconnections.)• Adjust alternator belt tension. * See EVERY 250 HOURS SERVICE.
Even when the engine is rotating, the battery charge circuit caution lamp does not go out.	<ul style="list-style-type: none">• Defective alternator• Defective wiring• Defective adjustment of alternator belt tension	<ul style="list-style-type: none">• (Replace.)• (Check, repair.)• Adjust alternator belt tension. * See EVERY 250 HOURS SERVICE.
Abnormal noise is generated from alternator.	<ul style="list-style-type: none">• Defective alternator	<ul style="list-style-type: none">• (Replace.)
Starting motor does not turn when starting switch is turned ON.	<ul style="list-style-type: none">• Defective wiring• Insufficient battery charge• Battery disconnect switch is in the ON position	<ul style="list-style-type: none">• (Check, repair.)• Charge.• Turn the battery disconnect switch to the OFF position
Pinion of starting motor keeps going in and out.	<ul style="list-style-type: none">• Insufficient battery charge	<ul style="list-style-type: none">• Charge.
Starting motor turns engine sluggishly.	<ul style="list-style-type: none">• Insufficient battery charge• Defective starting motor	<ul style="list-style-type: none">• Charge.• (Replace.)
Starting motor disengages before engine starts.	<ul style="list-style-type: none">• Defective wiring• Insufficient battery charge	<ul style="list-style-type: none">• (Check, repair.)• Charge.
Preheating pilot lamp does not illuminate.	<ul style="list-style-type: none">• Defective wiring• Defective heater relay, heater controller, temperature sensor• Defective preheating pilot lamp	<ul style="list-style-type: none">• (Check, repair.)• (Replace.)• (Replace.)
Even when engine is stopped, battery charge circuit caution lamp does not illuminate (starting switch at ON position).	<ul style="list-style-type: none">• Defective wiring• Defective monitor	<ul style="list-style-type: none">• (Check, repair.)• (Replace.)

* See "Every 250 Hours Service" on page 3-61.

Chassis

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main Causes	Remedy
Transmission		
Engine is running but machine does not move.	<ul style="list-style-type: none"> • Parking brake applied • Directional lever is not shifted properly • Lack of oil in transmission case 	<ul style="list-style-type: none"> • Release parking brake. • Shift lever properly. • Add oil to specified level. * See WHEN REQUIRED.
Even when engine is run at full throttle, machine only moves slowly and lacks power.	<ul style="list-style-type: none"> • Lack of oil in transmission case • Screen is clogged 	<ul style="list-style-type: none"> • Add oil to specified level. * See WHEN REQUIRED. • (Disassemble, clean.)
Oil overheats.	<ul style="list-style-type: none"> • Too much oil or too little oil in transmission case • Machine is not traveling in correct speed range • Torque converter is stalled for long periods • Engine is overheating 	<ul style="list-style-type: none"> • Add or drain oil to specified level. * See WHEN REQUIRED. • Place in correct speed range. • Reduce stall time. • (Check engine.)
Noise generated.	<ul style="list-style-type: none"> • Lack of oil in transmission case 	<ul style="list-style-type: none"> • Add oil to specified level. * See WHEN REQUIRED.
Axle		
Noise generated.	<ul style="list-style-type: none"> • Lack of oil • Improper oil used (for machines with limited slip differential) 	<ul style="list-style-type: none"> • Add oil to specified level. * See WHEN REQUIRED. • Replace with specified oil.
Brake		
Brake is not applied when pedal is depressed.	<ul style="list-style-type: none"> • Disc has reached wear limit • Lack of oil in hydraulic tank • Air in brake line 	<ul style="list-style-type: none"> • (Replace disc.) • Add oil to specified level. ** See EVERY 100 HOURS SERVICE. • Bleed air.
Brake drags or remains applied.	<ul style="list-style-type: none"> • Vent hole of brake valve is clogged 	<ul style="list-style-type: none"> • Clean
Brakes squeal	<ul style="list-style-type: none"> • Disc is worn. • Large amount of water in axle oil • Deteriorated axle oil due to overuse of brake 	<ul style="list-style-type: none"> • (Replace disc.) • Change axle oil. • Change axle oil.

* See “When Required” on page 3-28.

** See “Every 100 Hours Service” on page 3-59.

OPERATION

Problem	Main Causes	Remedy
Steering		
Steering wheel is heavy.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE.
Steering wheel is loose.	<ul style="list-style-type: none"> Play in steering cylinder pin Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Grease bearing or replace pin and bushing where there is play. Add oil to specified level. * See EVERY 100 HOURS SERVICE.
Parking brake		
Brake does not work well.	<ul style="list-style-type: none"> Disc is worn 	<ul style="list-style-type: none"> (Replace disc.)
Brake drags or remains applied.	<ul style="list-style-type: none"> Lack of oil in transmission case Screen is clogged 	<ul style="list-style-type: none"> Add or drain oil to specified level. ** See WHEN REQUIRED. (Disassemble, clean.)
Hydraulic system		
Lacks bucket lifting power. Takes time to lift the bucket.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank Clogged hydraulic tank filter 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE. Replace filter. *** See EVERY 2000 HOURS SERVICE.
Excessive bubbles in oil	<ul style="list-style-type: none"> Low quality oil being used Lack of oil in hydraulic tank Air in oil line 	<ul style="list-style-type: none"> Replace with good quality oil. Add oil to specified level. * See EVERY 100 HOURS SERVICE. Bleed air. *** See EVERY 2000 HOURS SERVICE.
Hydraulic pressure is low.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank causes pump to suck in air. 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE. Then bleed air. *** See EVERY 2000 HOURS SERVICE.
Movement of cylinder is irregular.	<ul style="list-style-type: none"> Lack of oil in hydraulic tank 	<ul style="list-style-type: none"> Add oil to specified level. * See EVERY 100 HOURS SERVICE.

* See "Every 100 Hours Service" on page 3-59.

** See "When Required" on page 3-28.

*** See "Every 2000 Hours Service" on page 3-79.

Engine

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, contact your Komatsu distributor for repairs.

Problem	Main causes	Remedy
Engine oil pressure caution lamp illuminates.	<ul style="list-style-type: none"> • Oil level in engine oil pan is low (sucking in air). • Clogged oil filter cartridge • Defective tightening of oil pipe joint, oil leakage from damaged part • Defective monitor 	<ul style="list-style-type: none"> • Add oil to specified level. * See CHECK BEFORE STARTING. • Replace cartridge. ** See EVERY 500 HOURS SERVICE. • (Check, repair.) • (Replace.)
Steam is emitted from top part of radiator (pressure valve). Engine water temperature gauge is in red range. Engine coolant water temperature caution light illuminates.	<ul style="list-style-type: none"> • Cooling water level low, water leakage • Defective fan pump or motor • Dirt or scale accumulated in cooling system • Clogged radiator fin or damaged fin • Defective thermostat • Defective thermostat seal • Loose radiator filler cap (high altitude operation) • Defective monitor 	<ul style="list-style-type: none"> • Check, add cooling water, repair. *** See WHEN REQUIRED. • (Check, repair.) • Change cooling water, clean inside of cooling system. *** See WHEN REQUIRED. • Clean or repair. *** See WHEN REQUIRED. • (Replace thermostat.) • (Replace thermostat seal.) • Tighten cap or replace packing. • (Replace)
Engine water temperature gauge is in white range.	<ul style="list-style-type: none"> • Defective thermostat • Defective monitor 	<ul style="list-style-type: none"> • (Replace thermostat.) • (Replace.)
Engine does not start when starting motor is turned.	<ul style="list-style-type: none"> • Lack of fuel • Air in fuel system • No fuel in fuel filter • Defective injection pump or injector • Starting motor cranks engine too slowly. • Starting motor does not rotate. • Preheating pilot lamp does not illuminate. • Defective valve clearance (defective compression) 	<ul style="list-style-type: none"> • Add fuel. * See CHECK BEFORE STARTING. • Repair place where air is sucked in. • Fill fuel filter with fuel **SEE EVERY 500 HOURS SERVICE • (Replace pump or injector) • **** See ELECTRICAL SYSTEM • **** See ELECTRICAL SYSTEM • **** See ELECTRICAL SYSTEM • (Adjust valve clearance)
Exhaust gas is white or blue.	<ul style="list-style-type: none"> • Too much oil in oil pan • Improper fuel 	<ul style="list-style-type: none"> • Add oil to specified level. * See CHECK BEFORE STARTING. • Replace with specified oil
Exhaust gas occasionally turns black.	<ul style="list-style-type: none"> • Clogged air cleaner element • Defective injector • Defective compression • Defective turbocharger 	<ul style="list-style-type: none"> • Clean or replace. *** See WHEN REQUIRED. • (Replace injector.) • (See defective compression above.) • (Clean or replace turbocharger.)
Combustion noise occasionally makes breathing sound.	<ul style="list-style-type: none"> • Defective nozzle 	<ul style="list-style-type: none"> • (Replace nozzle.)
Abnormal noise generated (combustion or mechanical).	<ul style="list-style-type: none"> • Low grade fuel being used • Overheating • Damage inside muffler • Excessive valve clearance 	<ul style="list-style-type: none"> • Change to specified fuel. • Refer to "Engine water temperature gauge is in red range" in this table. • Replace muffler. • (Adjust valve clearance.)

OPERATION

* See “Check Before Starting Engine” on page 2-80.

** See “Every 500 Hours Service” on page 3-67.

*** See “When Required” on page 3-28.

**** See “ELECTRICAL” on page 2-73.

MAINTENANCE

GUIDES TO MAINTENANCE

Remark

Do not perform any inspection or maintenance operation that is not found in this manual.

WARNING

Due to the high voltage/amps and high-pressure fuel, avoid any contact with the engine electrical system (1) and the fuel injection system (2) when the engine is running. Severe injury may result.

Check Service Meter

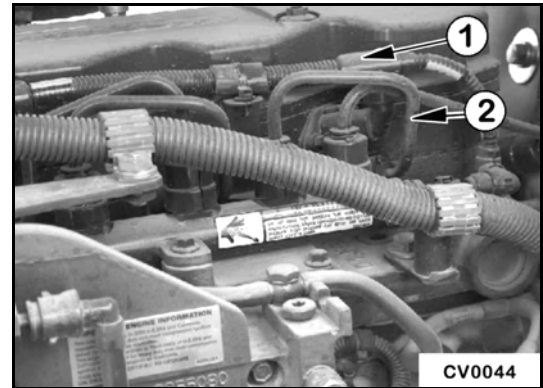
- Check the service meter reading every day to see if the time has come for any necessary maintenance to be performed.

Komatsu Genuine Replacement Parts

- Use Komatsu genuine parts specified in the *Parts Book* as replacement parts.

Komatsu Genuine Oils

- Use Komatsu genuine lubricants.
- Choose oil of the specified viscosity according to the ambient temperature.
- See “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-12.



Always Use Clean Washer Fluid

- Use automobile window washer fluid.
- Be careful not to let any dirt get into the fluid.

Always Use Clean Oil and Grease

- Use clean oil and grease.
- Keep containers for the oil and grease clean.
- Keep foreign materials away from oil and grease.

Checking for Foreign Materials in Drained Oil and on Filters

- After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials.
- If large quantities of metal particles or foreign materials are found, always report to the person in charge and perform suitable action.

Fuel Strainer

- Do not remove the fuel strainer from the filler port when adding fuel.

Welding Instructions

- Turn the engine starting switch off; wait for approximately one minute; turn off all power to the electrical system by turning the battery disconnect switch (if applicable) and take out the battery disconnect switch key. Then disconnect the battery negative (-) terminal.
- Do not apply more than 200V continuously.
- Connect grounding cable within 1 m (3.3 ft) of the area to be welded.
 - If grounding cable is connected near instruments, connectors, etc., the instruments may malfunction.
- Avoid seals or bearings located between the area to be welded and the grounding point.
- Do not use the area around the work equipment pins or hydraulic cylinders as the grounding point.

Do Not Drop Things Inside the Machine

- When opening inspection windows or the oil filler port of the tank to perform an inspection, be careful not to drop nuts, bolts, or tools inside the machine.
 - If such things are dropped inside the machine, it may cause damage and/or malfunction of the machine and will lead to failure.
 - If you drop anything inside the machine, always remove it immediately.
- Do not put unnecessary things in your pockets. Carry only things which are necessary to perform inspection or maintenance.

Dusty Work Sites

When working at dusty work sites, do the following:

- Check the air cleaner clogging caution lamp more frequently to check the degree of clogging of the air cleaner.
- Clean the radiator core frequently to avoid clogging.
- Clean and replace the fuel filter frequently.
- Clean electrical components, especially the starting motor and alternator, to avoid an accumulation of dust.
- When inspecting or changing oil, move the machine to a place that is free of dust to prevent dirt from getting into the oil.

Avoid Mixing Oil

- Never mix different brands or grades of oil.
- If a different brand or grade of oil must be added, drain the old oil and replace all the oil with the new brand or grade of oil.

Locking Inspection Covers

- Lock the inspection cover in position securely with the lock bar.
 - If inspection or maintenance is performed with the inspection cover open and not locked into position, there is a danger that it may be suddenly blown shut by the wind and injure the worker.

Bleeding Air from Hydraulic Circuit

- After repairing or replacing parts of the hydraulic circuit, or removing the piping of the hydraulic circuit, it is necessary to bleed the air from the circuit.
 - See “Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element” on page 3-79.

MAINTENANCE

Precautions When Installing Hydraulic Hoses

- When removing parts at locations where there are O-rings or gasket seals, clean the mounting surface and replace with new parts.
 - When doing this, be careful not to forget to assemble the O-rings and gaskets.
- When installing hoses, do not twist or bend them sharply. If installed in this manner, the hose will be damaged and its service life drastically reduced.

Checks After Inspection and Maintenance

If you forget to perform the checks after inspection and maintenance, unexpected problems may occur. This may lead to serious injury or property damage. Always do the following checks.

Checks After Operation (with engine stopped)

- Have any inspection and maintenance points been forgotten?
- Have all inspection and maintenance items been performed correctly?
- Have any tools or parts been dropped inside the machine?
 - It is particularly dangerous if parts are dropped inside the machine and get caught in the lever linkage mechanism.
- Are there any coolant or oil leaks?
- Have all nuts and bolts been tightened?

Checks When Engine is Running

- Be extremely careful to ensure safety during this operation. When checking the operation of the engine, see “Running the Machine During Maintenance” on page 1-44.
- Check that the component/system that was inspect and maintained is working properly.
- Increase the engine speed and check for coolant, oil, and fuel leaks.

SERVICE OUTLINE

- Always use Komatsu genuine parts for replacement parts, grease, or oil.
- When changing or adding oil, do not mix different types of oil.
- When changing the type of oil, drain all the old oil and fill completely with the new oil.
- Always replace the filter at the same time as you change the oil. (There is no problem if the small amount of oil remaining in the piping mixes with the new oil.)
- Unless otherwise specified, when the machine is shipped from the factory, it is filled with the oil and coolant listed in the following table.

Item	Type
Engine oil pan	Engine oil EO15W40-DH (Komatsu genuine parts)
Transmission case	Power train oil TO10 (Komatsu genuine parts)
Hydraulic oil system	Power train oil TO10 (Komatsu genuine parts)
Axle	Axle oil AXO80 (Komatsu genuine parts)
Radiator	Supercoolant AF-NAC (Komatsu genuine parts) (density: 30% or above)

Handling Oil, Fuel, Coolant, and Performing Oil Clinic

Oil

- Oil is used in the engine and hydraulic equipment under extremely severe conditions (high temperature, high pressure); it deteriorates with use.
- Always use oil that matches the grade and maximum and minimum ambient temperatures recommended in this manual.
 - See “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-12.
- Even if the oil is not dirty, always change the oil after the specified interval.
- Oil corresponds to blood in the human body; it is crucial to the functioning of the machine. Always be careful when handling it to prevent any impurities (water, metal particles, dirt, etc.) from getting into the oil.
 - The majority of problems with machines are caused by the entry of such impurities.
 - Take particular care not to contaminate the oil when storing or adding it.
- Never mix oils of different grades or brands.
- Always add the specified amount of oil.
 - Having too much oil or too little oil both cause problems.
- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit.
 - In such cases, contact your Komatsu distributor for inspection and repair.
- When changing the oil, always replace the related filters at the same time.
- Komatsu strongly recommends that you have an analysis made of the oil periodically to check the condition of your machine. For details of this service, contact your Komatsu distributor.
- When using commercially available oil, it may be necessary to reduce the oil change interval.
 - We recommend that you use the Komatsu oil clinic to carry out a detailed check of the characteristics of the oil.

MAINTENANCE

Fuel

- To prevent the moisture in the air from condensing and forming water inside the fuel tank, always fill the fuel tank after completing the day's work.
- The fuel pump is a precision instrument. If fuel containing water or dirt is used, the fuel pump cannot work properly.
- Be extremely careful not to let impurities get into the fuel when storing or adding it.
- Always use the fuel specified for the temperature.
 - See "RECOMMENDED FUEL, COOLANT, AND LUBRICANTS" on page 3-12.
 - The fuel will solidify if it is used at temperatures lower than the specified temperature (particularly at temperatures below -15°C (5°F)).
 - If the fuel is used at temperatures higher than the specified temperature, the viscosity will drop. This may result in problems such as a drop in output.
- Before starting the engine, or when ten minutes have passed after adding fuel, drain the sediment and water from the fuel tank.
- If the engine runs out of fuel, or if the filters have been replaced, it is necessary to bleed the air from the fuel line.
- If there is any foreign material in the fuel tank, wash the tank and fuel system.

Remark

Always use diesel fuel.

The engine mounted on this machine uses an electronically controlled, high-pressure fuel injection device to ensure good fuel consumption and exhaust gas characteristics.

This device requires high precision parts and lubrication. If low viscosity fuel with low lubricating ability is used, the durability of the engine may drop markedly.

Coolant and Water for Dilution

- Coolant prevents corrosion and freezing.
- Even in areas where it is not necessary to prevent freezing, the use of antifreeze coolant is essential. Use Supercoolant (AF-NAC) at a mixing ratio of at least 30% to prevent corrosion of the cooling system.
- Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anti-corrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours.
- Komatsu Supercoolant (AF-NAC) is strongly recommended.
 - We do not recommend the use of any coolant other than Komatsu genuine Supercoolant (AF-NAC).
 - If you use another coolant, it may cause serious problems such as corrosion of the engine and parts of the cooling system that use light metals, such as aluminum.
- When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor. For details, see "Clean Inside of Cooling System" on page 3-33.
- When diluting the antifreeze coolant, use distilled water or tap water (soft water).
 - Natural water, such as river water or well water (hard water), contains large amounts of minerals (calcium, magnesium, etc.). This makes it easier for scale to form inside the engine or radiator. Once scale is deposited inside the engine or radiator, it is extremely difficult to remove it. The deposition of scale also causes overheating due to poor heat exchange.
 - When you dilute the coolant, we recommend that you use water with an overall hardness of less than 100 PPM.
- When using antifreeze, always observe the precautions given in Section 1 of this manual. See "Cooling System Precautions" on page 1-45 and "Disposal of Waste Materials" on page 1-51.

- Antifreeze coolant is flammable; be sure to keep it away from flames.
- The ratio of Supercoolant (AF-NAC) to water differs according to the ambient temperature.
 - For details of the ratio when mixing, see “Clean Inside of Cooling System” on page 3-33.
 - Supercoolant (AF-NAC) may be supplied already mixed. In such cases, never dilute with water.
- If the engine overheats, wait for the engine to cool before adding coolant.
- If the coolant level is low, it will cause overheating; it will also cause problems with corrosion due to air entering the coolant.

Grease

- Grease is used to prevent seizure and noises at the joints.
- This construction equipment is used under heavy-duty conditions. Always use the recommended grease and follow the change intervals and ambient temperatures given in this manual.
- Grease fittings not included in the MAINTENANCE section are grease fittings that are used at the time of overhaul; there is no need to grease these points.
- When using the machine after it has been in storage for a long time, carry out greasing if there is any stiffness or screeching.
- If any part becomes stiff or makes noise after being used for a long time, apply grease.
- Always wipe off all of the old grease that is pushed out when greasing.
- Be particularly careful to wipe off the old grease in places where sand or dirt sticking in the grease would cause wear of the rotating parts.

Storing Oil and Fuel

- Keep oil or fuel indoors to prevent any water, dirt, or other impurities from getting into it.
- When keeping a drum for a long period, put the drum on its side so that the filler port of the drum is at the side.
 - This action prevents moisture from being sucked into the drum.
 - If the drum must be stored outside, cover it with a waterproof sheet or take other measures to protect it.
- To prevent any change in quality during long-term storage, be sure to use the oil or fuel in the order of “first in - first out” (use the oldest oil or fuel first).

Filters

- Filters are extremely important safety parts. Filters prevent impurities in the fuel and air circuits from entering important equipment where they could cause problems.
 - Replace all filters periodically. Details are provided in the SERVICE PROCEDURE section of this manual.
 - When working in severe conditions, replace the filters at shorter intervals according to the oil and fuel (sulfur content) being used.
- Never try to clean the filters (cartridge type) and use them again.
 - Always replace with new filters.
- When replacing oil filters, check if any metal particles are attached to the old filter. If you find any metal particles, contact your Komatsu distributor.
- When replacing the engine oil filter, fill the new filter with the specified clean oil and then install it.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatsu genuine filters.

MAINTENANCE

Performing KOWA (Komatsu Oil Wear Analysis)

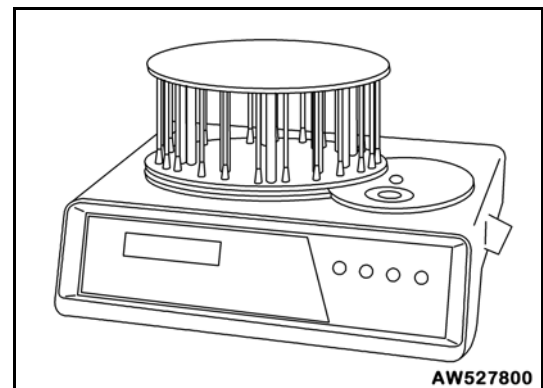
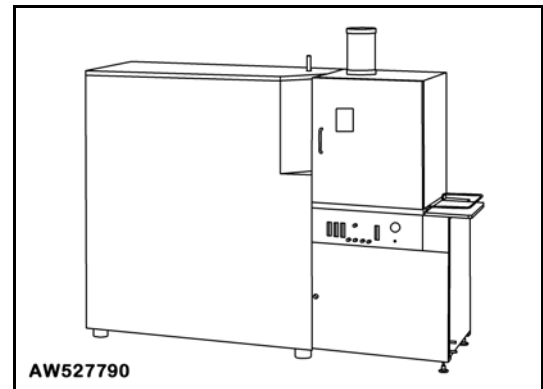
KOWA (Komatsu Oil Wear Analysis) is a maintenance service that makes it possible to prevent machine failures and downtime. With KOWA, the oil is periodically sampled and analyzed. This enables early detection of wear of the machine drive parts and other abnormalities.

- We strongly recommend that you use the KOWA service.
- The results of the analysis are reported, together with recommendations which will reduce repair costs and machine downtime.
- The oil analysis is done at low cost (only the actual expenses are charged).

KOWA Analysis Items

The analysis of the following items enables you to obtain a very precise diagnosis of the health of the machine.

- Measurement of density of metal wear particles
This uses an ICP (Inductively Coupled Plasma) analyzer to measure the density of iron, copper, and other metal wear particles in the oil.
- Measurement of particle quantity
This uses a PQI (Particle Quantifier Index) instrument to measure the quantity of large iron particles (larger than 5 microns) in the oil, which enables the early detection of failures.
- Others
Measurements are made of items such as the ratio of water in the oil, density of the antifreeze coolant, ratio of fuel in the oil, and dynamic viscosity.



Oil Sampling

- Sampling interval:
 - 250 hours: Engine
 - 500 hours: Other components
- Precautions when sampling:
 - Make sure that the oil is well mixed before sampling.
 - Perform sampling at regular fixed intervals.
 - Do not perform sampling on rainy or windy days when water or dust can get into the oil.
- For further details about KOWA, contact your Komatsu distributor.

Outline of Electric System

- It is extremely dangerous if the electrical equipment becomes wet or the covering of the wiring is damaged. This situation will cause an electrical short circuit and may cause the machine to malfunction.
 - Do not wash the inside of the operator's cab with water.
 - When washing the machine, be careful not to get water into the electrical components.
- Service relating to the electric system:
 - Checking fan belt tension
 - Checking damage or wear to the fan belt
 - Checking the battery fluid level
- Never install any electric components other than those specified by Komatsu.
- External electromagnetic interference may cause malfunction of the control system controller.
 - Before installing a radio receiver or other wireless equipment, contact your Komatsu distributor.
- When working at the seashore, carefully clean the electric system to prevent corrosion.
- The optional power source must never be connected to the fuse, starting switch, or battery relay.

MAINTENANCE

WEAR PARTS

- Replace wear parts (such as the filter element, air cleaner element, bucket tooth, etc.) at the time of periodic maintenance or before they reach the wear limit.
- The wear parts should be replaced correctly in order to ensure more economic use of the machine.
- Always use Komatsu genuine parts of excellent quality.
- As a result of Komatsu's continuous efforts to improve product quality, part numbers may change.
- When ordering parts, always inform your Komatsu distributor of your machine serial number so he can check for the latest part number.

Wear Parts List

★ For standard specification

The parts in parentheses are to be replaced at the same time.

Item	Part Name	Qty	Replacement Frequency	
Engine oil filter	Cartridge	1	EVERY 500 HOURS	
Fuel main filter	Cartridge	1	EVERY 1000 HOURS	
Corrosion resistor	Cartridge	1	EVERY 1000 HOURS	
Fuel prefilter	Cartridge	1	EVERY 500 HOURS	
Transmission oil filter	Cartridge	1	EVERY 1000 HOURS	
Transmission strainer	Strainer (O-ring)	1 (1)	- EVERY 1000 HOURS	
Hydraulic filter	Element (O-ring)	1 (1)	EVERY 2000 HOURS	
Hydraulic tank breather	Element	1	EVERY 2000 HOURS	
Hydraulic oil strainer	Strainer	1	-	
Fuel tank breather	Element	1	-	
Air cleaner	Element assembly	1	-	
Air conditioner filter	Fresh	Element	1	EVERY 2000 HOURS
	Recirc	Element	1	EVERY 2000 HOURS
PPC Accumulator	Accumulator (O-ring)	1 (1)	EVERY 4000 HOURS	
Bolt on cutting edge	Standard type	Center edge	1	-
		Side edge	2	
		(Bolt)	(14)	
Long life type	Center edge	(Nut)	(14)	
		(Washer)	(14)	
		Side edge	2	
Segment type	Center edge	(Bolt)	(16)	
		(Nut)	(16)	
		(Washer)	(16)	

★ For poor fuel arrangement specification

Item		Part Name	Qty	Replacement Frequency
Engine oil filter		Cartridge	1	EVERY 500 HOURS
Fuel main filter(★)		Cartridge	2	EVERY 1000 HOURS
Corrosion resistor		Cartridge	1	EVERY 1000 HOURS
Fuel prefilter		Cartridge	1	EVERY 500 HOURS
Transmission oil filter		Cartridge	1	EVERY 1000 HOURS
Transmission strainer		Strainer (O-ring)	1 (1)	- EVERY 1000 HOURS
Hydraulic filter		Element (O-ring)	1 (1)	EVERY 2000 HOURS
Hydraulic tank breather		Element	1	EVERY 2000 HOURS
Hydraulic oil strainer		Strainer	1	-
Fuel tank breather		Element	1	-
Air cleaner		Element assembly	1	-
Air conditioner filter	Fresh	Element	1	EVERY 2000 HOURS
	Recirc	Element	1	EVERY 2000 HOURS
PPC accumulator		Accumulator (O-ring)	1 (1)	EVERY 4000 HOURS
Additional water separator		Case (O-ring) Screen	1 (1) 1	-
Bolt on cutting edge	Standard type	Center edge	1	-
		Side edge (Bolt) (Nut) (Washer)	2 (14) (14) (14)	
	Long life type	Center edge Side edge (Bolt) (Nut) (Washer)	2 2 (14) (14) (14)	-
Segment type	Center edge Side edge (Bolt) (Nut) (Washer)	7 2 (16) (16) (16)	-	

★ If the fuel filter gets clogged before its scheduled periodic replacement time, replace both the fuel prefilter and fuel main filter together.

RECOMMENDED FUEL, COOLANT, AND LUBRICANTS

- In order to keep your machine in the best condition for long periods of time, it is essential to follow the instructions in this manual.
 - Failure to follow these recommendations may result in the shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricants and additives may be good for the machine, but they may also cause harm.
 - Komatsu does not recommend any commercially available lubricants and/or additives.
- Komatsu genuine oils are formulated to maintain the reliability and durability of Komatsu construction equipment.
- Use the oil recommended according to the ambient temperature listed in the “Fuel, Coolant, and Lubricant Ambient Temperature Chart” on page 3-13.
- *Specified capacity* means the total amount of oil in the tank and the piping. *Refill capacity* means the amount of oil required to refill the system during inspection and maintenance.
- When starting the engine in temperatures below 0°C (32°F), be sure to use the recommended multi-grade oil, even if the ambient temperature may become higher during the course of the day.
- If the machine is operated at a temperature below -20°C (-4°F), a separate device is required. Consult your Komatsu distributor.
- Always use the fuel specified for the ambient temperature.
 - If the fuel is used at temperatures lower than the specified temperature (particularly at temperatures below -15°C (5°F)), the fuel will solidify.
 - If the fuel is used at temperatures higher than the specified temperature, the viscosity will drop; this may result in problems such as a drop in output.
- When the fuel sulfur content is less than 0.2%, change the engine oil according to the period inspection table given in this manual.
- If the fuel sulfur content is more than 0.2%, change the oil according to the following table.

Sulfur Content (%)	Oil Change Interval
Less than 0.5	500 hours
0.5 – 1.0	250 hours
1.0 and up	Not recommendable (★)

- ★ If these fuels are used, serious problems may occur because of early deterioration of engine oil or early wear of the engine’s internal parts. If the local situation makes it necessary to use these fuels, be sure to do the following:
 - Check Total Basic Number (TBN) of oil frequently using a TBN handy checker, etc., and change oil based on the results.
 - Always be aware that the oil change interval is much shorter than the standard interval.
 - Be sure to have the Komatsu distributor’s expert perform periodic engine inspections, since change intervals of periodic replacement parts and overhaul intervals are also shorter.

Fuel, Coolant, and Lubricant Ambient Temperature Chart

RESERVOIR	FLUID TYPE	AMBIENT TEMPERATURE									
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104°F 40°C	122°F 50°C	
Engine oil pan	Engine oil (Note 1)	Komatsu EOS0W30									
		Komatsu EOS5W40									
	Engine oil	Komatsu EO10W30-DH									
		Komatsu EO15W40-DH									
		Komatsu EO30-DH									
Transmission case	Power train oil (Note 2)	TO10									
Hydraulic system	Power train oil	TO10									
	Hydraulic oil	HO46-HM									
	Engine oil	Komatsu E010W30-DH									
		Komatsu EO15W40-DH									
Axle	Axle oil (Note 3)	AX080									
	Power train oil (Note 4)										TO 50
Pin / Bushing Grease fitting	Hypergrease (Note 5)	G2-T, G2-TE									
	Lithium EP grease	G2-L1									
Cooling system	Supercoolant (Note 6)	AF-NAC									
Fuel tank	Diesel fuel	ASTM Grade #1-DS15 / DS500									
		ASTM Grade # 2-DS15 / DS500									

★ ASTM: American Society of Testing and Material

Reservoir/Capacity		Engine Oil Pan	Transmission Case	Hydraulic System	Axle		Cooling System	Fuel Tank
					Front	Rear		
Specified	Liters	32	62	200	49	40	34	325
	US gal	8.5	16.4	52.8	12.9	10.6	9.0	85.9
Refill	Liters	30	54	139	49	40	–	–
	US gal	7.9	14.3	36.7	12.9	10.6	–	–

MAINTENANCE

Remark

Use diesel fuel only.

This engine uses an electronically controlled, high-pressure fuel injection system to obtain good fuel economy and low emissions. For this reason, it requires high-precision parts and good lubrication.

If kerosene or other fuel with low lubricating ability is used, the durability may drop markedly.

Note	Explanation
1	HTHS (High-Temperature High-Shear Viscosity 150°C [302°F]), specified by ASTM D4741 must be equal to or higher than 3.5 mPa·S. Komatsu EOS0W30 and EOS5W40 are the most suitable oils.
2	Power train oil has different properties from engine oil. Be sure to use the recommended oil.
3	Axle oil AX080 prevents squealing from the brakes and LSD (Limited-Slip Differential). If only AX080 is recommended, use Komatsu genuine AX080 or equivalent.
4	When the ambient temperature is higher than 45°C (113°F) and the machine operation hour is longer than 12 hours/day, use TO50 instead of AX080. Squealing of the brakes may occur with the use of TO50 but there is no problem with the brake performance or durability. ★ For machines with the LSD (Limited-Slip Differential), use AX080 regardless of the ambient temperature. Do not use TO50.
5	Hypergrease (G2-T, G2-TE) is a high-performance grease. In the following case, we recommend the use of G2-T or G2-TE. <ul style="list-style-type: none"> When it is necessary to improve the lubricating ability of the grease in order to prevent squeaking of the pins or bushings
6	Supercoolant (AF-NAC) <ul style="list-style-type: none"> The coolant has the important function of preventing corrosion as well as preventing overheating and freezing. Even in areas where freezing is not an issue, the use of antifreeze coolant is essential. Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC). Komatsu Supercoolant (AF-NAC) has excellent anticorrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours. Komatsu Supercoolant (AF-NAC) is strongly recommended wherever available. For details about the ratio when diluting supercoolant with water, see "Clean Inside of Cooling System" on page 3-33. When the machine is shipped from the factory, it may be filled with coolant containing 30% or more Supercoolant (AF-NAC). In this case, no adjustment is needed for temperatures down to -10°C (14°F) (never dilute with water). To maintain the anticorrosion properties of Supercoolant (AF-NAC), always keep the density of Supercoolant between 30% and 68%. On machines equipped with an aluminum alloy radiator, not using Komatsu genuine Supercoolant may cause the corrosion of the tubes in the radiator core resulting in leakage. Only Komatsu genuine Supercoolant provides both high freezing protection and high corrosion protection for aluminium alloy systems as well as cylinder liner cavitation protection.

Recommended Brands, Other Than Komatsu Genuine Oil

When using commercially available oils other than Komatsu genuine oil, consult your Komatsu distributor.

Biodiesel Usage

With increased interest in emissions and reduced usage of petroleum distillate-based fuels, some governments and regulating bodies are encouraging the use of biofuels. Biofuels are a class of fuels derived from recently dead biological material. This fuel may be in solid, liquid, or gaseous form. Biodiesel belongs to the first generation biofuels which are made from starch, sugar, vegetable oil, or animal fat using conventional technology.

Governmental incentives and/or environmental legislation requiring the use of biofuels may have an impact on the use of Komatsu engines. This section outlines Komatsu’s criteria and parameters for the use of biodiesel fuel.

Biodiesel Recommendation for Komatsu Engines

The recommendation is submitted for those wishing to use biodiesel blends from B5 to B20. In the broad sense, the quality of available biodiesel blends remains inconsistent. Komatsu recommends that you follow the parameters as listed. In addition, Komatsu suggests that you contact your local Komatsu representative to periodically report engine conditions and machine performance, when using biodiesel blends from B5 to B20.

Biodiesel Terminology

Term	Description
Biofuels	Fuels produced from renewable resources
Biodiesel	A non-petroleum-based diesel fuel comprised of methyl or ethyl ester-based oxygenates of long chain fatty acids derived from the transesterification of vegetable oils, animal fats, and cooking oils. These fuels are commonly known as Fatty Acid Methyl Esters (FAME) or Fatty Acid Ethyl Esters (FAEE). Biodiesel properties are similar to those of diesel fuel, as opposed to gasoline or gaseous fuels, and thus are capable of being used in compression ignition (diesel) engines.
B100	A fuel containing 100% biodiesel - pure biodiesel
Biodiesel Blend	A fuel comprised of a mixture of petrodiesel and B100 biodiesel. A biodiesel blend is typically designated by the percentage of biodiesel in the blend. Example: B5 contains 95% petrodiesel and 5% B100 biodiesel.
BQ-9000	The National Biodiesel Accreditation program, BQ-9000, is a cooperative and voluntary program for the accreditation of producers and marketers of biodiesel fuel. The program is a unique combination of the ASTM standard for biodiesel, ASTM D6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices.
Cloud point	Fuel cloud point is the temperature at which wax begins to form in the fuel. If the atmospheric temperature is lower than the cloud point of the fuel, wax will form and plug the fuel filter.
Petrodiesel	Diesel fuel produced purely from petroleum. Petrodiesel can also be referred to as distillate diesel.
Rapeseed Methyl Ester (RME) diesel	Biodiesel derived from rapeseed oil. RME diesel is the most common biodiesel used in Europe.
Soy Methyl Ester (SME or SOME) diesel	Biodiesel derived from soybean oil. SME diesel is the most common biodiesel used in United States.

MAINTENANCE

Certification and Standards

Komatsu certifies its engines based on the use of the prescribed EPA and European Certification Fuels. Komatsu does not certify its engines on any other fuels.

It is the user's responsibility to use the correct fuel as recommended by Komatsu and allowed by the EPA or other local regulatory agencies. In the United States, the EPA allows only registered fuels and fuel additives to be used in commerce. The EPA has provided a web site for additional alternative fuel information at:

<http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm>

The specifications for biodiesel are described in the ASTM D6751 Standard in North America and the EN14214 Standard in Europe. These specifications do not cover the fuel blends that may be purchased by the end user. Despite the specifications and standards, the quality of available biodiesel remains inconsistent.

WARNING

- To use biodiesel in Komatsu engines, it is imperative that the biodiesel fuel be of high quality.
 - The biodiesel fuel must meet or exceed the specifications outlined by Komatsu or engine damage will occur.
-
- In order for the customer to successfully use biodiesel, it is recommended that the fuel be of high quality.
 - The biodiesel fuel must meet or exceed the specifications outlined by Komatsu.
 - It is the responsibility of the customer/user to verify/obtain the proper local, regional, or national exemptions required for the use of biodiesel in any emissions-regulated Komatsu engine.
- ★ If these items are disregarded, engine damage may occur.

Warranty and Use of Biodiesel Fuel in Komatsu Engines

The Komatsu warranty covers failures that are a result of defects in material or factory workmanship. Engine damage, service issues, and/or performance issues, determined by Komatsu to be caused by use of biodiesel fuel not meeting the specifications as outlined here, are not considered to be defects in material or workmanship and are not covered under the Komatsu warranty.

Requirements for Using Biodiesel Fuel in Komatsu Engines

Applications for diesel and biodiesel fuel blends of up to B5 must meet the requirements of ASTM D975 D1 and D2 fuels. An acceptable biodiesel fuel blend of up to 20% volume concentrate (B20) biodiesel with 80% petrodiesel can be used for all Komatsu engines.

End users must adhere to the following Komatsu requirements when using biodiesel blends above B5 and up to B20.

Remark

Komatsu requires that biodiesel blends be purchased from a BQ-9000 Certified Marketer. The B100 biodiesel fuel used in the blend must be sourced from a BQ-9000 Accredited Producer. Certified Marketers and Producers can be found at this web site: <http://www.bq-9000.org>.

Oil Sampling

Under certain biodiesel operating conditions, fuel dilution of lubricating oil has been observed. Monitoring fuel dilution can be accomplished by performing oil sampling. Fuel levels in lubricating oil must not exceed 5%.

In order to determine if the oil change interval needs to be modified, the end user is required to use oil sampling during the first six months of operation to monitor engine oil condition and fuel dilution of lubricating oil.

Fuel Water Separation

Biodiesel has a natural affinity to water and water leads to accelerated microbial growth. Storage tanks must be equipped with a fuel water separator to make sure water is eliminated before entering the machine's fuel tank. The machine should be equipped with a water separator as well. It is recommended that storage and machine fuel tanks are kept full in order to reduce potential condensation.

Due to the solvent nature of biodiesel and the potential for *cleaning* of the vehicle fuel tank and lines when using biodiesel, new fuel filters must be installed when switching to biodiesel. Fuel filters must be replaced more frequently. Specifically, the first two fuel filter changes, after biodiesel introduction, must be done at one half the standard interval; that is, if the standard interval is 500 hours then the fuel filter must be changed at 250 hours.

Komatsu Genuine fuel filters must be used for fuel filter changes.

Biodiesel Fuel Storage

Biodiesel fuel must be used within six months of its manufactured date. Long-term storage problems have occurred with biodiesel due to its poor oxidation stability. This poor oxidation stability is accelerated with increased ambient temperature. For this reason, Komatsu does not recommend using biodiesel for low use applications, such as standby power or seasonal applications. Your fuel supplier can recommend oxidation stability additives.

WARNING

Avoid storing equipment with biodiesel blends in the fuel system for more than three months or fuel system damage can occur.

When using biodiesel for seasonal applications, the engine and fuel systems must be purged before storage by running the engine on pure diesel fuel for a minimum of 30 minutes.

When storing biodiesel in bulk storage tanks, the systems must be properly cleaned and maintained. Steps must be taken to minimize moisture and microbial growth in storage tanks. Consult your fuel supplier for assistance in storing and handling biodiesel.

Properties of Biodiesel

Energy Content

B100 biodiesel provides approximately 7% to 10% less energy per gallon of fuel when compared to conventional diesel fuels. Depending on the application, operating with B20 biodiesel blends can result in a slight decrease in fuel economy and power.

Engine Material Compatibility

Biodiesel may affect engine elastomers; periodic checks of seals and hoses is required.

As previously mentioned, biodiesel has excellent cleaning properties and fuel filters must be replaced and inspected more frequently. Specifically, the first two fuel filter changes, after biodiesel introduction, must be done at one half the standard interval. When replacing fuel filters at any time, Komatsu strongly recommends that fuel filters be inspected, especially for metal particles.

Low Temperature Performance

Biodiesel properties change with ambient temperature change. In low ambient temperature, biodiesel will start turning waxy or gelling. Precautions must be taken when storing this fuel at low temperatures by using a heated building or a heated storage tank. Additives can be used for low ambient operation.

The fuel system may require heated fuel lines, filters, and tanks to avoid being plugged by biodiesel fuel solidifying in low ambient temperatures. A fuel heater is recommended for ambient temperatures below -5°C (23°F). Consult your fuel and additive supplier for assistance in attaining proper cloud point fuel; see *cloud point* on 3-15.

MAINTENANCE

Microbial Growth

Biodiesel fuel is an excellent medium for microbial growth. Microbes cause fuel system corrosion and premature filter plugging. The effectiveness of all commercially available conventional anti-microbial additives, when used in biodiesel, is not known. Consult your fuel and additive supplier for assistance.

Komatsu Biodiesel Blend Specification for B5 to B20

Final Blend Fuel Requirements (at point of delivery)

Item	Performance Characteristics	Requirements		Test Procedure
		D1 Blends	D2 Blends	
1	Flash Point, minimum	38°C (100°F)	52°C (125°F)	ASTM D93
2	Water and sediment volume, maximum	0.05%	0.05%	ASTM D2709 or D1796
3	Physical Distillation, T90°C (T194°F), maximum	343	343	ASTM D86
4	Kinematics Viscosity, cSt at 40°C (104°F)	1.3 – 4.1	1.9 – 4.1	ASTM D445
5	Ash, mass%, maximum	0.01	0.01	ASTM D482
6	Sulfur, st% maximum	Per regulation	Per regulation	ASTM D482
7	Copper strip corrosion rating, maximum	Number 3	Number 3	ASTM D130
8	Cetane Number, minimum	43	43	ASTM D613
9	Cloud Point ¹	Per foot note	Per foot note	ASTM D2500
10	Rams bottom carbon residue on 10% distillation residue, wt%, maximum	0.15	0.35	ASTM D524
11	Lubricity, HFRR at 60°C (140°F), micron, maximum	460	460	ASTM D6079
12	Acid number, mgKOH/g, maximum	0.3	0.3	ASTM D664
13	Phosphorus, wt%, maximum	0.001	0.001	ASTM D4951
14	Total Glycerin	–	–	N/A
15	Alkali metals (Na+K), ppm, maximum	Nd	Nd	EN14108
16	Alkali metals (Mg+Ca), ppm, maximum	Nd	Nd	EN14108
17	*Blend fraction, volume% ²	±2%	±2%	EN14078
18	Thermo-oxidative stability, insolubles, mg/100 mL, maximum	10	10	Modified ASTM D2274 ³
19	Oxidation stability, Induction time, hours, minimum	6	6	EN14112 (Rancimat)

* Blend fraction refers to the variation in volume percent of B100 in diesel fuel claimed.

★ The maximum cloud point temperature shall be equal to or lower than the tenth percentile minimum ambient temperature in the geographical area and seasonal time frame as defined by ASTM D975.

★ Use glass fiber filter.

Summary of Recommendations

WARNING

- It is imperative that the end user read and understand the information provided in the Biodiesel Usage section.
 - It is not sufficient to read and rely on just the following summary.
-
- The user is required to purchase biodiesel blends from BQ-9000 Certified Marketers.
 - Biodiesel blends must be used within six months of manufactured date.
 - Fuel put into storage tanks of vehicles must be used within three months; a period longer than three months will cause engine damage.
 - Storage and vehicle fuel tanks must be equipped with water separators to prevent water from entering engine fuel lines.
 - When switching from conventional diesel fuel to biodiesel blends, fuel filters must be changed with new Komatsu genuine fuel filters. Specifically, the first two fuel filter changes, after biodiesel introduction, must be changed at one half the standard interval; that is, if the standard interval is 500 hours, then the filter must be changed at 250 hours.
 - During the first six months of biodiesel usage, the user must perform oil sampling on the engine numerous times to ensure that fuel dilution of lubricating oil is not greater than 5%. The user will also determine what oil change interval is appropriate.
 - Komatsu requires periodical inspection of seals and hoses made of elastomers for any degradation in performance. These inspections are also required on the fuel system, looking for corrosion and premature filter plugging.
 - Special precautions are required when using biodiesel at low temperatures.

Remark

Komatsu certifies its engines using the prescribed EPA and European Certification Fuels. Komatsu does not certify engines on any other fuel.

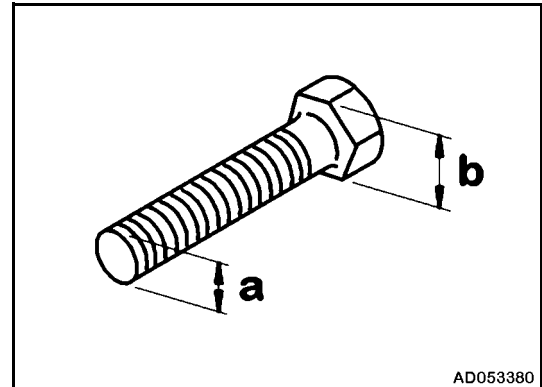
STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

Torque List

WARNING

- If nuts, bolts, or other parts are not tightened to the specified torque, it will cause looseness or damage to the tightened parts. This will cause failure of the machine or problems with operation.
- Always pay careful attention when tightening parts.

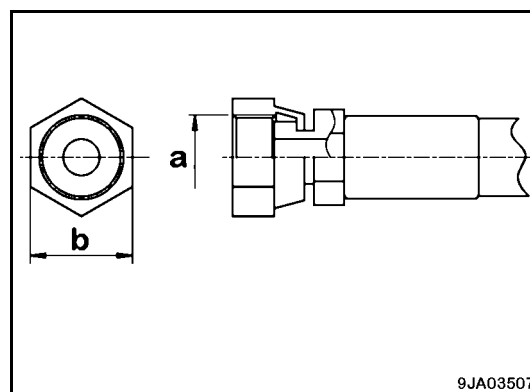
- Unless otherwise specified, tighten the metric nuts and bolts to the torque shown in the following table.
- If it is necessary to replace any nut or bolt, always use a Komatsu genuine part of the same size as the part that was replaced.



Thread Diameter of Bolt (a)	Width across Flats (b)	Tightening Torque					
		Target Value			Service Limit		
mm	mm	N•m	kgm	lbf ft	N•m	kgm	lbf ft
6	10	13.2	1.3	9.7	11.8 – 14.7	1.2 – 1.5	8.7 – 10.8
8	13	31	3.2	22.9	27 – 34	2.8 – 3.5	19.9 – 25.1
10	17	66	6.7	48.7	59 – 74	6.0 – 7.5	43.5 – 54.6
12	19	113	11.5	83.3	98 – 123	10.0 – 12.5	72.3 – 90.7
14	22	172	17.5	126.9	153 – 190	15.6 – 19.4	112.8 – 140.1
16	24	260	26.5	191.8	235 – 285	24.0 – 29.1	173.3 – 210.2
18	27	360	36.7	265.5	320 – 400	32.6 – 40.8	236.0 – 295.0
20	30	510	52.0	376.2	455 – 565	46.4 – 57.6	335.6 – 416.7
22	32	688	70.2	507.4	610 – 765	62.2 – 78.0	450.0 – 564.2
24	36	883	90.0	651.3	785 – 980	80.0 – 100.0	579.0 – 722.8
27	41	1295	132.1	955.1	1150 – 1440	117.3 – 146.8	848.2 – 1062.1
30	46	1720	175.4	1268.6	1520 – 1910	155.0 – 194.8	1121.1 – 1408.7
33	50	2210	225.4	1630.0	1960 – 2450	199.9 – 249.8	1445.6 – 1807.0
36	55	2750	280.4	2028.3	2450 – 3040	249.8 – 310.0	1807.0 – 2242.2
39	60	3280	334.5	2419.2	2890 – 3630	294.7 – 370.2	2131.6 – 2677.3

Use the following table for hydraulic hoses.

Nominal No. of threads (a)	Width across Flats (b)	Tightening Torque					
		Target Value			Permissible Range		
	mm	N•m	kgm	lbf ft	N•m	kgm	lbf ft
9/16 -18UNF	19	44	4.5	32.5	35 – 63	3.6 – 6.4	25.8 – 46.5
11/16 -16UN	22	74	7.5	54.6	54– 93	5.5 – 9.5	39.8 – 68.6
13/16 -16UN	27	103	10.5	76.0	84 – 132	8.6 – 13.5	61.9 – 97.4
1 -14UNS	32	157	16.0	115.8	128 – 186	13.1 – 19.0	94.4 – 137.2
13/16 -12UN	36	216	22.0	159.3	177 – 245	18.0 – 25.0	130.5 – 180.7



PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

To ensure safety at all times when operating or driving the machine, the user of the machine must always perform periodic maintenance. In addition, to further improve safety, the parts in the Safety Critical parts list must also be replaced at the specified interval. These parts are particularly closely connected to safety and fire prevention; contact your Komatsu distributor to have them replaced.

The material quality of these parts can change as time passes; they are likely to wear out or deteriorate. However, it is difficult to determine the extent of wear or deterioration at the time of periodic maintenance. You must replace these parts with new ones, regardless of their condition, after a certain period of usage. This is important in order to ensure that these parts maintain their full performance at all times.

- Should anything abnormal be found on any of these parts, replace it with a new one even if the periodic replacement time for the part has not yet arrived.
- If any of the hose clamps show deterioration such as deformation or cracking, replace the clamps at the same time as the hoses.
- Perform checks of the hydraulic hoses which need to be replaced periodically. Tighten all loose clamps and replace defective hoses, as required.
- When replacing hoses, always replace O-rings, gaskets, and other such parts at the same time.
- Have your Komatsu distributor replace the critical parts.

Safety Critical Parts List

★ For standard specification

No.	Safety Critical Parts	Qty	Replacement Interval
1	Fuel hose (fuel tank - fuel prefilter)	1	Every 2 years or 4,000 hours, whichever comes sooner
2	Fuel hose (fuel pre-filter - supply pump)	1	
3	Fuel hose (supply pump - fuel main filter)	1	
4	Fuel hose (fuel main filter - supply pump)	1	
5	Fuel hose (supply pump - common rail overflow)	1	
6	Fuel hose (engine - fuel tank)	1	
7	Steering hose (pump - steering valve)	2	
8	Steering hose (steering valve - steering cylinder)	6	
9	Steering hose (steering valve - hydraulic tank)	2	
10	Steering hose (steering valve - hydraulic tank: seal drain circuit)	2	
11	Steering hose (steering valve - pump: LS)	1	
12	Brake hose (pump - charge valve)	1	
13	Brake hose (charge valve - hydraulic tank)	2	
14	Brake hose (charge valve - accumulator)	2	
15	Brake hose (accumulator - brake valve)	2	
16	Brake hose (brake valve - front axle)	3	
17	Brake hose (brake valve - rear axle)	2	
18	Brake hose (brake valve - hydraulic tank)	1	
19	Brake hose (accumulator - emergency release valve)	1	
20	Brake hose (emergency release valve - transmission valve)	1	
21	Transmission hose (pump - transmission valve)	1	
22	Transmission hose (transmission valve - transmission filter)	1	
23	Transmission hose (transmission filter - transmission main valve)	1	
24	Transmission hose (transmission - torque converter cooler)	1	
25	Transmission hose (torque converter cooler - transmission)	1	
26	Accumulator (for PPC)	1	
27	Alarm	2	
28	Engine high-pressure piping clamp	1 set	Every 8,000 hours
29	Fuel spray prevention cap	1 set	
30	Seat belt (see "Seat Belt Inspection" on page 1-11)	1	Every 3 years after the start of usage or 5 years after the date of manufacture or at first sign of wear or damage

MAINTENANCE

★ For poor fuel arrangement specification

No.	Safety Critical Parts	Qty	Replacement Interval
1	Fuel hose (fuel tank - additional water separator)	1	Every 2 years or 4,000 hours, whichever comes sooner
2	Fuel hose (additional water separator - fuel prefilter)	1	
3	Fuel hose (fuel pre-filter - supply pump)	1	
4	Fuel hose (supply pump - fuel main filter)	1	
5	Fuel hose (fuel main filter - supply pump)	1	
6	Fuel hose (supply pump - common rail overflow)	1	
7	Fuel hose (engine - fuel tank)	1	
8	Steering hose (pump - steering valve)	2	
9	Steering hose (steering valve - steering cylinder)	6	
10	Steering hose (steering valve - hydraulic tank)	2	
11	Steering hose (steering valve - hydraulic tank: seal drain circuit)	2	
12	Steering hose (steering valve - pump: LS)	1	
13	Brake hose (pump - charge valve)	1	
14	Brake hose (charge valve - hydraulic tank)	2	
15	Brake hose (charge valve - accumulator)	2	
16	Brake hose (accumulator - brake valve)	2	
17	Brake hose (brake valve - front axle)	3	
18	Brake hose (brake valve - rear axle)	2	
19	Brake hose (brake valve - hydraulic tank)	1	
20	Brake hose (accumulator - emergency release valve)	1	
21	Brake hose (emergency release valve - transmission valve)	1	
22	Transmission hose (pump - transmission valve)	1	
23	Transmission hose (transmission valve - transmission filter)	1	
24	Transmission hose (transmission filter - transmission main valve)	1	
25	Transmission hose (transmission - torque converter cooler)	1	
26	Transmission hose (torque converter cooler - transmission)	1	
27	Accumulator (for PPC)	1	
28	Alarm	2	
29	Engine high-pressure piping clamp	1 set	Every 8,000 hours
30	Fuel spray prevention cap	1 set	
31	Seat belt (see "Seat Belt Inspection" on page 1-11)	1	Every 3 years after the start of usage or 5 years after the date of manufacture or at first sign of wear or damage

MAINTENANCE SCHEDULE CHART

This schedule outlines the maintenance to be performed on the machine according to the hours accumulated on the machine. Following this schedule will prolong the life of the machine.

Maintenance Interval and Item	Section - Page
INITIAL 10 HOURS SERVICE	
(SERVICE FOR THE FIRST 50 HOURS ON NEW MACHINE)	
LUBRICATING	3-89
INITIAL 250 HOURS SERVICE	
(ONLY AFTER THE FIRST 250 HOURS)	
CHANGE TRANSMISSION OIL FILTER CARTRIDGE	3-76
REPLACE HYDRAULIC TANK FILTER ELEMENT	3-79
INITIAL 1000 HOURS SERVICE	
(ONLY AFTER THE FIRST 1000 HOURS)	
CHECK ENGINE VALVE CLEARANCE, ADJUST	3-88
WHEN REQUIRED	
CLEAN, REPLACE AIR CLEANER ELEMENT	3-28
CHECK ADDITIONAL WATER SEPARATOR, CLEAN INSIDE CASE.	3-32
(For poor fuel arrangement specification)	
CLEAN INSIDE OF COOLING SYSTEM	3-33
CHECK TRANSMISSION OIL, ADD OIL	3-37
CHECK AXLE OIL LEVEL, ADD OIL	3-38
CLEAN AXLE CASE BREATHER	3-40
CLEAN AIR CONDITIONER CONDENSER	3-41
CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID	3-41
CLEAN RADIATOR FINS AND COOLER FINS	3-42
TURN, REPLACE BOLT-ON CUTTING EDGE	3-45
REPLACE BUCKET TEETH	3-46
CHECK AIR CONDITIONER	3-49
REPLACE SLOW-BLOW FUSE	3-51
CHECK FUNCTION OF ACCUMULATOR	3-52
SELECT TIRES	3-53
CHECK TIRE PRESSURE	3-54
CLEAN, REPLACE FUEL BREATHER FILTER	3-55
CHECK BEFORE STARTING	3-57
EVERY 50 HOURS SERVICE	
DRAIN WATER, SEDIMENT FROM FUEL TANK	3-58
(For standard specification)	
EVERY 100 HOURS SERVICE	
LUBRICATE REAR AXLE PIVOT PIN	3-59
CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL	3-59
CLEAN ELEMENT IN AIR CONDITIONER FRESH AIR FILTER	3-60

MAINTENANCE

EVERY 250 HOURS SERVICE

CHECK BATTERY ELECTROLYTE LEVEL	3-61
CHECK PARKING BRAKE	3-62
CHECK AIR CONDITIONER COMPRESSOR BELT TENSION, ADJUST	3-63
CHECK FOR LOOSE WHEEL HUB NUTS, TIGHTEN	3-64
CLEAN ELEMENT IN AIR CONDITIONER RECIRCULATION FILTER	3-64
CHECK FUNCTION OF BRAKE ACCUMULATOR	3-65
LUBRICATING	3-66

EVERY 500 HOURS SERVICE

CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE	3-67
REPLACE FUEL PREFILTER CARTRIDGE	3-69

EVERY 1000 HOURS SERVICE

REPLACE FUEL MAIN FILTER CARTRIDGE	3-72
(For standard specification)	
REPLACE FUEL MAIN FILTER CARTRIDGE	3-74
(For poor fuel arrangement specification)	
CHANGE OIL IN TRANSMISSION CASE, REPLACE CARTRIDGE, CLEAN STRAINER	3-76
CLEAN TRANSMISSION CASE BREATHER	3-77
LUBRICATING	3-77
CHECK ENGINE AIR INTAKE PIPING CLAMPS FOR LOOSENESS	3-78
CHECK ALTERNATOR DRIVE BELT TENSION, REPLACE	3-78
REPLACE CORROSION RESISTOR CARTRIDGE	3-78
(For standard specification)	
REPLACE CORROSION RESISTOR CARTRIDGE	3-78
(For poor fuel arrangement specification)	

EVERY 2000 HOURS SERVICE

CHANGE OIL IN HYDRAULIC TANK, REPLACE HYDRAULIC FILTER ELEMENT	3-79
REPLACE HYDRAULIC TANK BREATHER ELEMENT	3-82
CHANGE AXLE OIL (*)	3-83
REPLACE ELEMENT IN AIR CONDITIONER RECIRCULATION AIR FILTER, FRESH AIR FILTER	3-84
CHECK BRAKE DISC WEAR	3-85
CHECK FUNCTION OF PPC ACCUMULATOR	3-87
CHECK ALTERNATOR	3-88
CHECK ENGINE VALVE CLEARANCE, ADJUST	3-88
CHECK VIBRATION DAMPER	3-88

* The interval of 2,000 hours for changing the axle oil is for standard operations. If the brakes are used more frequently or the brakes make a sound, change the oil at shorter intervals.

EVERY 4000 HOURS SERVICE

LUBRICATING	3-91
CHECK WATER PUMP	3-91
CHECK STARTING MOTOR	3-91
CHECK AIR CONDITIONER COMPRESSOR, ADJUST	3-91
CHECK FOR LOOSE ENGINE HIGH-PRESSURE CLAMPS, HARDENING OF RUBBER	3-91
CHECK FOR MISSING FUEL SPRAY PREVENTION CAP, HARDENING OF RUBBER	3-92

EVERY 8000 HOURS SERVICE

REPLACE HIGH-PRESSURE PIPING CLAMPS	3-93
REPLACE FUEL SPRAY PREVENTION CAP	3-93

SERVICE PROCEDURE

Initial 10 Hours Service

Perform the following maintenance every 10 hours for the first 50 hours of operation for a new machine.

- Lubricating
 - ★ For details, see “Lubricating” on page 3-66.

Initial 250 Hours Service

Perform the following maintenance only after the first 250 hours.

- Change transmission oil filter cartridge.
 - ★ For details, see “Change Oil in Transmission Case, Replace Oil Filter Cartridge, Clean Strainer” on page 3-76.
- Replace hydraulic tank filter element.
 - ★ For details, see “Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element” on page 3-79.

Initial 1000 Hours Service

Carry out the following maintenance only after the first 1000 hours.

- Check engine valve clearance, adjust
 - ★ For details, see “Check Engine Valve Clearance, Adjust” on page 3-88.

MAINTENANCE

When Required

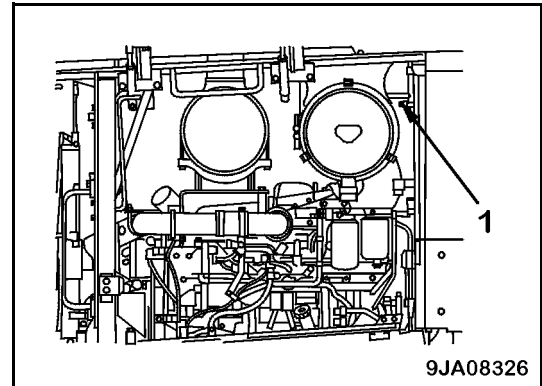
Clean, Replace Air Cleaner Element

WARNING

- Always stop the engine before doing this procedure. If inspection, cleaning, or maintenance is carried out with the engine running, dirt will get into the engine and damage it.
- When using compressed air, there is danger that dirt may be blown around and cause serious injury.
- Always use protective glasses, dust mask, and other protective equipment.

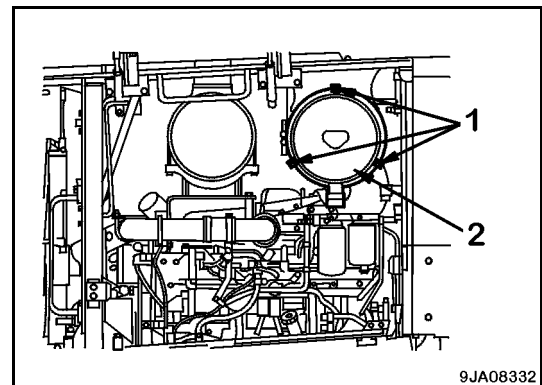
Inspect Air Cleaner Element

- ★ The air cleaner clogging caution lamp on the machine monitor lights up when the air cleaner element is clogged. For more information about this warning lamp, see “Air Cleaner Clogging Caution Lamp” on page 2-23.
- ★ If you wish to check the state of the air cleaner element, there is a dust indicator (1) installed inside the engine hood on the right side of the machine. When the yellow piston of the dust indicator enters the red range (7.5 kPa [1.09 psi]), it is time to clean the air cleaner element. Follow the inspection procedure as described in “Check Air Cleaner” on page 2-86.



Clean Outer Element

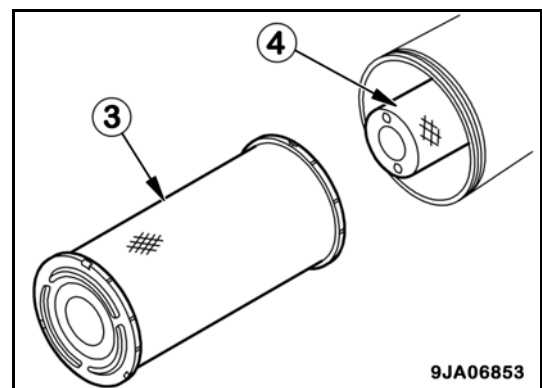
1. Stop the engine.
2. Open the engine side cover on the right side of the chassis.
3. Remove three clips (1), then remove cover (2).



Remark

*Do not remove the inner element (4). If it is removed, dust will enter and cause engine trouble. The inner element is removed **ONLY** when you are replacing the outer element; see “Replace Element” on page 3-30.*

4. Remove the outer element (3) from the air cleaner.



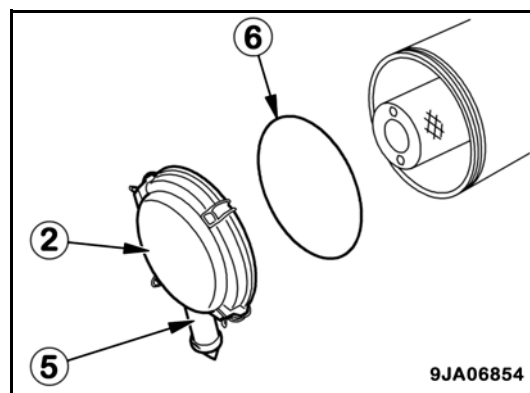
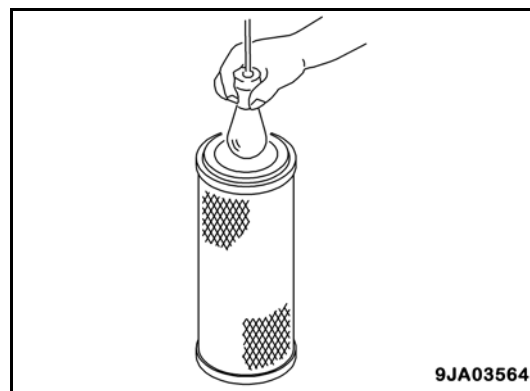
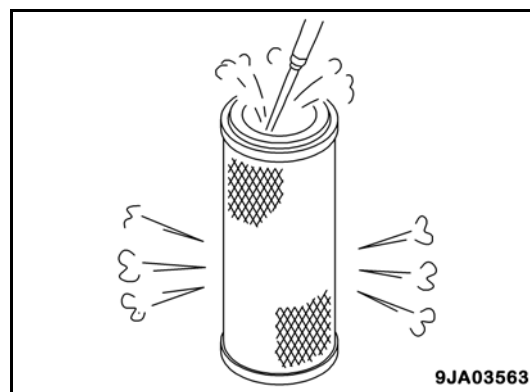
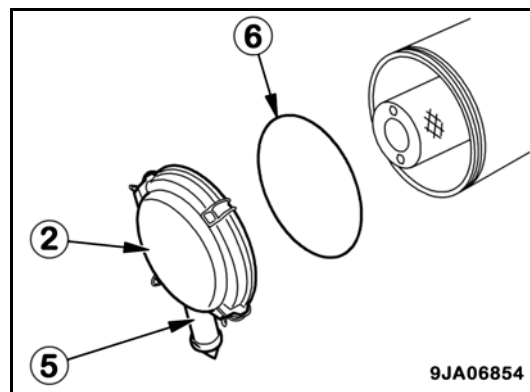
5. Clean the inside of the air cleaner body, the cover (2), and evacuator valve (5).
6. Check the condition of the O-ring (6).

⚠ WARNING
 You must replace the O-ring if it is damaged (scratches, etc.).

7. Direct dry compressed air (max. 0.69 MPa (100.1 psi)) from the inside of the outer element along its folds. Then direct the compressed air from the outside along the folds, and again from the inside.

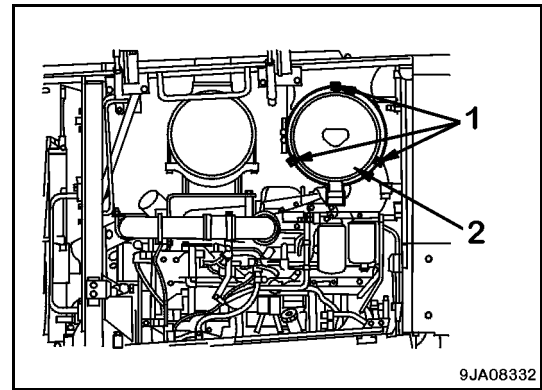
8. After cleaning the element, check it by shining a light through it. If you find any small holes or thin cracks, replace the element.
 - ★ When cleaning the element, do not hit it or beat it against anything.
 - ★ Do not use an element that has damaged folds, gaskets, or seals.

9. Insert the clean outer element into the air cleaner; then install the O-ring (6) and cover (2).
 - ★ Make sure that the O-ring is not damaged.



MAINTENANCE

10. Secure the cover (2) with mounting clips (1).

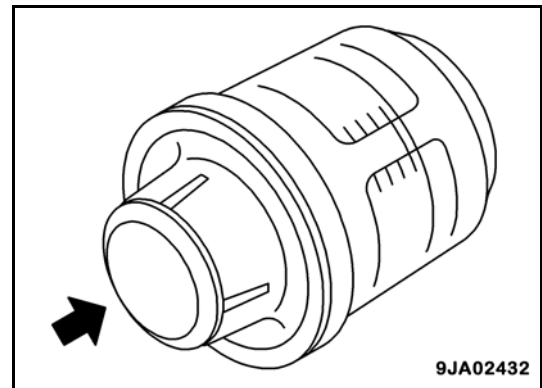


11. Press the dust indicator button to return the yellow piston to its original position.

12. Close the engine side cover on the right side of the machine.

13. You must replace both the inner and outer elements if one of the following events occurs immediately after you have cleaned the element.

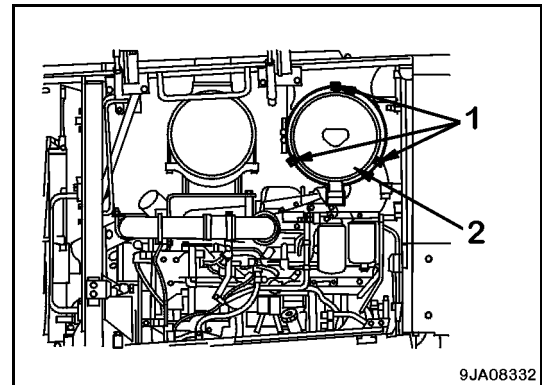
- The air cleaner clogging caution lamp lights up immediately.
- The yellow piston reaches the red line (7.5 kPa [1.09 psi]).



Replace Element

★ You must replace the inner element and the O-ring if you are replacing the outer element.

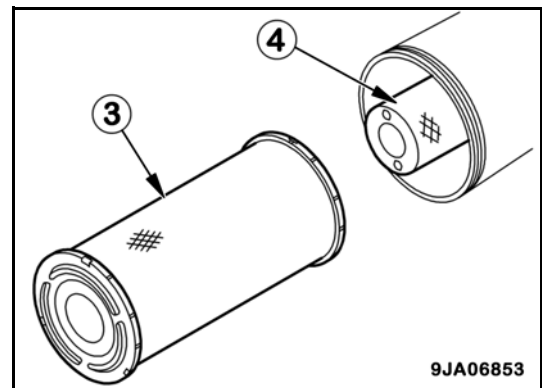
1. Stop the engine.
2. Open the engine side cover on the right side of the chassis.
3. Remove three clips (1), then remove cover (2).



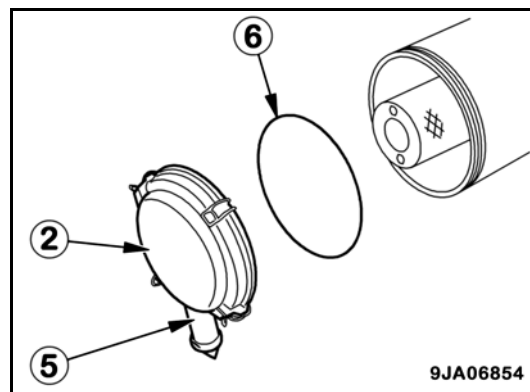
4. Remove outer element (3).

Remark

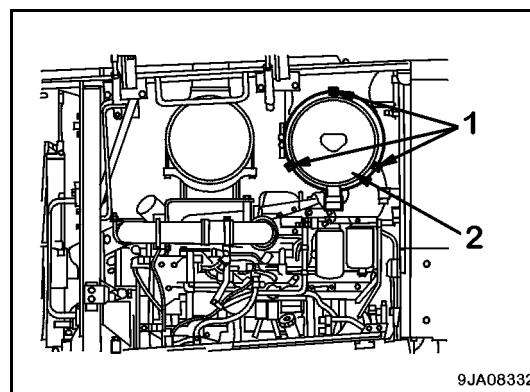
Do not remove the inner element (4) at this time.



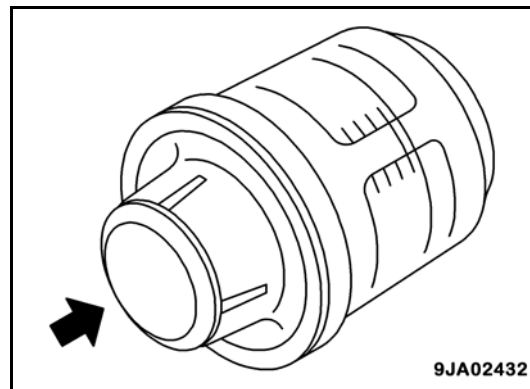
5. Discard the O-ring (6).
6. Clean the inside of the air cleaner body, cover (2), and evacuator valve (5).
7. Remove the inner element (4), then install a new inner element immediately.
8. Insert the new outer element (3) into the air cleaner; install the new O-ring (6) and the cover (2).



9. Secure the cover (2) with mounting clips (1).



10. Press the dust indicator button to return the yellow piston to its original position.
11. Close the engine side cover on the right side of the machine.



MAINTENANCE

Check Additional Water Separator, Clean Inside Case

- ★ For poor fuel arrangement specification

WARNING

- The engine fuel piping system is under high internal pressure when the engine is running. Always reduce the internal pressure before draining water or replacing the element cup.
 - This engine consists of higher precision parts than on the conventional fuel injection pump and nozzle. If dirt gets in, it will cause problems. If there is any dirt stuck to the fuel line, use fuel to wash it off completely.
 - Do not bring fire close.
-
- ★ When carrying out inspection and maintenance of the fuel system, be particularly careful not to let any dirt or dust get in. If there is any dirt or dust around the fuel system, clean it off thoroughly with fuel before starting the operation.
 - ★ To prevent dirt or dust from getting into the fuel circuit, remove all dirt and dust from the surrounding area before starting the operation.

Required

- Container to catch the fuel

1. Stop the engine and open the engine side cover on the right side of the chassis.

2. Drain the water and fuel.

- ★ For details, see “Check Additional Water Separator, Drain Water” on page 2-84.

3. Loosen the ring nut (1), then remove case (2).

4. Pull screen (5) down to remove it from the water separator holder (3).

5. Wash screen (5) in clean fuel.

- ★ Check screen (5) and replace it if it is damaged.

6. Wash the inside of case (2) with clean fuel.

- ★ Check case (2). If it is scratched, damaged, or so dirty that the position of float (6) cannot be checked, replace case (2).

7. Wash the inside of water separator holder (3) with clean fuel.

8. Install screen (5) to the water separator holder and replace O-ring (7) with a new part.

9. Tighten plug (4) and insert in case (2). Be careful not to let float (6) be at an angle.

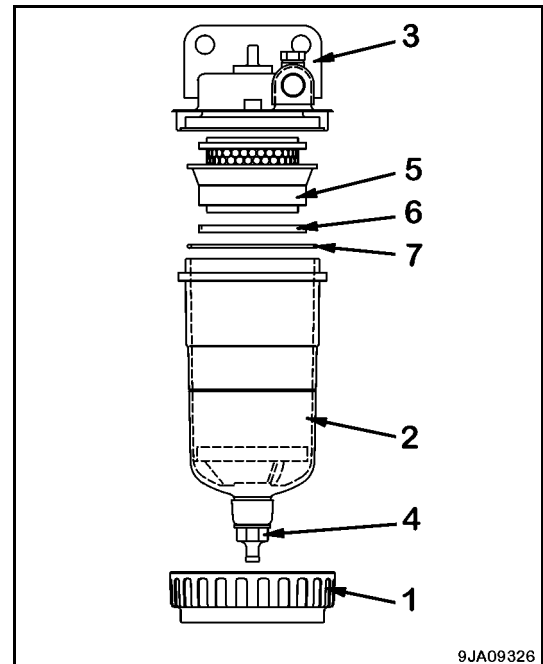
Tightening torque: 2 – 3 N•m (18 – 27 lbf in)

10. Install case (2) to the water separator holder (3), then tighten ring nut (1).

Tightening torque: 23 – 27 N•m (17 – 20 lbf ft)

11. After completing the inspection and cleaning, bleed the air.

- ★ For details of bleeding the air, see “Bleeding Air from Fuel Line” on page 3-73.



Clean Inside of Cooling System

WARNING

- Use a ladder or stand when removing or replacing the radiator cap and when adding water.
- Immediately after stopping the engine, the engine coolant is very hot and the pressure inside the radiator is high. Removing the cap and draining the coolant under this condition could cause burns. Allow the engine to cool down and then turn the cap slowly to release the pressure.
- Start the engine and flush the system. When standing up or leaving the operator's seat, set the work equipment lock lever to the LOCK position.
- For details about starting the engine, see "Check Before Starting Engine" on page 2-80, "Adjustments" on page 2-90, and "Starting Engine" on page 2-98.
- When the undercover is removed, there is danger of touching the fan. Never enter the rear of the machine when the engine is running.

- ★ Stop the machine on level ground when cleaning the cooling system or changing the coolant.

Clean the inside of the cooling system and change the coolant according to the schedule in the following table.

Antifreeze Coolant	Interval for Cleaning Inside Cooling system and Changing Antifreeze Coolant	Precautions for Use
Komatsu Supercoolant (AF-NAC)	Every two years or every 4,000 hours whichever comes first	1 ★

- ★ When using Komatsu Supercoolant (AF-NAC), there is no need to use a corrosion resistor.

When no corrosion resistor is used, use the special cover. Consult your Komatsu distributor for installation instructions.

- ★ When using corrosion resistor, use Komatsu genuine corrosion resistor.

If you use another corrosion resistor, it may cause serious problems such as corrosion of the engine and parts of the cooling system that use light metals such as aluminum.

- The coolant prevents corrosion as well as freezing.
- Even in areas where freezing is not an issue, the use of antifreeze coolant is essential.
- Even in areas where it is not necessary to prevent freezing, use Supercoolant (AF-NAC) at a mixing ratio of at least 30% to prevent corrosion of the cooling system.
- Komatsu machines are supplied with Komatsu Supercoolant (AF-NAC).
Komatsu Supercoolant (AF-NAC) has excellent anti-corrosion, antifreeze, and cooling properties and can be used continuously for two years or 4,000 hours.
- As a basic rule, we do not recommend the use of any coolant other than Komatsu genuine Supercoolant (AF-NAC).
If you use another coolant, it may cause serious problems such as corrosion of the engine and parts of the cooling system that use light medals, such as aluminum.
- To maintain the anti-corrosion properties of Supercoolant (AF-NAC), always keep the density of the Supercoolant between 30% and 68%.
- When deciding the proportions for mixing the coolant with water, check the lowest recorded temperature for your area and use the Water and Supercoolant Mix Ratio table on page 3-34 to decide the mixing ratio.

It is better to estimate a temperature about 10°C (50°F) lower than the minimum temperature.

MAINTENANCE

- The mixing ratio depends on the ambient temperature, but it should always be a minimum of 30% by volume (amount of antifreeze/total amount of coolant in system x 100).
- The freezing temperature of 100% undiluted Supercoolant is -15°C (5°F). Do not store undiluted Supercoolant at a temperature below -15°C (5°F).

Water and Supercoolant Mix Ratio Table

Min. atmospheric temperature	°C	Above -10	- 15	- 20	- 25	- 30
	°F	Above 14	5	- 4	- 13	- 22
Amount of antifreeze	Liters	10.8	12.6	14.4	16.2	18.0
	US gal	2.85	3.33	3.80	4.28	4.76
Amount of water	Liters	25.2	23.4	21.6	19.8	18.0
	US gal	6.66	6.18	5.71	5.23	4.76
Ratio	%	30	36	41	46	50

WARNING

- Antifreeze coolant is flammable. Keep it away from flame.
- Antifreeze coolant is toxic. When removing the drain plug, be careful not to get water containing antifreeze coolant on yourself.
- If antifreeze gets in your eyes, flush your eyes with a large amount of fresh water and see a doctor immediately.

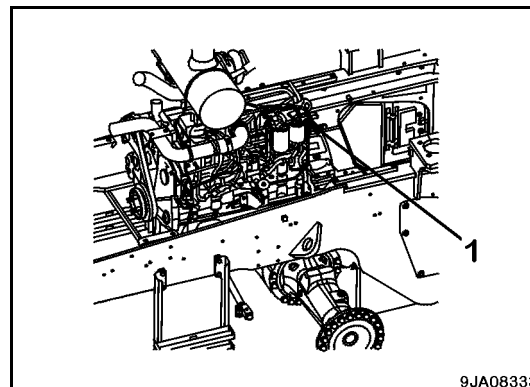
★ Stop the machine on a level surface.

Required

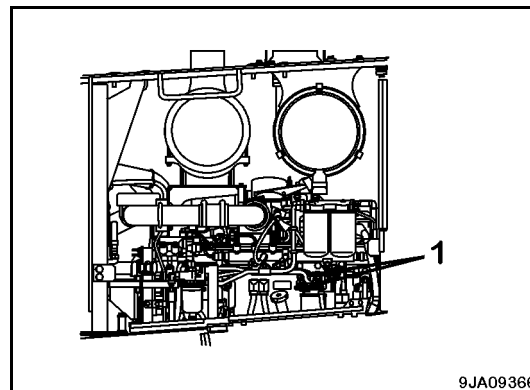
- Suitable water: To dilute the antifreeze; for details, see “Coolant and Water for Dilution” on page 3-6.
- Antifreeze density gauge: To control the mixing proportions.
- Container: To catch the drained coolant; capacity must be larger than the specified coolant volume.
- Hose: To fill the machine with coolant and water.

1. Stop the engine.
2. Open the engine side covers and tighten two valves (1) of the corrosion resistor.

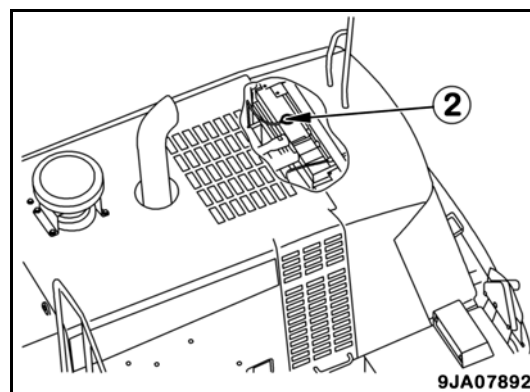
★ Graphic for standard specification



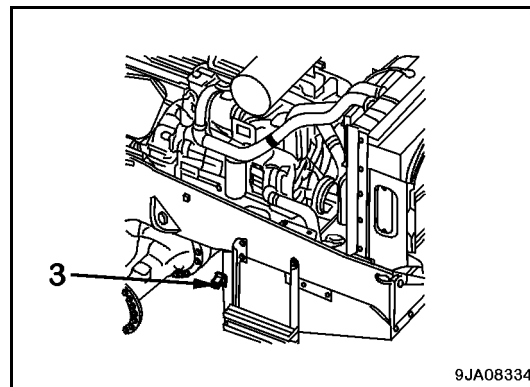
★ Graphic for poor fuel arrangement specification



3. Check that the surface of the radiator cap is cool enough to be touched by hand.
4. Turn the radiator cap (2) slowly until it contacts the stopper to release the pressure.
5. Push radiator cap (2) further; turn it until it contacts the stopper; then remove it.
6. Put a container under the radiator to catch the coolant.



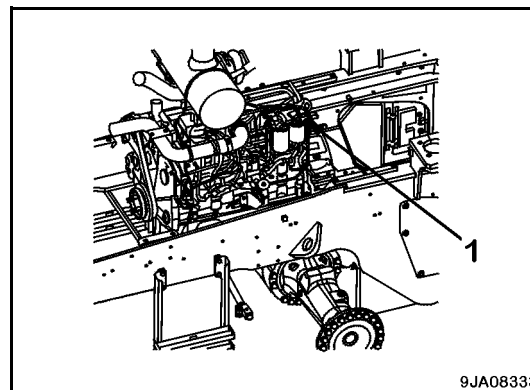
7. Open drain valve (3), at the left side of the fuel tank and drain the water.
8. Close drain valve (3) and fill the radiator with water.
9. Start the engine and run it at low idle. Keep the engine running at low idle for ten minutes until the coolant temperature reaches more than 90°C (194°F).
10. Stop the engine; open drain valve (3); drain the water; then tighten the drain valve again.



11. Clean the cooling system with the cleaning agent. Follow the instructions provided with the cleaning agent.
12. Replace the corrosion resistor cartridge, then open the two valves (1).

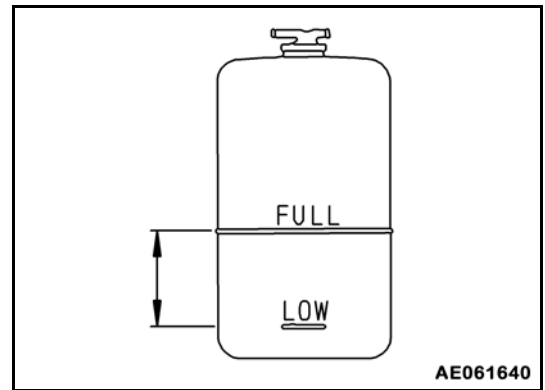
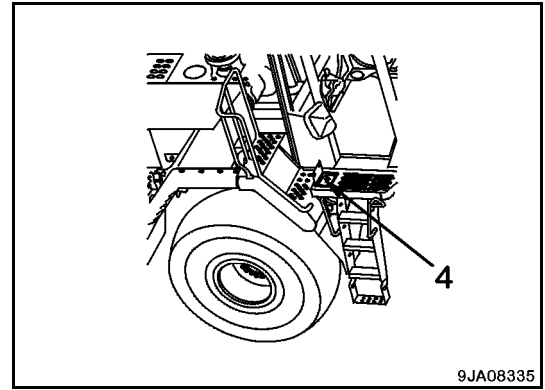
★ For details about replacing the corrosion resistor, see “Replace Corrosion Resistor Cartridge (Standard Specification)” on page 3-78 or “Replace Corrosion Resistor Cartridge (Poor Fuel Arrangement Specification)” on page 3-78.

13. Add the coolant and water mix through the water filler port until it overflows. To determine the mixing ratio for the antifreeze and water, see “Water and Supercoolant Mix Ratio Table” on page 3-34.



MAINTENANCE

14. Bleed the air from the cooling system.
 - Run the engine at low idle for five minutes, then for a further five minutes at high idle. (This removes the air from the coolant.)
 - ★ Make sure that the radiator cap is off.
15. Drain the coolant inside the subtank (4) and clean the inside of the subtank.
16. Add water to the subtank to a point midway between the FULL and LOW marks.
17. Stop the engine and wait for three minutes.
18. Add coolant to the radiator until the coolant level is near the coolant filler port, then tighten the cap. Check the coolant level and add coolant, if necessary.
19. Replace the radiator cap and tighten it.



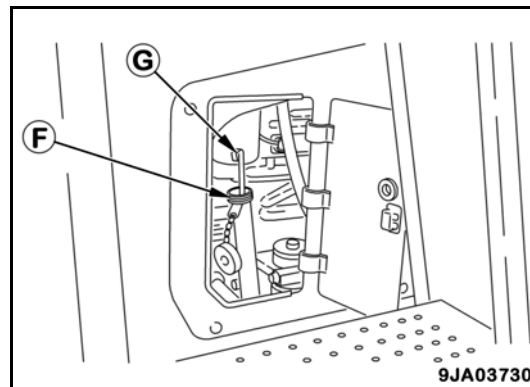
Check Transmission Oil, Add Oil

! WARNING

- The parts and oil are very hot immediately after the engine is stopped and may cause burns, if touched.
- Wait for the temperature to drop before starting the work.

★ Do this procedure if there is any sign of oil on the transmission case or if there is oil mixed with the cooling water.

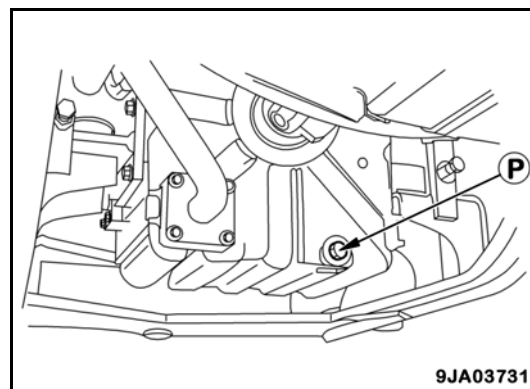
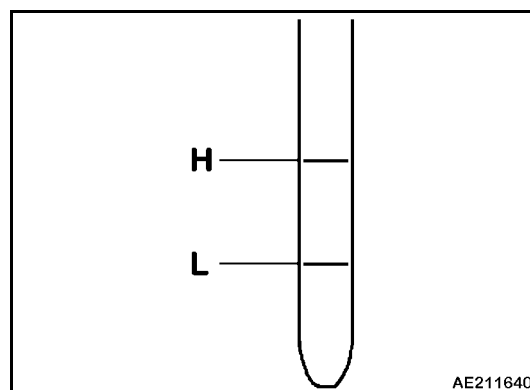
1. Start the engine and run it for at least five minutes.
2. Open the cap of oil filler port (F).
3. Take out the dipstick (G) and use a cloth to wipe off the oil.



4. Fully insert dipstick (G) into filler pipe (F) and then remove it.

★ The oil level should be between the H and L marks on dipstick (G).

- ★ If the oil level is below the L mark, add oil through oil filler (F).
- ★ If the oil is above the H mark, drain the excess engine oil from drain plug (P) and check the oil level again.
- ★ If the oil level is correct, insert dipstick (G) in the dipstick guide and then tighten the cap.



MAINTENANCE

Check Axle Oil Level, Add Oil

⚠ WARNING

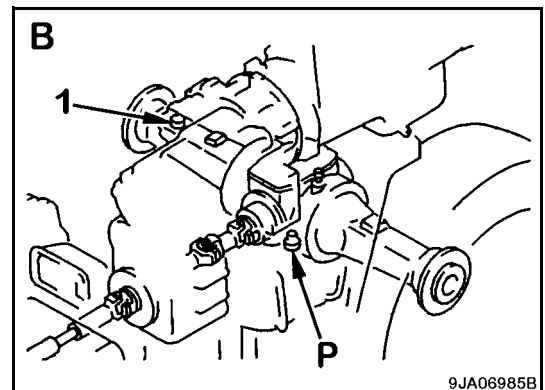
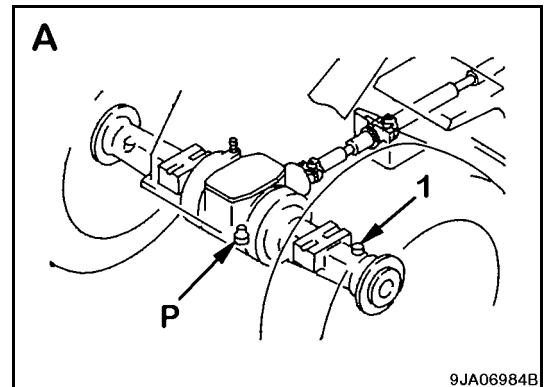
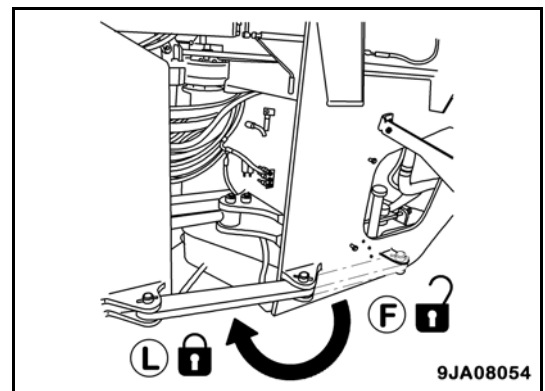
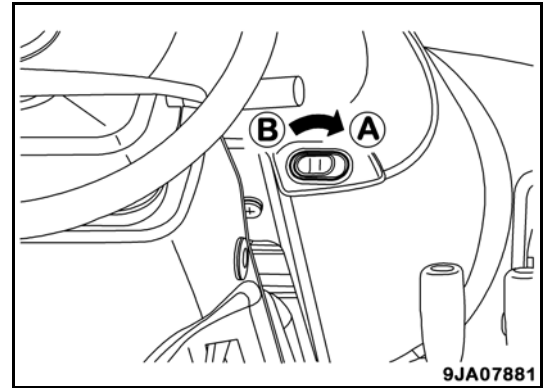
- Apply the parking brake and lock the front and rear frames with the frame lock bar.
- After stopping the engine, the parts and oil are very hot. Wait for the temperature to go down before starting this operation.

- ★ Do this procedure if there is any sign of oil on the axle case.
 - ★ Inspect the machine when it is parked on a horizontal road surface. If the road surface is at an angle, the oil level cannot be checked correctly.
1. Set the parking brake switch to the ON position (A).
 2. Lower the work equipment to the ground; stop the engine; and wait for the temperature of all parts to go down.
 3. Set the frame lock bar to the LOCK position (L) to lock the front and rear frames.

4. Remove the mud and dirt from around oil level plug (1), then remove the plug.

- A: Front axle
- B: Rear axle

5. Use a cloth to wipe off any oil stuck to the oil level gauge attached to plug (1).

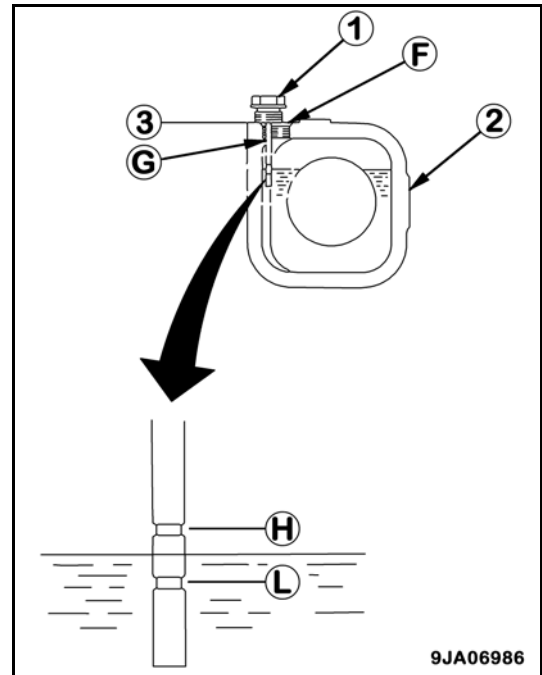


6. Set the oil level gauge (G) as shown in the graphic.
 - (2): Axle
 - (3): Spot facing face
7. The oil level should be between the two lines (H) and (L) on the oil level gauge.
 - ★ If the oil is below the (L) line, add axle oil through oil filler port (F).
 - ★ If the oil level is above the (H) line, drain the excess oil through drain plug (P), then check the oil level again.
 - ★ If the oil level is correct, install oil level plug (1)

Tightening torque: 127 – 177 N•m (94 – 131 lbf ft)

Remark

For axles with the limited-slip differential, the brand of lubricating oil is different. Use the specified lubricating oil as listed in "RECOMMENDED FUEL, COOLANT, AND LUBRICANTS" on page 3-12.



MAINTENANCE

Clean Axle Case Breather

WARNING

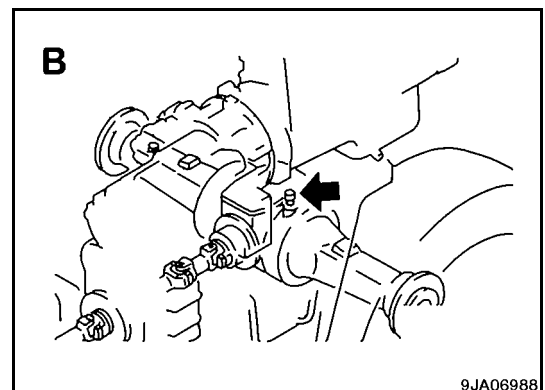
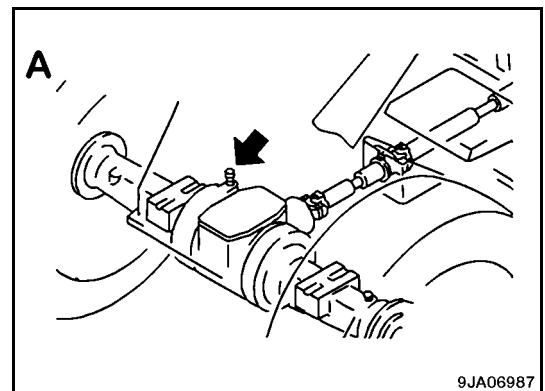
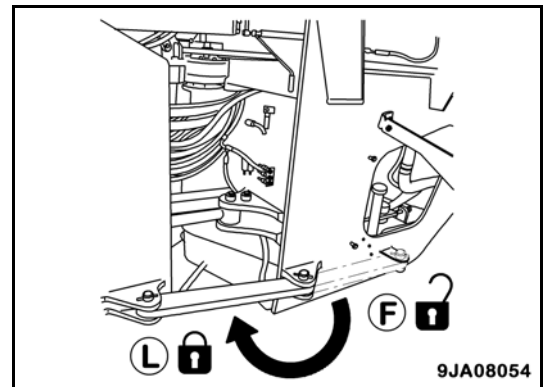
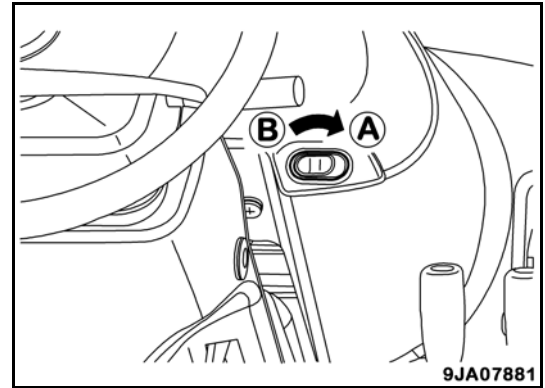
Apply the parking brake and lock the front and rear frames with the frame lock bar.

1. Set the parking brake switch to the ON position (A).
2. Lower the work equipment to the ground; stop the engine; and wait for the temperature of all parts to go down.
3. Set the frame lock bar to the LOCK position (L) to lock the front and rear frames.
4. Use a brush to clean off all the mud or dirt from around the breather.
 - A: Front axle
 - B: Rear axle
5. Remove the breather and soak it in cleaning liquid, then clean it.
6. Clean the breather at two places (front and rear).

Remark

When removing the breather, be careful that dirt or dust does not get into the mount.

7. Install the breather.



Clean Air Conditioner Condenser

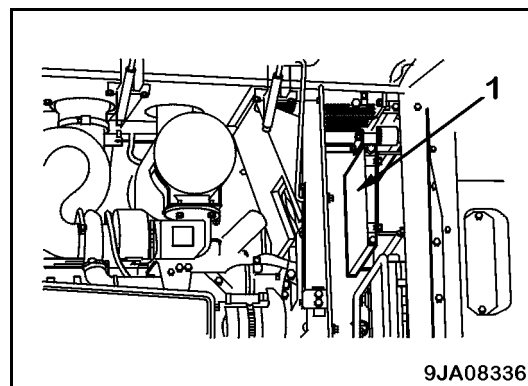
⚠ WARNING

- Do not wash the condenser using a steam cleaner. There is danger that the condenser could overheat.
- If high-pressure water hits your body directly or the water sends dirt flying, there is danger of personal injury.
- Always wear protective glasses, dust mask, and other protective equipment.

★ If there is mud or dust on the air conditioner condenser, clean it with water.

★ If the water pressure is too high, the fins may get deformed. When washing with a high-pressure washer, apply the water from a reasonable distance.

1. Open the engine side cover on the left side of the machine.
2. Wash the top of the condenser (1) with water.

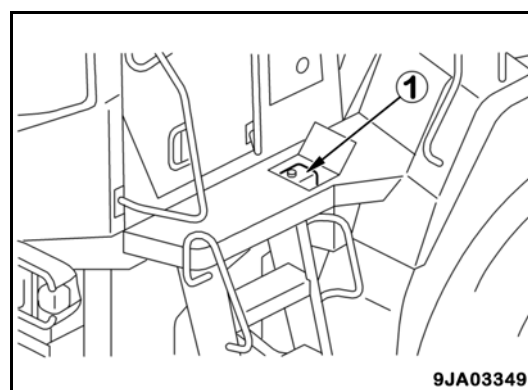


Check Window Washing Fluid Level, Add Fluid

1. Open the cover of the washer tank (1).
2. Check the level of the washing fluid.
3. Add automotive window washing fluid, if the fluid level is low.

Remark

Be careful not to let dirt and dust get into the fluid.



MAINTENANCE

Clean Radiator Fins and Cooler Fins

⚠ WARNING

- Never open the engine side cover when the engine is running. Stop the engine completely before starting the cleaning operation (compressed air method).
- If compressed air, pressurized water, or steam hits your body directly or causes dirt to fly, there is danger of personal injury.
- Always wear safety glasses, dust mask, or other protective equipment.

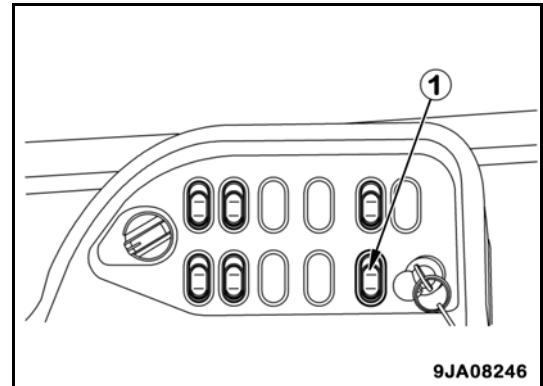
- ★ Clean the radiator fins if any mud or dirt is stuck to the radiator.
- ★ There are two methods of cleaning the radiator fins:
 - Using the fan reverse function
 - Using compressed air

On job sites where it is easy for dirt to stick to the radiator or cooler, turn the cooling fan reverse rotation switch (1) ON to rotate the fan in reverse. This will blow off the dirt and dust stuck to the radiator or cooler, and can extend the cleaning interval.

Remark

When rotating the fan in reverse, be careful of flying dust and do not let any cloth get caught in the fan.

Dust may rise; check that there is no one in the surrounding area when rotating the fan in reverse.



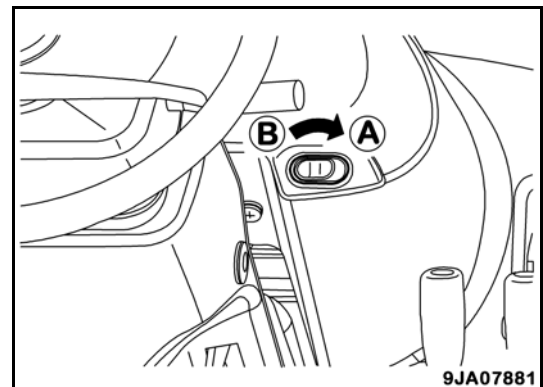
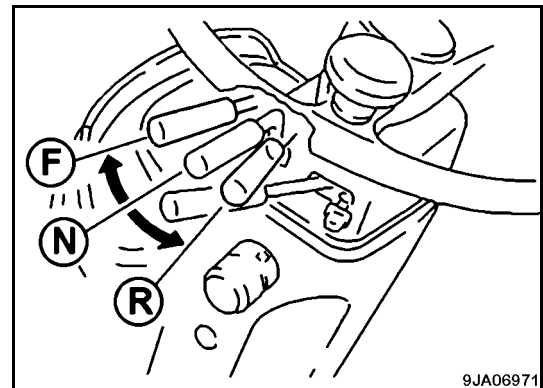
Using the Fan Reverse Function

Remark

Never rotate the fan in reverse by hand when carrying out the operation.

Before operating the fan reverse rotation switch, run the engine at low idle.

1. Set the directional lever to the neutral position (N).
2. Set the parking brake switch to the ON position (A) to apply the parking brake.
3. Run the engine at low idle.



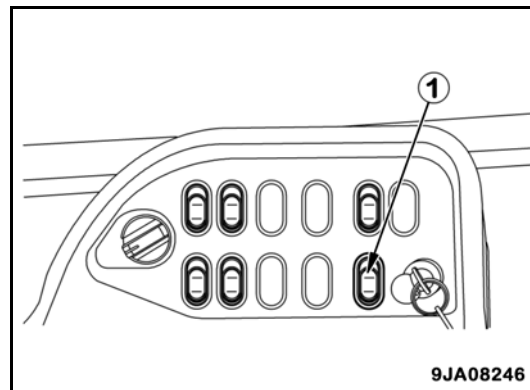
- Press position (a) (auto-reverse rotation ON) of the cooling fan reverse rotation switch (1).

★ For additional information about the fan reverse rotation switch, see “Cooling Fan Auto-Reverse Rotation Switch” on page 2-54.

- Check that the pilot lamp inside the switch and the cooling fan reverse rotation pilot lamp on the machine monitor light up.

The fan automatically rotates in reverse for two minutes every two hours.

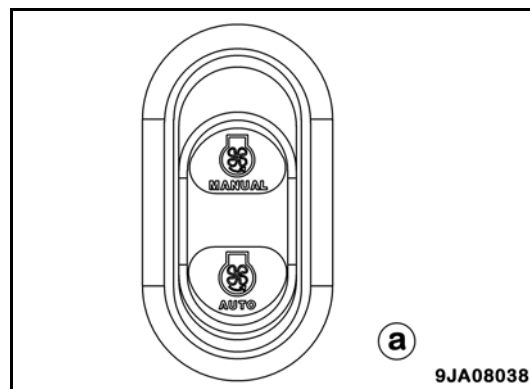
★ For additional information about the pilot lamp see “Cooling Fan Reverse Rotation Pilot Lamp” on page 2-25.



Remark

When the fan direction is switched, the reverse rotation pilot lamp flashes. When the machine is operating under high load or in low temperatures, the direction of rotation of the fan may not change. This protects the machine.

- If the direction of fan rotation does not change, run the engine at low idle and wait for the oil temperature or water temperature to go down before operating the switch.



MAINTENANCE

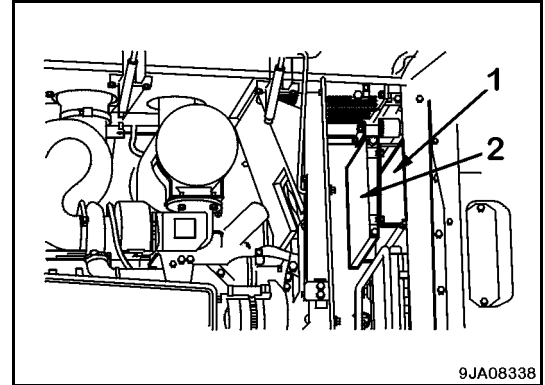
Using Compressed Air

- ★ Steam or water can be used instead of compressed air.

! WARNING

- Never open the engine side cover when the engine is running.
- Stop the engine completely before starting the cleaning operation.

1. Insert a jet nozzle through the gaps between the radiator, oil cooler, aftercooler (1), and air conditioner condenser (2).



When cleaning the face behind the radiator, or oil cooler, and aftercooler (1), remove bolt (4) and plate (3), then insert the jet nozzle through the opening to clean the fins.

- ★ If the steam jet nozzle is brought too close to the radiator fins, it may damage the fins. Keep the nozzle a suitable distance away from the fins when cleaning.

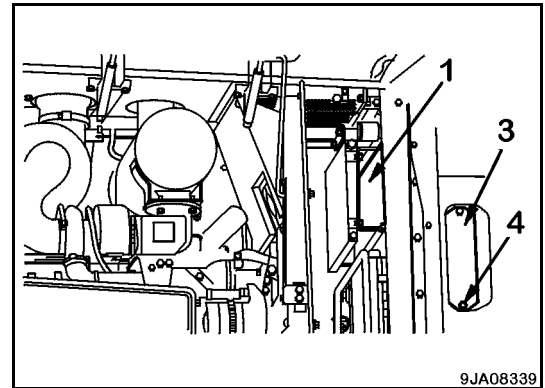
2. Work under the following rough conditions:

Injection pressure: Max. 9.8 MPa (1420 psi)

Nozzle diameter: Max. 2 mm (0.1 in)

Distance between nozzle and radiator fins: . . Min. 100 mm (3.9 in)

3. Inspect the rubber hoses. If any hose is cracked or deteriorated, replace it.
4. Check that there are no loose hose clamps.



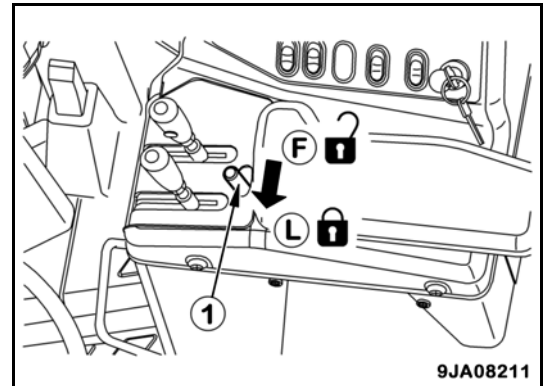
Turn, Replace Bolt-On Cutting Edge

⚠ WARNING

- It is dangerous if the work equipment moves by mistake during the turning or replacement operation.
- Set the work equipment on a stable position; stop the engine; then set the work equipment lock lever securely to the LOCK position to lock the work equipment control levers.

★ Turn or replace the cutting edge before the wear reaches the edge of the bucket.

1. Raise the bucket to a height greater than the height of the blocks (A).
2. Set the bucket so that the bottom of the bucket is horizontal to the blocks (A) and then lower the bucket so that the center of the bucket rests on the blocks.
3. Stabilize the bucket and then stop the engine.
4. Set the work equipment lock lever to the LOCK position (L).
5. Remove nuts and bolts (1), then remove cutting edge (2).



6. Clean the mounting surface of cutting edge (2).
7. Turn cutting edge (2) and install it to the bucket. When turning the edge, install it to the opposite side (left edge to right side, right edge to left side).

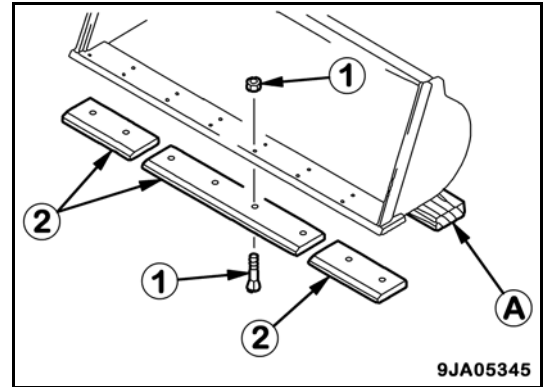
- ★ If both sides of the cutting edge are worn, replace with a new part.
- ★ If the wear extends to the mounting surface, repair the mounting surface before installing the cutting edge.

8. Tighten nuts and bolts (1) uniformly so that there is no gap between the bucket and cutting edge.

Tightening torque for mounting bolt:

..... 745 ±108 N•m (550 ±80 lbf ft)

9. Tighten the mounting bolts again after operating the machine for several hours.



MAINTENANCE

Replace Bucket Teeth (if equipped)

WARNING

- It is extremely dangerous if the work equipment moves when the teeth are being replaced. Set the work equipment in a stable position; stop the engine; and set the work equipment lock lever securely to the LOCK position to lock the work equipment control levers.
- If the pin is hit with a strong force, there is danger that the pin may fly out. Check that there is no one in the surrounding area.
- There is danger of pieces flying during the replacement operation. Always wear protective clothing, such as safety glasses and gloves.

One-Piece Tooth

Remark

Replace bucket teeth before they wear down as far as the bucket edge.

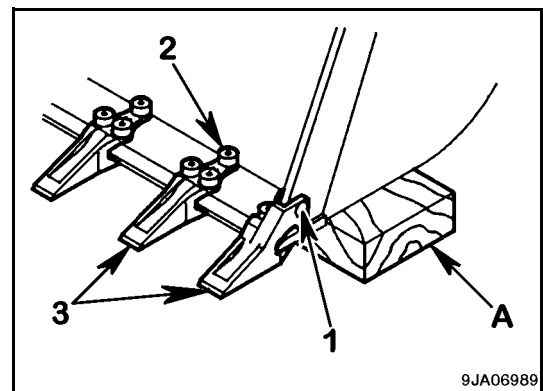
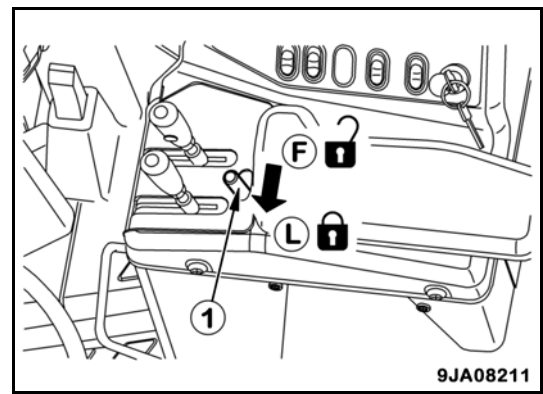
1. Raise the bucket to a height greater than the height of the blocks (A).
2. Set the bucket so that the bottom of the bucket is horizontal to the blocks (A) and then lower the bucket so that the center of the bucket rests on the blocks.
3. Stabilize the bucket and then stop the engine.
4. Set the work equipment lock lever to the LOCK position (L).
5. Remove the bolt (1) and nuts (2), and then remove bucket tooth (3).
6. Clean the installation surface of the bucket tooth.
7. If the mounting surface is worn, correct the mounting surface before installing the tooth.
8. Install the new tooth to the bucket.
 - When doing this, insert shims so that there is no clearance between the tooth and the top surface of the bucket.
 - Continue to add shims until it becomes impossible to add a 0.5 mm (0.02 in) shim.
9. To prevent any gap from forming between the tooth and tip of the bucket, tighten bolts (1) and nuts (2) temporarily, and then hit the tip of the tooth with a hammer.

Tightening torque:

(1): 637 ±853 N•m (470 ±629 lbf ft)

(2): 618 N•m (456 lbf ft)

10. After operating the machine for a few hours, tighten the mounting nuts again.



Bucket with Tip Tooth

! WARNING

- It is dangerous if the work equipment moves by mistake when the teeth are being replaced. Set the work equipment in a stable position; stop the engine; and lock the work equipment control levers securely with the work equipment lock lever.
- If the pin is hit with a strong force, there is danger that the pin may fly out. Check that there is no one in the surrounding area.
- There is danger of pieces flying during the replacement operation. Always wear protective clothing, such as safety glasses and gloves.

Remark

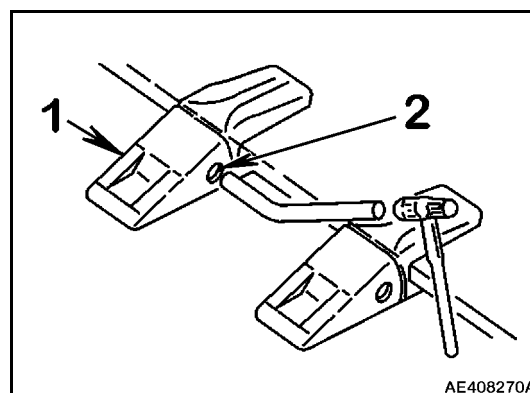
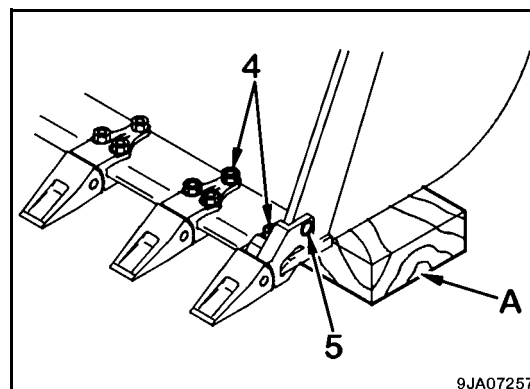
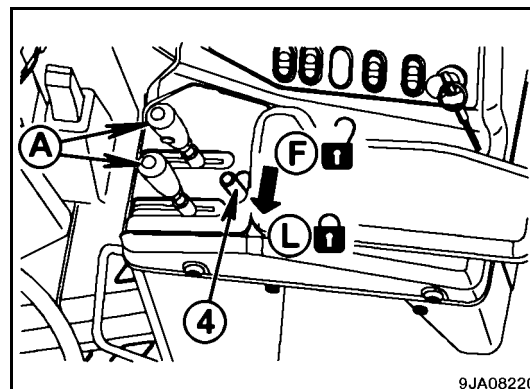
Replace the teeth before they wear down as far as the adapter.

1. Raise the bucket to a height greater than the height of the blocks (A).
2. Set the bucket so that the bottom of the bucket is horizontal to the blocks and then rest the center of the bucket on the blocks.
3. Stabilize the bucket and then stop the engine.
4. Set the work equipment lock lever to the LOCK position (L).
5. Remove pin (2) installed to the bucket, then remove tooth (1).

Use a rod (slightly narrower than the pin) in contact with the hatched portion (either left or right) and tap pin (2) out to the opposite side.

Remark

If the tooth cannot be removed by this method, for safety reasons always contact your Komatsu distributor to have the replacement carried out.



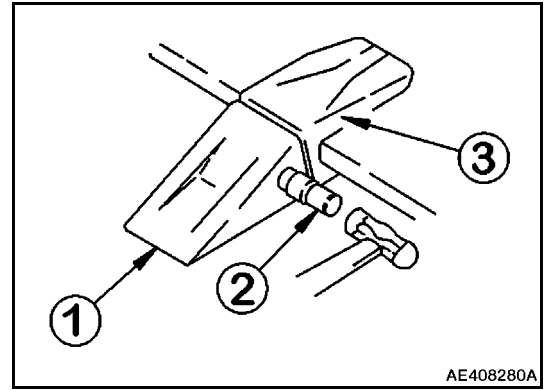
MAINTENANCE

6. Clean the installation surface of the tooth and adapter (3).
7. Fit new tooth (1) in adapter (3); use your hand to push in pin (2) partially; then knock it in with a hammer.
8. After operating the machine for a few hours, check that the pin does not come out.
9. If mounting bolts (4) or (5) of adapter (3) are loose, tighten them.

Tightening torque of mounting bolt:

(4): 637 ±853 N•m (470 ±629 lbf ft)

(5): 618 N•m (456 lbf ft)



Check Air Conditioner

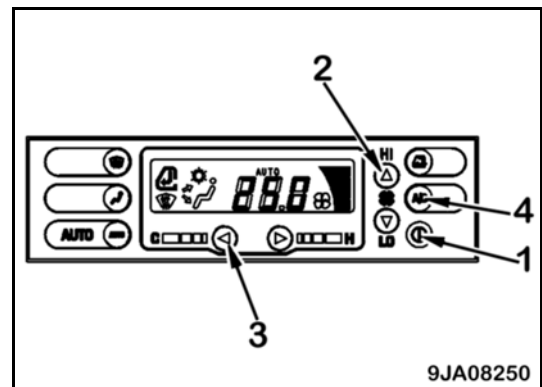
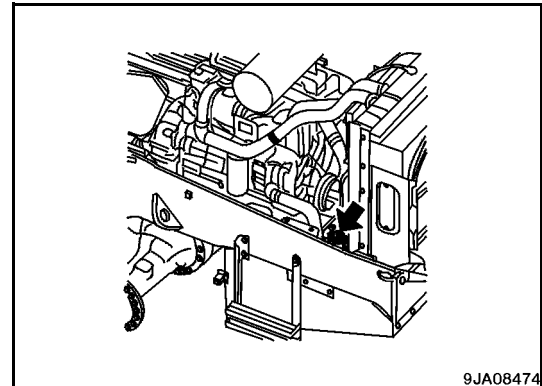
! WARNING

- If the refrigerant used in the air conditioner gets into your eyes or on your hands, it may cause loss of sight or frostbite.
- Do not touch the refrigerant.
- Never loosen any part of the refrigerant circuit.
- Do not bring any flame close to any point where the refrigerant gas is leaking.

Check Level of Refrigerant (Gas)

If the air conditioner is not cooling properly, there may be a lack of refrigerant (gas).

1. Start the engine and set the engine speed to about 1,500 rpm.
2. Press main power switch (1) of the air conditioner to turn the power ON.
3. Press fan switch (2) and set the air flow to “Hi.”
4. Press temperature control switch (3) to set the temperature to the lowest setting.
5. Open the door and window fully.
6. Press air conditioner switch (4) to turn the air conditioner switch ON.

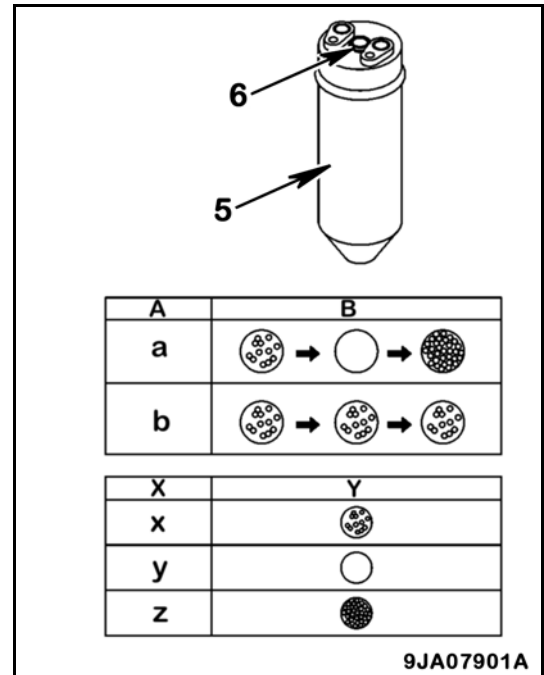


MAINTENANCE

7. Use sight glass (6) (inspection window) of receiver drier (5) to check the condition of the refrigerant gas (freon 134a) flowing in the refrigerant circuit.

A: Quantity of Refrigerant		B: Condition of Sight Glass
a	Proper	After air conditioner switch is turned ON, few bubbles are seen and refrigerant becomes milk-white and then becomes pale milk-white.
b	Insufficient refrigerant	After air conditioner switch is turned ON, bubbles are seen continuously.

X: Condition of Refrigerant Flow		Y: Condition of Sight Glass
x	There are bubbles.	Gas and liquid of refrigerant are mixed.
y	There are no bubbles.	All refrigerant is liquefied and transparent.
z	Refrigerant is milk-white.	Oil and refrigerant are separated from each other and their mixture is pale milk-white.



Schedule for Maintenance and Inspection

Inspection Location	Item to Check	Maintenance Interval		
		Check before Operating	6 Months	Replacement Interval
Filter	Clogging, dirt	Carry out check	–	2 years
Condenser	Clogging, dirt	Carry out check	–	–
Belt	Looseness, damage	Carry out check	–	2 years
Refrigerant gas	Amount	–	Carry out check	–
Piping	Looseness, damage, leakage	–	Carry out check	–
Receiver drier	–	–	–	2 years

When Not Using the Air Conditioner Regularly

To prevent leakage of the refrigerant from the air conditioner cooling circuit, operate the air conditioner for several minutes two or three times a month during the off-season. If the air conditioner is left for a long time when the refrigerant is leaking, it may cause internal rust.

Run the air conditioner in cooling or dehumidification plus heating mode for several minutes from time to time to prevent the loss of the oil film in various parts of the compressor.

If the temperature inside the cab is low, the air conditioner may not work. In such cases, use the recirculated air to warm up the inside of the cab, then turn the air conditioner switch on.

Replace Slow-Blow Fuse

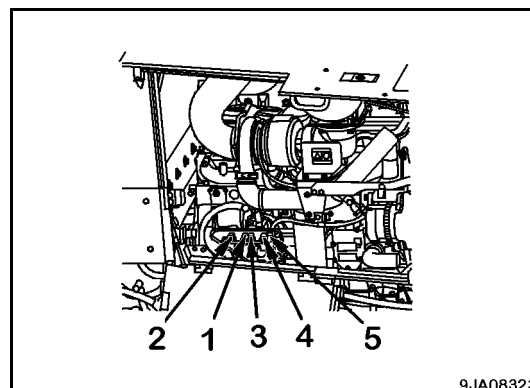
Remark

Always turn the power OFF when replacing the slow-blow fuse (turn the starting switch to the OFF position). If machine is equipped with a battery disconnect switch, turn switch to turn off power to machine and take key out also.

Always replace the slow-blow fuse with one of the same capacity.

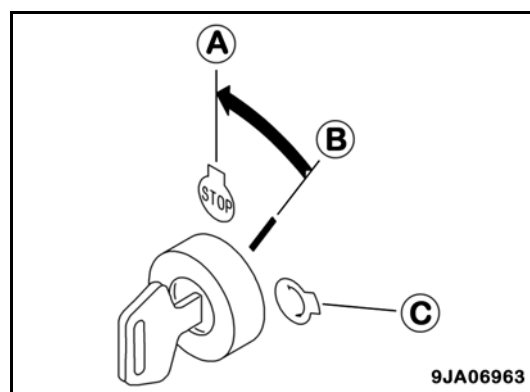
- ★ The slow-blow fuses (1), (2), (3), (4), (5) are located in a fuse box at the left side of the machine, at the side of the engine.

(1)	50A	Permanent power source
(2)	50A	Main power A
(3)	50A	Main power B
(4)	120A	Charging circuit
(5)	120A	Heater relay (electrical air intake heater)



9JA08323

1. Turn the starting switch to the OFF position (A).
2. Remove the slow-blow fuse box from the chassis.



9JA06963

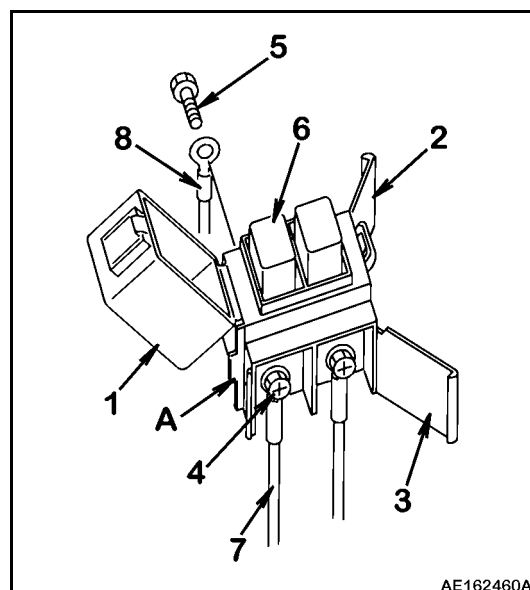
3. Open covers (1), (2), and (3) of the slow-blow fuse box.

Covers (2) and (3) can be removed easily by using protrusion (A) on the body as a fulcrum and levering the catch of the cover with a flat-headed screwdriver to release it.

4. Loosen screws (4) and (5) and remove them.

When screws (4) and (5) are removed, slow-blow fuse (6) will also come off, together with electric wiring (7) and (8).

5. Using screws (4) and (5), install a new slow-blow fuse together with electric wiring (7) and (8) in the slow-blow fuse box; then close covers (1), (2), and (3).
6. Install the slow-blow fuse box to the chassis.



AE162460A

MAINTENANCE

Check Function of Accumulator

WARNING

- The accumulator is charged with high-pressure nitrogen gas.
 - When handling the accumulator, a careless procedure may cause an explosion which could lead to serious personal injury or death.
-

Remark

For details about handling the accumulator, see “Accumulator and Gas Spring” on page 1-50.

Accumulator for Travel Damper (ECSS)

When the ECSS switch is ON, the hydraulic spring effect of the accumulator absorbs the up-and-down motion of the machine during travel, and reduces swaying.

- Drive the machine and compare the up-and-down movement of the machine during travel when the ECSS switch is ON and when it is OFF.
 - If there is no change in the up-and-down movement of the machine, the gas pressure in the accumulator has probably dropped.
 - Contact your Komatsu distributor to have the accumulator inspected.

Remark

Carry out the inspection with the speed range set to 2 – 4 and the machine traveling at a speed of at least 5 km/h (3 mph). If the speed range is 1st or if the machine is traveling at a speed of less than 5 km/h (3 mph), the ECSS will not be actuated even if the ECSS switch is turned ON.

Accumulator for Brake Damper

When the brake pedal is depressed, the hydraulic spring effect of the accumulator actuates the brake smoothly.

If any change is felt in the smoothness of the brake operation during daily operations, the gas pressure in the accumulator has probably dropped. Please contact your Komatsu distributor to have the accumulator inspected.

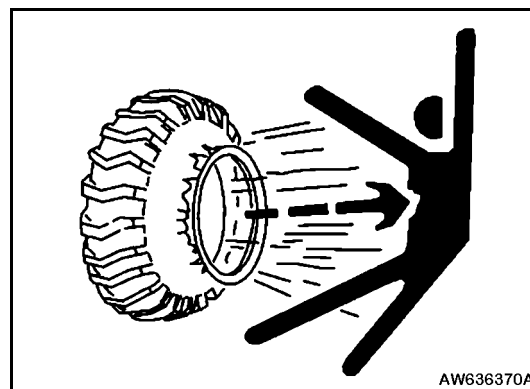
Remark

Even if there is a change in the smoothness, there is no drop in the braking force or brake performance.

Select Tires

⚠ WARNING

- If a tire or a rim is handled improperly, the tire may burst or may be damaged and the rim may be broken and scattered. This can cause serious injury or death.
- Because maintenance, disassembly, repair, and assembly of the tires and rims require special equipment and skill, make sure to ask a tire repair shop to do the work.
- Do not heat or weld the rim to which the tire is installed. Do not make a fire near the tire.



⚠ WARNING

- Select the tires according to the conditions of use and the weight of the attachments on the machine.
- Use only specified tires and inflate them to the specified pressure. See “Check Tire Pressure” on page 3-54.
- Use the following table to select the tires according to the conditions of use and the weight of the attachments of the machine.
- Since the travel speed indicated on the speedometer varies with the tire size, consult your Komatsu distributor when using optional tires.

		Tire Size	Maximum Load kg (lb)
Standard	Front and Rear	23.5-25-16PR	9,095 (20,051)

MAINTENANCE

Check Tire Pressure

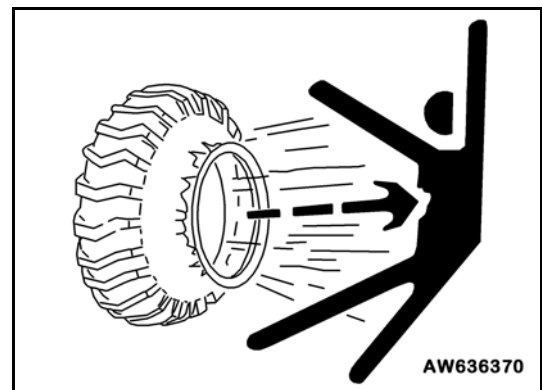
WARNING

- When inflating a tire, check that no one enters the working area.
- Use an air chuck which has a clip and can be fixed to the air valve.
- While inflating the tire, check the inflation pressure occasionally so that it does not rise too high.
- If the rim is not fitted normally, it may be broken and scattered while the tire is inflated. To ensure safety, place a guard around the tire and do not work in front of the rim; work on the tread side of the tire.
- Abnormal drop of inflation pressure and abnormal fitting of the rim indicate a problem in the tire or rim. In this case, be sure to ask a tire repair shop to do the repairs.
- Be sure to observe the specified inflation pressure.
- Do not adjust the inflation pressure of the tires immediately after high-speed travel or heavy-duty work.

- ★ Measure the inflation pressure with a tire pressure gauge while the tires are cool, before starting work.

Inflation of Tires

- Adjust the inflation pressure properly.
- When inflating a tire, use an air chuck which can be fixed to the air valve of the tire as shown in the graphic.
- Do not work in front of the rim; work on the tread side of the tire.

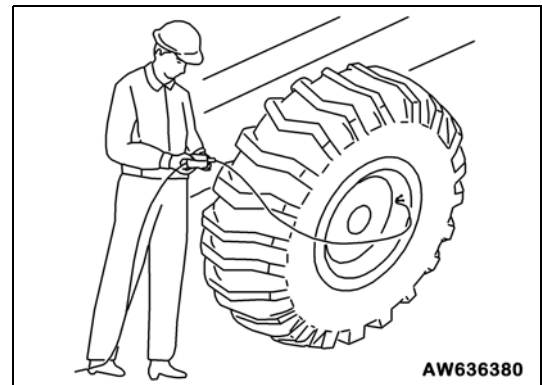


Remark

The optimum inflation pressure differs according to the type of work being performed. For details, see "HANDLING TIRES" on page 2-154.

The proper inflation pressure is shown in the following table.

	Tire Size	Inflation Pressure kPa (psi)
Standard	23.5-25-16PR	Front Tire: 350 (51) Rear Tire: 310 (45)

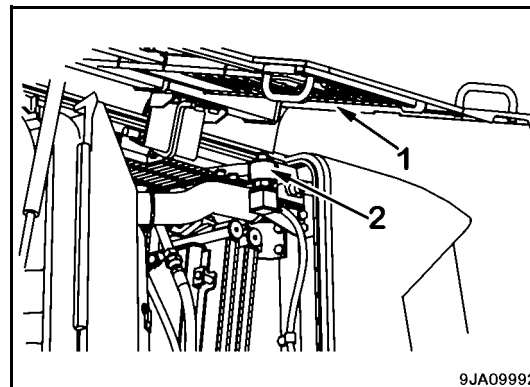


Clean, Replace Fuel Breather Filter

⚠ WARNING

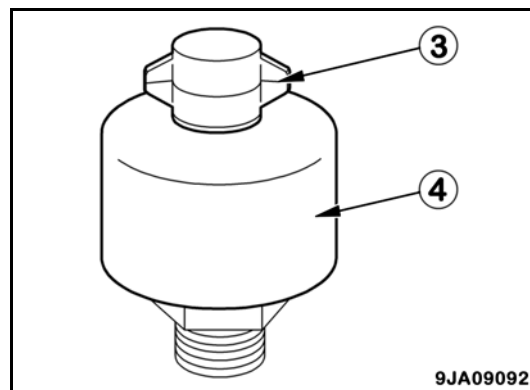
- If inspection and cleaning is carried out with the engine running, dust will enter the fuel tank and this will lead to damage to the engine.
- Always stop the engine before carrying out inspection or cleaning.

1. Open engine side cover (1) on the left side of the machine.



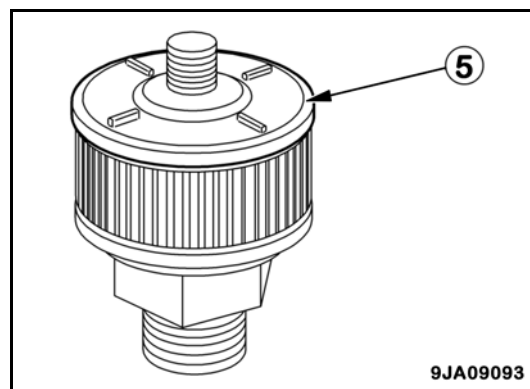
2. Loosen nut (3) at the top of fuel breather (2) at the top of the radiator frame, then remove it.

3. Turn cover (4) counterclockwise and remove it.



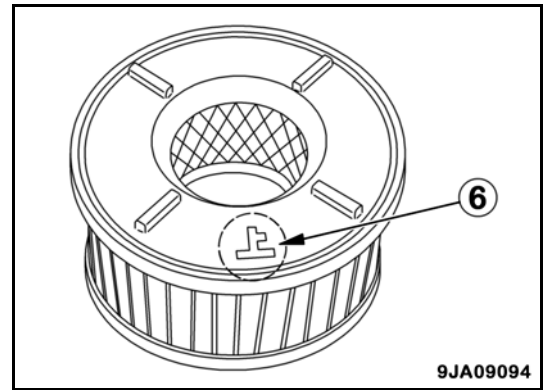
4. Remove element (5) from the top.

5. Blow with dry compressed air from the inside of the element.



MAINTENANCE

6. After cleaning, install the element to the breather.
 - When doing this, be careful not to mistake the direction of installation.
 - Set so that the surface with the mark shown in (6) is at the top, then install.
7. Install the cover (4).
8. Tighten nut (3).
Tightening torque: 10 – 14 N•m (89 – 124 lbf in)
9. Close engine side cover (1) on the left of the machine.



Remark

If the element is excessively dirty, or if it is damaged, replace it with a new part.

Check Before Starting

For the following items, see “Check Before Starting Engine” on page 2-80.

- Check machine monitor
- Check coolant level, add coolant
- Check oil level in engine oil pan, add oil
- Check water separator
- Check air cleaner
- Check fuel level, add fuel
- Check electric wiring
- Check inflation pressure of tires
- Check condition of window washer spray
- Check wiping efficiency of wiper
- Check horn
- Check defroster function
- Check locks
- Check emergency exit

MAINTENANCE

Every 50 Hours Service

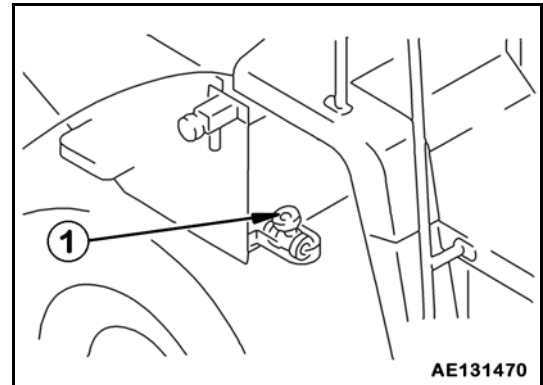
Drain Water, Sediment from Fuel Tank

- ★ Prepare a container to catch the fuel.

Remark

The fuel tank holds 325 l (86 gal).

1. Place the container under the fuel tank.
2. Open the drain valve (1) on the right side of the fuel tank so that the water and sediment collected at the bottom of the tank can drain, along with the fuel.
3. When all the water and sediment have drained out, close the drain valve.



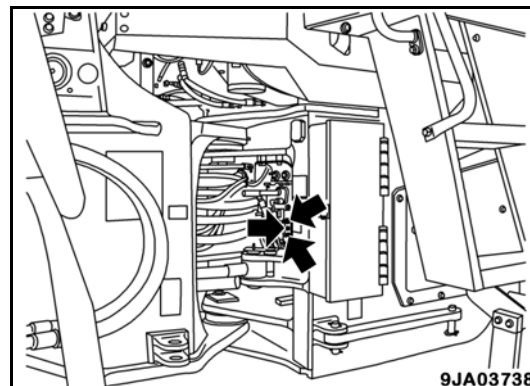
Every 100 Hours Service

★ Maintenance for every 50 hours service should be performed at the same time.

Lubricate Rear Axle Pivot Pin

★ Three sites to be greased

1. Using a grease pump, pump in grease through the grease fittings marked by the arrows in the graphic.
2. After greasing, wipe off any old grease that was pushed out.



Check Oil Level in Hydraulic Tank, Add Oil

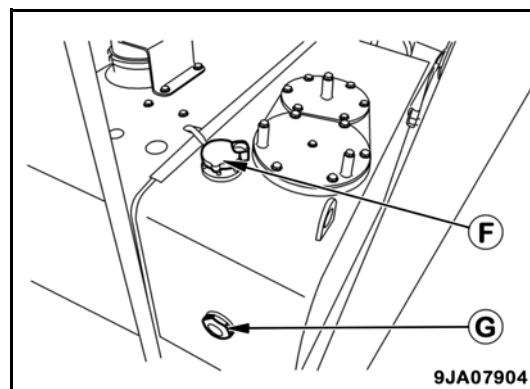
WARNING

- The parts and oil are very hot immediately after stopping the engine, and may cause burns. Wait for the temperature to decrease before starting the work.
- When removing the oil filler cap, turn it slowly to release any internal pressure and then remove it.

1. Park the machine on a level surface; lower the bucket to the ground; stop the engine; and wait for approximately five minutes.
2. Check the oil level with sight gauge (G) on the hydraulic tank.

★ The oil level should be between the H and L marks.

- ★ If the oil level is above the H level, drain the excess oil from the drain plug. Using the machine with excess oil in the circuit will cause damage to the hydraulic circuit or cause the oil to spurt out.
- ★ If the oil is below the L mark, add oil through oil filler port (F).



MAINTENANCE

Clean Element in Air Conditioner Fresh Air Filter

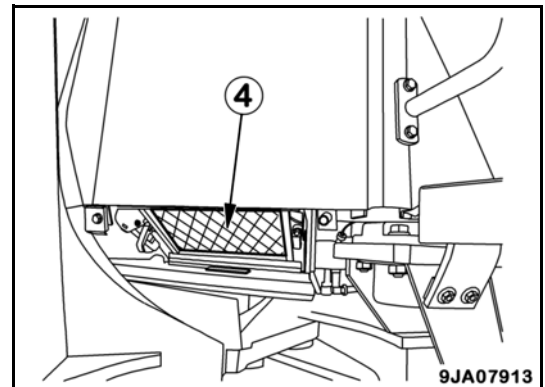
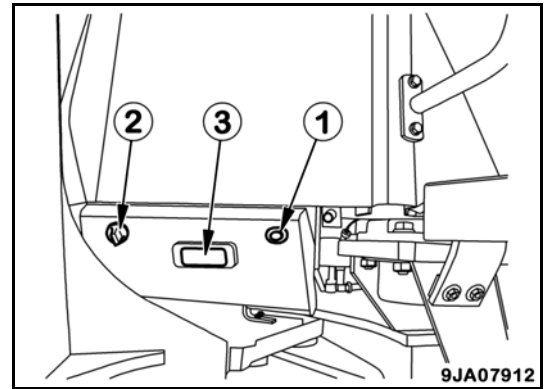
WARNING

- If compressed air is used, there is danger that dirt may fly and cause personal injury.
- Always wear safety glasses, dust mask, and other protective equipment.

Remark

If the air conditioner has been used, the air filter should be cleaned.

- ★ If the filter is clogged, the air flow will be reduced; there will be an abnormal noise from the air conditioner unit.
 - ★ Articulate the machine completely to the right before cleaning the air conditioner.
1. Stop the engine.
 2. Stop the air conditioner.
 3. Insert the starting key into key slot (1), release the lock; loosen knob (2); and open cover (3).
 4. Take out element (4) and clean it.
 5. Direct dry compressed air (less than 7.4 kg/cm^2 [100 psi]) to the element from inside along its folds, then direct it from outside along its folds and again from inside.
 6. Replace the filter with a new part if the clogging cannot be removed with compressed air, or if it has been used for one year.
 7. After cleaning, return filter (4) to its original position and close the cover.
 8. Use the starting switch key to lock the cover. Do not forget to remove the starting switch key.



Every 250 Hours Service

- ★ Maintenance for every 50 and 100 hours service should be performed at the same time.

Check Battery Electrolyte Level

Perform this check before operating the machine. See additional information about handling a battery safely in “Battery Information” on page 1-45.

WARNING

- Do not use the battery if the battery electrolyte level is below the LOWER LEVEL line. This situation will accelerate deterioration of the inside of the battery and reduce the service life of the battery. In addition, it may cause an explosion.
- The battery generates flammable gas and there is danger of explosion. Do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with a large amount of water and consult a doctor immediately.
- When adding distilled water to the battery, do not allow the battery electrolyte to go above the UPPER LEVEL line. If the electrolyte level is too high, it may leak and cause damage to the paint surface or corrode other parts.

Remark

If there is a danger that the battery water may freeze after refilling it with purified water (e.g., commercially available replenishment water for a battery). Add the water only the next day before starting work.

- ★ Try to check the electrolyte level on a daily basis. Be sure to check it at least once a month. Follow the basic safety procedures provided here.

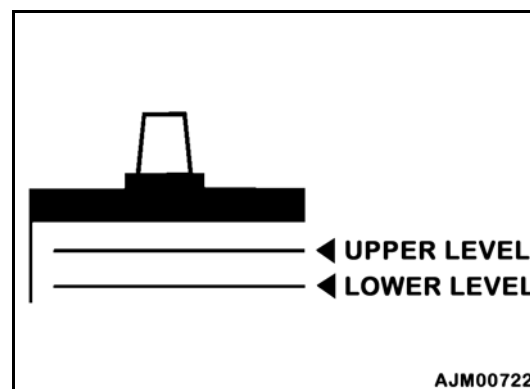
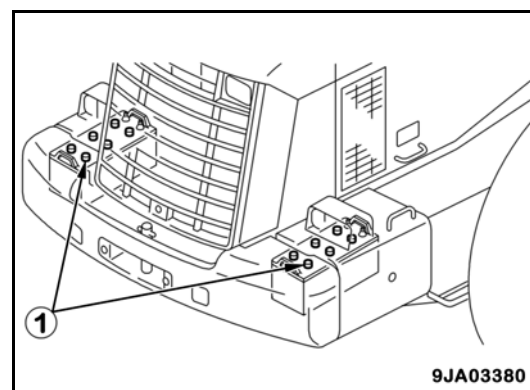
When Checking Electrolyte Level from Side of Battery

If it is possible to check the electrolyte level from the side of the battery, do this procedure.

1. Open the cover of the battery box.
 - ★ There are two battery boxes, one on each side at the rear of the machine.
2. Use a wet cloth to clean the area around the electrolyte level lines and check that the electrolyte level is between the UPPER LEVEL (U.L.) and LOWER LEVEL (L.L.) lines.
 - ★ If you wipe the battery with a dry cloth, static electricity may cause a fire or explosion.
3. If the electrolyte level is below the midway point between the UPPER LEVEL (U.L.) and LOWER LEVEL (L.L.) lines, remove cap (1) and add distilled water to the U.L. line.
 - ★ If distilled water has been added to any cell of cap (1), add distilled water also to the other cells.
4. Clean the vents of the battery caps, then close the caps securely.
 - ★ Keep the top of the battery clean and wipe it with a wet cloth.

Remark

If distilled water is added above the UPPER LEVEL (U.L.) line, use a syringe to lower the level to the UPPER LEVEL (U.L.) line. Neutralize the fluid that is removed with baking soda (sodium bicarbonate) and then flush it away with a large amount of water, or consult your Komatsu distributor or battery manufacturer.



MAINTENANCE

When It Is Impossible to Check Electrolyte Level from Side of Battery

If it is impossible to check the electrolyte level from the side of the battery or there is no display of the UPPER LEVEL line on the side of the battery, use this procedure to check the level.

1. Open the cover of the battery box.
 - ★ There are two battery boxes, one on each side at the rear of the machine.
2. Remove cap (1) on the top of the battery; look through the water filler port (2); and check the electrolyte level.

If the electrolyte does not reach the sleeve (3), add distilled water so that the level reaches the bottom of the sleeve (UPPER LEVEL line).

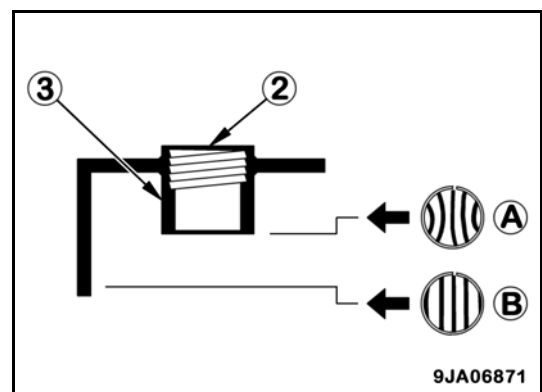
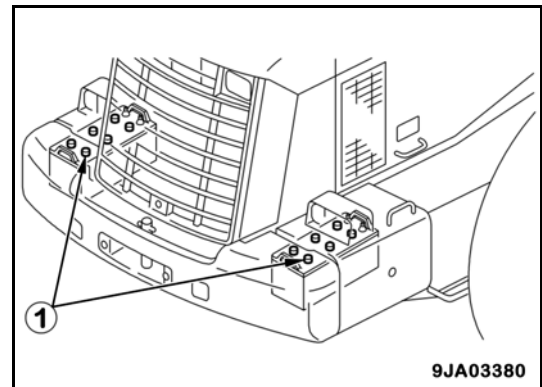
- (A): Suitable level

Electrolyte level is up to bottom of sleeve; surface tension causes electrolyte surface to bulge and poles appear bent.

- (B): Low

Electrolyte level is not up to bottom of sleeve; poles appear straight and not bent.

3. If distilled water has been added to any cell of cap (1), add distilled water also to the other cells.
4. Replace the cap (1) and tighten it securely.



Remark

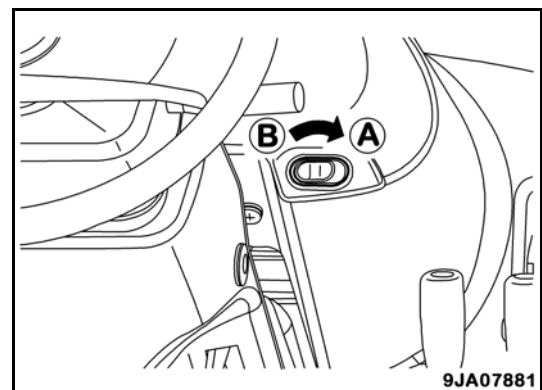
If water is added above the bottom tip of the sleeve, use a syringe to remove the electrolyte and lower the level to the UPPER LEVEL (U.L.) line. Neutralize the removed fluid with baking soda (sodium bicarbonate) and then flush it away with a large amount of water, or consult your Komatsu distributor or battery manufacturer.

When It Is Possible to Use Indicator to Check Electrolyte Level

If it is possible to use an indicator to check the electrolyte level, follow the instructions provided with the indicator.

Check Parking Brake

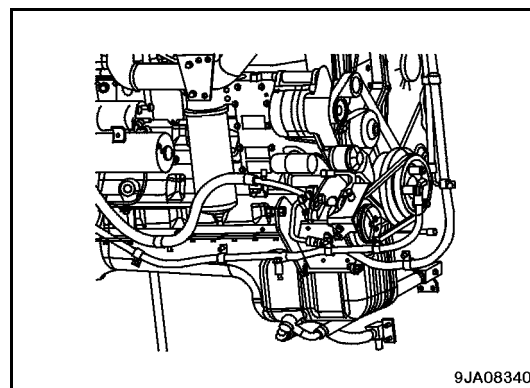
1. Stop the machine on a dry, downhill slope.
2. Set the parking brake switch to the ON position (A) and check if the parking brake holds the machine in position.
 - Position (A): ON
 - Parking brake is actuated and parking brake pilot lamp illuminates.
 - Position (B): OFF
 - The parking brake is released.
3. If any problem is found, contact your Komatsu distributor.



Check Air Conditioner Compressor Belt Tension, Adjust

Checking

1. Stop the engine.
2. Remove cover (1).
 - Belt deflection should be 11 to 15 mm (0.43 to 0.59 in) when pressed with a finger force of approximately 98 N (22.03 lbf) at a point midway between the air conditioner compressor pulley and the crank pulley.
 - When a belt tension gauge is used, the standard tension is within a range of 353 – 530 N (79.36 – 119.15 lbf).



Check When Changing the V-Belt

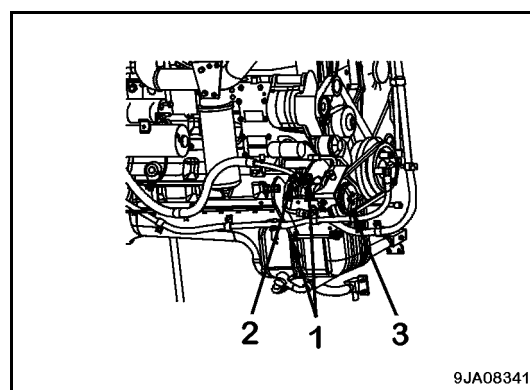
- Belt deflection should be 8 to 11.5 mm (0.31 to 0.45 in) when pressed with a finger force of approximately 98 N (22.03 lbf) at a point midway between the air conditioner compressor pulley and the fan pulley.
- When a belt tension gauge is used, the standard tension is within a range of 530 – 745 N (119.15 – 167.48 lbf).

Remark

When the belt has been replaced with a new part, a high tension is necessary. The initial tension is the value given above.

Adjusting

1. Loosen bolt (1), then loosen the locknut of bolt (2).
2. Tighten bolt (2) and move compressor (3) to adjust.
3. Tighten bolt (1) and the locknut of bolt (2) to hold compressor (3) in position.
4. Check each pulley for damage, wear of the V-groove, and wear of the V-belt. In particular, be sure to check that the V-belt is not touching the bottom of the V-groove.
5. If the fan belt exhibits any of the following problems, ask the Komatsu distributor in your territory to replace the belts with new ones:
 - The fan belt has elongated, leaving little allowance for adjustment.
 - There is a cut or crack on the belt.
 - A slipping or creaking sound is heard from the belt.
6. When the V-belt is set, operate the machine for one hour and then adjust the belt again.



MAINTENANCE

Check for Loose Wheel Hub Nuts, Tighten

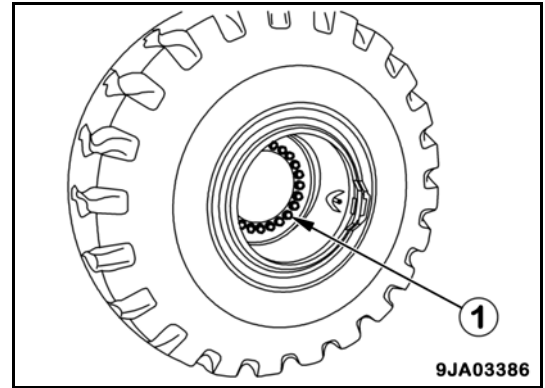
★ If wheel hub bolts (1) are loose, tire wear will increase and accidents might happen.

1. Check for loose nuts and tighten, if necessary.

When checking for loose nuts, always turn the nuts in the tightening direction.

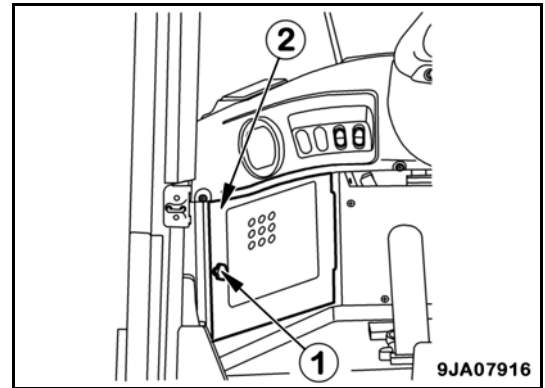
Tightening torque: 825 – 1030 N•m (608.49 – 759.69 lbf ft)

2. If any stud bolt is broken, replace **all** the stud bolts for that wheel.



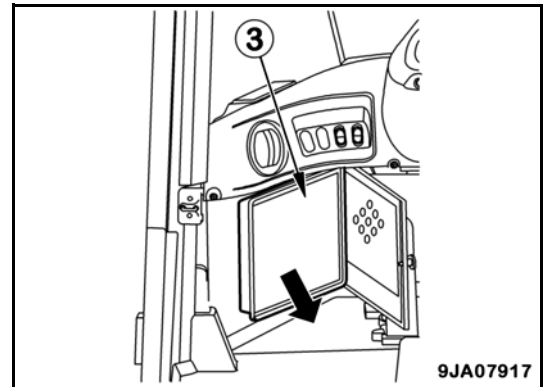
Clean Element in Air Conditioner Recirculation Filter

1. Loosen knob (1), then remove filter inspection cover (2).
2. Remove filter (3) in the direction shown by the arrow.
3. Use compressed air to clean the recirculated air filter.
 - Direct dry compressed air (less than 0.69 MPa (100.08 psi)) to the element from inside along its folds, then direct it from outside along its folds and again from inside.
4. Replace the filter with a new part if the clogging cannot be removed with compressed air, or if it has been used for one year.



Remark

If the filter is clogged, the air flow will be reduced; there will be an abnormal noise from the air conditioner unit.



Check Function of Brake Accumulator

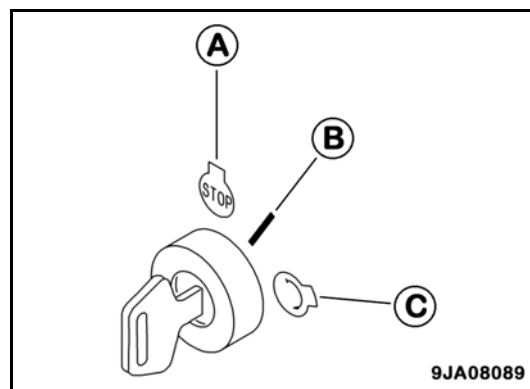
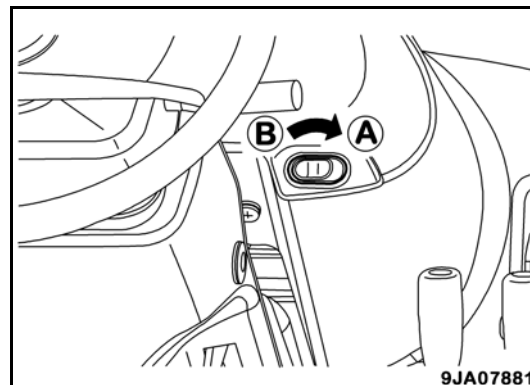
★ For details of handling the accumulator, see Section “Accumulator and Gas Spring” on page 1-50.

If the engine stops when the machine is traveling, the oil pressure in the accumulator can be used to apply the brake as an emergency measure.

1. Stop the machine on level ground and lower the work equipment completely to the ground.
2. Set the parking brake to the ON position (A).
3. Start the engine; run it at a mid-range speed for one minute; then stop the engine.
4. Turn the starting switch key to the ON position (B) and depress the brake pedal repeatedly.
 - If the brake oil pressure caution lamp does not light up even when the brake is depressed six times, the gas pressure in the accumulator is normal.
 - If the brake oil pressure caution lamp lights up when the brake has been depressed five or less times, the gas pressure in the accumulator has probably dropped. Contact your Komatsu distributor to have the accumulator inspected.

Remark

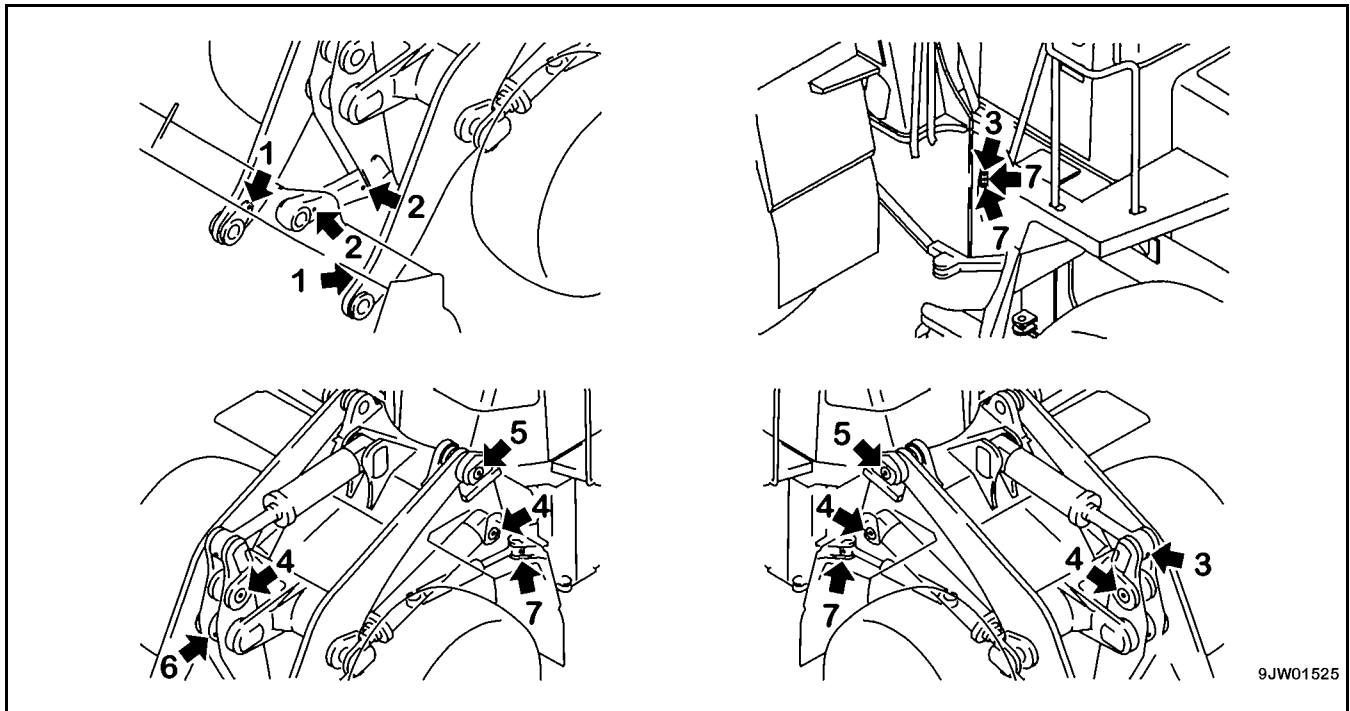
Carry out the check within five minutes after stopping the engine. If the machine is left with the engine stopped, the accumulator pressure will drop and it will be impossible to check the cause of the problem.



MAINTENANCE

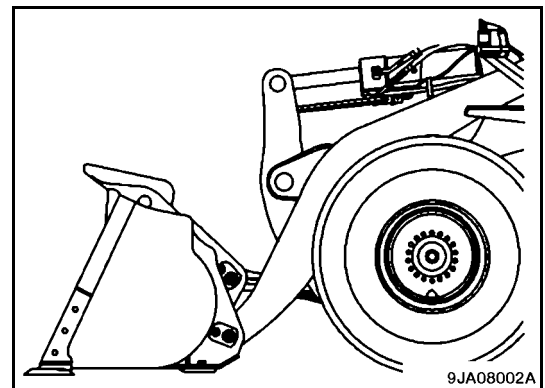
Lubricating

1. Using a grease pump, pump grease in through the grease fittings marked by the arrows in the graphic.
 2. After greasing, wipe off any old grease that was pushed out.
- ★ During the initial breaking of a new machine, carry out lubrication every ten hours for the first 50 hours of operation.
 - ★ When working on job sites where heavy-duty operations are frequent or when working continuously for more than eight hours, shorten the lubrication interval and carry out lubrication more frequently.



- | | |
|---------------------------------|-------------------------------------|
| 1. Bucket pin (2 places) | 5. Lift arm pivot pin (2 places) |
| 2. Bucket link pin (2 places) | 6. Bellcrank pin (1 place) |
| 3. Dump cylinder pin (2 places) | 7. Steering cylinder pin (4 places) |
| 4. Lift cylinder pin (4 places) | |

- ★ When carrying out greasing of bucket pin (1), lift arm pivot pin (5), and bellcrank pin (6), lower the bucket to the ground and set it horizontally.



Every 500 Hours Service

★ Maintenance for every 50, 100, and 250 hours service should be performed at the same time.

Change Oil in Engine Oil Pan, Replace Engine Oil Filter Cartridge

⚠ WARNING

- The engine parts and oil are very hot immediately after the engine is stopped and may cause serious burns. Wait for the temperature to cool down before starting the work.
- When removing the oil filler cap, turn it slowly to release internal pressure and then remove it.

Required

- Filter wrench
- Container to catch engine oil
Refill capacity: 30 ℓ (8 gal)

1. Stop the engine and wait for the temperature of all parts to go down.

★ Wait for ten minutes before starting the operation.

2. Open the engine side cover on the right side of the chassis.

3. Open oil filler (F).

4. Place a container under drain plug (P) to catch the oil.

5. Loosen drain plug (P) and drain the oil.

6. Check the drained oil. If there are excessive metal particles or foreign material, contact your Komatsu distributor.

7. Install drain plug (P).

8. Open the engine side cover on the left side of the machine.

9. Using the filter wrench, turn filter cartridge (1) counterclockwise to remove it.

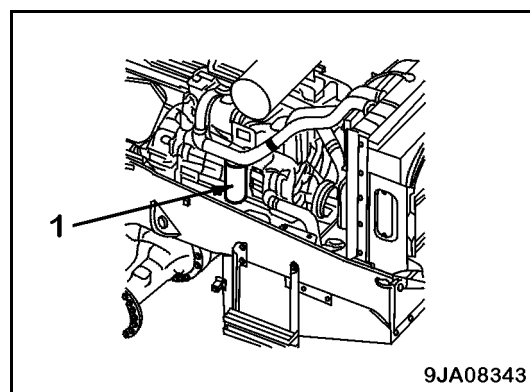
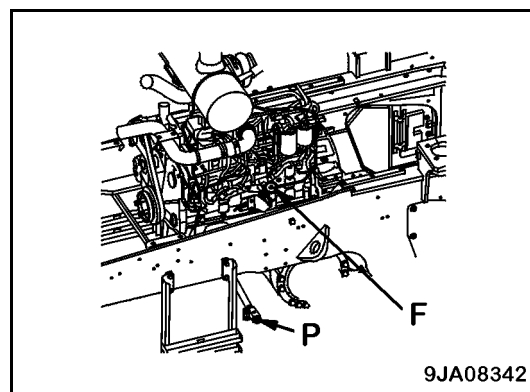
★ Make sure that you have waited for ten minutes before starting the operation. Otherwise a large amount of oil will come out.

10. Clean the filter holder.

11. Fill a new filter cartridge with clean engine oil; coat the seal and thread of the filter cartridge with engine oil (or coat with a thin layer of grease).

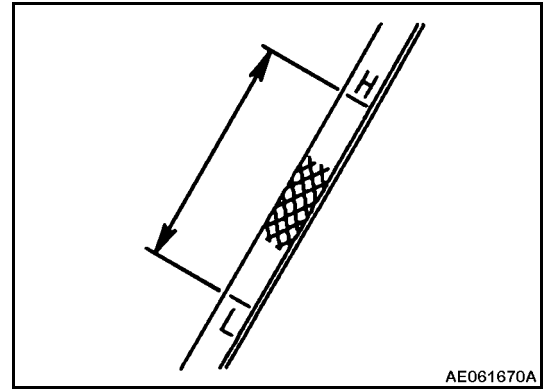
12. Install the new filter cartridge to the filter holder.

When installing the cartridge, bring the seal surface into contact with the filter holder and then tighten a further 3/4 to one turn by hand.



MAINTENANCE

13. After replacing the filter cartridge, add oil through oil filler (F) until the oil level is between the H and L marks on the dipstick (G).
14. Run the engine at low idle for a short time.
15. Stop the engine and check that the oil level is between the H and L lines on the dipstick.
 - ★ For details, see “Check Oil Level in Engine Oil Pan, Add Oil” on page 2-82.



Replace Fuel Prefilter Cartridge

⚠ WARNING

- Immediately after the engine is stopped, all parts are very hot. Do not replace the filter immediately. Wait for the engine to cool down before starting the operation.
- High pressure is generated inside the engine fuel piping system when the engine is running. When replacing the filter, wait for at least 30 seconds after the engine stops to let the internal pressure go down before replacing the filter.
- Do not bring any fire or spark close.

Remark

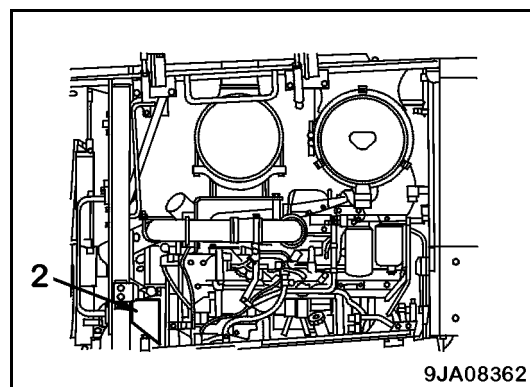
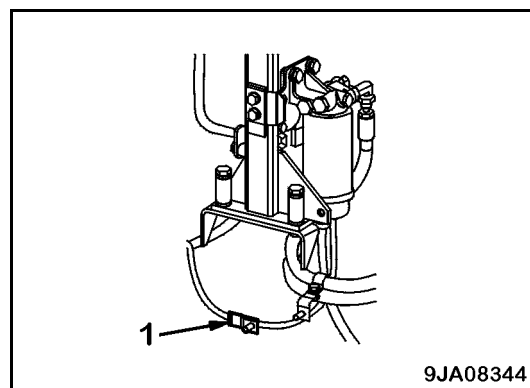
Genuine Komatsu fuel filter cartridges use a special filter that has a highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.

The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection pump and nozzle. If any part other than a genuine Komatsu filter cartridge is used, dust or dirt may get in and cause problems with the injection system. Never use substitute parts.

When performing inspection or maintenance of the fuel system, pay more attention than normal to the entry of dirt. If dirt is stuck to any part, use fuel to wash it off completely.

Required

- Container to catch fuel
 - Filter wrench
1. Stop the engine.
 2. Open the engine side cover on the right side of the chassis.
 - ★ The fuel prefilter forms one unit with the water separator and is installed at the rear of the engine.
 3. Remove connector (1).
 - ★ After removing the connector, cover the connector terminals with a vinyl bag or tape to protect them and prevent them from becoming dirty.
 4. Set the container to catch the fuel under the filter cartridge.
 5. Using a filter wrench, turn filter cartridge (2) counterclockwise to remove it.



MAINTENANCE

- Take water separator cup (3) installed on the bottom of the cartridge and turn it to the left to remove it.

★ If the cup is broken or damaged, replace it with a new part.

- Clean transparent cup (3) and remove the seal ring. Replace the seal ring with a new part.
- Coat the new seal ring with clean fuel and install it to the cup (3).
- Install cup (3) to the bottom of the new prefilter cartridge.

Tightening torque for cup: 10 N•m (89 lbf in)

- Check that drain plug (4) at the bottom of cup (3) of the fuel prefilter is tightened securely.

Tightening torque: 0.2 – 0.45 N•m (1.8 – 4 lbf in)

- Clean the filter holder.

- Check that cap (A) is installed to the new filter cartridge and then fill with clean fuel through the eight small holes (B).

Remark

When filling with fuel, always use fresh fuel and be careful not to let any dirt or dust get into the fuel cartridge. Cap (A) prevents fuel, containing dirt, from getting into the filter cartridge. Always add the fuel with cap (A) installed.

- Coat the packing surface of the filter cartridge with oil.

- Remove filter cartridge cap (A) and dispose of it.

- Install the filter cartridge to the filter holder.

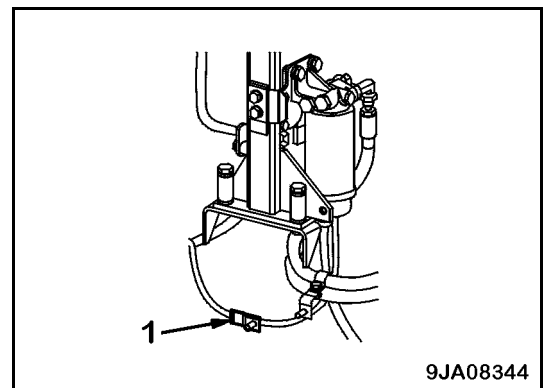
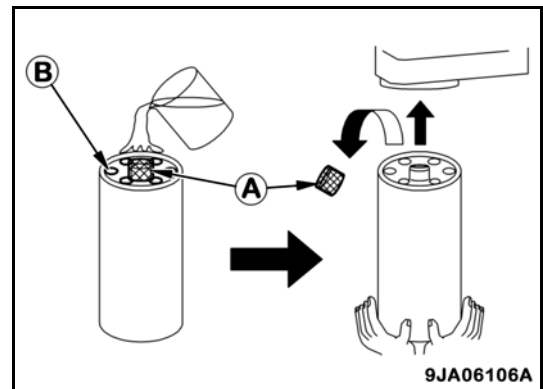
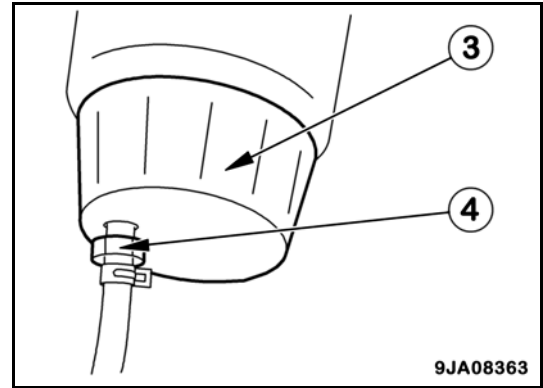
- When installing, tighten until the packing surface contacts the seal surface of the filter holder and then tighten it 3/4 of a turn.
 - If the filter cartridge is tightened too much, the packing will be damaged; this will result in leakage of fuel. If the filter cartridge is too loose, fuel will leak from the packing. Always tighten the filter cartridge the correct amount.
- ★ If tightening with a wrench, be very careful not to dent or damage the filter.

- Connect connector (1).

- If it is necessary to replace the fuel main filter cartridge (EVERY 1000 HOURS) at this time, follow the instructions in “Replace Fuel Main Filter Cartridge (Standard Specification)” on page 3-72 or “Replace Fuel Main Filter Cartridge (Poor Fuel Arrangement Specification)” on page 3-74.

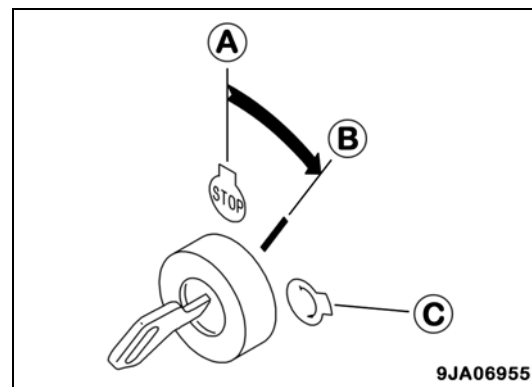
★ Do not put fuel in the main filter cartridge.

- Start the engine; check that there is no leakage of fuel from the filter seal surface or water separator mounting surface; then run at low idle for approximately ten minutes.



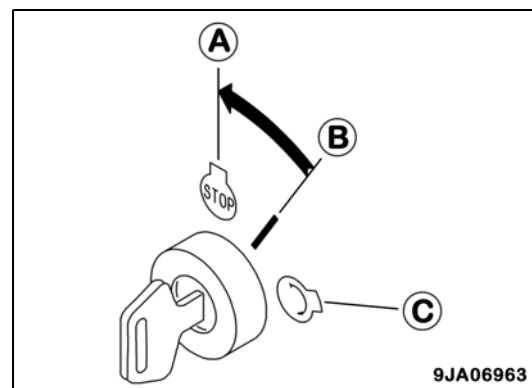
Procedure for Bleeding Air

1. Fill the fuel tank with fuel.
2. Insert the key in the starting switch and turn it to ON position (B).
3. Hold the key at the ON position (B) for 30 seconds, then return it to OFF position (A) and wait for ten seconds.



4. Repeat the operations in Step 2 and Step 3 four times.
5. Crank the engine with the starting motor (starting rotation of starting motor) and start the engine.

- When the engine is cranked, the air is automatically bled from the high-pressure circuit.
- If the engine does not start, the air has probably not been bled properly from the low-pressure circuit. Repeat the procedure from Step 1.
- If the engine is operated with air remaining in the fuel circuit, an error (AC449), CA559) may be generated in the fuel system. If this happens, keep the throttle at Lo after starting the engine and run the engine continuously for approximately three minutes.
- When the air is bled and the engine rotation becomes stabilized, the error display will go out.



MAINTENANCE

Every 1000 Hours Service

- ★ Maintenance for every 50, 100, 250, and 500 hours service should be performed at the same time.

Replace Fuel Main Filter Cartridge (Standard Specification)

WARNING

- After the engine has been operated, all parts are very hot. Do not replace the filter immediately. Wait for all parts to cool down before starting the operation.
- High pressure is generated inside the engine fuel piping system when the engine is running. When replacing the filter, wait for at least 30 seconds after stopping the engine to let the internal pressure go down, before replacing the filter.
- Do not bring any fire or flame close.

Remark

Genuine Komatsu fuel filter cartridges use a special filter that has a highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.

The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection pump and nozzle.

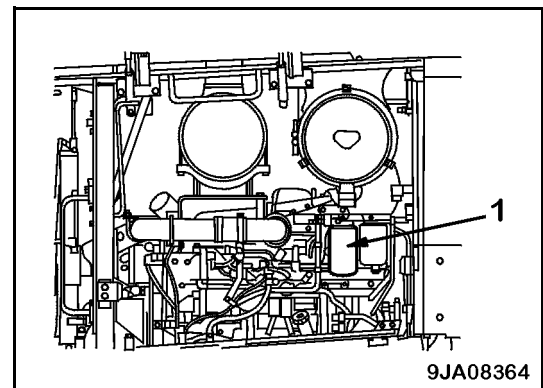
If any part other than a genuine Komatsu filter cartridge is used, dust or dirt may get in and cause problems with the injection system. Never use substitute parts.

When carrying out inspection or maintenance of the fuel system, pay more attention than normal to the entry of dirt. If dirt is stuck to any part, use fuel to wash it off completely.

- ★ If it is necessary to replace the fuel prefilter cartridge, see “Replace Fuel Prefilter Cartridge” on page 3-69.

Required

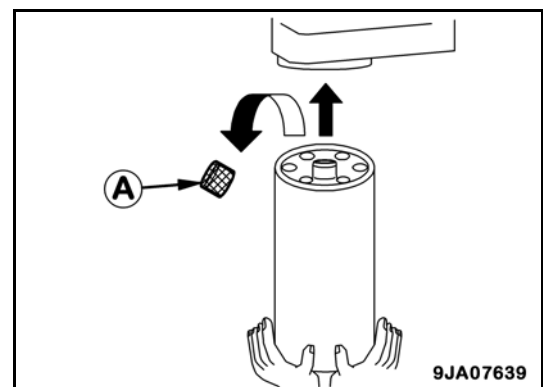
- Container to catch oil
 - Filter wrench
1. Stop the engine.
 2. Open the engine side cover on the right side of the chassis.
 3. Set the container to catch the fuel under the filter cartridge.
 4. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
 5. Clean the filter holder.
 6. Check that cap (A) is installed on the new filter cartridge.



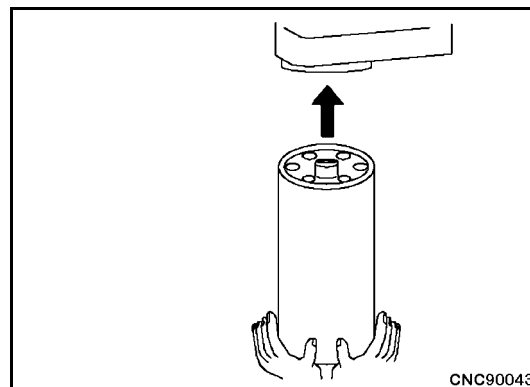
Remark

Cap (A) prevents dirt from getting into the filter cartridge

7. Coat the packing surface of the new filter cartridge with oil.
 - ★ Do not fill the fuel main filter cartridge with fuel.
8. Remove filter cartridge cap (A) and discard it.



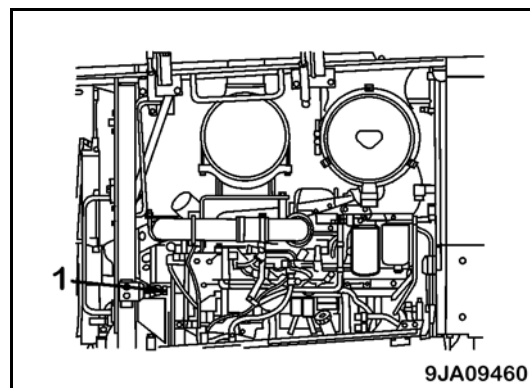
9. Install the filter cartridge to the filter holder.
 - When installing the filter cartridge, tighten until the packing surface contacts the seal surface of the filter holder and then tighten it 3/4 of a turn.
 - If the filter cartridge is tightened too far, the packing will be damaged; this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will leak from the packing. Always tighten the filter cartridge the correct amount.
 - ★ When tightening with a filter wrench, be extremely careful not to dent or damage the filter.
10. After replacing the fuel main filter cartridge, bleed the air from the fuel line.



Bleeding Air from Fuel Line

1. Fill the fuel tank with fuel.
 Fuel capacity: 325 ℓ (86 gal)

2. Open the engine side cover on the right side of the chassis.
3. Loosen and pull out feed pump knob (1) and move it forward and backward.
 - It is not necessary to remove the plug on the side surface of the fuel prefilter head.
 - Keep moving knob (1) until it becomes heavy.



4. After bleeding air, push in and tighten knob (1).
5. Crank the engine with the starting motor (starting rotation of starting motor) and start the engine.
 - When the engine is cranked, the air is automatically bled from the high-pressure circuit.
 - If the engine does not start, the air has probably not been bled properly from the low-pressure circuit. Repeat the procedure from Step A.
 - If the engine is operated with air remaining in the fuel circuit, an error (CA449, CA559) may be generated in the fuel system.
 - If this happens, keep the throttle at Lo after starting the engine and run the engine continuously for approximately three minutes.
 - When the air is bled and the engine rotation becomes stabilized, the error display will go out.
6. After completing the air bleeding, start the engine and check that there is no leakage of fuel from the filter seal surface.
 - If there is any leakage of fuel, check the tightening of the filter cartridge.
 - If there is still leakage of fuel, return to the Replace Fuel Main Filter Cartridge (Standard Specification) procedure and follow Steps 3 and 4 to remove the filter cartridge, then check the packing surface for damage or foreign material. If any damage or foreign material is found in the packing, replace the cartridge with a new part, then repeat Steps 5 - 9 to install the filter cartridge.

MAINTENANCE

Replace Fuel Main Filter Cartridge (Poor Fuel Arrangement Specification)

WARNING

- After the engine has been operated, all parts are very hot. Do not replace the filter immediately. Wait for all parts to cool down before starting the operation.
- High pressure is generated inside the engine fuel piping system when the engine is running. When replacing the filter, wait for at least 30 seconds after stopping the engine to let the internal pressure go down, before replacing the filter.
- Do not bring any fire or flame close.

Remark

Genuine Komatsu fuel filter cartridges use a special filter that has a highly efficient filtering ability. When replacing the filter cartridge, always use a genuine Komatsu part.

The common rail fuel injection system used on this machine consists of more precise parts than the conventional injection pump and nozzle.

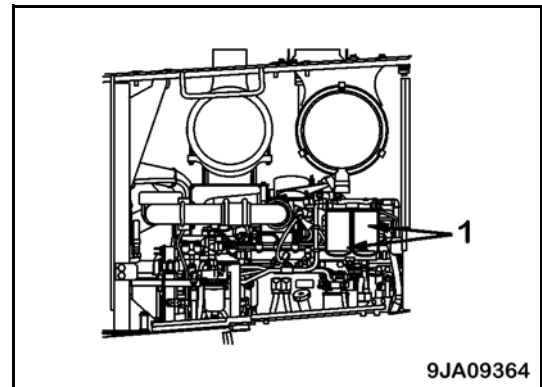
If any part other than a genuine Komatsu filter cartridge is used, dust or dirt may get in and cause problems with the injection system. Never use substitute parts.

When carrying out inspection or maintenance of the fuel system, pay more attention than normal to the entry of dirt. If dirt is stuck to any part, use fuel to wash it off completely.

- ★ If it is necessary to replace the fuel prefilter cartridge, see “Replace Fuel Prefilter Cartridge” on page 3-69.

Required

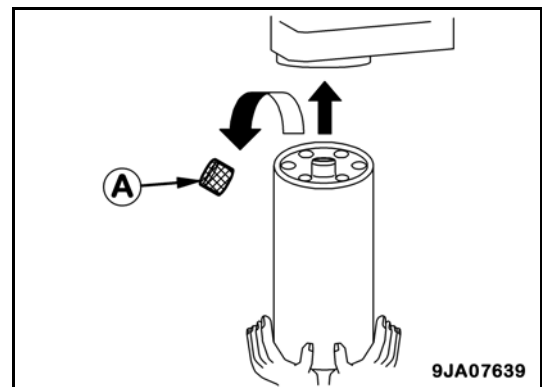
- Container to catch oil
 - Filter wrench
1. Stop the engine.
 2. Open the engine side cover on the right side of the chassis.
 3. Set the container to catch the fuel under the filter cartridge.
 4. Using a filter wrench, turn filter cartridge (1) counterclockwise to remove it.
 5. Clean the filter holder.
 6. Check that cap (A) is installed on the new filter cartridge.



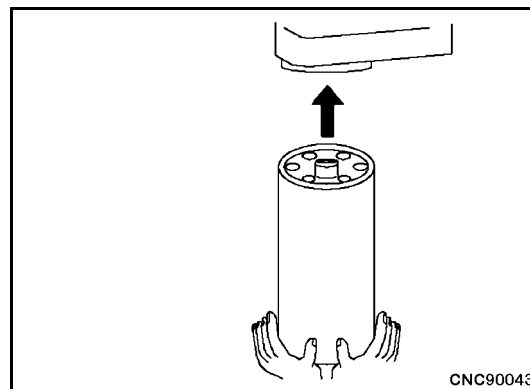
Remark

Cap (A) prevents dirt from getting into the filter cartridge

7. Coat the packing surface of the new filter cartridge with oil.
 - ★ Do not fill the fuel main filter cartridge with fuel.
8. Remove filter cartridge cap (A) and discard it.



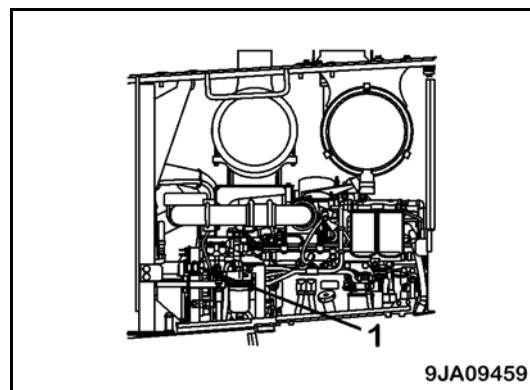
9. Install the filter cartridge to the filter holder.
 - When installing the filter cartridge, tighten until the packing surface contacts the seal surface of the filter holder and then tighten it 3/4 of a turn.
 - If the filter cartridge is tightened too far, the packing will be damaged; this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will leak from the packing. Always tighten the filter cartridge the correct amount.
 - ★ When tightening with a filter wrench, be extremely careful not to dent or damage the filter.
10. After replacing the fuel main filter cartridge, bleed the air from the fuel line.



Bleeding Air from Fuel Line

1. Fill the fuel tank with fuel.
 Fuel capacity: 325 ℓ (86 gal)

2. Open the engine side cover on the right side of the chassis.
3. Loosen and pull out feed pump knob (1) and move it forward and backward.
 - It is not necessary to remove the plug on the side surface of the fuel prefilter head.
 - Keep moving knob (1) until it becomes heavy.



4. After bleeding air, push in and tighten knob (1).
5. Crank the engine with the starting motor (starting rotation of starting motor) and start the engine.
 - When the engine is cranked, the air is automatically bled from the high-pressure circuit.
 - If the engine does not start, the air has probably not been bled properly from the low-pressure circuit. Repeat the procedure from Step A.
 - If the engine is operated with air remaining in the fuel circuit, an error (CA449, CA559) may be generated in the fuel system.
 - If this happens, keep the throttle at Lo after starting the engine and run the engine continuously for approximately three minutes.
 - When the air is bled and the engine rotation becomes stabilized, the error display will go out.
6. After completing the air bleeding, start the engine and check that there is no leakage of fuel from the filter seal surface.
 - If there is any leakage of fuel, check the tightening of the filter cartridge.
 - If there is still leakage of fuel, return to the Replace Fuel Main Filter Cartridge (Poor Fuel Arrangement Specification) procedure and follow Steps 3 and 4 to remove the filter cartridge, then check the packing surface for damage or foreign material. If any damage or foreign material is found in the packing, replace the cartridge with a new part, then repeat Steps 5 - 9 to install the filter cartridge.

MAINTENANCE

Change Oil in Transmission Case, Replace Oil Filter Cartridge, Clean Strainer

WARNING

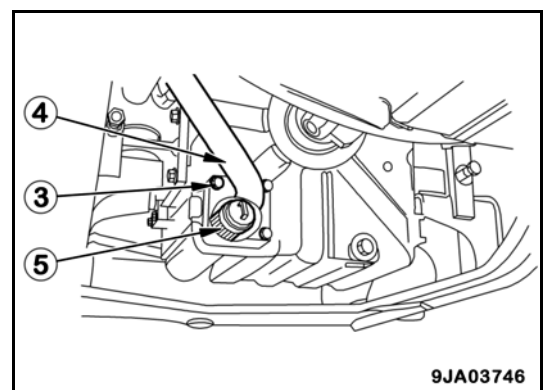
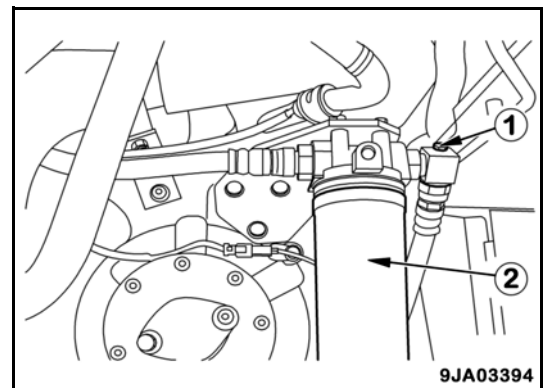
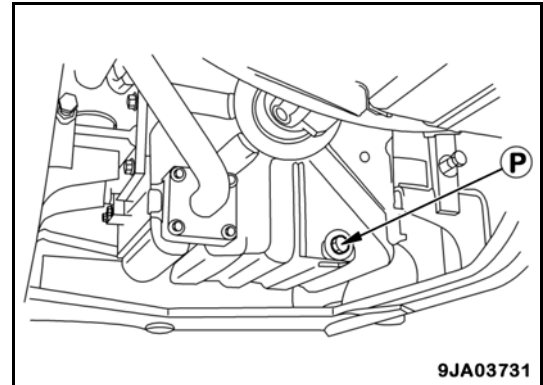
- Immediately after stopping the engine, the parts and oil are very hot and may cause burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove the cap.

Required

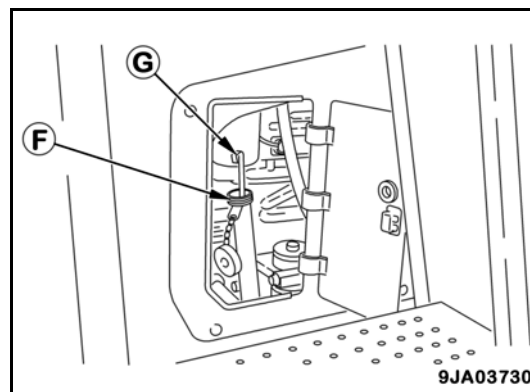
- Filter wrench
- Container to catch oil

Refill capacity: 54ℓ (11 gal)

1. Stop the engine and wait for the temperature of all parts to go down.
2. Set a container to catch the drained oil directly under drain plug (P).
3. Remove drain plug (P) and drain the oil.
To prevent the oil from spurting out, loosen the drain plug slowly and then gradually remove it.
4. After draining the oil, install and tighten drain plug (P).
Tightening torque: 68.6 ±9.8 N•m (51 ±7 lbf ft)
5. Set a container directly under the transmission filter to catch the oil.
6. Remove drain plug (1) of the transmission filter; drain the oil; then tighten the plug again.
7. Using a filter wrench, turn filter cartridge (2) to the left to remove it.
8. Clean the filter holder; coat the seal surface and thread of the new filter cartridge with engine oil; then install it.
9. When the seal surface comes in contact with the filter holder, tighten a further 2/5 of a turn with the filter wrench.
10. Remove four bolts (3); move tube (4); then remove strainer (5).
11. Remove any dirt stuck to strainer (5), then wash it in clean diesel fuel or flushing oil.
★ If strainer (5) is damaged, replace it with a new part.
12. Install strainer (5) in the case.
13. Replace the O-ring of tube (4) with a new part, then install tube (4).



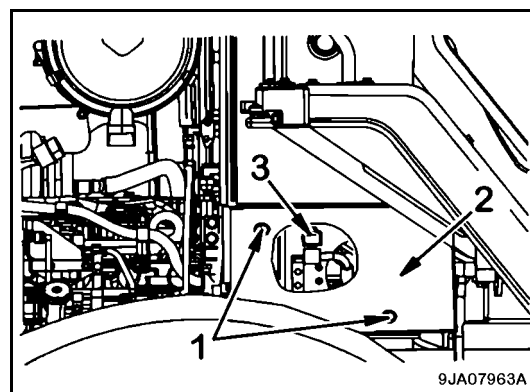
14. Refill the specified quantity of oil through oil filler (F).
15. After filling with oil, check that the oil is at the specified level.
 - ★ For details, see “Check Transmission Oil, Add Oil” on page 3-37.
16. Check that there is no leakage of oil from the transmission case or oil filter.



9JA03730

Clean Transmission Case Breather

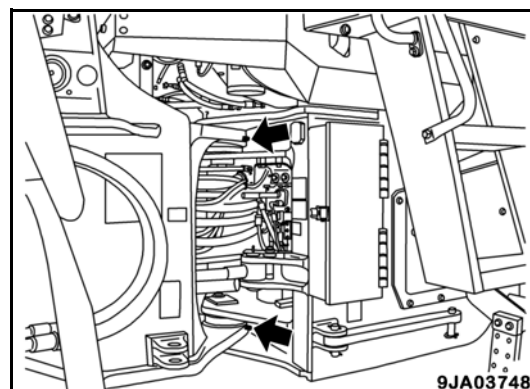
1. Stop the engine and wait for the temperature of all parts to go down.
2. Loosen bolt (1) and remove cover (2).
3. Remove all mud and dirt from around the breather.
4. Remove breather (3) and fit a cover to the breather mounting hole to prevent dirt from entering.
5. Soak the breather in flushing liquid and wash it.
6. Install the breather.



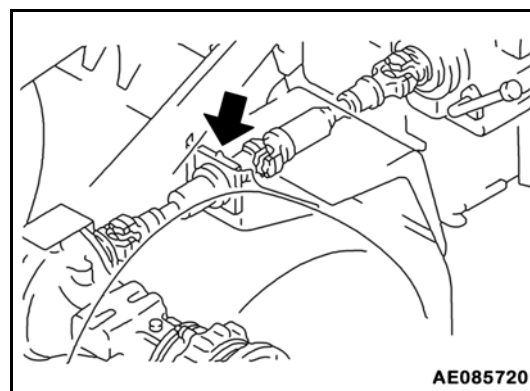
9JA07963A

Lubricating

1. Using a grease pump, pump in grease through the grease fittings marked by the arrows.
2. After greasing, wipe off any old grease that was pushed out.
 - (1) Center hinge pin (two places)
 - (2) Drive shaft center support (one place)



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MAINTENANCE

Check Engine Air Intake Piping Clamps for Looseness

- ★ Contact your Komatsu distributor to check the clamps between the air cleaner, turbocharger, after cooler and engine.

Check Alternator Drive Belt Tension, Replace

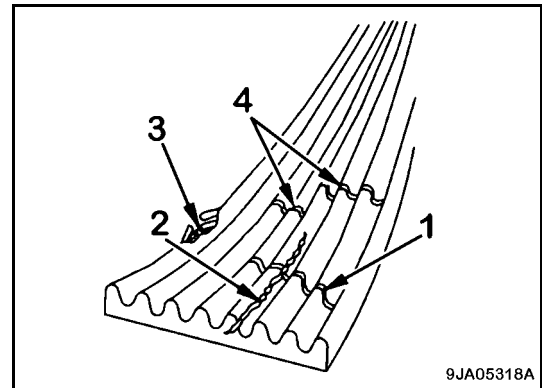
Since inspection and replacement of the fan belt requires special tools, contact your Komatsu distributor.

- ★ The machine is equipped with an auto tensioner; there is no need to adjust the tension.

If the alternator drive belt exhibits any of the following problems, the belt must be replaced. Ask your Komatsu distributor to replace the belt.

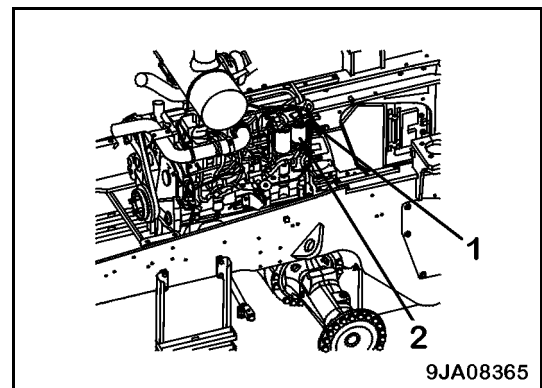
- When horizontal scratch (1) crosses vertical scratch (2)
- When there are tears (3) in part of the belt

- ★ In case (4) where there are horizontal scratches only, there is no need to replace the belt.



Replace Corrosion Resistor Cartridge (Standard Specification)

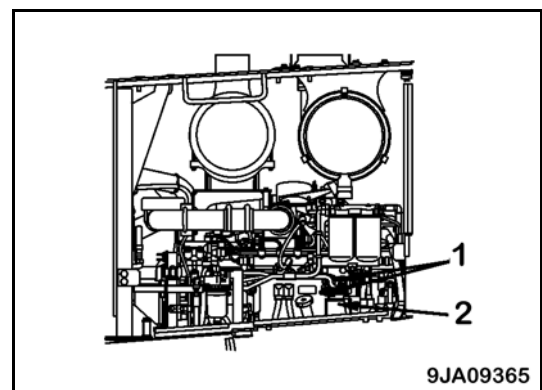
1. Stop the engine and wait for the temperature of all parts to go down.
2. Close valve (1) of the corrosion resistor at two points.
3. Using a filter wrench, turn cartridge (2) to the left to remove it.
4. Apply engine oil to the sealing surface of a new cartridge and then install it to the filter holder.
 - When installing the cartridge, bring the packing surface in contact with the seal surface of the filter holder and then tighten it a further 2/3 of a turn.



5. Open valve (1) of the corrosion resistor at two points.
6. After replacing the cartridge, start the engine and check that there is no leakage of water from the cartridge seal surface.

Replace Corrosion Resistor Cartridge (Poor Fuel Arrangement Specification)

1. Stop the engine and wait for the temperature of all parts to go down.
2. Close valve (1) of the corrosion resistor at two points.
3. Using a filter wrench, turn cartridge (2) to the left to remove it.
4. Apply engine oil to the sealing surface of a new cartridge and then install it to the filter holder.
 - When installing the cartridge, bring the packing surface in contact with the seal surface of the filter holder and then tighten it a further 2/3 of a turn.



5. Open valve (1) of the corrosion resistor at two points.
6. After replacing the cartridge, start the engine and check that there is no leakage of water from the cartridge seal surface.

Every 2000 Hours Service

★ Maintenance for every 50, 100, 250, 500, and 1,000 hours service should be performed at the same time.

Change Oil in Hydraulic Tank, Replace Hydraulic Filter Element

⚠ WARNING

- The parts and oil are at high temperature immediately after the engine is stopped and may cause burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove it.

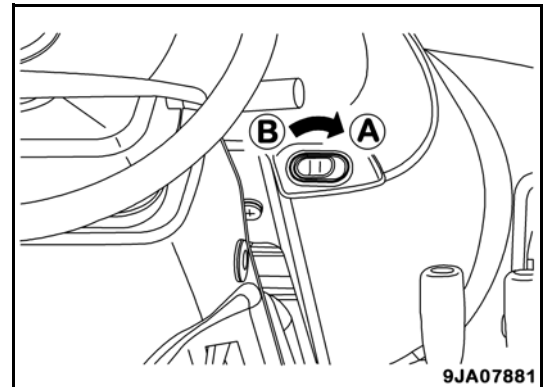
Required

- Container to catch oil.

Refill capacity:..... 139 ℓ (37 gal)

★ Before removing the oil filter cap for a filter or oil change, clean around the filter cap to avoid any dust or dirt from entering the hydraulic system. Dust or dirt can damage the system.

1. Lower the bucket horizontally to the ground and turn the parking brake switch to the ON position (A).
2. Stop the engine and wait for the temperature of all parts to go down.
3. Remove oil filler cap (F).

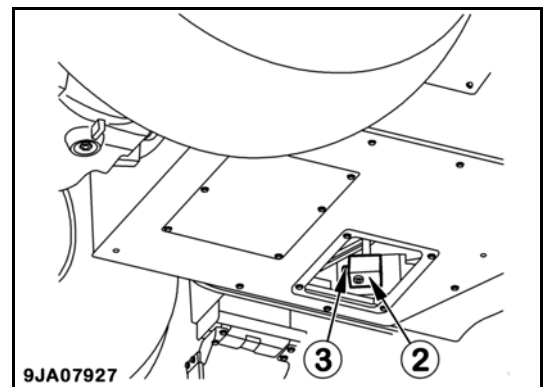
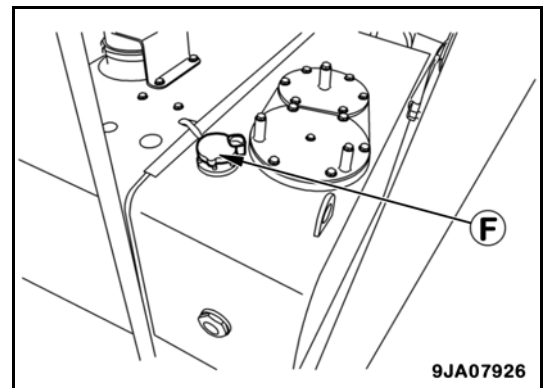


4. Set a container to catch the oil under drain plug (2).
5. Remove drain plug (2).
6. Loosen drain valve (3), then gradually pull it out to drain the oil.
7. After draining the oil, close drain valve (3), then install and tighten drain plug (2).

Tightening torque:

Drain plug (2): 69 ±10 N•m (51 ±7 lbf ft)

Drain valve (3): 64 ±15 N•m (47 ±11 lbf ft)

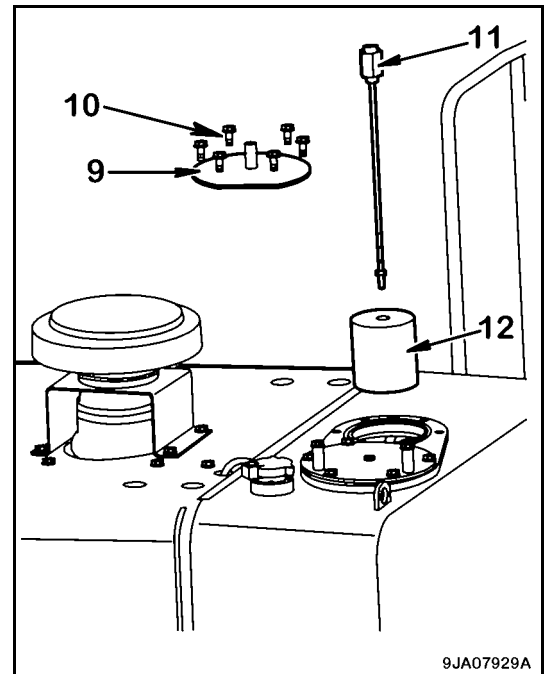
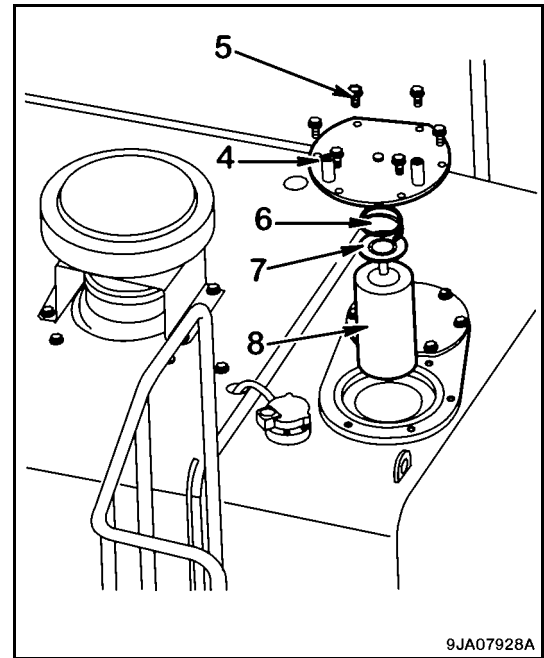


MAINTENANCE

8. Remove mounting bolt (5) of filter cover (4) at the top of the tank, then remove the cover.
 - ★ When doing this, the cover may fly off under the force of spring (6); keep the cover pressed down when removing the bolts.
9. Remove spring (6) and bypass valve (7), then take out element (8).
10. Check that there is no foreign material inside the tank, then clean it.
11. Install new element (8), then set bypass valve (7), spring (6), and cover (4) on the tank.
 - ★ When doing this, check the cover O-ring. If it is damaged or deteriorated, replace it.
12. Remove six bolts (10), then remove cover (9).
13. Pull the top of rod (11) from the top and remove strainer (12).
14. Remove any dirt stuck to strainer (12), then wash it in flushing oil.
15. Install strainer (12), rod (11), and cover (4).
 - ★ If strainer (12) is damaged, replace it with a new part.
16. When installing the cover bolts (10), push down the cover and tighten the bolts evenly.
17. Add the specified amount of engine oil through oil filler port (F), then install cap (F).
18. Check that the hydraulic oil is at the standard level.
 - ★ For details, see “Check Oil Level in Hydraulic Tank, Add Oil” on page 3-59.
19. Run the engine at low idle. Extend and retract the steering, bucket and lift arm cylinders four to five times. Be careful not to operate the cylinder to the end of its stroke (stop approximately 100 mm (3.94 in) before the end of stroke).

Remark

If the engine is run at high speed immediately after startup or a cylinder is pushed up to its stroke end, air taken inside the cylinder may cause damage to the piston packing.



20. Operate the steering, bucket, and lift arm cylinders to the end of their stroke three to four times. Stop the engine and loosen air bleed plug (13) to bleed the air from the hydraulic tank. After bleeding the air, tighten plug (13) again.

★ Keep the engine running at low idle when bleeding the air.

21. Check that the hydraulic oil is at the standard level.

★ For details, see “Check Oil Level in Hydraulic Tank, Add Oil” on page 3-59.

22. Increase the engine speed and repeat the procedure in Step 20 to bleed the air. Continue this operation until no more air comes out from plug (13).

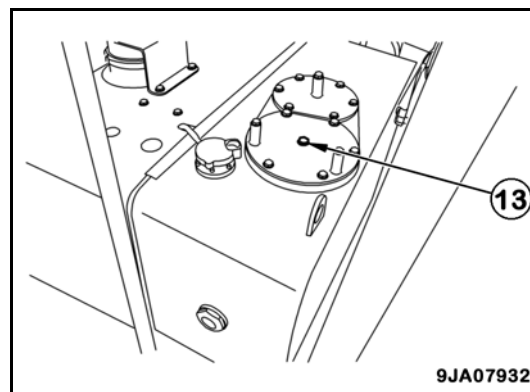
23. After the bleeding air process has been completed, tighten plug (13).

Tightening torque: $11 \pm 2 \text{ N}\cdot\text{m}$ ($100 \pm 13 \text{ lbf in}$)

24. Check that the hydraulic oil is at the standard level.

★ For details, see “Check Oil Level in Hydraulic Tank, Add Oil” on page 3-59.

25. Check that there is no leakage of oil from the filter cover mount.



MAINTENANCE

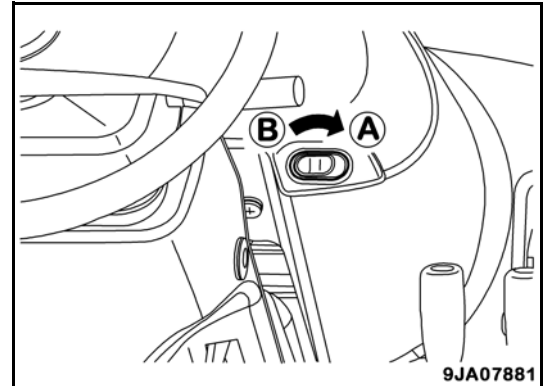
Replace Hydraulic Tank Breather Element

WARNING

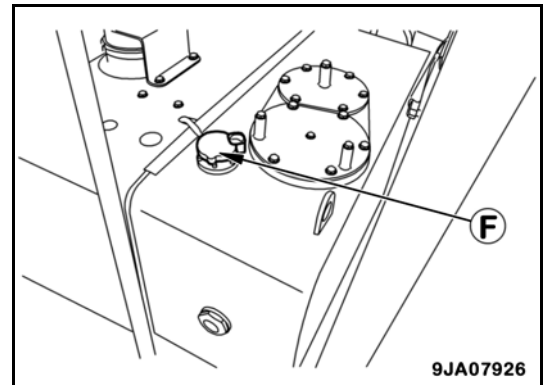
- The parts and oil are very hot immediately after the engine is stopped, and may cause burns. Wait for the temperature to go down before starting the work.
- When removing the oil filler cap, turn it slowly to release the internal pressure and then remove it.

★ Before removing the breather, wipe all dust from around the breather.

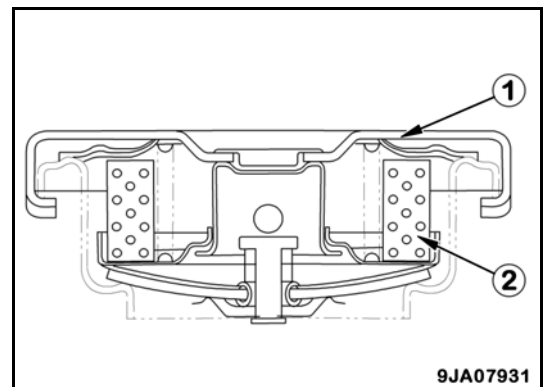
1. Lower the work equipment to the ground and turn the parking brake switch to the ON position (A).
2. Stop the engine and wait for the temperature of all parts to go down.



3. Remove the cap of oil filler (F).



4. Remove breather (1) built into the cap.
5. Replace the filter element (2) with a new part, and then install breather (1) to the cap.
6. Tighten the cap of oil filler (F).



Change Axle Oil

WARNING

- When changing the oil, turn the parking brake switch to the ON position and set the frame lock bar to the LOCK position to secure the front and rear frames.
- Immediately after stopping the engine, the parts and oil are very hot and may cause burns. Wait for the temperature to go down before starting the operation.
- When the plug is removed, oil may spurt out. Turn the plug slowly to release the internal pressure and then remove the plug carefully.

Remark

For operations where the brake is used frequently, change the axle oil at shorter intervals.

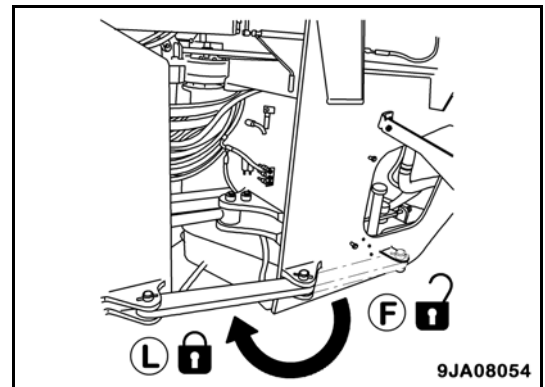
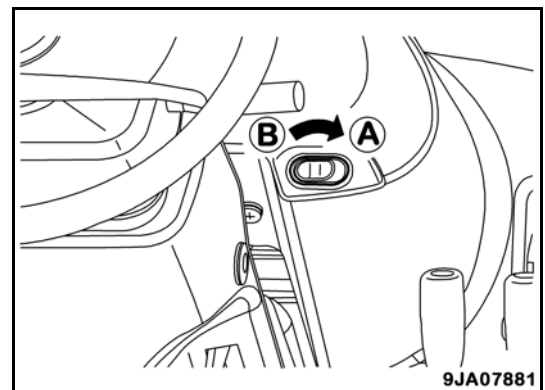
Required

- Container to catch oil.

Refill capacity: Front Axle: 49 ℓ (13 gal)

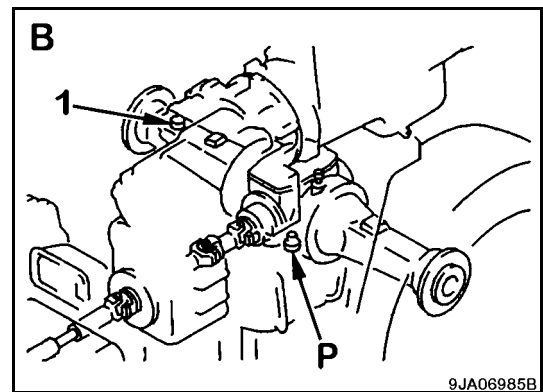
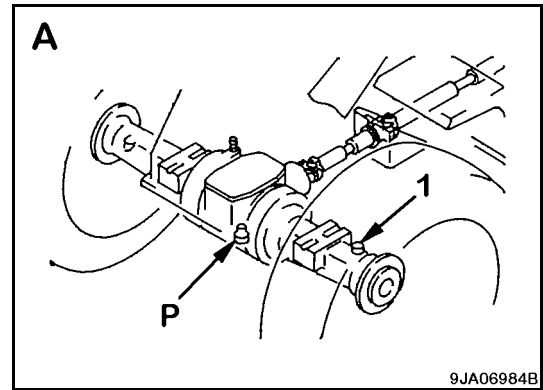
. Rear Axle: 40 ℓ (11 gal)

1. Set the parking brake switch to the ON position (A).
2. Lower the work equipment to the ground; stop the engine; and wait for the temperature of all parts to go down.
3. Set the frame lock bar to the LOCK position (L) to lock the front and rear frames.



MAINTENANCE

4. Set a container to catch the oil under drain plug (P).
5. Remove front and rear oil filler plugs (1), then remove drain plug (P) to drain the oil.
 - A: Front axle
 - B: Rear axle
 - ★ Remove any mud and dirt from around the plugs before removing them.
6. After draining the oil, clean drain plug (P) and install it again.
7. Add oil to the specified level through plug hole (1).
 - ★ If your machine has the LSD (Limited-Slip Differential), be sure to use only the specified lubricating oil for this axle; refer to “RECOMMENDED FUEL, COOLANT, AND LUBRICANTS” on page 3-12.
8. After adding oil, check at oil level plug (1) that the oil is at the specified level.
 - ★ For details, see “Check Axle Oil Level, Add Oil” on page 3-38.
9. If the oil level is correct, install both oil level plugs (1)



Replace Element in Air Conditioner Recirculation Filter, Fresh Air Filter

- Remove both the recirculation air filter and fresh air filter in the same manner as when performing the cleaning procedure. Replace both filters with new parts.
- ★ For details about cleaning the recirculation air filter, see “Clean Element in Air Conditioner Recirculation Filter” on page 3-64.
- ★ For details about cleaning the fresh air filter, see “Clean Element in Air Conditioner Fresh Air Filter” on page 3-60.

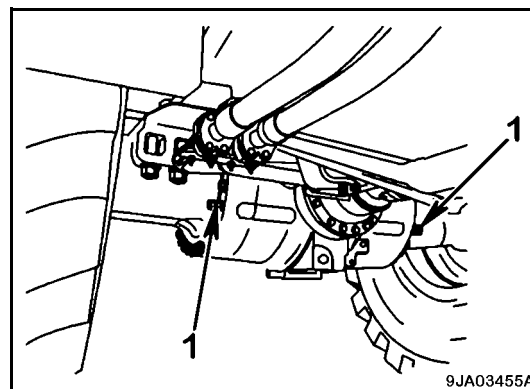
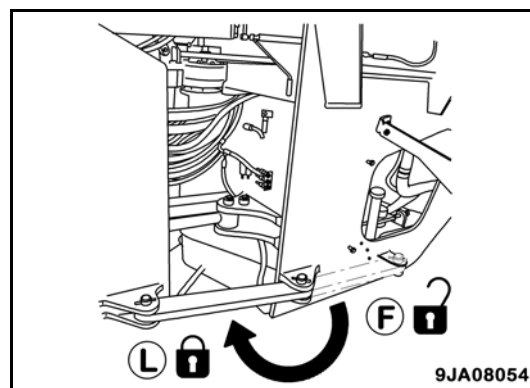
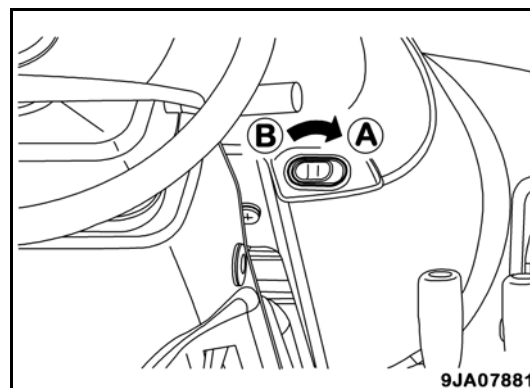
Check Brake Disc Wear

⚠ WARNING

- When checking the brake disc wear, turn the parking brake switch to the ON position (A) and set the frame lock bar to the LOCK position (L) to secure the front and rear frames.
- Make sure that the brake oil temperature is less than 60°C (140°F) before checking the brake wear.
- If the disc is near the wear limit, carry out inspection at shorter intervals, regardless of the specified inspection interval.

★ When checking the brake disc for wear, there are four places (front axle and rear axle, left and right); use the same procedure to check all four places.

1. Set the parking brake switch to the ON position (A).
2. Lower the work equipment to the ground; stop the engine; and wait for the temperature of all parts to go down.
3. Set the frame lock bar to the LOCK position (L) to lock the front and rear frames.
4. Remove cap nut (1).



MAINTENANCE

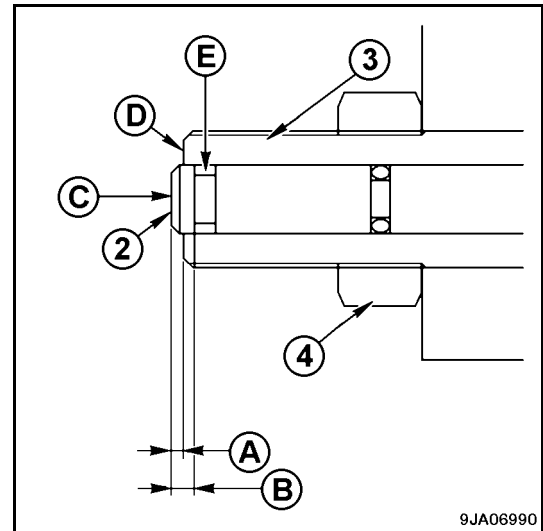
5. Depress the brake pedal and push in rod (2) fully.
6. Measure the amount of wear.
 - Amount of wear (A) is the amount that end face (C) of the rod protrudes from end face (D) of the guide. Measure the amount of protrusion.
 - Permitted wear limit (B) of the disc is the point where groove (E) of the rod is in line with end face (D) of the guide.
 - When this point is reached, ask your Komatsu distributor to carry out inspection and replacement of parts.
 - ★ If the disc is near the wear limit, carry out inspection at shorter intervals, regardless of the specified inspection interval.
7. Install cap nut (1).

Tightening torque: 29 – 39 N•m (22 – 29 lbf ft)

Remark

On new machines, the position of the guide is adjusted so that the end face of rod (2) comes to the end face of guide (3). For this reason, do not loosen locknut (4) except when replacing the disc.

Carry out the operation with two workers; one worker depresses the brake pedal and the other worker pushes in rod (2).



Check Function of PPC Accumulator

- ★ For details about handling the accumulator, see “Accumulator and Gas Spring” on page 1-50.
- ★ Replace the accumulator every 4,000 hours or every two years.

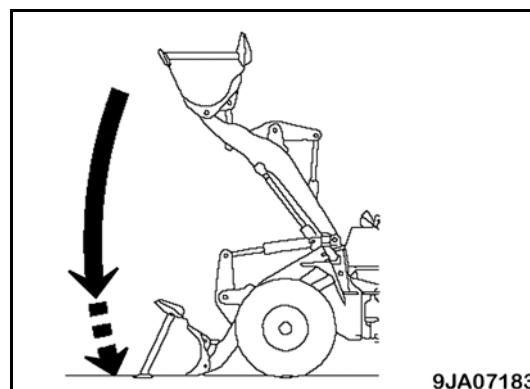
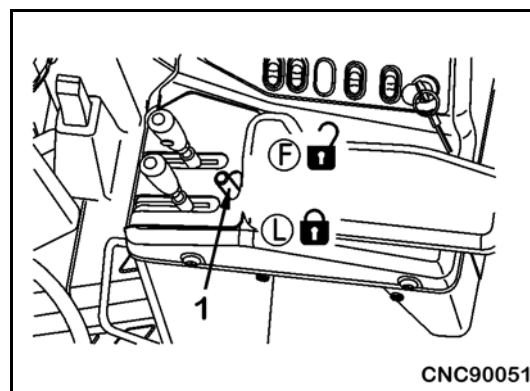
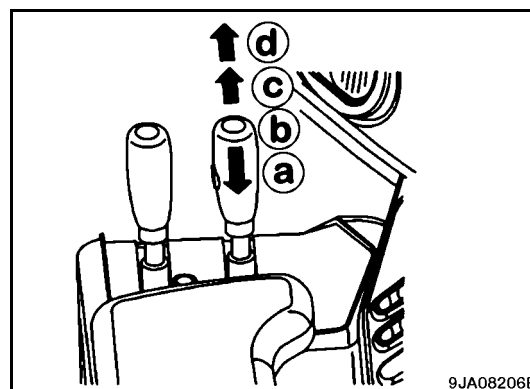
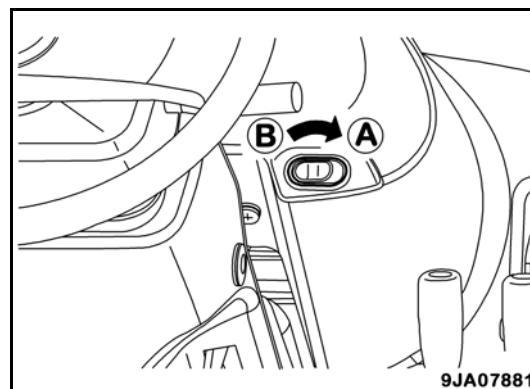
If the engine stops with the work equipment raised and it is impossible to start the engine again, it is possible, as an emergency measure, to actuate the valve with the oil pressure stored in the accumulator and lower the work equipment to the ground.

1. Set the parking brake switch to the ON position (A).
2. Raise the work equipment to the maximum height and then operate the lift arm control lever to the HOLD position (b).
3. Stop the engine.
4. Leave the work equipment lock lever (1) in the FREE position.
5. Check and be sure the area around the machine is safe.

Remark

Carry out the procedure within two minutes after stopping the engine. If the machine is left with the engine stopped, the accumulator pressure will drop and it will be impossible to check the cause of the problem.

6. Set the lift arm control lever to the FLOAT position (d) and lower the work equipment to a point 1 m (3.3 ft) above the ground.
 7. When the lift arm comes to the 1-meter position, return the lift arm control lever to the LOWER position (c) and lower the work equipment slowly to the ground.
- ★ If the work equipment stops while it is moving, the gas pressure in the accumulator has probably dropped. Contact your Komatsu distributor to have the accumulator inspected.



MAINTENANCE

Check Alternator

- Contact your Komatsu distributor to have the alternator checked.
- ★ If the engine is started frequently, have this inspection carried out every 1,000 hours.

Check Engine Valve Clearance, Adjust

- As a special tool is required for removing and adjusting the parts, ask your Komatsu distributor for service.

Check Vibration Damper

- Check that there are no cracks or peeling in the outside surface of the rubber.
- ★ If any cracks or peeling are found, contact your Komatsu distributor to have the parts replaced.

Every 4000 Hours Service

★ Maintenance for every 50, 100, 250, 500, 1,000, and 2,000 hours service should be performed at the same time.

Lubricating

Carry out the greasing once every two years, regardless of whether the 4,000 hour interval has passed.

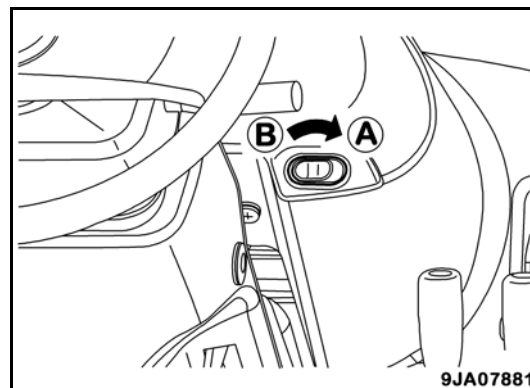
WARNING

If you fail to grease the drive shaft, the shaft will break. There is a danger that the broken shaft will cause serious damage to the machine. To avoid this problem, always maintain the specified greasing interval strictly.

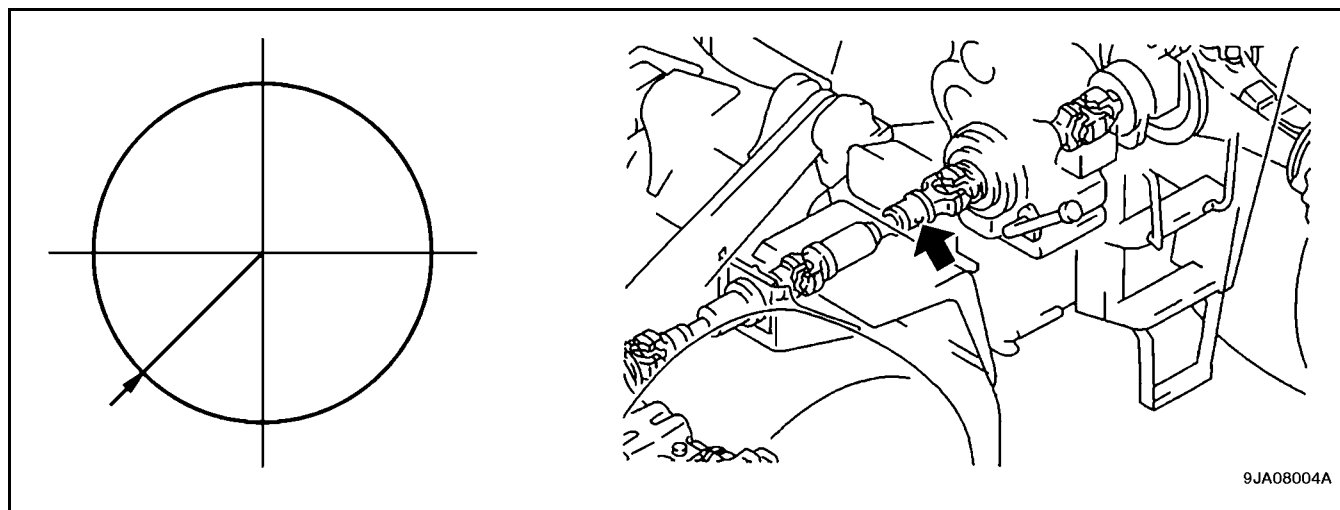
★ If special drive shaft grease is used, carry out greasing every 4,000 hours or every two years. When the special grease is not used but the normal lithium-based grease is used, carry out greasing every 1,000 hours.

Required

1. Stop the engine and set the parking brake switch to the ON position (A).
2. Stop the machine so that the drive shaft is in the position so that the grease fitting of center drive shaft spline (1) is as shown in the figure and you can supply grease from under the machine.
 - ★ At this time, the grease fitting is at the position indicated by the arrow at the circle below, seen from the rear of the machine.
 - ★ All graphic views are from the rear of the machine.
3. Using a grease pump, pump in grease through the grease fittings marked by the arrows.
4. After greasing, wipe off any old grease that was pushed out.

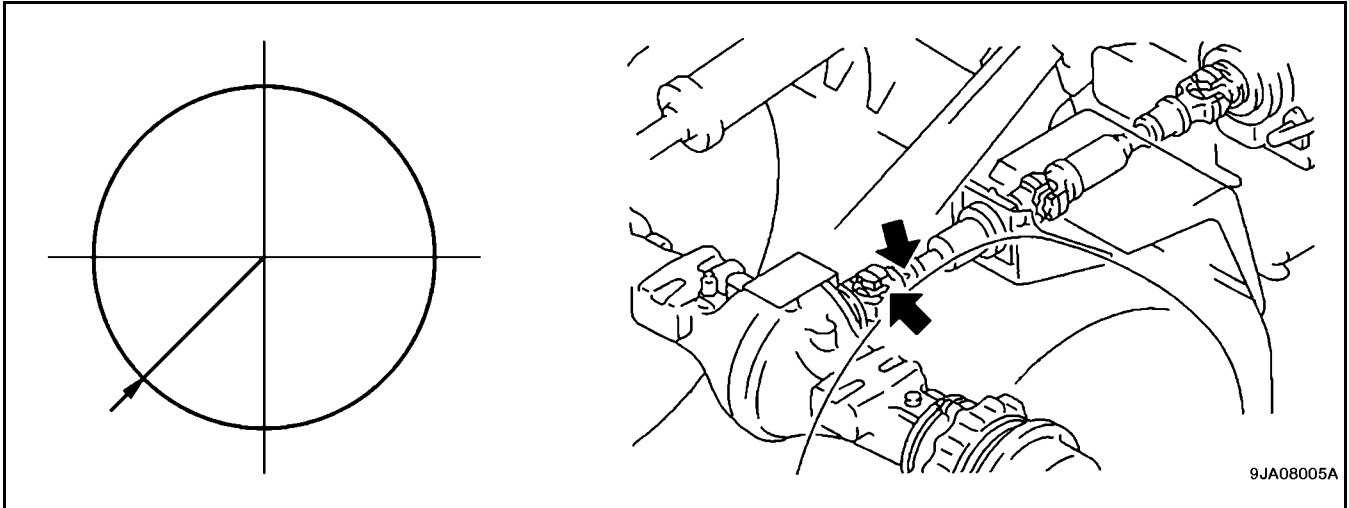


(1) Center drive shaft spline (1 place)

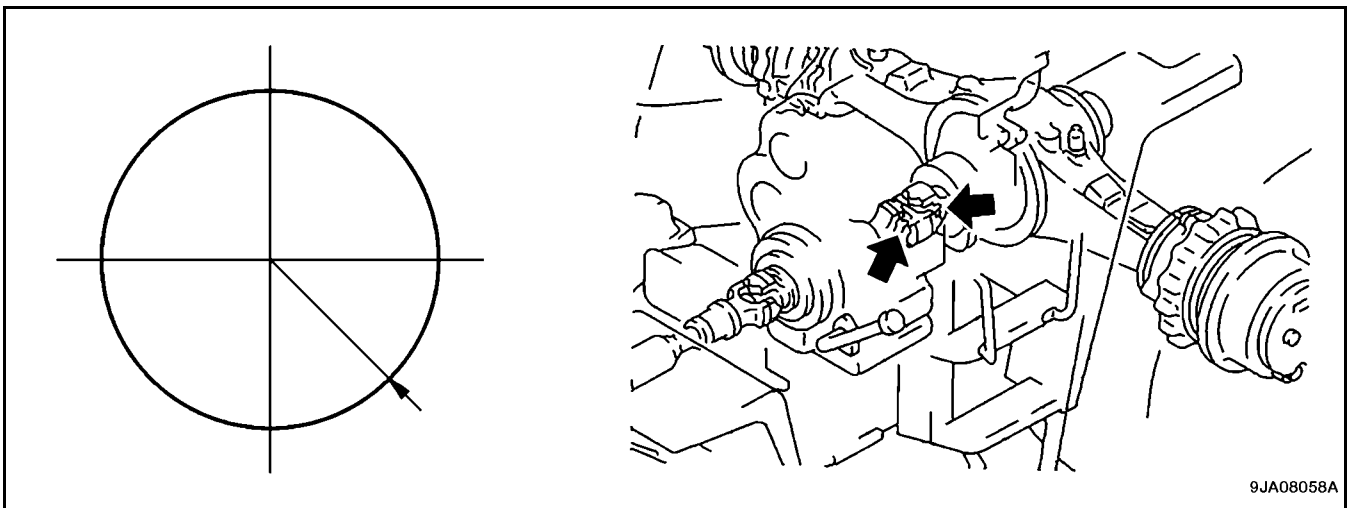


MAINTENANCE

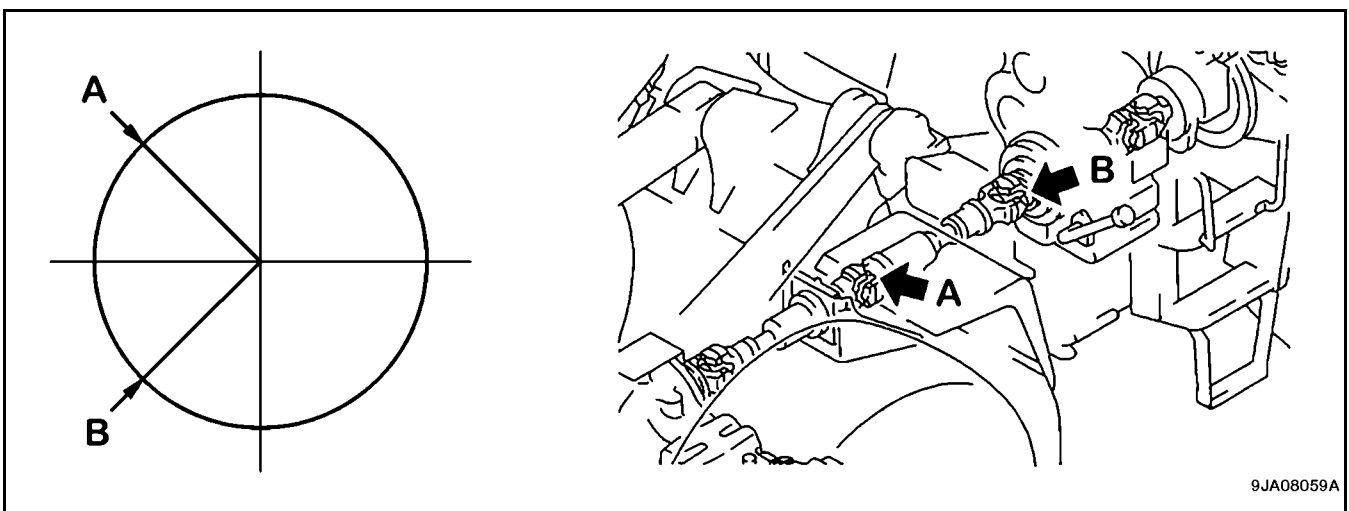
(2) Front drive shaft (2 places)



(3) Rear drive shaft (2 places)



(4) Center drive shaft (2 places)



Check Water Pump

- Check the water pump and its related parts for water leakage.
- ★ If any abnormality is found, contact your Komatsu distributor for repairs or replacement.

Check Starting Motor

- Contact your Komatsu distributor to have the starting motor checked.
- ★ If the engine is started frequently, have this inspection carried out every 1,000 hours.

Check Air Conditioner Compressor, Adjust

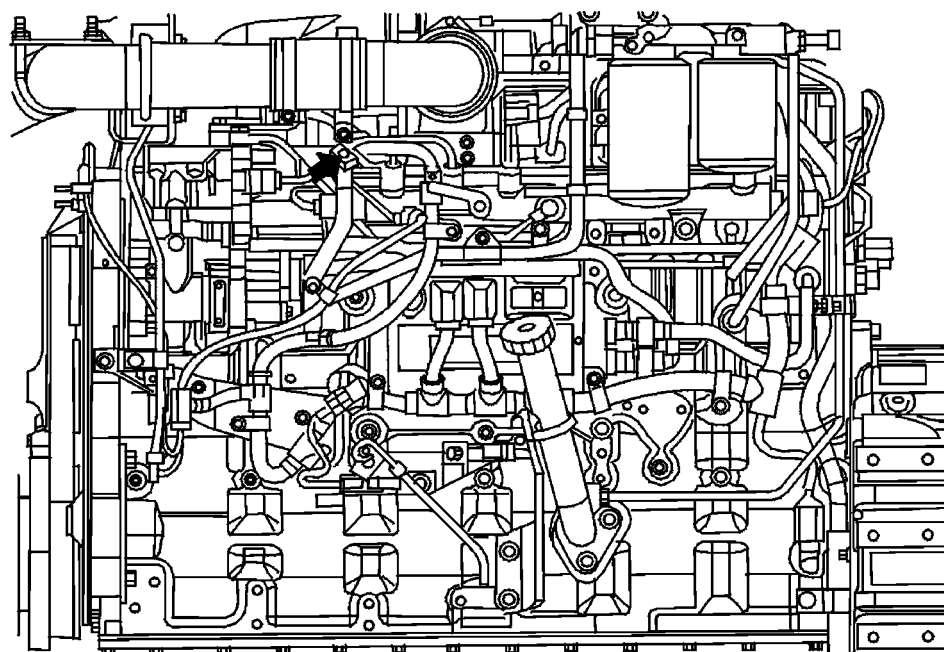
- As a special tool is required for checking and adjusting the parts, ask your Komatsu distributor for service.

Check for Loose Engine High-Pressure Piping Clamps, Hardening of Rubber

- Check visually and then use your hand to feel if there are any loose bolts of the mounting clamps and if there is any hardening of the rubber parts for the high-pressure piping between the supply pump and the common rail.
- ★ If any problem is found, the part must be replaced. Ask your Komatsu distributor to carry out the replacement.

Remark

If the engine continues to be used when there are loose bolts, hardened rubber, or missing parts, there is a danger of damage or breakage occurring due to vibration and wear at the connections of the high-pressure piping. Always check that the proper high-pressure piping clamps are correctly installed.



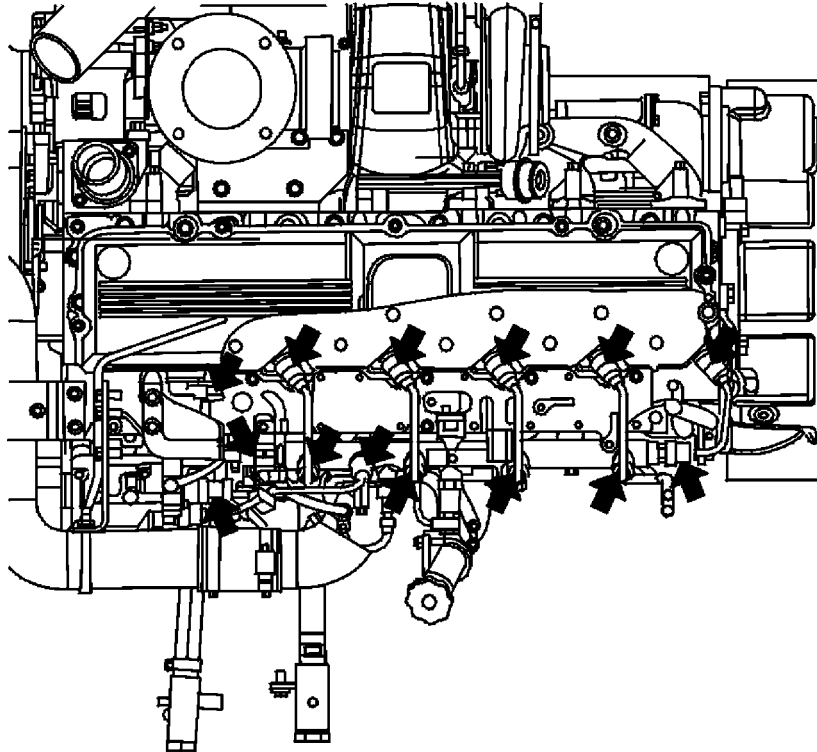
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MAINTENANCE

Check for Missing Fuel Spray Prevention Cap, Hardening of Rubber

Fuel spray prevention caps are protective parts installed to prevent fire caused if fuel leaks and sprays on high-temperature parts of the engine.

- Check visually and then use your hand to check if there are any missing caps, loose bolts, or hardening of the rubber.
- ★ If there are any missing components or the rubber is hardened, the problem part must be replaced. Contact your Komatsu distributor for part replacement.



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Every 8000 Hours Service

- ★ Maintenance for every 50, 250, 500, 1,000, 2,000, and 4,000 hours service should be performed at the same time.

Replace High-Pressure Piping Clamps

- ★ Contact your Komatsu distributor to replace the engine high-pressure clamps.

Replace Fuel Spray Prevention Cap

- ★ Contact your Komatsu distributor to replace the fuel spray prevention cap.

MEMORANDUM

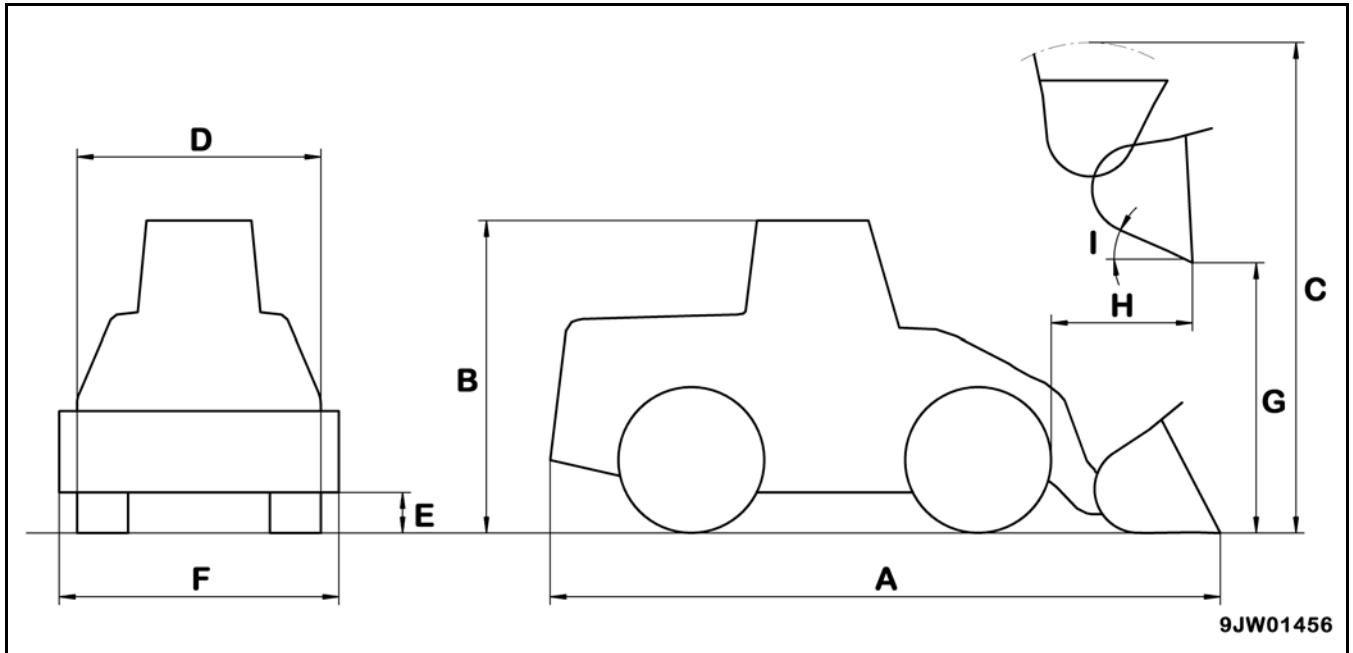
SPECIFICATIONS

SPECIFICATIONS

SPECIFICATIONS

Item		Unit	WA430-6 standard specification machine (when using POWER mode)	
Machine weight (with bolt on cutting edge)		kg (lb)	18,290 (40,323)	
Normal load		kg (lb)	5,600 (12,346)	
Bucket capacity	Heaped	m ³ (yd ³)	3.5 (4.6)	
Engine model		-	Komatsu SAA6D114E-3 diesel engine	
Flywheel horsepower		kW(HP)/rpm	172 (231)/2,100	
A	Overall length	mm (ft in)	8,305 (27 ft 3 in)	
B	Overall height	mm (ft in)	3,390 (11 ft 1 in)	
C	Max. dimension when shaking bucket	mm (ft in)	5,710 (18 ft 9 in)	
D	Overall width	mm (ft in)	2,820 (9 ft 3 in)	
E	Min. ground clearance	mm (ft in)	455 (1 ft 6 in)	
F	Bucket width	mm (ft in)	3,050 (10 ft 0 in)	
G	Dumping clearance (*1)	Cutting edge [BOC tip]	mm (ft in)	3,105 (10 ft 2 in) [3,020 (9 ft 11 in)]
H	Dumping reach (*1)	Cutting edge [BOC tip]	mm (ft in)	1,150 (3 ft 9 in) [1,190 (4 ft 11 in)]
I	Bucket dump angle (max. height)		degrees	49
	Min. turning radius	Outside of chassis	mm (ft in)	7,230 (23 ft 9 in)[7,335 (24 ft 1 in)]
		Center of outside tire	mm (ft in)	6,335 (20 ft 9 in)
Permissible towing load		kN (kg) {lb}	116 (11,800) {26,015}	
Travel speed	Forward	1st	km/h (mph)	7.0 (4.3)
		2nd	km/h (mph)	12.3 (7.6)
		3rd	km/h (mph)	21.6 (13.4)
		4th	km/h (mph)	37.2 (23.1)
	Reverse	1st	km/h (mph)	7.6 (4.7)
		2nd	km/h (mph)	12.9 (8.0)
		3rd	km/h (mph)	23.0 (14.3)
		4th	km/h (mph)	37.2 (23.1)

*1: Indicates the value at the 45° bucket dump angle.



MEMORANDUM

OPTIONS, ATTACHMENTS

JOYSTICK STEERING SYSTEM

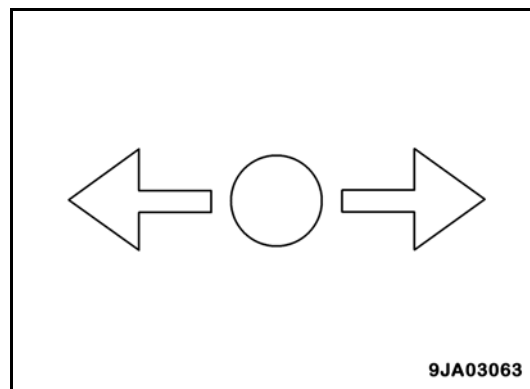
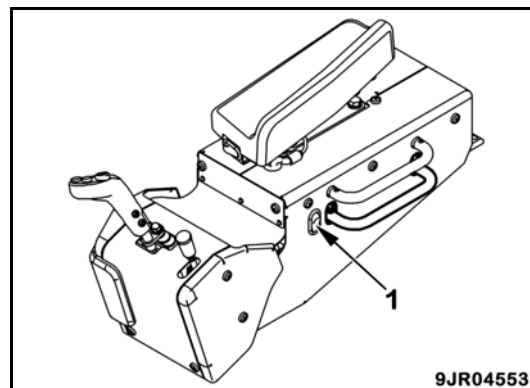
★ Your machine may be equipped with the joystick steering system.

To use the joystick steering safely and efficiently, read the information in this section before using the system.

Structure and Function

The joystick steering system steers the wheel loader with a lever instead of a steering wheel.

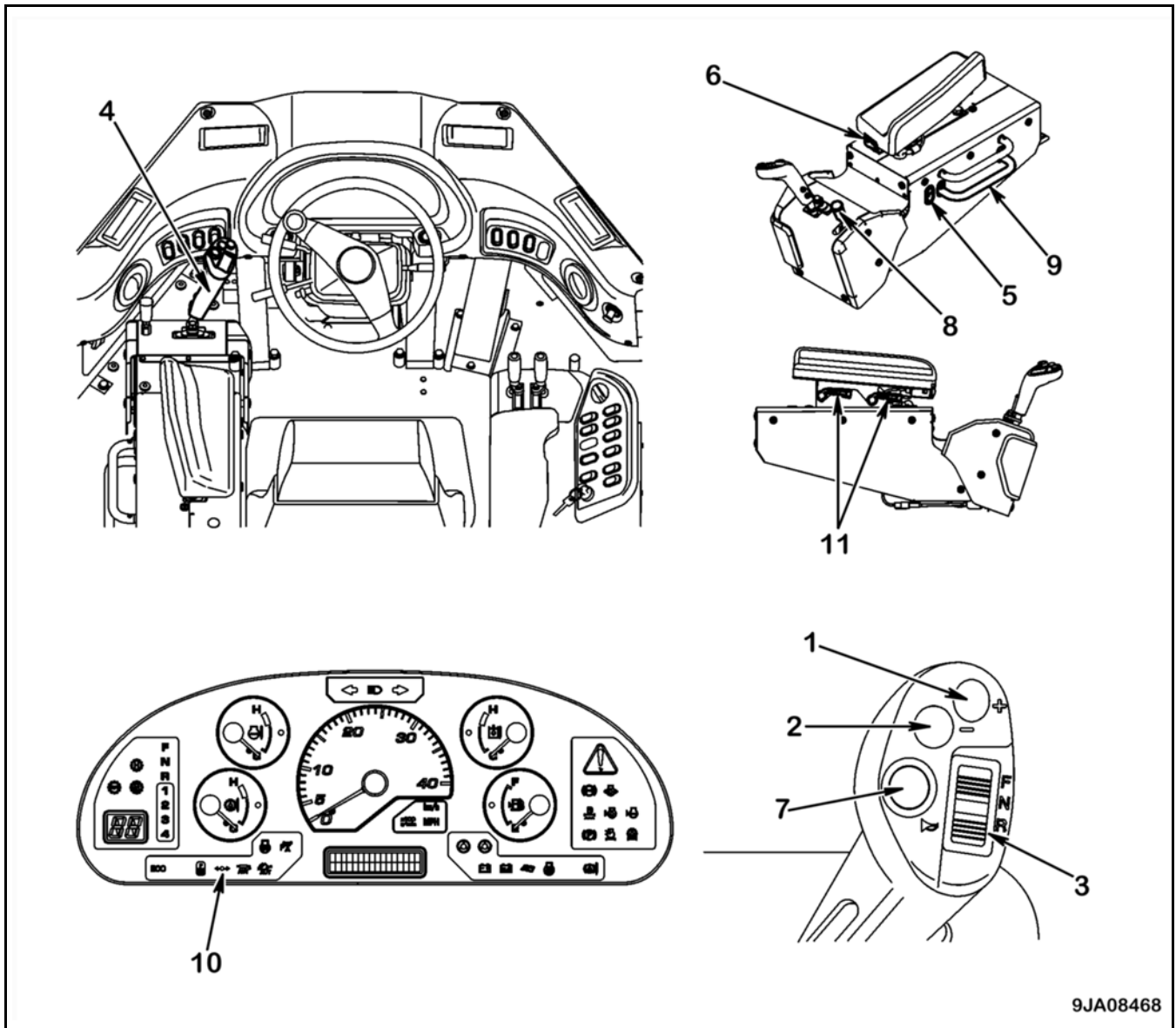
- The joystick enables steering with small, light movements and helps to reduce operator fatigue.
- When joystick ON/OFF switch (1) is turned ON, it is possible to operate the steering with the joystick.
- If the joystick steering system is installed, the steering and transmission control methods can be selected with the joystick ON/OFF switch.
- Before turning the joystick ON/OFF switch ON, adjust the position of the joystick console and check that there is no play in the console. See “Adjusting Joystick Console” on page 5-13.
- When the joystick steering is in use, the joystick pilot lamp on the machine monitor lights up. See “Joystick Pilot Lamp (if equipped)” on page 2-26.
- The functional difference between steering with the joystick steering system as opposed to the steering wheel is shown in the following table.



Selection		Operation Using Joystick		Operation Using Steering Wheel	
Joystick ON/OFF Switch		ON		OFF	
Steering		Steering using joystick (steering with steering wheel is also possible)		Steering using steering wheel	
Transmission	Changing direction	Operation using directional selector switch at top of joystick		Operation using transmission directional lever	
	Transmission auto-shift/manual shift selector switch	Manual	Auto (L, H)	Manual	Auto (L, H)
	Selection of speed range	Speed range selection using shift UP, shift DOWN switches at top of joystick*	Automatic gearshifting according to travel speed	Operation using gearshift lever	Automatic gearshifting according to travel speed
		1st - 3rd	2nd - 3rd	1st - 4th	2nd - 4th

* Does not shift up above speed range of gearshift lever.

Components



- | | |
|--------------------------------|--|
| 1. Shift UP switch | 7. Horn switch |
| 2. Shift DOWN switch | 8. Console tilt lever |
| 3. Directional selector switch | 9. Console fore-and-aft adjustment lever |
| 4. Joystick steering lever | 10. Joystick pilot lamp |
| 5. Joystick ON/OFF switch | 11. Armrest adjustment lever |
| 6. HI/LOW selector switch | |

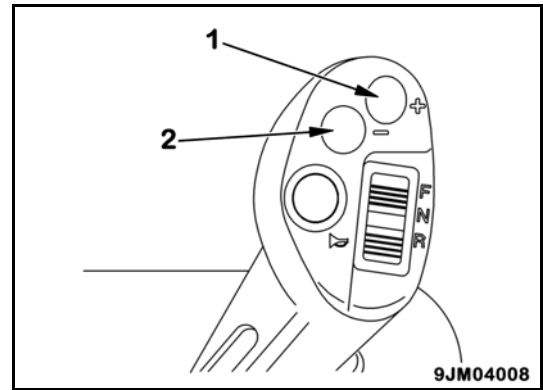
OPTIONS, ATTACHMENTS

Shift UP, Shift DOWN Switches

The shift UP/Shift DOWN switches (1) and (2) are used to shift up or down in the manual shift mode.

- Press (1): Shift UP
- Press (2): Shift DOWN

These switches are not used in the auto-shift mode.

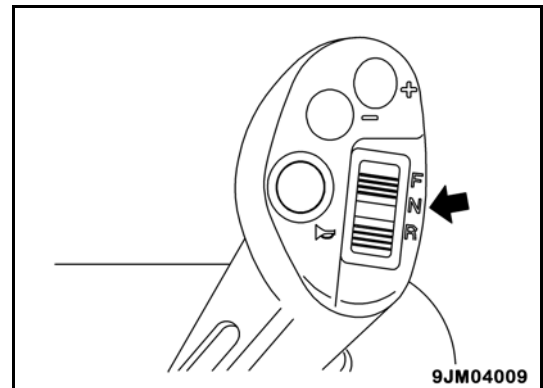


Directional Selector Switch

The directional selector switch (3) on the head of the joystick steering lever is used to switch the transmission between forward and reverse.

- (F) position: FORWARD
- (N) position: NEUTRAL
- (R) position: REVERSE

In the manual shift mode, use the shift UP and shift DOWN switches on the head of the joystick steering lever to shift the speed range.

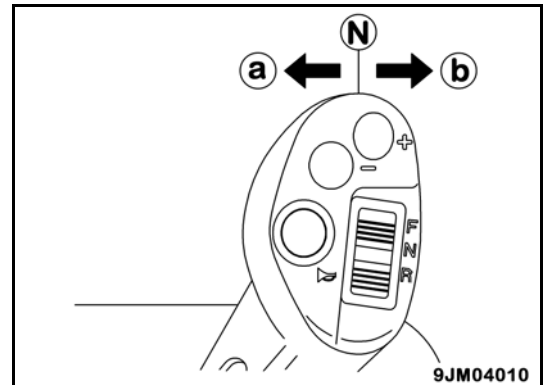


Joystick Steering Lever

The joystick steering lever (4) is used to steer the machine to the left or right.

When traveling, operate this lever in the direction that you want to turn the machine.

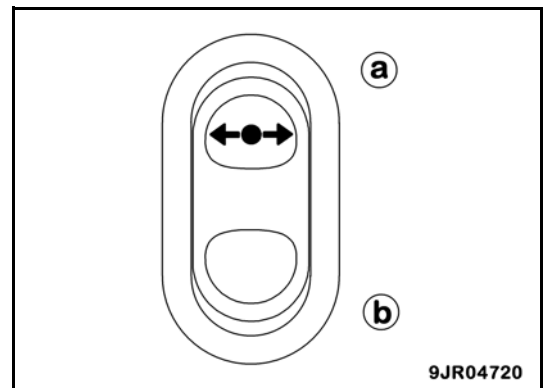
- (a): Left turn
- (b): Right turn
- (N): Neutral



Joystick ON/OFF Switch

The joystick ON/OFF switch (5) is used to switch the joystick steering function ON or OFF.

- Position (a): ON (possible to steer with joystick)
- Position (b): OFF (impossible to steer with joystick)



HI/LOW Selector Switch

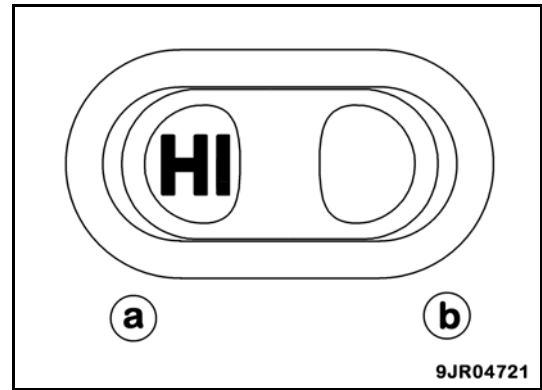
The HI/LOW selector switch (6) is used to switch the steering speed between HIGH and LOW.

- Position (a): HI

The articulating speed of the machine is high in relationship to the operation of the joystick. This setting is suitable for comparatively fast cycle times.

- Position (b): LOW

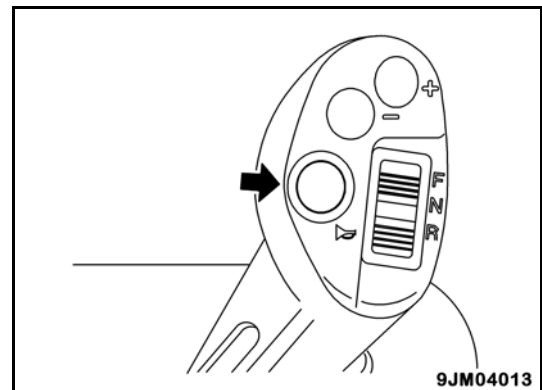
The articulating speed of the machine is low in relationship to the operation of the joystick. This setting is suitable for operations loading loose materials and materials that spill easily.



Horn Switch

The horn switch (7) is used to sound the horn.

This switch is located at the top of the joystick and can be used to sound the horn without taking your hand off the joystick.

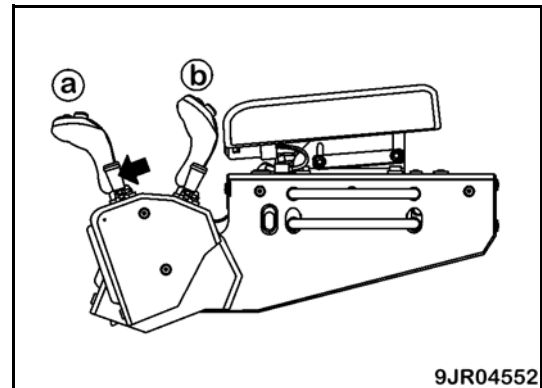


Console Tilt Lever

The console tilt lever (8) is used to release the tilt lock for the joystick console lever.

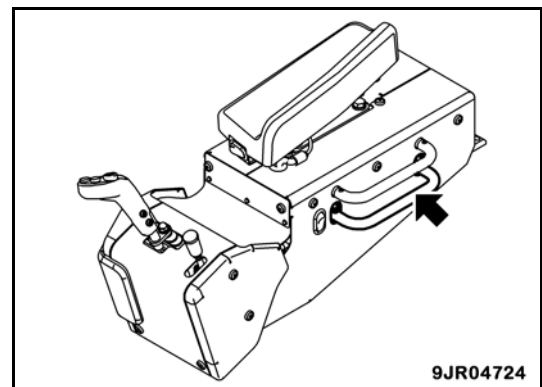
Push the console tilt lever to the front to release the tilt lock, then tilt the console.

- Position (a): Joystick steering system is actuated.
- Position (b): Joystick steering system is not actuated (system is turned OFF).



Console Fore-and-Aft Adjustment Lever

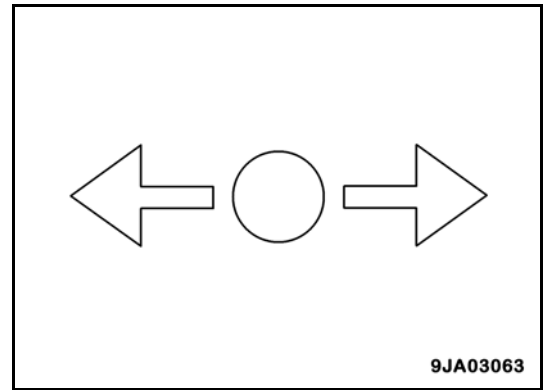
The console fore-and-aft adjustment lever (9) is used to slide the whole joystick console to the front or rear. For details, see “Adjusting Joystick Console” on page 5-13.



OPTIONS, ATTACHMENTS

Joystick Pilot Lamp

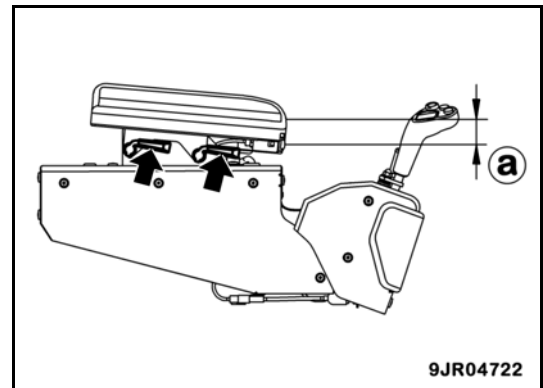
The joystick pilot lamp (10) lights up when the joystick ON/OFF switch is at the ON position and the joystick console is moved to the front to make it possible to use the joystick.



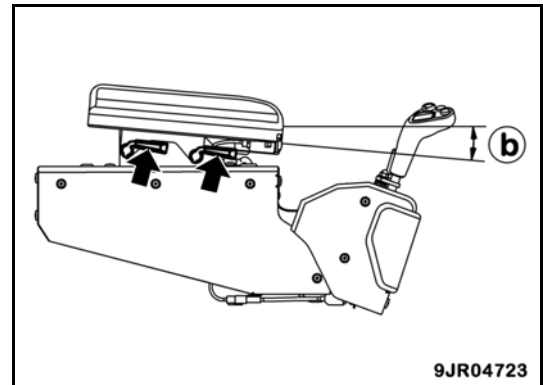
Armrest Adjustment Lever

The armrest adjustment lever (11) is used to adjust the height of the armrest within range (a) of 26 mm (1 in).

Pull the lever to adjust the angle.



It is possible to adjust the angle within range (b) of approximately 7°.



Steering with Joystick Lever or Steering Wheel

WARNING

- Set the joystick lever to the Neutral position when starting the engine.
- If the directional lever and joystick directional selector switch are not at the neutral position, the neutral interlock circuit makes it impossible to switch the transmission directional control (when the joystick ON/OFF switch is ON, it is switched from the directional lever to the joystick directional selector switch; when the joystick ON/OFF switch is OFF, it is switched from the joystick directional selector switch to the directional lever).
- Never use the joystick when traveling on public roads.
- When traveling on public roads, turn the joystick ON/OFF switch to the OFF position, then tilt the joystick console lever portion to the rear.
- If the engine is running and the joystick lever is touched by accident, there is danger that it may cause the machine to articulate unexpectedly. To avoid this when the machine is not being operated, always move the joystick ON/OFF switch to the OFF position and tilt the joystick console lever portion to the rear.
- Use the joystick only when carrying out continuous loading operations.
- Never use the joystick when carrying out load-and-carry operations.

Select joystick operation or steering wheel operation according to the type of work.

- ★ Before using the joystick steering, read the precautions in “Precautions for Steering with Joystick” on page 5-8.

Steering Using Joystick

- This is suited for continuous loading operations on job sites with ample space, where the loading operation can be carried out with a comparatively relaxed cycle time.
- Because operations can be carried out with small movements and light operating effort, this is also suitable for reducing operator fatigue when operating continuously.
- When the joystick is actuated, the transmission will not enter the 4th speed range.

Steering Using Steering Wheel

- This provides excellent fine control and ability to travel in a straight line.
- It is suitable for travel between job sites and for load-and-carry operations.
- It is also suitable for short-cycle loading operations because the upper part of the operator’s body is supported by the steering wheel when frequently switching between FORWARD and REVERSE.
- Always steer with the steering wheel when driving the machine on public roads.

Precautions for Steering with Joystick

WARNING

- If using the joystick lever to operate the steering and transmission but the operation of the machine does not match the operation performed by the operator and the warning lamp lights up, do these steps.
 - Use the steering wheel to steer, if necessary; apply the brakes immediately; turn the joystick ON/OFF switch OFF; operate the steering wheel and the directional lever to move the machine to a safe place; then stop the machine.
 - Before starting the operation of the machine again, find the problem part and repair it then confirm that the function is normal. For troubleshooting and repair, contact your Komatsu distributor.
 - Never operate the machine before it is repaired completely.
-
- If the machine is steered with the steering wheel, its turning angle is fixed when turning of the steering wheel stops.
 - If the machine is steered with the joystick and the joystick is held in a turning position, the machine is steered to the articulate end.
 - ★ Since the feel of steering with the joystick is different from using the steering wheel, be very careful until you are accustomed to the joystick.
 - If the joystick ON/OFF switch is turned OFF and the directional selector switch and directional lever are not at the N position, the neutral interlock circuit is actuated; the central warning lamp lights up; and the alarm buzzer sounds.

Return the directional selector switch and directional lever to the N position.
 - If there is a problem with the electric circuit of the joystick steering system or transmission control system, the central caution lamp (red) on the left side of the machine monitor flashes to notify the operator of the problem.

Since both steering system and transmission are set in the respective neutral positions, turn off the joystick ON/OFF switch, then use the steering wheel and the directional lever to drive the machine.

Operating the Joystick Steering System

⚠ WARNING

- It is dangerous to turn the machine suddenly at high speed, or to turn on steep hills. Do not operate the steering in such conditions.
- When turning, the articulation stops at the position to which the steering wheel is turned, but if the joystick is held in the tilted position, the body will articulate fully.
- The feeling when operating the steering with the joystick is different from when operating with the steering wheel. Be extremely careful until you have become used to operating the joystick.
- If the joystick ON/OFF switch is at the ON position and the directional lever is operated to F or R, the machine will travel in forward or reverse according to the operation of the directional lever, regardless of the position of the directional selector switch on the head of the joystick lever. Priority is given to the operation of the directional lever; be careful when operating the directional lever.
 - When this is done, the central warning lamp lights up and the alarm buzzer sounds.
 - Set the directional lever and directional selector switch on the head of the joystick to the N position.

★ Check the adjustment and operation before starting the engine. See “Check Before Starting Engine” on page 2-80.

1. When starting the engine, check that the joystick lever is at the N position, that the transmission directional lever is at the N position, and that the surrounding area is safe.

2. Under the following conditions, a warning may be given when the engine is started.

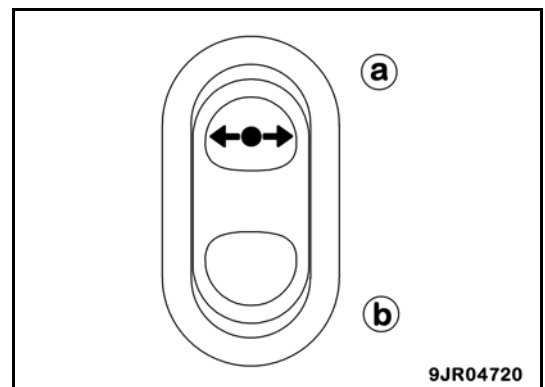
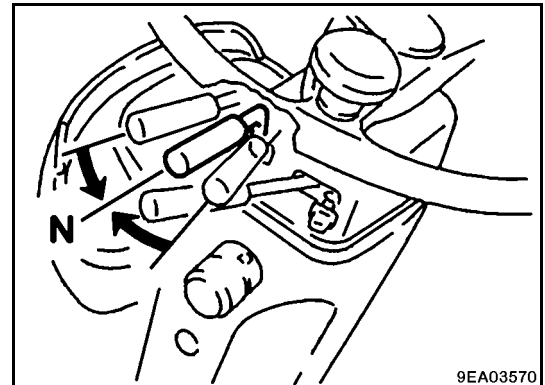
- If the directional selector switch on the joystick is at F or R, the joystick pilot lamp flashes; the central warning lamp lights up; and the alarm buzzer sounds.

In this condition, the engine will not start. Set the directional selector switch to N.

- If the joystick is not at the N position, the joystick pilot lamp flashes; the central warning lamp lights up; and the alarm buzzer sounds.

In this condition, the engine will not start. Set the joystick to the N position.

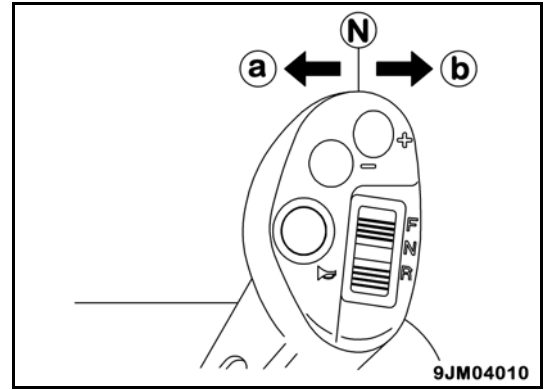
3. When using the joystick, set the joystick ON/OFF switch to position (a) to activate the joystick steering system.



OPTIONS, ATTACHMENTS

4. Operate the joystick in direction (b) to turn the machine to the right; operate it in direction (a) to turn the machine to the left.

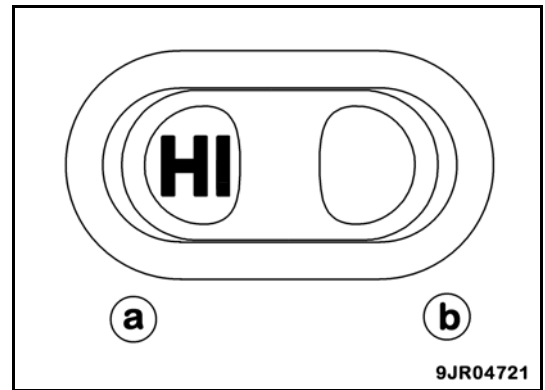
The greater the angle of operation, the faster the articulating speed becomes.



5. It is possible to switch the articulating speed with the HI/LOW selector switch. Select the speed to match the operation.
6. When the machine has articulated to the desired angle, return the joystick to the N position.

The joystick will return automatically to the N position.

7. To return the direction of travel of the machine so that it travels in a straight line, operate the joystick in the opposite direction from the N position (for example, when the machine is articulated to the right, operate the joystick to the left).

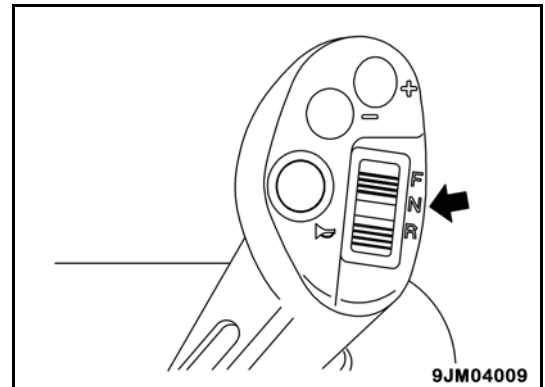


8. Use the directional selector switch at the top of the joystick lever to set the transmission to the direction of travel.

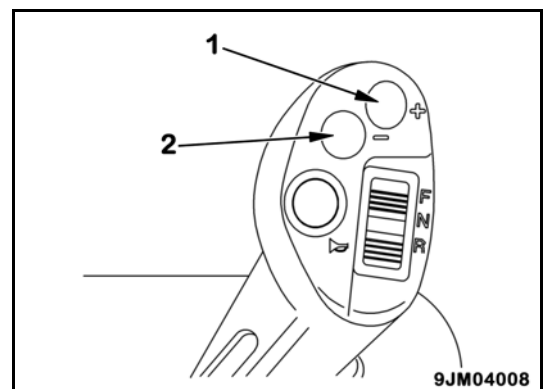
- N position: NEUTRAL
- F position: FORWARD
- R position: REVERSE

If the position of the directional lever and the directional selector switch are different, the joystick pilot lamp flashes; the warning lamp lights up; and the alarm buzzer sounds.

In this condition, the machine moves to the front or rear according to the position of the directional lever. Place the directional lever at the N position.

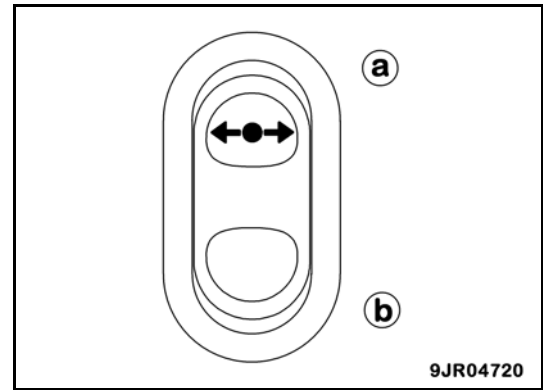


9. When the shift mode is in manual, use shift UP switch (1) and shift DOWN switch (2) on the joystick lever to shift the travel speed range.



10. When not using the joystick, set the joystick ON/OFF switch to position (b).

The activation of the joystick is cancelled.



Getting In and Out of Operator's Cab

WARNING

- Before getting in or out of the operator's cab, turn the joystick ON/OFF switch to the OFF position.
- Grip console fore-and-aft adjustment lever (A) and slide the joystick console fully to the rear and lock it in position.

When the console fore-and-aft adjustment lever is gripped, the joystick console lever portion moves together and tilts to the rear; the joystick steering system power is turned OFF; and the joystick becomes inactive.

To make it easier to get in or out of the operator's cab, the joystick console can slide 220 mm (8.66 in) to the front and rear.

- When not using joystick:

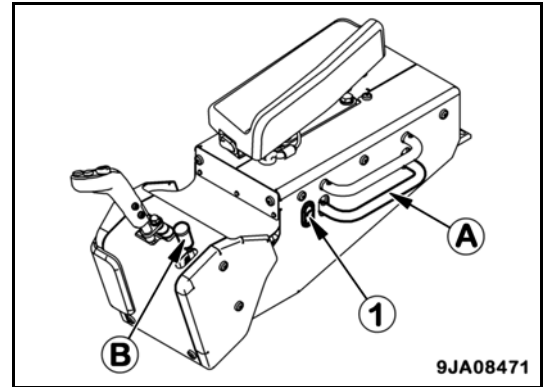
Always turn the joystick ON/OFF switch (1) to the OFF position; push lever (B) to the front; and tilt the joystick console lever portion to the rear.

The electric power is turned OFF and the joystick steering system becomes inactive.

- When using joystick:

When operating the machine, push lever (B) to the front; tilt the joystick console lever portion to the front; and set joystick ON/OFF switch (1) to the ON position.

The electric power is turned ON and the joystick steering becomes active.



Adjustments

! WARNING

- Stop the machine on level ground in a safe place when carrying out the adjustment.
- Carry out the adjustment before starting operations or when changing operator shifts.
- Put your back against the backrest of the operator's seat and adjust the seat so that it is possible to depress the brake fully, then adjust the console.

Adjusting Joystick Console

1. Grip console fore-and-aft adjustment lever (1) and adjust the position of the joystick console to the front or rear.

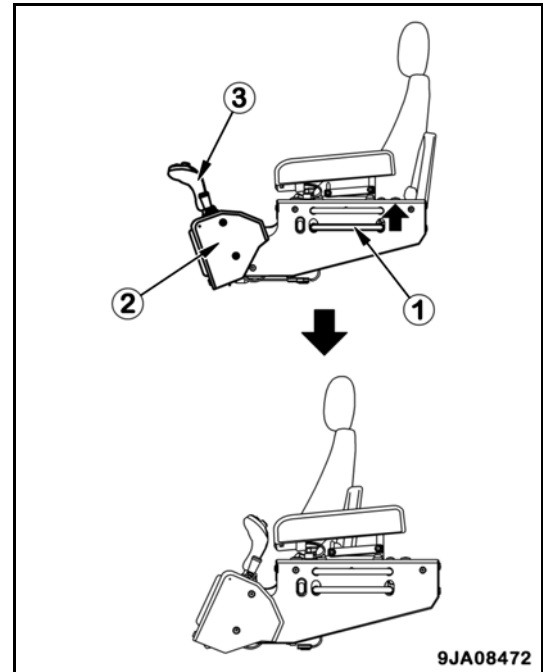
If you grip the console fore-and-aft adjustment lever (1), lever portion (2) of the joystick console automatically tilts to the rear.

Maximum slide to rear when getting on or off: 220 mm (8.7 in)

Fore-and-aft adjustment when operating joystick: . 160 mm (6.3 in)

..... (16 mm (0.6 in) x 10 stages)

2. When using the joystick, adjust the fore-and-aft position, then push console tilt lever (3) to the front and tilt lever portion (2) fully from the rear to the front.
3. After doing this, set the joystick ON/OFF switch to the ON position.



OPTIONS, ATTACHMENTS

Adjusting Seat

WARNING

- Stop the machine in a safe place before adjusting the operator's seat.
- Adjust the seat position at the beginning of each shift or when operators change.
- Put your back against the backrest of the operator's seat and adjust the seat so that it is possible to depress the brake fully.

- (A) Fore-and-aft adjustment

Move lever (1) up; move the seat to the desired position; then release the lever.

Fore-and-aft adjustment: 210 mm (10 mm x 21 stages)
. (8.27 in [0.39 in x 21 stages])

- (B) Adjusting seat angle

Move lever (2) up; move the seat cushion at the front up or down to set to the desired position; then release the lever.

Adjustment range:

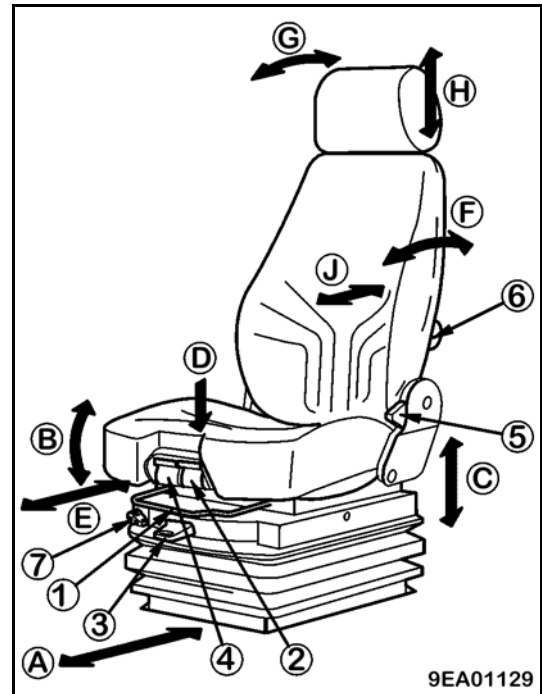
Forward tilt: 3°

Rear tilt: 11°

Remark

An air compressor built into the seat is used for adjustments (C) and (D). Turn the engine starting switch to the ON position before starting the adjustment.

There is danger of damage to the air compressor. Do not keep lever (3) operated continuously for more than one minute.



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- (C) Adjusting seat height

The seat height adjustment uses an air system and can be adjusted easily.

When adjusting the height, pull lever (3) up fully or push it down fully (when pulling it up, pull it until you feel a click). When the seat is set at the desired height, release the lever. If the lever is kept pulled up, the position where the seat does not rise any further is the maximum height. When the seat reaches the maximum height, the suspension automatically goes down slightly to secure the amount of movement of the lever.

If the operator raises his body from the seat or changes the amount of weight applied to the seat during adjustment, the air in the suspension may be discharged.

Adjustment range: 80 mm (3.15 in)

Remark

If the lever is operated in the RAISE direction from the maximum height, the compressor may continue to operate for approximately eight seconds. This does not indicate any abnormality with the seat.

If this happens, the compressor will stop automatically after approximately eight seconds. The compressor will also stop if the height control lever is operated in the LOWER direction.

- (D) Adjusting seat for operator's weight

Pull lever (3) up fully (pull it until you feel a click). When the lever is released, the weight adjustment is carried out automatically. To ensure that the weight adjustment is carried out correctly, the operator should sit in the normal operating position when operating the lever. If the operator raises his body from the seat or changes the amount of weight applied to the seat during adjustment, the air in the suspension may be discharged.

When operators change shifts, the new operator should pull lever (3) up fully (pull it until he hears a click). When the lever is released, the weight adjustment is carried out automatically.

If lever (3) is pulled lightly, the weight adjustment starts, but always pull the lever up fully (pull it until you hear a click) before releasing it.

Remark

When making the initial adjustment or when adjusting the weight settings when operators change shifts, set the damping force of the suspension damper to the soft setting (for details, see "(K) Adjusting hardness of suspension damper" on page 5-16), then adjust it to match the operator's weight. If the damping force of the suspension damper is left set to the hard setting and the height of the seat is adjusted, even if the height is raised, the seat may go down. If the seat goes down, set the damping force of the suspension damper to the soft setting; lower the seat; then adjust the weight again. After completing adjustment of the weight and height, set the damping force of the suspension damper to the desired strength.

To protect the operator, the suspension must be adjusted to match the operator's weight. Adjust the weight before starting operations.

When adjusting, do not remove your weight from the seat or change the load in any other way. If this is done, the air may be released from the suspension seat.

- (E) Fore-and-aft adjustment of seat cushion

Operate lever (4) up; set the seat cushion to the desired position; then release the lever.

Adjustment range: 60 mm (2.36 in)

- (F) Adjusting reclining angle

Operate lever (5) up and move the back cushion to the front or rear.

Put your back firmly against the seat back when carrying out this adjustment. If you move your back away from the seat back, the seat back may suddenly spring forward.

Adjustment range:

Forward tilt: 10° (over 10° is free)

Rear tilt: 36°

Remark

If the seat back is reclined too far, the seat back may hit the rear glass. Use it in a position where it does not contact the glass.

- (G) Adjusting headrest angle

Rotate the headrest to the front or rear.

Adjustment range: 38°

OPTIONS, ATTACHMENTS

- (H) Adjusting headrest height

Move the headrest up or down and set to the desired height.

Adjustment range: 100 mm (3.94 in)

- (J) Adjusting lumbar support

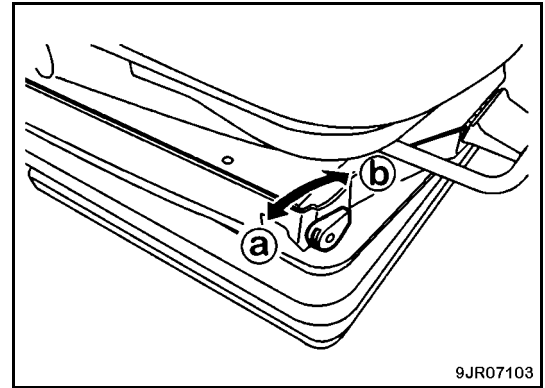
Turn the knob (6) to the right or left to give the suitable amount of lumbar support.

- (K) Adjusting hardness of suspension damper

Operate knob (7) to adjust the strength of the suspension damper.

Turn knob (7) towards the front of the seat (a) to make the damping force harder; turn it towards the rear of the seat (b) to make the damping force softer.

Amount of adjustment: 5 stages



TORQUE CONVERTER LOCKUP

! WARNING

- When traveling down slopes with a grade of more than 6°, never depress the accelerator pedal fully, regardless of whether the torque converter lockup switch is ON or OFF. It is extremely dangerous to drive too fast.

★ The travel speed mentioned in this section is applicable when the 23.5-25 tire is used.

★ The travel speed is subject to working conditions and the road condition.

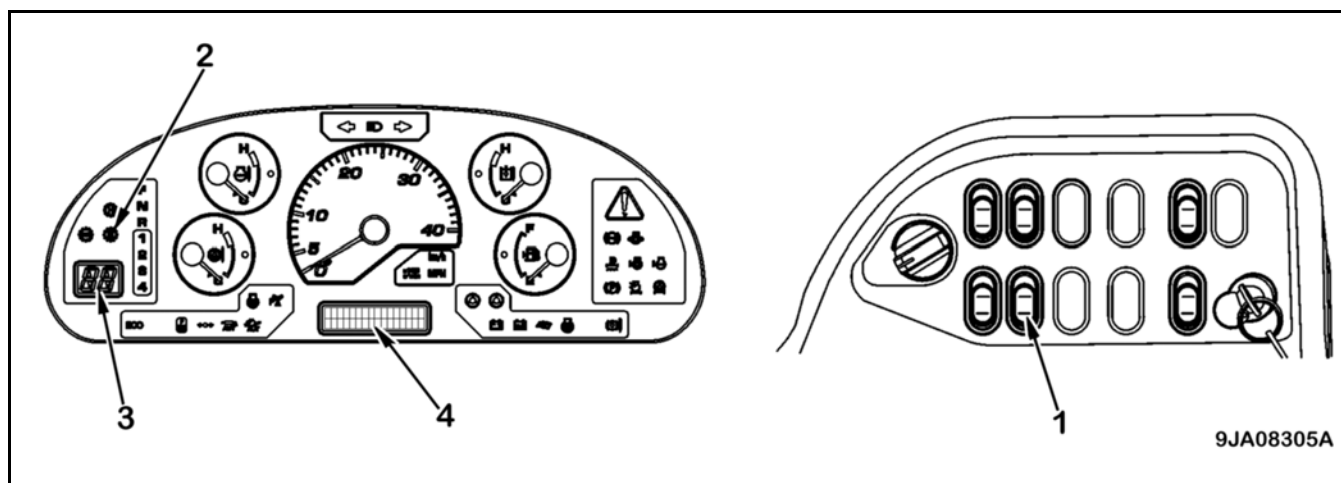
To prevent overrunning when traveling at high speed in the following cases, do not downshift gears.

- When traveling in F3 at a speed of more than 18.0 km/h (11.2 mph), do not shift down to F2.
- When traveling in F4 at a speed of more than 28.0 km/h (17.4 mph), do not shift down to F3.

When the actual speed range is 3rd or 4th in either FORWARD or REVERSE, the torque converter lockup function is actuated according to the travel speed and sets to direct drive.

To prevent overrun, the lockup is automatically canceled to prevent the travel speed from going above 40 km/h (24.9 mph).

Components



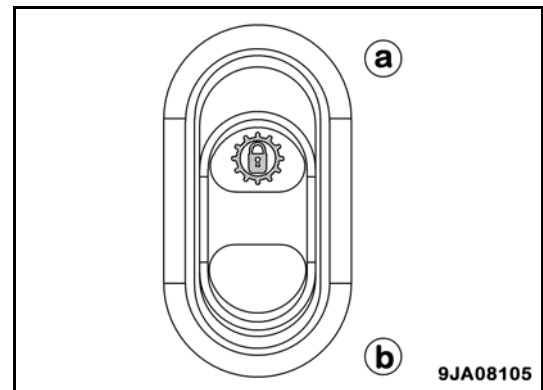
1. Torque converter lockup switch
2. Torque converter lockup pilot lamp
3. Shift indicator (displays actual speed range)
4. Character display (Action code display)

OPTIONS, ATTACHMENTS

Torque Converter Lockup Switch

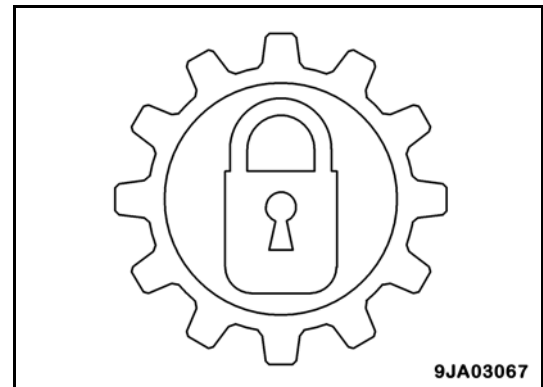
The torque converter lockup switch (1) is the control switch for the torque converter lockup function.

- Position (a): ON
The pilot lamp inside the switch lights up and the lockup is actuated dependent on travel speed. While the lockup is engaged, the lockup pilot lamp on the machine monitor lights up.
- Position (b): OFF
The lockup does not function.



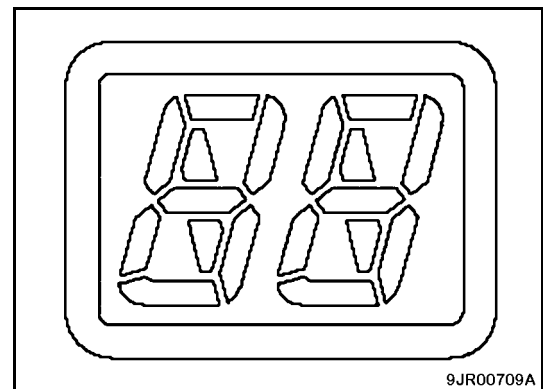
Torque Converter Lockup Pilot Lamp

The torque converter lockup pilot lamp (2) lights up when the torque converter lockup is engaged and the transmission actually enters direct drive.



Shift Indicator

The shift indicator (11) indicates the transmission gear range (actual travel speed range).

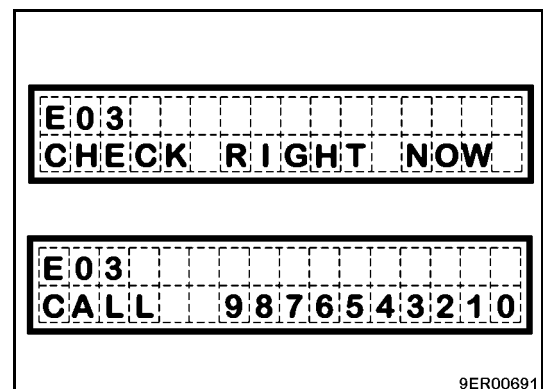


Character Display

The character display (4) indicates if there is a failure on the machine, if it is necessary to change the method of operation, or if inspection or maintenance must be carried out. Action codes and short messages appear on the display.

See “Action Code Display” on page 2-10 for additional information.

- ★ The display to the right is an example.



Method of Operation

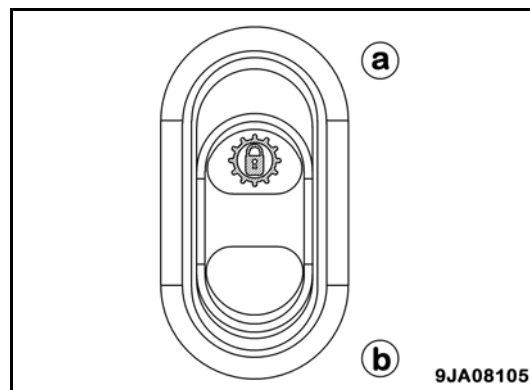
1. Press the top (a) of the torque converter lockup switch to turn it ON.

The pilot lamp inside the switch lights up.

- ★ When the actual speed range is 3rd or 4th in either FORWARD or REVERSE, the torque converter lockup function is actuated according to the travel speed and sets to direct drive.

- ★ When the gearshift lever is at 4th in auto-shift mode, the lockup is not actuated if the actual speed range is 3rd. The lockup is actuated only when the actual speed range is 4th.

- ★ When the lockup is actuated, the lockup pilot lamp on the machine monitor lights up.



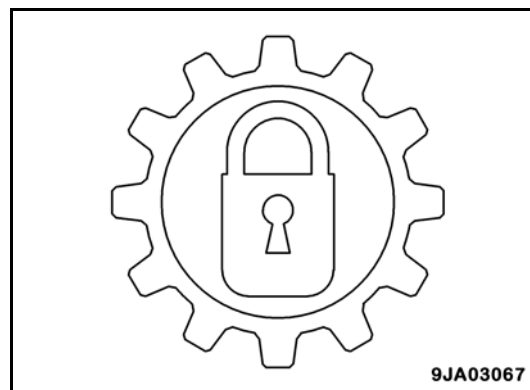
2. To cancel the lockup function, press the bottom (b) of the torque converter lockup switch to turn it OFF.

The lockup function is canceled.

- ★ For a full description of the torque converter function, see *Transmission Controller System* in the *Shop Manual*.

Remark

The travel speed for actuation and cancellation of the lockup function is shown in the table.



Lockup Speed Range	FORWARD Travel Speed km/h (mph)		REVERSE Travel Speed km/h (mph)	
	Actuated	Canceled	Actuated	Canceled
3rd	11 to 13 (6.8 to 8.1)	10 to 12 (6.2 to 7.5)	12 to 14 (7.5 to 8.7)	11 to 13 (6.8 to 8.1)
4th	19 to 22 (11.8 to 13.7)	18 to 21 (11.2 to 13.0)	20 to 23 (12.4 to 14.3)	19 to 22 (11.8 to 13.7)

- ★ The travel speed mentioned in this table is applicable when the 23.5-25 tire is used.

OPTIONS, ATTACHMENTS

Warning/Limit Functions for Travel Speed

Travel Speed Warning Function

★ This function works even when the torque converter lockup switch is OFF.

When the engine speed goes above 40 km/h (24.9 mph), the central warning lamp lights up and the alarm buzzer sounds.

At the same time, “OVERRUN PROTECT” is displayed on the character display.

- If the alarm buzzer sounds, depress the brake immediately to slow the machine down.

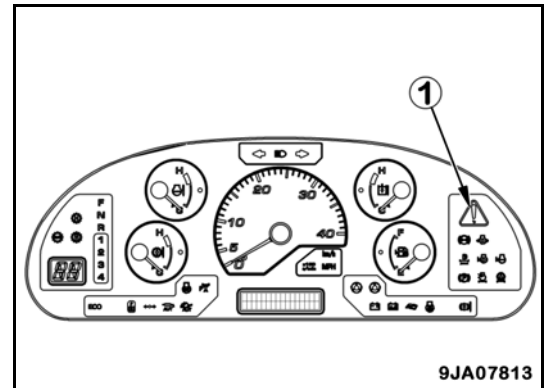
When the travel speed goes below 39.5 km/h (24.5 mph), the alarm buzzer stops.

Travel Speed Limit Function

★ This function works only when the torque converter lockup switch is ON.

To prevent the travel speed from going above 40 km/h (24.9 mph), the lockup is automatically canceled.

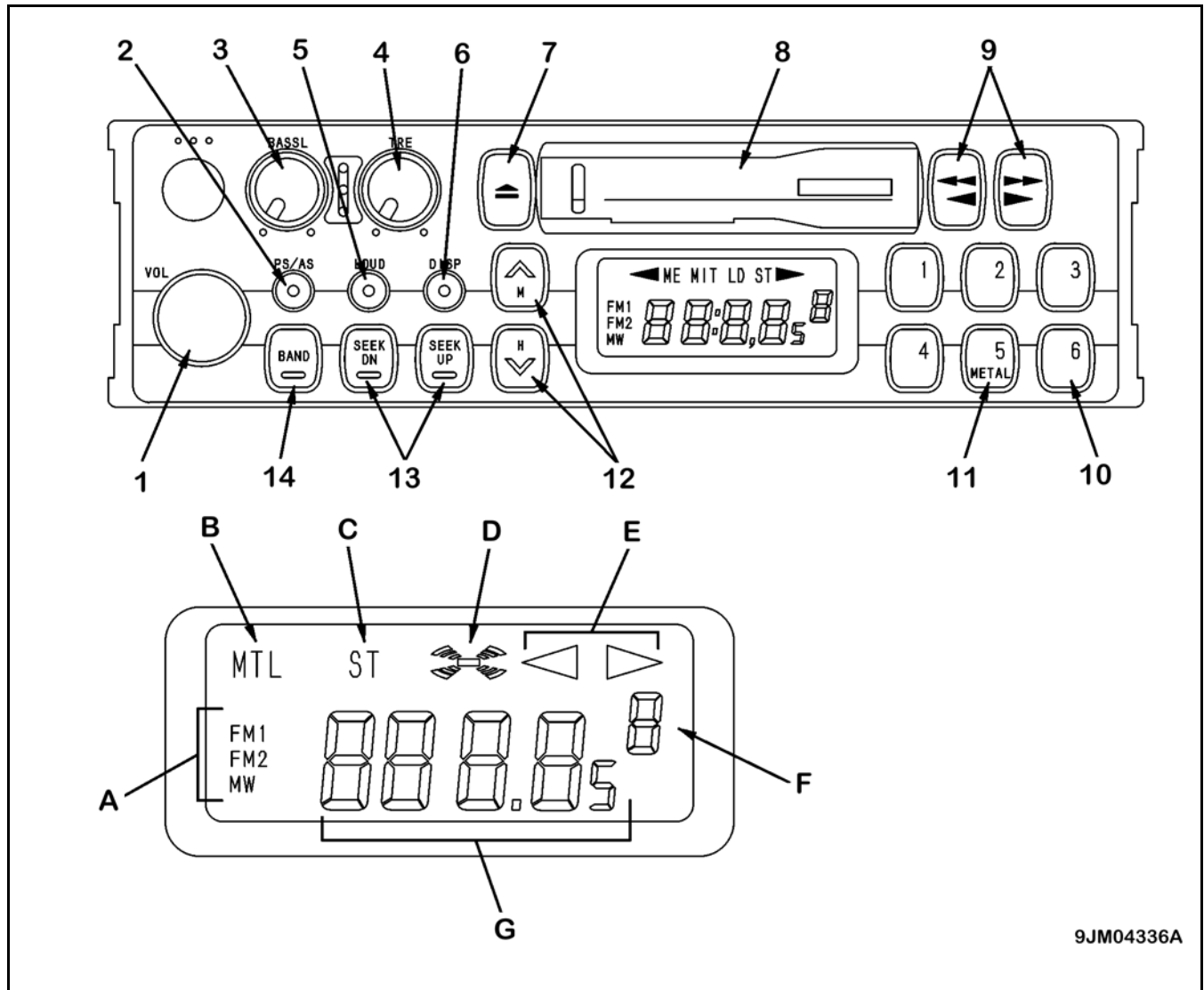
The lockup cancel continues until the travel speed goes below 38 km/h (23.6 mph).



AM/FM RADIO CASSETTE STEREO SOUND SYSTEM

★ Your machine may be equipped with the AM/FM radio-cassette stereo sound system.

Using the radio during machine operations may lead to distractions. When using the radio, always be aware of what you are doing and your operating environment. Do not allow yourself to become distracted.



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OPTIONS, ATTACHMENTS

1. Power switch/Volume
2. Auto-store/Preset scan button
3. Bass control knob
4. Treble control knob
5. Loudness button
6. Time/Radio display selector button
7. Tape eject button
8. Cassette door
9. Fast forward/Rewind buttons
10. Preset buttons
11. Metal tape button
12. Manual tuning buttons
13. Seek tuning buttons
14. Band selector button

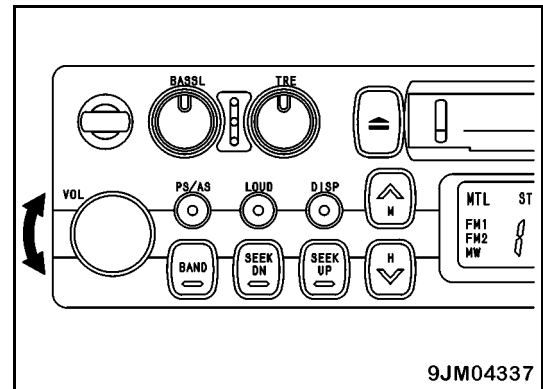
- A. Band display
- B. Metal tape display
- C. FM stereo reception display
- D. Loudness display
- E. Tape direction display
- F. Preset channel display
- G. Time/Frequency display

Sound System Components

Power Switch/Volume

Turn the power switch/volume knob (1) to the right to turn the power ON; you will hear a click.

- To increase the volume, turn the knob to the right.
- To decrease the volume, turn the knob to the left.



Auto-Store/Preset Scan Button

Use the auto-store/preset scan button (2) to actuate the preset scan and auto-store functions.

Auto-Store

Each time this button is pressed for more than two seconds while in radio reception, the auto-store function automatically starts to search for the desired station within a receivable band, and memorizes the frequency in the preset memory. During this scanning process, the frequency shown in the right side of the display continues to change. This indicates that each frequency is memorized in auto-store.

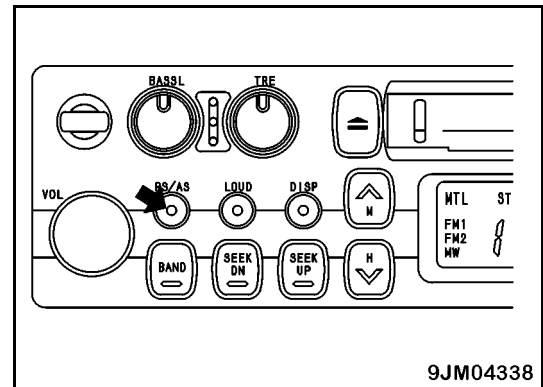
Remark

The auto-store function cannot be used when the channel display is flashing. When the display is flashing, the preset scan function is being used.

Preset Scan

If this button is pressed for less than 0.5 second while in radio reception, programs from the six preset stations in the same band will be broadcast one after another for five seconds each, starting from No. 1 through 6 stations consecutively.

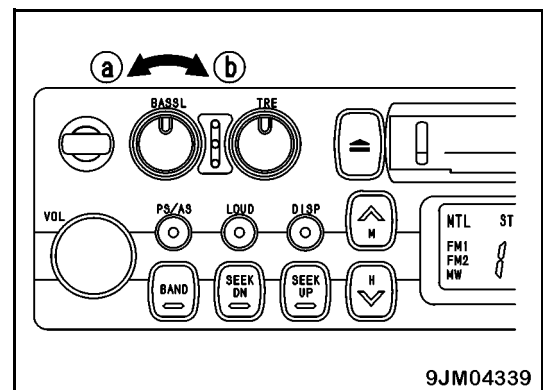
When the desired station is reached, press the button again. This stops the preset scan tuning process and switches to ordinary broadcasting. The same process will be repeated continuously until the button is pressed again.



Bass Control Knob

Use the bass control knob (3) to control the low tones.

- Direction (a): Low tone reduced
- Direction (b): Low tone emphasized

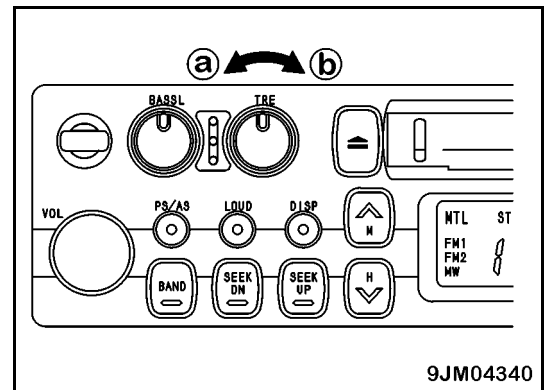


OPTIONS, ATTACHMENTS

Treble Control Knob

Use the treble control knob (4) to control the high tones.

- Direction (a): High tone reduced
- Direction (b): High tone emphasized

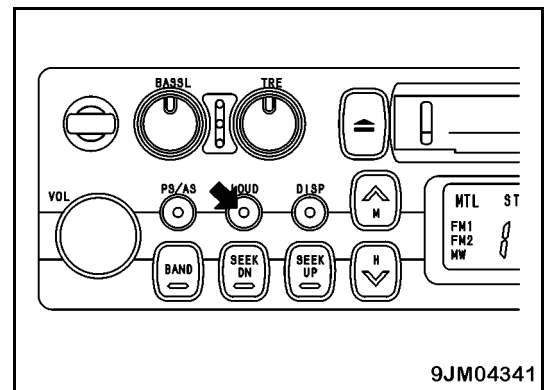


Loudness Button

Use the loudness button (5) to play the stereo at low volume.

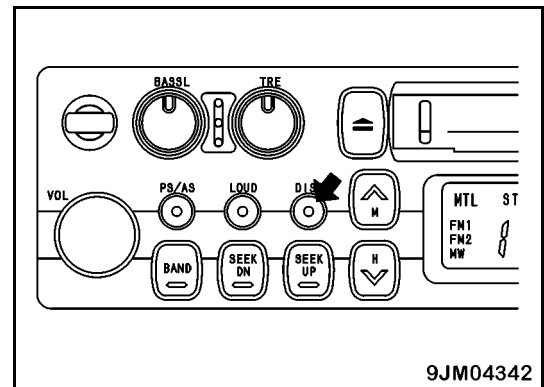
This makes it possible to hear more easily by emphasizing the low tone when the low tones are weak.

- Push button: Actuated (ON)
- Push button again: Canceled (OFF)



Time/Radio Display Selector Button

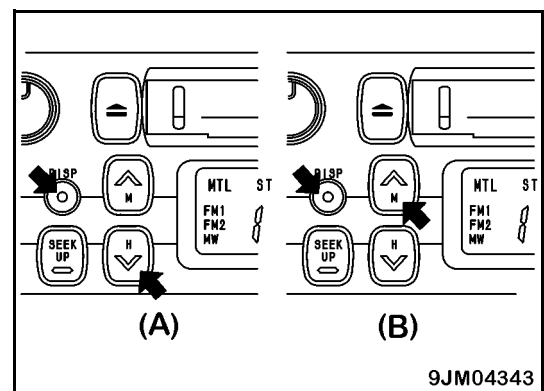
Use the time/radio display selector button (6) to switch between the Radio/Tape display and the Time display.



Correcting the Time

Press the button to set the time display.

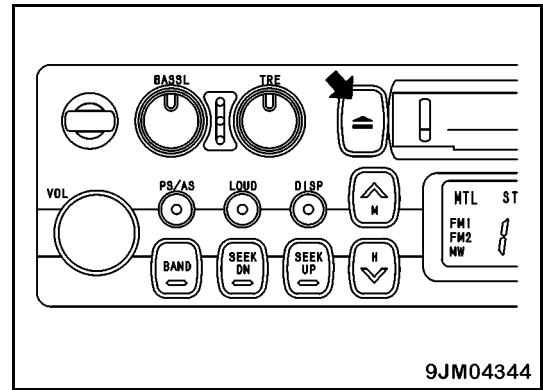
- (A) Correcting Hour
 - Keep the DISP button pressed and press the bottom (H) of the TUNING button to correct the hour.
- (B) Correcting Minute
 - Keep the DISP button pressed and press the top (M) of the TUNING button to correct the minute.



Tape Eject Button

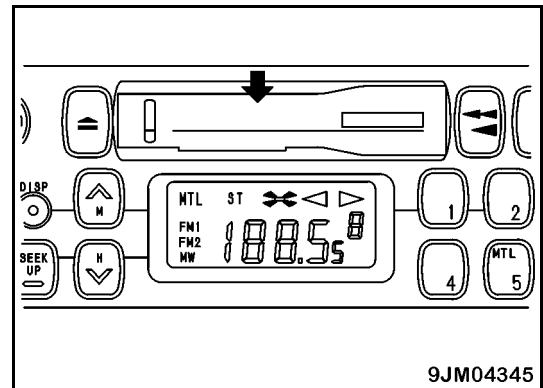
Use the tape eject button (7) to stop the tape and to eject the cassette.

When the tape is ejected, the radio plays.



Cassette Door

Set the cassette with the exposed portion of the tape on the right side and insert it in cassette door (8).



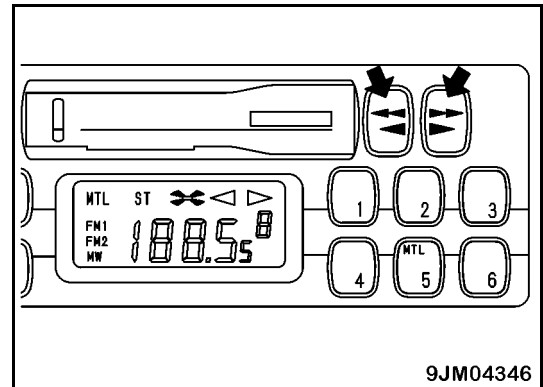
Fast-Forward, Rewind Buttons

Use the fast-forward button (9) to fast forward the tape. Use the rewind button (9) to rewind the tape.

If you press the button pointing in the same direction as the illuminated arrow (indicating the direction of play), the tape will fast forward; if you press the button pointing in the opposite direction, the tape will rewind.

To stop the tape, lightly press the button that is not locked. The fast-forward or rewind operation will be canceled.

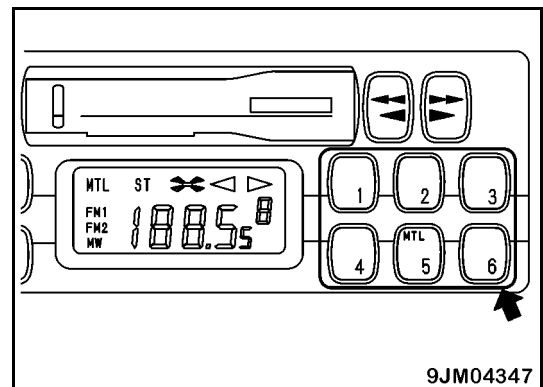
If the fast-forward and rewind buttons are pressed at the same time, the tape will change sides.



Preset Buttons

Use the preset buttons (10) to obtain the broadcast station frequencies preset in memory for each of buttons No. 1 to No. 6.

It is possible to preset 18 stations (FM: 12; AM: 6) with these buttons.



OPTIONS, ATTACHMENTS

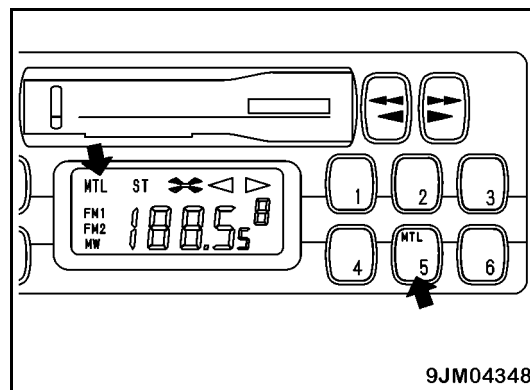
Metal Tape Button

Use the metal tape button (11) to play a metal or chrome tape.

When it is pressed, "MTL" appears on the display.

Remark

This button is used also for preset button No. 5.

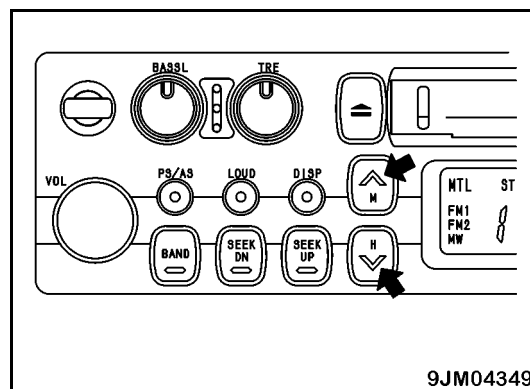


Manual Tuning Buttons

Use the manual tuning buttons (12) to change the frequency manually.

When the **TUN ^** button is pressed, the frequency goes up 9 kHz for AM and 0.1 MHz for FM; when the **TUN v** button is pressed, the frequency goes down 9 kHz for AM and 0.1 MHz for FM.

If the button is pressed and held, the frequency changes continuously.

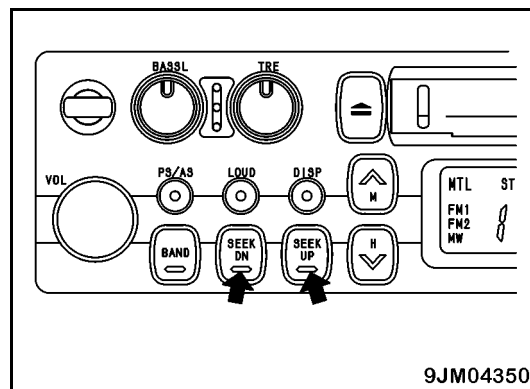


Seek Tuning Buttons

Use the SEEK tuning buttons (13) to find stations within your broadcasting range.

When the **SEEK UP** button is pressed, the frequency goes up automatically; when the **SEEK DOWN** button is pressed, the frequency goes down automatically.

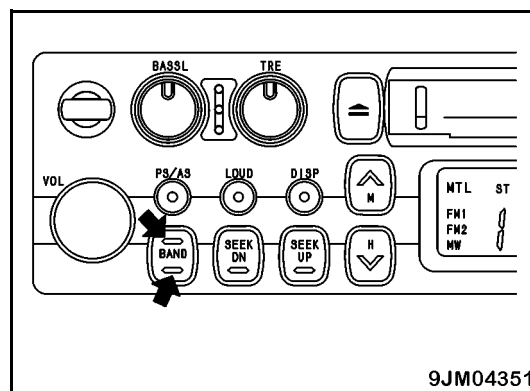
When the next station within broadcasting range is found, seeking stops automatically.



Band Selector Button

Press the band selector button (14) to switch the band between FM1, FM2, and MW (AM).

The band is shown on the display.



Method of Operation

Setting Preset Buttons

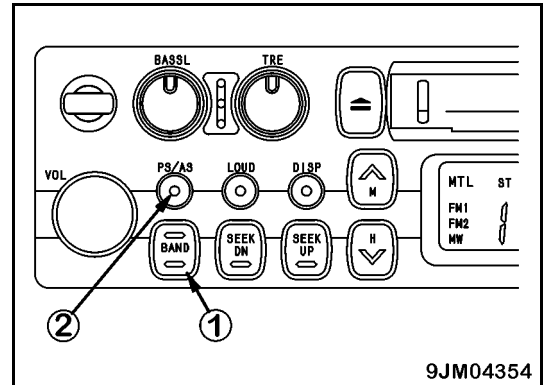
It is possible to preset six MW (AM) stations and 12 FM stations (FM1: six stations, FM2: six stations).

Remark

If you are playing the cassette, press the tape eject button to stop the tape.

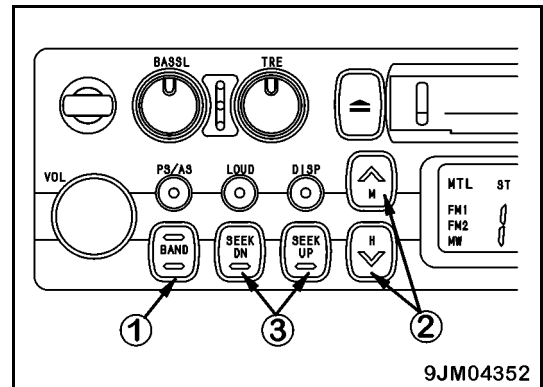
Using Auto-Preset

1. Use band selector button (1) to select MW (AM), FM1, or FM2.
2. Press auto-store/preset scan button (2) for less than 0.5 second.
3. The preset scan tuning function automatically searches for the desired station within the same band and can memorize as many as six stations in the preset memory.



Using Manual Preset

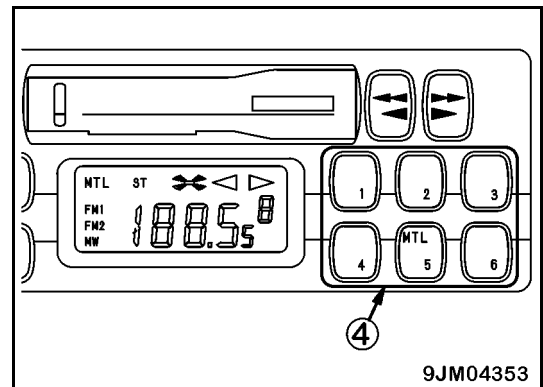
1. Use band selector button to select MW (AM), FM1, or FM2.
2. Press manual tuning buttons (2) or SEEK tuning buttons (3) to select the station to be preset.
3. Keep one of the preset buttons (4) pressed for two seconds while the frequency display is shown on the display. (The preset channel and frequency are displayed and the presetting is completed.)
4. Repeat Steps 2 and 3 to preset other stations to the subsequent numbers.
5. If you want to preset a station in the other bands, follow Steps 1 to 4.



Remark

Use Steps 2 and 3 when changing the setting of a preset switch to another station.

When the power is disconnected, such as when the battery is replaced, all the settings are deleted. You must preset the stations again.



OPTIONS, ATTACHMENTS

Listening to Radio

1. Turn the starting switch ON and then turn power switch (1) ON.
2. Set band selector button (2) to MW (AM), FM1, or FM2.
3. Select the station with the preset buttons (3).
 - ★ If you want to tune to a station that is not preset, use either seek tuning buttons (5) or manual tuning buttons (6).

Remark

In case you do not remember the number assigned to a certain preset station, press the auto-store/preset scan button (4) for less than 0.5 second.

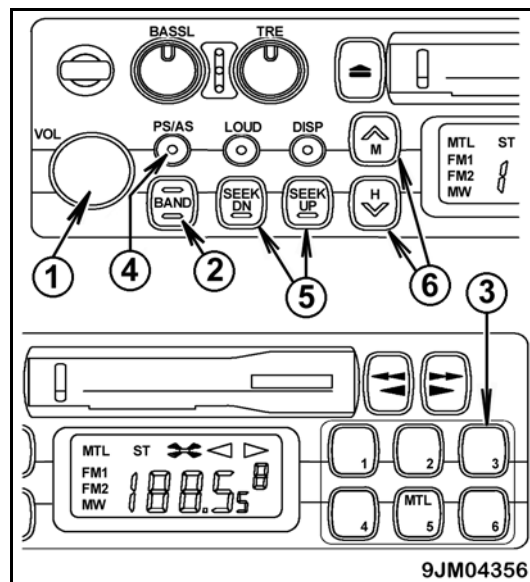
The six preset stations will broadcast one after another for five seconds each. When the desired station broadcasts, press the button again and scan tuning stops at that station.

4. Adjust the volume, balance, and tone as desired.
5. When turning the radio OFF, turn power switch (1) to the left until you hear a click.

Remark

To switch to the radio when listening to a cassette, press the cassette eject button to stop the tape.

If you insert a cassette when listening to the radio, the tape will start to play.



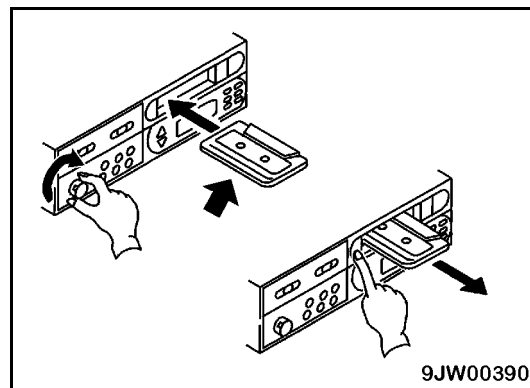
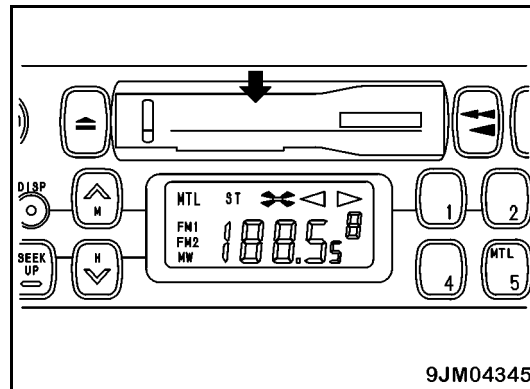
Listening to Cassette Tape

1. Turn the starting switch ON and then turn power switch (1) ON.
2. Set the cassette with the exposed portion of the tape on the right side and push it through the cassette door. The tape starts to play automatically.

If the arrow indicating the direction of play is pointing to the right, the top side is being played; if the arrow is pointing to the left, the bottom side is being played.

When the tape reaches the end, it reverses automatically and the other side starts to play.

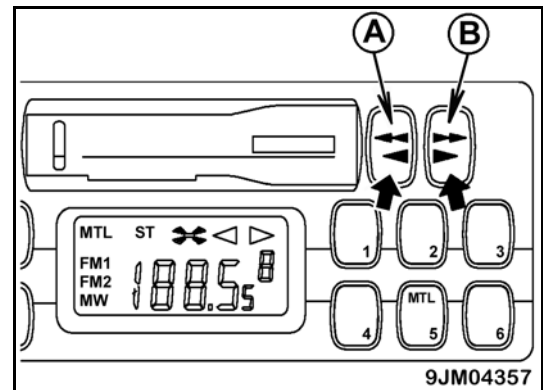
3. When you have finished with the tape, press the cassette eject button to eject the tape and automatically switch to the radio.



Reversing the Tape

If you want to reverse the tape while listening to it, press both FAST FORWARD, REWIND buttons (A) and (B) at the same time lightly.

When this is done, the tape direction display will be reversed.



Precautions When Using

! WARNING

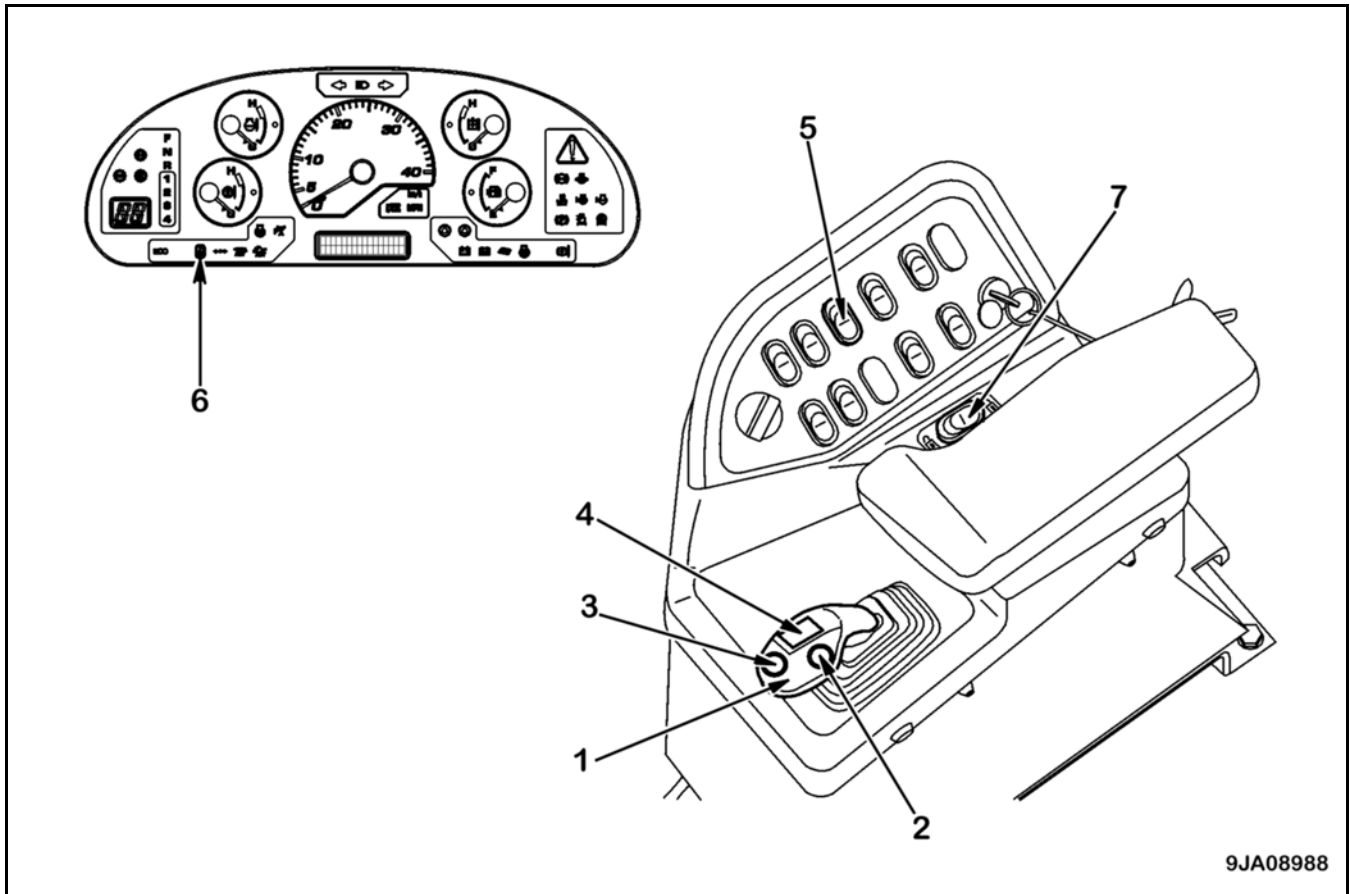
- If a voltage greater than the specified voltage is input, it may cause fire, electrocution, or other failure. Never input any voltage other than the specified voltage.
 - Places inside the radio are under high voltage. Do not remove the cover.
 - Do not carry out any modifications. This may cause fire, electrocution, or other failure.
 - If you cannot hear any sound or nothing is displayed, or any other problem occurs, turn off the power switch and ask your Komatsu distributor to make repairs without delay.
-
- Stow the antenna when traveling in places with low overhead clearance.
 - To ensure safety, always keep the volume at a level where it is possible to hear outside sounds during operation.
 - If water gets inside the speaker case or radio, it may cause a serious problem. Be careful not to get water on the equipment.
 - Do not wipe the display panel or buttons with solvents such as benzene or thinner. Wipe with a soft, dry cloth. Use a cloth soaked in alcohol if the equipment is extremely dirty.

Handling Cassette Tape

- Clean the tape head approximately once a month with a commercially available head cleaning tape.
- Do not leave the tape in a place where it is exposed to direct sunlight; all tape is sensitive to fluctuating temperature and humidity.
- Do not leave the tape in a place that is excessively dusty.
- Do not leave the tape near a magnetic field. A magnetic field is capable of erasing a tape.
- Do not use a 120-minute tape. This tape is thin and can easily get caught inside the machine.
- If the tape is slack, it can easily get caught inside the machine. Use a pencil to wind the tape to remove any slack.
- Do not use a cassette tape if the label has started to come off. It may cause defective rotation, or it may be impossible to get the tape out of the machine.

MULTI-FUNCTION LEVER

Components



9JA08988

1. Work equipment lever
2. Kickdown switch
3. Hold switch
4. FNR switch
5. Directional selector switch actuation switch
6. Directional selector pilot lamp
7. Work equipment lock switch

Work Equipment Lever

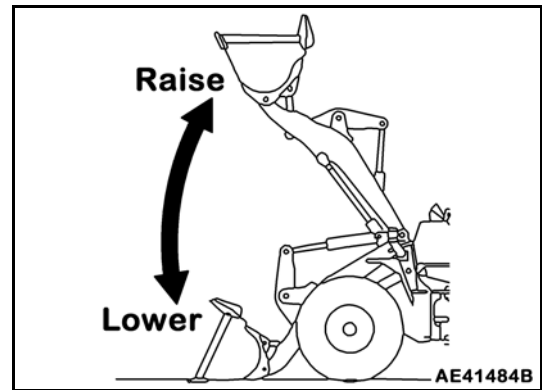
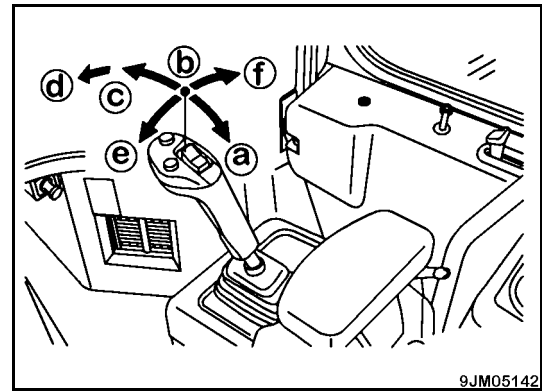
The work equipment lever (1) is used to control the lift arm and bucket.

Lift Arm Operation

Remark

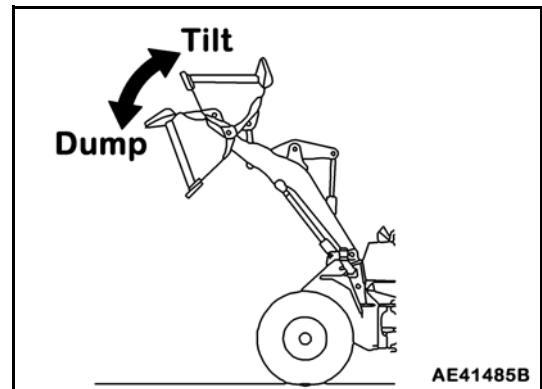
Do not use the FLOAT position when lowering the bucket. Use the FLOAT position when leveling, see "Leveling Operations" on page 2-123.

- Position (a): RAISE
 - When the work equipment control lever is pulled further beyond the RAISE position, the lever is stopped in this position until the lift arm reaches the preset position of the kickout, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The lift arm is kept in the same position.
- Position (c): LOWER
- Position (d): FLOAT
 - The lift arm moves freely under external force.



Bucket Operation

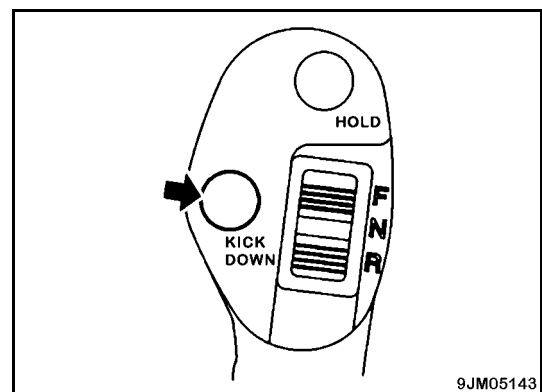
- Position (e): TILT
 - When the work equipment control lever is pulled further beyond the TILT position, the lever is stopped in this position until the bucket reaches the preset position of the positioner, and the lever is returned to the HOLD position.
- Position (b): HOLD
 - The bucket is kept in the same position.
- Position (f): DUMP



Kickdown Switch

- If the gearshift lever is in 2nd and kickdown switch (2) is pressed, the transmission will downshift to 1st.

Use this when you need to increase the drawbar pull in digging operations.
- If the transmission is in auto-shift and the travel speed is below 10.5 km/h (6.5 mph) in any speed range when traveling in either forward or reverse, the kickdown switch is actuated. It is possible to downshift to 1st.



OPTIONS, ATTACHMENTS

This makes it easy to carry out load and carry operations:

Even if the travel speed is more than 10.5 km/h (6.5 mph), this switch can be used to downshift the transmission. Each time the kickdown switch is pressed, the speed range will downshift one range at a time (F4 → F3 → F2).

When the torque converter is in the lockup condition (if equipped), the lockup is canceled.

Remark

When canceling the kickdown, operate the directional lever or the FNR switch. In manual shift, it can be canceled by operating the speed lever to any position other than 2nd. It is also possible to cancel the kickdown by turning the starting switch OFF.

In auto-shift, if the travel speed increases after the kickdown, the gear will be shifted up by the auto-shift.

In auto-shift, when traveling at more than 18 km/h (11.2 mph) in 3rd or at more than 28 km/h (17.4 mph) in 4th, even if the kickdown switch is pressed, the transmission will not downshift. This prevents the engine from overrunning.

Hold Switch

The hold switch (3) is used to fix the speed range when traveling while using the automatic transmission.

- When the switch is pressed, the transmission is fixed in the speed range displayed on shift indicator (A) on the machine monitor and shift hold pilot lamp (B) will light up.
- When the switch is pressed again, the display goes out.

Use this function to select the desired speed range when traveling up or down hills or when carrying out operations such as grading.

Remark

When the torque converter is in the lockup condition (if equipped), the transmission cannot be fixed.

When canceling the shift hold, operate the directional lever or the FNR switch. It can also be canceled by operating the speed lever and by switching the shift/manual selector switch to MANUAL. It is also possible to cancel the shift hold by turning the starting switch OFF.

FNR Switch

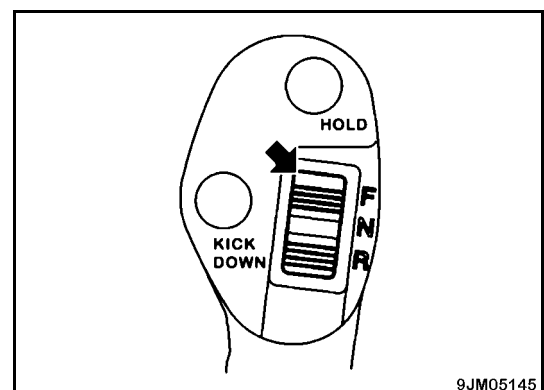
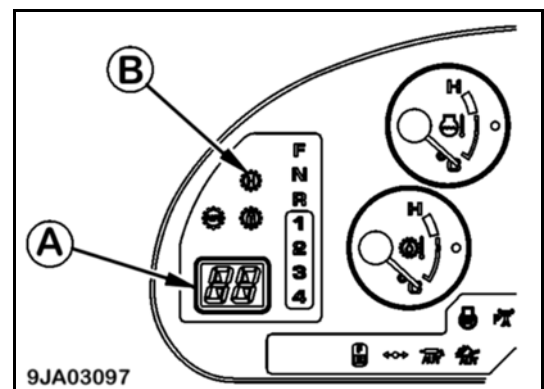
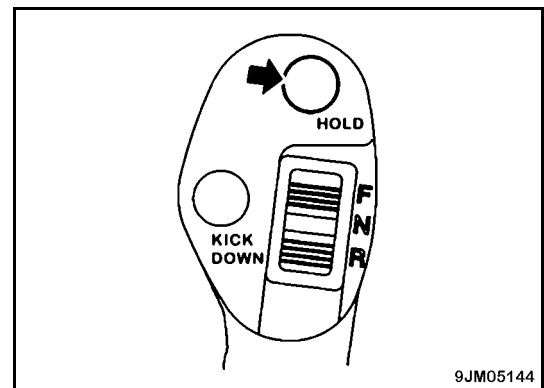
The FNR switch (4) is used to change the direction of travel of the machine.

- Position (F): FORWARD
- Position (N): Neutral
- Position (R): REVERSE

Before operating this switch, check that the following conditions are present:

- Directional lever is at N.
- Directional selector switch actuation switch is at ON.

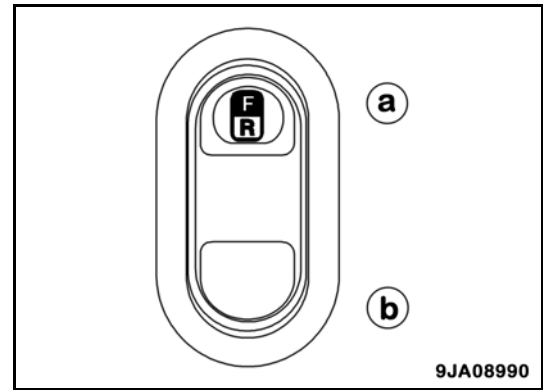
★ If the conditions are not present, the switch will not work.



Directional Selector Switch Actuation Switch

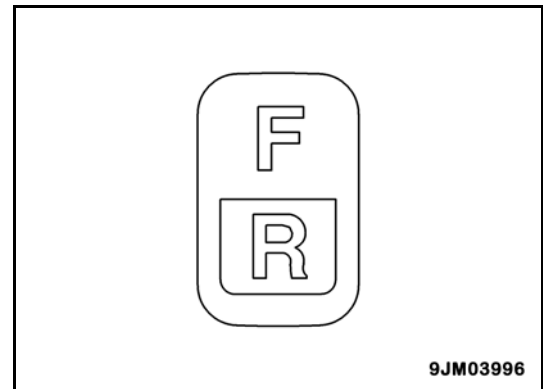
The directional selector switch actuation switch (5) is used to activate the FNR switch on the head of the multi-function lever.

- Position (a): ON
 - The pilot lamp inside the switch and the directional selection pilot lamp on the machine monitor light up, and the FNR switch is activated.
- Position (b): OFF
 - The FNR switch is not activated.



Directional Selector Pilot Lamp

The directional selector pilot lamp (6) lights up when the directional selector switch actuation switch on the right switch panel is turned ON. It indicates that it is possible to operate the travel direction of the machine with the FNR switch on the head of the multi-function lever.



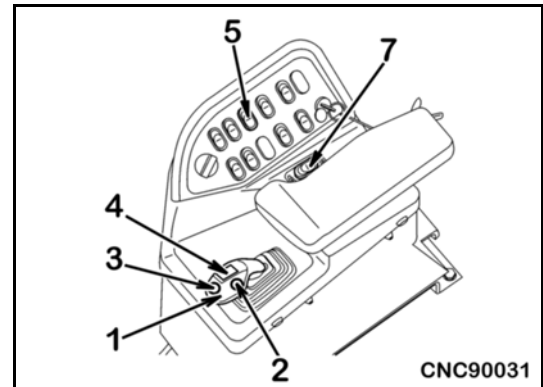
OPTIONS, ATTACHMENTS

Work Equipment Lock Switch

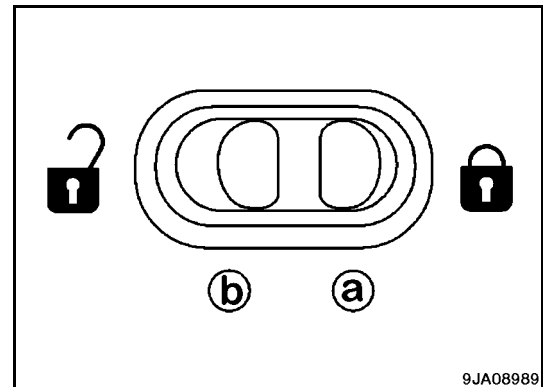
WARNING

- Before standing up from the operator's seat, set the work equipment lock switch securely to the LOCK position. If the work equipment lock switch is not at the LOCK position and work equipment control lever (1) is touched by mistake, it may lead to a serious accident.
- If the work equipment lock switch is not placed securely at the LOCK position, the work equipment may move; this may lead to a serious accident or personal injury. Check that the lever is in the position shown in the diagram.
- When operating the work equipment lock switch, check that work equipment control lever (1) is at the HOLD position.
- When operating the work equipment lock switch, be careful not to touch work equipment control lever (1).

The work equipment lock switch (7) is used to switch the work equipment lock system between LOCK and FREE.



- Position (a): LOCK
- Position (b): FREE

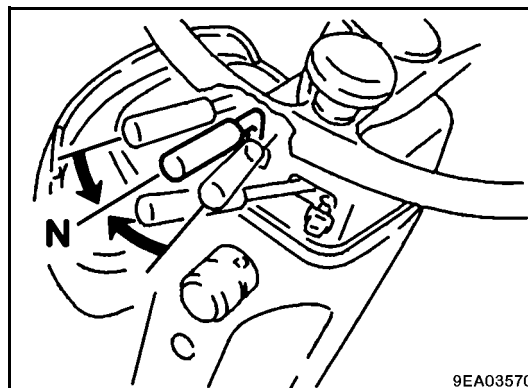


Using FNR Switch to Change Between Forward and Reverse

WARNING

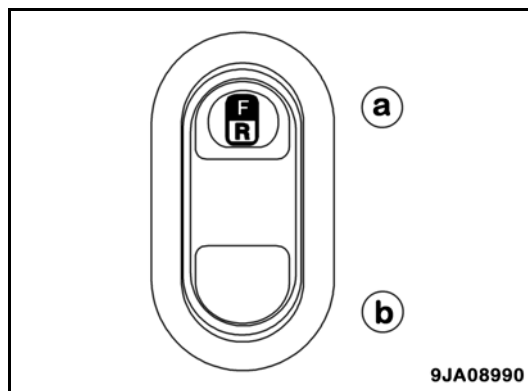
- When changing direction between FORWARD and REVERSE, check that the new direction of travel is safe. There is a blind spot behind the machine. Be particularly careful when changing direction to travel in reverse.
- If the directional selector switch actuation switch is at the ON position and the directional lever is operated to F or R, the machine will travel in forward or reverse according to the operation of the directional lever, regardless of the position of the FNR switch on the head of the multi-function lever.
- Priority is given to the operation of the directional lever. Be careful when operating the machine.
- Do not switch between FORWARD and REVERSE when traveling at high speed.
- When switching between FORWARD and REVERSE, depress the brake to reduce the travel speed sufficiently, then change the direction of travel. (Maximum speed for changing direction: 10.5 km/h (6.5 mph))

1. Place the directional lever at the N position.

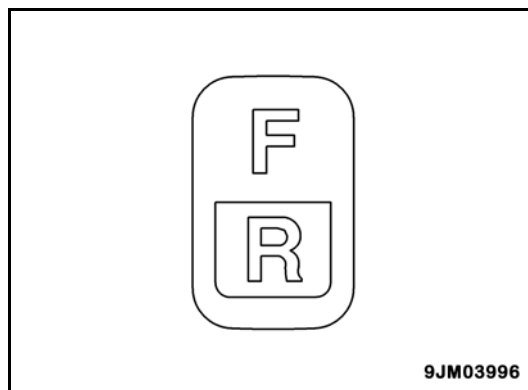


2. Turn on the directional selector switch on the right side of the switching panel to enable directional selection.

- Position (a): ON
- Position (b): OFF



The pilot lamp inside the switch and the directional selection pilot lamp on the machine monitor light up, and the FNR switch is activated.



OPTIONS, ATTACHMENTS

3. Push the FNR switch on the head of the multi-function lever to the desired position.

If the directional selector pilot lamp on the machine monitor flashes, the switch or the lever is in one of the following conditions.

- If the directional selector switch actuation switch is at the OFF position and the FNR switch is operated to F (or R):

The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds.

- ★ Set the FNR switch to the N position.

- If the engine is started and the directional selector switch is at the ON position and the directional lever is at N, and the FNR switch is operated to F (or R):

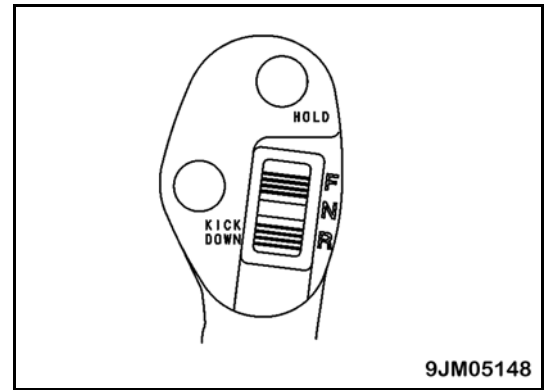
The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds.

- ★ Set the FNR switch to the N position.

- If the directional selector switch is at the ON position and the FNR switch is operated to F (or R):

The pilot lamp flashes and, at the same time, the central warning lamp lights up and the alarm buzzer sounds. In this condition, the machine will travel in forward or reverse according to the operation of the directional lever.

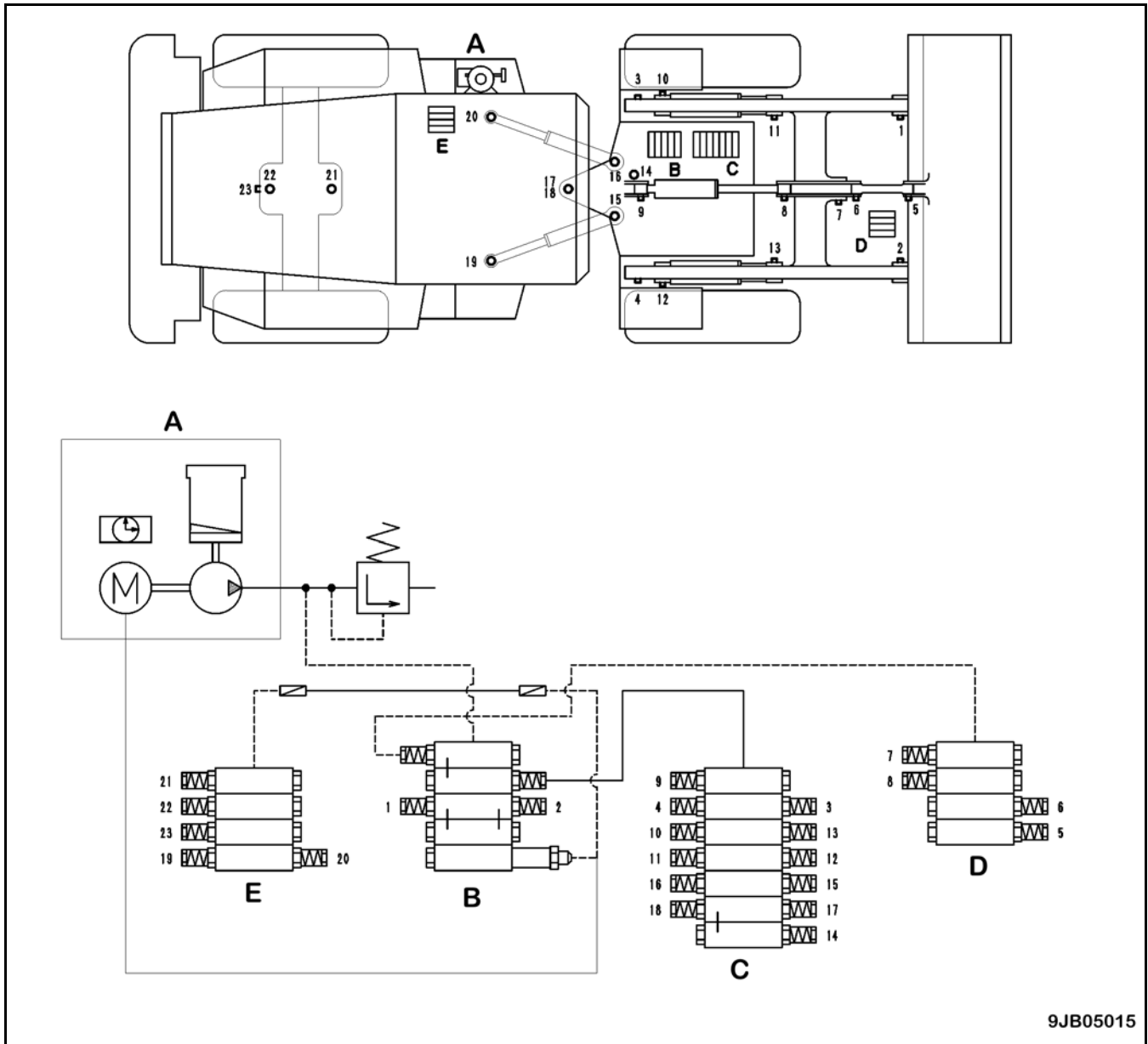
- ★ Set the directional lever and the FNR switch on the head of the multi-function lever to the N position.



CENTRAL LUBRICATION SYSTEM

Automatic Greasing Circuit Diagram

- ★ If your machine is equipped with the Lincoln QuickLub® auto-greasing pump:
 - Please read the instructions provided by Lincoln Industrial Corp.
 - Refer to the graphic and the corresponding table on the next page to see the greasing points for your machine.



OPTIONS, ATTACHMENTS

Item	Greasing Parts
A. Automatic greasing pump assembly *	1. Bucket pin (left)
B. Feeder 1	2. Bucket pin (right)
C. Feeder 2	3. Lift arm pivot (left)
D. Feeder 3	4. Lift arm pivot (right)
E. Feeder 4	5. Bucket link pin (bucket side)
	6. Bucket link pin (bellcrank side)
	7. Bellcrank pin
	8. Bucket cylinder head pin
	9. Bucket cylinder bottom pin
	10. Lift cylinder bottom pin (left)
	11. Lift cylinder head pin (left)
	12. Lift cylinder bottom pin (right)
	13. Lift cylinder head pin (right)
	14. Drive shaft center support
	15. Steering cylinder bottom pin (right)
	16. Steering cylinder bottom pin (left)
	17. Center hinge pin (upper)
	18. Center hinge pin (lower)
	19. Steering cylinder head pin (right)
	20. Steering cylinder head pin (left)
	21. Rear axle pivot pin (front side)
	22. Rear axle pivot pin (rear side)
	23. Rear axle pivot pin (rear side)

* Position of auto-greasing pump assembly is the preferred installation location.

- ★ The graphic shows the pump installed on the left side; it can be mounted on either side but the left side is preferable so the driver can see it easily.

WHEEL CHOCKS

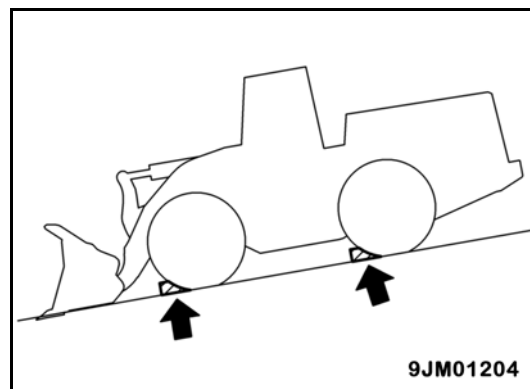
★ This option is not available in all areas.

WARNING

- Do not park the machine on slopes.
- If the machine has to be parked on a slope, set it facing directly down the slope, then dig the bucket into the ground and put the wheel chocks under the tires to prevent the machine from moving.
- When moving the machine, remove the chocks.

During transportation or when it is necessary to park the machine on a slope, put wheel chocks securely under the tires to hold the machine in position and prevent it from moving.

★ For details about parking the machine, see “Parking the Machine” on page 2-149.



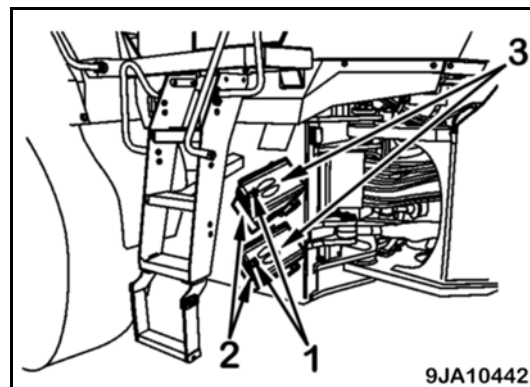
The wheel chocks are stowed on the right side of the rear frame.

Using the Wheel Chocks

1. Remove clip (1).
2. Remove wheel chocks (3) from holder (2).

Stowing the Wheel Chocks

1. Insert the wheel chocks into the holder (2).
2. Attach clip (1).



BATTERY DISCONNECT SWITCH

★ This option is not available in all areas.

The battery disconnect switch cuts the flow of electricity from the battery. It is located beside the engine, on the right side of the machine behind the engine side cover.

- (A): OFF position

The key can be inserted and removed from the switch, and the flow of electricity from the battery is turned on or off.

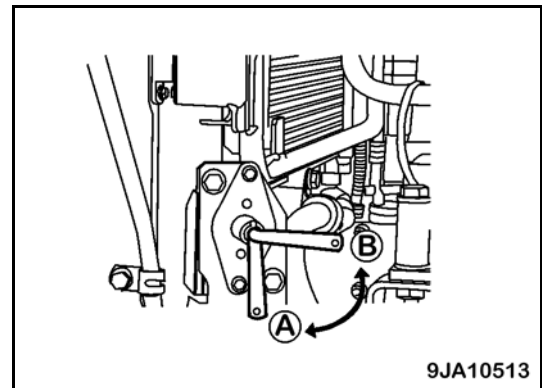
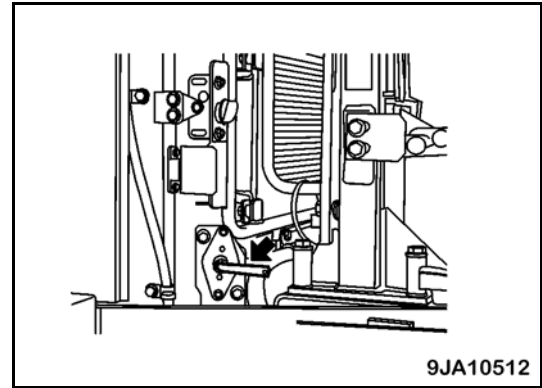
- (B): ON position

Electricity flows from the battery to the circuits.

★ Always set to the ON position before operating the machine.

Operation

- Except in cases of emergency, do not turn the battery disconnect switch to the OFF position when the engine is running.
 - Wait for at least one minute after the engine is stopped before turning the switch OFF.
 - Turning the switch OFF when the engine is running may cause failure or abnormality in the electrical system.
- Before disconnecting the battery terminals, always turn the starting switch to the OFF position, then turn the battery disconnect switch to the OFF position.
 - Be sure to disconnect the ground terminal (negative (-) terminal) first.
 - When connecting the terminals, connect the positive (+) terminal first and the ground (-) terminal last.
- In the following cases, set the battery disconnect switch to the OFF position:
 - When machine is put into long-term storage (one month or more)
 - When electrical system is to be repaired
 - When carrying out electric welding
 - When inspecting or handling battery
 - When replacing fuse or slow-blow fuse
- When the battery disconnect switch is turned OFF, all the electrical systems on the machine stop.
 - The time display on the radio and monitor, the preset memory for radio station reception, and the memory for the load meter data are lost; reset them as necessary.
 - Immediately after the fan has been rotated in reverse, even if the starting switch is turned OFF, the fan reverse rotation solenoid retains electric power for a short time. This protects the hydraulic motor. Before turning the battery disconnect switch OFF, check first that the fan is completely stopped.
 - If the battery disconnect switch is turned OFF, it can prevent the battery from losing power but the KOMTRAX function also stops.
 - Even if you forget to release the parking brake, the alarm buzzer does not sound. Always be sure to release the parking brake before operating the machine.



BUCKET AND TIRES

Select the most suitable bucket and tires for the type of work and ground conditions on the job site.

Type of Work	Bucket	Ground Conditions	Tire
Loading products Loading and carrying products	Stockpile bucket (with bolt-on cutting edge) (3.5 m ³ (4.6 cu.yd)) Stockpile bucket (with teeth) (3.3 m ³ (4.3 cu.yd)) Light material bucket (with bolt-on cutting edge) (4.6 m ³ (6.0 cu.yd))	General ground conditions	23.5-25-16PR (L3 Rock)
		Leveled ground	23.5-25-16PR (L2 Traction)
		Soft ground	23.5-25-16PR (L2 Traction)
Loading crushed rock	Excavating bucket (with segment edge) (3.1 m ³ (4.1 cu.yd))	General ground conditions	23.5-25-20PR (L3 Rock)
		Soft ground	23.5-25-16PR (L3 Rock)
		Ground with many light rocks	23.5-25-12PR (L3 Rock)
		Soft ground with many light rocks	23.5-25-12PR (L3 Rock)

- ★ The displayed travel speed changes according to the tire size.
- ★ When installing optional tires, contact your Komatsu distributor.

MEMORANDUM