

STANDARD OPERATING PROCEDURE
FOR
PORTABLE 18" FLOOD CONTROL PUMP
OPERATIONS AND MAINTENANCE



San Luis Obispo County Flood Control &
Water Conservation District

June 2013

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AUTHENTICATION

This Standard Operating Procedure has been approved and is hereby incorporated as a department/agency/jurisdiction procedure.

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Date

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Date

REVISIONS

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PART 1 – OVERVIEW

1-1. INTRODUCTION

1-1.1 PURPOSE

This Standard Operating Procedure (SOP) details the specific standard operating procedures to be followed by the Department of Public Works in carrying out the operation, maintenance and relocation, if necessary, of the San Luis Obispo County Flood Control and Water Conservation District (District) Portable 18" Flood Control Pump (Flood Pump).

1-1.2 OBJECTIVES

The objectives of this plan are as follows:

- Provide procedures for Flood Pump mobilization, set-up, operation and maintenance
- Establish responsibilities and identify responsible parties for Flood Pump operation and maintenance
- Define communications procedures for Flood Pump use during a flood event

1-2. BACKGROUND

1-2.1 FLOOD PUMP

In June 2011, the District purchased a skid-mounted Griffin Variable-Use Non-Clog Pump (Model No. 18NCRD-CIS-C30W02J29) and trailer for the purpose of providing flood control and dewatering at various locations in the County during large storm events. Basic Flood Pump information is as follows (see Appendix A for details):

- County General Services Equipment No. 0P083
- 16"x16"x25" centrifugal pump (self-priming)
- 250 horsepower diesel John Deere engine
- Wallenstein rotary vane vacuum pump for priming
- 18-inch diameter inlet / 16-inch diameter outlet
- 11,000 gallons per minute (gpm) pumping capacity at a total dynamic head (TDH) of 45-feet and 15-feet of suction lift.
- 3-inch diameter solids-handling capability

1-2.2 FLOOD PUMP HOME LOCATION

The Flood Pump, as depicted in Figures 1 and 2, normally resides on County owned property located in the West Village of Cambria. Specifically, the site is located between Main Street and Highway 1, approximately 500 feet southeast of the Main Street/Windsor Boulevard intersection. The site is a secure site, fenced on all sides and locked with a County lock. Although the Flood Pump is portable and will be moved to other locations as needed, this site is considered the Flood Pump's home location.

When located at its home location, the Flood Pump will be set up to provide flood protection for the West Village of Cambria. The suction side of the Flood Pump will be connected to a 54-inch diameter, 10-foot deep sump via 24-inch HDPE piping. The discharge side of the sump will be connected to a steel manifold via 24-inch HDPE piping, which then transitions into a 42-inch reinforced concrete pipe (RCP) that outlets into Santa Rosa Creek on the opposite side of Highway 1. During flooding events, the pump will be used to draw water out of the sump and pump it into Santa Rosa Creek.



Figure 1: Cambria site / Flood Pump connected to 54-inch diameter intake sump



Figure 2: Cambria site / Flood Pump connected to 42-inch diameter discharge pipe

1-3. CONCEPT OF OPERATIONS

The purpose of the Flood Pump is to provide pumping to help mitigate flooding and assist in dewatering applications at various locations across San Luis Obispo County on an as needed basis. Specific operation and set up of the Flood Pump will depend on the site and situation; however, the pump will generally operate as follows:

- The Flood Pump will be mobilized to a site needing dewatering or flood control
- HDPE piping will be used to connect the 18-inch pump suction flange to a sump area
- HDPE piping will be used to connect the 16-inch discharge to a location where water will be discharged
- The Flood Pump will be operated manually or automatically with floats for the duration of the flood event or dewatering application

1-4. RESPONSIBILITIES

The Utilities Division Manager, or his designee, will be ultimately responsible to coordinate and ensure the performance of all activities in connection with Flood Pump training, maintenance and operations.

Table 1 identifies the parties that will be involved in the various aspects of Flood Pump training, maintenance and operations. Details of these responsibilities are provided in the following sections.

Table 1. Summary of Responsibilities

	Communications	Pump Mobilization	Pump Set-Up & Tear Down	Pump Exercising & Inspection	Pump Maintenance	Pump Operations	Safety & Training	SOP Updates
PW – Utilities Division Manager	●	●	●	●	●	●	●	●
PW – North County Operations	*		✓	✓		✓	*	
PW – South County Operations	*		✓	✓		✓	*	
PW – Road Crews	*	✓		✓		✓	*	
GSA – Mechanics	*				✓		*	

Legend: ● Primary Responsibility * General Responsibility
 ✓ Performance Responsibility

1-5. COMMUNICATIONS

The Utilities Division Manager, or designee, is the primary point of contact for all aspects of Flood Pump use, including but not limited to, mobilization, set-up and tear down, exercising and inspection, maintenance, operations, safety, training and SOP updates.

Appendix B lists contact information for parties involved with the Flood Pump.

1-6. SAFETY

All personnel working with the Flood Pump shall observe the following safety measures:

- Read Safety Information (Appendix C) before working with the Flood Pump
- Review Safety Information (Appendix C) and conduct tailgate training before each Flood Pump exercise and inspection

ONLY TRAINED PERSONNEL SHALL OPERATE THE FLOOD PUMP

1-7. TRAINING

The Utilities Division Manager, or designee, will be responsible for coordinating all Flood Pump training. Training will be conducted on an as-needed basis or whenever procedures are significantly revised. When possible, training will be conducted during routine Flood Pump exercising and inspection. Applicable staff will be included in training.

1-8. AIR POLLUTION CONTROL DISTRICT REQUIREMENTS

The Flood Pump is permitted by the Air Pollution Control District (APCD) as a standby, emergency flood control pump. A copy of the permit (Permit 1812-1) as well as specific permit conditions and requirements are attached in Appendix F.

The APCD permit requires annual renewal in November. Permit renewal requires an APCD inspection of the Flood Pump and the Flood Pump's Air Pollution Control Engine Log, located in the JoBox on the pump.

1-9. SOP UPDATES

This SOP document will be maintained by the Utilities Division Manager or designee. The document will be reviewed after any flood emergency in which the Flood Pump is used and as determined by the Utilities Division Manager to evaluate SOP effectiveness. Lessons learned during a flood emergency will be documented and incorporated into the updated SOP document.

PART 2 – PREPARATION

2-1. MOBILIZATION

2-1.1 GENERAL DESCRIPTION

Mobilization consists of transporting the Flood Pump from one location to another and back to the Home Location specified in Section 1-2.2.

2-1.2 PERFORMANCE

The following actions shall be undertaken for Flood Pump mobilization:

1. Location Identification: Identify a site for the Flood Pump, including approximate pump layout, and determine a time for delivery.

Responsible Party: **Utilities Division Manager (or Designee)**

2. Authorization/Communication: Contact Transportation Division Manager and Road Maintenance Manager to schedule Flood Pump mobilization, providing specific time, location and approximate pump layout details.

Responsible Party: **Utilities Division Manager (or Designee)**

3. Mobilization: Move Flood Pump from current location to needed location and notify Utilities Division Manager, or designee, when complete.

Responsible Party: **Transportation Division Manager
Roads Maintenance Manager
Roads Crews**

2-1.3 REQUIREMENTS & INFORMATION

Skid-mounted Flood Pump Information:

- Dimensions – 8'-0" wide x 15'-6" long x 6'-0" tall
- Weight – 16,000 lbs.

Flood Pump Trailer Information:

- Weight (trailer only) – 6,000 lbs.
- Payload Capacity – 19,000 lbs.
- Trailer Dimensions – 33'-1" long x 8'-6" wide x 3'-0" tall
- Deck Dimensions – 25'-0"

Overall Trailer/Flood Pump Information:

- Weight – 22,000 lbs.
- Dimensions – 33'-1" long x 8'-6" wide x 9'-6" tall

CLASS A DRIVER'S LICENSE IS REQUIRED TO HAUL FLOOD PUMP

2-2. SET-UP / TEAR DOWN

2-2.1 GENERAL DESCRIPTION

Flood Pump set-up and tear down occurs before and after Flood Pump mobilization and consists of the following:

- Assembling, placing and connecting suction and discharge piping from the Flood Pump to suction and discharge locations after pump mobilization
- Repositioning the Flood Pump (if needed) to accommodate piping alignments
- Installation or construction of all appurtenances and facilities needed for suitable intake and discharge
- Disconnecting and disassembling all suction and discharge piping, appurtenances and facilities prior to pump mobilization

2-2.2 PERFORMANCE

The following actions shall be undertaken for Flood Pump set-up/tear down:

1. Authorization: Determine the need to set-up or tear down the Flood Pump.
Responsible Party: **Utilities Division Manager (or Designee)**
2. Pump Layout and Configuration (Set-up Only): Design configuration of Flood Pump piping and other needed facilities (if at location other than the Home Location) to meet specific site and pumping needs. Obtain environmental permits and incorporate permit conditions into design.
Responsible Party: **Utilities Division Manager (or Designee) and/or Design Consultant / Pump Vendor**
3. Materials Acquisition (Set-up Only): Identify materials needed (piping, intake screens, etc.) to set-up the Flood Pump and purchase or rent the materials through County Purchasing.
Responsible Party: **Utilities Division Manager (or Designee) and/or Design Consultant / Pump Vendor**
4. Communication: Select the appropriate party (South County Operations, North County Operations, Pump Vendor or Contractor) to set-up or tear down the Flood Pump. Contact selected party to schedule set-up or tear down, providing specific timing, design details and materials information.
Responsible Party: **Utilities Division Manager (or Designee)**
5. Set-up/Tear Down: Set-up the Flood Pump according to provided design details or tear down the Flood Pump and store or return materials as directed. Notify Utilities Division Manager, or designee, when complete.
Responsible Party: **South County Operations or North County Operations or Pump Vendor / Contractor**

PART 3 – MAINTENANCE

3-1. ROUTINE MAINTENANCE

3-1.1 GENERAL DESCRIPTION

The Flood Pump needs to be routinely exercised, inspected and maintained in order to ensure it is available and operational when needed. Exercising and inspection of the Flood Pump consists of inspecting the main components and running the pump on a bimonthly basis. Maintenance will include detailed mechanical care and shall be performed annually.

3-1.2 EXERCISING AND INSPECTION

The following actions shall be undertaken to exercise the Flood Pump:

1. Authorization: Coordinate with South County Operations, North County Operations and the Transportation Division Manager or Roads Maintenance Manager at the beginning of each fiscal year to ensure that pump exercising and inspection is entered into the SAP system and performed in accordance with the schedule in Section 3-1.4.

Responsible Party: **Utilities Division Manager (or Designee)**

2. Exercising and Inspection: Contact Utilities Division Manager to advise of date(s) of planned work and to verify the Flood Pump location. Follow the step-by-step procedure in Checklist #3.

Responsible Party: **South County Operations or
North County Operations or
Road Crews**

3. Repairs: If mechanical problems are encountered during exercising and inspection, contact the General Services Mechanic and schedule repairs.

Responsible Party: **South County Operations or
North County Operations or
Road Crews**

4. Follow Up: Upon completion of exercising and inspection and/or any repairs, report completion and any observed problems, recommended needs and/or completed repairs to the Utilities Division Manager or designee.

Responsible Party: **South County Operations or
North County Operations or
Road Crews**

3-1.3 MECHANICAL MAINTENANCE

The following actions shall be undertaken to maintain the Flood Pump:

1. Authorization: Coordinate with the General Services Mechanic at the beginning of each fiscal year to ensure that Flood Pump maintenance is

entered into the SAP system in accordance with the schedule in Section 3-1.4.

Responsible Party: **Utilities Division Manager (or Designee)**

2. Maintenance: Perform all mechanical maintenance recommended in the Flood Pump operation and maintenance manuals.

Responsible Party: **General Services Mechanic**

3-1.4 PERFORMANCE SCHEDULE

The following table provides an annual schedule for Flood Pump exercising and inspection and mechanical maintenance, including parties assigned to perform each activity.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Exercise	NC		SC		RC		NC		SC		RC	
Maintain					GS						GS	

Legend: NC North County Operations RC Road Crews
 SC South County Operations GS General Services Mechanic

NOTE: PERMIT RESTRICTS NON-EMERGENCY OPERATIONS TO 30 HRS/YEAR

PART 4 – OPERATION

4-1. PUMP OPERATION

4-1.1 GENERAL DESCRIPTION

Flood Pump operation generally consists of pump startup, operation and monitoring during use and pump shutdown. The Flood Pump can be operated manually or automatically with a float system.

4-1.2 PERFORMANCE

The following actions shall be undertaken for Flood Pump operation:

1. Flood Monitoring and Initial Notification: During heavy rain events, monitor flooding near the Flood Pump on an hourly basis and notify the Utilities Division Manager, or designee, of potential need for Flood Pump operation.

Responsible Party: **Road Crews**

2. Authorization: Determine the need to operate Flood Pump. Assign Flood Pump operations responsibility to Road Crews, South County Operations or North County Operations for a maximum 8-hour shift. Coordinate with the appropriate Division Manager to assign operations shifts.

Responsible Party: **Utilities Division Manager (or Designee) or
Road Maintenance Manager**

3. Flood Pump Operations: Operate the Flood Pump manually or automatically by following steps in Checklist #2, "Flood Pump Operation".

Responsible Party: **Road Crews or
North County Operations or
South County Operations**

4. Flood Pump Monitoring: Once Flood Pump is running, check the Flood Pump and flooding conditions on an hourly basis. Make adjustments and/or add fuel to the Flood Pump as needed.

Responsible Party: **Road Crews or
North County Operations or
South County Operations**

5. Flood Pump Reporting: Record hourly observations of flood conditions and Flood Pump actions on the Reporting Sheet in Appendix E. Notify Utilities Division Manager, or designee, of conditions and actions taken.

Responsible Party: **Road Crews or
North County Operations or
South County Operations**

6. Operation Direction: Upon receiving hourly reports, assess conditions and provide Flood Pump operation direction, such as pump adjustments,

changes to operation responsibility, personnel shift changes and/or cease pump operations. Coordinate with the appropriate Division Manager to assign operations shifts.

Responsible Party: ***Utilities Division Manager (or Designee) or
Road Maintenance Manager***

4-1.3 REQUIREMENTS & INFORMATION

Pump Monitoring:

- When operational (manual and automatic), the Flood Pump shall not be unsupervised for more than one hour.
- The Flood Pump can run dry without causing damage to the pump.

Pump Operation Shifts:

- Utilities Division Manager, in coordination with the Transportation Division Manager and Roads Maintenance Manager, shall assign 8-hour shifts to operational teams when pump is operational for periods greater than eight hours.
- Road Crews, South County Operations and North County Operations shall keep two staff available to operate the Flood Pump during storm events.
- An operation team shall consist of at least two people.
- At least one staff on an operation team shall be trained in Flood Pump use.

If the Flood Pump is experiencing problems during operation, see Appendix D, "Troubleshooting."

PART 5 – CHECKLISTS

Checklist #1: Daily Pre-Startup Inspection

Checklist #2: Flood Pump Operation

Checklist #3: Flood Pump Exercising and Inspection

CHECKLIST #1: DAILY PRE-STARTUP INSPECTION

Completed by: _____

Date: _____

CHECKLIST #1

DAILY PRE-STARTUP INSPECTION

PURPOSE: This checklist provides inspection items to be completed prior to Flood Pump startup each day in order to avoid pump damage.

1. DIESEL ENGINE

- 1.1 Check engine oil on dipstick by unscrewing the oil fill port cap and pulling out the oil dipstick. Add SAE 10W-30 diesel engine oil as needed. Do not fill above the top mark on the dipstick.

SEE PHOTO 6.1 AT THE END OF THIS CHECKLIST

- 1.2 Check gear box oil by pulling out the oil dipstick. Add SAE 30 gear oil as needed. Do not fill above the top mark on the dipstick.

SEE PHOTO 6.1 AT THE END OF THIS CHECKLIST

- 1.3 Check radiator coolant level (only when engine is cold) by removing the fill cap on top of the radiator. Coolant level should be at bottom of the radiator filler neck. Add heavy duty diesel engine coolant as required. If coolant level is low, check for cooling system for leaks when filling.

SEE PHOTO 6.2 AT THE END OF THIS CHECKLIST

- 1.4 Check fuel level by removing the fill port cap on top of the fuel tank. Add diesel fuel as required.

SEE PHOTO 6.3 AT THE END OF THIS CHECKLIST

- 1.5 Drain water and debris from each fuel filter as needed. To drain, loosen drain valve on each fuel filter all the way so that the valve opens to the hold tabs. Retighten valves when finished.

SEE PHOTO 6.4 AT THE END OF THIS CHECKLIST

- 1.6 Check the rubber automatic dust unloader valve on the air cleaner. Squeeze the unloader valve on the air cleaner assembly to clear away any dust build-up.

SEE PHOTO 6.5 AT THE END OF THIS CHECKLIST

- 1.7 Thoroughly inspect engine compartment for the following:

Radiator for leaks and trash build-up

Air intake system hoses for cracks and loose clamps

- Fan, alternator and drive belts for cracks or damage
- Coolant pump for coolant leaks

Remove trash build-up and have repairs made as needed.

2. CENTRIFUGAL PUMP

- 2.1 Check run-dry seal lubricant reservoir. There is an upper site glass located on one side of the reservoir and a lower site glass located on the opposite side of the reservoir. If the lubricant oil is below the upper site glass, add Royal Purple Barrier Fluid FDA 22 or Synthetic White Oil until lubricant level can be seen in the upper site glass. **DO NOT DRY-RUN THE PUMP IF THE LUBRICANT RESERVOIR LEVEL IS BELOW THE LOWER SITE GLASS.**

SEE PHOTO 6.6 AT THE END OF THIS CHECKLIST

- 2.2 Check piping connections to the discharge and suction flanges to ensure an air tight connection. Tighten flange bolts as needed.

3. VACUUM SYSTEM

- 3.1 Check the hydraulic oil reservoir level with the side mounted site glass. Add AW-68 hydraulic oil through the fill port as needed.

SEE PHOTO 6.7 AT THE END OF THIS CHECKLIST

- 3.2 Drain water condensation from the hydraulic oil reservoir by opening removing the cap and opening the hydraulic oil reservoir drain valve.

SEE PHOTO 6.7 AT THE END OF THIS CHECKLIST

4. BATTERY

- 4.1 Check to make sure 12V battery is fully charged. Charge or jump as needed.

SEE PHOTO 6.8 AT THE END OF THIS CHECKLIST

5. FLOATS – (Only for Automatic Pump Operation)

- 5.1 Check to make sure float cables are connected to the control panel terminals located at the bottom of the control panel.

- 5.2 Check to make sure floats are untangled and are set at the appropriate levels.

SEE PHOTO 6.9 AT THE END OF THIS CHECKLIST

6. PHOTOS

6.1 ENGINE / GEARBOX OIL



Engine oil fill cap



Gearbox oil dipstick

6.2 ENGINE COOLANT



Radiator



Radiator fill cap

6.3 ENGINE FUEL



Fuel Tank

Fuel Fill Port

6.4 ENGINE FUEL FILTERS



Drain Valves

Fuel filters

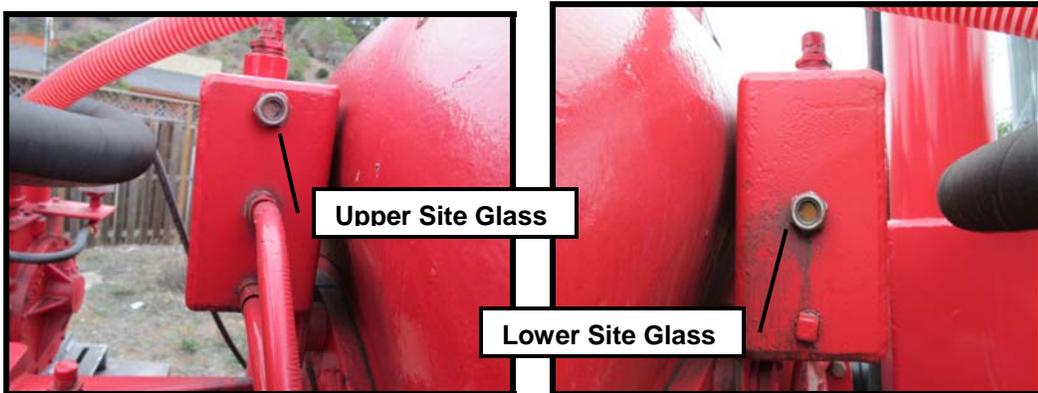
6.5 AIR CLEANER



Automatic Dust Unloader Valve

Air cleaner

6.6 RUN-DRY SEAL LUBRICANT RESERVOIR



Upper Site Glass

Lower Site Glass

Lubricant Reservoir

6.7 HYDRAULIC OIL RESERVOIR LEVEL



Side Mounted Site Glass

Reservoir Drain Valve and Cap

Hydraulic Oil Reservoir

6.8 12V BATTERY



Solar Panel Cable

6.9 AUTOMATIC FLOAT SYSTEM



Floats

CHECKLIST #2: FLOOD PUMP OPERATION

Completed by: _____

Date: _____

CHECKLIST #2

FLOOD PUMP OPERATION

PURPOSE: This checklist provides steps for Flood Pump operation.

SAFETY: ONLY trained personnel shall operate the Flood Pump.

1. PRE-STARTUP INSPECTION

- 1.1 Perform pre-start up inspection (Checklist #1) prior to starting the Flood Pump each day.

2. MANUAL PUMP OPERATION – (See Section 3 for Automatic Operation)

- 2.1 Check to make sure the clutch switch on the control panel is disengaged (in the down position). The clutch switch is located between the control panel lock box and the control panel on the left side of the control panel. The switch can only be accessed by reaching around the back side of the control panel.

SEE PHOTOS 5.1 AND 5.2 AT THE END OF THIS CHECKLIST

- 2.2 Disconnect the solar battery charger cable from the negative terminal on the 12V battery to enable the battery to power the engine starter.

SEE PHOTO 5.3 AT THE END OF THIS CHECKLIST

- 2.3 Rotate the key switch on the control panel clockwise to the “RUN” position to turn the engines electronics on.

SEE PHOTO 5.1 AT THE END OF THIS CHECKLIST

- 2.4 Record run-time hours displayed on the control panel on the Air Pollution Control Engine Log, located in the JoBox on the pump.

- 2.5 To start the engine, rotate the key switch clockwise to the spring-loaded position “CRANK” to engage the starter motor and then release so that it springs back into the “RUN” position.

- 2.6 Run the engine at or below 1200 rpm with no load for 1-2 minutes to ensure proper lubrication. Adjust engine speed with the up (rabbit) and down (turtle) buttons on the control panel.

SEE PHOTO 5.1 AT THE END OF THIS CHECKLIST

- 2.7 To engage the pump, push the clutch switch (on left side of control panel) upward to the up position.

- 2.8 Slowly throttle the engine speed up to 1800 rpm by repeatedly pressing the up (rabbit) button on the control panel.
- 2.9 To allow the pump to prime, open the ball valve located near the top of the air chamber and attached to the hose leading to the vacuum pump.
SEE PHOTO 5.4 AT THE END OF THIS CHECKLIST
- 2.10 After vacuum develops and water begins pumping, close ball valve on the hose leading to the vacuum unit.
- 2.11 Adjust engine speed to the desired RPM with the up (rabbit) and down (turtle) buttons on the control panel to meet pumping needs. **DO NOT RUN THE ENGINE UNDER 1,000 RPM OR OVER 2,200 RPM WHILE PUMPING.**
- 2.12 To stop pumping, slowly throttle the engine speed down below 1200 rpm by repeatedly pressing the down (rabbit) button. When engine is throttled down, disengage the pump by pushing the clutch switch (on left side of control panel) downward into the down position.
- 2.13 Run the engine at or below 1200 rpm with no load for 1-2 minutes to cool the engine down.
- 2.14 To stop the engine, turn the key switch counterclockwise to the "OFF" position.
- 2.15 Record run-time hours displayed on the control panel on the Air Pollution Control Engine Log, located in the JoBox on the pump.
- 2.16 Reconnect the solar battery charger cable to the negative terminal on the 12V battery to enable the battery to charge after pump operations.

3. AUTOMATIC PUMP OPERATION

- 3.1 Check to make sure the clutch switch on the control panel is disengaged (in the down position). The clutch switch is located between the control panel lock box and the control panel on the left side of the control panel. The switch can only be accessed by reaching around the back side of the control panel.

SEE PHOTOS 5.1 AND 5.2 AT THE END OF THIS CHECKLIST

- 3.2 Disconnect the solar battery charger cable from the negative terminal on the 12V battery to enable the battery to power the engine starter.

SEE PHOTO 5.3 AT THE END OF THIS CHECKLIST

- 3.3 Rotate the key switch on the control panel counterclockwise to the "AUTO" position. Display will indicate "Auto Start ARMED".

SEE PHOTO 5.1 AT THE END OF THIS CHECKLIST

- 3.4 Record run-time hours displayed on the control panel on the Air Pollution Control Engine Log, located in the JoBox on the pump.

- 3.5 To allow the pump to prime, open the ball valve located near the top of the air chamber and attached to the hose leading to the vacuum pump. ONLY OPEN VALVE HALFWAY TO PREVENT EXCESSIVE WATER CONDENSATION.

SEE PHOTO 5.4 AT THE END OF THIS CHECKLIST

- 3.6 Upon closing of both floats, the controller will start the engine and operate the throttle and the pump automatically based on preset rpm levels for engine warm-up and pumping.

- 3.7 Opening both floats will begin the preset engine cool-down and shutdown sequence.

- 3.8 Record run-time hours displayed on the control panel on the Air Pollution Control Engine Log, located in the JoBox on the pump.

- 3.9 To disengage automatic pump operation or to stop the engine, turn the key switch clockwise to the "OFF" position.

- 3.10 Fully close the ball valve located near the top of the air chamber and attached to the hose leading to the vacuum pump.

- 3.11 Reconnect the solar battery charger cable to the negative terminal on the 12V battery to enable the battery to charge after pump operations.

4. REPORTING

- 4.1 Fill out the Air Pollution Control Engine Log (located in the JoBox) to record pump operations.

- 4.2 During emergency operations, monitor Flood Pump hourly and record observations/actions on the Hourly Pump Operations Status Reports Sheet in Section 6 of this checklist.

5. PHOTOS

5.1 PUMP CONTROL PANEL



Control panel

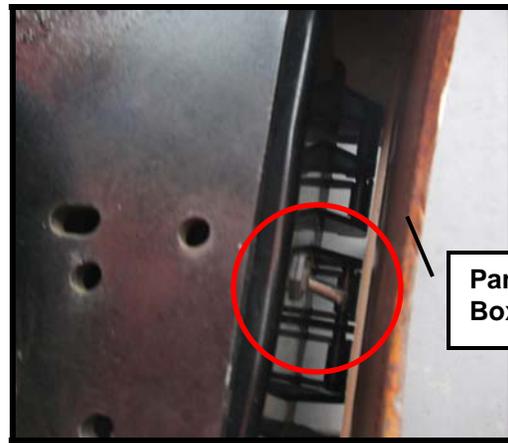


Throttle buttons & key switch

5.2 CLUTCH SWITCH



Control panel lock box (left side)



Clutch switch (from back of panel)

5.3 BATTERY SOLAR CHARGER



5.4 VACUUM SYSTEM BALL VALVE



Air chamber & vacuum pump hose



Ball valve on air hose

CHECKLIST #3: FLOOD PUMP EXERCISING & INSPECTION

Completed by: _____

Date: _____

CHECKLIST #3

FLOOD PUMP EXERCISING & INSPECTION

PURPOSE: This checklist provides steps for the bi-monthly Flood Pump exercising and inspection.

1. SAFETY TRAINING

- 1.1 Read Appendix C, Safety Information, while at the site of the Flood Pump. Visually identify hazard areas/parts on or around the Flood Pump, as noted therein.
- 1.2 Read Checklist #1 and Checklist #2 for a general understanding of Flood Pump inspection and operation.

2. FLOOD PUMP INSPECTION

- 2.1 Check the Flood Pump site for trash and other items that could hinder operation of the Flood Pump. Remove items as necessary.
- 2.2 Perform a complete Pre-startup Inspection by following all the steps in Checklist #1.
- 2.2 Record any abnormalities discovered during the Pre-startup Inspection (i.e. leaks, low oil levels, cracked hoses, etc.).
- 2.3 Check for rusted areas on the Flood Pump and record locations.

3. FLOOD PUMP EXERCISING

- 3.1 **MANUAL EXERCISING**
 - 3.1.1 Simulate manual Flood Pump operation by following steps 2.1 through 2.16 in Checklist #2, "Flood Pump Operation", except as noted below:
 - Do not keep pump engaged (clutch switch in up position) for longer than 5 minutes (Steps 2.7 through 2.12)
 - Pump will not prime without water. Only simulate steps 2.9 and 2.10 briefly if water is not available.
 - 3.1.2 Record any problems or abnormal occurrences.

PART 6 - APPENDICES

Appendix A: Pump Specifications & Schematic Drawings

Appendix B: Contact Information

Appendix C: Safety Information

Appendix D: Troubleshooting

Appendix E: Reporting Sheet

Appendix F: Air Pollution Control Permit

APPENDIX A: PUMP SPECIFICATIONS & SCHEMATIC DRAWINGS

UNIT SPECIFICATION SHEET

PART NO 18NCRD **UNIT SERIAL NO** 18NCRD-1120
MODEL NO 18NCRD-CIS-C30W02J29
MFG DATE 8/22/2011



DRIVE SYSTEM SPECIFICATIONS

ENGINE/MOTOR JOHN DEERE 6090HF485
SERIAL NO. RG6090L105302
FUEL FILTER RE525523
AIR FILTER P77-7868/P77-7869
OIL FILTER RE509672
KEY 601
VOLTAGE/BATTERY 4D SERIES
BELT STYLE 3V x 500 2
DRIVER PULLEY 2-3V 6.50 **DRIVEN PULLEY** 2-3V 6.5
COUPLING CFDS14

PUMP END SPECIFICATIONS

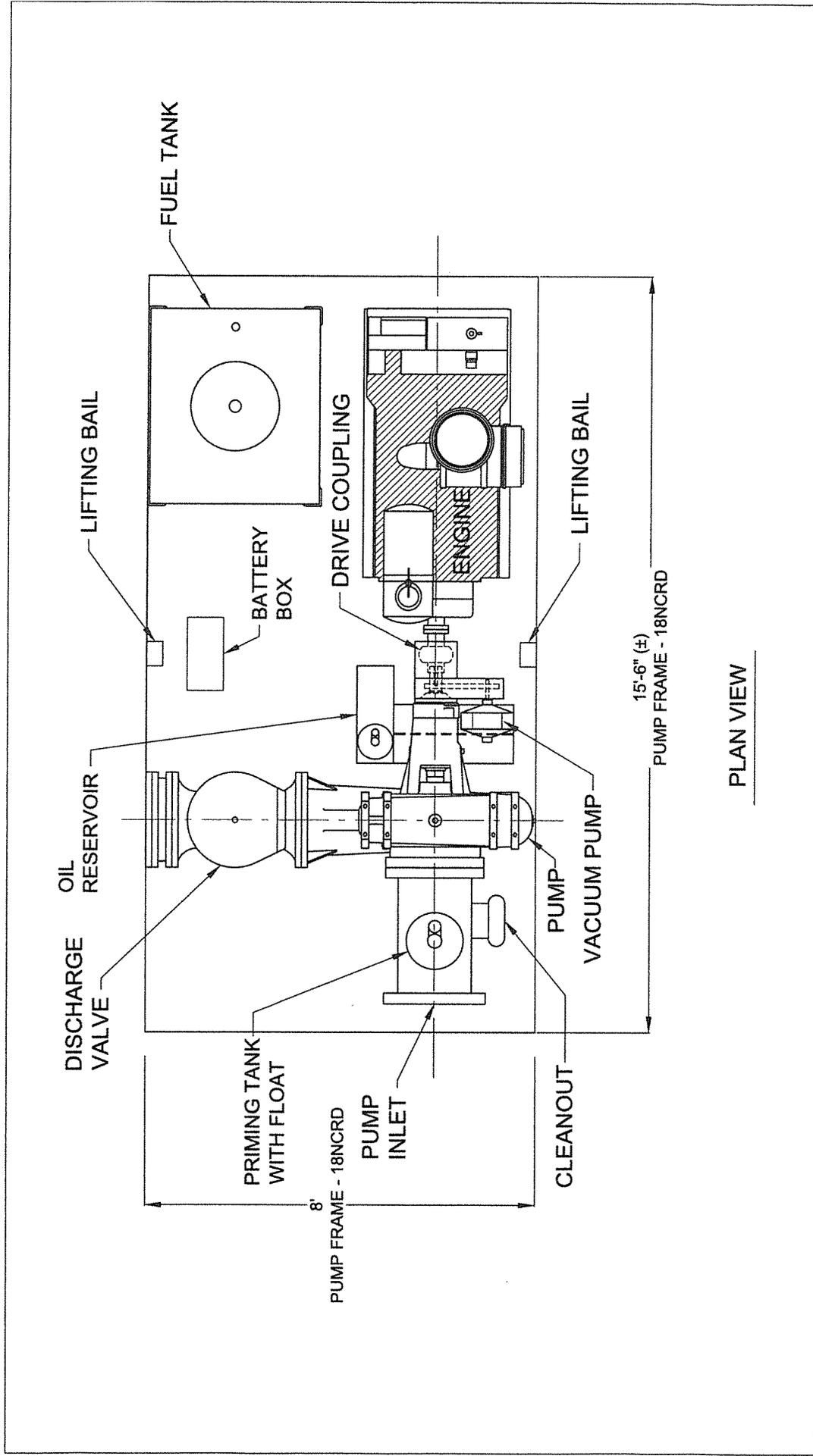
PUMP MODEL 16NHG-22 CORNELL 151798
AIR SEPARATOR PRIMING TEE
FLOAT SYSTEM GRIFFIN CLASSIC
OIL COOLER INTEGRAL TO TEE

VACUUM PUMP SPECIFICATIONS

VACUUM PUMP WALLY 202HR 20220112192
LUBRICATOR OIL-RITE HEX

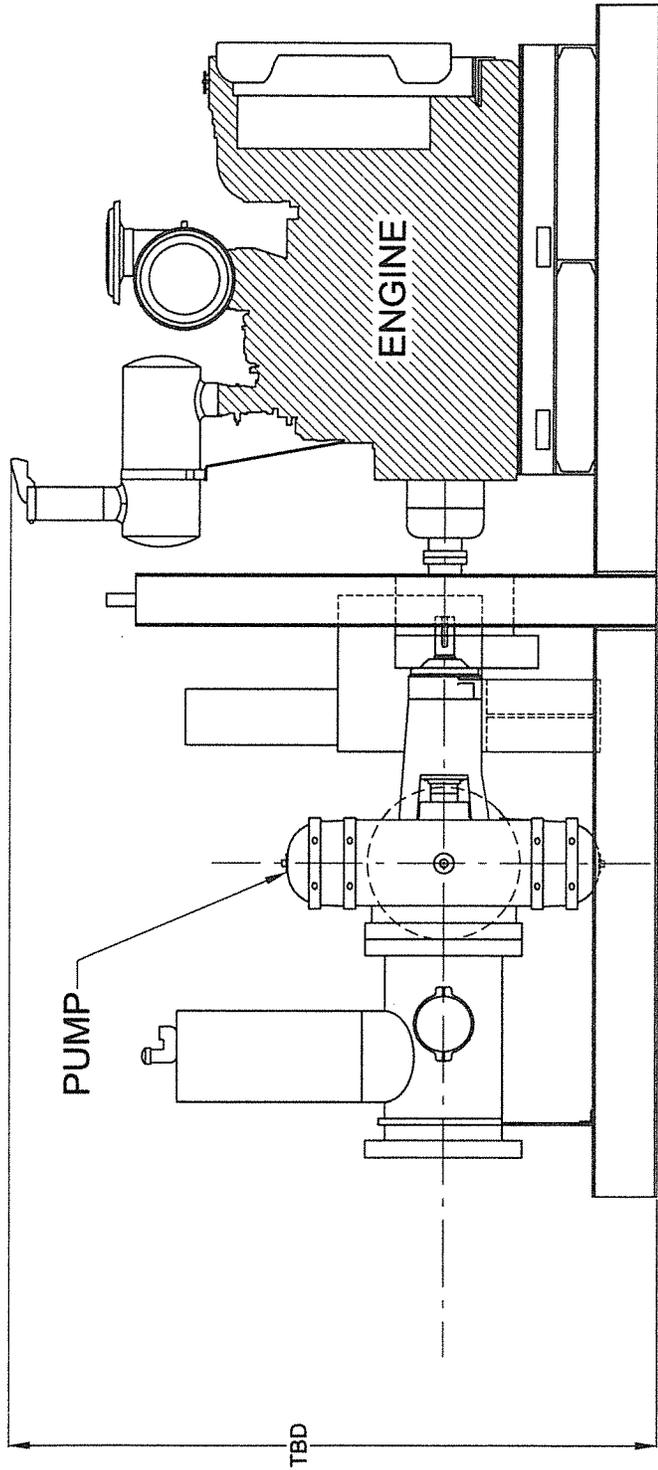
FRAME SPECIFICATIONS

FRAME I-BEAM FRAME SPECIAL
DIMENSIONS 96" x 186" x 72" 10500 lbs.
MISC AW68 HYD OIL, SKID GALVANIZED W/ DECK PLATE, REDUCTION CLUTCH ZF304 S/N 20078722



PLAN VIEW

<p>GRIFFIN CONSTRUCTION SERVICES GROUP 5306 CLINTON DRIVE HOUSTON, TX 77020 TEL: (713) 676-8000 FAX: (713) 676-8080 E MAIL: griffin@griffindewatering.com WEBSITE: www.griffindewatering.com</p>		<p>SAN LOUIS OBISPO, CALIFORNIA</p>		<p>DRAWN: J. CURRY</p>
<p>REV.</p>		<p>DESCRIPTION</p>		<p>SCALE: N.T.S.</p>
<p>This drawing is the property of Griffin Dewatering Corporation and its associated companies and is intended only for its sole or authorized use. It may contain proprietary, public or authorized third party information. Any alteration of this drawing is prohibited, without the express, written consent of an authorized representative of Griffin Dewatering Corporation.</p>		<p>18NCRD - 1120 P.O. # 22006538</p>		<p>DATE: 03-08-2012</p>
<p>MAJOR COMPONENTS - PLAN VIEW</p>		<p>DATE BY APPVD.</p>		<p>DWG: 01</p>

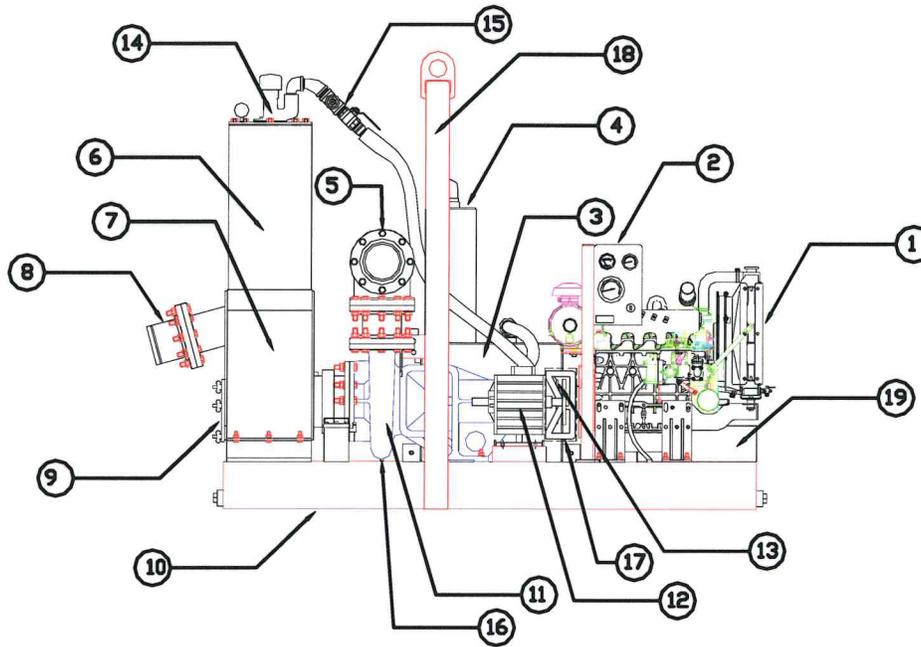


ELEVATION VIEW

GRIFFIN CONSTRUCTION SERVICES GROUP 5306 CLINTON DRIVE HOUSTON, TX 77020 TEL: (713) 676-8000 FAX: (713) 676-8080 E MAIL: griffin@griffindewatering.com WEBSITE: www.griffindewatering.com		SAN LOUIS OBISPO, CALIFORNIA 18NCRD - 1120 P.O. # 22006538 MAJOR COMPONENTS - ELEVATION VIEW		DRAWN: J. CURRY SCALE: N.T.S. DATE: 05-08-2012 DWG: 02
REV.	DESCRIPTION	DATE	BY	APPVD.
	This drawing is the property of Griffin Dewatering Corporation and its associated companies and is intended only for its sole or authorized use. It may contain proprietary, public or authorized third party information. Any alteration of this drawing is prohibited, without the express, written consent of an authorized representative of Griffin Dewatering Corporation.			



FIGURE 1 – VARIABLE-USE NON-CLOG PUMP



1. Engine
2. Control Panel
3. Oil Separation Tank
4. Air Discharge
5. Discharge Valve
6. Float Chamber
7. Air Separation Tank
8. Suction Flange with Nipple (Optional)
9. Air Separation Tank Drain
10. Fuel Tank or Skid
11. Centrifugal Pump
12. Vacuum Pump
13. Drive System (Belts, Flexible Coupling, and Sheaves)
14. Float Assembly
15. Suction Air Line
16. Volute Drain Plug
17. Belt Guard
18. Lifting Bail
19. Battery Box

APPENDIX B: CONTACT INFORMATION

FLOOD PUMP
QUICK REFERENCE CONTACT LIST

During Office Hours:

San Luis Obispo County Public Works Department..... (805) 781-5252

Utilities Division Manager (Dean Benedix)..... (805) 781-5267
..... Cell: (805) 441-1237

Road Maintenance Manager (Jeremy Ghent)..... (805) 781-5293
..... Cell: (805) 305-2444

Transportation Manager (Glenn Marshall) (805) 781-1596
..... Cell: (805) 709-0197

Deputy Director (Dave Flynn)..... (805) 781-4463
Director (Paavo Ogren)..... (805) 781-5291

Road Crews (contact Road Maintenance Manager) (805) 781-5293
North County Operations (Charlie Berna) (805) 438-5349
..... Cell: (805) 610-5202

South County Operations (Ron Coleman) (805) 473-7153
..... Cell: (805) 674-1951

General Services Mechanics
 Darren Whittington (805) 781-5123
 David Pelliteri (805) 781-5886

Cambria CSD (805) 927-6223

Outside Office Hours:

San Luis Obispo County Public Works Department..... (805) 781-5252
UDOC..... (805) 781-4264

Manufacturer Contacts:

Griffin Pump & Equipment (866) 770-8100
 Tim Boicourt (909) 986-4498
 Cell: (951) 453-3362
 Thomas Aldridge (713) 671-7067
 Cell: (713) 539-5749

Wallenstein Vacuum Pumps (800) 801-6663
Controls Incorporated..... (330) 239-4345
Cornell Pump Company (503) 653-0330

Piping Suppliers:

Rain For Rent..... (661) 399-1724

APPENDIX C: SAFETY INFORMATION

SAFETY INFORMATION

Engine Safety

Safety

Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



DX,ALERT -19-29SEP98-1/

T81389—UN—07DEC88

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

▲ DANGER

▲ WARNING

▲ CAUTION

DX,SIGNAL -19-03MAR93-

TS187—19—30SEP88

Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.



If you do not understand any part of this manual and need assistance, contact your John Deere dealer.

DX,READ -19-16JUN08

TS201—UN—23AUG88

Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



TS201 —JUN—23AUG88

DX,SIGNS1 -19-04JUN90-1/1

Prevent Machine Runaway

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.



TS177 —JUN—11JAN89

DX,BYPAS1 -19-29SEP98-1/1

Handle Fuel Safely—Avoid Fires

Handle fuel with care: it is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.

Always stop engine before refueling machine. Fill fuel tank outdoors.

Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.



TS202 —JUN—23AUG88

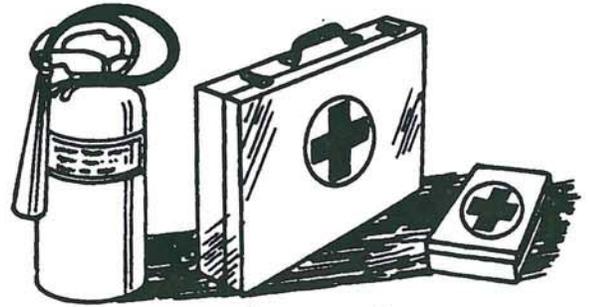
DX,FIRE1 -19-03MAR93-1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



DX,FIRE2 -19-03MAR93

TS291 —UN—23AUG88

Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



DX,FIRE3 -19-16APR9

481A009

Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

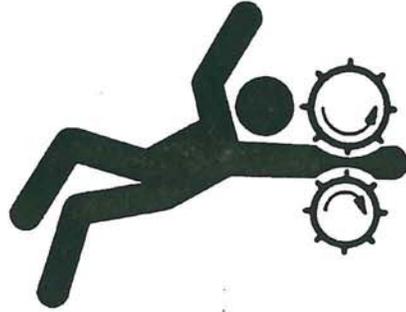


DX,FLAME -19-29SEP

Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



TS228—UN—23AUG88

DX,LOOSE -19-04JUN90-1/1

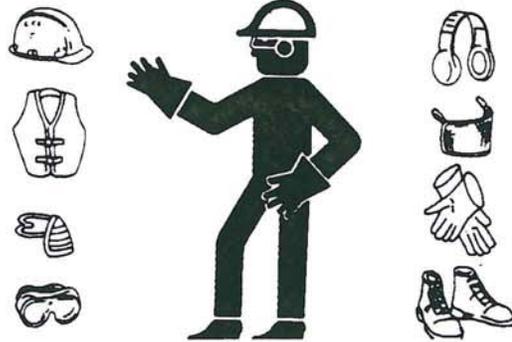
Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



TS206—UN—23AUG88

DX,WEAR -19-10SEP90-1/1

Protect Against Noise

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



TS207—UN—23AUG88

DX,NOISE -19-03MAR93-1/1

Handle Chemical Products Safely

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



TS1132—UN—26NOV90

DX,MSDS.NA -19-03MAR93-1/1

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep all shields in place at all times. Make sure rotating shields turn freely.

Wear close-fitting clothing. Stop the engine and be sure that all rotating parts and drivelines are stopped before making adjustments, connections, or performing any type of service on engine or machine driven equipment.



TS1644—UN—22AUG95

DX,ROTATING -19-18AUG09-1/1

Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.



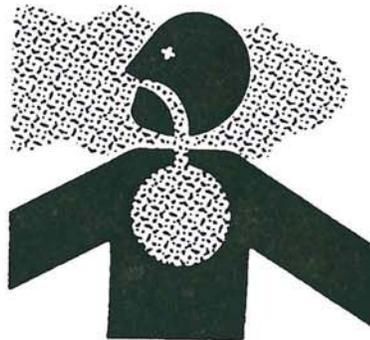
TS218 —UN—23AUG88

DX,SERV -19-17FEB99-1/1

Work In Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.



TS220 —UN—23AUG88

DX,AIR -19-17FEB99-1/1

Avoid High-Pressure Fluids

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available in English from Deere & Company Medical Department in



X9811 —UN—23AUG88

Moline, Illinois, U.S.A., by calling 1-800-822-8262 or +1 309-748-5636.

DX,FLUID -19-20AUG09-1/1

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can accidentally burst when heat goes beyond the immediate flame area.



TS953 —UN—15MAY90

DX,TORCH -19-10DEC04-1/1

Do Not Open High-Pressure Fuel System

High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair of fuel lines, sensors, or any other components between the high-pressure fuel pump and nozzles on engines with High Pressure Common Rail (HPCR) fuel system.

Only technicians familiar with this type of system can perform repairs. (See your John Deere dealer.)



TS1343 —UN—18MAR92

DX,WW,HPCR1 -19-07JAN03-1/1

Remove Paint Before Welding or Heating

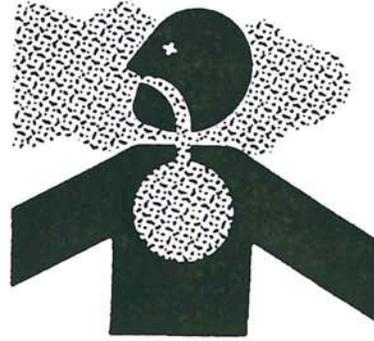
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Remove paint before heating:

- Remove paint a minimum of 100 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

Do not use a chlorinated solvent in areas where welding will take place.



TSS20—UN—23AUG88

Do all work in an area that is well ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.

DX,PAINT -19-24JUL02-1/1

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TSS281—UN—23AUG88

DX,RCAP -19-04JUN90-1/1

Install All Guards

Rotating cooling system fans, belts, pulleys, and drives can cause serious injury.

Keep all guards in place at all times during engine operation.

Wear close-fitting clothes. Stop the engine and be sure fans, belts, pulleys, and drives are stopped before making adjustments, connections, or cleaning near fans and their drive components.



TSS677—UN—21SEP89

DX,GUARDS -19-18AUG09-1/1

Avoid Hot Exhaust

Servicing machine or attachments with engine running can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.

Exhaust parts and streams become very hot during operation. Exhaust gases and components reach temperatures hot enough to burn people, ignite, or melt common materials.



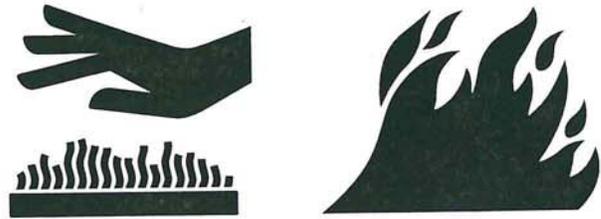
RG17488 —UN—21AUG09

DX,EXHAUST -19-20AUG09-1/1

Exhaust Filter Cleaning

Servicing machine or attachments during exhaust filter cleaning can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.

During auto or manual/stationary exhaust filter cleaning operations, the engine will run at elevated idle and hot temperatures for an extended period of time. Exhaust gases and exhaust filter components reach temperatures hot enough to burn people, or ignite, or melt common materials.



RG17488 —UN—21AUG09

DX,FILTER -19-20JAN10-1/1

Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.



TS220 —UN—23AUG88

Keep bystanders away from the area.

DX,DUST -19-15MAR91-1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



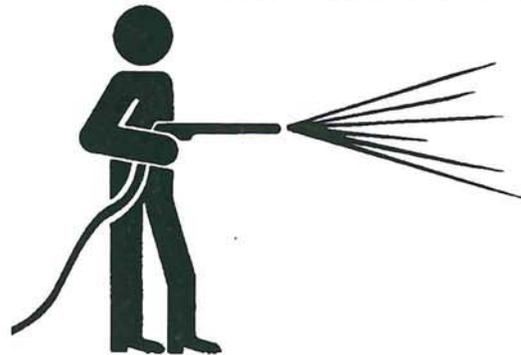
TS204 — UN—23AUG88

DX.SPARKS -19-03MAR93-1/1

Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



T6642EJ — UN—18OCT88

DX.CLEAN -19-04JUN90-1/1

Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



TS223 — UN—23AUG88

DX.LIGHT -19-04JUN90-1/1

Handling Batteries Safely

Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove grounded (-) battery clamp first and replace grounded clamp last.

Sulfuric acid in battery electrolyte is poisonous and strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid hazards by:

- Filling batteries in a well-ventilated area
- Wearing eye protection and rubber gloves
- Avoiding use of air pressure to clean batteries
- Avoiding breathing fumes when electrolyte is added
- Avoiding spilling or dripping electrolyte
- Using correct jump-start procedure

If acid is spilled on skin or in eyes:

1. Flush skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 qt.).
3. Get medical attention immediately.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**



TS204 —UN—23AUG88



TS203 —UN—23AUG88

DX,WW,BATTERIES -19-13OCT09-1/1

Protect Against High Pressure Spray

Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.

If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



TS1343 —UN—18MAR92

DX,SPRAY -19-16APR92-1/1

Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



TS226 —JUN—23AUG88

DX,LIFT -19-04JUN90-1/1

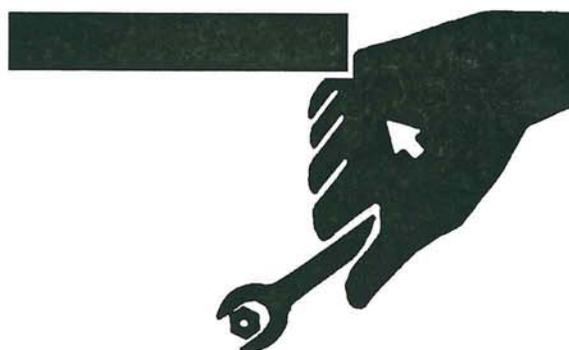
Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.



TS779 —JUN—08NOV89

DX,REPAIR -19-17FEB99-1/1

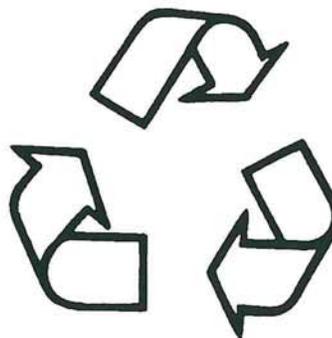
Dispose of Waste Properly

Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.



TS1133 —JUN—26NOV90

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.

DX,DRAIN -19-03MAR93-1/1

California Proposition 65 Warning

Diesel engine exhaust, some of its constituents, along with certain machine components contain or emit chemicals known to the State of California to cause cancer and birth

defects or other reproductive harm. In addition, certain fluids contained in the machine and certain products of component wear contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

RG41061,000001F -19-12JAN10-1/1

Pump Safety

CAUTION/WARNING PAGE

START-UP INSTRUCTIONS – PAGE 3200-326

CAUTION: Single port impellers (food pumps) have threaded shafts. Improper rotation will cause failure.
WARNING: Never operate electric motors or pumps without protective cover, etc. Before disconnecting any electrical wiring, shut off the main switch, or serious personal injury may result.

CAUTION: If pumpage does not start immediately, no amount of additional pumping will solve the problem.
WARNING: Do not run pumps equipped with mechanical seal dry.

CAUTION: Do not exceed maximum recommended operating pressure for the pump. Consult factory as needed.
WARNING:

PRESSURE TESTING – PAGE 3200-353

WARNING: Failure to follow instructions on this may damage pump or cause serious personal injury.
CAUTION: Do not operate pump when at test pressure.
CAUTION: For mechanical seal only. Do not run dry.

IMPELLER LOCKSCREW INSTALLATION – PAGE 3200-14

CAUTION: Lockscrew failure can damage impeller and volute. Proper torque during installation is important.

BELT DRIVES/FLEXIBLE COUPLINGS – PAGE 3200-311

CAUTION: All rotating parts should be properly protected. Guards should be installed. Do not operate pumps when the guards are removed.

CHOPPER IMPELLER AND CUTTER-BAR INSTRUCTIONS – PAGE 3200-355

WARNING: Chopper impellers and cutter bars have VERY SHARP edges. DO NOT place body parts in suction spool, pump inlet, or clean-outs at any time. Wear protective gloves when working on chopper impellers, cutter bars, and associated components.

INSTRUCTIONS FOR MECHANICAL SEAL – PAGE 3200-632

CAUTION: Do not run pump dry unless pump is equipped with Run-Dry option.
CAUTION: Once the rotating portion has been placed on the shaft, the rest of the installation must be made at once.

**DISMANTLING AND ASSEMBLING F18 AND EM18 CORNELL PUMP FRAMES – PAGE
3200-821**

CAUTION: Never hammer the shaft or parts attached to the shaft or you will ruin both the shaft and the bearings.

DISMANTLING AND ASSEMBLING F18DB, EM18DB, AND F18DBK – PAGE 3200-826

CAUTION: Never hammer the shaft or parts attached to the shaft or you will ruin both the shaft and the bearings.

**DISMANTLE AND REASSEMBLE A CORNELL PUMP WITH THREADED SHAFT – PAGE
3200-417**

CAUTION: If the sleeve has an “O” ring it should not be heated.

**DISMANTLING AND ASSEMBLING EM5/F5 AND EM5K/F5K CORNELL FRAME PUMPS –
PAGE 3200-459**

CAUTION: Never hammer the shaft or parts attached to the shaft or you will ruin both the shaft and the bearings.

**DISMANTLING AND ASSEMBLING F16 AND F16K CORNELL FRAME PUMPS – PAGE
3200-810**

CAUTION: Never hammer the shaft or parts attached to the shaft or you will ruin both the shaft and the bearings.

MOUNTING PUMPS TO ENGINES – PAGE 3200-12

CAUTION: All engine driven pumps must be supported and alignment must be assured before bolting frame to engine flywheel housing.

OPERATION OF COMPRESSORS LOCATED IN CLOSE PROXIMITY TO PUMP

WARNING: Do not allow compressed air to pressurize the pump or vent-off compressed air through the pump as this may damage pump or cause serious personal injury.

MSDS Sheets



604447-00 TERESSTIC 68
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: TERESSTIC 68
SUPPLIER: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency (Primary) CHEMTREC: 800-424-9300
(Secondary) 281-834-3296

Product and Technical Information:

Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 713-613-3661
MSDS Internet Website: <http://www.exxon.com>, <http://www.mobil.com>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES

GLOBALLY REPORTABLE MSDS INGREDIENTS:

None.

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).

EMERGENCY OVERVIEW: Straw Liquid. DOT ERG No. : NA

POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)

INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.

INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): 202(396) (ASTM D-93).

Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%

NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.

WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

When mists/aerosols can occur, the following are recommended: 5 mg/m³ (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m³ (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m³ (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.

RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.

EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid

COLOR: Straw
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): NE
MELTING POINT C(F): NA
FLASH POINT C(F): 202(396) (ASTM D-93)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.87
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 68.0
VISCOSITY AT 100 C, cSt: 8.6
POUR POINT C(F): < -21(-6)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not

performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this product, this assessment is based on information for representative products.

ECOTOXICITY: Available ecotoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.

MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.

PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.

BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.

RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.

IATA: NOT REGULATED BY IATA.

STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, METI, and DSL.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS *
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*** NO REPORTABLE INGREDIENTS ***

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: TURBINE OIL

NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBs.

Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:

INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INDUSTRIAL LABEL

Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.

For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 604447-00,
CMCS97: 97P668, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 17OCT2002

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Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA

APPENDIX D: TROUBLESHOOTING

FLOOD PUMP TROUBLESHOOTING

Engine Troubleshooting

Engine Troubleshooting

NOTE: Before troubleshooting the engine, first retrieve any fault codes on the diagnostic gauge display

and perform the corrective actions. (See earlier in this section.) If any problems remain, use the following charts to solve engine problems.

Symptom	Problem	Solution
Engine Will Not Crank	Weak battery	Replace battery.
	Corroded or loose battery connections	Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
Hard to Start or Will Not Start	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Slow cranking speed	Check for problem in the charging/starting system.
	Too high viscosity crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System Problem or Basic Engine Problem	See your John Deere engine distributor or servicing dealer.
Engine Misfiring or Runs Irregularly	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Lack of Engine Power	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Plugged fuel filter	Replace fuel filters.
	Engine overloaded	Reduce engine load.
	Improper crankcase oil	Drain crankcase oil and replace with correct viscosity oil.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
Black or Gray Exhaust Smoke	Engine overloaded	Reduce engine load.
	Engine burning oil	See <u>LUBRICATION SYSTEM TROUBLESHOOTING</u> , later in this section.
	Air cleaner restricted or dirty	Replace air cleaner element as required.

Continued on next page

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Troubleshooting

Symptom	Problem	Solution
White Exhaust Smoke	Defective muffler/exhaust piping (causing back-pressure)	Replace muffler or defective piping.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
	Engine compression too low	Determine cause of low compression and repair as required. See your John Deere engine distributor or servicing dealer.
	Defective thermostat(s) (does not close)	Test thermostats; replace thermostats as required.
Engine Idles Poorly	Coolant entering combustion chamber (failed cylinder head gasket or cracked cylinder head)	Repair or replace as required. See your John Deere engine distributor or servicing dealer.
	Electronic Control System problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Air leak on suction side of air intake system.	Check hose and pipe connections for tightness; repair as required.
Excessive Fuel Consumption	Electronic control system problem or basic engine problem	See your John Deere engine distributor or servicing dealer.
	Engine overloaded	Reduce engine load.
	Air cleaner restricted or dirty	Replace air cleaner element as required.
	Compression too low	Determine cause of low compression and repair as required.
	Leaks in fuel supply system	Locate source of leak and repair as required.
	Improper type of fuel.	Use proper type of fuel.
	Poor fuel quality	Drain fuel and replace with quality fuel of the proper grade.
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.
	Fuel injectors defective.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.

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Troubleshooting

Symptom	Problem	Solution
	Improper turbocharger operation.	Inspect turbocharger. See your authorized servicing dealer or engine distributor.
	Low engine temperature.	Check thermostats.
Fuel in Oil	Cracked cylinder head	Locate crack, repair/replace components as required. See your John Deere engine distributor or servicing dealer.
Low-Pressure System - Fuel Pressure Low	Plugged fuel filter	Replace fuel filter.
	Restricted fuel line	Locate restriction, repair as required.
	Faulty high-pressure fuel pump	Remove fuel pump, repair/replace pump as required. See your John Deere engine distributor or servicing dealer.
Abnormal Engine Noise <i>NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.</i> <i>Do not confuse the whine heard during turbocharger run down with noise which indicates a bearing failure. The whine heard during turbocharger run down is normal.</i>	Worn main or connecting rod bearings	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
	Excessive crankshaft end play	Check crankshaft end play. See your John Deere engine distributor or servicing dealer.
	Loose main bearing caps	Check bearing clearance; replace bearings and bearing cap screws as required. See your John Deere engine distributor or servicing dealer.
	Worn connecting rod bushings and piston pins	Inspect piston pins and bushings. See your John Deere engine distributor or servicing dealer.
	Scored pistons	Inspect pistons. See your John Deere engine distributor or servicing dealer.
	Worn timing gears or excess backlash	Check timing gear back lash. See your John Deere engine distributor or servicing dealer.

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Troubleshooting

Symptom	Problem	Solution
	Excessive valve clearance	Check and adjust valve clearance. See your John Deere engine distributor or servicing dealer.
	Worn camshaft lobes	Inspect camshaft. See your John Deere engine distributor or servicing dealer.
	Worn rocker arm shaft(s)	Inspect rocker arm shafts. See your John Deere engine distributor or servicing dealer.
	Insufficient engine lubrication	See <u>LUBRICATION SYSTEM TROUBLESHOOTING</u> , later in this section.
	Turbocharger noise	See <u>AIR INTAKE SYSTEM TROUBLESHOOTING</u> , later in this section.
Engine emits white smoke	Improper type of fuel.	Use proper fuel.
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective fuel injectors.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.
Engine emits black or gray exhaust smoke	Improper type of fuel.	Use proper fuel.
	Clogged or dirty air cleaner.	Service air cleaner.
	Engine overloaded.	Reduce load.
	Fuel injectors dirty.	See your authorized servicing dealer or engine distributor.
	High pressure fuel pump out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
Engine Overheats	Engine overloaded.	Reduce load.
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.

Continued on next page

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Troubleshooting

Symptom	Problem	Solution
	Faulty radiator cap.	Have technician check.
	Stretched poly V-belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.
	Low engine oil level.	Check oil level. Add oil as required.
	Cooling system needs flushing.	Flush cooling system.
	Defective or wrong type of thermostats.	Remove and check thermostats.
	Defective temperature gauge or sender.	Check coolant temperature with thermometer and replace, if necessary.
	Incorrect grade of fuel.	Use correct grade of fuel.

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Electrical Troubleshooting

Symptom	Problem	Solution
Undercharged system	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter, or alternator.	Inspect and clean as necessary.
	Defective battery.	Test batteries.
Battery used too much water	Defective alternator.	Test charging system.
	Cracked battery case.	Check for moisture and replace as necessary.
Batteries will not charge	Battery charging rate too high.	Test charging system.
	Loose or corroded connections.	Clean and tighten connections.
Starter will not crank	Sulfated or worn-out batteries.	See your authorized servicing dealer or engine distributor.
	Stretched belt or defective belt tensioner.	Adjust belt tension or replace belts.
	Engine drivelines engaged.	Disengage engine drivelines.
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage or discharged battery.	Charge or replace batteries.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
	Blown fuse.	Replace fuse.
Starter cranks slowly	Clean battery terminals and connections.	Clean battery terminals and connections.
	Defective main switch or start safety switch	Repair switch as required.
	Starter solenoid defective	Replace solenoid.
	Starter defective	Replace starter.
Starter cranks slowly	Low battery output.	Charge batteries.
	Crankcase oil too heavy.	Use proper viscosity oil.
	Loose or corroded connections.	Clean and tighten loose connections.

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Troubleshooting

Symptom	Problem	Solution
Starter and hour meter functions; rest of electrical system does not function	Blown fuse on magnetic switch.	Replace fuse.
Entire electrical system does not function	Faulty battery connection.	Clean and tighten connections.
	Sulfated or worn-out batteries.	Replace batteries.
	Blown fuse.	Replace fuse.

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Lubrication System Troubleshooting

Symptom	Problem	Solution
Low Oil Pressure	Low crankcase oil level	Fill crankcase to proper oil level.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Clogged oil cooler or filter	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Excessive oil temperature	Remove and inspect oil cooler. See your John Deere engine distributor or servicing dealer.
	Defective oil pump	Remove and inspect oil pump. See your John Deere engine distributor or servicing dealer.
	Incorrect oil	Drain crankcase and refill with correct oil.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Clogged oil pump screen or cracked pick-up tube	Remove oil pan and clean screen/replace pick-up tube.
	Excessive main or connecting rod bearing clearance	Determine bearing clearance. See your John Deere engine distributor or servicing dealer.
High Oil Pressure	Improper oil classification	Drain crankcase and refill with correct oil.
	Faulty pressure sensor	Replace sensor. See your John Deere engine distributor or servicing dealer.
	Oil pressure regulating valve failure	Remove and inspect oil pressure regulating valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged filter bypass valve	Remove and inspect filter bypass valve. See your John Deere engine distributor or servicing dealer.
	Stuck or damaged oil cooler bypass valve	Remove and inspect oil cooler bypass valve. See your John Deere engine distributor or servicing dealer.
Excessive Oil Consumption	Too low viscosity crankcase oil	Drain crankcase and refill with correct viscosity oil.

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Troubleshooting

Symptom	Problem	Solution
	Crankcase oil level too high	Drain oil until oil level is correct.
	External oil leak(s)	Determine source of oil leak(s) and repair as required.
	Oil control rings not seated	See your John Deere engine distributor or servicing dealer.
	Oil control rings worn or broken	Replace piston rings. See your John Deere engine distributor or servicing dealer.
	Scored cylinder liners or pistons	Remove and inspect cylinders and liners; replace as required. See your John Deere engine distributor or servicing dealer.
	Worn valve guides or stems	Inspect and measure valve stems and valve guides; repair as required. See your John Deere engine distributor or servicing dealer.
	Excessive oil pressure	See <u>High Oil Pressure</u> .
	Piston ring grooves excessively worn	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston rings sticking in ring grooves	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Insufficient piston ring tension	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Piston ring gaps not staggered	Remove and inspect pistons. See your John Deere engine distributor or servicing dealer.
	Front and/or rear crankshaft oil seal faulty	Replace oil seals. See your John Deere engine distributor or servicing dealer.
		See <u>LOW PRESSURE SYSTEM-FUEL PRESSURE LOW TROUBLESHOOTING</u> earlier in this section.

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Troubleshooting

Symptom	Problem	Solution
Fuel in Oil		See <u>FUEL IN OIL TROUBLESHOOTING</u> earlier in this section.
Coolant in Oil		See <u>COOLING SYSTEM TROUBLESHOOTING</u> later in this section.

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Cooling System Troubleshooting

Symptom	Problem	Solution
Engine Overheats	Lack of coolant in cooling system	Fill cooling system to proper level.
	Radiator core dirty	Clean radiator as required.
	Engine overloaded	Reduce engine load.
	Too low crankcase oil level	Fill crankcase to proper oil level.
	Loose or defective fan belt	Replace fan belt as required. Check belt tensioner. (See Lubrication and Maintenance 500 Hour/12 Month Section.)
	Defective thermostat(s)	Test thermostat opening temperature; replace thermostats as required.
	Damaged cylinder head gasket	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Defective coolant pump	Replace coolant pump. See your John Deere engine distributor or servicing dealer.
Coolant in Crankcase	Defective radiator cap	Replace radiator cap as required.
	Cylinder head gasket defective	Replace cylinder head gasket. See your John Deere engine distributor or servicing dealer.
	Cylinder head or block cracked	Locate crack, repair/replace components as required.
	Cylinder liner seals leaking	Remove and inspect cylinder liners. See your John Deere engine distributor or servicing dealer.
	Leaking oil cooler	Pressure test oil cooler; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Defective oil cooler O-rings	Remove and inspect oil cooler O-rings; replace as required. See your John Deere engine distributor or servicing dealer.
	Faulty coolant pump seal; weep hole plugged; coolant leaking through bearing	Replace coolant pump seals. See your John Deere engine distributor or servicing dealer.
Coolant Temperature Below Normal	Defective thermostat(s)	Test thermostats; replace thermostats as required.

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Air Intake and Exhaust System Troubleshooting

Symptom	Problem	Solution
Hard to Start or Will Not Start		See <u>ENGINE TROUBLESHOOTING</u> earlier in this section.
Engine Misfiring or Runs Irregularly		See <u>ENGINE TROUBLESHOOTING</u> earlier in this section.
Black or Grey Exhaust Smoke		See <u>ENGINE TROUBLESHOOTING</u> earlier in this section.
Lack of Engine Power		See <u>ENGINE TROUBLESHOOTING</u> earlier in this section.
Turbocharger "Screams"	Air leak in intake manifold.	Check intake manifold gasket and manifold; repair as required. See your John Deere engine distributor or servicing dealer.
Turbocharger Noise or Vibration	Bearings not lubricated (insufficient oil pressure)	Determine cause of lack of lubrication; repair as required. See your John Deere engine distributor or servicing dealer.
<i>NOTE: Variable geometry turbocharger recycles after starting engine, causing a momentary revving sound in the engine. This is normal.</i>		
<i>Do not confuse the whine heard during run down with noise which indicates a bearing failure.</i>		
	Air leak in engine intake or exhaust manifold	Check intake and exhaust manifold gaskets and manifolds; repair as required. See your John Deere engine distributor or servicing dealer.
	Improper clearance between turbine wheel and turbine housing	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.
	Broken blades (or other wheel failures)	Inspect turbocharger; repair/replace as required. See your John Deere engine distributor or servicing dealer.

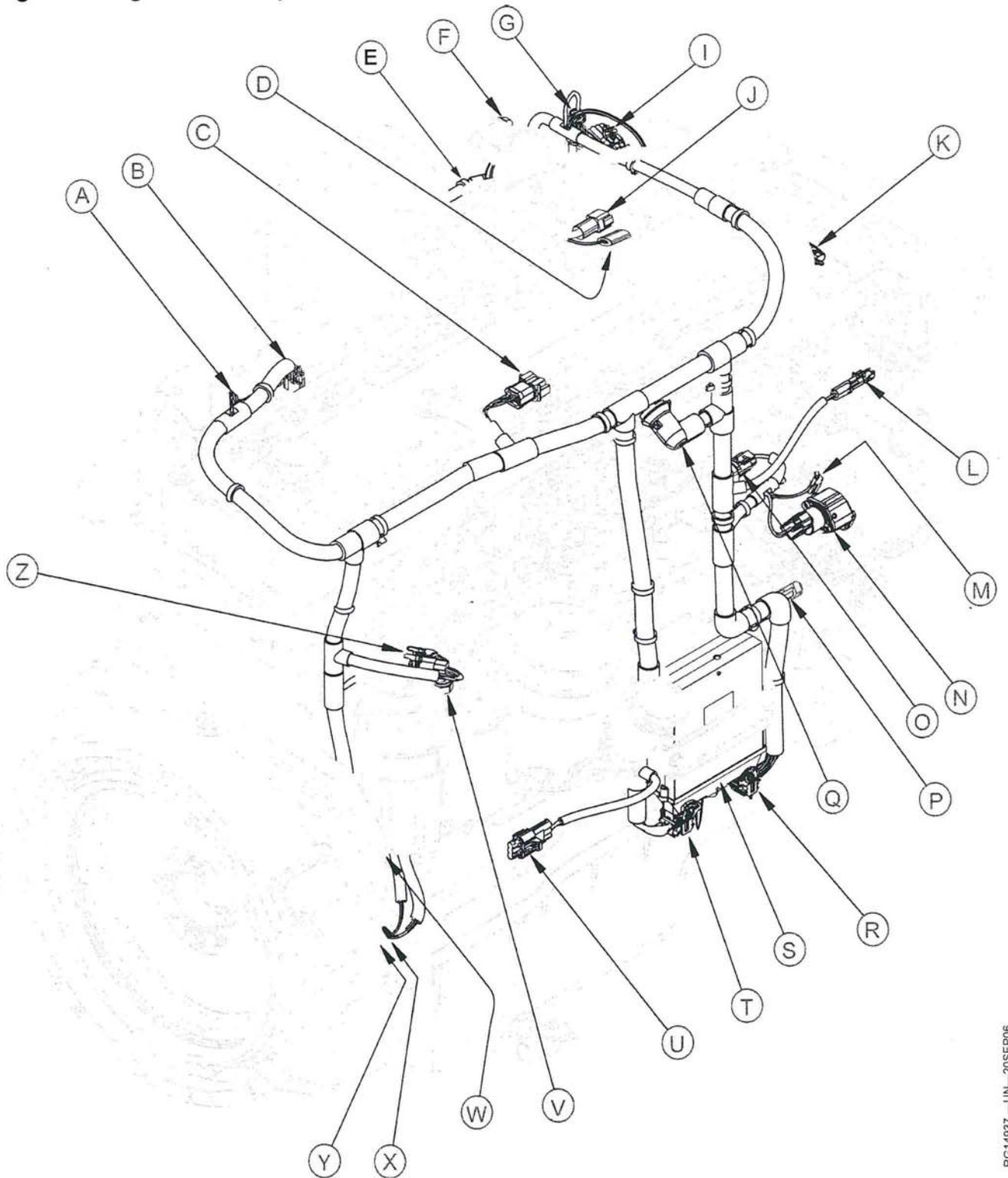
OURGP11,000006B -19-11OCT06-1/1

Precautions for Electrical System When Steam Cleaning Engine

IMPORTANT: Do not steam clean any electrical or electronic components while steam cleaning the engine as it could damage sensitive parts.

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Engine Wiring Harness Layout



Electrical Wiring Harness Layout

Continued on next page

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Troubleshooting

<p>A—Manifold Air Pressure (MAP) Sensor Connector</p> <p>B—Exhaust Gas Recirculation (EGR) Mixed Air Temperature Sensor Connector</p> <p>C—Turbocharger Sensor Jumper Connector</p> <p>D—VGT Turbocharger Connector</p> <p>E—Exhaust Gas Recirculation (EGR) Exhaust Temperature Sensor Connector</p> <p>F—Exhaust Gas Recirculation (EGR) Valve Sensor Connector</p> <p>G—Exhaust Pressure Sensor Connector</p>	<p>H—Exhaust Gas Recirculation (EGR) Fresh Air Sensor Connector</p> <p>I—Air Heater Jumper Connection</p> <p>J—VGT Turbocharger Connector</p> <p>K—Coolant Temperature Sensor Connector</p> <p>L—Alternator Excitation Connector</p> <p>M—Fuel Temperature Sensor Connector</p> <p>N—Fuel Pump Control Valve Connector</p>	<p>O—Fuel Rail Pressure Sensor Connector</p> <p>P—Camshaft Sensor Connector</p> <p>Q—Fuel Injector Connector</p> <p>R—ECU Connector</p> <p>S—ECU</p> <p>T—ECU Engine</p> <p>U—Auxiliary Power Connector</p>	<p>V—Fuel Pressure Sensor</p> <p>W—Water In Fuel Sensor</p> <p>X—Crankshaft Speed/Position Sensor</p> <p>Y—Oil Pressure Sensor</p> <p>Z—Fuel Transfer Pump Sensor</p>
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OURGP11.000002A -19-11OCT06-2/2

Precautions For Welding

IMPORTANT: Welding on an engine is not recommended. If welding must be performed, follow the following precautions.

IMPORTANT: ALWAYS disconnect Engine Control Unit (ECU) connectors and battery before welding on engine or machine. High currents or electro-static discharge in electronic components from welding may cause permanent damage. Remove battery or flammable liquid lines if welding near those items.

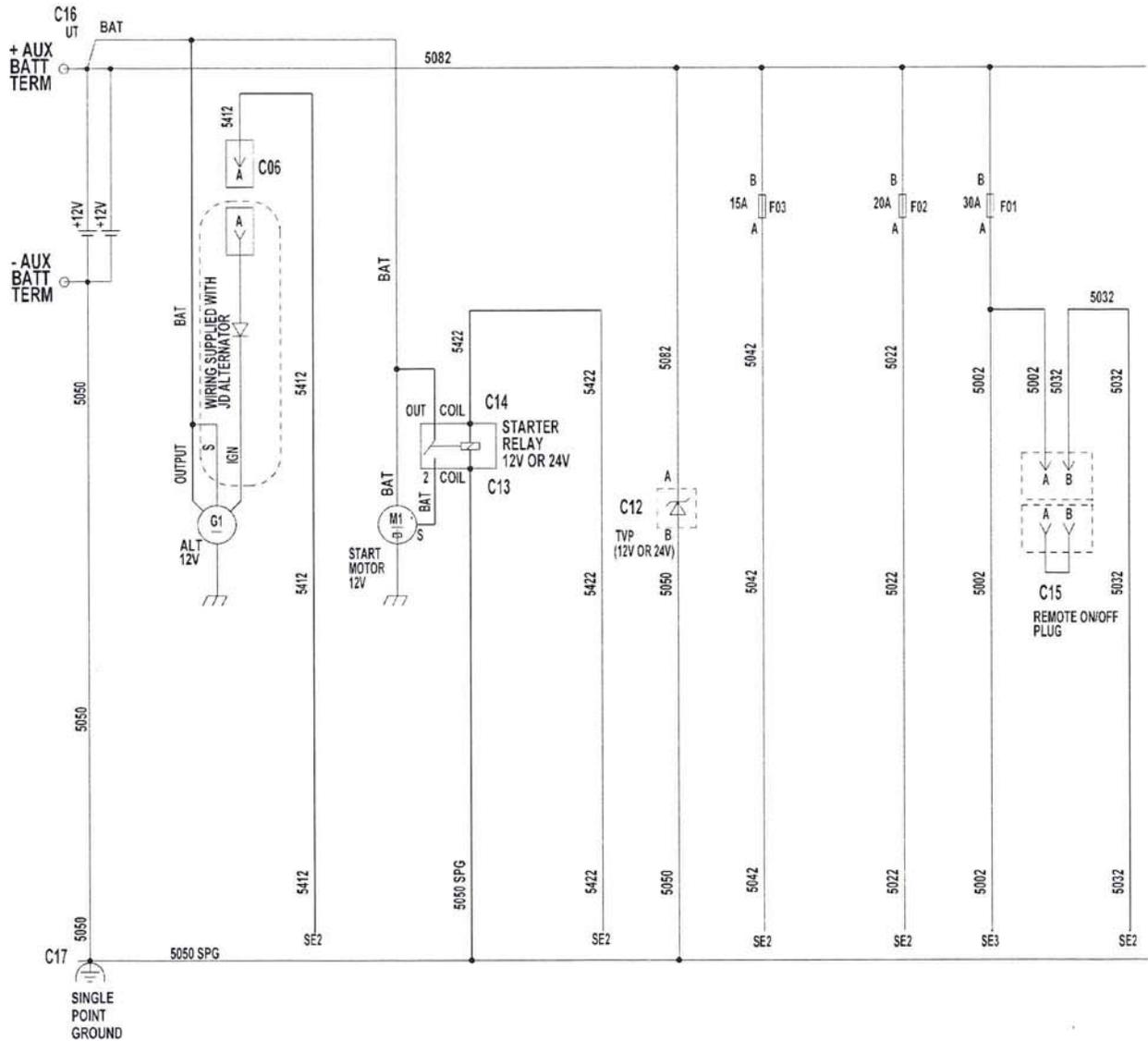
1. Disconnect connectors from ECU.
2. Disconnect battery cables from battery.
3. If necessary, disconnect flammable liquid lines or battery.
4. Connect welder ground to same engine component as the welding point and be sure ECU or other electronic components are not in ground path.
5. Never connect welder ground to crankshaft damper or pulley, engine flywheel, or any driveline components. Be sure that engine bearings are not in ground path, as this can create bearing damage.



TS953 —UN—15MAY90

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Engine Wiring Diagram (Engines With Full-Featured Instrument Panel)



Start Components Schematic

ALT— Alternator
 BATT— Battery
 C06— Alternator Connector
 C13, C14— Starter Relay Coil

C15— Remote On/Off Plug
 C16— Battery
 C17— Single Point Ground
 SE2— See SE1, ECU/Engine Wiring Schematic

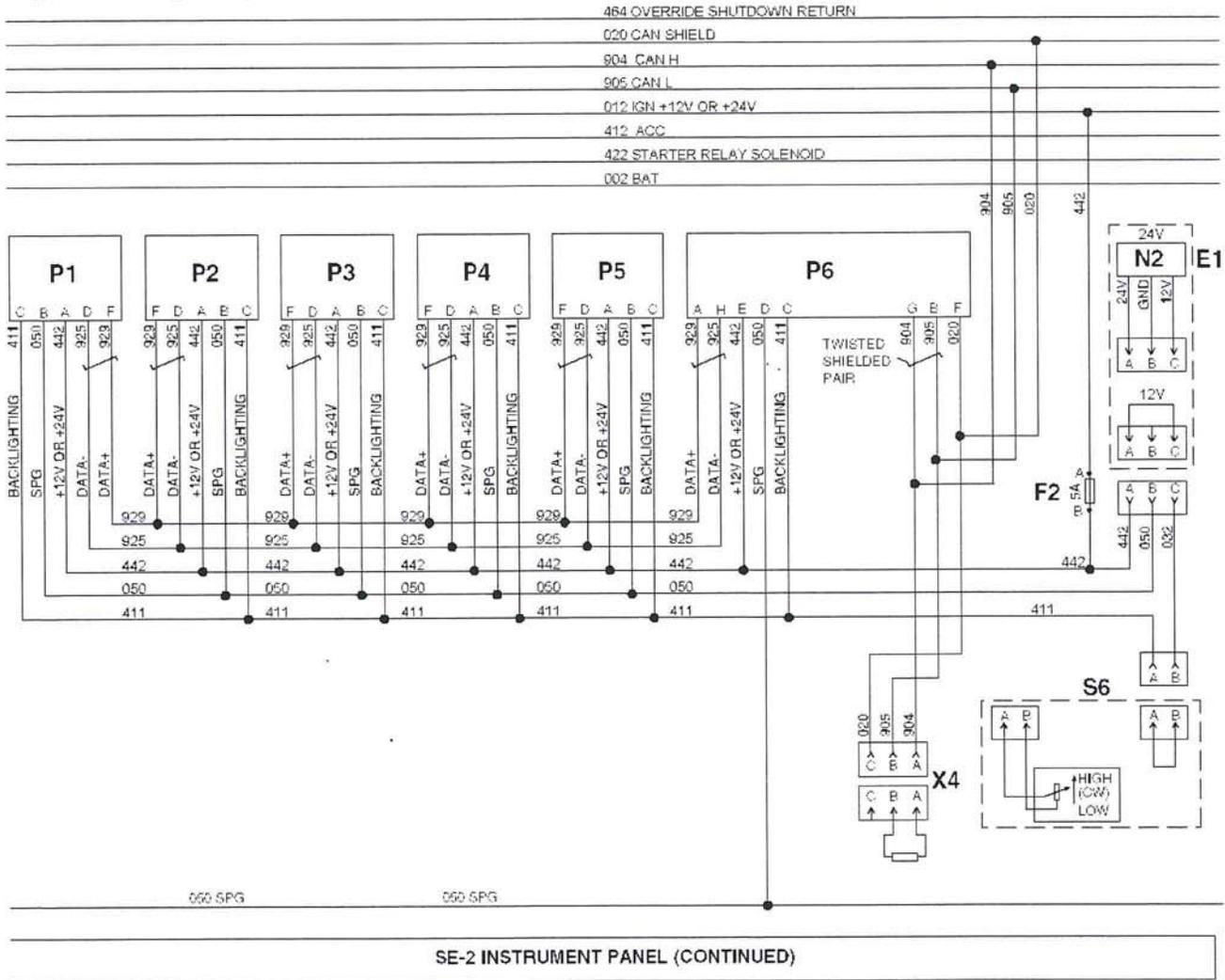
5002— Unswitched Battery
 5022— Unswitched Battery
 5032— Unswitched Battery
 5042— Unswitched Battery

5050— Ground
 5082— Unswitched Battery
 5412— Key Switch, Accessory Position
 5422— Start

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RG14539—UN—25OCT05

Engine Wiring Diagram (Engines With Full-Featured Instrument Panel) (Continued)



- E1— Back Light Regulator (24V) or Plug (12V)
- N2— Voltage Regulator (for 24V Operation)
- P1— Optional Gauge
- P2— Optional Gauge
- P3— Oil Pressure Gauge
- P4— Coolant Temperature Gauge
- P5— Tachometer Display
- P6— Hourmeter/Diagnostic Meter
- S5— Override Shutdown Switch (Momentary)
- S6— Dimmer Control or Jumper Plug
- X4— CAN Terminator

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Troubleshooting

General Troubleshooting Information

Troubleshooting engine problems can be difficult. An engine wiring diagram is provided in this section to help isolate electrical problems on power units using John Deere wiring harness and instrument (gauge) panel.

Later in this section is a list of possible engine problems that may be encountered accompanied by possible causes and corrections. The illustrated diagrams and troubleshooting information are of a general nature; final design of the overall system for your engine application may be different. See your engine distributor or servicing dealer if you are in doubt.

A reliable program for troubleshooting engine problems should include the following basic diagnostic thought process:

- Know the engine and all related systems.
- Study the problem thoroughly.
- Relate the symptoms to your knowledge of engine and systems.
- Diagnose the problem starting with the easiest things first.

- Double-check before beginning the disassembly.
- Determine cause and make a thorough repair.
- After making repairs, operate the engine under normal conditions to verify that the problem and cause was corrected.

NOTE: All engines have electronic control systems which may send diagnostic trouble codes to signal problems (see DISPLAYING OF DIAGNOSTIC TROUBLE CODES, later in this section).

1. If fault codes are present, perform the suggested corrective actions.
2. If this does not correct the engine problem, contact your servicing dealer.
3. If engine has problems but no fault codes are displayed, refer to ENGINE TROUBLESHOOTING later in this section for problems and solutions.

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Instrument Panel Method for Retrieving Diagnostic Trouble Codes

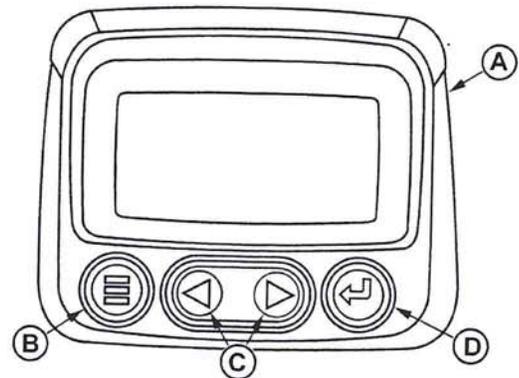
IMPORTANT: Care should be used during diagnostic procedures to avoid damaging the terminals of connectors, sensors, and actuators. Probes should not be poked into or around the terminals or damage will result. Probes should only be touched against the terminals to make measurements.

Diagnosis of the Deere electronic control system on engines with Deere electronic instrument panel should be performed as follows:

1. Make sure all engine mechanical and other systems not related to the electronic control system are operating properly. (See ENGINE TROUBLESHOOTING later in this section.)

NOTE: Diagnostic gauge (A) uses the menu key (B) to access various engine functions, two arrow keys (C) to scroll through the engine parameter list and view the menu list, and an enter key (D) for selecting highlighted items.

2. Read and record DTC(s) displayed on LCD of diagnostic gauge (A). For procedure to access diagnostic trouble codes, refer to "Using Diagnostic Gauge to Access Engine Information", earlier in this manual.



Trouble Code Display On Instrument Panel

A—Diagnostic Gauge
B—Menu Key

C—Arrow Keys
D—Enter Key

3. Go to the LISTING OF DIAGNOSTIC TROUBLE CODES (DTCs) later in this section, to interpret to the DTC(s) present.
4. Contact your nearest engine distributor or servicing dealer with a list of DTC(s) so that necessary repairs can be made.

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RG13740—UN—11NOV04

Displaying Of Diagnostic Trouble Codes (DTCs)

SPN/FMI CODES

Stored and active diagnostic trouble codes are output on the diagnostic gauge on the Deere electronic instrument panel according to the J1939 standard as a two-part code as shown on the tables on the following pages.

The first part is a Suspect Parameter Number (SPN) followed by a Failure Mode Identifier (FMI) code. In order to determine the exact failure, both parts (SPN and FMI) of the code are needed.

The SPN identifies the system or the component that has the failure; for example SPN 000110 indicates a failure in the engine coolant temperature circuit.

The FMI identifies the type of failure that has occurred; for example FMI 03 indicates value above normal. Combining SPN 000110 with FMI 03 yields a fault code "engine coolant temperature input voltage too high". A corrective action will also be displayed, "check sensor and wiring". If this check does not solve the engine fault, contact your servicing dealer.

Always contact your servicing dealer for help in correcting unsolved diagnostic trouble codes which are displayed for your engine.

OURGP12,00000F0 -19-24AUG10-1/1

Listing of Diagnostic Trouble Codes (DTCs)

NOTE: If the corrective actions below do not solve the engine fault, contact your servicing dealer.

NOTE: Not all of these codes are used in all engine applications.

SPN	FMI	Fault	Corrective Action
000028	03.....	Throttle #3 Voltage Out of Range High	Check Sensor and Wiring
	04.....	Throttle #3 Voltage Out of Range Low	Check Sensor and Wiring
000029	03.....	Throttle #2 Voltage Out of Range High	Check Sensor and Wiring
	04.....	Throttle #2 Voltage Out of Range Low	Check Sensor and Wiring
000091	03.....	Throttle Voltage Out of Range High	Check Switch and Wiring
	04.....	Throttle Voltage Out of Range Low	Check Switch and Wiring
	09.....	Throttle Voltage Out of Range	Check Switch and Wiring
	14.....	Throttle Voltage Out of Range	Check Switch and Wiring
000094	01.....	Fuel Delivery Pressure Very Low	Check Sensor and Wiring
	03.....	Fuel Pressure Voltage Out of Range High	Check Sensor and Wiring
	04.....	Fuel Pressure Voltage Out of Range Low.....	Check Sensor and Wiring
	10.....	Fuel Pressure Voltage Dropping Fast.....	Check Sensor and Wiring
	13.....	Fuel Pressure Voltage Fuel Pressure-Not Calibrated.....	Check Sensor and Wiring
	16.....	Fuel Delivery Pressure High	Check Sensor and Wiring
	17.....	Fuel Pressure Low-Most Severe	Check Fuel Supply and Prime System
	18.....	Fuel Pressure Low-Least Severe	Check Fuel Supply and Prime System
000097	00.....	Water in Fuel	Check Sensor and Wiring
	03.....	Water in Fuel Voltage Out of Range High	Check Sensor and Wiring
	04.....	Water in Fuel Voltage Out of Range Low.....	Check Sensor and Wiring
	16.....	Water in Fuel Detected.....	Stop and Drain Water Separator
	31.....	Water in Fuel Detected.....	Stop and Drain Water Separator
000100	01.....	Engine Oil Pressure Low-Most Severe	Check Oil Level
	03.....	Engine Oil Pressure Voltage Out of Range High	Check Sensor and Wiring
	04.....	Engine Oil Pressure Voltage Out of Range Low	Check Sensor and Wiring
	16.....	Engine Oil Pressure Out of Range.....	Check Sensor and Wiring
	18.....	Engine Oil Pressure Low-Moderately Severe	Check Oil Level
000105	00.....	Manifold Air Temperature High-Most Severe	Check Air Cleaner, Aftercooler, or Ambient Temperature
	03.....	Manifold Air Temperature Input Voltage High.....	Check Sensor and Wiring
	04.....	Manifold Air Temperature Input Voltage Low	Check Sensor and Wiring
	15.....	Manifold Air Temperature High-Least Severe	Contact Servicing Dealer
	16.....	Manifold Air Temperature High-Moderately Severe	Check Air Cleaner, Aftercooler, or Ambient Temperature
000108	02.....	Barometric Air Pressure Sensor Signal Invalid.....	Contact Servicing Dealer
000107	00.....	Air Filter Restriction High	Check for Plugged Air Filter
	31.....	Air Filter Restriction	Check for Plugged Air Filter
000110	00.....	Engine Coolant Temperature High-Most Severe.....	Check Cooling System, Reduce Power
	03.....	Engine Coolant Temperature Input Voltage High	Check Sensor and Wiring
	04.....	Engine Coolant Temperature Input Voltage Low.....	Check Sensor and Wiring
	16.....	Engine Coolant Temperature High-Moderately Severe.....	Check Cooling System, Reduce Power
	17.....	Engine Coolant Temperature Low-Least Severe	Check Cooling System
000111	01.....	Coolant Level Low-Most Severe	Check Operator's Manual
000158	02.....	Keyswitch Intermittent.....	Check Service Manual
	17.....	Keyswitch Circuit Problem.....	Check Service Manual
000174	00.....	Fuel Temperature High-Most Severe.....	Add Fuel or Switch Fuel Tanks
	03.....	Fuel Temperature Voltage Out of Range High	Check Sensor and Wiring
	04.....	Fuel Temperature Voltage Out of Range Low	Check Sensor and Wiring
	15.....	Fuel Temperature High.....	Add Fuel or Switch Fuel Tanks
	16.....	Fuel Temperature High-Moderately Severe.....	Add Fuel or Switch Fuel Tanks
	31.....	Fuel Temperature Voltage Out Of Range	Check Sensor and Wiring

Continued on next page

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Troubleshooting

SPN	FMI	Fault	Corrective Action
000189	31	Engine Speed Derate	Contact Servicing Dealer
000190	00	Engine Speed High-Most Severe	Reduce Engine Speed
	01	Engine Speed Low	Reduce Engine Speed
	02	Engine Speed Out Of Range	Reduce Engine Speed
	03	Engine Speed High or Short	Reduce Engine Speed
	04	Engine Speed Low or Short	Reduce Engine Speed
	05	Engine Speed Open	Reduce Engine Speed
	16	Engine Speed Overspeed	Reduce Engine Speed
	18	Engine Speed Low	Reduce Engine Speed
000237	02	VIN Data Doesn't Match Controllers in VIN Network	Contact Servicing Dealer
	13	Option Code Of VIN Data Doesn't Match Controllers in VIN Network	Contact Servicing Dealer
	31	VIN Messages Missing or Controllers in VIN Network Not in Time	Contact Servicing Dealer
000611	03	Electronic Injector Wiring Shorted to Power Source	Check Wiring
	04	Electronic Injector Wiring Shorted to Ground	Check Wiring
000620	03	5V Sensor Supply Voltage Out of Range High	Check Wiring
	04	5V Sensor Supply Voltage Out of Range Low	Check Wiring
000627	01	Power Supply Voltage- Low	Check Battery Voltage and Wiring
	04	Power Supply Voltage- Interrupted	Contact Servicing Dealer
	16	Power Supply Voltage- High	Contact Servicing Dealer
000629	13	ECU Programming Error	Contact Servicing Dealer
	19	ECU Failure	Contact Servicing Dealer
000632	02	Fuel Shutoff Valve Error	Check Sensor and Wiring
	05	Fuel Shutoff Valve Failure	Check Sensor and Wiring
	11	Fuel Shutoff Valve Open or Shorted	Check Sensor and Wiring
000636	02	Engine Position Sensor Noise	Check Sensor and Wiring
	08	Engine Position Sensor Input Missing	Check Sensor and Wiring
	10	Engine Position Sensor Pattern Error	Check Sensor and Wiring
000637	02	Timing Sensor (Crank) Noise	Check Sensor and Wiring
	07	Crank/Camshaft Positions Out of Sync	Check Sensor and Wiring
	08	Crank Position Input Missing	Check Sensor and Wiring
	10	Crank Position Input Pattern Error	Check Sensor and Wiring
000639	13	CAN Bus Failure	Check Sensor and Wiring
000644	02	External Speed Command Output	Check Sensor and Wiring
000651	05	Cylinder #1 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #1 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #1 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000652	05	Cylinder #2 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #2 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #2 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000653	05	Cylinder #3 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #3 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #3 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000654	05	Cylinder #4 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #4 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #4 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000655	05	Cylinder #5 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #5 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid
	07	Cylinder #5 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000656	05	Cylinder #6 Electronic Injector Circuit Open	Check Injector Wiring or Injector Solenoid
	06	Cylinder #6 Electronic Injector Circuit Shorted	Check Injector Wiring or Injector Solenoid

Continued on next page

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Troubleshooting

SPN	FMI	Fault	Corrective Action
	07.....	Cylinder #6 Electronic Injector Fuel Flow Low	Injector Failed or Flow Limiter Closed
000676	03.....	Glow Plug Relay	Contact Servicing Dealer
	05.....	Glow Plug Relay	Contact Servicing Dealer
000729	03.....	Inlet Air Heater #1 Error.....	Contact Servicing Dealer
	05.....	Inlet Air Heater #1 Failure	Contact Servicing Dealer
000833	02.....	Rack Position Sensor Error	Contact Servicing Dealer
	03.....	Rack Position Sensor Voltage High	Contact Servicing Dealer
	04.....	Rack Position Sensor Voltage Low	Contact Servicing Dealer
000834	02.....	Rack Actuator Error	Contact Servicing Dealer
	03.....	Rack Actuator Voltage High	Contact Servicing Dealer
	05.....	Rack Actuator Open	Contact Servicing Dealer
	06.....	Rack Actuator Grounded	Contact Servicing Dealer
	07.....	Rack Actuator Position Error.....	Contact Servicing Dealer
000970	02.....	Auxiliary Engine Shutdown Switch Signal Invalid.....	Check Switch And Wiring
	11.....	External Engine Protection Shutdown Switch Signal Active.....	Check Switch And Wiring
	31.....	Auxiliary Engine Shutdown Switch Signal Invalid.....	Check Switch And Wiring
000971	31.....	Engine Derate Switch Signal Active	Check Switch And Wiring
001041	02.....	Start Signal Indicator Failure.....	Check Switch And Wiring
	03.....	Start Signal Indicator Active.....	Check Switch And Wiring
001075	06.....	Fuel Transfer Pump Current High or Grounded Circuit (Racor Fuel Pump Only)	Contact Servicing Dealer
	12.....	Fuel Transfer Pump Failure (Racor Fuel Pump Only)	Contact Servicing Dealer
001076	00.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	01.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	02.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	03.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	05.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	06.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	07.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	10.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
	13.....	Fuel Injection Pump Control Error	Contact Servicing Dealer
001077	07.....	Fuel Injection Pump Controller	Contact Servicing Dealer
	11.....	Fuel Injection Pump Controller	Contact Servicing Dealer
	12.....	Fuel Injection Pump Controller	Contact Servicing Dealer
	19.....	Fuel Injection Pump Controller	Contact Servicing Dealer
	31.....	Fuel Injection Pump Controller	Contact Servicing Dealer
001078	07.....	Fuel Injection Pump Speed/Position Sensor Error	Contact Servicing Dealer
	11.....	Fuel Injection Pump Speed/Position Sensor Error	Contact Servicing Dealer
	31.....	Fuel Injection Pump Speed/Position Sensor Failure	Contact Servicing Dealer
001079	03.....	Sensor Supply Voltage 3 Out of Range High	Check Wiring
	04.....	Sensor Supply Voltage 3 Out of Range Low	Check Wiring
001080	03.....	Fuel Rail Pressure Sensor Supply Voltage 2 Out of Range High	Check Wiring
	04.....	Fuel Rail Pressure Sensor Supply Voltage 2 Out of Range Low.....	Check Wiring
001109	31.....	Engine Not Available or Condition Exists.....	Check Fault Codes
001110	31.....	Engine Not Available or Condition Exists.....	Check Fault Codes
001347	05.....	Fuel Pump Pressurizing Assembly #1 Sensor Circuit Open, Shorted to Ground, or Overloaded	Check Pump Wiring
	07.....	Fuel Pump Assembly #1 Rail Pressure Control Mismatch.....	Check Fuel Filter and Lines
	10.....	Fuel Pump Assembly #1 Fuel Flow Low	Check Fuel Filter and Lines
001348	05.....	Fuel Pump Pressurizing Assembly #2 Sensor Circuit Open, Shorted to Ground, or Overloaded	Contact Servicing Dealer

Continued on next page

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SPN	FMI	Fault	Corrective Action
	10.....	Fuel Pump Assembly #2 Fuel Flow Low	Check Fuel Filter and Lines
001485	02.....	ECU Main Relay Pump Error	Contact Servicing Dealer
001569	31.....	Engine Protection Derate	Check Fault Codes
001639	01.....	ECU Detects Zero Fan Speed	Contact Servicing Dealer
	16.....	ECU Detects High Fan Speed	Contact Servicing Dealer
	18.....	ECU Detects Low Fan Speed	Contact Servicing Dealer
002000	06.....	Fuel Injection Pump Control Valve Error.....	Contact Servicing Dealer
	13.....	Security Violation Controller Not Installed.....	Contact Servicing Dealer
002005	09.....	No CAN Message From Source 5	Contact Servicing Dealer
002030	09.....	No CAN Message From Source 49.....	Contact Servicing Dealer
002071	09.....	No CAN Message From Source 71.....	Contact Servicing Dealer
003509	03.....	Sensor Supply Voltage 1 High.....	Check Wiring
	04.....	Sensor Supply Voltage 1 Low	Check Wiring

NOTE: Diagnostic gauge on instrument panel may also display text for communication faults, such as "CAN BUS FAILURE". Contact your servicing dealer.

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Intermittent Fault Diagnostics

Intermittent faults are problems that periodically "go away". A problem such as a terminal that intermittently doesn't make contact can cause an intermittent fault. Other intermittent faults may be set only under certain operating conditions such as heavy load, extended idle, etc. When diagnosing intermittent faults, take special note of the condition of wiring and connectors, since a high percentage of intermittent problems originate here. Check for loose, dirty or disconnected connectors. Inspect the wiring routing, looking for possible shorts caused by contact with external parts (for example, rubbing against sharp sheet metal edges). Inspect the connector vicinity, looking for wires that have pulled out of connector terminals, damaged connectors, poorly positioned terminals, and corroded or damaged splices and terminals. Look for broken wires, damaged splices, and wire-to-wire shorts. Use good judgement if component replacement is thought to be required.

NOTE: The engine control unit (ECU) is the component LEAST likely to fail.

Suggestions for diagnosing intermittent faults:

- If diagnostic charts on preceding pages indicate that the problem is intermittent, try to reproduce the operating conditions that were present when the diagnostic trouble code (DTC) set.
- If a faulty connection or wire is suspected to be the cause of the intermittent problem: clear DTCs, then check the connection or wire by wiggling it while watching the diagnostic gauge to see if the fault resets.

Possible causes of intermittent faults:

- Faulty connection between sensor or actuator harness.
- Faulty contact between terminals in connector.
- Faulty terminal/wire connection.
- Electromagnetic interference (EMI) from an improperly installed 2-way radio, etc., can cause faulty signals to be sent to the ECU.

NOTE: Refer to wiring diagrams later in this section as a guide to connections and wiring.

OURGP12.000013A -19-11OCT06-1/1

Displaying Diagnostic Gauge Software

NOTE: The following steps can be used to display the software version of the diagnostic gauge if needed by your dealer for troubleshooting. This is a read only function.

1. Starting at the single or four engine parameter display, press the "Menu" key.

1800 RPM

ENG RPM COOL TEMP

98%
LOAD@RPM

1000 RPM
ENG RPM

14.2
BAT VOLT

57 PSI
OIL PRES

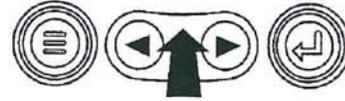
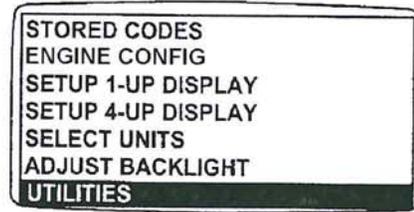
Menu Key

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OURGP12.00000D5 -19-11OCT06-1/4

RG13159—UN—26SEP03

- The main menu will be displayed. Use the "Arrow" key to scroll through the menu until "Utilities" is highlighted.

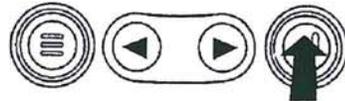
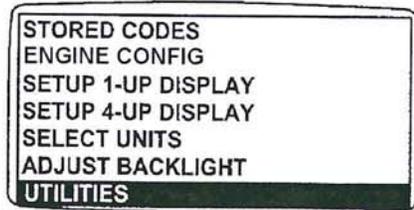


Select Utilities

RG13234 —UN—22OCT03

OURGP12.00000D5 -19-11OCT06-2/4

- Once "Utilities" is highlighted, press "Enter" to activate the utilities function.

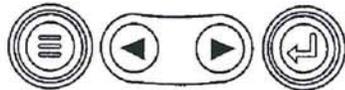


Select Utilities

RG13237 —UN—22OCT03

OURGP12.00000D5 -19-11OCT06-3/4

- Scroll to the "Software Version". Press "Enter" to view the software version. Press the menu button twice to return to the main menu.



Software Version

RG13236 —UN—13OCT03

OURGP12.00000D5 -19-11OCT06-4/4

Vacuum Pump Troubleshooting

BASIC TROUBLESHOOTING

Presented below are some basic conditions encountered by vacuum pumps in the liquid waste industry. If your condition is not listed please consult your original tank manufacturer for further advice.

CONDITION:	CHECKLIST:
> new pump starts to vibrate	> vane may be warped, remove and straighten
> old pump starts to vibrate	> vanes may be worn too far, remove and replace
> pump vibrates after checking vanes	> drive system may be out of balance, correct drive
> vanes wear too fast	> check and correct safeties, flush pump regularly
> pump will not fill tank to top	> vertical lift may be too high, measure distance
> vertical lift is too high	> take air in with waste to break the column
> tank will not fill even with air intake	> pump too small or loading hose too large
> pump runs very hot	> inspect and correct cooling system
> cooling system OK, pump still hot	> excessive duty cycle, limit RPM or vacuum level
> pump too hot for intended service	> improve cooling system
> pump seizes	> allow to cool, rotate by hand, resume
> pump spins backwards	> check ball or flap not working, inspect & correct
> pump makes loud metallic noise	> housing may be scored, inspect & hone housing
> pump makes high pitched squeal	> bearing may be worn, inspect and replace
> vacuum loss, pump wears too fast	> rebuild pump, improve air filtration
> exhaust smoke a problem in-plant	> use smoke filter after oil catch muffler
> exhaust smoke a problem outdoors	> decrease oil flow, reduce vacuum level
> pumping time is too slow	> increase loading hose size, use two hoses
> pump works hard & will not load tank	> check for collapsed hose
> pump works easy & will not load tank	> check for air leaks in system and hoses
> liquid enters vacuum pump	> correct safeties, flush pump & lines, resume
> pump will not rotate by hand	> check for freezing or damaged vanes
> vanes are split	> excessive heat, improve cooling
> vanes are chipped	> operation while vanes not sliding freely
> vanes are worn unevenly	> check for overspeeding, reduce RPM
> vanes are gouged or sheared in half	> insufficient lubrication or excessive pressure
> pump leaks oil at shaft on pressure	> oil seal is worn, remove and replace
> oil flow too slow in winter operation	> oil is too thick, use lighter weight oil
> oil flow too fast in summer operation	> oil is too light, use heavier weight oil

Centrifugal Pump Troubleshooting

PUMP TROUBLE SHOOTING GUIDE

SYMPTOMS	CAUSES	CORRECTIONS
Failure to pump	Pump not properly primed. Speed too low or head too high. Not enough head to open check valve. Air leak. Plugged suction. Too high a suction lift.	Prime pump correctly. Consult Cornell Factory. Consult Cornell Factory. Check and rework suction line. Unplug suction. Consult Cornell Factory.
Reduced performance	Air pockets or small air leaks in suction line. Obstruction in suction line or impeller. Insufficient submergence of the suction pipe. Excessively worn impeller or wear ring. Too high a suction lift. Wrong direction of rotation.	Locate and correct. Remove obstruction. Consult Cornell Factory. Replace impeller and/or wear ring. Consult Cornell Factory. See start-up instructions.
Driver overloaded	Speed higher than planned. Liquid specific gravity too high. Liquid handled of greater viscosity than water. Too large an impeller diameter. Low voltage. Stress in pipe connection to pump. Packing too tight.	Reduce speed. Consult Cornell Factory. Consult Cornell Factory. Trim impeller. Consult power company. Support piping properly. Loosen packing gland nuts.
Excessive noise	Misalignment. Excessive suction lift. Material lodged in impeller. Worn bearings. Impeller screw loose or broken. Cavitation (improper suction design). Wrong direction of rotation.	Align all rotating parts. Consult Cornell Factory. Dislodge. Replace bearings. Replace. Correct suction piping. See start-up instructions.
Premature bearing failure	Balance line plugged or pinched. Worn wear rings. Misalignment. Suction or discharge pipe not properly supported. Bent shaft. Water or contaminants entering bearings. Lubrication to bearings not adequate. Wrong type of lubrication.	Unplug or replace. Replace. Align all rotating parts. Correct supports. Replace shaft. Protect pump from environment. See Lubrication Instr. (O&M Manual). See Lubrication Instr. (O&M Manual).
Electric motor failure	High or low voltage. High electric surge. Poor electric connection. Overloads. Bearing failure. Cooling vent plugged (roden, leaves, dirt, etc.) Water is sucked into motor.	Check voltage with voltage meter. Monitor voltage and consult power co. Turn power off, clean and check connections. Check amperage. Do not exceed nameplate full load amperage. Change bearings in motor. Install proper screens. Protect pump from environment.
Rapid wear on coupling cushion	Misalignment. Bent shaft.	Align. Replace shaft.

Gearbox

Troubleshooting

TROUBLE SHOOTING

SYMPTOMS, CAUSES AND REMEDIES

SYMPTOMS

1) No Oil Pressure
(Neutral or Engaged
position)

CAUSES

- 1 - Empty sump
- 2 - Wrong rotation
- 3 - Fully clogged suction filter screen
- 4 - Damaged oil suction tubes
- 5 - Damaged oil pump assembly
- 6 - Broken oil pump drive
- 7 - Broken input or intermediate shaft
- 8 - Coupling broken

REMEDIES

- Fill marine gear sump
- * - See application specifications
- * - Remove and clean filter screen
- * - Disassemble and inspect suction tubes.
Replace parts as required
- * - Remove and replace oil pump assembly
- * - Remove pump and replace drive
- * - Remove and replace the shaft
- * - Replace the coupling

2) Low Oil Pressure
Engaged position

- 1 - Pressure control valve stuck in open position
- 2 - Low level oil
- 3 - Selector valve lever not properly set
- 4 - Oil leaks on clutch oil line (break-down segments, damaged oil distribution supports, faulty piston rings)
- 5 - Partially clogged filter screen
- 6 - Damaged oil pump assembly
- 7 - Scored valve bore on pressure control valve damaged
- 8 - Pressure control valve spring worn or broken
- 9 - Improper oil
- 10 - Trolling control valve lever in trolling mode
- 11 - High oil temperature

- Remove and clean control valve carefully
- Fill oil level
- Adjust remote controls
- * - Overhaul gearbox and replace worn parts
- Remove and clean filter screen
- * - Remove and replace oil pump assembly
- * - Remove valve assembly. Disassemble valve assembly and inspect valve bore
- * - Inspect and replace worn spring and adjust the pressure
- Drain gearbox and fill with proper oil
- Put the lever in no trolling range
- See symptom 4



SYMPTOMS	CAUSES	REMEDIES
3) High Oil Pressure	<ul style="list-style-type: none">1 - Pressure control valve stuck in closed position2 - Internal lines and pipes obstructed3 - Oil side cooler fulded	<ul style="list-style-type: none">- Remove and clean control valve carefully* - Overhaul gearbox and clean pipes* - Clean internal oil cooler
4) High Oil Temperature	<ul style="list-style-type: none">1 - Insufficient heat exchanger capacity2 - Insufficient cooling water flow3 - Dirty heat exchanger4 - Oil level too high or too low5 - Improper oil6 - Clutches slipping7 - Oil pump cavitation8 - Improper bearing preload adjustment or damage bearing9 - Clutch piston locked10 - Clutch plates warped11 - Insufficient oil flow to the cooler	<ul style="list-style-type: none">* - Replace present heat exchanger with heat exchanger of suitable capacity* - Replace valves and lines with larger inside diameter ones* - Clean heat exchanger- Restore normal level- Drain gearbox and fill with proper oil- Check main pressure- Add oil* - Check bearings preload and eventually replace* - Remove and overhaul clutches* - Overhaul gearbox and replace plates* - Check oil pump
5) Excessive noise	<ul style="list-style-type: none">1 - Air leaks in suction side of system2 - Improper bearing end play adjustment (excessive end play)3 - Damaged bearings4 - Worn gear teeth5 - Improper elastic coupling or damaged	<ul style="list-style-type: none">- Tighten all fittings and/or replace damaged tubes. Check filter screen* - Check end play for bearings and make proper shim adjustments* - Overhaul gearbox and replace damaged parts* - Overhaul gearbox and replace worn gears* - Remove coupling and replace it with a suitable one
6) No neutral	<ul style="list-style-type: none">1 - Selector valve lever not properly set2 - Clutch plates warped3 - Clutch piston seized	<ul style="list-style-type: none">- Adjust remote controls* - Overhaul gearbox and replace plates* - Remove and overhaul the clutch

* To make the operations marked with this sign, it is advisable to ask ZF Aftersale Services.

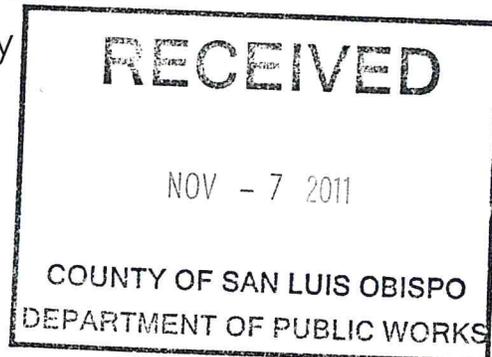
SYMPTOMS	CAUSES	REMEDIES
7) Irregular engagement or no engagement	1 - Air in oil 2 - Clutch piston seized 3 - Misfunctioning of the rate of rise system 4 - Wrong linkage position 5 - internal oil leak circuit 6 - Improper oil temperature 7 - Electrical circuit or solenoids damaged (for electrical control valve only)	- Check oil level. Correct air leaks on tubes and replace emulsified oil * - Remove and overhaul the clutch * - Check control valve * - Adjust remote control - Check oil circuit - Check heat exchanger - Check electrical circuit
8) External oil leakage	1 - Seals or shafts damaged 2 - Breather fulded 3 - Oil dipstick leak 4 - Plugs and connectors loosening 5 - Damaged hoses 6 - Leakage from the housing	* - Replace seals or shafts - Clean the breather and check the seat - Replace oil dipstick - Lock the plugs and connectors - Replaces hoses * - Replace gasket or sealant
9) Oil level variation	1 - Exchange water-oil through the cooler	* - Replace the cooler

APPENDIX E: REPORTING SHEET

APPENDIX F: AIR POLLUTION CONTROL PERMIT



Air Pollution Control District
San Luis Obispo County



November 2, 2011

Tom Trott
SLO Co. Flood Control & Water Conservation Dist.
SLO County Public Works
Government Center, Room 207
San Luis Obispo CA 93408

SUBJECT: Issuance of an Air Pollution Control District Permit to Operate Number 1812-1 for the Located at 2853 Lopez Dr., Arroyo Grande.

Dear Mr. Trott:

Enclosed you will find an Air Pollution Control District Permit to Operate a which was authorized under APCD Authority to Construct Number 5578 dated July 19, 2011. Permit Number 1812-1 has been assigned to this equipment. Future renewals are scheduled every year during the month of November to determine if the equipment continues to comply with District Rules and Regulations. If the equipment is still in compliance, the Permit to Operate will be renewed.

You will note that conditions have been placed upon your Permit to Operate. The described equipment and operations must comply with all District Rules and stated conditions to be deemed in compliance. Review the equipment description and conditions and contact the District within ten (10) days if any discrepancies are found. As per District Rule 208, appeals to District actions on permits may be made in writing to the Hearing Board within thirty (30) days of receipt of the permit.

Enclosed you will also find an invoice in the amount of \$737.00, of which \$345.00 is for the costs of engineering evaluation and permit processing, and \$392.00 covers the Initial Permitting Fee. Please make your check payable to the San Luis Obispo County Air Pollution Control District and pay the full amount of the invoice within thirty (30) calendar days of the invoice date to keep your Permit to Operate valid. If you have any questions, feel free to contact Brian Kane at this office at (805) 781-5912.

Very truly yours,

LARRY R. ALLEN
Air Pollution Control Officer

A handwritten signature in blue ink, appearing to read "Gary E. Willey", written over the typed name.

GARY E. WILLEY
Manager, Engineering Division

Enclosures

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Air Pollution Control District
San Luis Obispo County

PERMIT TO OPERATE

Number 1812-1

EQUIPMENT OWNER-OPERATOR:

SLO Co. Flood Control & Water Conservation Dist.
SLO County Public Works
Government Center, Room 207
San Luis Obispo, CA 93408

EQUIPMENT LOCATION:

2853 Lopez Dr., Arroyo Grande

EQUIPMENT DESCRIPTION:

A stationary, standby diesel powered flood control pump for use at various locations consisting of one (1) emergency water pump powered by a diesel fueled, 250 hp, 2010 John Deere Model 6090HF485 engine, EPA Tier III, EPA Family No. AJDXL13.5900, Serial Number: RG6090L105302

CONDITIONS:

1. Non-Emergency Operation
 - a. Non-emergency operation shall be limited to maintenance and performance testing only and shall not exceed thirty (30) hours per engine per calendar year. Operation for emissions testing required by the District shall not be limited by this condition.
 - b. The Air Pollution Control Officer (APCO) shall be notified in writing within seven (7) days of exceeding the yearly non-emergency operation limit.
 - c. An emergency is defined as failure of normal electrical power service that is beyond the control of the permit holder and does not include voluntarily disconnecting from utility grid power.

2. Only diesel fuel that meets the California Air Resources Board's specifications for on-road use shall be used to fuel the engine(s) unless otherwise approved by the APCO. Records of the fuel purchases shall be maintained and include a fuel specification sheet that shows compliance with this condition.
3. Visible emissions from the engine shall not exceed Ringelmann No. ½ or ten percent (10%) opacity for periods aggregating more than three (3) minutes in any hour.
4. A non-resettable hour meter for each engine shall be installed and maintained unless an APCO approved alternative tracking procedure is approved.
5. An operating log for the current calendar year shall be maintained for each engine on a monthly basis. Entries shall also be made for any day that the engine is operated and for any day that the engine receives fuel. The logs shall be retained for at least three (3) years and shall include the following data:
 - a. Operating mode: emergency, maintenance, or District required testing
 - b. Engine hour meter reading at start-up,
 - c. Engine hour reading at shutdown,
 - d. Operating hours for the calendar day,
 - e. Running total calendar year to date operating hours,
 - f. Running total calendar year to date operating hours in maintenance mode,
 - g. Running total calendar year to date operating hours in emergency mode,
 - h. Estimated fuel use for the day in gallons,
 - i. Running total calendar year to date fuel use in gallons,
 - j. Fuel purchased in gallons, and
 - k. Total costs of any engine repair or reconstruction, excluding consumable items associated with standard maintenance activities.
6. Within fourteen (14) days of a request, the following information shall be submitted to the APCO for the previous calendar year for each engine:
 - a. Maintenance operating hours,
 - b. Emergency operating hours,
 - c. District required testing operating hours,
 - d. Total engine operating hours,
 - e. Total fuel usage,
 - f. Copies of all fuel purchase records, and
 - g. Total cost of engine repairs to date for each engine.
7. The APCO shall be notified prior to the repair or reconstruction of any diesel engine under permit. Consumable items used for regular maintenance, such as filters, hoses, belts, fluids, and glow plugs, are not considered repairs. In addition, replacement parts costing less than \$100.00 can be omitted from this requirement. This condition is a result of a state regulation on rebuilds or repairs. Extensive repairs could trigger lower allowable emission rates. If lower emission rates apply, they may not be achievable with a simple rebuild.

8. Temporary Engine Replacement: Any engine subject to this permit may be temporarily replaced with another engine if all the requirements listed in sections a. through e. below are satisfied:
 - a. The APCO shall be notified in writing or by fax at (805) 781-1002 within seventy two (72) hours of a permitted engine being replaced with a qualified temporary engine. The notification shall include the replacement engines make, model, rated horsepower, engine family number, current engine hour meter reading, manufacturer's particulate matter and oxides of nitrogen (NOx) emission rates in grams per horsepower-hour (g/hp-hr) and the reason for the replacement.
 - b. The permitted engine is in need of routine repair or maintenance and is returned to its original service within 180 days of installation of the temporary engine.
 - c. The temporary replacement engine has the same or lower manufacturer rated horsepower and same or lower potential to emit of particulate matter and Oxides of Nitrogen (NOx) as the permitted engine that is being temporarily replaced. Upon written request, the APCO may approve a replacement engine with a larger rated horsepower than the permitted engine if the proposed temporary engine has manufacturer guaranteed emissions less than or equal to the permitted engine or if the engine meets current permitting requirements.
 - d. The temporary replacement engine shall comply with all conditions of this permit, including but not limited to, engine operating hour limits, recordkeeping and reporting requirements.
 - e. The APCO shall be notified in writing or by fax at (805) 781-1002 within 14 days of removal of the temporary engine.
9. This equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the information presented in the application under which this permit was issued.
10. If the APCO determines that the operation of this equipment is causing a public nuisance, the owner/operator shall take immediate action and eliminate the nuisance.
11. The APCO shall be notified in writing before any changes are made to operating procedures, equipment, or materials used which have the potential to increase the emission of any air contaminant.

12. This permit is not transferable to a new owner or location without the APCO's approval. A change of ownership application shall be submitted to the APCO at least ten (10) working days prior to any change in the person or agency that is responsible for the operation of the equipment described above. An authority to construct application must be submitted and approved by the APCO prior to moving the permitted equipment to a new location.

November 3, 2011

ISSUANCE DATE

November (annually)

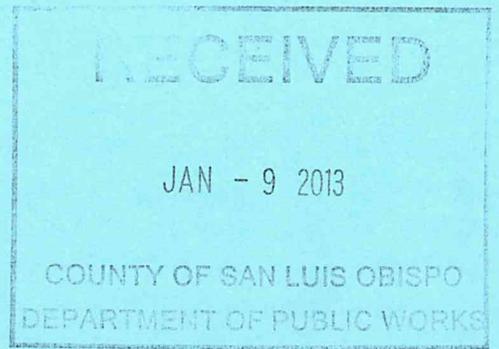
ANNIVERSARY

LARRY R. ALLEN
Air Pollution Control Officer



GARY E. WILLEY
Manager, Engineering Division

Application Number: 5578



TO: TOM TROTT
SLO COUNTY FLOOD CONTROL & WATER CONSERVATION DIST.
SLO COUNTY PUBLIC WORKS
GOVERNMENT CENTER, ROOM 207
SAN LUIS OBISPO CA 93408

The Air Pollution Control District has received payment of your permit renewal fees. Attached below is your permit renewal. Please detach the bottom portion of this page and affix to your Permit to Operate.



Air Pollution Control District
San Luis Obispo County

PERMIT RENEWAL

DATE: January 8, 2013

Permit Number: 1812-1

A permit renewal inspection was recently conducted at your facility and it has been determined from the inspection that the subject equipment is operated in compliance with the rules and regulations of the Air Pollution Control District. This is a renewal of the permit operating license until **November 2013**.

Please also consider this a receipt for your fees in the amount of **\$392.00**.

Equipment Location: **2853 Lopez Drive, Arroyo Grande**

San Luis Obispo County Air Pollution Control District

Please affix this note to your Permit to Operate.