

Shop Manual

CEBM007000



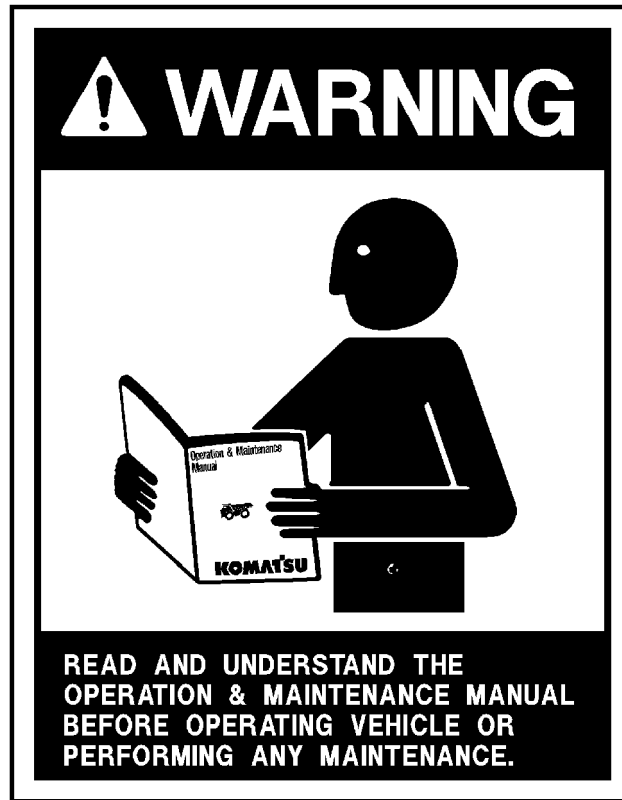
930E-2

DUMP TRUCK

SERIAL SUFFIX

A30181 thru A30223
W/ Cummins QSK60 Engine

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.***

This material is proprietary to Komatsu Mining Systems, Inc. and is not to be reproduced, used, or disclosed except in accordance with written authorization from Komatsu Mining Systems, Inc.

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 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.***

NOTES:

FOREWORD

This Shop 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 $\pm 10\%$ tolerance unless otherwise specified.

A Product Identification plate is normally located on the truck frame in front of the right 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 KOMATSU Truck Model designation consists of three numbers and one letter (i.e. 930E). 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.



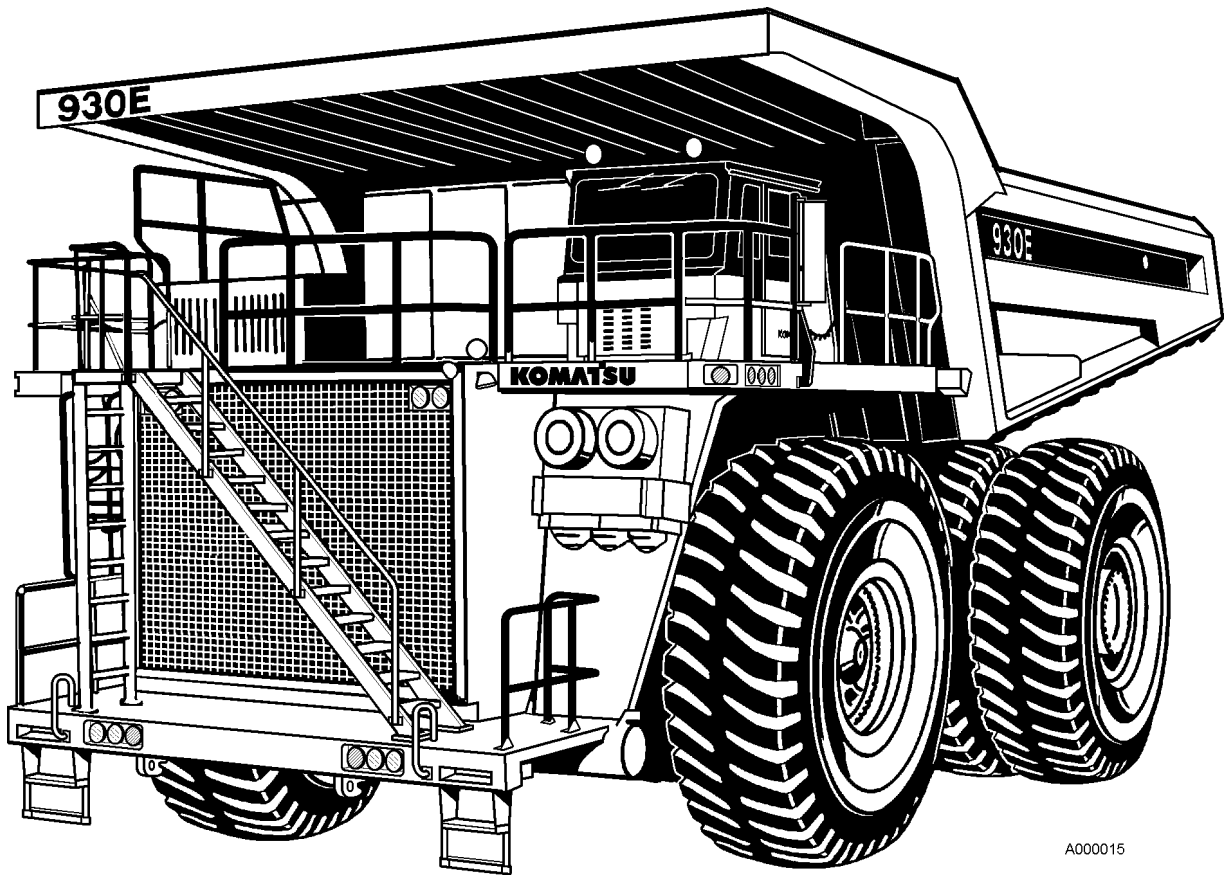
“WARNING” identifies a specific potential hazard WHICH MAY RESULT in either INJURY OR DEATH if proper precautions are not taken.



“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.

TABLE OF CONTENTS

SUBJECT	SECTION
GENERAL INFORMATION	A
STRUCTURES	B
ENGINE, FUEL, COOLING AND AIR CLEANER	C
ELECTRIC SYSTEM (24 VDC. NON-PROPULSION)	D
ELECTRIC PROPULSION AND CONTROL	E
DRIVE AXLE, SPINDLES AND WHEELS	G
HYDRAIR [®] II SUSPENSIONS	H
BRAKE CIRCUIT	J
HYDRAULIC SYSTEM	L
OPTIONS AND SPECIAL TOOLS	M
OPERATOR'S CAB	N
LUBRICATION AND SERVICE	P
ALPHABETICAL INDEX	Q
SYSTEM SCHEMATICS	R



A000015

KOMATSU MODEL 930E Dump Truck

SECTION A

GENERAL INFORMATION

INDEX

TRUCK COMPONENT DESCRIPTION & SPECIFICATIONS	A2-1
GENERAL SAFETY AND TRUCK OPERATION	A3-1
WARNINGS AND CAUTIONS	A4-1
CHARTS AND TABLES	A5-1
STORAGE PROCEDURES	A7-1

NOTES

MAJOR COMPONENT DESCRIPTION

Truck And Engine

The 930E Dump Truck is an off-highway, rear dump truck with AC Electric Drive. The gross vehicle weight is 1,100,000 lbs. (498 957 kg). The engine is a Cummins QSK60C rated @ 2700 HP (2014 kW).

Alternator (GE-GTA34)

The diesel engine drives an in-line alternator at engine speed. The alternator produces AC current which is rectified to DC within the main control cabinet. The rectified DC power is converted back to AC by groups of devices called “inverters”, also within the main control cabinet. Each inverter consists of six “phase modules” under the control of a “gate drive unit” (GDU). The GDU controls the operation of each phase module.

Each phase module contains an air-cooled solid-state switch referred to as a “gate turn-off thyristor” (GTO). The GTO cycles on and off at varying frequencies to create an AC power signal from the DC supply.

The AC power signal produced by each inverter is a variable-voltage, variable-frequency signal (VVVF). Frequency and voltage are changed to suit the operating conditions.

AC Induction Traction Motorized Wheels

The alternator output supplies electrical energy to the two wheel motors attached to the rear axle housing. The motorized wheels use three-phase AC induction motors with full-wave AC power.

The two wheel motors convert electrical energy back to mechanical energy through built-in gear trains within the wheel motor assembly. The direction of the wheel motors is controlled by a forward or reverse hand selector switch located on a console to the right side of the operator.

Blower

Both the inverters and the wheel motors produce heat while in operation and must be cooled. Cooling air is provided by a separate AC drive blower using rectified DC as its power source. Cooling air flow volume is modulated based on thermal requirements.

Suspension

HYDRAIR® II suspension cylinders located at each wheel provide a smooth and comfortable ride for the operator and dampens shock loads to the chassis during loading and operation.

Operator's Cab

The Operator's Cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck. The cab provides for wide visibility, with an integral 4-post ROPS/FOPS structure, and an advanced analog operator environment. It includes a tinted safety-glass windshield and power-operated side windows, a deluxe interior with a fully adjustable seat with lumbar support, a fully adjustable/tilt steering wheel, controls mounted within easy reach of the operator, and an analog instrument panel which provides the operator with all instruments and gauges which are necessary to control and/or monitor the truck's operating systems.

Power Steering

The truck is equipped with a full time power steering system which provides positive steering control with minimum operator effort. The system includes nitrogen-charged accumulators which automatically provide emergency power if the steering hydraulic pressure is reduced below an established minimum.

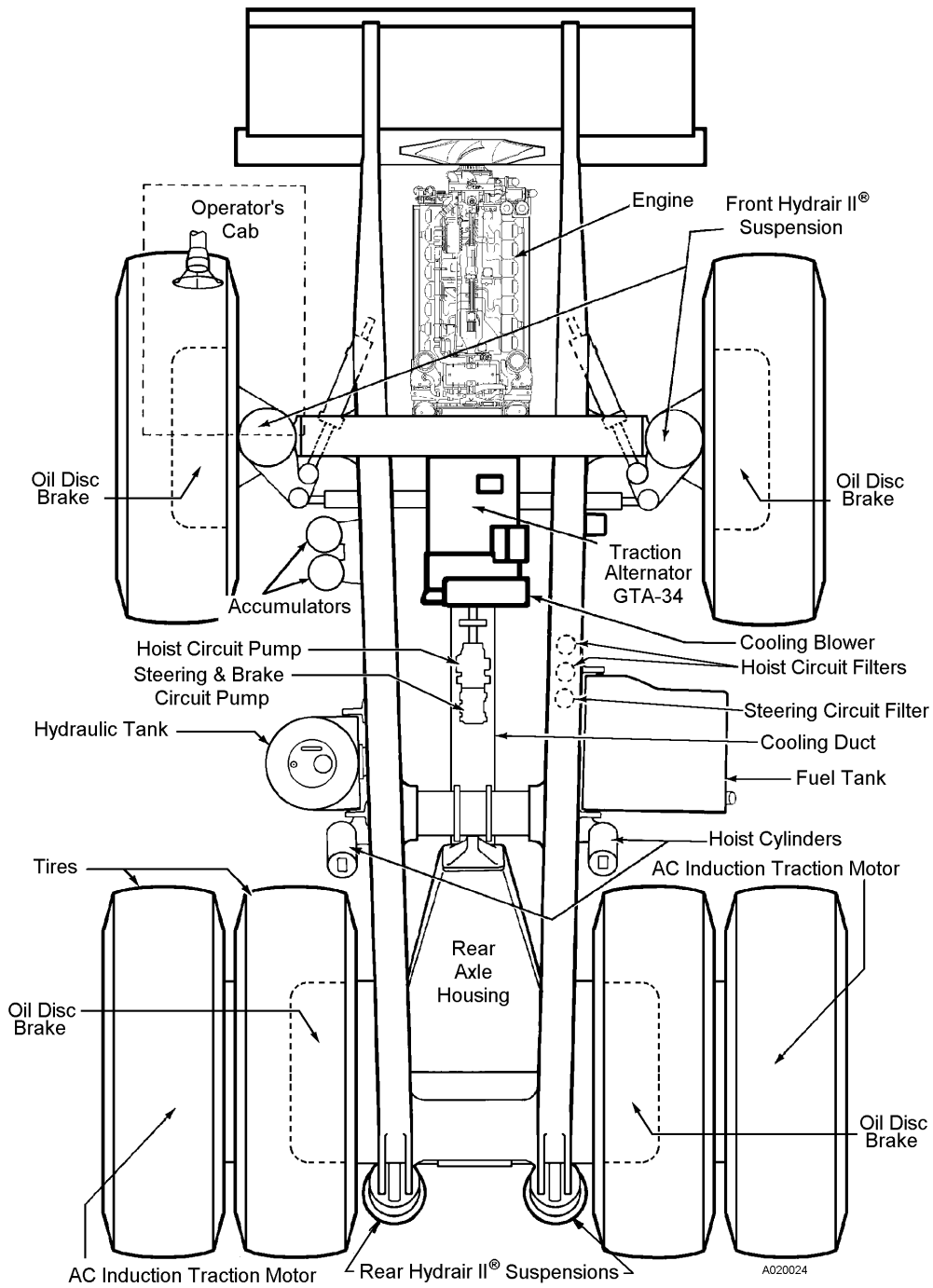
Dynamic Retarding

The dynamic retarding is used to slow the truck during normal operation or control speed coming down a grade. The dynamic retarding ability of the electric system is controlled by the operator through the activation of the retarder pedal (or by operating a lever on the steering wheel) in the operators cab and by setting the RSC (Retarder Speed Control). Dynamic Retarding is automatically activated, if the truck speed goes to a preset overspeed setting.

Brake System

Service brakes at each wheel are oil-cooled multiple disc brakes applied by an all-hydraulic actuation system. Depressing the brake pedal actuates both front and rear brakes, after first applying the retarder. All wheel brakes will be applied automatically, if system pressure decreases below a preset minimum.

The parking brake is a dry disc type, mounted inboard on each rear wheel motor, and is spring-applied and hydraulically-released with wheel speed application protection (will not apply with truck moving).



930E MAJOR COMPONENTS

SPECIFICATIONS

These specifications are for the standard 930E Truck. Customer Options may change this listing.

ENGINE

Cummins QSK60

Number of Cylinders	16
Operating Cycle	4-Stroke
Rated Brake HP 2700HP (2014 kW) @ 1900 RPM	
Flywheel HP	2550HP (1879 kW)
Weight (Dry)*	19,515 lbs. (8852 kg)

* Weight does not include Radiator, Sub-frame, or Alternator

AC ELECTRIC DRIVE SYSTEM

AC/DC Current

Alternator	General Electric GTA - 34
Integral Cooling Fan	2500 cfm (71 m ³ /min)
AC Thermally Mod. Dual Fan	
.	12,000 cfm (340 m ³ /min)
Motorized Wheels	AC Induction Traction Motors
.	Wheel Slip/Slide Control
Standard Gear Ratio*	31.50:1
Maximum Speed	40 MPH (64.5 km/h)

*NOTE: Wheelmotor application depends upon GVW, haul road grade, haul road length, rolling resistance, and other parameters.
Komatsu & G.E. must analyze each job condition to assure proper application.

DYNAMIC RETARDING

Electric Dynamic Retarding	Standard
Maximum Retarding	5400 HP (4026 kW)
Continuous	3300 HP (2460 kW)
Continuously Rated High-density Blown Grids with Retard at Engine Idle and Retard in Reverse Propulsion.	

BATTERY ELECTRIC SYSTEM

Batteries -	bumper-mounted
4 x 8D & 2 x 30H 12 Volt Batteries in Series/Parallel	
.	220 Ampere-Hour Capacity
.	With Disconnect Switch
Alternator	24 Volt, 240 Ampere Output
Lighting	24 Volt
Starters (2)	24 Volt

SERVICE CAPACITIES

	U.S. Gallons	Liters
Crankcase (Includes lube oil filters)		
QSK60-C	74	280
Cooling System	157	594
Fuel	1200	4542
Hydraulic System	350	1325
Wheel Motor Gear Box 20/Wheel	76/Wheel	

HYDRAULIC SYSTEM

Hoist & Brake Cooling Pump:	Tandem Gear
Output	270 GPM (1022 l/min) @ 1900 RPM
.	and 2500 psi (17 237 kPa)
Steering/Brake Pump: Press. Compensated Piston	
Output	65 GPM (246 l/min) @ 1900 RPM
.	and 2750 psi (18 961 kPa)
Relief Pressure- Hoist	2500 psi (17.2 MPa)
Relief Press.- Steering/Brake	2750 psi (22.4 MPa)
Hoist	Two 3-Stage Hydraulic Cylinders
Tank	Vertical - Cylindrical, Non-Pressurized
Tank Capacity	250 U.S. Gal. (947 Liters)
Filtration	In-line replaceable elements
Suction	Single, Full Flow, 100 Mesh
Hoist & Steering Filters	Beta 12 rating = 200
.	Dual, In-Line, High Pressure

SERVICE BRAKES

All Hydraulic Actuation	with Traction System
.	Wheel Slip/Slide Control
Front & Rear Oil-Cooled Multiple Discs	
.	at Each Wheel.
Total Friction Area /Brake	15,038 in ² (97 019 cm ²)
Maximum Apply Pressure	2500 psi (17 238 kPa)

STEERING

Turning Circle (SAE)	97 ft. 4 in. (29.67 m)
Twin hydraulic cylinders with accumulator assist to provide constant rate steering.	
Emergency Power Steering automatically provided by Accumulators	

STANDARD DUMP BODY*

Capacity:

Struck	224 yds ³	171 m ³
Heaped @ 2:1 (SAE)	276 yds ³	211 m ³
Width (Inside)	26 ft. 9 in.	(8.15 m)
Depth	10 ft. 3 in.	(3.1 m)
Loading Height	23 ft.	(7.01 m)
Dumping Angle	45°	

* OPTIONAL Capacity Dump Bodies are available.

WEIGHT DISTRIBUTION

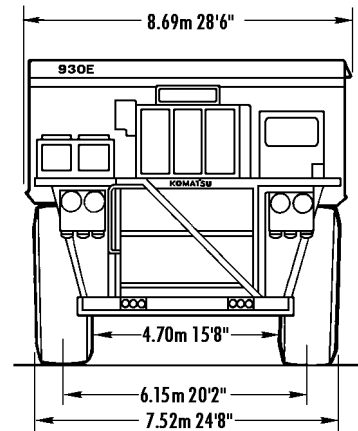
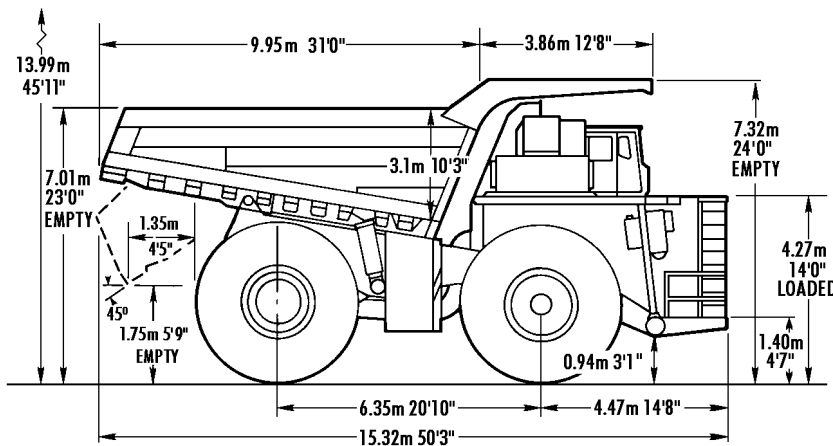
EMPTY	Pounds	Kilograms
Front Axle (49.3%)	219,913	99 751
Rear Axle (50.7%)	226,121	102 567
Total (50% Fuel)	446,034	202 318
LOADED		
Front Axle (33.9%)	372,727	169 069
Rear Axle (66.1%)	727,273	329 891
Total	1,100,000	498 960

Not to exceed 1,100,000 lbs. (498 957 kg), including options, fuel, and payload. Weights in excess of this amount require factory approval.

TIRES

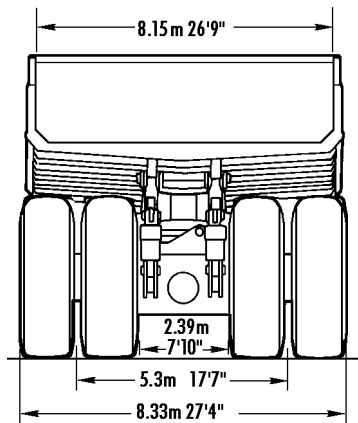
Radial Tires (standard)	53/80 R63
Rock Service, Deep Tread	Tubeless
Rims . (patented Phase II New Generation™ rims)	

OVERALL TRUCK DIMENSIONS



All Dimensions with 171/211 m³ 224/276 yd³ Body

BODIES	Struck		2:1 Heap		Loading Height	
	M ³	Yd ³	M ³	Yd ³	M	Feet
Standard	171	224	211	276	7.01	23'0"



A020025

GENERAL SAFETY

Safety records of most organizations will show that the greatest percentage of accidents are caused by unsafe acts of persons. The remainder are caused by unsafe mechanical or physical conditions. Report all unsafe conditions to the proper authority.

The following safety rules are provided as a guide for the operator. However, local conditions and regulations may add many more to this list.



Read and follow all safety precautions. Failure to do so may result in serious injury or death.

SAFETY RULES

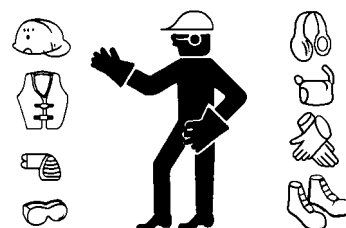
- ONLY trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- When working with another operator or a person on worksite traffic duty, be sure all personnel understand all hand signals that are to be used.
-

SAFETY FEATURES

- Be sure all guards and covers are in their proper position. Have guards and covers repaired if damaged. (See Walk-Around Inspection, Operating Instructions - Section 3)
- Learn the proper use of safety features such as safety locks, safety pins, and seat belts, and use these safety features properly.
- NEVER remove any safety features. ALWAYS keep them in good operating condition.
- Improper use of safety features could result in serious bodily injury or death.
-

CLOTHING AND PERSONAL PROTECTIVE ITEMS

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



A0055010

UNAUTHORIZED MODIFICATION

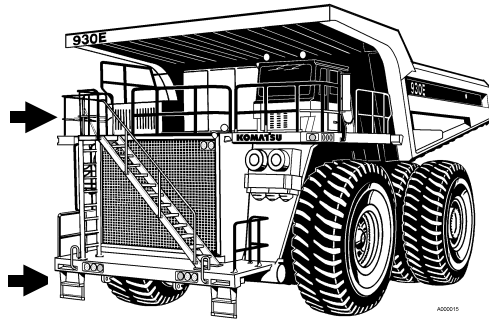
- Any modification made to this vehicle without authorization from Komatsu Mining Systems, Inc. can possibly create hazards.
- Before making any modification, consult the authorized regional Komatsu Mining Systems, Inc. distributor. Komatsu will not be responsible for any injury or damage caused by any unauthorized modification.

LEAVING THE OPERATOR'S SEAT

- When preparing to leave the operator's seat, do not touch any control lever that is not locked.
To prevent accidental operations from occurring, always carry out the following:
- Move the shift control lever to the Neutral position (N) and set the parking lever/switch to the PARKING position.
- Lower the dump body, set the dump lever to the FLOAT position.
- Stop the engine. When leaving the machine, always lock everything. Always remember to take the key with you. If the machine should suddenly move or move in an unexpected way, this may result in serious bodily injury or death.

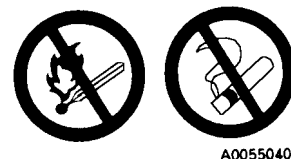
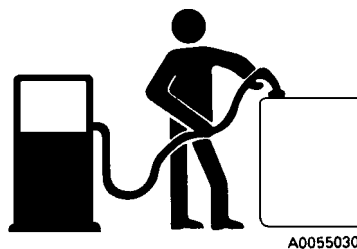
MOUNTING AND DISMOUNTING

- NEVER jump on or off the machine. NEVER get on or off a moving machine.
- When getting on or off the machine, face the machine and use the handhold and steps.
- Never hold any control levers when getting on or off the machine.
- Always maintain three-point contact with the handholds and steps to ensure that you support yourself.
- When bringing tools to the operator's compartment, always pass them by hand or pull them up by rope.
- If there is any oil, grease, or mud on the handholds or steps, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.
- Use the handrails and steps marked by arrows in the diagram below when getting on or off the machine.



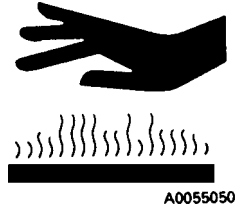
FIRE PREVENTION FOR FUEL AND OIL

- Fuel, oil, and antifreeze can be ignited by a flame. Fuel is particularly FLAMMABLE and can be HAZARDOUS.
- Keep flame away from flammable fluids.
- Stop the engine and do not smoke when refueling.
- Tighten all fuel and oil tank caps securely.
- Refueling and oiling should be made in well ventilated areas.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.



PRECAUTIONS WHEN HANDLING AT HIGH TEMPERATURES

- Immediately after operations, the engine cooling water, engine oil, and hydraulic oil are at high temperature and are under pressure. If the cap is removed, or the oil or water is drained, or the filters are replaced, there is danger of serious burns. Always wait for the temperature to cool down, and carry out the operation according to the specified procedure.
- To prevent hot water from spurting out:
 - 1) Stop the engine.
 - 2) Wait for the water temperature to cool down.
 - 3) Turn the cap slowly to release the pressure before removing the cap.
- To prevent hot engine oil from spurting out:
 - 1) Stop the engine.
 - 2) Wait for the oil temperature to cool down.
 - 3) Turn the cap slowly to release the pressure before removing the cap.

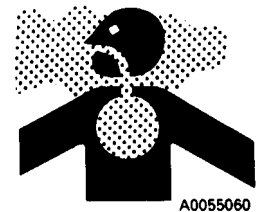


ASBESTOS DUST HAZARD PREVENTION

Asbestos dust can be HAZARDOUS to your health if it is inhaled.

If you handle materials containing asbestos fibers, follow these guidelines as given below:

- NEVER use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Operate the machine with the wind to your back, whenever possible.
- Use an approved respirator if necessary.

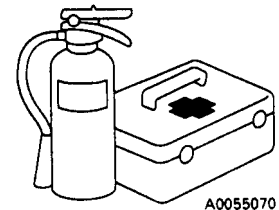


PREVENTION OF INJURY BY WORK EQUIPMENT

- Never enter or put your hand or arm or any other part of your body between movable parts such as the dump body and chassis or cylinders. If the work equipment is operated, the clearance will change and this may lead to serious bodily injury or death.

FIRE EXTINGUISHER AND FIRST AID KIT

- Be sure fire extinguishers have been provided and know how to use them.
- Provide a first aid kit at the storage point.
- Know what to do in the event of a fire.
- Be sure you know the phone numbers of persons you should contact in case of an emergency.



PRECAUTIONS WHEN USING ROPS

- If ROPS is installed, the ROPS must never be removed when operating the machine.
- The ROPS is installed to protect the operator if the machine should roll over. It is designed not only to support the load if the machine should roll over, but also to absorb the impact energy.
- The ROPS installed on equipment manufactured and designed by Komatsu Mining Systems, Inc. fulfills all of the regulations and standards for all countries, but if it is modified or repaired without authorization from Komatsu Mining Systems, Inc., or is damaged when the machine rolls over, the strength will drop and it will not be able to fulfill its function properly. It can only display its performance if it is repaired or modified in the specified way.
- When modifying or repairing the ROPS, always consult the authorized regional Komatsu Mining Systems, Inc. distributor.
- Even if the ROPS is installed, it cannot show its full effect if the operator does not fasten the seat belt properly. Always fasten the seat belt when operating.

PRECAUTIONS FOR ATTACHMENTS

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

PRECAUTIONS DURING OPERATION

SAFETY IS THINKING AHEAD

Prevention is the best safety program. Prevent a potential accident by knowing the employer's safety requirements and all necessary job site regulations. In addition, know the proper use and care of all the safety equipment on the truck. Only qualified operators or technicians should attempt to operate or maintain the Komatsu Truck.

Safe practices start before the operator gets to the equipment!

SAFETY AT WORKSITE

- When walking to and from the truck, maintain a safe distance from all machines even if the operator is visible.
- Before starting the engine, thoroughly check the area for any unusual conditions that could be dangerous.
- Examine the road surface in the jobsite and determine the best and safest method of operation.
- Choose an area where the ground is as horizontal and firm as possible before carrying out the operation.
- If you need to operate on a road, protect pedestrians and cars by designating a person for worksite traffic duty or by installing fences around the worksite.
- The operator must check personally the work position, roads to be used, and existence of obstacles before starting operations.
- Always determine the travel roads in the worksite and maintain them so that it is always safe for the machines to travel.
- If travel through wet areas is necessary, check the depth and flow of water before crossing the shallow parts. NEVER be in water which is in excess of the permissible water depth.

FIRE PREVENTION

- Thoroughly remove wood chips, leaves, paper and other flammable things accumulated in the engine compartment. These could cause a fire.
- Check fuel, lubrication, and hydraulic systems for leaks. Have any leaks repaired.
Wipe up any excess oil, fuel or other flammable fluids.
- Be sure a fire extinguisher is present and working.
- Do not operate the machine near any flame.



PREPARING FOR OPERATION

- Always mount and dismount facing the truck. Never attempt to mount or dismount the truck while it is in motion. Always use handrails and ladder when mounting or dismounting from the truck.
- Check the deck areas for debris, loose hardware or tools. Check for people and objects that might be in the way.
- Become familiar with and use all protective equipment devices on the truck and insure that these items (anti-skid material, grab bars, seat belts, etc.) are securely in place.

VENTILATION FOR ENCLOSED AREAS

- If it is necessary to start the engine within an enclosed area, provide adequate ventilation. Exhaust fumes from the engine can KILL.



IN OPERATOR'S CAB - BEFORE STARTING ENGINE

- Do not leave tools or spare parts lying around in the operator's compartment or allow trash to accumulate in cab of truck. Keep all unauthorized reading material out of truck cab.
- Keep the cab floor, controls, steps, and handrails free of oil, grease, snow, and excess dirt.
- Check the seat belt, buckle and hardware for damage or wear. Replace any worn or damaged parts. Always use seat belts when operating your machine.
- Read and understand the contents of this manual. Read the Section 3 pertaining to safety and operating instructions with special attention. Become thoroughly acquainted with all gauges, instruments and controls before attempting operation of the truck.
- Read and understand the **WARNING** and **CAUTION** decals in the operator's cab.
- Insure steering wheel, horn, controls and pedals are free of any oil, grease or mud.
- Check operation of windshield wiper, condition of wiper blades, and check washer reservoir for fluid level.
- Be familiar with all steering and brake system controls and warning devices, road speeds and loading capabilities, before operating the truck.

KEEP MIRRORS, WINDOWS, AND LIGHTS CLEAN

- Remove any dirt from the surface of the windshield and all cab windows and lights. Good visibility may prevent an accident.
- Adjust the rear view mirror to a position where the operator can see best from the operator's seat, and keep the surface of the mirror clean. If any glass or light should break, replace it with a new part.
- Insure headlights, worklights and taillights are in proper working order. Check that the machine is equipped with the head lamps and working lamps needed for the operating conditions.

OPERATING THE MACHINE

WHEN STARTING ENGINE

- NEVER start the engine if a warning tag has been attached to the control.
- When starting the engine, sound the horn as an alert.
- Start and operate the machine only while seated.
- Do not allow any person other than the operator in the operator's compartment or any other place on the machine.

Truck Operation - General

- **WEAR SEAT BELTS AT ALL TIMES.**
- Only authorized persons are allowed to ride in truck. Riders should be in cab only and belted in passenger seat.
- Do not allow anyone to ride on decks or steps of truck.
- Do not allow anyone to get on or off truck while it is in motion.
- Do not move truck into or out of a building without a signal person present.
- Know and obey the hand signal communications between operator and spotter. When other machines and personnel are present, the operator should move in and out of buildings, loading areas and through traffic, under the direction of a signal person. **Courtesy at all times is a safety precaution!**
- Report immediately to supervisor any conditions on haul road, pit or dump area that may cause an operating hazard.