DG642

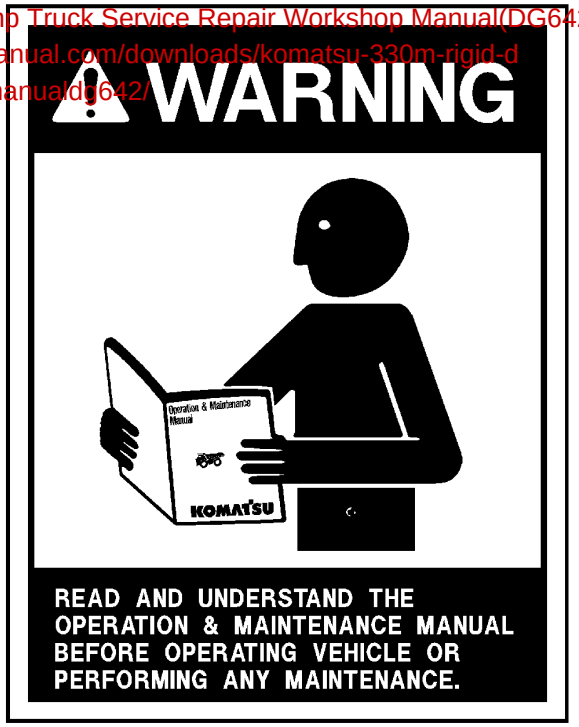
Shop Manual

330M

DUMP TRUCK

SERIAL SUFFIX **BFP41-A thru BFP41-AD**

KOMATSU®



Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read and understand this manual before operating or maintaining this machine.

This manual should be kept in or near the machine for reference, and periodically reviewed by all personnel who will come into contact with it.

It is the policy of the Company to improve products whenever it is possible and practical to do so. The Company reserves the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Because of continuous research and development, periodic revisions may be made to this publication. Customers should contact their local Komatsu distributor for information on the latest revision.

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

CALIFORNIA
Proposition 65 Warning

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

⚠WARNING

NON-OEM PARTS IN CRITICAL SYSTEMS

For safety reasons, Komatsu America Corp. strongly recommends against the use of non-OEM replacement parts in critical systems of all Komatsu equipment. Critical systems include but are not limited to steering, braking and operator safety systems.

Replacement parts manufactured and supplied by unauthorized sources may not be designed, manufactured or assembled to Komatsu's design specifications; accordingly, use of such parts may compromise the safe operation of Komatsu products and place the operator and others in danger should the part fail.

Komatsu is also aware of repair companies that will rework or modify an OEM part for reuse in critical systems. Komatsu does not generally authorize such repairs or modifications for the same reasons as noted above.

Use of non-OEM parts places full responsibility for the safe performance of the Komatsu product on the supplier and user. Komatsu will not in any case accept responsibility for the failure or performance of non-OEM parts in its products, including any damages or personal injury resulting from such use.

FOREWORD

This Manual is written for use by the service technician and is designed to help the technician become fully knowledgeable of the truck and all its systems in order to keep it running and in production. All maintenance personnel should read and understand the materials in this manual before performing maintenance and/or operational checks on the truck. All safety notices, warnings and cautions should be understood and followed when accomplishing repairs on the truck.

The first section covers component descriptions, truck specifications and safe work practices, as well as other general information. The major portion of the manual pertains to disassembly, service and reassembly. Each major serviceable area is dealt with individually. For example: The disassembly, service and reassembly of the radiator group is discussed as a unit. The same is true of the engine and engine accessories, and so on through the entire mechanical detail of the truck. Disassembly should be carried only as far as necessary to accomplish needed repairs.

The illustrations used in this manual are, at times, typical of the component shown and may not necessarily depict a specific model.

This manual shows dimensioning of U.S. standard and metric (SI) units throughout and all references to "Right", "Left", "Front", or "Rear" are made with respect to the operator's normal seated position, unless specifically stated otherwise.

Standard torque requirements are shown in torque charts in the general information section and individual torques are provided in the text in bold face type, such as **100 ft.lbs. (135 N.m)** torque. All torque specifications have ± 10% tolerance unless otherwise specified.

A Product Identification plate is normally located on the truck frame upright in front of the left side front wheel and designates the Truck Model Number, Product Identification Number (vehicle serial number), and Maximum G.V.W. (Gross Vehicle Weight) rating.

The HAULPAK® Model designation consists of three numbers and one letter (i.e. 330M). The three numbers represent the basic truck model. The letter "M" designates a Mechanical drive and the letter "E" designates an Electrical propulsion system.

The Product Identification Number (vehicle serial number) contains information which will identify the original manufacturing bill of material for this unit. This complete number will be necessary for proper ordering of many service parts and/or warranty consideration.

The Gross Vehicle Weight (GVW) is what determines the load on the drive train, frame, tires, and other components. The vehicle design and application guidelines are sensitive to the **total maximum Gross Vehicle Weight (GVW)** and this **means the total weight**: the Empty Vehicle Weight + the fuel & lubricants + the payload.

To determine allowable payload:
Service all lubricants for proper level and fill fuel tank of empty truck (which includes all accessories, body liners, tailgates, etc.) and then weigh truck.
Record this value and subtract from the GVW rating. The result is the allowable payload.
NOTE: Accumulations of mud, frozen material, etc. become a part of the GVW and reduces allowable payload. To maximize payload and to keep from exceeding the GVW rating, these accumulations should be removed as often as practical.

Exceeding the allowable payload will reduce expected life of truck components.

This* "ALERT"** ***symbol is used with the signal words,* "CAUTION", "DANGER",** ***and* "WARNING"** ***in this manual to alert the reader to hazards arising from improper operating and maintenance practices.

"DANGER" ***identifies a specific potential hazard***
WHICH WILL RESULT
in either INJURY OR DEATH
if proper precautions are not taken.

"WARNING" ***identifies a specific potential hazard***
WHICH MAY RESULT
in either INJURY OR DEATH
if proper precautions are not taken.

"CAUTION" ***is used for general reminders of proper safety practices OR to direct the reader's attention to avoid unsafe or improper practices which may result in damage to the equipment.***

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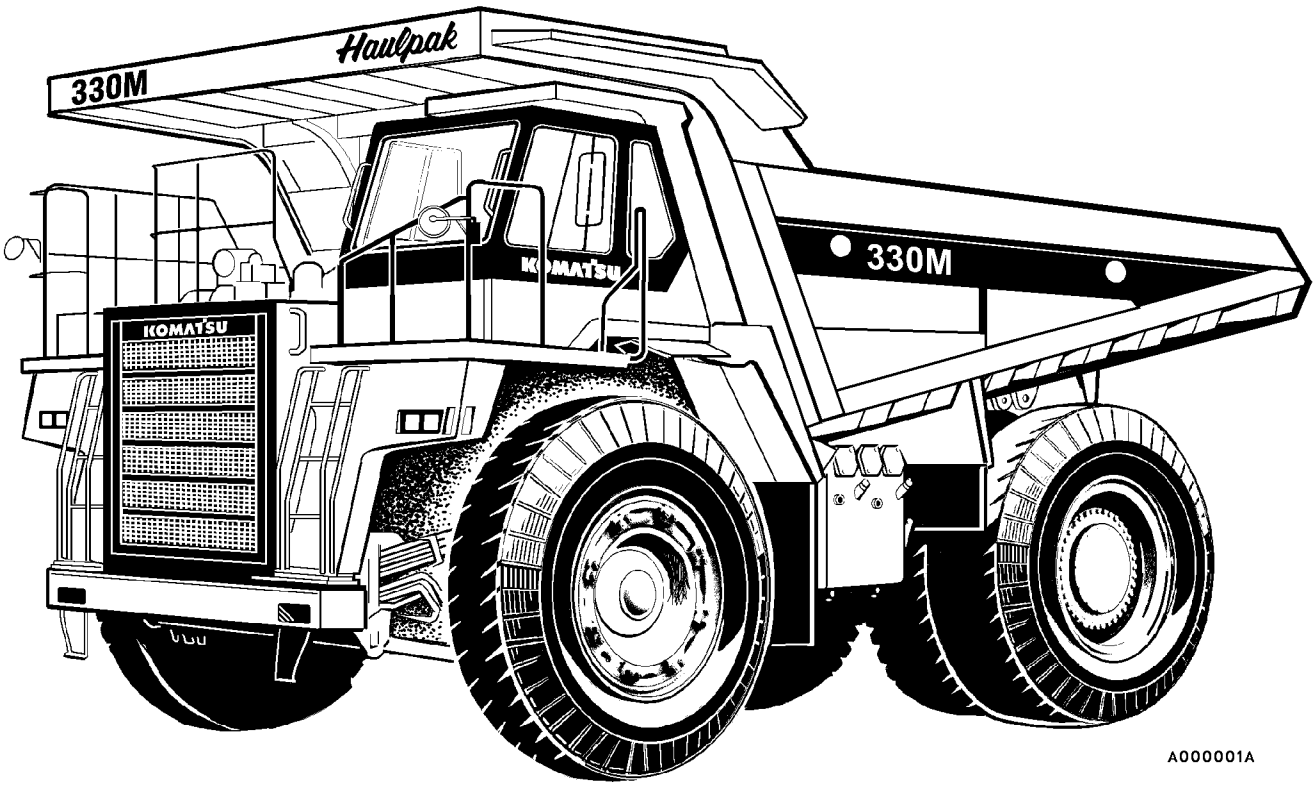

330M HAULPAK® TRUCK

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MAJOR COMPONENTS AND SPECIFICATIONS

ENGINE

The 330M HAULPAK® Truck is powered by a Cummins diesel engine.
Other OPTIONAL engines may be specified.

TRANSMISSION

The TORQFLOW transmission consists of a 3-element, single-stage, two-phase torque converter and a planetary gear, multiple disc clutch transmission which is hydraulically actuated and force-lubricated for optimum heat dissipation.

The TORQFLOW transmission is capable of seven (7) forward speeds and one (1) reverse gear. Automatic shifting is controlled by electronic shift control with automatic clutch modulation in all gears. A lockup system consisting of a wet, double-disc clutch, is activated in F1–F7 gears for increased fuel savings.

FINAL DRIVE ASSEMBLY

The final drive consists of a plug-in differential with planetary wheel drive.

OPERATOR'S CAB

The Operator's Cab is spacious and comfortable and includes wide windows all around for excellent visibility. All pedals, controls and instruments are arranged for maximum efficiency and ease of operation. The electronic display/monitoring panel keeps the operator informed of the truck's operating systems. Audible alarms and lights warn the operator of system malfunctions.

POWER STEERING

The 330M is equipped with full hydraulic power steering. The system includes an electric motor driven pump which automatically provides emergency power if the steering pump hydraulic flow is reduced below an established minimum.

BRAKE SYSTEM

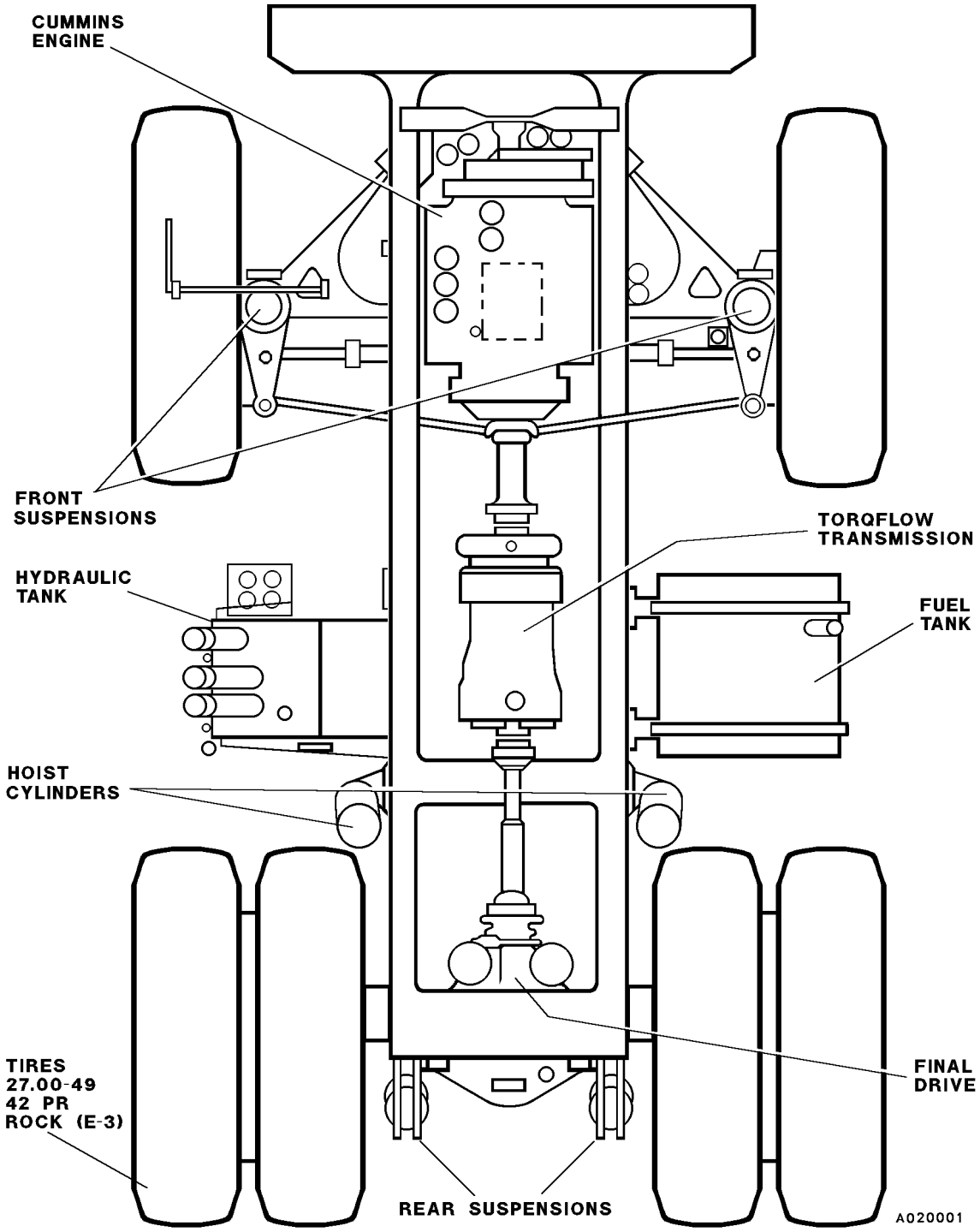
Depressing the brake pedal actuates front and rear air-over-hydraulic service brakes. The front service brakes are a caliper dry disc type. The rear service brakes are oil-cooled, multiple wet-disc brakes (used also for retarder).

RETARDER

The operator can manually apply the rear oil-cooled, multiple-disc retarder brakes by moving the retarder contol lever which is mounted on the steering column. These brakes are automatically activated when the engine speed exceeds the rated revolutions of the shift position.

SUSPENSION

Hydro-pneumatic suspension cylinders are used at each wheel to reduce shock and provide riding comfort for the operator and machine stability.



330M MAJOR COMPONENTS

SPECIFICATIONS

ENGINE

Cummins KTA-38-C

Number of Cylinders 12

Operating Cycle 4-Stroke

Rated 783 kW **(1050 SAE Brake HP)** @ 2100 RPM

Flywheel . . 753 kW **(1010 SAE HP)** @ 2100 RPM

Maximum torque 4631 N.m **(3415 lb-ft)** @ 1300 RPM

TORQFLOW TRANSMISSION

Automatic Electronic Shift Control
. . . with Automatic Clutch Modulation In All Gears.

Lockup Clutch . . . . . Wet, Double-disc,
. . . . . Activated in F1–F7 gears.

Torque Converter . . . . . 3-Element, Single-stage,
. . . . . Two-phase

Transmission . Planetary Gear, Multiple Disc Clutch,
. . . . . Hydraulically Actuated, Force-lubricated

Speeds . . . . . 7 Forward, 1 Reverse

Max Travel Speed . . . . . 68 Km/h **(42.3 MPH)**

FINAL DRIVE ASSEMBLY

Final Drive . . . . . Plug-in Differential
. . . . . with Planetary Wheel Drive

Reduction Ratios:

Bevel Set 3.467:1

Planetary Final Drive 50:1

Total Reduction 22.54:1

ELECTRIC SYSTEM

Batteries . . . . . 4 x 12V / 170 A. Hr.

Alternator . . . . . 24 Volt, 75 Ampere Output

Lighting . . . . . 24 Volt

Starter . . . . . Electric

AIR SYSTEM

Compressor:
Cummins . . . . . 0.85 m^3/min . . . **(30 cfm)**

SERVICE CAPACITIES

	Liters	U.S. Gallons
Cummins (Includes Lube Oil Filters)	116	**(30.6)**
Cooling System	250	**(66.0)**
Fuel Tank	1240	**(327.6)**
Transmission And Torque Converter	105	**(27.7)**
Hydraulic System	162	**(42.8)**
Retarder Cooling	268	**(70.8)**
Differential	130	**(34.3)**
Final Drive (each planetary)	64	**(19.9)**

HYDRAULIC SYSTEM

The steering/hoisting and retarder cooling circuits are independent circuits. Load sensing steering system controls the flow to the steering circuit in accordance with demand.

Hydraulic Pumps . . . . . 2-Separate Gear Pumps

Steering/Hoist Functions
Flow rated at . . 668 l/min. **(176.5 U.S. gal/min.)**

Retarder Cooling
Flow rated at . . 1051 l/min. **(277.7 U.S. gal/min.)**

Hoist Control Valve . . . . . Spool Type

Positions . . . . . Raise, Hold, Float, and Lower

Hydraulic Cylinders

Hoisting . . . . . 2- Stage Telescoping Piston

Steering . . . . . Double Acting Piston

Relief Valve Setting . . . . . 210 kg/cm^2 **(3,000 psi)**

SERVICE BRAKES

Actuation: . . . . . Air-Over-Hydraulic

Front . . . . . Caliper Disc Brakes

Rear . . . . . Oil-Cooled, Multiple-Disc
. . . . . Act as both Service and Retarder Brakes

Retarder Brakes:

Normally Applied . . . . . Manually By Operator.
Automatically Actuated . . . . . when engine speed exceeds the rated revolutions of the shift position for the transmission.

Parking Brake: . . . . Spring-loaded, Caliper Disc
. . . . . Actuates On Drive Shaft

Emergency Brakes:

An emergency relay valve actuates the brakes automatically should air pressure in the air tank drop below a pre-set value.
Manual operation is also possible.

STEERING

Min Turning Radius . . . . . 9.9 m (32' 6")

Automatic Emergency Steering . . . . . Standard

TIRES

Rock Service (E-3) . . . . . Tubeless

Standard . . . . . 27.00 - 49, 42 Ply Rating

Rim Size . . . . . .

. . . . . 50 cm X 124.4 cm (19.5 in. X 49 in.)

. . . . . Separable Tire Rims

DUMP BODY CAPACITY (Standard)

Struck . . . . . 36 m^3 (47.1 yds^3)

Heaped @ 2:1 (SAE) . . . . . S53m^2 (69.3 yds^3)

OVERALL TRUCK DIMNSIONS

Loading Height . . . . . 4.22 m (13' 10")

Minimum Clearance Height . . . . . 5.00 m (16' 5")

Overall Length . . . . . 10.11 m (33' 2")

Maximum Width . . . . . .99 m (19' 9")

WEIGHT DISTRIBUTION

(w/ Cummins Engine; 27.00-49 Tires; Standard Body)

EMPTY	**Kilograms**	**Pounds**
Front Axle	30 020	66,181
Rear Axle	32 914	ss72,563
Total	62 934	138,744

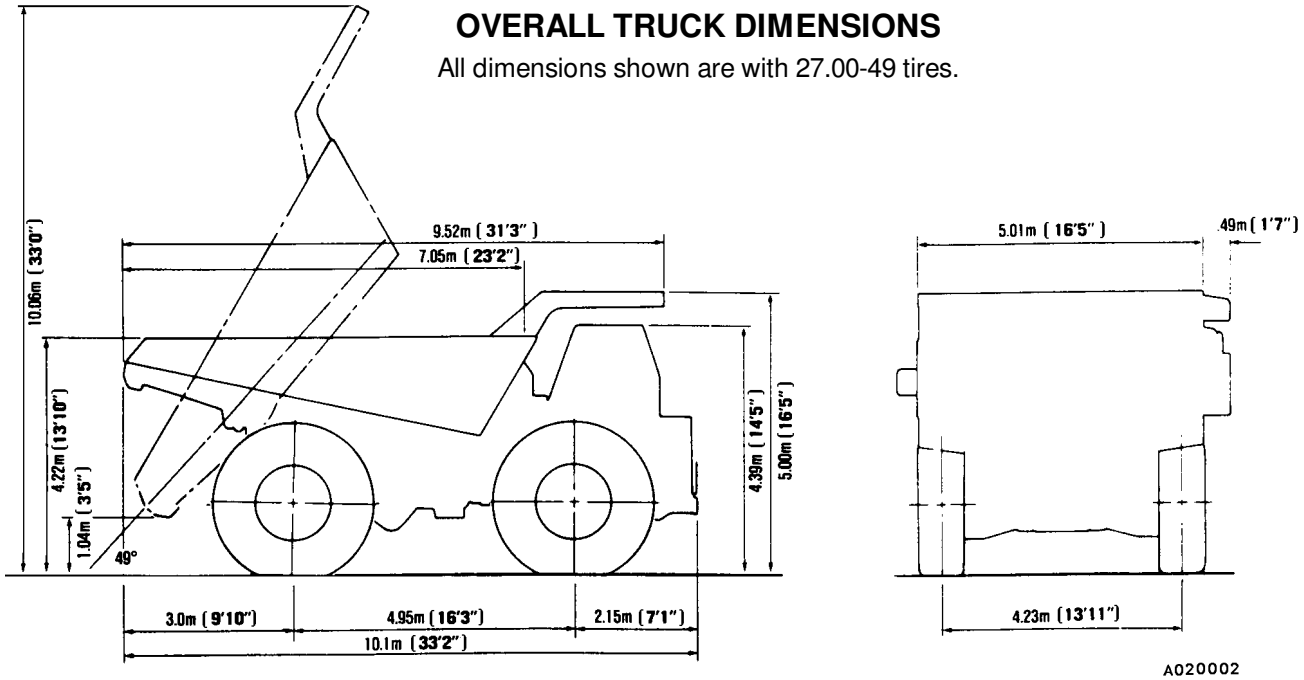
LOADED

	Kilograms	**Pounds**
Front Axle	45 375	100,033
Rear Axle	94 671	208,711
Total *	140 046	308,744

* Not to Exceed 149 685 kg (330,000 lbs.).
Including Options, Fuel & Payload

OVERALL TRUCK DIMENSIONS

All dimensions shown are with 27.00-49 tires.



SAFETY RULES

Safety records of most organizations will show that the greatest percentage of accidents are caused by unsafe acts of persons while the remainder are caused by unsafe mechanical or physical conditions.

The following safety rules are intended to instruct the HAULPAK® operator on what to do and not to do while operating the truck. However, all situations cannot be covered by these safety rules; local conditions and regulations may add many more to this list.

GENERAL

1. Prevention is the best safety program. Prevent accidents by knowing all the safety regulations required by the employer, all necessary precautions at the job site, and the manufacturer's recommendations for the truck. Report any conditions that need attention to the proper authorities.
2. Wear proper clothing. Loose fitting clothing, unbuttoned jackets and sleeves, jewelery, etc. can catch on a protrusion and cause a potential hazzard.
3. Always use personal safety equipment such as safety shoes, safety glasses and hard hat. There may be conditions when ear protective devices should also be worn.
4. When walking to or from the truck, keep a safe distance from all machines even if the operator is visible.

Before Starting Engine

1. Carefully study the Operator Handbook before starting engine or driving truck. Give particular attention to safety material and caution and warning decals. Only qualified operators or technicians should attempt to operate the HAULPAK®.
2. Before operating truck, a careful visual inspection as well as operational checks should be completed. Report any items that need attention to the proper authority.

   a. Inspect entire truck for oil or coolant leaks.

⚠WARNING

If engine has been running, allow coolant to cool before removing the fill cap or draining radiator.

⚠WARNING

Any operating fluid, such as hydraulic oil, or engine coolant escaping under pressure, can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death, if proper medical treatment by a physician who is familiar with this type of injury is not received immediately.

   b. When checking coolant in radiator, relieve pressure before removing radiator cap.

   c. Check tires for cuts, damage or "bubbles". Check tires for proper inflation. If tire is warm from operation, allow tire to cool before adjusting tire pressure. If inflation is needed, use an air chuck with extension hose clipped on the tire inflation valve to allow service away from front of wheel.

   d. Visually inspect all headlights, worklights, clearance lights, and taillights for damage and be certain lenses are clean. Good visibility may prevent an accident.

   e. Upon completion of an exterior inspection of the truck, clean mud, grease, ice or snow from shoes and ladder before climbing access ladder.

   f. Always use handrails and ladder when mounting or dismounting truck.

⚠WARNING

Always mount and dismount facing the truck. Never attempt to mount or dismount while the truck is in motion.

   g. Check the deck areas for debris or loose hardware.

   h. When getting in or out of truck cab, face the cab and use handrails provided.

   i. Become familiar with all protective equipment devices on the truck and insure that these items (seat belts, grab bars, anti-skid material, canopies, etc.) are securely in place.

   j. Check on-board fire extinguishers. Do not use a fire extinguisher for any purpose other than extinguishing a fire. If extinguisher is used, report the occurrence so it may be refilled or replaced.

Starting Engine And General Operation

1. Make sure all persons are clear of truck before starting engine. Always sound the horn as a warning device before activating any controls. When backing the truck, give backup signal (three blasts on horn); when starting forward, two blasts on horn. These signals must be given each time the truck is moved forward or backward.
2. Insure adequate ventilation before startup if the truck is in an enclosure. Exhaust fumes are dangerous.
3. If a cold weather starting aid is used, read and follow the manufacturer's instructions for use and disposal.

⚠WARNING

Starting fluid is highly flammable. Use with extreme care.

4. Check windshield wipers, lights, windows and horn for proper operation and cleanliness.
5. Operate the emergency steering and each of the truck brake circuits at least twice prior to operating and moving the truck. These checks should include individual activations of the service brake, parking brake, and emergency brake with the engine running. If any application/release of any brake circuit does not actuate properly, or if there is apparent sluggishness on application/release, shut the engine down and notify maintenance personnel. DO NOT operate truck until brake circuit in question is fully operational.
6. Check parking brake periodically during shift. **Use parking brake for parking only.**
7. Observe safety and warning decals on the truck at all times.
8. Keep all unauthorized reading material out of truck cab.
9. Do not carry tools and supplies in cab of truck or allow trash to accumulate in cab.
10. Do not allow anyone to ride on decks or steps of truck. Riders should be in cab only.
11. Only authorized persons are allowed to ride in the truck cab. **Wear seat belts at all times**.
12. Do not allow anyone to get on or off truck while it is in motion.
13. Do not move truck into or out of a building without a signal person present.
14. DO NOT leave truck unattended while engine is running.
15. Check for flat tires periodically during shift. If truck has been run on a "flat", **it must not be parked in a building until the tire cools.**

    If tire must be changed, do not stand in front of rim and locking ring when inflating tire mounted on the machine. Initial inflation to required pressure must be done with a safety cage or rack enclosing the tire and rim assembly. Observers should not be permitted in the area and should be kept at least 457 m (1500 ft.) away from the side of such tires.

⚠WARNING

Do not weld or apply heat on the rim assembly with the tire mounted on the rim. Resulting gases inside the tire may ignite causing explosion of tire and rim.

⚠WARNING

In the event of fire in the tire and wheel area (including brake fires), stay away from the truck until the tire and wheel are cool. Tire and rim assembly may explode if subjected to excessive heat. Personnel should move to a remote or protected location if sensing excessively hot brakes, smell of rubber burning or evidence of fire near tire and wheel area.

If the truck must be approached to extinguish a fire, those personnel should do so only from the front or the back of the tire, unless protected by use of large heavy equipment as a shield. Stay at least 15 m (50 feet) from the tread of the tire.

16. Report haul road conditions which may present hazards immediately to supervisor. Muddy or icy roads, pot holes or other obstructions can present hazards.

Loading

1. Pull into the loading area with caution. Remain at a safe distance while truck ahead is being loaded.
2. Do not drive over unprotected power cables.
3. When approaching or leaving a loading area, watch out for other vehicles and for personnel working in the area.
4. When pulling in under a loader or shovel, follow "Spotter" or "Shovel Operator" signals. The truck operator may speed up loading operations by observing the location and loading cycle of the truck being loaded ahead, then follow a similiar pattern.
5. Operator should remain in truck cab with engine running while truck is being loaded. Place Transmission Range Selector in "**N**eutral" and apply Parking Brake lever.

⚠WARNING

If operator must leave truck cab during loading, engine must be shut down and parking brake applied. DO NOT use emergency brake for parking. Remain far enough away from truck to avoid being struck by flying material.

6. When truck is loaded, pull away from shovel as quickly as possible, but with extreme caution.

Hauling

1. Always stay alert! If unfamiliar with the road, drive with extreme caution.
2. Govern truck speed by the road conditions, weather and visibility.
3. Operate truck so it is under control at all times.
4. Use extreme caution when approaching a haul road intersection. Maintain a safe distance from oncoming vehicles.
5. Obey all road signs.
6. Always dim headlights when meeting oncoming vehicles.
7. Maintain a safe distance when following another vehicle. Never approach another vehicle from the rear, in the same lane, closer than 15 m (50 ft). When operating on a down grade, stay at least 30 m (100 ft) away.
8. During normal operation, the retarder control lever should be used to control the speed of the truck and to stop the truck instead of using the foot-operated service brake pedal. Use of this lever allows the operator to apply **the REAR oil-cooled brakes only**, thus extending the life of the front caliper disc pads while still maintaining maximum control of the truck. The foot-operated brake pedal should be used when maneuvering in tight places, at the shovel and dump, and when quick stops or severe braking is required.

   Before starting down a grade, maintain a speed that will insure safe driving and provide effective retarding under all conditions. Refer to **Retarding Capacity** decal located inside the cab on the left-hand door panel.

   When descending a known grade with a loaded truck, the operator should **preselect a gear range**, *and adjust the vehicle speed*, so that continous retarder operation can be maintained within the SHADED portion of the graph. For limited duty [610 m (2000 ft.)], operation may be continued into the unshaded portion of the graph steps.

   For efficient retarder operation, the operator should:

   - Maintain engine RPM between 1800 — 2400 RPM, and
   - Observe the Brake Oil Temperature gauge to make certain the Brake Oil Temperature does not exceed 255°F (125°C).

     If the Brake Oil Temperature exceeds this limit, use truck service brakes and reduce ground speed to allow transmission to shift to next lowest gear range.

9. When operating truck in darkness or when visibility is poor, do not move truck unless headlights are on. Do not back truck if back-up horn or lights are inoperative.
10. When backing the truck, give back-up signal (three blasts on air horn); when starting forward, two blasts on air horn. These signals must be given each time the truck is moved forward or backward.
11. Do not stop or park on a haul road unless unavoidable. If you must stop, move truck to a safe place, apply parking brake, shut down engine, block wheels securely and notify maintenance personnel for assistance.

12. If the "Emergency Steering" light and/or "Low Air Pressure" warning light come on during operation, steer the truck **immediately** to a safe stopping area, away from other traffic if possible. Refer to item 11 above.

13. Cab doors should remain closed at all times while truck is in motion or unattended.

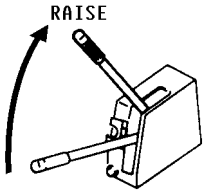
Passing

1. Use only the areas designated for passing.
2. Do not pass another truck on a hill or blind curve!
3. Before passing, make sure the road ahead is clear. If a disabled truck is blocking your lane, slow down and pass with extreme caution.

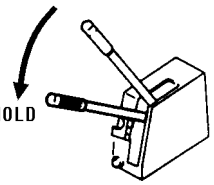
Dumping

1. Pull into dump area with extreme caution.
2. Carefully maneuver truck into dump position. Obey signals directed by the spotter, if present.
3. When in dump position, place transmission range selector at the "**N**eutral" position, and apply the park brake lever.

To Raise dump body:

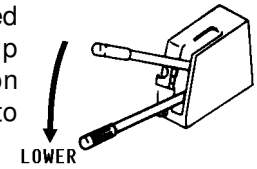


4. Pull dump lever all the way up to the "RAISE" position and release lever.
5. Raise engine RPM to accelerate hoist speed. When body is near the maximum angle, reduce engine RPM (reduce foot pressure on the accelerator pedal) to reduce shock load to the hydraulic system and hoist cylinders.
6. When the dump body rises to the set position (adjusted position of body positioner) dump lever returns to the "HOLD" position. If desired to raise the body further, move dump lever to raise position and dump will rise. If dump lever is released, lever will return to hold position. Dump body will stop in that position.

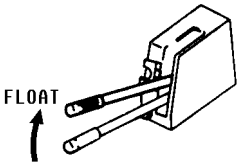


To Lower Body:

7. After material being dumped clears body, move dump lever to the "LOWER" position and dump body will start to move down.



8. Release the lever and it will return automatically to the "FLOAT" position. The body will move down under its own weight.



*If dumped material builds up at body tailgate and body cannot be lowered, shift Transmission Range Selector to "D" (Drive), release retarder control lever, and drive forward to clear material. Stop, shift Transmission Range Selector to "N" (Neutral), apply retarder control lever and lower body. See NOTE : **

⚠CAUTION

The HAULPAK® is not to be moved with the dump body raised, except for emergency moves only. Failure to lower body before moving truck may cause damage to hoist cylinders, frame and/or body hinge pins.

NOTE: When traveling, always place the dump lever at the FLOAT position, regardless of whether or not the truck is loaded.

** If the transmission range selector is moved to any position other than "N" (neutral) when the dump lever is not at the FLOAT position, the central warning lamp will light up and the alarm buzzer will sound.*

9. With body returned to frame, move Transmission Range Selector to "D" (Drive), release retarder control lever, and leave dump area carefully.

Safe Parking Procedures

The operator must continue the use of safety precautions when preparing for parking and engine shutdown.

In the event that the equipment is being worked in consecutive shifts, any questionable truck performance the operator may have noticed must be checked by maintenance personnel before the truck is released to another operator.

1. When parking, park only in designated parking areas and at a safe distance from other vehicles as determined by supervisor. The truck should be parked on level ground, if at all possible. If parking must be done on a grade, the truck should be positioned at right angles to the grade.
2. The parking brake must be applied and/or chocks placed fore/aft of wheels so that the truck cannot roll. Each truck should be parked at a reasonable distance from another. If parking truck in other than designated parking area is necessary, select a level area, apply parking brake and block wheels front and rear.
3. Haul roads are not safe parking areas. In an emergency, pick the safest spot most visible to other machines in the area. If the truck becomes disabled where traffic is heavy, mark the truck with warning flags in daylight or with flares at night.
4. When parking, do not leave truck unattended if engine is left running or if dump body is raised.
5. If engine is to be shut down, allow engine to run from 3 to 5 minutes at idle to provide cooling of the engine and follow procedure outlined under "Shutting Down Engine".

Shutting Down Engine

1. Bring truck to complete stop, reduce engine RPM to low idle. Place Transmission Range Selector in "**N**eutral" and apply parking brake.
2. Allow engine to cool gradually by running at low idle for 3 to 5 minutes.

⚠WARNING

Do not leave truck unattended during engine idle cool down period.

3. Turn off all lights and accessories.
4. Turn keyswitch "off" to stop engine.
5. Close and lock all windows, remove key from key-switch and lock cab to prevent unauthorized truck operation. Dismount truck properly.

When Service Is Necessary

1. If truck is to be towed for any reason, use a rigid tow bar. Check truck cab for decal recommending special towing precautions. Refer to "**Towing**" instructions for further precautions.
2. When truck body is in the dump position, do not allow anyone beneath it unless "body-up" retaining pins are installed.
3. Do not repair or service truck while engine is running, except when adjustments can only be made under such conditions. **Keep a safe distance from moving parts.**
4. When servicing air conditioning system with refrigerant (Freon), wear a face shield and cold resistant gloves for protection against freezing.
5. Follow package directions carefully when using cleaning solvents.

Battery Assist Starting (Jump Starting)

If an auxiliary battery assist is needed, turn off all accessories and be sure area is well ventilated.

NOTE: 330M HAULPAK® Trucks are equipped with four 12 volt batteries connected in series and parallel to provide 24 volt output. Be certain to maintain correct voltage and polarity when connecting booster cables. Damage to electrical components may result if voltage and polarity are not correct.

⚠WARNING

Lead-sulphate batteries will give off hydrogen gas! Sparks or flame near these batteries may cause a violent explosion which will expel debris and extremely toxic and corrosive sulphuric acid!

Use the following procedure to minimize the possibility of sparks in the vicinity of the battery:

a. Connect one lead of booster cable to 24V positive (+) post of battery needing assist, and other lead of the booster cable to the 24V positive (+) post of auxiliary battery.
b. Connect one lead of second booster cable to 24V negative (-) post of auxiliary battery and then connect other lead of the booster cable to a good frame ground on the disabled truck away from the battery needing assist.

Towing

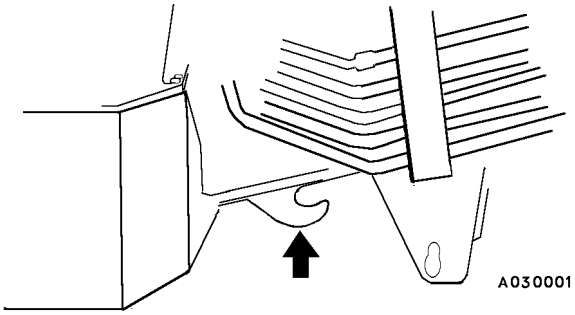
⚠WARNING

The truck should be towed only in an emergency.

Prior to towing a truck, many factors must be carefully considered. Serious personal injury and/or significant property damage may result if important safety practices, procedures and preparation for moving heavy equipment are not observed.

⚠CAUTION

Both right and left planetary sun gears/drive axles should be removed before any towing.
Refer to Section "G" in the Service Manual for these instructions.
Extensive secondary damage can occur to final drive components and/or transmission, if truck is towed without first removing sun gears/drive axles.



When towing becomes necessary, use the tow hook installed under the front frame and take the following precautions:

1. Block disabled truck to prevent movement while attaching tow bar.
2. If the engine is operable; keep the engine running while towing the machine, so that the steering and braking can be used.

   If there is a failure in the air circuit, the brakes cannot be used, so be extremely careful when towing. When air pressure in air reservoir abnormally drops due to leakage from air circuit, parking brake and emergency brake are actuated. When towing truck, both brakes must be released. Refer to "BRAKE RELEASE" following these "TOWING" instructions.

   If the engine is NOT operable, it is possible to steer using the emergency steering, but do not use it for more than 90 seconds, and travel at a speed of less than 5 km/h (3 mph).
3. If the engine is NOT operable, never haul the truck over 800m (2,625 ft).

   If the towing distance surpasses that limit, be sure to remove the drive shaft between the transmission and the differential case (if final drive sun gears have not been removed).
4. If truck is equipped, install hydraulic connections for steering and dumping between towing and towed vehicles. Inspect tow bar for capacity (it should be strong enough to tow 1.5 times the gross vehicle weight of truck being towed).
5. Determine that towing vehicle has adequate capacity to *both move and stop* the towed truck under all conditions.
6. Protect both operators in the event of tow bar failure.
7. Release disabled truck brakes and remove blocking.

⚠WARNING

Do not tow the truck any faster than 8 kph (5 MPH).

8. Sudden movement may cause tow bar failure. Smooth and gradual truck movement is preferred.
9. Minimize tow angle at all times - NEVER EXCEED 30^{o}.
   The towed truck must be steered in the direction of the tow bar.

BRAKE RELEASE

Releasing Parking Brake And Emergency Brake After Being Actuated In An Emergency

If the pressure inside the air tank drops abnormally due to some problem, such as leakage of air from the air circuit, the parking brake and emergency brake are automatically actuated.

Release Of Parking Brake

The parking brake is a dry disc brake mounted on the rear drive shaft at the differential input with two (2) **spring-applied, air-released** calipers. Each caliper is individually applied/released through separate air chamber actuators (spring cylinder assemblies). If the parking brake can not be released after its emergency application – even if the parking brake valve lever is put in RELEASE position – take the following actions to release the parking brake:

1. Block disabled truck to prevent movement and confirm safety in the surrounding area.

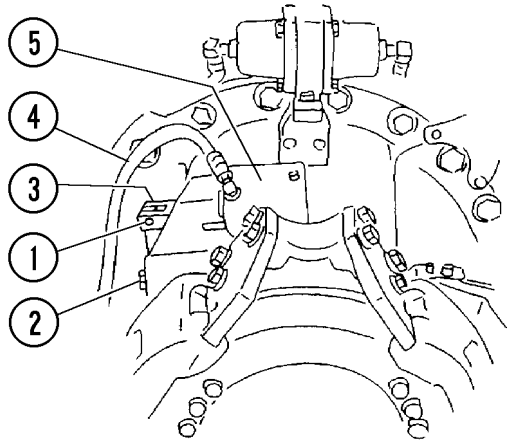


FIGURE 3-1. PARKING BRAKE ACTUATOR

1. Pin
2. Adjustment Bolt
3. Linkage
4. Air Supply Hose
5. Spring Cylinder Assembly

2. At the parking brake relay valve, remove both air hoses (4, Figure 3-1) connected to each air chamber of the parking brake spring cylinder assemblies (5).
3. Connect these hoses together using a “tee” fitting with compatible thread ends.
4. Connect third connector of “tee” to a hose from an air supply of sufficient capacity to release calipers. Apply air and release brake.
5. With parking brake released, turn adjustment bolt (2) counterclockwise, and check for “play” in linkage (3). Remove pin (1). Repeat for other caliper. Disconnect air supply.
6. With parking brake disconnected, remove blocking and immediately move the truck to a safe place. Refer to INSTRUCTIONS FOR TOWING THE MACHINE.

⚠WARNING

If the air system is not operating, the service brakes will not apply; this is very dangerous. Be sure to tow the truck at low speed, keeping the engine running (if possible) and always being ready to steer.

Refer to service manual for instructions for reconnecting and adjusting park brake.

Release Of Emergency Brake

When the emergency brake has been applied, do not continue to drive the machine. This will cause seizure of the brake discs and linings.

If the emergency brake can not be released after its emergency application – even if the emergency brake valve lever is put in RELEASE position – release the emergency brake in the following manner:

Before releasing the air pressure from the emergency brake reservoir, confirm safety in the surrounding area and put chocks against the tires.

1. After making preparations to tow the machine, pull rings (2, Figure 3-2) on the 4 drain valves on the air tank.
   After air pressure is released, the emergency brake should release.
2. After releasing the emergency brake, release rings (2).

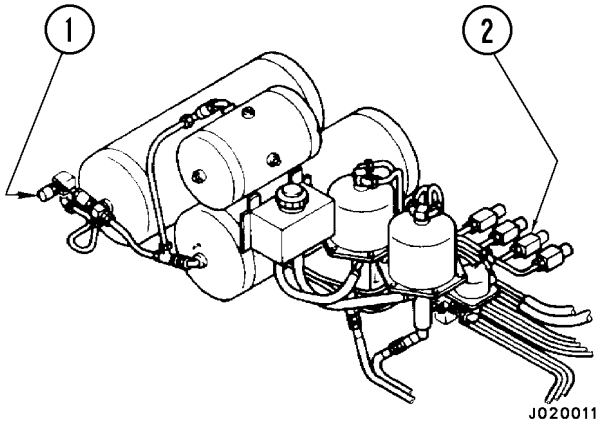


FIGURE 3-2. RELEASING EMERGENCY BRAKE

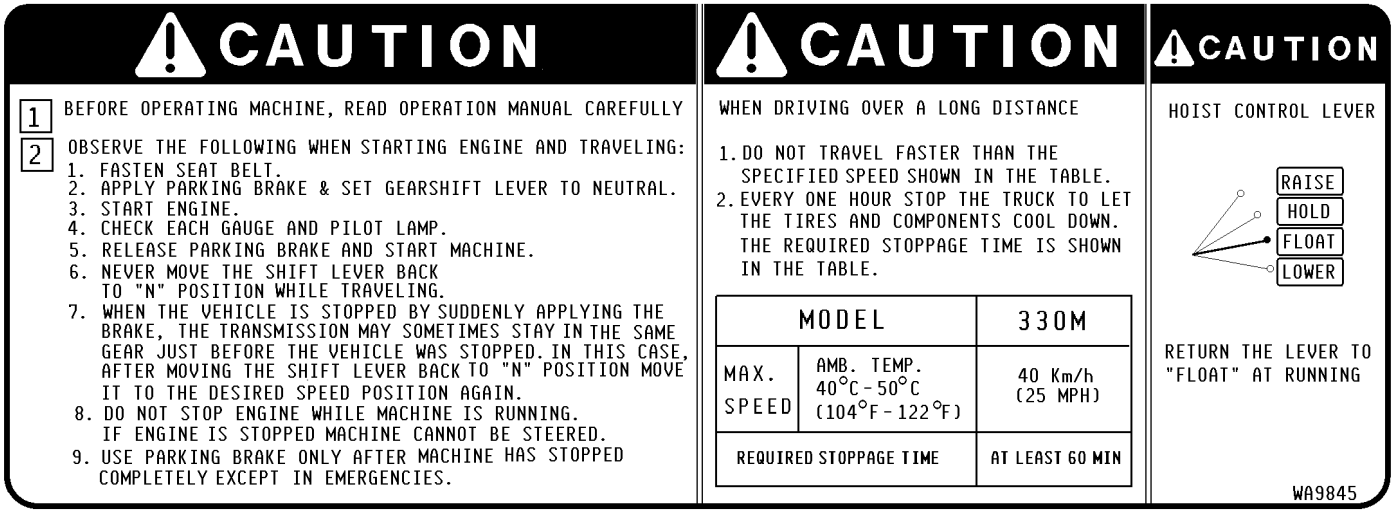
1. Air Quick Disconnect
2. Drain Valve Pull Rings

NOTES

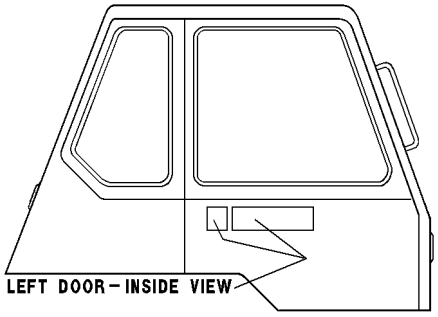
WARNINGS AND CAUTIONS

The following paragraphs give an explanation of the WARNING, CAUTION, and Service Instruction plates and decals attached to the HAULPAK® truck. The plates and decals listed here are typical of this HAULPAK® model, but because of customer options, individual trucks may have plates and decals that are different from those shown here.

The plates and decals must be kept clean and legible. If any decal or plate becomes worn or unable to be read, it should be replaced with a new one.



This caution plate is located inside the cab on the left-hand door panel under the arm rest. It contains (3) CAUTIONS - Operating Machine Safely, Driving Over A Long Distance, and Hoist Control Lever operation. These decals stress the importance of reading and understanding the operators manual prior to the operation of equipment.



TIRE AIR PRESSURE Caution plate is located inside the cab on left-hand door panel under the arm rest. Extreme caution should be used when taking a pressure reading. Tire is under high pressure.

CAUTION

TIRE AIR PRESSURE

ADJUST THE TIRE PRESSURE TO THE PROPER AIR PRESSURE BEFORE OPERATION

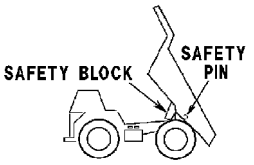
TIRE SIZE	PROPER AIR PRESSURE	
	FRONT	REAR
24.00-49-42PR	6.65 kg/cm² (95 psi)	6.65 kg/cm² (95 psi)
24.00-49-48PR	6.65 kg/cm² (95 psi)	6.65 kg/cm² (95 psi)
27.00-49-42PR	4.9 kg/cm² (70 psi)	4.9 kg/cm² (70 psi)
27.00-49-48PR	5.6 kg/cm² (80 psi)	5.6 kg/cm² (80 psi)

561-93-61940

⚠ WARNING

WHEN IT IS NECESSARY TO WORK UNDER THE MACHINE WITH THE BODY RAISED, FOLLOW INSTRUCTION BELOW.

1. CARRY OUT INSPECTION AND MAINTENANCE WITHOUT LOAD.
2. LOCK THE HOIST CONTROL LEVER IN THE HOLD POSITION AND INSTALL SAFETY PINS SECURELY
3. IN CASE OF HEAVY MAINTENANCE, ALWAYS USE SAFETY BLOCK IN ADDITION.



⚠ WARNING

1 EMERGENCY STEERING SYSTEM (DAILY CHECK)
CHECK THE FUNCTION WITH ENGINE STOP ON FLAT GROUND.
1. TURN THE STARTING SWITCH TO THE "ON" POSITION.
2. APPLY EMERGENCY STEERING SWITCH TO "ON" POSITION AND CHECK THAT STEERING WHEEL CAN BE OPERATED.
3. TURN EMERGENCY STEERING SWITCH TO "OFF" POSITION.

IN CASE OF THE AUTOMATIC EMERGENCY STEERING SYSTEM, IF EQUIPPED.
1. TURN THE STARTING SWITCH TO THE "ON" POSITION.
2. RELEASE THE PARKING BRAKE. THE SYSTEM WILL ACTIVATE WITHIN 1.5 SECONDS.
3. APPLY THE PARKING BRAKE.

2 EMERGENCY BRAKE SYSTEM (DAILY CHECK)
1. RAISE THE AIR PRESSURE TO THE MAXIMUM AND APPLY EMERGENCY BRAKE.
2. PLACE GEAR SHIFT LEVER IN THE "D" POSITION. GRADUALLY INCREASE THE ENGINE SPEED, AND CHECK THAT THE MACHINE DOES NOT MOVE EVEN WHEN THE ENGINE SPEED REACHES 1900 rpm.

DO NOT USE EMERGENCY OR RETARDER BRAKE FOR PARKING.

⚠ WARNING

BEFORE LEAVING OPERATOR'S SEAT:
1. LOWER THE BODY.
2. STOP THE MACHINE ON LEVEL GROUND.
3. STOP ENGINE AND APPLY PARKING BRAKE SECURELY.

BLOCK WHEELS SECURELY BEFORE LEAVING THE MACHINE.

IDLE THE ENGINE FOR 5 MINUTES BEFORE SHUTTING IT DOWN.

⚠ WARNING

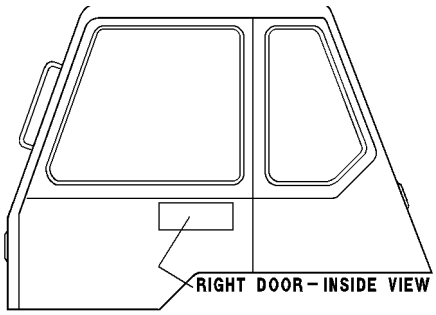
WHENEVER THE RETARDER OIL TEMPERATURE WARNING LAMP LIGHTS UP, SHIFT DOWN AND STOP THE MACHINE.

RETURN THE SHIFT LEVER TO NEUTRAL.

RUN THE ENGINE AT 2000 rpm UNTIL THE WARNING LAMP GOES OUT.

561-93-61731

This caution plate contains (4) cautions - Inspection and Maintenance With Body In Raised Up Position, Equipment Steering System, Engine Shut Down Procedure, Retarder Oil Temperature Warning Light.
These "CAUTIONS" stress the importance of reading and understanding the operators manual prior to the operation of equipment.



⚠ D A N G E R

HIGH PRESSURE CYLINDER CHARGED WITH DRY NITROGEN

DO NOT REMOVE ANY HARDWARE INCLUDING CAPSCREWS, PLUGS, VALVE OR VALVE CORE UNTIL ALL PRESSURE HAS BEEN RELEASED. REMOVAL OF ANY HARDWARE WHILE CYLINDER IS UNDER PRESSURE MAY RESULT IN HARDWARE FLYING FROM CYLINDER. REFER TO OPERATION AND MAINTENANCE MANUAL OR SHOP MANUAL FOR PRESSURE RELEASE INSTRUCTIONS.

1. CHECK OIL LEVEL ACCORDING TO INSTRUCTION MANUAL.
2. CHARGE CYLINDER WITH DRY NITROGEN GAS ONLY.

TO CHARGE CYLINDER: SEE YOUR HAULPAK DISTRIBUTOR FOR ALL TOOLS AND INFORMATION REQUIRED FOR CHARGING CYLINDERS

EB9099

DANGER plates are mounted on each suspension cylinder. These plates warn that the suspensions are charged with high pressure nitrogen. No servicing of any kind should be attempted until the service manual has been referenced and proper and safe procedures are followed.

⚠ C A U T I O N

DRAIN WATER FROM AIR RESERVOIR AFTER DAILY OPERATION.

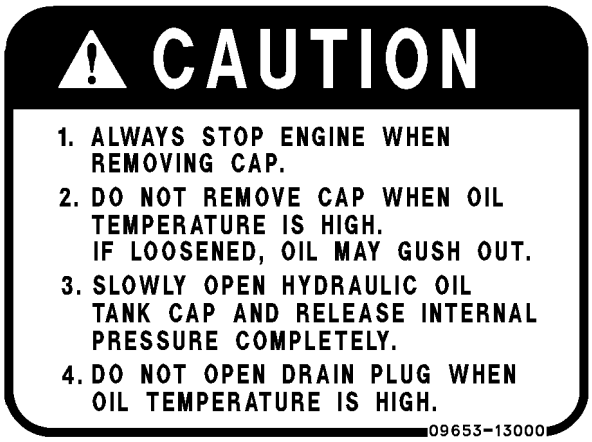
EB9097

Caution plates are mounted at the air tank on center top deck, also at rear frame just below tail light assemblies. Caution should be used when opening drain valves. System under high pressure.

BRAKE
COOLING
OIL

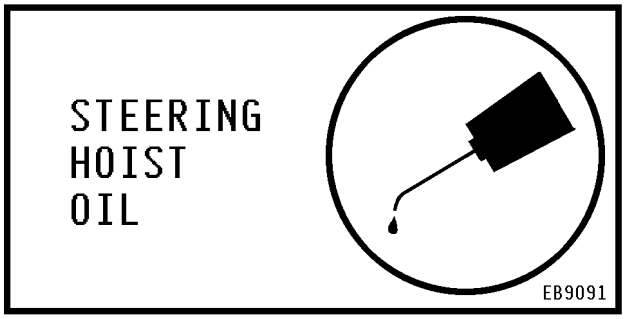
EB9090

A Brake Cooling Oil decal is located between the filler cap and sight gauge on the right hand side of the hydraulic tank.

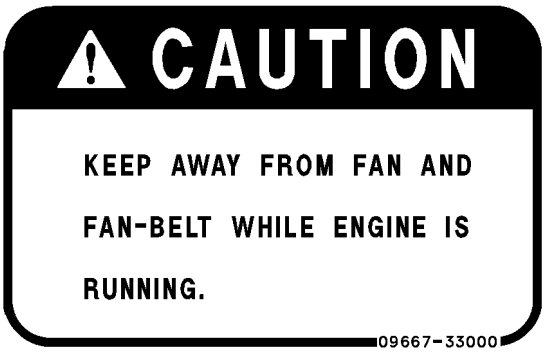


A CAUTION plate is attached to the hydraulic tank, alerting the service person that the engine must always be shut down and cooled before removing fillercap. This plate also alerts the service person of HOT oil under pressure. Hydraulic oil becomes heated and pressurized during operation. Care must be taken to avoid burns when it is necessary to open the hydraulic system.

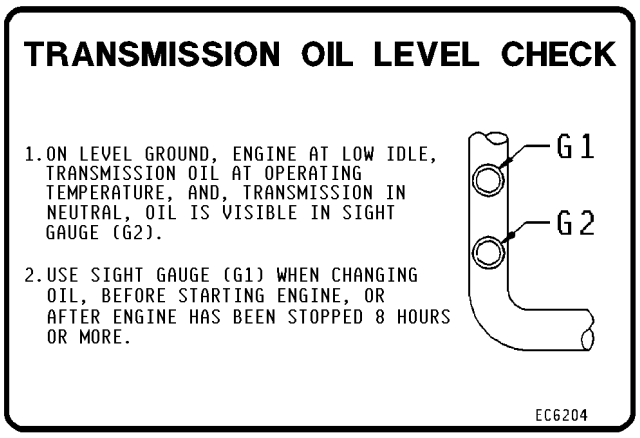
Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.



Steering and Hoist Oil decal is located to the left of the left hand filler cap on left hand side of hydraulic tank.



This CAUTION plate is located on left hand side of radiator shroud. Extreme care should be taken when working around fan and belts. Hands and loose articles of clothing should be kept away when machine is operating.



A plate is mounted on the left hand side of the transmission oil pan to provide instructions for proper transmission oil level check.

A Caution plate is located next to the sight gauge on the front brake oil tank, mounted on air tank top right hand deck. The Caution plate alerts service person to use only SAE-10W oil.
Brake system components are not compatible with other fluids which can cause component deterioration.

DIESEL FUEL ONLY

(SEE YOUR OPERATION AND MAINTENANCE MANUAL FOR DETAILS.)

-DRAIN WATER FROM THE FUEL TANK AT THE BEGINNING OF THE DAY'S RUN.

EB9094

A plate is located next to filler cap on fuel cap which specifies Diesel Fuel Only. Care should be taken to open cap slowly and bleed off pressure that may be in tank when removing filler cap.
Operation and Maintenance Manual refered to is from **Engine** Manufacturer.

. . . . . .

DANGER EXPLOSIVE GASES

Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge battery or use booster cables or adjust post connections without proper instruction and training.

KEEP VENT CAPS TIGHT AND LEVEL

POISON CAUSES SEVERE BURNS

Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.

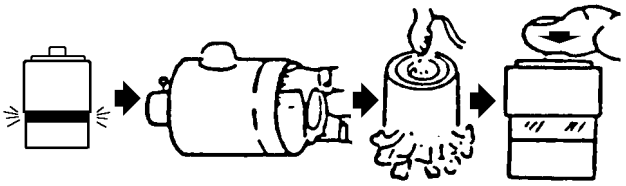
KEEP OUT OF REACH OF CHILDREN A210

09664-30081

A040012

Attached to the interior of battery box lid is a DANGER plate. This plate stresses the need to keep from making any sparks near the battery. When another battery or 24VDC power source is used for auxiliary power, all switches must be "Off" prior to making any connections. When connecting auxiliary power cables, positively maintain correct polarity; connect the positive (+) leads together and then connect the negative (-) lead of the auxiliary power cable to a good frame ground. Do not connect to the negative post of the truck battery or near the battery box. This hookup completes the circuit but minimizes danger of sparks near the batteries.

Sulfuric acid is corrosive and toxic. Use proper safety gear, goggles, rubber gloves and rubber apron when handling and servicing batteries. Avoid contact with skin, eyes or clothing. In event of accident, immediately flush with plenty of water and call a physician. KEEP OUT OR REACH OF CHILDREN!



SERVICE INDICATOR A040015

A service indicator plate is located on the center air cleaner housing.
Service filter element when red signal reaches service level in dust indicator.

⚠CAUTION

When using compressed air, wear safety glasses and all other safety equipment required when cleaning.

. . . . . .

⚠ C A U T I O N

PRIOR TO WELDING ON TRUCK

1) DISCONNECT THE FOLLOWING TERMINALS
   - BATTERY (GROUND)
   - ALTERNATOR TERMINAL (B)
   - CONTROLLER FOR TRANSMISSION (CNSC3)
   - JUNCTION CONNECTOR IN CAB (CNJ04)

2) COVER THE (AESC) ALL ELECTRONIC SPEED CONTROL UNIT FOR PROTECTION FROM SPARKS.

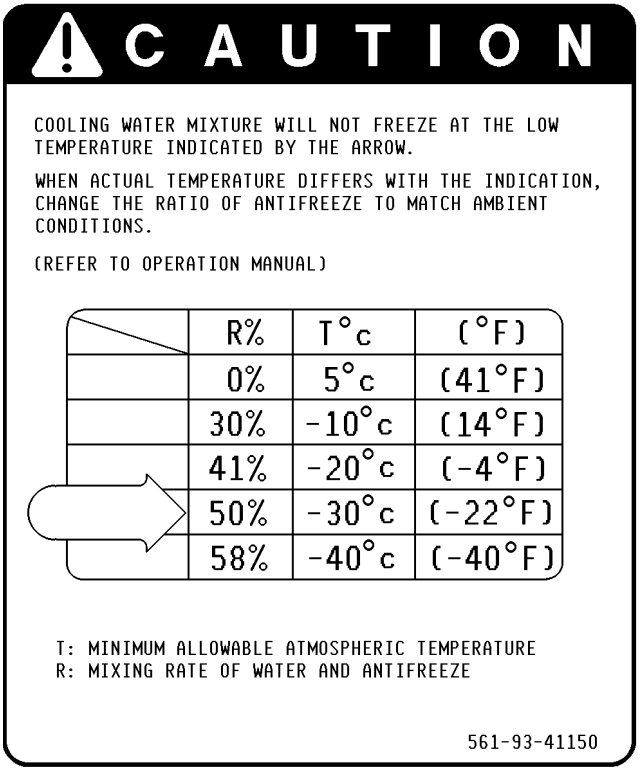
3) DO NOT CONNECT WELDING CABLES TO THE AESC.

4) DO NOT WELD ON THE AESC.

5) REMOVE THE AESC UNIT IF WELDING IS TO BE DONE WITHIN 10" OF IT.

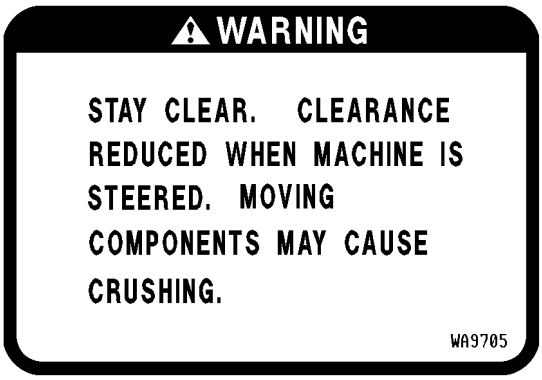
EC6203

A caution plate is located on the right hand inside door panel and also on the lid of the battery box. These instructions must be followed when welding is done on the truck to avoid damage to the electronic components.

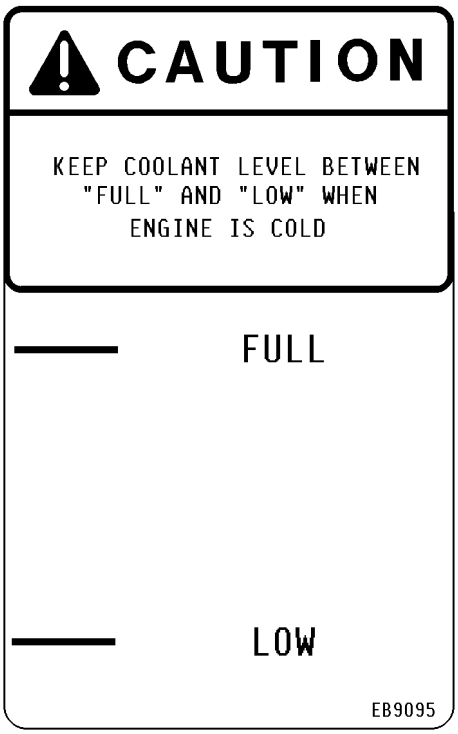


A Caution plate is located on center deck floor next to radiator fill access cover plate. When actual temperature differs with the indication, change the ratio of antifreeze to match ambient conditions.

Service personnel should use caution when servicing radiator. The system is pressurized because of thermal expansion of coolant. "DO NOT" remove radiator cap while engine is hot. Severe burns may result.

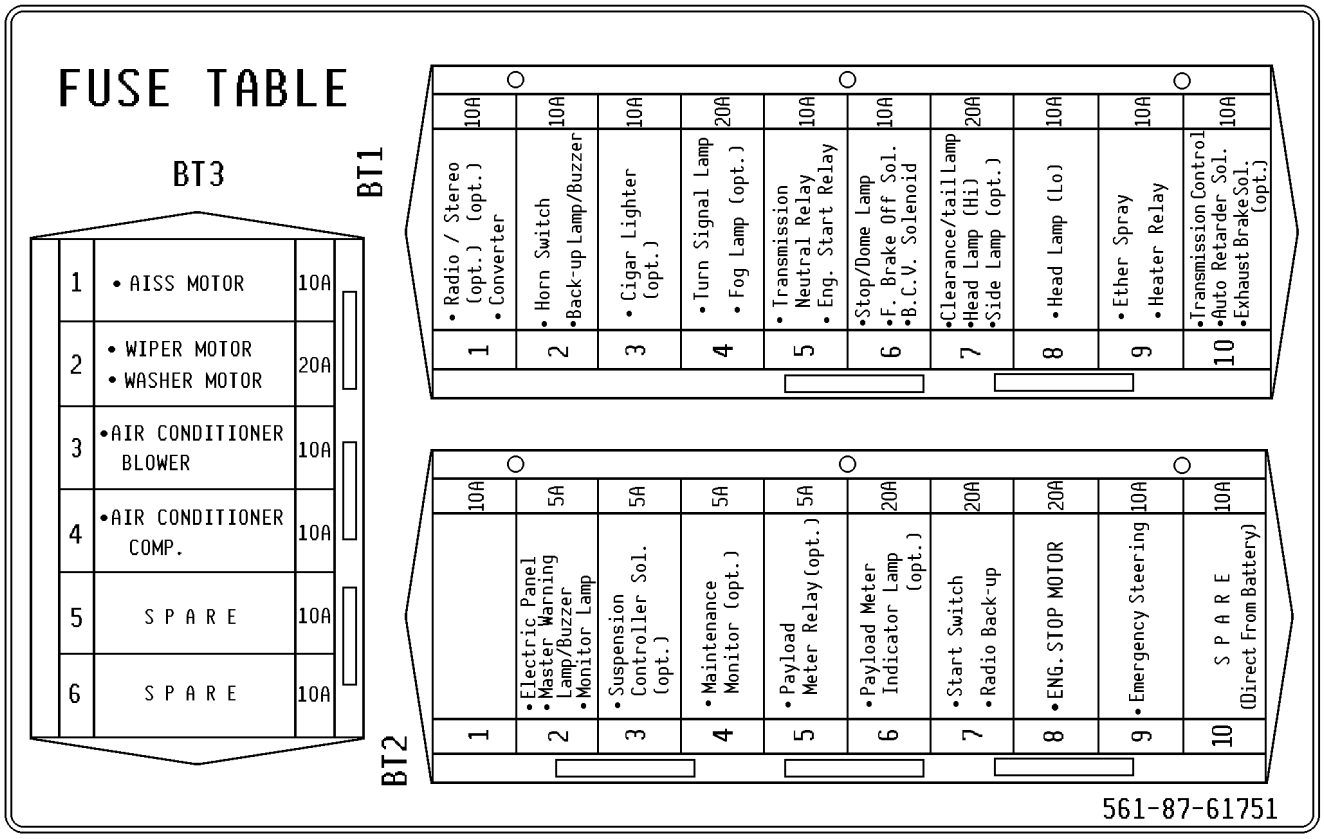


Warning plates are mounted on the truck frame in front of and to the rear of both front tires to alert all persons to stay clear when the truck is being steered.



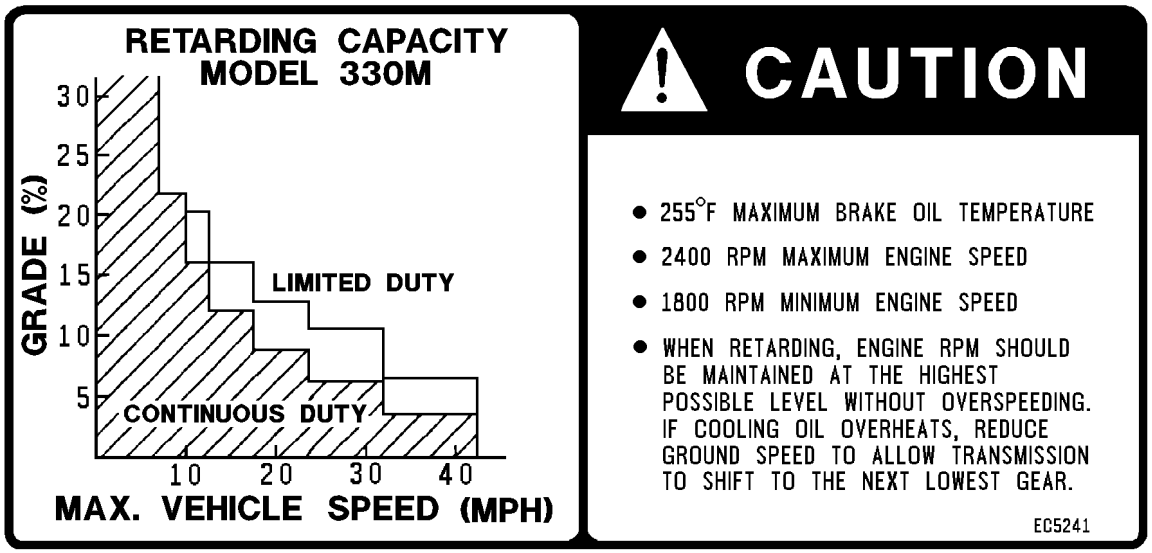
A Caution plate is located next to the sight gauge on the radiator cooling water reserve tank on top of right hand deck just aft of battery box.

Keep coolant level between "FULL" and "LOW" when engine is cold.



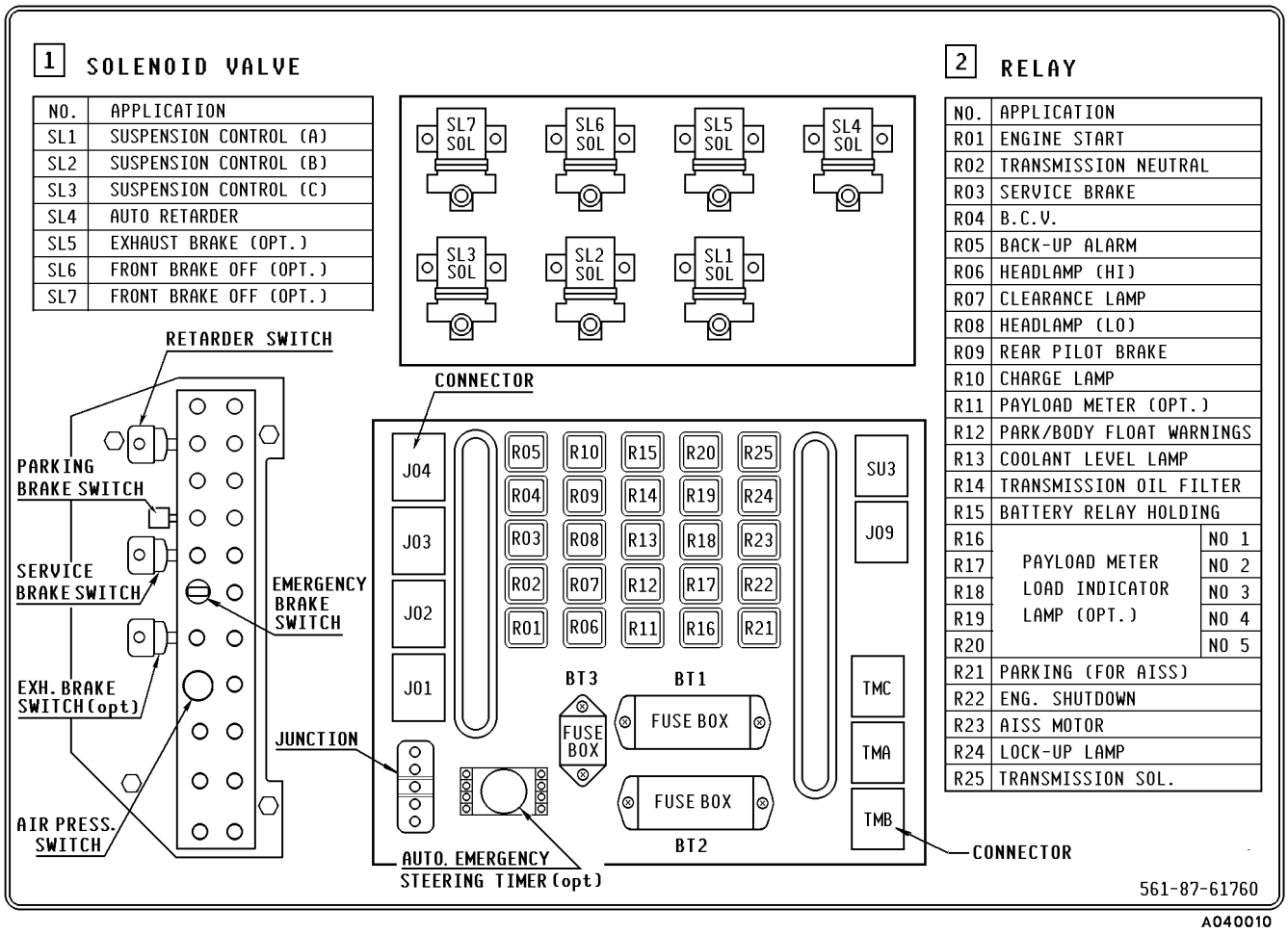
A040037

An informational plate for solenoid valve and relays is mounted to the inside lid of the electrical console behind the operator and passenger seats.

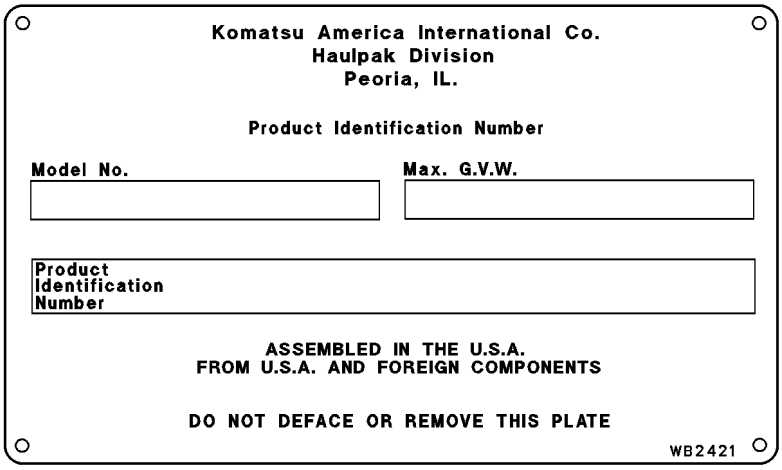


A Speed/Grade decal showing Retarding Capacities is located inside the cab on the left-hand door panel to help the operator maintain a safe vehicle speed while descending a grade with a loaded truck. The operator should preselect a ground speed and gear range for a known grade that will permit continous retarder operation within the SHADED portion of the graph.

For efficient retarder operation, the operator should: Maintain engine RPM between 1800 — 2400 RPM, and Observe the Brake Oil Temperature gauge to make certain the Brake Oil Temperature does not exceed 255°F (125°C). If the Brake Oil Temperature exceeds this limit, use truck service brakes and reduce ground speed to allow transmission to shift to next lowest gear range.



An informational plate for the fuse table is located to the left of the solenoid valve and relay plate. This is mounted inside of lid of the electrical console behind the operator and passenger seats.



A product identification plate is located on left hand front fender on the inside top, this gives the vehicles model number, maximum G.V.W. and product identification number.

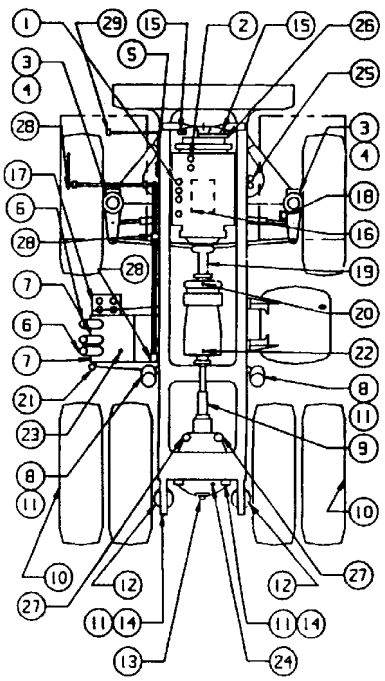
LUBRICATION CHART

LUBRICATION SPECIFICATIONS

LUBE KEY	TYPE LUBRICANT	-65°F TO -25°F	-25°F TO +32°F	+32°F TO +90°F	ABOVE 90°F
A	ENGINE OIL	SEE ENG. MANUAL*	SEE ENG. MANUAL*	SEE ENG. MANUAL	SEE ENG. MANUAL
B	MULTI-PURPOSE GEAR OIL	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W
C	HYDRAULIC OIL	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 10W	MIL-L-2104 C SAE 10W
D	MOLYBDENUM DISULPHIDE GREASE 3% MIN	#0	#1	#2	#2

DESCRIPTION	SYM.	PTS.	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR
ENGINE LUBE FILTERS	1	4					CHANGE			
FUEL FILTER ELEMENT	2	2					CHANGE			
FRONT SUSPENSION ASSEMBLY/PINS	3	8	D				GREASE			
STEERING CYLINDER LINKAGE	4	4	D				GREASE			
STEERING LINKAGE	5	5	D				GREASE			
HYDRAULIC FILTER	6	3							CHANGE	
HYDRAULIC TANK	7	2	C	CHECK						CHANGE
HOIST CYLINDER PIVOT	8	4	D				GREASE			
U-JOINT ASSEMBLY (REAR)	9	3	D				GREASE			
FINAL DRIVE CASE	10	2	B				CHECK			CHANGE
AXLE SUPPORT PIN	11	8	D				GREASE			
REAR SUSPENSION PIN	12	4	D				GREASE			
DIFFERENTIAL CASE	13	1	B				CHECK			CHANGE
BODY HINGE PINS	14	2	D				GREASE			
CORROSION RESISTOR	15	4					CHANGE			
ENGINE CRANKCASE OIL	16	1	A	CHECK			CHANGE			
TRANSMISSION OIL FILTER	17	4						CHANGE		
FRONT BRAKE OIL TANK	18	1		CHECK						
U-JOINT ASSEMBLY (FRONT)	19	2	D				GREASE			
TRANSMISSION MOUNT	20	1	D						GREASE	
TRANSMISSION OIL	21	1	C	CHECK					CHANGE	
TRANSMISSION CASE BREATHER	22	1					CLEAN			
HYDRAULIC TANK BREATHER	23	1					CLEAN			
DIFFERENTIAL CASE BREATHER	24	1								CLEAN
ENGINE BY-PASS FILTER	25	2					CHANGE			
TENSION PULLEY ARM	26	1							GREASE	
PARKING BRAKE	27	8	D						GREASE	
DUMP CONTROL LINKAGE	28	3	D							GREASE
ENGINE CONTROL LINKAGE	29	4	D							GREASE
	30									
	31									
	32									
	33									
	34									

* AUXILIARY HEATERS REQUIRED BELOW -23°C (-10°F)



WA9876

The lubrication chart is located on the left hand front fender behind the ladder. Refer to service manual, Section "P", "Lubrication and Service", for more complete lubrication instructions.

STANDARD CHARTS AND TABLES

This manual provides dual dimensioning for many specifications. Metric units are specified first, with U.S. standard units in parentheses. References throughout the manual to standard torques or other standard values will be to one of the following Tables.

For values not shown in any of the charts or tables, standard conversion factors for most commonly used measurements are provided in the conversion table below.

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COMMON CONVERSION MULTIPLIERS
METRIC To ENGLISH

To Convert From	TO	Multiply By
millimeter (mm)	inch – in.	0.0394
centimeter (cm)	inch – in.	0.3937
meter (m)	foot – ft.	3.2808
meter (m)	yard – yd.	1.0936
kilometer (km)	mile – mi.	0.6210
sq. centimeters (cm^2)	sq. in. – $in.^2$	0.1550
sq. centimeters (cm^2)	sq. ft. – $ft.^2$	0.001
cu. centimeters (cm^3)	cu. in. – $in.^3$	0.061
liters (l)	cu. in. – $in.^3$	61.02
cu. meters (m^3)	cu. ft. – $ft.^3$	35.314
liters (l)	cu. ft. – $ft.^3$	0.0353
grams (g)	ounce – oz.	0.0353
milliliter (ml)	fluid ounce – fl. oz.	0.0338
kilogram (kg)	pound (mass)	2.2046
Newton (N)	pound (force) – lbs.	0.2248
Newton.meters (N.m)	kilogram.meters (kg.m)	0.102
Newton.meters (N.m)	ft. lbs. (force)	0.7376
kilogram.meters (kg.m)	ft. lbs. (force)	7.2329
kilogram.meters (kg.m)	Newton.meters (N.m)	9.807
Kilopascals (kPa)	psi (pressure)	0.1450
megapascals (MPa)	psi (pressure)	145.038
kilograms/cm^2 (kg/cm^2)	psi (pressure)	14.2231
kilograms/cm^2 (kg/cm^2)	kilopascals (kPa)	98.068
kilogram (kg)	ton (short)	0.0011
metric ton	ton (short)	1.1023
liters (l)	quart – qt.	1.0567
liters (l)	gallon – gal.	0.2642
Watts	HP (horsepower)	0.00134
kilowatts (kw)	HP (horsepower)	1.3410