



# P-600

## Operation & Safety Instruction Manual



### **WARNING**

Unsafe use of this equipment could result in serious injury or death. This manual contains important instructions for the safe operation and recommended maintenance of your P-600. All operators must carefully read and understand this manual before starting the machine. Keep this manual available both as a reminder for your experienced operator and as a training aid for your new staff. Replacement manuals are available by calling American Augers.



## Forward

### INTRODUCTION

Since 1970, American Augers has been a devoted manufacturer of trenchless technology equipment; customers worldwide will recognize the P-600 as a premier piece of equipment that is a vital accessory to our directional drilling equipment. American Augers always provides its equipment with worldwide technical support, parts and service. American Augers encourages customers to contact the factory with any operational or assistance needs.

Every effort has been made to adequately cover the operation of the P-600 in this

manual.

Specifications are subject to change without notice or obligation. American Augers will continue to update its product manuals with current operational information, but some units maybe retrofitted independently by the customer or by the manufacturer per a customer request at the factory, or while in service, and the information herein may not reflect those changes.

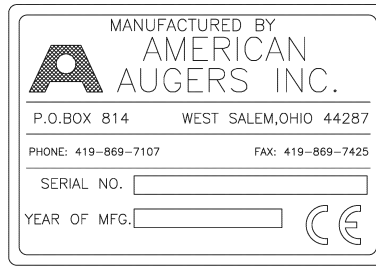
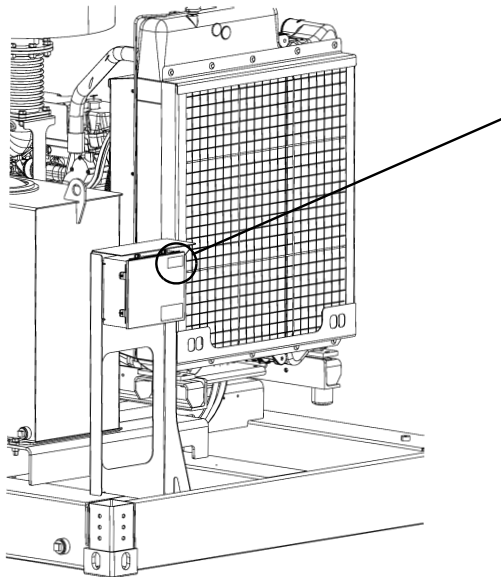
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Original Instructions  
Manual Part Number 60MP10000  
Released September 2011 Revision 00

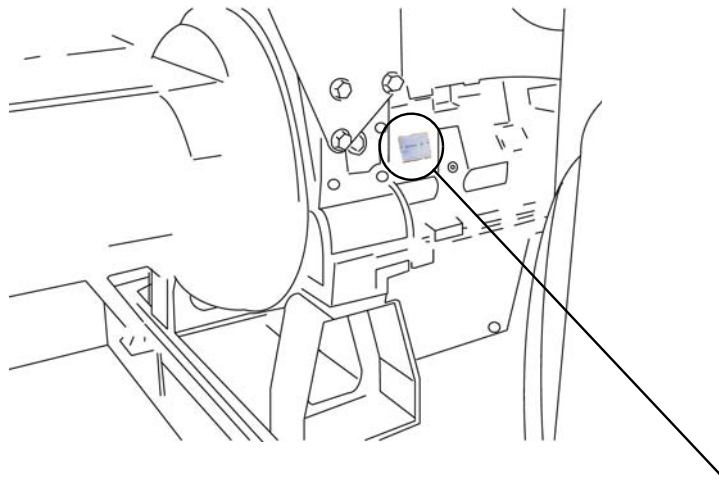
**Machine Serial Number Locations**

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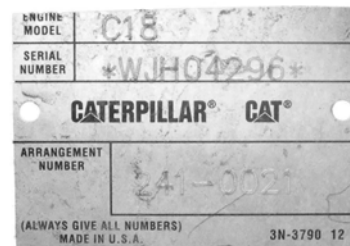
Location of Machine Serial Number Plate  
Machine Serial Number

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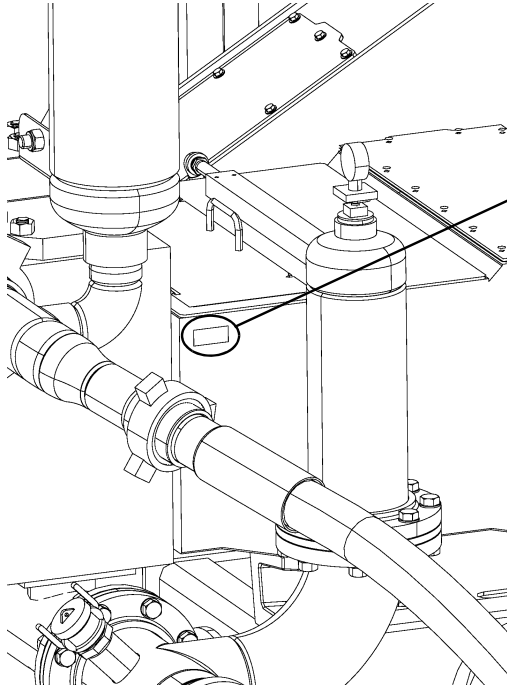


Location of Engine Serial Number Plate  
Engine Serial Number

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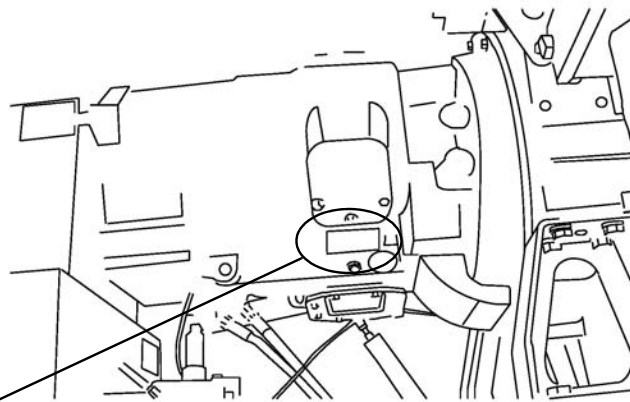
## Machine Serial Number Locations



Location of Pump Serial Number Plate

Pump Serial Number

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Location of Transmission Serial Number Plate

Transmission Serial Number

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## Safety Awareness Program

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### Understanding Operation Safety


This manual is part of the safety system of the equipment. Use it during training of all personnel who will participate in the operation of the equipment. Ensure that a copy is always available with the machine and that the operators have read it and have access to it. Carefully follow the instructions, advice and procedures it contains.


Mud pumps have a number of hazards unique to their operation. Safety alert decals are provided on American Augers' equipment to alert the operator to hazards of the machines. The "Safety Alerts" section beginning on page 26 shows these hazard alert signs.

### Signal Words

Signal words are used to identify safety information within the text of this manual. They are reserved for personal injury hazards.

 **DANGER** is used for a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

 **WARNING** is used for a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

 **CAUTION** is used for a hazard with a low level of risk which, if not avoided, could result in a minor or moderate injury.

**NOTICE:** Hazard alert signs are placed on the machine to inform your operator and other personnel of potential hazards that exist while these machines are in operation. These decals should be kept clean and legible. Replacement decals are available from American Augers.





**Revision Record**

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**Revision to Manual**



Revision Number	Description of Change	Date
00	New Release; Serial numbers under top level 60MP1012 from P600030511	9/7/2011



Revision to Manual, Continued

Revision Number	Description of Change	Date

## ***To The Owner***

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### **To The Owner**



Thank you for your purchase of the American Augers P-600. This is an authorized accessory for use with our directional drills.

This manual contains important information that will help you and your crew set up and safely operate the P-600. DO NOT operate or permit anyone to operate or service this machine until you have read this Manual. Use only trained operators who have demonstrated the ability to operate and service this machine correctly and safely.

DO NOT use this machine for any application or purpose other than those described in this Manual. Consult the American Augers factory for changes, additions, or modifications that may be required for this machine to comply with various safety requirements. Unauthorized modifications could cause serious injury or death. Anyone making such unauthorized modifications is responsible for the consequences.

Make sure this Manual is complete and in good condition. Contact the American Augers factory to obtain additional manuals and for further information about or assistance with your machine. Your American Augers factory has approved service parts and technicians with special training that know the best methods of repair and maintenance for your machine.



**NOTICE**

**Before using this manual, familiarize yourself with the Description Of Components on page 15.**

**PERFORMANCE**

Actual machine, accessory, and component performance, capacity, and results can be adversely affected by or vary with such factors, as environmental conditions, weather, failing to exercise proper maintenance, machine functionality not being utilized within suggested operating levels, mechanical or component substitutions that may alter factory standards, operator experience, or other unforeseen limitations not previously listed.

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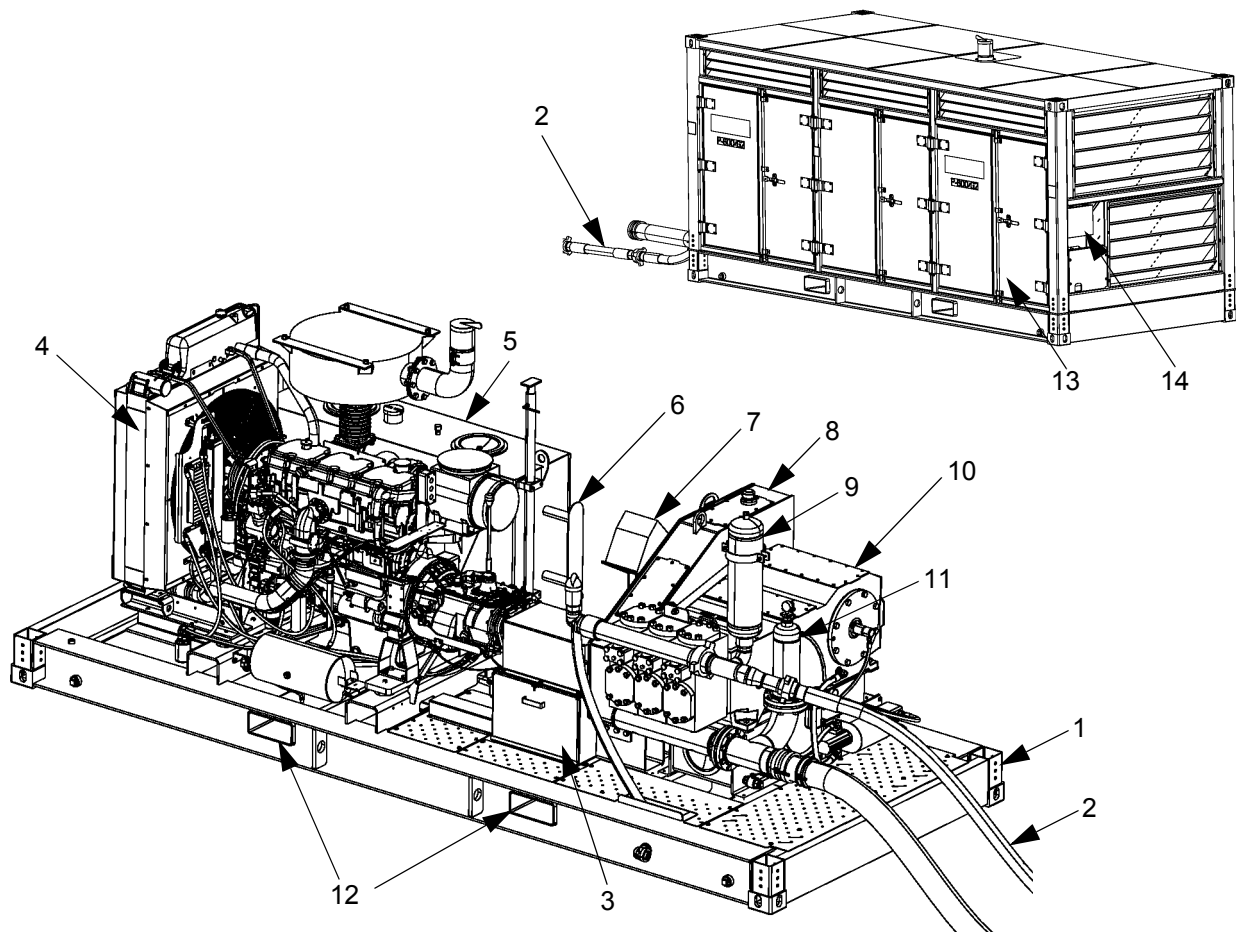


**Overview**

**Overview**



**P-600 Mud Pump Components**



1. Skid Assembly
2. Mud Pump Piping
3. Battery Box
4. Engine/Transmission Assembly
5. Fuel Tank
6. Cable Holder
7. Operator's Station
8. Chain Box Reducer
9. Discharge Dampener
10. Mud Pump
11. Suction Dampener
12. Fork Pockets for Lifting
13. Quiet-Pak Enclosure
14. Main Junction Box



## Operation and Maintenance Manual

TITLE: P-600 Operation & Safety Instruction Manual  
EDITION: 2011  
Part Number: 60MP10000

### Ownership of Information

American Augers, Inc. reserves all rights to the information in this manual.

The manual cannot be reproduced or photocopied in part or in whole without previous written authorization from American Augers, Inc. The use of the manual is restricted to the customer who received it and only for purposes of installation, use, and maintenance of the relevant machine. American Augers declares that the information contained in this manual fits the technical and safety specifications of the machine. American Augers disclaims responsibility for direct or indirect damages to persons or property caused when the manual or the machine are used in violation of the information contained herein.

The information contained in the manual refers only to the machine mentioned under "Machine Identification Data" below. American Augers reserves the right to modify or improve the manual and the machines without notice.

### Manufacturer Identification Data

AMERICAN AUGERS, INC.  
135 U.S. Rt. 42, P.O. Box 814  
West Salem, Ohio 44287 USA  
Tel. 419-869-7107 • Fax 419-869-7425  
Web Site: [www.americanaugers.com](http://www.americanaugers.com)

### Machine Identification Data

Type: Mud Pump  
Model: P-600  
Serial number: Found on identification plate  
Year of manufacture: Incorporated as part of the serial number

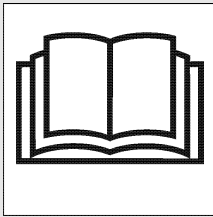
Location of identification plate: See drawing on page 3.

### Scope of Document

This manual covers operation, safety and maintenance of the P-600. Operating a direction drill, selecting drilling fluid and operating mud cleaning and recycling systems are outside the scope of this manual.

## Overview

### Qualification of Personnel



Improper operation can result in serious injury, death and damage to the equipment. Personnel should read the manual and/or obtain appropriate training based on their duties.

- Only skilled and authorized personnel should be permitted to transport, operate and maintain the machine.
- Training is available by contacting the American Augers factory.

**NOTICE:** American Augers disclaims any responsibility for damages to persons or property caused by the operation of the machine by untrained personnel.

After delivery of the machine, a technician from American Augers is available for training the operators. American Augers is available for further information or instruction. It is expected that customer personnel will be available and ready for training upon the scheduled arrival of the American Augers trainer.

### Declaration of Conformity

If required, the Declaration of Conformity is issued at consignment of the machine. A sample document is reproduced on page 72. The Declaration of Conformity is not required in most countries.

### Use of Personal Protective Equipment



If personal protective equipment is not used, serious injury or death of personnel can occur. The operator and all other personnel on the jobsite should use proper protective equipment according to their duties.

### Legal Disclaimer

**NOTICE:** American Augers disclaims any responsibility for damages to persons or property caused by the operation of this machine in violation of the instructions contained in this manual.

### Purpose of Machine

The machine was designed for pumping drilling fluid to directional drills.



## Ambient Conditions

Temperature limits: Consult the table “Approved Replacement Fluids” on page 49 and Attachment 5: American Augers Lubrication Guide. For temperatures above or below the temperature ranges, contact American Augers.

Relative humidity: 100%

Maximum altitude: 6500 feet (2000 m) above sea level

Atmospheric conditions should allow adequate visibility within the operating area.

The machine should not be operated when lightning is likely.

## Transport

The machine should be transported by a truck tractor in accordance with local transportation laws.

## Operation

It is recommended only one person operates the controls. Other trained personnel may work near the P-600 if they are wearing appropriate personal protective equipment.

## Warranty: General Conditions

Warranty is subject to the conditions specified in the warranty certificate. The warranty certificate is on the inside of the last page of this manual. If you have questions about the warranty or any part of the machine operation, please contact American Augers.

**NOTICE:** Modifications to the equipment made by the customer might reduce warranty coverage. See “Limited Warranty” on page 73.

## Limitations of Warranty

The warranty for all components that are not manufactured by American Augers are subject to the original warranties of their manufacturers and not by American Augers.

## Request for Service/Support

For service support in or out of the warranty period, contact American Augers. Provide machine model number, serial number and number of operating hours.

## Warranty and Service for Diesel Engine

The warranty on the engine is valid worldwide and is supplied by the engine dealer in the area where the machine is sold. Only diesel engine dealers are authorized to perform repairs under warranty, provide service and supply spare parts.

## Safety Information

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# Safety

## Safety Regulations and Practices

This manual contains important information about the safety practices and safe operation of the P-600. All operators must read and understand the Operation and Safety Instruction Manual before starting the machine. Careful adherence to the safety and operating instructions in this manual will help ensure a safe and productive jobsite.



The safety information in this Manual does not replace safety codes, insurance needs, national, provincial, state and local laws. Ensure that your machine has the correct equipment required by the local laws and regulations. It is the responsibility of each person working with this equipment to learn and follow all applicable local, state, provincial and national safety regulations.

**NOTICE:** American Augers disclaims any responsibility for damages to persons or property caused by operation in violation of safety advice contained in the manual.

## Emergency Procedures

**EMERGENCY SHUTDOWN:** Push the red Emergency Stop button in one of the following locations:

- on the Operator's Console
- on the Junction Box
- on the Mud Pump Control Box
- on the Engine Control Panel

All workers should know the locations of the Emergency Stop buttons before starting the machine on the jobsite.

## Response to Electrical Strike

- If you are on the machine, stay on it.
- Remain calm.
- If you are not on the machine, do not touch any part of the machine as it may be highly charged.
- Notify public safety authorities to secure the area.
- Notify the electric utility company immediately.
- When the proper utility authorities verify that the power has been disconnected and the work area is safe, you may get off the machine.

Other workers in the immediate area of the machine should not move. The voltage difference between the equipment and the ground, or between a person's feet may be sufficient to cause injury or death. Do not touch the machine, hoses, drill pipe, water system, mud mixing system or anything connected to the drill as these items may be highly charged.

## Response to a Gas Strike

If a gas line strike occurs, evacuate the area immediately. Shut down all engines. Extinguish all flame and sparks immediately. Do not attempt to reverse the bore to break contact as further movement may cause a spark. Contact emergency services and the gas utility company immediately.

## Safety Information

### Response to a Fiber Optic Strike

If a fiber-optic strike occurs, stop drilling immediately. Do not look into the cut ends of the cable. This can cause severe eye damage. Notify the utility owner.

### Response to a Communications Line Strike

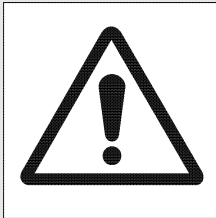
If a communications line strike occurs, stop drilling immediately and notify the utility company.



### Response to a Sanitary/Storm Sewer and Water Strike

If a water or sewer line strike occurs, stop drilling immediately. Warn all bystanders that a strike has occurred and that they should stay away. Obtain medical attention for personnel who have come into contact with sewage. Notify the utility owner immediately.

## Basic Safety Guidelines



**Jobsite hazards could result in serious injury or death. All personnel on the jobsite should use proper protective equipment according to their duties.**

1. Before using the P-600, all operators should receive thorough training in the use of this equipment. This manual should be used as a training tool.
2. A copy of this manual should remain with the machine and be accessible to all personnel at all times.
3. Personnel on the jobsite should receive training on safety practices, procedures, safety signs and hazards. Operators, support personnel, repair technicians, and visitors should be aware of their responsibilities and any restrictions to their activities.
4. All new, inexperienced employees should receive a complete orientation to the jobsite and thorough training in their job duties. Never allow inexperienced personnel to operate or work near the machine unless they are carefully supervised.
5. The meaning of the hazard alert signs on the equipment is explained in the “Safety Alerts” section beginning on page 26.
6. Follow all national, state, provincial and local regulations regarding, but not limited to:

Drilling fluid system operation  
Rotating drill pipe  
Vehicle operation  
Trench shoring and sloping  
Mobile equipment operation  
Confined space entry  
Noise

Hand and power tools  
Verification of utilities  
Communications  
Fall protection  
Security of jobsite and isolation of hazards  
Material handling  
Manual lifting

## Safety Information

In the United States, workplace safety is regulated by the Occupational Safety and Health Administration (OSHA). OSHA regulations are found in the Code of Federal Regulations, Chapter 29. This is known as 29CFR1910. Information can be obtained from your Regional U.S. Department of Labor Office. In other countries, the operator is responsible for determining which national, provincial, state and local laws govern operations at the jobsite.

7. Use required or recommended protective equipment which meets applicable standards when operating this machine:
  - Hard hats
  - Safety glasses, goggles, or face shields
  - Work boots
  - Work gloves
  - Highly visible reflective clothing
  - Hearing protection
  - Boots and gloves having electrical insulation
  - Any additional safety equipment mandated by other rules or required by the Owner or regulatory agency
8. If a hazardous situation is suspected, stop work until an evaluation is made and appropriate corrective action is taken.
9. Use hand signals required for specific jobs. Know who has the responsibility for signaling.
10. Post the location and phone number of the nearest aid station or hospital. Have a fire extinguisher and complete first aid kit on site. Have at least one of your workers trained in first aid.



## Utility Locations



**Electric shock and explosion hazard. Have all utility lines marked before you begin to dig. Notify One Call (by calling 811) as well as utility companies that do not subscribe to the One Call system.**

- The One-Call system (dial 811 (US only) or 1-888-258-0808 (US and Canada only)) is in place to facilitate identifying appropriate local utility contacts.
- It is the operator's responsibility to follow applicable laws and regulations which govern locating and avoiding existing utilities.

Before beginning any drilling project, have local utility companies mark the location of utility lines buried in the area. Design the bore profile to maintain acceptable clearances between underground utilities and structures and the final reamed hole. Carefully consider possible migration of the backreamer from the pilot bore toward the utility due to excessive steering or a tight radius when establishing clearances.

The One-Call system (dial 811 (US only) or 1-888-258-0808 (US and Canada only)) is in place to facilitate identifying appropriate local utility contacts. Additionally, the Pipeline Association for Public Awareness website has several references for excavators at <http://www.pipelineawareness.org/excavators>. Their "Excavation Safety Guide" describes best practices and contains a guide to state contacts and regulations.

It is the operator's responsibility to follow applicable laws and regulations which govern locating and avoiding existing utilities.

## Overhead Hazards

Overhead lines must be avoided. Overhead lines are of particular concern during mobilization/demobilization, loading and unloading heavy equipment and while handling drill pipe. If the voltage is unknown, always maintain at least 20 feet (6 m) of separation between equipment and power lines. If the voltage is known, OSHA regulations outline the required minimum separation in the United States. If necessary, place highly visible markers on either side of the overhead hazard or designate an individual to notify equipment operators as they approach.



## Operator—General Precautions

- It is the responsibility of the operator to read and understand the Operator's Manual and other information provided and use the correct operating procedure. Machines should be operated only by qualified operators and trained helpers.
- Verify that all protective guards, doors, etc. are in place and secure.
- Remove all loose objects stored in or on the machine.
- Remove all objects which do not belong in or on the machine and its equipment.
- Point out each of the safety signs on the machine and ensure that the crew understand them.
- Ensure that all underground utilities have been located before the bore is started, and avoid them by using proper drilling techniques.
- Understand and obey all applicable national, provincial, state, and local codes and regulations.
- Make sure all personnel stay in their prescribed areas to ensure a safe operation.
- Ensure that traffic and terrain will permit safe operation.

## Starting and Stopping Precautions

- Do not start the machine until all personnel are away from rotating or moving parts.
- Be sure all machine controls are in the neutral or off position before starting the engine.
- Check the operation of all machine controls before using the machine.
- Complete all servicing prescribed in this Operator's Manual.
- Securely connect all fluid lines before starting the machine.

## Operating Precautions

- Make sure all operating personnel observe and use safe operating practices.
- Ensure that all personnel and objects are away from rotating or moving parts.
- Never leave the operator's station while the machine is operating.
- Do not operate the machine unless protective guards, doors, etc. are in place.
- Check that all hydraulic fittings, bolts, and nuts are tight before operating the machine.
- Do not operate the machine while under the influence of alcohol or drugs.
- Shut down the machine at the first sign of malfunction or hazardous condition.

## Safety Information

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### Drilling Precautions

- Identify and avoid potential pinch points on the drill rig and support equipment.
- Stay away from the rotating drill string at all times.

### Maintenance Precautions

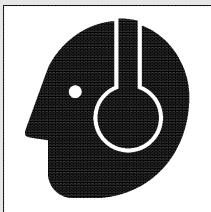
- Shut down the power source and relieve system pressures before doing maintenance.
- Allow the machine to cool before servicing. Hydraulic components, engine, radiator and exhaust systems can get hot enough to cause serious injury.
- Use proper lock out and tag out procedures when doing maintenance.
- Follow manufacturer's recommended maintenance procedures.
- Allow only properly trained personnel to perform maintenance activities.
- Do not modify the machine in any way.
- Repair or replace damaged or missing protective guards, doors, etc.
- Replace all missing, illegible, or damaged safety signs. Keep all safety signs clean.
- Use a piece of cardboard or wood to check for pressurized leaks to prevent fluid penetrating the skin.
- Seek medical attention immediately if hydraulic fluid escaping under pressure has penetrated the skin. Even if the injury seems minor, prompt medical treatment by a physician familiar with this injury is essential. This is a serious condition which can cause serious injury and possibly death.



### Transporting Precautions

- Inspect the tractor trailer being used to transport the machine, including but not limited to checking the brakes, tires, tire pressure and lights.
- Remove or secure loose items so they cannot fall off during transport.

### Noise Level Safety

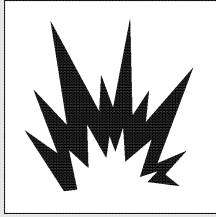


**Exposure to high noise levels may cause hearing loss. Wear appropriate hearing protection.**

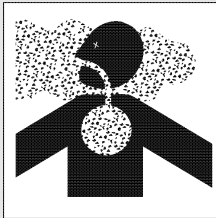
The sound pressure measured according to ISO 11202:1993, ISO 3746:1995, IEC 651:1979 and IEC 804:1985 is 90 dB(A) enclosed and 102 dB(A) open skid. The machine was running under normal operating conditions. Background emissions were recorded with EUT turned off.

## Safety Information

## Hazardous Chemicals



**Explosion hazard. Flammable solvents could ignite if placed near fire, sparks or other ignition sources. Keep flammable solvents in closed containers and away from fire, sparks and ignition sources.**



**Inhalation hazard. Dust from drilling fluid additives such as bentonite may irritate the respiratory system or lungs. Prolonged exposure may damage the respiratory system. Use respiratory protection and dust resistant safety goggles.**

**IMPORTANT:**

- Do not use containers that can leak.
- Do not drain fluids on the ground or dump them into sewage systems, streams, rivers, lakes or the sea.
- Always follow laws and regulations for proper disposal of waste materials.

## Dangerous Zones -- Safe Distances



**Electrocution Hazard. Personnel are at risk if an electric line is struck during drilling. All personnel must wear appropriate protective equipment (electrical insulating boots and gloves) on the job site.**

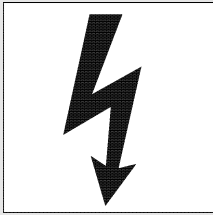
A dangerous zone is any zone inside or near the machine where health, safety and security risks exist. All personnel on the jobsite should be advised of these zones, the hazards they may encounter and the safety precautions which are required or recommended.

**Hazardous Area:** All areas from which a person could touch parts of the machine when it is operating or when maintenance is being performed. On electrical jobsites, wear appropriate protective equipment.

**Electrically Charged Safe Distance:** 25 feet (8 m) from the drill hole. Personnel in this zone during drilling operations are at risk in the event an electric line is struck. On electrical jobsites, wear appropriate protective equipment (insulated boots and gloves). All other personnel must stay out of this zone during drilling or back-reaming or any time when an electric line could be struck.

Safety Information

Grounding



**Electrocution hazard. Improperly grounded components may become electrically charged. Serious injury or death could occur. Bond all fixtures together and ground to a single stake before starting the engine.**

- Follow all local codes and regulations with regard to bonding and grounding.

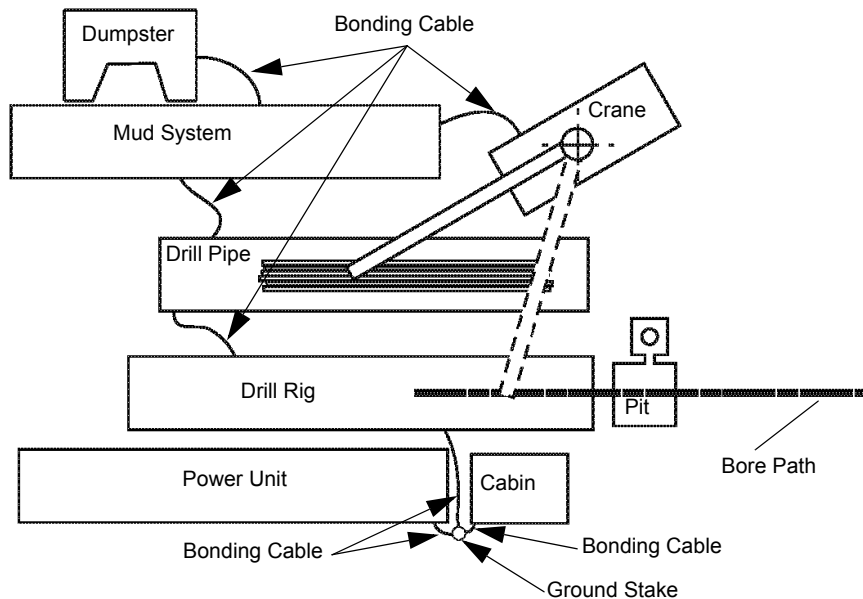


Metal components on a drill rig site can become electrically charged for a number of reasons: faulty or damaged wiring, inductive capacitance from generators, motors, motor drives, transformers, contact with local distribution wiring or underground cables etc. Care should be taken to avoid electrocution.

All metal components on a drill rig site should be bonded together as shown in the drawing below. Bonding will reduce the electric potential difference between components with respect to any other components on the site. Current will not flow between two sections that are at the same electric potential. All remote equipment that is in close proximity to the drill rig must also be electrically bonded to the drill rig, i.e. pipe racks, mud pumps etc. This will reduce the risk of shock to any personnel who might contact both the drill rig and the remote equipment.

**IMPORTANT:** For additional information on electrical hazards, bonding and grounding, you may wish to consult publications from the U.S. Occupational Safety and Health Administration.<sup>a b</sup>

- a. *Controlling Electrical Hazards, U.S. Department of Labor, OSHA 3075.*
- b. *Protection from Step and Touch Potentials, 29CFR1910.269 Appendix C.*



Typical Bonding Scheme

Safety Alerts

**⚠ DANGER** Machine may become electrically charged



**⚡ DANGER ⚡**

DIRECTIONAL DRILL AND ALL ASSOCIATED EQUIPMENT AND SURROUNDING SOIL CAN BECOME ELECTRICALLY CHARGED IF DRILL HEAD OR STEM COMES IN CONTACT OR NEAR BURIED POWER LINES. USE PROPER SAFETY EQUIPMENT AND CLOTHING. CHECK EACH AREA BEFORE DRILLING. LOCATE AND EXPOSE EACH HAZARD.

BEFORE OPERATING, SEE OWNERS MANUAL

**⚠ DANGER** Machine may become electrically charged

**DANGER**

**ELECTROCUTION HAZARD  
KEEP CLEAR**

DEATH OR SERIOUS INJURY CAN RESULT FROM CONTACT WITH THIS EQUIPMENT OR VEHICLE IF IT SHOULD BE ELECTRICALLY CHARGED



**⚠ WARNING** Precautions about diesel exhaust

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.

BNP41209

**⚠ WARNING** Precautions about underground utilities

**⚠ WARNING**




**811**

BNP71119

**⚠ CAUTION** Rotating parts can cause injuries

**CAUTION**

**ROTATING PART**

KEEP GUARD IN PLACE

**⚠ CAUTION** Pump may be damaged if allowed to run dry

**CAUTION!**

**DO NOT RUN  
PUMP DRY**

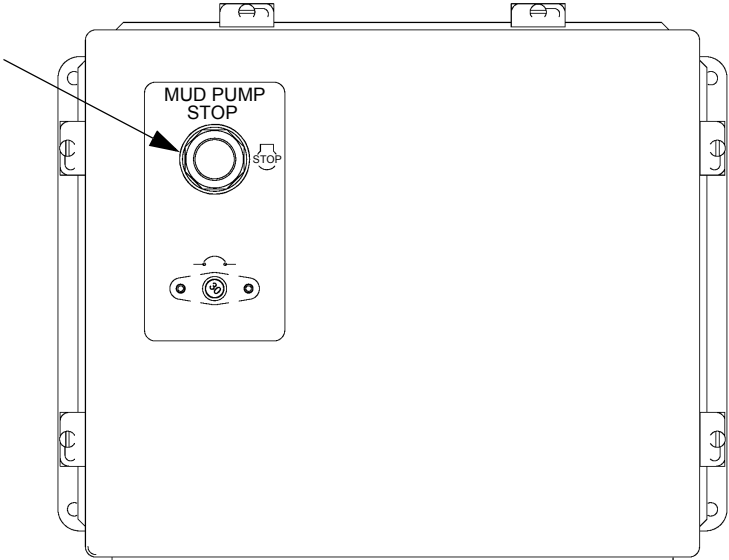
RUNNING PUMP DRY COULD RESULT  
IN DAMAGE TO PUMP

Machine Controls

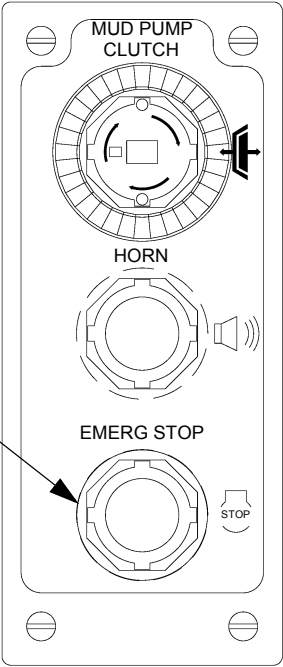
Controls

Safety Switches

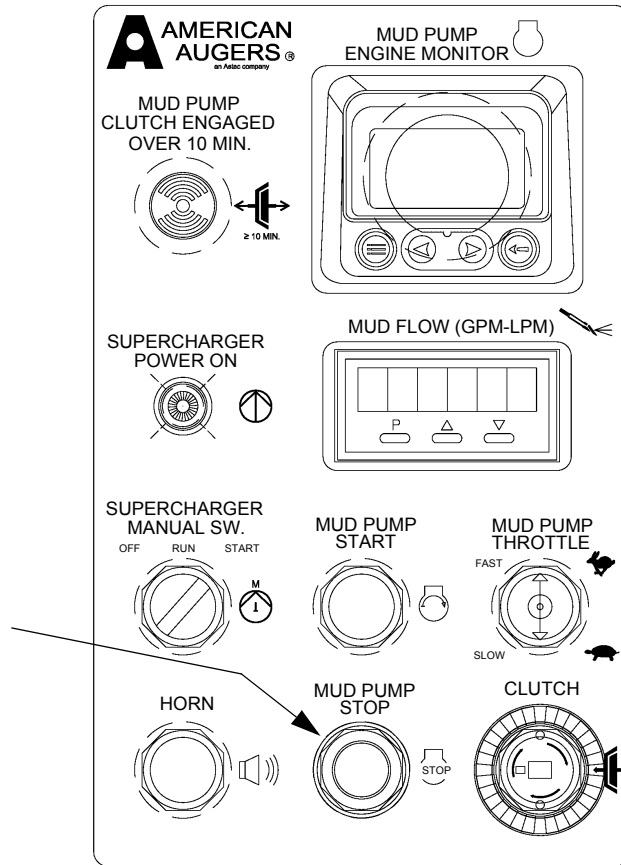
There are push buttons at four different locations that stop the diesel engine on the P-600.



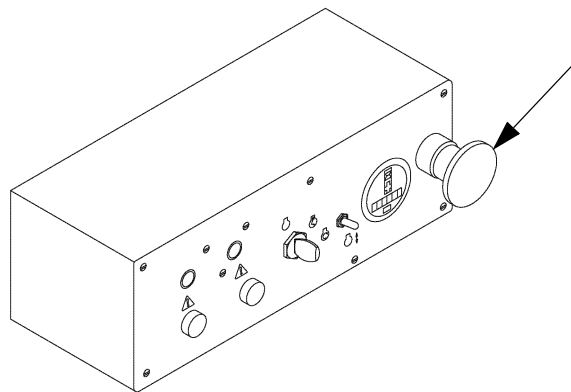
Diesel Engine Stop Push Button on the Junction Box



Diesel Engine Stop Push Button on the Mud Pump Control Box



Diesel Engine Stop Push Button on the Operator's Console



Diesel Engine Stop Push Button on a Typical Engine Control Panel

**Machine Controls**

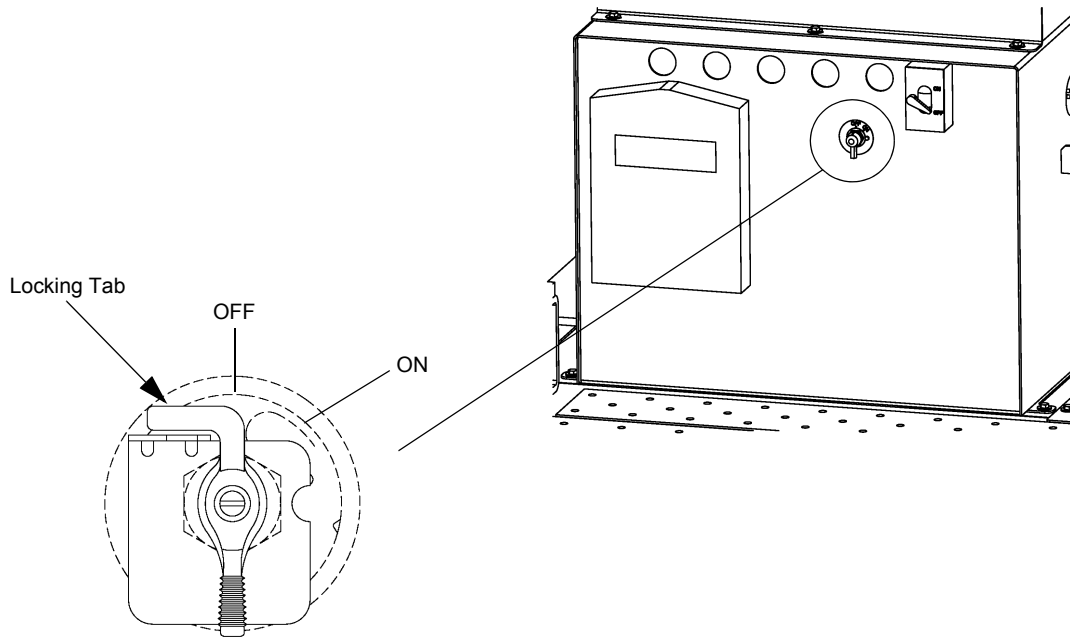
**Battery Switch**

**IMPORTANT:**

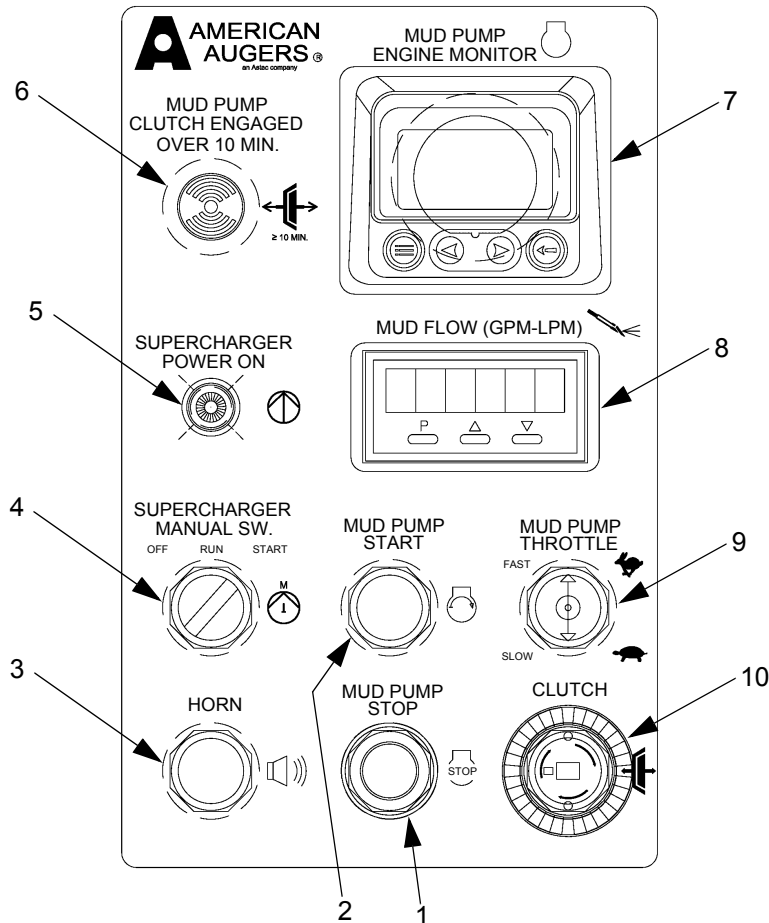
- DO NOT disconnect the batteries while the engine is running.
- DO NOT try to stop the engine with this switch. You can damage the electrical system.
- During maintenance, turn the switch OFF and use proper lockout and tagout procedures.

The battery switches are located on the side of the battery box as shown in the drawing below. The switch connects and disconnects the batteries from the electrical system.

- Rotate to the right to connect.
- Rotate left to disconnect.
- The battery switch must be in the ON position before starting the engine.
- Turn the battery switch OFF after you stop the engine. Remove the key if so equipped.
- When performing maintenance, install a padlock through the tab and follow proper lockout-tagout procedures.



P-600 Operator's Console



- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Mud Pump Stop</li> <li>2. Mud Pump Start</li> <li>3. Horn</li> <li>4. Supercharger Manual Switch</li> <li>5. Supercharger Power On</li> </ol> | <ol style="list-style-type: none"> <li>6. Mud Pump Clutch Engaged Over 10 Min.</li> <li>7. Mud Pump Engine Monitor</li> <li>8. Mud Flow Gauge</li> <li>9. Mud Pump Throttle</li> <li>10. Clutch</li> </ol> |
|---|--|

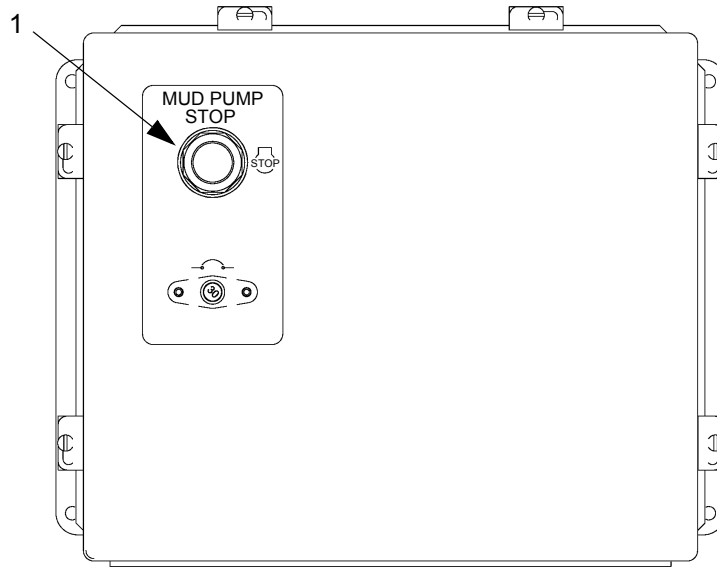
**Machine Controls**

Control	Function
1. Mud Pump Stop	<ul style="list-style-type: none"> <li>• Stop the mud pump engine: push button</li> <li>• Enable engine start: button must be pulled out</li> </ul>
2. Mud Pump Start	Start mud pump: push button Note that the ignition switch on the Engine Control Panel must be in the “ON” position.
3. Horn	Sound horn: push button
4. Supercharger Manual Switch	When this switch is turned off, it overrides control by the mud pump system. The switch should remain in the “RUN” position during normal operations.
5. Supercharger Power On	Light is lit when the supercharge pump should be running. Verify that the supercharger is operating. If the supercharger fails to start or stops running, damage to the machine could result.
6. Mud Pump Clutch Engaged over 10 Min.	An audible alarm alerts the operator that the Mud Pump clutch is pushed in and the engine has been running in gear for over 10 minutes. Either: <ul style="list-style-type: none"> <li>• pull out the clutch button and begin mud pump flow</li> <li>• shift into neutral to idle the engine</li> <li>• turn off the engine.</li> </ul>
7. Mud Pump Engine Monitor	Engine Management System Display <sup>a</sup> for the engine.
8. Mud Pump Flow (GPM-LPM)	Displays the Mud Pump flow rate in Gallons per Minute (GPM) or Liters per Minute (LPM). It is set at the factory to GPM.
9. Mud Pump Throttle	<ul style="list-style-type: none"> <li>• Increase engine speed and mud flow rate: push control up</li> <li>• Decrease engine speed and mud flow rate: pull control down</li> </ul>
10. Clutch	Remotely engage and disengage the Mud Pump clutch. <ul style="list-style-type: none"> <li>• Push in (like you would push in the clutch pedal on an automobile) so you can shift into gear or neutral</li> <li>• Pull out with the engine in neutral to run at idle or with the engine in gear to begin mud pump flow</li> </ul>



a. The displays can be configured to show various parameters from the engines. These include engine RPM, engine hours, machine hours, coolant temperature, oil pressure and throttle position. Use the four keys below the display to change the information shown. Refer to Attachment 2: “Murphy Power System User Guide”, Attachment 3: “Murphy Troubleshooting” and Attachment 4: “Murphy Error Messages”.

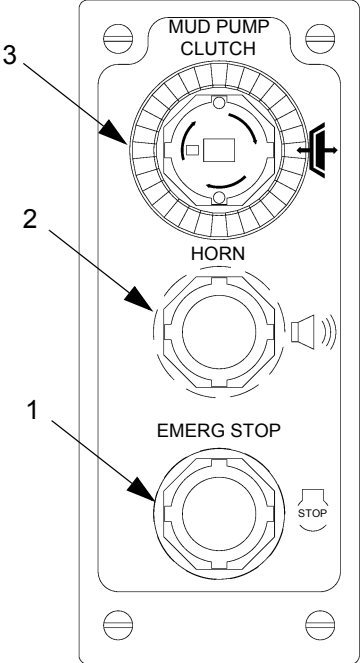
P-600 Junction Box



Control	Function
1. Mud Pump Stop	<ul style="list-style-type: none"> <li>• Stop the mud pump engine: push button</li> <li>• Enable engine start: button must be pulled out</li> </ul>

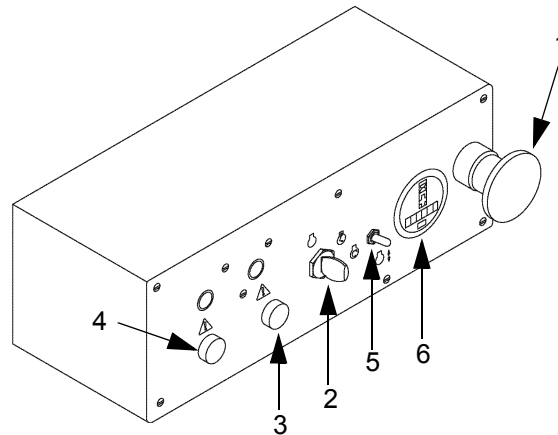
Machine Controls

P-600 Mud Pump Control Box



Control	Function
1. Mud Pump Stop	<ul style="list-style-type: none"> <li>• Stop the mud pump engine: push button</li> <li>• Enable engine start: button must be pulled out</li> </ul>
1. Horn	Sound horn: push button
1. Mud Pump Clutch	Remotely engage and disengage the Mud Pump clutch. <ul style="list-style-type: none"> <li>• Push in (like you would push in the clutch pedal on an automobile) so you can shift into gear or neutral</li> <li>• Pull out with the engine in neutral to run at idle or with the engine in gear to begin mud pump flow</li> </ul>

Typical Engine Control Panel



- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1. Emergency Stop                  | 4. Red Diagnostic Warning Light |
| 2. Key Ignition Switch             | 5. Throttle                     |
| 3. Yellow Diagnostic Warning Light | 6. Engine Hours Meter           |

Control	Function
1. Emergency Stop Button	<ul style="list-style-type: none"> <li>• Stop the mud pump engine: push button</li> <li>• Enable engine start: button must be pulled out</li> </ul>
2. Key Ignition Switch	<ul style="list-style-type: none"> <li>• Stop: Turn the key straight up</li> <li>• Run: Rotate key 45° to the right</li> <li>• Start: Rotate key 90° to the right</li> </ul>
3. Yellow Diagnostic Warning Light	If this light turns on, follow instructions in the Diesel Engine manual or contact the engine manufacturer.
4. Red Diagnostic Warning Light	If this light turns on, follow instructions in the Diesel Engine manual or contact the engine manufacturer.
5. Throttle	<ul style="list-style-type: none"> <li>• Increase engine speed: push control up</li> <li>• Decrease engine speed: pull control down</li> </ul>
6. Engine Hours Meter	Displays the number of accumulated hours on the engine.

## Preparation

# Operations

## Site Preparation and Set Up

Scrape an area 10 feet wide x 20 feet long (3 x 6m) to a level grade so that the P-600 is located 50 to 75 feet (15.2 to 23 m) from the point where the mud hoses attach to the directional drill.

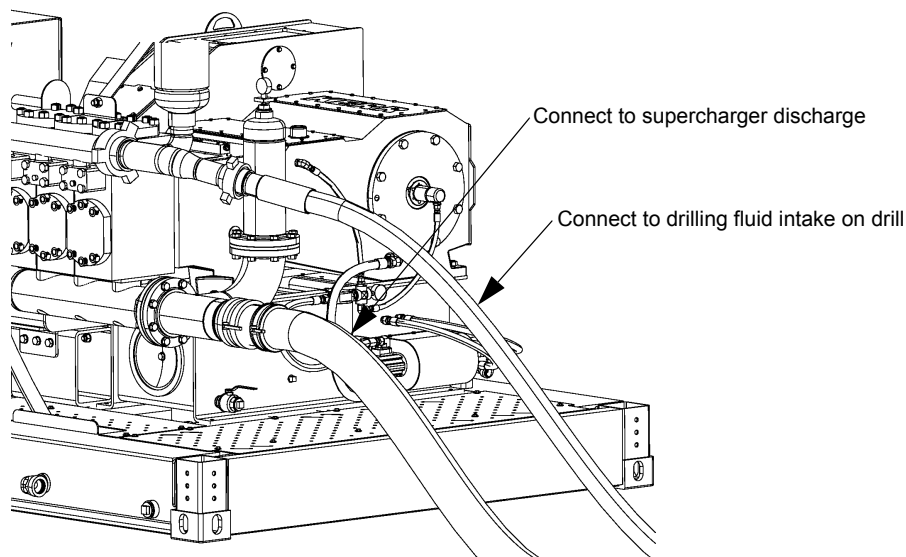
Connect all components on the drill site with a bonding cable and install a ground stake.

## Hose Connections

### **IMPORTANT:**

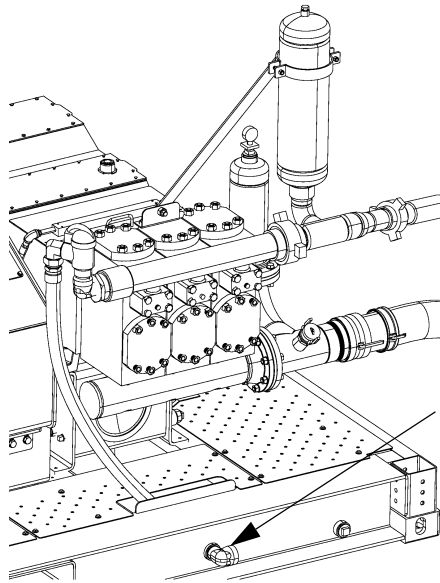
- Liquid contents of these hoses is under high pressure. Work on these hoses only when the pump is off.
- Pumping drilling fluid with sand content greater than 1/2% can cause excessive wear to the fluid pumping system.
- Ensure valves in the mud piping are in the proper position so as not to damage the system when the mud pump is started.

1. Securely connect the suction hose of the P-600 mud pump to the outlet (discharge) of the supercharger pump.
2. Securely connect the P-600 discharge to the drilling fluid intake on the directional drill. The discharge hose connection is a hammer union. It must be tightened securely by hitting the ears of each collar with a hand sledge hammer.
3. Route the hoses with a minimum number of bends. Sharp bends in the hose reduce the flow to directional drill. The mud cleaning system should supply drilling fluid at 25-30 PSI (975 GPM), minimum, to the inlet of the P-600 pump.



**Preparation**

The machine is also equipped with a fitting through which drilling fluid can escape if there is a pressure backup in the system (see "Mud Pump Pressure Relief Valve" on page 43). You may wish to connect a suitable hose to this fitting to route the fluid back to the mud tank. The drawing below shows the location of this fitting.



Connect hose here to route drilling fluid back to the mud tank when pressure relief valve has been activated



## Starting the P-600

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### Starting the P-600



Signal lights and operator displays warn of potential operating problems. If ignored, damage to the machine could result. In case of unusual noise, abnormal pressure values, or if signal lights appear, stop the engine immediately and carry out necessary repairs.



Do not use starting fluid (ether). Immediate engine damage and personal injury may result.

A manufacturer's manual for the diesel engine is supplied with the P-600. The following instructions cover general engine starting procedures. Consult the manufacturer's manual for detailed starting and stopping procedures, engine maintenance and repair instructions.



1. If you have not already done so, verify that the ground stake is installed properly.
2. Confirm that all the fluid connections to and from the pump are correct. Check that the valves in the piping are in the correct position to prevent damage to the system when the system is started.
3. Unplug the block heater, if connected.
4. Disconnect all battery chargers.
5. Plug the cable from the mud pump cable holder into the Operator's Console.
6. Pull OUT the emergency stop buttons on the Operator's Console, Junction Box, Mud Pump Control and in the Engine Control Panel. The engine will not start if any emergency stop button is pushed in.
7. Check the engine oil level, coolant level and the diesel fuel level. DO NOT let the diesel engine fuel tank run dry. If the tank is dry, bleed the fuel system. Refer to Attachment 1: "Diesel Engine Manual" for instructions.
8. Check the oil level in the mud pump and chain reducer box. Add oil if necessary.
9. Switch all controls OFF or put them in neutral. Ensure that the gear shift lever on the mud pump transmission is in neutral.
10. Turn the Battery switch to the ON position.

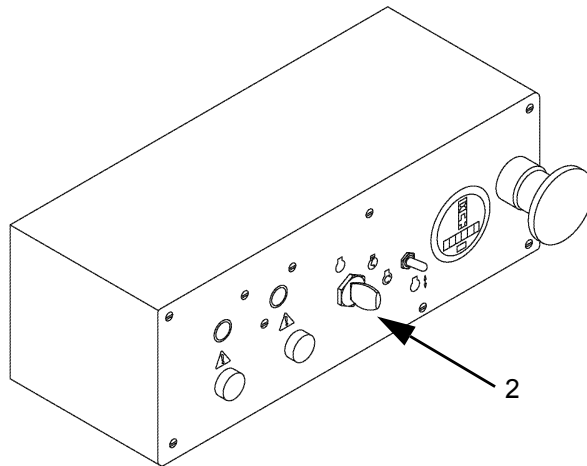
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**Starting the P-600/G2**

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11. You may start the engine from the Engine Control Panel

- Turn the ignition key 90° to the right to start the engine.
- When the engine starts, release the key. No throttle action is required during starting. The engine system provides the correct amount of fuel.
- If the engine fails to start in 30 seconds, release the key switch and wait 2 minutes. This will allow the starter motor to cool. Then repeat the start process.



12. Alternatively, you may start the engine from the Operator's Console.

- On the engine panel, turn the ignition key (2) to the right to enable start.
- At the Operator's Console, push the Mud Pump Start button.

Let the engine run at idle ( $\leq 900$  rpm) for at least ten minutes for proper warm-up and to build pressure in the air circuit.

**COLD WEATHER NOTE:** The block heater on the engine should be set at 85°F (30°C) if it is an adjustable thermostat type. Newer models are preset at the factory and have no adjustment. These block heaters are 240 volt models and require a similar power source. Plug in the block heater at the end of the day's shift. The heater will keep the water jacket coolant warm to 85°F (30°C) which will make starting the engine easier. See Attachment 1, Diesel Engine Manual for information on using the engine block heater.

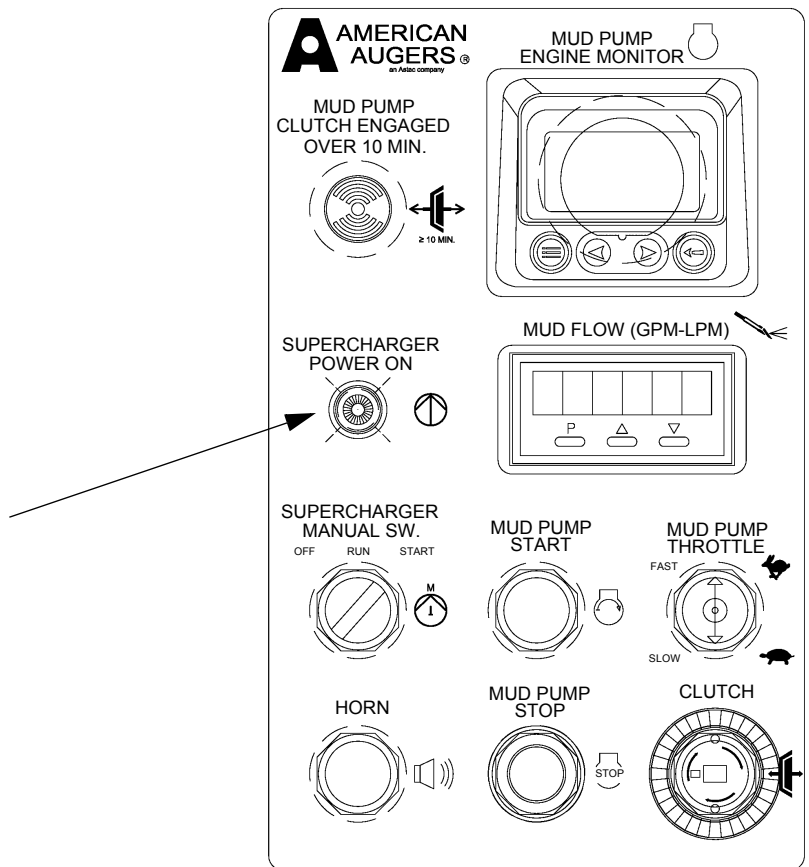
**Operating the Mud Pump**

**Supercharge Pump**

**IMPORTANT:**

- When pumping fluid to a directional drill, the supercharge pump must be running. Damage to the P-600 could result if the supercharge pump fails to start or stops running.
- The P-600 does not automatically shut down if the supercharge pump is not running.

The supercharge pump draws drilling fluid from the mud cleaning system discharge and pumps it directly to the suction port of the P-600. The indicator light on the Control Box (see drawing below) lights when the supercharge pump should be running. Verify that the supercharge pump is operating properly.



Operating the Mud Pump

Adjusting Flow Rate

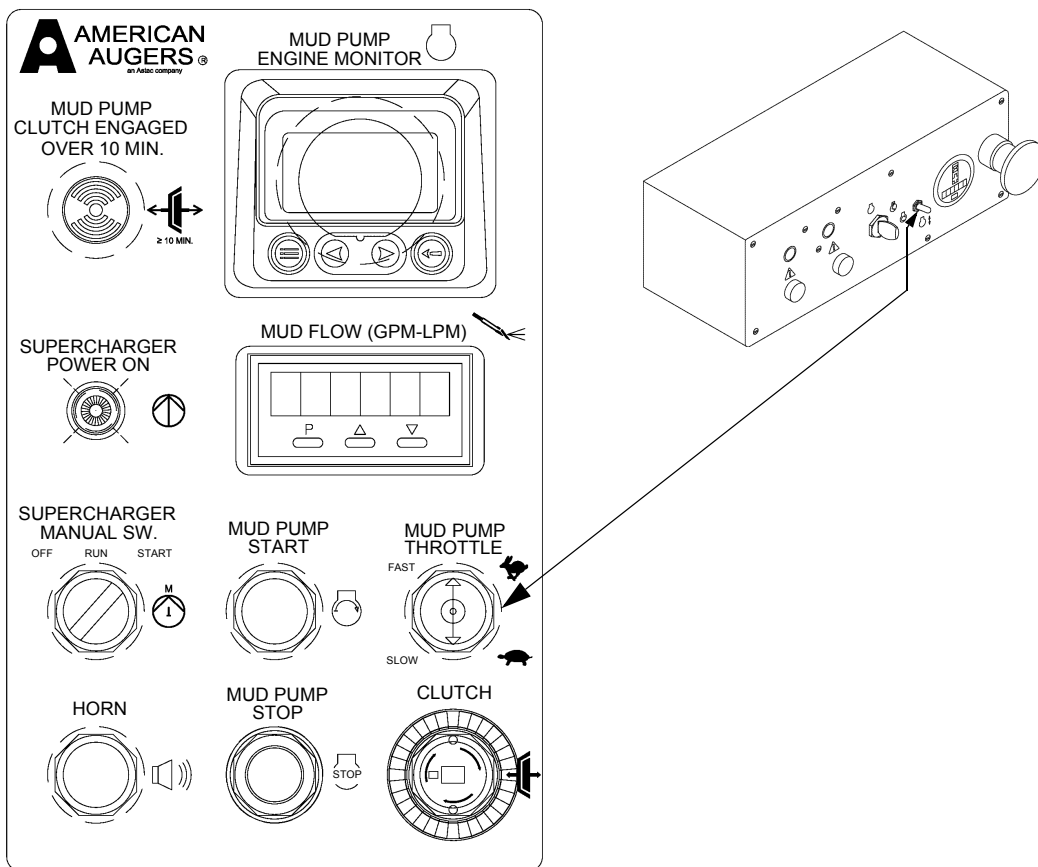
Select the proper transmission gear to get the desired mud pump flow rate.

MAXIMUM ENGINE RPM AND GPM IN EACH GEAR		
GEAR	ENGINE RPM	GPM
1	2100	105
2	2100	141
3	2100	191
4	2100	259
5	2100	346
6	2100	466
7	1994	600
8	1482	600
9	N/A	N/A
10	N/A	N/A

NOTE: OVER SPEED GOVERNOR ON THIS UNIT LIMITS PUMP OUTPUT IN THE SHADED AREAS.  
T60HD (6" PISTONS), 4:1, FRO-16210B  
P/N: 8NP41844



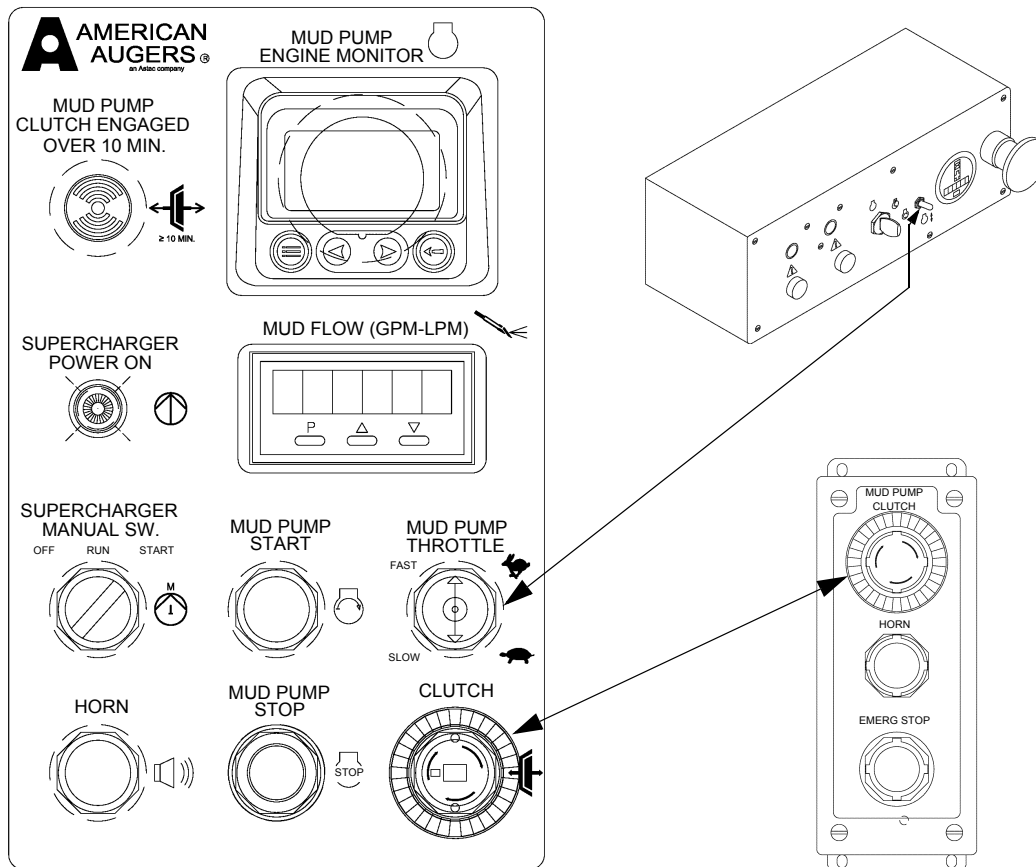
The amount of drilling fluid flowing through the system can be controlled by adjusting the throttle.



## Operating the Mud Pump

### Operation When Adding or Removing Drill Pipe

The P-600 is equipped with an alarm which sounds when the length of time the clutch is engaged exceeds 10 minutes. To minimize sounding the alarm, follow the appropriate procedure from the two described below depending on the time needed to change the drill pipe.



(Clockwise, Left to Right) Operator's Console, Engine Control Panel, Mud Pump Control

#### Add/remove section of drill pipe in < 10 minutes

1. Throttle the mud pump engine down to an idle ( $\leq 900$  rpm).
2. Push the "Clutch" button IN. This stops the pump from rotating and pumping drilling fluid.
3. Add or remove the section of pipe.
4. Pull the "Clutch" button OUT. This will restart the desired flow of drilling fluid from the mud pump to the directional drill.
5. Move the throttle lever to bring the engine up to the desired rpm.

#### Add/remove section of drill pipe in > 10 minutes

1. Throttle the mud pump engine down to an idle ( $\leq 900$  rpm).
2. Push the "Clutch" button IN. This stops the pump from rotating and pumping drilling fluid.

***Operating the Mud Pump***

---

3. Shift the transmission into neutral.
4. Pull the “Clutch” button OUT.
5. Add or remove the section of pipe.
6. Push the “Clutch” button IN.
7. Shift the transmission into the desired gear. This will restart the flow of drilling fluid from the supercharge pump to the P-600.
8. Pull the “Clutch” button OUT. This will restart the desired flow of drilling fluid from the mud pump to the directional drill.
9. Move the throttle lever to bring the engine up to the desired rpm.



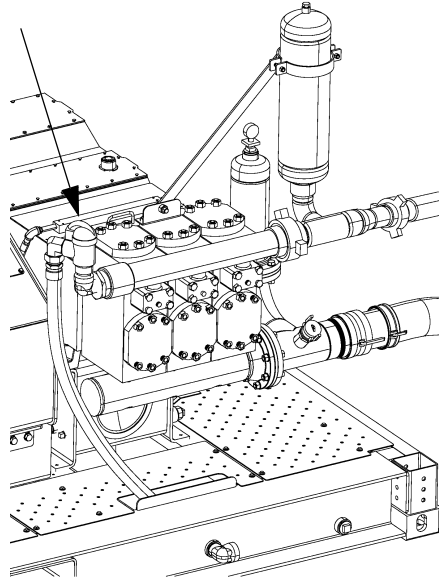
## Operating the Mud Pump

### Mud Pump Pressure Relief Valve

**IMPORTANT:**

- Do not set pressure relief higher than 1750 psi (120 bar). Doing so could void the warranty on the pump.

The variable setting pressure relief valve is set at the factory to 1750 psi (120 bar).



If a clog downhole results in a pressure back-up, the pressure will spike and shear the pin on the relief valve. This will allow fluid to pass through the relief valve, back into the mud tank. Shut down the mud pump and resolve the reason for the relief valve tripping. Before resuming operations, replace the shear pin. Insert it under the cap through the bar with holes at 1750 psi. A pack of 10 shear pins is provided. Additional pins can be ordered from American Augers' Parts Department.

***End of Pumping Operations***

---

**Stopping the Mud Pump Engine**

1. Throttle the mud pump engine down to an idle ( $\leq 900$  rpm).
2. Push the Clutch button IN. This stops the pump from rotating and pumping drilling fluid.
3. Shift the transmission to neutral.
4. Pull the Clutch button OUT.
5. Run at idle speed for 5 to 10 minutes to cool down the engine.
6. If you expect freezing temperatures, flush the pump with clear water, and add antifreeze to the pump. Turn the pump over 3 or 4 revolutions.
7. Turn the ignition key to OFF to shut down the engine.
8. Turn the Battery Switch to OFF.



**Machine Storage and Transport**

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**Storage and Transport****Minimum Storage Space Required**

Consult the “Specifications” section beginning on page 67 for the dimensions and weight of the P-600 to establish storage space requirements. The surface must be firm enough to support the weight of the machine and prevent sinking.

**Storage Site Conditions**

If the machine has been lubricated, it can be stored uncovered for up to 30 days. Protect the machine from salty or acid environments, solvents, gas, flammable liquids and explosives.

For periods longer than 30 days, the machine should be stored in a covered, dry area.

The temperature ranges recommended for storage are between 32°F and 120°F (0°C to 50°C). Refer to Attachment 1: Diesel Engine Manual for temperatures outside this range.

**Preparations for Storage**

For short-term storage, i.e. periods less than 30 days:

1. Clean the machine as described in the “Cleaning” section beginning on page 47.
2. Make sure there is no water or drilling fluid in the drilling fluid course. If freezing temperatures are expected, precharge the drilling fluid system with antifreeze when the machine is not in use.
3. Eliminate sediment and water from the tanks (diesel fuel and oil).
4. Lubricate the entire machine according to the 10 Hour Inspection and Maintenance schedule. Coat all exposed hydraulic cylinder rods with oil to protect against corrosion.

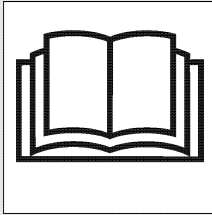


For storing longer than 30 days, follow the procedures for short-term storage plus these additional steps:

1. Store the machine in a covered, dry location.
2. Follow manufacturer’s instructions for long-term storage of a diesel engine.
3. Remove and store the batteries where the temperature will remain between 32°F and 105°F (0°C to 45°C).
4. Completely fill all gear boxes with lubricant.

## Machine Storage and Transport

## Transportation



Improper operation of controls and use of unsafe techniques can result in serious injury, death and damage to the equipment. Personnel should read the manual and learn proper procedures to transport and lift the machine.

The machine must be transported in accordance with local laws and regulations. All components must be properly secured on the rig. If the rig exceeds the overall dimensions allowed, they must be flagged according to the highway laws of the countries or states involved in the transport. The transporter is responsible for using the proper method of transport and following all other applicable regulations.

## Lifting the Machine

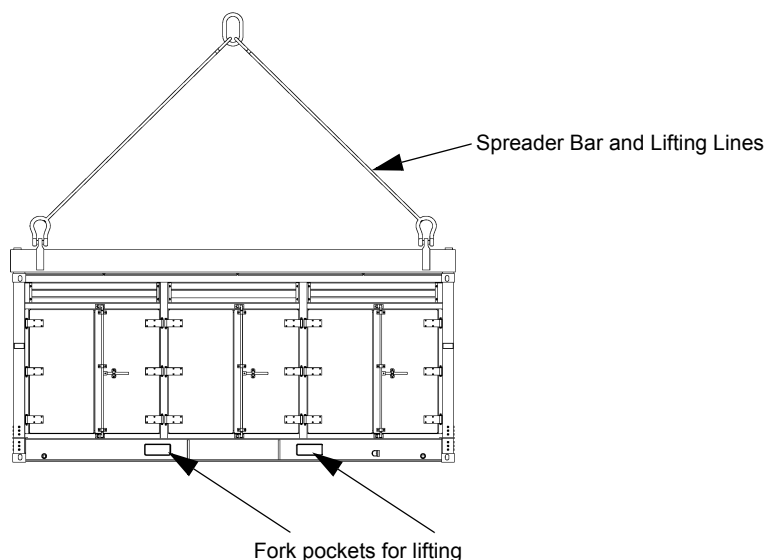


Crush hazard from above. If the load shifts or falls it could crush you or kill you. Use appropriate lifting equipment for the size of the load.

- Use chain or cable suitable for the weight of the machine being lifted.
- Ensure load is stable and properly secured before lifting.
- All personnel must remain a safe distance away while the machine is being lifted.

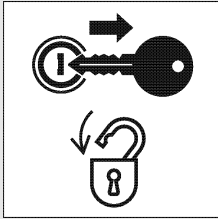


If the machine is equipped with a Quiet-Pak® enclosure, use spreader bars to ensure that lifting lines do not come in contact with the machine. Alternatively, you may use the fork pockets on the sides of the skid to lift the machine (see drawing below).



## General Maintenance

# Maintenance



**Failure to turn off the machine and lockout systems before doing maintenance work may result in personal injury or death. Turn off power, relieve system pressures, and turn the Battery switch to the OFF position. Remove key from the Engine Start switch. Use proper lockout and tagout procedures before working on the machine.**

Hydraulic oil, gearbox oil, diesel engine oil, pin and bearing greases, diesel engine cooling liquid, battery liquids and fuel should be handled with care. Consult Material Safety Data Sheets. Dispose of spent fluids according to laws and regulations. Take appropriate precautions to ensure that these fluids do not leak or spill on the ground or into sewage systems, streams, rivers, lakes or the sea.

Engines, muffler, gearboxes and the hydraulic system can reach very high temperatures. Do not attempt maintenance immediately after stopping work. Wait until the parts are cool.

For additional drawings, diagrams and explanations necessary for maintenance and repair, contact the factory.

## Qualification of the Technician

Ensure that all field personnel conducting visual inspections of the machine have adequate training to enable them to identify problems and that they have read this manual.

The maintenance technician must be trained in mud pump operations. The maintenance technician is responsible for conducting maintenance with suitable test and repair equipment, personal protective equipment and attention to safety hazards.



## Cleaning



**Water can damage sensitive electronic components. Do not spray water against electronic components and control panels.**

## General Cleaning

Clean all the marking plates as well as all lighting devices. Do not direct water spray inside the muffler or the air filter, against electric components and control panels or on caps and open tanks. Do not use acid or abrasive solutions. Keep caps and covers for hydraulic connections clean. Contamination of hydraulic oil will negatively impact performance of your P-600.

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**General Maintenance**

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**Cleaning Plastic and Resin Parts**

Avoid using gasoline, kerosene, paint thinner and similar materials when cleaning the instrument cluster, gauges, console, plastic windows, etc. These materials will cause discoloration, cracking or deformation of the part being cleaned. Use **ONLY** water, mild soap and a soft cloth when you clean these parts.

**Cleaning Hydraulic Connections**

Hydraulic couplings and protective caps must be kept clean and free of all debris. Use an evaporative, petroleum-based aerosol cleaner. When hydraulic couplings are not connected, replace protective caps on the connectors and hose ends. Failure to keep the hydraulic couplings clean could impact equipment performance, cause serious damage and may void the product warranty.

**Cleaning Electrical Connections**

Electrical connectors and dust caps must be kept clean and dry. Use a high quality electrical contact cleaner. When electrical cables are disconnected, replace dust caps on the connections and cable ends. Failure to keep the electrical connectors clean could impact equipment performance, cause serious damage and may void the product warranty.

**Welding****IMPORTANT:**

- Disconnect all electrical connections before welding. Damage can occur to processor and electrical system if electrical components are connected during welding.
- Do not weld near the tanks and flammable liquids.
- Failure to follow welding procedure can cause damage to electric and mechanical components. Damage to components due to improper procedures is not covered under warranty.



Consult the factory for additional information about preheating or post weld heat treating requirements if welding is necessary in cooler temperatures. Welding should not be done when the ambient temperature is below 0°F.

**General Maintenance**

**Approved Replacement Fluids**

When adding or replacing fluids, use the same fluid that is in the system. Avoid mixing different fluids as they may be incompatible. Use the fluid in the table below or select an equivalent from the American Augers Specifications (see Attachment 5: American Augers Lubrication Guide). The compatibility table is a guideline. It lists the compatibility of the main thickener systems used in the industry. Contact the factory for advice on the compatibility of a new grease with the one in service.

Fluids oils and greases have been selected specifically for their properties in colder temperatures. Consult the factory for specifications at temperatures outside the ambient temperature range.

**Approved Replacement Fluids**  
(Temperature range 0°F to 100°F [-18°C to 37°C])

Engine Oil	Shell Rotella® T	AA Specification 401
Engine Antifreeze	Shellzone® 60%, Water 40%	AA Specification 601
Transmission Oil	Shell Spirax® GSX 50	AA Specification 502
Pump Chainbox Hydraulic Oil	Shell Tellus® T ISO 46	AA Specification 202
Pump Lube System Hydraulic Oil	Shell Tellus® T ISO 46	AA Specification 202
Pump Crankcase Oil	Shell Spirax® EW 75W-90	AA Specification 101
Linerwash Antifreeze	Pitt-Penn RV Antifreeze	AA Specification 603
Grease	Shell Retinax® LC-2	AA Specification 301



Scheduled Maintenance

P-600 Maintenance Schedule

Function	After each job	10* hours	50* hours	500* hours	1000* hours
Cycle Emergency Stop Buttons		X			
Leak Check Valves, Hoses, Fittings, Cylinders		X			
Engine: Check Fuel Level		X			
Engine: Check Coolant Level		X			
Engine: Check Crankcase Oil Level		X			
Check Battery Water Level		X			
Engine: Inspect Air Filter Service Indicator		X			
Check Pump Crankcase Oil Level		X			
Check Pump Chainbox Oil Level		X			
Check Hydraulic Oil for Lube Pump Level		X			
Check Linerwash Antifreeze Level		X			
Inspect Drive Shaft		X			
Check Transmission Fluid Level			X		
Lubricate Drive Shaft			X		
Tighten Pump Flange Bolts			X		
Engine: Change Oil and Filter				X	
Engine: Test Coolant				X	
Engine Belts: Check Tension				X	
Clean or Replace Air Filter Elements				X**	
Tighten Drive Shaft Fasteners				X	
Engine: Change Fuel Filters					X
Engine: Clean Cooling System					X
Engine: Replace Coolant					X
Engine: Change Transmission Fluid					X
Change Pump Chainbox Oil					X
Change Pump Crankcase Oil					X
Change Hydraulic Oil for Lube Pump					X
Change Linerwash Antifreeze					X
Drain and Flush Mud Hoses	X				

NOTES:

\* Do not exceed the indicated number of hours without performing the required maintenance

\*\* Unless filter indicator shows change required at a more frequent interval



## Scheduled Maintenance

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### 10 Hour Inspection and Maintenance

Perform the 10 hour inspection and maintenance items in the Maintenance Schedule.

#### Cycle Emergency Stop (Disable) Buttons

Verify that all emergency stop buttons are working properly. Perform an operating check of all controls. Make necessary repairs before starting operations.

#### Engine: Check Fuel Level

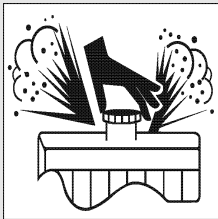
Begin each shift with a full tank of fuel. To prevent dirt and water from reaching the injection parts which will cause damage and decrease performance, use clean fuel and service the fuel filter at regular intervals as prescribed in the Maintenance Schedule.

Use Number 2 Diesel fuel in your engine (with 50 Cetane or higher). Using other fuels will result in loss of engine power and high fuel consumption. When the temperature is very cold, using a mixture of Number 1 and Number 2 fuel is acceptable for a short period. See your fuel dealer for winter fuel requirements in your area.

Diesel fuel conditioner is available from your dealer. Instructions for the use of the fuel conditioner are on the container. The use of diesel fuel conditioner will:

- Clean fuel injectors, valves and manifolds for increased service life
- Disperse insoluble gummy deposits that can form in the fuel system
- Separate moisture from the fuel
- Stabilize fuel in storage

#### Engine: Check Coolant Level



**Hot coolant can spray out and cause serious injury. Do not remove radiator cap while the engine is hot. Wait for the engine to cool.**

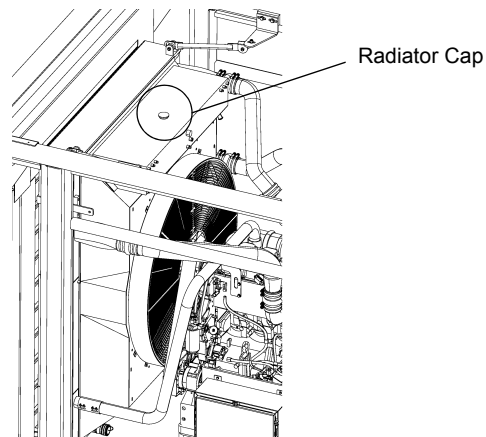
- Slowly open the radiator cap and allow pressure to escape slowly.
- Always wear face protection (face shield or goggles) when cleaning radiator fins with compressed air or pressure washer.



**IMPORTANT:** Water quality is important to the performance of the cooling system. Use distilled, deionized or demineralized water when mixing with coolant concentrate.

## Scheduled Maintenance

- Coolant should be checked while the coolant is cold.
- Check that the level of the coolant is at maximum and there is no contamination.
- Add coolant if level is low.
- After filling is complete, install and tighten the filler cap.



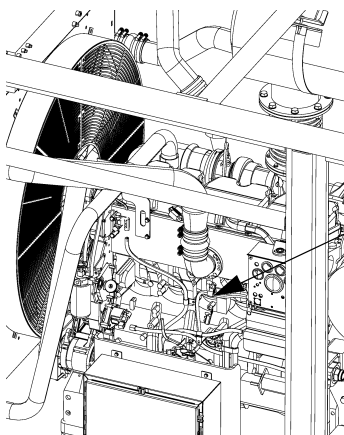
## Engine: Check Crankcase Oil Level

**IMPORTANT:**

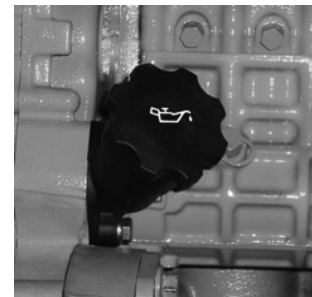
- Before checking or changing engine crankcase lube oil, wait for the engine to cool.
- Refer to Attachment 1: "Engine Manufacturers Manual" or "Approved Replacement Fluids" on page 49 for correct crankcase lube oil to use if more oil is required.

Check that the engine oil is at the maximum level and that there is no contamination. To check the engine oil:

1. The mud pump should be on a flat, level surface. Engine oil should be checked while the oil is warm. DO NOT check the engine oil when the engine is hot.
2. Remove the engine oil dipstick (shown in the left-hand photo below) and wipe off oil. Reinsert dipstick.
3. Remove dipstick and read the oil level. If level is at the ADD mark or below, oil must be added to the engine crankcase through the oil filler tube.
4. Remove the oil filler cap (shown in the right-hand photo below) and add oil sufficient to bring the crankcase oil level to the ADD mark on the engine oil dipstick. Add additional oil until the oil level is between the ADD and FULL marks on the dipstick. Do not overfill. Only fill to the FULL mark on the dipstick.



Engine Oil Dipstick



Oil Filler Tube Cap

## Scheduled Maintenance

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### Engine: Check Air Filter Service Indicator

The air filter service indicator provides a quick check of the condition of the air filter(s). When the red marker on the air filter service indicator appears, the air filter is clogged with dust. This causes a substantial decrease in engine efficiency and can cause serious damage to inner mechanical parts. Clean or replace the filter elements as described in “Clean/Replace Air Filter Elements” on page 60.

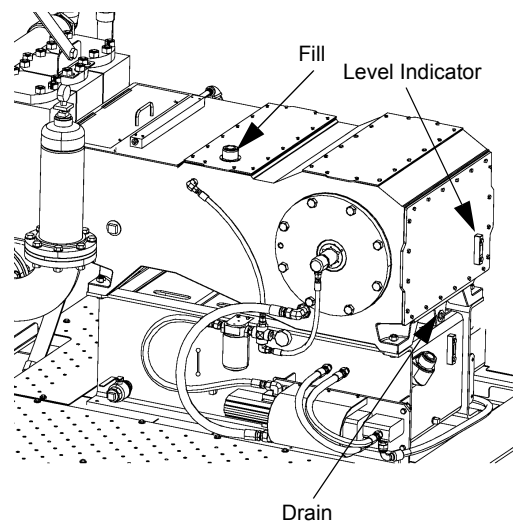
At each air cleaner inspection, inspect the rubber evacuator valve. Check that there are no deposits in the air cleaner pipes. If there are, clean the pipes. The primary filter can be cleaned and reused up to six times. The secondary filter must not be reused. In extremely dusty conditions, increase the frequency of engine air filter maintenance.

### Inspect Drive Shaft

Inspect drive shaft from engine to chainbox. Retighten any loose fasteners.

### Check Pump Crankcase Oil Level

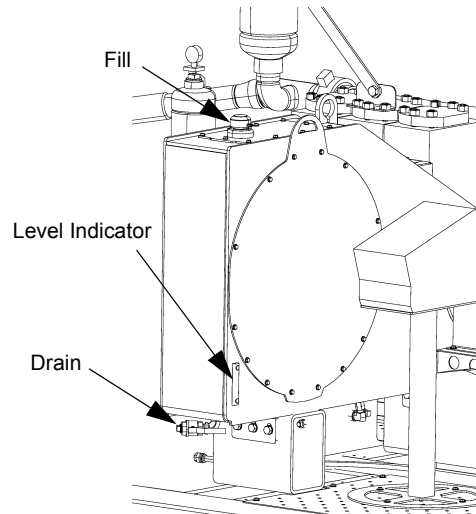
1. Turn off the machine.
2. Remove the oil level plug.
3. Inspect the oil. If contaminated, drain, flush and change immediately.
4. Check the oil level on the level indicator. Add oil until proper fill level is reached.



## Scheduled Maintenance

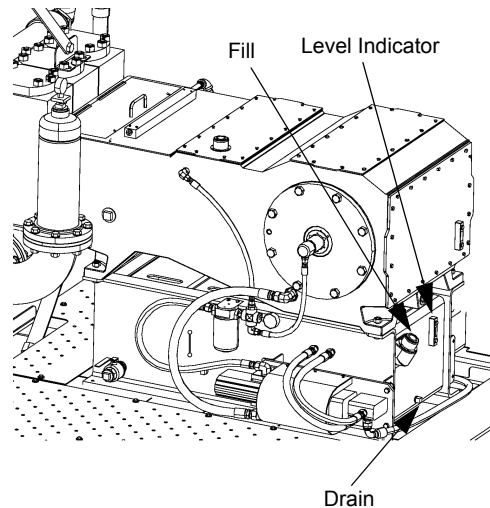
## Check Pump Chainbox Oil Level

1. Turn off the machine.
2. Check the oil level using the transparent gauge mounted on the side of the chainbox.
3. Inspect the oil. If contaminated or milky, flush and change immediately.
4. The oil level should be to the midpoint of the gauge. Add oil as necessary.



## Check Hydraulic Oil for Lube Pump Level

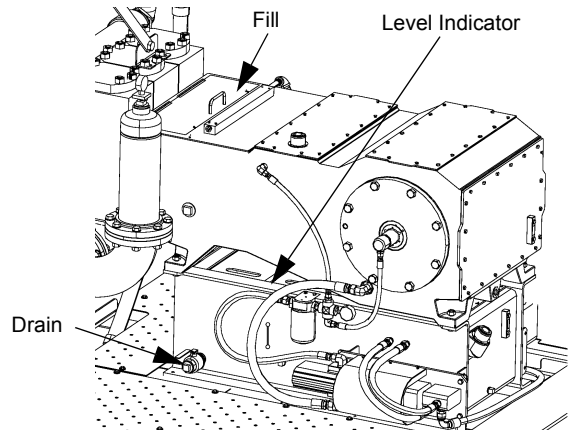
1. Turn off the machine.
2. Remove the oil level plug.
3. Inspect the oil. If contaminated, drain, flush and change immediately.
4. Check the oil level on the level indicator. Add oil until proper fill level is reach.



**Scheduled Maintenance**

**Check Liner Wash Antifreeze Level**

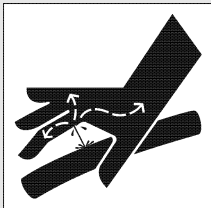
1. Turn off the machine.
2. Remove the oil level plug.
3. Inspect the oil. If contaminated, drain, flush and change immediately.
4. Check the oil level on the level indicator. Add oil until proper fill level is reach.



**General Inspections**

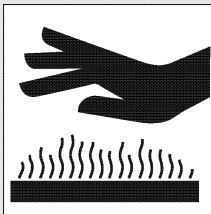


**Use of equipment with damaged hoses, fittings, loose or missing fasteners may result in damage to the machine, personal injury or death. Inspect the machine regularly. Replace or repair damaged or missing components promptly.**



**Hydraulic fluid under pressure can cause serious personal injury and death if it penetrates the skin. Stay away from the jet.**

- Use a piece of cardboard or wood to check for pressurized leaks to prevent fluid penetrating the skin.
- Seek immediate medical attention if hydraulic fluid has penetrated the skin even if the injury seems minor. Prompt medical treatment by a physician familiar with this injury is essential.



**Hot surfaces can cause burns. Do not touch until cool.**



Inspect the machine for leaks of gear oil and hydraulic oil. Leaks should be repaired. Allowing oil or other fluids to leak into the environment is unlawful in most locations. Observe the following:

## Scheduled Maintenance

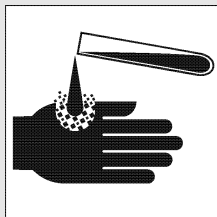
- Power end seal leakage; Observe while the pump is operating at normal temperature. If repairs are required, turn the machine off and follow proper lockout and tagout procedures.
- Pony rod gland seals; Although a small amount of dripping from the seals is normal, replace the seals when excessive leakage occurs.
- Liquid end seal leakage; Observe while the pump is operating at normal pressure. If repairs are required, turn the machine off and follow proper lockout and tagout procedures.
- Liquid end packing; A slight leak is normal and extends packing life. If excessive leaking occurs with adjustable packing, try adjusting the Stuffing box Nut. If excessive leakage persists, replace the packing.
- Cover caps; If they are leaking, ensure the Cap/Cap Fasteners are in good condition and properly torqued. If properly torqued and still leaking, replace the Cap seals.
- Check that power frame plunger hold drains and piping are clear to evacuate any product or oil leakage.
- Visually inspect plungers. Worn or damaged plungers will cause premature packing failure/wear and an increase in NPSHR (net positive suction head required). Look for excessive grooving, pits or flaking in the plunger coating.

Visually inspect all hoses, fittings and pipes. Replace parts that are damaged.

Ensure drive coupling is secure and properly adjusted.

Check all major fasteners, such as hose clamps, stakedown, tie downs, etc. Tighten all loose fasteners. Replace any that are missing or damaged. Check the control cable connections and ensure they are tight.

### Engine: Check Battery and Battery Fluid Levels



**BATTERY ACID CAN CAUSE SEVERE BURNS. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Wear eye protection and gloves when working with batteries.**

**ANTIDOTE:**

- EXTERNAL: flush with water.
- INTERNAL: drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call Poison control and a physician immediately.
- EYES: flush with water for 15 minutes and get prompt medical attention.



**All exposed metal parts on a storage battery are “live”. Laying a metal object across the terminals may cause a spark, short circuit or explosion. Personal injury or damage to the equipment may result. Never lay a metal object across the battery terminals.**

## Scheduled Maintenance

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**IMPORTANT:**

- When disconnecting battery terminals, remove the Negative (-) GROUND cable first; then remove the Positive (+). When connecting the cables, connect the Positive (+) first, then connect the Negative (-) GROUND cable last.
- To prevent damage to the battery, DO NOT over tighten the battery hold down.

Check the level of the electrolyte in the batteries. Add distilled water until level is at the split ring of each cell opening if the level is too low.

Check the battery cables and verify that there are no abrasions or indentations; if necessary, replace the battery cables. Check that the battery terminals are not corroded. Clean and replace them if necessary. The voltage of the battery is 12 volts.

Clean corrosion off battery terminals. A paste made of sodium bicarbonate and water is normally enough to clean terminals and battery box. After cleaning, rinse thoroughly with clean water. Coat the terminals with grease in order to prevent future corrosion.



## Scheduled Maintenance

### 50 Hour Inspection and Maintenance

Perform 10 Hour Inspection and Maintenance items, plus:

#### Engine: Remove Water from Fuel Filter

**NOTE:** Always drain water and sediment into a container and dispose of properly. Never allow water and sediment to drain onto the ground.

Open the water drain at the bottom of the fuel filter (see photo below).



Drain for water separator bowl for engines so equipped

Close the drain after all water has been removed. If there is an excess of water being drained from the filter, check for water in the fuel tank.

If there is water in the fuel tank, remove the drain plug from the bottom of the fuel tank and allow water and sediment to drain. Replace and tighten the plug after draining is complete.

#### Check Transmission Fluid Level



1. Turn off the machine.
2. Check the fluid level using the level/fill port on the side of the transmission.
3. The fluid should be level with the bottom of the port.
4. Add fluid if necessary.



#### Other Items

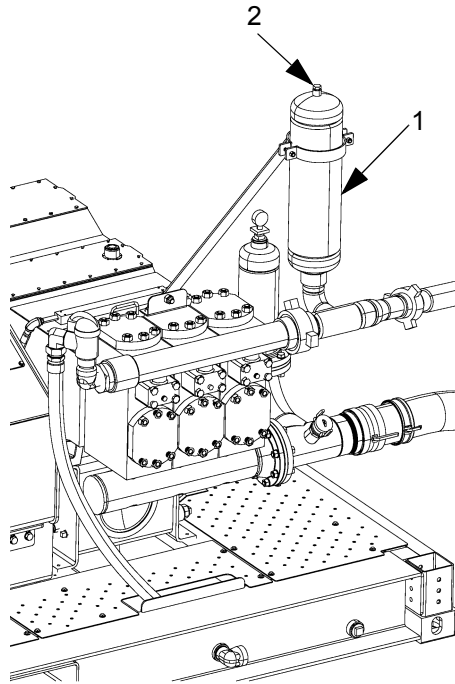
Lubricate the drive shaft between the engine and the pump. Access the drive shaft grease fittings by removing the drive shaft guard.

Tighten the pump flange bolts.

## Scheduled Maintenance

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Ventilate the surge chamber (1) on the mud pump discharge dampener. The discharge dampener dampens surges of the mud pump. The standard surge chamber is an air chamber where the mud compresses the air to dampen movement of the discharge hose. The mud gradually absorbs the air in the surge chamber. Remove the plug on top (2) of the surge chamber to allow air into the chamber when the pump is not running. Reinstall the plug before resuming operations. An optional nitrogen filled, bladdered surge chamber is available.



## Scheduled Maintenance

### 500 Hour Inspection and Maintenance

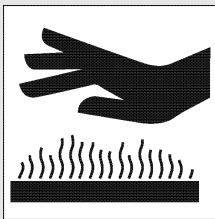
Perform 10 and 50 Hour Inspection and Maintenance items, plus:

#### Change the Engine Oil and Filter

Engine oil should be warm to assist in draining. To change the engine oil and filter:

1. Wipe the area around the oil filler cap with a clean rag. Remove the oil filler cap.
2. Place a container under the oil pan drain plug. Remove the oil pan drain plug and drain the engine oil.
3. Using a filter wrench, remove and discard the old oil filter element and o-rings. Clean the area with a clean rag.
4. Apply a thin coat of oil to the o-ring of the new filter element. Install the new filter element.
5. Hand tighten filter making contact with base. Continue to tighten 3/4 turn. DO NOT use a filter wrench to tighten the filter. Damage to the filter may result.
6. Install and tighten the drain plug.
7. Add correct type and amount of engine oil via the filler tube.
8. Replace the oil filler cap.
9. Start the engine and check for leaks.
10. Turn off engine and remove the key. After a few minutes, use the dipstick and recheck the oil level. Repeat the leak check.

#### Engine Belts



Hot surfaces can cause burns. Do not touch until cool.

Check that belts have the correct tension. If they have loosened, adjust them. Replace belts if they are worn over the limits. Follow instructions in Attachment 1, you diesel engine manual.

#### Test Radiator Coolant

**IMPORTANT:** Water quality is important to the performance of the cooling system. Use distilled, deionized or demineralized water when mixing with coolant concentrate.

pH should be maintained between 9.5 and 10.0. Coolant with pH below 8.3 is not acceptable due to its corrosive nature. When coolant pH drops below 9.0, flush the cooling system and refill with fresh coolant. For accurate pH readings, the coolant should be below 122°F (50°C).

#### Clean/Replace Air Filter Elements

The air filter assembly should be cleaned and the air filter replaced every 250 hours. In dusty conditions, the filter element should be checked and cleaned more frequently.

## Scheduled Maintenance

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The air filter assembly includes the housing, cover, external element, internal element and a service indicator. The housing is shown in the photograph below.



To check and clean the air filter system:

1. Release the cover latches and remove the housing cover.
2. Remove the outer element.
3. Remove the inner element and wipe out any dust which has collected on the inside of the housing.
4. Replace the inner element. The closed end of the element should be toward the housing cover. Be careful that the inner element is installed correctly.
5. Replace the outer element
6. Replace the housing cover and secure the cover latches.

### Other Items

Tighten drive shaft fasteners.



## Scheduled Maintenance

### 1000 Hour Inspection and Maintenance

Perform 10, 50 and 500 Hour Inspection and Maintenance items, plus:

#### Change the Fuel Filter Elements

1. Turn off the engine and remove the key.
2. Place a container under the fuel filters to avoid any spills.
3. Clean the filter head and the outside of the fuel filters.
4. Turn the filters counterclockwise and remove from the filter head. Discard the old filter elements.
5. Apply a thin layer of clean oil to the gasket of the new filter elements.
6. Install the filter elements by hand turning clockwise. Hand tighten 1/2 to 3/4 turn after the elements make contact with the filter head. DO NOT use a filter wrench to install filters. Damage to the filter gasket may occur.
7. Remove air from the fuel system as explained below.

#### Remove Air from the Fuel System

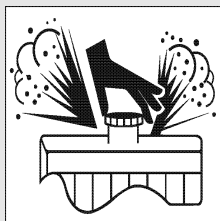
Air must be removed from the fuel system when any of the following occur:

- The engine is run until the fuel tank is empty.
- The fuel filter elements are replaced.
- The fuel system is serviced.
- The engine has been in storage for a long time.

\*Refer to Attachment 1: "Diesel Engine Manual" for instructions on removing air from the fuel system.



#### Engine: Clean the Cooling System and Replace Coolant



**Hot coolant can spray out and cause serious injury. Do not remove radiator cap while the engine is hot. Wait for the engine to cool.**

- Slowly open the radiator cap and allow pressure to escape slowly.
- Always wear face protection (face shield or goggles) when cleaning radiator fins with compressed air or pressure washer.

#### **IMPORTANT:**

- NEVER put cold coolant in a hot engine. The engine block or cylinder heads can crack because of the difference in temperature between the metal and the coolant. Make sure the engine block and radiator drain valves are closed.
- Always use a container and dispose of waste coolant properly. Make sure the container will have enough capacity to avoid spillage. Never allow coolant to drain onto the ground.

1. When the system is cool, turn the radiator cap to the first notch. Wait until all pressure is released.
2. Slowly remove the radiator cap. Scalding can result from fast removal of radiator cap.
3. Place a suitable container under the radiator drain tube (adjacent to the petcock shown below).

## Scheduled Maintenance

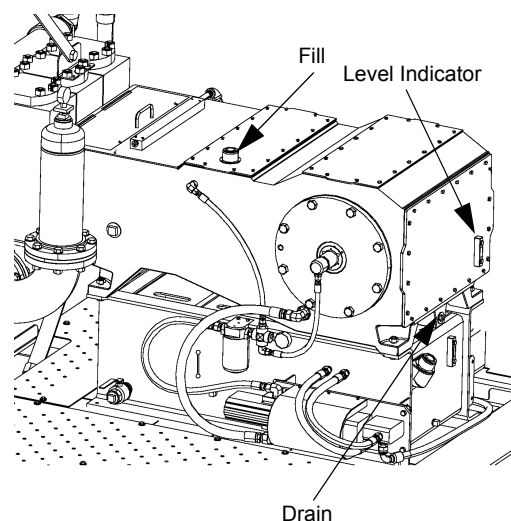
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4. Rotate the petcock handle counterclockwise to open the drain.
5. When the engine and radiator are cool and the system is drained, run fresh, clean water through the system. This will flush out any particles. Allow water to drain from the system before refilling.
6. Close the drain.
7. Fill the radiator with a 50/50 mixture of clean water and ethylene glycol. Slowly add the coolant solution until the level comes up to the filler port neck.
8. With the radiator is full, start the engine and run at low idle for approximately 5 minutes. Coolant level will drop.
9. Turn OFF the engine and remove the key. Fill radiator with coolant to filler port neck.
10. Replace the radiator cap.
11. Fill the coolant reservoir to the proper level.

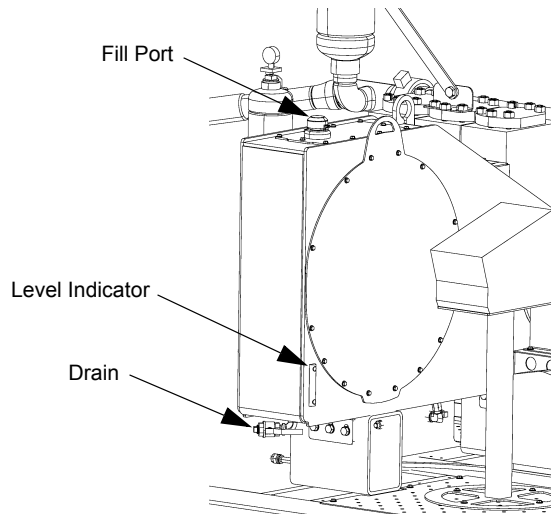
## Change Pump Crankcase Oil

1. Turn off the machine.
2. Using diesel fuel or solvent, flush and clean the entire crankcase area.
3. Place a suitable container under the crankcase drain. Open the drain and collect the oil. Dispose of properly.
4. If contaminants are observed in the oil, determine the cause and repair before using the pump.
5. Close the drain.
6. Refill with fresh oil. Close the fill port.



## Scheduled Maintenance

## Change Pump Chainbox Oil

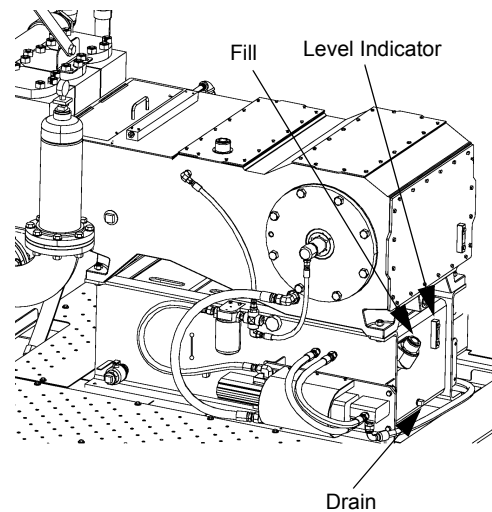


1. Place a suitable container under the chainbox drain.
2. Open the drain and collect the oil. Dispose of properly.
3. If contaminants are observed in the oil, determine the cause and repair before using the chainbox.
4. Close the drain.
5. Oil can be added using either the access panels or the fill port shown above.

## Change Hydraulic Oil for Lube Pump



1. Turn off the machine.
2. Place a suitable container under the lube pump drain. Open the drain and collect the oil. Dispose of properly.
3. If contaminants are observed in the oil, determine the cause and repair before using the pump.
4. Close the drain.
5. Refill with fresh oil. Close the fill port.

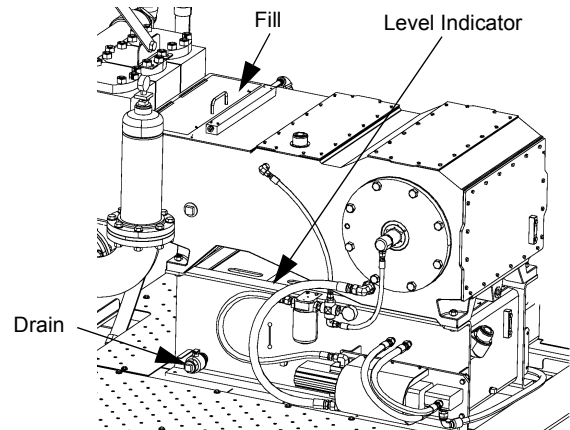


## Scheduled Maintenance

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### Change Liner Wash Antifreeze

1. Turn off the machine.
2. Remove the antifreeze drain plug.
3. Drain the antifreeze and flush the reservoir.
4. Close the drain plug.
5. Add antifreeze until proper fill level is reach.



### Change Transmission Fluid

1. Place a suitable container under the transmission drain.
2. Open the drain and collect the oil. Dispose of properly.
3. Close the drain.
4. Refill the transmission.





**Specifications**

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**Specifications**

**Machine Dimensions / Weight**

Length:	20 feet (6 m)
Width:	8 feet (2.5 m)
Height:	9 feet (2.7 m)
Estimated Weight:	29800 pounds (13520 kg)
Approx. Weight with Quiet-Pak	39700 pounds (18000 kg)

**Power Train**

Engine:	Caterpillar C-15 Diesel (Tier depends on place of purchase)
Rating:	475 HP (354 kW)
Fuel Capacity:	300 gallons (1136 liter)
Transmission:	Eaton FRO-16210B, 10-speed
Battery:	(2) DEKA 908 DMF, 12 volt, 1450 CCA

**Pump**

Pump Design:	Triplex 600 gpm
Rated Capacity:	600 U.S. Gallons (2067l)/min
Bore X Stroke:	6 X 6 inches (152.4 X 152.4 mm)
Maximum Pressure:	1505 psi (104 bar)

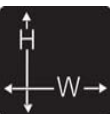
(\* Note: Pump capacity will vary depending on the overall mud weight, drilling fluid mixture/content, and the working elevation)

**Controls**

Remote Control	Mud Pump Throttle, Mud Pump Start/Stop, Clutch Actuator, Horn
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**Accessories**

- Pulsation Dampeners on inlet and discharge
- Two 25 foot (7.6 m) suction hoses with kamlock fittings
- Two 25 foot (7.6 m) discharge hoses with NPT hammer unions
- Liner wash system with supply tank
- Two, 24 volt work lights





**Appendix**

The appendix contains information that we believe the operator of the P-600 will find useful to have available for reference during the operation of the P-600. The information is placed in the appendix because it is of general interest or it supplements the information in the body of the manual.





**Appendix A: List of Attachments**

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**Appendix A**

Attachment 1: Diesel Engine Manual

Attachment 2: Murphy Power System User Guide

Attachment 3: Murphy Troubleshooting

Attachment 4: Murphy Error Messages

Attachment 5: American Augers Lubrication Guide (current revision)



Sample Declaration of Conformity



**American Augers, Inc.**  
*Innovative Leaders For The Trenchless Industry*  
135 U.S. Route 42 • P.O. Box 814 • West Salem, Ohio 44287  
TEL (419) 869-7107 • FAX (419) 869-7425 • USA toll free (800) 324-4930  
<http://www.americanaugers.com>

DECLARATION OF CONFORMITY

[Date]

Manufacturer's Name: American Augers, Inc.

Manufacturer's Address: 135 U.S. Route 42, P.O. Box 814, West Salem, Ohio 44287 U.S.A

declares that the product:

Product Description: Mud Pump  
Model Number: P-600  
Serial Number:

to which this declaration relates is in conformity with the Essential Health and Safety Requirements and relevant requirements of:

This machinery fulfills all the relevant provisions of the following directives:  
EU Machinery Directive 2006/42/EC  
ISO 11202: 1993, Acoustics – Noise Emitted by Machines  
ISO 3746: 1995, Acoustics - Sound Power Levels  
EN61000-6-4, 2001 – Electromagnetic Compatibility  
SAE J2305

The Technical Construction File is maintained at American Augers, Inc., 135 U.S. Route 42, P.O. Box 814, West Salem, Ohio 44287 U.S.A.

Person Authorized to Compile the Technical File:  
G. Dokter  
Brasemkolk 9  
8017NV Zwolle  
The Netherlands

Authorized by American Augers and signing for the company:

\_\_\_\_\_  
Vice President Engineering

West Salem, Ohio 44287 U.S.A.

Manufacturers of Horizontal Earth Boring Machines • Horizontal Directional Drills • Drilling Fluid Mixing, Pumping and Cleaning Systems

## Limited Warranty

### Limited Warranty

This warranty is extended by American Augers, Incorporated in respect of equipment & products sold. American Augers warrants to the initial purchaser that this Equipment will be free of defects in material and/or workmanship for a period of 365 days after the factory shipment date to the initial purchaser, or 1000 hours of operation, whichever occurs first. Once the equipment is placed into service as a retail sale, rental or lease, a properly completed Warranty Registration Certificate must be submitted to American Augers to start and validate warranty coverage.

- The Limited Warranty does not include (1) batteries, lamp bulbs, fuses, various types of gaskets, and packing, filter elements, oil lubricants, fluids, track chain, track drive sprockets, Drill Pipe, Auger sections, die holders, wrench wear parts, guide bushings, shaft seals, mud swivel assemblies, valves, piston liners, centrifugal pumps, shaker screens, and other normal wearing or aging parts, (2) engines, and (3) transmissions not manufactured by American Augers, (4) down hole tools & accessories. American Augers extends to the initial purchaser the benefits of any warranty (if any) of the manufacturers or suppliers of any of the excluded items.
- Claims for defects in material and workmanship shall be made in writing by the initial purchaser to American Augers within ten days of defect discovery. American Augers reserves the right to send a service representative, contract an authorized representative, or request that the equipment is returned to the factory for product inspections. Failure on the behalf of the purchaser to permit such above action can cause a voiding of warranty coverage.
- Within the warranty period, American Augers will repair or replace, at its option, free of charge any portion of parts of the new Equipment, which are found by American Augers to be defective in material or workmanship. Replacement or repaired parts provided under the terms hereof are guaranteed in like fashion for the remainder of the warranty period. Any parts replaced under the terms of this warranty become the property of American Augers and upon written request, must be returned, transportation prepaid, to American Augers.
- In no event shall American Auger's liability exceed the purchase price of the Equipment. American Augers reserves the right to fully satisfy its warranty obligation by refunding to the Buyer the full purchase price of the Equipment upon the return of the Equipment by the Buyer, transportation prepaid, to American Augers.
- This warranty applies only if the alleged defective Equipment has been properly maintained and operated as specified by American Augers. This warranty will not apply if the alleged defect is attributable to an unauthorized modification or service repair made, a component part installed, improper equipment storage, neglect or abuse of the equipment on the behalf of the purchaser or their representatives, improper product operation or use of the product exceeding the design limitations, or an attachment supplied, by a party other than American Augers or its subsidiaries, or the authorized representative of any of the forgoing.
- If any tests are conducted to ascertain or demonstrate defects in material or workmanship, such test shall be conducted after reasonable notice to American Augers and upon conditions mutually agreed upon in advance of the test, and American Augers may be represented at any test that shall be made. American Augers, at its option may charge the Customer for any tests performed by American Augers at the request of the Customer in respect to the merchandise sold hereunder.
- The remedies in this warranty shall be exclusive and sole remedies of the Buyer. There are no other Warranties, expressed or implied, of any kind, including but without limitation, any warranty that the Equipment is of merchantable quality or that the Equipment is fit for any particular purpose. American Augers will have no monetary liability whatsoever for any damage, loss costs, or expense (whether general, special, incidental, or consequential) suffered by the Buyer as a result of or connection with the Equipment. In no event shall American Augers be liable for incidental or consequential damages including, but not limited to, freight charges, transportation charges, downtime, or other parts incidental to the removal and replacement of parts repaired or replaced under this warranty.
- American Augers reserves the right to modify, alter, and improve any product or parts without incurring any obligation to replace any product or parts previously sold with such modified, altered or improved product or parts.
- No person is authorized to alter or extend this warranty unless made in writing and signed by an officer of American Augers.
- Used products and equipment delivered by American Augers or picked up by American Augers are sold without conditions or warranties, express or implied, "as is, where is", unless there is a clear agreement with the Customer in writing to the contrary. The Customer agrees to inspect and all such equipment before purchase is completed and to accept same with out any warranty of merchantability or fitness for a particular purpose.

By acceptance hereof, the Customer covenants and agrees that in the event any products purchased hereunder are resold either in their original form or as a component of another system, the LIMITED WARRANTIES provision set forth above will be included in all sales documents by which the Customer resells any such products. In all such cases, the sales documents by which a purchaser from the Customer purchases and accepts delivery of the products sold here under will include from such LIMITED WARRANTIES and prior to any such sale or delivery and authorized representative of the subsequent purchaser will be made aware of the limitations on the warranty of American Augers or other manufacturer of the products and that the disclaimers of American Augers apply to the resale of such products. The Customer agrees to indemnify and hold harmless American Augers from any such loss, claim or damage. Including attorney's fees and expenses resulting from a breach of the foregoing covenant.



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Always include machine serial number when ordering parts  
Due to our continuing product improvement, machine specifications are subject to change without notice.

Original Instructions  
Manual Part Number 60MP10000  
Released September 2011 Revision 00