



T1 DuraTank Trailer

Owner/Operator Manual



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Part # 161559

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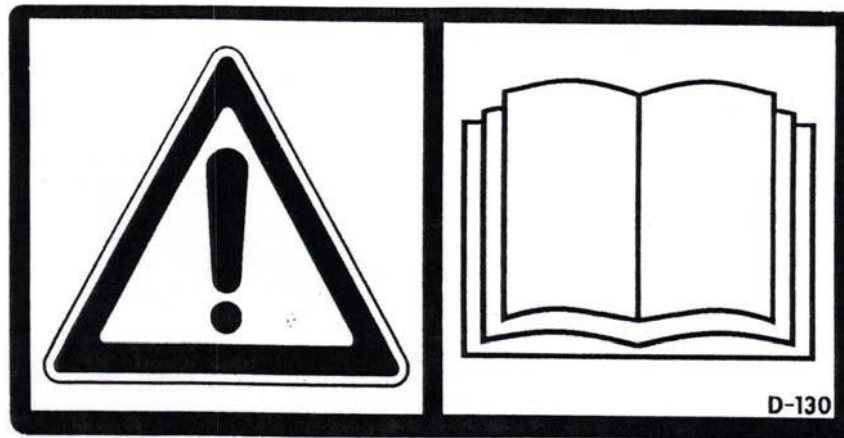
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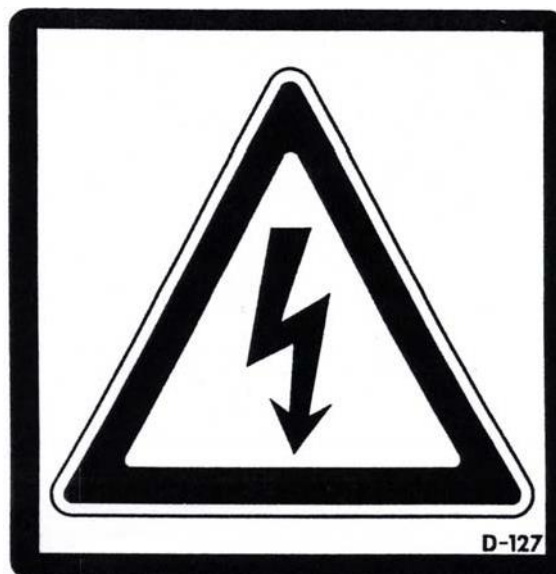
Keep this Manual with the Dura Tank at all times. This will allow new users to read it before operating the machine. It is the Dura Tank owner's responsibility to ensure that all workers using this machine are thoroughly trained. Provide workers with this Manual and make sure they understand its contents. Read it to them if necessary. Letting poorly trained workers use this machine can result in property or machine damage and/or serious injury or death to personnel.

WARNING!

THIS TANK IS DESIGNED TO TRANSPORT, STORE AND OFFLOAD EMULSION USING THE TECHNIQUES DESCRIBED IN THIS MANUAL. ANY OTHER USE MAY CAUSE SERIOUS INJURY OR DEATH TO PERSONNEL.



READ THE INSTRUCTIONS MANUAL BEFORE MACHINE OPERATION BEGINS!!



DANGER OF ELECTRICAL SHOCK!!!

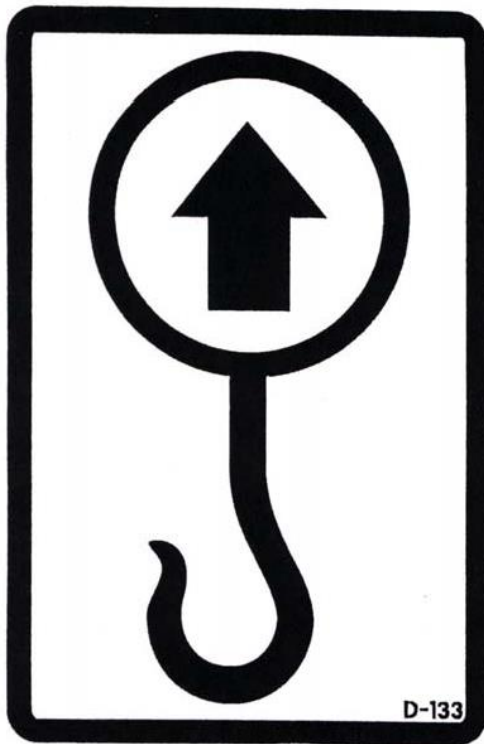


HOT SURFACE!! DO NOT TOUCH!!!



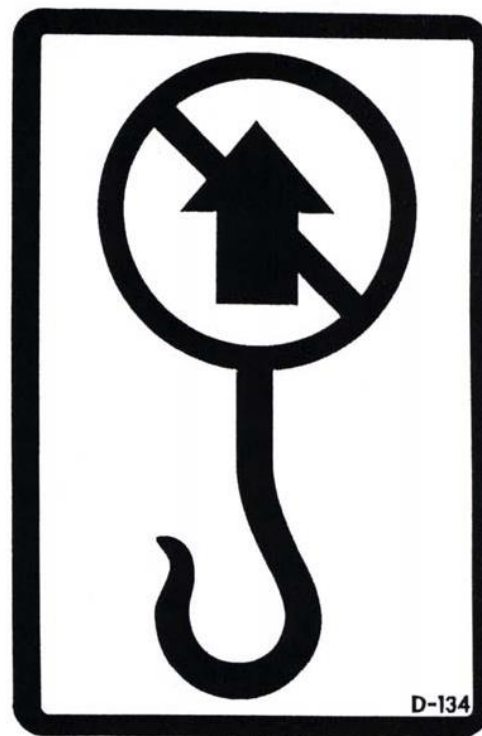
PINCH POINTS!

KEEP PERSONNEL CLEAR WHILE MACHINE IS IN OPERATION!



LIFTING POINTS

NO LIFT POINTS



Safety Alert Symbol

SAFETY

This Safety Alert symbol means
**ATTENTION! BECOME
ALERT!**



SAFETY

This Safety Alert symbol means
ATTENTION! BECOME ALERT!

YOUR SAFETY IS INVOLVED!
The Safety Alert symbol identifies important safety messages on the DURA Patcher and in this manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is **SAFETY** important to you?

3 Big Reasons:

- **Accidents Disable and Kill**
- **Accidents Cost**
- **Accidents Can Be Avoided**

Signal Words

Note the use of the signal words **DANGER**, **WARNING** and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guide-lines:

DANGER

An immediate and specific hazard which **WILL** result in severe personal injury or death if the proper precautions are not taken.

Warning

A specific hazard or unsafe practice which **COULD** result in severe personal injury or death if proper precautions are not taken.

CAUTION

Unsafe practices which **COULD** result in personal injury if proper practices are not taken, or as a reminder of good safety practices.

SAFETY

YOU are responsible for the SAFE operation and maintenance of your Dura Patcher. **YOU** must ensure that you and anyone else, who is going to operate, maintain or work around the patcher be familiar with the operating and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be adhered to while operating the patcher.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this equipment is familiar with the recommended operating and maintenance procedures and follows all safety precautions. Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

~Patcher owners must give operating instructions to operators or employees before allowing them to operate the machine, and at least annually thereafter.

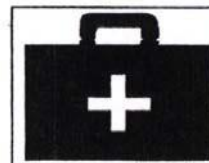
‘~The most important safety device on this equipment is a SAFE operator. It is the operator’s responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow them. All accidents can be avoided. A person who has not read and understood all operating and safety instructions is not qualified to operate the machine. An untrained operator exposes himself and• bystanders to possible serious injury or death.

~DO NOT modify the equipment in any way. Unauthorized modification may impair function and/or safety and affect the life of the equipment.

1. Read and understand the Operator’s Manual and all safety signs before operating, maintaining, or adjusting this equipment.



2. Have a first-aid kit available for use should the need arise and know how to use it.

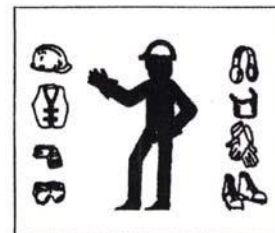


3. Have a fire extinguisher available for use should the need arise and know how to use it.



4. Wear appropriate protective gear. This list includes but is not limited to:

- Boots,
- Protective glasses,
 - goggles / face shield
- Heavy gloves
- Protective coveralls
- Hearing protection
- Protective head gear
- Orange safety vest



<p>2.1 GENERAL SAFETY (cont.)</p> <p>5. Install and secure all guards before starting.</p> <p>6. Bituminous asphalt material must be hot to be applied. Protect yourself from contacting the machine or material with bare skin. Severe burns can occur.</p> <p>7. Wear appropriate ear protection for prolonged exposure to excessive noise. Failure to wear protection could result in permanent lose of hearing.</p> <p>8. Place all controls in neutral, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, or repairing. Death or serious injury can result from entanglement in moving parts.</p> <p>9. Clear the area of people before starting or operating the unit. Death or serious injury can occur to bystanders because of the possibility of being run over or struck with the boom.</p> <p>10. DO not get into a big rush. Use recommended hand holds and steps with at least three points of support when getting on and off the Patcher. Keep steps, floor, hand holds and controls clean and free from grease. Face the machine when climbing up and down and never jump off or dismount while the machine is in motion. Severe injury can occur from falls.</p> <p>11. Review safety related items annually with all personnel who will be operating or maintaining the Patcher.</p>	<p>2.1 GENERAL SAFETY (cont.)</p> <p>12. Do not run engine in an enclosed area. Exhaust gases contain carbon monoxide, an odorless and deadly poison, which can cause death.</p> <p>13. Do not use the patcher without first providing proper traffic control measures to prevent accidents by traffic colliding with the Patcher.</p> <p>14. Do not inflate tires beyond the maximum recommended inflation pressure. Refer to the Truck manual for proper inflation pressures. Death or serious injury can occur due to tire exploding.</p> <p>15. Do Not hang additional components from the discharge hose support boom. The hose support boom is not designed to be used as a means for lifting.</p> <p>2.2 OPERATING SAFETY</p> <p>1. Do not allow riders on the tank when transporting. Death or serious injury can occur if riders fall off or under the machine.</p> <p>2. Keep hands, feet, hair, and clothing away from moving parts. Death or serious injury can occur by becoming entangled in moving parts.</p>
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<p>2.2 OPERATING SAFETY (cont.)</p> <p>3. Clean reflectors and lights so that they are visible before transporting to avoid collision hazards with other traffic.</p> <p>4. Do not smoke around machine. Fuel, emulsion and the fumes from both can explode when exposed to flame or heat from smoking or other sources.</p> <p>5. Operate the machine only in well ventilated areas. Death can occur due to carbon monoxide poisoning.</p> <p>6. Pressure in asphalt or flush tank MUST be released with pressure relief valve before checking or filling the tank. The cap or lid can come off with explosive force causing death or serious injury.</p> <p>7. Asphalt tank level is checked by level gauge on tank</p> <p>8. Disconnect electrical power before adjusting thermostat or servicing electric heaters.</p> <p>Serious injury or death can result from electrical shock.</p>	<p>2.2 OPERATING SAFETY (cont.)</p> <p>9. Review safety instructions with all operator's annually.</p> <p>Operation shall be limited to personnel with the following minimum qualifications:</p> <ol style="list-style-type: none"> 1. Designated persons. 2. Trainees under the direct supervision of a designated person.
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<p>CONDUCT OF OPERATORS</p> <p>A. The operator shall not engage in any practice which will divert his/her attention while actually engaged in operating the pump</p> <p>B. Each operator shall be responsible for those operations under the operator's direct control. Whenever there is any doubt as to safety, the operator shall consult with the supervisor.</p> <p>C. If there is a warning sign on a switch, engine control or component, the operator shall not close the switch, start the engine or use the component until the warning sign has been removed or acknowledged by the appointed person.</p> <p>22 OPERATING SAFETY (cont.)</p> <p>D. Before operating the pump, the operator shall see that all controls are in the 'OFF' or neutral position and that all personnel are in the clear.</p> <p>E. In accordance with OSHA regulations 928.51 and 1928.52, operating instructions must be provided initially to operators and employees before allowing them to operate the DuraTank and should be reviewed annually thereafter.</p> <p>The most IMPORTANT safety device on this equipment is a well trained and safe operator. It is his/her responsibility to read and understand all safety</p>	<p>2.3 HOT MATERIAL SAFETY (cont.)</p> <p>. Hot emulsion can also cause injury.</p> <p>2. To avoid serious burns, allow the machine to cool before repairing or maintaining working components.</p> <p>3. When hot asphalt touches the skin, flush area immediately with cold water. Do Not apply ice directly to the affected area. DO NOT ATTEMPT TO REMOVE ASPHALT with products containing solvents or ammonia. Natural separation will occur in about 48-72 hours. Get medical attention as soon as possible.</p> <p>4. Avoid discharge area of boom. Rocks, asphalt emulsion and solvent may spray out suddenly.</p> <p>2.4 ELECTRIC HEATER SAFETY</p> <p>1. Do not exceed asphalt flash temperature. Hot fumes can explode causing serious injury.</p> <p>2. Follow electric heater operating instructions. Stay away from electric heaters when heating material in tank and keep others away from machine when operating electric heaters. Death or serious injury can result due to electrical shock.</p>
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<p>and operating instructions in this manual. A person who has not read and understood all operating and safety instructions is not qualified to operate the patcher. An untrained operator exposes himself/herself and bystanders to possible serious injury or death. All accidents can be avoided!</p> <p>DO NOT modify the tank in any way. Unauthorized modification may impair function and/or safety and affect the working life of the equipment.</p> <p>2.3 HOT MATERIAL SAFETY</p> <p>1. Wear protective gear for face, hands, feet and body when working on the tank.</p>	<p>3. Do not attempt to service or perform maintenance on electrical components without disconnecting power first. Severe injury or death could result. Always use an electrical outlet with ground fault circuit interrupter (GFCI) protection.</p>
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<p>2.5 EXPLOSION PREVENTION</p> <p>1. Keep the machine and asphalt material away from sparks, incandescent material, and open flames. Fumes are flammable and can explode if ignited.</p> <p>2. Do not use Cutback Asphalts. Death or serious injury can occur due to violent explosion and/or fire.</p> <p>3. Do not mix grades of asphalt material. Hot asphalt can vaporize material with lower flash point temperature and cause an explosion.</p> <p>4. Pressure in asphalt or flush tanks MUST be released with vent valve before checking or filling the tank. The lids/covers can fly open with explosive force causing death or serious injury.</p> <p>2.6 FIRE PREVENTION</p> <p>1. Keep away from sparks, open flames and incandescent materials. Hot asphalt and its fumes are flammable and can ignite causing fire or explosion. Death or serious injury could result.</p> <p>2. Do not smoke around machine. Fuel, emulsion and the fumes from both can explode when exposed to flame or heat from smoking or other sources.</p> <p>3. Clean off asphalt and oil accumulations from surfaces that can get hot. Fire can occur in accumulated asphalt or oils and get out of hand quickly.</p>	<p>2.7 BATTERY SAFETY</p> <p>1. Keep all sparks and flames away from batteries, as gas given off by the batteries electrolyte solution is extremely explosive. An explosion could result in acid coming in contact with a persons eyes causing blindness.</p> <p>2. Wear safety glasses when working near batteries. Battery acid in the eyes can cause blindness.</p> <p>3. Avoid contact with battery electrolyte solution: wash off any spilled electrolyte immediately. Spilled electrolyte can cause chemical burns. Do not tip batteries more than 45 degrees to avoid spilling electrolyte solution.</p> <p>4. To avoid injury from burns or shock caused by a spark or short circuit, disconnect the battery ground cable before servicing any part of the electrical system.</p> <p>5. Do not jump start a damaged battery.</p> <p>2.8 MAINTENANCE SAFETY</p> <p>1. Follow ALL the operating, maintenance, and safety information in this manual.</p> <p>2. DO NOT attempt repairs or maintenance procedures you do not understand. Refer to manuals and experienced repair personnel for help.</p> <p>3. Support the truck with blocks or safety stands when changing tires or working beneath it. Death or serious injury can result from the machine falling off of a jack and crushing you.</p>
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<p>2.8 MAINTENANCE SAFETY (cont.)</p> <p>4. Place all controls in neutral, stop engine, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, or repairing. Death or serious injury can result from entanglement in moving parts.</p> <p>5. Follow good shop practices: -Keep service area clean and dry. -Be sure electrical outlets and tools are properly grounded. -Use adequate light for the job at hand.</p> <p>6. Make sure all guards are in place and properly secured when maintenance work is completed. Serious injury can occur from being caught in unguarded moving parts.</p> <p>7. Never wear loose-fitting, baggy, or frayed clothing when working around or on any of the drive system components. Loose garments can become entangled in moving parts, pulling the person into the machine which could cause serious injury or death.</p> <p>8. Wear protective glasses and other required safety equipment when servicing or repairing the tank.</p> <p>9. Wear proper hand and eye protection when searching for hydraulic leaks (Use a piece of wood or cardboard as a backstop, instead of hands to isolate and identify a leak.).</p> <p>10. Keep hands, feet, hair, and clothing away from moving or rotating parts. Death or serious injury can occur by becoming entangled in moving parts.</p> <p>11. Clear the area of bystanders when carrying out any maintenance and repairs or making any adjustments.</p> <p>13. Allow the machine and material to cool before working on it. Hot asphalt and hot machine components can cause serious burns.</p> <p>14. Disconnect the battery before working on the electrical system. Death or serious injury can result from electrical shock.</p>	<p>2.8 MAINTENANCE SAFETY (cont.)</p> <p>15. DO NOT make repairs on pressurized components, fluid, fuel or mechanical until the pressure has been relieved according to instructions.</p> <p>16. Replace all missing, illegible or damaged safety decals or signs. Keep all safety decals and signs clean.</p> <p>2.10 TRANSPORT SAFETY</p> <p>1. Make sure you are in compliance with all local regulations regarding transporting equipment on public roads and highways.</p> <p>2. DO NOT DRINK AND DRIVE.</p> <p>3. Make sure the lights and reflectors that are required by the local highway and transport authorities are in place, are clean, are in good working order, and can be seen clearly by all overtaking and oncoming traffic to avoid accidents.</p> <p>4. Do not exceed 55 MPH (88 KM/H) when transporting the machine. Reduce speed on rough roads and surfaces and when making turns.</p> <p>5. Lock pintle hitch (or other highway authority approved hitch for size of load being towed) and attach safety chains to hitch if towing a load.</p> <p>2.11 STORAGE SAFETY</p> <p>1. Store the patcher in an area away from human activity.</p> <p>2. Do not permit children to play on or around the stored machine. Serious injury can occur due to slips and falls.</p> <p>3. Make sure the unit is stored in an area that is firm, level, and free of debris.</p> <p>4. Store the patcher inside a building or cover with a weather-proof tarpaulin and support securely.</p>
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<p>2.12 TIRE SAFETY</p> <ol style="list-style-type: none"> 1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion separation of the tire and rim which may result in serious injury or death. 2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job. 3. Have a qualified tire dealer or repair service perform required tire maintenance. 4. When inflating tires, use a self-attaching inflation chuck with remote shut off and stand clear of the tire. The tire can explode with great force. 5. DO NOT inflate the tire beyond the tire manufacture's recommended inflation pressure. 6. DO NOT operate the machine with loose wheels or rims. Check wheel nuts periodically for proper tightening torque. 7. DO NOT hammer on rims with steel hammers. Use rubber, lead, plastic or brass faced mallets if necessary. 8. Block the tire and wheel on opposite side of the vehicle before you place a jack in position. 9. Place hardwood blocks under the jack regardless of how hard or soft the ground is. ALWAYS support the vehicle with blocks or preferably jack stands in case the jack should slip. 	<p>2.13 REFUELING SAFETY (cont.)</p> <ol style="list-style-type: none"> 3. Fill the fuel tank outdoors to reduce the chance of fumes accumulating and causing a fire or explosion. 4. Prevent fires by keeping machine clean of accumulated trash, fuels, grease, and debris 5. DO NOT allow fuel to spill on hot components. Maintain control of the fuel filler nozzle when filling the tank. Fire can result from fuel contacting hot components. 7. When refueling, keep the hose nozzle or the funnel and container in contact with the metal of the fuel tank to avoid the possibility of an electrical spark igniting the fuel. 8. Do not overfill the fuel tank. Allow room for expansion reduce the risk of fuel expanding and spilling from the tank.. 9. Tighten the fuel tank cap securely. Should the fuel cap be lost, replace it only with the original manufacturer's approved cap. Use of a non-approved cap without proper venting may result in pressurization of the tank.
<p>2.13 REFUELING SAFETY</p> <ol style="list-style-type: none"> 1. Handle fuel with care. It is highly flammable. 2. DO NOT SMOKE when refueling and never refuel when near an open flame. Also never refuel when the engine is running. Handle fuel with care. It is highly flammable. Death or serious injury can occur due to explosion and/or fire. Be sure to clean up spilled fuel before restarting the engine. 	

<p>2.14 SAFETY DECALS</p> <ol style="list-style-type: none"> 1. Keep safety decals and signs clean and legible at all times. 2. Replace safety decals and signs that are missing or have become illegible. 3. Replaced parts that displayed a safety sign should also display the current sign. 4. Safety decals or signs are available from your authorized Duraco parts dealer. <p>DECAL INSTALLATION</p> <ol style="list-style-type: none"> 1. Be sure that the installation area is clean and dry. Use hot soapy water and dry area thoroughly before installing decals. 2. Decide on the exact position by taking measurements and test fitting before you remove any of the backing paper. 3. For decals with no top protection paper, decide on the location for the decal and remove the smallest adhesive backing of the split backing paper. 4. Align the decal over the specified area and carefully press the small portion with the exposed adhesive backing in place. 5. Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place. 	<p>DECAL INSTALLATION (CONT.)</p> <ol style="list-style-type: none"> 6. Small air pockets can be pierced with a pin and smoothed out using a piece of decal backing paper. 7. If the decal has a protective top paper, use hot soapy water on the surface to which the decal is being applied. Leave wet. After deciding on the location, remove the backing paper and soak the decal in clean soapy water before application. This will help to alleviate air bubbles in the finished decal. 8. Smooth the decal into place with a squeegee, and check for air bubbles. Small air pockets may be pierced with a pin and smoothed out. When the decal is completely smoothed out, carefully remove the top paper.
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Trailer Stabilizing Procedure

Going under the trailer puts a person at risk of severe injury or death. Follow procedure below to stabilize trailer before going under the trailer

Method #1 Hitch to Vehicle

Park both the tow vehicle and trailer on a flat level surface. Place tow vehicle in park and remove keys.

Method #2 Unhitched

Park trailer on a level surface. Place wheel blocks in front of and behind wheels on both sides of the trailer. Inspect your swivel jack thoroughly for damage or abnormal wear, especially if it was subject to abnormal load or shock. *[If damaged do not use, replace swivel jack.]* Turn the swivel jack to the vertical position and pin in place. Use the swivel jack to decouple trailer from tow vehicle. After raising the hitch coupler, crib, block, or otherwise secure the trailer at once.

1000 GALLON DURATANK OPERATION

NOTE: This list does not take the place of nor is it in lieu of the instructions and safety warnings contained in the operator's manual. These Instructions do not take the place of nor are they in lieu of proper "on-site" training by a qualified operator. This is only a guide.

MACHINE PREPARATION PRIOR TO PUMPING EMULSION

1. Inspect machine for any defects, loose or damaged items.
2. Ensure that the trailer is securely fastened to tow vehicle with safety chains and lights are in proper working order
3. Ensure the solvent tank is full. Fill as needed.

Solvent Tank



Vented Cap



4. Close all valves before filling emulsion tank. Open vented cap. **Fill Tank to within 5" from top of tank. "DO NOT OVERFILL"**. Close and latch cap after filling.

The most commonly used emulsions for patching are CRS-2 (Cationic- positive charged) and RS-2 (Anionic- negative charged). These are rapid set emulsions that react very quickly with aggregate and form a fast curing patch which can support traffic immediately. In certain climates, rapid set emulsions may set up too quickly. If this is the case, medium set emulsions such as MS-2 and CMS-2 may be recommended. It is always best to consult your emulsion supplier to determine the best type of emulsion to use in your area.

CAUTION!

NEVER MIX CATIONIC OR ANIONIC EMULSIONS WITHOUT PROPERLY CLEANING THE EMULSION TANK! MIXING THESE WILL RESULT IN A HARDENED MASS OF MATERIAL THAT IS DIFFICULT TO REMOVE.

5. Replace all tank caps securely.
6. Check engine oil and add as needed.
7. Inspect and clean engine air filter. Replace when clogged or as per service intervals.
8. When ready to begin pumping emulsion from DuraTank
9. Remove hose from holder tube and attach to pump with quick connect fittings and lock.
10. Place other end of hose in tank to be filled.
11. Open Valve #1 and Valve #3
12. Start the engine.
13. When fill level is achieved close Valve #3 and Valve #1 and shut off engine.

CLEANUP

When you are finished with the DuraTank and are ready to store the unit overnight or any extended time, the emulsion supply line must be purged with diesel or other solvent.

1000 GALLON DURATANK

Operating Instructions

FILLING THE TANK

CLOSE ALL VALVES
OPEN VENTED CLOSURE
FILL TO WITHIN 5" FROM TOP OF TANK
CLOSE AND LATCH BOTH CLOSURES AFTER FILLING

TO OFFLOAD EMULSION

ATTACH LOADER HOSE AND PUT THE END IN THE TANK TO BE FILLED
OPEN VALVE #1 AT THE BOTTOM OF TANK
START PUMP ENGINE AND OPEN VALVE #3 TO FILL UNIT
WHEN FILL LEVEL IS ACHIEVED, CLOSE VALVE #1 **AND** #3
SHUT OFF PUMP ENGINE

TO FLUSH PUMP

PUT HOSE FROM VALVE #4 IN DISPOSAL CONTAINER
START ENGINE
OPEN VALVE #4
OPEN VALVE #2
RUN APPROXIMATELY 15 SECONDS OR UNTIL YOU SEE SOLVENT IN
DISPOSAL CONTAINER
CLOSE VALVE #2 AND VALVE #4

TO RECIRCULATE THE EMULSION

OPEN VALVE #1
OPEN VALVE #5
START ENGINE

**NOTE* THESE STEPS CAN ALSO BE FOUND ON THE DECAL ON THE
FRONT OF YOUR 1000 GALLON DURATANK TRAILER*

ALWAYS FLUSH THE PUMP WITH SOLVENT TO PREVENT EMULSION BUILDUP INSIDE THE PUMP.

The valve numbering for the 1000 Gallon DuraTank Trailer is shown below:



KEEP ALL VALVES CLOSED WHEN TANK IS NOT IN USE.

DuraTank

1000 Gallon Emulsion Tank

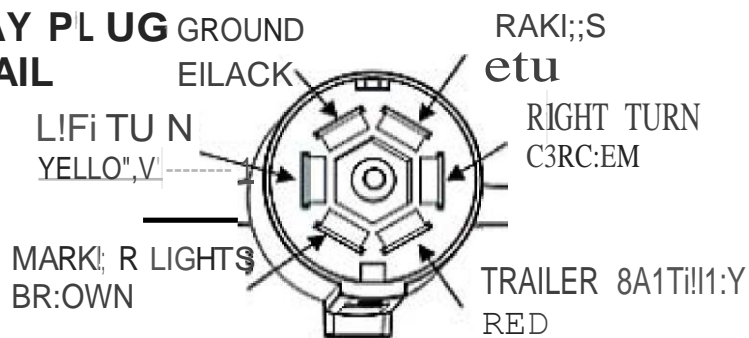
Measure from Bottom of Emulsion Tank

Inches	Gallons
2	14
4	40
6	72
8	110
10	151
12	196
14	243
16	293
18	343
20	395
22	448
24	500

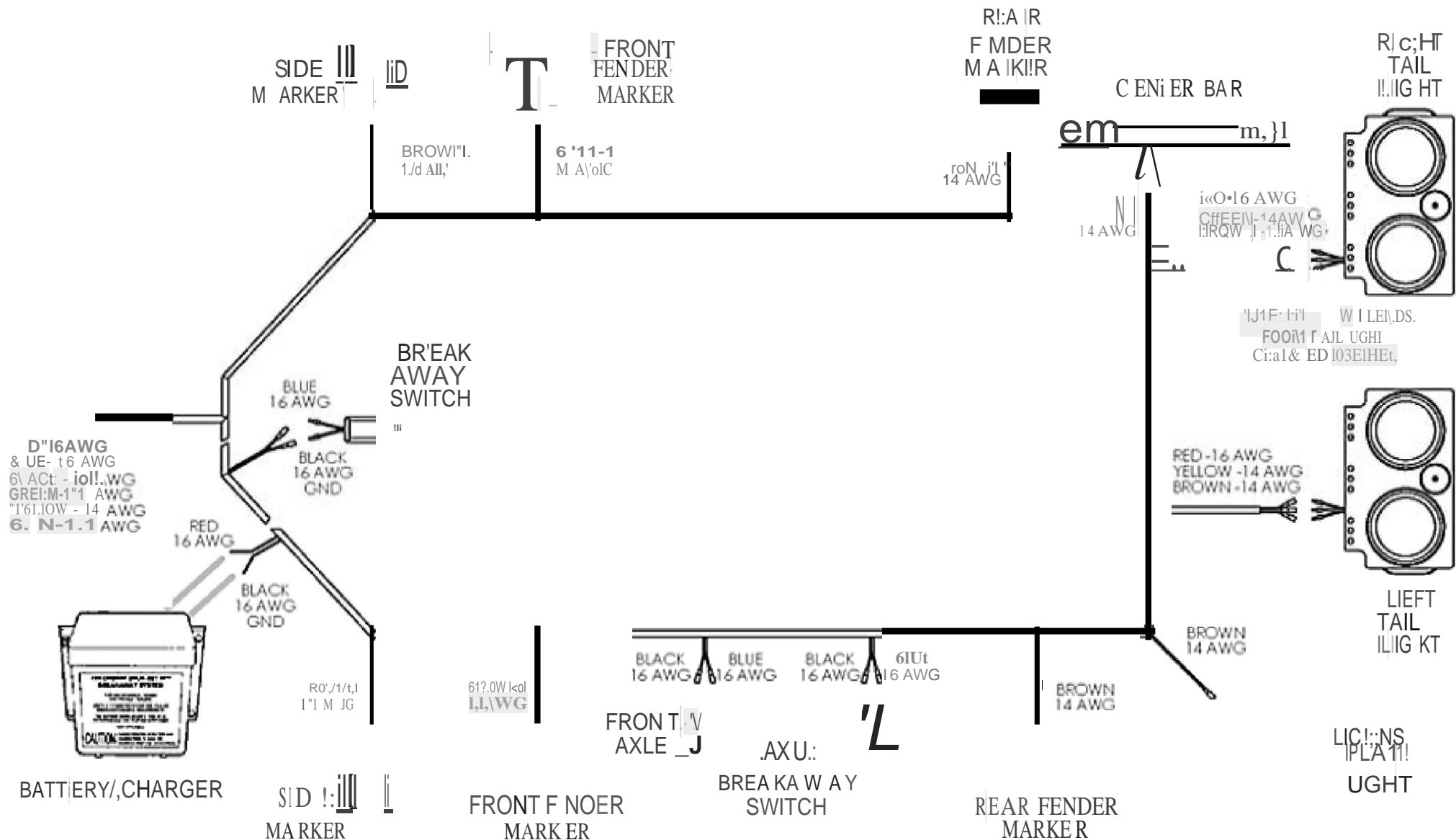
Inches	Gallons
26	554
28	607
30	659
32	710
34	759
36	807
38	851
40	893
42	930
44	963
46	988
48	1000

All measurements $\pm 10\%$

7 WAY PLUG GROUND
DETAIL EILACK



1000 GAL TRAILER WIRING DIAGRAM



1000 TT PARTS LIST

PART #	Item Description	UOM	NOTES
140613	7000 LB DROP AXLE	EA	
140667	LEAF SPRING FOR 7000 LB AXLE	EA	
140643	HANGER KIT FOR 7000 LB AXLE WITH SLIPPER SPRINGS	EA	
140646	16" TIRE & RIM - 8 HOLE	EA	
140645	7000 LB JACK SIDEWINDER	EA	
140644	DRAWBAR / PINTLE EYE, PLATE MOUNT 1000TT	EA	
130590	HEATING BLANKET 120V	EA	
101053	HEATING BLANKET SPRING	EA	
120959	3/4" EF75 SEALTITE FLEXIBLE CONDUIT	PER FOOT	
130640	S/O CORD GRIP FITTING	EA	
130595	THERMOSTAT WITH BOX	EA	
130607	THERMOSTAT POWER SO CORD	PER FOOT	
155309	PIPE GRIP FOR GRAB HANDLE	EA	
161476	DT1000 TRAILER TANK DECAL SET	EA	
155546	TEMPERATURE GAUGE FOR 1000 GALLON	EA	
130641	30A MALE PLUG	EA	
120047	1/2" COUPLER	EA	
120010	1/2" CLOSE NIPPLE	EA	
172362	1/2" BALL VALVE	EA	
172405	1/2 x 1/2 -90 FITTING	EA	
172322	1/2" NSTAGRIP HOSE	PER FOOT	
172404	1/2 PUSH LOCK FITTING	EA	
121002	1-1/2" 90 ELBOW BLACK	EA	
121000	1-1/2" X 4" PIPE NIPPLE	EA	
121001	1-1/2" X 5" PIPE NIPPLE	EA	
121010	1-1/2" X 12" NIPPLE	EA	
121003	1-1/2" MALE CAMLOCK FITTING	EA	
121004	1-1/2" FEMALE CAMLOCK FITTING	EA	
121005	1-1/2" DUST COVER CAMLOCK	EA	
172340	1-1/2" BALL VALVE	EA	
172410	1-1/2" PIPE CAP	EA	
121008	1-1/2" BLACK TEE	EA	
121011	1-1/2" X 1-1/2" X 1/2" TEE	EA	
121012	1-1/2" X 1/2" BELL REDUCER	EA	
121013	1-1/2" BLACK 90 DEG STREET ELBOW	EA	
121014	1-1/2" CLOSE NIPPLE	EA	
500747	1-1/2" FLEXWING HOSE	PER FOOT	
180596	1-1/2" TANK LOADER HOSE; 10' LONG	EA	
121009	2" 301 S/S CLAMPS	EA	
121006	3" BLACK STREET ELL 90 DEGREE	EA	
121007	3" PLUG	EA	
121015	3" BALL VALVE	EA	
408350	SOLVENT TANK ASSEMBLY FOR 1000 TT	EA	
155502	SOLVENT TANK FILLER NECK TWIST CAP	EA	
406644	PUMP PACKAGE 5 HP 1000 GALLON	EA	
130571	AMBER SIDE MARKER LIGHT, FRAME MOUNTED	EA	
155459	ANTI SKID TAPE	PER FOOT	
155458	DOT REFLECTIVE TAPE	PER FOOT	
130586	TAIL LIGHT ASSEMBLY RIGHT HAND	EA	
130587	TAIL LIGHT ASSEMBLY LEFT HAND	EA	
130588	BAR LIGHT	EA	
130570	YELLOW MARKER LIGHT, FENDER MOUNTED	EA	
130572	RED MARKER LIGHT, FENDER MOUNTED	EA	
155478	6 WAY TRAILER PLUG	EA	
130642	BREAKAWAY KIT 1000 TT	EA	
130610	MAIN WIRING HARNESS	EA	
155445	3/8 GRADE 70 CHAIN W/HOOK	EA	



DURAPATCHER
TECHNOLOGY

EQUIPMENT WARRANTY

T-Series DuraTank

Cimline, Inc.
2601 Niagara Lane N.
Plymouth, MN 55447

Duraco, Inc.
2000 Old Whitfield Rd.
Pearl, MS 39208

(877) 841-0848

Tel: 763-694-2665

Fax: 763-553-1093

cimline.com

Cimline, Inc. / Duraco, Inc. warrants its equipment, to the original purchaser only, against defects in material or workmanship based on normal use of service. Except as provided herein, no agent, dealer, employee or any other person is authorized to give any warranties of any nature outside of this agreement on behalf of Cimline, Inc. / Duraco, Inc.

Warranty period; begins at the date unit is first placed in service, or shipped from the factory. Upon sale or rental of the equipment by the distributor or Cimline, Inc. / Duraco, Inc., the provided warranty card should be mailed within 14 days starting date the unit is placed in service thus beginning the warranty period.

In the absence of any warranty card on file, the warranty period begins from date of shipment from factory.

Warranty for items for the T-Series DuraTank Units, are pro-rated using the following scale:

<u>Days</u>	<u>Hours</u>	<u>Warranty Coverage</u>
365 (1 year)	N/A	100%

Any warranty claims on parts may require a return for evaluation. Returning items will require an appropriate Return Merchandise Authorization (RMA) from Cimline Customer Care and that the item be returned for evaluation with that RMA for any warranty claim to be considered.

Replacement parts are warranted for a period of 60 days from factory invoice. For replacement parts that are purchased from distributor stock, the 60-day period will commence from the date of distributor to end user invoice. A copy of the invoice will be required as proof of in service date. If invoice is not provided, policy will revert back to the original factory invoice date.

Warranty does not apply to defects caused by improper or unreasonable use, acts of God (weather related), including but not limited to damage (including freight damage), accidents, and failure to provide reasonable maintenance or faulty repair made by others. Weather related (acts of God) including electrical surges, high winds, storm damage, flooding or lightning damage, including lightning damage even after a lightning protection package has been installed. Furthermore, warranty is void if the product or any of its components are modified or altered in any way or if aftermarket (NON-OEM) parts have been used during the warranty period. In the event of freight damage, a claim must be filed by the purchaser with the freight carrier.

Our responsibility under this warranty is limited to replacement or repair (at Cimline, Inc. / Duraco, Inc. discretion) of such part or parts, as inspection shall disclose to have been defective, to be performed at Cimline, Inc. / Duraco, Inc. factory at Plymouth, MN / Pearl, MS or at a facility designated by Cimline.

In no event shall Cimline, Inc. / Duraco, Inc. be liable for incidental or consequential damages of any kind whatsoever. Downtime, overhead and performance penalties are not recognized at any time as part of warranty coverage. Reasonable labor, travel, and diagnostic time will be reviewed for reimbursement. The use of aftermarket (NON-OEM) parts will result in denial of the claim. Mileage will be reimbursed at a rate of \$0.80 (80 cents) per mile (domestic 48 states), and no more than one round trip per claim. Shop Labor will be reimbursed at a max rate of \$80/hour. Parts freight will be reimbursed at a "UPS REGULAR" rate only for stock items, and for non-stock items will be reimbursed at a "UPS BLUE" rate.

All warranty claims must be processed through the factory authorized Cimline, Inc. / Duraco, Inc. dealer that was the original distributor of your Cimline, Inc. / Duraco, Inc. equipment or OEM Parts. All claim notices to Cimline, Inc. / Duraco, Inc. pursuant to this limited warranty must be made by completing a Cimline Warranty Claim Form which should be emailed to: customercareorders@plymouthind.com

No exceptions will be made to this warranty unless agreed to in writing by the Cimline Director.

This warranty is in lieu of all other warranties expressed or implied, and such other warranties are hereby disclaimed including any warranty of merchantability and fitness for a particular purpose.

VIKING PUMP

TECHNICAL SERVICE MANUAL

HEAVY-DUTY BRACKET MOUNTED PUMPS

SERIES 125 AND 4125

SIZES G-LL

SECTION TSM 141.1

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ISSUE D

PRESSURE ADJUSTMENT

If a new spring is installed or if the pressure setting of the pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove the valve cap which covers the adjusting screw.

Loosen the locknut which locks the adjusting screw so the pressure setting will not change during operation of the pump.
2. Install a pressure gauge in the discharge line for actual adjustment operation.
3. Turn the adjusting screw in to increase the pressure and out to decrease the pressure.
4. With the discharge line closed at a point beyond the pressure gauge, gauge will show the maximum pressure the valve will allow while the pump is in operation.

IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of the pump as it appears on the nameplate and the name of the part wanted. When ordering springs, be sure to give the pressure setting desired.

VIKING PUMP



WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. If, during said warranty period, any products sold by Viking prove to be defective in workmanship or material under normal use and service, and if such products are returned to Viking's factory at Cedar Falls, Iowa, transportation charges prepaid, and if the products are found by Viking to be defective in workmanship or material, they will be replaced or repaired free of charge, FOB. Cedar Falls, Iowa.

Viking assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of Viking products by the purchaser, his employees or others. Viking will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by Viking from outside sources which are incorporated into any Viking product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

THIS IS VIKING'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No officer or employee of IDEX Corporation or Viking Pump, Inc. is authorized to alter this warranty.

VIKING PUMP

TECHNICAL SERVICE MANUAL

HEAVY-DUTY BRACKET MOUNTED PUMPS

SERIES 125 AND 4125

SIZES G-LL

SECTION TSM 14.1 1

PAGE 1 OF 16

ISSUE D

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INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a Viking® representative. Always give complete name of part, part number and material with model number and serial number of pump when ordering repair parts. The unmounted pump or pump unit model number and serial number are on the nameplate.

In the Viking model number system, basic size letters are combined with series number (125 and 4125) and used to indicate either an unmounted pump or mounted pump unit.

UNMOUNTED PUMP		- UNITS
PACKED	MECH. SEAL	
G125	G4125	Units are designated by the unmounted pump model numbers followed by a letter indicating drive style. V = V-belt D = Direct Connected R = Viking Speed Reducer P = Commercial Speed Reducer
H125	H4125	
HL125	HL4125	
AK125	AK4125	
AL125	AL4125	
K125	K4125	
KK125	KK4125	
L125	L4125	
LQ125	LQ4125	
LL125	LL4125	

This manual deals only with Series 125 and 4125 Heavy Duty Bracket Mounted Pumps. Refer to Figures 1 through 19 for general configuration and nomenclature used in this manual. Pump specifications and recommendations are listed in Catalog Section 141, Series 125 and 4125 Heavy Duty Bracket Mounted Pumps.

CORPORATION

ID EX CORPOM TION

VIKING PUMP, INC. • A Unit of IDEX Corporation• Cedar Falls, IA50613 USA

FIGURE 1

Sizes G, H and HL

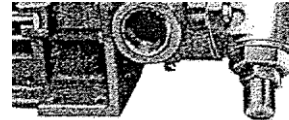


FIGURE 2

FIGURE 2

Sizes AK and AL

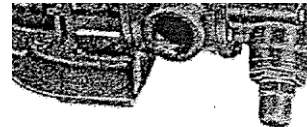


FIGURE 3

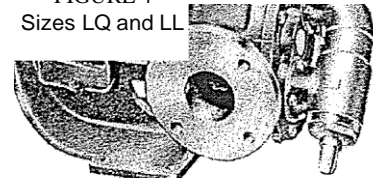
FIGURE 3

Sizes K, KK and L



FIGURE 4

Sizes LQ and LL



SAFETY INFORMATION AND INSTRUCTIONS

IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF PUMP MAY CAUSE SERIOUS INJURY OR DEATH AND/OR RESULT IN DAMAGE TO PUMP AND/OR OTHER EQUIPMENT. VIKING'S WARRANTY DOES NOT COVER FAILURE DUE TO IMPROPER INSTALLATION, OPERATION OR MAINTENANCE.

THIS INFORMATION MUST BE FULLY READ BEFORE BEGINNING INSTALLATION, OPERATION OR MAINTENANCE OF PUMP AND MUST BE KEPT WITH PUMP. PUMP MUST BE INSTALLED, OPERATED AND MAINTAINED ONLY BY SUITABLY TRAINED AND QUALIFIED PERSONS..

THE FOLLOWING SAFETY INSTRUCTIONS MUST BE FOLLOWED AND ADHERED TO AT ALL TIMES.

Symbol
Legend:

Danger - Failure to follow the indicated instruction may result in serious injury or death.

WARNING

Warning . In addition to possible serious injury or death, failure to follow the indicated instruction may cause damage to pump and/or other equipment.

BEFORE opening any liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) be sure that :

- Any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections
- The pump drive system means (motor, turbine, engine, etc.) has been "locked out" or otherwise been made non-operational so that it cannot be started while work is being done on the pump.
- You know what material the pump has been handling, have obtained a material safety data sheet (MSDS) for the material, and understand and follow all precautions appropriate for the safe handling of the material.

WARNING

INSTALL pressure gauges/sensors next to the pump suction and discharge connections to monitor pressures.

USE extreme caution when lifting the pump. Suitable lifting devices should be used when appropriate. Lifting eyes installed on the pump must be used only to lift the pump, not the pump with drive and/or base plate. If the pump is mounted on a base plate, the base plate must be used for all lifting purposes. If slings are used for lifting, they must be safely and securely attached. For weight of the pump alone (which does not include the drive and/or base plate) refer to the Viking Pump product catalog.

DO NOT attempt to dismantle a pressure relief valve that has not had the spring pressure relieved or is mounted on a pump that is operating.

AVOID contact with hot areas of the pump and/or drive. Certain operating conditions, temperature control devices (sockets, heat-tracing, etc.), improper installation, improper operation, and improper maintenance can all cause high temperatures on the pump and/or drive.

THE **PUMP** must be provided with pressure protection. This may be provided through a relief valve mounted directly on the pump, an in-line pressure relief valve, a torque limiting device, or a rupture disk. **if** pump rotation may be reversed during operation, pressure protection must be provided on *both* sides of pump. Relief valve adjusting screw caps must always point towards suction side of the pump. If pump rotation is reversed, position of the relief valve must be changed. Pressure relief valves cannot be used to control pump flow or regulate discharge pressure. For additional information, refer to Viking Pump's Technical Service Manual TSM 000 and Engineering Service Bulletin ESB-31.

THE **PUMP** must be installed in a manner that allows safe access for routine maintenance and for inspection during operation to check for leakage and monitor pump operation.



BEFORE operating the pump, be sure all drive guards are in place.



DO NOT operate pump if the suction or discharge piping is not connected.



DO NOT place fingers into the pumping chamber or its connection ports or into any part of the drive train if there is any possibility of the pump shafts being rotated.

DO NOT exceed the pumps rated pressure, speed, and temperature, or change the system/duty parameters from those the pump was originally supplied, without confirming its suitability for the new service.

WARNING

BEFORE operating the pump, be sure that:

- It is clean and free from debris
- all valves in the suction and discharge pipelines are fully opened.
- All piping connected to the pump is fully supported and correctly aligned with the pump.
- Pump rotation is correct for the desired direction of flow.

WARNING

WARNING

fil

WARNING

SPECIAL INFORMATION

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

ROTATION: Viking pumps operate equally well in a clockwise or counterclockwise rotation. Shaft rotation determines which port is suction and which is discharge. The port in the area where pumping elements (gear teeth) come out of mesh is suction port.

PRESSURE RELIEF VALVES:

1. Viking pumps are positive displacement pumps and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, a torque limiting device or a rupture disk.
2. There are relief valve options available on those pump models designed to accept a relief valve. Options may include a return to tank relief valve or a jacketed relief valve. Pumps equipped with a jacketed head plate are not available with an integral relief valve.
3. If pump rotation is reversed during operation, pressure protection must be provided on *both* sides of the pump.
4. the relief valve adjusting screw cap must *always* point towards the suction side of the pump. If pump rotation is reversed, remove the pressure relief valve and turn end for end. Refer to Figures 1, 2, 3 and 4, page 1.
5. Viking integral pressure relief valves should not be used to control pump flow or regulate discharge pressure.

For additional information on pressure relief valves, Refer to Technical Service Manual TSM000 and Engineering Service Bulletin ESB-31.

SPECIAL MECHANICAL SEALS can be installed either next to the rotor hub or in the stuffing box. Consult the factory for non-standard seal arrangements.

Extra care must be taken in the repair of pumps with mechanical seals. Read and follow all special information supplied with the pump and seal.

MAINTENANCE

Series 125 and 4125 pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

LUBRICATION: External lubrication must be applied slowly with a hand gun to all lubrication fittings every 500 hours of operation with multi-purpose grease, NLGI #2. Do not over-grease. Applications involving very high or low temperatures will require other types of lubrication. Refer to Engineering Service Bulletin ESB-515. Consult the factory with specific lubrication questions.

PACKING ADJUSTMENT: New packed pumps require initial packing adjustment to control leakage as packing "runs in". Make initial adjustments carefully and do not over-tighten the packing gland. After initial adjustment, periodic inspection will reveal the need for packing gland adjustment or packing replacement. Refer to instructions under Disassembly, page 5, and Assembly, page 5, regarding repacking the pump.

CLEANING PUMP: Keep the pump as clean as possible. This will facilitate inspection, adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

STORAGE: If the pump is to be stored, or not used for six months or more, the pump must be drained and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts. Lubricate the fittings and apply grease to the pump shaft extension. Viking suggests rotating the pump shaft by hand one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS: The following tools must be available to properly repair Series 125 and 4125 pumps. These tools are in addition to standard mechanics' tools such as open end wrenches, pliers, screw drivers, etc. Most of the items can be obtained from an industrial supply house.

1. Soft Headed hammer.
2. Allen wrenches (some mechanical seals and set collars).
3. Packing hooks, flexible (packed pumps)
Viking Part No. 2-810-049-999-00; G-HL
Viking Part No. 2-810-042-999-00; AK-LL
4. Mechanical seal installation sleeve.
Viking Part No. 2-751-001-730 for 0.75 inch seal; G4125
Viking Part No. 2-751-002-730 for 1.12 inch seal;
H & HL4125
Viking Part No. 2-751-003-730 for 1.44 inch seal;
AK - LL4 125
5. Bearing locknut spanner wrench.
Viking Part No. 2-810-043-375-00
6. Spanner wrench, adjustable pin type for use on double end caps. Viking Part No. 2-810-008-375-00
7. Brass bar.
8. Arbor press.
9. Standard 5/16" 12 point socket.

PACKED PUMPS

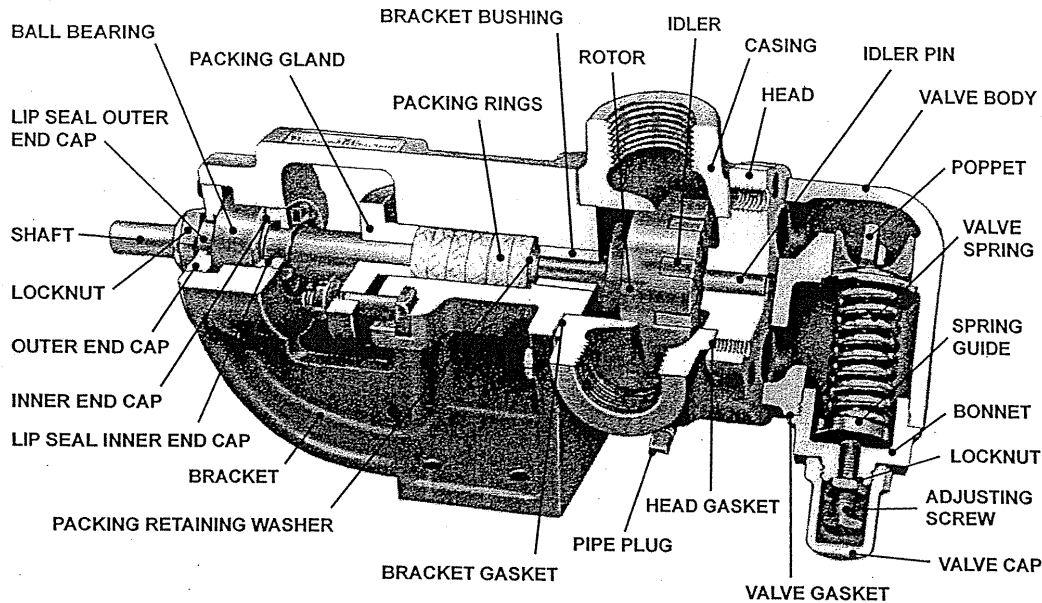
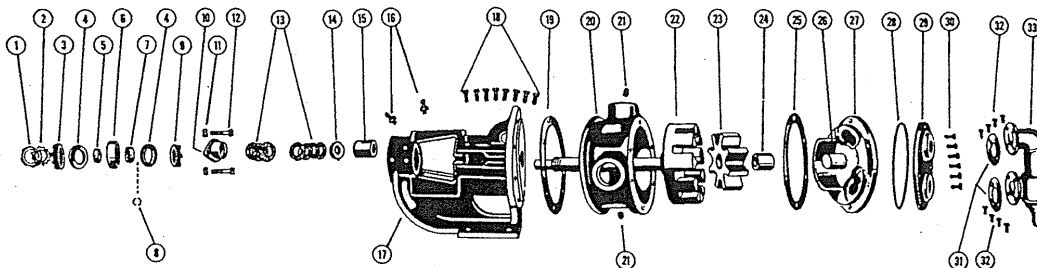


FIGURE 5
CUTAWAY VIEW OF G125 WITH CALLOUTS



EXPLODED VIEW OF MODELS G125, H125, HL125, AK125, AL125, K125, KK125, L125, LQ125 AND LL125
(MODEL KK125 SHOWN)

ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	12	Packing Gland Capscrews	23	Idler and Bushing Assembly
2	Lockwasher (Not G)	13	Packing	24	Idler Bushing
3	End Cap (Outer)	14	Packing Retaining Washer	25	Head Gasket
4	Lip Seal for End Cap	15	Bracket Bushing	26	Idler Pin
5	Bearing Spacer Collar (Outer)	16	Grease Fittings	27	Head and Idler Pin Assembly
6	Ball Bearing	17	Bracket and Bushing Assembly	28	O-Ring for Jacketed Head Plate
7	Bearing Spacer Collar (Inner)	18	Capscrews for Bracket	29	Jacketed Head Plate
8	Ring, Half Round (Not G, H, HL)	19	Bracket Gasket	30	Capscrews for Head
9	End Cap (Inner)	20	Casing	31	Relief Valve Gaskets
10	Packing Gland	21	Pipe Plug	32	Capscrews for Valve
11	Packing Gland Nuts	22	Rotor and Shaft Assembly	33	Internal Relief Valve

DISASSEMBLY

DANGER!

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

1. Mark the head position relative to the casing before disassembly to ensure proper reassembly. The idler pin, which is offset in the pump head, must be positioned toward and equal distance between port connections to allow for proper flow of liquid through the pump.

Tilt the top of the head back when removing the head to prevent the idler from falling from the idler pin. Remove the head from the pump. Avoid damaging the head gasket. If the pump is furnished with a pressure relief valve, it need not be removed from the head or disassembled at this point. Refer to Pressure Relief Valve Instructions, page 15.

If the pump has a jacketed head plate, it will separate from the head when it is removed. The gasket between the head and the jacket head plate must be totally removed. Always use a new gasket when assembling the pump.

2. Remove the idler and bushing assembly.
3. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Bend up the tang of the lockwasher and with a spanner wrench remove the locknut and lockwasher from the shaft. There is no lockwasher on G size pumps.
4. Remove the packing gland nuts.
5. Tap the shaft forward approximately 0.5 inch and remove the pair of half round rings under the inner bearing spacer collar. There is no pair of half round rings on G, H and HL

6. Carefully remove the rotor and shaft to avoid damaging the bracket bushing.
7. Remove the packing gland from the side of the bracket.

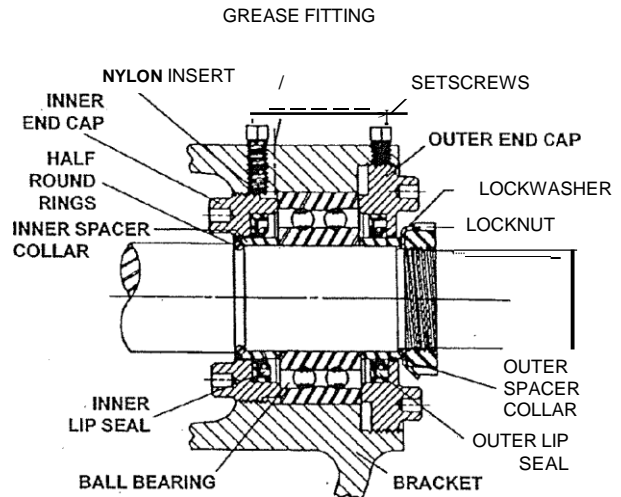


FIGURE 6

8. Loosen the setscrews. Two on G, H and HL, size pumps, four on all other sizes. With a spanner wrench, remove both end caps with lip seals. Remove the ball bearing and spacer collars. Refer to Figure 6.
9. Remove the packing and packing retainer washer.
10. Clean all parts thoroughly and examine for wear and damage. Check the lip seals, ball bearing, bushings and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash the bearings in clean solvent. Blow out the bearings with compressed air. Do not allow the bearings to spin; turn them slowly by hand. Spinning the bearings will damage the race and balls. Make sure the bearings are clean, then lubricate with non-detergent SAE 30 weight oil and check for roughness. Roughness can be determined by turning the outer race by hand.

11. Casing can be checked for wear or damage while mounted on the bracket.

ASSEMBLY

1. Install the bracket and/or idler bushing. If the bracket bushing has a lubrication groove, install the bushing with the groove at 12:00 o'clock position in bracket. If replacing carbon graphite, Refer to Installation of Carbon Graphite Bushings, page 14.
2. Coat the shaft of the rotor shaft assembly with non-detergent SAE 30 weight oil. Start the end of the shaft in the bracket bushing turning from right to left, slowly pushing the rotor in the casing.

3. Place the packing retainer washer in the bottom of the packing chamber. Use packing suitable for the liquid being pumped. Lubricate the packing rings with oil, grease or graphite to aid assembly. A length of pipe will help to seat each packing ring. (Install packing, staggering the joints from one side of shaft to other.)
4. Install the packing gland, capscrews and nuts. Back the rotor and shaft out of the casing just far enough to insert the packing gland through the side opening of the bracket over the end of the shaft. Make sure the gland is installed square and the nuts are tightened evenly. Tighten the nuts wrench tight then back off until the gland is slightly loose.
5. Coat the idler pin with non-detergent SAE 30 weight oil and place the idler and bushing on the idler pin in the head.
6. Using a .010 to .015 inch head gasket, install the head and idler assembly on the pump. Pump head and casing were marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is offset in the pump head, is positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

If the pump is equipped with a jacketed head plate, install at this time along with a new gasket.

Tighten the head capscrews evenly.
7. Slide the inner spacer collar over the shaft with the recessed end facing the rotor. G, H and HL size bearing spacer collars are not recessed.

Place pair of half round rings on the shaft and slide the inner bearing spacer collar over the half round rings to lock them in place. There is no pair of half round rings on G, H and HL size pumps. **Refer to Figure 6, page 5.**
8. Press the lip seal, the lip facing the end of the shaft, in the inner end cap and insert the end cap through the shaft end of the bracket. Turn the end cap clockwise, looking at the shaft end, until it engages the threads. The end cap spanner wrench holes must be facing the rotor. Turn the end cap with a spanner wrench until it projects slightly from the opening on the side of the bracket. The end cap must not be turned so far that the lip seal drops off the end of the spacer collar on the shaft or end cap becomes disengaged from the threads. **Refer to Figure 6, page 5.**

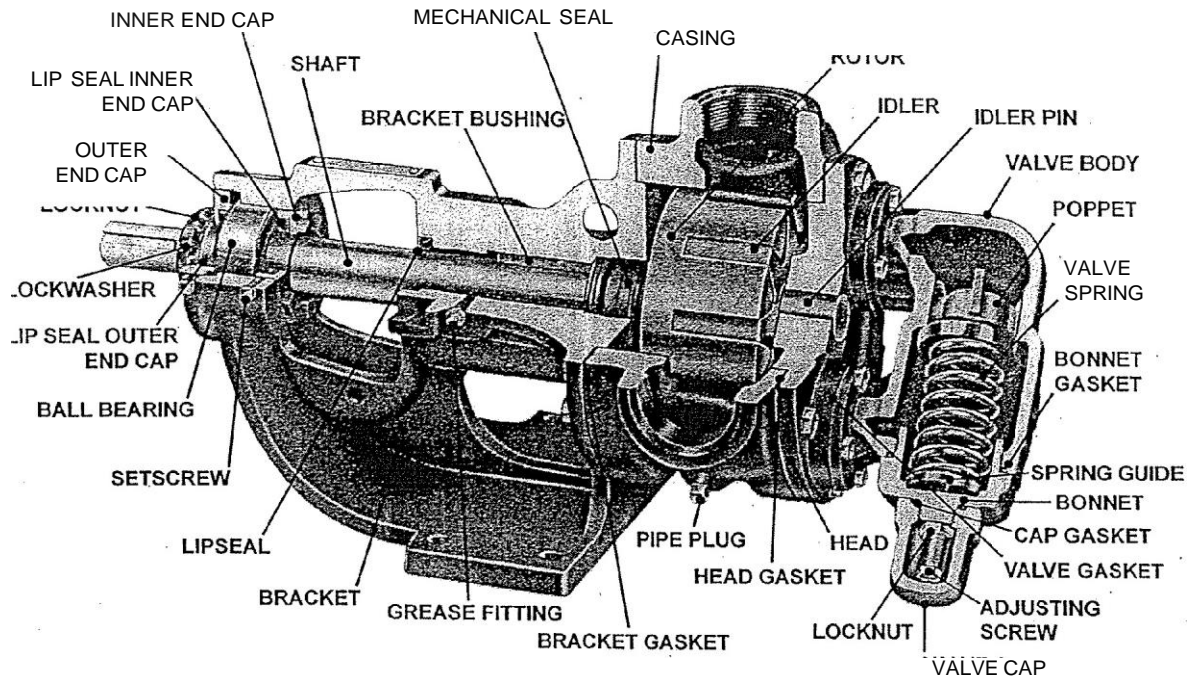
If this happens, remove the inner spacer collar, half round rings and end cap and start over at Step 7.
9. Pack the ball bearing with multi-purpose grease, NLGI #2. Place on the shaft and push or gently drive in place in the bracket.
10. Press the lip seal, the lip facing the end of the shaft, in the outer end cap and insert the end cap in the bracket. Turn the end cap in the bracket until it is tight against the bearing. **Refer to Figure 6, page 5.**
11. Put the lockwasher and locknut on the shaft. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Lighten the locknut and bend one tang of the lockwasher into the slot of the locknut. There is no lockwasher on G size pumps.
12. Adjust pump end clearance. **Refer to Thrust Bearing Adjustment, page 13.**
13. Lubricate all grease fittings with multi-purpose grease, NLGI #2.

DANGER!

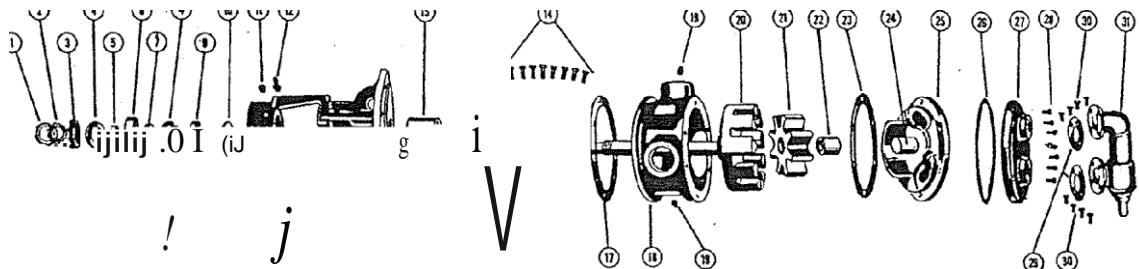
Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

MECHANICAL SEAL PUMPS



FIGURE?
CUTAWAY VIEW OF KK4125 WITH CALLOUTS



EXPLODED VIEW FOR MODELS G4125, H4125, HL4125, K4125, KK4125, L4125, LQ4125 AND LL4125
(MODEL KK4125 SHOWN)

ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	12	Grease Fitting	23	Head Gasket
2	Lockwasher (Not G)	13	Bracket and Bushing Assembly	24	Idler Pin
3	End Cap (Outer)	14	Capscrews for Bracket	25	Head and Idler Pin Assembly
4	Lip Seal for End Cap	15	Bracket Bushing	26	Gasket for Jacketed Head Plate
5	Bearing Spacer Collar (Outer)	16	Mechanical Seal	27	Jacketed Head Plate
6	Ball Bearing	17	Bracket Gasket	28	Capscrews for Head
7	Bearing Spacer Collar (Inner)	18	Casing	29	Relief Valve Gaskets
8	Ring, Half Round (Not G, H, HL)	19	Pipe Plug	30	Capscrews for Valve
9	End Cap (Inner)	20	Rotor and Shaft Assembly	31	Internal Relief Valve
10	Lip Seal for Seal Chamber	21	Idler and Bushing Assembly		
11	Pressure Relief Plug	22	Idler Bushing		

DISASSEMBLY

DANGER!

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

5. Carefully remove the rotor and shaft to avoid damaging the bracket bushing.
6. Remove the rotary member of the seal from the shaft and the stationary seal seat from the bracket
7. Loosen the setscrews. Two on G, H and HL size pumps, four for all other sizes. With a spanner wrench, remove both end caps and lip seals. Remove the ball bearing and spacer collars. **Refer to Figure 6, page 5.**
8. Examine the seal chamber lip seal and remove if it shows wear or damage. The lip seal must be removed if the bracket bushing needs to be replaced.
9. Clean all parts thoroughly and examine for wear or damage. Check the lip seals, ball bearing, bushing and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash the bearings in clean solvent. Blow out the bearings with compressed air. Do not allow the bearings to spin; turn them slowly by hand. Spinning the bearings will damage the race and balls. Make sure the bearings are clean, then lubricate with non-detergent SAE 30 weight oil and check for roughness. Roughness can be determined by turning the outer race by hand.

Be sure the shaft is free from nicks, burrs and foreign particles that might damage the bracket bushing. Scratches on the shaft in the seal area will provide leakage paths under the mechanical seal.
10. Casing can be checked for wear or damage while mounted on the bracket.

ASSEMBLY

Standard Mechanical Seal

(Synthetic Rubber Bellows Type)

Sizes G, H, HL, K, KK, L, LQ and LL

The seal used in this pump is simple to install and good performance **will** result if care is taken during installation.

The principle of the mechanical seal is contact between the rotary and stationary members. These parts are lapped to a high finish and their sealing effectiveness depends on complete contact.

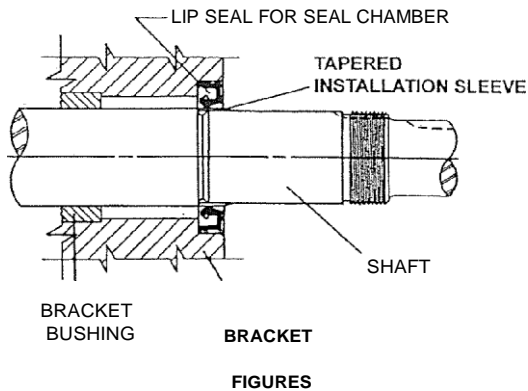
Viking furnishes a number of heavy-duty pumps with special mechanical seals installed in the packing end of the pump. These special seals are not discussed in this manual (TSM141.1). Information is available by contacting the factory. When requesting special seal information, be sure to give the pump model number and serial number.

1. Mark the head position relative to the casing before disassembly to ensure proper reassembly. The idler pin, which is offset in the pump head, must be positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

Tilt the top of the head back when removing the head to prevent the idler from falling. Remove the head from the pump. Avoid damaging the head gasket. If the pump is furnished with a pressure relief valve, it need not be removed from the head or disassembled at this point. Refer to Pressure Relief Valve Instructions, page 15.

If the pump has a jacketed head plate, it will separate from the head when it is removed. The gasket between the head and the jacket head plate must be totally removed. **Always** use a new gasket when assembling the pump.
2. Remove the idler and bushing assembly.
3. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Bend up the tang of the lockwasher and with a spanner wrench remove the locknut and lockwasher from the shaft. There is no lockwasher on G size pumps.
4. Tap the shaft forward approximately 0.5 inch and remove the pair of half roundrings under the inner spacer collar. There is no pair of half round rings on G, H and HL size pump?

1. Install the bracket bushing. If the bracket bushing has a lubrication groove, install the bushing with the groove at the 12:00 o'clock position in the bracket. If replacing carbon graphite bushings, **Refer to Installation of Carbon Graphite Bushings, page 14.**
2. Install the lip seal in the bracket. **Refer to Figure 8, page 9.**



Prior to installing the rotating portion of the mechanical seal, prepare and organize the rotor shaft, head and idler assemblies and appropriate gaskets for quick assembly.

Once the rotating portion of the mechanical seal is installed on the rotor shaft, it is necessary to assemble the parts as quickly as possible to ensure that the seal does not adhere to the shaft in the wrong axial position. The seal should be expected to stick to the shaft after only a few minutes setting time.

Never touch the sealing faces with anything except clean hands or a clean cloth. Minute particles can scratch the seal faces and cause leakage.

3. Coat the idler pin with non-detergent SAE 30 weight oil and place the idler and bushing on the idler pin in the head. If replacing a carbon graphite bushing, **Refer to Installation of Carbon Graphite Bushings, page 14.**
4. Clean the rotor hub and bracket seal housing bore. Make sure both are free from dirt and grit. Coat the outer diameter of the seal seat and the inner diameter of the seal housing bore with non-detergent SAE 30 weight oil.
5. Start the seal seat in the seal housing bore, **Refer to Figure 9.** If force is necessary, protect the seal face with a clean cardboard disc and gently tap it in place with a piece of wood.
6. Place the tapered installation sleeve on the shaft, **Refer to Figure 10.** Sleeve is furnished with H, HL, K, KK, L, LO and LL size replacement mechanical seals. Coat the rotor shaft, tapered installation sleeve and inner diameter of the mechanical seal rotary member with a generous amount of non-detergent SAE 30 weight oil. Petrolatum may be used but grease is not recommended.
7. Place the seal spring on the shaft against the rotor hub. **Refer to Figure 11.**
8. Slide the rotary member, the lapped contact surface facing away from the spring, over the installation sleeve on the shaft until it is against the spring.
Do not compress the spring.

COAT SEAL SEAT AND SEAL HOUSING BORE WITH NON-DETERGENT SAE 30 WEIGHT OIL BEFORE ASSEMBLY.

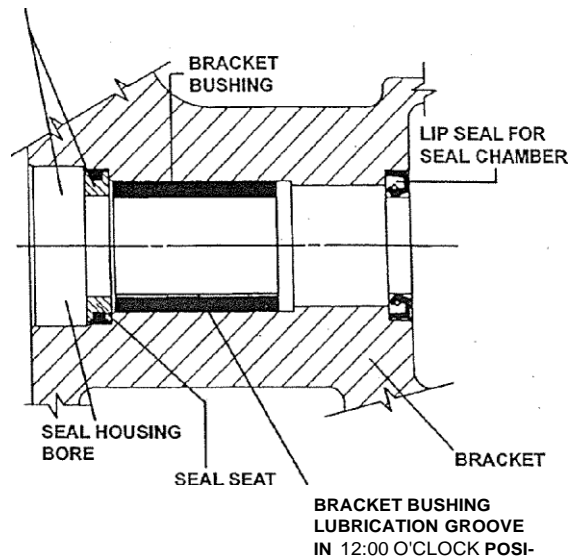
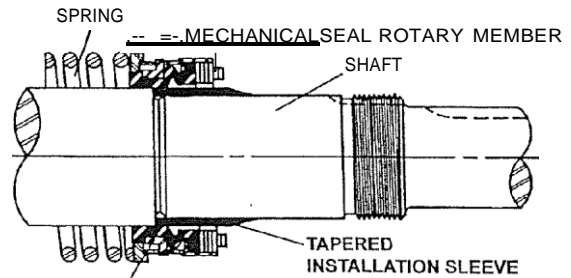


FIGURE 9



COAT ROTOR SHAFT, TAPERED INSTALLATION SLEEVE AND INNER DIAMETER OF MECHANICAL SEAL WITH NON-DETERGENT SAE 30 WEIGHT OIL BEFORE ASSEMBLY.

FIGURE 10

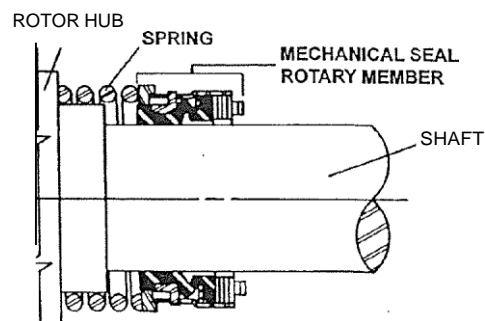


FIGURE 11

9. Coat the rotor shaft with non-detergent SAE 30 weight oil. Start the end of the shaft in the bracket bushing and turn from right to left, slowly pushing until the ends of the rotor teeth are just below the face of the casing.

Leave the rotor in this position. Withdrawal of the rotor and shaft may displace the carbon seal rotating face and result in damage to the seal.

10. Using a .010 to .015 inch head gasket, install the head and idler assembly on the pump. The pump head and casing were marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is offset in the pump head, is positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

If the pump is equipped with a jacketed head plate, install at this time along with a new gasket.

Tighten the head capscrews evenly.

Remove the tapered installation sleeve from the shaft.

11. Slide the inner spacer collar over the shaft with the recessed end facing the rotor. G, H and HL size bearing spacer collars are not recessed.

Place the pair of half round rings on the shaft and slide the inner bearing spacer collar over the half round rings to lock them in place. There is no pair of half round rings on G, H and HL size pumps. Refer to Figure 6, page 5.

12. Press the lip seal, lip facing the end of the shaft, in the inner end cap and insert the end cap through the shaft end of the bracket. Turn the end cap clockwise, looking at the shaft end, until it engages the threads. End cap spanner wrench holes must be facing the rotor. Turn the end cap with a spanner wrench until it projects slightly from opening on the side of the bracket. The end cap must not be turned so far that the lip seal drops off the end of the spacer collar on shaft or the end cap becomes disengaged from the threads. Refer to Figure 6, page 5.

If this happens, remove the inner spacer collar, half round rings and end cap and start over at Step 11.

13. Pack the ball bearing with multi-purpose grease, NLGI #2. Place on the shaft and push or gently drive into place in the bracket.
14. Press the lip seal, lip facing the end of the shaft, in the outer end cap and insert the end cap in the bracket. Turn the end cap in the bracket until it is tight against the bearing. Refer to Figure 6, page 5.
15. Put the lockwasher and locknut on the shaft. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Tighten the locknut and bend one tang of the lockwasher into the slot of the locknut. There is no lockwasher on G size pumps.
16. Adjust the pump end clearance. Refer to Thrust Bearing Adjustment, page 14.
17. Lubricate the grease fitting over the seal chamber with petroleum jelly, petrolatum (Vaseline) or other similar low melting point lubricant. Lubricate all other grease fittings with multi-purpose grease, NLGI #2.

DANGER!

Before starting pump, be sure all drive equipment guards are in place.

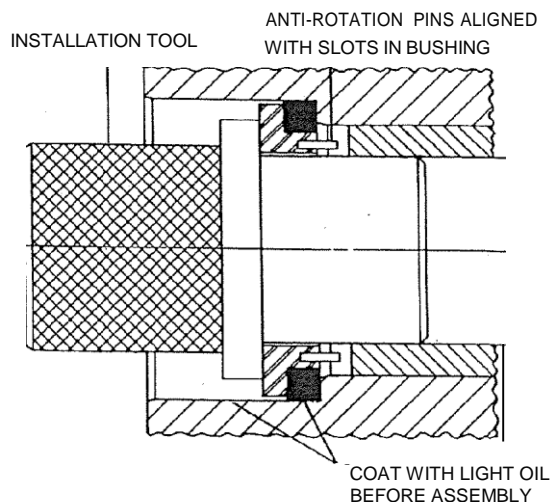
Failure to properly mount guards may result in serious injury or death.

ASSEMBLY

Optional Mechanical Seal
(PTFE Fitted Type)

The seal type shown in Figures 12, 13 and 14 can be installed as an alternate to the standard mechanical seal (synthetic rubber bellows type). These seals are setscrew driven and the stationary seats have anti-rotation pins which mate with slots in the end of the bracket bushing.

1. Install the bracket bushing. If the bracket bushing has a lubrication groove, install the bushing with the groove at the 12:00 o'clock position in the bracket. If carbon graphite, Refer to Installation of Carbon Graphite Bushings, page 14.
2. Install the lip seal in the bracket.
3. Clean the rotor hub and bracket seal housing bore. Refer to Figure 12. Make sure both are free from dirt and grit. Coat the outer diameter of the seal seat gasket and the inner diameter of seal housing bore with non-detergent SAE 30 weight oil.
4. Start the seal seat in the seal housing bore. Make sure the seat anti-rotation pins are aligned to engage the slots in the end of the bracket bushing. Refer to Figure 12.



BRACKET SEAL HOUSING BORE WITH SEAL SEAT INSTALLED. NOTE SPECIAL INSTALLATION TOOL USED FOR FACTORY ASSEMBLY.

FIGURE 12

5. Using a cardboard disc to protect the lapped face of the seal seat, press the seal seat assembly to the bottom of the seal housing bore using a piece of wood. An arbor press can also be used to install the seal seat. The seal seat must be started square and carefully pressed to the bottom of the seal housing bore.

K size pumps require a 0.25 inch spacer between the seal and the rotor hub to properly position the seal on the shaft.

6. Place the tapered installation sleeve (furnished with H, HL, K, KK, L, LQ and LL size replacement mechanical seals) on the shaft. Refer to Figure 13. Coat the inner diameter of the seal rotary member, tapered installation sleeve and the shaft with a generous quantity of non-detergent SAE 30 weight oil. Place the rotary member on the shaft over the sleeve and against the hub of the rotor. **Refer to Figure 14.**

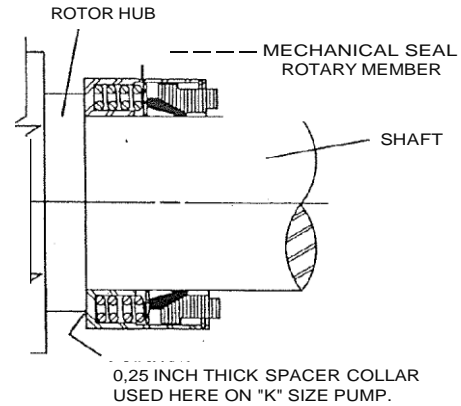


FIGURE 14

TAPERED INSTALLATION SLEEVE

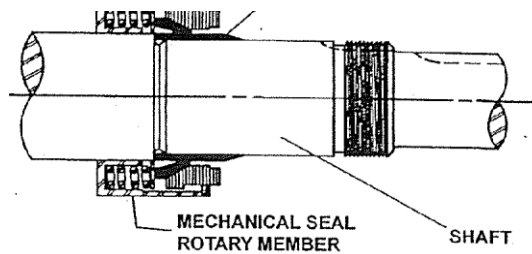
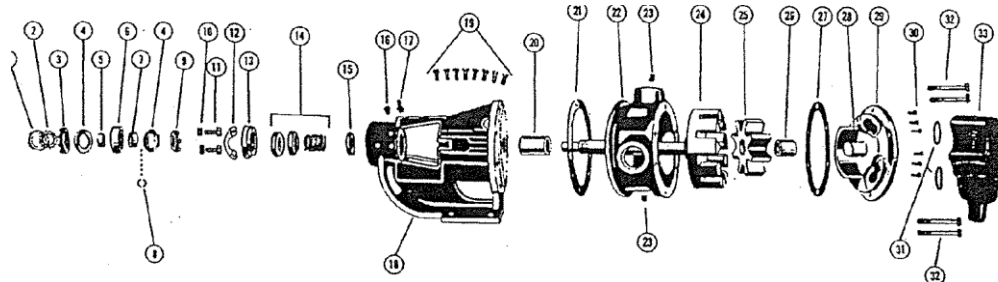


FIGURE 13

Some PTFE seals are equipped with holding clips which compress the seal springs. Remove the holding clips to release the springs after the seal is installed on the shaft. Tighten all drive setscrews securely to the shaft.

AT THIS POINT, FINISH ASSEMBLY PROCEDURES STARTING AT STEP 9, PAGE 10 (STANDARD MECHANICAL SEAL).

EXPLODED VIEW OF MODELS AK4125 AND AL4125 (MODEL AK4125 SHOWN)



ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	12	Seal Plate	23	Pipe Plug
2	Lockwasher (Not G)	13	Seal Holder	24	Rotor and Shaft Assembly
3	End Cap (Outer)	14	Mechanical Seal	25	Idler and Bushing Assembly
4	Lip Seal for End Cap	15	Set Collar with Setscrews	26	Idler Bushing
5	Bearing Spacer Collar (Outer)	16	Pipe Plug	27	Head Gasket
6	Ball Bearing	17	Grease Fitting	28	Idler Pin
7	Bearing Spacer Collar (Inner)	18	Bracket and Bushing Assembly	29	Head and Idler Pin Assembly
8	Ring, Half Round	19	Capscrews for Bracket	30	Capscrews for Head
9	End Cap (Inner)	20	Bracket Bushing	31	Relief Valve Gaskets
10	Seal Holder Nut	21	Bracket Gasket	32	Capscrews for Relief Valve
11	Seal Holder Capscrew	22	Casing	33	Internal Relief Valve

DISASSEMBLY

DANGER!

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

1. Mark the head position relative to the casing before disassembly to ensure proper reassembly. The idler pin, which is offset in the pump head, must be positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

Tilt the top of the head back when removing the head to prevent the idler from falling. Remove the head from the pump. Avoid damaging the head gasket. If the pump is furnished with a pressure relief valve, it need not be removed from the head or disassembled at this point. **Refer to Pressure Relief Valve Instructions, page 15.**

If the pump has a jacketed head plate, it will separate from the head when it is removed. The gasket between the head and jacket head plate must be totally removed. **Always** use a new gasket when assembling the pump.

2. Remove the idler and bushing assembly.
3. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Bend up the tang of the lockwasher and with a spanner wrench remove the locknut and lockwasher from the shaft.
4. Rotate the shaft so that the two setscrews for the set collar can be seen through the seal access hole on the left side of the pump (viewed from the shaft end). These two setscrews must be loosened before the shaft can be removed from the pump. **Refer to Figure 15, page 13.**

5. Remove the seal holder nuts, seal holder plate and the capscrews.
6. Seal holder cannot be removed until the shaft is removed.
7. Tap the shaft forward approximately 0.5 inch and remove the pair of half round rings under the inner spacer collar.
8. Carefully remove the rotor and shaft to avoid damaging the bracket bushing.
9. Remove the seal holder, seal seat and rotary member of the seal from the side opening in the bracket.
10. Loosen the four setscrews over the outer and inner end caps. With a spanner wrench remove both end caps and lip seals. Remove the ball bearing and spacer collars. **Refer to Figure 6, page 5.**
11. Clean all parts thoroughly and examine for wear or damage. Check the lip seals, ball bearing, bushings and idler pin and replace if necessary. Check all other parts for nicks, burrs, excessive wear and replace if necessary.

Wash the bearings in clean solvent. Blow out the bearings with compressed air. Do not allow the bearings to spin; turn them slowly by hand. Spinning the bearings will damage the race and balls. Make sure the bearings are clean, then lubricate with non-detergent SAE 30 weight oil and check roughness. Roughness may be determined by turning the outer race by hand.

Be sure the shaft is free from nicks, burrs and foreign particles that might damage the bracket bushing. Scratches on the shaft in the seal area will provide leakage paths under the mechanical seal.

12. Casing can be checked for wear or damage while mounted on the bracket.

ASSEMBLY

Standard Mechanical Seal (Synthetic Rubber ?ellows Type) Sizes AK and AL

The seal used in this pump is simple to install and good performance will result if care is taken during installation.

The principle of the mechanical seal is contact between the rotary and stationary members. These parts are lapped to a high finish and their sealing effectiveness depends on complete contact.

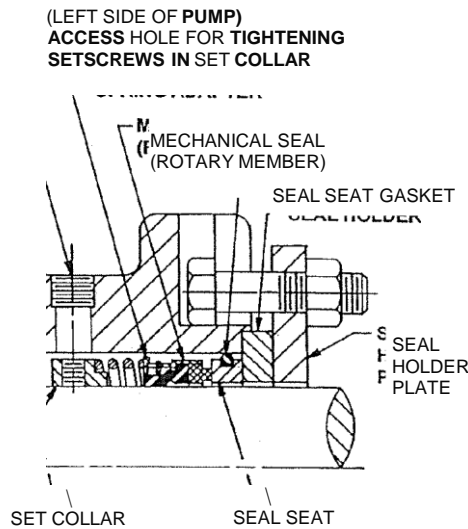
1. Install the bracket bushing. If the bracket bushing has a lubrication groove, install the bushing with the groove at the 12:00 o'clock position in the bracket. If carbon graphite, **Refer to Installation of Carbon Graphite Bushings, page 14.**
2. Coat the shaft of the rotor shaft assembly with non-detergent SAE 30 weight oil. Start the end of the shaft in the bracket bushing turning from right to left, slowly pushing the rotor into the casing.
3. Coat the idler pin with non-detergent SAE 30 weight oil and place the idler and bushing on the idler pin in the head. If replacing carbon graphite bushing, **Refer to Installation of Carbon Graphite Bushings, page 14.**

4. Using a .010 to .015 inch head gasket, install the head and idler assembly on the pump. Pump head and casing were marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is offset in the pump head, is positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

If the pump is equipped with a jacketed head plate, install at this time with a new gasket.

Tighten the head capscrews evenly.

5. Examine the set collar to be sure there are no burrs or scratches and that the setscrews are withdrawn so the shaft will not be scratched when the set collar is installed.
6. Place the seal set collar on the shaft, push into the seal chamber so the centerline of the setscrew coincides with the centerline of the access hole on the left side of the bracket (viewed from the shaft end). **Refer to Figure 15.** Tighten the setscrews to secure the set collar to the shaft.
7. Slide the spring over the shaft into the seal chamber on the set collar pilot. Place the tapered installation sleeve on the shaft. Refer to Figure 10, page 9.



8. Apply a generous amount of non-detergent SAE 30 weight oil to the large diameter of the shaft, the tapered installation sleeve and the inner diameter of the mechanical seal rubber parts.
9. Slide the rotary member, lapped contact surface facing away from the spring, over the installation sleeve on the shaft until it is against the spring.
Do not compress the spring.
10. Lubricate the outer diameter of mechanical seal O-ring seal gasket and flush the lapped seal faces with non-detergent SAE 30 weight oil.

11. Press the stationary seal seat in the bore until the back, unlapped face, is just inside the bore. Position the stationary seal seat by the installing seal holder and secure the seal holder to the machined face of the bracket with the seal holder plate.

12. Tighten the nuts securing the seal holder plate evenly so the seal holder will not be distorted:

13. Remove the tapered installation sleeve.

14. Slide the inner bearing spacer collar over the shaft with the recessed end facing the rotor.

Place the pair of half round rings on the shaft and slide the inner bearing spacer collar over the half round rings - to lock them in place. Refer to Figure 6, page 5.

15. Press the lip seal, lip facing the end of the shaft, in the inner end cap and insert the end cap through the shaft end of the bracket. Turn the end cap clockwise, looking at the shaft end, until it engages the threads. End cap spanner wrench holes must be facing the rotor. Turn the end cap with a spanner wrench until it projects slightly from the opening on the side of the bracket.

The end cap must not be turned so far that the lip seal drops off the end of the spacer collar on the shaft or the end cap becomes disengaged from the threads. **Refer to Figure 6, page 5.**

If this happens, remove the inner spacer collar, half round rings and end cap and start over at Step 15.

16. Pack the ball bearing with multi-purpose grease, NLGI #2. Place on the shaft and push or gently drive into place in the bracket.

Install the outer spacer collar.

17. Press the lip seal, lip facing the end of the shaft, in the outer end cap and insert the end cap in the bracket. Turn the end cap in bracket until it is light against the bearing. Refer to Figure 6, page 5.

18. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning. Push the lockwasher and locknut on the shaft, tighten and bend the tang of the lockwasher into the slot of the locknut.

19. Adjust the pump end clearance. **Refer to Thrust Bearing Adjustment, page 14.**

20. Lubricate all grease fittings with multi-purpose grease, NLGI #2.

DANGER!

Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

THRUST BEARING ADJUSTMENT

1. Loosen the setscrews over the outer and inner end caps. Two for G, H and HL size pumps, four for all other sizes.
2. Turn the inner end cap clockwise, viewed from the shaft end, until it projects slightly from the bracket exposing approximately three threads.
3. Turn the outer end cap clockwise until the rotor is tight against the head and the rotor shaft cannot be turned.
4. Make a reference mark on the bracket end, opposite a notch on the outer end cap. There are no notches on G size pumps. Back off the outer end cap the required number of notches. **Refer to Figure 16.**

Each 0.25 inch travel on the circumference of the end cap is equivalent to approximately .002 inch end clearance for G size pumps and .0015 inch for all other sizes.

5. End clearances set per Step 4 are adequate for viscosities up to 750 SSU (SAE 20 lube oil at room temperature). Higher viscosity liquids require additional end clearances.

As a general guideline, for viscosities between 750 and 7500 SSU (heavier lube oils) double the amount of end clearance indicated in Step 4; for viscosities between 7500 and 75,000 SSU (e.g., resins) triple the amount and for viscosities greater than 75,000 SSU (e.g., black strap molasses) use 4 times the amount.

For specific recommendations for end clearances for viscosity or for operating temperatures above 225°F, check with your Viking representative or consult the factory.

6. Tighten the inner end cap with a spanner wrench. Tap the spanner wrench lightly but **DO NOT OVER TIGHTEN** as it will only damage the threads.
7. Tighten all setscrews that hold inner and outer end caps to prevent their turning in the bracket.
8. Rotor and shaft should turn smoothly by hand one complete revolution. If the rotor and shaft doesn't turn smoothly, go back and repeat **Thrust Bearing Adjustment Steps 1 through 8.**

PUMP SIZE	Turn Outer End Cap C.C.W.	
	No. of Notches*	or Length on O.D., Inches
G	–	0.38"
H-HL	3	0-5"
AK- LL	5	0.66"

* Each small notch on outer end cap represents .001 inch end clearance

FIGURE 16

INSTALLATION OF CARBON GRAPHITE BUSHINGS

When installing carbon graphite bushings, extreme care must be taken to prevent breaking. Carbon graphite is a brittle material and is easily cracked. If cracked, the bushing will quickly disintegrate. Using a lubricant and adding a chamfer on the bushing and the mating part will help in installation. The additional precautions listed below must be followed for proper installation:

1. A press must be used for installation.
2. Be certain the bushing is started straight.
3. Do not stop the pressing operation until the bushing is in the proper position. Starting and stopping will result in a cracked bushing.
4. Check the bushing for cracks after installation.

Carbon graphite bushings with extra interference fits are frequently furnished for high temperature operation. These bushings must be installed by a shrink fit.

1. Heat the bracket or idler to 750°F.
2. Install the cool bushings with a press.
3. If facilities are not available to reach 750°F temperature, it is possible to install with 450°F temperature; however, the lower the temperature, the greater the possibility of cracking the bushing.

Consult the factory with specific questions on high temperature applications. **Refer to Engineering Service Bulletin ESB-3.**

PRESSURE RELIEF VALVE INSTRUCTIONS

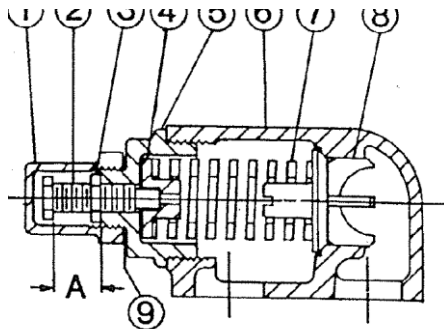


FIGURE 17
Sizes G, H and HL

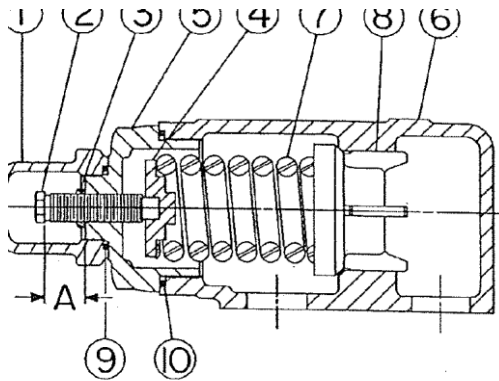


FIGURE 18
Sizes AK and AL

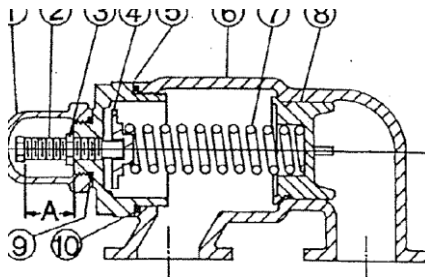


FIGURE 19
Sizes K, KK, L, LQ and LL

LIST OF PARTS

- | | |
|--------------------|-----------------|
| 1. Valve Cap | 6. Valve Body |
| 2. Adjusting Screw | 7. Valve Spring |
| 3. Lock Nut | 8. Poppet |
| 4. Spring Guide | 9. Cap Gasket |
| 5. Bonnet | 10. Bonnet |

DANGER!

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine; etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

Mark the valve and head before disassembly to ensure proper reassembly.

1. Remove the valve cap.
2. Measure and record the length of extension of the adjusting screw. Refer to "A" on Figures 17, 18 and 19.
3. Loosen the locknut and back out the adjusting screw until the spring pressure is released.
4. Remove the bonnet, spring guide, spring and poppet from the valve body. Clean and inspect all parts for wear or damage and replace as necessary.

ASSEMBLY

Reverse the procedures outlined under **Disassembly**. If the valve is removed for repairs, be sure to replace in the same position. Relief valve adjusting screw cap must **always** point toward the suction side of the pump. If pump rotation is reversed, remove the relief valve and turn end for end. Refer to Figures 1, 2, 3 and 4, page 1.

DANGER!

Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

VIKING PUMP

TECHNICAL SERVICE MANUAL

HEAVY-DUTY BRACKET MOUNTED PUMPS

SERIES 125 AND 4125

SIZES G-LL

SECTION TSM 141.1

PAGE 16 OF 16

ISSUE D

PRESSURE ADJUSTMENT

If a new spring is installed or if the pressure setting of the pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove the valve cap which covers the adjusting screw.
Loosen the locknut which locks the adjusting screw so the pressure setting will not change during operation of the pump.
2. Install a pressure gauge in the discharge line for actual adjustment operation.
3. Turn the adjusting screw in to increase the pressure and out to decrease the pressure.
4. With the discharge line closed at a point beyond the pressure gauge, gauge will show the maximum pressure the valve will allow while the pump is in operation.

IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of the pump as it appears on the nameplate and the name of the part wanted. When ordering springs, be sure to give the pressure setting desired.

VIKING PUMP



WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. If, during said warranty period, any products sold by Viking prove to be defective in workmanship or material under normal use and service, and if such products are returned to Viking's factory at Cedar Falls, Iowa, transportation charges prepaid, and if the products are found by Viking to be defective in workmanship or material, they will be replaced or repaired free of charge, FOB. Cedar Falls, Iowa.

Viking assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability for the consequences of the use or misuse of Viking products by the purchaser, his employees or others. Viking will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by Viking from outside sources which are incorporated into any Viking product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

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INTRODUCTION

Thank you for purchasing a Honda engine. We want to help you to get the best results from your new engine and to operate it safely. This manual contains information on how to do that; please read it carefully before operating the engine. If a problem should arise, or if you have any questions about your engine, consult an authorized Honda servicing dealer.

All information in this publication is based on the latest product information available at the time of printing. Honda Motor Co., Ltd. reserves the right to make changes at any time without notice and without incurring any obligation. No part of this publication may be reproduced without written permission.

This manual should be considered a permanent part of the engine and should remain with the engine if resold.

Review the instructions provided with the equipment powered by this engine for any additional information regarding engine startup, shutdown, operation, adjustments or any special maintenance instructions.

United States, Puerto Rico, and U.S. Virgin Islands:
We suggest you read the warranty policy to fully understand its coverage and your responsibilities of ownership. The warranty policy is a separate document that should have been given to you by your dealer.

SAFETY MESSAGES

Your safety and the safety of others are very important. We have provided important safety messages in this manual and on the engine. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is preceded by a safety alert symbol **A** and one of three words: DANGER, WARNING, or CAUTION.

These signal words mean:

A DANGER

You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

A WARNING

You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

A CAUTION

You CAN be HURT if you don't follow instructions.

Each message tells you what the hazard is, what can happen, and what you can do to avoid or reduce injury.

DAMAGE PREVENTION MESSAGES

You will also see other important messages that are preceded by the word NOTICE.

This word means:

NOTICE

Your engine or other property can be damaged if you don't follow instructions.

The purpose of these messages is to help prevent damage to your engine, other property, or the environment.

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GX120U1 - GX160U1 - GX200U

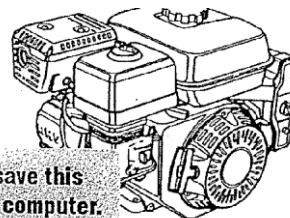
37Z4F603

00X37-Z4F-6030

:H:ON:O.A..

OWNER'S MANUAL MANUEL DE L'UTILISATEUR MANUAL DEL PROPIETARIO

GX120. GX160 - GX200



Click here to save this manual to your computer.

CE

A

WARNING: 1

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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ENGLISH

FRANÇAIS

ESPAÑOL

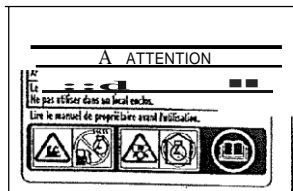
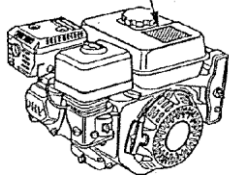
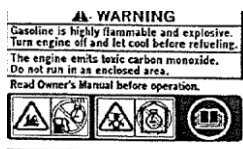
ENGLISH

SAFETY INFORMATION

- Understand the operation of all controls and learn how to stop the engine quickly in case of emergency. Make sure the operator receives adequate instruction before operating the equipment.
- Do not allow children to operate the engine. Keep children and pets away from the area of operation.
- Your engine's exhaust contains poisonous carbon monoxide. Do not run the engine without adequate ventilation, and never run the engine indoors.
- The engine and exhaust become very hot during operation. Keep the engine at least 1 meter (3 feet) away from buildings and other equipment during operation. Keep flammable materials away, and do not place anything on the engine while it is running.

SAFETY LABEL LOCATION

This label warns you of potential hazards that can cause serious injury. Read it carefully. If the label comes off or becomes hard to read, contact your Honda dealer for replacement.



For Canadian types only:
French label comes with the engine.

1 1 1

Gasoline is highly flammable and explosive. Turn engine off and let cool before refueling.

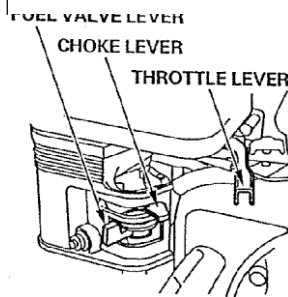
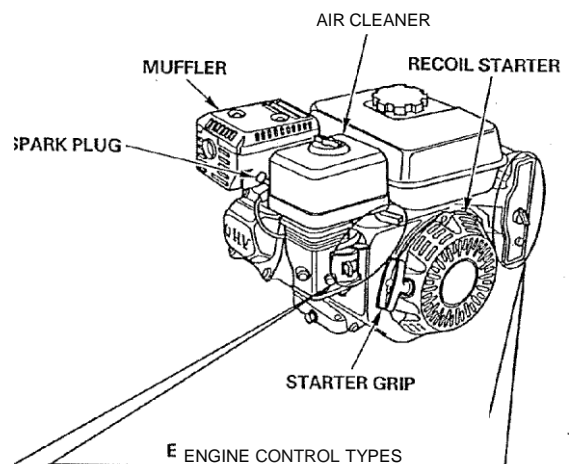
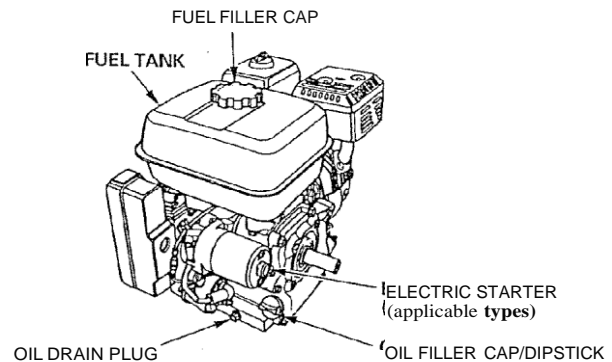
1 & 1

The engine emits toxic poisonous carbon monoxide gas. Do not run in an enclosed area.

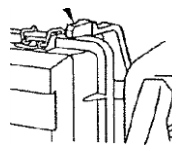
E in

Read Owner's Manual before operation.

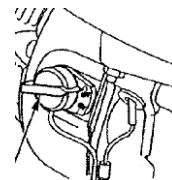
COMPONENT & CONTROL LOCATION



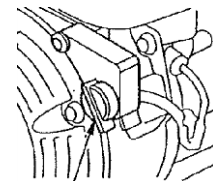
CHOKE LEVER
(air cleaner low profile type)



EXCEPT ELECTRIC
STARTER TYPES



ENGINE SWITCH



ENGINE SWITCH
ELECTRIC STARTER TYPES

ENGINE
CUTCH

CIRCUIT/IL
PROTECTOR

FEATURES

OIL ALERT® SYSTEM (applicable types)

The Oil Alert® system is designed to prevent engine damage caused by an insufficient amount of oil in the crankcase. Before the oil level in the crankcase can fall below a safe limit, the Oil Alert® system will automatically stop the engine (the engine switch will remain in the ON position).

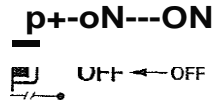
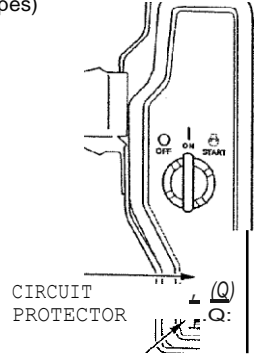
If the engine stops and will not restart, check the engine oil level (see page 9) before troubleshooting in other areas.

CIRCUIT PROTECTOR (applicable types)

The circuit protector protects the battery charging circuit. A short circuit, or a battery connected with reverse polarity, will trip the circuit protector.

The green indicator inside the circuit protector will popout to show that the circuit protector has switched off. If this occurs, determine the cause of the problem, and correct it before resetting the circuit protector.

Push the circuit protector button to reset.



BEFORE OPERATION CHECKS

IS YOUR ENGINE READY TO GO?

For your safety, and to maximize the service life of your equipment, it is very important to take a few moments before you operate the engine to check its condition. Be sure to take care of any problem you find, or have your servicing dealer correct it, before you operate the engine.

A WARNING

Improperly maintaining this engine, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always perform a preoperation inspection before each operation, and correct any problem.

Before beginning your preoperation checks, be sure the engine is level and the engine switch is in the OFF position.

Always check the following items before you start the engine:

Check the General Condition of the Engine

1. Look around and underneath the engine for signs of oil or gasoline leaks.
2. Remove any excessive dirt or debris, especially around the muffler and recoil starter.
3. Look for signs of damage.
4. Check that all shields and covers are in place, and all nuts, bolts, and screws are tightened.

Check the Engine

1. Check the fuel level (see page 8). Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.
2. Check the engine oil level (see page 9). Running the engine with a low oil level can cause engine damage.

The Oil Alert® system (applicable types) will automatically stop the engine before the oil level falls below safe limits. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

3. Check the reduction case oil level on applicable types (see page 9). Oil is essential to reduction case operation and long life.
4. Check the air filter element (see page 10). A dirty air filter element will restrict air flow to the carburetor, reducing engine performance.
5. Check the equipment powered by this engine.

Review the instructions provided with the equipment powered by this engine for any precautions and procedures that should be followed before engine startup.

OPERATION

SAFE OPERATING PRECAUTIONS

Before operating the engine for the first time, please review the **SAFETY INFORMATION** section on page 2 and the **BEFORE OPERATION CHECKS** on page 3.

A WARNING

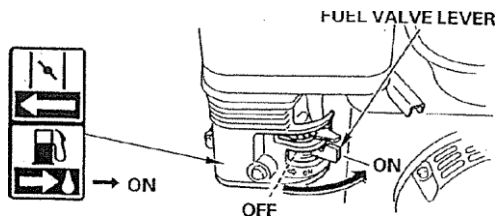
Carbon monoxide gas is toxic. Breathing it can cause unconsciousness and even kill you.

Avoid any areas or actions that expose you to carbon monoxide.

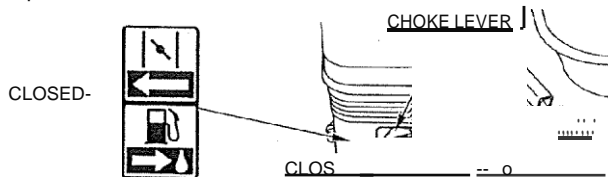
Review the instructions provided with the equipment powered by this engine for any safety precautions that should be observed with engine startup, shutdown or operation.

STARTING THE ENGINE

1. Move the fuel valve lever to the ON position.



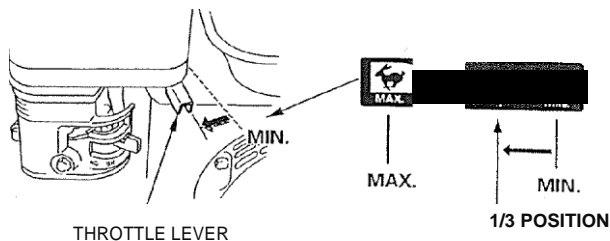
2. To start a cold engine, move the choke lever to the CLOSED position.



To restart a warm engine, leave the choke lever in the OPEN position.

Some engine applications use a remote-mounted choke control rather than the engine-mounted choke lever shown here. Refer to the instructions provided by the equipment manufacturer.

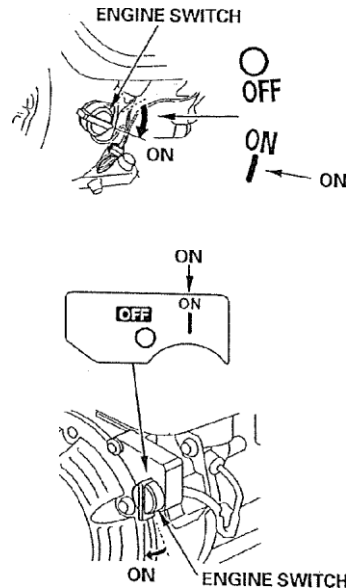
3. Move the throttle lever away from the MIN. position, about 1/3 of the way toward the MAX. position.



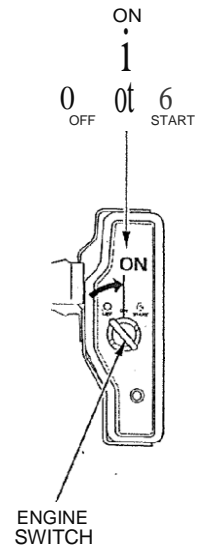
Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here. Refer to the instructions provided by the equipment manufacturer.

4. Turn the engine switch to the ON position.

EXCEPT ELECTRIC STARTER TYPES



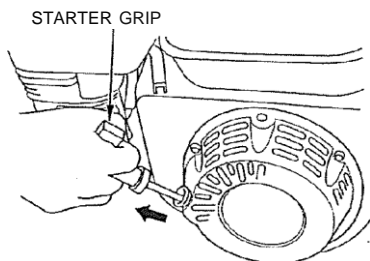
ELECTRIC STARTER TYPES



5. Operate the starter.

RECOIL STARTER:

Pull the starter grip lightly until you feel resistance, then pull briskly. Return the starter grip gently.



NOTICE

Do not allow the starter grip to snap back against the engine. Return it gently to prevent damage to the starter.

ELECTRIC STARTER (applicable types):

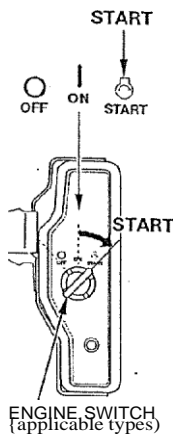
Turn the key to the START position, and hold it there until the engine starts.

If the engine fails to start within 5 seconds, release the key, and wait at least 10 seconds before operating the starter again.

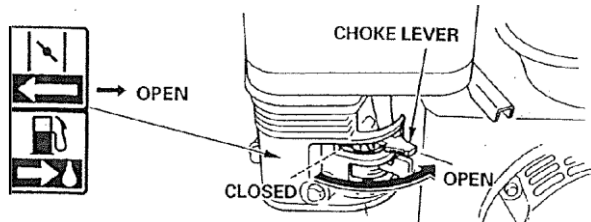
NOTICE

Using the electric starter for more than 5 seconds at a time will overheat the starter motor and can damage it.

When the engine starts, release the key, allowing it to return to the ON position.



6. If the choke lever has been moved to the CLOSED position to start the engine, gradually move it to the OPEN position as the engine warms up.

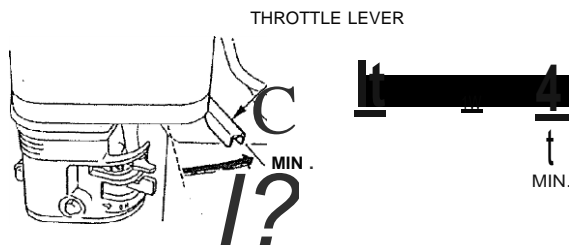


STOPPING THE ENGINE

To stop the engine in an emergency, simply turn the engine switch to the OFF position. Under normal conditions, use the following procedure. Refer to the instructions provided by the equipment manufacturer.

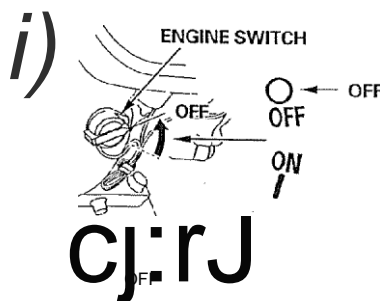
1. Move the throttle lever to the MIN. position.

Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here.

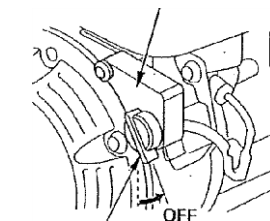
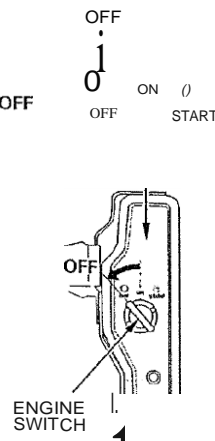


2. Turn the engine switch to the OFF position.

EXCEPT ELECTRIC STARTER TYPES

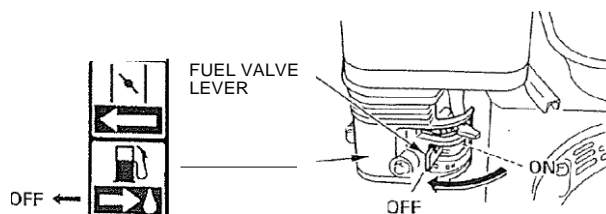


ELECTRIC STARTER TYPES



ENGINE SWITCH

3. Turn the fuel valve lever to the OFF position.

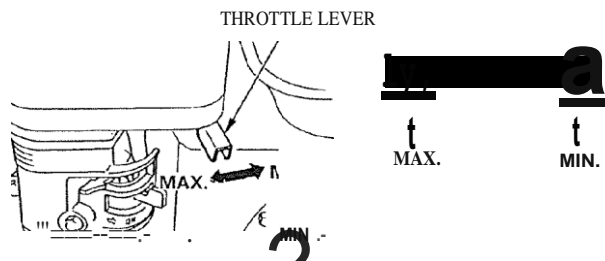


SETTING ENGINE SPEED

Position the throttle lever for the desired engine speed.

Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here. Refer to the instructions provided by the equipment manufacturer.

For engine speed recommendations, refer to the instructions provided with the equipment powered by this engine.



SERVICING YOUR ENGINE

THE IMPORTANCE OF MAINTENANCE

Good maintenance is essential for safe, economical and trouble-free operation. It will also help reduce pollution.

A WARNING

Improper maintenance, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always follow the inspection and maintenance recommendations and schedules in this owner's manual.

To help you properly care for your engine, the following pages include a maintenance schedule, routine inspection procedures, and simple maintenance procedures using basic hand tools. Other service tasks that are more difficult, or require special tools, are best handled by professionals and are normally performed by a Honda technician or other qualified mechanic.

The maintenance schedule applies to normal operating conditions. If you operate your engine under severe conditions, such as sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, consult your servicing dealer for recommendations applicable to your individual needs and use.

Maintenance, replacement, or repair of the emission control devices and systems may be performed by any engine repair establishment or individual; using parts that are "certified" to EPA standards.

MAINTENANCE SAFETY

Some of the most important safety precautions follow. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance. Only you can decide whether or not you should perform a given task.

A WARNING

Failure to properly follow maintenance instructions and precautions can cause you to be seriously hurt or killed.

Always follow the procedures and precautions in this owner's manual.

SAFETY PRECAUTIONS

- Make sure the engine is off before you begin any maintenance or repairs. This will eliminate several potential hazards:
 - Carbon monoxide poisoning from engine exhaust.**
Be sure there is adequate ventilation whenever you operate the engine.
 - Burns from hot parts-**
Let the engine and exhaust system cool before touching.
 - Injury from moving parts.**
Do not run the engine unless instructed to do so.
- Read the instructions before you begin, and make sure you have the tools and skills required.
- To reduce the possibility of fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep cigarettes, sparks and flames away from all fuel related parts.

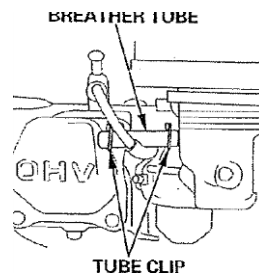
Remember that an authorized Honda servicing dealer knows your engine best and is fully equipped to maintain and repair it. To ensure the best quality and reliability, use only new genuine Honda parts or their equivalents for repair and replacement.

MAINTENANCE SCHEDULE

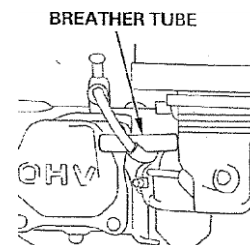
REGULAR SERVICE PERIOD (3)		Each Use	First Month or 20 Hrs	Every 3 Months or 50 Hrs	Every 6 Months or 700 Hrs	Every Year or 300 Hrs	Refer to Page
Perform at every indicated month or operating hour interval, whichever comes first.							
ITEM							
Engine oil	Check level	0					9
	Change		0		0		9
Reduction case oil (applicable types)	Check level	0					9- 10
	Change		0		0		10
Air filter	Check	0					10
	Clean			0 (1)	0*(1)		17 ... 12
	Replace					0**	
Sediment cup	Clean				0		72
Spark plug	Check-adjust				0		12
	Replace					0	
Spark arrester (applicable rvs)	Clean				0		13
Idle speed	Check-adjust					0 (2)	13
Valve clearance	Check-adjust					0 (2)	Shop manual
Combustion chamber	Clean	After every 500 Hrs. (2)					Shop manual
Fuel tank & filter	Clean				0 (2)		Shop manual
Fuel tube	Check	Every 2 years (Replace if necessary) (2)					Shop manual

- * • Internal vent carburetor with dual element type only.
• Cyclone type every 6 months or 150 hours.

INTERNAL VENT CARBURETOR TYPE



STANDARD TYPE



- ** • Replace paper element type only.
• Cyclone type every 2 years or 600 hours.

- (1) Service more frequently when used in dusty areas.
- (2) These items should be serviced by your servicing dealer, unless you have the proper tools and are mechanically proficient. Refer to Honda shop manual for service procedures.
- (3) For commercial use, log hours of operation to determine proper maintenance intervals.

Failure to follow this maintenance schedule could result in non-warrantable failures.

REFUELING

Recommended Fuel

Unleaded gasoline	
U.S.	Pump octane rating 86 or higher
Except U.S.	Research octane rating 91 or higher
	Pump octane rating 86 or higher

This engine is certified to operate on unleaded gasoline. Unleaded gasoline produces fewer engine and spark plug deposits and extends exhaust system life.

A.WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when refueling.

- Stop engine and keep heat, sparks, and flame away.
- Refuel only outdoors.
- Wipe up spills immediately.

NOTICE

Fuel can damage paint and some types of plastic. Be careful not to spill fuel when filling your fuel tank. Damage caused by spilled fuel is not covered under the Distributor's Limited Warranty.

Never use stale or contaminated gasoline or oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

Occasionally you may hear a light "spark knock" or "pinging" (metallic rapping noise) while operating under heavy loads. This is no cause for concern.

If spark knock or pinging occurs at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see an authorized Honda servicing dealer.

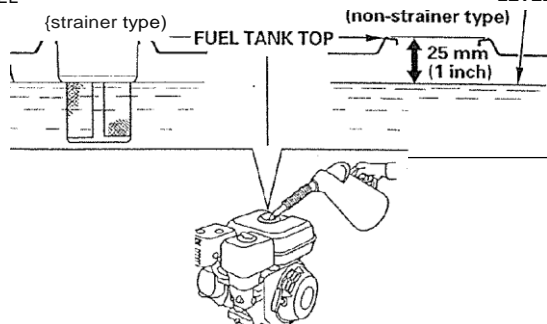
NOTICE

Running low engine with persistent spark knock or pinging can cause engine damage.

Running the engine with persistent spark knock or pinging is considered misuse, and the Distributor's Limited Warranty does not cover parts damaged by misuse.

1. With the engine stopped and on a level surface, remove the fuel tank cap and check the fuel level. Refill the tank if the fuel level is low.
2. Add fuel to the bottom of the fuel level limit of the fuel tank. Do not overfill. Wipe up spilled fuel before starting the engine.

MAXIMUM
FUEL
LEVEL



Refuel in a well-ventilated area before starting the engine. If the engine has been running, allow it to cool. Refuel carefully to avoid spilling fuel. Do not fill the fuel tank completely. Fill tank to approximately 25 mm (1 inch) below the top of the fuel tank to allow for fuel expansion. It may be necessary to lower the fuel level depending on operating conditions. After refueling, tighten the fuel tank cap securely.

Never refuel the engine inside a building where gasoline fumes may reach flames or sparks. Keep gasoline away from appliance pilot lights, barbecues, electric appliances, power tools, etc.

Spilled fuel is not only a fire hazard, it causes environmental damage. Wipe up spills immediately.

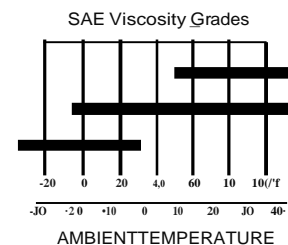
For information regarding oxygenated fuels, please refer to page 17.

ENGINE OIL

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

Recommended Oil

Use 4-stroke motor oil that meets or exceeds the requirements for API service classification SJ, SL, or equivalent. Always check the API service label on the oil container to be sure it includes the letters SJ, SL, or equivalent.

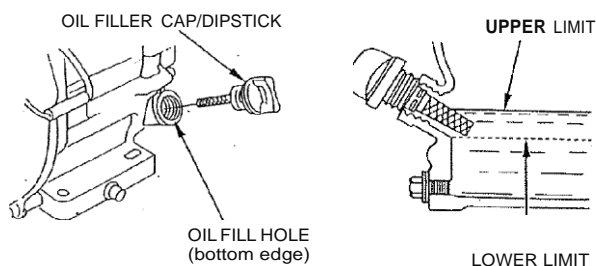


SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the indicated range.

Oil Level Check

Check the engine oil level with the engine stopped and in a level position.

1. Remove the oil filler cap/dipstick and wipe it clean.
2. Insert the oil filler cap/dipstick into the oil filler neck as shown, but do not screw it in, then remove it to check the oil level.
3. If the oil level is near or below the lower limit mark on the dipstick, fill with the recommended oil (see page 8) to the upper limit mark (bottom edge of the oil fill hole). Do not overfill.
4. Reinstall the oil filler cap/dipstick.



NOTICE

Running the engine with a low oil level can cause engine damage.

The Oil Alert® system (applicable types) will automatically stop the engine before the oil level falls below the safe limit. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

Oil Change

Drain the used oil when the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the engine to catch the used oil, then remove the oil filler cap/dipstick, oil drain plug and washer.
2. Allow the used oil to drain completely, then reinstall the oil drain plug and new washer, and tighten the oil drain plug securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or down a drain.

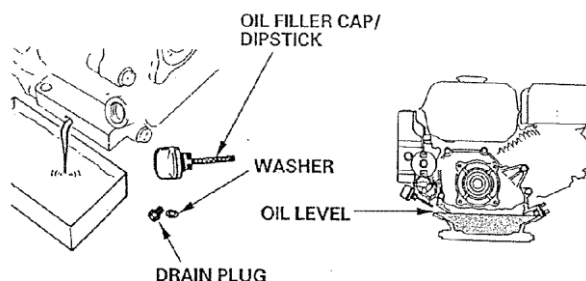
3. With the engine in a level position, fill to the upper limit mark (bottom edge of the oil fill hole) on the dipstick with the recommended oil (see page 8).

NOTICE

Running the engine with a low oil level can cause engine damage.

The Oil Alert® system (applicable types) will automatically stop the engine before the oil level falls below the safe limit. However, to avoid the inconvenience of an unexpected shutdown, fill to the upper limit, and check the oil level regularly.

Install the oil filler cap/dipstick and tighten securely.



REDUCTION CASE OIL (applicable types)

Recommended Oil

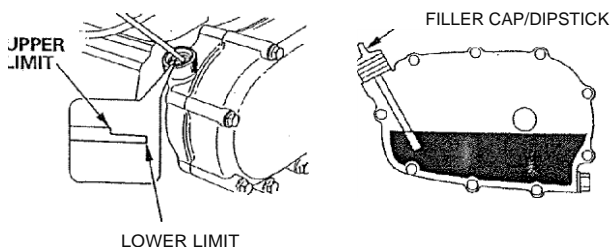
Use the same oil that is recommended for the engine (see page 8).

Oil Level Check

Check the reduction case oil level with the engine stopped and in a level position.

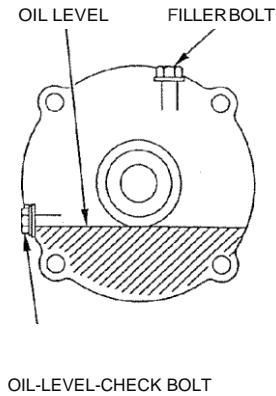
2 : 1 Reduction Case With Centrifugal Clutch

1. Remove the oil filler cap/dipstick and wipe it clean.
2. Insert and remove the oil filler cap/dipstick without screwing it into the filler hole. Check the oil level shown on the oil filler cap/dipstick.
3. If the oil level is low, add oil to reach the upper limit mark on the dipstick with the recommended oil.
4. Screw in the oil filler cap/dipstick and tighten securely.



6 : 1 Reduction Case

1. Remove the oil-level-check bolt and washer, and see whether the oil level is at the edge of the bolt hole.
2. If the oil level is below the check bolt hole, remove the filler bolt and washer. Add oil until it starts to flow out the check bolt hole with the recommended oil (see page 9).
3. Install the oil-level-check bolt, filler bolt and washers. Tighten them securely.



Oil Change

2 : 1 Reduction Case With Centrifugal Clutch

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the reduction case to catch the used oil, then remove the oil filler cap/dipstick, the drain plug and washer.
2. Allow the used oil to drain completely, then reinstall the drain plug and a new washer, and tighten it securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash or pour it on the ground or down a drain.

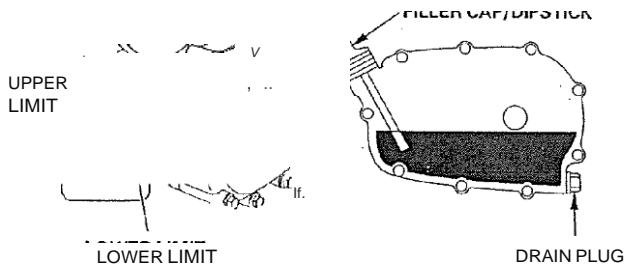
3. With the engine in a level position, fill to the upper limit mark on the dip stick with the recommended oil (see page 9). To check the oil level, insert and remove the dipstick without screwing it into the filler hole.

Reduction case oil capacity : 0.50 R (0.53 US qt, 0.44 Imp qt)

NOTICE

Running the engine with a low reduction case oil level can cause reduction case damage.

4. Screw in the filler cap/dipstick securely.



6 : 1 Reduction Case

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the reduction case to catch the used oil, then remove the filler bolt, oil-level-check bolt and washers.
2. Drain the used oil completely into the container by tipping the engine toward the oil-level-check bolt hole.

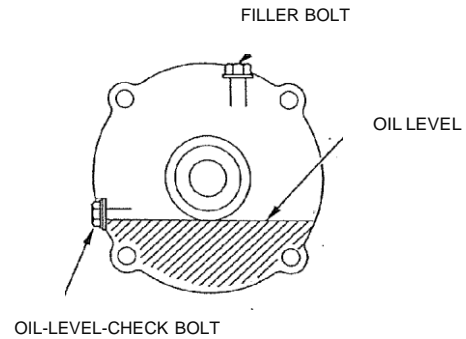
Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash or pour it on the ground or down a drain.

3. With the engine in a level position, fill oil until it starts to flow out the check bolt hole with the recommended oil (see page 9).

NOTICE

Running the engine with a low reduction case oil level can cause reduction case damage.

4. Reinstall the oil-level-check bolt, filler bolt and new washers, and tighten them securely.



AIR CLEANER

A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If you operate the engine in very dusty areas, clean the air filter more often than specified in the MAINTENANCE SCHEDULE.

NOTICE

Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.

Inspection

Remove the air cleaner cover and inspect the filter elements. Clean or replace dirty filter elements. Always replace damaged filter elements. If equipped with an oil-bath air cleaner, also check the oil level.

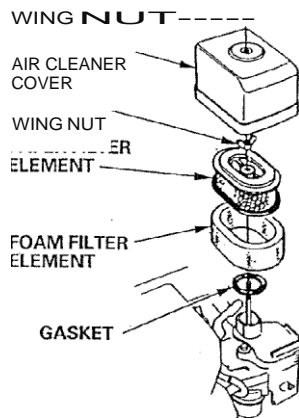
Refer to pages 11 -12 for instructions that apply to the air cleaner and filter for your engine type.

Cleaning

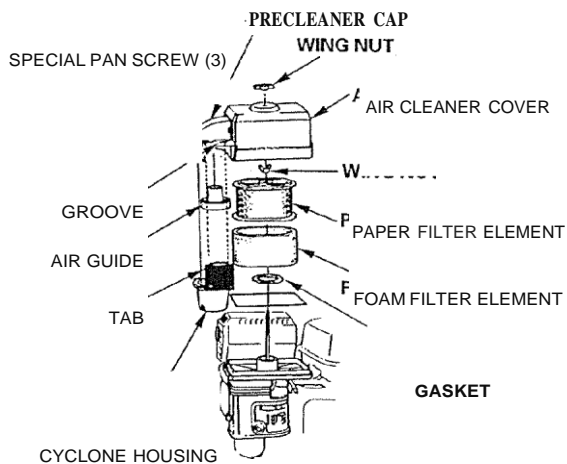
Dual-Filter-Element Types

1. Remove the wing nut from the air cleaner cover, and remove the cover.
2. Remove the wing nut from the air filter, and remove the filter.
3. Remove the foam filter from the paper filter.
4. Inspect both air filter elements, and replace them if they are damaged. Always replace the paper air filter element at the scheduled interval (see page 7).

STANDARD DUAL-FILTER-ELEMENT TYPE



CYCLONE DUAL-FILTER-ELEMENT TYPE



5. Clean the air filter elements if they are to be reused.

Paper air filter element: Tap the filter element several times on a hard surface to remove dirt, or blow compressed air [not exceeding 207 kPa (2.1 kgf/cm², 30 psi)] through the filter element from the inside. Never try to brush off dirt; brushing will force dirt into the fibers.

Foam air filter element: Clean in warm soapy water, rinse, and allow to dry thoroughly. Or clean in nonflammable solvent and allow to dry. Dip the filter element in clean engine oil, then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the foam.

6. CYCLONE TYPE ONLY: Remove the three pan-head screws from the precleaner cap, then remove the cyclone housing and air guide. Wash the parts with water, dry them thoroughly, and reassemble them.

Be sure to install the air guide as shown in the illustration.

Install the cyclone housing so the air intake tab fits into the groove in the precleaner cap.

7. Wipe dirt from the inside of the air cleaner case and cover, using a moist rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.

8. Place the foam air filter element over the paper element, and reinstall the assembled air filter. Be sure the gasket is in place beneath the air filter. Tighten the air filter wing nut securely.

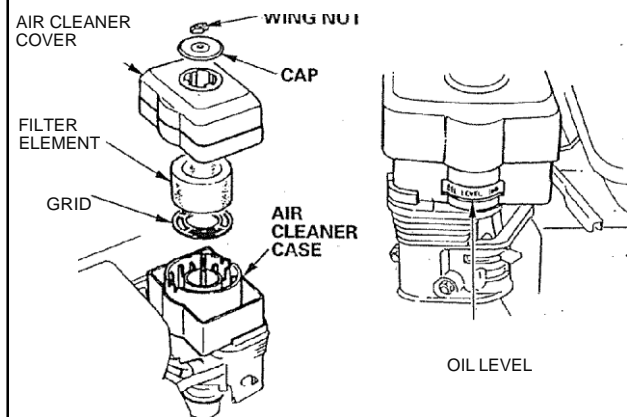
9. Install the air cleaner cover, and tighten the wing nut securely.

Oil-Bath Type

1. Remove the wing nut, and remove the air cleaner cap and cover.
2. Remove the air filter element from the cover. Wash the cover and filter element in warm soapy water, rinse, and allow to dry thoroughly. Or clean in nonflammable solvent and allow to dry.
3. Dip the filter element in clean engine oil, then squeeze out all excess oil. The engine will smoke if too much oil is left in the foam.
4. Empty the used oil from the air cleaner case, wash out any accumulated dirt with nonflammable solvent, and dry the case.
5. Fill the air cleaner case to the OIL LEVEL mark with the same oil that is recommended for the engine (see page 8).

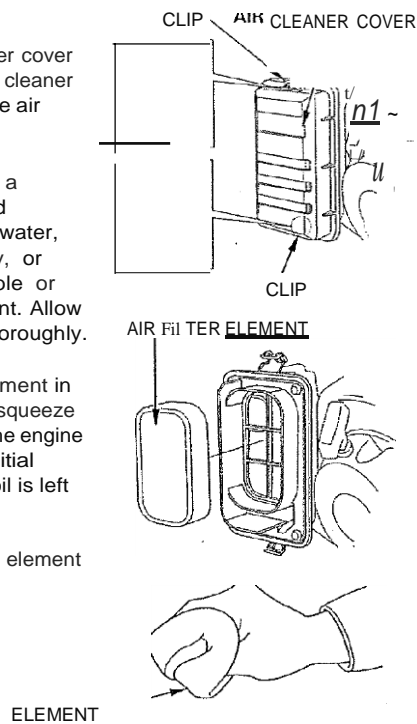
Oil capacity: 60 cm³ (2.0 US oz, 2.1 Imp oz)

6. Reassemble the air cleaner, and tighten the wing nut securely.



Low Profile Types

1. Unsnap the air cleaner cover clips, remove the air cleaner cover, and remove the air filter element.
2. Wash the element in a solution of household detergent and warm water, then rinse thoroughly, or wash in nonflammable or high flashpoint solvent. Allow the element to dry thoroughly.
3. Soak the air filter element in clean engine oil and squeeze out the excess oil. The engine will smoke during initial startup if too much oil is left in the element.
4. Reinstall the air filter element and the cover.



SEDIMENT CUP

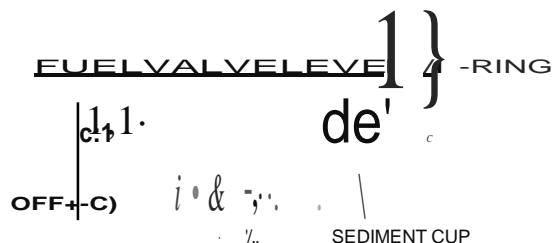
Cleaning

A WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when handling fuel.

- Stop engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

1. Move the fuel valve to the OFF position, then remove the fuel sediment cup and O-ring.
2. Wash the sediment cup and O-ring in nonflammable solvent, and dry them thoroughly.



- 3 Place the O-ring in the fuel valve, and install the sediment cup. Tighten the sediment cup securely.

4. Move the fuel valve to the ON position, and check for leaks. Replace the O-ring if there is any leakage.

SPARK PLUG

Recommended Spark Plugs: BPR6ES (NGK)

WZ0EPR-U (DENSO)

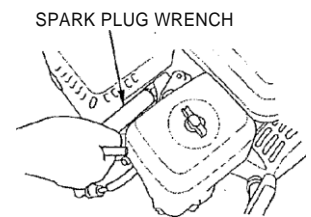
The recommended spark plug is the correct heat range for normal engine operating temperatures.

NOTICE

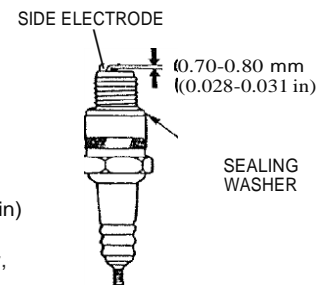
An incorrect spark plug can cause engine damage.

For good performance, the spark plug must be properly gapped and free of deposits.

1. Disconnect the spark plug cap, and remove any dirt from around the spark plug area.
2. Remove the spark plug with a 13/16-inch spark plug wrench.
3. Inspect the spark plug. Replace it if damaged, badly fouled, if the sealing washer is in poor condition, or if the electrode is worn.



4. Measure the spark plug electrode gap with a wire-type feeler gauge. Correct the gap, if necessary, by carefully bending the side electrode. The gap should be: 0.70- 0.80 mm (0.028-0.031 in)



5. Install the spark plug carefully, by hand, to avoid cross-threading.
6. After the spark plug is seated, tighten with a 13/16-inch spark plug wrench to compress the sealing washer.
7. When installing a new spark plug, tighten 1/2 turn after the spark plug seats to compress the washer.
8. When reinstalling the original spark plug, tighten 1/8-1/4 turn after the spark plug seats to compress the washer.

NOTICE

A loose spark plug can overheat and damage the engine. Overtightening the spark plug can damage the threads in the cylinder head.

9. Attach the spark plug cap to the spark plug.

SPARK ARRESTER (applicable types)

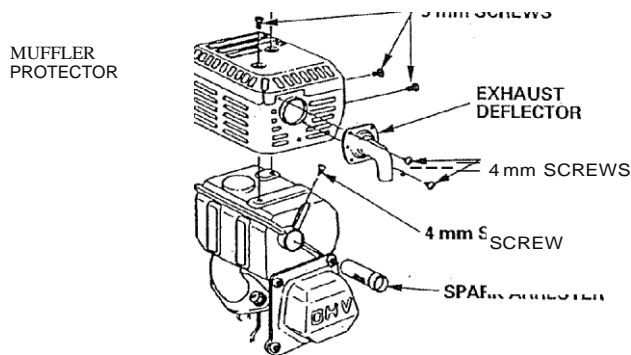
The spark arrester may be standard or an optional part, depending on the engine type. In some areas, it is illegal to operate an engine without a spark arrester. Check local laws and regulations. A spark arrester is available from authorized Honda servicing dealers.

The spark arrester must be serviced every 100 hours to keep it functioning as designed.

If the engine has been running, the muffler will be hot. Allow it to cool before servicing the spark arrester.

Spark Arrester Removal

1. Remove the three 4 mm screws from the exhaust deflector, and remove the deflector (applicable types).
2. Remove the four 5 mm screws from the muffler protector and remove the muffler protector.
3. Remove the 4 mm screw from the spark arrester, and remove the spark arrester from the muffler.



Spark Arrester Cleaning & Inspection

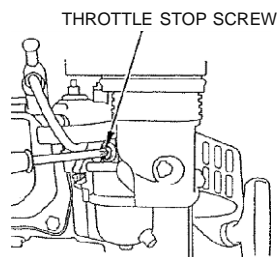
1. Use a brush to remove carbon deposits from the spark arrester screen. Be careful not to damage the screen. Replace the spark arrester if it has breaks or holes.
2. Install the spark arrester, muffler protector, and exhaust deflector in the reverse order of removal.

SCREEN

IDLE SPEED

Adjustment

1. Start the engine outdoors, and allow it to warm up to operating temperature.
2. Move the throttle lever to its minimum position.
3. Turn the throttle stop screw to obtain the standard idle speed.



Standard idle speed: 1,400 ± rpm

HELPFUL TIPS & SUGGESTIONS

STORING YOUR ENGINE

Storage Preparation

Proper storage preparation is essential for keeping your engine trouble-free and looking good. The following steps will help to keep rust and corrosion from impairing your engine's function and appearance, and will make the engine easier to start when you use it again.

Cleaning

If the engine has been running, allow it to cool for at least half an hour before cleaning. Clean all exterior surfaces, touch up any damaged paint, and coat other areas that may rust with a light film of oil.

NOTICE

Using a garden hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage.

Fuel

Gasoline will oxidize and deteriorate in storage. Deteriorated gasoline will cause hard starting, and it leaves gum deposits that clog the fuel system. If the gasoline in your engine deteriorates during storage, you may need to have the carburetor, and other fuel system components, serviced or replaced.

The length of time that gasoline can be left in your fuel tank and carburetor without causing functional problems will vary with such factors as gasoline blend, your storage temperatures, and whether the fuel tank is partially or completely filled. The air in a partially filled fuel tank promotes fuel deterioration. Very warm storage temperatures accelerate fuel deterioration. Fuel problems may occur within a few months, or even less if the gasoline was not fresh when you filled the fuel tank.

Fuel system damage or engine performance problems resulting from neglected storage preparation are not covered under the *Distributor's Limited Warranty*.

You can extend fuel storage life by adding a gasoline stabilizer that is formulated for that purpose, or you can avoid fuel deterioration problems by draining the fuel tank and carburetor.

Adding a Gasoline Stabilizer to Extend Fuel Storage Life

When adding a gasoline stabilizer, fill the fuel tank with fresh gasoline. If only partially filled, air in the tank will promote fuel deterioration during storage. If you keep a container of gasoline for refueling, be sure that it contains only fresh gasoline.

1. Add gasoline stabilizer following the manufacturer's instructions.
2. After adding a gasoline stabilizer, run the engine outdoors for 10 minutes to be sure that treated gasoline has replaced the untreated gasoline in the carburetor.
3. Stop the engine.

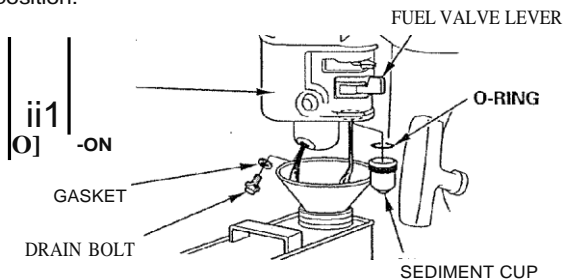
Draining the Fuel Tank and Carburetor

⚠ WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when handling fuel.

- Stop engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

1. Place an approved gasoline container below the carburetor, and use a funnel to avoid spilling fuel.
2. Remove the carburetor drain bolt and gasket. Remove the sediment cup and O-ring, then move the fuel valve lever to the ON position.

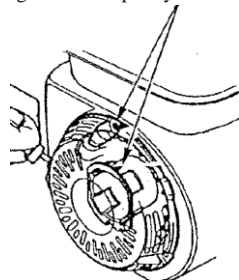


3. After all the fuel has drained into the container, reinstall the drain bolt, gasket, sediment cup and O-ring. Tighten the drain bolt and sediment cup securely.

Engine Oil

1. Change the engine oil (see page 9).
2. Remove the spark plug (see page 12).
3. Pour a tablespoon 5-10 cm³ (5-10 cc) of clean engine oil into the cylinder.
4. Pull the starter rope several times to distribute the oil in the cylinder.
5. Reinstall the spark plug.
6. Pull the starter rope slowly until resistance is felt and the notch on the starter pulley aligns with the hole at the top of the recoil starter cover. This will close the valves so moisture cannot enter the engine cylinder. Return the starter rope gently.

Align notch on pulley with hole at top of cover.



Storage Precautions

If your engine will be stored with gasoline in the fuel tank and carburetor, it is important to reduce the hazard of gasoline vapor ignition. Select a well-ventilated storage area away from any appliance that operates with a flame, such as a furnace, water heater, or clothes dryer. Also avoid any area with a spark-producing electric motor, or where power tools are operated.

If possible, avoid storage areas with high humidity, because that promotes rust and corrosion.

Keep the engine level in storage. Tilting can cause fuel or oil leakage.

With the engine and exhaust system cool, cover the engine to keep out dust. A hot engine and exhaust system can ignite or melt some materials. Do not use sheet plastic as a dust cover. A nonporous cover will trap moisture around the engine, promoting rust and corrosion.

If equipped with a battery for electric starter types, recharge the battery once a month while the engine is in storage. This will help to extend the service life of the battery.

Removal from Storage

Check your engine as described in the *BEFORE OPERATION CHECKS* section of this manual (see page 3).

If the fuel was drained during storage preparation, fill the tank with fresh gasoline. If you keep a container of gasoline for refueling, be sure it contains only fresh gasoline. Gasoline oxidizes and deteriorates over time, causing hard starting.

If the cylinder was coated with oil during storage preparation, the engine will smoke briefly at startup. This is normal.

TRANSPORTING

Keep the engine level when transporting to reduce the possibility of fuel leakage. Turn the fuel valve to the OFF position (see page 5).

TAKING CARE OF UNEXPECTED PROBLEMS

ENGINE WILL NOT START	Possible Cause	Correction
1. Electric starting (applicable types): Check battery and fuse.	Battery discharged.	Recharge battery.
	Fuse burnt out.	Replace fuse (p. 15).
2. Check control positions.	Fuel valve OFF.	Move lever to ON position.
	Choke open.	Move lever to CLOSED position unless the engine is warm.
	Engine switch OFF.	Turn engine switch to ON position.
3. Check engine oil level.	Engine oil level low (Oil Alert models).	Fill with the recommended oil to the proper level (p. 9).
4. Check fuel.	Out of fuel.	Refuel (p. 8).
	Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 14). Refuel with fresh gasoline (p. 8).
5. Remove and inspect spark plug.	Spark plug faulty, fouled, or improperly gapped.	Gap or replace spark plug (p. 12).
	Spark plug wet with fuel (flooded engine).	Dry and reinstall spark plug. Start engine with throttle lever in MAX. position.
6. Take engine to an authorized Honda servicing dealer, or refer to shop manual.	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.

ENGINE LACKS POWER	Possible Cause	Correction
1. Check air filter.	Filter element(s) restricted.	Clean or replace filter element(s) (p. 11-12).
2. Check fuel.	Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 14). Refuel with fresh gasoline (p. 8).
3. Take engine to an authorized Honda servicing dealer, or refer to shop manual.	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.

FUSE REPLACEMENT (applicable types)

The electric starter relay circuit and battery charging circuit are protected by a fuse. If the fuse burns out, the electric starter will not operate. The engine can be started manually if the fuse burns out, but running the engine will not charge the battery.

1. Remove the 6 X 12 mm screw from the rear cover of the engine switch box.
2. Remove the fuse cover, then pull out and inspect the fuse.

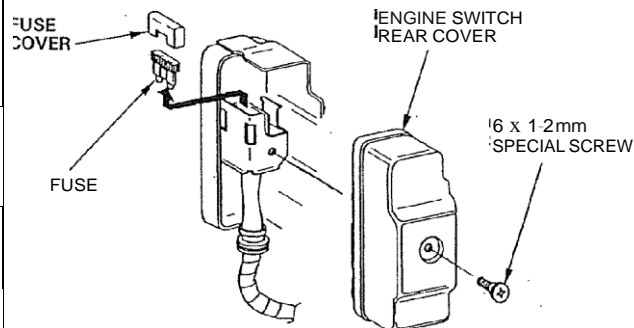
If the fuse is burnt out, discard the burnt-out fuse. Install a new fuse with the same rating as the one that was removed, and reinstall the cover.

If you have questions regarding the rating of the original fuse, contact your servicing Honda engine dealer.

NOTICE

Never use a fuse with a rating greater than the one originally equipped with the engine. Serious damage to the electrical system or a fire could result.

3. Reinstall the rear cover. Install the 6 X 12 mm screw and tighten it securely.

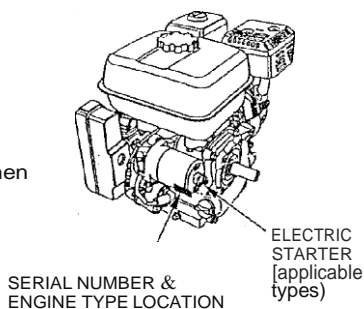


Frequent fuse failure usually indicates a short circuit or an overload in the electrical system. If the fuse burns out frequently, take the engine to a servicing Honda dealer for repair.

TECHNICAL & CONSUMER INFORMATION

TECHNICAL INFORMATION

Serial Number Location
Record the engine serial number, type and purchase date in the space below. You will need this information when ordering parts and when making technical or warranty inquiries.



Engine serial number: _ _ _ _ -

Engine type: _ _ _ _ -

Date Purchased: ____ / ____ / ____

Battery Connections for Electric Starter (applicable types)

Use a 12-volt battery with an ampere-hour rating of at least 18 Ah.

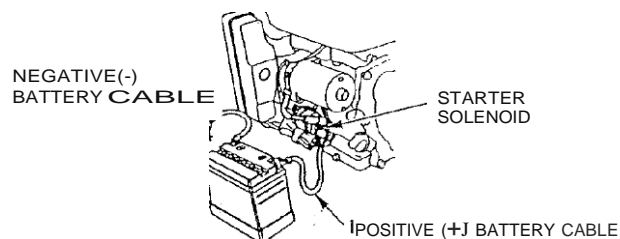
Be careful not to connect the battery in reverse polarity, as this will short circuit the battery charging system. Always connect the positive (+) battery cable to the battery terminal before connecting the negative (-) battery cable, so your tools cannot cause a short circuit if they touch a grounded part while tightening the positive (+) battery cable end.

A WARNING

A battery can explode if you do not follow the correct procedure, seriously injuring anyone nearby.

Keep all sparks, open flames, and smoking materials away from the battery.

1. Connect the battery positive (+) cable to the starter solenoid terminal as shown.
2. Connect the battery negative (-) cable to an engine mounting bolt, frame bolt, or other good engine ground connection.
3. Connect the battery positive (+) cable to the battery positive (+) terminal as shown.
4. Connect the battery negative (-) cable to the battery negative (-) terminal as shown.
5. Coat the terminals and cable ends with grease.

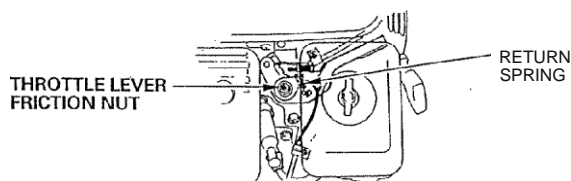


Remote Control Linkage

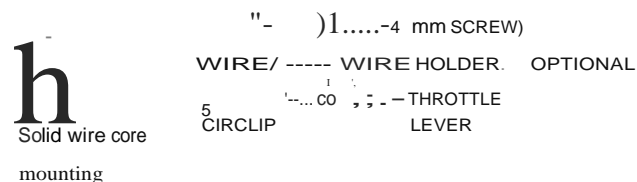
The throttle and choke control levers are provided with holes for optional cable attachment. The following illustrations show installation examples for a solid wire cable and for a flexible, braided wire cable. If using a flexible, braided wire cable, add a return spring as shown.

It is necessary to loosen the throttle lever friction nut when operating the throttle with a remote-mounted control.

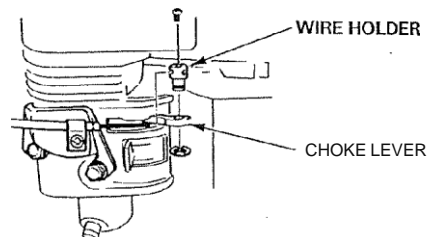
REMOTE THROTTLE LINKAGE



Flexible wire core mounting



REMOTE CHOKE LINKAGE



Carburetor Modifications for High Altitude Operation

At high altitude, the standard carburetor air-fuel mixture will be too rich. Performance will decrease, and fuel consumption will increase. A very rich mixture will also foul the spark plug and cause hard starting. Operation at an altitude that differs from that at which this engine was certified, for extended periods of time, may increase emissions.

High altitude performance can be improved by specific modifications to the carburetor. If you always operate your engine at altitudes above 1,500 meters (5,000 feet), have your servicing dealer perform this carburetor modification. This engine, when operated at high altitude with the carburetor modifications for high altitude use, will meet each emission standard throughout its useful life.

Even with carburetor modification, engine horsepower will decrease about 3.5% for each 300-meter (1,000-foot) increase in altitude. The effect of altitude on horsepower will be greater than that if no carburetor modification is made.

NOTICE

When the carburetor has been modified for high altitude operation, the air-fuel mixture will be too lean for low altitude use. Operation at altitudes below 1,500 meters (5,000 feet) with a modified carburetor may cause the engine to overheat and result in serious engine damage. For use at low altitudes, have your servicing dealer return the carburetor to original factory specifications.

Oxygenated Fuels

Some conventional gasolines are being blended with alcohol or an ether compound. These gasolines are collectively referred to as oxygenated fuels. To meet clean air standards, some areas of the United States and Canada use oxygenated fuels to help reduce emissions.

If you use oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirements.

Before using an oxygenated fuel, try to confirm the fuel's contents. Some states/provinces require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates:

ETHANOL---(ethyl or grain alcohol) 70% by volume
You may use gasoline containing up to 10% ethanol by volume. Gasoline containing ethanol may be marketed under the name Gasohol.

MTBE----- (methyl tertiary butyl ether) 15% by volume
You may use gasoline containing up to 15% MTBE by volume.

METHANOL----- (methyl or wood alcohol) 5% by volume
You may use gasoline containing up to 5% methanol by volume as long as it also contains cosolvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station or switch to another brand of gasoline. Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under the *Distributor's Limited Warranty*

Emission Control System Information

Source of Emissions

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Honda utilizes lean carburetor settings and other systems to reduce the emissions of carbon monoxide, oxides of nitrogen, and hydrocarbons.

The U.S., California Clean Air Acts and Environment Canada EPA, California and Canadian regulations require all manufacturers to furnish written instructions describing the operation and maintenance of emission control systems.

The following instructions and procedures must be followed in order to keep the emissions from your Honda engine within the emission standards.

Tampering and Altering

Tampering with or altering the emission control system may increase emissions beyond the legal limit. Among those acts that constitute tampering are:

- Removal or alteration of any part of the intake, fuel, or exhaust systems.
- Altering or defeating the governor linkage or speed-adjusting mechanism to cause the engine to operate outside its design parameters.

Problems That May Affect Emissions

If you are aware of any of the following symptoms, have your engine inspected and repaired by your servicing dealer.

- Hard starting or stalling after starting.
- Rough idle.
- Misfiring or backfiring under load.
- Afterburning (backfiring).
- Black exhaust smoke or high fuel consumption.

Replacement Parts

The emission control systems on your Honda engine were designed, built, and certified to conform with EPA, California and Canadian emission regulations. We recommend the use of genuine Honda parts whenever you have maintenance done. These original-design replacement parts are manufactured to the same standards as the original parts, so you can be confident of their performance. The use of replacement parts that are not of the original design and quality may impair the effectiveness of your emission control system.

A manufacturer of an aftermarket part assumes the responsibility that the part will not adversely affect emission performance. The manufacturer or rebuilder of the part must certify that use of the part will not result in a failure of the engine to comply with emission regulations.

Maintenance

Follow the maintenance schedule on page 7. Remember that this schedule is based on the assumption that your machine will be used for its designed purpose. Sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, will require more frequent service.

Air Index

An Air Index Information hang tag/label is applied to engines certified to an emission durability time period in accordance with the requirements of the California Air Resources Board.

The bar graph is intended to provide you, our customer, the ability to compare the emissions performance of available engines. The lower the Air Index, the less pollution.

The durability description is intended to provide you with information relating the engine's emission durability period. The descriptive term indicates the useful life period for the engine's emission control system. See your *Emission Control System Warranty* for additional information.

Descriptive Term	Applicable to Emissions Durability Period
Moderate	50 hours [0-65 cm ³ (0-65 cc)] 125 hours [greater than 65 cm ³ (65 cc)]
Intermediate	125 hours [0-65 cm ³ (0-65 cc)] 250 hours [greater than 65 cm ³ (65 cc)]
Extended	300 hours [0-65 cm ³ (0-65 cc)] 500 hours [greater than 65 cm ³ (65 cc)]

The Air Index Information hang tag/label must remain on the engine until it is sold. Remove the hang tag before operating the engine.

Specifications

120 (PTO shaft type SI)

Length x Width x Height	297 x 341 x 318 mm (11.7 x 13.4 x 12.5 in)
Driveweight	13.0 ka (28.7 lbs)
Engine type	4-stroke, overhead valve, single cylinder
Displacement [Bore x Stroke]	119 cm ³ (7.3 cu-in) [60 x 42 mm (2.4 x 1.7 in)]
Max. output	2.9 kW (4.0 PS, 4.0 bhp) at 3,600 rpm
Max. torque	7.4 N m (0.75 kgf-m, 5.4 lbf-ft) at 2,500 rpm
Engine oil capacity	0.60 l (0.63 US at, 0.53 lmo at)
Fuel tank capacity	2.5 l (0.66 US gal, 0.55 lmo gal)
Fuel consumption	313 a/kWh (230 q/PSH, 0.51 lb/hoh)
Cooling system	Forced air
Ignition system	Transistorized magneto
PTO shaft rotation	Counterclockwise

GX160 (PTO shaft type SI)

Length x Width x Height	304 x 362 x 335 mm (12.0 x 14.3 x 13.2 in)
Driveweight	15.0 ka (33.1 lbs)
Engine type	4-stroke, overhead valve, single cylinder
Displacement [Bore x Stroke]	163 cm ³ (9.9 cu-in) [68 x 45 mm (2.7 x 1.8 in)]
Max. output	4.0 kW (5.5 PS, 5.5 bhp) at 3,600 rpm
Max. torque	10.8 N m (1.1 kgf-m, 8.0 lbf-ft) at 2,500 rpm
Engine oil capacity	0.60 l (0.63 US at, 0.53 lmo at)
Fuel tank capacity	3.6 l (0.95 US gal, 0.79 lmo gal)
Fuel consumption	313 a/kWh (230 q/PSH, 0.51 lb/hoh)
Cooling system	Forced air
Ignition system	Transistorized magneto
PTO shaft rotation	Counterclockwise

GX200 (PTO shaft type SI)

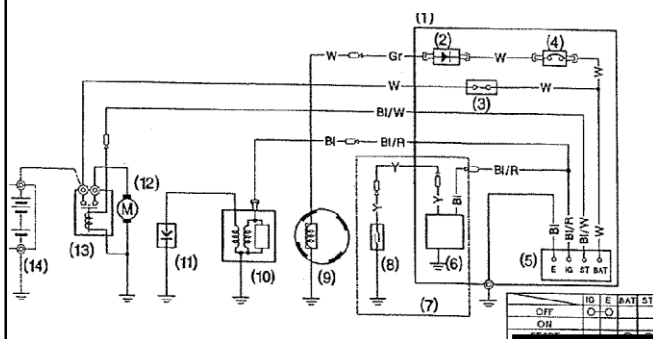
Length x Width x Height	313 x 376 x 335 mm (12.3 x 14.8 x 13.2 in)
Driveweight	16.0 ka (35.3 lbs)
Engine type	4-stroke, overhead valve, single cylinder
Displacement [Bore x Stroke]	196 cm ³ (12.0 cu-in) [68 x 54 mm (2.7 x 2.1 in)]
Max. output	4.8 kW (6.5 PS; 6.5 bhp) at 3,600 rpm
Max. torque	13.2 N m (1.35 kgf-m, 9.76 lbf-ft) at 2,500 rpm
Engine oil capacity	0.60 l (0.63 US at, 0.53 lmo at)
Fuel tank capacity	3.6 l (0.95 US gal, 0.79 lmo gal)
Fuel consumption	313 q/kWh (230 q/PSH, 0.51 lb/hph)
Cooling system	Forced air
Ignition system	Transistorized magneto
PTO shaft rotation	Counterclockwise

Tuneup Specifications GX120/160/200

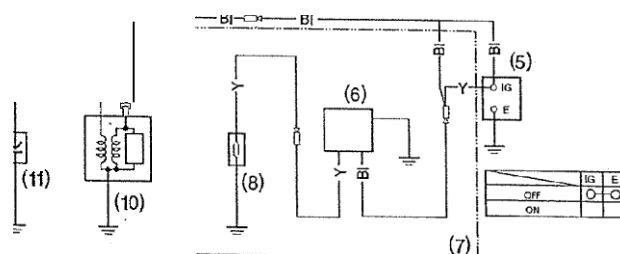
ITEM	SPECIFICATION	MAINTENANCE
Spark plug gap	0.70 - 0.80 mm (0.028 - 0.031 in)	Refer to page: 12
Idle speed	1,400 rpm	Refer to page: 13
Valve clearance (cold)	IN: 0.15 ± 0.02 mm EX: 0.20 ± 0.02 mm	See your authorized Honda dealer
Other adjustments	No other adjustments needed.	

Fuel	<p>Unleaded gasoline (Refer to page 8)</p> <p>U.S. Pump octane rating 86 or higher</p> <p>Except Research octane rating 91 or higher</p> <p>U.S. 85 or higher</p>
Engine oil	SAE 10W-30, API SJ or SL, for general use. Refer to page 8.
Reduction case oil	Same oil to engine oil, see above (applicable types).
Spark plug	BPR6ES (NGK) WZ0EPR-U (DENSO)
Maintenance	<p>Before each use:</p> <ul style="list-style-type: none"> • Check engine oil level. Refer to page 9. • Check reduction case oil (applicable types). Refer to page 9 - 10. • Check air filter. Refer to page 10. <p>First 20 hours:</p> <ul style="list-style-type: none"> • Change engine oil. Refer to page 9. • Change reduction case oil (applicable types). Refer to page 10. <p>Subsequent:</p> <p>Refer to the maintenance schedule on page 7.</p>

With Oil Alert® and Electric Starter



With Oil Alert® and Without Electric Starter



- | | |
|------------------------------|-----------------------|
| (1) CONTROL BOX | (8) OIL U:VEL SWITCH |
| (2) RECTIFIER | (9) CHARGING COIL |
| (3) FUSE | (10) IGNITION COIL |
| (4) CIRCUIT BREAKER | (11) SPARK PLUG |
| (5) ENGINE SWITCH | (72) STARTER MOTOR |
| (6) OIL ALERT UNIT | (13) STARTER SOLENOID |
| (7) Type with Oil Alert unit | (14) BATTERY (12 V) |

Bl	Black	Br	Brown
y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	L	Light green
R	Red	p	Pink
W	White	Gr	Gra

CONSUMER INFORMATION

Distributor/Dealer Locator Information

United States, Puerto Rico, and U.S. Virgin Islands:

Visit our website: www.honda-engines.com

Canada:

Call (888) 9HONDA9

or visit our website: www.honda.ca

For European Area:

visit our website: <http://www.honda-engines-eu.com>

Customer Service Information

Servicing dealership personnel are trained professionals. They should be able to answer any question you may have. If you encounter a problem that your dealer does not solve to your satisfaction, please discuss it with the dealership's management. The Service Manager, General Manager, or Owner can help. Almost all problems are solved in this way.

United States, Puerto Rico, and U.S. Virgin Islands:

If you are dissatisfied with the decision made by the dealership's management, contact the Honda Regional Engine Distributor for your area.

If you are still dissatisfied after speaking with the Regional Engine Distributor, you may contact the Honda Office as shown.

All Other Areas:

If you are dissatisfied with the decision made by the dealership's management, contact the Honda Office as shown.

(Honda's Office)

When you write or call, please provide this information:

- Equipment manufacturer's name and model number that the engine is mounted on
- Engine model, serial number, and type (see page 16)
- Name of dealer who sold the engine to you
- Name, address, and contact person of the dealer who services your engine
- Date of purchase
- Your name, address and telephone number
- A detailed description of the problem

United States, Puerto Rico, and U.S. Virgin Islands:

American Honda Motor Co., Inc.

Power Equipment Division

Customer Relations Office

4900 Marconi Drive

Alpharetta, GA 30005-8847

Or telephone: (770) 497-6400, 8:30 am - 7:00 pm EST

Canada:

Honda Canada, Inc.

715 Milner Avenue

Toronto, ON

M1B 2K8

Telephone: (888) 9HONDA9 Toll free

(888) 946-6329

English: (416) 299-3400

Local Toronto dialing area

French: (416) 287-4776

Local Toronto dialing area

Facsimile: (877) 939-0909

Toll free

(416) 287-4776

Local Toronto dialing area

Australia:

Honda Australia Motorcycle and Power Equipment Pty. Ltd.

1954-1956 Hume Highway Campbellfield Victoria 3061

Telephone: (03) 9270 1111

Facsimile: (03) 9270 1133

For European Area:

Honda Europe NV.

European Engine Center

<http://www.honda-engines-eu.com>

All Other Areas:

Please contact the Honda distributor in your area for assistance.

HONDA
The Power of Dreams



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