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OPERATION / MAINTENANCE MANUAL

HURRICANE 500 & 600 ELECTRONICALLY CONTROLLED ENGINES

INTRODUCTION

The *Hurricane* is designed for rugged, reliable operation featuring powerful vacuuming capability with a very minimum daily maintenance. The *Hurricane* will pneumatically convey material from distances in excess of 1000 feet. Any material that is flowable, whether liquid, slurry or solid, or able to move through a 4", 5" or 6" diameter hose, can be handled with this equipment.

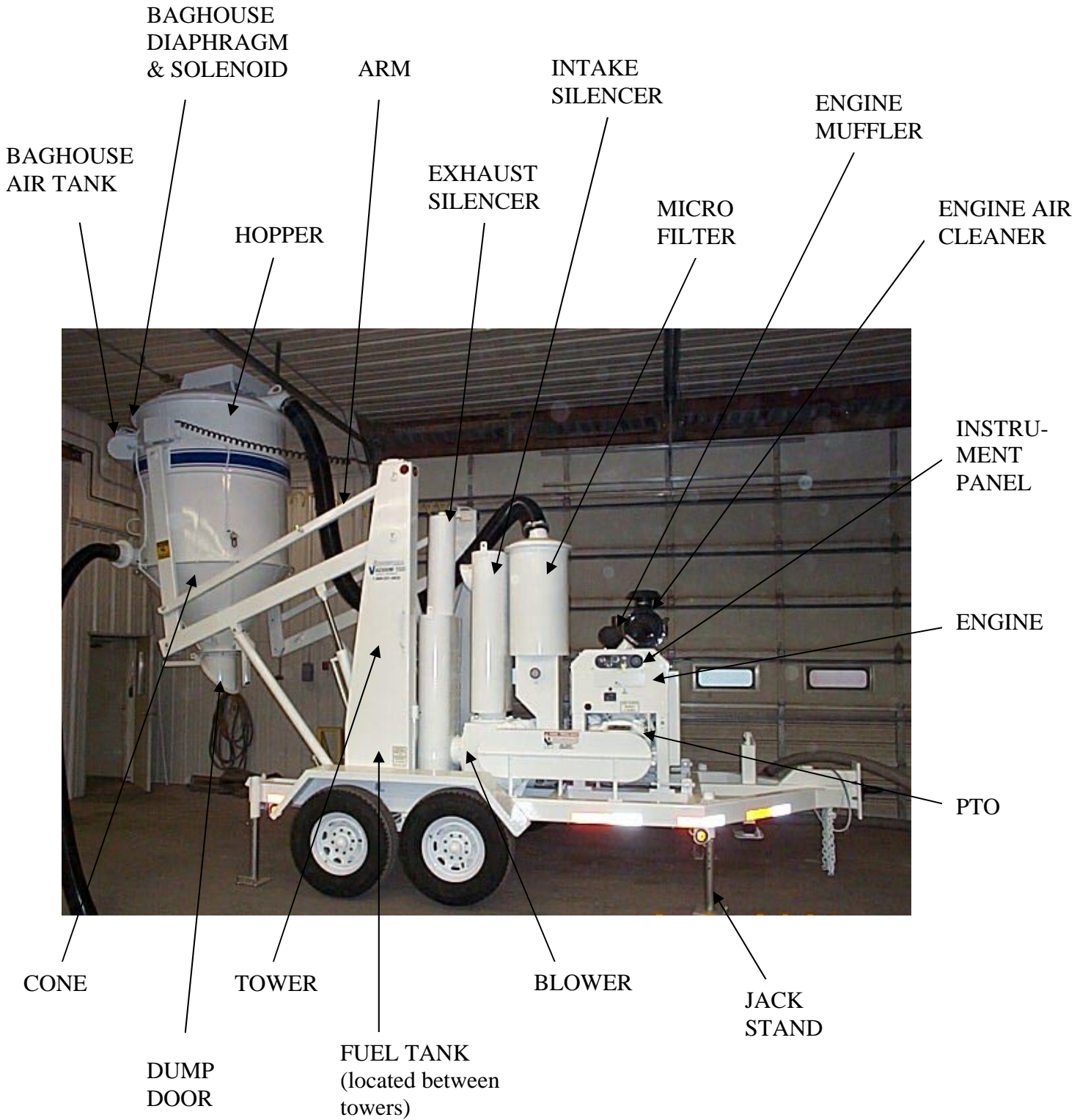
THE *Hurricane* SHOULD NEVER BE USED OR MOVED WITHOUT REFERENCE TO THE SAFETY PROCEDURES NOTED BELOW.

This equipment is self-contained and powered by a six-cylinder diesel engine. It will provide excellent service if properly maintained. There are no unique or complicated parts that require sophisticated maintenance procedures under normal operation. The diesel engine is equipped with automatic shutdowns for low oil pressure and high temperature.

The engine enclosure of the *Hurricane* has locking latches and the fuel tank has a locking cap. It is possible to secure the machine when it is running and leave it unattended.

The tandem axle trailer is equipped with electric brakes. The *Hurricane* can easily be towed and maneuvered with a one ton, or larger, truck having dual rear wheels.

Because of its ease of set-up and maneuverability, the *Hurricane* is a very flexible and effective piece of industrial vacuum cleaning equipment. You will find its value to you will only be limited by your imagination.





Coiled Cable
P/N EC2002

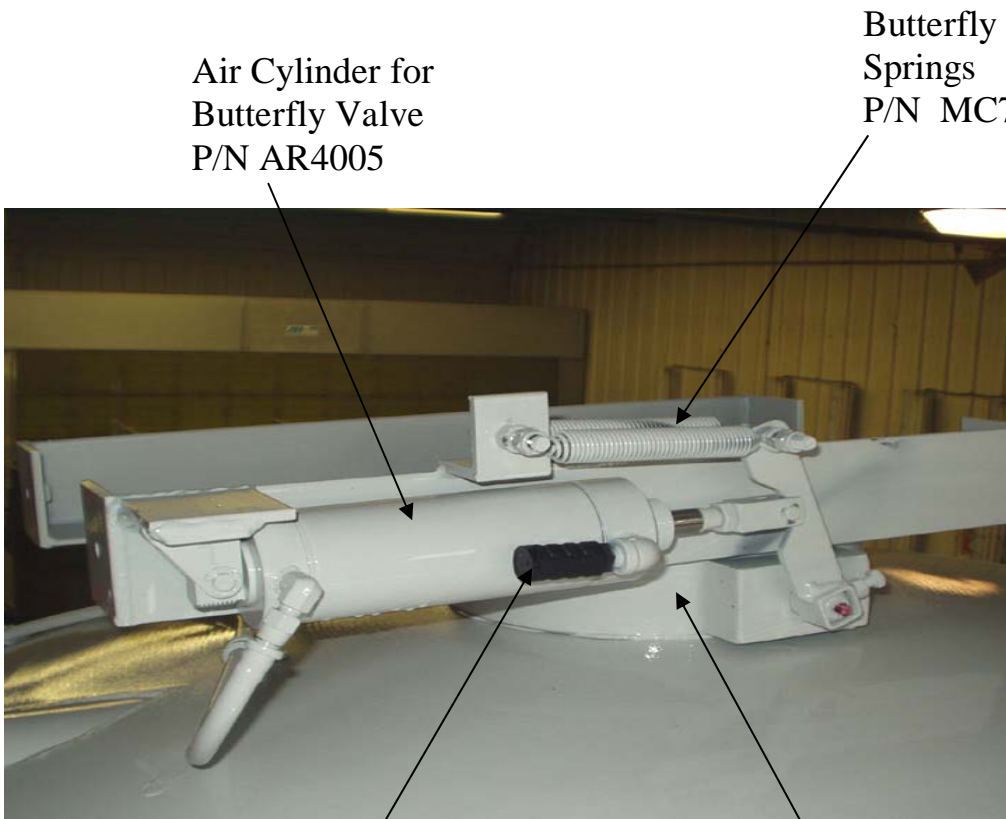
Baghouse Timer
Board
P/N EC2001

Butterfly
Solenoid
P/N: AR4201



Baghouse Solenoid
P/N
AR4015

Baghouse Diaphragm
P/N
AR4016



Air Cylinder for
Butterfly Valve
P/N AR4005

Butterfly
Springs
P/N MC7001

Breather for Butterfly
Air Cylinder
P/N AR4034

Butterfly Valve
P/N MC9712

SAFETY

Failure to follow the safety rules in this manual can result in personal injury, death or property damage. Please observe the same common sense precautions used with any machine, where carelessness, inattention or poor maintenance could be hazardous to people or property. Carefully read the safety precautions below and within this manual.

Towing Safety Instructions

- Due to the *Hurricane's* height of 11'1", extra caution is required for overhead clearance.
- The *Hurricane's* height does not permit shipping or transporting via semi-truck trailer. The *Hurricane* must be towed behind an appropriate motor vehicle.
- The *Hurricane* is not engineered to be lifted or lowered by a crane or similar lifting devices, contact Industrial Vacuum for additional engineering if unit needs to be lifted or lowered by these means.
- Caution must be used when towing the *Hurricane* due to it weighing in excess of 10,500 lbs.
- Be sure all lights on the trailer are functioning properly before traveling with this unit.
- Always tow the *Hurricane* with the safety chains and the emergency brake chain attached to the towing vehicle.
- Before towing the *Hurricane*, inspect the tires and the hitch mechanism to be sure they are road-worthy.
- Always tow the *Hurricane* with the Hopper in the lowered and locked position.
- Always tow the unit with the Hopper completely empty and the discharge door strapped shut.

Set-up Safety Instructions

- Be sure to block the wheels before detaching the unit from the towing vehicle.
- Always position the unit on solid ground. If the unit must be set-up on soft ground, make sure there are planks underneath the jack stands to distribute the weight of the machine evenly.
- Always position the unit so that it is sitting no more than 5 degrees off level in any direction.
- Never raise the Hopper on the unit under electrical wires or near any power cables of any kind.
- Never stand under the raised Hopper unless the hydraulic safety struts are pinned in place.
- Always pin the hydraulic safety struts when the Hopper is in the raised position.
- Lower and pin all four jack stands so that ALL jack stands bear weight before raising the hopper.

SAFETY (cont'd)

Follow Safety Instructions

- Carefully read all safety messages on your machine. 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 through the manufacturer.

Handle Fuel Safely

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

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.

Wear Protective Clothing

- Wear close fitting clothing and safety equipment appropriate to the job.
- Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.

Protect Against Noise

- Prolonged exposure to loud noise can cause impairment or loss of hearing.
- Wear a suitable hearing proactive device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Handle Chemical Products Safely

- Direct exposure to hazardous chemical can cause serious injury. Potentially hazardous chemicals used with 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.

SAFETY (cont'd)

Stay Clear of Rotating Drivelines

- Entanglement in rotating driveline can cause serious injury or death.
- Keep master shield and driveline shields in place at all times.
- Always operate the machine with access doors closed.
- Lock all access doors before leaving the machine running unattended.
- Make sure rotating shields turn freely.
- Wear close fitting clothing. Stop the engine and be sure all moving parts have stopped before make adjustments or performing service on machine.

Practice Safe Maintenance

- Understand service procedure before doing work. See components service manual, located in *Hurricane's* owner manual for instructions and additional safety requirements.
- Vacuum creates VERY HIGH SUCTION—EXTREME CAUTION IS REQUIRED when handling suction end points.
- When vacuuming certain materials, vacuum and supply lines can create static electricity. PROPER STEPS SHOULD BE TAKEN TO PREVENT INJURY.
- 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 machine. 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.
- Disconnect battery ground cable (-) before making adjustment on electrical systems or welding on machine.
- Do not look into the discharge door or the hopper inlet pipe when unit is running.
- Always wear safety glasses or goggles when looking inside the hopper through the discharge door.
- Always operate the machine with the engine doors closed and belt guard on.
- Whenever picking up sticky materials, such as a thick slurry or pitch dust on hot days, be sure to check the hopper every few hours to make sure all the material is discharging and not building up on the inside. Operating the Vibrator on these days is recommended.

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.

SAFETY (cont'd)

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.
- 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.

Avoid Heating Near Pressurized Fluid Lines

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

Blower Discharge Dust

- DO NOT operate the unit if dust is visible at the blower discharge.
- Turn unit off
- Contact Industrial Vacuum before continuing any use of unit.

Remove Paint Before Welding or Heating

- Avoid potentially toxic fumes and dust.
Hazardous fumes can be generated when welding, soldering or using a torch heats paint.
- Do all work outside or in a well-ventilated area. Dispose of paint and solvent properly.
- Remove paint before welding or heating
 - 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.

Service Cooling System Safely

- Explosive release of fluids from pressurized cooling systems 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.

SAFETY (cont'd)

Dispose of Waste Properly

- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with this machine includes such items as oil, fuel, coolant, brake fluid, filters and batteries. Follow OSHA, State and Federal guidelines.
- Use leak proof 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. Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center.

E-Stop Button Instructions

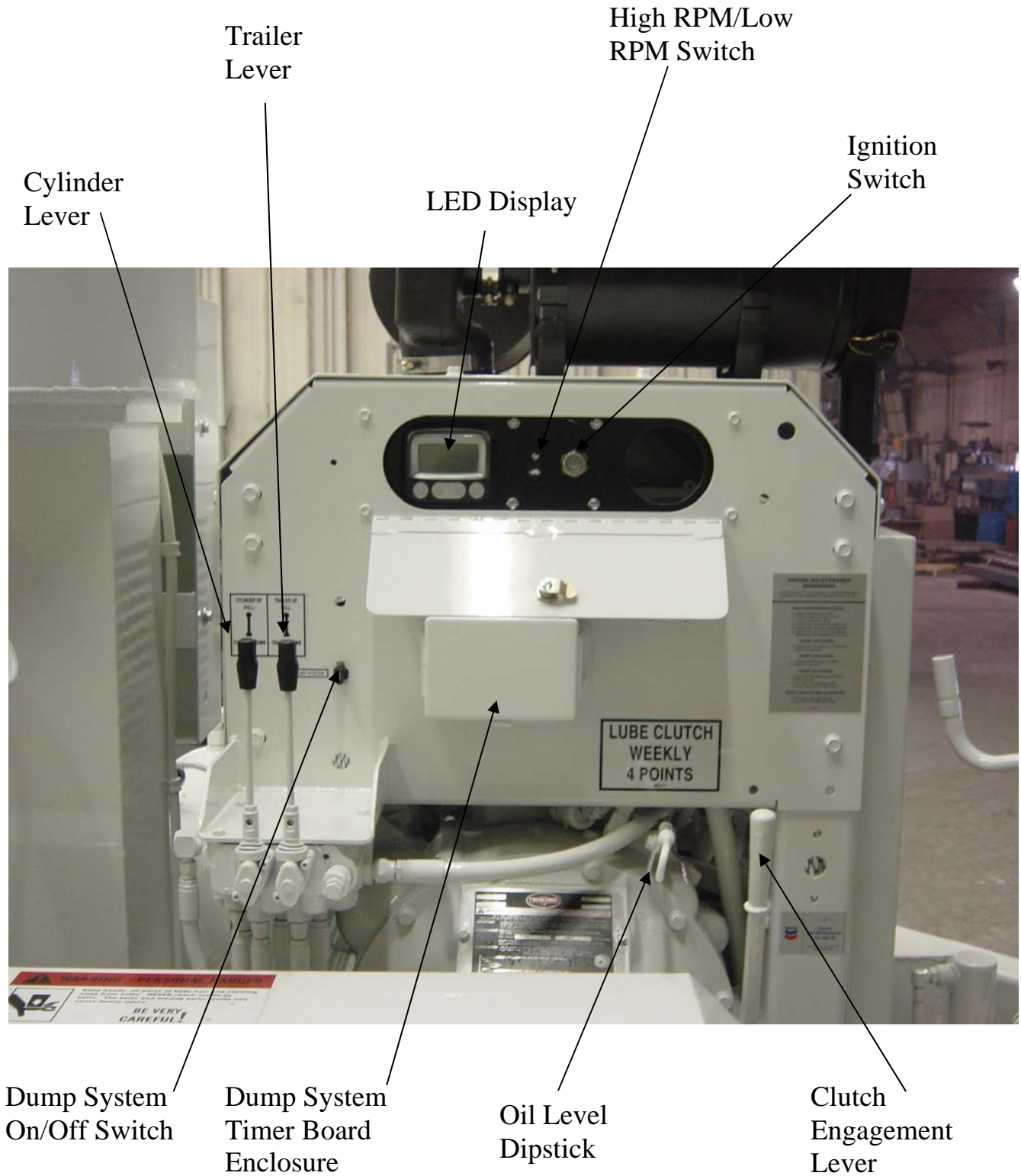
- Each day, before beginning vacuum operations, test the e-stop button to make sure it is working properly.
- Whenever the vacuum is in operation, the e-stop button **MUST** be within reach of the vacuum hose operator, or must be attended by another operator.
- Whenever adding/removing hose and/or pipe, the E-stop button should be used to stop vacuum suction until all connections are completed.

INSTRUMENTATION

The instrument panel on the *Hurricane* contains the following items:

1. LED Display – Will show engine instrumentation by using the Fwd/Back arrow keys.
Example: Tachometer, Hours, Oil Pressure, Coolant Temperature
2. Air Pressure Gauge – **Located on air tank**; air pressure should read between 90 and 115 PSI.
3. Ignition Switch – Off/On/Start sequence for starting.
4. Cylinder Lever – This lever is used to raise or lower the collection hopper.
5. Trailer Lever – This lever is used to raise or lower trailer hydraulic foot.
6. Dump System Timer Board Enclosure – The dump timer is equipped with an ON TIME or VACUUM TIMER adjustable from 1 to 10 minutes. The OFF TIME or DUMP TIME is adjustable from 10 to 100 seconds.
7. Dump Systems On/Off Switch – When the switch is in the ON position, the dump timer will start working.
Note: The Emergency Stop Button must be pulled out.
Note: The dump timer always starts its cycle in the dump mode, or OFF time.
8. Oil Level Dipstick
9. Clutch Engagement Lever
10. High RPM/Low RPM Switch

Hurricane 500 & 600 Instrumentation Panel



DAILY MAINTENANCE

**ALL INSPECTION PROCEDURES SHOULD BE ACCOMPLISHED WITH ENGINE OFF
AND KEY REMOVED!**

ENGINE

1. Check oil level.
2. Check radiator coolant level.
3. Check or change outer air cleaner cartridge.
4. Check battery connections (most units have service-free batteries).
5. Check radiator fins for dirt and obstructions on the fan side. Keep hands and loose clothing away from fan, belts and pulleys.

BLOWER

1. Check oil level at both ends of blower.
2. Check belt tension.

AIR COMPRESSOR

1. Auxiliary drive air compressor – NO daily maintenance needed.

HYDRAULIC SYSTEM

1. Check oil level (at least 1/2 to 2/3 full).
2. Check for hydraulic leaks on the various hoses and connections.

GENERAL

1. Check fuel level.
2. Make general inspection for leaks and loose bolts.
3. Drain water from all air tanks.
4. Check the inside of the collection hopper to be sure no material is collecting on the walls of the cone.
5. When the unit is running and the air pressure is up to 90 PSI, listen for the bag pulsing sequence.

EXTENDED MAINTENANCE

FIRST 100 HOURS

1. Change engine oil and engine oil filter. Refer to John Deere Manual.

EVERY 200 HOURS

1. Change engine oil and engine oil filter. Refer to John Deere Manual.
2. Check upper deflector plate inside collection hopper for excessive wear.

EVERY 300 HOURS

1. Change blower safety filter.
2. Change filter bags if needed. See maintenance procedures.
3. Rebuild air drier. Refer to Air Dryer Bulletin.

EVERY 500 HOURS

1. Change engine fuel filter. Refer to John Deere Manual.
2. Change blower oil in both ends. Refer to Blower Manual.
3. Check condition of removable wear plate for excessive wear.

EVERY 1,000 HOURS

1. Remove vent tube on engine and clean it with diesel fuel. Refer to John Deere Manual.
2. Change hydraulic oil. See spec sheet.
3. Check dump door gasket for excessive wear.

EVERY 5,000 MILES

1. Repack wheel bearings on trailer. Refer to Dexter Manual.
2. Check pressure on trailer tires, 80 PSI.

MAINTENANCE PROCEDURES / INFORMATION

Filter Bag Change

1. Remove butterfly cover bolts and lift off cover. **CAUTION:** Drain air in system. Disconnect air line that runs from butterfly cylinder to the solenoid.
2. Remove all lid bolts.
3. Carefully lift off unit.
4. Locate blast pipes and remove.
5. Lift cages out of filter bags and set aside
6. Using a large screwdriver, press in on the top part of the filter and pop it out of place. Let the filter fall down and through the cone.
7. Remove all filters. Clean all of the dust off filter area.
8. Install filters using the same method, only in reverse (filters in, cages, blast pipes, lid, and air line).
9. Completed



ENGINE

Maintenance instructions on the engine are included with this manual. The engine should be maintained per their requirements.

BLOWER

Maintenance instructions on the blower are included with this manual. This blower is a precision piece of equipment, and service should not be attempted by other than qualified personnel. The blower needs little maintenance other than checking oil levels and changing oil as required. If the blower begins to “knock”, **SHUT DOWN THE UNIT IMMEDIATELY AND CONSULT FACTORY.** The blower has a one-year warranty.

NACD/CLUTCH

Operating and maintenance instructions are included with this manual. Follow their instructions as to grease intervals and adjustment procedures. The clutch needs adjustment when there is little or no effort required to snap it over center. Sometimes this means adjusting the clutch every few days for the first 100 hours of operation. If the clutch slips excessively, it will overheat and cause damage. The clutch carries a limited warranty—see Operator's Manual.

AIR DRYER

A bulletin on this component is included in this manual. This should require no maintenance, however, it is recommended that the desiccant be changed every 1,000 hours.

BAGHOUSE TIMER AND DUMP CYCLE TIMER

These components cannot be serviced in the field. All that can be checked are voltage to unit, fuse and output. If the fuse is good and power is present at the input leads and the unit fails to operate, replace the entire circuit board.

VACUUM RELIF VALVE

This valve is factory set and should not be tampered with. Serious damage may result if unqualified personnel improperly adjust valve.

ENGINE AIR CLEANER

The Donaldson air cleaner on the diesel engine is a dual element filter. There is a smaller secondary element inside the primary element. The secondary element needs only to be changed if the primary element gets torn, broken, or is installed improperly. Operating the engine without proper filtration will **VOID THE ENGINE WARRANTY**. Operating the engine without proper air filtering for as little as one hour can seriously shorten engine life.

FUEL AND LUBRICANTS

FUEL SPECIFICATIONS

1. Use grade No. 2-D Diesel fuel above 32° F.
2. Use grade No. 1-D Diesel fuel below 32° F.
3. Use grade No. 1-D Diesel fuel for all temperatures at elevations above 5,000 feet.

ENGINE LUBRICATING OIL

Use SAE 15W-40, multi-viscosity oil.

Example: Chevron-Delo 400 Multigrade

BLOWER LUBRICATING OIL

The required lubricant for this machine is Amsoil Synthetic R&O, AW Gear & Bearing ISO-220 (RCM).

HYDRAULIC LUBRICATING OIL

Use hydraulic oil AW ISO 32.

SETTING UP FOR VACUUMING

1. Perform daily maintenance procedures.
2. When the trailer is in position, set the wheel chocks so it cannot move when disconnected from the truck.
3. Start the engine – turn key to run position and hit enter button, let it idle to build up air pressure and warm up.
4. Attach suction hose to inlet port on cylinder.
5. Using the adjustable jack on the front of the trailer, raise tongue of *Hurricane* off pintle hook on the truck and pull the truck away. Lower front of trailer, then lower and pin rear jack stands in such a way that trailer will sit level. Make sure these pads are sitting on a concrete surface; if on soft ground, they should be placed on heavy planks that will not sink into the ground.
6. Raise front of trailer so that the rear jack stands are carrying weight, then lower and pin the front jack stands.
7. When the unit is properly set, it should be level with pressure on all four jack stands.
8. Remove spring clamp/ rubber strap holding dump door closed.
CAUTION: Do not proceed or raise hopper unless area around and above unit is inspected and found to be free of electrical wires or other obstructions.
9. Using “Cylinder” control lever, located near engine, raise collection hopper to necessary height to clear the collection box, dump truck, or container.
10. When the proper height is reached, place the pins in the closest hole on the hydraulic safety struts just above the hydraulic cylinder top, and then gradually lower the hopper until it is resting on the safety strut pins.
11. DO NOT STAND UNDER THE COLLECTION HOPPER OR GET BETWEEN THE COLLECTION HOPPER AND THE TRAILER WHEN THE CYLINDER IS IN THE RAISED POSITION WITHOUT THE HYDRAULIC SAFETY STRUTS PINNED IN PLACE.
12. DO NOT LEAVE THE COLLECTION CYLINDER IN THE RAISED POSITION WITHOUT THE HYDRAULIC SAFETY STRUTS PINNED IN PLACE.

OPERATING VACUUM

1. Start engine – turn key to run position and hit enter button, leave it at idle speed (approximately 800 RPM).
2. Check air pressure gauge, located on air tank, to be sure there is at least 80 PSI of air.
3. Engage PTO or clutch on right side of vacuum. Be sure it is fully engaged.
4. Increase throttle by pushing UP arrow key until full RPM is reached (maximum throttle setting 2200 RPM).
5. Select the proper vacuum or ON TIME and OFF TIME or dump time. The dump time and vacuum time must be set on the instrument panel according to the type of material being picked up.
6. Turn dump system ON/OFF switch to the ON position.
7. Turn baghouse switch to the ON position.
8. Start vacuuming.

E-STOP BUTTON INSTRUCTIONS

1. Each day, before beginning vacuum operations, test the e-stop button to make sure it is working properly.
2. Whenever the vacuum is in operation, the e-stop button **MUST** be within reach of the vacuum hose operator, or must be attended by another operator.
3. Whenever adding/removing hose and/or pipe, the E-stop button should be used to stop vacuum suction until all connections are completed.

TO SHUT DOWN VACUUM

1. Allow all material to clear suction hose.
2. Turn dump system switch to OFF.
3. Decrease throttle by pushing Down arrow key to return engine to idle speed.
4. Disengage clutch.
5. Always allow diesel engine to idle for at least 5 minutes after it has been under load before shutting off.
6. It helps to let the baghouse system pulse when the engine is cooling down. This helps keep the filters clean.

PREPARING UNIT FOR TRAVEL

1. Raise collection hopper and unpin hydraulic safety struts.
2. Lower collection hopper and guide the 6” hose down between the engine shroud and the cross bracing on the towers.
CAUTION: Do not place arms or hands in or near the hopper extension arm mechanisms.
3. As the collection hopper approaches the bottom position, be sure the bottom of the hopper swings in towards the trailer and the retention hook on the discharge spout engages the bar on the trailer frame.
4. Attach spring clamp/rubber strap that holds discharge door closed.
5. Be sure the trailer’s adjustable jack is fully raised, and jack stands are pinned in uppermost position before traveling on the road.
6. Be sure safety chains are attached to towing vehicle before traveling on the road.
7. Be sure all marker lights, brake and turn signals are functioning properly before traveling on the road.
8. Latch and lock all engine doors and remove the key.

MAJOR COMPONENT SPECIFICATIONS

	<u>MODEL 500</u>	<u>MODEL 600</u>
ENGINE	John Deere Model 6068T, 170 HP	John Deere Model 6068T, 170 HP
BLOWER	Roots Model 616 DVJ	Roots Model 624 RAM
AIR COMPRESSOR	Haldex 13.5 ACFM at 110 PSI	Haldex 13.5 ACFM at 110 PSI
BLOWER DRIVE	5 V-belt drive w/adjustable engine mounts	5 V-belt drive with adjustable engine mounts
HYDRAULIC PUMP & TANK (12-Volt Electric)	Barnes	Barnes
CLUTCH	NACD 11.5"	NACD 11.5"
BATTERY	12 volt, 75 amps	12 volt, 75 amps

RECOMMENDED SPARE PARTS FOR 500 & 600

<u>PART NUMBER</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
FN8014	37	Filter Bags
FN8065	37	Cages
FN8006H	1	Primary Filter
EC2001	1	Baghouse Timer – Hurricane
EC2000	1	Dump Timer – Hurricane
AR4015	1	Solenoid Baghouse
AR4016	1	Solenoid Rebuild Kit
MC7020	1	Removable Wear Plate
ED0008-3	1	Fuel Filter
ED0008-2	1	Fuel Filter
ED0007-2	1	Oil Filter
ED0016-2	1	Air Filter
ED0016-1	1	Air Filter
MC7001	2	Butterfly Spring
MC7007	1	Dump Door Gasket
AR5003	1	Air Dryer Kit
AR5000	1	Desiccant Kit
AR5001	1	Valve Kit

AVAILABLE OPTIONAL EQUIPMENT

Industrial Vacuum Equipment Corp. offers a variety of accessories and optional equipment to complement your *Hurricane*, including:

- | | |
|------------------------|--|
| Floor Nozzles | Attach to the end of the vacuum hose to pick up material spread across bare floors or decks. |
| Removable Bulk Nozzles | Lightweight nozzle for attachment to the end of the vacuum hose. Provides a rigid handle and suction tube to vacuum material from bare floors and enhances the operator's ability to vacuum hard to reach areas. |
| Replacement Parts | Industrial Vacuum stocks complete replacement parts for your <i>Hurricane</i> , including hose and filters. It is recommended that only Industrial Vacuum supplied replacement parts be used for your <i>Hurricane</i> . |

INDUSTRIAL VACUUM ALSO MANUFACTURES A WIDE LINE OF VACUUM AND COLLECTION DEVICES AND HOPPERS FOR HAZARDOUS AND NON-HAZARDOUS APPLICATIONS. CONSULT YOUR FACTORY REPRESENTATIVE FOR INFORMATION ON ALL OF OUR PRODUCTS.

INDUSTRIAL VACUUM EQUIPMENT CORP.
LIMITED WARRANTY

Seller warrants each new product to be free from defects in material and workmanship under normal use and maintenance as herein described. This warranty does not apply to commercial items manufactured by others (Roots Vacuum Pumps, John Deere Engines, etc.), which are covered by existing warranties of the respective manufacturers thereof. Seller's sole obligation under this warranty shall be limited to repairing, replacing or allowing credit for, at Seller's option, any part which under normal and proper use and maintenance proves defective in material or workmanship within twelve (12) months after delivery to Buyer. In the event of defects developing within that period, the Seller will furnish, F.O.B. its plant, without charge, parts required to replace material found defective. Beyond this, the Seller assumes no responsibility.

This warranty is in lieu of all other warranties (except of title), expressed or implied, and there is not an implied warranty of merchantability or fitness for a particular purpose. In no event shall Seller be liable for consequential or special damages.

Used products are sold on an "as is" basis and there is no implied warranty of merchantability or of fitness for a particular purpose, unless otherwise expressly stated on the face of this form.

JOHN DEERE NEW OFF-HIGHWAY ENGINE WARRANTY

Warranty Duration

Unless otherwise provided in writing by John Deere, John Deere makes the following warranty to the first retail purchaser and each subsequent purchaser (if purchase is made prior to expiration of applicable warranty) of each John Deere new off-highway engine marketed as part of a product manufactured by a company other than John Deere or its affiliates:

- 12 months, unlimited hours of use, or
- 24 months and prior to the accumulation of 2000 hours of use; and on each John Deere engine used in an off-highway repower application:
- 12 months, unlimited hours of use.

Note: In the absence of a functional hourmeter, hours of use will be determined on the basis of 12 hours of use per calendar day.

Warranty Coverage

This warranty applies to the engine and to integral components and accessories sold by John Deere.

All John Deere-warranted parts and components of John Deere engines which, as delivered to the purchaser, are defective in materials and/or workmanship will be repaired or replaced, as John Deere elects, without charge for parts or engine repair labor, including reasonable costs of labor to remove and reinstall nonengine parts or components of the equipment in which the engine is installed, and, when required, reasonable costs of labor for engine removal and reinstallation, if such defect appears within the warranty period as measured from the date of deliver to the first retail purchaser, if the delivery is reported to John Deere within 30 days of the delivery.

Obtaining Warranty Service

Warranty service must be requested of the nearest authorized John Deere engine service outlet before the expiration of the warranty. An *authorized* service outlet is a John Deere engine distributor, a John Deere engine service dealer, or a John Deere equipment dealer selling and servicing equipment with an engine of the type covered by this warranty. (See “When Warranty Service is Needed”)

Authorized service outlets will use only new or remanufactured parts or components furnished or approved by John Deere.

Authorized service locations and the name of the John Deere division or subsidiary making this warranty are listed in the *Parts and Service Directory for John Deere Engines* (stock number DKD376) available through any John Deere Dealer or from Deere Power Systems Group (P.O. Box 5100, Waterloo, IA 50704-5100, U.S.A.; US\$5.00, includes shipping and handling). Dealer information may also be obtained by calling (from U.S. and Canada) 1-800 JD ENGINE, or from elsewhere by calling U.S.A. number 1-319-292-5871 or faxing 1-319-292-5844; or calling

JOHN DEERE NEW OFF-HIGHWAY ENGINE WARRANTY (cont'd)

Obtaining Warranty Service (cont'd)

33.2.38.82.61.57 or faxing 33.2.38.84.62.66 in France. Some of the off-highway engine service locations will also be found on the Internet at <http://www.deere.com>. (Click on “Dealer Locator”.)

At the time of requesting warranty service, the purchaser must be prepared to present evidence of the date of delivery of the engine.

John Deere reimburses authorized service outlets for limited travel expenses incurred in making warranty service repairs in non-John Deere applications when travel is actually performed. The limit, as of the date of publication, is US\$300.00 or equivalent. If distances and travel times are greater than reimbursed by John Deere, the service outlet will charge the purchaser for the difference.

Warranty Exclusions

John Deere’s obligations shall not apply to fuel injection pump and nozzles during the pump and nozzle manufacturer’s warranty period on the pump and nozzles, components and accessories which are not furnished or installed by John Deere, nor to failures caused by such items. When the pump manufacturer’s warranty is less than the engine warranty, John Deere will reimburse pump repair costs for warrantable-type failures during the remainder of the original engine warranty period, when so documented by the pump manufacturer’s approved service outlet.

Purchaser’s Responsibilities

The cost of normal maintenance and depreciation.

Consequences of negligence, misuse, or accident involving the engine, or improper application, installation, or storage of the engine.

Consequences of service performed by someone other than a parts authorized to perform warranty service, if such service, in John Deere’s judgment, has adversely affected the performance or reliability of the engine.

Consequences of any modification or alteration of the engine not approved by John Deere, including, but not limited to, tampering with fuel and air delivery systems.

The effects of cooling system neglect as manifested in cylinder liner or block cavitation (“pitting”, “erosion”, “electrolysis”).

Any premium for overtime labor requested by the purchaser.

Costs of transporting the engine or the equipment in which it is installed to and from the location at which the warranty service is performed, if such costs are in excess of the maximum amount payable to the service location where the warranty service performed at the engine’s location.

JOHN DEERE NEW OFF-HIGHWAY ENGINE WARRANTY (cont'd)

Purchaser's Responsibilities (cont'd)

Costs incurred in gaining access to the engine; i.e., overcoming physical barriers such as walls, fences, floors, decks or similar structures impeding access to the engine, rental of cranes or similar, or construction of ramps or lifts or protective structures for engine removal and reinstallation.

Incidental travel costs including tolls, meals, lodging, and similar.

Service outlet costs incurred in solving or attempting to solve non-warrantable problems.

Services performed by a parts other than an authorized John Deere engine service dealer, unless required by law.

Charges by dealers for initial engine start-up and inspection, deemed unnecessary by John Deere when operation and maintenance instructions supplied with the engine are followed.

Costs of interpreting or translating services.

No Representations or Implied Warranty

Where permitted by law, neither John Deere nor any company affiliated with it makes any guaranties, warranties, conditions, representations or promises, express or implied, oral or written, as to the nonoccurrence of any defect or the quality or performance of its engines other than those set forth in this document, and DOES NOT MAKE ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY OR FITNESS otherwise provided for in the Uniform Commercial Code or required by any Sale of Goods Act or any other statute. This exclusion includes fundamental terms. In no event will a John Deere engine distributor or engine service dealer, John Deere equipment dealer, or John Deere or any company affiliated with John Deere be liable for incidental or consequential damages or injuries including, but not limited to, loss of profits, loss of crops, rental of substitute equipment or other commercial loss, damage to the equipment in which the engine is installed or for damage suffered by purchaser as a result of fundamental breaches of contract or breach of fundamental terms, unless such damages or injuries are caused by the gross negligence of intentional acts of the foregoing parties.

Remedy Limitation

The remedies set forth in this warranty are the purchaser's exclusive remedies in connection with the performance of, or any breach of guaranty, condition, or warranty in respect of new John Deere engines. In the event the above warranty fails to correct purchaser's performance problems caused by defects in workmanship and/or materials, purchaser's exclusive remedy shall be limited to payment by John Deere of actual damages in an amount not to exceed the cost of the engine.

JOHN DEERE NEW OFF-HIGHWAY ENGINE WARRANTY (cont'd)

No Seller's Warranty

No person or entity, other than John Deere, who sells the engine or product in which the engine has been installed makes any guaranty or warranty of its own on any engine warranted by John Deere unless it delivers to the purchaser a separate written guaranty certificate specifically guaranteeing the engine, in which case John Deere shall have no obligation to the purchaser. Neither original equipment manufacturers, engine or equipment distributors, engine or equipment dealers, nor any other person or entity, has any authority to make any representation or promise on behalf of John Deere or to modify the terms or limitations of this warranty in any way.

Replacement Parts Warranty

New John Deere parts installed during engine warranty service are warranted for 90 days (Certain major parts may be warranted for longer periods.) or for the remaining warranty period of the engine, whichever is longer. A new engine replacing a failed engine under warranty is warranted for the remaining warranty period of the original engine.

Warranty Transfer

The remainder of the original engine warranty and the emissions control-related warranty may be transferred to a subsequent owner of the engine. The Engine Warranty Transfer card should be used to report the transfer to John Deere.

Purchased Extended Warranty

Extended warranty may be purchased on most engines in many areas of the world. John Deere engine distributors and equipment dealers, and dealers of manufacturers using John Deere engines in their products, have details. John Deere may also be contacted at U.S.A. fax number 1-319-292-5844, or by fax in France at number 33.2.38.84.62.66.

Emissions Warranties

Emissions warranties appear in the operation and maintenance instructions furnished with the engine/machine. **(Warning: Statues providing severe penalties for tampering with emissions controls may apply at the user's location.)** John Deere may also be contacted at U.S.A. fax number 1-319-292-5844; or by fax in France at number 33.2.38.84.62.66.

**DRESSER ROOTS BLOWER WARRANTY
POLICY & PROCEDURE WP-5020**

A. APPLICABLE UNIT MODELS

- a. URAI[®] & URAI-J[®] Series 2 ½-inch through 7-inch gear diameter. Including the Dual Splash Lube (DSL) units.
- b. RAM[™] & RAM-J[™] Series 4 ½ through 6-inch gear diameter.

Note: Units not explicitly listed (i.e. mechanical seal gas units including URAI-G[®], water sealed units, steam blowers, DVJ series units, ROOTSFLO[™] & special material units, etc.) are specifically excluded from this amended policy and will conform to the General Terms of Sale GTS-5001.

B. APPLICABLE CUSTOMER CLASSIFICATIONS

All Customers purchasing applicable unit models. (Note: OEMs authorized by Dresser ROOTS and Authorized Distributors will pass the warranty on to their Customers.)

C. WARRANTY PERIOD

Twenty-four (24) months from date of original unit start-up or 30 months from date of original shipment, whichever occurs first.

D. POLICY

Dresser ROOTS warrants that the applicable model, when shipped will meet all applicable specifications and other specific unit and work requirements hereof. Units will be of good quality and will be free from defects in material and workmanship. All claims for defect units under this warranty must be made in writing immediately upon discovery and, in any event, within 24 months from start-up of a unit, or 30 months from shipment of the applicable unit, whichever occurs first.

Unit is defined in paragraph A above as Dresser ROOTS bare-shaft unit only. Buyer agrees to follow Dresser ROOTS' operating and maintenance instructions; maintain accurate records of same and provide these records upon request in order to process any claim.

E. PROCEDURE TO REPAIR OR REPLACE AT ROOTS' OPTION*

1. Customer ships the defective unit to Dresser ROOTS or the Authorized Distributor FREIGHT PREPAID.
2. Dresser ROOTS or the Authorized Distributor will, at our option, ship a replacement unit FREIGHT COLLECT or repair the unit and return it to Customer FREIGHT COLLECT.

**DRESSER ROOTS BLOWER WARRANTY
POLICY & PROCEDURE WP-5020 (cont'd)**

- F.** This policy and procedure, and the grant of the warranty herein, is expressly subject to and conditional upon Buyers acceptance of GTS-5001, except as modified hereby. The foregoing is expressly in lieu of all other warranties whatsoever, express, implied and statutory, including without limitation, the implied warranties of merchantability and fitness. Except for the remedies permitted under Dresser ROOTS Terms and Conditions of Sale, GTS-5001, as modified by this WP-5020, the foregoing is Dresser ROOTS' only obligation and Customer's exclusive remedy for breach of warranty, contract, tort or otherwise. In no event shall Customer be entitled to incidental or consequential damages, including without limitation any damage, loss or injury of whatsoever nature which does not flow directly from the act or omission in question but from a consequence or result of such act or omission including, but not limited to, any loss or anticipated loss of profit, loss or anticipated loss of revenue, business interruption, loss of use of any equipment, loss of any contract or other business opportunity and any other indirect loss of a similar nature. Any action for breach of this agreement must commence within two (2) years after the cause of action has accrued.

**DRESSER ROOTS BLOWER
GENERAL TERMS OF SALE**

1. GENERAL

- a. Seller's prices are based on these sales terms, and (i) this document together with any additional writings signed by Seller shall represent the final, complete and exclusive statement of the agreement between the parties and may not be modified, supplemented, explained or waived by parol evidence, Buyer's purchase order, a course of dealing, Seller's performance or delivery, or in any other way except in writing signed by an authorized representative of Seller, and (ii) these terms are intended to cover all activity of Seller and Buyer hereunder, including sales and use of products, parts and work and all related matters (references to products include parts and references to work include construction, installation and start-up). Any reference by Seller to Buyer's specification and similar requirements are only to describe the products and work covered hereby and no warranties or other terms therein shall have any force or effect. Catalogs, circulars and similar pamphlets of the Seller are issued for general information purposes only and shall not be deemed to modify the provisions hereof.
- b. The agreement formed hereby and the language herein shall be subject to the laws in effect on the date hereof of the state in which any order resulting from this Proposal is accepted.

2. TAXES

Any sales, use or other similar type taxes imposed on this sale or on this transaction are not included in the price. Such taxes shall be billed separately to the Buyer. Seller will accept a valid exemption certificate from the Buyer if applicable; however, if an exemption certificate previously accepted is not recognized by the governmental taxing authority involved, and the Seller is required to pay the tax covered by such exemption certificate, Buyer agrees to promptly reimburse Seller for the taxes paid.

3. CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE

- A. Unless Seller specifically assumes installation, construction or start-up responsibility, all products shall be finally inspected and accepted within thirty (30) days after receipt at point of delivery. Products not covered by the foregoing and all work shall be finally inspected and accepted within thirty (30) days after completion of the applicable work by Seller. All claims whatsoever by Buyer (including claims for storage) excepting only those provided for under the WARRANTY and PATENTS Clauses hereof must be asserted in writing by Buyer within said thirty (30) day period or they are waived. If this contract involves partial performance, all such claims must be asserted within said thirty (30) day period for each partial performance. There shall be no revocation of acceptance. Rejection may be only for defects substantially impairing the value of products or work and Buyer's remedy for lesser defects shall be those provided for under the WARRANTY Clause.

**DRESSER ROOTS BLOWER
GENERAL TERMS OF SALE (cont'd)**

- B. Shipping dates are approximate and are based upon prompt receipt of all necessary information. Seller shall not be responsible for nonperformance or delays in performance occasioned by any causes beyond Seller's reasonable control, including, but not limited to, labor difficulties, delays of vendors or carriers, fires, governmental actions and material shortages. Any so occasioned shall effect a corresponding extension of Seller's performance dates which are, in any event, understood to be approximately. In no event shall Buyer be entitled to incidental or consequential damages for late performance or a failure to perform.

4. RISK OF LOSS

Full risk of loss (including transportation delays and losses) shall pass to the Buyer upon delivery of products to the f.o.b. point or if Seller consents to a delay in shipment beyond the contract date at the request of the Buyer, upon notification by the Seller that the products are manufactured.

5. TITLE

The title to and property in all apparatus sold hereunder and any substitutions or additions thereto and the right to possession thereof whether attached to realty or otherwise shall not pass from the Seller until all payments as herein set forth have been fully made by the Buyer in cash. Upon failure to make any payment as herein provided, the whole purchase money and any note or security given on account thereof shall forthwith become due and payable and the Seller may immediately enter the premises where the said apparatus is located and take possession of and remove the same as its personal property and may retain any or all partial payments already received a rental charge for the use of the said apparatus and material without affecting any further or other claims which it may have against the Buyer. The Buyer agrees to do all acts necessary to perfect and maintain such right and title in the Seller.

6. WARRANTY

- A. Seller warrants that its product and parts when shipped and its work (including installation, construction and start-up) when performed will meet all applicable specifications and other specific products and work requirements (including those of performance). If any, of this agreement, will be of good quality and will be free from defects in material and workmanship. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery and, in any event, within one (1) year from start-up or eighteen (18) months from shipment of the applicable item, whichever occurs first. Defective items must be held for Seller's inspection and returned to the original f.o.b. point upon request. **THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS.**
- B. Upon Buyer's submission of a claim as provided above and its substantiation, Seller shall at its option either (i) repair or replace its product, part or work at the original f.o.b. point of delivery, or (ii) refund an equitable portion of the purchase price.

**DRESSER ROOTS BLOWER
GENERAL TERMS OF SALE (cont'd)**

- C. The warranty specified herein shall apply to this contract, but it is specifically understood that products sold hereunder are not warranted for operation with erosive or corrosive fluids or those which may tend to buildup within the product quoted. No product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action of any fluid and Buyer shall have no claim whatsoever against Seller therefore nor for problems resulting from buildup of material within the unit.
- D. The foregoing is Seller's only obligation and Buyer's exclusive remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under THE CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is buyer's exclusive remedy hereunder by way of breach of contract, tort or otherwise. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within two (2) years after the clause of action has accrued.

7. PATENTS

Seller agrees to assume the defense of any suit for infringement of any United States patents brought against Buyer to the extent such suit charges infringement of an apparatus or product claim by Seller's product in and of itself, provided (i) said product is built entirely to Seller's design, (ii) Buyer notifies Seller in writing of the filing of such suit within ten (10) days after the service of process thereof, and (iii) Seller is given complete control of the defense of such suit, including the right to defend, settle and make changes in the product for the purpose of avoiding infringement. Seller assumes no responsibility for charges of infringement of any process or method claims, unless infringement of such claims is the result of following specific instructions furnished by Seller.

8. TERMS OF PAYMENT

- A. Unless other terms are specified, all payments shall be in U.S. dollars. All shipments, unless otherwise specified, shall be EX WORKS manufacturer's plant per latest INCO terms. Loading of the equipment onto any collecting vehicle is included; however, this is not to be considered as part of the shipping terms required for payment. If delivery is delayed by Buyer, date of readiness for delivery shall be deemed date of delivery for payment purposes. If manufacture is delayed by Buyer, a payment shall be due based upon purchase price and percentage of completion. Balance shall be payable in accordance with terms stated herein.
- B. For contracts totaling less than \$100,000 U.S. dollars, all payment shall become due thirty (30) days after shipment.

**DRESSER ROOTS BLOWER
GENERAL TERMS OF SALE (cont'd)**

- C. For contacts totaling \$100,000 U.S. dollars and greater, special progress payments, as offered by Seller, shall apply. In cases where special terms are not proposed, final payment shall become due thirty (30) days after shipment.
 - 1) In the event any equipment is ready for shipment prior to scheduled date, any payment not due in accordance with the above terms shall immediately become due and payable upon notification by Seller to buyer that the equipment is ready for shipment.
 - 2) If shipments are delayed by Buyer for any cause whatsoever or are delayed by Seller for any cause whatsoever beyond Seller's control, payments shall become due and payable from the date of notification by Seller and the equipment is ready for shipment.
- D. Seller may, at its option, upon Buyer's default in payment hereunder, charge Buyer with any cost incurred by Seller incidental to its collection efforts including without limitation, reasonable attorney's fees and court costs.
- E. A service fee equal to 2% per month shall be charged on all amounts not received by the specified due date in order to recover costs and damages incurred as a result of the delay in payment.

9. LIMITATION OF LIABILITY

In no event shall Seller be liable for special, indirect or consequential damages whether for breach of contract, breach of warranty, tort or otherwise. The Seller's liability on any other claim for loss or liability arising out of or connected with this contract, or the manufacture, sale, delivery, resale, or use of any apparatus covered by this contract (including but not limited to loss of liability arising from breach of contract), shall in no case exceed the unit price of such apparatus or part thereof involved in the claim, except as provided in the paragraph entitled "Patents".

NACD WARRANTY

North American Clutch and Driveline provides a limited general warranty for their equipment. Basic information regarding this warranty is located on page 59 of the Service Manual provided in Section 4. Further terms and clarifications can be obtained by contacting NACD in Rockford, Illinois (Phone 800-383-9204).