Guzzler CL-E Operator's Manual

Release history

33 Updated dense phase image descriptions (AJK 5-5-2025)

Manual and Parts Page Files

Operation, maintenance, troubleshooting, parts pages, and supporting files for this unit are located in the Service Cloud and Vactor's Electronic Parts Catalog at: **Vactor.com** → **Parts and Service** → scroll down to **Service Cloud**

Replacement operation manuals require the unit serial number. Order part No.: 512459A-30

NOTICE

Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

NOTICE

- **Due to available options, the control panel illustrations and decals reflected in this manual may not appear the same on all units.**
- **Prior to operation, perform daily maintenance on the Vactor unit according to the Daily Maintenance Check List in the Maintenance Section of this manual.**
- **Read the safety and operation manuals before operating Vactor equipment.**
- **Set the parking brake and select neutral before operating the Vactor.**
- **Turn on any safety lighting according to procedures and local, state and federal law requirements.**
- **Everyone associated in any way with a Vactor® Mfg. product must thoroughly understand and apply the contents of this manual. It is the responsibility of the owner to train his employees in the operation and safety procedures while operating or repairing this equipment.**

NOTICE

- **Do not overload the vehicle. Due to weight restrictions, it may be better to fill the water tanks near the work site. Know the Gross Vehicle Weight Rating (G.V.W.R.). Know the vehicle axle capacities. Do not exceed the Gross Vehicle Weight (G.V.W.).**
- **Always follow procedures established by the water supplier.**
- **When connecting the fill hose, inspect the area around the fire hydrant and place hose in a position that will not impede traffic or cause vehicles to strike the hose.**

NOTICE

Custom Machine Parameters

Reprogramming the chassis or engine controls will result in problems ranging from improper operation to complete loss of service. Follow chassis manufacturer's procedures when reprogramming to avoid the loss of the custom machine parameters.

WARNING

Overriding Controls

To avoid injury or death never override any operator controls, fail-safe or deadman features of a control; or hydraulic, mechanical, or electrical safety devices during use.

Follow service instructions for overrides during maintenance.

WARNING

Cancer and Reproductive Harm

Required for compliance with California Prop 65. Refer to: www.P65Warnings.ca.gov

NOTICE

Follow recommended safety practices while performing all work. Refer to the FS Solutions/Guzzler/Vactor/TRUVAC/Westech Safety Manual for additional information.

This manual is available at: www.vactor.com

NOTICE

Jump Starting Or Welding Can Damage Electrical System

To avoid damage:

- **Disconnect ECU, control modules and batteries before welding on unit.**
- **Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.**
- **Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.**
- **Set all ignition switches to OFF before testing CANbus system.**

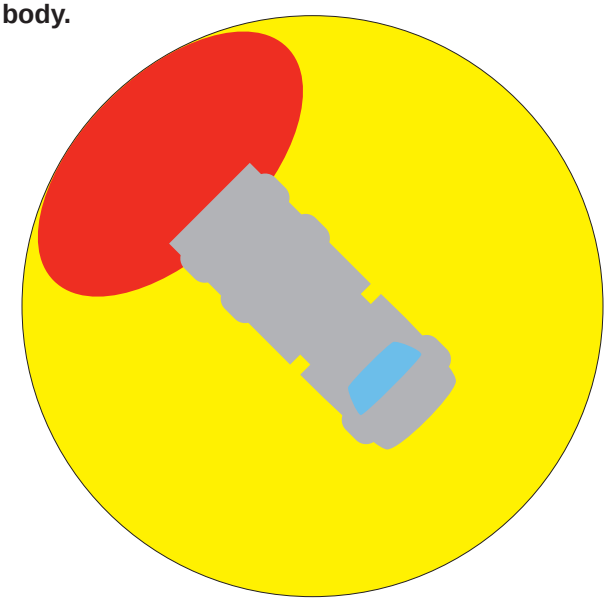
SAFETY INSTRUCTIONS

Unit operator must hold the pendant/remote during vacuum operations and stay within line of sight of the hose end operation. In an emergency, use the E-stop or pendant/remote to disable the vacuum. Maintain clear access to all E-stops and place an operator near one.

NOTICE

Safe Work Zone

Bystanders must be kept a minimum of 15 feet from the work area. NEVER stand directly behind the truck when raising or lowering the body.



NOTICE

Preparing for Transport

Prior to transport secure all tools, hoses and all miscellaneous items in their storage locations.

- **All items in tool trays and racks need to be secured or tied down.**
- **If equipped, secure boom in transport mode.**
- **If equipped, lower debris body, close rear door.**
- **If equipped, secure all hose ends on hose reels.**
- **Close and secure all cabinet, tool box and control panel doors and covers.**
- **Remove and stow all hoses, suction tube, extension pipes and accessories.**
- **Disengage the hydraulic, vacuum and water systems.**
- **Check and clear the area around the unit before moving.**

⚠ WARNING

Trip, fall and other hazards

To avoid serious injury or death always use the ladders, walkways, grab handles and safety tie off points provided on the unit. Follow all required site, local, state, federal requirements for service work. This may require that the unit be moved to location that can provide the required safe access equipment.

FSESG Environmental Solutions Group

Scan the QR Code with your mobile device or visit:

http://www.fsesgsafety.com

for the latest FSESG product and application safety information.

507048 r0

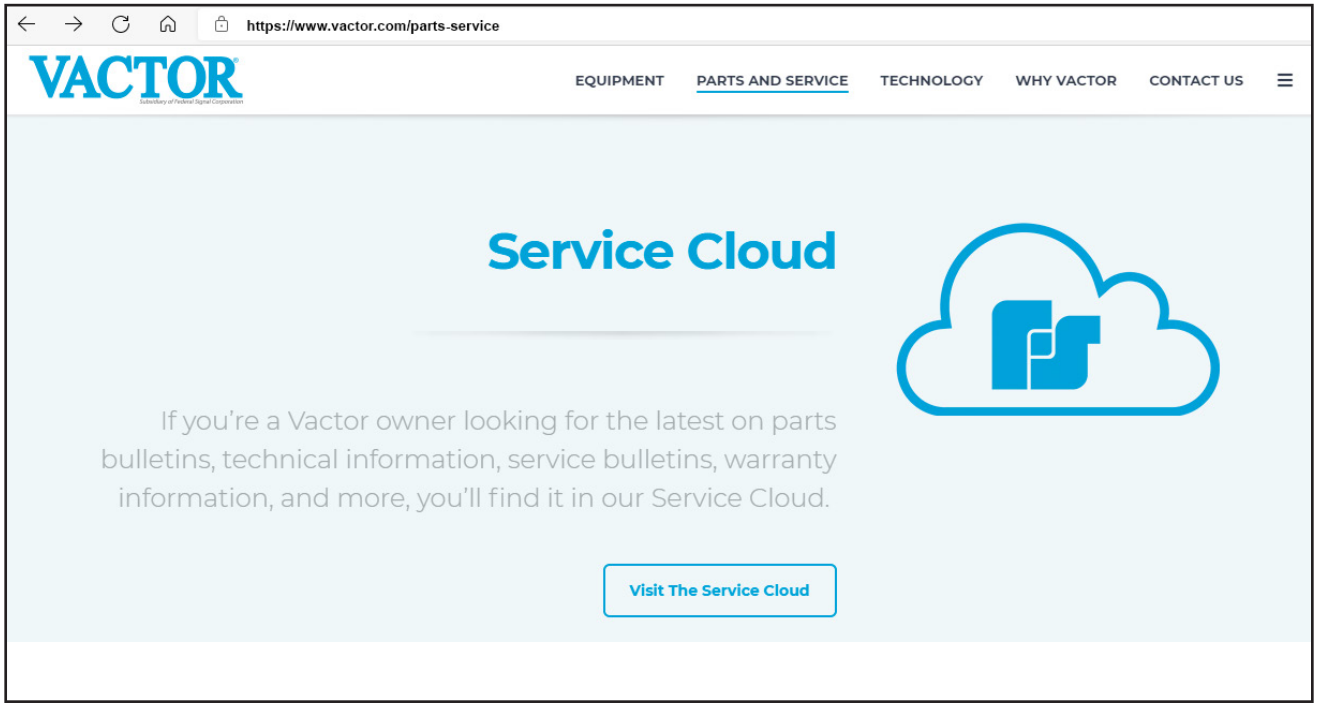
Guzzler/TRUVAC/Westech/Vactor Manual

This manual package contains safety and operation, maintenance, basic troubleshooting for your unit.

Electronic versions of the operation, maintenance, troubleshooting, parts pages, options, videos, and supporting files for this unit are located in the Service Cloud and Vactor's Electronic Parts Catalog at: **Vactor.com** → **Parts and Service** → scroll down to **Service Cloud**

Replacement operation manuals require the unit serial number.

Order part No.: 512459A-30



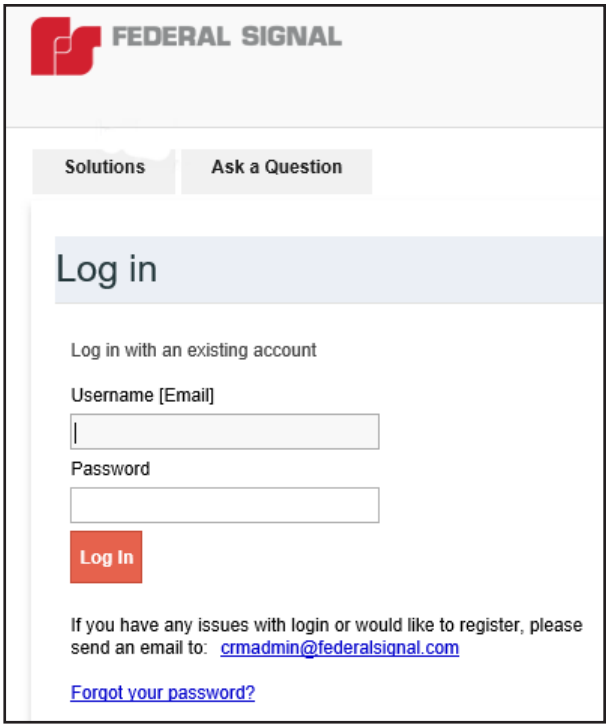
Units with High Pressure Handgun Options

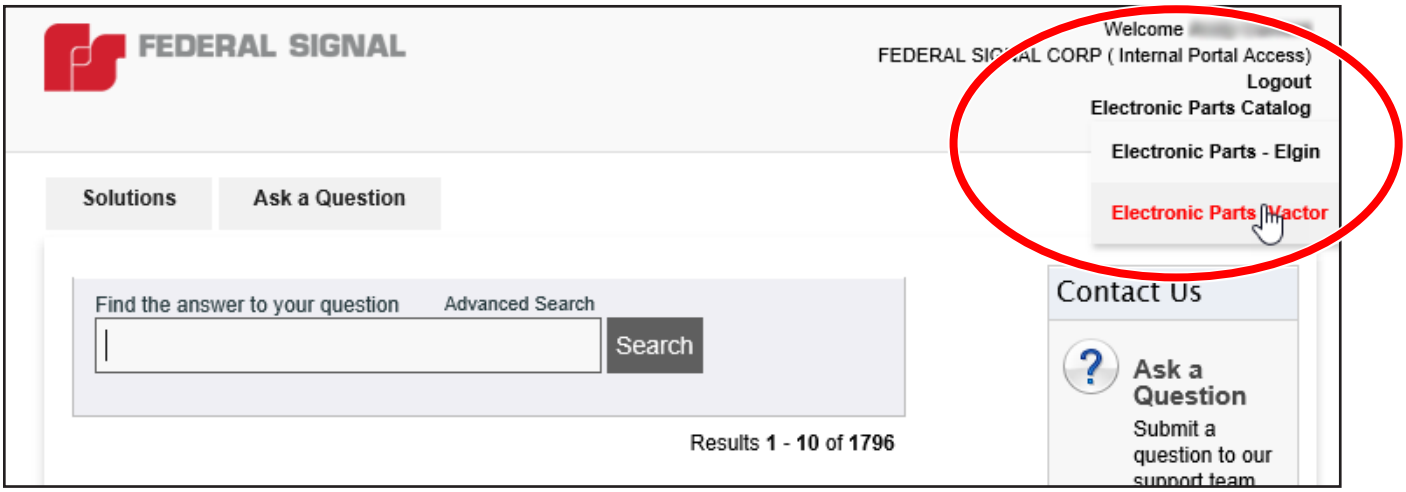
Note: Preferred browsers are Microsoft Edge or Google Chrome. Other browsers may not work correctly.

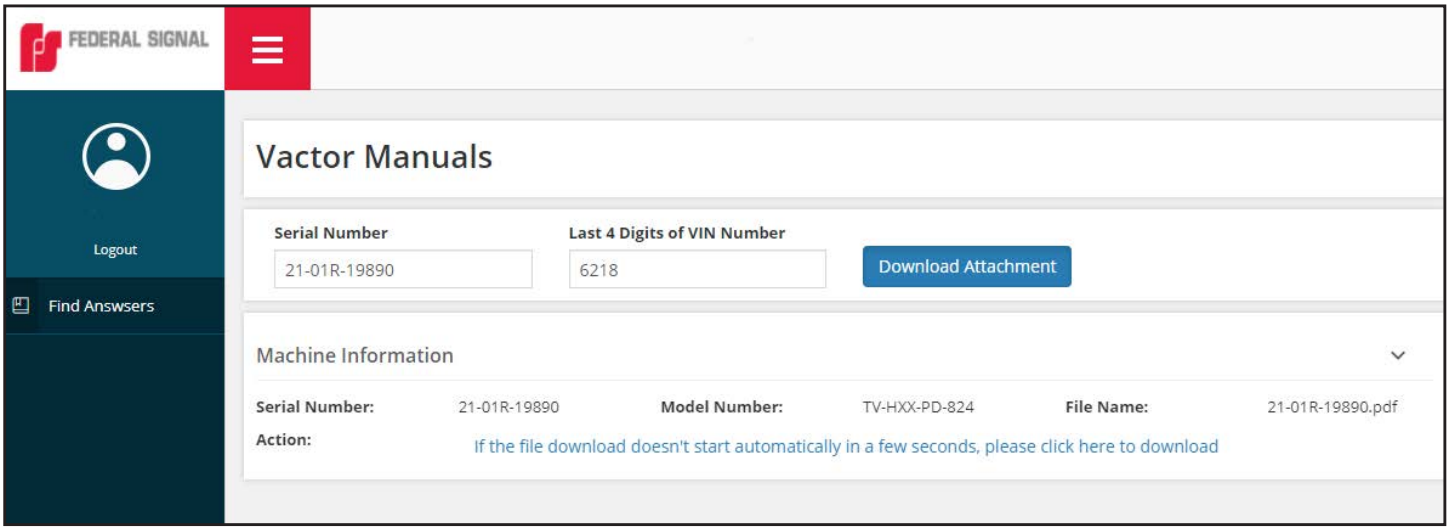
Selecting the Service Cloud will take you to the login page. Registration is required.

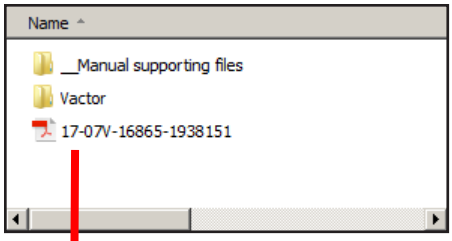
Once in you will find parts manuals for over 7000 Vactor products. Each manual contains relevant drawings and parts lists for the assemblies that make up the machine as a whole. The purpose of the EPC is to provide you with the parts information that is relevant to your machine.

If you have any issues with obtaining a Vactor manual through this website to please e-mail crmadmin@federalsignal.com.









Unit Parts Pages from the Service Cloud

The parts pages Adobe Acrobat PDF file is arranged in the same order as when printed.

A. Cover page with model and serial number of unit.

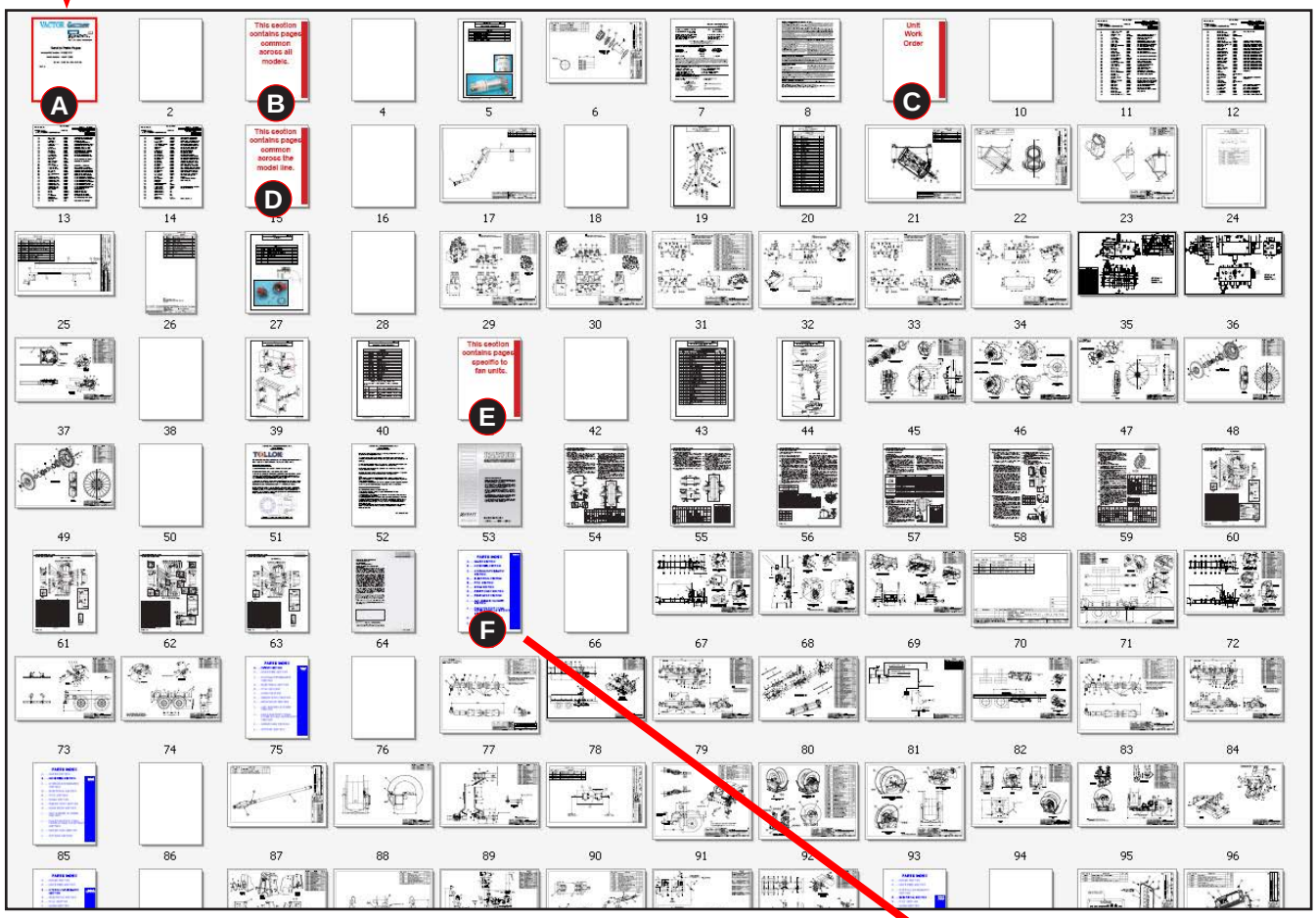
B. Parts common to all models.

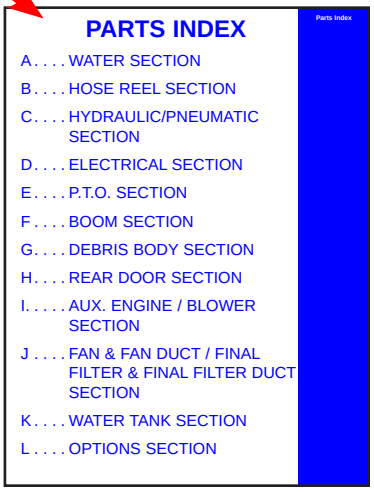
C. Build ticket - included with units built after February 2011.

D. Common parts across the model line.

E. Parts specific to model variations as noted.

F. Parts Index - start of unique parts pages for the unit organized as shown. Note, older units may not be indexed.





PARTS INDEX

A . . . . WATER SECTION
B . . . . HOSE REEL SECTION
C . . . . HYDRAULIC/PNEUMATIC SECTION
D . . . . ELECTRICAL SECTION
E . . . . P.T.O. SECTION
F . . . . BOOM SECTION
G . . . . DEBRIS BODY SECTION
H . . . . REAR DOOR SECTION
I. . . . . AUX. ENGINE / BLOWER SECTION
J . . . . FAN & FAN DUCT / FINAL FILTER & FINAL FILTER DUCT SECTION
K . . . . WATER TANK SECTION
L . . . . OPTIONS SECTION

The Vactor Service Team provides assistance to all Guzzler/TRUVAC/Vactor dealers and customers via remote (telephone, e-mail, fax, etc.) and on-site (dealer/customer visits, field training, etc.) support operations.

Toll-Free Telephone

1-877-DIAL ESG

(877) 342-5374

Fax (815) 673-1621 • Website www.vactor.com

Technical Support • 24 hours/Day, 7 Days/Week!

FS Solutions

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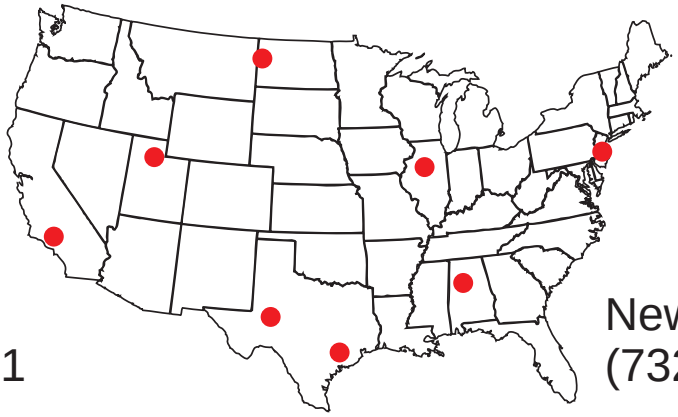
Authorized provider of service, parts, and accessories for Guzzler® vacuum loaders and Vactor® HydroExcavators



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Streator, IL
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- Bloodborne Pathogens
- Confined Space Entry
- Electrical Safety
- Fall Protection
- Emergency Action Plans
- Fire Prevention, Fire Safety and Fire Extinguishers
- Hand and Power Tool Safety
- Hazard Communication and Hazardous Materials
- Heat & Cold Stress
- Ladders & Stairways

OSHA General Industry Courses (cont.)
- Lockout/Tag out
- Machine Guarding
- Personal Protective Equipment and Hearing Conservation
- Powered Industrial Truck Overview
- Respiratory Protection
- Scaffold User
- Trenching and Excavation
- Walking and Working Surfaces

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- Industrial Vacuum Safety
- Waterblast Safety
- Introductory Waterblast & Vacuum Skills
- Advanced Vacuum Skills For the Technician
- Advanced Waterblast Skills for the Technician
- Vacuum Unit Operator Skills
- Waterblast Unit Operator Skills
- First Time Supervisor Skills
- Advanced Supervisor Skills
- Estimating Workshop for Vacuum & Waterblasting
- Introduction to Industry Classes:
  - Paper and Pulp
  - Power Generation
  - Refineries and Chemical Processing
- Quality & Safety Advancement Workshop
- Lump Sum Bidding for Vacuum & Water blasting
- Combined Estimating & Bidding Workshop
- Business Systems for Industrial Contractors
  - Accounts Payable Module
  - Accounts Receivable Module
  - Codes of Company Policy Module
  - Evaluations, Promotions and Wage Module
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Pride in partnership ...

training from Vactor

At Vactor, our partnership with you includes our commitment to insure that you're getting the maximum performance from your Vactor, Guzzler or TRUVAC unit.

That's why we offer a full range of training giving you the know-how to safely and efficiently operate, troubleshoot, repair, and maintain your equipment. Training to help you:

* Operate safely and efficiently at all times
* Select the right tools for every application and environment
* Save time and money on troubleshooting and repairs
* Protect your investment by using proper maintenance techniques

Whether you're an operator, dealer, mechanic, or contractor, Vactor training will help you boost performance and your bottom line!

Make the most of your partnership with Vactor. Call us today for complete information on upcoming training opportunities.

Training at Vactor takes advantage of our multimedia classroom and hands-on lab where you'll enjoy working with our expert instructors. Small class size and an informal atmosphere mean you will have ample opportunity to ask questions and get answers for your specific needs.

In-the-field demonstrations provide additional hands-on learning showcasing the right tools and techniques for safe, efficient operations; the key to getting the maximum performance out of your Vactor equipment!

Learn about our entire range of custom-crafted options and tools designed to boost your system's performance in every application. We've refined our products during thirty years of partnering with our customers to develop the world's leading vacuum loader technologies!

Take a tour of our facility to see how we build in quality at every step of the design and production process. Meet with our experts in engineering, manufacturing, and customer service to get connected with your entire Vactor support team!

Training workshops held at our facility are typically two or three days in length, depending on the topic and the audience. Sessions focus on the specific needs of operators, mechanics, and dealers. On-site training at your location may also be arranged. Call our Customer Service Coordinator, at 847-468-2371 or visit our web site at www.vactor.com for complete information on training from Vactor!

Contents

General Section

Vactor® Manufacturing, LLC is happy to welcome you to our growing family of Vactor, Guzzler and TRUVAC customers. The current series of Vactors, Guzzlers, TRUVACs and accessory equipment are the latest developments in the continuous research program carried out by the Vactor's engineering staff. This program is formulated to bring you the latest and most efficient pneumatic cleaning and jet-rodding equipment available in the world today.

Good operation and a planned maintenance program, as outlined in this manual, are of vital importance in obtaining maximum performance and long life. Instructions on the operation and preventive maintenance of the current series Vactors and Jet-Rodders, as well as applicable parts lists are contained herein. The operator should familiarize himself thoroughly with the contents of this manual before operating the equipment or carrying out maintenance procedures.

The information, specifications, illustrations and parts numbers in this publication are based on the information in effect at the time of approval for publication. We are constantly improving our products and, therefore, reserve the right to make changes at any time without notice.

If a question arises concerning your Vactor product or this publication, please contact your Vactor® Manufacturing, LLC distributor.

SALES POLICY

Prices: All merchandise will be billed at prices at the time of shipment, unless otherwise stated.

Terms: Standard terms are NET cash within 30 days from date of invoice to customers with approved credit.

Shipments: All shipments, unless otherwise quoted, are F.O.B. ex--factory. Claims for shortages or damages in transit shall be made by the Consignee against the Carrier. If shipping instructions are not given, we will decide how to ship. We are not responsible for products after delivery to the transportation company. We are not responsible for delays resulting from causes beyond our control.

Returned Material: Goods **will not** be accepted for return or credit unless pre-authorized by us. Credit or allowance for authorized return of new parts will be based on condition of part, price originally paid and current parts prices. A restocking charge may be made, if required. We will not allow credit for return of used parts unless specifically authorized.

INFORMATION FOR ORDERING PARTS

Parts

When ordering parts or accessory equipment, refer to the Vactor® Manufacturing, LLC name plate. The name plate (one located on Vactor equipment, one located in cab of truck) lists the model and serial number of your Vactor. The model number and serial number of your Vactor are also listed in the front of the parts book. It is important that the model number and serial number be included with ALL parts orders to insure prompt service and necessary replacement parts. Parts should be ordered from Vactor® Manufacturing, LLC through your Vactor distributor.

Trucks

Refer truck parts orders to your local chassis distributor following the instructions in the truck manual.

INTRODUCTION

PROPER USE OF THE PART'S MANUAL

This manual provides the general information that will enable operation and maintenance personnel to understand the unit and it's accessories. Each Vactor Parts Manual is customized for the individual unit shown on the binder cover. Each Vactor unit is unique unto itself. The individual specifications and option package make this unit different from any other unit. This manual shows those unique differences and should only be used to order parts for the serial numbered unit shown on the binder cover. Use of this manual for any other unit may cause incorrect parts to be ordered.

Each manual has tabs A through L. An index of these tabs is at the beginning of the manual. All of the tabs may not be used on a particular unit. If a section, or tab, is not used a sheet is installed in that section explaining that the particular section is not used. If the section is used, the particular information shown on the index is illustrated in that section.

EXAMPLE: Section F is the BOOM section of the manual If the particular unit does not have a boom on it, this section is empty. If the unit does have a boom on it, all of the information pertaining to that particular boom is shown in that section.

Many times the information in a section will show the word (REF) in place of a part number. This is generally the case with items not normally supplied by Vactor such as engine components. It is also the case for electrical and hydraulic components. When an electrical or hydraulic component is referenced (REF) it is normally shown in the electrical or hydraulic schematics supplied for that unit. In some cases the particular part number for a item shown in the breakdown is left blank. These items are usually electrical or hydraulic and are therefore shown in the individual schematic for that unit.

EXAMPLE: The hydraulic cylinders do not have part numbers listed. If you look at the hydraulic schematic for the boom you will find all of the individual cylinders listed.

This is done specifically because the same base drawing can be used on many different units. Some units may require a special spacer in the cylinder to restrict its movement. Again, this would be reflected in the part number shown in the schematic not in the parts page.

If after going through the manual, you still cannot find the particular part you are after, feel free to contact the Vactor parts and service department. Please have the model and serial number of the unit that you are working on, available to give to the parts and service representative at Vactor. He or she must have the correct model and serial number of the unit in order to look up and get the correct information.

This manual is for use only with units meeting Vactor Mfg., standards. If your unit does not meet these standards, contact your Vactor representative to have your unit retrofit to meet these standards.

Manufacturing, LLC

1621 S. Illinois St.
Streator, IL 61364
Ph: 815-672-3171
Fax: 815-672-2779

Subsidiary of Federal Signal Corporation

OWNERS MANUAL COVERING OPERATION, SAFETY, UNIT IDENTIFICATION AND REGISTRATION FOR VACTORS, GUZZLERS, TRUVACS, VAXJETS AND JET RODDERS.

IMPORTANT NOTICE

It is essential that everyone associated in any way with a Vactor® Mfg. product thoroughly understand and apply the contents of this manual. It is the responsibility of the owner to train his employees in the operation and safety procedures while operating or repairing this equipment.

PLEASE KEEP VACTOR MFG. INFORMED OF ANY CHANGE OF VEHICLE OWNERSHIP OR ADDRESS.

THIS OPERATOR'S MANUAL SHOULD BE CONSIDERED A PERMANENT PART OF THE YOUR UNIT AND SHOULD BE WITH THE VEHICLE AT ALL TIMES FOR READY REFERENCE.

Vactor (ESG) Technical Service Hotline

24 Hour

Vactor now has in place a 24 hour a day service hotline In the USA or Canada Call:

877-342-5374 • Outside the USA or Canada call 847-741-4330

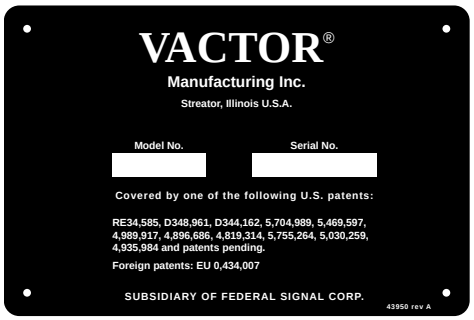
You will be asked for specific information pertaining to the type of unit you are calling about, Vactor, Elgin, Guzzler, TRUVAC, etc. You will be asked for the zip code you are calling from. Your call will then automatically be transferred to the Vactor dealer closest to you. If it is after normal business hours and the closest dealer to you does not have a 24-hour line, your call will be transferred to a factory service technician.

When the dealer or the technician answers, you will be asked for the model and serial number of the Vactor unit you are working on. Please have that number available. It will definitely help to expedite our being able to help you with any questions or problems you have. Our plan is to service our customers to the best of our ability 24 hours a day, seven days a week, no matter where you are in the world!

Model Identification - Serial Numbers

These reference charts cover most Vactor/Guzzler /TRUVAC models.

Serial Numbers				
Example: 03-02GL-4125				
Year made	**Month made**	**Product Code**	**Manufacturing Location**	**Sequential build number**
03	**02**	**G**	**L**	**4125**
		G - Guzzler	No letter - Streator IL	
		E - Elgin	E - Elgin IL	
		V - Vactor	C - Long Beach CA	
		R - TRUVAC	L - Leeds AL	
		T - Jetter/Ramjet	H - La Porte TX	
		X - Vaxjet	N - New Brunswick NJ	
		S - Gylcol	W - Williston ND	



Pre 2011 serial plate. Location varied by model. Refer to the serial number location page in the maintenance section.

2011 and newer units all have the serial plate in the same general location on the driver side on the front part of the subframe. Options may obscure direct viewing.

Note: Unit serial number can also be found on the chassis door tag.

FEDERAL SIGNAL
Environmental Solutions

DELIVERY, INSTALLATION AND WARRANTY REGISTRATION FORM

Serial Number: _____ Dealer Name: _____

Hours: _____ Miles: _____ Delivery Date:_____ In-Service Date: _____**

** Form must be accompanied by a letter of request/explanation if different from Delivery date.

Comments: _____

Dealer Representative **ESG Representative**

_____	_____	_____	_____
Print Name	Signature	Print Name	Signature

To assure warranty protection, this form must be filled out completely and signed by an authorized retail customer agent at the time of delivery to the end user / customer.

Failure to complete, sign and return form to the factory will void the limited warranty.

We have reviewed the ESG product installation and start up procedures, and understand the warranty, operation, service, and maintenance responsibilities for the above ESG product dated this _____ day of _____, _____.

End/Retail Customer Name: _____

Address 1: _____

Address 2: _____

City: _____ State / Province: _____

Zip Code: _____ Country: _____

Customer Contact Name: _____

Phone: (_____)_____ Fax: (_____)_____ E-mail: _____

Whom should we contact after 6 months to inquire about machine reliability and level of satisfaction with product?

Name: _____ Phone # (_____)_____

Customer Representatives Present at Delivery

_____	_____	_____
Print Name	Print Name	Print Name
_____	_____	_____
Signature	Signature	Signature

For information regarding this form or filing instructions call (815) 673-3841 • attn warranty administrator. Mail completed form to:

Vactor Mfg., INC., 1621 S Illinois St., Streator IL 61364 • attn warranty administrator

Original to Manufacturer Copy to Dealer Copy to Customer

Operation

The Guzzler is a powerful, efficient, heavy duty, dust-free, single mode, mobile vacuum loading unit for the pneumatic removal of dry materials, sludges, slurries and liquids from remote and inaccessible locations through suction lines eight inches in diameter and smaller. The vacuum system moves loose material to a debris body for cartage to an appropriate dump or disposal site.

PRINCIPLES OF OPERATION - The Guzzler consists of a diesel power source, positive displacement type vacuum pump, hydraulic and pneumatic control systems, multiple air filtration systems, and a dump-type hydraulically sealed payload debris body. It is capable of vacuuming a wide range of wet or dry materials in a variety of viscosities and weights.

The vacuum module is powered by the truck's diesel engine and is coupled to the truck power transmission chain by means of a transfer case. The

transfer case is positioned between the transmission and the rear axle. When engaged, the transfer case diverts power away from the road wheels to drive a blower, which is the source of airflow.

The positive displacement blower sucks air out of the tank which creates an area of low pressure in the tank. By means of hoses attached to an opening in the tank, air from outside the tank rushes in to equalize the pressure differential. Any loose material, in the path of the air rushing in, will be conveyed by the high-speed air stream to the debris body via the hoses.

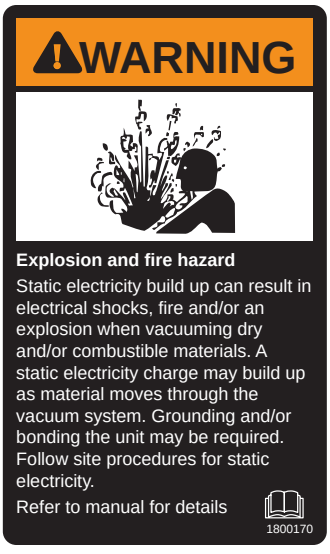
When material enters the debris body, the transition from a hose to the larger debris body causes the air speed to drop considerably. The incoming air strikes a specially designed deflector plate that directs the material flow downward. The now slower airflow cannot sustain the debris in the air and the material falls into the tank. This is the first of four stages of filtration.

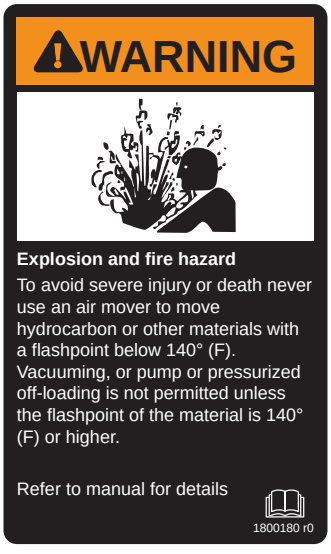
Any lighter, powdery material still suspended in the airflow is conveyed to the cyclone chamber, the second filtration stage. There, due to the forced centrifugal action of the flow, most of the dust particles separate and collect in the dead air space of the hopper. By this stage of filtration, about 98% of the material has dropped out of the airflow.

Only the lightest and finest of the dust particles now carry over to the third stage of filtration in the baghouse. There, the air passes through a set of filter bags, which screen it further. Exiting the baghouse, nearly dust-free air passes through the final stage of filtration. It enters the microstrainer. After leaving the microstrainer, the air flow passes through the blower and the silencer before being exhausted into the atmosphere.

The blower in the Guzzler is an air mover capable of high vacuum; however, it is the airflow rather than the vacuum that loads the solid material in the tank. The higher vacuum capability comes into play while vacuuming liquids.

Because vacuum is a function of airflow, higher vacuum translates into lower airflow. As such it is not the high vacuum but a high airflow that is necessary for the Guzzler to do its job of efficiently loading materials. A blower speed just high enough to move material and convey it to the debris body is all that is required for the system to perform optimally.





Running the system at higher speeds than necessary is not only uneconomical in terms of excessive fuel consumption, accelerated wear and tear on the engine, transmission, and the blower; but will also prevent the filtration system from working properly, and thus reducing filter life.

The Guzzler is designed to vacuum a variety of materials, both wet and dry. For smooth conveyance through the hose the material should be completely dry or easy-flowing wet. Matter with a paste-like consistency or even damp material will stick to the walls of the hose and may cause obstructions that eventually clog the hose.

To help prevent or reduce clogging, smooth bore hose of a large diameter (up to 8-inches) should be used in as straight a line as possible. For maximum output, the system is designed to utilize 8-inch diameter hose. Hose sizes smaller than that will cause additional friction losses and a higher percentage of the available engine and blower power will be used up in overcoming these inefficiencies. This will obviously result in a dramatic increase in time required to complete a job.

If it is necessary to use smaller hose diameters, then multiple connections should be employed. Their combined area should equal that of an 8-inch hose.

To reduce friction losses it is recommended that metallic, smooth-bore piping be used as much as possible and flexible hose utilized for bends and curves. When bends in the hose run must be made, they should be wide and gradual. Using inexpensive, lightweight hose lengths for the last few working feet at the operator's end will provide greater maneuverability and less operator fatigue

Reduction of hose diameter at any point in the run causes an airflow speed drop at the point of transition. Material will drop out of the air stream, starting an obstruction that eventually develops into a clog. For this reason, when the hose size has to be reduced, it should be done right at the truck's vacuuming port using an adapter and multiple smaller diameter hoses. Never reduce hose size at a point midway through the run.

As a rule of thumb, the diameter of the hose should be at least three times the size of the largest piece of debris expected to be vacuumed. When vacuuming light, powdery, dry material, or when operating in restricted spaces, a smaller diameter hose may be used; however, the blower speed will have to be reduced to avoid overheating.

NOTICE

- **Due to available options, the control panel illustrations and decals reflected in this manual may not appear the same on all units.**
- **Prior to operation, perform daily maintenance on the Vactor unit according to the Daily Maintenance Check List in the Maintenance Section of this manual.**
- **Read the safety and operation manuals before operating Vactor equipment.**
- **Set the parking brake and select neutral before operating the Vactor.**
- **Turn on any safety lighting according to procedures and local, state and federal law requirements.**
- **Everyone associated in any way with a Vactor® Mfg. product must thoroughly understand and apply the contents of this manual. It is the responsibility of the owner to train his employees in the operation and safety procedures while operating or repairing this equipment.**

In addition to conveying material, airflow also acts as the coolant for the blower. Consequently, a healthy dose of air needs to pass through it. The optimum way to achieve blower cooling while still efficiently conveying debris to the tank requires that you never bury the vacuum hose into the material.

Experience has shown that a sweeping motion of the hose, rather than burying the hose in a debris pile, is more efficient and reduces the chances of hose blockage or engine overload.

The blower is the source of airflow used for the vacuuming process.

Overview of the Filtration System

The filtration system is designed to clean the air coming into the system by removing all dirt, dust and foreign matter from the air. The filtration system's primary purpose is to protect the blower by removing all material from the air stream before it reaches the blower. There are four stages to the filtration system:

- First Stage: Debris Tank Collection
- Second Stage: Cyclone
- Third Stage: Filter Baghouse
- Fourth Stage: Microstrainer

1. Waste material first enters the Guzzler through the 8-inch inlet port at the rear of the machine or through the optional boom located on top of the tank.
2. The deflector plate knocks the bulk of the material out of the airstream and it falls to the floor of the debris tank. The deflector plate is located immediately inside the rear and at the top of the tank. In the tank, the air travels through it to the other end.
3. The air flows into the cyclone filter chamber.
4. In the filter chamber, centrifugal force hurls the denser particles toward the cyclone walls where they spiral downward into the collection hopper. The lighter and by now relatively particle-free air which has travelled to the bottom of the cyclone, returns to the top.
5. The air stream leaves the cyclone chamber and enters the filter baghouse. The air stream enters through the top and travels to the bottom of the baghouse.
6. The air returns to the top of the baghouse through a series of filter bags. While the loader is in operation, short bursts of compressed air are directed from the air cannon through the filter bags dislodging the dust into the baghouse collection hopper.
7. The now clean air flows into the microstrainer housing from the filter baghouse through the stand pipe plenum. The microstrainer housing contains a metal basket. It is the safety dropout point for any objects which may accidentally enter the filtration system during servicing.
8. Finally, the air passes through the vacuum pump and out through the silencer.

Of course, the debris body can be unloaded conventionally by opening the debris body and raising the tank by means of a hydraulic hoist cylinder.

Applications where pressurized off-loading is useful include collecting spillage of recyclable raw or finished materials such as grain, cement, and coal.

The major components of the vacuum system are illustrated in this section, as follows:

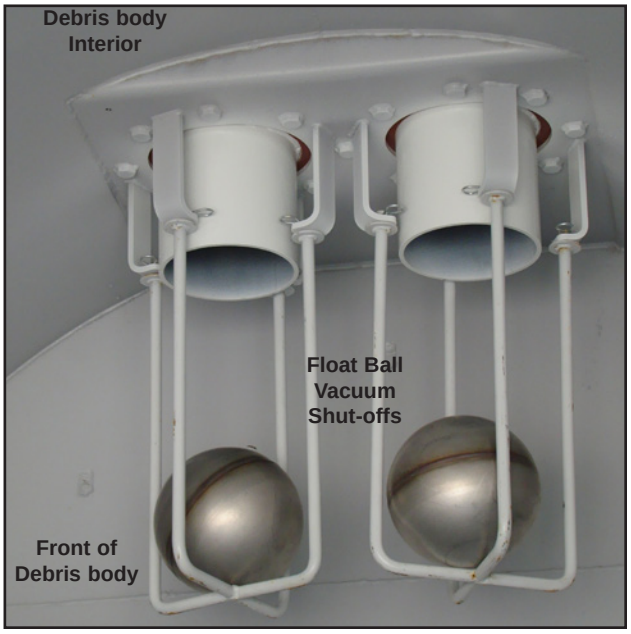
- Suction Hose (as required)
- Boom (optional)
- Porthole Elbow
- Debris body
- Deflector Plate
- Float-Ball Vacuum Shut-Off (liquids only)
- Cyclone Separator
- Baghouse
- Standpipe
- Air Cannon
- Air Dryer
- Microstrainer
- Vacuum Relief Valves (automatic & manual)
- Blower (vacuum pump)
- Silencer (inlet and discharge)

The debris body is a single cylindrical shell which can be hydraulically raised or lowered for the purpose of dumping material collected during operations. The debris body is normally constructed of carbon steel and is the primary dropout point for any material vacuumed through the vacuum hose. The vacuum hose is normally connected to the debris body through an inlet elbow located on the back of the tank near the top.

From the vacuum hose, debris flows through the inlet elbow to the deflector plate which separates debris from the airstream. The bulk of the debris, about 90 percent, falls to the bottom of the debris body; the air flows past the two float-ball vacuum shut-off valve to the cyclonic housing.

The float ball vacuum shut-offs are located on the inside of the body towards the front and at the top. It is positioned directly below the air exit pipe. The purpose of the float-ball vacuum shut-offs are to close off the debris body outlet when the debris body is full, thereby preventing liquids from entering the cyclone housing and the blower. It consists of two stainless steel float balls. The floats closes the air exit port of the debris body when it is full. Float balls are only effective for liquids as it will not float on solid material.

The level of solid debris in the body can be visually seen through an optional inspection port located on either the top of the debris body or on the debris body if equipped. The approximate level of liquid matter can be determined by the red indicator arm normally located on the driver side of the debris body.



The body is emptied by hydraulically raising the body and allowing the material to be dumped from the back by gravity. On the back of the debris body is the rear door. The standard rear door is the half rear door as shown. This half door is hydraulically opened and closed. The hydraulic system must be turned on for the debris body to open or close. The half door is hinged from the top with three hinges and locked by two rams at the bottom when the door is fully closed.

The door has a gasket around the perimeter to seal against the debris body.

Note: The debris body door seal gasket and corresponding surface of the debris body must be kept clean to ensure safe and adequate operation of the unit. Remember to always wipe the debris body seal face and door gasket clean before closing, to prevent accidental damage to the gasket from foreign material sticking to the body or the gasket.

Located on the top of the body and near the back is a flange which is removed for those units installed with the optional boom. If no boom has been installed, the opening for the boom is covered with a steel plate and bolted in place.

⚠ WARNING

Crushing Hazard

NEVER leave body raised or partly raised while vehicle is unattended or while performing maintenance or service under body unless body is propped to prevent accidental lowering. [Always disengage PTO when hoist is not in use or when moving vehicle.] The debris body MUST BE empty for service work.

NEVER attempt to raise body when vehicle is on unlevel ground.

Rear door MUST BE opened before the front of the body is 3 feet above the chassis frame. Operator must remain at controls during all operations.

View of Debris Body with Rear Door Open

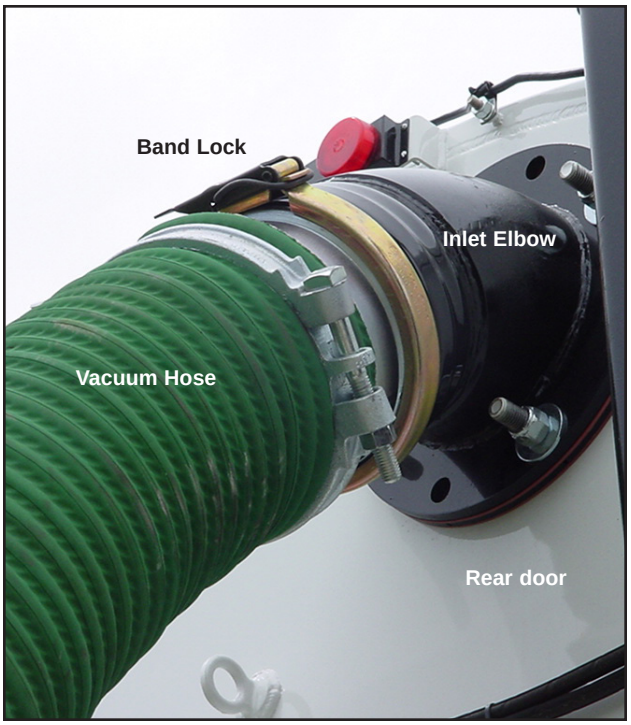
Material enters the debris body through an 8” elbow mounted on the rear door. Typically a short hose is attached and it is used to attach to longer hose runs. The elbow is stationary, but can be adjusted so that the inlet points in different directions. This allows the hose to be positioned according to the location of the material and method of operation. To reposition the elbow, remove the four nuts that secure the elbow. The elbow can be lifted off and repositioned according to the desired position.

Raise the debris body to attach the vacuum hose to the rear door port. This lowers the port to a ground accessible height.

Before the vacuum hose can be attached to the elbow, a rubber gasket is inserted into the elbow until it is seated firmly inside the elbow. The vacuum hose is connected to the elbow by slipping it into the elbow. It is held in place by a steel band lock clamp. To tighten the clamp, the lever is pushed against the hose until it locks in place. To release the clamp, the lever is pulled away from the hose and the hose can be pulled off the elbow.

Connect as many sections or feet of hose as is necessary to reach the material to be loaded.

Raise the **empty** debris body to attach vacuum hose to the rear door port. The short hose normally stays with the unit while emptying the load and during transport. Never raise a loaded debris body to attach the hose. The inspection port and hose clamp can readily be accessed from a ladder or if equipped a rear door platform.



Raise the **empty** debris body to attach vacuum hose to the rear door port.


GUZZLER
Vacuum
Blower
n/min
Never operate above the maximum R.P.M. rating
49589D rev 0
Master Switch
Vacuum
Air Cannon
Pendant
Wireless Remote
Vibrator
Work Lights
1
2
3
4
5
6
7
8
9
10
11


Pendant
Air
STOP
Push to STOP
Pull to start
12
13
14
15

1 **Blower Temperature Gauge/Switch -** This gauge monitors the heat generated by the vacuum pump. The sensor for this is located at the inlet to the exhaust silencer. Severe damage to the vacuum pump will occur if it is operated at too high a temperature. The gauge indicates the proper range of temperature for safe operation and has a red line to indicate the maximum safe operating temperature of 275 degrees (F). Do not exceed this limit.

2 **Vacuum Pressure Gauge -** Vacuum in inches of mercury in the system. The reading is taken at the inlet end of the vacuum pump. If the vacuum is too low, unsatisfactory transfer of material may occur.

3 **Blower Tachometer Gauge -** Functions only when the blower is engaged and the master switch is turned on. **Do not exceed the maximum blower speed.**

4 **Master Power Switch -** This switch provides power to the master control panel and should be turned on first. By default the automatic vacuum relief valve is opened when OFF.

5 **Automatic Vacuum Relief Switch -** This switch releases the vacuum in the cleaning hose by opening the automatic vacuum relief valve. Switch status light is ON when the automatic vacuum relief valve is closed.

6 **Air Cannon Switch -** Controls the baghouse cleaning system.

7 **Pendant Switch -** Pendant is used for remote operation of the vacuum relief, E-stop and if equipped the boom.

8 **Wireless Remote -** Wireless pendant.

9 **Throttle Switch -** Controls the engine speed from the master control panel. The switch is a three-way momentary switch. The throttle switch allows the operator to increase engine speed (rpm) by continuing to hold it in an upward position. When the throttle switch is held in a downward position, the engine rpm will decrease.

10 **Vibrator Switch -** Controls the debris body vibrator(s). **Do NOT use long or continuous blasts.**

11 **Work Light Switch -** (optional)

12 **Pendant plug -** Pendant is used for remote operation of the vacuum relief, E-stop and if equipped the boom.

13 **Air Pressure Gauge -** monitors the amount of pressure in the air cannon reservoir.

14 **Emergency Stop Switch -** This switch opens the automatic vacuum relief valve, blocks system hydraulic oil flow and throttles the engine speed to idle when pushed in. Pulling the switch out allows throttle to operate, closes the vacuum relief (if still set to close) and allows hydraulic system oil flow. Additional E-stops may be in other locations. Activate the E-Stop daily to verify it functions correctly.

15 **Hydraulic Pressure Gauge.** This gauge monitors the amount of hydraulic pressure in the system and normally operates in the range of 2000 psi. Hydraulic oil temperature can be found on the hydraulic oil tank gauge.

Hydraulic oil temperature gauge on side of hydraulic oil tank

The blower is the heart of the vacuum system. Large volumes of air are displaced from the intake side to the discharge side. This creates air flow and allows material to be conveyed through the suction hose.

Clean air from the microstrainer enters the blower inlet. The vacuum pump is driven by the chassis engine through a heavy duty transfer case. Its fuel-efficient, positive displacement design enables the unit to vacuum solids from beneath water surfaces and convey material for distances of over 600 feet under the right conditions. These positive displacement vacuum pumps can produce free airflows that range from 2,660 CFM (cubic feet per minute) to 5,500 CFM at vacuums up to 28 in-Hg. The amount of airflow created by the vacuum pump is controlled by the engine speed with maximum vacuum limited by the relief valves and airflow. The level of vacuum can be monitored on the vacuum gauge located on the master control panel.

The higher vacuum systems, as shown here, also have an air injection system to provide additional air flow to cool the blower during operation.

Note: The blower is operational when the truck is started and the power of the truck is diverted from “Road Mode” to “Blower Mode”.

The transfer case enables the truck chassis engine to drive the truck on the road, or to transfer the power to drive the blower. The blower is run only when the truck is stationary and parking brake is applied. In the Road Mode, the drive shaft is connected to the rear drive axles and disconnected to the blower. In the Blower Mode, the engine driveshaft is diverted to the blower and away from the rear axles.

This transmission of the drive is done by engaging or disengaging two sets of gears in the transfer case nose cones, similar to those in a transmission. There are two 'Nose Cones' in the transfer case output, one for the blower and the other for the road.

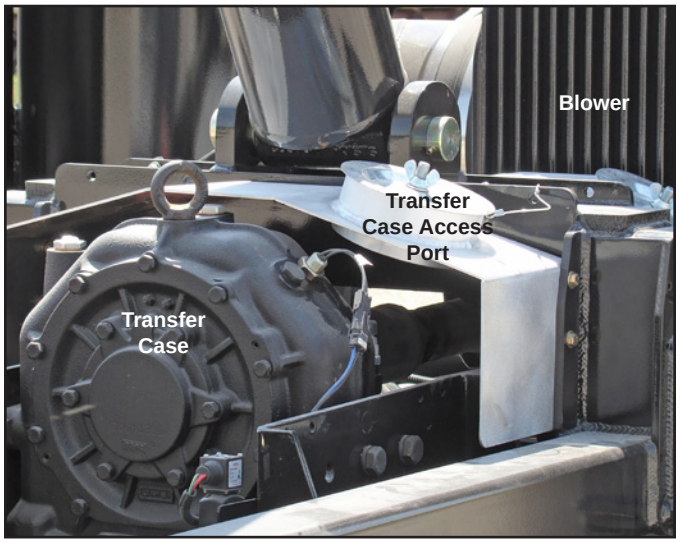
A drive line guard is provided to cover the upper drive line from the transfer case to the blower. It must remain in place unless the driveline has to be worked on. Ports are provided for easy access to the driveline for greasing, which should be put back in place when the blower is running.

⚠ DANGER

Entanglement Hazard

Contacting moving parts with clothes or body can cause injury or death:

- **Never go underneath the vehicle with the engine running.**
- **Never work near a rotating drive shaft.**
- **Never attempt to engage or disengage the pump or other driven equipment from underneath the vehicle with the engine running.**
- **Never attempt to engage or disengage any driven equipment from any position that could result in getting entangled in the drive shaft or moving parts.**
- **Never attempt to work on any installed driven equipment with the engine running.**
- **Remove the ignition keys and post a lockout/tagout sign on the chassis steering wheel and engine control panels as required.**



Overview

Vacuum relief valves are installed on vacuum trucks that use positive displacement vacuum pumps. The blowers require free air for start up to prevent overloading the drive engine, and for shutdown to prevent reversal damage to the blower and drive engine. Hand operated and operator triggered (air actuator, etc.) automatically operated valves are the two styles typically used. Lower vacuum units are also equipped with spring loaded automatic relief valves to protect the blower by limiting the vacuum level.

Vacuum reliefs are normally labeled enable/disable.

Enable   Disable

Application on PD blower vacuum trucks

Vacuum relief valves are not meant to be a substitute for the safety tee during most vacuum operations. Operators of PD blower vacuum trucks are typically working close to the hose ends and can become entrapped. In most situations a safety tee is required and the operator and/or their observer would release the safety tee to relieve the system vacuum in an emergency.

In applications where the hose is supported vertically from a boom and the operator does NOT manually manipulate the hose, a safety tee is not practical nor necessary.

High vacuum PD blower trucks are typically equipped with a hand operated vacuum relief valve so that the valve can be throttled to control the amount of fresh air allowed into the system. This feature is usually used to control the air temperature while vacuuming hot materials to prevent overheating the vacuum pump.

Most PD blower trucks are equipped with an operator triggered vacuum relief valve. This is usually a large valve located near the vacuum pump inlet. All units require that this valve be open during startup to prevent the drive engine from stalling. It is also opened before shutdown so that the system vacuum does not attempt to reverse the airflow through the vacuum pump. Reversed flow can damage the vacuum pump, drive engine and drivelines. They are also used to quickly relieve system vacuum to correct hose blockage or other emergency situations.

Application on sewer cleaner vacuum systems

Sewer cleaner vacuum systems that use positive displacement vacuum pumps are equipped with an operator triggered vacuum relief valve. The main purpose in these applications is to quickly relieve system vacuum to correct hose blockage or other emergency situations. Typical sewer cleaner operations do not expose the operator to the vacuum hose inlet end as the hose end is normally in a confined space such as a manhole or catch basin. A safety tee is required when vacuuming any time the operator is exposed to the hose inlet end. Hand operated valves are not normally found on sewer cleaner vacuum systems as hot materials are usually not vacuumed. High vacuum sewer cleaners normally have an operator triggered vacuum relief system standard.

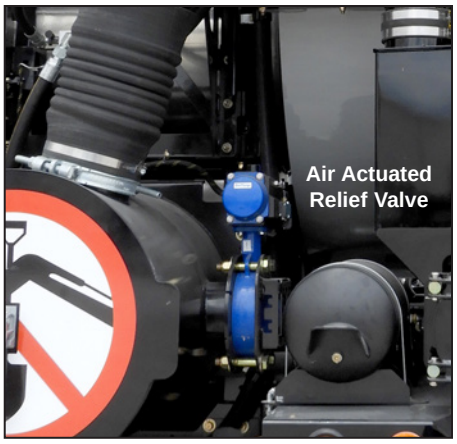
PD versus Fan vacuum relief operation

The method for disabling the vacuum is different on Fan and PD units.

On a FAN unit the inlet to the fan will be blocked off. This stops the flow of air from the debris body into the fan and therefore stops the flow of air from the hose into the debris body. A smaller valve opens at the same time to relieve the debris body vacuum.

On a PD unit the inlet to the blower is opened to external air, providing a path of least resistance for air into the blower. This stops the flow of air from the debris body into the blower and therefore stops the flow of air from the hose into the debris body.

The air operated vacuum valve is used to relieve the system if the vacuum hose, debris body or inlet filter become plugged or restricted. These valves are on all blower units. The valves are normally operated by a switch or E-stop button located on the master control panel, pendant, or wireless remote (if equipped). Proper operation should be verified daily while under vacuum. Actual location size and configuration of the valve varies by the model and options. Typical location is in the inlet piping of the blower.


Air Actuated Relief Valve


Manual Vacuum Relief Valve (shown closed) (if equipped)

Vacuum valves require regular inspection and periodic cleaning. Develop a regular program of visual inspection, looking for clogged drains and discharge pipe, dirt buildup in and around the valve seat, and broken or missing parts. Keep the valve and the area around the valve clean and free of any foreign material or substance.

Use proper hearing protection when in the vicinity of this device which emits a loud, sharp sound. Follow safety precautions to prevent injury from high velocity flow of materials.

Note: Keep foreign material from entering the valve. Never paint, oil, or otherwise cover any interior or working parts of any safety valve; safety valves do not require any lubrication or protective coating to work properly.

Note: Test all vacuum valves to ensure proper valve operation.

The switch controls an air valve which sends air pressure to the valve either opening or closing, whichever is selected. The vacuum valve needs to be closed for normal vacuuming using the boom and debris hose. When the vacuum valve is opened, air flow to the boom and debris hose is stopped.

The vacuum valve normally defaults to the disabled (valve open) position when the master switch is off, E-stop is activated or the unit is shut down. Verify how the vacuum valves operate on the unit before use.

Automatic Vacuum Relief Valve (Kunkle Valve)

The automatic vacuum relief valves provide for the inlet of air when it reaches a preset vacuum level.

These valves are standard on the units with 15” and 18” blowers. Depending on the unit, the number of automatic vacuum relief valves can range from two to three.

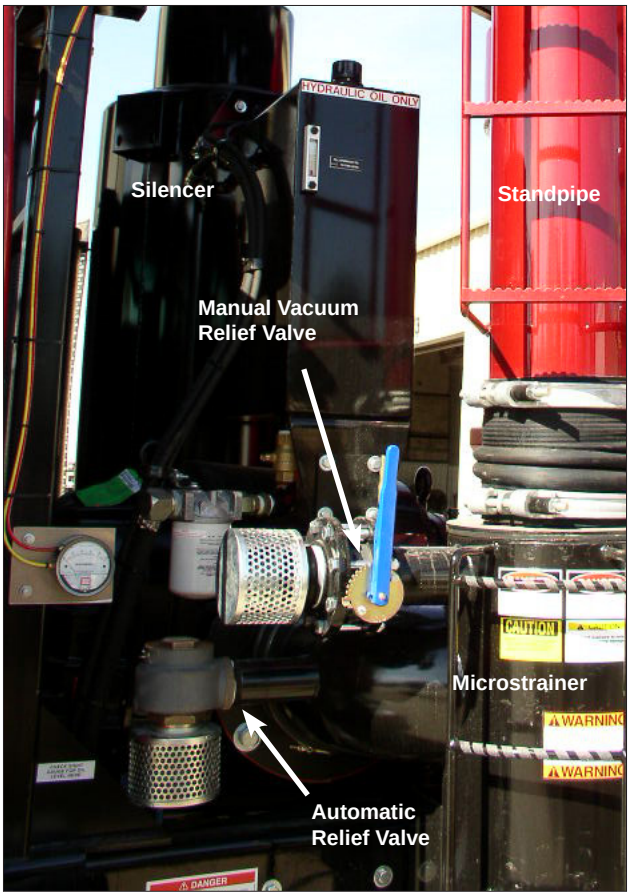
Testing of Vacuum Relief Valves

As with every safety device, the automatic vacuum relief valve should be tested for proper functioning every day before operations are begun.

The following steps should be followed:

1. Start the truck engine and engage the hydraulics.
2. Allow the engine to reach 1500 rpm.
3. Raise the debris body approximately two feet.
4. Open the manual relief valve.
5. Place a sturdy board on the opening of the microstrainer. It should be large enough to cover the entire opening of the microstrainer.
6. Slowly close manual relief valve until a whistling or clattering sound is heard coming from the vacuum relief valves.
7. Check the vacuum relief gauge on the master control panel. It should be 1” or less below the vacuum rating of the pump.
8. If it is not 1” or less, or the valve fails to open, the valve should be reset or replaced.

Note: Refer to the Maintenance section for the proper maintenance of the vacuum relief valves.



The filtration system is kept clean by an air pulsating system. The system uses an air cannon to send an instantaneous blast of compressed air through the system and into the filter bags. The air blast is what cleans the system, and in particular, the filter bags. The air cannon stores large volumes of air under high pressure which is used for the cleaning process. The high pressure air travels from the air cannon through a network of manifolds and is eventually dispersed through a blowpipe located near the top and on the inside of each baghouse. The blow pipe contains a series of holes on the underside from which the compressed air is sent into the individual filter bags The air enters the bags from the clean side of the filter bags.

The blast of air generated by the air cannon travels in the opposite direction of the normal air flow induced by the positive displacement blower. It is the combination of air flow reversal and the direct impact resulting from the air blast velocity that causes debris to be released from the filter bags. The blast of air knocks particles and debris away from the sides of the bags, thereby keeping the bags clean and continuously functioning. The dislodged particles and debris fall to the bottom of the baghouse.

Note: The air cannon is only used when vacuuming dry material.

The pressurized air is used to clean the baghouse at certain intervals during the operation. The length of the cycle is controlled at the master control panel. The air cannon will fire approximately every 60 seconds.

Blowpipe in operational position.

Blowpipe in service position.

The basic components of the pulsating air system are:

- The truck air compressor
- The air dryer and solenoid
- The pressure transducer and the time delay relay)
- The solenoid valve and the air cannon assembly

Truck air compressor

The truck air compressor is used to fill or charge the air cannon with compressed air. The pressure inside the tank is regulated by a governor. The governor acts as an automatic safety to prevent compressed air from reaching above a certain pressure level, usually 125 psi. Once the governor has been activated, the truck compressor will not operate until the air pressure falls below a preset pressure level, usually around 90 psi. The air compressor is activated when the truck is started.

The solenoid valve and the air cannon assembly

The air cannon is a large tank designed to hold and release compressed air generated by the truck air compressor. This compressed air is used to clean the filter bags.

The solenoid valve controls the release of the compressed air. The valve is used for opening and closing the air canon reservoir. When the valve is closed, the reservoir is sealed which allows compressed air to fill or charge the air cannon. When it is open, the compressed air is dispersed into the pulsating air system.

The time delay relay

The purpose of the relay is to control the solenoid valve and thereby regulate the discharge of compressed air from the air cannon. It does this by sensing the level of pressure in the air canon. When the system reaches a preset pressure, usually 110 psi, the air cannon valve will open and allow the air cannon to fire and thereby send a blast of air through the system. As the air leaves the cannon, and the air pressure drops, the valve will close at a preset pressure level and the cannon will stop firing. With the valve closed, the air cannon can now be recharged or filled with compressed air.

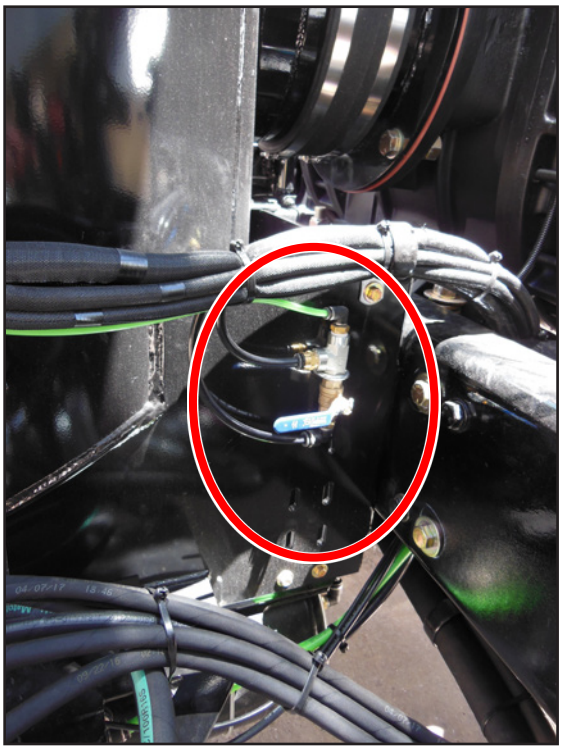
Air Dryer and Solenoid

The air dryer is used to remove moisture from the compressed air generated by the air compressor. The air dryer is located under the cab on the driver side. The dryer serves the needed function of preventing moisture from reaching the filter bags. The moisture removed from the air is collected and automatically discharged through a discharge valve mounted at the bottom of the air dryer. The air dryer operates automatically.

The air cannon charge solenoid valve operates when the master control panel is turned on. The valve allows the air cannon to be charged with air. The purpose of the valve is to ensure that the system uses no air when the master switch is tuned off and the truck is being driven down the road.

Note: The air cannon should always be turned on when vacuuming dry material and left off when vacuuming liquids.

Manual shut off for the air cannon is located behind the master control panel.



Air leaving the blower enters the silencer where it passes through a series of baffles and is vertically discharged into the atmosphere. The baffles in the silencer are tuned to reduce pump noise by combining similar sound frequencies that are out of phase so as to cancel each other. Discharging air vertically further reduces objectionable ground-level sound.

Depending on the type of blower installed, the size and number of silencers will vary. A 15” or 18” blower will have one silencer while the units installed with a 27” or 28” blower will contain two silencers – an inlet silencer and a discharge silencer or auxiliary silencer. The inlet silencer is needed on the larger blowers to aid in cooling the blower down.

The silencers are installed on the passenger side of the unit because this is the discharge side of the blower. The inlet side to the blower is on the driver side and the blower is mounted in the middle of the chassis directly behind the truck cab.

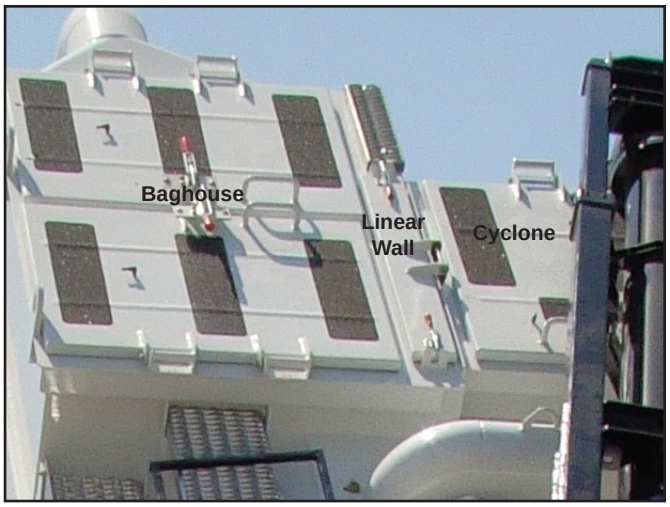
The appearance and configuration of the silencer will depend on the type of blower installed (Roots or Hibon).

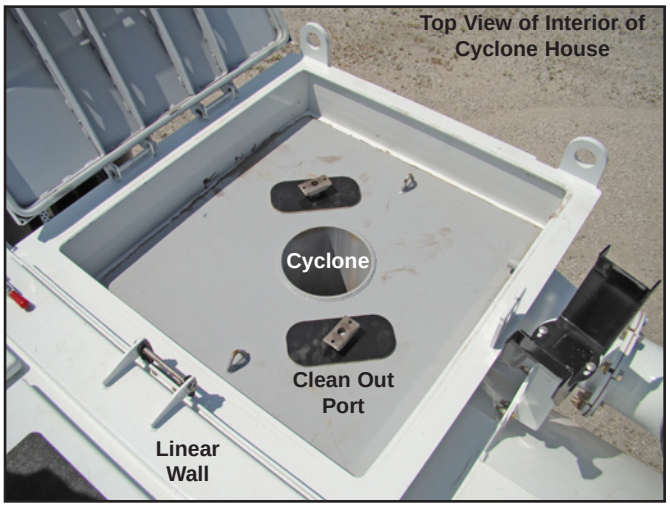
The units utilize a cyclone separator and a filter baghouse.

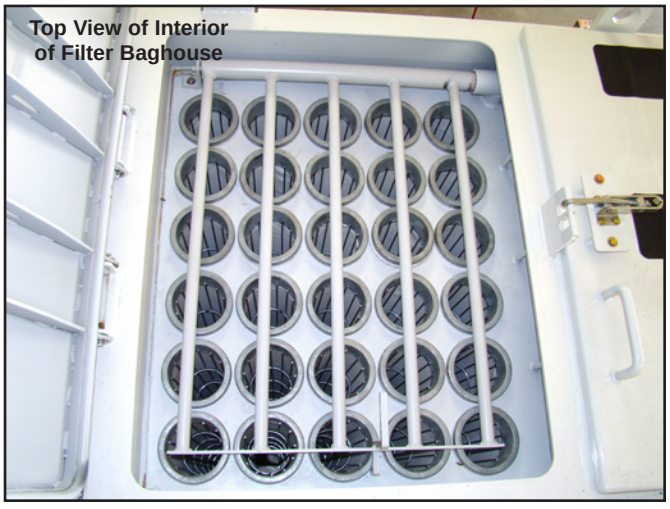
Air leaving the float-ball vacuum shut-off in the debris body enters a cyclone housing located on the passenger side of the unit and directly in front of the debris body. Additionally, there is a filter baghouse which is found on the driver side of the unit and directly in front of the debris body. It protects the blower by removing all material from the air stream before it reaches the blower.

The cyclone spins the air stream around the walls of the housing until it reaches the bottom of the cyclone house. The cyclone reduces particle matter in the airstream leaving relatively clean air to return to the top of the cyclone so that it may enter the baghouse filter. The air stream leaves the cyclone through an area called the linear wall and travels down to the the baghouse bottom and then travels upward through a series of filters that stretch the length of the baghouse. There are 60 cloth filter bags 70” long that hang from the top of the baghouse and stretch to the bottom of the baghouse. Airflow continues through the filter bags and leaves it through the baghouse outlet.

Note: The filters or filter bags should be inspected before each operation. If they are torn, damaged, dirty or worn, they should be replaced before beginning operations.







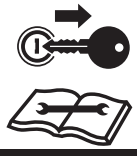
Access to the filter baghouse and cyclone can be gained by using the ladder mounted on the driver side of the debris body.

WARNING

Trip, fall and other hazards

To avoid serious injury or death always use the ladders, walkways, grab handles and safety tie off points provided on the unit. Follow all required site, local, state, federal requirements for service work. This may require that the unit be moved to location that can provide the required safe access equipment.

NOTICE



Service Access
Never use access ladders or platforms with the unit running. Shut down and lock out the unit before all service to avoid injury. Refer to the unit manual and safety manual for details.

507592 r0

From the baghouse outlet, air enters the microstrainer housing. The microstrainer is a metal basket filter located on the intake side of the blower. Its purpose is to prevent any objects or foreign matter which has entered the system during servicing from reaching the blower.

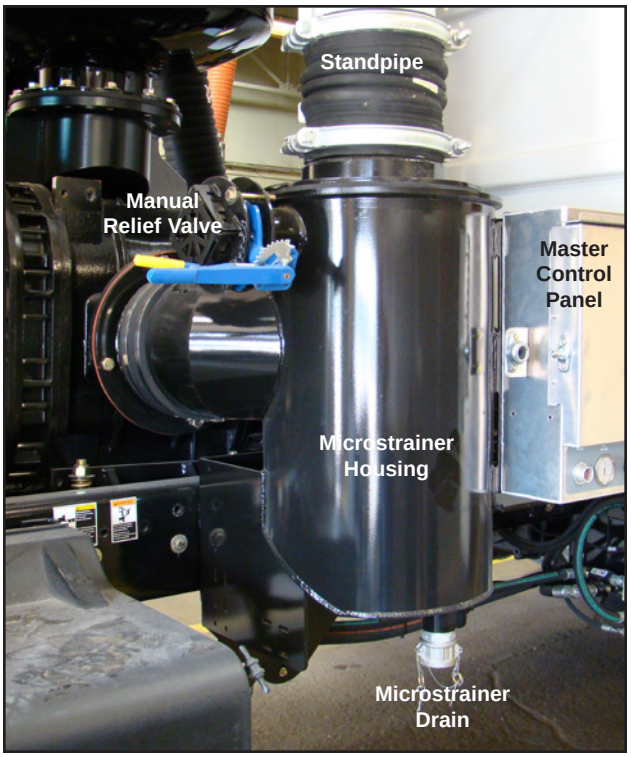
The microstrainer should be checked before each and every operation. Follow these steps:

The microstrainer should be cleaned if necessary and any foreign matter contained in the microstrainer should be removed. To gain access to the microstrainer, the debris body must be raised.

1. Raise the debris and engage the safety prop.
2. The microstrainer can now be pulled up through the top of the housing.

⚠ WARNING Install the safety prop. See the section entitled, “Debris Body Safety Props.” With debris body safely secured, access to the microstrainer housing can be gained.

3. Inspect the basket and remove any foreign matter or substance and clean if necessary. The basket can be cleaned by ordinary cleaning solutions and water.
5. While the basket is removed, drain any moisture from the microstrainer housing by removing the drain cap at the bottom of the microstrainer.
6. After the moisture has completely drained from the housing, close the valve and place the strainer back in the housing.



Advanced Planning

Before starting any new job, meet with your supervisor to discuss the details, such as:

- Hoses and accessories needed to properly perform the job.
- Any special considerations related to the site or the material to be collected
- Any anticipated hazards; features of the dump location
- Any safety precautions you should take to ensure correct set-up and operations.

All aspects of safety need to be thoroughly considered, no matter how routine using the Guzzler equipment has become.

Consider how operating the Guzzler will affect the work area. Know and observe all requisite safety precautions and procedures.

Arrival at the Job Site

Upon arriving at the job site, park the vehicle. Set the parking brake and turn on flashers. Whenever possible, park the truck between yourself and oncoming traffic.

Observe the job site carefully. Look for overhead obstructions, traffic movement, pedestrian walkways, and for places where traffic control devices should be positioned. Always use a co-worker's assistance when spotting the vehicle.

It is important to ensure that the vehicle is in the best possible position for the easiest and safest access to the work site and material to be loaded.

Set the parking brake and chock the tires.

CAUTION

Driveline can be damaged.

Open vacuum relief valve.

Lower engine RPM to idle before engaging or disengaging blower.

Failure to open vacuum relief valve and lower engine RPM to idle before engaging or disengaging blower may result in serious engine, transmission or blower damage.

1800121A rA

The system is equipped with a single elbow intake opening located near the top of the debris body rear door. Clamp the vacuum hose (optional) to the elbow intake. Continue attaching hose or tubing to the required length, making sure that hose runs are as straight as possible with as few bends and turns as possible. Use as short and direct a route as possible.

Use as large a tubing as possible. Light weight, smooth, bore flexible hose is recommended at the working end. Use rigid, aluminum tubes for longer runs, this reduces losses due to friction and have a longer life.

Do not reduce the diameter of hose in mid-stream. If a smaller hose is needed, install a reducer at the truck and run the smaller hose all the way through. Use the largest size that can be handled safely and easily.

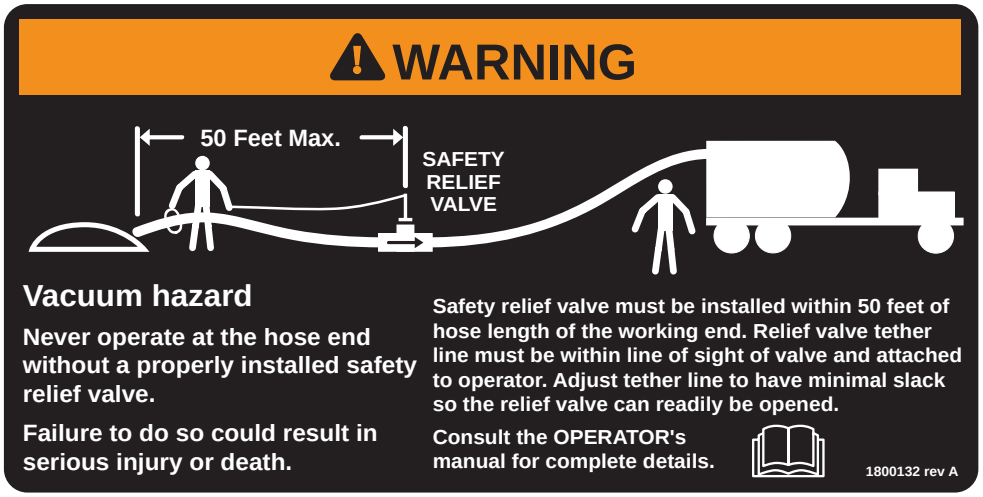
Before connecting the last section of hosing, install the in-line vacuum relief valve. Leave the in-line vacuum relief valve open until vacuum operations are ready to begin.

Note: See the *Safety Manual* for proper installation and use of the in-line safety valve.

Keep the pendant switch for the emergency vacuum relief valve as close to the working end of the hose as possible. This is to break vacuum in an emergency.

Beware of the characteristics of the material including the temperature of the material.

Note: Extremely hot material may cause the blower to overheat if proper precautions are not observed.



Run the unit for about 20 minutes warm the system up and to dry the system out before vacuuming dry material.

1. Always use a vacuum nozzle at the working end of the hose.
2. Never hold the open end of the hose with your hand while vacuum system is on.
3. Never guide debris to the nozzle end or open end with your foot or hand.
4. Never remove obstructions from the nozzle while the system is operating.
5. Always open vacuum relief valves and reduce RPM before attempting to dislodge any obstruction in the vacuum hose.
6. For best performance, vacuum at lower vacuum levels, do not bury the nozzle in the material. Air flow is required to convey the material through the hose.
7. If air flow is not sufficient enough to convey the material, increase the RPM. Do not over speed the vacuum pump.
8. Never wear loose clothing or untied hair when working on or near the unit or open end of the hose.
9. Eliminate as much corrugated hose as possible as it lessens vacuum efficiency.
10. Eliminate unnecessary bends or turns in the hose.
11. Always check the working condition of all safety devices before starting the unit.
12. Observe all safety instructions and markings on the unit. Use ear plugs, safety glasses and gloves when necessary.
13. Be aware that the blower and silencer become hot during vacuum operations.

SAFETY INSTRUCTIONS

In an EMERGENCY the VACUUM must be stopped
Activate the E-Stop

To shut down the system:

- Stop vacuuming.
- Enable vacuum relief valves.
- Reduce engine/blower/fan RPM.
- If required, shut down the engine.

For ease of assembly and operator safety, do not engage the vacuum pump until the vacuum tubing is located near the material to be loaded.

When ready to begin vacuum operations the truck must be running and the following procedures should be followed:

1. At the control panel, turn on the master control switch and open all vacuum relief valves.
2. Plug in the remote pendant and carry the pendant to the working end of the vacuum hose.
3. On the control panel, turn on the air cannon/ pulsation switch if dry material is being vacuumed.
4. Close all vacuum relief valves except the in-line vacuum relief valve.
5. Communicate with the hose handler. When hose handler is ready, increase the RPM to the desired level.

Note: The appropriate level of RPM is the lowest RPM that will readily convey the material into the hose and carry it to the tank. This will depend on the density of the material, and the distance it has to travel to the body as well as the type of hose used.

As a suggestion, start with a RPM between 800 and 900. Start vacuuming, if the flow is non-existent or sluggish, increase the RPM in steps and observe the vacuuming and flow rate. Stop raising the RPM when satisfactory flow of material is achieved.

6. When ready to vacuum, position the vacuum hose at the bottom of the pile to be vacuumed and close the in-line relief valve.

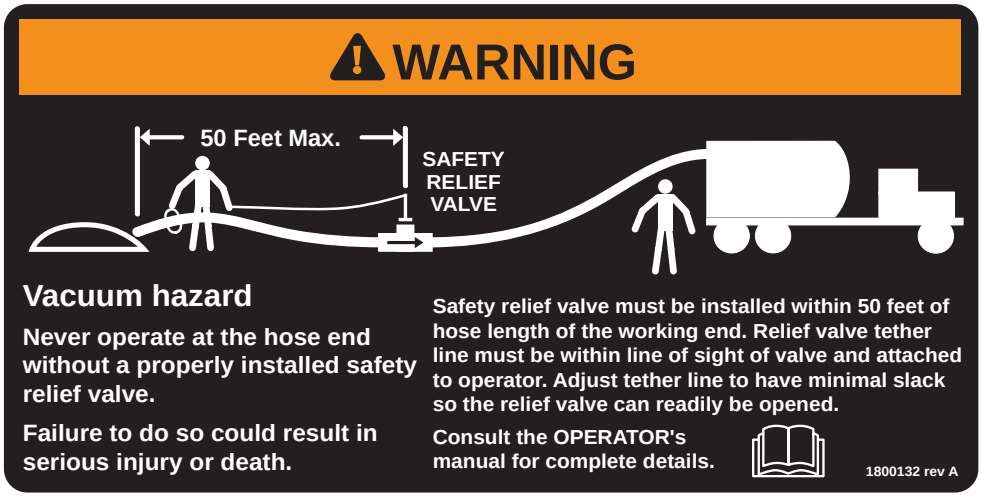
Begin vacuuming by using a side to side sweeping motion. Take care and allow some air to enter the hose along with the debris.

Note: it is the air flow that takes the material with it into the debris body. If there is no air flow, there is no material flow either.

Experience has shown that a sweeping motion of the hose, rather than burying the hose in a debris pile, is more efficient and reduces the chances of hose blockage or engine overload.

Never attempt to “guide” or push debris to the open end of the hose with your foot or hand. Vacuum suction is powerful enough to suck a limb into the hose. Similarly, do not reach into a vacuum hose to free clogs, Always open vacuum relief valves, reduce RPM before attempting to dislodge any obstructions in the vacuum hoses.

If the air flow is not large enough to carry the material, increase the RPM at the control panel to just a little more than required to have a free flow of the material. Do not over speed the blower as that will create excessive overflow of the debris into the cyclone chamber and the baghouse, resulting in a drop in efficiency as the material builds up in the baghouse. It will also make the engine work harder than it really has to decreasing the overall life of the unit.



Vacuuming can continue until the debris body capacity is reached at which time all vacuum operations must cease.

Beware of carry-over of material through the blower/fan. Running the blower/fan too fast with light material can carry the material into the blower/fan. This will cause premature wear.

In liquid vacuuming, the level indicator or the change in the sound of the blower (the float ball will get sucked up) will indicate a full tank and time to stop vacuuming.

To check the level of solid debris in the tank, open all vacuum relief valves, reduce the blower RPM and open the inspection door at the rear of the debris body. The level can be checked by looking in the tank through the opening behind the inspection door. Use a flashlight to get a clearer view of the content level.

If the debris body is full, vacuuming operations must cease. Follow these procedures:

1. Remove the vacuum hose from the work area. Let it suck air for some time to allow any material still in the hose to be carried into the tank.
2. Open the vacuum relief valves.
3. At the control panel, reduce the RPM to idling
4. Inside the truck cab, disengage the blower following the blower shut down procedure.

NOTICE

Never overfill the debris body. Do not exceed the GVWR (gross vehicle weight rating.)

NOTICE

Machine Can Be Damaged

- **Beware of carry over material from debris body through the blower.**
- **Running the blower too fast with light material can carry the material over into the blower. This can cause premature wear.**
- **Over filling the debris body can cause carry over and damage to the blower.**

Located on the boom cradle is a boom out-of-position sensor. This provides a way to notify the operator if the boom is not in its stowed position. The boom must be stowed before transit.

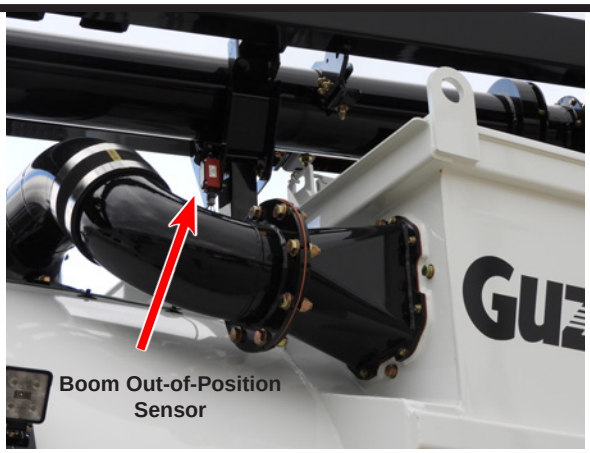
Functionality

Park Brake Set

1. Red light for boom out-of-position illuminates

Park Brake Released

1. Red light for boom out-of-position illuminates
2. Alarm sounds



All of the main functions on the system are activated by hydraulic power. Hydraulic power is supplied by the main hydraulic pump. This pump is driven by the power takeoff (PTO) on the truck transmission. The hydraulic tank, complete with filters is positioned behind the truck's cab.

To Engage Hydraulics

Note: Controls for all hydraulic functions are found on a multi-valve control bank located directly below the master control panel on the driver side of the system.

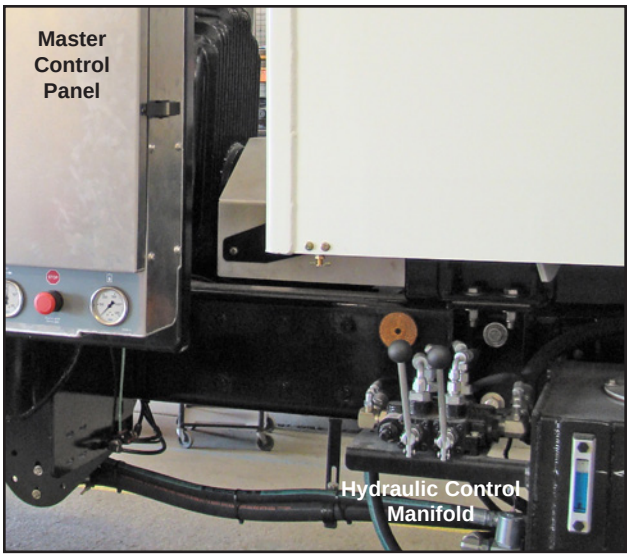
Hydraulics are needed for the following functions:

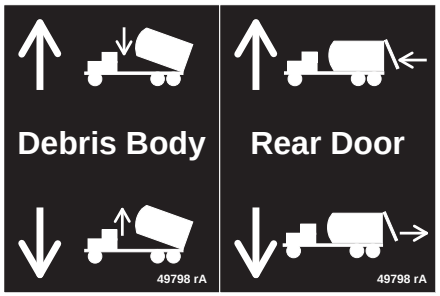
- To raise and lower the debris body
- To open and close the rear door on the debris body
- To operate the boom
- Operate optional equipment

In order to engage or disengage the hydraulics, the operator must be positioned inside the truck cab. In addition, if hydraulics are required while not in blower mode simply engage the hydraulics by using the hydraulic pump shifter on the shift tower in the cab of the truck.

If hydraulics are required during blower vacuum operations, the hydraulics must be engaged at the time you move the vacuum pump from road mode to blower mode – see instructions under the Blower Start-up Procedure immediately following.

There are several different types of shifters available. Refer to the operating instructions supplied with each truck, typically on the driver side visor.





Typical hydraulic controls decal (varies with options)

There are several different types of shifters available. Refer to the operating instructions supplied with each truck and the Vactor supplied decal typically on the driver side visor. The common PTO shift instructions for manual transmissions is shown for reference.

Some units with automatic transmissions may require a high range lock up or similar means of locking the transmission. Check the vehicle instructions supplied with each truck. Typically the transfer case will need to be engaged with the transmission not in gear to run the PTO only. The throttle controls only work when the transfer case is engaged. This is normally labeled as *Stationary Mode*.

When engaging or disengaging the blower, make sure the blower has completely stopped turning before attempting shift in or out of gear.

PTO Operation

Engage PTO

1. Apply parking brake
2. Set engine to idle
3. Depress clutch fully
4. Shift into NEUTRAL
5. Wait 5 seconds
6. Switch PTO to ON
7. Slowly release clutch

If grinding is heard, disengage PTO and repeat engage PTO procedure.

Disengage the PTO

1. Set engine to idle
2. Depress clutch fully
3. Shift into NEUTRAL
4. Switch PTO to OFF
5. Slowly release clutch

Do not engage the PTO while moving or with the clutch engaged.

Refer to manual for details.

L-131 (47047HU rB)

NOTICE

Machine Can Be Damaged

NEVER turn the chassis ignition off, disengage the clutch (if equipped) or change modes (if equipped) while operating the blower/fan, hydraulic system, or drive train.

- **Always allow the engine to return to idle before engaging/disengaging the blower/fan.**
- **NEVER operate the blower/fan more than its rated rpm or vacuum rating.**
- **Always open the vacuum relief before shutting down. Stored energy from vacuum can back-drive the system.**
- **Always disengage PTO(s) before shutting down.**
- **Always allow the driveline to stop before switching to driving mode.**
- **NEVER engage/disengage PTO(s) while driving. PTO should only be engaged while moving if equipped with a recirculation system.**

There are several different types of shifters available. Refer to the operating instructions supplied with each truck and the Vactor supplied decal typically on the driver side visor. The common blower shift instructions for manual transmissions is shown for reference. There will also be a designated gear decal on the dash for manual transmissions.

Some units with automatic transmissions may require a high range lock up or similar means of locking the transmission. Check the vehicle instructions supplied with each truck.

When engaging or disengaging the blower, make sure the blower has completely stopped turning before attempting shift in or out of gear.

Most operations require teamwork. It is common for two people to work in conjunction to perform most functions, including vacuuming, dumping of debris, cleanup, and maintenance.

Start the Truck

The transfer case is located between the blower and rear axle and is used to shift power from the rear axle to the blower when vacuuming.

Insure both vacuum relief valves (manual and automatic) are open.

The operator should be positioned safely in the driver's seat of the truck cab in order to perform the following procedures.

1. Engage the parking brake by pulling the yellow diamond shaped knob located on the dashboard straight out. Refer to the truck operator manual for proper operation of the parking brake.
2. Verify the truck is in neutral. If not, put it in neutral.

Blower Mode

1. Apply parking brake
2. Depress clutch & start engine
3. Turn on transfer case switch
4. Wait 20 seconds
5. Shift into designated gear
6. Slowly release clutch

Road Mode

1. Depress clutch & shift to neutral
2. Turn off transfer case switch
3. Wait 20 seconds
4. Push in ROAD MODE switch
5. Road mode is now activated

Note: Any driveline movement will restart the 20 second time delay.

Refer to manual for details.

1800172 rev 0

3. Depress the clutch pedal and hold until all steps have been completed.
4. Start the truck engine.
5. Set the transfer case switch to BLOWER MODE.
6. Wait 20 seconds for the transfer case to shift.
7. If hydraulics are required (boom, sludge pump, etc.), set the PTO (power-take-off) toggle switch on. This will engage the hydraulic power to the unit.
8. Select high range on the gear shift lever and shift the transmission into proper gear. Typically, high gear will be ninth gear. Slowly release the clutch pedal.

The blower on the unit is now operational and running.

Master Control Panel

The remaining functions are performed at the master control panel located on the driver's side of the exterior of the truck.

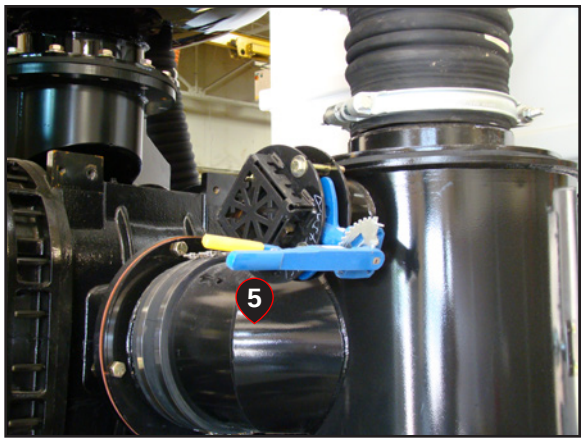
1. Attach the remote pendant.

Note: Vacuum Relief Valves – Both the automatic and manual vacuum relief valves need to be closed. If they are not closed, there will be no vacuum to transfer the material.

2. Set the master switch to ON.
3. Increase the engine rpm by pushing up on the throttle toggle switch. Continue to push up on the switch until the engine speed is about 800-900 rpm. This is a starting point and will be adjusted later as required to efficiently vacuum site material. The rpm gauge is located at the top and to the far left on the master control panel.

Note: Only operate the blower at a level sufficient enough to efficiently convey the material. If the blower is operated at too high a rpm, fuel will be wasted and the material will not properly separate from the air stream.

4. Turn the air cannon switch on if you are sucking dry material.
5. Close manual relief valve.
6. Set the vacuum relief switch to vacuum enable.
7. Set the pendant vacuum relief switch to vacuum enable.



SAFETY INSTRUCTIONS

In an EMERGENCY the VACUUM must be stopped Activate the E-Stop

To shut down the system:

- Stop vacuuming.
- Enable vacuum relief valves.
- Reduce engine/blower/fan RPM.
- If required, shut down the engine.

After transfer operations are complete, the following procedures should be followed to shut down the system.

1. Allow the vacuum hose to clear all material.
2. Open both vacuum relief valves. See the section entitled “Vacuum Relief Valves” for their proper operation.
3. At the master control panel, reduce the engine rpm to idle by pressing down on the momentary throttle switch until the tachometer gauge on the master control panel indicates idle.
4. Turn the master control switch on the master control panel to the “off” position.

NOTICE

Machine Can Be Damaged

NEVER turn the chassis ignition off, disengage the clutch (if equipped) or change modes (if equipped) while operating the blower/fan, hydraulic system, or drive train.

- **Always allow the engine to return to idle before engaging/disengaging the blower/fan.**
- **NEVER operate the blower/fan more than its rated rpm or vacuum rating.**
- **Always open the vacuum relief before shutting down. Stored energy from vacuum can back-drive the system.**
- **Always disengage PTO(s) before shutting down.**
- **Always allow the driveline to stop before switching to driving mode.**
- **NEVER engage/disengage PTO(s) while driving. PTO should only be engaged while moving if equipped with a recirculation system.**

5. Inside the truck cab, depress the clutch pedal and wait for the speedometer to register zero. This gives time for all drive lines to stop turning.
6. With the clutch still depressed, put the gear shift lever in neutral.
7. Wait 20 seconds for the driveline to fully stop.
8. Set the blower switch on the dashboard to ROAD MODE.

Note: Toggling the mode switch back and forth while the light is illuminated will reset the shift protection system and delay road mode engagement an additional 20 seconds.

Note: The clutch pedal should be depressed every time the blower is engaged or disengaged. Also, the clutch pedal should be depressed every time the hydraulic pump switch is engaged or disengaged.

9. Set the PTO switch to OFF. See the section entitled “Hydraulics” for further detailed instruction.
10. Release the clutch pedal.
11. Unit is now in road mode

Note: Never turn the chassis key off while in the blower mode or while the hydraulics are engaged. Permanent transmission damage may result. If the hydraulics were engaged previously, move the PTO switch of the “off” position. The PTO light will no longer glow.

Blower Mode

1. Apply parking brake
2. Depress clutch & start engine
3. Turn on transfer case switch
4. Wait 20 seconds
5. Shift into designated gear
6. Slowly release clutch

Road Mode

1. Depress clutch & shift to neutral
2. Turn off transfer case switch
3. Wait 20 seconds
4. Push in ROAD MODE switch
5. Road mode is now activated

Note: Any driveline movement will restart the 20 second time delay.

Refer to manual for details.

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NOTICE

Preparing for Transport

Prior to transport secure all tools, hoses and all miscellaneous items in their storage locations.

- **All items in tool trays and racks need to be secured or tied down.**
- **If equipped, secure boom in transport mode.**
- **If equipped, lower debris body, close rear door.**
- **If equipped, secure all hose ends on hose reels.**
- **Close and secure all cabinet, tool box and control panel doors and covers.**
- **Remove and stow all hoses, suction tube, extension pipes and accessories.**
- **Disengage the hydraulic, vacuum and water systems.**
- **Check and clear the area around the unit before moving.**

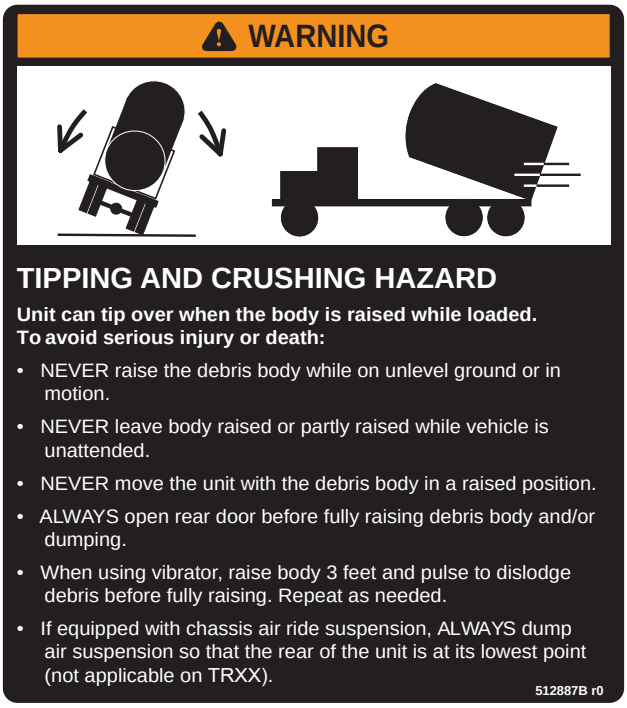
- Maneuver the unit to the dump site and park on firm/level ground. Make sure the ground in that area is compact enough to prevent the truck from getting stuck.
- Ensure there are no overhead obstacles that will interfere with raising the debris body.
- Engage the parking brake.

Dumping Safely & Effectively

NOTE: If equipped with a boom, stow the boom so that the hose clears the unit's components when raising the debris body.

- Read the in-cab or manual instructions on how to properly engage the hydraulic system.
- Keep one operator on the hydraulic controls for safety, and to cease operations if an emergency arises. Ensure the operator is proficient with the controls.
- Monitor the dump site area for anyone or anything that may interfere with the safe operation of the unit.
- Check behind the unit for people or obstacles before opening the rear door to avoid harming anyone or causing damage.
- The rear door MUST be opened before the front of the debris body is 3 feet above the chassis
frame.
- During decanting or off-loading liquids, only raise the body no more than 3 feet, enough to allow the liquid out and not plug the ports.
- Observe the material as the debris body raises to make sure it is coming out. Do not continue raising the body if the material is not moving. High pressure water or mechanical removal may be necessary.

NOTE: If equipped with dump tubes, as the debris body is being raised the dump tube doors located on each side of the debris body will automatically open.

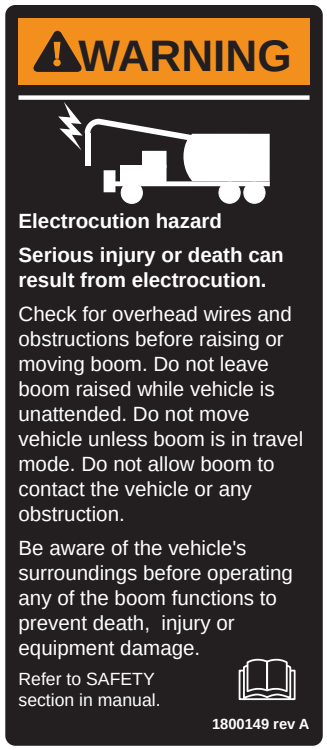


NOTE: If equipped with the optional vibrator, it can be used to dislodge any material that is attached to the sides of the debris body. Make sure to raise debris body 3 feet and pulse vibrator to dislodge debris. Activate the vibrator mechanism intermittently with the switch on the master control panel until debris starts to move. Only use short vibrating blasts. DO NOT use long or continuous blasts. DO NOT raise body fully and then activate vibrator as extreme weight shift could cause unit to tip/roll.

- Deploy the rear door safety props to secure the door from accidentally falling during cleaning operations. Never enter the debris body without thoroughly cleaning it first. Be aware of the dangers of confined spaces and request a confined space permit if required.
- Using the hand gun, wash out the debris body, paying particular attention to the door seal, lock bolts, level indicator, float balls, screens, etc. and the inside of the rear door.

Transportation Precautions

- NEVER leave the debris body raised or partly raised while the unit is unattended, nor when in motion.
- NEVER move the unit with the debris body in the up or raised position.
- ALWAYS disengage the PTO when hoist is not in use or when moving the unit.



SAFETY INSTRUCTIONS

Best Practices for Dumping

- Position unit on level, stable ground.
- Check for overhead wires and obstructions
- Operator must remain at controls during all operations.
- During decanting or offloading liquids, only raise the body no more than three feet, enough to allow the liquid out and not plug the ports.
- Open rear door before dumping.
- Observe the material as the debris raises to make sure it is coming out. If equipped use the vibrator. Do not continue raising if the material is not moving. High pressure water or mechanical removal may be necessary.
- NEVER move the unit with the debris body in the up or raised position.

Vibrator (if equipped)

- The vibrator can be used to dislodge any material that is attached to the sides of the debris body while raising. Only use short vibrating blasts.

WARNING

Crushing Hazard

NEVER leave body raised or partly raised while vehicle is unattended or while performing maintenance or service under body unless body is propped to prevent accidental lowering. [Always disengage PTO when hoist is not in use or when moving vehicle.] The debris body MUST BE empty for service work.

NEVER attempt to raise body when vehicle is on unlevel ground.

Rear door MUST BE opened before the front of the body is 3 feet above the chassis frame. Operator must remain at controls during all operations.

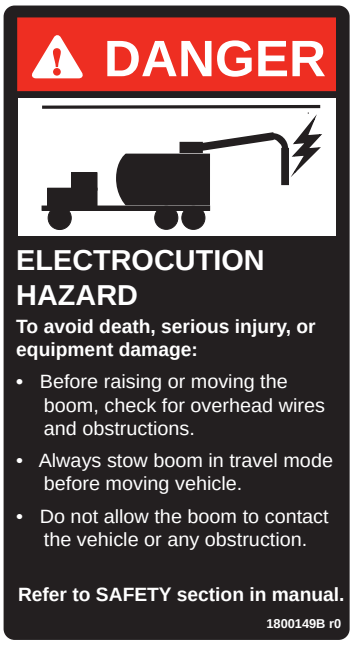
When the payload is reaching capacity, check the main body for load level. First, fully reduce the auxiliary throttle and open the vacuum relief valve. (Check the load level through the debris body inspection port or the inspection port located on top of the debris body.)

When vacuuming liquid material, as the body becomes full, the float in the main body rises automatically with the load level to stop the flow of air through the filtration system. When this happens the vacuum relief valves “whistle.” Shut the system down at this point and prepare for dumping.

Dumping Body (Inside the Cab)

The truck engine must be started to dump the debris body containing the material collected. The engine provides the power to the hydraulic system which lifts the front of the body and opens the debris body door.

1. Back the unit up to the dump site and park on firm level ground.
2. Ensure there is adequate clearance overhead for the debris body to rise.
3. Inspect the rear of the unit and the area that the material will be dumped.
4. Turn the ignition switch in the cab and start the engine.
5. If truck is equipped with air ride suspension, dump air suspension so that the rear of the truck is at its lowest point.
6. Engage the PTO. See the section entitled “Engaging the PTO” for proper instruction on engaging the PTO.



WARNING

Crushing Hazard

Unit can tip over when the body is raised while loaded. During decanting or offloading liquids only raise the body no more than three feet, enough to allow the liquid out and not plug the ports.

NEVER attempt to raise body when vehicle is on unlevel ground or in motion.

After decanting or offloading liquids, rear door MUST BE opened before the front of the body is 3 feet above the chassis frame.

Operator must remain at controls during all operations.

The controls for dumping the debris body are normally located to the right of the master control panel located on the driver side. With the hydraulic PTO engaged run the engine throttle up to about 1200 rpm to operate the control station properly and efficiently.

The left two valve levers normally control the debris body raise/lower and rear door open/close functions. Depending on options there may one or more additional valve levers available. The debris body will begin to hydraulically raise from the front and continue to raise until the hoist lever is released. Fully raised, the body will be in an approximately 50 degree inclined position. The body can be stopped from rising any further at any point by releasing the lever. The lever will return to its normal position. By gravity, the body will dump the material.

Note: When dumping the debris body, the door should be opened first and then the debris body raised.

As the debris body is being raised, the dump tube doors will automatically open. The dump tube doors are located on each side of the debris body. There is a separate dump tube for each cyclone house and filter baghouse. With the dump tube doors open, this will allow both filter baghouse and cyclone house to be emptied at the same time the debris body is being emptied.

Vibrator (optional)

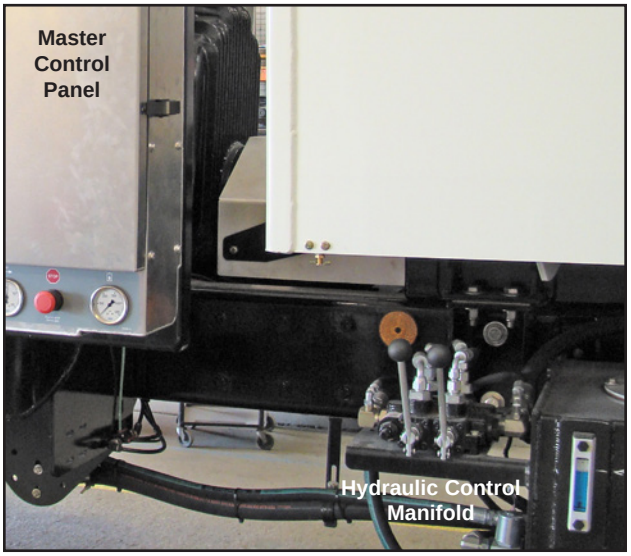
After the debris body has been raised, the vibrator mechanism (if this option is equipped with the unit) can be used to dislodge any material that is attached to the sides of the debris body. Activate the vibrator mechanism intermittently with the switch on the master control panel. Only use short vibrating blasts. **Do NOT use long or continuous blasts as this may seriously damage the unit. ONLY operate the vibrator with the debris body up and rear door open.**

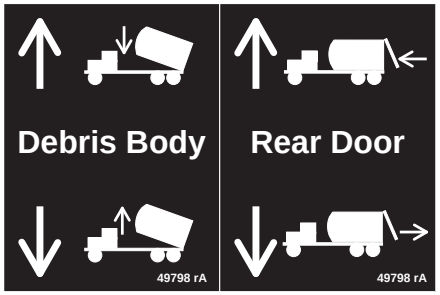
⚠ WARNING

Crushing / Tipping Hazard

To avoid injury or death:

- **Position unit on level stable ground.**
- **Open rear door before dumping.**
- **NEVER move the unit with the debris body in the up or raised position.**





Typical hydraulic controls decal (varies with options)

Upon completion of the dumping operation, the door gasket and mating surface on the debris body should be completely cleaned so that it may form a complete seal when it is closed. Additionally, both dump tube door gaskets and mating surface should be inspected and cleaned as well.

Prior to cleaning the gasket and surface, insert the rear door safety prop. This will secure the door from accidentally falling during cleaning operations.

Lowering body/closing door

After the debris body has been emptied and the seals cleaned, the body can be lowered to its original operating position and the rear door closed.

Note: The body should always be lowered first and then the door closed.

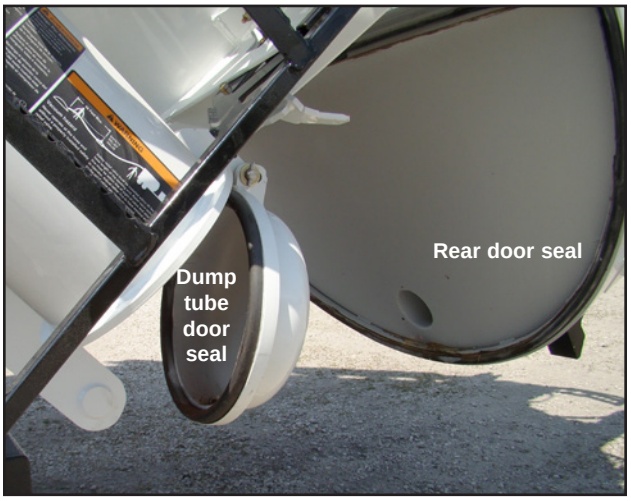
Raise the debris body enough to lower the debris body safety prop. Lower the debris body until it comes to rest in the operating position. Releasing the lever will stop the body from lowering any further.

Next, the rear door safety prop is removed and placed in the stowed position and the rear door is lowered to the closed position.

Disengage the hydraulics.

Disengage the clutch and set the PTO switch on the dashboard to OFF.

Note: Never raise a loaded body unless the rear door is open and you intend to empty the body.



Located on the subframe is a body out-of-position sensor. This provides a way to notify the operator if the debris body is not all the way down. The debris body must be fully down before transit.

Functionality

Park Brake Set

1. Red light for body out-of-position illuminates

Park Brake Released

1. Red light for body out-of-position illuminates
2. Alarm sounds

The purpose of the vibrator is to assist in the dumping of debris by reducing the friction between the debris and the debris body. When the vibrator is used, friction is reduced because the vibrational forces generated by the vibrator actually fluidize the debris. The fluidized (liquid like) debris is then more conducive to dumping.

For the same reasons the vibrator helps promote the dumping of material it can also prevent material from dumping if used improperly. Damage to the vibrator and to the Guzzler can result when it is used improperly. Please adhere to the following guidelines when using your vibrator:

1. Never turn the vibrator on while the body is in the down position. Fluidizing material that has no place to go results in further compaction, making the material more difficult to dump once the debris body is opened.
2. Never raise the debris body before opening the rear door fully. This is an unsafe practice and should never be done. It also contributes to reduced dump ability .
3. Never use the vibrator to “settle” debris that has been vacuumed into the body in an effort to increase the payload. This will result in dumping difficulties.
4. Never run the vibrator for more than 30 seconds at a time and always allow a 60 second “cooling off’ period between each operation cycle.
5. Always turn off as much electrical equipment as can safely be done. This will ensure the vibrator has ample electrical power.
6. Always open the rear door first, then raise the debris body. This will allow material to be dumped before it becomes compacted.
7. Always attempt to dislodge the debris with short bursts of the vibrator (5 to 10 seconds) before resorting to the full 30 second cycle.
8. Always cease vibrator operation if the vibrator has been cycled four times (30 seconds “on”, 60 seconds “off”) without success. At that point an alternative method for emptying the debris compartment must be employed.

At any time the debris body is raised in order to obtain easier access to the underside of the debris body, all safety precautions must be followed. The debris body should be stabilized and secured before entering any space below it. All safety props must be used to secure the debris body. The number of props varies with configuration.

1. Raise the empty debris body so that the front of the tank is approximately 5 feet in the air to allow the safety prop to clear the tank and swing up into position underneath the front of the body.
2. Raise the safety prop from its horizontal stowed position until it tips back a little to the rear on its stop. All props must be raised.
3. Lower the body until it is resting in the cradle of the prop. This will secure the body from falling.

Disengaging Safety Prop

1. Raise the debris body enough to clear the safety prop.
2. Release the hoist lever after the body has cleared the safety prop.
3. Lower the prop stand.

NOTICE

Rear Door Can Be Damaged

Remove safety support(s) before closing door to avoid damage. Open rear door before raising the debris body. Make sure rear door attachments clear the bumper and ground when raising the debris body.

89384CA rev E

When any work is to be done inside the debris body or on the rear door that requires it to be open, use the rear door support.

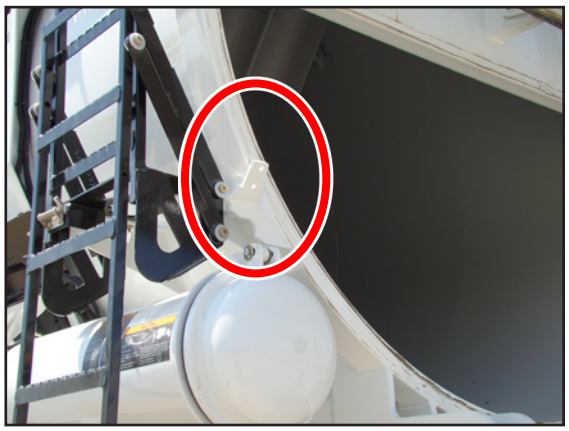
Installing Safety prop

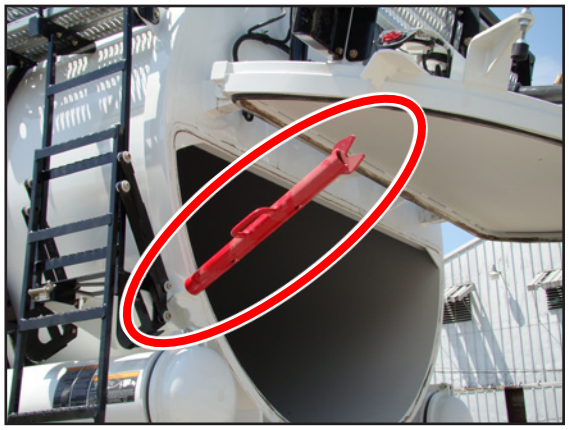
Prior to cleaning the gasket and surface, insert the rear door safety prop. This will secure the door from accidentally falling during cleaning or maintenance operations. The safety prop is stored on the driver side near the rear of the debris body.

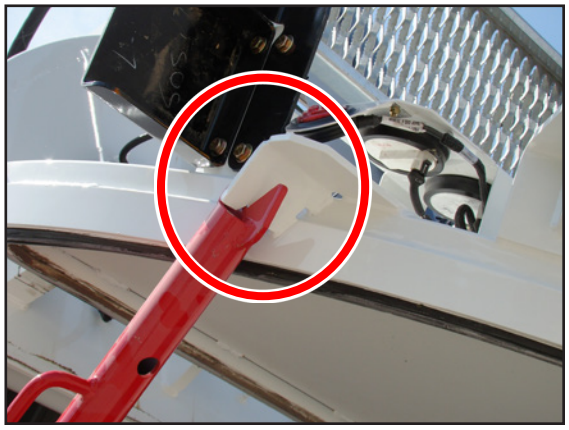
Open the rear door until it will clear the safety prop and allow the safety prop to be fully slid into the tank bracket. Lower the rear door until the door bracket just touches the safety prop as shown.

Removing Safety prop

Open the rear door until it will clear the safety prop and allow the safety prop to be removed. The rear door can now be closed. The safety prop should be returned to its proper storage location for future use.







When any work is to be done inside the debris body or on the rear door that requires it to be open, use the rear door support provided.

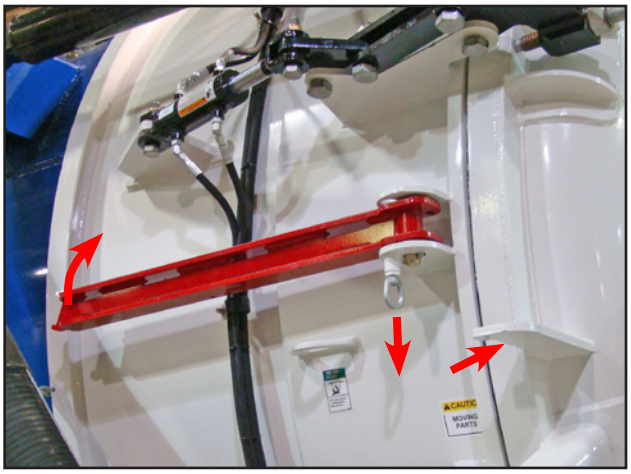
NOTICE

Rear Door Can Be Damaged

Remove safety support(s) before closing door to avoid damage. Open rear door before raising the debris body. Make sure rear door attachments clear the bumper and ground when raising the debris body.

89384CA rev E

Upon completion of the dumping operation, the door gasket and mating surface on the body should be completely cleaned so that it may form a complete seal when it is closed. Prior to cleaning the gasket and surface, insert the rear door safety prop.



The prop is released by a spring pin. Open the rear door. Release the prop and swing it full around and reengage the spring pin. Gently lower the rear door until the catch just touches the end of the prop.

Lowering Debris Body/Closing Door

After the debris body has been emptied and the seal cleaned, the body can be lowered to its original operating position and the rear door closed.

Note: The body should always be lowered first and then the door closed

The debris body is raised enough to remove the debris body safety prop, so that the debris body safety prop can be stowed. The debris body is lowered by pushing the right lever towards the unit and continue to hold the lever in until the debris body comes to rest in the operating position. Releasing the lever will stop the body from lowering any further.

Next, the rear door safety prop is removed and placed in the stowed position and the rear door is lowered to the closed position. Push the left lever towards the unit. This will close the rear body door. When locking the rear door hold the hydraulic valve for the rear door open/close in the close position while depressing the rear door lock switch until the door is fully locked.

Note: Never raise a loaded body unless the rear door is open and you intend to empty the body.

Units are equipped with an electrical equipment disconnect switch which can be found on the driver side behind the cab. This switch is used in the event of servicing the machine or jump starting the chassis. Switching to OFF separates the chassis electrical systems from the Guzzler systems.

When the switch is in the OFF position, the cab and chassis electronics will still remain active.

Notes

1.) The master switch light is powered by the ignition and will still illuminate with the disconnect switch enabled.

2.) Wait at least 2 minutes after shutting the truck down before turning off the chassis batteries.

Inspect all vacuum hoses, tubes and connectors before each use. Leaks reduce vacuum efficiency and may result in spills.

1. Dents or kinks in the hose reduce air flow.
2. Do not pile hose as the weight of the piled hose can crush or kink it.
3. Always use the correct hose clamp for the hose. Vactor recommends common cream type hand cleaner as a lubricant to assemble hose to the fittings. Do not use grease as it may allow the hose to pull off the fitting much easier.
4. Route hose away from traffic other work to avoid damage.
5. Verify the hose is suitable for the material and temperatures being vacuumed.
6. Store hose in a cool, dry, dark and clean place.
7. Verify all electrical connections are good for proper static protection.

Vacuum line routing

Generally the shorter the run the better. Large easy curves reduce wear on the hose. Eliminate unnecessary bends or turns. Eliminate as much corrugated hose as possible as it lessens vacuum efficiency. Use as short and direct a route as possible. Rotating the hose regularly will also increase the usable life. The hose run should be well supported without any large sags when crossing open areas.

Hose and tube assemblies are not intended to support their weight on vertical drops or runs up. Rope or other supports should be provided to support the run. The assembly should be supported at multiple locations so it can not tip over if a connection should become disconnected. In operation the added weight of the material being vacuumed along with the hose and tubes can pull connections and hoses apart.

Generally, the hose diameter should be larger than the maximum lump size handled. For heavy materials, the larger hose diameters provide more efficient pneumatic conveying and also can handle higher blower speeds for additional carrier air volume.

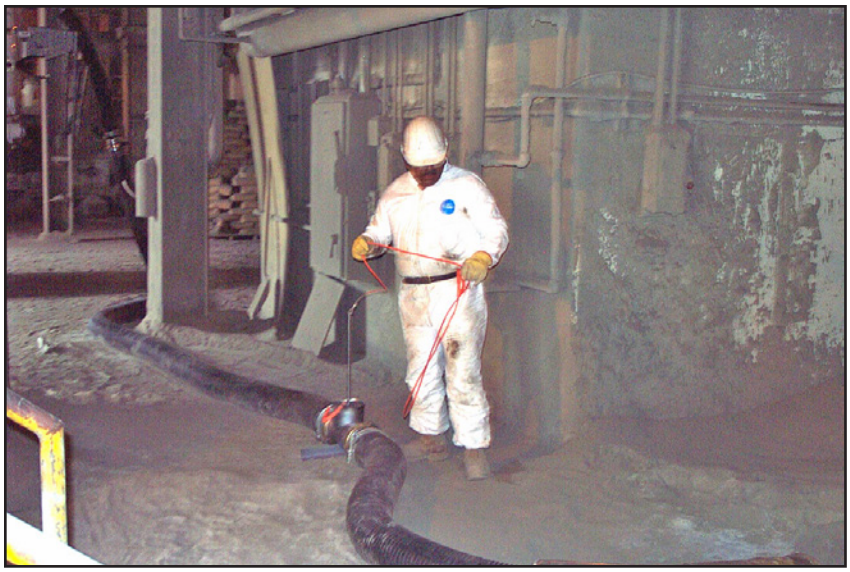
Use as large a tubing as possible. Light weight, smooth, bore flexible hose is recommended at the working end. Use rigid, aluminum tubes for longer runs, this reduces losses due to friction and have a longer life.

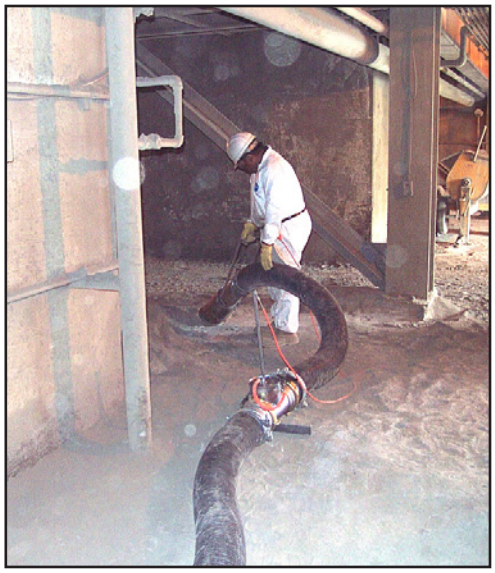
Do not reduce the diameter of hose in the middle of a run. For example 8” from the unit for 100 feet then reduced to 4” for 20 feet then back up to 6” for 50 feet. The change in air flow and velocity can result in debris plugging the hose closest to the unit.

If a smaller hose is needed, install a reducer at the truck and run the smaller hose all the way through. Use the largest size that can be handled safely and easily.

Always use a vacuum nozzle at the working end of the tube.

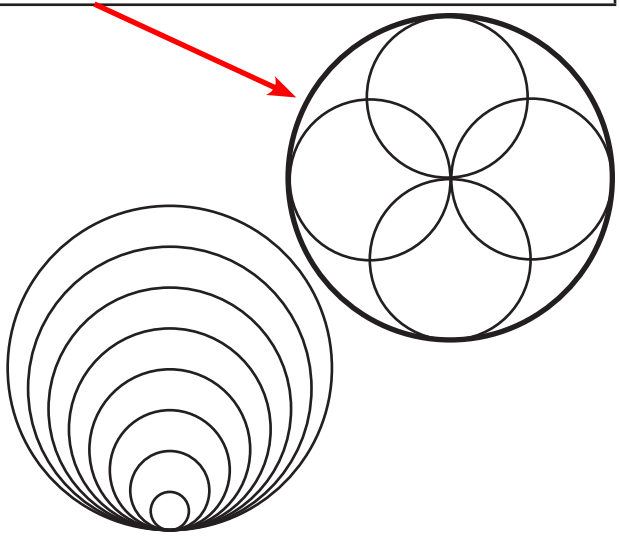
Before connecting the last section of hosing, install the in-line vacuum relief valve. Leave the in-line vacuum relief valve open until vacuum operations are ready to begin.





Shown is an example of a good vacuum hose run. The hose is the same size from the truck to the hose end. The Safety tee is located for good operator access and a hose end is being used.

Multiple Hose Runs
Multiple lines should all be the same length.
Three 2” hoses = 4” hose run
Nine 2” hoses = 6” hose run
Four 3” hoses equals 6” hose run
Two 4” hoses equals 6” hose run
Sixteen 2” hoses = 8” hose run
Seven 3” hoses = 8” hose run
Four 4” hoses equals 8” hose run



Hose Restriction				
Hose Dia. Inches	Hose Area square/inches	Orifice Area	Orifice Area	Orifice Area
8	50.3	100.0%		
7	38.5	76.6%		
6	28.3	56.3%	100.0%	
5	19.6	39.1%	69.4%	
4	12.6	25.0%	44.4%	100.0%
3	7.1	14.1%	25.0%	56.3%
2	3.1	6.3%	11.1%	25.0%
1	0.8	1.6%	2.8%	6.3%

Before and after all work serious issues need to be addressed which include:

1. Has the unit been thoroughly cleaned?
2. Will any of the debris react with any of the components of the unit?
3. Has the debris been positively identified?
4. In the case of a spill, there may be cross contamination issues with material soaked into the surrounding area.

Cleaning

The owner, operator and user are responsible for determining what level of cleaning is required for the specific job due to the possibility of cross contamination of chemicals. Two common resources for information are shown here for reference.

Things to consider when cleaning:

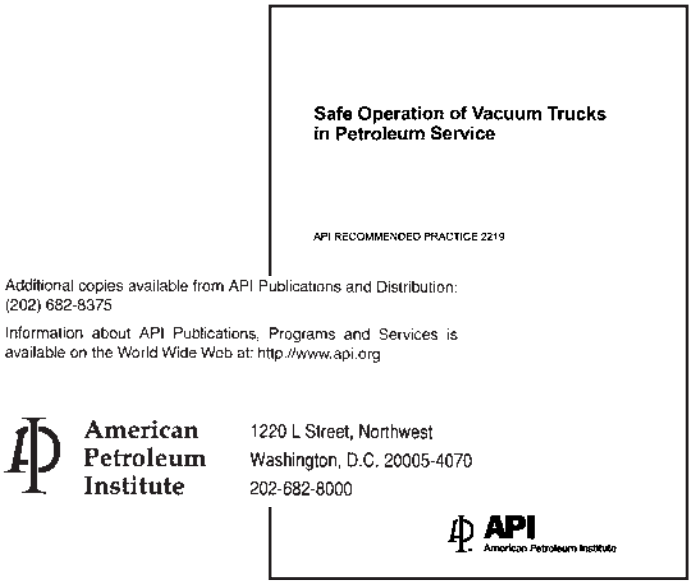
1. Visually inspect the debris body, cyclone(s), baghouse(s) and all material flow paths. They should be clean and clear of all visible debris and should be dry.
2. Replace all filter media in the debris path.
3. Disassemble and clean all filter screens and hoses.
4. Dispose of all waste in accordance with federal, state, and local laws and regulations.
5. Maintain an MSDS/SDS for all materials the units is used for.
6. A procedure should be developed and strictly followed to track the last material the unit was used for and cleaning. A sample form is included here.

WARNING

Cross Contamination Hazards

Serious hazards from poison gasses, fire and explosions are possible when the wrong chemicals or materials come in contact with each other.

Serious injury or death may result if cleaning procedures are not followed.



Safe Operation of Vacuum Trucks in Petroleum Service

API RECOMMENDED PRACTICE 2219

Additional copies available from API Publications and Distribution: (202) 682-8375

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American Petroleum Institute

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API American Petroleum Institute

Available from the WJTA: *Recommended Practices for the Use of Industrial Vacuum Equipment*.

Unit			
Work performed by		**Date**	
Notes			
Areas NOT decontaminated			
1			
2			
3			
4			
5			
Last material in unit			
MSDS/SDS attached			**Yes - No**
Cleaning agents used			**Yes - No**
MSDS/SDS attached			**Yes - No**
Other			
1	**Unit fully winterized?**		**Yes - No**
2	**Water tanks drained and flushed?**		**Yes - No**
3	**All filters, strainers, filter bags cleaned or replaced?**		**Yes - No**
4	**Exterior of unit cleaned?**		**Yes - No**
5	**Debris body, cyclone(s), bag house(s), dump tube(s) cleaned?**		**Yes - No**
6	**All other areas material passes or accumulates cleaned?**		**Yes - No**

Units used around or for sewer work present some special handling issues due to biological hazards. This also includes all of the unit's exterior that may have come in contact with waste material. The unit's water tanks, debris body, pumps, filters and plumbing can all become contaminated in use. Recycling units will require additional cleaning before servicing.

Thoroughly flushing with fresh water is the first step to cleaning a unit. A wide variety of chemicals and procedures are available for decontamination. Machine components and seals can be damaged by some chemicals. Consult Vactor Service before use. The owner, operator and user are responsible for determining what level of cleaning is required.

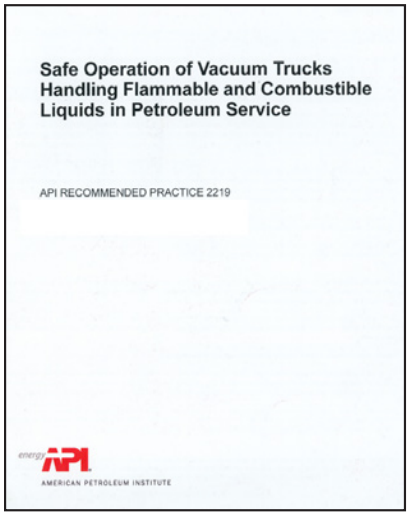
⚠ WARNING

Biological hazards

Germs and other biological hazards are common in sewers. All operators must wear safety apparel: hard hat, visor and / or goggles, ear protection, rain suit, safety-toe shoes or boots with non skid soles and water proof gloves are recommended to avoid injury and contamination. Additional equipment may be required as determined by an on site safety assessment.

Immediately treat all abrasions, cuts and nicks for contamination. Get medical attention for injuries associated with cleaning sewers, drains and catch basins if biological contamination is suspected. Serious illness may result if this procedure is not followed.

The owner, operator and user are responsible for determining if static grounding is required and what level of protection is required for the specific job. Due to the possibility of static electricity build up in the system we recommend grounding the unit in all applications.



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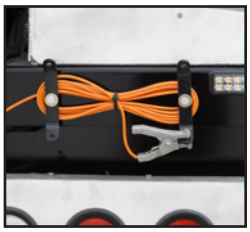

Typical static cable and clamp

The American Petroleum Institute provides additional resources and programs to industry which are based on API Standards. For more information, contact:

• Training/Workshops	Ph:	202-682-8490
	Fax:	202-682-8222
• Inspector Certification Programs	Ph:	202-682-8161
	Fax:	202-962-4739
• American Petroleum Institute Quality Registrar	Ph:	202-682-8130
	Fax:	202-682-8070
• Monogram Program	Ph:	202-962-4791
	Fax:	202-682-8070
• Engine Oil Licensing and Certification System	Ph:	202-682-8233
	Fax:	202-962-4739
• Petroleum Test Laboratory Accreditation Program	Ph:	202-682-8129
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Helping You Get The Job Done Right.™

Available from the WJTA-IMCA: *Recommended Practices for the Use of Industrial Vacuum Equipment*. Familiarize yourself with the Recommended Practices, particularly Section 2.0 Accidents & Section 5.5 Grounding/Bonding.

In addition, NFPA 77 Recommended Practice on Static Electricity provides more detailed grounding methods. This can be obtained from the National Fire Protection Association at www.NFPA.org (800-344-3555).

These three references are recommended to help in making good decisions in the proper use of vacuum truck technology. Other references are also available.

Library of Congress Cataloging-in Publication Data
Britton, Laurence G., 1951–
Avoiding static ignition hazards in chemical operations / Laurence G. Britton.
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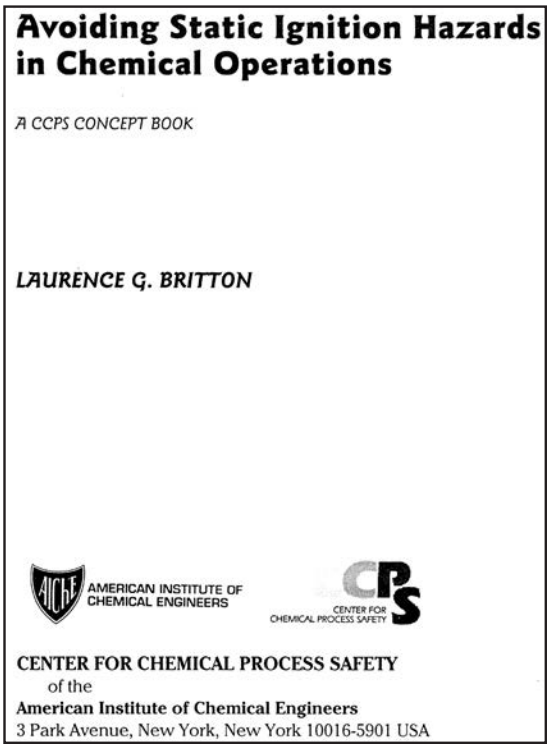


If use of Vactor equipment results in exposure to potentially hazardous dust, employers and users should consult any applicable SDS as well as OSHA regulations, guidelines, and information to ensure safety of operators. Under these circumstances, users should pay particular attention to possible increased exposure when dumping debris hoppers and changing bag filters. Wearing appropriate respirator during dumping operations and wetting down filter bags before service or removal may reduce exposure to certain dusts such as silica dust. To reduce exposure in presence of potentially hazardous dusts, employers should consider use of upgraded filters, broken bag detectors, and ensure that any leaking gaskets and seals are promptly serviced. Employers should monitor exposure of operators and ensure compliance with applicable OSHA regulations and standards.

Some common practices to reduce exposure include:

1. Upgrading filters
2. Servicing gaskets and seals if leaking
3. Wetting down filter bags, if appropriate before servicing or removal.
4. Operators wearing appropriate respirators when servicing, dumping or during air excavation.

Combustible dusts

Materials that are, or could produce, combustible dusts must be handled in such a way as to prevent combustible dust explosions and deflagrations (fires).

Combustible dusts consist of the following dust types as per NFPA 70: National Electrical Code 2014 Edition

- Group E - Metallic Dusts
- Group F - Carbonaceous Dusts
- Group G - Organic Dusts

It is the responsibility of the owner to insure that all of the following steps are taken before using any air mover unit on combustible dust materials.

5. All employees involved in handling combustible dusts must be trained as to the combustible dust hazards as part of their HAZCOM training. See: OSHA 3371-08 2009 - Hazard Communication Guidance for Combustible Dusts
6. Consult the SDS(s) of the material(s) for the recommended Safe Handling Procedures and Fire and Explosion potentials.
7. Dry materials and low relative humidity increase the dangers of handling combustible dusts.
8. Never dry sweep or *Blow Down* the dusts with compressed air to form piles for easier vacuum removal. Both of these methods can create conditions for a dust explosion to occur.
9. Position the air mover so that the top baghouse doors, which are the emergency relief vent in the event of an explosion, do not create a greater hazard should an explosion occur within the unit. Keep all personnel clear of the baghouse and cyclone clean out doors which may also vent should an explosion occur.
10. The air mover itself contains many possible exterior ignition sources (electrical and heat). Never operate the unit in an area containing airborne combustible dust.
11. Insure the grounding cable on the unit is properly mounted, bare metal bottom of the grounding reel to bare metal mounting surface on either the frame or bed of the unit, and that the grounding cable and clamp are in good condition.

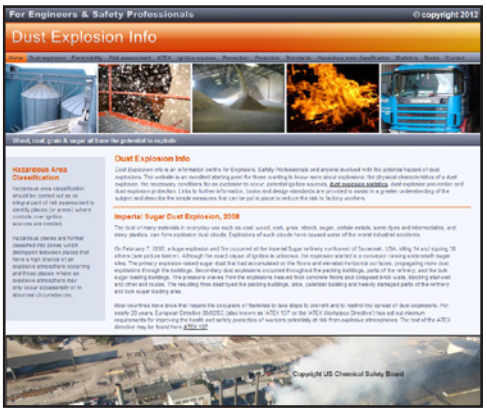
12. Ground the unit to an approved grounding point or grounding rod. If using a grounding rod(s), it must be designed for grounding and driven firmly into the soil per the site requirements. The grounding point should be wire brushed to remove oxidation or other materials that might prevent the free flow of electricity.
13. For rear loading air movers, a rubber baffle placed over the diverter plate is strongly recommended to prevent any potential metal to metal contact during vacuuming. This is essential when vacuuming metal combustible dusts.
14. All components of the vacuum line must be bondable. This includes: nozzle, hoses, pipes, fittings, safety tee, trunk hose.
15. Never use any non-conductive materials in any part of the vacuum line (PVC Pipe or Plastic Hose).
16. Never use bare copper wire inside or outside of the vacuum line as a jumper across non-conductive components.
17. Rubber hoses must include a continuous wire helical stiffener. The wire should be stripped 4-6” on each end of the hose, the bared wire pushed into the hose opening and then the metal hose shanks pressed in to the hoses and clamped together.
18. All bonds and grounds must be tested with a suitable Ohm meter to verify the bonding and grounding meet the site requirements.
19. Do not restrict the air flow to the unit to prevent overheating of the blower. Restricting the air flow could cause the blower to become an ignition source for dusts. Use multiple smaller hoses if a larger hose is not practical.
20. Run the unit at the lowest RPM that moves the material. Excess RPM’s create excess heat in the blower.
21. If the unit begins to blow dust from the discharge silencer, immediately shut the unit down, disconnect the vacuum line, repair any broken or unseated bags in the bag house, rinse any dust out of the silencer, clean or purge any dust remaining in the unit between the top of the bag house and the blower and finally reconnect the vacuum line and resume work. Failure to do so could result in a dust explosion.
22. Upon completion of the job, insure the air mover has been cleaned of any combustible dust residue.

Vactor can not possibly, know, evaluate, and advise the service trade of all conceivable ways in which operation or service might be done or the possible hazardous consequences of each way. Anyone who uses operational procedures, service procedures, or tools, whether recommended by Vactor or not, must first satisfy himself thoroughly that neither his safety nor the product safety will be jeopardized by the methods he shall select.

Vactor vacuum systems are designed to user specifications. The owner/operator/user is responsible for the safe use and application of this equipment and proper waste disposal. Transportation and disposal of waste may be subject to local, state or federal laws.

There is an increased risk of fire and/or explosion from combustible dust. The following section provides resources will assist in solving those issues.

http://www.dustexplosion.info/



General Information

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Amyotte, P., Kahn, F., and Dastidar, A. “Reduce Dust Explosions the Inherently Safer Way,” Chemical Engineering Progress, vol. 99, no. 10, October 2003, pp. 36-43.

Ebidat, Vahid. “Is Your Dust Collection System an Explosion Hazard?” Chemical Engineering Progress, vol. 99, no. 10, October 2003, pp. 44-49.

Center for Chemical Process Safety (CCPS). “Guidelines for Safe Handling of Powders and Bulk Solids.” CCPS, American Institute for Chemical Process Safety, New York, New York, January 2005.

An online refresher course, OSHA’s Combustible Dust National Compliance Directive, is available through Federal Signal. The course can be accessed at the following web address:

www.fssolutionsgroup.com/Training/OnlineCourses/tabid/115/Default.aspx

Code of Federal Regulations (CFR) [Standards]

U.S. Government Printing Office
732 N. Capitol Street, NW Washington, DC 20401
Telephone: 1-866-512-1800 (toll-free)
OSHA Standards, Interpretations, and Publications
U.S. Department of Labor/OSHA OSHA Publications Office
200 Constitution Ave., NW, N-3101
Washington, DC 20210
Telephone: (202) 693-1888
or by Fax: (202) 693-2498

Related OSHA standards found in 29 CFR:

1910.22 - General Requirements: Housekeeping

1910.94 - Ventilation

1910.107 - Spray Finishing Using Flammable and Combustible Materials

National Fire Protection Association (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Telephone: (800) 344-3555

Related NFPA Standards:

NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities

NFPA 68, Guide for Venting of Deflagrations

NFPA 69, Standard on Explosion Prevention Systems

NFPA 70, National Electrical Code 2014 Edition

NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids

NFPA 120, Standard for Fire Prevention and Control in Metal/Nonmetal Mining and Metal Mineral Processing Facilities

NFPA 432, Code for the Storage of Organic Peroxide Formulations

NFPA 480, Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders

NFPA 481, Standard for the Production, Processing, Handling, and Storage of Titanium

NFPA 482, Standard for the Production, Processing, Handling, and Storage of Zirconium

NFPA 484, Standard for Combustible Metals, Metal Powders, and Metal Dusts

NFPA 485, Standard for the Storage, Handling, Processing, and Use of Lithium Metal

NFPA 495, Explosive Materials Code

NFPA 499, Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation

NFPA 560, Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigat

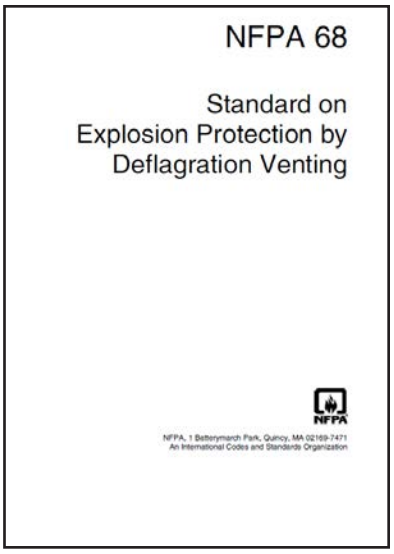
NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids

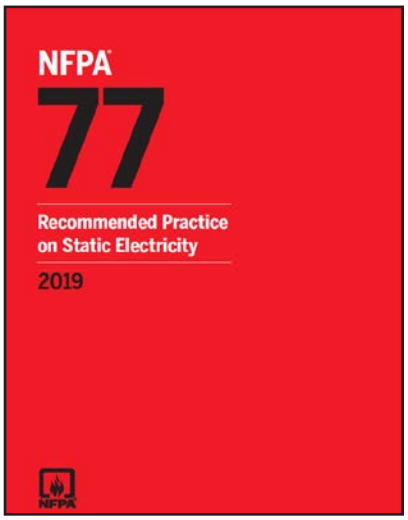
NFPA 655, Standard for Prevention of Sulfur Fires and Explosions

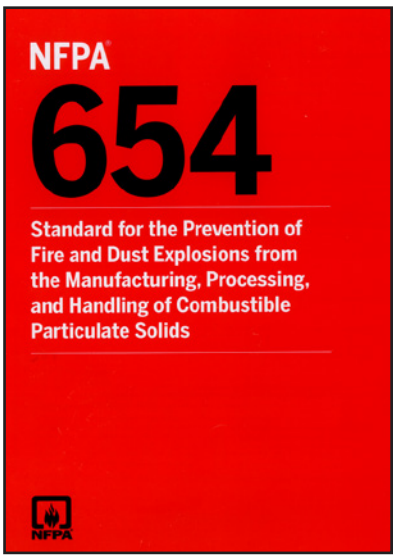
NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

NFPA 1125, Code for the Manufacture of Model Rocket and High Power Rocket Motors







OSHA® FactSheet

Hazard Alert: Combustible Dust Explosions

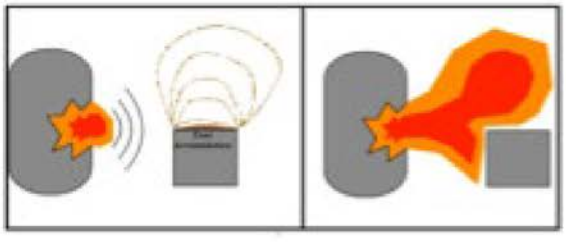
Combustible dusts are fine particles that present an explosion hazard when suspended in air in certain conditions. A dust explosion can be catastrophic and cause employee deaths, injuries, and destruction of entire buildings. In many combustible dust incidents, employers and employees were unaware that a hazard even existed. It is important to determine if your company has this hazard, and if you do, you must take action now to prevent tragic consequences.

How Dust Explosions Occur

In addition to the familiar fire triangle of oxygen, heat, and fuel (the dust), dispersion of dust particles in sufficient quantity and concentration can cause rapid combustion known as a deflagration. If the event is confined by an enclosure such as a building, room, vessel, or process equipment, the resulting pressure rise may cause an explosion. These five factors (oxygen, heat, fuel, dispersion, and confinement) are known as the "Dust Explosion Pentagon". If one element of the pentagon is missing, an explosion cannot occur.

Catastrophic Secondary Explosions

An initial (primary) explosion in processing equipment or in an area where fugitive dust has accumulated may dislodge more accumulated dust into the air, or damage a containment system (such as a duct, vessel, or collector). As a result, if ignited, the additional dust dispersed into the air may cause one or more secondary explosions. These can be far more destructive than a primary explosion due to the increased quantity and concentration of dispersed combustible dust. Many deaths in past incidents, as well as other damage, have been caused by secondary explosions.



A pharmaceutical plant after a dust explosion.

Industries at Risk

Combustible dust explosion hazards exist in a variety of industries, including: agriculture, chemicals, food (e.g., candy, sugar, spice, starch, flour, feed), grain, fertilizer, tobacco, plastics, wood, forest, paper, pulp, rubber, furniture, textiles, pesticides, pharmaceuticals, tire and rubber manufacturing, dyes, coal, metal processing (e.g., aluminum, chromium, iron, magnesium, and zinc), recycling operations, fossil fuel power generation (coal), and additive manufacturing and 3D printing.

Prevention of Dust Explosions

To identify factors that may contribute to a explosion, OSHA recommends a thorough hazard assessment of:

- All materials handled;
- All operations conducted, including by-products;
- All spaces (including hidden ones); and
- All potential ignition sources.

Dust Control Recommendations

- Implement a hazardous dust inspection, testing, housekeeping, and control program;
- Use proper dust collection systems and filters;
- Minimize the escape of dust from process equipment or ventilation systems;
- Use surfaces that minimize dust accumulation and facilitate cleaning;
- Provide access to all hidden areas to permit inspection;
- Inspect for dust residues in open and hidden areas at regular intervals;
- If ignition sources are present, use cleaning methods that do not generate dust clouds;
- Use only vacuum cleaners approved for dust collection; and
- Locate relief valves away from dust deposits.

Ignition Control Recommendations

- Use appropriate electrical equipment and wiring methods;
- Control static electricity, including bonding of equipment to ground;
- Control smoking, open flames, and sparks;
- Control mechanical sparks and friction;
- Use separator devices to remove foreign materials capable of igniting combustibles from process materials;
- Separate heated surfaces from dusts;
- Separate heating systems from dusts;
- Select and use industrial trucks properly;
- Use cartridge-activated tools properly; and
- Use an equipment preventive maintenance program.

Injury and Damage Control Methods

- Separation of the hazard (isolate with distance);
- Segregation of the hazard (isolate with a barrier);
- Deflagration isolation/venting;
- Pressure relief venting for equipment;
- Direct vents away from work areas;
- Specialized fire suppression systems;
- Explosion protection systems;
- Spark/ember detection for suppression activation;
- Develop an emergency action plan; and
- Maintain emergency exit routes.

Applicable OSHA Requirements Include:

- §1910.22 Housekeeping
- §1910.307 Hazardous Locations
- §1910.1200 Hazard Communication
- §1910.269 Electric Power Generation, Transmission and Distribution (coal handling)
- §1910.272 Grain Handling Facilities
- General Duty Clause, Section 5(a)(1) of the *Occupational Safety and Health Act* (Employers must keep workplaces free from recognized hazards likely to cause death or serious physical harm).

Resources

Readily available from www.osha.gov are:

- Combustible Dust National Emphasis Program
- Safety and Health Information Bulletin (SHIB) (07-31-2005) *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fires and Explosions*

See the SHIB or www.osha.gov for other applicable standards.

The primary National Fire Protection Association (NFPA) consensus standards related to this hazard are:

- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 484, Standard for Combustible Metals
- NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
- NFPA 655, Standard for the Prevention of Sulfur Fires and Explosions
- See www.nfpa.org to view NFPA standards.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For assistance, contact us. We can help. It's confidential.

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

U.S. Department of Labor

DSG FS-3791 05/2015

OSHA® FactSheet

CONTROL SILICA DUST
Breathe Easier

OSHA's Respirable Crystalline Silica Standard for Construction

Workers who are exposed to respirable crystalline silica dust are at increased risk of developing serious silica-related diseases. OSHA's standard requires employers to take steps to protect workers from exposure to respirable crystalline silica.

What is Respirable Crystalline Silica?

Crystalline silica is a common mineral that is found in construction materials such as sand, stone, concrete, brick, and mortar. When workers cut, grind, drill, or crush materials that contain crystalline silica, very small dust particles are created. These tiny particles (known as "respirable" particles) can travel deep into workers' lungs and cause silicosis, an incurable and sometimes deadly lung disease. Respirable crystalline silica also causes lung cancer, other potentially debilitating respiratory diseases such as chronic obstructive pulmonary disease, and kidney disease. In most cases, these diseases occur after years of exposure to respirable crystalline silica.

How are Construction Workers Exposed to Respirable Crystalline Silica?

Exposure to respirable crystalline silica can occur during common construction tasks, such as using masonry saws, grinders, drills, jackhammers and handheld powered chipping tools; operating vehicle-mounted drilling rigs; milling; operating crushing machines; using heavy equipment for demolition or certain other tasks; and during abrasive blasting and tunneling operations. About two million construction workers are exposed to respirable crystalline silica in over 600,000 workplaces.

What Does the Standard Require?

The standard (29 CFR 1926.1153) requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers. Employers can either use a control method laid out in Table 1 of the construction standard, or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures in their workplaces to the permissible exposure limit (PEL).

What is Table 1?

Table 1 matches 18 common construction tasks with effective dust control methods, such as using water to keep dust from getting into the air or using a vacuum dust collection system to capture dust. In some operations, respirators may also be needed. Employers who follow Table 1 correctly are not required to measure workers' exposure to silica from those tasks and are not subject to the PEL.

Table 1 Example: Handheld Power Saws

If workers are sawing silica-containing materials, they can use a saw with a built-in system that applies water to the saw blade. The water limits the amount of respirable crystalline silica that gets into the air.

Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica

Equipment/ Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hrs/ shift	> 4 hrs/ shift
Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • When used outdoors. • When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10

Excerpt from Table 1 in 29 CFR 1926.1153

In this example, if a worker uses the saw outdoors for four hours or less per day, no respirator would be needed. If a worker uses the saw for more than four

hours per day or any time indoors, he or she would need to use a respirator with an assigned protection factor (APF) of at least 10, such as a NIOSH-certified filtering facepiece respirator that covers the nose and mouth (sometimes referred to as a dust mask). See the respiratory protection standard (29 CFR 1910.134) for information on APFs.

Alternative Exposure Control Methods

Employers who do not fully implement the control methods on Table 1 must:

- **Determine the amount of silica that workers are exposed to** if it is, or may reasonably be expected to be, at or above the **action level of 25 µg/m³** (micrograms of silica per cubic meter of air), averaged over an 8-hour day;
- Protect workers from respirable crystalline silica exposures above the **PEL of 50 µg/m³**, averaged over an 8-hour day;
- Use **dust controls** and safer work methods to protect workers from silica exposures above the PEL; and
- Provide **respirators** to workers when dust controls and safer work methods cannot limit exposures to the PEL.

What Else Does the Standard Require?

Regardless of which exposure control method is used, all construction employers covered by the standard are required to:

- Establish and implement a **written exposure control plan** that identifies tasks that involve exposure and methods used to protect workers, including procedures to restrict access to work areas where high exposures may occur;
- Designate a **competent person** to implement the written exposure control plan;
- Restrict **housekeeping** practices that expose workers to silica, such as use of compressed air without a ventilation system to capture the dust and dry sweeping, where effective, safe alternatives are available;
- Offer **medical exams**—including chest X-rays and lung function tests—every three years for workers who are required by the standard to wear a respirator for 30 or more days per year;
- **Train workers** on the health effects of silica exposure, workplace tasks that can expose them to silica, and ways to limit exposure; and
- **Keep records** of workers' silica exposure and medical exams.

Applying water to the blade of a handheld power saw reduces the amount of dust created when cutting.

Additional Information

Additional information on OSHA's silica standard can be found at www.osha.gov/silica.

OSHA can provide compliance assistance through a variety of programs, including technical assistance about effective safety and health programs, workplace consultations, and training and education.

OSHA's On-Site Consultation Program offers free, confidential occupational safety and health services to small and medium-sized businesses in all states and several territories across the country, with priority given to high-hazard worksites. On-Site consultation services are separate from enforcement and do not result in penalties or citations. Consultants from state agencies or universities work with employers to identify workplace hazards, provide advice on compliance with OSHA standards, and assist in establishing and improving safety and health management systems. To locate the OSHA On-Site Consultation Program nearest you, call 1-800-321-OSHA or visit www.osha.gov/consultation.

How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

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U.S. Department of Labor

OSHA® Occupational Safety and Health Administration

DSG FS-3681 12/2017

NOTICE

Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

For reliable operation these items should be reviewed daily for proper operation. Perform a walk around to verify all items are properly secured for travel.

Note: A printable checklist is in the Maintenance section.

Under the hood: check all fluids, belts and hoses. Fill fuel tanks.

Check all lights including brake and running.

Check tire pressure and condition.

Check brakes, driving and parking.

Fill diesel exhaust fluid tank if equipped.

Wheel chocks should be available on the unit.

Drain air tank(s) and check air dryer system.

For reliable operation these items should be reviewed daily for proper operation.

- Verify all safety decals are in place and legible
- All safety equipment should be with the unit including a safety tee if required

Note: All drain plugs should be left open to keep residual water from the tanks from migrating to the system during transport. Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow any residual water to drain.

Perform a walk around to verify all items are properly secured for travel.

Note: A printable checklist is in the Maintenance section.

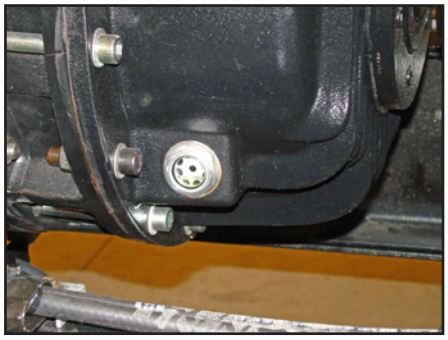
Check all hydraulic and electrical functions for proper operation.

Verify the correct operation of all manual and automatic vacuum relief valves.

Activate the E-Stop to verify it functions correctly and that no error message appear on the display (if equipped).

Verify all drains have been drained and all drain caps are with the unit.

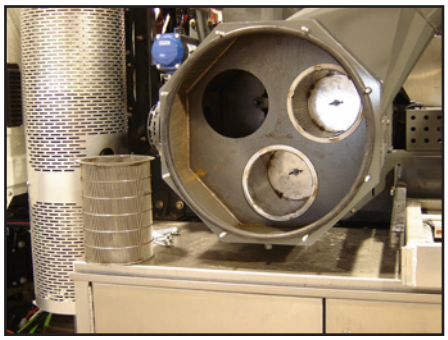
Verify all that all blower, transfer case, pump and gearbox fluid levels are correct.



Check filters if equipped.

Replace any that have excessive build up.

Check all micro-strainers and strainer baskets as equipped.



Verify ground bonding cable.

Changes to the emissions systems may require the operator to perform additional procedures while operating the equipment not required on prior years trucks. The EPA requires a 50% reduction in Nitrogen Oxides (NOx) which are created by the high temperatures and speed of combustion. NOx creates ground level ozone formation and smog.

To comply changes in engines have been made that include:

- Exhaust systems with a Diesel Particulate Filter (DPF) and Diesel Oxidation Catalyst (DOC) unit.
- Larger cooling packages to remove the added heat.
- Require Ultra Low Sulfur Diesel fuel
- Require low ash oils to extend service intervals

A Diesel Particulate Filter (DPF) is a porous ceramic filter to capture the soot particles. It is larger than normal exhaust mufflers and provides maximum ash storage capability between periodic cleanings. The smaller DOC unit is after the DPF to complete the processing of the exhaust.

NOTICE

Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

A process called regeneration oxidizes the soot naturally at high exhaust temperatures to eliminate it. The truck is equipped with a regeneration system that operates automatically under proper conditions or manually when conditions require.

Prolonged operations at low engine rpm may not permit the automatic regeneration cycle. This may require parking the unit for regeneration. Some longer operations like vacuuming fly ash at low rpm are more likely to require parked regeneration. It may be more efficient for an operator to perform a manual regeneration as part of the pre-job preparations to reduce the need for regeneration any time during that day.

Note: The regen process will not function if the check engine light has been activated. The unit must be serviced to allow the regen process to function.

Typical cab instruction decal (IH shown)

EMISSION SYSTEM INSTRUCTIONS

(Solid)	(Flashing)	(Flashing) (Solid)	(Solid)	
LEVEL 1	**LEVEL 2**	**LEVEL 3**	**LEVEL 4**	**Exhaust System Temperature is HOT**
Exhaust filter regeneration required.	Exhaust filter is full.	Exhaust filter is full. Engine performance **LIMITED**.	A serious engine problem has occurred. Exhaust filter may be overfull. Engine may **SHUTDOWN** soon.	**⚠WARNING:** Exhaust components and exhaust gas are at extremely high temperatures. When stationary, keep away from people and flammable materials, vapors, or structures or **STOP ENGINE**.
Drive on highway at highway speeds **OR** start *Parked Regeneration to prevent loss of engine power.	Pull vehicle safely off roadway and start *Parked Regeneration to prevent loss of engine power.	**⚠WARNING:** Pull vehicle safely off roadway and start *Parked Regeneration to prevent engine stopping.	**⚠WARNING:** Pull vehicle safely off roadway, turn on flashers, place warning devices, and **STOP ENGINE**. Seek service immediately.	

*** See Operator's Manual for Further Details**

⚠WARNING:
When performing *Parked Regeneration, make certain vehicle is safely off roadway and exhaust system is away from people, or any flammable materials, vapors, or structures. Parked Regeneration may increase engine speed.

⚠WARNING:
Failure to follow these instructions may result in a loss of engine power, vehicle speed, increased exhaust temperatures, and may cause an accident or fire resulting in property damage, personal injury, or death.

Installed on this truck is a supplemental engine and diesel particulate filter warning system, consisting of a horn and flashing external lights, which is designed to augment, not replace, the standard warning system in the cab.

This system will sound a horn and flash the external mirror lights in conjunction with the engine and diesel particulate filter warning lamps located in the instrument cluster.

No liability or warranty is assumed by or provided on this secondary external warning system, as the primary in cab warning and derate system remains in place. Observance of the warning lamps must be adhered to and acted upon as directed in the chassis owner's manual.

External Alert System

This unit is equipped with an external alert system. Park brake must be applied to enable system. External mirror lights will flash and horn will sound when DPF and /or check engine indicators are illuminated in dash panel.

Consult chassis operator's manual for service details.

Newer chassis are often equipped to accommodate the California Air Resources Board (CARB) requirement to shut down the engine after five minutes of non-use idle time. Operators need to be aware of this feature as it may interfere with operations. Refer to the chassis manufacture manuals for details and to verify if the chassis is equipped. Typically on Vactor units the throttle switch must be set to ON and the unit in work or blower mode to override the five minute shutdown feature.

Note

There are many misconceptions — mainly that turning the engine off and restarting it several times a day will increase wear. "Starting and stopping the engine is actually easier on the engine than prolonged idling," says Brian Lindgren, vocational sales director, Kenworth Truck Co. "It is a good idea to have a good set of batteries and a high-quality starter and alternator to ensure sufficient power to start the engine numerous times if it is not run long enough to recharge the batteries."

Mike Powers, product development manager for Caterpillar Global On-Highway, agrees, noting, "There is no additional wear when shutting the truck on/off several times a day. There are benefits in fuel economy and wear/durability when shutting the truck down rather than idling."

According to Christy Nycz, Cummins Inc., an idling engine in a Class 8 truck will consume roughly 1 gal./hour of fuel at 1,000 rpm and .5 gal./hour at 650 rpm.

"The fuel consumption depends on the application, load factor on the engine, etc.," Powers adds. "It is very difficult to quantify exact savings. But if you decrease your idle time from 50% to 25%, it could improve your fuel economy by up to 4%."

http://articles.directorym.net/Crack_Down_on_Idle_Time-a878668.html

NOTICE

Jump Starting Or Welding Can Damage Electrical System

To avoid damage:

- **Disconnect ECU, control modules and batteries before welding on unit.**
- **Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.**
- **Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.**
- **Set all ignition switches to OFF before testing CANbus system.**

NOTICE

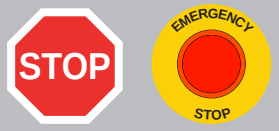
Follow recommended safety practices while performing all work. Refer to the FS Solutions/Guzzler/Vactor/TRUVAC/Westech Safety Manual for additional information.

This manual is available at: www.vactor.com

Shown are common industry standard symbols used on the various controls. Actual symbols used will vary with options.

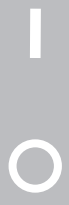
Refer to manual

Refer to Service manual



Emergency Stop

Operator Alert



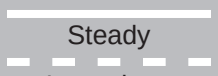
On
Off

Lock
Unlock

Adjustment Range
Max. to Min.

Alarm On / Off

Audible Alert
On / Off

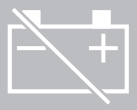


Remote Control

Counter

Timer

Hour meter



Battery power Disconnect

Battery charging and/or volts

Plug Connection or Socket

Scale

Slower / Faster

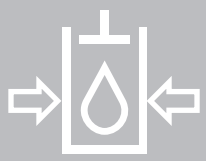
Increase
Decrease

Pressure

Oil

Oil Temperature

Hydraulic Oil



Hydraulic Oil Pressure

Hydraulic Oil Temperature

Temperature Low/Normal Range/High

Switch Home Position

Hot Water

Spray

Water

Water Level Indicator

Shown are common industry standard symbols used on the various controls. Actual symbols used will vary with options.

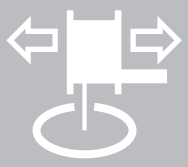
Worklights
Front - Side - Rear

Water Recirculation

Vibrator

Valve
Open
Closed

Heater or Cabinet heater



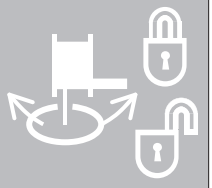
Hose reel IN/OUT

Hose reel Speed

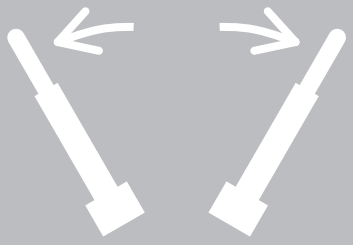
Hose reel PAY IN/PAY OUT

Hose reel IN/OUT

Hose reel pinch roller lock



Hose reel lock (swivel)



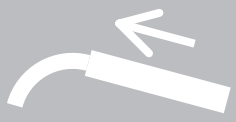
Boom rotate CCW or CW

Strobe/Beacon/ Revolving Light

Mirror Strobe

Boom retract

Boom DigFast (Clump Buster)



Boom extend

Debris Body Up/DOWN

High Rail UP/DOWN

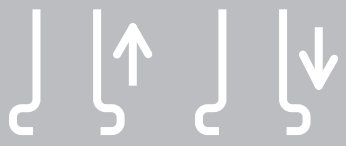
Boom down

Rear Door OPEN/CLOSE

ENGAGE/DISENGAGE

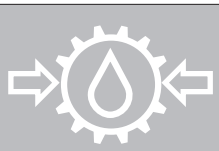
Boom up

Vacuum ENABLE / DISABLE



Suction pick up head UP/DOWN

Shown are common industry standard symbols used on the various controls. Actual symbols used will vary with options.



Transmission or Transfer Case Oil Pressure

Transmission or Transfer Case Oil

Transmission or Transfer Case

Clutch

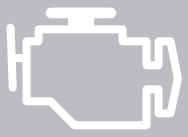
Engine Run

Engine Start

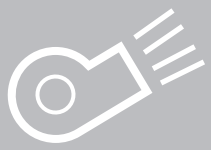
Engine Stop

Engine RPM

Power Take Off (PTO)



Engine



Fan

Park Brake

Road Mode

Blower or Compressor RPM

Blower or Compressor

Rotary Compressor, Liquid Ring or Vacuum Pump

Water Pump

Liquid Pump

Centrifugal Pump

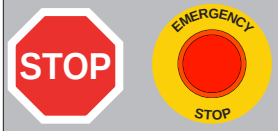
Engine REGEN

Reset

Recirculator

Automatic Cycle

Water Reclaimer



Emergency Stop

E-Stop - normally disables vacuum and water pressure. Refer to the controls section for each model for the additional functions controlled by the E-Stop.

Activate the E-Stop daily to verify it functions correctly and that no error message appear on the display (if equipped).

Red indicator light - activated when a condition requires immediate attention or the function has been activated.

Hydraulic Oil Temperature

Red indicator light - normally activated when condition requires immediate attention.

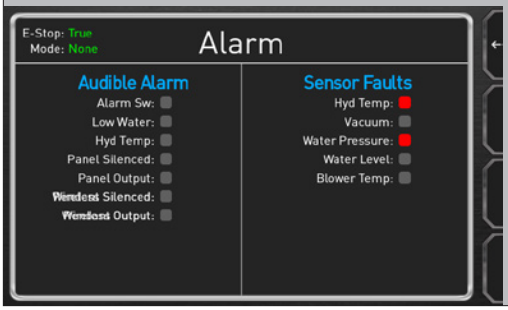
Oil Temperature

Red indicator light - normally activated when condition requires immediate attention.

Vacuum ENABLE / DISABLE

Red indicator light - normally activated when vacuum relief valve is set for vacuuming. The vacuum relief valve works differently on PD and fan machines. Refer to the control pages for details.

Note - on many older units (pre-2011) this indicator was used for the vacuum relief valve open/closed position. Refer to the unit's manual for details.



Displays use a variety of colors and message boxes to indicate function status and alerts. Refer to the display information in the unit manual for the specific use when equipped.

Note - Other colors of lights may be used on water level indicators and vendor supplied components like lighting, cameras, scales, etc.

Options

The sludge pump provides the option of emptying the body by a valve and hose for liquid or semi-liquid material only. Additionally, the pump can be removed from the unit and used to pump material from one location to another by submerging it in the material.

The material is pumped through a 6” valve located on the rear door. The pump is hydraulically operated by a control located below the master control panel.

Note: The sludge pump can be used during vacuum operations. The sludge pump can be turned on when the indicator level on the back of the truck starts moving. Use of the sludge pump must stop to avoid pumping solid material when the level drops, as shown by the level indicator.

The following procedures should be used to operate the pump:

1. Engage the PTO for the hydraulics.
2. Remove the cap covering the end of the sludge pump pipe. Attach a hose if needed.

Note: Tubing can be hooked up to the end of the pipe to direct the flow of material, or it can be pumped directly out of the end of the pump.

3. Open the knife gate valve to allow material to be pumped from the debris body. The switch for the valve is normally located on the driver side of the pump.
4. Activate the pump.
5. When finished pumping, close the knife gate valve.

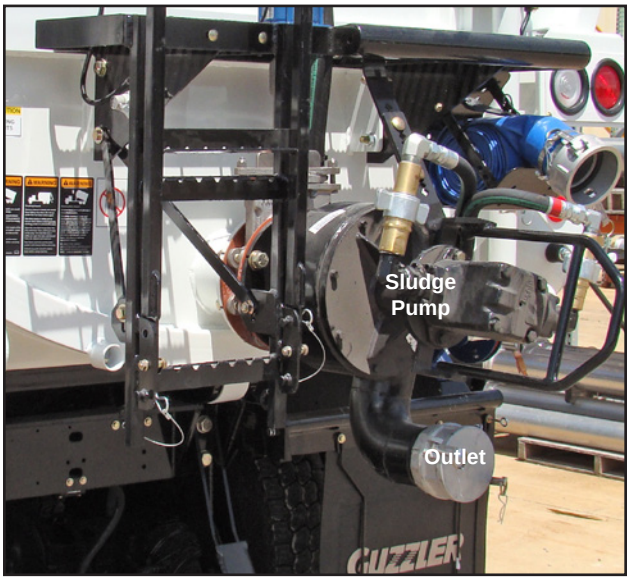
Removal of Pump

The pump can be removed from the unit. Close the knife gate valve before removing. Remove the nuts holding the pump in place on the body and disconnect the two hydraulic lines from the pump. The pump can be lifted off and set aside. Attach the hydraulic lines to the fittings on the rear door for storage.

NOTICE

Pump may be damaged.

Never use the sludge pump for unloading solids.

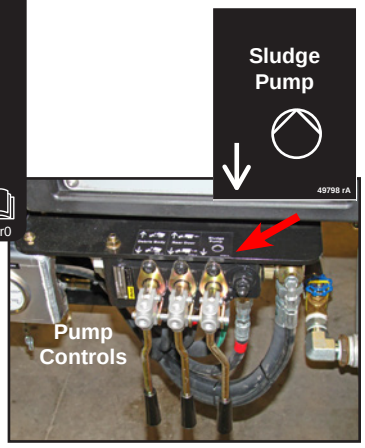


NOTICE

Hydraulic System can be damaged.

Loose hydraulic couplings prevent oil flow. Hydraulic quick couplings must be fully tightened to avoid hydraulic system damage.

Refer to manual for details. 507018 r0



WARNING

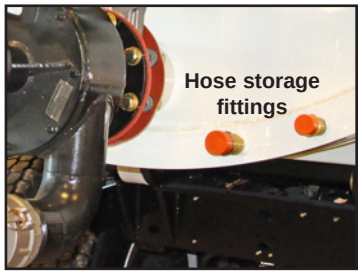
Crushing Hazard

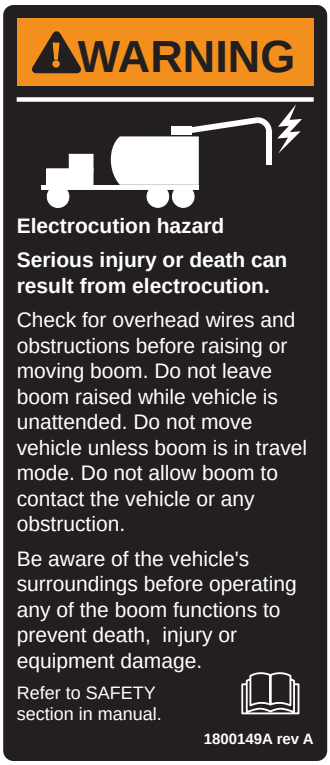
Unit can tip over when the body is raised while loaded. During decanting or offloading liquids only raise the body no more than three feet, enough to allow the liquid out and not plug the ports.

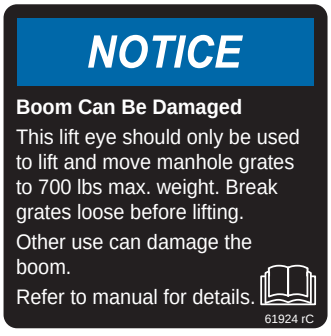
NEVER attempt to raise body when vehicle is on unlevel ground or in motion.

After decanting or offloading liquids, rear door MUST BE opened before the front of the body is 3 feet above the chassis frame.

Operator must remain at controls during all operations.







DANGER

Boom Can Injure or Kill

Always park the boom in travel mode before raising the debris body.

Misuse of boom, including contact with wires or other objects can cause serious injury or death.

Always be aware of the boom position in relation to over head wires, any obstruction (including the unit body) that may prevent proper movement of the boom.

SAFETY INSTRUCTIONS

Unit operator must hold the pendant/remote during vacuum operations and stay within line of sight of the hose end operation. In an emergency, use the E-stop or pendant/remote to disable the vacuum. Maintain clear access to all E-stops and place an operator near one.

NOTICE

Machine can be damaged

The boom operator must maintain a clear view of the boom during all movements to avoid striking the parts of the unit and surrounding structures.

NOTICE

Machine Can Be Damaged

If ice builds up in the boom, shut down the vacuum system. Use hot water to heat the boom tubes or move the vehicle to a warm place. Slowly retract the boom when the tubes have warmed up. Do not retract the boom with ice build up in the vacuum tube. Damage to the boom and/or seal can occur. If hot water is available, start the vacuum system and spray hot water into the vacuum tube/nozzle. As the ice breaks away it will be carried to the debris body.

Boom - Overview

Options

The boom provides the operator with greater ease and efficiency of operation. The boom allows the unit to adapt to nearly all types of cleaning circumstances that may arise. The optional boom is located on top of the debris body. It is connected to the debris body at a pivot point near the top rear center of the tank.

The boom rotates horizontally and up or down with hydraulic cylinders. Additionally, it can be hydraulically extended or retracted if equipped. Rotation of the boom is achieved by means of a hydraulic gearmotor. The gearmotor meshes with a gear on the bottom of the boom turret. Hydraulic oil flow to the motor is controlled by an electric over hydraulic solenoid operated by a switch on the remote control pendant.

The boom is operated by switches located on the pendant control or wireless remote if equipped.

The boom can rotate around the unit, but can not pass completely over the unit. Built in stops prevent it from going completely over the unit. Depending on configuration and options it can normally swing horizontally about a total of 270 degrees, as well as move vertically up or down.

The boom can easily be rotated around and lowered for easy access to attached vacuum hose or tubes.

NOTICE

Boom Can Be Damaged

The lift eye should only be used to lift and move manhole grates to 700 lbs max. weight. Grate must be loose and free prior to lifting with boom. The rest of the boom is only rated for vacuum hoses, tubes and debris during normal operation.

- **Rope or other supports should be provided to support the run. Hose and tube assemblies are not intended to support their weight on vertical drops or runs up.**
- **Long hose/tube runs should be supported at multiple locations to prevent tip overs and connection failures.**
- **Hose and tubes can pull connections and hoses apart In operation from the added weight of the material being vacuumed.**
- **Inspect all connections prior to operation and periodically during operation.**

Boom - Types

Options

There are three types of booms available. The standard optional boom can rotate all the way around to the other side of the unit from the parked travel position and can be raised or lowered. The extendable version can also be extended and retracted. When being extended or retracted the end hose slides along the trough at the end of the boom. This results in the hose end being raised as the boom extends or lowered as the boom retracts.

The optional telescopic boom is similar to the extendable boom except that the boom hose or tube moves with the end of the boom as it extend or retracts. This gives more precise control of the boom hose at the working end.

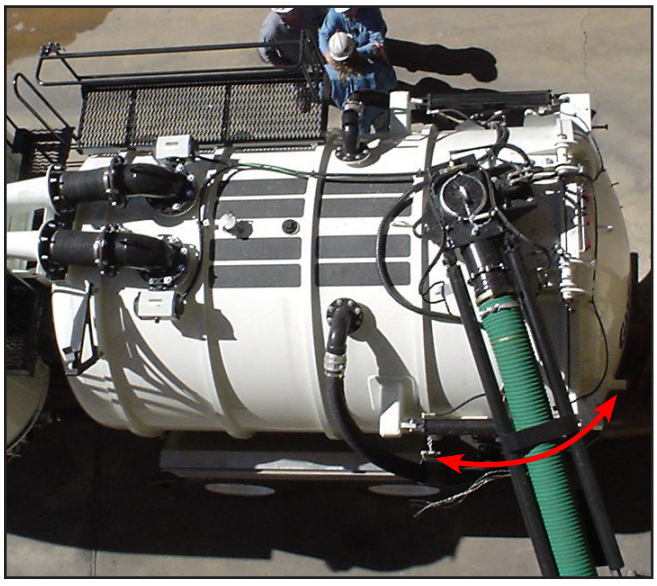
All of the controls and operation are similar across the model line.

All versions of the booms normally require the use of additional hose or pipe to reach the material being vacuumed. These are readily attached by rotating the boom out to the side or rear of the unit and lowering the end to a convenient height. All additional hose or pipe must be removed to store the boom in transport mode.

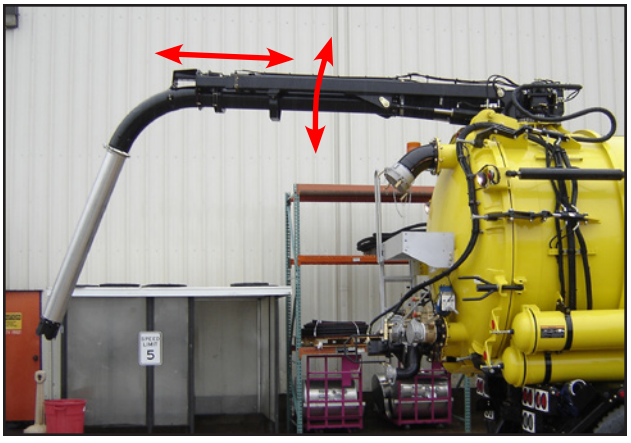
Standard boom

Extendable boom

All boom versions rotate



Telescoping boom



Preparing the boom for operation.

The boom is entirely controlled by the remote pendant. The pendant is a remote control box used by the operator to direct the operation of the boom. It is connected to the master control panel with a cable. The top two buttons on the pendant are dedicated to the automatic relief valve operation. The remaining four buttons on the bottom are used for the boom. The function of the buttons are:

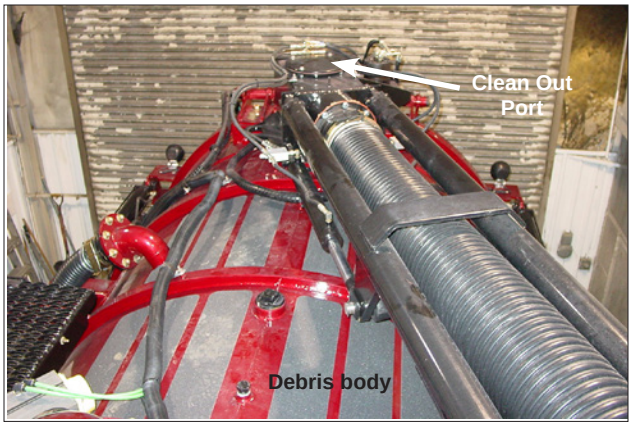
1. Up - the boom will raise
2. Down - the boom will lower
3. Left - the boom will rotate counterclockwise
4. Right - the boom will rotate clockwise

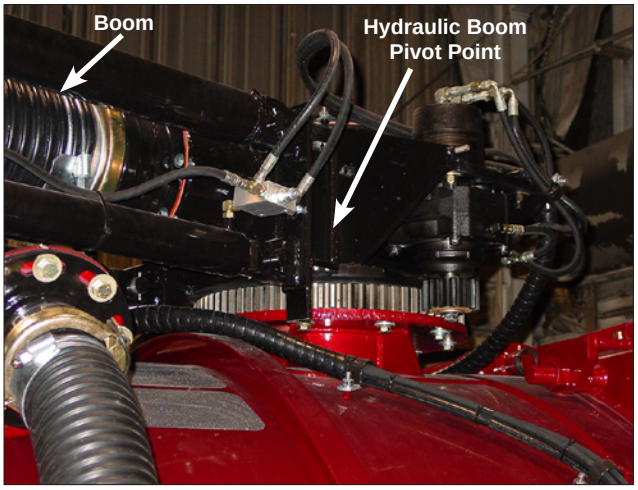
In addition if the boom is extendable or telescoping there will be two additional buttons.

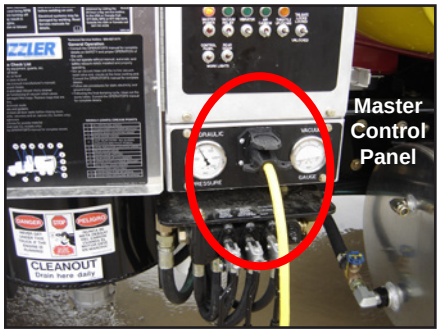
OUT - the boom extends out

IN - the boom will retract

The buttons are momentary switches and upon releasing the button, the boom will cease moving.

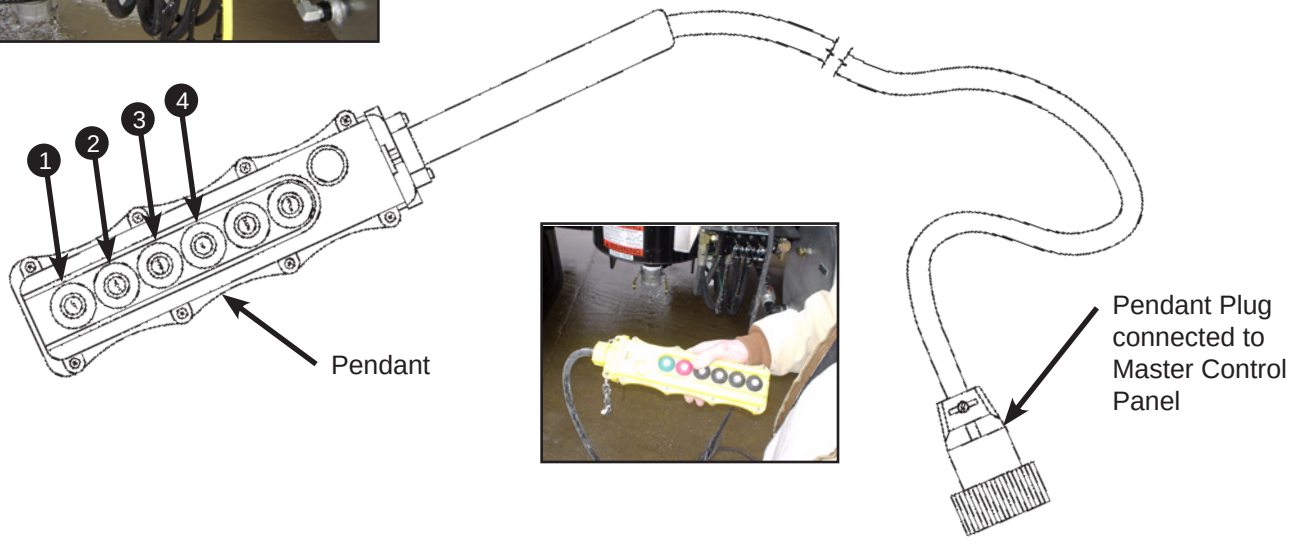






Operating the Boom.

To take the boom out of its stored position, the boom must be raised slightly to clear the boom saddle that it rests upon. Once clear of the saddle, it can be raised, lowered or rotated horizontally.



To store the boom, it must be lowered and allowed to seat in the boom saddle. Lower the boom, until it firmly rests in the saddle. The open end of the boom remains hanging down next to the front of the debris body. Depending on the unit the hose end may be secured to the tank by a chain and hook latch mounted to the debris body front or the end of the hose will placed over a hose keeper.

All additional hose or pipe must be removed to store the boom in transport mode. These are readily removed by rotating the boom out to the side or rear of the unit and lowering the end to a convenient height.

DANGER

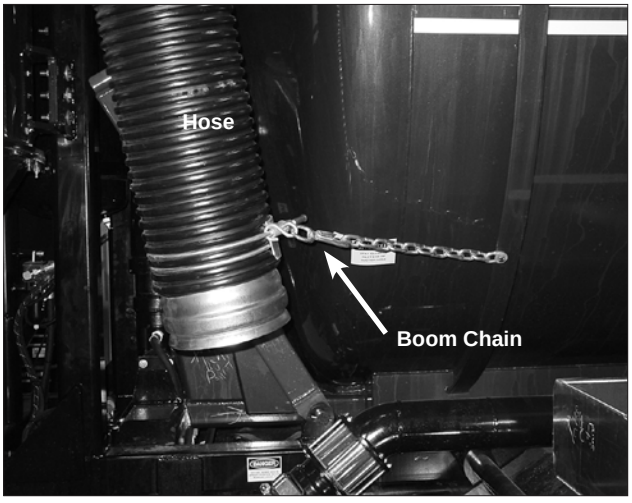
Boom Can Injure or Kill

Always park the boom in travel mode before raising the debris body.

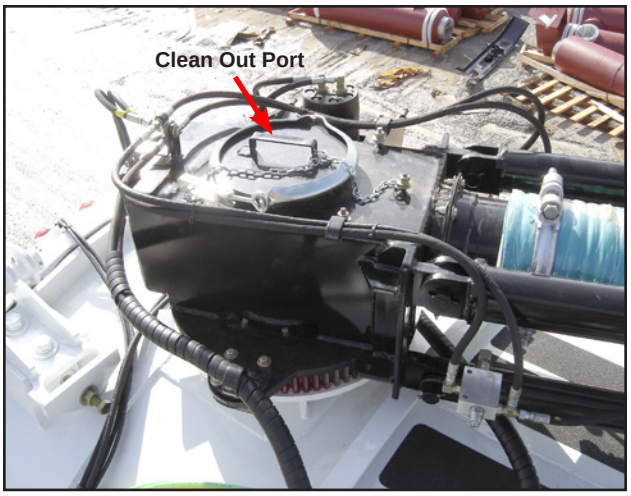
Misuse of boom, including contact with wires or other objects can cause serious injury or death.

Always be aware of the boom position in relation to over head wires, any obstruction (including the unit body) that may prevent proper movement of the boom.

The end of the hose should be capped for travel to prevent debris from sloshing out while moving. Units equipped with a hose keeper do not require this.



The point the boom pivots upon and is connected to the debris body can be inspected and cleaned if necessary through the 8” clean out port. Unclamp the 8 inch band lock clamp by flipping the toggle latch. The plate covering the port can be lifted off and safely set aside.



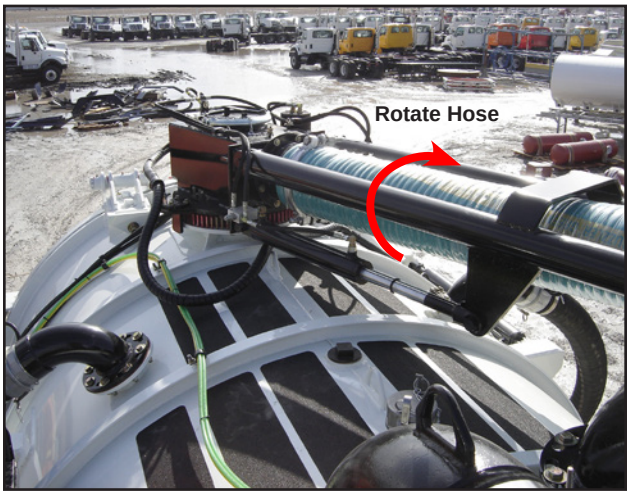
Additionally, the clean out port can serve as a secondary view port to check the level in the debris body.

Hose

The flexible hose connected to the boom should be rotated end to end as well as turned on its axis 180 degrees. This should occur on a regular basis and at least no later than 100 hours of operation. This will assure longer life of the hose so that material being vacuumed will not unduly wear on any one side of the vacuum hose.

Lubrication

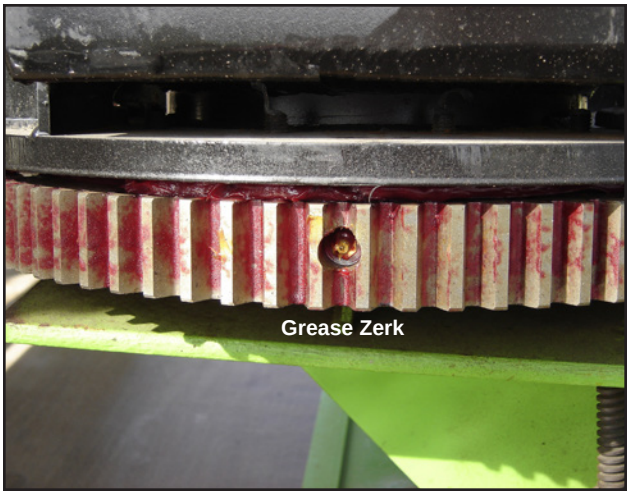
Lubricate the boom bearing weekly, check for leaky hoses, loose connections, loose or broken wiring, and hardened vacuum hoses.



This boom is equipped with a special heavy-duty swivel bearing and gear drive. The bearing has a grease zerk on the gear face. This bearing must be lubricated weekly, or every 25 operating hours. The boom must be rotated in 45° increments when greasing. Coat the gear teeth with grease. Refer to the main maintenance section for grease specifications.

Note: Failure to rotate the boom when greasing can cause premature failure of the bearing. Any one of the grease fittings can be used. It is not necessary to grease all three fittings.

Grease all boom pivot points. If equipped with the extendable or telescoping boom fully extend the boom and wash it down including the tube seals. Then grease the extension.



Cleaning - Telescopic Boom

A buildup of dirt in the hose will cause leaky boom seals. Run clean water through the boom at least on a weekly basis, preferably after each job is finished.

Rinse off the outside of the boom when extending or retracting to keep the seal moist and clean. If the seal is squeaking when extending or retracting, do not grease it. The seal is dry and/or dirty. Maintain a clean boom, inside and out, to alleviate problems.

Hose

The flexible hose connected to the boom should be rotated end to end as well as turned on its axis 180 degrees. This should occur on a regular basis and at least no later than 100 hours of operation. This will assure longer life of the hose so that material being vacuumed will not unduly wear on any one side of the vacuum hose.

Lubrication

Lubricate the boom bearing weekly, check for leaky hoses, loose connections, loose or broken wiring, and hardened vacuum hoses.

This unit is equipped with a special heavy-duty swivel bearing and a worm gear drive. The bearing has three grease zerks. Two are on the inside and one is on the external gear.

Note: Starting in early 2016 boom bearings were updated for remote greasing through a zerk located on the passenger side of the debris body just above the dump tube.

This bearing must be lubricated weekly, or every 25 operating hours. The boom must be rotated in 45 degree increments when greasing. Coat the gear teeth with grease.

Note: Failure to rotate the boom when greasing can cause premature failure of the bearing. Any one of the grease fittings can be used. It is not necessary to grease all three fittings.

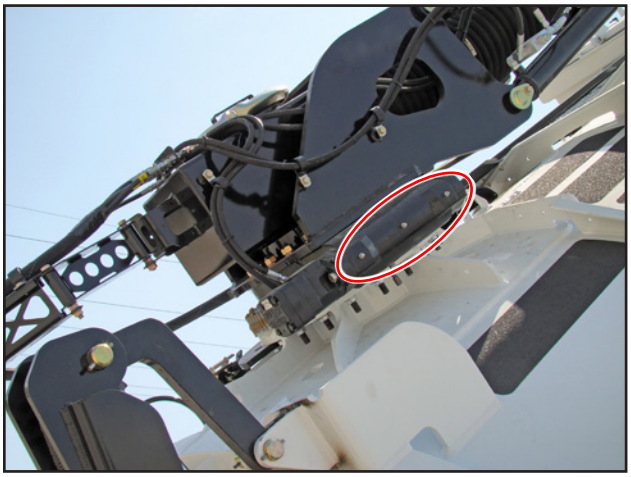
Grease all boom pivot points. Fully extend the boom and wash it down including the tube seals. Then grease the extension.

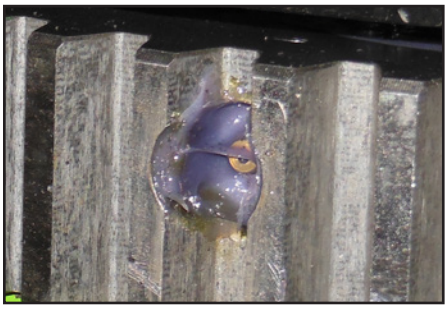
Note: If the seal is squeaking when extending or retracting, do not grease it. The seal is dry and/or dirty. Maintain a clean boom, inside and out, to alleviate problems.

Cleaning

A buildup of dirt in the hose will cause leaky boom seals and the majority of boom malfunctions. Run clean water through the boom at least on a weekly basis, preferably after each job is finished.

Rinse off the outside of the boom when extending or retracting to keep the seal moist and clean.



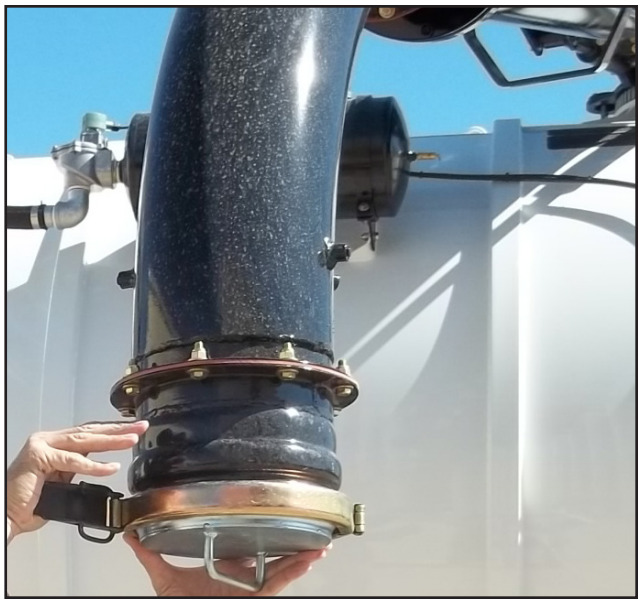


One grease zerk is located in the gear face.

The vacuum tube is maneuvered and controlled using the pendant control. Plug in the pendant control. The vacuum must be off when attaching or removing vacuum tubes.

1. Remove the boom from its stored position and swing boom from its stowed position into a lowered position so the connections can be made at ground level working heights.
2. The first vacuum tube if short enough can be stood on the ground and the boom end lowered to them.
3. Install the quick clamp to fasten the nozzle to the vacuum tube.

To remove the vacuum tube lower the end of the tube to the ground to relieve tension in the joint.



After every job and before changing modes, the following components on the unit should be thoroughly cleaned with the on-board washdown system or any available water source:

- Debris Body – clean the inside of the body, the deflector plate, the rear door, and the rear door seal. Wipe down gasket and mating surfaces. Inspect the vacuum float balls for cleanliness and free travel.

Note: Failure to clean rear door seal may result in waste leakage from debris body.

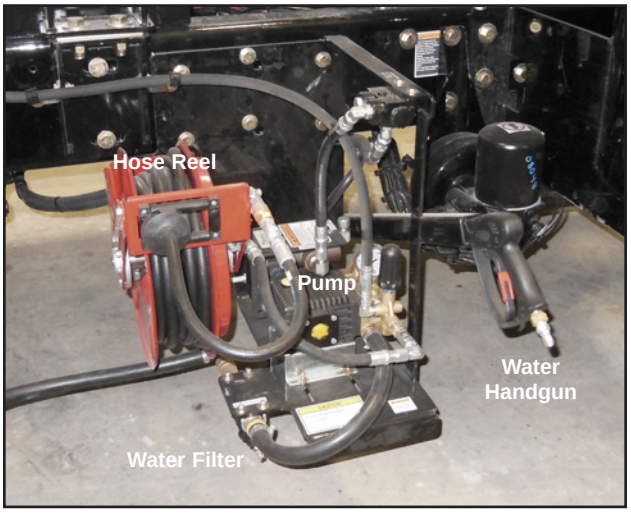
- Cyclone chamber – clean the chamber, the top access area, and the collection hopper underneath the cyclone.
- Baghouse – clean the collection hopper under the bags.
- Microstrainer – clean the drop-out basket and the microstrainer housing. Drain any material build-up out of the housing by opening the drain plug located underneath the microstrainer housing.

Note: When cleaning, avoid spraying water on the filter bags directly. Soaking the bags will reduce their efficiency during operation. The hand gun and hose reel are used for washdown operations. The hose reel and handgun are mounted to the side of the truck chassis on the driver side . Water is stored in the water reservoir tank and is pumped out of the water tank through the water hose to the handgun. Normally, water is released at about 600 psi. A gauge on top of the water pump monitors the water pressure.

Hand Gun

The hand gun has a pistol grip with a pressure lever or trigger.

1. Unwind the water hose by pulling on it to a sufficient length to allow for easy attachment of the hand gun.
2. The hand gun is attached to the hose by a quick coupler.
3. Water is released by a trigger mechanism. Pull back on the trigger to release a stream of water while holding the handgun safely and securely. Release the trigger to stop the water.



⚠ WARNING

Handguns Use High Pressure Water

High pressure water can cause serious injury or death.

- **Wear appropriate safety equipment including: Waterproof apparel, protective boots, insulated gloves, safety glasses or goggles, hearing protection (ear plugs and/or ear muffs) and a hard hat with a face shield.**
- **Never point the handgun at or near a person or animal.**
- **Bleed pressure from handgun by shutting off water pump pressure and pressing the trigger before disconnecting from high pressure connection.**
- **Use handgun and connection supplied with the unit; never use common low pressure handguns or connectors with the high pressure system.**

The washdown system is hydraulically operated. The truck engine must be running and the hydraulics engaged prior to operating the water system.

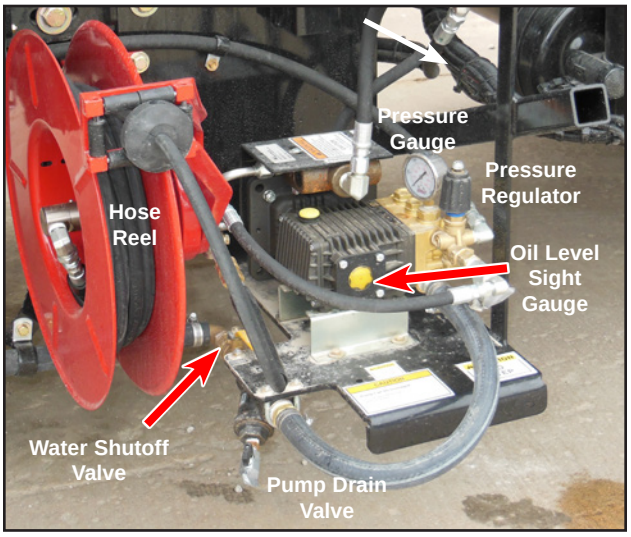
1. Set the water valve to on. The water valve is located near the pump.
2. Activate the pump by pushing the Wash Down Pump Valve inward.
3. Remove the handgun from the scabbard and begin washing.

Continue to monitor the pressure gauge to ensure the pressure does not exceed 700 psi. If it exceeds this level, use the pressure regulator to lower the pressure. Turn the regulator counter clockwise to lower the pressure.

Note: Before operations, always check the oil level on the washdown water pump. Oil level is checked through the sight glass. It should be one-half full. If oil is too low, add the proper oil through the oil filler port on top of the pump.

Shutting Down and Storing

1. Set the water valve to off.
2. Pull out on Wash Down Pump Valve
2. Remove the hand gun from the hose by releasing the quick coupler.
3. Retract the water hose onto the hose reel. To retract the hose, pull slightly out until you hear no clicks. At that moment, gradually release the hose to allow it to retract. Do not completely release the hose but continue to apply gradual and steady pressure to guide it onto the reel.
4. Drain the water pump by opening the drain valve near the bottom of the pump.



NOTICE

Water System Can Be Damaged By Freezing

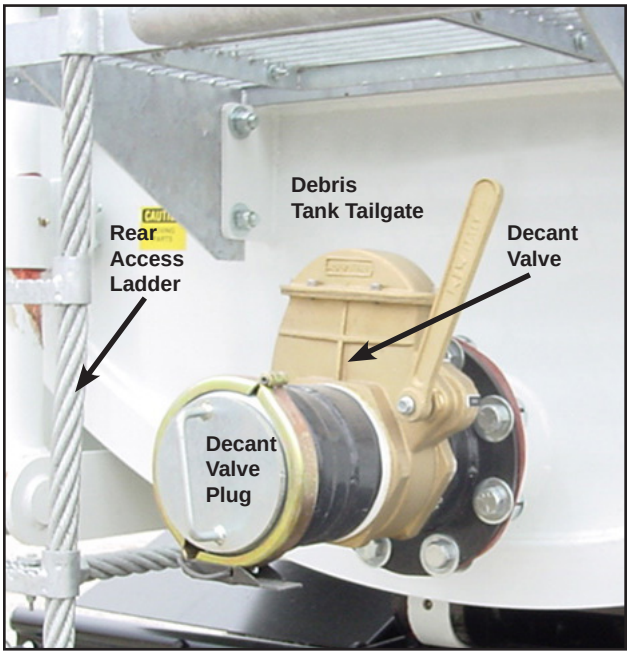
Ice in the water system can severely damage components. To avoid ice damage:

- **Verify that water flows when valves or plugs are opened. Insure that ice has not plugged drain lines, valves or drain plugs.**
- **Leave all drain plugs open to keep residual tank water from the tanks from migrating to the system during transport.**
- **Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow residual water to drain.**
- **If the unit cannot be properly drained, move the unit to a warm area and allow the water system to warm completely to drain.**
- **Never operate water pump(s) if system is frozen.**

The decant valve is a valve that allows for the draining of liquids from the debris tank. It is closed during vacuuming operations. The band clamp is loosened and the plug pulled out when liquids need to be drained from the debris tank. The decant valve is then opened by using the lever on the valve.

A hose can be attached to the end of the decant valve to direct the liquid material into another vessel or other location. This must be done prior to opening the valve.

Note: The decant valve can not be used during vacuuming operations.



Dirty Bag Detector

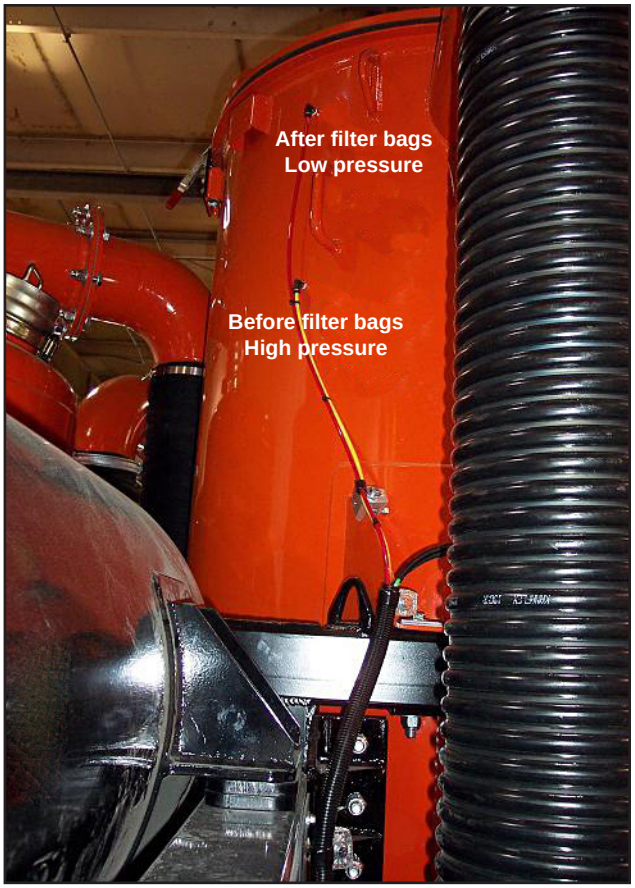
The cleanliness of the filters is monitored by a magnehelic gauge normally mounted on the driver side above the fender. The gauge has two lines (red line and yellow line) attached to the baghouse and in the path of the clean air flow. The yellow line measures the air pressure on the dirty side of the filter while the red line measures the air pressure on the other side of the filter or clean air side. These lines allow the gauge to measure the restriction of air flow through the filters. As the filters get dirty, the air becomes restricted and the pressure increases on the dirty side of the filter. An increase in pressure indicates the filter bags are becoming dirty.

The bags should be changed when the gauge measures 80 to 85.

Broken Bag Detector

The broken bag detector determines whether any filter bags in the baghouse are damaged or broken. A light on the master control panel will illuminate if the sensor detects a damaged bag. A bag is determined to be broken or damaged if it fails to filter out dust particles.

A damaged or broken bag will allow dust particles to pass through the filter into the clean air. The sensor in the clean air area of the bag house will detect the additional high level of dust due to the broken bag's failure to filter out the dust. At that moment, the light will illuminate on the master control panel. When the light illuminates, vacuum operations must cease and the bags inside the bag house must be inspected and replaced.



Unit may also be equipped with optional broken bag alarm and indicator light(s).

To operate the wireless set the control panel switch to wireless. Actual functions and controls will vary with model and options. All controls function the same as on the control panels.

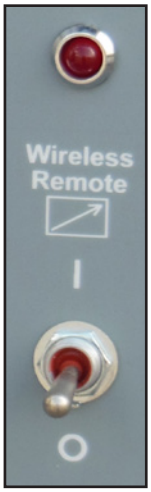
A manufacturer's manual is provided with the unit. Refer to it for specific details on batteries.

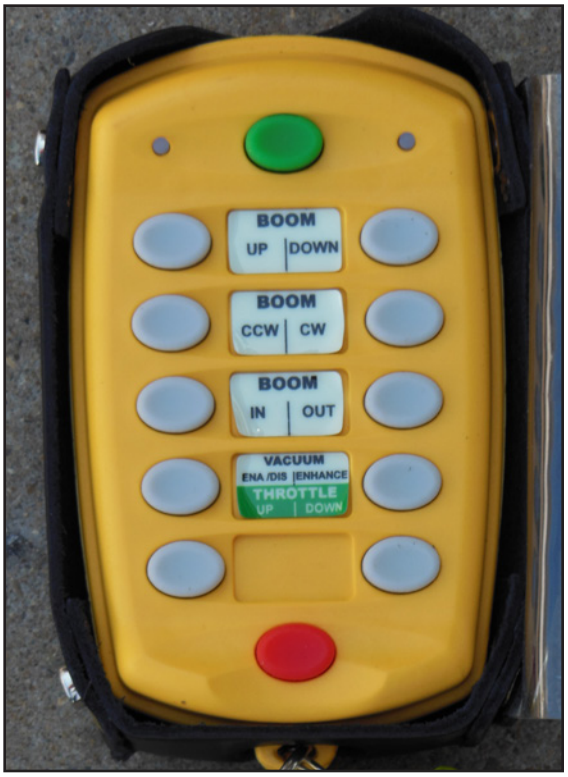
The wireless controls the boom operation, up/down, left/right, extend and retract. It controls the vacuum enable/disable. It can activate the water pump on/off and operate the multi-flow. It also can control the engine throttle rpm. The maximum distance the radio control can effectively operate from the truck depends a lot on the operating environment. Buildings, terrain, other pieces of large equipment between the operator and the truck, will affect operating distance. The optimum distance would be about 500 feet under ideal conditions.

The receiver is normally located inside the master control panel.

SAFETY INSTRUCTIONS

Unit operator must hold the pendant/remote during vacuum operations and stay within line of sight of the hose end operation. In an emergency, use the E-stop or pendant/remote to disable the vacuum. Maintain clear access to all E-stops and place an operator near one.





Wireless Operation

Wireless ON

1. Set engine to idle

2A. Belly pack:

a. Engage the emergency stop on the remote

b. Press and release the Power switch on the remote

c. Disengage the emergency stop on the remote

2B. Handheld remote:

a. Press and release the Power switch on the remote

3. Set to wireless remote at control panel

4. Wireless will now be engaged and duplicate controls will be disabled

Wireless OFF

1. Set engine to idle

2. Remote control switch to OFF/Pendant

3. Engage emergency stop on the remote

Refer to manual for details. 49824 rev B

Estop on remote is both a hard wired and software E-stop. E-stop will engage both with the push button and automatically in some cases:

- Loss of communication between transmitter and receiver
- Dead Batteries in transmitter
- Loss of power to Receiver

E-stop has the same effect as any other E-stop on the vehicle. Wireless E-stop is bypassed when the remote control switch (secondary controls) is in the OFF position so that the transmitter can be turned off when not in use without creating a system E-stop.

The function of lower red button on the remote varies with the unit's configuration. On some units it will also be an E-stop. If set up as an E-stop the remote must be relinked to clear the E-stop function.

SAFETY INSTRUCTIONS

Unit operator must hold the pendant/remote during vacuum operations and stay within line of sight of the hose end operation. In an emergency, use the E-stop or pendant/remote to disable the vacuum. Maintain clear access to all E-stops and place an operator near one.


GUZZLER


GUZZLER

Cab controls

Blower indicator light - on when blower is engaged.

Blower mode/Road mode switch - sets mode

Trans brake switch - momentarily stops the transmission to allow the truck chassis driveline to engage from blower mode.

Creep drive IN/OUT indicator lights - on indicates creep drive engaged status.

Creep jog switch - momentarily rotates creep drive to align mechanism for shifting modes.

To engage the blower / creep drive

The blower must be engaged before the creep drive. The blower must be engaged to use the creep drive.

1. Start with 120psi air pressure in the system and parking brake engaged. If parking brake is released power will be lost to all system functions.
2. Start engine, set to idle and select NEUTRAL.
3. Select BLOWER mode. Always engage blower before the creep drive. The blower indicator light will turn on.
4. Select creep drive IN if required.
5. Shift transmission to DRIVE
6. If the creep drive indicator light does not show IN, momentarily activate the creep jog switch FORWARD. Repeat if needed.
7. The blower / creep drive is now engaged.

Notes

The creep drive JOG switch is only required if the creep drive IN indicator does not turn on.

Road mode

The creep drive must be disengaged before the blower to go to road mode.

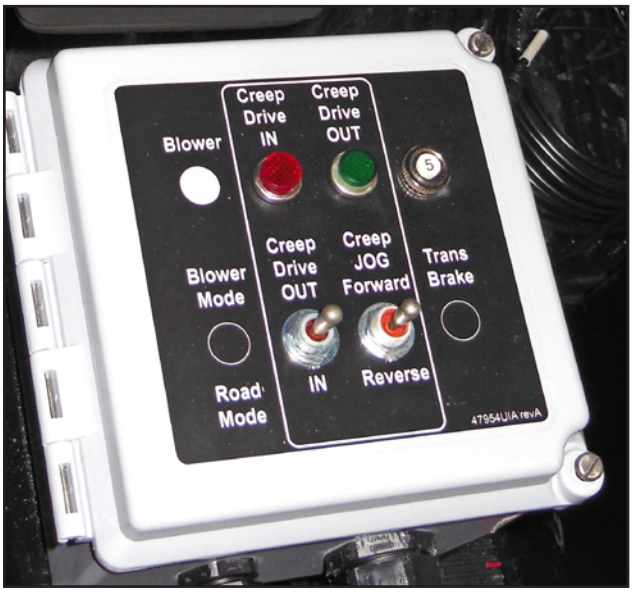
1. Set engine to idle
2. Wait until unit is fully stopped.
3. Select creep drive OUT if engaged.

   If the creep drive indicator light does not show OUT, momentarily activate the creep jog switch FORWARD. Repeat if needed.
4. Shift transmission to NEUTRAL and wait 20 seconds for blower to stop turning.
5. Select ROAD mode. The blower indicator light should be off.

NOTICE

Creep drive can be damaged

Never drive chassis in road mode with creep drive engaged.



In cab controls

If the blower indicator light does not go out, momentarily press the trans brake switch to allow the chassis driveline to engage.

Notes

The creep drive JOG switch is only required if the creep drive OUT indicator does not turn on.

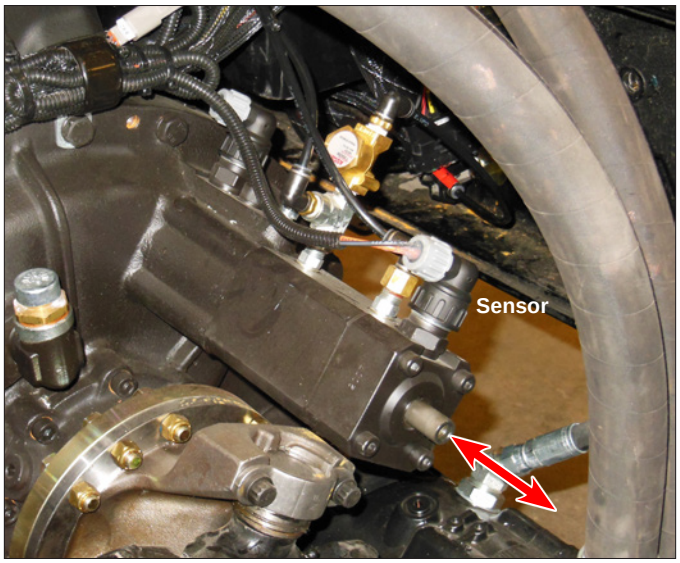
The trans brake switch is only used when engaging the chassis driveline for road mode.

The creep drive is engaged and disengaged with a pneumatic cylinder located at the upper rear of the transfer case. The creep drive actuation can be verified by looking at the position of the pneumatic cylinder rod end.

CAUTION

Creep drive can be damaged

Do not drive chassis in road mode with creep drive engaged.

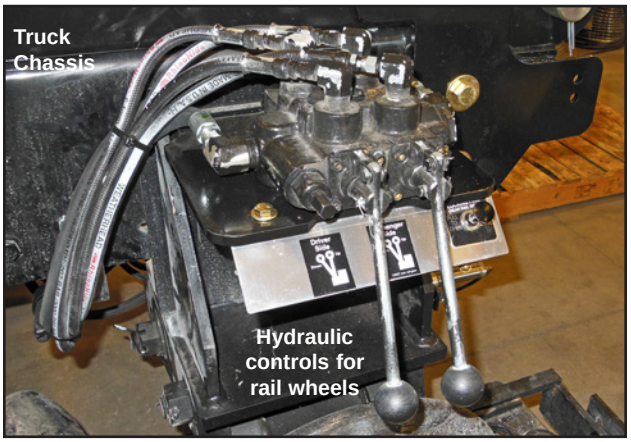


The high rail system allows the unit to travel on railroad tracks to access remote locations along railroad lines. Normally, the high rail option is used in conjunction with the boom option. The railroad wheel carriages (front and rear) are retracted up under the chassis until they are needed and then hydraulically lowered when the unit is placed on the railroad tracks.

The unit is first located and aligned with the tracks at any level railroad crossing. The rear carriage is hydraulically lowered first. The front wheels of the truck can be used to further position the truck and more accurately align it with the tracks. The front carriage wheels can then be hydraulically lowered. The hydraulic levers for lowering or raising the wheels are normally located at the axles themselves on the driver side.

The carriage wheels guide the unit along the track while the road wheels on the truck move it along the track. The road wheels, being larger than the railroad carriage wheels remain in contact with the railroad tracks which supply the forward and backward motion of the unit.

The actual operation of the unit occurs from a chair mounted on the back of the unit. The chair swivels from side to side and a control box is mounted on each side of the chair. The control box mounted on the left side controls the movement of the truck along the tracks while the right side controls are for the boom.

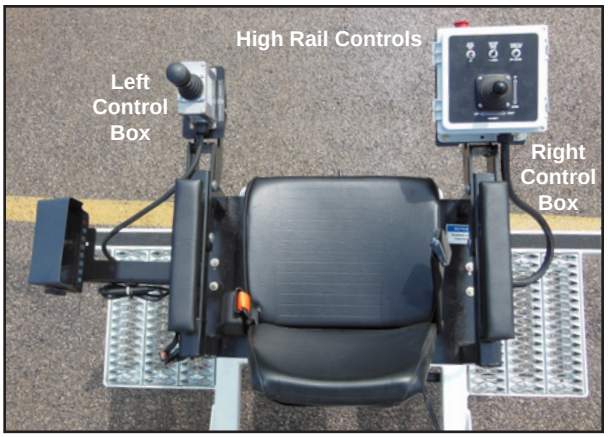


Right Control Box

The joy stick on the right control box controls the boom movement with a joystick. The chassis park brake can be activated along with vacuum relief. Controls may very with options. The E-Stop switch is located on the side of the box.

Left Control Box

The joy stick on the left control box controls the speed of the truck on the tracks. The speed can be varied by how far the stick is pull or pushed.



NOTICE

Seatbelt use required

1800168 rA

Guzzler CL-E

The Micro-Trenching Option enables a Guzzler vacuum truck to enhance a micro-trenching unit's ability to create the least obtrusive utility trenches for installing, repairing, or removing items. The Guzzler's vacuum system removes the debris cut by the micro-trencher as soon as it is created which results in less blade wear and tear, more trench-feet cut, and time saved. The Creep Drive system included with this option enables the Guzzler unit to move in unison with the micro-trencher, allowing the vacuum system to stay enabled without disabling the drivetrain. The in-cab controls include a joystick to control the Creep Drive along with an Emergency Stop (E-Stop) to cease activity in case of an emergency.

Kit Inventory:

- Creep Drive with In-Cab Joystick Controller
- "Body-Out-of-Position" Alarm System that alerts the operator that the unit is in motion with the debris body up
- Grounding Cord to reduce the risk of static electricity buildup
- 4-Way Camera System via the 10.1-inch In-Cab Display that shows the work site and displays: Blower Tachometer, Blower Temperature (*F), Vacuum Gauge
- Acrylic coated filter bags to reduce debris buildup
- 6-Inch Abrasion Resistant Hose (Lengths Vary)
- 6 Inch Rear Port with 6-Inch to 4-inch Vacuum Hose Reducer (Sold Separately)

Work Required Items:

- Full Personal Protection Equipment: Eye Protec tion, Hearing Protection, Hard Hat, High-Visibility Vest, Gloves, Fall Harness with Safety Lanyard, Non-Slip Work Boots
- Micro-Trencher
- Vacuum Hose between the Guzzler and the Micro-Trencher
- 6-Inch to 4-inch Vacuum Hose Reducer (If Re quired, Sold Separately)

LEGEND

1. E-Stop System Active Indicator
2. High Blower Temp. Alarm
3. High Hydraulic Temp. Alarm
4. Function Touchscreen Buttons
5. Blower Temp. Indicator
6. Creep Drive REV Speed Limiter
7. Vacuum Suction Gauge
8. Creep Drive FWD Speed Limiter
9. Blower RPM Indicator
10. Camera Touchscreen Buttons
11. PTO Engaged Indicator
12. Debris Body Out of Position Alarm Indicator
13. Boom Out of Position Alarm

4-Way Camera System

The 10.1-Inch Monitor Display provides functionality with safety and optimization in mind. The Monitor displays multiple measurements and indicators of its installed systems for the operator's attention. Its 4-Way Camera System boosts overall safety by enhancing situational awareness of the environment around the truck. Selecting the touchscreen buttons on the right provides the desired amount and layout of cameras to be displayed. The touchscreen buttons on the left are for adding those chosen cameras to the layout.

- 4-Way shows all four cameras in their corresponding locations to their mounting on the truck (left camera on left, and so on).
- Split enables the operator to choose between viewing only the front and rear cameras at once or the left and right cameras at once.
- Single displays only the camera selected.

Diagnostic - General
This section indicates the statuses of the listed systems.

Diagnostic - Home Page
The Diagnostic Page lists a number of items which are explained in later pages. Simply select a touchscreen button to see more information specific to it.

- Powertrain
- Work Mode Engaged
- Road Mode Engaged
- Creep IN Engaged
- Creep OUT Engaged
- CAN Network
- Sensors
- Options
- MD4 Inputs/Outputs (I/O)
- MC43 Inputs/Outputs (I/O)

Diagnostic – Powertrain
This page displays information involving the Throttle, PTO, Creep Drive, Allison (Transmission), General (Indicators), and the Road and Work Modes.
Throttle – Indicates whether a throttle keypad input is pressed and the corresponding output.

PTO – Indicates which PTO (A or B), if any, is engaged.
Creep Drive – Details at what status the Creep Drive is currently in.
Allison Transmission – Details which gear the transmission is currently in.
General – The parking brake, high rail, shift protection, and turn signals indicators show what is in use here.
Road and Work Mode – Indicates which mode, if any, is engaged.

Diagnostic - CAN
The Controlled Area Network (CAN) is an on-board programming standard vehicles use to allow on-board devices to communicate with one another.

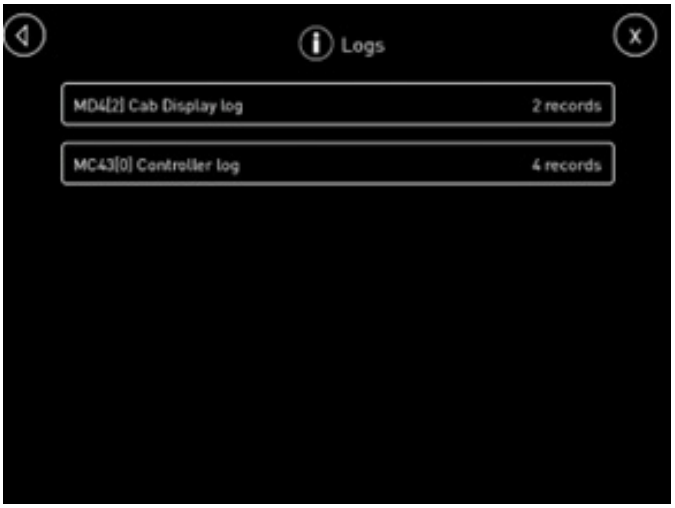
Top Keypad – Shows status.
Bottom Keypad – Shows status.
Module Status – Status of installed modules.
Joystick – Status and input percentage, if any.

System
This hub page leads to the System Info, Modules, and Logs Pages.

System Info
The System Info page shows the name, version, description, and the Project's ID # for reference.

Modules
The Modules page shows the installed modules and their statuses. Individually click on them to see their specific information. The following page has information specific to each module.

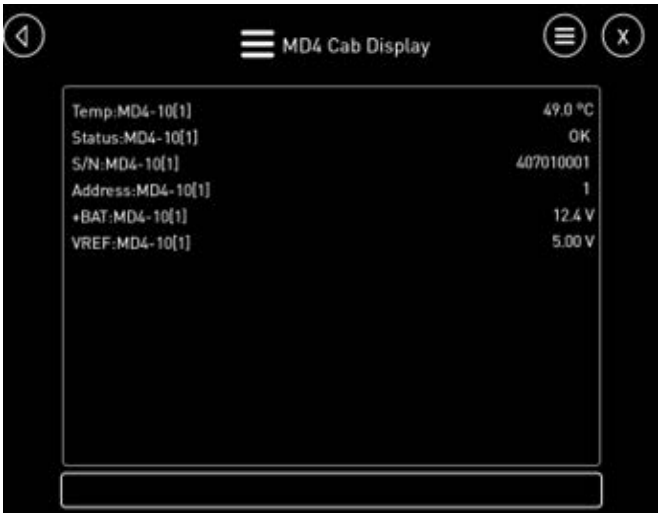
Logs Page
The Logs page leads to logs specific to the installed modules. Individually click on them to see their specific information.



Measure
The Measure page leads to the installed modules for their summaries.

MC43 Controller
The MC43 Controller is a large space-saving central unit used for the management of multiple truck functions, especially the input/output functions of the hydraulic systems.

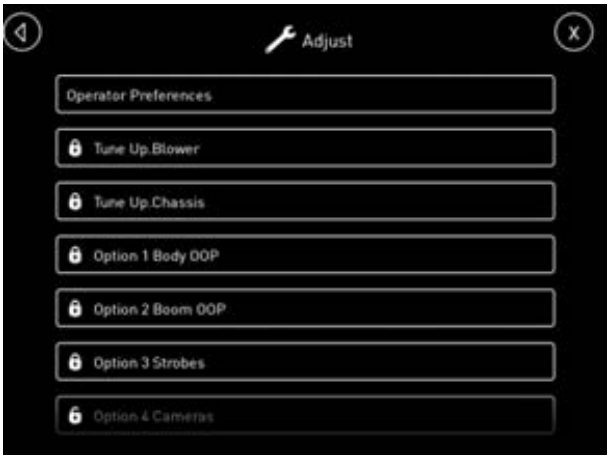
MD4 Module - Cab Display
This page details the MD4 10.1-inch touchscreen display/master controller combination unit installed in the cab.



WARNING

Creep Drive Motion Alarm Configuration

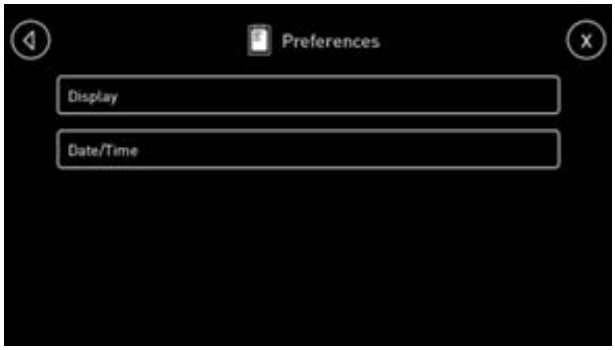
The Motion Alarm Configuration option is located in the Operator Preferences Page. As a safety feature, this system has settings to sound an audible alarm automatically whenever the vehicle changes direction while using the Creep Drive. The audible alarm is loud enough to be heard by all workers and machine operators working within the immediate area to avoid injuries. Its duration is adjustable and it is clearly distinguishable from other noises in the area. The alarm timing (frequency) can be adjusted since some work functions may require a constant direction changing. Adjust the alarm timing properly to ensure safety.



Settings
Some screens must be scrolled down to see all available options to select.

NOTICE

Do not drive the vehicle in Road Mode while the creep drive is engaged. Damage to the Creep Drive can result.



Preferences
The Preferences page leads to the user-defined Display and Date/Time pages.

Display
The Display Page enables the user to adjust the backlight and screen saver settings.
- The Backlight changes the brightness.
- The Screensaver permits the screen to turn off when not in frequent use.

Date/Time
Adjusting the Date/Time makes corresponding changes to the logs and reports generated for the installed modules.

Note: the date and time are synchronized between all installed modules.

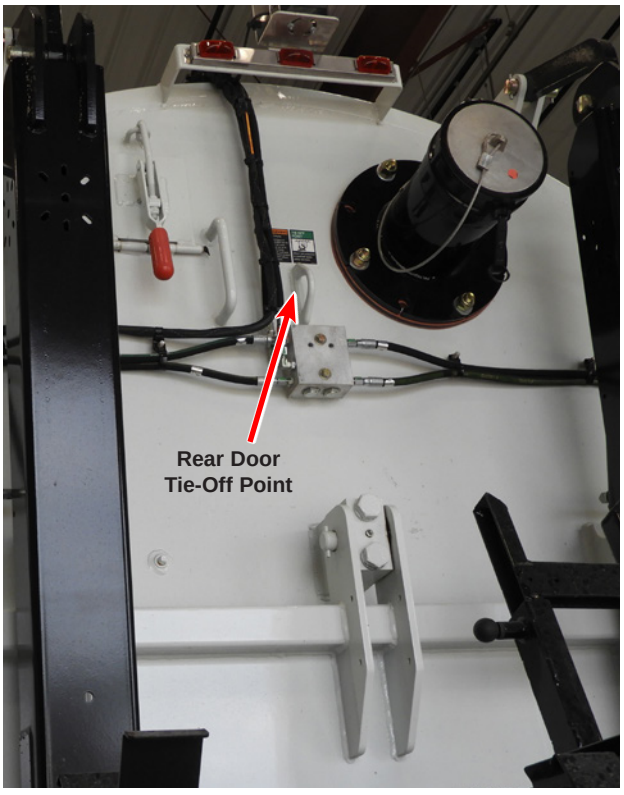
Note: Safety is the first priority. Always exercise caution when maneuvering about the vehicle. Be sure to wear all Personal Protective Equipment (PPE) and employ the safety lanyard and fall harness to prevent injury.

Setup Steps:

1. Safely arrive to the work site and park close enough to the micro-trencher unit for the vacuum hose to reach.
2. Exit the truck and put on your required Personal Protective Equipment: Non-Slip Work Boots, Gloves, Eye Protection, Hearing Protection, an approved Hard Hat, and your Fall Harness with Safety Lanyard.

3. Make sure the immediate area is clear before lowering the ladder in a controlled manner on the driver's side. There is a locking mechanism on the left-hand side of the ladder that must be pulled out to allow the ladder to move.

4. Using 3 points of contact, climb the ladder, connect your Harness' safety lanyard to the tie-off point on the debris body on the right-hand side of the ladder, and move to the platform on the rear of the Guzzler. Once on the platform, move the safety lanyard to the tie-off point on the rear of the debris body near the top by the handle.



The hose cradle is designed to support the weight of the vacuum hose and create a gradual, straight path for the material to reach the debris body. It can be raised into the support position by pulling it upward while pulling the locking knob outward, which is on the driver's side of the tube. It is then angled out from the debris body by pulling the passenger-side locking knob outward and moving the hose cradle rearward.

Hose Cradle Positions

1. Lowered - parallel with the vertical debris body rear door for storage and transportation.
2. Extended - at an approximate 45° angle for supporting the hose (shown).

Deployment

1. Deploy the Hose Cradle from the lowered storage position (#1) to the outward support position (#2) for installing the vacuum hose.

2. Attach the vacuum hose to the 6-inch Rear Port using the Cam Lock on its end.

Note: (If Required) Install the 6-in to 4-in Reducer to the Rear Port.

3. Maneuver across the platform and climb down the ladder using 3 points of contact. Be sure to safely move your safety lanyard from tie- off point to tie-off point.

4. Lift and lock the ladder back in its upright storage position.

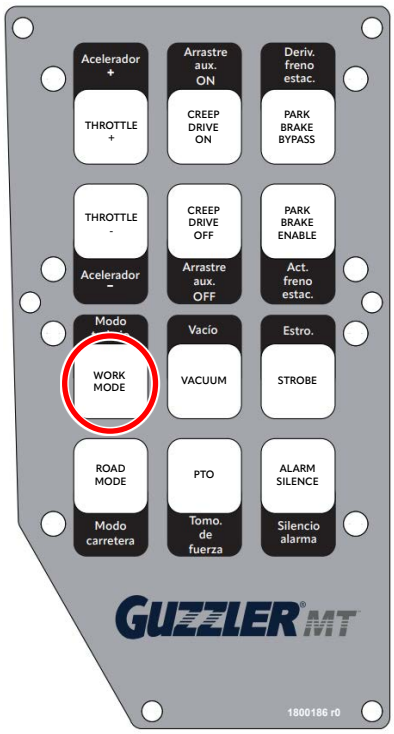
5. Deploy the grounding chain or cord on the rear bumper to the ground.

6. Pull the hose to the micro-trencher.

7. Ensure the micro-trencher is off.

8. Secure the vacuum hose to the micro-trencher's vacuum port located on the top or side of the blade housing, depending on the application.

6-Inch to 4-Inch Reducer



Vacuum Mode Steps:

1. Start the truck's engine, put the transmission in Neutral, and set the Parking Brake.

2. Ensure the in-cab secondary air pressure gauge reads 100PSI or above.

3. Select Work Mode on the center console.

4. Wait for the button indicator to turn **blue** which indicates it is engaged and ready.

5. Shift the transmission to Drive – the transmission now powers the blower to create vacuum.

6. Next, move to the external control panel located on the driver's side and set the Master Switch to ON.

Note: The Emergency Stop (aka the E-Stop) system is active until the Master Switch is turned On.

7. Engage the vacuum via the in-cab button on the center console.

NOTICE

The hose cradle must be lowered and relocated to its stored position before the rear door of the debris body is opened for dumping or inspecting inside it. Damage to components can result if it is not properly stored.

WARNING

Always exercise caution when the vehicle and/or its systems are in motion. Serious injury and/or property damage can occur.

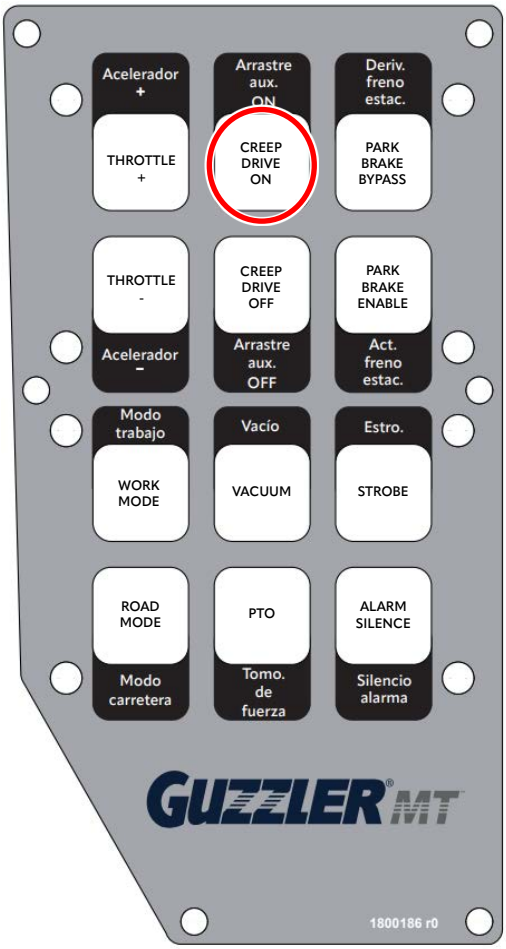
Guzzler MT Creep Drive Operation:

1. To use the Creep Drive, press Work Mode.

2. Turn ON the Creep Drive Switch located on the driver side external Control Panel.

3. Re-enter the cab and press the Creep Drive ON button on the Center Console. It can take a few seconds to engage, wait for the blue indicator light to appear.
4. When ready to begin moving, press the Parking Brake Bypass Button on the Center Console. This disengages the Parking Brake and enables the Guzzler to move forward or backward with the micro-trencher.
5. Use the Joystick on the center console to control the forward or reverse motion.

Note: The rate of the forward and reverse motion can be limited using the limiters at the bottom of the in-cab display.



Creep Drive Disengagement Steps:

1. Disengage Creep Drive by bringing the truck to a complete stop by returning the Joystick back to its center position.
2. Activate the Parking Brake.

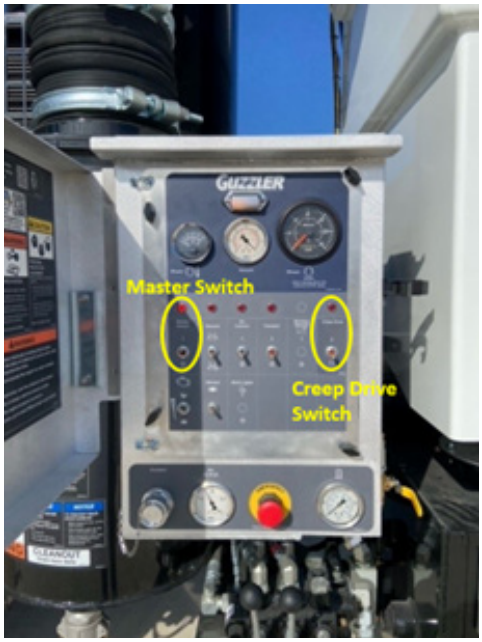
3. Press the Creep Drive OFF button, then wait for the button's light to turn off.

4. At the external control panel, set the Creep Drive Switch, Vacuum Switch and the Master Switch to OFF.

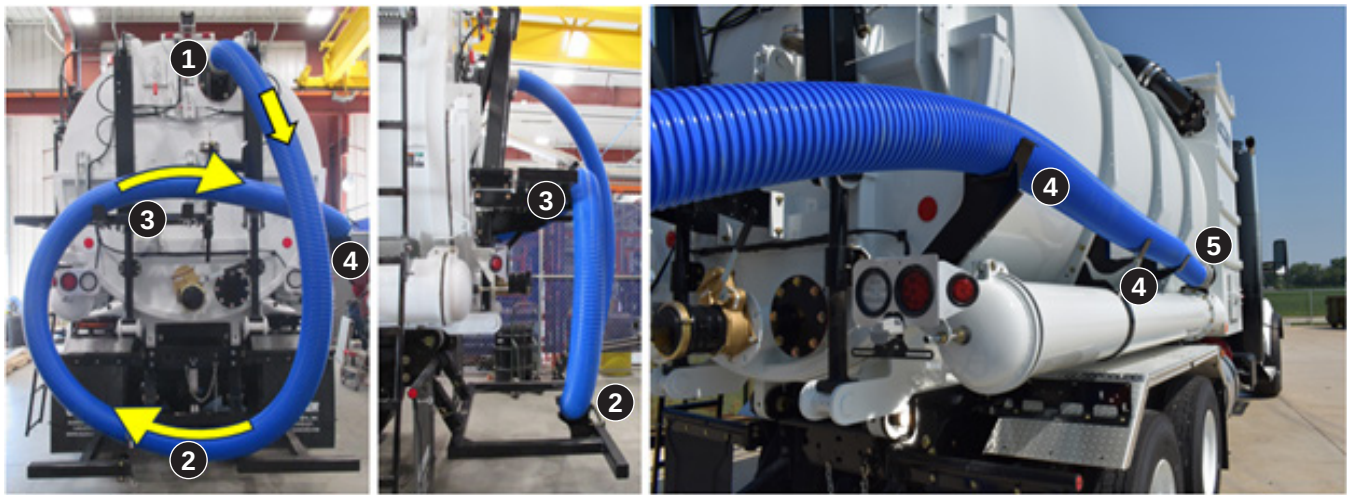
5. In the cab, shift to Neutral.

6. Wait 10 seconds for the blower to stop.

7. Press Road Mode. The switch light will turn blue when engaged.
8. Release the parking brake to move.



On-Unit, Temporary Storage



The vacuum hose is properly temporarily stored as depicted above for work site to work site travel, not extended road travel.

1. Leave it fastened to the rear port on the debris body.

2. Curl and slightly twist the vacuum hose into this round shape. The vacuum hose can then be secured with rubber straps, tow straps, or rope on the bumper. This is followed by securing the vacuum hose to the rear support pylons of the platform the same way (See 3 and 4).
3. Finally, route it alongside the Debris Body onto the tube racks 4 and end cap 5 and fasten it with rubber straps, canvas straps, or rope.

⚠ WARNING

Be sure no part of the tube drags along the ground. An improperly secured vacuum hose can become a safety hazard and therefore extra care should be employed.

Note: There are several conditions where the hose may need to be stored off of the unit. Permanent storage, extended road travel are two examples.

Hose Storage

1. Exit the cab, lower the ladder then climb it like before using 3 points of contact and your safety lanyard employed.
2. Disconnect the vacuum hose by unlocking its cam lock's on the end, and carefully lower it to the ground.

3. Reposition the hose cradle to its lowest position and allow the locking mechanism to fix it in place. Also, bring the hose cradle to its vertical position alongside the debris body.
4. Install the plug into the rear port.

5. Once again, maneuver off the rear platform and down the ladder while employing your safety lanyard and 3 points of contact. Once on the ground, safely lift and lock the ladder back into place for safe transport.

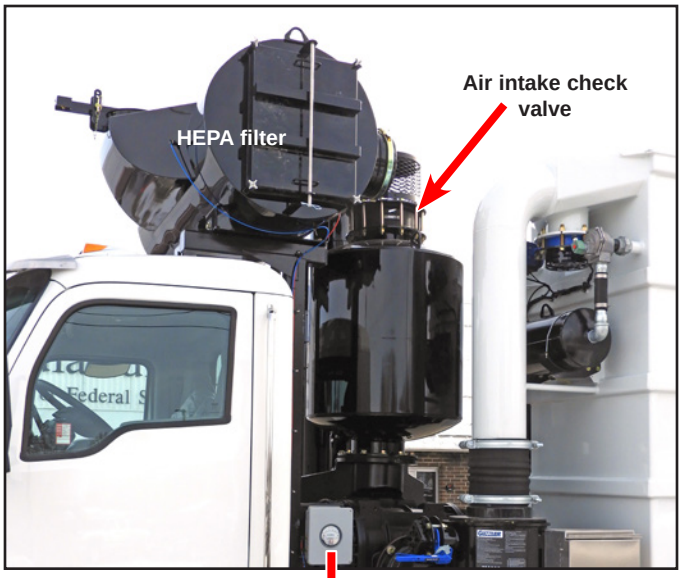
NOTICE

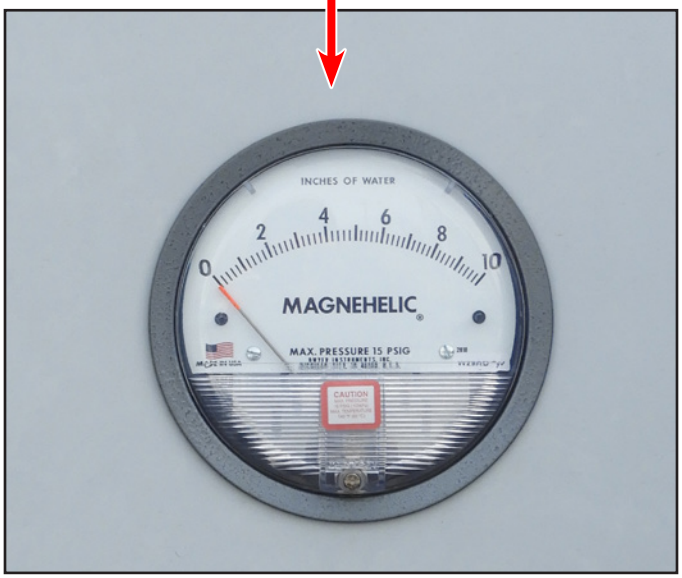
It is up to the crew's discretion to store and transport the vacuum hose in accordance with applicable laws and regulations.

The HEPA air filter option allows for the capture of potentially hazardous contaminants or other materials that the operator does not wish to release or escape into the environment. Depending on the configuration of the system ordered, the air stream will flow through the filter before being released into the atmosphere. The air stream will either pass through the silencer and/or blower first before going through the filter, or it may go through the filter first before going through the blower and/or silencer. The HEPA system is normally mounted in the front above the truck cab. Dirty air enters the HEPA chamber on the back side and passes through a series of filters. The air will leave through the exhaust port on top of the unit. A hose can be attached to the top of the exhaust port to direct the released air.

Note: The HEPA filter does not remove fumes. Combustible fumes can be directed through a hose in order to avoid flash points around the unit.

The cleanliness of the filters is monitored by a Magnehelic gauge mounted behind the truck cab on the driver side. The gauge has two lines attached to it from the HEPA filters. One line measures the air pressure on the dirty side of the filter while the other line measures the air pressure on the other side of the filter or clean side. These lines allow the gauge to measure the restriction of air flow through the filters. The restriction of air flow is caused by debris that has been filtered from the air stream by the filter bags. As the filters get dirty, the air becomes restricted and the pressure increases on the dirty side of the filter. It is recommended that the filters be changed when the pressure reaches six inches of water.





The filters are contained in three sections and are placed in the HEPA filter housing from the driver side. To access the filters for servicing, open the door by loosening the wing nuts on the four corners of the door. Remove the hair pin on the bottom of the rod holding the door closed and pull straight up on the rod and open the door. Now the three HEPA filters can be removed and new filters installed. To remove the filters, pull the plastic bag over each of the filters by using the rods or hooks to pull the bag over all three filters. After the bag covers all three filters, pull the draw string tight thereby sealing the filter inside the bag. The new filters are installed with the plastic bag pushed back to expose the filters. The rods or hooks are used to push the bag back into the housing.

Note: Any time the door is opened, the HEPA filters must be changed, due to the broken seal.

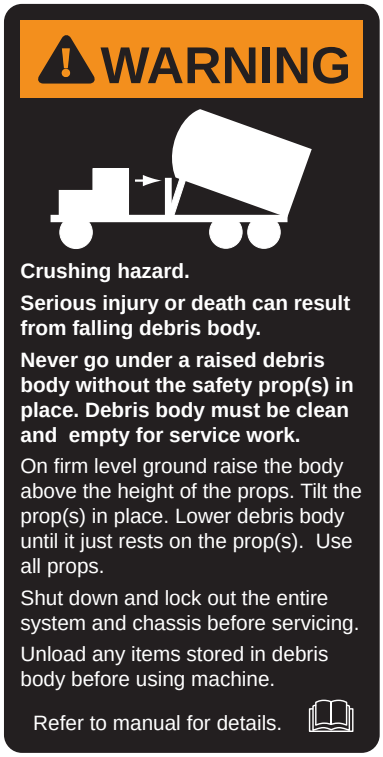
Observe all warning and danger signs and labels. Follow all safety precautions while working in and around the unit

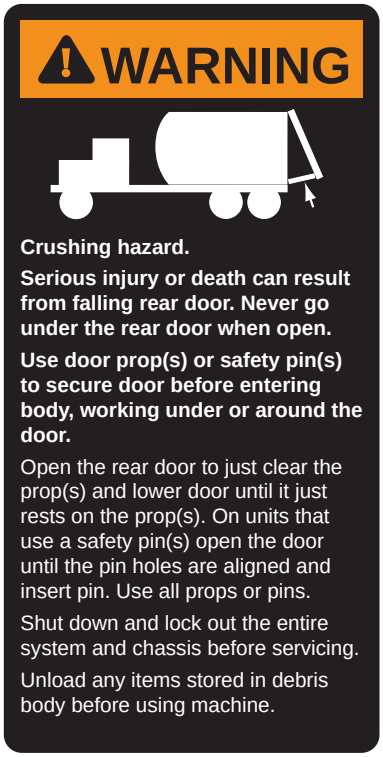
WARNING

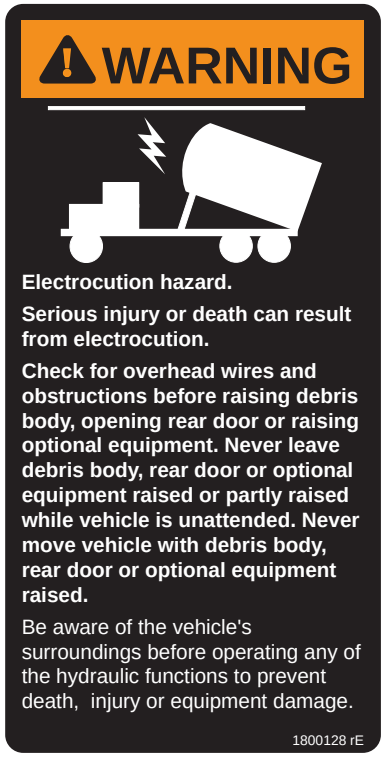
Cyclone Hazards

The cyclone presents numerous potential pinch points and crush areas. To avoid injury or death:

- **Stand away from the area between the cyclone and the truck and the cyclone travel path to its cradle while the cyclone is being moved.**
- **Never interfere with the valves during operation.**
- **Completely shut down the cyclone system before opening the access door. Never put your hand or arm inside the cyclone while it is operating.**
- **Never stand on or ride on the cyclone.**
- **Stand alone cyclone - to prevent tipping never stand the cyclone without attaching the feet. Fully open the legs.**







The swingout cyclone provides for continuous loading of material without the interruption of having to dump collected material. The swingout cyclone achieves this uninterrupted operation by serving as a collection tank for vacuumed material while simultaneously offloading the collected material into a rail car, truck, drum, bag or other holding facility.

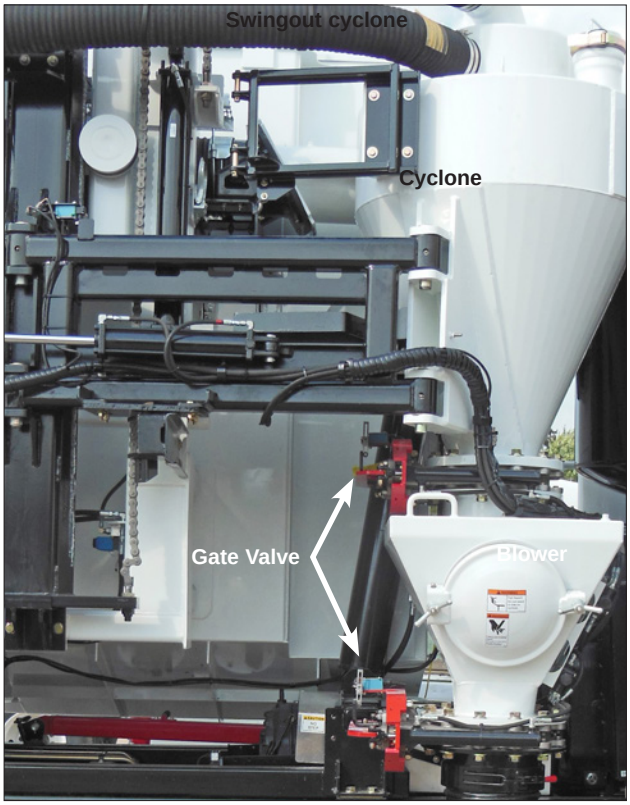
The swingout cyclone is a single unit that provides several functions, including:

- Continuous uninterrupted operation
- Collected material can be offloaded into specific containers or tanks
- Material collected can be isolated from other material

Mechanics of Operation

The swingout cyclone moves out from the main debris body and material is vacuumed directly into it. The cyclone, which is the upper part serves as the collection hopper and the bottom part discharges the collected material out the bottom by gravity into another receptacle. A knife valve separates the two sections. Also a knife valve opens and closes the bottom chamber.

At the beginning of operations, the top valve is open while the bottom valve is closed, making both sections one single hopper for collected material. Material that enters the cyclone is separated from the air stream by the centrifugal motion of the air flow and falls to the bottom of the hopper. At a preset time, the top valve closes, effectively cutting off the bottom part of the cyclone known as the “Dutchman.” The bottom valve now opens and the collected material in the Dutchman is gravity discharged. While the discharge is taking place, the cyclone continues to collect material because the top valve is closed effectively isolating the cyclone from the bottom chamber where discharge is occurring. With the top and bottom chambers isolated, vacuuming operations continue uninterrupted. After the bottom chamber is emptied, the bottom valve closes and the top valve opens to allow for the newly vacuumed material collected in the cyclone and Dutchman. The cycle continues; ceasing only to change collection containers.



After the debris falls to the bottom chamber, the relatively free air will exit the cyclone through two six inch flexible tubes. Depending on the type of cyclone being used, it will either go to the debris body or will go to the bag house. The opening and closing of the top and bottom valves is either done manually or automatically based upon certain preset time intervals. A three-way switch on the swingout control panel can be set to either the automatic or manual position.

Air flow for this system is as follows:

Swing-out cyclone → baghouse → blower

The swingout control panel is normally located inside the tool box on the passenger side of the unit next to the cyclone.

The pendant control is attached to the side of the swingout control box. The auto position opens and closes the knives automatically every four seconds. The manual position gives the operator the option to open the knives from the pendant control and at the operator's discretion.

Note: The pendant controls both the knife gates and the movement of the cyclone.

Control Panel

Bottom Valve - open/close

Top Valve - open/close

Fold - out/in. Pivots the cyclone on the end of the arm. Swing out the cyclone until fully clear of the unit before folding in or out to avoid hitting the blower discharge silencer. The cyclone must be fully folded in before swinging the arm in.

Swing - out/in. Pivot the cyclone assembly out from the unit. The mast must be raised about four inches before swinging the cyclone out for use to clear the travel locks.

WARNING

Cyclone Hazards

The cyclone presents numerous potential pinch points and crush areas. To avoid injury or death:

- **Stand away from the area between the cyclone and the truck and the cyclone travel path to its cradle while the cyclone is being moved.**
- **Never interfere with the valves during operation.**
- **Completely shut down the cyclone system before opening the access door. Never put your hand or arm inside the cyclone while it is operating.**
- **Never stand on or ride on the cyclone.**
- **Stand alone cyclone - to prevent tipping never stand the cyclone without attaching the feet. Fully open the legs.**

Lift - up/down. Raises or lowers the cyclone assembly. The mast must be raised about four inches before swinging the cyclone out for use to clear the travel locks.

Auto/Off/Manual - Allows manual override for most functions. Set to manual in order to move the cyclone. To operate the valves, the cyclone must be the stored road mode position and the red valve override switch held in to activate.

NOTICE

Cyclone Operation

Raise the mast up about four inches before swinging the cyclone out for use to clear the travel locks.

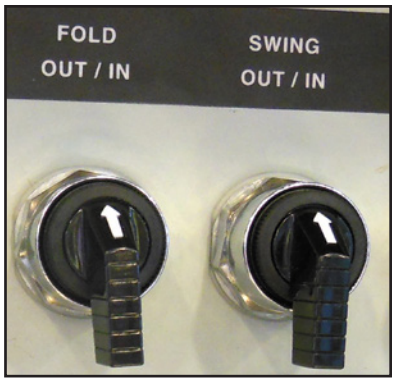
Swing out the cyclone until fully clear of the unit before folding in or out to avoid hitting the blower discharge silencer.

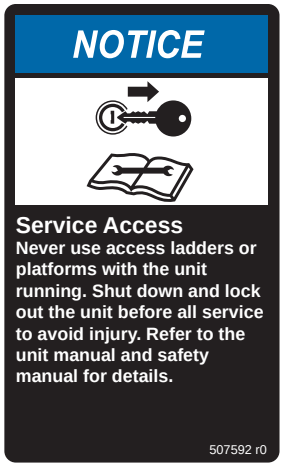
Notice XCR Cyclone Switches

The cyclone must be in travel mode for road travel and before raising the debris body.

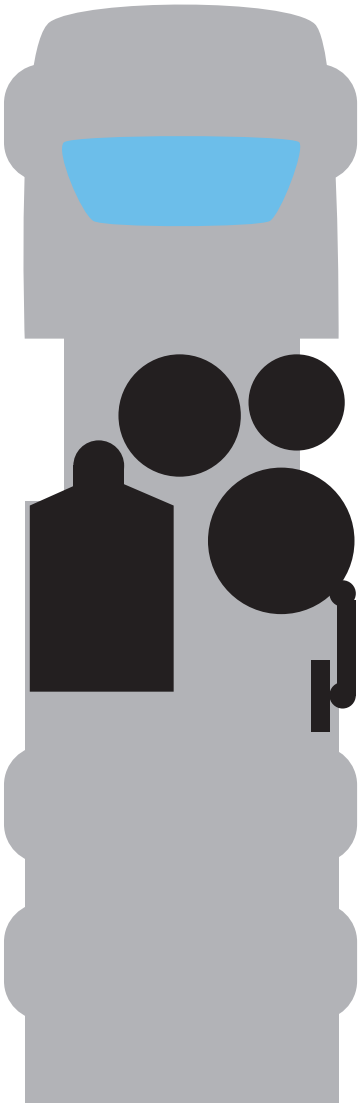
Raise the mast up about 4 inches before swinging out the cyclone to clear the travel locks. Swing out fully clear of the unit before folding in or out to avoid hitting the blower discharge silencer. The cyclone must be fully folded in before swinging the arm in.

Valve and fold interlock switch - this interlock prevents the cyclone valves from operating and disables the fold switch while in the travel mode. Both can be overridden with the manual override switch.

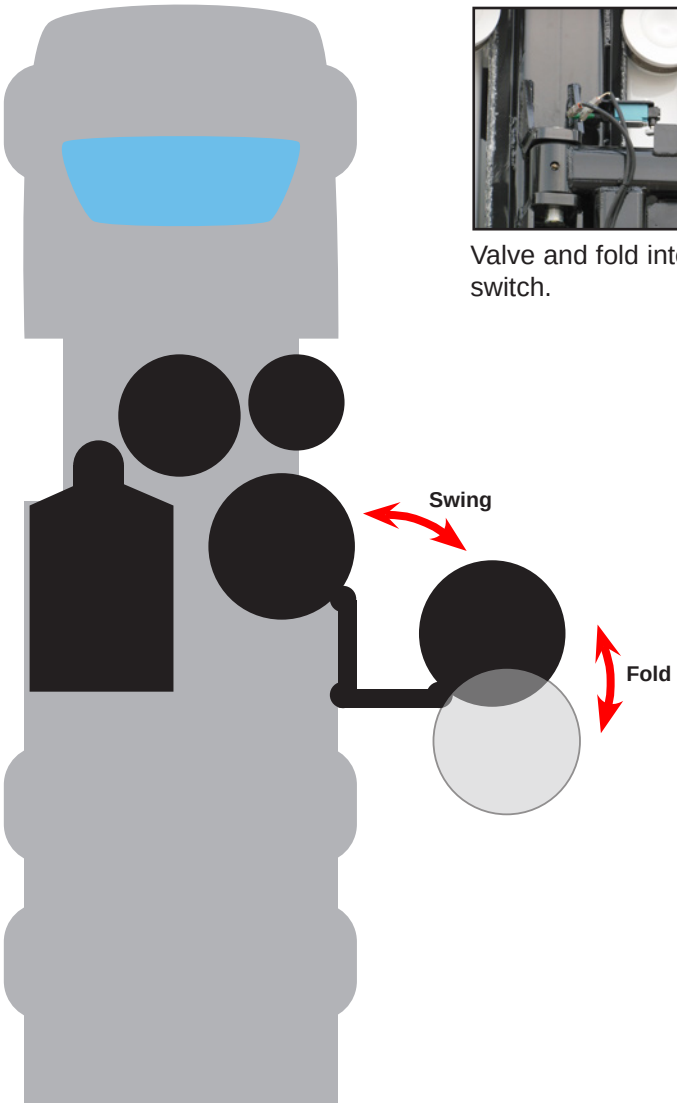




Travel/Road and Dumping mode



Swingout Cyclone Work Mode Positions



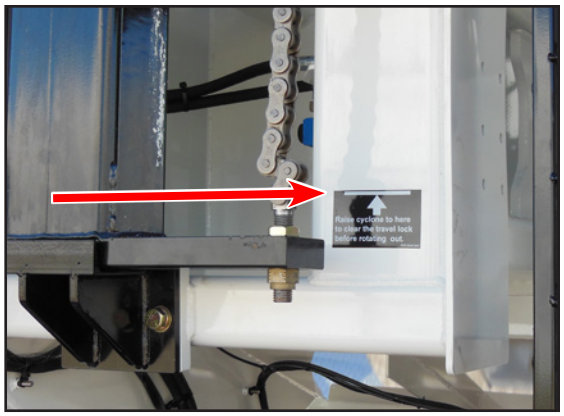
Valve and fold interlock switch.

⚠ WARNING

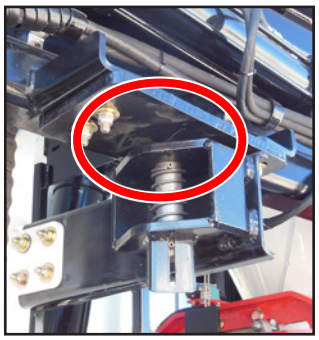
Cyclone Hazards

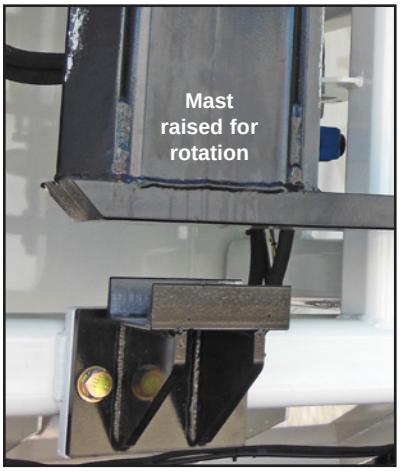
The cyclone presents numerous potential pinch points and crush areas. To avoid injury or death:

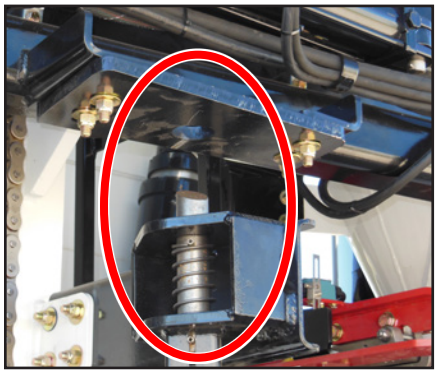
- **Stand away from the area between the cyclone and the truck and the cyclone travel path to its cradle while the cyclone is being moved.**
- **Never interfere with the valves during operation.**
- **Completely shut down the cyclone system before opening the access door. Never put your hand or arm inside the cyclone while it is operating.**
- **Never stand on or ride on the cyclone.**
- **Stand alone cyclone - to prevent tipping never stand the cyclone without attaching the feet. Fully open the legs.**



Spring latch fully engaged

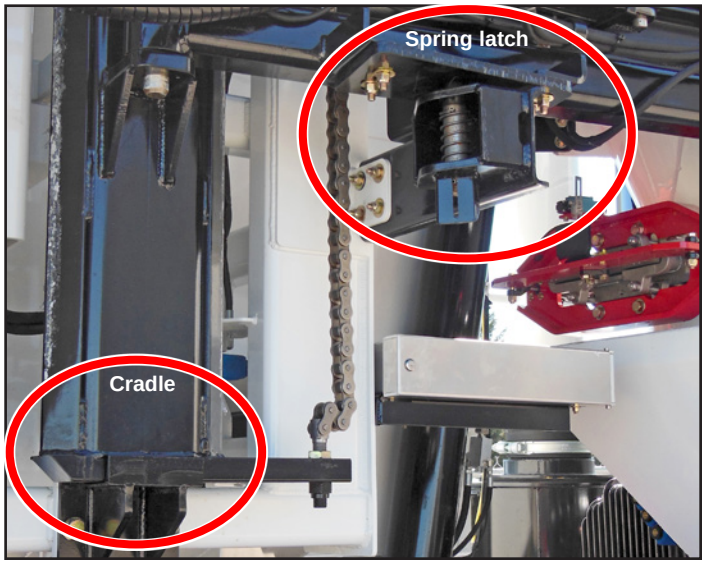




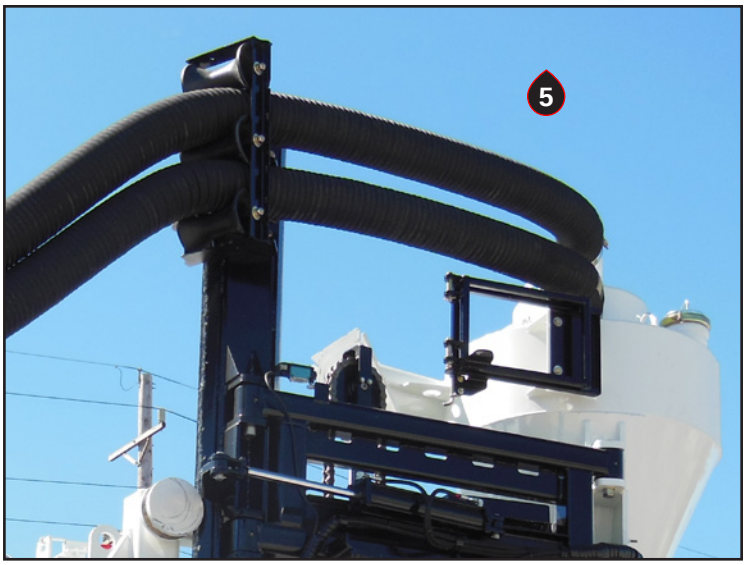


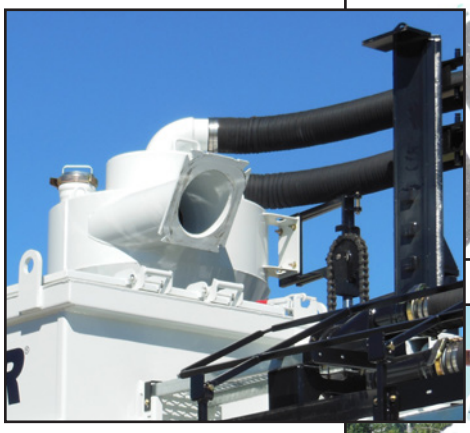
The cyclone mast assembly has a secured position for road transport and when dumping the debris body. The mast rests in a cradle on the lower end and a spring latch engages a hole farther up. The mast must be raised about four inches before swinging the cyclone out for use. The swinging arm must be fully parked and the spring latch fully engaged before travel.

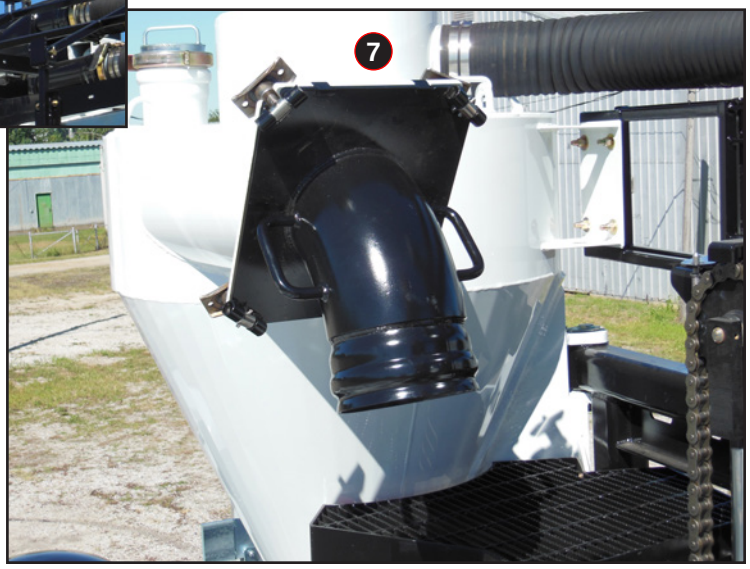
⚠ **The cyclone must be in travel mode for road travel and before raising the debris body.**



1. Position the unit for vacuum operations. Be aware of and clear all overhead wires, structures, etc. Refer to the safety manual for additional details.
2. Set the parking brake
3. Per the cab decal instructions engage the PTO.
4. Set the master power switch to ON.
5. Raise the cyclone mast fully up and shut the unit down so the next steps can be safely performed on top the debris body.
6. From on top of the debris body attach the hose elbow to the cyclone. The elbow is stowed on top of the debris body. It is equipped with handles for easy lifting.
7. Hang the elbow off the top edge of cyclone flange with the hooks on the elbow and secure with the wingnuts.







8. Per the cab decal instructions engage the PTO.
9. Set the master power switch to ON.
10. Swing out the cyclone mast and fully lower.
11. Rotate the cyclone around as required. Rotate out the cyclone until it is fully clear of the unit before folding in or out to avoid hitting the blower discharge silencer.
12. Attached the vacuum hose. Additional equipment, platforms and ladders may be required to attach the vacuum hose.

The unit is now ready for vacuuming operations.

Attach telescoping ladder to the platform hook as shown. Swing the guard rail around and latch in place once on the platform.

⚠ WARNING

Cyclone Hazards

The cyclone presents numerous potential pinch points and crush areas. To avoid injury or death:

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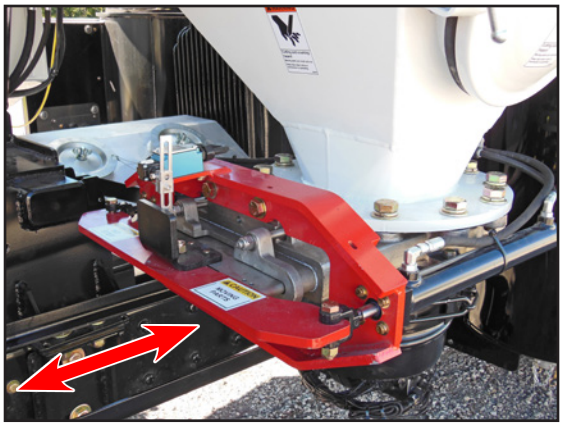
- **Never interfere with the valves during operation.**
- **Completely shut down the cyclone system before opening the access door. Never put your hand or arm inside the cyclone while it is operating.**
- **Never stand on or ride on the cyclone.**
- **Stand alone cyclone - to prevent tipping never stand the cyclone without attaching the feet. Fully open the legs.**



The swingout cyclone is ready for vacuuming operations. Either Manual or Automatic mode can be selected. Selection of the appropriate mode is made at the control panel. Manual mode allows the operator to manually open and close the knife gates by using the pendant. The automatic position opens and closes the knife gates at preset intervals.

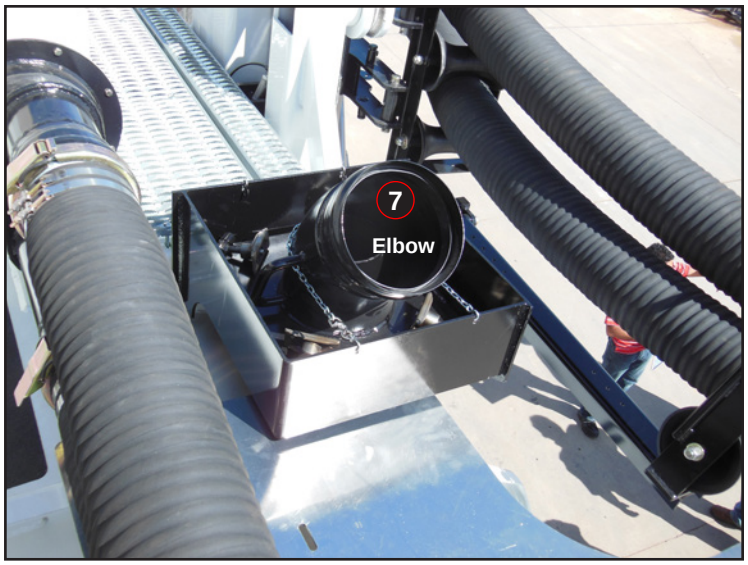
The cyclone can be operated in either the “manual” or “automatic mode,” depending on the nature of the job and material to be vacuumed. If the accumulation material to be picked up is large enough to have a steady and even flow, select automatic. If the material is scattered around and the vacuuming is expected to be “stop and go”, with frequent interruptions, select “manual.” If automatic is selected, the valves will open and close automatically at preset timings, but if you choose manual, the push-buttons on the pendant control will have to be operated to empty out the hopper at regular intervals.

At any time offloading is paused for any reason; including repositioning the cyclone, changing the dump container, the vacuuming should be stopped. If vacuuming is continued uninterrupted, the cyclone might overfill, creating excessive carryover into the baghouse. Additionally, if the manual mode of valve operation is selected, the discharge rate should be at least as fast as the loading rate; not slower.

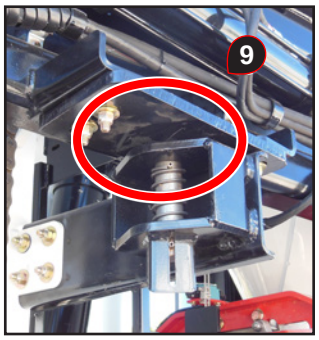
When the cycle is stopped, it is very likely that one of the valves will be fully or partially open. To close the valve, select manual on the pendant control and close that valve.

1. Remove suction hose from the work site and allow unobstructed air to flow through the hose until all the material in the hose is conveyed to the cyclone and is off loaded.
2. Open all relief valves
3. Reduce the engine/blower rpm at the master control panel.
4. Set the air cannon/pulsation switch to off.
5. Shut down the vacuum system before removing the collection equipment (ie) the flexible debris hose. Remove any collection equipment or dust skirt attached to the discharge opening of the collection hopper.
6. Fully fold in the cyclone to avoid hitting the blower discharge silencer when swinging the cyclone in.
7. From on top of the debris body remove the hose elbow from the cyclone. The elbow is stowed on top of the debris body. Secure the elbow for transport.
8. Raise the cyclone and swing it into travel position using the pendant. The cyclone must be raised high enough so that the hook clears the pin when rotating inward.
9. Raise the cyclone mast fully up and shut the unit down so the next steps can be safely performed on top the debris body.
10. In the cab, start up and per the cab decal instructions engage the PTO.
11. Set the master power switch to ON.
12. Fully lower the cyclone mast and verify that the spring latch is properly engaged for transport.
13. Set the master power switch to OFF.

The unit is now ready for transport.



Spring latch fully engaged



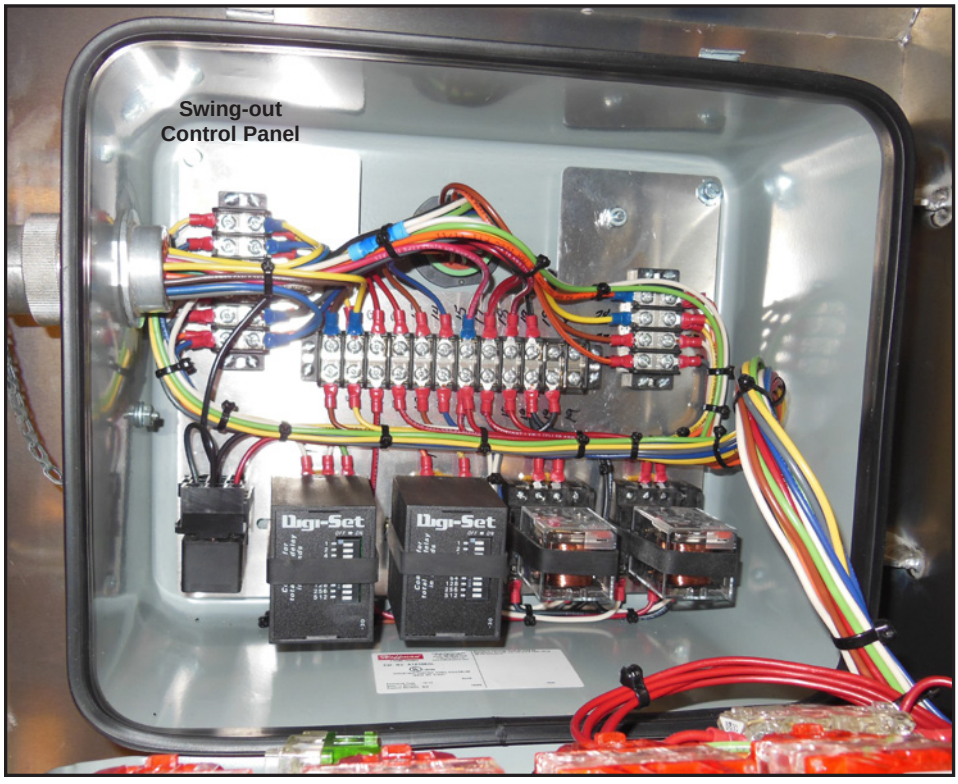
Access to the bottom half of the hopper can be gained by opening the door on the front. The access door can be used for cleaning the inside of the cyclone as well as removing blockage.

Daily maintenance

1. Inspect cyclone and lift mechanism for proper operation and safety.
2. Inspect and clean the knife gate valve tracks from inside the lower chamber access door. Material build up in the gate tracks will increase valve wear from the air flow leakage.

Weekly maintenance

1. Lube lift chain with chain lube
2. Grease all zerks (see unit maintenance section for grease specifications)
3. Rotate hoses 90° to maximize wear life.



Baghouse unloader valve is a common option with the swingout cyclone. As with the cyclones a container is positioned under the baghouse unloader valve.

The knife valve is operated from the control panel.

The various models of the XCR system all share similar characteristics that require additional service and inspections for optimal performance and reliability.

NOTICE

Keep grease fittings clean, accessible, and free from damage. Grease fittings should be checked every week. Examine and replace broken fittings.

WARNING

Cyclone Hazards

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- **Never interfere with the valves during operation.**
- **Completely shut down the cyclone system before opening the access door. Never put your hand or arm inside the cyclone while it is operating.**
- **Never stand on or ride on the cyclone.**
- **Stand alone cyclone - to prevent tipping never stand the cyclone without attaching the feet. Fully open the legs.**

NOTICE

Follow recommended safety practices while performing all work. Refer to the FS Solutions/Guzzler/Vactor/TRUVAC/Westech Safety Manual for additional information.

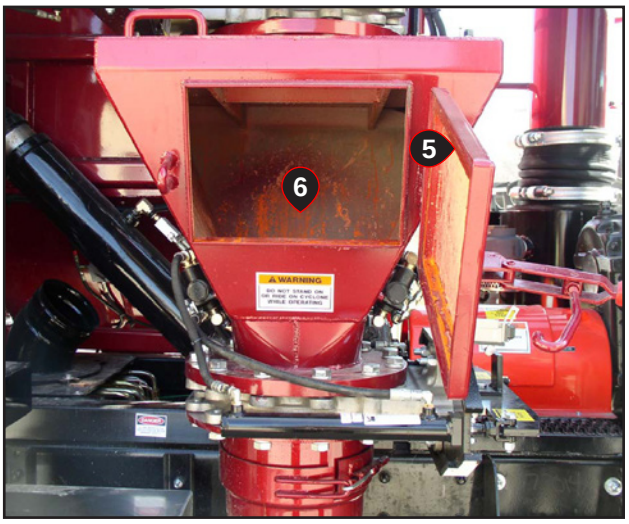
This manual is available at: www.vactor.com

SAFETY INSTRUCTIONS

This service procedure requires that the unit and chassis be shut down and locked out.

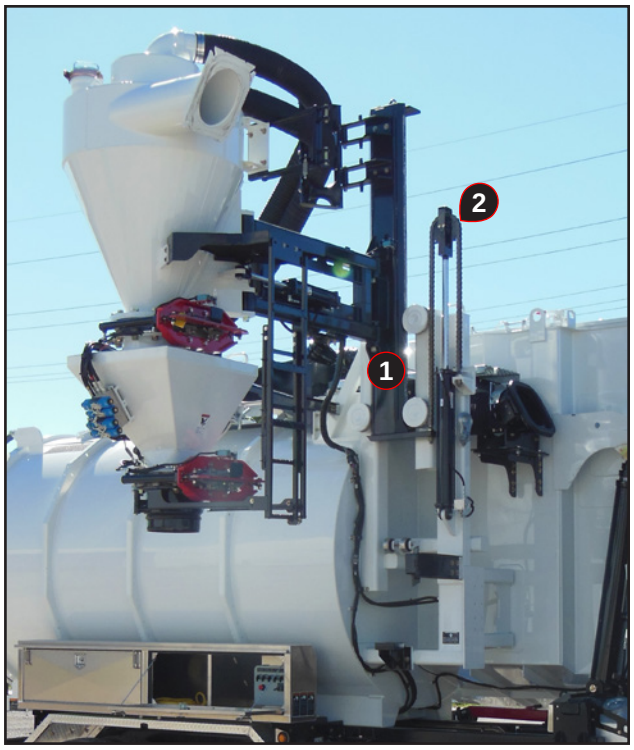
Guzzler Classic and ACE systems:

1. Verify all mast rollers rotate and are free of corrosion and dirt.
2. Verify that all supporting links are free of corrosion and dirt. Verify that all bolts and pins are in place.
3. Verify chain roller rotates and is free of corrosion and dirt. Chain and chain anchors must be free of corrosion and dirt and lubed. Any standard machine oil of 30 to 40 weight should be used. Lubricate as needed to maintain an oil coating. Refer to the chain troubleshooting forms for detailed inspection guidance.
4. Verify that all pivot points are free of corrosion and dirt. Verify that all bolts and pins are in place.
5. Clean door seals and mating surfaces. The seal and mating surface must be free of damage for a good seal. Service as required.
6. Verify that all travel mode links are free of corrosion and dirt. Verify that all bolts and pins are in place.
7. Verify and clean as required the valve track areas.
8. Verify that all supporting links are free of corrosion and dirt. Verify that all bolts and pins are in place.
9. Inspect all hoses and wiring for damage and wear. Service as required.
10. Inspect the mast and supporting structure for signs of excessive wear, damage or corrosion. Service as required.
11. Inspect all hydraulic cylinders and clevises for signs for damage or leaks. Service as required.



Guzzler CL-E systems:

1. Verify all mast rollers rotate and are free of corrosion and dirt.
2. Verify chain roller rotates and is free of corrosion and dirt. Chain and chain anchors must be free of corrosion and dirt and lubed. Any standard machine oil of 30 to 40 weight should be used. Lubricate as needed to maintain an oil coating. Refer to the chain troubleshooting forms for detailed inspection guidance.
3. Verify that all pivot points are free of corrosion and dirt. Verify that all bolts and pins are in place.



4. Verify that all travel mode lock works freely and is free of corrosion and dirt. Verify that all bolts and pins are in place.
5. Clean door seals and mating surfaces. The seal and mating surface must be free of damage for a good seal. Service as required.
6. Verify and clean as required the valve track areas.
7. Inspect all hoses and wiring for damage and wear. Service as required.
8. Inspect the mast and supporting structure for signs of excessive wear, damage or corrosion. Service as required.
9. Inspect all hydraulic cylinders and clevises for signs for damage or leaks. Service as required.

Standard roller chain inspection & troubleshooting procedure				Date	
Symptom	Appearance	Probable cause	Correction	Pass	Fail
Worn contour		Abnormal wear rubbing on guides	Replace roller chain when 5% worn		
			Check roller chain alignment or increase clearance		
Pin galling		Inadequate lubrication	Reduce load or roller chain drive speed		
Tight joints		Dirt or foreign substance packed in joints	Clean & re-lubricate roller chain		
		Corrosion or rust	Replace roller chain		
		Bent pins	Replace roller chain		
Hooked sprocket teeth		Excessive roller chain wear	Replace roller chain and roller chain sprocket		
Abnormal protrusion or turned pins		Excessive internal friction caused by high loading and inadequate lubrication	Replace roller chain, improve lubrication and eliminate overload conditions		
Cracked plates (fatigue)	Crack from aperture towards edge of linkplate at 90º to line of pull. Note there is no linkplate distortion.	Loading beyond chain's dynamic capacity (above fatigue endurance limit)	Replace chain with roller chain of larger dynamic capacity or eliminate or high load condition or dynamic (impulse) overloading		
Fractured plates (tension mode)	Note material distortion	High overload	Replace roller chain and correct cause of overload		

Standard roller chain inspection & troubleshooting procedure				Date	
Symptom	Appearance	Probable cause	Correction	Pass	Fail
Arc like cracked plates (stress corrosion)		Severe rusting or exposure to acidic or caustic medium, plus static pressure at press fit (between pin and pin linkplate). No cyclic stress is necessary for this phenomenon to occur.	Replace roller chain and protect from hostile environment.		
Enlarged holes		High overload	Replace roller chain and correct cause of overload		
Corrosion pitting		Exposure to corrosive environment	Replace roller chain and protect from hostile environment.		
Broken,		Speed too high	Replace roller chain and reduce speed		
Cracked or deformed rollers		Sprockets too small	Replace roller chain and use larger roller chain sprockets		
Broken pins		Extreme overload	Replace roller chain. Eliminate cause of overload or redesign roller chain drive		
Rusted chain		Exposed to moisture	Replace roller chain and protect from moisture		
		Water in lubricant	Change roller chain lubricant		
		Inadequate lubrication	Replace roller chain and improve roller chain lubrication		

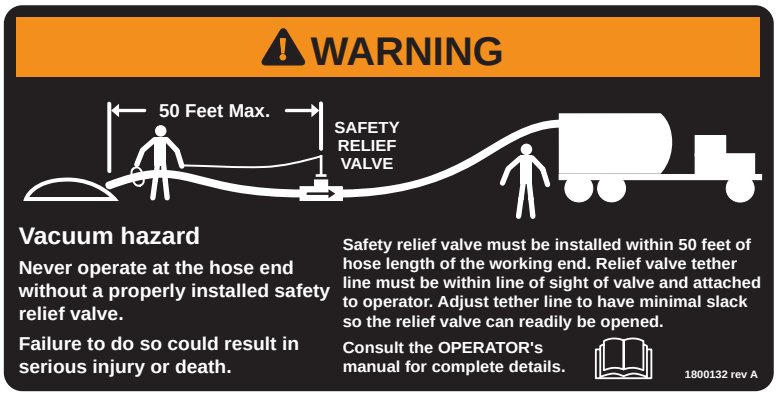
Nitrogen Purge - Overview

The nitrogen purge closed loop system is used in the removal of catalyst to avoid contact between the catalyst and air. In this operation the vacuum system is put into a closed loop system operating at a lower vacuum level. Nitrogen is injected in to the chassis air compressor system, debris body, baghouse, and cyclone to displace air. As catalyst is vacuumed into the cyclone, the blower discharge exhaust is looped back into the catalyst vessel completing the closed loop.

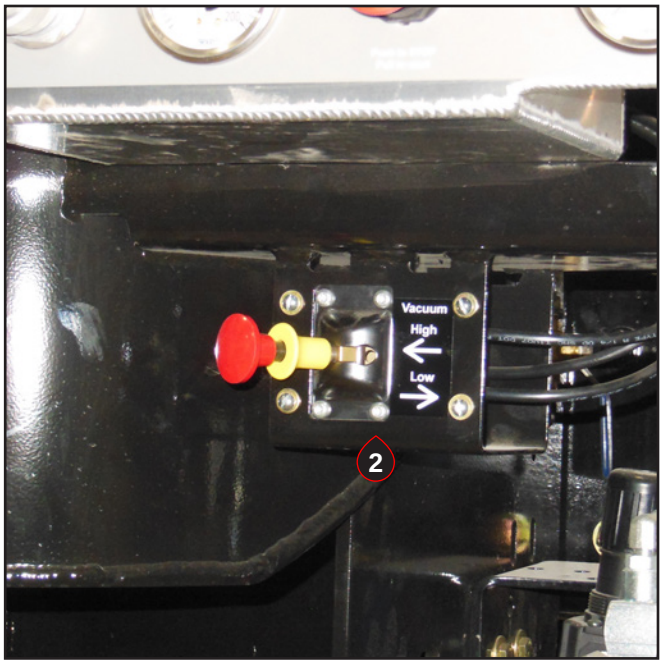
All work for the catalyst vessel must be performed with a safety relief valve between the catalyst vessel and Guzzler unit.

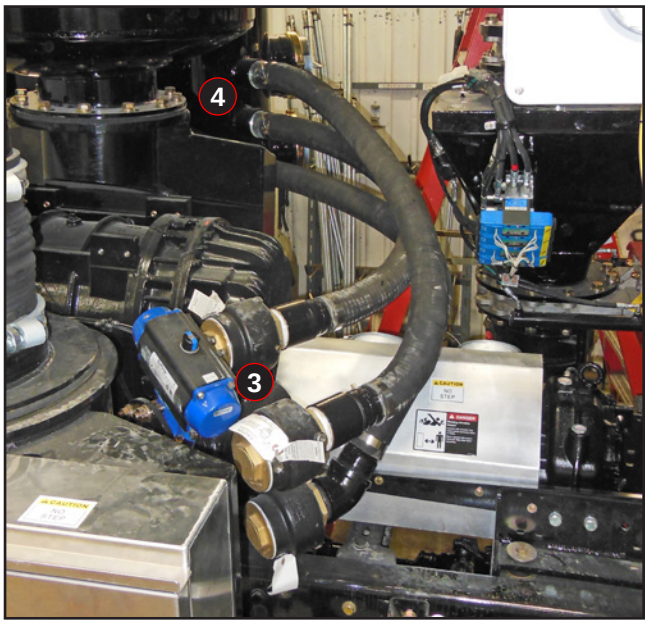
The air activated vacuum relief valve must be capped during nitrogen purge operations.

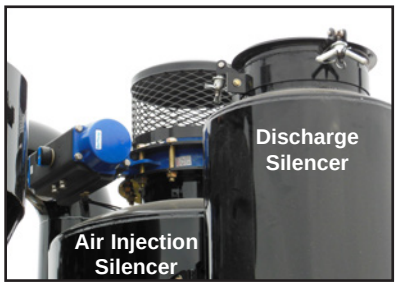
All normal operating and safety procedures must be followed including monitoring breathing air and temperature for personnel. The catalysts atmosphere must maintained per manufacturer and facility specifications.

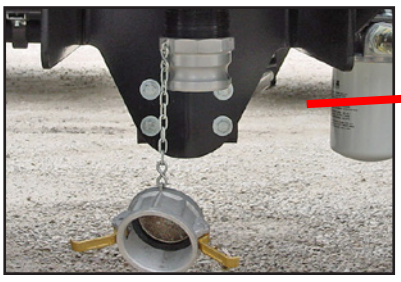


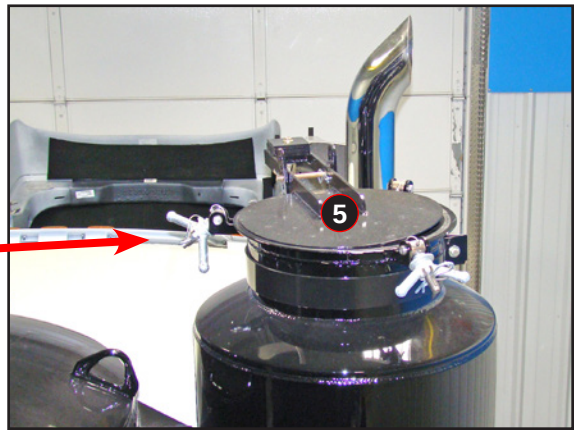
1. **Auxiliary hydraulic controls -** Optional - common option for operating various hydraulic pumps and tools. Consult Vactor/Guzzler Service for application information.
2. **Low vacuum closed loop valve -** This valve changes the system from a normal high vacuum air injection cooled system, to a Kunkle valve controlled low vacuum system for catalyst work. Operation in high vacuum requires that the air operated vacuum relief be uncapped and the debris screen be installed. Low vacuum operation requires that the air operated vacuum relief be capped. The air valve opens the butterfly valve to the Kunkle valves and closes the butterfly valve at the air injection silencer inlet.
3. **Kunkle relief valves -** when opened, exhaust is pulled from the blower discharge silencer to maintain lower vacuum. This permits a fully closed loop system.
4. **Silencer outlet ports -** used to create a closed loop vacuum system for catalyst work by connecting back to the catalyst vessel. Caps must be installed for high vacuum operations.
5. **Discharge silencer cap -** functions as a normal rain cap during normal vacuum operations. Install the domed lid and clamp down to create a closed loop vacuum system for catalyst work. The domed lid is normally stored in one of the unit's tool boxes. The domed discharge silencer cap must be removed for high vacuum operations.

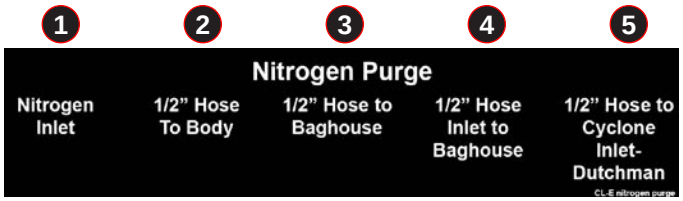


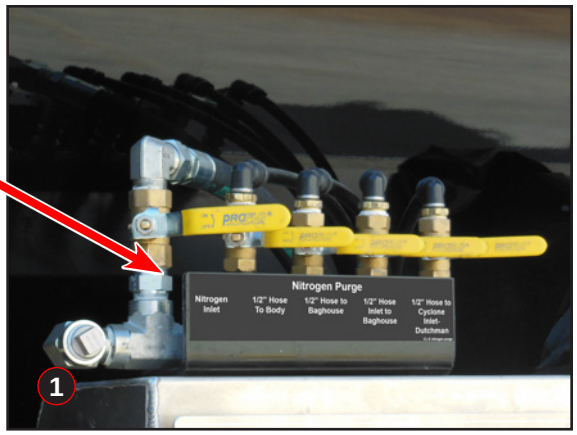






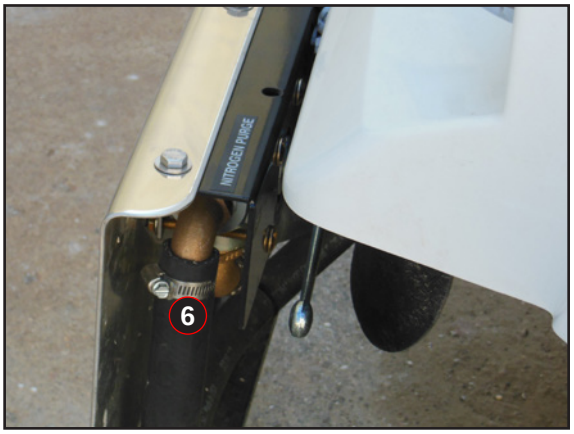


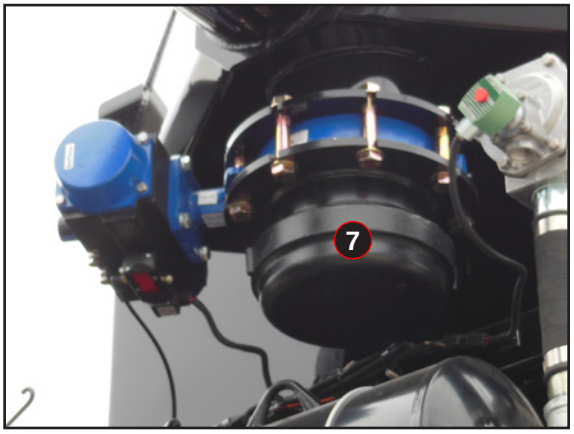




The nitrogen gas system consists of a series of valves that control gas flow to all locations. The primary manifold location is normally located on top of the driver side toolbox. All valves are normally closed to isolate the gas system from contamination when not in use. The actual number of valves and ports will vary with the unit's configuration.

1. **Nitrogen inlet port -** attach nitrogen here.
2. **1/2" hose to body -** valve outlet to the debris body nitrogen line.
3. **1/2" hose to Baghouse -** valve outlet to the baghouse nitrogen lines.
4. **1/2" hose inlet to baghouse -** valve outlet to the linear wall area between the cyclone and baghouse cyclone.
5. **1/2" hose to cyclone inlet/dutchman -** valve outlet to the cyclone nitrogen lines.
6. **Down/Off Compressor -** valve from nitrogen inlet manifold to chassis air compressor. Additionally, valve 6 is normally located on the driver side front bumper. Valve 6 switches between nitrogen gas input to the chassis air compressor and ambient air.
7. **Air operated vacuum relief valve -** capped during low vacuum closed loop catalyst operations. Operation in high vacuum requires that the vacuum relief be uncapped and the debris screen be installed.





General operation

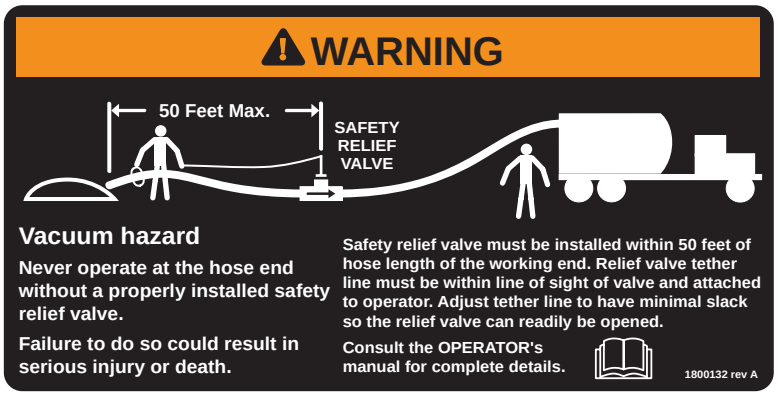
1. Prepare the unit and work site for safe operation following all site specific and recommended procedures.
2. With the blower disengaged, prepare the unit for nitrogen purge:
   a. Install and latch down the domed discharge silencer cap.
   b. Air operated vacuum relief valve - remove the debris screen and cap the port.
   c. Attach return hoses to the discharge silencer output ports and the catalyst vessel.
   d. Set the low vacuum closed loop valve for LOW vacuum mode. This valve changes the system from a normal high vacuum air injection cooled system, to a Kunkle valve controlled low vacuum system for catalyst work.

      Low vacuum operation requires that the air operated vacuum relief be capped. The low vacuum closed loop valve opens the butterfly valve to the Kunkle valves and closes the butterfly valve at the air injection silencer inlet.

      Operation in high vacuum requires that the air operated vacuum relief be uncapped and the debris screen be installed.
   e. Attach the nitrogen source to the inlet at the manifold.
   f. Set the front mounted compressor valve to nitrogen purge.
3. Complete setting up the vacuum inlet hose to the cyclone.
4. Install a safety relief valve near the vacuum hose end between the vessel and unit.

The unit is now ready for the blower to be engaged and operations to begin.

The amount of nitrogen required should be adjusted with the manifold valves.



Shutting Down

When all work is completed with the blower shutdown:

1. Unlatch the domed discharge silencer cap and store it.
2. Air operated vacuum relief valve - remove the cap and reattach the debris screen.
3. Remove the return hoses to the discharge silencer output ports and cap the ports
4. Set the low vacuum closed loop valve for HIGH vacuum mode.
5. Remove the nitrogen source at the manifold.
6. Set the front mounted compressor valve back to air compressor.

The unit is now ready for a final cleaning and normal operations.

Replace filter element when indicator goes into the red zone.

DANGER

High pressure can cause explosion, severe injury or death.

- **Relieve tank pressure before opening covers or unlocking rear door.**
- **This truck is equipped with a tank pressurization system. Untrained operators must not operate.**
- **Objects exiting the discharge hose can reach dangerous velocities. Direct hose away from persons or property.**
- **Keep all off-load air pressure valves closed except when off-loading material.**
- **Verify relief valves are clean and working to avoid over pressurization of the debris body.**

NOTICE

Machine Can Be Damaged

- **Relieve system pressure before blower is shut down to avoid material backing up into blower.**
- **Relieve pressure and uncouple the air hose before opening the rear door to avoid damaging the hose, fittings, etc.**
- **Fully open rear door before raising the debris body to dump to avoid the discharge port being damaged by hitting the ground.**

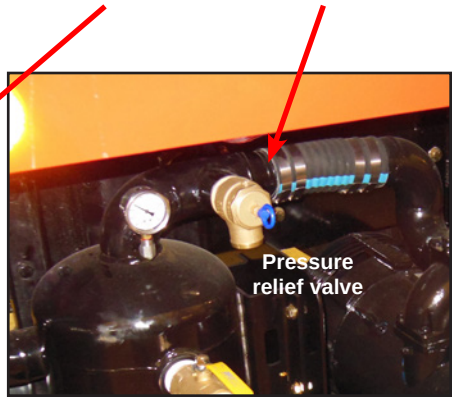
Emergency Shut Down Procedure

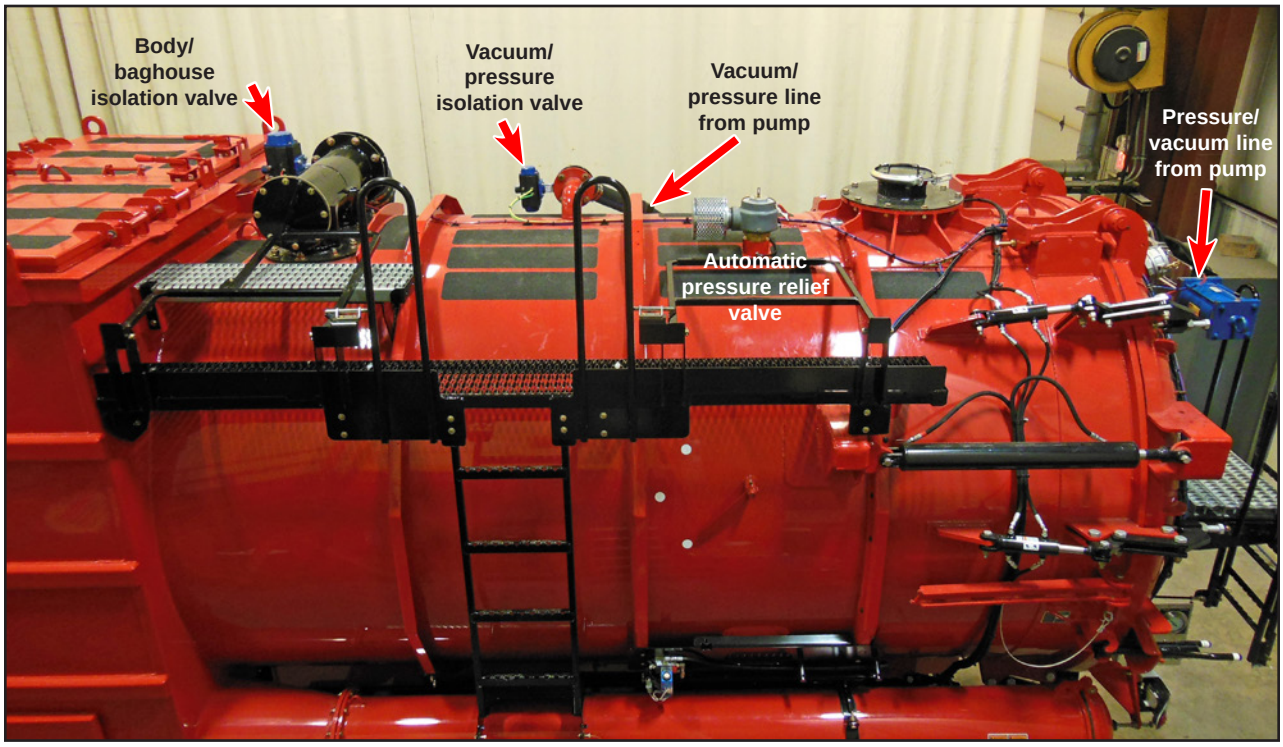
When the system needs to be shutdown immediately, use the following steps to prevent material back flow and other problems.

1. Open the pressure relief valve and relieve all pressure in the system
2. In the cab, disengage the blower and PTO.

In the event of this type of shutdown, it is recommended that all relief valves be checked to ensure that they are in proper working order.

Pressure Relief Settings		
	Debris body Kunkle valve	**Pump valve**
Full rear door	14.5psi	13.5psi



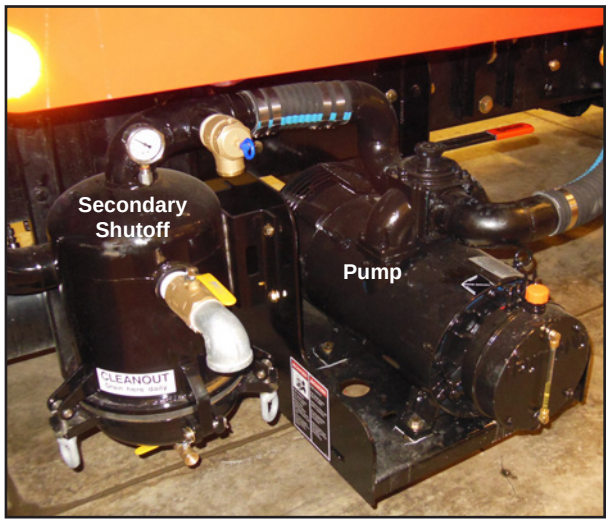


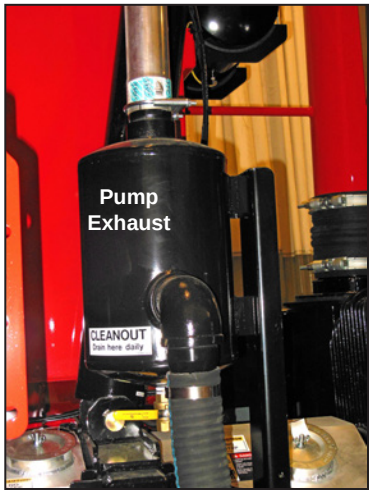
The Fruitland pump Off-load option allows for the loading and unloading of liquids without having to dump the debris body. The material is moved by using the airflow from the pump to pressurize the tank and eject out the rear door port. The system can also be used for vacuum loading of liquids.

The maximum system pressure is limited by the automatic pressure relief valve on top of the debris body. During operation the debris body is isolated with set of valves at the loading port, boom (if equipped) and outlets to the baghouses.

Note: Hydraulic door locks will not function while there is positive pressure in the debris body.

Various sizes of the Fruitland pump are offered. Appearance and operation is similar through the size range.

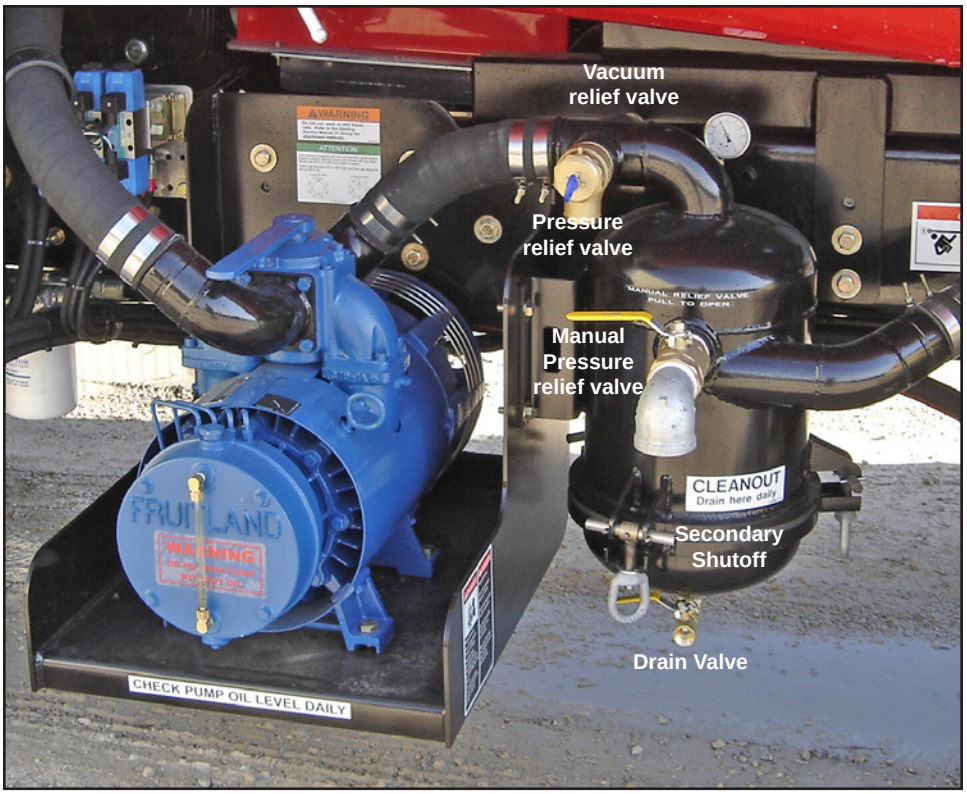


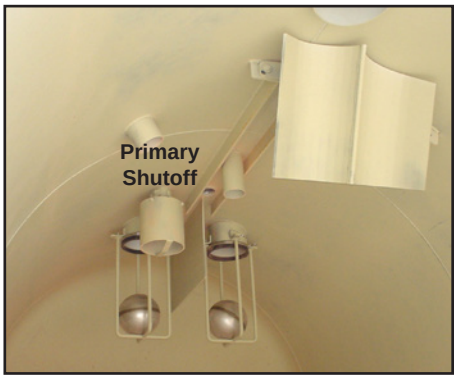


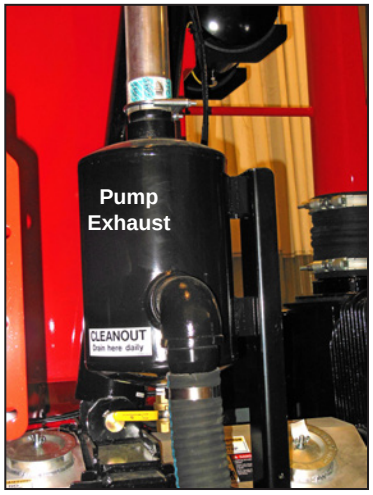
The pump system is equipped with two float ball shutoffs, one secondary near the pump and one primary inside the debris body. The primary shutoff indicates a full debris body. The secondary shutoff protects the pump from liquid getting past the primary shutoff. If liquid is visible in the sight glass then the system is full and should be shut down and emptied.

Inspect and clean the secondary float ball, seal and chamber before and after each use. Inspect and clean the primary float ball and seal while doing the scheduled inspection of the main float balls for the debris body.

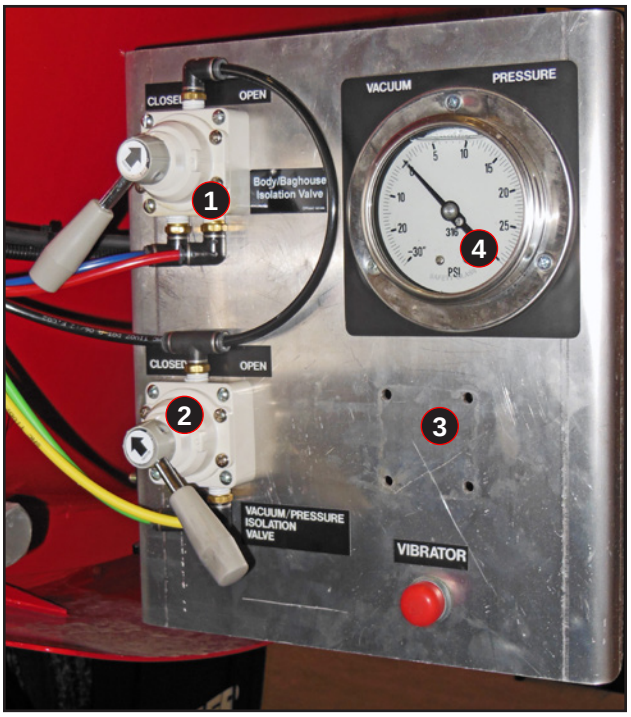
The secondary shutoff and pump exhaust need to be drained daily.







These controls are located on the control panel located at the rear of the unit.



1. **Body/baghouse isolation valve -** Valve isolates the debris body from the cyclones and baghouse.
2. **Vacuum/pressure isolation valve -** opens the vacuum/pressure line from the Fruitland pump to the debris body.
3. **Boom isolation valve -** Boom valve controls the isolation valve at the boom turret (if equipped).
4. **Vacuum/Pressure gauge -** displays the debris body vacuum/pressure.

Fruitland Pump Off-Load - Pump

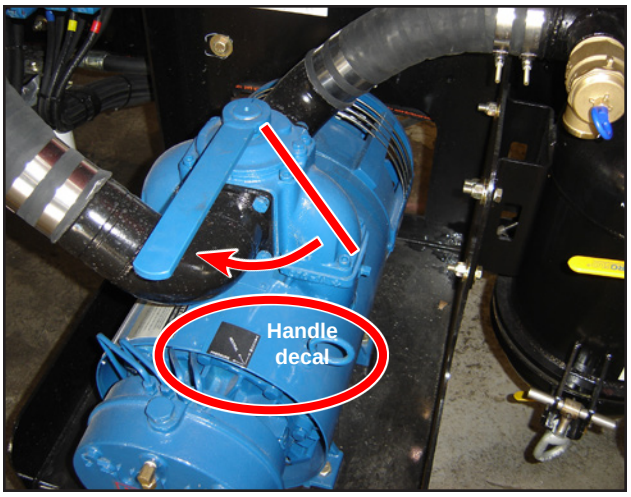
The pump is located on the passenger side of the unit. It is used to pressurize the body or to create vacuum to move liquids. The pump is driven hydraulically from the chassis PTO.

Refer to the pump handle decal for correct operation. Pump operation varies with the size of the Fruitland pump due to hose routing. Neutral is always at the halfway position.

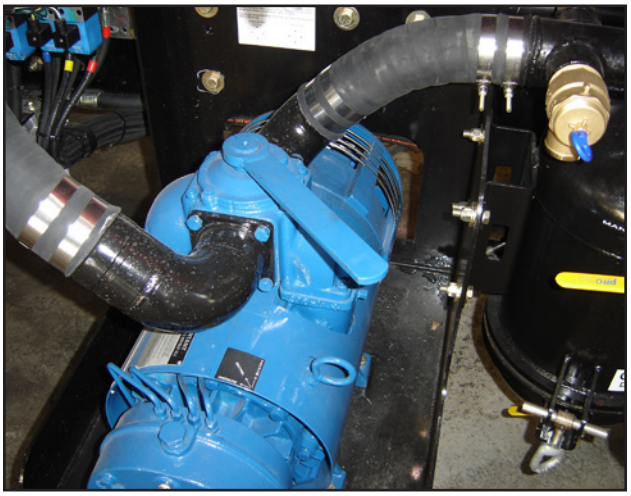
Note: the pump handle may be warm from running. Gloves are recommended.

Maintenance

Check oil level daily. Refer to the pump manual from the manufacturer for routine service.

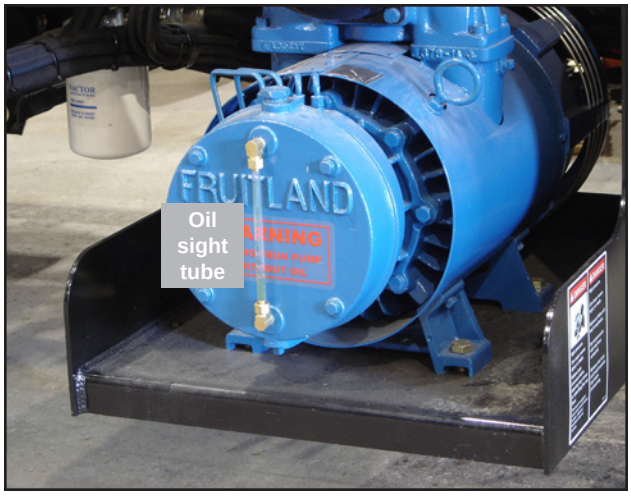


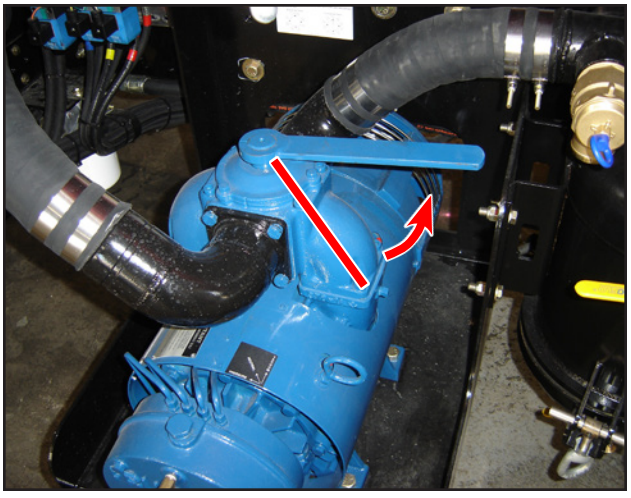
Pressure



Neutral

Vacuum





The following procedures should be followed during off-loading of liquid materials.

Rear of Truck

Secure discharge hose to the outlet port.

Inside Truck Cab

1. Engage hydraulics. See the main manual for the proper engagement procedures.

Pump

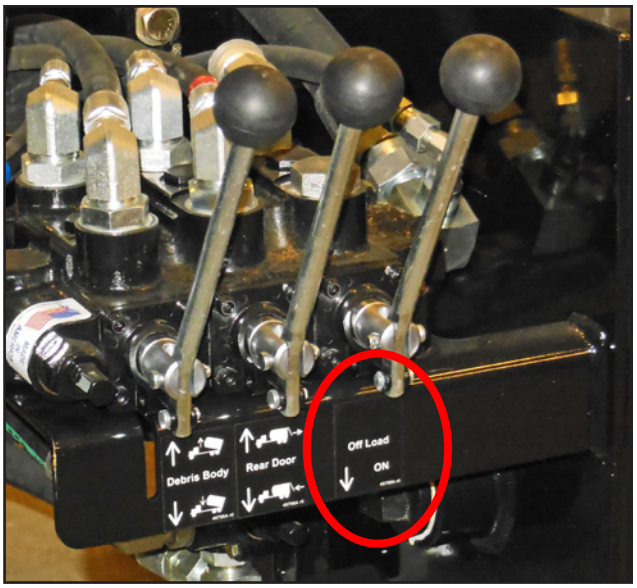
2. Position pump handle to desired function

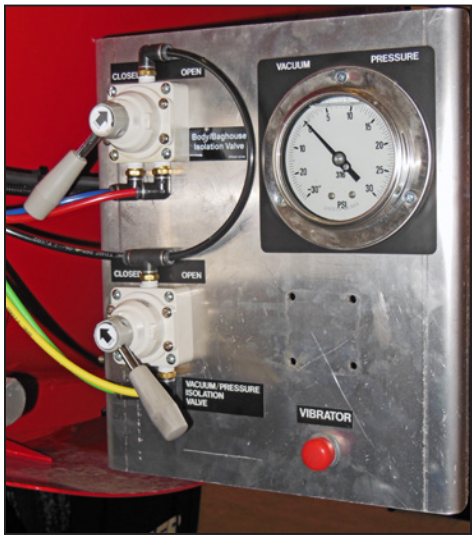
Rear of Truck

3. Close all isolation valves.
4. After pressure has built up open rear door port valve.

Master Control Panel

5. Set the master switch to ON.
6. Set vacuum to Off
7. Hydraulic Control Valves - pull out on OFF LOAD lever to activate pump.
8. Idle truck throttle up to 1650 RPM maximum.





Rear Control Panel

DANGER

High pressure can cause explosion, severe injury or death.

- **Relieve tank pressure before opening covers or unlocking rear door.**
- **This truck is equipped with a tank pressurization system. Untrained operators must not operate.**
- **Objects exiting the discharge hose can reach dangerous velocities. Direct hose away from persons or property.**
- **Keep all off-load air pressure valves closed except when off-loading material.**
- **Verify relief valves are clean and working to avoid over pressurization of the debris body.**

Before shutting down, allow the hose to be blown free of all material, and then follow these steps:

Rear of the Truck

1. Allow air pressure to drain from the tank through the open rear door valve. If vacuuming close the rear door valve and open the system vacuum reliefs.
2. Open all isolation valves
3. Turn pump handle to neutral position. This allows pressure to also vent back through the pump system.

   Note: the pump handle may be warm from running. Gloves are recommended.

Master Control Panel

4. Reduce engine RPM's to Idle.
5. Hydraulic Control Valves - push in on OFF LOAD lever to stop pump.
6. Set master switch to OFF.

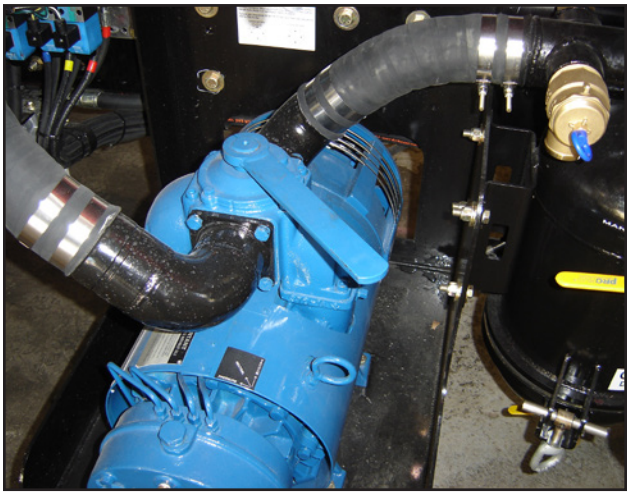
Inside Truck Cab

7. Disengage hydraulics. See the main manual for the proper engagement procedures.

Rear of the Truck

8. Close the rear door valve.

Move pump lever to neutral position to relieve pressure.



Neutral

⚠ DANGER

High pressure can cause explosion, severe injury or death.

- **Relieve tank pressure before opening covers or unlocking rear door.**
- **This truck is equipped with a tank pressurization system. Untrained operators must not operate.**
- **Objects exiting the discharge hose can reach dangerous velocities. Direct hose away from persons or property.**
- **Keep all off-load air pressure valves closed except when off-loading material.**
- **Verify relief valves are clean and working to avoid over pressurization of the debris body.**

DANGER

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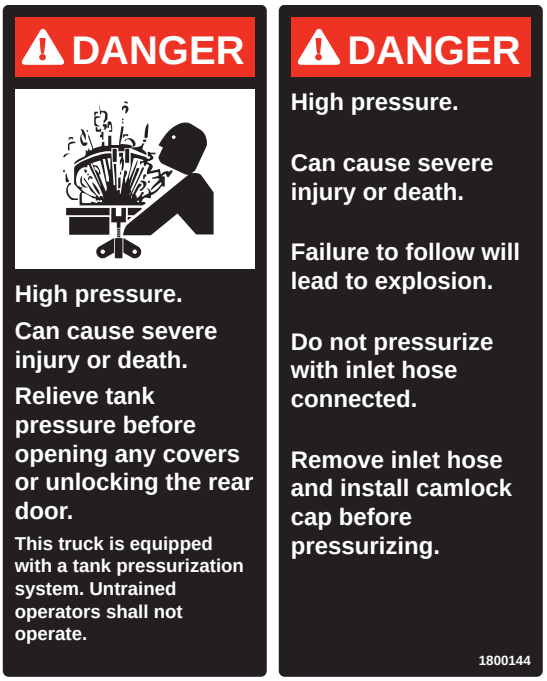


Emergency Shut Down Procedure

When the system needs to be shutdown immediately, use the following steps to prevent material back flow and other problems.

1. Open the pressure relief valve and relieve all pressure in the system
2. In the cab, disengage the blower and PTO.

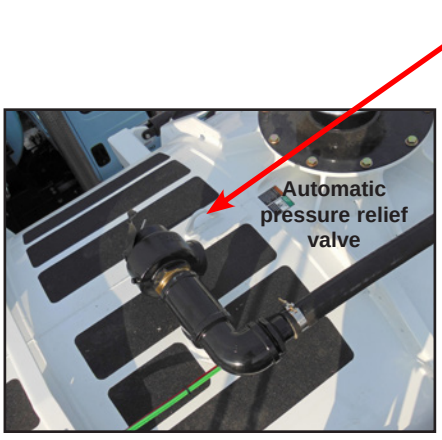
In the event of this type of shutdown, it is recommended that all relief valves be checked to ensure that they are in proper working order.

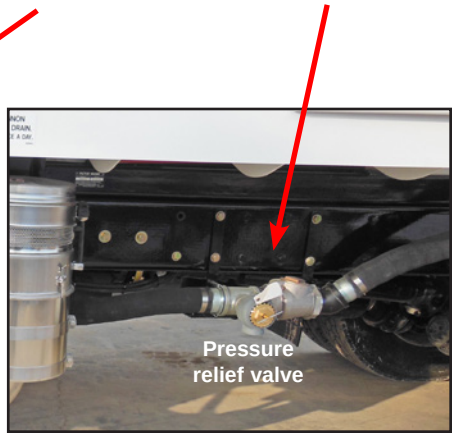
NOTICE

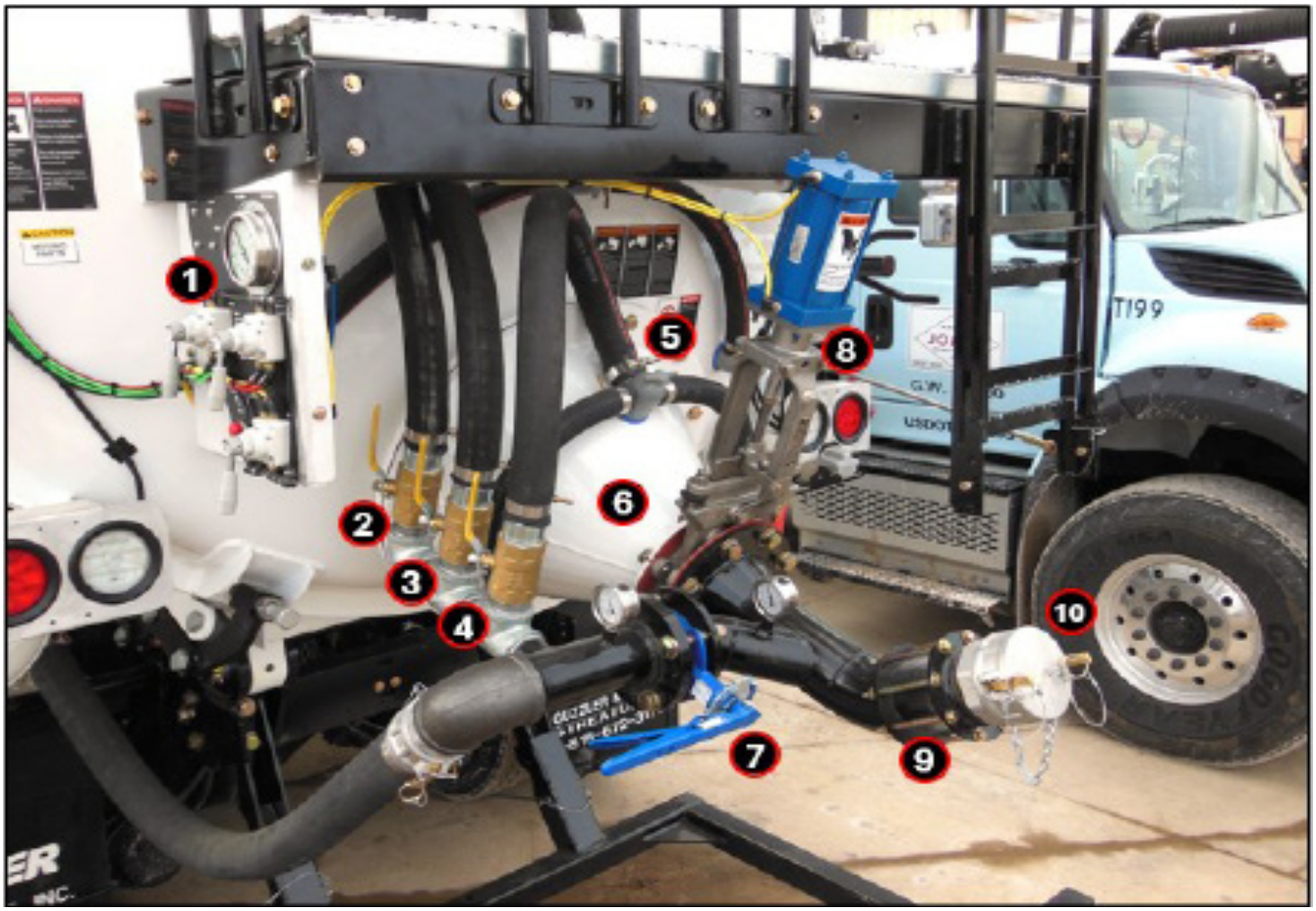
Machine Can Be Damaged

- **Relieve system pressure before blower is shut down to avoid material backing up into blower.**
- **Relieve pressure and uncouple the air hose before opening the rear door to avoid damaging the hose, fittings, etc.**
- **Fully open rear door before raising the debris body to dump to avoid the discharge port being damaged by hitting the ground.**

Pressure Relief Settings		
	Debris body Kunkle valve	**Pump valve**
Full rear door	14.5psi	13.5psi







LEGEND

1 – Valve Control Panel

2 – Debris Body Pressure Line Ball Valve

3 – Rear Door Fluidizer Ball Valve

4 – Cone Fluidizer Ball Valve

5 – Cone Fluidizer Hoses

6 – Dense Phase Off-Load Cone

7 – Off-Load Air Valve

8 – Off-Load Knife Valve

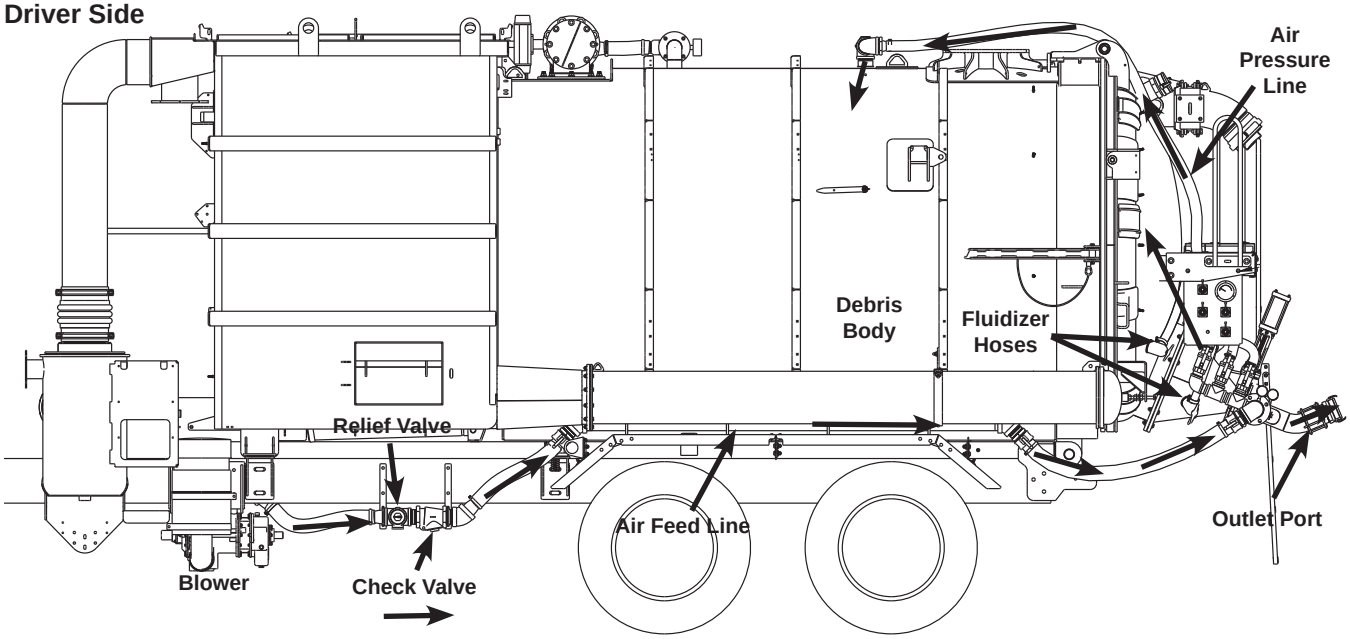
9 – Sight Glass

10 – Discharge Port

Dense Phase Off-load option allows for the unloading of materials without having to dump the debris body. The material is moved by using the airflow from the Cyclo-blower to pressurize the tank, fluidize the material, and convey it with the aid of a fluidizer cone. The cone allows the operator to fine tune the air flow to achieve the best conveying rates.

Note: The dense-phase off-load system is limited in the debris size it can move due to the 4" discharge line and amount of airflow and pressure available. Consult factory for off-loading debris greater than 1/2" to 3/4"

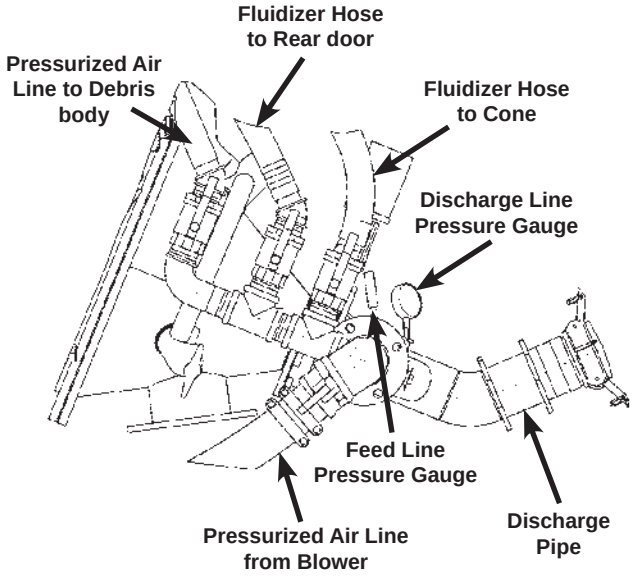
Side View from Driver Side



The debris body is pressurized to allow for the material to be pushed out of the back of the rear door. The cyclo blower supplies pressurized air to the top of the debris body. To allow the debris body to build up pressure, the tank must be sealed at both the inlet port and the port between the tank and the cyclone. Air actuated valves control the opening and closing of the ports. Additionally, the pressure relief valve must be closed to completely seal the tank. When the tank reaches a minimum of 10 psi, off-loading may begin. The off-load valve is opened and adjusted to maintain minimum pressure of 10 psi. Pressure should not exceed 14.5 psi. If the air pressure exceeds 14.5 psi, the pressure relief valve will open.

To assist with the off-loading, and to prevent the material from clogging at the point of discharge, several fluidizers are located around the rear door and the cone. The fluidizers, keep the material fluffed up and prevents it from compacting which would cause blockage. Additionally, pressurized air is used to prevent blockage in the off-load port. The off-load air valve is manually opened and closed during the off-loading process.

Detail of Cone



Dense Phase Off-Load - Overview

The system operates through the use of several valves. There are eight valves with four of them operated manually and the other four air operated. The controls for the air operated valves are located on a control panel located on the back of the debris body on the driver side. The manual valves include:

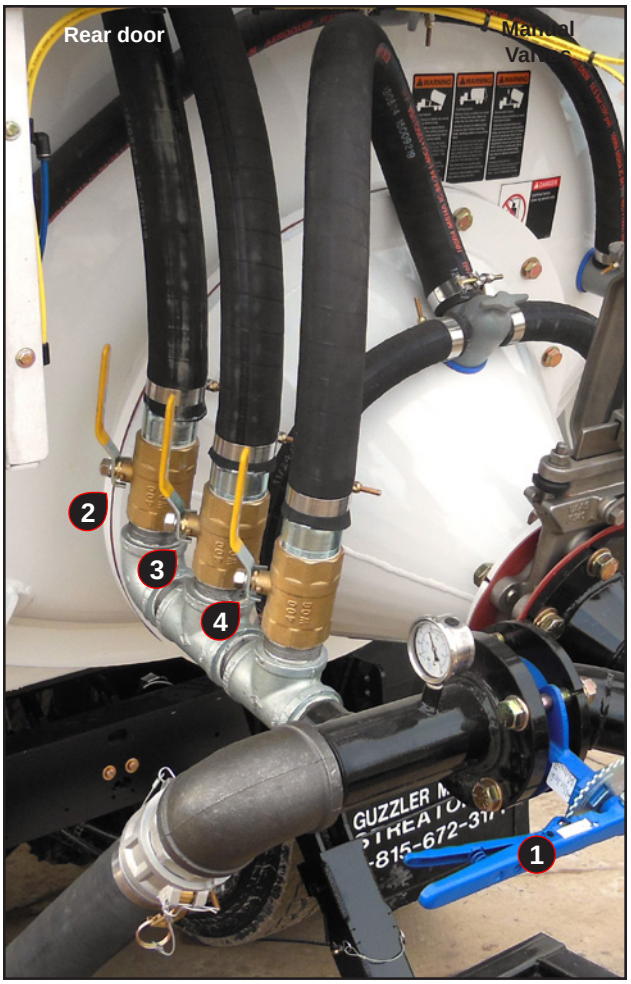
1. **Off–Load Butterfly Air Valve -** provides air flow to the conveying line. This helps keep the line from becoming plugged. This valve is operated by the blue handle lever.

Note: The next three valves are operated by yellow levers mounted on the hoses on the driver side.

2. **Debris body Pressure Line Ball Valve -** provides pressure to the debris body. Pressure is supplied to the top of the tank through a hose extending from the cone. The increased pressure in the tank helps “push” certain materials out of the tank.

3. **Rear door Fluidizer Valves -** provides air to the rear door fluidizers. This helps fluidize the material and aids in tank clean out. There are three of these located in a semi-circle on the rear door.

4. **Cone Fluidizer Valves -** provides air to the cone fluidizers. This helps fluidize the material and aids in material flow from the tank. There are three of these located around the perimeter of the cone.



The air operated valves are located on the control panel located on the back of the unit on the driver side. These valves are:

Off–load Valve - controls the material flow rate from the cone. This valve is operated by the lever on the control panel.

Isolation Valve - isolates the debris body from the cyclone. This valve is operated by the lever on the control panel.

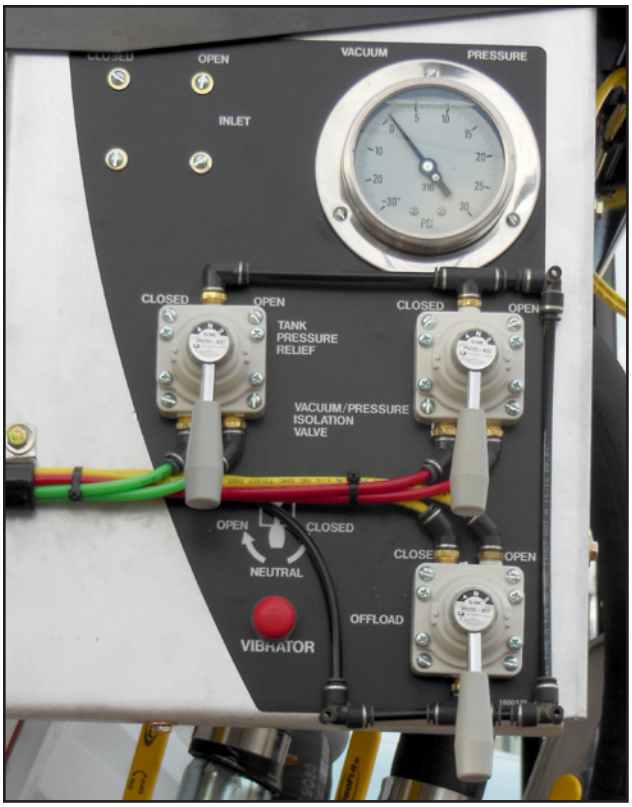
Inlet Valve - closes the inlet pipe on the back of the debris body. This valve is operated by the lever on the control panel.

Pressure Relief Valve - relieves air pressure in the debris body. This valve is located on the top of the debris body and is operated by the lever on the control panel.

Vibrator Button - is the red push button located in the lower left of the valve control panel.

Note: This button should be used intermittently and not to exceed 15 seconds.

Tank Pressure Gauge is located in the upper right hand corner of the valve control panel. This gauge monitors the amount of pressure in the debris body. If the tank reaches 14 psi, the automatic relief valve will open to relieve pressure. If psi reaches 14 psi and the valve does not open, shut the unit down and correct the problem.

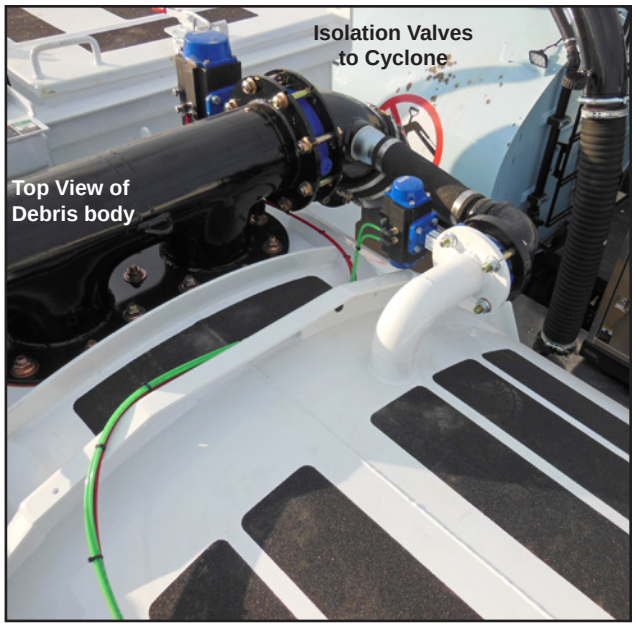


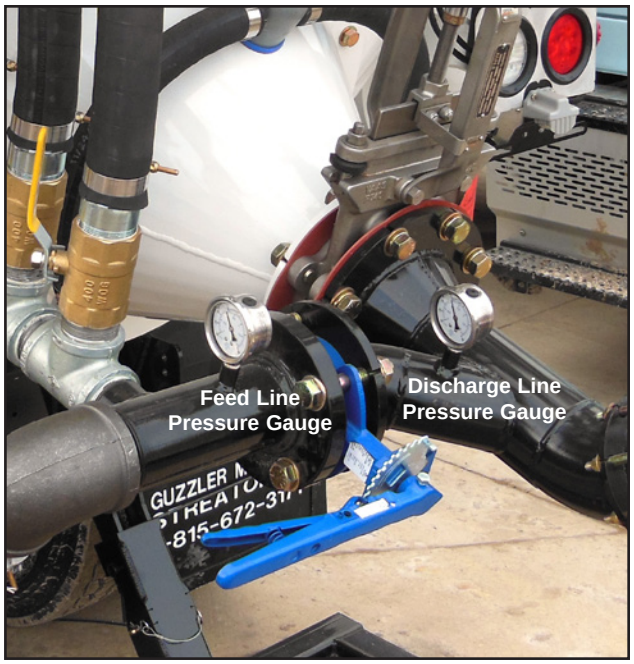
Additionally, there are two other pressure gauges that allow for monitoring of the off-loading, they include:

Feed Line Pressure Gauge - measures the amount of air pressure in the fluidizer nozzle.

Discharge Line Pressure Gauge - measures the amount of pressure in the line. Normally, the pressure should be 10 psi.

There is a sight glass to monitor the flow of material The sight glass is located on the end of the system.





The system uses a cyclo-blower normally located on the driver side of the unit. The cyclo-blower pressurizes the body and to create vacuum to move the material. The blower is controlled from inside the cab.

Maintenance

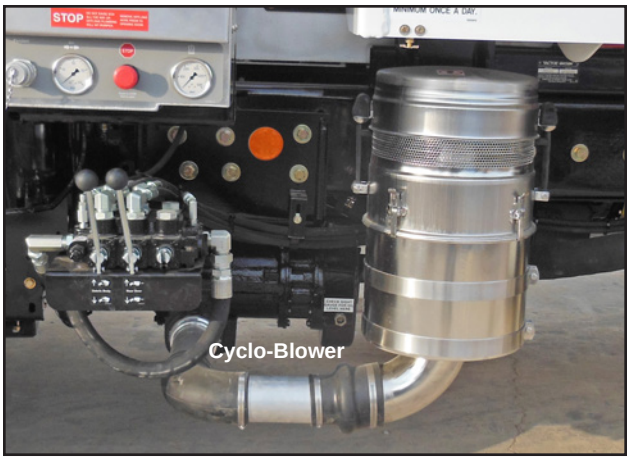
The cyclo-blower should be properly maintained at all times. Proper oil level in the Cyclo-blower is checked through the site glass. Refer to the cyclo-blower manufacturer manual for the proper oil usage and frequency of oil changes, and perform the following:

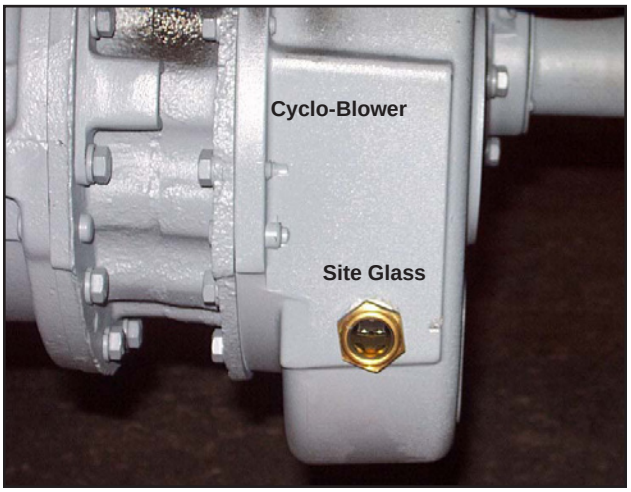
- Check oil level daily
- Check air filter daily
- Change oil every 100 operating hours or more if operating in dusty or moist conditions
- Flush gear case with clean solvent every 4 changes.

Lubrication

Refer to the cyclo-blower manufacturer manual for recommended lubricants and grease for the inlet end.

To grease both the zerk fittings and the pressure relief fitting, first clean each of all dirt and material then fill the bearing cavity with grease.





Troubleshooting

- Correct alignment of shafts. -Blower turns freely.
- Air filter and fittings tight. -Air filter serviced.
- All bolts tight. -Proper oil level in gear case.
- Check valve okay. -Relief valve okay.
- Fusible plug okay.

Trouble Shooting Checklist:

Blower failure can be caused by the following:

1. Operation at Higher than maximum rated pressure.
2. Operation at below minimum allowable speed.
3. Insufficient lubrication.
4. Product carry-over into blower .

Blower problem checklist:

Pressure related problems:

- Determine maximum allowable discharge pressure for altitude involved.
- Check actual blower discharge pressure as close to blower discharge port as possible with an accurate gauge.
- Check inlet filter for excessive pressure loss due to restricted or plugged filter element.
- Check line pressure relief valve for proper operation at no more than maximum allowable pressure.

Speed related problems:

- Determine actual blower speed. A hand tachometer can be used opposite drive end.
- Check for Minimum allowable blower speed for pressure being produced.

Insufficient lubrication:

- Check oil sump for proper oil grade, viscosity at existing ambient temperature and proper oil level. Level should be maintained at 112 sight glass.
- Check grease lubricated bearings for proper type and amount of bearing grease.

Non-rotatable blower:

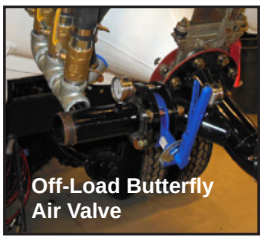
- Remove inlet filter. Check interior of blower for possible back flow of product being conveyed. If product is present, in line check valve is probably faulty and should be repaired or replaced.
- Check interior for possible rust contamination. Check for possible rotor contact due to loss of clearances caused by excessive temperature, related to overpressure of low speed

Off-Load Operation

The following procedures should be followed during off-loading of solid materials.

Rear of Truck

1. Secure discharge hose to the outlet port.
2. Disconnect the end of the air feed line from the rear storage connection located on the rear bumper.
3. Reconnect air feed line to the connection near the off-load air valve on the rear door cone plumbing.
4. Place all of the valves (inlet valve, pressure relief valve, isolation valve & off-load valve) on the valve control panel to the closed position.
5. Ensure both the rear door and cone fluidizer ball valves are in the closed position.
6. Close debris body pressure line ball valve.
7. Open off-load butterfly air valve.



Off-Load Butterfly Air Valve

Valve Positioning

	Valve	Function	Valve Position During Loading	Valve Position for Shut-ting Down/Loading	Valve Position During Off-Loading
Valve Control Panel	Vacuum Pressure Isolation Valve & Optional Boom Isolation Valve	Closes the port between debris body & cyclone	Open	Open	Closed
	Inlet Valve (Boom equipped units)	Closes the inlet port on the back of debris body	Open - for rear inlet Closed - for optional boom	Open	Closed
	Tank Pressure Relief Valve	Relieves air pressure in the debris body	Closed	Open	Closed
	Off-load-Valve	Controls the rate of material being discharged	Closed	Closed	Adjust as needed
Manual Valves	Debris body Pressure Line Ball Valve	Provides air pressure to the debris body	Closed	Closed	Open
	Cone Fluidizer Valves	Fluffs up material in the off-loading cone	Closed	Closed	Adjust as needed
	Rear door Fluidizer Valves	Fluffs up material near the rear door	Closed	Closed	Adjust as needed
	Off-Load Butterfly Air Valve	Provides air flow to the conveying line	Closed	Closed	Adjust as needed

Inside Truck Cab

1. Slowly depress clutch pedal.
2. Engage hydraulics. See the section entitled “Hydraulics” for the proper engagement procedures.
3. Engage cyclo-blower by flipping the switch on the truck instrumentation panel.
4. Slowly release the clutch pedal.

Master Control Panel

1. Turn master switch to the ON position.
2. Idle truck throttle up to 1100 RPM.

Rear of Truck

1. Open debris body air pressure feed line ball valve.
2. Close the off-load butterfly air valve.
3. Wait for the tank to pressurize to a minimum of 10 psi.
4. On valve control panel, gradually open off-load valve to regulate the flow of material.

Note: Preceding photograph shows the off-load valve in the closed position. During off-loading, it is adjusted between the closed and open position in order to control the flow of material.

5. Monitor material flow through the sight glass.
6. Gradually open rear door and cone fluidizer ball valves to aid in the removal of the bridged material from the rear door and the cone area.

Note: While material is off-loading it is recommended to raise the tank to aid in the material flow to the off-load cone area in the debris body. To also aid in the off-loading of material a vibrator switch is located on the control panel. Use the vibrator intermittently and for short periods of time.

Note: The amount the valves will need to be opened will depend on the material being moved and how much is in the tank. If material is not adequately being moved to the cone, the debris body may have to be raised and/or the optional vibrator used. Additionally, when the tank is almost empty, the remaining material can be moved by allowing pressure to build up in the tank and then releasing it slowly by opening and closing the off-load valve in small amounts.

DANGER

High pressure can cause explosion, severe injury or death.

- **Relieve tank pressure before opening covers or unlocking rear door.**
- **This truck is equipped with a tank pressurization system. Untrained operators must not operate.**
- **Objects exiting the discharge hose can reach dangerous velocities. Direct hose away from persons or property.**
- **Keep all off-load air pressure valves closed except when off-loading material.**
- **Verify relief valves are clean and working to avoid over pressurization of the debris body.**

Emergency Shut Down Procedure

When the system needs to be shutdown immediately, use the following steps to prevent material back flow and other problems.

1. Open the pressure relief valve and relieve all pressure in the system
2. In the cab, disengage the clutch and move off-load shifter to the out position.

In the event of this type of shutdown, it is recommended that all relief valves be checked to ensure that they are in proper working order. If the blower is accidentally shut down with any pressure in the system, the swing check valve located just rearward of the Cyclo-blower and Kunkle relief should be cleaned to ensure free movement of the flap.

Plugged System

If a clog in the off-load line occurs gradually close the opening in the off-load valve and gradually open the off-load air butterfly valve to increase the airflow through the off-load plumbing.

Shut Down of Dense Phase Off-load System:

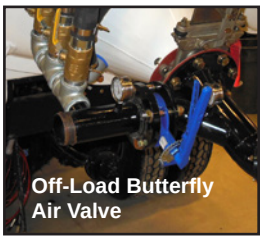
Before shutting down, allow the hose to be blown free of all material, and then follow these steps:

Rear of the Truck

1. Open off-load air valve to remove the bulk of the remaining material in the off-load hose.
2. Close debris body pressure line ball valve.
3. Close rear door and cone fluidizer ball valves.
4. Allow air pressure to drain from the tank through the open off-load valve.
5. Once air pressure has reached 10 psi, open the pressure relief valve on the valve control panel.

Master Control Panel

1. Reduce engine RPM's to Idle.
2. Turn master switch to the OFF position.
3. Lower debris body to travel position.


Off-Load Butterfly Air Valve

Valve Positioning

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	Rear door Fluidizer Valves	Fluffs up material near the rear door	Closed	Closed	Adjust as needed
	Off-Load Butterfly Air Valve	Provides air flow to the conveying line	Closed	Closed	Adjust as needed

Inside Truck Cab

1. Slowly depress clutch pedal.
2. Disengage hydraulics.
3. Disengage cyclo-blower turning the switch off.
4. Slowly release the clutch pedal.

Rear of the Truck

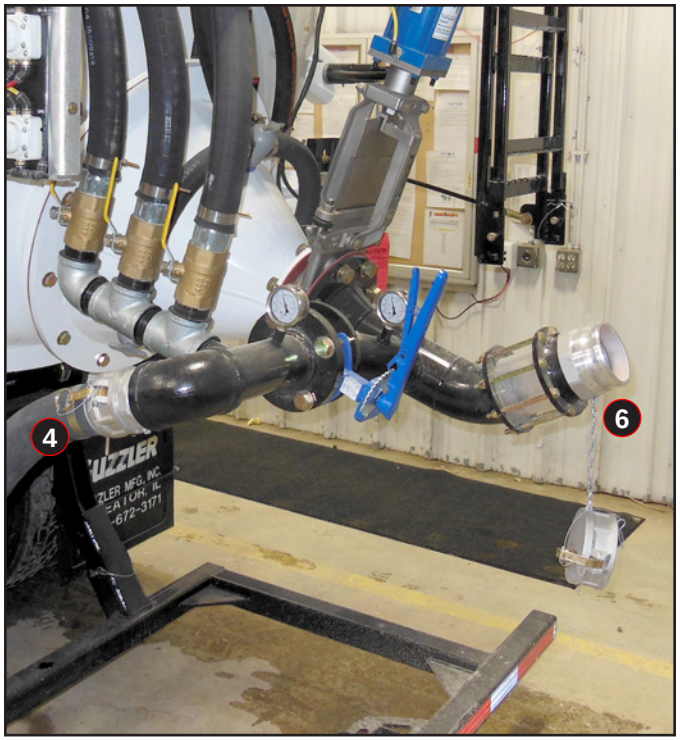
1. Close the off-load butterfly air valve.
2. Ensure pressure relief valve, isolation valve and inlet valve are in the open position.

   Note: The pressure relief valve must be in the open position when the system is shut down and during loading operations.
3. Close the off-load valve.

   Note: Hydraulic door locks will not function until this has been done.
4. Disconnect the female air feed line from the rear door cone plumbing to avoid hose damage.
5. Reconnect to the storage position near the rear bumper.
6. Disconnect discharge hose from the outlet port.

   Note: The drive line must be fully stopped before disengaging the Cyclo-blower.

   Note: Disconnect the two couplings before opening rear door.



NOTICE

Rear Door and Hoses Can Be Damaged

To avoid damage:

- **Remove the air and offload hoses before opening the rear door.**
- **Do NOT raise debris body all the way up with rear door closed.**
- **Fully open rear door before fully raising the debris body.**

508654 r0

Periodic cleaning of the piping, off-load cone, and tank is necessary to ensure optimum performance of the unit. It is recommended that these items are cleaned after each use. This will keep material from building up in the lines and cone which can impact on performance.

Periodic maintenance or rebuilding of the relief valves will be necessary in order to ensure that the tank is not over pressurized. If the relief valves are not functioning properly, removal and cleaning will usually solve the problem. If the valves still do not function properly, they must be rebuilt or replaced. If the relief valves are used during off-loading, they must be inspected and cleaned before off-loading again.

Periodic maintenance or rebuilding of the swing check valve will be necessary to ensure that material does not back up into the blower and cause blower failure.

Note: Failure to maintain the swing check valve will result in material back up into the blower and blower failure.

⚠ DANGER

High pressure can cause explosion, severe injury or death.

- **Relieve tank pressure before opening covers or unlocking rear door.**
- **This truck is equipped with a tank pressurization system. Untrained operators must not operate.**
- **Objects exiting the discharge hose can reach dangerous velocities. Direct hose away from persons or property.**
- **Keep all off-load air pressure valves closed except when off-loading material.**
- **Verify relief valves are clean and working to avoid over pressurization of the debris body.**

Dense Phase Off-Load - Vibrator

The purpose of the vibrator is to assist in the dumping of debris by reducing the friction between the debris and the debris body. When the vibrator is used, friction is reduced because the vibrational forces generated by the vibrator actually fluidize the debris. The fluidized (liquid like) debris is then more conducive to dumping.

For the same reasons the vibrator helps promote the dumping of material it can also prevent material from dumping if used improperly. Damage to the vibrator and to the Guzzler can result when it is used improperly. Please adhere to the following guidelines when using your vibrator:

1. Never turn the vibrator on while the body is in the down position. Fluidizing material that has no place to go results in further compaction, making the material more difficult to dump once the rear door is opened.
2. Never use the vibrator to “settle” debris that has been vacuumed into the body in an effort to increase the payload. This will result in dumping difficulties.
3. Never run the vibrator for more than 30 seconds at a time and always allow a 60 second “cooling off’ period between each operation cycle.
4. Always turn off as much electrical equipment as can safely be done. This will ensure the vibrator has ample electrical power.
5. Always attempt to dislodge the debris with short bursts of the vibrator (5 to 10 seconds) before resorting to the full 30 second cycle.
6. Always cease vibrator operation if the vibrator has been cycled four times (30 seconds “on”, 60 seconds “off”) without success. At that point an alternative method for emptying the debris compartment must be employed.

Debris Body Heater

The debris body heater is diesel powered from the chassis fuel tank. It reduces the risk of material in the debris body freezing. To activate use the switch located at the master control panel. The master switch mus t be on.

Before use verify the antifreeze tank is full and the system has been bleed. Ensure the antifreeze valve is open. At 70° F ambient the cold fill level will be about halfway in the sight tube.

Refer to the manufacturer's manual for details.

Heater system bleeder valve - one located on each side of the debris body by the rear door.

Basic operation from the manufacturer's manual for reference:

4 Operation and function

Operating instructions

The heater is operated by a control unit.
The control unit is accompanied by detailed operating instructions which you will receive from the company installing the heater.

Initial commissioning

The following points are to be checked by the company installing the heater during initial commissioning.

- After installation of the heater, the coolant circuit and the whole fuel supply system must be vented carefully. Comply with the instructions issued by the vehicle manufacturer.
- Open the coolant circuit before the trial run (set the temperature control to "WARM").
- During the trial run of the heater, check all water and fuel connections for leaks and firm fitting.
- If the heater shows a fault during operation, find and eliminate the cause of the fault using a diagnosis unit (Contact JE service partner).

Important instructions for operation

Safety checks before the start

After a longer interval in operations (after the summer months) the fuse must be put in position and / or the heater connected up to the battery. Check that all parts fit firmly (tighten screws where necessary).
Check the fuel system visually for any leaks.

Before switching on

Before switching on or pre-programming the heater, adjust the heating control in the vehicle to "WARM" (maximum setting) and the fan to "SLOW" (low power consumption).
In vehicles with automatic heating, adjust the heating control to "MAX" and open the heating vents before switching the ignition off.

Temperature drop (optional)

The control stages are reached earlier and the heater's control action is adjusted to the lower heat requirement. It is possible to lower the temperature by connecting a plus signal to the 12-pin connector B2, PIN C3, if necessary by integrating an ON-OFF switch (see circuit diagrams page 32 and 34).
The switch-on temperature (55 °C) and switch-off temperature (40 °C) of the cooling water for switching on or off the vehicle fan are lowered by 10 °C.

Heating mode at high altitudes – up to 3500 m asl

The combustion behaviour of the heater changes with increasing altitude, due to the lower air density.
The heater has an automatic altitude detection device which it uses to automatically compensate for the change in air density, i.e. the combustion ratio between fuel and air is adapted to the ambient conditions by reducing the fuel quantity.

Please note!

- The usual switching limit for altitude detection lies between 1000 m asl and 2000 m asl and solely depends on the local climatic conditions.
- The maximum heating output of the Hydronic M10 / M12 in "Altitude Mode" is 8.5 kW.
- The Hydronic M8 Biodiesel does not have an altitude detection device. Unrestricted heating mode is possible up to 1500 m asl.
- Heaters suitable for high altitudes have "H Kit" marked on the side of the nameplate.

Description of functions

Switching on

On being switched on, the switch-on check is displayed in the control unit. The heater starts, whereby the water pump and the combustion air blower start up first.
The glow phase of the glow pencils begins simultaneously with distribution of the combustion air.
The metering pump starts fuel feed somewhat delayed.
The glow pencils are switched off if a stable flame has formed in the combustion chamber.

Heating mode

After starting, the heater runs with "POWER" stage until the water temperature exceeds the "POWER" / "HIGH" changeover threshold.
Hydronic M8 Biodiesel / M10
Then, depending on the heat requirement, the heater switches to the "HIGH – MEDIUM – LOW – OFF" stages.
Hydronic M12
Then, depending on the heat requirement, the heater switches to the "HIGH – MEDIUM 1 / MEDIUM 2 / MEDIUM 3 – LOW – OFF" stages.
If the heating requirement in the "LOW" stage is so small that the cooling water temperature reaches 86 °C, the heater switches from "LOW" to "OFF".
An after-run of approx. 180 seconds follows.
The water pump remains active until the controlled start.
If the cooling water has cooled to approx. 72 °C, the Hydronic M8 / M10 heater starts in "MEDIUM" stage, the Hydronic M12 heater starts in "MEDIUM 1" stage.
If the cooling water temperature reaches 55 °C, the vehicle fan switches on; if the temperature drops to 40 °C, the vehicle fan switches back off again.

4 Operation and function

Switching off

After switching off, the heater briefly switches to “LOW” stage to reduce emissions and smoke formation.
This process can take up to 40 seconds maximum if the fuel quantity is constantly reduced.
Once this process has finished the heater starts the after-run for 180 seconds.
During the after-run both glow plugs are switched on alternately.

Please note!

In independent heater mode (vehicle engine and heater are switched on), always ensure that the heater is completely switched off before entering a petrol station area.

Control and safety devices

The heater is equipped with the following control and safety devices:

- If the heater does not ignite within 74 seconds after starting the fuel pump, the start is repeated. If the heater still does not ignite after another 65 seconds, the heater is switched off.*
  After an unacceptable number of failed start attempts, the controller is locked.**
- If the flame goes off by itself during operation, the heater is restarted. If the heater does not ignite within 74 seconds after the fuel pump has started again, the heater is switched off.*
  After an unacceptable number of failed start attempts, the controller is locked.**
- In the case of overheating (e.g. lack of water, poorly vented coolant circuit), the overheating sensor triggers, the fuel supply is interrupted and the heater switched off.*
  Once the cause of overheating has been eliminated, the heater can be re-started by switching off and on again (on condition that the heater has cooled down again sufficiently, cooling water temperature <72 °C).
  After the heater has been switched off for overheating an unacceptable number of times, the controller is locked.*
- The heater is switched off if the upper or lower voltage limit is reached.*
- The heater does not start up if the electric cable to the metering pump is interrupted.
- If one of the two glow plugs is defective the start sequence takes place with one glow plug only.
- The speed of the fan motor is monitored continuously. If the blower motor does not start up if it is blocked, or if the speed differs by > 12.5 % from the desired speed a safety lockout (shutdown on faults) takes place after 60 sec.*
- The water pump‘s function is continuously monitored.

* This status can be remedied by briefly switching off and on again.
** For details of how to cancel the lock and to read out errors, refer to the Troubleshooting and Repair instructions of the heater.

Please note!

Do not switch the heater off and on again more than twice.

Forced shut-down for ADR / ADR99 operation

In vehicles for the transport of dangerous goods (e.g. tanker trucks), the heater must be switched off before the truck drives into a danger area (refinery, fuel service station, etc.)
Failure to comply results in the heater switching off automatically when:
- The vehicle engine is switched off.
- An additional unit is started up (e.g. auxiliary drive for unloading pump etc.).
- A vehicle door is opened (ADR99 regulation, only in France).

The fan then runs on for max. 40 seconds.

Emergency shutdown – EMERGENCY OFF
If an emergency shutdown – EMERGENCY OFF – is necessary during operation, proceed as follows:
- Switch the heater off with the control or
- pull the fuse out or
- disconnect the heater from the battery.

Vacuum Excavation occurs when high-pressure water or pressurized air breaks up and cuts the soil, while a high-flow vacuum system lifts the soil up and out of the excavation area.

Buried natural gas, petroleum pipelines, and water mains can be quickly and efficiently uncovered with greatly reduced risk of strike. Fiber optic lines, cables, and other utilities can be efficiently located without the damage that can happen with traditional mechanical digging.

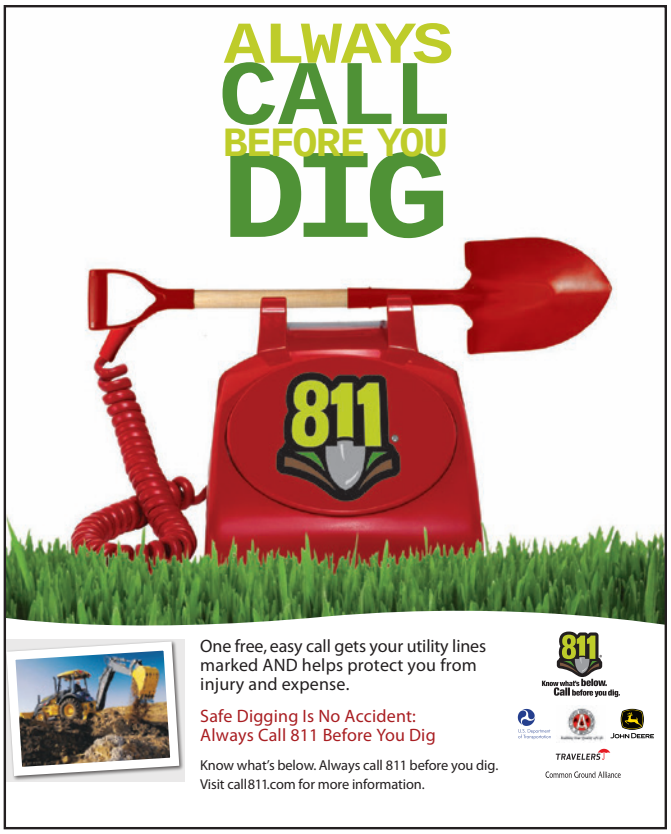
Operators can dig with precision, establishing a less invasive method for slot trenching, pot holing, and pipe location.

This manner of excavation causes less surface damage, reduces disruption of traffic and other surface activities and can be easier and less expensive to repair.

Non-destructive vacuum excavation has quickly gaining acceptance by cities, utilities, and contractors as a relatively safe, effective alternative to traditional excavation methods in a wide range of applications such as line location, installation and repair for utilities and pipelines, sewer and pipe, rehabilitation, slot trenching, waterline maintenance and repair, directional digging, excavation in congested areas, sign and pole installation, landscaping excavation and precision digging.

The following pages provide basic resources to plan and operate a hydro-excavation digging site safely.

Follow all federal, state, and local regulations for locating utilities before starting work.



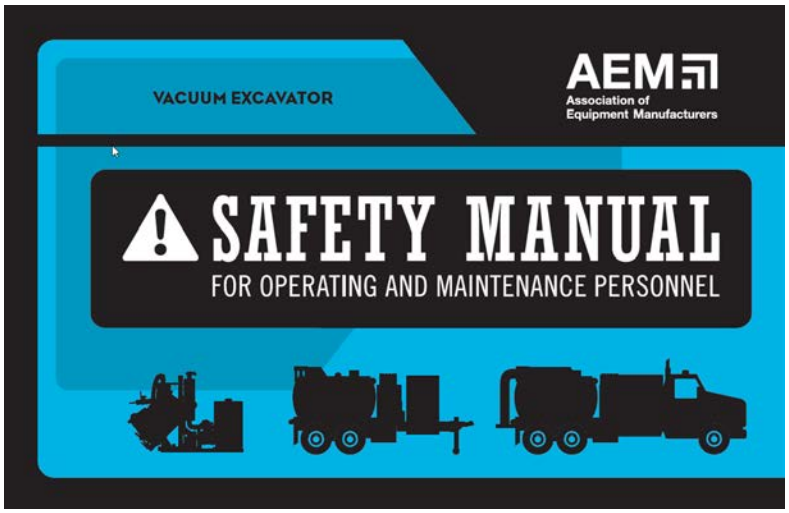
⚠ WARNING

High pressure water

High pressure water can cause serious injury or death. The handgun operates under high pressure. Never point the handgun at another individual. Severe injury can result from the high-pressure water.

Special safety equipment is required when operating the high-pressure handgun. Always wear safety toe shoes or boots (waterproof shoes or boots preferred), coveralls, face shield and safety goggles and gloves (waterproof gloves preferred).

The AEM is a leading provider of training and safety material.



Association of Equipment Manufacturers
6737 West Washington Street
Suite 2400
Milwaukee, WI 53214-5647

414.272.0943
Fax: 414.272.1170
Email aem@aem.org
website: www.aem.org

Operators using or working around high pressure water systems need to take additional precautions including specialized personal protection equipment. Additional information on high pressure water safety is available from the WJTA.

Also available from the WJTA:

Recommended Practices for the Use of High Pressure Waterjetting Equipment

Recommended Practices for the Use of Industrial Vacuum Equipment

WaterJet Technology Association
917 Locust Street, Suite 1100
St Louis MO 63101-1419

314-241-1445
Fax 314-241-1449
e-mail: wjta@wjta.org
website: www.wjta.org

Underground power lines may require special precautions including cutting power to the lines and the use of special protective bonding equipment.

Kri-Tech is a source of protective bond mats used during hydro-excavation:

Kri-Tech Products Ltd.
Box 364, Mirror
Alberta Canada T0B 3C0

877-788-3883
Fax: 403-788-3723
Email: info@kri-tech.net
website: www.kri-tech.net

Common Ground Alliance
2300 Wilson Boulevard
Suite 400
Arlington, Virginia 22201

703-836-1709
Fax: 309-407-2244
websites:
www.commongroundalliance.com
www.call811.com
www.cga-dirt.com

Ontario Regional Common Ground Alliance
195 King Street, Suite 105
St Catharines, Ontario L2R 3J6

866-446-4493
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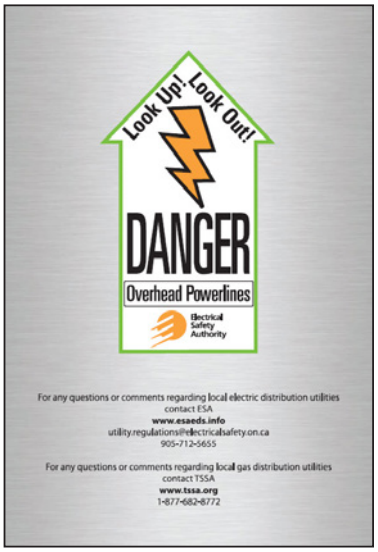
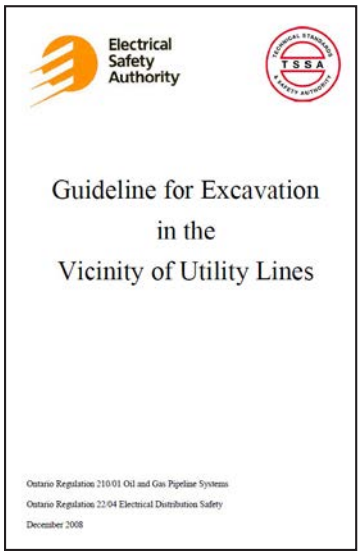
Email: office@orga.com
website: www.orcga.com



Centre for Health and Safety Innovation
5110 Creekbank Road, Suite 400
Mississauga, ON L4W 0A1

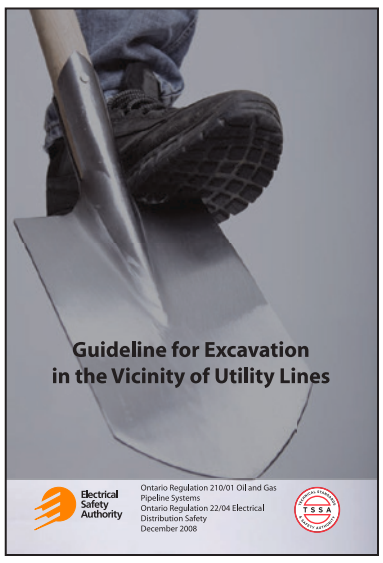
800-263-5024
Fax: 905-625-8998
Email: info@ihsa.ca
website: www.ihsa.ca



Electrical Safety Authority

1-877-ESA-SAFE
1-877-372-7233
Customer Service Center

website: www.esasafe.com



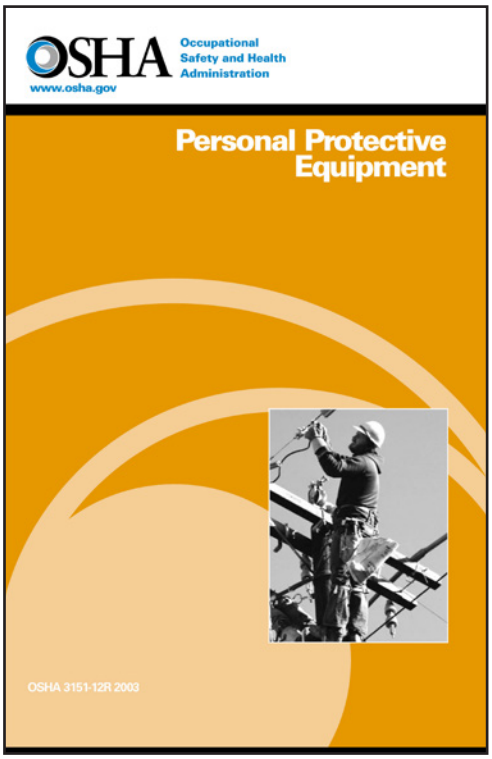
Follow all requirements for PPE when operating and servicing. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA 3151-12R 2003. The full document can be obtained from www.osha.gov.

A hazard assessment should be made to determine the correct level of footwear safety protection. Underground electrical utilities may require the use of insulating gloves and dielectric footwear. The minimum requirements for gloves are compliant with OSHA 1910.137, OSHA 1910.268, NFPA 70E and exceeds the ASTM D120 and European EN60903 standards. Refer to NFPA 70E for dielectric footwear.

National Fire Protection Association (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Telephone: (800) 344-3555

NOTICE

Reference to OSHA regulations are for informational purposes only and not intended as legal advice.



ASTM Labeling Chart
Natural Rubber Electrical Insulating Gloves

Class Color	Proof Test Voltage AC/DC	Max. Use Voltage AC/DC	Insulating Rubber Glove Label
00 Beige	2,500 / 10,000	500 / 750	10
0 Red	5,000 / 20,000	1,000 / 1,500	10
1 White	10,000 / 40,000	7,500 / 11,250	10
2 Yellow	20,000 / 50,000	17,000 / 25,500	10
3 Green	30,000 / 60,000	26,500 / 39,750	10
4 Orange	40,000 / 70,000	36,000 / 54,000	10

Refer to the Vactor/Guzzler/TRUVAC/Westec Safety Manual for general site preparation. Site specific regulations may also apply.

1. Call 811 before all digging operations to locate and mark off all known utilities
2. All buried utilities suspected to be damaged must be de energized prior to digging.
3. Follow all recommended procedures for electrical bonding. Ground mats may be required.
4. Verify all equipment is in safe working order and suitable for the work to be performed. Water flows above 10gpm are normally not suitable due to the higher risk of erosion problems.
5. The working end of the vacuum tube should be equipped with a soft nonconductive end to help reduce the risk of contact or damage to buried lines and pipes.
6. Water pressure, volume and temperature can have a big impact on the risk of damaging the various underground utilities. Some testing may be required to avoid damage. Lower the water pressure and temperature when getting close to the utilities. The water nozzles must always be in motion.
7. Teamwork is very important when trenching and digging large holes. One person is operating the wand or hand gun. The other person is positioning the boom so the vacuum tube is in the right position to move the material as soon as it breaks away. It is not productive to try to wash the material to the nozzle or to try to vacuum the material a great distance to the nozzle.

The operational systems on the units are dependent upon the options and capacities of the vehicle as ordered. The vehicle is custom designed to provide a combination of high-pressure water and suction to perform in a designated area and application. The water, hydraulic and vacuum systems work together to provide a powerful excavating machine.

It is important to remember that the vacuum tube uses air flow and not vacuum to pick up material. Keep the suction end of the nozzle in the upright position to receive air and material. Submerging the nozzle in material stops airflow, prevents material movement and creates a loading and unloading effect on the blower/fan. The nozzle is designed to pull air into the pipe to move material. The end is serrated with small holes; if the end is submerged no air is pulled in through the holes.

811®

Know what's below.
Call before you dig.

⚠ WARNING

Underground hazards

Gas and electrical utility damage can result in fire, explosion and electrocution. To avoid injury or death:

- **Before digging locate all underground utilities. Always call 811 before digging.**
- **Shut off gas lines and electrical power**
- **Always use nozzles designed for excavating applications to reduce the risk of damage.**

Water System - Overview

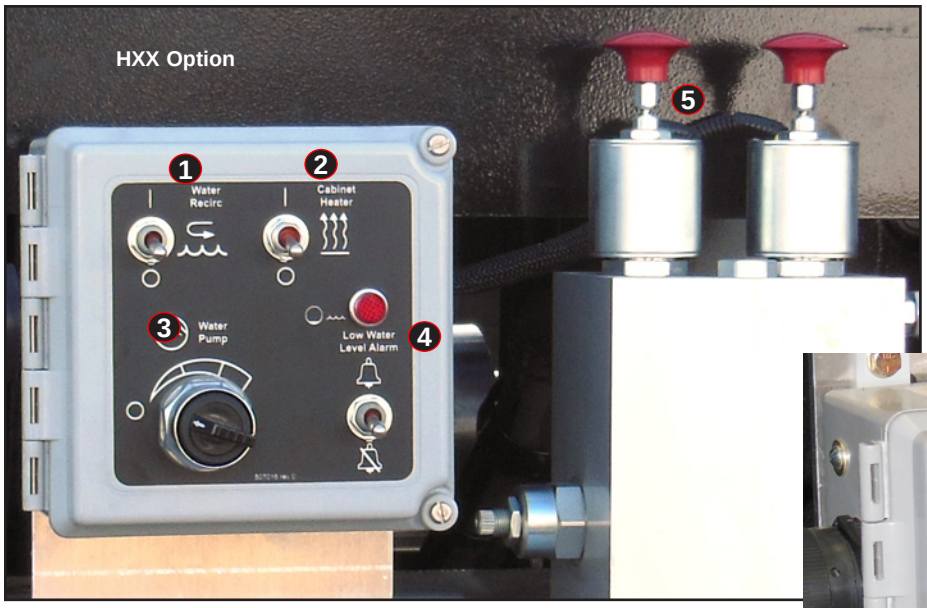
Options

Water is held in the water tank. It can be heated with the optional waterheater for clay or cold weather applications. It can be recirculated to keep it from freezing and to maintain a consistent temperature.

Water is pumped out under pressure through a hose to the handgun or wand. The high pressure water is used to cut up soil into chunks small enough to fit in the vacuum hose.

The water system on this unit consists of a water tank(s), water filter, water pump, hose reel, a water heater, various size hoses with quick disconnect couplers, ball valves and an air purge system. The various size hoses with quick couplers allows for easy connecting and disconnecting of the different systems for draining and storage.

GUZZCAVATOR



Passenger side of unit. Varies with options.

1	**Water recirculator switch -** activates the optional water recirculation pump system to reduce risk of freezing in cold weather.
2	**Water heater cabinet heater switch -** activates optional heater in water heater cabinet to reduce risk of freezing in cold weather.
3	**Water pump switch -** Off/Low/Medium/High
4	**Low water -** indicator light ON when activated. Switch silences the alarm.
5	**Water pump manual overrides -** normally only used for testing.

GUZZCAVATOR

Passenger side of unit. Varies with options.

1	**Water recirculator switch -** activates the optional water recirculation pump system to reduce risk of freezing in cold weather.
2	**Water heater cabinet heater switch -** activates optional heater in water heater cabinet to reduce risk of freezing in cold weather.
3	**Water pump switch -** On/Off
4	**Multi•Flow Switch -** This switch incrementally adjusts the water flow from the pump. The flow can be adjusted from 1-10 gpm (1-20 gpm with optional 20 gpm pump). Push the switch up or down to get the desired flow.
5	**Low water -** indicator light ON when activated. Switch silences the alarm.

Units 2017 and newer have been equipped with a consolidated master control panel on the passenger side of the unit. All the functions work the same.

1 **Air Pressure Gauge -** monitors the amount of pressure in the air cannon reservoir.

2 **Blower Temperature Gauge/Switch -** This gauge monitors the heat generated by the vacuum pump. The sensor for this is located at the inlet to the exhaust silencer. Severe damage to the vacuum pump will occur if it is operated at too high a temperature. The gauge indicates the proper range of temperature for safe operation and has a red line to indicate the maximum safe operating temperature of 275 degrees (F). Do not exceed this limit.

3 **Blower Tachometer Gauge -** Functions only when the blower is engaged and the master switch is turned on. Do not exceed the maximum blower speed.

4 **Vacuum Pressure Gauge -** Vacuum in inches of mercury in the system. The reading is taken at the inlet end of the vacuum pump. If the vacuum is too low, unsatisfactory transfer of material may occur.

5 **Pendant plug -** Pendant is used for remote operation of the vacuum relief, E-stop and if equipped the boom.

6 **Emergency Stop Switch -** This switch opens the automatic vacuum relief valve, blocks system hydraulic oil flow and throttles the engine speed to idle when pushed in. Pulling the switch out allows throttle to operate, closes the vacuum relief (if still set to close) and allows hydraulic system oil flow. Additional E-stops may be in other locations.

7 **Throttle Switch -** Controls the engine speed from the master control panel. The switch is a three-way momentary switch. The throttle switch allows the operator to increase engine speed (rpm) by continuing to hold it in an upward position. When the throttle switch is held in a downward position, the engine rpm will decrease.

8 **Pendant Switch -** Pendant is used for remote operation of the vacuum relief, E-stop and if equipped the boom.

9 **Automatic Vacuum Relief Switch -** This switch releases the vacuum in the cleaning hose by opening the automatic vacuum relief valve. Switch status light is ON when the automatic vacuum relief valve is closed.

10 **Air Cannon Switch -** Controls the baghouse cleaning system.

11 **Vibrator Switch -** Controls the debris body vibrator(s). Do NOT use long or continuous blasts.

12 **Work Light Switch -** (optional)

13 **Work Light Switch -** (optional)

14 **Wireless Remote -** Wireless pendant.

15 **Water recirculator switch -** activates the optional water recirculation pump system to reduce risk of freezing in cold weather.

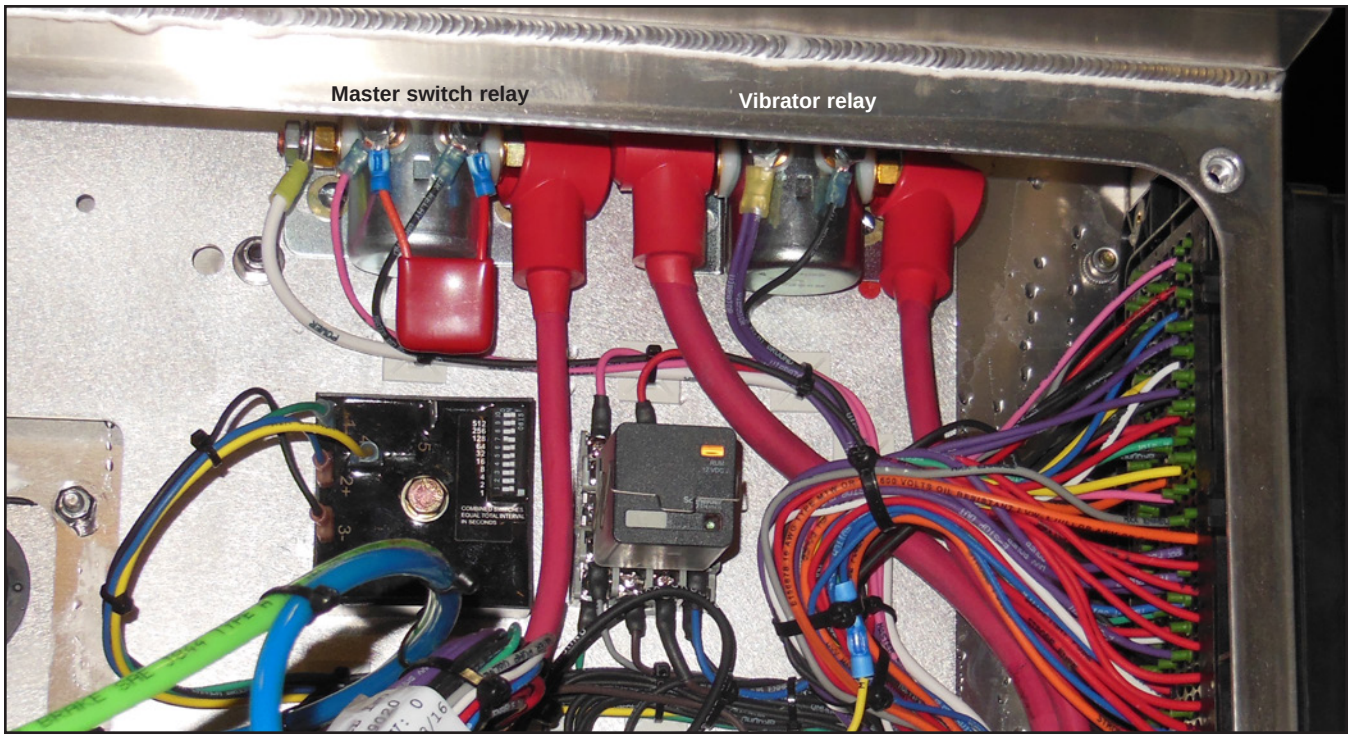
16 **Low water -** indicator light ON when activated. Switch silences the alarm.

17 **Water heater cabinet heater switch -** activates optional heater in water heater cabinet to reduce risk of freezing in cold weather.

18 **Water pump switch -** On/Off

Multi•Flow Switch - This switch incrementally adjusts the water flow from the pump. The flow can be adjusted from 1-10 gpm (1-20

gpm with optional 20 gpm pump). Push the switch up or down to get the desired flow.



No power to Master Control Panel

All power for the master control panel is controlled by the master switch relay in the master control panel.

Before attempting to check for power failure at the control panel, check all connections for tightness at the battery. This includes all auxiliary wires connected to the battery terminals.

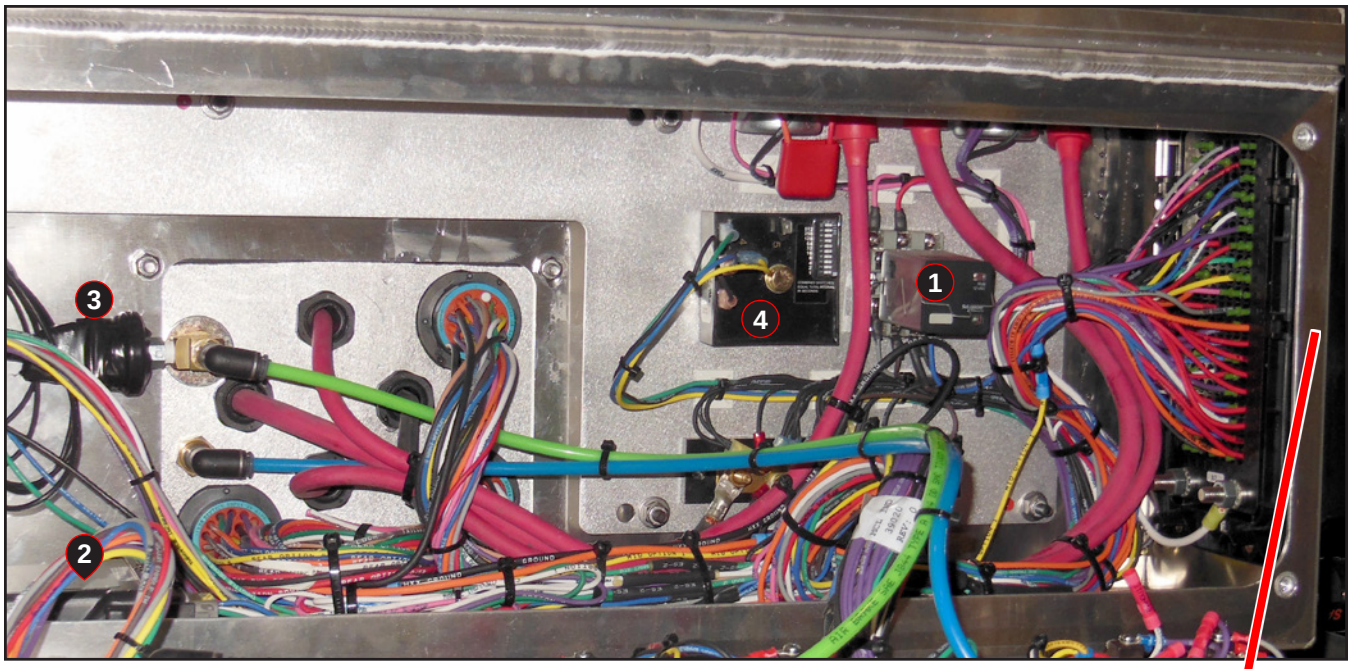
Verify that there is power to the relay and that the master switch is functioning. Replace relay or master switch as required.

NOTICE

Jump Starting Or Welding Can Damage Electrical System

To avoid damage:

- **Disconnect ECU, control modules and batteries before welding on unit.**
- **Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.**
- **Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.**
- **Set all ignition switches to OFF before testing CANbus system.**



Control panel lights are automatically illuminated when the key switch is turned on.

1	**Relay -** E Stop
2	**Omnex wireless receiver -** Optional -
3	**Air switch -** Air cannon
4	**Air cannon timer module -** Default timer setting is 64 seconds.

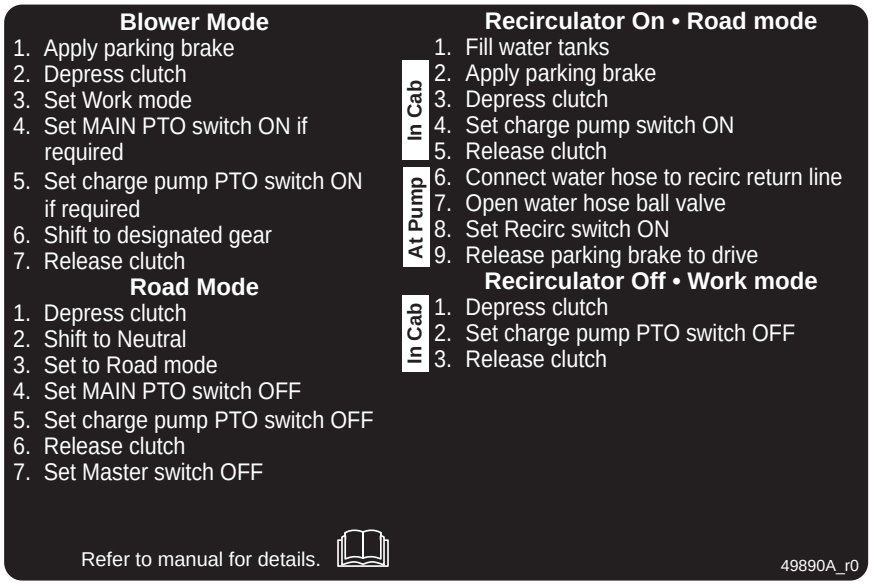
Note: Standard configuration shown. Relay configuration changes with options. Consult the unit schematics for details.

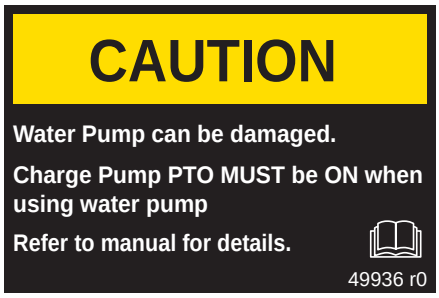
SWITCHED	RELAY	BATTERY
F20 -	R10 - Throttle	- F40
F19 -		- F39
F18 -	R9 - Multiflow Down	- F38
F17 -		- F37
F16 -	R8 - Multiflow Up	- F36
F15 -		- F35
F14 -	R7 - Recirc	- F34
F13 -		- F33
F12 -	R6 - HXX 2	- F32
F11 -		- F31
F10 -	R5 - HXX 1	- F30
F9 - Heat Ex		- F29
F8 - Switched 3	R4 - Alarm	- F28
F7 - Switched 2		- F27
F6 - Switched 1	R3 - Wireless	- F26
F5 - CNTRL Box		- F25
F4 - Recirc	R2 - Worklight	- F24
F3 - HXX		- F23
F2 - Work Lt	R1 - Strobe	- F22
F1 - Strobe		Recirc - F21

506485H rA

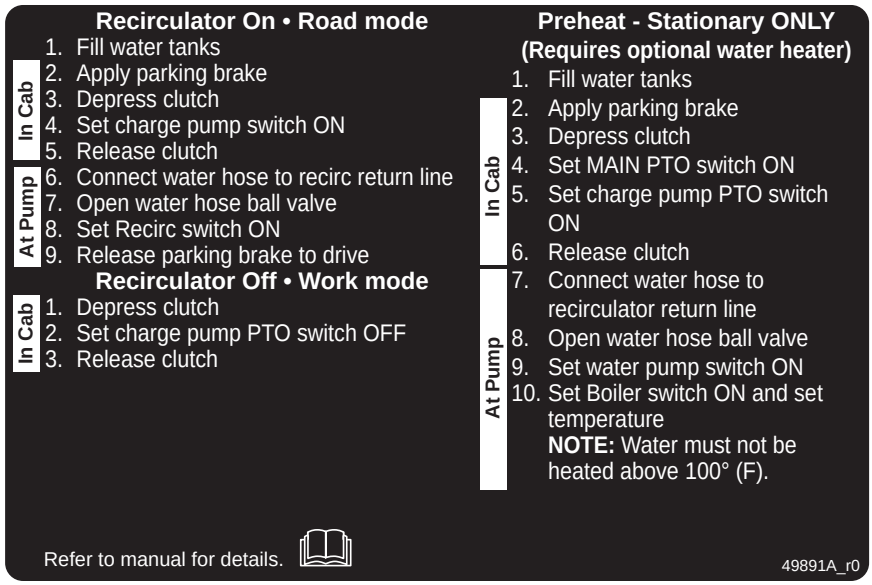
Refer to the operation decals normally located in the cab on the visor for specific instructions for the chassis. These decals will detail how to engage the recirculator and preheat the water (if equipped).

Note: the charge pump PTO must be ON when using the water pump to avoid damaging the water pump. The water pump must not be run dry.





Typical water pump cabinet decal.



The standard water pump on this unit is capable of producing 10 gallons a minute at 2500 PSI (20 gpm optional). It is both pressure and flow compensated to ensure the operator maximum performance at a variety of flows or pressures, all through the hand gun.

The water pump is controlled by a hydraulic proportional valve and the system controller. The first time the water pump switch is activated after the master control switch has been turned on the pump speed defaults to the lowest setting. This is adjusted with the multiflow switch.

The water pump is hydraulically driven. Follow the step by step instructions located in the cab of the truck for proper engagement of the hydraulics. Prior to engaging the water pump, connect the hose reel hose to a water hand gun, a water wand or the recirculator.

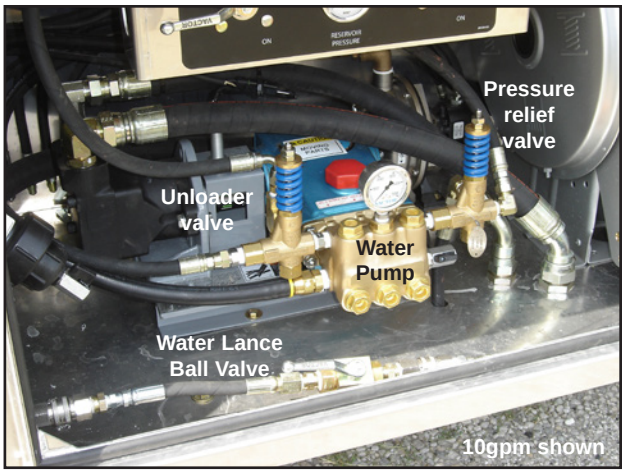
Note: The water system must be full prior to connecting or turning on the water heater. The water heater will not fire if there is no water flow. See water heater instructions for proper operation of the water heater.

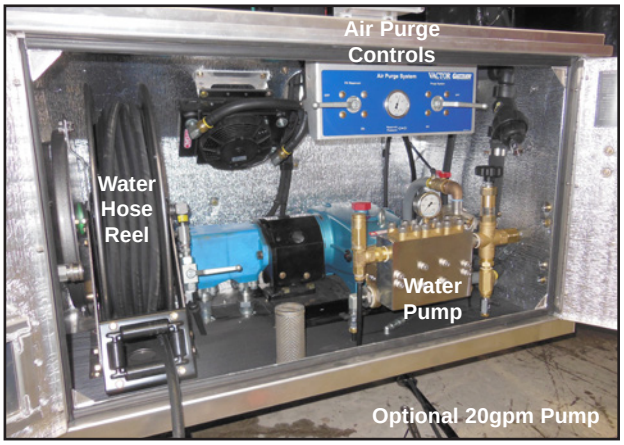
Once the hydraulics are engaged and all of the water hoses connected, turn the water pump switch to the ON position. Adjust the multiflow switch on the control panel to achieve the flow and pressure needed for the particular job. Pressure will be in relationship to the flow setting and hand gun nozzle being used.

Water Lance Ball Valve

The water lance ball valve is removed when using the optional recirculator.

When using the handgun, use quick couplers to remove the water lance ball valve.





Water System Manual Relief Valve

If the handgun nozzle plugs during operation turn off the water pump and open the relief valve to relieve pressure in the handgun. Then remove the nozzle and clean the orifice.

This unit is equipped with a high pressure handgun. The high pressure handgun can only be connected to the hose reel located in the water pump cabinet. The high pressure water system uses up to the full water pump pressure of 2500 psi and can only be used with the special high pressure handgun or a high pressure wand. The high pressure system also uses a high pressure water unloader valve and ball valve.

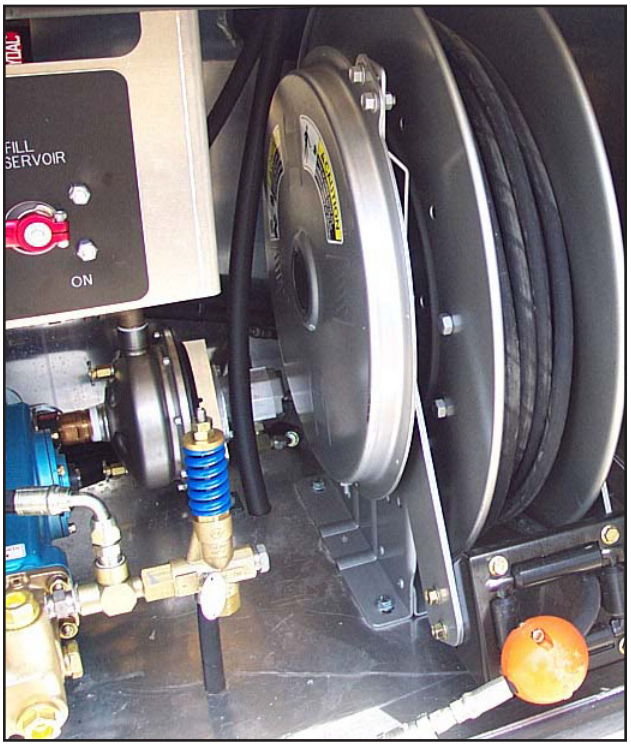
Note: Should the handgun high pressure relief valve trip (or open), water will unload straight down on the ground. The main control unloader dumps to the suction line.

⚠ WARNING

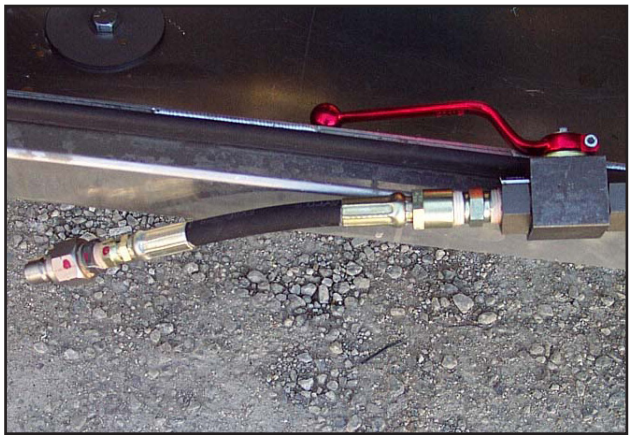
Handguns Use High Pressure Water

High pressure water can cause serious injury or death.

- **Wear appropriate safety equipment including: Waterproof apparel, protective boots, insulated gloves, safety glasses or goggles, hearing protection (ear plugs and/ or ear muffs) and a hard hat with a face shield.**
- **Never point the handgun at or near a person or animal.**
- **Bleed pressure from handgun by shutting off water pump pressure and pressing the trigger before disconnecting from high pressure connection.**
- **Use handgun and connection supplied with the unit; never use common low pressure handguns or connectors with the high pressure system.**



The digging lance and extensions can be stored behind the rear bumper for transport.



HXX Nozzle Chart

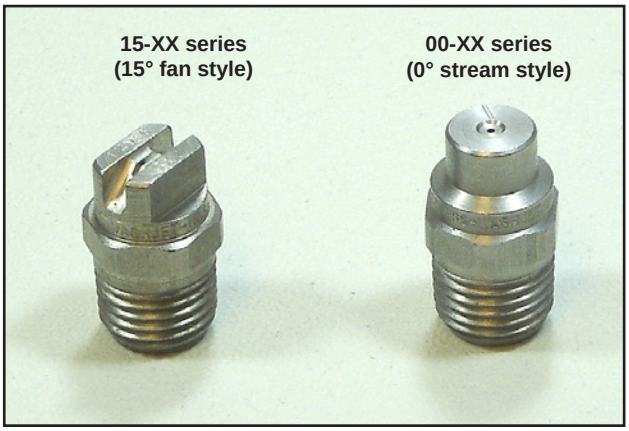
GPM @ 2,500 PSI

Size	Part Number	GPM 1 Nozzle	GPM 2 Nozzle	GPM 3 Nozzle
00-02	48089	1.6	3.2	4.8
00-03	48089B	2.4	4.8	7.2
00-04	48089C	3.2	6.4	9.6
00-05	48089D	4.0	8.0	12.0
00-06	48089E	4.7	9.4	14.1
00-07	48089F	5.5	11.0	16.5
15-02	48090	1.6	3.2	4.8
15-03	48093	2.4	4.8	7.2
15-04	48091	3.2	6.4	9.6
15-05	48091A	4.0	8.0	12.0
15-06	48092	4.7	9.4	14.1
15-07	48092A	5.5	11.0	16.5

¼” NPT 10,000 PSI Rating, Stainless Steel

Note: The choice of nozzles will affect the maximum temperature rise and operation of the water heater, and also limit the maximum flow rate.

Optional rotating nozzles

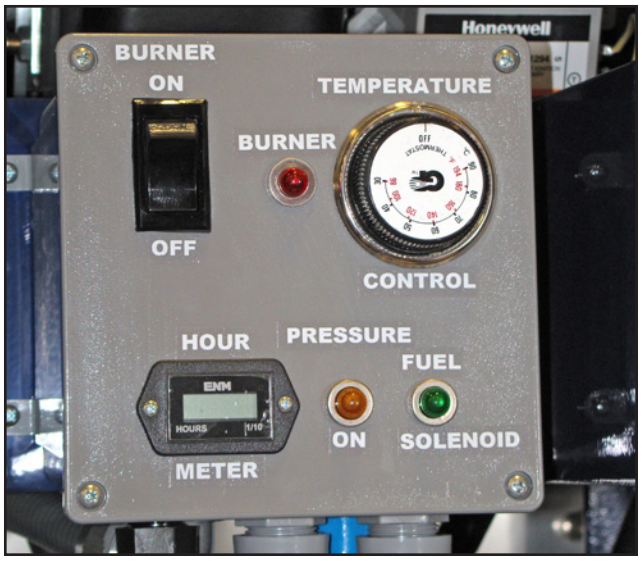


The optional water heater is used for winter operation and in clay applications. Complete all necessary hose connections prior to turning on the water heater. Follow the supplied detailed instructions for the water heater supplied by the manufacturer of the water heater.

Note: There is a burner interlock with a pressure switch set to 1200psi hydraulic pressure to the pump before it will ignite. Always verify settings with the schematics for the unit.

Heater controls are located below the heater. Separate operating instructions are supplied for the heater in the Options section.

The temperature gauge and heater settings are in Fahrenheit. Do not set temperature above 180 degrees Fahrenheit.



⚠ WARNING

Hot Water Can Burn

Avoid contact with the water stream. The water heater can produce water at temperatures greater than 125° (F). and could result in death or serious injury from burns.

NOTICE

Fire hazard

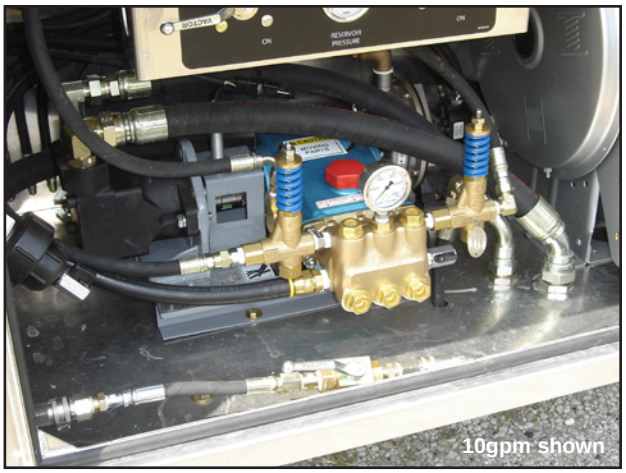
Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

If the unit is equipped with a recirculator, water can be recirculated to reduce the risk of freezing. If equipped with a water heater the water can also be preheated while stationary. Flow can be adjusted during preheat.

Recirculating water keeps the water from freezing. The water heater can be used to preheats\ the water for cold weather applications, certain soil types, and cleaning the HXX unit. The water heater can not be used with the recirculator.

The adjacent picture shows the hose reel connected to the recirculator.



NOTICE

Fire hazard

Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

Recirculator On • Road mode

In Cab
1. Fill water tanks
2. Apply parking brake
3. Set Master switch ON
4. Depress clutch (MAN trans only)
5. Set PTO switch ON (MODE button)
6. Release clutch (MAN trans only)

At Pump
7. Connect water hose to recirc return line
8. Open water hose ball valve
9. Set water pump switch ON
10. Set Recirc switch ON
11. Release parking brake to drive

Recirculator Off • Work mode

In Cab
1. Set water pump switch OFF
2. Depress clutch (MAN trans only)
3. Set PTO switch OFF (MODE button)
4. Release clutch (MAN trans only)
5. Set Master Switch OFF

Preheat - Stationary ONLY
(Requires optional water heater)

In Cab
1. Fill water tanks
2. Apply parking brake
3. Set Master switch ON
4. Depress clutch (MAN trans only)
5. Set PTO switch ON (MODE button)
6. Release clutch (MAN trans only)

At Pump
7. Connect water hose to recirculator return line
8. Open water hose ball valve
9. Set water pump switch ON
10. Set Boiler switch ON and set temperature

NOTE: Water must not be heated above 100° (F).

Refer to manual for details.

49891_r0

The watertanks hold water for use during operations. The watertank capacity is unique with each unit configuration.

A visual gauge is standard. The sight gauges have red float balls inside the clear tube to indicate the level of the water in the tank. This gauge is used when the tanks are being filled with water. The watertank fill point is equipped with an air gap to prevent siphoning.

The watertanks should be filled prior to operating the water pump, but always flushed and stored empty when done.

NOTICE

The fill mechanism installed on the Vactor water system has an air gap as required by OSHA to prevent siphoning water out of the tank and back into the fire hydrant and water supply. Never modify or otherwise obstruct this passageway. Obstructions will cause water to be spilled and sprayed onto the operator and/ or equipment or possibly contaminate the water supply.

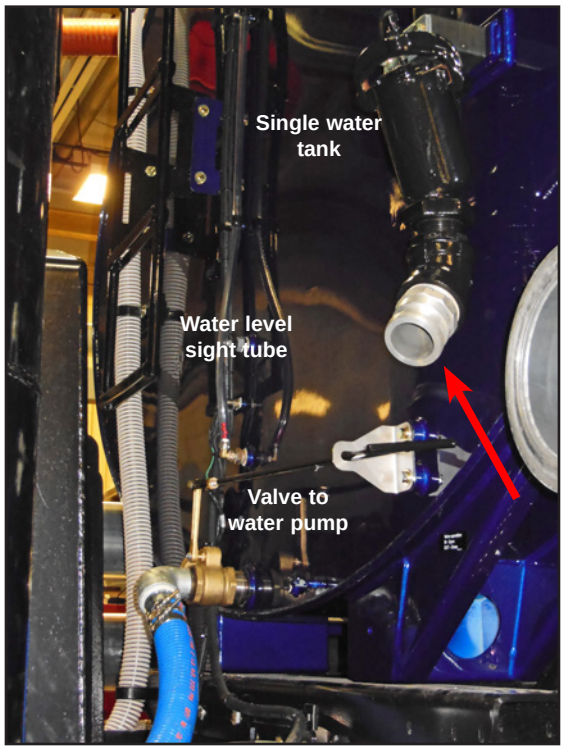
Filling the Watertank

Prior to connecting the fill hose to the water hydrant always flush the hydrant to clear it of contaminants that may enter the vehicle water system.

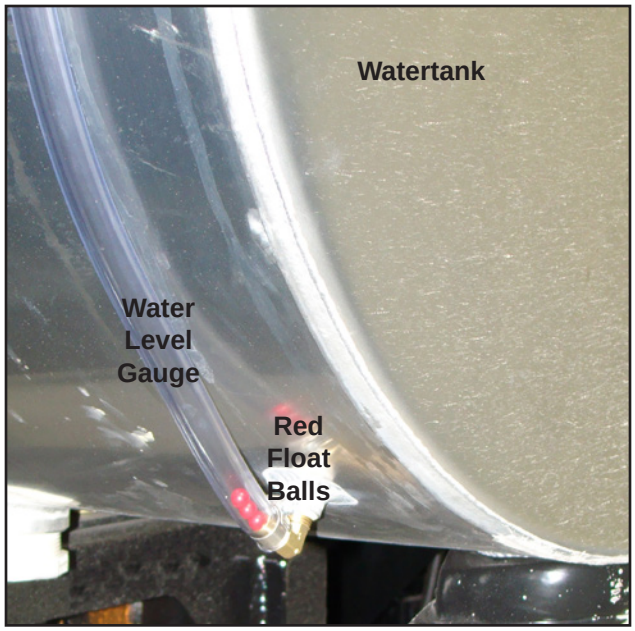
- Park the truck centered with the hydrant on the passengers side of the unit.
- If equipped check and clean y-strainers daily prior to filling tanks. Make sure y-strainer gaskets are in place.
- Remove the cap on the hydrant and flush the hydrant, or water supply, until water runs clear.
- Turn off the hydrant and remove the water fill hose from its compartment and attach it securely to the hydrant, or water source.
- If equipped make sure the water filter screen in the y-strainer is clean and in place. Be sure both gaskets are on the filter housing cap.
- Attach the other end of the water fill hose to the watertank hose connection.

NOTICE

- **Do not overload the vehicle. Due to weight restrictions, it may be better to fill the water tanks near the work site. Know the Gross Vehicle Weight Rating (G.V.W.R.). Know the vehicle axle capacities. Do not exceed the Gross Vehicle Weight (G.V.W.).**
- **Always follow procedures established by the water supplier.**
- **When connecting the fill hose, inspect the area around the fire hydrant and place hose in a position that will not impede traffic or cause vehicles to strike the hose.**

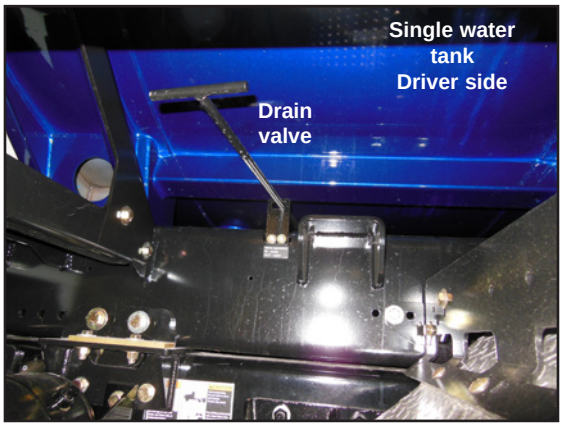


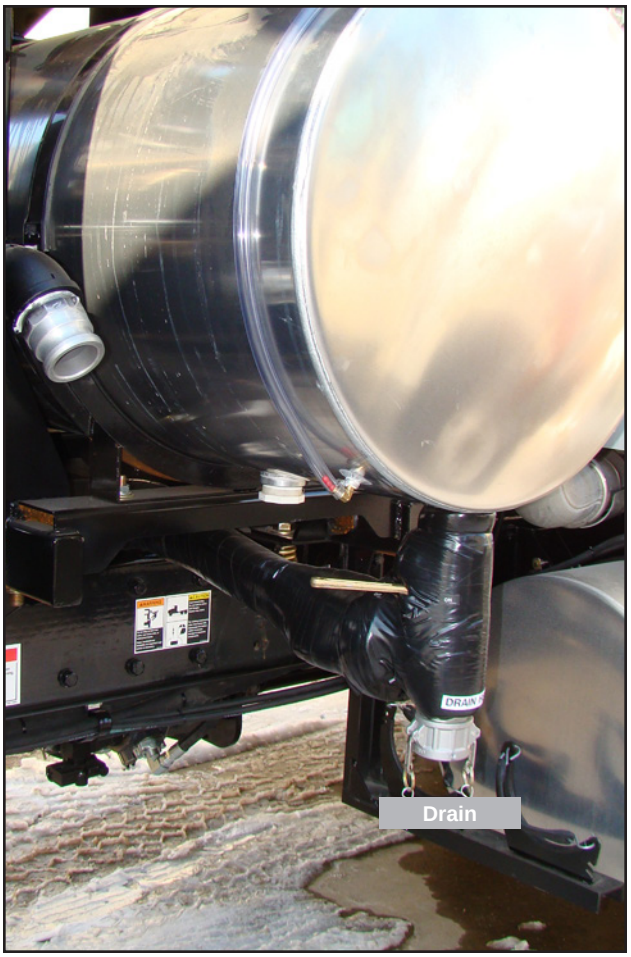
- Allow the tank to fill. The operator should monitor the sight gauges located on the side of the tank. Red balls inside a clear hose float upward as the water level rises. Turn the water supply off when the gauge indicates full and disconnect the hose from the water source.
- Remove any excess water by lifting the hose at the watertank and walking toward the end of the hose
- Roll the fill hose securely and place in storage compartment.
- Replace any cap previously removed.



All lower watertanks are equipped with water drains. Additionally water drains for other system components are also located under the watertanks. A variety of plugs and valves are used. All drains should be opened and flushed weekly. When not in use, typically overnight, the watertanks should be drained and empty.

All drains must be left open to avoid freezing during cold weather when unit is not being used.





NOTICE

Water System Can Be Damaged By Freezing

Ice in the water system can severely damage components. To avoid ice damage:

- **Verify that water flows when valves or plugs are opened. Insure that ice has not plugged drain lines, valves or drain plugs.**
- **Leave all drain plugs open to keep residual tank water from the tanks from migrating to the system during transport.**
- **Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow residual water to drain.**
- **If the unit cannot be properly drained, move the unit to a warm area and allow the water system to warm completely to drain.**
- **Never operate water pump(s) if system is frozen.**

The air purge system uses compressed air to remove water from the water lines, hoses and some components prior to storage in cold weather. The controls are located inside the water pump cabinet.

Air from the chassis reservoir is used to pressurize an auxiliary air tank. An air protection valve located on the chassis reservoir protects the brake system. If air pressure in the chassis reservoir drops to a critical level, the protection valve closes to protect the brake system air pressure. The brake system has priority over any auxiliary components. As added protection, a check valve in the purge system allows air to flow into the water system but prevents water from entering the air system.

Late 2011 a charge pump isolation valve was added to help purge the water pump valve area. The following is the procedure for the updated system.

Note: The chassis air reservoir should be at 90psi when activating the air purge system. It may be necessary to refill the auxiliary tank multiple times to completely purge the water system.

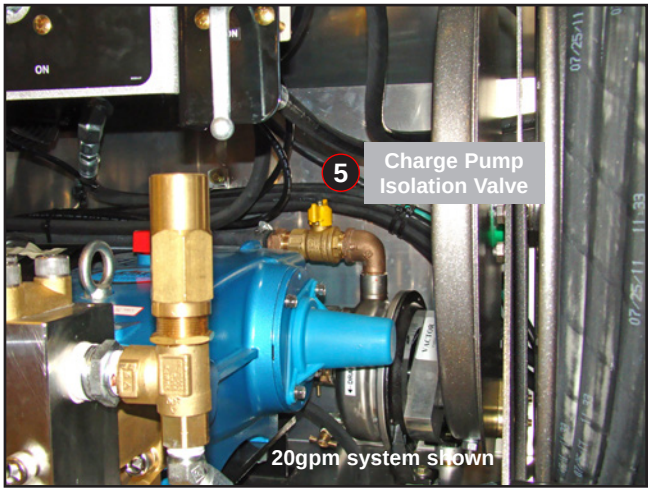
Purge the water system:

Follow the steps indicated below after each use for winterizing the water system.

Note: The water system should be drained. Refer to the water tank pages in this section.

1. Open the ball valve at the end of the hose on the hose reel to depressurize the system.
2. Disconnect the ball valve assembly from the end of the hose reel hose so the male end of quick disconnect is open to allow the purge air to flow freely.
3. Pull all the hose off the hose reel and lay it flat on the ground to gravity assist the water bleeding process.
4. Open the ball valve on the Air Purge panel marked FILL RESERVOIR. Close the ball valve when the gauge shows 90psi.
5. Close the charge pump isolation valve. This will create back pressure and force the check valves open when the air purge and Cat pump are turned on.

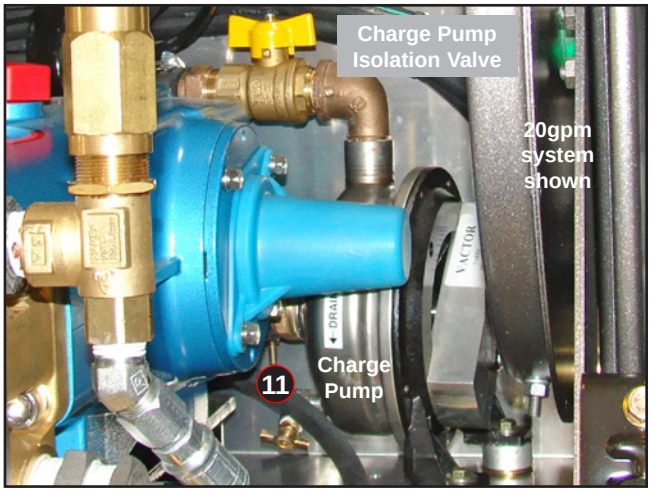
Note: Air above 90psi and high volume can damage the pump seal retainers and ceramic plungers.



6. Turn the water pump on for 10-15 seconds at lowest speed and at the same time SLOWLY turn on the ball valve marked PURGE SYSTEM. Allow the air to drop to 15psi. Close ball valve and shut the pump off. Recharge tank to 90psi and repeat purging until all the water is drained.
7. It should not be necessary to run the pump more than the 10-15 seconds with the suction line closed; but additional air purging may be necessary.
8. Remove the water filter.
9. Repeat purging procedure to blow out the hose reel and lines until all the water is drained.
10. Allow the hose to go back on the hose reel slowly . This will ensure all the water has been drained from it.
11. Open the two charge pump drains.
12. Open all mini ball valves on the pump.
13. Open the charge pump isolation valve. This is the normal operating position.

When the water hose is purged of water, put the water pump ball valve in the OPEN position. Put other systems, such as the handgun, open for purging. After the system is purged, place the Fill reservoir and Purge System ball valves in the OFF position.

Note: Leave all drain plugs open to keep residual water from the tanks from migrating to the system during transport.



Winterizing

Draining the water system

1. Remove Y strainer water filter and leave out.
2. Open the tank drains and leave them open. The composite water tank has two drain valves.
3. Allow water to drain from the system.
4. Slowly cycle the T handled drain valves to drain any residual water and leave open.
5. Unwind all hose to allow the water to drain.
6. Turn the water pump on for no more than 10 seconds to push water out of the pump.

If equipped with air purge

7. If equipped set the dual hose real valves to rear ON and Front OFF.
8. Open the ball valve at the end of the hose on the hose reel to depressurize the system and remove the valve assembly.
9. Open the FILL RESERVOIR valve on the Air Purge and close when the gauge shows 90psi.
10. Close the charge pump isolation valve.
11. Turn the water pump on for 10-15 seconds at lowest speed while SLOWLY turning on PURGE SYSTEM. Allow the air to drop to 15psi, recharge tank to 90psi and repeat purging until all the water is drained.
12. Repeat purging procedure to blow out the hose reel and lines until all the water is drained.
13. Place the Fill reservoir and Purge System ball valves in the OFF position.

For all units

14. Slowly rewind the hose onto the hose reel.
15. Open the two charge pump drains.
16. Open all mini ball valves on the pump.
17. Open the charge pump isolation valve.
18. If equipped set the dual hose real valves to rear OFF and Front ON and repeat purging process.
19. Disengage the hydraulics.
20. Put the water pump ball valve in the OPEN position.

If equipped - Anti-Freeze System

Prepare for transport

1. Turn off the water to the water pump.
2. Open the antifreeze tank and pump valves.
3. Operate the handgun at low speed until antifreeze can be seen coming out the nozzle.
4. Stop the handgun and shut down the water pump.
5. Close the anti-freeze tank and pump valves.
6. The water pump is now ready for transport.

Refer to manual for details.

WARNING

High pressure water

High pressure water can cause serious injury or death. The handgun operates under high pressure. Never point the handgun at another individual. Severe injury can result from the high-pressure water.

Special safety equipment is required when operating the high-pressure handgun. Always wear safety toe shoes or boots (waterproof shoes or boots preferred), coveralls, face shield and safety goggles and gloves (waterproof gloves preferred).

NOTICE

Water pump can be damaged

Do not operate water pump without water.

Water System Can Be Damaged By Freezing

Ice in the water system can severely damage components. To avoid ice damage:

- Verify that water flows when valves or plugs are opened. Insure that ice has not plugged drain lines, valves or drain plugs.
- Leave all drain plugs open to keep residual tank water from the tanks from migrating to the system during transport.
- Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow residual water to drain.
- If the unit cannot be properly drained, move the unit to a warm area and allow the water system to warm completely to drain.
- Never operate water pump(s) if system is frozen.

If equipped - Anti-Freeze System

Prepare for use

1. Turn off the water to the water pump.
2. Attach the handgun hose to quick coupling return to the anti-freeze tank.
3. Operate the water pump at low speed until all the anti-freeze has been pumped from the system.
4. Shut down the water pump.
5. The water system is now ready for use.

508705 r0

Before starting any new job, meet with your supervisor to discuss the details, such as hoses and accessories needed to properly perform the job; any special considerations related to the site or the material to be collected; any anticipated hazards; features of the digging or dump location; and any safety precautions you should take to ensure correct set-up and operations.

All aspects of safety need to be thoroughly considered, no matter how routine using the equipment has become.

Consider how operating the equipment will affect the work area. Carefully inspect the area for overhead power lines or other potential hazards or obstructions. Look for personnel behind the unit or work area of the unit.

Observe all requisite safety precautions and procedures.

If the truck must be positioned on a grade, chock the wheels to prevent it from rolling.

Upon arriving at the job site, park the vehicle. Set the parking brake and turn on flashers. Whenever possible, park the truck between yourself and oncoming traffic when working in traffic areas.

Observe the job site carefully. Look for overhead obstructions, traffic movement, pedestrian walkways, and for places where traffic control devices should be positioned. Always use a co-worker's assistance when spotting the vehicle.

It is important to ensure that the vehicle is in the best possible position for the easiest and safest access to the work site and material to be loaded. Ensure the ground is stable enough to hold the truck securely.

Be aware of underground utilities.

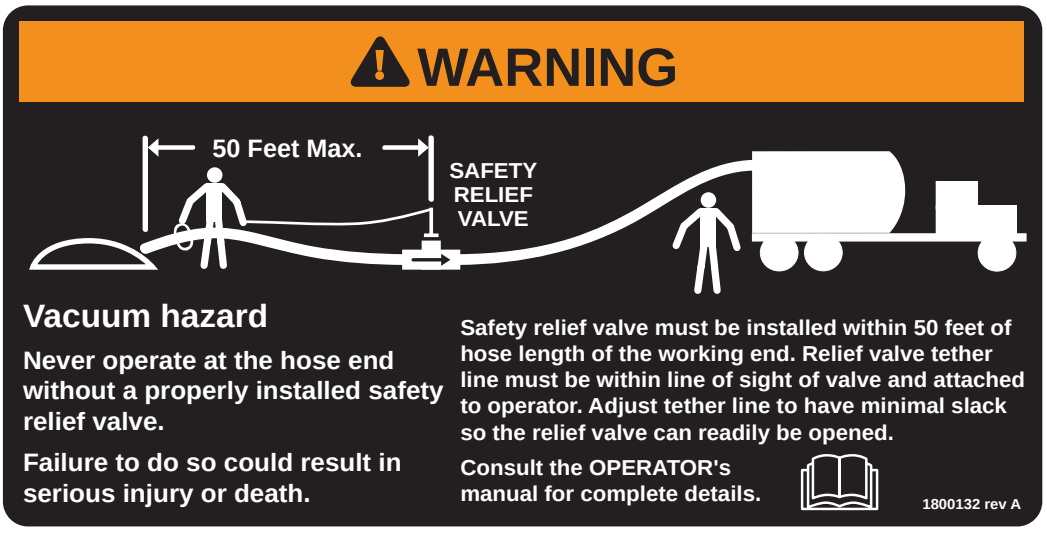
Installing the Equipment:

Clamp the vacuum hose to the end of the boom. Continue attaching hose or tubing to the required length, making sure that hose runs are as straight as possible with as few bends and turns as possible. Use as short and direct a route as possible. Refer to the Vactor/Guzzler Safety Manual on how to use the safety relief valve.

Use as large a tubing as possible. Light weight, smooth, bore flexible hose is recommended at the working end. Use rigid, aluminum tubes for longer runs, this reduces losses due to friction and have a longer life.

Do not reduce the diameter of hose in mid-stream. If a smaller hose is needed, install a reducer at the truck and run the smaller hose all the way through. Use the largest size that can be handled safely and easily.

Keep the pendant switch for the vacuum relief valve as close to the working end of the hose as possible. This is to break vacuum in an emergency.



1. Always use a vacuum nozzle at the working end of the tube.
2. Never hold the open end of the hose with your hand while vacuum system is on.
3. Never guide debris to the nozzle end or open end with your foot or hand.
4. Do not remove obstructions from the nozzle while the system is operating.
5. Always open vacuum relief valves and reduce RPM before attempting to dislodge any obstruction in the vacuum tube.
6. For best performance, run the vacuum pump at a lower RPM. Do not bury the nozzle in the material. Air flow is required to convey the material through the tube.
7. If air flow is not sufficient enough to convey the material, increase the RPM in moderation.
8. Do not wear loose clothing or untied hair when working on or near the unit or the open end of the tube.
9. Eliminate unnecessary bends or turns in the tube.
10. Always check the working condition of all safety devices before starting the Vactor unit.
11. Observe all safety instructions and markings on the unit. Use ear plugs, safety glasses and gloves.
12. Be aware that the air system becomes hot during vacuum operations.

SAFETY INSTRUCTIONS

In an EMERGENCY the VACUUM and WATER must be stopped

Activate the E-Stop

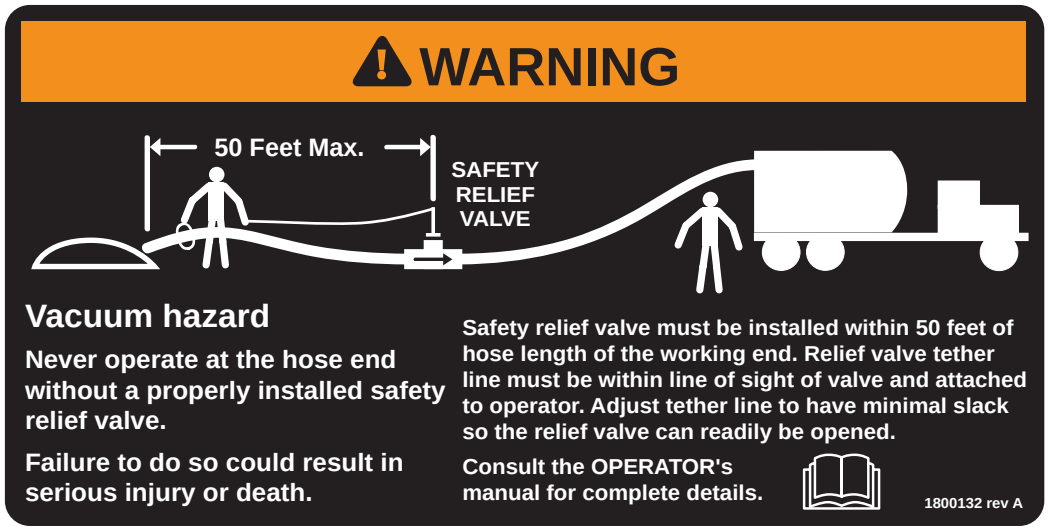
To shut down the system:

- Stop vacuuming.
- Enable vacuum relief valves.
- Reduce engine/blower/fan RPM.
- If required, shut down the engine.

When ready to begin, the truck must be running and the following procedures should be followed:

1. Communicate with the hose handler. When hose handler is ready, increase the RPM to the desired level.

Note: The appropriate level of RPM is the lowest RPM that will readily convey the material into the hose and carry it to the tank. This will depend on the density of the material, and the distance it has to travel to the tank as well as the type of hose used. The blower should not be operated at idle rpm's. Maintain at least 1200rpm's to reduce wear on the transfer case.



Start vacuuming, if the flow is non-existent or sluggish, increase the RPM in steps and observe the vacuuming and flow rate. Stop raising the RPM when satisfactory flow of material is achieved.

2. Position the vacuum hose near the material to be vacuumed.

3. Begin vacuuming taking care to allow some air to enter the hose along with the debris.

Note: it is the air flow that takes the material with it into the debris tank. If there is no air flow, there is no material flow either.

Never attempt to "guide" or push debris to the open end of the vacuum hose with your foot or hand. Vacuum suction is powerful enough to suck a limb into the hose. Similarly, do not reach into a vacuum hose to free clogs. Always open vacuum relief valves, reduce RPM before attempting to dislodge any obstructions in the vacuum hoses.

If the air flow is not large enough to carry the material, increase the RPM at the control panel to just a little more than required to have a free flow of the material. Do not over speed the blower as that will create excessive overflow of the debris into the cyclone chamber and the baghouse, resulting in a drop in efficiency. It will also make the engine work harder than it really has to decreasing the overall life of the unit.

All vacuum trucks move material through air conveyance. They rely on air movement to entrap and carry away the debris. It is very important to keep the suction end of the pipe or hose in the right position so that it is always receiving air and material. Submerging the nozzle in the material cuts off the air flow preventing material movement. This also creates a loading and unloading effect on the blower when the nozzle is lifted. This load / unload effect can cause undo stress on bearings and hydraulic components in the system which creates premature failure of the component.

It is very important when trenching and digging large holes that you work as a team. One person is operating the wand or hand gun. The other person is positioning the boom so the vacuum tube is in the right position to move the material as soon as it breaks away. It is not productive to try to wash the material to the nozzle or to try to vacuum the material a great distance to the nozzle.

Use the boom to lower the nozzle into the material to be removed. With most material, it helps to move the nozzle up and down using the boom controls. Lower the nozzle into the material and raise the nozzle enough for the bottom of the nozzle to clear the material, and then back down into the material. Using this up and down motion will help loosen the debris, especially compacted material.

When picking up water or slurries, allow the tip of the nozzle to just clear the top of the water or slurry. As material is removed, the nozzle can be tipped, or the pipe and boom moved horizontally to reach other material. Continually working the nozzle this way enables the operator to observe the work area. If the material to be picked up is not in a pile, use a shovel, rake or hoe to work the material into the nozzle. The water stream can be used to move material toward the tip of the nozzle.

NOTICE

Machine Can Be Damaged

If ice builds up in the boom, shut down the vacuum system. Use hot water to heat the boom tubes or move the vehicle to a warm place. Slowly retract the boom when the tubes have warmed up. Do not retract the boom with ice build up in the vacuum tube. Damage to the boom and/or seal can occur. If hot water is available, start the vacuum system and spray hot water into the vacuum tube/nozzle. As the ice breaks away it will be carried to the debris body.

Blower speed rpm is important when working is freezing or near freezing temperatures. High speeds or rpm's cause high wind chill factors due to the large air velocity being created. This can lead to ice build up in the vacuum nozzle or boom which blocks material movement. Use hot water, when available, and lower fan / blower speeds to reduce the problem. If you do get an ice build up in the boom, shut the vacuum system down. Use hot water to heat the boom tubes or get the unit inside where it can warm up. Once the boom tubes are warm, slowly retract the boom.

Start the vacuum system. If hot water is available, spray the hot water in the suction hose / nozzle. This will allow the ice to move into the debris body. You may need to do this in one to two foot increments, in order to fully retract the boom.

Blower/fan rpm is important in rocky ground. Air velocity should be set so that the rocks don't hang in the pipe. Air tends to move around rocks causing them to hang in the air stream. Adjust the rpm to the lowest setting to move the material efficiently. You may need to increase speed for larger rocks. This is especially true in freezing conditions.

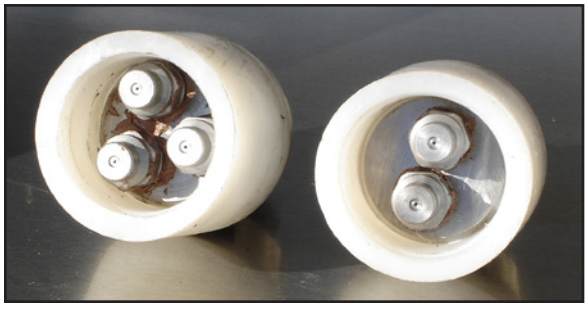
During operation, observe the debris body level gauge. When the indicator is horizontal the body is full and must be drained and/or dumped.

Water Pressure

Be sure to wear all proper safety equipment prior to operating any high pressure hand gun or wand. Adjust the pressure for the job at hand. Keep in mind that different units may have different pressure ratings. Lower pressures are good in easy digging conditions and when working around older utilities where the protective cover may be in poor condition. It is also safer and uses less water. Keep the nozzle as close to the ground that you are cutting to maximize the water pressure. In general, 2000 psi at the nozzle is more than enough for excavating in the worst conditions. Higher pressures get into higher safety concern. Any gain is far out weighed by the safety issues.

Remember, the number of orifices divided into the water volume you want determines the water flow for each nozzle. If you have 3gpm and two nozzles then 1.5gpm goes out each nozzle.

Typical nozzles



Water Volume

This is the most important factor in productive and profitable hydro-excavating. Several factors determine the proper water volume to be used.

- The material must be wet enough to prevent any dust from carrying over into the blower.
- How far do you have to haul the debris and how long will it take to dump? If you can dump on site and not travel far, higher water volumes are more productive (4-8 gpm). If you have to travel longer distances to dump, an hour or more round trip, lower volumes are more productive (3-4 gpm).
- What are the soil conditions? Soft or sandy soils allow for higher water volumes to move more material faster. Hard packed, clay or rocky soils require lower volumes and slower working conditions to cut the soil into chunks small enough to fit in the vacuum hose or tube.
- What are you doing? Digging pot holes or locating utility lines requires lower volumes. Digging trenches or larger holes, where you are in one area for a longer time, higher volumes work better. You may need to experiment with different volumes to determine what is most productive. Example: Using lower volumes took longer to dig the pole hole but were able to dig twice as many holes in a day because the debris box didn't fill up as fast with water, therefore less time dumping!
- Nozzle head design is important in different soil conditions. Hard or rocky conditions, one or two orifices in the nozzle head works best. Soft or sandy conditions, three or four orifices work best. There is not one nozzle that works best in all conditions. Keep in mind that water nozzles wear out. Pay attention to how much water is used in an hour or two to check water flow.

Operating Instructions

1. It is important to remember that the vacuum tube uses air flow and not vacuum to pick up material. Keep the suction end of the nozzle in the right position to receive air and material
2. Submerging the nozzle in material stops air flow and prevents material movement. The catch basin nozzle is designed to pull air into the pipe to move material. The end is serrated with small holes; if the end is submerged, air is pulled in through the holes.
3. The weather and operating conditions cannot be controlled, but the blower speed, water volume and water pressure can be. The blower speed controls the volume of air and the speed of air movement through the pipe and into the debris tank.
4. If the soil or material breaks up easily, the blower can run at higher speeds and allow faster material pickup. The blower speed must be adjusted to move maximum amounts of material without carry-over into the blower/fan.
5. Blower/fan speed is important when working in freezing temperatures. High blower speeds cause wind chill conditions because of the air velocity. The wind chill conditions cause ice build-up in the vacuum tube or boom, which blocks material movement.
6. Proper speed will vary depending on the material moved. Air velocity should be set so material does not hang in the pipe. Adjust RPM to the lowest setting to move the material efficiently. Increase the speed as needed to pick up large rocks or heavy sludge. Watch the blower exhaust for carry-over material. Any type of carry-over should be avoided.
7. The further the distance from the work site to the debris body, the higher the blower/fan speed should be. The shorter the distance, the lower the blower/fan speed. Material moving through a pipe or tube creates a friction factor. The longer the tube or pipe, the higher the friction factor - called friction loss. Pipe and tube diameter is a major factor when moving material.

NOTICE

Machine Can Be Damaged

If ice builds up in the boom, shut down the vacuum system. Use hot water to heat the boom tubes or move the vehicle to a warm place. Slowly retract the boom when the tubes have warmed up. Do not retract the boom with ice build up in the vacuum tube. Damage to the boom and/or seal can occur. If hot water is available, start the vacuum system and spray hot water into the vacuum tube/nozzle. As the ice breaks away it will be carried to the debris body.

NOTICE

Machine Can Be Damaged

- **Beware of carry over material from debris body through the blower.**
- **Running the blower too fast with light material can carry the material over into the blower. This can cause premature wear.**
- **Over filling the debris body can cause carry over and damage to the blower.**

NOTICE

Preparing for Transport

Prior to transport secure all tools, hoses and all miscellaneous items in their storage locations.

- **All items in tool trays and racks need to be secured or tied down.**
- **If equipped, secure boom in transport mode.**
- **If equipped, lower debris body, close rear door.**
- **If equipped, secure all hose ends on hose reels.**
- **Close and secure all cabinet, tool box and control panel doors and covers.**
- **Remove and stow all hoses, suction tube, extension pipes and accessories.**
- **Disengage the hydraulic, vacuum and water systems.**
- **Check and clear the area around the unit before moving.**

Operation Overview of 400,000 BTU and 800,000 BTU Systems

The water heater is designed to control the temperature of the water. The heater output temperature is controlled by an adjustable thermostat control. The water heater normal ratings are from 400,000 BTU at 3 to 10 GPM or 800,000 BTU at 3 to 20 GPM. This will depend on what type of water heater and water pump installed.

A water heater with an electronic temperature control will allow the water heater to heat different volumes of water without overheating and going into steam. The electric temperature control has a microprocessor in it that senses a rapid heat rise and shows the accent of the heat. The electronic temperature control will typically have 4 to 5 on/off cycles in 60 seconds at 2.8 to 6 GPM. At volumes over 6 GPM the E.T.C. will typically run solid during operation.

The adjustable temperature control is similar to the electronic control except the temperature is set with a calibrated dial.

The primary controls are designed with a safety system that shuts down after about 13 seconds if no flame is detected.

Routine Maintenance

The system should be run for at least 15 minutes every month to maintain proper operation. Inspect for road debris and animal nesting before use. Clean as needed before operation.

The controls are located under the water heater inside the cabinet on all versions. The 400,000 and 800,000 BTU units use the same control panel.

Burner ON/OFF - Master switch to operate or shut down water heater.

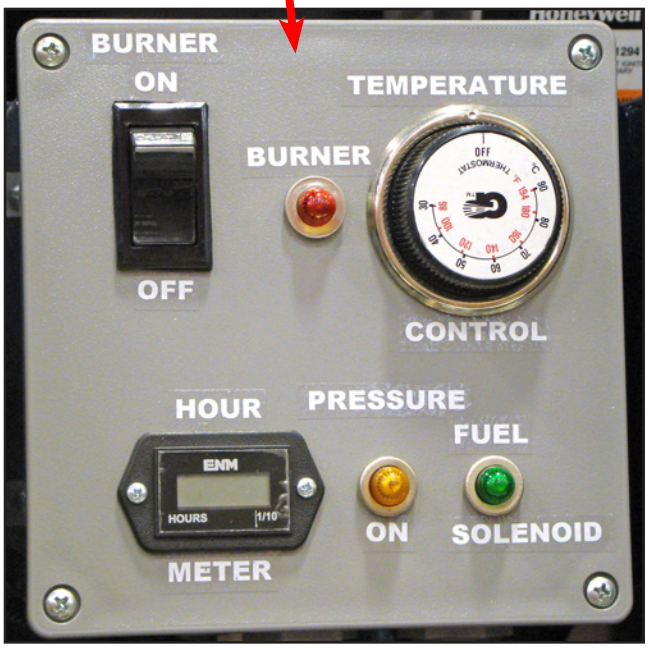
Hour Meter - Hours unit burner switch is on.

Power indicator light - indicates there is power at the primary control.

Fuel Solenoid indicator light - indicates that the fuel solenoid is active.

Temperature Control - Turn to adjust to desired water temperature. The burner will not operate in the OFF setting.

Pressure indicator light - indicates that the minimum flow and pressure of water is moving through the system. This light is triggered by the pressure switch located inside the water pump cabinet (may also be located in heater cabinet). To achieve the minimum hydraulic pressure to activate the pressure switch requires proper water nozzle selection.



CAUTION

Fire hazard

Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

Refer to manual for details

47954KP rA

High Temperature Relief Valve

This valve will relieve the system to a drain hose when the system overheats or reaches 5000psi. This is a fail safe type of valve and must be replaced if activated.

1. Check to make sure fuel tanks have at least a ¼ tank of fuel. Heater will not ignite if fuel falls below this level.
2. Ensure water tank has water in it.
3. Open door on heater cabinet, this must remain open during operation to provide adequate air flow to the burner and to prevent overheating of the system.
4. Turn burner power switch to the “ON” position.
5. Set desired water temperature. Do not exceed 180° F.
6. Turn on water pump and begin digging.
7. The green flow indicator light will light when proper water flow/pressure is sensed by the pressure switch. Proper nozzle selection is required to produce needed flow.
8. When green indicator light is on the burner will receive the signal to ignite.
9. Burner will turn on/off automatically to keep water temperature within the set range.

If for any reason the water heater does not fire after 15 seconds, the fuel solenoid will lock out due to no flame. This can be reset by turning the burner power switch “off” and waiting 10 seconds. Return the burner power switch to the “on” position. If after 3 consecutive attempts and the burner does not ignite, discontinue use, start trouble shooting the water heater (refer to water heater troubleshooting section). The fuel solenoid indicator light will be on when the fuel solenoid is powered.

10. At lower water volumes the burner will cycle on/off as much as 4 to 5 times per minute. At higher volumes the burner will run continuously.
11. It is recommended the water heater be turned off and allowed to cool with water flowing through the coil. This will decrease the amount of scale build-up in the coil.

It is recommended to change the fuel nozzle after every 1000 hours of operation.

Some locations do not require heat for operation due to higher temperatures or soft materials being vacuumed. It is recommended to start your burner and let it run for 10-15 minutes once per month to ensure proper operation and prevent fuel from draining back to tank or debris from accumulating on the coils.

800,000 BTU unit shown

NOTICE

Fire hazard

Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

Notes:

- Enabled when water pump is ON in stationary mode (does not work in road mode)
- Does NOT run in recirculation mode
- Disabled if water tank temperature is at least 100° F and water return line temperature is at least 120° F. (Does not apply to 2100i CB units)

Burner performance is not affected until the elevation is over 2000 ft. As elevation increases above sea level, the ambient air contains less oxygen. Because there is less available oxygen per Cubic foot of air, the burner must deliver a higher volume flow (cfm) of air to provide the proper amount of oxygen for the amount of oil being burned. This is the reason that an increase in the burner air setting or a fuel nozzle downsize may be required as elevation increases. For every 1000 ft. above sea level there is a 1.84% rate reduction in the burner.

During normal operation there should not be any visible smoke. If smoke is observed shut down and correct the burner setup. If not corrected the heat exchanger will be covered in soot and efficiency will be reduced.

The water flow determines the on/off cycle rate of the burner and the resulting temperature rise.

All burner nozzles sizes are in gallons per hour at 100psi fuel pressure.

High Elevation Nozzles	
Part No.	**Description**
49785A	ALKOTA 400K NOZZLE 4000-8000 X 2.5GPM
49785B	ALKOTA 400K NOZZLE 8000+ X 2GPM
49785C	ALKOTA 800K NOZZLE 4000-8000 X 4.5GPM
49785D	ALKOTA 800K NOZZLE 8000+ X 4GPM

This flow indicator light is triggered by the pressure switch located inside the water pump cabinet (may also be located in heater cabinet). To achieve the minimum hydraulic pressure to activate the flow switch requires proper water nozzle selection. The pressure switch is actually triggered off the hydraulic motor for the water pump.

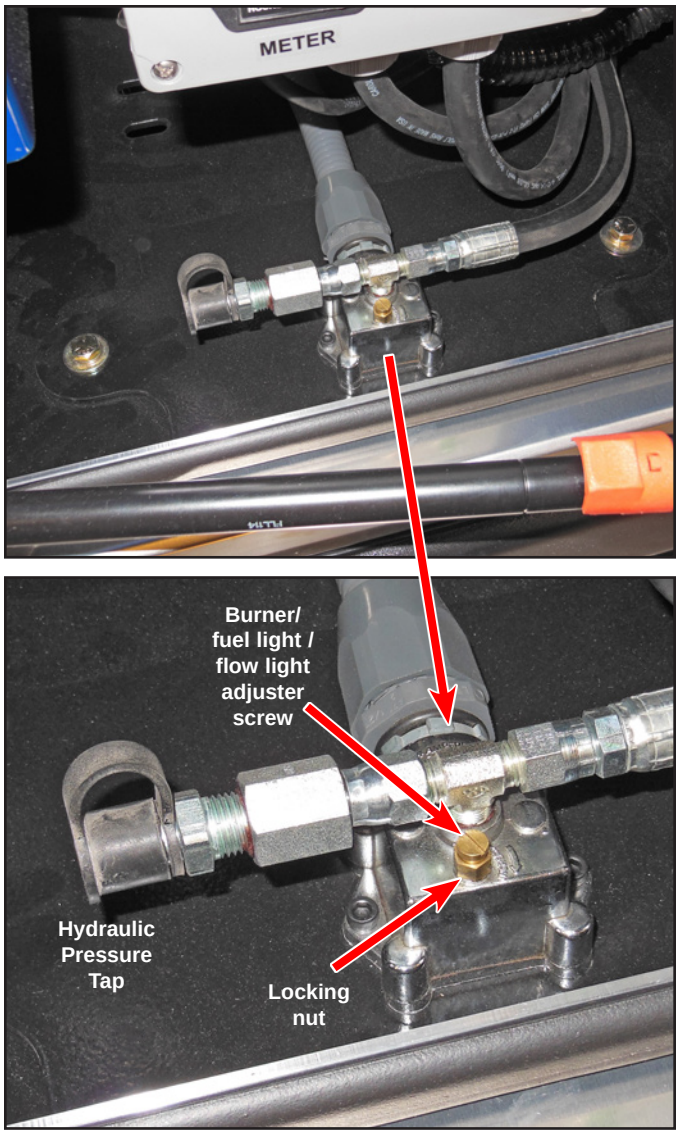
This procedure sets up a replacement pressure switch:

1. Attach the hose ball valve to the water lance hose. The water will be discharged to the ground during the test.
2. Locate the pressure switch. If it has one set screw, it controls the burner, fuel light and flow light. If two, one is for the burner/fuel light and the other turns on the flow light.
3. Install a tee and pressure tap in the 1/4 inch line going to the switch (if one is not installed). Connect a suitable pressure gauge.
4. Run the throttle at a moderate speed with multiflow to maximum.
5. Slowly close the ball valve until the pressure gauge reads 940 psi. At this point turn the switch adjuster screw(s). When the flow light just turns on, lock the screw down. Turn the other screw, and the burner should fire. Lock that screw down by holding the screw in place with a screwdriver and snugging up the lock nut. The heater controller takes a few seconds to react to the signal from the switch. Turn the adjusting screws slowly, even pausing to ensure the switch point is at 940 psi.
6. Verify the adjustments by operating normally with the gun. When you squeeze the trigger, the flow light, the burner and the fuel light should come on after a few seconds. Release the handle. The burner and flow light should go off. Repeat to ensure proper operation.

Alternate 45277D-30 pressure switch

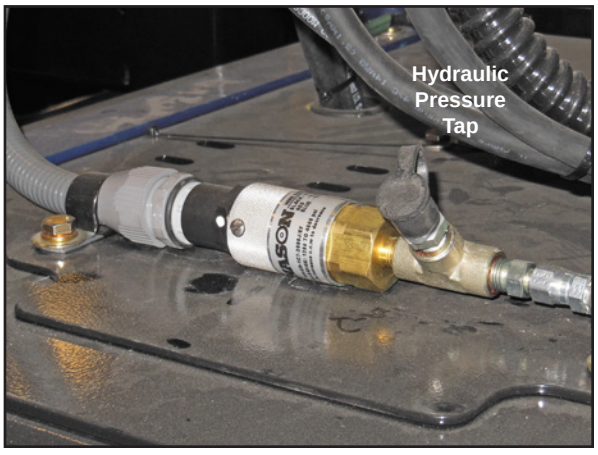
This switch is normally set to 1200psi. Always verify settings with the schematics for the unit.

To adjust set point: Loosen the adjusting collar screw, then turn CW to increase and CCW to decrease set point.



45277-30 Pressure switch
Located on floor of water heater cabinet.

Alternate 45277D-30 Pressure switch
Located on floor of water heater cabinet.



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ALKOTA WATERHEATER PARTS

Parts List

Part No.	Description	400K BTU	800K BTU	800K BTU 12VDC
49830-30	THERMOSTAT, ALKOTA HEATER	x	x	x
49830A-30	TEMPERATURE GAUGE, ALKOTA HEATER	x	x	x
49830B-30	BURNER GASKET, ALKOTA HEATER		x	x
49830C-30	BURNER MOTOR, ALKOTA 400K HEATER	x		x
49830D-30	BURNER MOTOR, ALKOTA 800K HEATER		x	
49830E-30	IGNITER, ALKOTA 400K HEATER	x		x
49830F-30	IGNITER, ALKOTA 800K HEATER		x	
49830G-30	FUEL FILTER, ALKOTA HEATER	x	x	x
49830H-30	DECK INSULATION, ALKOTA 400K HEATER	x		
49830J-30	DECK INSULATION, ALKOTA 800K HEATER		x	x
49830K-30	HOOD, DOMED, ALKOTA 400K HEATER	x		
49830L-30	HOOD, DOMED, ALKOTA 800K HEATER		x	x
49830M-30	FUEL PUMP, ALKOTA HEATER	x	x	x
49830N-30	POWER SWITCH, ALKOTA 400K HEATER	x		x
49830P-30	POWER SWITCH, ALKOTA 800K HEATER		x	
49830R-30	RELIEF VALVE, ALKOTA HEATER	x	x	x
49830S-30	PRESSURE SWITCH, ALKOTA HEATER	x	x	
49830T-30	BURNER COIL, ALKOTA 400K HEATER	x		
49830U-30	BURNER COIL, ALKOTA 800K HEATER		x	x
49830AG-30	CAD CELL	x	x	x
49830AH-30	TIMER	x		
49830AJ-30	ELECTRODE-LEFT HAND FLAT BUSS	x		x
49830AK-30	ELECTRODE-RIGHT HAND FLAT BUSS	x		x
49830AV-30	COIL TOP			
49830AT-30	HOUR METER		x	
49830AW-30	24” GAUGE SHIELD	x	x	x
49830AX-30	HOSE - 1/2”X29”, COUPLED	x		
49830AY-30	INDICATOR LIGHT, RED	x		x
49830AZ-30	ADJUSTABLE PRESSURE SWITCH			x
49830BA-30	30 AMP CIRCUIT BREAKER			x
49830BB-30	RELAY, AUTOMOTIVE			x
49830BC-30	CONTROL OIL PRIMARY			x
49830BD-30	IGNITOR, 12V	x		x
49830BE-30	SOLENOID, OIL		x	
49830BF-30	VALVE, RELIEF SS		x	
49830BG-30	HOSE - 1/2”X28”, COUPLED	x		
49830BH-30	12 VOLT FUEL SOLENOID	x		x
49830BJ-30	AC/DC HOUR METER FOR 49875	x		x

Parts List				
Part No.	Description	400K BTU	800K BTU	800K BTU 12VDC
High Elevation Nozzles				
49785A	ALKOTA 400K NOZZLE 4000-8000 X 2.5GPM	x	x	x
49785B	ALKOTA 400K NOZZLE 8000+ X 2GPM	x	x	x
49785C	ALKOTA 800K NOZZLE 4000-8000 X 4.5GPM	x	x	x
49785D	ALKOTA 800K NOZZLE 8000+ X 4GPM	x	x	x

Parts Common With Hotsy Units		Alkota			Hotsy	
Part No.	Description	400K BTU	800K BTU	800K 12VDC	400K BTU	900K BTU
47390AA-30	PRESSURE GAUGE,5000PSI (47390)	x	x	x	x	x
47390AJ-30	TEMPERATURE GUAGE, 47390D,J	x	x	x	x	x
47390AM-30	SWITCH-BURNER 120V	x	x		x	x
47390EA-30	FUEL SOLENOID (47390E)	x		x		x
47390ED-30	BURNER MOTOR (47390E)	x		x	x	
47390EP-30	THERMOCOUPLE,TYPE J (47390E)	x	x	x	x	x
47390ET-30	FUEL PUMP,BURNER,400K BTU	x			x	
47390FA-30	FUEL PUMP,BURNER,900K BTU		x	x		x
47390FE-30	PRIMARY CONTROL (47390F,J)		x			x
47390JB-30	GUAGE,TEMPERATURE (47390J)	x	x	x	x	x
47390JC-30	THERMOSTAT,MANUAL CNTRL (47390	x	x	x	x	x
47390KC-30	FUEL GAUGE,0-200PSI	x	x	x	x	x
47390FG-30	FUEL SOLENOID 110V		x			x

The water system on this unit consists of a water tank, water filter, water pump, hose reel, a water heater, various size hoses with quick disconnect couplers, ball valves and an air purge system. The various size hoses with quick couplers allows for easy connecting and disconnecting of the different systems for draining and storage.

Water Pump

The water pump on this unit is capable of producing 10 gallons a minute at 2500 PSI (20 gpm optional). It is both pressure and flow compensated to ensure the operator maximum performance at a variety of flows or pressures, all through the hand gun.

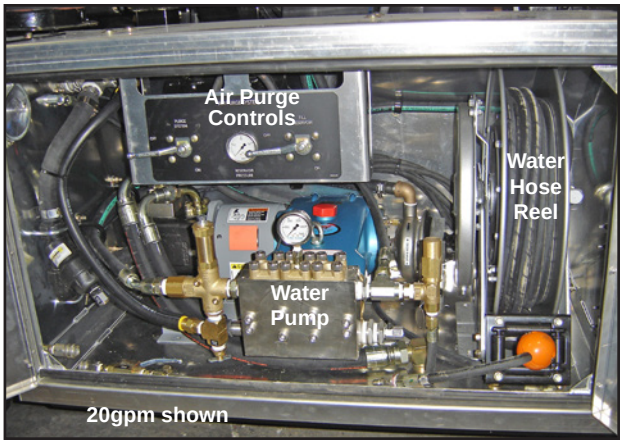
The water pump is controlled by a hydraulic proportional valve and the system computer. The first time the water pump switch is activated after the master control switch has been turned on the pump speed defaults to the lowest setting. This is adjusted with the multiflow switch.

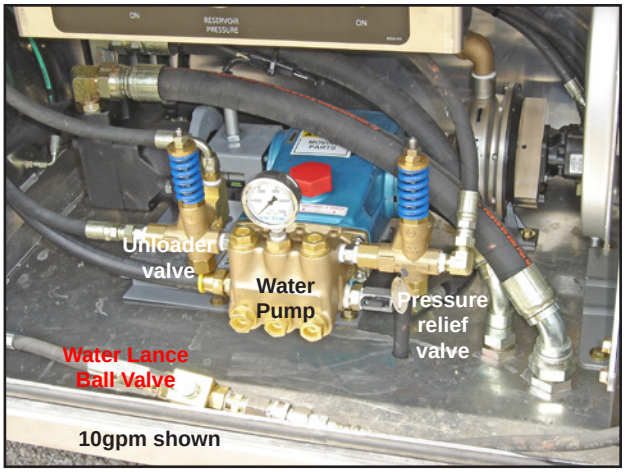
The water pump is hydraulically driven. The transfer case (TC) must be engaged in blower mode to operate the water pump. Follow the step by step instructions located in the cab of the truck for proper engagement of the TC. Prior to engaging the water pump, connect the hose reel hose to a water hand gun, a water wand or the recirculator.

Note: The water system must be full prior to connecting or turning on the water heater. Water flow is required for heater will fire. See water heater instructions for proper operation of the water heater.

Once the TC is engaged and all of the water hoses connected, turn the water pump switch to the ON position. Adjust the multiflow switch on the control panel to achieve the flow and pressure needed for the particular job. Push the switch down to decrease flow and up to increase flow. Pressure will be in relationship to the flow setting and hand gun nozzle being used.

The water lance ball valve can be removed from the system when using the hand gun by simple quick couplers.





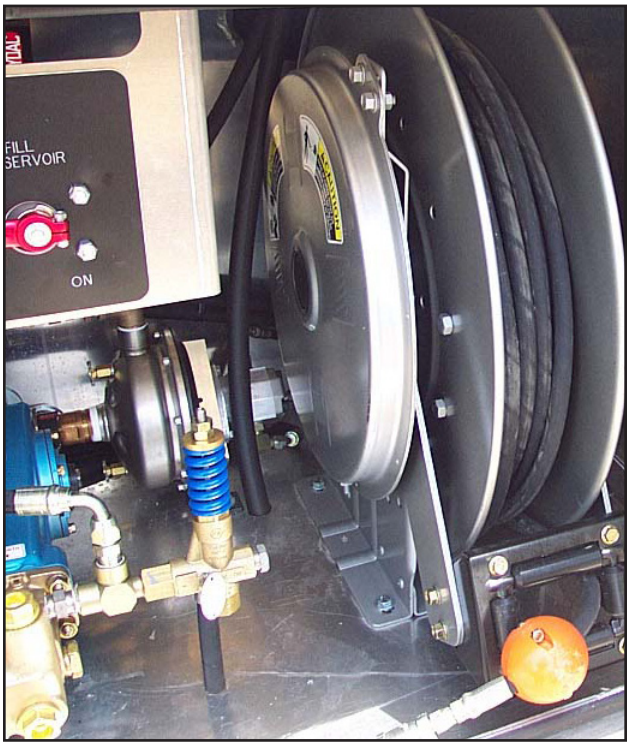
The water gun and extensions are stored behind the rear bumper for transport.

This unit is equipped with a high pressure hand gun. The high pressure hand gun can only be connected to the hose reel located in the water pump cabinet. The high pressure water system uses up to the full water pump pressure of 2500 PSI and can only be used with the special high pressure hand gun or a high pressure wand. The high pressure system also uses a high pressure water unloader valve and ball valve.

Note: Should the handgun high pressure relief valve trip (or open), water will unload straight down on to the ground. The main control unloader dumps to the suction line.

Water System Manual Relief Valve

If the handgun nozzle plugs during operation turn off the water pump and open the relief valve to relieve pressure in the handgun. Then remove the nozzle and clean the orifice.

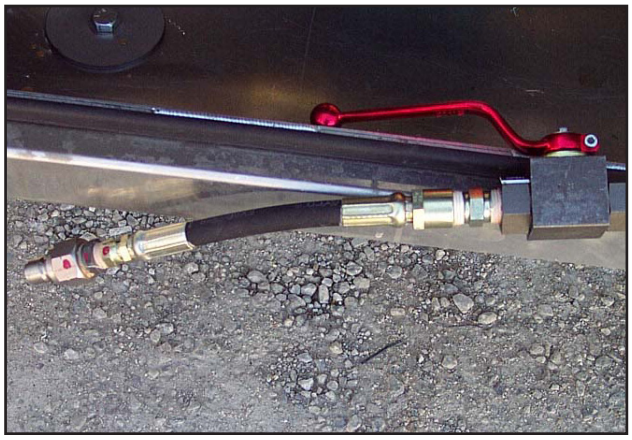


⚠ WARNING

Handguns Use High Pressure Water

High pressure water can cause serious injury or death.

- **Never point the handgun at or near a person or animal.**
- **Bleed pressure from handgun by (shutting off pressure and) pressing the trigger before disconnecting from high pressure connection.**
- **Wear appropriate safety equipment including face shield and safety goggles, safety gloves and safety toe boots, waterproof apparel is preferred.**
- **Use only handgun and connection supplied with the unit; never use common low pressure handguns or connectors with the high pressure system.**



HXX Nozzle Chart

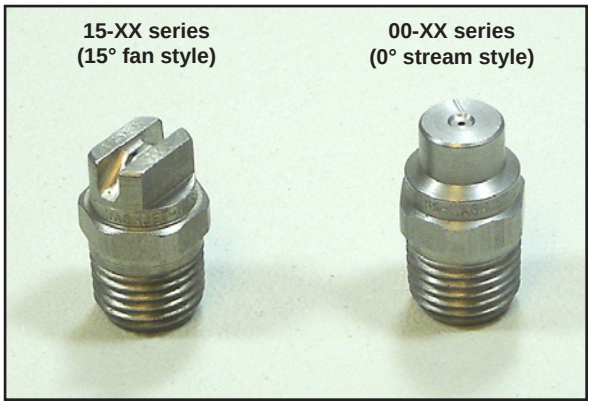
GPM @ 2,500 PSI

Size	Part Number	GPM 1 Nozzle	GPM 2 Nozzle	GPM 3 Nozzle
00-02	48089	1.6	3.2	4.8
00-03	48089B	2.4	4.8	7.2
00-04	48089C	3.2	6.4	9.6
00-05	48089D	4.0	8.0	12.0
00-06	48089E	4.7	9.4	14.1
00-07	48089F	5.5	11.0	16.5
15-02	48090	1.6	3.2	4.8
15-03	48093	2.4	4.8	7.2
15-04	48091	3.2	6.4	9.6
15-05	48091A	4.0	8.0	12.0
15-06	48092	4.7	9.4	14.1
15-07	48092A	5.5	11.0	16.5

¼” NPT 10,000 PSI Rating, Stainless Steel

Note: The choice of nozzles will affect the maximum temperature rise and operation of the water heater, and also limit the maximum flow rate.

Optional rotating nozzles



The optional water heater is used for winter operation and in clay applications. Complete all necessary hose connections prior to turning on the water heater. Follow the supplied detailed instructions for the water heater supplied by the manufacturer of the water heater.

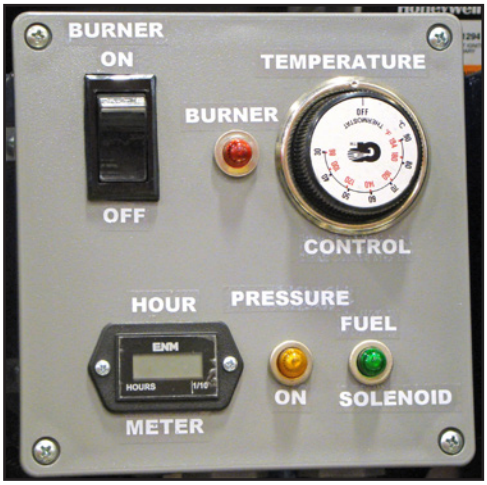
Note: Water heater must have 3GPM of water flow before it will ignite.

Heater controls are located below the heater. Separate operating instructions are supplied for the heater in the Options section.

⚠ WARNING

Hot Water Can Burn

Avoid contact with the water stream. The water heater can produce water at temperatures greater than 125° (F). and could result in death or serious injury from burns.



Water Heater Control Panel

CAUTION

Fire hazard

Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

Refer to manual for details

47954KP rA

If equipped water can be recirculated with (not while in motion) or without the water heater. The connections and procedures are the same except whether the boiler is turned on or not. If equipped with a water heater the water can also be preheated while stationary. The way the system is designed, water flows through the heater all of the time. When NOT in motion turn the heater on when you want the water warmed. DO NOT heat water above 140°F (60°C) in the tank.

The adjacent picture shows the hose reel connected to the recirculator.

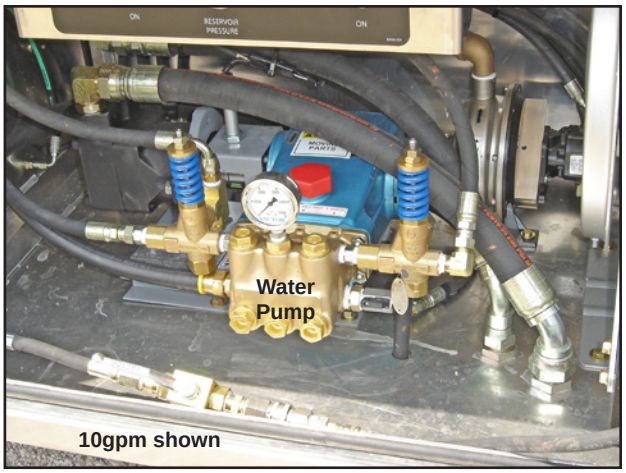
Recirculate Without Heater

1. Connect hose reel outlet line to recirculator line
2. Open ball valve on hose reel outlet line
3. Open all water suction valves to water pump
4. Turn master switch ON
5. Turn recirculator switch ON
6. Water will recirculate.

Preheat With Heater while stationary only

1. Connect hose reel outlet line to recirculator line
2. Open ball valve on hose reel outlet line
3. Open all water suction valves to water pump
4. Turn master switch ON
5. Turn water pump switch ON
6. Turn boiler switch ON and set temperature

   Note: Do not heat water over 140° in the tank.
7. Water will recirculate and heat water in tank



NOTICE

Fire hazard

Do not use water heater when unit is in motion.

For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation.

HXX Recirculator Operation

Recirculate

1. Fill water tank(s)
2. Connect hose reel outlet line to recirculator return line
3. Open ball valve on hose reel outlet line
4. Open all water suction valves to water pump
5. Turn Master switch ON
6. Turn Recirculator switch ON

Preheat - Stationary ONLY (Requires optional water heater)

1. Fill water tank(s)
2. Connect hose reel outlet line to recirculator return line
3. Open ball valve on hose reel outlet line
4. Open all water suction valves to water pump
5. Turn Master switch ON
6. Turn Water Pump switch ON
7. Turn Boiler switch ON and set temperature
   NOTE: do not heat water over 140° (F) in tank

Refer to manual for details.

49263 rev 0

The air purge system uses compressed air to remove water from the water lines, hoses and some components prior to storage in cold weather. The controls are located inside the water pump cabinet.

Air from the chassis reservoir is used to pressurize an auxiliary air tank. An air protection valve located on the chassis reservoir protects the brake system. If air pressure in the chassis reservoir drops to a critical level, the protection valve closes to protect the brake system air pressure. The brake system has priority over any auxiliary components. As added protection, a check valve in the purge system allows air to flow into the water system but prevents water from entering the air system.

Late 2011 a charge pump isolation valve was added to help purge the water pump valve area. The following is the procedure for the updated system.

Note: The chassis air reservoir should be at 90psi when activating the air purge system. It may be necessary to refill the auxiliary tank multiple times to completely purge the water system.

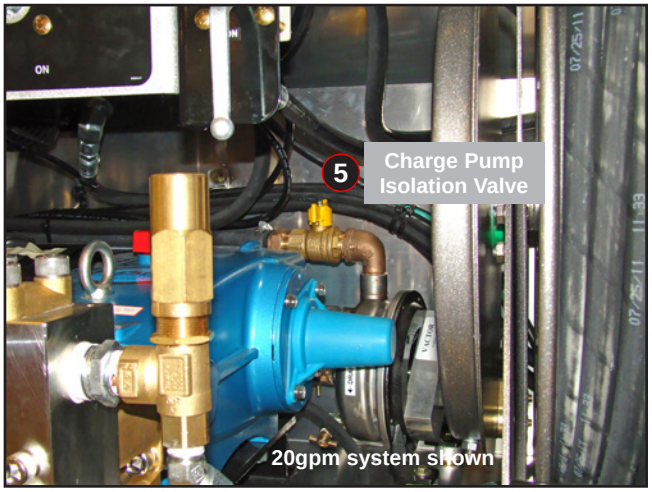
Purge the water system:

Follow the steps indicated below after each use for winterizing the water system.

Note: The water system should be drained. Refer to the water tank pages in this section.

1. Open the ball valve at the end of the hose on the hose reel to depressurize the system.
2. Disconnect the ball valve assembly from the end of the hose reel hose so the male end of quick disconnect is open to allow the purge air to flow freely.
3. Pull all the hose off the hose reel and lay it flat on the ground to gravity assist the water bleeding process.
4. Open the ball valve on the Air Purge panel marked FILL RESERVOIR. Close the ball valve when the gauge shows 90psi.
5. Close the charge pump isolation valve. This will create back pressure and force the check valves open when the air purge and Cat pump are turned on.

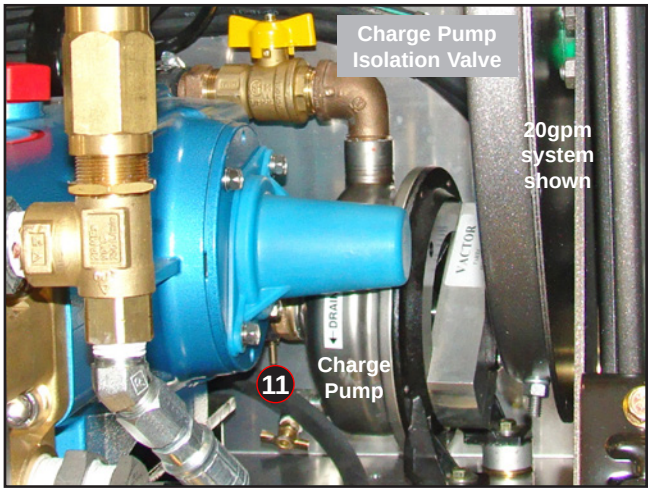
Note: Air above 90psi and high volume can damage the pump seal retainers and ceramic plungers.



6. Turn the water pump on for 10-15 seconds at lowest speed and at the same time SLOWLY turn on the ball valve marked PURGE SYSTEM. Allow the air to drop to 15psi. Close ball valve and shut the pump off. Recharge tank to 90psi and repeat purging until all the water is drained.
7. It should not be necessary to run the pump more than the 10-15 seconds with the suction line closed; but additional air purging may be necessary.
8. Remove the water filter.
9. Repeat purging procedure to blow out the hose reel and lines until all the water is drained.
10. Allow the hose to go back on the hose reel slowly . This will ensure all the water has been drained from it.
11. Open the two charge pump drains.
12. Open all mini ball valves on the pump.
13. Open the charge pump isolation valve. This is the normal operating position.

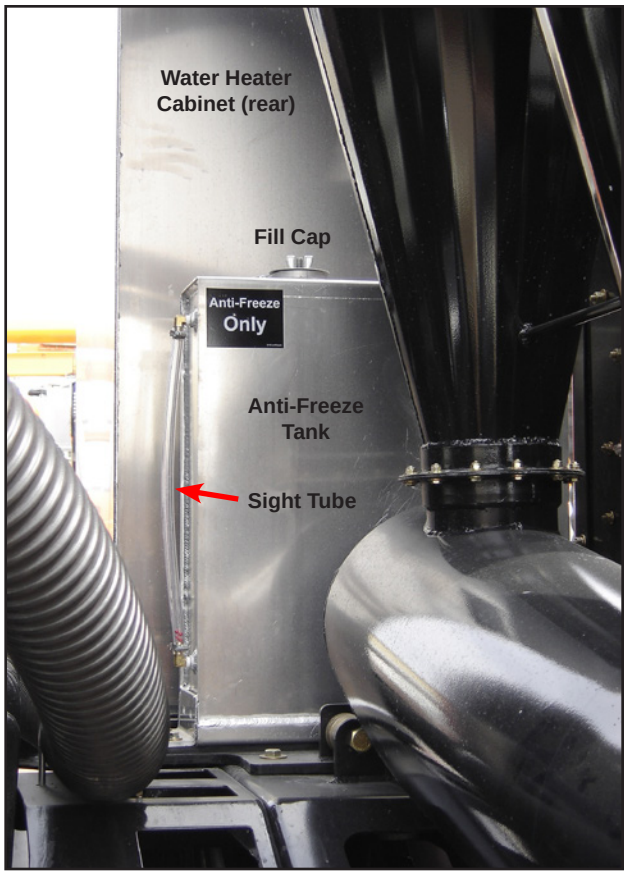
When the water hose is purged of water, put the water pump ball valve in the OPEN position. Put other systems, such as the handgun, open for purging. After the system is purged, place the Fill reservoir and Purge System ball valves in the OFF position.

Note: Leave all drain plugs open to keep residual water from the tanks from migrating to the system during transport.



Anti-Freeze Tank

The anti-freeze tank provides a supply of anti-freeze that can be drawn into the water pump system to reduce the risk of freezing during transport. The tank is normally located behind the water heater cabinet on the passenger side. There is a sight tube to indicate the liquid level. The control valves may be located inside the water pump cabinet or above the cabinet as shown here.

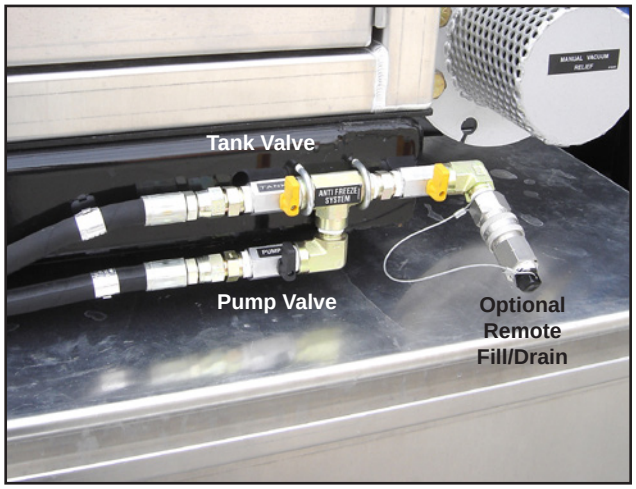


Prepare for transport

1. Turn off the water to the water pump.
2. Before operating the handgun open the anti-freeze tank and pump valves.
3. Operate the handgun at low speed until anti-freeze can be seen coming out the nozzle.
4. Stop the handgun and shut down the water pump.
5. Close the anti-freeze tank and pump valves.
6. The water pump is now ready for transport.

Prepare for use

1. Turn off the water to the water pump.
2. Aim the handgun hose in to the filler cap opening on the anti-freeze tank.
3. Operate the water pump at low speed until all the anti-freeze has been pumped from the system. This should only take a few seconds.
4. Shut down the water pump.
5. The water system is now ready for use.



Maintenance

On a yearly basis at the end of the cold weather flush and drain the anti-freeze tank and system.

Air Excavation

Air excavation is similar to hydro-excavation in operation.

Vactor offers CEG's Air-Spade® digging tools for use with the optional air compressor system. Refer to the manufacturer's manual for operation, service and maintenance.

Air-based vacuum system offers the same benefits of the water-based vacuum excavation trucks with the following advantages:

- With air, spoils stay dry so they can be used for backfilling
- Air eliminates mud disposal problems
- Air reduces erosion of roadbase or around utilities
- Air units are smaller and more versatile and can get into tight areas.
- Air units are quieter and therefore less disruptive

Note: Working with air will require more frequent maintenance of the air filter.

Air Compressor - Controls

The air system on this unit consists of an air compressor and hose reel.

Air compressor gauge panel detail

The hydraulic system must be engaged to operate with air. Follow the step by step instructions located in the cab of the truck for proper engagement of the hydraulics. Prior to engaging the air system, connect the hose reel hose to the air gun and prepare to operate.

The system is designed so that either the air or water system can operate, but not both at the same time.

Controls

1. **High/Low switch -** If equipped, 150psi for digging and 110psi for air tools.
4. **Pressure gauge -** Do not operate above 150 psi.
3. **Hour meter -** Used to track service intervals.
5. **Temperature gauge -** Indicates operating temperature. Unit will go in to shut down at 240° (F).
2. **Reset switch -** Resets system after unit has gone in to a shut down mode. A message will be displayed when a reset is required.

Automatic blow down valve

There is an integrated blow down valve in the compressor system. It is located at the downstream side of the coalescer head and will automatically bleed the sump to zero pressure when the compressor is disengaged. Blow down time interval takes between 30 to 60 seconds and is controlled by a pressure sensor. If the mode switch at the master control panel it quickly switched between modes and back to air mode the air indicator light will not go on until the blow down time interval has completed.

Operation

To operate switch to air mode at the master control panel.

The unit is equipped with a load sensing ability. The rpm's drop to an idle mode after 10 seconds of no load and return to full speed when the gun is triggered.

Air Compressor - Controls

Shut down systems

Excess flow (velocity fuse) - closes when full free air flow is detected. Resets automatically when problem is corrected.

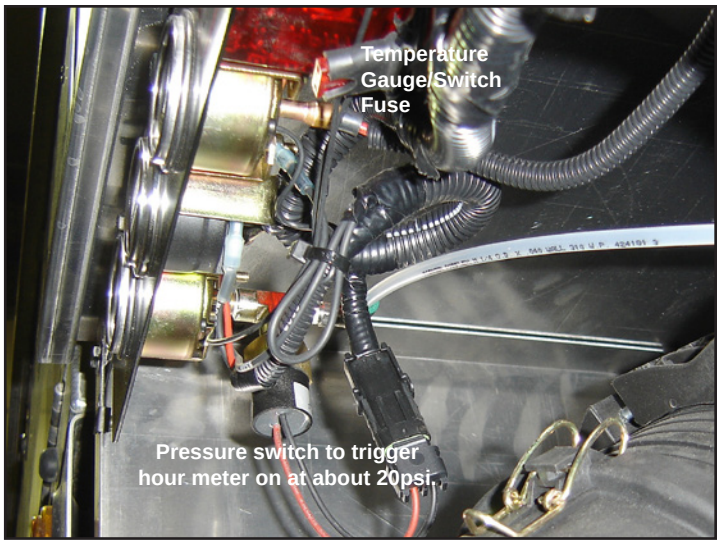
Temperature shut down - unit will go in to shut down at about 240° (F). Use the reset switch to restart after correcting the problem. The temperature guage is also the switch for this function. The normal reading about 175° - 200° (F). A sensing probe goes to the lower rear of the unit.

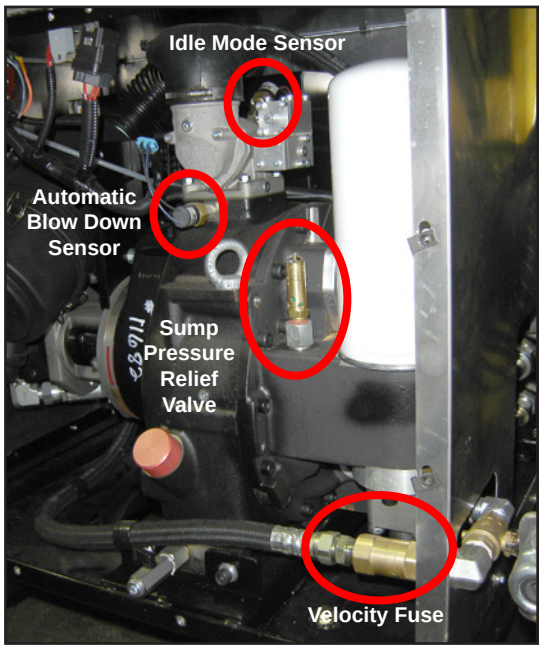
High pressure shut down - unit will go in to shut down after 150 psi is reached. Use the reset switch to restart after correcting the problem. The guage is also the switch for this function.

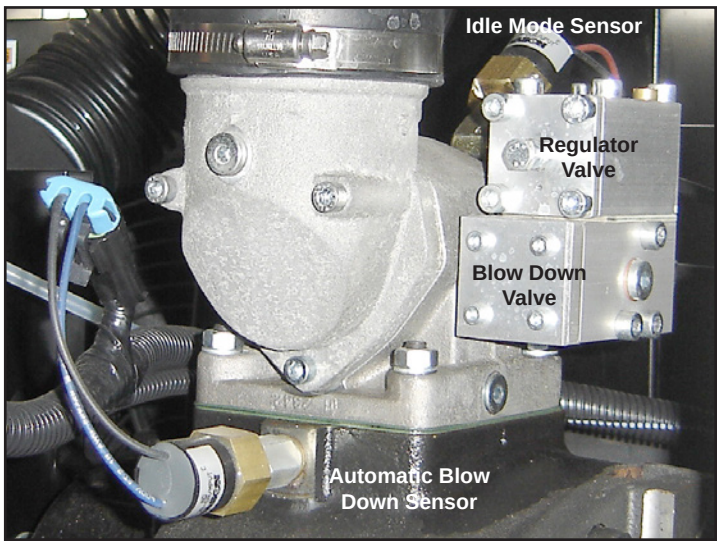
Housing pressure relief - opens at 175 psi to protect the compressor. Resets automatically when problem is corrected.

Note: Two similar air compressors are in service and are similar in appearance.

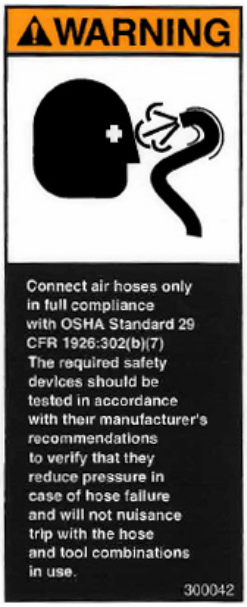
Sensor	Mode
Idle mode	Normally Open
Automatic blow down	Normally Closed
Hour meter switch	Normally Open
Temperature (gauge)	Normally Open
Pressure (guage)	Normally Open

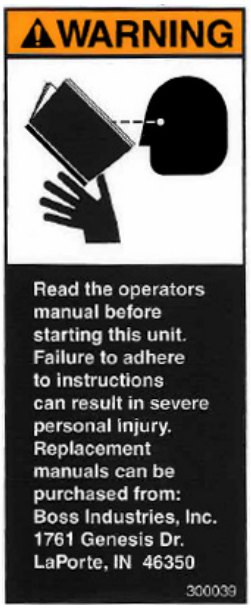






Air Compressor - Decals



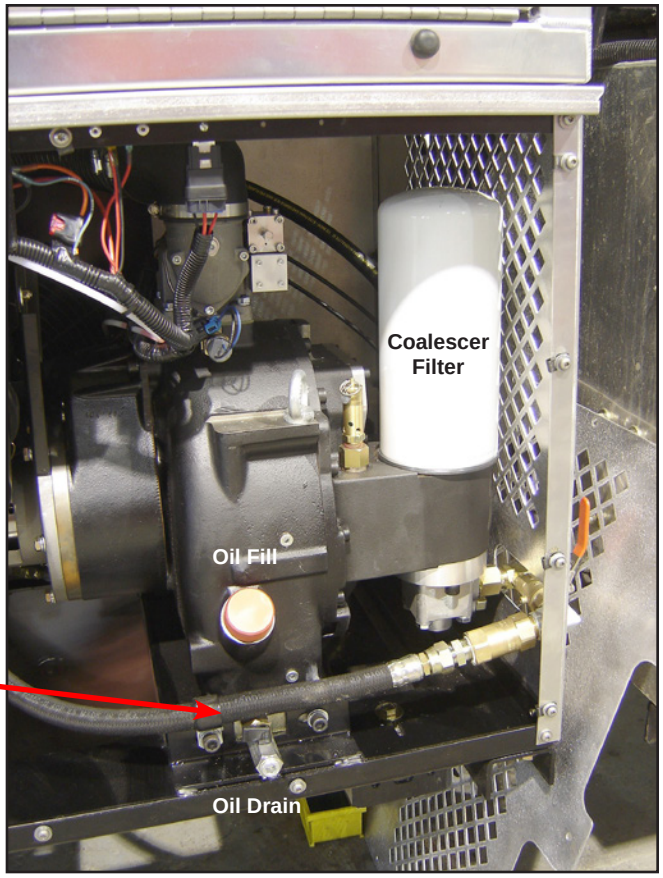


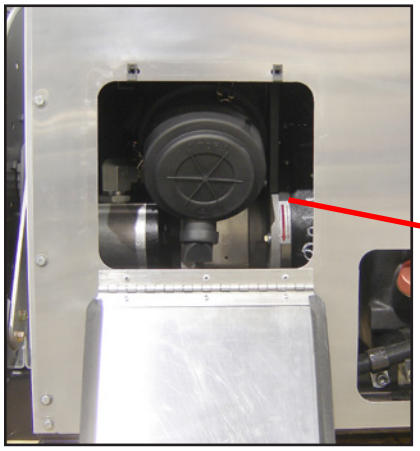
Air Compressor - Service

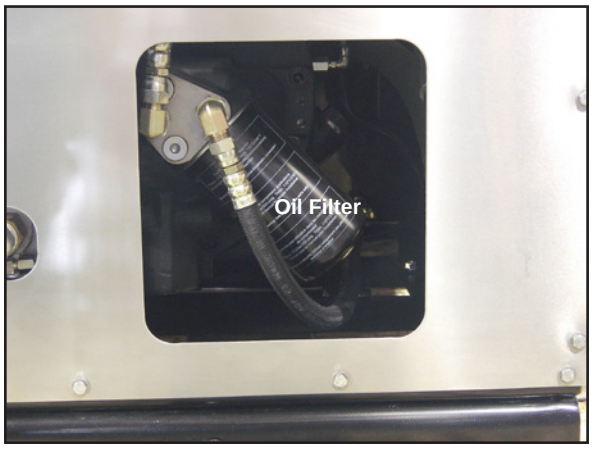
Refer to the manufacturer's manual for service and maintenance.

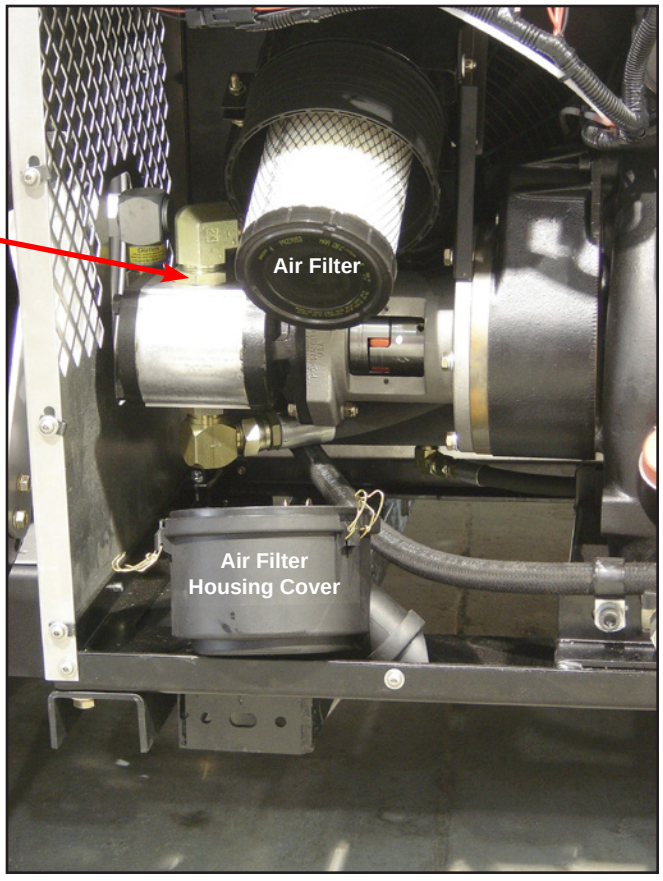
The oil filter is accessed through the side access panel from underneath.

Note: Two similar air compressors are in service and are similar in appearance.









Hand gun nozzles - refer to the data chart in the Operation section.

Part Number	Description	Frequency (hours)	PD units	Fan units
46938JF-30	Remtron plastic carry bag	As Needed	●	●
48611-30	Spindle Box Lube, Shell Omala RL 68	500	●	●
48209A-30	Filter Element for 48208A Hydraulic Filter	500		●
42431B-30	Filter Element for 62643B Hydraulic Filter	500		●
42431-30	Filter Element for 62643 Hydraulic Filter	500	●	
48749A-30	Kit, Seal Cat 3560	1500	●	●
48567-30	Kit, Seal Cat 660	1500	●	●
48749B-30	Kit, Valve Cat 3560	2000	●	●
48556-30	Kit, Valve Cat 660 (2 required)	2000	●	●
48565-30	Spider for motor coupling Cat 660	As Needed	●	●
48047MC-30	Spider for motor coupling Cat 3560	As Needed	●	●
46441D-30	Unloader Valve Cat 660 (pump# 48947L / 10gpm)	As Needed	●	●
46441E-30	Relief Valve Cat 660	As Needed	●	●
46441EA-30	Seal Kit, Buna-N for 46441E Relief Valve	As needed	●	●
46441EB-30	Seal Kit, Viton for 46441E Relief Valve	As needed	●	●
46441G-30	Unloader Valve Cat 3560 (pump# 48047N / 20gpm)	As Needed	●	●
46441H-30	Relief Valve Cat 3560	As Needed	●	●
39893-30	Boom Turret Cover Gasket	As Needed	●	●
70404M-30	Debris Hose, Red 8” x 34”	As Needed	●	●
43958A-30	Debris Hose, Red 8” x 136” (Ext.Boom)	As Needed	●	●
46564D-30	Debris Hose, Red 8” x 60” (Tel. Boom)	As Needed	●	●
70404M-30	Debris Hose, Red, Gum Lined 8” x 36”	As Needed	●	●
1140363A-30	Air Filter, Final Filter 19.6OD x 14ID x 28.5 tall (round style for HXX PD)	As Needed	●	
1140363B-30	Air Filter, Final Filter 19.6OD x 14ID x 21.5 tall (round style for Prodigy)	As Needed	●	
1140467D-30	Air Filter, Final Filter 20 x 30 x 3.5 (old square style for HXX PD)	As Needed	●	
35096-30	8” to 6” Reducer Flange	As Needed	●	●
34141-30	6” to 4” Reducer Flange	As Needed	●	●
46471A-30	Quick Clamp 4”	As Needed	●	●
32087-30	Quick Clamp 6”	As Needed	●	●
16584-30	Quick Clamp 8”	As Needed	●	●
51770-30	Band Lock, 8” FLG to 6” MBL	As Needed	●	●
50271-30	Bank Lock, 8” FLG to 6” FMBL	As Needed	●	●
51188-30	Band Lock, 8” FLG to 8” FMBL	As Needed	●	●
1280043-30	Band Lock, 8” FLG to 6” FMBL	As Needed	●	●
42577-30	Band Lock Assembly 4”	As Needed	●	●
42578-30	Band Lock Assembly 6”	As Needed	●	●
42579-30	Band Lock Assembly 8”	As Needed	●	●
42580-30	Band Lock, Female 4”	As Needed	●	●
42581-30	Band Lock, Female 6”	As Needed	●	●
42582-30	Band Lock, Female 8”	As Needed	●	●

Part Number	Description	Frequency (hours)	PD units	Fan units
42583-30	Band Lock, Male 4”	As Needed	●	●
42584-30	Band Lock, Male 6”	As Needed	●	●
42585-30	Band Lock, Male 8”	As Needed	●	●
42589-30	Band Lock, Gasket 4”	As Needed	●	●
42590-30	Band Lock, Gasket 6”	As Needed	●	●
42591-30	Band Lock, Gasket 8”	As Needed	●	●
42586-30	Band Lock, Clamps 4”	As Needed	●	●
42587-30	Band Lock, Clamps 6”	As Needed	●	●
42588-30	Band Lock, Clamps 8”	As Needed	●	●
43322-30	PVC Flex Hose Bulk 4”	As Needed	●	●
43323-30	PVC Flex Hose Bulk 6”	As Needed	●	●
43716-30	PVC Flex Hose Buk 8”	As Needed	●	●
25637D-30	Aluminum Pipe 8” x 72”	As Needed	●	●
25637E-30	Aluminum Pipe 8” x 90”	As Needed	●	●
25637G-30	Aluminum Pipe 8” x 120”	As Needed	●	●
25262-30	Aluminum Pipe Handle 8”	As Needed	●	●
29314-30	Water Ring 8”	As Needed	●	●
20188M-30	Quick Disconnect (Water) 1/2” Male	As Needed	●	●
20188L-30	Quick Disconnect (Water) 1/2” Female	As Needed	●	●
40589-30	Quick Disconnect 1/2” to 1/2” NPT	As Needed	●	●
27771K-30	Ceramic Lined Elbow 8”	As Needed	●	●
89444-30	Digging Lance Fiberglass	As Needed	●	●
500619A-30	Digging Lance Pipe Assy. 83”	As Needed	●	●
500619B-30	Digging Lance Pipe Assy. 108”	As Needed	●	●
500619C-30	Digging Lance Pipe Assy. 48”	As Needed	●	●
500619E-30	Digging Lance Pipe Assy. 83” w/nozzle	As Needed	●	●
500619F-30	Safety Shutoff Valve Assy.	As Needed	●	●
89714-30	Nozzle Guard Assembly, 3.2 GPM	As Needed	●	●
89714A-30	Nozzle Guard Assembly, 4.8 GPM	As Needed	●	●
89714B-30	Nozzle Guard Assembly, 9.6 GPM	As Needed	●	●
89714C-30	Nozzle Guard Assembly, 16.5 GPM	As Needed	●	●
89714D-30	Nozzle Guard Assembly, 6.4 GPM	As Needed	●	●
86230-30	Nozzle, 3 Insert with out Guard (Inline)	As Needed	●	●
86230D-30	Nozzle, 2 Insert with out Guard	As Needed	●	●
89714A-30	Nozzle, 3 Insert with out Guard	As Needed	●	●
89713-30	Nozzle Tube, Guard (plastic)	As Needed	●	●
47390KJ-30	Heating Coil for 47390K (400K BTU unit)	As Needed	●	●
47390LD-30	Heating Coil for 47390L (940K BTU unit)	As Needed	●	●

Hand gun nozzles - refer to the data chart in the Operation section.

Part Number	Description	Frequency (hours)	PD units	Fan units
49209-30	**Air Spade**			
49209-30	AIR EXCAVATION KIT, PREMIUM	As Needed	●	●
49209A-30	AIR-SPADE SERIES 2000 TOOL	As Needed	●	●
49209B-30	AIR-SPADE 3FT EXTENSION POLE	As Needed	●	●
49209C-30	AIR-SPADE 10FT LIGHTWEIGHT HOS	As Needed	●	●
49209D-30	AIR-SPADE 45* ANGLED ADAPTER	As Needed	●	●
49209E-30	AIR-SPADE HANDLE	As Needed	●	●
49209F-30	AIR-SPADE 4FT EXTENSION POLE	As Needed	●	●
49209G-30	AIR-SPADE NOZZLE, 150 CFM	As Needed	●	●
49209H-30	AIR-SPADE NOZZLE, 105 CFM	As Needed	●	●
49209J-30	AIR-SPADE HANDLE REBUILD KIT	As Needed	●	●
49209K-30	DIRT GUARD, AIR SPADE	As Needed	●	●
	3000 Series Air Spade			
49931-30	3000 SERIES AIR SPADE	As Needed	●	●
49931A-30	FLEX LEADER HOSE, 1” X 25FT.	As Needed	●	●
49931B-30	LANCE EXTENSION, 3’ LG	As Needed	●	●
49931C-30	NOZZLE, 330 SCFM	As Needed	●	●
503054A-30	AIR EXCAVATION KIT, 330 SCFM	As Needed	●	●
	Fuses (normally located in the battery box)			
507865-30	80A MEGA FUSE	As Needed	●	●
507865A-30	150A MEGA FUSE	As Needed	●	●
507865B-30	350A MEGA FUSE	As Needed	●	●

Vactor

Reference - Hydraulic Symbols

Lines

	Line, Working (Main)
	Line, Pilot or Drain
	Flow Direction Hydraulic Pneumatic
	Lines Crossing
	Lines Joining
	Lines With Fixed Restriction
	Line, Flexible
	Station, Testing, Measurement or Power Take-Off
	Variable Component (run arrow through symbol at 45°)
	Pressure Compensated Units (Arrow parallel to short side of symbol)
	Temperature Cause or Effect

Reservoir

	Vented
	Pressurized

Line, To Reservoir

	Above Fluid Level Below Fluid Level
	Vented Manifold

Hydraulic Pumps

	Fixed Displacement
	Variable Displacement

Motors and Cylinders

Hydraulic

	Fixed Displacement
	Variable Displacement
	Cylinder, Single-Acting

Cylinder, Double-Acting

	Single End Rod
	Double End Rod
	Adjustable Cushion Advance Only
	Differential Piston
	Telescopic

Miscellaneous Units

	Electric Motor
	Accumulator, Spring Loaded
	Accumulator, Gas Charged
	Heater

Miscellaneous Units

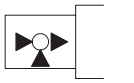
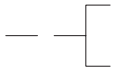
	Cooler
	Temperature Controller
	Filter, Strainer
	Pressure Switch
	Pressure Indicator
	Temperature Indicator
	Component Enclosure
	Direction of Shaft Rotation (assume arrow on near side of shaft)

Methods of Operation

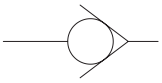
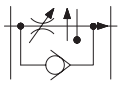
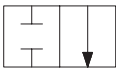
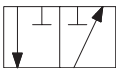
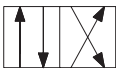
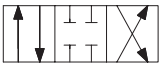
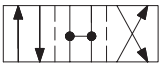
	Spring
	Manual
	Push Button
	Push-Pull Lever
	Pedal or Treadle
	Mechanical
	Detent
	Pressure Compensated

Reference - Hydraulic Symbols

Methods of Operation

	Solenoid, Single Winding
	Servo Control
Pilot Pressure	
	Remote Supply
	Internal Supply

Valves

	Check
	On-Off (manual shut-off)
	Pressure Relief
	Pressure Reducing
	Flow Control, Adjustable - Non-Compensated
	Flow Control, Adjustable (Temperature and pressure compensated)
	Two-Position Two Connection
	Two-Position Three Connection
	Two-Position Four Connection
	Three-Position Four Connection
	Two-Position In Transition

Color Code for Fluid Power Schematic Drawings

Black	Intensified Pressure
Red	Supply
Intermittent Red	Charging Pressure
Intermittent Red	Reduced Pressure
Intermittent Red	Pilot Pressure
Yellow	Metered Flow
Blue	Exhaust
Green	Intake
Green	Drain
Blank	Inactive

The Liquid Ring industrial vacuum loader combines the best feature of the - high vacuum (28” in-Hg) power, four stage filtration and modular filter components for easy maintenance - with a liquid ring pump. Because of the its unique design, the liquid ring pump is virtually maintenance free and operates at an extremely low noise level.

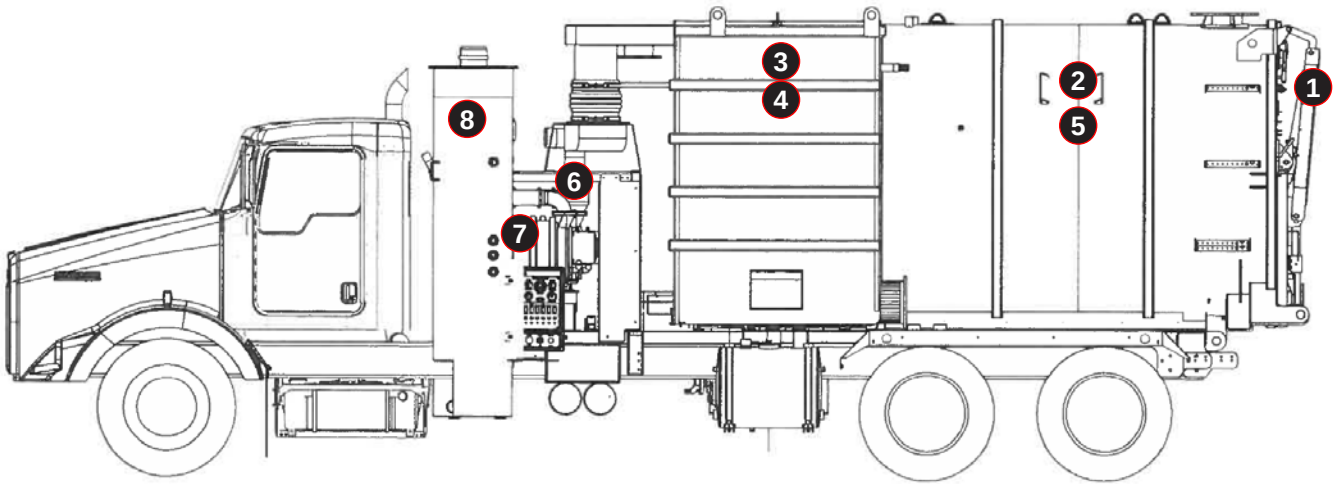
PRINCIPLES OF OPERATION - The Liquid Ring consists of a diesel power source, liquid vacuum pump, hydraulic and pneumatic control systems, multiple air filtration systems, and a dump-type hydraulically sealed payload debris body. It is capable of vacuuming a wide range of wet or dry materials in a variety of viscosities and weights.

The vacuum module is powered by the truck’s diesel engine and is coupled to the truck power transmission chain by means of a transfer case and belt drive. The transfer case is positioned between the transmission and the rear axle. When engaged, the transfer case diverts power away from the road wheels to drive a blower, which is the source of airflow.

The liquid ring vacuum pump picks up any loose material, in the path of the vacuum and is conveyed to the debris body via the vacuum hoses.

Completely read and follow manufacturer’s instruction in the manual for the proper operation and maintenance of the water pump. Failure to do so may result in serious injury or damage to the water pump.

Do not let the pump run dry, serious pump damage will occur.



The filtration system is designed to clean the air coming into the system by removing all dirt, dust and foreign matter from the air. The filtration system's primary purpose is to protect the blower by removing nearly all material from the air stream before it reaches the blower. There are four stages to the filtration system:

- First Stage: Debris body Collection
- Second Stage: Cyclone Filter
- Third Stage: Filter Baghouse
- Fourth Stage: Mesh Basket

1 Waste material first enters the Liquid Ring Ace through the 8-inch inlet port at the rear of the machine or through the optional boom located on top of the tank.

2 The deflector plate knocks the bulk of the material out of the airstream and it falls to the floor of the debris body. The deflector plate is located immediately inside the rear and at the top of the tank. In the tank, the air travels through it to the other end and exits the debris body.

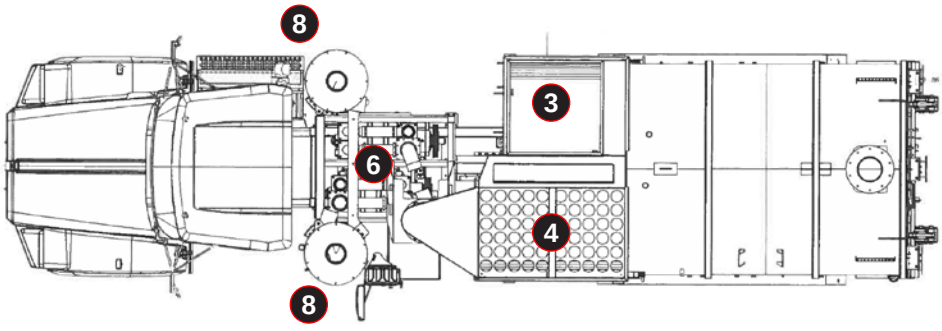
3 The air flows into a cyclone filter chamber. In the filter chamber, centrifugal force hurls the denser particles toward the cyclone walls where they spiral downward into the collection hopper. The lighter and by now relatively particle-free air which has travelled to the bottom of the cyclone, returns to the top.

4 From there, the air stream leaves the cyclone chamber through a standpipe and enters the filter bag house. The air stream enters through the top and travels to the bottom of the bag house. The air returns to the top of the bag house through a series of filter bags.

5 While the loader is in operation, short bursts of compressed air are directed from the air cannon through the filter bags dislodging the dust into the baghouse collection hopper.

6 The now clean air flows into the Liquid Ring pump inlet manifold which contains a metal basket. The metal basket is the safety dropout point for any objects which may accidentally enter the filtration system during servicing.

7 **8** Finally, the air passes through the vacuum pump and out through the water reservoir tank.



The master control panel containing many of the operator controls is located near the front of the tank on the driver's side. Directly below the master control panel are a series of levers that control various hydraulic functions of the unit. The number of levers will vary depending on the model and options. The panel is illuminated any time there is power to the master control panel.

The master control panel can be viewed in three sections. The top third contains three round-dial gauges. The middle third contains a series of toggle switches and corresponding lights. The bottom third contains two gauges and the pendant plug.

The master control panel houses a throttle switch, a main power switch, a vacuum relief switch, vibrator switch and a switch for the air cannon, a tachometer to read the speed of the truck engine and working temperature of the blower. There are gauges to determine the pressures of the vacuum, air and hydraulics.

An important component of the control panel are the warning lights and alarm for low/high water and water temperature.
The liquid ring system adds some additional controls to the standard control panel.

1. **Alarm Switch -** This switch turns on and off the audible alarm, warning the operator of low water or high temp temperature.
2. **High Water Temperature Light -** On when the water temperature has reached too high a level. Water at a high temperature will break the seal and cause the pump to cavitate.
3. **High Water Level Light -** On when water level is too high. This is critical to keep debris, especially vacuumed liquids from entering the water reservoir tank and then being exhausted along with the water.
4. **Low Water Level Light -** On when the water level in the pump is too low for proper operation. It is critical that the pump not be allowed to run dry.

The blower is the heart of the vacuum system. The Liquid Ring vacuum loader is truly a vacuum machine with high vacuum and a relatively low airflow. The liquid ring vacuum pump employs a liquid (water, in this case) as a sealant, lubricant and a cooling agent for the pump. The water is held in the bottom portion of the pump and is circulated through two water reservoirs. The water reservoirs aid in dissipating the heat and thereby keeping the pump operating at a low temperature.

To get the material flowing into the debris body, a high vacuum needs to be built up in the system before commencing to vacuum. This creates air flow and allows material to be conveyed through the suction hose. It is possible to build up high vacuum, shut the machine off and then use the power of the built up vacuum to suck material into the tank, especially volatile or low flash point liquids.

The vacuum pump is driven by the chassis engine through a heavy duty transfer case. These vacuum pumps can produce airflows in the range of 3,640 CFM (cubic feet per minute) at vacuums up to 26 in-Hg. The low volume liquid ring pump runs at a low speed of 500- 600rpm.

The amount of airflow created by the vacuum pump is controlled by the engine speed with maximum vacuum limited by the relief valves and airflow. The level of vacuum can be monitored on the vacuum gauge located on the master control panel.

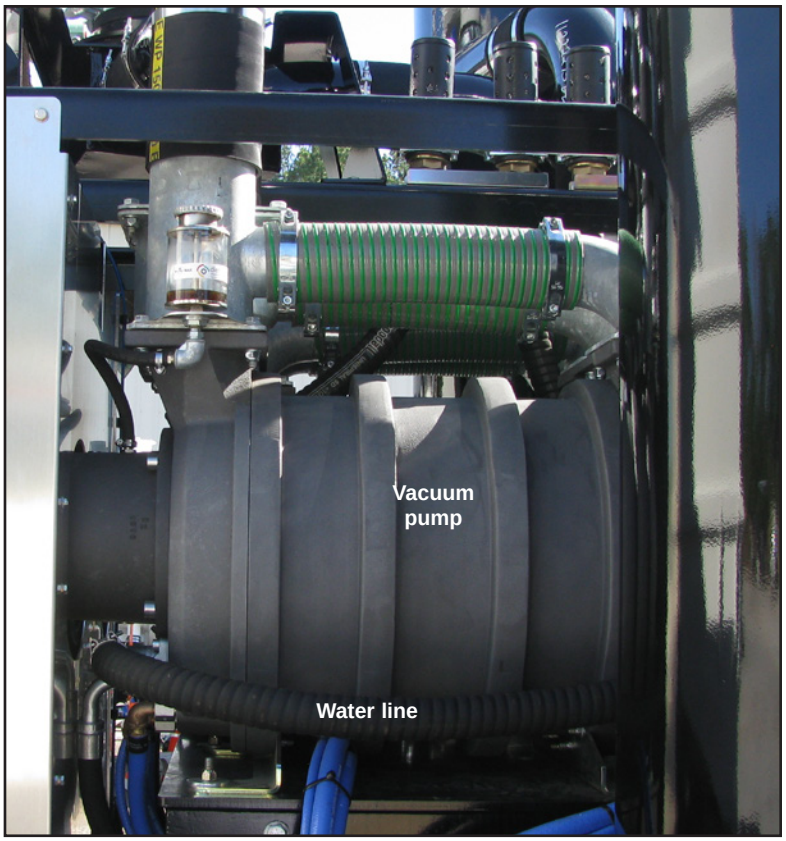
Note: The blower is operational when the truck is started and the power of the truck is diverted from “Road Mode” to “Blower Mode”.

The operating temperature and pump noise is very low compared to the conventional rotary lobe or screw type pumps.

Blower Passenger Side

Blower Driver Side

Water Flow Diagram



The pump operates with the use of water which acts as a lubricant, sealer and cooler. For this reason, a steady supply of water is required. The water reservoir tanks (2) hold the water needed for the pump. Water leaves the tank through a port at the bottom of each tank. It passes through tubing to the back of the pump. The water then enters the pump near the bottom at the back. The water collects at the bottom of the pump where a steady level of water is maintained for pump operation. Air rushing into the pump as a result of vacuuming operations, will mix with the water in the pump. When the air stream leaves the pump some of the water in the air stream will leave the pump through the water tank in the form of a fine mist. Replenishing the water that is being removed by the air stream is a secondary purpose of the water tanks.

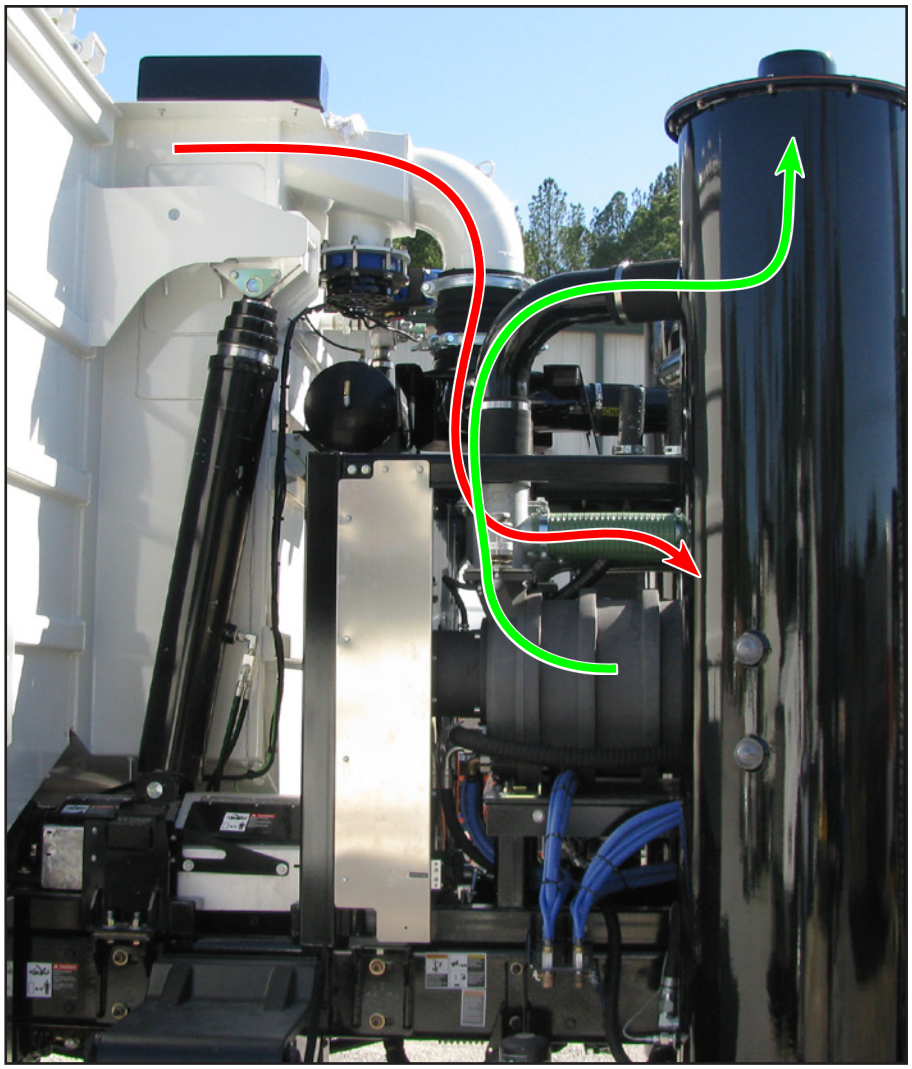
Water flow to the pump is turned on with two ball valves, one on each side of the pump.

There are two valves on the back of the pump that are used to fill the pump. Before starting the pump, it must have a certain level of water in it. Follow these procedures for adding water to the pump.

1. Open both drain valves on the back of the tank.
2. Open the ball valve on the water line and allow water to fill the pump.
3. When water begins to come out of the bottom drain valve, close the valve.
4. Continue to fill the pump with water until there is a steady flow of water coming from the top drain valve. Then turn off the top drain valve.

When the water is seen coming from the top drain, the water level in the pump will be at the correct level for pump operation.

Relatively clean air from the baghouse enters the intake manifold above the pump. The manifold maintains an even pressure in the blower which keeps the seal in place. From there, the air enters the pumps from the top and mixes with the water in the lower portion of the pump. The air then leaves the pump through the outtake manifold and enters the water reservoir where it is exhausted out of the top of the reservoir.



Air Intake RED

- Air leaves the filter baghouse and travels through a standpipe and metal basket.
- The air stream enters the air intake manifold
- The air stream splits and enters the pumps from the front and back side of the pump.

Air Outtake GREEN

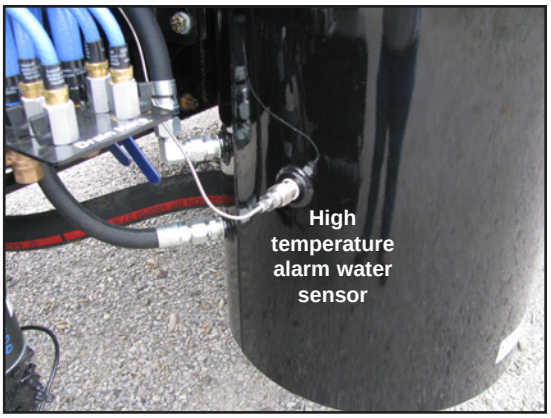
- The air that enters the pumps, picks up moisture from the water contained inside the pump.
- The air leaves the pumps and flows into the nearest water tank.

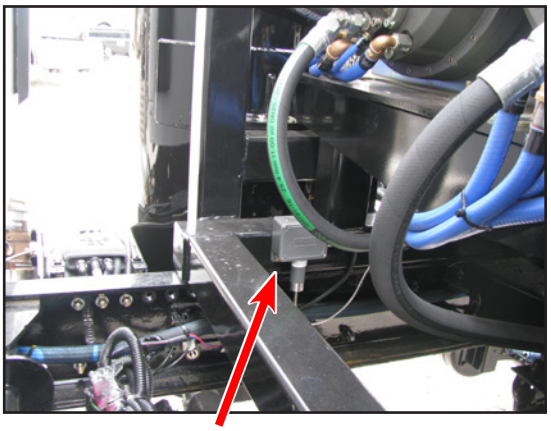
High Temperature

Limit the amount of vacuum at high temperatures of the pump. Under high vacuum, water begins to boil at low temperatures and the air bubbles due to boiling, break the seal created by water. The pump, then, starts to cavitate and lose vacuum. Cavitation also causes the truck to vibrate.

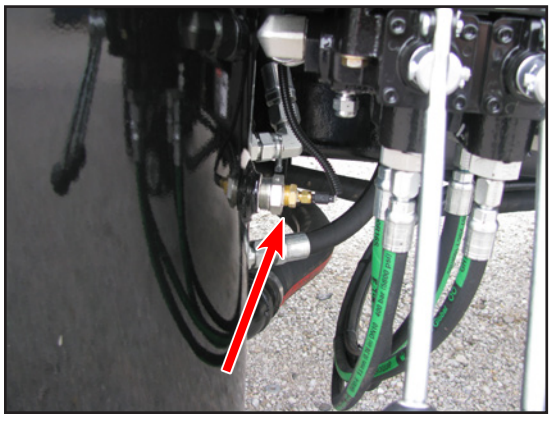
Unlike a dry running blower, once the liquid ring vacuum pump overheats, it takes a considerably longer time for it to cool. For this reason it is very important to monitor the temperature. Remember that at a high vacuum, (27-28 in-Hg.), water begins to boil at around 130 degrees Fahrenheit. Reducing amount of vacuum at higher temperature keeps further rise in check. When an excessive temperature is reached, reduce the vacuum to 20 in-Hg. If this does not lower the water temperature, then there are two options available, either shut the machine down for extended hours for it to cool or change the entire water in the system.

Note: Do not allow the pump to operate at a temperature in excess of 130 degrees Fahrenheit.





High temperature alarm water sensor controller box



High temperature water sensor for the control panel gauge

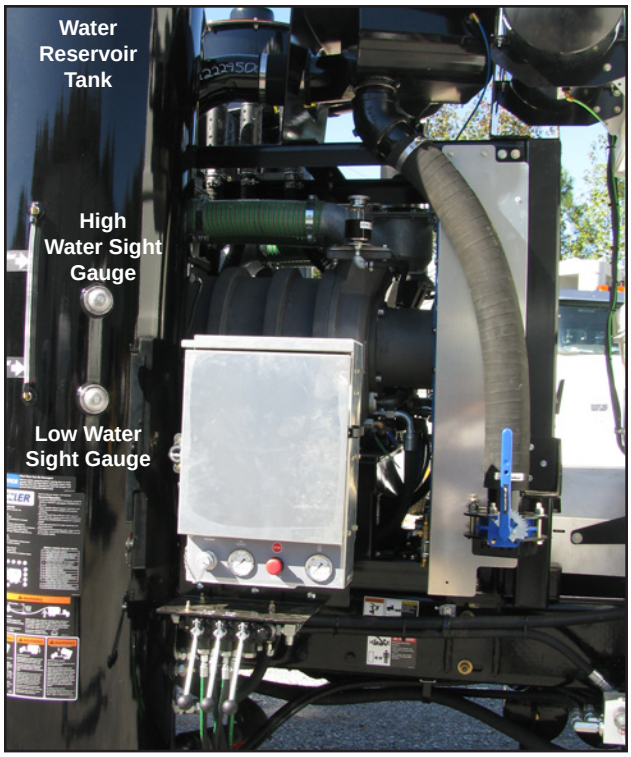
The water reservoir tanks hold the water used in the operation of the pump. They hold 200 gallons of water. Two tanks are mounted directly behind the truck cab with one on each side of the chassis. The tanks are joined so that the level in one tank will be the same as the level in the other tank.

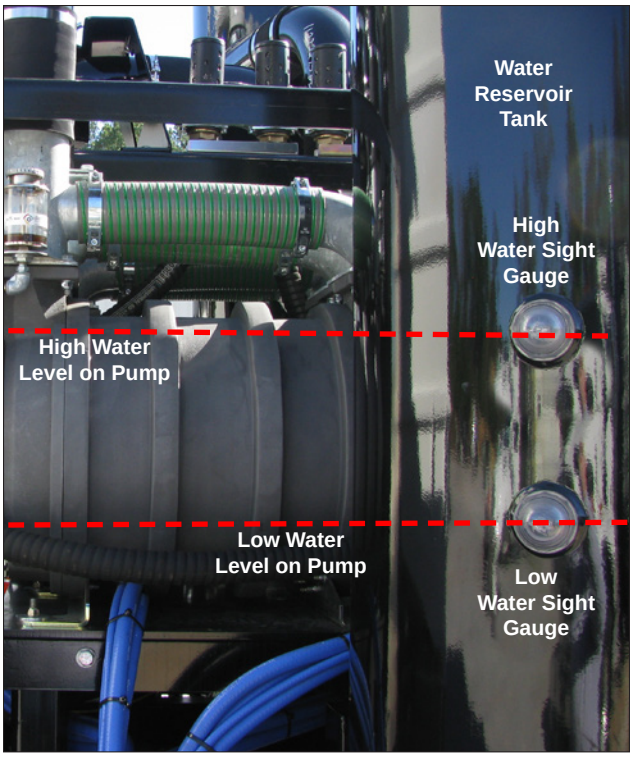
Water is added to the driver side tank near the top. Initially, water should be added until the level reaches the middle of the high water sight gauge. When the valves to the pump are opened to allow the water to fill the pump, the water will drop in the tank to a level between the two sight gauges. During operations, it is normal for condensation to form outside the water reservoirs.

The water reservoirs/air water separators are open to the atmosphere and it is normal for water level to drop as some of it exits the machine in a fine mist. Therefore, it is important to monitor water level in the system. Sight glasses as well as audible and visual alarms are provided to warn of low water levels.

If the water level is allowed to exceed the high water level, there is the risk of debris staying in the water and eventually being released into the atmosphere. This is especially true when vacuuming liquids as the liquids will mix with the water and both will be released in the form a fine mist.

Note: Never allow the pump to run dry or operate below the low water level or serious damage may be done to the pump.





Water Level Alarm

There are two sensors mounted on the water reservoirs to monitor the level of the water. One sensor is a high water alarm while the other is a low water alarm. If the water level in the reservoir reaches a too high of a level or too low of a level, an audible alarm on the control panel will sound. The horn is located behind the control panel. Additionally, the corresponding water light will illuminate on the control panel. The horn can be turned off with a switch on the master control panel.

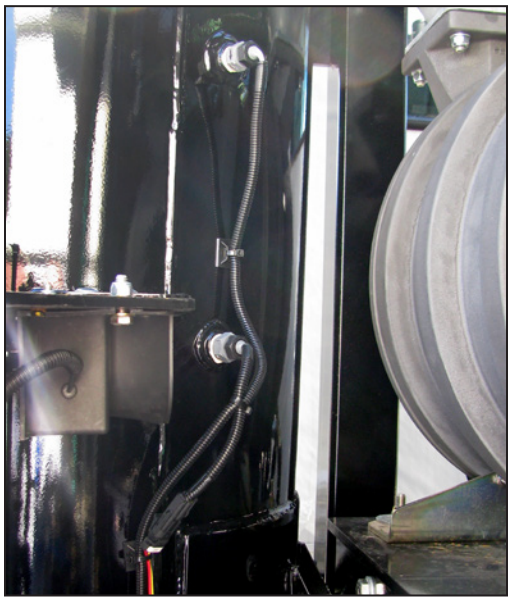
In addition to the audible and visual warnings, the water level can be monitored by the operator through the sight glasses mounted on the side of the water reservoir. A high water and low level sight glass are on the driver side reservoir tank, while only a high level sight gauge is mounted on the passenger side water reservoir tank. Two sight gauges instead of one are provided on the driver side because the system is filled with water on the driver side.

Water Temperature Alarm

If the water reaches 130 degrees Fahrenheit, the high water temperature alarm light will illuminate on the master control panel and the horn will sound, unless it is turned off at the master control panel. The sensor is mounted on the passenger side water reservoir tank near the bottom.

The water level in the water tank corresponds with the water level in the pump. As a result, the high water sight gauge will provide a visual of how high the water is in the pump. Conversely, the low water sight gauge will show how low the water is in the pump.

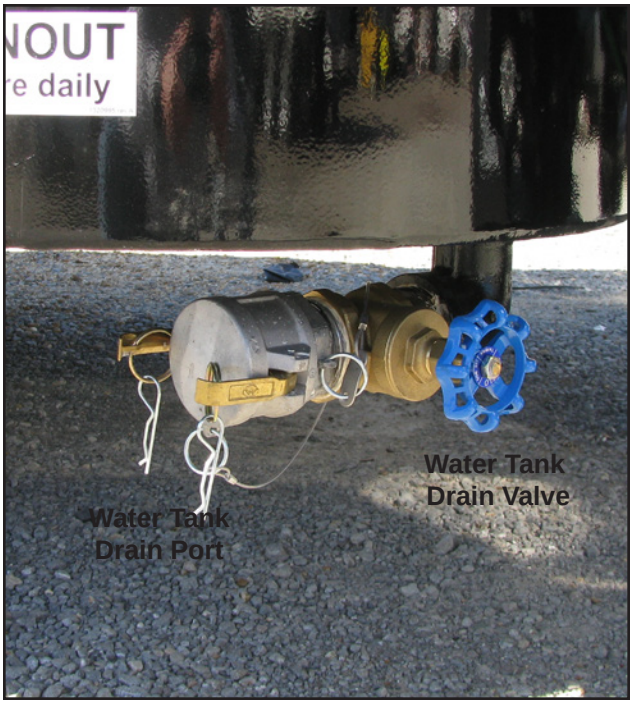
High and low water level sensors



Fine particles of debris that are too small for the filter bags to trap, pass through the pump, they cloud and contaminate the water. Change the water when water gets more than translucent.

Once water has been changed, the unit will have to be air purged as explained in the vendor manual for the pump.

Note: Water in the system is contaminated with fine particles of the material handled and may be hazardous. Follow all Federal and locally mandated laws and regulations for safe disposal of this water.



Draining Water Tanks

1. Connect “Lay flat” hoses to the drain for the water reservoirs.
2. Connect hose to the water drain cock at the vacuum pump drain or place a suitable container under it.
3. Direct all hoses for draining water to containers or places where it is safe to discharge the water.
4. Open the drain valves and let all water drain out.
5. Close drain valves and stow the discharge lay flat hoses and other containers.

The system should be serviced according to the following schedule. Proper service of the system includes proper lubrication. Consult the lubrication checklist in conjunction with the service checklist. The following time intervals are based upon a normal eight hour working day. Frequency of maintenance may have to be increased if the system is placed into operation for longer periods of time.

Service Checklist

	ITEM	8 Hrs. or each shift	25 Hrs. or Weekly	100 Hrs. or Monthly	500 Hrs. or Every 6 Months	1000 Hrs. or Every 12 Months
1	Lubricate blower bearings					x
2	Check hydraulic oil level	x				
3	Service chassis (consult manufacturer's manual)	x	x	x	x	x
4	Inspect all door seals		x			
5	Inspect all vacuum hoses	x				
6	Wash and clean entire truck		x			
7	Inspect all safety equipment, guards, etc.	x	x			
8	Inspect, manually recover and clean baghouses	x				
9	Inspect all warning labels		x			
10	Inspect proper functioning of vacuum relief valves	x				
11	Inspect for damaged filter bags	x				
12	Inspect make/break seals	x				
13	Drain air cannon tank	x				
14	Change water reservoir tanks	Change whenever water is murky or has a translucent appearance				
15	Change transfer case oil & filter		x			x
16	Check transfer case oil level	x	Check the OMSI Manual for proper scheduled maintenance			
17	Insect all material flow paths for wear			x		

DANGER

Confined Space Hazard

Entering a confined space without proper precautions can lead to death or serious injury. Before entering the debris body, watertank or filter housing comply with all work rules and applicable federal, state, and local regulations.

VPC60-80 pump Maintenance

Daily maintenance (after each job)

- check vacuum pump oil levels
- pump dewatering
- separator chamber drainage and clean

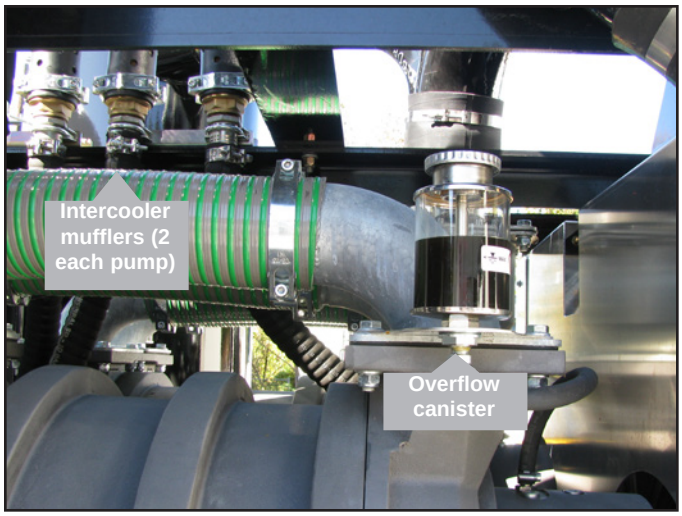
Every 600 operation hours

- check and clean black intercooler mufflers and check valves

Every 1000 operation hours

- change bearing lubrication oil. Recommended lubricant is a mineral motor oil type SAE 15W40.
- drain is located at the bottom of the bell housing of each pump
- Oil is filled through the overflow canister
- Biodegradable oils are not suitable.

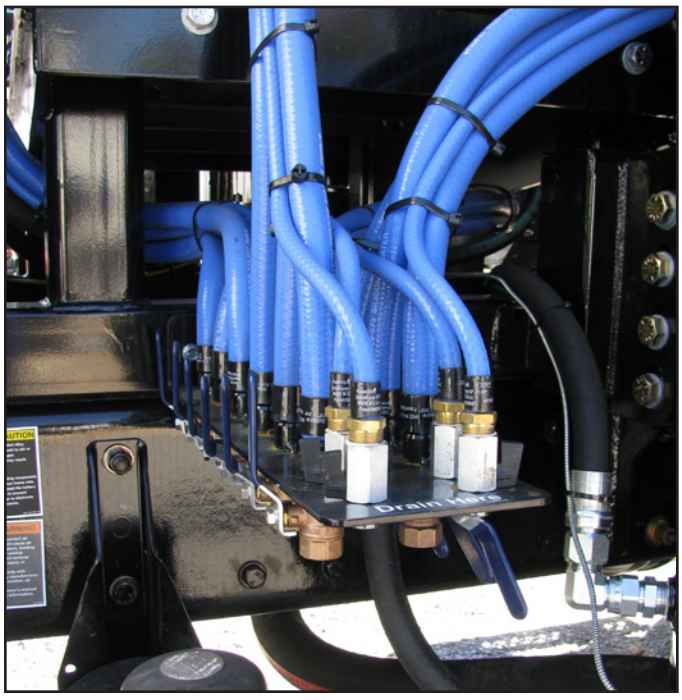
Refer to manufacturer's manual for complete details.



Internal vacuum pump clean

Every 4 – 5 operating hours, the vacuum pump casing should be flushed by means of opening the seal water drainage cocks while the pump is running for approximately 10 seconds each. Valves for both pumps are grouped together are shown below.

It may be necessary to capture the draining liquid for proper disposal.



Lubrication Checklist						
	ITEM	8 Hrs. or each shift	25 Hrs. or Weekly	100 Hrs. or Monthly	500 Hrs. or Every 6 Months	1000 Hrs. or Every 12 Months
1	All grease zerks (unless otherwise noted)		x			
2	Lift cylinder		x			
3	Box hinges			x		
4	Rear door hinges			x		
5	All clamp and lid screws		x			
6	Lubricate pump shaft bearings (every 1500 hours)					x
7	Change transfer case oil					x
8	Change hydraulic oil and filter					x
9	Driveline joints		x			
10	Grease boom		x			

Grease - Unless otherwise noted grease all zerks and required surfaces with Castrol Pyroplex Protection ES Synthetic EP Grease NLGI #2 (purple) or equivalent. Special operating conditions (excessive temperature or speed) may require a different type of grease (consult the factory). Do not over grease.

Note: Keep grease fittings clean, accessible, and free from damage. Grease fittings should be checked every week. Examine for broken fittings.

All clamp and lid screws should be lubed with an anti-sieze compound.

Chassis service - refer to the chassis manual

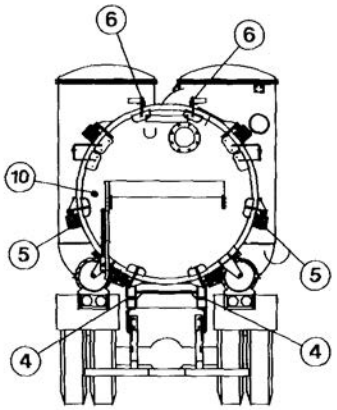
NOTICE

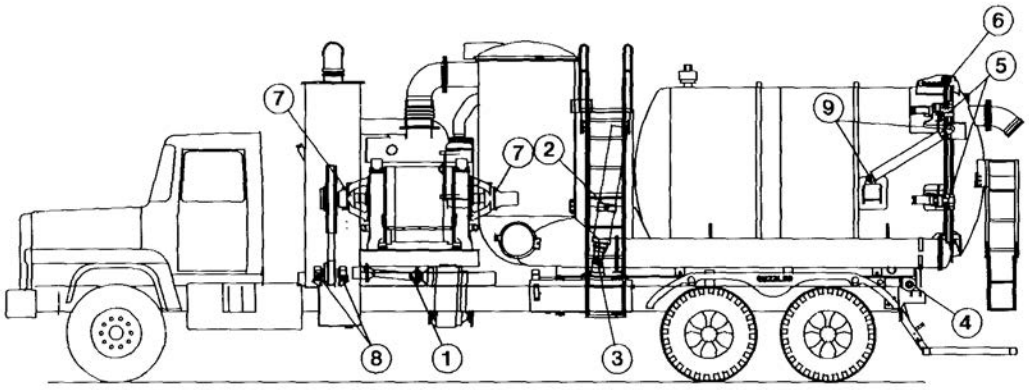
Keep grease fittings clean, accessible, and free from damage. Grease fittings should be checked every week. Examine and replace broken fittings.

GREASE POINT DIAGRAM

DET.	DESCRIPTION
1	ALL DRIVELINE JOINTS
2	UPPER HOIST CYLINDER BRACKET
3	LOWER HOIST CYLINDER BRACKET
4	TANK MOUNTING HINGE
5	REAR DOOR LOCKS
6	REAR DOOR HINGE
7	LIQUID-RING PUMP BEARINGS
8	LIQUID-RING DRIVELINE/BEARINGS
9	REAR DOOR CYLINDER
10	LEVEL INDICATOR

NOTE: ALL DOOR HINGES NEED TO BE GREASED



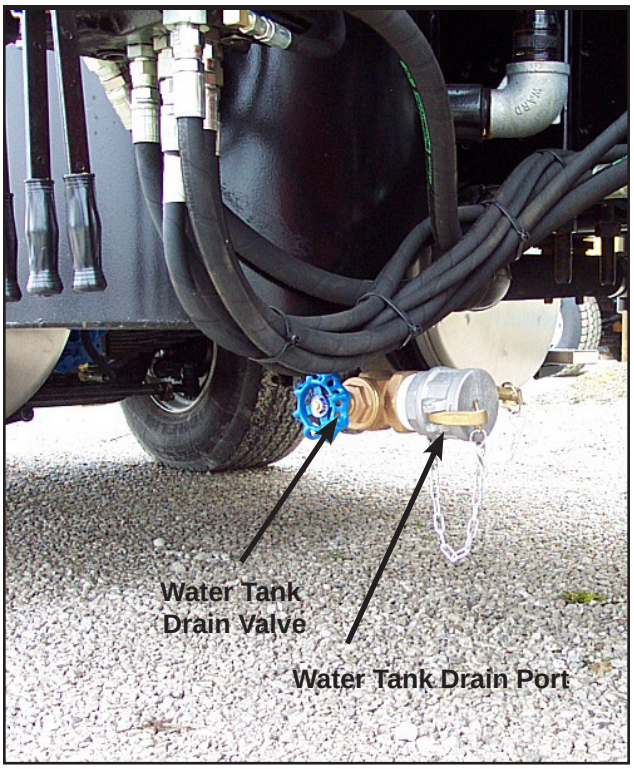


The water reservoir tanks should be periodically drained and replaced with clean water. If the water becomes contaminated, or has a translucent appearance, the tanks should be drained immediately and replaced with clean water. Failure to drain the water may damage the seals.

The drain is located at the bottom of the driver-side reservoir tank. The drain will drain both water reservoir tanks. Drain the tanks according to the procedures outlined in the Operations Section of this manual.

Once water has been changed, the unit will have to be air purged as explained in the operating instructions above. See manufacturer's manual for complete instructions on purging the system.

Note: Water in the system is contaminated with fine particles of the material handled and may be hazardous. Follow all Federal and locally mandated laws and regulations for safe disposal of this water.



Lubricant

The vacuum pump has two access panels on each side and they should be removed so that the ends of the pumps can be cleaned. They should be cleaned every 100 hours of operation. The pump shaft bearings are to be lubricated once every 1500 hours.

For further maintenance instructions, consult the manufacturer's manual.

Anti-Freeze

40/60 (-23° F) or 50/50 (-34°F) anti-freeze/water mix is recommended. The Liquid Ring Vacuum pump may hold 70-75 gallons, so add that to the volume in your tanks plus a few more gallons for the piping. Once you have the total volume in gallons and add the 40% Antifreeze first then fill with water. Run the Liquid Ring pump system for 30 minutes to thoroughly mix the fluids.

The preferred Antifreeze is Ethylene Glycol, however it requires proper disposal. Propylene Glycol is good, but exposure to air can cause lactic acid. Inhibitors are needed to prevent corrosion.

WARNING

Electrocution hazard

Serious injury or death can result from electrocution.

Check for overhead wires and obstructions before raising or moving boom. Do not leave boom raised while vehicle is unattended. Do not move vehicle unless boom is in travel mode. Do not allow boom to contact the vehicle or any obstruction.

Be aware of the vehicle's surroundings before operating any of the boom functions to prevent death, injury or equipment damage.

Refer to SAFETY section in manual.

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WARNING

Crushing hazard.

Serious injury or death can result from falling debris body.

Never go under a raised debris body without the safety prop(s) in place. Debris body must be clean and empty for service work.

On firm level ground raise the body above the height of the props. Tilt the prop(s) in place. Lower debris body until it just rests on the prop(s). Use all props.

Shut down and lock out the entire system and chassis before servicing.

Unload any items stored in debris body before using machine.

Refer to manual for details.

WARNING

Crushing hazard.

Serious injury or death can result from falling rear door. Never go under the rear door when open.

Use door prop(s) or safety pin(s) to secure door before entering body, working under or around the door.

Open the rear door to just clear the prop(s) and lower door until it just rests on the prop(s). On units that use a safety pin(s) open the door until the pin holes are aligned and insert pin. Use all props or pins.

Shut down and lock out the entire system and chassis before servicing.

Unload any items stored in debris body before using machine.

WARNING

Electrocution hazard.

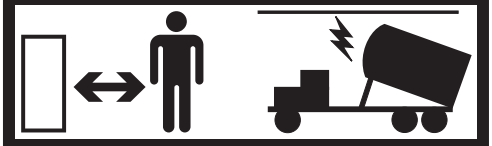
Serious injury or death can result from electrocution.

Check for overhead wires and obstructions before raising debris body, opening rear door or raising optional equipment. Never leave debris body, rear door or optional equipment raised or partly raised while vehicle is unattended. Never move vehicle with debris body, rear door or optional equipment raised.

Be aware of the vehicle's surroundings before operating any of the hydraulic functions to prevent death, injury or equipment damage.

1800128 rE

WARNING



Crushing and Electrocution hazard.

Serious injury or death can result.

Never go under a raised debris body. Check for overhead wires and obstructions before raising debris body, opening rear door or raising optional equipment. When hi-dump system is ON, never drive over 3 mph.

All personnel must be clear of the unit when in motion. NEVER allow anyone to get between the unit and the collection hopper.

Refer to manual for details 1720010J2 r0

WARNING

Crushing Hazard

NEVER leave body raised or partly raised while vehicle is unattended or while performing maintenance or service under body unless body is propped to prevent accidental lowering. [Always disengage PTO when hoist is not in use or when moving vehicle.] The debris body MUST BE empty for service work.

NEVER attempt to raise body when vehicle is on unlevel ground.

Rear door MUST BE opened before the front of the body is 3 feet above the chassis frame. Operator must remain at controls during all operations.

All dumping and cleaning operations require that the unit be positioned with the unit on firm level ground in a clear area away from any other equipment, personnel and overhead wires or obstructions.

Observe and follow all other standard procedures for dumping normally.

When the Hi-Dump mode lamp is illuminated, NEVER drive over 3 mph.

Never allow anyone to get between the truck and the collection hopper.

1. Set Park Brake and remove the quick connect bumper extensions and place out of the path of the truck.
2. Engage the power divider on the rear axle.
3. Set the Hi-Dump master control switch to ON.
4. Simultaneously press the Left and Right Hi-Dump switches to raise the rear of truck. Observe the visual angle display keeping the lateral tilt (X Axis) to no more than ± 0.5 degrees. When fully raised level the truck to a maximum of ± 0.2 degrees before raising the debris body.
5. Release Park Brake and slowly back up to the collection hopper. DO NOT TRAVEL OVER 3 MPH IN HI-DUMP MODE AND REAR OF THE UNIT RAISED.
6. Stop the unit, engage the Park Brake and hydraulic system PTO.
7. Exit the truck and proceed to the control panel.
8. Operate the dump controls in normal fashion.
9. After dumping, simultaneously press the Left and Right Hi-Dump switches to lower the rear of the truck completely.
10. Set Hi-Dump master control switch to OFF
11. Disengage power divider on the rear axle

NOTICE

To avoid damage, keep the right and left side level when raising the rear of the truck in Hi-Dump Mode.

Angle Display

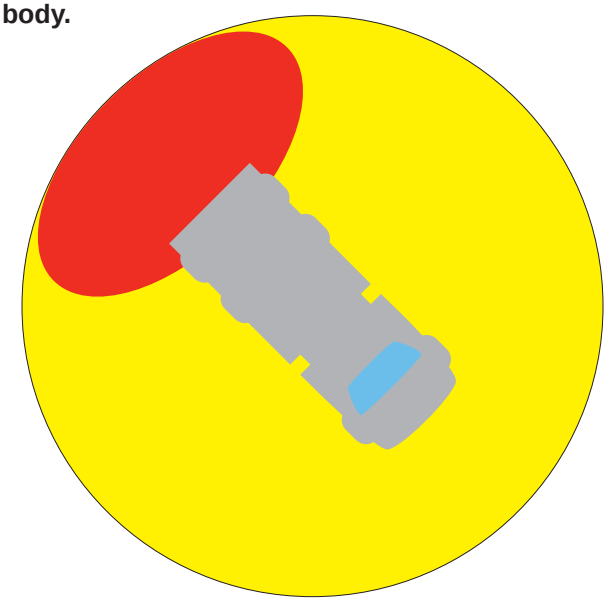
X Axis: Truck lateral tilt

Y Axis: Truck front to rear angle

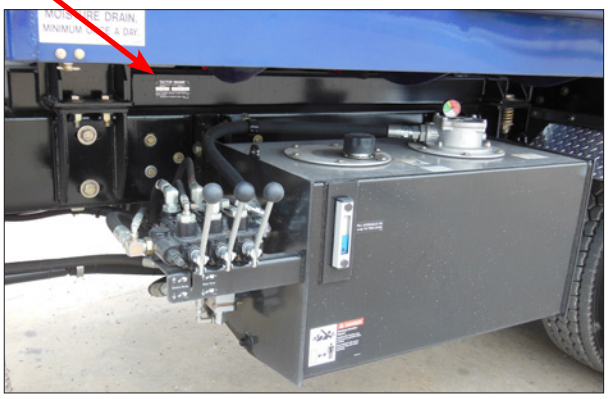
NOTICE

Safe Work Zone

Bystanders must be kept a minimum of 15 feet from the work area. NEVER stand directly behind the truck when raising or lowering the body.



Maintenance



Composite control box location

Note: All have the tag in the same general location on the driver side on the front part of the subframe. Options may obscure direct viewing.

Perform these items in addition to all other service and lubrication requirements.

New Unit First Time Service & Lubrication Checklist				
	ITEM	**When**	**Performed By**	**Date**
1	Service chassis (consult manufacturer's manual)			
2	Inspect all door seals	1st week		
3	Inspect all vacuum hoses	1st week		
4	Wash and clean entire truck	1st week		
5	Inspect all safety equipment, guards, etc.	1st week		
6	Drain air tanks	1st week		
7	All grease zerks (unless otherwise noted)	1st week		
8	Lift cylinder	1st week		
9	Box hinges	1st week		
10	Rear door hinges	1st week		
11	All clamp and lid screws	1st week		
12	Change blower oil	100 hours		
13	Change transfer case oil	100 hours		
14	Change hydraulic filter	100 hours		
15	Driveline joints	1st week		
16	Grease boom	1st week		
17	Inspect / repair leaks	1st week		
18	Retorque boom/inlet bearing bolts	100 hours		

DANGER

Confined Space Hazard

Entering a confined space without proper precautions can lead to death or serious injury. Before entering the debris body, watertank or filter housing comply with all work rules and applicable federal, state, and local regulations.

The system should be serviced according to the following schedule. Proper service of the system includes proper lubrication. Consult the lubrication checklist in conjunction with the service checklist.

The following time intervals are based upon a normal eight hour working day. Frequency of maintenance may have to be increased if the system is placed into operation for longer periods of time.

Service Checklist

	ITEM	8 Hrs. or each shift	25 Hrs. or Weekly	100 Hrs. or Monthly	500 Hrs. or Every 6 Months	1000 Hrs. or Every 12 Months
1	Check blower oil level	x				
2	Check hydraulic oil level	x				
3	Service chassis (consult manufacturer's manual)	x	x	x	x	x
4	Inspect all door seals		x			
5	Inspect all vacuum hoses	x				
6	Wash and clean entire truck		x			
7	Inspect all safety equipment, guards, etc.	x	x			
8	Inspect and clean blower micro strainer	x				
9	Inspect all warning labels		x			
10	Inspect proper functioning of vacuum relief valves	x				
11	Inspect for damaged filter bags	x				
12	Inspect make/break seals	x				
13	Drain air tank	x				
14	Drain silencers	x				
15	Drain micro strainer	x				
16	Inspect, manually recover and clean baghouses	x				
17	Check transfer case oil level	x				
18	Insect all material flow paths for wear			x		
19	Drain blower manifold	x				
20	Check for proper operation of all functions/equipment		x			
21	Clean and verify that all cooling systems are clear	x				
22	Retorque boom/inlet bearing bolts					x

DANGER

Confined Space Hazard

Entering a confined space without proper precautions can lead to death or serious injury. Before entering the debris body, watertank or filter housing comply with all work rules and applicable federal, state, and local regulations.

All units are equipped with this general purpose decal, normally located on the passenger side, to assist operators.

DANGER

Confined Space Hazard

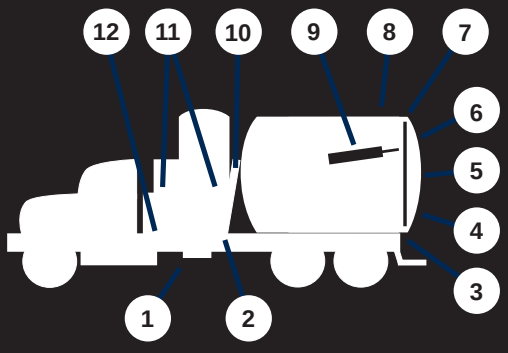
Entering a confined space without proper precautions can lead to death or serious injury. Before entering the debris body, watertank or filter housing comply with all work rules and applicable federal, state, and local regulations.

GUZZLER®
Subsidiary of Federal Signal Corporation

Technical Service Hotline - 877-342-5374

Daily Service Check List

- Inspect all safety equipment, guards, etc.
- Check blower oil level
- Check hydraulic oil level
- Check transfer case oil level
- Service chassis (consult manufacturer's manual)
- Inspect all vacuum hoses
- Drain, inspect and clean blower micro strainer
- Drain, inspect and clean all air/water filters and Y-strainers
- Inspect proper functioning of vacuum relief valves
- Inspect for damaged filter bags. Replace bags that are extremely dirty.
- Inspect make/break seals
- Inspect hoses and gaskets
- Inspect and clean all door seals before closing doors
- Drain air tanks, silencers and air cannon
- Inspect bag houses
- Inspect cyclones for excess material
- Inspect linear wall (CL models only)
- Consult the OPERATOR'S manual for complete details



General Operation

- Consult the OPERATOR'S manual for complete details on SAFETY and proper OPERATION of this unit.
- Never operate without manual, automatic and safety vacuum reliefs installed and properly operating.
- Set up vacuum hose with the in-line vacuum relief valve and nozzle at the hose working end. Consult the OPERATOR'S manual for complete details.
- Follow site procedure for static electricity and ground the truck.
- Following the final dumping cycle, clean out the dump tubes. Consult the OPERATOR'S manual for complete details.

WEEKLY (25HRS) GREASE POINTS

1	ALL DRIVELINE JOINTS
2	LOWER HOIST CYLINDER BRACKET
3	DEBRIS BODY MOUNTING HINGE
4	REAR DOOR LOCKS
5	HALF REAR DOOR - ALL SLIDING SURFACES AND PIVOT POINTS
6	LEVEL INDICATOR (LOCATION VARIES)
7	REAR DOOR HINGE
8	BOOM GEAR (OPTION)
9	REAR DOOR LIFT CYLINDERS
10	UPPER HOIST CYLINDER BRACKET
-	ALL SMALL DOOR HINGES
	LIQUID RING UNITS ONLY
11	LIQUID RING PUMP BEARINGS
12	LIQUID RING DRIVELINE BEARINGS

1800165 rev D

Lubrication Checklist						
	ITEM	8 Hrs. or each shift	25 Hrs. or Weekly	100 Hrs. or Monthly	500 Hrs. or Every 6 Months	1000 Hrs. or Every 12 Months
1	All grease zerks (unless otherwise noted)		x			
2	Lift cylinder		x			
3	Box hinges			x		
4	Rear door hinges			x		
5	All clamp and lid screws		x			
6	Change blower oil			First	500	
7	Change transfer case oil			First	x	
8	Change hydraulic oil and filter - earlier if indicated by the filter gauge			First Filter		x
9	Driveline joints		x			
10	Grease boom (if present)		x			
11	Check the tightness of the blower oil case plugs			x		

Grease - Unless otherwise noted grease all zerks and required surfaces with Castrol Pyroplex Protection ES Synthetic EP Grease NLGI #2 (purple) or equivalent. Special operating conditions (excessive temperature or speed) may require a different type of grease (consult the factory). Do not over grease.

Note: Keep grease fittings clean, accessible, and free from damage. Grease fittings should be checked every week. Examine for broken fittings.

All clamp and lid screws should be lubed with an anti-sieze compound.

Chassis service - refer to the chassis manual

NOTICE

Keep grease fittings clean, accessible, and free from damage. Grease fittings should be checked every week. Examine and replace broken fittings.

Roots Blower Lubricant		
	Fluid	**Notes**
1	Castrol Alpha HC/Isolube 220	Standard Fill - refer to Root's manual for additional recommendations based on ambient conditions.

Hibon Blower Lubricant		
	Fluid	**Notes**
1	Castrol Alpha HC/Isolube 220 (Guzzler & Ace)	*Standard Fill*
2	Castrol SHL Lubricant 220	
3	Conoco SynCon Synthetic R&O 220	
4	Mobil SHL 630	

OMSI Transfer Case		
	Fluid	**Notes**
-	BP Autran SYN 295 - main transfer case front box if a standard transfer case and the same on high rail versions	*Standard Fill*
-	API 80W-90 - only used in the rear hydrostatic drive box of the creep drive rail units (see above for main transfer case lubricant)	*Standard Fill*

NOTICE

Machine Can Be Damaged

To avoid damage:

- **Never overfill or under fill lubricant or fluid levels.**
- **Maintain proper fill levels.**
- **Always use the correct lubricant or fluid.**
- **Overfilling can cause overheating in gear lubrication systems.**
- **NEVER operate with either a malfunctioning lubrication system or indicator light ON (if equipped).**

The hydraulic system leaves the factory filled with Castrol Hydraulic Dual Range 32 oil. This purple fluid is recommended for all normal operation conditions from -20° to 95° (F) ambient. For continuous operation above 95° (F) ambient Castrol Hydraulic Plus Blue 68 is recommended. For continuous operation below -20° (F) ambient grade 22 oil is recommended.

Other hydraulic oils, if used, should be a quality product carefully selected with assistance from a credible supplier. The oil should include thermal stability, sheer stability, low-temperature fluidity, anti-wear, anti-corrosion, anti-foaming and seal conditioning characteristics. Consult the factory for oil other than the recommended products.

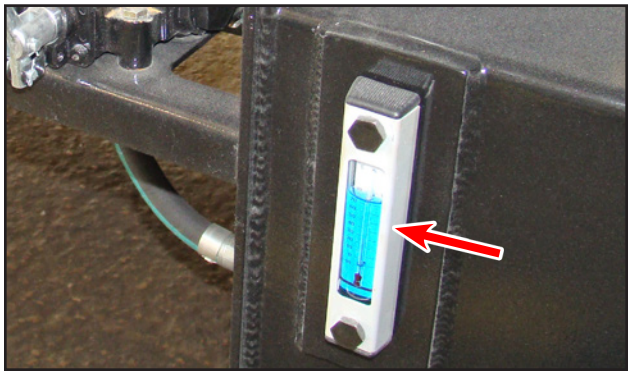
Dual range - Viscosity is similar to a grade 46 oil at temperatures of 155° F and above. Viscosity is similar to a grade 32 oil at temperatures of 60° to 155° F. Viscosity superior to a grade 32 oil at temperatures of -20° to +60° F.

The first change is for the filter at 100 hours and oil every 1000 hours or six months after that. Filters should be changed whenever indicated by the filter gauge. Contaminants allowed to remain in the circuit not removed by the filters will cause excessive wear and malfunctions.

The oil tank will normally feel hot to the touch.

Two sight eyes are installed to determine the oil level are mounted on the side of the oil reservoir tank Proper oil level should not be less than 1/2 as viewed in the lower sight eye and not above 1/2 in the upper sight eye. The debris body should be down, rear door closed, boom stored, hose reel retracted and system off when checking level. Check the oil level every eight hours. If the oil level is low, add proper grade hydraulic oil.

Anti-Wear Hydraulic Oils				
	GRADE	**32**	**46**	**68**
1	Gravity, API D 1298	32.2	29.3	28.5
2	Flash, COC, °F D 92.	410	440	460
3	Viscosity cSt at 40° C D 445	32	46	68
4	Viscosity cSt at 100° C	5.4	6.8	8.7
5	Viscosity SUS at 100° F	165	237	352
6	Viscosity SUS at 210° F	44.4	49	55.5
7	Viscosity Index D 2270	102	102	99
8	Emulsion at 130° F D-1401	Pass	Pass	Pass
9	Turbine Oil Stability Test D 943 Hours	5000+	5000+	5000+
10	Rust Test, SSW D 665B	Pass	Pass	Pass



The oil filters supplied by Vactor/Guzzler are equipped with a high efficiency absolute filtering media. Many common filters only give approximately thirty percent filtration of the particles in the hydraulic oil. These filters are referred to as nominal filters. Absolute filtering can give as much as ninety eight percent filtration of the particles in the hydraulic oil. Vactor/Guzzler uses and recommends only the use of absolute filters.

The hydraulic oil filter element is located in a housing accessed from the top of the oil tank.

Filters should be changed whenever indicated by the filter gauge and any time the hydraulic oil is changed. More frequent replacement could be advisable, depending on operating conditions or oil changes at more frequent intervals may be necessary if oil condition becomes poor. Contaminants allowed to remain in the circuit not removed by the filters will cause excessive wear and malfunctions.

If equipped, the indicator on the filter automatically resets after maintenance and is color-coded as follows:

Green - Normal

Yellow - Warning

½ Yellow & ½ Red - Service

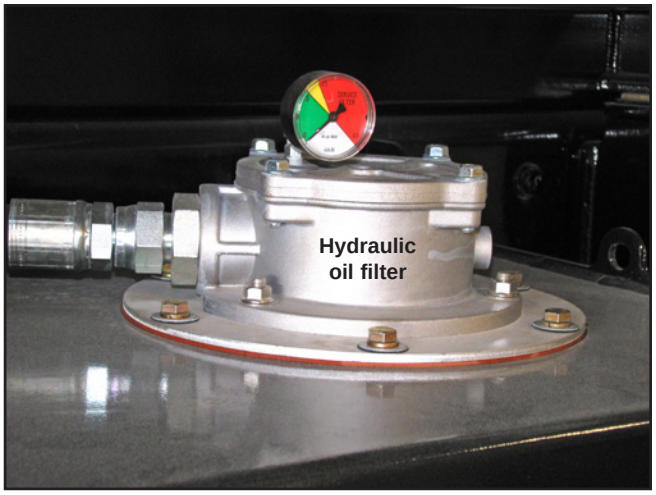
The indicator signals the following conditions:

- Clogged filter element
- Fluid temperature below normal
- Impending filter by-pass valve open condition

Hydraulic oil filters should not be cleaned. They should be replaced and the old filter properly discarded in compliance with all federal, state and local laws.

To change the filter, follow these steps.

1. Shut down the system and relieve pressure in the filter line.
2. Remove the cover bolts and remove.
3. Install the new element. Tighten only hand tight.
4. Apply a thin film of oil to the cover seal.
5. Start the hydraulic pumping system and check for leaks.



NOTICE

Machine Can Be Damaged

To avoid damage:

- **Never overfill or under fill lubricant or fluid levels.**
- **Maintain proper fill levels.**
- **Always use the correct lubricant or fluid.**
- **Overfilling can cause overheating in gear lubrication systems.**
- **NEVER operate with either a malfunctioning lubrication system or indicator light ON (if equipped).**

The oil level should be checked before beginning any operation. A sight glass for determining the oil level is mounted on the side of the back of the transfer case under the truck chassis. The sight glass can be viewed from the passenger side. Oil level should be in the center of sight glass.

Oil Level

A sight glass for determining the oil level is mounted on the side of the back of the transfer case which is under the chassis of the truck. The sight glass can be viewed from the passenger side. Oil level should be one-third to one-half as viewed in the sight gauge.

Note: The oil level should not be full as viewed in the sight gauge. Oil level should be checked only after unit has been shut down for a minimum of one-half hour. Checking the oil level too soon may give an incorrect reading. See manufacturer's manual for correct oil type. Fill the transfer case slowly with oil. Allow time for the oil to flow down into the transfer case.

Check oil level daily and service as needed. Fill to center of sight glass. Every 500 hours or six months, whichever comes first, drain, flush and refill with the recommended oil. The case holds about 11 quarts. See manufacturer's manual for additional details on oil. Transfer case oil should be drained and replaced whenever it becomes contaminated by water, chemicals, or any material which could cause congealing or be abrasive.

Oil changes at more frequent intervals may be necessary if oil condition becomes poor.

Oil Filling

Clean away all dirt around the filler plug before removing the plug. Fill until the oil level is halfway as viewed in the sight glass. Typical fill is about 11 quarts.

Note: Never overfill the transfer case. Overfilling usually results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug up oil ports and build up on splines and bearings.

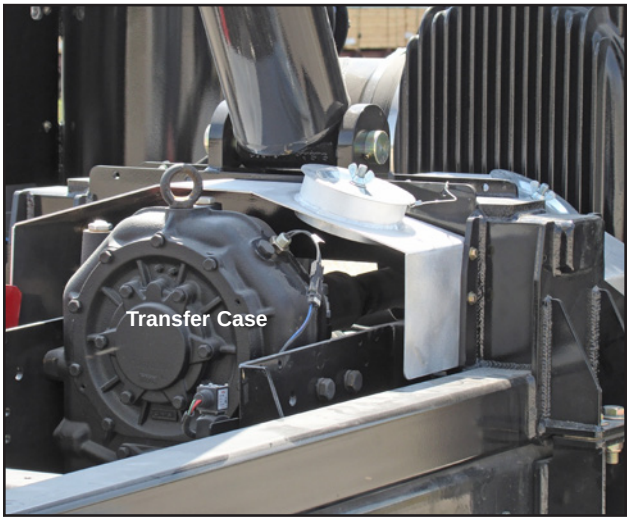
Creep drive units: The rear hydrostatic drive box of the transfer case on creep drive rail units uses a different oil. Refer to manufacturer's manual for details on oil.

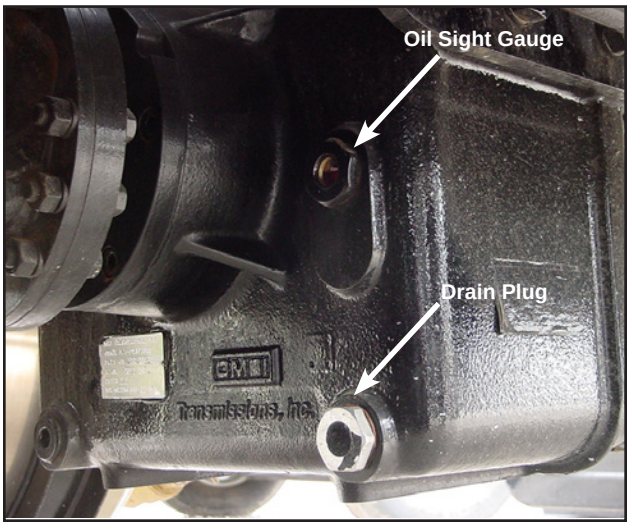
NOTICE

Machine Can Be Damaged

To avoid damage:

- **Never overfill or under fill lubricant or fluid levels.**
- **Maintain proper fill levels.**
- **Always use the correct lubricant or fluid.**
- **Overfilling can cause overheating in gear lubrication systems.**
- **NEVER operate with either a malfunctioning lubrication system or indicator light ON (if equipped).**





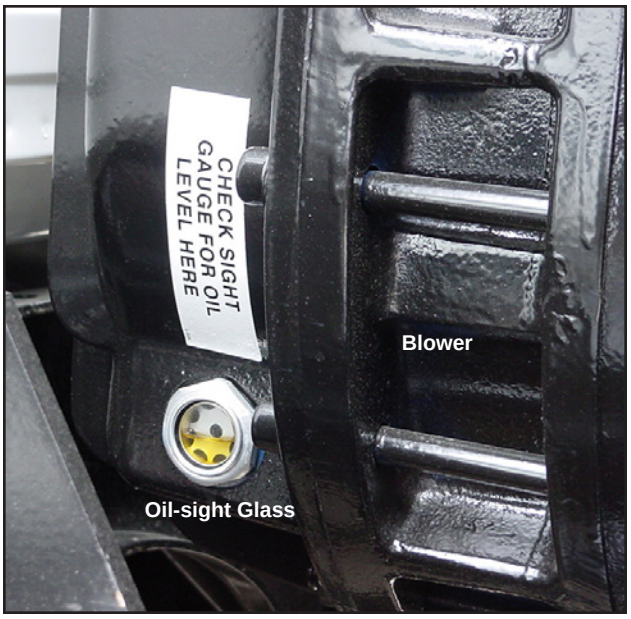
For proper oil type and grade, see the manufacturer's manual.

For continuous operation outside the ambient ranges listed below consult the factory.

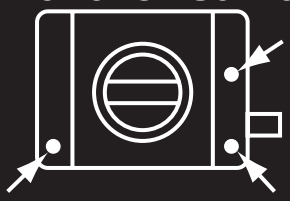
Note: Oil level should be checked only after unit has been shut down for a minimum of one-half hour. Checking the oil level too soon may give an incorrect reading. The oil level should be checked before beginning any operation.

Oil Level

A sight glass determining the oil level is mounted on the end of the blower which is located behind the cab of the truck. The sight glasses can normally be viewed from the passenger side. Oil level should be one-third to one-half as viewed in the sight glass.



Blower Oil Service



Check blower oil daily or the start of each shift.

All vacuum blowers are equipped with at least one sight glass at each end of the blower. Depending on blower configuration the sight glasses may be located on either side or the end of the blower at each end, and there may also be upper and lower sight glasses. The oil level must be checked at both ends of the blower while the unit is off and on level ground.

Refer to the maintenance section in the manual and the blower manufacturer's manual.

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NOTICE

Machine Can Be Damaged

To avoid damage:

- **Never overfill or under fill lubricant or fluid levels.**
- **Maintain proper fill levels.**
- **Always use the correct lubricant or fluid.**
- **Overfilling can cause overheating in gear lubrication systems.**
- **NEVER operate with either a malfunctioning lubrication system or indicator light ON (if equipped).**

Blower oil should be drained and replaced every 500 hours or whenever it becomes contaminated by water, chemicals, or any material which could cause congealing or be abrasive.

Oil changes at more frequent intervals may be necessary if oil condition becomes poor.

Remove debris from the oil fill plugs and sight gauges of the blower.

Oil draining

In the event of temperatures below 68° F (20°C) let the machine run for several minutes in order to heat the oil and to make it more fluid.

1. Remove the upper fill plugs (one each end).
2. Remove the drain plug at each end and let the oil flow out completely.
3. Install and tighten the draining plug. Replace sealant on fill plugs (use LOCTITE PST56747 or equivalent).

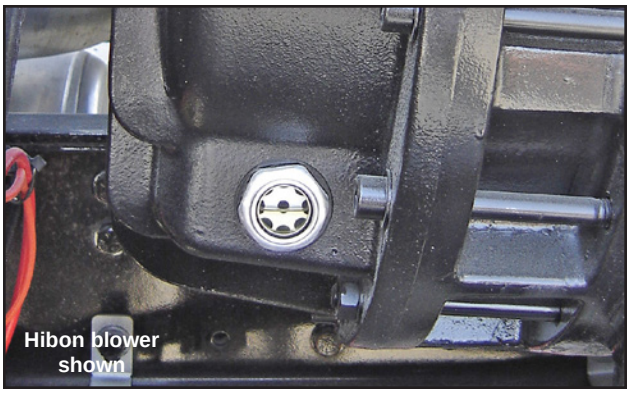
Oil filling

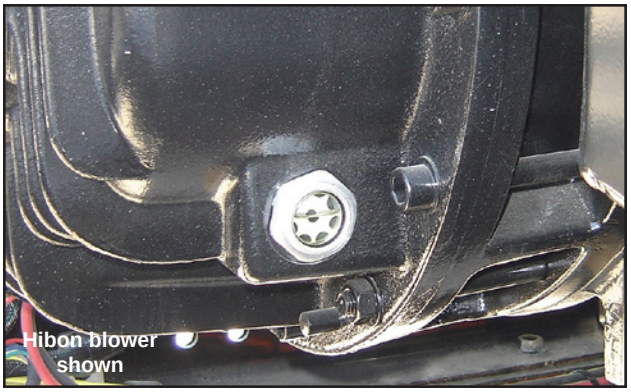
1. Remove the upper fill plugs (one each end).
2. Fill the tank to the maximum level in the sight gauge (about 3.15 quarts in each end).
3. Install and tighten the fills plugs.
4. Start the unit up and run the blower about 1000 rpm for 10 minutes Stop the blower and let the levels stabilize for about 30 minutes.
5. Check that the oil level at each sight gauge is correct. Add oil as required to bring it to the center of the sight gauge on the rear gauge. The front gauge should be in the middle of the upper half of the sight gauge window.

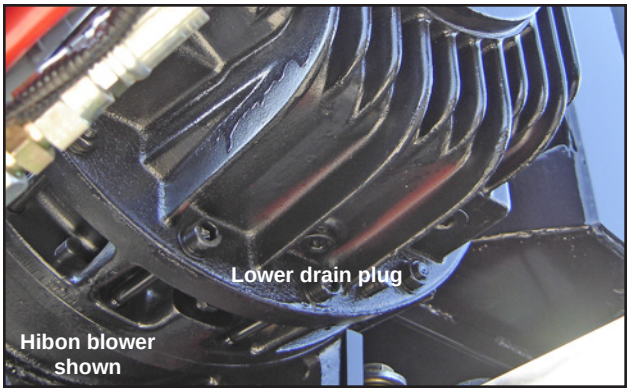
Note: Never overfill the blower. Overfilling usually results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug up oil ports and build up on splines and bearings.

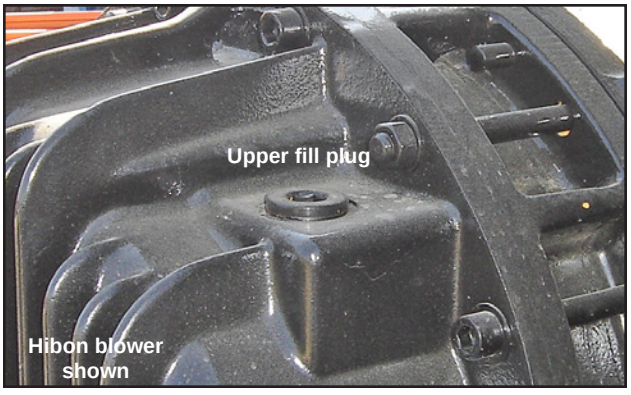
Verifications and regular maintenance

If the oil sight gauges are dirty and make verification difficult, completely clean the cases and/or replace the gauges.







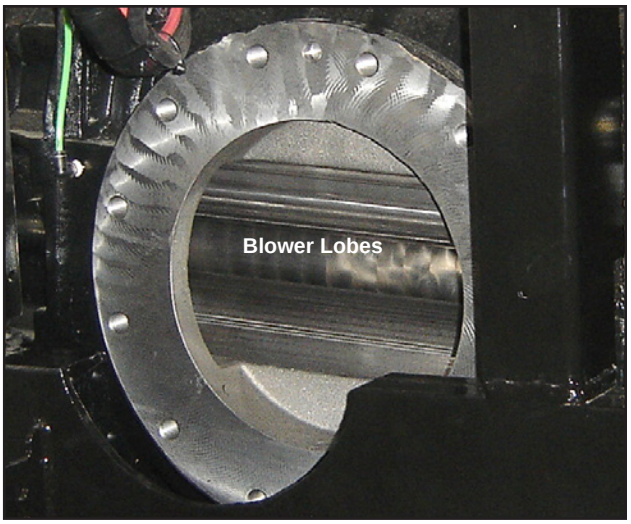


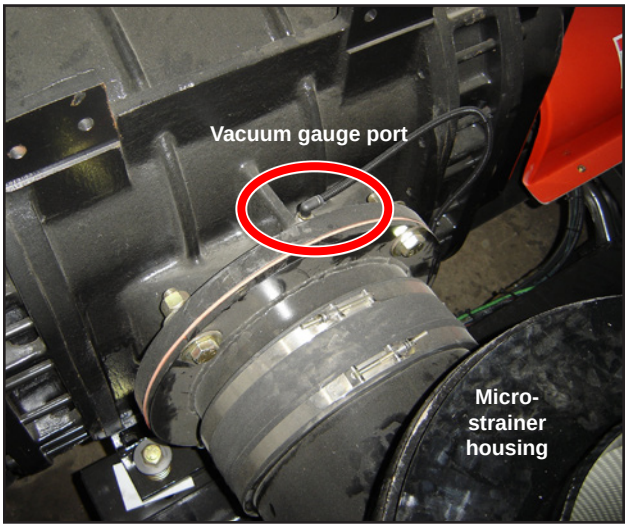
When the blower will not be used for any time beyond a few days there is risk the close fitting surfaces inside the blower will rust and increase blower lobe wear on startup. Refer to the blower manufacturer's manual for details on long term storage.

Units in extended storage or not being used should have the blowers operated at a minimum bi-weekly to ensure gear and bearing lubrication, and protects against failures due to condensation and moisture.

Short term in high humidity conditions allow the blower to run for 3-5 minutes with the vacuum relief open to dry out the system. Then with the blower at idle speed and the vacuum relief open spray up to 8 ounces of Liquid Wrench® NON-FLAMMABLE Penetrant and Lubricant L312 or L-412 or equivalent rust preventative in to the vacuum relief or in the vacuum gauge port (remove hose to gauge first).

Leave all drain plugs out when not in use. This prevents rain water from building up in the microstrainer housing and silencers.





The vacuum filtration system requires some specific cleaning for optimal operation. When a job is completed, the unit driven and parked between work, or there will be more than a shift of downtime between work, the filter baghouse and cyclone need to be cleaned. Some special conditions such as high humidity combined with certain materials like fly ash may require more frequent purging.

Access to the interior of the baghouse and cyclone for cleaning purposes can be gained through the top and bottom. The top door for the baghouse as well as the cyclone are split in half and open from the center. Either door may be opened exposing half of the baghouse or both doors can be opened which gives full access to the top of the baghouse or cyclone. Each door has a gasket around the perimeter to seal the unit. Additionally there is a smaller access door in the bottom of each housing.

Cyclone Cleaning

From the top of the cyclone, material and debris can be swept into the clean out ports along the perimeter of the housing. The clean out ports are openings in the top of the cyclone that allow debris to fall to the bottom of the cyclone for later removal. At the bottom of the cyclone housing, the access door can be opened and the material that has fallen and collected in the bottom of the housing can be completely removed.

Filter Baghouse Cleaning

Inspect the underside of the baghouse top access doors. If there is a pattern build-up of material, one or more filter bags may have to be replaced in the area that corresponds to the build-up.

The individual filter bags can be cleaned with an air wand. Insert the wand into each of the bags and allow the air to blow the material away from the sides of the bag. The material will fall to the bottom of the baghouse for later removal.

Note: the bags can be left in place to clean them. They do not have to be removed for cleaning.

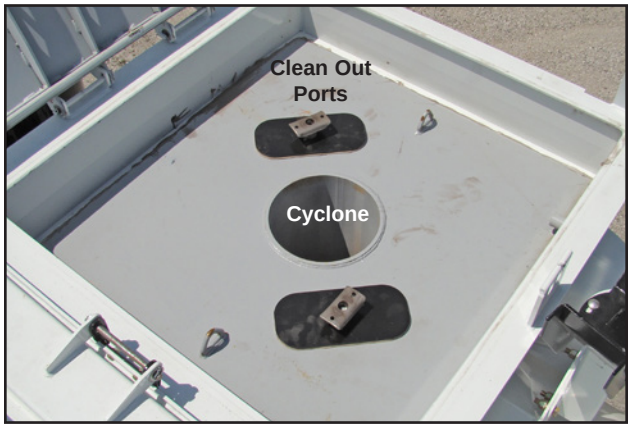
After the bags have been cleaned, remove the material at the bottom of the baghouse via the lower access door.

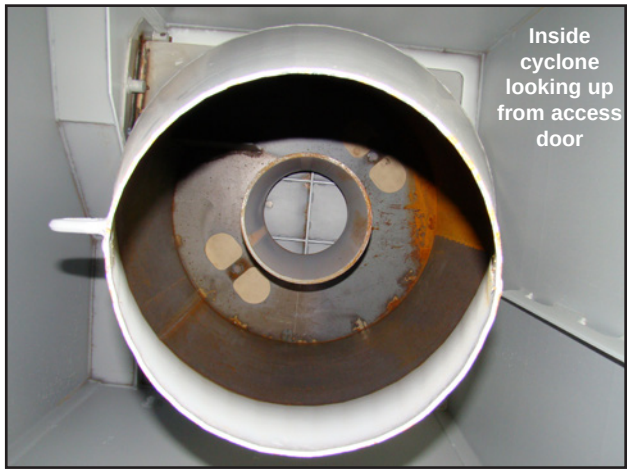
Note: All door gaskets and mating surfaces should be cleaned and wiped down after each operation.

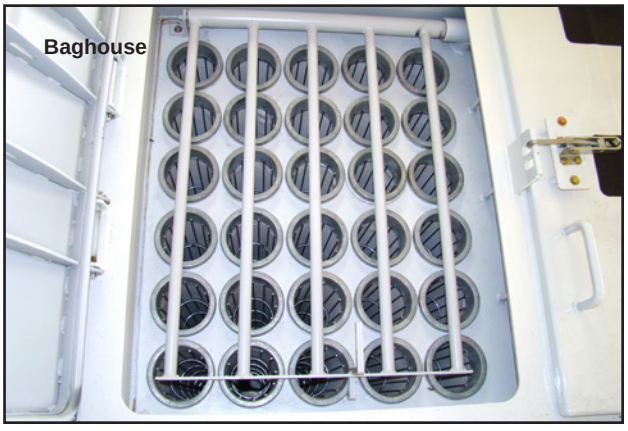
⚠ WARNING

Trip, fall and other hazards

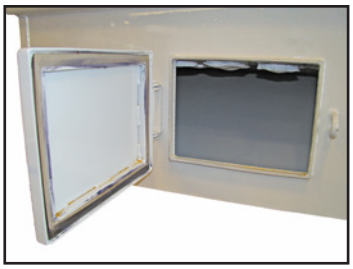
To avoid serious injury or death always use the ladders, walkways, grab handles and safety tie off points provided on the unit. Follow all required site, local, state, federal requirements for service work. This may require that the unit be moved to location that can provide the required safe access equipment.

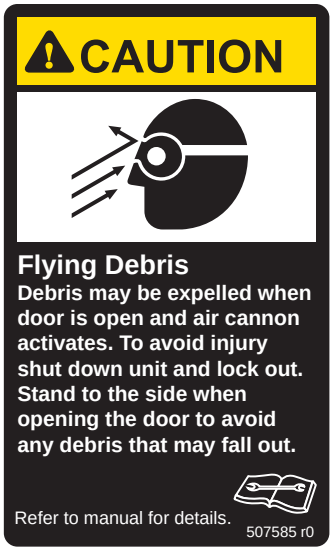






Stand to the side opposite of the opening when opening the lower access doors to avoid any excess material that may be released.

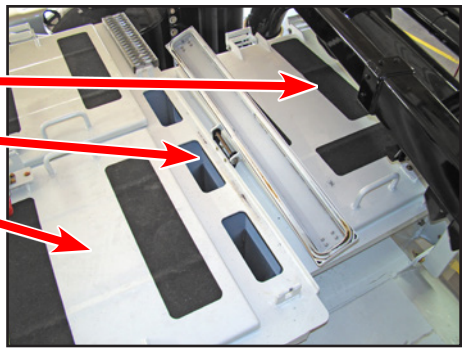


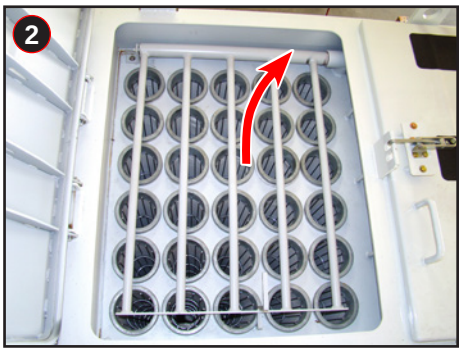


Use the top access doors to change the filter bags.

With the unit shut down:

1. Open both baghouse doors.
2. Raise the blow pipes to a vertical position so as to allow access to the filters. The blow pipes are hinged.
3. The top of each of the filter bags can now be viewed. Each bag has a metal cage stretching the length of the filter on the inside of the bag which is to keep the bag from collapsing during vacuuming operations. Lift the cage straight up so as to clear the filter bag. Set the cage to the side.
4. Remove the snap ring bag from the tube sheet by pinching the ring partially closed so that it will collapse and allow it to fall through the opening and land in the bottom of the housing for later removal.
5. Install the new bag firmly in the tube sheet by lowering it into the same hole that the old one was removed from.
6. Ensure that the lip of the snap ring is secured around the entire perimeter. If there are any gaps, a bag could become dislodged or bypass material.
7. Replace the metal cage inside the new filter bag by slowly lowering it into the filter bag until it firmly rests on top of the new snap ring bag.
8. Check the door gasket and clean it and remove all foreign matter if necessary. The gasket must be clean to form a tight seal against the housing unit.
9. Close and secure the door.
10. Open the side access door at the bottom of the baghouse and remove any old bags. The bag filter should be properly and safely discarded.





Draining

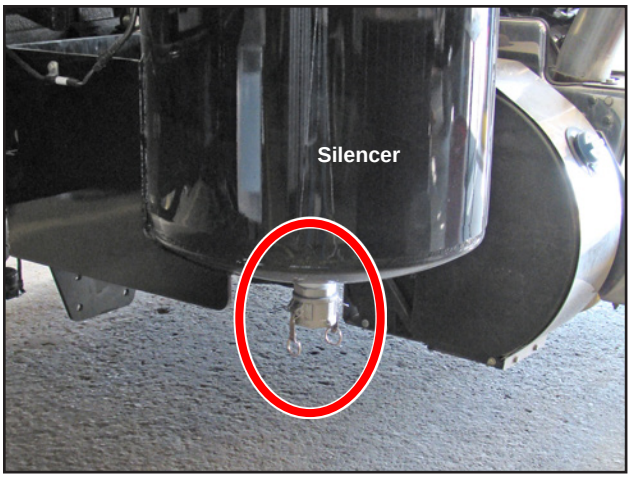
A drain is provided at the bottom of the microstrainer which is used to drain any excess moisture that has collected in the microstrainer during operations. It is closed during normal operations. At the end of the day, the drain is opened to drain the water. The drain is opened by unlatching both latches on each side of the drain cap and pulling the cap off. The drain cap has a safety chain attached to it and the safety chain is attached to the bottom of the microstrainer. This keeps the drain cap from being inadvertently misplaced.

Note: Further disassembly and cleaning of the microstrainer may be required if a lot of material (water, etc.) comes out of the drain.

Note: All drain plugs should be left open to keep residual water from the tanks from migrating to the system during transport. Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow any residual water to drain.

Silencer Drain Valve

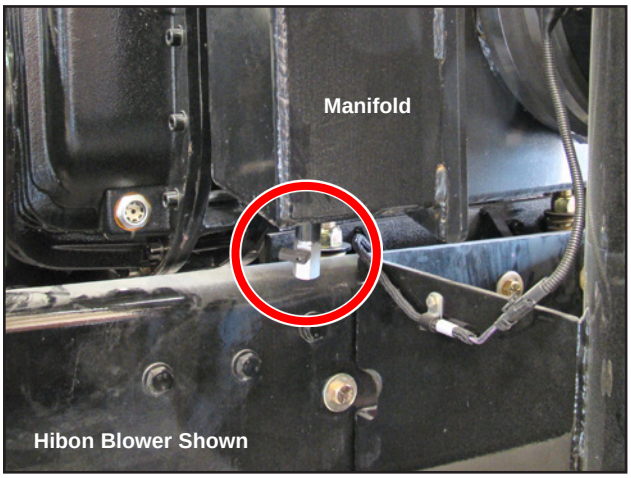
A drain is provided at the bottom of the silencer housing which is used to drain any excess moisture that has collected in the silencer during operations. It is closed during normal operations. At the end of the day, the drain is opened to drain the water. The drain is opened by unlatching both latches on each side of the drain cap and pulling the cap off. The drain cap has a safety chain attached to it and the safety chain is attached to the bottom of the silencer housing. This keeps the drain cap from being inadvertently misplaced.



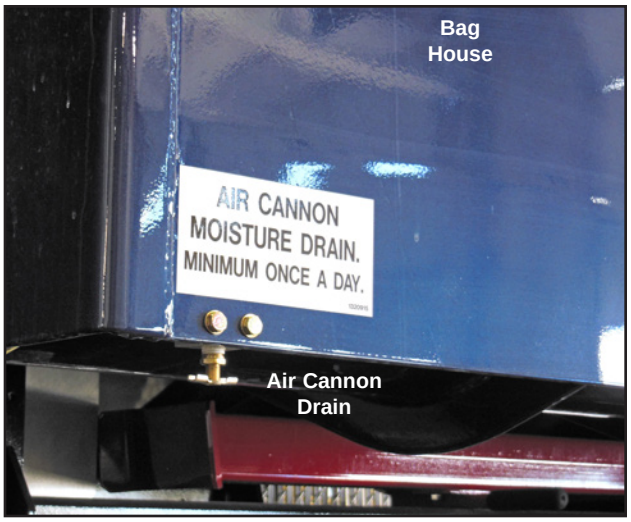
Blower Manifold

Drain the blower manifold daily while the blower is off. Drain location will vary with blower model.

Note: All drain plugs should be left open to keep residual water from the tanks from migrating to the system during transport. Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow any residual water to drain.



The air cannon should be drained of any moisture at the end of operations. All moisture is drained through the drain valve. Depending on the location of the air cannon, the drain valve will be positioned differently. If the air cannon is located on the bag house, the drain valve is located at the bottom of the air cannon tank. Open the pet cock to drain the moisture from the air cannon.



FULL REAR DOOR ADJUSTMENTS

Adjusting the rear door to properly seal typically requires several adjustments to bring both the hinges and the locks into adjustment.

Hinges

1. Loosen lock bolts and jam nuts.
2. Adjust door in or out as needed with jam nuts.
3. Tighten jam nuts.
4. Tighten lock bolts.
5. Repeat as needed with lock adjustments.

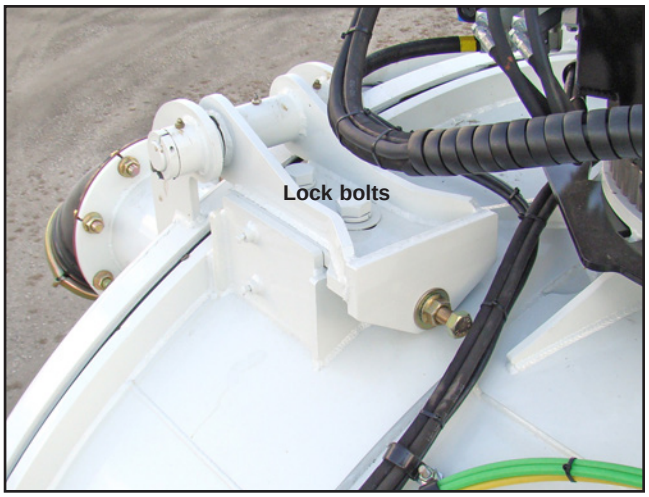
Door Locks

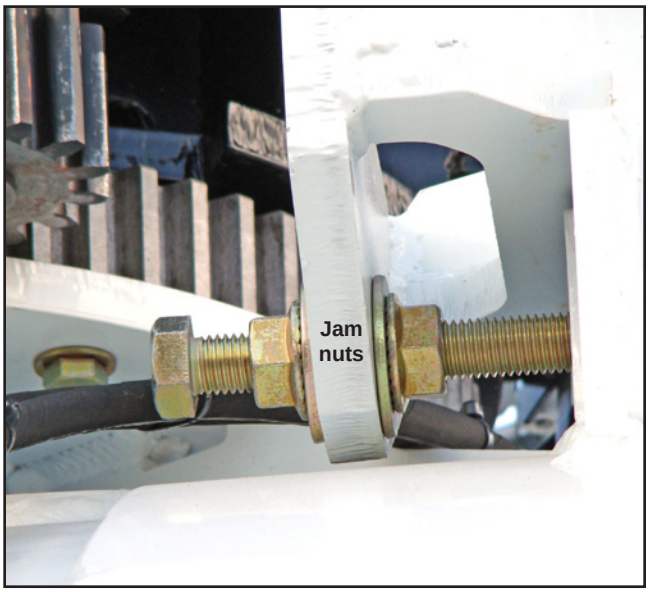
1. Bring system vacuum level up to about 10 inches-Hg.

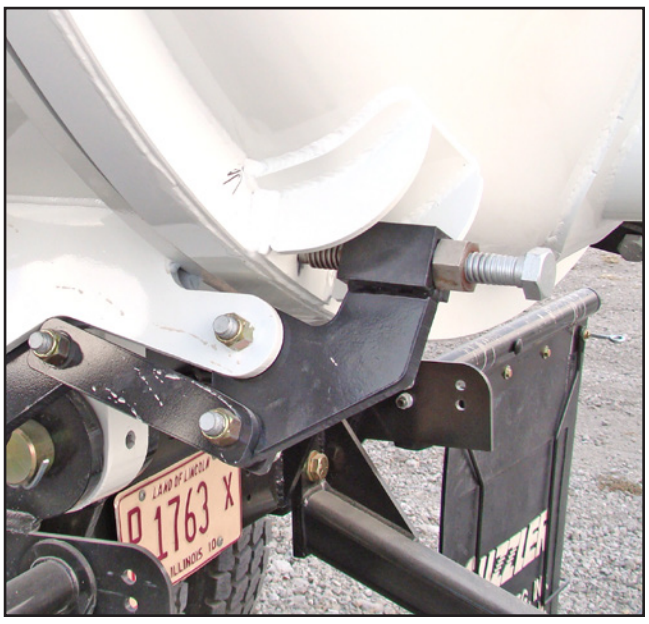
Repeat for each lock

2. Loosen jam nut
3. Adjust lock bolt until it just touches the stop pad.
4. Tighten the jam nut.

Verify that all locks will unlock and lock correctly. If not, repeat adjustments with a lower vacuum level until they do. Perform a leak test to verify that the door seal is working. Repeat adjustments as needed to achieve a working seal.







Pre-Job/Daily Checklist					
	Engine Off, Engine Cool			**Engine ON**	
Check	**Item**	**Date**	**Check**	**Item**	**Date**
	Radiator Coolant			Engine Sound and Exhaust	
	Battery Water			Foot Brakes	
	Hydrometer			Emergency Brake	
	Drive Belts			Power Steering	
	Fan			Cab Lights	
	Alternator			Headlights	
	Crankcase Oil			Taillights	
	Fuel Tank			Turn Signals, Rear	
	Transmission Fluid			Turn Signals, Front	
	Brake Function			Clearance Lamps, Front	
	Brake Fluid			Clearance Lamps, Rear	
	Instrument Gauges			Marker Lamps, Front	
	Windshield Wipers			Marker Lamps, Rear	
	Windshield Washers			Instrument Panel Lamps	
	Mirrors			Instrument Panel Gauges	
	Tire Wear			Horn	
	Tire Damage			Heating and Ventilating	
	Tire Inflation			Air Conditioning	
	Hoses			Mirrors	
	Frame			Seating	
				Test Drive	
	Engine Off			**Engine On, Park Brake Set**	
Check	**Item**	**Date**	**Check**	**Item**	**Date**
	Hydraulic Pump Oil Level			Open Rear Door	
	Blower/fan spindle box Oil Level			Install Rear Door Safety Prop	
	Vacuum Relief Valves			Inspect Vacuum Float Balls	
	Transfer Case Oil Level			Inspect, Clean Rear Door Seal	
	Access Door Secured			Store Rear Door Safety Prop	
	Hoses, Tubing, and Loose Items Secured			Close Rear Door	
	Water Pump Case Oil Level			Hydraulic Pump ON when PTO is Engaged	
				Verify Blower/Fan Operation	

Copy and use this check list prior to each job. Failure to monitor the items included in the check list prior to each job will increase the risk of accidental injury to personnel and/or damage to the equipment.

All areas where material flows are subject to wear. The rate of wear varies greatly with the material and operating conditions. All models are equipped with a replaceable deflector to receive the highest wear and to reduce the materials wear on other parts of the system. Models with a half rear door also have a replaceable port hole insert. All rear door ports are replaceable.

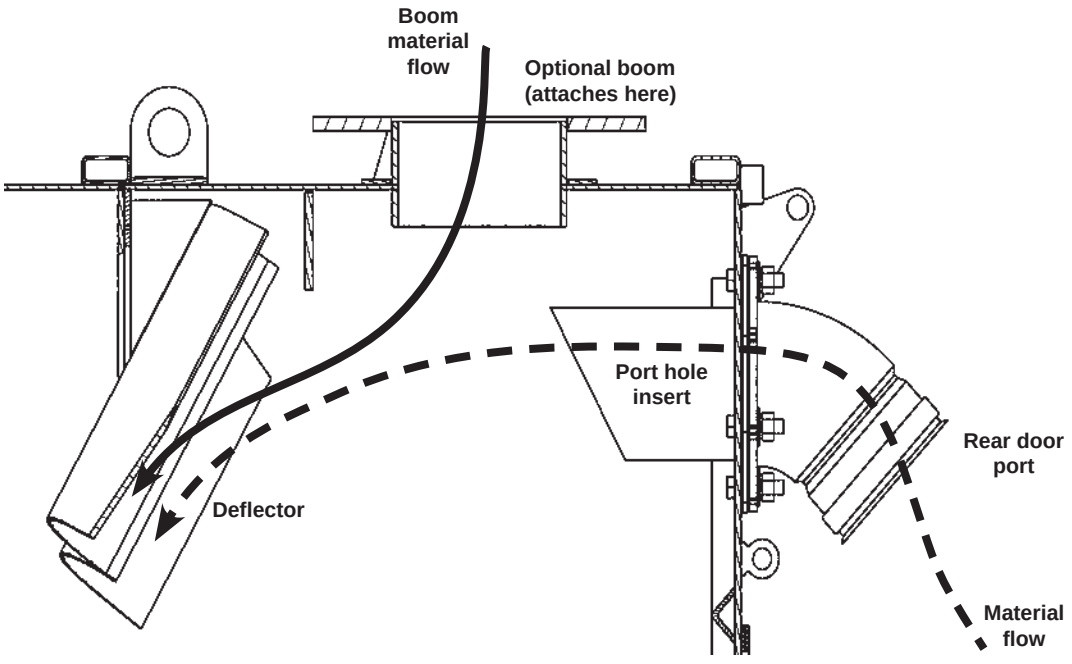
The rear door port, port hole insert, deflector, cyclone, hoses, tubes, elbows, boom turret and all areas in contact with the moving material should be inspected monthly and repaired or replaced as required. Highly abrasive and/or corrosive materials will require more frequent inspections.

DANGER

Confined Space Hazard

Entering a confined space without proper precautions can lead to death or serious injury. Before entering the debris body, watertank or filter housing comply with all work rules and applicable federal, state, and local regulations.

Half rear door area



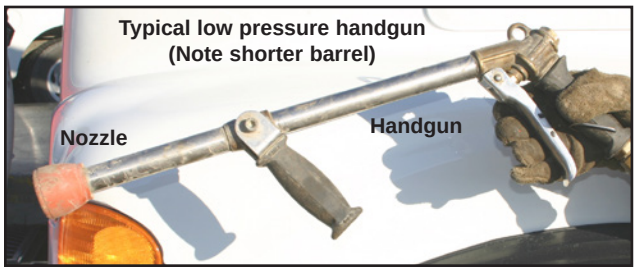
Units may be equipped with a low or high pressure handgun system. The handgun system can be used to clean the unit, the inside of the debris body, screens, floats, the rear door seal; it can also be used to clean catch basins, to add water to material for easier pick-up, to flush streets around work sites, and to clean ladders and ledges. The system consists of a handgun assembly, a hose, and a quick-connect/disconnect system.

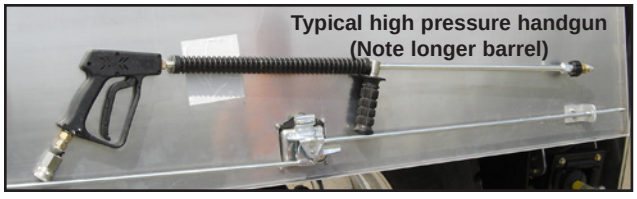
The low pressure handgun is typically mounted on the passenger side of the truck, although other locations are optional. The low pressure handgun and hose are typically stored in the vehicle tool box.

High pressure handguns have long barrels to reduce the risk of operators spraying themselves. High pressure handguns are typically used with systems intended for hydro excavating and industrial applications.

Handgun pressure is controlled with the engine throttle and limited by a pressure relief valve. The handgun must not exceed 600 psi or a maximum volume of 20 gpm when cleaning the unit. Use caution when washing around decals and labels, gear box or blower vents, all air vents or exhausts, painted surfaces, bearings, seals and other soft components to avoid damage. Never spray on or around electrical components. Keep the end of the nozzle at least two feet from the wash area and only work closer after verifying that no damage is occurring.

NEVER use sewer cleaning hose or lateral cleaning hose for any purpose outside of a sewer. Refer to the Safety Manual and Operation section for additional instructions.





WARNING

Handguns Use High Pressure Water

High pressure water can cause serious injury or death.

- **Wear appropriate safety equipment including: Waterproof apparel, protective boots, insulated gloves, safety glasses or goggles, hearing protection (ear plugs and/or ear muffs) and a hard hat with a face shield.**
- **Never point the handgun at or near a person or animal.**
- **Bleed pressure from handgun by shutting off water pump pressure and pressing the trigger before disconnecting from high pressure connection.**
- **Use handgun and connection supplied with the unit; never use common low pressure handguns or connectors with the high pressure system.**

NOTICE

Machine Can Be Damaged During Cleaning

High pressure water can damage or remove safety decals, vents, paint, wash lubricants out of bearings, and damage seals or other soft components. Avoid spraying on or around electrical boxes and components.

Never increase speed of engine above that which is necessary to obtain a maximum of 600psi water pressure while hand gun is being used to prevent damage to the hose and hand gun.

To prevent rodder pump damage, if equipped, always open at least one ball valve before engaging the pump.

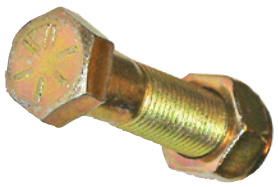
Driveline components installed by Vactor all require these bolt, nut and torque specifications.

Chassis manufacturers may use other bolt, nut and torque configurations in the chassis drivelines. Some transfer cases are installed by the chassis manufacturer. Follow chassis manufacturer specifications for bolt, nut and torque when provided.

Vactor standard practice is to replace any yoke strap that is removed with a new strap and bolts. All Vactor installed driveline bolts are marked with *TORQUE SEAL* (508727-30) to verify the bolts were properly torqued and to detect vibration loosening.

Use only recommended and approved components and torque specified here or by the chassis manufacturer for service work. Alterations, substitutions, or use of additional components must have Vactor engineering approval.

Series	Strap & Bolt Kit P/N	Bolt Torque (Ft-Lbs)
1710	48332D-30	115-135
1760	48332D-30	115-135
1810	48332D-30	115-135
SPL250	48332F-30	115-135



Note: Use Loctite 242 or equivalent on all bolt threads. If the seal on the bolts is broken at any point reapply the thread locker.

Driveline Bolt and Torque Specifications

Driveline Series	Diameter, Thread, Length	Grade	Vactor Bolt	Vactor Nylock Nut	Torque (Ft-Lbs) ±5% Lubed w/Loctite 242 or Equiv.
1280-1310	3/8”-24 X 1”	8	1210648-30	43042A-30	35
1610	3/8”-24 X 1-3/16”	8	1210008-30	43042A-30	35
1710	3/8”-24 X 1-1/4”	8	16337N-30	43042A-30	35
1610*	3/8”-24 X 1-9/16”	8	48400B-30	43042A-30	35
1710*	3/8”-24 X 1-11/16”	8	1210701-30	43042A-30	35
1350/1410	7/16”-20 x 1-3/16”	8	1210650-30	49751-30	60
1760	7/16”-20 x 1-3/4”	8	47635C-30	49751-30	60
1810	7/16”-20 x 1-3/8”	8	1210010-30	49751-30	60
1350/1410*	7/16”-20 x 1-5/8”	8	1210913-30	49751-30	60
1810*	7/16”-20 x 1-3/4”	8	47635C-30	49751-30	60
SPL140	3/8”-24 x 1-11/16”	8	1210701-30	43042A-30	35
SPL170	7/16”-20 x 1-3/4”	8	47635C-30	49751-30	60
SPL250	7/16”-20 x 1-3/4”	8	47635C-30	49751-30	60
* Tru Stop Brake Applications					

Regularly clean the door, especially the door seal, and lubricate the hinges. The door seal should be cleaned each time the debris body is dumped.

The rear door seal provides an airtight seal for the debris body. It is important to keep the seal clean and in good condition. Inspect the seal after each dump and replace if damaged or worn. The seal can be replaced on the vehicle or the door may be removed and placed on supports with the seal channel facing up.

Changing the Door Seal

Materials needed:

- Replacement seal
- 3M Industrial Adhesive P/N 4799 (2 tubes 1002)
- Cyanoacrylate adhesive (super glue)
- Duckbill vise grip pliers
- Hacksaw
- Mallet

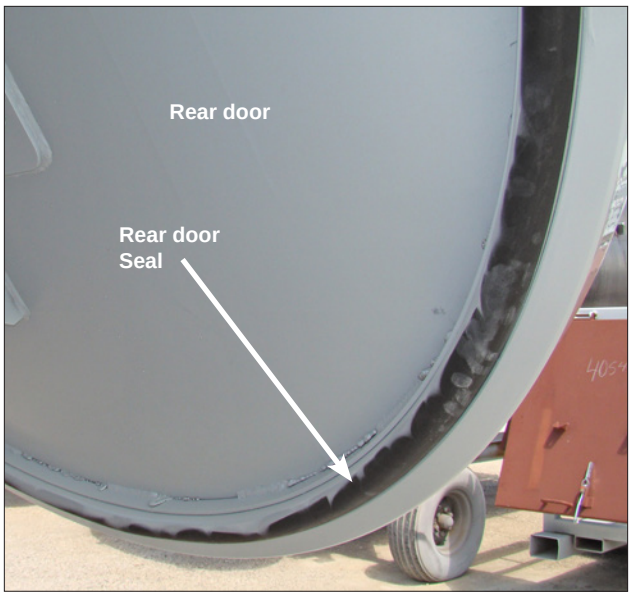
Seal Replaced with Door Removed

If removing the door for installation of the seal off the vehicle, use an overhead crane support and lift to remove the door. Place it on supports with the seal channel facing up.

Use an overhead crane support and lift to secure the door before disassembling the door hinges. Use the crane to remove the door and position it for seal replacement. Never work underneath the door without proper support or safety props.

Seal Replaced with Door on Unit

When installing the seal with the door on the vehicle, do the following:



a. Use the instructions posted in the cab to engage the hydraulic pump.

b. Raise the debris body. Install the debris tank and rear door safety prop.

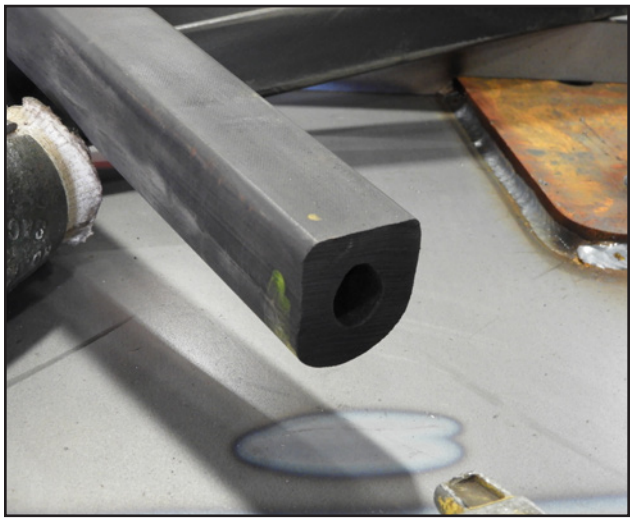
c. Shut down the engine and remove the ignition key.

d. Post a notice on the steering wheel that maintenance is being performed.

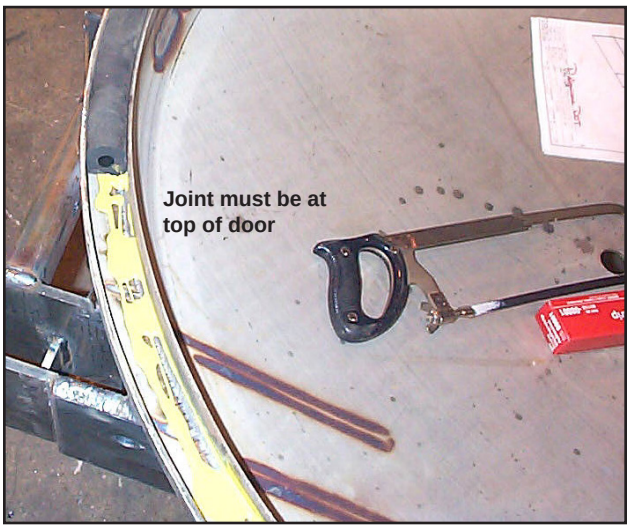
Procedure When Replacing the Door Seal

1. Completely remove the seal and clean the seal channel of all glue and dirt.
2. Apply a generous amount of adhesive to all sides of the seal channel.

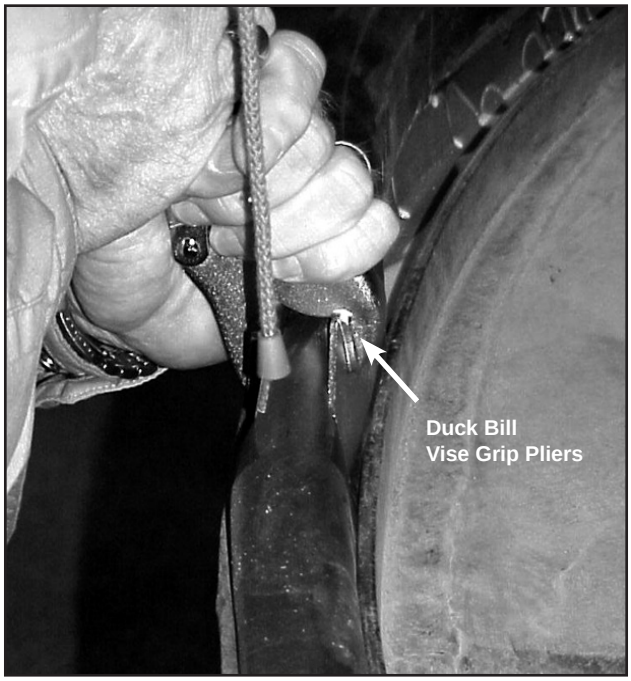
3. Make sure the end of the seal is cut squarely for a proper seal at the end of the procedure. A hacksaw works well.



4. Starting at the top of the door, place the flat surface of the new seal into the seal channel.

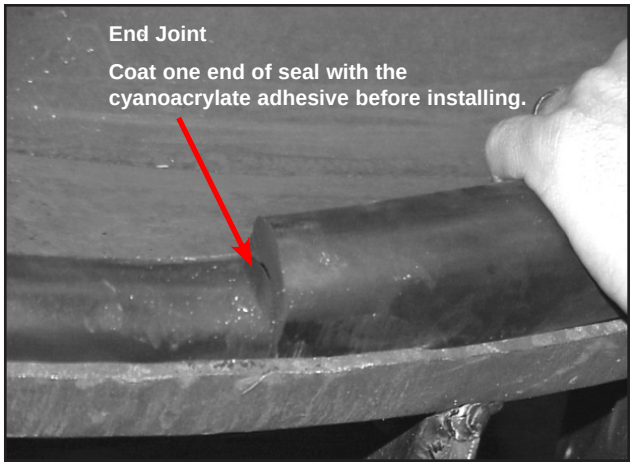


5. If installing the seal with the door on the vehicle, do the following:
   - Squeeze the seal with the duckbill pliers while feeding the seal into the channel.



6. If installing the seal with the door removed do the following:
   - Using a mallet, pull on the seal while pounding the seal into the channel.

7. Use the hacksaw to cut off excess seal to form a flush, airtight mating surface between seal ends. Coat one end of seal with the cyanoacrylate adhesive before installing.
8. If installing the seal with the door off of the vehicle, use an overhead crane support and lift to install the door on the debris body.



A variety of air and hydraulic actuated butterfly style valves from a number of different manufacturers are used. A butterfly valve, shown at right, rotates a disc in the material flow to open and closed positions (shown in closed position). The valves are normally actuated by switches or automatically by the system controls. During servicing or use an inadvertent actuation could result in an injury from the moving parts. The valves can still remain active when not installed unless the air or hydraulic lines are disconnected and all safety precautions followed.

Do not allow tools, arm, hands etc. in the butterfly areas as serious injury may occur. Shut down all systems and de-energize or disconnect the air or hydraulic system to the valve before servicing.

Improperly adjusted valves can cause actuator damage or disc bolt fatigue and failure. *Valve should open and close smoothly.*

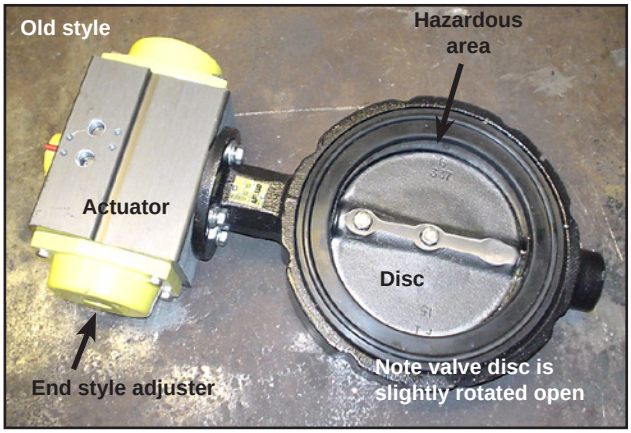
Butterfly pneumatic actuators are designed to allow adjustment without the removal of the actuator end caps. Typically there is a jam nut located on each end of the actuator in the center of the end cap. Newer style butterfly valves have the adjuster bolt on the side of the actuator. One adjuster controls the closed position and the other the open position.

With the valve in the CLOSED position:

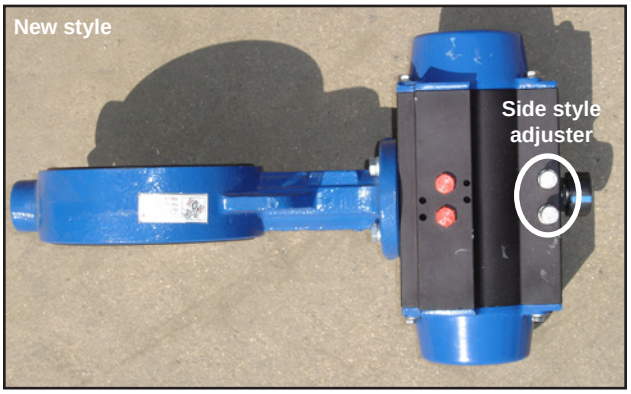
1. Determine which adjuster screw is for the closed position. It will be the one that moves the disc.
2. Adjust the screw all the way in (for side adjusters - out for end cap adjusters). This should give you about 5 deg. adjustment.
3. The disc should start to unseat in this position and still provide shut-off.
4. Tighten the jam nut and check your system to see if the valve is providing shut-off.
5. If the valve is not providing shut-off loosen the jam nut and readjust to where the disc just seals.
6. Observe the valve operating:

   CLOSED Valve angle seat should be between 3 and 5 degrees.

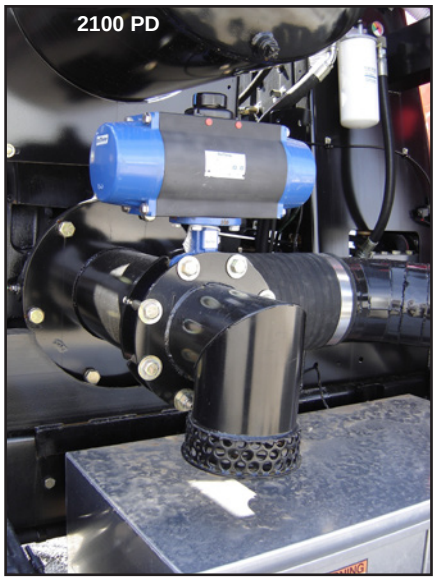
   Valve should open and close smoothly.



Butterfly Valve

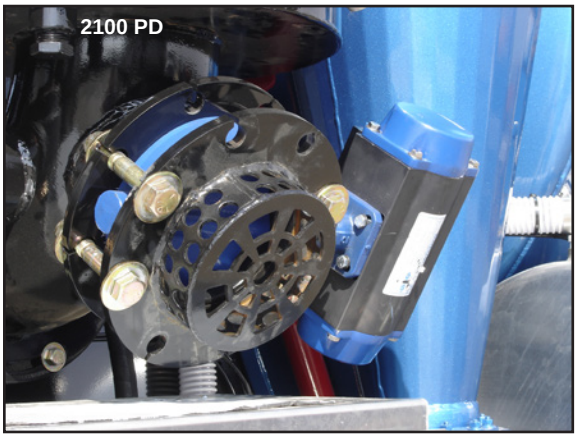


The air operated vacuum relief valve is used to relieve the system if the vacuum hose, debris body or inlet filter become plugged or restricted. These valves are on all blower units. The valves are normally operated from the master control panel, pendant or optional wireless remote. Proper operation should be verified daily by verifying under vacuum. Actual location size and configuration of the valve varies by the model and options. Typical location is in the inlet piping of the blower.



Vacuum relief valves require regular inspection and periodic cleaning. Develop a regular program of visual inspection, looking for clogged drains and discharge pipe, dirt buildup in and around the valve seat, and broken or missing parts. Keep the valve and the area around the valve clean and free of any foreign material or substance.

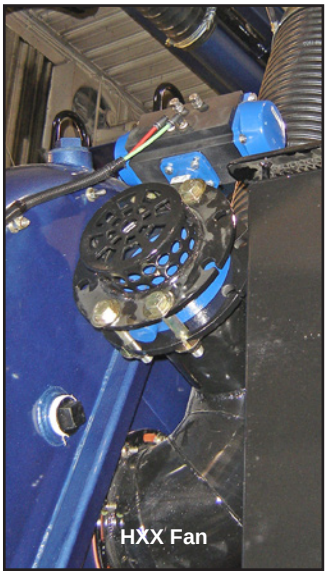
Use proper hearing protection when in the vicinity of this device which emits a loud, sharp sound. Follow safety precautions to prevent injury from high velocity flow of materials.



Note: Keep foreign material from entering the valve. Do not paint, oil, or otherwise cover any interior or working parts of any safety valve; safety valves do not require any lubrication or protective coating to work properly.

Note: Test all vacuum relief valves to ensure proper valve operation. See the section “Vacuum Relief Valves” in the Operations section.

The vacuum relief valve is actuated by a switch located on the main control panel or a switch located on the pendant control. The switch controls an air valve which sends air pressure to the valve either opening or closing, whichever is needed. The vacuum relief valve needs to be open for normal vacuuming using the boom and debris hose. When the vacuum relief valve is closed, air flow is blocked to the boom and debris hose.



Whether it is manually or automatically operated, a switch energizes an electric over air solenoid valve. This allows pressurized air to fill a chamber on the actuator for the butterfly valve which opens or closes depending on whether the ‘on’ or the ‘off’ solenoid is actuated.

As with any other electrical system in Vactor products, the master switch in the main control panel has to be in the ON position. If the valve fails to function, the problem could lie in the electrical or the pneumatic system. It is in very rare cases that there is a mechanical reason for the failure of the valve. To trouble-shoot, first ascertain whether the problem is mechanical, electrical or pneumatic. To do this, start the engine, build up air pressure to the maximum and follow the procedure to obtain power to the control panel and turn on the master switch. Trace back the two air lines at the valve actuator to the double air solenoid. This may be located very close to the valve itself or may be somewhere at the underbelly of the debris body. Remove one air line at a time on the “out” side of the solenoid. If there is pressure at one of the ports, the problem is not pneumatic.

Now, operate the switch. If the air pressure switches to the other port, there is no electrical malfunction either. Now that the problem has been categorized, we can proceed to rectify the defect.

Pneumatic

If there is no air pressure at the “out” side of the air solenoid, remove the incoming air line to the solenoid. Does that have air pressure? If yes, you have a faulty solenoid. Open, clean and reassemble or replace the solenoid assembly. If there is no pressure in the incoming line, trace the incoming line to its origin, checking for kinks or blockages. Pull out the air line coming out of the air dryer/ tank at the air protection valve. Check for air in the reservoir. Check if air protection valve functions properly, if not, replace.

Electrical

Is the master switch in the control panel turned on? Check for loose connections at the mating plugs. Open the control panel door and check for blown fuses, loose connections or damaged wiring. Repair as required. Unplug the wiring harness at the solenoid and check for voltage at the harness connectors with the switches in both, the open and closed positions. If no power, go back to the pendant switch and open it. Check incoming voltage to the switch, corroded, worn or otherwise damaged contacts or loose or damaged wiring. Repair as required.

If there is voltage at the wiring harness connectors at the solenoid valve, press the solenoid over ride rubber buttons, one on each of the solenoid assembly. If that operates the valve, the solenoids are faulty. Replace the faulty solenoids).

Mechanical

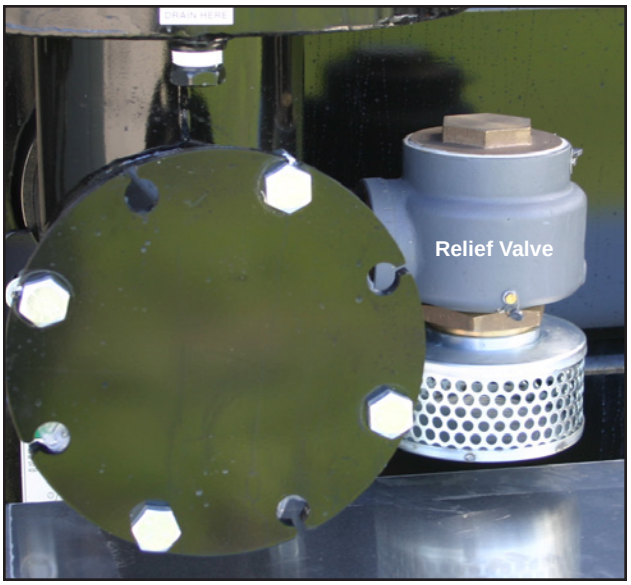
If air is being supplied to the valve actuators and the valve still does not work, the valve could be binding. Remove the strainer basket and try to free the valve by squirting some penetrating oil at the shaft bushings. Remove the air lines going to the actuators and lubricate the ports with air tool oil or penetrating oil. It may be that the screws of the valve to shaft or the actuator coupling have come loose or the shaft is broken. Rectify as necessary.

The automatic relief valves protect the blower if the vacuum hose, debris body or inlet filter become plugged or restricted. These valves are on all units with 15-18 in-hg systems. The valves open at a preset vacuum level and allow the blower to draw air through the valve openings. Proper operation should be verified daily by temporarily blocking off the vacuum hose and observing that the valve whistles at the unit's rated vacuum level.

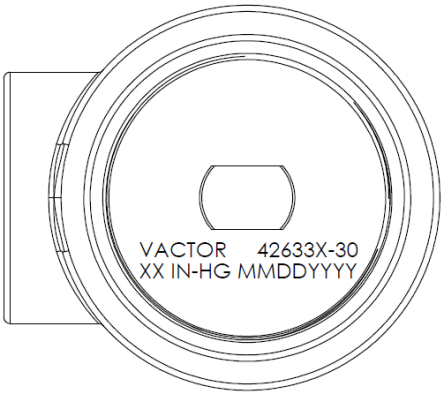
The relief valve, when operating, will emit a loud, sharp whistle. This will occur when the vacuum hose is plugged or when the floatball shutoff stops the airflow, indicating the debris body is full.

The blower is cooled internally by the air moving through it. As the vacuum levels increase, the airflow decreases; therefore less cooling air is available which causes the blower to heat up.

The relief valve opens at a preset level to admit extra air into the blower. The valve will whistle when this happens. Steps should be taken to reduce the vacuum.



Mid-2020 Vactor started using a second supplier for vacuum relief valves. Both are supplied using the same part numbers for the 15, 16 and 18 IN-HG applications. The new valves can be identified by the stamping shown. The new valves are not user adjustable and must be replaced.



Note: The new valves have a set pressure tolerance of -0/+2 IN-HG. Always install a second known good vacuum pressure gauge to verify correct operation when troubleshooting.

Adjusting the older Kunkle Relief Valve

1. To adjust, start the blower.
2. Then block off the intake pipe to about 80 percent.
3. Slowly raise the RPM and watch the vacuum level rise.
4. The relief valve should start to open at 1-1/2” HG less than the blower rating and be open fully at the rated inches of HG.
5. Reduce the engine RPM to idle and remove the intake pipe block.

NEVER adjust the valves with vacuum on the system.

6. Loosen the set screws on the top of the valve and, with a large pipe wrench, screw the top of the valve in or out to adjust the level at which the relief valve opens.
7. Start back at step 1 and repeat as required.
8. These valves can also be disassembled, cleaned and reset.

Replace the Relief Valve

A safety-relief valve should begin opening 1-1/2 to 2-inches hg below maximum hg and be fully open at maximum hg. To check relief valve operation, leave vacuum tube attached to bumper mount and watch vacuum gauge, located on control panel. Briefly increase truck RPM to normal operating pressure. If relief valve does not open, increase RPM until it opens or vacuum gauge shows 15 hg. Replace or service the relief valve if it opens before system pressure reaches normal level or after 15-inches hg on the vacuum gauge.

To replace the relief valve, do the following:

1. Remove screen from bottom of relief valve. Then remove the relief valve.
2. Before installing a new safety-relief valve, use a pipe tap to ensure clean-cut uniform threads are in the opening for normal hand-tight installation.

Note: Use pipe compound sparingly to prevent excess from entering valve and causing leakage.

3. Thoroughly clean and flush system of all dirt and debris, which can scratch seals and cause erosion and leaking.
4. On relief valve, leave female pipe threads and the first thread of the male pipe free of pipe compound; apply a moderate amount to remaining male pipe threads.
5. Install relief valve hand-tight followed by one half to one full turn.

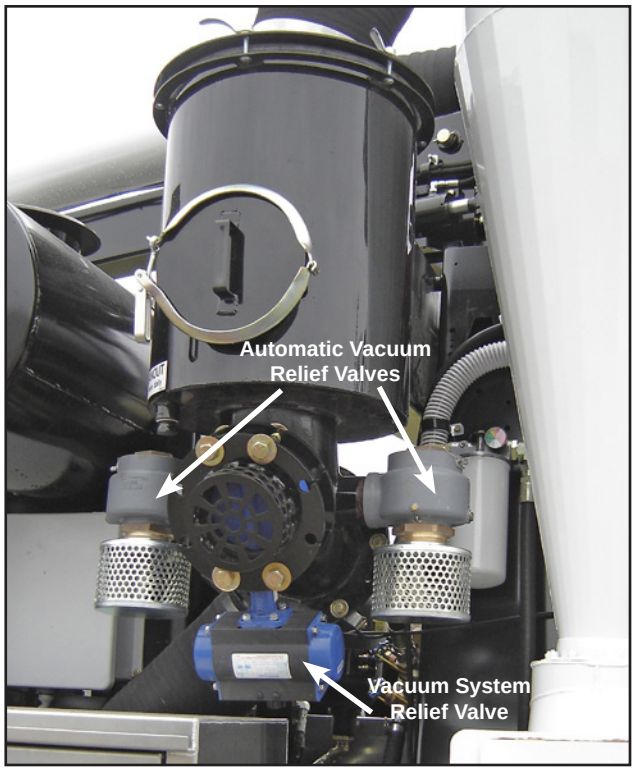
Note: Avoid over-tightening which will distort safety-relief valve seals. As the vessel and valve are heated, the heat causes an explosion, which grasps the valve more firmly.

6. Apply a moderate amount of pipe compound to the male pipe threads on the relief valve.
7. Install the screen (hand-tight) followed by one-half to one full turn.

NOTICE

Safety / relief valves should be operated only to assure that they are in good working condition. Opening can cause leakage of trapped foreign material.

Never break lead and wire seals or tamper with safety / relief valve. Never reset relief valves to higher vacuum settings. Damage to the blower can occur.



Kunkle brand vacuum relief valves (Automatic Valves) are preset at the factory to the setting suitable for the particular unit. If it becomes necessary to service them it is very necessary that the valves be reset to the correct setting before putting them back in service. Below is the service and resetting procedure for these valves. Vactor Manufacturing Inc. accepts no responsibility for damage caused by improper or unauthorized resetting of the valves. Over a period of time, especially if the valves operate frequently they may suck in some dirt which might either clog them and prevent their function or wear them out causing damage to the seats and cause leaks.

To service the valves, remove them from the unit and work on a clean work bench. Clamp the valve in a vise using soft jaws to prevent damage to the cast shell. Do not over tighten the vise as the valves might distort causing difficult dismantling and damage to the threads. Remove the two screws holding the identification plate and the plate and save them. Using a suitable tool, scrape off the silicone bead around the cap. Slowly loosen the cap and remove it.

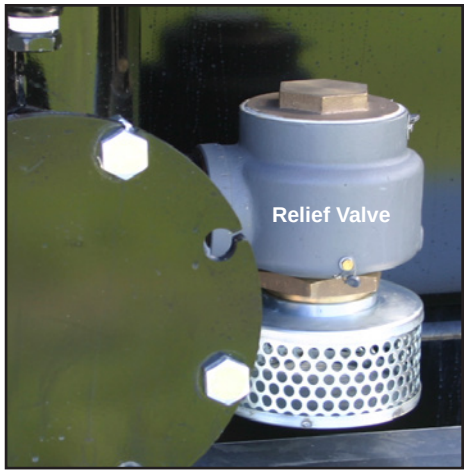
Remove the spring and the seat. Check the seat for deep scoring or pitting marks at the seating surfaces. Check for burrs, wear marks or cracks. Check for spring deformity or rust/ corrosion on coils. Check for damaged threads or cracks of the valve body. Replace if any component is observed to be damaged. Clean all components in parts washing solution and air dry. Assembly is reverse of disassembly. Do not lubricate any part as it might attract dirt and cause unnecessary wear.

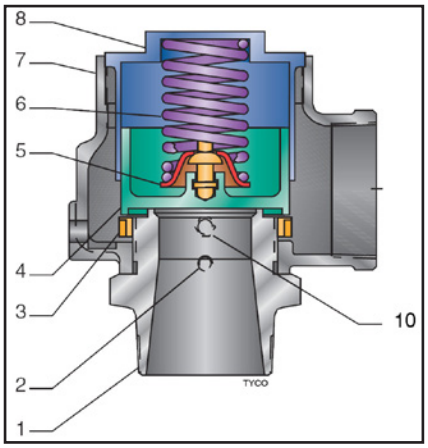
Press down firmly on the cap after seating the spring and start the threads. Do not tighten the cap more than two or three turns as the valve still has to be set. Do not install the identification plate or its screws yet. Apply liquid or paste Teflon on the male threads of the nipple welded on the micro-strainer or the blower hat or the blower box as the case might be and screw on the female side of the automatic valve by hand. Tighten the valve on the nipple no more than one turn with a wrench. Point the opening of the valve downwards or between 4 o'clock and 8 o'clock positions, never upwards.

⚠ CAUTION

Flying Parts

The valve is spring loaded. Use care while dismantling the valve. Always wear safety glasses and protective gloves while working with the valves.





Automatic Vacuum Relief Valve	
Item	**Description**
1	NOZZLE
2	SET SCREW
3	REGULATOR DISC
4	DISC
5	SPRING STEP
6	SPRING
7	BODY
8	COMPRESSION SCREW
9	STEM
10	REGULATOR RING SET SCREW

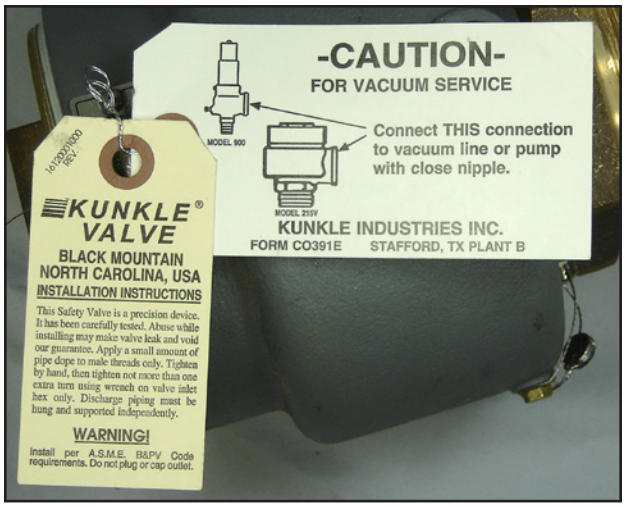
Setting The Valve

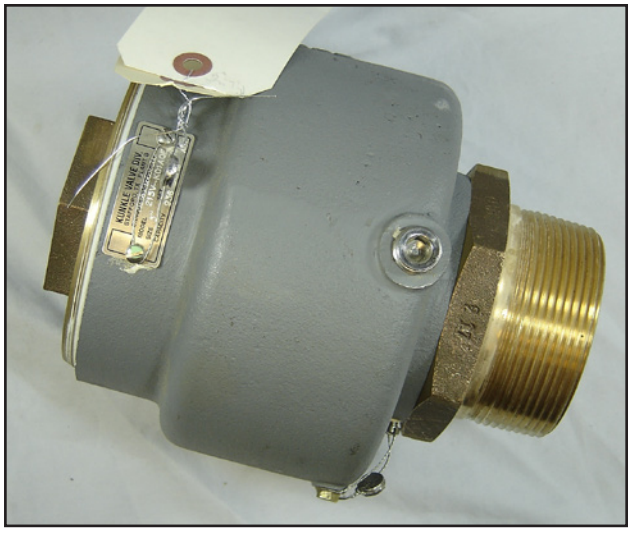
Attach an accurate vacuum gauge (+/- 2% accuracy) to the tee provided at the blower inlet. (One side of this tee is already attached to the vacuum gauge in the control panel, the other is plugged, remove this plug to attach the test vacuum gauge). Make sure that all doors and ports on the truck are shut except for the vacuuming port farthest from the blower (rear port hole or the boom vacuuming port).

Cap off all Automatic valves except the one that is to be set. If more than one are to be set, set them one at a time, capping off all but one. Have a thick board, large enough to cover the vacuum port and strong enough to resist a strong vacuum, handy. Start engine and engage the blower following the normal blower engaging procedure. Increase the RPM with the throttle at the control panel to about 1500. Place the board on the port covering it about 3/4th of the opening. Gradually increase blocking of the opening till the valve just begins to open (you will hear a whistling sound and if you put a thin sheet of metal at the valve opening you can feel it suck in). At this point, note the vacuum reading on the test vacuum gauge. Tighten the cap to increase the setting and loosen it to reduce the setting. Tighten or loosen the cap in small increments and repeat the procedure till the valve just opens at the recommended vacuum. (Check your blower manual for vacuum capabilities/settings of your unit).

Note: Do not set the Automatic valve(s) at a higher vacuum than it/they was/were originally set at. Doing so will not only void any warranties but also seriously harm the blower.

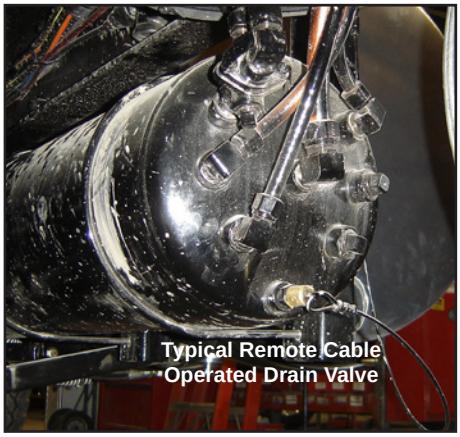
After setting the relief valve, cross check it once more and then install the identification plate and its screws. These screws hold the cap in place and prevent it from vibrating loose and so prevent the setting of the valve from changing. Run a bead of silicone caulk at the join of the cap to the valve body to prevent any vacuum leakage at that point. Do not operate the machine till the silicone is dry or it will get sucked in and defeat its purpose.





All units use compressed air to operate various valves and cylinders. The air is normally supplied by the chassis air system. Depending on options, unit or chassis configuration there will normally be one or more air tanks, filters or dryers located on the unit in varying locations.

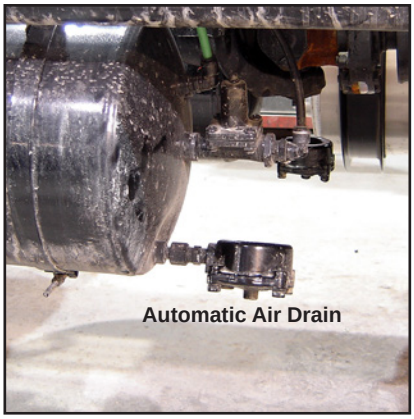

Typical Manual Air Valve


Typical Remote Cable Operated Drain Valve

Maintenance

If equipped all air tank filters should be checked daily and cleaned if necessary. If upon a visual inspection, the filter is dirty or clogged, it should be replaced.

Note: the chassis air tank should be drained daily and the unit air filter checked and cleaned if necessary every 48 hours. Cold or very humid weather may require more frequent draining of the chassis air tanks.


Automatic Air Drain

When air is compressed the water vapor in the air is put into the vehicle's air system. The liquid accumulates and affects system performance by washing away lubricants, accelerating corrosion and blocking air system components by freezing. High humidity, high air consumption and cold temperatures increase the water vapor collected in the air system. Two common methods are used to address this issue are automatic drains and desiccant-type air dryers. Manual drains may also be found.

Note: Alcohol injection systems are sometimes used by others. They are very specialized and should not be used as the alcohol can damage seals and plastic parts in an air system.

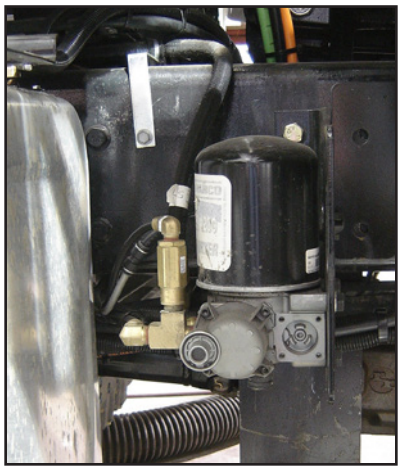
In-line dryers and filters are normally used on units with blowers and transfer cases for the air shift.


Typical In-line Air Dryer and Filter

Freezing conditions can create situations where the frozen water can slow down or stop the proper operation of the various components in an air system. This can include chassis brakes, air valves and air cylinders that operate safety systems such as vacuum reliefs. When operating under these conditions proper operation of the air systems should be routinely verified. The frequency will vary with the conditions.

When the conditions exist for air system water problems Vactor Manufacturing and most chassis manufacturers recommend draining all system air reservoirs every 2-3 hours of operation.

Typical desiccant style air dryer with replaceable filter element.



Desiccant-type air dryers require routine replacement of the desiccant element. Refer to the chassis service manual.

Consult the Vactor Manufacturing Service Group for recommendations and systems suited to your applications.

Machines can often sit at a work site for months while work creeps along. For long term storage beyond one year consult Vactor-Guzzler Service. Refer to the unit's manual for specific details. Storage protection plans should look like the following for a northern, dry climate:

Rotation - Rotate all compressors, pumps, fans and blowers every two weeks.

Visual Inspection - When rotating exposed machined surfaces, check shafts and couplings to see that a protective coating has been applied and has not been removed. Reapply if needed.

Miscellaneous - Lubricate miscellaneous equipment as applicable per normal maintenance schedule.

Drains - Leave all drain plugs out to prevent the buildup of moisture.

Other Considerations

In a warm, high-precipitation climate it is wise to look for alternate solutions to the problem of field storage during construction and prior to start-up.

For engines refer to the manufacturer's manual for procedures.

Vacuum System

Any time the unit will sit after use, the blower should be run 3-5 minutes with the vacuum relief open to dry out the vacuum system.

If the unit is not in operation, or will be parked for an extended period of time, the rear door can be opened slightly to drain and vent the debris body. This allows airflow into the body which reduces rusting and allows the rear door seal to relax, preventing it from training to a flat state. To ensure no entry to the debris body, or operation of the unit while the door is open, the door must only be cracked enough to relax the seal and a lockout/tagout procedure must be performed.

Air Systems

Drain all moisture traps and tanks. Replace all filters and all desiccant.

Freezing Weather

Any time the unit will sit after use during freezing weather the blower should be run 3-5 minutes with the vacuum relief open to dry out the vacuum system.

Oil & Grease

The unit should be on level ground and off. Before storage all oil should be changed and filled to the center of the sight glass(s) or fill mark. **DO NOT OVERFILL.** When the blower will not be used for any time beyond a few days there is risk the close fitting surfaces inside the blower will rust and increase blower lobe wear on startup. Refer to the blower manufacturer's manual for details on long term storage. Grease the unit per the manual's schedule.

Sound Suppression Systems

Leave the drain plugs out when not in use to prevent rain water from building up in the silencers. Verify the rain cap works correctly to assure rain and water cannot enter.

Water Systems

Drain and purge all the water components. When completed open all ball valves, put Y-strainers, cap, clamp and drain plugs in a tool box if the unit will sit overnight or longer. This will allow any residual water to drain.

- Verify that water flows when valves or plugs are opened. Insure that ice has not plugged drain lines, valves or drain plugs.
- Leave all drain plugs open to keep residual tank water from the tanks from migrating to the system during transport.
- Leave all valves open, Y-strainers out and drain plugs out when the unit will sit overnight or longer. This will allow residual water to drain.
- If the unit cannot be properly drained, move the unit to a warm area and allow the water system to warm completely to drain.
- Never operate water pump(s) if system is frozen.

Putting the unit back in service

- Close the rear door if left open.
- Verify all fluids are at correct levels.
- Install all drain plugs and Y-strainers and close all drain valves.
- Operate engine(s) at low RPM's until warm.
- Engage and cycle all functions to verify operation.

NOTICE

Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

PURPOSE: THE PURPOSE OF THIS STANDARD IS TO PROVIDE A RECOMMENDED TORQUE FOR THREADED FASTENERS SUCH AS BOLTS, NUTS, CAP SCREWS,USED IN STEEL AND CAST IRON PARTS.

APPLICATION: THIS STANDARD IS INTENDED FOR FASTENERS OF GASKETED OR NON-GASKETED JOINTS, WITH OR WITHOUT STEEL WASHERS, AND WITH COARSE OR FINE THREADS. ALL SPECIAL CONDITIONS WHICH WILL SERIOUSLY AFFECT THE RELATIONSHIP BETWEEN TORQUE AND TENSION OF THE FASTENER, SUCH AS SPECIAL SURFACE FINISHES, LEAD WASHERS, AND FASTENERS SCREWED INTO MATERIAL OTHER THAN STEEL OR CAST IRON, WILL REQUIRE SEPARATE TORQUE VALUES TO BE INCLUDED IN THE APPLICABLE SPECIFICATION. THIS SPECIFICATION DOES NOT APPLY TO TORQUING OF HYDRAULIC CONNECTIONS.

MEAN OR BASIC RECOMMENDED TIGHTENING TORQUE FOR INCH FASTENER REQUIRING ±20% ACCURACY*. TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS.

BOLT HEAD MARKING

GRADE 5

GRADE 8

	TORQUE IN POUND FOOT (LB-FT)	
NOM. DIA. INCH	GRADE 5	GRADE 8
1/4 -.250	9	12
5/16 - .312	18	25
3/8 - .375	30	45
7/16 - .438	50	70
1/2 - .500	75	110
9/16 - .562	110	155
5/8 - .625	155	215
3/4 - .750	270	385
7/8 - .875	435	620
1 - 1.000	660	930

	TORQUE IN NEWTON METER (Nm)	
NOM. DIA. INCH	GRADE 5	GRADE 8
1/4 - .250	12.2	16.3
5/16 - .312	24.4	33.9
3/8 - .375	40.7	61.0
7/16 - .438	68	95
1/2 - .500	101	149
9/16 - .562	150	210
5/8 - .625	210	290
3/4 - .750	365	520
7/8 - .875	590	840
1 - 1.000	895	1260

*WRENCH TYPES WITH ±20% ACCURACY:

TORQUE CONTROLLED IMPACTS WITH TORSION BARS
HAND TORQUE WRENCHES
NUTRUNNERS - STALL AND SHUTOFF
NUTRUNNERS - ELECTRONIC SHUTOFF
AIR CYLINDER - STALL TYPE

NOTE: THIS DOES NOT INCLUDE AIR AND ELECTRIC IMPACT WRENCHES WHICH TYPICALLY ARE ±50% ACCURATE.

NOTE: NYLON LOCKING NUTS WILL BE TORQUED TO GRADE 5 STANDARDS

PURPOSE: THE PURPOSE OF THIS STANDARD IS TO PROVIDE A RECOMMENDED TORQUE FOR THREADED FASTENERS SUCH AS BOLTS, NUTS, CAP SCREWS,USED IN STEEL AND CAST IRON PARTS.

APPLICATION: THIS STANDARD IS INTENDED FOR FASTENERS OF GASKETED OR NON-GASKETED JOINTS, WITH OR WITHOUT STEEL WASHERS, AND WITH COARSE OR FINE THREADS. ALL SPECIAL CONDITIONS WHICH WILL SERIOUSLY AFFECT THE RELATIONSHIP BETWEEN TORQUE AND TENSION OF THE FASTENER, SUCH AS SPECIAL SURFACE FINISHES, LEAD WASHERS, AND FASTENERS SCREWED INTO MATERIAL OTHER THAN STEEL OR CAST IRON, WILL REQUIRE SEPARATE TORQUE VALUES TO BE INCLUDED IN THE APPLICABLE SPECIFICATION. THIS SPECIFICATION DOES NOT APPLY TO TORQUING OF HYDRAULIC CONNECTIONS.

MEAN OR BASIC RECOMMENDED TIGHTENING TORQUE FOR METRIC FASTENER REQUIRING ±20% ACCURACY*. TORQUE VALUES ARE BASED ON NON-LUBRICATED THREADS.

BOLT HEAD MARKING

	TORQUE IN POUND FOOT (LB-FT)		
SIZE	GRADE 8.8	GRADE 10.9	GRADE 12.9
M3	0.4	1.3	1.5
M4	2.2	3.3	3.7
M5	4.5	6.5	7.5
M6	7.5	11.0	13.0
M8	18	30	33
M10	35	50	63
M12	65	95	110
M14	105	150	177
M16	160	235	277
M20	320	460	542
M24	550	790	937

	TORQUE IN NEWTON METER (Nm)		
SIZE	GRADE 8.8	GRADE 10.9	GRADE 12.9
M3	0.5	1.8	2.0
M4	3.0	4.5	5.0
M5	6	9	10
M6	10	15	18
M8	25	35	45
M10	50	70	85
M12	90	125	150
M14	140	200	240
M16	225	310	375
M20	435	610	735
M24	750	1050	1270

*WRENCH TYPES WITH ±20% ACCURACY:

TORQUE CONTROLLED IMPACTS WITH TORSION BARS
HAND TORQUE WRENCHES
NUTRUNNERS - STALL AND SHUTOFF
NUTRUNNERS - ELECTRONIC SHUTOFF
AIR CYLINDER - STALL TYPE

NOTE: THIS DOES NOT INCLUDE AIR AND ELECTRIC IMPACT WRENCHES WHICH TYPICALLY ARE ±50% ACCURATE.

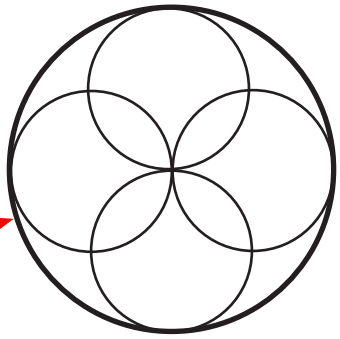
NOTE: NYLON LOCKING NUTS WILL BE TORQUED TO GRADE 8.8 STANDARDS

Troubleshooting

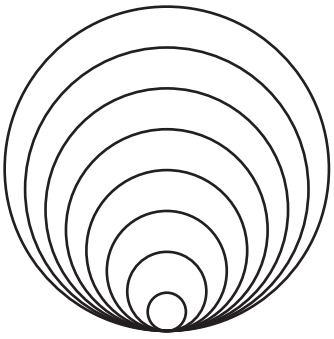
Trouble	Probable Cause	Remedy
Air volume (suction) at hose pickup point drops.	Plugged hose, elbow, horizontal connection hose.	Material has plugged tubing at some point. Most likely blockage is at the truck elbow or the horizontal hose connection location. Remove hose and inspect for blockage. Use the vacuum enhancer if equipped.
	Hose has flattened or collapsed.	Check hose for flattening or collapse. Blockage will be immediately ahead of such an area.
	Filter bags are caked with dust and are restricting the air flow.	Check the air pressure levels and the air purge system for proper operation. Adjust and/or repair, as required.
	Leaking seals.	Check rear door, baghouse, cyclone, microstrainer, and filter enclosures for proper sealing. Clean and/or repair, as required.
	Blower is faulty (blower lobe wear or timing problems).	Normal vacuum is inadequate; the blower is not functioning properly. Refer to the Blower manual for repair information or contact factor service for repair assistance.
	Debris body is full.	Empty debris body and baghouse at the dump site.
	Air filter is plugged.	Remove and clean air filter.
	Microstrainer is plugged.	Remove and clean microstrainer.
	Inner liner of hose has collapsed.	Remove and discard hose. Replace with a new hose section.
	Inlet seal is damaged or missing.	Repair or replace the faulty inlet seal.
	Plugged hose from heavy material being vacuumed.	Mix air and heavy material evenly to avoid sluggish in-hose transport.
	Frozen water and debris in hose	Spray warm water into boom or bring unit inside to warm up.
Hoses soften or melt.	Material is too hot for plastic hoses.	Switch to rubber hose or steel pipe.
		Reduce feed rate so that material is cooled as it flows through the hose.
Excessive blower (vacuum system) discharge	Hole(s) in filter bag(s)	Check filter bags: replace faulty bags.
	Filter bags are loose in the tubesheet.	Check filter bags: replace faulty bags.
Dust plume appears when handling hot material.	Filter bags are burned by excessive heat. Blower will feel hot to the touch.	Replace damaged filter bags. Allow material to cool. Reduce feed rate at the hose to provide for additional air dilution. Install high temperature, Nomex™ filter bags (available from Vactor Manufacturing Company) if continued high temperature operation is anticipated.

Trouble	Probable Cause	Remedy
Air volume (suction) at hose pickup point drops.	Worn hose or pipe.	Repair or replace. Keep bends and turns to a minimum.
	Damp material clogging hose or pipe.	Material must be very wet to be effectively vacuumed.
	Hose has split or come apart at a joint.	Replace damaged hose section.
Air volume (suction) at hose pickup point drops and/or hose shortens suddenly (the anaconda effect).	Hose blockage.	Examine hose for blockage; clear blockage, repair, or replace hose.
Lump material enters hose but does not flow to debris tank	Material too heavy or lumpy.	Material too heavy to be conveyed on existing air volume or the lumps are too large for hose diameter in use. Use larger hose if possible.
Low air volume (suction) in multiple hose hookups.	Blockage at porthole connection or ”Y” adapters.	Generally, the hose diameter should be larger than the maximum lump size handled. For heavy materials, the larger hose diameters provide more efficient pneumatic conveying and also can handle higher blower speeds for additional carrier air volume.
		Find and remove blockage.

Multiple Hose Runs
Multiple lines should all be the same length.
Three 2” hoses = 4” hose run
Nine 2” hoses = 6” hose run
Four 3” hoses equals 6” hose run
Two 4” hoses equals 6” hose run
Sixteen 2” hoses = 8” hose run
Seven 3” hoses = 8” hose run
Four 4” hoses equals 8” hose run



Hose Restriction				
Hose Dia. Inches	Hose Area square/inches	Orifice Area	Orifice Area	Orifice Area
8	50.3	100.0%		
7	38.5	76.6%		
6	28.3	56.3%	100.0%	
5	19.6	39.1%	69.4%	
4	12.6	25.0%	44.4%	100.0%
3	7.1	14.1%	25.0%	56.3%
2	3.1	6.3%	11.1%	25.0%
1	0.8	1.6%	2.8%	6.3%



What should i look for when my vacuum loader has little or no suction at the end of the vacuum hose?

There are several reasons that could singly or in combination cause loss of suction at the end of a vacuum hose. By following these logical steps you can identify and easily rectify the problem by the process of elimination.

Are all vacuum relief valves (including the automatic vacuum relief valves, if equipped), closed?

If not, close them, do not tape any relief, pressure or safety valves shut. To do so will jeopardize safety and serious bodily harm or even death might occur. Faulty valves need to be repaired, not bypassed or forcibly shut.

Did you reduce the size of the hose somewhere down the run?

Reduction of the hose size midway down the run can cause material to build up in the hose around the area where the hose size changes. As the hose size changes, the speed of air flowing through the hose drops and some material falls off the airstream and begins to collect in that area. Over a short period, the accumulation grows into an obstruction which clogs the hose, resulting in loss of suction at the hose inlet. The idea is to keep a constant air velocity from the point of material pick up to the entrance to the debris body. A velocity just high enough to transport the material to the tank.

What Do I do to remedy the situation?

Uncouple the hoses at the point of the size change and operate the blower. If the clog is not very bad, it will clear itself otherwise manual cleaning of the hose or removal of the clogged section of the hose may be required. To avoid the situation, if a smaller hose is all that will work, run that size hose right from the truck but remember a 50% diameter reduction reduces the effective area to 1/4th the original size. Therefore the job will take much longer and also blower cooling will be reduced. To get the job done faster and better blower and equipment health, use the recommended hose size.

Is the debris body full?

In a liquid filled debris body, the float ball will get sucked to the passageway to the cyclone and block the opening, resulting in a drop of suction at the hose inlet.

In case of solids, an over full tank, debris might partially block the passageway, translating to a loss of suction at the hose end. If continued, debris will get carried over to the cyclone chamber and the baghouse, choking the bags. Any blockage of the air path or a considerable reduction of airflow will not supply enough cooling to the blower and it will over heat. The blower is a positive displacement pump and has to have a certain amount of air flowing through it to work efficiently. It is similar to failure of the water pump in an engine cooling system, if cooler water is not allowed to flow through the engine block, it will overheat rapidly and damage.

The Remedy?

Stop vacuuming and empty the debris body and clean it thoroughly.

Leaky gaskets, damaged or blocked hoses, damaged debris body.

Leaky or damaged gaskets will cause air to be sucked in through the leaky area which will translate into loss of suction at the hose inlet. Same will be the result of a leaky hose or connection.

Repair or replace the damaged hose. Replace a leaky gasket as soon as possible and repair any other sources of leaks.

Do you have clogged filter bags or cartridges?

If the filter media is dirty to the point of choking, it will cause a restriction of airflow and a loss of suction at the hose end.

How do I prevent this from happening?

Blinding of the filter bags can not be prevented. It can however, be delayed an the time between filter bag changing can be increased by:

A. Regulating the vacuuming speed. It is a misconception that higher the blower RPM the faster the job will be completed, especially where dusty light weight material is vacuumed. A faster blower speed generates a high velocity airflow and increases the production of flying dust. As it is, light weight dust is difficult to separate from the airstream and a high velocity airstream makes it even harder. As a result, with higher RPM than required, more dust carries over into the cyclone chamber and the baghouse. All the dust that enters the baghouse tries to pass through the filters, exposing them to faster choking. This ingress can be reduced by reducing the operating blower speed. As a rule of thumb, keep the blower speed just high enough to easily convey the debris to the debris body and no faster. This will depend on the type of material handled and the distance through which it has to travel to the tank. Start

with a low RPM and if it does nor do the job, increase it gradually till material starts flowing easily into the suction hose. A lower RPM will reduce the carryover into the cyclone and baghouse.

B. Making sure the air cannon/pulsation system is in good working order and is used every time dry, dusty material is vacuumed. A blast of the air cannon or a puff of the pulsation system air dislodges some dust clinging to the outside of the bags but not all of it is removed. Over a period of time the bags will need to be replaced and cleaned by other means than the air cannon.

Is the silencer blocked?

Any dust that is small enough to pass through the bags, also passes through the blower and through the silencer. Although most of this is emitted in the atmosphere, some of the minute particles cling to the insides of the silencer. Over a period of time (depending on how well or how poorly the filter bags were maintained), the silencer will get choked. This will not allow all the air from the blower to readily exhaust out of the blower, effectively creating a back pressure in the blower. This reduces its efficiency as it has to use some of its power to overcome this back-pressure, resulting in loss of airflow through it.

The remedy is to clean or replace the silencer.

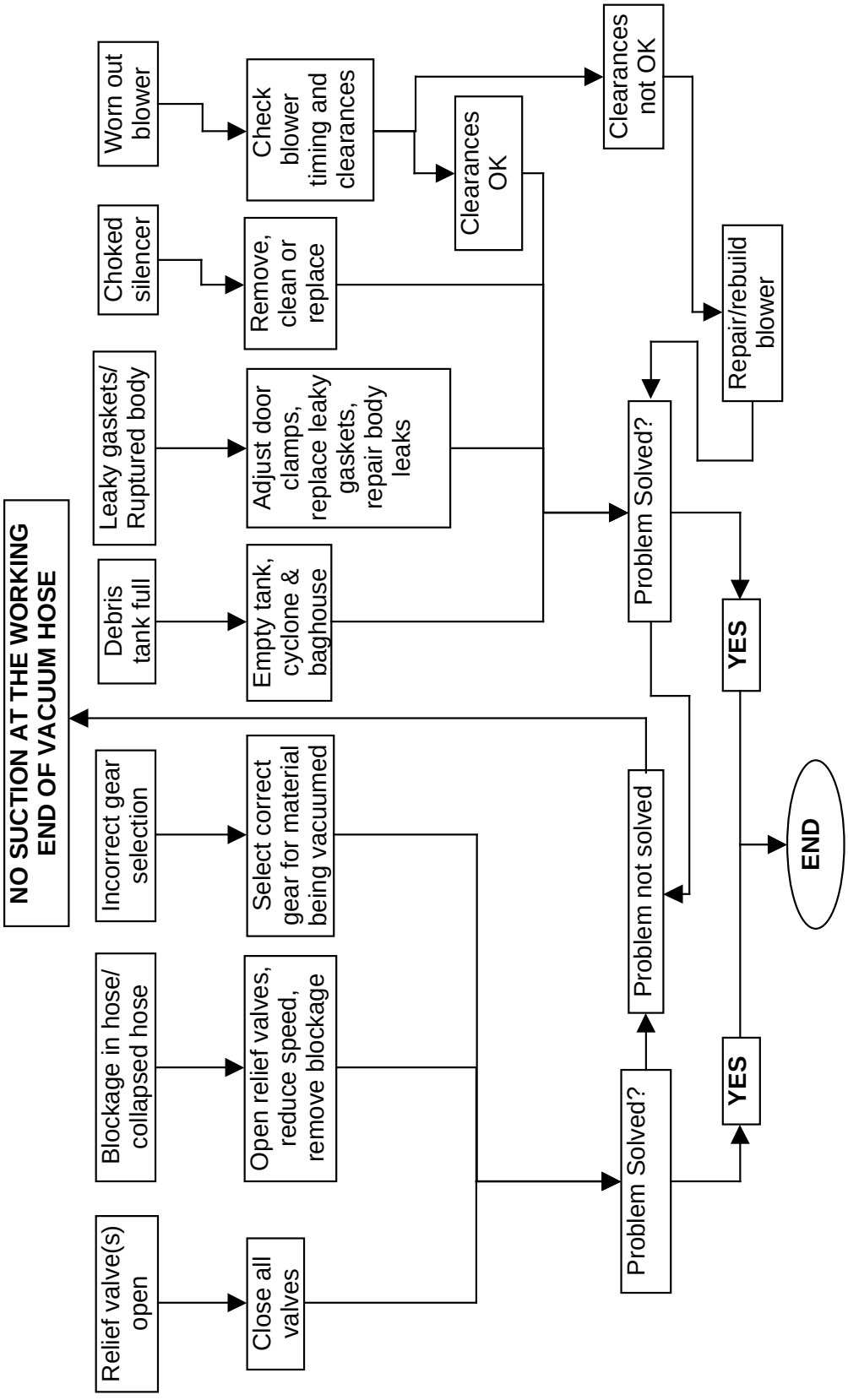
Is the blower worn out?

Any dust particle that passes through the filter bags, however small it may be, at the high speed it is traveling sand blasts the internals of the blower and eventually wear it out. The tolerances between the moving and stationary parts in a blower are very minute and they get even smaller as the metals expand when the blower achieves its working temperature. This helps in creating a seal to trap air and pump it out. As the blower wears, the clearances get larger and the sealing gets weaker, the pumping performance reduces, creating less and less airflow. Eventually it needs to be taken out of service rebuilt.

On a unit the blower's condition can be checked by the following method:

- Start the engine, engage the blower and hydraulic pump.
- Raise the debris body and install the safety stand.
- Ensure that the micro-strainer basket is in place.
- Increase the blower RPM to about 1500.
- Open the 4" manual relief valve at the micro-strainer.
- Carefully cover the micro-strainer opening with a sturdy board.
- Slowly close the manual relief valve, noting the rise in the vacuum gauge reading.
- Observe the blower as vacuum builds and the automatic vacuum relief valves (Kunkle valves) open up at the specified vacuum for the blower, or in case of a high vacuum blower, the gauge climbs up without an appreciable loss in blower speed.

If the blower achieves the required vacuum, the blower is in good shape. If, in spite of fully closing the 4" valve it fails to achieve the rated vacuum, the blower needs attention. If the engine bogs down and begins to stall, the engine is not building enough power to run the blower to full load. It could also translate to a choked silencer and excessive back pressure.


NO SUCTION AT THE WORKING END OF VACUUM HOSE
Relief valve(s) open
Close all valves
Blockage in hose/ collapsed hose
Open relief valves, reduce speed, remove blockage
Incorrect gear selection
Select correct gear for material being vacuumed
Debris tank full
Empty tank, cyclone & baghouse
Leaky gaskets/ Ruptured body
Adjust door clamps, replace leaky gaskets, repair body leaks
Choked silencer
Remove, clean or replace
Worn out blower
Check blower timing and clearances
Clearances OK
Clearances not OK
Repair/rebuild blower
Problem Solved?
YES
Problem not solved
Problem Solved?
YES
END

Trouble	Probable Cause	Remedy
Noisy.	Low oil.	Check sight gauge and add oil.
	Bearings bad.	Disassemble and replace.
	Timing out	Place transfer case in neutral and with engine OFF manually rotate the blower. If interference is felt call service.
Runs hot.	Too much or too little oil.	Check sight gauge and service as needed.
	Operating at too low RPM or too high vacuum.	Do not operate below 1,200 RPM or above the blowers rated vacuum level.
	Submerged or blocked vacuum hose limiting air flow	Clear hose and verify air flow
Locked up.	Material in blower.	Disassemble and clean. Inspect filtration system
	Ice in blower **(Do not operate)**	Bring inside and warm up.
Bearing cover paint discolored.	Too much or too little oil.	Check sight gauge and service as needed.
	Bearings bad.	Disassemble and replace.
	Submerged or blocked vacuum hose limiting air flow	Clear hose and verify air flow
Low vacuum at pick up nozzle.	Hose plugged.	Disengage and clean or replace.
	Hose damaged.	Repair or replace.
	Tube/hose leaks (can be heard).	Replace.
	Final filter screen plugged.	Disassemble and clean or replace.
	Relief valve plugged or stuck open.	Clean or replace.
	Blower worn.	Repair or replace.
	Microstrainer plugged	Remove and clean
No vacuum	Doors not sealed.	Secure locks, check for debris; replace seals if worn.
	Clamps on joints not sealed	Check for proper attachment.
	Blockage in pipe / tube.	Clean or check to see if inner liner has collapsed and replace.
	Debris box full.	Dump.
	Suction nozzle immersed	Operate properly by raising and lowering nozzle in material.
	Air filter plugged	Clean air filter
Protective strainer plugged (float ball cages)	Screen assemblies plugged	Dump debris, open body, install safety prop, clean screens.
	Float balls stuck.	Remove and flush with water or air.

Trouble	Probable Cause	Remedy
No air flow.	Engine speed too low.	Verify engine operation
	Wrong direction of rotation.	Compare actual rotation with vacuum pump illustration and arrow on blower. Compare driver if wrong.
	Obstruction in piping.	Check piping, screen, valves, silencer, to assure an open flow path.
Low capacity.	Engine speed too low.	See item in “No air flow”.
	Excessive discharge pressure.	Check inlet vacuum and discharge pressure, and compare these figures with specified operating conditions on order.
	Obstruction in piping.	See item “No air flow.”
	Excessive slip.	Check inside of casing for worn or eroded surfaces causing excessive clearances.
	Hose leaks.	Check hose for tears or splits.
	Connection leaks.	Check connections for air leaks.
	Rear door leak.	Check for leaking seal at rear door.
	Expansion joint leak.	Check for air leaks at rubber seal connection at the make/break.
	Blower lobe wear or timing problem.	Disengage the blower and raise body high enough to clear the make/break. Check seal on the make/break. Engage the blower, using a 14" x 14" square of light sheet metal or wood, close the inlet slowly by sliding the square across the opening. The relief valve should open. Do not allow the inlet to be completely closed more than momentarily. At this point, if developed vacuum is inadequate, the blower is not functioning properly. Refer to competent repair facilities (factory service can assist), or refer to blower manufacturer’s maintenance manual.
	Vacuum relief valves	Check for leaks and proper operation.

NOTICE

Machine Can Be Damaged

To avoid damage to the blower/fan and drive train immediately shut down the unit when any vibrations or material discharge at the exhaust is noticed. Immediately stop operations and correct problem.

Trouble	Probable Cause	Remedy
Dust plume through blower (silencer) exhaust.	Excessive blower speed for job requirement creates dust carry-over through the filter bags.	Reduce engine speed to optimize vacuum operations.
	Over loaded cyclone section resulting in excessive carry over. Filter bags overloaded.	Dump the vacuum system and thoroughly inspect for material buildup. Clean vacuum system, as required.
	Overloaded baghouse hoppers.	Open the filter door and clean out the housing area. **NOTE:** This section should be cleaned every time that the vacuum system is dumped.
	Faulty or improperly installed filter bags.	Open the filter access door, remove the filter bags and inspect for dust buildup. If a general buildup or leak is evident, replace the filter bags. Material behind the filter bags is an indication of a leaking or damaged filter bags.
A plume appears for several minutes after filter change over.	Dust from previous vacuuming activities is being blown into the atmosphere.	Clean equipment between filters service intervals.
Residual dust blows through the vacuum system during initial operation with new filter bags.	This blow by is normal for newly installed filter bags.	Allow vacuum system to run freely for 15 to 30 minutes; the blow by problem will clear by itself.
Excessive power (chassis)	Speed too high.	Do not operate above rated RPM of blower.
	Pressure too high.	See item “Low capacity.”
	Impellers rubbing.	Inspect outside of cylinder and head plates for high temperature areas, then check for impeller contacts at these points. Correct blower mounting, drive alignment.
	Vacuum too high	Do not exceed blower system rating. Repair or replace the vacuum relief (Kunkle) valve.
Overheating of bearings or gears.	Inadequate lubrication	Restore correct oil levels in main oil sumps.
	Excessive lubrication	Check oil level. If incorrect, drain and refill with clean oil of recommended grade.
	Excessive pressure	See item “Low capacity.”

NOTICE

Machine Can Be Damaged

- **Beware of carry over material from debris body through the blower.**
- **Running the blower too fast with light material can carry the material over into the blower. This can cause premature wear.**
- **Over filling the debris body can cause carry over and damage to the blower.**

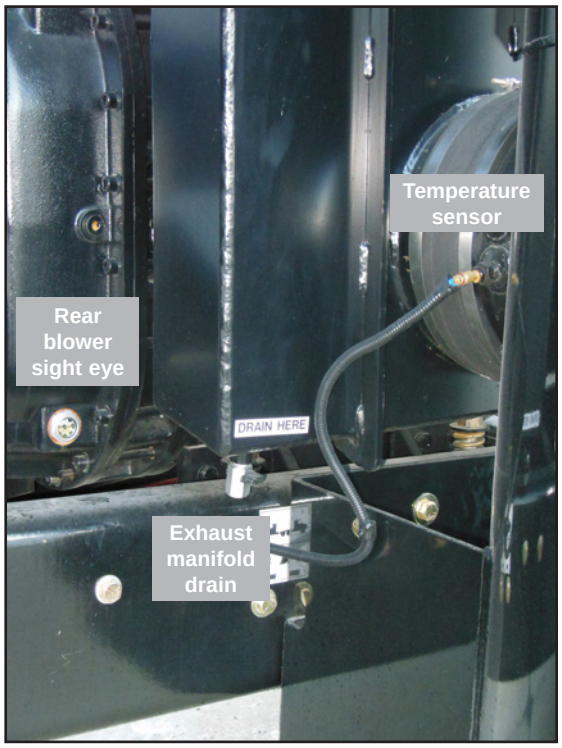
Trouble	Probable Cause	Remedy
Vibration	Driver of blower loose.	Tighten mounting bolts securely.
	Driveline bearings	Check and replace as needed both UPPER and LOWER driveline bearings.
	Misalignment.	See item “Overheating of bearings or gears.”
	Impellers rubbing.	See item “Excessive power.”
	Worn bearings/gears.	Check gear backlash and condition of bearings. Refer to blower manual for specifications. Replace gears and bearings.
	Unbalanced or rubbing.	Scale or process material may build up on casing and impellers, or inside impellers. Remove buildup to restore original clearances and impeller balance.
	Piping resonance's.	Determine whether standing wave pressure pulsations are present in the piping. Refer to Sales Office.
Engine overheats and blower gets hot to the touch.	Hose sized incorrectly.	Allow more air to flow into vacuum hoses.
	Filter bags are plugged	Clean filter bags
High blower temperatures, high vacuum, low air flow.	Hoses are plugged.	Allow more air to flow into vacuum hoses.
High blower temperatures, high material temperatures.	Insufficient air flow in vacuum hose.	Allow more air to enter the vacuum hose. If possible, cool the hot material with water.
High blower temperature with normal air flow.	Improper amount, type, or weight of oil in blower.	Drain blower lubricant and refill with proper type and weight of oil. Refer to the OEM manual for further information.
Noisy blower.	Silencer or muffler defects.	Check for holes and/or leaks.
		Replace silencer if sound deadening material has hardened or has disintegrated.
Engine loads up and relief valve pops open.	Debris tank is full.	System is overloaded. Shutdown and dump. Debris body is full and float has closed off air passage. **NOTE**: After dumping, clean rear door seal and inspect gasket for cuts. Check and clean float balls.

NOTICE

Machine Can Be Damaged

To avoid damage to the blower/fan and drive train immediately shut down the unit when any vibrations or material discharge at the exhaust is noticed. Immediately stop operations and correct problem.

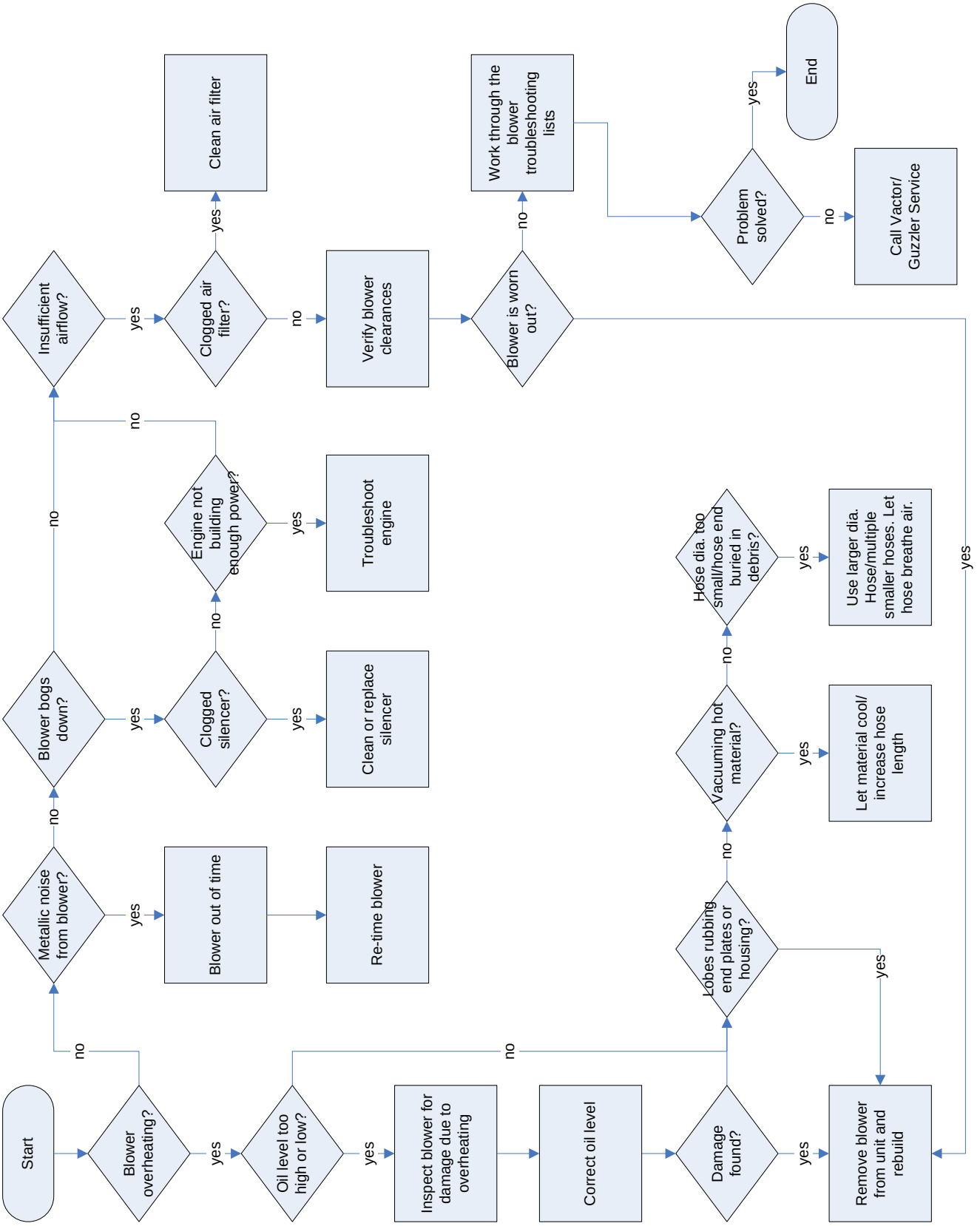
Trouble	Probable Cause	Remedy
Blower returns to idle or will not speed up past idle.	Discharge temperature above 275° (F)	Lower feed rate of hot material.
		Lower vacuum level.
		Add additional vacuum line to provide more cooling.
		Check chassis



NOTICE

Machine Can Be Damaged

To avoid damage to the blower/fan and drive train immediately shut down the unit when any vibrations or material discharge at the exhaust is noticed. Immediately stop operations and correct problem.


Start
Blower overheating?
yes
Oil level too high or low?
yes
Inspect blower for damage due to overheating
Correct oil level
Damage found?
yes
Remove blower from unit and rebuild
no
Lobes rubbing end plates or housing?
yes
no
Vacuuming hot material?
yes
Let material cool/ increase hose length
no
Hose dia. too small/hose end buried in debris?
yes
Use larger dia. Hose/multiple smaller hoses. Let hose breathe air.
no
Metallic noise from blower?
yes
Blower out of time
Re-time blower
no
Blower bogs down?
yes
Clogged silencer?
yes
Clean or replace silencer
no
Engine not building enough power?
yes
Troubleshoot engine
no
Insufficient airflow?
yes
Clogged air filter?
yes
Clean air filter
no
Verify blower clearances
Blower is worn out?
yes
no
Work through the blower troubleshooting lists
Problem solved?
yes
End
no
Call Vactor/ Guzzler Service

Trouble	Probable Cause	Remedy
Excessive carry-over into cyclonic chamber.	Debris	Overfilled debris body.
	Float ball problem	Float ball not sealing in debris tank. Clean float ball and seal.
	Excessive blower RPM	Lower blower RPM or dry and/or lighter materials.

NOTICE

Machine Can Be Damaged

- **Beware of carry over material from debris body through the blower.**
- **Running the blower too fast with light material can carry the material over into the blower. This can cause premature wear.**
- **Over filling the debris body can cause carry over and damage to the blower.**

Trouble	Probable Cause	Remedy
Rear door will not operate.	Hydraulic pump is not engaged.	Engage hydraulic pump.
	Leaks and blockages.	Check hydraulic oil level in sight gauge. Ensure main supply valve is open. Hydraulic pressure gauge should indicate pressure at 2,000 PSI.
		Check hydraulic pump and hoses for leaks.
		Check hydraulic system for dirt or blockage.
		Check hydraulic return oil spin-on filter.
		Check suction line strainer.
	Electrical	Check for power at fuse.
		Check dump function solenoid coil.
		Verify switches and relays
Rear door leaks on way to dump site.	Leaking rear door seals.	Seal is not holding. After dumping, clean off seal and inspect gasket for cuts.
		Replace door seal.
		Adjust door locks

Emergency Vacuum Relief Valve

The optional, air operated emergency vacuum relief valve is mounted either at the underside of the dry duct or on the stand pipe on the inlet side of the blower. This valve may be configured to operate by manually operated wired remote pendant switch and or it may be tied up to high temperature at the blower outlet. In this case it opens automatically when the blower outlet temperature exceeds the preset limit. The temperature limit at which the switch is set depends on the type of blower in use. This limit is indicated near the blower temperature gauge in the main control panel.

Whether it is manually or automatically operated, a switch energizes an electric over air solenoid valve. This allows pressurized air to fill a chamber on the actuator for the butterfly valve which opens or closes depending on whether the ‘on’ or the ‘off’ solenoid is actuated.

As with any other electrical system in Guzzler products, the master switch in the main control panel has to be in the ‘on’ position. If the valve fails to function, the problem could lie in the electrical or the pneumatic system. It is in very rare cases that there is a mechanical reason for the failure of the valve. To trouble-shoot the EVR, first ascertain whether the problem is mechanical, electrical or pneumatic. To do this, start the engine, build up air pressure to the maximum and follow the procedure to obtain power to the control panel and turn on the master switch. Trace back the two air lines at the EVR actuator to the double air solenoid. This may be located very close to the EVR itself or may be somewhere at the underbelly of the debris tank. Remove one air line at a time on the “out” side of the solenoid. If there is pressure at one of the ports, the problem is not pneumatic.

Now, operate the switch. If the air pressure switches to the other port, there is no electrical malfunction either. Now that the problem has been categorized, we can proceed to rectify the defect.

Pneumatic

If there is no air pressure at the “out” side of the air solenoid, remove the incoming air line to the solenoid. Does that have air pressure? If yes, you have a faulty solenoid. Open, clean and reassemble or replace the solenoid assembly. If there is no pressure in the incoming line, trace the incoming line to its origin, checking for kinks or blockages. Pull out the air line coming out of the air dryer/ tank at the air protection valve. Check for air in the reservoir. Check if air protection valve functions properly, if not, replace.

Electrical

Is the master switch in the control panel turned on? Check for loose connections at the mating plugs. Open the control panel door and check for blown fuses, loose connections or damaged wiring. Repair as required. Unplug the wiring harness at the solenoid and check for voltage at the harness connectors with the switches in both, the open and closed positions. If no power, go back to the pendant switch and open it. Check incoming voltage to the switch, corroded, worn or otherwise damaged contacts or loose or damaged wiring. Repair as required.

If there is voltage at the wiring harness connectors at the solenoid valve, press the solenoid over ride rubber buttons, one on each of the solenoid assembly. If that operates the valve, the solenoids are faulty. Replace the faulty solenoids).

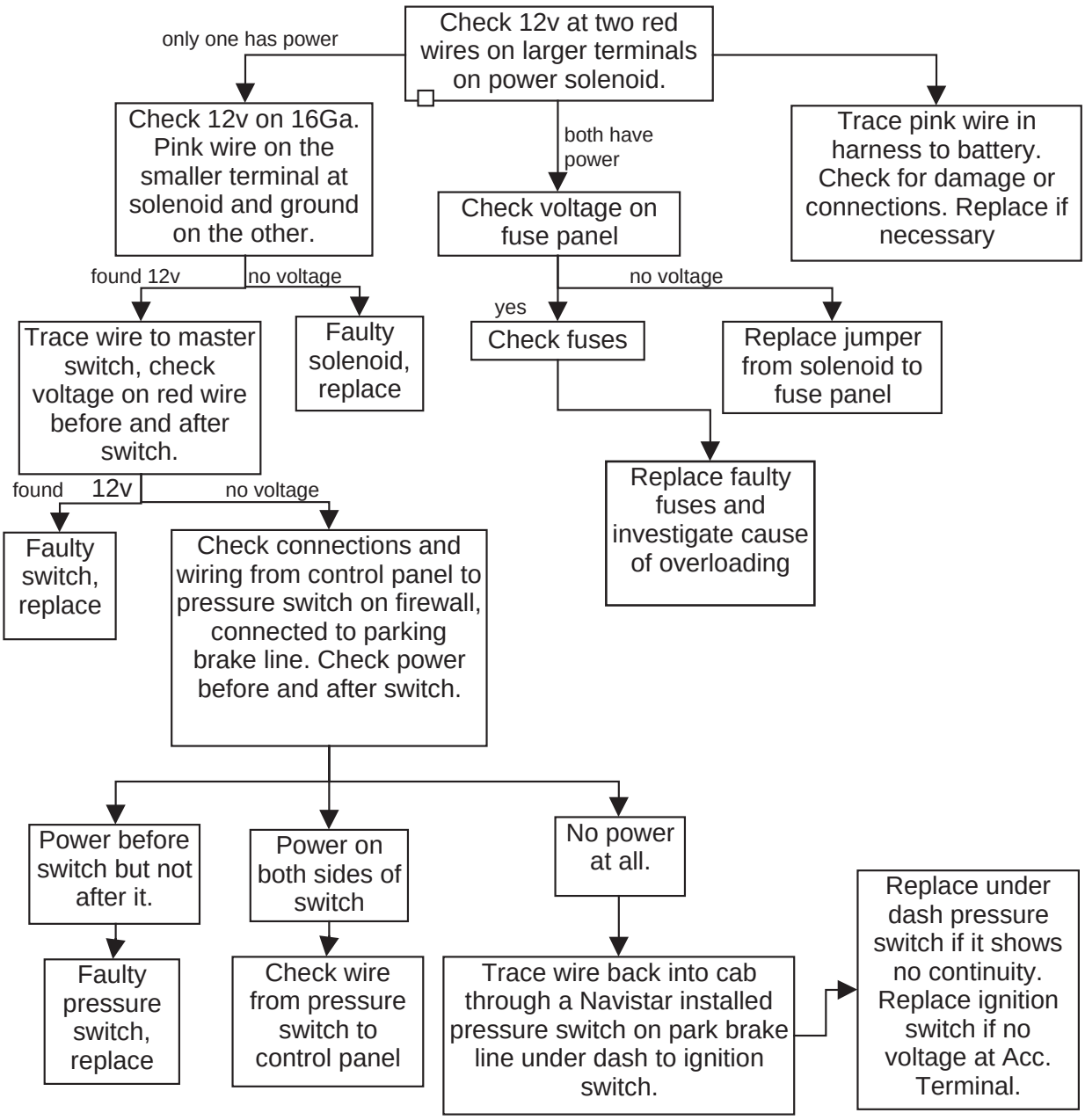
Mechanical

If air is being supplied to the valve actuators and the valve still does not work, The valve could be in a bind. Remove the strainer basket and try to free the valve by squirting some penetrating oil at the shaft bushings. Remove the air lines going to the actuators and lubricate the ports with air tool oil or penetrating oil. May be that the screws of the valve to shaft or the actuator coupling have come loose or the shaft is broken. Rectify as necessary.

Trouble	Probable Cause	Remedy
Transfer case runs hot.	Too much or too little oil in the transfer case.	Drain and refill the transfer case with the proper type and amount of oil.
Transfer case is noisy.	Vehicle has been idling with blower engaged.	Do not allow vehicle to idle with blower engaged. **Note:** The blower should not be operated at idle rpm's. Maintain at least 1200rpm's to reduce wear on the transfer case.
Transfer case is hard to engage. (MANUAL transmission)	Transfer case gears are not meshing properly.	Feather the clutch pedal to allow the transmission to roll. This will allow the transfer case gears to mesh.
Transfer case does not operate blower when engaged. No power is available at the remote control panel. (MANUAL transmission)	Faulty transmission shift prior to engaging the transfer case.	Set switch to ROAD MODE, listen for transfer case to shift, and restart the gear shifting process until road mode is engaged. Then set the switch to BLOWER MODE.
Transfer case does not engage.	Proper transfer case engagement procedure not followed.	Procedures are normally decaled on the driver side visor.
Blower does not engage.	Low air pressure.	Check compressor air pressure gauge. There must be a minimum air pressure of 80 PSI for the air shifter to operate.
	Air leak at air shifter.	Tighten or replace leaking air shifter components.
	Transfer case nose cone not shifting.	Refer to the transfer case manual for repair instructions.
	Proper engagement procedure not followed.	Attempt engagement procedure.
Blower mode indicator light in cab stays on continuously	Transfer case shift switch is failing	Replace switch. Note that water damage is common failure mode over time.

NO POWER AVAILABLE AT THE CONTROL PANEL

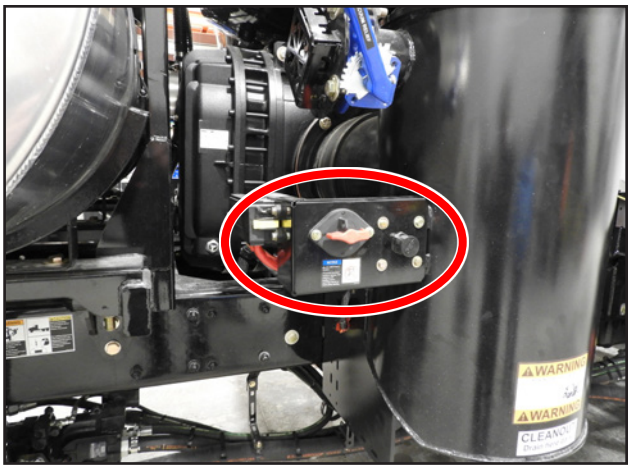
Before attempting to check for power failure at the control panel, check all connections for tightness at the battery. This includes all auxiliary wires connected to the battery terminals. The power supply for the control panel is tapped from the battery using function coded **pink wire (+)** and **black wire as (-)**. **Check fuse # F 14** in the Navistar cab fuse panel. This is the trigger wire for the solenoid in the control panel. In the cab turn ON the ignition, engage parking brake and on the control panel, **turn ON the master switch**. Open control panel to access the fuse panel and buss bar.

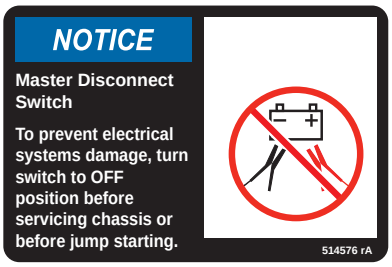


Units built from late 2022 are equipped with a master disconnect switch normally located on the driver side behind the cab. Switching to off separates the chassis electrical systems from the Vactor systems for service.

Below the switch is the main power fuse box. Circuits are normally labeled under the cover. Refer to the unit specific schematics for details.

Wait at least 2 minutes after shutting the truck down before turning off the chassis batteries.



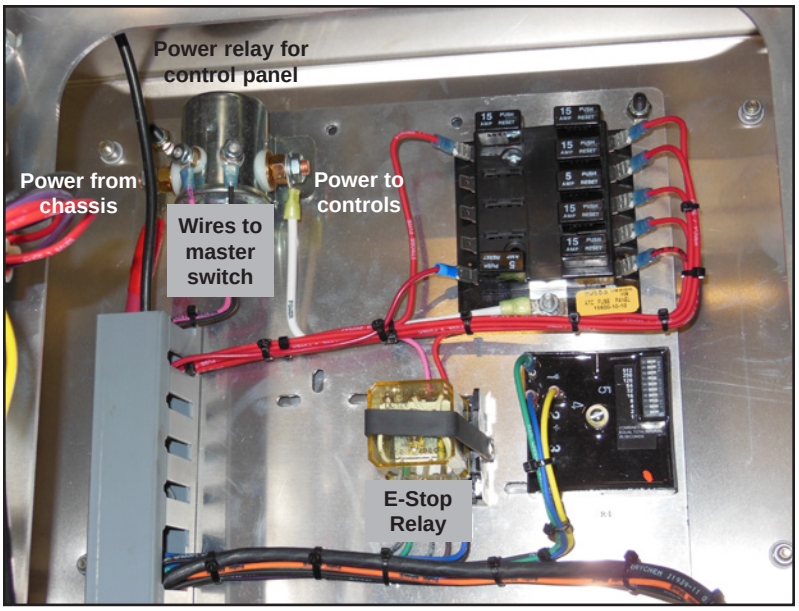


No power to Master Control Panel

All power for the master control panel is controlled by the larger relay in the master control panel.

Before attempting to check for power failure at the control panel, check all connections for tightness at the battery. This includes all auxiliary wires connected to the battery terminals.

Verify that there is power to the relay and that the master switch is functioning. Replace relay or master switch as required.



NOTICE

Jump Starting Or Welding Can Damage Electrical System

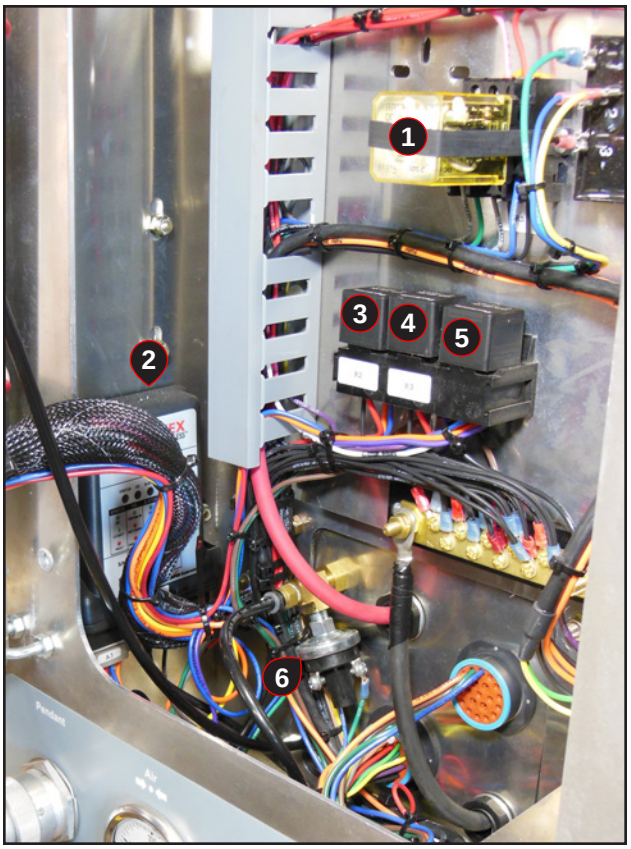
To avoid damage:

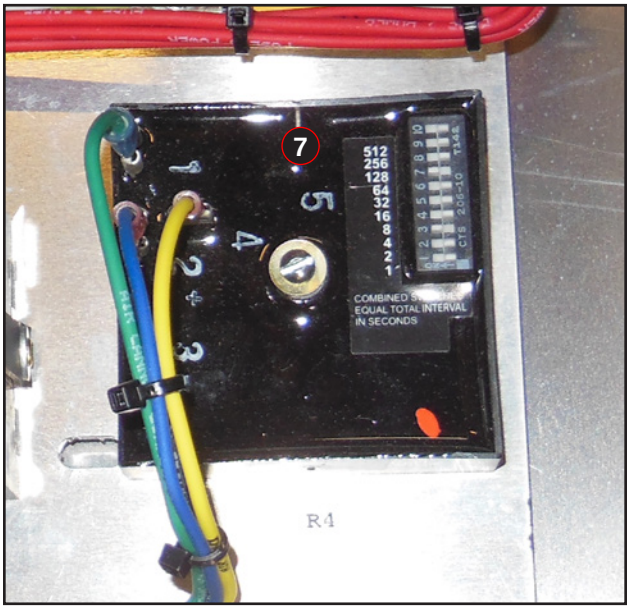
- **Disconnect ECU, control modules and batteries before welding on unit.**
- **Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.**
- **Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.**
- **Set all ignition switches to OFF before testing CANbus system.**

Control panel lights are automatically illuminated when the key switch is turned on. (Panel light is optional equipment and is not on all panels.)

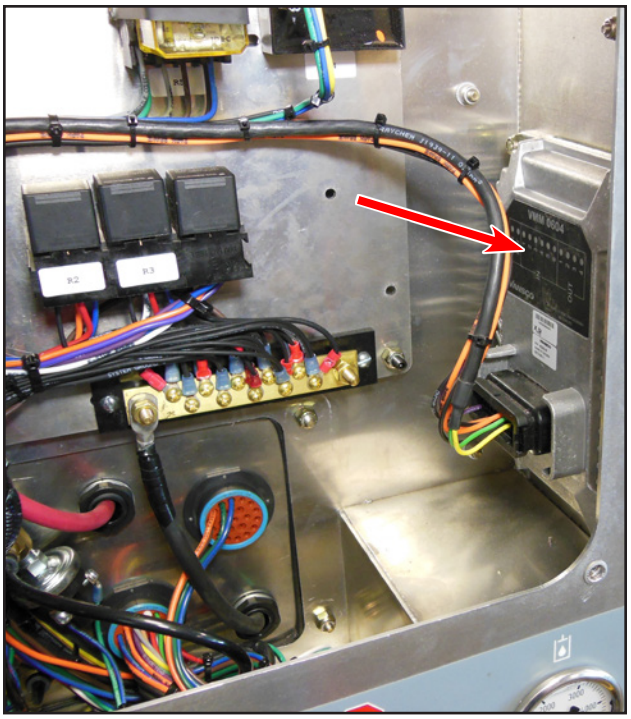
1	**Relay -** E Stop
2	**Omnex wireless receiver -** Optional -
3	**Relay -** Work lights
4	**Relay -**
5	**Relay -** Wireless option
6	**Air switch -** Air cannon
7	**Air cannon timer module -** Default timer setting is 64 seconds.

Note: Standard configuration shown. Relay configuration changes with options. Consult the unit schematics for details.





The Vansco CANbus control module is used for shift protection and may be used for throttle control depending on the engine. The module monitors the vehicle speed (auto transmissions - output shaft of transmission) and clutch switch position (depressed). Output 1 provides power to work mode switch to allow the transfer case to shift when all conditions are met.



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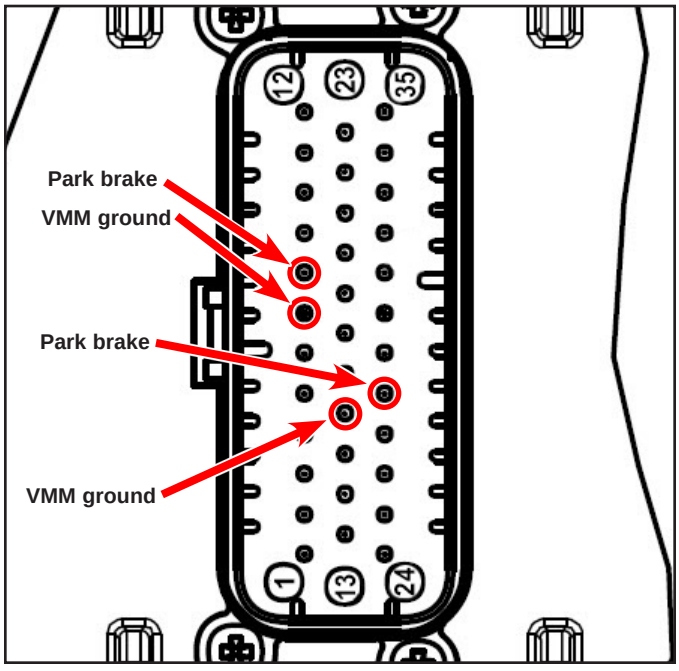
- **Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.**
- **Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.**
- **Set all ignition switches to OFF before testing CANbus system.**

VMM	LABEL	MODEL	TELLTALES	MASTER POWER	
V2	VMM2	VMM0604	No	Enabled	
INPUT	LABEL	PIN	ACTIVE HIGH	POWER CTRL	PROG TYPE
I2-1	Throttle Up	INPUT 1 (J1-33)	N		DIGITAL_INPUT
I2-2	Throttle Down	INPUT 2 (J1-32)	N		DIGITAL_INPUT
I2-3	Throttle On	INPUT 3 (J1-31)	N		DIGITAL_INPUT
I2-4	Range ID	INPUT 4 (J1-30)	N		DIGITAL_INPUT
I2-5	T/C Ball Sw	INPUT 5 (J1-29)	N		DIGITAL_INPUT
I2-6	Park Brake	INPUT 6 (J1-17)	Y		DIGITAL_INPUT
I2-7	IGNITION	POWER CONTROL INPU...	N	Y	
ANALOG	LABEL	PIN	MAX VALUE	PULL UP OR DOWN	
A2-1		INPUT 1 (J1-33)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
A2-2		INPUT 2 (J1-32)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
A2-3		INPUT 3 (J1-31)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
A2-4		INPUT 4 (J1-30)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
A2-5		INPUT 5 (J1-29)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
A2-6		INPUT 6 (J1-17)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	
FREQ	LABEL	PIN	MAX VOLTAGE	PULL UP OR DOWN	TYPE
X2-1		INPUT 1 (J1-33)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
X2-2		INPUT 2 (J1-32)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
X2-3		INPUT 3 (J1-31)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
X2-4		INPUT 4 (J1-30)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
X2-5		INPUT 5 (J1-29)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
X2-6		INPUT 6 (J1-17)	(DIGITAL_INPUT)	(DIGITAL_INPUT)	Frequency
OUTPUT	LABEL	PIN	LOAD TYPE		
O2-1	SHIFT PROTECTION OUT	OUTPUT 1 HS (J1-12)			
O2-2		OUTPUT 2 HS (J1-34)			
O2-3		OUTPUT 3 HS (J1-1)			
O2-4		OUTPUT 4 HS (J1-25)			
O2-5		OUTPUT 1 LS (J1-11)			
O2-6		OUTPUT 2 LS (J1-35)			
O2-7		OUTPUT 3 LS (J1-2)			
O2-8		OUTPUT 4 LS (J1-24)			



Ground Addressing Pin Locations.

To understand how the module receives it's address, the technician will have to look at specific grounding pins on the module connector A25 pins 7 and 16. A24 pin 8 and A24 pin 28 are the power inputs to the module. The two switched power inputs wake the module and provide the input voltage that turns the module ON and the POWER LED will flash.

VMM Power LED

POWER LED

Two states, OFF/FLASHING. POWER LED ON (Flashing)

Unit is powered up, internal diagnostics run and found no errors.

If the Power LED does not flash, check the Park Brake voltage inputs from the Master switch.

Note: The behavior of the indicator lights varies among the Vactor/Guzzler models.

VMM NETWORK LED

NETWORK LED flashes when there is network communication.

Two VMM modules or more connected in a network and the POWER LED is flashing on each VMM in the system and the NETWORK LED should be flashing (flickering). LED OFF indicates no communication at all, LED should always be flickering.

Inspecting and testing the CANbus will be necessary.

Because the Bosch J1939 CAN protocol is being used, as soon as the Ignition switch is turned ON the CANbus will communicate with the chassis systems.

Activating the Master switch on the control panel allows the VMM2 to receive the CAN messages from the chassis and the Guzzler systems to make the truck function as a unit.

Note: The behavior of the indicator lights varies among the Vactor/Guzzler models.

A24 pin 8 and A24 pin 28 are the power inputs to the module. The two switched power inputs wake the module and provide the input voltage that turns the module ON and provides the input that causes the POWER LED to flash.

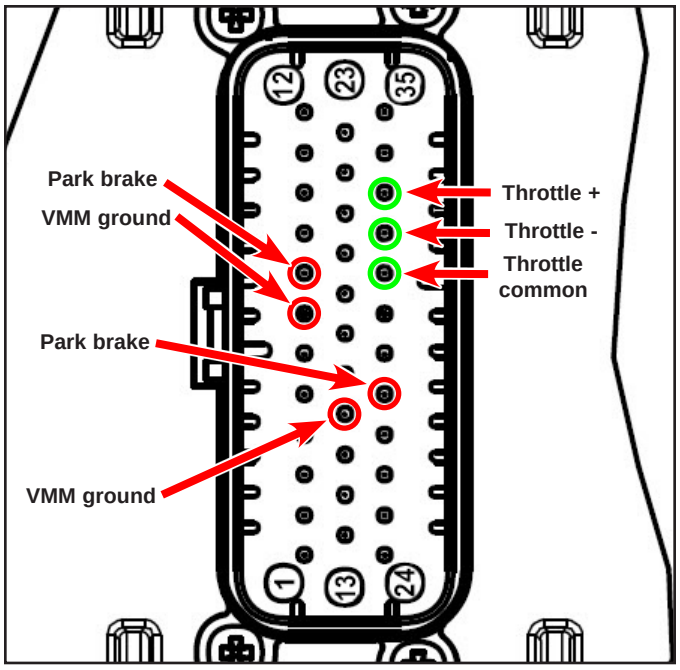
Output Types - High Side

Output circuit is sourcing current

Indicates current is flowing out of the module to the Road/Work Mode switch. Called "High Side" (HS).

On the basic standard unit with a single module, there is only one Output, Shift Protection, as a High Side Output, provides output voltage to the ROAD/WORK mode switch. Without this output the R/W switch will not have power and the transfer case cannot be shifted.

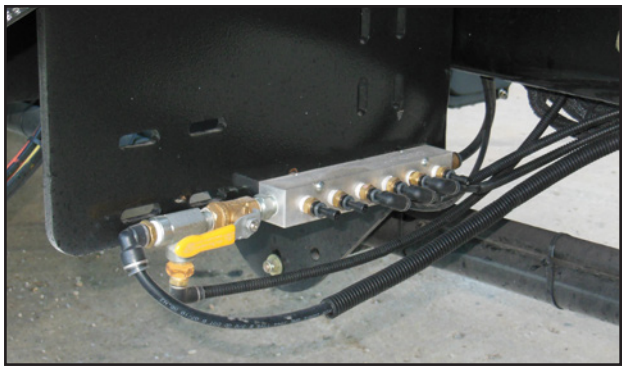
If there is a fault with the circuit the Output will flash.



An air manifold supplies air to all the Guzzler systems. The manifold is normally located under the master control panel. A valve is supplied to shut off the air cannon and control panel gauge air supply.

Refer to the unit specific schematics for all the other manifold ports.

All pneumatic controls added to the chassis are fed from the chassis air reservoir through an air pressure protection valve. This valve acts like an electrical fuse by not allowing the reservoir air pressure to drop below about 70psi. When air pressure drops to about 75psi the valve closes and shuts off the Guzzler systems. Normal chassis operating air pressure is about 120psi. By limiting the available air pressure to a minimum of 75psi the chassis will still have functional brakes and other needed systems.



Trouble	Probable Cause	Remedy
Noisy hydraulic pump.	Insufficient flow of hydraulic fluid.	An insufficient oil flow to the hydraulic pump will cause what is called “Starving the Pump”. First check the reservoir. **NOTE:** Insufficient oil supply in the reservoir with lift cylinders in extreme raised position will cause the pump to deliver charges of air instead of oil into hydraulic unit.
Slow lift (body, rear door.)	Extreme temperature.	In cold weather, oil becomes thick. This can cause hoist cylinder to be slow in raising a load. Pump efficiency is retarded by the oil being unable to flow readily enough to supply the pump in extreme hot or cold temperatures.
Insufficient lifting of debris body.	Hydraulic leakage.	Check for leaks in hydraulic lines.
	Bad check valve.	Check for leakage in hoist cylinder packing.
Hoist cylinder will not operate in up or down position.	Improperly functioning check valve.	The pilot in the check valve holds hydraulic fluid to operate cylinder. If this does not happen, replace check valve when body is in fully lowered position.
Body is up and will not come down	Center of gravity of body and debris misaligned.	Do not attempt any repair. Consult factory.
	Bad check valve.	If debris body is in the up position and will not come down, it is most important to have the debris body held securely by means of the safety stand. If it will not, place blocking between tank and chassis or other means before removing and replacing new check valve.

⚠ WARNING

Crushing hazard

NEVER go under a raised loaded debris body. To avoid injury or death:

- **Empty debris body before service work.**
- **Always use the body prop when the debris body is raised for service.**
- **NEVER disconnect check valve with the debris body in raised position. Debris body will fall.**
- **NEVER remove the bleeder screw (if equipped) from cylinder with pressure on the cylinder. Debris body will fall. Only loosen bleeder screw to bleed air from cylinder.**
- **NEVER loosen or disconnect any hydraulic components while the hydraulic pump is running.**

Noisy hydraulic pump.

Insufficient oil supply in the reservoir will “starve the pump” (cavitation) and cause it to deliver charges of air instead of oil when hoist is in the extreme raised position.

The primary causes of pump noise are a lack of hydraulic oil known as “starving the pump,” or operating in extremely cold temperatures. Check the hydraulic oil level daily before operating. In extremely cold weather, allow the unit to warm up completely and slowly operate the hydraulic controls until the hydraulic oil has warmed. See the Maintenance Section for information on hydraulic oil level and specifications.

1. Check hydraulic oil reservoir level and service as needed.
2. Keep the truck engine speed at a moderate level when using the hydraulic controls.

Lift cylinder creeping down or drifting.

The terms “creeping down” and “drifting” refer to the hydraulic cylinder dropping slowly during operation. The primary cause of this is a loss of hydraulic pressure, either internally or due to leaks in the system.

1. Visually check for oil leaks at the following points:
   - Cylinder sleeve packing
   - Hoses and connections
   - Tubing and connections
   - Pipe fittings
   - Pump mounting base

Note: A small particle of dirt between the ball and seat of check valves and control spools can result in pressure loss and damage to internal parts. See the Maintenance Section for information on hydraulic system service.

2. Examine for debris in the check valves by operating the hoist several times to dislodge and pass the debris to the filter.

Drifting can also be caused by hydraulic oil bypassing internally and causing a lack of pressure at the cylinder. Wear and damage can cause bypassing around cylinder packing, control valve seals / spools and actuating solenoid. If drifting continues after checking for leaks and debris in the system, check the system for bypassing.

⚠ WARNING

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- **NEVER disconnect check valve with the debris body in raised position. Debris body will fall.**
- **NEVER remove the bleeder screw (if equipped) from cylinder with pressure on the cylinder. Debris body will fall. Only loosen bleeder screw to bleed air from cylinder.**
- **NEVER loosen or disconnect any hydraulic components while the hydraulic pump is running.**

Extreme temperatures effects pump efficiency.

1. During hot weather, the oil may become thin and cause the hoist to be slow in raising because the pump efficiency is reduced by the thin oil.
2. During cold weather, the oil may become thick and cause the hoist to be slow in raising. Thick oil will also retard the descent. Pump efficiency is reduced because the oil is unable to flow readily enough to supply the pump. This is another case of “starving the pump.”
3. Be sure to have the right viscosity oil for your operating conditions. (See suggested oils in the Maintenance section.)

Poor hoist performance.

Air in the lift cylinder can cause many problems including:

- Failure to lift
- Jerky hoist operation
- Lift cylinder won’t raise to full extension
- Lift cylinder drops several inches when lowered

Note: If there is a bleeder screw on the upper end of the cylinder bleeding air from the lift cylinder can result in a discharge of hydraulic oil from the cylinder. Make sure the vehicle is in an appropriate area for cleanup. Make sure surrounding personnel are aware of the procedure. If there is no bleeder screw use the following procedure.

Check the hydraulic reservoir oil level daily before use. If air enters the hydraulic system, add oil to the reservoir if needed and operate the hoist several times. If necessary, cycle the lift cylinder to purge the air out of the cylinder. Check the hydraulic reservoir level.

⚠ WARNING

Crushing hazard

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- **Empty debris body before service work.**
- **Always use the body prop when the debris body is raised for service.**
- **NEVER disconnect check valve with the debris body in raised position. Debris body will fall.**
- **NEVER remove the bleeder screw (if equipped) from cylinder with pressure on the cylinder. Debris body will fall. Only loosen bleeder screw to bleed air from cylinder.**
- **NEVER loosen or disconnect any hydraulic components while the hydraulic pump is running.**

A variable displacement pressure compensated piston pump is used with a closed center valve system.

The closed center hydraulic system uses a pressure compensated piston pump. Piston pumps that are compensated will destroke and produce no flow even when they are rotating. These pumps use closed center valves. Once the valve is activated for a specific function, flow is produced. Oil flow is on demand; so there is no flow if the valve is not activated. This arrangement offers more flexibility with multiple options. The primary system control is the compensator on the pump.

The system has a secondary relief valve located on the directional valve. The compensator controls the position of the pump swashplate, which controls oil volume. If compensator is improperly adjusted, oil will flow across the relief valve. An improper setting will cause the hydraulics to overheat. The relief valve is always set higher then the compensator.

The hydraulic gauge on this system will show 2000 psi when the hydraulic system is engaged. The pressure will change when functions are activated.

There is a mechanical relief in the directional valve in the system.

There are manual controls on the debris body and the rear door. There are electric controls on the door locks and the vibrator.

NOTICE

Hydraulic System Can Overheat

Improper setting of reliefs and compensators can overheat the hydraulic system. To avoid damage:

- **Relief valves must be set higher than the compensator pressure.**
- **Whenever a PTO or a variable volume hydraulic pump is removed for repairs or replaced, the system pressure must be reset to specifications.**

Hydraulic System Pressure Adjustment - Variable Volume Pump

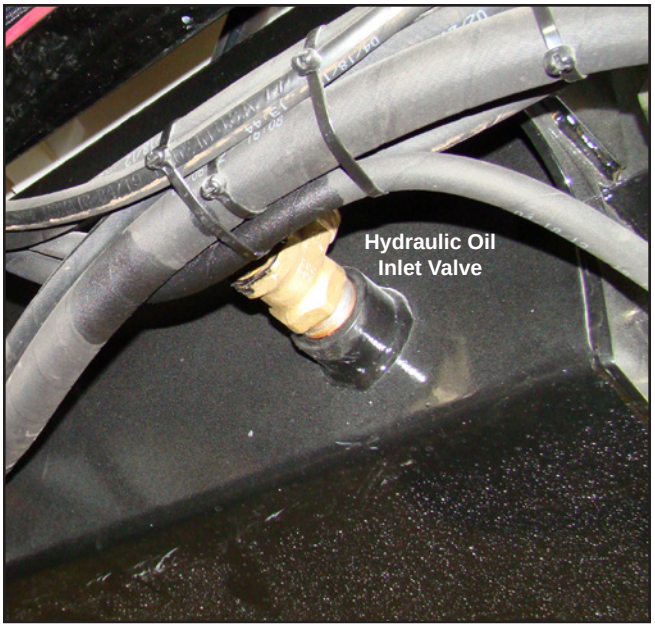
Check the hydraulic system pressure following repairs to the PTO or variable volume pump. Incorrect relief settings will cause the hydraulics to overheat.

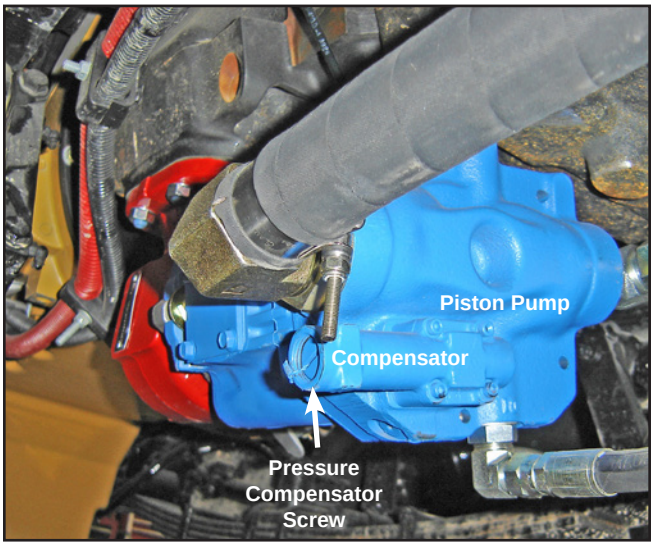
After the PTO or hydraulic pump is installed and all fittings connected, perform the following procedures.

Adjusting Relief and Compensator on the Closed Center System

1. Open the hydraulic oil inlet valve under the hydraulic tank. The valve handle is normally tie-wrapped to avoid accidently being shut off and starving the pump.
2. On the hydraulic pump, screw in the pressure compensator screw all the way.
3. Start the engine and engage the pump.
4. At the hydraulic control manifold, remove the acorn nut to expose a slotted adjustment screw and loosen the jam nut behind it.
5. With a screwdriver, adjust the screw to achieve 2300psi on the gauge. Tighten the jam nut temporarily.
6. At the hydraulic pump, turn the compensator screw counterclockwise until the gauge in the control panel reads 2000psi.
7. Operate the hydraulic components several times.

   If a whistling sound is heard, repeat procedure form step 2.
8. Retighten the jam nut and install the acorn nut.
9. Check for leaks in the entire system, rectify if found.



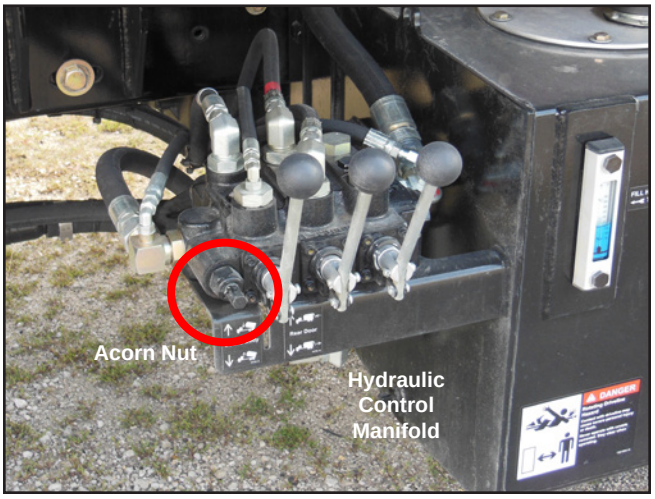


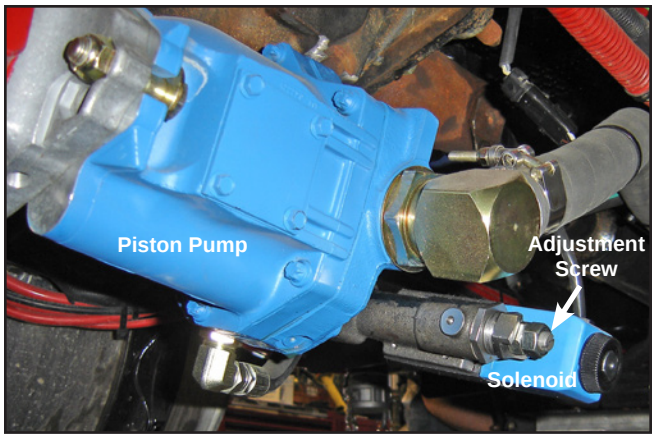
NOTICE

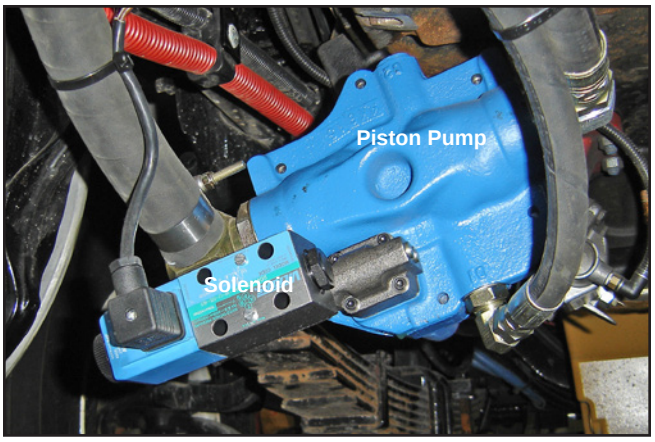
Hydraulic System Can Overheat

Improper setting of reliefs and compensators can overheat the hydraulic system. To avoid damage:

- **Relief valves must be set higher than the compensator pressure.**
- **Whenever a PTO or a variable volume hydraulic pump is removed for repairs or replaced, the system pressure must be reset to specifications.**







The dual compensator hydraulic system is a variation of the closed center hydraulic system. It is only found on XCR units. These units have a remote cyclone.

The compensator changes the maximum pressure capabilities of the hydraulic pump for operating the cyclone gate valves. Because it is two-stage, the compensator can be set at two different settings, allowing two specific pressure settings for different hydraulic systems.

For normal body functions the maximum pressure capability is 2000psi. Maximum pressure for cyclone gate valve operation is 1000psi. The compensator is shifted via an electrical signal.

Solenoids are used to shift the compensator from one setting to another.

The system has a secondary relief valve located on the directional valve.

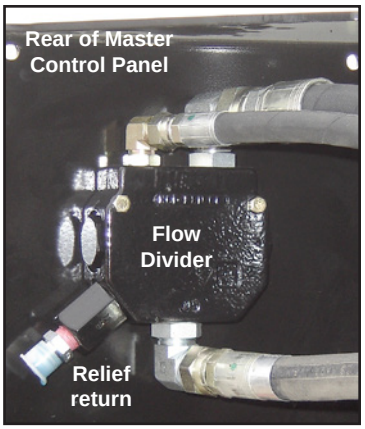
NOTICE

Hydraulic System Can Overheat

Improper setting of reliefs and compensators can overheat the hydraulic system. To avoid damage:

- **Relief valves must be set higher than the compensator pressure.**
- **Whenever a PTO or a variable volume hydraulic pump is removed for repairs or replaced, the system pressure must be reset to specifications.**

Optional content may require the use of a flow divider. Location will vary.

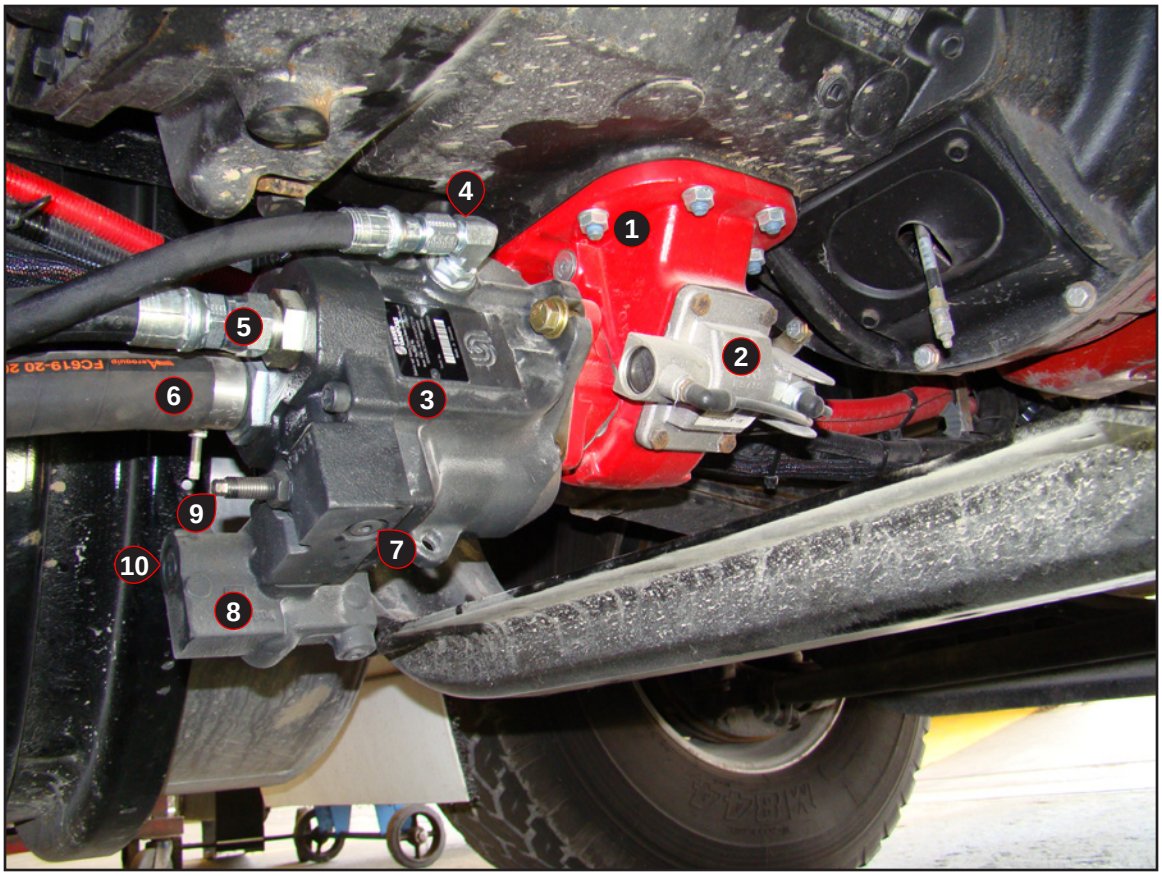


Adjusting Flow Divider

The flow divider regulates the flow of hydraulic oil to the various hydraulic functions. A locking block replaces the normal adjustment knob so the flow divider can not inadvertently be adjusted.

Oil flows to the circuit control through a priority style flow divider. The divider has an internal relief for safety.

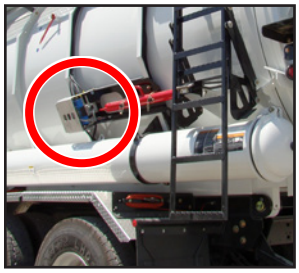
The relief adjustment is located inside the relief return fitting. Refer to the unit's schematics for correct relief settings.



	Function
1	PTO
2	PTO actuator
3	Pump
4	Case drain
5	Outlet
6	Inlet
7	Gauge port
8	Compensator block
9	Max displacement block
10	Compensator adjustment (6mm hex wrench to adjust and 4mm locking set screw on back side)

Coils are easily replaced by unscrewing the end cap and removing the wire plug.

Valves can be manually overridden by pushing in on the plunger on either end.



A variety of solenoid valves are used for boom, rear door locks and other options. They are normally located on the driver side towards the rear.

Each solenoid performs a certain function or movement and there are normally two solenoid controls on each directional valve. Verify each valve's function with the unit schematics. A typical arrangement is shown.

The pendent control buttons activate the individual solenoid valves to perform a specific function.

Note: Each solenoid is equipped with manual override for troubleshooting or emergency operation.

Manual Solenoid Override

Before operating any of the manual overrides, ensure that the push button moves freely inside the sleeve.

a. Turn the hydraulics off so you can operate the button to make sure it is not stuck.

b. Insert a small pin into the hole in the center of the end of each solenoid and verify that the button moves freely.

If a button is stuck, use a spray lubricant, such as WD-40, to release it.

If the directional button is pushed and does not return to its original position, one of two procedures can be used to stop the movement of the boom:

- Shut the hydraulics off, or
- Reach across and push the opposite function.

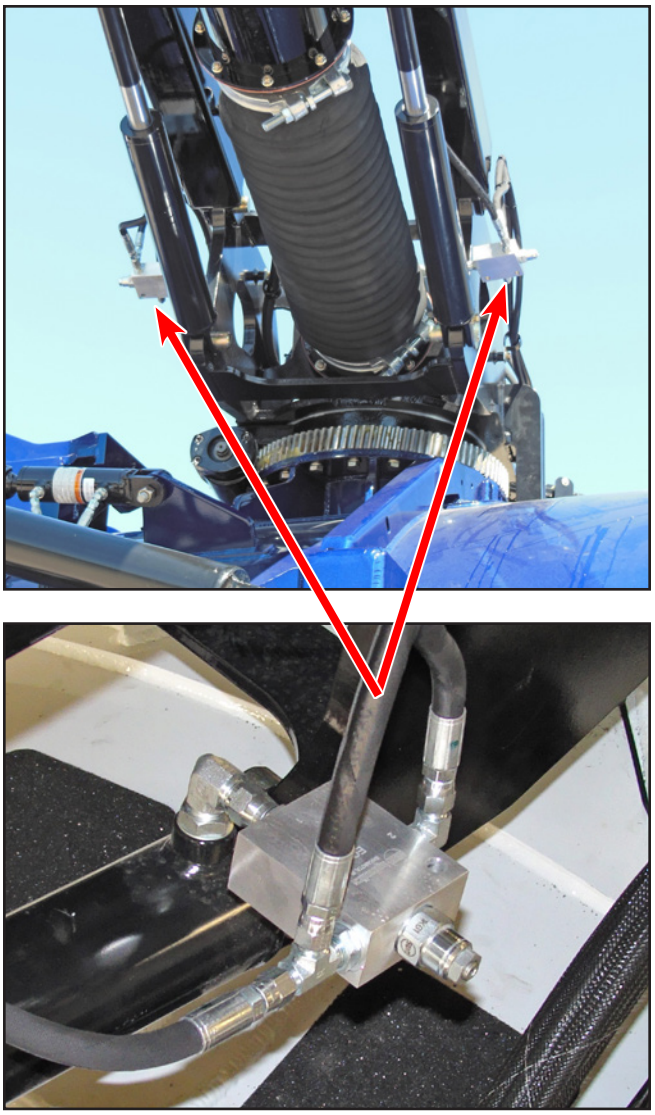
⚠ WARNING

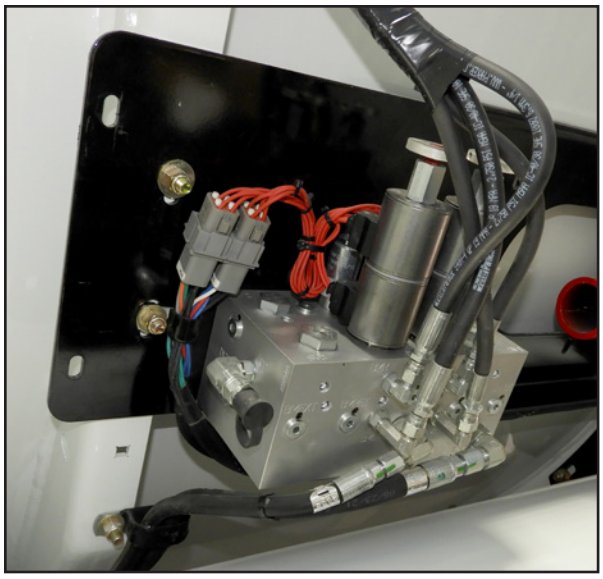
Crushing hazard

To avoid serious injury or death while servicing powered systems:

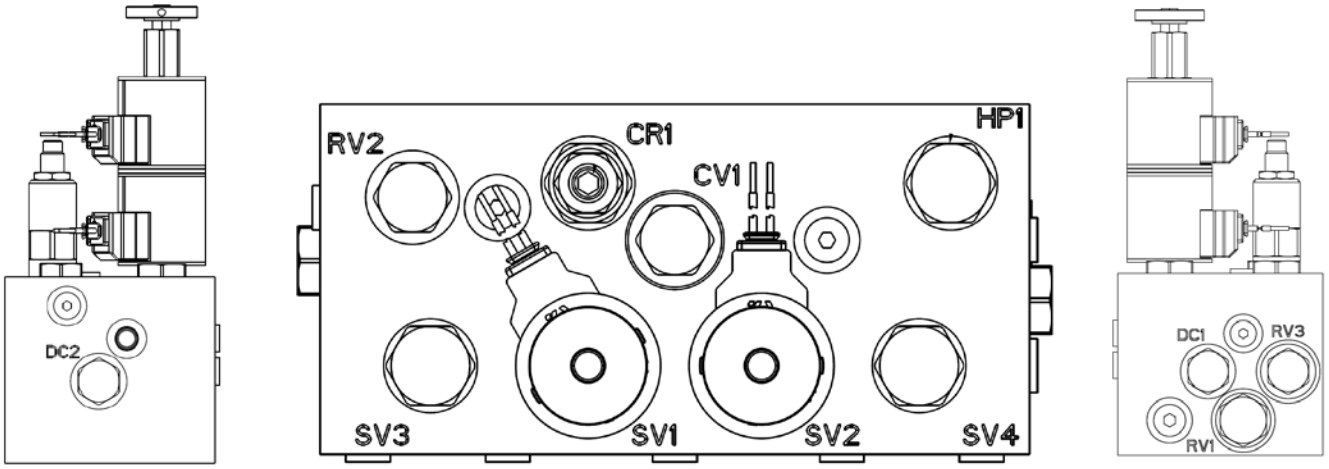
- **NEVER go under a raised boom, debris body, rear door or other powered system.**
- **Relieve all residual pressure in pneumatic and hydraulic circuits.**
- **NEVER loosen or disconnect any hydraulic components while the hydraulic pump is running.**
- **The unit must be off and hydraulics disengaged when performing electrical or hydraulic service. Before operating any of the manual overrides, ensure that the solenoid override buttons move freely.**
- **Verify all areas are clear and safe before manually overriding any pneumatic, electrical or hydraulic circuit.**
- **To stop unexpected movements turn off all pendants and remote controls.**
- **Remove the ignition keys and post a lockout/tagout sign on the chassis steering wheel and engine control panels as required.**

Both boom cylinders are equipped with counter balance valves. The boom is pressure up and gravity down. The valves provide a relief to reduce the risk of damage from overloading the boom. They are factory preset and should not be adjusted.

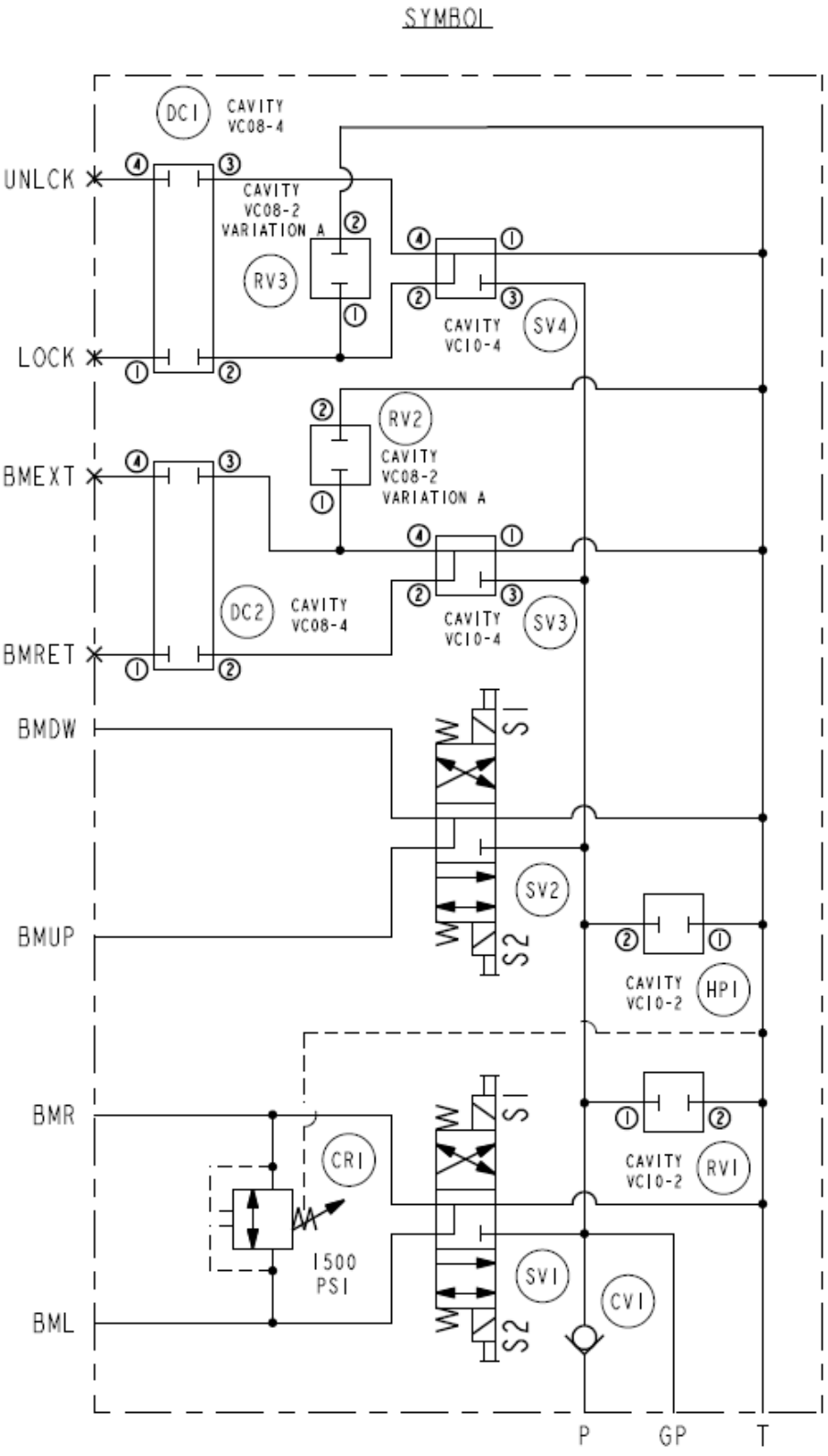




Manifold is normally located right above the driver side dump tube. This is the newer style that started mid-2019.



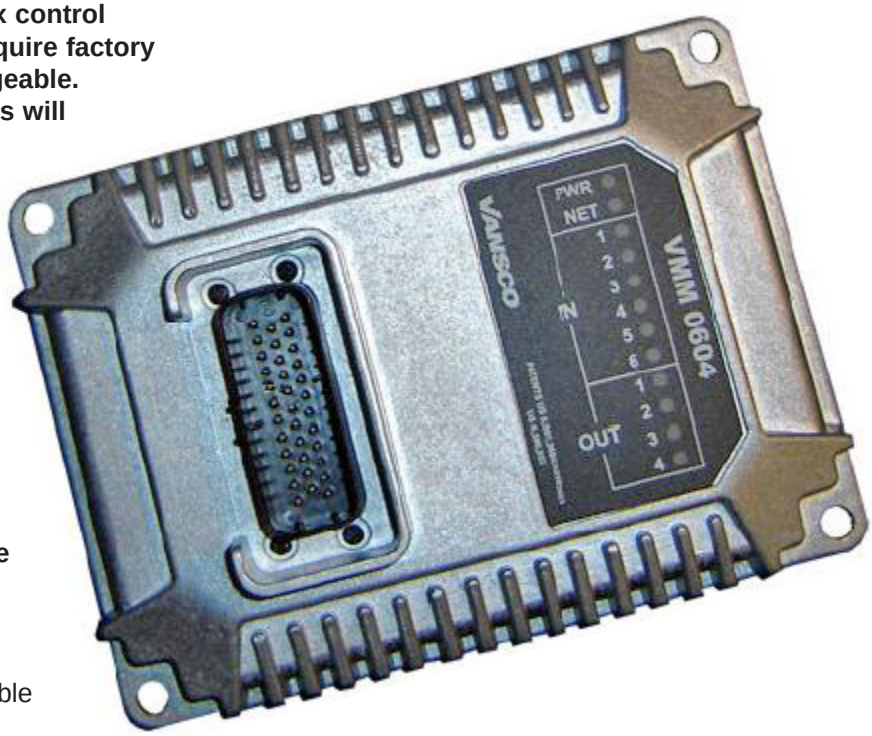
Port		Function	Setting
1	CV1	Check valve (prevents backflow of optional hand pump)	
2	CR1	Crossover relief, boom rotate	1500 psi
3	DC1, DC2	Cavity plug	
4	RV1, RV2, RV3	Cavity plug	
5	HP1	Cavity plug (optional hand pump)	
6	SV3	Cavity plug (optional additional valve section: telescoping boom)	
7	SV4	Cavity plug (optional additional valve section)	
8	SV1	Boom rotate solenoid valve	
9	SV2	Boom up/down solenoid valve	


SYMBOL
DC1
CAVITY
VC08-4
UNLCK
LOCK
CAVITY
VC08-2
VARIATION A
RV3
CAVITY
VC10-4
SV4
RV2
CAVITY
VC08-2
VARIATION A
BMEXT
BMRET
DC2
CAVITY
VC08-4
CAVITY
VC10-4
SV3
BMDW
BMUP
S1
S2
SV2
CAVITY
VC10-2
HP1
BMR
BML
CR1
1500
PSI
CAVITY
VC10-2
RV1
SV1
CV1
P
GP
T

The Vansco, Intelliview®, and Omnex control modules used on various models require factory programming and are not interchangeable. Interchanging modules between units will result in loss of operation, erratic operation and possible damage to the unit.

Each VMM has unique programming. Swapping them can corrupt the programming possibly leading to extensive diagnostic issues. Consult your factory service contact for the correctly programmed VMM module for you unit.

VMM modules rarely fail. All diagnostic efforts should assume the module is good to avoid delays and repeated efforts to fix an issue.



This vehicle is equipped with Vansco Multiplexed Module (VMM) programmable logic controllers (PLC) for vehicles.

Modules are placed at various locations in a vehicle and all are linked via the J1939 twisted pair shielded cable.

This allows the modules to receive inputs and drive outputs and communicate that input/output state information to all others in the system.

This reduces long runs of wiring since all input/output information is available on the CAN/J1939 network.

Modern electronics communicate information from their ECUs utilizing a standard protocol.

This is called the SAE J1939 Recommended Practice for Serial Control and Communication Vehicle Network – often referred to simply as SAE J1939 CAN.

It is based on the popular CAN (Controller Area Network) system developed by Bosch in the 1980's and widely adopted in Europe and North America.

The versatility of the modules, using the J1939 network, allows the modules to be connected to other J1939 based devices.

The modules are linked via the a Vansco Pocket Gateway Module (PGM). This allows it to remain isolated from the drive train network and to communicate with devices on other networks such as J1708.

The drive train network must remain separate from the VMM network because of amount of network traffic (messages).

The modules process ladder logic. The ladder logic defines which inputs or arrangement of inputs turns on which outputs on the module.

The inputs and outputs in the ladder logic can be from one or more modules connected together in a system via the J1939 network.

"Ladder logic" is so named because the logic is drawn in "rungs" where one rung represents the logic to activate/deactivate a specific output in the system.

Ladder logic uses geometric symbols to represent certain aspects of the system being controlled.

Module inputs would be represented by a symbol and module outputs would be represented by a symbol.

Each VMM contains a EEPROM (Electrically Erasable Programmable Read-Only Memory) chip and contains a copy of the ladder logic file.

The EEPROM chip is re-programmable on the vehicle.

The EEPROM retains its contents even when the power is turned off.

Any changes to the program state (Log files) is automatically saved to the VMM's every 15 minutes.

Inputs Types - Switch To Ground

Input circuit in module senses device is grounded.

Indicates switch is closed, circuit complete to ground. Called “Active Low” (AL).

Maximum resistance to ground for an active input is 200 ohms.

LED confirms circuit is complete.

RED = ON OFF = Open Circuit

Input Types - Switch to Battery

Inputs circuit senses when device is tied to battery.

Module input senses circuit is closed. Minimum input voltage is 2.25 volts to indicate circuit is closed and stays closed until voltage is below 2.05 volts. Called “Active High” (AH).

Voltage input -LED confirms circuit is complete.

RED = ON OFF = Open Circuit

Input Types - Analog

Analog Inputs

Variable Input from 0 to Max Input Voltage

Most modules have programmable Pullup/Pulldown option, Max Input Voltage and Sample rate

Resolution is 0.1 volts in voltage mode and in Raw AD mode it’s 1023 steps from 0 to Max Input Voltage

Input Types - Frequency

Frequency Inputs

Used for communication to gauges, speed indicators, alarm set points.

Allow a periodic waveform with frequencies ranging from 10Hz to 10kHz (cycles per second) to be read as a frequency value.

Output Types - High Side

Output circuit is sourcing current

Indicates current is flowing out of the module to the Load. Called “High Side” (HS).

Output Types - Low Side

Output circuit is sinking current

Indicates current is flowing into the module from the Load. Called “Low Side” (LS).

Output Types - H-Bridge

Output circuit switches direction of current flow.

Used to change direction of motors, fans, solenoids.

Configurations

The various versions of VMM’s used all share these common inputs/outputs. The number varies with model.

- Various inputs, programmable as digital, analog or frequency
- 3A Outputs (4 High-Side, 4 Low-Side)
- Current feedback Outputs using both HS and LS
- OR H-Bridge outputs (number varies with model)
- OR HS outputs and 4 LS outputs (number varies with model)
- OR a combination of the above

Inputs & Output Types

The type of inputs and outputs are defined in the I/O view of the VMMS software.

VMM Power LED

POWER LED

Three states, ON/OFF/FLASHING.

POWER LED ON (Solid)

Unit is powered up, internal diagnostics run and found no errors.

VMM Power LED Flashing

POWER LED Flashing

On all modules the power LED will flash if it requires information from another module in ladder logic and does not see this information on the network.

This means that if a module loses connection to the network it will not be sending information on the network.

If another module requires information from the disconnected module this module will flash its Power LED.

I.E. If Module 3 is not powered and Module 2 is requesting information from Module 3, Module 2 will have a flashing power LED.

Note: The behavior of the indicator lights varies among the Vactor/Guzzler models.

VMM NETWORK LED

NETWORK LED flashes when there is network communication.

Two VMM units or more connected in a network and the POWER LED is lit on each VMM in the system the NETWORK LED should be flashing (flickering).

LED OFF indicates no communication at all, LED should always be ON.

Note: The behavior of the indicator lights varies among the Vactor/Guzzler models.

VMM Input LED's

For ground input (Active Low, AL), if the pin does not go to a ground, check the wire or the device that controls the input.

For a voltage input (Active High, AH), if the pin does have voltage, check the wire or the device that controls the input.

VMM Input LED - Analog

Inputs programmed as analog require approx. 0.5 volts to activate the input.

Using a voltmeter check the pin corresponding to the input to see if there is a voltage of 0.5 volts on the pin. If there is no voltage check the input device or the wire harness.

LED will only turn on if value is greater than 2% of full range.

VMM Output LED's

The output LED's have three states, ON/OFF/FLASHING.

If an output LED is ON, the output that the LED represents is Active.

Refer to the I/O Assignments Schematic Page for the type of output it is programmed for.

12 or 24 volt DC output, Ground Output or PWM (Variable).

VMM Output LED's (OFF)

If an output LED is OFF, the corresponding output that the LED represents is Inactive.

This indicates the ladder logic is not activating the output.

Determine the output operation with the diagnostic software or ladder logic print out.

VMM Output LED's (FLASHING)

There are five types of faults that will cause output LED's to flash.

1. Short circuit
2. Over current
3. Back drive
4. No power detected
5. Open load

The type of fault can not be determined in the flash, troubleshooting is required.

VMM Output LED - Short Circuit

Short circuit power faults are detected when the output is in the on state.

The VMM output is shorted to ground.

Power down the system and check the pin in the harness corresponding to the output to see if there is a short to ground. This can be done with an ohmmeter.

VMM Output LED - Over Current

Over current power faults are detected when the output is in the on state.

An over current fault occurs when the output is drawing excessive current.

VMM Output LED - Over Current

Use an ohmmeter and check the resistance to ground on the pin in the harness for that output.

Using this resistance and the voltage of the bus bar you can calculate the amperage the load will draw from the output. In the case of motors, a current probe will have to be used to determine the current draw.

VMM Output LED - Back Drive

Back drive are detected when the output is in the OFF state.

A back drive fault occurs when the VMM output is shorted to battery voltage.

If the VMM powers up with the output in the off state check the pin to the output with a voltmeter to see if there is a voltage present.

VMM Output LED - Back Drive

If there is a voltage on this pin the harness has a short to power in it or the device the output is controlling is defective.

VMM Output LED - No Power

No power faults are detected when the output is in the ON state.

No power detected fault occurs if an output circuit is physically damaged or there is no power on the output bus bars.

With a voltmeter check the pin corresponding to the output to see if there is a voltage on the output.

VMM Output LED - No Power

If there is no voltage on the output pin, check to see if there is a voltage on the corresponding bus bar pin in the connector.

If there is a voltage on the corresponding bus bar pin and there is still no voltage on the output pin the VMM has been damaged and should be replaced.

VMM Output LED - No Power

If there is no voltage on the bus bar input the harness will have to be checked for an open wire.

If there is no voltage on a bus bar all outputs on that bus bar will show a fault condition when they are powered up. (All output LED's will be flashing).

VMM Output LED's - Open Load

Open load faults are detected when the output is in the OFF state.

The VMM will check for a load on the outputs every second.

Check the faulted output to see if there is a load on the corresponding pin for the output.

Check the device or the wiring harness.

Note: The behavior of the indicator lights varies among the Vactor/Guzzler models.

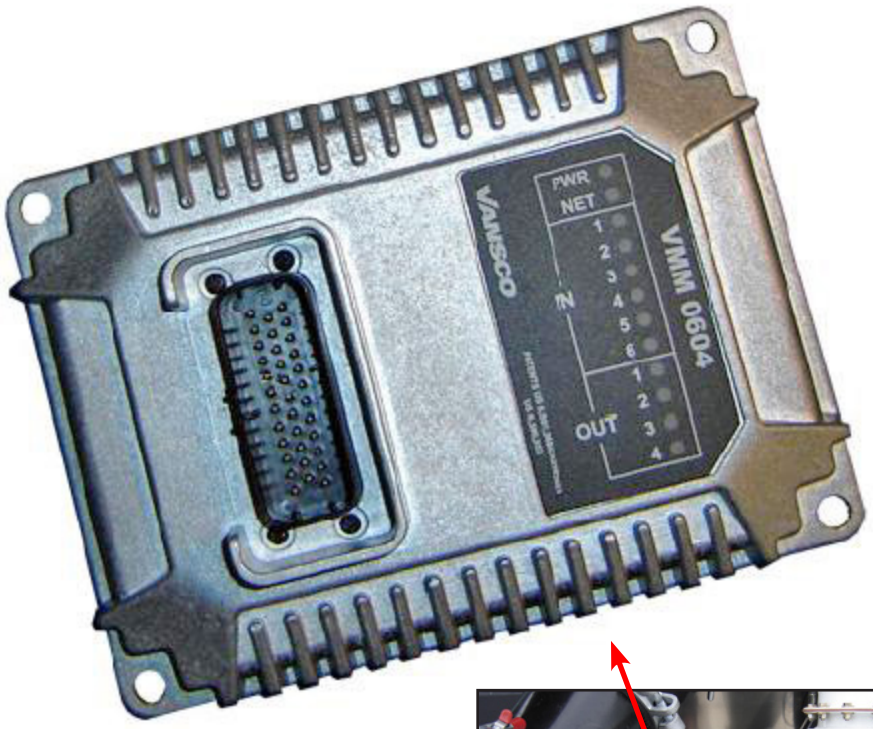
This vehicle is equipped with Vansco Multiplexed Module (VMM) Model 0604 programmable logic controller (PLC) for vehicles.

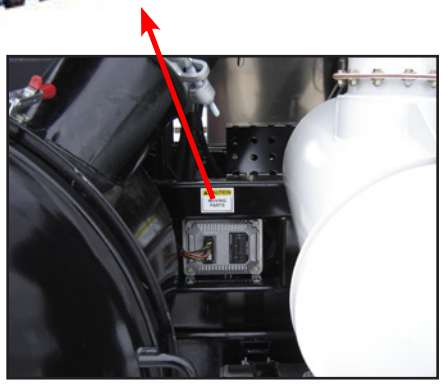
Modules are placed at various locations in a vehicle and all are linked via the J1939 twisted pair shielded cable.

This allows the modules to receive inputs and drive outputs and communicate that input/output state information to all others in the system.

This reduces long runs of wiring since all input/output information is available on the CAN/J1939 network.

Modern electronics communicate information from their ECUs utilizing a standard protocol.





This is called the SAE J1939 Recommended Practice for Serial Control and Communication Vehicle Network – often referred to simply as SAE J1939 CAN.

It is based on the popular CAN (Controller Area Network) system developed by Bosch in the 1980's and widely adopted in Europe and North America.

The versatility of the modules, using the J1939 network, allows the modules to be connected to other J1939 based devices.

The modules are linked via the a Vansco Pocket Gateway Module (PGM). This allows it to remain isolated from the drive train network and to communicate with devices on other networks such as J1708.

The drive train network must remain separate from the VMM network because of amount of network traffic (messages).

The modules process ladder logic.The ladder logic defines which inputs or arrangement of inputs turns on which outputs on the module.

The inputs and outputs in the ladder logic can be from one or more modules connected together in a system via the J1939 network.

"Ladder logic" is so named because the logic is drawn in "rungs" where one rung represents the logic to activate/deactivate a specific output in the system.

Ladder logic uses geometric symbols to represent certain aspects of the system being controlled.

Module inputs would be represented by a symbol and module outputs would be represented by a symbol.

Each VMM contains a EEPROM (Electrically Erasable Programmable Read-Only Memory) chip and contains a copy of the ladder logic file.

The EEPROM chip is re-programmable on the vehicle.

The EEPROM retains its contents even when the power is turned off.

Any changes to the program state (Log files) is automatically saved to the VMM's every 15 minutes.

Inputs Types - Switch To Ground

Input circuit in module senses device is grounded.

Indicates switch is closed, circuit complete to ground. Called “Active Low” (AL).

Maximum resistance to ground for an active input is 200 ohms.

LED confirms circuit is complete.

RED = ON OFF = Open Circuit

Input Types - Switch to Battery

Inputs circuit senses when device is tied to battery.

Module input senses circuit is closed. Minimum input voltage is 2.25 volts to indicate circuit is closed and stays closed until voltage is below 2.05 volts. Called “Active High” (AH).

Voltage input -LED confirms circuit is complete.

RED = ON OFF = Open Circuit

Input Types - Analog

Analog Inputs

Variable Input from 0 to Max Input Voltage

Most modules have programmable Pullup/Pulldown option, Max Input Voltage and Sample rate

Resolution is 0.1 volts in voltage mode and in Raw AD mode it’s 1023 steps from 0 to Max Input Voltage

Input Types - Frequency

Frequency Inputs

Used for communication to gauges, speed indicators, alarm set points.

Allow a periodic waveform with frequencies ranging from 10Hz to 10kHz (cycles per second) to be read as a frequency value.

Output Types - High Side

Output circuit is sourcing current

Indicates current is flowing out of the module to the Load. Called “High Side” (HS).

Output Types - Low Side

Output circuit is sinking current

Indicates current is flowing into the module from the Load. Called “Low Side” (LS).

Output Types - H-Bridge

Output circuit switches direction of current flow.

Used to change direction of motors, fans, solenoids.

Model 0604

6 Inputs, programmable as digital, analog or frequency

8 - 3A Outputs (4 High-Side, 4 Low-Side)

4 Current feedback Outputs using both HS and LS

OR 2 H-Bridge outputs

OR 4 HS outputs and 4 LS outputs

OR a combination of the above

Model 0604 Inputs & Output Types

The type of inputs and outputs are defined in the I/O view of the VMMS software.

All VMM work as “Masters”

Allows modules to work independently of faulted modules. One failed module will not prevent the others from working.

VMM Power LED

POWER LED

Three states, ON/OFF/FLASHING.

POWER LED ON (Solid)

Unit is powered up, internal diagnostics run and found no errors.

VMM Power LED Flashing

POWER LED Flashing

On all modules the power LED will flash if it requires information from another module in ladder logic and does not see this information on the network.

This means that if a module loses connection to the network it will not be sending information on the network.

If another module requires information from the disconnected module this module will flash its Power LED.

I.E. If Module 3 is not powered and Module 2 is requesting information from Module 3, Module 2 will have a flashing power LED.

After checking these things and the POWER LED still flashes there is an internal fault and the module will have to be replaced.

VMM NETWORK LED

NETWORK LED flashes when there is network communication.

Two VMM units or more connected in a network and the POWER LED is lit on each VMM in the system the NETWORK LED should be flashing (flickering).

LED OFF indicates no communication at all, LED should always be ON.

VMM 2820 NETWORK LED (OFF)

If the resistance is not 60 ohms, check network cabling.

Check terminating resistors at either end or a bad connection. (120 ohms indicates only one resistor in place).

Check for open wire in the cables.

If all the wiring has been checked. The module should be replaced.

VMM Input LED's

Two states, ON/OFF.

Input LED is ON, the Input is Active.

If an input LED is OFF, the corresponding input is Inactive.

Two types of Inputs, either active when connected to ground or connected to voltage.

Refer to the I/O Assignments Schematic to determine the type of input it is.

VMM Input LED's

For ground input (Active Low, AL), if the pin does not go to a ground, check the wire or the device that controls the input.

For a voltage input (Active High, AH), if the pin does have voltage, check the wire or the device that controls the input.

VMM Input LED - Analog

Inputs programmed as analog require approx. 0.5 volts to activate the input.

Using a voltmeter check the pin corresponding to the input to see if there is a voltage of 0.5 volts on the pin. If there is no voltage check the input device or the wire harness.

LED will only turn on if value is greater than 2% of full range.

VMM Output LED's

The output LED's have three states, ON/OFF/FLASHING.

If an output LED is ON, the output that the LED represents is Active.

Refer to the I/O Assignments Schematic Page for the type of output it is programmed for.

12 or 24 volt DC output, Ground Output or PWM (Variable).

VMM Output LED's (OFF)

If an output LED is OFF, the corresponding output that the LED represents is Inactive.

This indicates the ladder logic is not activating the output.

Determine the output operation with the diagnostic software or ladder logic print out.

VMM Output LED's (FLASHING)

There are five types of faults that will cause output LED's to flash.

1. Short circuit
2. Over current
3. Back drive
4. No power detected
5. Open load

The type of fault can not be determined in the flash,

troubleshooting is required.

VMM Output LED - Short Circuit

Short circuit power faults are detected when the output is in the on state.

The circuit that a VMM output is shorted to ground.

Power down the system and check the pin in the harness corresponding to the output to see if there is a short to ground. This can be done with an ohmmeter.

VMM Output LED - Over Current

Over current power faults are detected when the output is in the on state.

An over current fault occurs when the output is drawing excessive current.

VMM Output LED - Over Current

Use an ohmmeter and check the resistance to ground on the pin in the harness for that output.

Using this resistance and the voltage of the bus bar you can calculate the amperage the load will draw from the output. In the case of motors, a current probe will have to be used to determine the current draw.

VMM Output LED - Back Drive

Back drive are detected when the output is in the OFF state.

A back drive fault occurs when the circuit that a VMM output is shorted to battery voltage.

If the VMM powers up with the output in the off state check the pin to the output with a voltmeter to see if there is a voltage present.

VMM Output LED - Back Drive

If there is a voltage on this pin the harness has a short to power in it or the device the output is controlling is defective.

VMM Output LED - No Power

No power faults are detected when the output is in the ON state.

No power detected fault occurs if an output circuit is physically damaged or there is no power on the output bus bars.

With a voltmeter check the pin corresponding to the output to see if there is a voltage on the output.

VMM Output LED - No Power

If there is no voltage on the output pin, check to see if there is a voltage on the corresponding bus bar pin in the connector.

If there is a voltage on the corresponding bus bar pin and there is still no voltage on the output pin the VMM has been damaged and should be replaced.

VMM Output LED - No Power

If there is no voltage on the bus bar input the harness will have to be checked for an open wire.

If there is no voltage on a bus bar all outputs on that bus bar will show a fault condition when they are powered up. (All output LED's will be flashing).

VMM Output LED's - Open Load

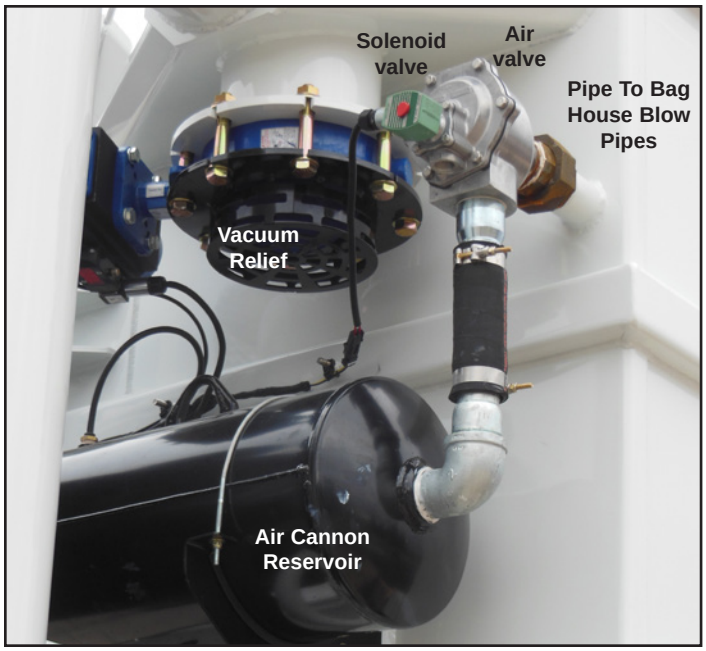
Open load faults are detected when the output is in the OFF state.

The VMM will check for a load on the outputs every second.

Check the faulted output to see if there is a load on the corresponding pin for the output.

Check the device or the wiring harness.

Trouble	Probable Cause	Remedy
Air cannon fires repeatedly in rapid succession.	Short timer setting	Set to longer timer setting.
Entire system loses pressure if the power to panel switch is turned on and no external air leaks are present.	The air cannon piston is stuck in the open position or the internal O-rings in the air cannon are worn or damaged.	Sometimes a stuck piston can be freed by removing the air supply line (with the system off) and spraying a liberal amount of WD-40 into the air supply line. After this procedure, reconnect the supply line, allow the system to build pressure and then turn the power to panel switch on and off several times. If this does not fix the problem, then the firing end of the air cannon must be dissembled and inspected.
Air cannon will not fire.	Power to the panel switch is not available.	Turn on power to panel switch.
	System has no air pressure at the control panel.	Verify air cannon manual air valve is open. This valve is normally located under the microstrainer.
	Twelve volt power not present at the air solenoid valve.	Inspect wiring and associated components for electrical and mechanical faults.
	Faulty air solenoid valve.	Loosen air hose exiting the air dryer and verify that air is being supplied to the system. If air is not being supplied then replace the air dryer solenoid valve.
Air cannon will not fire.	Faulty air pressure switch.	If the system has sufficient air pressure and still does not work, then use a test light and verify that the pressure switch contacts are closing and the circuit is complete to the air cannon solenoid. Allow the compressor to build pressure until it reaches maximum.
		If the switch has not been actuated, then it is either defective or it is set higher than the air compressor governor. Lower the setting by 10psi and retest.
	Faulty air cannon solenoid valve.	If the pressure switch contacts are closing, then use a test light to verify that twelve volts are going to the air cannon solenoid. This should be done with the system on and ready to fire. If 12vdc are present at the solenoid valve, then manually actuate the air solenoid with the manual override button located on the air solenoid. If the air cannon fires, then the solenoid is defective.



Refer to the unit's schematics for additional details.

1. Verification of the air solenoid valve operation.

   Manually drain all the air from the air cannon tank. Start the chassis and set the master switch on. Does the air cannon tank fill with air? Note the chassis air tanks must have 70psi air pressure before the air cannon tanks will fill. This is because there is a pressure protection valve on the chassis air system. If the tank fills you can move to step #2. If it does not we need to do further review and fix this first.

2. Air Cannon switch - Set the master switch on and check for power at the air cannon switch. E-stop must not be activated. If the switch has power proceed to step three.

3. Verification of air pressure switch operation and settings.

   Drain all the air from the chassis air tanks and the air cannon air tank. Set the master switch on. Set the air cannon switch on. Verify there is power air pressure switch located in the control cabinet. Verify air pressure switch is showing an open circuit at NO terminal.

   Start the chassis and monitor the air pressure. This switch should close at about 100psi.

   If the air pressure switches do not trip at the proper settings they will need adjusted. Remove the rubber plug and the adjustment screw is in the top of each switch, in will increase the trip point and out will decrease the trip point. If these functions check ok proceed to step #4

4. Verification of timer relay operation.

   Verify timer relay terminal #1 has 12 volts -Air cannon switch must be on. Verify timer relay terminal 3 is grounded. From step 3 above verify timer relay terminal #2 has 12 volts when the air pressure switch at approximately 100psi. Terminal #4 should see 12 volts after 64 seconds (default setting). If terminal #4 does not see power the timer may be faulty. You can move to step five to verify the air cannon will fire.

5. Verification air cannon solenoid works.

   Verify master switch is on. Verify air cannon switch is on. Verify air cannon air tank is full of air. Remove the wire from terminal #4 on the timer relay. Jumper it to any 12 volt signal. The air cannon should fire. If it does not check the solenoid at the air cannon tank to see if it is activating or seeing power.

Timer Relay Terminal Information.

Terminal #1 primary power from air cannon switch (timer relay common)

Terminal #2 + signal from pressure switch (starts timer sequence)

Terminal #3 - ground signal

Terminal #4 power signal to air cannon solenoid after timer sequence

Principle of Operation

Air is stored in a reservoir an held with a diaphragm valve. The valve allows or prevents pressurized air to be injected into the bags via ducting and blowpipes at preset intervals. The timing and duration of the opening of the diaphragm valve is achieved by means of solenoids which are controlled by a printed circuit timer panel, weather sealed in an enclosure. The timing of each valve can be set by adjusting the “off” and “on” time on the circuit board.

A pressure switch is activated when a preset air pressure is reached in the system, sending voltage to all the solenoids in the system, but not completing the circuit beyond the solenoids, thus keeping the diaphragm valve shut, or “off”. At the end of the timed “off” cycle, the “on” switch is activated by the timer, completing the circuit for the first solenoid. This energizes that solenoid, triggering an exhaust for the corresponding diaphragm valve and opening it to let the air in the reservoir shoot out through the ducts and the blow pipe into a row of bags.

The system then resets itself to “off” and the cycle continues, this time the second solenoid energizes at the time the “on” cycle begins. This continues until the valve fires into the bags and then it starts all over again with the first solenoid. The “off” time is normally set to 64 seconds and the “on” time is set at about 120-140 milliseconds. An “off” time of less than about 15 seconds might not give enough time for the reservoir to charge fully between each pulse.

Troubleshooting

Problems that can arise in the pulsation system can be categorized as being either mechanical or electrical. Not much can go wrong pneumatically, other than air not being supplied to the air reservoir or the pressure switch.

Before attempting to dis-assemble any component or circuit, check that there is enough air pressure in the system and air is present at the pressure transducer port and at the reservoir.

Pulsation system air pressure leaks down

1. Check for any air leaks in the air system on the unit from the air compressor, piping, and air dryer or on the pulsation manifold and tubing from the solenoids to the diaphragm valves.
2. If leak is from a solenoid valve, remove the screws securing the base of the solenoid, remove base and check for dirt on the valve seat or rubber tip of the plunger, clean and reassemble. If worn out, replace the solenoid.
3. Drain air from system and remove screws holding the diaphragm valve covers. Check for dirt corrosion or punctures in the diaphragm, cracks in the housing. Repair or replace as necessary.

Troubleshooting Air Cannon Pulsation System

The air cannon can malfunction due to one or more of the following reasons:

a. Air supply problem.

b. Electrical malfunction.

c. Mechanical binding of components.

Before trying to open or test any components of the air cannon system, make sure that there is enough air pressure (120psi), available at the discharge port of the air dryer. If not, locate the fault (in the truck air compressor, storage tanks or leaks in the plumbing or other non-air cannon related areas) and rectify before proceeding further.

Also ensure that 12vdc is available at the control panel. If not, locate the fault and rectify. (Everything being all right, improper gear shifting procedure (manual transmissions) can cause a state of no power being available at the control panel or there could be fault in the shift procedure circuit components.

Air Cannon Does Not Fire.

1. Air supply problem. No air to the air cannon. Make sure that the power to panel (master switch) is on. Unscrew the 1/2” rubber air line at the solenoid valve on the air cannon. There should be air pressure at the hose end. If not, trace the air line back under the debris tank and on the chassis sub frame, to the air dryer and check for leaks or restrictions in the hose. If none found, unscrew the same 1/2” hose at the air dryer end and check for air pressure.

   If there is air pressure at the air dryer end, there is a restriction in the hose. If no air pressure, the solenoid valve at the air dryer is not opening. It may have a loose or broken wire, blown fuse or the valve may be faulty. Repair or replace as necessary.

Air Cannon Fires But Does Not Clean Bags/ Filters

1. Badly clogged holes in the blowpipes. The blowpipes through which air is blasted into the filters are located on top of the bag house. These pipes have holes that open in the center of each filter.
2. Obstruction / damage in the hose from the air cannon to the bag house. Clean or replace.

Compressed air quality

A lot of air cannon problems are caused by condensation of moisture in the air. Regular draining of water at various points on the unit can reduce this. These are at the chassis air storage tanks, bottom of the air dryer and at the bottom of the air cannon reservoir. Use caution in lubricating because over lubrication can cause lubricant being squirted into the filters, attracting dirt and clogging them.

All versions of the booms are hydraulically operated. The operations of the boom may be controlled by the operator using a wired or wireless (optional) pendants. These switches control electric over hydraulic solenoids, which direct hydraulic oil through different circuits to accomplish the various functions.

There are optional extend and retract functions.

Hydraulic Operation

Hydraulic operation of the boom is achieved by a hydraulic motor with a gear on its shaft. This gear meshes with a gear on the bottom of the boom mounted on a bearing. Hydraulic oil flow to the motor is controlled by an electric over hydraulic solenoid operated by a switch on the pendant.

Prevention of Problems

Routine maintenance is imperative, even for an infrequently used boom. An infrequently used boom is prone to problems due to rust, corrosion or hardening of rubber components. Run all boom functions weekly to ensure they are functioning.

Inspect for binding due to weather, intact wiring, leaky hoses, loose hose connections, loose or broken wiring, hardened vacuum hoses, rusted or corroded brake linkages, jammed brake friction linings, and other problems.

Repair all problems as soon as possible.

Lubricate the boom bearing as specified.

Oil Flow

The hydraulic system for the boom requires four gallons of hydraulic oil for proper operation.

The relief setting is normally 2350psi. Confirm the relief settings with the unit's hydraulic schematics.

Beginning Isolation Techniques

Before starting to troubleshoot malfunctions of the boom, ensure that:

a. The hydraulic reservoir has the correct grade and quantity of hydraulic oil in it. Rectify any leaks in the system.

b. The unit's engine is running.

c. The PTO to operate the hydraulic pump has been engaged.

d. All other hydraulic systems work, such as the rear door and hoist. This will eliminate the speculation of faulty hydraulic pump, relief valve setting at the pump or the hydraulic control valve.

e. There is sufficient air pressure in the system. Rectify any air leaks.

f. Plugs and connectors are securely fastened.

g. E-stop not activated

Nothing Happens When Control Button Is Pushed, Isolation Technique.

1. Verify:
   a. The PTO is engaged to provide hydraulics for the directional valves.
   b. The master switch is on to provide electrical power to the pendent control.
   c. E-stop not activated
2. Test all boom functions by operating each solenoid manually. This will isolate the problem to either the hydraulics system or the electrical system.
   a. Turn the hydraulics off so you can operate the button to make sure it is not stuck.
   b. Insert a small pin into the hole in the center of the end of each solenoid and verify that the button moves freely.

      If a button is stuck, use a spray lubricant, such as WD-40, to release it.
   c. Turn the hydraulics back on and insert the small pin to depress the control spool for each solenoid. The hydraulic function should operate.

   If the unit functions with the manual overrides, troubleshoot the electrical system. If the unit does not function with manual overrides, focus troubleshooting on the hydraulic system and valves.

⚠ WARNING

Crushing hazard

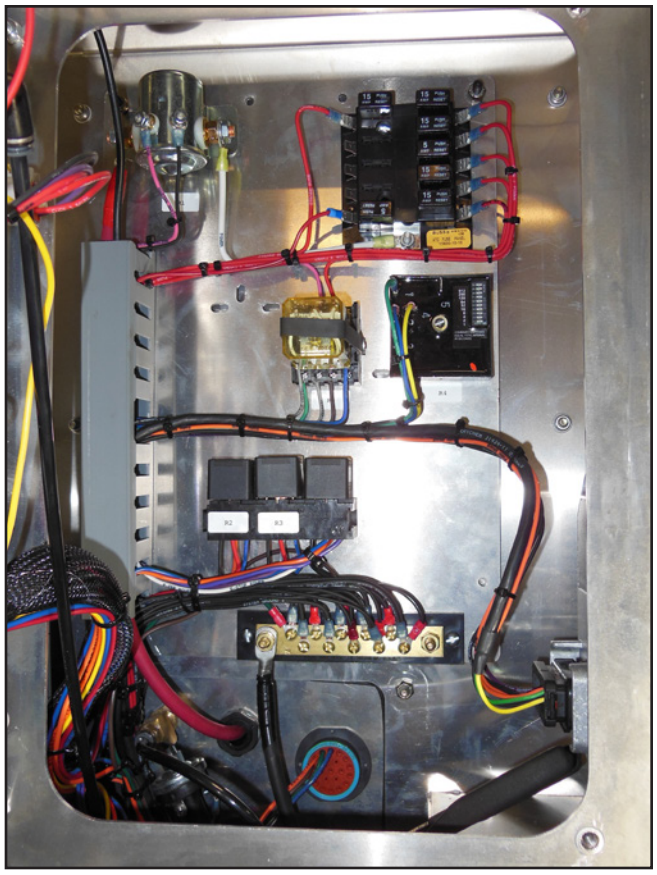
NEVER go under a raised boom. To avoid injury or death:

- **NEVER loosen or disconnect any hydraulic components while the hydraulic pump is running.**
- **Always vent residual pressure from the hydraulic system before disconnecting any hydraulic components. High pressure hydraulic oil will injure by injection into the skin and by cutting.**
- **The unit must be off and hydraulics disengaged when performing electrical or hydraulic service. Before operating any of the manual overrides, ensure that the solenoid override buttons move freely.**
- **To avoid unexpected boom movement turn OFF pendant and remote controls.**
- **Remove the ignition keys and post a lockout/tagout sign on the chassis steering wheel and engine control panels as required.**

Nothing Happens When Control Button Is Pushed, Electrical Troubleshooting.

The boom is controlled using the pendant control. If nothing happens when a control button is pushed, check the following:

1. Check so see if other control buttons are functional.
2. Check the circuit breaker in the electrical control box, refer to schematic.
3. Using a multi-meter, check for 12VDC at the solenoid lead when the button is pressed. If power is available at the lead, check for a bad solenoid winding or corroded core.
4. If power is not available at the lead, disconnect the pendant control from the receptacle. Using a multi-meter, check for 12VDC pendant input at the receptacle. If 12VDC is not available, check for 12VDC at circuit breaker.
5. If 12VDC is available at the receptacle, check the pendant control for continuity between the power input socket and the button output sockets. If continuity is not available, check the pendant control.



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Isolation Technique to isolate electrical problems to the pendant control or the module wiring.

Perform this check only if you have no boom functions.

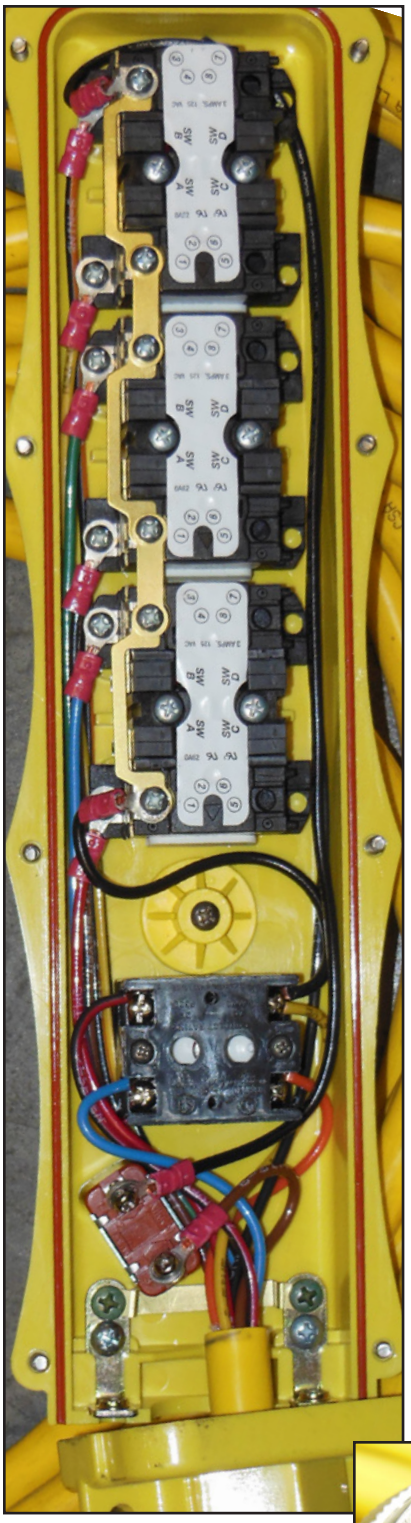
At the master control panel pendant plug:

1. Unplug the pendant and check for power at pin D.
2. If power is present troubleshoot the pendant control.
3. If power is not present at C17-A,
   a. Check the breaker in the control panel.
   b. Run continuity checks on the wire from the breaker through to the pendant connector.
4. If power is present at the pendent plug but individual functions do not work, perform continuity checks on the pendant control switches and the signal wires to the plug.
5. If the continuity checks are ok, check the continuity between the power and ground wires for each individual coil wire.

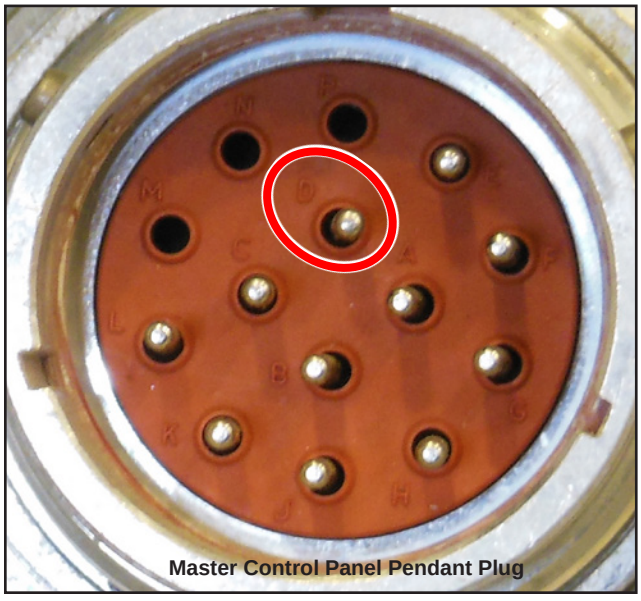
Other

The boom system has one primary power wire.

Check the pendant cable for damage. Twisting during use over time can break the wires inside.



Extendable Boom Pendant shown (Reference schematic 1000517C-30)

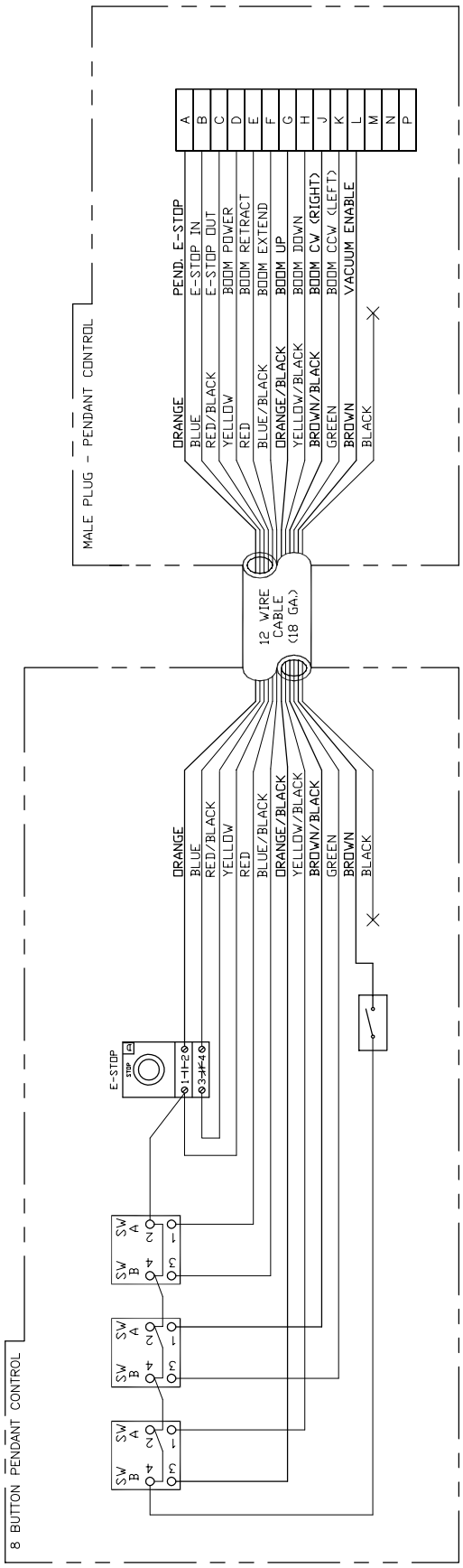


Master Control Panel Pendant Plug

Pendant Plug

Extendable Boom
Pendant shown
(Reference schematic 1000517C-30)

Drawing for reference ONLY
Refer to the drawing/schematic for your unit for exact details.



Boom Fails to Raise When Up Button Is Pushed.

1. Check operation of pendant control buttons. See troubleshooting fault, “Nothing Happens When Control Button Is Pushed.”

2. Check for proper hydraulic oil level. See the Maintenance Section for information on hydraulic oil service and specifications.

3. Check the hydraulic pump as follows:

   a. Insert a pressure gauge in the line between pump and solenoid valve.

   b. When solenoid is actuated, check for low operating pressure.

   c. If hydraulic pressure is below 1000psi, check the pump or relief.

4. Check the vacuum suction tube to see if it is loaded with mud or debris, causing excessive weight. Clean as needed.

Boom Doesn’t Stop When Button Is Released.

A spool in the solenoid stack can stick, allowing hydraulic oil to bypass the continued operating of the boom. Check the operation of each solenoid spool.

Hydraulic solenoid valves have a manual override for troubleshooting and emergency functions.

1. Press the solenoid release button on the bottom of each solenoid.

2. A sticking spool or broken spring can prevent the spool from centering. If the spool continues to stick, follow this procedure:

   a. Disengage the hydraulic pump.

   b. Shut down the truck engine and remove the ignition keys.

   c. Disassemble the solenoid and spool assembly. Repair or replace as necessary.

The boom creeps up or down.

1. Check for internal leakage in the boom cylinders.

   With the hydraulic pump disengaged, remove the two hoses from the boom cylinders and plug them.

   If the boom creeps down with the ports plugged, one or both cylinders are leaking internally. Rebuild or replace the cylinders.

   If the boom does not creep down with the ports plugged, and creeps only with the engine running and the hydraulic pump engaged, the fault lies in the pilot valve.

2. If the solenoid operated pilot valve is stuck partially open due to dirt or other contamination, repair it.

3. Verify that the solenoids were replaced with the correct solenoids. Check the old spools and replace them with an exact match.

Boom moments are jerky.

Remove air from the system by operating the hydraulic systems a few times to purge air from the system.

Boom Only Raises Part Way.

Check hydraulic oil level in the hydraulic reservoir. See the Maintenance Section for hydraulic oil service and specifications.

Boom Won’t Lower.

If the boom fails to lower from the raised position, follow this procedure:

1. Increase the engine speed to 1,500rpm to increase oil flow and pressure.

2. Depress solenoid release button to be sure spool is in the down position.

If the solenoid is centered and goes in the down position, check the control buttons using the fault “Nothing Happens When Control Button Is Pushed.”

Hydraulic Squeal.

If the hydraulic system squeals when the raise button is pushed, check the following:

1. Check the suction tube for overload of debris build-up causing by-pass of relief valve.

2. Check the hydraulic:

   a. Insert a pressure gauge in the line between pump and solenoid valve.

   b. When solenoid is actuated, check the operating pressure.

   c. If the hydraulic pressure is below 1,000psi, check the pump.

3. Check hydraulic oil level. See the Maintenance Section for information on hydraulic oil service and specifications.

Boom will not move right or left

If the boom will not move right and left, check the following:

1. Check the operation of the pendent control buttons. See troubleshooting fault, “Nothing Happens When Control Button is Pushed.”

2. Check lubrication of the boom bearings. If the boom bearings are dry or jammed, lubricate

them.

3. Check for foreign material wedged between the gears.
4. Check for gear teeth contact. It should not be a root contact. If so, loosen the bolts, securing the boom motor at its mount, to establish some backlash between the gears.
5. Check for a faulty hydraulic motor. Repair and replace as necessary
6. Check for a faulty solenoid or valve.
    a. With the engine running and the hydraulics engaged, place your hand on the solenoid valve that operates the up and down movement.
    b. Operate the “up” switch in the pendant panel. Listen or feel for a “click.” Do the same using the “down” switch. A click indicated that the coil is functioning.

Before starting to troubleshoot malfunctions of the boom, ensure that:

a. The hydraulic reservoir has the correct grade and quantity of hydraulic oil in it. Rectify any leaks in the system.
b. The unit’s engine is running and that the PTO to operate the hydraulic pump has been engaged using the proper procedure and other hydraulic systems such as the tail gate and hoist work. This will eliminate the speculation of faulty hydraulic pump, relief valve setting at the pump or the hydraulic control valve.
c. There is sufficient air pressure in the system. Rectify any air leaks.
d. Plugs and connectors are securely fastened.

Fault

1. No response to any of the switches.

Possible Cause

a. Power to panel switch not “on”.
b. Tripped circuit breaker.
c. Open electrical circuits.
d. Improper adjustment of flow divider (If equipped)
e. Faulty pressure carry over connection at the hydraulic control valve.

2. No up/down movement only

Possible Cause

a. Open electrical circuits.
b. Faulty solenoid or valve.

3. No left/right movement only

Possible Cause

a. Open electrical circuits.
b. Faulty solenoid or valve.
c. Boom bearing running dry or jammed.
d. Mechanical binding between boom motor gear and boom bearing gear.
e. Faulty boom motor.

5. Boom creeps up/down

Possible Cause

a. Internal leakage in boom cylinders.
b. Solenoid valve stuck partially open.
c. Wrong replacement solenoids used

6. Boom creeps from a. Boom brake not side to side.

Possible Cause

a. Solenoid valve stuck partially open.
b. Faulty hydraulic motor.

ACTIONS TO TAKE

FAULT 1.

Cause a.

Turn power to panel switch “on”.

Cause b.

Replace fuse with one of same value./Reset circuit breaker.

Cause c.

Check for loose wires behind control panel, in junction boxes, inside plug connectors, at solenoid valve switches, inside pendant switch panel. Also check for proper switch contacts. Repair or replace as necessary.

Cause d.

If so equipped, check flow out of the port marked “c”. It should be regulated for speed. Turning knob clockwise reduces and finally stops regulated flow. By turning it counter clockwise, the flow and the speed of the boom movement can be increased. Keep it regulated so the boom does not jerk and is always in control.

Cause e.

Remove hose connection at the pressure carry over port located at the left side of the hydraulic control valve and divert the flow either to a suitable container or back to the hydraulic

reservoir. Start the engine and engage the PTO. Oil should flow at the system pressure through the port. If not, shut off the engine and remove the pressure carry over fitting screwed into the side of the control valve and inspect it for cracks and the condition of the “O” rings. Repair or replace as necessary.

FAULT 2.

Cause a.

Trouble shoot as FAULT 1. Cause c.

Cause b.

With the engine running and the hydraulics engaged, place hand on the solenoid valve that operates the up and down movement. Operate the “up” switch in the pendant panel, feel or hear a click. Do the same using the “down” switch. A click indicates that the coil is all right. For full servicing of the solenoid refer to the memo on Electric over Hydraulic Solenoids.

FAULT 3.

Cause a.

Troubleshoot as FAULT 1. Cause c.

Cause b.

Lubricate boom bearing.

Cause c.

Check for foreign material wedged between the gears. Check for gear teeth contact. It should not be a root contact. If so loosen the bolts securing the boom motor at its mount, to establish some backlash between the gears.

Cause d.

Repair or replace hydraulic motor.

Cause e.

Troubleshoot as FAULT 2. Cause.

FAULT 4.

Cause a.

Operate hydraulic systems for a few times to purge air out of the system.

FAULT 5.

Cause a.

With the hydraulic pump disengaged, remove the two hoses from the boom cylinders and plug them. If after a while the boom creeps down, one or both cylinders are leaking internally. Rebuild or replace cylinders. If the boom does not creep down with the ports plugged and creeps only with the engine running and the hydraulic pump engaged, the fault lies with the pilot valve. Proceed as below.

Cause b.

If the solenoid operated pilot valve is stuck partially open due to dirt or other contamination, repair it as outlined in the trouble shooting procedure for “Electric Over Hydraulic Solenoid Valve”

Cause c.

Check old spools and replace with an exact match.

FAULT 6.

Cause a.

Proceed as in trouble shooting procedure for FAULT 4 causes a. through d.

Cause b.

Proceed as in FAULT 6 cause b.

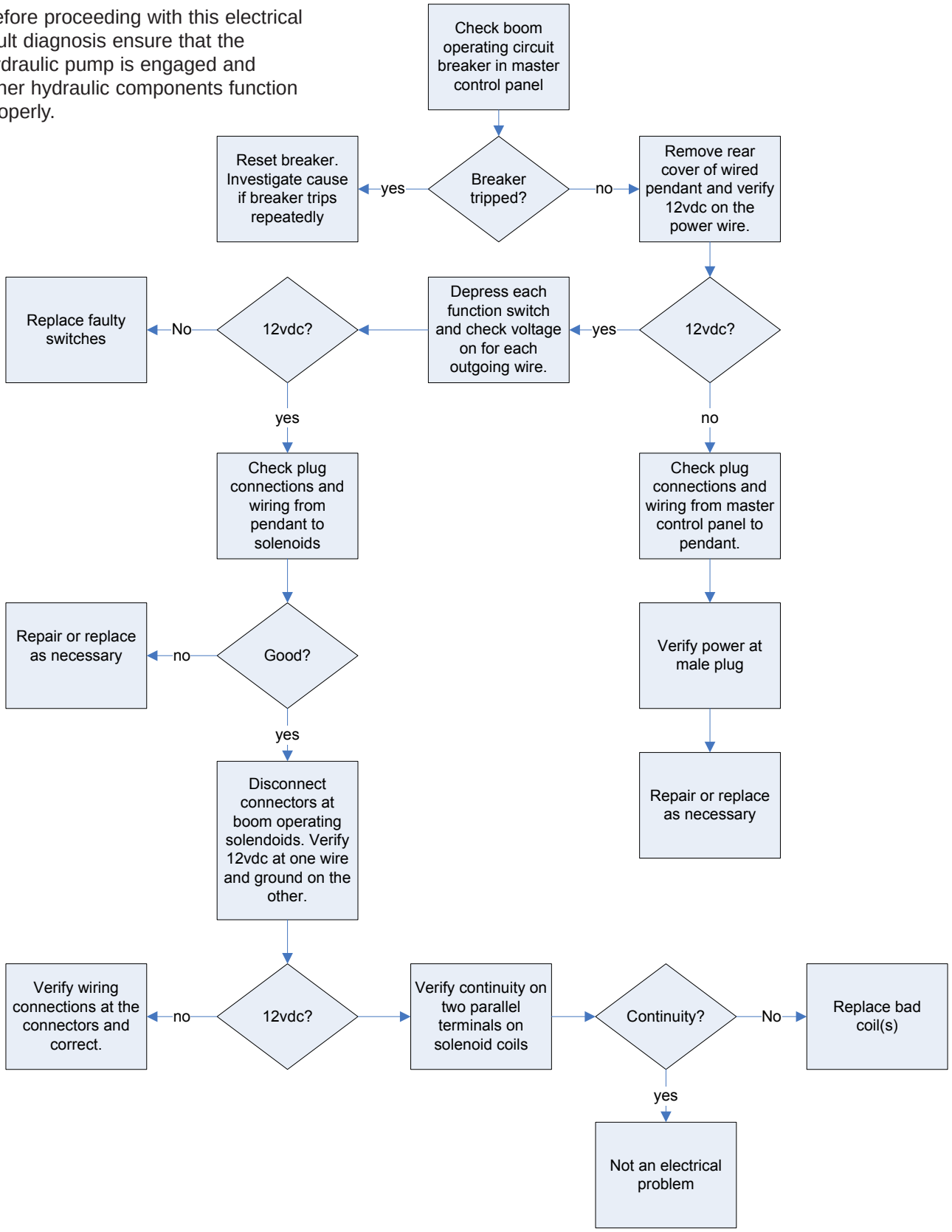
Cause c.

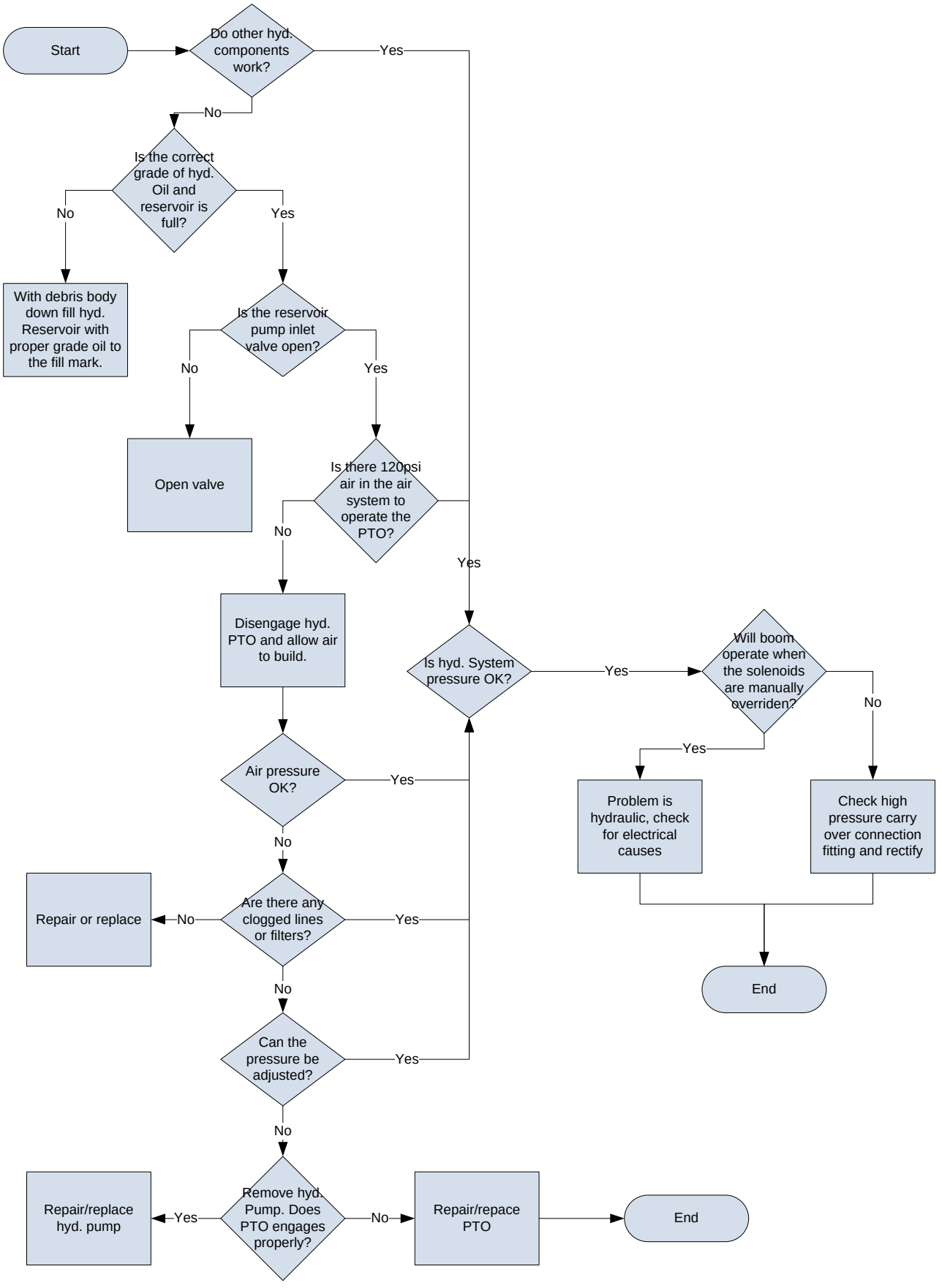
Repair or replace the hydraulic motor.

Trouble	Probable Cause	Remedy
Debris leaks from the seal between the inner and outer boom tube when unit is shut down.	Operator is shutting the vacuum system down with debris in tube. Debris runs between tubes and leaks out the seal.	Prior to shutdown of the vacuum system, raise the boom and allow the vacuum system to clear the tube of any debris.
Debris leaks from the seal between the inner and outer boom tube while vacuuming (telescoping boom, if equipped)	Excessive build up of debris between the inner and outer boom tubes.	Engage the vacuum system. Extend and retract the boom. At the same time, use a pressure washer to wash the seal area. If this does not stop the leak, disassemble the boom and clean the area between the inner and outer boom tube. Prior to shutdown of the vacuum system, raise the boom and allow the vacuum system to clear the tube of any debris.
Bottom of inner tube has holes in it causing leaks.	Excessive build up of material between the inner and outer boom tubes causing tube to rust and corrode as well as physical wear of the tube.	Replace the inner tube. Prior to shutdown of the vacuum system, raise the boom and allow the vacuum system to clear the tube of any debris.
Debris hose and / or tube wear out quickly.	Material being vacuumed is highly abrasive.	Add water to the material being vacuumed. Reduce the engine rpm. Reducing the air flow and / or adding more water reduces the abrasion factor of the material.
Debris leaks at boom turret.	Abrasive action of debris has worn through elbow.	Replace turret.

No response to and action of the pendant switch(s)

Before proceeding with this electrical fault diagnosis ensure that the hydraulic pump is engaged and other hydraulic components function properly.




Start
Do other hyd. components work?
Yes
No
Is the correct grade of hyd. Oil and reservoir is full?
No
Yes
With debris body down fill hyd. Reservoir with proper grade oil to the fill mark.
Is the reservoir pump inlet valve open?
No
Yes
Open valve
Is there 120psi air in the air system to operate the PTO?
No
Yes
Disengage hyd. PTO and allow air to build.
Is hyd. System pressure OK?
Yes
Will boom operate when the solenoids are manually overriden?
No
Yes
Problem is hydraulic, check for electrical causes
Check high pressure carry over connection fitting and rectify
End
Air pressure OK?
Yes
No
Repair or replace
No
Are there any clogged lines or filters?
Yes
No
Can the pressure be adjusted?
Yes
No
Repair/replace hyd. pump
Yes
Remove hyd. Pump. Does PTO engages properly?
No
Repair/repace PTO
End

Interlocks

Most throttle problems on the Guzzler are electrical and related to the throttle interlocks. An interlock is a safety mechanism that assures a specific function has to happen before a secondary function can occur.

Guzzler units with automatic transmissions have two interlocks, one on the parking brake and one on the transfer case. Units with standard transmissions have one interlock on the parking brake.

Note: The master switch at the master control panel must be ON.

Parking Brake Interlock

This system uses an air pressure switch for the interlock. This switch has two open electrical contacts. When the parking brake is on, air pressure is supplied, which closes the switch.

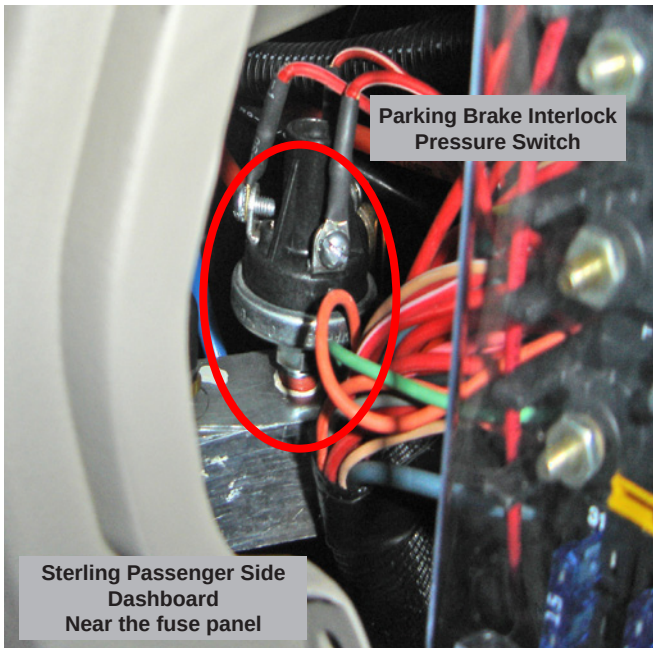
The throttle common ground is interlocked with a parking brake switch. The switch is located on the driver's side firewall. The interlock is located between the C5 plug and the ECU on the side of the engine. The wire is white and comes from pin #3 on the ECU

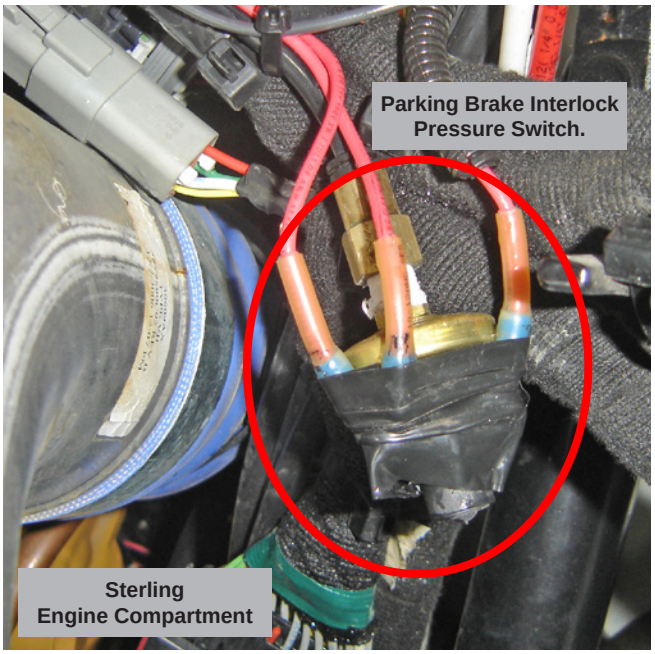
IH Chassis - The pressure switch in the passenger side dash center console.

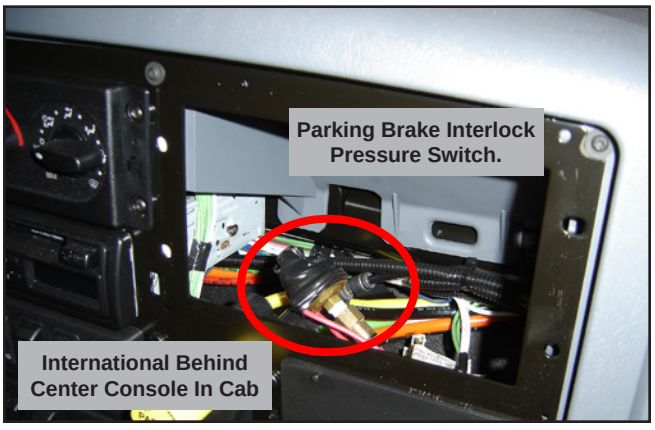
Sterling Chassis - The pressure switch can be under the dash or in the engine compartment.

Transfer Case Interlock

The transfer case interlock is only found on units with an automatic transmission. It consists of a relay and proximity sensor. The relay is in the control panel. The proximity sensor is located on the transfer case. It is activated magnetically. When the transfer case shifts, a mechanical rod moves under the sensor and closes the contacts. This assures that the transfer case is fully shifted into work mode. The proximity sensor provides the power signal to trip the relay when the transfer case is shifted to road mode.







Isolating the Vactor Throttle Wiring From the Chassis Throttle Wiring on CAT engines

Note: for other engines review the schematics for the comparable connections.

1. Put the transfer case in work mode when using this troubleshooting technique.
2. Isolate the Vactor throttle wiring from the chassis throttle wiring. Unplug Connector C5. Install jumpers in the pigtail **on the ECU side** at the C5 plug, C5A, and C5B.

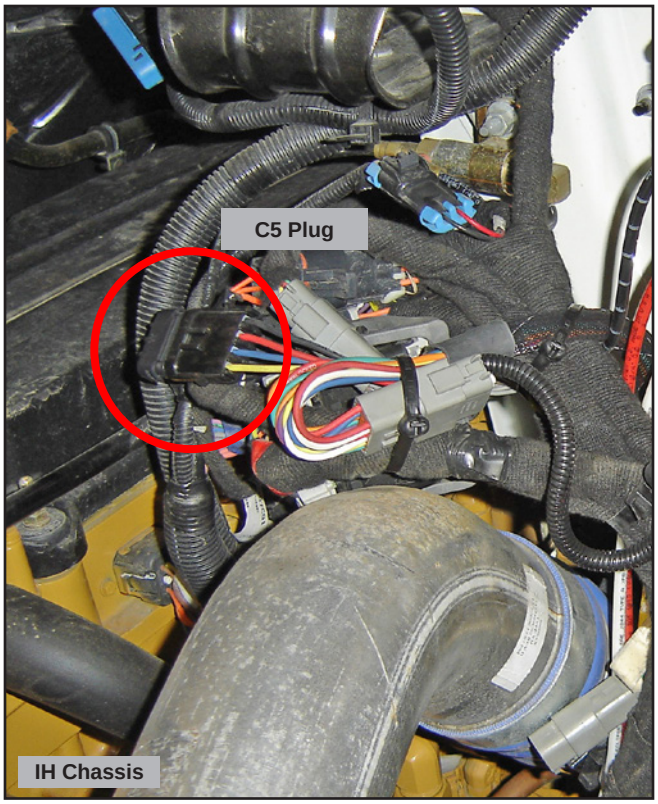
   Jumping C5D into the circuit should decrease the throttle

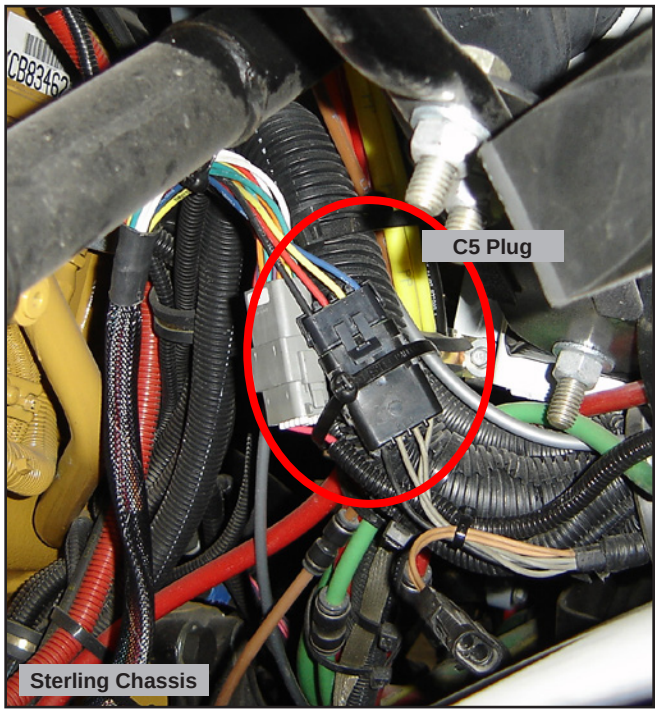
   Jumping C5C into the system should increase the throttle.

   If jumping the wires causes the throttle to increase or decrease appropriately, the problem is in the Vactor wiring module. If jumpering does not work, the problem is in the ECU or chassis access harness.

   Note: The parking brake interlock is still functional when jumping the circuits.
3. After isolating at C5, check the parking brake interlock. Use a continuity test to verify the switch is opening and closing. While parking brake is on, it should be closed. When the parking brake is off, the switch should be open.

   If the switch does not open and close, replace it.





Explanation of the Interlock Circuit

Reference Schematic 1000473L

A Terminals 5 and 6 on the master power switch activate the throttle enable function. See “A” on the schematic.

Terminal 5 contains a blue/black wire coming from terminal C1-9, the throttle common wire. Terminal 5 also contains a blue/black wire that acts as a common signal wire coming from the throttle up and down switch.

Terminal 6 contains a blue/black/white wire coming from terminal C1-3, the throttle on signal wire.

B Terminals 87 and 30 on the relay complete the throttle enable function through pin 56 at the ECU and terminal C5B at throttle connector C5. The throttle is then increased or decreased through a separate toggle switch up or down. See “B” on the schematic.

Common Schematics For Reference

Manual Transmission

1000465J Electrical Schematic-Guzzler Series Control Panel

1000468W Electrical Schematic-Guzzler Series Electronic Throttle

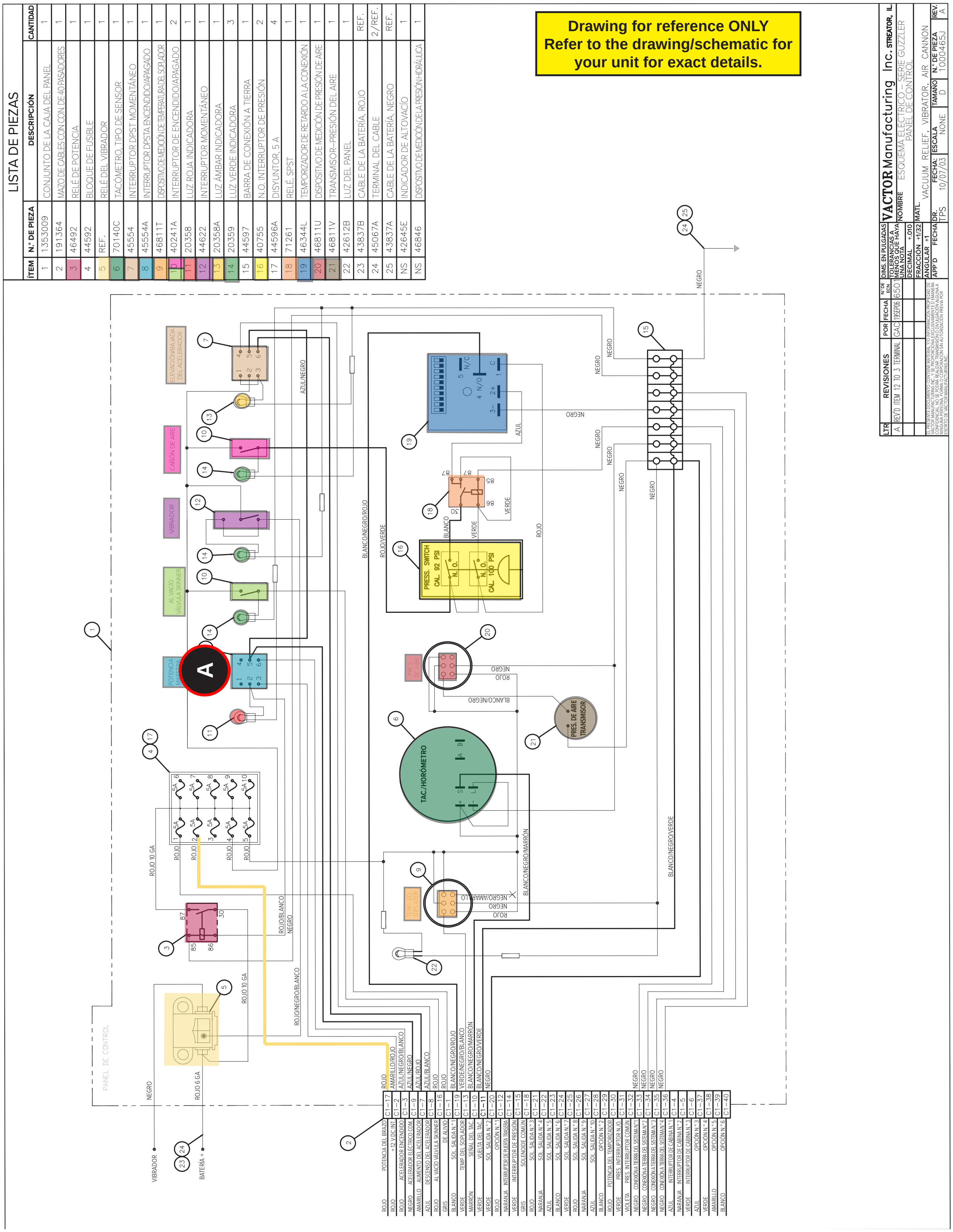
1000472 Electrical Schematic - Guzzler Series Harness #191362A Standard Options

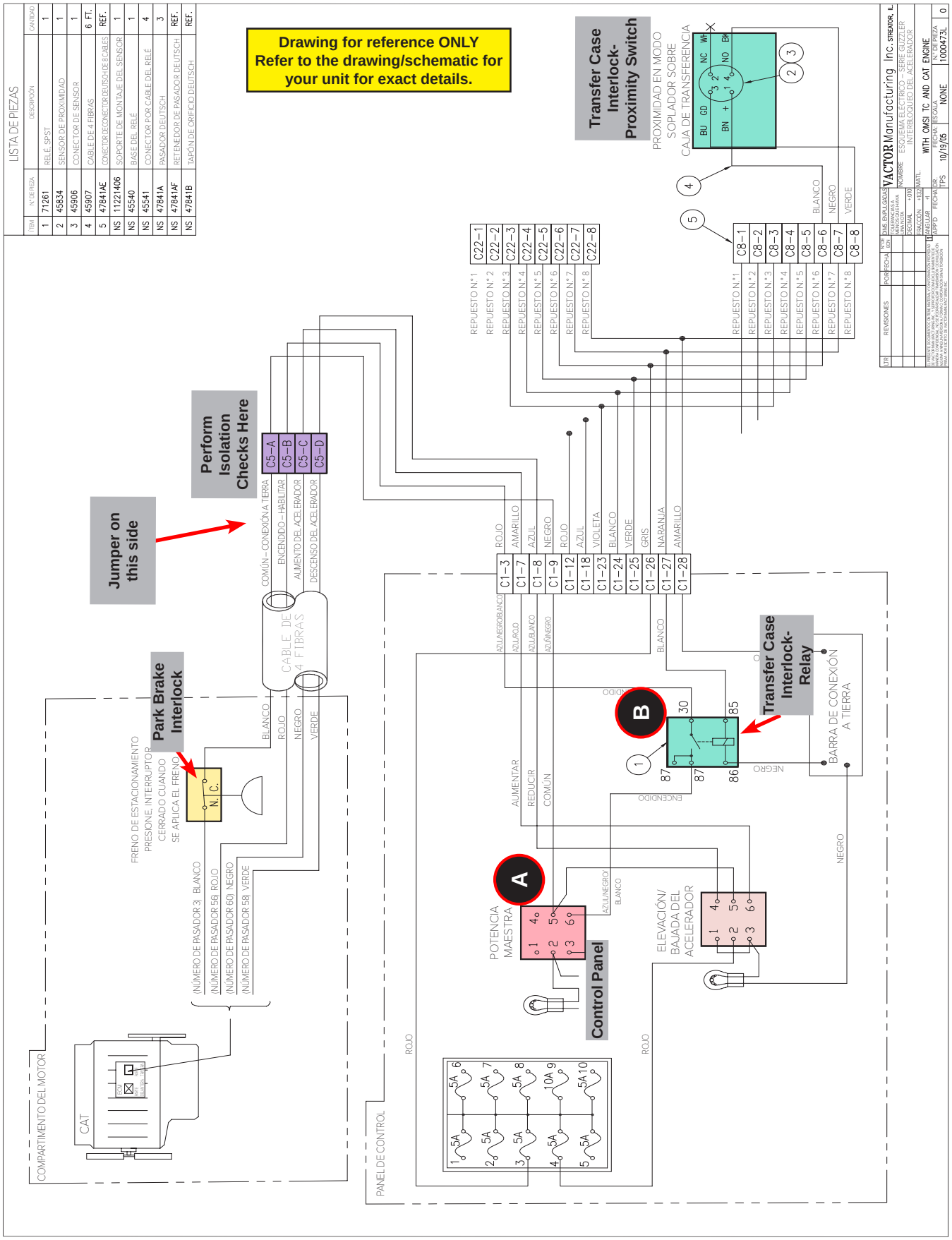
Automatic Transmission

1000473L Electrical Schematic-Guzzler Series Throttle Interlock

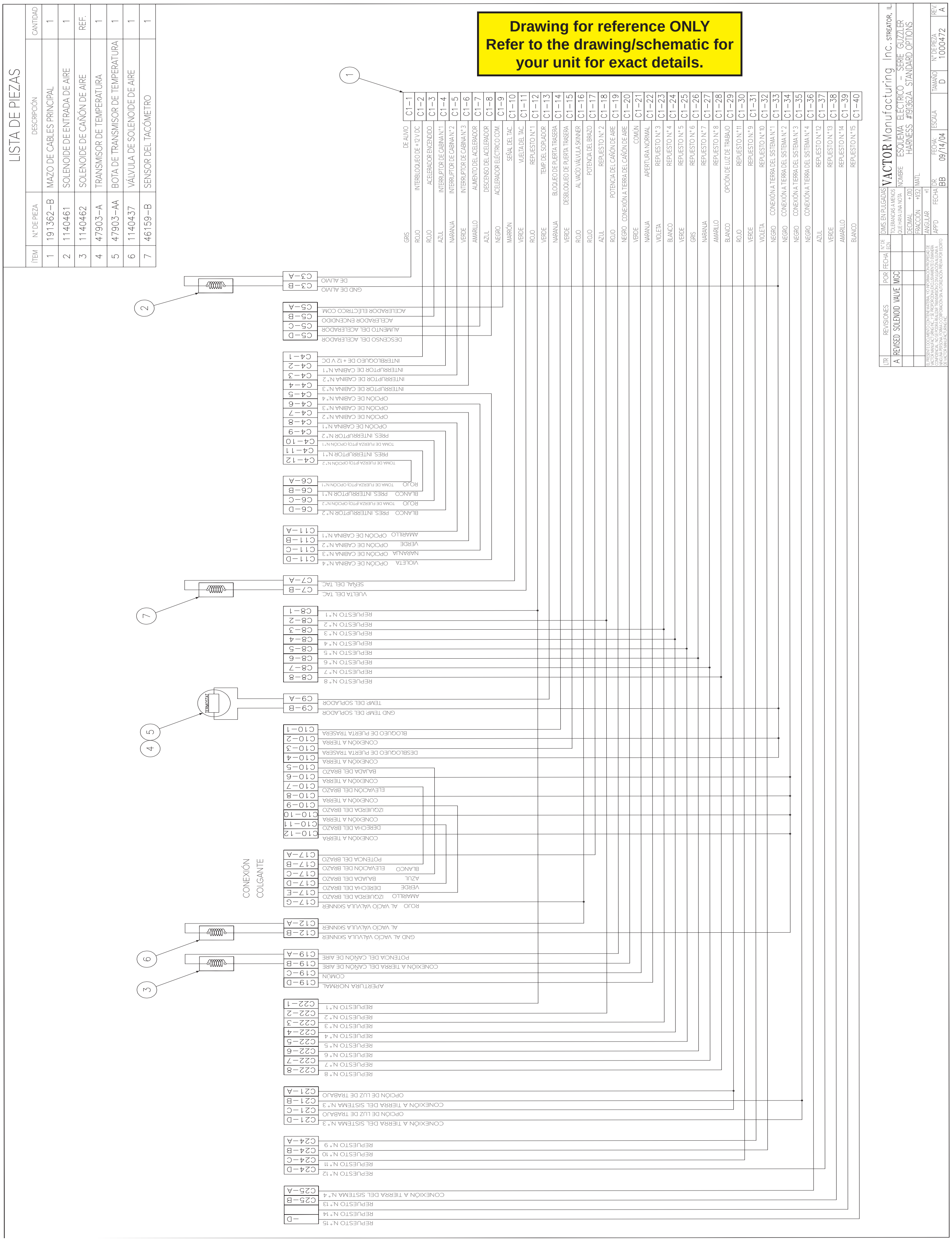
1000468W Electrical Schematic-Guzzler Series Electronic Throttle

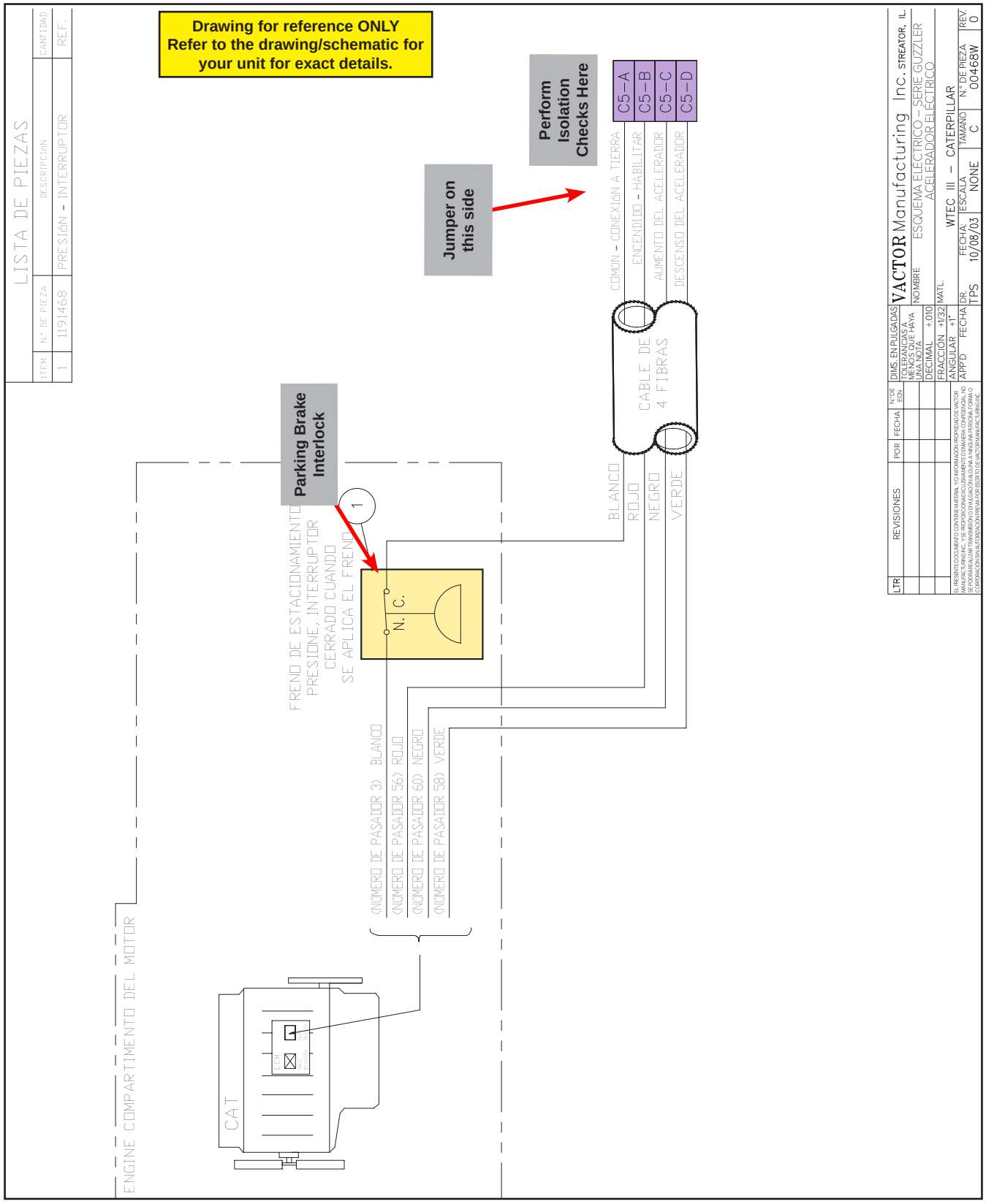
1000511E Electrical Schematic-Guzzler Series Throttle Interlock for Cummins engines


Drawing for reference ONLY
Refer to the drawing/schematic for your unit for exact details.


Drawing for reference ONLY
Refer to the drawing/schematic for your unit for exact details.
Transfer Case Interlock- Proximity Switch
PROXIMIDAD EN MODO SOPLADOR SOBRE CAJA DE TRANSFERENCIA
Perform Isolation Checks Here
Jumper on this side
Park Brake Interlock
Transfer Case Interlock- Relay
Control Panel
POTENCIA MAESTRA
ELEVACIÓN/ BAJADA DEL ACELERADOR
BARRA DE CONEXIÓN A TIERRA
CABLE DE 4 FIBRAS
COMPARTIMENTO DEL MOTOR
PANEL DE CONTROL
FRENO DE ESTACIONAMIENTO PRESIONE, INTERRUPTOR CERRADO CUANDO SE APLICA EL FRENO
VACTOR Manufacturing Inc. STREATOR, IL
ESQUEMA ELÉCTRICO – SERIE GUZZLER
INTERBLOQUEO DEL ACELERADOR
WITH OMSI TC AND CAT ENGINE
1000473L
LISTA DE PIEZAS

Drawing for reference ONLY
Refer to the drawing/schematic for your unit for exact details.

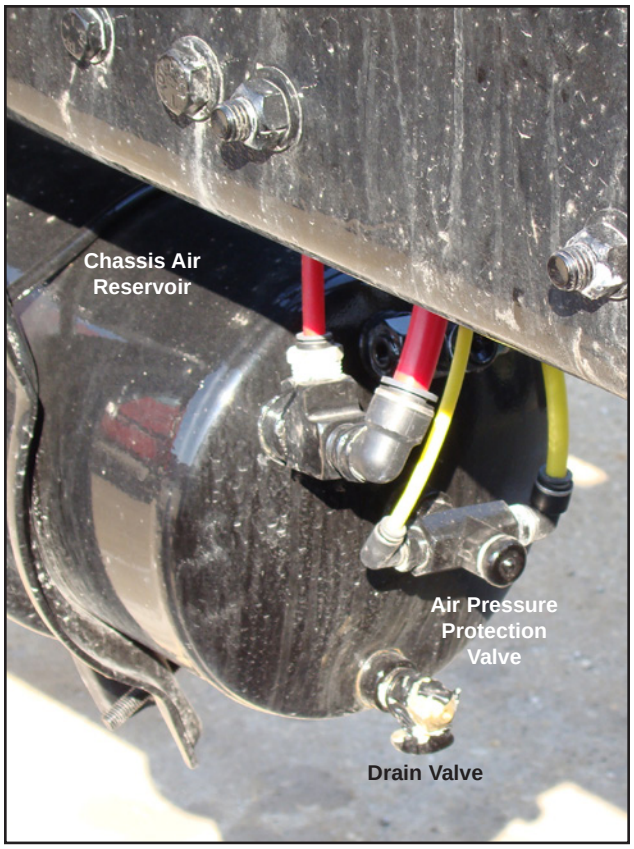



Drawing for reference ONLY
Refer to the drawing/schematic for your unit for exact details.
Perform Isolation Checks Here
Jumper on this side
C5-A
C5-B
C5-C
C5-D
COMÚN - CONEXIÓN A TIERRA
ENCENDIDO - HABILITAR
AUMENTO DEL ACELERADOR
DESCENSO DEL ACELERADOR
CABLE DE 4 FIBRAS
BLANCO
ROJO
NEGRO
VERDE
Parking Brake Interlock
FRENO DE ESTACIONAMIENTO PRESIONE, INTERRUPTOR CERRADO CUANDO SE APLICA EL FRENO
1
N. C.
(NÚMERO DE PASADOR 3) BLANCO
(NÚMERO DE PASADOR 56) ROJO
(NÚMERO DE PASADOR 60) NEGRO
(NÚMERO DE PASADOR 58) VERDE
ENGINE COMPARTIMENTO DEL MOTOR
CAT
LISTA DE PIEZAS
ITEM
Nº DE PIEZA
DESCRIPCIÓN
CANTIDAD
REF.
1
1191468
PRESIÓN - INTERRUPTOR
VACTOR Manufacturing Inc. STREATOR, IL.
ESQUEMA ELÉCTRICO – SERIE GUZZLER
ACELERADOR ELÉCTRICO
WTEC III – CATERPILLAR
00468W
REVISIONES
DIMS. EN PULGADAS
TOLERANCIAS A MENOS QUE HAYA UNA NOTA
DECIMAL +.010
FRACCIÓN +1/32
ANGULAR +1°
APP'D
FECHA
DR
TPS
10/08/03
ESCALA
NONE
TAMAÑO
C
Nº DE PIEZA
REV.
0

All pneumatic controls added to the chassis by Vactor are fed from the chassis air reservoir through an air pressure protection valve. This valve acts like an electrical fuse by not allowing the reservoir air pressure to drop below about 70psi. When air pressure drops to about 75psi the valve closes and shuts off the Vactor systems. Normal chassis operating air pressure is about 120psi. By limiting the available air pressure to a minimum of 75psi the chassis will still have functional brakes and other needed systems.

The valve typically fails due to debris in the air system and corrosion. The valve may work intermittently or fail either open or closed. If the valve fails open, an air leak may deplete the chassis air system if there is a significant system failure on the Vactor side. If the valve fails closed no air will be supplied to the Vactor systems. Either can be verified by putting an air gauge in the system. The valve is not user serviceable and must be replaced.

Note: There are a variety of these valves in service. Some are supplied by the chassis manufacturers. Appearance will vary.



International chassis are equipped with a variety of air solenoids for use by builders. For the most part they are very similar for troubleshooting purposes.

A variety of functions are controlled in the cab using switches and air solenoids provided by the chassis manufacturer. Some of these control air solenoids located under the driver seat tucked in between the frame rail and transmission. The following information provides a basic guide to troubleshooting issues.

There are two systems used by International. The first is a single seven solenoid bank system in use to about mid-2007. The other system employes one or more four solenoid banks. This system started about mid-2007. Both systems are presented here. The physical inspections for wiring and connectors are the same. Replacement solenoids are the same for both.

Transfer case solenoids

The normally open solenoid provides air flow to the transfer case (TC) road mode. With the chassis ignition on air should flow from this valve if the air line is removed. When the blower mode is actuated the normally open valve should close and the normally closed valve should open providing air flow to engage the blower mode.

PTO

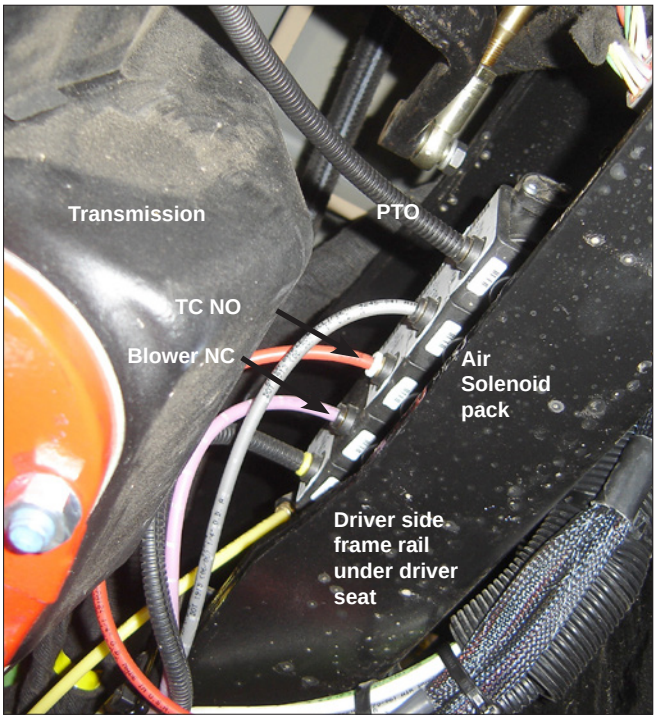
If PTO keeps kicking out the normally open PTO solenoid should be checked first.

1. The PTO solenoid is normally the forward one.
2. The third solenoid is the transfer case.
3. Test the solenoid valve by switching the PTO NC solenoid valve with the transfer case NO valve. (This is temporary).
4. When switching keep track which air line goes where.
5. A #10 torx screwdriver is required (6” works best)
6. If PTO works with the transfer case solenoid, then replace with a new one.
7. When finished with test replace transfer case solenoid with the original valve.

To check codes (International can assist with code diagnosis)

1. Turn on ignition switch (engine off)
2. Cruise controls
3. Simultaneously hold ON & ACCELL switch at the same time
4. Watch the odometer readout
5. It will provide the amount of error codes
6. P= passive a= active
7. Always record top &bottom codes

8 Press the tripometer to scroll through the codes faster if needed.



Note: airline color coding varies

To clear inactive codes

1. Only do this after recording all codes
2. Cruise control
3. Hold ON & SET (simultaneously)

IH Replacement Parts List

Part No.	Description	Qty.
1191783	Remote Power module	1
1191784	Air Solenoid “yellow ring” air horn	1
1191785	Air Solenoid “black ring” normally closed - BLOWER MODE and PTO	1
1191786	Air Solenoid “white ring” normally open - ROAD MODE	1

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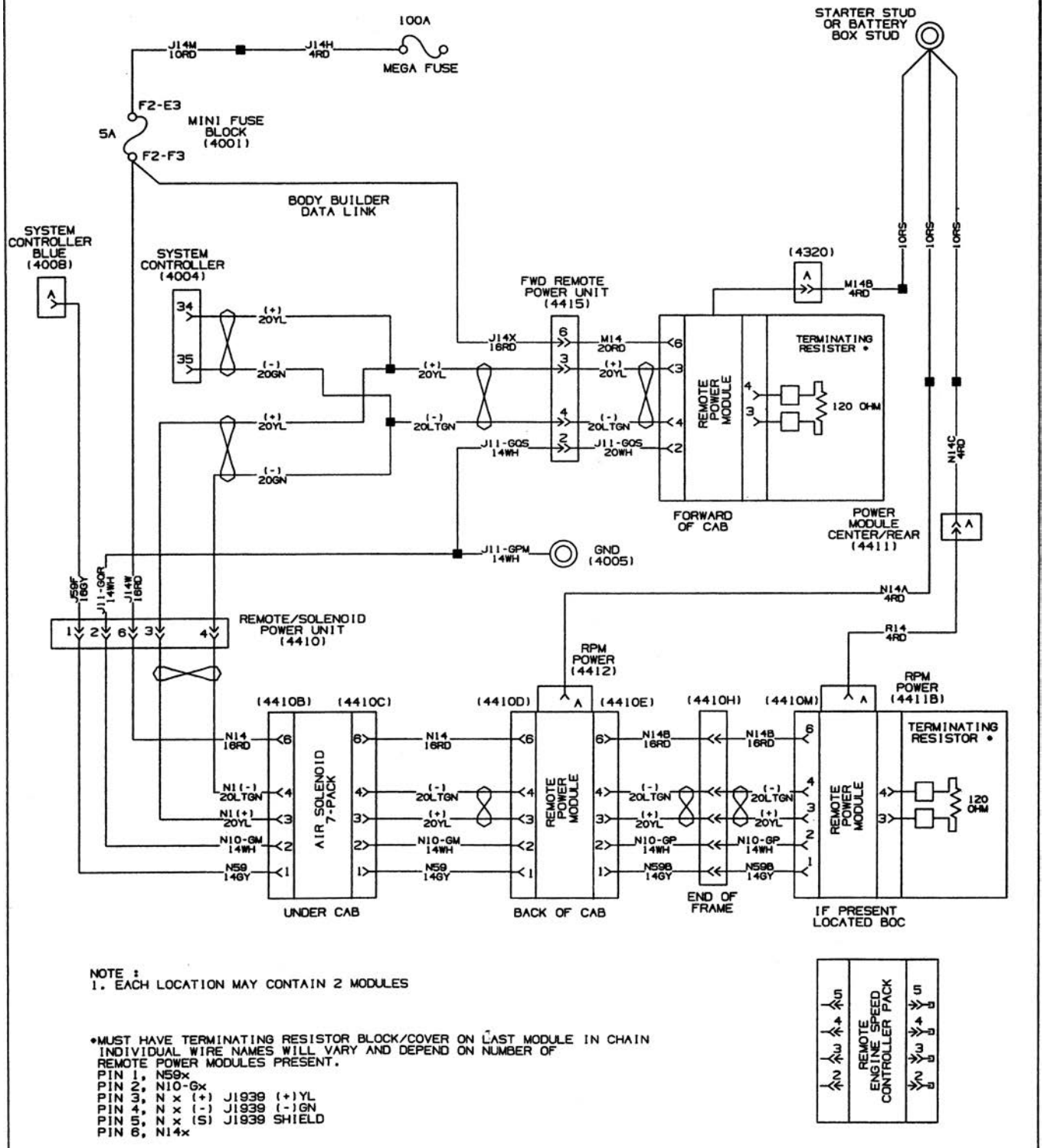
ELECTRICAL CIRCUIT DIAGRAM CHAPTER 9

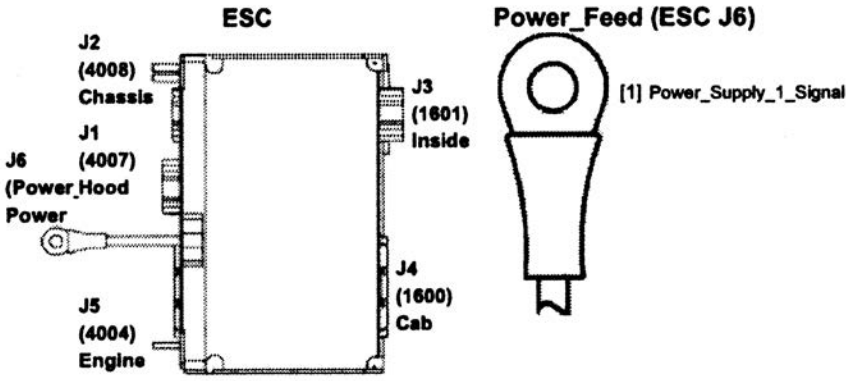
REMOTE POWER UNITS, SOLENOID PACKS, REMOTE ENGINE SPEED CONTROLLER



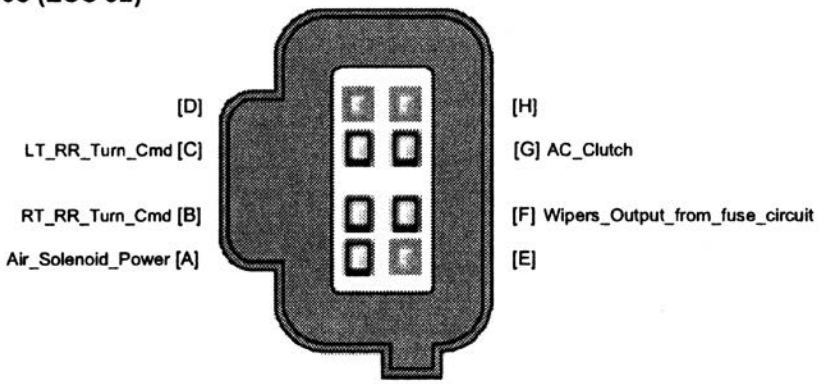
NOTE :
1. EACH LOCATION MAY CONTAIN 2 MODULES

*MUST HAVE TERMINATING RESISTOR BLOCK/COVER ON LAST MODULE IN CHAIN
INDIVIDUAL WIRE NAMES WILL VARY AND DEPEND ON NUMBER OF REMOTE POWER MODULES PRESENT.
PIN 1, N59x
PIN 2, N10-Gx
PIN 3, N x (+) J1939 (+)YL
PIN 4, N x (-) J1939 (-)GN
PIN 5, N x (S) J1939 SHIELD
PIN 6, N14x

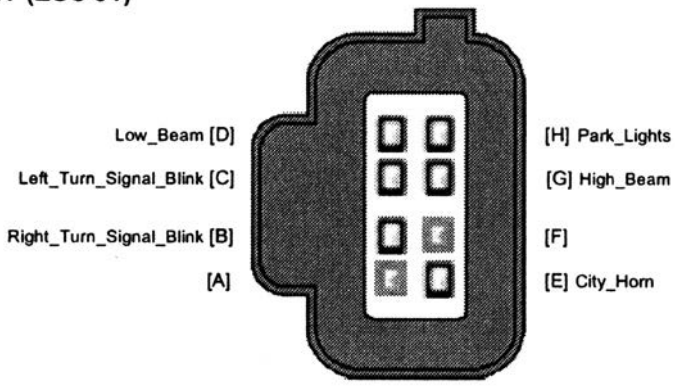
CHK	DATE	CHANGE	REV	REFERENCE	DRAWN	NAME
	05EP05	CONVERSION FROM SABER TO UG	F	59756E	U00JXP9	42/43/44/85/8600 & 73/74/7500 CIRC DIAGRAMS
					RELEASE NO. 52778H	DATE 10AUG00 PART NO. AE08-52373 SHEET 15



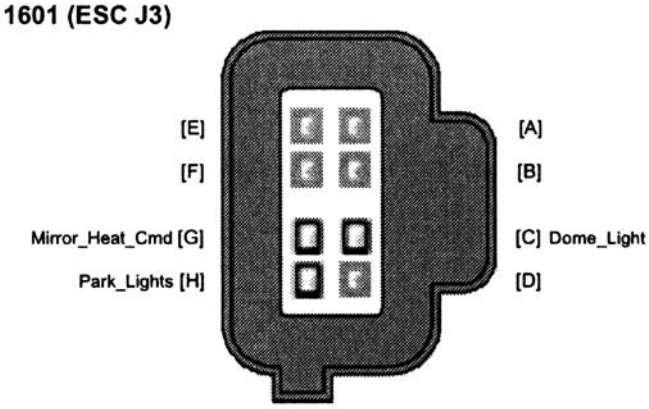
4008 (ESC J2)



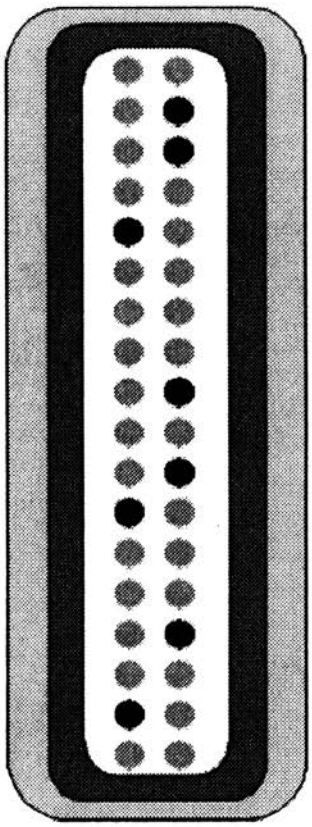
4007 (ESC J1)



1601 (ESC J3)

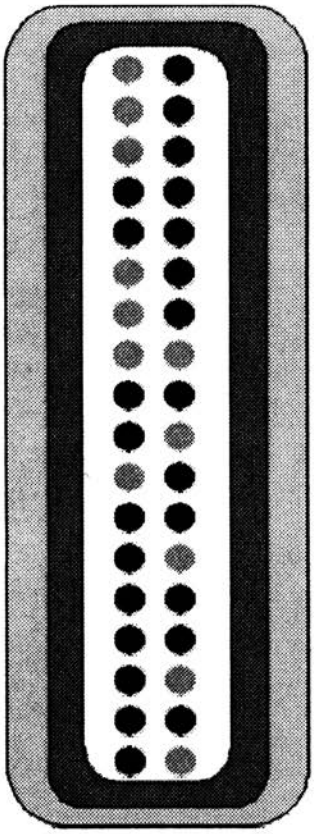


4004 (ESC J5)



	[1]	[19]	
	[2]	[20]	Wiper_High_Speed
	[3]	[21]	Brake_Lights
	[4]	[22]	
Fuel_Sensor1_Signal	[5]	[23]	
	[6]	[24]	
	[7]	[25]	
	[8]	[26]	
	[9]	[27]	Switched_5V_Sense_Signal
	[10]	[28]	
	[11]	[29]	Wiper_Low_Speed
Low_Washer_Fluid_WL_Signal	[12]	[30]	
	[13]	[31]	
	[14]	[32]	
	[15]	[33]	Brake_Switch_Signal, Brake_Analog_Switch_Signal
	[16]	[34]	
Trailer_Marker_Relay	[17]	[35]	
	[18]	[36]	

1600 (ESC J4)

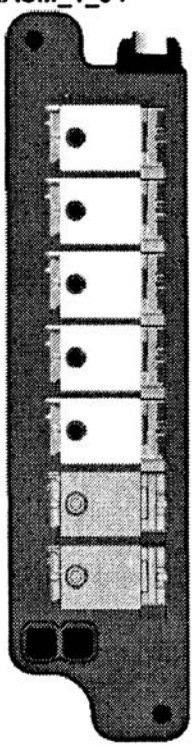


	[36]	[18]	Right_Turn_Signal_Switch
	[35]	[17]	Clutch_Switch_Signal
	[34]	[16]	Secondary_Air_Pressure
Brake_Analog_Switch_Signal, Brake_Switch_Signal	[33]	[15]	Primary_Air_Pressure
Park_Brake_Switch_Signal	[32]	[14]	Headlight_Enable_Signal
	[31]	[13]	Elec_City_Horn_SW_Signal
	[30]	[12]	Ignition
	[29]	[11]	
Washer_Pump_Signal	[28]	[10]	Cruise_Switch_Signal
Switched_5V_Sense_Signal	[27]	[9]	
	[26]	[8]	RCD_HVAC_Ctrl_Head_Diag_Signal
Door_Switch	[25]	[7]	AC_Request
Wiper_2_Signal	[24]	[6]	
Wiper_1_Signal	[23]	[5]	Air_Horn_SW_Signal
Wiper_0_Signal	[22]	[4]	Park_Brake_Relay_Cmd
Flash_To_Pass_Signal	[21]	[3]	
Highbeam_Signal	[20]	[2]	Bias_Voltage_Signal, Accessory
Left_Turn_Signal_Switch	[19]	[1]	

Air Solenoid Valve /RASM_1_J4

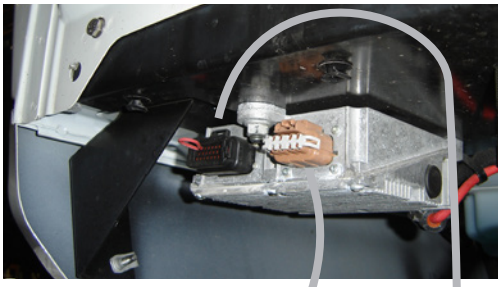
Address: 34
Configured
Location: Solenoid #1
Data Link: Body Builder J1939

_J4
(RASM_1_J4)



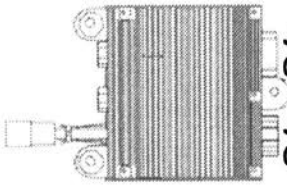
[1] Air_Horn
[3] SSpd_Xfer_Case_NC_Sol_Cmd
[5] SSpd_Xfer_Case_NO_Sol_Cmd
[7] PDL_Lock_Solenoid_Cmd
[9] TEM_PTO_Air_Solenoid_Cmd
[11]
[13]

Remote Power Module
(Normally located under the driver seat under the cab)



Remote Power Module #1

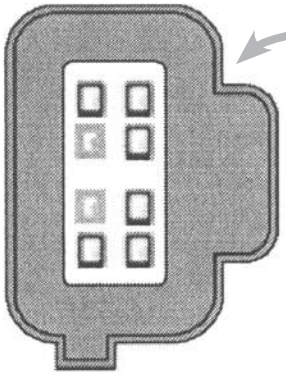
Address: 225
Configured
Location: 1st back of cab
Data Link: Body Builder J1939



J3
(RPM_1_J3)
J4
(RPM_1_J4)

RPM_1_J4

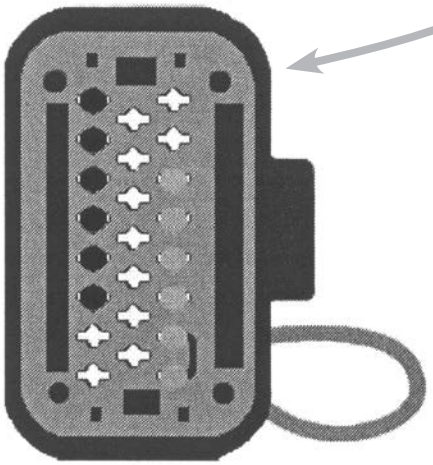
PwrMod1_Output5_Cmd [E]
[F]
[G]
PwrMod1_Output6_Cmd [H]



[A] PwrMod1_Output1_Cmd
[B] PwrMod1_Output2_Cmd
[C] PwrMod1_Output3_Cmd
[D] PwrMod1_Output4_Cmd

RPM_1_J3

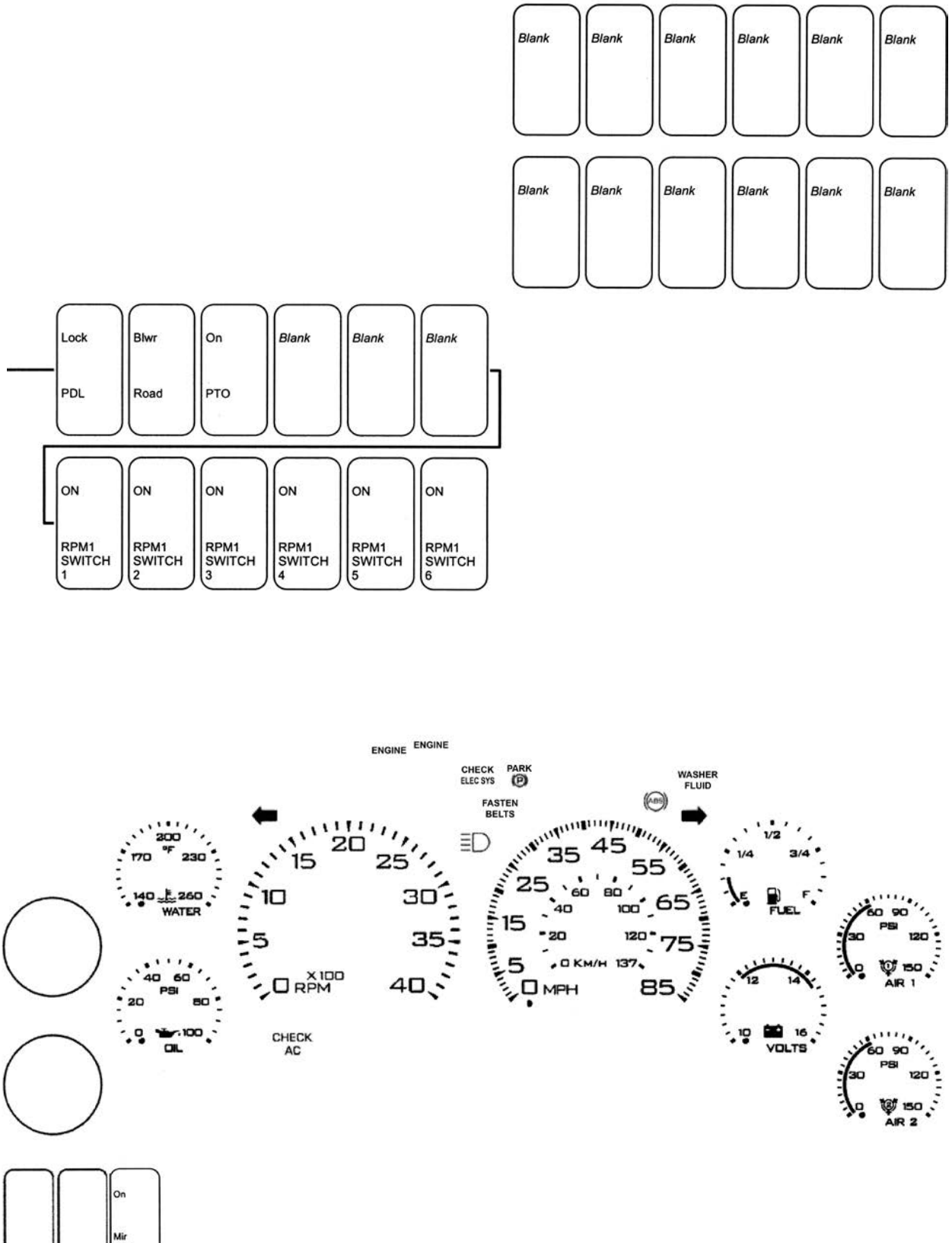
RPM1_Generic_Input6_12V,	RPM1_Generic_Input6_GND [23]
RPM1_Generic_Input5_12V,	RPM1_Generic_Input5_GND [22]
RPM1_Generic_Input4_12V,	RPM1_Generic_Input4_GND [21]
RPM1_Generic_Input3_12V,	RPM1_Generic_Input3_GND [20]
RPM1_Generic_Input2_12V,	RPM1_Generic_Input2_GND [19]
RPM1_Generic_Input1_12V,	RPM1_Generic_Input1_GND [18]



[6]
[5]
[4]
[3]
[2]
[1]

Instrument Panel: 1HTWYSBT25J042390

Mon Apr 03 08:12:03 CDT 2006



The following procedure with assist in determining if there is a chassis problem with the solenoid bank.

Make sure the park brake is set. If the brake is not set the codes cannot be displayed.

Turn the key to the ON position and wait for the gages to cycle and return to the proper position.

In the picture you see the odometer in normal configuration. Note this is an automatic transmission display. Manual transmission display will look similar, but without the range selector display

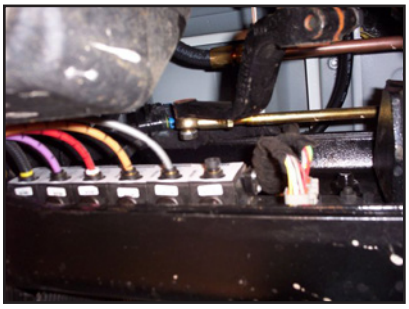
This photo shows the cruise switches you must depress and hold On and Accelerate simultaneously for a period of 5 seconds. This will bring up the cab diagnostic trouble codes.

This is how faults are displayed. In this case 2 faults are showing. Continue to watch as the computer will scroll through the faults.

This photo shows the first displayed code on the odometer. This code is 1231_14A 209 : 1 All codes are 14A or 14P (14A is a active code 14P is passive code) In this case the code is Active meaning that there is something wrong at this time. You need to record all codes both active and passive at this time. Note you may have a code displayed as a passive code if the switch is not in the ON position for the function that you are having problems with. After this is done turn the key to the OFF position and step outside of the truck.

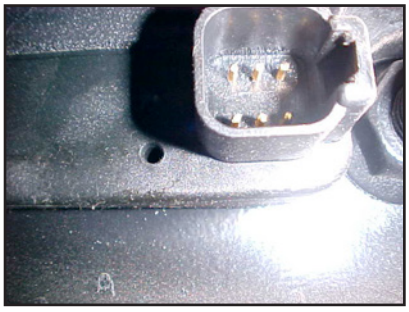
In this photo you can see the Remote Power Module that is bolted to a bracket under the cab on the driver side of the truck. What you need to do is remove the terminating resistor (red arrow) and the 6 wire connector (yellow arrow) for the wiring and inspect for corrosion or bent pens. Correct as needed, be sure to properly reinstall both the terminating resistor and the 6 way plug. Both should lock in place.

This is a picture of the 7 pack solenoid bracket mounted inside the drivers side fame rail. As you can see there are two connectors. One is an input, the other is a output to the Remote Power Module located under the cab.

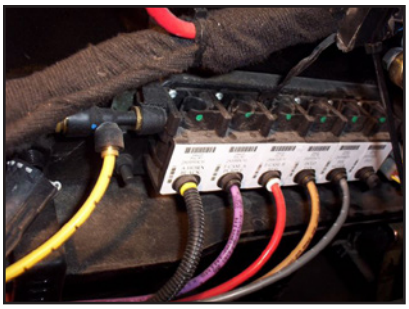


Remove each connector and inspect for corrosion. Also check for rubber seal to be in place. Look at pins in the bracket for corrosion or damage. If everything appears OK reinstall connectors. Be sure each locks in place.

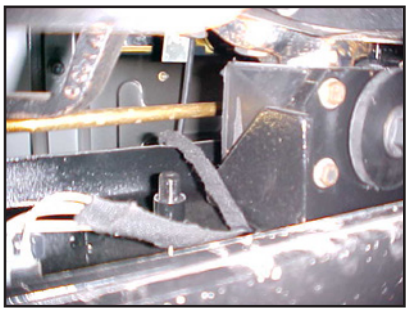
This picture shows what the pins should look.



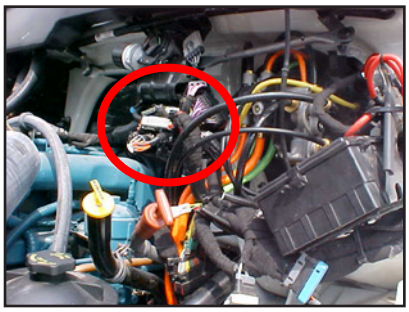
Looking left to right the first solenoid is air horn (Yellow ring) second (black ring) is the blower solenoid, third (white ring) is road solenoid, fourth is driver controlled locking differential, fifth is power divider lock, sixth is PTO solenoid. Note all trucks don't have driver controlled locking differential. This moves the fifth and sixth solenoid to the number four and five position.



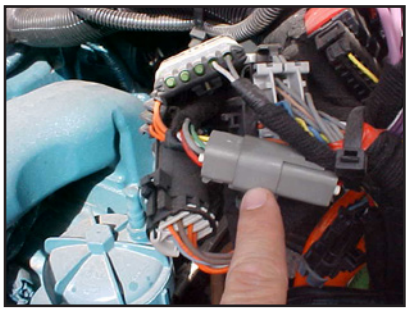
This picture shows the wiring to the 7 pack. As you can see it crosses the frame rail and also runs close to the clutch linkage. It is very uncommon for the wiring to short to the frame due to the protective shield. But we have seen problems if the zip tie brakes. It will allow the wiring to get into the clutch linkage and cause a short which results in the 7 pack system shutting down.



This is a picture of the wiring under the hood. Notice the bundle of wiring shown.

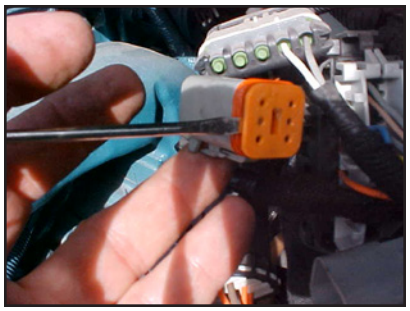


This is the connector to unplug and inspect for corrosions or damaged pins. This connector is in the bundle of wires, sometimes you have to move the various connectors around to find this connector. Make sure to get the connector locked when you plug it back together.

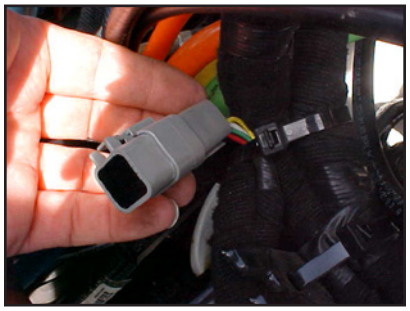


This is how the inside of the connector should look. As you can tell there is no sign of corrosion, damaged pins or sign of moisture in this connector.

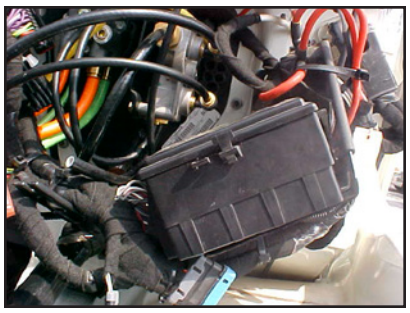
This is what the mating connector should look like. As you can tell there is no sign of moisture or corrosion. You can also see that there is a trace of dielectric grease. This connector should have a small amount of dielectric grease to insure proper connection.



This is a picture of the Terminating resistor. This resistor is also located under the hood. It is 10 to 12 inches from the previous connector. This connector has a resistor installed in the connector and also needs to be checked for corrosion and moisture. Note the terminating resistor must be installed for proper operation. The resistor is sealed under the black cover.

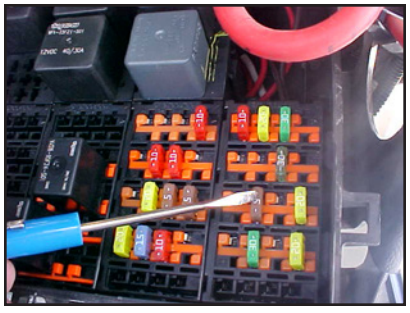


This is a picture of the power distribution center under the hood. There is a 5 amp fuse located in the box that controls the air solenoids and remote power module.

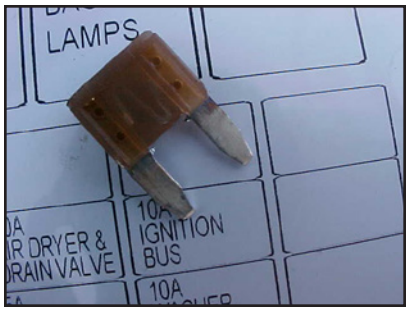


Remove the lid to the power distribution box and look at the diagram on the inside of the lid. Locate the remote power module fuse.

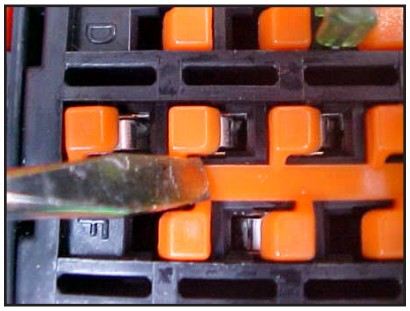
This is the location of the fuse. Remove the fuse and inspect.



Look closely to see if the fuse is blown. You also want to look at the prongs for corrosion.



As you can see in this picture there are two very small terminals that the fuse plugs into. Inspect for corrosion and make sure the terminals are still locked in place and not slid back down in the distribution box.

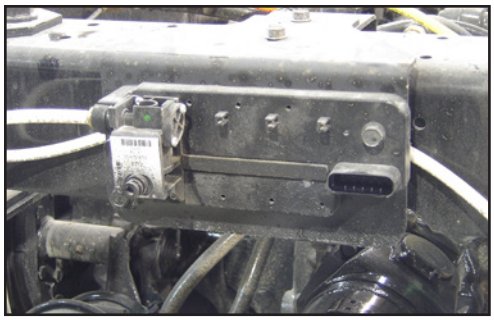


At this point you have completed all the checks that can be done in the field. You need to get back in the cab of the truck and check the codes again.

This photo shows the cruise switches, you must depress and hold On and Accelerate simultaneously for a period of 5 seconds. This will bring up the cab diagnostic trouble codes.

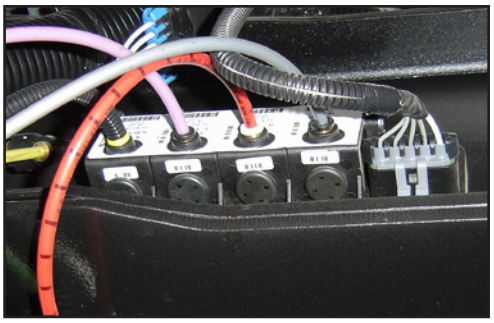
Once you pull the codes and see the faults displayed on the odometer again, turn on the Left turn signal. Once you have done this depress ON and SET on the cruise switches and hold for 5 seconds. This will clear all inactive codes.

If the problem was corrected when the previous checks were done you will see NO FAULT displayed on the odometer. At that point test to if the blower and PTO function properly. If it doesn't function properly check to see if faults have reoccurred. If so it will need to go to the nearest International dealer for further diagnosis.



Single valve on 4-valve bank mounting plate. This valve is normally used for the TC/PTO and is located behind the TC.

4-valve bank located inside the frame rails under the driver's seat.



BODY CONTROLLER DIAGNOSTIC TROUBLE CODES

1. DISPLAYING DIAGNOSTIC TROUBLE CODES

The ability to display diagnostic trouble codes (DTC) is an optional feature. Codes may be displayed on either the gauge cluster or an optional vehicle information display (VID). The vehicle must be equipped with the option to display codes in both cases. Codes will not be displayed on the gauge cluster if the vehicle is equipped with the VID.

1.1. VEHICLES EQUIPPED WITH OPTION TO DISPLAY CODES

1.1.1. Displaying Codes on the Gauge Cluster (Non-VID equipped vehicles)

To display codes on vehicles not equipped with a VID:

1. Set the parking brake.
2. Turn the key switch to the ACCESSORY position to view only previously active codes. Turn the key switch to the IGNITION position to view both active and previously active codes.
3. Momentarily press the Cruise "ON" switch and the Cruise "Resume" switch at the same time.

A gauge sweep will be performed on the gauges. The gauge cluster will then display the following information for 5 seconds:

- Software Rev: XXX
- Hardware Rev: XXX
- Active Faults: XXX
- Total Faults: XXX

NOTE – The gauge cluster will only display "Software Rev" and "Hardware Rev" for 5 seconds followed by the message "Diagnostic Trouble Codes are not available" if the vehicle is not equipped with the option to display codes.

If faults are present, the gauge cluster display will show each diagnostic trouble code for 10 seconds and then automatically scroll to the next entry and continue to cycle through the faults. Once all faults have been displayed the number of faults will be displayed again, then the cycle will repeat. To manually cycle through the fault list press and release the cluster display selector button. The following information will be displayed for each fault:

SPN: XXXX FMI: XX

Active

OC: XXX SA: XXX

SPN: XXXX FMI: XX

Previously Active

OC: XXX SA: XXX

NOTE – Turning the key switch off, turning the key switch to the CRANK position, or releasing the park brake will take the gauge cluster out of the diagnostic mode.

BODY CONTROLLER DIAGNOSTIC TROUBLE CODES

1.1.2. Displaying Codes on the VID (if equipped)

The VID can be used to display all diagnostic trouble codes (DTC) on the vehicle. Suspect parameter number (SPN), failure mode indicator (FMI) and occurrence count numbers are listed. Source addresses and DTC descriptions are presented in plain text.

NOTE – The VID will display "Not Available" if a DTC description is not available for a particular fault.

Displaying codes will only be allowed if all of the following conditions are true:

- The key switch is in the IGNITION position.
- AND displaying codes is allowed due to vehicle orderable options
- AND the programmable parameter "Diagnostics" is enabled using Diamond Logic® Builder (DLB).
- The vehicle is not moving (the Vehicle Speed is equal to zero).
- The feature is not password protected to prevent unauthorized access. Refer to the Vehicle Information Display Owner's Manual for more information.

Perform the following steps if all of the above conditions are met:

1. Go to the main menu screen

NOTE – The following selections will not be available if the vehicle is not equipped with the option to display codes.

1. Select "DIAGNOSTIC CODES"
2. Select "ACTIVE" or "INACTIVE". The VID may initiate a password prompt if the VID has been password protected. Refer to the Vehicle Information Display Owner's Manual for more information.

The VID will indicate "NO FAULT DETECTED" if faults are not found. Scroll through the list of faults if faults are present.

The following information will be displayed for each fault:

SPN:FMI OC

SA

DTC Description

2. CLEARING DIAGNOSTIC TROUBLE CODES

Previously active diagnostic trouble codes can only be cleared by a service tool, such as Diamond Logic® Builder (DLB). Some previously active codes may not be cleared by this method.

3. DEFINITIONS

"SPN" represents the Suspect Parameter Number. This number identifies the item for which diagnostics are being reported.

"FMI" is the Failure Mode Indicator. This number represents the type of failure detected. Refer to Failure Mode Indicators (FMI) below for more information.

"Active"or"Previously Active" will be displayed to identify whether a fault is currently active or if the fault waspreviouslyactive.

"OC" is the Occurrence Count. This number represents the number of times a fault has gone from previously active to active.

"SA" is the Source Address. This number identifies the module reporting the fault. Refer to Source Addresses (SA) for more information.

3.1. FAILURE MODE INDICATORS (FMI)

FMI=0 -Data Valid But Above Normal Operational Range -Most Severe Level

FMI=1 -Data Valid But Below Normal Operational Range -Most Severe Level

FMI=2 -Data Erratic, Intermittent Or Incorrect

FMI=3 -Voltage Above Normal, Or Shorted To High Source

FMI=4 -Voltage Below Normal, Or Shorted To Low Source

FMI=5 -Current Below Normal Or Open Circuit

FMI=6 -Current Above Normal Or Grounded Circuit

FMI=7 -Mechanical System Not Responding Or Out Of Adjustment

FMI=8 -Abnormal Frequency Or Pulse Width Or Period

FMI=9 -Abnormal Update Rate

FMI=10 -Abnormal Rate Of Change

FMI=11 -Root Cause Not Known

FMI=12 -Bad Intelligent Device Or Component

FMI=13-OutOfCalibration

FMI=14 -Special Instructions

FMI=15 -Data Valid But Above Normal Operating Range -Least Severe Level

FMI=16 -Data Valid But Above Normal Operating Range -Moderately Severe Level

FMI=17 -Data Valid But Below Normal Operating Range -Least Severe Level

FMI=18 -Data Valid But Below Normal Operating Range -Moderately Severe Level

FMI=19-Received NetworkDataInError

FMI=20 -Data Drifted High

FMI=21 -Data Drifted Low

FMI=31 -Condition Exists

3.2. SOURCE ADDRESSES (SA)

NOTE – The available source addresses will vary depending on each vehicle configuration.

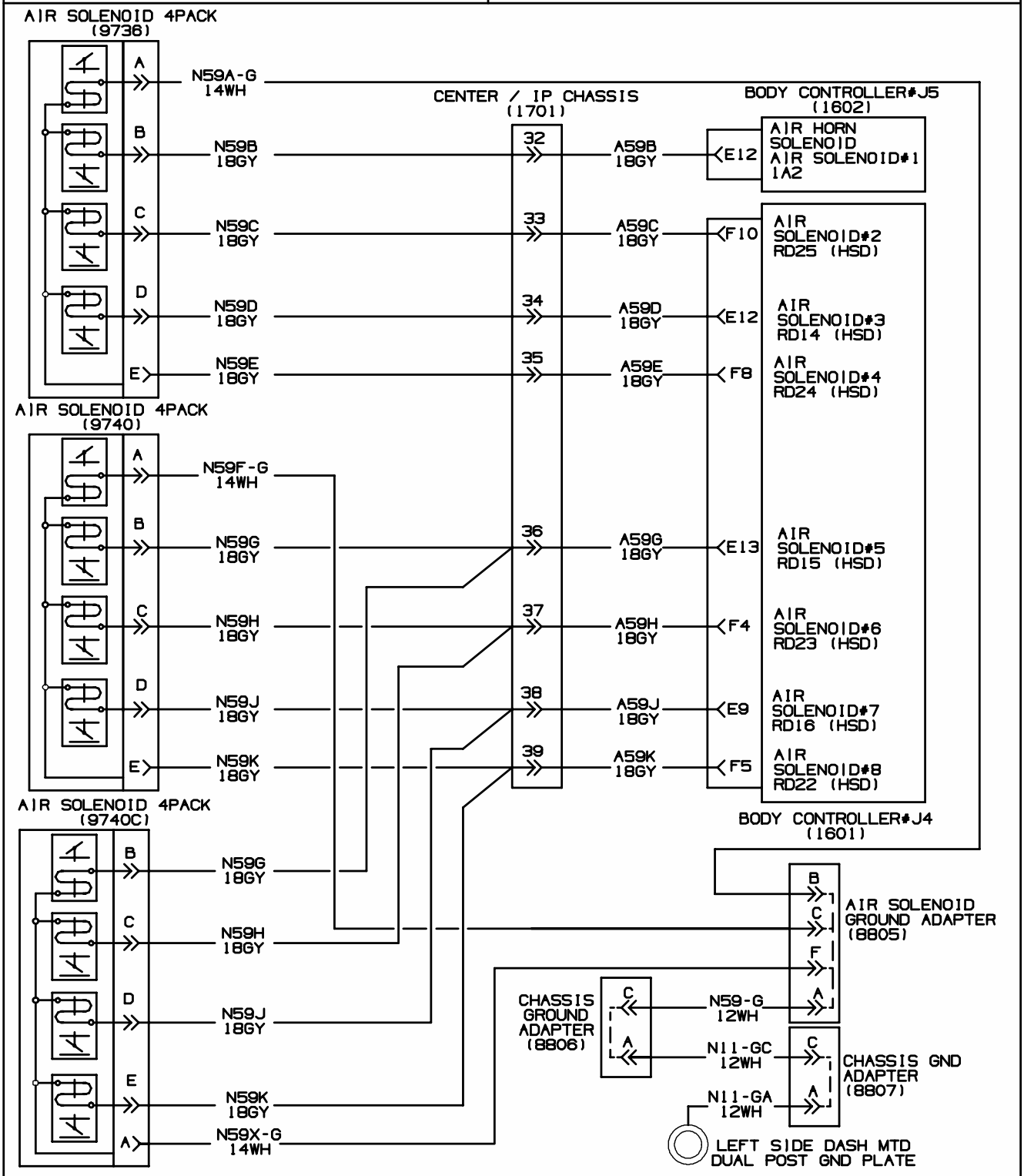
NOTE – Diagnostic Trouble Codes listed in this document are Body Controller only, Source Address 33.

Table 1

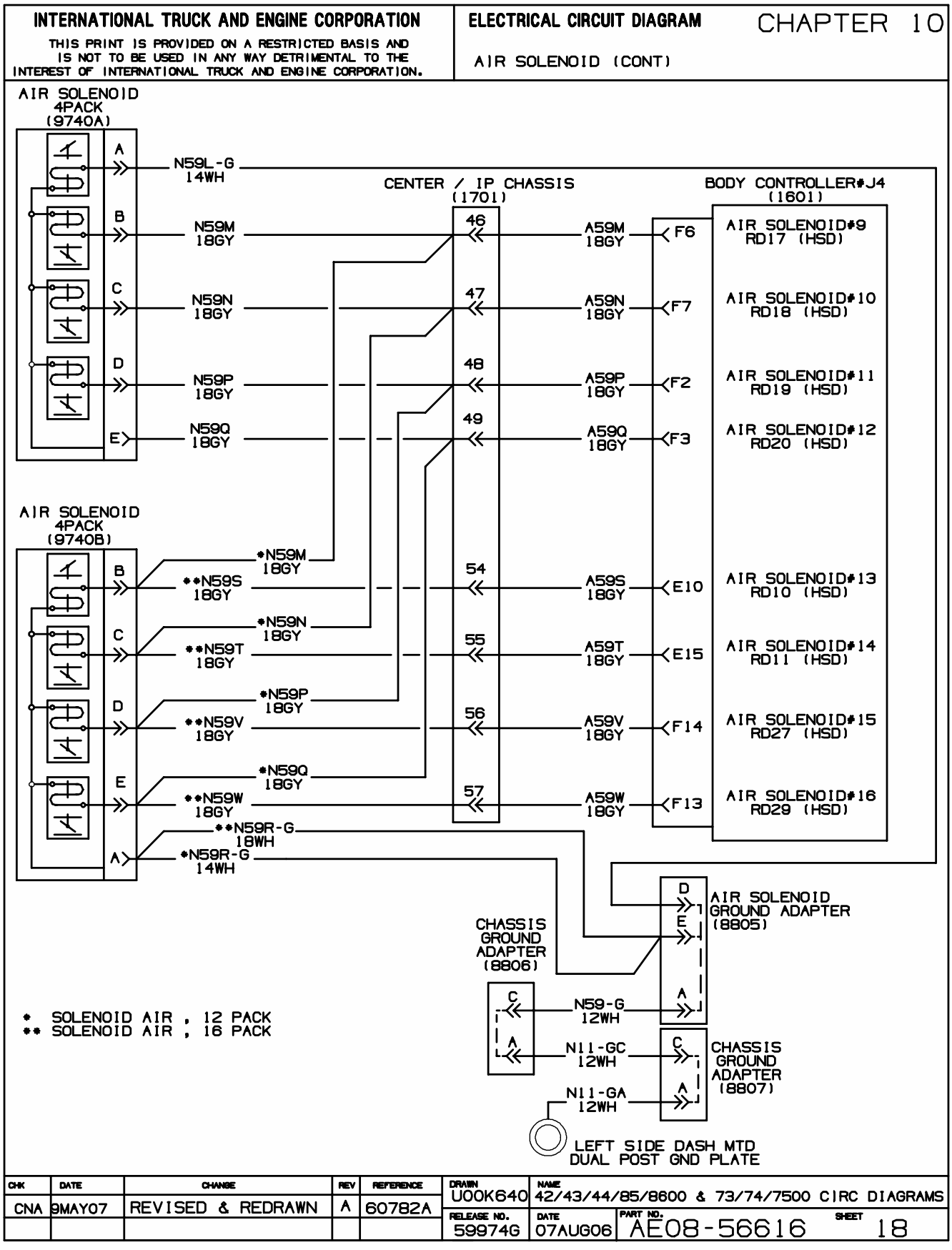
Module Name	Source Address
Engine Control Module (ECM)	00
Transmission Control Module (TCM)	03
Shift Selector	05
Antilock Brake System (ABS)	11
Electronic Gauge Cluster (EGC)	21
Compass Module	28
Body Controller	33
Vehicle Sensor Module (VSM)	39
Vehicle Information Display (VID)	40
Rear HVAC	58
Aftertreatment Module	61
Telematics Module	74
Tire Pressure Monitoring System (TPMS)	51
Auxiliary Gauge Switch Pack (AGSP) 3	132
Secondary Instrument Cluster (SIC) 1	167
Service Tool	249
Global	255

ELECTRICAL CIRCUIT DIAGRAM CHAPTER 10

AIR SOLENOID



CHK	DATE	CHANGE	REV	REFERENCE	DRAWN	NAME
CNA	9MAY07	REVISED & REDRAWN	A	60782A	U00K640	42/43/44/85/8600 & 73/74/7500 CIRC DIAGRAMS
					RELEASE NO. 59974G	DATE 07AUG06 PART NO. AE08-56616 SHEET 17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ELECTRICAL CIRCUIT DIAGRAM
CHAPTER 10
AIR SOLENOID (CONT)
AIR SOLENOID 4PACK (9740A)
AIR SOLENOID 4PACK (9740B)
CENTER / IP CHASSIS (1701)
BODY CONTROLLER#J4 (1601)
N59L-G 14WH
N59M 18GY
N59N 18GY
N59P 18GY
N59Q 18GY
A59M 18GY
A59N 18GY
A59P 18GY
A59Q 18GY
AIR SOLENOID#9 RD17 (HSD)
AIR SOLENOID#10 RD18 (HSD)
AIR SOLENOID#11 RD19 (HSD)
AIR SOLENOID#12 RD20 (HSD)
*N59M 18GY
**N59S 18GY
*N59N 18GY
**N59T 18GY
*N59P 18GY
**N59V 18GY
*N59Q 18GY
**N59W 18GY
**N59R-G 18WH
*N59R-G 14WH
A59S 18GY
A59T 18GY
A59V 18GY
A59W 18GY
AIR SOLENOID#13 RD10 (HSD)
AIR SOLENOID#14 RD11 (HSD)
AIR SOLENOID#15 RD27 (HSD)
AIR SOLENOID#16 RD29 (HSD)
AIR SOLENOID GROUND ADAPTER (8805)
CHASSIS GROUND ADAPTER (8806)
CHASSIS GROUND ADAPTER (8807)
N59-G 12WH
N11-GC 12WH
N11-GA 12WH
LEFT SIDE DASH MTD DUAL POST GND PLATE
* SOLENOID AIR ; 12 PACK
** SOLENOID AIR ; 16 PACK
CHK CNA
DATE 9MAY07
CHANGE REVISED & REDRAWN
REV A
REFERENCE 60782A
DRAWN U00K640
NAME 42/43/44/85/8600 & 73/74/7500 CIRC DIAGRAMS
RELEASE NO. 59974G
DATE 07AUG06
PART NO. AE08-56616
SHEET 18

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520728	Trailer Left Turn Light Relay Command	6	Trailer Left Turn Lamp Relay Over Current	Short To Ground or Defective Relay in Trailer Left Turn Lamp Circuit		
520729	Trailer License Plate Light Relay Command	5	Trailer License Plate Lamp Relay Under Current Or Open Circuit	Open Circuit or Defective Relay in Trailer License Plate Lamp Circuit		
520729	Trailer License Plate Light Relay Command	6	Trailer License Plate Lamp Relay Over Current	Short To Ground or Defective Relay in Trailer License Plate Lamp Circuit		
520730	Trailer Marker Light Relay Command	5	Trailer Marker Lamp Relay Under Current Or Open Circuit	Open Circuit or Defective Relay in Trailer Marker Lamp Circuit		
520730	Trailer Marker Light Relay Command	6	Trailer Marker Lamp Relay Over Current	Short To Ground or Defective Relay in Trailer Marker Lamp Circuit		
520731	Trailer Right Turn Light Relay Command	5	Trailer Right Turn Lamp Relay Under Current Or Open Ciruit	Open Circuit or Defective Relay in Trailer Right Turn Lamp Circuit		
520731	Trailer Right Turn Light Relay Command	6	Trailer Right Turn Lamp Relay Over Current	Short To Ground or Defective Relay in Trailer Right Turn Lamp Circuit		
520732	Trailer Stop Light Relay Command	5	Trailer Stop Lamp Relay Under Current Or Open Circuit	Open Circuit or Defective Relay in Trailer Stop Lamp Circuit		
520732	Trailer Stop Light Relay Command	6	Trailer Stop Lamp Relay Over Current	Short To Ground or Defective Relay in Trailer Stop Lamp Circuit		
520733	Transfer Case Blower Switch	2	Transfer Case Switch Error	Data erratic, intermittent or incorrect		
520734	Transfer Case Front Driveline Solenoid Command	5	Transfer Case Solenoid D Under Current Or Open Circuit	Current below normal or open circuit		
520734	Transfer Case Front Driveline Solenoid Command	6	Transfer Case Solenoid D Short To Ground	Current above normal or grounded circuit		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520735	Transfer Case High Range Solenoid Command	5	Transfer Case Solenoid C Under Current Or Open Circuit	Current below normal or open circuit		
520735	Transfer Case High Range Solenoid Command	6	Transfer Case Solenoid C Short To Ground	Current above normal or grounded circuit		
520736	Transfer Case Low Range Solenoid Command	5	Transfer Case Solenoid A Under Current Or Open Circuit	Current below normal or open circuit		
520736	Transfer Case Low Range Solenoid Command	6	Transfer Case Solenoid A Short To Ground	Current above normal or grounded circuit		
520737	Transfer Case Neutral Solenoid Command	5	Transfer Case Solenoid B Under Current Or Open Circuit	Current below normal or open circuit		
520737	Transfer Case Neutral Solenoid Command	6	Transfer Case Solenoid B Short To Ground	Current above normal or grounded circuit		
520738	Transfer Case PTO Solenoid Command	5	Air Solenoid B Packs Relay Under Current Or Open Circuit	Current below normal or open circuit		
520738	Transfer Case PTO Solenoid Command	6	Air Solenoid B Packs Relay Over Current	Current above normal or grounded circuit		
520739	Transfer Case PTO Solenoid Relay Command	5	Transfer Case PTO Solenoid Under Current Or Open Circuit	Current below normal or open circuit		
520739	Transfer Case PTO Solenoid Relay Command	6	Transfer Case PTO Solenoid Short To Ground	Current above normal or grounded circuit		
520740	Transfer Case PTO Switch	2	Transfer Case PTO Switch Error	Data erratic, intermittent or incorrect		
520741	Transfer Case Range Switch	2	Transfer Case Switch Error	Data erratic, intermittent or incorrect		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520742	Transfer Case Rear Driveline Solenoid Command	5	Air Solenoid A Packs Relay Under Current Or Open Circuit	Current below normal or open circuit		
520742	Transfer Case Rear Driveline Solenoid Command	6	Air Solenoid A Packs Relay Over Current	Current above normal or grounded circuit		
520743	Transmission PTO Engagement Acuator Command	5	TEM PTO Engagement Relay Under Current Or Open Circuit	Current below normal or open circuit		
520743	Transmission PTO Engagement Acuator Command	6	TEM PTO Engagement Relay Overcurrent	Current above normal or grounded circuit		
520744	Transmission PTO Retention Actuator Command	5	TEM PTO Retaining Solenoid Undercurrent	Current below normal or open circuit		
520744	Transmission PTO Retention Actuator Command	6	TEM PTO Retaining Solenoid Overcurrent	Current above normal or grounded circuit		
520745	Transmission PTO Switch	2	TEM PTO Engagement Switch Error	Data erratic, intermittent or incorrect		
520746	Transmission Retarder Enable Switch	2	Transmission Retarder On/Off switch Failure	Data erratic, intermittent or incorrect		
520747	Two Speed Axle Actuator	5	Two Speed Axle Solenoid Relay Under Current Or Open Circuit	Current below normal or open circuit		
520747	Two Speed Axle Actuator	6	Two Speed Axle Solenoid Relay Short To Ground	Current above normal or grounded circuit		
520748	Wiper Motor Power	5	Wiper Motor Undercurrent	Open in Wiper Motor Circuit		
520748	Wiper Motor Power	6	Wiper Motor Overcurrent	Short To Ground or Overload in Wiper Motor Circuit		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520749	Mirror Heater	2	Mirror Heat Switch Error	Faulty Switch Actuator or Microswitch for Mirror Heat Switch		Mirror_Heat_On_Switch
520750	Fog Lights Left Command	5	Left Fog Light Uncercurrent	Open in Left Fog Light Circuit		
520750	Fog Lights Left Command	6	Left Fog Light Overcurrent	Short To Ground or Overload in Left Fog Light Circuit		
520751	ICON Freedomline Gear Indicator	5	ICON Freedomline Gear Indicator Relay Under Current	Open Circuit or Defective Relay in ICON Freedomline Gear Indicator Circuit		Freedomline_Gear_Indication_Relay_Cmd
520751	ICON Freedomline Gear Indicator	6	ICON Freedomline Gear Indicator Relay Over Current	Short To Ground or Defective Relay in ICON Freedomline Gear Indicator Circuit		Freedomline_Gear_Indication_Relay_Cmd
520752	Electrical Accessory Power Switch	2	Electrical Accessory Power Switch Error	Faulty Switch Actuator or Microswitch for Electrical Accessory Power Switch		Sw_Acc_Load_On_Switch
520753	Transmission Economy Mode Switch	2	Transmission Economy Mode Switch Error	Faulty Switch Actuator or Microswitch for Transmission Economy Mode Switch		Bus_Econ_Mode_Switch
520754	Universal Air Solenoid Relay Driver 2	5	Universal Air Solenoid Relay Driver 2 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520754	Universal Air Solenoid Relay Driver 2	6	Universal Air Solenoid Relay Driver 2 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520755	Universal Air Solenoid Relay Driver 3	5	Universal Air Solenoid Relay Driver 3 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520755	Universal Air Solenoid Relay Driver 3	6	Universal Air Solenoid Relay Driver 3 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520756	Universal Air Solenoid Relay Driver 4	5	Universal Air Solenoid Relay Driver 4 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520756	Universal Air Solenoid Relay Driver 4	6	Universal Air Solenoid Relay Driver 4 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520757	Universal Air Solenoid Relay Driver 5	5	Universal Air Solenoid Relay Driver 5 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520757	Universal Air Solenoid Relay Driver 5	6	Universal Air Solenoid Relay Driver 5 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520758	Universal Air Solenoid Relay Driver 6	5	Universal Air Solenoid Relay Driver 6 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520758	Universal Air Solenoid Relay Driver 6	6	Universal Air Solenoid Relay Driver 6 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520759	Universal Air Solenoid Relay Driver 7	5	Universal Air Solenoid Relay Driver 7 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520759	Universal Air Solenoid Relay Driver 7	6	Universal Air Solenoid Relay Driver 7 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520760	Universal Air Solenoid Relay Driver 8	5	Universal Air Solenoid Relay Driver 8 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520760	Universal Air Solenoid Relay Driver 8	6	Universal Air Solenoid Relay Driver 8 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520761	Universal Air Solenoid Relay Driver 9	5	Universal Air Solenoid Relay Driver 9 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520761	Universal Air Solenoid Relay Driver 9	6	Universal Air Solenoid Relay Driver 9 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520762	Universal Air Solenoid Relay Driver 10	5	Universal Air Solenoid Relay Driver 10 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520762	Universal Air Solenoid Relay Driver 10	6	Universal Air Solenoid Relay Driver 10 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520763	Universal Air Solenoid Relay Driver 11	5	Universal Air Solenoid Relay Driver 11 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520763	Universal Air Solenoid Relay Driver 11	6	Universal Air Solenoid Relay Driver 11 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520764	Universal Air Solenoid Relay Driver 12	5	Universal Air Solenoid Relay Driver 12 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520764	Universal Air Solenoid Relay Driver 12	6	Universal Air Solenoid Relay Driver 12 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520765	Universal Air Solenoid Relay Driver 13	5	Universal Air Solenoid Relay Driver 13 or Spare Relay Driver 4 Under Current Or Open Circuit	Opne Circuit or Defective Relay or Defective Solenoid		
520765	Universal Air Solenoid Relay Driver 13	6	Universal Air Solenoid Relay Driver 13 or Spare Relay Driver 4 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520766	Universal Air Solenoid Relay Driver 14	5	Universal Air Solenoid Relay Driver 14 or Spare Relay Driver 3 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520766	Universal Air Solenoid Relay Driver 14	6	Universal Air Solenoid Relay Driver 14 or Spare Relay Driver 3 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520767	Universal Air Solenoid Relay Driver 15	5	Universal Air Solenoid Relay Driver 15 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		
520767	Universal Air Solenoid Relay Driver 15	6	Universal Air Solenoid Relay Driver 15 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520768	Universal Air Solenoid Relay Driver 16	5	Universal Air Solenoid Relay Driver 16 Under Current Or Open Circuit	Open Circuit or Defective Relay or Defective Solenoid		

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520768	Universal Air Solenoid Relay Driver 16	6	Universal Air Solenoid Relay Driver 16 Over Current	Short To Ground or Defective Relay or Defective Solenoid		
520769	BUS Spare Relay Driver One	5	Spare Relay Driver One Under Current Or Open Circuit	Open Circuit or Defective Relay		
520769	BUS Spare Relay Driver One	6	Spare Relay Driver One Over Current	Short To Ground or Defective Relay		
520770	BUS Spare Relay Driver Two	5	Spare Relay Driver Two Under Current Or Open Circuit	Open Circuit or Defective Relay		
520770	BUS Spare Relay Driver Two	6	Spare Relay Driver Two Over Current	Short To Ground or Defective Relay		
520771	PPE3 AC Module Output Current	6	AC Module has shutdown due to overload condition.	A Surge may have occurred for a while in the Vehicle AC bus for a long time (The inverter supplies additional current to the load).		
520772	PPE3 Fuse Open	31	PPE3 Fuse Open.	Load exceeded rating.		
520773	PPE3 AC Module Temperature	0	AC module over temperature condition.	An overcurrent condition in the Vehicle AC Bus might have caused an over temperature.		
520775	Anti Theft Ignition Relay	5	Anti Theft Ignition Relay Under Current Or Open Circuit	Open circuit or Defective Relay in Anti Theft Ignition Circuit		Anti_Theft_Ignition_Relay
520775	Anti Theft Ignition Relay	6	Anti Theft Ignition Relay over current	Short to Ground or Defective Relay in Anti Theft Ignition Circuit		Anti_Theft_Ignition_Relay
520776	Anti Theft Engine Stop Switch	2	Anti Theft Engine Stop Switch Error	Faulty Switch Actuator or Microswitch for Anti Theft Engine Stop Switch		Anti_Theft_Engine_Stop_Switch
520777	Anti Theft Switch 0	2	Anti Theft Switch 0 Error	Faulty Switch Actuator or Microswitch for Anti Theft Switch 0		Anti_Theft_Switch_0

SPN	DTC Description	FMI	Message	Cause	Pins	Logical Signal
520778	Anti Theft Switch 1	2	Anti Theft Switch 1 Error	Faulty Switch Actuator or Microswitch for Anti Theft Switch 1		Anti_Theft_Switch_1
520779	Anti Theft Switch 2	2	Anti Theft Switch 2 Error	Faulty Switch Actuator or Microswitch for Anti Theft Switch 2		Anti_Theft_Switch_2
520780	Anti Theft Switch 3	2	Anti Theft Switch 3 Error	Faulty Switch Actuator or Microswitch for Anti Theft Switch 3		Anti_Theft_Switch_3
520781	Anti Theft Switch 4	2	Anti Theft Switch 4 Error	Faulty Switch Actuator or Microswitch for Anti Theft Switch 4		Anti_Theft_Switch_4
520788	TEG Aux Relay Driver 1	5	TEG Aux Relay Driver Output 1 Under Current Or Open Circuit	Current below normal or open circuit		TEG_Aux_Relay_Driver_1_RD13_Cmd
520788	TEG Aux Relay Driver 1	6	TEG Aux Relay Driver Output 1 Overcurrent	Current above normal or grounded circuit		TEG_Aux_Relay_Driver_1_RD13_Cmd
520799	TEG Aux Relay Driver 2	5	TEG Aux Relay Driver Output 2 Under Current Or Open Circuit	Current below normal or open circuit		TEG_Aux_Relay_Driver_2_RD14_Cmd
520799	TEG Aux Relay Driver 2	6	TEG Aux Relay Driver Output 2 Overcurrent	Current above normal or grounded circuit		TEG_Aux_Relay_Driver_2_RD14_Cmd
520800	Transmission Economy Mode output	5	Transmission Economy Mode Relay Driver Output Under Current Or Open Circuit	Current below normal or open circuit		Econ_Mode_Enable_Cmd
520800	Transmission Economy Mode output	6	Transmission Economy Mode Relay Driver Output Overcurrent	Current above normal or grounded circuit		Econ_Mode_Enable_Cmd
520801	Transmission Auto Neutral Output	5	Transmission Auto Neutral Relay Driver Output Under Current Or Open Circuit	Current below normal or open circuit		Auto_Neutl_Relay_Cmd
520801	Transmission Auto Neutral Output	6	Transmission Auto Neutral Relay Driver Output Overcurrent	Current above normal or grounded circuit		Auto_Neutl_Relay_Cmd

Transfer Case Tach Sensor

The tachometer on units equipped with a transfer case typically uses a magnetic pickup sensor to determine RPMs. When a sensor fails the tachometer will not indicate RPM or may become erratic.

Before replacing the sensor verify that the wiring to the sensor is not damaged and that connections are good.

Inspect the wires that go into the sensor and verify they are not loose. If loose replace the sensor.

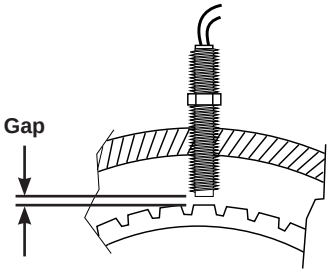
A multi-meter can be used to verify the sensor is functioning correctly. Set the meter to read Ohms and attach leads to the sensor wires. Hold the sensor near the edge of a piece of steel and move it sideways away and back slowly. The meter should alternate between a resistance and a higher resistance value as the sensor moves over or away from the edge of the metal.

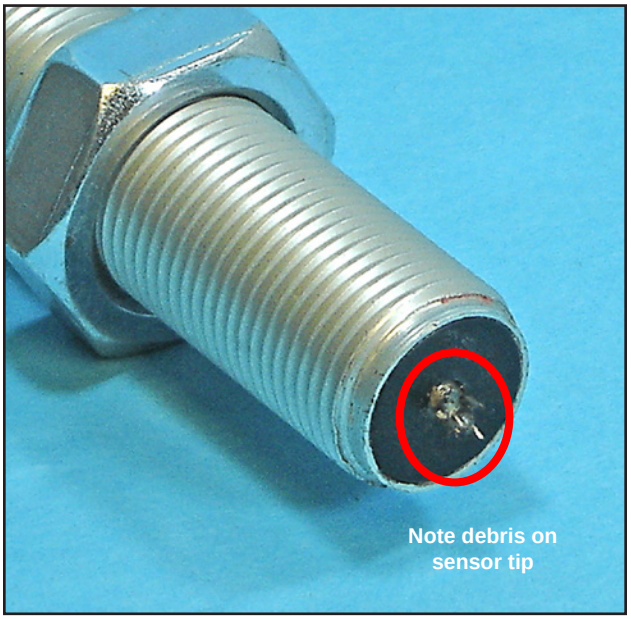
Inspect the end of the sensor for debris build up as the magnetic tip will attract metal debris. Metal debris can cause erratic action.

Transfer Case
(46159C-30 sensor shown)

Installation procedure

1. Clean the area around the transfer case hole so the sensor can not pick up debris during installation.
2. Verify that a tip of the trigger gear is aligned with the sensor hole. The sensor can be damaged if it is adjusted to the gap as there may not be enough clearance.
3. Screw in the sensor until it just touches the trigger gear. Back off the sensor half to one full turn.
4. Snug up the lock nut on the sensor body without rotating the sensor body.
5. Reattach all wiring, guards, etc.
6. Verify correct operation.





Note debris on
sensor tip

Setting Transfer Case Tach - 70140C-30

Blower tachometer 70140C-30 is normally used with the magnetic pick-up sender 46159B-30 for all type transfer cases. In some case an external sprocket is used in the blower driveline. Then use the number of sprocket teeth.

Note: Powering the tachometer varies by model. Industrial units typically require the ignition on, then use the master switch. Sewer cleaners typically require the ignition on, master switch on, and blower switch on. Two people may be needed with one in the cab.

1. To enter tachometer programming mode press and hold the trip reset button. While depressing the reset button apply power to the meter (turn on ignition, but not engine). The meter will enter calibration mode and the LCD will display the current input configuration.

2. To select the signal type, press and release button to increment the type number:

Type 1: Magnetic Sensor	Type 4: TTL level signals
Type 2: Pulse Generator	Type 5: Ignition Systems
Type 3: Alternator	Type 6: ECM (analog)

3. Once the correct (Type 1) type is displayed press and hold the reset button for two seconds to select it.

4. Use transfer case upper gear teeth number to program tachometer.

   Press and release the reset button to increment the current digit selected. To select the next digit, press and hold the button for two seconds and the next digit will start to flash. Once you have finished adjusting the last digit, press and hold the reset button for two seconds. The tachometer will store new calibration and exit programming mode.

Alternate method with vehicle engine ON

Use this method when the number of gear teeth are not known or different pick up method is used.

Enter the current engine speed/RPM by pressing and releasing the reset button to increment the current digit selected. To select the next digit, press and hold the button for two (2) seconds and the next digit will start to flash. Once you have finished adjusting the last digit, press and hold the button for two (2) seconds. The meter will display the calculated calibration in pulses per revolution and store it. The meter will then exit calibration mode.

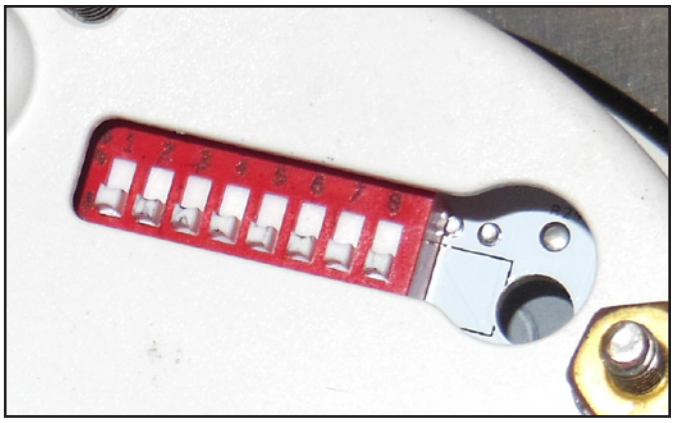
Transfer Case Upper Drive Gears	
Model	**No. of Teeth**
48051-30	47
48051A-30	47
48051B-30 (*ACE/CL)	47
48051C-30 (*Guzzler NX)	38
48051D-30	47
48051E-30	40
48051F-30	40
48051G-30	47
48051H-30	38
48051J-30	38
48051K-30	47
48052-30	40
48052A-30	40
48052B-30	40
48052C-30	40
45446B-30	43
45446P-30	43
* Verify number, TC may change with options.	

Setting Transfer Case Tach - 70140E-30

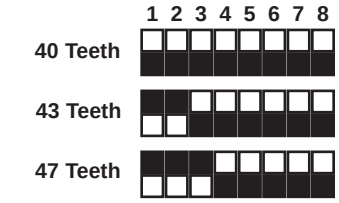
Blower tachometer 70140E-30 is normally used with the magnetic pick-up sender 46159B-30 for all type transfer cases. In some case an external sprocket is used in the blower driveline. Then use the number of sprocket teeth.

To change settings:

1. Set Master switch to OFF.
2. Remove rubber cover from rear of gauge.
3. Set DIP switches as required to match the transfer case on the unit.
4. Reinstall the rubber cover in the rear of gauge.
5. Verify correct operation.



Switch Settings



Transfer Case Upper Drive Gears	
Model	**No. of Teeth**
48051-30	47
48051A-30	47
48051B-30 (*ACE/CL)	47
48051D-30	47
48051E-30	40
48051F-30	40
48051G-30	47
48051K-30	47
48052-30	40
48052A-30	40
48052B-30	40
48052C-30	40
45446B-30	43
45446P-30	43
* Verify number, TC may change with options.	

Guzzler

Recommended Spare Parts - Classic

Part No.	Description	Qty.
1280056-30	8”X10’ ALUM. PIPE W/ BANDLOCK ENDS	5
1280055-30	6”X10’ ALUM. PIPE W/ BANDLOCK ENDS	5
1280029-30	8”X45 DEG. ELBOW	2
1280028-30	6”X45 DEG. ELBOW	2
1280034-30	8”X90 DEG. ELBOW .	2
1280033-30	6” 90 DEG. ELBOW	2
1280464-30	8”X10’ KANAFLEX AR HOSE ASSY.	5
1280344-30	6”X10’ KANAFLEX AR HOSE ASSY.	5
1280343-30	4”X20’ KANAFLEX AR HOSE ASSY.	5
1280582A-30	8”X96” GREEN MONSTER HOSE	1
1280043-30	8” X 6” REDUCER	2
1280042-30	6” X 4” REDUCER	2
42588-30	8” BANDLOCK CLAMP	20
42587-30	6” BANDLOCK CLAMP	20
42586-30	4” BANDLOCK CLAMP	20
42591-30	8” BANDLOCK GASKET	20
42590-30	6” BANDLOCK GASKET	20
1280091-30	6” BULK NOZZLE	1
1250012-30	EXP.JOINT 12” FLANGE GASKET	1
1250011-30	GASKET, INSP. DOOR 7X7	1
1260038-30	FILTER BAG, 4.5/8”X70”	60
1270007-30	CAGE, 68” GALV.	5
1280760-30	INLINE VACUUM RELIEF VALVE 8”	1
1280619-30	INLINE VACUUM RELIEF VALVE 6”	1
50078-30	MALE END PLUG,8”	1
1370085-30	PORTHOLE ELBOW, 8”	1
1372863-30	REAR DOOR SAFETY PIN	1
1202167-30	HYD. SUCTION FILTER	1
1201310-30	HYD. RETURN FILTER	1
49963-30	INTANK OIL FILTER (GUZZLER EVOLUTION)	1
1250076-30	O-RING FOR LEVEL INDICATOR	2
1374700C-30	WING DEFLECTOR	1
1250082-30	REAR DOOR GASKET	1
1250158R-30	CLEAN OUT DOOR GASKET	2
1250161R -30	BAGHOUSE DOOR GASKET	2
1250258R-30	CYCLONE DOOR GASKET	1
1250157R-30	DUMP CHUTE DOOR GASKET	1
1250259R-30	LINEAR WALL CLEAN-OUT DOOR GASKET	1
1321067-30	PLUNGER DUMP CHUTE	1

GUZZLER TRUVAC VACTOR

Manual • Guzzler CL-E