OPERATION MANUAL

MULTIQUIP®

Discount Equipment

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Mikasa SERIES

MODEL MRH601DS

VIBRATORY ROLLER

(Kubota EA330-E3-NB3-HGMS-1 DIESEL ENGINE)

Revision #1 (06/10/20)

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

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MRH601DS Vibratory Roller

NOTICE

Specifications and part numbers are subject to change without notice.

Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.

SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER, WARNING, CAUTION** or **NOTICE.**

SAFETY SYMBOLS

DANGER

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY.**

WARNING

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY.**

CAUTION

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY.**

NOTICE

Addresses practices not related to personal injury.

The following table shows the potential hazards associated with the operation of this equipment.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Respiratory hazards
	Rotating parts hazards
	Pressurized fluid hazards
	Electric shock hazards
	Runover hazards

GENERAL SAFETY

⚠ CAUTION

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.

- **NEVER** operate this equipment when not feeling well due to fatigue, illness or when under medication.

- **NEVER** operate this equipment under the influence of drugs or alcohol.

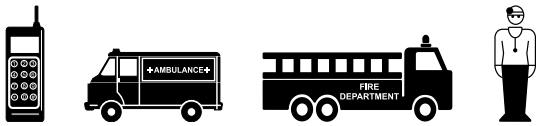
- **ALWAYS** check the equipment for loosened threads or bolts before starting.
- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.
- **ALWAYS** clear the work area of any debris, tools, etc. that would constitute a hazard while the equipment is in operation.

NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to user may result.
- **ALWAYS** know the location of the nearest **fire extinguisher.**

- **ALWAYS** know the location of the nearest **first aid kit.**

- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site.** Also, know the phone numbers of the nearest **ambulance, doctor** and **fire department.** This information will be invaluable in the case of an emergency.



ROLLER SAFETY

⚠ DANGER

- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe **bodily harm or even death.**

⚠ WARNING

- **NEVER** disconnect any **emergency or safety devices.** These devices are intended for operator safety. Disconnection of these devices can cause severe injury, bodily harm or even death. Disconnection of any of these devices will void all warranties.

⚠ CAUTION

- **NEVER** lubricate components or attempt service on a running machine.
- Never leave the roller unattended with the engine running. Turn off engine.
- Use chock blocks when parking roller on a grade.
- Use extreme care when operating near obstructions, on slippery surfaces, grades, and slide slopes.
- When reversing, particularly on the edges and banks of ditches, as well as in front of obstaces, the operator must stay in a standing position at a safe distance from the machine.
- When operating near any house/building or pipelines, always check the effect of machine vibration. Stop work if necessary.
- **DO NOT** operate the roller with the covers open.
- **ALWAYS** keep the machine away from other personnel and obstacles. Always keep immediate are free of bystanders.

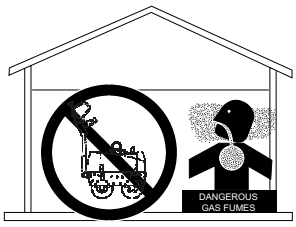
NOTICE

- **ALWAYS** keep the machine in proper running condition.
- Fix damage to machine and replace any broken parts immediately.
- **DO NOT** use worn-out hoses or couplings. Inspect daily.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.

ENGINE SAFETY

⚠ DANGER

- The engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled.
- The engine of this equipment requires an adequate free flow of cooling air. **NEVER** operate this equipment in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.



⚠ WARNING

- **DO NOT** place hands or fingers inside engine compartment when engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- Keep fingers, hands hair and clothing away from all moving parts to prevent injury.

- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the roller.

⚠ CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing equipment.

- **ALWAYS** turn the engine off before performing maintenance.

NOTICE

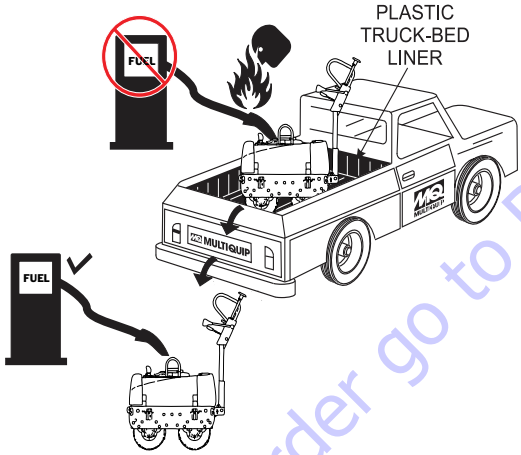
- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.

- **NEVER** tip the engine to extreme angles during lifting as it may cause oil to gravitate into the cylinder head, making the engine start difficult.

FUEL SAFETY

⚠ DANGER

- DO NOT add fuel to equipment if it is placed inside truck bed with plastic liner. Possibility exists of explosion or fire due to static electricity.



- **DO NOT** start the engine near spilled fuel or combustible fluids. Diesel fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.

BATTERY SAFETY (ELECTRIC START ONLY)

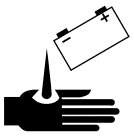
⚠ DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.

⚠ WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.

- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **DO NOT** charge battery if frozen. Battery can explode. When frozen, warm the battery to at least 61°F (16°C).
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gases.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.



- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.

⚠ CAUTION

- **ALWAYS** disconnect the **NEGATIVE battery terminal** before performing service on the equipment.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.

TRANSPORTING SAFETY

⚠ CAUTION

- **NEVER** allow any person or animal to stand underneath the equipment while lifting.

NOTICE

- Before lifting, make sure that the equipment parts are not damaged and screws are not loose or missing.
- Use lifting equipment capable of lifting the weight of the roller.
- **ALWAYS** make sure crane or lifitng device has been properly secured to the lifting bail (hook) of the equipment.
- **ALWAYS** shutdown engine before transporting.
- **NEVER** lift the equipment while the engine is running.
- Tighten fuel tank cap securely and close fuel cock to prevent fuel from spilling.
- Use adequate lifting cable (wire or rope) of sufficient strength.
- Use one point suspension hook and lift straight upwards with sufficient bearing capacity to prevent machine from tilting or slipping.
- **DO NOT** lift machine to unnecessary heights.
- **ALWAYS** make sure that roller is secured correctly when transporting on a trailer. Make sure all supports attaching the roller to the trailer are tight.

ENVIRONMENTAL SAFETY/DECOMMISSIONING

NOTICE

Decommissioning is a controlled process used to safely retire a piece of equipment that is no longer serviceable. If the equipment poses an unacceptable and unrepairable safety risk due to wear or damage or is no longer cost effective to maintain (beyond life-cycle reliability) and is to be decommissioned (demolition and dismantlement),be sure to follow rules below:

DO NOT pour waste or oil directly onto the ground, down a drain or into any water source.

Contact your country's Department of Public Works or recycling agency in your area and arrange for proper disposal of any electrical components, waste or oil associated with this equipment.

When the life cycle of this equipment is over, remove battery and bring to appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.

When the life cycle of this equipment is over, it is recommended that the trowel frame and all other metal parts be sent to a recycling center.

Metal recycling involves the collection of metal from discarded products and its transformation into raw materials to use in manufacturing a new product.

Recyclers and manufacturers alike promote the process of recycling metal. Using a metal recycling center promotes energy cost savings.

EMISSIONS INFORMATION

NOTICE

The diesel engine used in this equipment has been designed to reduce harmful levels of carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NOx) contained in diesel exhaust emissions.

This engine has been certified to meet US EPA Evaporative emissions requirements in the installed configuration.

Attempting to modify or make adjustments to the engine emission system by unauthorized personnel without proper training could damage the equipment or create an unsafe condition.

Additionally, modifying the fuel system may adversely affect evaporative emissions, resulting in fines or other penalties.

Emission Control Label

The emission control label is an integral part of the emission system and is strictly controlled by regulations.

The label must remain with the engine for its entire life.

If a replacement emission label is needed, please contact your authorized Kubota Engine Distributor.

Table 1. Specifications (Vibratory Roller)	
Dimensions (L x H x W)	89.14 x 47.05 x 27.24 in (2265 x 1195 x 692 mm)
Drum Diameter	13.98 in. (355 mm)
Drum Width	25.59 in. (650 mm)
Distance between Axes	20.47 in. (520 mm)
Weight	1214.75 lbs. (551 kg)
Vibration Frequency	3,300 vpm (55 Hz)
Centrifugal Force	2,428 lbf (10.8 kN)
Gradeablility	35 % (20°)
Working Speed	0 - 1.86 mph (0 - 3 kph)
Lubricating Oil	5.8 gallons (22 liters)
Water Tank Capacity	7.92 gallons (30 liters)

Table 2. Specifications (Engine)	
Engine Model	Kubota EA330-E3-NB3-HGMS-1
Engine Type	Diesel
Maximum Output	6.2 HP (4.6 kW)
Fuel Tank Capacity	5.6 quarts (5.4 liters)
Starting System	Electric
Max. Set Speed of Rotation	2,650

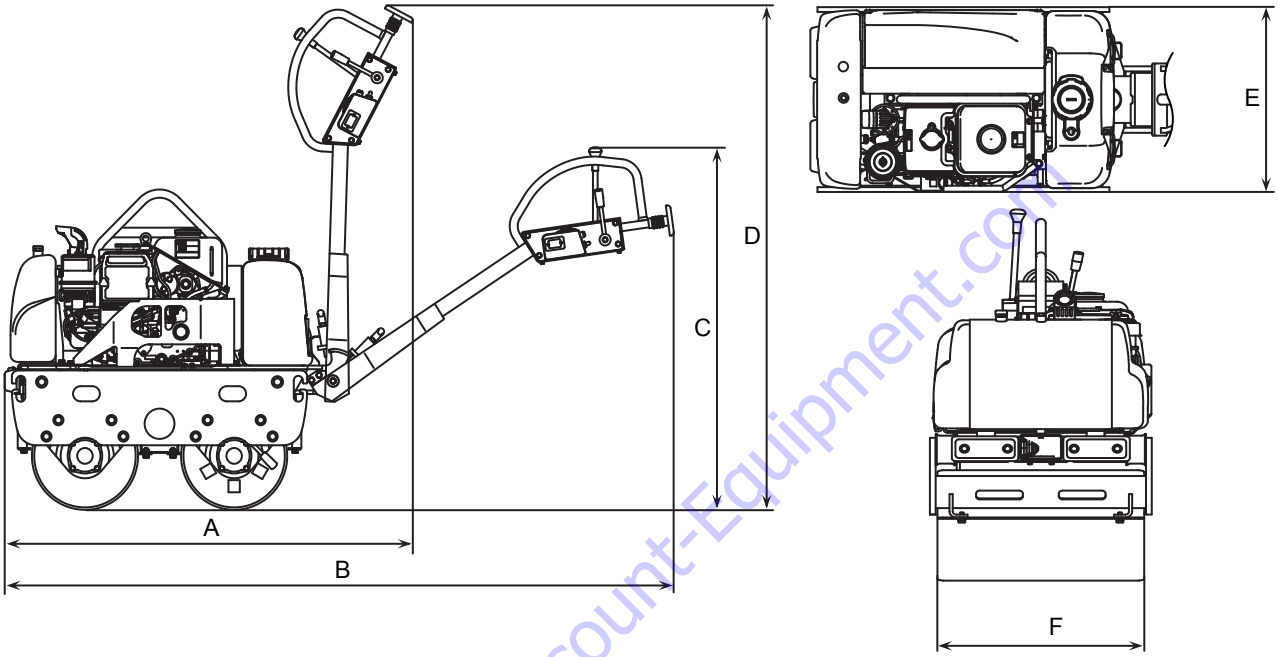


Figure 1. MRH601DS Dimensions

Table 3. MRH601DS Dimensions		
A	52.4 in.	1330 mm.
B	89.2 in.	2265 mm.
C	47.0 in.	1195 mm.
D	67.1 in.	1705 mm.
E	27.2 in.	692 mm.
F	25.6 in.	650 mm.

The Mikasa Model MRH601DS is a powerful compacting tool capable of applying tremendous force in consecutive impacts to a soil surface. Its applications include soil compacting for backfilling for gas pipelines, water pipelines and cable installation work.

The impact force of the MRH601DS levels and uniformly compacts voids between soil particles to increase dry density.

Features include:

- Hydraulic transmission to allow speed change without gear shifting.
- Deadman device which when pressed or hit will cause the travel lever to return to neutral position bringing the machine to a stop.
- A horn to warn of machine's approach.
- An hourmeter/tachometer to measure runtime and rpm.
- Non-corrosive water tank for the sprinkler system with a capacity of 7.9 gallons (30 liters).
- Lifting hook to transport machine.
- Front bumper and working light.
- Narrow profile with less than one inch wall clearance. Narrower width allows access to tighter areas. No exposed hydraulic hoses.
- Oil bath lubricated bearings and external vibration for less servicing and more dependability.
- Front and rear drum scrapers.
- Drum sprinkler system controls located near the operator.
- Easy access to hydraulic components and hydraulic filter.

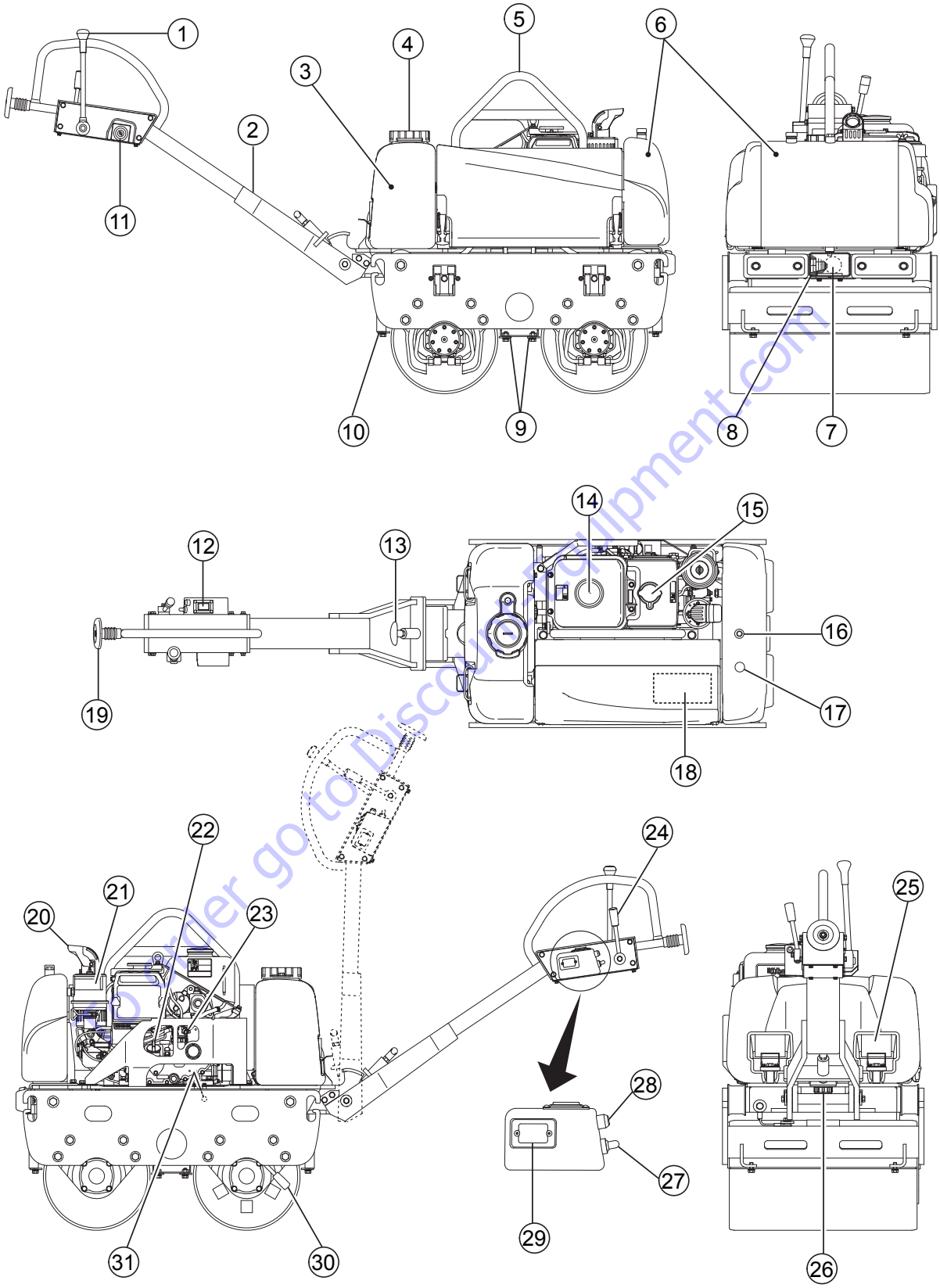


Figure 2. MRH601DS Components

Figure 2 illustrates the location of the major components for the MRH601DS Vibration Roller. The function of each component is described below:

1. **Traveling Lever** — Push the lever forward, the roller will move in a forward direction, pull the lever backwards, the roller will move in a backwards direction. Placing the lever in the middle (midway) will cause the roller not to move (neutral).
2. **Handle Bar** — When operating the roller, this handle is to be in the downward position. When the roller is to be stored, move the handle bar to the upright position.
3. **Water Tank** — Holds 7.9 gallons (30 liters) of water for the sprinkler system.
4. **Water Tank Cap** — Open to fill water tank.
5. **Lifting Hook** — Used to lift unit with crane or other lifting device when transporting.
6. **Oil Tank** — Fill with proper grade of hydraulic oil.
7. **Horn** — Gives a warning sound of the machine approaching, for jobsite safety.
8. **Front Headlights** — Activate using switch on control handle. Used to illuminate ground during nighttime or low-light operating conditions.
9. **Scraper (In)** — Prevents buildup of material between the drums.
10. **Scraper (Out)** — Prevents buildup of material between the drum and the frame.
11. **Engine Starting Switch** — **ON** position permits engine starting, **OFF** position stops engine operation.
12. **Vibration ON/OFF Switch** — Turns vibration on and off.
13. **Handlebar Stopper Pin** — Locks handlebar in place.
14. **Fuel Tank/Cap** — Fill with diesel fuel. Fuel tank holds approximately 2 gallons (7.5 liters). **DO NOT** top off fuel. Wipe up any spilled fuel immediately.
15. **Coolant Radiator Cap** — Open to fill radiator with coolant.
16. **Breather Cap** — Allow pressure to escape to the air in the form of a gas from heat.
17. **Hydraulic Oil Filler Port**— Used to fill hydraulic oil tank.
18. **Battery** — Provides +12VDC to the electrical system. Replace only with recommended type battery.
19. **Dead-Man Device** — When pressed or hit while traveling in reverse, causes the travel lever to return to neutral position to stop the machine.
20. **Muffler** — Used to reduce noise and emissions.
21. **Air Cleaner** — Prevents dirt and other debris from entering the fuel system.
22. **Engine Oil Filler Port** — Used to fill engine oil.
23. **Fuel Cock** — Controls the flow of diesel fuel to the engine. Must be in the **ON** position when starting and running the engine.
24. **Throttle Lever** — Placed in operation position at start up.
25. **Stopper** — Holds handlebar.
26. **Drain Outlet** — Drains out the water from the water tank.
27. **Headlight ON/OFF Switch** — Turns the headlight on and off.
28. **Horn Button** — Press this button to sound horn.
29. **Hour/Tacho Meter** — Measures the run time of the unit. During operation it displays the rpm reading.
30. **Parking Brake** — Makes sure machine will not accidentally move when parked or not in use. Move lever to the left to place parking brake in the locked position.
31. **Sprinkler Cock** — Turns on the sprinklers (front and rear drums).

BEFORE STARTING

Before starting the roller:

1. Read safety information at the beginning of manual.
2. Understand the geographical features and regulations of the job site.
3. Check the items listed in Table 4:

Table 4. Inspection Points

Item	Check
Parking Brake	Movement
Wheel Stopper	Broken
Body (Frame)	Cracks, Skewness
Lifting Hook	Broken, Cracks, Loose, Bolts and Nuts falling off
Fuel Tank	Leak, Quantity of Fuel, Dirt
Fuel System	Leak
Fuel Filter	Dirt
Engine Oil	Leak, Quantity of Oil, Dirt
Coolant	Leak, Quantity of Water
Oil Tank	Leak, Quantity of Oil, Dirt
Vibrator V-belt	Cracks,Tension
Engine Fan Belt	Cracks, Tension
Oil Pressure Pipe-Line System	Leak, Looseness, Crack, Abrasion
Water Pipe Line System	Leak, Looseness, Crack, Abrasion
Horn	Operation (if working)
Headlight	Operation (if working)
Traveling Lever	Broken, Cracks, Loose, Bolts and Nuts falling off
Deadman Device	Operation (if working)
Scraper	Curve, Damage, Adjustment
Bolt, Nuts	Looseness, Falling off

ENGINE OIL CHECK

1. To check the engine oil level, place the machine on secure level ground with the engine stopped.
2. Remove the filler dipstick from the engine oil filler hole (Figure 3) and wipe clean.

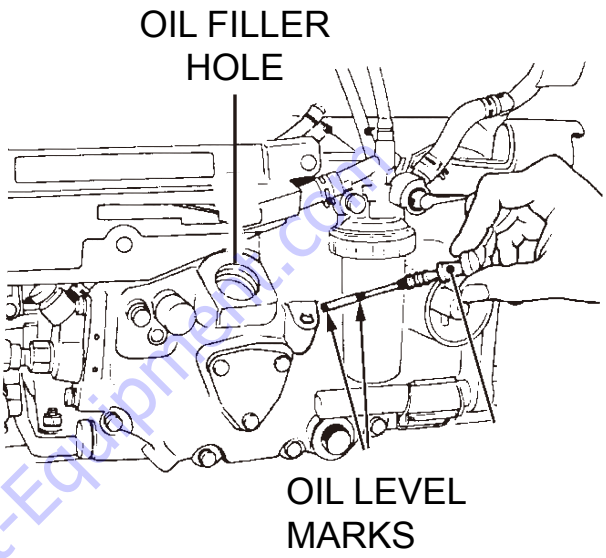


Figure 3. Engine Oil Level

3. Insert and then remove the dipstick again. Check that the oil level is between the two oil level marks on the dipstick (Figure 3).
4. If the oil level is low, fill to the edge of the oil filler hole with the recommended oil type (Table 5). Maximum oil capacity is 1.37 quarts (1.3 liters).

Table 5. Oil Type

Season	Temperature	Oil Type
Summer	25°C or Higher	SAE 10W-30
Spring/Fall	25°C~10°C	SAE 10W-30/20
Winter	0°C or Lower	SAE 10W-10

CHECKING THE HYDRAULIC SYSTEM

1. Check the oil level gauge (Figure 4). Oil level should be at the reference point or higher. Fill as required.

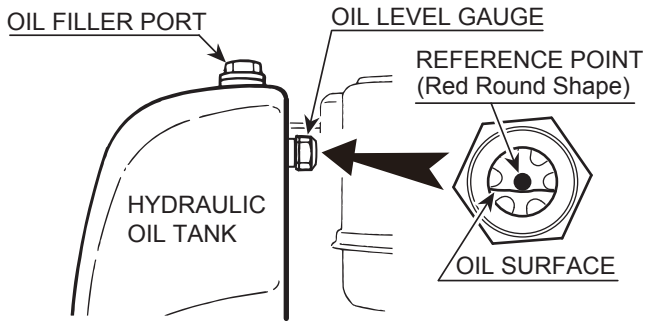


Figure 4. Hydraulic System Oil Level Gauge

2. Check the hydraulic pump and hydraulic motor for damage.
3. Check for loosening of hose and pipes, and check for oil leaking part.
4. Check to see if the hydraulic oil looks whitish and cloudy.

CHECKING THE V-BELT

DANGER

ALWAYS keep hands and fingers away from pinch points. **DO NOT** allow anyone to reach in on dangerous sections of the machine to avoid any accidents.

1. Check the looseness of V-belt. When the tension is low, the vibration become weak or V-belt tends to get damaged (Figure 5).

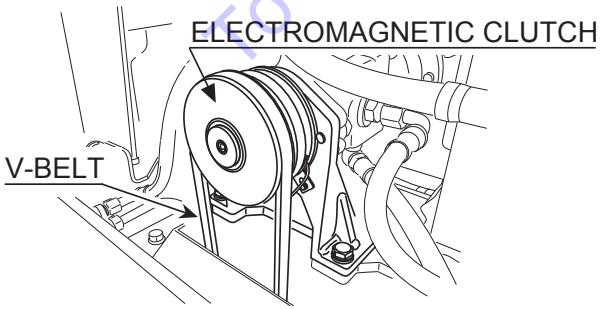


Figure 5. Checking V-Belt Tension

ELECTROMAGNETIC CLUTCH INSPECTION

1. The clutch friction surface gets worn out gradually over the course of machine use, which results in increase in the gap. When this gap exceeds more than 0.5 mm (gap limit), the clutch operation failure occurs or the engagement function of the clutch fails. This indicates that the electromagnetic clutch needs to be replaced.

Table 6. Electromagnetic Clutch Specifications (For Vibration)

Item	Check
Static friction torque	25 Nm (2.5 kg m)
Rated voltage	DC12V
Capacity	20W
Coil resistance	6.6Ωf
Gap limit	0.5 mm

2. The temperature of the surface of the electromagnetic clutch might rise to about 194° to 212° (90° to 100°C) due to built-in coil. Make sure that the peripheral temperature does not become higher than 176°F (80°C).

CAUTION

Before inspection of electromagnetic clutch, always stop the engine to prevent possibility of your hand or clothes getting caught in rotating parts. Be careful not to burn your hand when checking the temperature.

FUEL CHECK

DANGER

Motor fuel is highly flammable and can be dangerous if mishandled. **DO NOT** smoke while refueling. **DO NOT** attempt to refuel the pump if the engine is ***hot or running.***

1. Remove the fuel cap located on top of the engine fuel tank.
2. Visually inspect to see if the fuel level is low. If fuel is low, replenish with unleaded gasoline using a strainer for filtration. **DO NOT** top-off fuel. Wipe up any spilled fuel immediately!

CHECKING WATER TANK

1. Check the water tank to see if filled. Add water if necessary. The water tank has a capacity of approximately 10 gallons (40 liters). See Figure 6.

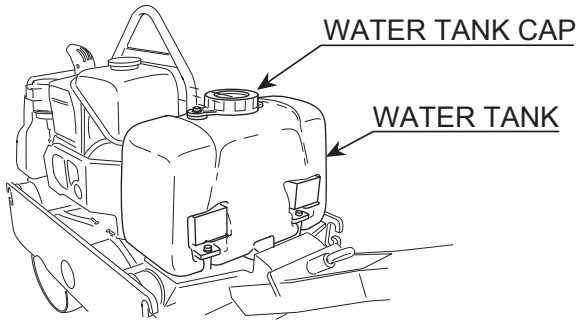


Figure 6. Checking Water Tank

CAUTION

Be careful not to confuse the water tank with the oil tank.

CHECKING SPRINKLER

1. Move the sprinkler cocks for both the rear and front drums to the open position and confirm that the water flows normally.

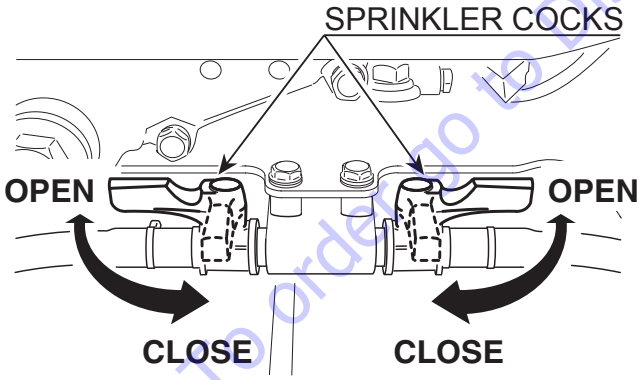


Figure 7. Sprinkler Check

CHECKING LEVERS AND HORN

1. Check travel and throttle levers to make sure they are functioning properly (Figure 8).
2. Turn on the light switch and confirm that the headlight comes on (Figure 8).
3. Press the horn and verify that it sounds normally (Figure 8).

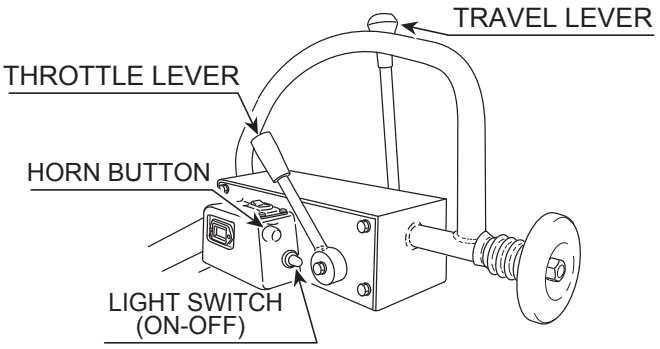


Figure 8. Levers, Horn, and Light Check

4. With travel lever placed in reverse, push the deadman device and verify that the travel lever returns to neutral position. The travel lever stays in neutral position once the deadman device is released (Figure 9).

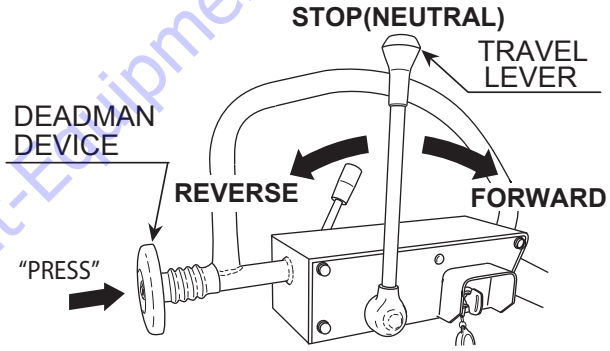


Figure 9. Deadman Device Check

CHECKING SCRAPERS

1. Check scrapers and make sure that they are not clogged with mud, bent or damaged (Figure 10).

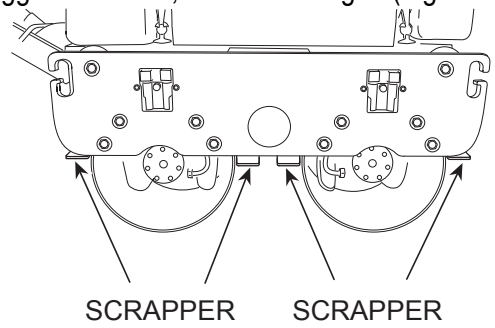


Figure 10. Checking Scrapers

2. Adjust clearance between drums and scrapers as necessary.

CHECKING BOLTS, NUTS AND SCREWS

1. Check bolts, nuts, and screws on various parts of the machine, including the engine, for proper tightness.

CAUTION

DO NOT attempt to operate the roller until the Safety Information, General Information, and Inspection sections of this manual have been ***read and thoroughly understood.***

STARTING

CAUTION

When the engine is running, never turn the starter key to the **START** position.

1. Move the throttle lever to the operation position (Figure 11).

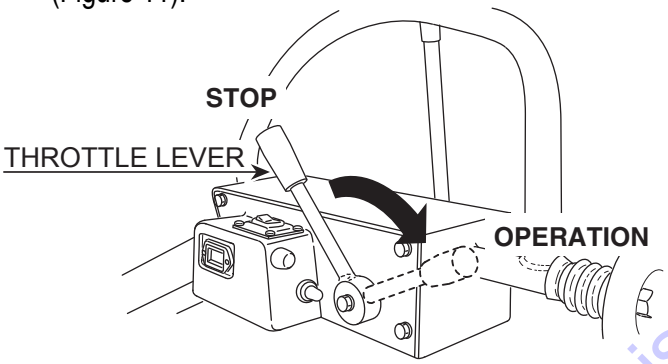


Figure 11. Throttle Lever (Operation Position)

2. Move the travel lever to the stop (neutral) position (Figure 12).
3. Move the vibration on/off switch to the off position (Figure 12).
4. Move the light switch to the off position (Figure 12).

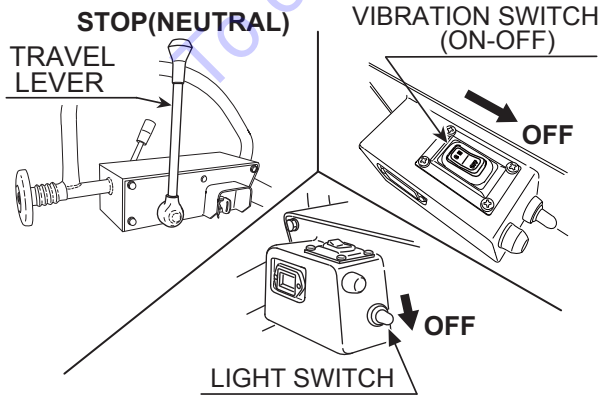


Figure 12. Travel Lever, Vibration Switch and LIght Switch

5. Open the fuel cock.
6. Insert the key into the key switch and turn it to the **operation** position (Figure 13). The buzzer should sound at this time.

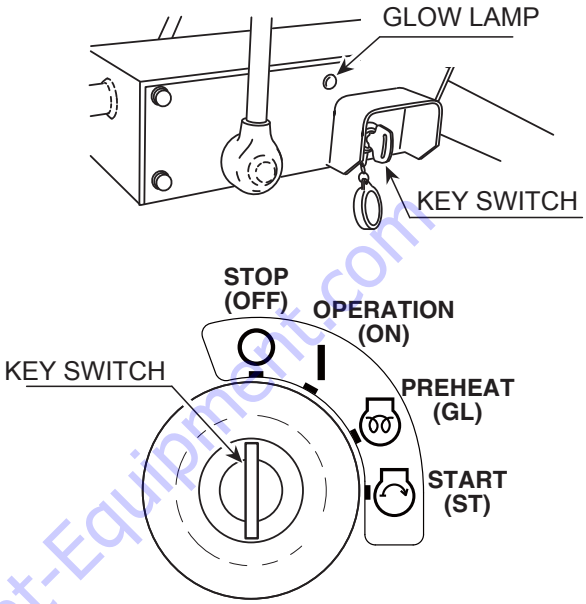


Figure 13. Starter Key (Operation Position)

7. Turn the key to preheat position and wait until the glow lamp lights (about 5 seconds). The glow lamp goes out automatically after 5 seconds.
8. After preheat is complete, turn the key to the start position. After the engine is started, take your hand off the key. Buzzer stops when the engine speed increases.
9. Turn the starter key further to the right to the start position (Figure 13) to start the engine. Buzzer stops sounding when the engine speed increases.

NOTICE

Machine will not start if the travel lever is not at the stop position.

10. If the engine fails to start, do not continue to rotate the starter key for more than 5 seconds. Return the key to the operation position and wait 20 to 30 seconds before starting again.
11. After starting the engine, continue to warm up the engine for about 3 to 10 seconds especially in cold weather.

12. If the buzzer does not stop sounding after the engine has started, shut down engine immediately and check engine oil level. The buzzer also functions as engine oil level warning.

TRAVELING

1. Before starting to travel, make sure to release parking brake (Figure 14).

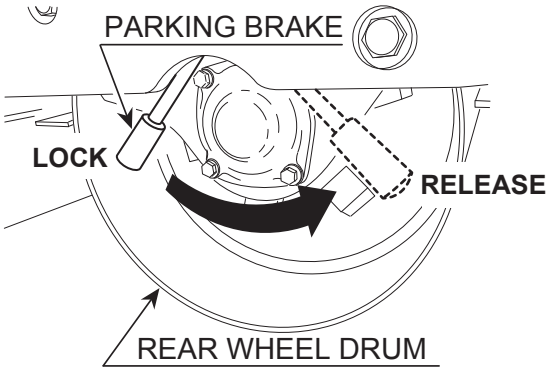


Figure 14. Parking Brake

2. Push the travel lever forward slightly. This will cause the roller to travel forward at slow speed.

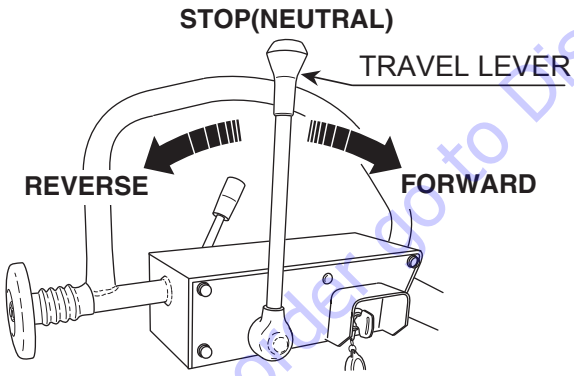


Figure 15. Travel Lever

3. To increase the travel speed, push the travel lever further.

4. Push the travel lever backward to go in the reverse direction.

⚠ CAUTION

Do not reduce speed during work. When shifting travel lever from forward to reverse, be sure to stop the lever at the neutral position first before moving the lever to the opposite direction. Do not shift the lever from forward to reverse (or reverse to forward) in one motion.

⚠ CAUTION

After test travel, shut down engine and check for any problems including oil leakage. If any trouble is found, correct the problem before attempting to operate the roller again.

VIBRATING

1. Shift the vibration switch from off to on position. The roller will start vibrating (Figure 16).

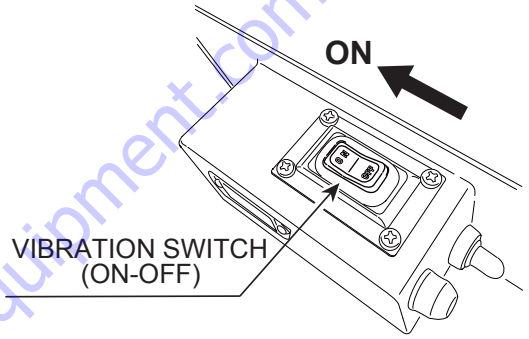


Figure 16. Vibration Switch

2. If vibration does not occur (electromagnetic clutch does not operate) while other functions are working properly, the fuse might be blown. Check the fuse (10A) in the handle box (Figure 17) and if it is blown, replace with a new one.

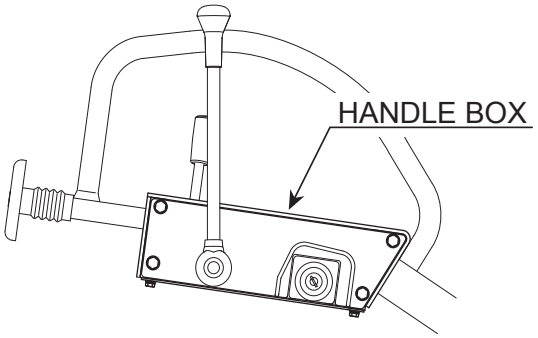


Figure 17. Location of Fuse (Handle Box)

⚠ CAUTION

Vibration should not be used over completely compacted area, paved road surface, or with stationary roller.

SPRINKLING

3. Open the water cocks for the front and rear drums, to start sprinkling. (Figure 18).

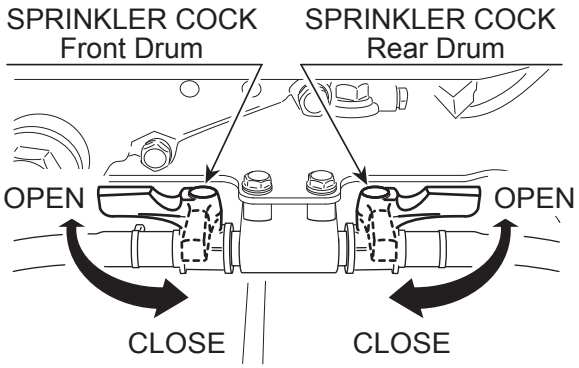


Figure 18. Water Cocks

DEADMAN DEVICE

The deadman device prevents accidental traveling in reverse. It automatically returns the travel lever to the neutral position by stopping the machine when the deadman device is pressed forward (Figure 19).

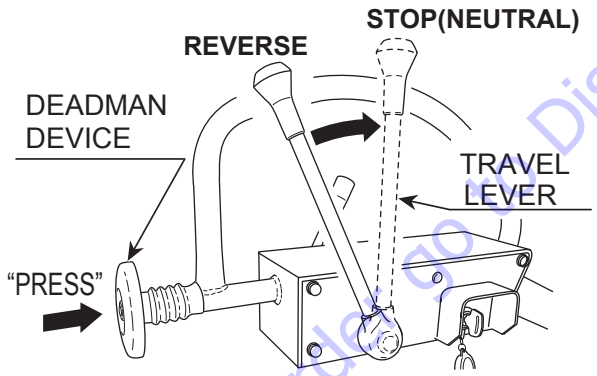


Figure 19. Deadman Device

⚠ CAUTION

Except for switching operation between forward, reverse and neutral, keep your hands off the travel lever. Deadman device might not work properly if your hand is on the travel lever and you are caught between the machine and some other object.

STOPPING

1. With the vibration switch in the off position, return the travel lever to the stop (neutral) position. Move the throttle lever to the stop position after making sure vibration has stopped.
2. Return the key switch to the stop position as soon as the engine stops.

⚠ CAUTION

Neglecting to return the key switch to the stop position will cause the battery to discharge.

3. After the engine stops, close the fuel cock.
4. Lock the parking brake (Figure 20).

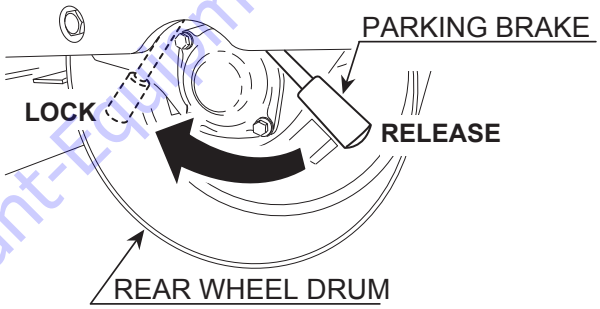


Figure 20. Parking Brake (Lock)

NOTICE

When leaving the machine, use the wheel stopper and remove the key. Never park or stop on a slope.

NOTICE

Parking brake system should always be kept clean to avoid mud deposits.

⚠ CAUTION

Inspection and other services should always be carried out on hard and level ground with the engine shut down.

NOTICE

These inspection intervals are for operation under normal conditions. Adjust your inspection intervals based on the number of hours the roller is in use and your particular working conditions.

INSPECTION AND MAINTENANCE TABLE

To make sure your roller is always in good working condition, perform the maintenance inspection procedures before using.

Table 8. Inspection

ITEM	CHECK	FREQUENCY
Parking brake	Movement Check	Daily
Stopper	With or Without Breakage	Daily
Sprinkler	Leaks, Looseness, Cracks, Abrasion	Daily
Body	Cracks,Skewness	Daily
Fuel tank	Leak, Quantity of Fuel, Dirt	Daily
Hook	Falling Off, Breakage,Cracks, Loose Bolts and Nuts	Daily
Fuel system	Leak	Daily
Fuel filter	Dirt	Daily
Engine oil	Leak, Quantity of Oil, Dirt	Daily
Cooling water	Leak, Quantity of Coolant	Daily
Oil tank	Leak, Quantity of Oil, Dirt	Daily
V-Belt for Vibrator	Cracks,Tension	Daily
Fan Belt (Engine)	Cracks,Tension	Daily
Oil Pressure Pipe Line System	Leak, Looseness, Cracks, Abrasion	Daily
Horn	Operation Check	Daily
Headlight	Light Check	Daily
Travel Lever	Falling Off, Breakage, Cracks, Loose Bolts and Nuts	Daily
Deadman Device	Operation Check	Daily
Scraper	Curve, Signs of Damage, Adjust	Daily
Other Bolts and Nuts	Loose, Falling Off	Daily
Fan Belt (Engine)	Check, Adjust	Every 10 hours
Engine Oil	Change Oil	After first 50 hours
Engine Oil Filter	Clean	After first 50 hours
Air-Cleaner Element	Clean	After first 50 hours
Hydraulic Oil Filter	Change	After first 50 hours
Fan Belt (Engine)	Change	After first 50 hours
Wiring	Check	After first 50 hours

Table 10. Inspection (continued)		
ITEM	**CHECK**	**FREQUENCY**
Traveling Lever Corollary Part	Grease	Every 50 hours
Hydraulic Pump Lever	Grease	Every 50 hours
Deadman Device	Grease	Every 50 hours
Handle Stopper	Grease	Every 50 hours
Parking Brake	Grease	Every 50 hours
Engine Oil	Change	Every 100 hours
Battery Terminal	Clean	Every 100 hours
Air Cleaner Element	Clean	Every 100 hours
Fan Belt (Engine)	Check	Every 100 hours
Engine Oil Filter	Cleaning	Every 200 hours
Hydraulic Oil Filter	Change	Every 300 hours
Fuel Filter	Change	Every 450 hours
Fuel Tank Sediment	Remove	Every 450 hours
Inside of Radiator (Engine)	Clean	Every 450 hours
Fan Belt (Engine)	Change	Every 500 hours
Valve Clearance (Engine)	Adjust	Every 800 hours
Hydraulic Oil	Change	After 1000 hours
Injection Nozzle (Engine)	Check, Clean	After 1500 hours
Injection Pump (Engine)	Check	After 2000 hours
Air Cleaner Element	Change	After 1 year
Fuel Return Pipe And Band	Change	After 2 years
Coolant	Change	After 2 years
Battery	Change	After 2 years
Hydraulic Hose	Change	As Needed
Electromagnetic Clutch	Change (Gap Limit - 0.5 mm)	As Needed

DAILY SERVICE

1. Check for leakage of fuel or oil.
2. Check for loose screws including tightness. See Table 7 below (tightening torque), for retightening:

Table 7. Tightening Torque (in. kg/cm) Diameter

Material	6mm	8mm	10mm	12mm	14mm	16mm	18mm	20mm
4T	70	150	300	500	750	1,100	1,400	2,000
6-8T	100	250	500	800	1,300	2,000	2,700	3,800
11T	150	400	800	1,200	2,000	2,900	4,200	5,600
*	100	300~ 350	650 ~ 700					

3. Remove soil and clean the bottom of roller.
4. Check hydraulic pump, piping and hose for any leakage.
5. Check hydraulic hose connections with wrench applied for tightness. A loosened hydraulic hose can be a cause for leakage.
6. Check engine oil.

ENGINE OIL REPLACEMENT

1. To drain engine oil, remove the oil strainer at the bottom of the engine (Figure 21). Oil may be drained more easily when it is warm after operation. (For more details, refer to Engine Owner's Manual).

Figure 21. Engine Oil Draining

2. Clean the strainer before putting it back.
3. To replace engine oil, refer to the Inspection section.

AIR CLEANER

1. Remove air cleaner element from the air cleaner (Figure 22).

Figure 22. Engine Air Cleaner

2. If dust and dirt are on the element, blow them off by sending compressed air from inside in a vertical direction (Figure 23).

Figure 23. Cleaning Air Cleaner Element

NOTICE

When cleaning the element with compressed air, the air pressure should not exceed 0.69MPa (7.0kgf/cm^2).

3. If the element is dirty with carbon and oil, wash carefully with mild detergent.

FAN BELT ADJUSTMENT

1. Push the fan belt (middle of the fan drive pulley and tension pulley) at 98N (about 10 kgf) to check the deflection (Figure 24).
2. If the level of deflection is not of the standard value, adjust it with tension bolt.
3. Check the belt visually to see if there is any breakage, crack or discoloration on the surface skin. If any defect is found, replace it with a new one. Also, replace if the belt is worn and it touches the bottom of the pulley.

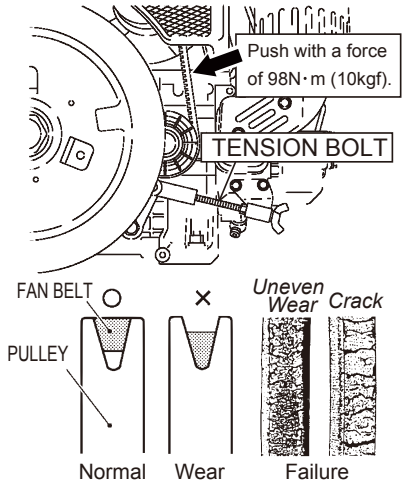
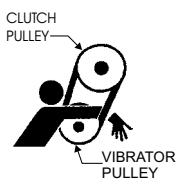


Figure 24. Fan Belt Adjustment

CAUTION



NEVER attempt to check the fan belt with the engine running. Severe injury can occur if your hand gets caught between the fan belt and the clutch. **ALWAYS** use safety gloves.

FUEL FILTER

1. Close the fuel filter cock.
2. Remove the retainer ring above the cup to remove the filter cup and the element (Figure 25).

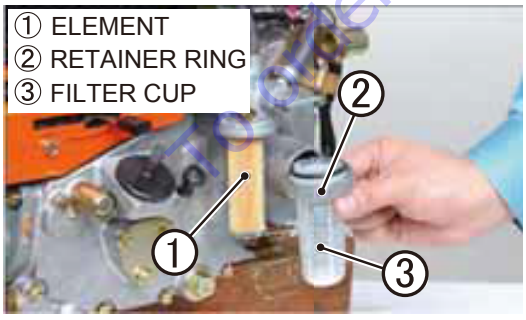


Figure 25. Fuel Filter Replacement

3. Rinse inside the cup with light oil, and install a new filter element.
4. Tighten the retainer ring to prevent dust and dirt entry and fuel leakage, then open the filter cock.

ADDING COOLANT

1. Remove the radiator cap to see if the coolant is filled to the cap opening.
2. If the coolant has decreased due to evaporation, add distilled water.
3. In case of leakage, mix antifreeze liquid with the distilled water before adding.
4. If coolant needs to be replaced, place the drain cock in the open position and drain the existing coolant to a suitable container (Figure 26).

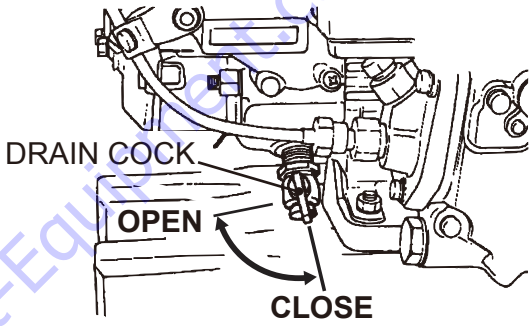


Figure 26. Coolant Drain Cock

5. Replace with 1.27 quarts (1.2 liters) coolant.

NOTICE

For handling of antifreeze, refer to the operation manual provided by the manufacturer.

HYDRAULIC SYSTEM INSPECTION AND SERVICE

1. Check motor and pump for any damage.
2. Check hoses and pipes for proper tightness and make sure there are no leaks.
3. Check oil tank for proper oil level. Make sure hydraulic oil has not whitened or emulsified. Whitish color means aeration in pump. Retighten pipe and correct level of oil. Emulsification means water in the hydraulic oil. If emulsification happens, replace the oil. See Inspection section for oil replacement procedure.

NEUTRAL POSITION ADJUSTMENT

1. If neutral position for forward and reverse travel has been displaced, conduct the neutral adjustment.
2. The travelling lever gets lightly locked at the neutral position. Adjust the turnbuckle part of the running cable at the hydraulic pump side to correct the position.

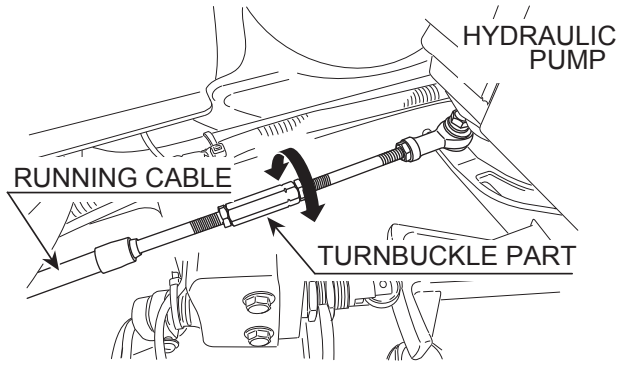


Figure 27. Adjustment of Neutral Position

> ***NOTICE***
>
> This machine has a micro-switch that allows the engine to start only at the stop (neutral) position to prevent uncontrolled running when the engine is started.

3. Check and make sure that the roller at the end of the micro-switch is at the dent of the camshaft of the lever (hydraulic pump). Adjust if necessary (Figure 28).

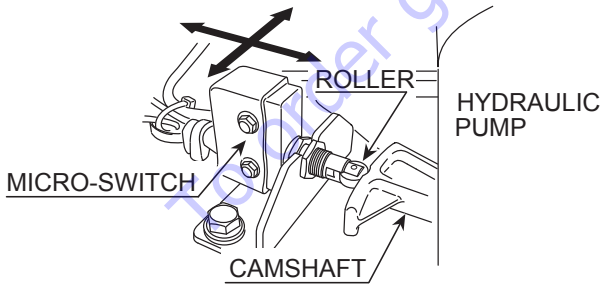


Figure 28. Micro-Switch Adjustment

4. After adjustment, lightly apply grease to the roller bearing of the micro-switch.

BATTERY MAINTENANCE

> ***NOTICE***
>
> Read and understand the battery safety information in the front of this manual before performing maintenance on the battery.

5. Check the battery terminals periodically to ensure that they are in good condition.
6. Looseness and corrosion of the terminal will lead to contact trouble. If white powder is found on the terminal, clean with lukewarm water then apply grease on it. If the corrosion is serious, replace the battery with a new one.
7. Check battery for cracks or any other damage. If white pattern appears inside the battery or paste has accumulated at the bottom, replace the battery.
8. If the machine will not be in operation for a long period of time, charge the battery sufficiently, tighten all caps correctly, store in cool dry place and check the battery charge level every month to maintain the performance of the battery.

BATTERY CABLE CONNECTION

1. When removing cable, disconnect the negative terminal first (Figure 29) then the positive terminal. When connecting the battery, connect the positive terminal first.

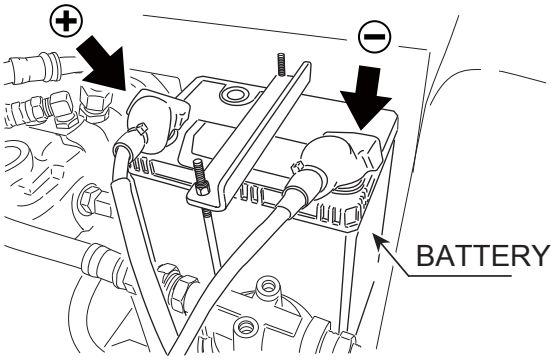


Figure 29. Battery Connection

MACHINE MAINTENANCE

1. At the end of each day's operation, wash dust and dirt off the machine. Clean area around drums and scrapers making sure all mud is removed.

NOTICE

When using a high pressure water sprayer, be careful not to let water enter the engine from the engine muffler and air cleaner.

If water enters the engine cylinder, water hammer effect might occur. See Water Hammer Effect Information section for explanation.

An air breather is equipped with the oil tank (Figure 30). A cover is provided to prevent entry of water into the oil tank. Be careful not to let the cover fall off when cleaning with a high pressure water sprayer.

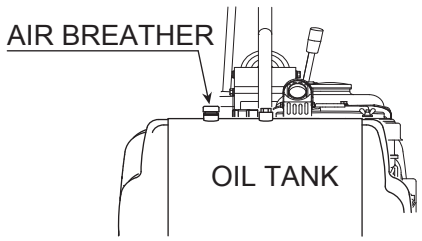


Figure 30. Air Breather Location

2. Drain water tank completely. Wash and clean inside the tank if it is dirty.
3. Cover the machine to prevent dust and store in a dry place away from sun exposure and high humidity.

LONG TERM STORAGE

1. Conduct thorough lubrication and oil change.
2. Disconnect battery terminals and dismount battery from machine. Store battery.
3. If there is a possibility that ambient temperature will drop below freezing point, add antifreeze agent to coolant.
4. Cover the inlet and outlet of air cleaner and muffler securely.
5. Store machine indoors. Do not leave outdoors.

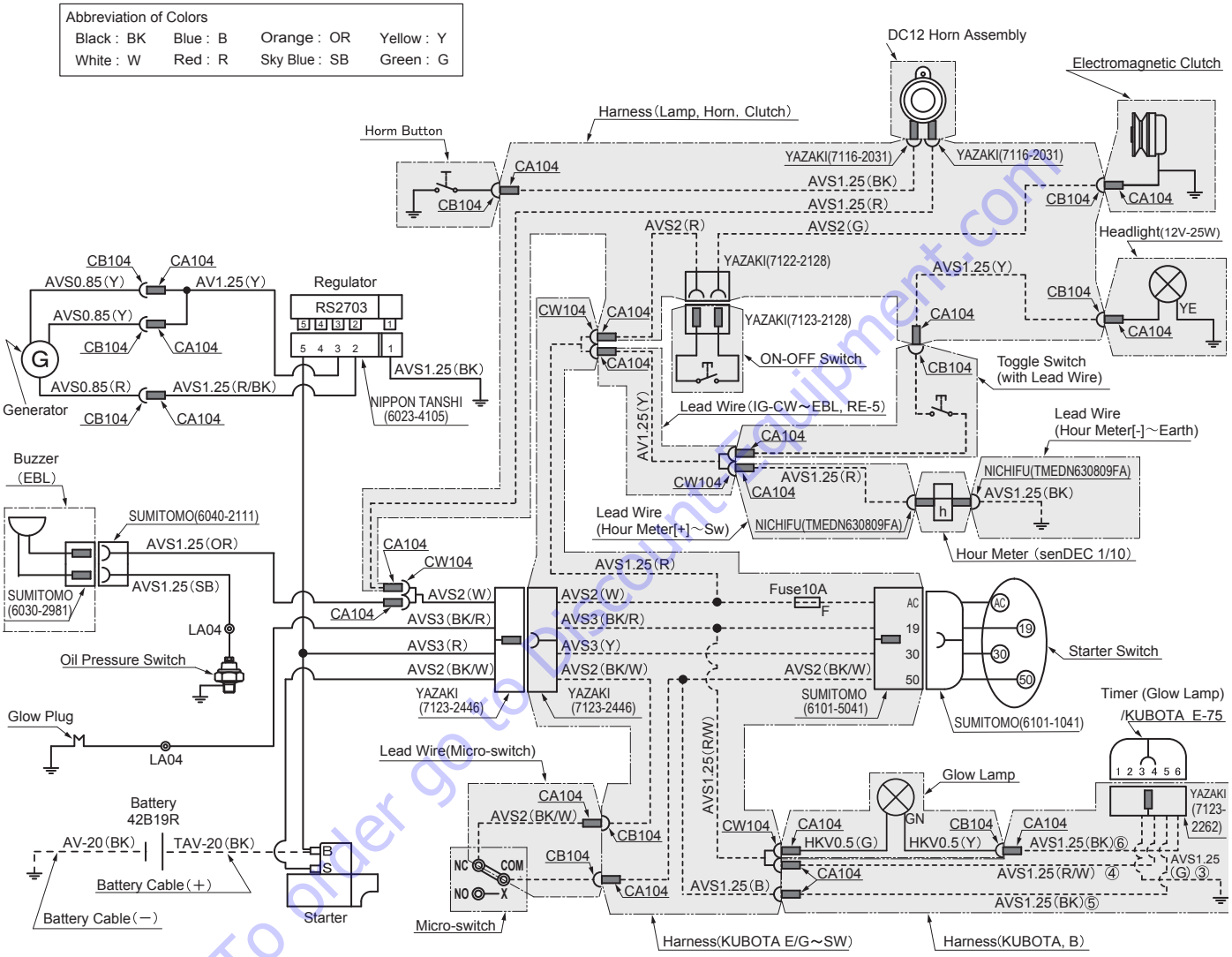
WATER HAMMER EFFECT INFORMATION

When water enters inside the diesel engine cylinder, and because water cannot be compressed like air, shock and high water pressure occur inside the cylinder. This causes damage to the parts inside the engine. This phenomenon is called water hammer effect.

Troubleshooting - Roller		
SYMPTOM	**POSSIBLE PROBLEM**	**SOLUTION**
Unit does not travel.	Parking brake still engaged?	Release parking brake lever.
Unit does not travel or travel is not smooth.	Defective centrifugal clutch?	Repair or replace clutch.
	Damaged rubber coupling and flange?	Replace rubber coupling and flange.
	Defective travel cable and link?	Repair or replace travel cable and link.
	Damaged scraper or too much mud in scraper?	Replace or repair scraper.
	Damaged or clogged oil filter?	Replace filter.
	Damaged or leaking hydraulic pipe?	Repair or replace parts.
	Low oil level or contaminated oil?	Replenish or replace oil.
	Damaged or leaking hydraulic pump?	Repair or replace hydraulic pump.
	Damaged or leaking hydraulic motor?	Repair or replace hydraulic motor.
	Damaged drum gear and bearing?	Repair parts.
	Bad drum rotation?	Repair or replace drum.
Unit does not vibrate or has weak vibration.	Defective centrifugal clutch?	Repair or replace clutch.
	Damaged or slipping V-belt?	Replace V-belt or adjust tension.
	Damaged vibration cable and linkage?	Replace or repair vibration cable and linkage.
	Damaged vibration clutch?	Adjust or replace clutch.
	Defective clutch vibrator pulley V-belt?	Replace V-belt.
	Vibrator does not turn smoothly with hand?	Check and repair vibrator. Check if oil level is not excessively high.

Troubleshooting (Engine)		
Symptom	**Possible Problem**	**Solution**
Engine will not start or start is delayed, although engine can be turned over.	No Fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and clean tank.
	Faulty fuel supply line?	Replace or repair fuel line.
	Compression too low?	Check piston, cylinder and valves. Adjust or repair per engine repair manual.
	Fuel pump not working correctly?	Repair or replace fuel pump.
	Oil pressure too low?	Check engine oil pressure.
	Low starting temperature limit exceeded?	Comply with cold starting instructions and proper oil viscosity.
	Defective battery?	Charge or replace battery.
	Air or water mixed in fuel system?	Check carefully for loosened fuel line coupling, loose cap nut, etc.
At low temperatures engine will not start.	Engine oil too thick?	Refill engine crankcase with correct type of oil for winter environment.
	Defective battery?	Replace battery.
Engine fires but stops soon as starter is switched off.	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
	Defective fuel pump?	Replace fuel pump.
Engine stops by itself during normal operation.	Fuel tank empty?	Add fuel.
	Fuel filter blocked?	Replace fuel filter.
	Defective fuel pump?	Replace fuel pump.
	Mechanical oil pressure shutdown sensor stops the engine due to low oil?	Add oil. Replace low oil shutdown sensor if necessary.
Low engine power, output and speed.	Fuel tank empty?	Replace fuel filter.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure that tank is adequately vented.
	Leaks at pipe unions?	Check threaded pipe unions tape and tighten unions a required.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level.
	Injection pump wear?	Use No. 2-D diesel fuel only. Check the fuel injection pump element and delivery valve assembly and replace as necessary.

Troubleshooting (Engine) - continued		
Symptom	**Possible Problem**	**Solution**
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.
Engine overheats.	Too much oil in engine crankcase?	Drain off engine oil down to uppermark on dipstick.
	Entire cooling air system contaminated/ blocked?	Clean cooling air system and cooling fin areas.
	Fan belt broken or elongated?	Change belt or adjust belt tension.
	Coolant insufficient?	Replenish coolant.
	Radiator net or radiator fin clogged with dust?	Clean net or fin carefully.
	Fan, radiator, or radiator cap defective?	Replace defective part.
	Thermostat defective?	Check thermostat and replace if necessary.
	Head gasket defective or water leakage?	Replace parts.



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OPERATION MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL
NUMBER ON-HAND WHEN CALLING

MULTIQUIP®