Operation & Maintenance Manual

EXCEL PGZUU,ZUULG-6

HYDRAULIC EXCAVATOR

SERIAL NUMBERS PC200,200LC-103534 and up PC220,220LC-55729

▲ 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 will come into contact with it.

NOTICE

Komatsu has Operation & Maintenance Manuals written in some other languages. If a foreign language manual is necessary, contact your local distributor for availability.



FOREWORD

This manual provides rules and guidelines which will help you use this machine safely and effectively. Keep this manual handy and have all personnel read it periodically, if this manual has been lost or has become dirty and can not be read, request a replacement manual from Komatsu or your Komatsu distributor.

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

Continuing improvements in the design of this machine can lead to changes in detail which may not be reflected in this manual. Consult Komatsu or your Komatsu distributor for the latest evallable information of your machine or for questions regarding information in this manual.

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

A WARNING -

- Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.
- Operators and maintenance personnel should read this manual thoroughly before beginning operation or maintenance.
- Some actions involved in operation and maintenance of the machine can cause a serious accident,
 if they are not done in a manner described in this manual.
- The procedures and procautions given in this manual apply only to intended uses of the 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. In no event should you or others engage in prohibited uses or actions as described in this manual.
- Komatsu delivers machines that comply with all applicable regulations and standards of the
 country to which it has been shipped. If this machine has been purchased in another country or
 purchased from someone in another country, it may lack certain safety devices 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 Komatsu or your
 Komatsu distributor before operating the machine.
- The description of safety is given in SAFETY INFORMATION on page 0-2 and in SAFETY from page 1-1.

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.

2. SAFETY INFORMATION

Most accidents are caused by the failure to follow fundamental safety rules for the operation and maintenance of machines. To avoid accidents, read, understand and follow all precautions and warnings in this manual and on the machine before performing operation and maintenance.

To identify safety messages in this manual and on machine labels, the following signal words are used.



DANGER

This word is used on safety messages and safety labels where there is a high probability of serious injury or death if the hazard is not avoided. These safety messages or labels usually describe precautions that must be taken to avoid the hazard. Failure to avoid this hazard may also result in serious damage to the machine.



MARNING →

This word is used on safety messages and safety labels where there is a potentially dangerous situation which could result in serious injury or death if the hazard is not avoided. These safety messages or labels usually describe precautions that must be taken to avoid the hazard. Failure to avoid this hazard may also result in serious demage to the machine.



CAUTION

This word is used on safety messages and safety labels for hazards which could result in minor or moderate injury if the hazard is not avoided. This word might also be word for hazards where the only result could be damage to the machine.

MOTICE

 This word is used for precautions that must be taken to avoid actions which could shorten the life of the machine.

Safety precautions are described in SAFETY from page 1-1.

Komatsu cannot predict every circumstance that might involve a potential hexard in operation and maintenance. Therefore the safety messages 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 safety and without damaging the machine. If you are unsure about the safety of some procedures, contact Komatsu distributor.

3. INTRODUCTION

3.1 INTENDED USE

This Komatsu HYDRAULIC EXCAYATOR is designed to be used mainly for the following work:

- Digging work
- Smoothing work
- Ditching work
- Loading work

See the section "12.13 WORK POSSIBLE USING HYDRAULIC EXCAVATOR" for further details.

3.2 FEATURES

- Wrist control levers make operations smooth and easy.
- Air-conditioned operator's cab assures comfortable operation.
- Low noise level and smart urban-style design and coloring.
- Superb operating performance provided by powerful engine and high-performance hydraulic pumps.

3.3 BREAKING IN THE MACHINE

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 machine life.

Be sure to break in the machine for the initial 100 hours (as indicated by the service meter.) Quring breaking in:

- Idle the engine for 5 minutes after starting it up.
- Avoid operation with heavy loads or at high speeds.
- Avoid sudden starts, sudden acceleration, sudden steering and sudden stops except in cases of emergency.

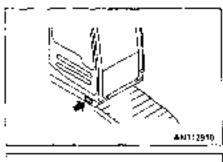
The precautions given in this manual for operating, maintenance, and safety procedures are only those that apply when this product is used for the specified purpose. If the machine is used for a purpose that is not listed in this manual, Komatsu cannot bear any responsibility for safety. All consideration of safety in such operations is the responsibility of the user.

Operations that are prohibited in this manual must never be carried out under any circumstances.

4. LOCATION OF PLATES, TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

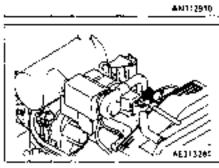
4.1 MACHINE SERIAL NO. PLATE POSITION

On the front bottom right of the operator's cab



4.2 ENGINE SERIAL NO. PLATE POSITION

On the upper side of the engine cylinder head cover



4.3 TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

| Machine serial No.: | |
|-------------------------------------|--------|
| Engine sérial No.: | |
| Distributor name: | • |
| | |
| Address: | Phone: |
| | |
| Service personnel for your machine: | |
| gerate personner for your machine. | |

REMARKS

5. CONTENTS

| 1. | Foreword | 0- 1 |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 2. | Safety information | 0- 2 |
| 3. | Introduction | 0-3 |
| 4. | Location of plates, table to enter serial No. and distributor | 0- 4 |
| S/ | AFETY | |
| 6. | General precautions | 1- 2 |
| 7. | Precautions during operation 7.1 Before starting engine 7.2 After starting engine 7.3 Transportation 7.4 Battery 7.5 Towing 7.6 Bucket with hook | 1- 9 1-11 1-18 1-19 |
| g. | Precautions for maintenance 8.1 Before carrying out maintenance 8.2 During maintenance | 1.23 |
| | Position for attaching safety labels | 1-33 |
| | | |
| 10 | 10.1 General view of machine 10.2 General view of controls and gauges | 2- 2 |
| | I. Explanation of components 11.1 Machine monitor 11.2 Switches 11.3 Control levers and pedals 11.4 Ceiling window 11.5 Front window 11.6 Door lock 11.7 Ashtray 11.8 Cap. cover with lock 11.9 Air conditioner (machines equipped with air conditioner) 11.10 Car radio (machines equipped with car radio) 11.11 Electric power source 11.12 Fuse 11.13 Fusible link 11.14 Tool box | 2- 4 2- 9 2-13 2-19 2-21 2-21 2-22 2-23 2-29 2-30 2-31 |
| | 11.15 Grease pump holder 11.16 Handling accumulator | 2-31 |

| 12. | Opera | tion | 2-34 |
|-----|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| - | - | Check before starting engine | 2-34 |
| | 12.2 | Starting engine | 2-43 |
| | 12.3 | Operations and checks after starting engine | 2-45 |
| | 12.4 | Moving machine off , | 2-47 |
| | 12.5 | Steering machine | 2-50 |
| | 12.6 | Stopping machine | 2-52 |
| | 12.7 | Swinging | 2-53 |
| | 12.8 | Operation of work equipment | 2-54 |
| | 12.9 | Prohibitions for operation | 2-55 |
| | 12.10 | Precautions for operation | 2-57 |
| | | Precautions when traveling up or down hills | 2-58 |
| | 12.12 | How to escape from mud. | 2.60 |
| | | Work possible using hydraulic excavator | 2-61 |
| | | Replacement and inversion of bucket | 2-62 |
| | | Perking machine | 2-64 |
| | | Check after finishing work | 2-65 |
| | | Stopping engine | 2-66 |
| | 12.18 | Check after stopping engine | 2-67 |
| | | Locking | 2-67 |
| | | | |
| 13. | Trans | portațion | 2-68 |
| | 13.1 | Loading, unloading work, | 2-68 |
| | 13.2 | Precautions for loading | 2-70 |
| | 13.3 | Precautions for transportation | 2-71 |
| | 13.4 | Method of lifting machine | 2-72 |
| 14. | Cold | weather operation | 2-74 |
| | 14.1 | Precautions for low temperature | 2-74 |
| | 14.2 | Precautions after completion of work | 2-76 |
| | | After cold weather | 2-76 |
| 15. | Long | term storage | 2-77 |
| | 15.1 | Before storage | 2-77 |
| | 15.2 | During storage | 2-78 |
| | 15.3 | After storage | 2-78 |
| | 15.4 | The state of the s | |
| 40 | Teart | leshooting | 2-79 |
| 40. | . 17000 16.1 | Phenomena that are not failures | 2-79 |
| | 16.2 | Method of towing machine | 2.79 |
| | 16.3 | | 2-79 |
| | 16.4 | | 2-80 |
| | 16.5 | If battery is discharged | 2-80 |
| | | Other trouble | 2-64 2-94 |

MAINTENANCE

| 17. | Guides to maintenance | 3- 2 |
|-------------|----------------------------------------------------------------------|------------------|
| 18. | Outlines of service | 3- 5 |
| | 18.1 Outline of oil, fuel, coolant | 3- 5 |
| | 18.2 Outline of electric system | 3-8 |
| | 18.3 Outline of hydraulic system | 3- 9 |
| 19. | Wear parts list | 3-10 |
| 2 0. | Use of fuel, coolant and lubricants according to ambient temperature | 3-12 |
| 21. | Standard tightening torques for bolts and nuts | 3-16 |
| | 21.1 Introduction of necessary tools | 3-1 6 |
| | 21.2 Torque list | 3-17 |
| 22. | Periodic replacement of safety critical parts | 3 -18 |
| 23. | Maintenance schedule chart | 3-22 |
| | 23.1 Maintenance schedule chart | 3-22 |
| | 23.2 Maintenance interval when using hydraulic breaker | 3-24 |
| 24. | Service Procedure | |
| | 24.1 Initial 250 hours service | |
| | 24.2 When required | |
| | 24.3 Check before starting .,,, | |
| | 24.4 Every 100 hours service | |
| | 24.5 Every 250 hours service | |
| | 24.6 Every 500 hours service | |
| | 24.7 Every 1000 hours service | 3-63 |
| | 24.8 Every 2000 hours service | 3- 6(|
| | 24.9 Every 4000 hours service | 3-69 |
| | 24.10 Every 5000 hours service | 3-70 |
| SF | PECIFICATIONS | |
| 25 | Specifications | 4- 2 |

OPTIONS, ATTACHMENTS

| 26. | Gene | ral precautions | |
|-----|-------|----------------------------------------------|------------------|
| | 26.1 | Precautions related to safety | |
| | 26.2 | Precautions when installing attachments | 5 - 3 |
| 27. | Hand | ling bucket with hook | 5- 4 |
| | 27.1 | Checking for damage to bucket with hook | 5. 4 |
| | 27.2 | Prohibited operations | 5- 4 |
| | 27.3 | Precautions during operations | 5- 4 |
| 28. | Usino | soat belt | 5- 5 |
| | | Seat belt, | 5- 5 |
| 29. | Hand | ling car heater | 5- 7 |
| | 29.1 | Explanation of components | 5- 7 |
| | 29.2 | Preparing car heater | 5- 7 |
| 30. | Mach | ines ready for attachments | 5- 6 |
| | 30.1 | Explanation of components | 5- 6 |
| | 30.2 | hydraulic circult | 5-10 |
| | 30.3 | Attachment mounting/dismounting procedure | 5-12 |
| | 30.4 | Operation | 5-14 |
| | 30.5 | Long-term storage | 5-15 |
| | 30.6 | Specifications | 5-15 |
| 31. | Intra | duction of attachments | 5-1 0 |
| | 31.1 | Specification, use | 5-1 0 |
| | 31.2 | Attachment installation combination table | 5-18 |
| | 31.3 | Selection of track shoes | 5-20 |
| | 31.4 | Selection of bucket teeth | 5-21 |
| | 31.5 | Handling rubber pad shoe | 5-22 |
| | 31.6 | Handling trapezoidal bucket | 5-24 |
| | 31.7 | Handling extension arm | 5-25 |
| | 31.8 | Handling clamshell bucket | 5-26 |
| 32. | Exte | nding machine service life | 5-27 |
| | 32.1 | Hydraulic breaker | 5-27 |
| | 32.2 | Power ripper | 5-3 |
| | 32.3 | Fork grab | 5-32 |
| | 32.4 | Grapple bucket | 5-33 |
| | 32.5 | Scrap grapple | 5-34 |
| | 32.6 | Crusher & cutter | 5-35 |
| | 32.7 | Hydraulic pile driver | 5-36 |
| | 32 B | Hydraulic excevetor with multi-ournose crane | 6.37 |

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.

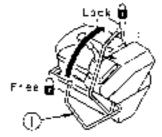
6. GENERAL PRECAUTIONS

SAFETY RULES

- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- Do not operate the machine if you are not feeling well, or if you are taking medicine which will
 make you sleepy, or if you have been drinking. Operating in such a condition will adversely affect
 your judgement and may lead to an accident.
- When working with another operator or with a person on worksite traffic duty, be sure that all
 personnel understand all hand signals that are to be used.
- Always follow all rules related to safety.

SAFETY FEATURES

- Be sure that all guards and covers are in their proper position. Have guards and covers repaired
 if damaged.
- Use safety features such as safety lock levers ① and the seat belt properly.
- Never remove any safety features. Always keep them in good operating condition.
 Safety lock lever → See "12.15 PARKING MACHINE".
 Seat belt → See "28. USING SEAT BELT".
- Improper use of safety features could result in serious bodily injury or death.



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CLOTHING AND PERSONAL PROTECTIVE ITEMS

- Avoid loose clothing, jewelry, and loose long hair. They can catch on controls or in moving parts and cause serious injury or death.
- Also, do not wear oily clothes, because they are flammable.
- Wear a hard hat, safety glasses, safety shoes, mask or gloves when operating or maintaining the
 machine. Always wear safety goggles, herd hat and heavy gloves if your job involves scattering
 metal chips or minute materials particularly when driving pins with a hammer and when cleaning
 the air cleaner element with compressed air. Check also that there is no one near the machine.
- Check that all protective equipment functions properly before using.



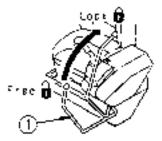
UNAUTHORIZED MODIFICATION

Any modification made without authorization from Komatsu can create hazards. Before making a modification, consult your Komatsu distributor. Komatsu will not be responsible for any injury or damage caused by any unauthorized modification.

ALWAYS APPLY LOCK WHEN LEAVING OPERATOR'S SEAT

- When standing up from the operator's seat, always place the safety lock levers (i) securely in the LOCK position. If you accidentally touch the levers when they are not locked, the work equipment may suddenly move and cause serious injury or damage.
- When feaving the machine, lower the blade and ripper completely to the ground, set the safety lock levers ① to the LOCK position, then stop the engine. Use the key to lock all the equipment, Always remove the key and take it with you.

Work equipment posture → See *12.15 PARKING MACHINE*. Locking → See *12.19 LOCKING*

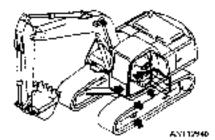


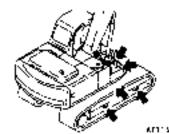
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MOUNTING AND DISMOUNTING

- · Never jump on or off the machine. Never get on or off a moving machine.
- When getting on or off the machine, always face the machine and use the handrails and steps.
- Never hold any control layers or lock levers when getting on or off the machine.
- To ensure safety, always maintain three-point contact (both feet and one hand, or both hands and
 one foot) with the handrails and steps to ensure that you support yourself.
- If there is any oil, grease, or mud on the handrails or steps, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.
- When getting on or off the machine, or when moving along the top of the track, if you hold the handrail inside the door when moving on top of the track shoe, and the door lock is not locked securely, the door may move and cause you to fall.
 Always lock the door securely.

Method of locking door - See "11.6 DOOR LOCK".







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FIRE PREVENTION FOR FUEL AND OIL

Fuel, oil, and antifreeze can be ignited by a flame. Fuel is particularly flammable and can be hazardous.

Always observe the following:

- Keep any flame or lighted digarette away from flammable fluids.
- Stop the engine and do not smoke when refueling.
- Tighten all fuel and oil caps securely.
- Use well-ventileted areas for adding or storing oil and fuel.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.









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PRECAUTIONS WHEN HANDLING AT HIGH TEMPERATURE

- Immediately after operations are stopped, the engine oil and hydraulic oil are at high temperature and are still under pressure. Attempting to remove the cap, drain the oil or water, or replace the filters may lead to serious burns. Always wait for the temperature to go down, and follow the specified procedures when carrying out these operations.
- To prevent hot water from spurting out, stop the engine, wait for the water to cool, then loosen
 the cap slowly to relieve the pressure before removing the cap
 (When checking if the water temperature has gone down, put your hand near the front face of the
 radiator and check the air temperature. So careful not to touch the radiator.)
- To prevent hot oil from spurting out, stop the engine, wait for the oil to cool, then loosen the cap slowly to relieve the pressure before removing the cap.
 When checking if the oil temperature has gone down, put your hand near the front face of the hydraulic tank and check the air temperature. Be careful not to touch the hydraulic tank.



ASBESTOS DUST HAZARD PREVENTION

Asbestoe dust can be hezerdous to your health if it is inhaled.

Komatsu does not use asbestos in its products, but if you handle materials containing asbestos fibers, follow the guidelines given below:

- Never use compressed air for cleaning.
- Use water to keep down the dust when cleaning.
- If there is danger that there may be asbestos dust in the sir, operate the machine from an upwind position whenever possible.
- Use an approved respirator it necessary.



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CRUSHING OR CUTTING PREVENTION

Do not enter, or put your hand or arm or any other part of your body between movable parts such as the work equipment and cylinders, or between the machine and work equipment if the work equipment is operated, the clearance will change and this may lead to serious damage or personal injury.

If it is necessary to go between movable parts, always lock the levers and be sure that the work equipment cannot move. For details, see "8. PRECAUTIONS FOR MAINTENANCE".

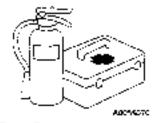


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FIRE EXTINGUISHER AND FIRST AID KIT

Always follow the precautions below to prepare for action if any injury or fire should occur.

- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them.
- Provide a first aid kit at the storage point. Carry out periodic checks and add to the contents if necessary.
- Know what to do in the event of a fire or injury.
- Decide the phone numbers of persons (doctor, ambulance, fire station, etc.) to contact in case of an emergency. Post these contact numbers in specified places and make sure that all personnel know the numbers and correct contact procedures.



PROTECTION AGAINST FALLING OR FLYING OBJECTS

If there is any danger of falling or flying objects hitting the operator, install protective guards in place to protect the operator as required for each particular situation.

- For work with breakers, install a front guard on the windshield. Also, place a laminate coating sheet over the windshield.
- For demolition or shear work, install a front guard on the windshield and a top guard on the cab. Also, place a laminate coating sheet over the windshield.
- For work in mines, tunnel or other places where there is danger of falling rocks, put FOPS (falling object protective structure) in place. Also, place a laminate coating sheet over the windshield.

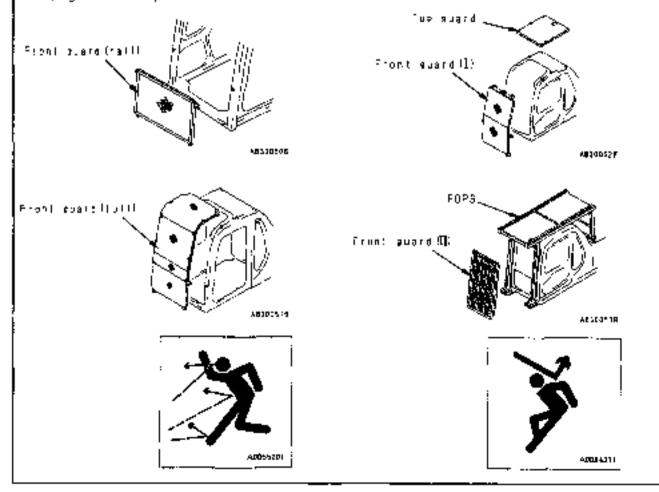
The above comments are made with regards to typical working conditions. By all means you should put on other guards if required by conditions at your particular sits.

For details of safety guards, please contact your Komatsu distributor.

Also, even for other types of work, if there is any danger of getting hit by falling or flying objects, or of objects entering the operator's cab, select and install a guard that matches the working conditions.

Be sure to close the front window before commencing work.

When carrying out the above operations, make sure to keep all persons other than the operator outside the range of falling or flying objects. Be particularly sure to maintain a proper distance when carrying out shear operations.



PRECAUTIONS FOR ATTACHMENTS

- When installing and using an optional attachment, read the instruction manual for the attachment and the information related to attachments in this manual.
- Do not use attachments that are not authorized by Komatsu or your Komatsu distributor. Use of unauthorized attachments could create a safety problem and adversely affect the proper operation and useful life of the machine.
- Any injuries, accidents, product failures resulting from the use of unauthorized attachments will
 not be the responsibility of Kometsu.

MACHINES WITH ACCUMULATOR

On machines equipped with an accumulator, for a short time after the engine is stopped, the work equipment will lower under its own weight when the work equipment control lever is shifted to LOWER. After the engine is stopped, set the safety lock lever \bigcirc to the lock position and also lock the attachment pedal with the lock pin.

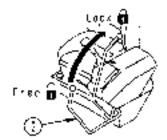
When releasing the pressure inside the work equipment circuit on machines equipped with an accumulator, follow the procedure given in the inspection and maintenance section.

Method of releasing pressure → See *11.16 HANDLING ACCUMULATOR*.

The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions.

- Never make any hole in the accumulator or expose it to fisme or fire.
- Do not weld any boss to the accumulator.
- When carrying out disassembly or maintenance of the accumulator, or when disposing of the
 accumulator, it is necessary to release the gas from the accumulator. A special air bleed valve is
 necessary for this operation, so please contact your Komatsu distributor.

Gas in accumulator - See "11,16 HANDLING ACCUMULATOR".



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VENTILATION FOR ENCLOSED AREAS

Exhaust fumes from the engine can kill-

- If it is necessary to start the engine within an enclosed area, or you handle fuel, flushing oil, or paint, open the doors and windows to ensure that you provide adequate ventilation to prevent gas poisoning.
- If opening the doors and windows still does not provide adequate ventilation, set up fans.

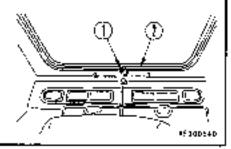


PRECAUTIONS WITH CAB GLASS

If by mistake the cab glass on the work equipment side should crack, there is danger of direct contact between the operator's body and the work equipment. This is extremely dangerous. If the glass is cracked, stop operations immediately and replace the glass.

EMERGENCY EXIT FROM OPERATOR'S CAB

- If it should become impossible to open the cab door, open the rear window and use it as an emergency escape.
- Remove the rear window as follows.
- Pull ring (1) and completely remove seal (2) from the window frame rubber.
- Push the corner of the rear window glass strongly to push it out and make it possible to remove.
- Remove the rear window only when it is being used as an emergency ascape.



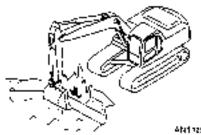
7.1 BEFORE STARTING ENGINE

SAFETY AT WORKSITE

- 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 worksite, and determine the best and safest method of operation.
- Make the ground surface as hard and horizontal as possible before carrying out operations. If the jobsite is dusty, spray water before starting operations.
- If you need to operate on a road, protect pedestrians and cars by designating a person for worksite. treffic duty or by installing fences and putting up No Entry signs around the worksite.
- If water lines, gas lines, or high-voltage electrical lines may be buried under the worksite, contact. each utility and identify their locations. Be careful not to sever or damage any of these lines.
- Check the ground condition and the depth and flow of water. before operating in water or crossing a river. NEVER be in water. which is in excess of the permissible water depth.

Permissible water depth →

See "12.10 PRECAUTIONS FOR OPERATION".



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CHECKS BEFORE STARTING ENGINE

Carry out the following checks before starting the engine at the beginning of the days work. Failure to carry out these checks may lead to serious injury or damage.

 Completely remove all flammable materials accumulated around the engine and battery, return. all fuel containers to their proper place, remove all parts and tools from the operator's compartment, and remove any dirt from the mirrors, handrails, and steps.

Walk-around checks - See "12.1.1 WALK-AROUND CHECK".

 Check the coolant level, fuel level, and oil level in the hydraulic tank, check for clogging of the air. cleaner, and check the electric wiring.

Checks before starting → See *12.1.2 CHECK BEFORE STARTING*.

 Adjust the operator's seat to a position where it is easy to carry out operations, and check for wear or damage to the seat belt and seat belt mounting equipment.

Adjusting operator's seat - See "12.1.3 ADJUSTING BEFORE STARTING OPERATION". Seat belt - See "28. USING SEAT BELT".

 Check that the gauges work properly, and check that the control levers are all at the NEUTRAL. position.

Method of checking operation of gauges →

See "12.1.4 OPERATIONS AND CHECKS BEFORE STARTING ENGINE".

- Clean all dirt off the surface of the mirrors, window glass, and lights to ensure good visibility.
- Adjust the mirrors so that they give the optimum view from the operator's seat.

When adjusting → See *12.1 CHECK BEFORE STARTING ENGINE*.

- If any of the mirrors are broken, replace them with new ones.
- When removing and installing the mirrors for replacement or transportation, see "13.3 PRECAUTIONS FOR TRANSPORTA-TION".

If the above inspections show any abnormality, carry out repairs immediately.



WHEN STARTING ENGINE

- Walk around your machine again just before mounting it, and check for people and objects that might be in the way.
- Never start the engine if a warning tag has been attached to the work equipment control lever.
- When starting the engine, sound the horn as an alert.
- Start and operate the machine only while seated.
- An additional worker may ride in the machine only when sitting in the passenger seat. Do not allow anyone to ride on the machine body.
- Do not short circuit the starting motor circuit to start the engine. It is not only dangerous, but will also cause damage to the equipment.





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7.2 AFTER STARTING ENGINE

CHECKS AFTER STARTING ENGINE

Failure to carry out the checks properly after starting the engine will lead to delays in discovery of abnormalities, and this may lead to serious injury or damage to the machine.

When carrying out the checks, use a wide area where there are no obstructions. Do not allow enyone near the machine.

- Check the operation of the gauges and equipment, and check the operation of the blade, ripper, brakes, travel system, and steering system.
- Checks for any abnormality in the sound of the machine, vibration, heat, small, or gauges; check also that there is no leakage of air, oil, or fuel.
- If any abnormality is found, carry out repairs immediately.
 If the machine is used when it is not improper condition, it may lead to serious injury or damage to the machine.

PRECAUTIONS WHEN STARTING OFF

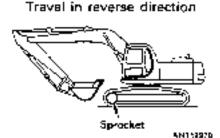
Chack the direction of the track frame before operating the travel tever

 When the aprocket is at the front, the operation of the travel lever is reversed, so operate the machine carefully.

Method of steering machine → See *12.4 MOVING MACHINE OFF*.

Before moving the machine off, check again that there are no persons or obstacles in the surrounding area.

- When moving the machine off, sound the horn to warn people in the surrounding area.
- Always sit in the operator's seat when driving the machine.
- Fasten your seat belt securely.
- The operator must not let any other person sit anywhere except in the assistant's seat.
- Check that the travel alarm (option) works properly.
- Always close the door of the operator's cab and check that the door is locked in position securely.





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CHECK WHEN CHANGING DIRECTION

To prevent serious injury or death, always do the following before moving the machine or doing the leveling work.

- Before changing between forward and reverse, reduce speed and stop the machine.
- Before operating the machine, sound the horn to warn people in the area.
- Check that there is no one hear the machine. Be particularly careful to check behind the machine.
- When operating in areas that may be hazardous or have poor visibility, designate a person to direct worksite traffic.
- Ensure that no unauthorized person can come within the direction of turning or direction of travel.
 Always be sure to carry out the above precautions even when the machine is equipped with a backup alarm and mirrors.

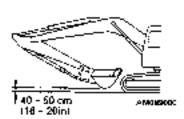




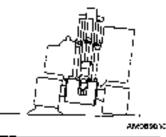
PRECAUTIONS WHEN TRAVELING

- Never turn the key in the starting switch to the OFF position when traveling. This will cause trouble
 in the electrical system.
- It is dangerous to look around you when operating. Always concentrate on your work.
- It is dangerous to drive too fest, or to start suddenly, stop suddenly, turn sharply, or zigzag.
- If you find any abnormality in the machine during operation (noise, vibration, smell, incorrect gauges, air leakage, oil leakage, etc.), move the machine immediately to a safe place end look for the cause.
- Set the work equipment to a height of 40 50 cm (16 20 in) from the ground level and travel
 on level ground.
- When traveling, do not operate the work equipment control levers. If the work equipment control levers have to be operated, never operate them suddenly.
- Do not operate the steering suddenly. 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.
- When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.
- Avoid traveling over obstacles as far as possible. If the machine has to travel over an obstacle, keep the work equipment as close to the ground as possible and travel at low speed. Never travel over obstacles which make the machine tilt strongly (10° or more).
- When traveling or carrying out operations, always keep your distance from other mechines or structures to avoid coming into contact with them.
- NEVER be in water which is in excess of the permissible water depth.
 Permissible water depth → See "12.10 PRECAUTIONS FOR OPERATION".
- When passing over bridges or structures on private land, check first that the structure is strong
 enough to support the mass of the machine. When traveling on public roads, check first with the
 relevant authorities and follow their instructions.

Travel posture



INCORRECT

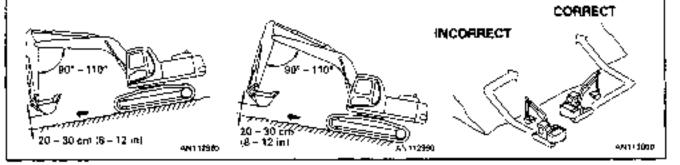


TRAVELING ON SLOPES

- Traveling on slopes could result in the machine tipping over or slipping to the side.
- When traveling on slopes, keep the blade approximately 20 30 cm (8 12 in) above the ground.
 In case of emergency, quickly lower the bucket to the ground to help the machine to stop.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to perform these
 operations.

Method of traveling on slopes → See "12.11 PRECAUTIONS WHEN TRAVELING UP OR DOWN HILLS".

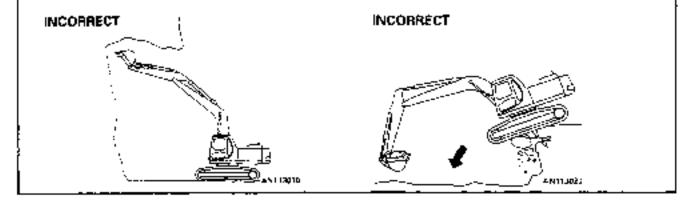
- Do not travel on grass, fallen leaves, or wet steel plates. Even slight slopes may cause the machine
 to slip to the side, so travel at low speed and make sure that the machine is always traveling
 directly up or down the slope.
- If the engine stops on a slope, place the travel lever at the neutral position and lower the bucket to the ground. Do not operate the steering. There is danger that the machine will turn under its own weight.



PROHIBITED OPERATIONS

- Do not dig the work face under an overhang. This may cause the overhang to collapse and fall
 on top of the machine.
- Do not carry out deep digging under the front of the machine. The ground under the machine may
 collapse and cause the machine to fall. Take emergencies into consideration and set with the travel
 motor at the rear and the track (undercarriage) at right angles to the road shoulder before digging
 to enable the machine to move back quickly, if the ground under the machine collapses and there
 is no time to drive in reverse, do not suddenly raise the arm and boom. In some cases, it may
 in fact be safer to lower the arm and boom.
- Do not swing the work equipment to the side when it is carrying a heavy load. The stability to
 the side is less than the stability to the front, so there is danger that the machine may turn over.
- Limits on use

To prevent accidents caused by breakage of the work equipment or tipping over of the machine under excessive load, do not use the machine in excess of its capacity. Always be sure to keep within the maximum specified load and safe angle determined for the structure.



PRECAUTIONS WHEN OPERATING

- Be careful not to approach too close to the edge of cliffs.
- Carry out only work that is specified as the purpose of the machine.
 Carrying out other operations will cause breakdowns.

Specified operations → See "12.13 WORK POSSIBLE USING HYDRAULIC EXCAVATOR".

- Do the following to ensure good visibility,
 - When operating in dark places, turn on the working lamps and front lamps, and install lighting at the jobsite if necessary.
 - Do not carry out operations in fog, mist, snow, or heavy rain, or other conditions where the
 visibility is poor. Wait for the weather to clear so that visibility is sufficient to carry out work.
- Always do as follows to prevent the work equipment from hitting other objects
 - When operating in tunnels, under bridges, under electric wires, or other places where the height is limited, be extremely careful not to let the bucket, boom, or arm 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.
 - Never pass the bucket over the head of any worker or over the operator's cab on a dump truck.

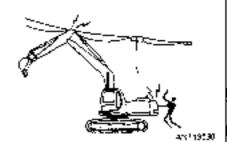


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DO NOT GO CLOSE TO HIGH-VOLTAGE CABLES

- Do not let the machine touch overhead electric cables. Even going close to high-voltage cables
 can cause electric shock. Always maintain the safe distance given below between the machine and
 the electric cable.
- To prevent accidents, always do as follows.
 - On jobsites where there is danger that the machine may touch the electric cables, consult the
 electricity company before starting operations to check that the actions determined by the
 relevant laws and regulations have been taken.
 - Wear rubber shoes and gloves. Lay a rubber sheet on top of the operator's seat, and be careful
 not to touch the chassis with any exposed part of your body.
 - Use a signalmen to give warning if the machine approaches too close to the electric cables.
 - If the work equipment should touch the electric cable, the operator should not leave the operator's compartment.
 - When carrying out operations near high voltage cables, do not let anyone come close to the machine.
 - Chack with the electricity company about the voltage of the cables before starting operations.

| | | |
|-------------------|-------------|----------------------|
| | Voltage | Min. safety distance |
| Low | 100 + 200 V | 2 m |
| 그를 | 6,600 V | 2 m |
| | 22,000 V | 3 m |
| ¥ i | 66,000 V | 4 m |
| \$ | 154,000 V | 5 m |
| 7 | 187,000 V | 6 m |
| Very high vollage | 275,000 V | .7 m |
| š | 500,000 V | tī m |



OPERATE CAREFULLY ON SNOW

- When working on snow or icy roads, even a slight slope may cause the machine to slip to the side, so always travel at low speed and avoid sudden starting, stopping, or turning. There is danger of slipping particularly on uphill or downhill stopes.
- With frozen road surfaces, the ground becomes soft when the temperature rises, so the travel
 conditions become unstable. In such cases be extremely careful when traveling.
- When there has been heavy snow, the road shoulder and objects placed beside the road are buried
 in the snow and cannot be seen, so always carry out operations carefully.
 When traveling on snow-covered slopes, never apply the brakes suddenly. Reduce the speed and

When traveling on snow-covered slopes, never apply the brakes suddenly. Heduce the speed and use the engine as a brake while applying the fool brake intermittently (depress the brake intermittently several times). If necessary, lower the bucket to the ground to stop the machine.

The load varies greatly according to the characteristics of the snow, so adjust the load accordingly
and be careful not to let the machine slip.

WORKING ON LOOSE GROUND

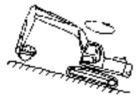
- Do not operate the machine on soft ground. It is difficult to get the machine out again.
- Avoid operating your machine too close to the edge of cliffs, overhangs, and deep ditches. If these
 areas collapse under the mass or vibration of your machine, it could fall or tip over and this could
 result in serious injury or death. Remember that the soil after heavy rain, blasting, or earthquakes
 is weakened in these areas.
- Earth laid on the ground and the soil near ditches is loose. It can collapse under the mass or vibration of your machine and cause your machine to tip over.
- Install the head guard (FOPS) when working in areas where there is danger of falling stones.
- Install the ROPS and wear the seat belt when working in areas where there is danger of falling rocks or of the machine turning over.

PRECAUTIONS WHEN WORKING ON SLOPES

- When working on slopes, there is danger that the machine may lose its balance and turn over when the swing or work equipment are operated. Always carry out these operations carefully,
- Do not swing the work equipment from the uphill side to the downhill side when the bucket is loaded. This operation is dangerous.
- If the machine has to be used on a slope, pile the soil to make a platform that will keep the machine
 as horizontal as possible.

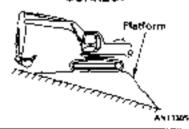
Piled soil on slope → See "12.11 PRECAUTIONS WHEN TRAVELING UP OR DOWN HILLS".

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PARKING MACHINE

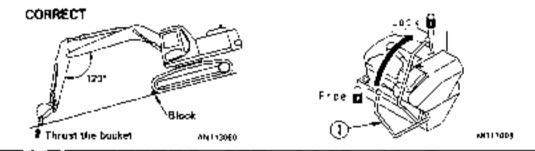
- Park the machine on level ground where there is no danger of falling rocks or landslides, or of flooding if the land is low, and lower the work equipment to the ground.
- If it is necessary to park the machine on a slope, set blocks under the tracks to prevent the machine from moving, then dig the work equipment into the ground.
- After stopping the engine, operate the right work equipment control lever several times to the BAISE and LOWER positions to release the remaining pressure in the hydraulic circuit.
- When parking on public roads, provide fences, signs, flags, or lights, and put up any other
 necessary signs to ensure that passing traffic can see the machine clearly, and park the machine
 so that the machine, flags, and fences do not obstruct traffic.

Parking procedure → See *12.75 PARKING MACHINE*.

• When leaving the machine, set the safety lock lever (i) to the LOCK position, stop the engine, and use the key to lock all the equipment. Always remove the key and take it with you.

Work equipment posture → See *12.15 PARKING MACHINE*. Locks → See *12.19 LOCKING*.

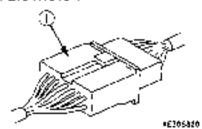
Always close the door of the operator's compartment.



PRECAUTIONS IN COLD AREAS

- After completing operations, remove all water, show, or mud stuck to the wiring harness, connector (), switches, or sensors, and cover these parts.
 If the water freezes, it will cause malfunctions of the machine when it is next used, which may lead to unexpected accidents.
- 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, and this may lead to unexpected accidents.
- Operate the control levers to relieve the hydraulic pressure (raise to above the set pressure for the hydraulic circuit and release the oil to the hydraulic tankl to warm up the oil in the hydraulic circuit. This ensures good response from the machine and prevents malfunctions.
- 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.
 When charging or starting the engine with a different power source, med the battery electrolyte and check for leakage of battery electrolyte before starting.

Battery charge rate → See *14. COLD WEATHER OPERATION*.



7.3 TRANSPORTATION

PRECAUTIONS FOR TRANSPORTATION

- When transporting the machine, follow the relevant rules and regulations, and take steps to ensure
 safety,
- When selecting the transportation route, take into consideration the maximum width, height, and weight of the machine when loaded on the trailer.
- When passing over bridges or structures on private land, check first that the structure is strong
 enough to support the weight of the machine. When traveling on public roads, check first with the
 relevant authorities and follow their instructions.
- · For machines equipped with a cab, always lock the door securely.

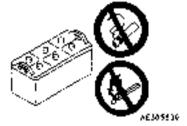
7.4 BATTERY

BATTERY HAZARO PREVENTION

Battery electrolyte contains sulphuric acid, and batteries generate hydrogen gas, so mistaken handling can lead to serious injury or fire. For this reason, always observe the following precautions.

- Never bring any lighted digarette or flame near the battery.
- When working with batteries, ALWAYS wear safety glasses and rubber gloves.
- If you spill acid on your clothes or skin, immediately flush the area with large amounts of water.
- Battery acid could cause blindness if splashed into the eyes, If acid gets into your eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink electrolyte, drink a large quantity of water or milk, beaten egg or vegetable oil. Call a doctor or poison prevention center immediately.
- Before working with batteries, stop the engine and turn the starting switch to the OFF position.
- When installing the battery, connect the positive
 \(\extre{\text{:}} \) terminal first, and when removing the battery, disconnect the negative
 \(\extre{\text{:}} \) terminal (ground side) first.
- When cleaning the top surface of the battery, wipe it with a damp cloth. Never use gasotine, thinner, or any other organic solvent or cleaning agent.
- · Tighten the battery caps securely.
- 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.
 When charging or starting the engine with a different power source, melt the battery electrolyte and check for leakage of battery electrolyte before starting.
- Always remove the battery from the chassis before charging it.







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STARTING WITH BOOSTER CABLES

If any mistake is made in the method of connecting the booster cables, it may cause a fire, so always do as follows.

- Carry out the starting operation with two workers (with one worker sitting in the operator's seat).
- When starting from another machine, do not allow the two machines to touch.
- When connecting the booster cables, turn the starting switch QFF for both the normal machine,
 and problem machine.
- Be sure to connect the positive ⊕ cable first when installing the booster cables. Disconnect the ground or negative ⊕ cable first when removing them.
- The final ground connection is the connection of the ground to the engine block of the problem machine. However, this will cause sparks, so be sure to connect it as far as possible from the battery.

Starting procedure when using booster cables → See "16.5 IF BATTERY IS DISCHARGED".

 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



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CHARGING BATTERY

If the battery is handled incorrectly when it is being charged, there is danger that the battery may explode, so follow the instructions in HANDLING BATTERY and in the instruction manual for the charger, and always observe the following precautions.

- Carry out the charging in a well-ventilated place, and remove the battery caps. This disperses the hydrogen gas and prevents explosion.
- Set the voltage on the charger to match the voltage on the battery to be charged. If the voltage setting is wrong, it will cause the charger to overheat and catch fire, and this may lead to an explosion.
 - Connect the positive \bigoplus charging clip of the charger to the positive \bigoplus terminal of the battery, then connect the negative \bigoplus charging clip to the negative \bigoplus terminal of the battery. Be sure to tighten both terminals securely.
- If the battery charge is less than 1/10 of the rated charge, and high speed charging is carried out, set to a value below the rated capacity of the battery.
 - If there is an excessive flow of charging current, it may cause leakage or evaporation of the electrolyte, which may catch fire and explode.

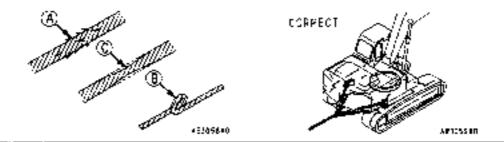
INCORRECT



7.5 TOWING

WHEN TOWING

- Injury or death could result if a disabled machine is towed incorrectly or if there is a mistake in the selection of the wire rope, so always do as follows.
- Do not tow in a different way from the method given in the section "16.2 METHOD OF TOWING MACHINE".
- Always wear leather gloves when handling wire rope.
- When carrying out the preparation for towing with another worker, agree on signals before starting the operation.
- If the engine on the problem machine will not start or there is a failure in the brake system, please contact your Komatsu distributor for repairs.
- It is dangerous to tow a machine on a slope, so choose a place where there is a gradual slope.
 If there is no place with a gradual slope, carry out work to make the slope as small as possible.
- If a problem machine is towed by another machine. ALWAYS use a wire rope with a sufficient towing capacity for the weight of the problem machine.
- Do not use a wire rope which has out strands ĕ, kinks ®, or reduced diameter ©.

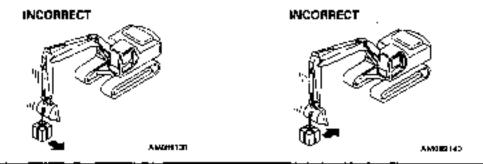


7.6 BUCKET WITH HOOK

PRECAUTIONS WHEN INSTALLING, OPERATING BUCKET WITH HOOK

Using a hydraulic excavator to raise loads is permitted under the following special conditions. These conditions must be followed strictly

- The specified hook must be installed to the bucket. For details, please consult your Kometsul distributor.
- When carrying out operations with a lifted load, set the machine on firm flat ground in a safe place and install the wire securely to the special lifting hook.
- Lifting work is prohibited except for the main purpose. Never raise or lower people in this way.
- Do not allow anyone inside the operating radius.
- When carrying out lifting work, determine the method and order of operations and signals to be used. Appoint a leader and follow his directions.
- Wear leather gloves when handling the wire rope. Use only wire rope which fulfils the specified standards.
- Run the engine at low speed when carrying out the lifting work.
- Do not leave the operator's seat when the load is raised.
- It is dangerous to use the work equipment to pull loads in or to the side or to carry out work that
 exceeds the capacity of the work equipment. Do not carry out such operations.
- Do not travel with a raised load.
- Depending on the operating posture of the work equipment, there is danger that the wire rope or ring may slip from the hook, so always pay attention to the angle of the hook to prevent the wire or ring from coming off.



BEFORE CARRYING OUT MAINTENANCE 8.1

NOTIFICATION OF FAILURE

Carrying out maintenance not described in the Komatsu operation and maintenance manual may lead to unexpected failures.

Please contact your Kornatsu distributor for repairs.

WARNING TAG

- ALWAYS attach the "DO NOT OPERATE" warning tag to the work equipment control lever in the operator's cab to alert others that you are working on the machine. Attach additional warning tags: around the machine if necessary.
- If others start the engine, or touch or operate the work equipment control lever while you are performing service or maintenance, you could suffer serious injury or death.

Warning tag Part No. 09963-03000



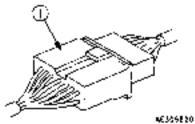


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CLEAN BEFORE INSPECTION AND MAINTENANCE

- Clean the machine before carrying out inspection and maintenance. This will ensure that dirt does not get into the machine and will also ensure that maintenance can be carried out safely.
- If inspection and maintenance are carried out with the machine still dirty, it will be difficult to find the location of problems, and there is also the danger that you will get dirty or mud in your eyes, and that you will slip and injure yourself.
- When washing the machine, always do as follows.
 - Wear non-slip shoes to prevent yourself from stipping on the wet surface.
 - When using high-pressure steam to wash the machine, always wear protective clothing. This will protect you from being hit by high-pressure water, and cutting your skin or getting mudor dust into your eyes.
 - Do not spray water directly on to the electrical system (sensors, connectors) ①, If water gets. into the electrical system, there is danger that it will cause defective operation and malfunction,





KEEP WORK PLACE CLEAN AND TIDY

Do not leave hammers or other tools lying around in the work place. Wipe up all grease, oil, or other substances that will cause you to slip. Always keep the work place clean the tidy to enable you to carry out operations safely.

If the work place is not kept clean and tidy, there is danger that you will trip, slip, or fall over and injure yourself.

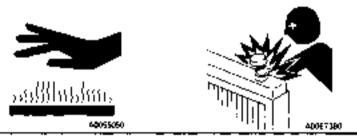
APPOINT LEADER WHEN WORKING WITH OTHERS

When repairing the machine or when removing and installing the work equipment, appoint a leader and follow his instructions during the operation.

When working with others, misunderstandings between workers can lead to serious accidents.

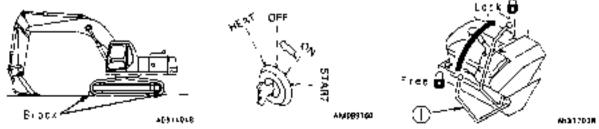
RADIATOR WATER LEVEL

- When inspecting the radiator water level, stop the engine, and wait for the engine and radiator
 to cool down. Check the water level in the sub-tank. Under normal conditions, do not open the
 rediator cap.
- If there is no sub-tank, or the radiator cap must be removed, always do as follows.
- Wait for the radiator water temperature to go down before checking the water level.
 (When checking if the water temperature has gone down, put your hand near the engine or radiator and check the air temperature. Be careful not to touch the radiator or engine.)
- Release the internal pressure before removing the radiator cap, and remove the radiator cap slowly.



STOP ENGINE BEFORE CARRYING OUT INSPECTION AND MAINTENANCE

- When carrying out inspection and maintenance, park the machine on level ground where there
 is no danger of falling rocks or land slides, or of flooding if the land is low, then lower the work
 equipment to the ground and stop the engine.
- Operate the right work equipment control lever several times to the RAISE and LOWER positions
 to release the remaining pressure in the hydraulic circuit, then set safety lock lever ① to the LOCK
 position.
- Put blocks under the track to prevent the machine from moving.
- The worker carrying out the maintenance should be extremely careful not to touch or get caught
 in the moving parts.



SAFETY DEVICES FOR WORK EQUIPMENT

When carrying out inspection and maintenance with the work equipment raised, fit stand ② securely to the boom to prevent the work equipment from coming down.

Place the work equipment control levers at HQLD, and set safety lock lever (5) to the LOCK position.



PROPER TOOLS

Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools could cause personal injury.

Broken pieces of chisels or hammers could fly into your eyes and blind you.

Tools - See "21.1 INTRODUCTION OF NECESSARY TOOLS".



PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS

Hoses and other parts of the fuel, hydrautic, and brake system are critical parts for ensuring safety, so they must be replaced periodically.

Replacement of safety critical parts requires skill, so please ask your Komatsu distributor to carry our replacement.

- Replace these components periodically with new ones, regardless of whether or not they appear
 to be defective.
 - These components deteriorate over time, and can cause fire because of oil leakage or failure in the work equipment system.
- Replace or repair any such components if any defect is found, even though they have not reached
 the time specified.

Replacement of safety critical parts --

See "22. PERIODIC REPLACEMENT OF SAFETY CRITICAL PARTS".

USE OF LIGHTING

- When checking fuel, oil, or battery electrolyte, always use lighting with anti-explosion specifica-
 - If such lighting equipment is not used, there is danger of explosion.
- If work is carried out in dark places without installing lighting, there is danger of injury, so always. install proper lighting.
- Even if it is dark, do not use a lighter or flame instead of lighting. There is danger of starting a fire, and if the battery gas ignites, it may cause an explosion.
- When using the machine as the power supply for the lighting, follow the instructions in this Operation and Maintenance Manual.



PREVENTION OF FIRE

There is danger of the fuel and battery gas catching (ire during maintenance, so always follow the precautions below when carrying out maintenance.

- Store fuel, oil, grease, and other flammable materials away from flame.
- Use non-flammable materials as the flushing oil for cleaning parts. Do not use diesel oil or gasoline. There is danger that they will catch fire.
- Never smoke when carrying out inspection or maintenance. Always smoke in the prescribed place.
- When checking fuel, oil, or battery electrolyte, always use lighting with anti-explosion specifications. Never use lighters or matches as lighting.
- When carrying out grinding or welding operations on the chassis, remove any flammable. materials to a safe place.
- Be sure that a fire extinguisher is present at the inspection and maintenance point.



8.2 DURING MAINTENANCE

PERSONNEL

Only authorized personnel can service and repair the machine. Do not allow unauthorized personnel into the area. If necessary, employ an observer.

Extra precaution should be used when grinding, welding, and using a sledge-hammer.

ATTACHMENTS

- Appoint a leader before starting removal or installation operations for attachments.
- Do not allow anyone other than the workers close to the machine or attachment.
- Place attachments that have been removed from the machine in a sale place so that they do not fall. Put a fence around the attachments, and set up No Entry signs to prevent unauthorized persons from coming close.



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WORK UNDER THE MACHINE

- Stop the machine on firm, level ground, and always lower all work equipment to the ground before
 performing service or repairs under the machine.
- Always block the track shoes securely.
- It is extremely dangerous to work under the machine if the track shoes are off the ground and the machine is supported only by the work equipment. Never work under the machine if the machine is poorly supported.



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WORK ON TOP OF MACHINE

- When carrying out maintenance on top of the machine, make sure that the footholds are clean
 and free of obstructions, and follow the precautions below to prevent yourself from falling.
 - Do not spill oil or grease.
 - Do not feave tools lying around.
 - Mind your step when you are walking.
- Never jump down from the machine. When getting on or off the machine, always use the steps and handrails, and maintain three-point contact (both feet and one hand or both hands and one foot) at all times.
- Use protective equipment if necessary.



LOCKING INSPECTION COVERS

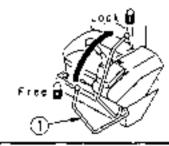
When carrying out maintenance with the inspection cover open, lock it securely with a lock bar. If maintenance is carried out with the inspection cover open and not locked in position, it may close suddenly if knocked or blown by the wind, and may cause injury to the operator.

MAINTENANCE WITH ENGINE RUNNING

To prevent 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 do as follows.

- 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.
- When carrying out operations near rotating parts, there is danger of being caught in the parts, so be extremely careful.
- When cleaning inside the radiator, set safety lock lever ① to the LOCK position to prevent the work
 equipment from moving.
- Do not touch any control levers. If any control lever must be operated, always give a signal to the
 other workers to warm them to move to a safe place.
- Never touch the fan blade or fan belt with any tool or any part of your body. There is danger of serious injury.





A431700B

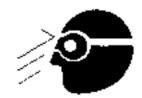
DO NOT DROP TOOLS OR PARTS INSIDE MACHINE

- When opening the inspection window or tank oil filler to carry our Inspection, be careful not to drop any nuts, bolts, or tools inside the machine.
 If such parts are dropped into the machine, it will cause breakage of the machine, mistaken operation, and other failures. If you drop any part into the machine, always be sure to remove it from the machine.
- When carrying out inspection, do not carry any unnecessary tools or parts in your pocket.

PRECAUTIONS WHEN USING HAMMER

When using a hammer, always wear safety glasses, safety helmet, and other protective clothing, and put a brass bar between the hammer and the part being hammered.

If hard metal parts such as pins, edges, teeth, or bearings are hit with a hammer, there is danger that broken pieces might fly into your eyes and cause injury.



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REPAIR WELDING

Welding operations must always be carried out by a qualified welder and in a place equipped with a proper equipment. Gas is generated, and there is danger of fire or electrocution when carrying out welding, so never allow any unqualified personnel to carry out welding.

The qualified welder must follow the preceutions given below.

- Disconnect the battery terminals to prevent explosion of the battery.
- · Remove the paint from the place being welded to prevent gas from being generated.
- If hydraulic equipment or piping, or places close to these are heated, flammable vapor or spray
 will be generated, and there is danger of this catching fire, so avoid applying heat to such places.
- If heat is applied directly to rubber hoses or piping under pressure, they may suddenly burst, so cover them with fireproof sheeting.
- Always wear protective clothing.
- Ensure that there is good ventilation.
- Clear up any flammable materials, and make sure that there is a fire extinguisher at the workplace.

PRECAUTIONS WITH BATTERY

When repairing the electrical system or when carrying out electrical welding, remove the negative \oplus ; terminal of the battery to stop the flow of current.

Handling battery - See "16.5 IF BATTERY IS DISCHARGED".



WHEN ABNORMALITY IS LOCATED

- If any abnormality is found during inspection, always carry out repairs. In particular, if the machine
 is used when there is any abnormality in the brakes or work equipment systems, it may lead to
 serious accident.
- Depending on the type of failure, please contact your Komatsu distributor for repairs.

RULES TO FOLLOW WHEN ADDING FUEL OR OIL

If any flame is brought close to fuel or oil, there is danger that it will catch fire, so always follow the precautions below.

- Stop the angine when adding fuel or oil.
- Do not smoke.
- Spilled fuel and oil may cause you to slip, so always wipe it up immediately.
- Always tighten the cap of the fuel and oil fillers securely.
- Always add fuel and oil in a well-ventilated place.







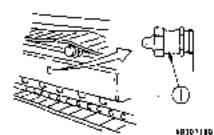


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PRECAUTIONS WHEN USING HIGH-PRESSURE GREASE TO ADJUST TRACK TENSION

- Grease is pumped into the track tension adjustment system under high pressure.
 If the specified procedure for maintenance is not followed when making adjustment, valve (i) may fly out and cause damage or personal injury.
- When loosening grease drain valve (i), never loosen it more than one turn.
- Never put your face, hands, feet, or any other part of your body directly in front of any grease drain valve.

Adjusting track tension → See "24.2 WHEN REQUIRED".





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HANDLING HIGH-PRESSURE HOSES

- If oil or fuel leaks from high-pressure hoses, it may cause fire or defective operation, which may lead to personal injury or damage. If any damaged hoses or loose bolts are found, stop work and contact your Komatsu distributor for repairs.
- Replacing high-pressure hoses requires a high level of skill, and the torque is determined according to the type of hose and size, so please do not carry out replacement yourself. Ask your Komatsu distributor to carry out replacement.

PRECAUTIONS WITH HIGH-PRESSURE OIL

When inspecting or replacing high-pressure piping or hoses, always check that the pressure in the hydraulic circuit has been released. If the circuit is still under pressure, it will lead to serious injury or damage, so always do as follows.

- For details of the method of releasing the pressure, see "8.1 BEFORE CARRYING OUT MAINTE-NANCE, STOP ENGINE BEFORE CARRYING OUT INSPECTION AND MAINTENANCE", Never carry out inspection or replacement before releasing the pressure completely.
- Wear safety glasses and leather gloves.
- If there is any leakage from the piping or hoses, the piping, hoses, and the surrounding area will
 be wet, so check for cracks in the piping and hoses and for swelling in the hoses.
 If it is difficult to locate the leakage, always please contact your Kometsu distributor for repairs.
- If you are hit by a jet of high-pressure oil, consult a doctor immediately for medical attention.



PRECAUTIONS WHEN CARRYING OUT MAINTENANCE AT HIGH TEMPERATURE

immediately after stopping operations, the engine cootant, oil at all parts, the exhaust manifold, and the muffler are at high temperature.

In this condition, if the cap is removed, or the oil is drained, or the filters are replaced, this may result in burns or other injury. Wait for the temperature to go down, then carry out the inspection and maintenance in accordance with the procedures given in this manual.

Cleaning inside of cooking system → See "24.2 WHEN REQUIRED".

Checking coolant level, ail level in hydraulic tank → see "24,3 CHECK BEFORE STARTING".

Checking lubricating oil level, adding oil → see "24.3-7 PERIODIC MAINTENANCE".

Changing oil, replacing filters → see "24.5-10 PERIODIC MAINTENANCE".



CHECKS AFTER INSPECTION AND MAINTENANCE

Failure to carry out inspection and maintenance fully, or failure to check the function of various maintenance locations may cause unexpected problems and may even lead to personal injury or damage, so always do as follows.

- Checks when engine is atopped.
 - Have all the inspection and maintenance locations been checked?
 - Have all the inspection and maintenance items been carried out correctly?
 - Have any tools or parts dropped inside the machine? It is particularly dangerous if they get caught in the lever linkage.
 - Has water and oil leakage been repaired? Have bolts been tightened?
- Checks when engine is running. For details of checks when the engine is running, see "8.2 DURING MAINTENANCE, MAINTE-NANCE WITH ENGINE RUNNING", and be extremely careful to ensure safety.
- Do the inspection and maintenance locations work normally?
- Is there any oil teatage when the engine speed is raised and load is applied to the hydraulic system)

WASTE MATERIALS

To prevent politition, particularly in places where people or animals are living, always follow the procedures given below.

- Never dump waste oil in a sewer system, rivers, etc.
- Always put oil drained from your machine in containers. Never. drain oil directly onto the ground.
- Opey appropriate laws and regulatrons when disposing of harmful objects such as oil, fuel, coolant, solvent, filters, and batteries.

INCORRECT



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MAINTENANCE OF AIR CONDITIONER

If the air conditioner refrigerant gets into your eyes or touches your skin, it may cause blindness or frostbite.

- When repairing or inspecting the air conditioner, be sure to handle the refrigerant gas according to regulations of your country.
- . When handling the refrigerant, follow the precautions given on the container.
- To prevent the refrigerant from leaking into the atmosphere, use a recovery recycling system.
- Never touch the refrigerant.

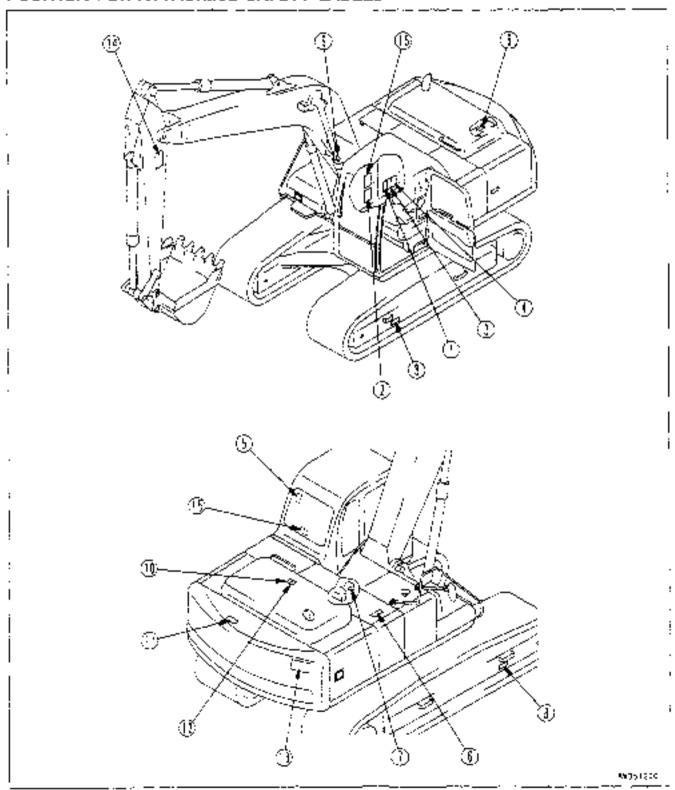
9. POSITION FOR ATTACHING SAFETY LABELS

Always keep these labels clean, if they are lost or damage, attach them again or replace them with a new label.

There are other labels in addition to the safety labels listed as follows, so handle them in the same way.

Safety labels may be available in languages other than English. To find out what labels are available, contact your Komatsu distributor.

POSITION FOR ATTACHING SAFETY LABELS



 Precautions for operation, inspection and maintenance (09651-A0641)



Warning¹

Read the Operation and Maintenance Manual before operating, mainteining, carrying out disassembly, assembly or transportation of this machine. 2. Precautions for operation (09802-03000)



- if it can be done safely.

 Use spotter if view is obstructed.
- Use spotter if view is obstructed.
 Follow above even if machine equipped with travel alarm and marrors.

09807-03000 •

 Precautions for leaving the operator's sest (09654-A0641)



There is the hazard that machine may move suddenly and catch or run over someone near the machine causing injury.

When leaving the mechine, always lower the work equipment completely to the ground, place the control levers in LOCK position, stop the engine and remove the key and take it with you.

 Precentions for going close to electric cables (09801-A0641)



If machine goes close to high-voltage cables, it will result in electric shock to the operator.

Maintain a sale distance between the machine and the electric cables.

Precautions for stowage (09803-A0481)



When the front window is stowed, there is the hazard that it will laf:.

Always lock the front window securely at the stowed position.

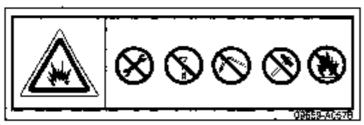
Precautions for high-temperature cooling water and hydraulic oil (09653-A0481)



Never remove the cap when the engine is at operating (high) tempratures. Stream or high temperature oil blowing up from the radiator or hydraulic tank, will cause personal injury and/or burns.

Never remove the radiator cap or hydraulic tank of filler when cooling water or hydraulic oil is at high temperatures.

Precautions for handling accumulator (09659-A057B)



There is the hazard of exclosion causing injury

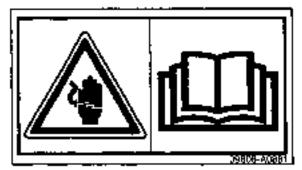
Do not disassemble the accumulator, make holes in it. weld it. cut it, twi it, roll it or bring it near flams.

Precautions for check and adjust track tension (09657-A0881)



Plug coming from track shoe tension adjustment device causing injury. Read the operation and maintenance manual and carrying out the correct method when loosening track tension.

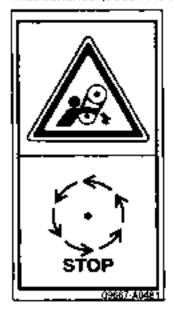
Precautions for handling electric wires (09808-A0881)



There is the hazard to electric shock when handling electric wires.

Read the operation and maniference manual and carrying cut the correct method when handing.

Stop rotating parts when inspection and maintenance (09667-A0481)



There is the hazard of being caught in the rotating parts of the machine causing injury.

Stop the rotating parts of the machine completely when earrying out inspection and maintenance.

Precautions for avoiding falling down-(09805-A0881)



There is the hazard of falling down.

Do not go close to the edge of the machine by mistake.

Precautions for avoiding falling down (09905-C0481)



There is the hazard of falling down.

Do not step here!

Prohibited to enter range of swing (09133-A3281)



There is ganger of getting caught when upper structure swings

Do not emer range of swing

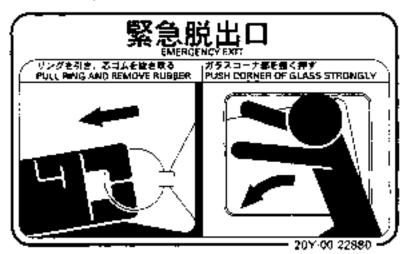
14. Beware of work equipment (09134-A1681)



There is danger of getting hit and injured by work equipment

Do not go close to work equipment.

 Explanation of escape method in emergency (20Y-00-22880)



 Precautions for opening the window (09839-03000)



To avoid hitting unlocked operation levers, lower equipment to ground and move SAFETY LOCK LEVER (located near seas) to LOCK position before standing up from operator's seat, for the purpose of such as opening window and leaving the machine.

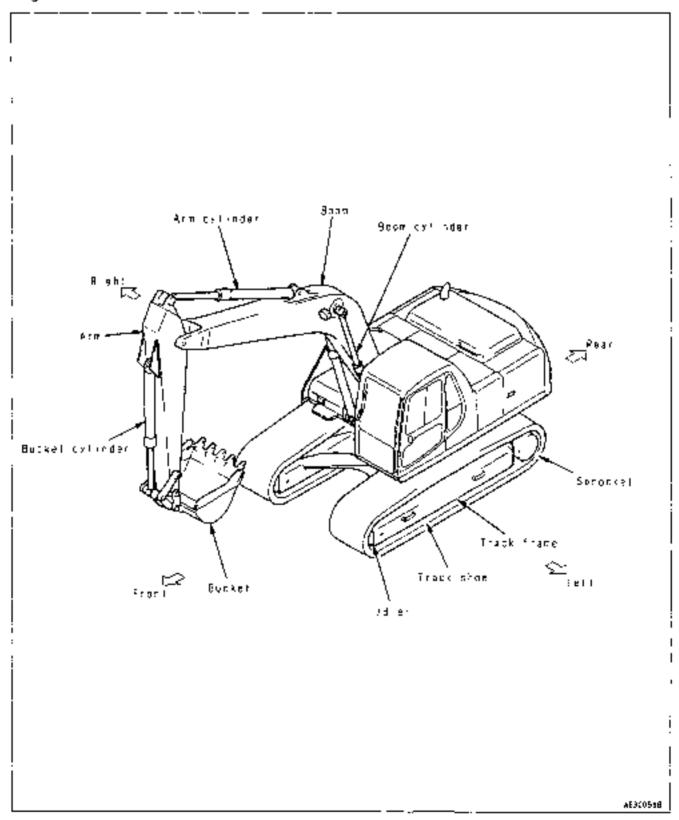
Sudden and unwanted machine movement can cause serious wjury or death.

- C9839-03000 ·

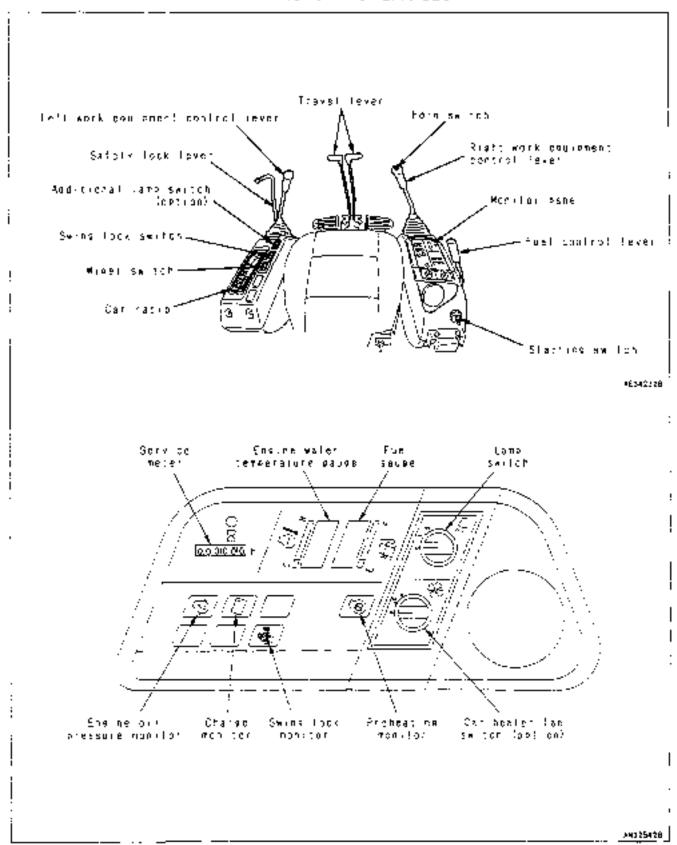
OPERATION

10.1 GENERAL VIEW OF MACHINE

If directions are indicated in this section, they refer to the directions shown by the arrows in the diagram below.



10.2 GENERAL VIEW OF CONTROLS AND GAUGES

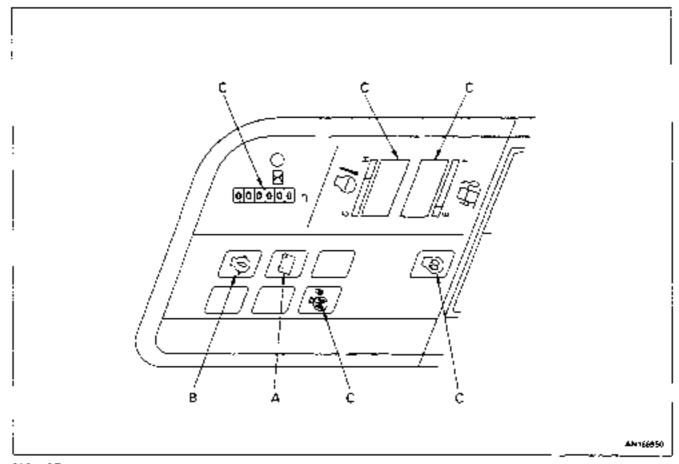


11. EXPLANATION OF COMPONENTS

The following is an explanation of the devices needed for operating the machine.

To carry out suitable operations correctly and safely, it is important to understand fully the methods of operating the equipment and the meanings of the displays.

11.1 MACHINE MONITOR



NOTICE

When carrying out checks before starting, do not simply rely on the monitor. Always refer to the periodic maintenance items or *12. OPERATION* to carry out the checks.

A. CAUTION ITEMS (11.1.1)

If these monitor items flash, check and repair the appropriate location as soon as possible.

These are items which need to be observed while the engine is running. It any abnormality occurs, items which need to be repaired as soon as possible are displayed.

If there is any abnormality, the appropriate monitor lamp will flash to indicate the location of the abnormality.

B. EMERGENCY STOP ITEMS (11.1.2)

— 🕰 CAUTION -

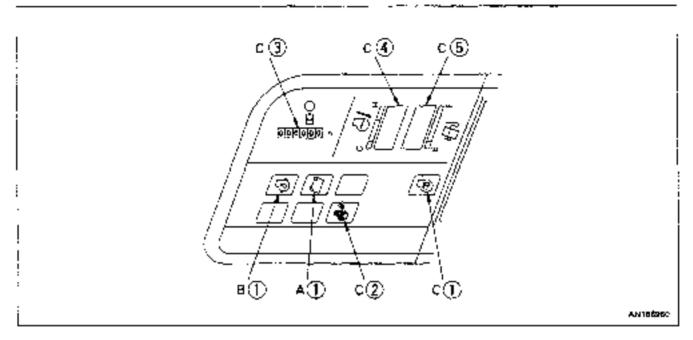
If these monitor items flash, stop operations immediately, then check and repair the appropriate location.

These are items which need to be observed while the engine is running. If any abnormality occurs, items which need to be repaired immediately are displayed.

If there is any abnormality, the appropriate monitor lamp will liash to indicate the focation of the abnormality, and the alarm buzzer will sound.

C. METER DISPLAY PORTION (11.1.3)

This portion consists of pre-hearing monitor, swing lock monitor, service meter, engine water temperature gauge and fuel gauge.



12.1.1 A: CAUTION ITEMS



If the caution monitor lamp flashes, repair the problem as soon as possible.

1. CHARGE LEVEL

This monitor indicates an abnormality in the charging system while the engine is running.

If the monitor lamp flashes, check the V-belt tension. If any abnormality is found, see "16.5 OTHER TROUBLE".



REMARK

- While the starting switch is ON, the tamp will remain lit and will go off once the engine is started.
- When the engine is started or stopped with the staring switch at the ON position, the lamp may light up and the buzzer may sound momentarily, but this does not indicate any abnormality.

11.1.2 B: EMERGENCY STOP ITEMS

- 🕰 CAUTION -

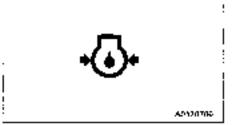
If any monitor lamp flashes, stop the engine or run it at lowidling, and take the following action.

1. ENGINE OIL PRESSURE

If the engine oil pressure drops below the normal pressure, the monitor lamp flashes. At this item, stop the engine and inspect it according to "16,6 OTHER TROUBLE."

REMARK

While the starting switch is ON, the lamp remains lit and goes off once the engine is started. When the engine starts, the buzzer may sound for a short time, however, this does not indicate a fault.



11.1.3 C: MÉTER DISPLAY PORTION

1. ENGINE PRE-HEATING MONITOR

This monitor tamp indicates the pre-heating time required when starting the engine at an ambient temperature below 0°C.

The monitor lamp lights when the starting switch is turned to HEAT position and flashes after about 30 seconds to show that the pre-heating is completed. The monitor lamp will go off after about 10 seconds.)



2. SWING LOCK MONITOR

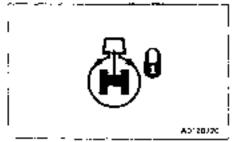
This informs the operator that the swing lock is being actuated. [Actuated: Lights up

When the swing lock switch is turned ON (ACTUATED), the promoter famp lights up.

REMARK

A disc brake is installed in the swing motor to mechanically stop motor rotation.

The brake is always applied while the swing lock is actuated.

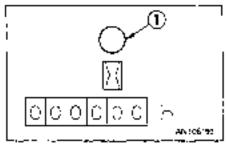


3. SERVICE METER

This meter shows the total operation hours of the machine. Set the periodic maintenance intervals using this display. The service meter advances while the engine is running - even if the machine is not traveling.

While the engine is running, operation display \Re at the top inside of the meter will light to show that the meter is advancing.

The meter will advance by 1 for each hour of operation regardless of the engine speed.

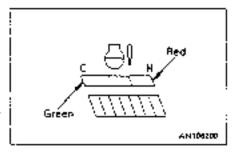


4. ENGINE WATER TEMPERATURE GAUGE

This displays the engine cooling water temperature. During normal operation, the lamp should light up in the green range.

If the lamp in the red range lights up during operation, run the engine at low idling and wait for the temperature to go down to the green range.

After starting the engine, warm up it until the green range lights up.

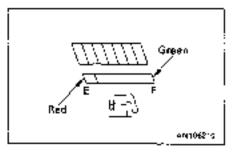


5. FUEL GAUGE

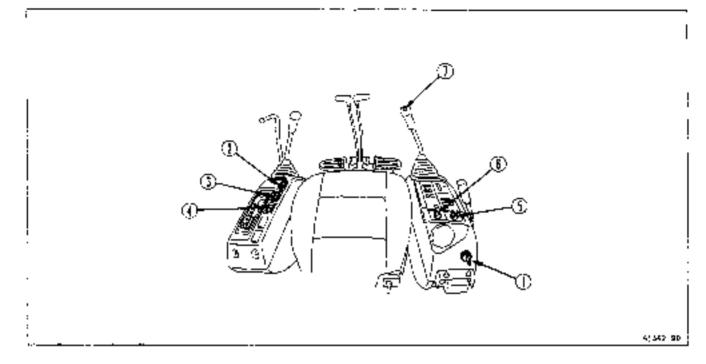
This shows the fuel level in the fuel tank. During normal operation, the lamp should light up in the green range.

If the lamp in the red range flashes during operation, there is less than 45 liters (11.9 US gal, 9.9 UK gal) of fuel remaining, so check and edd fuel.

The correct level may not be displayed for a short time after the starting switch is turned to the ON position, but this is not an abnormality.



11.2 SWITCHES



1. STARTING SWITCH

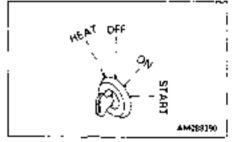
This switch is used to start or stop the engine.

OFF position

The key can be inserted or withdrawn. Except for the cab lamp, the switches for the electric system are all turned off.

ON position

Electric current flows in the charging and lamp circuits. Keep the starting switch key at the ON position while the engine is running.



START position

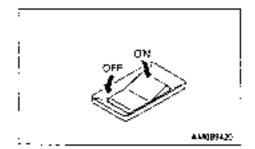
This is the engine-start position. Keep the key at this position during cranking. Immediately after starting the engine, release the key which will automatically return to the ON position.

HEAT (preheat) position

When starting the engine in winter, set the key to this position. When the key is set to the HEAT position, the pre-heating monitor lights up. Keep the key at this position until the monitor lamp flashes. Immediately after the pre-heating monitor flashes, release the key. The key automatically returns to the OFF position. Then, start the engine by turning the key to the START position.

2. ADDITIONAL LAMP SWITCH (OPTION)

This switch is provided to turn on an additional lamp on the cab front top. Setting to OFF turns the switch off.



3. SWING LOCK SWITCH

- A WARNING -

- When the machine is traveling under its own power, or when the swing is not being operated, always set the switch to the ON (ACTUATED) position.
- On a slope, the work equipment may swing to the down side even if the swing lock switch is located at the ON position.
 Be careful concerning this point.

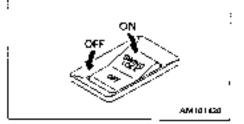
This switch is used to lock the upper structure so that it cannot swing.

ON position (actuated):

The swing lock is always applied, and the upper structure will not swing even if the swing is operated. In this condition, the swing lock lamp lights up.

OFF position (canceled):

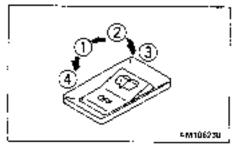
The swing lock is canceled, and the upper structure will swing when the swing lever is operated.



4. WIPER SWITCH

This switch actuates the front window wiper.

- OFF: The wiper srops.
- ON: The wiper moves continuously.
- 3) Window washer fluid is sprayed out: When the switch is released, it returns to 2:.
- Window washer fluid is sprayed out: When the switch is released, it returns to (1).



5. LAMP SWITCH

This lights up the head lamps and the panel lamp.

Position 1: Panel lamp lights up.

Position 2: Head lamps and panel lamp light up.

Position OFF. Lamps go off.

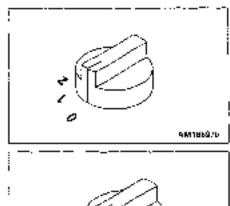
6. CAR HEATER FAN SWITCH

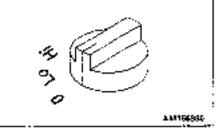
This switch is used to heat the operator's compartment. The flow rate of the hot air can be set to two levels.

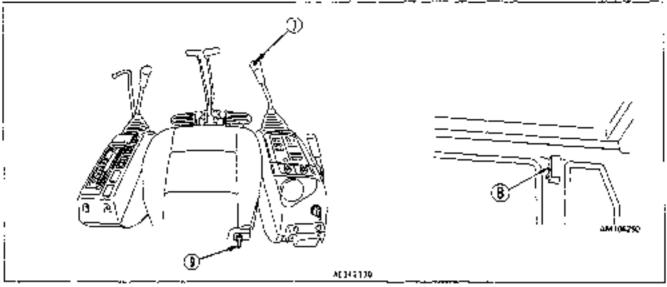
Hi position: Strong Lo position: Weak

OFF position; Car heater is stopped.

The cab is heated by hot water from the engine, so if the engine cooling water temperature is low, the cab will not heat up.

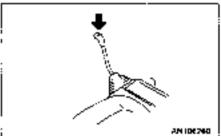






7. HORN BUTTON

When the button at the tip of the right work equipment control lever is pressed, the horn will sound.

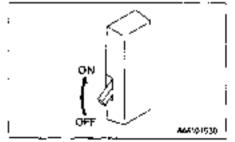


8. CAB LAMP SWITCH

This lights up the cab lamp.

ON position: Lights up

The cab lamp can be turned on even when the starting switch is at the OFF position, so be careful not to leave it on by mistake.



9. PUMP CONTROL OVERRIDE SWITCH

When normal: Switch is down

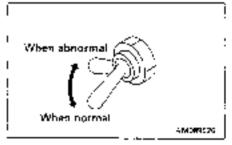
When abnormal: When the pump control system or its circuit has 1

any abnormality, set this switch to "UP", and

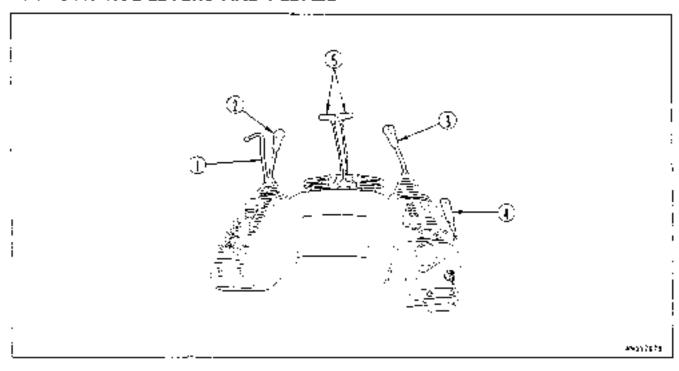
operation can be carried out.

If the engine stalls easily or the machine speed drops radically, the pump control system and its circuit may have an abnormality. If the switch is set to "UP" at this time, operation can be carried out temporarily.

The pump control override switch is designed to allow operations to be carried out for a short period when there is an abnormality in the pump control system (TVC valve system error). The abnormality must be repaired immediately.



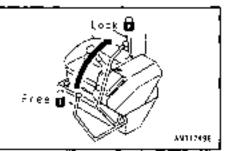
11.3 CONTROL LEVERS AND PEDALS



LOCK LEVER (FOR LEFT AND RIGHT WORK EQUIPMENT (EVERS AND TRAVEL LEVERS)

- A WARNING

- When leaving the operator's compartment, set the safety lever securely to the LOCK position. If the gear shift lever is not locked, and it is touched by mistake, this may lead to a serious accident.
- If the safety lever is not placed securely in the LOCK position, the control lever may not be properly locked.
 Check that the situation is as shown in the diagram.



- 🕰 WARNING -

When pulling the lock lever up, be careful not to touch the
work equipment control lever. If the lock lever is not pulled
up fully, there is danger that the work equipment or swing
may move.

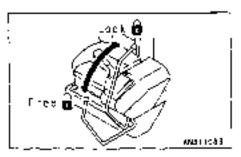
- 🕰 WARNING ----

When pushing the lock lever down, be careful not to touch the work equipment control levers.

This lever locks the work equipment control, travel control, swing control, and attachment control (option).

When the lever is pulled up, the lever stand springs up and is locked.

This lever is a hydraulic lock, so even if it is in the lock position the control levers for work equipment and travel will move, but the work equipment, swing motor, and travel motor themselves will not move.



2. LEFT WORK EQUIPMENT CONTROL LEVER

This lever is used to operate the arm and upper structure.

Arm operation

Swing operation

Swing to right

Arm IN

(ii) Swing to left

@ Arm QUT

N (Neutrel)

When the lever in this position, the upper structure and the arm will be retained in the position in which they stop.

3. RIGHT WORK EQUIPMENT CONTROL LEVER

This lever is used to operate the boom and bucket.

Boom operation

Bucket operation

① RAISE

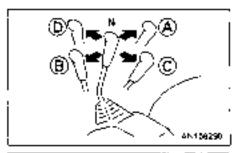
③ DUMP

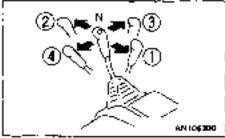
② LOWER

② CURL

N (Neutral)

When the lever in this position, the boom and the bucket will be retained in the position in which they stop.





4. FUEL CONTROL LEVER

This lever is used to control the engine speed and output.

- Engine stopping position: Push the lever in and forward fully.
- Low idling position:

Pull the lever back from the above |

position [] until the operating ef- i

fort becomes light.

3) Full speed position:

Pull the lever back fully from the

position of 2 above.

5. TRAVEL LEVERS

- 🕰 WARNING --

When the track frame is facing the rear, the direction of the travel operation is reversed.

Before operating the travel lever, check if the track frame is facing the front or the rear.

(The track frame is facing the front if the sprocket is at the rear.)



The lever is pushed forward

② REVERSE:

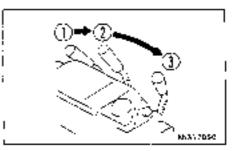
The lever is pulled back

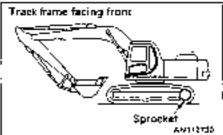
N (Neutral): The machine stops

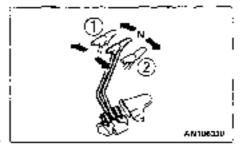
REMARK

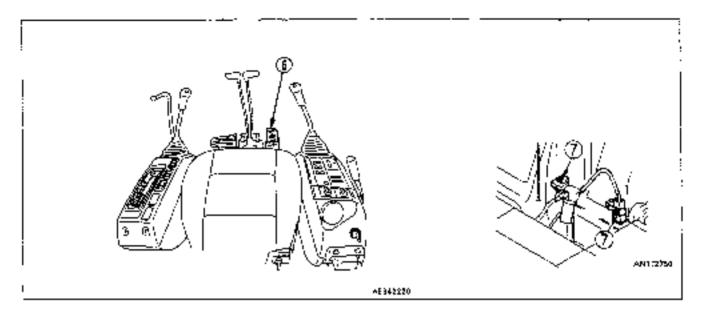
Machines equipped with travel alarm

If the lever is shifted to the advance or reverse position from the neutral position, the alarm sounds to warn that the machine is starting to advance.









6. ATTACHMENT CONTROL PEDAL

A WARNING

Do not put your foot on the pedal except when operating the pedal. If resting your foot on the pedal during operations, and it is depressed by accident, the attachment may move suddenly and cause serious damage or injury.

When breaker is installed

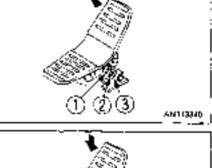
· 🕰 WARNING -

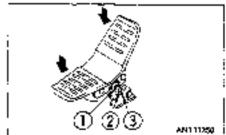
Never operate the breaker with the lock pin position ③. Otherwise such operation will affect badly to the mechine and breaker in durability.

- When the front part of the pedal is depressed, the breaker is actuated.
- The lock pin actuates locking at ①. Position ② is the pedal half stroke position and position ③ is the pedal full stroke position.
- Use the lock pin at the position ②.

When general attachment is installed

- When the pedal is depressed, the attachment is actuated.
- The lock pin actuates locking at ①. Position ② is the pedal half stroke position and position ③ is the pedal full stroke position.





HYDRAULIC OIL FLOW

When the front part of the pedal is depressed, the hydraulic oil flows into the left-hand work equipment piping, and, when the rear part of the pedal is depressed, the oil flows into the right-hand work equipment piping. (When equipped with breaker, depress only the front part of the pedal.)



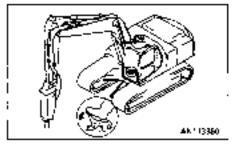
· AWARNING ·

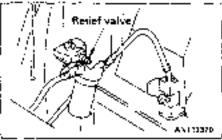
Do not touch the ralief valve.

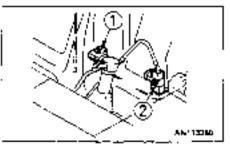
When using the breaker and general attachment (crusher etc.), turn the rotors of 3-way valves ① and ② to change them over according to the following illustration.

(The arrow marks indicating the port direction are stamped on the 3-way valve heads.)

| | | · |
|--------------|------------------------------|----------------------------|
| Anachments | Left 3-way valve 🔿 | Right 3-way valve (2) |
| Breaker etc. | Forward direction of machine | Upper direction of machine |
| | Forward direction | Upper direction |
| Crusher etc. | of machine | of machine |







NOTICE

Perform work only after the engine is stopped and the work equipment and machine body are in a stable posture on the ground.

REMARK

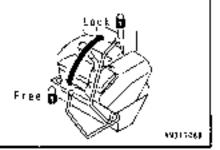
For details, see "30, MACHINES READY FOR ATTACHMENTS".

11.4 CEILING WINDOW

A WARNING-

When leaving the operator's compartment, sat the safety lock lever securely to the LOCK position.

if the control levers are not locked, and they are touched by mistake, this may lead to a serious accident.

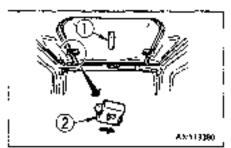


When opening

- 1. Lock the safety lock lever securely.
- Check for any ceiling window movement by pulling took @ located on both sides, then push up and open the ceiling window grasping grip .

When closing

Close the ceiling window grasping grip ① and lock it with lock ②. If the lock cannot be applied, open and close the ceiling window again.

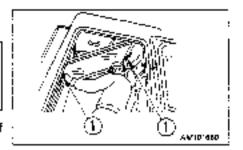


11.5 FRONT WINDOW

- 🕰 WARNING -

When opening the bront window, always hold grip ① firmly with both hands and pull up. If you use only one hand, your hand may slip and get caught.

It is possible to store (pull up) the front window (top) in the roof of the operator's compartment.

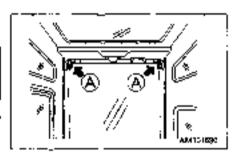


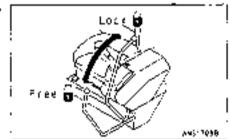
When opening

- AWARNING -

When the front window is open, there is danger that it will fall, so always lock it with left and right lock pins (a).

- Stop the machine on flat ground, lower the work equipment to the ground, and stop the engine.
- Set the lock lever for the work equipment control levers securely to the LOCK position.



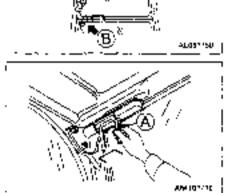


Disconnect the wiring for the wiper motor from socket @.

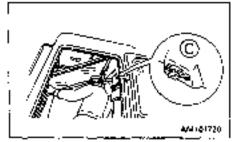
NOTICE

If it is attempted to open the front window without disconnecting the wiring, the wiring will be torn off.

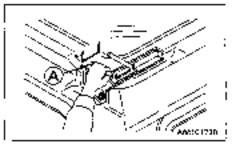
 Pull lock pins (A) at the top left and right sides of the front window to the inside to release the lock.



5. From the inside of the operator's cab, hold the bottom grip with [the left hand and the top grip with the right hand, pull up the window, and push it in fully until it is locked by catch ...]



6. Lock with lock pins (8) on the left and right sides.

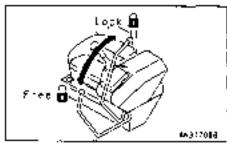


When closing

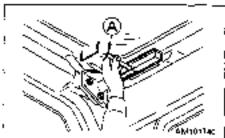
- A WARNING -

When closing the window, lower it slowly and be careful not to get your hand caught.

- Place the work equipment on a flat ground and stop the engine.
- 2. Securely lock the safety lock lever.



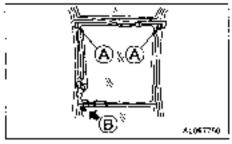
Release the lock pin (4).



4. Hold the grip at the bottom of the front window with your left hand and the grip at the top with your right hand, release the lock of catch © with your right thumb, then pull the top grip slowly and lower the front window. When releasing the lock of catch ©, push release lever © in the direction of the arrow to release the lock.

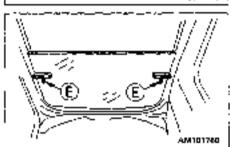


- Lock securely with lock pins (a) at the left and right sides.
- Connect the wiper motor wiring to socket (8).

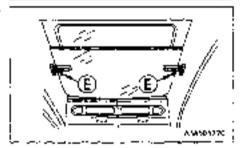


Removing front window (bottom)

With the front window open, remove lock pins (£), and the bottom part of the front window can be removed.



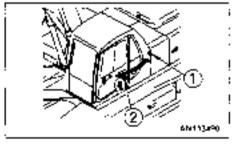
Store the removed bottom part of the front window at the rear of the opertor's cab and lock with lock pins (i).



11.6 DOOR LOCK

Use the door lock to fix the door in position after opening it.

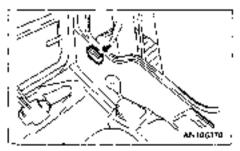
- The door will become fixed in place when it is pressed against catch (j).
- To release the lock, press knob (2) down at the left side of the operator's seat to release the catch.
 When fixing the door, fix it firmly to the catch.



11.7 ASHTRAY

This is on the right side of the operator's seat.

Always make sure that you extinguish the digarette before closing the lid.

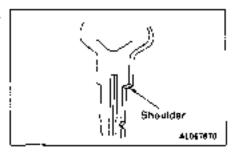


11.8 CAP, COVER WITH LOCK

The fuel filler, operator's cab, engine hood, tool box cover, pump room door (right side of the machine body) and battery room door (left side of the machine body) are fitted with locks.

Use the starting key to lock or unlock these places.

Insert the key as far as it will go. If the key is turned before it is inserted all the way, it may break.



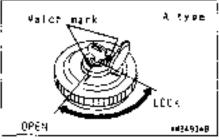
11.8.1 METHOD OF OPENING AND CLOSING CAP WITH LOCK

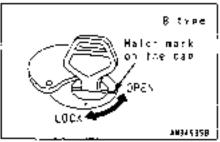
To open the cap

- 1. Insert the key into the key slot.
- Turn the key clockwise (but, for the B type, turn counterclockwise), is align the key slot with the match mark on the cap, then open the cap.

To lock the cap

- 1. Turn the cap into place and insert the key into the key slot.
- Turn the key counterclockwise (but, for the B type, turn clockwise) and take the key out.





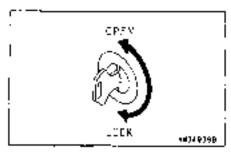
11.8.2 METHOD OF OPENING AND CLOSING COVER WITH LOCK

To open the cover (locked cover)

- 1. Insert the key into the key slot.
- Turn the key counterclockwise and open the cover by pulling the | cover grip.

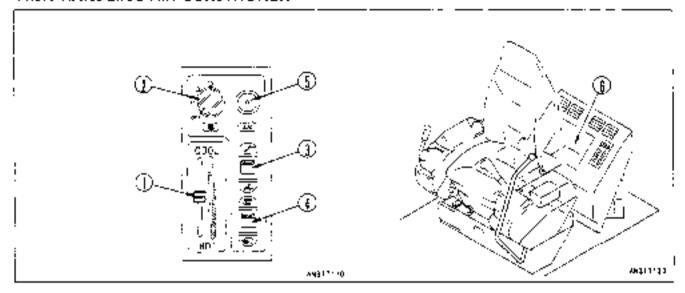
To lock the cover

- 1. Close the cover and insert the key into the key slot.
- 2. Turn the key clockwise and take the key out.



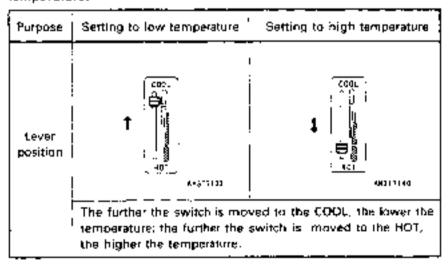
11.9 AIR CONDITIONER (MACHINES EQUIPPED WITH AIR CONDITIONER)

11.9.1 HANDLING AIR CONDITIONER



1. Temperature control switch

This switch can be adjusted between low temperature and high temperature.



2. Air flow selector switch

The air flow can be adjusted to three levels.

| Purpose | Turning Bit flow OFF | Turning air flow to LOW | Furning air flow to MEDIUM | furning au flow to HIGH |
|---------|-------------------------|-------------------------|----------------------------------|-------------------------------|
| Switch | D | Ě | Ĉ. | |
| | FEJ: 7153 | , JA317160 | 4M317/10 | A9011160 |

3. Vent selector switch

The vents can be selected to match the purpose.

| Purpose | Sending air flow to feet | Sending oir flow to face |
|---------|--------------------------|--------------------------|
| Switch | | |
| Vent | W917215 | W211213 |

4. Fresh/recirculate selector switch

This switches between recirculating the air or taking in fresh air.

| Purpose | Recorculation This is used when heating or cooling the inside of the operator's cab quickly, or when the outside air is dirty. | Fresh air This is used when taking in fresh outside air or when defrosting. |
|---------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Switch | (I) | E ↓ |

5. Air conditioner switch

This is used as the ON/OFF switch for the air conditioner.

| Purpose | When stopping air conditioner | When starting air conditioner |
|---------|-------------------------------|-------------------------------|
| Switch | AM211759 | AH3117763 |

6. Luggage box

Drinks battles, etc. may be stored in this box.

11.9.2 PRECAUTIONS WHEN USING AIR CONDITIONER

When carrying out cooling, ventilate the cab from time to time.

- If you smoke when cooling the cab, your eyes may start to sting, so in such cases, carry out ventilation and cooling together to remove the smoke.
- If the air conditioner is used for a long period, carry out ventilation and cooling together once every hour.

Be careful not to cool too much.

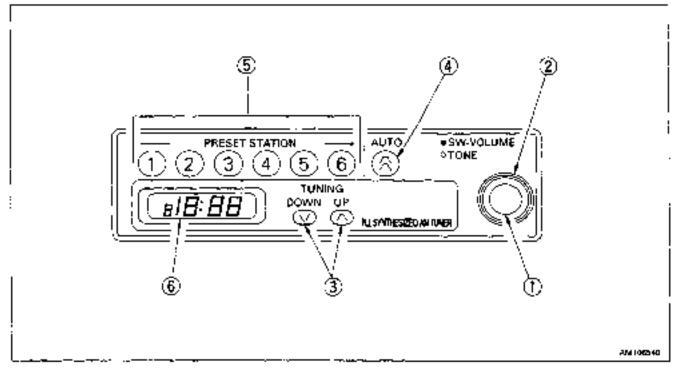
 For reasons of health, it is recommended that the cab should feel pleasantly cool when you enter it from the outside (5 – 6°C lower than the outside temperature). Pay attention to the temperature when carrying out cooling.

11.9.3 CHECK, MAINTAIN MACHINE WITH EQUIPPED AIR CONDITIONER

When carrying out inspection and maintenance of a machine equipped with air conditioner, see "23.1 MAINTENANCE SCHEDULE CHART".

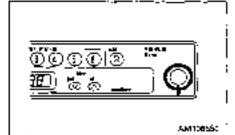
11.10 CAR RADIO (MACHINES EQUIPPED WITH CAR RADIO)

11.10.1 EXPLANATION OF COMPONENTS



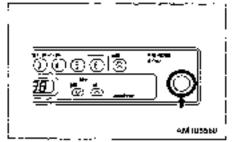
Power switch/volume control knob (e SW-VOLUME).

When this switch is depressed, the radio is turned on and the selected frequency appears on the display (§). When the switch is pressed again, the power is turned off. When the knob is turned clockwise, the sound volume increases. Counterclockwise turning lowers the volume.



2. Tone control (:: TONE)

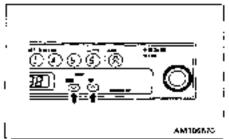
When the control switch is turned clockwise from the intermediate position, treble tone is emphasized. Counterckockwise turning reduces the treble and emphasizes the bass.



3. Manuel tuning button (TUNING)

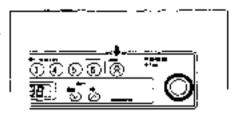
Frequency is changed using this button.

Each time the up-button \sim is pressed, the frequency increases by , 9 kHz, and each time the down button \sim is pressed, the frequency decreases by 9 kHz. If either button is continuously pressed for about 0.5 seconds or more, the frequency also increases/decreases until 1 the button is released.



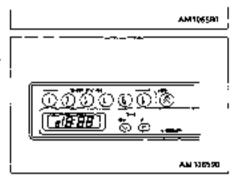
4. Auto tuning button [AUTO]

In frequency selection, when this button is pressed, the frequency automatically moves to high frequency.



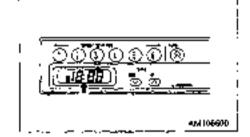
5. Preset button (1, 2, 3, 4, 5, 6) (PRESET STATION)

If a desired station is preset using this button, the station can be selected by one-touch action.



6. Display

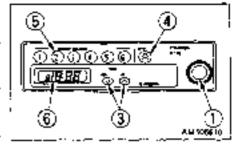
The frequency and preset No. are displayed.



11,10.2 SETTING METHOD

Presetting

- Press the power switch ①. A frequency will appear on the display ⑥.
- Select a desired frequency using the auto-tuning button @ or manual-tuning button @.
- 3. Press the preset button for 1.5 sec or longer to store the number into the memory. The display ® will show the preset number when storing is completed. Then, when preset button ® is released after being pressed for less than 1.5 seconds, the stations stored in the memory can be selected. One station per button can be stored.



Manual tuning

Select a desired frequency by pressing the manual tuning button ③. Each time the switch is pressed, the frequency is changed by 9 kHz. If the button is continuously pressed for about 0.5 seconds or more, the frequency also increases or decreases until the button is released.

- button: selects higher frequency,
- v button: selects lower frequency.
- When the frequency reaches the upper or lower limit, it is automatically changed to the opposite limit as the case may be.

Auto tuning

When the auto tuning button (a) is pressed, the frequency increases and once the desired station is selected, auto tuning will stop. If wishing to select another station, press the auto tuning button again.

During auto tuning, when this button is pressed, auto tuning is released and the frequency prior to auto tuning is selected.

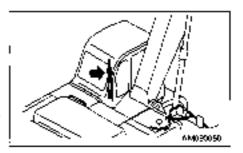
 When the frequency reaches the upper or lower limit, it is automatically changed to the opposite limit as the case may be, if the receiving wave is too weak to receive, select the desired frequency using the manual tuning button.

Antenna

If the receiving wave is weak or generates noise, extend the antenna. If the wave is too strong, adjust the sensitivity by retracting if the antenna.

NOTICE

When transporting the machine or parking it in a garage, always fully retract the antenna to avoid the possibility of breakage.



11.10.3 PRECAUTIONS FOR USE

- To assure safe operation, adjust the volume level so that external noise is still audible.
- Ensure no water is splashed over the speaker case or car radio rauto tuning) to prevent unexpected malfunction.
- Never use solutions such as benzine or thinners to clean the dial or buttons. These should be wiped with a dry, soft cloth, iUse a cloth dipped in alcohol for very dirty surfaces.)
- At battery replacement, all the memory preset with the preset buttons will be cleared. Perform presetting again.

11,10.4 SPECIFICATIONS

Tuning system : PLL synthesizer system

Receiving frequency : 522 kHz to 1629 kHz (in 9 kHz steps)

Actual max. sensitivity: 30 dB Actual max. output : 8 W

Current consumption : 0.35 A (at 0.5 W output)

External dimensions : W 184 mm x H 58 mm x D 316 mm

 $(7.25 \text{ in } \times 2.21 \text{ in } \times 4.57 \text{ in})$

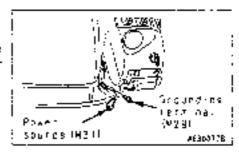
Weight : 0.45 kg (1 lb)

11.11 ELECTRIC POWER SOURCE

A power source (M31) and a grounding terminal (M29) are installed to the bottom of the fuse box. The capacity of this power source is 85 W (24 V \times 3.5 A).

NOTICE

Do not use this socket to drive a 12 V device. If it is used, the device may develop trouble.



11.12 FUSE

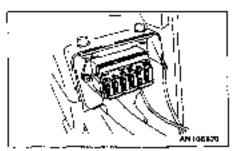
NOTICE

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

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

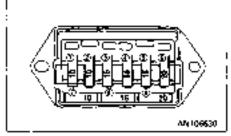
If the fuse becomes corroded, or white powder can be seen, or the fuse is loose in the fuse holder, replace the fuse.

Replace a fuse with another of the same capacity.



Fuse capacity and name of circuit

| No. | Fuse capacity | Name of circuit |
|---------------|------------------|--------------------------------------------|
| $^{\odot}$ | 10 A | Room lamp, radio (back-up) |
| (2) | 10 A | Controller, monitor panel, solenoid valve |
| 3 | 15 A | Wiper, radio, horn, window washer |
| 1 | 10 A | Head lamp |
| (3) | 15 A | Heater, head lamp, rear working lamp |
| (<u>6</u>) | 20 A | Spare fuse (Air conditioner), travel alarm |
| Đ | 10 A | Spare fuse |
| (§) | 15 A | Spare fuse |
| (<u>ij</u>) | 20 A | Spare fuse |

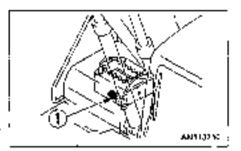


11.13 FUSIBLE LINK

If the starting motor will not rotate when the starting switch is turned ON, a possible cause is disconnection of wire-type fusible link. ①. Open the battery box cover on the right side of the machine body to inspect the fusible link and, if necessary, replace it.

REMARK

A fusible link refers to the large-sized tuse wiring installed in the high current flow portion of the circuit to protect electrical components and wiring from burning, similarly to an ordinary fuse.

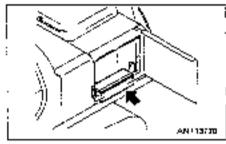


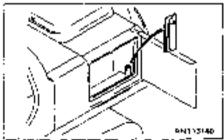
11.14 TOOL BOX

This is usedd for keeping the tools.

11.15 GREASE PUMP HOLDER

This is inside the left rear door of the machine. Fit the grease pump to the holder when it is not being used.





11.16 HANDLING ACCUMULATOR

- 🕰 WARNING --

On machines equipped with an accumulator, for a short time after the engine is stopped, if the work equipment control lever is moved to the LOWER position, the work equipment will move down under its own weight.

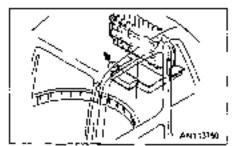
After stopping the engine, always place the safety lock lever in the LOCK position and lock the attachment control pedal with the lock pin.

The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions.

- Never make any hole in the accumulator or expose it to flame or fire.
- Do not weld any boss to the accumulator.
- When disposing of the accumulator, it is necessary to release the gas from the accumulator, so please contact your Komatsu distributor.

This machine is equipped with the accumulator in the control circuit. The accumulator is a device to store the pressure in the control circuit, and when it is installed, the control circuit can be operated for a short time even after the engine is stopped. Therefore, if the control lever is moved in the direction to lower the work equipment, it is possible for the work equipment to move under its own weight.

The accumulator is installed to the position shown in the diagram on the right.



11.16.1 METHOD OF RELEASING PRESSURE IN CONTROL CIRCUIT ON MACHINE EQUIPPED WITH ACCUMULATOR

- Place the work equipment on the ground. Close the crusher attachment jaws, etc.
- 2. Stop the engine.
- Move the safety lock lever to the free position. Move the work
 equipment control lever and the attachment control pedal to full
 stroke back and forth, right and left so as to release the pressure
 in the control circuit.
- 4. Move the safety lock lever to the lock position. Lock the control lever and attachment control pedal. The pressure, however, will not be completely released, so when the accumulator is removed in the control circuit, gradually loosen the screws. Never stand in the oil ejection direction.

12.1 CHECK BEFORE STARTING ENGINE

12.1.1 WALK-AROUND CHECK

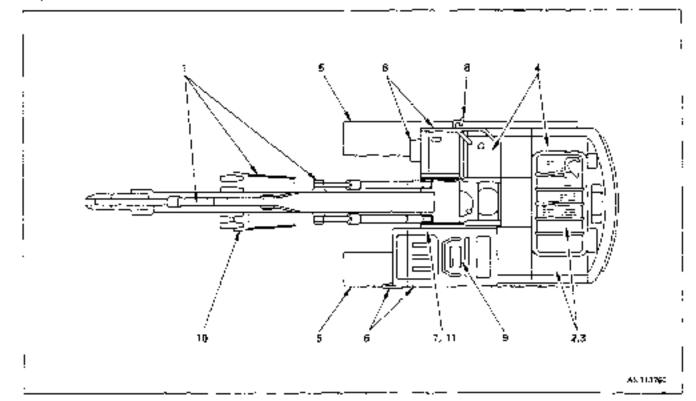
- 🕰 WARNING

Leakage of oil or fuel, or accumulation of flammable material around high temperature parts, such as the engine muffler or turbocharger, may cause fire.

Check carefully, and if any abnormality is found, repair it or contact your Komatsu distributor.

Before starting the engine, look around the machine and under the machine to check for loose nut or bolts, or leakage of oil, fuel, or coolant, and check the condition of the work equipment and hydraulic system. Check also for loose wiring, play, and collection of dust at places which reach high temperatures.

Always carry out the items in this section before starting the engine each day.



 Check for damage, wear, play in work equipment, cylinders, linkage, hoses

Check that there are no cracks, excessive wear, or play in the work equipment, cylinders, linkage, or hoses. If any abnormality is found, repair it.

2. Remove dirt and dust from around engine, battery, radiator Check if there is any dirt or dust accumulated around the engine or radiator. Check also if there is any flammable material (dead feeves, hwigs, grass, etc.) accumulated around the battery or high temperature engine parts, such as the engine muftler or turbocharger. Remove all such dirt or flammable material.

3. Check for leakage of water or oil around engine

Check that there is no leakage of oil from the engine or leakage of water from the cooling system. If any abnormality is found, repair it.

Check for oil leakage from hydraulic equipment, hydraulic tank, hoses, joints

Check that there is no oil leakage. If any abnormality is found, repair the place where the oil is leaking.

- Check the undercarriage (track, sprocket, idler, guard) for demage, wear, loose bolts, or leakage of oil from rollers
- 6 Check for demage to handrail, loose boits Repair any damage and tighten any loose.
- 7. Check for damage to gauges, monitor, loose bolts.

Check that there is no damage to the gauges and monitor in the operator's cab. If any abnormality is found, replace the parts. Clean off any diff on the surface.

8. Clean rear view mirror, check for damage

Check that there is no damage to the rear view mirror. It it is damaged, replace it with a new mirror. Clean the surface of the mirror and adjust the engle so that the view to the rear can be seen from the operator's seat.

9. Seat beit and mounting clamps

Check that there is no abnormality in the seat belt or mounting clamps, if there is any damage, replace with new parts.

10. Check bucket with hook for damage.

Check the hook, catcher and hook foot for damage. If damage is found, contact your Komatsu distributor for repair.

12.1.2 CHECK BEFORE STARTING

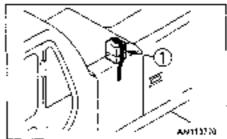
Always carry out the items in this section before starting the engine each day.

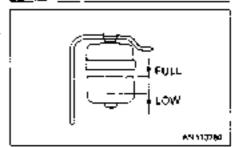
CHECK COOLANT LEVEL, ADD WATER

A WARNING-

Do not open the radiator cap unless necessary. When checking the coolant, always check the radiator reserve tank when the engine is cold.

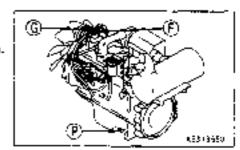
- Open the rear door on the left side of the machine and check that
 the cooling water level is between the FULL and LOW marks on
 redistor reserve tank ① (shown in the diagram on the right).
 If the water level is low, add water through the water filler of
 reserve tank ① to the FULL level.
- 2. After adding water, tighten the cap securely.
- If the reserve tank becomes empty, first inspect for water leaks and then fill the radiator and the reserve tank with water.





CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL

- 1. Open the engine hood.
- Remove dipatick @ and wipe the oil off with a cloth.
- 3. Insert dipstick @ fully in the oil filler pipe, then take it out again.



4. The oil level should be between the H and L marks on dipatick ⑤.

If the oil level is below the Limark, addlengine oil through oil titler (F).

NOTICE

For details of the oil to use, see "20. USE OF FUEL, COQLANT | AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".



- If the oil is above the H mark, drain the excess engine oil from drain plug ②, and check the oil level again.
- Withe oil level is correct, tighten the oil filter cap securely and close the engine hood.

REMARK

When checking the oil level after the engine has been operated, wait for at least 15 minutes after stopping the engine before checking.

If the machine is at an angle, make it horizontal before checking.

CHECK FUEL LEVEL, ADD FUEL

A WARNING -

When adding fuel, never let the fuel overflow. This may cause a fire. If spilling fuel, thoroughly clean up any spillage.

- Open fuel filler cap (f) of the fuel tank.
- When fuel filler cap (E) is opened, float gauge (E) will rise according to the fuel level.
 Check that the fuel tank is fulf. Check by looking into the tank and by using float gauge (E).
- If the tank is not full, add fuel through the fuel filler until float gauge @ rises to the maximum position.
- Fuel tank capacity: 340 £ (89.8 US gal. 74.8 UK gal)
- Position of tip of float gauge @ when tank is full: Approx.
 130 mm (5.1 in) from top surface of fuel tank

NOTICE

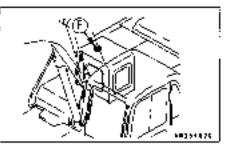
For details of the fuel to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

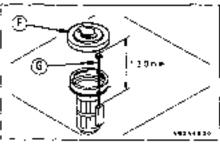
4. After adding fuel, push float gauge (§ straight down with fuel filler cap : §). Be careful not to get float gauge (§) caught in the tab (§) of fuel filler cap (§), and tighten fuel filler cap (§) securely.

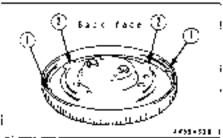
REMARK

If breather hole \mathcal{X} on the cap is clogged, the pressure in the tank will drop and fuel will not flow.

Clean the hale from time to time.







CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL

- A WARNING -

- When removing the oil filler cap, oil may spurt out, so turn the cap slowly to release the internal pressure before removing the cap.
- If oil has been added to above the H mark, stop the engine and wait for the hydraulic oil to cool down, then drain the excess oil from the drain plug ②.
- If the work equipment is not in the condition shown in the diagram on the right, start the engine, run the engine at low speed, retract the arm and bucket cylinders, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.
- Within 15 seconds after stopping the engine, move each control lever lifer work equipment and travell to the full stroke in all directions to release the internal pressure.
- Check sight gauge 3. The oil level is normal if between the H and L marks.



Do not add oil if the level is above the H line. This will demage the hydraulic equipment and cause the oil to spurt out.

4. If the level is below the L mark, add oil through oil filler ①.

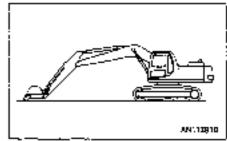
NOTICE

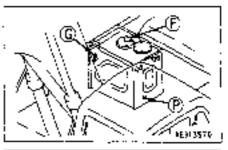
For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

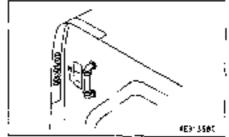
REMARK

The oil level will vary depending upon the oil temperature. Accordingly, use the following as a guide:

- Before operation: around Lifevel (Oil temperature 10 to 30°C (50 to 86°F)).
- Normal operation: around H level (Oi) temperature 50 to 80°C (122 to 176°F))

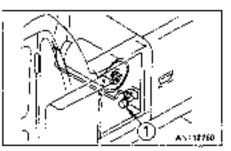


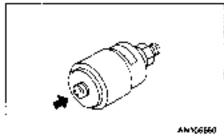




CHECK DUST INDICATOR

- If the red piston has appeared, clean or replace the element immediately.
 - For details of the method of cleaning the element, see "24.2.1 CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT".
- After checking, cleaning, and replacing, press the knob of dust indicator (i) to return the red piston to its original position.





CHECK ELECTRIC WIRINGS

- 🕰 WARNING -

- If fuses are frequently blown or if there are traces of short circuit on the electrical wiring, locate the cause and carry out repair.
- Accumulation of flammable material (dead leaves, twigs, grass, etc.) around the bettery may cause fire, so alweys check and remove such material.
- Keep the top surface of the battery clean and check the breather hole in the battery cap. If it is clogged with dart or dust, wash the battery cap to clear the breather hole.

Check for damage and wrong capacity of the fuse and any sign of disconnection or short circuit in the electric wiring. Check also for loose terminals and tighten any loose parts.

Check the wiring of the "battery", "starting motor" and "alternator" carefully, in particular.

When carrying out walk-around checks or checks before starting, always check if there is any accumulation of flammable material around the battery, and remove such flammable material.

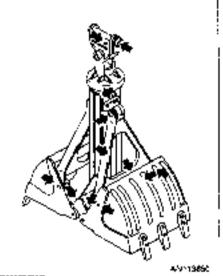
Please contact your Komatsu distributor for investigation and correction of the cause.

CHECK FUNCTION OF HORN

- 1. Turn the starting switch to the ON position.
- Confirm that the horn sounds without delay when the horn button is pressed. If the horn does not sound, ask your Kornatsu distributor for repair.

LUBRICATE CLAMSHELL BUCKET (12 POINTS)

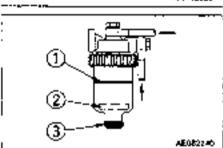
- Prepare a grease pump.
- Place the work equipment in a stable posture on the ground, then stop the engine.
- Using a grease pump, pump in grease through the grease fittings shown by arrows.
- 3. After greasing, wipe off any old grease that was pushed out.



CHECK FOR WATER AND SEDIMENT IN WATER SEPARATOR, DRAIN WATER

The water separator separates water mixed in the fuel. If float \mathfrak{D} is at or above red line \mathfrak{T} , drain the water according to the following procedure:

- Loosen drain plug (3) and drain the accumulated water until the float reaches the bottom.
- Tighten drain plug (3).
- If the air is sucked into fuel line when drawing and water, be sure
 to bleed air in the same manner as for the fuel filter. See "24.6
 EVERY 500 HOURS SERVICE".



12.1.3 ADJUSTING BEFORE STARTING OPERATION ADJUSTING OPERATOR'S SEAT

A Fore-and-aft adjustment of operator's seat

The seat and the left and right console boxes slide to the front and rear.

Move lever ① to the right, set the operator's seat at the desired position, then release the lever.

Fore-and-aft adjustment: 160 mm (6.3 in) (9 stages)

Adjust the position of the operator's seat to match the operation. For example, when carrying out deep digging operations, slide the seat to the front to improve the view below the front of the machine.

Adjusting ractining angle of seat

Pull lever \odot in the direction of the arrow, set the seat-back to the desired position, then release the lever.

ADJUSTMENT OF MIRRORS

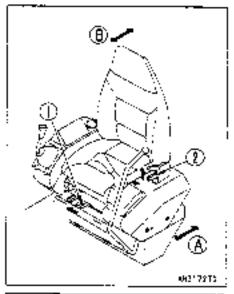
- Loosen nut (i) and bolt (2) of the mirror and adjust the mirror so that it gives the optimum view from the operator's seat.
- Adjust the mirror mount so that any person on the left and right side at the rear of the machine (or any object approx. 1 m (39.4 in) high and 30 cm (11.8 in) in diameter) is clearly visible.
- Install so that the mounting position of the mirror is the dimensions shown in the chart. The field of visibility is given in the chart below for reference.

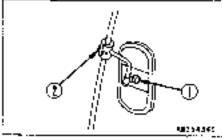
| | Mounting position | Field of visibility | |
|--------------------------------|-------------------|---------------------|--------------------|
| | × | Y (right) | Z (lefti |
| PC200,200LC-6 PC220,220LC-6 | 50 mm (2.0 in) | 1500 mm (59 in) | 1830 mm (72 in) |

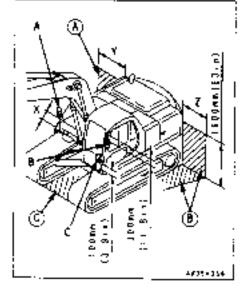
Mirror A: Hatched area (E) lopposite side from (R) to be visible

Mirror B: Matched area @ to be visible

Mirror C: Hatched area ≲ (option) to be visible







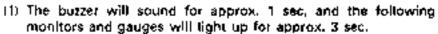
12.1.4 OPERATIONS AND CHECKS BEFORE STARTING ENGINE

-- 🕰 WARNING

If the control lever is touched by accident, the work equipment or the machine may move suddenly. When leaving the operator's compartment, always set the safety lock lever securely to the LOCK position.

- Check that safety lock lever ① is at the LOCK position.
- 2. Check the position of each lever.





- Charge level monitor (3)
- Engine oil pressure monitor (4)
- Swing lock monitor ®
- Engine water temperature gauge ®

position, then carry out the following checks.

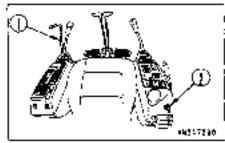
Fuel gauge (?)

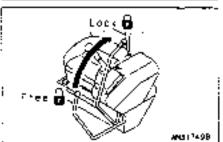
If the monitors or gauges do not light up or the buzzer does not sound, there is probably a broken bulb or disconnection in the monitor wiring, so contact your Komatsu distributor for repairs.

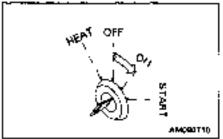
After approx. 3 sec, the following gauges will remain on and the other monitors will go out.

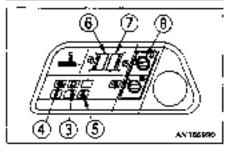
- Engine water temperature gauge ⑤
- Fuel gauge ②

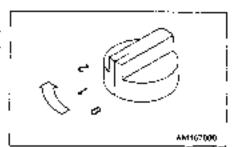
(2) Turn lamp switch (§) to turn on the head lamps.
If the lamps do not light up, there is probably a broken bufb or disconnection in the wiring, so contact your Komatsu distributor | for repairs.









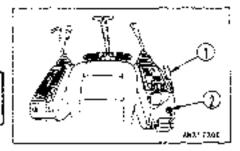


12.2 STARTING ENGINE

12.2.1 NORMAL STARTING

---- 🛕 WARNING -

Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.

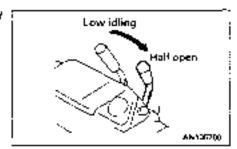


NOTICE

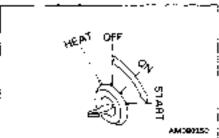
Do not keep the starting motor rotating continuously for more than 20 seconds.

If the engine will not start, wait for at least 2 minutes before trying to start the engine again.

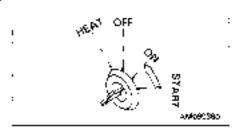
 Pull fuel control lever ① to the center position between LOW IDLING and HIGH IDLING.



Turn the key in starting switch ② to the START position. The engine will start.



When the engine starts, release the key in starting switch ②. The
key will return automatically to the ON position.



12.2.2 STARTING IN COLD WEATHER

A WARNING -

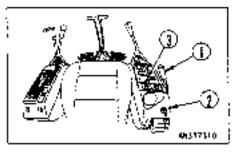
Check that there are no persons or obstacles in the surrounding area, then sound the horn and start the engine.

NOTICE

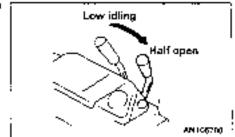
Do not keep the starting motor rotating continuously for more than 20 seconds.

If the engine fails to start, repeat steps from 2 and after waiting for about 2 minutes.

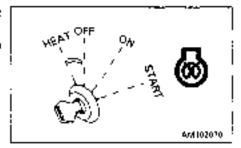
When starting in low temperatures, do as follows.



 Pull fuel control lever ① to the center position between LOW IDLING and HIGH IDLING.



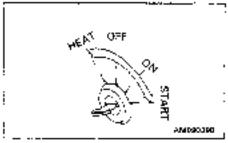
 Hold the key in starting switch ② at the HEAT position, and check that preheating monitor ③ fights up.
 After approx. 30 seconds, preheating monitor ③ goes out to inform that the preheating is completed.

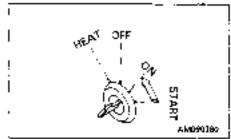


REMARK

The monitor and gauge also light up when the key is at the HEAT position, but this does not indicate any abnormality.

- When preheating monitor (2) goes out, turn the key in starting switch (2) to the START position to start the engine.
- When the engine starts, release the key in starting switch ②. The key will return automatically to the ON position.





12.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE

A WARNING -

- Emergency stop
 - If there is abnormal actuation or trouble, move the fuel control lever to the engine STOP position and stop the engine. Then turn the key in the starting switch to the OFF position.
- · If the work equipment is operated without warming the mechine up sufficiently, the response of the work equipment to the movement of the control lever will be slow, and the work aguipment may not move as the operator desires, so always carry out the warming-up operation. Particularly in cold areas, be sure to carry out the warming-up operation. fully.

NOTICE

The most suitable temperature for the hydraulic oil is 50 - 80°C. but in order to extend the life of the machine, the temperature must be raised to at least 20°C before starting work.

NOTICE

Do not suddenly operate the levers when the hydraulic oil temperature is below 20°C.

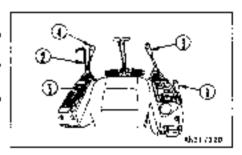
NOTICE

Do not suddenly accelerate the engine before the warming-up operation is completed.

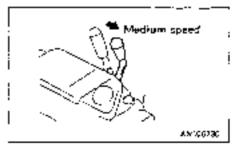
Do not run the engine at low idling or high idling continuously for more than 20 minutes.

If it is necessary to run the engine at idling, apply a load from time to time or run the angine at a mid-range speed.

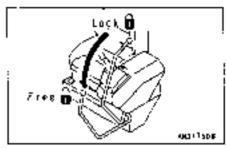
After starting the engine, do not immediately start operations First, carry out the following operations and checks.



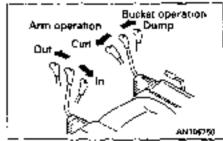
1. Puti fuel control lever 2, to the center position between LOW IDLING and HIGH IDLING and run the engine at medium speed. for about 5 minutes with no load.



Set lock lever ② to the FREE position, and raise the bucket from the ground.

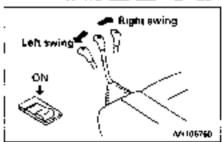


Operate bucket control lever (3) and arm control lever (3) slowly
to move the bucket cylinder and arm cylinder to the end of the
stroke.



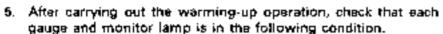
Carry out bucket and arm operation for 5 minutes at full stroke, alternating between bucket operation and arm operation at 30 second intervals.

If the swing lock switch (\S) is set to the ON factuated) position and swing control lever (\S) is operated at full stroke, oil temperature-rise can be increased earlier.

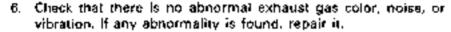


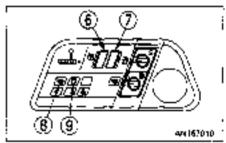
NOTICE

When the work equipment is retracted, take care that it does not interfere with the machine body or ground.

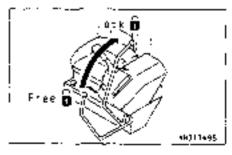


- Engine water temperature gauge (§). Inside green range.
- Fuel gauge ①. Inside green range.
- Engine oil pressure monitor ®. OUT
- Charge level monitor (§), OUT.





 Set lock lever ② to the LOCK position and check that it is impossible to operate the swing and work equipment with the left and right work equipment control levers.

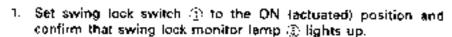


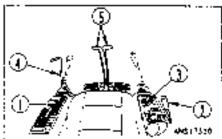
12.4 MOVING MACHINE OFF

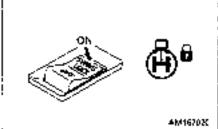
12.4.1 MOVING MACHINE FORWARD

A WARNING -

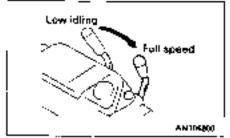
- Before operating the travel levers, check the direction of the track frame. If the sprocket is at the front, the operation of the travel levers is reversed.
- When moving off, check that the area around the machine is safe, and sound the horn before moving.
- Clear all personnel from the machine and the area.
- Clear all obstacles from the path of the machine.



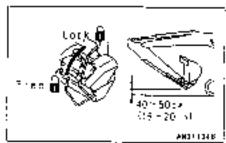




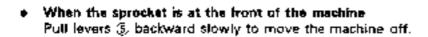
Pull fuel control lever ② towards the high idling position to increase the engine speed.

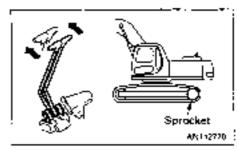


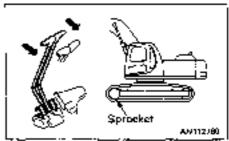
 Set lock lever ② in the FREE position, fold the work equipment, and raise it 40 - 50 cm (16 to 20 in) from the ground.



- 4. Operate right and left travel levers 3, as follows.
- When the sprocket is at the rear of the machine.
 Push levers (3) forward slowly to move the machine off.



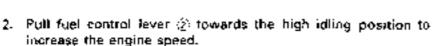


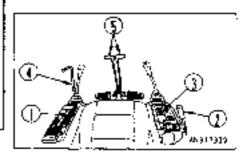


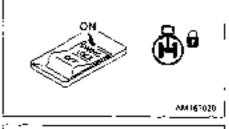
12.4.2 MOVING MACHINE BACKWARD

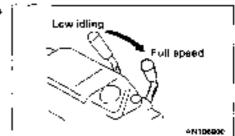
- A WARNING -

- Before operating the travel levers, check the direction of the track frame. If the sprocket is at the front, the operation of the travel levers is reversed.
- When moving off, check that the area around the mechine is safe, and sound the hom before moving.
- Clear all personnel from the machine and the area.
- Clear all obstacles from the path of the machine.
- Use extreme care when reversing the machine. Note there is an blind spot behind the machine.
- Set swing lock switch to the ON (actuated) position and confirm that swing lock monitor lamp lights up.

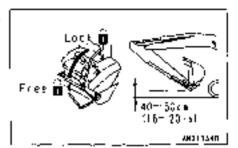




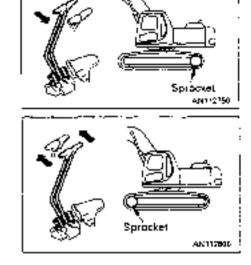




 Set lock lever 3 in the FREE position, fold the work equipment, and raise it 40 - 50 cm (16 to 20 in) from the ground.



- Operate right and left travel levers (b) as follows.
- When the sprocket is at the rear of the machine
 Pull levers (3) backward slowly to move the machine off.
- When the sprocket is at the front of the machine
 Push levers (5) forward slowly to move the machine off.



12.5 STEERING MACHINE

12.5.1 STEERING (CHANGING DIRECTION)

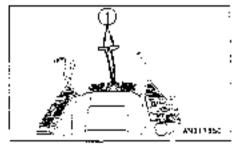
A WARNING -

Before operating the travel levers, check the position of the sprocket. If the sprocket is at the front, the operation of the travel levers is reversed.

Use the travel levers to change direction.

Avoid sudden changes of direction as far as possible. In particular, when carrying out counter-rotation (spin turn), stop the machine first before turning.

Operate two travel levers ① as follows.



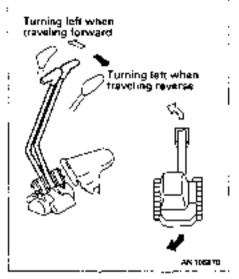
Changing direction of machine when stopped

When turning to the left:

Push the right travel lever forward to travel left when traveling is forward; and pull it back to turn left when traveling in reverse.

REMARK

When turning to the right, operate the left travel lever in the same way.



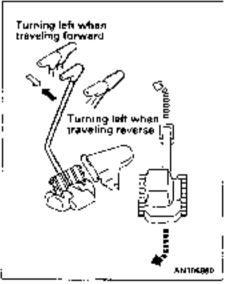
Steering when traveling (left and right travel levers both operated in same direction)

When turning to the left:

If the left travel lever is returned to the neutral position, the machine will turn to the left.

REMARK

When turning to the right, operate the right travel lever in the same way.

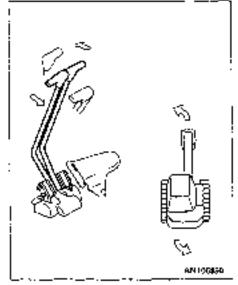


When making counter-rotation turn (spin turn)

When turning left using counter-rotation, pull the left travel lever back and push the right travel lever forward.

REMARK

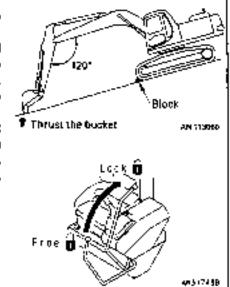
When turning right using counter-rotation, pull the right travel lever back and push the left travel lever forward.



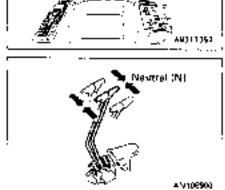
12.6 STOPPING MACHINE

A WARNING -

- Avoid stopping suddenly. Give yourself ample room when stopping.
- When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneeth the track shoes.
 As an additional safety measure, thrust the bucket into the ground.
- If the control lever is touched by accident, the work equipment or the machine may move suddenly, and this may lead to a serious accident. Before leaving the operator's compartment, always set the safety lock lever securely to the LOCK position.



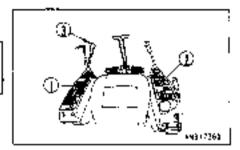
 Put the left and right travel levers (3) in the neutral position, then stop the machine.



12.7 SWINGING

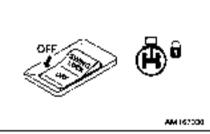
- 🕰 WARNING -

When operating the swing, check that the area around the machine is safe.



NOTICE

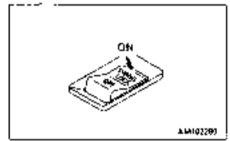
Check that swing lock monitor ② goes out at the same time.



Operate left work equipment control lever (2) to swing the upper structure.



 When not operating the swing, turn swing lock switch () ON (ACTUATED).



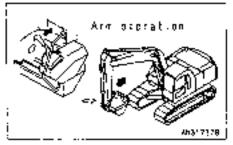
12.8 OPERATION OF WORK EQUIPMENT

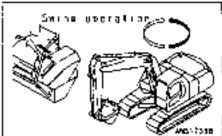
The work equipment is operated by the left and right work equipment control levers. The left work equipment control lever operates the arm and swing, and the right work equipment control lever operates the boom and bucket.

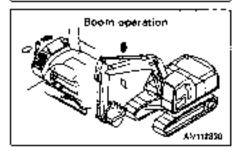
The movements of the lever and work equipment are as shown in the diagrams on the right. When the levers are released, they automatically return to the neutral position and the work equipment is held in place.

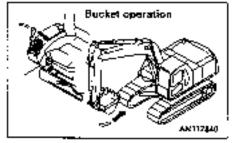
REMARK

If the levers are operated within 15 seconds after stopping the engine, it is possible to lower the work equipment to the ground. In addition, the levers can also be operated to release any remaining pressure inside the hydraulic cylinder circuit and to lower the boom after loading the machine on a trailer.









12.9 PROHIBITIONS FOR OPERATION

- 🕰 WARNING -

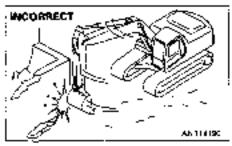
- If it is necessary to operate the work equipment control lever when the machine is traveling, stop the machine before operating the work equipment control lever.
- Never operate the machine on a rock bed (hard or soft rock).

Prohibited operations using swing force

Do not use the swing force to compact soil or break earth mounds or walls.

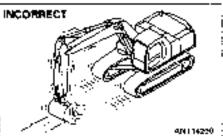
When swinging, do not dig the bucket teeth into the soil.

These operations will damage the work equipment.



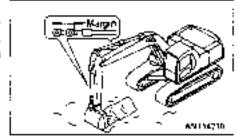
Prohibited operations using travel force

Do not leave the bucket dug into the ground and use the travel force to excavate. This will bring excessive force to bear on the rear of the machine.



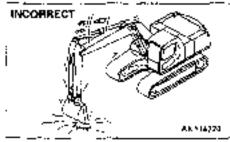
Precautions when operating hydraulic cylinders to end of stroke

If the cylinder is operated to the end of its stroke during operations, force will be brought to bear on the stopper inside the cylinder, and this will reduce the life of the machine. To prevent this, always leave a small safety margin when operating the cylinders.



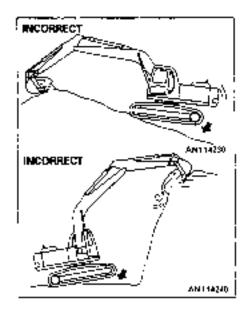
Prohibited operations using dropping force of bucket

Do not use the dropping force of the bucket as a pickaxe, breaker, or pile driver. This will bring excessive force to bear on the rear of the machine, and will not only damage the machine, but is also a dangerous.



Prohibited operations using dropping force of machine

Do not use the dropping force of the machine for digging.



Digging tocky ground

It is better to excavate hard rocky ground after breaking it up by some other means. This will not only reduce damage to the machine but make for better economy.

12.10 PRECAUTIONS FOR OPERATION

PRECAUTIONS WHEN TRAVELING

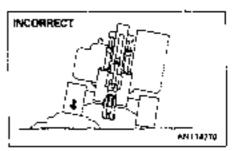
When traveling over obstacles such as boulders or tree stumps, if the machine lin particular, the undercarriagel is subjected to a large shock, so reduce the travel speed and travel over the obstacle at the center of the tracks. As far as possible, remove such obstacles or avoid traveling over them.

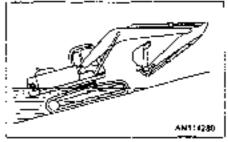
PERMISSIBLE WATER DEPTH NOTICE

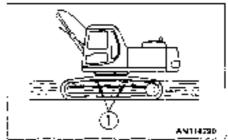
When driving the machine out of water, if the angle of the machine exceeds 15°, the rear of the upper structure will go under water, and water will be thrown up by the radiator fan. This may cause the fan to break.

Be extremely careful when driving the machine out of water.

Do not immerse the machine in water by more than the permissible depth funder center of carrier roller ①). In addition, for parts that have been immersed in water for a long time, pump in grease until the old grease comes out from the bearings. (Around the bucket pins)



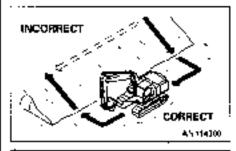


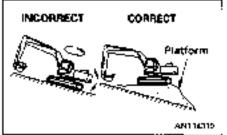


12.11 PRÉCAUTIONS WHEN TRAVELING UP OR DOWN HILLS

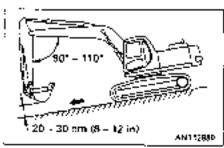
AWARNING -

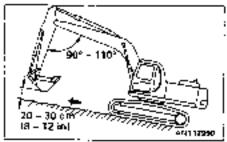
- When traveling, raise the bucket approx. 20 -- 30 cm (8 -- 12 in) from the ground.
 Do not travel downhill in reverse.
- When traveling over ridges or other obstacles, keep the work equipment close to the ground and travel slowly.
- It is dangerous to turn on slopes or to travel across slopes.
 Always go down to a flat place to perform these operations.
 It may be longer, but it will ensure safety.
- If the machine starts to slide or loses stability, lower the bucket immediately and brake the machine.
- Turning or operating the work equipment when working on slopes may cause the muchine to lose its balance and turn over, so avoid such operations. It is particularly dangerous to swing downhill when the bucket is loaded. If such operations have to be cerried out, pile soil to make platform on the slope so that the machine can be kept horizontal when operating.
- Do not travel on slopes of over 30° as there is danger that the machine may overturn.





- 1) When traveling down steep hills, use the travel lever and fuel control lever to keep the travel speed low.
 When traveling down slopes of more than 15°, set the work equipment in the posture shown in the figure on the right, and lower the angine speed.
- When traveling up a steep hill of more than 15°, set the work equipment in the posture shown in the diagram on the right.





Braking when traveling downhill

To brake the machine during downhill runs, put the travel lever in the neutral position. This will cause the brake to be automatically applied.

lf shaes slip

When traveling uphill, if the shoes slip or it is impossible to travel uphill using the force of the track only, it is possible to use the pulling force of the arm to help the machine travel uphill.

If engine stops

If the engine stops when traveling uphill, move the travel levers to the neutral position, lower the bucket to the ground, stop the machine, then start the engine again.

Precautions on slopes

- If the engine stops when the machine is on a slope, never use the left work equipment control lever to carry out swing operations. The upper structure will swing under its own weight.
- Do not open or close the door on the cab if the machine is on a slope. This may cause a sudden change in the operating force. Always keep the door locked.

12.12 HOW TO ESCAPE FROM MUD

Always operate carefully to avoid getting stuck in mud. If the machine does get stuck in mud, use the following procedures to get the machine out.

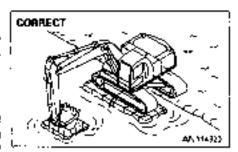
12.12.1 WHEN ONE SIDE IS STUCK

When only one side is stuck in mud, use the bucket to raise the I track, then lay boards or logs and drive the machine out. If necessary, put a board under the bucket also.

NOTICE

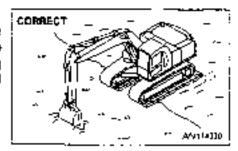
When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. (Never push with the teeth). The angle between the boom and arm should be 90° to 110°.

The same applies when using the inverting bucket.



12.12.2 WHEN BOTH SIDES ARE STUCK

When the tracks on both sides are stuck in mud and the machine will not move, lay boards as explained above, and dig the bucket into the ground in front. Then pull in the arm as in normal digging operations and put the travel levers in the FORWARD position to pull the machine out.



12.13 WORK POSSIBLE USING HYDRAULIC EXCAVATOR

In addition to the following, it is possible to further increase the range of applications by using various attachments.

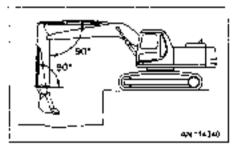
12.13.1 BACKHOE WORK

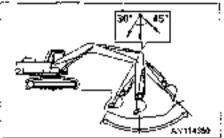
When condition of the machine is as shown in the diagram at right, each cylinders maximum pushing excavation force is obtained when the bucket cylinder and link, arm cylinder and arm are at 90°.

When excavating, use this angle effectively to optimize your work efficiency.

The range for excavating with the arm is from a 45° angle away from the machine to a 30° toward the machine.

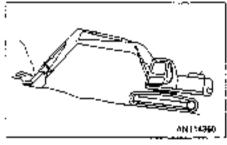
There may be some differences depending on the excevation depth, but try to use within the above range rather than going all the way to the extreme end of the cylinder stroke.





T2.13.2 SHOVEL WORK

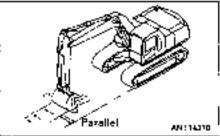
A shovel is suitable for excavaring at a position higher than the machine. Shovel work is performed by attaching the bucket in the reverse direction.



12,13.3 DITCHING WORK

Ditching work can be performed efficiently by attaching a bucket to match the width of the ditch and then setting the tracks parallel to the line of the ditch to be excavaled.

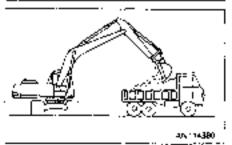
To excavate a wide ditch, first dig out both sides and then finally remove the center portion.



12.13.4 LOADING WORK

In places where the swing angle is small, work efficiency can be enhanced by locating the dump truck in a place easily visible to the operator.

Loading is easier and capacity greater if you begin from the front of the dump truck body than if loading is done from the side.



12.14 REPLACEMENT AND INVERSION OF BUCKET

A WARNING -

- When knocking the pin in with a hammer, metal particles
 may fly and cause serious injury, particularly if they get into
 your eyes. When carrying out this operation, always wear
 goggles, helmet, gloves, and other protective equipment.
- When the bucket is removed, place it in a stable condition.

Stop the machine on a firm, flat surface. When performing joint work, make clear signals to each other and work carefully for safety's sake.

12.14.1 REPLACEMENT

1. Place the bucket in contact with a flat surface.

REMARK

When removing the pins, place the bucket so that it is in light contact with the ground.

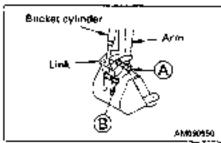
If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

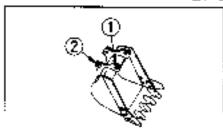
 Remove the stopper bolts and muts, then remove pins (a) and (b), and remove the bucket.

NOTICE

After removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

Align the arm with holes ① and the link with holes ②, then coat with grease and install pins ② and ③.

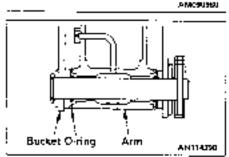




REMARK

When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the arm end as shown in the diagram. When knocking the pin, move the O-ring gown to the regular groove.

 Install the stopper bolts and nuts for each pin, then grease the pin.



12.14.2 INVERSION

Place the bucket in contact with a flat surface.

REMARK

When removing the pins, place the bucket so that it is in light contact with the ground.

If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

 Remove the stopper bolfs and nuts, then remove pins (A) and (B), and remove the bucket.

NOTICE

After removing the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

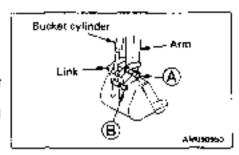
- Install the bucket inversely.
 After the bucket is inversed, correct the inclination and direction of the retaining pin holes ① and ② and stabilize the bucket securely.
- Align the arm with holes ① and the link with holes ②, then cost with grease and install pins ② and ③.

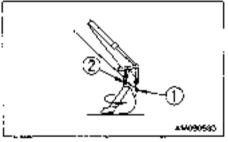
REMARK

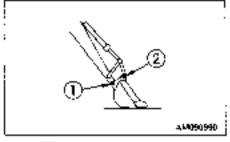
Install the O-rings into retaining hole ① of the arm and bucket.

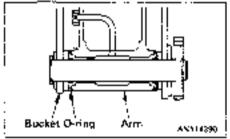
When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the arm and as shown in the diagram. When knocking the pin, move the O-ring down to the regular groove.

Install the stopper bolts and nuts for each pin, then grease the pin.





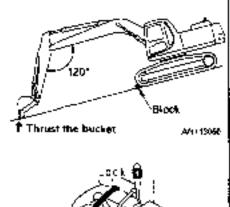




12.15 PARKING MACHINE

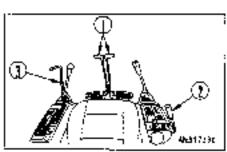
A WARNING -

- Avoid stopping suddenly. Give yourself ample room when stopping.
- When stopping the machine, select flat hard ground and avoid dangerous places. If it is unavoidably necessary to park the machine on a slope, insert blocks underneath the track shoes.
 As an additional safety measure, thrust the bucket into the ground.
- If the control lever is touched by accident, the work equipment or the machine may move suddenly, and this may lead to a serious accident. Before leaving the operator's compartment, always set the safety lock lever securely to LOCK position.

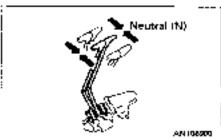


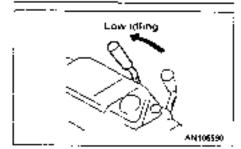
Free (1) 1943 17433

Put left and right travel levers (i) in the neutral position.
 The machine stops.

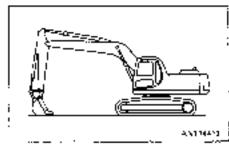


2. Lower the angine speed to low idling by fuel control lever ②.

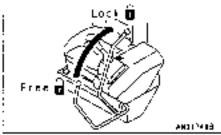




Lower the bucket horizontally until the bottom touches the ground.

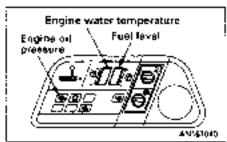


4. Set safety lock lever 3: in the LOCK position.



12.16 CHECK AFTER FINISHING WORK

Check the engine water temperature, engine oil pressure and fuel level on the monitor.



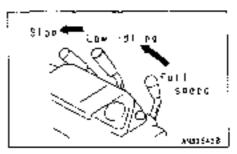
12.17 STOPPING ENGINE

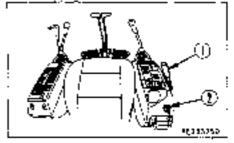
NOTICE

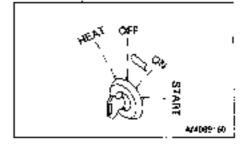
If the engine is abruptly stopped before it has cooled down, engine life may be greatly shortened. Consequently, do not abruptly stop the engine apart from an emergency.

In particular, if the engine has overheated, do not abruptly stop it but run it at medium speed to allow it to cool gradually, then stop it.

- Run the engine at low idling speed for about 5 minutes to allow it go gradually cool down.
- Push fuel control lever ① to the STOP position to stop the engine.
- 3. Turn the key in starting switch (2) to the OFF position.
- Remove the key from starting switch ②.







12.18 CHECK AFTER STOPPING ENGINE

- Walk around the machine and check the work equipment, paintwork, and undercarriage, and check also for leakage of oil or water. If any abnormalities are found, repair them.
- 2. Fill the fuel tank.
- Check the engine compartment for paper and debris. Clean out any paper and debris to avoid a fire hazard.
- 4. Remove any mud stuck to the undercarriage.

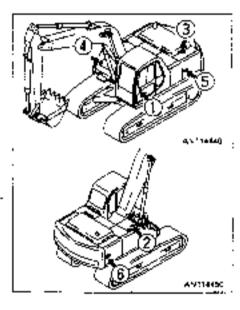
12.19 LOCKING

Always lock the following places.

- Door of operator's cab
 Always remember to close the window.
- § Fuel tank filler port
- © Engine hood
- Battery box cover
- 3. Left side door of the machine
- 3: Right side door of the machine

REMARK

Use the starting switch key to open and close all these places.



When transporting the machine, observe all related laws and regulations, and be careful to assure safety.

13.1 LOADING, UNLOADING WORK

A WARNING -

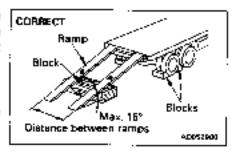
- Loading or unloading the machine can be a dangerous operation, so be particularly careful.
 When loading or unloading the machine, run the engine at low idling and travel at low speed.
- Make sure the ramp has sufficient width, length and thickness to enable the machine to be safely loaded and unloaded.
 If the ramp sags appreciably, reinforce it with blocks, etc.
- When loading and unloading the machine, park the trailer on a tlat firm roadbed. Keep a fairly long distance between the road shoulder and the machine.
- Remove the mud from the undercarriage to prevent the machine from slipping to the side on slopes.
 Be sure the ramp surface is clean and free of grease, oil, ice and loose materials.
- Never change the direction of travel when on the ramps, if it is necessary to change direction, drive off the ramps and correct the direction, then drive on to the ramps again.
- When turning the machine on the trailer, the machine's footing is unstable, so carry out the operation slowly.
- Always check that the door on the cab is locked, regardless
 of whether it is open or closed.
 Do not open or close the door on ramps or on a platform.
 This may cause a sudden change in the operating force.

When loading or unloading, always use ramps or a platform and carry out the operations as follows.

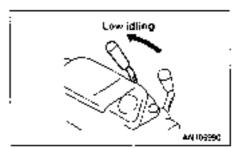
Properly apply the brakes on the trailer and insert blocks beneath
the tires to ensure that it does not move. Then fix the ramps in
line with the centers of the trailer and the machine. Be sure that
the two sides are at the same level as one another.

Make the angle of the ramps a maximum of 15'.

Set the distance between the ramps to match the center of the tracks.

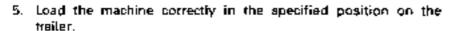


2. Lower the engine speed using the fuel control lever.



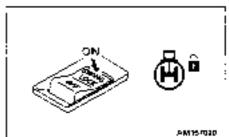
- 3. Turn the swing lock switch ON to apply the swing lock.
- Set in the direction of the ramps, lower the work equipment as far as possible without letting it hit the trailer, then travel slowly to load or unload the machine.

When on the ramps, do not operate any lever other than the travel lever.



REMARK

When the work equipment is installed, load the machine from the front; when the work equipment is not installed, load the machine from the rear.



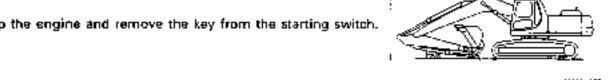
13.2 PRECAUTIONS FOR LOADING

- 🕰 WARNING –

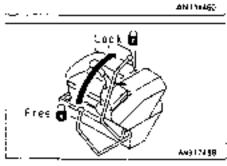
When loading the machine, park the trailer on a flat firm roadbed. Keep a fairly long distance between the road shoulder. and the machine.

After loading to the specified position, secure the machine as follows.

- 1. Fully extend the bucket cylinder and arm cylinder, then slowly lower the boom.
- 2. Stop the engine and remove the key from the starting switch.



3. Lock all the control levers securely with the safety lock lever.



4. When transporting the machine, place rectangular timber underneath the front and rear track shoes to prevent the machine from moving about. Also, hold it down with chains or rope. Beparticularly careful to ensure that the machine does not slip sideways.

NOTICE

When transporting the machine, place rectangular timber under one and of the bucket cylinder to prevent it touching the ground, thereby saving it from possible damage.



13.3 PRECAUTIONS FOR TRANSPORTATION

A WARNING -

- Determine the route for transporting the machine by taking into account the width, height and weight of the machine.
- Always check that the door on the cab is closed and locked before transporting the machine.

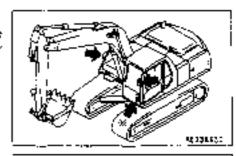
NOTICE

Always retract the car radio antenna.

Obey all state and local laws governing the weight, width and length of a load. Observe all regulations governing wide loads.

REMOVAL AND INSTALLATION OF MIRRORS

Mirror are installed to the positions shown at right (The one marked with * is optional). When removing and installing them for replacement or transportation, observe the following procedures.

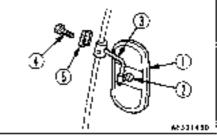


Removal

- Loosen nut ② of mirror ①, and remove mirror ③ from support
 ②.
- Loosen boit (a), and remove support (b) and clamp (c) from the handrail.

Installation

- Install support (2) and clamp (5) to the handrail, then secure it with bolt (4).
- 2. Install missor ① to support ③, then tighten nut ②.



13.4 METHOD OF LIFTING MACHINE

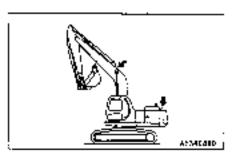
– 🕰 WARNING —

- Never raise the machine with any worker on it.
- Always make sure that the wire rope used for lifting the machine is of ample strength for the weight of the machine.
- Never try to lift the machine in any posture other than the posture given in the procedure below.
 There is danger that the machine may lose its balance.
- The machine must never be raised with the undercarriage turned.
- Never lift the machine with the undercarriage at an angle.
 Swing the work equipment to the sprocket end and set the upper structure and undercarriage parallel before starting lifting operations.
- When lifting the machine, be careful of the position of the center of gravity and always maintain the balance.
- It is dangerous to go under the machine when it is raised.
 Never go under the machine in such cases.

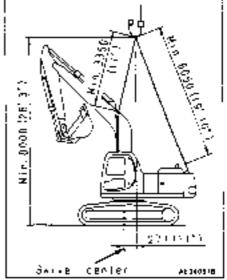
When lifting the machine, carry out the operations on level ground as follows.

13.4.1 MACHINES WITH UFTING HOOK

- Start the engine and set the work equipment as shown at right (Raise the boom to the stroke end and retract the arm and bucket to the stroke end). Direct the upper structure straight forward (Idler side).
- Set the safety lock lever to the LOCK position.
- Stop the engine and confirm the safety around the operator's seat, then get off the machine. Close the doors and front glass of the cab. Close both doors and engine hood securely.
- Install shackles to the lifting hooks on the boom and counterweight, then install wire ropes to them.

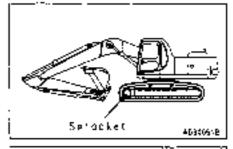


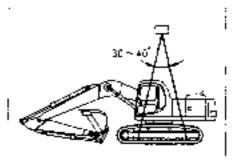
- Adjust the wire ropes so that hanging position P will be just above the center of gravity of the machine (277 mm (11 in) after the swivet center) as shown at right.
- Confirm that the position of the machine will not be changed because of leakage from the hydraulic circuit on the boom cylinder head side when the machine is suspended.
- After the machine leaves the ground, stop it temporarily and check its balance carefully and wait until it is stabilized. Then, raise slowly.



13.4.2 MACHINES WITHOUT LIFTING HOOKS

- Start the engine and swing the upper structure to bring the work
 equipment to the rear of the machine.
- Fully extract the bucket cylinder and arm cylinder, then lower the work equipment to the ground with the boom cylinder as shown at right.
- Stop the engine and confirm the safety around the operator's seat, then get off the machine. Close the doors and front glass of the cab. Close both doors and engine hood securely.
- Pass wire ropes through the spaces between the first and second track rollers from the front and between first and second track rollers from the rear.
 If the full roller guard is installed to the track rollers, however,
- Set the hanging angle of the wire ropes to 30 40°, and hang up
- After the machine leaves the ground, stop it temporarily and check its balance carefully and wait until it is stabilized. Then, raise slowly.





АПЗОЗЕЗО

NOTICE

slawly.

Apply this lifting method to machines of standard specifications.

The lifting method varies with the mounted attachments and options. For each case, ask your Komatsu distributor.

For the weight, see "25. SPECIFICATIONS".

pass the wire ropes under the tracks.

14. COLD WEATHER OPERATION

14.1 PRECAUTIONS FOR LOW TEMPERATURE

if the temperature becomes low, it becomes difficult to start the engine, and the coolant may freeze, so do as follows.

14.1.1 FUEL AND LUBRICANTS

Change to fuel and oil with low viscosity for all components. For details of the specified viscosity, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

14.1.2 COOLANT



Keep antifraeze fluid away from an open flame. Never smoke when using antifreeze

NOTICE

- Never use methanol, ethanol or propanol based antifreeze.
- Absolutely avoid using any water leak preventing agent irrespective of whether it is used independently or mixed with an antifreeze.
- Do not mix one antifreeze with a different brand.

For details of the antifreeze mixture when changing the coolant, see "24.2 WHEN REQUIRED".

Use a Permanent Antifreeze (ethylene glycol mixed with corrosion inhibitor, antifoam agent, etc.) meeting the standard requirements as shown below. With permanent antifreeze, no change of coolant is required for a year. If it is doubtful that an available antifreeze meets the standard requirements, ask the supplier of that antifreeze for information.

Standard requirements for permanent antifreeze

- ◆ FEDERAL STANDARD 0-A-548D

REMARK

Where no permanent antifreeze is available, an ethylene glycol antifreeze without corrosion inhibitor may be used only for the cold season. In this case, clean the cooling system twice a year (in spring and autumn). When refilling the cooling system, add antifreeze in autumn, but do not add any in spring.

14.1.3 BATTERY



A WARNING-

- To avoid gas explosions, 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 large amounts of water, and consult a doctor.

When the ambient temperature drops, the capacity of the battery. will also drop. If the battery charge ratio is low, the battery electrolyte may freeze. Maintain the battery charge as close as possible to 100%, and insulate it 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.

| Temp. of fluid Rate of charge | ZD*C | 6 *C | -10°C | -20°C |
|----------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 100% 90% 80% 75% | 1.28 1.26 1.24 1.23 | 1.29 1.27 1.25 1.24 | 1.30 1.28 1.26 1.25 | 7.31 1.29 1.27 1.26 |

14.2 PRECAUTIONS AFTER COMPLETION OF WORK

To prevent mud, water, or the undercarriage from freezing and making it impossible for the machine to move on the following morning, always observe the following precautions.

- Mud and water on the machine body should be completely removed. This is to prevent damage to the seel caused by mud or dirt getting inside the seal with frozen drops of water.
- Park the machine on hard, dry ground. If this is impossible, park
 the machine on wooden boards. The boards help protect the
 tracks from being freezed in soil and the machine can start next
 morning.
- Open the drain valve and drain any water collected in the fuel system to prevent it from freezing.
- After operation in water or mud, remove water from undercarraige as described below, to extend undercarriage service life.

A WARNING

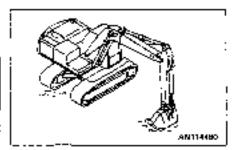
Performing idle-running of tracks is potentially dangerous so stay well away from tracks at this time.

- Swing by 90° with engine at low idle and bring work equipment beside track.
- Slightly float track by slowly pushing the ground and cause track to idle-run. Perform this for the opposite track, too.
- As the bettery capacity drops markedly in low temperatures, cover the bettery or remove it from the machine, keep it in a warm place, and install it again the next morning.
- If electrolyte level is found low, add distilled water in the morning before beginning work. Do not add the water after the day's work so as to prevent fluid in the battery from freezing in the night.

14.3 AFTER COLD WEATHER

When season changes and the weather becomes warmer, do as follows.

- Replace the fuel and oil for all parts with oil of the viscosity specified.
 - For details, see "20, USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".
- If for any reason permanent antifreeze cannot be used, and an ethyl glycol base entifreeze (winter, one season typel is used instead, or if no antifreeze is used, drain the cooling system completely, then clean out the inside of the cooling system thoroughly, and fill with fresh water.



15. LONG-TERM STORAGE

15.1 BEFORE STORAGE

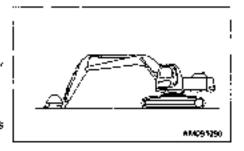
NOTICE

To protect the cylinder rod when the machine is not being used, set the work equipment in the posture shown in the diagram.

(This prevents rusting of the cylinder rod)

When putting the machine in storage for a long time, do as follows.

- Wash and clean each part, then store the machine indoors. If you
 must keep the machine outdoors, place it on a level place where
 it will not be subjects to floods and other natural disasters, and
 keep it covered.
- Completely fill the fuel tank, lubricate and change the oil before storage.
- Apply a thin coat of grease to metal surface of the hydraulic piston rods.
- Disconnect the negative terminals of the battery and cover it, or remove it from the machine and store it separately.
- If the ambient temperature is expected to drop below 0°C, always add antifreeze to the cooling water.
- Lock each control lever and pedal with the lock lever and pedal lock.
- Set the stop valve to the "tock" position on machines ready for attachments, install the blind plugs to the elbows.
- Set the selector valve to the "When not use" position on machines ready for attachments.



15.2 DURING STORAGE

------ 🕰 WARNING ---

If it is unavoidably necessary to carry out the rustpreventive operation while the machine is indoors, open the doors and windows to improve ventilation and prevent gas poisoning.

Operate the engine and move the machine for a short distance once a month so that a new film of oil will be coated over movable parts and component surfaces. At the same time, also charge the battery.

Also carry out cooler operation in the case of machines equipped with an air conditioner.

15.3 AFTER STORAGE

NOTICE

If the machine is stored without carrying out the monthly rust prevention operation, request your Komatsu distributor for service.

Carry out the following procedure when taking the machine out of long-term storage.

- Wipe off the grease from the hydraulic cylinder rods.
- Add oil and grease to all places.

15.4 STARTING MACHINE AFTER LONG-TERM STORAGE

When starting the machine after a long-term storage, first cancel the automatic warming-up function as follows.

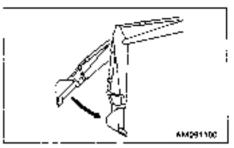
- Turn the starting switch key to the ON position.
- Turn the fuel control dial from the low idling (MIN) position to the full (MAX) position, hold it there for 3 seconds, then return it to the low idling (MIN) position and start the engine.

16. TROUBLESHOOTING

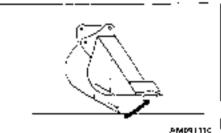
16.1 PHENOMENA THAT ARE NOT FAILURES

Note that the following phenomena are not failures:

 When the arm is pulled in, the speed of movement will drop momentarily when the arm is more or less vertical.



- The arm spead will drop momentarity when the bucket teeth are more or less horizontal.
- When starting or stopping the swing, noise will be emitted from the brake valve.
- When going down a steep slope at low speed, a noise will be emitted from the travel motor.



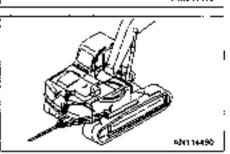
16.2 METHOD OF TOWING MACHINE



When towing the machine, use a wire rope that has ample strength for the weight of the machine that is being towed.

If the machine sinks in mud and cannot get out under its own power, or if the drawbar pull of the excavator is being used to tow a heavy object, use a wire rope as shown in the diagram on the right. Place pieces of wood between wire ropes and body to prevent damage to ropes and body.

At this time, never use the hole for light-weight towing.

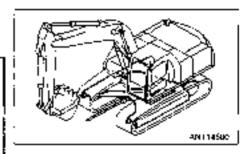


16.3 USING METHOD FOR LIGHT-WEIGHT TOWING HOLE

A WARNING

- The shackle must always be used.
- Hold the rope level and direct it straight to the track frame.
- Move the machine slowly in the Lo mode.

The track frame has been opened with a hole to pass the shackle for towing light objects.



16.4 PRECAUTIONS ON PARTICULAR JOBSITES

- When carrying out digging operations in water, if the work equipment mounting pin goes into the water, carry out greasing every time the operation is carried out.
- For heavy-duty operations and deep digging, carry out greasing
 of the work equipment mounting pins every time before operation.

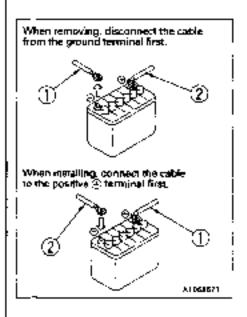
After greasing, operate the boom, arm and bucket several times, then grease again.

16.5 IF BATTERY IS DISCHARGED

· A WARNING -

- When checking or handling the battery, stop the engine and turn the starting switch key to the OFF position before starting.
- The battery generates hydrogen gas, so there is danger of explosion. Do not bring lighted cigarettes near the battery, or do anything that will cause sparks.
- Battery electrolyte is dilute sulphuric acid, and it will attack
 your clothes and skin. If it gets on your clothes or on your
 skin, wash it immediately off with large amounts of water, if
 it gets in your eyes, wash it out with fresh water, and consult
 a doctor.
- When handling battery, always wear protective goggles.
- When removing the battery, first disconnect the cable from the ground (normally, from the negative (a) terminal). When installing, install the positive (b) terminal first. If a tool touches the cable connecting the positive terminal and the chassis, there is danger that it will cause sparks.
- If the terminals are loose, there is danger that the defective contact may generate sparks that will cause an explosion.
 When installing the terminals, install them tightly.
- When removing or installing, check which is the positive

 terminal and negative
 terminal.



16.5.1 REMOVAL AND INSTALLATION OF BATTERY

- When removing the battery, remove the cable from the ground side first (normally the negative terminal).
 If any tool contacts between the positive terminal and the chassis, a spark will be caused. This is dangerous.
- When installing, connect the ground cable last.
- Tightening torque for battery holder: 9.8 14.7 Nm (1.0 1.5 kgfm, 7.2 10.9 lbft)

16.5.2 STARTING ENGINE WITH BOOSTER CABLE

When starting the engine with a booster cable, do as follows:

Precautions when connecting and disconnecting booster cable

A WARNING -

- When starting the engine with a booster cable, always wear selety glasses.
- Be careful not to let the normal machine and problem machine contact each other. This prevents sparks from generating near the battery which could ignite the hydrogen gas given off by the battery. If hydrogen gas explodes, it could cause serious injury.
- Make sure that there is no mistake in the booster cable connections. The final connection is to the revolving frame, but sparks will be generated when this is done, so connect to a place as far as possible from the battery. (However, avoid connecting the cable to the work equipment, as conduction is poor.)
- Use care when removing the cables from the machine that has been started. Do not allow the cable ands to contact each other or the machine, to avoid hydrogen explosion.

INCORRECT ©

NOTICE

- The size of the booster cable and clip should be suitable for the battery size.
- The battery of the normal machine must be the same capacity as that of the engine to be started.
- Check the cables and clips for damage or corrosion.
- Make sure that the cables and clips are firmly connected.

Connecting the booster cables

Keep the starting switch at the OFF position.

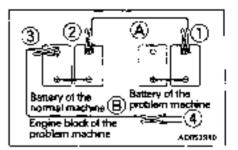
Connect the booster cable as follows, in the order of the numbers marked in the diagram.

- Make sure that the starting switches of the normal machine and problem machine are both at the OFF position.
- 2. Connect one clip of booster cable (a) to the positive (f) terminal of the problem machine.
- Connect the other clip of booster cable (a) to the positive (e) terminal of the normal machine.
- Connect one clip of booster cable (8) to the negative

 terminal of the normal machine.
- Connect the other clip of booster cable (8) to the engine block of the problem machine.

Starting the engine

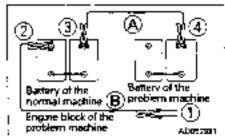
- 1. Make sure the clips are firmly connected to the battery terminals.
- Start the engine of the normal machine and keep it to run at high idling speed.
- Turn the starting switch of the problem machine to the START
 position and start the engine. If the engine doesn't start at first,
 try again after 2 minutes or so.



Disconnecting the booster cables

After the engine has started, disconnect the booster cables in the reverse of the order in which they were connected.

- Remove one clip of booster cable § from the engine block of the problem machine.
- 2. Remove the other clip of booster cable ® from the negative \ominus terminal of the normal machine.
- Remove one ctip of booster cable A: from the positive ⊕ terminal
 of the normal machine.



16.6 OTHER TROUBLE 16.6.1 ELECTRICAL SYSTEM

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for regains.

| Problem | Main causes | Remedy |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lamp does not glow brightly even when the engine runs at high speed | Defective wiring Defective adjustment of alternator | le Check, repair loose terminals, disconnections) |
| Lamp flickers while engine is running | Belt rension | Check, repair alternator belt tension For details, see EVERY 1000 HOURS SERVICE |
| Charge level monitor does not go out even when engine is running | Defective alternator Defective wiring | (e Réplace) (e Check, repair) |
| Abnormal noise is generated from alternator | Defective alternator | (• Replace) |
| Starting motor does not turn when starting switch is turned to ON | Defective wiring Insufficient battery charge | te Chéck, repáir) • Chárge |
| Pinion of starting motor keeps going in and out | ■ Insufficient battery charge | • Charge |
| Starting motor turns engine sluggishly | Insufficient bettery charge Defective starting motor | . Charge ■ Replace |
| Starting motor disengages before engine starts | Defective wiring Insufficient battery charge | = Check, repair = Charge |
| Pre-heating monitor does not light | Defective wiring Defective heater relay Defective monitor | I = Check, repair! I = Replace I = Replace |
| Oil pressure monitor does not light up when engine is stopped (starting switch at ON position) | Defective monitor Defective caution lamp switch | l• Replacel l• Replace⊦ |
| Outside of electrical heater is not warm when touched by hand | Defective wiring Disconnection in electric heater Defective operation of heater relay switch | I |

16.6.2 CHASSIS

- I >): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for repairs.

| Problem | Main causes | Remedy |
|------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Speed of travel, swing, boom, arm, bucket is slow | Lack of hydrastic oil | Add oil to specified level. see CHECK BEFORE STARTING |
| Pump generates abnormal noise | Clogged element in hydraulic tank strainer | Clean, see EVERY 2000 HOURS SERVICE |
| Excessive rise in hydraulic gil temperature | Loose fan belt Dirty oil cooler Lack of hydraulis oil | Adjust fan belt tension, see EVERY 250 HOURS SERVICE Clean, see EVERY 500 HOURS SERVICE Add oil to specified level, see CHECK BEFORE STARTING |
| Track comes off Abnormal wear of sprocket | ■ Track too loose | Adjust frack tension, see WHEN REQUIRED |
| Bucket rises slowly, does not rise | Lack of hydrau-ic orl | Add oil to specified level, see CHECK BEFORE STARTING |
| Does not swing | Swing look switch still applied | Tush swing lock switch OFF |
| | | <u> </u> |

16.6.3 ENGINE

- (): Always contact your Komatsu distributor when dealing with these items.
- In cases of abnormalities or causes which are not listed below, please contact your Komatsu distributor for repairs.

| Problem | Мыл свивея | Remedy |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine all pressure monitor lights up | Engine oil pan oil level is low (sucking in air) Clogged oil filter cartridge Defective tightening of oil pipe joint, oil leakage from damaged part Defective engine oil pressure sensor | Add oil to specified level, see CHECK BEFORE STARTING Replace cartridge, see EVERY 250 HOURS SERVICE (* Check, repair) (* Replace sensor) |
| Steam is emitted from top part of radiator (pressure valve) | Cooling water level fow, water leakage Loosen fan belt Dirt or scale accumulated in cooling system | Add cooling water, repair, see CHECK BEFORE STARTING Adjust fan belt tension, see EVERY 250 HOURS SERVICE Change cooling water, clean inside of cooling system, see WHEN REQUIRED |
| Red range of engine water temperature gauge lights up | Clogged radiator fin or damaged fin Defective thermostat Loose radiator filler cap (high altitude operation) | Clean or repair, see EVERY 500 HOURS SERVICE (• Replace thermostat) • Tighten cap or replace packing |
| Engine does not start when starting motor is turned | Lack of fuel Air in fuel system | Add fuel, see CHECK BEFORE STARTING Repair place where air is sucked in, see EVERY 500 HOURS SERVICE |
| | Defective fuel injection pump or nozale Starting motor cranks engine stuggishly Preheating monitor does not light up Defective compression Defective valve clearance | (e Replace pump or nozzle) Sex ELECTRICAL SYSTEM (c. Adjust valve clearance) |

ENGINE (cont'd) (16.6.3)

| Problem | Main causes | Remedy |
|-----------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------|
| Exhaust gas is white or blue | e Too much oil in nil pan | Add bil to specified level. see CHECK BEFORE STARTING |
| | • Improper fuel | Change to specified fuel |
| Exhaust gas occasionally turns black | Clogged air cleaner etement | Clean or replace, see WHEN REQUIRED |
| | ◆ Defactive nozzte | (a Replace nozzle) |
| | Defective compression | (• See detective compression above) |
| | Defective surbocharger | Clean or replace turbochauger |
| Combustion noise occasionally makes breathing sound | Defective nozzle | i i (♠ Replace nozziel |
| Abnormal noise generated | Low grade fuel being used | Change to specified fuel |
| loombustion or mechanical) | Overheating | Refer to "Radiator water level monitor lights up" as above |
| | Damage inside muffler | I Replace muffleri |
| | Excessive valve clearance | I Adjust valve clearancel |

MAINTENANCE

17. GUIDES TO MAINTENANCE

Do not carry out any inspection and maintenance operation that is not given in this manual. Perform maintenance work on hard, flat ground.

Check service meter:

Check the service meter reading every day to see of the time has come for any necessary maintenance to be carried out.

Komatsu genuine replacement parts:

Use Komatsu genuine parts specified in the Parts Book as replacement parts.

Komatsu genuine oils:

Use Komatsu genuine oils and grease. Choose oils and grease with proper viscosities specified for ambient temperature.

Always use clean washer fluid:

Use automobile window washer fluid and be careful not to let any dirt get into it.

Always use clean oil and grease:

Use clean oil and grease. Also, keep containers of the oil and grease clean. Keep foreign materials away from oil and grease.

Keeping the machine clean:

Always keep the machine clean. This makes is easier to find parts causing problems. Keep in particular grease fittings, breathers and oil level gauges clean and avoid foreign matters from getting in them.

Be careful of hot water and oil:

Oraining hot alls and coolants and removing their filters immediately after the angine stops are hazardous. Allow the engine to cool.

If the oil has to be drained when it is cold, warm up the oil to a suitable temperature (approx. 20 - 40°C) before draining it.

Checking foreign materials in drained oil and on filter:

After oil is changed or filters are replaced, check the oil and filters for metallic particles and foreign materials, if large quantities of metallic particles or foreign materials are found, consult your Komatsu distributor.

Fuel strainer:

If your machine is equipped with a fuel strainer, do not remove it while fueling,

Oil channe

Check or change pile in the places where dust is scarce to keep foreign materials away from pile.

Warning tag:

Attach the warning tag to the starting switch or other appropriate control lever to avoid someone who is not aware of the circumstances from starting the engine.

Obey precautions:

During the operation, always obey the precautions on the safety label attached to the machine.

Welding instructions:

- Turn off the engine starting switch.
- Do not apply more than 200 V continuously.
- Connect grounding the cable within 1 m from the area to be welded.
- Avoid seals or bearings from being between the area to be welded and the position of grounding point.
- Do not use the area around the work equipment pins or the hydraulic cylinders as the grounding point.

Fire prevention:

Use nonframmable cleaner or light oil for cleaning parts. Keep flame or digarette light away from light oil.

Clamp faces:

When Q-rings or gaskets are removed, clean the clamp faces and replace the Q-rings and gaskets with new ones. Be sure to fit Q-rings and gaskets when assembling.

Objects in your pockets:

Keep your pockets free of loose objects which can fall out and drop into the machinery; especially when you work on the machinery while banding over it.

Checking undercarriage:

When working in rocky areas, check for damage to the undercarriage and for looseness, flaws, wear and damage in bolts and nots. Loosen the track tension a little when working in such areas.

Precautions when washing machine:

- Never spray steam or water directly on the connectors and mechatronics parts.
- Do not allow water to get on the monitors inside the operator's cab.
- Never spray water at high pressure directly at the radiator or oil cooler when washing the machina.

Pre-and post-work checks:

Before starting work in mud, rain, snow or at seashore, check plugs and valves for tightness. Wash the machine immediately after the work to protect components from rusting. Lubricate components more frequently than usual. Be sure to lubricate work equipment pins daily if they are submerged in water.

Dusty worksites:

When working at dusty worksites, do as follows:

- Inspect the dust indicator to see whether the air cleaner is blocked up.
- 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 accumulation of dust.

Avoid mixing oils:

Never mix oils of different brands, if you have only oil which is a different brand from the one that is used in the machine, do not add it but replace all the oil.

18. OUTLINES OF SERVICE

- Use Komatsu genuine parts for replacement.
- When changing or adding oil, do not use a different type of oil.
- Unless otherwise specified, the oil and coolant used at the time of shipment from the factory are as shown in the table below.

| ltem | Kind of fluid |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Engine oil pan | SAE 15W-40 API classification CD |
| Swing machinery case Final drive case Damper case | SAE 30 API classification CD |
| Hydraulic tenk | SAE 10W API classification CD |
| Fuel tank | ASTM D975 No. 2 (However, ASTM D975 No. 1 is used for the winter season (October to March) |
| Radiator | Komatsu Super Coolant (AF-ACL) 41% added to water |

18.1 OUTLINE OF OIL, FUEL, COOLANT

18.1.3 OiL

- Oil is used in the engine and work equipment under extremely severe conditions (high temperature, high pressure), and it deteriorates with use.
 - Always use oil that matches the grade and temperature for use given in the Operation and Maintenance Manual. Even if the oil is not dirty, always replace the oil after the specified interval.
- Oil corresponds to blood in the human body, so always be careful when handling it to prevent any
 impurities lwater, metal particles, dlrt, etc.) from getting in.
 - The majority of problems with machine are caused by the entry of such impurities.
 - Take particular care not to let any impurities get in when storing or adding oil.
- Never mlx oils of different grades or brands.
- Always add the specified amount of oil.
 Having roo much oil or too little oil are both causes of problems.
- If the oil in the work equipment is not clear, there is probably water or air getting into the circuit.
 th such cases, please contact your Komatsu distributor.
- When changing the oil, always replace the related filters at the same time.
- We recommend you to have an analysis made of the oil periodically to check the condition of the machine. For those who wish to use this service, please contact your Komatsu distributor.

18.1.2 FUEL

- The fuel pump is a precision instrument, and if fuel containing water or dirt is used, it cannot work
 properly.
- Be extremely careful not to let impurities get in when storing or adding fuel.
- Always use the fuel specified in the Operation and Maintenance Manual.
 Fuel may congeal depending on the temperature when it is used (particularly in low temperature below-15°C), so it is necessary to change to a fuel that matches the temperature.
- 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.
- Before starting the engine, or when 10 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 litters have been replaced, it is necessary to bleed the air from the circuit.

18.1.3 COOLANT

- River water contains large amounts of calcium and other impurities, so if it is used, scale will stick
 to the engine end radiator, and this will cause defective heat exchange and overheating.
 Do not use water that is not suitable for drinking.
- When using anti-freeze, always observe the precautions given in the Operation and Maintenance Manual.
- Komatsu machines are supplied with Komatsu original anti-freeze in the coolant when the machine
 is shipped.
 - This anti-freeze is effective in preventing corrosion of the cooling system.
 - The anti-freeze can be used continuously for two years or 4000 hours. Therefore, it can be used as it is even in hot areas.
- Anti-freeze is inflammable, so be extremely careful not to expose it to flame or fire.
- The proportion of anti-freeze to water differs according to the ambient temperature.
 For details of the mixing proportions, see 24.2.2 CLEAN INSIDE OF COOLING SYSTEM.
- If the angine overheats, wait for the engine to cool before adding coolant.
- If the coolant level is low, it will cause overheating and will also cause problems with corrosion from the air in the coolant

18.1.4 GREASE

- Grease is used to prevent twisting and noise at the joints.
- The hipples not included in the maintenance section are hipples for overhaul, so they do not need grease.
 - If any part becomes stiff after being used for long time, add 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 diπ sticking in the grease would cause wear of the rotating
 parts.

18.1.5 STORING OIL AND FUEL

- Keep indoors to prevent any water, dirt, or other impurities from getting in.
- When keeping drum cans for a long period, put the drum on its side so that the filter port of the drum
 can is at the side. (To prevent moisture from being sucked in)
 If drum cans have to be stored outside, cover them with a waterproof sheet or take other measures
 to protect them.
- To prevent any change in quality during long-term storage, be sure to use in the order of first in first out (use the oldest oil or fuel first).

18.1.6 FILTERS

- Filters are extremely important safety parts. They prevent impurities in the fuel and air circuits from
 entering important equipment and causing problems.
 Replace all filters periodically. For details, see the Operation and Maintenance Manual.
 However, when working in severa conditions, it is necessary to consider replacing the filters at
 shorter intervals according to the oil and fuel (sulfur content) being used.
- Never try to clean the fifters (cartridge type) and use them again. Always replace with new filters.
- When replacing oil filters, check if any metal particles are stuck to the old filter. If any metal particles are found, please contact your Komatsu distributor.
- Do not open packs of spare filters until just before they are to be used.
- Always use Komatşu genuine filters.

18.2 OUTLINE OF ELECTRIC SYSTEM

- If the wiring gets wet or the insulation is damaged, the electric system leaks and this could result
 in hazardous malfunction of the machine.
- Services relating to the electric system are (1) check of fan blet tension, (2) check of damage or wear
 in the fan belt and (3) check of battery fluid level.
- Never remove or disessemble any electric components installed in the machine.
- Never install any electric components other than these specified by Komatsu.
- Be careful to keep the electric system free of water when washing the machine or when it rains.
- When working on the seashore, carefully clean the electric system to prevent corrosion.
- When installing a car cooler or any other electrical equipment, connect it to an independent power source connector. The optional power source must never be connected to the fuse, starting switch, or battery relay.

18.3 OUTLINE OF HYDRAULIC SYSTEM

- During operation and immediately after operation is ended, the temperature of the hydraulic system stiff remains high.
 - In addition, high hydraulic pressure is applied to the system. Take care when inspecting and maintaining the hydraulic system.
 - Stop the machine on level ground, lower the bucket to the ground, then set so that there is no pressure applied to the cylinder circuit.
 - Always stop the engine.
 - Immediately after operations, the hydraulic oil and lubricating oil are at high temperature and high pressure, so wait for the oil temperature to go down before starting maintenance. Even when the temperature goes down, the circuit may still be under internal pressure, so when loosening the plug or screw, or the hose joint, do not stand in front of the part. Loosen it slowly to release the internal pressure before removing it.
 - When carrying out inspection or maintenance of the hydraulic circuit, always bleed the air form.
 the hydraulic tank to remove the internal pressure.
- Periodic maintenance includes the inspection of the hydraulic oil level, replacement of the filter and refilling of hydraulic oil.
- When the high pressure hose, etc. is removed, check the O-ring for damage. If necessary, replace
 it.
- After the hydrautic filter element and strainer are cleaned or replaced, or after the hydrautic system
 is repaired or replaced or the hydrautic piping is removed, bleed air from the hydrautic circuit.
- The accumulator is charged with high-pressure nitrogen gas, incorrect handling may be dangerous.
 For the handling procedure, see "11.16 Handling accumulator".

19. WEAR PARTS LIST

Wear parts such as the filter element, bucket tooth, etc. are to be replaced at the time of periodic maintenance or before their abrasion limits.

The wear parts should be changed correctly in order to use the machine economically.

For part change, Komatsu genuine parts of excellent quality should be used.

When ordering parts, please check the part number in the parts book.

The parts in parantheses are to be replaced at the same time.

| ltem | Part No. | Part Name | G,tÅ | Replacement frequency |
|---------------------------------|-------------------------------|---------------------|-------|--------------------------|
| Engine oil filter | 6735-51-5140 | Cartridge | 1 | Every 250 hours service |
| Hydraulic oil filter | 20Y-60-21510 (07000-05180) | Element (O-ring) | 1 (1) | Every 500 hours service |
| Fuel filter | 6732-71-6111 | Cartridge | 1 | Every 500 hours service |
| Additional fuel filter toption! | 600-311-9121 | Cartridge | 1 | Every 500 hours service |
| Hydraulic tank breather | 20Y-60-21470 | Element | 1 | Every 500 hours service |
| Air cleaner | 600-181-6740 | Double element | 1 | _ |
| Additional filter for breaker | 20Y-970-1820 (07000-12115) | Element (O-ring) | 1 111 | · _ |
| Electrical intake air heater | 6732-11-4810 | Gasket | 2 | _ |
| Corrosion resistor (option) | 600-411-1161 | Cartridge (400 g) | 1 | When change the coolent |
| Carrosion resistor | 600-411-1791 | Cartridge (200 g) | 1 | Every 1000 hours service |

| ltam | Part No. | . Part Name | Q'ty | Replacement frequency |
|---------|----------------|---------------------|---------|--------------------------|
| Bucket | | Vartical pin type | ! | |
| (PC200) | 205-70-74272 | Tooth | ! 5 | |
| | (205-70-74281) | ; IPin) | (5) | |
| | (205-70-74291) | (Lock) | l (5) | |
| | | Horizontal pin type | : | |
| | 205-70-19570 | Tooth | 5 | _ |
| | (09244-02496) | ! (Pin) | 151 | |
| | 205-70-74180 | Cutter (left) | 1 1 | |
| | 205-70-74190 | Cutter (right) | , 1 · | |
| | {176-32-11210} | (Bolt) | i 181 | |
| | (01803-02430) | (Nut) | 18) | |
| Bucket | | Vertical pin type | Γ . | |
| (PC220) | 206-70-54221 | Tooth | 4 ! | |
| | (207-70-34221) | (Pin) | (4) | |
| | (205-70-74291) | (Lock) | (4) | |
| | | Horizontal pin type | <u></u> | |
| | 206-70-48610 | _I Tooth | j 4 | |
| | (09244-02516) | ! IPini | (4) | |
| | 205-70-74180 | Cutter (left) | 1 | |
| | 205-70-74190 | Cutter (right) | 1 , | |
| | (176-32-11210) | (Bolt) | (8) | |
| | (01803-02430) | (Nut) | (8) | |

20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE

PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

| | KIND OF | AMBIENT TEMPERATURE | CAPACITY | |
|-------------------------|-------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--|
| RESERVOIR | FLUID | -40 -22 -4 14 32 50 58 86 104 122°F -40 -30 -20 -10 0 10 20 30 40 50°€ | Specified Refill | |
| Engine oil par | | SAE 15W-40. SAE 10W-30 SAE 10W. SAE 10W. Synthetic SAE 5W-30 | 26.3 & 24.0 & 6.95 US gal 6.34 US gal 5.79 UK gal 5.28 UK gal | |
| Swing machinery case | | | 5.5 8 5.5 8 1.45 US gal 1.45 US gal 1.21 UK gal 1.21 UK gal | |
| Final drive case (each) | Engine oil | SAE 30 | 4.4 f 4.2 f 1.16 US gal 1.11 US gal 0.97 UK gal 0.92 UK gal | |
| Damper case | | | 0.75 ¢ 0.20 US gal — 0.17 UK gal | |
| Hydraulic system | | SAE 19W-40 | (PC200) 239 # 63.1 US gal 166 # 52.6 UK gal 43.8 US gal (PC220) 36.5 UK gal 246 # 64.9 US gal 54.1 UK gal | |
| Fuel tank | Diesel fuel | ASTM D975 No.2 | 340 € 89.8 US gal — 74.8 UK gal | |
| Cooling system | Water | Add antifreeze | (PC200) 22.2 £ 5.87 US gel 4.88 UK gel (PC220) 23.3 £ 6.16 US gel 5.13 UK gel | |

※ ASTM D975 No.1.

REMARK

 When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.

Change oil according to the following table if fuel sulphur content is above 0.5%.

| Fuel sulphur content | Change interval of oil in engin oil pan | | |
|----------------------|-----------------------------------------|--|--|
| 0.5 to 1.0% | 1/2 of regular interval | | |
| Above 1.0% | 1/4 of regular interval | | |

- When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine
 oil of SAE10W, SAE10W-30 and SAE15W-40, even though an atmospheric temperature goes up to
 10°C more or less in the day time.
- Use API classification CD, CE or CF-4 as engine oil and if API classification CC, reduce the engine
 oil change interval to half.
- There is no problem if single grade oil is mixed with multigrade oil (SAE1099-30, 15W-40), but be sure to add single grade oil that matches the temperature in the table.
- We recommend Komatsu genuine oil which has been specifically formulated and approved for use in engine and hydraulic work equipment applications.

Specified capacity: Total amount of oil including oil for components and oil in piping.

Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

ASTM: American Society of Testing and Material

SAE: Society of Automotive Engineers API: American Petroleum Institute

| ı No. | Supplier | Engine Oil (CD, CE or CF-4) SAE10W, 30, 40 10W30, 15W40 (The 15W40 oil marked 1 is CE.) | Gear Oil [GL-4 or GL-5] SAE80, 90, 140 | Grease (Lithium-Base) NLGI No. 2 | Anti-freeze Coolant (Ethylene Giycol Base) Permanent Type |
|-------|-----------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------|
| 1 | KOMATSU | EO10-CO EO30-CD EO10-30CD EO15-40CD | G090 G0140 | G2-LI Gz-LI-S | AF-ACL AF-PTL AF-PT (Winter, one season type) |
| 2 | AGIP | Dieset sigma S Super dieselmulti- grade *Sigma turbo | Rotra MP | GR MU/EP | - |
| . 3 | AMOCO | *Amoco 300 | Multi-purpose gear oil | RYKON prenium grease | - |
| 4 | ARCO | *Arcofleet S3 plus | Arco HD gear oil | Litholine HEP 2 Arco EP moly D | · - |
| 5 | BP | Vanellus C3 | Gear oil EP Hypogear EP | Energrease LS-EP2 | Antifreeze |
| 6 | į CALTEX | *RPM delo 400 RPM delo 450 | Universal thuban Universal thuban EP | Mariak all purpose 2 Ultra-duty grease 2 | AF engine coolant |
| 7 | CASTROL | *Turbomax *RX super CRD | EP EPX Hypay Hypay B Hypay C | MS3 Sphearol EPL2 | Anti-freeze |
| 8 | CHEVRON | *Delo 400 | Universal gear | Ultra-duty grease 2 | - |
| 9 | CONOCO | *Fleet mator gil | Universal gear lubricant | Super-sta grease | - |
| 10 | ELF | ! Muhiperformance 3C Performance 3C | - | Tranself EP Tranself EP type 2 | Glacelf |
| 11 | EXXON :ESSO: | Essolube D3 *Essolube XD-3 *Essolube XD-3 Extra *Essolube XD-3 Extra *Essolube XD-3 Extra *Essolube XD-3 Extra | Gear oil GP Gear oil GX | Beacon ÉP2 | All sexson coolant |
| 12 | : GULF | Super dury motor oil *Super duty plus | Multi-purpose gear . lubricant | Gulferown EP2 Gulferown EP special | Antifréeze and coolant |
| 13 | MOBIL | Delvac 1300 *Delvac super 10W-30, 15W-40 | Mobilube GX Mobilube HD | Mobilux EP2 Mobilgrease 77 Mobilgrease special | i |

| No. | Supplier | Engine OB 1CD, CE or CF-41 SAE*0W, 30, 40 10W30, 15W40 (The 15W40 oil marked * is CE.) | Gear Oil (GL-4 or GL-5) SAESD, 90, 140 | Grease (Lithium-Base) NLGI No. 2 | Anti-freeze Coolant (Ethylene Giyeo) Base) Pennaneni Type |
|-----|-----------|-------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------|
| 14 | PENNZQIL | *Supreme duty fleet motor oit | Multi-purpose 4092 Multi-purpose 4140 | Multi-purpose white grease 705 7071 White - bearing grease | Anti-freeze and summer coolant |
| 15 | PETROFINA | FINA kappa TO | FINA potonic N FINA potonic NE | FINA marson EPL2 | FINA tamidor |
| 16 | SHELL | Rimula X | Spirax EP Spirax heavy duty | Alvania FP grease | - |
| 17 | SUN | - | Suncer GL5 gear oit | Sunoco eltra prestiga 259 Sun prestiga 742 | Sunoco antifreeze and summer sociant |
| 18 | TEXACO | *Ursa super plus Ursa premium | : Multigear | Muhitak EP2 Starplex 2 | Code 2055 startex antifreeze coolant |
| 19 | TOTAL | Rubia S *Rubia X | Total EP Total transmission TM | Mutus EP2 | Antigel/antilreeze |
| 20 | NOIN | *Guardol | : MP goar lube LS I | Unoba EP | - |
| 21 | I VEEDOL | *Turbostar *Diesel star MDC | Multigear Multigear B Multigear C | - | Antifreeze |

21. STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

21.1 INTRODUCTION OF NECESSARY TOOLS

The following tools are needed when carrying out maintenance.

| No. | Name of tool | Part No. | Remarks |
|-----|----------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 1 | Wrench | 09002-01417 09002-03032 | Applicable width across flats (S ₁ -S ₂) 14mm - 17mm 30mm - 32mm S1 S2 40055570 |
| 2 | Screwdriver | 09033-00190 | Interchangeable flat-head and cross-head type |
| 3 | Socket wrench set | 20Y-9B-21130 | Applicable width across flats 12 mm, 14 mm, 17 mm, 19 mm, 22 mm, 24 mm, 30 mm Extension, Handle (large), Handle (small) |
| 4 | Hexagon Wrench | 09007-00836 | Applicable width across flats 8 mm |
| 5 | Filter wrench | 09019-08035 | |
| 6 | Grease pump | 07950-10450 | For greasing work |
| 7 | Nozzie | 07951-11400 | |
| 8 | Grease cartridge | 07950-90403 | (Lithium base grease, 400 g) |
| 9 | Hammer | 09039-00150 | |
| 10 | Pinch bar | 09055-10390 | |

If any of the above tools are broken, please order them from your Komatsu distributor.

21.2 TORQUE LIST

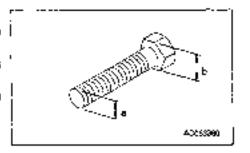
Unless otherwise specified, tighten the metric bolts and nuts to 1 the torque shown in the table.

The tightening torque is determined by the width across the flats (5) of the nut and bolt.

If it is necessary to replace any nut or bolt, always use a Komatsugenuine part of the same size as the part that was replaced.

Nm Inewton meteri: 1Nm = 0.1 kgm

= 0.74 lbft



| Thread diameter of bott (mml | Width across flat (mm) (b) | (a) (b) | | |
|------------------------------|----------------------------------|--------------------|------------------|----------------|
| | | Nm i | kgm | lbh |
| ŝ | 10 | 13.2 ± 1.4 | 1.35 ± 0.15 | 9.73 ± 1.03 |
| 8 | 13 | 31.4 ± 2.9 | 3.2 ± 0.3 | 23.2 ± 2.1 |
| 10 | . 17 | 65.7 ± 6.8 | 67±07 | 48.5 ± 5.0 |
| 12 | . 79 | 112 ± 9.8 | 915 ± 1.0 | 62.6 ± 7.2 |
| 14 | 22 | 177 ± 19 | 18 0 ± 2.0 | 131 ± 14 |
| 16 | 24 | 279 ± 29 | 29.5 ± 3 | 208 ± 21 |
| 18 | 27 | . 393 ± 39 | 39 ± 3 | 262 ± 29 |
| 20 | 30 | 549 ± 58 | 58 ± 6 | 405 ± 43 |
| 22 | 32 | 745 ± 78 | 76 ± 8 | 549 ± 58 |
| Ž4 | 36 | . 927 ± 98 | 94.5 ± 10 | £84 ± 72 |
| 27 | 41 | 1320 ± 140 | 135 - 15 | 973 ± 100 |
| 30 | 45 | 1720 ± 190 | 175 - 20 | 1276 ± 140 |
| 33 | 5 0 | 2210 ± 240 | 225 = 25 | 1630 ± 180 |
| 36 | 55 | 2750 ± 290 | 280 ± 30 | 2030 ± 210 |
| 39 | 60 | 3 280 + 340 | 33 5 - 35 | 7420 ± 250 |
| | | | | |

NOTICE

When tightening panels or other parts having tightening fixtures made of plastic, be careful not to use excessive tightening torque; doing so will damage the plastic parts.

22. 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 carry out periodic maintenance. In addition, to further improve safety, the user should also carry out periodic replacement of the parts given in the table. These parts are particularly closely connected to safety and fire prevention.

With these parts, the material changes as time passed, or they easily wear or deteriorate. However, it is difficult to judge the condition of the parts simply by periodic maintenance, so they should always be replaced after a fixed time has passed, regardless of their condition. This is necessary to ensure that they always maintain their function completely.

However, if these parts show any abnormality before the replacement interval has passed, they should be repaired or replaced immediately.

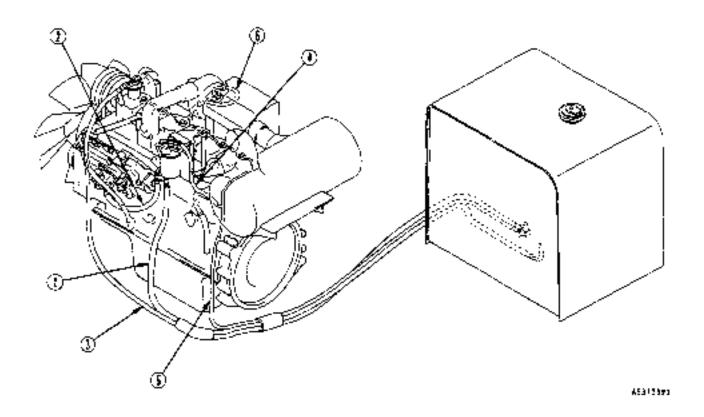
If the hose clamps show any deterioration, such as deformation or cracking, replace the clamps at the same as the hoses.

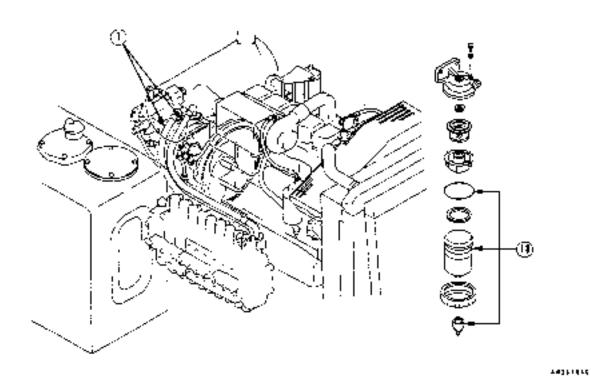
When replacing the hoses, always replace the O-rings, gaskets, and other such parts at the same time.

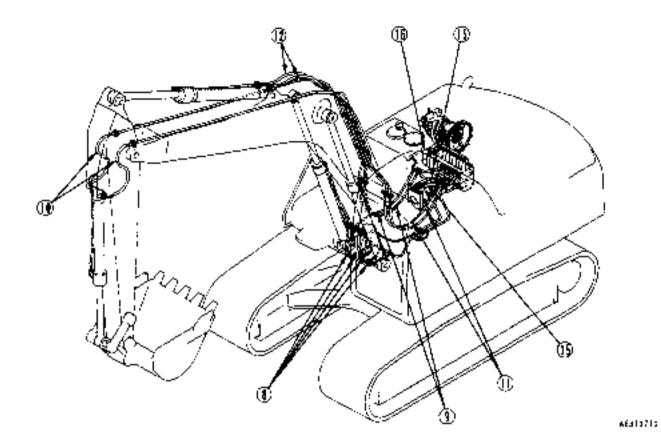
Ask your Komatsu distributor to replace the safety critical parts.

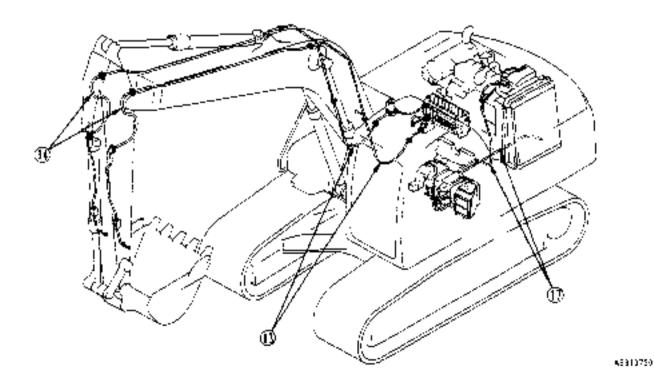
SAFETY CRITICAL PARTS

| No. | Safety critical parts for periodic replacement | Q'ty | Replacement interval |
|-----|-------------------------------------------------------------------|------|-----------------------------------------------------|
| 1 | Fuel hose (Fuel tank – Connector) | 1 . | |
| 2 | Fuel hose (Connector - Fuel injection pump) | : 1 | |
| 3 | Fuel return hose (Fuel injection pump - Fuel tank) | 1 | |
| 4 | Fuel return hase (Fuel filter - Connector) | 1 | |
| 5 | Fuel return hose (Connector - Fuel tank) | 1 | |
| 6 | Turbocharger lubricating oil hose | 1 | |
| 7 | Pump outlet hose (Pump - Control valve) | 2 | |
| 8 | Work equipment hose (Boom cylinder Inlet) | . 4 | |
| 9 | Work equipment hase (Bucket cylinder line – Boom foot section) | 2 | Every 2 years or 4000 hours, whichever comes sooner |
| 10 | Work equipment hose (Bucket cylinder inlet) | . 2 | |
| 31 | Work equipment hose IArm cylinder line - Boom foot sections | 2 | |
| 12 | Work equipment hose (Arm cylinder inlet) | 2 | |
| 13 | Additional attachment line hose (Boom foot section) | 2 | |
| 14 | Additional attachment line hose (Boom top section) | 2 | |
| 15 | Swing line hose (Swing motor inlet) | | |
| 16 | Main suction hose | 1 | |
| 17 | Heater hose | 2 | |
| 18 | Water separator case, O-ring, plug | 1 | |
| 19 | Seat belt | 1 | Every 3 years |









3-21

23. MAINTENANCE SCHEDULE CHART

23.1 MAINTENANCE SCHEDULE CHART

| SERVICE ITEM | PAGI |
|-----------------------------------------------------------------------------|-------------|
| INITIAL 250 HOURS SERVICE (only after the first 250 hours) | |
| Replace fuel filter cartridge and additional (uel filter cartridge (option) | 3-58 |
| Check engine valve clearance, adjust | 3-67 |
| WHEN REQUIRED | |
| Check, clean and replace sir cleaner element | 3-26 |
| Clean inside of cooling system | 3-28 |
| Check and tighten track shoe boils | 3-32 |
| Check and adjust track tension | 3-33 |
| Check electrical intake air heater | 3-35 |
| Replace bucket teeth (vertical pin type) | 3-36 |
| Replace bucket teeth (horizontal pin type) | 3-39 |
| Adjust bucket clearance | 3-40 |
| Check window washer fluid level, add fluid (option) | 3-41 |
| Check and adjust sir conditioner | 3-42 |
| Replace additional breaker filter element | 3-43 |
| CHECK BEFORE STARTING | |
| Check coolant level, add water | 3.44 |
| Check oil level in engine oil pan, add oil | 3.44 |
| Check fuel level, add fuel | 3.45 |
| Check oil level in hydraulic tenk, add oil | 3-46 |
| Check dust indicator | 3.47 |
| Check electric wirings | 3.47 |
| Check function of horn | 3.47 |
| Lubricate clamshell bucket (12 points) | 3-48 |
| Check for water and sediment in water separator, drain water loption! | 3-48 |
| EVERY 100 HOURS SERVICE | |
| Lubricating | 3-49 |
| Boom cylinder foot pin (2 points) | 3-49 |

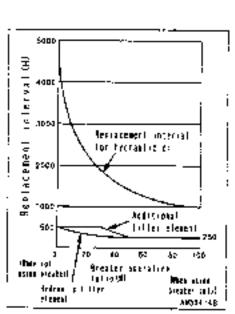
| SERVICE ITEM | PAGE |
|--------------------------------------------------------------------------------------------------------------------------|--------------|
| Lubricating | 3-49 |
| Beem foot pin (2 points) | 3-49 |
| Boom cylinder rod end (2 points) | 3-49 |
| Arm cylinder foot pin I1 paint) | 3-49 |
| Boom-arm coupling pin (1 point) | 3-50 |
| Arm cylinder rod end (1 point) | 3-50 |
| Bucket cylinder foot pin (1 point) | 3-50 |
| Arm-link coupling pin (1 point) | 3-50 |
| Arm-bucket coupling pin (1 point) | 3-50 |
| Link coupling pin (2 paints) | 3-50 |
| Bucket cylinder rod end (1 point) | 3-50 |
| Bucket-link coupling pin [1 point} | 3-50 |
| Check oil level in swing machinery case, add oil | 3-50 |
| Drain water and sediment from fuel tank | 3 -51 |
| EVERY 250 HOURS SERVICE | |
| Check oil level in final drive case, add oil | 3-52 |
| Check level of battery electrolyte | 3-53 |
| Change oil in engine oil pan, replace engine oil filter cartridge | 3-54 |
| Lubricate swing circle (2 points) | 3-55 |
| Check fan belt tension, adjust | 3-56 |
| Check air conditioner compressor belt tension, adjust | 3-57 |
| EVERY 500 HOURS SERVICE | |
| Replace fuel filter cartridge and additional fuel filter cartridge (option) | 3-58 |
| Check swing pinion grease level, add grease | 3-59 |
| Clean and inspect radiator fins, oil cooler fins and condenser fins (only for machines equipped with air conditioner) | 3-60 |
| Clean internal and external air filters of air conditioner system tonly for machines equipped with air conditioner! | 3-61 |
| Replace hydraulic tank breather element | 3-61 |
| Replace hydraulic filter element | 3-52 |

| SERVICE ITEM | PAGE |
|-----------------------------------------------------------|------|
| EVERY 1000 HOURS SERVICE | |
| Change oil in swing machinary case | 3-63 |
| Check oil level in damper case, add oil | 3-64 |
| Check all tightening parts of turbocharger | 3-64 |
| Check play of turbocharger rotor | 3-64 |
| Check alternator belt tension and replace alternator belt | 3-65 |
| Replace corrosion resistor cartridge | 3-65 |
| EVERY 2000 HOURS SERVICE | |
| Change oil in final drive case | 3-66 |
| Clean hydraulic tank strainer | 3-67 |
| Clean, check turbocharger | 3-67 |
| Check alternator, starting motor | 3-67 |
| Check engine valve clearance, adjust | 3-67 |
| Check vibration damper | 3-68 |
| EVERY 4000 HOURS SERVICE | |
| Check water pump | 3-69 |
| EVERY 5000 HOURS SERVICE | |
| Change oil in hydraulic tank | 3-70 |

23.2 MAINTENANCE INTERVAL WHEN USING HYDRAULIC BREAKER

For machines equipped with a hydraulic breaker, the hydraulic oil deteriorates faster than for normal bucket digging operations, so set the maintenance intervals as follows.

- Replacing hydraulic element
 On new machines, replace the element after the first 100 to 150 hours, then carry out further replacement of the element according to the table on the right.
- Changing oil in hydraulic tank
 Change the oil according to the table on the right.
- Replacing additional filter element for breaker.
 Use a guideline of 250 hours for use of the breaker (operating ratio for the breaker; 50 % or more), and replace the element according to the table on the right.



24. SERVICE PROCEDURE

24.1 INITIAL 250 HOURS SERVICE

Carry out the following maintenance only after the first 250 hours.

- REPLACE FUEL FILTER CARTRIDGE AND ADDITIONAL FUEL FILTER CARTRIDGE (OPTION)
- CHECK ENGINE VALVE CLEARANCE, ADJUST

For details of the method of replacing or maintaining, see the section on EVERY 500 HOURS and 2000 HOURS SERVICE.

24.2 WHEN REQUIRED

24.2.1 CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT

- 🛕 WARNING

- Never clean or replace the air cleaner element with the engine running.
- When using pressure air to clean the element wear salety glasses or goggles to protect the eyes.

Checking

Whenever the red piston in dust indicator ① appears, clean the air cleaner element.

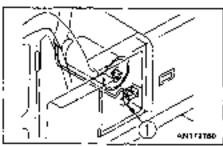
NOTICE

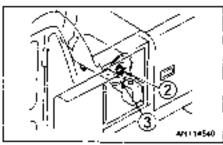
Do not clean the element before the dust indicator indicates red. If the element is cleaned frequently before the dust indicator indicates red, the true performance of the air cleaner is not used and the cleaning efficiency is lowered.

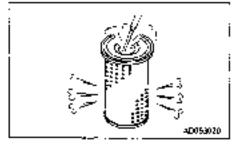
in addition, when the element is cleaned, more of the dust sticking to it drops onto the inner element.

Cleaning or replacing outer element

- Open the front door on the left side of the machine, remove wing nut ② and take out element ③.
 - To prevent entry of dirt and dust, cover the air connector side of the rear end of the air cleaner with a clean cloth and adhesive tape.
- 2. Clean the air cleaner body interior and the cover.
- Direct dry compressed air (less than 700 kPa (7 kg/cm², 100 psi)):
 to element ③ from inside along its folds, then direct it from
 outside along its folds and again from inside.
 - Remove one seal from the outer element whenever the outer element has been cleaned.
 - Replace the outer element which has been cleaned 6 times repeatedly or used throughout a year. Replace the inner element at the same time.
 - Replace both inner and outer elements when the dust indicator red piston appears soon after installing the cleaned outer element even though it has not been cleaned 8 times.
 - Check inner element mounting nuts for looseness and, if necessary, retighten.







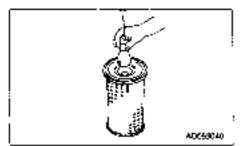
 If small holes or thinner parts are found on the element when it is checked with an electric bulb after cleaning replace the element.

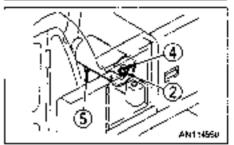
NOTICE

Do not use an element whose folds or gasket or seal are lamaged.

When cleaning the element, do not hit it or best it against something.

- 5. Remove the cloth and tape used for cover in Step 1.
- 6. Install the cleaned element and fix it with the wing nut.
- Replace seal washer (i) or wing nut (i) with new parts if they are broken.
- Remove evacuator valve (a) and clean with compressed air.
 After cleaning, install it.





Replacing inner element

- First remove the cover and the outer element, and then remove the inner element.
- To prevent dust from getting in, use a clean cloth or tape to cover the air connector (outlet side).
- Clean the air cleaner body interior, then remove the cover installed in Step 2.
- Fit a new inner element to the connector and tighten it with nuts.
 Do not clean and reinstablia inner element.
- Install the outer element and fix it with the wing nut.

24.2.2 CLEAN INSIDE OF COOLING SYSTEM

- 🛕 warning -

- Soon after the engine has been stopped, the coolant is not and can cause personal injury. Allow the engine to cool before draining water.
- Since cleaning is performed while the engine is running, it is very dangerous to enter the rear side of the machine as the machine may suddenly start moving. If the under cover is left removed, it may interfere with the fan. While the engine is running, never enter the rear side of the machine.
- Never remove the radiator cap when the engine is at operating temperature. At operating temperature, the coolant is under pressure. Steam blowing up from the radiator could cause personal injury. Allow the engine to cool until the radiator filler cap is cool enough to touch with your hand. Remove the filler cap slowly to allow pressure to be relieved.
- Clean the inside of the cooling system change the coolant and replace the corrosion resistor (option) according to the table below.

| Cind of coolent | Clearing inside of cooling system and shanging coolent | Replacing corrosion resistor (option) |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Permanent type antifreeze (All season type) | Every year lautumn) or every 2000 hours whichever comes first | |
| Non permanent type antifreese containing ethylene glycol IWinter, one season type! | Every 6 months (spring, butumn) (Torain antiffeese in spring, add amifreese in autumn) | Every 1806 hours and when cleaning the inside of the cooling to system and when thanking to changing collars. |
| When not using antifreeze | Every 6 manths or every 1000 hours whichever comes first | - Li-anging coulding |

- Stop the machine on level ground when cleaning or changing the coolant.
- Use a permanent type of antifreeze.
 If, for some reason, it is impossible to use permanent type antifreeze, use an antifreeze containing ethylene glycol

 When deciding the ratio of antifreeze to water, check the lowest temperature in the past, and decide from the mixing rate table given below.

It is actually better to estimate a temperature about 10°C lower when deciding the mixing rate.

Mixing rate of water and antifreeze

PC200

| Min. atmospheric | °C | -5 | -10 | -15 | -20 | -25 | -30 |
|----------------------|--------|------|---------------|------|------|------|------|
| temparature | °F | 23 | 14 | 5 | -4 | -13 | -22 |
| Amount of antifreeze | £ | 5.1 | 6.7 | 8.0 | 9.3 | 10.2 | 11,1 |
| | US gal | 1.35 | 1.77 | 2.11 | 2.40 | 2.59 | 2.93 |
| | UK gal | 1.12 | 1.47 | 1.76 | 2.00 | 2.24 | 2.44 |
| Amount of water | £ | 17.1 | 1 5 .5 | 14.2 | 13.1 | 12.0 | 11.1 |
| | US gal | 4.52 | 4.10 | 3.75 | 3.96 | 3.17 | 2.93 |
| | UK gal | 3.76 | 3.41 | 3.12 | 2.88 | 2.64 | 2.44 |

PC220

| Min. atmospheric temperature | °C . | -5 | -10 | -15 | -20 | -25 | -3 0 |
|------------------------------------|---------|------|------|------|------|--------|-------------|
| | °F | 23 | , 14 | 5 | -4 | -13 | -22 |
| Amount of antifreeze | e | 5.4 | 7.0 | B.4 | 9.6 | 10.7 | 11.65 |
| | Ų\$ gal | 1.43 | 1.85 | 2.22 | 2.54 | 2.83 | 3.08 |
| | UK gal | 1.19 | 1.54 | 1.85 | 2.11 | 2.35 | 2.56 |
| Amount of water | · · | 17.9 | 16.3 | 14,9 | 13,7 | . 12.6 | 17.65 |
| | US gal | 4.73 | 4,31 | 3.94 | 3.62 | : 3.33 | 3.08 |
| | UK gal | 3.94 | 3.59 | 3.28 | 3.01 | 2.77 | 2.56 |

- 🕰 WARNING ---

Antifreeze is flammable, so keep it away from any flame.

- Use city water for the cooling water.
 If river water, well water or other such water supply must be used, contact your Komatsu distributor.
- We recommend use of an antifreeze density gauge to control the mixing proportions.

--- AWARNING -

When removing drain plug, avoid pouring coolant on yourself.

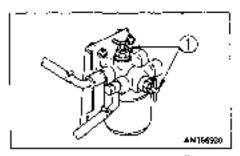
- Prepare a container to catch drained coolant: Min 23.3 £ (8.16 US gal, 5.13 UK gal) capacity.
- If a corrosion resistor cartridge is installed, close valves ().
- Turn radiator cap ② slowly to release the internal pressure.
- 3. Pushing radiator cap ②, turn it slowly to remove it.
- 4. Remove the undercover, then set a container to catch the coolant under drain valve ③ and drain plug ⑥. Open drain valve ③ at the bottom of the radiator to drain the water. Remove drain plug ⑥ in the cylinder block when draining the water.
- After draining the water, close drain valve ③ and drain plug ④, and fill with city water.
- Open drain valve 3 and drain plug 4, run the engine at lowiding, and flush water through the system for 10 minutes.

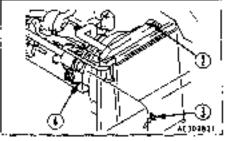
When doing this, adjust the speed of filling and draining the water so that the radiator is always full.

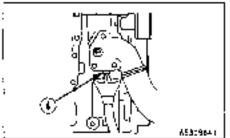
While flushing water through the system, watch carefully that the water inlet hose does not come out of the radiator water filler.

- After flushing, stop the engine, open drain valve 3 and drain plug 3, then close it again after all the water has drained out.
- After draining the water, clean with a flushing agent.
 We recommend use of a Komatsu genuine cleaning agent. For details of the cleaning method, see the instructions given with the cleaning agent.
- After cleaning, open drain valve (a) and drain plug (a) to drain all the cooling water, then close them and fill slowly with clean water.
- 10. When the water comes up to near the water filler port, open drain valve ② and drain plug ②, run the engine at low idling, and continue to run water through the system until clean coloniess water comes out.

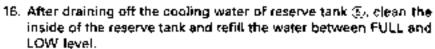
When doing this, adjust the speed of filling and draining the water so that the rediator is always full.

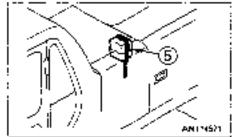






- 11. When the water is completely clean, stop the engine, close drain valve \mathfrak{J} , wrap the drain plug with seaf tape, then close drain plug \mathfrak{J}_{+} .
- 12. Replace the corrosion resistor cartridge and open valves ①. For details of replacement of the corrosion resistor, see "24.7 EVERY 1000 HOURS SERVICE".
- 13. Install the undercover.
- 14. Add cooling water until it overflows from the water filler.
- 15. To remove the sir in the cooling water, run for five minutes at low idling, then for another five minutes at high idling.
 When doing this, leave radiator cap ② off.

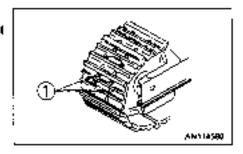




17. Stop the engine, wait for about three minutes, add cooling water up to near the radiator water filler port, then tighten cap ②.

24.2.3 CHECK AND TIGHTEN TRACK SHOE BOLTS

If the machine is used with track shoe bolts (i) loose, they will break, so tighten any loose bolts immediately.

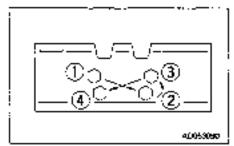


Method for tightening

- 1 First tighten to a tightening torque of 490 ± 50 Nm (50 ± 5 kgm, 360 ± 36 lbft) then check that the nut and shoe are in close contact with the link contact surface.
- 2 After checking, tighten a further 120° ± 10°.

Order for tightening

Tighten the bolts in the order shown in the diagram on the right. After tightening, check that the nut and shoe are in close contact with the link mating surface.



24.2.4 CHECK AND ADJUST TRACK TENSION

AWARNING -

Carry out this operation with two workers. The operator must move the machine in accordance with the signals from the other worker. The track tension is checked with the chassis raised, so it is extremely dangerous if the machine is lowered by mistake during the inspection. Never move the machine while anyone is carrying out measurements.

The wear of pins and bushings on the undercarriage will vary with the working conditions and soil properties. It is thus necessary to continually inspect the track tension so as to maintain the standard tension.

Carry out the check and adjustment under the same conditions as when operating jon jobsites where the track becomes clogged with mud, measure with the track clogged with mud).

Inspection

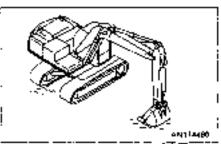
- Raise the chassis with the boom and arm.
 When doing this, operate the levers slowly.
- Measure the clearance between the bottom of the track frame and the top of the track shoe at a position that is safe even if the chassis should come down.

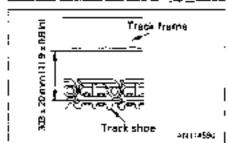
Standard clearance: 303 ± 20 mm (11.9 ± 0.8 in).

Places to measure

PC200 : 4th track roller from sprocket PC200LC : 5th track roller from sprocket

PC220 : Between 4th and 5th track roller from sprocket PC220LC : Between 5th and 6th track roller from sprocket



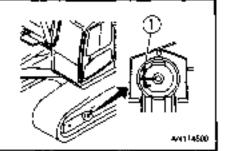


If the track tension is nor at the standard value, adjust it in the following manner.

Adjustment

– 🕰 WARNING -

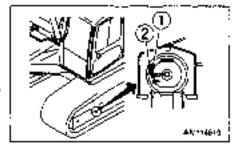
Grease inside the edjusting mechanism is under high pressure. Grease coming from plug ① under pressure can penetrate the body causing injury or death. For this reason, do not loosen plug ① more than one turn. Do not loosen any part other than plug ①. Furthermore, do not bring your face in front of the plug ①. If the track tension is not relieved by this procedure, please contact your Komatsu distributor.

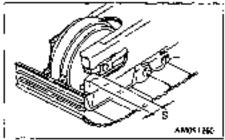


When increasing tension

Prepare a grease gun.

- 1. Pump in grease through grease fitting ② with a grease gun.
- To check that the tension is correct, move the machine slowly forward (7 – 8 m).
- Check the track tension again, and if the tension is not correct, adjust it again.
- Continue to pump in grease until S becomes 0 mm. If the tension
 is still loose, the pin and bushing are excessively worn, so they
 must be either turned or replaced. Please contact your Kometsu
 distributor.





When loosening tension

- AWARNING —

It is extremely dangerous to release the grease by any method except the procedure given below. If the track tension is not relieved by this procedure, please contact your Komatsu distributor.

- ANTIALES
- Locsen plug (i) gradually to release the grease.
- Turn plug (i) a maximum of one turn.
- if the grease does not come out smoothly, move the machine backwards and forwards a short distance.
- 4. Tighten plug ①..
- 5. To check that the rension is correct, move the machine slowly forward (7 8 m).
- Check the track tension again, and if the tension is not correct, adjust it again.

24.2.5 CHECK ELECTRICAL INTAKE AIR HEATER

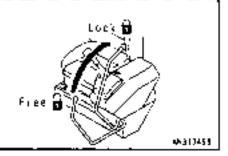
Before the start of the cold season fonce a year), contact your Komatsu distributor to have the electrical intake air heater repaired or checked for dirt or disconnections.

24.2.6 REPLACE BUCKET TEETH (VERTICAL PIN TYPE)

Replace the point before the adapter starts to wear.

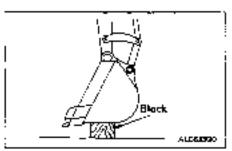
AWARNING ⋅

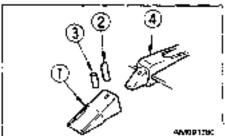
It is dangerous if the work equipment moves by mistake when the teeth are being replaced. Set the work equipment in a stable condition, then stop the engine and apply the locks securely to the levers.



- Place a block under the bucket bottom to allow the pin of tooth

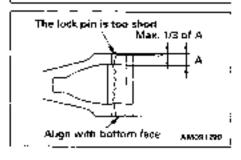
 to be knocked out with a hammer. Carry out full stroke operation of the control levers within 15 seconds after stopping the engine. After confirming that the work equipment is in a stable condition, lock the safety lock lever.
 Set so that the bottom face of the bucket is horizontal.
- Use a hammer and drift to knock out lock pin ② Iff the drift is set against rubber pin lock ② when it is hit, the rubber pin lock may break. Set it against the back of the pin.)
- 3. After removing lock pin (2) and rubber pin lock (3), check them,



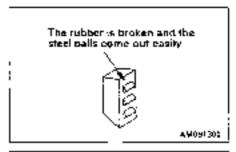


If lock pins and rubber pin locks with the following defects are used, the point may come off the bucket. Replace them with new ones,

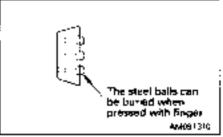
The lock pin is too short.



 The rubber of the rubber pin lock is torn, and the steel bells may come out.

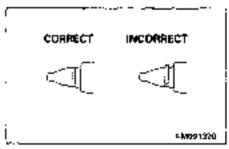


c. The steel balls are buried when they are pressed by hand.

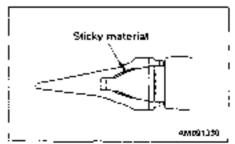


 Clean the surface of adapter (2) and remove the soil from it with a knife.

5. Use your hand or a hammer to push rubber pin lock (*) into the if hole of the adapter.
When doing this, be careful that the rubber pin lock does not fly out from the adapter surface.

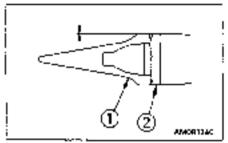


- 6. Clean the inside of point ①, then install it to adapter ③. If there is mud stuck to it or if there are protrusions, the point will not enter the adapter properly, and there will not be proper contact at the mating portion.
- 7. Fit point ① to adapter ②, and confirm that when the pointer is pressed strongly, the rear face of the hole for the pin of the point is at the same level as the rear face of the hole for the pin of the adapter.



If the rear face of the hote for the pin of point (1) is protruding to the front from the rear face of the pin hole for adapter (2), do not try to knock the pin in. There is something preventing point (1) from entering adapter (2) fully, so remove the obstruction. When point (2) enters adapter (3) fully, knock in lock pin (3).

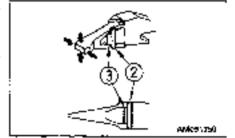
- 8. Insert lock pin ② in the hole of the point and hit it until its top is the same level as the surface of point ③.
- 9. After replacing a bucket tooth, always check the following.
 - After the lock pin has been knocked in completely, check that
 it is being secured by the point and surface.
 - Lightly hit lock pin (2) in the reverse direction from which it was hit in.
 - 3) Lightly hit the tip of the point from above and below, and hit its sides from right and left.



4) Confirm that rubber pin lock (3) and lock pin (2) are set as shown in the figure.

The life of the point can be langthened and the frequency of its replacement can be reduced by turning it upside down so that it will wear evenly.

Replace the rubber pin and locking pin with new pins at the same time as replacing the point to prevent the point from falling.

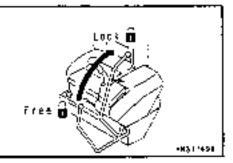


24.2.7 REPLACE BUCKET TEETH (HORIZONTAL PIN TYPE)

Replace the teeth before the wear reaches the adapter.

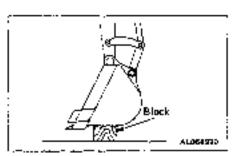
▲WARNING

It is dangerous if the work equipment moves by mistake when the teeth are being replaced. Set the work equipment in a stable condition, then stop the angine and apply the locks securely to the levers.



 Place a block under the bucket bottom so that the pin (1) of tooth can be knocked out with a hammer. Carry out full stroke operation of the control levers within 15 seconds after the engine has stopped. After confirming that the work equipment is in a stable condition, lock the salety lock lever.

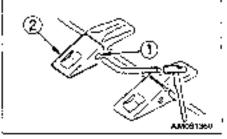
Set so that the bottom face of the bucket is horizontal.



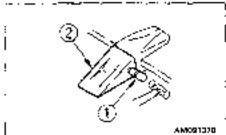
2 Place a bar on the pin head and strike the bar with a hammer to knock out pin ①. Remove tooth ②.

REMARK

Use a round bar with a smaller diameter than that of the pin.



Clean the mounting face. Fit a new tooth ② in the adapter, push
in pin ①, partially by hand, then lock it with a hammer to install
the tooth to the bucket.

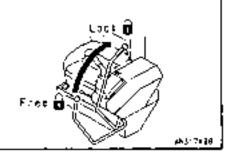


24.2.8 ADJUST BUCKET CLEARANCE

- AWARNING -

It is dangerous if the work equipment moves by mistake when the clearance is being adjusted.

Set the work equipment in a stable condition, then stop the engine and lock the lever securely.



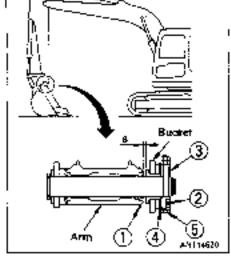
- Set the work equipment to the position shown in the diagram at [right, stop the engine and set the lock lever to the locked | position.
- Shift O-ring (i) of the linkage and measure the amount of play (a).
 Measurement is easier of you move the bucket to one side or the

other so all the play can be measured in one place.

(In the diagram this is on the left-hand side)

Use a gap iclearancel gauge for easy and accurate measurement.

- Loosen the four plate fixing bolts of ② and loosen plate ③.
 Because it uses split shims, you can carry out the operation without removing the bolts entirely.
- Remove shim (4) corresponding to the amount of play (a) measured above.



[Example]

In the case of play of 3 mm, remove two 1.0 mm shims and one 0.5 mm shim, Play becomes 0.5 mm. For shim (4), two types of 1.0 mm and 0.5 mm are used.

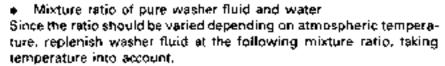
When play a is smaller than one shim, do not carry out any maintenance.

Tighten the four bolts ②.
 If the bolts ② are too stiff to tighten, pull out pin stopper bolt ③.
 for easier tightening.

24.2.9 CHECK WINDOW WASHER FLUID LEVEL, ADD FLUID (OPTION)

If air is ejected with the window washer fluid, check the fluid jevel in window washer tank 3. If showing under the level, fill with automobile window washer fluid.

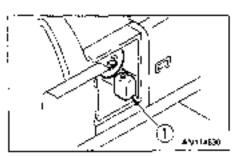
When adding fluid, be careful not to let dirt or dust get in.



| Operation area and season | Mixture ratio | Freezing temperature | |
|---------------------------------|-------------------------------------|-------------------------|--|
| Normal | Pure washer fluid 1/3: water 2/3 | - 10°C +14°FI | |
| Winter in cold region | Pure washer fluid 1/2: water 1/2 | - 20°C (- 4°F) | |
| Winter in extremely cold region | Pure washer fluidi | - 30°C (= 22°F) | |

Pure washer fluid comes in two types: for -10°C (14°F) (for general use) and for -30°C (-22°F) (cold regions).

Use pure washer fluid according to operation area and season.



24,2,10 CHECK AND ADJUST AIR CONDITIONER

CHECK LEVEL OF REFRIGERANT (GAS)

AWARNING -

- When repairing or inspecting the air conditioner, be sure to handle the refrigerant gas according to regulations of your country.
- If the liquid gets into your eyes or on your hands, it may cause loss of sight or trostbite, so never loosen any part of the refrigerant circuit.

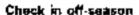
If there is a tack of refrigerant (Freon 134a), the cooling performance will be poor.

When operating the cooler at high speed, there should be no bubbles in the sight glass (inspection window) mounted on the condenser unit receiver.

- No bubbles in refrigerant flow: Correct
- Bubbles in refrigerant flow (bubbles continuously pass through):
 Refrigerant level low
- Colorless, transparent: No refrigerant



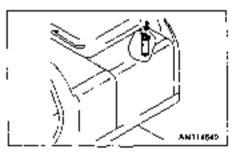
When there are bubbles, the refrigerant gas level is low, so contact your refrigerant dealer to have refrigerant added. If the sin conditioner is run with the refrigerant gas level low, it will cause damage to the compressor.

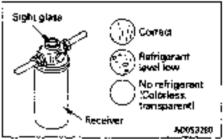


When not being used for a long period, operate the cooler for 3 to 5 minutes once a month to supply lubricant to each component of the compressor.

Inspection and maintenance items list for cooler

| Inspection and maintenance items | Contents | Maintenance interval | |
|----------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------|--|
| Refrigerant (gas) | Filling quantity | Twice a year; spring and autumo | |
| Condenser | Clogging of fin | Every 500 hours | |
| Compressor | Function | Every 4000 hours | |
| V belt | Damage and tension | Every 250 hours | |
| Blower motor and fan | Function (Check for abnormal sound) | When required | |
| Control mechanism | Function (Check for normal function) | When required | |
| Piping for connection | Installation condition looseness of tightening connection portions gas leakage, damage | When required | |





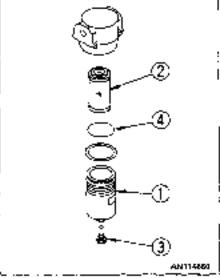
24.2.11 REPLACE ADDITIONAL BREAKER FILTER ELEMENT

- AWARNING -

Immediately after operating the engine, all parts still retain high temperature. Never replace the fifter in such condition. Replace it only after each part has sufficiently cooled.

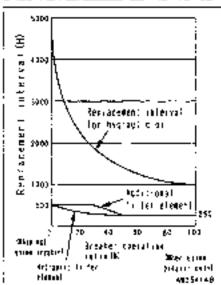
- Prepare a container for draining off oil.
- Place the container under the filter element.
- Turn filter case () counterclockwise to remove ir. Remove element (2) from the case.
- 3. Unscrew plug 3 from filter case 3:
- 4 Clean the removed parts. Mount a new element ② and O-ring ③.
- After the case reaches the filter holder, additionally tighten the case by more than a 1/2 turn.

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NOTICE

- When the breaker is used, replace the element every approx. 250 hours (when operating ratio is more than 50%), referring to the chart at the right.
- if the machine is equipped with the hydraulic breaker, be sure to install an additional filter to the return circuit.



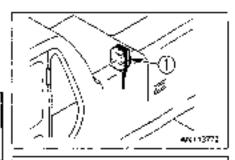
24.3 CHECK BEFORE STARTING

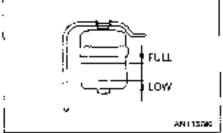
24.3.1 CHECK COOLANT LEVEL, ADD WATER

AWARNING

Do not open the radiator cap unless necessary. When checking the coolant, always check the radiator reserve tank when the engine is cold.

- Open the rear door on the left side of the machine and check that it the cooling water level is between the FULL and LOW marks on (radiator reserve tank () (shown in the diagram on the right). If the water level is low, add water through the water filler of reserve tank () to the FULL level.
- 2. After adding water, tighten the cap securely.
- If the reserve becomes empty, first inspect for water leaks and then fill the radiator and the reserve tank with water.





24.3.2 CHECK OIL LEVEL IN ENGINE OIL PAN, ADD OIL

- Open the engine hood.
- Remove dipstick \$\ointigs\$ and wipe the oil off with a cloth.
- 3. Insert dipstick @ fully in the oil filler pipe, then take it out again
- 4. The oil level should be between the H and L marks on dipstick 意。
 If the oil level is below the L mark, add engine oil through oil filler 意。

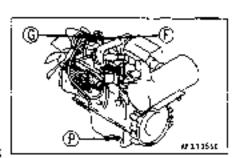
NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

- If the oil level is correct, tighten the oil filler cap securely and close the engine hood.

REMARK

When checking the oil level after the engine has been operated, for at least 15 minutes after stopping the engine before checking. If the machine is at an angle, make it horizontal before checking.





24.3.3 CHECK FUEL LEVEL, ADD FUEL

A WARNING -

When adding fuel, never let the fuel overflow. This may cause a fire. If spilling fuel, thoroughly clean up any spillage.

- When fuel filler cap is opened, float gauge will rise according to the fuel level.
 Check that the fuel tank is full. Check by looking into the tank and by using float gauge .
- If the tank is not full, add fuel through the fuel filler until float gauge © rises to the maximum position.
- Fuel tank capacity: 340 € 189.8 US gal. 74.8 UK gat).
- Position of tip of float gauge @ when tank is full: Approx.
 130 mm (5.1 in) from top surface of fuel tank



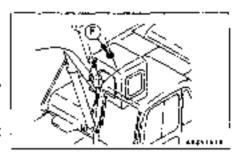
For details of the fuel to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

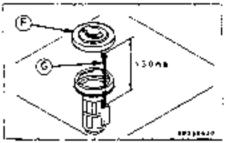
4. After adding fuel, push float gauge @ streight down with fuel filler cap @. Be careful not to get float gauge @ caught in the tab @ of fuel filler cap @, and tighten fuel filler cap @ securely.

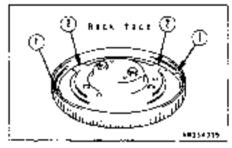
REMARK

If breather hole \odot on the cap is clogged, the pressure in the tank will drop and fuel will not flow.

Clean the hole from time to time.







24.3.4 CHECK OIL LEVEL IN HYDRAULIC TANK, ADD OIL

▲WARNING -

- When removing the oil filler cap, oil may spurt out, so turn the cap slowly to release the internal pressure before removing the cap.
- If oil has been added to above the H mark, stop the engine and wait for the hydraulic oil to cool down, then drain the excess oil from drain plug @.
- If the work equipment is not in the condition shown in the diagram on the right, start the engine run the engine at low speed, retract the arm and bucket cylinders, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.
- Within 15 seconds after stopping the engine, move each control lever (work equipment and travell to full stroke in all directions to release the internal pressure.
- Check sight gauge ③. The oil level is normal if between the H and L marks.



Do not add oil if the level is above the H line. This will damage the hydraulic equipment and cause the oil to spurt out.

If the level is below the L mark, add oil through oil filler ②.

NOTICE

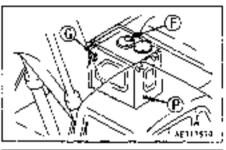
For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

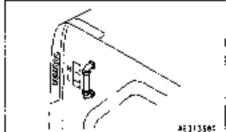
REMARK

The oil level will vary depending upon the oil temperature. Accordingly, use the following as a guide:

- Before operation; around L level (Oil temperature 10 to 30°C (50 to 85°F));
- Normal operation: around H level (Oil temperature 50 to 80°C 1122 to 176°F).

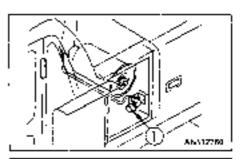


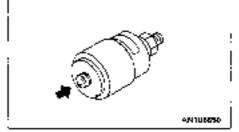




24.3.5 CHECK DUST INDICATOR

- Open the engine hood, check that the red piston is not showing in dust indicator <a>\tilde{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\te}\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi{\text{\texi{\texi{\texi{\texi}\tex{\texi{\texi{\texi{\texi{\texi{\texi{\texi{\texi{\texi{\texi\t
- If the red piston has appeared, clean or replace the element immediately,
 - For details of the method of cleaning the element, see "24.2.1 CHECK, CLEAN AND REPLACE AIR CLEANER ELEMENT".
- After checking, cleaning, and replacing, press the knob of dust indicator (i) to return the red piston to its original position.





24,3.6 CHECK ELECTRIC WIRINGS

- 🛕 WARNING -

- If fuses are frequently blown or if there are traces of short circuit on the electrical wiring, locate the cause and carry out repair.
- Accumulation of flammable material (dead leaves, twigs, grass, etc.) around the battery may cause fire, so always check and remove such material.
- 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 for damage and wrong capacity of the fuse and any sign of disconnection or short circuit in the electric wiring. Check also for loose terminals and tighten any loose parts.

Check the wiring of the "battery", "starting motor" and "alter nator" carefully, in particular.

When carrying out walk-around checks or checks before starting, always check if there is any accumulation of flammable material around the battery, and remove such flammable material.

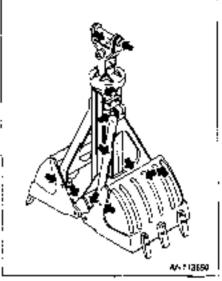
Please contact your Komatsu distributor for investigation and correction of the cause

24.3.7 CHECK FUNCTION OF HORN

- Turn the starting switch to the ON position.
- Confirm that the horn sounds without delay when the horn bottom is pressed. If the horn does not sound, ask your Komatsu distributor for repair.

24.3.8 LUBRICATE CLAMSHELL BUCKET (12 POINTS)

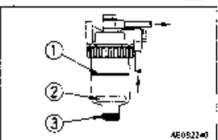
- Prepare a grease pump.
- Place the work equipment on the ground in a stable posture and stop the engine.
- Using a grease gun, pump in grease through the grease fittings (12 points) shown by arrows.
- 3. After greasing, wipe off any old grease that was pushed out.



24.3.9 CHECK FOR WATER AND SEDIMENT IN WATER SEPARATOR, DRAIN WATER (OPTION)

The water separator separates water mixed in the fuel, if float 2^n is at or above red line \oplus , drain the water according to the following procedure:

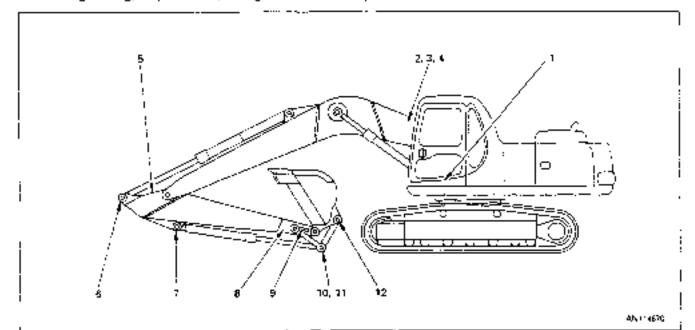
- Loosen drain plug (3) and drain the accumulated water until the float reaches the bottom.
- 2. Tighten drain plug ③.
- If the air is sucked into fuel line when draining and water, be sure
 to bleed air in the same manner as for the fuel filter. See 124.6
 EVERY 500 HOURS SERVICE".



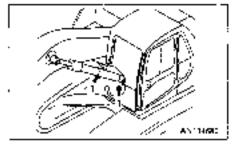
24.4 EVERY 100 HOURS SERVICE

24.4.1 LUBRICATING

- If any abnormal noise is generated from any greasing point, carry out greasing regardless of the greasing interval.
- Carry out greasing of greasing points 1 7 every 10 hours for the first 100 hours on a new machine.
- Set the work equipment in the greasing posture below, then lower the work equipment to the ground and stop the engine.
- Using a grease pump, pump in grease through the grease fittings shown by arrows.
- 3. After greasing, wipe off any old grease that was pushed out.



Boom cylinder foot pin 12 points).

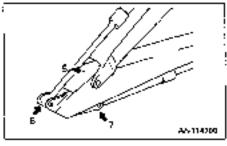


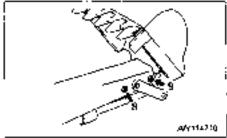
- 2. Boom foot pin (2 points)
- 3. Boom cylinder rod end (2 points)
- Arm cylinder foot pin (1 paint).

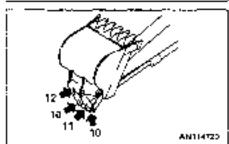


- Boom-Arm coupling pin (1point).
- Arm cylinder rod end (1 point).
- 7. Bucket cylinder foot pin (1 point)
- Arm-Link coupling pin (1 point).
- 9. Arm-Bucket coupling pin (1 point)

- 10. Link coupling pin (2 points)
- 11. Bucket cylinder rod end (1 point)
- Bucket-Link coupling pin (1 point)





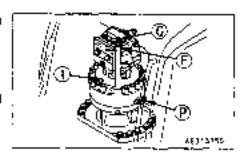


24.4.2 CHECK OIL LEVEL IN SWING MACHINERY CASE, ADD OIL

- 🕰 WARNING ---

The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before carrying out this check.

- 2. Insert dipatick (a) fully in the guide.
- When dipstick @ is pulled out, if the oil level is between the H
 and L marks of the gauge, oil level is proper.



 If the oil does not reach the L mark on dipatick @, add engine oil through dipatick insertion hole E.
 When refilling, remove pleeding plug (i).

NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

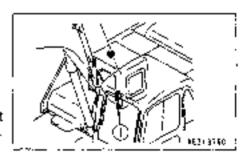
- If the oil level exceeds the H mark on the dipstick, loosen drain valve (P) to drain the excess oil.
- After checking oil level or adding oil, insert the dipstick into the hole and install air bleeding pfug (i).

24.4.3 DRAIN WATER AND SECIMENT FROM FUEL TANK

- Carry out this procedure before operating the machine.
- 2. Prepare a container to catch the fuel that is drained.
- Open valve ① at the bottom of the tank and drain the sediment and water that has accumulated at the bottom together with fuel.
 When doing this, be cateful not to get fuel on yourself.
- 4. When only clean fuel comes out, close drain valve ①...



Never use trichlene for washing the inside of the tank.



24.5 EVERY 250 HOURS SERVICE

24.5.1 CHECK OIL LEVEL IN FINAL DRIVE CASE, ADD OIL

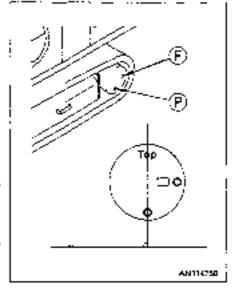
AWARNING -

- The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before starting the operation.
- If there is still pressure remaining inside the case, the oil or plug may fly out.
 - Loosen the plug slowly to release the pressure.
- Prepare a handle.
- Set the TOP mark at the top, with the TOP mark and plug @ perpendicular to the ground surface.
- Asmove plug (F) using the handle. When the oil level reaches a
 point 10 mm below the bottom of the plug hole, the correct
 amount of oil has been added.
- If the oil level is too low, install plug (F), operate the travel levers, and drive forward or in reverse to rotate the sprocket one turn.
 Then repeat Step 2 to check again.
- If the oil level is still roo low, add engine oil through the hole in plug ② until the oil overflows.

NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

After checking, install plug (£).



24.5.2 CHECK LEVEL OF BATTERY ELECTROLYTE

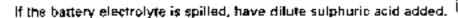
- 🕰 WARNING :

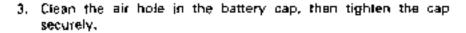
- To avoid gas explosions, do not bring fire or sparks near the battery.
- Battery electrolyte is dangerous. If it gets in your eyes or on your skin, wash it off with large amounts of water, and consult a doctor.

Carry out this check before operating the machine.

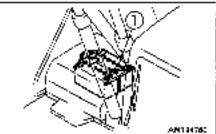
- Open the battery box cover on the right side of the machine.
- Remove cap ①, and check that the battery electrolyte is up to the UPPER LEVEL line. If the level is low, add distilled water to the UPPER LEVEL line.

Do not add water above the UPPER LEVEL line. This may cuase leakage of the electrolyte, which may cause fire.





When adding distilled water in cold weather, add it before starting operations in the morning to prevent the electrolyte from freezing.



24.5.3 CHANGE OIL IN ENGINE OIL PAN, REPLACE ENGINE OIL FILTER CARTRIDGE

Perform this maintenance every 500 hours on machines equipped with bypass filter.

AWARNING

The oil is at high temperature after the engine has been operated, so never change the oil immediately after finishing operations. Weit for the oil to cool down before changing it.

Prepare the following

- Container to catch drained oil: Min 24 & capacity.
- Refill capacity: 24 € (6.34 US gal, 5.28 UK gal).
- Filter wrench

- Check the drained oil, and if there are excessive metal particles or foreign material, please contact your Komatsu distributor.
- Install drain plug ®.
- Open the engine hood. Using the filter wrench from the upper side of the engine, turn filter cartridge () counterclockwise to remove it.
 - In particular, if this operation is carried out immediately after stopping the engine, a large amount of oil will come out, so wait for 10 minutes before starting the operation.
- Clean the filter holder, coat the packing surface of a new filter cartridge with engine oil for coat it thinly with grease), then install it to the filter holder.

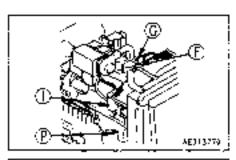
REMARK

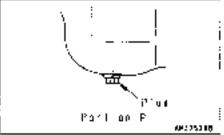
Confirm that no remnants of old packing still adhere to the filter holder as this may result in oil feakage.

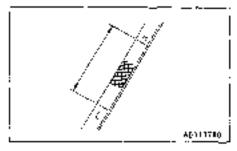
- When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it up 3/4 of a turn.
- B. After reptacing the fitter cartridge, add engine oil through oil tiller 更 until the oil tevel is between the H and L marks on dipstick ⑤.

NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".







 Run the engine at idling for a short time, then stop the engine, and check that the oil level is between the H and L marks on the dipstick, For details, see "24.3 CHECK BEFORE STARTING".

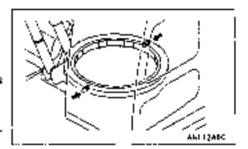
NOTICE

Even if the machine has not been operated for 250 hours, the oil and filter cartridge must be replaced when the machine has been operated for 6 months.

In the same way, even if the machine has not been operated for 6 months, the oil and filter cartridge must be replaced when the machine has been operated for 250 hours.

24.5.4 LUBRICATE SWING CIRCLE (2 POINTS)

- 1. Lower the work equipment to the ground.
- Using a grease gun, pump in grease through the grease fittings shown by arrows.
- 3. After greasing, wipe off all the old grease that was pushed out.



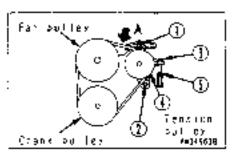
24.5.5 CHECK FAN BELT TENSION, ADJUST

Checking

The belt should normally deflect by about 5 - 6 mm (0.20 - 0.24 in) when pressed with the finger (with a force of approx. 6 kg (13 lb) at a point midway between the lan pulley and tension pulley.

Adjusting

- Loosen bolts and nuts (5) and (2).
- Loosen locknut (§) and use adjustment bolt (§) to move tension pulley (§) to adjust the bett tension so that the deflection is ; approx. 5 – 6 mm (0.20 – 0.24 in) when pushed at portion A (with a force of approx. 6 kg (13 lb)).
- Tighten the tock nots ③, bolts ① and nots ② to fix tension pulley ④ in position.
- 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.
- Replace 2 belts if it has stretched, leaving no allowance for adjustment, or if there is a cut or crack on belt.
- When the new belt is set, readjust it after operation for an hour.



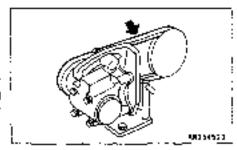
24.5.6 CHECK AIR CONDITIONER COMPRESSOR BELT TENTION, ADJUST

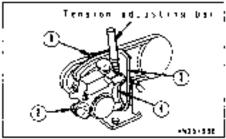
Checking

The belt should normally deflect by about 5 – 8 mm (0.20 – 0.31 in) when pressed with the linger lwith a force of approx. 6kg (13 lb)) at a point midway between the drive pulley and compressor pulley.

Adjusting

- Insert a tension adjusting bar wrapped with cloth or another cushioning material between brackets (§), and (§).
- Loosen bolts (i) and (ii).
- Move bracket (a) with the tension adjusting bar so that the deflection of the balt will be 5 - 8 mm (0.20 - 0.31 in).
- Tighten bolts (1) and (2) to secure bracket (3). Then, take out the tension adjusting bar.
- 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.
- Replace belt if it has stretched, leaving no allowance for adjustment, or if there is a cut of crack on belt.
- When the new belt is set, readjust it after operation for an hour.





24.6 EVERY 500 HOURS SERVICE

Maintenance for every 100 and 250 hours should be carried out at the same time.

24.6.1 REPLACE FUEL FILTER CARTRIDGE AND ADDITIONAL FUEL FILTER CARTRIDGE (OPTION)

- AWARNING -

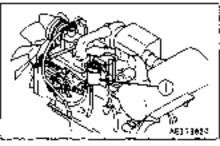
- Engine is at high temperature immediately after the machine has been operated. Wait for engine to cool down before replacing the filter.
- Do not bring fire or sparks near the fuel.

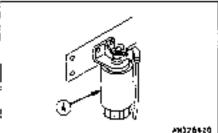
Prepare a filter wrench and a container to catch the fuel.

- 1. Set the container to catch the fuel under the filter cartridge.
- Using a filter wrench, turn filter cartridge (i) and (i) counterclockwise to remove it.
- Clean the filter holder, fill a new filter cartridge ① with clean fuel, coat the packing surface with engine oil, then install it to the filter holder.
- 4. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it up 1/2 of a turn.
- Clean the additional filter holder, fill a new additional cartridge.
 with clean fuel, cost the packing surface with engine oil, then install it to the filter holder.
- When installing, tighten until the packing surface contacts the seal surface of the additional filter holder then tighten it up 2/3 of a turn.

If the filter cartridge is tightened too far, the packing will be damaged and this will lead to leakage of fuel. If the filter cartridge is too loose, fuel will also leak from the packing, so always tighten to the correct amount.

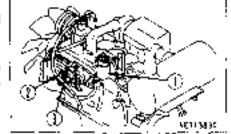
After replacing the fuel filter cartridge, bleed the air.Bleed the air according to the following procedures.





Normal air bleeding procedure

- 11) Add fuel to the fuel tank until full ito FULL mark on the fuel gauge).
- (2) After replacing filter cartridge ①, loosen joint bolt ③.
- (3) Loosen the knob of feed pump ②, and move it up and down about 50 – 60 times to cause fuel to overflow until bubbles do not come out from the joint bolt any more.
- (4) Tighten joint balt 🕃 .



NOTICE

Do not rotate the starting motor continuously for more than 20 seconds. Wait for 1 = 2 minutes before rotating again.

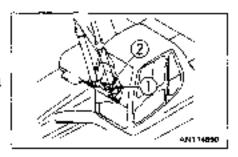
REMARK

When the engine stops because of running out of fuel, also operate the feed pump according to the above procedure to bleed air.

24.6.2 CHECK SWING PINION GREASE LEVEL, ADD GREASE

Prepare a scale.

 Remove bolts ① (2 bolts) on the top of the revolving frame and remove cover ②.



- Insert a scale into the grease and check that the height of the grease in the portion where the pinion passes is at least 28 mm 11.1 in). Add more grease if necessary.
- Check if the grease is milky white. If it is milky white, it is necessary to change the grease. Please contact your Komatsu distributor.

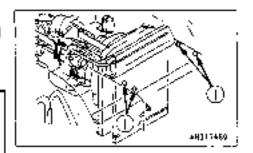
The total amount of greese is 21 £ (18.9 kg) (5.5 US gal, 4.6 UK gal (41.7 lb))

4. Install cover (2) with bolts (1).

24.6.3 CLEAN AND INSPECT RADIATOR FINS, OIL COOLER FINS AND CONDENSER FINS (ONLY FOR MACHINES EQUIPPED WITH AIR CONDITIONER)

- AWARNING -

If compressed air, steam, or water hit your body directly, there is danger of injury. Always wear protective glasses, mask, and safety shoes.



- Open the engine hood and rear door on the left side of the machine. Loosen 4 bolts ① and remove the radiator front cover.
- Blow off mud, dust or leaves clogging the radiator fins and oil cooler fins using compressed air.

At the same time, clean the net in front of the oil cooler.

Clean the condenser fins on machines equipped with the air

Steam or water may be used instead of compressed air. After cleaning, install the cover with bolts (\tilde{i}) .

 Check the rubber hose. Replace with a new one if the hose is found to have cracks or to be hardened by ageing.
 Further, check hose clamps for looseness.

NOTICE

conditioner.

To prevent damage to the fins, apply compressed air from and appropriate distance. Damaged fins may cause water leakage or overheating, in a dusty site, check the fins daily, irrespective of the maintenance interval.

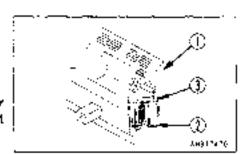
24.6.4 CLEAN INTERNAL AND EXTERNAL AIR FILTERS OF AIR CONDITIONER SYSTEM (ONLY FOR MACHINES EQUIPPED WITH AIR CONDITIONER)

- Internal air filter (2) and external air filter (3) are at the left lower portion of seat rear cover (3). Remove the filter cover and pull out the filters.
- Clean filters ② and ③ with compressed air. If there is oil on the filter or it is extremely dirty, wash it in a neutral washing agent, After washing it, dry it completely before using it again.

If a clogged filter cannot be cleaned with air or water, replace it with a new one.



The normal cleaning interval is 500 hours. However, if the filters are used at a dusty site, shorten this interval.

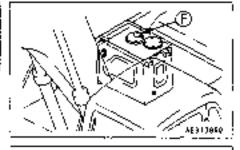


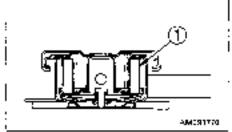
24.6.5 REPLACE HYDRAULIC TANK BREATHER ELEMENT

- 🕰 WARNING -

Wait for the oil to cool down before replacing the breather element. When removing the oil filler cap, turn it slowly to release the internal pressure, then remove it carefully.

- Remove the cap of oil filler E.
- Replace element ① inside the cap with a new one.





24.6.6 REPLACE HYDRAULIC FILTER ELEMENT

▲WARNING -

When removing the oil filler cap, turn it slowly to release the internal pressure before removing it.

- Remove the cap from oil filler (É), and release the internal pressure.
- Loosen 4 bolts, then remove cover ①.
 When doing this, the cover may fly out under the force of spring ②, so hold the cover down when removing the bolts.
- After removing spring ② and valve ③, take out element ④.
- Clean the removed parts in diesel oil.
- Install a new element in the place where old element @ was installed.
- Set valve ③ and spring ② on top of the element.
- Set cover ① in position, push it down by hand, and install the cover with the mouning bolts.
- 8. Screw in the oil filler cap and install the cover.
- To bleed the air, start the engine according to "12.2 STARTING ENGINE" and run the engine at low idling for 10 minutes.
- 10. Stop the engine.

REMARK

Operate the machine after halting for more than 5 minutes to eliminate bubbles in the oil inside the tank.

11. Check for oil leakage and wipe off any spilled oil.

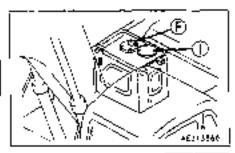
When the hydraulic breaker is installed, the hydraulic oil deteriorates sarlier than in normal bucket digging work.

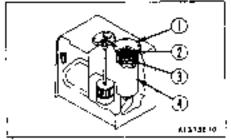
The first element replacement should be at 100 to 150 hours for new machines. Thereafter, replace the element according to the table on the right,

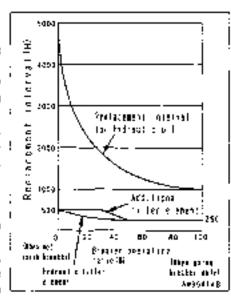
Replace the additional filter element for the breaker every approx. 250 hours (when breaker operating ratio is more than 50%) according to the table on the right. (See "24.2.11 REPLACE ADDITIONAL BREAKER FILTER ELEMENT".)

NOTICE

- If the machine is equipped with the hydraulic breaker, be sure to install an additional filter to the return circuit.
- When it is obliged to use the breaker horizontally in a tunnel, etc., check the hydraulic oil periodically by OIL CLINIC to prepare and to carry out the oil replacement program matched to the jobsite.







24.7 EVERY 1000 HOURS SERVICE

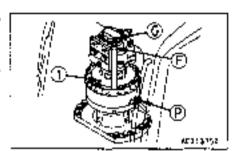
Maintenance for every 100, 250 and 500 hours should be carried out at the same time.

24.7.1 CHANGE OIL IN SWING MACHINERY CASE

▲WARNING

The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before carrying out maintenance.

- Container to catch drained oil: Min. 5.5 f capacity.
- Refill capacity: 5.5 £ (1.45 US gal, 1.21 UK gal).
- Set an oil container under drain valve (2) under the machine body.
- Loosen drain valve @ under the body, drain the oil, then tighten the drain valve again.
- Remove dipatick @ and bleeding plug ①.
 Add the specified amout of engine oil through gauge hole ⑥.



NOTICE

For details of the oil to use, see 120. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE.

- After refilling, install bleeding plug ①.
- 5. Wipe off oil on the dipstick with a cloth.
- Insert dipatick @ into the gauge pipe thoroughly and then pull out it again.
- When the oil level is between the H and L marks, on dipstick ⑤,
 it is normal. If the oil does not reach the L mark, add more oil
 through oil filter ⑥.
- If the oil level exceeds the H mark, drain the excess engine oil from drain valve P, and check the oil level again.

24.7.2 CHECK OIL LEVEL IN DAMPER CASE, ADD OIL

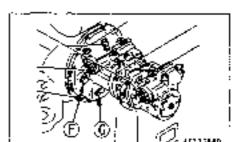
AWARNING -

The oil is at high temperature immediately afater the machine has been operated. Wait for the oil to cool down before carrying out maintenance.

NOTICE

Park the machine on flat ground and stop the engine. After walting for more than 30 minutes after stopping the engine, check the oil level.

- 1. Open the door on the right side of the machine.
- 2. Remove plug @ and check the oil level. If the oil is up to near the bottom of the plug hole, it is normal. If Insufficient, remove plug @ and add oil through the hole of plug @ up to the bottom of the plug @ hole.



NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

NOTICE

If excess oil is supplied, drain it to the specified amount to avoid overheating.

- Install plugs @ and ①.
- 4. Close the door.

24.7.3 CHECK ALL TIGHTENING PARTS OF TURBOCHARGER

Contact your Komatsu distributor to have the tightening portions checked.

24.7.4 CHECK PLAY OF TURBOCHARGER ROTOR

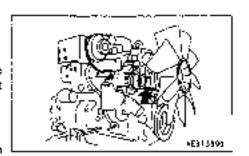
Ask Komatsu distributor to check the play of the turbocharger rotor.

24.7.5 CHECK ALTERNATOR BELT TENSION AND REPLACE ALTERNATOR BELT

Special tools are required for inspection and replacement of the alternator belt. Contact your Komatsu distributors for inspection and replacement.

REMARK

Since the auto-rensioner alternator belt is installed, its tension does not need to be adjusted.



24.7.6 REPLACE CORROSION RESISTOR CARTRIDGE

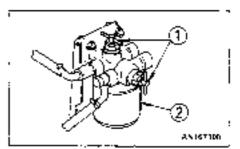
-▲WARNING-

If the engine has been operated, all parts will be at a high temperature, so never try to replace the cartridge immediately after stopping the engine.

Always wait for the engine and other parts to cool down.

Prepare the following.

- Container to catch drained coolant
- Filter wrench
- C)ose valves (*).
- Set a container to catch the coolant under the cartridge,
- 3. Using a filter wrench, remove cartridge ②.
- Clean the filter holder, coat the packing surface and thread of the new cartridge with engine oil, then install it to the filter holder.
- 5. When installing, tighten until the packing surface contacts the seal surface of the filter holder, then tighten it up 2/3 of a turn. If the filter cartridge is tightened too far, the packing will be damaged and this will lead to leakage of coolant. If the filter certridge is too loose, coolant will also leak from the packing, so always tighten to the correct amount.
- Open valves ①.
- After replacing the cartridge, start the engine and check for any leakage of water from the filter seal surface. If there is any water leakage, check if the cartridge is tightened properly.



24.8 EVERY 2000 HOURS SERVICE

Maintenance for every 100, 250, 500 and 1000 hours should be carried out at the same time.

24.8.1 CHANGE OIL IN FINAL DRIVE CASE

- AWARNING -

- The oil is at high temperature immediately after the machine has been operated. Walt for the oil to cool down before carrying out maintenance.
- If there is still pressure remaining inside the case, the oil or plug may fly out.

Loosen the plug slowly to release the pressure.

Prepare the following.

- Container to catch drained oil: Min. 4.2 (capacity
- Refill capacity: 4.2 & (1.11 US gal, 0.92 UK gall)
- Handle
- Set the machine with plug (f) and plug (g) perpendicular to the ground surface.
- 3. Then, supply new engine oil through oil filler (£) respectively to the specified level. (Refer to EVERY 250 HOURS SERVICE.)

REMARK

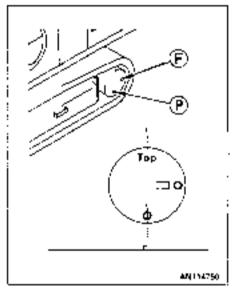
Check the O-rings in the plugs for damage, if necessary, reptace with new ones.

- Screw in plug
- Add engine oil through the hole of plug (F).

NOTICE

For details of the oil to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".

When the oil overflows from the hole of plug ∑, install plug ∑.
 Tightening torque of plugs ⊕ and ∑: 70 ± 10 Nm (7 ± 1 kgm, 50 ± 7 lbft)

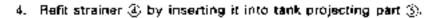


24,8.2 CLEAN HYDRAULIC TANK STRAINER

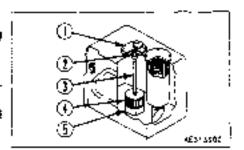
AWARNING -

The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before cleening the strainer. When removing the oil filler cap, turn it slowly to release the internal pressure, then remove it carefully.

- Loosen 4 botts, then remove cover ①.
 When doing this, the cover may fly out under the force of spring.
 ②. so push the cover down when removing the bolts.
- Pull up the top of rod 3, and remove spring 2 and strainer 4.
- Remove the dirt stuck to strainer ②, then wash it in clean dieseloil or flushing oil.
 If strainer ② is damaged, replace it with a new one.







24.8.3 CLEAN, CHECK TURBOCHARGER

Contact your Komatsu distributor for cleaning or inspection.

24.8.4 CHECK ALTERNATOR, STARTING MOTOR

The brush may be worn, or the bearing may have run out of grease, so contact your Komatsu distributor for inspection or repair. If the engine is started frequently, carry out inspection every 1000 hours.

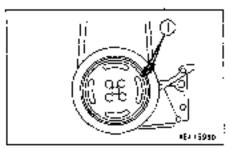
24.8.5 CHECK ENGINE VALVE CLEARANCE, ADJUST

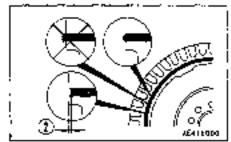
As special tool is required for removing and adjusting the parts, you shall request Komatsu distributor for service.

24.8.6 CHECK VIBRATION DAMPER

Since special tools are required for inspection and replacement of the vibration damper, contact your Komatsu distributor in the following case.

Match marks ① are stamped on the damp hub and inertial member so that deviation from each other can be checked. If they are deviated from each other by 1.6 mm (0.05 in) or more, or if there is a dent ② below the bearing metal of the damper 3.2 mm (0.13 in) or more, ask for replacement of the parts.



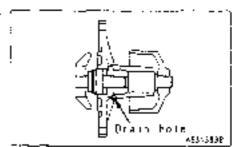


24.9 EVERY 4000 HOURS SERVICE

Maintenance for every 100, 250, 500, 1000 and 2000 hours should be carried out at the same time.

24.9.1 CHECK WATER PUMP

Since the pulley may have play, oil may leak, water may leak and the drain hole may be clogged, contact your Kometsu distributor for inspection, overhaul or replacement.



24.10 EVERY 5000 HOURS SERVICE

Maintenance for every 100, 250, 500 and 1000 hours should be carried out at the same time.

24.10.1 CHANGE OIL IN HYDRAULIC TANK

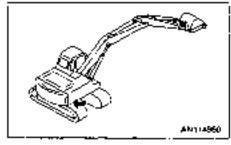
- 🕰 WARNING -

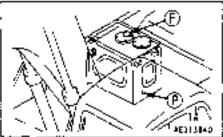
The oil is at high temperature immediately after the machine has been operated. Wait for the oil to cool down before changing the oil. When removing the oil filter cap, turn it slowly to release the internal pressure, then remove it carefully.

Prepare the following.

- Container to catch drained oil: min. 166 & capacity.
- Refill, capacity: 186 ε (43.8 US gal, 38.5 UK gal).
- Prepare a handle for the socket wrench set.
- Swing the upper structure so that the drain plug under the hydraulic tank comes at the middle of the left or right track,
- Retract the arm and bucket cylinders to the stroke end, then lower the boom and put the bucket teeth in contact with the ground.
- 3. Lock the safety lock lever and stop the engine.
- Remove the cap of oil filler (F) over the hydrautic tank.
- 5. Set the oil container under the drain plug under the mechine. Using the handle, remove drain plug ® and drain the oil. Check the O-ring installed to plug ®, and if it is damaged, replace the O-ring. After draining the oil, tighten drain plug ®. Tightening torque: 69 ± 10 Nm I7 ± 1 kgm, 51 ± 7 lbft).

When removing drain plug 🖲, be careful not to get oil on yourself.

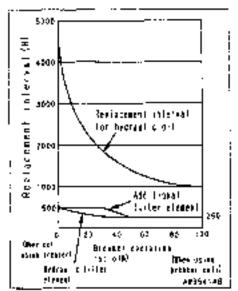




Add the specified amount of engine oil through oil filler port (£).Check that the loil level is between H and L on the sight gauge.

NOTICE

- For details of the bill to use, see "20. USE OF FUEL, COOLANT AND LUBRICANTS ACCORDING TO AMBIENT TEMPERATURE".
- If the machine is equipped with the hydraulic breaker, be sure to install an additional fifter to the return circuit.
- When the hydraulic breaker is installed, the hydraulic oil detederates earlier than in normal bucket digging work. Therefore, replace the hydraulic oil according to the chart at the right.
- After replacing hydrautic oil and cleaning or replacing filter element and strainer, bleed air from the circuit according to the following procedure.



Air bleading procedure

Follow Steps 1 to 7 to bleed the air.

Bleeding air from pump

- Loosen air bleeding plug (f), and check that oil oozes out from the air bleed plug.
- If oil does not coze out from the plug, remove the drain hose from the pump case, and add oil through drain poπ (2) to fill the pump case with hydraulic oil.

Oil will come out from the drain hose when it is removed, so secure the mouth of the hose at a place higher than the oil level inside the hydraulic tank,

 After completion of the air bleed operation, tighten air bleeding plug ①, then install the drain hose.



If the drain hose is installed first, oil will spurt out from the hole of plug ${\mathfrak T}_{\mathbb R}$

If the pump is operated without filling the pump case with hydraulic oil, abnormal heat will be generated and this may lead to premature demage of the pump.

2. Starting engine

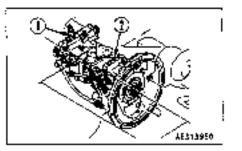
Start the engine according to "12.2 STRAT ENGINE". Keep running the engine at low idling for 10 minutes, and carry out the following procedure.

3. Bleeding air from cylinders

- Run the engine at low idling, and extend and retract each cylinder 4-5 times without operating it to the end of its stroke. (Stop approx. 100 mm (4 in) before the end of the stroke.
- 2. Next, operate each cylinder to the end of its stroke 3-4 times.
- After this, operate each cylinder 4-5 times to the end of its stroke to completely bleed the air.

NOTICE

If, at first, the engine is run at high speed or the cylinder is operated to the end of its stroke, the air inside the cylinder may cause demage to the piston packing or other parts.



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4. Sleeding air from swing motor

 Run the engine idle at a low speed for about five minutes, then loosen drain port plug ① and confirm that oil flows out.

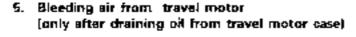
NOTICE

When doing this, do not operate the swing.

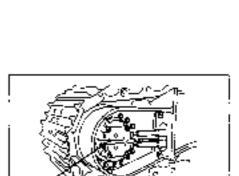
- If oil does not flow out, stop the engine and fill the motor case with hydraulic oil through drain port plug ①.
- After completion of the air bleed operation, tighten drain portplug (1).
- Run the engine at low idling, and swing 2 or more times slowly and uniformly to the left and right.

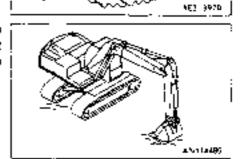


If the air is not bled from the swing motor, the bearings of the motor may be demaged.



- Run the engine at low idling, loosen air bleeding plug ①, and
 if oil flows out, tighten the air bleed plug.
- Keep the engine running at low idling, and swing the work equipment 90° to bring it to the side of the track.
- 3. Jack up the machine until the track is raised slightly from the ground. Rotate the track under no load for 2 minutes. Repeat this procedure on both the left and right sides, and rotate the track equally both forward and in reverse.





6. Bleeding air from attachment (if installed)

For machines equipped with attachments such as the breaker, actuate the attachment pedal about 10 times to blead the air completely from the attachment circuit while running the engine at low idling.

NOTICE

If the attachment bleeding procedure is specified by the manufacturer, bleed the attachment according to such procedure.

7. Operation

- After completion of bleeding the air, stop the engine, and wait for at least 5 minutes before starting operations. In this way, the air bubbles are removed from the oil inside the hydraulic tank.
- Check for any leakage of oil, and wipe off any oil that has been spilled.

SPECIFICATIONS

25. SPECIFICATIONS

PC200, 200LC-6

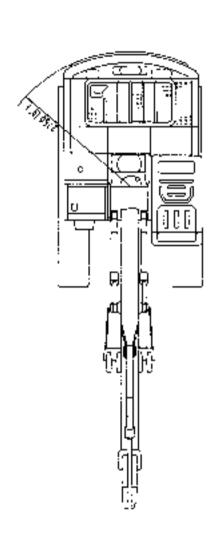
| | | PC200-5 | PC200LC-6 |
|--------------------------------------------|--------------------|-----------------------------------|-------------------------|
| WEIGHT | | | |
| Operating weight (without operator) | | 19100 kg (42120 lb) | 20500 kg (45200 lb) |
| PERFORMANCE | | | |
| Bucket capacity (standard bucket) SAE/CECE | | 0.8 m² {1,95 cu.yd\/0.7 m² | |
| • Width of opening | (Standard bucket) | 1045 mm (41 in) | |
| | (With side cutter) | 1150 mm (45 in) | |
| Travel speed | | 3.8 km/h (2.4 MPH) | |
| Swing speed | | 12.4 rpm | |
| TRACK SHOE | | | • |
| Triple grouser shoe (standard) | | 500 mm (20 in) width | 600 mm (24 in) width |
| ENGINE | | | |
| Model : | | Komatsu S6D102E-1-A diesel engine | |
| Flywheel horsepower | | 95.6 kW (128 HP)/2000 rpm | |
| Starting motor | | 24 V 4.5 kW | |
| Alternator | | 24 V 35 A | |
| ◆ Battery | | 12 V 110 Ah x 2 pieces | |

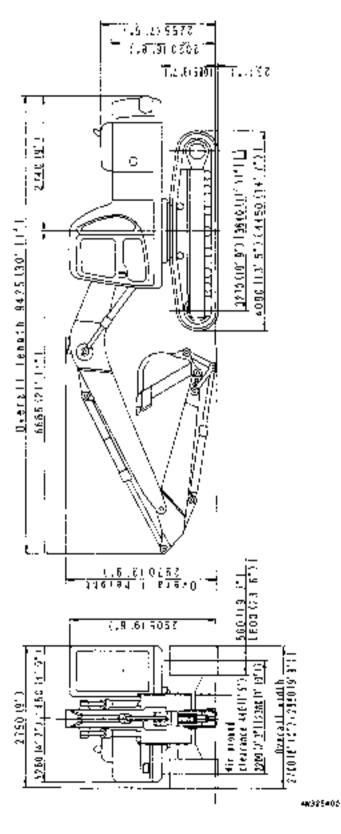
PC200, 200LC-6

The values given are the values for PC200-6 | |: Values for PC200LC-6

In cases where there are no values given in | the same as for PC200-6.

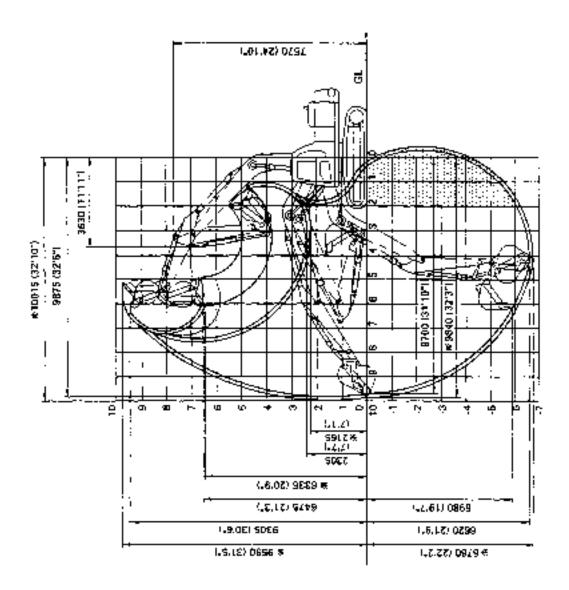
I, the values are





PC200, 200LC-6

- 1. The mark # indicates the dimensions for shovel operation.
- Never allow other person than the operator to enter the swing range (Max. swing range, Max. digging radius).



PC220, 220LC-6

| | | PC220-6 | PC220LC-6 |
|--------------------------------------------|--------------------|------------------------------------|-------------------------|
| WEIGHT | | | |
| Operating weight (without operator) | | 21700 kg (47850 lb) | 23000 kg 150720 lbi |
| PERFORMANCE | | | |
| Bucket capacity (standard bucket) SAE/CECE | | 1.0 m² (1.3 cu.ydl/0.9 m² | |
| Width of opening | (Standard bucket) | 1155 mm (45 in) | |
| | (With side cutter) | 1260 mm (50 in) | |
| Travel speed | | 3.8 km/h (2.4 MPH) | |
| Swing speed | | 12.4 rpm | |
| TRACK SHOE | | | |
| Triple grouser shoe (standard) | | 500 mm 120 in) width | 600 mm (24 in) width |
| ENGINE | | | |
| Model | | Komatau SA6D102E-1-A diesel engine | |
| Flywheel horsepower | | 114 kW (153 HP)/2100 rpm | |
| Starting motor | | 24 V 4.5 kW | |
| Alternator | | 24 V 35 A | |
| Battery | | 12 V 110 Ah x 2 pieces | |

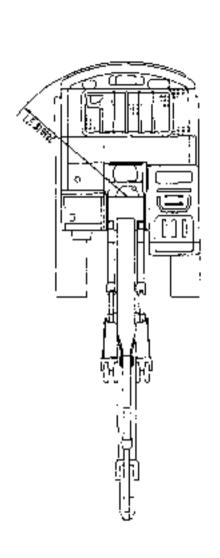
PC220, 220LC-8

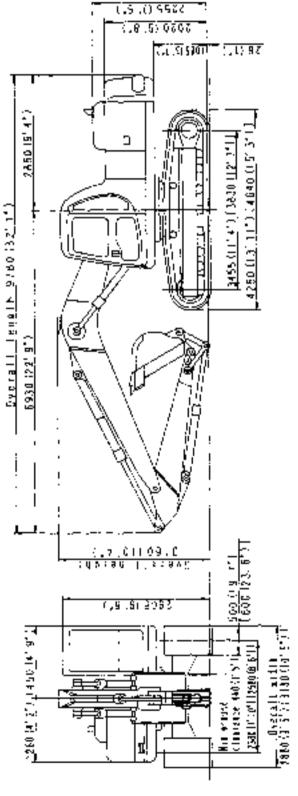
The values given are the values for PC220.

): Values for PC220LC

In cases where there are no values given in [same as for PC220.

], the values are the

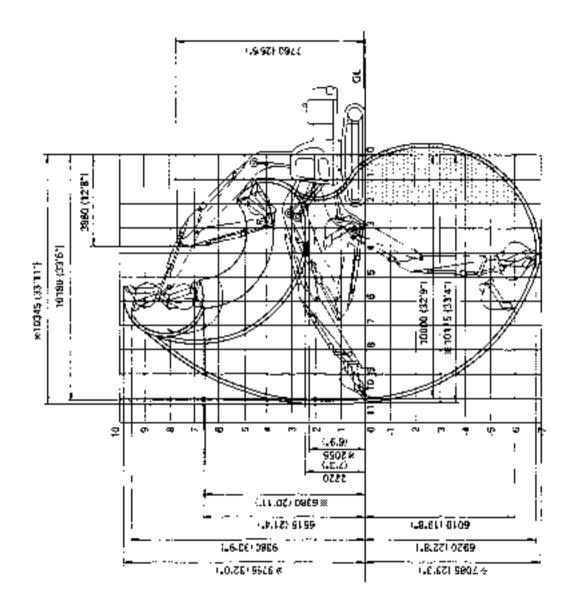




AN3254:0

PC220, 220LC-6

- 1. The mark % indicates the dimensions for shovel operation.
- Never allow other person than the operator to enter the swing range (Max. swing range, Max. digging radius).



OPTIONS, ATTACHMENTS

26. GENERAL PRECAUTIONS

26.1 PRECAUTIONS RELATED TO SAFETY

If attachments or options other than those authorized by Komatsu are instalted, this will not only affect the life of the machine, but will also cause problems with safety.

When installing attachments not listed in this Operation and Maintenance Manual, please contact your Komatsu distributor first.

If you do not contact Komatsu, we cannot accept any responsibility for any accident or failure.

- 🕰 WARNING -

Precautions for removal and installation operations

When removing or installing attachments, obey the following precautions and take care to ensure safety during the operation.

- Carry out the removal and installation operations on a flat, firm ground surface.
- When the operation is carried out by two or more workers, determine signals and follow these during the operation.
- When carrying heavy objects (more than 25 kg (65 lb)), use a crane.
- When removing heavy parts, always support the part before removing it.
 When lifting such heavy parts with a crane, always pay careful attention to the position of the center of gravity.
- It is dangerous to carry out operations with the load kept suspended. Always set the load on a stand, and check that it is safe.
- When removing or installing attachments, make sure that they are in a stable condition and will
 not fall over.
- Never go under a load suspended from a crane.
 Always stand in a position that is safe even if the load should fail.

NOTICE

Qualifications are required to operate a crane. Never allow the crane to be operated by an unqualified person.

For details of the removal and installation operations, please contact your Kometsu distributor.

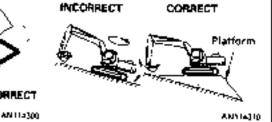
26.2 PRECAUTIONS WHEN INSTALLING ATTACHMENTS

▲ WARNING

Long work equipment reduces the stability of the chassis, so if the swing is operated on a slope, or when going down a steep hill, the machine may lose its balance and overturn. The following operations are particularly dangerous, so never operate the machine in these ways.

Traveling across slopes

- Going downhill with the work equipment raised
- INCORRECT
- Swinging the upper structure on slopes



20 - 30 cm (8 - 12 in)

ANT 12991

 If heavy work equipment is installed, the overrun of the swing becomes greater (the distance from the point where the operator operates the control levers to stop the swing to the point where the upper structure stops completely), so there is danger of mistaking the distance and hitting something.

Always operate so that there is an ample mergin to the stopping point, Furthermore, the hydraulic drift also becomes larger (when the work equipment is stopped in mid-air, it will gradually move down under its own weight).

 Always follow the correct procedure when installing the boom and arm. If the correct procedure is not followed, this may lead to serious damage or injury, so please consult your Komatsu distributor before carrying out installation.

If long work equipment is installed, the working range will suddenly become larger, so there is danger of mistaking the distance and hitting something. Always operate the work equipment so that there is ample space from any obstacles in the area.

5-3

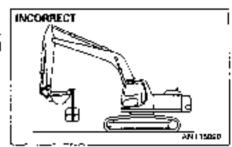
27. HANDLING BUCKET WITH HOOK

27.1 CHECKING FOR DAMAGE TO BUCKET WITH HOOK

Check that there is no damage to the hook, stopper, or hook mount. If any abnormality is found, please contact your Komatsu distributor.

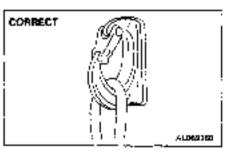
27.2 PROHIBITED OPERATIONS

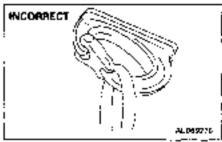
The standard work equipment must not be used for lifting loads. If this machine is to be used for lifting loads, it is necessary to install the specified bucket with hook.



27.3 PRECAUTIONS DURING OPERATIONS

- When carrying out lifting operations, reduce the engine speed and use the lifting operation mode.
- Depending on the posture of the work equipment, there is danger that the wire or load may slip off the hook.
 Always be careful to maintain the correct hook angle to prevent this from happening.
- Never steer the machine while lifting a load.
- If the bucket with hook is turned and used for operations, it with hit the arm during dumping operations, so be careful when using it.
- Loads suspended must not exceed the limit indicated in the "LIFTING CAPACITY TABLE" stuck on the right-side lower portion of the driver's seat.
- If you wish to install a hook in the future, please contact your Komatsu distributor.





28.1 SEAT BELT

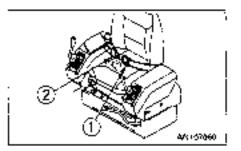
· 🕰 WARNING -

- Before fastening the seat belt, inspect the securing brackets and belt for abnormal conditions.
 Replace any worn or damaged seat belt or the securing brackets.
- Even if there appears to be no abnormality with the seat belt, always replace it once every three years. The data manufacture is woven on the reverse side of the belt.
- Adjust and fasten the seat belt before operating the machine.
- Always use sext belt when operating the machine.
- . Do not use seat belt with either half of the belt kinked.

28.1.1 FASTEN THE BELT AND REMOVE IT

- Adjust the sept so that the operator is easy to operate, with the operator's back against the backrest.
- 2. After adjusting the seat position, sit in the seat. Grip buckle (*) and tongue (*) in each hand and insert tongue (*) into buckle (*). Confirm by pulling the belt that the tongue is securely locked to the buckle.
- When removing the belt, raise the tip of buckle (i) lever to release
 it.

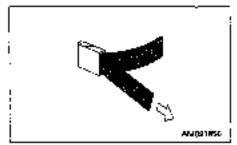
Fasten belt along your body without kinking it. Adjust the lengths of the belt on both the buckle and the tongue sides so that the buckle is located at the mid-point of your body front.



28.1.2 ADJUST THE BELT LENGTH

To shorten the blet

Pull the free end of the belt on either the buckle body or tongue side.

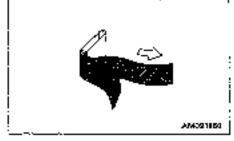


To lengthen the belt

Pull the belt while holding it at a right angle to buckle or tongue.

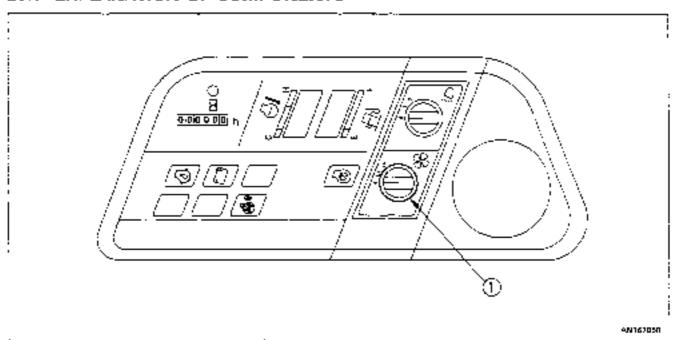
Inspect bolts and fittings on the chassis for tightness. Retighten any loose bolts to 20 to 29 Nm (2 to 3 kgm, 15 to 20 lbft) torque.

If the seat is scratched or frayed or if any of the fittings are broken or deformed from long service, replace the seat belt immediately.



29. HANDLING CAR HEATER

29.1 EXPLANATION OF COMPONENTS



The car heater utilizes the water heated by the engine. Use the car heater when the engine coolant is warmed.

1. CAR HEATER FAN SWITCH

This adjusts air-flow in 2 steps.

Hi : Strong Lo : Weak

OFF: Car heater is stopped.

29,2 PREPARING CAR HEATER

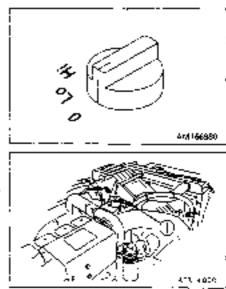
If the ambient temperature drops, use the cab heater.

When using the cab heater, turn valve \odot on the water pump counterclockwise to open it.

When leaving the cab heater unused for a long time, turn valve $\mathfrak{J}_{\varepsilon}$ clockwise to close it.

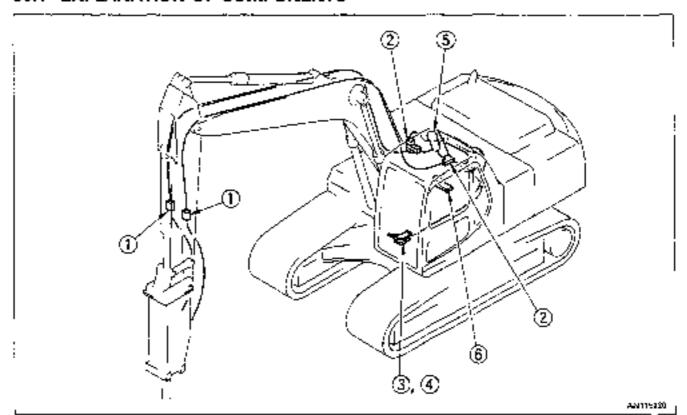
REMARK

On machines equipped with the air conditioner system, always open valve $\hat{\mathbb{T}}$:



30. MACHINES READY FOR ATTACHMENTS

30.1 EXPLANATION OF COMPONENTS



1. STOP VALVE

This valve stops the flow of the hydraulic oil.

- FREE: Hydraulic oil Hows
- LOCK: Hydraulic bil stops

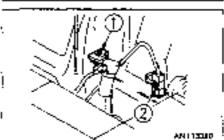
Set this valve to the LOCK position when removing or installing ! attachments.

2. SELECTOR VALVE

This switches the flow of the hydraulic oil.

For attachment to be mounted and the direction of left and right 3-way valves (i) and (2), see "30.2 HYDRAULIC CIRCUIT".





3. ATTACHMENT CONTROL PANEL

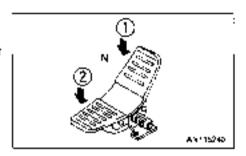
This is used to operate the attachment.

When the operator depresses the pedal at the front, neutral or real portions, the attachment moves as follows.

Hydraulic breaker

Pedal front () : actuated Pedal neutral (6) : stopped Pedal rear (2) : stopped

For other attachments, confirm with the manufacturer regarding the relation between pedal operation and attachment movement when the attachment is mounted. Use the attachment only after confirming the above.



4. LOCK PIN

This is used to lock the control pedal.

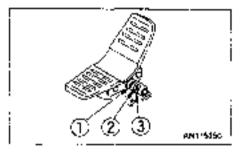
Position (D: lock

Position @: pedal half stroke position (flow: about flow of one pump).

Position @: pedal full stroke position (flow: about flow of two pumps).

- Use position 3) for ordinary work with the breaker, etc.
- Use position ③ for work with the crusher, etc. which needs a large flow

Set the lock pin at the lock position when attachment is not used.



5. ADDITIONAL FILTER FOR BREAKER

This filter prevents degradation of the hydraulic oil when the breaker is used.

Oil flows only when the selector valve is turned to the breaker position.

NOTICE

If the machine is equipped with the hydraulic breaker, be sure it to install an additional filter to the return circuit.

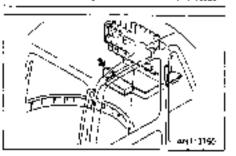


ACCUMULATOR

- 🕰 WARNING -

The accumulator is filled with high-pressure nitrogen gas, and it is extremely dangerous if it is handled in the wrong way. For handling procedure, see "11.19 HANDLING ACCUMULATOR".

The accumulator is provided to release the pressure remaining in the attachment circuit after stopping the engine. Normally, never touch it.

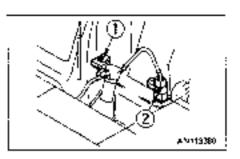


30.2 HYDRAULIC CIRCUIT

Change-over hydraulic circuit

When the machine is equipped with an attachment or a bucket, set left and right 3-way valves ① and ② as follows.

Referring to the following chart, turn the notors of left and right 3-way valves (i) and (2) using a wrench to select the attachment to be mounted and the direction of both 3-way valves. IThe arrows indicating the port direction are stamped on the 3-way valve heads.)



| Anachment | Left 3-way valve ① | Right 3-way valve ② |
|---------------|------------------------------|----------------------------|
| | Forward direction of machine | Upper direction of machine |
| Breaker etc. | | () |
| | Forward direction of machine | Upper direction of machine |
| Crusher etc. | | \bigoplus |
| | Forward direction of machine | Upper direction of machine |
| When not used | | |

NOTICE

- When the machine is equipped with the breaker, connect the return circuit directly to the return filter.
- The set pressure of the low pressure safety valve is set to 20600 kPe (210 kg/cm², 2980 psi) as standard when delivered from the factory.

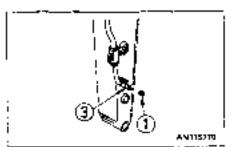
If a breaker by another manufacturer is installed, adjustment is required. Consult your Kornetsu distributor.

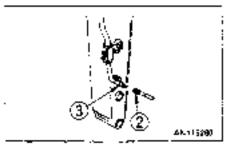
30.2.1 CONNECTING HYDRAULIC CIRCUIT

When connecting the attachment, connect the circuit as follows:

- Remove blind plugs (i) located on the end of the stop valve piping (2 places, left and right).
 - Take care not to lose or damage the removed parts.
- Connect attachment tubes ② supplied by the attachment manu-!
 facturer to the end from which the plug was removed in step 1. i

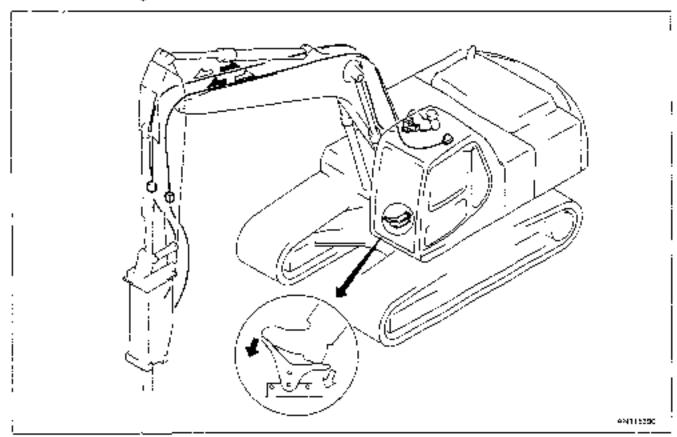
When the machine is shipped from the factory, a 1" taper seal hose is installed to tube (3). The procedure used by the attachment manufacturer if an accumulator is added is different, so please consult your Komatsu distributor.





PATH OF OIL

The direction of operation of the pedal and the path of the oil are as shown in the diagram below.

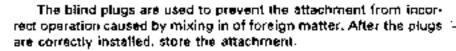


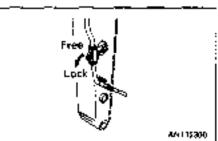
30.3 ATTACHMENT MOUNTING/DISMOUNTING PROCEDURE

DISMOUNTING PROCEDURE

- Place the attachment on the ground and stop the engine.
- After stopping the engine, operate each work equipment control lever and the attachment control pedal back and forth, left and right at full stroke 2 to 3 times to eliminate the internal pressure in the hydraulic circuit.

- After confirming low oil temperature, turn the rotor of the stop valve connected to the inlet and outlet piping on the arm side face toward the lock side.
- Remove the hoses on the attachment side. Install the blind plugs to the two outlets.

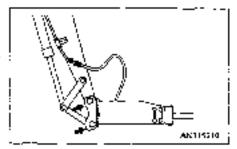




 Dismount the attachment by removing the retaining pins (2) pins). Then, mount the bucket.

For the bucket mounting procedure, see "12.14 REPLACEMENT AND INVERSION OF BUCKET".

6. After the bucket is mounted, check the hydraulic oil level,

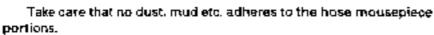


MOUNTING PROCEDURE

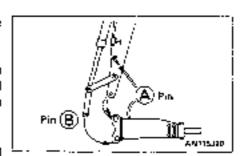
Remove the bucket.

For bucket dismounting procedure, see "12.14 REPLACEMENT AND INVERSION OF BUCKET".

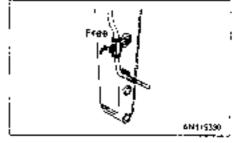
- Place the attachment on a flat place, install pins (4) and (6) to the arm in that order.
- After mounting the attachment, stop the engine. Operate each
 work equipment control lever and the attachment control pedal
 to full stroke back and forth, right and left to eliminate the
 internal pressure in the hydraulic circuit.
- After confirming low oil temperature, remove the blind plug from the outlet and inlet port respectively.



If O-ring is damaged, replace it with a new one.



- Turn the rotor of the stop valve connected to the inlet and outlet piping on the arm side face toward the free side.
- Confirm that oil level in the hydraulic oil tank is correct, after mounting the attachment.



30.4 OPERATION



Do not put your foot on the pedal except when operating the pedal. If resting your foot on the pedal during operations, and it is depressed by accident, the attachment may move suddenly and cause serious damage or injury.

The operation of the attachment is as follows.

WHEN USING BREAKER



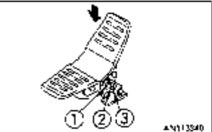
Never operate the breaker with the lock pin position ③. Otherwise such operation will affect badly to the machine and breaker in durability.

When the front portion of the padal is depressed after the lock pin is set at the position (2), the breaker is actuated.

- Use the position ② for the ordinary work with the breaker, etc.
- Use the position 3 for the work with the crusher, etc. which needs a high oil flow rate.

Precautions when using

- Check that the stop valve is at the FREE position.
- Check that the selector valve is at the position for using the breaker.
 - For details of the oil path, see "30.2 HYDRAULIC CIRCUIT".
- Consult with the attachment manufacturer as to whether the accumulator is required for the attachment circuit or not.
- For other precautions when using the breaker, see the instruction manual provided by the breaker manufacturer.
- When the breaker is used, the hydraulic oil degrades faster than in normal operation. Shorten the maintenance interval of the hydraulic oil and filter element.
 - See "23.2 MAINTENANCE INTERVAL WHEN USING HYDRAULIC BREAKER".



WHEN USING GENERAL ATTACHMENT SUCH AS CRUSHER

When the lock pin is set to the free position and the pedal is depressed at the front or rear portions, the attachment is actuated.

- Use the position 2 for the ordinary work with the breaker, etc.
- Use the position @ for the work with the crusher, etc. which needs a high oil flow rate.

Precautions when using

- Check that the stop valve is at the FREE position.
- Confirm that the selector valve is set to the position for general attachments such as the crusher.
 - For details of the pil path, see "30.2 HYDRAULIC CIRCUIT".
- For other precautions when using the attachment, see the instruction manual provided by the attachment manufacturer.



If the equipment is not to be used for a long period, do as follows.

- Set the stop valve to the LOCK position.
- Install the blind plugs and O-rings to the valves.
- Set the selector valve to the "when not use" position.
- Lock the lock pin to the lock position.

If the pedal is operated when there is no breaker or general attachment installed, it will cause overheating and other problems.

30.6 SPECIFICATIONS

Hydraulic specifications

- Max. flow when flow is joined:
 - 191 x 2 fiter/min (50 x 2 US gal/min, 42 x 2 UK gal/min)
- Safety valve relief set pressure of service valve;

27500 kPa (280 kg/cm², 3980 psi)

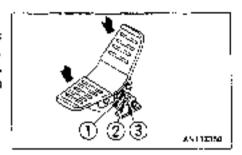
- Safety valve cracking pressure of service valve;
 - 24500 kPa (250 kg/cm², 3550 psi)
- Low pressure safety valve relief set pressure:

20500 kPa (210 kg/cm², 2980 psi)

Low pressure safety valve cracking pressure:

15200 kPa +155 kg/cm², 2200 psi)

Other than these specifications, low pressure safety valve relief set pressure of 24500 kPa (250 kg/cm², 3560 psil and low pressure safety valve cracking pressure of 20100 kPa (205 kg/cm², 2910 psi) are provided. Consult your Komatsu distributor.



31. INTRODUCTION OF ATTACHMENTS

31.1 SPECIFICATION, USE PC200, 200LC

| | | |
|-------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Name | Specifications. | , tale |
| Namew Bucket | Cepacity SAE/CECE ¢.5 r Outside width | m² -0.65 ca yak0 45 m² 750 mm (80°) |
| Namow bucket | Capacity SAE/CECE 0.6 / Dutside width | m² (3.18 du yd i)0 5 6 m² 970 mm (381) |
| Light duty trucket | Capacity SAE-CECE C & Outside wedth | m ¹ 12 18 cc.vsW0 8 m ¹ 1 200 mm (47°) |
| Light duffy bricket | Capacity SAE/CECE 1.3 Outside wedth | m" (/ \$1 ca vstat) 9 m" 13390 mm (\$2") |
| light duty bucket | Capacity SAECECE 117 Outside width | m" (158 paystal 6 m" 1450 ppm (57") |
| Stoce finishing businet | Casecity SAECECE 0.40 : Compacting width Compacting area | 5.00 mm (₁ .2.1 5.000 mm (₁ .2.1 m, 10.03 en ³ .000°52 m, |
| • | 33 | mi (\$12 ou yoli9,5 m² 165 mm (10'5') (46') 280 mm (10'9') (46') 10 mm (10')0') (45') |
| Aipper bucker | Capacity SAE/CECE 0.61 Outside wroth | m* 10,8 ps vdV0,55 m² 860 mm (37*) |
| Clamshell bucker U cedings | Capacity SAECFCF 566 Optione width Opening width | m' 10 86 cu ye./0 6 m² 886 mm (341) 1782 mm (701) |
| Ottch clauner (vycke) | Councily SAE/CECE 6.60 Quiede width | : m² (1 05 cy.ya)rû 7 m² 1800 man (71″) |
| One touth vapor bucket | Shank wireh. Crushing dapah | 106 mm (#2*) 800 mm (32*) |
| | | · — |
| : | AND AND | 20.50 |

| Neme | Specifications, use | | | |
|-------------------|---------------------------|----------------------|--|--|
| Three teath apper | Shank wydth | 90 mm (3.5°) | | |
| (Armphil | Cic)uhung depih | 640 mm (75°) | | |
| Track shoes | Triple grauser shae width | 1 90 mm (28°) | | |
| (PC200) | Triple grause shoe width | 800 mm (31 Å*) | | |
| | Plate shoe width | 810 mm (241) | | |
| | Swamp shoe width | 860 mm (341) | | |
| | Rubber shoe width | 600 mm 124"I | | |
| Track shaes | Topia grouser shoe with | 500 mm (24°) | | |
| 4PC200LCI | Triple grouser shoe withh | 800 mm (31,41) | | |
| | Treple grouser shoe width | 900 mm (35.47) | | |
| | Swamp shoe width | 860 mm (341) | | |
| | Flate state width | 610 mm (24°) | | |
| | Aubber shoe width | 600 mm (24°) | | |
| Short arm | Arm length | 2400 mm (710°) | | |
| | Max digging depth | 9 095 mm (20) | | |
| Short erm | Arm length | 1890 mm (51111) | | |
| | Mex. degging depth | 5495 mm (181) | | |
| Extension arm | Arm length | 1130 mm (3781) | | |
| | Max. digging depth | 7750 mm (25'5") | | |

PC220, 220LC

| Name | Specifications, use | | | |
|-------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--|--|
| Narrow buckes | Capacity SAE/CECE 0.72 (Cutside width | m ⁾ 10.94 cu.vdb0.65 m ⁾ 900 mm (351) | | |
| Light dury busset | Capacity SAE/0808 114 Coasite width | m ¹ (1.49 culydd1.0 m² 1200 mm (517) | | |
| Light duny bucker | Capacity SAE/0506 1.26 Outside width | m* (1.65 cu.yd81.1 m² 1490 mm (557) | | |
| Slape finishing bucker | Capacity SAE/CECE 0.40 n Compacting width Compacting area | o ⁵ 10 57 cu.ydV3.35 m² 2000 mm 1797) 2.00 m² | | |
| Trapezo-dal bucket | 1 | m² 10 72 04,9050,6 m² 165 mm (19'91) (457) 180 mm (19'91) (457) 19 mm (10'161) (457) | | |
| Aipper bucket | Capacity SAE/CECE 0.61 Outside wroth | m" (38 cuyda0.56 m" 983 (mm (37)) | | |
| Clamshell buoker ILoadingi | Capacity SAE/CECE 0.66 Curside width Copening width | m/ 10.95 ca yd50.6 m² 856 mm (34°) 1782 mm (73°) | | |
| Ditch cleaner bucket | Capaciny SA6/0808 9/80 Outside width | m" (1,03 gu yd45,7 m" 1800 ann (*11) | | |
| One tooth ripper hyskef | Shame width Crushing depth | 106 mm (36.21) 800 mm (321) | | |
| | | <u></u> | | |

| Name | Specifications, use | | | |
|--------------------|---------------------------|-----------------------|--|--|
| Three seesh ripper | Shant width | 90 m/m (3.51) | | |
| busket | Grushing depih | 640 mm (251) | | |
| Frack shoes | Tinple grouser shoe width | 700 mm (28") | | |
| (₽C2 20) | Triple grouser shoe width | 800 mm (31/47) | | |
| | Flace shoe width | 610 mm (24 °) | | |
| Track shoes | Triple grouser shop width | 6 00 mm (241) | | |
| (から2201さ) | Triple grouser shap width | 900 mm (31'4") | | |
| | Frace stype width | 610 mm (241) | | |
| Shon arm | Arm length | 2500 mm (5 2*) | | |
| | Max. digg-ng depth | 6370 m¥m (201111) | | |
| Snort arm | Arm length | 2000 mm (6°7") | | |
| | Max. digg-rig death | 5870 mm (49°31) | | |
| Long +m | Arres length | 3800 mm (#1'6") | | |
| | Max. digging death | 7350 mm (24'11) | | |

 Long-life tooth, self-sharpening tooth, track frame center guard, arm hydraulic drift prevention valve, additional headlamp, rear lamp, travel alarm etc. are also provided. Please consult your Komatsu distributor.

31.2 ATTACHMENT INSTALLATION COMBINATION TABLE

PC200, 200LC

This table lists the combination of attachments which can be installed to the long arm Israndard), short arm and extension arm.

o : Can be used

4: Can be used only for light-duty work

x: Cannot be used

NOTICE

When the extension arm is equipped, if the bucket is drawn to the machine body, the arm interferes
with the body. Operate the extension arm carefully.

When the boom is fully lowered during oblique digging, the boom interferes with the undercarriage.
 Operate the boom carefully.

Categories of use

For general digging: digging or loading sand, gravet, clay etc.

For light duty digging: digging or loading dry, uncaked earth and sand, mud etc.

For loading work: loading dry, loose earth and sand

 For digging or loading hard soil or soft rock, it is recommended that the strengthened bucket with high durability and high wear resistance be employed.

*: Equipped with side cutter

| Name of bucket | Capacity (m²) 5AB (CECE) | Outside width (mm) | Use | Standard arm (2.9 m) | Short erm (8.4 m) | Extension 8/41 (1.1 m) | Short arm (1.8 ml |
|----------------------------------------------|--------------------------------|--------------------------|-------------------------------|----------------------------|-------------------------|------------------------------|-------------------------|
| * Narrow bucket | 0.50 (0.45) | 750 (301) | Narrow digging | ۵ | 0 | c i | 9 |
| * Narrow backet | (a.60 (0.55) | 970 (38*) | Narrow digging | v | 0 | ۱ . | 9 |
| • Standard bucket | 0.8 (0.7) | 1160 (451) | General digging | ٥ | 0 | × | 0 |
| * Light duty bucket | 0.9 (0.8) | 1200 (471) | Loading | ۷ | ÷ | : × | ۵ |
| Light duty bucket | 1.0 (0.9) | 1330 (521) | Loading | к | ذ | × ; | Δ |
| Light duty bucket | 1.17 (1.0) | 1460 (571) | Loading | к | ۷. | × | Δ |
| Slope finishing bucket | 0.40 (0.35) | _ ! | Slope finishing | 0 | 0 | . × | 5 |
| Trace zoidal bucket (Variable stope type) | 0.65 (0.6) | | Trapezoidal 9habed diching | ٥ | | . × | э |
| Ripper bucket | 0.61 (0.56) | 950 (371) | Digging rocke | * | . 0 | × | Э |
| Clamshell bucket | 0.66 (0.6) | 866 (341) | Ditching, leading | 0 | C | × | 0 |
| Ditch cleaning bucket | 0.8 (0.7) | וינקו 1800 | Ditching, cleaning | l 0 | c | ! × | 0 |
| One tooth ripper | | - <u>-</u> . | Digging, removing locks | | : | i × i | 0 |
| Three teeth ripper | | - | Digging, remaying rocus | ·_ | 0 | × | 0 |

PC220, 220LC

For trimming of a slope and rolling compaction.

available

available only for light-duty work.

x : not available

NOTICE

When the boom is fully lowered during oblique digging, the boom interferes with the undercarriage.
 Operate the boom carefully.

Categories of use

For general digging. digging or loading sand, gravel, clay etc.

For light duty digging: digging or loading dry, uncaked earth and sand, mud etc.

For loading work: loading dry, loose earth and sand

 For digging or loading hard soil or soft rock, it is recommended that the strengthened bucket with high durability and high wear resistance be employed.

*: Equipped with side cutter. *1 is available only during loading operation.

| Name of bucket | Capacity (m²) SAE ICECE) | Dutside width (mm) | Use | Standard arm (3.0 m) | Long arm (3.5 m) | Short acre (2.5 m) | Short arm (2.0 ml |
|----------------------------------------------|--------------------------------|--------------------------|--------------------------------------------------|----------------------------|------------------------|--------------------------|-------------------------|
| * Yerrow bucket | 0 72 (0 65) | 900 (351) | Nerrow digging | | 0 | 3 | ٥ |
| * Standard bucket | 1.0 (0.9) | 1260 (501) | General digging | ٥ | △ •1 | 3 | · _ 0 |
| * Light duty bucket | 1,17 (1.0) | '300 (51°); | r dusk glöðind | | h | <u>-</u> | Α. |
| Light duty bucket | 1.26 (1.1) | 1400 (551) | Loading | ÷ | , | | |
| Slope finishing bucket | 0.40 (0.35) | - | For triming of a slope and rolling compaction | 0 | 0 | o | 0 |
| Trape zoidal Sucket (Variable_slope_type) | 0.55 (0.5) | - | Trapszoldai shapsd dienang | 0 | 0 | 0 | 0 |
| Ripper Ducket | 0.61 (0.56) | 95D (37*) | Digging rocks | • | s: | 0 | 9 |
| Ciamehell bucket | g.66 (Q.6) | 866 (341) | Ditching, loading | ۰ | 5 | 0 | 9 |
| Ditch cleaning bucker | 0.8 (0.7) | 1800 (715) | Ditching, cleaning | c | = | 9 | ဂ |
| One tooth ripper | - | | Eigging, removing rocks | ٥ | × | 0 | n |
| Three 198th ripper | | · | Digging, removing rocks | | × | ٥ | 0 |

31.3 SELECTION OF TRACK SHOES

Select suitable track shoes to match the operating conditions.

METHOD OF SELECTING SHOES

Confirm the category from the list of uses in Table 1, then use Table 2 to select the shoe.

Categories B and C are wide shoes, so there are limitations on their use. When using these shoes, check the precautions, then investigate and study fully the conditions of use to confirm that these shoes are suitable.

When selecting the shoe width, select the narrowest shoe possible that will give the required flotation and ground pressure. If a wider shoe than necessary is used, the load on the track will increase, and this will cause the shoes to bend, links to crack, pins to break, shoe boits to come loose, and various other problems.

Table 1

| Category | Uae | Preceutions when using |
|----------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Α | Rocky ground, riverbeds, normal soil | When traveling on rough ground where there are large obstacles such as boulders and fallen trees, reduce speed and travel slowly. |
| ē | Nerman soil, soft ground | These shoes cannot be used or rough ground where there are large obstacles such as boulders or fallen trees. If it is impossible to avoid traveling over obstacles, reduce speed to about \$72\$ speed and travel slowly. |
| c | Extremely soft ground awampy ground | Use the shoes only in places where the machine sinks and it is impossible to use A or B shoes. These shoes cannot be used on rough ground where there are large obstacles such as boulders or fallen trees. If it is impossible to avoid travelling over obstacles, reduce speed to about 1/2 speed and travel slowly. |
| г | Paved road surfaces | The shoes are flat, and the graduumility is low, so use care on slopes. |
| E | Paved road surfaces | To protect the rubber shoes, always follow the instructions given in 31.5 HANDLING RUBBER PAD SHOE. |

Table 2

| | PG280 | | PC200LC | | PC220 | | PC220LC | : |
|----------|---------------------|----------|---------------------|----------|--------------------|----------|--------------------|------------------|
| | Specifications | Саверогу | Specifications | Category | Specifications | Category | Specifications | Category |
| Stangard | 500 triple grouser | ^ . | 600 triple grouser | A | 500 triple grouser | A | 600 triple grouser | Α |
| Opman | 600 triple grouser | B | 700 triple grauser | В — | 600 triple grouser | В | 700 triple grouser | ê |
| Option | 700 triple grouser | c | 800 triple grouser | С | 700 triple grouser | 2 | 900 tripla grouses | c |
| Option | 800 triple grouser | 0 | 900 triple grouse | C C | 610 flat shoe | _3 | 900 triple greaser | c |
| Option | 350 swamp shoe | C | 860 swamp shoe | C | | | 610 flat shoe | i D |
| Option | 610 flat shae | 0 | ,610 flat shoe | D | <u> </u> | - | - | İ |
| Opt.on | 500 rubber pad shoe | Ē | 500 rubbar pad shoe | E | | | | - · - |
| Option | - | - | - | - | - | - | - - | : _ |

31.4 SELECTION OF BUCKET TEETH

Depending on the working conditions, there is danger that the adapter and teeth may break, so select from the vertical pin teeth and horizontal pin teeth to give teeth that are suitable for the purpose.

METHOD OF SELECTING TEETH

Use of vertical pin tooth

General digging: Digging, loading normal soil, such as sand, gravet, clay Light-duty digging: Digging, loading loose dry sandy soil or muddy soil.

Loading: Loading dry loosened soll.

Use of horizontal pin tooth

Heavy-duty digging: Compacting, digging hard soil, soil mixed with rocks, heavy-duty work such as

scraping

The heavy-duty bucket is a horizontal pin tooth type, so use it for heavy-duty digging.

The standard vertical pin and horizontal pin teeth can be used over a wide range, but we recommend the following teeth to match the operating conditions.

Long-life teath

Jobsites where wear life is demanded, such as when loading hard rocks.

- Jobsites where no penetration is needed, such as when working with crushed rock after blasting or ripping.
- Jobsites where heavy-duty operations are carried out, such as hitting or pulling up rocks with the tips of the teeth.

Self-sharpening teeth [horizontel pin type, vertical pin type]

Jobsites demanding penetration such as digging and loading sandy or clayey soil.

Standards for selecting horizontal pin type and vertical pin type teeth

| | | Appropriate work site | | | | |
|--------------|----------------------------|---------------------------------------------------|----------------|--------------------------------------|---------------------------------|--|
| | | Rock | Crushed stone | Clay, spread earth | 5and | |
| Heavy | Ground breaking excavation | Lateral | pin-type teeth | Lateral p-n-type Vernoal pin-typ | | |
| 1 | Scraping down | Lateral | pin-type reeth | Lateral pin-type Vertical pin-typ | e teeth e T ee lh | |
| | General excavation | | | n-type leath n-type teeth | | |
| ۶ , Light | Loading | Lateral pinitype (eeth Vertical pinitype teeth | | | | |

31.5 HANDLING RUBBER PAD SHOE

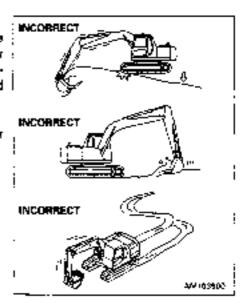
When using rubber shoes, always obey the following precautions for handling.

WORKING ENVIRONMENT

- Use the rubber pad shoes mainly for work on paved road surfaces.
 - If they are used on surfaces which are not paved, the rubber will be cut or damaged, so its durability will drop markedly. In particular, avoid the following operations.
 - Operations on broken pieces on concrete or gravel.
 - Operations on sharp protruding objects such as reinforcing iron or glass land in particular when traveling over steel sheets driven into the ground).
 - Operations traveling over the shoulder of concrete roads, and operations on rockbed or stony river bads.
- Be careful not to let the machine slip when operating on road surfaces covered with water, ice, snow, or gravel.
 Be perticularly careful when unloading the machine.
- Because of the physical properties of rubber, use the rubber pad shoe in a temperature range of -25°C to 65°C (-13°F to 149°F).

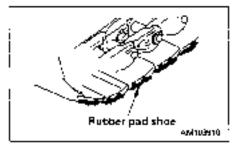
OPERATING CONDITIONS

- Operations such as those shown in the diagram where the machine is braced when working, side ditching operations, or a operations on slopes, or operations where the machine is frequently steered from side to side, there will be an excessive load on the rubber pad shoe and this will cause damage.
- If special work equipment is installed, the durability of the rubber pad shoe cannot be guaranteed.



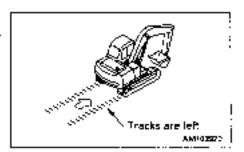
STORAGE, MAINTENANCE

- Be careful not to get oil or grease on the rubber. If there is any oil or grease on the rubber, wipe it off immediately.
- Install the rubber pad shoe continuously to all links.
 If it is not installed, it will cause excessive deformation of damage to the rubber.
- When storing the rubber pad shoe for a long time, keep it indoors out of direct sunlight or rain.

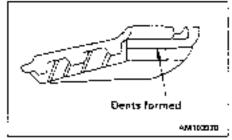


CONDITION OF DAMAGE TO RUBBER

 When traveling on concrete road surfaces, the rubber is transferred to the road surface, and leaves a black track.



 When the shoes contact each other, dents may be formed, but the shoes can still be used.

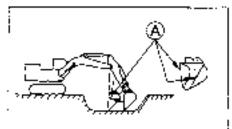


 Even if there are cuts or pieces of the rubber missing, and the shoes look in extremely bad condition, this damage does not extend immediately to the whole shoe, and it does not damage the road surface, so the shoe can be used.

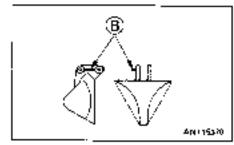
31.6 HANDLING TRAPEZOIDAL BUCKET

This bucket is used to dig trapezoidal ditches in paddy fields. I farmland etc. and it can dig 3 types of ditch gradients (45°, 40° and 38°) when a movable plate is attached.

 The mounting position of the movable plate varies depending on whether the ditch gradient is 45°, 40° or 38°.



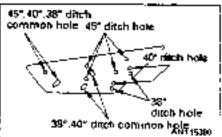
AN1 15360



HOW TO PERFORM EXCAVATION

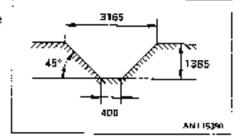
Operate the boom, the arm and the bucket to make the line (3) of the side-plate of the bucket vertical.

The guide plate (a) to check this position is installed beside the bucket pins. Accordingly, hold this plate horizontal when digging.



Ditch gradient of 45*

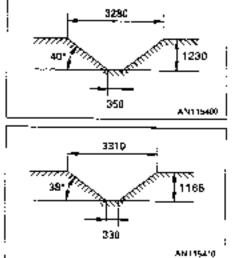
Attach the bucket only or the movable plate by selecting the related ditch holes. Perform digging by the above method.



Ditch gradient of 40° and 38°

Attach the movable plate by selecting the related ditch holes. Perform digging according to the above method.

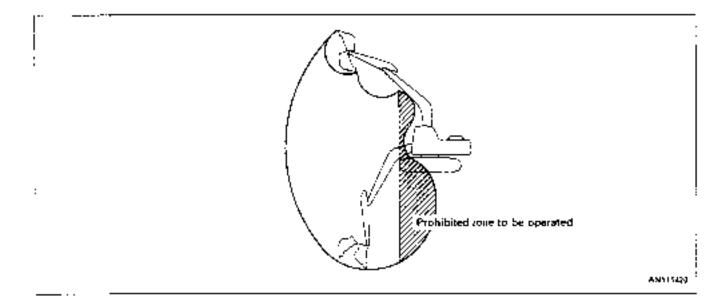
Even if the trapezoidal bucket is provided with the movable plate, always perform digging with the bucket side face perpendicular to the ground.



31.7 HANDLING EXTENSION ARM

When the extension arm is equipped, if the arm is retracted, the bucket interferes with the boom cylinder foot and the revolution frame. Be careful at operation and transportation.

- When the extension arm is equipped, use the narrow bucket (bucket width: 750 mm (30") and 580 mm (22")) without the side outter.
 - Since the standard bucket causes body instability and the bucket interferes with the operator's cab when retracting the arm, do not mount the standard bucket.
- Work in hard soil or rocky terrain will shorten the life of the extension arm, the boom and the arm.
 It is better not to use the extension arm in such conditions.



31.8 HANDLING CLAMSHELL BUCKET

This bucket is used for digging and loading in side-ditches or the confined spaces.

How to perform excavation

This clamshelf digs by pushing the boom against the ground. However, when perform bucket operation, perform digging while gradually raising the boom.

If the clamshell bucket rotates, relieve the bucket cylinder pressure then set the lever to the neutral position. This can temporarily stop the rotation.

PRECAUTIONS WHEN USING

- For safety, always avoid abrupt traveling, swing and stopping.
- Make the teeth of the bucket vertical in digging.
- Do not swing the bucket to crush the rock or to cut through solt.
- Do not use the bucket for hammering or pulling out piles etc.
- Sefore leaving the machine, open the bucket and lower is to the ground.

REMARK

Remove the bucket from the arm when transporting the machine.

32. EXTENDING MACHINE SERVICE LIFE

This section describes the necessary precautions to be observed when operating a hydraulic excavator equipped with an attachment.

NOTICE

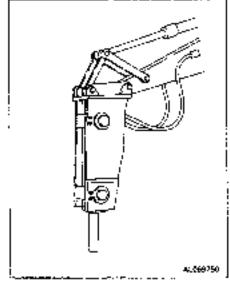
Select the attachment most suited to the machine body.

 The machine models to which attachments can be mounted vary. For selection of attachment and machine model, consult your Kornatsu distributor.

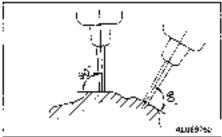
32.1 HYDRAULIC BREAKER MAIN FIELDS OF APPLICATION

- ; Crushed rock.
- Demolition work.
- Road construction

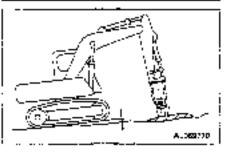
This attachment can be used for a wide range of work including demolition of buildings, breaking up of road surfaces, tunnel work, breaking up stag, rock crushing, and breaking operations in quarries.



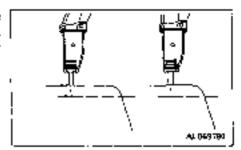
Keep the chisal pushed perpendicularly against the impact surface when carrying out breaking operations.



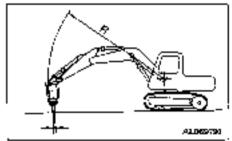
When applying impact, push the chisel against the impact surtace and operate so that the chassis rises approx. 5 cm off the ground. Do not let the machine come further off the ground than is necessary.



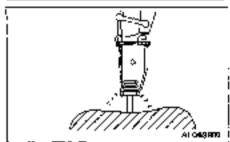
When applying continuous impact to the same impact surface, if the chisel does not penetrate or break the surface within 1 minute, change the point of impact and carry out breaking operations closer to the edge.



The direction of penetration of the chisel and the direction of the breaker body will gradually move out of line with each other, so always adjust the bucket cylinder to keep them aligned.



Always keep the chisel pressed against the impact surface properly to prevent using the impact force when there is no resistance.

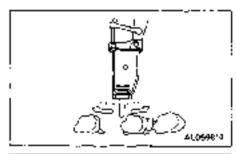


MISTAXEN METHODS OF USE

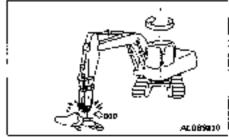
To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.

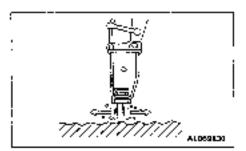
Using the mount to gather in pieces of rock



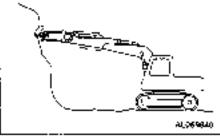
Operations using the swing force



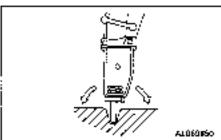
Moving the chisel while carrying out impacting operations



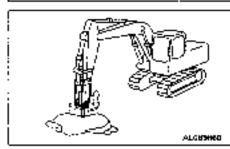
Holding the chisel horizontal or pointed up when carrying out (impacting operations



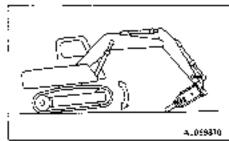
Twisting the chisel when it has penetrated the rock



Pecking operations



Extending the bucket cylinder fully and thrusting to raise the machine off the ground

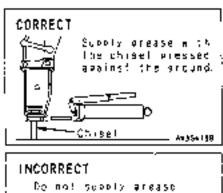


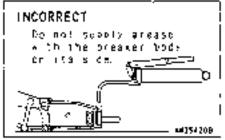
GREASING POSITION FOR HYDRAULIC BREAKER

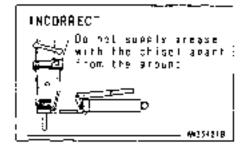
Supply grease in the correct position.

NOTICE

If grease is supplied in an incorrect position, the breaker is filled with more grease than necessary. As a result, soil and sand will enter the hydraulic circuit and can demage the hydraulic devices while the breaker is used. Accordingly, be sure to supply grease in the correct position.







32.2 POWER RIPPER MAIN FIELDS OF APPLICATION

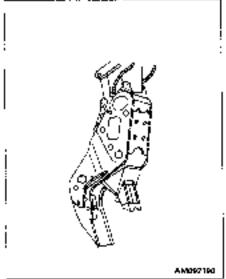
- Road repair work.
- Demolition work

This attachment can be used for a wide range of work including peeling off and crushing pavement roads, demolishing wooden houses and buildings, and crushing foundation and roadbeds.

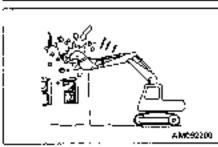
MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.



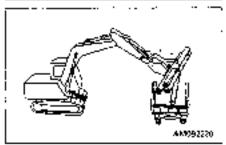
Impact operations using attachment



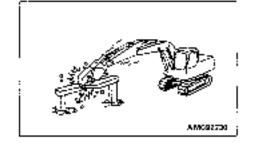
Impact operations using swing force



Overloading work equipment during lifting and loading operations



Operations using attachment to grip at an angle



32.3 FORK GRAB MAIN FIELDS OF APPLICATION

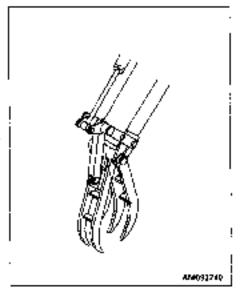
- Disposing of industrial waste.
- Disposing of demolition waste

This can be used for a wide range of work including collecting or loading demolition waste materials and debris, timber, grass etc.

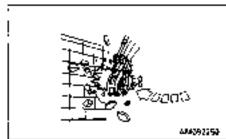
MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

Do not operate the cylinder to the end of its strake.
 Always leave approx. 5 cm (2 in) to spare.



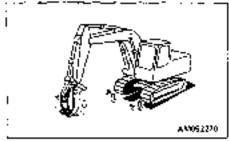
Operations using the swing force



Operations using one side of work equipment



Pushing fork into ground surface to jack up and change direction of machine



Impact operation with no load



32.4 GRAPPLE BUCKET MAIN FIELDS OF APPLICATION

- Demolition
- Disposing of industrial waste
- Forestry

This bucket is widely used for demolition including breaking-up work, grading and digging, clean-up work after natural disasters, dumping industrial waste, and forestry work, etc.

MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

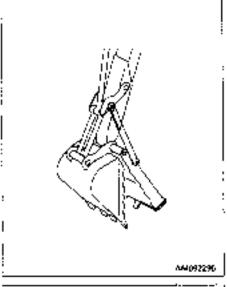
Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.

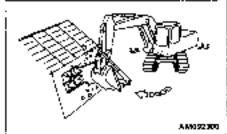
Operations using the swing force

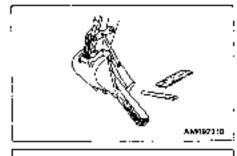
Grabbing a object using buckets on only one side

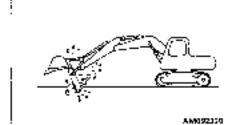
Closing the sub-bucket with the boom and arm fully extended.

Impact operation with no load











32.5 SCRAP GRAPPLE MAIN FIELDS OF APPLICATION

Disposal of rock or debris

This attachment is mounted to the arm end and used to grasp a rock, debris etc. by opening and closing the claws 13 to 5) corresponding to the extension and retraction of the hydraulic cylinder.

MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

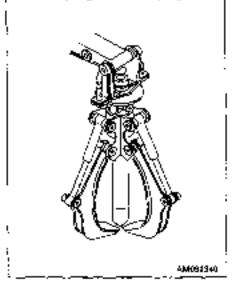
Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.

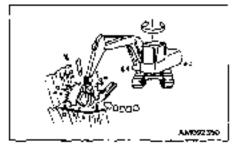


Operations using one side of work equipment

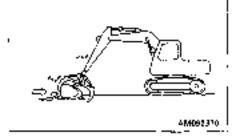
Catching and dragging with claw end

Gouging











32.6 CRUSHER & CUTTER MAIN FIELDS OF APPLICATION

- : Demolition
- Road repair work

This is the optimum attachment for demolition of steel frame reinforced structures, and for crushing of concrete blocks and rock, etc. The unique blade shape provides heavy crushing power.

MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that poperations are carried out in safety, do not operate the machine in I any of the following ways.

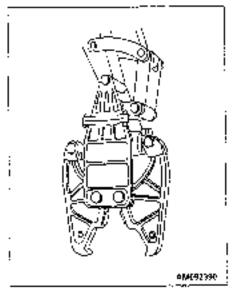
Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.

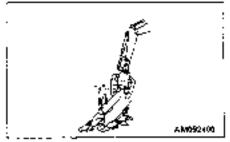


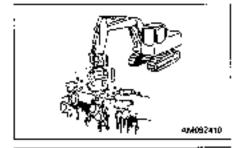
Impact operation with no load

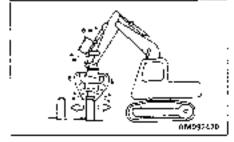
Twisting operations at end of cylinder stroke

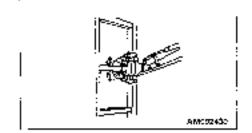
Sudden gripping and breaking operations











32.7 HYDRAULIC PILE DRIVER MAIN FIELDS OF APPLICATION

- Foundation work
- River work
- Water supply and sewerage

This is a piling machine employing the hydraulic power source of the excavator. The machine features a long arm and a chuck unit movable by 360°. This facilitates operations such as driving and removing long piles, driving in piles at comers, vertical driving etc.

MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

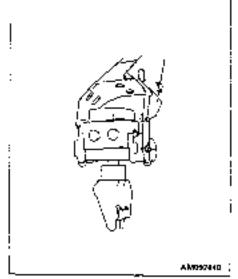
Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm (2 in) to spare.

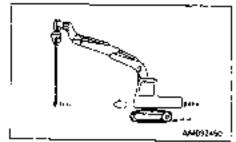
Forward or swing motion while grasping a pile

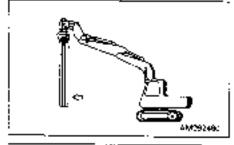
Lifting more than two piles at the same time

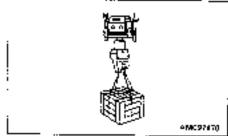
Work other than standard works

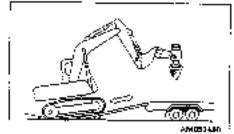
Loading or unloading a machine equipped with hydraulic pile driver











32.8 HYDRAULIC EXCAVATOR WITH MULTI-PURPOSE CRANE

MAIN FIELDS OF APPLICATION

- Site preparation
- Water supply and sewerage
- River work
- Agricultural, civit engineering work

Crane operation can be carried out without removing the bucket. This machine is used for laying U section gutters and hume pipes for water supply and sewerage as well as river and canal work, agricultural, civil engineering work and site preparation.

MISTAKEN METHODS OF USE

To ensure that the machine has a long life, and to ensure that operations are carried out in safety, do not operate the machine in any of the following ways.

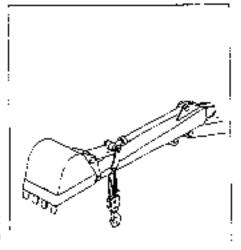
Do not operate the cylinder to the end of its stroke.
 Always leave approx. 5 cm 12 mil to spare.

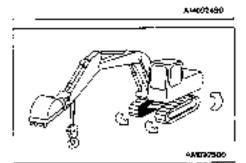
Abrupt lever operation

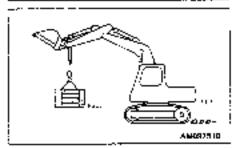
Traveling with a suspended load

Operating other work equipment during crane operation

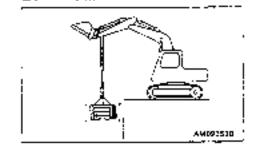
Excessive langthening of wire rope











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