OPERATION MANUAL

IC100-2

CRAWLER CARRIER

SERIAL NUMBER:
CB000201 and up

IHI

Ishikawajima Construction Machinery Co., Ltd.

PUB. No.1
0212 EC•US

SAFETY INFORMATION

We offer you basic and important rules and precautions for safe operations.

Read, understand, and observe them before starting operation. This is the most essential way to prevent accidents.
Wrong operation, inspection, or maintenance can cause personal injury or death.

Throughout this manual and on the machine, precautions are provided with ⚠ marks and classified by the words **"DANGER"**, **"WARNING"**, and **"CAUTION"** according to their extent of danger.
The classification is as follows :

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

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

⚠ CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components.

We have made every effort for you to prevent accidents during operation, however, we cannot be held responsible for predicting every kind of danger in all operating conditions.
It is the owner or user of the machine who is responsible for **ALWAYS** paying attention to operate the machine; as well as reading and understanding this manual enough to obtain the essential knowledge and skills fundamental to correct machine operation.

⚠ WARNING

- **BEFORE** inspection, operation, or maintenance of the machine, be sure to read and understand this manual.
- Incorrect operation or maintenance of the machine can cause the accident and serious injury or death.
- Keep this manual on hand during operation so that you can immediately consult it when necessary. If it should be missing or damaged, place an order from **IHI** distributor for a replacement.
- There are various kinds of federal, state, and local regulations that effect construction and industrial machinery. Since the regulations are subject to change, and differ from one locale to another, it is impossible for us to provide such information in this manual.
  It is the responsibility of the owner or user to be familiar with the regulations.
- Specifications and materials of the machine are subject to change without any obligation on the part of the manufacturer.

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FOREWORD

This manual contains safety, operation, maintenance, and adjustment information.
The procedures are designed to provide the best performance of the machine in an effective and economical way, In order to obtain it, remembers the next basic rules.

- This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

- Before inspection, maintenance or operating the machine, read and understand this manual completely.

- Since all of the explanations in this manual may not be thoroughly understood at first, repeat reading it until abilities as an operator are obtained and developed for proper operation.

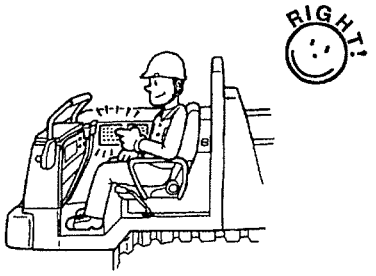
- Further abilities as an operator outside of descriptions in this manual can be obtained from the experience during normal operations and under proper supervision.

- The illustrations in this manual are used first of all to let you pay attention. They do not show all of illustrations in this manual. Because of continuing improvement and advancement of product design, the shape of machine in the illustrations may be partly different from your machine. Please understand it. Whenever a question arises regarding your machine, or this publication, please consult your local **IHI** distributor for the latest available information.

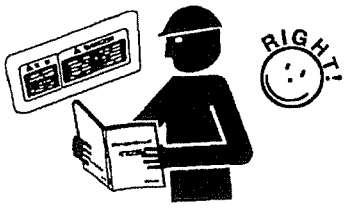
1 SAFETY

1 - 1 GENERAL

READ AND UNDERSTAND THE WARNINGS SIGNS AND LABELS

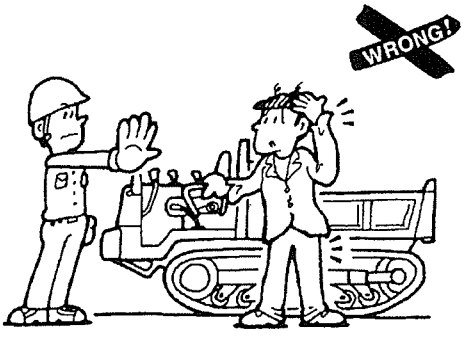


There are several specific safety signs on your machine. Please take the time to familiarize yourself with these safety signs.
Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.



You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part.
See your **IHI** dealer for new labels.

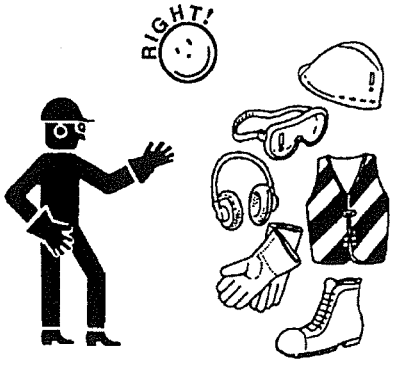
OPERATOR SHOULD BE IN GOOD HEALTH.



Operator should be physically and mentally alert, which is one of the best insurance against an accident.

NEVER operate the machine under the influence of alcohol, medication, or intoxication.

WEAR PROPER WORKING CLOTHES.



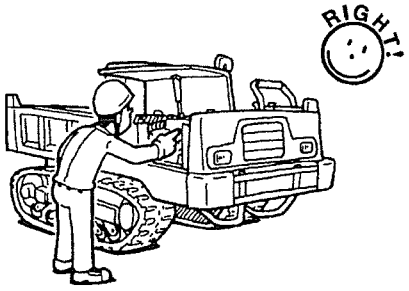
Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the machine.

Make certain all protective guards and covers are secured in place on the machine.

PERFORM "WALK-AROUND" INSPECTION.

Walk around the machine to check safety guards, plates, and other related parts are set in place. Do not attempt to operate the machine when any unsafe condition is detected.

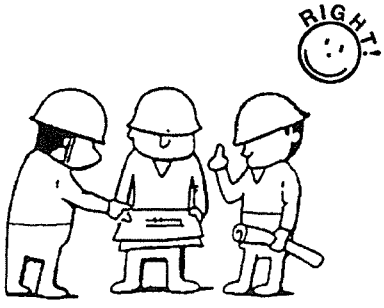


NEVER ASSUME ANYTHING GUARANTEED.

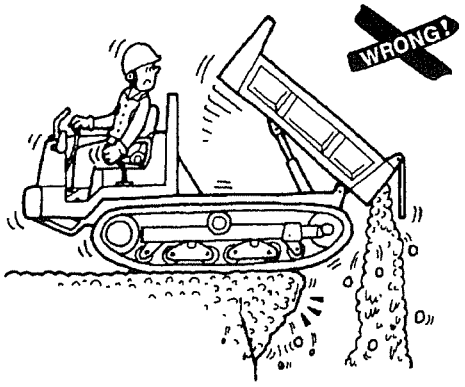
Never assume that everything is all right at the start of a work day just because it seemed satisfactory at the end of the previous work day. Before beginning each days operation, thoroughly inspect the entire crawler carrier for signs of vandalism.

MAKE A WORK PLAN.

Prior to operation, investigate your job site sufficiently. When any obstruction or hazards are detected, mark it so that all personnel are aware of it. Avoid any oversight that may cause serious accident.
Observe a local weather forecast and discuss well work procedures and let all personnel know them without exception.



CHECK THE JOB SITE.

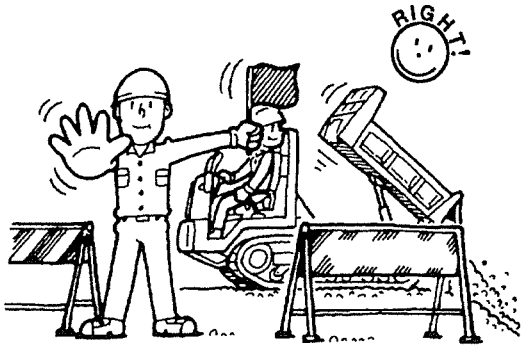


ALWAYS check the job site for grade and stability of the ground, ventilation, depth of water and ambient obstructions.

The operator must be satisfied that no one will be endangered before moving the machine.

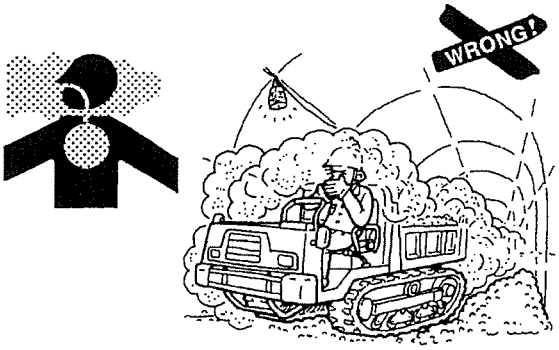
Stay a safe distance from the edge of cliffs, overhangs and slide areas.

CLEAR ALL PERSONNEL FROM THE MACHINE AND AREA.



Be sure to barricade the job site to prevent entry of the unauthorized. Confirm that there is no one around the machine before starting the engine or operating the machine.

MAINTAIN GOOD VENTILPLTION.

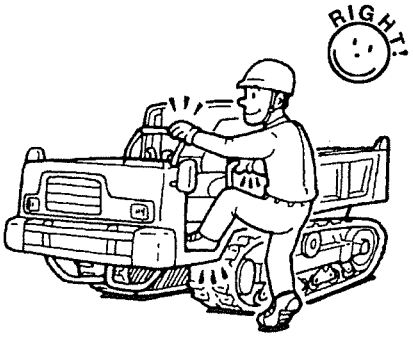


Diesel engine exhaust contains products of combustion which may be harmful to your health. Always start and operate the engine in a well ventilated area, If in an enclosed area, vent the exhaust to the outside.

1 - 2 MOUNTING AND DISMOUNTING

CAREFULLY MOUNT AND DISMOUNT THE MACHINE.

Mount and dismount the machine only where steps and/or handholds are provided.
Inspect, and when necessary, clean and have repairs made to steps and handholds before mounting and dismounting.
Face the machine when mounting and dismounting.
Maintain a three point contact (TWO feet and one hand or one foot and two hands contact) with the steps and handholds.
Do not use any controls as handholds when entering or leaving the operator's station.



NEVER get on or off a moving machine.

NEVER jump oft the machine.

Do not try to climb on or oft the machine when carrying tools or supplies. Use a hand line to pull equipment up onto the platform.

1 - 3 BEFORE STARTING THE ENGINE

Clear all personnel from the machine and the area.
Move all control levers to the **NEUTRAL** position before starting the engine.
Inspect the condition of the seat belt and mounting hardware. Replace any damaged or worn parts.
Fasten the seat belt (if equipped) securely.
Adjust the seat so that full lever travel can be obtained with the operator's back against the seat back.
Make sure the machine is equipped with a lighting system as required by conditions.
Make sure all lights are working properly.
Make sure no one is working on, underneath or close to the machine before starting the engine or beginning to move the machine.
Make sure the area is free of personnel.

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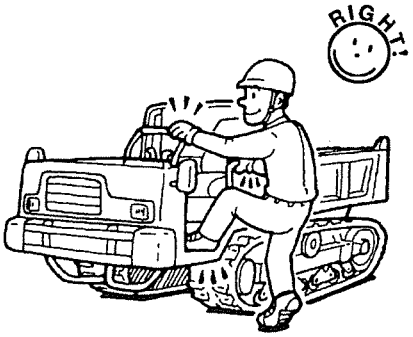

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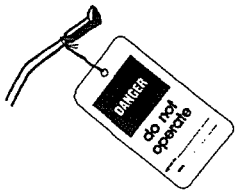
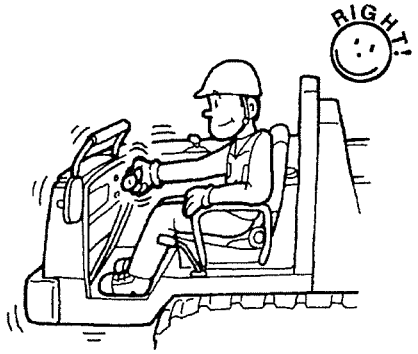
1 - 4 ENGINE STARTING

- **ALWAYS** start the engine only from the operator's station flowing the starting procedure in this manual.
- Do not start the engine or move any of the controls if there is a **DO NOT OPERATE** or similar warning tag attached to the start switch or controls.
- Move all hydraulic controls to the **HOLD** position before starting engine.
- **NEVER** short across the starter terminals or across the battery, as well as damage the electrical system.





1 - 5 BEFORE OPERATING THE MACHINE

CONDUCT WARM-UP BEFORE OPERATION.

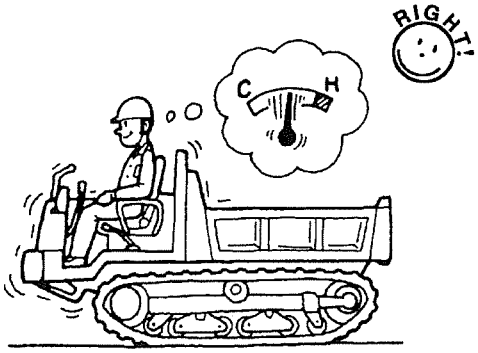
Warm up the engine and the hydraulic oil before operating the machine.

Clear all personnel from the machine and the area.

Clear all obstacles from the path of the machine. Beware of hazards such as wires, ditches, etc.

Be sure all windows are clean. Secure the doors and windows in either the open or shut position.
Adjust the rear view mirrors for best vision, especially close to the machine.

Fasten the seat belt securely.
Make sure the machine horn, the travel alarm (if equipped) and all other warning devices are working properly.



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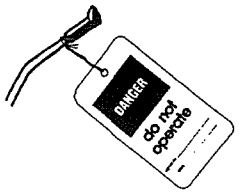

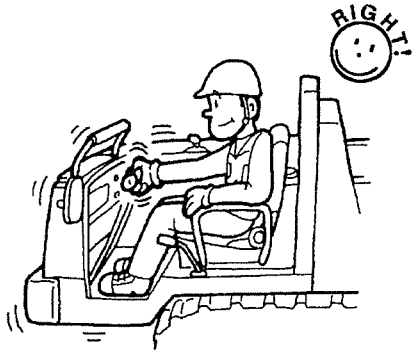

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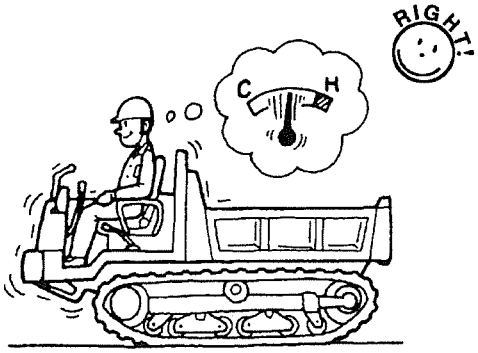


1 - 6 MACHINE OPERATION

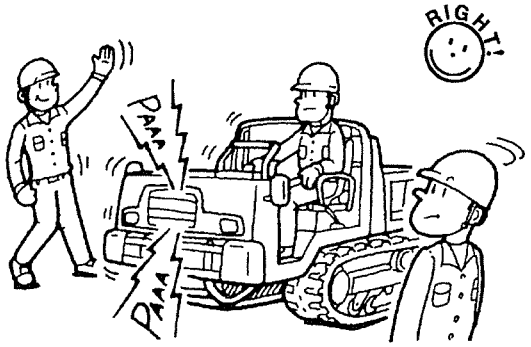
STAY SEATED WHILE OPERATING

Operate the machine only while seated and with the seat belt fastened.

PREVENT ACCIDENTS WHILE MOVING

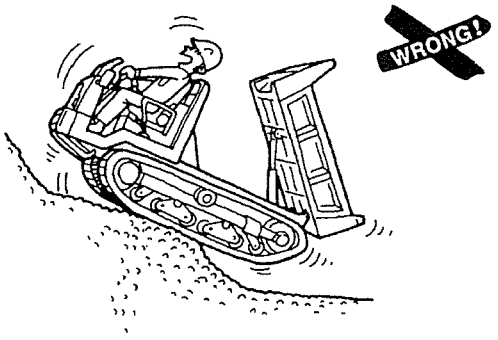
Always sound the horn to signal others nearby that you are moving the machine. Check that no one is within the working area of the machine before attempting to move it.

Report any need repairs noted during operation.



DO NOT TRAVEL WITH THE BODY IN DUMP POSITION

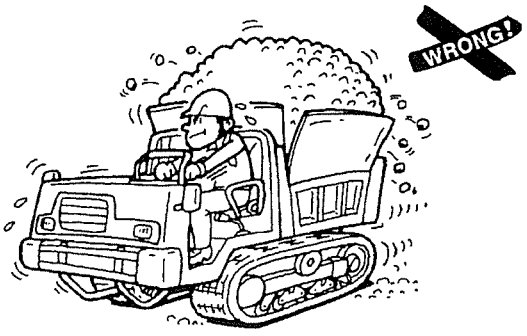
Travelling with the body in dump position not only makes the vehicle unstable but limits driver visibility causing hazardous situations. Never attempt to travel with the body in dump position.



DO NOT OVERLOAD

Keep the machine under control and do not work it over its capacity.

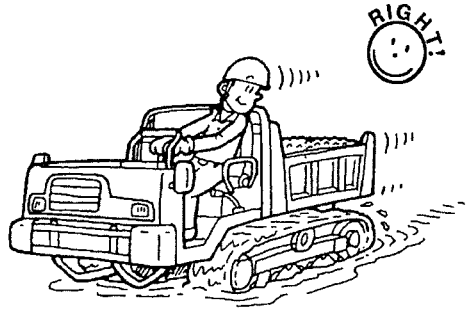
- Never exceed the maximum load limits.
- Never place a load onto the sideracks.



DO NOT EXCEED THE WATER DEPTH LIMIT

The acceptable water limit is up to the lower roller.

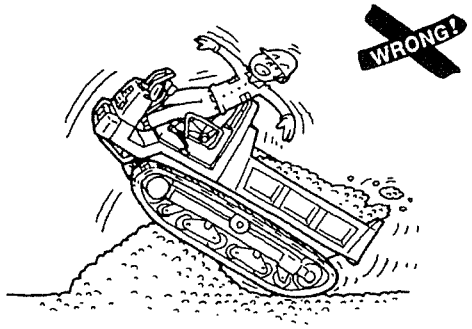
Check the water depth, foundation and strength of water current and other safety factors before operating. Do not place the machine in locations exceeding the lower frame of the vehicle.



DO NOT TRY TO TRAVEL OVER OBSTRUCTIONS

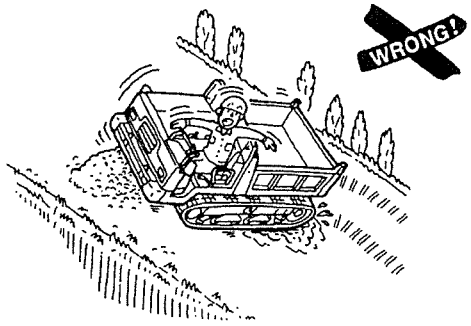
Trying to travel over obstacles could cause the machine to lose its balance and topple over.
Avoid potential obstacles in your path.

Be careful to avoid the condition which could lead to tipping when working on hills, banks or slopes, and when crossing ditches, ridges or other obstructions.



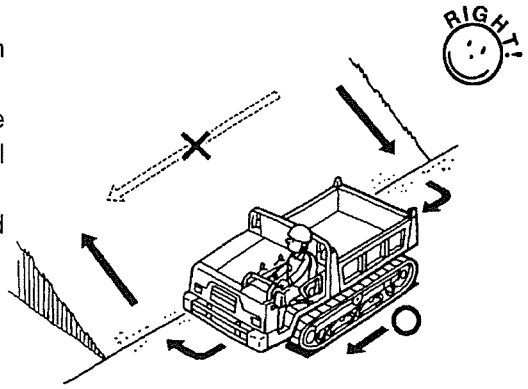
DO NOT CHANGE DIRECTIONS WHILE ON A SLOPE

Avoid changing the direction of travel on a slope, which could result in tipping or side slipping of the machine.



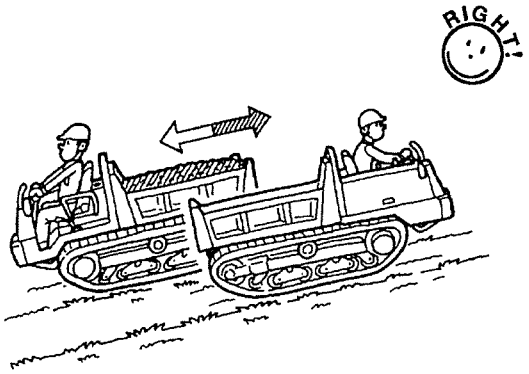
MOVE UP AND DOWN SLOPES DIRECTLY NOT SIDEWAYS

Work up and down slopes, rather than sideways, whenever possible.
Moving sideways or parallel to the slope while on it may cause the machine to slide and fall over.
To prevent such accidents, only move up and down slopes at a direct angle.



WATCH THE VEHICLE POSITION WHILE TRAVELLING ON SLOPES

The vehicle center of gravity tends to quickly change while travelling on sloping surfaces. This can create hazardous situations where the vehicle may tip over.
Observe the following points regarding vehicle position.
Go forward up the hill and back down the hill **WHEN NOT CARRYING A LOAD.**
Reverse up the hill and go forward down the hill **WHEN CARRYING A LOAD.**

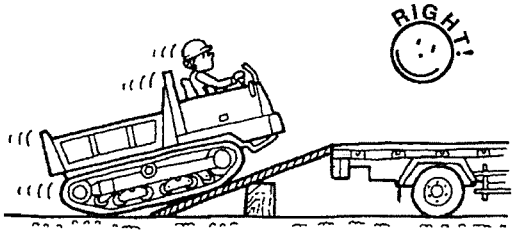


NEVER ALLOW PERSONNEL RIDE ON THE MACHINE OTHER THAN OPERATOR.

Only operator is authorized to be on the machine during operation.
Never let unauthorized personnel ride on the machine.

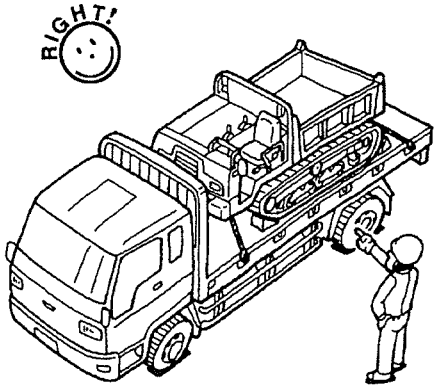
1 - 7 SAFE TRANSPORTATION

CAREFULLY LOAD AND UNLOAD THE MACHINE.



ALWAYS load and unload the machine on the level ground.
Use a ramp that has sufficient strength, width, length, and thickness.
Remove ice, snow, or slippery material from the ramp and truck deck before loading.
NEVER make a turn on a ramp.

OBSERVE PRECAUTIONS ON TRANSPORTATION.

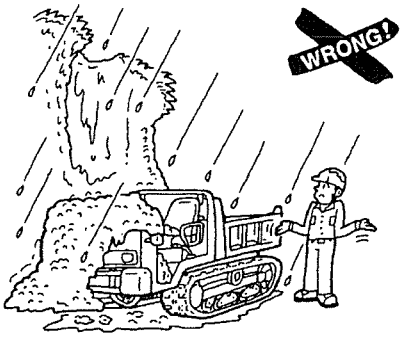


Block tracks and secure the machine to the truck before transporting.
Prior to transportation, check the travel route for clearances around the truck and the machine.

1 - 8 PARKING THE MACHINE

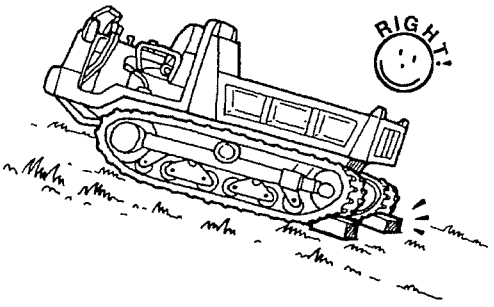
BANKS AND SLOPES

NEVER leave the machine on or near any bank which may cace, or on the edge of an excavation which might give way. Back the machine away from such from such areas which it is to be left idle or unattended for more than a brief period. Whenever possible, park on level ground.



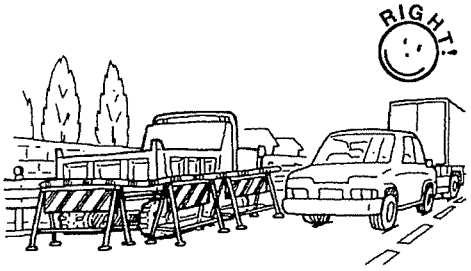
DO NOT PARK THE MACHINE ON A GRADE.

Park on a level surface. If necessary to park on a grade, block the machine.



OBSERVE PRECAUTIONS WHEN PARKING THE MACHINE ON THE ROAD.

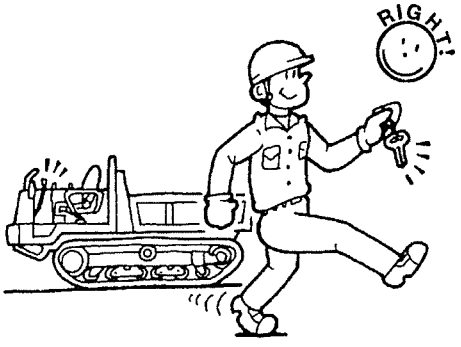
If you have to park the machine on the road, use appropriate flags, barriers, flares, and warning signals.



OPERATOR LEAVING MACHINE

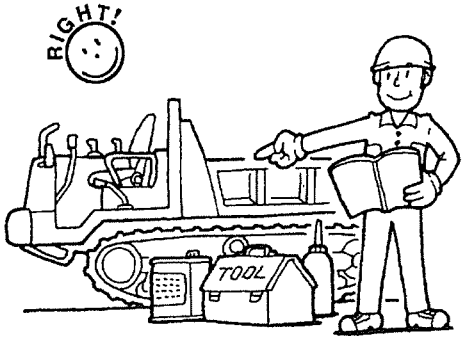
Move the gate lock lever to the **LOCKED** position.

Turn the engine start switch to the **OFF** position and remove the key.



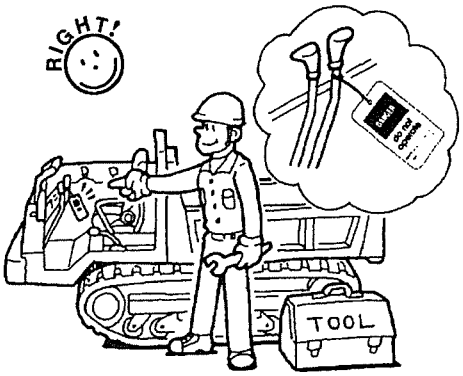
1 - 9 SAFE MAINTENANCE

KEEP ROUTINE MAITENANCE



You must read and understand the warnings and instructions contained in this manual, before performing any operation or maintenance procedures.

Perform all maintenance unless otherwise specified as follows:
Park the machine on level ground.
Move the dump and travel levers to the **HOLD** position.
Move the gate lock lever to the **LOCKED** position.
Stop the engine.
Turn the engine start switch off and remove the key.

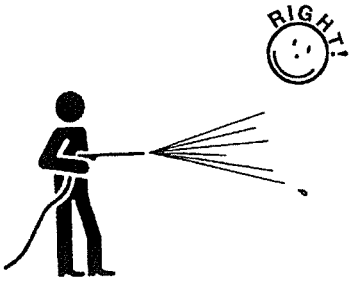


PERFORM MAINTENANCE WORK CORRECTLY.

Attach a **DO NOT OPERATE**, or similar warning tag to start switch or controls before servicing or repairing the machine.

When performing maintenance, put the gate lock lever in the **LOCKED** position and stop the engine.

ALWAYS CLEAN THE MACHINE.



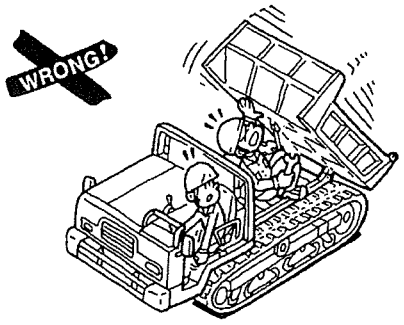
Maintain the machine clean for safe operation.
Remove dirt, grease, maintenance tool from the operator's cab for secured control.
Clean the window to obtain good sight.
Do not place anything flammable around the machine.

PRESSURE AIR

Pressure air can cause personal injury. When using pressuere air for cleaning, wear a protective face shield, protective clothing and protective shoes.

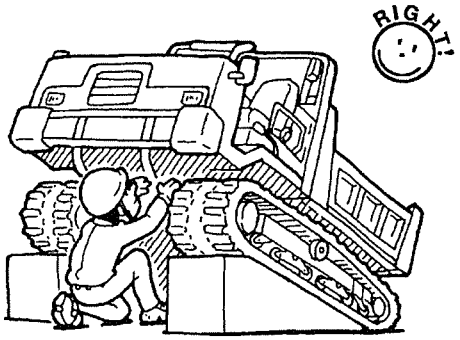
PREVENT CRUSHING OR CUTTING.

NEVER attempt adjustments while the machine is moving or the engine is running unless otherwise specified.



SUPPORT THE UNDERCARRIAGE WHEN WORKING UNDER TRACKS.

NEVER allow anyone to work undercarriage that is lifted and not properly blocked.
Check that the machine is supported sufficiently by the blocks and will not fall down. Attach a warning tag to warn, **"DONOT OPERATE"**.

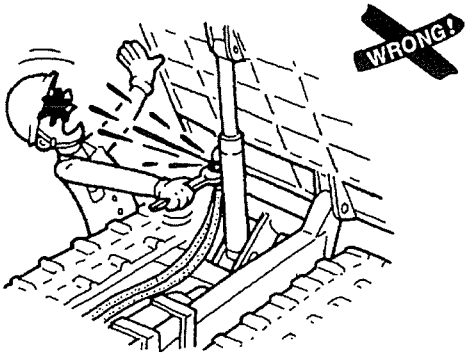


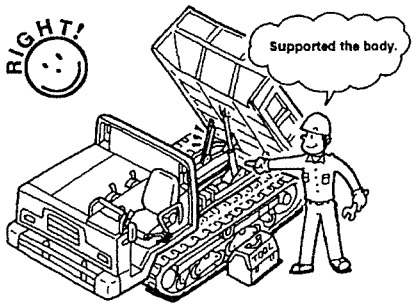
ALWAYS RELEASE PRESSURE BEFORE DIS CONNECTING HYDRAULIC LINES.

Before disconnecting **hydraulic fluid lines** on a hydraulic machine, be sure you.

- Set the safety bar to the body.
- Shut off engine,
- Always release any pressurized air on hydraulic tank.
- Move dump control lever up and lower to relieve pressures.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

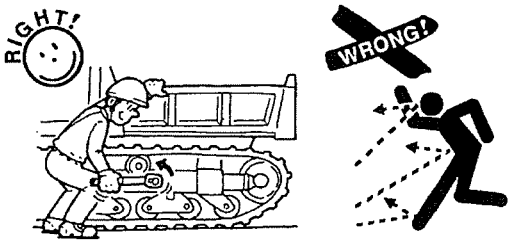




DO NOT WATCH THE RELIEF VALVE WHEN ADJUSTING TRACKS.

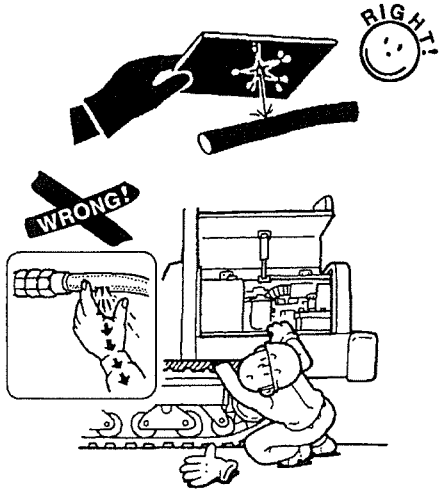
Track adjusting grease is under high pressure. Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened. Loosen the relief valve one turn only.



PRESSURIZED HYDRAULIC FLUID CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH.

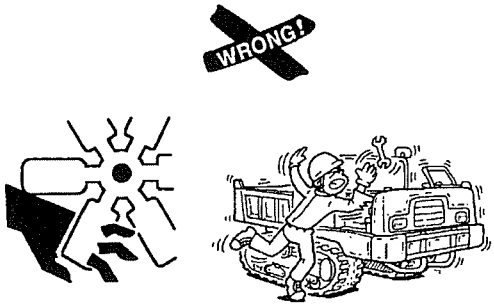
Always use a board or cardboard when checking for a leak. Escaping fluid under pressure, even a pinhole leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated by a doctor familiar with this type of injury immediately.



BE CAREFUL TO ROTATING AND MOVING PARTS.

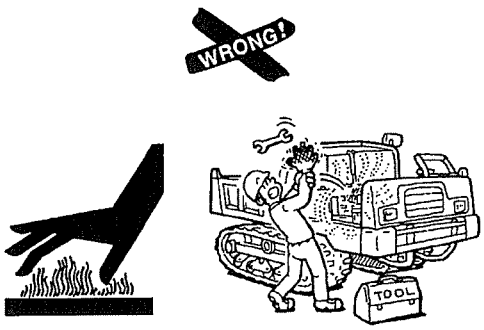
Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades. They will throw or cut any object or tool that falls or is pushed into them.



BE CAREFUL TO HOT ENGINE AFTER THE MACHINE STOPS.

Do not touch the engine or muffler right after the machine is stopped. It is very hot and causes burns.



CAREFULLY HANDLE THE ENGINE COOLANT.

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam. Any contact can cause severe burns.

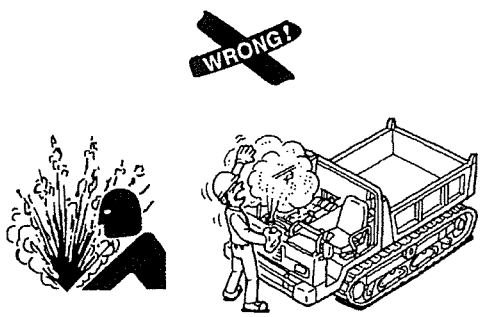
Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the fill cap is cool enough to remove with your bare hand.

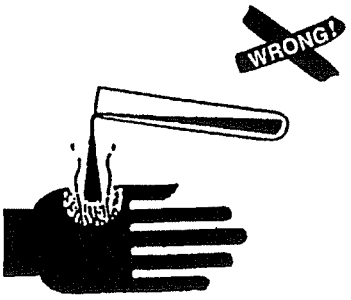
Remove the cooling system fill cap slowly to relieve pressure.

Cooling system additive contains alkali that can cause personal injury. Avoid contact with the skin, eyes and mouth.

Allow cooling system components to cool before draining.



DO NOT TOUCH BATTERY ELECTROLYTE.



Battery give off flammable fumes which can explode.

Do not smoke when observing the battery electrolyte levels.

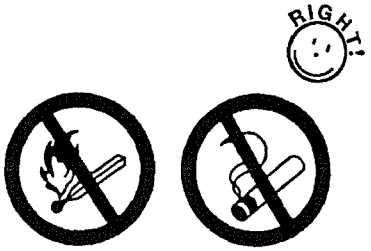
Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with battery.

FIRE OR EXPLOSION PREVENTION

All fuels, most lubricants and some coolant mixtures are flammable.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.



Do not smoke while refueling or in a refueling area.

Do not smoke in areas where battery are charged, or where flammable materials are stored.

Do not use other types of starting aids such as ether on engines equipped with inlet manifold heaters. Such use could result in an explosion and personal injury.

SET HYDRAULIC PRESSURE CORRECTLY.

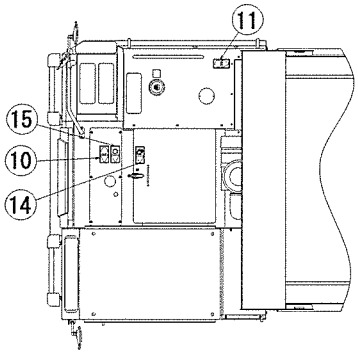
Only qualified person is allowed to gauge and adjust the hydraulic pressure following the specified procedure and using the correct gauge if necessary.
If there is no qualified person, consult your local IHI distributor.

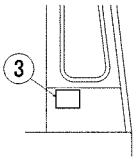
1 - 10 WARNING SIGNS AND LABELS

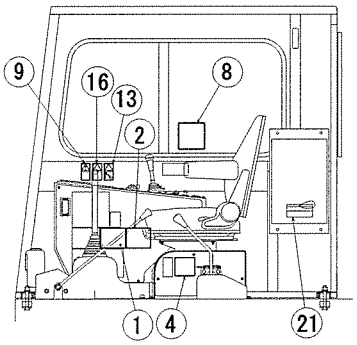
There are several specific safety signs on your machine. Their exact location and description of the hazard are reviewed in this section.
Please take the time to familiarize yourself with these safety signs.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

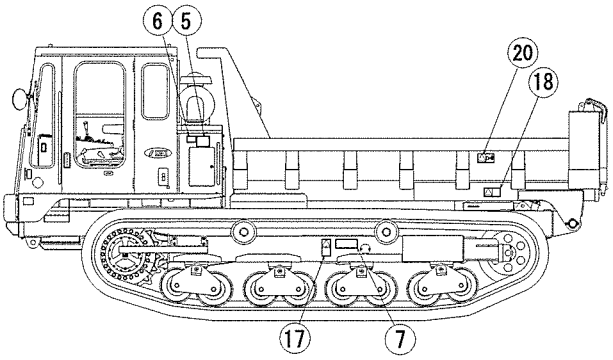
You must replace a label if it is damaged, missing or cannot be read.
If a label is on a part that is replaced, make sure a new label is installed on the replaced part.
See your IHI dealer for new labels.

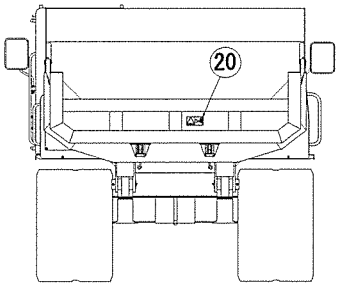


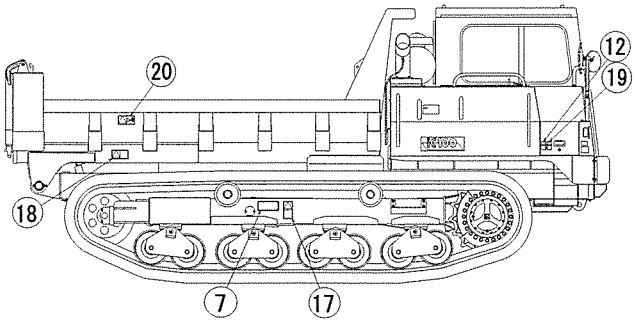


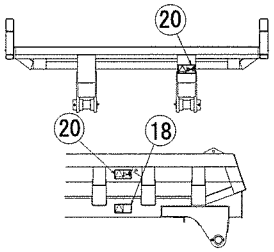


Details of the driver's cab inside

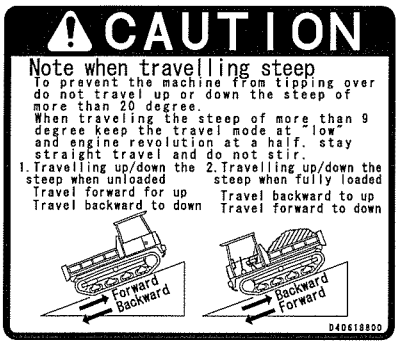








Scoopend Vessel

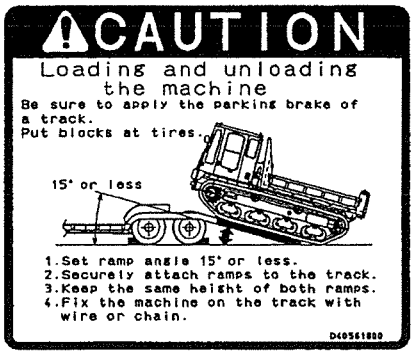


① Note when travelling steep

To prevent the machine from tipping over do not travel up or down the steep of more than 20 degree.

When travelling the steep of more than 9 degree keep the travel mode at "low" and engine revolution at a half. Stay straight travel and do not stir.

1. Travelling up/down the steep when unloaded
   - Travel forward for up.
   - Travel backward to down.
2. Travelling up/down the steep when fully loaded
   - Travel backward to up.
   - Travel forward to down.



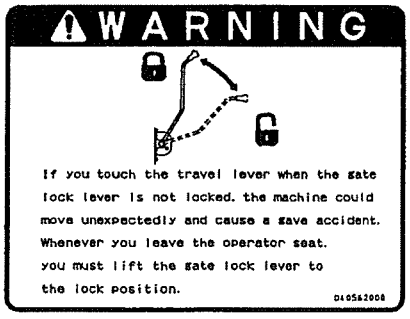
② Loading and unloading the machine

Be sure to apply the parking brake of a track.

Put blocks at tires.

1. Set ramp angle 15° or less.
2. Securely attach ramps to the track.
3. Keep the same height of both ramps.
4. Fix the machine on the track with wire or chain.

Located in the cab.

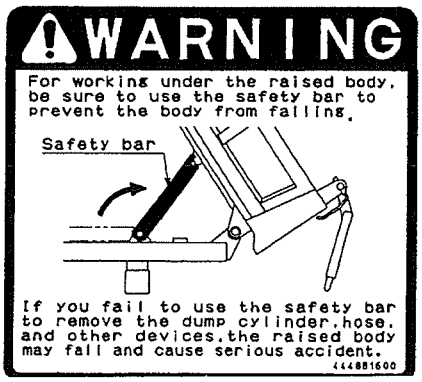


③ If you touch the travel lover when the gate lock lever is not locked, the machine could move unexpectedly and cause a gave accident.

Whenever you leave the operator seat.

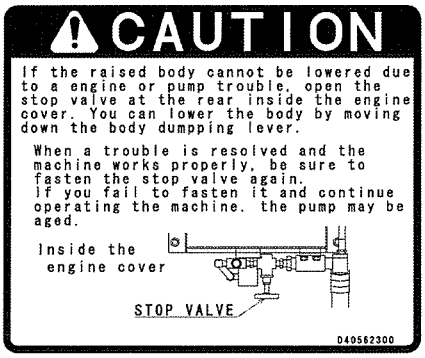
You must lift the gate lock lever to the lock position.

Located in the cab.



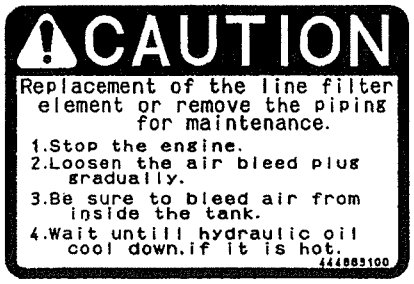
④ For working under the raised body, be sure to use the safety bar to prevent the body from falling.
If you fail to use the safety bar to remove the dump cylinder, hose, and other devices, the raised body may fall and cause serious accident.

Located in the cab.



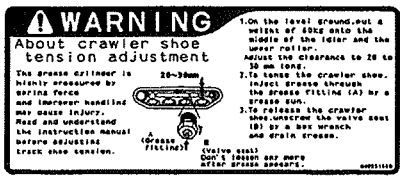
⑤ If the raised body cannot be lowered due to an engine or pump trouble, open the stop valve at the rear inside the engine cover. You can lower the body by moving down the body dumping lever.

When a trouble is resolved and the machine works properly, be sure to fasten the stop valve again.
If you fail to fasten it and continue operating the machine, the pump may be aged.



⑥ Replacement of the line filter element or remove the piping for maintenance.

1. Stop the engine.
2. Loosen the air bleed plug gradually.
3. Be sure to bleed air from inside the tank.
4. Wait until hydraulic oil cool down, if it is hot.

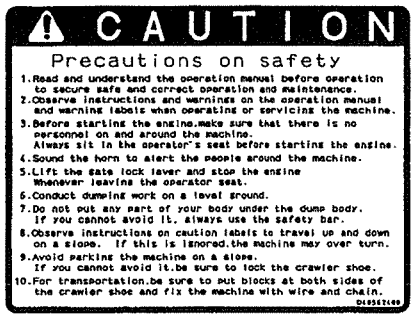


⑦ About crawler shoe tension adjustment

The grease cylinder is highly pressured by spring force and improper handling may cause injury.

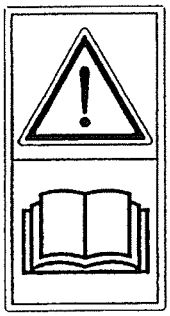
Read and understand the instruction manual before adjusting track shoe tension.

1. On the level ground, put a weight of 60kg onto the middle of the idler and the upper roller.
   Adjust the clearance to 20 to 30 mm long.
2. To tense the crawler shoe, inject grease through the grease fitting (A) by a grease gun.
3. To release the crawler shoe, unscrew the valve seat (B) by a box wrench and drain grease.



⑧ Precautions on safety

1. Read and understand the operation manual before operation to secure safe and correct operation and maintenance.
2. Observe instructions and warnings on the operation manual and warning labels when operating or servicing the machine.
3. Before starting the engine, make sure that there is no personnel on and around the machine.
   Always sit in the operator's seat before starting the engine.
4. Sound the horn to alert the people around the machine.
5. Lift the gate lock lever and stop the engine. Whenever leaving the operator seat.
6. Conduct dumping work on a level ground.
7. Do not put any part of your body under the dump body.
   If you cannot avoid it, always use the safety bar.
8. Observe instructions on caution labels to travel up and down on a slope. If this is ignored, the machine may over turn.
9. Avoid parking the machine on a slope.
   If you cannot avoid it, be sure to lock the crawler shoe.
10. For transportation be sure to put blocks at both sides of the crawler shoe and fix the machine with wire and chain.



⑨ Warning!
Read manual before operation, maintenance, disassembly, assembly and transportation.

Located in the cab.

(D405 359 00)

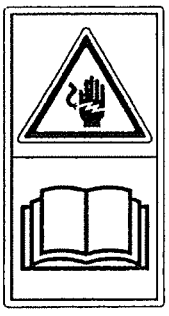
⑩ Sign indicates a burn hazard from spurting hot water or oil if radiator or hydraulic tank is uncapped while hot.
Allow radiator or hydraulic tank to cool before removing cap.

(D405 476 00)

⑪ Sign indicates a burn hazard from touching heated parts, such as engine, motor, or muffler during or right after operation.
Never touch when hot.

Located on the engine cab.

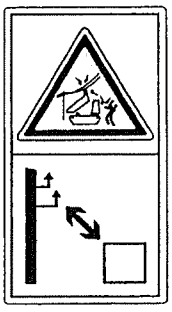
(D405 477 00)



⑫ Sign indicates an electrical hazard from handling the cable.
Read manual for safe and proper handling.

Located on the engine cab side.

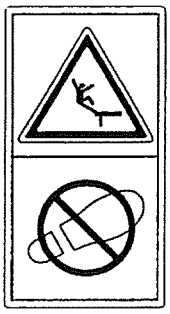
(D405 363 00)



⑬ Sign indicates an electrocution hazard if machine is brought too near electric power lines.
Keep a safe distance from electric power lines.

Located in the cab.

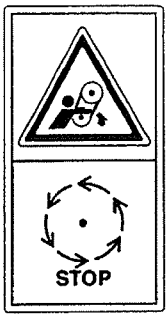
(D405 364 00)



⑭ Sign indicates a hazard of falling.
Do not stand on this place.

Locate on the engine.

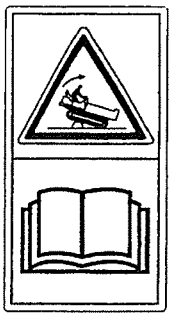
(D405 481 00)



⑮ Sign indicates a hazard of rotating parts, such as belt.
Turn off before inspection and maintenance.

Located on the both body.

(D405 482 00)



⑯ Sign indicates a hazard of falling out when vehicle goes over an obstacle.
Read manual and follow instructions for safe and proper operation.

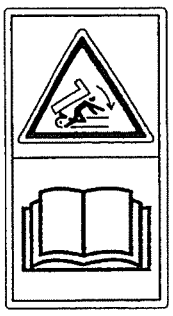
Located in the cab.

(D405 368 00)

⑰ Sign indicates a hazard of a flying plug from track adjuster that could cause injury.
Read manual before adjusting track for safe and proper handling.
Never touch when hot.

Located on the both track flame.

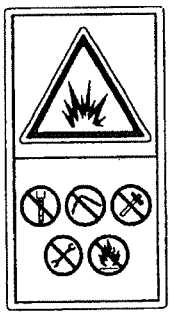
(D405 485 00)



⑱ Sign indicates a crush hazard from falling body.
Read manual and follow safety instructions when holding the body in a raised position.

Located on the both body.

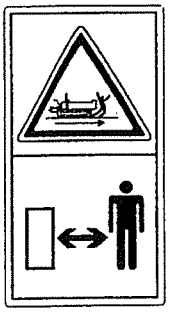
(D405 487 00)



⑲ Sign indicates an explosion hazard.
Never drill, cut with gas, hit or disassemble.
Also, keep open flame away.

Located on the engine cab side.

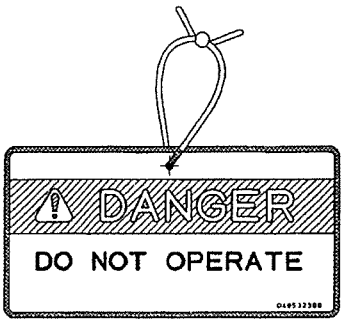
(D405 362 00)



⑳ Sign indicates a hazard of being run over by moving equipment.
Keep away from equipment when it is moving.

Located on the both body.

(D405 488 00)



㉑ DENGER!
Attach a DO NOT OPERATE warning tag to start switch or controls before servicing or repairing the machine.
Do not start the engine or move any of the controls if there is DO NOT OPERATE or similar warning tag attached to the start switch or controls.
(D405 323 00)

2 SPECIFICATIONS

2 - 1 GENERAL SPECIFICATIONS

■ BASE MACHINE PERFORMANCE

	Unit	IC100-2
Travel speed	km/h	Low: 7.0 High: 12.0
Gradability	% (deg.)	57 (30)

■ ENGINE

Engine model	–	ISUZU AA-6HK1X
Engine type		4cycle, water cooled, overhead valve, direct injection type with turbocharger
No. of cyl. – bore × stroke	mm	6 – 115 × 125
Total piston displacement	cm^3	7,790
Rated output	kW/min^{-1}(ps/rpm)	185.4/2,000 (250/2,000)
Max. torque	$N•m/min^{-1}$ (kgf•m/rpm)	879.3/1,700 (89.7/1,700)

■ WEIGHT

Unloaden vehicle weight		kg	13,000
Maximum payload		kg	10,000
Average ground bearing pressure	With unloaden		22.5 (0.23)
	With load	$kPa(kgf/cm^2)$	39.7 (0.40)

■ CAPACITY

Body capacity	Struck	m^3	3.5
	Heaped		5.9

2 SPECIFICATIONS

■ REFILL CAPACITEIES

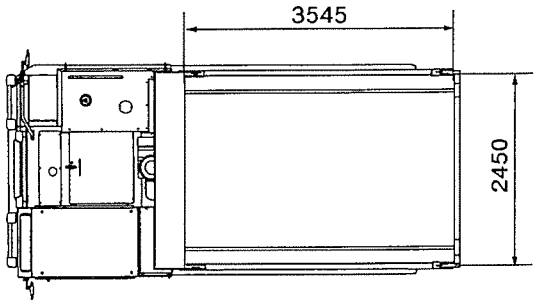
Fuel		L	300
Hydraulic fluid	Oil level	L	112
	Total amountin system		147
Engine oil	Volume of the oil in the oil pan	L	MAX. 33 – MIN. 25
Coolant	Engine proper	L	14.5
	Total amount		27.8

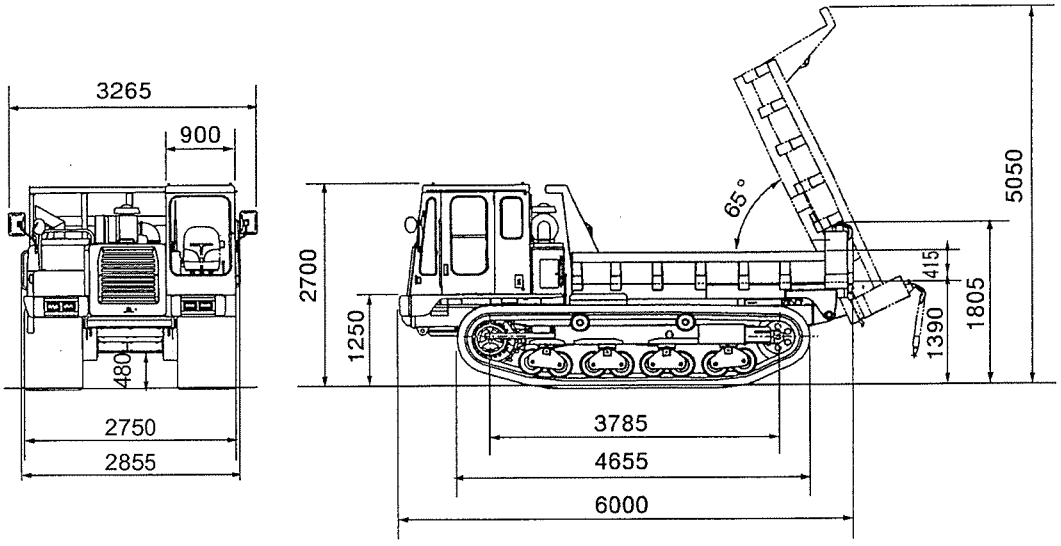
■ TRAVEL DRIVE

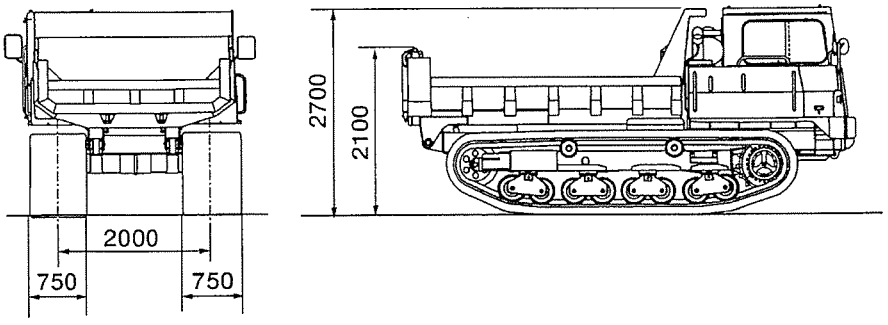
Travel drive system	–	Hydraulic Static Transmission (HST)
Transmission system	–	2 speed motor automatic control and select low speed
Transmission stage	–	2 (High and low)
Brake system	–	HST brake and parking brake
HST set pressure	MPa (kgf/cm^2)	34.3 (350)

2 - 2 DIMENSIONS

1. DIMENSIONS

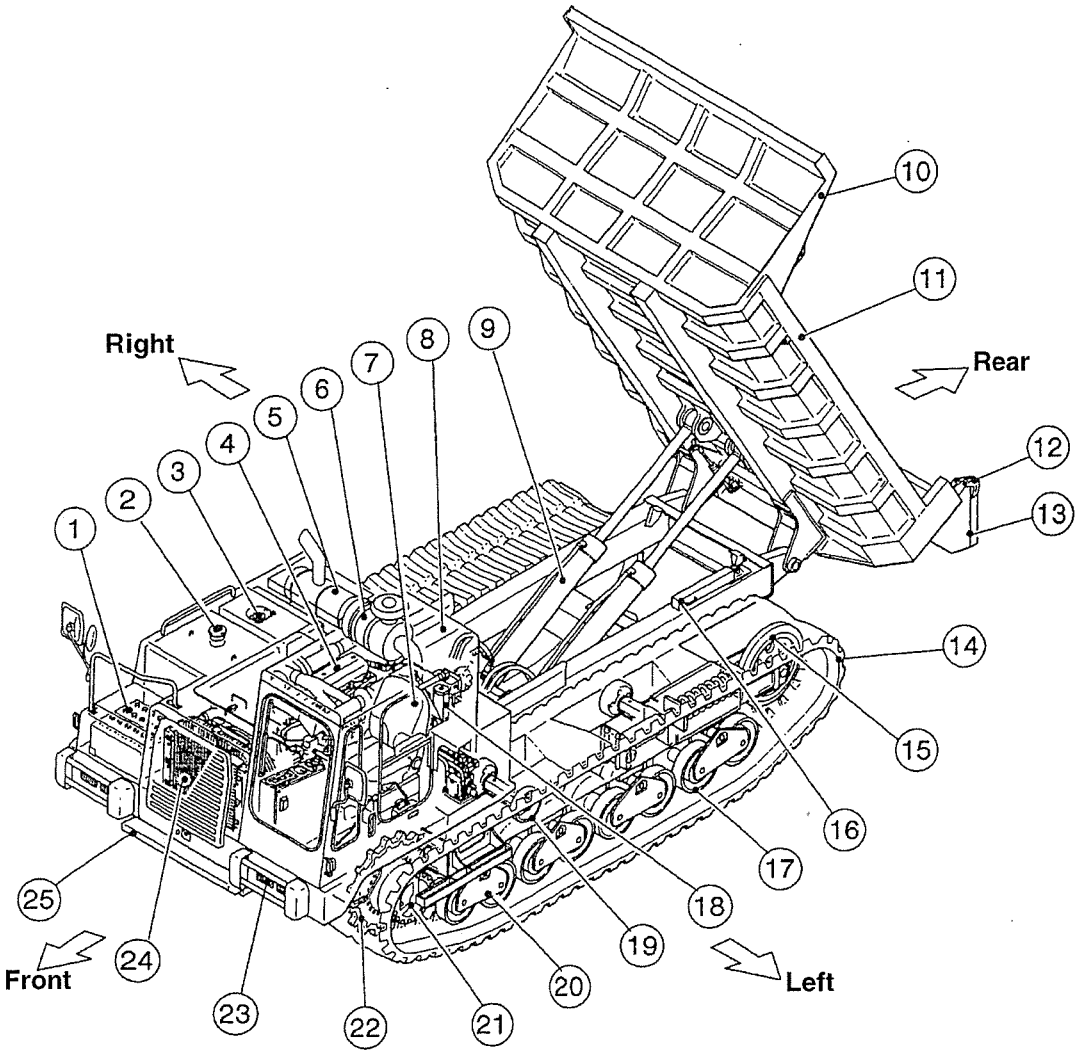






3 OPERATION

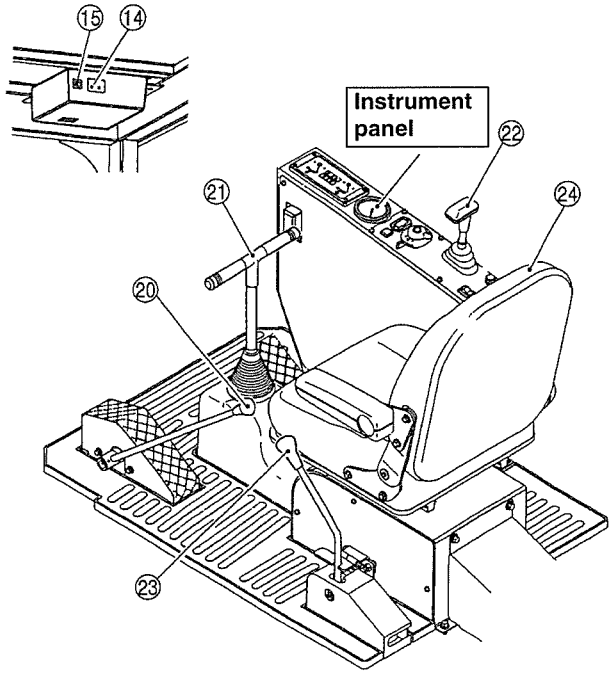
3 - 1 NOMENCLATURE



(1) Battery
(2) Fuel tank
(3) Hydraulic oil tank
(4) Engine
(5) Muffler
(6) Air cleaner
(7) Operator seat
(8) Cabin
(9) Dump cylinder
(10) Protector
(11) Loading space
(12) Upper hinge
(13) Rear gate
(14) Rubber crawler
(15) Idle tumbler
(16) Safety bar
(17) Lower roller
(18) Hydraulic pump
(19) Upper roller
(20) Oscillating, link
(21) Travel drive gear
(22) Drive sprocket
(23) Headlight
(24) Radiator oil cooler
(25) Bumper

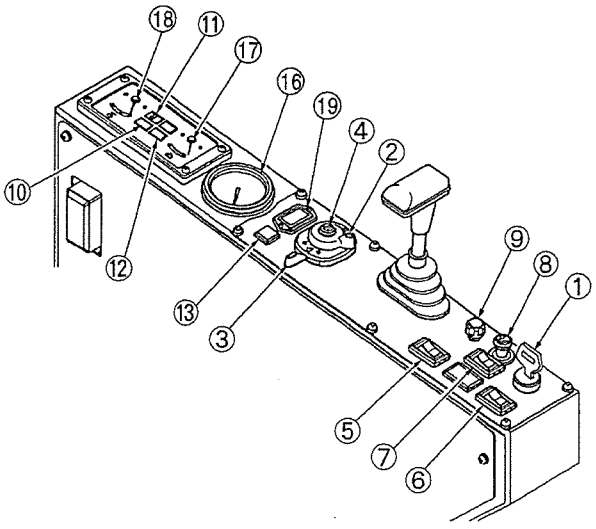
The directions as used in this manual are indicated by the direction of the arrows in the above drawing.

3 - 2 CONTROLS AND INSTRUMENTS



⑭ Slope alarm lamp
⑮ Overrun alarm lamp
⑳ Gate lock lever
㉑ Travel lever
㉒ Throttle lever
㉓ Dump lever
㉔ Operator seat

INSTRUMENT PANEL



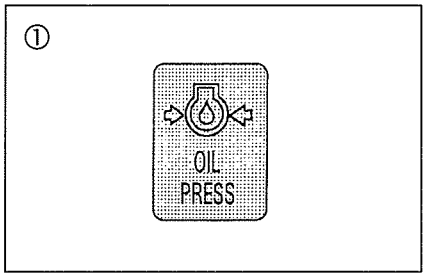
① Starter switch
② Light switch
③ Signal switch
④ Horn switch
⑤ Two-speed selector switch
⑥ Emergency stop switch
⑦ Car heater switch (OPT)
⑧ Cigar lighter
(cabin specification machine)
⑨ Wiper switch
(cabin specification machine)
⑩ Engine oil pressure alarm lamp
⑪ Battery charge alarm lamp
⑫ Glow (pre-heating) monitor
⑬ Parking lamp
⑯ Tachometer
(engine revolution indicator)
⑰ Fuel level gauge
⑱ Coolant temperature gauge
⑲ Service meter

1. MONITOR LAMPS

① Engine Oil Pressure Warning Lamp

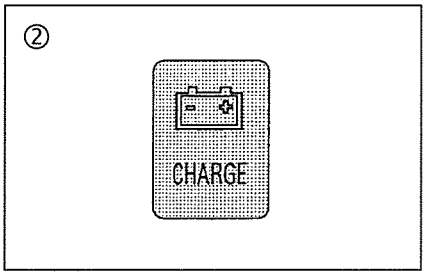
When the indicator comes on and the action alarm sounds with the engine running, stop the engine.

This indicates insufficient oil pressure. Check the engine oil level and have any necessary repairs made before starting the engine again.



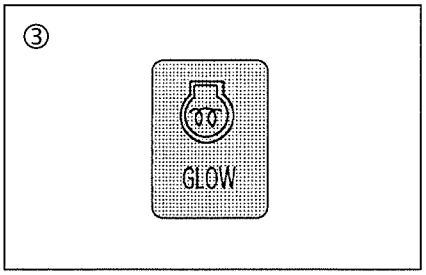
② Charge Warning Lamp

This indicates a malfunction in the electrical changing system. If the indicator does not go off shortly after the engine is started or if the light comes on while the engine is running, the machine can be operated until repairs can used, the battery will discharge rapidly.



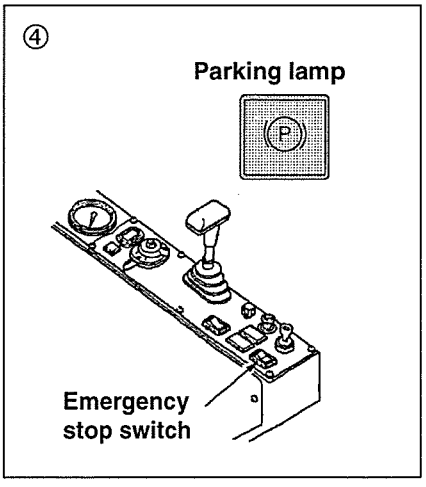
③ Heat Indicate Lamp

Hold the engine start switch to the **HEAT** position for approximately 15 to 20 seconds. The air heater is activated and the indicator comes on.



④ Parking lamp

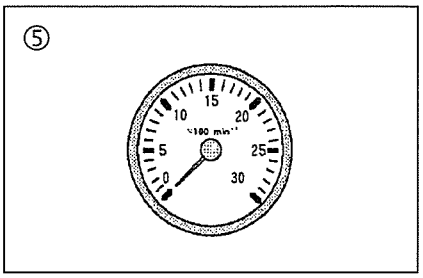
The emergency stop switch shift to **ON** position. This indicator comes on.



2. METERS

⑤ Tachometer

This meter shows the engine speed per one minute (in rpm).

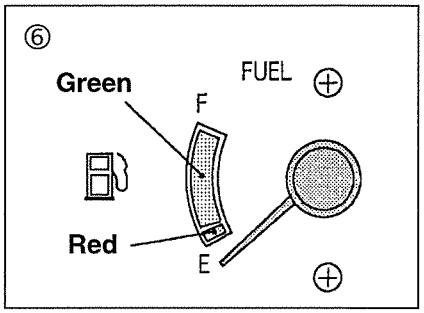


⑥ Fuel Level Gauge

It indicates the fuel level in the fuel tank.

F: The fuel tank is full.

E: Fuel level is too low. Add the fuel.



⑦ Water Temperature Gauge

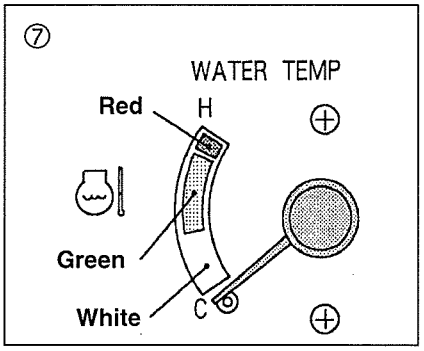
This indicates the engine water temperature.

Upon start-up, the lowest **"White"** range indicate.

While running the engine, with out load and low idling warming up.

Indicate the **"Green"** range, that the water temperature is in the normal operating temperature range.

If the water temperature rise to an overheated situation, the **"Red"** range will indicate. If this situation aries, set the engine throttle at low idle until the engine temperature lowers. **SHUT** the engine **OFF**, check the radiator and determine the cause.

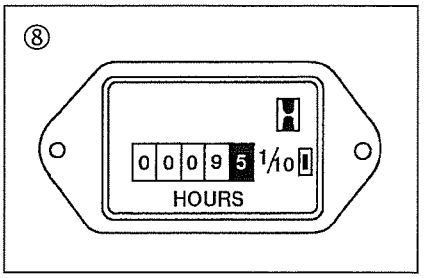


⑧ Service Hour Meter

Indicates the total service hours on the engine.

Use it to determine the service intervals.

While the engine is running, the hour meter is operated.



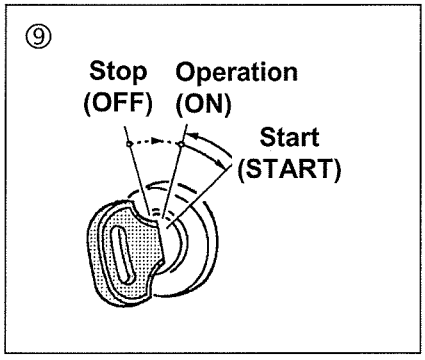
3. SWITCHES

⑨ Engine Start Switch

A four position switch energizes the electrical circuits, cranks the engine and also heats the glow plugs for cold weather starting.
Turn key fully clockwise and hold in the start position to complete the electrical circuit between the start switch and engine starter.

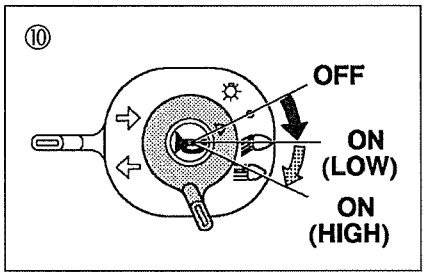
For cold weather start-ups, turn key fully clockwise and hold for 15 to 20 seconds to allow heating of the glow plugs.

If the engine does not start, or is being restarted after shutdown, turn the key to **OFF** before returning it to **START**.



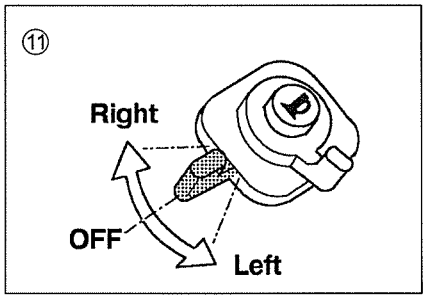
⑩ Head Light Switch

This switch turns on the front vehicle lights when the starter switch is set to ON. This switch is used to change the brightness and turn oft the front lights.



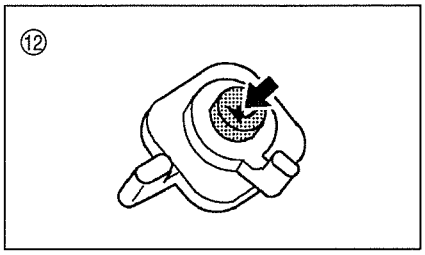
⑪ Direction Indicator Switch

Use with the starter switch set to **ON**.
Turn the lever down to light the left indicator.
Turn the lever up to light the right indicator.



⑫ **Horn Switch**

Push down on the center of the combination switch to activate the horn.

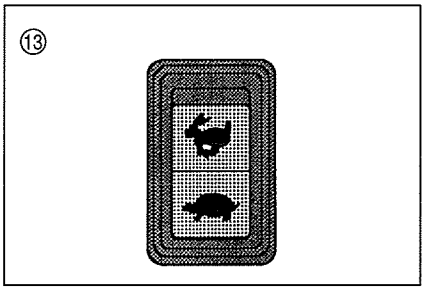


⑬ **Travel Speed Select Switch**

Low speed ·····Push down on mark.

High speed ····· Push down on mark.

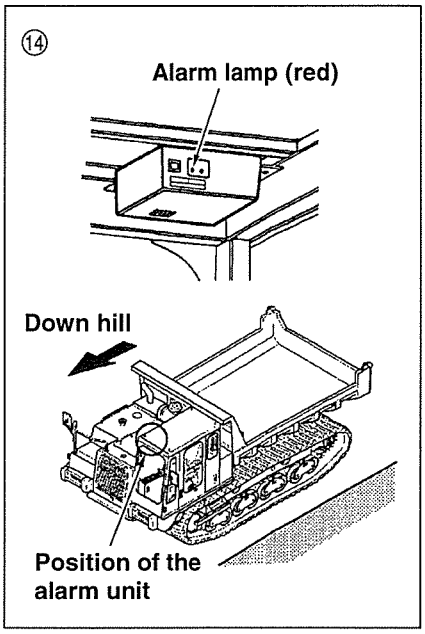
If a load placed on the machine increases to a certain level during **HIGH** speed travel, the machine automatically decreases its travel speed to **LOW**.



NOTE : Do not operate travel speed control switch while traveling.

⑭ Slope alarm lamp

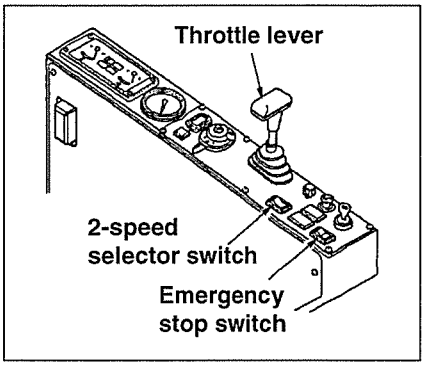
When the angle of the downhill slope exceeds 9 degrees, the alarm lamp on the ceiling lights up, sounding the buzzer. (The alarm continues to sound for 5 seconds.) Upon the sounding of the buzzer, reduce the engine revolution speed to a middle or lower speed, turn the two-speed selector switch to the low speed and run straight. Avoid traveling sideways or taking an oblique direction (including a zigzag travel).



⑮ Overrun alarm lamp

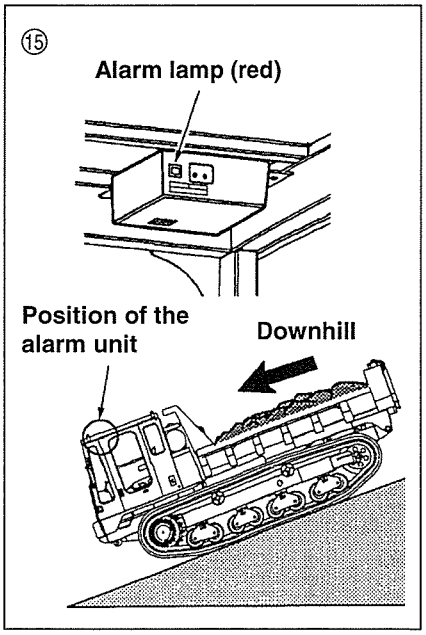
⚠WARNING

* The "Emergency Stop Switch" is used to avoid a danger. Usually, therefore, the "Emergency Stop Switch" must not be used simply to stop the vehicle.
  After using this switch, be sure to check or repair the parking brake. Otherwise, the parking brake might fail to work, which is dangerous.
* The overrun alarm starts to work when the revolution speed becomes 50 to 200 min^{-1} higher than the high idle revolution speed.



When the alarm lamp on the ceiling turns on, to sound an alarm, the vehicle is in a possible danger that could cause an overrun. Before going downhill, be quick to take the following actions to avoid a danger.

1. Return the travel lever to the neutral position. (The HST brake will apply.)
2. Turn the engine throttle lever to the low speed position in order to reduce the engine speed.
3. When the vehicle cannot be stopped completely, push the P side of the "Emergency Stop Switch" to apply the parking brake.

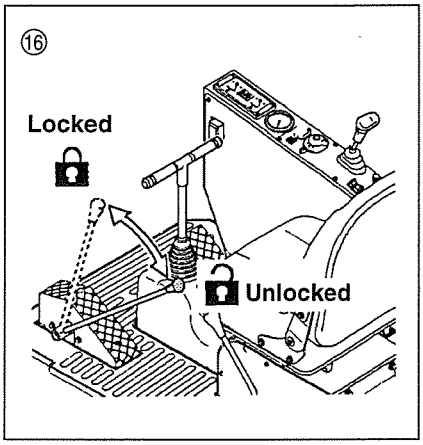


4. MACHINE CONTROLS

⑯ Gate Lock Lever

Locked : Move the lever locked position to engage the parking brake and the indicator comes on.

Unlocked: Move the lever unlocked position to release the parking brake and the indicator goes oft.



⚠ CAUTION

ALWAYS have shut-oft lever **UP** to locked position when mounting and dismounting the machine.

⑰ Travel Lever

Control travel lever to move the carrier forward or backward, stop the carrier and control travel speed.

Forward (1) – Move the travel lever forward.

Reverse (2) – Move the travel lever backward.

Stop (3) – Release the lever to stop the track and apply the brakes.

Pivot left turn (4) – Move the lever right side forward.

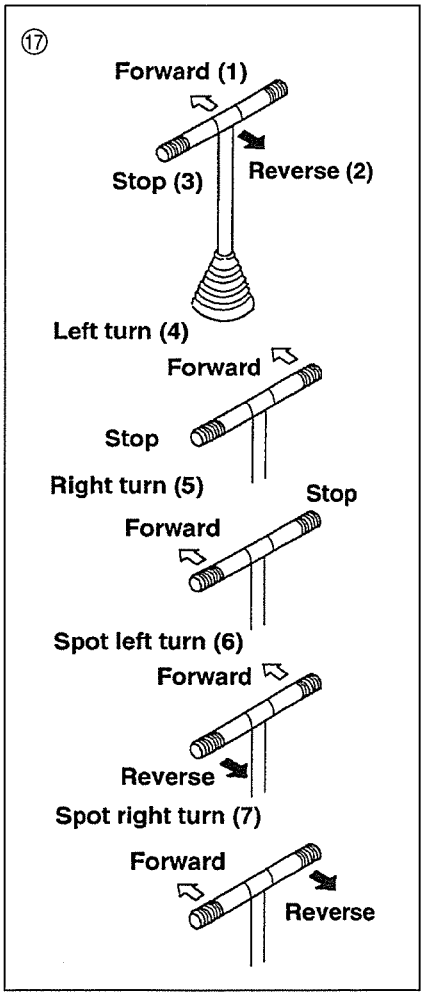
Pivot right turn (5) – Move the lever left side forward.

Spot left turn (6) – Move the right side lever forward and move the left side lever backward at the same time.

Sport right turn (7) – Move the left side lever forward and move the right side lever backward same time.

Control travel speed

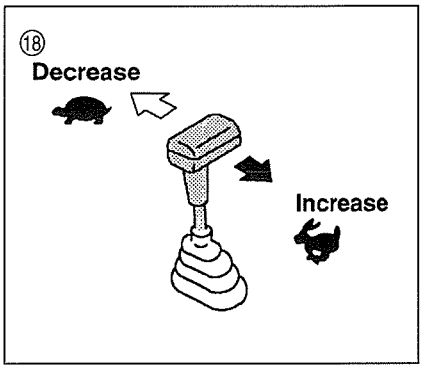
Change the stroke of levers to change control travel speed. The bigger stroke increase the speed.



⑱ **Engine Throttle Lever**
Move this lever to control the engine speed.

Decrease – Move the lever forward to decrease engine speed.

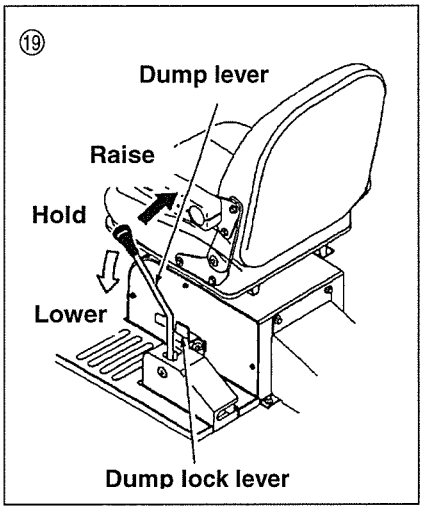
Increase – Move the lever backward to increase engine speed.



⑲ **Dump Lever**
Raise – Pull the lever up to raise and dump the body.

Hold – When the lever is released from either position, the lever will return to hold.
Raise or lower body will stop.

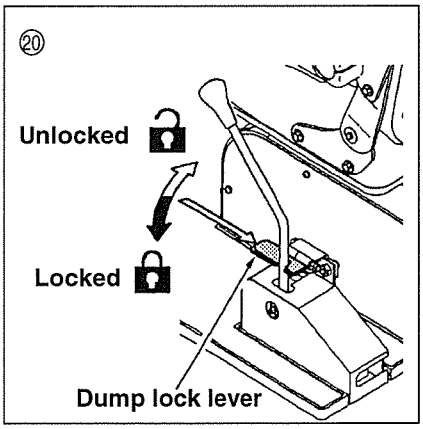
Lower – Push the lever down to lower the body.



⑳ **Dump lock lever**
Move the dump lever to the **HOLD** position to lock the dump lever.

Locked – Move the lever forward to the locked position.

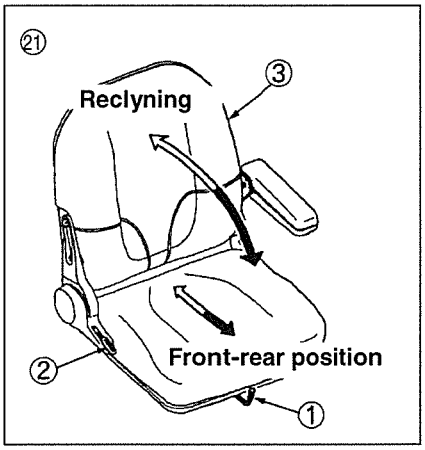
Unlocked – Move the lever back to the unlocked position.



㉑ Seat

CAUTION

* Do not adjust the seat while driving. Sudden seat movement can cause operating errors or unforeseen accidents.
* Seat adjustment should be checked at the beginning of each shift or when changing operators.
* Always use the seat belt when operating machine.
* Adjust the seat to allow full lever travel with operator's back against seat back.



To adjust the seat forward or backward, pull left and hold lever ① and move the seat to the desired position. Release the lever to lock the seat in the selected position.

To adjust the seat back tilt, pull up and hold lever ② and tilt the seat back to the desired position. Release the lever to lock the seat back in the selected position.

㉒ Seat Belt

⚠ CAUTION

* ALWAYS fasten the seat belt while operating the machine.
* ALWAYS check the condition of the seat belt and mounting hardware before operating the machine.
* Replace the seat belt at least once every three years, regardless of appearance.

Inspect for worn or frayed webbing.

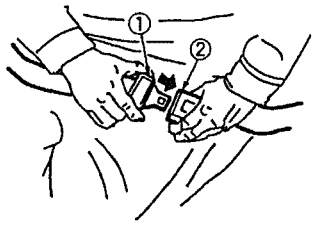
Check for worn or damaged buckle, retractor, extrusion and mounting hardware. Replace them if they are worn or damaged.

If the bolts and nuts of the mounting hardware are not correctly installed, the seat belt can separate from its monting. Make certain the bolts and nuts are correctly installed.

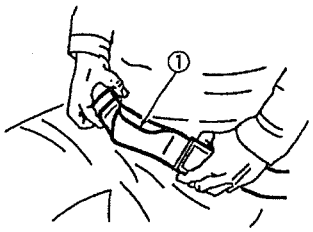
If a bolt and nut are not correctly installed, remove them. Install a new bolt and nut.

To Fasten the Belt

1. Confirm that the seat belt ① is not twisted and put it into the buckle ② securely.

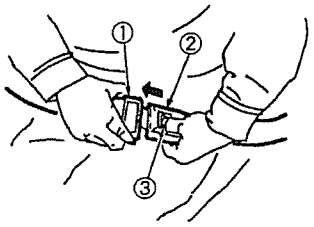


2. Adjust the seat belt length according to your body size.
   Slightly pull the belt and confirm the belt ① is locked.



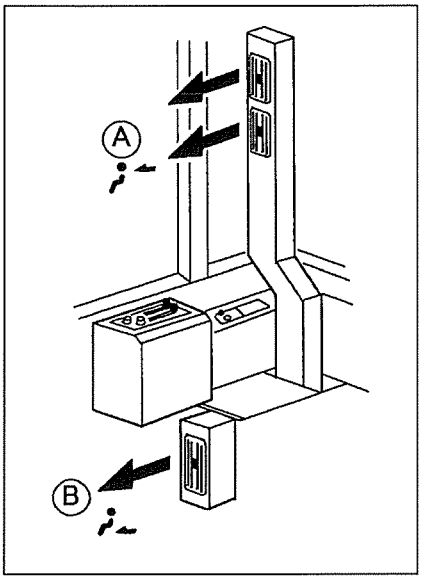
To Unfasten the Belt

Press the button ③ of the buckle ② and unfasten seat belt.



■ Air Conditioner (If Equipped)

The air conditioner (if equipped) are behind the operator's seat in the cab.
Operate the air conditioner when necessary to lower the cab temperature or to defrost the cab windows.

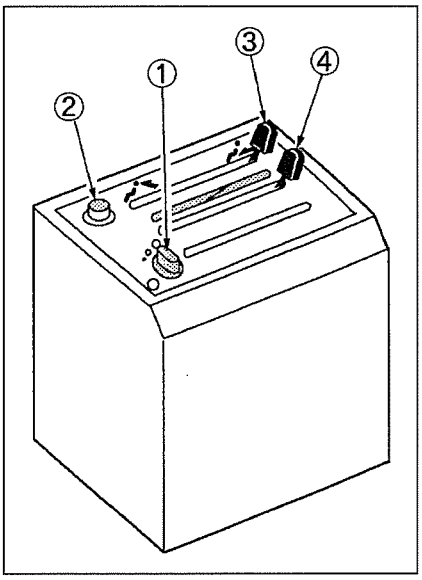


① Fan Switch

The switch control the fan of the air conditioner on/oft function and the blower fan speed. The low, median or high fan speeds control the amount of air flow.

② Air Conditioner Switch

The switch control the air conditioner on/oft function. Pushing the switch activates the air conditioner. When this switch is on, the indicator should be on.



③ Air Outlet Selection Lever

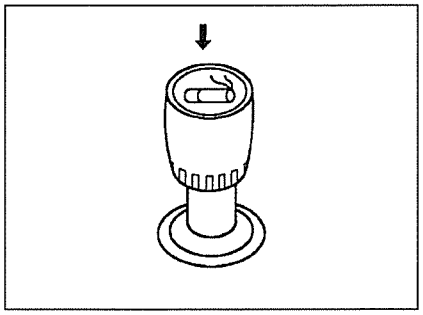
The lever control the open/close of each air outlet. Select the desired air flow mode form the two mode positions shown in the following illustration.

④ Temperature Control Lever

The lever control the temperature of air coming out of the air outlets to any of levers during heating (red label) and cooling (blue label).

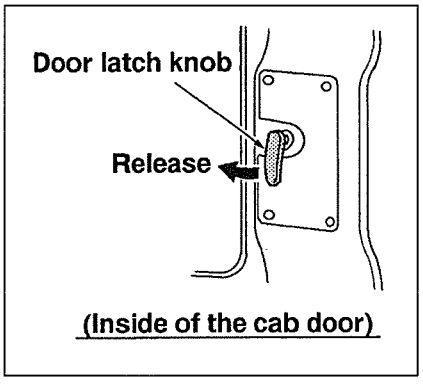
■ Lighter

Push the knob to activate the lighter. The knob will come back out slightly, when ready to use.
Push the lighter into the socket until the outer portion is flush with the socket to reinsert it into the socket.

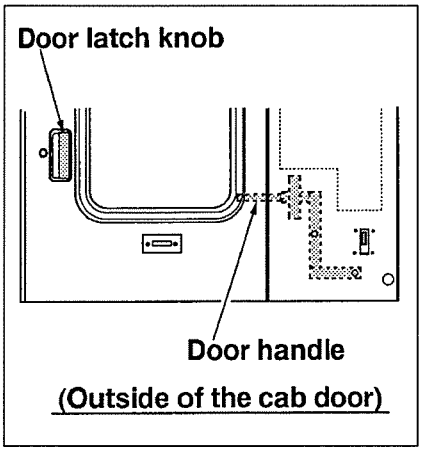


■ Cab Door

Pull the knob of the door latch backward to open the door. Open the door all the way and secure it to the catch on the cab wall, for additional ventilation.

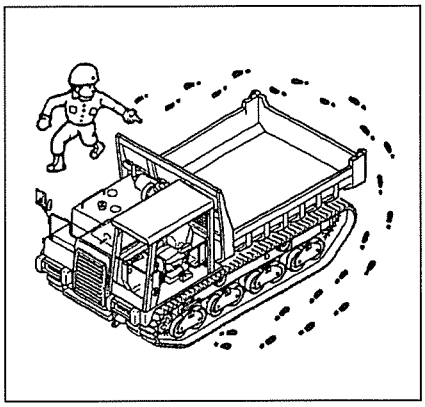


Move the cab door release lever up and towards the operator (with operator in seat) to unlatch the door from the catch.



3 - 3 BEFORE STARTING THE ENGINE

Machine Walk-Around Inspection

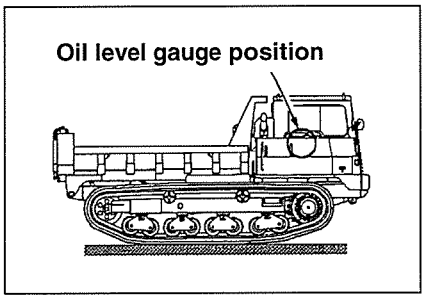


Walk-around inspection before mounting the machine to start the engine.

Look around and under the machine for such items as loose bolts, trash build up, oil or coolant leaks, broken or worn parts. Inspect the condition of the implements and the hydraulic components.

Refer to walk-Around Inspection in the Maintenance Section for more detailed information.

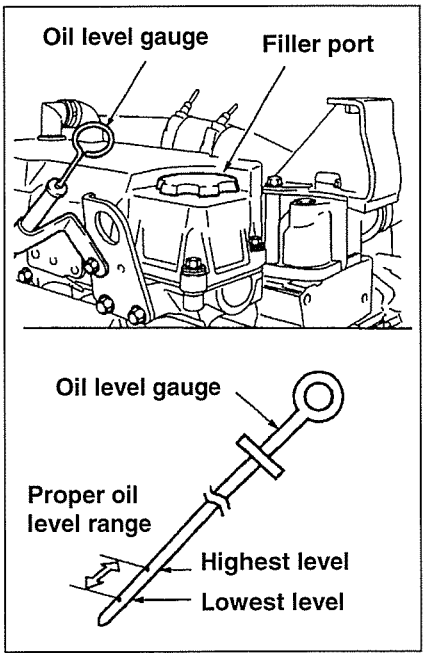
Machine Pre-Start Checks



Check all of the oil, coolant and fuel levels.

Refer to the Daily in the Maintenance Section for more detailed information.

Seat and Seat Belt Checks



Adjust the seat at the beginning of each shift or when changing operators.

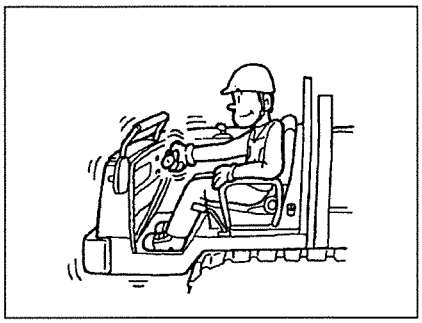
Adjust the seat to allow full travel of the levers when the operator id seated against the seat back.

Inspect the belt mounting hardware. Replace any damaged or worn hardware. Keep the mounting bolts tight.

Fasten the seat belt before starting the engine.

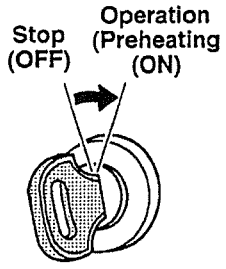
3 - 4 STARTING ENGINE

Once the pre-start inspection has been completed, the engine may be started.



1. Depress the Parking Brake switch to the parking position.
2. Set the operation levers to the neutral position.
3. Move the engine throttle lever ① above the **LOW IDLE** position (advance about one-third to one-halt).

4. Turn the sart switch to the **ON** position.
   The **GLOW** lamp turns on during engine preheating.
   GLOW lap turns off, and preheating is over.



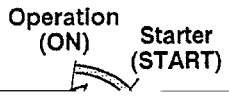
5. Turn thestart switch key to the **START** position.

6. Release the start switch key when the engine starts.

Turns on ⇨ turns off, and the glow time is over.

CAUTION

1. Do not engage the starter motor for more than 10 seconds at a time. Should the engine fail to start within 10 seconds, allow the starter motor to cool for 2 minutes, before attempting to start the engine again.
   Turn the key to **OFF** before trying to restart the engine.
2. The **"OK"** warning monitor should be observed immediately after starting and during operations.
   If the display does not register normal readings, stop the engine and determine cause.
3. Allow the engine to warm up until operating temperature and required oil pressure are obtained.
4. Before attempting any working operations, warm



3 - 5 STARTING WITH JUMPER CABLES

⚠ WARNING

* Battery give off flammable fumes that can explode.
* Prevent sparks near the batteries, They cause vapors to explode. Do not allow jump ends to contact each other or the machine.
* Always connect battery **POSITIVE** (+) to battery **POSITIVE** (+) and **NEGATIVE** (–) to battery **NEGATIVE** (–).
* Jump only with a battery source and with the same voltage as the stalled machine.
* This machine has a 24 volt starting system. Use only equal voltage for jump stating. Use of a higher voltage will damage the electrical system.
* Turn off all lights and accessories on the stalled machine. Otherwise, they will operate when the jump source is connected.

1. Move all controls to **HOLD**. Move the gate lock lever to the **LOCKED** position.

2. On stalled machine, turn the start switch key to **OFF**. Turn oft all accessories.

3 Move boost start machine near enough to stalled machine for the jumper cables to reach.
But, do not allow machines to touch.

4. Stop the engine on the boost machine. Or, if using an auxiliary power source, turn oft the charging system.

5. Connect positive (+) jumper cable (red) to positive (+) cable terminal of discharged battery, or battery set on stalled machine.
Do not allow positive (+) cable clamps to touch any metal other than battery terminals.

6. Connect the other end of this positive (+) jumper cable (red) to positive (+) terminal of boost battery. Use procedure of Step 5 to determine correct terminal.

7. Connect on end of the negative (–) jumper cable to the negative (–) boost battery terminal in the same battery set as used in Step 6.

8. Make final connection of negative (–) cable to frame of the stalled machine (not battery negative (–) post) away from battery, fuel or hydraulic lines, or moving parts.

9. Start the engine on the boost machine. Or, energize the charging system on the auxiliary power source.

10. Wait a minimum of two minutes for the battery in the stalled machine to partially charge.
11. Attempt to start the stalled engine. Refer to section on Engine Starting.

12. Immediately after starting the stalled engine, disconnect the jumper cables in reverse order.

13. Conclude failure analysis on starting/charging system of stalled machine as required now that engine is running and charging system is in operation.

3 - 6 AFTER STARTING THE ENGINE

⚠ CAUTION

Keep engine speed low until the engine oil pressure warning lamp goes out. If it does not go out within 10 seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

1. Allow the engine to warm up at **LOW IDLE** for at least five minutes. Engage and disengage the implement controls to help speed warm up of hydraulic components.

⚠ CAUTION

* The hydraulic control valve may become overheated if the dump is operated continuously under relief conditions.
* Operate the control valve for 10 to 15 seconds and then return the control lever to the HOLD position for five to ten seconds.

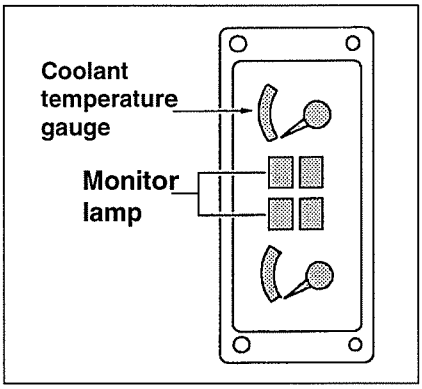
2. To warm up the hydraulic oil, move the engine throttle lever to medium engine speed. Run the engine for about five minutes while intermittently holding the dump control lever in the dump lower position.

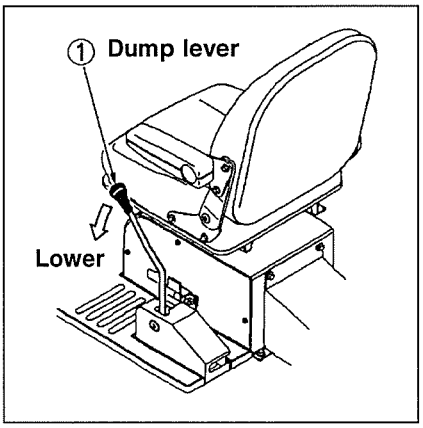
3. Turn the engine throttle lever to the maximum engine speed. Run the engine for an additional five minutes while intermittently holding the dump control lever in the dump lower position.

This will allow the oil to reach relief pressure, which causes it to warm more rapidly.

Cycle all controls to allow warm oil to circulate through cylinders and lines.

4. Observe the gauges and indicators frequently during the operation.





3 - 7 "BREAK-IN" OPERATION

In case of the new machine, as the severe operation from the beginning will have a bad influence upon the machine life, perform the enough break-in operation as described the right table.

Hour meter	Load
Up to 10 hours	About 60% load
Up to 50 hours	About 80% load
After 50 hours	Full load

3 - 6 AFTER STARTING THE ENGINE

⚠ CAUTION

Keep engine speed low until the engine oil pressure warning lamp goes out. If it does not go out within 10 seconds, stop the engine and investigate the cause before starting again. Failure to do so, can cause engine damage.

1. Allow the engine to warm up at **LOW IDLE** for at least five minutes. Engage and disengage the implement controls to help speed warm up of hydraulic components.

⚠ CAUTION

* The hydraulic control valve may become overheated if the dump is operated continuously under relief conditions.
* Operate the control valve for 10 to 15 seconds and then return the control lever to the HOLD position for five to ten seconds.

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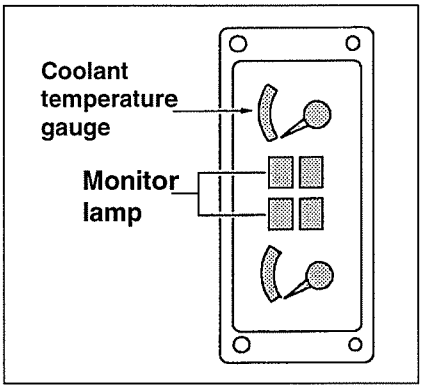
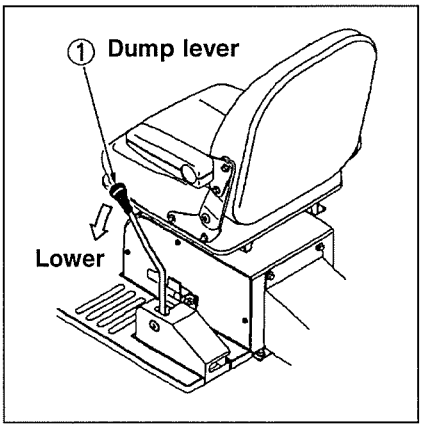
This will allow the oil to reach relief pressure, which causes it to warm more rapidly.

Cycle all controls to allow warm oil to circulate through cylinders and lines.

4. Observe the gauges and indicators frequently during the operation.





3 - 7 "BREAK-IN" OPERATION

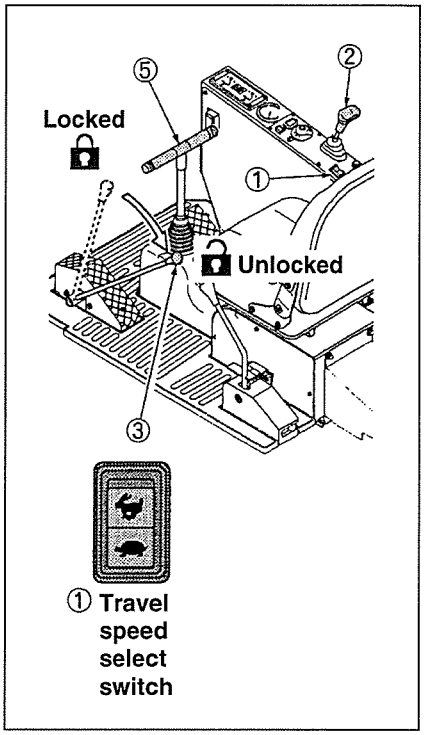
In case of the new machine, as the severe operation from the beginning will have a bad influence upon the machine life, perform the enough break-in operation as described the right table.

Hour meter	Load
Up to 10 hours	About 60% load
Up to 50 hours	About 80% load
After 50 hours	Full load

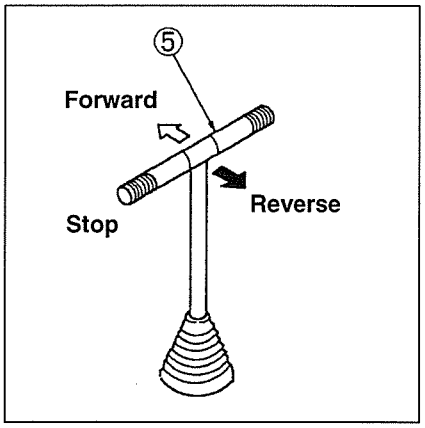
3 - 8 TRAVELING THE MACHINE

⚠ WARNING

* Be sure no one is working on or near the machine to prevent injury. keep the machine under control at all times to prevent injury.
* Reduce engine speed when maneuvering in tight quarters or when breaking over a rise.
* Select the travel speed range necessary before starting downgrade. Do not change travel speed ranges while going downhill.
* A good practice is to use the same travel speed range going downgrade that would be used to go up the grade.



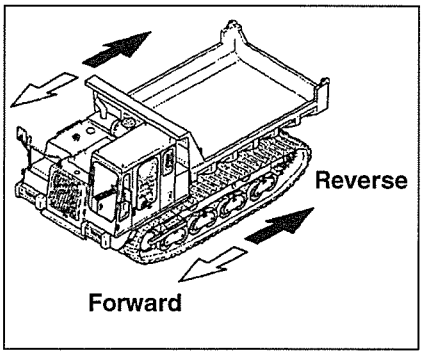
1. Adjust the operator's seat.
2. Fasten the seat belt.
3. Select the desired travel speed by operating the travel speed select switch ①.
4. Move the engine throttle lever ② to increase the engine speed (rpm) to the desired speed.
5. Move the gate lock lever ③ to the **UNLOCKED** position.
6. Straight travel
   - Forward direction travel – Push the both travel lever ⑤ forward to travel forward.
   - Reverse direction travel – Pull the both travel lever ⑤ backward to travel reverse.



NOTE : If the machine dose not operate or travel in a straight line, contact your IHI dealer.

7. Slowly move both travel lever to the center position, which engage the hydraulic brake and stop the machine

NOTE : If the engine stall when travelling while the engine speed (rpm) is low or the travel speed select switch is set to H (high) range. Restart the engine, increase the engine speed (rpm) and set the travel speed select switch is set to L (standard) range.
Avoid the engine stall to control the travel levers stroke while travelling.



STEERING CONTROL

⚠ WARNING

* NEVER steer on a grade or unstable ground, which causes turnover. It's very dangerous.
* If the engine stall when changing directions while the engine speed (rpm) is low or the travel select switch is set to high. Restart the engine, increase the engine speed (rpm) and set the travel select lever is set to low. Avoid the engine stall to control the travel levers stroke while travelling.

Pivot Left Turn

Move the right side travel lever ① forward, allowing the machine to the left, pivoting on the left track.

Pivot Right Turn

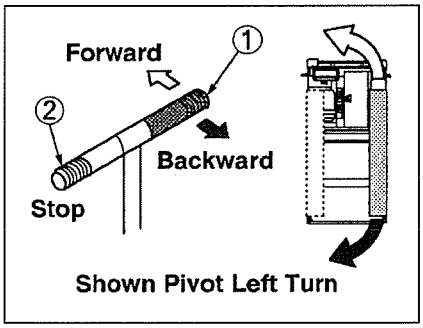
Move the left side travel lever ② forward, allowing the machine to turn to the right, pivoting on the right track.

Spot Left Turn

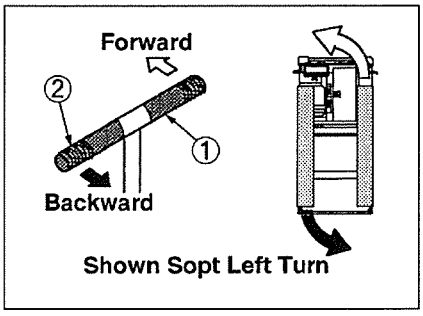
Move the right side travel lever ① forward and move the left side travel lever ② backward at the same time.
This allows a quick left turn (counter track rotation).

Spot Right Turn

Move the right side travel lever ① backward and move the left side travel lever ② forward at the same time.
This allows a quick right turn (counter track rotation).



Shown Pivot Left Turn



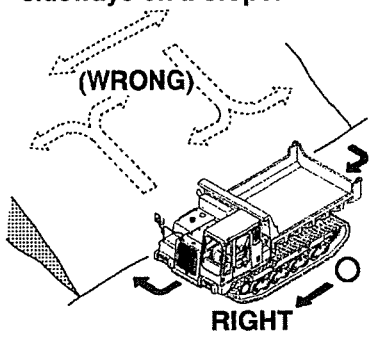
Shown Sopt Left Turn

CAUTION OF TRAVEL ON A STEEP GRADE

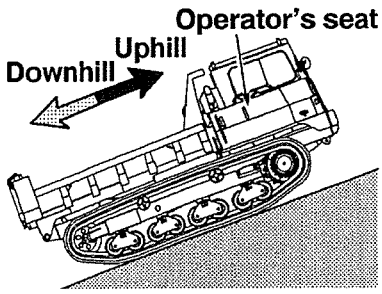
⚠ WARNING

* Be sure no one is working on or near the machine to prevent injury, keep the machine under control at all times to prevent injury.
* Reduce engine speed when maneuvering in tight quarters or when breaking over a rise.
* Select the travel speed range necessary before starting downgrade. Do not change travel speed ranges while going downhill.
* A good practice is to use the same travel speed range going downgrade that would be used to go up the grade.
* Work up and down slopes, rather than sideways, whenever possible.
* Keep the machine under control and do not work it over its capacity.
* Avoid changing the direction of travel on a slope, which could result in tipping or side slipping of the machine.

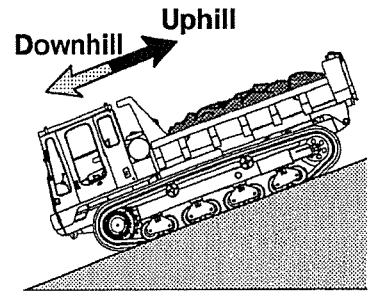
Avoid changing the direction of travel or going sideways on a slope.



Traveling on slope with an unloaded vehicle.



Traveling on slope with a loaded vehicle.



1. **Traveling on slopes with an unloaded Vehicle.**
   - Set the taravel speed select switch to the **LOW** range.
   - When traveling on a steep grade, keep the operator station on the uphill side of the machine.

2. **Traveling on slopes with unloaded Vehicle.**
   - Set the taravel speed select switch to the **LOW** range.
   - When traveling on a steep grade, keep the operator station downhill side of the machine.

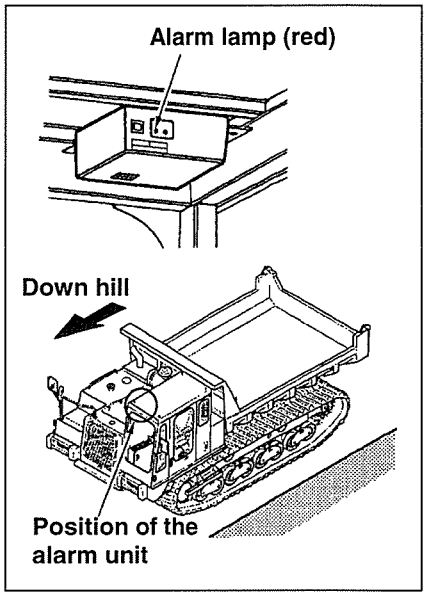
3. **Braking on slopes**
   - When braking on slopes, move the travel lever to neutral and braking will take place automatically.
   - Do not stop by move the gate lock lever to **LOCKED** position while traveling.

4. When the engine has stopped

When the engine has stopped while traveling, return the travel lever to the neutral position and then start the engine.

5. Slope alarm lamp

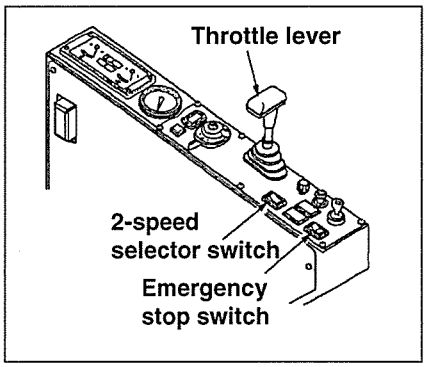
When the angle of the downhill slope exceeds 9 degrees, the alarm lamp on the ceiling lights up, sounding the buzzer. (The alarm continues to sound for 5 seconds.) Upon the sounding of the buzzer, reduce the engine revolution speed to a middle or lower speed, turn the two-speed selector switch to the low speed and run straight. Avoid traveling sideways or taking an oblique direction (including a zigzag travel).



6. Overrun alarm lamp

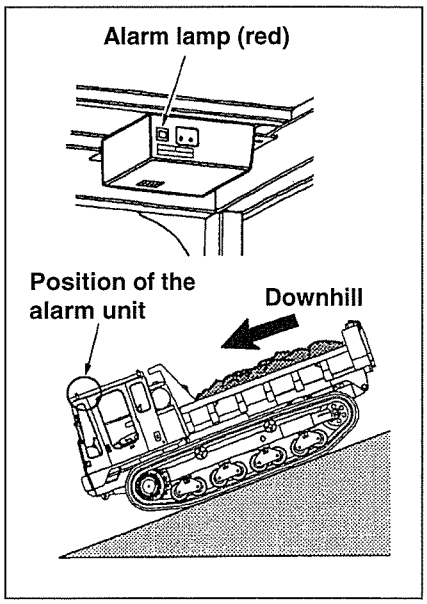
⚠ WARNING

* The "Emergency Stop Switch" is used to avoid a danger. Usually, therefore, the "Emergency Stop Switch" must not be used simply to stop the vehicle.
  After using this switch, be sure to check or repair the parking brake. Otherwise, the parking brake might fail to work, which is dangerous.
* The overrun alarm starts to work when the revolution speed becomes 50 to 200 min^{-1} higher than the high idle revolution speed.



When the alarm lamp on the ceiling turns on, to sound an alarm, the vehicle is in a possible danger that could cause an overrun. Before going downhill, be quick to take the following actions to avoid a danger.

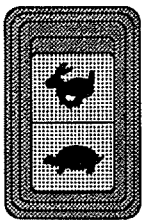
1. Return the travel lever to the neutral position. (The HST brake will apply.)
2. Turn the engine throttle lever to the low speed position in order to reduce the engine speed.
3. When the vehicle cannot be stopped completely, push the P side of the "Emergency Stop Switch" to apply the parking brake.



SELECT THE TRAVEL SPEED RANGE

Select the desired travel speed by operating the travel speed select switch.

Select the travel speed range necessary before starting travel. Do not change travel speed range while traveling.



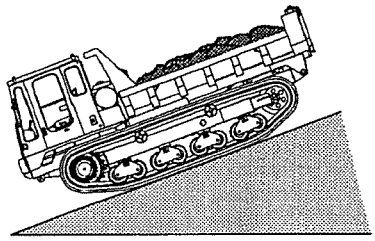
Travel speed select switch

■ **Select the travel speed range as needed.**

Low speed ( ) range :

- Use low speed range when going up and down slopes or uneven ground where lots of travel power is needed.
- A good practice is to use the same travel speed range going down grade that would be used to go up the grade.

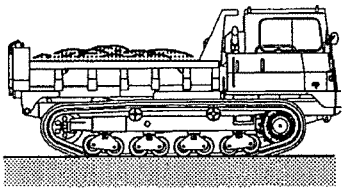
Low speed range



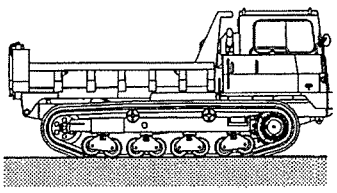
High speed ( ) range :

- Use high speed when traveling on a hard even surface while carrying a load.
- Use high speed when traveling on a hard even surface without load.
  If a load placed on the machine increases to a certain level during **HIGH** speed travel, the machine automatically decreases its travel speed to **LOW**.

High speed



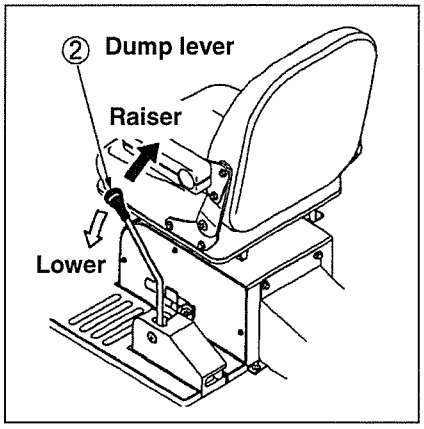
High speed



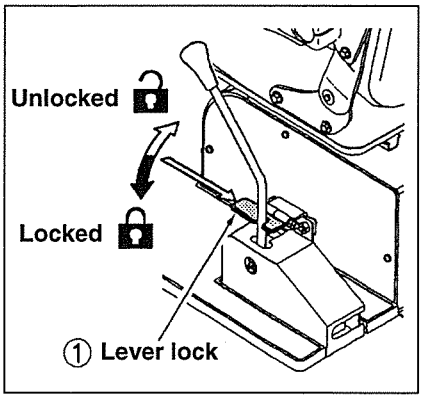
3 - 9 DUMP OPERATION

⚠ CAUTION

Be sure no one is working on or near the machine to prevent injury. keep the machine under control at all times to prevent injury.

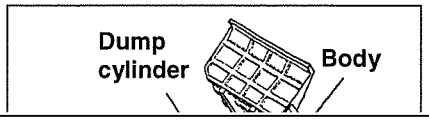


1. Stop the machine and confirm safety of a dumping place.
2. Move the engine throttle lever to increase the engine speed (rpm) to the desired speed.
3. Move the lever lock ① to the unlocked position.
4. Slowly move the dump lever ② to the raise position to raise the body.
5. Release the dump lever to the hold position to hold the body after dump operation.
6. Push the lever down to lower the body.
7. Release the dump lever ② to the hold position to stop the body after completely lowered.
8. Move the lever lock ① to the locked position.



NOTE :

1. The rear gate of body automatically opens or closes as the body rises or lowers.
2. Place the dump lock lever in lock position when no dumping is needed.



■ **Body Lowering with the Engine Stopped For Machine Equipped With Body Lowering Stop Valve**

Use the following procedure instead of the previous procedure when it is necessary to lower the body while the engine is shut down or the hydraulic system disabled and the carrier is equipped with body lowering stop valve.

⚠ WARNING

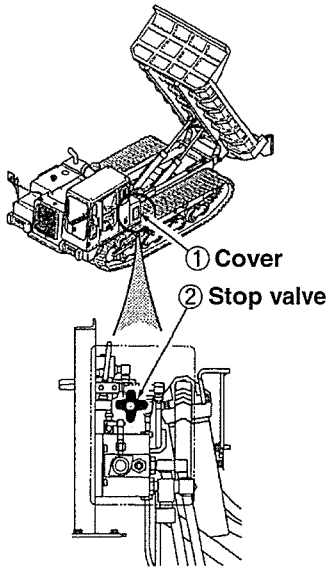
* Body load may cause cylinder oil pressure to reach relief pressure of the body lowering stop valve when body is supported by cylinders. Body can lower suddenly.
* Be sure no one is under or near the front implements before manually lowering the body.
* Keep all personnel away from the body drop area when lowering the body with the engine stopped.

A body lowering stop valve is installed inside of the engine cover, as shown.
The body lowering stop valve allow the operator to manually lower the body with the engine stopped. The body lowering stop valve also function to open the body lowering hydraulic circuit.

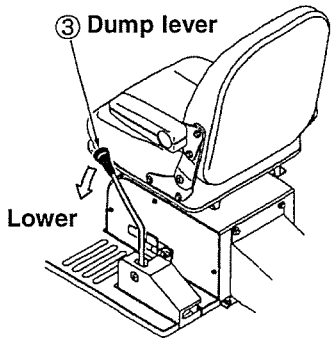
1. Open the engine cover.
2. Turn the body lowering stop valve handle counterclockwise to open the valve.
3. Move the dump lever down to lower the body.
   The body will start to lower slowly
4. Afer making sure that the body has lowered completely onto the lower frame, securely tighten the valve.
5. Make any necessary repairs before placing the carrier back into service.

⚠ CAUTION

* Only lower the body lowering the stop valve when trouble occurs.
* When open the body lowering stop valve applies the parking brake and the carrier stops.
* Be sure to always completely close the body lowering stop valve once the trouble has been repaired.
  If the body lowering stop valve is not completely closed, the parking brake will not fully release, causing lower travel power and early brake wear due to constant application of the brake.
  This is also related to pump damage.



Position of top valve



3 - 10 TOWING

⚠WARNING

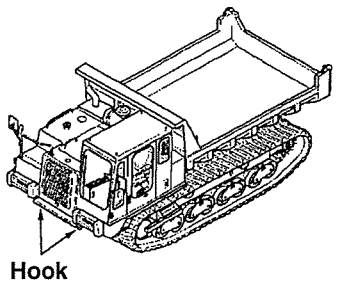
* Personal injury or death could result when towing a disabled machine incorrectly.
* Follow the recommendations below, to properly perform the towing procedure.
* During towing operation, **NEVER** allow anyone between the towing machine and the towed machine.
* Quick machine movement could overload the tow line or bar and cause it to break. Gradual and smooth machine movement will work better.
* Keep the tow line angle to a minimum. Do not exceed a 30° angle from the straight ahead position.

■ Towing the carrier

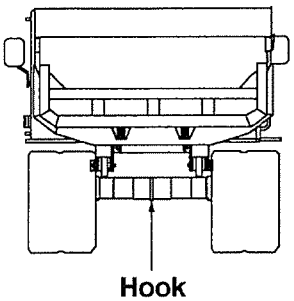
When the carrier gets stuck for instance in mud and cannot escape under its own power it must be towed by another vehicle. In such cases attach a shackle to a wire rope and attach this to the front or rear hook. The carrier can now be towed.

1. Start the engine.
2. Press the unmarked side of the parking brake switch to release the parking brake.
3. Steer the travel lever in the direction you are being towed in.

NOTE : When the engine is broken and will not start, the parking brake will not release. The parking brake will prevent the crawler belt from rotating so the carrier cannot be towed.



Front towing hook



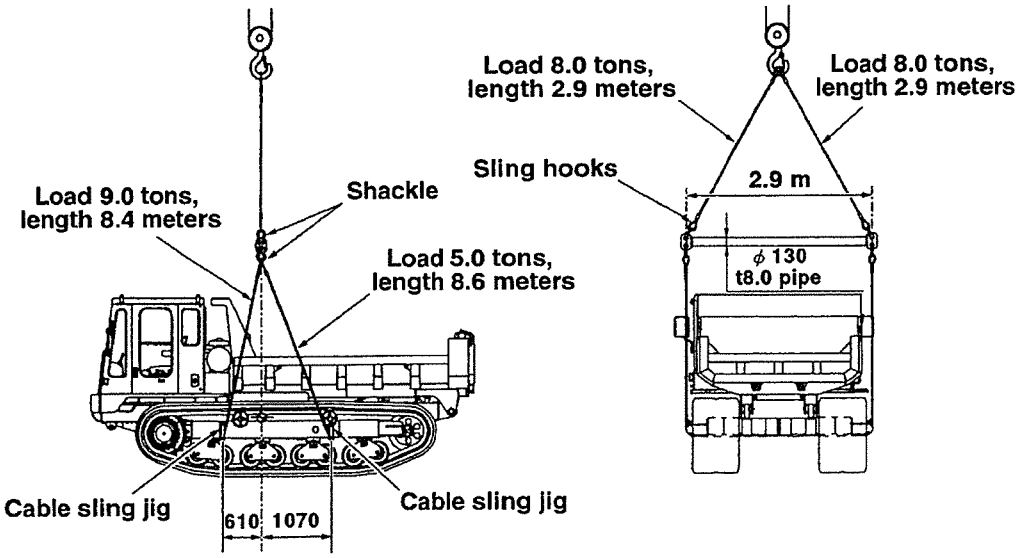
Rear towing hook

3 - 11 LIFTING THE MACHINE

⚠WARNING

Personal injury or death can result, if the following is not observed.

* **ALWAYS** lift the machine on the level ground.
* **NEVER** lift the machine loaded with any personnel.
* Make sure the lifting cables and other lifting devices are strong enough to support the machine.
* Use a crane whose lifting capacity meets the weight of the machine.
* Use guide or tag lines to prevent the machine from swinging or turning.



1. Prepare a wire rope, shackle and sling hooks of sufficient strength to handle the loads shown in the above figure.
2. Lower the body completely and stop the engine.
3. Install the wire rope to the crawler frame as shown in the figure.
4. Install the wire rope to the sling hooks with the shackle.
5. Install the wire rope to the crane hooks and lift upward so the crawler is a little bit above the ground, then stop lifting. Check the machine balance.
6. If the balance is good continue slowing lifting the machine.

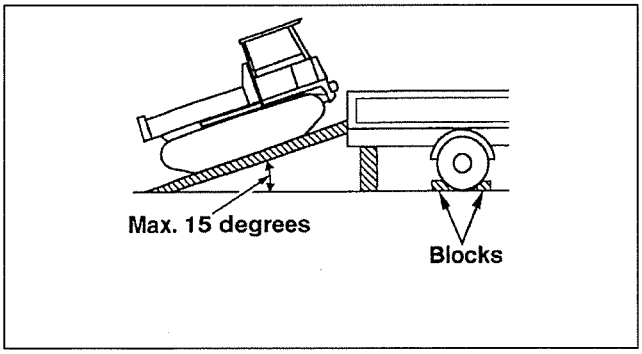
Total operation weight (kg)	13,000

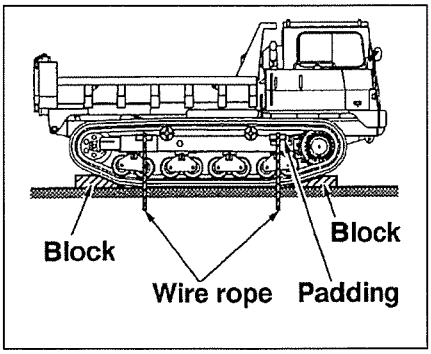
3 - 12 LOADING AND UNLOADING THE MACHINE

⚠ WARNING

* Set the travel speed select switch to LOW before loading the machine. **NEVER** operate this switch when loading the machine on a trailer.
* Choose as flat ground as possible for loading or unloading the machine.
* When using loading ramps, be sure there is adequate length, width, firmness and slope.
* To prevent the machine from slipping while loading, or shifting in transit, remove ice, snow or other slippery material from the loading dock and the truck bed before loading.
* Perform warm-up before loading and unloading under cold weather.
* **NEVER** make a turn on the loading ramps. To make a turn, get oft the machine from the loading lamp first.

1. Block the trailer wheels before loading.
2. Install the loading lamps to the trailer securely.
3. Maintain the slope of loading ramps within 1 5 degrees.
4. The body has lower completely and position the operator station to forward.
5. Position the machine so that it can be run straight on the loading ramps. Never operate control levers other than the travel lover while the machine is on the loading ramps.
6. Maintain the machine balance point while traveling over the loading ramp joint areas.
7. Move the gate lock lever to the **LOCKED** position.
8. Turn the engine start switch key to **OFF** to stop the engine and remove the key.
9. Lock the door, access covers and attach any vandalism protection.
10. Block the tracks and secure the machine with tiedowns. For this purpose, with proper rated wire rope cable, use the front and rear eyes on the lower frame and towing eyes located in front and rear of the lower frame.





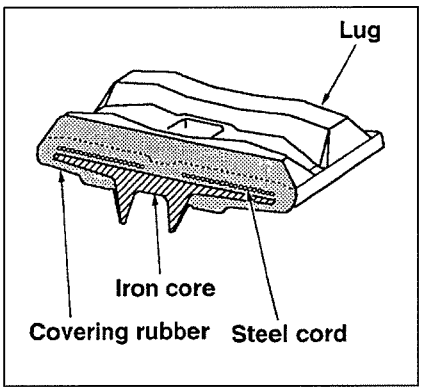
3 - 13 PRECAUTION ON USE OF RUBBER CRAWLER SHOE

⚠ CAUTION

The rubber crawler shoe may be damaged or worn faster depending on working conditions. Perform working operation properly according to working site conditions and machine operation.

■ Structure of Rubber Crawler Shoe

The structure of rubber crawler shoe. It consists of steel cord to sustain tension, iron core to support it, and covering rubber to them.

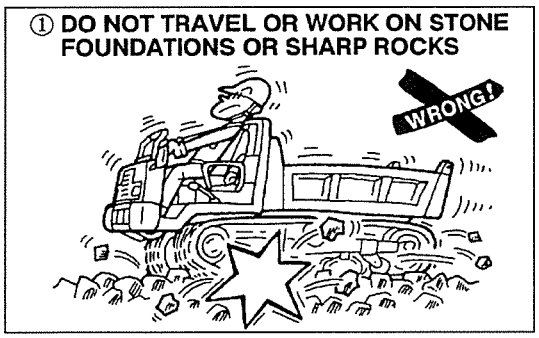


NOTE : If a crack reaches the steel cord, it may be rusted and cut off by moisture. When any crack is detected, immediate repair is essential. Please contact your local IHI distributor.

■ Cautions while working and travelling

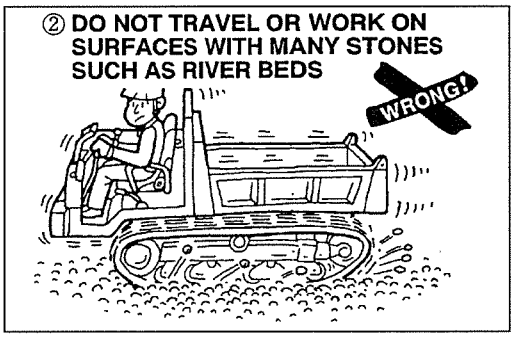
Avoid the following while travelling.

① **DO NOT TRAVEL OR WORK ON STONE FOUNDATIONS OR SHARP ROCKS**



This wears down the lug and causes the steel cord to break.

② **DO NOT TRAVEL OR WORK ON SURFACES WITH MANY STONES SUCH AS RIVER BEDS**

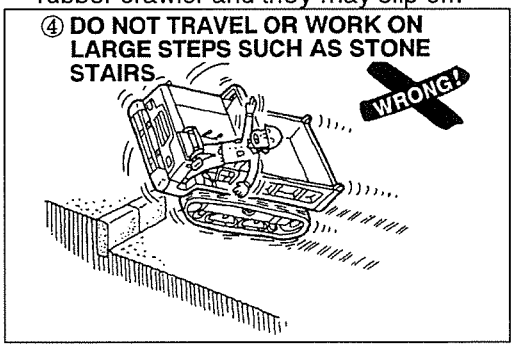


This causes damage or wear on the rubber crawler and they may slip off.

③ **DO NOT TRAVEL OR WORK ON STEEL OR SCRAP MATERIAL**

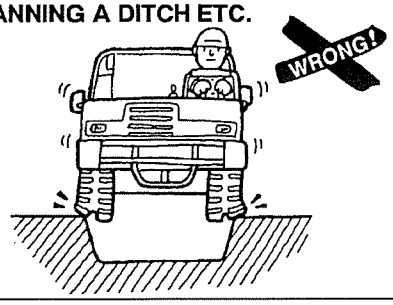
This wears down the lug and causes the steel cord to break.

④ **DO NOT TRAVEL OR WORK ON LARGE STEPS SUCH AS STONE STAIRS**



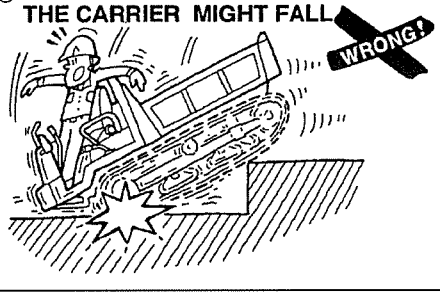
- Move slowly directly up steps.
- While moving up the steps avoid places where the road surface changes.

⑤ DO NOT TRAVEL OR WORK WHILE SPANNING A DITCH ETC.



- This wears down the lug and breaks the iron core.
- The carrier might fall or topple over.

⑥ AVOID LOCATIONS WHERE THE CARRIER MIGHT FALL

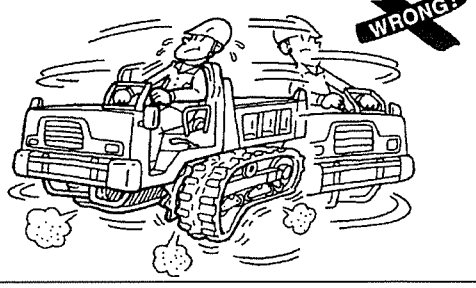


Do not let the carrier fall from locations like large stone steps.
This might damage or break the iron core.

⑦ AVOID TRAVELLING OVER LARGE RUTS OR PROTRUSIONS ON THE ROAD

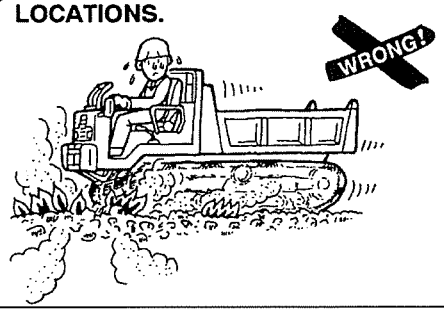
- Travel slowly and take care not to let the crawlers come off the rollers.
- Do not change directions when the crawlers may have lost tension at the high and low parts of ruts and protrusions. This may cause the crawlers to come off.

⑧ AVOID SUDDEN CHANGES IN DIRECTION WHEN STEERING



- Make direction changes in several smaller steering movements.
- Avoid sudden changes in direction. This causes early wear on the lug and may cause the crawlers to slip off.

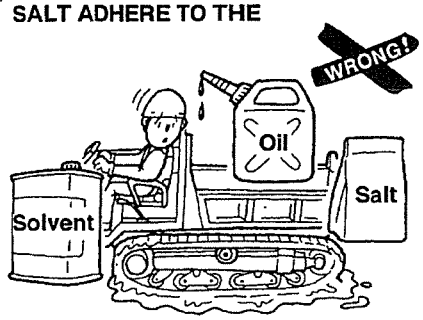
⑨ DO NOT TRAVEL OVER HIGH HEAT LOCATIONS.



Do not try to travel over place subjected to high heat such as steel plate that was placed in bonfires or under scorching heat, asphalt or floorboards etc.
This causes serious abrasion or damage and breakage of the lug.

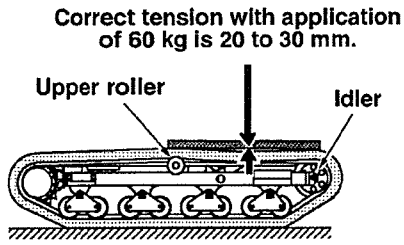
■ OTHER ITEMS FOR CAUTION

① DO NOT LET OIL – SOLVENTS OR SALT ADHERE TO THE



- If fuel, transmission fluid or paint should adhere to the rubber crawlers wipe it away quickly
- Wash away with water after working in locations with a large salt content. Salt can cause the iron core to rust or peel.

② ALWAYS USE CORRECT TENSION ON THE SHOE



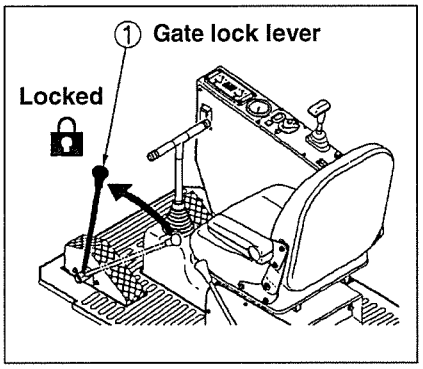
Attempting to change directions on terrain with different levels or steps while the rubber crawler is still slack may damage the rubber crawlers or cause them to come off the rollers.

3 - 14 PARKING THE MACHINE

Machine Stopping

Park on a level surface. If it is necessary to park on a grade, block the tracks securely.

1. Move engine throttle lever forward to reduce the engine speed.
2. Release the travel lever to stop the machine.
3. Move the gate lock lever to the **LOCKED** position.



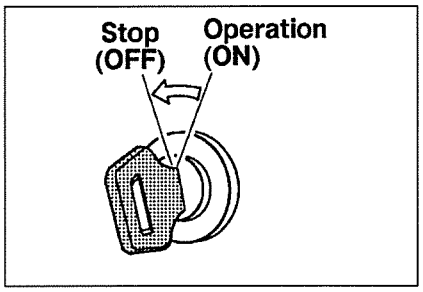
Freezing Conditions

If freezing temperature are expected, each crawler frame should be cleaned of mud and dirt and the machine parked on wood planks.

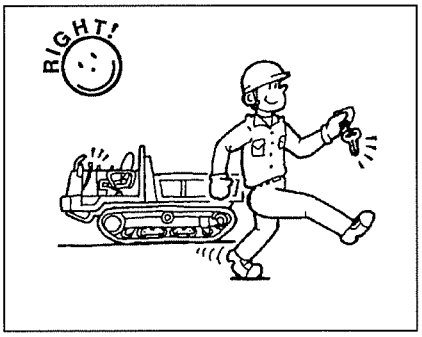
Engine Stopping

⚠ CAUTION

Refer to the following stopping procedure, to allow the engine to cool, and to prevent excessive temperatures in the turbocharger center housing, which could cause oil coking problems.



1. With the machine stopped, run the engine for five minutes at **LOW IDLE**. Stopping the engine immediately after it has been working under load, can result in overheating and accelerated wear of the engine components.
2. Turn the engine start switch key to **OFF**. Remove the key.



Leaving the Machine

1. Use the steps and handhold, use both hands and face the machine, when dismounting.
2. Inspect the engine compartment for debris. Clean out any debris and paper to avoid a fire.
3. Close and lock the doors.

3 - 15 EMARGENCY ENGINE STOP

To stop the engine in emergency, turn the starter switch to **"OFF"** position.

3 - 14 PARKING THE MACHINE

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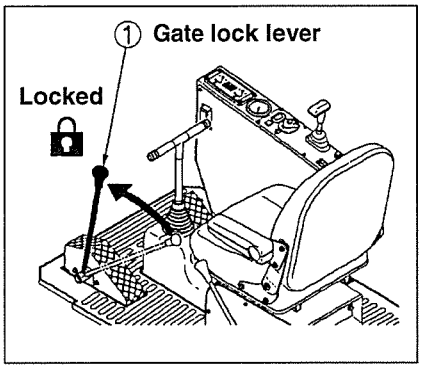

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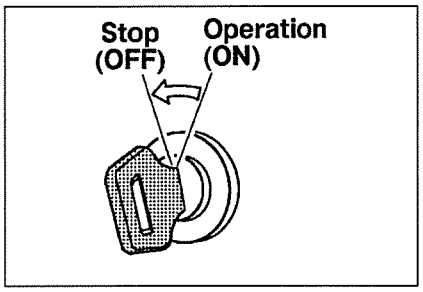

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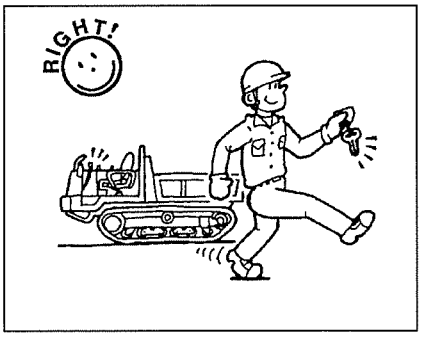

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4 MAINTENANCE

MAINTENANCE INTERVALS

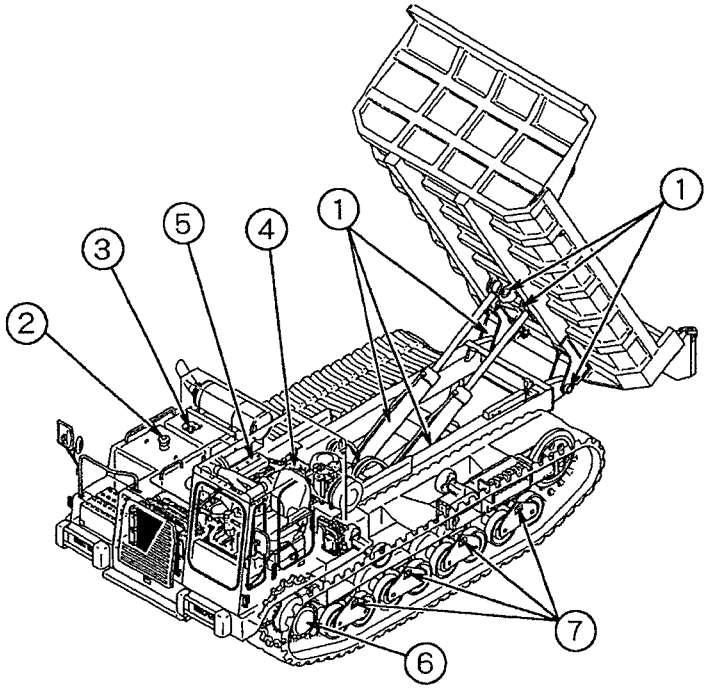
Check Point	Item	Page
Daily Check (8 Service hours)		
Engine Oil	Check Oil Level	4 – 6
Hydraulic Tank	Check Hydraulic Oil Level	4 – 6
Engine Coolant	Check Coolant Level	4 – 7
Air Cleaner	Check Filter Dust Indicator	4 – 7
Water Separator	Check Level and Drain Water	4 – 8
Every 50 Service Hours (First perform previous service hour items)		
Pins	Lubricate Fitting with Grease	4 – 9
Full Tank	Drain Water and Sediment	4 – 9
Engine	Change Oil and Filter *	4 – 10
Hydraulic System	Change Line Filter *	4 – 14
Every 250 Service Hours (First perform previous service hour items)		
Engine Oil and Filter	Change Oil and Filter	4 – 10
Air Cleaner	Service Air Cleaner Element	4 – 11
Fan and Alternator Belt	Inspect / Adjust	4 – 12
Engine Coolant	Change Coolant (When not used L.L.C)	4 – 20
Every 500 Service Hours (First perform previous service hour items)		
Tighten Bolts	Retighening Bolt	4 – 13
Line Filter	Change Line Filter Element	4 – 14
Fuel Filter	Change Filter	4 – 15
Travel Reduction	Check Oil Level	4 – 16
Air Cleaner	Change Filter Element	4 – 17
Every 1000 Service Hours (First perform previous service hour items)		
Travel Reduction	Change Gear Case Oil	4 – 18
Hydraulic Tank	Change Hydraulic Oil / Clean Strainer	4 – 19
Every 2 years Service Hours		
Engine Coolant	Change Coolant (When used L.L.C)	4 – 20
When Required		
Tracks	Check and Adjust Tension	4 – 22
Battery	Inspect and Topping Up	4 – 23
Fuses	Replace	4 – 24
Fusible Link	Replace	4 – 24
Pre-cleaner (option)	Cleaning	4 – 25
Rubber Shoes	Check Rubber Shoes	4 – 26

* Interval given applies only to initial period of use (Break-in).

4 MAINTENANCE

4 - 1 LUBRICATION CHART MAINTENANCE AND CHECKS

The interval of lubrication, maintenance and check is the maximum interval indicated by the service hour meter. Of course it should be shortened in service operating conditions.



Check points		Check items	Check intervals					
			Initial period of use After 50 hours	Daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours
①	Body and cylinders Pins	Lubricate the Fittings			G O			
②	Fuel Tank	Drain the Water and Sediment			O			
③	Hydraulic Tank	Check Level and Change Oil		O				H ●
		Drain the Water and Sediment			O			
		Clean the Suction Strainer						O
④	Line Filter	Change the Filter	●				●	
⑤	Engine	Check and Change the Oil	E ●	O		E ●		
		Change the Oil Filter Element	●			●	●	
		Change the Air Filter Element				O Clean	●	
		Check the Coolant Level		W O				
⑥	Travel Reductions	Check and Change the Oil					O	L ●
⑦	Link Pins	Lubricate the Fittings			O			

Symbol	G	L	H	E	W	O	●
Remarks	Grease	Gear oil	Hydraulic fluid	Engine oil	Coolant	Inspection/ Maintenance /Supply	Replacement
	EP- 2 Lithium grease	API · GL- 4, GL-5 ISO-VG320	Wear-proof hydraulic fluid ISO-VG46	API•CC or CD SAE 10W30			

4 - 2 RECOMMENDED LUBRICATION TABLE

LOCATION	REFILL CAPACITIEAS	REPLACING INTERVAL	USE	SPECIFICATION	SHELL OIL	ESSO STANDARD	MOBIL OIL
Diesel Engine	33 ~ 25	250 Hrs. Initial 50 hours	Cold Regions	API, Class CD SAE20	Rimula Oil 20/20W	Esso Lube HDX20	Mobil Delbac 1320
			General	API, Class CD SAE30	Rimula Oil 30	Esso Lube H DX30	Mobil Delbac 1330
			Tropical Regions	API, Class CD SAE40	Rimula Oil 40	Esso Lube H DX40	Mobil Delbac 1340
Hydraulic oil	Total Amount 147 liters Tank level Capacity 112 liters	1,000 Hrs.	Ambient Temp. Above -5°C	Wear Proof Hydraulic Fuluid ISO - VG 46	Tellus Oil No. 46 *No. 68	Nuto H46 *H68	Mobil Oil DTE25 *DTE26
			Ambient Temp. Below -5°C	Wear Proof Hydraulic Fuluid ISO - VG 32	Tellus Oil 32	Nuto H-32(-12°C) H-22(-36°C)	DTE24 (-22°C)
Lower Roller	650 cc/per	1,000 Hrs.	General	API, GL-4 or GL-5, ISO-VG320 (SAE90) Gear Oil	Spirax EP90	Esso Gear Oil GP90	Mobil Lube HD90
Travel Reduction Drive	2.2 liter	1,000 Hrs.	General				
Upper Roller	80 cc	1,000 Hrs.	General	API, Class CD SAE30	Rimula Z Oil 30	EXXON D-3 30	Mobil Delbac 1330
Idler	300 cc						
General Greasing Points	Body pin, Link pin for rotary roller		General	EP2 Lithium Grease	Albania Grease EP2	Lithtan EP2	Mobilax EP2

Note:

1. Oils in the hydraulic fluid columns marked with *should be use above 0°C.
2. If the oil becomes dirty or deterioration of the oil's properties are excessive, replace more frequently than described above.
3. Disassemble lower and upper rollers when replacing oil.

4 - 3 PRECAUTION ON MAINTENANCE

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

■ Use the safety bar

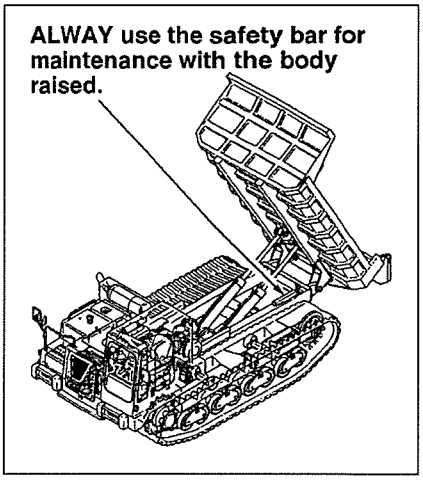
⚠ WARNING

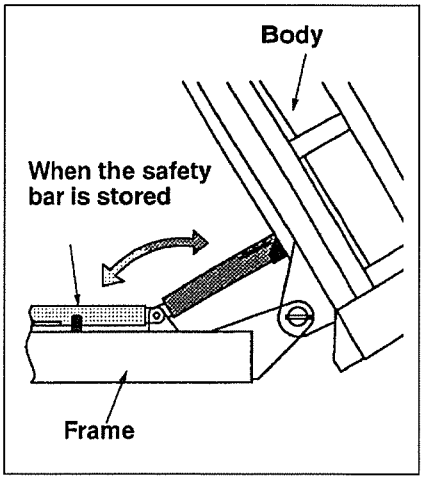
ALWAYS use the safety bar to prevent personal injury or death, when maintenance under the raised body.

Use the safety bar when underneath the body witch has been raised.

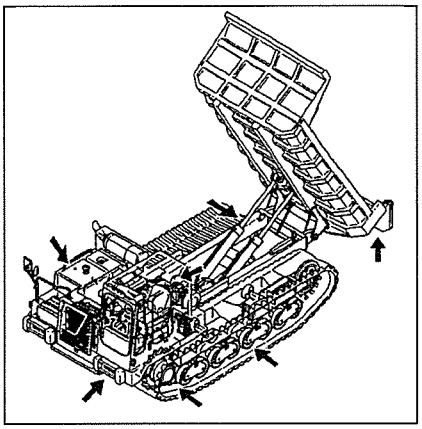
1. Set the safety bar
   (1) Raise the body completely.
   (2) Raise the safety bar and set it to the bracket under the body.
   (3) Lower the body contact the safety bar with engine low idle.
   (4) Stop the engine.

2. Remove the safety bar
   (1) Start the engine and pull up the dump lever to raise the body completely.
   (2) Remove the safety bar from the bracket and store the bar onto the frame.





4 - 4 DAILY MAINTENANCE AND CHECKS



The following items should be checked each day before start-up or the start operations.

■ Walk-Around Inspection

Inspect the operator's compartment for cleanliness. Keep it clean.

Inspect lights for broken bulbs and lenses.
Replace it broken.

Inspect and remove any trash build up the engine compartment.

Inspect any cracks in body and gate hinges.
Repair if it damaged.

Inspect the cooling system for leaks, faulty hoses and trash buildup. Correct any leaks and remove any trash from radiator.

Inspect the hydraulic system for leaks, Inspect the tank, hoses, tubes, plugs, joints and fittings.
Correct any leaks.

Inspect the hydraulic level. Maintain the oil level.
Add oil if necessary.

Check the engine oil level. Maintain the oil level.
Add oil if necessary.

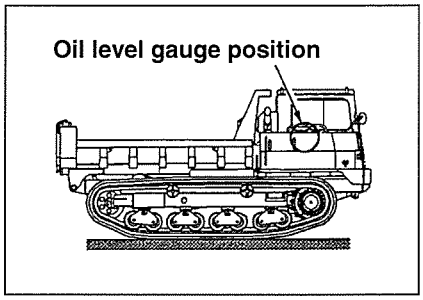
Check the coolant level on the coolant reserve tank. Maintain the level. Add coolant if necessary.

Check the air filter dust indicator. If the indicator is in the red zone, service the engine air filter.
After servicing, push the reset button to reset the dust indicator.

Inspect and repair any travel reduction leaks.
Check the oil level if leakage is noticed.

■ Check the Engine Oil Level

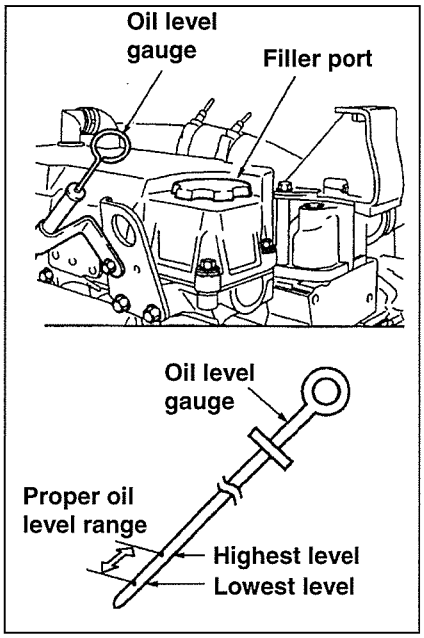
Check the oil level with the engine stopped. DO NOT check the oil level with the engine running.



⚠ CAUTION

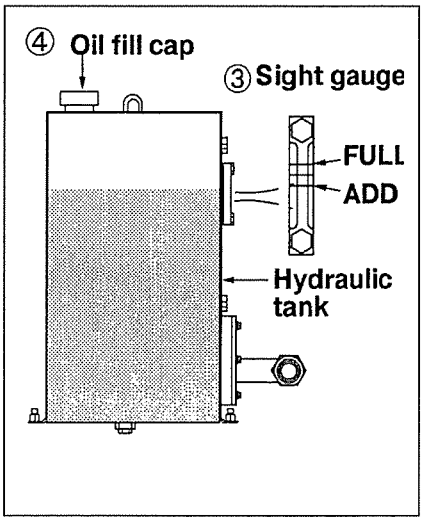
* Do not overfill the crankcase. Engine damaged can result.
* Never operate the engine when oil level is above **FULL** mark or **ADD** marks.

1. Open the access cover on the engine.
2. Remove dipstick ① and wipe it clean. Insert dipstick ①, then move it again to read actual oil level. Insert dipstick ①.
3. Maintain the oil level to the FULL mark on dipstick ①. Add oil if necessary.
4. Remove the oil fill plug ② and Add oil.
5. Check oil level.
6. Clean and install the fill plug ②.
7. Close the access cover.



■ Check the Hydraulic Oil Level

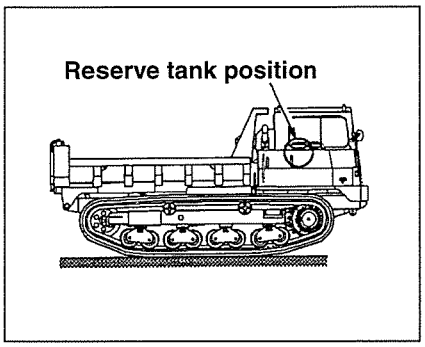
1. Place the machine on the level ground, and the engine stopped.
2. Check the oil level with the oil colded.
3. Maintain oil level between the FULL and ADD marks on the sight gauge ③.
4. Remove the oil fill plug ④.
5. Fill the hydraulic tank with hydraulic oil.
6. Clean and install the oil fill cap ④.



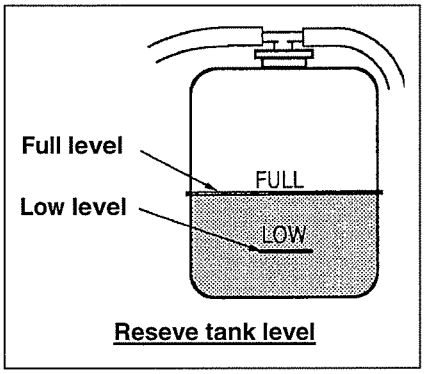
■ Check the Coolant Level

⚠WARNING

* Steam generated by hot fluid under pressure in radiator can cause personal injury.
* Remove filler cap only when cool enough to touch with bare hand.



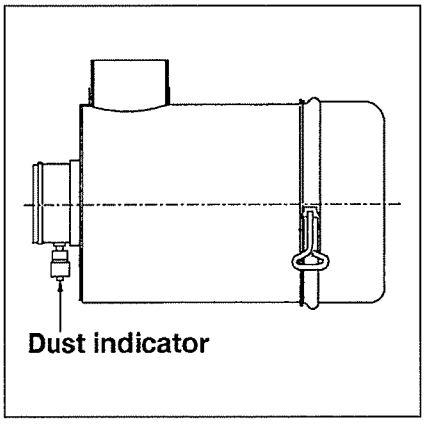
1. Open the access door at the right of the machine.
2. Always check the coolant level in the reserve tank. Coolant level should be between the marks on the coolant reserve tank.
3. If additional coolant is needed, remove the coolant fill cap ① of the reserve tank and add appropriate coolant / water mixture as necessary.
4. If the reserve tank is empty, remove the cover on the engine.
   Add coolant to the radiator. Slowly loosen fill cap ② of the radiator to release pressure.
5. Inspect the condition of the cap gasket.
   Replace the cap if necessary.
6. Install the radiator cap ②.
7. Inspect the radiator core ③ for debiris and clean if necessary.
8. Close and latch the access door and install the engine cover.



■ Check the Dust Indicator

Check the air filter dust indicator. If the indicator is in the red zone, service the engine air filter.

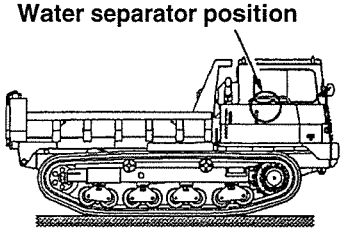
After servicing, push the reset button to reset the filter indicator.



■ Check Level and Drain Water Separator

⚠WARNING

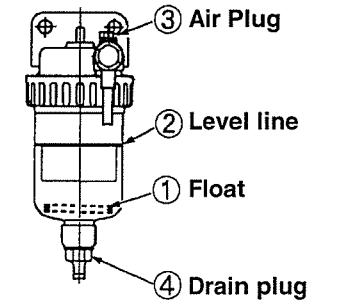
Fuel leaked or spilled onto hot surfaces can cause a fire.



Maintenance intervals:
- Check Level: Daily
- Drain Water and Sediment: When the float ① floated up to the level line ② on the separator.

1. Stop the engine.
2. Turn the drain plug ③ on the bottom of the water separator counterclockwise to open.
3. Drain water and sediment into suitable container.

NOTE : Always dispose of drained fluids as established by local regulations.



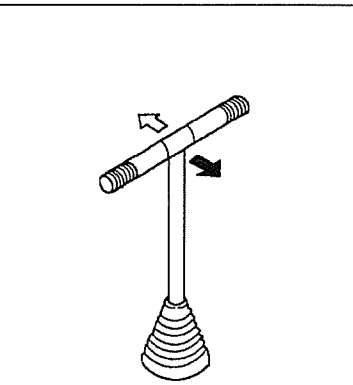
4. Close the drain plug ③.

■ Travel Alarm (if Equipped)

Test

The machine must be moved to test the alarm.

1. Start the engine. Move the gate lock lever to the **UNLOCKED** position.
2. Use the travel lever to move the machine forward. The travel alarm should sound.
3. Release the travel lever to stop the machine.
4. Use the travel lever to move the machine backward. The travel alarm should sound.



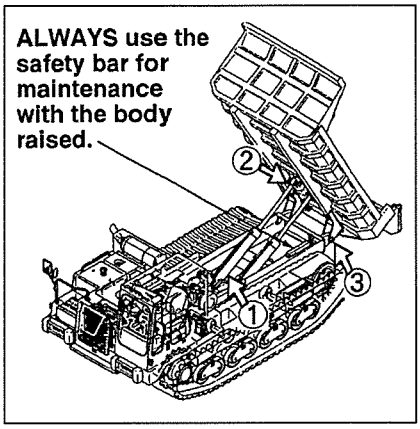
4 - 5 50 HOURS MAINTENANCE AND CHECKSCHECKS

Farst Perform Previous Service Hour Items.

■ Lubricate the Fittings

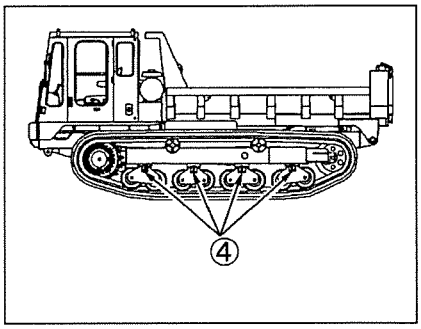
⚠WARNING

ALWAYS set a safety bar in place under the body when lubricating the vehicle with the body raised.



Wipe all fittings before lubricating.

1. Lubricate fittings ① and ② for the dump cylinders bottom and rod.
2. Lubricate the fittings ③ at the connection of the body and main frame.
3. Lubricate the fittings ④ on the roller link pins.

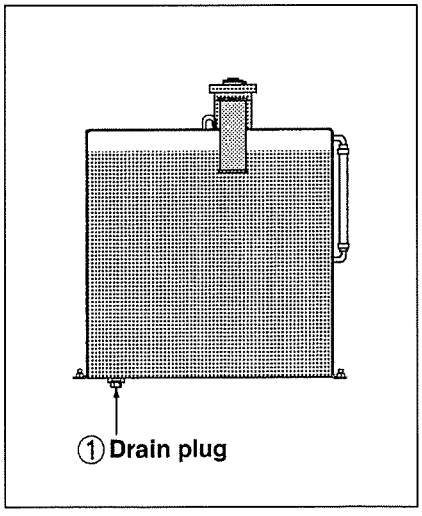


FUEL TANK

■ Drain the Water and Sediment

NOTE : Dispose of drained material according to local regulations.

1. Loosen the drain plug ① carefully (three turn maximum) located under the fuel tank and allow the water and sediment to drain into a container.
2. Tighten the drain plug.



4 - 6 250 HOURS MAINTENANCE AND CHECKS

Carry out also checks and maintenance at intervals of 50 hours.

■ Replacing engine oil and engine oil filters

⚠ CAUTION

The oil will be hot immediately after the start of operation. If you touch it, you may suffer a burn. Start working after the oil gets cool.

● Draining the engine oil

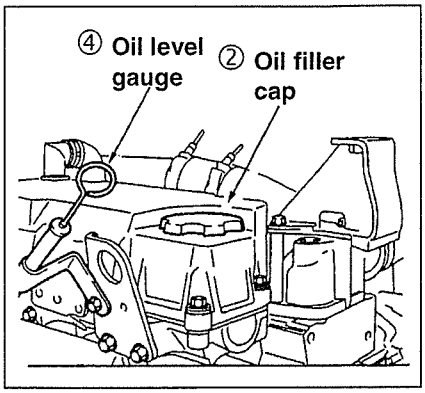
1 Stop the engine.
2 Place the oil receiver just under the engine drain plug ①.
3 Clean the surroundings of the oil filler cap ② to prevent foreign matter from getting into the oil. Then, remove the cap.
4 Remove the drain plug ① in such a way as not to spill the oil over the plug. Drain the oil completely.
5 Check the drained oil. If a large amount of metal powder or foreign matter is found in it, contact our sales service shop.

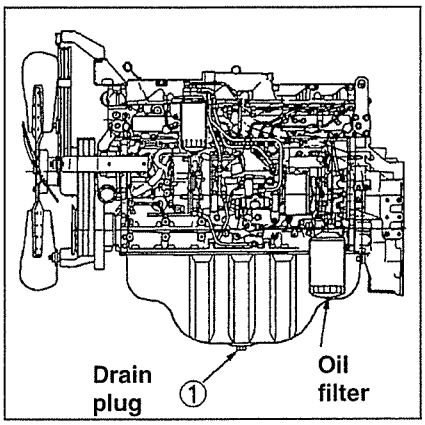
● Replacing filter cartridges

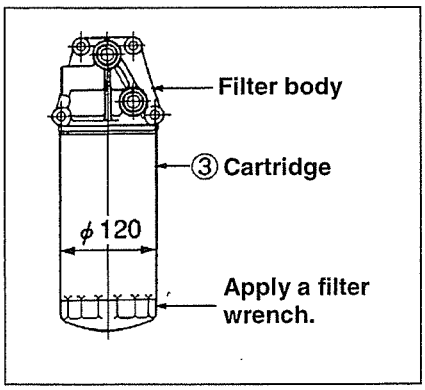
1 Using a filter wrench, turn the cartridge ③ counterclockwise and remove it.
2 Clean the seal surface of the filter body. Apply a thin coat of engine oil on the gasket of the new cartridge ③. Lightly screw the cartridge in manually until it comes in contact with the seal surface of the filter head.
3 Using a filter wrench, further tighten it by one turn.

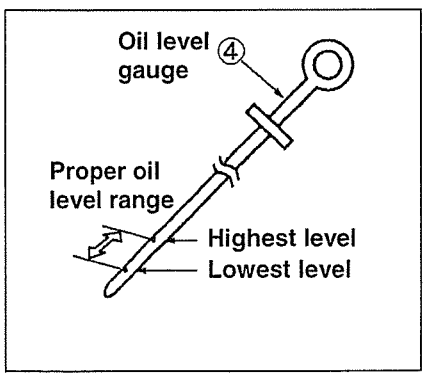
● Filling engine oil

1 Fit the drain plug ①.
2 Fill new engine oil from the oil filler up to the proper oil level range on the level gage ④.
3 Start the engine, and after idling for a while, stop the engine. Check the amount of engine oil again in 10 to 20 seconds. If the oil level is low, fill oil again.
4 Make sure that there is no oil leakage from the drain plug and the cartridge mounting section.



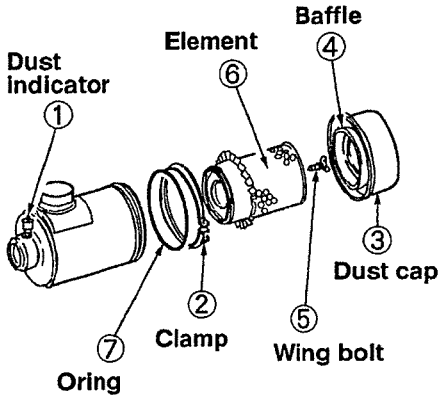






■ Clean the Air Filter Element

Clean the air filter element after every 250 hours of operation or indicated red signal in the dust indicator ①.

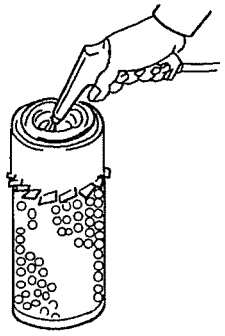


⚠ CAUTION

- Service the air cleaner only with the engine stopped. Engine damage could result.
- Do not clean the filter elements by bumping or tapping them.
- Do not use filter element with damaged pleats, gaskets or seals.
  Engine damage could result.

1. Stop the engine.
2. Loosen the clamp ②, remove the dust cap.
3. Remove the baffle ④ from the dust cap ③. Clean the inside of the dust cap ③.
4. Install the baffle ④ to the dust cap ③.
5. Remove the wing bolt ⑤ and take out the element ⑥.
   Clean the inside of the air cleaner housing.

Open the access door at right side of the machine.



Cleaning the Element

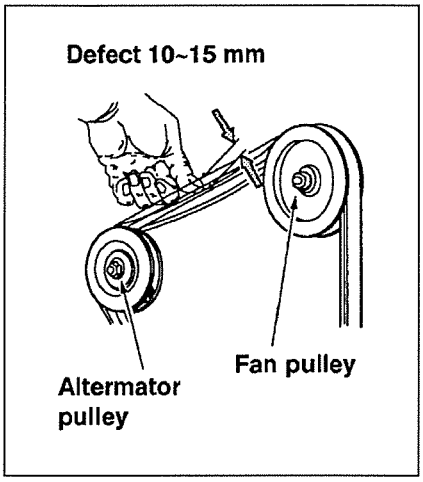
6. Filter element can be cleaned with compressed air which never exceed 685 kPa.
7. Direct air along pleats inside of filter element.
8. Make sure the cleaned filter element are completely dry before installing in to the filter housing.
9. Inspect the filter element after cleaning. Do not use a filter element with damaged pleats, gasket or seals.
10. Install a clean element ⑥ and tighten the wing bolt ⑤.
11. Install the dust cap with arrow point upward.
12. Reset the dust indicator by pushing in the reset button.

Normally a tilter can be cleaned up to four times. Replace after four cleanings maximum.

■ Fan and Alternator Belts

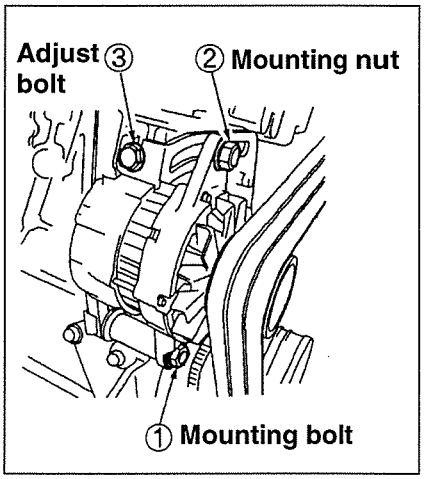
Inspect

1. Stop the engine.
2. Open the access door on the rear of the machine.
3. Inspect the condition and adjustment of the belts. If the belt are damaged, replace them.
4. To check the belt tension, apply a 98N (10kgf) force, push the belt inward by hand midway between the pulieys. Correctly adjusted belts will deflect 10 to 15 mm.



● To Adjust

1. To adjust the belts, loosen mounting bolts ① and bracket bolt ②.
2. Move component in or out as required to obtain the correct adjustment.
3. Tighten bolts ① and ②.
4. Close the access door.



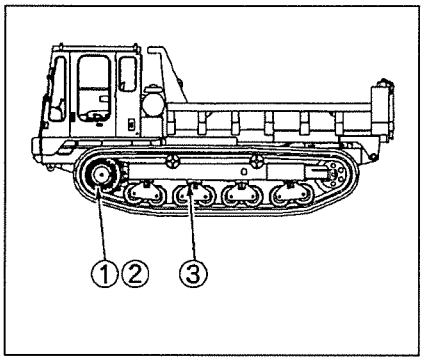
NOTE : If new belts are installed, check the belt adjustment again after 30 minutes of engine operation at rated speed.
Replace belts in matched sets only.

4 - 7 500 HOURS MAINTENANCE AND CHECKS

First Perform Previous Service Hour Items.

■ Check the Fixed Bolt Torque

When loosened bolt or nut is found at daily check, retaight it with torque specifications table.



1. Special torque specifications

Special tighten is applied for main bolts as illustrated below.

When replacing bolts, apply molybdenum grease to bolts, nuts, and bearing surface of nuts. Then, tighten them with specified torques.

No.	Special tightening	Wrench Size (mm)	Thread Size	Tightening Torque	
				kgf-m	N•m
①	Travel reduction drive	30	M20	53.5	523
②	Sprocket	30	M20	53.5	523
③	Lower roller	30	M20	48.5	476

2. General torque specifications

Other than above-mentioned, refer the next table for torques.

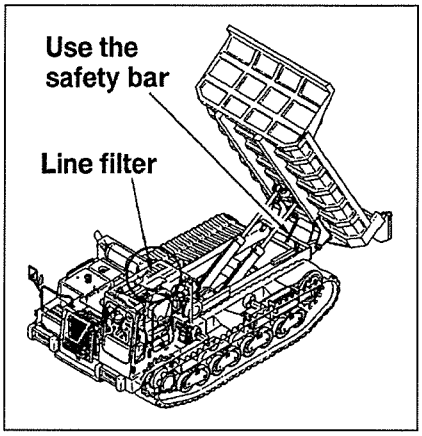
Thread Size (mm)	Standard Torque			
	Coarse 10T Bolt		Fine 10T Bolt	
	(kgf•m)	(N•m)	(kgf•m)	(N•m)
M8	2.3	23	2.5	25
M10	4.8	47	5.1	50
M12	8.5	83	9.3	91
M16	21.0	206	22.5	220
M20	42.0	412	46.0	450
M24	73.0	715	83.0	813

High Pressure Hose Union Nut		
Hose Size (inch)	Standard Torque	
	(kgf•m)	(N•m)
1/4″	2.5	25
3/8″	5.0	49
1/2″	6.0	59
3/4″	12.0	118
1″	14.0	137
1-1/4″	17.0	167

■ Change Line Fitter

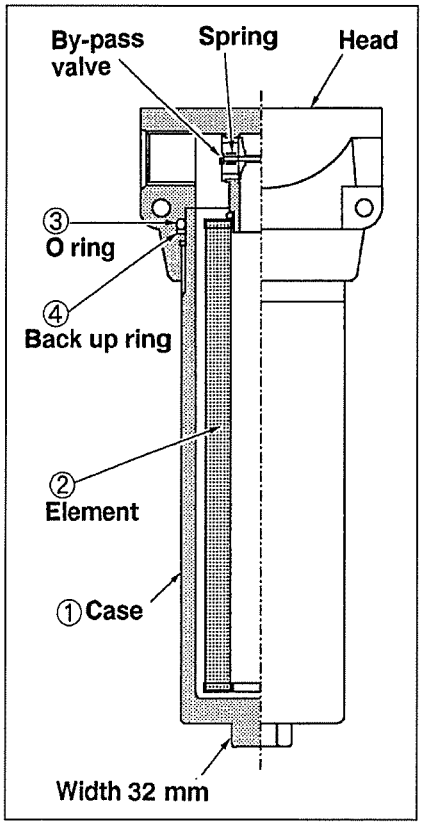
⚠ WARNING

* Hot oil can cause burns.
* At operating temperature, the hydraulic tank is hot and under pressure.
* Remove the line filter only when the engine is stopped, and the line filter is cool enough to touch with your bare hand.



1. Set the safety bar. Refer to precaution on Maintenance in this section.
2. Stop the engine
3. Clean the area to keep dirt out of the filter head.
4. Loosen the case ① and remove the used element ②.
5. Clean the inside of the case ① and filter head.
6. Install the new element to the case ①.
7. Install the case ① to the filter base.
8. Start the engine and operate it a few minutes. Inspect for leaks.
9. Stop the engine. Check the hydraulic oil level.
10. Maintain the oil level between the **ADD** and **FULL** marks on the sight gauge,
11. Remove the safety bar from the body and store the bar onto the frame.

☆ Replace it after 50-hours use at initial period.



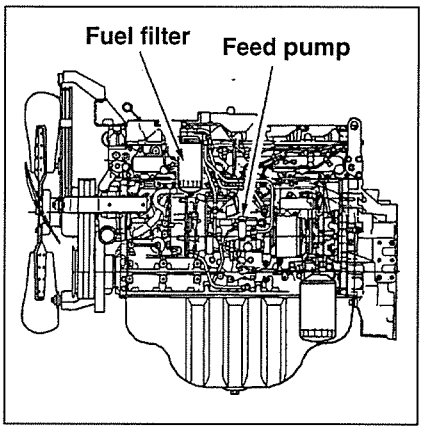
■ Replacing fuel filter elements

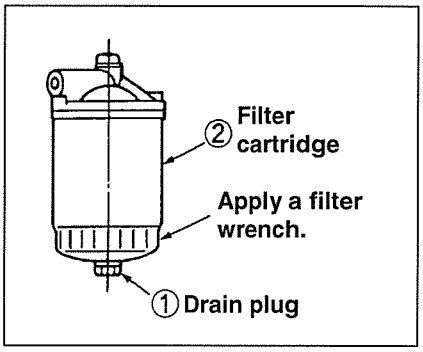
⚠ CAUTION

* Replace filter elements after each part of the engine gets cool.
* Keep from flame
* Spilt oil can cause a fire. Wipe it completely.

NOTE : Do not tighten the filter cartridge too much. Otherwise, elements may become damaged

1 Stop the engine.
2 Remove the drain plug ① and drain the fuel from the filter.
3 Using a filter wrench, turn the filter cartridge ② counterclockwise to remove it.
4 When fitting the filter cartridge ②, coat fuel thinly on the packing of the cartridge, and then screw it in. After the packing has come in contact with the seal surface, tighten it approximately a 1/2 to 3/4 of a turn.
5 After fitting the cartridge, release the air.

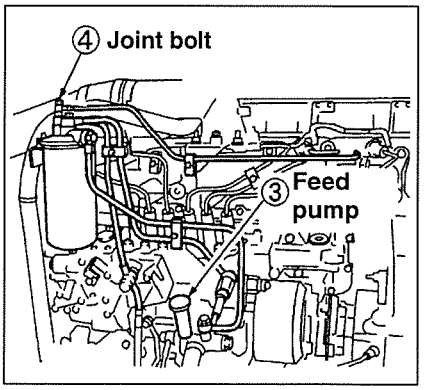


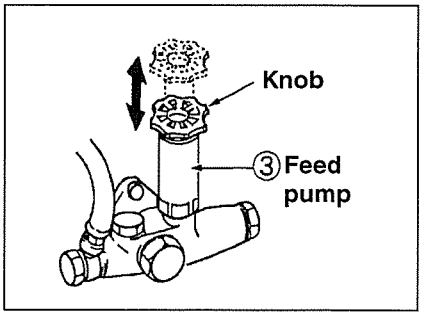


● Releasing air from a fuel system

When a fuel filter is disassembled or a fuel tank is emptied, air comes in the pipe, thus making it impossible for fuel to flow. It is therefore necessary to remove the air from the pipe.

1 Loosen the joint bolt ④ at the outlet of the fuel filter.
2 Loosen the knob of the feed pump ③.
3 Move the knob of the feed pump up and down, and continue to feed fuel until no air bubble comes out from the joint bolt ④.
4 When there comes no air bubble, tighten the joint bolt ④, and continue to do so until the knob becomes heavy. Then, reinstall the knob by screwing in.
5 After wiping spilt fuel completely, start the engine and make sure that there is no fuel leakage.

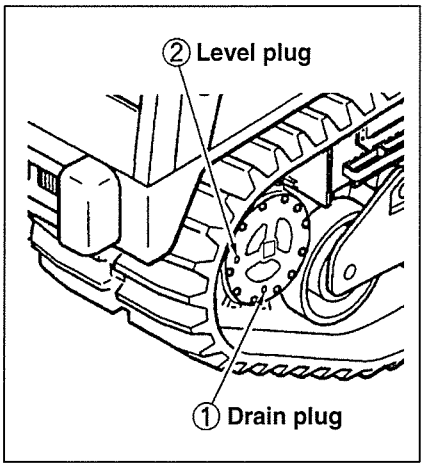




■ Check the Travel Reduction Oil Level

⚠ WARNING

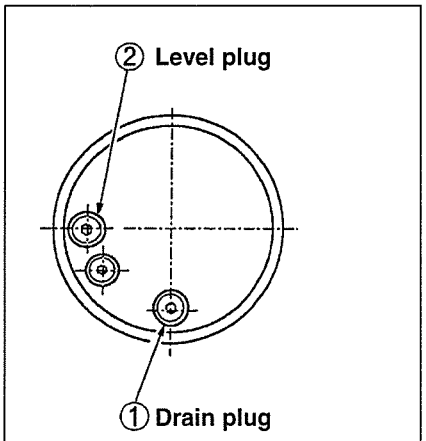
Hot oil and components can cause burns personal injury. Do not allow hot oil or components to contact skin.



1. Position one travel reduction with oil drain plug ① at the bottom.
2. Remove oil level plug ②.
3. Oil should be to the bottom of oil level plug ② opening.
4. Add oil through the opening of oil level plug ②, if necessary.
5. Clean plug ② using a clean nonflammable solvent.
6. Install level plug ②.
7. Repeat procedure on the other travel reduction.

Recommended oil
IS0-VG320 API GI-4 orGL-5 (SAE 90)

NOTE: Overfilling the travel reduction will case the travel motor seals to allow hydraulic oil or water to enter and contaminate the drive.

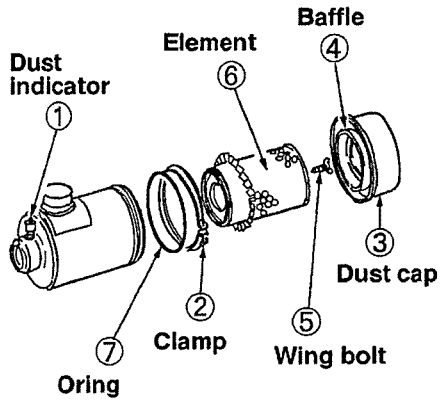


Plug position at oil inspection

■ Change the Air Filter Element

Change the air filter element after every 500 hours of operation or indicated red signal in the dust indicator ①.

Open the access door at right side of the machine.



⚠ CAUTION

- Service the air cleaner only with the engine, stopped. Engine damage could result.
- Do not clean the filter elements by bumping or tapping them.
- Do not use filter element with damaged pleats, gaskets or seals.
  Engine damage could result.

1. Stop the engine.
2. Loosen the clamp ②, remove the dust cap.
3. Remove the baffle ④ from the dust cap ③. Clean the inside of the dust cap ③.
4. Install the baffle ④ to the dust cap ③.
5. Remove the wing bolt ⑤ and take out the element ⑥.
   Clean the inside of the air cleaner housing.
6. .Install a new clean element ⑥ and tighten the wing bolt ⑤.
7. Install the dust cap with arrow point upward .
8. Reset the dust indicator by pushing in the reset button.

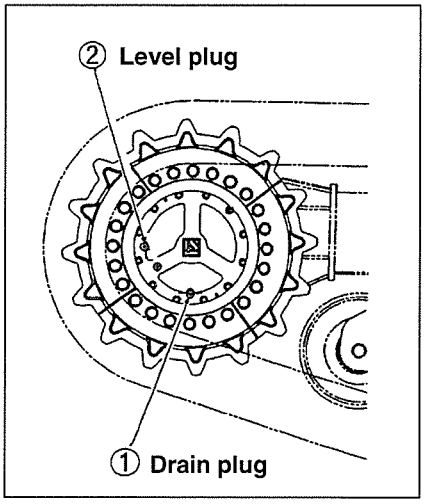
4 - 8 1000 HOURS MAINTENANCE AND CHECK

First Perform Previous Service Hours Items.

■ Change the Travel Reduction Oil

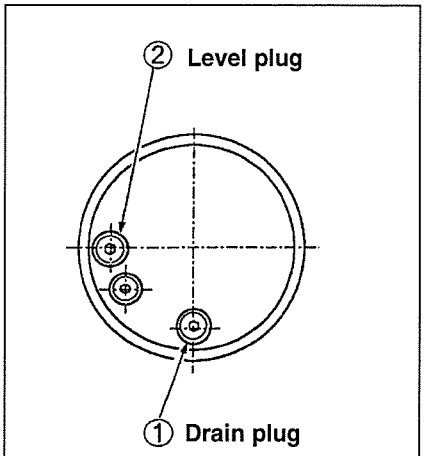
⚠WARNING

Hot oil and components can cause burns personal injury. Do not allow hot oil or components to contact skin.



NOTE: Always dispose of drained oils as established by local regulations.

1. Position one travel reduction with oil drain plug ① at the bottom.
2. Remove drain plug ① and level plug ②.
   Allow the drain into a container.
3. Clean the plugs using a clean nonflammable solvent.
4. Install drain plug ①.
5. Fill the travel reduction to bottom of level plug ② opening.
6. Install level plug ②.
7. Perform Steps 1-6 on the other travel reduction. Using a different container for the oil so the travel reduction oil samples will be separate.
8. Completely remove oil spilled onto surfaces.
9. Start the engine and allow the travel reductions to run through several cycles.
10. Stop the engine. Check the oil level.
11. Check the drain oil for metal chips or particles. If there are any, contact IHI dealer.



Plug position at oil supply

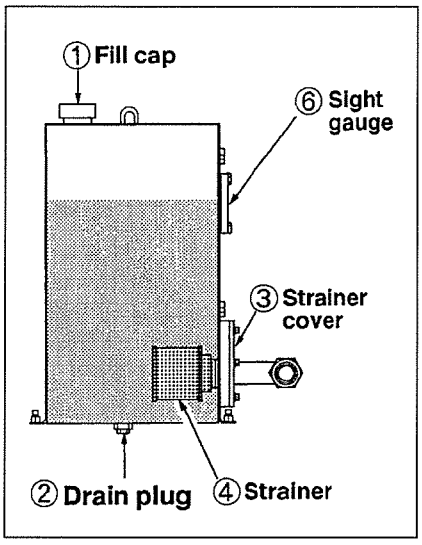
Recommended oil	Refill capacities
ISO-VG320 API GI-4 or GL-5 (SAE 90)	3.5 liters

■ Change hydraulic Oil and Clean the Strainer

⚠WARNING

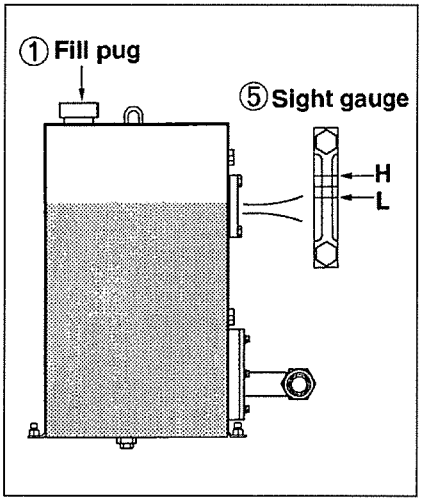
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

At operating temperature, the hydraulic tank is hot.

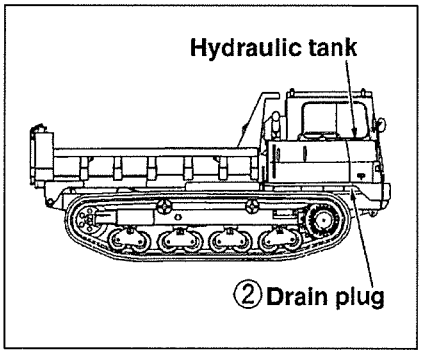


1. Place the machine on level ground and lower the body to the frame.
2. Stop the engine. Remove hydraulic tank fill plug ①.
3. Remove the oil drain plug ②. Drain oil into a container. Drain oil in all parts of the hydraulic system thereafter.

NOTE : Always dispose of used oil and filter as established by local regulations.



4. Remove the strainer cover ③ from the hydraulic tank and clean the strainer ④.
5. Clean the inside of the tank with the clean oil.
6. Inspect the O-ring and replace it if damaged.
7. Install the drain plug ②.
8. Install the strainer cover ③ to the hydraulic tank. Fill the hydraulic tank with oil.
   See "Recommended lubrication table."
9. Clean and install the fill plug ①.
10. Start and operate the engine at idling speed for five minutes.
11. Operate the control levers to allow the hydraulic oil to circulate through all hydraulic circuits.
12. Lower the body. Stop the engine. Check the hydraulic oil level.
13. Maintain the oil level between the marks on the sight gauge ⑤.



4 - 9 2 YEARS MAINTENANCE AND CHECKS

COOLING SYSTEM COOLANT

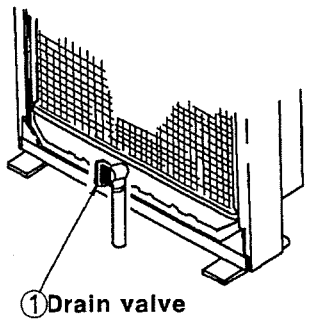
■ **Change the Coolant/Clean System**

⚠ CAUTION

* At operating temperature, the engine coolant is hot and under pressure.
* Steam can cause personal injury.
* Change the coolant only after the engine has been stopped and the fill cap is cool enough to touch with your bare hand.
* Remove the fill cap slowly to relieve pressure.

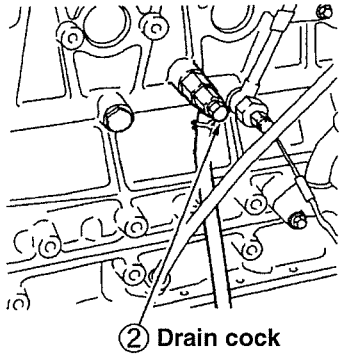
Coolant should be drained and replaced every 250 service hours or six months. However, when adding "Long-Life-Coolant" the drain period can be extended to 2 years.
Drain the coolant earlier whenever the coolant is dirty or foaming is observed.

1. Place the machine on firm and level ground. Stop the engine.
2. Loosen the radiator cap slowly to release pressure, and remove the cap.
3. Open the drain valves and allow the coolant to drain.
   Drain valves located under the radiator and the cylinder block left side.
4. Close the drain valves. Fill the system with cleaning solution.
5. Start and run the engine for 1/2 hour. Stop the engine and drain the cleaning solution.
6. Flush the system with water, with the engine stopped, until the draining water becomes clear.
7. Close the drain valves. Fill the system with clean water and run the engine for five minutes. Stop the engine and drain the water.
8. Repeat step 6 several times, if necessary, until the drained water becomes clear.
9. Add the coolant solution. See next page.
10. Operate the engine for five minutes with the fill cap off.
11. Maintain the coolant level to the fill port neck.
12. Replace the cap if the gasket is damaged. Install the cap.
13. Maintain the coolant level between the **FULL** and **LOW** marks on the reservoir.

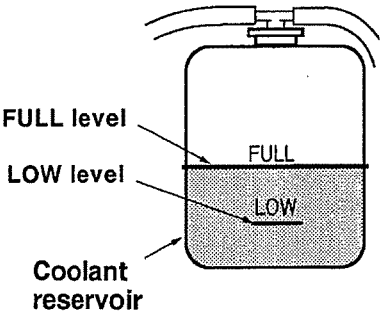


① Drain valve

Radiator part



② Drain cock



■ **Radiator exterior cleaning**

When the radiator core is clogged, the cooling air flow is interrupted lowering the cooling efficiency.
Clean the radiator with a steam or a pressurized water at 500 hours interval. Whenever the radiator is found to be closed, clean it at any time.

■ **Selection of coolant**

Long-Life-Coolant (LLC) is supplied to this machine before shipment.
This is a coolant provided with properties of antifreeze, corrosion-proof and fouling-proof.
Its long lasting effects will maintain the machine free from coolant exchange for 2 years through summer and winter seasons.
The Long-Life-Coolant is therefore recommended for use with this machine when exchanging its coolant.

■ **Mixing Rate of Long-Life-Coolant**

The mixing ratio of Long-Life-Coolant with water determines the freezing point.
Select the mixing ratio for a freezing point lower by 5°C than the expected lowest atmospheric temperature.
Normally, the Long-Life-Coolant is used under a mixing ratio of 30 to 50%.
If the mixing ratio is less than 30%, occurrence of rust is feared and when it is over 50%, overheating is feared and sealing components may be deteriorated quicker than usual.
Meanwhile, use city water to mix with Long-Life-Coolant

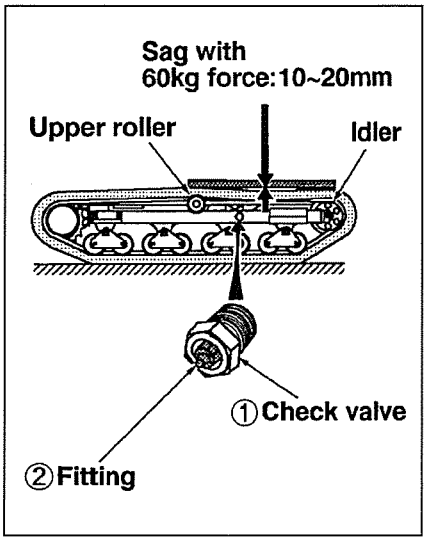
Freezing point (°C)	–15	–25	–35
Mixing ration (%)	30	40	50
Quantity of LLC (L)	8.3	11.1	13.9
Quantity of water (L)	19.5	16.7	13.9
Coolant Total amount: 27.8 L	Engine proper : 14.5 L Radiator and others proper : 11.8 L Tank : 1.5 L		

4 - 10 WHEN REQUIRED MAINTENANCE AND CHECKS

TRACK ADJUSTMENT

■ Measuring Track Tension

1. Place the carrier on a firm and level ground.
2. Completely raise the body. Set the safety bar.
3. Have a person (60kg) on the center of the upper roller and the idler.
4. Place a straight edge, long enough to reach from the idler to the upper roller, on the tracks.
5. Measure the maximum amount of track sag from the high point of the track grouser to the bottom of the straight edge. Properly adjusted track will have approximately 20 to 30 mm slack.



■ To Tighten Track

1. Add grease through the check valve fitting ② until the adjustment is correct.
2. Operate the machine back and forth to equalize pressure.
3 Check the amount of track sag again and adjust as necessary.

■ Track Loosening

1. Remove soil deposited on idler bearing.
2. Loosen the check valve ② one turn only to allow grease to escape.
3. Tighten the check valve seat when the adjustment is correct.
   NEVER over tighten the check valve, The torque requirement for check valve is 59 to 69 N·m (6 to 7 kgf•m)
4. Operate the machine back and forth to equalize pressure.
5. Check the amount of track sag again and adjust as necessary.

If the correct adjustment cannot be obtained, contact your **IHI** dealer.

⚠ WARNING

Grease is under high pressure.

Do not remove grease fitting ②.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.
Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the check valve ① 3 turns only.

BATTERY MAINTENANCE

⚠ WARNING

Batteries give off flammable fumes that can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

If the battery electrolyte comes in contact with eyes, wash it away with water and call for emergency medical cure.

Always wear protective glasses when working with batteries.

1. **Cleanliness**
   Any acid that may have been spilled should be mopped and battery then should be cleaned with a rag and water and allowed to dry. Terminals must not be allowed to corrode; this can be prevented by keeping them coated with a good quality grease.

2. **Battery Recharge**
   Battery should not be allowed to stand in a fully discharged condition, but should be recharged as soon as possible. If battery is out of use for a long time, it must not be allowed to run down completely. The battery should be given a small recharge, sufficient to bring it back to fully charged state about every one or two months. Trickle charging is not recommend and during charging as before, care must be taken that temperature of electrolyte does not rise above 40°C for temperate climates and 52°C for battery using lower gravity acids specified for tropical use.

3. **Inspection**
   For close inspection of cells, use a flashlight and not a naked light as gases evolved from a battery may, in certain circumstances, be highly explosive. To avoid risk of sparks giving rise to explosion, do not rest flashlight or other metal object on top of battery.

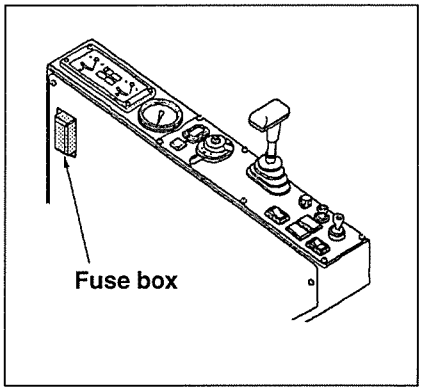
4. **Topping Up**
   Maintain level of electrolyte in cells at correct height by adding distilled water when required. If any electrolyte is spilled, replace it with fresh sulfuric acid of same specific gravity as that of remaining in cell. Level of electrolyte must never fall below tops of plates.

FUSES

The fuse box is located on the front of the instrument panel.

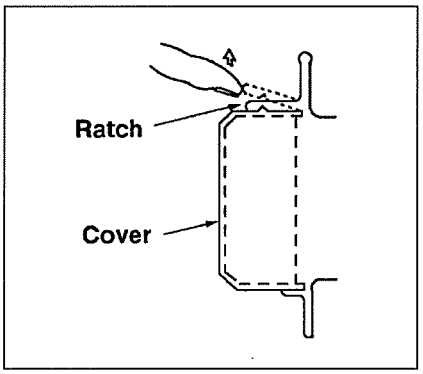
Fuses protect the electrical system from damage caused by overloaded circuits.

Replace the fuses with the same type and size only. Otherwise, electrical damage can result. Change a fuse, have the circuit checked and repaired.



■ Replace

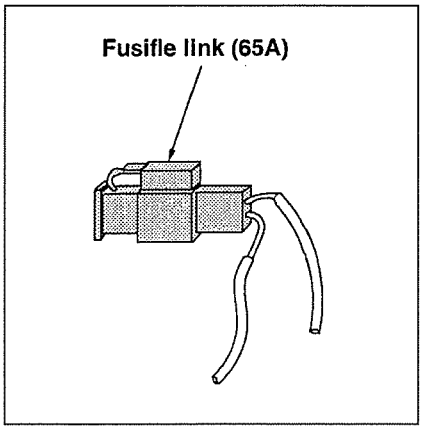
1. Turn the start switch to the **OFF** position.
2. Pull the ratch and remove the cover for fuse access.
3. Change the damaged fuse to new one.
   Fuse amperage: 20A



FUSIBLE LINK

The fusible link is provided between the positive terminal of the battery and the starter switch to prevent electrical circuit wires from being burnded because of short circuit. When the power is turned off by short circuit, check the fusible link.

When it is blown out, replace it with new one after repairing the electrical wires.



■ Cleaning the battery terminal section

NOTE :

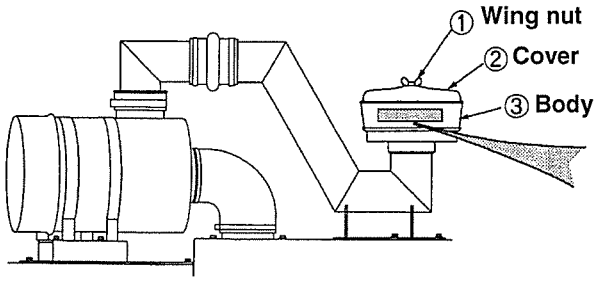
- Be sure to stop the engine while working.
- While working, take care that the ⊕ and ⊖ terminals of the battery will not get shorted by a tool or the like.
- When removing the battery terminals, start with the ⊖ terminal.
  When installing them, fit the ⊖ terminal last.
- Tighten them securely lest the terminal side is loosened.

1. Remove the terminal cover.
2. Clean the terminal section if it is dirty or corroded. (If the terminal section is corroded and has white powder attached on the surface, use warm water to wipe it off. This will be very effective in cleaning.)
3. If the terminal area is badly corroded, take the terminal section off, and clean it with a wire brush or sand paper.
4 After cleaning and tightening the terminal section, apply a thin coat of grease on the unit.
5. Install a terminal cover.

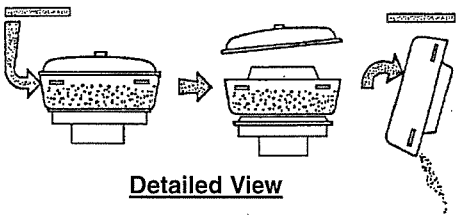
■ Cleaning the pre-cleaner (Option)

For an air cleaner provided with a pre-cleaner, discharge the dust when it reaches the level line.

1. Loosen the wing nut ① and remove the cover ②.
2. Remove the body ③ to discharge the dust and clean it.
3. Reinstall the body ③ and cover ② and tighten the wing nut ①.



Assembly of an air cleaner
(With a pre-cleaner)

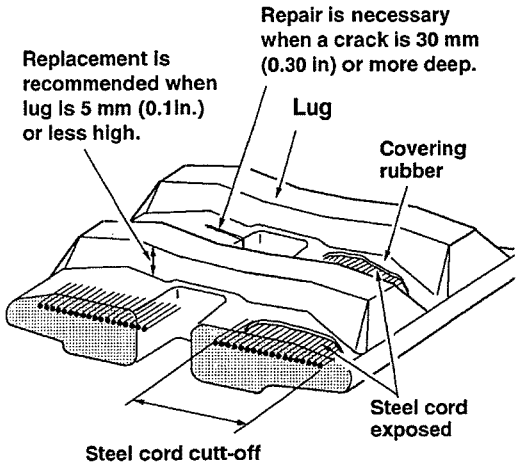


Detailed View

RUBBER CRAWLER SHOE MAINTENANCE

⚠ CAUTION

Rubber crawler shoe should be repaired or replaced under the next conditions.
If is necessary to repair or replace it, contact your **IHI** dealer.



1. **Height of lugs**
   The rubber crawler can be used even if it is worn, however, if it is excessively worn, the crawler shoe is likely to be slippery and more travel force is required. If the remaining lug is less than 5 mm (approx. 0.2 in.) high, replace it with brand-new one.

2. **Exposure of Steel Cords**
   If steel cord is exposed because of weary rubber or damage, replace it with brand-new one.

3. **Cutting of Steel Cords of Rubber Crawler Shoes**
   When cutting of steel cord is detected, replace it immediately. If you leave it as it is, the rubber crawler shoes can be cut off without expectation, which causes a serious accident.

4. **Crack of Covering Rubber**
   If a crack is 30mm (1.2 in.) or more long and 8 mm (0.32 in.) or more deep, repair the cover immediately. If Steel cord appears even if a crack is small, repair it immediately. Otherwise, water may come into a crack, which rusts steel cords and cuts off the rubber crawler shoe.

4 - 11 UNUSUAL OPERATING CONDITIONS

Special problems in maintenance and operation are caused by unusual conditions such as extremes in heat, cold and humidity, high altitude, salt water, and dusty or sandy work sites. When operating under such conditions, special precautions must be taken to prevent machine damage, minimize wear, and avoid component deterioration.

■ Extreme Cold

In periods of extreme cold, the problems of freeze damage, inadequate lubrication and battery failure may become particularly troublesome. With the onset of very cold weather, it is advisable to "winterize" the machine by servicing the cooling system and switching to the lubricants recommended for cold weather usage. Follow the recommendations below when the machine must be operated in very cold conditions.

1. To prevent freeze damage to the cooling system and cracking of the engine block or head, drain and flush the cooling system.
   Clean the radiator exterior, making certain the air passages through the core and the cooling fins are free of foreign matter.

   Refill the cooling system, adding an antifreeze solution recommended by the engine manufacturer in an amount and strength appropriate to the anticipated temperatures. A corrosion inhibitor is recommended.

   Never use a chromatic base corrosion inhibitor when the coolant contains ethylene glycol. Use only non-chromatic base inhibitors.

   Inspect the thermostat, clamps, radiator hoses and radiator core for proper condition.
   Replace or repair any cooling system component found to be defective.

2. Condensation in the fuel tank contaminates the fuel supply with water, which can freeze in the fuel lines and block the fuel flow to the engine. To minimize this possibility, keep the tank as full as is practical during cold weather.
   This may entail refilling the tank more frequently than usual, but the inconvenience is small compared to clearing a blocked fuel line.
   If water should be noticed in the fuel supply, drain the tank and refill it with uncontaminated fuel

3. Lubricate the machine with the lubricants recommended for cold weather operation in the Lubrication Section, If necessary, change the engine oil and other lubricants in order to conform to the recommendations.

4. The battery is more likely to sustain freeze damage if not kept fully charged because its electrolyte will freeze at a higher temperature than that in a fully charged battery. Be certain the battery is charging when the engine is running and use an external charger to restore full charge when the machine is not being operated.
   The battery can discharge if snow or ice short circuits the terminals. Keep the battery posts and cable connectors clean and dry.
   Remove any corrosion with a solution of soda and water.
   During extremely cold weather, it is advisable to remove and store the battery in a heated area when the machine is to remain idle overnight or for any extended period.

⚠ CAUTION

Water added to the battery can freeze before it mixes with the electrolyte.
During very cold weather, add water to the battery just prior to, or during operation of the machine. If the machine is not to be run, water may be added if an external charger is connected to the battery.

5. Special attention must be given to the hydraulic oil during very cold weather.

> **CAUTION**
>
> **BEFORE** attempting any working operations, warm up the hydraulic oil as described in "Pre-Operation Warm-Up on page 45".

6. At the end of the work period, or whenever the machine is to be left idle for extended periods, prevent it from being frozen to the ground by parking it on wood, concrete, asphalt or mat surface.

■ Extreme Heat

Like extreme cold, extreme heat requires that precautions be taken with respect to the cooling system, the battery and lubrication. Protect the machine by performing the following recommended procedures:

1. High temperatures necessitate the use of lubricants which are both more viscous and which resist deterioration at higher operating temperatures. Refer to the Lubrication Section and lubricate the machine using the lubricants recommended for the expected temperatures.
   Crankcase oil is particularly important because it helps dissipate heat. Check the oil level frequently and add oil as required to maintain required level. Too little oil will hinder heat dissipation.

2. To ensure proper coolant circulation, drain and flush the cooling system, clean any foreign matter from the radiator cooling fins and through-core air passages, replace defective hoses, tighten hose clamps, tension the water pump drive belt properly, eliminate any leaks detected and fill the system with a 50% solution of ethylene glycol.
   A corrosion inhibitor is recommended.
   Engine overheating due to loss of coolant will most often be corrected by **SLOWLY** adding coolant while the engine is running at **FAST IDLE**. Should this fail to correct the problem, drain and flush the system and refill with fresh coolant (50% solution of ethylene glycol) and a corrosion inhibitor.

   Allow the engine to cool before draining and flushing the cooling system.
   Water containing more than small concentrations of salt or minerals should not be used in the cooling system. Salt facilitates corrosion and minerals deposit on the coolant passage walls.
   Both processes inhibit proper cooling.

3. Increased evaporation rates will cause the battery electrolyte level to fall more rapidly during very hot weather. Check the level frequently and add distilled water as required to maintain the proper level.

4. Air circulation around the engine and battery must not be restricted. Keep air intake and exhaust openings clear of leaves, paper or other foreign matter which may restrict air flow.

5. Keep the engine clean of dirt, grease and other substances which inhibit heat dissipation.

6. Operate engine at full throttle when digging or tracking machine.
   Run the engine only when engaged in work operations or when traveling the machine.
   Avoid prolonged periods at idle and shut the engine down if operations are interrupted.

■ Sandy or Dusty Work Sites

The presence of large amounts of sand or dust at the work site can contribute to accelerated component weather. Either substance will act as an abrasive when deposited on moving parts of the machine.

This problem can be alleviated by increasing the schedule of lubrication and by servicing breathers and filters at more frequent intervals.
Follow the recommendations below when operating in sand or dust on a regular bases.

1. Keep sand and dust out of the hydraulic system by keeping the reservoir filler cap tight and servicing the hydraulic system filters frequently.

2. The fuel system should be kept free of sand and dust by keeping the tank filler cap tight and servicing the fuel filters frequently.

3. The engine breathers and air cleaner should also be serviced frequently to prevent sand and dust from entering the engine. The engine oil and oil filter should be changed at shorter than normal intervals to ensure a clean oil supply to the engine's moving parts.

4. When lubricating the machine, thoroughly clean each grease fitting before attaching the grease gun. Pump generous amounts of grease into all lubrication points, using the fresh grease to pump out old.

5. Adequate ground bearing support may be required for the tracks when operating in soft sand. Be alert for signs of track digging into sand during operations. It may be necessary to back off and fill in area where tracks dig in.
   The increased frequency of lubrication and service discussed above should be determined by observations made at the work site. Inspection will determine how long it takes for lubricants, breathers and filters to accumulate unacceptable amounts of sand or dust. The frequency of lubrication and service should be adjusted accordingly.

■ High Humidity or Saltwater

In some locations, such as coastal areas, the machine may be exposed to the deteriorating effects of salt, moisture, or both. To protect exposed metallic surfaces, wiring, paint and other items, keep them dry and well lubricated where salt or high humidity are encountered. Follow the recommendations below when operating in these conditions.

1. Make frequent inspections for rust and corrosions and remove them as soon as they are detected. Dry and paint exposed surfaces after rust and corrosion have been removed.

2. Where paint may not be applied, such as on polished or machined surfaces, coat the area with grease or lubricant to repel water.

3. Keep bearings and their surrounding surfaces well lubricated to prevent the entry of water.

4. Never use saltwater in the cooling system.
   Internal corrosion will occur and all parts will have to be replaced.

5. Hose down the machine periodically when working in saltwater. If necessary, use an oil soaked cloth to clean moving parts.

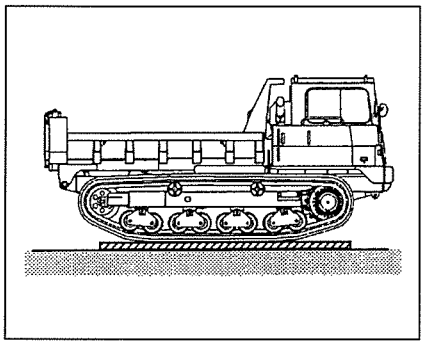
6. If the machine is submerged, be sure it is never submerged in water deeper than upper crawler belt.
   If the machine exceeds this limit, disassemble, clean and lubricate the lower.

■ High Altitudes

Variations in altitude alter the fuel-air mixture burned in the engine and affect the engine's performance. At high altitudes, atmospheric pressures are lower and less oxygen is available for combustion of the fuel. Above 1500 meter, the engine fuel setting may have to be changed to ensure proper performance.
Consult engine manufacturer should this problem anse.
Keeping the air cleaner clean and free of obstructions will help alleviate high altitude problems.
At high altitudes, closely monitor the engine temperature for overheating.

4 - 12 LONG TERM STORAQE

If the machine is to be stored for more than one month, observe the following precautions so that its function will not be impaired during storage.



■ Before Storage

To store the machine from long term, follow the next procedures.

- Clean parts of the machine and store indoors. If you have to place the machine outdoors, choose a flat place and cover the machine.
- Be sure to perform fill the fuel , lubrication, and oil change.
- Store the battery after remove the negative terminal and covering it or dismounting the battery from the machine.
- Lock the dump lever with the lock lever.

■ During Storage

⚠ WARNING

If you have to operate the machine indoors to prevent rust, keep good ventilation and gas poisoning by window or entrance.

During storage, operate the machine once a month to maintain films of oil at the lubrication section and charge the battery at the same time.

■ After Storage

After long term storage, follow the next procedures before operating the machine.

- Be sure to perform fill the fuel and lubrication.

5 TROUBLE SHOOTING

5 - 1 TROUBLE AND REMEDY

It is essential to detect any abnormality at early stage and prevent trouble in advance by fully understanding normal performance and conditions of the machine during daily operation. If any abnormality is detected, immediately investigate cause and take necessary action such as adjustment, repair, and so on. Keeping operation with detected abnormality may cause more serious trouble.
Regarding to procedures marked with ★ , contact the distributor or service personnel.

■ Engine

SYMPTOM	PROBABLE CAUSE	REMEDY
Engine does not start.	• Shot of fuel • Clogged fuel filter • Mixed water in fuel system • Stopped fuel pump • Burned fuse • Insufficiently charged battery • Defect of wiring • Defect of injection pump or nozzle • Insufficient compressed pressure	• Supply fuel and bleed air. • Clean the fuel filter. • Drain mixed water. • Replace the fuel pump. • Check and replace fuse. • Charge the battery. ★ Check and repair wires. ★ Repair and replace pump or nozzle. ★ Repair parts.
Engine oil pressure warning lamp lights.	• Short of oil in oil pan • Clogged oil filter • Defect of oil pressure switch • Defect of monitor	• Supply oil. • Replace element. ★ Replace parts. ★ Replace parts.
Engine water temperature gauge	• Short or leakage of coolant • Slack of fan belt • Damage or stain inside the cooling system • Clogged radiator fin or fall of fin • Defect of thermostat • Defect of thermosensor or water temperature gauge	• Supply coolant or fix water leakage. • Adjust tension of fan belt. • Replace coolant and clean cooling system. • Clean or repair fin. ★ Replace thermostat. ★ Replace water temperature gauge or sensor.
Engine water thermometer gauge points white zone even after long operation	• Defect of thermostat	★ Replace thermostat.
Exhaust of the engine is white or blue.	• Excessive oil of oil pan • Mixed water in fuel	• Drain oil up to the specified level. • Drain mixed water.
Exhaust of engine is black of dark gray.	• Oil of poor quality • Clogged air cleaner • Defect of nozzle • Insufficiently compressed pressure	• Replace with specified fuel. • Clean or replace Cleaner. ★ Replace nozzle. ★ Disassemble to repair or replace

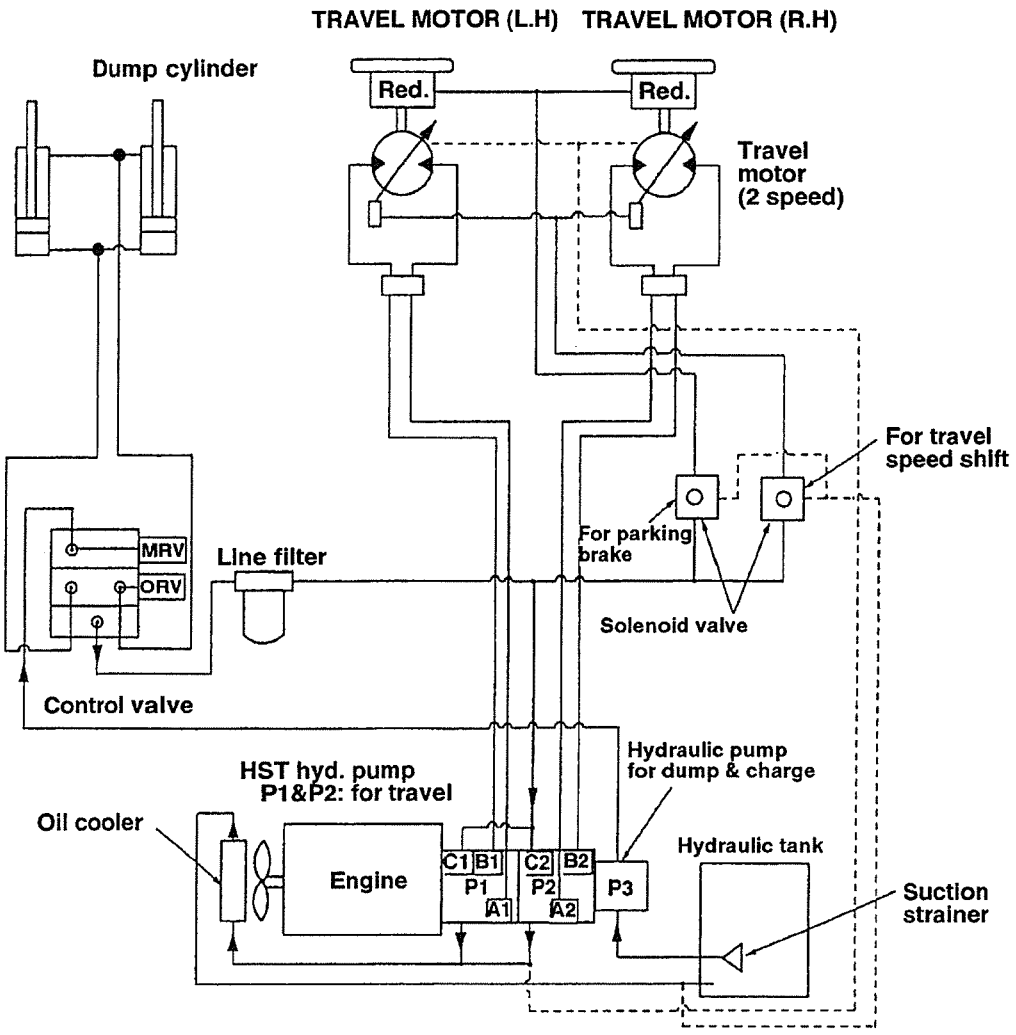
■ Others

Regarding to actions marked with ★ , contact the distributor or service personnel.

SYMPTOM	PROBABLE CAUSE	REMEDY
Levers cannot be controlled smoothly.	• Short of grease at lever operating portions • Defect of control valve	• Supply oil or grease. ★ Repair or replace parts.
Machine does not travel fast and powerfully.	• Short of hydraulic oil • Lowered pressure set for relief valve • Defect of motor or reduction gear • Defect of pomp • Over – tensed crawler	• Supply oil up to specified level. ★ Adjust pressure to regular value. ★ Repair or replace parts. ★ Repair or replace parts. • Adjust both right and left tension to regular value.
Speed does not change even if changing selectors.	• Discontinuity or disconnection of electric wires • Defect of limit switch for selector • Defect of solenoid valve for	• Reconnect wires. ★ Replace limit switch. ★ Replace solenoid value.
Machine curves during travel.	• Change of speed during travel • Tangled obstacle • Unequal tension of right and left • Loose stopper bolt of travel selector lever • Loose fixed bolts of travel lever link	• Stop travel and select speed. • Remove obstacle. • Adjust tension of right and left to regular value. ★ Adjust and fix stopper bolts. ★ Adjust and fix lever link/bolts.
Machine does not travel smoothly.	• Tangled stone and obstacle • Over – tensed crawler • Short of hydraulic oil • Defect of motor or reduction gear • Defect of pomp	• Remove obstacle. • Adjust tension of right and left to regular value. • Supply oil to specified level. ★ Repair or replace parts. ★ Repair or replace parts.

6 HYDRAULIC SYSTEM DIAGRAM

6 - 1 HYDRAULIC SYSTEM DIAGRAM



Set Pressure for Relief Valves

Locations	Item	Valves		Set Pressure	
				MPa	kgf/cm^2
Pump 1	A1:Foword B1:Reverse	P1:Pump Relief Valves for Left Travel Motor	High Pressure	37.3	380
			Cut-off	34.3	350
Pump 2	A2:Foword B2:Reverse	P2:Pump Relief Valves for Left Travel Motor	High Pressure	37.3	380
			Cut-off	34.3	350
Control Valve	MRV	Main Relief Valve for Dump (Raise)		17.6	180
	ORV	Over Load Relief Valve (Lower)		5.9	60
Pump1•2	C1•C2	Charge Relief Valve		2.6	27

7 ELECTRIC SYSTEM DIAGRAM