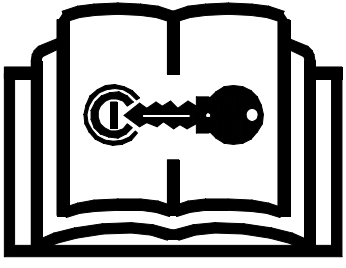
HAMMERHEAD

Hydraulic Power Supply

PowerPack PP73
PowerPack PP4000
PowerPack PP20
PowerPack PP13A

Operator and Maintenance Manual



PP70/73_PP20_PP13_09_08
SERIAL NO. 101 -
ORDER NO. OM1610

INTRODUCTION

This manual explains the proper operation of your machine. Study and understand these instructions thoroughly before operating or maintaining the machine. Failure to do so could result in personal injury or equipment damage. Consult your HammerHead dealer if you do not understand the instructions in this manual, or need additional information.

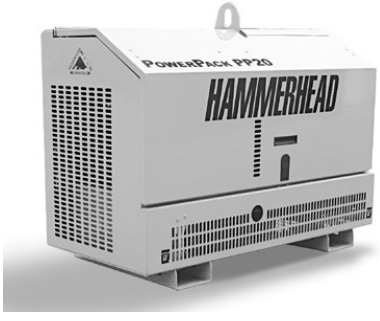
The instructions, illustrations, and specifications in this manual are based on the latest information available at time of publication. Your machine may have product improvements and features not yet contained in this manual.

Earth Tool Company LLC reserves the right to make changes at any time without notice or obligation.

Operation instructions are included in the two Operator's Manuals provided with the machine. The tethered (cabled) manual must remain attached to the machine for ready reference. Store it in the manual storage box when not in use.

Lubrication and maintenance procedures are in the Maintenance Manual provided with the machine. Refer to it for all lubrication and maintenance procedures.

Additional copies of the manuals are available from your dealer. Use the reorder number on the front cover to order additional manuals.



HAMMERHEAD MOLE®, HAMMERHEAD™ and HYDROBURST™ are trademarks	**Earth Tool Company, LLC.**

Hydraulic PowerPack

PATENTS

This machine may be covered by one or more of the following patents:

US 5,025,868	US 5,199,151	US 5,487,430	US 5,317,953	US 5,465,797
US 5,440,797	US 5,494,116	US 5,505,270	US 5,603,383	US 5,651,639
US 5,687,803	US 5,782,311	US 6,148,935	US 6,171,026 B1	US 6,260,634 B1
US 6,261,027 B1	US 6,263,983 B1	US 6,269,889 B1	US 6,273,201 B1	US 6,283,229 B1
US 6,302,410 B1	US 6,299,382 B1	US 5,337,837	US 6,321,858 B1	US 6,390,207 B2
US 6,371,223 B2	US 6,390,087 B1			

(Other U.S. and foreign patents pending.)

HAMMERHEAD EQUIPMENT LIMITED WARRANTY

EARTH TOOL COMPANY LLC, hereinafter sometimes referred to as ETC warrants each new industrial product of its own manufacture to be free from defects in material and workmanship, under normal use and service for one full year after delivery to the owner or 1000 operating hours, whichever occurs first. During the warranty period, the authorized selling HammerHead Dealer shall furnish parts without charge for any HammerHead product that fails because of defects in material and workmanship. Warranty is void unless warranty registration card is returned within ten days from the date of purchase. This warranty and any possible liability of Earth Tool Company LLC here under is in lieu of all other warranties, express, implied, or statutory, including, but not limited to any warranties of merchantability or fitness for a particular purpose.

The parties agree that the Buyer's SOLE AND EXCLUSIVE REMEDY against ETC, whether in contract or arising out of warranties, representations, or defects shall be for the replacement or repair of defective parts as provided herein. In no event shall ETC's liability exceed the purchase price of the product. The Buyer agrees that no other remedy (including, but not limited to, incidental or consequential loss) shall be available to him. If, during the warranty period, any product becomes defective by reason of material or workmanship and Buyer immediately notifies ETC of such defect, ETC shall, at its option, supply a replacement part or request the return of the product to its plant in Oconomowoc, Wisconsin. No part shall be returned without prior written authorization from ETC, and this warranty does not obligate ETC to bear any transportation charges in connection with the repair or replacement of defective parts. earth Tool Company LLC will not accept any charges for labor and/or parts incidental to the removal or remounting of parts repaired or replaced under this Warranty.

This Warranty shall not apply to any part or product which shall have been installed or operated in a manner not recommended by ETC nor to any part or product which shall have been neglected, or used in any way which, in ETC's opinion, adversely affects its performance; nor negligence of proper maintenance or other negligence, fire or other accident; nor with respect to wear items; nor if the unit has been repaired or altered outside of an ETC authorized dealership in a manner of which, in the sole judgment of ETC affects its performance, stability or reliability; nor with respect to batteries which are covered under a separate adjustment warranty; nor to any product in which parts not manufactured or approved by ETC have been used, nor to normal maintenance services or replacement of normal service items. Equipment and accessories not of our manufacture are warranted only to the extent of the original Manufacturer's Warranty and subject to their allowance to us, if found defective by them. ETC reserves the right to modify, alter, and improve any products or parts without incurring any obligation to replace any product or parts previously sold

with such modified, altered, or improved product or part. No person is authorized to give any other Warranty, or to assume any additional obligation on ETC's behalf unless made in writing, and signed by an officer of ETC.

EARTH TOOL COMPANY LLC

Oconomowoc, Wisconsin

Hydraulic PowerPack

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Receiving and Delivery Report

DEALER PREP

Check or perform the following:

___ Check machine for shortage or damage in transit.

Engine

___ Check engine oil level.
___ Check engine coolant level.
___ Check battery electrolyte level and charge.
___ Check air cleaner condition.
___ Check engine for proper operation.

Hydraulics

___ Check hydraulic fluid level. (HB175,HB125, HB80 and HB100T - check level with cylinders retracted)
___ Check all hydraulic components for leaks or damage.
___ Check all hydraulic connections for foreign objects and dirt.

General

___ Check tension of alternator/fan belt.
___ Check installation and condition of shields.
___ Check machine for proper lubrication.
___ Check tightness of nuts and bolts.
___ Check condition of all decals.
___ Check all phases of operation.

DEALER / CUSTOMER INFORMATION

dealer	*owner*
address	*address*
city	*city*
state / province	*state / province*
zip / postal code	*zip / postal code*
country	*country*

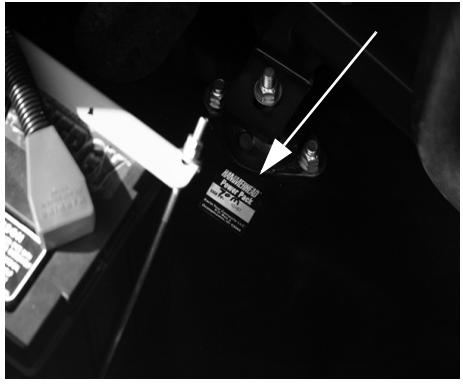
MACHINE IDENTIFICATION NUMBERS - RECORD

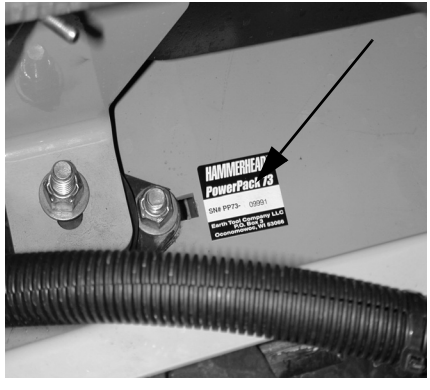
Engine Model Number _____

Engine Serial Number _____

Model Number_____

Model Serial Number_____





DELIVERY

Check and perform the following with the customer:

Hydraulic PowerPack System

___ Review all sections of the *Operator's Manual*.

___ Grease or oil all lubrication points.

Review of Operation

Review and demonstrate with the customer the various aspects of Hydraulic PowerPack operation:

___ overall explanation of how the Hydraulic PowerPack system works

___ preparing the Hydraulic PowerPack system for operation

TABLE OF CONTENTS

Table of Contents

Section 10: Safety Messages

General safety messages appear in this Safety Messages section. Specific safety messages are located in appropriate sections of the manual where a potential hazard may occur if the instructions or procedures are not followed.

Understand Safety Alert Symbol

This is the safety alert symbol. This symbol placed on your machine or in the manual is used to alert you to the potential for bodily injury or death.

Understand Signal Words

A signal word **"DANGER"**, **"WARNING"**, or **"CAUTION"** is used with the safety alert symbol.

Safety signs with signal word **"DANGER"**, **"WARNING"**, or **"CAUTION"** are located near specific hazards.

DANGER—Imminent hazards which, if not avoided, will result in serious personal injury or death.

WARNING—Potential hazards or unsafe practices which, if not avoided, could result in serious personal injury or death.

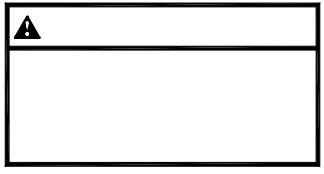
CAUTION—Potential hazards or unsafe practices which, if not avoided, could result in minor personal injury or product or property damage.

READ, UNDERSTAND, AND FOLLOW INSTRUCTIONS

Read, understand, and follow all instructions and safety messages included in this manual and on decals attached to the machine. These instructions and safety messages contain important information.

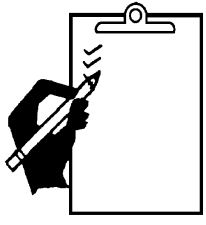
Allow only responsible, properly instructed individuals to operate and service the machine.

Failure to follow the instructions and safety messages in this manual and on the decals attached to the machine could result in serious injury or death.



Keep all safety and instruction decals in good condition. Replace any missing or damaged decals.

KEEP MACHINE IN GOOD CONDITION



Be sure the machine is in good operating condition and that all safety devices are installed and functioning properly.

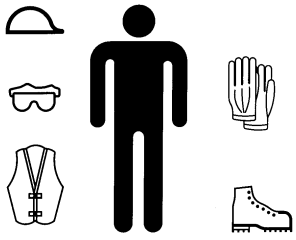
Visually inspect the machine daily before starting the machine.

Make no modifications to your equipment unless specifically recommended or requested by Earth Tool Company LLC.

KEEP SPECTATORS AWAY FROM MACHINE

Keep all spectators and unauthorized workers away from the machine and work area while in operation.

Personal Protective Equipment



Wear required personal protective equipment.

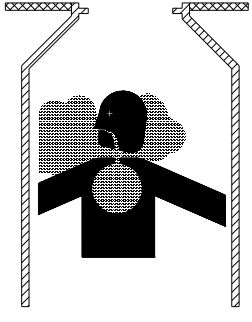
Wear close-fitting clothing and confine long hair.

Avoid wearing jewelry, such as rings, wrist watches, necklaces, or bracelets.

Always wear:

- Safety glasses
- Work shoes
- Hard hat
- Leather gloves when handling rods
- High visibility clothing when working near traffic

Confined Space Regulations



Do not work in a confined space, such as a sewer, until requirements are met to ensure a hazard free environment. Specific requirements for confined space entry are available from federal and state O.S.H.A. offices.

CALL YOUR ONE-CALL SYSTEM FIRST

WARNING: Always contact your local One-Call system before the start of your digging project.

Before you start any digging project, don't forget to call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority concerned to locate and mark the underground installations. If you don't call, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or experience job delays.

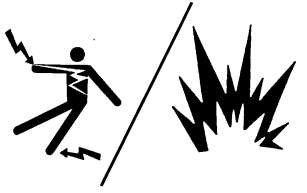
The One-Call representative will notify participating utility companies of your proposed digging activities. If you are in the U.S. or Canada and do not know the number for the local One-Call representative in your area, dial the North American One-Call number, 1-888-258-0808, for this information. Utilities will then mark their underground facilities by using the following international marking codes:

Red	Electric
Yellow	Gas, Oil, Petroleum
Orange	Communication, Telephone, TV
Blue	Potable Water
Green/Brown	Sewer
White	Proposed Excavation
Pink	Surveying

WARNING: Contacting buried utilities may cause death or serious injury.

- **Cut electric lines can shock or electrocute.**
- **Ruptured gas lines can cause fire or explosion.**
- **Laser light from cut fiber optic cable can cause eye damage.**

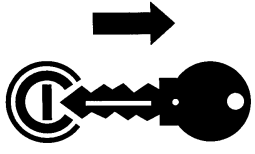
Before excavating or boring, contact the local One-Call system and any utility company that does not subscribe to the One-Call system, to locate all buried utilities in and around the proposed excavation or bore.



OSHA CFR 29 1926.651 requires that the estimated location of underground utilities be determined before beginning the excavation or underground boring operation. When the actual excavation or bore approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable, and dependable method. If the utility cannot be precisely located, it must be shut off by the utility company.

USE SHUTDOWN PROCEDURE

Before working on the machine for any reason, including servicing, cleaning, repairing, inspecting, lubricating, fueling, or transporting the machine, refer to the *Shutdown Procedure*, page *22-1*, for proper instructions.



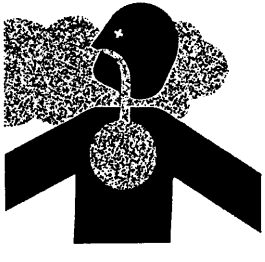
DO NOT WORK IN PIT

Do not work in pit with unstable sides which could cave in. Specific requirements for shoring or sloping pit walls are available from several sources including federal and state O.S.H.A. offices. Be sure to contact suitable authorities for these requirements before working in the pit. Federal O.S.H.A. regulations can be obtained by contacting the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402. State O.S.H.A. regulations are available at your local state O.S.H.A. office.

SAFE OPERATING PRACTICES

- Do not lift loads over personnel.
- To avoid back injury, use proper lifting techniques. Lift with your legs, not your back!
- Do not override any safety controls on the system or any support machinery. Shut down the unit at the first sign of malfunction or any hazardous condition.
- If the system runs, but does not move forward, shut off the machine. Ensure there are no obstructions in the path of the hydraulic cylinder. If bursting, ensure that the tool is not in contact with an un underground utility or other obstruction that can be damaged or cause personal injury.

WORK IN VENTILATED AREA



Exhaust fumes can be fatal.

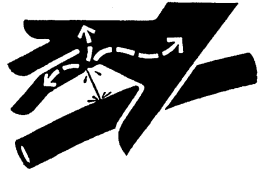
If operating the machine in an enclosed area, remove the exhaust fumes with an exhaust pipe extension to the outside.

HANDLE FUEL SAFELY

Fuel and fumes can catch fire or explode and cause serious injury from burns.

Shut off engine before fueling. No smoking. No flame.

AVOID HIGH PRESSURE LEAKS



Pressurized fluid can penetrate body tissue and result in serious injury or death. Leaks can be invisible. Relieve pressure before working on system. When searching for a leak, use an object like cardboard - not your hand. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

AVOID COOLANT BURNS

Hot fluid under pressure can erupt and scald if opened.

Allow to cool before opening.

WARNING: Failure to follow any of the preceding safety instructions or those that follow within this manual, could result in serious injury or death. This machine is to be used only for those purposes for which it was intended as explained in this Operator's Manual.

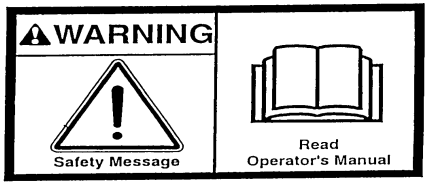
Section 11: Safety Decals

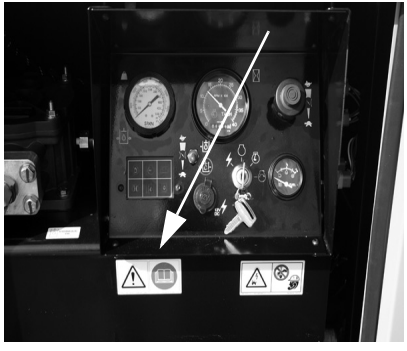
SAFETY DECAL MAINTENANCE

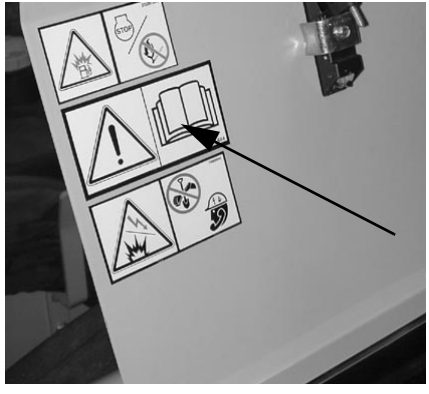
Safety decals located on your machine contain important and useful information that will help you operate your equipment safely.

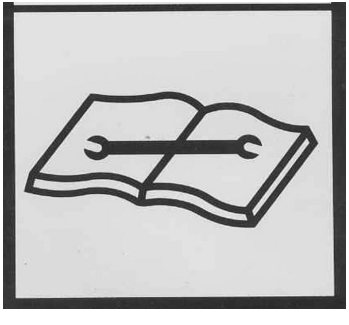
To assure that all decals remain in place and in good condition, follow the instructions given below:

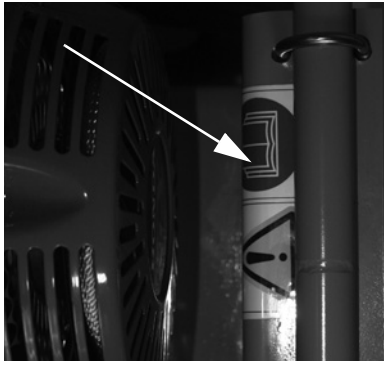
- Keep decals clean. Use soap and water - not mineral spirits, abrasive cleaners, or other similar cleaners that will damage the decal.
- Replace any damaged or missing decals. When attaching decals, surface temperature of the mounting surface must be at least 40°F (5°C). The mounting surface must also be clean and dry.
- When replacing a machine component with a decal attached, replace the decal also.
- Replacement decals can be purchased from your HammerHead equipment dealer.

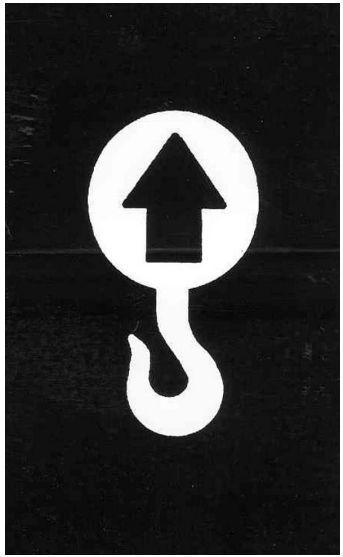

WARNING
Safety Message
Read
Operator's Manual

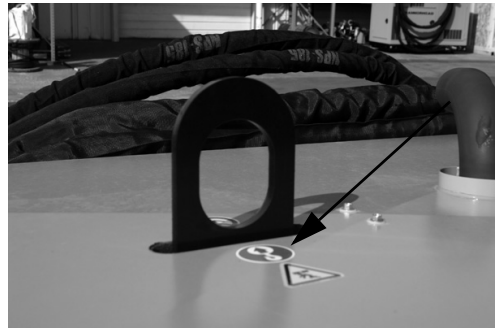


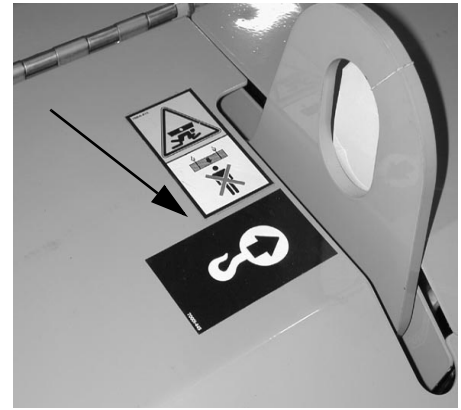




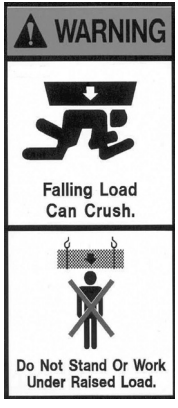


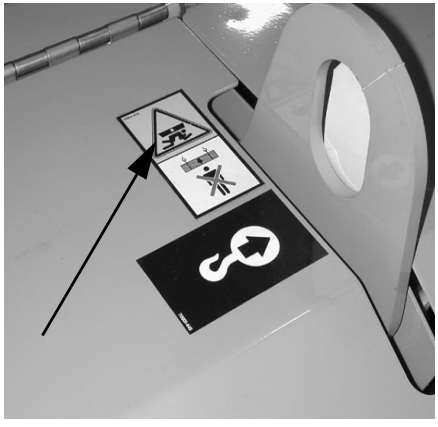


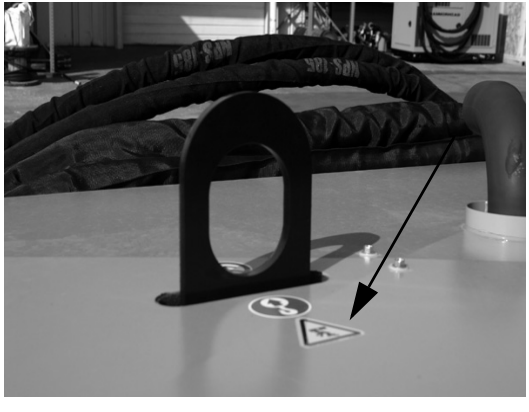


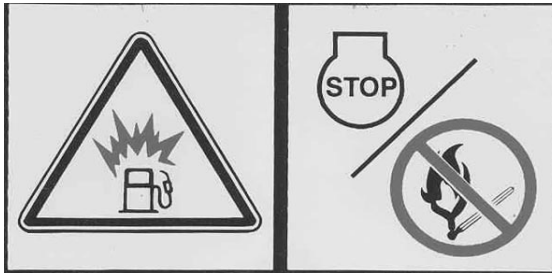


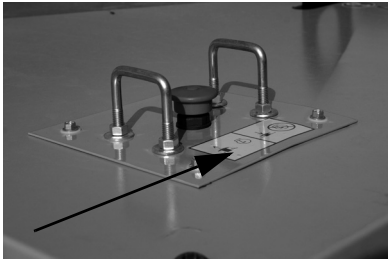

WARNING

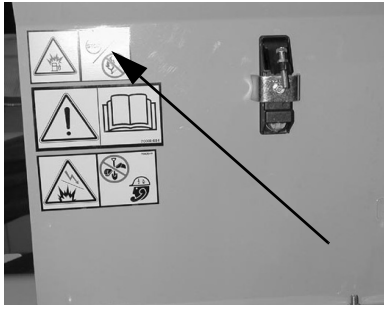

WARNING
Falling Load
Can Crush.
Do Not Stand Or Work
Under Raised Load.



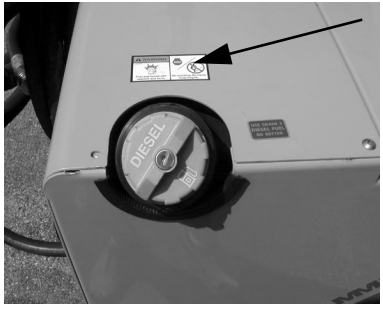



STOP



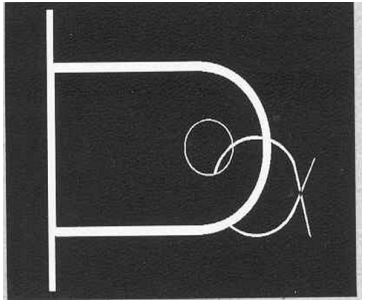


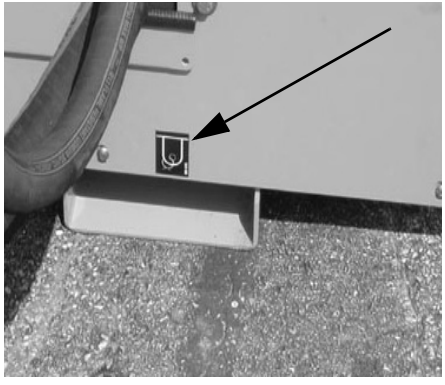

WARNING
STOP
Fuel and fumes can explode and burn.
No smoking. No flame Stop engine.


DIESEL


WARNING
Hot Fluid Under Pressure Can Scald
Allow To Cool Before Opening


WARNING
Battery Explosion Can Blind.
Acid Can Blind And Burn.
Read Manual
Before Service.





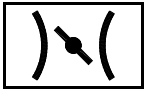
Section 20: Machine Controls

IMPORTANT: Do not start or operate any machine until the instructions in this manual and the Engine Operator's Manual supplied by the engine manufacturer have been carefully read and understood.

POWERPACK 73

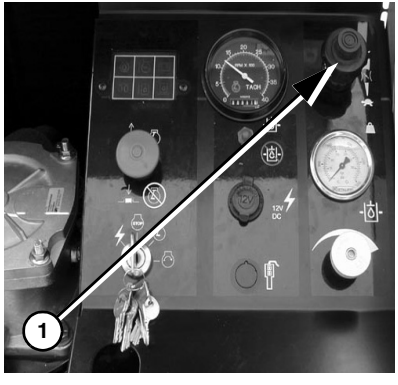
NOTE: The standard power unit includes a Kubota 73 hp (54.4 kW) engine @2600 rpm, hydraulic power on/off switch, two 40-ft hydraulic hoses, two quick connectors, and a 12-volt electrical outlet. Any alternative power unit should have equivalent features, with a required hydraulic power rating of 4600 psi (317 bar), and fluid flow rate of 41 gpm (155 L/min).

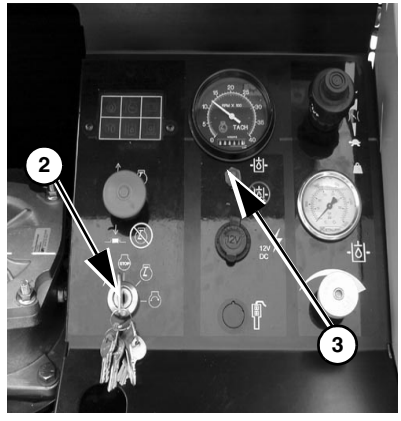
(1) Throttle



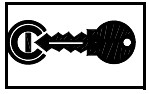
With center button depressed:
Pull knob out . . . . . .increase RPM

Push knob in . . . . . decrease RPM





(2) Ignition Switch



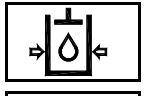
Center position . . . . . .engine off

1st position clockwise. . . . . .engine on

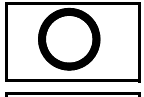
Fully clockwise . . . . . .engine start

Fully counterclockwise. . . . . glow plugs on

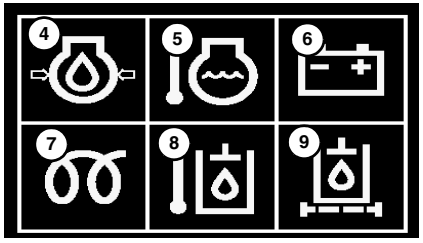
(3) Hydraulic Systems On/Off Switch



Down . . . . . hydraulic systems off

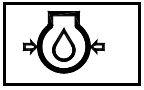


Up . . . . . hydraulic systems on
Switch must be in OFF (down) position when starting engine.



(4) Oil Pressure Warning Light

On . . . . . engine oil pressure low

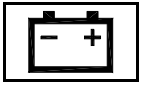


(5) Coolant Temperature Warning Light

On . . . . . engine coolant hot

(6) Alternator Warning Light

On . . . . . not charging



(7) Pre-Heat Indicator

With ignition switch in the GLOW PLUG position:

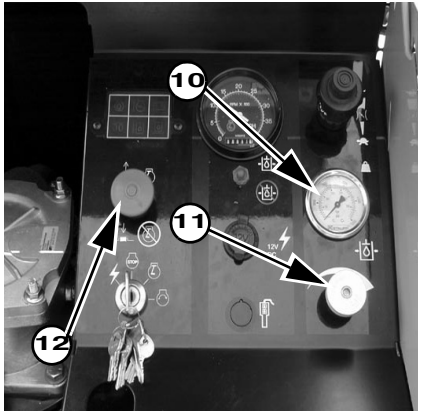
Yellow . . . . . heating

(8) High Hydraulic Oil Temperature Indicator

On . . . . . hydraulic oil hot

(9) Hydraulic Oil Filter Condition Indicator

On . . . . . hydraulic filter flow restricted



(10) Pressure Gauge

Shows hydraulic operating pressure

(11) Pressure Control

Rotate Clockwise . . . . . increase hydraulic pressure
Rotate Counterclockwise . . . . . decrease hydraulic pressure

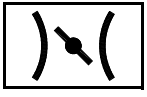
(12) Emergency Stop Switch

Pull . . . . . run
Push . . . . . stop

POWERPACK PP4000

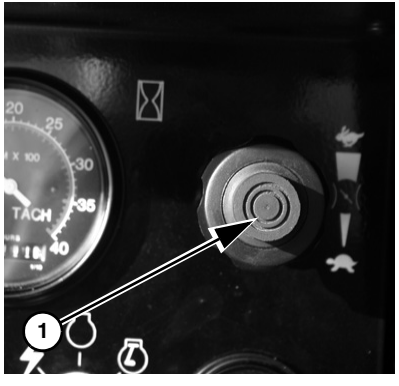
NOTE: The standard power unit includes a Kubota 73 hp (54.4 kW) engine @2200 rpm, hydraulic power on/off switch, two 40-ft hydraulic hoses, two quick connectors, and a 12-volt electrical outlet. Any alternative power unit should have equivalent features, with a required hydraulic power rating of 4100 psi (282 bar), and fluid flow rate of 41 gpm (155 L/min).

(1) Throttle

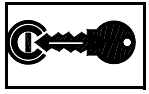


With center button depressed:
Pull knob out . . . . . .increase RPM

Push knob in . . . . . decrease RPM



(2) Ignition Switch



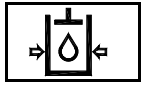
Center position . . . . . .engine off

1st position clockwise . . . . . .engine on

Fully clockwise . . . . . .engine start

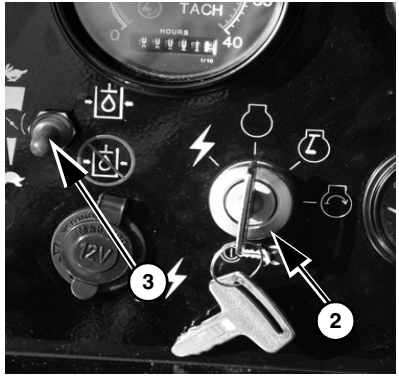
Fully counterclockwise. . . . . glow plugs on

(3) Hydraulic Systems On/Off Switch



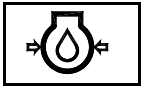
Down . . . . . hydraulic systems off
also controls electric throttle (down 1000 rpm, up 2200 rpm) on PP4000

Up . . . . . hydraulic systems on
Switch must be in OFF (down) position when starting engine.



(4) Oil Pressure Warning Light

On . . . . . engine oil pressure low

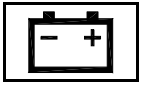


(5) Coolant Temperature Warning Light

On . . . . . engine coolant hot

(6) Alternator Warning Light

On . . . . . not charging



(7) Pre-Heat Indicator

With ignition switch in the GLOW PLUG position:

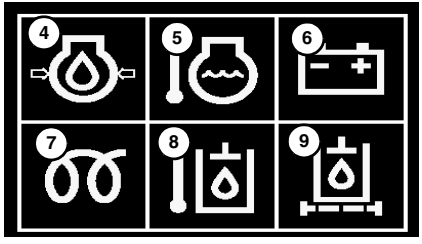
Yellow . . . . . heating

(8) High Hydraulic Oil Temperature Indicator

On . . . . . hydraulic oil hot

(9) Hydraulic Oil Filter Condition Indicator

On . . . . . hydraulic filter flow restricted



(10) Pressure Gauge

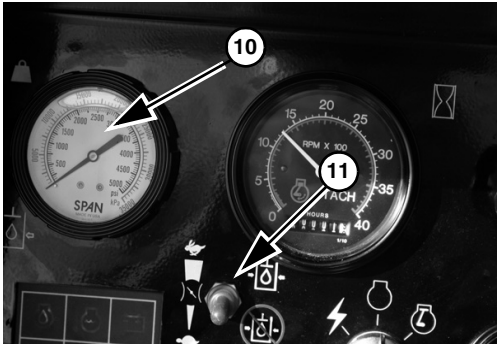
Shows hydraulic operating pressure

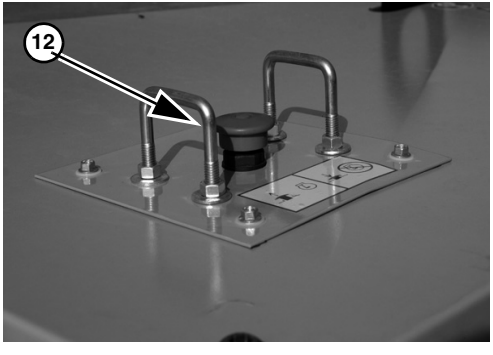
(11) Pressure Control

Up . . . . . .increase hydraulic pressure
Down . . . . . decrease hydraulic pressure

(12) Emergency Stop Switch

Pull . . . . . .run
Push . . . . . stop

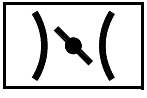




POWERPACK 20

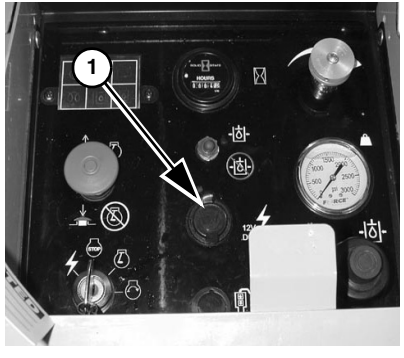
NOTE: The standard power unit includes a Kubota 20.3 hp (15.1 kW) engine, hydraulic power on/off switch, two 25-ft hydraulic hoses, two quick connectors, and a 12-volt electrical outlet. Any alternative power unit should have equivalent features, with a required hydraulic power rating of 3000 psi, and fluid flow rate of 23-25 gpm (87-94 L/min).

(1) Throttle

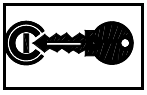


With center button depressed:
Pull knob out . . . . . .increase RPM

Push knob in . . . . . decrease RPM



(2) Ignition Switch



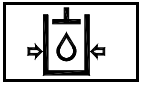
Center position . . . . . .engine off

1st position clockwise. . . . . .engine on

Fully clockwise . . . . . .engine start

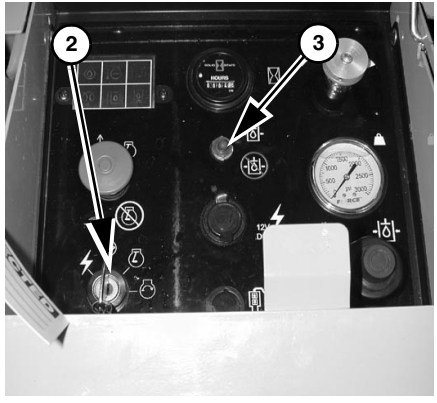
Fully counterclockwise. . . . . glow plugs on

(3) Hydraulic Systems On/Off Switch



Down . . . . . hydraulic systems off

Up . . . . . hydraulic systems on
Switch must be in OFF (down) position when starting engine.



(4) Oil Pressure Warning Light

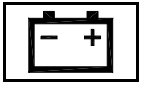
On . . . . . engine oil pressure low

(5) Coolant Temperature Warning Light

On . . . . . engine coolant hot

(6) Alternator Warning Light

On . . . . . not charging



(7) Pre-Heat Indicator

With ignition switch in the GLOW PLUG position:

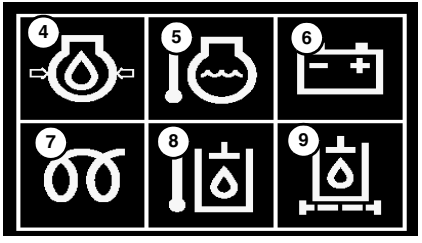
Yellow . . . . . heating

(8) High Hydraulic Oil Temperature Indicator

On . . . . . hydraulic oil hot

(9) Hydraulic Oil Filter Condition Indicator

On . . . . . hydraulic filter flow restricted



(10) **Pressure Gauge**

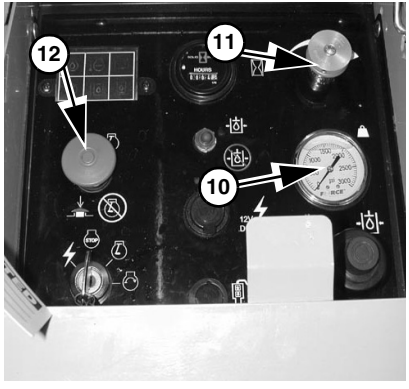
Shows hydraulic operating pressure

(11) **Pressure Control**

Rotate Clockwise . . . . . .increase hydraulic pressure
Rotate Counterclockwise . . . . . decrease hydraulic pressure

(12) **Emergency Stop Switch**

Pull . . . . . .run
Push . . . . . stop

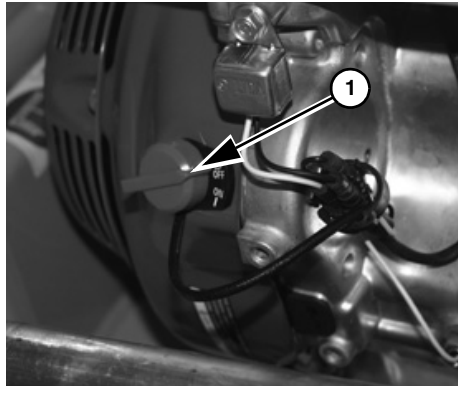


POWERPACK 13A

NOTE: The PowerPack 13A's hydraulic pump capacity is less than that of the larger powerpacks. The shuttle speed and maximum sustained pressure output will be less than that of the larger powerpack. This will translate into slower production rates.

On/Off Switch

The on/off switch **(1)** is located under the fuel tank mounted to the side engine cover.



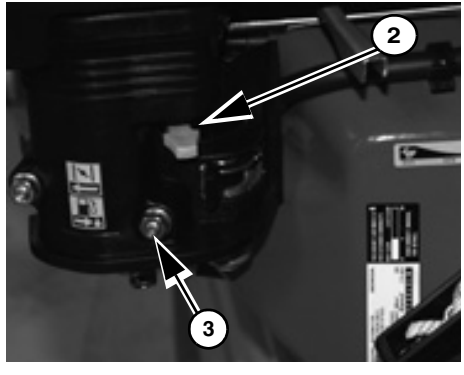
NOTE: The engine is equipped with a low oil automatic shutdown module. If the unit will not start or shuts down immediately after starting, check the engine oil level.

Fuel Valve Lever

The fuel valve **(3)** opens and closes the fuel path from the fuel tank to the carburetor. The fuel valve lever must be in the ON position for the engine to run. When the engine is not in use, place the fuel valve lever in the OFF position to prevent the possibility of fuel leakage and carburetor flooding.

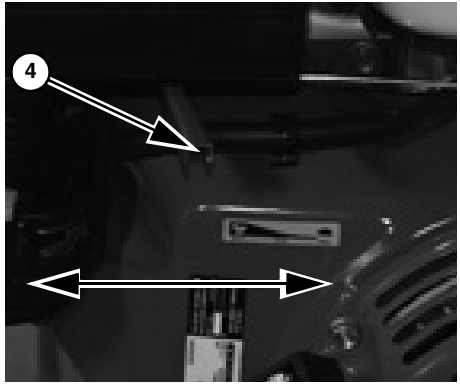
Choke Lever

The choke lever **(2)** opens and closes the choke valve in the carburetor. The CLOSED position enriches the air/fuel mixture to aid in starting a cold engine. The OPEN position provides the correct air/fuel mixture for operation after the engine has been started or for restarting a warm engine.



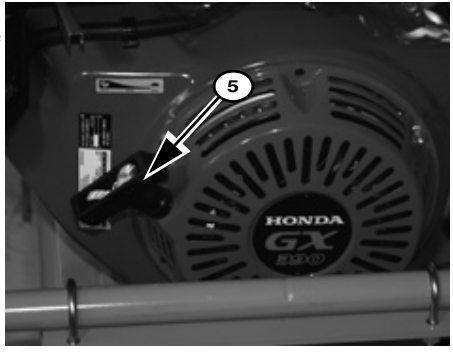
Throttle Lever

The throttle lever **(4)** Controls engine speed. Moving the throttle lever to the left will increase engine speed. Moving the lever to the right will decrease engine speed.

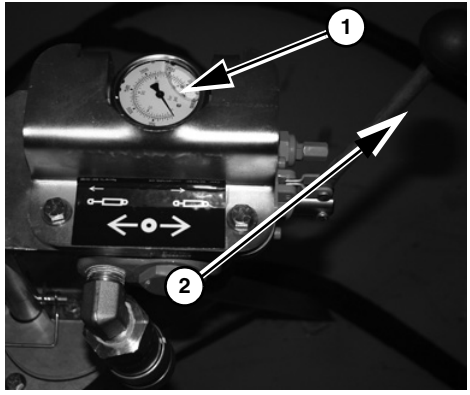


Recoil Starter

Pulling the starter grip **(5)** operates the recoil starter to spin the crankshaft and start the engine.



Control Stand Assembly



(1) Pressure Gauge

Shows hydraulic operating pressure

(2) Direction Control

Push In . . . . . .extends main cylinder (pulls cable)
Pull Out. . . . . retracts main cylinder
Centered . . . . . neutral or starting position

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Section 21: Starting Procedure

WARNING: The instructions in this section are a brief description of the starting procedures for the HammerHead line of hydraulic powerpacks. For detailed instructions, please read the Hydraulic Power Pack Operator Manual before attempting to run the equipment.

POWERPACK 73

IMPORTANT: To avoid engine component damage:

- Do not use ether or other starting fluids.
- Do not turn on pre-heat system on for more than 15 seconds at a time.
- Never run the starter motor for more than 15 seconds at a time. Allow the starter motor to cool 1 minute between attempts.
- Place the softstart switch in the down position. The engine will not start if the switch is in the up position or if the emergency stop button is pressed.

NOTE: The motor has a built in Low Oil Pressure timer circuit which prevents the engine from starting if it has not started after 15 seconds. The ignition key must be placed in the off position to reset the timer before attempting to restart the motor.

Step 1: Set the throttle to 1/4 out.

Step 2: On a cold engine, turn on pre-heat system (5 seconds above freezing, 10 seconds below freezing).

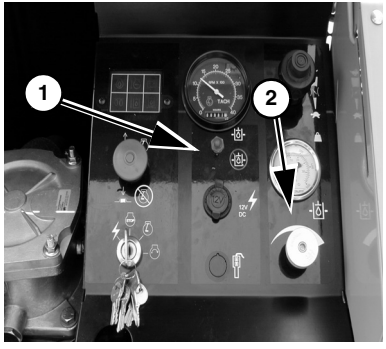
Step 3: Start the engine. If it doesn't start within 15 seconds, wait 1 minute, reset the ignition switch and use the pre-heat system again.

Step 4: Slowly move the throttle to idle and allow engine to warm up.

Step 5: Connect the hydraulic hoses to the slave machine.

Step 6: Place hydraulic on/off switch (**1**) into the run or up position.

Step 7: Set operating pressure using pressure adjustment knob (**2**).



POWERPACK PP4000

IMPORTANT: To avoid engine component damage:

- Do not use ether or other starting fluids.
- Do not turn on pre-heat system on for more than 15 seconds at a time.
- Never run the starter motor for more than 15 seconds at a time. Allow the starter motor to cool 1 minute between attempts.
- Place the softstart switch in the down position. The engine will not start if the switch is in the up position or if the emergency stop button is pressed.

NOTE: The motor has a built in Low Oil Pressure timer circuit which prevents the engine from starting if it has not started after 15 seconds. The ignition key must be placed in the off position to reset the timer before attempting to restart the motor.

Step 1: Set the throttle to 1/4 out.

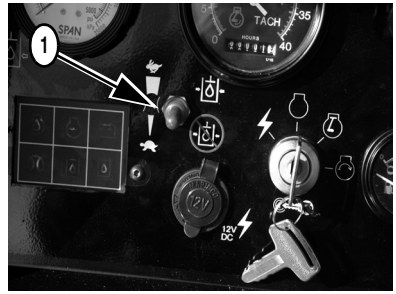
Step 2: On a cold engine, turn on pre-heat system (5 seconds above freezing, 10 seconds below freezing).

Step 3: Start the engine. If it doesn't start within 15 seconds, wait 1 minute, reset the ignition switch and use the pre-heat system again.

Step 4: Slowly move the throttle to idle and allow engine to warm up.

Step 5: Connect the hydraulic hoses to the slave machine.

Step 6: Place hydraulic on/off switch (**1**) into the run or up position.

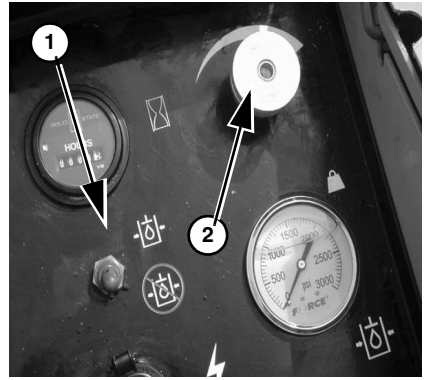


POWERPACK 20

STARTING THE ENGINE (SERIAL NUMBER 10014 AND LOWER)

IMPORTANT: To avoid engine component damage:

- Do not use ether or other starting fluids.
- Shut off pre-heat system when indicator glows a dull red. Do not turn pre-heat system on for more than 15 seconds at a time.
- Never run the starter motor for more than 15 seconds at a time. Allow the starter motor to cool 1 minute between attempts.
- Connect hydraulic hoses to each other or to the down-hole unit before starting the engine.



Step 1: Set the throttle to 1/2 throttle.

Step 2: On a cold engine, turn on pre-heat system until the indicator glows (approximately 15 seconds).

Step 3: Start the engine. If it doesn't start within 15 seconds, use the pre-heat system again.

Step 4: Slowly move the throttle to idle and allow engine to warm up.

STARTING THE ENGINE (SERIAL NUMBER 10015 AND HIGHER)

IMPORTANT: To avoid engine component damage:

- Do not use ether or other starting fluids.
- Do not turn pre-heat system on for more than 15 seconds at a time.
- Never run the starter motor for more than 15 seconds at a time. Allow the starter motor to cool 1 minute between attempts.
- Place the hydraulic on/off switch in the down position. The engine will not start if the switch is in the up position or if the emergency stop button is pressed.

NOTE: The motor has a built in Low Oil Pressure timer circuit which prevents the engine from starting if it has not started after 15 seconds. The ingnition key must be placed in the off position to reset the timer before attempting to restart the motor.

Step 1: Set the throttle to 1/4 out.

Step 2: On a cold engine, turn on pre-heat system (5 seconds if above freezing, 10 seconds if below freezing).

Step 3: Start the engine. If it doesn't start within 15 seconds, reset the ignition switch and use the pre-heat system again.

Step 4: Slowly move the throttle to idle and allow engine to warm up.

Step 5: Connect the hydraulic hoses to the slave machine.

Step 6: Pull throttle out completely.

Step 7: Place hydraulic on/off switch (**1**) into the run or up position.

Step 8: Set operating pressure using pressure adjustment knob (**2**).

POWERPACK 13A

IMPORTANT: To avoid engine component damage:

- Do not use ether or other starting fluids.
- Connect hydraulic hoses to each other or to the PB30 before starting the system.

Step 1: Turn On/Off Switch to On position

Step 2: Set the throttle to 1/4 open from low idle.

Step 3: On a cold engine slide the choke lever see *Choke Lever, page* 20-13

Step 4: Open fuel valve.

Step 5: Pull starter rope until engine starts.

Step 6: Allow the engine to warm up.

COLD WEATHER STARTING

Engine

Before operating in cold weather, it is important to use the recommended engine oil viscosity and fuel to reduce starting problems. Refer to the *Engine Manual* for recommended engine oil, fuel, and starting procedures.

IMPORTANT: Do not spray starting fluid into the air cleaner. Engine damage can result.

Hydraulic Fluid

Allow adequate time for the hydraulic fluid to warm up. Refer to the *Specifications* section in the *Maintenance Manual* for recommended hydraulic fluids.

For frequent starts below 10°F (-12°C), consult your HammerHead dealer.

JUMP-STARTING

Battery Explosion - Avoid

WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Do not smoke. Tools and cable clamps can make sparks. Shield eyes and face from battery.

Do not jump-start or charge a battery that is frozen or low on electrolyte.

Avoid explosion hazard. Battery caps must be in place and tight on all batteries.

IMPORTANT: Use only a 12-volt system for jump-starting. Do not allow vehicles to touch.

Battery Burns - Avoid

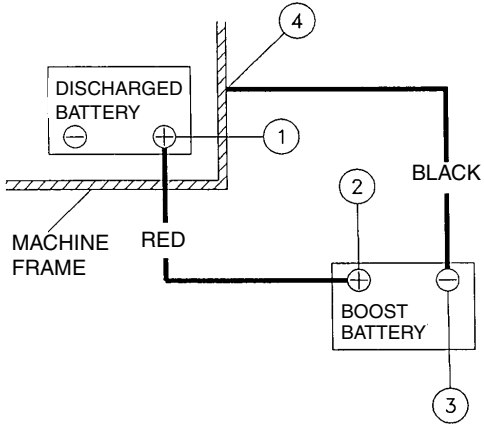
Battery contains sulfuric acid which can cause severe burns. Avoid contact with eyes, skin, and clothing.

In case of acid contact:

External: Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical attention.

Internal: Drink large quantities of water or milk, follow with milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

Jump-Starting Procedure



Step 1: Turn ignition key OFF. Remove battery access panel.

Step 2: Connect jumper cables in the following order:

a. Red to discharged battery POSITIVE (+) terminal **(1).**

b. Red to boost battery POSITIVE (+) terminal **(2).**

c. Black to boost battery NEGATIVE (-) terminal **(3).**

d. Black to frame **(4)** of machine with the discharged battery. Make connection away from battery.

NOTE: To avoid sparks near the battery, always disconnect black jumper cable at point **(4)** before making any adjustment to the red jumper cable at point **(1).**

Step 3: Start engine.

Step 4: Remove cables in REVERSE order and install cover over POSITIVE cable clamp. Install battery access cover.

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Section 22: Shutdown Procedure

STOPPING THE MACHINE

When shutting off the engine, use the following shutdown procedure:

- Shut off hydraulics.
- Reduce engine speed to idle.
- Shut the engine off and remove the key.

For your safety and the safety of others, use the shutdown procedure before servicing, cleaning, inspecting, or transporting the machine.

A variation of the above procedure may be used if instructed within this manual or if an emergency requires it.

NOTE: If disconnecting the hoses from the quick couplers, cycle the control valve to relieve hydraulic pressure. It will be hard to reconnect the hoses if there is hydraulic pressure in the system.

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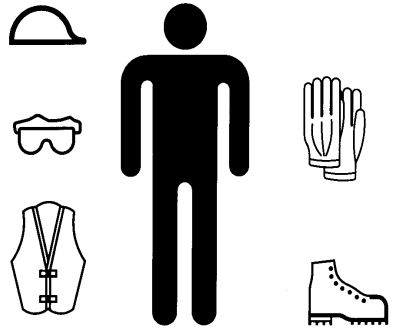
Section 30: Preparing Machine and Work Area

Personal Protective Equipment

Operating the machine will require you to wear protective equipment. You should always wear a hard hat, work shoes and eye protection. Wear leather gloves when handling rods or wire rope. If working near traffic, wear high visibility clothes.

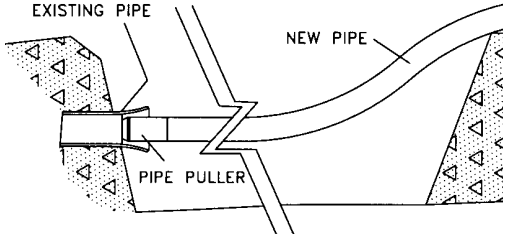


Pit Preparation

WARNING: Do not work in trench with unstable side which could cave in. Specific requirements for shoring or sloping trench walls are avaialble from several sources including federal and state OSHA offices. Be sure to contact suitable authorities for these requirements before working in a trench.

If entry into a confined space is necessary, follow all regulations and requirements for working in confined spaces to ensure a hazard-free environment.

NOTE: The down-hole unit is located in the exit pit; the pipe is pulled in from the entry pit.



Entry Pit

Uncover the end of the service being replaced. Make the pit large enough the new pipe can make a gentle bend into the old service.

NOTE: It is imperitive that the new pipe enter the old utility as flat or as on grade as possible. Failure to do so will cause the first few feet of the utility to be above grade. It may also create additional friction on the new pipe as it enters the old utility.

The rule of thumb for the entrance pit is that the length of the pit is normally 2-1/2 times the depth of the existing service. Larger diameters and/or lower SDR specifications (thicker walls) will require longer entrance pits to accomodate the larger bend radious of the pipe.

Exit Pit - HB3038/HB5058

- Uncover the end of the service being replaced. The pipe puller and spacer require a 1-1/2 ft by 9 ft (46 cm by 274 cm) pit. Add enough extra room so the operator can manuver safely.
- Slope, terrace or shore the trench to avoid cave ins.

NOTE: The centerline of the rods is 6-1/2" (16.5 cm) above the surface on which the down-hole unit sits.

- Slope the floor of the pit to the grade of the burst and square the face of the pit.
- It may be helpful to place two 2 x 8's aproximately 90" (230 cm) long in the pit. Planks or timbers can also be placed on the face ofe pit to distribute the pullback force over a larger area.
- Some situations may require other procedures, such as dewatering or bypass pumping.

Exit Pit - HB100T

- Uncover the end of the service being replaced. The pipe puller and spacer brace require a 3 ft by 10-1/2 ft (91 cm by 320 cm) pit. Add enough extra room so the operator can manuver safely.

- Slope, terrace or shore the trench to avoid cave-ins.

NOTE: The centerline of the rods is 14-1/4" (36.2 cm) above the surface on which the down-hole unit sits.

- Slope the floor of the pit to the grade of the burst and square the face of the pit.
- Square the face of the exit pit to the face of the HB100T.
- Prepare the pit by stabilizing the bottom of the pit with a layer of gravel, Further stabilization can be accomplished by placing a road plate on top of the gravel before setting the machine in place.

Exit Pit - HB125

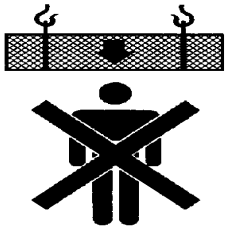
- Uncover the end of the service being replaced. The pipe puller and spacer brace require a 4 ft by 10-1/2 ft (1.2 m by 3.2 m) pit. Add enough extra room so the operator can manuver safely.
- Slope, terrace or shore the trench to avoid cave-ins.

NOTE: The centerline of the rods is 18" (45.7 cm) above the surface on which the down-hole unit sits. Therefore the pit must be at least 18" deeper than the existing utiltiy measured from the centerline of the existing utility.

- Slope the floor of the pit to the grade of the burst and square the face of the pit. Exact adjustments can be made with the verticle stabilizers on the HB125 if the option has been installed on the unit.
- Square the face of the exit pit to the face of the HB125.
- Prepare the pit by stabilizing the bottom of the pit with a layer of gravel, Further stabilization can be accomplished by placing a road plate on top of the gravel before setting the machine in place.

EQUIPMENT PLACEMENT AND INSTALLATION

WARNING: Never lift equipment over personnel. The load may fall or shift, crushing anyone beneath it

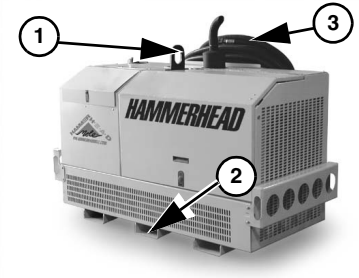


Set the unit up in a safe and efficient working position. If setting up near traffic, use the necessary warning and diversion systems for motor vehicles and pedestrian traffic. Use the necessary signs, cones and flag personnel for the work situation.

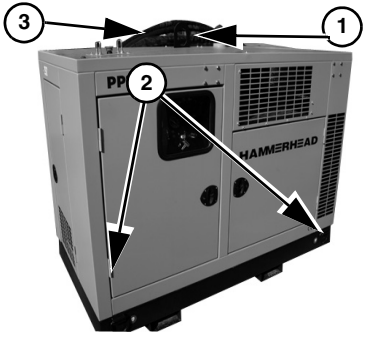
PowerPack PP73

Step 1: Attach lifting chains to lifting point **(1)** and use a hoist, or use a fork lift in tubes **(2),** to place the powerpack near the exit pit - close enoughthat the 40 ft (12.2 m) hoses will **(3)**will reach the down hole unit.

Step 2: Connect hoses **(3)** to quick couplerson the down-hole unit.



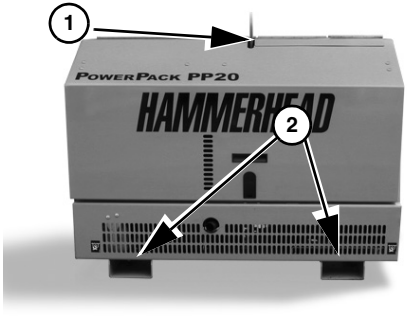
PowerPack PP4000



Step 1: Attach lifting chains to lifting point **(1)** and use a hoist, or use a fork lift in tubes **(2),** to place the powerpack near the exit pit - close enoughthat the 40 ft (12.2 m) hoses will **(3)**will reach the down hole unit.

Step 2: Connect hoses **(3)** to quick couplerson the down-hole unit.

PowerPack PP20

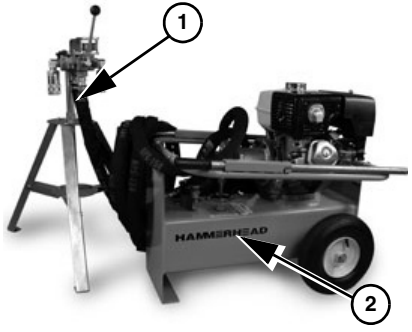


Step 1: Attach lifting chains to lifting point **(1)** and use a hoist, or use a fork lift in tubes **(2),** to place the powerpack near the exit pit - close enoughthat the 25 ft (7.6 m) hoses will **(3)**will reach the down hole unit.

Step 2: Connect hoses to quick couplerson the down-hole unit.

IMPORTANT: The hoses must be connected to each other or to the downhole unit before starting the unit

PowerPack PP13A



Step 1: Place the Control Station **(1)** near the exit pit - close enough that the operator has a clear, unobstructed view of the downhole unit.

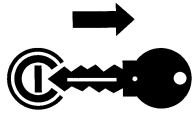
Step 2: Place the PP13A **(2)** as far away from the edge of the exit pit as possible while still having the hoses close enough to attach to the control station.

Step 3: Connect the hoses from the down-hole unit to the control station.

IMPORTANT: The hoses must be connected to each other or to the control station before attempting to start the engine.

Section 50: Maintenance Intervals

WARNING: Before servicing, cleaning, repairing, inspecting, lubricating, fueling, or transporting the machine, refer to the *Shutdown Procedure*, page *22-1*, for proper instructions.



HOURMETER - CHECK FOR MAINTENANCE INTERVAL

The hourmeter on the power unit is used to determine maintenance intervals for the machine. The hourmeter indicates the total number of hours the engine has been in operation.

The PowerPack 13 does not have an hourmeter attached to the unit. Hours of use, therefore, must be tabulated by noting the amount of time the unit is in operation.

Maintenance intervals are based on normal operating conditions. When operating under severe conditions, the maintenance intervals should be shortened.

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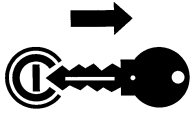
Section 51: Maintenance - 10 Service Hours or Daily

WARNING: Before servicing, cleaning, repairing, inspecting, lubricating, fueling, or transporting the machine, refer to the *Shutdown Procedure*, page *22-1*, for proper instructions.



FLUID LEVELS - CHECK

Check fluid levels daily before operating the machine. Also inspect the machine and make any necessary adjustments and repairs before starting the engine.

Engine Coolant Level

WARNING: Do not remove radiator cap from a hot engine. Wait until the temperature has cooled before removing the pressure cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove the filler cap slowly to relieve coolant system pressure.

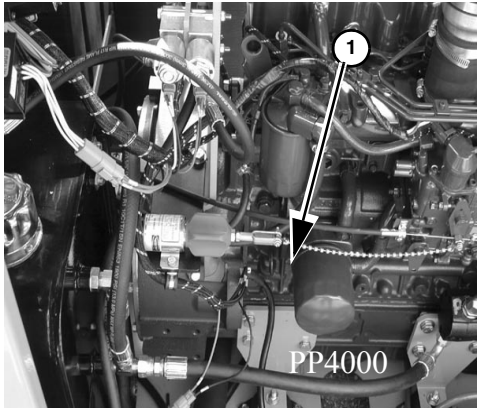
Fill to within 1/2" (13 mm) of the bottom of the fill pipe with a low-silicate (ethylene-glycol) antifreeze and clean water mixture.

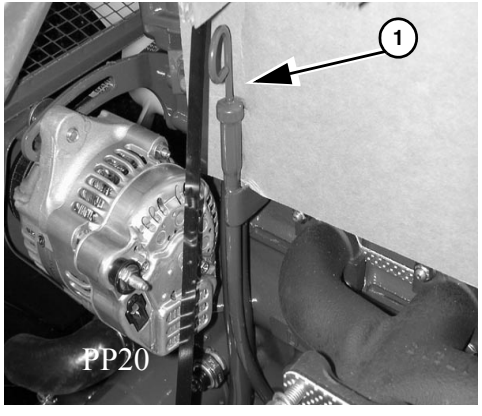
NOTE: Never add pure antifreeze to a cooling system. We recommend using a 50/50 mixture. Never use high-silicate antifreeze or antifreeze that is higher than 60/40 mixture.

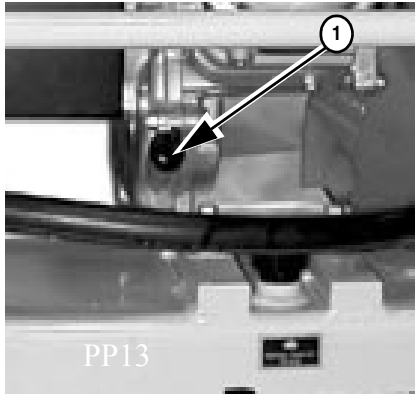
Crankcase Oil Level

PP73/4000

With engine level, fill to full mark on dipstick **(1)**. Do not overfill.





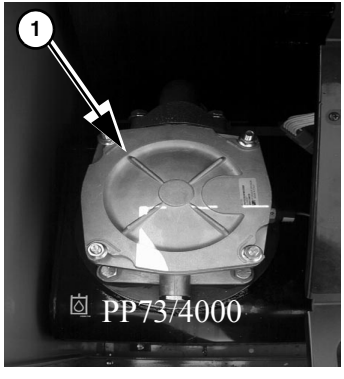


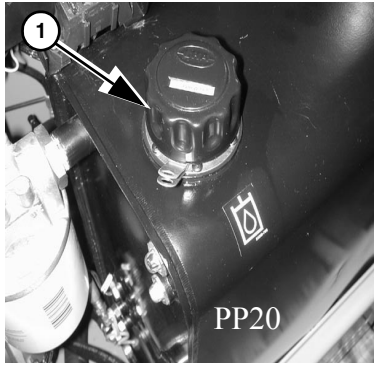
Hydraulic Fluid Level

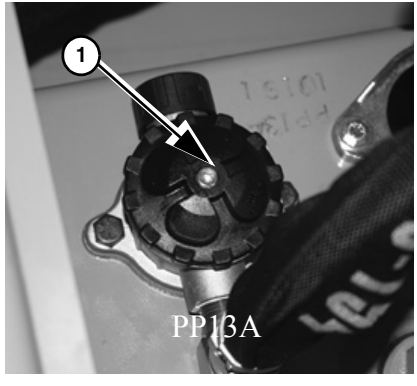
CAUTION: Clean hydraulic fluid is very important so do not spill dirt or other contaminants into the tank. Filter all hydraulic fluid through a 10-micron filter before adding it to the tank.

NOTE: The hydraulic fluid must be free of bubbles. Bubbles indicate trapped air in the hydraulic system.

(1) Fill Cap





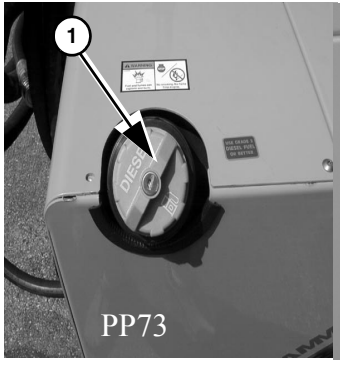


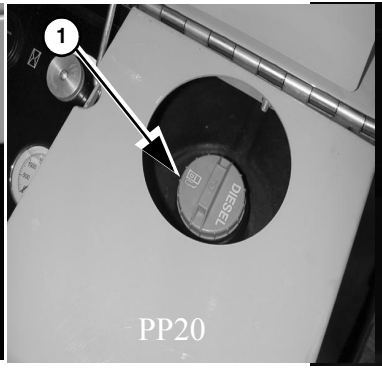
Fuel Tank - Fill

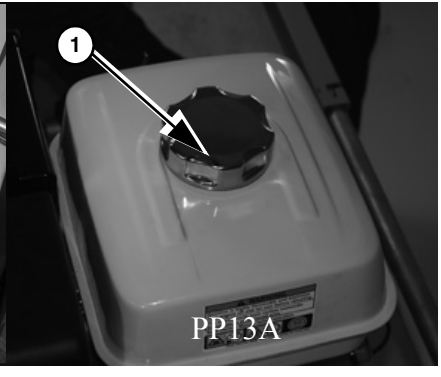
WARNING: Never refuel machine while smoking or with engine running. Fill fuel tank outdoors. Clean up spilled fuel. Do not allow any hot or burning material near the machine.

Fill the fuel tank at the end of each day to prevent condensation. Do not fill tank to the very top, leave room for expansion.

(1) Fill Cap







Section 52: Maintenance - 50 Service Hours or Weekly

Engine Maintenance

- Initial engine oil change
- Initial engine oil filter change
- Initial fan and alternator belt tension check

Refer to *Maintenance - 100 Service Hours, page 53-1*.

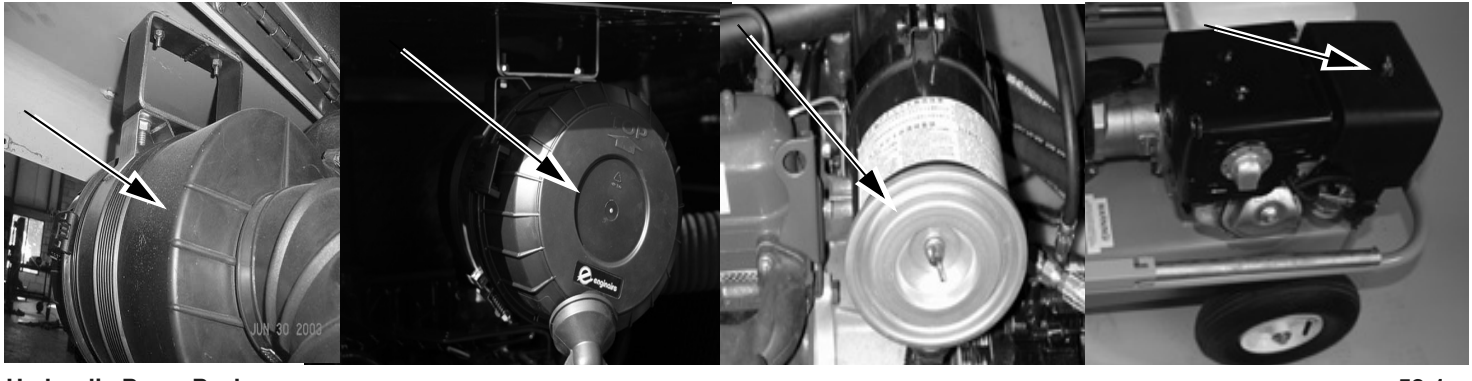
Air Cleaner - Service

In dusty conditions, the element must be cleaned more often.

Clean the element by tapping lightly on its edge or by using compressed air on the inside walls.

Use caution when using compressed air. Damage may occur if air nozzle is too close to element.

Replace the element after 6 cleanings or every 300 service hours, whichever comes first.



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Section 53: Maintenance - 100 Service Hours

ENGINE OIL AND FILTER - CHANGE

Step 1: Set the power unit on suitable blocking and place a container underneath hole **(1)**.

Step 2: Remove drain plug on bottom of oil pan and drain warm oil into the container. Install and tighten plug.

Step 3: Remove oil filter **(2)**.

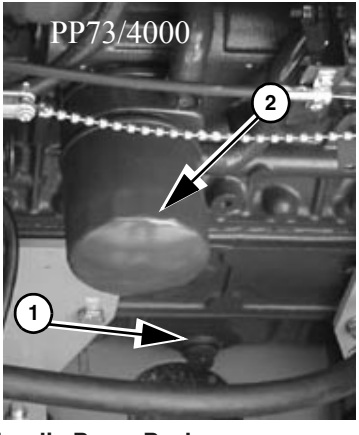
Step 4: Clean the filter head surface.

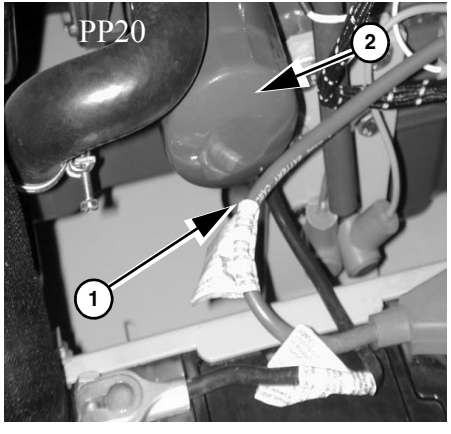
Step 5: Apply a thin film of oil to gasket of new filter.

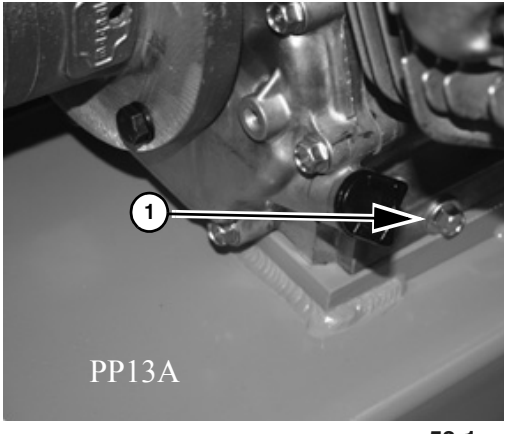
Step 6: Install filter and tighten until gasket contacts filter head, then tighten 3/4 turn more.

Step 7: Add oil to the full mark on the dipstick.

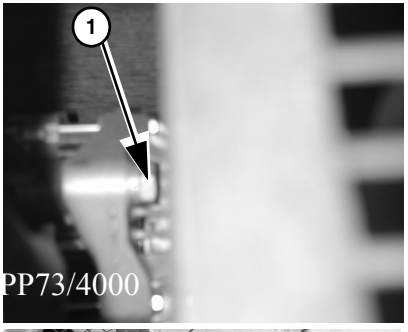
Step 8: Run the engine several minutes, follow shutdown procedure, and recheck oil level.







ENGINE FAN AND ALTERNATOR BELT - CHECK



Check tension:

The belt is correctly tensioned when 2.2 lb (1 kg) is applied to the center of the span, and the belt deflects 0.16˝ (4 mm).

Loosen bolts **(1)** to adjust belt.

Check belt wear:

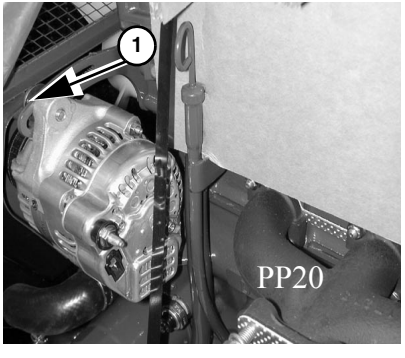
Check fan and alternator belt for cracks, breaks, and proper adjustment. Replace when necessary.

To replace belt:

Step 1: Loosen bolts **(1)**.

Step 2: Remove belt and install new belt.

Step 3: Adjust belt tension.



NOTE: Dispose of fluids per local laws and ordinances.

COOLING SYSTEM - CHECK

- Inspect hose clamps and overflow tube.
- Check for dirt and debris in radiator fins.
- Check fan for cracks, loose rivets and bent or loose blades.

HYDRAULIC FLUID FILTER - CHANGE

The hydraulic fluid filter element on a new machine needs to be changed after the first 100 service hours of operation and every 500 service hours thereafter. To change filter element, refer to the *Maintenance - 500 Service Hours* section, "Hydraulic Fluid Filter - Change," *page 55-4*, for proper procedure.

HYDRAULIC SYSTEM - CHECK

WARNING: Pressurized fluid can penetrate body tissue and result in serious injury or death. Leaks can be invisible. Relieve pressure before working on system. When searching for a leak, use an object like cardboard - not your hand. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Check hydraulic system for leaks, kinked hoses, and hoses or other parts that rub against each other.

OVERALL MACHINE - CHECK

Shields and Guards - Check that all shields and guards are installed and are fastened securely to the machine. Replace or repair any shields or guards that are damaged or have missing parts.

Decals - Check the machine for any worn or missing safety and operating decals. (Refer to *Safety Decals, page 11-1*, and *Machine Controls, page 20-1.)*

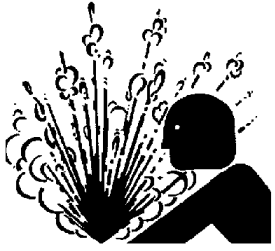
Hardware - Check the machine for loose, worn, or missing parts and hardware. Tighten any loose parts and replace any worn or missing parts (refer to *Parts Manual* for replacement **parts).**

Frame - check frame and contact dealer immediately if you notice any bending or cracking.

Section 54: Maintenance - 200 Service Hours

COOLING SYSTEM ADDITIVE - ADD

WARNING: Do not remove radiator cap from a hot engine. Wait until the temperature has cooled before removing the pressure cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove the filler cap slowly to relieve coolant system pressure.



Add 1 oz (29.6 cc) of Fleetguard DCA4 to coolant system to prevent electrolysis.

FUEL FILTER - REPLACE

WARNING: Keep heat, flames, and sparks away from fuel. Always clean up spilled fuel.

To replace:

Step 1: Clean outside surfaces of filter assembly **(1)**.

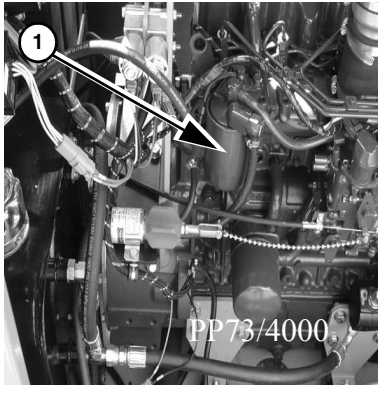
Step 2: Place tray under the filter to catch spilled fuel.

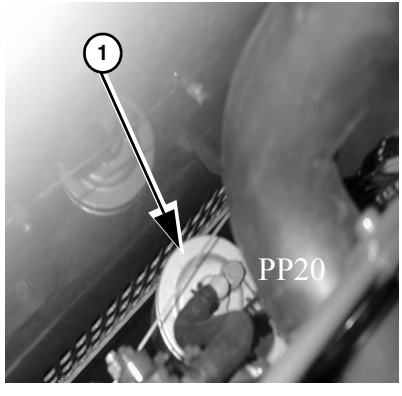
Step 3: Remove the filter with a filter wrench.

Step 4: Fill new filter with clean fuel. Allow enough time for fuel to pass through the element.

Step 5: Apply a thin film of oil to gasket of new filter.

Step 6: Install filter and tighten until gasket contacts filter head, then tighten 3/4 turn more.





Section 55: Maintenance - 500 Service Hours

COOLING SYSTEM - DRAIN AND CLEAN

WARNING: Do not remove radiator cap from a hot engine. Wait until the temperature has cooled before removing the pressure cap. Failure to do so can result in personal injury from heated coolant spray or steam. Remove the filler cap slowly to relieve coolant system pressure.

Step 1: Drain the old coolant from the system.

Step 2: Fill radiator with clean water. Check for signs of rust and add a cooling system cleaner to the water if necessary.

Step 3: Run the engine long enough to be sure thermostat has opened, allowing the engine and radiator to receive fresh water. Allow the system to cool, then drain the water.

Step 4: Add a 50/50 mixture of low-silicate ethylene glycol antifreeze and clean water to the radiator. Do not fill completely. Run the engine until mixture has circulated in the system.

Step 5: Add 4 oz (120 cc) of Fleetguard DCA4. Finish filling radiator. System capacity is approximately 1 gal (3.8 L).

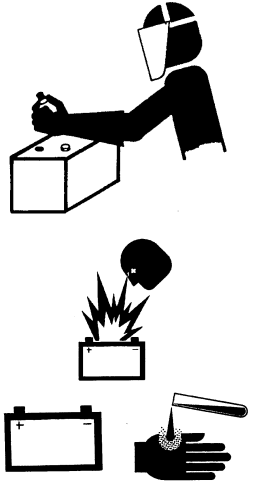
Recheck radiator after engine has cooled overnight. Fill as necessary. Continue to check each time machine is run and cooled off until radiator remains full.

BATTERY ELECTROLYTE LEVEL AND TERMINALS - CHECK

WARNING: Battery contains highly explosive hydrogen gas.

Battery contains sulfuric acid which can cause severe burns.

- **Wear safety glasses or face shield and rubber gloves.**
- **Use a flashlight to check electrolyte level.**
- **Work in a well-ventilated area.**
- **Avoid breathing fumes from battery.**
- **Avoid contact with skin, eyes, or clothing.**
- **Keep flame and sparks away, and do not smoke.**
- **Keep out of reach of children.**
- **Do not short across battery terminals or allow tools to short from battery terminals to frame.**
- **Do not jump-start or charge a battery with frozen electrolyte.**



In case of acid contact:

EXTERNAL: Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical attention.

INTERNAL: Drink large quantities of water or milk, follow with milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

Terminals - Clean

Electrolyte Level - Check

Step 1: Open side access door.

Step 2: Remove black negative (-) cable then red positive (+) cable.

Step 3: Remove battery bracket **(1)** and battery.

Step 4: Clean terminals and clamps with a stiff wire brush.

Step 5: Apply a light coating of petroleum jelly around the base of each terminal.

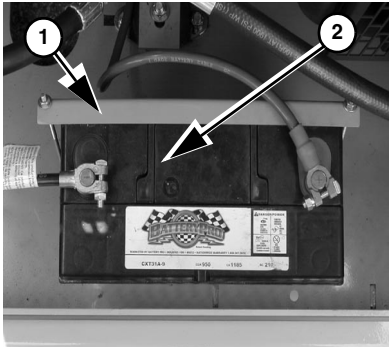
Step 6: Remove cell caps **(2)**; fill each cell with distilled water (never add acid); then replace cell caps.

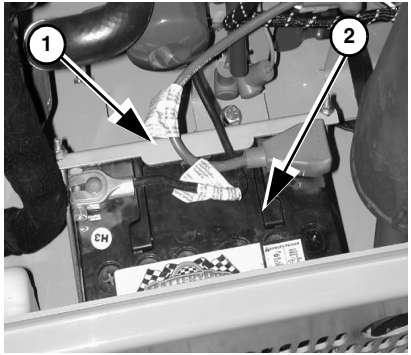
IMPORTANT: In freezing weather, run the engine immediately after filling the battery to allow water and electrolyte to mix.

Step 7: Install battery and bracket **(1)**.

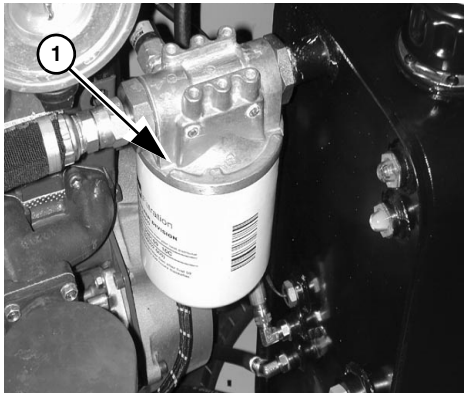
Step 8: Install the red positive (+) cable then the black negative (-) cable.

Step 9: Close side access panel.





HYDRAULIC FLUID FILTER - CHANGE



The hydraulic fluid filter **(1)** will need to be changed earlier if the machine is in storage for a long period of time, such as through the winter.

To change filter:

PP20

Step 1: Use a filter wrench to turn the filter counterclockwise to remove.

Step 2: Clean the filter head surface.

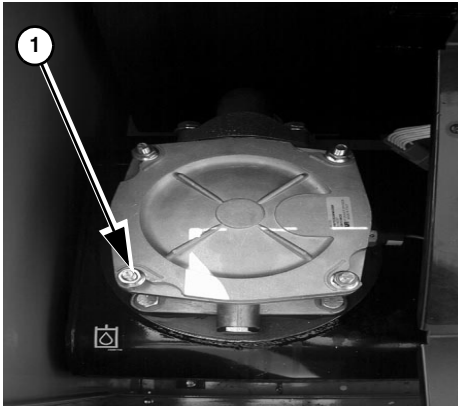
Step 3: Apply a thin film of oil to gasket of new filter.

Step 4: Install filter, by hand, clockwise onto the filter head until it contacts filter head surface.

Step 5: Tighten with filter wrench.

Step 6: Start engine and cycle control levers to pressurize system.

Step 7: Stop the engine. Check hydraulic fluid level (Refer to the *Specifications* section, "Lubricants," *page 60-1*). Check for leaks around filter. Tighten filter only enough to stop leak.



PP73/4000

Step 1: Remove 4 nuts **(1)** on top of canister.

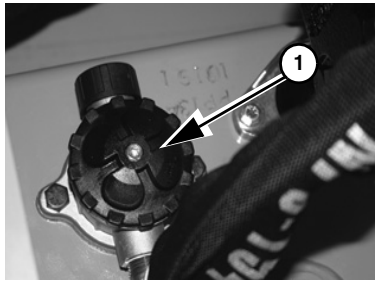
Step 2: Remove filter element and install new element.

Step 3: Reinstall canister lid

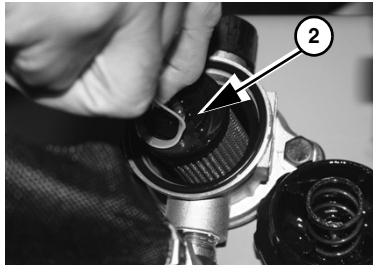
Step 4: Tighten 4 nuts evenly on top of canister.

PP13

Step 1: Use a filter wrench to turn the filter cap **(1)** counterclockwise to remove.

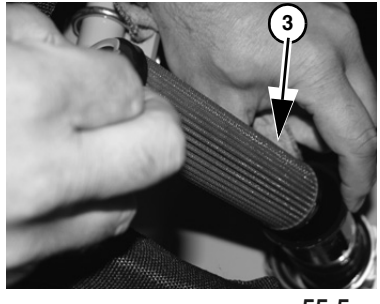


Step 2: Grab tab **(2)** on top of filter and gently pull filter assembly out.

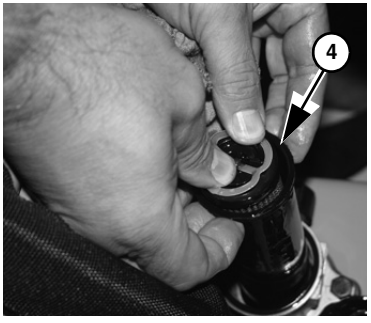


Step 3: Hold bottom of filter assembly pull filter from lower assembly.

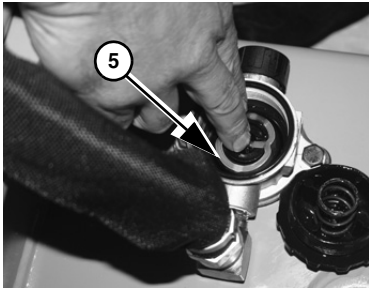
NOTE: Dispose of fluids and filter per local laws and ordinances.



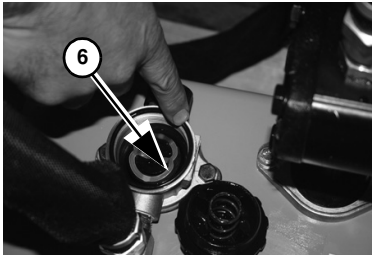
Step 4: Install filter and seat into lower part of assembly **(4)**.



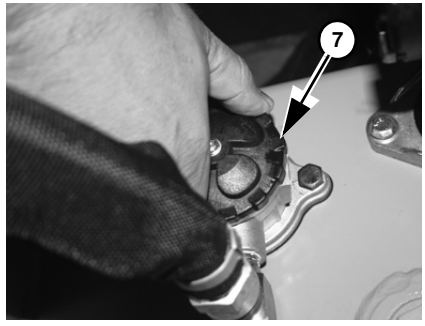
Step 5: Push assembly into hydraulic tank **(5)**.



Step 6: Make sure o-ring seal **(6)** is in place and apply a thin film of oil to the rubber o-ring.



Step 7: Reinstall cap **(7)**and tighten. Check for leaks around filter. Tighten filter only enough to stop leak.



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Section 56: Maintenance - 1000 Service Hours

HYDRAULIC FLUID - CHANGE

PP73/4000

If the fluid smells burned, contains air bubbles, or appears contaminated, consult HammerHead dealer immediately.

Step 1: When oil is warm, remove fill cap **(1)** and drain plug **(2)**. Drain fluid into a suitable container.

Step 2: Clean, inspect, and install drain plug.

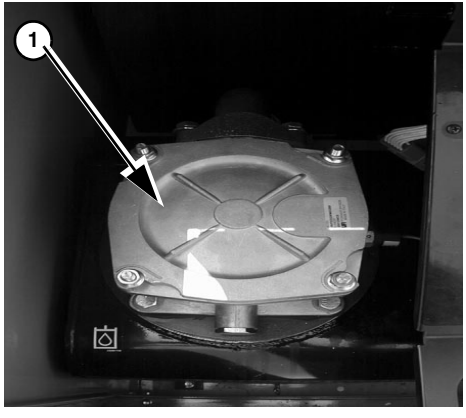
Step 3: Change the hydraulic filter(s) (refer to the *Maintenance - 500 Service Hours* section, "Hydraulic Fluid Filter - Change," *page 55-4*).

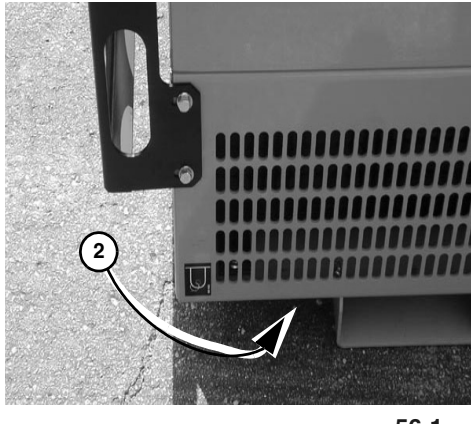
Step 4: Inspect the hydraulic strainer (refer to next page).

Step 5: Refer to the *Specifications* section, "Lubricants," *page 60-1,* for approved oils and fill hydraulic fluid tank.

Step 6: Operate the hydraulic system.

Step 7: Follow the *Shutdown Procedure*, page *22-1*, and recheck oil level.





PP20

Step 1: When oil is warm, remove fill cap **(1)** and drain plug **(2)**. Drain fluid into a suitable container.

Step 2: Clean, inspect, and install drain plug located under the hydraulic reservoir.

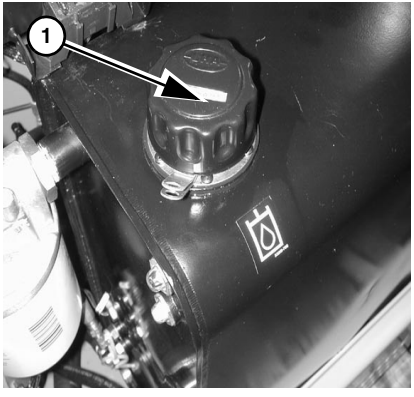
Step 3: Change the hydraulic filter(s) (refer to the *Maintenance - 500 Service Hours* section, “Hydraulic Fluid Filter - Change,” *page 55-4*).

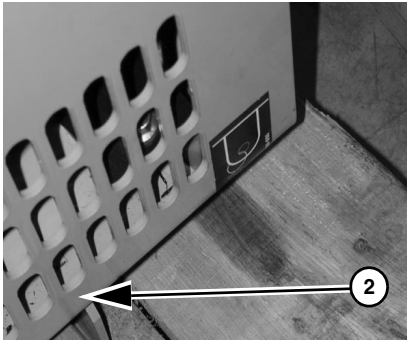
Step 4: Inspect the hydraulic strainer (refer to next page).

Step 5: Refer to the *Specifications* section, “Lubricants,” *page 60-1,* for approved oils and fill hydraulic fluid tank.

Step 6: Operate the hydraulic system.

Step 7: Follow the *Shutdown Procedure*, page *22-1*, and recheck oil level.





PP13

Step 1: When oil is warm, remove fill cap **(1)** and drain plug **(2)**. Drain fluid into a suitable container.

Step 2: Clean, inspect, and install drain plug located under the hydraulic reservoir.

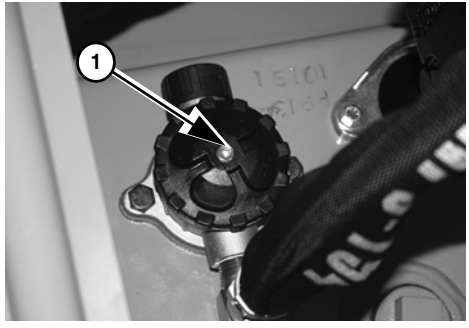
Step 3: Change the hydraulic filter(s) (refer to the *Maintenance - 500 Service Hours* section, “Hydraulic Fluid Filter - Change,” *page 55-4*).

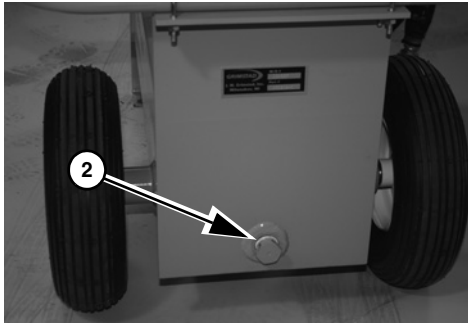
Step 4: Inspect the hydraulic strainer (refer to next page).

Step 5: Refer to the *Specifications* section, “Lubricants,” *page 60-1,* for approved oils and fill hydraulic fluid tank.

Step 6: Operate the hydraulic system.

Step 7: Follow the *Shutdown Procedure*, page *22-1*, and recheck oil level.





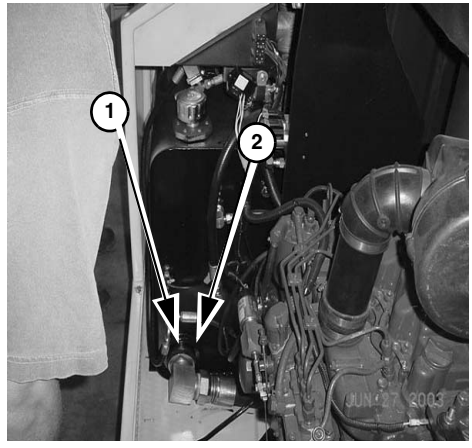
HYDRAULIC FLUID STRAINER - INSPECT

Check strainer when you change the hydraulic fluid. Use the following steps after draining the tank:

Step 1: Disconnect hose **(1)** and place end in bucket to catch hydraulic fluid.

Step 2: Turn strainer **(2)** counterclockwise and remove it from tank.

Step 3: Clean the strainer with a petroleum base paint thinner or other good cleaning solvent. Scrub the strainer with a small soft-bristled brush. Look for lacquers which may have formed as a result of hot spots in the hydraulic system.



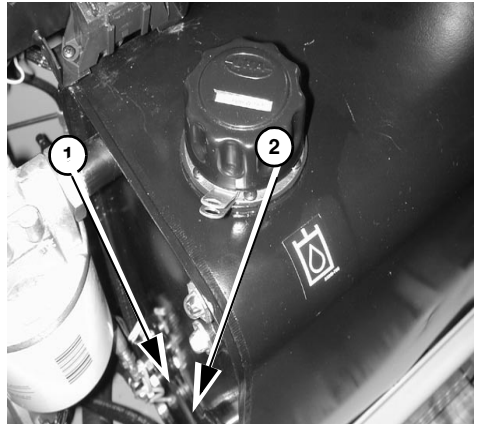
WARNING: Wear proper clothing, including a face shield, when using compressed air to clean or dry solvent-coated parts.

Step 4: Rinse the strainer with clean solvent or thinner. Use compressed air to blow it clean.

Step 5: Use a suitable thread sealant such as Loctite Vibra-seal on fitting and strainer.

Step 6: Install and tighten strainer and fitting.

Step 7: Connect and tighten hose.



Section 57: Maintenance - As Required

ENGINE SYSTEM - CHECK

An *Engine Operation Manual* is supplied with each machine. Refer to the manual for service requirements.

Refer to the *Engine Service Manual* or contact your dealer for procedures on the following maintenance items:

Check and adjust idle speed . . . . . every 100 hours or 3 months

Check injectors for performance . . . . . every 400 hours or yearly

Check and adjust valve clearances . . . . . every 600 hours or 18 months

Tighten cylinder head bolts . . . . . every 600 hours or 18 months

BATTERY - REPLACE

Replacement batteries must meet standard battery specifications provided in the the *Specifications* section, "Machine Specifications," *page 60-2*.

To replace:

Step 1: Open side access door.

Step 2: Remove black negative (-) cable then red positive (+) cable.

Step 3: Remove battery bracket **(1)** and battery.

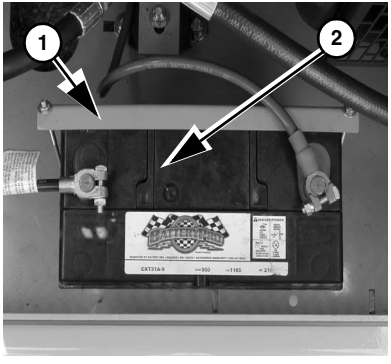
Step 4: Install new battery and bracket.

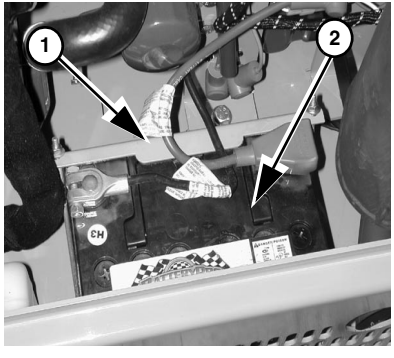
Step 5: Apply a light coating of petroleum jelly around the base of each terminal.

IMPORTANT: In freezing weather, run the engine immediately after filling the battery to allow water and electrolyte to mix.

Step 6: Install the red positive (+) cable then the black negative (-) cable.

Step 7: Close side access door.





Section 60: Specifications

LUBRICANTS

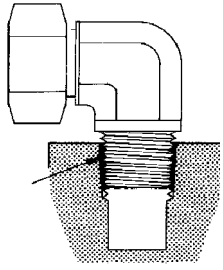
Lubricant	Capacity	Specification / Notes
Hydraulic Fluid	As required	**Phillips: Type HG** **ISO STD or equivalent** Use caution not to get dirt or other contaminants into the system(s) when connecting with a tractor, or when servicing. Filter all fluid through a 10-micron filter before adding.
Grease	As required	**EP grease or equivalent** To minimize condensation in bearings, grease machine after it is shut down for the day. Fittings and grease applicator nozzle must be clean before applying grease. Replace all missing fittings.
General Lubricating Oil	As required	**SAE-30, 882 Heavy Moly Lube or equivalent**

HYDRAULIC POWERPACK				
Specifications	**PP73**	**PP4000**	**PP20**	**PP13A**
Overall Length	72" (182.9 cm)	82.5" (210 cm)	52.5" (133 cm)	34.5" (87.6 cm)
Overall Width	41" (104 cm)	56" (142 cm)	29.3" (74.7 cm)	23.25" (59 cm)
Overall Height	58" (147 cm)	64.5" (164 cm)	41.7" (106 cm)	29.8" (76 cm)
Weight	2,800 lb (1,270 kg)	3200 lb (1451 kg)	690 lb (313 kg)	390 lb (177 kg)
Engine Model	Kubota V3300	Kubota V3307T	Kubota D905	Honda® GX390
Horsepower	73 HP (54.4 kw) @2,600 rpm	72.7 HP (54.2 kw) @2,300 rpm	20.8 HP (15.1 kw) @3,000 rpm	13.0 HP (9.7 kw) @ 3,600 rpm
Pump Flow	41 gpm (155 Lpm) @2,600 rpm	45.6 gpm (172.6 Lpm) @2,300 rpm	26 gpm (91 Lpm) @ 3,000 rpm	6 gpm (23 Lpm) @ 3,000 rpm
Sound Level	82 dbA	73 dbA	87.4 dbA	
Compatable HalmmerHead Models	HydroBurst HB125	HydroBurst HB175 HydroBurst HB125 HydroBurst HB100T HydroBurst HB80	PortaBurst PB30 HydroBurst HB3038 HydroBurst HB5058	PortaBurst PB30

Section 97: Torque Values

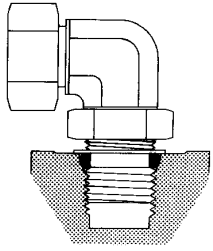
HYDRAULIC FITTINGS

Pipe Thread Fittings



- Ensure all threads are free from nicks, burrs, and dirt.
- Use a thread sealant such as Loctite Vibra-Seal, instead of pipe dope or Teflon tape, to seal the threads. Teflon tape can plug filters and drain orifices, and can cause hydraulic system failures.
- To tighten, turn the fitting approximately three turns past finger tight.

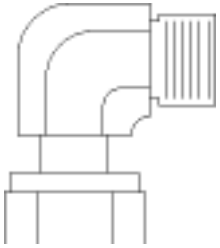
O-Ring Fittings



- Ensure the threads and sealing surfaces are free from nicks, burrs, scratches, or any foreign material.
- Lubricate the O-ring with a light coat of oil.
- To tighten adjustable O-ring fittings, hold the fitting and tighten the nut.
- To tighten non-adjustable O-ring fittings, tighten the fitting.

Size	Thread	Torque
#2	5/16˝ -24	7 - 8 ft-lb (10 - 11 Nm)
#3	3/8˝ -24	14 -16 ft-lb (19 - 21 Nm)
#4	7/16˝ -20	16 - 18 ft-lb (21 - 24 Nm)
#5	1/2˝ -20	22 - 24 ft-lb (29 - 32 Nm)
#6	9/16˝ -18	24 - 26 ft-lb (33 - 35 Nm)
#8	3/4˝ -16	40 - 43 ft-lb (54 - 59 Nm)
#10	7/8˝ -14	68 - 70 ft-lb (93 - 95 Nm)
#12	1-1/16˝ -12	98 - 102 ft-lb (133 - 138 Nm)
#16	1-5/16˝ -12	146 - 154 ft-lb (197 - 209 Nm)

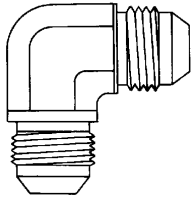
Face Seal Fittings



- Ensure the threads and sealing surfaces are free from nicks, burrs, scratches, or any foreign material.
- Lubricate the o-ring with a light coat of oil.
- To tighten adjustable o-ring fittings, hold the fitting and tighten the nut.Ensure the threads and sealing surfaces are free from nicks, burrs, scratches, or any foreign material.
- To tighten non-adjustable o-ring fitting, tighten the fitting.Ensure the threads and sealing surfaces are free from nicks, burrs, scratches, or any foreign material.

DASH SIZE	Nom Size (IN)	Thread Size	Female Thread	Male Thread	Steel Torque Recomendations (ft. Lbs)		O-Ring
			I.D. (In)	O.D. (In)	Min	Max	I.D. (In)
- 4	1/4	9/16 - 18	1/2	9/16	18	22	5/16
- 6	3/8	11/16 - 16	11/16	11/16	29	36	3/8
- 8	1/2	13/16 - 16	3/4	13/16	40	50	1/2
- 10	5/8	1 - 14	13/16	1	44	55	5/8
- 12	3/4	1-3/16 - 12	1-7/64	1-3/16	66	82	3/4
- 16	1	1-7/16 - 12	1-23/64	1-7/16	92	115	15/16
- 20	1-1/4	1-11/16 - 12	1-19/32	1-11/16	125	156	1-3/16
- 24	1-1/2	2 - 12	1-59/64	2	147	183	1-1/2

JIC Fittings



- Ensure the threads and sealing surfaces are free from nicks, burrs, scratches, or any foreign material.
- To tighten, turn the fitting until finger tight. Then turn the fitting an additional number of flats as indicated on the chart below. **One flat equals 1/6 of a turn.**

IMPORTANT: Do not overtighten the fitting. If overtightened, the female side of the fitting may deform or break, causing the oil flow to become restricted or a leak to form.

Flats from Finger Tight		
Size	New Fittings	Loose Fittings
#4 (1/4˝)	2 to 2-1/2	3/4 to 1
#6 (3/8˝)	2 to 2-1/4	1
#8 (1/2˝)	1-1/2 to 1-3/4	1
#10 (5/8˝)	1-1/2 to 1-3/4	3/4
#12 (3/4˝)	1-1/2	3/4
#14 (7/8˝)	2	1-1/4
#16 (1˝)	1-1/4 to 1 1/2	3/4 to 1
#20 (1-1/4˝)	1 1/2	3/4 to 1
#24 (1-1/2˝)	1 1/4 to 1 1/2	1 to 1 1/4
#32 (2˝)	1 1/4	3/4 to 1

FASTENERS

For SAE Grade 2, Grade 5, and Grade 8 Cap Screws and Bolts

NOTE: Torque values specified in text take precedence over values shown below. These values do not apply when used with lock nuts.

	Grade 2 		Grade 5 		Grade 8 	
Bolt Size	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**
1/4˝-20 NC	4	5	6	8.5	10	13
1/4˝-28 NF	5	6	8	11	11	15
5/16˝-18 NC	9	12	13	18	20	27
5/16˝-24 NF	10	13	15	20.5	22	29.5
3/8˝-16 NC	16	22	25	35	35	47
3/8˝-24 NF	18	24	30	40	40	55
7/16˝-14 NC	25	35	40	55	55	75
7/16˝-20 NF	30	40	45	60	65	88
1/2˝-13 NC	40	55	60	80	90	120
1/2˝-20 NF	45	60	70	95	95	130
9/16˝-12 NC	55	75	90	120	120	165
9/16˝-8 NF	60	80	95	130	135	185
5/8˝-11 NC	75	100	120	165	180	245

	Grade 2 		Grade 5 		Grade 8 	
5/8˝-18 NF	80	110	145	200	195	265
3/4˝-10 NC	130	175	210	285	300	405
3/4˝-16 NF	145	200	240	325	340	460
7/8˝-9 NC	150	205	320	435	500	680
7/8˝-14 NF	170	230	350	475	560	760
1˝-8 NC	180	245	480	650	800	1085
1˝-14 NF	200	270	560	760	920	1250
1 1/8˝-7 NC	240	325	700	950	1180	1600
1 1/8˝- 2 NF	275	375	780	1060	1340	1815
1 1/4˝-7 NC	340	460	1020	1385	1720	2330
1 1/4˝- 2 NF	370	500	1140	1545	1900	2575
1 3/8˝-6 NC	460	625	1360	1845	2280	3090
1 3/8˝-12 NF	540	730	1580	2140	2620	3550
1 1/2˝-6 NC	640	870	1840	2495	3060	4150
1 1/2˝-12 NF	740	1000	2100	2850	3460	4690

For Metric Grade 5.8, 6.9, 8.8, 10.9, & 12.9 Cap Screws and Bolts

	Grade 5.8 		Grade 6.9 		Grade 8.8 		Grade 10.9 		Grade 12.9 	
Bolt Size	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**
M4	1.1	1.5	1.7	2.3	2	2.7	2.9	4	3.6	5
M5	2.3	3.1	3.5	4.7	4	5.4	6	8	7	9.5
M6	3.9	5.3	5.8	7.8	7	9.5	10	13.5	11	15
M7	6.5	8.8	9.4	12.7	11	15	16	22	20	27
M8	10	13.5	14	19	18	24	25	34	29	39
M10	20	27	29	39	32	43	47	64	58	79
M12	34	46	50	68	58	79	83	112.5	100	136
M14	54	73	79	107	94	127	133	180	159	216
M16	80	108.5	122	165	144	195	196	266	235	319
M18	114	155	170	230.5	190	258	269	365	323	438
M20	162	220	220	298	260	353	366	496	440	597
M22	202	274	318	431	368	499	520	705	628	852
M24	245	332	410	556	470	637	664	900	794	1077
M27	360	488	606	822	707	959	996	1351	1205	1634
M30	500	678	815	1105	967	1311	1357	1840	1630	2210

For Grade B, C, F, and G Lock Nuts

	Grade B (Grade 5) 		Grade C (Grade 8) 		Grade F (Grade 5 Flange) 		Grade G (Grade 8 Flange) 	
Nut Size	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**	**Ft-Lb**	**Nm**
1/4˝-20 NC	7.5 - 10	10 - 13	10 - 14	14 - 19	8 - 10	11 - 14	12 - 16	16 - 21.5
1/4˝-28 NF	8 - 10	11 - 14	10 - 14	14 - 19	9 - 12	12 - 16	12 - 17	16 - 23
5/16˝-18 NC	14 - 17.5	19 - 24	17.5-22.5	24 - 30.5	15 - 20	20 - 27	19.5 - 27	27 -36
5/16˝-24 NF	15 - 18	20 - 25	18 - 23	25 - 32	16 - 22	21.5 - 29	19.5 - 26	27 - 35
3/8˝-16 NC	21 - 27	28.5 - 37	29 - 37	39 - 50	22.5 - 32.5	30.5 - 44	30 - 41	41 - 56
3/8˝-24 NF	27.5 - 38	37 - 51.5	22.5 - 31	30.5 - 42	23.5 - 31.5	32 - 43	31 - 42	42 - 57
7/16˝-14 NC	31 - 40	42 - 54	39 - 53	53 - 72	36 - 50	49 - 68	45 - 62	61 - 84
7/16˝-20 NF	39 - 51	53 - 69	41 - 56	56 - 76	38 - 53	51.5 - 72	51 - 71	69 - 96
1/2˝-13 NC	49.5 - 62.5	67 - 85	62 - 79.5	84 - 108	50.5 -69.5	68.5 - 94	72 - 102	98 - 132
1/2˝-20 NF	50 - 65	68 - 88	67 - 87	91 - 118	56.5 -78.5	77 - 106	67 - 106	91 - 144
9/16˝-12 NC	67 - 87	91 - 118	95 - 120	129 - 163	72 - 102	98 - 132	105 - 145	142 - 197
9/16˝-18 NF	74.5 - 94.5	101 - 128	95 - 120	129 - 163	79 - 111	107-150.5	113 - 157	153 - 213
5/8˝-11 NC	95 - 120	129 - 163	125 -157.5	169.5-214	100 - 137	136 - 186	130 - 178	176 - 241
5/8˝-18 NF	97.5-122.5	132 - 166	125 - 160	169.5 -217	105 - 145	142 - 197	150 - 210	203 - 285
3/4˝-10 NC	160 - 200	217 - 271	200 - 255	271 - 346	170 - 230	230.5-312	205 - 285	278-386.5

	Grade B (Grade 5) 		Grade C (Grade 8) 		Grade F (Grade 5 Flange) 		Grade G (Grade 8 Flange) 	
3/4˝-16 NF	155 - 200	210 - 271	200 - 255	271 - 346	163 - 227	221 - 308	215 - 315	291.5-427
7/8˝ -9 NC	235 - 300	319 - 407	295-382.5	400 - 519				
7/8˝ -14 NF	250 - 320	339 - 434	295-382.5	400 - 519				
1 -8˝ NC	345 - 445	468 - 603	450-512.5	610 - 695				
1 -14˝ NF	370 - 470	502 - 637	452.5-590	617 - 800				

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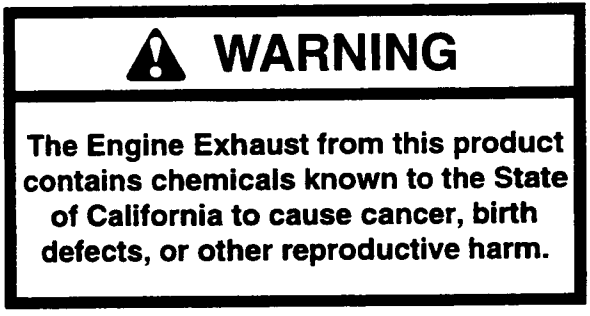
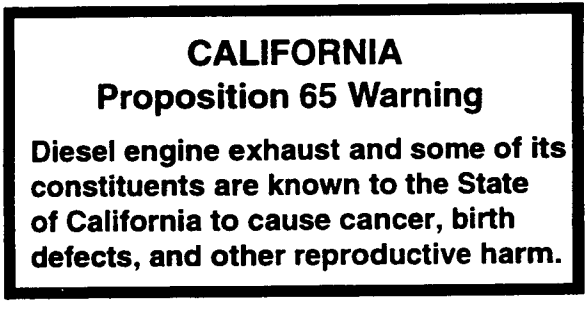
Revision History

Revision	Date	Page(s)	Description
o1_00	4/00	All	First edition combined operator's/ maintenance manual released.
01_02	09/02	front cover, warranty, patent page	Reformatted to HammerHead format.
01_03	12/03	All	Reformatted to include all PowerPacks
08_06	08/06	Table of Contents	Removed reference to non-existing section
05_08	05/08	Updated to include PP70	Included sections for PP70 PowerPack
09_08	09/08	Updated to PP13A Model	Added New model PP13A. Removed PP13


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


CALIFORNIA
Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.