PART NO. EM15J-NA2-1

Operator's Manual

EX270LC-5

Excavator

Serial No. 010505 and up

HITACHI

RECOGNIZE SAFETY INFORMATION

- This is the **SAFETY ALERT SYMBOL.**
  - When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.

SA-001

001-E01A-0001

UNDERSTAND SIGNAL WORDS

SA-1223

- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER or WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs.**
- **CAUTION** also calls attention to safety messages in this manual.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- ***NOTE*** indicates an additional explanation for an element of information.

002-E01A-1223

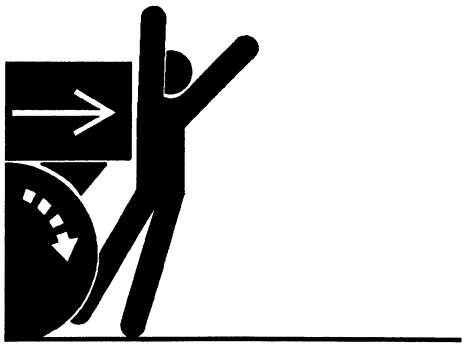
AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

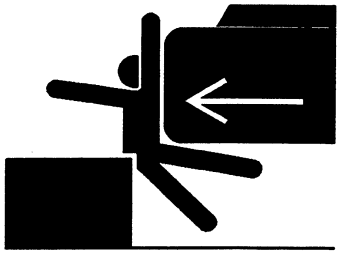
To avoid back-over and swing accidents:

- Always look around BEFORE YOU BACK UP AND SWING THE MACHINE. BE SURE THAT ALL BY-STANDERS ARE CLEAR.
- Keep the travel alarm in working condition (if equipped).
  ALWAYS BE ALERT FOR BYSTANDERS MOVING INTO THE WORK AREA. USE THE HORN OR OTHER SIGNAL TO WARN BYSTANDERS BEFORE MOVING MACHINE.
- USE A SIGNAL PERSON WHEN BACKING UP IF YOUR VIEW IS OBSTRUCTED. ALWAYS KEEP THE SIGNAL PERSON IN VIEW.
  Use hand signals, which conform to your local regulations, when work conditions require a signal person.
- No machine motions shall be made unless signals are clearly understood by both signalman and operator.
- Learn the meanings of all flags, signs, and markings used on the job and confirm who has the responsibility for signaling.
- Keep windows, mirrors, and lights clean and in good condition.
- Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.
- Read and understand all operating instructions in the operator's manual.

021-E01A-0494

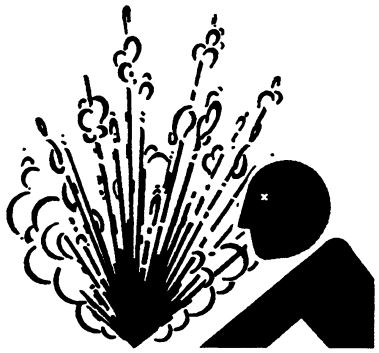


SA-383

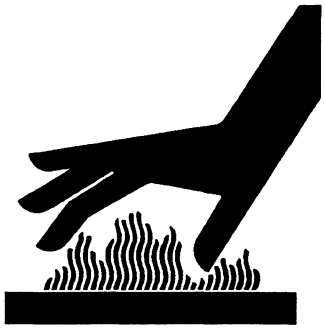


SA-384

PREVENT BURNS



SA-039



SA-225

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines.
  Skin contact with escaping hot water or steam can cause severe burns.
  - To avoid possible injury from hot spraying water, DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
  - The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also become hot during operation.
  The engine, hoses, lines and other parts become hot as well.
  - Wait for the oil and components to cool before starting any maintenance or inspection work.

505-E01B-0498

REPLACE RUBBER HOSES PERIODICALLY

SA-019

- Rubber hoses that contain flammable fluids under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by inspection alone.
  - Periodically replace the rubber hoses. (See the page of "Periodic replacement of parts" in the operator's manual.)
- Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.

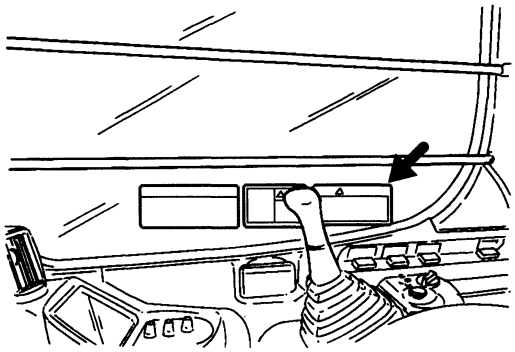
S506-E01A-0019

⚠ CAUTION

- AVOID DEATH OR SERIOUS INJURY - READ AND UNDERSTAND THE OPERATOR'S MANUAL AND SAFETY MANUAL PRIOR TO OPERATING THIS MACHINE.
- Controls may be changed for attachment or operator preference. Try control pattern before operating.
- Always lower working tools to the ground and engage hydraulic control lockout lever before leaving operator's seat.
- Keep riders off machine..
- Avoid contact between boom/attachments and overhead obstacles whenever operating, traveling or transporting machine.
- Keep bystanders clear of machine; especially before moving boom, swinging upperstructure or traveling.
- Upperstructure position affects travel direction. Try pedals or levers to determine travel direction before moving machine.
- Avoid tipping - Do not lift or move objects that exceed machine stability.
- Avoid parking machine on an incline.

3070586

SS-439



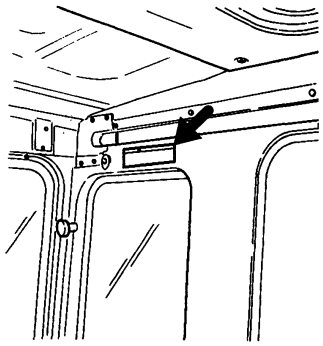
SS-1654

⚠ CAUTION

To prevent injury from falling front window, secure with lock pins on both sides of window.

4371798

SS-863



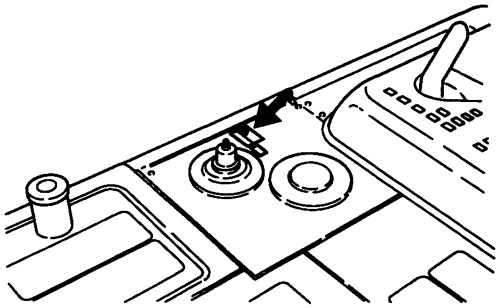
SS-1655

⚠ CAUTION

- BEFORE REMOVING HYDRAULIC RESERVOIR CAP AND AIR BREATHER ALWAYS STOP ENGINE
- BEFORE REMOVING CAP ALWAYS PRESS AIR BREATHER BUTTON TO RELEASE INTERNAL PRESSURE
- DO NOT REMOVE CAP WHEN OIL TEMPERATURE IS HOT.
- DO NOT LOOSEN DRAIN PLUG WHEN OIL TEMPERATURE IS HOT

3077560

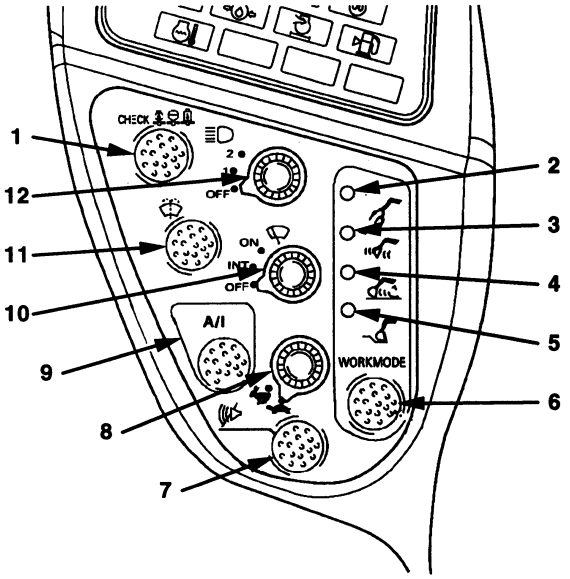
SS-864



SS-1656

SWITCH PANEL

1- Level Check Switch
2- Attachment Mode Indicator
3- Precision Mode Indicator
4- Grading Mode Indicator
5- General Purpose Indicator
6- Work Mode Select Switch
7- Buzzer Stop Switch
8- Travel Mode Switch
9- Auto-Idle Switch
10- Wiper Switch
11- Washer Switch
12- Work Light Switch



M157-01-145

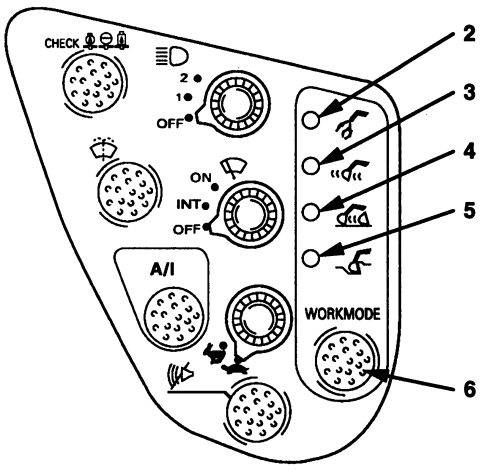
WORK MODE SELECT SWITCH

Work mode select switch (6) controls the speeds of the front and swing functions to match the work conditions at hand.

Each time work mode select switch (6) is pressed, one of the following indicators is selected:

- General Purpose Mode
- Grading Mode
- Precision Mode
- Attachment Mode

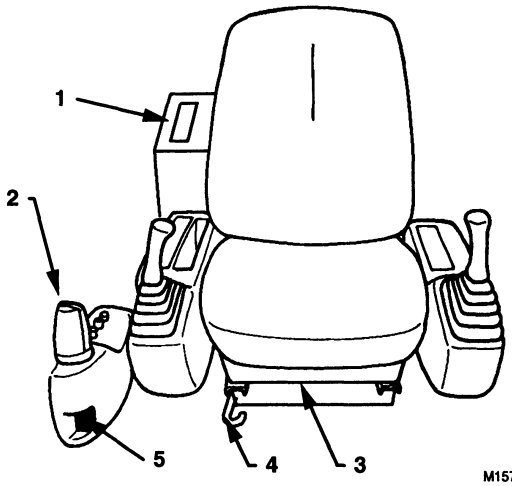
Selected work mode is indicated by indicators (2), (3), (4), or (5).



M157-01-092

CAB HEATER

1- Control Panel
2- Front Vent
3- Foot Vent
4- Foot Vent Open/Close Lever
5- Defroster Vent
6- Temperature Control Lever
7- Fresh Air/Recirculation Select Lever
8- Blower Switch

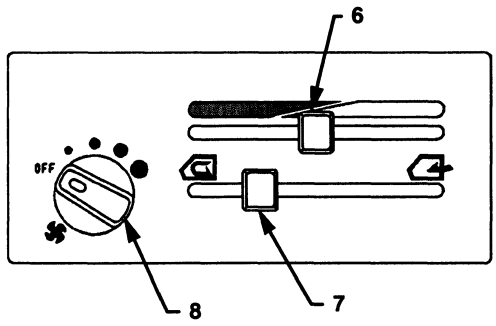


M157-01-108

NOTE: Except for the foot vent, all vents are provided with louvers to adjust the air flow direction. In addition, the louvers on the front air flow vent and defroster vent can be completely closed.

Designation and Function of Levers and Switches on Control Panel

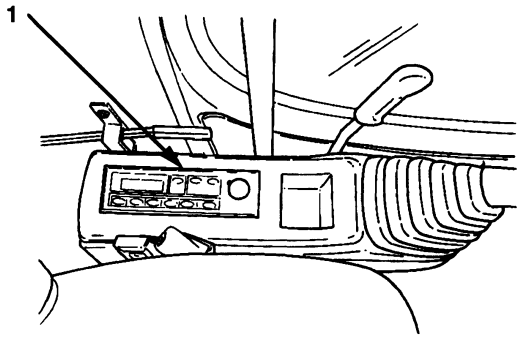
- Temperature Control Lever (6)
  Air temperature is the warmest with the lever in the rightmost position and the coolest in the leftmost position.
- Fresh Air/Recirculation Select Lever (7)
  The leftmost position is for recirculation and the rightmost position is for fresh air.
- Blower Switch (8)
  Four operating positions are provided. Turn the switch to the OFF position to stop the blower.



M157-01-109

LEFT CONSOLE

1- RADIO/CLOCK

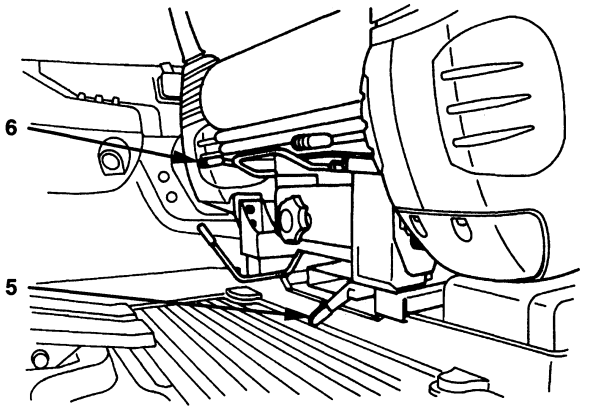


M157-01-165

Suspension Lock

Suspension can be locked with suspension lock lever (5) in two positions.

- Pushing downward: Suspension is locked at two up-and-down positions.
- Pulling upward: Suspension lock function is released.



M162-01-017

Backrest Adjustment

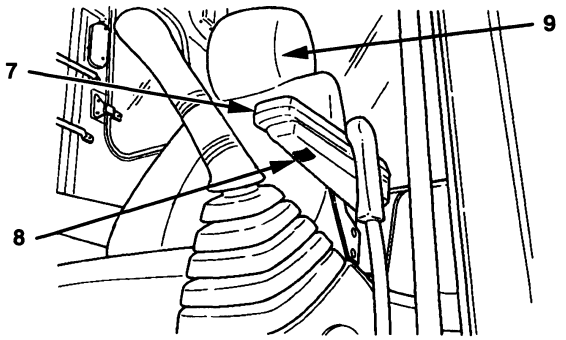
Pull up lever (6) to release backrest lock. Move backrest to the desired position and release the lever.

Armrest Adjustment

Armrest (7) can be pulled upright by hand to get on and off the machine easily.
The angle of armrest (7) can be adjusted to the desired position by turning adjusting dial (8) located on the bottom of armrest (7).

Headrest

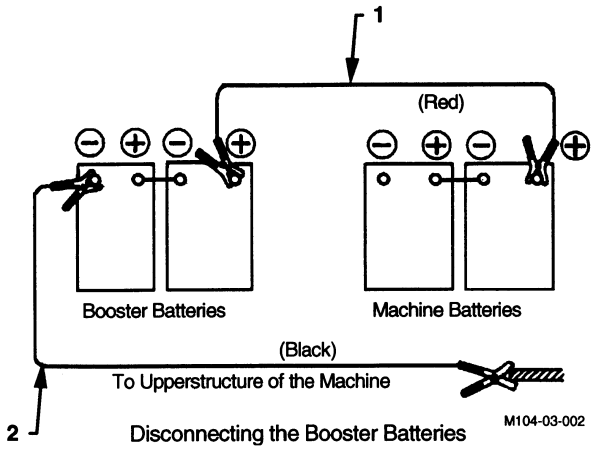
Headrest (9) can be adjusted up and down (50 mm in range).



M157-01-040

Disconnecting the booster batteries

1. Disconnect black negative (–) cable (2) from the machine frame first.
2. Disconnect the other end of black negative (–) cable (2) from the booster batteries.
3. Disconnect red positive (+) cable (1) from the booster batteries.
4. Disconnect red positive (+) cable (1) from the machine batteries.

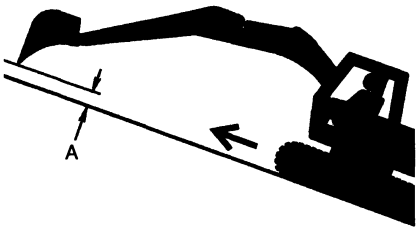


Disconnecting the Booster Batteries

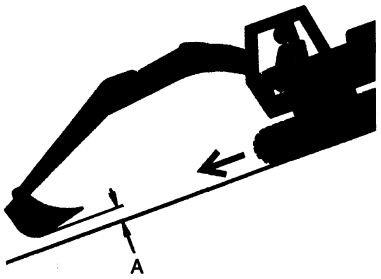
PRECAUTIONS FOR TRAVELING ON SLOPES

CAUTION: Avoid possible injury from traveling on slopes. Tipping over or skidding down of the machine may result. Thoroughly read and understand precautions below and be sure to travel at slow speed on slopes. Never attempt to travel on slopes with the bucket loaded or any load suspended by the bucket.

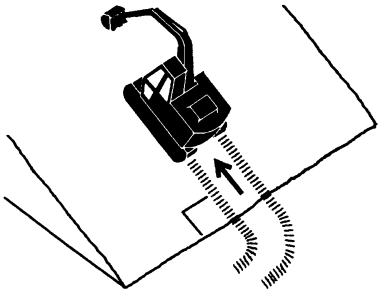
1. Never attempt to ascend or descend 30 degrees or steeper slopes.
2. Be sure to fasten the seat belt.
3. Keep the bucket pointed in the direction of travel, approximately 200 to 300 mm (8 to 12 in) (A) above the ground. If the machine starts to skid or becomes unstable, lower the bucket immediately.
4. Driving across the face of a slope or steering on a slope may cause the machine to skid or turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.
5. Avoid swinging the upperstructure on slopes. Never attempt to swing the upperstructure downhill. The machine may tip over. If swinging uphill is unavoidable, carefully operate the upperstructure and boom at slow speed.
6. If the engine stalls on a slope, immediately lower the bucket to the ground. Return the control levers to neutral. Then, restart the engine.
7. Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, sufficient performance may not be obtained.



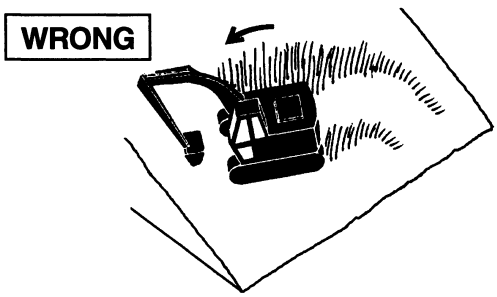
SA-657



SA-658



SA-441



SA-442

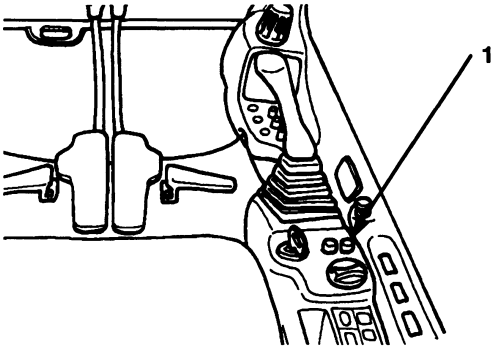
E (ECONOMY) MODE

Use the E mode when the priority is given to fuel consumption performance rather than work performance.

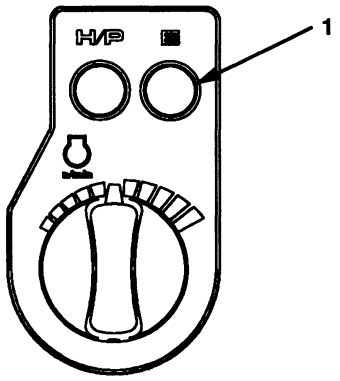
Although the engine speed decreases, the digging power is the same as that of the standard mode*. The work performance will decrease somewhat, but fuel consumption will also decrease, improving fuel efficiency and decreasing noise level. The E mode becomes effective when the general purpose mode is selected as the work mode.

NOTE: Standard Mode:
H/P Mode Switch..... OFF
E Mode Switch..... OFF

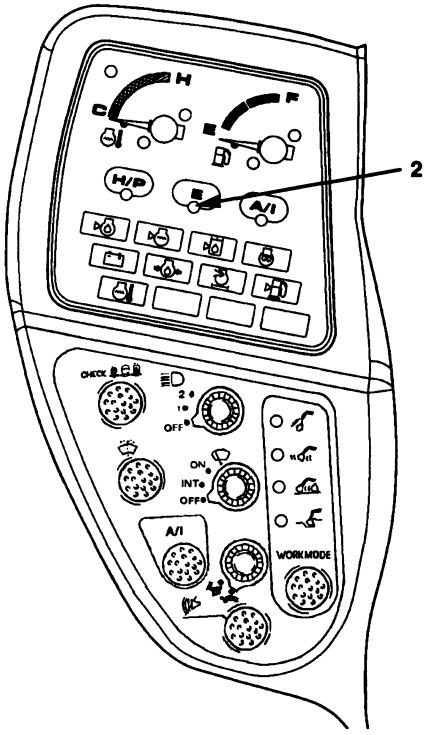
When E mode switch (1) is pushed down, the switch will stay down. At the same time, E mode indicator (2) will light. Pushing the E mode switch again, the switch will pop up to the original position, deactivating the E mode.



M157-05-012

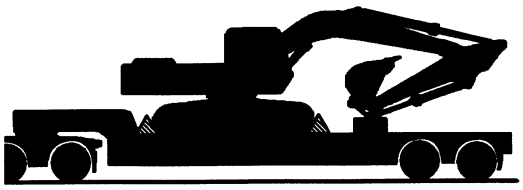


M157-05-003



M157-01-093

TRANSPORTING BY ROAD



M107-06-013

When transporting the machine on public roads, be sure to first understand and follow all local regulations.

- When transporting using a trailer, check the width, height, length and weight of the trailer with the machine loaded.
  Note that transporting the weight and dimensions may vary depending on the type of shoe or front attachments installed.
- Investigate beforehand the conditions of the route to be traveled, such as dimensional limits, weight limits, and traffic regulations.

In some cases, disassemble the machine to bring it within dimensional limits or weight limits of local regulations.

LOADING/UNLOADING ON A TRAILER

M107-06-013

Always load and unload the machine on a firm, level surface.

CAUTION: Be sure to use a loading dock or a ramp for loading/unloading.

Ramp/Loading Dock:

1. Before loading, thoroughly clean the ramp and flatbed. Dirty ramps or flatbeds with oil, mud, or ice on them are slippery and dangerous.
2. Place blocks against the truck and trailer wheels while using a ramp or loading dock.
3. Ramps must be sufficient in width, length, and strength. Be sure that the incline of the ramp is less than 15 degrees.
4. Loading docks must be sufficient in width and strength to support the machine and have an incline of less than 15 degrees.

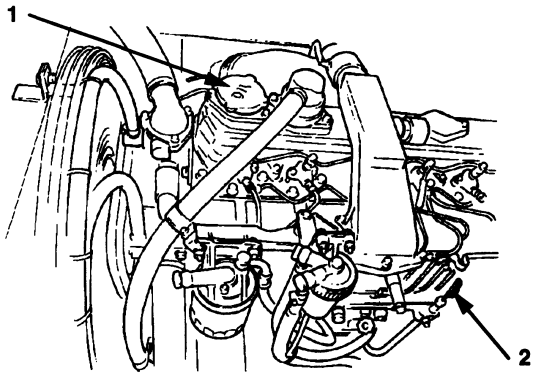
PERIODIC REPLACEMENT OF PARTS

To ensure safe operation, be sure to conduct periodic inspection of the machine. In addition, the parts listed below, if defective, may pose serious safety/fire hazards. It is very difficult to gauge the extent of deterioration, fatigue, or weakening of the parts listed below simply by visual inspection alone. For this reason, replace these parts at the intervals shown in the table below. However, if any of these parts are found to be defective, replace before starting operation, regardless of the interval.
Also, when replacing hoses, check the clamps for deformation, cracks, or other deterioration, and replace as necessary.
Be sure to perform periodic inspection of all hoses, as shown below, and replace or retighten any defective parts found, as necessary.
Consult your authorized dealer for correct replacement.

Periodic Replacement Parts			Replacement Intervals
Engine		Fuel hose (Fuel tank to filter)	Every 2 years
		Fuel hose (Fuel tank to injection pump)	Every 2 years
		Heater hose (Heater to engine)	Every 2 years
Hydraulic System	Base Machine	Pump suction hose	Every 2 years
		Pump delivery hose	Every 2 years
		Swing hose	Every 2 years
	Front Attachment	Boom cylinder line hose	Every 2 years
		Arm cylinder line hose	Every 2 years
		Bucket cylinder line hose	Every 2 years
		Pilot hose	Every 2 years

NOTE: Be sure to replace seals, such as O-rings and gaskets, when replacing hoses.

1 **Engine Oil Level --- check daily**



M158-07-006

IMPORTANT: For most accurate readings, check the oil level every day before starting the machine. Be sure the machine is on a level surface.

1. Remove dipstick (2). Wipe oil off with a clean cloth. Reinsert dipstick (2).
2. Remove dipstick (2) again. Read level. Oil level must be between the circle marks.
3. If necessary, add oil via oil filler cap (1). Be sure to use only recommended oil (see Recommended Engine Oil Chart).

NOTE: Checking the oil level immediately after shut down will result in inaccurate readings. Be sure to allow the oil to settle for at least 10 minutes before checking.

2 **Change Engine Oil --- every 500 hours**

3 **Replace Engine Oil Main and Bypass Filters--- --- every 500 hours**

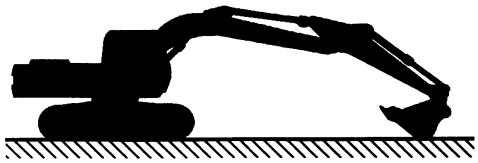
4

1. Run the engine to warm oil. DO NOT run the engine until oil is hot.
2. Park the machine on a level surface.
3. Lower the bucket to the ground.
4. Turn the auto-idle switch off.

IMPORTANT: The turbocharger may be damaged if the engine is not properly shut down.

5. Run the engine at slow idle speed without load for five minutes.
6. Turn the key switch OFF. Remove the key from the key switch.
7. Pull the pilot control shut-off lever to the LOCK position.

1 Check Hydraulic Oil Level --- daily



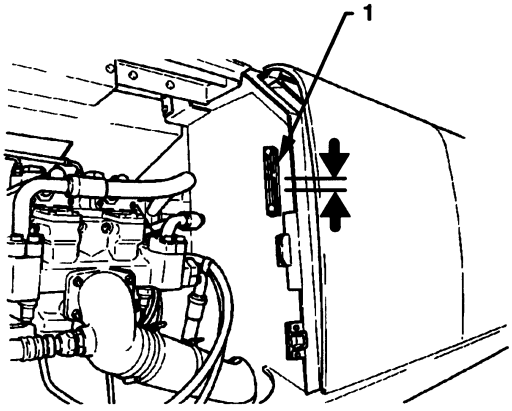
M104-07-021

IMPORTANT: Never run the engine without oil in hydraulic oil tank.

1. Park the machine on a level surface.
2. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended.
3. Lower the bucket to the ground.
4. Turn the auto-idle switch off.

IMPORTANT: The turbocharger may be damaged if the engine is not properly shut down.

5. Run the engine at slow idle speed without load for five minutes.
6. Turn the key switch OFF. Remove the key from the key switch.
7. Pull the pilot control shut-off lever to the LOCK position.
8. Open the access door in front of the main pump. Check oil level with level gauge (1) on hydraulic oil tank. Oil must be between marks on the gauge. If necessary, add oil.



M158-07-015

CAUTION: The hydraulic oil tank is pressurized. Push the pressure release button on the tank cap to release pressure, and carefully remove the cap.

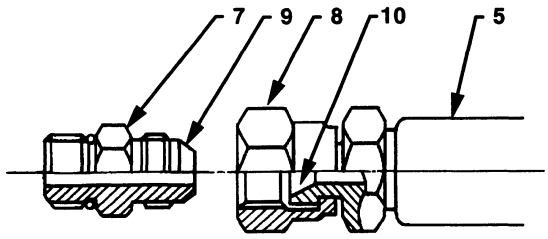
To add oil:

9. Push the pressure release button on the air breather to release pressure. Remove the cover.
10. Add oil. Recheck oil level with level gauge (1).
11. Install the cover. Make sure the filter and rod assembly is in correct position.

Metal Face Seal Fittings

Fittings are used on smaller hoses and consist of a metal flare and a metal flare seat.

1. Inspect flare (10) and flare seat (9). They must be free of dirt or obvious defects.



M202-07-051

IMPORTANT: Defects in the tube flare cannot be repaired. Overtightening a defective flare fitting will not stop a leak.

2. Tighten fitting (7) by hand.
3. Tighten fitting (7) or nut (8) to the torque values shown. Do not allow hose (5) to twist when tightening fittings.

Width across flats (mm)		19	22	27
Fastening torque	N·m	29.5	39	93
	kg·m	3	4	9.5
	lbf·ft	21.5	29	69

G. COOLING SYSTEM

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Check Coolant Level		1	▒						
2. Check and Adjust Fan Belt Tenstion		1		★★	▒				
3. Change Coolant		23.0 L (6.1 US gal)	Twice a year *1						
4. Clean Radiator and Oil Cooler Core	Outside	1					▒ *2		
	Inside	1	When changing coolant						
5. Clean Oil Cooler Front Screen		1					▒ *2		
6. Clean Air Conditioner Condenser (Opt.)		1					▒ *2		

NOTE: ★★ First time only

**1 Before leaving the Hitachi factory, the cooling system is filled with a mixture of water and Genuine Hitachi Long-Life Coolant. As long as Genuine Hitachi Long-Life Coolant is used, the service intervals between changing the coolant is once every two years, or every 4 000 hours, whichever comes first.*

**2 Shorten the maintenance interval when the machine is operated in dusty areas.*

Coolant

Fill the radiator with soft, pure tap or bottled water.

Anti-rust agent

Add approximately 0.46 L (0.49 US qt) of anti-rust agent to the new coolant when the coolant is changed.
It is not necessary to add anti-rust agent when antifreeze is used.

Antifreeze

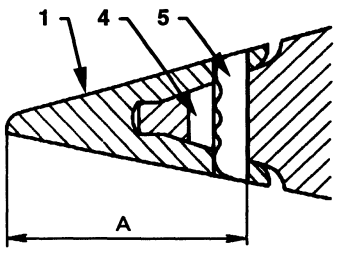
If the air temperature is expected to fall below 0°C (32°F), fill the cooling system with an antifreeze and soft water mix. As a general rule, the ratio of antifreeze should range between 30% and 60% as shown in the table below. If the ratio is below 30%, the system may develop rust, and if it is above 60%, the engine may overheat.

1 Check Bucket Teeth --- daily

Check the bucket teeth for wear and looseness

Replace teeth (1) if tooth wear exceeds the designated service limit shown below.

Dimension A in mm (in)	
New	Limit of Use
230 (9.1)	110 (4.3)

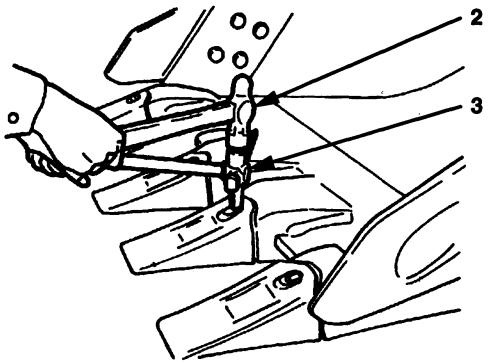


M104-07-056

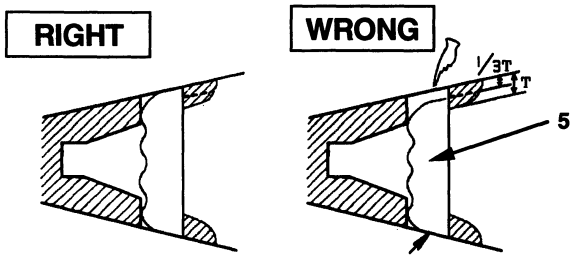
Replacing procedure

CAUTION: Guard against injury from flying pieces of metal. Wear goggles or safety glasses, and safety equipment appropriate to the job.

1. Use hammer (2) and drift (3) to drive out locking pin (5). Be careful not to damage rubber pin lock (4) while removing locking pin (5).
2. Remove tooth (1). Inspect locking pin (5) and rubber pin lock (4) for damage, replace if necessary. Short locking pins and damaged rubber pin locks must be replaced with new ones.



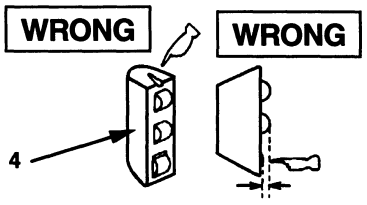
M104-07-116



Flush one end of the locking pin to evaluate. In this instance, the locking pin is too short.

M104-07-118

M104-07-058



M104-07-059

CAUTION: Use reduced compressed air pressure (less than 0.2 MPa, 2 kgf/cm^2) for cleaning purposes. Clear the area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

4. Clean Air Conditioner Filters
   Clean the air conditioner filters using compressed air (less than 0.2 MPa, 2 kgf/cm^2) or water.

When cleaning the filters with water:

4.1 Clean the filter using tap water.

4.2 Soak the filter in neutral-detergent-mixed water for 5 minutes.

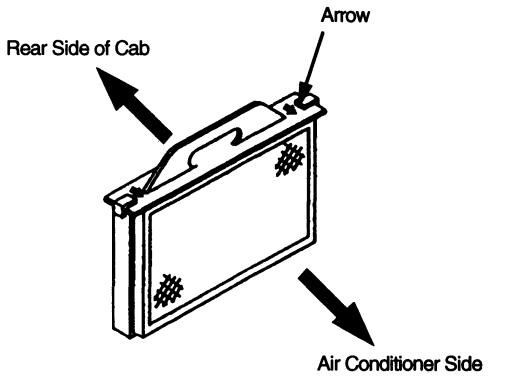
4.3 Rinse detergent and remaining dust and dirt from the filter with tap water.

4.4 Dry the filter.

5. Reinstall Filter and Install New Filter
   Reinstall the cleaned filter or install a new filter in the reverse order decsribed in the step 3. Also, refer to the precautions below for filter installation directions.

5.1 Fresh Air Filter
Position the filter so that the arrows stamped on the filter face the air conditioner side and the notched side of the filter faces the rear of the cab.

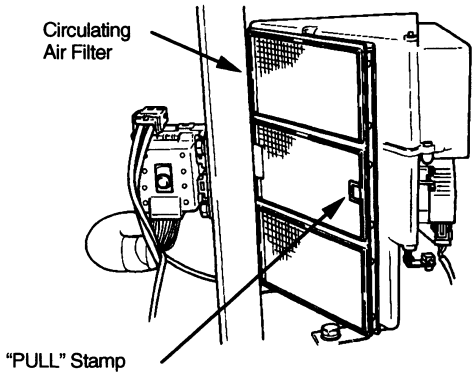
5.2 Circulating Air Filter
Position the filter so that the "PULL" stamped end of the filter faces upward.



M157-14-022

6. Reinstall the hot & cool box in the reverse order of the steps 1 and 2.
   When reinstalling the hot & cool box, reinstall the hose snug between the brackets. Be sure that the hose does not rest above or against the brackets.

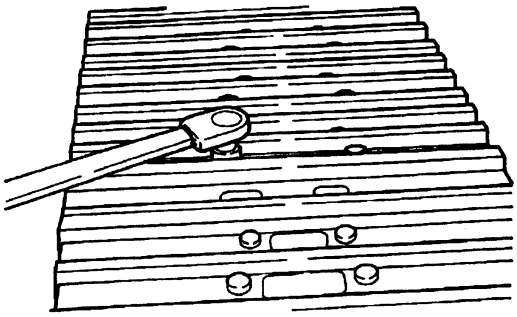
NOTE: If the hose is positioned on the upper surface of the bracket, the hose may be pinched, deformed, and/or damaged between the bracket and the bottom of the box. Also, the box cannot be securely installed.



M158-07-016

18. Retighten the shoe mounting bolts.

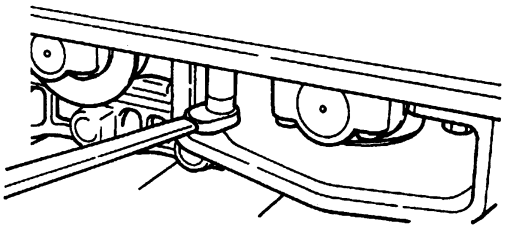
Tool: 30 mm
Torque: 840 N·m (86 kgf·m, 620 lbf·ft)



M107-07-093

19. Retighten the track guard mounting bolts.

Tool: 30 mm
Torque: 620 N·m (63 kgf·m, 460 lbf·ft)

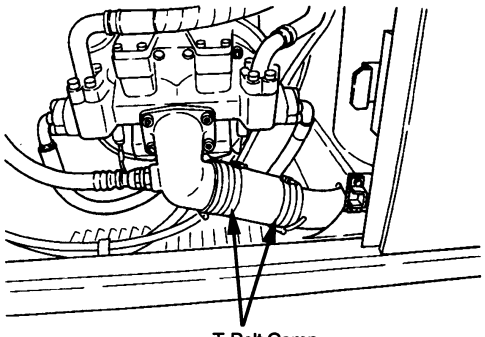


M107-07-094

20. Retighten coupling and T-bolt clamp

Coupling
Tool: 13 mm
Torque: 10.3 to 12.4 N·m
(1.05 to 1.26 kgf·m, 7.59 to 9.1 lbf·ft)

T-bolt Clamp
Tool: 8 mm
Torque: 2.9 N·m (0.3 kgf·m, 2.1 lbf·ft)
Tool: 10 mm
Torque: 5.9 N·m (0.6 kgf·m, 4.3 lbf·ft)



M157-07-215

TROUBLESHOOTING

ENGINE

Problem	Cause	Solution
Engine Cranks But Will Not Start or Hard to Start	No fuel	Add fuel. Bleed air.
	Wrong fuel	Drain tank. Use correct fuel.
	Contaminated fuel	Drain tank and add clean fuel.
	Low battery power	Charge or install new battery.
	Injection pump	See your authorized dealer.
	Wrong preheat line or glow plugs	See your authorized dealer.
	Poor electrical connection	Clean and tighten battery and starter motor connections.
	Starter motor failure	Replace starter.
	Wrong engine oil	Drain oil. Use correct oil.
	Air filter plugged	Replace elements.
	Fuel filter plugged	Remove air from fuel system. Clean fuel tank strainer.
	Engine compression low	See your authorized dealer.
	Injection nozzles dirty or not working correctly	See your authorized dealer.
	Fuel shut-off linkage	Adjust or repair linkage.
	Leaks in fuel system	Check fuel system connections.
	Air in fuel system	Bleed air.
	Fuel feed pump plunger up	Push down and tighten knob.
	Feed pump strainer dirty	Clean or replace.
Engine Knocks, Runs Irregularly or Stops	Engine oil level low	Add oil.
	Plugged air intake system	Clean filter and system.
	Feed pump strainer dirty	Clean or replace.
	Injection pump out of time	See your authorized dealer.
	Plugged fuel filters	Install new filters.
	Low coolant temperature	Thermostat not working correctly or too "cool".
	Water, dirt or air in fuel system	Bleed air from fuel system. Clean fuel tank outlet screen.
	Injection nozzles dirty or faulty	See your authorized dealer.
	Fuel shut-off linkage	Adjust or repair linkage.

HYDRAULIC SYSTEM

Problem	Cause	Solution
One Control Lever Does Not Work	Relief valve pressure low	See your authorized dealer.
	Tube or hose damaged	Repair or replace.
	Hydraulic fittings loose	Tighten.
	Damaged O-rings in fittings	Install new O-ring.
	Hydraulic Pump	See your authorized dealer.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
One Cylinder Does Not Work	Control valve spool damaged or contaminated with dirt	See your authorized dealer.
	Hydraulic lines damaged	Repair or replace.
	Fittings loose	Tighten.
	O-ring in fitting damaged	Install new O-ring.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
One Cylinder Does Not Work or Has Little Power	Piston seals leaking	See your authorized dealer.
	Cylinder rod damaged	See your authorized dealer.
	Pilot lines	Repair or replace.
	Pilot valve	See your authorized dealer.
	Failed wiring harness	See your authorized dealer.
Both Travel Motors Do Not Work	Center joint failure	See your authorized dealer.
One Travel Motor Does Not Work	Travel motor	See your authorized dealer.
	Parking brake not releasing	See your authorized dealer.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
Travel is Not Smooth	Track adjustment	Adjust tension.
	Track idler or rollers damaged	See your authorized dealer.
	Track frame bent	See your authorized dealer.

HYDRAULIC BREAKER

Select a breaker that is the correct size and weight for your machine. See your authorized dealer for correct breaker information.

Carefully study the operation manuals of the machine and breaker, and perform the required checks and/or inspection before connecting the breaker to the arm.

IMPORTANT: Precautions for connecting breaker piping.

- **Do not allow impurities to enter into the system when switching the breaker with the bucket.**
- **When the breaker is not used, apply the cover to the pipe opening on the arm top and install the plug into the hose end of the breaker to prevent impurities from entering the system.**
  Be sure to provide spare covers and plugs in the tool box so that they will be available when needed.
- **After connecting, check the connecting seal fitting for oil leakage, and pipe clamp bolts for looseness.**