OPERATION MANUAL

IC30

CRAWLER CARRIER

SERIAL NUMBER:
CC000329 and up

IHI

IHI Construction Machinery Limited

PUB. No.3
9811US

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FOREWORD

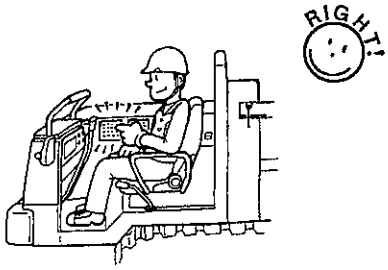
This manual contains safety, operation, maintenance, and adjustment information. The procedures are designed to provide the best performance of the machine in an effective and economical way. In order to obtain it, remember the next basic rules.

- 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.

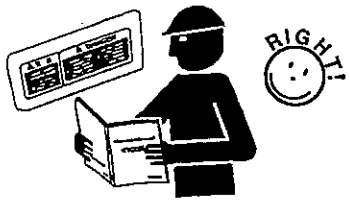
1 SAFETY

1-1 GENERAL

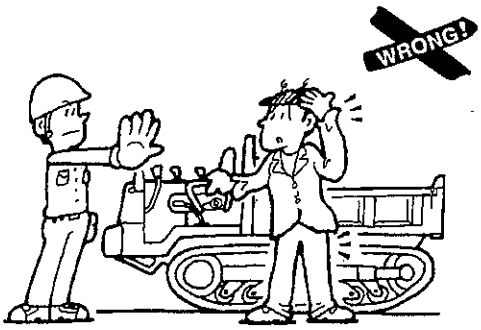
READ AND UNDERSTAND THE INSTRUCTIONS AND WARNINGS.



This manual, plates, and labels on the machine contain necessary instructions and warnings for safe operation. You are supposed to read and understand them first. If you should ignore them, injury or death may occur. Do not leave what you do not understand as it is. Your IHI distributor is glad to answer any question.
If the manual, plate, or label is missing or damaged, contact **IHI** distributor for replacement.



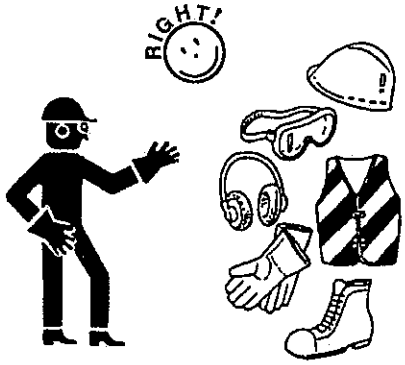
OPERATOR SHOULD BE IN GOOD HEALTH.



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.

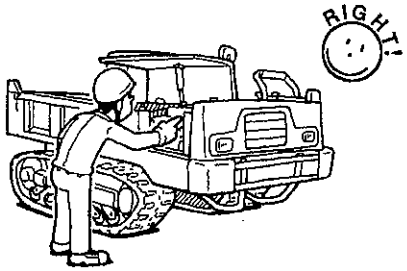


Wear working clothes that closely fit operators. Avoid loose jackets, shirt sleeves, rings, and other jewelry which may be caught in moving parts. Avoid also oil stained or damaged garments. Shoes should be clear of grease or mud before operation.
Always wear required protective items such as hard hats, safety glasses, reflective clothing, safety shoes, and ear protection as required,

1 SAFETY

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.

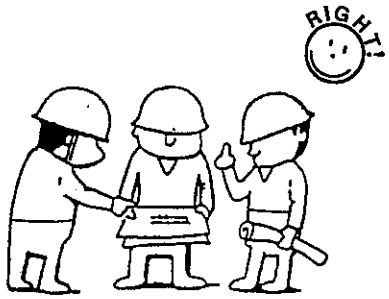


NEVER ASSUME ANYTHING GUARANTEED.

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.



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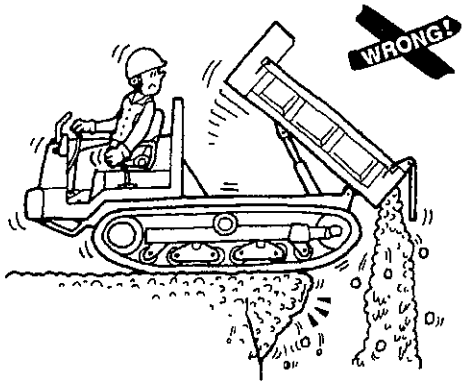
CHECK THE JOB SITE.

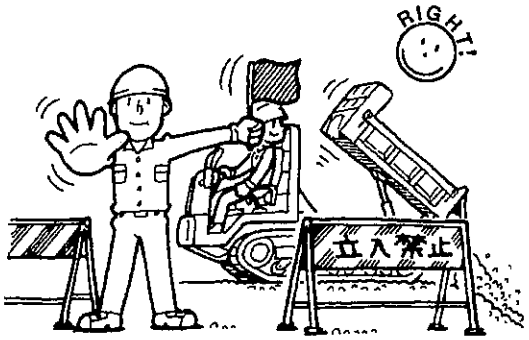
ALWAYS check the job site for grade and stability of the ground, ventilation, depth of water and ambient obstructions. Avoid operating your equipment too close to an overhang.

Since this machine is not provided with anti-explosion design, **NEVER** use it inside a tunnel or in explosive environment to avoid hazard coused by an explosion.



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 VENTILATION.

Take a countermeasure to vent the exhaust gas to the outside to start and operate the engine in a pit, tunnel, or trench. In such a place, the air trends to stagnate. It is very dangerous to inhale the exhaust gas.
Remember, exhaust gas can kill you.

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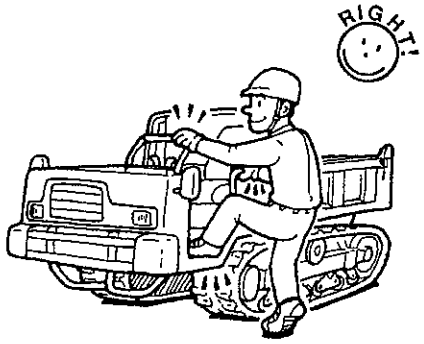
1-2 MOUNTING AND DISMOUNTING

CAREFULLY MOUNT AND DISMOUNT THE MACHINE.

ALWAYS use steps and handholds to mount and dismount the machine.
Hold the handholds with both hands and face the machine keeping a contact with at least three points of the steps and handrails.



NEVER hold control levers at mounting and dismounting.

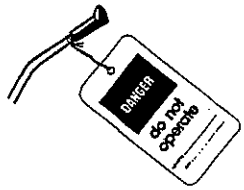
NEVER not try to mount or dismount the moving machine.

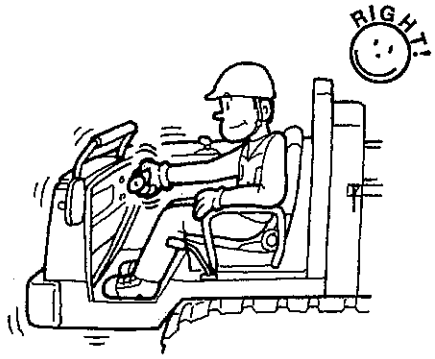
NEVER jump off the machine.

Do not try to climb on or off the machine with implements or supplies in your hand.

1-3 STARTING THE ENGINE

- **ALWAYS** start the engine only from the operator's seat following the starting procedure in this manual.
- When the start switch or controls are tagged with **"Do Not Operate"**, do not start the engine or move any of the controls.
- **NEVER** short across the starter termonals or across the battery.



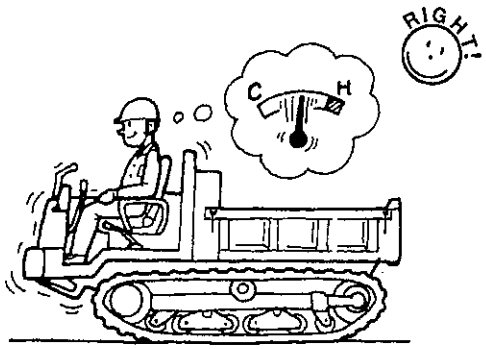


1-4 BEFORE OPERATING THE MACHINE

CONDUCT WARM-UP BEFORE OPERATION.

It is **ESSENTIAL** to conduct warm-up operation after starting the engine in order to run the hydraulic fluid smoothly.

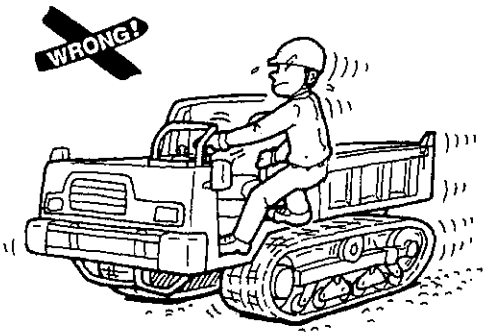
The pumps may squeak because of the cold and thick hydraulic fluid, which results in the damage to the pumps.
ALWAYS take a time to warm up the fluid with running the engine at a low speed to maintain the **FREE FLOW OF OIL.**



1-5 OPERATING THE MACHINE

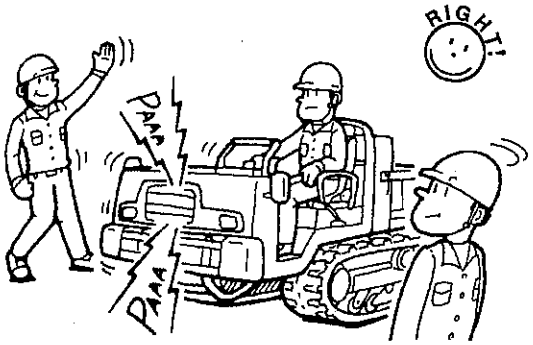
STAY SEATED WHILE OPERATING

Trying to operate while standing or from a position other than the operator's seat will cause mistakes and hazardous situations.
Always travel only while seated in the operator's seat.



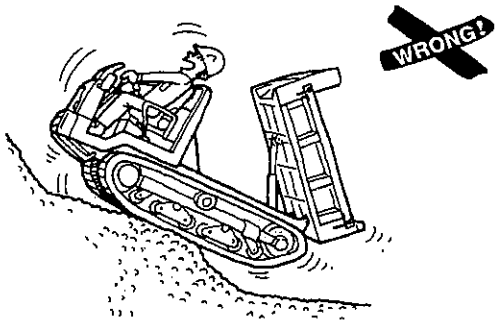
PREVENT ACCIDENTS WHILE MOVING

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.



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

Loads that exceed machine capacity, reduce safety factors and cause machine performance and service life to drop.

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

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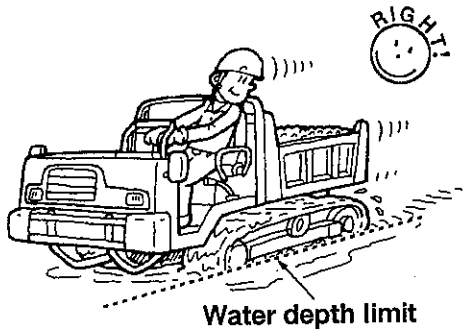
DO NOT EXCEED THE WATER DEPTH LIMIT

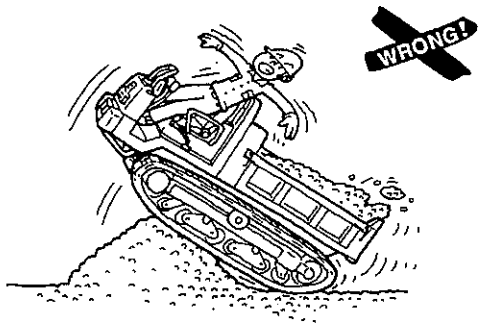
The acceptable water limit is up to the lower frame.

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.



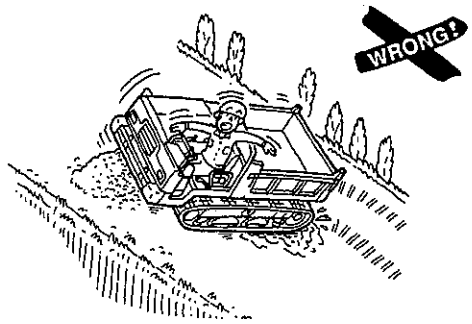
DO NOT TRY TO TRAVEL OVER OBSTRUCTIONS

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



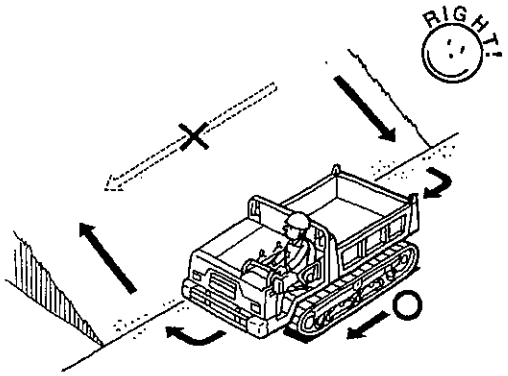
DO NOT CHANGE DIRECTIONS WHILE ON A SLOPE

Avoid changing directions on a slope as this can cause the machine to slip and possibly fall over.
When changing directions is unavoidable, do so on a gentle slope with stable ground.



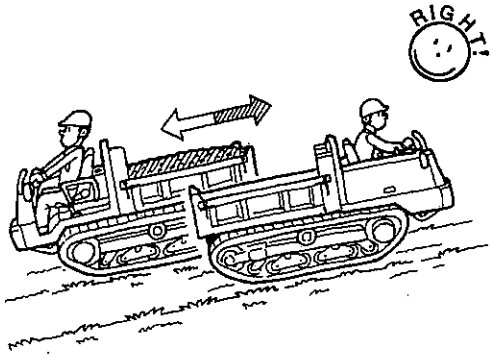
MOVE UP AND DOWN SLOPES DIRECTLY NOT SIDEWAYS

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.



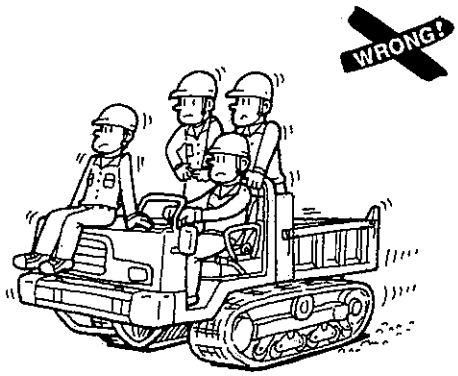
WATCH THE VEHICLE POSITION WHILE TRAVELLING ON SLOPES

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**.



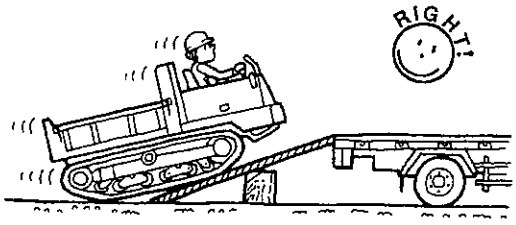
NEVER ALLOW PERSONNEL RIDE ON THE MACHINE OTHER THAN OPERATOR.

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



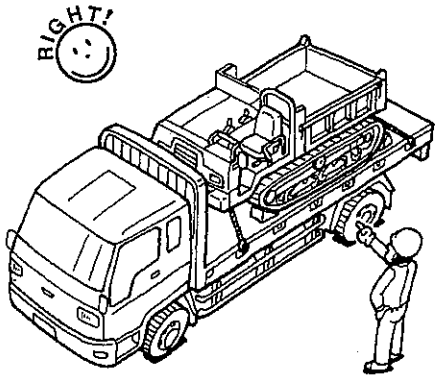
1-6 SAFE TRANSPORTATION

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.

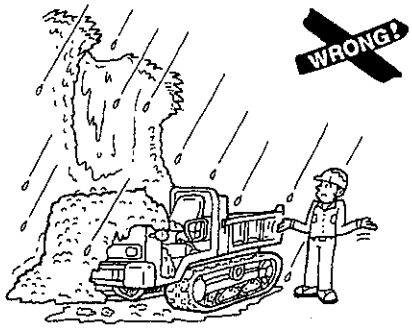


Block tracks and secure the machine to the truck before transporting.
Prior to transportation, check the travel route for clearances around the truck and the machine.

1-7 PARKING THE MACHINE

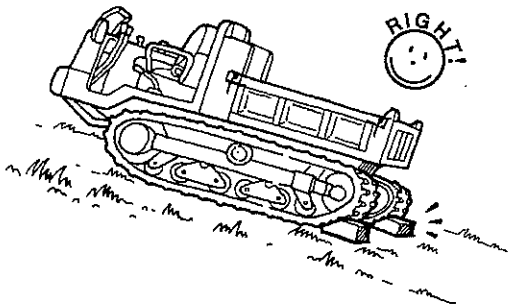
BANKS AND SLOPES

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 posible, park on level ground.



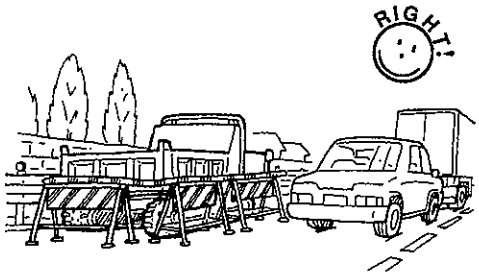
DO NOT PARK THE MACHINE ON A GRADE.

If you have to park the machine on a grade, **ALWAYS** block the machine.



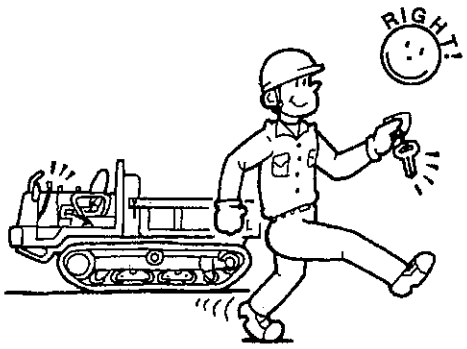
OBSERVE PRECAUTIONS WHEN PARKING THE MACHINE ON THE ROAD.

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



OPERATOR LEAVING MACHINE

ALWAYS lower the body and stop engine before leavng the machine unattended.
Engage all locks, turn off the start switch, and remove the start key. Lock the doors.

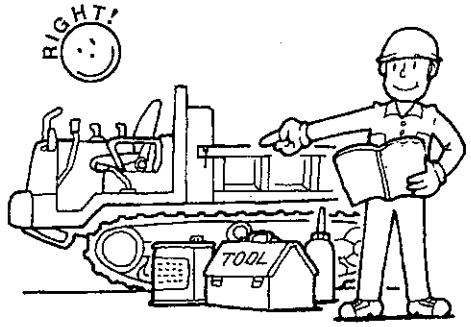


1 SAFETY

1-8 SAFE MAINTENANCE

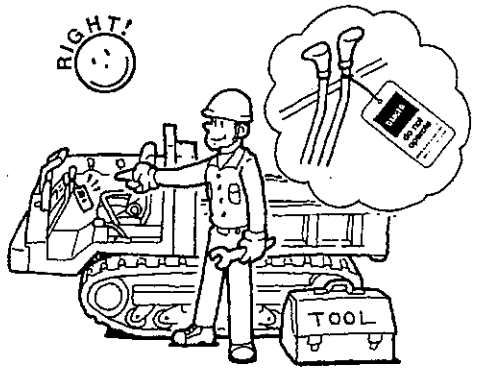
KEEP ROUTINE MAITENANCE

Maintenance work can be hazardous if not done in a cafeful manner. All personnel should realize the hazards and strictly follow safe practices. before performing any maintenance or repair work, consult the instruction manial.
Before maintenance, stop the engine and do not conduct any operations.



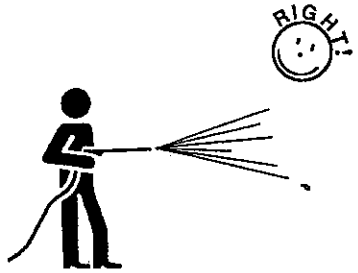
PERFORM MAINTENANCE WORK CORRECTLY.

While maintenance work is being done, that starting controls should be TAGGED. the tag should be removed only by someone who is aware of the circumstances, and who can assure that it is safe to do so.



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.



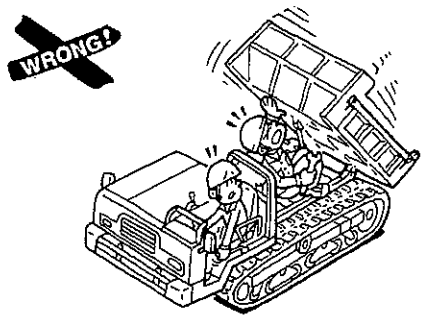
SET HYDRAULIC PRESSURE CORRECTLY.

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.

PREVENT CRUSHING OR CUTTING.

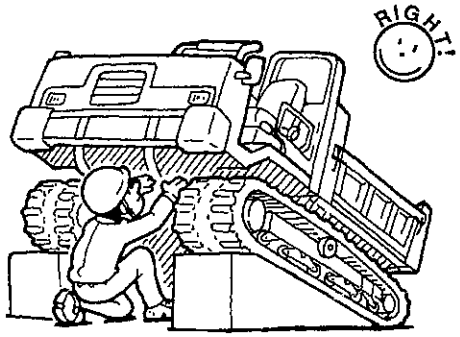
Before **ANY** kind of adjustment or service of the machine, stop the engine and do not operate the machine.

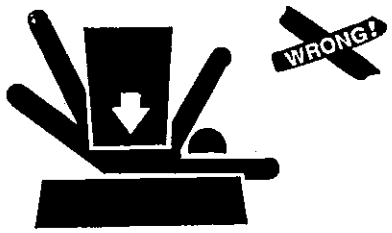
NEVER fuel or lubricate when the engine is running.



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, **"DO NOT OPERATE"**.





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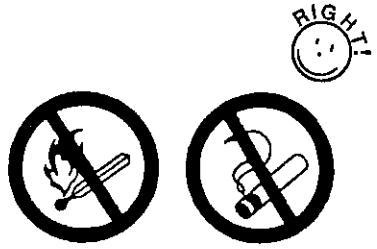
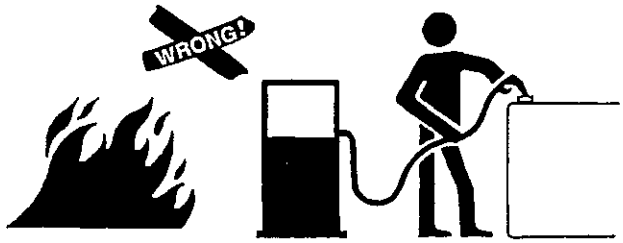
PREVENT FIRE OR EXPLOSIONS.

Keep away fuel, lubricant, and coolant from any fire or heat. Most of them are very flammable.
NEVER place flammable materials or objects close to fire or heat.



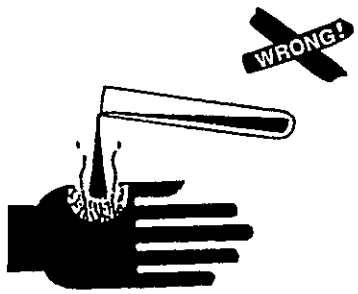
NEVER SMOKE WHILE REFUELLING.

NEVER smoke while refuelling or in a place close to flammable objects.



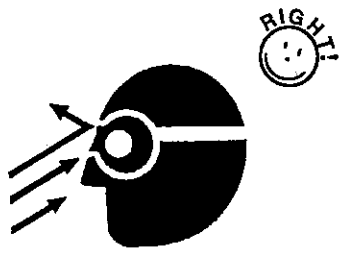
DO NOT TOUCH BATTERY ELECTROLYTE.

Battery acid will **burn skin**, eat holes in clothing, and **cause blindness** if splashed into eyes. If you spill acid on yourself flush skin immediately with lots of water. Apply baking soda to help neutralize the acid.
If acid gets in your eyes, flush immediately with lage amount of water and seek proper medical teratment immediately.



When servicing battery remenber that a lead-acid storage battery generates (when charging or dischaging) hydrogen and oxygen – a very explosive mixture. A spark or flame could ignite these gases.

Always wear **safety grasses and groves** when working with battery.

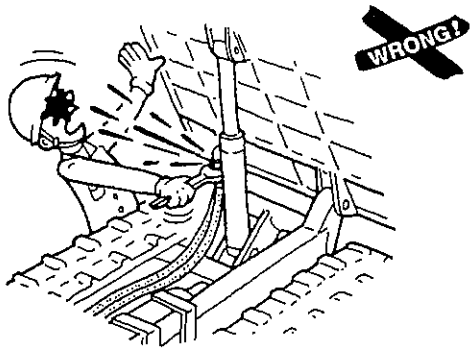


Eye protection required

ALWAYS RELEASE PRESSURE BEFORE DISASSEMBLING HYDRAULIC LINES.

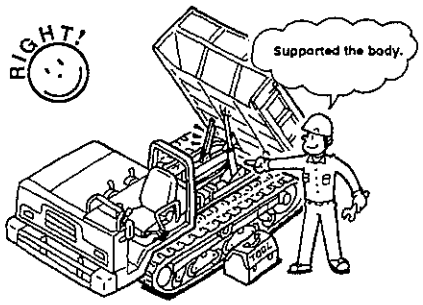
Before disconnecting **hydraulic fluid lines** on a hydraulic machine, be sure you.

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

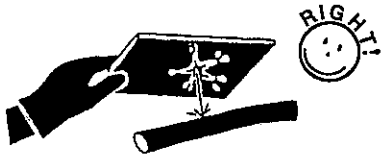


PRESSURIZED HYDRAULIC HLUID CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH.

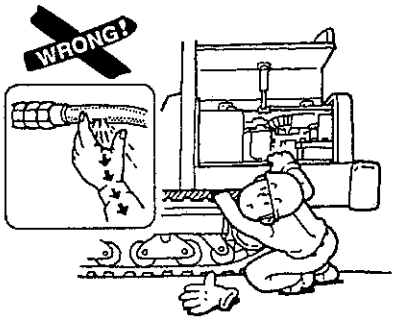
Therefore, be sure all connection are tight and that lines, pipes, and hoses are in good condition before starting the engine.



Fluid escaping from a small hole can be almost invisidle. Use a piece of cardboad or wood, instead of your hands, to search for suspected leaks.

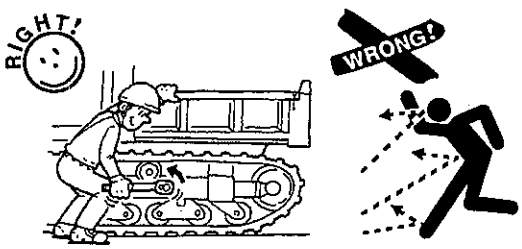


If you are struck by escaping hidraulic fluid under pressure, serious reactions can occur if proper medical treatment is not administed immediately.



NEVER WATCH THE RELIEF VALVE WHEN ADJUSTING TRACKS.

NEVER watch the relief valve when servicing the tracks. Position yourself not to be splashed with grease. Grease used to adjust the tracks is highly pressurized and can cause serious injury or death.
Carefully read and understand the maintenance procedure for track adjustment.

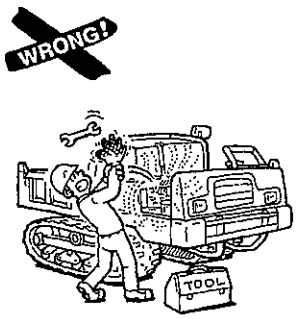


BE CAREFUL TO ROTATING AND MOVING PARTS.

Do not come close to all rotating or moving parts such as a fan belt.
Do not allow any object to come near moving parts.
It will be repelled and thrown out, which may cause personal injury.

BE CAREFUL TO HOT ENGINE AFTER THE MACHINE STOPS.

NEVER touch the engine or muffler right after the machine is stopped. It is very hot and causes burns.

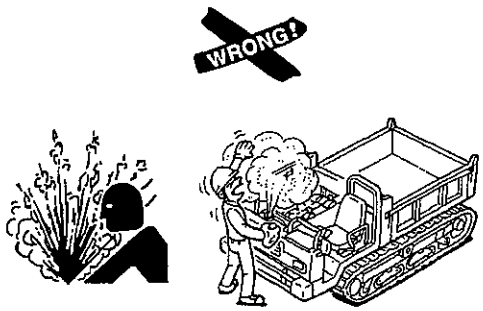


CAREFULLY HANDLE THE ENGINE COOLANT.

NEVER try to open the coolant filler cap while the engine is running or right after the engine is stopped. If the cap is open, the very hot steam will blow out, which causes serious burns. Wait until the coolant temperature goes down.

Slowly open the filler cap to release the pressure.

Do not touch the engine coolant directly. It may cause injury to your skin. Wear gloves or use a cloth to handle it. **NEVER** drink it, or **NEVER** let it come in contact with your eyes.



Before draining the engine coolant, cool down the radiating systems.

If you drink antifreeze, **IMMEDIATELY** have it thrown out and call for emergency medical cure.

Do not leave any tool on the machine after maintenance and place it in place before re–starting operation.

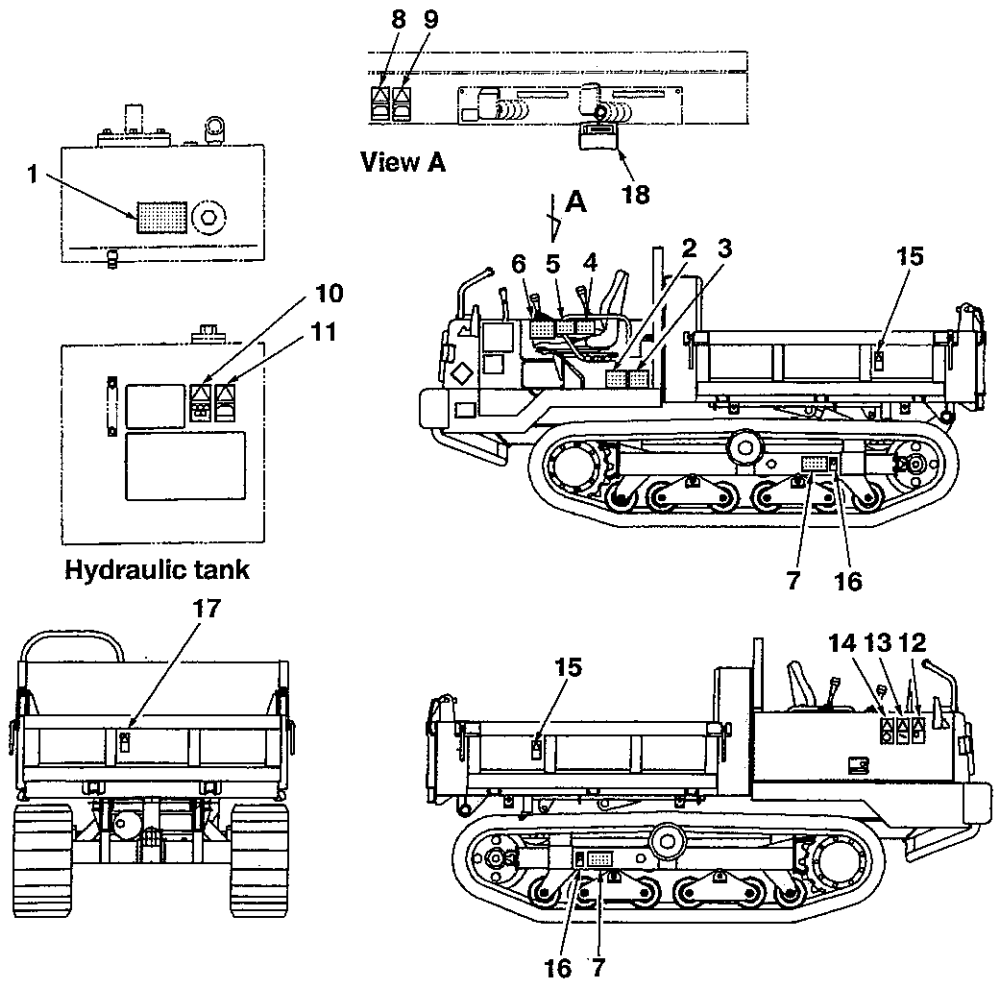
1 SAFETY

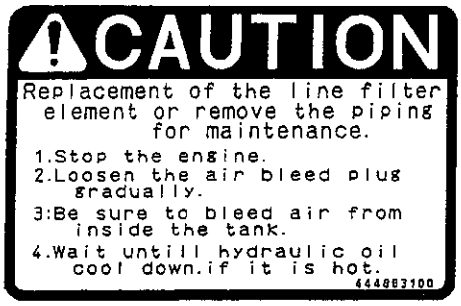
1-9 WARNING SIGNS AND LABELS

There are several specific safty 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.

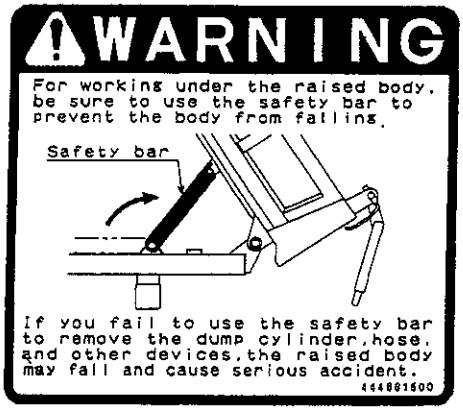
Wake sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasolin, etc.

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 IHIdealer for new labels.

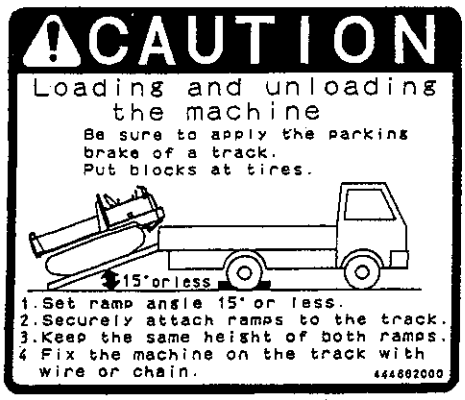




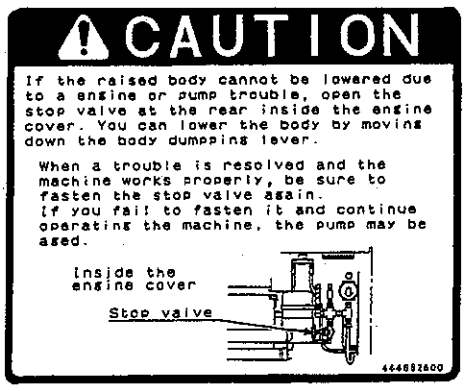
① • Located on the hydraulic tank.
• Part No. : 4448 831 00



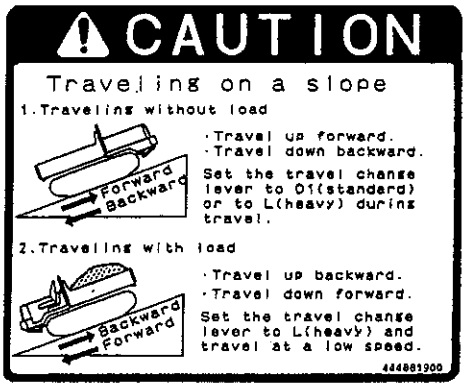
② • Located 1n the operator's station.
• Part No. : 4448 816 00



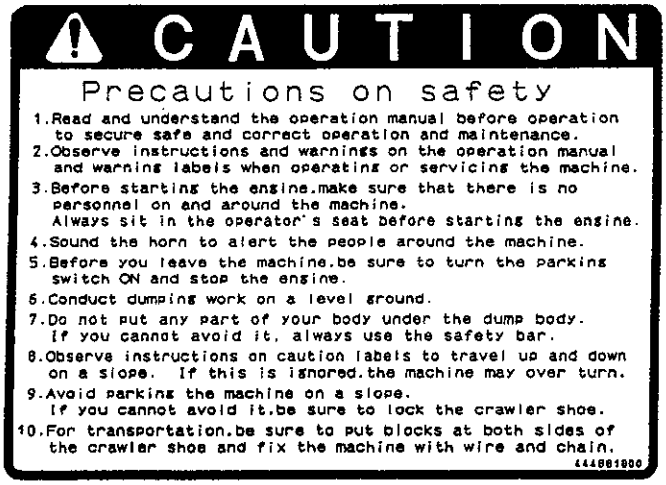
③ • Located 1n the operator's station.
• Part No. : 4448 820 00



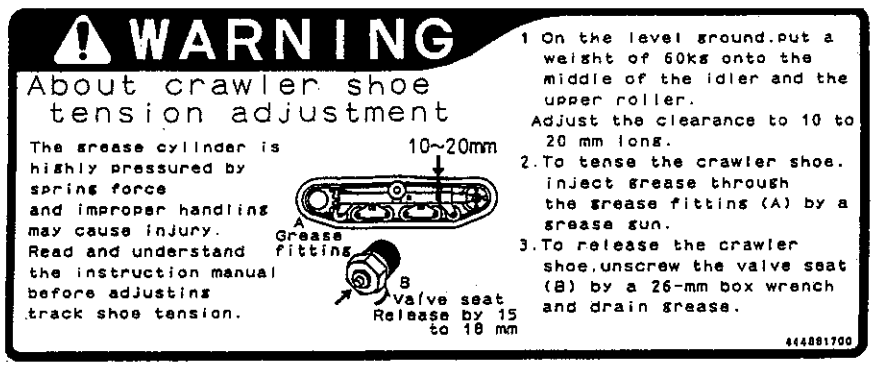
④ • Located 1n the operator's station.
• Part No. : 4448 826 00



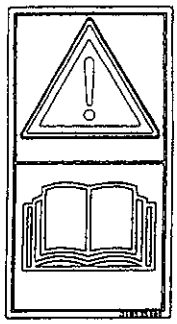
⑤ • Located inoperator's station.
• Part No. : D405 033 00



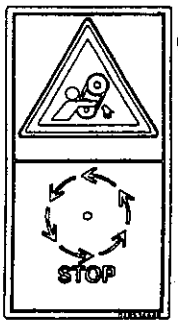
⑥ • Located in the operator's station.
• Part No. : 4448 818 00



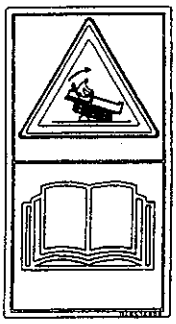
⑦ • Located on the both track frame.
• Part No. : 4448 817 00



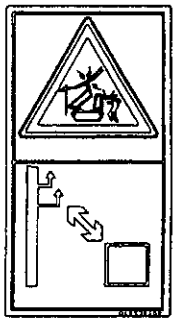
(8) • Read operator's manual.
• Located in the operator's station.
• Part No. : D405 359 00



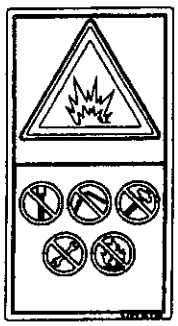
(12) • Entanglement hazards. Hand and arm entanglement.
• Donot open until engine have completely stoped.
• Located on the engine cab side.
• Part No. : D405 366 00



(9) • Fallimg hazards. Fallimg from oprator's sheet.
• Read operator's manual.
• Located in the operator's station.
• Part No. : D405 368 00

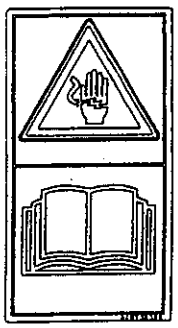


(13) • Electrical (shock/burn) hazards. Electrical shock/ electrocution.
• Keep sufficient distance away from electrical power lines.
• Located on the engine cab side.
• Part No. : D405 364 00

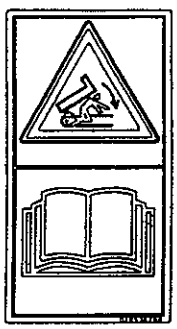


(10) • Thermal (combustion/ explosion) hazards. Explosion – Battery.
• Located on the hydraulic tank side.
• Part No. : D405 362 00

(14) • Thermal (burn/contact) hazards. Hot surfaces – Burns to finger or hand.
• Stay clear of hot surface.• Located on the engine cab side.
• Part No. : D405 360 00

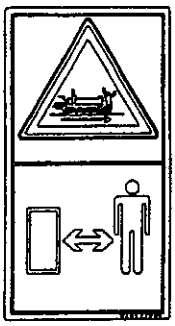


(11) • Electrical (shock/burn) hazards – Battery cable.
• Read operator's manual.
• Located on the hydraulic tank side.
• Part No. : D405 363 00

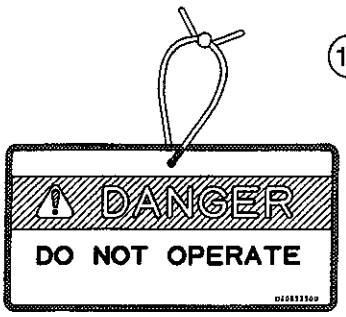


(15) • Crushing hazards. Falling the body.
• Attach support before getting into hazerdous area.
• Located on the both bodies side.
• Part No. : D405 367 00

(16)
- Thrown or flying object hazards – High pressure cylinder.
- See the Maintenance section of this manual track adjustment procedure.
- Located on the both track frames.
- Part No. : D405 369 00



(17)
- Runover/backover/strike hazards.
- Stay a safe distance from the machine.
- Located on the body of rear side.
- Part No. : D405 370 00



(18)
- Attach a DONOTOPERATE warning tag to start switch or controls before servicining or repeairing the machine.
- Do not start the engine or move any of the controls if ther is DONOTOPERATE or similar warning tag attached to the start switch or controls.
- Part No. : D405 323 00

2 SPECIFICATIONS

2 – 1 GENERAL SPECIFICATIONS

■ BASE MACHINE PERFORMENCE

	Unit	IC30
Travel speed	km / h	L (Standard) : 6 H (High) : 11
Gradability	% (deg.)	58 (30)

■ ENGINE

Engine model	–	ISUZU 3LD1
Engine type	–	4cycle, water cooled, Special swirl - chamber, overhead valve
No. of cyl. – bore × storoke	mm	3 – 83.1 × 92
Total piston displecement	cc	1496
Rated output	kW / min^{-1} (ps / rpm)	23.5 / 2800 (32 / 2800)
Max. torpue	N•m / min^{-1} (kgf•m / rpm)	95.1 / 1800 (9.78 / 1800)

■ WEIGHT

Unladen vehicle weight		kg	2100
Maximum payload		kg	2500
Average ground bearing pressure	With unladen	kPa (kgf / cm^2)	16.7(0.17)
	With load		37.3(0.38)

■ CPACITY

Body capacity	Struck	m^3	0.8
	Heaped		1.2

2 SPECIFICATIONS

2 - 1 GENERAL SPECIFICATIONS

■ AMOUNT OF FUEL, LUBRICATING OIL AND COOLANT

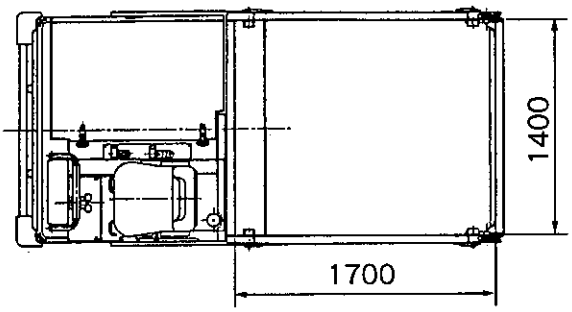
Fuel		ℓ	40
Hydraulic fluid	Oil level	ℓ	25
	Total amountin system	ℓ	30
Engine oil	Max. level	ℓ	6.3
	Min. level	ℓ	3.5
Coolant	Engine proper	ℓ	2.5
	Total amount	ℓ	5.7

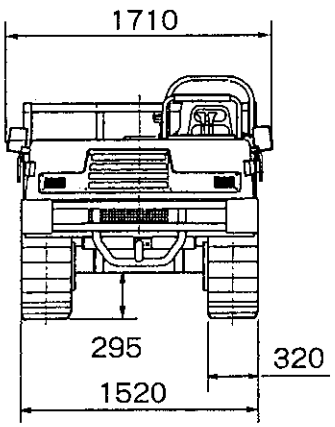
■ TRAVEL DRIVE SYSTEMS

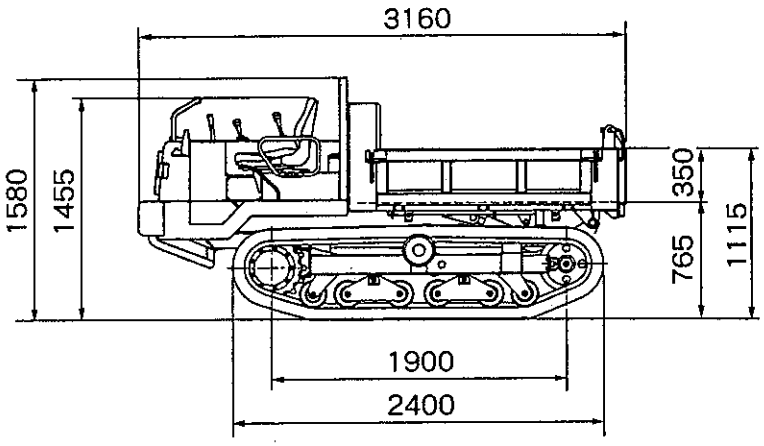
Travel drive system	–	Hydraulic Static Transmission (H.S.T)
Transmission system	–	2 speed motr and pump flow control
Transmission stage		2 stage (L : Standard, H : High)
Brake system	–	H.S.T hydraulic brake and mechanical parking brake
H.S.T set pressure	MPa (kgf / cm^2)	30.9 (315)

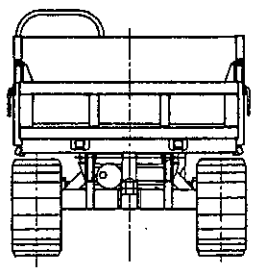
2 SPECIFICATIONS

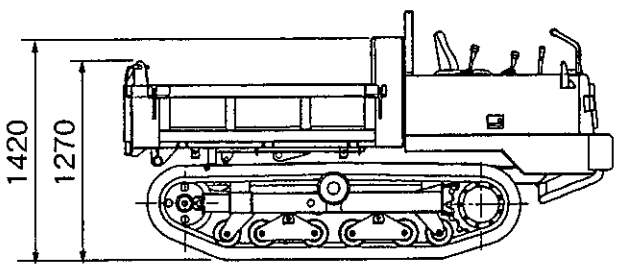
2 - 2 OVERALL DIMENSIONS





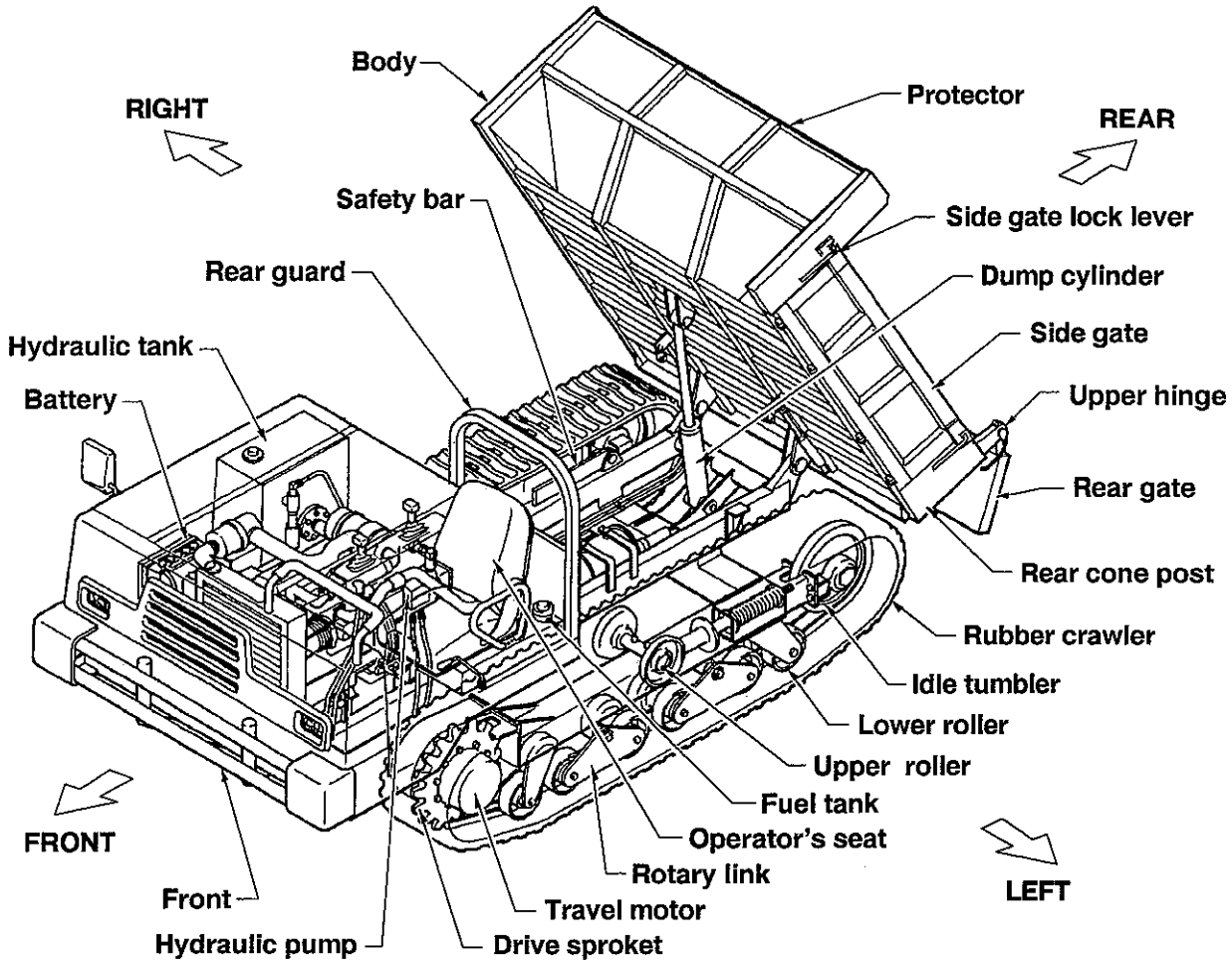






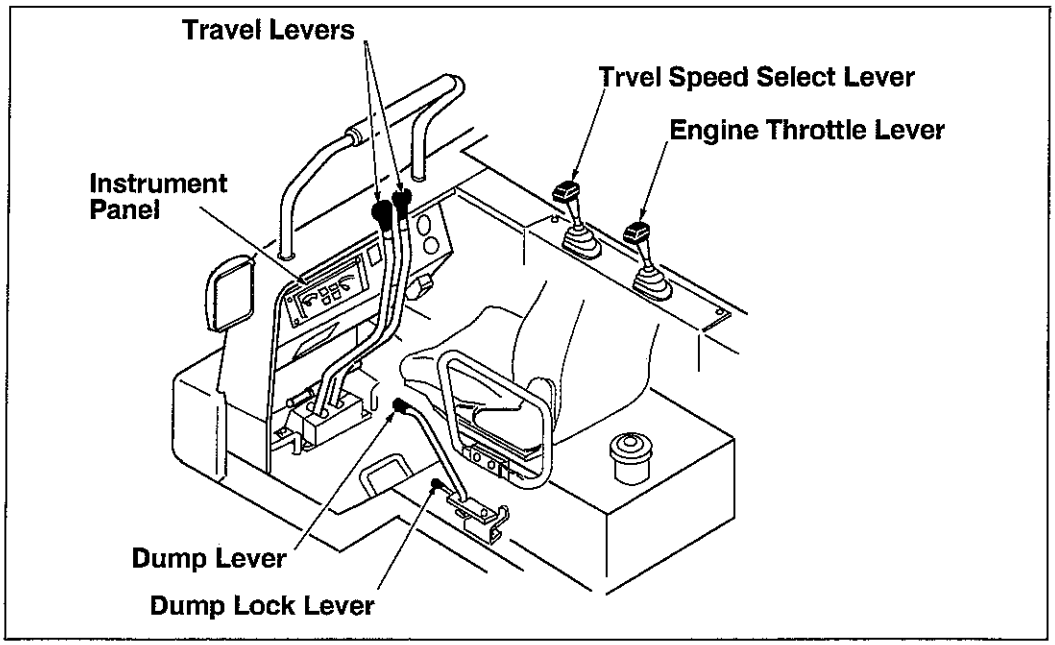
3 OPERATION

3 – 1 NOMENCLATURE

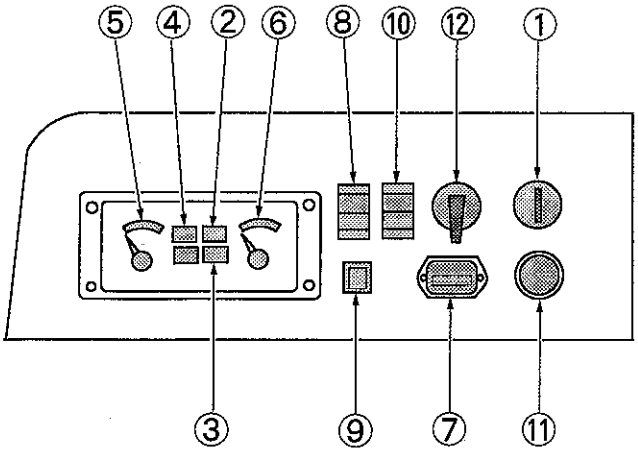


3 OPERATION

3 - 2 CONTROLS AND INSTRUMENTS



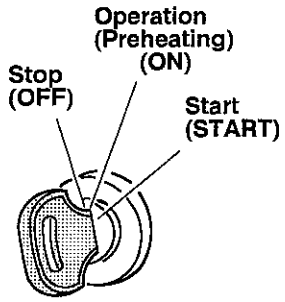
Ditail of Instrument Panel



① Engine start Switch
② Engine Oil Pressure Warning Lamp
③ Charge Warning Lamp
④ Quick Grow Lamp
⑤ Fuel Level Gauge
⑥ Engine coolant Ttemp. Gauge
⑦ Service Hour Meter
⑧ Parking Brake Switch
⑨ Parking Brake Lamp
⑩ Light Switch
⑪ Horn Switch
⑫ Drection Indicator Switch

3 OPERATION

① Engine Start Switch



OFF – Engine must be in the OFF position to insert or remove the key. Turn the key switch to OFF position before trying to restart the engine. Turn the key switch to the OFF opsition to stop the engine.

ON – The key will return to the ON position when released from the START position.
When engine is not warmed up, preheating proceeds autmatically.

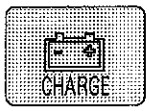
STRAT – Turn the key to the START position to crank the engine. Reliese the key as soon as the engine starts.

NOTE: If yhe engine does not start after 10 seconds return the key to OFF and wait for two minutes before returning it to START.

② Engine Oil Pressure Warning Lamp

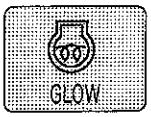
This warning lamp indicates that engine oil pressure has fallen. If it lights and buzzer sounds during operation, stop the engine immediately and check the cause of engine oil pressure's falling.

③ Charge Warning Lamp



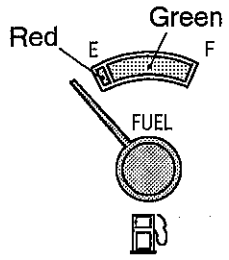
This warning lamp indicates abnormal condition in battery charging circuit. Light turns ON and buzzer sounds during engine operation.
The charge indicator light should be OFF when engine is started.

④ Quick Glow Lamp



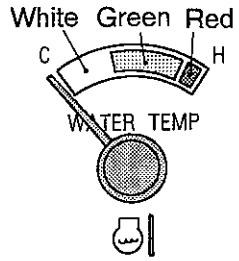
This lamp indicates preheating status of the engine in its starting period.
It lights when the start switch is turned ON and goes out when a preheating stage is over.
Lighting time of this lamp becomes shorter when the engine is already warmed.

⑤ Fuel Level Gauge



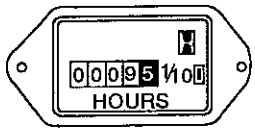
It indicates the amount of fuel in the fuel tank.
Add fuel immediately when the gauge indicates the level is in the red range.

⑥ Engine coolant Temperature Gauge



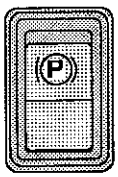
This indicates the engine coolant temperature.
The "White" range indicates cold temperature.
While running the engine, with out load and low idling warming up.
The "Green" range is the normal operating temperature.
The "Red" range indicates overheating.

⑦ Service Hour Meter



Indicates the total operating hours of the machine.
It should be used to determine service hour maintenance intervals.
While the engine is running, the hour meter is operated.

⑧ Parking Brake Switch



When leaving the operator's seat, engage the parking brake.

Depress "P" side of the switch to engage the mechanical parking brake. Then the parking brake lamp lights to indicate that the brake is engaged.

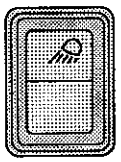
⑨ Parking Brake Lamp

Depress unmarked side to release the mechanical parking brake. Then the parking brake lamp goes off to indicate that the brake is released.

⚠ CAUTION

Do not engage the parking brake to stop the machine while travering.
Stop traveling without the parking brake first, then engage the parking brake.

⑩ Light Switch



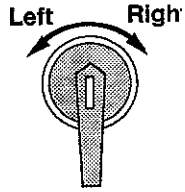
Depress the [ ] marked half of the switch plate turns on the headlight.

When to turn it off, depress the blank half of the switch

⑪ Horn Switch

Push down on the horn switch botton to activate the horn.

⑫ Drection Indicator Switch

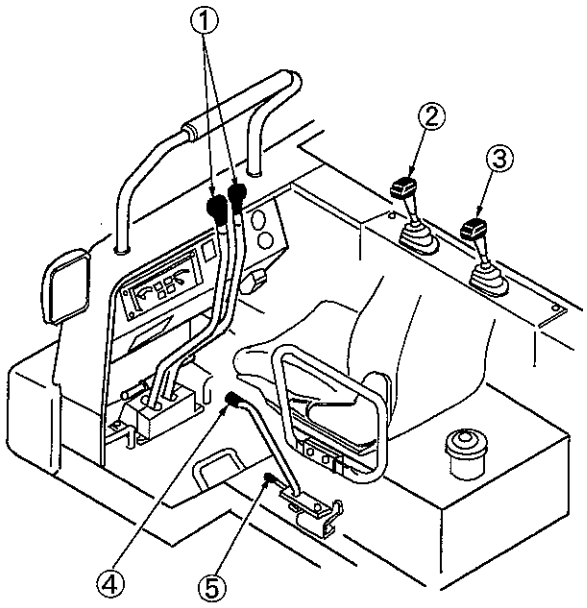


Trun lever left to light the left direction indicator.

Trun lever right to light the right direction indicator.

3 OPERATION

OPERATING LEVERS



① **Travel levers**

② **Trvel speed select lever**

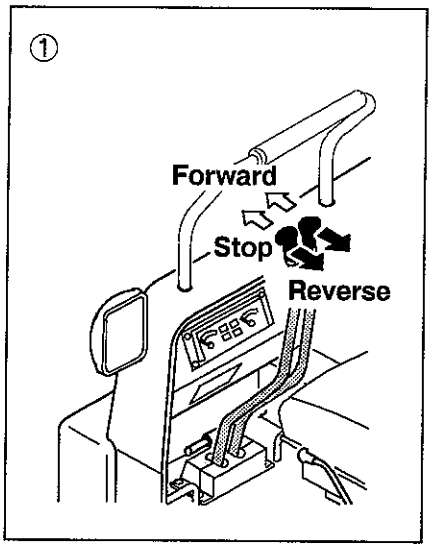
③ **Engine Throttle lever**

④ **Dump lever**

⑤ **Dump lock lever**

① Travel Levers

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



Left travel lever

Reverse – Move the travel lever backward to operate the left track in a reverse direction.

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

Forward – Move the travel lever forward to operate the left track in a forward direction.

Right travel lever

The right travel lever operates in the same nanner as the left travel lever except it controls the right track.

Move both travel levers the same distance in the same direction (either forward or reverse) for straight line travel.

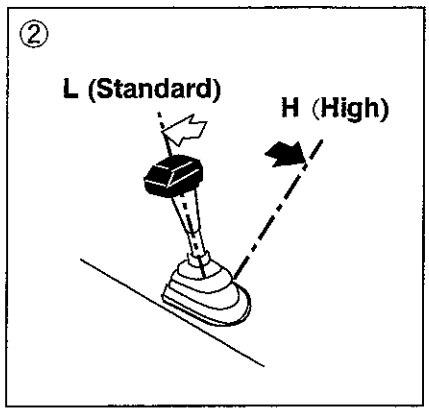
Change the stroke of levers to change control travel speed. The bigger stroke increase the speed.

② **Travel Speed Select Lever**

Move this lever to select either H (high) or L(standard) machine travel speed.

Select the L (standard) speed position 〔6 km/h maximun〕 when driving rough or soft surfaces and slopes. L (standard) is also recommended for loading or unloading from a trailer.

Select the H (high) speed position 〔11 km/h maximun〕 when driving on a hard even surface.



⚠ CAUTION

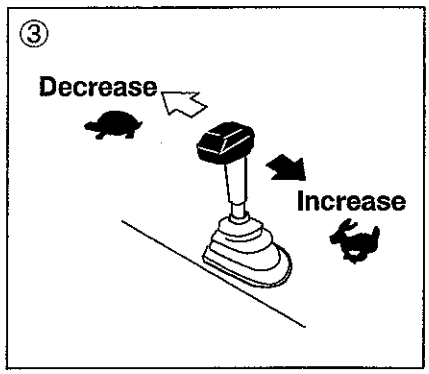
Do not operate travel speed select lever while travelling.

③ **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.

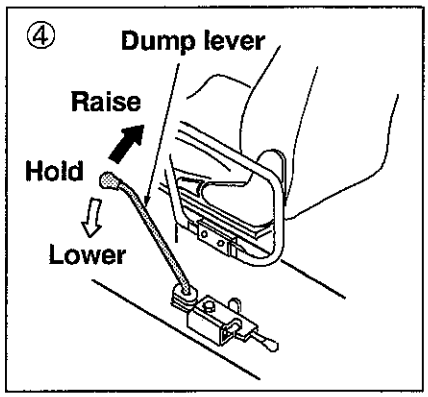


④ **Dump Lever**

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.

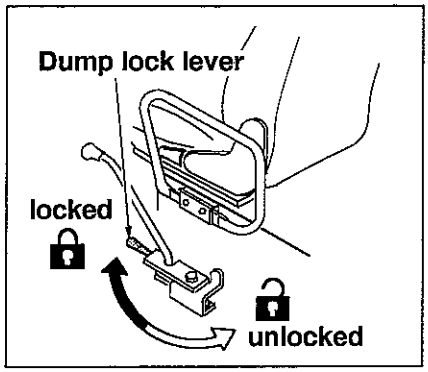


⑤ **Dump lock lever**

Move Dump lock lever to lock the dump lever.

Locked – Move the lever forword to the locked position.

Unlocked – Move the lever back to the unlocked position.



Seat

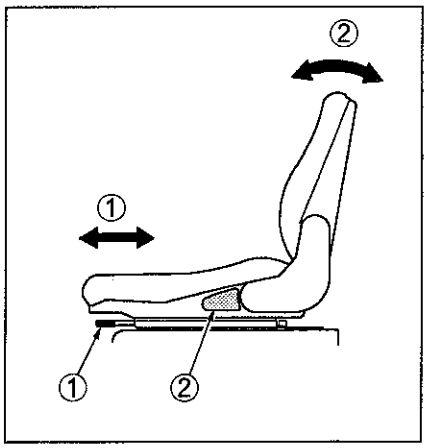
⚠ CAUTION

Do not adjust the seat while driving.
Sudden seat movement can cause operating errors or unforeseen accidents.

Seat adjustment should be checked at the begining of each shift or when changing operators.

Alway 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.

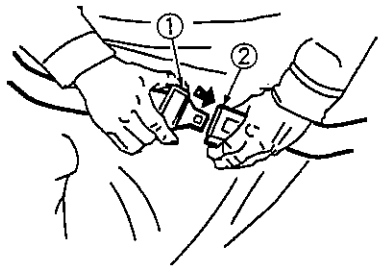
3 OPERATION

■ SEAT BELT

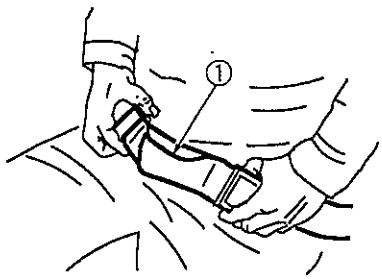
⚠ CAUTION

ALWAYS fasten the seat belt the while operating the machine.
Before operating the machine, be sure to inspect the seat belt and mounting for excessive wear and damaged. Replace if damaged.

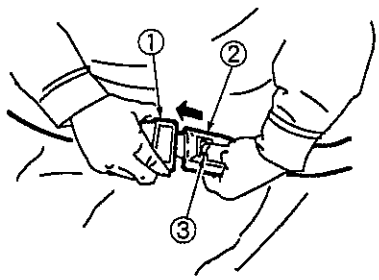
1. Confirm that the seat belt (1) is not twisted and put it into the buckle (2) securely.



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



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



3 OPERATION

3 - 3 PRE-START CHECKS

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

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

Inspect lights for broken bulbs and lenses. Replace if 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 . Mainten the oil level. Add oil if necessary.

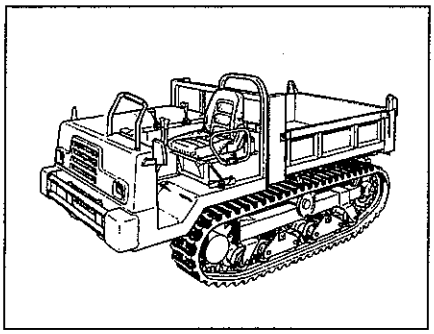
Check the engine oil level. Mainten the oil level. Add oil if necessary.

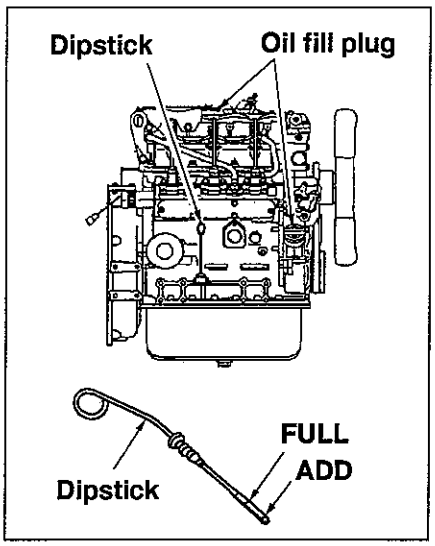
Check the coolant level on the collant reserve tank. Mainten the level. Add collant if necessary.

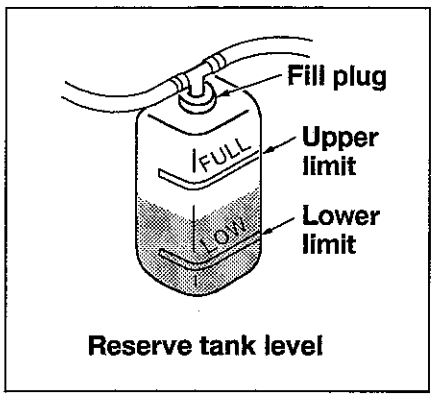
Check the air filter dust indicator. If the indicator is in the red zone, service the engine air filter. After servicing, push the reset button to reset the dust indicator.

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

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







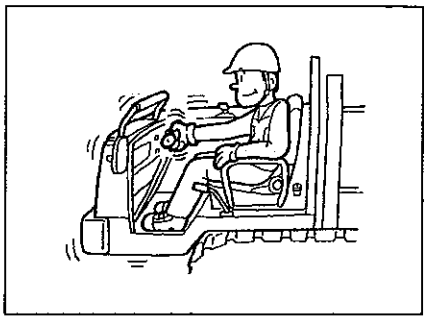
Reserve tank level

3 OPERATION

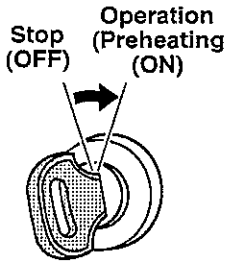
3 - 4 STARTING ENGINE

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-half).

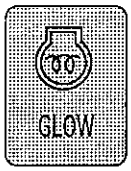


4. Turn the start switch to the **ON** position.
   The **GLOW** lamp turns on during engine preheating.
   GLOW lamp turns off, and preheating is over.



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

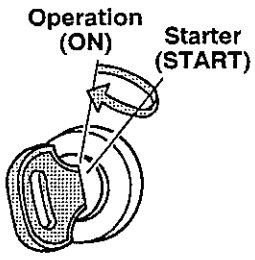
6. Release the start switch key when the engine starts.



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 up the hydraulic oil as described in "Preoperation Warm-Up"



⚠ DANGER

DO NOT USE ETHER FOR STARTING AID

3 OPERATION

3 - 5 JUMPER CABLE STARTING

⚠ CAUTION

Battery gives off flammable fumes that can explode.

Improper jump procedures can cause an explosion resulting in personal injury.

The ground cable must be **ATTACHED LAST** and removed **FIRST** to prevent sparks from occurring near the battery, which could cause battery vapors to explode.

Attach the ground cable from the booster battery to a point away from and below the battery (Use starter groundpost of machine to be started).

To prevent possible personal injury, care must be used when removing the cables from the machine that has been started.
Do not allow the cable ends to contact each other or the machine.

⚠ CAUTION

Jump only with a battery source and with the stalled voltage as the stalled machine.

Be sure the start switch is in the **OFF** position **BEFORE** attaching the jumper cables to the machine to be started.

Always connect battery **POSITIVE** (+) to battery **POSITIVE** (+) and **NEGATIVE** (−) to battery **NEGATIVE** (−).

1. Attach one cable to under grounded **POSITIVE** (+) terminal of battery on machine to be started.
   Attach opposite end of cable to **POSITIVE** (+) terminal of external starting source.
2. Attach second cable to **NEGATIVE** (−) terminal of starting souce. Attach remaining cable end to the starter ground post of machine to be started.
3. Start engine.
4. After engine starts, **FISRT** remove cable attached to starter ground post of started machine. Remove opposite end of cable from starting source.
5. Remove cable from **POSITIVE** (+) terminal of battery on machine started.
   Remove opposite end of cable from starting souce.

3 OPERATION

3 - 6 PRE-OPERATION WARM-UP

With any piece of hydraulically operated equipment, it is **EXTREMELY IMPORTANT** that the hydraulic fluid be thoroughly warmed fluid-up **BEFORE** any work is begun. A warm-up period is time well spent in preventive maintenance.

Practice the folowing warm-up procedure before attemping full load operations.

1. Perform the engine start - up procedure previously described and allow the engine to idle for 4~5 minutes at approximately 1000 rpm. (1000~1200 rpm in cold weather). Depending on the ambient temperatures, the following conditions may exist when the engine is first started:

2. The engine oil pressure warning lamp will come on. Within 10~15 seconds a minimum pressure should course the light go out. If this pressure **DOES NOT** indicated whithin 10~15 seconds, **STOP** the engine and check the oil lubricating system.

3. When the nessesary engine oil pressure has been obtained, gradually increse engine speed observing the "**OK**" monitor system to be sure all systems are normal. Work up to maximum engine speed in manner.

4. Perform all machine motions in order to get movement of oil through all working units.

5. In cold weather, it may be nessesary to heat the hydraulic oil by going over relief. To accomplish this, set engine speed at one-half to three-quaters throttle. Actuate dump lower function to direct pump flows over relief.

6. Repeat this over relief procedure in short 5 second attempts with 10~15 second pauses in between. Occasionally, go through all the hydraulic motions to move warmed oil to cylinders and cold oil buck to reservoir.

Depending on the ambient temperature, the above procedure should warm hydraulic oil to within its specified temperature range for full load operation in 15~30 minutes.

Be sure to perform the pre-operation warm - up procedure whenever the hydraulic oil temperature is lower than 20 ℃ at start- up

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.

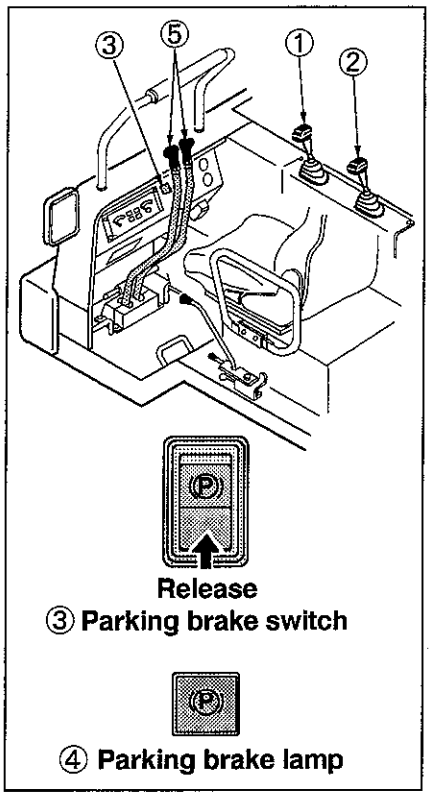
Hour meter	Load
Up to 10 hours	About 60% load
Up to 50 hours	About 80% load
After 50 hours	Full load

3 OPERATION

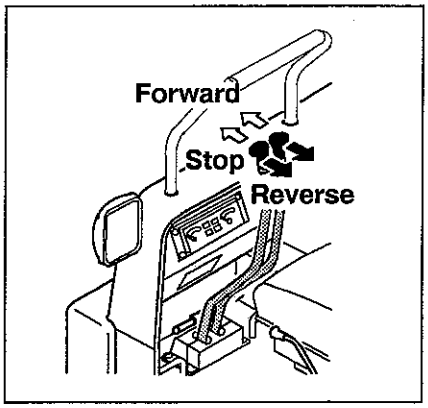
3-8 TRAVELING THE MACHINE

⚠ 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.

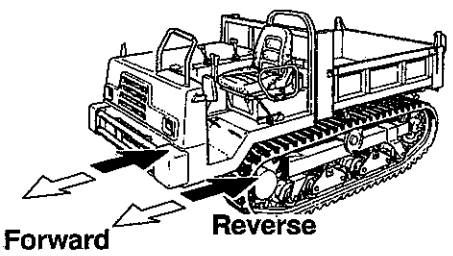


1. Adjust the operator's seat.
2. Fasten the seat belt.
3. Select the desired travel speed by operating the travel speed select lever ① .
4. Move the engine throttle lever ② to increase the engine speed (rpm) to the desired speed.
5. Release the parking brake by press the no mark side of the parking brake switch ③ . Chek the parking brake lamp ④ is now off.
6. Straight travel
   - Forward direction travel – Push the both travel levers ⑤ forward to travel forward.
   - Revers direction travel – Pull the both travel levers ⑤ backward to travel revers.



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

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



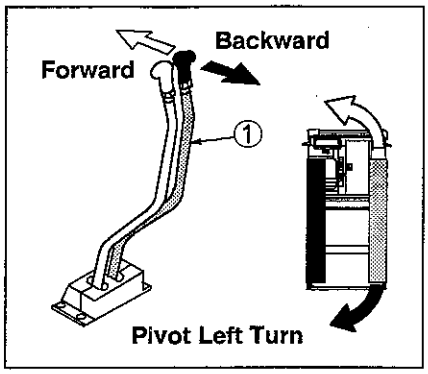
NOTE: If the engine stall when travelling while the engine speed (rpm) is low or the travel select lever is set to H (high) range. Restart the engine, increase the engine speed (rpm) and set the travel select lever is set to L (standard) range.
Avoid the engine stall to control the travel levers stroke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

3 OPERATION

STREERING CONTROL

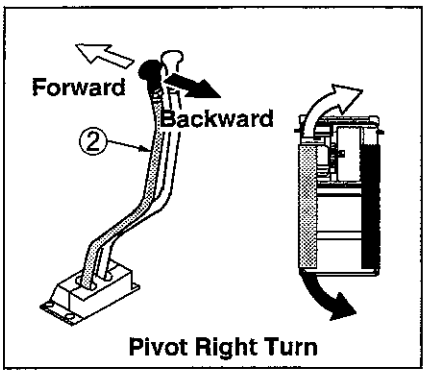
Pivot Left Turn

Move the right travel lever ① forward , allowing the machime to turn to the left, pivoting on the left track.



Pivot right Turn

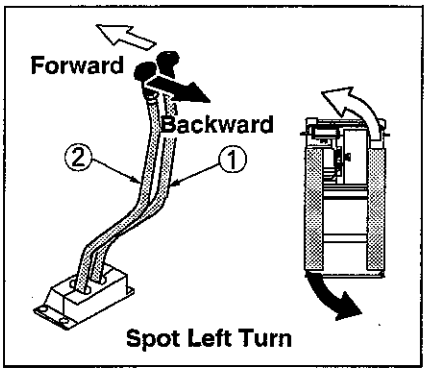
Move the left travel lever ② forward , allowing the machime to turn to the right, pivoting on the right track.



Spot Left Turn

Move the right travel lever ① forward and move the left travel lever ② backward at the same time .

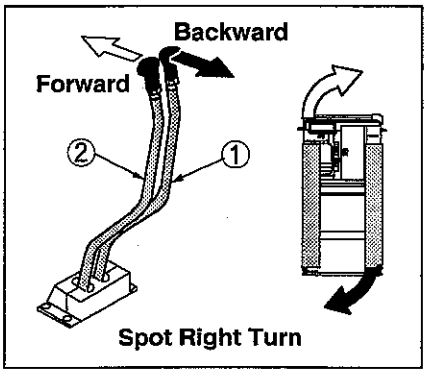
This allows a quick left turn (counter track rotation).



Spot right Turn

Move the right travel lever ① backward and move the left travel lever ② forward at the same time .

This allows a quick right turn (counter track rotation).



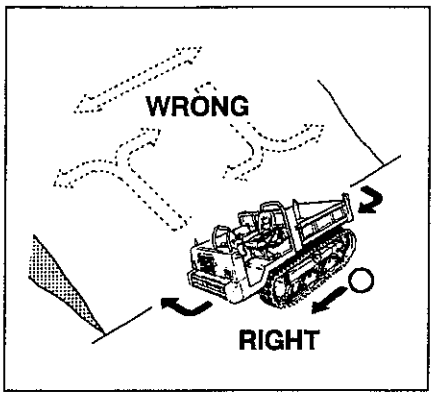
NOTE:

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 switch is set to low. Avoid the engine stall to control the travel levers stroke while travelling.

CAUTION ON TRAVEL ON THE 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.



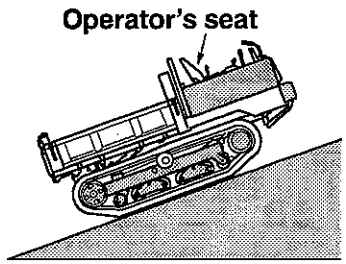
1. Travelling on slopes with anunloaded Vehicle.
- Set taravel speed select lever to the LOW range.
- Travel so the operator's seat faces up to the slope. The center of gravity of the machine is under the operator's seat so this will maintain stability.

2. Travelling on slopes with unloaded Vehicle.
- Set taravelspeed select lever to the LOW range.
- Travel so the body with the load faces up to the slope. The center of gravity of the machine is now under the body so this will maintain stability.
- Avoid sudden change in speed or quickly speeding up and slow down.

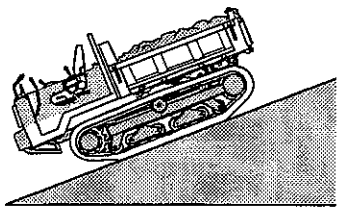
3. Braking on slopes
- When braking on slopes, move the travel lever to neutral and braking will take place automatically.

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

Travelling on slope with an unloaded vehicle.



Travelling on slope with a loaded vehicle.



SELECT THE TRAVEL SPEED

⚠ CAUTION

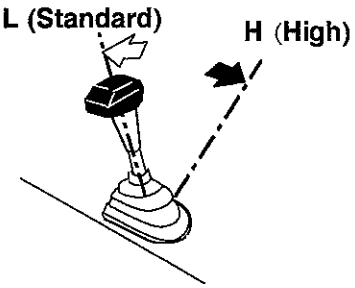
Do not operate travel speed select lever while travelling.

Move travel speed select lever to select either H (high) or L(standard) machine travel speed.

A good practice is to use the same travel speed range going downgrade that would be used to go up the grade.

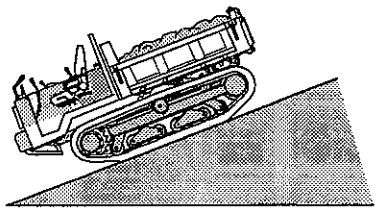
Select the L (standard) speed position 〔6 km/h maximun〕 when driving rough or soft surfaces and slopes with load.
L (standard) is also recommended for loading or unloading from a trailer.

Select the H (high) speed position 〔11 km/h maximun〕 when driving on a hard even surface without load.

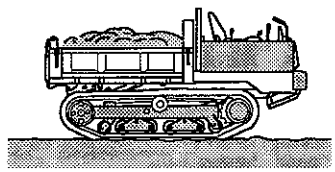


Travel speed select lever

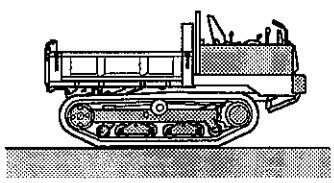
L (Standard) speed range



L (Standard) speed range



H (High) speed range



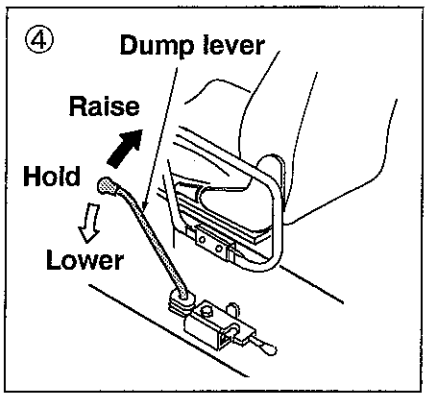
3 OPERATION

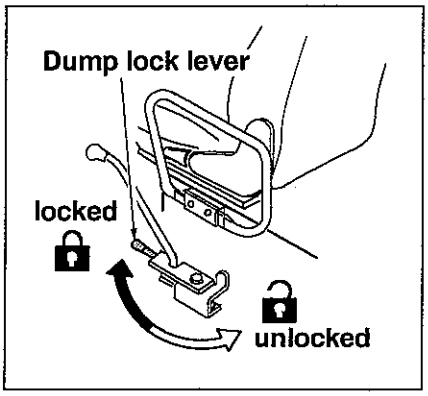
3 - 9 DUMP OPERATION

⚠ 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.

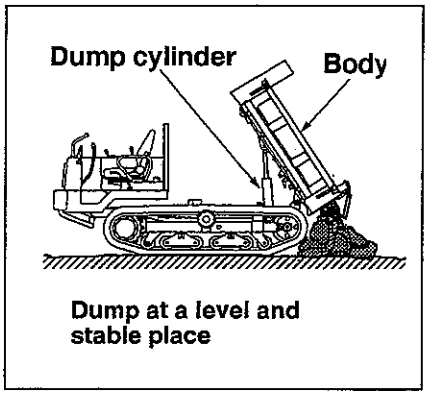
1. Stop the machine and confirm safety of a dumping place.
2. Move the engine throttle lever to increase the engine speed (rpm) to the desired speed.
3. Move the dump lever lock to the unlocked position.
4. Slowly move the dump lever to the raise position to raise the body.
5. Release the dump lever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





NOTE:

1. The rear gate of body autmatically opens or closes as the body rises or lowers.
2. Place the dump lock lever in lock position when no dumping is needed.
3. When dumping bigger stones, operate dumping slowly. If there is a too big object to be dumped through the rear gate, remove the gete in advance.
4. Do not travel while the body is raised. ALWAYS travel keeping the body lowered.



■ Emergency Lowering the body (Lowering the Body with Engine Stopped)

⚠ CAUTION

- Only lower the body using the stop valve when trouble occurs.
- Releasing the stop valve applies the parking brake and the carrier stops.
- Be sure to always completely close the stop valve once the trouble has been repaired.
  If the 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.

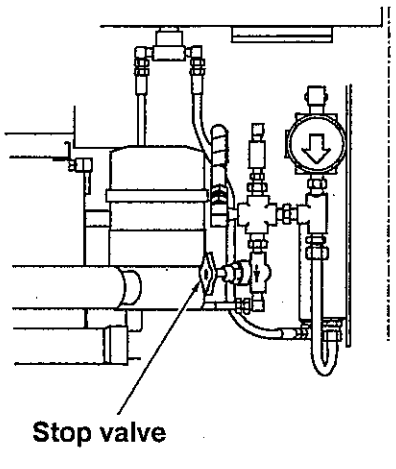
⚠ WARNING

Lowering the body with the engine stopped could cause personal injury or death.

Keep all personnel away from the body drop area when lowering the body with the engine stopped.

If trouble occurs in the engine or pump while the body is still raised and the engine stalls, you will be unable to lower the body. In such cases, open the stop valve which is located at the inside the engine cover at the rear. With the stop lever open, the body can now be lowered.

1. Keep all personnel away from the body drop area.
2. Open the engine cover.
3. Turn the stop valve handle counter-clockwise to open the valve.
4. Lower the dump lever down to lower the body.
5. Once the body is completely lowered, turn the stop valve clockwise and tighten it securely.



Engine cover interior

3 OPERATION

3 - 10 TOWING

⚠WARNING

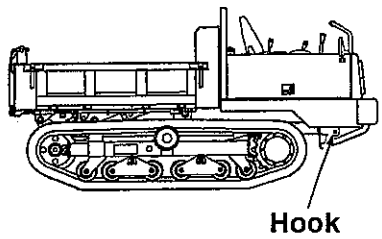
* Personal injury or death could result when towing a disabled machine incorrectry.
* Follow the recommendations below, to properly perform the towing procedure.
* During towing operation, **NEVER** allow anyone between the towing machine and the towed machine.
* Quick machine movement could overload 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

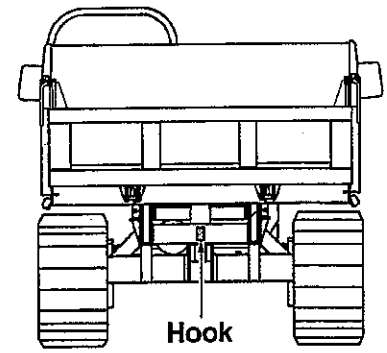
When the carrier gets stuck for instance in mud and cannot escape under its own power it must be towed by another vehicle. In such cases attach a shackle to a wire rope and attach this to the front or rear hook. The carrier can now be towed.

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

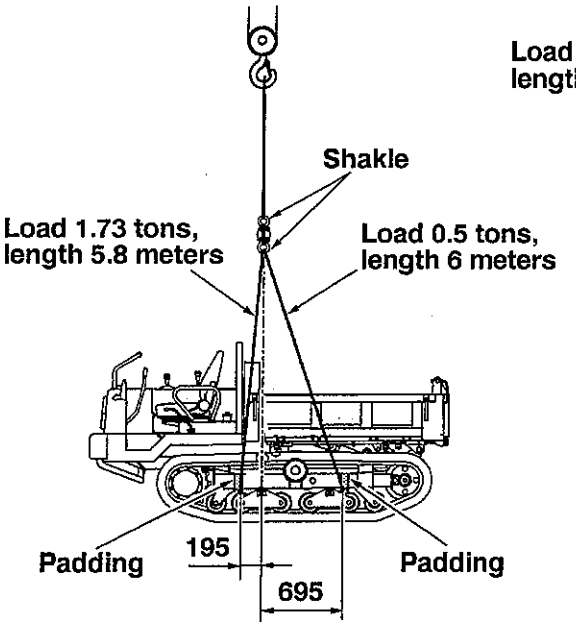
3 OPERATION

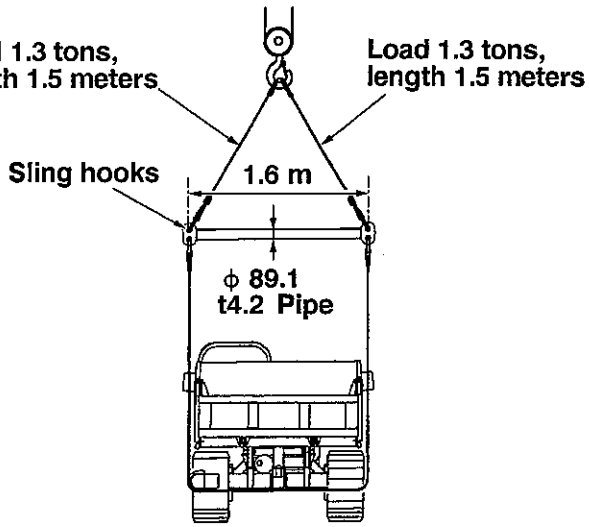
3 - 11 LIFTING THE MACHINE

⚠ 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)	2100

3 OPERATION

3 - 12 LOADING AND UNLOADING THE MACHINE

⚠ WARNING

* When using loading ramps, be sure there is adequate length, width, firmness and slope.
* To prevent the machine from slipping while loading, or sihting in transit, remove ice, snow or other slippery material from the loading dick and the truck bed before loading.
* Perform warm - up before loading and unloading under cold weather.
* **NEVER** make a turn on a ramp. To make a turn, get off the machine from the ramp first.
* Set the speed select lever to the L (Standard) position. **NEVER** operate the speed select lever when loading the machine on a truck.

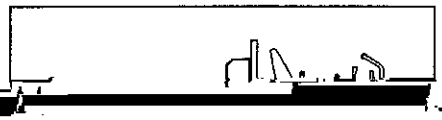
ALWAYS use the ramps for loading and unloading the machine by following the next procedures.

1. Choose as flat grpund as possible for loading or unloading the machine.
2. Block the truck wheels before loading the machine.
3. Mainten the slope of loading ramps within 15 degrees.
4. Position the machine so that it can be run straight on the loading lamps. The operator's seat should be to the front of the machine when going up and going down the ramps. Never operate the speed select lever while the machine is on the loading

Securing the Machine

Securely fix the machine to the truck body with wire rope cables.

1. Turn the engine start key to OFF to stop the engine and remove the key.
2. Engage block in front and back of the crawlers.
3. Block the crawler and secure the machine with tiedowns. For this porpose, with proper reted wire rope cable.



3 OPERATION

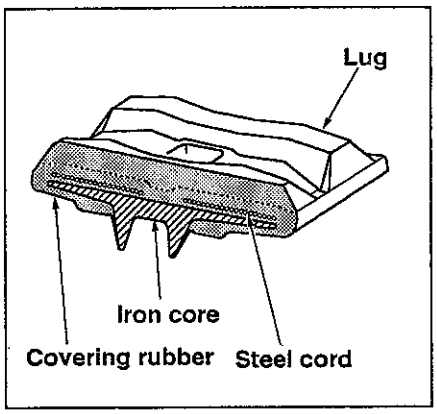
3 - 13 PRECAUTION ON USE OF RUBBER CRAWLER SHOE

⚠ CAUTION

The rubber crawler shoe may be damaged or worn faster depending on woking 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 suport it, and covering rubber to them.

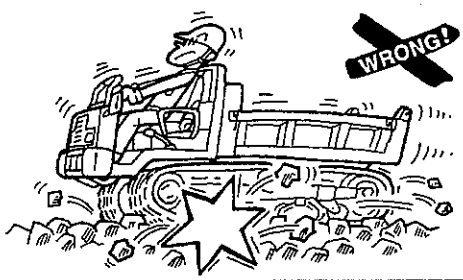


NOTE : If a crack reaches the steel cord, it may be rusted and cut off by moisture. When any crack is detected, immediate repair is essential. Please contact your local IHI destributor.

■Cautions while working and travelling

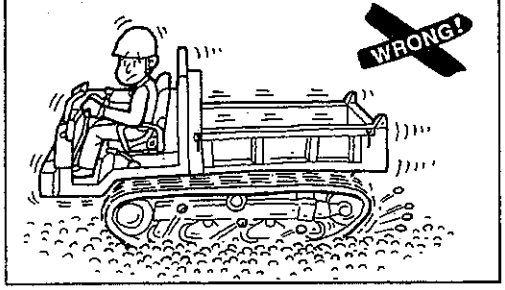
Avoid the following while travelling.

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**

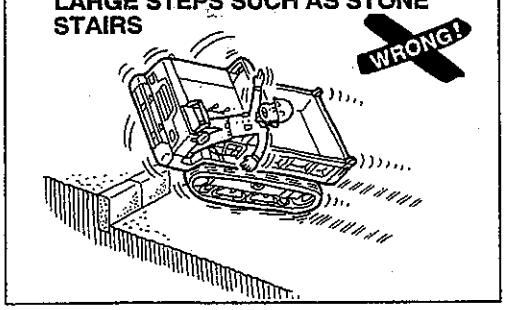


This causes damage or wear on the rubber crawler and they may slip off.

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

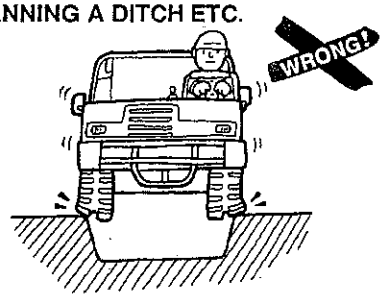
This wears down the lug and causes the steel cord to break.

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



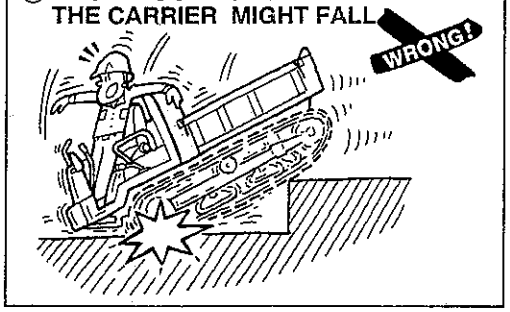
- Move slowly directly up steps.
- While moving up the steps avoid places where the road surface changes.

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



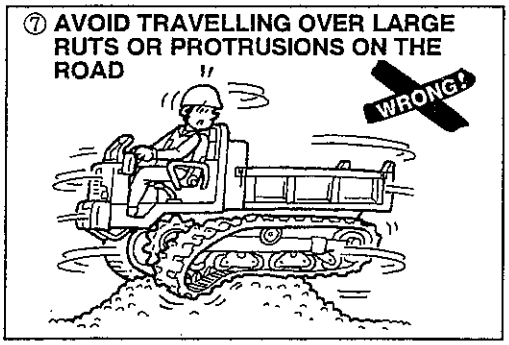
- This wears down the lug and breaks the iron core.
- The carrier might fall or topple over.

⑥ AVOID LOCATIONS WHERE THE CARRIER MIGHT FALL



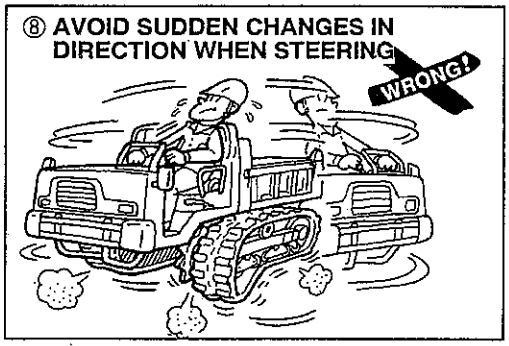
Do not let the carrier fall from locations like large stone steps.
This might damage or break the iron core.

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



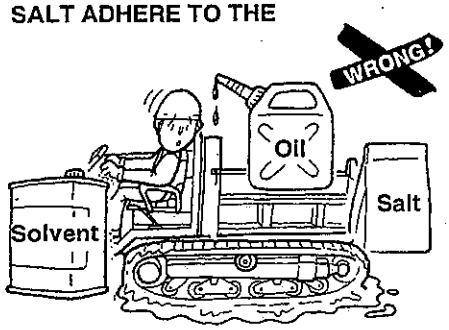
- Make direction changes in several smaller steering movements.
- Avoid sudden changes in direction. This causes early wear on the lug and may cause the crawlers to slip off.

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.

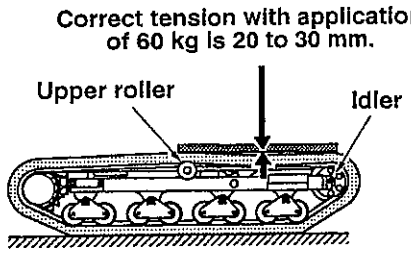
■OTHER ITEMS FOR CAUTION

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

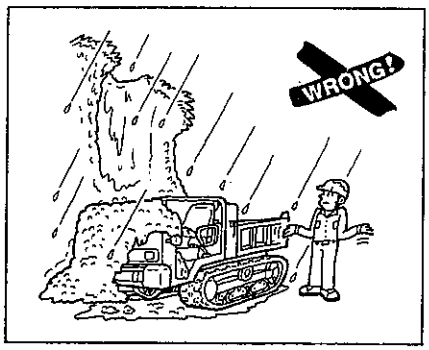


Attempting to change directions on terrain with different levels or steps while the rubber crawler is still slack may damage the rubber crawlers or cause them to come off the rollers.

3 OPERATION

3 - 14 PARKING THE MACHINE

At the end of a day's work, following steps should be observed as the established machine shut-down procedure:

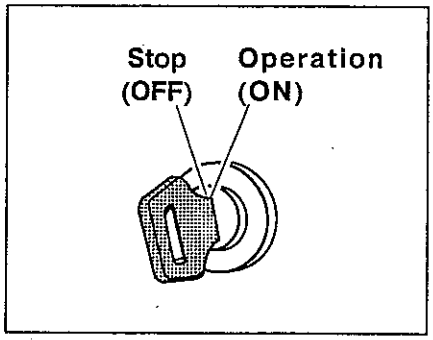


Stopping the Machine

Move the machine to a safe location on level ground. **ALWAYS** lower the body.

Freezing Conditions

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

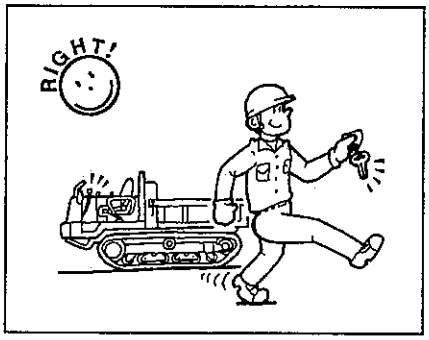


Stopping the Engine

1. Operate the engine at **LOW IDLE** for five minutes. This gives the engine a chance to cool off gradually before they are stopped.
2. Turn the start switch counterclockwise to **OFF** posision. Stopping the engine.

Leaving the Machine

1. **REMOVE THE START SWITCH KEY.**
2. **INSPECT THE ENTIRE MACHINE** for leaks, loose connections, signs of wear, crack etc. Report any signs of trouble discovered during this inspection.
3. Lock the cab door.
4. Close and lock the upper structure access doors.



3 - 15 EMARGENCY ENGINE STOP

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

4 MAINTENANCE

MAINTENANCE INTERVALS

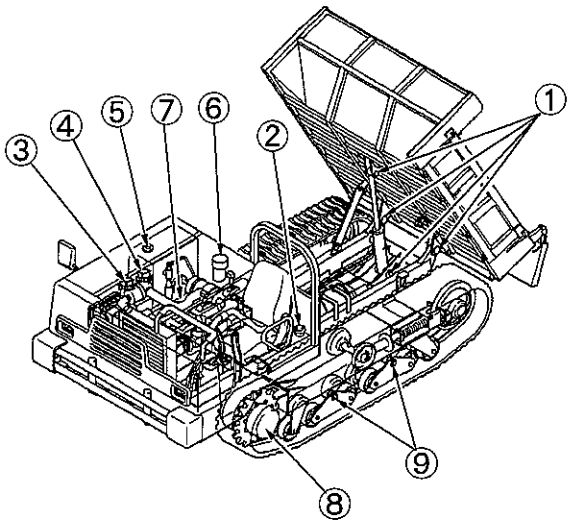
Check Point	Item	Page
Daily Check (8 Service hours)		
Engine Oil	Check Oil Level	4 – 5
Engine Coolant	Check Coolant Level	4 – 5
Hydraulic Tank	Check Hydraulic Oil Level	4 – 6
Fan Belt	Inspect / Adjust	4 – 6
Air Cleaner	Check Filter Dust Indicator	4 – 7
Water Sedimenter	Check Level and Drain the Water and Sediment	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
Fuel Filter	Drain Water and Clean Element	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 Element	4 – 15
Air Cleaner	Change Filter Element	4 – 16
Travel Reduction	Check Oil Level	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
Rubber Shoes	Check Rubber Shoes	4 – 25

* 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 maxmum inteval indicated by the service hour meter. Of course it should be shortend 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 cylinder	Lubricate the Fittings			G ○			
②	Fuel Tank	Drain the Water and Sediment			○			
③	Fuel Filter	Change the Filter						
④	Water Sedimenter	Check Level and Drain the Water		○				
⑤	Hydraulic Tank	Check Level and Change Oil		○				H ●
		Drain the Water and Sediment			○			
		Clean the Suction Strainer						○
⑥	Line Filter	Change the Filter	●				●	
⑦	Engine	Check and Change the Oil	E ●	○		E ●		
		Change the Filter	●			●	●	
		Change the Air Filter				○ Clean	●	
		Check the Coolant Level		W ○				
⑧	Travel Reductions	Check and Change the Oil					○	L ●
⑨	Rotary Roller Pins	Lubricate the Fittings			○			

Symbo	G	L	H	E	W	○	●
Remar	Grease	Gear oil	Hydraulic fluid	Engin 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 MAINTENANCE

4 – 2 RECOMMENDED LUBRICATION TABLE

LOCATION	REQUIRED AMOUNT	REPLACING INTERVAL	USE	SPECIFICATION	SHELL OIL	ESSO STANDARD	MOBIL OIL
Diesel Engine (ISUZU 3LD1)	Max. 6.3 liter (1.67 gal.) Min. 3.5 liter (0.93 gal.)	250 Hrs. (Farst oil change 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 HDX30	Mobil Delbac 1330
			Tropical Regions	API, Class CD SAE40	Rimula Oil 40	Esso Lube HDX40	Mobil Delbac 1340
Hydraulic Oil	Total Amount 30 liter (7.95 gal.) Tank Capacity 25 liter (6.63 gal.)	1000 Hrs.	Ambient Temp. Above -5℃	Wear Proof Hydraulic Fuluid ISO-VG46	Tellus Oil No. 46 *No. 68	Nuto H46 *H68	Mobil Oil DTE25 *DTE26
			Ambient Temp. Below -5℃	Wear Proof Hydraulic Fuluid ISO-VG32	Tellus Oil 32	Nuto H – 32 (– 12℃) H – 22 (– 36℃)	DTE24 (-22℃)
Travel Reduction Gears	0.8 liter/per (0.21 gal.)	1000Hrs.	–	API, GL-4 or GL-5, ISO-VG320 (SAE90) Gear Oil	Spirax EP90	Esso Gear Oil GP90	Mobil Lube HD90
Lower Rollers (Fixed)	120 cc/per (7.32 in^3)	1000Hrs.	–				
Lower Rollers (Rotary)	210 cc/per (12.8 in^3)	1000Hrs.	–				
Upper Rollers	40 cc/per (2.44 in^3)	1000Hrs.	–	API, Class CD SAE30	Rimula Oil 30	Esso Lube HDX30	Mobil Delbac 1330
Idle Tumblers	100 cc/per (6.1 in^3)	1000Hrs.	–				
Lubricate the Fittings	Body pin and Link pin for Rotary Rollers		–	EP2 Lithium Grease	Shell Albania EP2 Lithium Grease	Lithtan EP2	Mobil Prex 47

Note:
1. Oils in the hydraulic oil columns marked with *should be used above 0℃.
2. If the oil becomes dirty or deterioration of the oil's properties are excessive, replace more frequently than described above.

4 MAINTENANCE

4 - 3 PRECAUTION ON MAINTENANCE

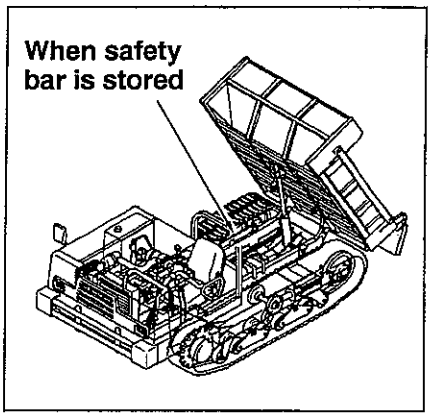
You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

■Using the safety bar

Use the safety bar when operating underneath the body which has been raised.

⚠ DANGER

ALWAYS use the safety bar for maintenance under the body since the body may lower if removing dump cylinder or hose without the bar.

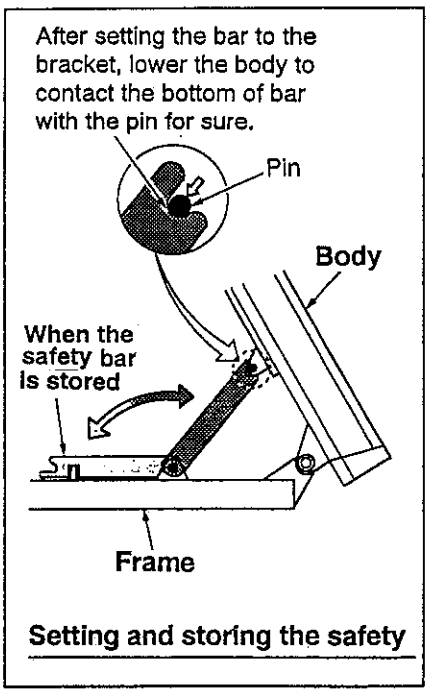


1. Set the safety bar

(1) Raise the body completely.
(2) Raise the safety bar and set it to the bracket under the body.
(3) Stop the engine.
(4) Open the stop valve and push down the dump lever to lower the body. Confirm the safety bar comes in contact with the bracket.
(5) Close the stop valve.

⚠ CAUTION

Do not start the engine and lower the body while using the safety bar. This may cause damage to the bar or body.



Setting and storing the safety

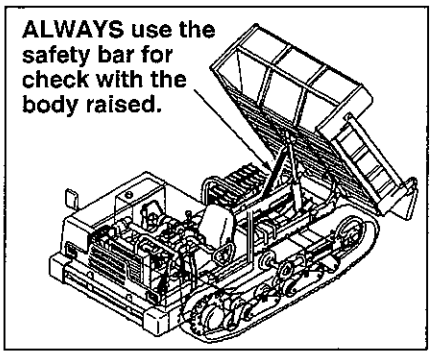
2. Remove the safety bar

(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 into the frame.

4 - 4 DAILY MAINTENANCE AND CHECKS

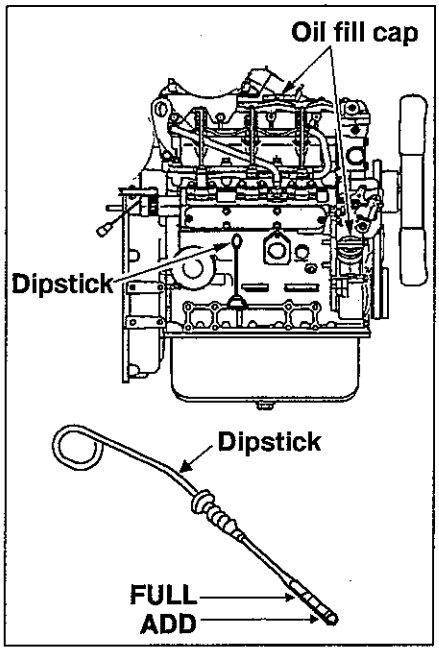
■ Check the Engine Oil Level

1. Place the machine on a leveled ground.
2. Stop the engine.
3. Open the access door on the rear of the machine.
4. Maintain the oil level between the **ADD** and **FULL** marks on the dipstick.
5. Remove the oil fill plug and add oil if necessary. Clean and install the fill plug.
6. Close the access door.



⚠ CAUTION

* Do not overfill the crankcase to avoide engine damaged.
* Never operate the engine when oil level is above **FLL** mark or **ADD** mark.

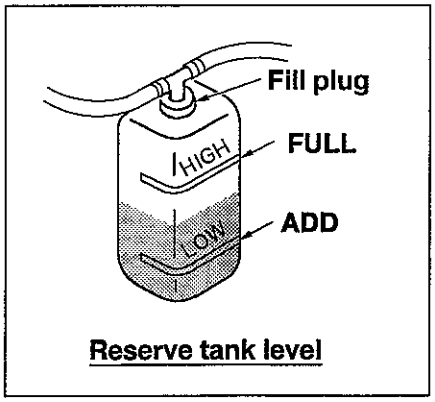


■ Check the Coolant Level

1. Open the access door on the side of the machine.
2. Always check the coolant level in the reserve tank. Maintain the coolant level between the **HIGH** and **LOW** marks on the reserve tank.
3. If additional coolant needed, remove the coolant fill cap of the collant reserve tank and addet the appropriate coolant/water mixture as necessary.
4. If the reserve tank is empty, check the radiator level with the engine stopped. Add coolant to the radiator and the reserve tank.
5. Close the access door.

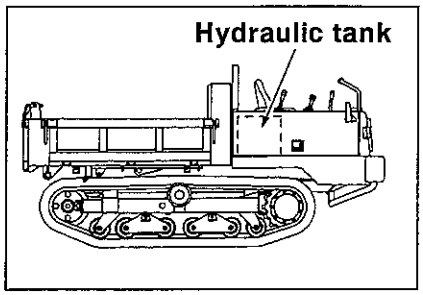
⚠ WARNING

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

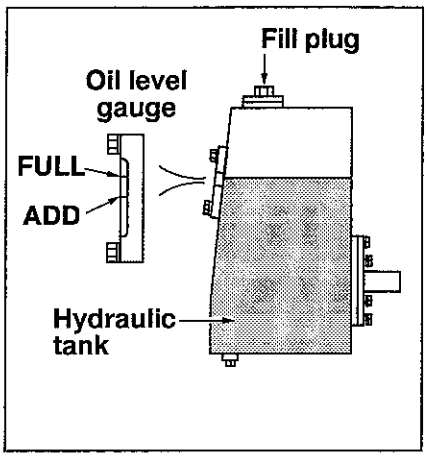


■ Check the Hydraulic Oil Level

To check the hydraulic oil level, place the machine on level ground and lower the body to the main frame, as shown.



1. Stop the engine.
2. Open the access door at the right side the machine.
3. Check the oil level with the oil colded and the engine stopped.
4. Maintain the oil level between the **FULL** and **ADD** marks on the level gauge.
5. Slowly loosen the fill plug to relieve any pressure and remove it to add oil if nesessary.
6. Clean and install the fill plug.
7. Close and latch the access door.



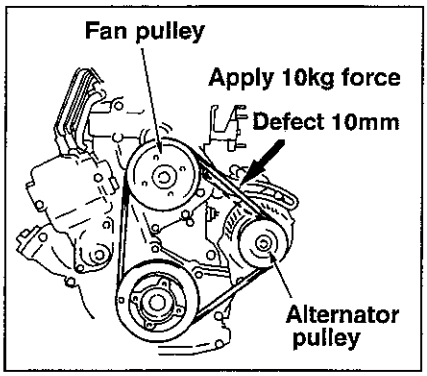
⚠ CAUTION

* Always clean around fill plug before removing.
* **DO NOT OVER FILL.**
* **DO NOT OPERATE** if the oil level is below bottom arrow in fluid level gauge when hydraulic oil is cold and lower the body.

■ Fan and Alternator Belt

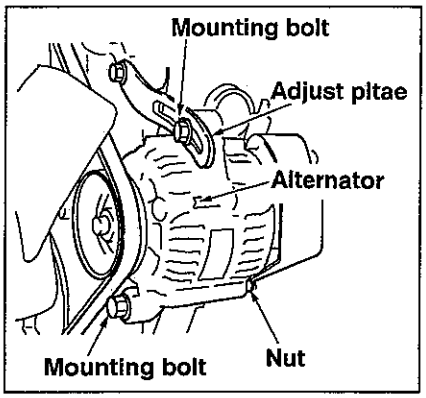
Inspect

1. Stop the engine.
2. Open the access door at the right side the machine.
3. Inspect the condition and adjustment of the belt. If the belt are damaged, replace them.
4. To check the belt tension, apply a 10kg force on belt, midway between the pulleys.
   Correctly adjusted belt will deflect 10 mm.



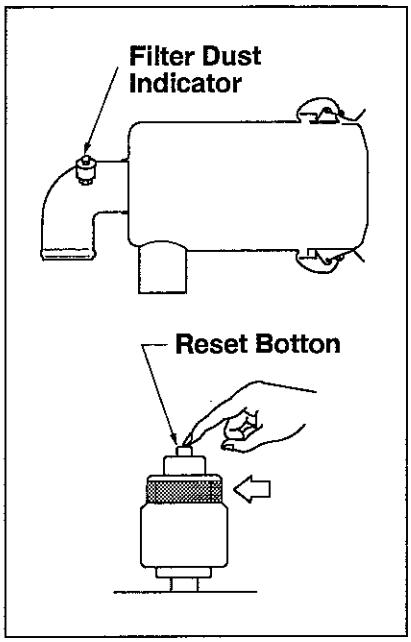
Adjust

1. To adjust the belt, loosen alternator mounting bolts.
2. Move component in or out as required to obtain the correct adjustment.
3. Tighten the mounting bolts and reinspect the adjustment.
2. Close and latch the access door.



■ Check the Filter Dust indicator

1. Open the access door at the right side the machine.
2. Check the filter dust indicator on the air filter. If the indicator is in the red zone, service the engine air filter.
3. Service the engine air filter. See clean the element or change the element.
4. After servicing, push the reset button to reset the filter dust indicator.
5. Close and latch the access door.



⚠ CAUTION

Servive the air cleaner only with the engine stoped. Engine damage could result.

■ Inspect Machine

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

Inspect and remove any trash build up in the engine compartment.

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

Inspect all engine attachment bolts for worn cracked or frayed edges. Repair if worn, cracked, frayed or broken.

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

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

Be sure covers and guards are firmly in place. Inspect for damage.

Inspect operator's compartment for cleanliness. Keep it clean

Inspect the travel alarm sound. Use the travel lever move to foward and backward with the engine start switch ON position. The travel alarm should sund.

■ Water Sedimenter

Maintenance intervals :

- Check Level: Daily
- Drain the Water and Sediment : When the float floated up to the bottom of the filter in the sedimenter.

⚠ WARNING

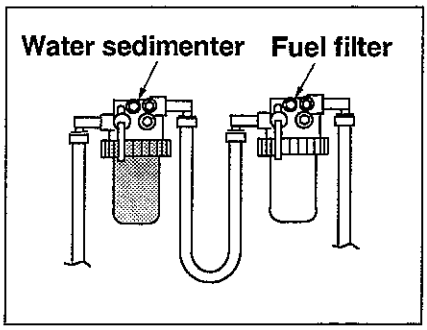
Fuel leaked or spilled onto hot surfaces can cause a fire.

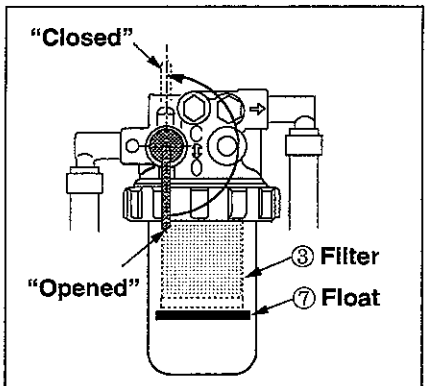
1. Sop the engine.
2. Turn the fuel stop lever to the "closed" position.
3. Loosen the ring nut ① and remove the bowl ② and the filter ③.
4. Drain water and sediment into suitable container.

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

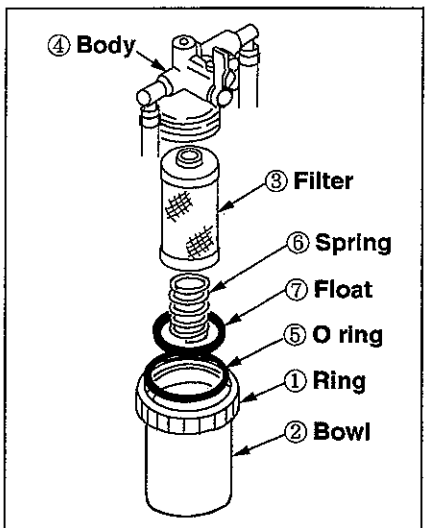
5. Clean the inside surfaces of the body ④ and bowl ② .
6. Clean the filter ③ .
7. Inspect the O ring ⑤ on bowl. Replace them if they are worn or damaged.
8. Install a filter ③ to the body. Install a spring ⑥ and float ⑦ into the bowl. Install the bowl to the body. Tighten ring nut ①.
9. Turn the fuel stop lever to the "opened" position.
10. Priming the system. There should be enough fuel in the system to allow the engine to start. Keep the engine start switch key at ON for a period of 20 seconds, which operates the fuel pump and priming automatically.

NOTE : Do not start the engine until all fuel system service is completed.





Water sedimenter



Water sedimenter

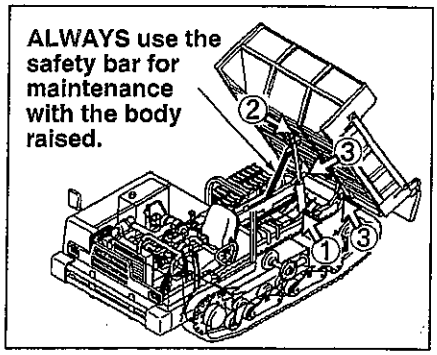
4 – 5 50 HOURS MAINTENANCE AND CHECKSCHECKS

First Perform Previous Service Hour Items.

■ Lublicate the Fittings

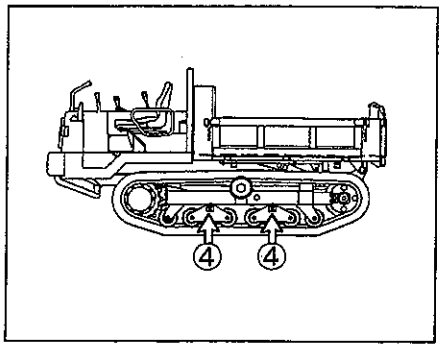
⚠ WARNING

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



Wipe all fittings before lubricating.

1. Lublicate the fittings ① and ② on the dump cylinder head and rod.
2. Lublicate the fittings ③ at the connection of the body and main frame.
3. Lublicate the fittings ④ on the roller link pins.

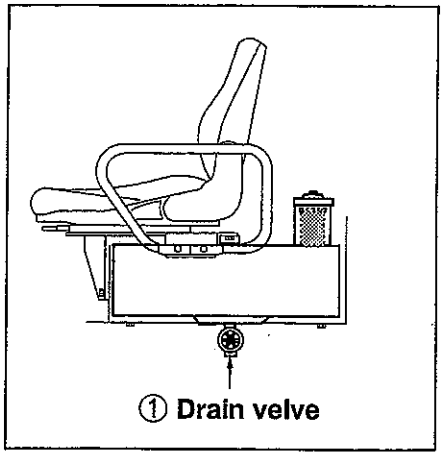


FUEL TANK

■ Drain the Water and Sediment

NOTE: Dispose of drained material according to local requlations.

1. Open the drain valve ① located under the fuel tank and allow the water and sediment to drain into a container.
2. Close the drain valve.



4 - 6 250 HOURS MAINTENANCE AND CHECKS

First Perform Previous Service Hour Items.

ENGINE CRANKCASE

■Change Oil and Filter

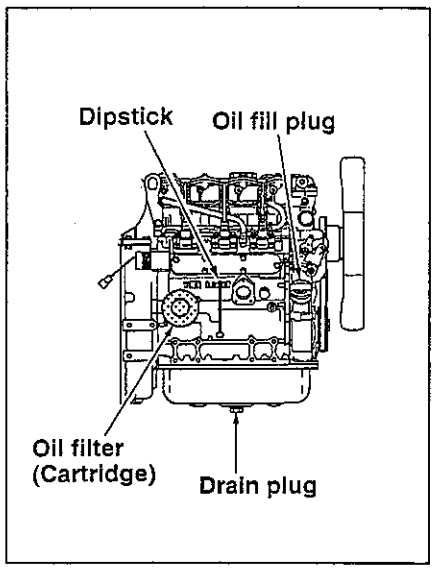
⚠ WARNING

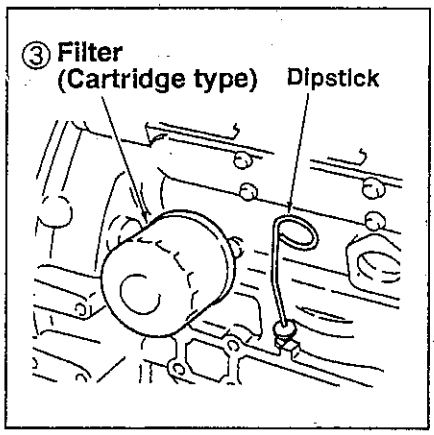
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

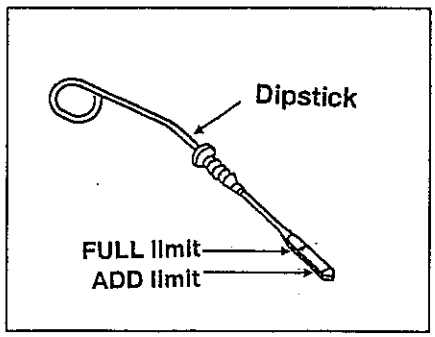
1. Stop the engine.
2. Remove the crankcase oil drain plug ②. Allow the oil to drain. Use a container to catch the drained oil so that the engine and the machine will not be fouled by the drained oil.
3. Remove the used cartridge type filter ③ by the filter wrench. Clean the filter base.
4. Coat the seal of a new filter with clean engine oil.
5. Install the new filter by hand. When the seal contacts the base, tighten an additional 5/8 turn by filter wrench.
6. Install the crankcase drain plug ②.
7. Remove the oil fill plug ①. Fill the crankcase with oil. See "Refill Capacities".
8. Start and operate the engine to fill the filter. Check for leak.
9. Stop the engine. Maintain the oil level between the ADD and FULL limit marks on the dipstick ④.

⚠ CAUTION

* Keep oil level close to full mark. DO NOT OVERFILL !
* NEVER operate the engine when oil level is above full mark or add marks.







4 MAINTENANCE 250 HOURS

■Clean the Air Filter Element

⚠ WARNING

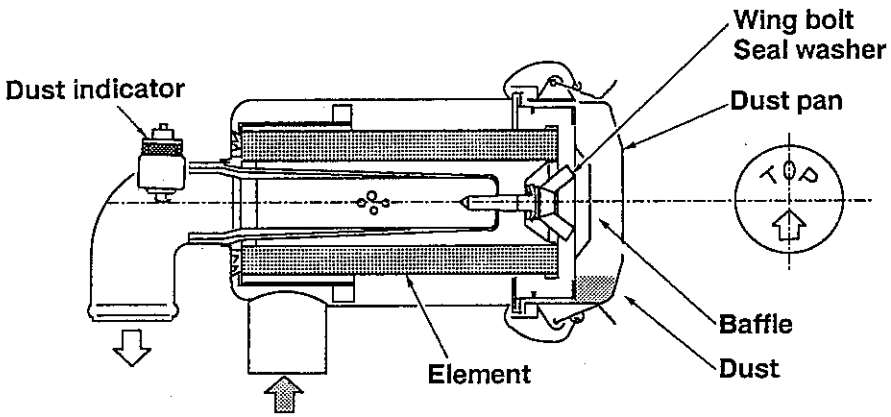
Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa(30 psi)for cleaning purposes.

⚠ CAUTION

Service the air cleaner only with the engine stopped to prevent engine damage.
Do not clean the filter element by bumping or tapping them. Engine damage could result.



Clean the filter element after 250 hours of operation or when the indicator turns red.

1. Stop the engine.
2. Remove the dust pan and clean the dust pan.
3. Remove the wing bolt and take out the element.
4. Clean the inside of the air cleaner housing.
5. Clean the filter element.

Filter elements can be cleaned with pressure air, pressure water, or detergent washing.

Direct air or water along pleats inside and outside of filter element.

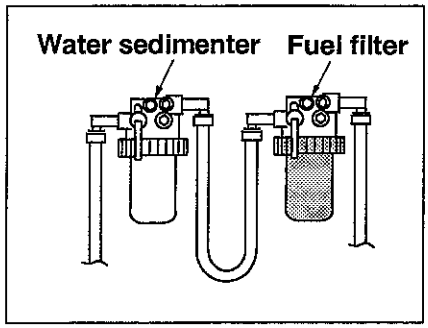
6. Inspect the filter element after cleaning. Do not use a filter element with damaged pleats, gaskets or seals.
7. Install a element and tighten the wing bolt finger tight.
8. Install the dust pan with arrow point upward.

- Resetting the dust indicator
  After cleaning by element, the dust indicator must be reset.
  The signal returns to clear when the bottom is pressed.

■ Drain the Water and Sediment in the Fuel Filter

⚠ WARNING

* Hot oil and components can cause personal injury.
* Fuel leaked or spilled onto hot surfaces can cause a fire.

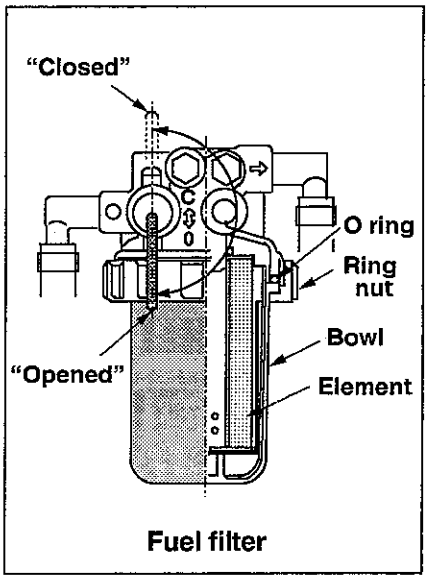


1. Sop the engine.
2. Turn the fuel stop lever to the "closed" position.
3. Loosen the ring nut and remove the bowl and the filter.
4. Drain water and sediment into suitable container.
5. Clean the inside surfaces of the filter head and bowl.

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

6. Clean the filter.
7. Inspect the O ring on bowl. Replace them if they are worn or damaged.
8. Install a element to the body. Install bowl. Tighten ring nut.
9. Turn the fuel stop lever to the "opened" position.
10. Priming the system. There should be enough fuel in the system to allow the engine to start. Keep the engine start switch key at ON for a period of 20 seconds, which operates the fuel pump and priming automatically.

NOTE: Do not start the engine until all fuel system service is completed.



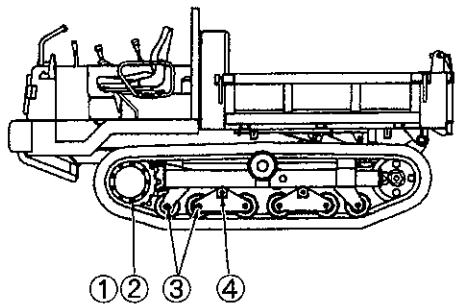
Fuel filter

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,
tighten 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 torque.

Items	Tighten point	Wrench size (mm)	Thread size metrie	Q'ty	Tighten torque N•m
①	Travel drive	22	M14	18	157
②	Sprocket	22	M14	18	157
③	Lower roller	24	M16	12	245
④	Rotary link	30	M20	4	392

Newton meter (N•m) is approximately the same as 0.1 kg•m

2. General torque specifications

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

Thread size metric	Wrench size (mm)	Tighten torque	
		Metric coarse H.T.	Metric fine H.T. bolt
		N • m	N • m
M8	13	23	25
M10	17	47	50
M12	19	83	91
M14	22	134	135
M16	24	206	220
M20	30	412	450
M24	36	715	813

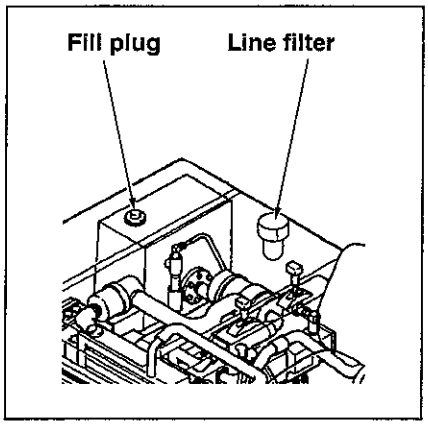
High pressure-hose union nut	
Hose size (inch)	Tighten torque
	N • m
1/4 ″	25
3/8 ″	49
1/2 ″	59
3/4 ″	118
1 ″	137
1-1/4 ″	167

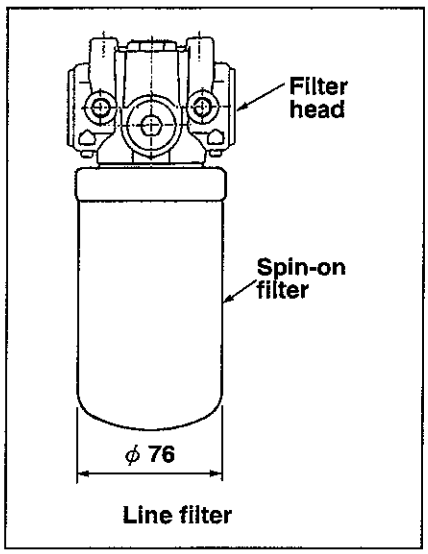
■ Change the Line Filter

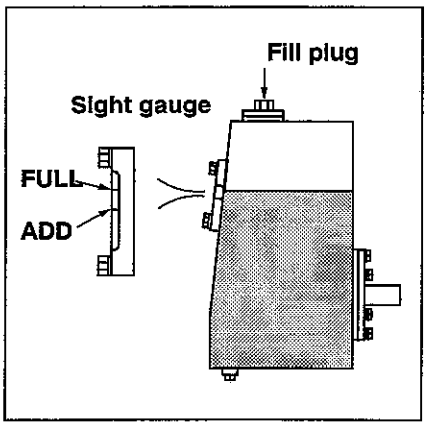
⚠ WARNING

* Hot oil can cause burns.
* Relieve tank pressure with engine off by removing fill plug slowly to prevent burns from hot oil.

1. Stop the engine.
2. Remove hydraulic tank oil fill plug slowly to relieve air pressure.
3. Remove the used spin-on type filter by filter wrench. Cean the filter head.
4. Coat the seal of new filter with clean hydraulic oil.
5. Install the new filter by filter wrench 2 kg-m tightnig torque.
6. Start and operate the engine to fill the filter. Maintain the oil level between ADD and FULL marks on the level gauge.
7. Check for leaks on the line filter.







■ Change the Fuel Filter Element

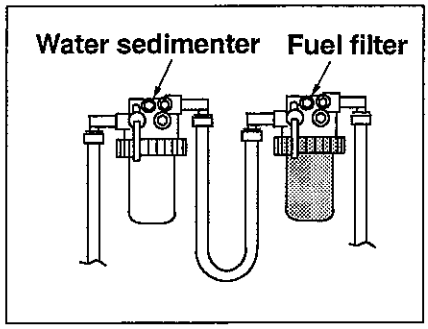
⚠ WARNING

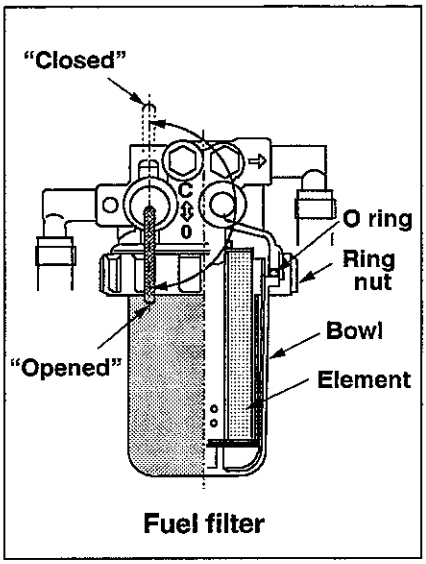
* Hot oil and components can cause personal injury.
* Fuel leaked or spilled onto hot surfaces can cause a fire.

1. Sop the engine.
2. Turn the fuel stop lever to the "closed" position.
3. Loosen the ring nut and remove the bowl and the filter.
4. Drain water and sediment into suitable container.

   NOTE: Always dispose of drained fluids as established by local regulations.
5. Clean the inside surfaces of the filter head and bowl.
6. Inspect the O ring on bowl. Replace them if they are worn or damaged.
7. Install a new fuel filter element to the body. Install bowl. Tighten ring nut.
8. Turn the fuel stop lever to the "opened" position.
9. Priming the system. There should be enough fuel in the system to allow the engine to start. Keep the engine start switch key at ON for a period of 20 seconds, which operates the fuel pump and priming automatically.

NOTE: Do not start the engine until all fuel system service is completed.



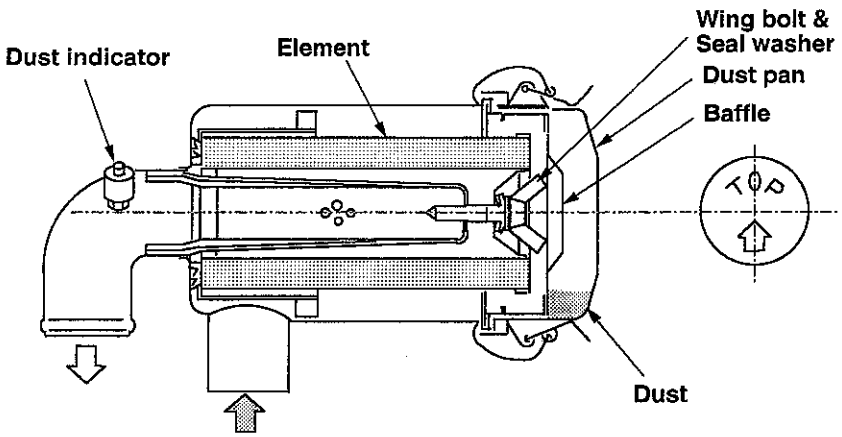


Fuel filter

■ Change the Air Filter Element

⚠ CAUTION

* Service the air cleaner if indicated the red signal in the dust indicator with the engine running at high idle.
* Service the air cleaner only with the engine stopped to prevent engine damage.
* Do not clean the filter elements by bumping or tapping them. Do not use filter element with the damaged pleats, gaskets or seals. Engine damage could result.
* When using pressure air for cleaning, wear a protective face shield or protective grasses.



1. Stop the engine.
2. Remove the dust pan and clean the dust pan.
3. Remove the wing bolt to take out the element.
4. Clean the inside of the air cleaner housing.
5. Install a new element and tightening the wing bolt.
6. Install the dust pan with arrow point upward.

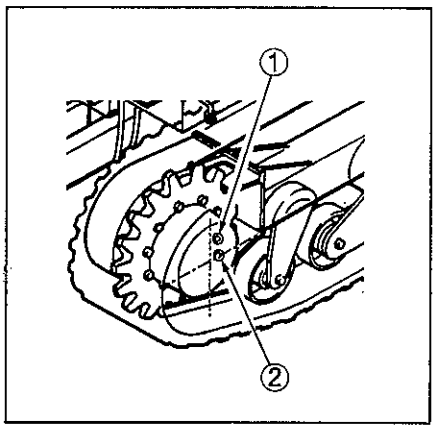
After replacement the element, the dust indicator must be reset. Press the button of the dust indicator to release off the red signal.

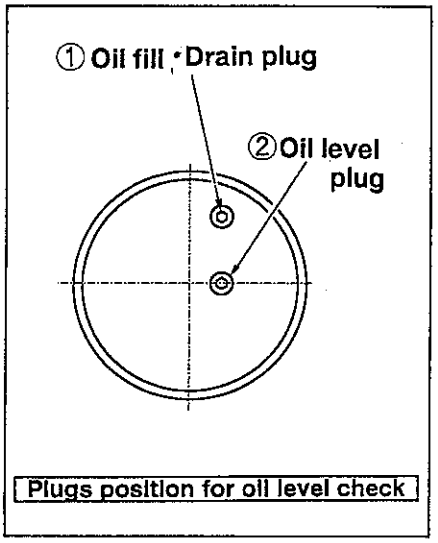
■Check the Travel Reductions Oil Level

1. Place the machine on level ground.
2. The oil fill plugs (oil level plugs) and drain plug may be aligned with one another as shown in the figure.
3. Remove the oil level check plug.
   Maintain the oil level in each travel reduction to the bottom of the plug opening.
4. Clean and install the plug.

⚠ CAUTION

When the quantity of oil is found to have increased abnormally, it is necessary to check the oil seal of the travel motor.
If the seal is leaking, contact a IHI dealer.





Plugs position for oil level check

4 - 8 1000 HOURS MAINTENANCE AND CHECKS

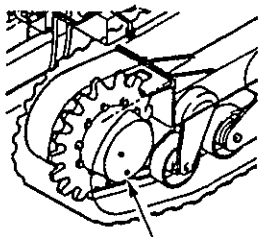
First Perform Previous Service Hour Items.

■Change the Travel Reductions Oil

⚠WARNING

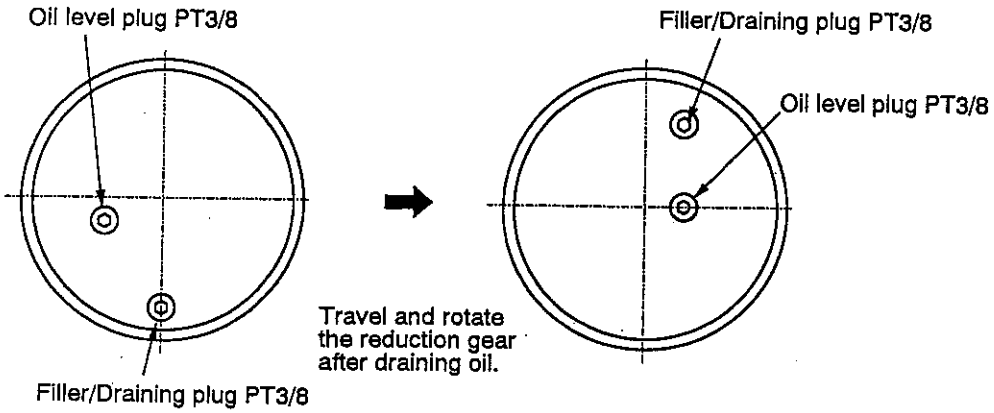
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

1. Set the drain plug down outside the reduction gear case cover.
2. Put a sump to receive 2.8 ℓ (approx. 0.74 gal.) or more drained oil under the drain plug.
3. Remove the drain plug and oil level plug with a hex wrench and drain oil.
4. Travel the machine to rotate the reduction gear to keep a plug position illustrated below for oil supply.
5. Suppy the specified volume of gear oil through the filler port.
6. When oil flows out from the level hole, wind the seal tape around the plug and install it.



Travel reduction gear case

Recommended oil	Quantity of oil
API, GL-4 or GL-5 Gear oil No.90	0.8 ℓ (approx. 0.21 gal.)



Plug position for oil draining

Plug position for oil injection

■Change hydraulic Oil and Clean the Strainer

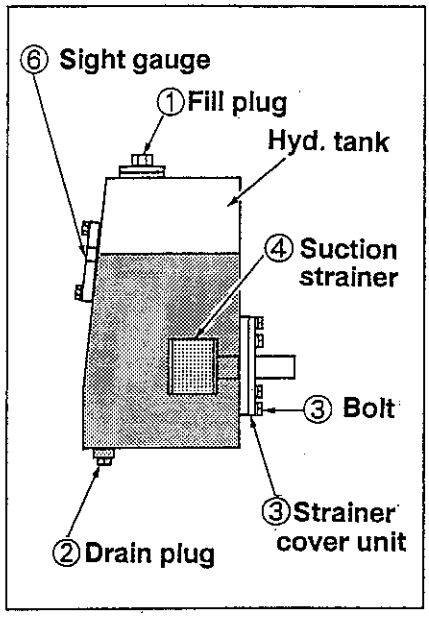
⚠ WARNING

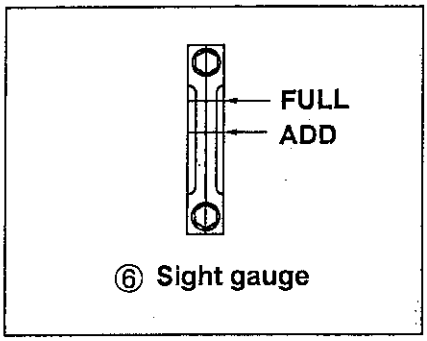
Hot oil can cause burns.

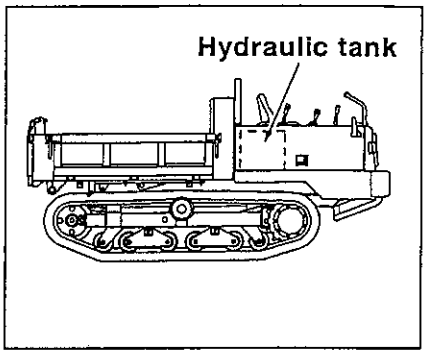
At operating temperature, the hydraulic tank is hot and under pressure.

Remove the fill plug only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the fill plug slowly to relieve pressure.

1. Lower the body and stop the engine.
2. Remove hydraulic oil tank fill plug ① to relieve air pressure in the tank.
3. The hydraulic tank oil drain plug ② is located on the right side of the machine under the upper structure.
4. Remove the oil drain plug ②. Drain oil into a container.
   Drain oil in all parts of the hydraulic system thereafter.
5. Remove the strainer cover unit ③ from the hydraulic tank and clean the strainer ④.
6. Clean the inside of the tank with the clean oil.
7. Install the strainer cover unit ③, and drain plug.
8. Fill the hydraulic tank with oil.
   See "Recommended lubrication table."
   Clean and install the fill plug ①.
9. Start the engine and operate it at **LOW IDLE**, to fill hydraulic system. Check for leaks. Cycle all hydraulic motors and cylinder.
10. Lower the body. Stop the engine. Check the hydraulic oil level.
11. Maintain the oil level between **FULL** and **ADD** marks on the sight gauge.







4 - 9 2 YEARS MAINTENANCE AND CHECKS

COOLING SYSTEM COOLANT

■Chane the Coolant

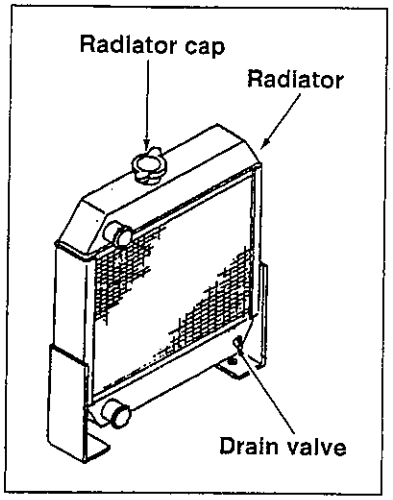
⚠ CAUTION

At operating temperature, the engine coolant is hot and under pressure.

Stem can cause personal injury.

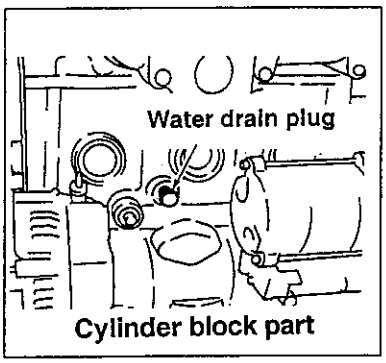
Change the coolant only after the engine has been stopped and the fill cap is cool enough to touch with your bare hand.

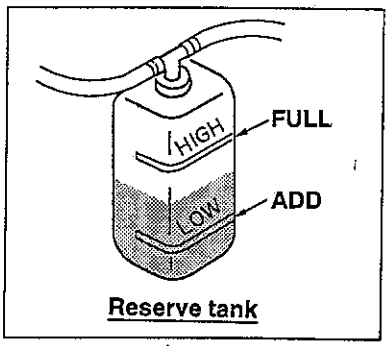
Remove the fill cap slowly to relieve pressure.



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. Remove the fill cap slowly to relieve pressure. (Do not handle while the coolant in hot !)
3. Open the drain valves and allow the coolant to drain into a conteiner.
   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 operate 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 operate 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 reserve tank.





■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° 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

LONG LIFE COOLANT MIXING RATIO TABLE

Freezing temp. (°C/°F)	-15 / 5	-25 / -13	-35 / -3
Mix. ratio (%)	30	40	50
Quantity of LLC (ℓ /gal.)	1.7/0.45	2.3/0.61	2.85/0.76
Quantity of water (ℓ /gal.)	4.0/1.06	3.4/0.9	2.85/0.76
Coolant Total amount : 5.7 ℓ (approx. 1.51 gal.)	Engine proper : 2.5 ℓ (0.66 gal.) Radiator and others : 2.7 ℓ (0.72 gal.) Tank : 0.5 ℓ (0.13 gal.)		

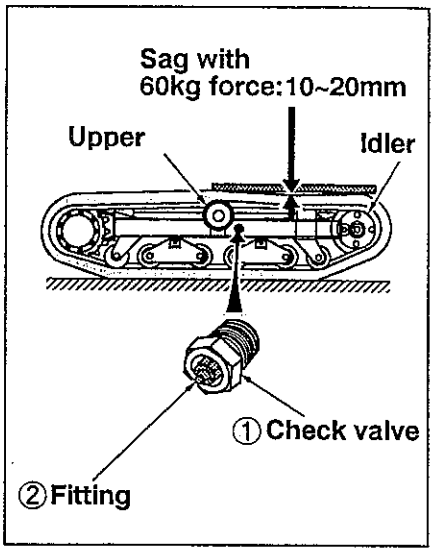
4 - 10 WHEN REQUIRED MAINTENANCE AND CHECKS

TRACK ADJUSTMENT

■Check Track Tension

Repeat the procedure on the opposite track after completion of the first track.

1. Place the carrier on a firm and level ground.
2. Completely raise the body. Set the safty bar.
3. Have a person(60kg)on the center of the upper roller and the idler.
4. Place a straightedge on the tracks. Measure the distance from the bottom of the straightedge to the top of the lowest grouser tip.
5. Correct adjustment allows 10 to 30mm of sag midway between the upper roller and the idler.



■To Tighten Track

1. Add grease through the check valve fitting until the adjustment is correct.
2. Operate the machine back and forth to equalize pressure.
3. Recheck the adjustment.

■To Loosen Track

1. Remove soil deposited on idler bearing.
2. Loosen the check valve ① 8 turns only to allow grease to escape.
3. Tighten the valve seat when the adjustment is correct.
4. Operate the machine back and forth to equalize pressure. Remeasure the adjustment.

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 8 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

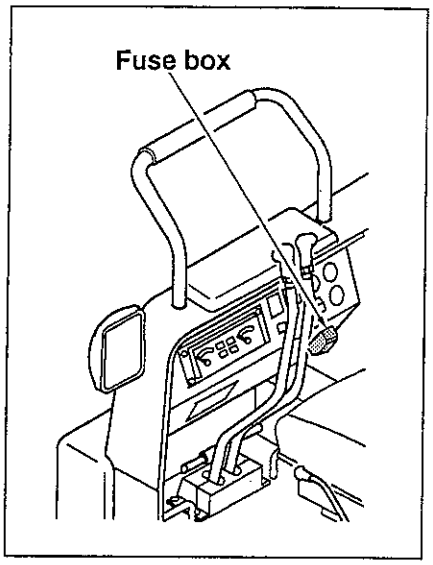
Maintain level of electrolyte in cells at correct height by adding distilled water when required. If any electrolyte is spilled, replace it with fresh sulphuric acid of same specific gravity as that of remaining in cell. Level of electrolyte must never fall below tops of plates.

FUSES

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

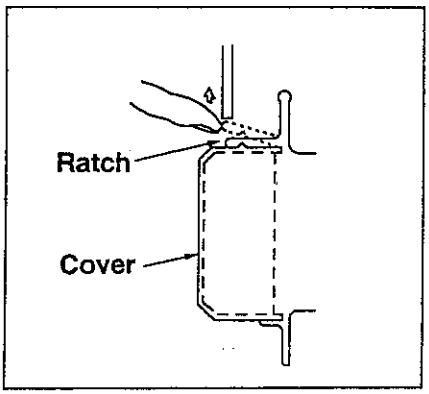
Fuses will protect the electrical system from damage caused by overloaded circuits.

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



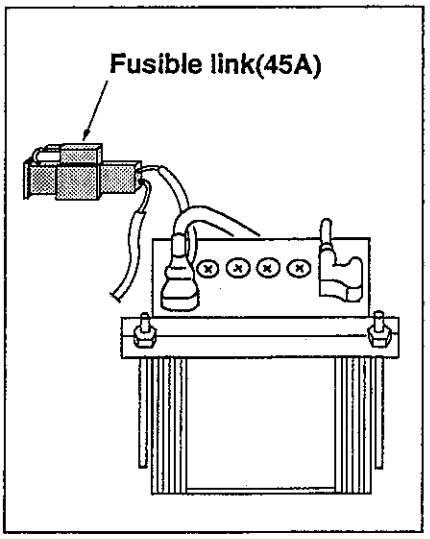
■ Replace

1. Pull the ratch and remove the cover for fuse access.
2. Change the damaged fuse to new one. Fuse amperage : 20A



FUSIBLE LINK

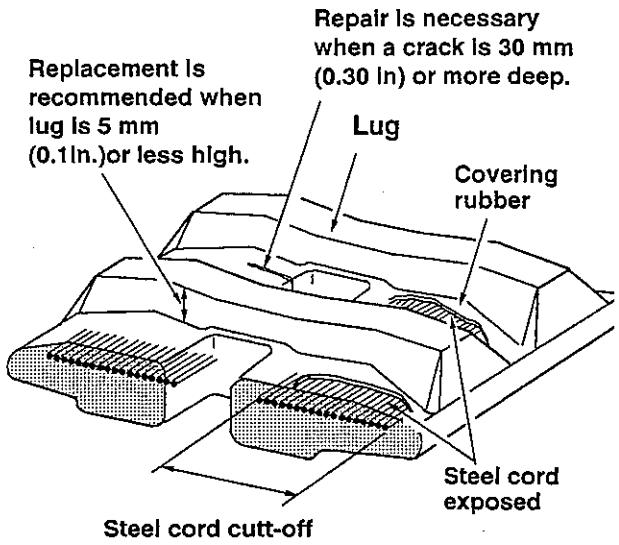
The fusible link is provided between the positive terminal of the battery and the starter switch to prevent electrical circuit wires from being burnded because of short circuit. When the power is turned off by short circuit, check the fusible link. When it is blown out, replace it with new one after repairing the wires.



RUBBER CRAWLER SHOE MAINTENANCE

⚠ CAUTION

Rubber crawler shoe should be repaired or replaced under the next conditions.
If is nesessary 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 likly to beslippery 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 particulaly 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

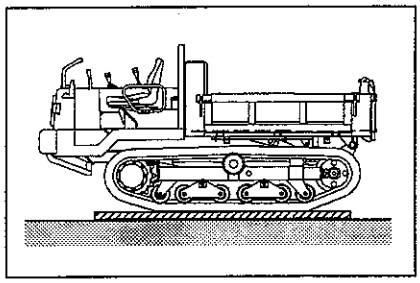
Variations in altitude alter the fuel-air mixture burned in the engine and affect the engine's performance. At high altitudes, atmospheric pressures are lower and less oxygen is available for combustion of the fuel. Above 1500 meter, the engine fuel setting may have to be changed to ensure proper performance.
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 STORAGE

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 Strage

To protect the cylinder rods, set the machine position in the right illustration. (To prevent the cylinder rods from being rusted)



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 control lever with the lock lever.

■ During Strage

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 Strage

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 adjusdtment, 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 or 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

5 TROUBLE SHOOTING

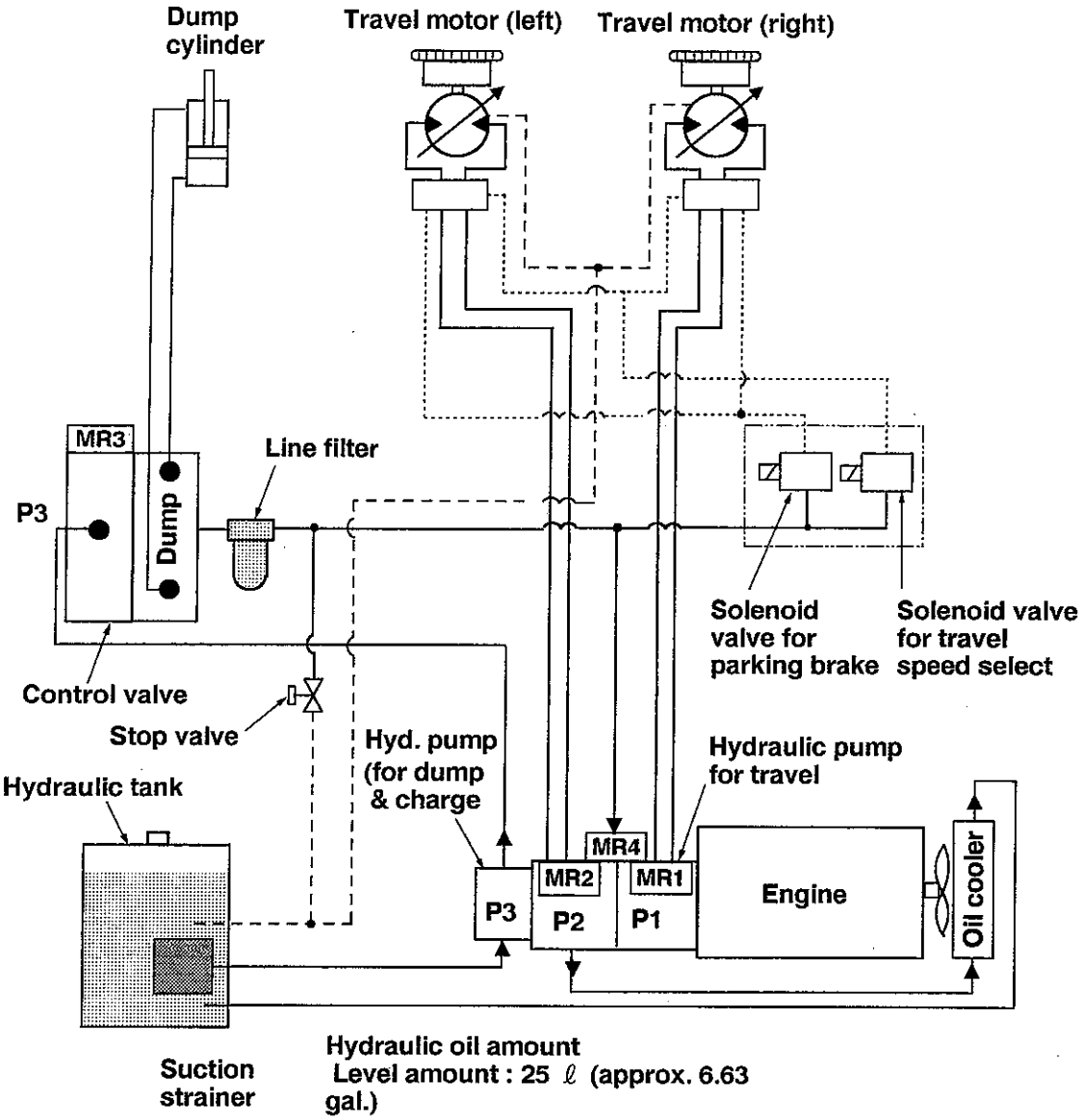
■Others

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 selevtor.	• Reconnect wires. ★ Replace limit switch. ★ Replace solenoid valve.
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

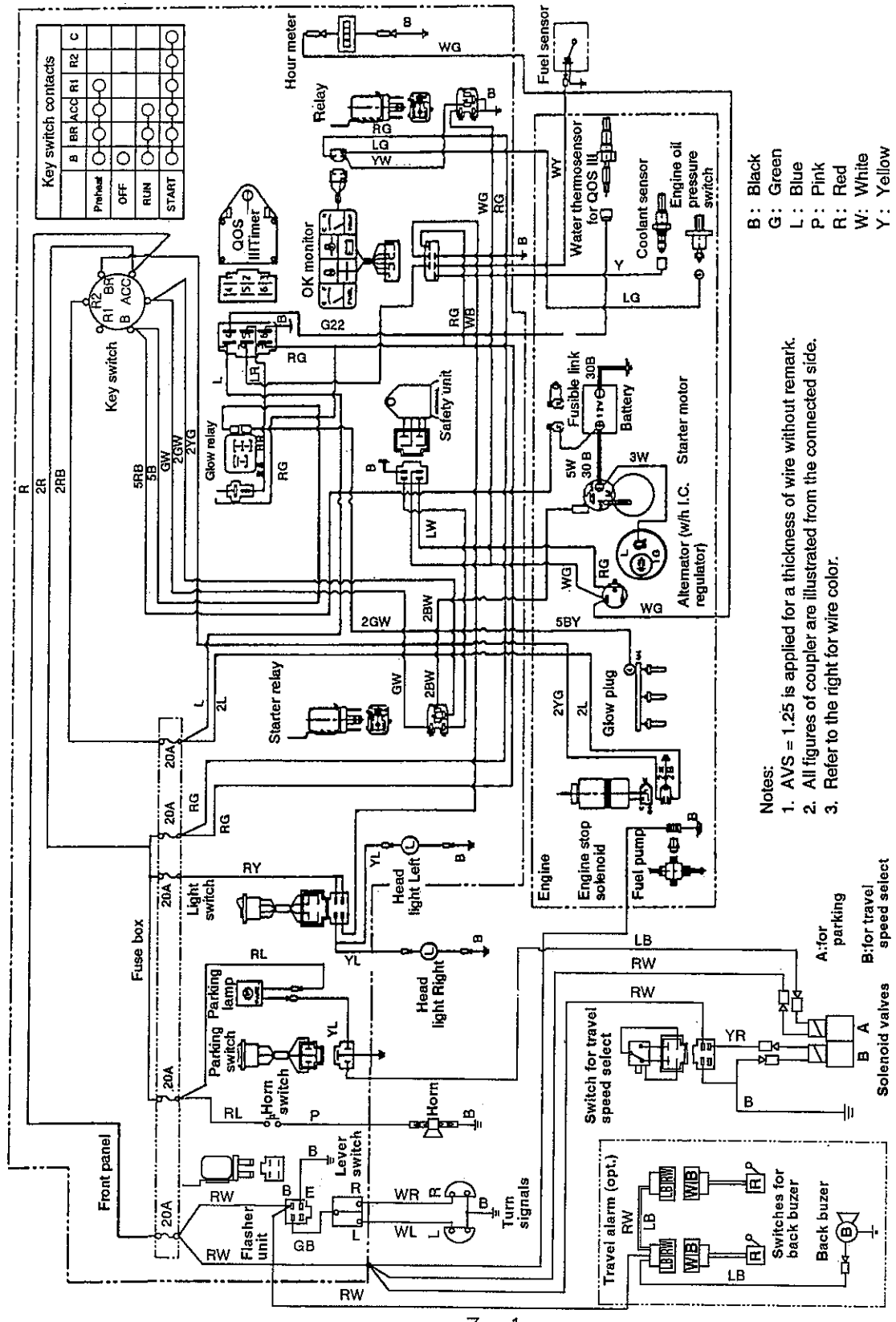


Relief valve set pressure;

Code	Item	Pressure	
		MPa	kgf/cm²
MRI	Main relief valve for right travel motor	30.9	315
MR2	Main relief valve for left travel motor	30.9	315
MR3	Main relief valve for P3 dump pump	18.6	190
MR4	Charge relief valve	1.5	15

7 ELECTRICAL SYSTEM DIAGRAM

7 - 1 ELECTRICAL WIRING SYSTEM DIAGRAM



MANUFACTURER

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JAPAN

IC30 CLAWLER CARRIER

PUBLISHED, AUGUST 1998

IHI CONSTRUCTION MACHINERY LIMITED

JAPAN