Super Products®

CAMEL® MAX SERIES
COMBINATION SEWER CLEANER

OPERATORS MANUAL

LIMITED WARRANTY

Subject to the terms and conditions below, Super Products warrants to its original purchaser ("original purchaser") that new equipment sold after the effective date of this limited warranty is free of defects in material or workmanship at the time it was shipped from Super Products for a period of 12 months from the shipment date, provided the equipment is used in a normal and reasonable manner and in accordance with all operating instructions. Super Products agrees, at its sole election, to either repair or replace (inclusive of labor) any parts and components manufactured by Super Products. Super Products must be notified with thirty (30) days of such defect or failure, at which time Super Products will provide instructions on the warranty procedures to be followed. This limited warranty is subject to those limitations and exclusions as described in such warranty procedures. Super Products will not honor claims for warranty that have not been previously authorized via the warranty procedures (including that labor rates and times must be preapproved in writing).

In addition, Super Products agrees to provide extended warranties for certain components as indicated below: (extended warranty periods begin from the shipment date to the original purchaser).

- "10 Years on the debris body and all poly water tanks (from defects in material or workmanship).
- "3 Years on Super Products' single-piston water pump (from defects in material or workmanship).

Super Products does not provide any express or implied warranty to (and Super Products shall not be responsible for)

- "Any major components of the equipment that Super Products used in manufacturing or assembling the equipment but that Super Products did not manufacture (including, but not limited to, truck engines or any component of the chassis, vacuum pump, water pump, and hydraulics, driveline, power takeoff, and transfer case). Super Products assigns to the original purchaser any warranty extended by the manufacturer of such components. Disposition of any warranty claim for such components will be at the sole discretion and remedy of the component supplier. Super Products shall have the right of disposal of parts and components that are replaced.
- "Normal wear parts, including but not limited to, valves, gaskets, light bulbs, filters, oils and fluids.
- "Consumable items, including but not limited to, vacuum hose, sewer hose, nozzles, and vacuum tubes.
- "Normal adjustments and maintenance services.

This limited warranty does not cover any damage to nonfunctioning or malfunctioning of the equipment, or any components or parts comprising the equipment, due to: (a) any alteration, substitution, misuse or abuse by the original purchaser or its agents; (b) their non-compliance with any operator's manual, maintenance manual or warning published by Super Products or the component manufacturer and issued to the original purchaser; or (c) their non-compliance with the general standard of reasonable care.

OTHER THAN AS EXPRESSLY STATED HEREIN, THERE ARE NO O THER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED. MORE SPECIFICALLY, THERE ARE NO IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY. ORIGINAL PURCHASER ACKNOWLEDGES AND AGREES THAT SUPER PRODUCTS MAKES NO REPRESENTATIONS OR PROMISES, AND THAT ORIGINAL PURCHASER IS NOT RELYING UPON ANY ORAL OR WRITTEN REPRESENTATIONS OR PROMISES , REGARDING ANY PERFORMANCE CHARACTERISTICS OR CAPABILITIES OF THE EQUIPMENT OR THE COMPONENTS THEREOF (INCLUDING , WITHOUT LIMITATION, THE INTEGRATION OF SUCH COMPONENTS OR THE COMBINATION IN WHICH SUCH COMPONENTS MAY BE USED), EXCEPT AS EXPRESSLY STATED IN THE DESCRIPTION OF THE EQUIPMENT CONTAINED IN THE ACKNOWLEDGMENT OR OTHER WRITTEN DESCRIPTIONS PROVIDED BY SUPER PRODUCTS.

SUPER PRODUCTS' MAXIMUM LIABILITY SHALL NOT EXCEED AND ORIGINAL PURCHASER'S REMEDY IS LIMITED TO EITHER (a) REPAIR OR REPLACEMENT OF THE DEFECTIVE EQUIPMENT, OR AT SELLER'S OPTION (b) RETURN OF THE PRODUCT AND REFUND OF THE PURCHASE PRICE. SUCH REMEDY SHALL BE ORIGINAL PURCHASER'S ENTIRE AND EXCLUSIVE REMEDY. ORIGINAL PURCHASER ACKNOWLEDGES THAT UNDER NO CIRCUMSTANCES SHALL SUPER PRODUCTS BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING IN CONNECTION WITH OR OUT OF THE EQUIPMENT AND THAT SUPER PRODUCTS' LIABILITY, WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY OR OTHERWISE SHALL NOT EXCEED THE RETURN OF THE AMOUNT OF THE PURCHASE PRICE PAID BY BUYER, WHICH AMOUNT MAY BE REDUCED DUE TO DEPRECIATION AND DAMAGE BEYOND NORMAL WEAR AND TEAR. ORIGINAL PURCHASER UNDERSTANDS THAT THE LIMITATION OF SUPER PRODUCTS' LIABILITY RELATING TO THE EQUIPMENT IS A MATERIAL TERM OF THE PARTIES' TRANSACTION.

This limited warranty is not transferable without the prior written approval of Super Products.

NO ACTION ARISING OUT OF ANY CLAIMED BREACH OF THIS LIMITED WARRANTY OR TRANSACTIONS UNDER THIS LIMITED WARRANTY MAY BE BROUGHT MORE THAN TWO (2) YEARS AFTER THE CAUSE OF ACTION HAS OCCURRED.

130 W Boxhorn Drive, Mukwonago, WI 53149 • P: 800.837.9711 • www.superproducts.com

As of 12/20/19

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Chapter 1

Safety

1

General Safety Instructions and Practices

A careful operator is the best operator. Safety is of primary importance to the manufacturer and should be to the owner/operator. Most accidents can be avoided by being aware of your equipment, your surroundings, and observing certain precautions. The first section of this manual includes a list of Safety Messages that, if followed, will help protect the operator and bystanders from injury or death. Read and understand these safety messages before assembling, operating, or servicing this equipment. This equipment should only be operated by those persons who have read the manual, who are responsible and trained, and who know how to do so responsibly.

The Safety Alert Symbol combined with a Signal Word, as seen below, is used throughout this manual and on decals which are attached to the equipment. The Safety Alert Symbol means: **"ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!"** The Symbol and Signal Word are intended to warn the owner/operator of impending hazards and the degree of possible injury faced when operating this equipment.

Practice all usual and customary safe working precautions and above all remember safety is up to **you**. Only **you** can prevent serious injury or death from unsafe practices.

DANGER

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury and property damage. It may also be used to alert against unsafe practices.

NOTICE

Indicates a potentially hazardous situation which, if not avoided, MAY result in property damage. It may also be used to alert against unsafe practices.

NOTE

Identifies points of particular interest for more efficient and convenient operation or repair.

READ, **UNDERSTAND**, and **FOLLOW** the following **Safety Messages**. Serious injury or death may occur unless care is taken to follow the warnings and instructions stated in this manual and in the Safety Messages on the implement. Always follow the instruction in this manual and use common sense to avoid hazards.

Visual Attention Safety

Pictographs are used throughout this manual to help bring your visual attention to safety issues.

1

SAFETY HAZARD	SAFETY AVOIDANCE	SAFETY PREVENTION
Pictograph surrounded by a triangle indicates a Safety Hazard that must be avoided.	Pictograph in a circle or inside a box indicates an avoidance procedure that should be followed to prevent injuries.	A circle with a slash through it indicates an action that is prohibited.
Example:  Equipment contacting overhead electrical lines	*Example:*  Always shut off engine and remove key before working on equipment.	*Example:*  No Smoking

Figure 1-1

NOTE

If you want a translation of this safety section in Spanish or French, please contact:

Translation — Safety Section
130 W Boxhorn Drive
Mukwonago, WI 53149
(800) 837-9711

Personal Protection Equipment (PPE)

Figure 1-2

Always wear protective clothing and personal safety devices issued to you or required by job conditions. This should always include:

- Hard hat
- Safety shoes
- Safety glasses with side shields (marked to comply with ANSI Z87), goggles, or face shield
- Heavy gloves (chemical resistant)
- Hearing protection
- Reflective clothing

WARNING

Never wear loose clothing or jewelry that can catch on controls or other parts of the machine. Loose clothing can be drawn into the suction hose. Never wear a wristwatch or finger rings when working on or around equipment.

When Using Pressurized Air or Water

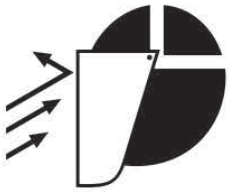
			
Wear Face Protection Shield	Wear Wet Weather Protective Suit	Wear Waterproof Gloves and Safety Shoes with Metatarsal	Wear Respirator

Figure 1-3

When using pressurized air or water for cleaning or material erosion/movement, you should use the following:

- Face Shield
- Wet Weather Protective Suit
- Waterproof Gloves
- Respirator
- Safety Boots with Metatarsal Guard

General Hazards and Prevention Safety

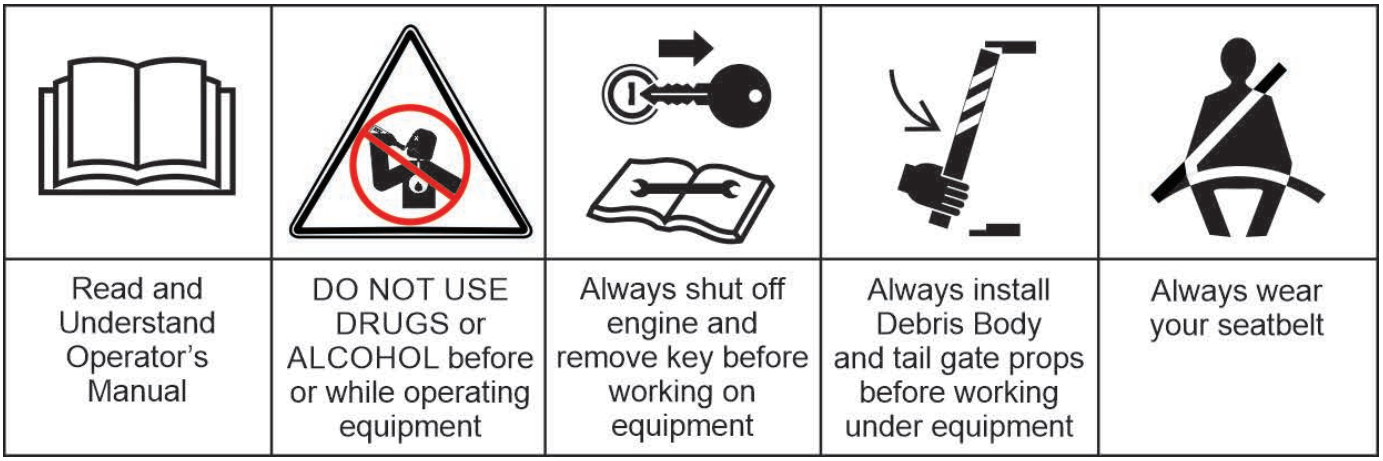


Figure 1-4

WARNING

To avoid serious injury or death, do the following:

- **Read, understand,** and **follow** the operator's manual instructions, warnings, and safety messages.
- **Do not allow** untrained or unauthorized persons to operate equipment.
- **Do not allow** untrained coworkers to operate or assist in operating equipment.
- **Do not allow** bystanders near equipment or work area.
- **Do not allow** anyone to operate equipment while under the influence of drugs or alcohol.
- **Do not use drugs** or **alcohol** before or while operating equipment.
- **Consult** medical professional for medication impairment side effects.
- **Wear** appropriate safety personal protective equipment **(PPE).**
- **Wear** appropriate breathing respirator and protective suit when operating with hazardous or unknown substances.
- **Do not wear** loose clothing or jewelry to avoid injury from entanglement in rotating parts.
- **Keep body and limbs away** from suction inlets.
- **Do not open or close** the tailgate or raise or lower the body unless the area is clear of people and obstructions.
- **Never** put any part of your body under an open tailgate unless it is sufficiently propped.
- **Never operate** the vacuum pump unless you are certain the suction hose is clear of people and obstructions.
- **Never operate** the vacuum pump without the safety relief systems working properly as described within this manual.
- **Do not enter the debris body** if hazardous materials are suspected inside the debris body. Take the unit to a certified tank cleaning facility.
- **Always shut off the engine**, remove the key, and set the parking brake before working on the truck or equipment.
- **Stay alert.** Prolonged operation can cause fatigue**. Stop** and **rest.**

General Hazards and Prevention Safety — continued

			
Use adequate lighting for proper vision.	Do not touch hot surface. Keep hands and limbs away from hot surfaces.	Tanks can be under pressure. Relieve pressure before opening.	Use three-point contact when climbimg on equipment.

Figure 1-5

Visibility Conditions When Operating

- **Operate in daylight** or with lights that gives at least 50 yards clear visibility.
- **Be able to see** and identify passersby, steep slopes, ditches, drop-offs, overhead obstructions, power lines, debris, and foreign objects.
- **Use extreme care** when backing up. Vision may be limited. Severe damage or injury can occur.
- **Do not run engines** in enclosed building without adequate exhaust ventilation.

Mounting and Dismounting Truck or Equipment

- **Only** mount or dismount when truck and moving parts are stopped.
- **Always use three-point contact** when climbing on or dismounting equipment.
- **Walkways, steps, and handrails** should be checked before use to ensure a proper non-slip surface. Replace or repair damaged component immediately.

Hot Surface

- **Stay clear** of hot surfaces such as mufflers, hydraulic pumps, valves, and tanks.
- **Relieve pressure** from tank, reservoirs, valves, and hoses before servicing or opening.

Safety Signs

- **Replace** missing, damaged, or unreadable safety signs immediately!

Equipment Guards

- **Never** operate machine if equipment guards are damaged or missing.
- **Replace** missing or damaged guards immediately!

Crushing Hazards and Prevention Safety

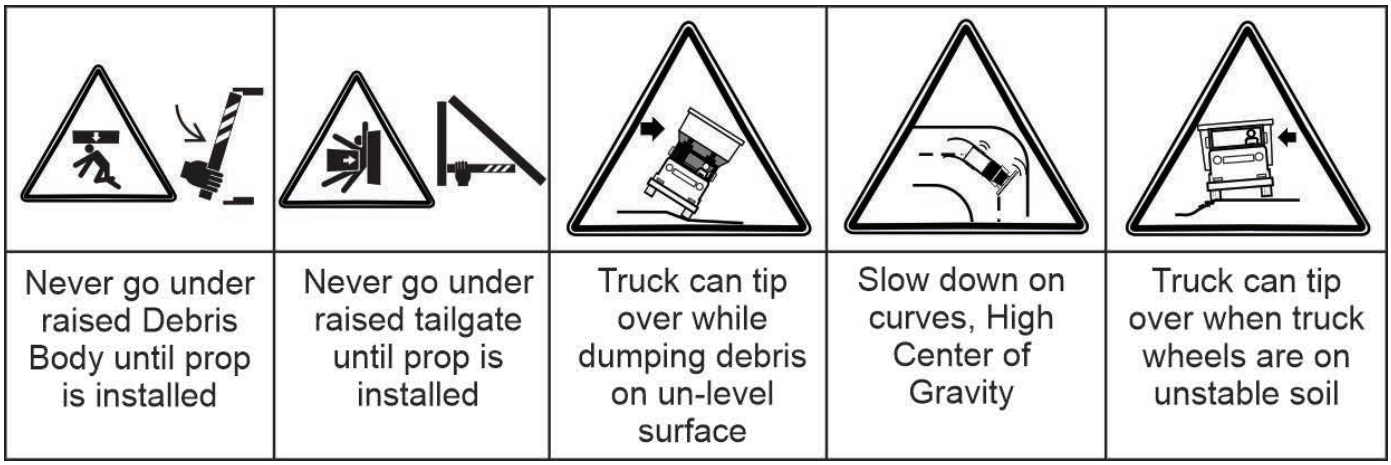


Figure 1-6

Debris Body Prop Support

WARNING

Never go under raised debris body until prop is installed. Failure to do so could result in personal injury or death.

1. Raise body sufficiently to allow body prop support to be swung into position.
2. Slowly lower body until body contacts body prop support.

- To remove body prop support, reverse above procedure.

Tailgate Prop Support

WARNING

Always position tailgate prop in proper position before entering any areas beneath tailgate or entering body. Failure to do so could result in serious injury or death.

1. Raise tailgate sufficiently to allow tailgate prop support to be swung into position.
2. Slowly lower body tailgate until tailgate contacts tailgate prop support.

- To remove tailgate body prop support, reverse above procedure.

Truck Tip Over

WARNING

Always wear seat belt while seated in truck to prevent injury.

- Truck driver must have valid and appropriate training license before transporting liquids on public roads.
- Slow down on curves to prevent truck from tipping over.
- Always ensure unit is on firm and level ground before operating the dump system. When dumping, raise the body in steps, allowing the material to dump out in a steady flow.
- **Do not allow** people and/or vehicles beside debris body while dumping.
- Never drive truck with raised debris body.
- Keep truck away from drop-offs and soft soil shoulder where truck could tip over.

Trip and Fall Prevention Safety

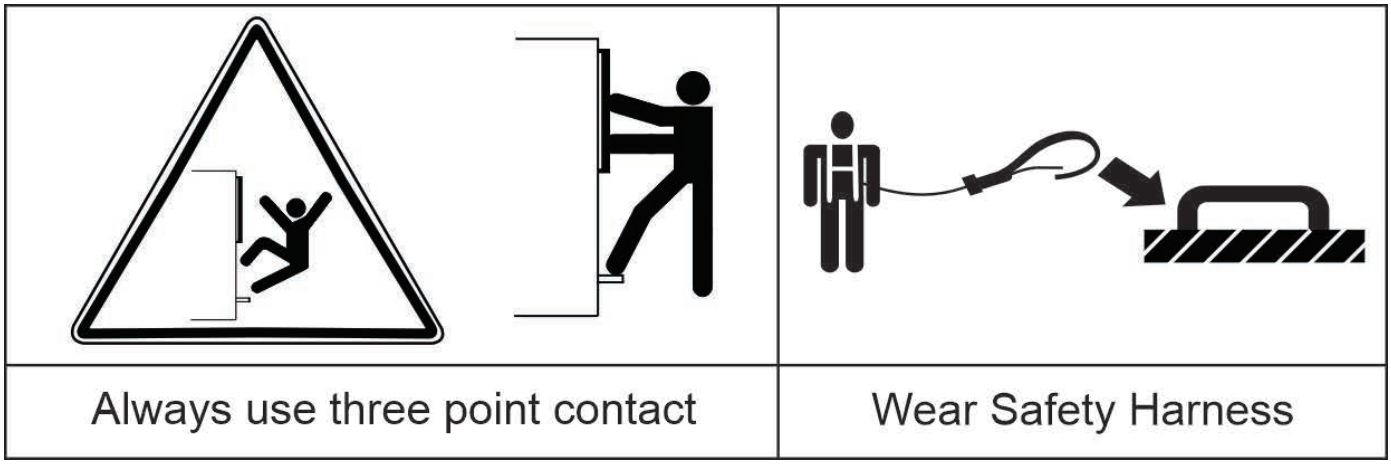


Figure 1-7

- **Always maintain** three-point contact with the machine, using two hands and one foot, or two feet and one hand, at all times during entry and exit. Never grab control levers or steering wheel when mounting or dismounting machine.
- **Walkways and steps** should be checked monthly to ensure a proper non-slip surface. Repair or replace damaged walkway or steps.
- **Keep** grab handles, steps, and walkways free of mud, oil, grease, and other foreign material. Clean non-skid surface material as required.
- **Ground level personnel** must be present whenever climbing onto unit to protect against inadvertent operation.
- **During operation**, occupants on elevated equipment surfaces must wear a full body harness with a lanyard attached to an authorized lanyard anchorage point. Attach only one lanyard per lanyard anchorage point.
- **Face the machine** when entering or leaving the elevated equipment surfaces.

High-Pressure Fluid Leak Hazards

Figure 1-8

DANGER

To avoid serious injury or death from high-pressure hydraulic oil leaks penetrating skin, follow these rules:

- **Do not operate** equipment with oil or fuel leaks.
- **Keep** all hydraulic hoses, lines, and connections **tight** and in **good condition** before applying pressure to the system.
- **Relieve hydraulic pressure** before servicing the hydraulic system.
- **Remove** and replace or test hydraulic hoses if a leak is suspected. Have a qualified service facility perform the test.

DANGER

High-pressure fluid leaks can be invisible. When checking for hydraulic leaks and working around hydraulic systems, follow these rules:

- **Always wear** safety glasses with side shields (marked to comply with ANSI Z87) and impenetrable gloves.
- **Use** paper or cardboard to search for leaks.
- **Do not use** hands or body parts to search for leak.
- **Keep** hands and body **away** from pin holes and nozzles ejecting hydraulic fluid.

CAUTION

Use caution when removing hydraulic tank cap. Contents may be under pressure.

- Tank contents may be under pressure.
- **Allow oil to cool** before removing cap slowly.
- **Relieve** oil pressure before removing cap slowly.
- **Stay away** from hot oil that may spray from tank or hoses.

DANGER

High-pressure hydraulic oil can puncture skin. If injured, seek immediate medical attention and inform the physician of the cause of the injury. Surgery is required to remove the fluid from the body. Failure to seek proper medical attention will result in serious injury or death.

Figure 1-9

Power Lines/Static Electrical Hazard Warnings

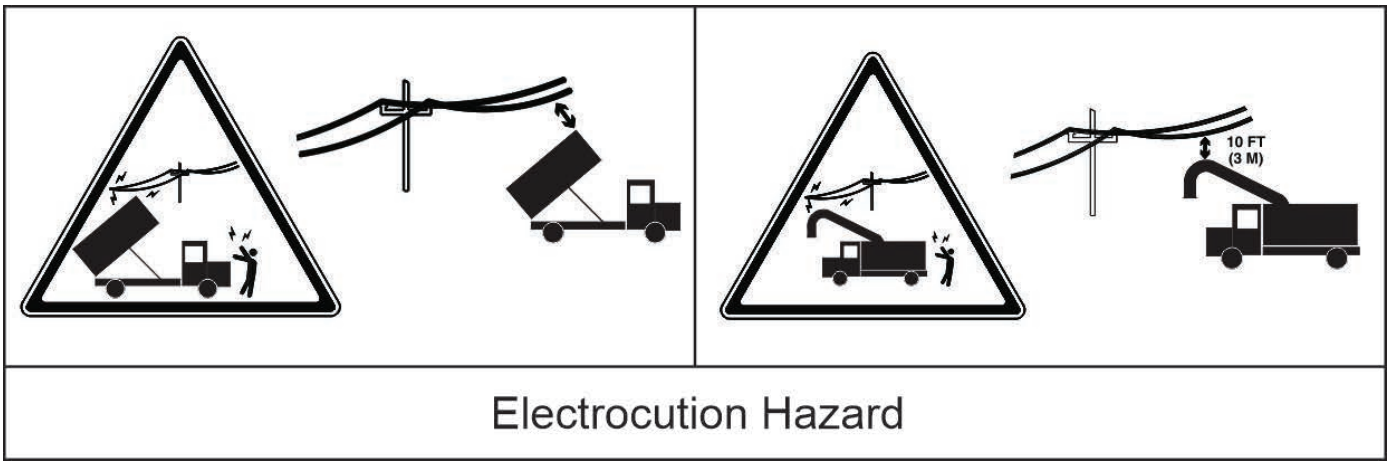


Figure 1-10

DANGER

This machine is not insulated and does not provide protection from contact or being near electrical current.

- **Never** operate the unit in an area where overhead power lines, overhead or underground cables, or other power sources may exist without ensuring that the appropriate power or utility company has de-energized the lines.
- **Always** check for power lines before raising boom or debris body.

Follow all requirements for using mobile equipment when working around power lines. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA. Additional information can be obtained from www.osha.gov.

Overhead Power Line Tips for Construction Workers Before You Begin Construction Work

- Survey the site for overhead power lines.

NOTE

Never get within 10 feet of an overhead power line!

- Consider all overhead lines as energized until the electric utility indicates otherwise or an electrician verifies that the line is not energized and has been grounded.
- In construction work, an overhead power line safety component should be part of your employer's overall safety and health program and safety training.
- If overhead lines are present, call the utility company and ask if the utility company can shut off the lines while you are working near them.
- If overhead lines cannot be shut down, ask the utility company if they can install insulation over the lines during the time you will be working near them.

Working with Tools and Equipment

- If the lines cannot be shut down and/or insulation cannot be applied, a minimum safe distance of 10 feet must be established.
- Only use non-conductive ladders when working on or near overhead power lines.
- Employees shall not be permitted to approach or carry any conductive object closer than 10 feet to an energized line.

WARNING

Non-electrical conducting coating must be used on water nozzles to prevent electrical contact with underground electrical power lines.

Chemical and Biological Hazard Safety

Figure 1-11

Chemicals and Diesel Engine Exhaust

WARNING

Operating, servicing and maintaining this equipment can expose you to chemicals including gasoline, diesel fuel, lubricants, petroleum products, engine exhaust, carbon monoxide, and phthalates, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer, birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov. This website, operated by California's Office of Environmental Health Hazard Assessment, provides information about these chemicals and how individuals may be exposed to them.

WARNING

Always read carefully and comply fully with the manufacturer's instructions when handling fuels, oils, solvents, cleansers, and any other chemical agent.

Sewer Gas Hazard

- Do not smoke or have lighted materials in or around sewer lines, drains, or catch basins.

Chemical Waste Hazard

- Storm drains, catch basins, and sewers may contain harmful chemicals. To prevent contamination and injury, wear chemical resistant gloves, long sleeves, trousers, and safety glasses or face shields.
- Seek immediate medical attention if exposure or contamination is suspected.

Biological Hazards

- Germs and other biological hazards are common in sewers, drains, and catch basins. Use appropriate personal protective equipment to avoid injury and contamination. Get medical attention for injuries associated with cleaning sewers, drains, and catch basins if biological contamination is suspected.

Dust Hazard

- Repeated or substantial breathing of hazardous dusts, including crystalline silica, could cause fatal or serious respiratory disease including silicosis. Concrete, masonry, many types of rock, and various other materials contain silica sand. California lists repairable crystalline silica as a substance known to cause cancer. Operation of this equipment under certain conditions may generate airborne dust particles that could contain crystalline silica. In those conditions personal protective equipment including an appropriate respirator must be used. If excessive dust is generated, a dust collection or suppression system should also be used during operation.

Transport Safety and Hazards Warnings

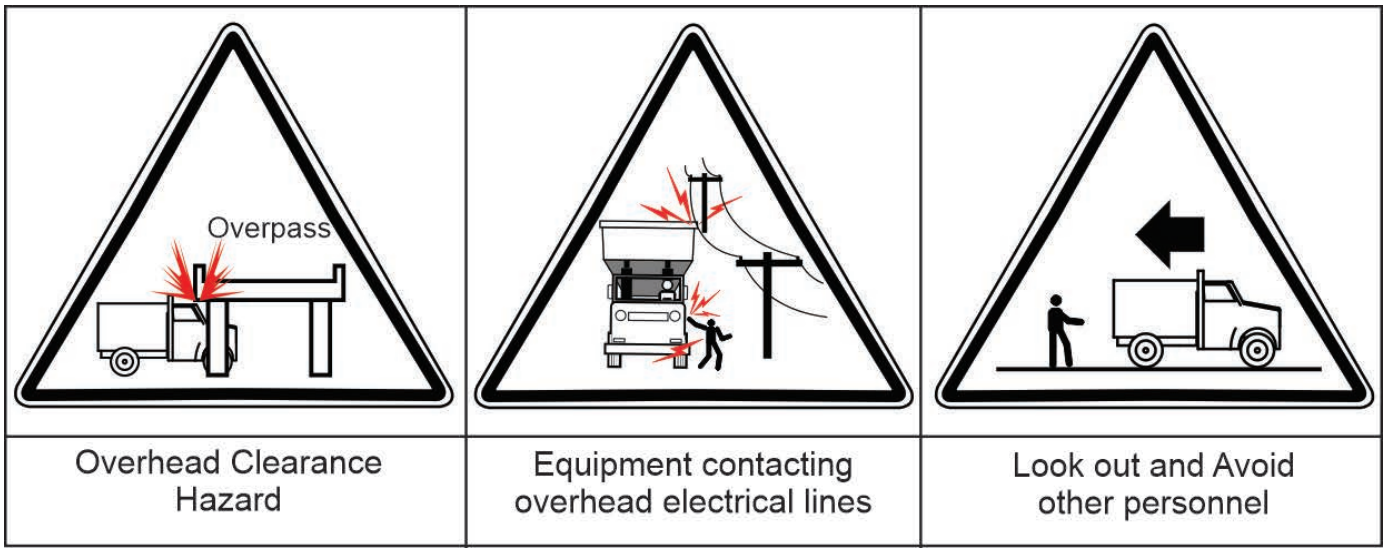


Figure 1-12

WARNING

Follow all steps before moving truck when towing or transporting equipment to avoid serious injury and death:

Before Transporting Truck Inspection

- Ensure unit is road worthy by performing a pre-trip inspection before driving to and from job site.
- Check that tailgate is closed and properly locked.
- Ensure all equipment is properly secured and positioned for maximum visibility and adequate clearances.
  - Close all water drain valves and install all plugs and strainers previously removed.
  - Check that boom (if equipped) is locked in transport position and properly secured.
  - Check that all tools, accessories, and work tubes/hoses are properly secured.
  - Check that cabinet doors and access panels are closed.
  - Check that all cleanout doors are closed and latched shut.
  - Check that the dust chute and tailgate are closed and latched shut.
- Always measure overhead clearance height of truck and equipment.
- Check for low hanging electric or telephone wires and power cables on the ground.
- Look out for and avoid other personnel, machinery and vehicles in the area. Use a spotter if you **do not** have clear view.

Never Exceed your Gross Vehicle Weight Rating (GVWR)

- In operation on public highways, the combined weight of the chassis, body, and payload must not exceed the gross vehicle weight rating of the chassis as rated by the cab and chassis manufacturer.

NOTE

It is possible to overload the unit capacity.

- *Load your water supply at or near the job site.*
- *Regulate your work to maintain minimum water storage when leaving the work location.*

Pedestrian Safety

- Conduct a visual check and warning (honk horn) before starting or moving the truck to ensure the safety of people on the ground and other equipment in the area.
- Be aware of all personnel who are working on the ground.
- Look out for and avoid other personnel, machinery and vehicles in the area. Use a spotter if you **do not** have clear view.

Transport Safety and Hazards Warnings — continued

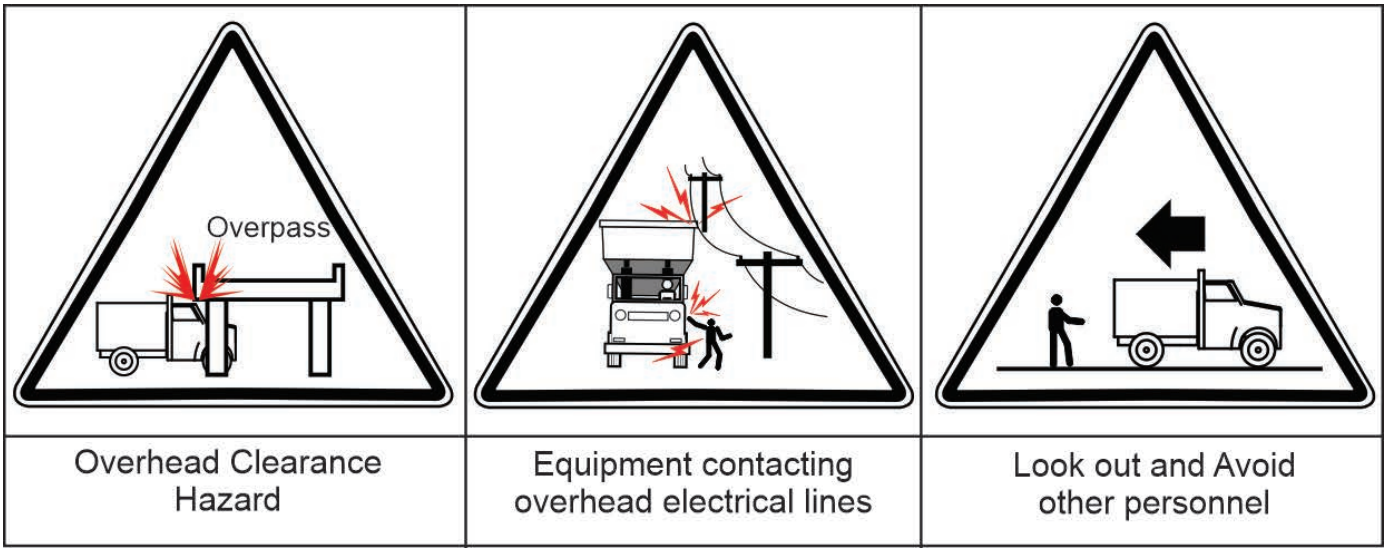


Figure 1-13

Determine Stopping Characteristics of Truck for Transporting Braking Tests

- Stopping distance with loaded debris body will be greater than empty truck.
- Reduce travel speed on wet or icy roads; stopping distances increase.

Determine Maximum Turning Speed Before Operating on Roads or Uneven Ground

- **Test** equipment by slowly increasing speed on turns to determine if it can be operated at higher speeds.
- **Use reduced** turning speeds on sharp turns to avoid equipment turning over.
- Truck has a high center of gravity when carrying a loaded debris body. Use extreme caution when transporting at highway speeds. Slow down for sharp corners to avoid tipping or turning over.

When Transporting Equipment

- **Do not move** truck unless debris body is fully lowered in the horizontal storage position.
- **Always** wear seat belt when operating truck.
- **Follow** all local traffic regulations.
- **Use** low speeds to avoid overturn tipping when debris body is filled.
- **Use** low speeds and gradual steering on curves, hills, rough or uneven surfaces, and wet roads.
- **Turn on** truck flashing warning lights when driving slower than traffic.
- Transport the truck only at safe speeds that allow for proper control of the truck while driving and stopping.

Job Site Safety and Hazard Warnings

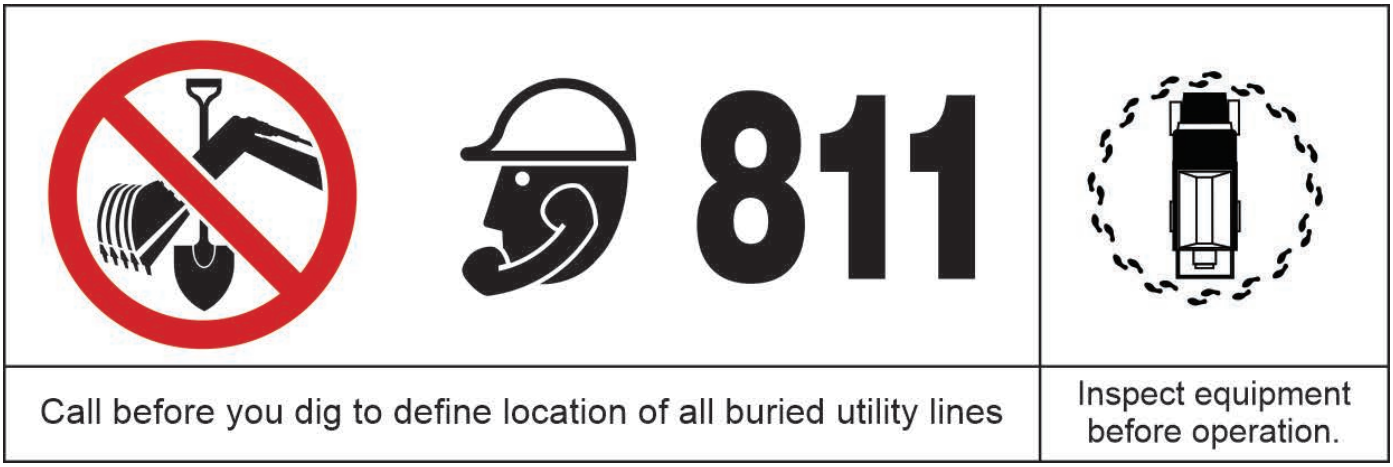


Figure 1-14

WARNING

Job site hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

To Help Avoid Injury

If job site classification is in question or if the possibility of unmarked electric utilities exists, classify the job site as electric.

Arrange for Traffic Control

- If working near a road or other traffic area, contact local authorities about safety procedures and regulations.
- Always activate beacons and flashers before job setup.
- Always use safety cones.
- If working on a roadway, follow required temporary traffic control measures.
- Use job site controls, such as cones and barricade tape, to prevent bystanders from entering potentially hazardous areas and to keep them away from machinery.

Prepare for Working Near Existing Utilities

- Boots must have high tops and meet the electric hazard protection requirements of ASTM F2413 OR ASTMF117, when tested at 14,000 volts. Tuck legs of pants completely inside boots.
- Gloves must have 17,000 AC maximum use voltage, according to ASTM specification D120. If working around higher voltage, use gloves and boots with appropriately higher ratings.

Plan for Emergency Services

- Make sure you have the telephone numbers for local emergency and medical facilities on hand, and access to a telephone.

Job Site Safety and Hazard Warnings — continued

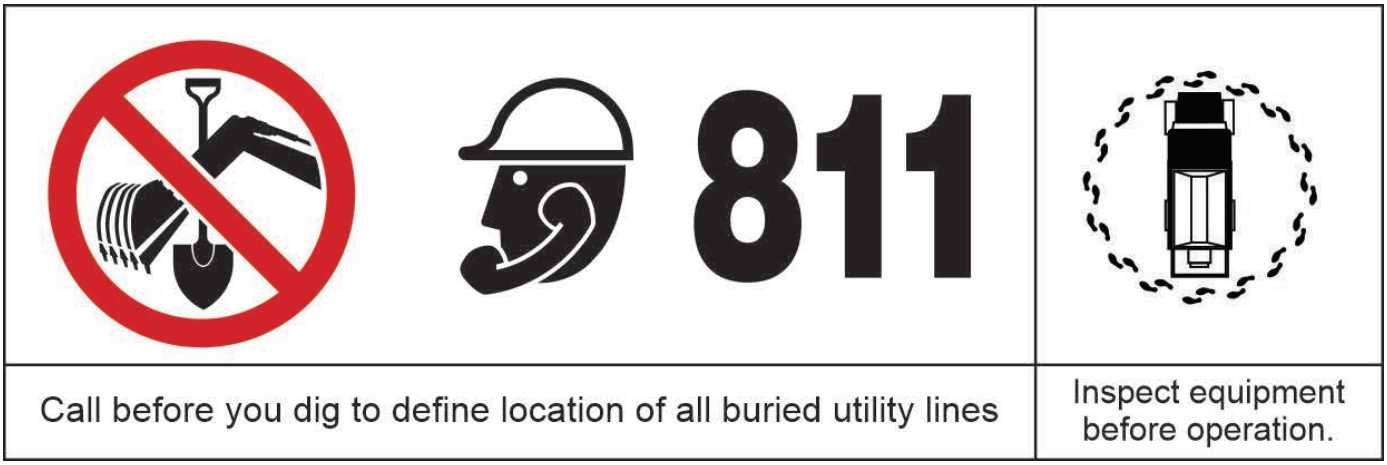


Figure 1-15

Inspect the Job Site

- Follow U.S. Department of Labor regulations on excavating and trenching (Part 1926, Subpart P) and other similar regulations.
- Contact your local One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before digging. Also contact any utilities that do not participate in the One-Call service.
- Inspect job site and perimeter for evidence of underground hazards, such as the following:
  - — “Buried utility” notices
  - — Utility facilities without overhead lines
  - — Gas or water meters
  - — Junction boxes
  - — Drop boxes
  - — Light poles
  - — Manhole covers
  - — Sunken ground
  - — Mark location of all buried utilities and obstructions
- Walk and inspect job site for unsafe conditions and identify any potential hazards for operators and bystanders. Do not operate equipment if unsafe conditions cannot be controlled.

Visibility Conditions When Operating

- **Operate in daylight** or with lights that provide adequate visibility to perform job safely.
- **Make sure** passersby, steep slopes, ditches, drop-offs, overhead obstructions, and power lines are visible and identifiable.

Prepare the Job Site

- Open manholes and other access openings create risk of trips and falls. Be aware of such locations and do not step in or over them. Ensure manhole covers and other covers are in place prior to leaving the job site.
- Be aware of traffic and pedestrians on the job site. Use extreme caution while moving around the vehicle to avoid contact with other moving vehicles. Before stowing the boom or moving the vehicle, make sure pedestrians are clear of the area.
- Clear the area to be excavated. Remove rocks or branches too large for vacuum hose.
- Select a solid area to stand on while excavating.

Fire Extinguisher

If required, mount a fire extinguisher near the power unit but away from possible points of ignition. The fire extinguisher should always be classified for both oil and electric fires. It should meet legal and regulatory requirements.

Vacuum Equipment Operation Safety And Hazard Warnings

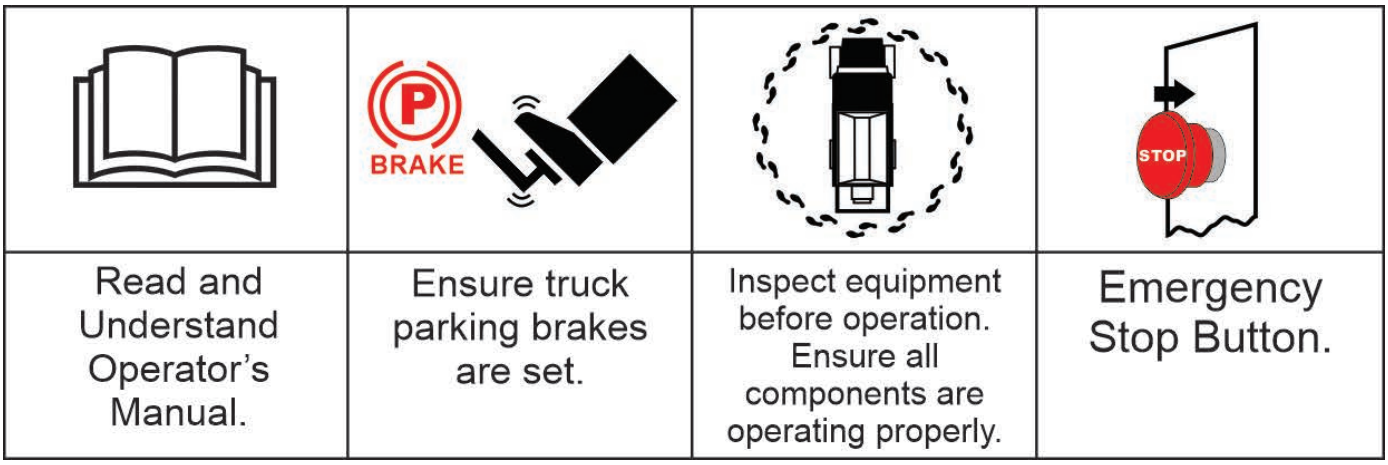


Figure 1-16

It is the operator's responsibility to be knowledgeable of all potential operating hazards and to take every reasonable precaution to ensure that oneself, others, animals, and property are not injured or damaged by the operation of this equipment. Do not operate the equipment if passersby or untrained persons are within the active job site.

Never operate this equipment if a shield or guard is missing or in poor operational condition.

NOTE

Read and understand all operating instructions and the entire safety section of this manual and the truck manual before attempting to operate any equipment.

If you do not understand any of the instructions, contact your nearest authorized dealer for a full explanation. Pay close attention to all safety signs and safety messages contained in this manual and those affixed to the unit.

WARNING

READ, UNDERSTAND, and FOLLOW the following Safety Messages. Serious injury or death may occur unless care is taken to follow the warnings and instructions stated in the Safety Messages. Always use common sense to avoid hazards.

WARNING

Always set the truck parking brakes and if on unleveled surfaces chock the wheels. Unexpected truck movement can cause serious injuries.

Before operating the equipment, conduct a walk-around inspection of the equipment for proper operation. Repair any improperly functioning, broken, or damaged equipment before operating.

Inspect the job site for unsafe conditions and identify any potential hazards for operators and bystanders. Do not operate equipment if unsafe conditions cannot be controlled.

Emergency Stop Button Function

This equipment is equipped with multiple emergency stop buttons that can be activated at any time during operation to disconnect the power and shut down the vacuum and dump operations. Emergency stop buttons are located on the front control panel, curbside control panel, and each remote pendant.

Pressing the emergency stop button while the machine is in operation has the following results:

- Brings truck RPM to idle
- Opens the vacuum relief valve
- Shuts off the water pump
- All functions that are stopped will remain inactive

A message on the front control panel HMI screen will indicate that it is in emergency stop mode.

Vacuum Equipment Operation Safety and Hazard Warnings — continued

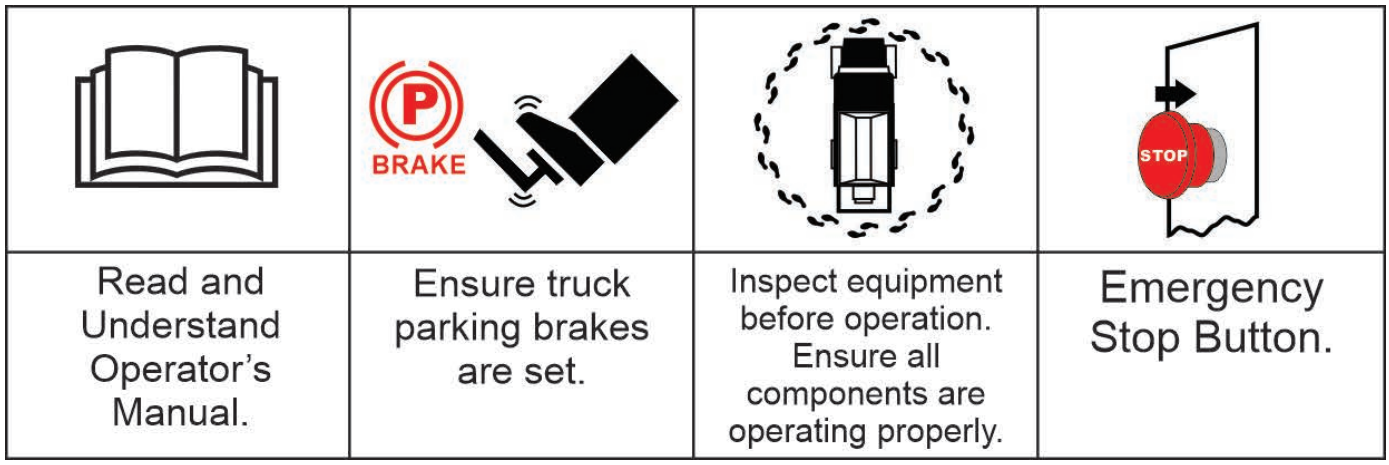


Figure 1-17

To Restore Power

1. The operator must reset the emergency stop button.
   - Twist the emergency stop button, and it will pop out
2. Upon resetting the emergency stop switch, the truck does not automatically go back to the state it was in when the button was pushed.
3. The switch panel must have power restored to continue operation. This will activate the boom and the hose reel functions at a neutral state.
   - The engine RPM must be increased
   - Water pump is engaged
   - Vacuum relief is closed

Vacuum Operation Safety

WARNING

When operating the vacuum equipment with extended vacuum hoses or tubes lying horizontal on the ground, you must install a vacuum relief T-type valve in the hose line.

NEVER operate the vacuum system without the vacuum relief valve being installed. Failure to install and operate the vacuum relief valve properly may result in serious injury and/or death.

The in-line vacuum relief valve must be in line within 50 feet from the end of the hose or pipe for proper operation.

WARNING

Make sure no one is near the end of the vacuum hose and that the vacuum relief door is open before engaging the vacuum pump. Failure to do so could cause personal injury.

- Keep vacuum tools and hoses away from face and body. An injury caused by vacuum can be serious. The vacuum must be stopped or the vacuum pressure relieved as quickly as possible at any sign of danger. Seek medical attention immediately.
- Do not attach hose, pipe, or accessories with the vacuum on. The vacuum can trap fingers, hands, and feet with enough force to crush or cut.
- Do not use a bare open hose end for vacuuming. A variety of hose and attachments are available to keep the operator clear of the hose opening.

Vacuum Equipment Operation Safety and Hazard Warnings — continued

⚠ CAUTION

Failure to engage parking brakes and/or position wheel chocks could result in unexpected chassis movement, which could cause bodily injury or property damage.

Pre-Start Checklist

- Ensure operator and co-workers have read and understood the safety instructions in the Operator's Manual.
- Ensure that all required maintenance has been performed.
- Park truck on level ground and set parking brakes.
- Ensure cleanout doors and tailgate are closed and latched shut.
- Attach suction hose and tubing as required, including relief valve.

Vacuum Operation

NOTE

See "Vacuum Relief Valve Safety" on pages 1-19–1-22.

- The unit must be thoroughly cleaned between jobs to prevent cross-contamination or chemical reactions.
- Never use the vacuum in any type of rescue operation.
- Operating the unit inside a building or confined areas can create additional risks to the unit, operators, and building occupants. Engine exhaust gas can reach deadly levels. Heat buildup from the engine and blower discharge can overheat equipment.
- Never use an air mover machine for vacuuming hydrocarbon or flammable materials unless the flash point of the material is 150°F or higher. Pressurized or pump off loading is not permitted unless the flash point of the material is 150°F or higher, unless nitrogen is present.

⚠ DANGER

Never operate engines where there are or can be combustible vapors. Vapors pulled into an engine air intake can cause engine acceleration and over speeding. This can result in death, injury, and property damage.

- The use of this equipment in the removal or handling of any regulated substance or material must be performed in strict accordance with all applicable federal, state, and local laws and regulations. Approved safety and personal protection equipment and clothing must be used and worn at all times.
- Never use a vacuum machine to vacuum dusty materials until the material safety data sheets (MSDS) have been consulted to determine if the dust is combustible. Only air mover units that are part of a verified assured grounding system and that have bags, doors, and any other non-welded debris body components grounded to the debris body can be used if the materials contain combustible dusts.

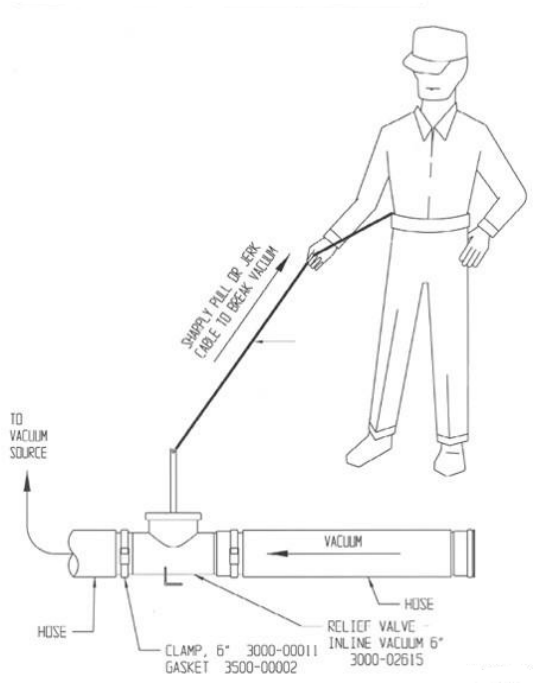


Figure 1-18

Vacuum Relief Valve Safety

Vacuum Relief Valves

The in-line T-type vacuum relief valve is delivered with the unit, and its operation is described in this procedure. The unit will also have a remote-operated vacuum relief valve. It consists of a hinged door that is opened and closed by a pneumatic cylinder. The vacuum relief valve is controlled by the operator at the front control panel or by the wired and wireless pendant remote. Its operation is also described in this section.

- Always use emergency T-type relief valve, except as noted below.
- When safety person is used, make sure he/she is in full view of person(s) at the end of vacuum hose.
- When working close to end of hose, wear tight-fitting clothes. Keep shirts and jackets closed so that shirt tails and jacket tails will not be pulled into end of hose. Remove loose-fitting jewelry such as bracelets and necklaces unless they are under tight-fitting clothing.
- Do not use hand or foot to remove obstructions from end of hose.
- Keep all body extremities and clothing from end of hose.
- The only time the emergency T-type relief valve is not required is when the operator is working vertically off the boom hose. In this case only, the operator should use the remote-operated relief valve. Failure to comply with this requirement could cause bodily injury, for which the manufacturer will not be responsible.

Operating the T-Type Vacuum Relief Valve

WARNING

Test the type T-type vacuum relief valve before using to ensure proper relief operation and to prevent injury or death.

1. With vacuum pump shut down, assemble T-type vacuum relief valve into vacuum inlet tubing or hose. The T-type vacuum relief valve should be kept as close as possible to the person working at the end of the vacuum hose (maximum of thirty feet away). If there is more than one operator, there must be a separate T-type valve for each operator.
2. Place a safety belt around the waist of the person working at the end of the vacuum inlet hose.
3. Attach the end of the pull cord to the loop on the safety belt. It is important to keep the pull cord as short as possible. Depending on how far the person with the safety belt is from the T-type vacuum relief valve, it might be necessary to shorten the pull cord. To shorten the pull cord (always keep pull cord swivel snap attached to loop on safety belt), loop the pull cord through the loop on the safety belt at the length required and knot the loop. During operation, the pull cord should be checked frequently (minimum of every two hours) to see that it can be operated freely and has not been damaged.

WARNING

If the person operating at the end of the vacuum hose is in a confined space or cannot easily reach the pull cord on their safety belt, there must be a safety person(s) wearing a safety belt with a pull cord attached who is in a position to view the person(s) working at the end of the vacuum hose.

4. When needed, the vacuum relief valve can be opened by pulling on the pull cord, which will greatly reduce the amount of vacuum at the end of the inlet hose. To totally eliminate the vacuum at the end of the inlet hose, the vacuum pump should be shut down.
5. With the vacuum pump shut down and the truck's engine off, reset the vacuum relief valve by placing the circular disk on top of the T-section.
6. When the relief valve is not being used, store it properly to prevent damage.

Vacuum Relief Valve Safety — continued

Testing the T-Type Vacuum Relief Valve

NOTE

The following test should be done every time the vacuum relief valve is assembled into the vacuum inlet line or every two hours of during operation, whichever is more frequent.

1. Visually inspect the vacuum relief valve, pull cord, and safety belt. Repair or replace as needed.
2. With the vacuum pump shut down and the truck's engine turned off, assemble the vacuum relief valve in the vacuum inlet line as shown in Figure 1-20. Attach the pull cord to the vacuum relief valve.
3. Insert the male plug into the end of the vacuum relief valve or vacuum inlet hose, whichever is at the inlet point.
4. With the vacuum relief valve closed, start up the vacuum pump and pull full vacuum.
5. At full vacuum, pull the cord to open the vacuum relief valve.
6. After the test, shut down the vacuum pump per operating procedure.
7. Open the vent door to make sure all vacuum is relieved before removing the plug from the end of the vacuum inlet hose.
8. Reset the vacuum relief valve. Remove and store the vacuum relief valve if it is not going to be used.

Figure 1-19

WARNING

If the vacuum relief valve is not working properly, personnel should not be allowed to work at the end of the vacuum inlet hose due to possible injury or death.

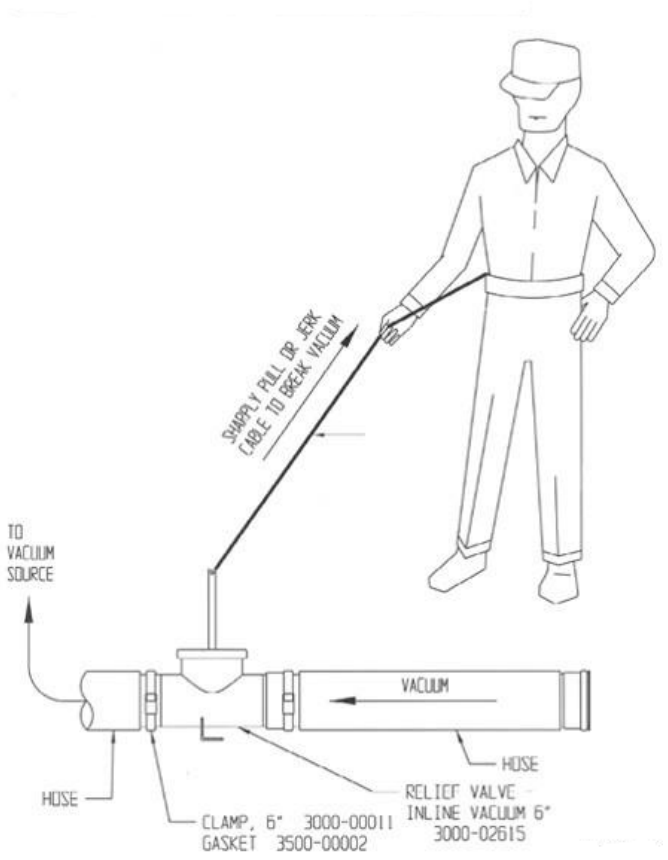


Figure 1-20

Vacuum Relief Valve Safety — continued

Operating the Remote-Operated Vacuum Relief Valve

The remote-operated vacuum relief valve is controlled by the pendant remote control or by the front control panel. The operation and testing instructions of this section apply to all relief valve controls.

- A safety person who is in full sight of the operator(s) must be used. The safety person must hold the pendant remote for the relief valve. Never allow workers at the end of the hose to operate the system without the safety person in position.
- Before cleaning the suction tubes or hoses, lower the engine speed to idle, open the relief valve, turn off the truck's engine, remove the keys, and lock the cab doors.
- When working close to the end of the hose, wear tight-fitting clothes. Keep shirts and jackets closed so that they will not be pulled into the end of hose.
- Remove loose-fitting jewelry such as bracelets and necklaces unless they are under tight-fitting clothing.
- Do not use hands or feet to remove obstructions from the end of the hose.
- Keep all body extremities and clothing away from the end of the hose.

1) VENT OPEN Button 2) VENT CLOSED Button

Figure 1-21

NOTE

See safety instructions for the vacuum relief valve on page 1-19.

WARNING

See the section on testing the remote-operated vacuum relief valve before using due to possible personal injury or death.

- For pendant remote control:
  - Insert the pendant cord into the socket located at the front control panel or the curbside control panel.
  - Route pendant cord to work area. Care should be taken in running pendant cord to work area from truck so that the cord will not be run over or damaged.
- The remote-operated relief valve must only be used with a safety person. The safety person must be holding the remote and must be in a position to observe the person(s) operating the vacuum hose. Never attach the remote to the work hose or to the person actually vacuuming up the product since situations could develop wherein the person using the vacuum hose may not be able to reach the remote.
- If the safety person observes an unsafe or dangerous action of any type, he/she should immediately press the VENT OPEN button (1) on the remote pendant. Only after all potential dangers have been removed should the vent door be closed and normal vacuum operations continue. The safety person should continue to be in a position to observe all vacuum hose operators until those operators have moved a safe distance from the end of all vacuum work hoses.
- After vacuum operation is completed and the vacuum pump is shut down, properly store pendant to prevent damage when truck is being moved.

WARNING

Never move close to the end of any vacuum hose unless the safety person has the remote pendant and is in a position to observe all operators. Failure to comply with this could result in serious personal injury or death.

Vacuum Relief Valve Safety — continued

Testing the Remote-Operated Vacuum Relief Valve

NOTE

The following test should be done every time the pendant is plugged in or every two hours of operation, whichever is more frequent.

1. Visually inspect the pendant cord, electrical plug, and control switch for damage. Repair or replace as needed.
2. If the pendant is not currently plugged in, insert the electrical plug on the end of pendant cord into the socket located at the front control panel or the curbside control panel.
3. Start up the vacuum pump per operating procedure in manual.
4. With unit at full vacuum, press the VENT OPEN button on the remote and verify that the vacuum relief door has opened. Press the VENT CLOSE button and verify that the vacuum relief door has closed.

WARNING

If vacuum relief valve is not working properly, personnel should not be allowed to work at end of vacuum hose due to possible personal injury or death. Repair or replace valve before operating vacuum pump.

5. After testing, shut down the vacuum pump per operating procedure.

CAUTION

Never work beyond the distance from the truck that the wireless remote control was previously tested at. Failure to comply could result in equipment not properly operating.

High-Pressure Water Safety and Hazard Warnings

Figure 1-22

- Release pressure before attempting to open any door, hatch, hose, or tube.
- Do not bend or strike high-pressure lines.
- Report any loose or damaged tubes or hoses to mechanics so repairs can be made prior to continued use.

WARNING

In the event of any water jet injury:

- **Seek medical attention immediately!**
- **Inform the physician of the cause of the injury.**
- **Tell the physician what type of water jet project was being performed at the time of the accident and the source of the water.**

Operators using or working around high-pressure water systems need to take additional precautions, including specialized personal protection equipment. This and additional information on high-pressure water safety is provided by and available as a wallet card from:

Water Jet Technology Association
906 Olive Street, Suite 1200
St Louis, MO 63101-1419
(314) 241-1445
fax (314) 241-1449
e-mail: wjta@wjta.org
website: www.wjta.org

IMPORTANT MEDICAL INFORMATION!

READ THIS PLASTIC CARD AND KEEP IT IN YOUR WALLET. IN THE EVENT OF A WATERJET INJURY, SHOW THE CARD TO YOUR DOCTOR.

Distributed by the: WaterJet Technology Association, 906 Olive Street, Suite 1200 St Louis, MO 63101-1419,
phone: (314) 241-1445, fax: (314) 241-1449
e-mail: wjta@wjta.org
website: www.wjta.org

Figure 1-23

- Use the handgun wash-down system for final equipment and job site cleanups or for cleaning debris buildups on the inside of body.

DANGER

The water handgun operates at high pressure. Never point the water handgun at yourself or others. Make sure you are holding handgun securely with both hands, in a secure stance. Water gun has a kickback when turned on.

- Always bleed the pressure from the handgun before disconnecting it from the high-pressure handgun connection.

High-Pressure Water Safety and Hazard Warnings — continued

When setting up for rodding operations, use the appropriate guide fin and hose guard (tiger tail) to prevent the nozzle from turning in the pipe and returning toward the operator. The length of the assembled nozzle and guide fin must be greater than the diameter of the pipe to be cleaned.

Inspect the rodder hose often for indications of damage or wear. Check the hose before each use for movement in hose fittings, exposed hose reinforcement, kinking or collapsing, blisters or bubbles, and fittings that are improperly installed or cutting into the hose.

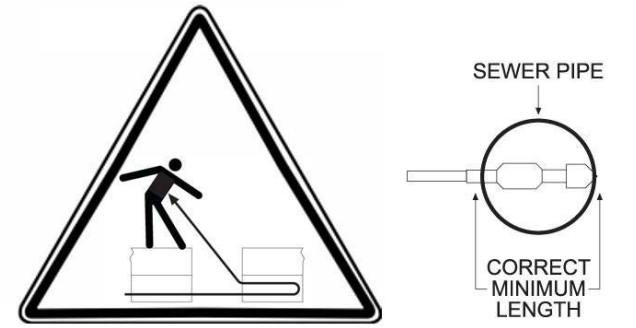


Figure 1-24

WARNING

Using improper fittings or using the sewer hose outside the sewer pipe can cause violent loss of control of the rodder hose.

The sewer hose creates tremendous pressure and must not be fitted with a reducer or handheld nozzle or be operated outside the sewer pipe. The back pressure created by such action will cause loss of control of the hose. Violent movement of the hose and fittings or high pressure can cause severe injury or death.

All hose manufacturers have instituted a color code system for identification of the hose, fittings, and tools. When repairing a hose, the inside color of the hose, the color of the fitting, and the die colors must match. Fittings from one manufacturer will not properly crimp onto hose from another manufacturer. The outside color of the hose indicates the pressure rating of the hose and must match during splicing operations. Be aware of the operating pressures associated with the vehicle and the proper hose specifications for safe operation.

Waste Equipment Technology Association publishes a variety of industrial-related information that owners and operators can obtain. This material includes specifications, repair, and inspection information for high-pressure hoses used in connection with sewer/catch basin cleaning equipment.

Waste Equipment Technology Association
4301 Connecticut Avenue, NW
Suite 300
Washington, DC 20008-2304
(Phone) (202) 244-4700
(Fax) (202) 966-4824
(E-mail) wastecinfo@WASTEC.org
(Web) http://www.wastec.org

High Water Pressure

WARNING

The handgun operates under high pressure. High-pressure water can cause serious injury or death.

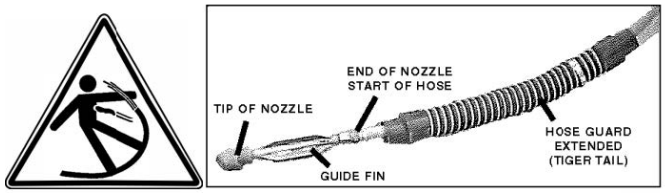


Figure 1-25

Do not open the sewer hose valve or turn on the water pressure until the hose is fully inserted into the sewer pipe, then increase water pressure slowly as you feed the hose into the sewer pipe. Always close the sewer hose valve when the hose reel is not in use.

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, safety goggles, and gloves (waterproof gloves preferred).

Dust Hazard and Explosion Prevention Safety

Figure 1-26

In a confined area, certain concentrations of dust in an otherwise normal atmosphere can explode when spark occurs. This phenomenon is known as a dust explosion. It has been known to occur in grain elevators, underground mines, flour mills, crushers, etc. The dust itself need not be an explosive or flammable substance.

The safe operation of transferring potentially explosive dust should be addressed by the following:

- Static charge dissipation
- Spark prevention

See “Static Charge Dissipation” on page 1-28 and “Spark and Fire Prevention Safety” on page 1-29 for specific information on addressing these two concerns.

Hydrocarbon Waste Recovery

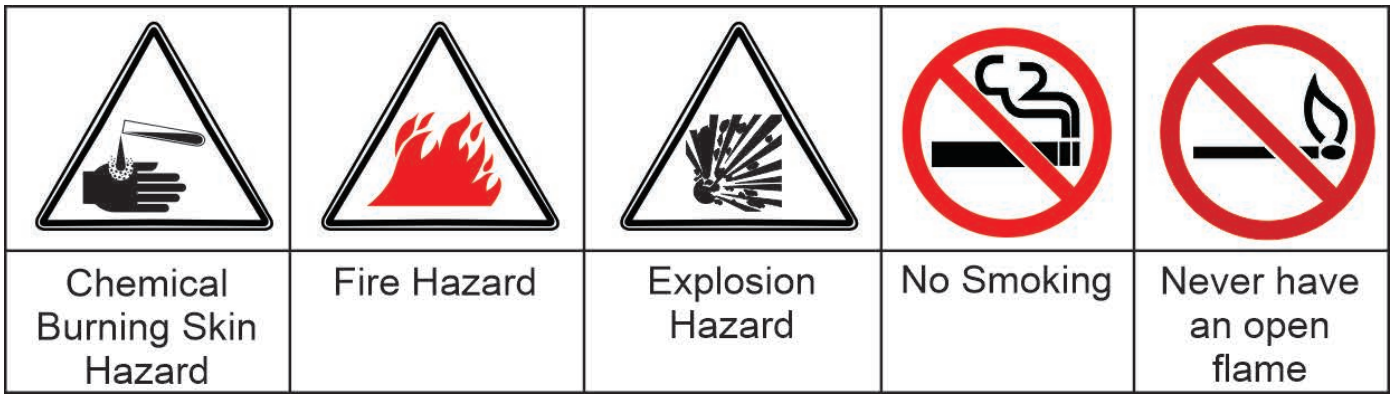


Figure 1-27

DANGER

Do not vacuum flammable or explosive materials.

Never use a rotary lobe blower to vacuum materials with flash points below 150°F. However, hydrocarbon materials with flash points greater than 150°F may be picked up with a rotary lobe blower if the following four concerns are addressed:

- Controlling the lower explosive level (LEL)
- High temperature prevention
- Static charge dissipation
- Spark prevention

DANGER

It is not recommended that materials with a flash point below 150°F be picked up under any operating conditions. The potential for an explosion is too great.

A rotary lobe blower may be used to pick up materials with flash points greater than 300°F without addressing the four concerns.

Refer to API Standard 2219 for more information on safe operation of vacuum trucks in petroleum service.

Controlling Lower Explosive Level (LEL)

Super Products recommends that a monitor for hazardous hydrocarbon concentrations be installed in the exhaust stream of the vacuum pump to continuously monitor for lower explosive level (LEL). The monitor must be properly calibrated based on the product being picked up.

For details on how the monitor operates, it is suggested you contact a reputable monitor manufacturer such as Industrial Scientific Corporation in Oakdale, PA at 1-800-338-3287.

If the LEL reading approaches 50%, it is recommended that the operator at the end of the work hose lift the hose out of the material being conveyed and allow only air to enter the vacuum hose. As an alternative, a bypass switch could be installed to open the two valves discussed in “High Temperature Prevention” on page 1-27.

High-Temperature Prevention

DANGER

Failure to comply with the recommendations for high-temperature prevention could result in equipment failure, personal injury, or death.

We suggest that in order to pick up materials with flash points below 300°F, primary and backup system sensors and air flow modifications to limit operating temperatures should be made to a standard vacuum system as manufactured by Super Products. They include the addition of two temperature gauges with adjustable switches, and two temperature sensors, which should be installed in the exhaust airstream of the vacuum pump. In addition, two air-operated valves should be installed on the body. The temperature sensors and gauges should be similar to a Murphy temperature “switch gauge” whereby a contact closes, permitting use of an electrical signal at temperatures above an adjustable preset temperature. The valves should have a minimum four inch diameter.

In operation, the operator should set the trip point of the temperature switches at or below the flash point of the material being picked up. If the exhaust temperature reaches the set point of the temperature switch, the valves would open. This would stop the conveyance of material through the vacuum hose, permit cool air to be sucked into the body and vacuum system for cooling the vacuum pump, and quickly vent from the body so as to not cause an explosion. Prior to each load being vacuumed, the operator should test each system to ensure the valves are working.

The operator should set the trip point of both Murphy gauges to the lowest possible setting, block off the intake hose, and operate the vacuum pump at a minimum of 1000 RPM until the temperature rises to the trip point. The operator should ensure that once the temperature has reached the trip point, the respective valve opens.

DANGER

Do not use the unit unless both temperature limitation systems are working properly.

Static Charge Dissipation

DANGER

Failure to comply with the recommendations for static charge prevention could result in equipment failure, personal injury, or death.

1

When picking up potential explosive materials (either hydrocarbons with flash points below 300°F, or explosive dust), it is necessary to safely dissipate static charges by completely grounding the vacuum truck, intake hose, and container from which the material is being removed. Only a static dissipating vacuum hose supplied by Super Products should be used. There should be a grounding strap run from the truck frame to a grounding stake.

All grounding cables should be a minimum of 1/0 in size. Grounding lugs should be welded onto the male and female couplings of all hose sections so that grounding straps (min. #10 gauge wire) can be run from the male coupling to the female coupling at all connection points. A grounding reel should be installed on the vacuum loader with the ground cable run to the container from which the material is being removed.

When material is being transferred by a pneumatic conveying system, static electricity is generated. If this electricity is not dissipated through an electrical ground, arcing can occur. The resulting spark can cause a dust explosion or a hydrocarbon explosion either within the unit or within a building that the conveying line enters.

The following safeguards are recommended to dissipate static charge caused by operation of the unit:

- Truck tires can insulate the unit; therefore, an electrical wire should be connected between the body and a known electrical ground such as a water pipe, plant ground loop system, or metal stake driven into the ground sufficiently deep to ensure an electrical ground. Bolt wire to truck frame — do not weld.
- The electrical resistance from the truck to the electrical ground must be at 10 ohms or less for the duration of the material transfer process. Some companies, such as Newson Gale, provide a ground verification system to enable operators to establish safe grounding of their vehicle.
- Supertube and hose couplers have rubber sealing gaskets. The presence of dirt and corrosion can prevent electrical conduction from tube to tube through the tube clamps. It is recommended to weld a bolt or a threaded stud to each end of each tube or hose coupler, and connect a wire of sufficient length from tube to tube after installation of the clamp. Wing nuts could assist in making these connections quickly.
- Standard Super Products material handling hoses are specially designed to conduct static electricity. Do not substitute hoses of unknown construction, particularly plastic hoses, which may not be static conducting.
- Never operate the unit inside a building that has a dust-laden atmosphere, such as inside of a grain elevator. The unit's electrical system and electrical components will arc in normal operation. Sparks and flame could also be emitted from the engine exhaust. Any of these conditions could cause a dust explosion within the building.
- Before operation, ensure that all ground wire connections are tight and free from corrosion and paint.

Spark and Fire Prevention Safety

Figure 1-28

DANGER

Failure to comply with the recommendation for spark prevention could result in equipment failure, personal injury, or death.

When picking up materials with flash points below 300°F, it is necessary to take precautions to prevent generating sparks. Explosion from spark ignition can occur when picking up an explosive product (solid or gaseous). Typically, sparks occur from material striking steel or when metal objects within the material, such as nuts, bolts, or nails, strikes a steel surface. This is especially prevalent where bends in the vacuum piping system occur or inside the collector body when material strikes the floor.

The suggested way of protecting from such an explosion is to use abrasive-resistant rubber-lined elbows where a bend occurs. Line the inside of the material deflector with a rubber abrasion-resistant material and partially fill the debris body with an extinguishing liquid, such as water, so the incoming material does not strike another object, causing a spark. The entire unit should be grounded, as described previously, and only static dissipating hoses should be used. It is essential the truck engine exhaust is directed away from the blower exhaust silencer to avoid an explosion caused by the hot gases or a spark from the engine exhaust.

The vacuum pump exhaust air should only enter the atmosphere at a minimum of 100 feet away from any other potential ignition source.

If the environment in which the truck sits has an explosive gas in the atmosphere, protective measures such as grounding all engine belts, explosive proof alternators, voltage regulators, special truck exhaust mufflers, engine run-away protection devices etc., must be used. Consult the truck manufacturer for details.

DANGER

All of the above situations are extremely dangerous, and all precautionary steps must be taken or else equipment damage, personal injury, or death could occur. If there is any doubt as to the material to be conveyed, a complete analysis must be done prior to vacuuming.

Debris Body Dumping Safety and Hazard Warnings

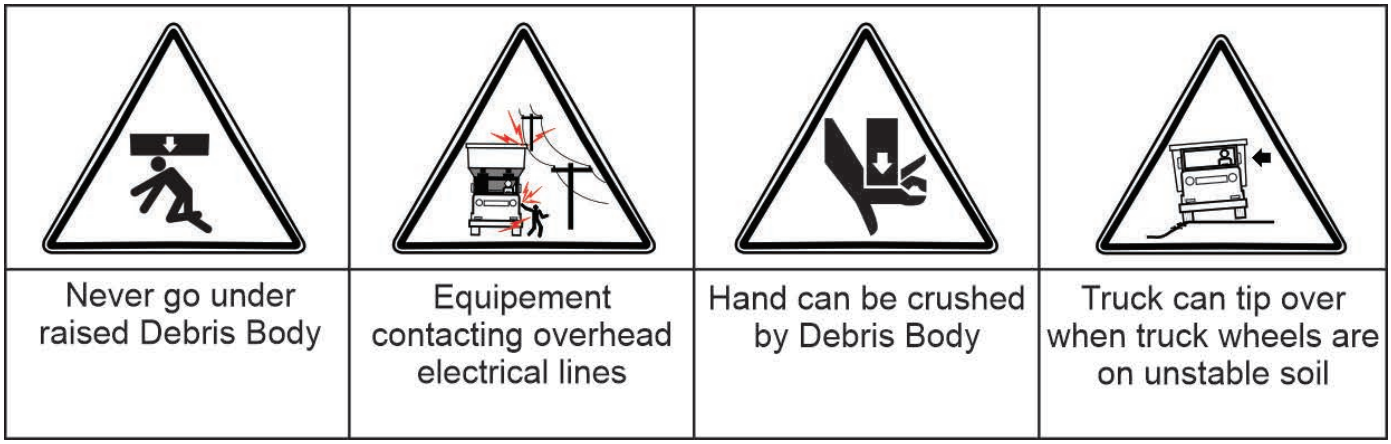


Figure 1-29

WARNING

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. The debris body MUST BE empty for service work.

- **Never** prop a raised loaded debris body.
- **Never** attempt to raise body when vehicle is on unlevel ground.

WARNING

Never go under a raised loaded debris body. Never go under a raised body without securely propping it. Body must be empty.

- **Immediately** report any damage or malfunction of the unit or components to your employer.
- **Never** ride, or let any other person ride, on any part of the vehicle other than in the cab.
- **Make sure** that all individuals and obstructions are clear of the hoist and body before operating the controls, and be ready to stop operation at any time that a hazardous condition might occur.

WARNING

Use extreme caution when dumping contents of the debris body. Ensure all personnel are at least 20 feet away from truck. Select a dump site that is on level ground and is clear of overhead obstructions. Serious injury or death to the operator and/or bystanders could occur if precautions are not taken when dumping the contents of the debris body.

- When positioning the truck at the dump station, choose an accessible location on level ground. Raising the debris body on unleveled ground increases the possibility of tipping.
- **Make sure** the area is clear of ground and overhead obstructions.
- **Never** raise the debris body unless you can clearly see all overhead structures. Stay clear of all utility lines.
- **Do not** dump the debris body over a pit area where the ground may cave in or is unstable.
- **Use care** when positioning the debris body to the dump station. Your vision, especially to the side and rear of the debris body, may be reduced by the size of the debris body. Use mirrors to aid vision. If you cannot see the dump site clearly, stop the truck and examine the area. If necessary, request assistance to guide you while backing the truck into position.
- **Never** drive with the debris body in the raised position. Traveling with the debris body in the raised position increases the chances of colliding with overhead obstructions. In addition, the center of gravity of the debris body is higher with a raised debris body, making the unit more prone to tipping over.

Sewer Gas Safety and Hazard Warnings

Figure 1-30

WARNING

- **Sewer lines often contain poisonous or explosive gas such as methane. NEVER enter or bend over a sewer without proper ventilation and personal protective equipment. If another person needs help in a sewer, immediately call for emergency assistance. NEVER enter the sewer to help unless you have been trained to do so and have proper personal protective equipment.**
- **NEVER smoke in or around sewer lines, drains, or catch basins.**
- **Failure to follow these instructions may result in death or serious injury.**

Confined Space Hazard

Follow all requirements for confined space when servicing. All large water bodies and vessels that can be entered are to be considered permit-required confined space as defined by the Occupational Safety and Health Administration (OSHA). The following information is from OSHA 3138-01R 2004. The full document can be obtained from www.osha.gov.

Many workplaces contain spaces that are considered to be “confined” because their configurations hinder the activities of employees who must enter into, work in, or exit from them. In many instances, employees who work in confined spaces also face increased risk of exposure to serious physical injury from hazards such as entrapment, engulfment, and hazardous atmospheric conditions. Confinement itself may pose entrapment hazards, and working in confined spaces may keep employees closer to hazards such as machinery components than they would be otherwise. For example, confinement, limited access, and restricted airflow can result in hazardous conditions that would not normally arise in an open workplace.

The terms “permit-required confined space” and “permit space” refer to spaces that meet OSHA’s definition of a “confined space” and contain health or safety hazards. For this reason, OSHA requires workers to have a permit to enter these spaces.

By definition, a confined space:

- Is large enough for an employee to enter fully and perform assigned work.
- Is not designed for continuous occupancy by the employee.
- Has a limited or restricted means of entry or exit.

These spaces may include underground vaults, bodies, storage bins, pits and diked areas, vessels, and silos.

Trenching Hazards

NOTE

Reference to OSHA regulations are for informational purposes only and not intended as legal advice.

OSHA Occupational Safety and Health Administration

Safety Tips

Working safely in trenches

Do NOT enter an unprotected trench!

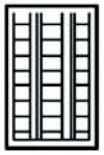
Each employee in a trench shall be protected from a cave-in by an adequate protective system.

Some of the protective systems for trenches are:

- Sloped for stability; or

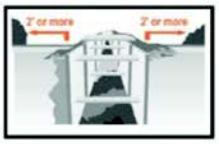
- Cut to create stepped benched grades; or

- Supported by a system made with posts, beams, shores or planking and hydraulic jacks; or

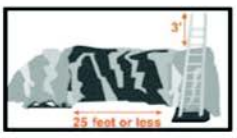


- Supported by a trench box to protect workers in a trench.

Additionally, excavated or other materials must be at least 2 feet back from the edge of a trench; and



A safe means of egress shall be provided within 25 feet of workers in a trench.



For more complete information:

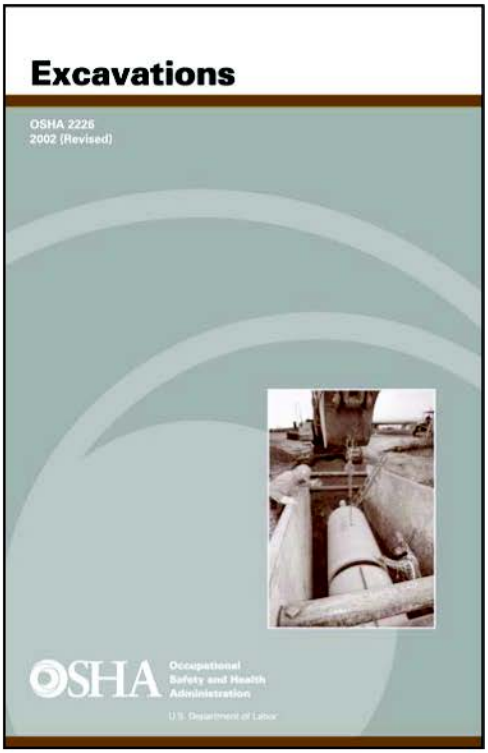
OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA

TTY (877) 889-5627

OSHA 3243-03R-05



De-Energize and Lockout Procedures

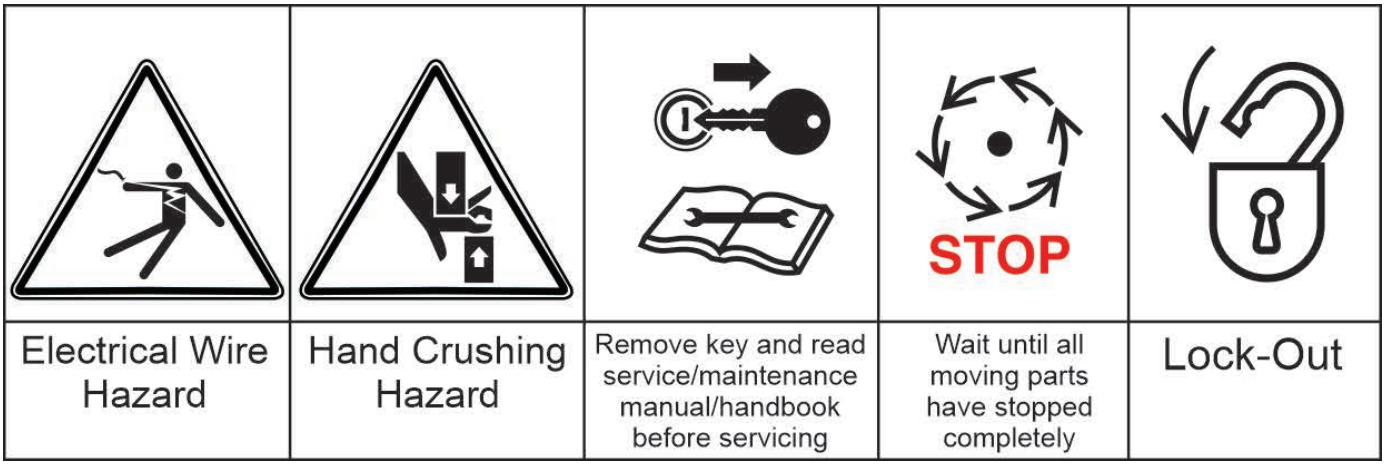


Figure 1-31

WARNING

Workers can be seriously or fatally injured if machinery they service or maintain unexpectedly energizes, starts up, or releases stored energy.

NOTE

Follow all requirements for PPE when servicing equipment.

De-energization and lockout refer to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment or from the release of hazardous energy during service or maintenance activities.

De-energization requires the authorized employee to turn off and disconnect the machinery or equipment from its energy source(s) before performing service or maintenance and to either lock out or isolate the equipment/components to prevent the release of hazardous energy (e.g., electricity, compressed air, high pressure fluid, etc.).

Lockout devices hold energy-isolation devices in a safe or “off” position. They provide protection by preventing machines or equipment from becoming energized because they are positive restraints that no one can remove without a key or other unlocking mechanism or through extraordinary means, such as bolt cutters.

To properly de-energize this equipment:

1. Lower the debris body and tailgate to the lowered transport position or onto the mechanical props to support the component.
2. Lower the boom (if equipped) to the storage position or to the lowest or ground position.
3. Place the transmission in the park position.
4. Set the parking brake.
5. Turn off the engine and remove the keys.
6. Switch the battery power off if the truck has a battery disconnect switch, or disconnect the battery ground cables.
7. Lock the truck doors and securely store the truck keys.

Hazards With Equipment Maintenance

WARNING

Avoid serious injury or death from component failure by keeping implement in good operating condition by performing proper service, repairs, and maintenance.

Before Performing Service, Repairs, and Maintenance on the Equipment

- **Stop pto and engine,** engage parking brake, lower implement, allow all moving parts to stop, and remove key before dismounting from truck.
- **Place** debris body, tailgate, and boom in lowered position or securely block up with support props.
- **Wear safety glasses, protective gloves** and follow **safety procedures** when performing service, repairs and maintenance on the equipment.
- Allow components to cool before servicing or performing maintenance.
- **Avoid contact** with hot hydraulic oil tanks, pumps, motors, valves and hose connection surfaces.
- **Securely** support or **block up** raised framework and lifted components before working underneath equipment.
- **Follow instructions** in maintenance section when replacing hydraulic cylinders to prevent component from falling.
- **Stop** and **shut off truck** engine before doing any work procedures.
- **Use** ladder or raised stands to reach high equipment areas inaccessible from ground.
- **Ensure** good footing by standing on solid flat surfaces when getting on equipment to perform work.
- **Follow** manufacturer's instructions in handling oils, solvents, cleansers, and other chemical agents.
- **Do not** change any factory-set hydraulic calibrations to avoid component or equipment failures.
- **Do not** modify or alter equipment, functions, or components.

Performing Service, Repairs, Lubrication, and Maintenance

- **Inspect** for loose fasteners, worn or broken parts, leaky or loose fittings, missing or broken cotter keys, washers on pins, and all moving parts for wear.
- **Replace** any worn or broken parts with authorized service parts.
- **Lubricate** unit as specified by lubrication schedule.
- **Never** lubricate, adjust, or remove material while it is running or in motion.
- **Torque** all bolts and nuts as specified.

Safety Shields, Guards, and Safety Devices Inspection

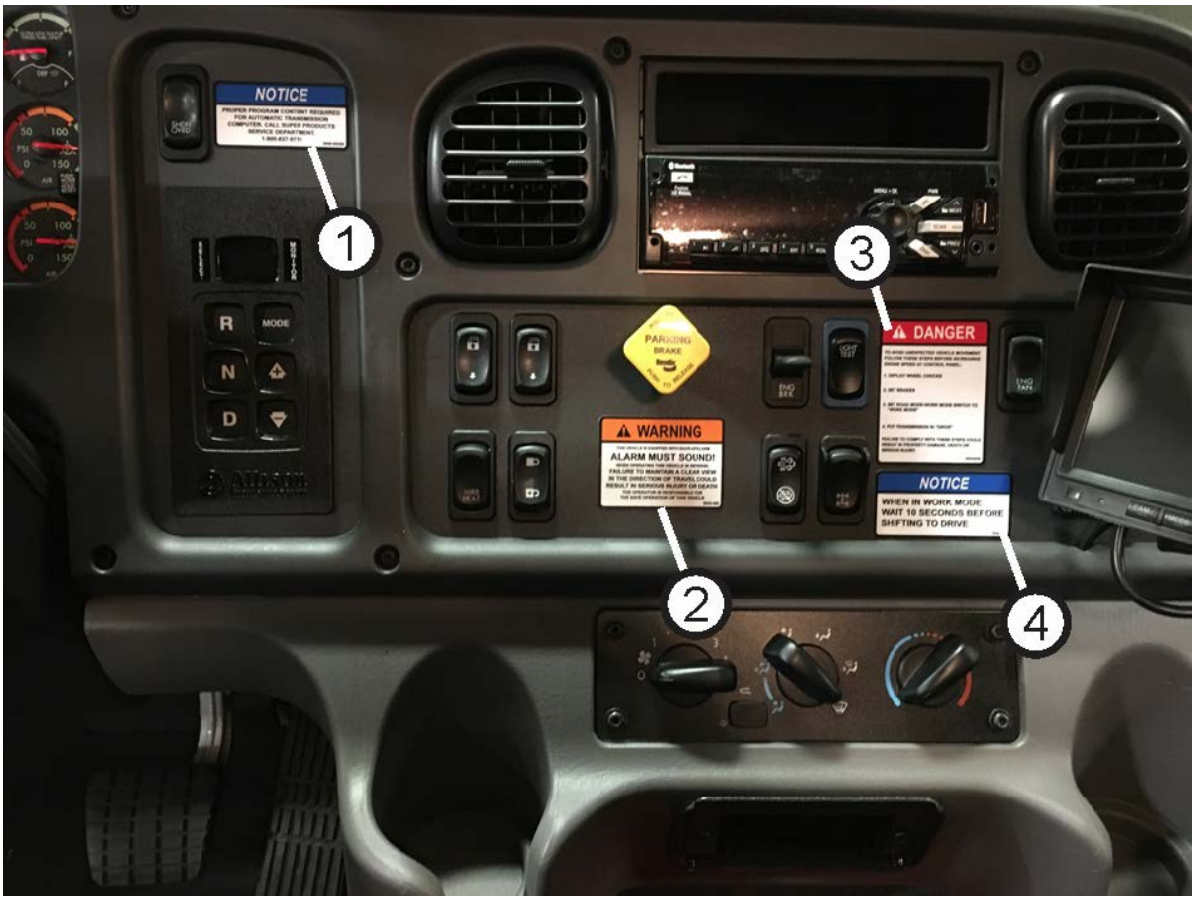
- **Replace** any missing, broken, or worn safety shields, guards, and safety devices.
- **Replace** any damaged or worn safety warning decals. Damaged or worn decals need to be replaced with new ones.

Decal Location

In addition to the decals provided by Super Products™ there may be decals shown that are part of the cab and chassis or other non Super Products components; these will not be covered.

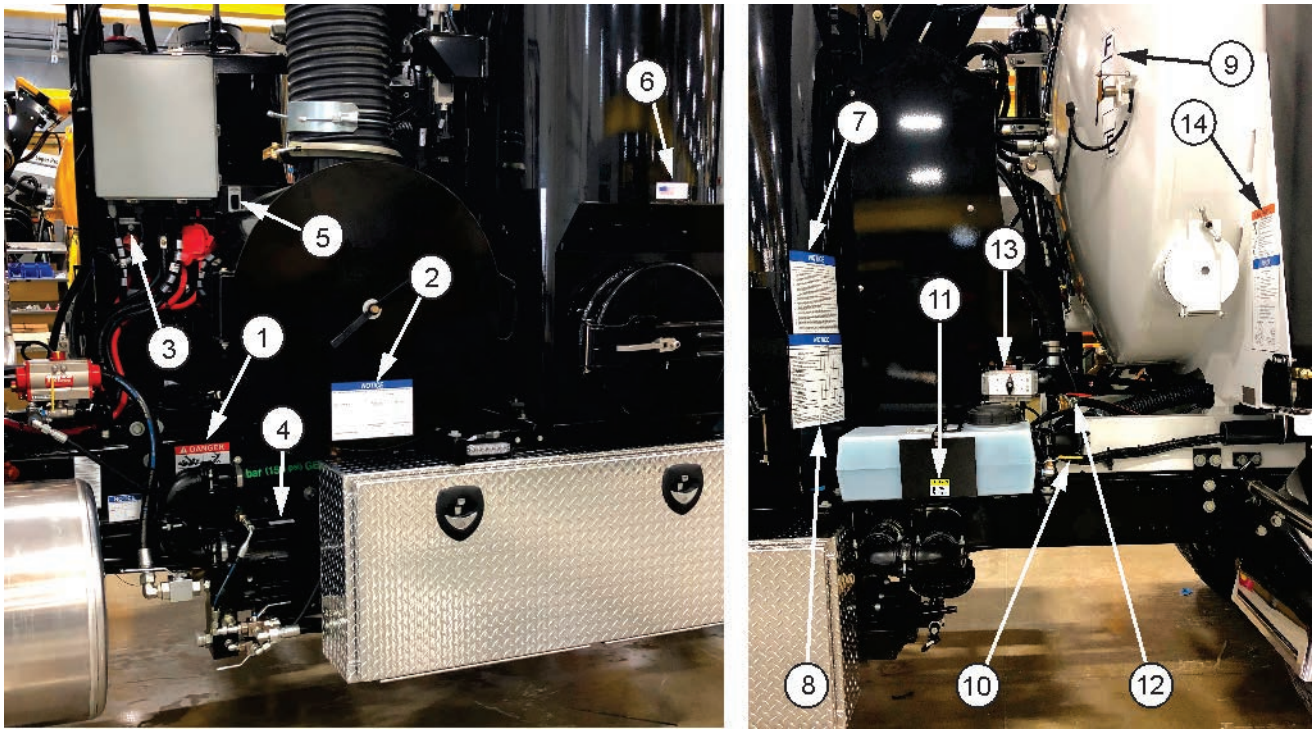
Some decals shown may appear in a different location than pictured due to differences in optional equipment on each machine and differences in cab and chassis configuration.

If any decal provided by Super Products is missing or becomes illegible, a replacement decal can be requested from Super Products at no charge and should be replaced immediately.



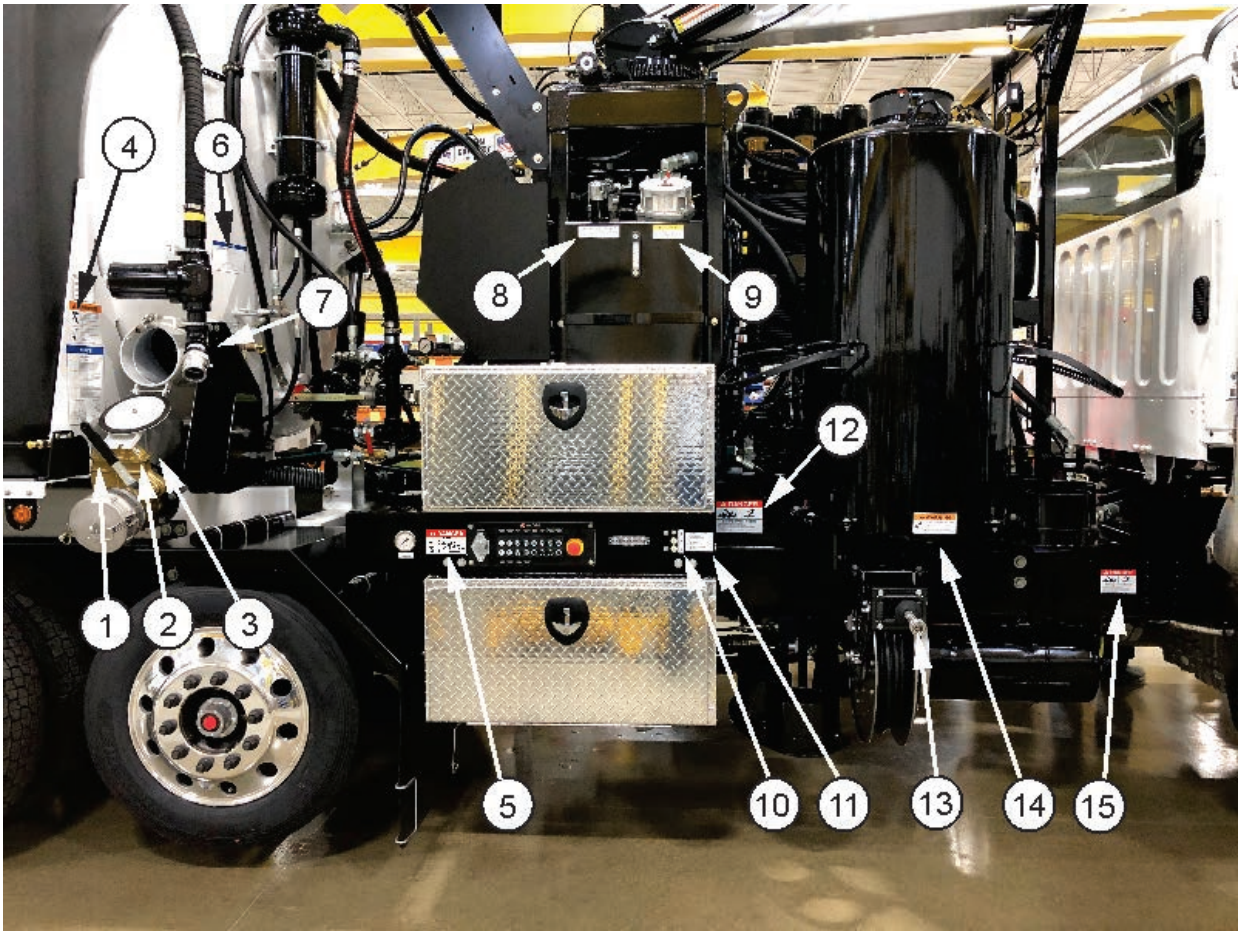
ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Automatic transmission program content	NOTICE	3050-00260	1-39
2	Alarm must sound	WARNING	0033402	1-40
3	Avoid unexpected vehicle movement	DANGER	0033220	1-41
4	Wait 10 seconds before shifting	INSTRUCTION	0030858	1-42
Not shown	Parameters and Software (by chassis diagnostic port)	INSTRUCTION	0003392	1-43
Not shown	Vehicle height (under driver's side sun visor)	CAUTION	0026566 - 9 yd 0041440-12 yd	1-44

Figure 1-32: Inside Cab



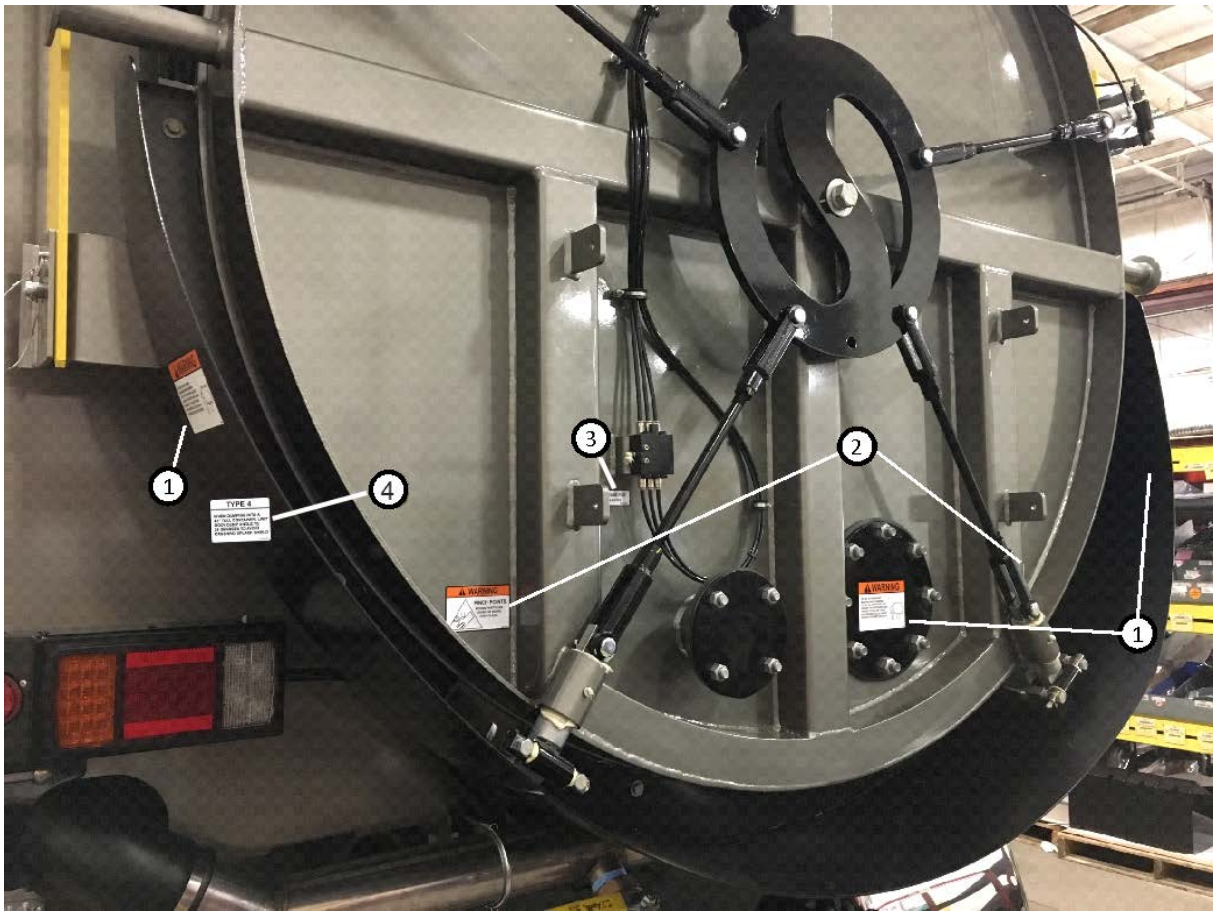
ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Rotating shafts can be dangerous	WARNING	3050-01180	1-45
2	Water pump valve positions	NOTICE	0041495	1-46
3	Hydraulic Power Unit disconnect switch	INSTRUCTION	0033294	1-47
4	Open valve to prime	INSTRUCTION	0030861	1-48
5	PTO override switch	INSTRUCTION	0033293	1-49
6	Made in the U.S.A.	INSTRUCTION	3050-00433	1-50
7	Winterization/air purge system	NOTICE	0033236	1-51
8	Service chart	INSTRUCTION	0033157	1-52
9	Level Gauge	INSTRUCTION	0007543	1-53
10	Air Purge Valve	INSTRUCTION	0032916	1-54
11	No step	INSTRUCTION	0041475	1-55
12	Drain here	INSTRUCTION	3050-00024	1-56
13	Water supply on/off	INSTRUCTION	3050-00572	1-57
14	Do not go under raised body	WARNING	0007448	1-58

Figure 1-33: Left Side of Truck



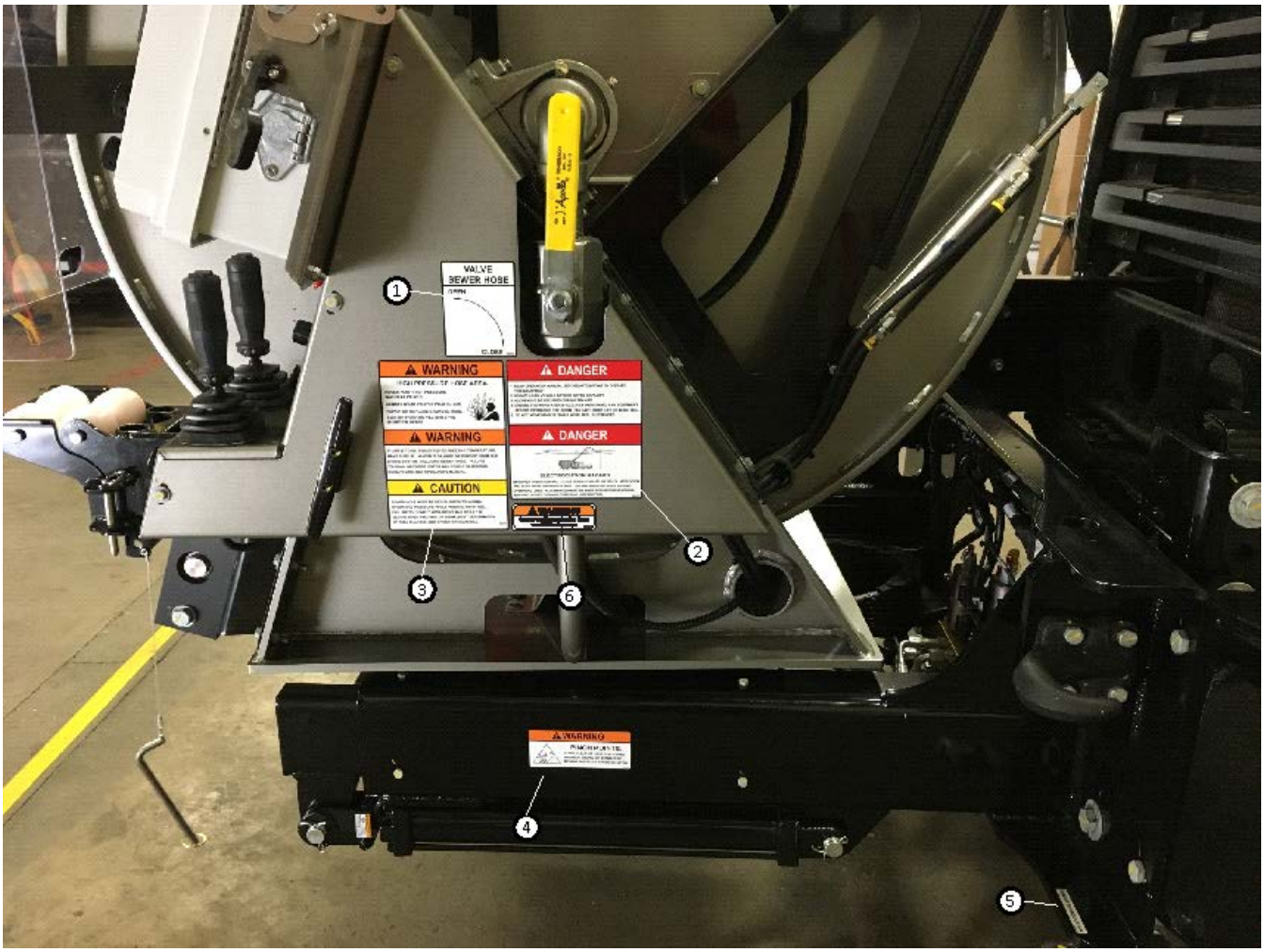
ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Closed	INSTRUCTION	3050-00338	1-59
2	Open	INSTRUCTION	3050-00337	1-60
3	Body drain	INSTRUCTION	3050-00578	1-61
4	Do not go under raised body	WARNING	0007448	1-58
5	Body Safety	DANGER	0033156	1-62
6	Valve positions	NOTICE	0026476	1-63
7	Water tank fill	INSTRUCTION	3050-00579	1-64
8	Hydraulic reservoir	INSTRUCTION	3050-0051	1-65
9	Suction line valve	CAUTION	3050-01286	1-66
10	1.2.3.	INSTRUCTION	0007522	1-67
11	Remote grease	INSTRUCTION	0007541	1-68
12	Rotating shafts can be dangerous	WARNING	3050-01180	1-45
13	Handgun connection	INSTRUCTION	3050-00009	1-69
14	High-pressure water	WARNING	0007433	1-70
15	Rotating shafts can be dangerous	WARNING	3050-01179	1-71

Figure 1-34: Right Side of Truck



ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Dumping and tailgate warning	WARNING	0003403	1-72
2	Pinch points	WARNING	3050-01201	1-73
3	Remote grease for tailgate latch	INSTRUCTION	3050-01200	1-74
4	Limit 28° Dump Angle	NOTICE	0041234	

Figure 1-35: Rear of Truck



ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Valve sewer hose	INSTRUCTION	0007423	1-75
2	Safety information	DANGER	0033153	1-76
3	Sewer hose safety	WARNING	0033150	1-77
4	Reel winding	WARNING	0033168	1-78
5	Winter recirculation	INSTRUCTION	3050-00205	1-79
6	Proposition 65 California	WARNING	D960	1-90

Figure 1-36: Left Side of Reel

ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Sewer hose containment system	DANGER	3050-00036	1-80
2	Hose maintenance instructions	INSTRUCTIONS	3050-00025	1-81
3	Avoid unexpected vehicle movement	DANGER	0033220	1-41
4	Boom controls	INSTRUCTIONS	0033154	1-82
5	Reel base rotation brake	INSTRUCTIONS	3050-00981	1-83
6	Reel controls	INSTRUCTIONS	0032936	1-84

Figure 1-37: Front of Reel

ITEM	DESCRIPTION	TYPE	PART NO.	SEE FIG.
1	Vacuuming unstable materials	DANGER	0026568	1-85
2	High-pressure hose area	WARNING	0007437	1-86
3	Handgun connection	INSTRUCTION	3050-00009	1-69
4	Transportation latch	INSTRUCTION	3050-00136	1-87
5	High-vacuum port	WARNING	3050-00116	1-88
6	Drain here	INSTRUCTION	3050-00024	1-56
7	Pinch Point - Hose Reel	WARNING	0033168	1-78
8	Reel locking pin	INSTRUCTION	3050-00641	1-89

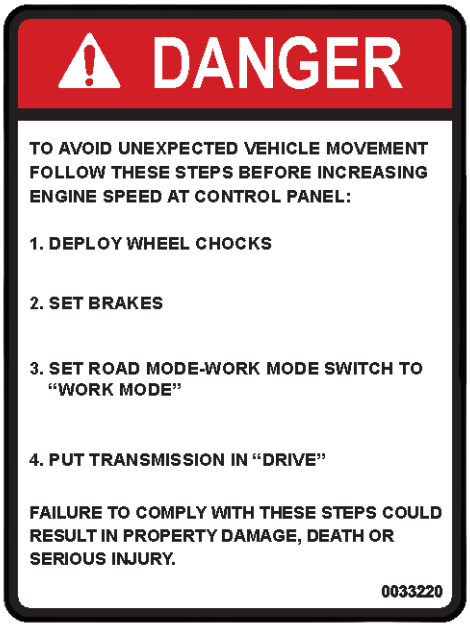
Figure 1-38: Right Side of Reel

Part no. 3050-00260

Figure 1-39

Part no. 0033402

Figure 1-40

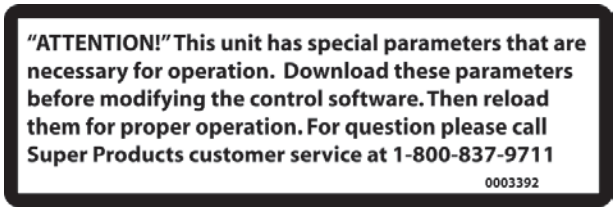


Part no. 0033220

Figure 1-41

Part no. 0030858

Figure 1-42

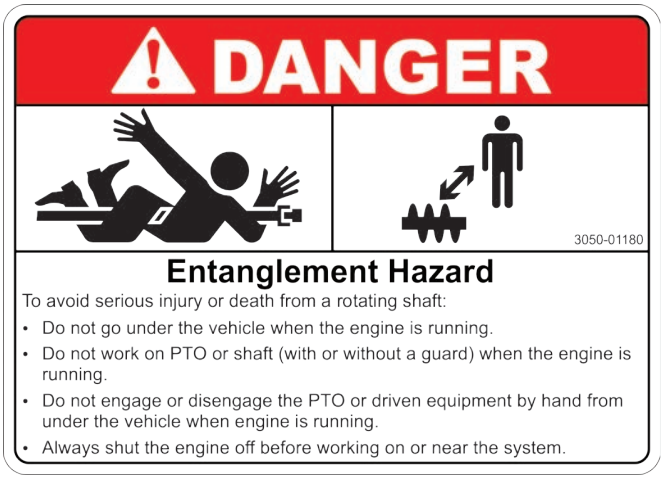


Part no. 0003392

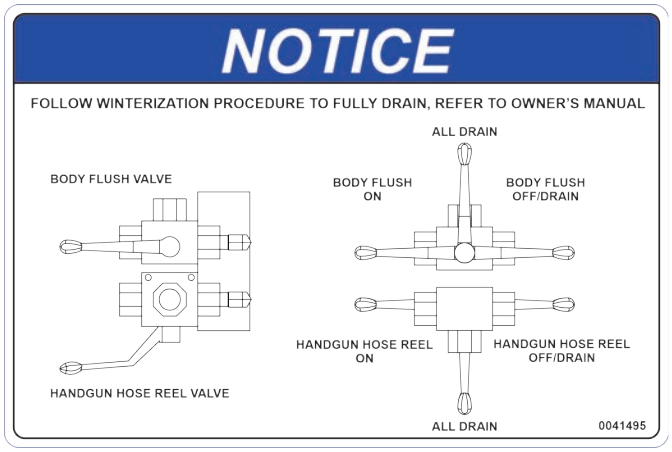
Figure 1-43

Part no. 0026566 - 9 yd Part no. 0041440 - 12 yd

Figure 1-44



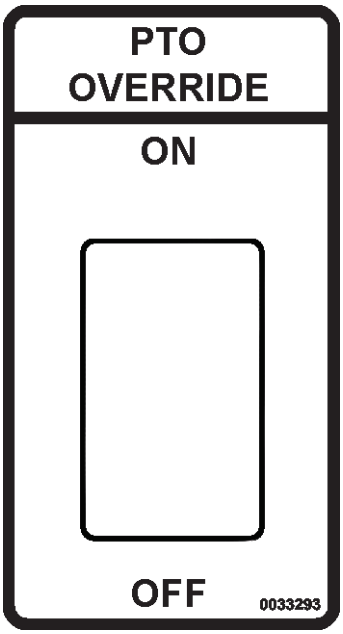
Part no. 3050-01180
Figure 1-45



Part no. 0041495
Figure 1-46

Part no. 0033294
Figure 1-47

Part no. 0030861
Figure 1-48



Part no. 0033293
Figure 1-49

Part no. 3050-00433
Figure 1-50

NOTICE

WINTERIZATION PROCEDURE

Follow these steps to purge water from the water system and winterize water pump.

Perform with truck running and DUMP MODE engaged at the front control panel.

1. Drain the fresh water tanks by opening the rear crossover pipe drain located at the rear of the truck underneath the optional splash shield. Remove the Y-strainer cap then open the water supply line valve at the front of the body.
2. When all water has drained, re-install Y-strainer cap and close the water supply line valve.
3. Raise body and secure body safety prop to help ensure all water drains. Open tailgate to allow water to drain from debris body.
4. Open the sewer hose valve located on the front reel.
5. Locate 3-way valve located on the heat exchanger on the driver's side of truck. Position valve to AIR PURGE to use the truck air supply to push water out of the water lines and sewer hose. Spin the front hose reel in the Pay In direction to assist the water removal process. Return valve to NORMAL position when all water is expelled.
   TIP: Throughout this process, you may need to periodically position valve to NORMAL to allow the truck rebuild air pressure.
6. OPTION: If your truck is equipped with the WATER RECIRCULATION, connect the sewer hose to the recirculation line at the front bumper. When air is heard entering the water tanks, return valve position to NORMAL and disconnet the sewer hose.
7. Close the sewer hose valve at the front hose reel.
8. Install a spray handgun to the front bumper handgun connection. Position valve to AIR PURGE and squeeze the trigger until all water is expelled.
8. Open the 3-way body flush valve at the debris body and water pump. Return valve to NORMAL position when air is heard entering the body.
10. FULL DUMP BODY UNITS: Open the two drain valves located between the frame rails under the debris body. These valves drain the body flush and winter recirculation lines.
11. OPTION: If your truck is equipped with a RETRACTABLE HOSE REEL, install a spray handgun and open the 3-way valve at the water pump. Position valve to AIR PURGE and squeeze the handgun trigger until all water is expelled. Remove the spray handgun and close the retractable hose reel 3-way valve.
12. Open the drain under the front bumper. When all water is expelled, then close drain valve.
13. Open the 3-way valve at the bottom of the water pump. Close valve when all water is expelled.
14. Position valve on heat exchanger to DRAIN. Return to NORMAL when all water is expelled.
15. Open the glycol tank feed valve. Turn water pump dial to PRIME/PURGE until the pump ingest about 2/3 of the tank of glycol. Turn off the pump and close the glycol tank valve. Slightly open the 3-way valve at the front of the water pump to verify glycol is in water pump and close valve.
16. Lower the body and close the tailgate.

0033236

Part no. 0033236

Figure 1-51

1

NOTICE

SERVICE CHART

DESCRIPTION	SERVICE INTERVAL				
	DAILY	WEEKLY	MONTHLY	1000 HRS OR YEARLY	LUBRICANT
HOSE REEL COMPONENTS					
1. PILLOW BEARINGS.	I	-	L	-	G
2. ROTARY ELBOW AND REEL ROTATION BEARING.	-	-	L	-	G
3. CHAIN LUBRICATE AND ADJUST- DO NOT OVERTIGHTEN.	I	-	L	-	-
4. LEVEL WIND (PIVOT PIN AND ROLLER PINS).	-	I/L	-	-	G
5. FRONT REEL SLIDING PAD	-	-	I/C	-	-
BODY COMPONENTS					
6. BOOM: REMOTE GREASE.	-	L	-	-	G
7. TAILGATE: REMOTE.	-	L	-	-	G
8. BODY PIVOT.	-	L	-	-	G
9. BODY LIFT CYLINDER.	-	L	-	-	G
HYDRAULIC SYSTEM.					
6. HYDRAULIC OIL.	-	I	-	R	HD
7. RETURN FILTER.	-	-	-	R	RF
8. CASE DRAIN FILTER	-	-	-	R	CF
9. HOSE AND FITTINGS.	-	I	-	-	-
DRIVE COMPONENTS.					
9. DRIVELINE U-JOINTS.	-	-	I/L	-	G
10. VACUUM PUMP OIL.	I	-	-	R	GB
11. TRANSFER CASE OIL.	-	I	-	R	GB
WATER SYSTEM.					
12. ACCUMULATORS (SET: HIGH @ 1,250 PSI AND LOW @ 500PSI)	-	-	-	I/A	-

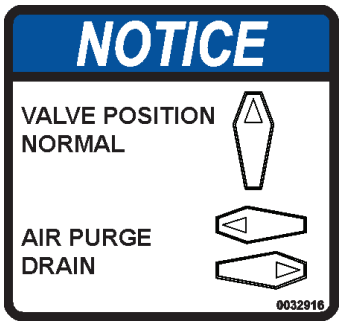
A-ADJUST.
C-CLEAN.
I - INSPECT AND CORRECT.
L - LUBRICANT.
R - REPLACE OR CHANGE EVERY 1000 HRS. OR YEARLY WHEN USING SUPER PRODUCTS OIL, OTHER OIL PRODUCTS, DIVIDE THIS INTERVAL IN HALF.

G - GREASE - SUPER PRODUCTS SPEC. P/N 3060 - 0023 WHITE LITHIUM
HD - HYD. OIL - SUPER PRODUCTS SPEC. P/N 3060 - 00048 CHEVRON RANDO HD.
GB - VAC / TRANS. OIL SUPER PRODUCTS SPEC. P / N 3060-00047
G - GLYCOL - SUPER PRODUCTS SPEC. P / N 3060-00036 PROPYLENE GLYCOL.
RF - ELEMNET, RETURN FILTER - SUPER PRODUCTS P / N 0031304
CF - ELEMENT, CASE DRAIN - SUPER PRODUCTS P / N 0031305

0033157

Part no. 0033157
Figure 1-52

Part no. 0007543
Figure 1-53



Part no. 0032916
Figure 1-54

Part no. 3050-00033
Figure 1-55

Part no. 3050-00024
Figure 1-56

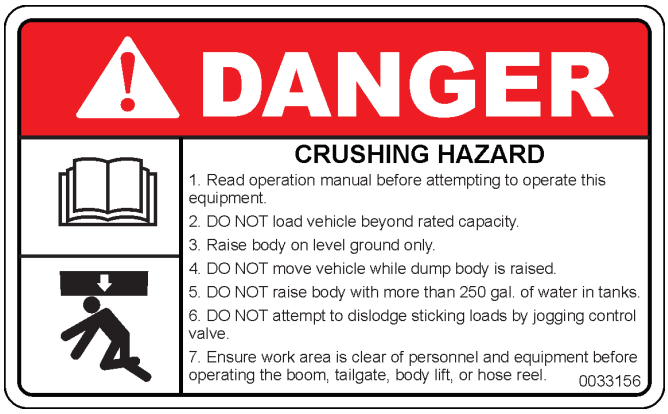
Part no. 3050-00572
Figure 1-57

Part no. 0007448
Figure 1-58

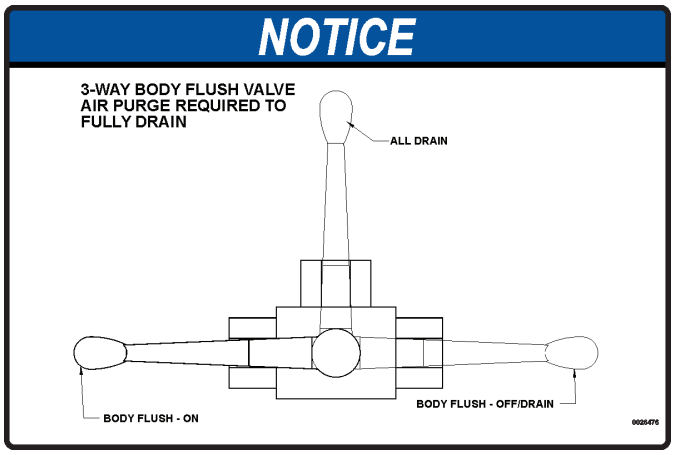
Part no. 3050-00338
Figure 1-59

Part no. 3050-00337
Figure 1-60

Part no. 3050-00578
Figure 1-61



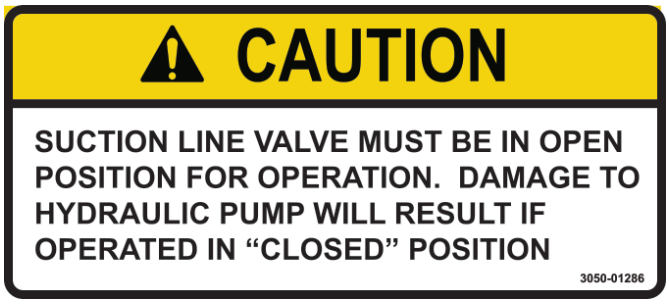
Part no. 0033156
Figure 1-62



Part no. 0026476
Figure 1-63

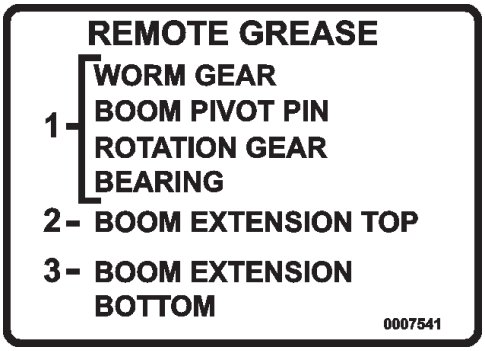
Part no. 3050-00579
Figure 1-64

Part no. 3050-00051
Figure 1-65



Part no. 3050-01286
Figure 1-66

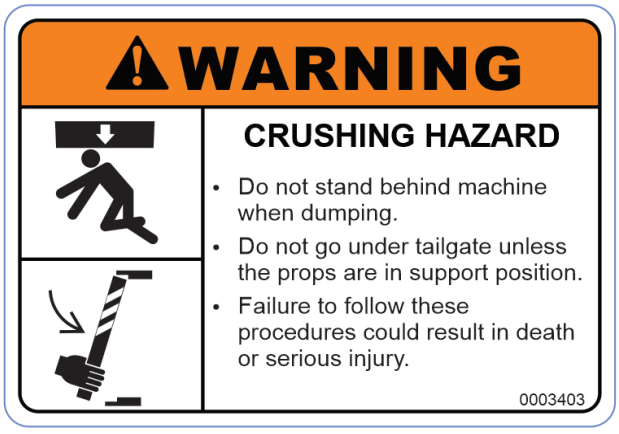
Part no. 0007522
Figure 1-67



Part no. 0007541
Figure 1-68

Part no. 3050-01179
Figure 1-71

Part no. 3050-00009
Figure 1-69

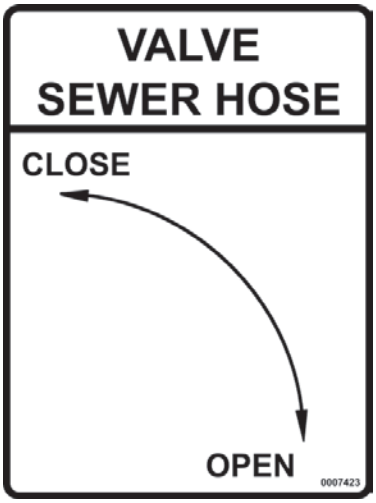


Part no. 0003403
Figure 1-72

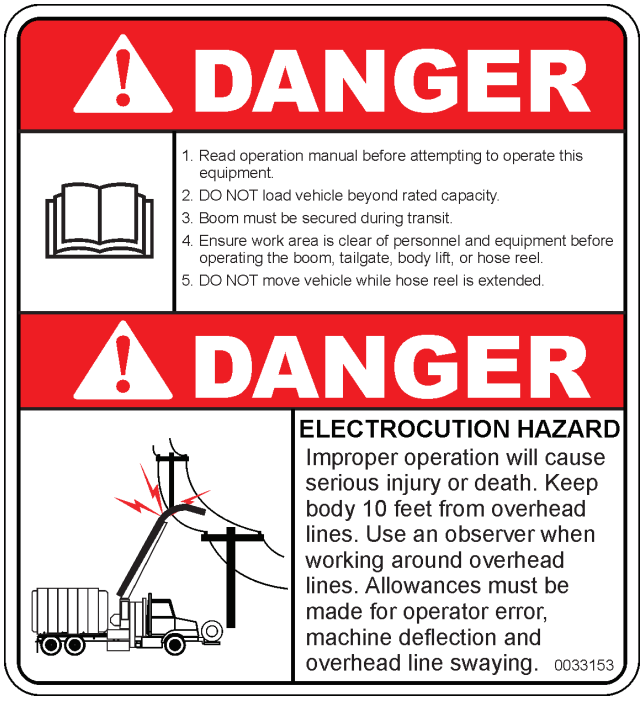
Part no. 0007433
Figure 1-70

Part no.3050-01201
Figure 1-73

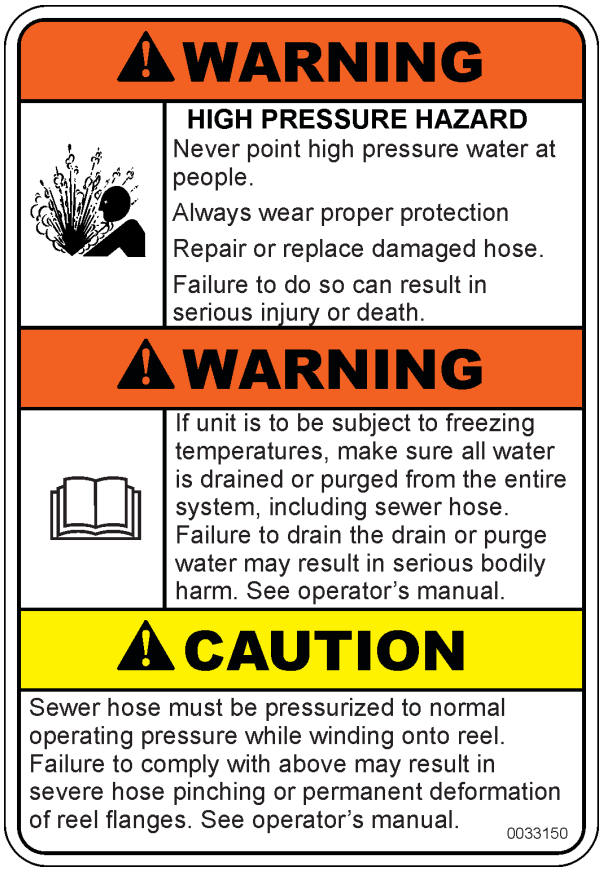
Part no. 3050-01200
Figure 1-74



Part no. 0007423
Figure 1-75



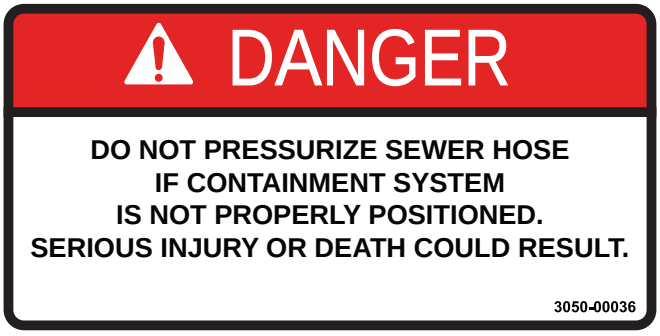
Part no. 0033153
Figure 1-76



Part no. 0033150
Figure 1-77

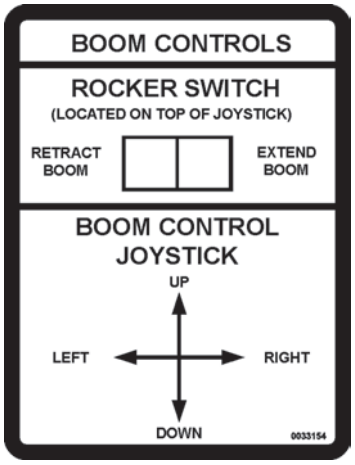
Part no. 0033168
Figure 1-78

Part no. 3050-00205
Figure 1-79

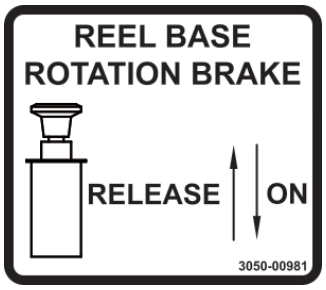


Part no. 3050-00036
Figure 1-80

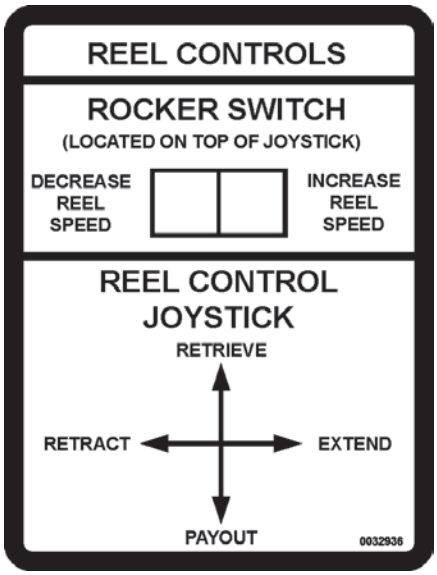
Part no. 3050-00025
Figure 1-81



Part no. 0033154
Figure 1-82



Part no. 3050-00981
Figure 1-83



Part no. 0032936
Figure 1-84

Part no. 0026568

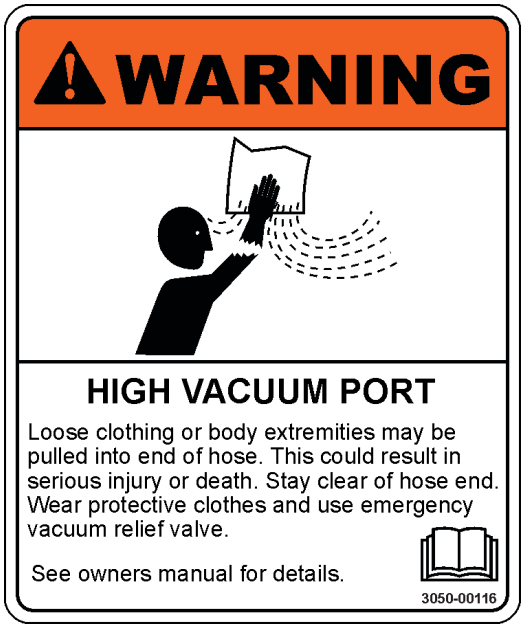
Figure 1-85

Part no. 0007437

Figure 1-86

Part no. 3050-00136

Figure 1-87



Part no. 3050-00116

Figure 1-88

Part no. 3050-00641

Figure 1-89

Part no. D960

Figure 1-90

Debris Body Tailgate Props

DANGER

Always position the tailgate props in the proper position before entering any area beneath the debris body tailgate or entering the debris body. Failure to do so could result in serious injury or death.

Unlocking the Tailgate Props and Raising the Debris Body Tailgate

1. Ensure the tailgate area is clear of people and obstructions.
2. Remove the retaining pins (1) from both tailgate props (2). Allow the tailgate props to rest on the tailgate pins (3).

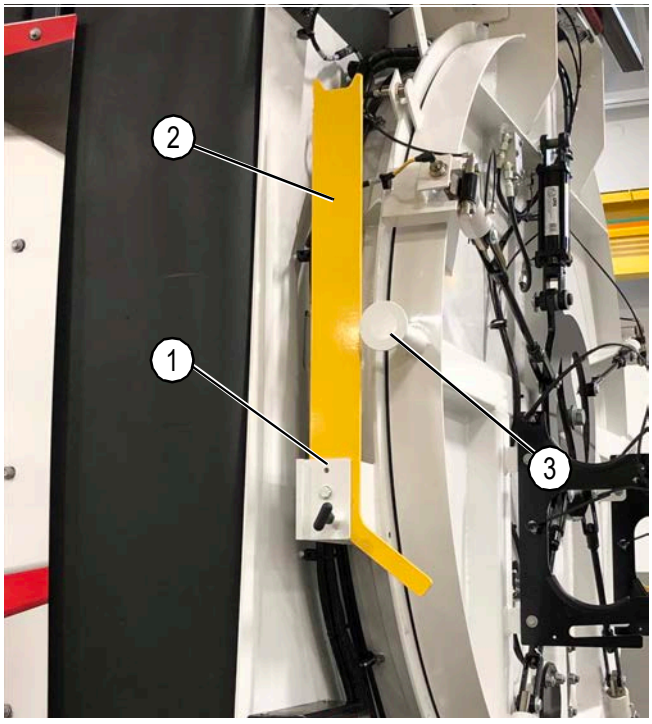


Figure 1-91

3. Unlock and raise the debris body tailgate. The tailgate props will maintain their aligned position with the tailgate pins.
4. Lower the debris body tailgate enough so that the tailgate pins rest against the tailgate props.

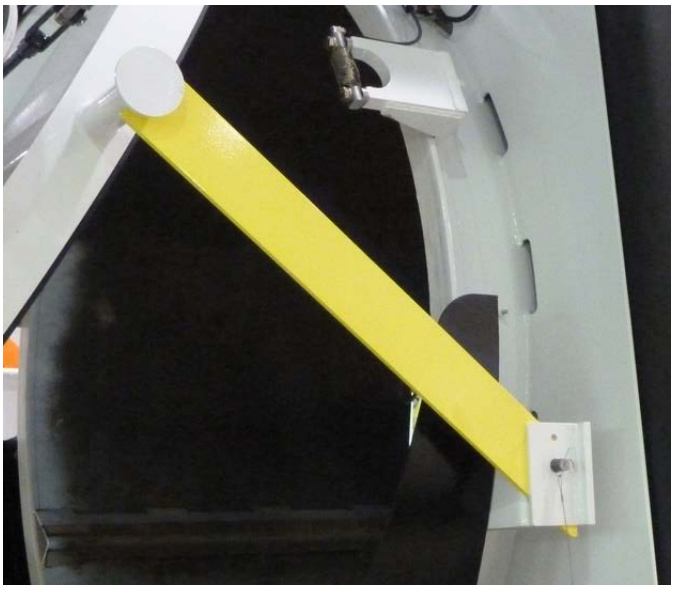


Figure 1-92

5. Shut the truck engine off and remove the keys.

Lowering the Debris Body Tailgate and Storing the Props

1. Ensure the area is clear of people and obstructions before lowering the debris body tailgate.
2. Raise the debris body tailgate off the tailgate props.
3. Return both tailgate props to their stored position and install the retaining pins.
4. Lower and latch the debris body tailgate.

Preparation Before Traveling To Worksite

If there are any questions on how to implement the below procedures, contact Super Products prior to starting operation. Super Products will not be responsible for any damage or injuries if all safety procedures are not completely followed.

1. Perform required maintenance as specified in the Maintenance Schedule section of this manual.
2. Check the oil and water levels in the engine, transmission, and fuel.
3. Close all water drain valves and install all plugs and strainers previously removed.
4. Make sure the boom is in transport position and properly secured to the front bumper.
5. Make sure the tailgate is closed and properly locked.
6. Make sure all tools, accessories, and work tubes/hoses are properly secured.
7. Make sure all cabinet doors and access panels are closed and there are no loose items on the truck exterior.
8. Make sure the final filter is clean and that the access cover is secure.
9. Make sure the fresh water fill pipe strainer is clean.
10. Close the water tank drain valve located above the rear bumper.
11. Conduct a complete truck walk-around to visually inspect the truck for damage, leaks, or unsafe conditions.
12. Check all lights for proper operation.
13. Set the brakes and place the transmission in neutral. Turn the key on without starting the truck and extend the hose reel.
14. Check the engine oil, coolant, windshield washer fluid, and transmission fluid. The truck must be running to check the transmission fluid.
15. Return the hose reel to the retracted position.
16. Make sure the jetting hose is securely fastened and the safety shield is clamped down.
17. Make sure the gravity drain beneath the front bumper is closed.
18. Turn the ignition key to off.
19. On the driver’s side, check both front and back vacuum pump sight glasses. They should be half full on level ground.
20. Make sure the Y-strainer is clean and the cap is on the drain.
21. Make sure the cyclone separator is clean.
22. Make sure the hydraulic fluid reservoir is full, showing halfway to 3/4 up on the sight glass.
23. Make sure the debris tank is lowered, the debris tank door is locked, and all inspection ports and drains are closed.
24. Make sure the body flusher handle is closed.
25. Make sure the optional ejector plate is retracted and the HOME switch on the curbside panel is lit green.

Chapter 2

Pre-Operation

Introduction

This manual contains important information regarding safe operation, adjustment, and maintenance for the Super Products' Camel® Combination Sewer Cleaner.

DO NOT allow anyone to operate or service this machine until they have read and understood all aspects of this manual.

DO NOT use this machine for any purpose or application other than those listed in this manual. Improper use or neglect of safety precautions will cause serious injury or death. Refer to Section 1, Safety.

NOTE

This operator's manual is to stay with the truck and be used as reference for operator personnel.

Principles of Operation

The Camel is designed as a combination vacuum and high-pressure water jetting sewer and catch basin cleaning system that can also be used for select material transferring operations. The Camel uses a water system to break up the material and a vacuum system to remove the material.

Equipment Specifications

Max. vacuum pressure rating (per blower selection) = 18" Hg (0.60 bar) or 27" Hg (0.90 bar)

Max. body pressure rating = Not Applicable. This unit is not designed for pressure unloading.

Max. water pressure rating (per pump selection) = 2,000 psi (136 bar); 2,500 psi (170 bar); or 3,000 psi (207 bar)

Max. height in transport configuration (typical chassis) = 11'-5" (3,480 mm) – 9yd; 11'-11" (3,632 mm) – 12yd

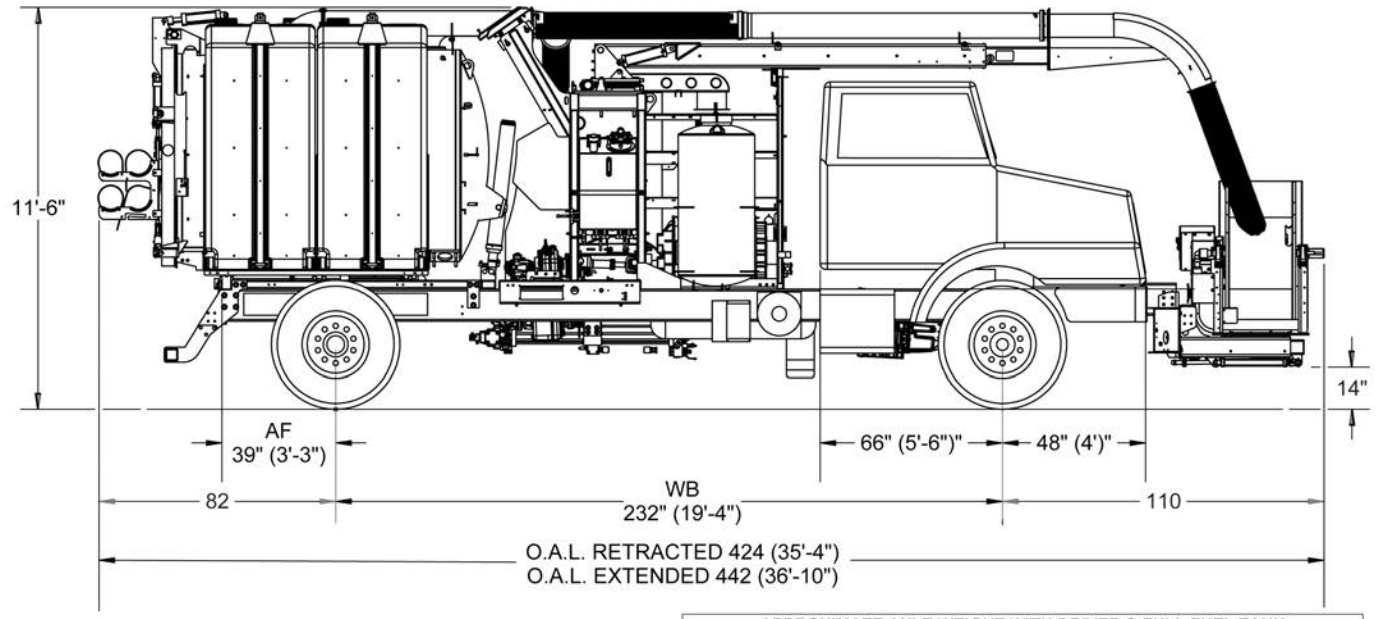
Max. height with boom raised and extended = 26' (7,925 mm)

Approx. empty weight of stock CM900 = 35,400 lbs (16,091 kg)

Approx. empty weight of stock CM1200 = 42,500 lbs (19,318 kg)

Debris body volume CM900 = 9.0 cu yd gross; 7.6 cu yd usable

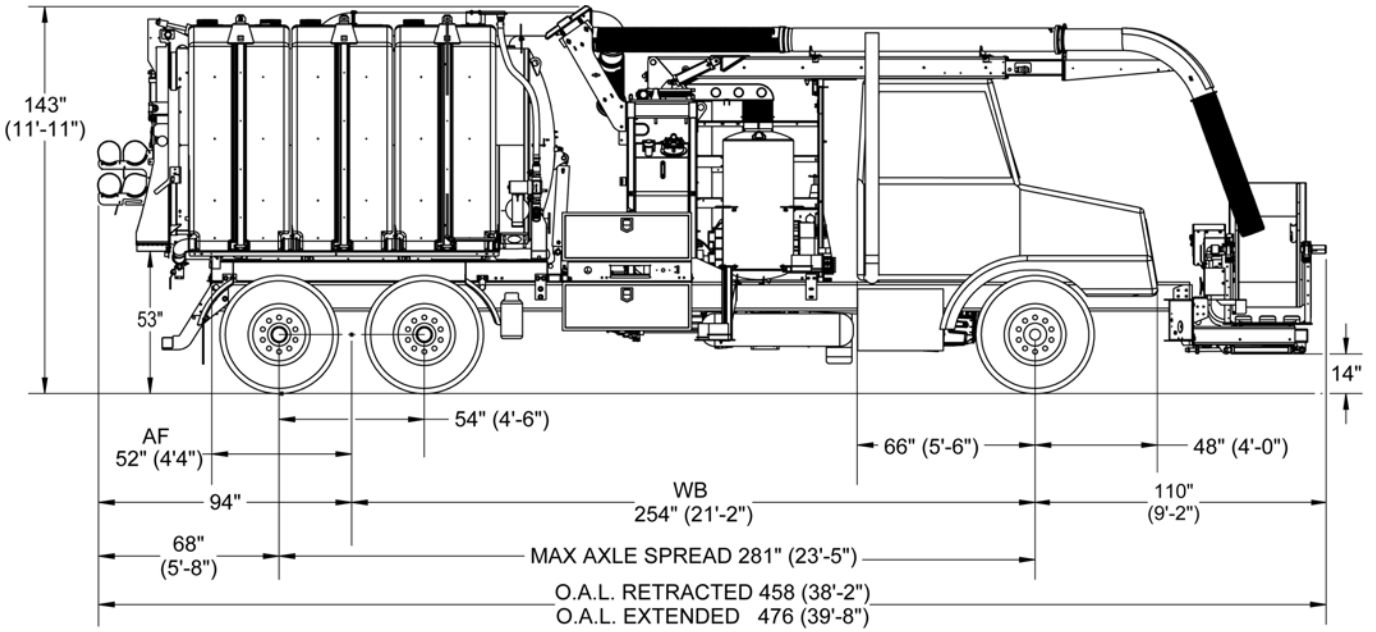
Debris body volume CM1200 = 12.1 cu yd gross; 10.2 cu yd usable



NOTES:
1. WIDTH W/ MIRRORS = 110"
2. MAX BODY WIDTH = 96"
3. ALL DIMENSIONS AND SPECS. ARE FOR A REFERENCE STOCK TRUCK. ACTUAL VALUES MAY VARY BASED ON CHASSIS MANUFACTURER & SELECTED OPTIONS.
4. WARNING! IT IS POSSIBLE TO OVERLOAD THIS VEHICLE. NEVER EXCEED THE GROSS VEHICLE WEIGHT RATING OR GROSS AXLE WEIGHT RATING.

APPROXIMATE AXLE WEIGHT WITH DRIVER & FULL FUEL TANK			
DESCRIPTION	STEER AXLE	REAR AXLE	GROSS WEIGHT
EMPTY	17500	17000	34500
WATER TANKS FULL	17500	25000	42500
BODY FULL OF WATER	18000	28620	46620

Figure 2-1



NOTES:
1. WIDTH W/ MIRRORS = 110"
2. MAX BODY WIDTH = 96"
3. ALL DIMENSIONS AND SPECS. ARE FOR A REFERENCE STOCK TRUCK. ACTUAL VALUES MAY VARY BASED ON CHASSIS MANUFACTURER & SELECTED OPTIONS.
4. WARNING! IT IS POSSIBLE TO OVERLOAD THIS VEHICLE. NEVER EXCEED THE GROSS VEHICLE WEIGHT RATING OR GROSS AXLE WEIGHT RATING.

APPROXIMATE AXLE WEIGHT WITH DRIVER & FULL FUEL TANK			
DESCRIPTION	STEER AXLE	REAR AXLE	GROSS WEIGHT
EMPTY	19500	23000	42500
WATER TANKS FULL	19500	35000	54500
BODY FULL OF WATER	19500	39600	59100

Figure 2-2

Definitions

- **Road Mode** — Used for driving the truck. Work mode functions are not operable when this mode is selected.
- **Work Mode** — Applies hydraulics for the boom, body, hose reel, tailgate, and ejector plate functions as well as water pump operation. The truck cannot be driven when work mode is selected.
- **Vac Mode** — Used to run the vacuum pump function after work mode has been enabled. The boom, hose reel, and water pump are also enabled in vac mode.
- **Dump Mode** — Used to dump and/or eject debris from the body, which includes the ejector plate compaction/dewatering function. The body, tailgate, and water pump are also enabled in the dump mode.
- **Winter Recirculation Mode** — Allows the water pump to circulate water at low pressure while in road mode, work mode, vac mode, or with truck parked and engine idling.

The vacuum system utilizes a positive displacement vacuum pump (1) driven by the truck engine via the transfer case. Material is picked up at the open end of the vacuum hose (2) and transferred into the debris body (3). The vacuum hose is supported by a boom that can be raised, lowered, extended, retracted, and rotated left or right at the operator's discretion. As material and air enter the debris body, the majority of the material falls out into the debris body because of gravity and the tremendous reduction in air velocity.

Air that was allowed to enter the debris body is now vented through an opening located on the top front of the debris body, creating the vacuum. The opening is equipped with a float ball (4) that prevents overflowing of material. When the water level rises to a certain point, the float ball closes off the opening. Once the opening is closed and air is no longer able to exit the collector body, the vacuum pressure is depleted.

Any remaining airborne material or mist is drawn through a hose and enters the centrifugal separator (5) located just in front of the debris body on the left (driver's) side of the truck. Centrifugal force separates the airborne material from the air stream, allowing the material to fall to the bottom of the separator. The air exits through the top of the separator and enters a ten-micron final filter (6), which captures any remaining material particles.

The clean air now enters a vacuum pump and exits through a high-efficiency exhaust silencer (7) into the atmosphere.

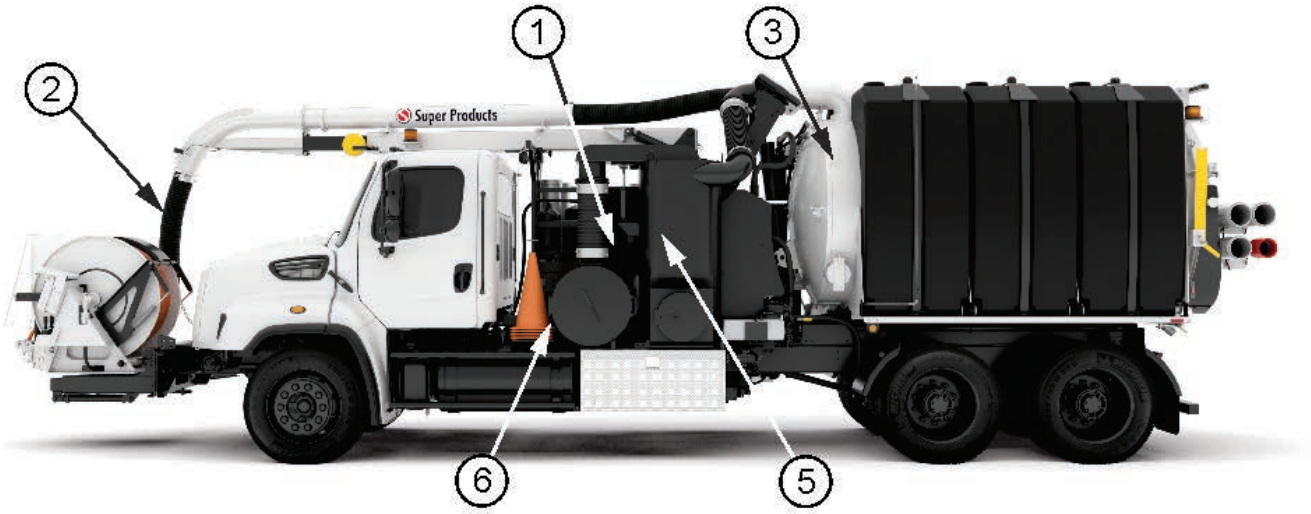


Figure 2-3

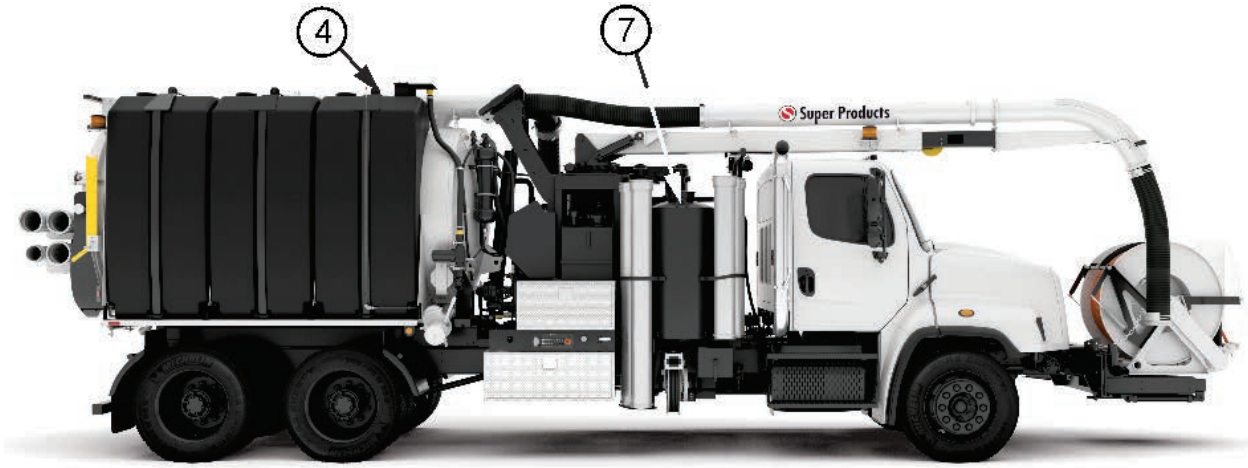


Figure 2-4

Vacuum System

The vacuum system utilizes a positive displacement type of vacuum pump that is mechanically driven from the truck's engine. The vacuum system has the capability of transferring materials using two methods — Pure Vacuum and Air Conveyance.

CAUTION

The vacuum system is designed for liquids, slurries, and damp materials. Dry or dusty materials must be wet down before vacuuming to limit the carryover of debris into the separator and final filter. This can be accomplished with the handgun attachment or by injecting water into the vacuum line with the liquid ring accessory.

Pure Vacuum

As a general rule, pure vacuum would be used for removing sludge from beneath a liquid or for rapid liquid loading. In this mode, the suction tube is totally submersed in the liquid, and only material (no air) travels through the tube. For materials with a greater density than water, the distance must be reduced. Consult the factory for additional information. The vacuum pump should be operated at the minimum speed required to perform the work. Operating the vacuum pump too fast will decrease performance. Loading rates up to 1,000 gallons per minute (GPM) through a six-inch tube can be accomplished.

Air Conveyance

The air conveyance method requires enough air velocity going past the material for it to be picked up and transferred. The material travels through the vacuum tube and is deposited into the debris body. This requires the vacuum pump to be operating at a fast enough speed to produce the required airflow to pick up and transfer the material.

NOTE

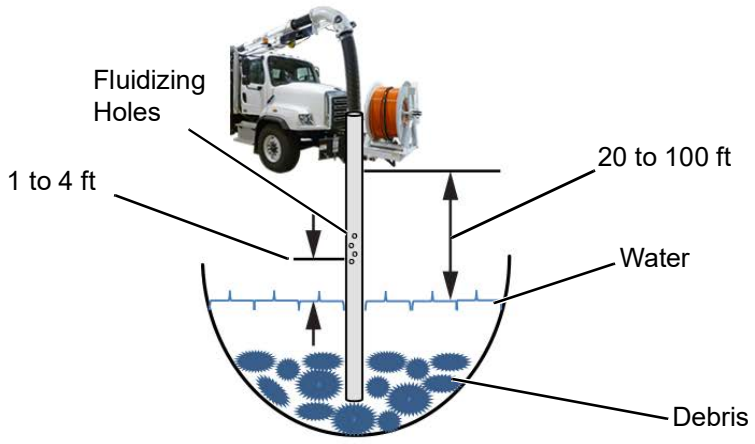
The most efficient and highest loading rate occurs when the pump is run as slow as permissible and still picks up the material.

IMPORTANT

There are applications in which a vacuum fluidizing tube should be used. See Figure 2-5. A fluidizing tube is a tube with air holes. This combines the benefits of pure vacuum and air conveyance. The fluidizing tube has the ability to remove sludge from beneath liquids where the distance exceeds the limitation of pure vacuum. These holes must be one foot to four feet above the surface of the water.

NOTE

For maximum efficiency, all vacuum line connection points must be airtight. This is accomplished by installing the O-ring gasket over the male end of the tube. Refer to "Operation Instructions" and "Maintenance Schedule" for more information.

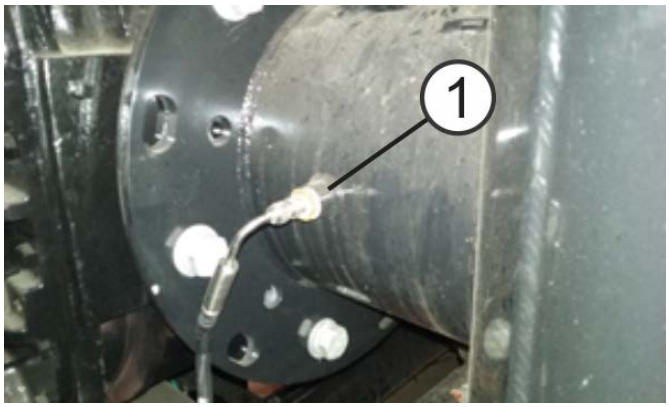


Air Conveyance

Figure 2-5

Blower Temperature Sensor (Option)

The blower temperature sensor (1) is an optional sensor that monitors the vacuum exhaust air temperature to help prevent vacuum pump damage and possible dust explosions.



Blower Temperature Sensor

Figure 2-6

WARNING

The vacuum pump should never be operated above a pump exhaust temperature of 320°F. If equipped with the blower temperature option and if the blower exhaust temperature exceeds 320°F, the BLOWER TEMP alarm message will appear and the warning buzzer will sound. Failure to heed the blower temperature warning could result in equipment damage, serious injury, or death.

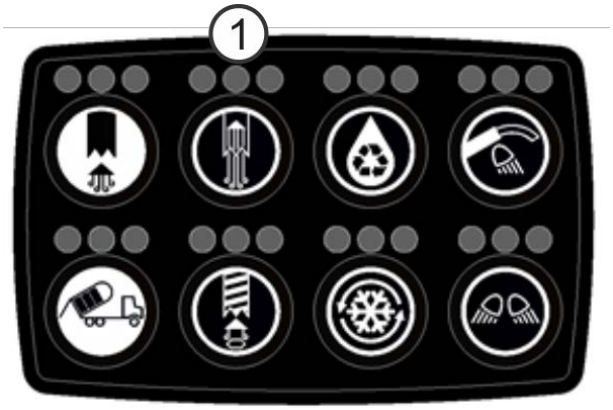
Blower Temperature Alarm Message

Figure 2-7

If the vacuum exhaust air temperature exceeds 320°F, the vacuum vent door will automatically open to allow the vacuum pump to cool down.

Vacuum Vent Door

The vacuum vent door button (1) is located on the front control panel. This button controls the opening and closing of the vacuum vent door (2) located in front of the separator on the left side of the machine.



Vacuum Vent Door Button

Figure 2-8

Vacuum Vent Door

Figure 2-9

Remote Operated Vacuum Vent Door

The vacuum vent door may also be controlled by either the wired pendant remote control or the wireless pendant remote control. The operations and testing instructions of this section apply to both pendant remote controls.

⚠ CAUTION

1. **A safety person who is in full sight of the operator MUST be present at all times.**
2. **The safety person MUST keep the remote control on their person at all times for immediate access.**
3. **NEVER allow workers positioned at the end of the hose to operate the system without the safety person in position.**
4. **ALWAYS wear tight-fitting clothing when working at the end of the hose. Keep shirts and jackets closed to avoid being pulled into the hose. Remove loose-fitting jewelry such as bracelets and necklaces unless they are under tight-fitting clothing.**
5. **DO NOT use hands or feet to clear obstructions from the end of the hose. Keep all body extremities from end of hose.**

For Wired Pendant Remote Control Only

1. Insert the electrical plug on the end of the pendant cord into the socket (1, 2) located at the right side of the front control panel or the left side of the curbside panel.

Front Control Panel Wired Pendant Receptacle

Figure 2-10

Curbside Panel Wired Pendant Receptacle

Figure 2-11

2. Route the pendant cord to the work area. Care should be taken when running the pendant cord to the work area from the truck so that the cord will not be run over and/or damaged.
3. If the safety person observes an unsafe or dangerous situation of any type, he/she should immediately press the VENT OPEN button on the remote. Only after all potential dangers have been resolved should the vent door be closed and normal vacuum operations be continued. The safety person should continue to be in a position to observe all vacuum hose operators until those operators have moved a safe distance from the end of all vacuum work hoses.

DANGER

Never move close to the end of any vacuum hose unless the safety person has the remote and is in a position to observe all operators.

Failure to comply with this could result in serious personal injury or death.

Figure 2-12

4. After the vacuum operation is completed and the vacuum pump is shut down, properly store the pendant to prevent damage when truck is being moved.

Testing of the Remote Operated Vacuum Vent Door

NOTE

The following test should be done every time the wired pendant remote control or wireless pendant remote control is put into use or every two hours during operation, whichever is more frequent.

Testing with Wired Pendant Remote Control

1. Visually inspect the pendant cord, electrical plug, and control switch for damage. Repair or replace as necessary..
2. If the pendant is not currently plugged in, insert the electrical plug on the end of the pendant cord into the socket located on the right side of the front control panel or the face of the curbside control panel.
3. Press the POWER button (1) to power up the remote. The display screen (2) will display system information when powered up.
4. Start up the vacuum pump per operating procedure outlined in this manual.
5. With the truck at full vacuum, press the VENT OPEN button (3) on the remote and verify that the vacuum vent door has opened. Press the VENT CLOSED button (4) and verify that the vacuum vent door has closed.
6. When the test is complete, shut down the vacuum pump.

Testing with Wireless Pendant Remote Control

1. Visually inspect the wireless pendant for damage. Repair or replace as necessary.
2. Press the POWER button (1) to power up the remote. The display screen (2) will display system information when powered up.
3. Start up the vacuum pump per operating procedure outlined in this manual.
4. With the truck at full vacuum, press the VENT OPEN button (3) on the remote and verify that the vacuum vent door has opened. Press the VENT CLOSED button (4) and verify that the vacuum vent door has closed.
5. When the test is complete, shut down the vacuum pump.

NOTE

Make sure the wireless pendant remote control is turned off when not in use to conserve battery power.

1) Power Button
2) Display Screen
3) Vent Open Button
4) Vent Close Button

Figure 2-13

DANGER

If the vacuum relief valve is not working properly, personnel should not be allowed to work at end of vacuum hose due to possible personal injury or death.

Never work beyond the distance from the truck that the wireless remote control was previously tested. Failure to comply could result in loss of control of the equipment and/or the equipment not operating properly.

Water System

CAUTION

When purchasing a new truck or when installing a new sewer hose on an existing reel, you must follow a procedure to pressurize the new hose (one time only).

Failure to follow this procedure could result in loose wraps and/or severe pinching of the hose and possible damage to the reel itself.

1. Locate a known sewer line that is as large as possible and is long enough to pay out all the hose on the reel.

NOTE

The sewer line must not be located in residential areas to avoid damage to homes and businesses when using maximum water pressure.

2. Pay out the entire length of sewer hose at the lowest possible pressure (800 psi).
3. When all the hose is paid out, increase the water pressure to maximum and rewind the hose back onto the reel under pressure.

The system consists of water tanks (1) saddled along the side of the debris body (2), a water pump (3), a suction line shutoff valve (4), and a Y-strainer (5).

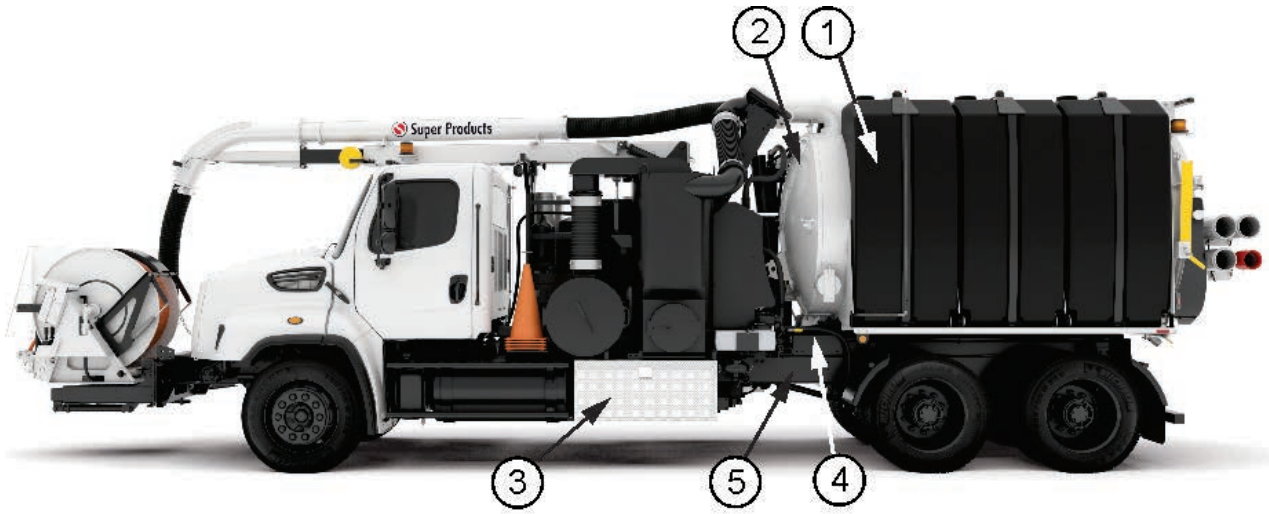


Figure 2-14

Winter Recirculation (Option)

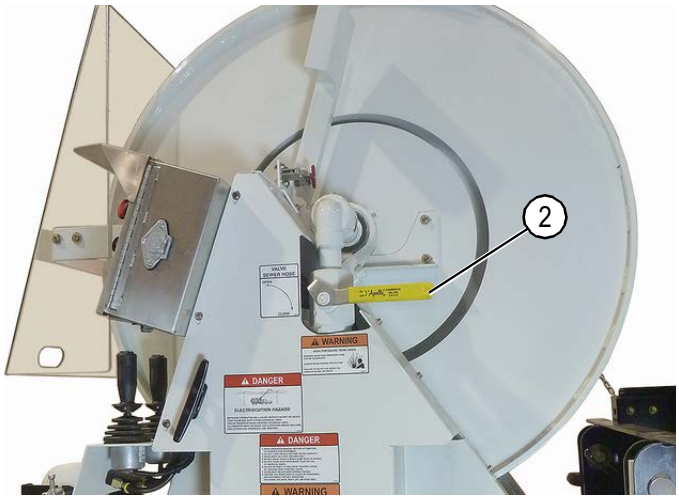
The truck may be equipped with an optional winter recirculation system to circulate water through the pump and back to the tank to prevent freeze-up in colder climates. This can be used while the truck is in road mode and when the truck is in work mode while stationary.

1. Remove the sewer hose from the travel fitting and attach it to the winter recirculation fitting (1) on the front bumper.

Winter Recirculation Fitting

Figure 2-15

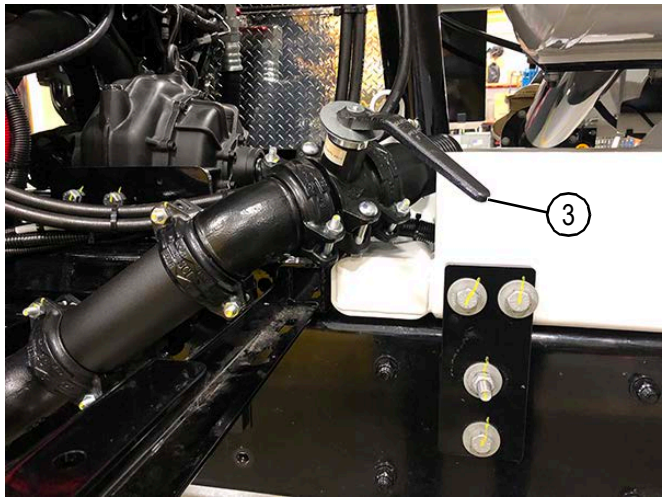
2. Open the sewer hose valve (2).



Sewer Hose Valve Shown Closed

Figure 2-16

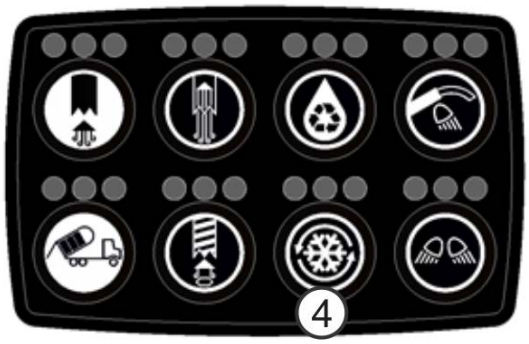
3. Open the water supply valve (3) at the front of the debris tank.



Water Supply Valve Shown Open

Figure 2-17

4. Press RECIRCULATE button (4) on the front control panel keypad.



Recirculate Button

Figure 2-18

5. Once winter recirculation has started, the front control panel display screen and cab display screen will show the Recirculation icon and the green LEDs above the RECIRCULATE button will illuminate.

Auxiliary Hydraulic Pump Operation

The auxiliary Hydraulic Pump Unit (HPU) can be used to operate hydraulic functions when the truck engine is not running. This allows body, boom, and hose reel functions to be operated in maintenance situations or in situations in which the truck engine cannot be started. The HPU does not allow the water pump to be operated when using this function.

NOTE

The auxiliary hydraulic pump is powered by the truck battery. Do not operate the auxiliary pump for extended periods of time to avoid draining the battery.

To operate the auxiliary hydraulic pump feature, perform the following:

1. Turn the Disconnect switch (1) to the ON position.

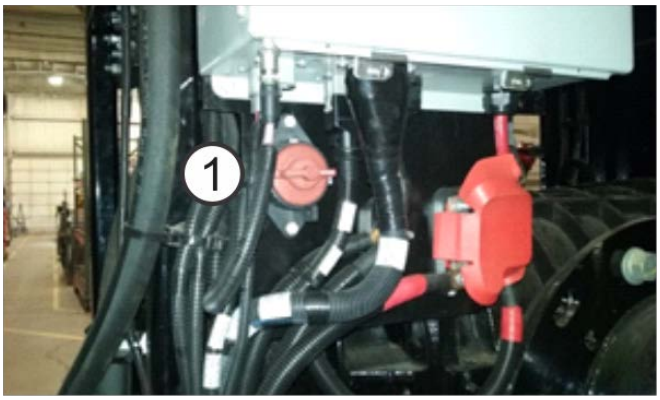


Figure 2-19

2. Turn the truck ignition to the on position (engine NOT running).
3. Select WORK MODE on the cab control panel.
4. Follow the operation instructions for hydraulic functions as outlined in this manual.

The auxiliary hydraulic pump has an operational duty cycle of 15 minutes. After 15 minutes of continuous operation, the pump will stop and the front control panel display screen will display the "Backup HPU Cool Down" message. The pump will not function until there has been sufficient time for the pump to cool and the "Cool Down Cycle" message is no longer displayed on the HMI screen.

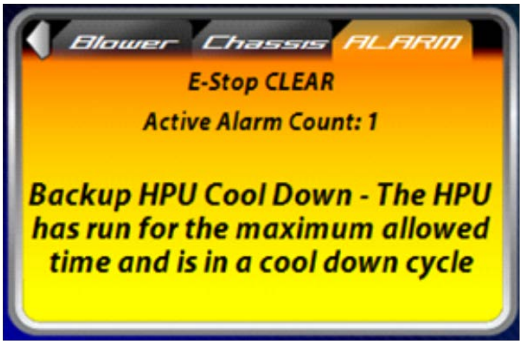


Figure 2-20

To exit the auxiliary hydraulic pump function, perform the following:

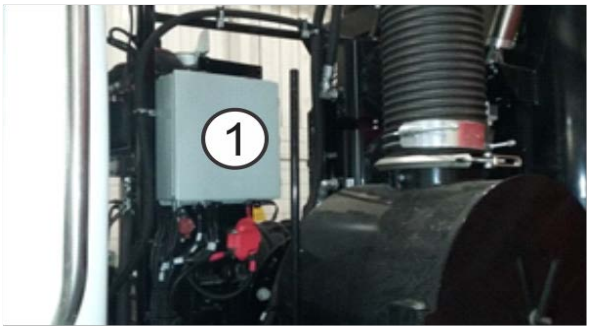
1. Select ROAD MODE on the cab control panel.
2. Turn the truck ignition to the off position.
3. Turn the Disconnect switch to the OFF position.

Chapter 3

Control System Operation

Power Distribution Panel

When the truck's ignition key is turned to the on position, the control system will boot up and the power distribution panel (1) distributes power separately to all devices.



Power Distribution Panel

Figure 3-1

Within the power distribution panel there is a fuse box (2) containing all fuses and relays for the control system.

Fuse and Relay Box

Figure 3-2

To access specific fuses and relays, open the cover to the fuse box.

See Table 3-1 for additional fuse information.

The state of the control panel fuses and relays can be checked on the HMI screen on the front or cab control panel and will be detailed in those sections of this manual.

1) Strobes Lights
2) Mid-Ship Work Lights
3) Beacon Lights
4) Boom Lights
5) Rear Work Lights
6) Transfer Case Cooler
7) Spare
8) Hydraulic Cooler

Figure 3-3

Table 3-1: Fuse Information

FUSE	AMPERAGE	RELAY	CIRCUIT
F1	7.5A	R1	Strobe Lights
F2	5A	R4	Boom Lights
F3	10A	R7	Spare
F4	5A	R2	Mid-Ship Work Lights
F5	20A	R8	Hydraulic Cooler
F6	20A	R6	Transfer Case Cooler
F7	7.5A	R3	Beacon Lights
F8	5A	R5	Rear Work Lights
F9	5A	-	Curbside Panel
F10	15A	-	Powerframe I/O
F11	10A	-	Cab Controls
F12	10A	-	Front Control Panel
F13	10A	-	Body I/O
F14	10A	-	Recycle I/O
F15	10A	-	Spare
F16	5A	-	Wireless Receiver

Control System Overview

There are three main control panels available to operate the Camel™ functions.

1. Cab Control Panel.
2. Front Control Panel.
3. Curbside Control Panel (passenger side of truck).

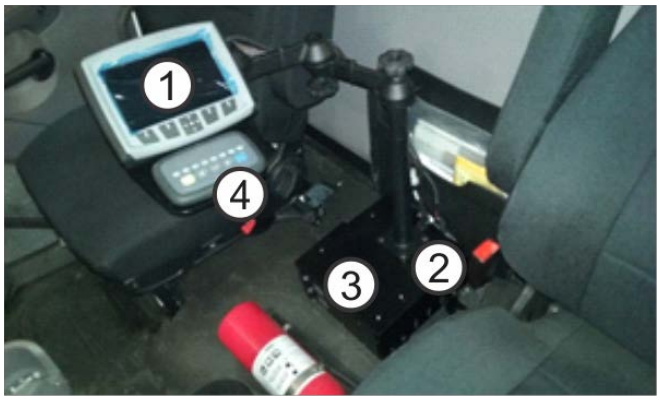
All control panels and their specific functions are detailed in the following pages. The power distribution panel is also detailed.

Emergency stop controls are provided at the front control panel, curbside control panel, and both wired and wireless pendant remote controls. The emergency stop function will disable all system operations but will allow the engine to operate at idle speed.

3

Cab Control Panel

The cab control panel consists of an HMI display (1), a control panel (2), a charging station for the optional wireless pendant transmitter (3), and a controller for the optional rear traffic director (4). This control panel is where the operator will begin operating the system by switching into WORK mode, turning on the work and warning lights, and monitoring various machine functions.



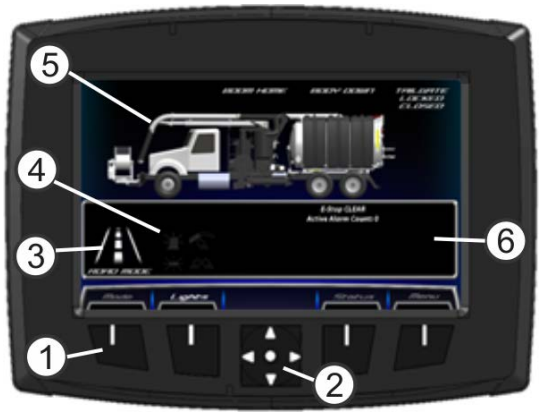
Cab Control Panel

Figure 3-4

NOTES

*In **road** mode an alarm will sound when the boom or dump body has not been returned to its home position or the tailgate is unlocked..*

Cab Control Panel Display Screen Menu Operation



Cab Display

1) Menu Buttons
2) Navigation Buttons
3) Current Operating Mode
4) Work & Warning Light Status
5) Truck Status
6) Information Window

Figure 3-5

Menu Buttons

The menu buttons (1) are used to select different menu selections from the display screen. Pressing a menu button will pop up a menu of items to select. Select a menu item by using the navigation buttons. Pressing the menu button when a menu is popped up will hide it again.

NOTE

Menu selections that are now available will be grayed out and cannot be selected.

Navigation Buttons

The navigation buttons (2) are used to navigate through the various menus or information on the screen. The area on the screen above the navigation buttons displays which navigation movements are available.

Current Operating Mode

Use the Mode menu button to select between WORK MODE and ROAD MODE. The current operating mode will be displayed as an icon and text (3).

When ROAD MODE is enabled, the rear axle will engage and the truck will be able to be driven.

When WORK MODE is enabled, the rear axle is automatically disengaged and allows remote control of the engine speed (RPM). It will also disable the speedometer so it will not accumulate odometer mileage while in work mode.

Once the cab control panel is in WORK MODE, VAC or DUMP mode can be selected on the front or curbside keypads.

Truck Status

Information Window

Figure 3-6

The truck status (5) displays information about the current state of the boom, body, and tailgate. When in ROAD MODE, an alarm will sound and an icon and warning message will be displayed if the boom or body isn't home or the tailgate is not securely locked to alert the operator.

Information Window

The information window (6) displays information about the emergency stop and system status. The number and location of the emergency stop buttons activated will be displayed in this window. Any system alarms or warnings are also displayed here. System alarms will sound an alarm. To silence the alarms, press the CENTER navigation button. Any new alarms that are activated will re-sound the alarm to alert the operator that a new alarm has been activated.

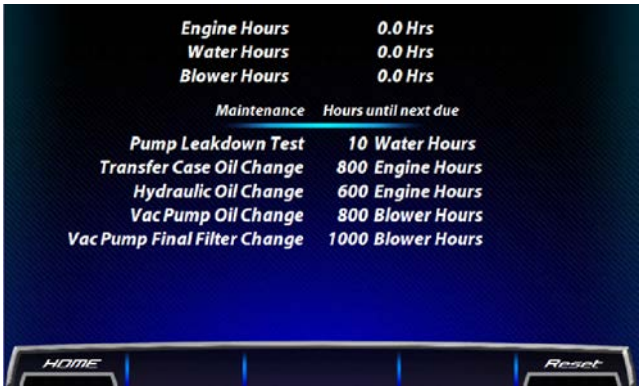
Operator Menu

Operator Menu

Figure 3-7

In the Operator Menu the operator can change the maximum brightness of the display and view the Maintenance Schedules for the truck.

The brightness of the display will be automatically adjusted to ambient lighting conditions. If the operator wishes to adjust the maximum brightness of the display press the Menu button followed by the UP/DOWN arrow to select the Brightness and pressing the RIGHT/LEFT arrow buttons to increase or decrease the brightness.



Maintenance Schedules

Figure 3-8

The Maintenance Schedules screen displays the remaining hours until each service item is due for maintenance. When an item has eight hours or less remaining, a warning message will appear in the information window of the main scree to alert the operator. When maintenance has been completed on a particular item, the remaining hours can be reset by pressing the Reset menu button. Enter Code 05935 to reset maintenance items.

Work and Warning Light Menu and Status

Lights Menu

Figure 3-9

To turn any of the work or warning lights on or off press the Lights button followed by the UP/DOWN arrow to select the desired lights and pressing the CENTER navigation button to toggle the lights on or off. The status of the work and warning lights will be shown in the Work and Warning light status area. Lights that are turned on will be indicated by a white icon.

The Boom Lights selection controls the optional two boom work lights.The boom lights can be controlled by either the cab display or the front control panel keypad.

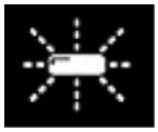
The selection that was last activated keeps control until a different selection is activated.

The boom lights can be turned on when the truck is driven less than 18 miles per hour. The boom lights will automatically turn off when the truck is driven at a speed of more than 20 miles per hour and the selection will be grayed out on the Cab display.

The Work Lights selection controls the optional two rear and two mid-ship work lights.The work lights can be controlled by either the cab display, front control panel keypad, or the curbside control panel keypad.The selection that was last activated keeps control until a different selection is activated.

The work lights can be turned on when the truck is driven less than 18 miles per hour. The work lights will automatically turn off when the truck is driven at a speed of more than 20 miles per hour and the selection will be grayed out on the Cab display. The optional two rear work lights will come on automatically when the truck is in reverse.

The Beacons selection controls the optional two rear and two boom beacon lights.



The Strobes selection controls the optional strobe lights mounted around the perimeter of the debris body and front bumper.

The All Lights selection controls the all of the optional lights equipped on the truck.

Status Menu

Status Menu

Figure 3-10

The Status menu allows the user to view status information about the control system. The status of the individual system groups are indicated by an icon next to the group name. In-depth status information about each group can be selected by using the UP/DOWN navigation arrows and pressing the CENTER navigation button to confirm the selection.

Pendant Status

The Pendant status screen will show the status of any connected pendants. If a pendant is connected and online, it will be indicated at the top of the screen. As buttons are pushed, the button will change colors to indicate it is pushed and the associated function will also be highlighted in green. The pendant will also display the RF link status and battery charge of the wireless pendant when connected.

Pendant Status

Figure 3-11

Power Distribution Status

The Power Dist status screen will show the status of the fuses and relays of the circuits used in the control system. At the top, the status of the mVEC module on the network is shown. Below that is a listing of all the circuits with the fuse and relay status. To the right of the descriptions are indicators of the circuit status. Black is off, Green is on, and red is faulted. If a circuit is faulted, the type of fault is displayed as the status and the indicator on the right of the screen will display in red to easily identify the location of the faulty component on the mVEC module.

Power Distribution Status

Figure 3-12

Control System Status

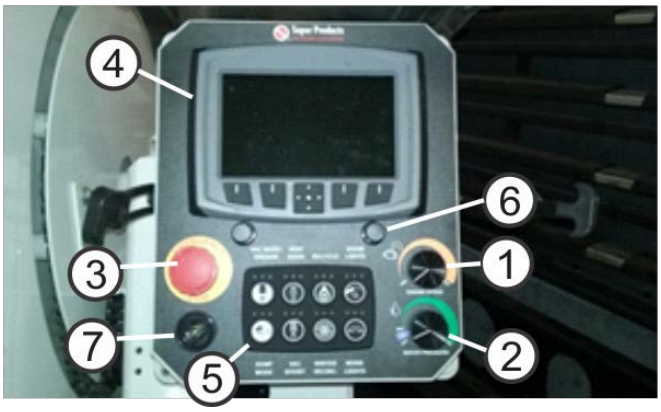
The Control System status screen will show the status of the various subsystems in the control system. The subsystems include the network, chassis, control panels, vacuum, water system, reel, boom, body, tailgate, and recycling if equipped.

Digital inputs and outputs will be shown as on or off. Analog inputs will display the raw analog data value. Faulted inputs or outputs will display the type of fault that is detected. The location of each input or output component on the truck can be viewed by using the UP/DOWN navigation buttons to select the item. Inputs and Outputs that are not equipped will be grayed out.

Control System Status

Figure 3-13

Front Control Panel and Functions



Front Control Panel

1) ENGINE SPEED Rotary Dial
2) WATER PRESSURE Rotary Dial
3) Emergency STOP Switch
4) Display Screen
5) Keypad
6) Panel Lights
7) Alarm

Figure 3-14

The following section will provide information on the use of available functions for the front control panel. It will also provide instructions and information on navigating the display screen.

Engine Speed Rotary Dial

Engine Speed can be controlled by the ENGINE SPEED rotary dial (1) on the front panel or the VAC INCR/VAC DECR buttons on the pendants or backup control screen.

The control system will obey the most recent command input.

The engine speed is at idle when the speed dial is between 0 and 5%. When the ENGINE SPEED rotary dial is turned to 5% or greater, the engine speed revolutions per minute (RPM) will increase up to the speed dial setting. Turning the ENGINE SPEED rotary dial to less than 5% will reduce engine RPM to idle. The speed of the vacuum pump is controlled by changing the RPM of the engine. The vacuum pump speed is monitored through a magnetic speed sensor.

If the engine speed dial is already set to a value greater than 5% when the truck enters work mode, the control system will ignore the speed dial setting until the setting is turned back to less than 5% or until the pendant or backup control screen inputs are used to set the engine speed.

Engine Speed

Engine Speed will be shown on the front control panel display screen (4).

Water Pressure Rotary Dial

Water pressure can be controlled by the WATER PRESSURE rotary dial (2) on the front panel or the WATER INCR/WATER DECR buttons on the pendants, backup control screen, or curbside panel.

The control system will obey the most recent command input.

The water pump is turned off when the speed dial is turned to less than 5%. If the water pressure dial is already set to a value greater than 5% when the truck enters work mode, the control system will ignore the speed dial setting until the setting is turned back to less than 5% or until the water pressure buttons on the curbside panel are pressed to decrease pressure or until the pendant or backup control screen inputs are used to set the water pressure.

When the speed dial is turned to 5% or greater, the following will happen:

1. The water pressure speed dial will affect engine RPM - 1500 RPM maximum.

2. The operator will increase the engine RPM via the engine speed dial when necessary.

Water Pressure

Water pressure will be shown on the front control panel display screen (4). Water pressure is displayed in pounds per square inch (PSI). Alternate water pressure units are user-selectable by accessing the Options menu.

Emergency STOP Switch

If the emergency STOP switch (3) is actuated the following will occur:

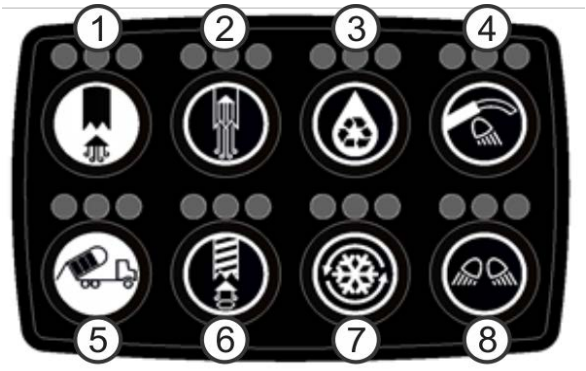
- The vent door will open.
- All functions will be turned off (boom, water, hose reel, etc.)
- The engine will be brought down to idle.
- A red E-Stop Active alarm message will be displayed on the display screens, and the alarm will sound. The alarm can be silenced by pressing the CENTER navigation button on the front panel.

Emergency Stop HMI Screen

Figure 3-15

- To return to full operation, reset the system by twisting the red emergency stop switch clockwise.

Front Control Panel Keypad



Front Control Panel Keypad

Figure 3-16

1) Vac MODE/ENGAGE Button
2) VENT DOOR Button
3) RECYCLING BUTTON
4) BOOM LIGH Button
5) DUMP MODE Button
6) VAC BOOST Button
7) RECIRCULATE MODE Button
8) WORK LIGHT Button

Vac/Dump Mode Buttons

- The VAC MODE/ENGAGE button (1) selects vacuum mode or engages the vacuum pump.
- The DUMP MODE button (5) selects dump mode

One of these two modes must be selected before any other function is selected.

- Vacuum (VAC) Mode - Enables the water pump, vacuum, boom, hose reel, and compaction functions while disabling the tailgate and body functions.
- Vacuum (VAC) Engage - when in vac mode, pressing the button will engage or disengage the vacuum pump. An LED above the button will move back and forth to indicate that the vacuum pump is engaged in vac mode.

- Dump Mode - Enables tailgate, body, and water pump functions while disabling the vacuum, boom, hose reel, and compaction functions.
- The VAC/DUMP MODE button LEDs will not illuminate until the cab panel mode is set to work mode. Once in work mode, neither VAC/DUMP MODE button LEDs will be illuminated until either VAC or DUMP mode is selected. The LEDs above the button will illuminate for the selected mode.

Vent Door Button

- The VENT DOOR button (2) opens or closes the vacuum vent door.

Vent door positions

- Truck Off - vent door is open

- Truck Start, Driving in Road Mode - vent door is closed
- Work Mode - vent door is open
- Dump Mode - vent door is open
- VAC Mode - vent door is open. Vent door can be open and closed in VAC mode via the front control panel, the VENT OPEN/VENT CLOSE buttons on the pendants or backup control screen. When the vent door is closed in work mode the LEDs above the button will be illuminated.

The control system will obey the most recent command input.

RECYCLE Button (Option)

The RECYCLE button (3) activates the water recycling system that filters sewer water and supplies it to the high-pressure water pump for reuse during sewer jetting work. This system allows the operator to continue working by recycling sewer water and not having to shut down and travel elsewhere to refill with potable water.

See Chapter 5, "Water Recycling System".

BOOM LIGHT Button

The BOOM LIGHT button (4) toggles the boom lights on and off. The boom lights can only be turned on when in work mode.

WORK LIGHT Button

The WORK LIGHT button (8) toggles the mid-ship and rear work lights on and off. The work lights can only be turned on when in work mode.

RECIRCULATE MODE Button (Option)

Winter recirculation mode is used to circulate water through the water system plumbing and water tanks to prevent freezing. Winter recirculation is meant to run when the truck is either idling or driving on the road. When the winter recirculation mode is switched ON, the LEDs above the button will illuminate and the hydraulic pumps driving the water pump are engaged. The water pump will run a minimum of 10 GPM (gallons per minute) while at idle. Faster engine RPM while in road mode will cause the water pump to pump up to 30 GPM or more due to the faster running hydraulic pump.

VAC BOOST Button (Option)

Pressing the VAC BOOST button (6) will close the vacuum booster door and build vacuum in the debris body as long as this switch is pressed. Releasing the switch will open the vacuum booster door and cause a huge rush of air through the boom hose.

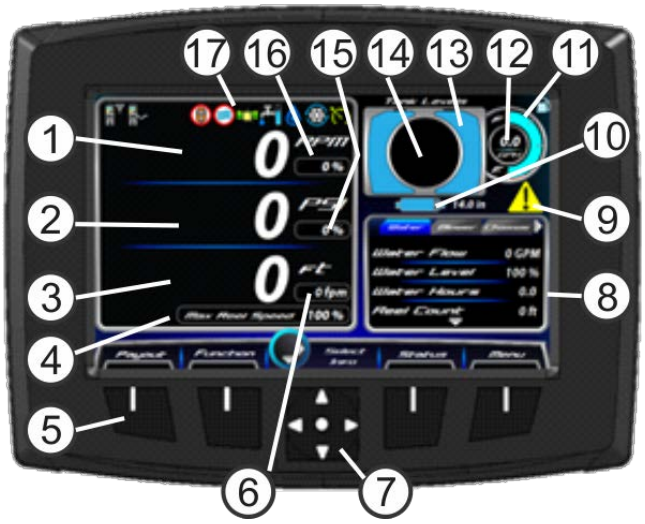
Works when cab panel mode is set to work and when front panel mode is set to VAC MODE.

Front Control Panel Display Screen Menu Operation

Located on the front control panel is the color display screen. This screen provides the operator with vital performance information and warning messages.

This screen will also enable the operator to control all functions needed to complete the sewer cleaning. There are several screens that are pointed out in detail to familiarize the operator with the functionality available.

The screen shown in Figure 3-17 is the home screen. This screen is used to navigate to other selections as needed.



Front Display

Figure 3-17

1) Engine Speed
2) Water Pressure
3) Payout Counter
4) Max Hose Reel Speed
5) Menu Buttons
6) Payout Speed
7) Navigation Buttons
8) Information Window
9) Alert Icon
10) LVDT Position
11) Fuel Level
12) Fuel Consumption
13) Water Fuel
14) Debris Level
15) Requested Water Pressure
16) Requested Engine Speed
17) Operation Icons

Engine Speed

Engine speed (1) is displayed in revolutions per minute (RPM).

Water Pressure

Water pressure (2) is displayed on the front display panel screen after initial power-up. Water pressure is displayed in a range of 0-3000 PSI. Alternate water pressure units are user-selectable by accessing the Options menu.

Payout Counter

The payout counter (3) can be reset independently of the reel counter once the hose is in the horizontal sewer line. This can alert the operator when the hose is nearing the opening.

Max Hose Reel Speed

Max Hose reel speed (4) displays percentage of max speed of the hose reel during pay-out and pay-in.

Menu Buttons

The menu buttons (5) are used to select different menu selections from the display screen. Pressing a menu button will pop up a menu of items to select. Select a menu item by using the navigation buttons. Pressing the menu button when a menu is popped up will hide it again.

Payout Speed

The payout speed (6) displays the speed at which the hose is paying in or paying out.

Navigation Buttons

The navigation buttons (7) are used to navigate through the various menus or information on the screen. The area on the screen above the navigation buttons displays which navigation movements are available.

Information Window

The information window (8) displays information about the water system, blower system, chassis, and system status. The LEFT/RIGHT navigation buttons can be used to select the desired information tab to view. The UP/DOWN navigation buttons can be used to scroll the information up or down if these is more available.

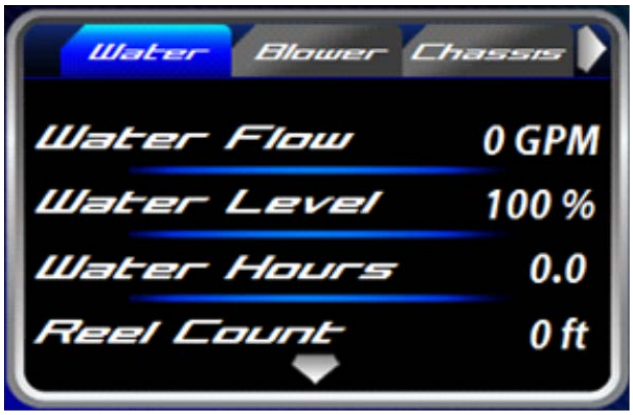


Figure 3-18

Alert Icon

The Alert Icon (9) is displayed when an alarm or E-Stop condition is active.

LVDT Position

LVDT position (10) displays the position of the water pump piston.

Fuel Consumption

Fuel consumption (11) displays how much fuel is being consumed by the truck while in work mode. Fuel consumption is shown in gallons per hour (GPH).

Fuel Level

Fuel Level (12) displays the fuel level in the truck's fuel tank.

Water Level (optional)

Water Level (13) displays the water level remaining in the fresh water tanks.

Debris Level (optional)

Water Level (14) displays the debris level in the debris body.

Requested Water Pressure

Displays the requested water pressure (15).

Requested Engine Speed

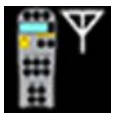
Displays the requested engine speed (16).

Operation Icons

Operation icons (17) are displayed to show current operation of the control system.

Status icons are displayed to show the current status of the control system.

The wired pendant icon is displayed when the wired pendant is plugged in and communicating with the control system.



The wireless pendant icon is displayed when the wireless pendant is linked and communicating with the control system.

The speed control icon is displayed when the control system is operating in speed control mode. The control system will enter speed control mode when excessive blower speed has been detected and limit the engine speed to protect the blower.

The flow control icon is displayed when the control system is operating in flow control mode. The control system will enter flow control mode when excessive flow has been detected and limit the output pressure to control the output flow rate.

The block buster icon will be displayed when Block Buster is activated in the Function menu.

The autofill mode icon will be displayed when the Autofill Mode is activated in the Function menu or curbside panel but not currently filling.

The autofill filling mode icon will be displayed when the Autofill Mode is activated in the Function menu or curbside panel and the fresh water tanks are being filled.

The trash pump icon will be displayed when the Trash Pump is activated from the Function Menu

The recycling mode icon will be displayed when the Recycling is activated from the front keypad.

The winter recirculation icon will be displayed when Winter Recirculation is activated from the front keypad.

The pump low icon will be displayed when Pump Low is activated in the Function menu.

Payout Menu

The payout menu can be accessed by pressing the Payout button. The menu options can be selected by using the UP/DOWN navigation arrows and pressing the CENTER navigation button to confirm the selection.

Payout Menu

Figure 3-19

Selecting Clear will clear the current hose payout.

Selecting Store will store the current hose payout to the next available memory location.

Selecting Recall will pop up the Payout Recall selections. The user can navigate to the desired payout footage to recall and load it to the current hose payout footage using the navigation buttons.

Payout Recall

Figure 3-20

Selecting Clear All Saved will reset all memory locations to zero.

Selecting Return will return the user to the Payout Menu.

Function Menu

The function menu is only available in work mode. Pressing the Function button will allow the user to turn on or off functions of the truck's water system. These functions include the Pump Low feature, Autofill mode (if equipped), Block Buster function (if equipped), Trash Pump function, and Recycling functions (if equipped) to activate Fresh Water Flush and Service Mode. Use the UP/DOWN navigation arrows to select a function and press the CENTER navigation button to turn the function on or off. Functions which are not available will be grayed out and cannot be selected.

Function Menu

Figure 3-21

Status Menu

The Status menu allows the user to view status information about the control system. The status of the individual system groups are indicated by an icon next to the group name. In-depth status information about each group can be selected by using UP/DOWN navigation arrows and pressing the CENTER navigation button to confirm the selection.

Status Menu

Figure 3-22

3

Pendant Status

The Pendant status screen will show the status of any connected pendants. If a pendant is connected and online, it will be indicated at the top of the screen. As buttons are pushed, the button will change colors to indicate it is pushed and the associated function will also be highlighted in green. The pendant will also display the RF link status and battery charge of the wireless pendant when connected.

Pendant Status

Figure 3-23

Power Distribution Status

The Power Dist status screen will show the status of the fuses and relays of the circuits used in the control system. At the top, the status of the mVEC module on the network is shown. Below that is a listing of all the circuits with the fuse and relay status. To the right of the descriptions are indicators of the circuit status. Black is off, Green is on, and red is faulted. If a circuit is faulted, the type of fault is displayed as the status and the indicator on the right of the screen will display in red to easily identify the location of the faulty component on the mVEC module.

Power Distribution Status

Figure 3-24

Control System Status

The Control System status screen will show the status of the various subsystems in the control system. The subsystems include the network, chassis, control panels, vacuum, water system, reel, boom, body, tailgate, and recycling if equipped.

Digital inputs and outputs will be shown as on or off. Analog inputs will display the raw analog data value. Faulted inputs or outputs will display the type of fault that is detected. The location of each input or output component on the truck can be viewed by using the UP/DOWN navigation buttons to select the item. Inputs and Outputs that are not equipped will be grayed out.

Control System Status

Figure 3-25

Operator Menu

The operator menu allows the user to select user options, adjust the valve offsets or activate the backup controls in the event of a component failure. The menu options can be selected by using the UP/DOWN navigation arrows and pressing the CENTER navigation button to confirm the selection.

Operator Menu

Figure 3-26

User Options

The Options screen shows the user options that can be changed. The options can be selected by using the UP/DOWN navigation buttons. The selection can be changed by using the LEFT/RIGHT navigation buttons. Pressing the Defaults button will reset all values to their factory default value. Unsaved values will be highlighted with orange text. To save the selections, press the CENTER navigation button.

NOTE

Setting an option to Installed when the hardware has not been installed will cause error message and alarm to be activated since the diagnostic system will detect a hardware fault.

User Options

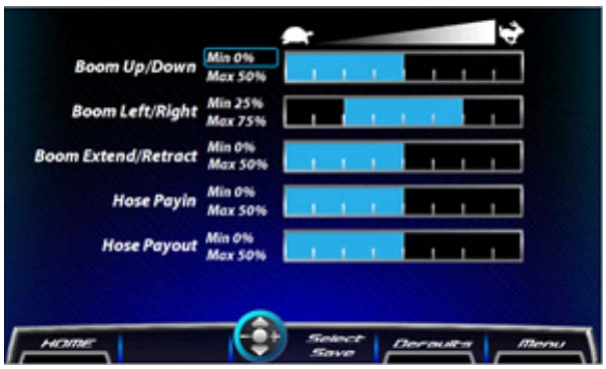
Figure 3-27

The Calibrate Hose button will reset both the hose payout and reel payout counters to zero to calibrate the hose counter function. This parameter should be calibrated to zero at the vertical entry point for best hose reel counter accuracy along with correctly setting the hose outside diameter and length,

The Factory button will navigate to a screen with factory level variables used for troubleshooting. These variables are not able to be edited without a factory password.

Valve Offsets

The valve offsets can be used to either increase or decrease the operating speed of the proportional controls per the operator's preference. The black bar represents the full operating range of the hydraulic valve while the blue area indicates the actual operating proportional range.



Valve Offsets

Figure 3-28

NOTE

When adjusting the speed offsets for use with the optional remote pendants or backup controls the MIN% setting will control the speed for the first four seconds that the button is depressed, after the first four seconds the MAX% setting will then control the speed.

Leakdown Test

A leakdown test is a method to test the water pump check valves for wear. Refer to Water Pump Check Valve Leak Test in Chapter 6 LUBRICATION AND MAINTENANCE for more information. The leakdown test procedure is initiated by selecting Leakdown Test and following the instructions displayed on the screen. If the test is cancelled, the previous test results will be displayed.

Figure 3-29

Backup Controls

The Backup controls screen allows the user to operate functions of the Water, Vacuum, Boom, and Body systems from the control screen in the event of a component failure. When a backup control button is being pressed, the box around the text on the screen will turn green to inform the operator that the function is being operated. If the function has an end of travel switch, a ring around the box on the text on the screen will turn green to inform the operator that the function has reached the end position.

Backup Controls

Figure 3-30

Backup Water Controls

When in VAC MODE, the water pressure can be increased and decreased using the UP/DOWN navigation buttons. The hose pay-in and pay-out can be controlled using the LEFT/RIGHT navigation buttons. The hose reel can be extended and retracted using the Reel Extend and Reel Retract menu buttons.

Backup Vacuum Controls

When in VAC MODE, the engine speed controlling the vacuum can be increased and decreased using the UP/DOWN navigation buttons. The vent door open/close can be controlled using the LEFT/RIGHT navigation buttons. The optional vacuum booster cycle can be activated by using the Vac Boost menu button.

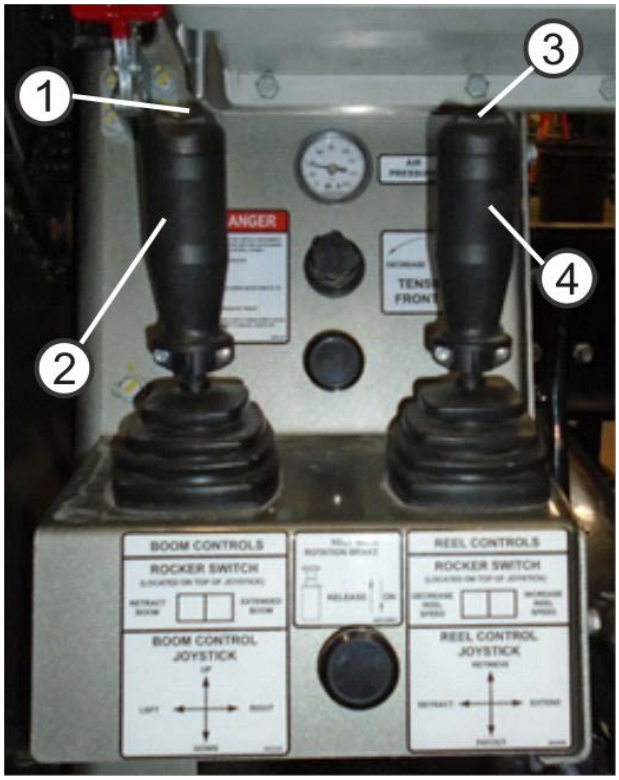
Backup Boom Controls

When in VAC MODE, the boom up and boom down operation can be controlled using the UP/DOWN navigation buttons. The boom left and boom right operation can be controlled using the LEFT/RIGHT navigation buttons. The boom extend and boom retract operation can be controlled by using the Boom Extend and Boom Retract menu buttons.

Backup Body Controls

When in DUMP MODE, the body up and body down operation can be controlled using the UP/DOWN navigation buttons. The tailgate open and tailgate close operation can be controlled using the LEFT/RIGHT navigation buttons. The optional ejector plate can be extended or retracted by using the Ejector Out and Ejector Home menu buttons.

Front Control Panel Joystick Functions



Backup Controls

Figure 3-31

1) Boom Thumb Switch
2) Boom Control Joystick
3) Reel Thumb Switch
4) Reel Control Joystick
5) Reel Brake

Boom Functions

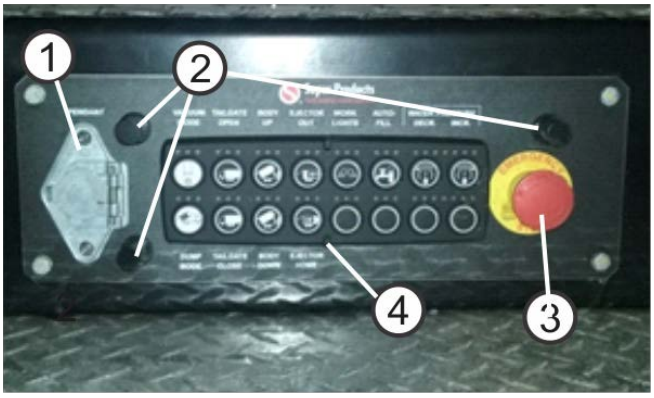
- Moving the boom control joystick forward or backwards (2) will lower or raise the boom.
- Moving the reel control joystick left or right on the boom control joystick will rotate the boom left or right.
- The thumb switch (1) on top of the boom control joystick will extend or retract the boom.
- All three boom functions are available while the hose reel is turning, although only one axis can be moved at a time.
- The speed of the boom up, down, left, and right joystick functions are proportional to how far the joystick is moved. Extend and retract are a fixed two-speed operation. This allows for slow, precise vacuum tube movement while working, but faster boom movement for job setup.
- All motions are also available when using the pendants. Pendants and backup controls operate the boom in two-speed mode.

Hose Reel Functions

- Moving the reel control joystick forward or backwards (4) will rotate the hose reel to retrieve (pay in) or pay out the sewer hose.
- Moving the reel control joystick right or left will extend or retract the hose reel carriage.
- The thumb switch (3) on the top of the reel control joystick will increase or decrease the maximum hose reel speed. The hose reel speed, as a percentage of maximum, is shown on the top left of the home screen.
- The speed of the pay in and payout to how far the joystick is moved. Extend and retract are a fixed peed operation.
- The pay in and pay out functions are also available when using the pendants. Pendants and backup controls operate the pay in and pay out in two-speed mode.

Curbside Control Panel

The curbside control panel contains the control functions for operating dump mode or other functions from the curbside area of the truck.



Curbside Control Panel

Figure 3-32

1) Pendant Port
2) Panel Lights
3) Emergency Stop Switch
4) Keypad

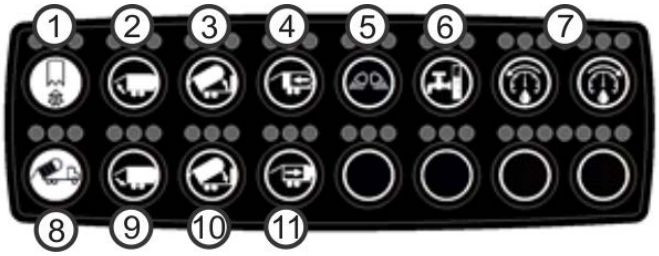
Emergency STOP Switch

If the emergency STOP switch (3) is actuated the following will occur:

- The vent door will open.
- All functions will be turned off (boom, water, hose reel, etc.)
- The engine will be brought down to idle.
- A red E-Stop Active alarm message will be displayed on the display screens, and the alarm will sound. The alarm can be silenced by pressing the CENTER navigation button on the front panel.

Figure 3-33

- To return to full operation, reset the system by twisting the red emergency stop switch clockwise.



Curbside Control Panel Keypad

Figure 3-34

1) VAC MODE Button
2) TAILGATE OPEN Button
3) BODY UP Button
4) EJECTOR OUT Button
5) WORK LIGHTS Button
6) AUTOFILL MODE ON/OFF Button
7) WATER PRESSURE Buttons
8) DUMP MODE Button
9) TAILGATE CLOSE Button
10) BODY DOWN Button
11) EJECTOR HOME Button

VAC/DUMP MODE Buttons

- The VAC MODE/ENGAGE button (1) selects vacuum mode or engages the vacuum pump.
- The DUMP MODE button (8) selects dump mode

One of these two modes must be selected before any other function is selected.

- Vacuum (VAC) Mode - Enables the vacuum, boom, hose reel, and compaction functions and disables tailgate and body functions.

NOTE

The vacuum pump can only be engaged or disengaged from the keypad on the front control panel.

- Dump Mode - Enables tailgate, body, and water pump functions and disables vacuum, boom, hose reel, and compaction functions.
- The VAC/DUMP MODE button LEDs will not illuminate until the cab panel mode is set to WORK mode. Once in work mode, neither VAC/DUMP MODE button LEDs will be illuminated until either VAC or DUMP mode is selected. The LEDs above the button will illuminate for the selected mode. If the vacuum pump is engaged, an LED above the VAC MODE button will move back and forth to indicate that the vacuum pump is engaged.

TAILGATE OPEN - Pressing the TAILGATE OPEN button (2) while in dump mode will perform the following:

- The backup lights and backup alarm will turn on and stay on until the button is released.
- There is a built-in 3-second delay to warn the operator that the tailgate is about to open.

- If the button is released, the time delay duration starts over again when the button is pressed again.
- The green LED lights above the button will motion while the function is active and will illuminate steady green when the tailgate is fully open.

TAILGATE CLOSE - Pressing the TAILGATE CLOSE button (9) while in dump mode will perform the following:

- The backup lights and backup alarm will turn on and stay on until the button is released.
- There is a built-in 3-second delay to warn the operator that the tailgate is about to close.
- If the button is released, the time delay duration starts over again when the button is pressed again.
- The operator must continue to press TAILGATE CLOSE until the tailgate lock switch function operates
- The green LED lights above the button will motion while the function is active and will illuminate steady green when the tailgate is fully closed and locked.

BODY UP - Pressing the BODY UP button (3) while in dump mode will perform the following:

- The backup lights and backup alarm will turn on and stay on until the BODY UP button is released.
- There is a built-in 3-second delay warning the operator that the body is about to rise.
- If the button is released, the time delay duration starts over again when the button is pressed again.
- The body will continue to rise to the maximum height as long as the button is pressed.
- The green LED lights above the button will motion while the function is active.

BODY DOWN - Pressing the BODY DOWN button (10) while in dump mode will perform the following:

- The backup lights and backup alarm will turn on and stay on until the BODY DOWN button is released.
- There is a built-in 3-second delay warning the operator that the body is about to lower.
- If the button is released, the time delay duration starts over again when the button is pressed again.
- The body will continue to lower to the home position as long as the button is pressed.
- The green LED lights above the button will motion while the function is active and will illuminate steady green when the body is fully down.

EJECTOR OUT (Option)

The ejector plate is used to eject the debris from the debris body. If the tailgate is fully raised, the ejector plate will be allowed to fully extend.

Pressing the EJECTOR OUT button (4) while in dump mode will perform the following if equipped:

- If the tailgate is closed, the ejector plate will move out until the compaction proximity switch is activated.
- If the tailgate is fully open, the ejector plate will move out until it reaches its maximum extension just past the end of the debris body opening.
- The green LED lights above the button will motion while the function is active and will illuminate steady green when the ejector plate is at the fully compacted position.

EJECTOR HOME (Option)

Pressing the EJECTOR HOME button (11) will perform the following if equipped:

- The ejector plate will retract until the ejector home proximity switch is activated.
- The green LED lights above the button will motion while the function is active and will illuminate steady green when the ejector is at the home position.

NOTE

An alarm will indicate if the EJECTOR PLATE is not in the home position while vacuuming.

WATER PRESSURE Buttons

The WATER PRESSURE buttons (7) perform the same function as the front control panel water pressure rotary control.

When the WATER PRESSURE INCR button is held, the water pressure will increase to its maximum.

When the WATER PRESSURE DECR button is held, the water pressure will decrease to zero.

- The green LEDs above the water pressure buttons will indicate the requested pressure.
- The water pressure can be adjusted each time the button is pressed to increase the water pressure in 3% increments or decrease the water pressure in 6% increments.

WORK LIGHT Button

The WORK LIGHT button (5) toggles the mid-ship and rear work lights on and off. The work lights can only be turned on when in work mode.

AUTOFILL MODE (Option)

The AUTOFILL MODE button (6) toggles the autofill shutoff on and off.

- The green LED lights above the button will be steady on when the autofill mode is engaged and the shutoff is active.
- The LED lights will flash when autofill mode is engaged and the shutoff is deactivated to refill the fresh water tanks.
- The LED lights will be off when autofill mode is not engaged.

Pendant Functions - Wired and Wireless

The functions, buttons, and labels on the wireless pendant are the same as those used on the wired pendant. Alternate functions require holding the SHIFT button while pressing the

Pendant Functions - Wired and Wireless

Figure 3-35

The pendant functions are as follows:

1. Pendant Power/Backlight
2. Emergency Stop
3. Scroll
4. Shift
5. Vent Door Close
6. Vent Door Open
   - **»+ SHIFT = Vac Boost**
7. Boom Left
   - **»+ SHIFT = Tailgate Open**
8. Boom Right
   - **»+ SHIFT = Tailgate Close**
9. Boom Up
   - **»+ SHIFT = Body Up**
10. Boom Down
    - **»+ SHIFT = Body Down**
11. Boom Extend
    - **»+ SHIFT = Ejector Extend**
12. Boom Retract
    - **»+ SHIFT = Ejector Home**
13. Vacuum Increase
14. Vacuum Decrease
15. Hose Pay In
    - **»+ SHIFT = Increase Water Pressure**
16. Hose Pay Out
    - **»+ SHIFT = Decrease Water Pressure**

NOTE

In VAC MODE the vacuum, boom, hose reel, water pump, and ejector functions are enabled while the tailgate and body function are disabled. In DUMP MODE the tailgate, body, water pump, and ejector functions are enabled while the vacuum, boom, and hose reel functions are disabled.

Pendant Power/Backlight

Pressing the power button will turn the pendant on. When the pendant is on, holding the power button for one second will turn on the pendant display backlight. Holding the power button for two seconds will turn the pendant off.

Scroll

Information about the operation of the truck is displayed on the pendant display. Pressing the scroll button allows the operator to scroll though the available information.

Emergency Stop

If an emergency condition arises, the operator can press the red emergency stop button on the remote pendant.

If the emergency stop button (2) is actuated the following will occur:

- The vent door will open.
- All functions will be turned off (boom, water, hose reel, etc.)
- The engine will be brought down to idle.
- A red E-Stop Active alarm message will be displayed on the display screens, and the alarm will sound. The alarm can be silenced by pressing the CENTER navigation button on the front panel.

Figure 3-36

- To return to full operation, reset the system by holding the red emergency stop button for 3 seconds.

Wired Pendant (Option)

The wired pendant is connected to the receptacle for power and system connections. The wired pendant receives 12VDC power from, and sends commands to, the control system.

Pendant Receptacles

There is a receptacle for the wired pendant located at the front panel (1) and at the curbside panel (2).

Front Control Panel Wired Pendant Receptacle

Figure 3-37

Curbside Panel Wired Pendant Receptacle

Figure 3-38

Wireless Pendant (Option)

The functions, buttons, and labels on the wireless pendant are the same as the ones used on the wired pendant.

NOTES

The wireless pendant power must be turned off when not in use to conserve battery power. The wireless pendant can be configured to automatically turn off after a period of inactivity. Contact customer service for information about enabling or disabling this feature.

Chapter 4

Sewer Cleaning — Typical Sequence

Setting the Truck at the Job Site

1. Position the truck at the job site.
2. Place the transmission in neutral (N). Both the SELECT and MONITOR indicators will display NN.
3. Apply the park brake.
4. Wait for the chassis air pressure to rise to 100 psi min. and make sure the red low air pressure warning lights and alarm go out.
5. Turn on the appropriate strobe lights, work lights, and traffic manager lights.
6. Place wheel chocks in front of and behind one of the rear tires. Place safety cones as needed.

Engaging Work and Vac Modes at the Job Site

NOTICE

Provided with every Camel™ are two instructional placards that describe in detail proper work and vacuum operation, as well as purge/prime feature activation. Read this material before operating the truck.

1. Press the MODE Menu button (1) located on the cab control panel display screen. The displayed mode will switch to WORK MODE when the transfer case is fully engaged.

Figure 4-1

2. If there is not a minimum of 100 psi of air pressure to properly shift the transfer case a warning message will appear on the display screen.
3. Engage the foot brake.
4. Wait five seconds, and then engage the truck transmission by selecting D (drive).
5. Take your foot completely off the brake.
6. The transmission will shift into 4-4 and be displayed on the SELECT MONITOR.

NOTE

The transmission must shift into 4-4. On occasion (usually on a cold engine) the transmission may shift into 6-1. If this occurs, place the transmission into N (neutral) then select D (drive). If the transmission fails to shift into 4-4 again, press the MODE button to switch the truck back into ROAD MODE. Repeat steps 1 through 5 after waiting for five seconds.

Front Control Panel

Figure 4-2

7. Make sure the ENGINE SPEED (2) and WATER PRESSURE (3) dials on the front control panel are set to their lowest settings (turned fully counterclockwise)
8. Press the VAC MODE/ENGAGE button (4) located on the front control panel keypad to begin working and engage the PTO, which runs the water pump. Press the VAC MODE/ENGAGE button a second time to turn the vacuum pump ON. Press the VAC MODE/ENGAGE button a third time to turn the vacuum pump OFF.

If the truck fails to properly engage the PTO, there will be one of three warning messages displayed on the front control panel display screen.

- The PTO ERROR message (Figure 4-3) is shown when the PTO cannot engage due to the engine RPM being too high. If this screen is shown, lower the engine RPM under 900 and try again.

Figure 4-3

- The PTO Solenoid Failure warning (Figure 4-4) is shown if a solenoid has failed or if there is an electrical problem between the solenoids and the control panel. If this screen is shown, inspection is necessary.

Figure 4-4

- The PTO Consent Failure warning (Figure 4-5) is shown if the transmission conditions are insufficient to properly handle the load of the PTO and therefore, not granted consent to the control system for engagement.

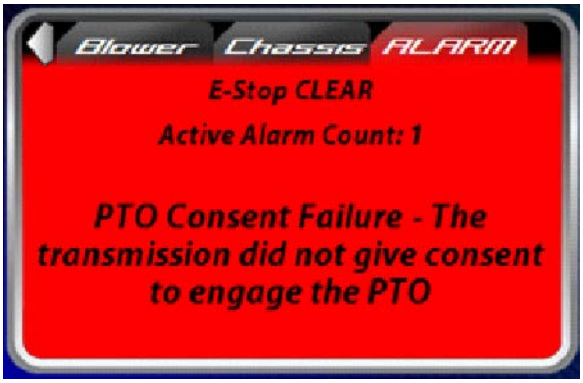


Figure 4-5

9. Press VAC MODE/ENGAGE button while in VAC MODE will engage the vacuum pump. An LED above the button will motion to indicate that the vacuum pump is engaged in vac mode

If the engine RPM is too high to engage the vacuum pump, a warning message will be displayed on the front control panel display screen.

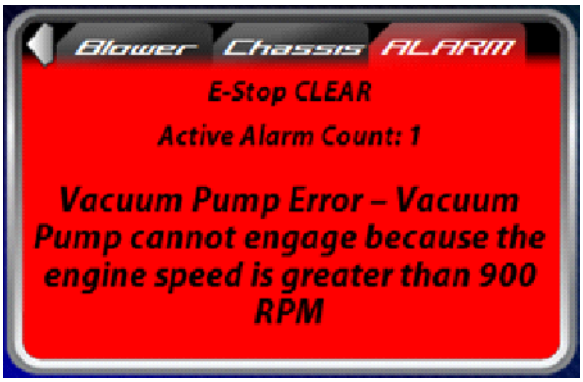


Figure 4-6

10. Pressing the VAC MODE/ENGAGE button while vacuum pump is engaged will disengage the vacuum pump. The LEDs above the VAC MODE/ENGAGE button will all illuminate steady green to indicate the truck is on VAC MODE with the vacuum pump disengaged.

Purge/Prime

The truck is equipped with an innovative purge/prime system that strokes the water pump the full extent of the stroke. This aids in removing unwanted air while in work mode. When winterizing the jetting system, the purge feature aids in removing water from the pump.

Follow these steps to prime the water pump:

1. Place the truck in WORK mode on the cab control panel with the engine running.

Figure 4-7

2. Make sure the water supply line valve (1), located on the driver's side under the front of the debris body is open.
3. Make sure the ENGINE SPEED and WATER PRESSURE dials located on the front control panel are set to their minimum settings (fully counterclockwise). See Figure 4-2.

NOTE

The system may be primed with the sewer hose secured in the travel fitting on the hose reel or after the hose has been placed in the sewer.

4. Press VAC MODE button (2) on the front control panel.

Figure 4-8

5. Turn the water pressure dial up slowly to the blue purge/prime (3) setting and until movement of the pump (LVDT) is observed on the screen of the control panel display. The LVDT directional arrow will appear blue in Purge/Prime mode.

Prime Purge Dial Zone

Figure 4-9

Prime Purge Dial Zone

Figure 4-10

6. If the engine RPM increases and the stroke of the LVDT shortens, the water pressure dial has been advanced too far into the normal operation zone. The LVDT directional arrow will appear green under normal operation. Decrease the dial setting until LVDT movement resumes on the display. Stroking the pump several times should yield the desired results.

Water Pump Operation — Jetting

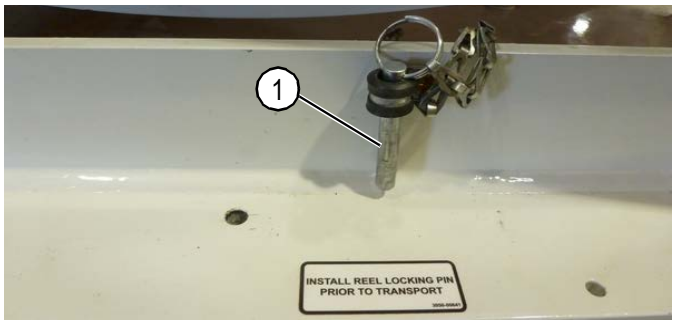
Determine what work will need to be performed at the job site to facilitate the proper positioning of the truck. Let's assume that we will clean a 12 in. storm line and catch basin and will need to vacuum the material that is backflushed. The handgun may be needed as well.

Starting Sewer Cleaning — Typical Sequence

NOTE

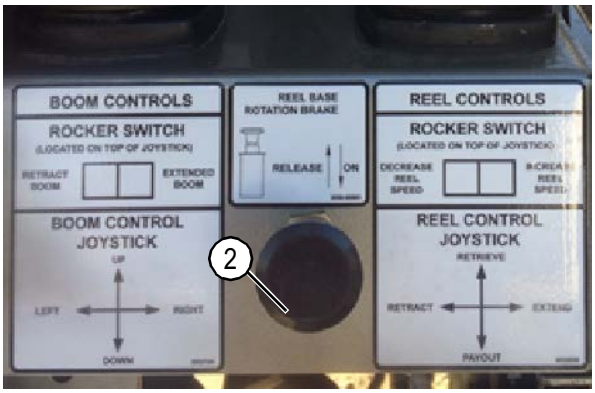
If the front mount hose reel cannot be placed directly over the drain, an upper manhole roller guide should be used to protect the jetting hose from damage. The front mount hose reel will operate in a 270° radius.

1. Make sure the truck's parking brakes are set and the cab control panel is in work mode and the transmission is in the proper gear. Let the engine idle and turn on the appropriate flashers, strobes, arrow boards, etc. Put on the proper PPE. Place wheel chocks in front of and behind one of the rear tires. Place safety cones as needed.
2. Retrieve the following items from the tool box:
   - Manhole hook to remove the drain cover.
   - Tiger tail to protect the jetting hose.
   - Cleaning Nozzle.
   - Nozzle Extension.
3. Position the truck so that the hose guide is positioned just over the drain on the downstream side if possible. To position the hose guide, remove the transport locking pin (1) on the front of the hose reel and unlock the hose reel base rotation brake (2) by pulling the knob out. Leave the hose reel brake in the RELEASE position at this time.



Hose Reel Transport Locking Pin Removed and Stowed

Figure 4-11



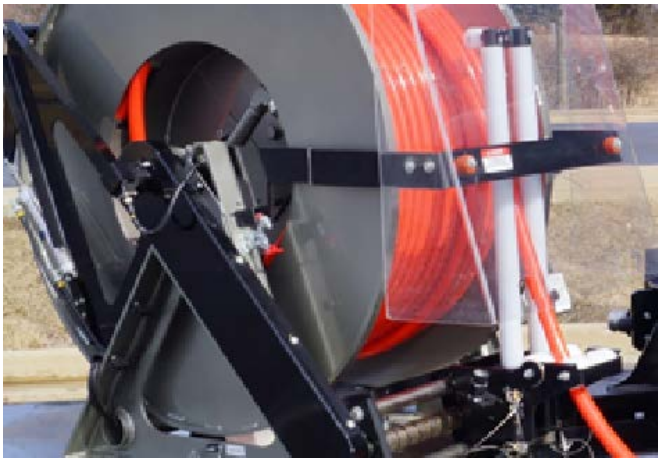
Hose Reel Base Rotation Brake

Figure 4-12

4. For remote manhole operations, the water pump may be operated with the containment shield raised, and the sewer hose does not need to be routed through the hose guide. See Figures 4-13 and 4-14 below for the location of containment shield latches.

WARNING

A sewer rupture can cause serious injury or death. Wear personal protection equipment (PPE) including hard hat and face shield when operating with the containment shield raised.



Left Containment Shield Latch

Figure 4-13

Right Containment Shield Latch

Figure 4-14

Personal Protection Equipment

Figure 4-15

Personal Protection Equipment

Figure 4-16

NOTES

- *The pipe extension should be at least as long as the diameter of the sewer pipe. The pipe extension will keep the nozzle from turning in the drain line or inadvertently going up a lateral. Contact your local distributor or Super Products for information on the wide variety of nozzles and their uses.*
- *If the wired or wireless remote pendant is to be used, it must stay in the operator's possession at all times during the sewer cleaning procedure.*

⚠ WARNING

If there is an emergency while operating the truck, immediately press one of the red emergency stop buttons.

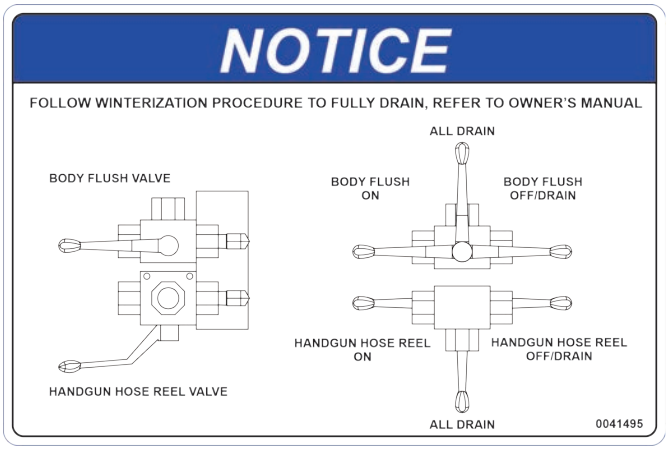
- **The pumps will shut off immediately, the truck will return to idle, and the vent door will open to relieve pressure on the vacuum system.**
- **To reactivate, do not pull the emergency stop button out; instead, turn the knob clockwise, and the button will pop out.**

5. Make sure the debris body flusher valve (3) is shut off. This valve is located on the curb side of the truck, on the front of the debris body on ejector models, and inside the rear bumper of dump models.

Debris Body Flush Valve on an Ejector Model

Figure 4-17

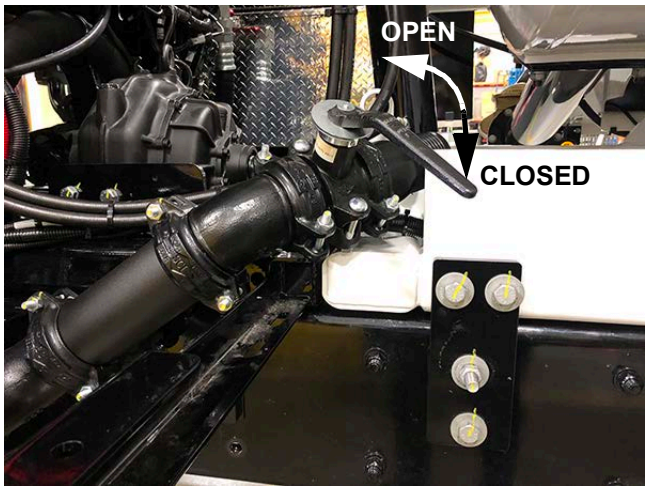
4



Body Flush Valve Decal

Figure 4-18

6. Make sure the water supply line valve located on the driver's side under the front of the debris body is open.



Water Supply Line Valve

Figure 4-19

7. Make sure all drain valves are closed. There is one located at the back of the heat exchanger, two located at the front of the water pump, and one located under the front bumper.

NOTE

Any time the sewer or leader hose is added on or removed, the footage counter parameters in the OPTIONS screen of the HMI should be reset.

8. Release the containment shield clamps and raise the shield.

DANGER

Never pressurize the sewer hose when the hose is lying on the street or not properly oriented in the sewer and the sewer nozzle is inside the pipe. The pressurized nozzle will cause the hose to whip uncontrollably and could cause personal injury or death.

Operating without the containment shield in place can cause serious injury or death.

9. Slip the hose guide (tiger tail) over the jetting hose.
10. Lower the containment shield before pressurizing the hose.

NOTE

Operators may prefer to put the tiger tail on the sewer hose rope end first, but for difficult areas, the tiger tail can be put on the hose rope end last to help lift and direct the nozzle into place.

11. Fasten the nozzle and the 1 in. nozzle extension hand-tight onto the jetting hose. Always make sure the nozzle is the proper pressure and flow rating for the water pump to avoid personal injury and provide maximum efficiency. Never attach any type of hand-held spray device to the jetting hose.
12. Lower the sewer hose and tiger tail into the bottom of the basin, allowing for a few extra feet of hose. The normal procedure is to jet up-stream, against the flow of water. Use care to avoid hose tangles, and, with a swinging motion, position nozzle into the line being cleaned. Open the sewer hose water valve. Slowly increase the water pressure on the jetting head and pay out 2 feet of hose into the sewer line. Make sure the tiger tail is aligned properly with the lower entrance to the line. The tiger tail will protect the jetting hose from wear and tear and possible damage. Secure the tiger tail rope to the truck and turn off the water pump. Place the jetting hose in the hose guide and lower the hose guide roller into place. Tighten the wing nut on the roller. The hose is now secured in the guide. Lower the Lexan containment shield. It is not necessary to lock the containment shield clamps at this time. Now prepare to set up the vacuum system.

NOTE

The variable pressure dial for the water pump allows use of various flow nozzles. Turn off the water pressure first and slowly increase the pressure up to the nozzle rating. Do not exceed the pressure rating of the hose or nozzle.

DANGER

- **Avoid close contact with a pressurized hose. Injury could result from hose bursts or coupling failure. When in close contact, relieve the pressure either by dialing the water pressure back to zero and/or opening the return to tank ball valve.**
- **Keep the containment shield in position and operating properly to avoid personal injury or death from sewer hose bursts or coupling failure. Replace the containment shield immediately if it becomes damaged.**

Vacuum and Boom Operation

The boom is operated off the main hydraulic system when engaged in work mode and is activated when the control system is in VAC MODE.

1. At the front control panel, locate the 6-way boom control joystick. Make sure the vacuum hose chain hook at the front bumper is released before swinging the boom. You may need to retract the boom. By moving the joystick in one of four directions, the boom will go up, down, left, or right. The boom will extend and retract with the use of the rocker switches provided on top of the joystick controls. The boom will swing 120° each way from the centerline of the truck for a total of 240°. A mechanical stop will automatically limit the maximum swing.

DANGER

- **When operating the boom, make sure you are aware of all personnel and that the swing path for the boom will not hit any person or obstruction. Failure to comply could result in personal injury and/or property damage.**
- **When operating the boom, make sure you watch for overhead electrical wires or anything else that could result in personal injury or property damage.**
- **The boom can be lowered below horizontal when rotated to the side of the truck. Make sure it does not come in contact with any part of the truck.**

Boom Warning

Figure 4-20

2. Connect the required intake vacuum tubes (or dig tubes) onto the boom. Make sure O-rings are positioned correctly on the couplings and the center clamp is fully closed. Use the shortest possible length of tubing to ensure the most direct route.
3. The jetting operation can now be started. Open the sewer hose valve and slowly increase the water pressure on the jetting head.
4. Send the sewer hose upstream using the lowest water pressure possible.
5. Once at the end target, increase the water pressure and return the hose slowly.
6. Once debris is observed or the operator hears debris hitting the vacuum tubes, begin vacuuming by closing the vent door.

DANGER

Never allow the cleaning nozzle to come out of the sewer line. If this happens, the cleaning nozzle will whip uncontrollably and could cause damage or death.

7. When the jetting operation is complete, shut off the water, close the sewer hose valve on the hose reel, open the vent door, and disconnect the tubes.

WARNING

Return the boom to the cradle before moving the truck. Moving the truck with the boom out of the cradle could cause excessive boom wear or failure, resulting in severe personal injury or death.

8. When finished using the boom, return the boom to the transport position before moving the truck. The proper transport position locates the boom over the passenger side front fender. Make sure the boom is in contact with the boom cradle. Connect the vacuum hose chain, located on the front bumper to the vacuum hose. Extend the boom until the vacuum hose chain is slightly taught. This will secure the boom in its transport position.

Return to Road Mode

1. The boom is operated off the main hydraulic system when engaged in work mode and is activated when the control system is in VAC MODE.

2. Disengage the vacuum pump by pressing the VAC MODE/ENGAGE (3) button while vacuum pump is engaged. The LEDs above the button will return to steady green when the vacuum pump has been disengaged
3. Return to the cab and apply the foot brake. On the transmission control, select neutral (N). Both the SELECT and MONITOR indicators will display NN.
4. Press the MODE Menu button (4) located on the cab control panel display screen. The displayed mode will switch to ROAD MODE when the transfer case is fully disengaged.

A flashing icon indicates the truck has shifted but is waiting for the confirmation that the rear axle has been engaged.

5. Make sure the BOOM UP, BODY UP and/or TAILGATE NOT CLOSED or UNLOCKED warning messages and alarms are not on. Both the boom and body must be stored in their road mode down position and the tailgate must be closed and fully locked.
6. If all indications show that the truck is properly ready for road mode, it can be driven.

Dumping Payload

1. Position the truck at the dump site.
2. Set the parking brake.
3. Shift the transmission to neutral (N).
4. Place wheel chocks in front of and behind one of the rear tires. Place safety cones as needed.
5. Press the MODE Menu button (1) located on the cab control panel display screen. The displayed mode will switch to WORK MODE when the transfer case is fully engaged.

6. Engage the foot brake.
7. Wait five seconds, and then engage the truck transmission by selecting D (drive).
8. Take your foot completely off the brake.
9. The transmission will shift into 4-4 and be displayed on the SELECT MONITOR.
10. At the front or curbside control panel, press the DUMP MODE button.

11. Make sure the tailgate area is clear of people and obstructions.

Using the curbside control panel:

- Press and hold the TAILGATE OPEN button to unlock and raise the tailgate. Allow the tailgate to completely open before starting the ejection process.

- Press and hold the EJECTOR PLATE OUT button.

Using the optional wired or wireless pendant:

- Power up the pendant and hold the SHIFT button while pressing the TG OPEN button to unlock and raise the tailgate. Allow the tailgate to completely open before starting the ejection process.
- Hold the SHIFT button while pressing the EJECT OUT button on the pendant at the same time.

The LEDs above the EJECTOR HOME button and TAILGATE CLOSE button will all illuminate steady green when the ejector plate is in its home position and the tailgate is fully closed and locked.

12. To aid in flushing debris, open the debris body flush valve. Turn the water pump on. Water will come out of the spray bar inside the debris body.
13. Connect the water hose to the handgun, open the hose reel valve located on the water pump, and clean the tailgate sealing surfaces, tailgate, ejector, ejector plate, ejector plate guides, and the back of truck as needed.
14. Reverse the above procedures when completed.

⚠ WARNING

Make sure the tailgate area is clear of people and obstructions before moving the ejector plate or closing the tailgate.

The ejector switch and tailgate lock switch will turn green when the ejector plate is in its home position and the tailgate is fully closed and locked.

Raise the Debris Body

The boom should be positioned in its cradle when raising the debris body.

Using the curbside control panel:

- Press and hold the BODY UP button to raise the debris body.

Using the optional wired or wireless pendant:

- Power up the pendant and hold the SHIFT button while pressing the BODY UP button to raise the debris body.

⚠ WARNING

Ensure the area is clear of hazards before raising or lowering the debris body.

NOTICE: Never drive the truck with the debris body raised.

NOTICE: When dumping into a container or dumpster bin use caution and monitor the clearance between the splash shield and the container. Equipment damage will occur if the body is raised too high or the container is too tall.

Separator Air System

The truck is equipped with a cyclone air separator (1) as part of the vacuum exhaust air filtration process. The operator should periodically check for any material accumulation in the bottom of the separator and manually clean it out. This separator is located in the exhaust air stream between the top of the debris body and the vacuum pump.

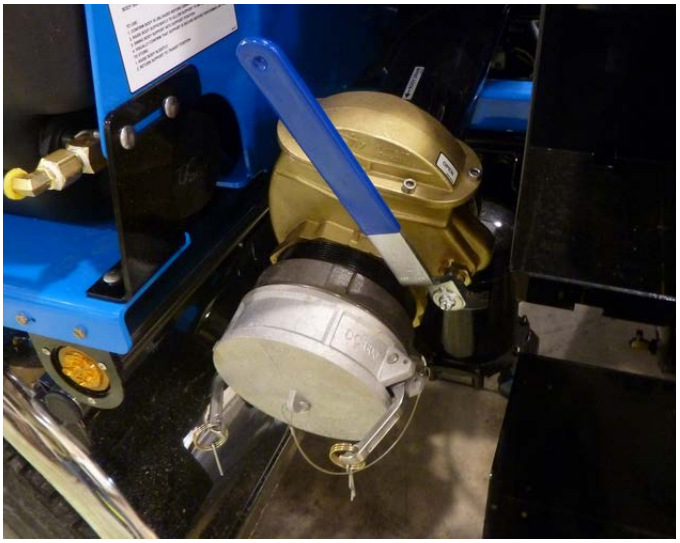
Cyclone Air Separator Clean-out Door

Figure 4-21

Camel Drain Valves (Option)

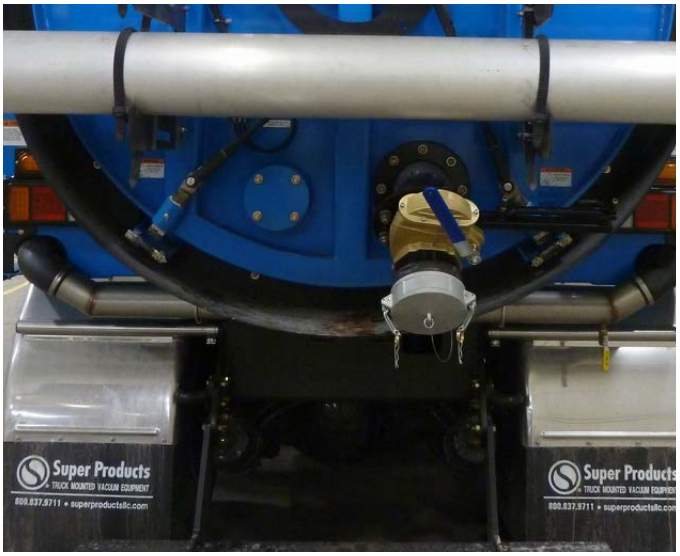
The truck has a front debris body drain valve so that excess liquids can be drained from the body if it is an ejector model. If the truck is a dump model, the body drain will be located at the rear of the truck. (Front body drain valves are an offered option on the dump model trucks.) With an ejector model, the ejector plate keeps material away from the front drain valve and allows the operator to separate the water, preventing the front drain from clogging.

Because the ejector plate keeps the larger materials away from this drain, you can drain off virtually all the liquid, resulting in a relatively dry payload. Make sure the drain hose is properly secured before moving the truck.



Camel Drain Valve at Front of Debris Body

Figure 4-22



Camel Drain Valve on Debris Body Tailgate

Figure 4-23

Debris Level Sensor (Option)

The truck may be equipped with a debris level sensor, which informs the operator of the debris level in the debris body. The system senses liquids, slurries, and solids. The components are immune to air flow, noise, vibration, dust, humidity, and temperature.

Tank Levels with Debris Level Sensor

Figure 4-24

The debris level system measures the debris level and indicates the debris level on the HOME screen of the front control panel display screen. A message will appear and alarm will sound when the debris body is nearing full to alert the operator. When the debris body is completely full, the vent door will automatically open to prevent overfilling and an alarm message will appear.

Figure 4-25

Once the debris body is full, either dump the load or perform a compaction and drain function to provide more room for additional debris. Return the ejector plate to the home position before proceeding.

Winterization

It is beneficial to purge the water from all water lines to prepare for freezing temperatures.

The Camel™ is equipped with an integral air purge line and ball valve above the water pump.

Follow these steps with the truck running to purge water from the water system. Perform with truck running and DUMP MODE engaged at the front control panel.

1. Drain the fresh water tanks by opening the rear crossover pipe drain located at the rear of the truck underneath the optional splash shield.

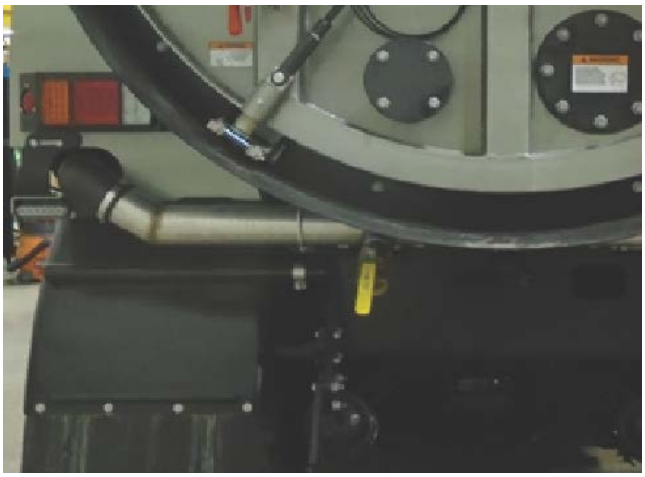


Figure 4-26

2. Remove the Y-strainer cap then open the water supply line valve at the front of the body.

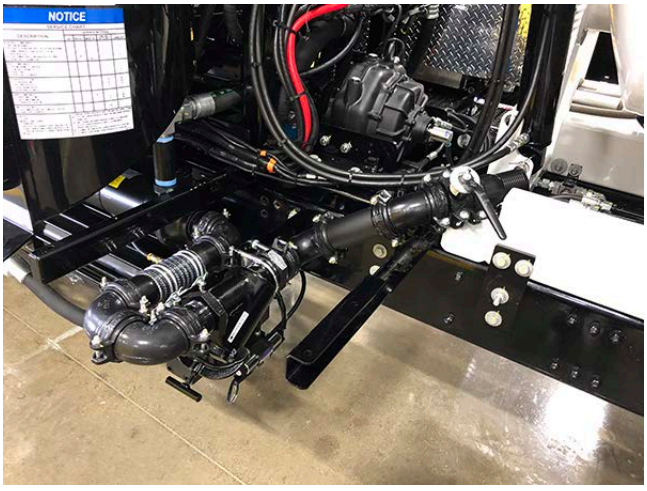


Figure 4-27

3. When all water has drained, re-install Y-strainer cap and close the water supply line valve..
4. Raise body and secure body safety prop to help ensure all water drains. Open tailgate to allow water to drain from debris body.
5. Open the sewer hose valve located on the front reel.

Figure 4-28

6. Locate 3-way valve located on the heat exchanger on the driver's side of truck. Position valve to AIR PURGE to use the truck air supply to push water out of the water lines and sewer hose. Spin the front hose reel in the Pay In direction to assist the water removal process. Return 3-way valve to NORMAL position when all water is expelled.

Figure 4-29

TIP: Throughout this process, you may need to periodically position valve to NORMAL to allow the truck rebuild air pressure.

7. OPTION: If your truck is equipped with the WINTER RECIRCULATION, connect the sewer hose to the recirculation line at the front bumper. When air is heard entering the water tanks, return valve position to NORMAL and disconnect the sewer hose.
8. Close the sewer hose valve at the front hose reel.
9. Install a spray handgun to the front bumper handgun connection. Position valve to AIR PURGE and squeeze the trigger until all water is expelled.

Figure 4-30

10. Open the 3-way body flush valve at the debris body and water pump. Return valve to NORMAL position when air is heard entering the body.

Figure 4-31

11. FULL DUMP BODY UNITS: Open the two drain valves located between the frame rails under the debris body. These valves drain the body flush and winter recirculation lines.

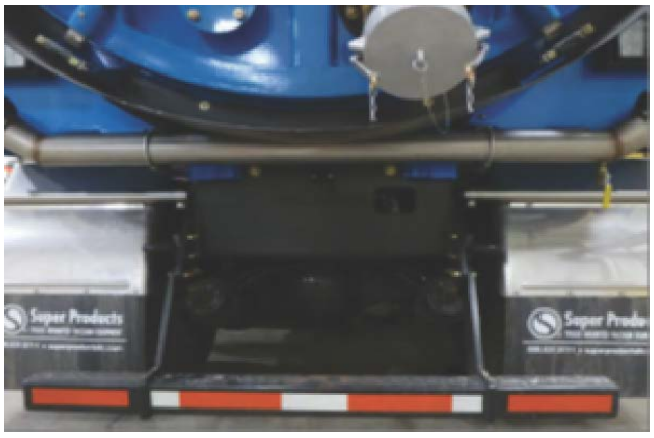


Figure 4-32

12. OPTION: If your truck is equipped with a RETRACTABLE HOSE REEL, install a spray handgun and open the 3-way valve at the water pump. Position valve to AIR PURGE and squeeze the handgun trigger until all water is expelled. Remove the spray handgun and close the retractable hose reel 3-way valve.
13. Open the drain under the front bumper. When all water is expelled, then close drain valve.

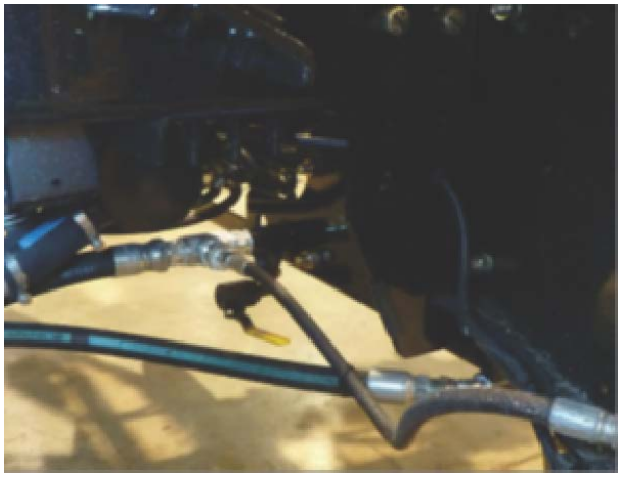
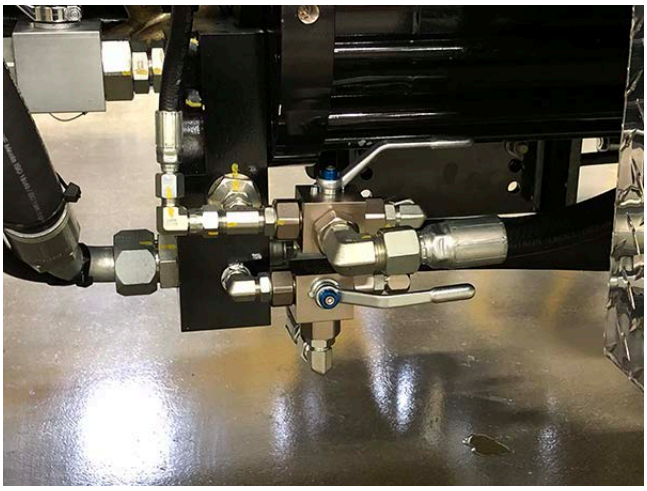


Figure 4-33

14. Open the 3-way valve at the bottom of the water pump. Close valve when all water is expelled.



15. Position valve on heat exchanger to DRAIN. Return to NORMAL when all water is expelled.

16. Open the glycol tank feed valve. Turn water pump dial to PRIME/PURGE until the pump ingests about 2/3 of the tank of glycol. Turn off the pump and close the glycol tank valve. Slightly open the 3-way valve at the front of the water pump to verify glycol is in water pump and close valve.

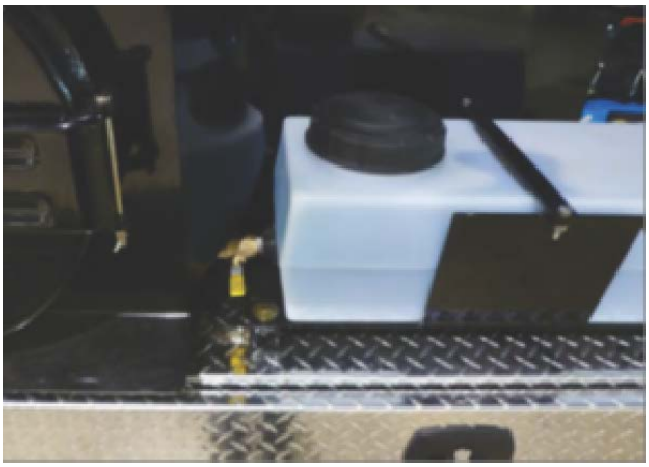


Figure 4-34

17. Lower the body and close the tailgate.

NOTES

Failure to turn off the air purge valve could cause damage to the truck's braking system if driven.

Water Lance Operation

The truck is equipped with a water system used for loosening soils, for wetting down dry materials, and for general cleanup.

WARNING

Never point the discharge flow of water from the lance toward a person since serious injury could result. Always make sure your feet are firmly planted and you are securely holding the lance with both hands before operating the lance.

1. Start the truck engine and allow it to idle. Make sure the parking brake is set and the wheel chocks are positioned. Place the transmission into neutral (N).
2. Inside the truck cab, locate the WORK MODE switch for the hydraulic pump and verify that the valve for the lance is in the CLOSED position.
3. Pull out the hose from the spring return reel located on the right side of the truck and attach the lance gun and the appropriate extensions along with the appropriate lance.

WARNING

Only use the nozzles with urethane coatings that are fully intact to protect against damaging exposed lines. Never hold the lance stationary while pointing toward any pipe or conduit since it could penetrate them. Always keep the lance moving. Failure to comply with these safety precautions could result in personal injury and/or property damage.

4. Turn the water pump on by turning the water pump speed dial on the front control panel clockwise to the desired water pressure, or by pressing and holding the pendant SHIFT switch on either pendant while pressing the WATER INCR button.

WARNING

Always wear a full face shield with eye protection, safety shoes, and gloves. Make sure all skin is covered by work clothes. There could be flying material from the lance as the water stream strikes the soil. Failure to comply with the above could result in serious injury or death.

5. Firmly grab the lance with both hands and point it in the direction of the work to be done. Squeeze the trigger on the lance and begin operation. Releasing the trigger will shut off the flow of water through the lance.

WARNING

Never block or tie back the trigger on the lance since this is a safety device that allows the water stream to be instantaneously shut off if the need arises. Failure to comply could result in personal injury.

6. When done using the lance, shut the water pump off by turning the water pump speed dial fully counterclockwise or by pressing and holding the pendant shift switch while pressing and holding the WATER DECR button.
7. Disengage the hydraulic pump by depressing the brake pedal, putting the transmission in neutral (N), and putting the truck in **road** mode.
8. Point the lance in a safe direction and pull the trigger to release any pressure inside the line. Once the pressure is reduced to zero, you can disconnect the extensions and lance from the hose.
9. Store the hose, lance, and extensions in their proper locations.

10. Turn the wired pendant OFF before moving the truck.

CAUTION

Never exceed the pressure rating of your system. Super Products supplies systems that are rated at 2000, 2500, and 3000 PSI. Know which system you have. If you have any questions, contact Super Products. Failure to comply could result in personal injury or property damage.

Lance/Cleaning Gun Precautions

DANGER

If any part of the body comes in contact with the pressurized spray stream, immediately contact a physician.

NOTE

The lance is to be operated only by trained operators. Please read the following instructions before attempting to operate.

Maximum operating pressure: 3000 PSI.

Make sure the maximum operating pressure does not exceed the equipment's maximum operating pressure rating.

Table 4-1:

Serious Injury or Death May Result. DO NOT:	**Safety Should Always Be Observed. DO:**
Aim the lance gun at any person or any part of the body. Fluids under high pressure can penetrate the skin and result in severe injury, amputation, or death.	Develop a habit of shutting off the pressure at the lance gun and hose before attempting to remove the nozzle, gun, or any part of the gun, or when the lance gun is not in use.
Place hands or any other portion of the body in front of the spray nozzle.	Carefully check and tighten all connections regularly. Make sure all connections are secure and leak-proof.
Alter equipment in any manner. (If repairs are necessary, use only genuine factory repair parts available from Super Products.)	Make sure trigger is operating properly.
Operate the lance gun without the trigger guard attached.	Adapt a secure body stance prior to and during lance gun operation to aid in control of the high reactionary force of the lance gun.
Exceed the maximum operating pressure.	Keep lance gun clean to allow for a positive grip and safe operation.
Leave the equipment under pressure and unattended at any time.	Relieve water pressure by shutting off the water supply. Actuate the lance gun trigger until water stops flowing.
Use if the hose if damaged or weakened.	Make sure the lance gun is insulated properly when used in a dangerous environment.
Operate the lance gun if there are any leaks from the packing, fittings, or hoses.	Never exceed the maximum operating pressure. Make sure the relief valve is operating properly.
Tape or otherwise lock the lance gun trigger into the ON position.	

Hydro Excavation Kit (Option)

The Camel™ hydro excavation kit is designed for removing soil from around utilities such as gas, water, electric, and telephone lines as well as in industrial plants for exposing buried lines of any nature. It can be used for "pot holing" on horizontal directional drilling sites. It can also be used to dig post holes for telephone and electric poles, as well as many other applications.

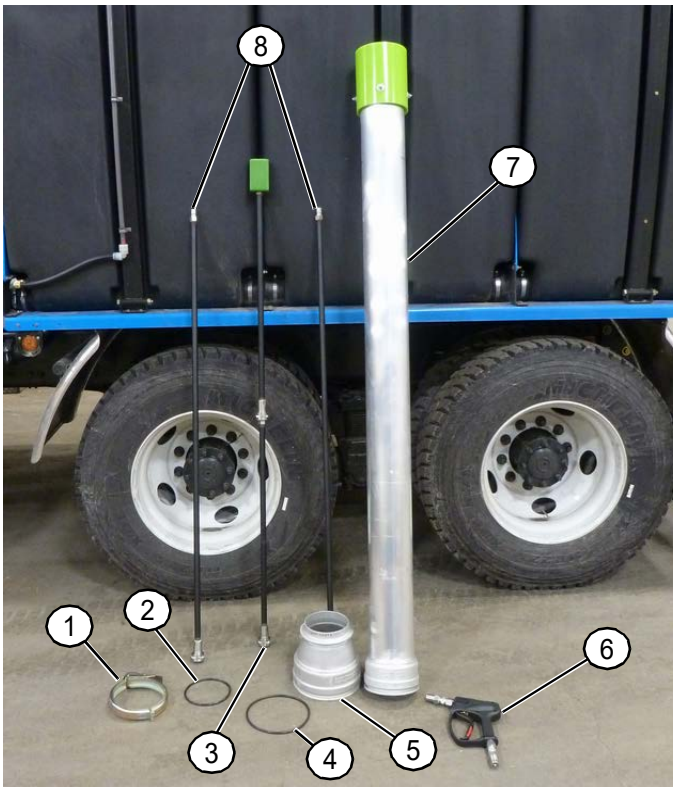
The hydro excavation kit uses the truck's high-pressure water system to break up soil and debris and its vacuum system to remove the debris.

The operation of the truck's water and vacuum functions while using the hydro excavation kit will follow normal sewer cleaning procedures.

⚠ WARNING

- **When hydro excavating only use nozzles with urethane coatings fully intact to protect against electrocution and damaging exposed lines. Failure to comply could result in personal injury and/or property damage.**
- **When hydro excavating be sure that a hydro excavating vacuum tube extension with the urethane coating fully intact is used to protect against electrocution and damaging exposed lines. Failure to comply could result in personal injury and/or property damage.**
- **Always wear a full face shield with eye protection, safety shoes, and gloves. Make sure any exposed skin is covered by work clothing. There could be flying material from the lance as the water stream strikes the soil. Failure to comply could result in serious injury or death.**
- **Never block or tie back the trigger on the lance gun. This is meant to be a safety device so the operator is in complete control and can instantaneously shut off the water stream if the need arises. Failure to comply could result in personal injury.**

Hydro Excavation Kit Components



1) 6 in. Tube Clamp
2) 6 in. O-Ring
3) 36 in. Lance and Extension
4) 8 in. O-Ring
5) Excavation Tube Adapter
6) Gun (Comes with Truck)
7) Hydro Excavating Tube
8) 5 ft. Lance Extensions

Figure 4-35

NOTE

The gun (6) comes with the Camel unit. It is not part of the hydro excavation kit. It is shown above as a required component for hydro excavating.

⚠ CAUTION

Never exceed the pressure rating of your system. Super Products supplies systems that are rated from 2000–3000 PSI. Know which system you have. If you have any questions, contact Super Products. Failure to comply could result in personal injury or property damage.

Hydro Excavation Kit Operation

When using the hydro excavation kit, all startup and operation procedures for the water and vacuum systems will be the same as normal sewer cleaning operations.

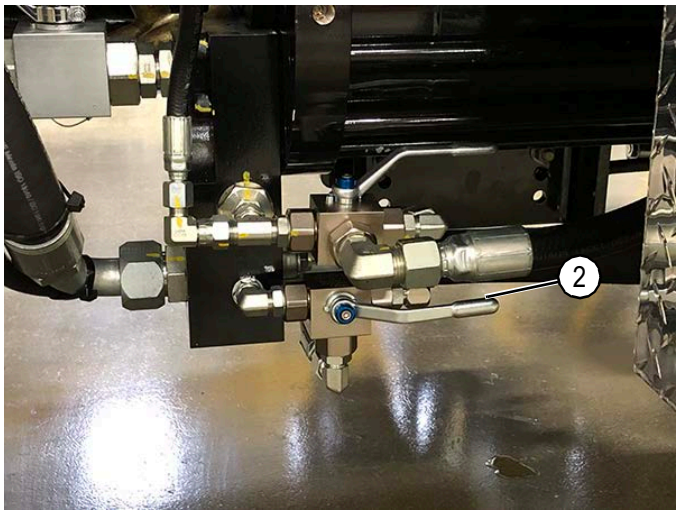
NOTE

See "Water Lance Operation" on page 4-14 for proper water lance operation and safety information.

1. Attach the gun, lance extensions (as needed), and hydro excavation lance to the hose reel (1) located on the passenger side of the truck.

Figure 4-36

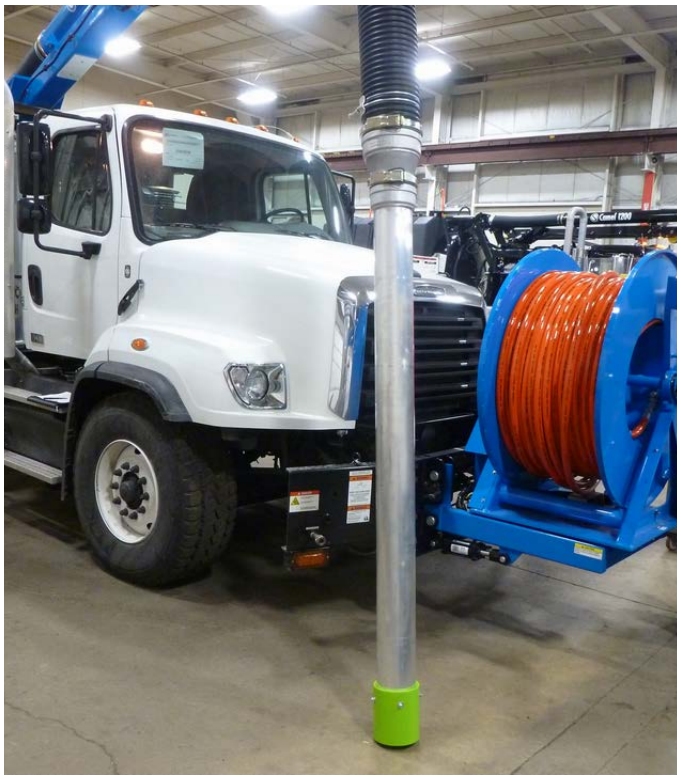
2. Open the handgun three-way valve (2) located at the front of the water pump. The hydro excavating lance is now ready for use.



Handgun Three-Way Valve (Shown in Open Position)

Figure 4-37

3. Make sure the large O-ring from the kit is installed between the vacuum hose or vacuum extension tube before installing the hydro excavation tube adapter. Install the smaller O-ring to the bottom side of the excavation tube adapter before installing the hydro excavation tube.



Hydro Excavation Tube Installed

Figure 4-38

WARNING

The operator must understand the legal road weight limit and the gross vehicle weight rating before using the body interconnect which increases the weight of the vehicle.

Chapter 5

Water Recycling System

Camel Recycling System Summary

The Camel Recycling system uses the onboard vacuum system to transfer sewer water and debris from the sewer to the debris body. A series of filters separates the water from the debris and supplies it to the high-pressure water pump for reuse during sewer jetting work. This system allows the operator to continue working by not having to stop the jetting process to travel elsewhere to refill with potable water.

The recycling system is turned on by pressing the Recycling Button at the front control panel. The control system then uses two water supply valves to shift the water pump supply line from fresh water to recycled water. Located at the front of the debris body, the lower valve closes the supply of fresh water to the water pump and the top valve opens the supply of recycled water to the pump. The operator can then use the water pressure controls for jetting operations using recycled water.

While the recycling system is running, a charge pump is used to push water from the debris body to the water pump. The control system monitors the water pressure from this charge pump to determine if any of the system filters need to be cleaned. If the charge pressure drops below the required level, the control panel will display a warning to clean the tank filter or Y-strainer.

If the water level in the debris body drops below the required level while using recycled water, the control system with automatically close the recycling water supply valve and open the fresh water supply valve, allowing the operator to continue jetting uninterrupted. A warning will alert the operator that fresh water is being consumed. When the water level in the debris body is raised to an acceptable level, the water supply valves will shift back to using recycled water.

The Six-Stage Separation and Filtration Process

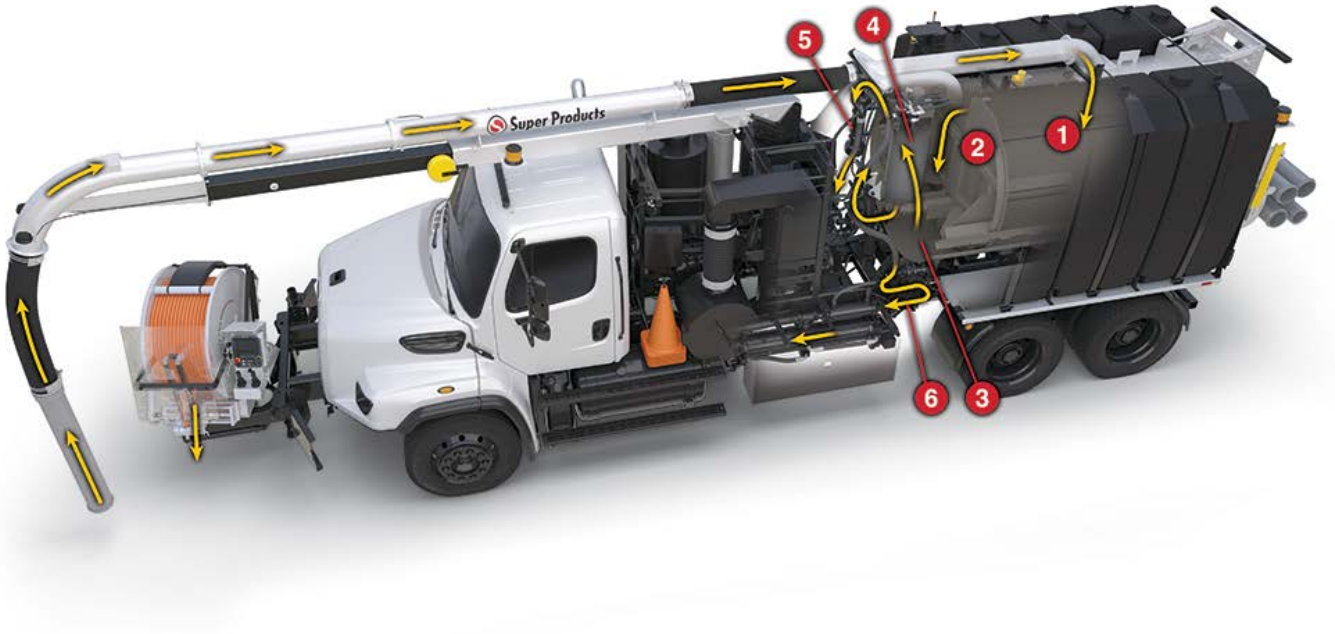
Separation

1. Separation occurs as material being vacuumed falls into the debris body. All debris and water enters the debris body on the front side of the ejector plate where the heavier solids fall to the bottom.
2. Separation occurs as water passes through the small clearances between the ejector plate wipers and the debris body to the rear of the ejector plate. The clearance between the ejector plate wipers and the debris body is only large enough to allow liquid and fine solids to pass to the rear of the ejector plate and will keep larger solids on the front side of the ejector plate.
3. Separation takes place in the area behind the ejector plate where fine solids and water accumulate to be used for the recycling purpose.

Filtration

4. Filtration performed by an oscillating self-cleaning tank filter inside the debris body in the settling area behind the ejector plate. This filter includes two self-cleaning spray bars. The first is a low-pressure spray bar that uses recycled water and is constantly cleaning the outside of the tank filter. The second is an internal high-pressure spray bar that uses fresh water to internally clean the filter. This internal spray bar is used to perform a fresh water flush and is controlled via the front control panel HMI screen.
5. Filtration performed by the centrifugal separator (Hydro cyclone) located on the front tank head of debris body. The centrifugal separator is designed to remove fine debris from the recycled water via centrifugal action and to continuously return the filtered debris back into the debris body.
6. Filtration performed by a Y-type cast-iron strainer with a stainless steel filter element that acts as a last-chance filter prior to water entering the high-pressure water pump.

5



1) Debris Settles to the Bottom of the Debris Body
2) Water Passes Through Small Clearances in the Ejector Plate
3) Debris Settling Area
4) Self-Cleaning Filter Screen
5) Centrifugal Separator
6) Y-Strainer

Figure 5-1

Recycling Components and Locations

The following section lists components of the recycling system and identifies the location of components on the truck

Table 5-1: Recycling Components

#	Description	Reference	Function of Component
1	Tank Filter	Figure 5-2	Wedge wire filter which rotates inside of the debris body. Filters down to 300 micron.
2	High Pressure Internal Flush Bar		Flushes the tank filter from inside out using high pressure water.
3	Tank Filter Motor		Rotates tank filter during Recycling operation and Fresh Flush.
4	Low Pressure External Flush Bar		Cleans the outside of the tank filter using water from the charge pump.
5	Charge Pump	Figure 5-3	Creates flow needed to push recycled water to the water pump.
6	Charge Pump Pressure Sensor		Senses the condition of the tank filter by monitoring water pressure.
7	Charge Pump Pressure Gauge		Gauge provides visual readout of charge pump water pressure.
8	Charge Pump Drain/Blaster Valve		Used to drain the recycling lines at the end of the day.
9	Cyclone Separator	Figure 5-4	Removes small abrasive particles from recycled water by spinning water at high velocity.
10	Cyclone Drain Valve		Directs particles removed by the cyclone back to the debris body or drain or drain to the ground.
11	Recycling Water Supply Air Valve	Figure 5-5	Controls water supply flow from the recycling system.
12	Fresh Water Supply Air Valve		Controls water supply flow from the fresh water tanks.
13	Air Purge and Drain Valve	Figure 5-6	Three-way valve allows to drain or air purge the water system.
14	Y-Strainer Pressure Sensor	Figure 5-7	Senses condition of the Y-Strainer by monitoring water pressure.
15	Y-Strainer Pressure Gauge		Gauge provides visual readout of Y-Strainer water pressure.
16	Fresh Flush Ball Valve	Figure 5-8	Controls flow to High Pressure Internal Flush Bar
17	Hose Reel Shut-Off Ball Valve		Shuts off flow to front hose reel when performing a Fresh Flush.
18	Recycling I/O Module	Figure 5-9	Sends and receives signals to and from the control system and components.
19	Recycling Hydraulic Manifold	Figure 5-10	Sends hydraulic fluid to the tank filter motor inside the body and to the charge pump.
20	Client I/O Module for Charge Pump	Figure 5-11	Sends a signal from the control system to the solenoid on the recycling hydraulic manifold.
21	Debris Body Low Water Switch	Figure 5-12	Monitors available recycled water inside the debris body.
22	Fresh Water Tank Level Sensor	Figure 5-13	Senses water level in the fresh water tanks by monitoring pressure.
23	External Flush Bar - High Pressure Flush Connection	Figure 5-14	Allows flushing of the external flush bar using the retractable hose.
24	Front Bumper Hydrant Fill	Figure 5-15	Used to fill debris body with hydrant water when in a low flow sewer.

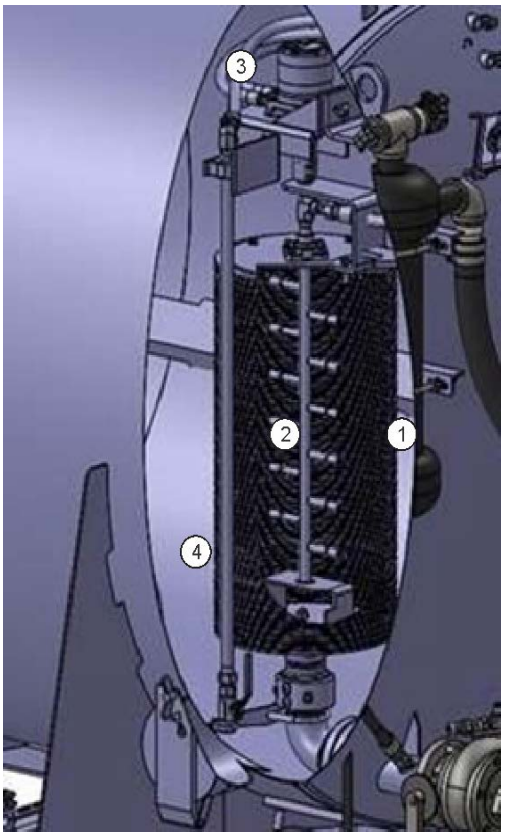


Figure 5-2: Tank Filter inside of Debris Body

Figure 5-4: Cyclone Separator and Drain Valve

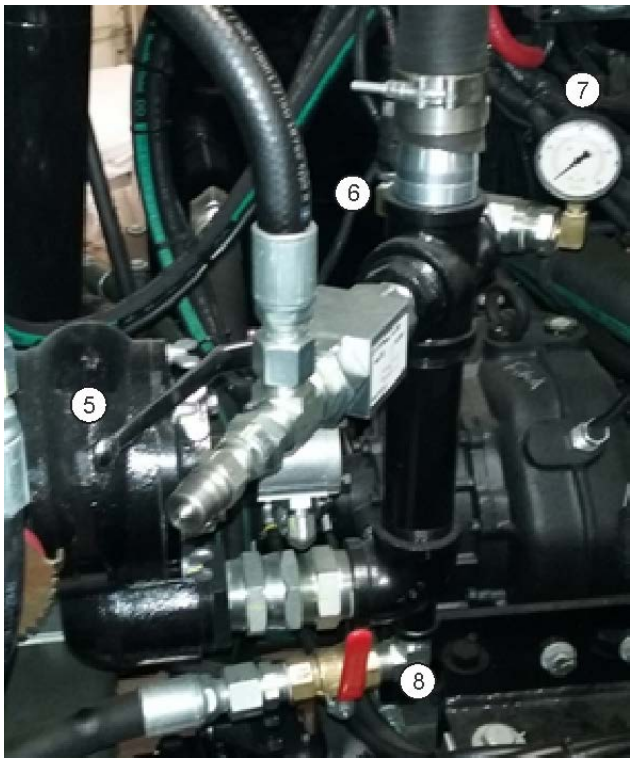


Figure 5-3: Charge Pump, Drain Valve, Tank Filter Pressure Sensor and Gauge

Figure 5-5: Water Supply Valves

Figure 5-6: Air Purge and Drain Valve

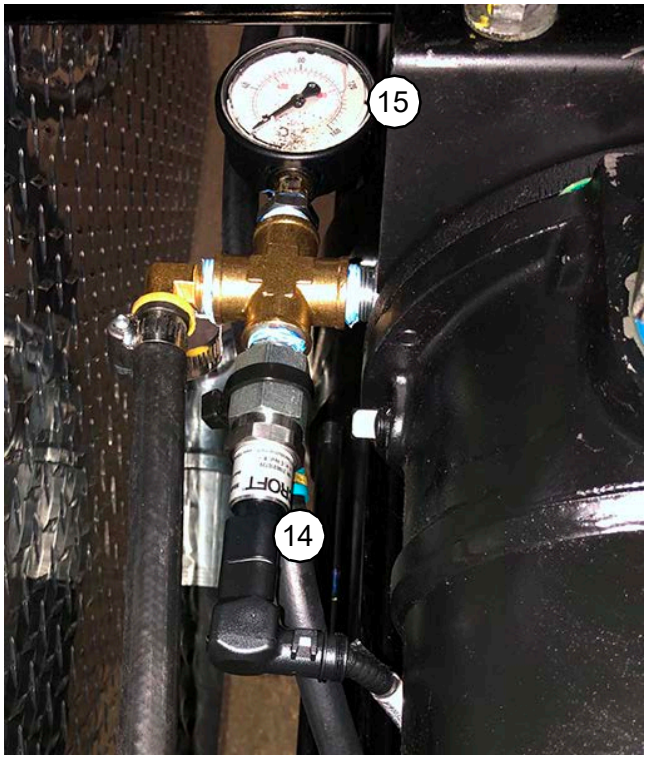


Figure 5-7: Y-Strainer Pressure Sensor and Gauge

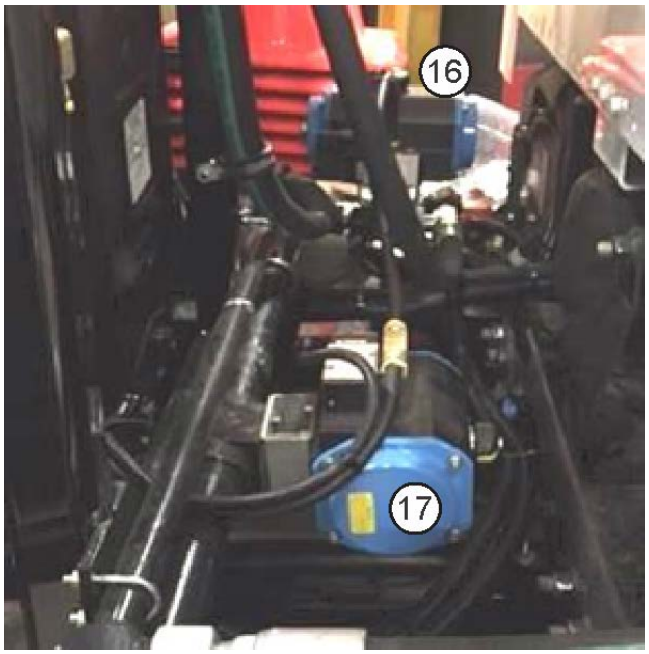


Figure 5-8: High Pressure Internal Flush Valve

Figure 5-9: Recycling I/O Module at Back of Cab

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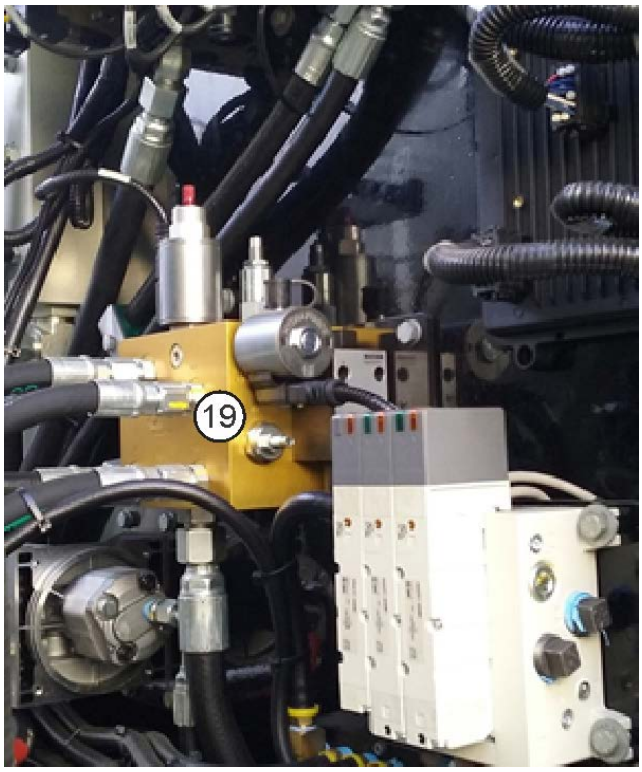


Figure 5-10: Recycling Hydraulic Manifold

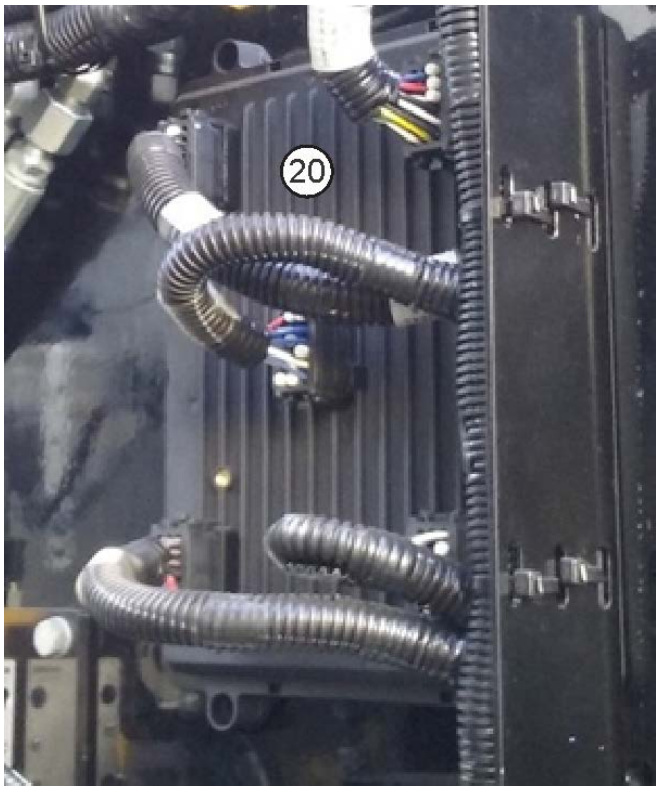


Figure 5-11: Client I/O Module

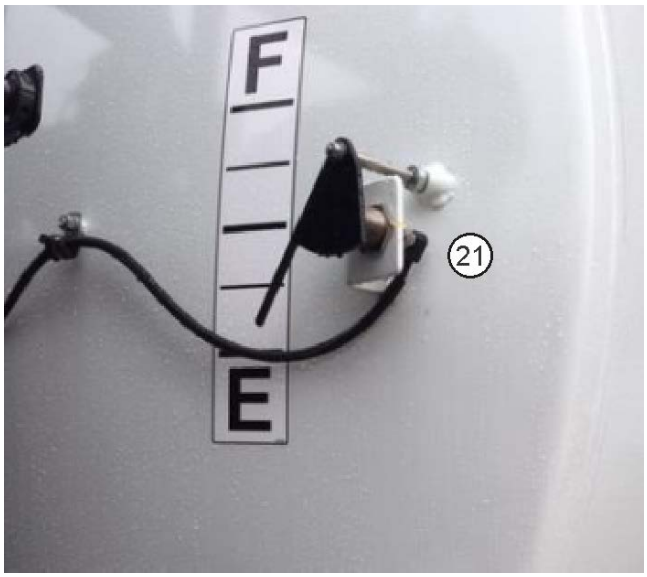


Figure 5-12: Debris Body Low Water Switch

Figure 5-13: Fresh Water Tank Level Sensor

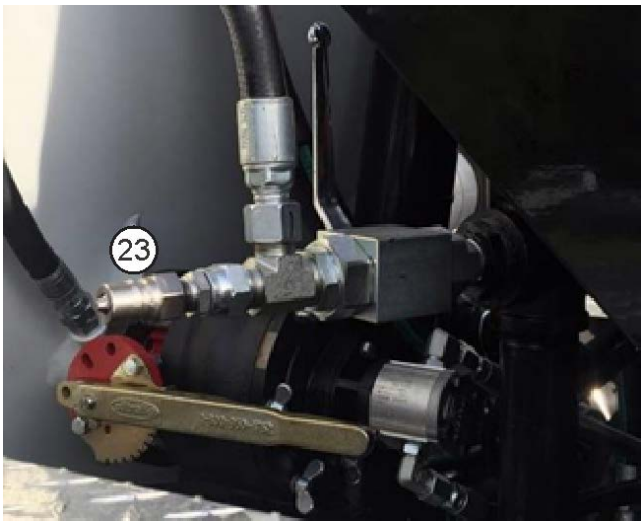


Figure 5-14: External Flush Bar - High Pressure Flush Connection

Figure 5-15: Front Bumper Hydrant Fill

Operating The Water Recycling System

The recycling system is designed to make jetting with recycled water as effortless as possible. Using the Camel's advanced control system, you can safely and efficiently operate the system from the front control panel. Use the following guide to setup and operate the water recycling system.

Engaging The Recycling System

1. Fill the debris body at least half full of water.

NOTE

If you do not have half of the debris body full of waste water, you can jet with fresh water until enough water is reclaimed to allow the recycling system to start.

2. Attach the Super Products recommended recycling nozzle for the best performance and trouble-free operation.

Figure 5-16: Super Product Recycling Nozzle

3. With the truck in the working position (vacuum tube and jet line in the sewer), activate recycling mode by pressing the RECYCLE button on the front control panel keypad.

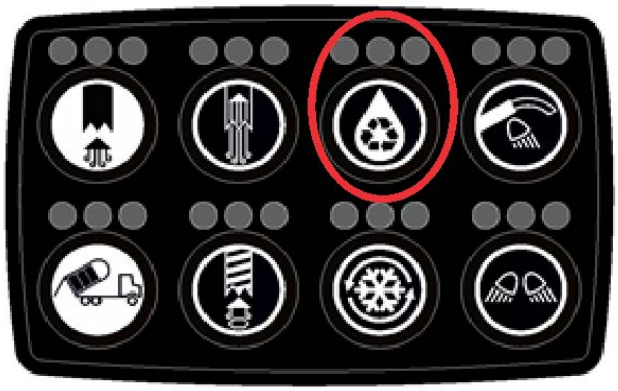


Figure 5-17: Front Control Keypad

4. Once the recycling system has been turned on, the green LEDs above the Recycling LED will illuminate and a recycling icon will be shown on the front control panel display screen.

Figure 5-18

5. Navigate to the Water tab of the information window on the front display screen and pressing the DOWN navigation arrow to scroll to down to view information about water recycling.

Figure 5-19: Tank Filter and Y-Strainer Pressures

6. Maintain a one-half to three-quarters fluid level in the debris body by monitoring the debris level on the front control panel HMI home screen.

While jetting the sewer, perform the following:

- Close the vent door to increase the fluid level.
- Open the vent door to decrease the fluid level when the debris level turns **yellow**.

Figure 5-20: Fresh Water and Debris Levels

7. If at any point there is not enough water available in the debris body to continue recycling, the system will automatically switch back to using fresh water from the fresh water tanks and display a CONSUMING Fresh Water message on the front control panel display screen. The green LEDs above the RECYCLE button on the front control panel will flash rapidly when

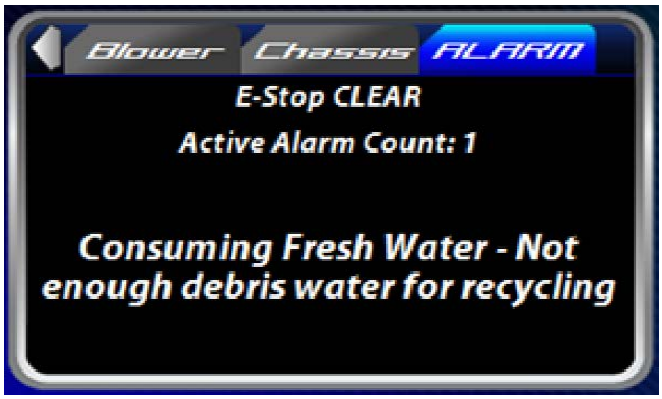
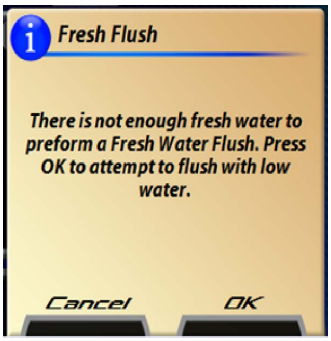


Figure 5-21

8. The front control panel HMI screen will display a warning message if any filters need cleaning.

Table 5-2: Control System Recycling Messages			
Condition	**What causes the condition?**	**Control System Message**	**Details**
Recycling System Enabled	Recycling is Turned on at the Front Control Panel		The green LED's above the Recycling button will illuminate and a recycling icon will be shown on the front control panel display screen.
Tank Filter Clogged or Dirty	FILTER CONDITION less than 15 PSI for 5 seconds. Pressure readings taken at item (7) and (8). If condition persists perform FRESH FLUSH from the Recycling Functions	*Tank Filter Needs Cleaning - Low pressure detected at the tank filter*	If the HMI indicates the TANK FILTER NEEDS CLEANING alarm, both condition pressure gauges may indicate low pressure. The readings will be: FILTER PRESSURE CONDITION less than 15 PSI Y-STRAINER CONDITION less than 5 PSI.
Y-Strainer Clogged or Dirty	Y-STRAINER CONDITION less than 5 PSI for 5 seconds. Pressure readings taken at (5) and (6). Verify Recycling Valve is Open.	*Y-Strainer Needs Cleaning - Low pressure detected at the Y-strainer*	If the HMI indicates the Y-Strainer needs cleaning, the FILTER CONDITION Pressure should read >15 PSI maintaining pump pressure while the Y-STRAINER CONDITION is < 5 PSI.
Debris Body Low Water Switch	Not enough water in the body causes the Debris Body Low Water Switch.	*Not enough debris water to operate recycling*	Fill the body with enough water to clear the error and continue using Recycling. Verify Recycling Valve is Open. This is a hard stop to consume fresh water.
Consuming Fresh Water	HMI displays this message after Debris Body Low Water Switch is tripped.	*Consuming Fresh Water - Not enough debris water for recycling*	Fill the body with enough water to clear the error and continue using Recycling. The user will consume fresh water for a minimum of 60 seconds once in this mode and must fill the body to continue recycling or they will continue to use fresh water.

Table 5-2: Control System Recycling Messages			
Condition	**What causes the condition?**	**Control System Message**	**Details**
Low Ambient Temperature Warning	This warning displays when ambient temperature is <32°F every 30 minutes.	*Recycling Low Temp - Fresh flush to prevent freezing*	This message can only be cleared by executing a Fresh Flush or if the temperature goes above 32°F. This is to prevent the Fresh Flush line from freezing in low temperatures.
Low Water Warning when consuming fresh water	Not enough water in the fresh water tanks to clean using fresh water. Fill fresh water tanks.	*Low Water Level*	Compare level of water in sight gauges on the side of water tanks to the water level displayed on the front control screen. If water is seen in the water sight gauge and this message is shown, check water level sensor and wiring for damage.
Fresh Water Warning in Recycling	Not Enough Water to do a “FRESH FLUSH”		This warning comes up when the tanks have less than 100 gallons of water in them. The user can force a flush by pressing OK. The user will do a fresh flush with a warning.
Fresh Flush Warning	This appears when you continue through the Fresh Water Too Low warning and execute the Fresh Flush.	*Fresh Water Too Low for Filter Cleaning*	Be aware if the level of water in the tanks is too low. Cavitation of the pump is possible.
Fresh Flush selected with adequate fresh water supply	Selection made for Fresh Flush.	The requested water pressure will automatically be set to 85% while a flush is in process.	The Control System will flush the debris tank filter for 30 seconds. The system will return to the previous state. If filter is still not clean repeat sequence.

Filter Maintenance

Y-Strainer Cleaning

The Y-strainer acts as a last-chance filter for larger particles and will filter some amounts of lint and fibrous materials. The stainless steel filter element will need to be removed and cleaned when prompted by the front control panel screen and at the end of every workday.

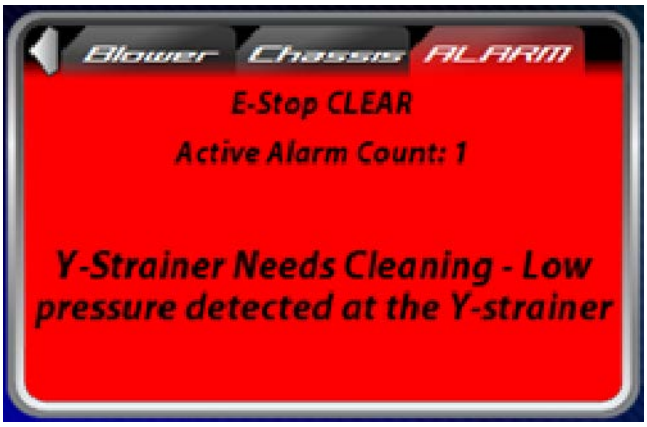


Figure 5-22

1. Close the air actuated vales to shut off the water supply. This can be done by putting the truck into road mode or by first, turning the water pressure dial to OFF and then navigating to the FUNCTION, RECYCLING on the front display screen and selecting SERVICE MODE with the CENTER navigation button.

Figure 5-23

While the recycling system is in service mode, the green LEDs above the RECYCLING button on the front keypad will alternate between the middle and outer LEDs.

2. Slowly loosen the T-handle (3) at the strainer cap (4) and allow the Y-strainer to drain.

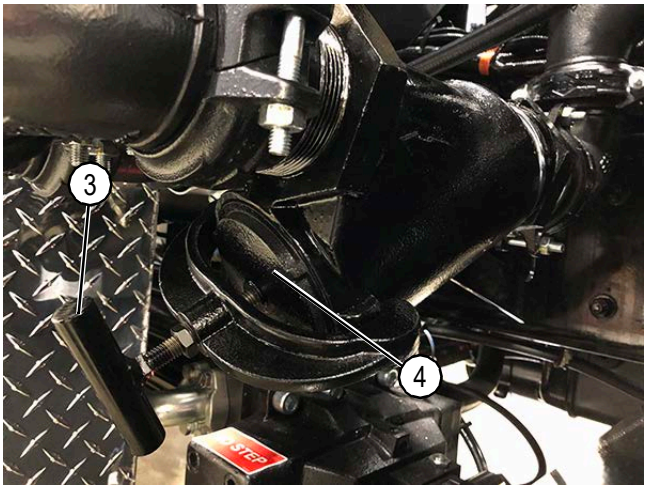


Figure 5-24

3. Remove the Y-strainer cap. Remove and clean the filter element (5).

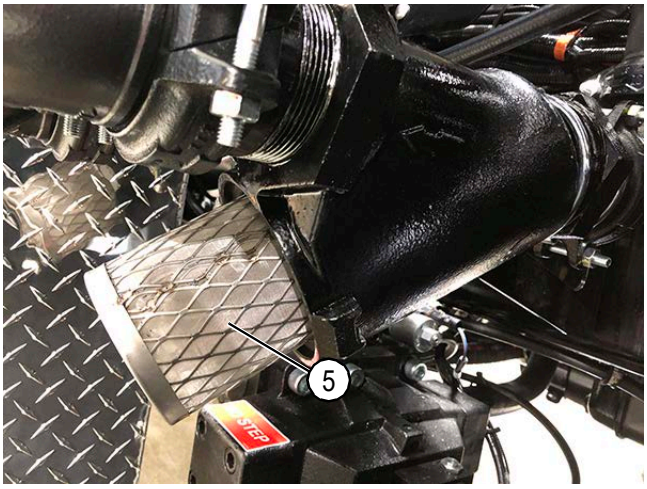


Figure 5-25

4. Reverse the procedure to install the Y-Strainer element.
5. To return to normal operation, select the SERVICE MODE again under FUNCTION, RECYCLING to toggle the Service Mode OFF.

NOTE

- *If you are jetting with clean water only, the fine Y-Strainer element should be used.*
- *If you are jetting using the recycle feature, the course Y-Strainer element should be used.*

Figure 5-26: Y-Strainer Elements-Standard (left) and Recycling (right)

5

Tank Filter Clean and Fresh Flush

The tank filter is an oscillating self-cleaning screen filter. Throughout the recycling process, low-pressure water jets continuously spray the filter to keep it clear of debris. This filter is self-cleaning during normal situations; however, at times it may be necessary to perform a high-pressure flush using a FRESH FLUSH operation.

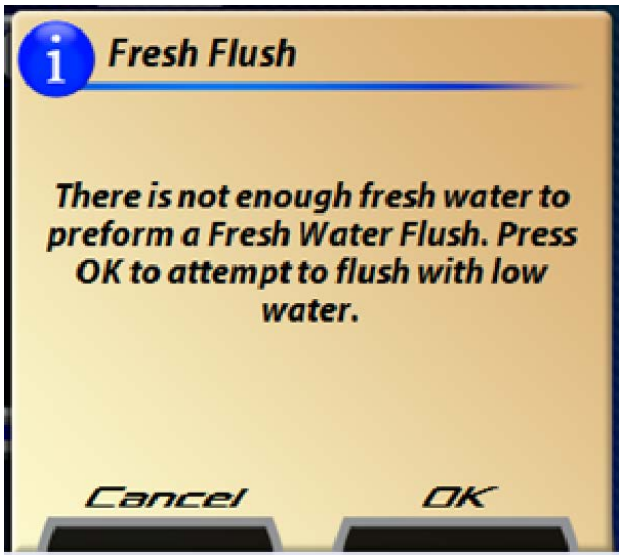
The FRESH FLUSH procedure uses clean water from the clean water tanks to flush the tank filter when there is not enough flow available to effectively clean the filter automatically.

If the tank filter needs to be flushed, the TANK FILTER Needs Cleaning warning will be displayed on the front control panel display screen.

Figure 5-27

Fresh Flush Procedure

1. Navigate to FUNCTION, RECYCLING on the front display screen.
2. Select FRESH FLUSH with the UP/DOWN navigation buttons and use the CENTER navigation button to confirm the selection.
3. A confirmation screen will be displayed if the fresh water level is too low to effectively perform a FRESH FLUSH.



4. The green LEDs above the RECYCLE button on the front control panel keypad will motion while a FRESH FLUSH is in process.
5. The FRESH FLUSH will (1) shut off water supply to the front hose reel, (2) run a 30 second sequence that cleans the tank filter from the inside out, and (3) reopens the supply to the front hose reel to resume normal operation.

Start and End of Day Maintenance Procedures

Maintenance at the start and end of each day is critical to maintain an efficient and fully functioning recycling system. Failure to do so may result in damage and accelerated wear on the water system components and water pump.

Start of Day

- Close drain valves that have been opened from previous use.
- Inspect the sewer nozzles and clean if necessary.
- Inspect the Y-Strainer and clean if necessary.
- Verify tank filter is free of debris and freely rotates when Recycling is turned on.
- Verify butterfly valve is open on charge pump.

- Prime the water pump.
- Perform leak down test to test the condition of the water pump check valves.

End of Day Procedure

1. It is recommended that the debris body is emptied at the end of each day. However, if not emptying the debris body, it is important to remove as much water as possible by compacting the load. NOTE: Do NOT exceed 1500 PSI when compacting, as shown on compaction gauge.

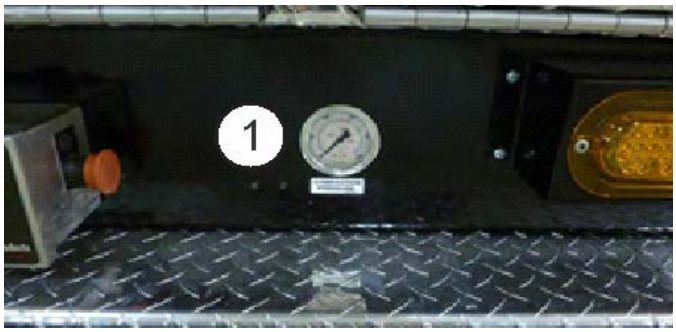


Figure 5-28: Compaction Gauge

2. Remove as much water from the debris tank as possible.
3. When the Not enough debris water to operate recycling warning is displayed on the front control panel display screen, you can continue jetting using the recycled water by depressing and holding the RECYCLE button. The system will continue to work until most of the water available in the debris body has been used.

Figure 5-29

4. Turn off Recycling and run fresh water through the water pump for 20-30 seconds by increasing the WATER PRESSURE dial on the front control panel.
5. Open the front drain valve to drain off the remaining water in the debris body.

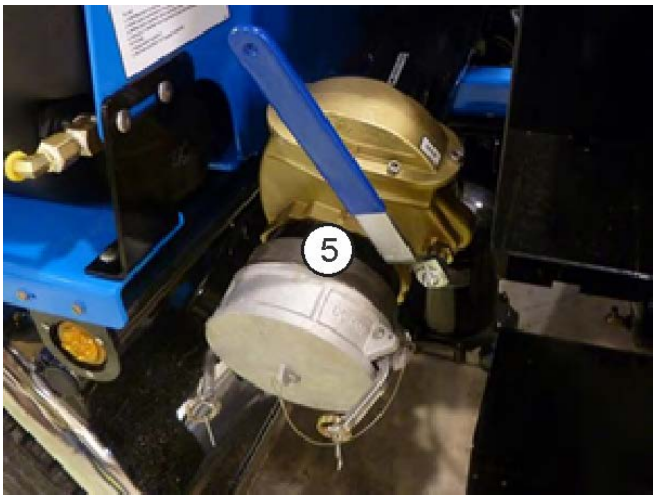


Figure 5-30: Front Body Drain

6. Position cyclone drain valve to DRAIN.

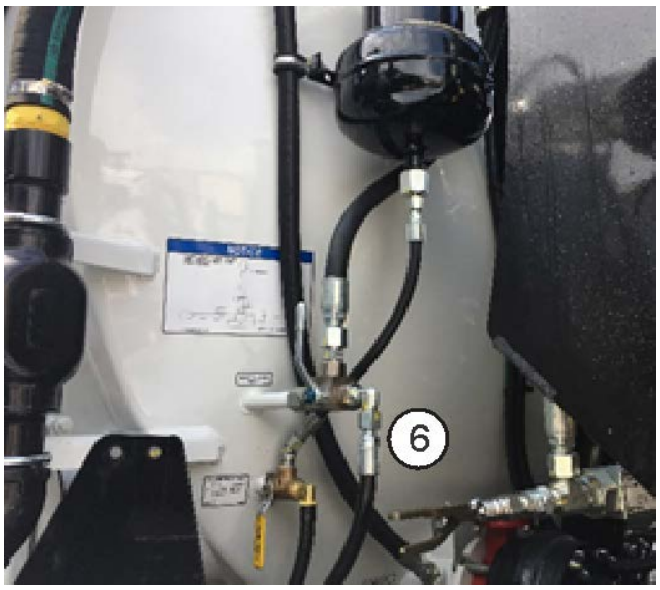


Figure 5-31: Cyclone Drain

7. Ensure that the butterfly valve at the charge pump is open.
8. Open the drain valve on the elbow of the charge pump.

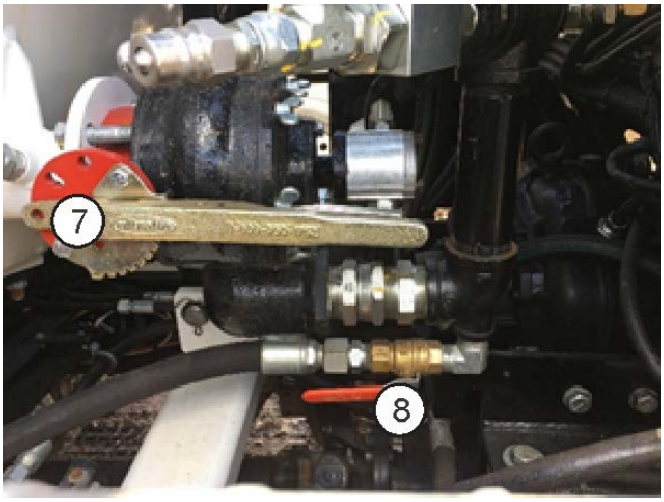


Figure 5-32: Charge Pump butterfly valve and drain

9. Close the External Flush Valve located above the charge pump next to the QD hose fitting for external flush.
10. Connect retractable hose to the QD hose fitting. Position Handgun Hose Reel Valve to ON at the water pump.

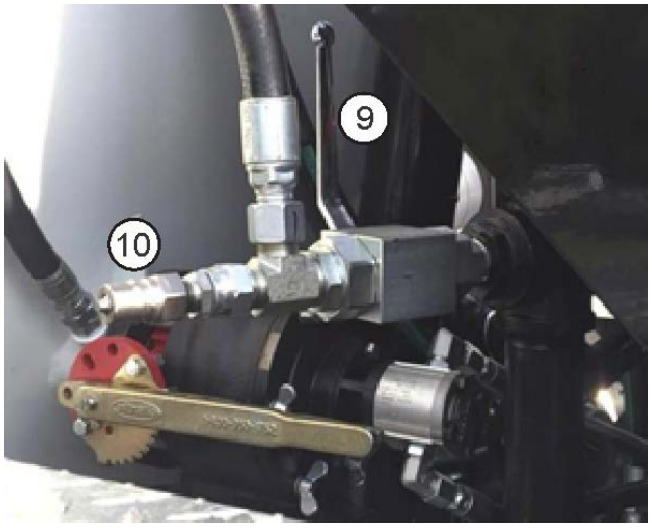


Figure 5-33: External Flush Valve and QD hose connection

11. Perform a fresh water flush by selecting FRESH FLUSH on the front control panel display screen.
12. After the Fresh Flush sequence has completed, turn off the recycling system using the RECYCLE button located on the front control panel keypad.
13. Disconnect retractable hose and open the External Flush Valve.
14. Position air purge valve at rear of water pump to DRAIN.

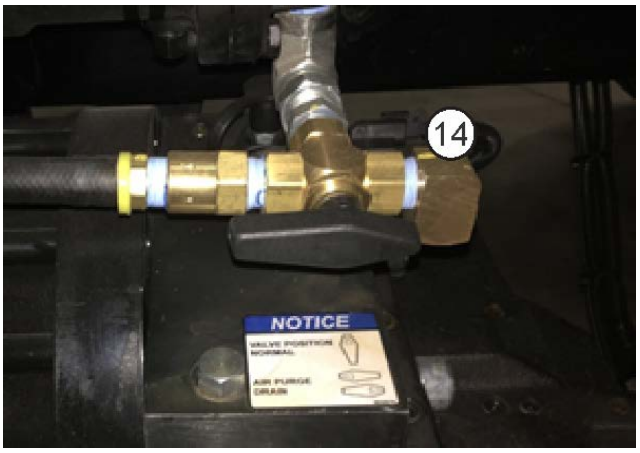


Figure 5-34: Air Purge Valve

15. Open drain valve located on the elbow before the recycling water supply valve.

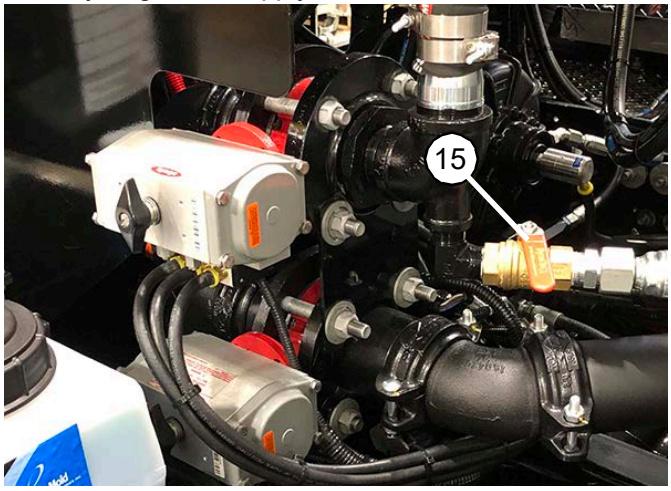


Figure 5-35: Recycling Supply Drain Valve

16. Open drain valve located at the back of cab at the fresh flush valve.

Figure 5-36: Fresh Flush Drain Valve

17. Close the water supply valves by navigating to FUNCTION, RECYCLING on the front display screen and selecting SERVICE MODE with the CENTER navigation button.
18. Remove and clean the Y-strainer filter element, then reinstall. (See "Y-Strainer Cleaning").
19. Return water supply valves to normal operating positions by selecting the SERVICE MODE again under FUNCTION, RECYCLING to toggle the Service Mode OFF.

Figure 5-37: Tank Filter Clogged with Grease

Figure 37 shows the condition of the filter with water decanted, before performing a fresh water flush in a greasy application. Notice the marks from the external flush not getting through the greasy residue.

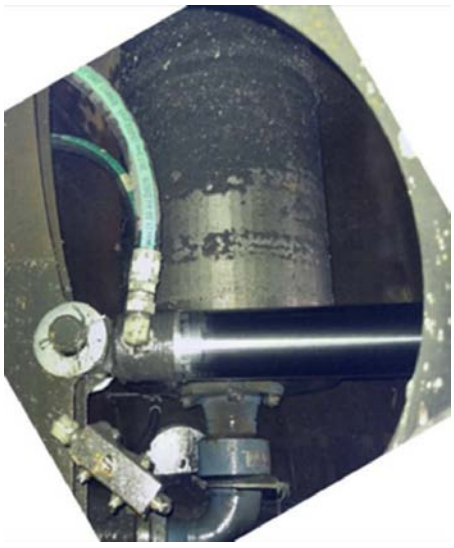


Figure 5-38: Aerated Sludge

Figure 38 shows the condition of the filter with water decanted, before performing a fresh water flush in a greasy application. The difference is that the top of the filter is clogged with light aerated material. Notice where the floating residue stopped and let water in on the lower third of the filter

Recycling Troubleshooting

Table 5-3: Recycling Troubleshooting

Function	Symptom	Probable Cause	Remedy
Recycling System Startup	LED's above Recycling button are slowly blinking and system will not turn on.	Water Pump pressure is not turned up.	Turn Water Pump on.
Tank Filter	Tank Filter Needs Cleaning alarm keeps appearing on at front control panel.	Butterfly valve closed before charge pump on the front of the debris body.	Open butterfly valve.
		Tank filter is dirty.	Perform Fresh Flush until message clears.
		Tank filter is still dirty. Fresh Flush will not clear message. Cause: low flow sewer with grease.	Grease will collect on the tank filter which will cause the filter to clog. If the truck runs for less than 10 minutes and needs a Fresh Flush, you may be in a low flow sewer with grease. Decant and inspect filter. See Figure 37 for example of grease clog. If plugged with grease: With body empty, perform a FRESH FLUSH, decant remaining fluid, and close inspection port. Fill body with fresh water from hydrant using vacuum. Once full, continue to operate recycling.
		Tank filter is still dirty. Fresh Flush will not clear message. Cause: light aerated grease on top of water level.	Grease and sewage many times will aerate once pulled through a sewer. Vacuum will further agitate the fluid. This causes foam to appear at the top of the highest water level. To verify this is the issue, decant and inspect See Figure 38. To continue to operate efficiently in a high grease application, run high water in the debris body, judge by using Acculevel and minimize fluidizing/aeration holes in tubes going into the sewer.
		Tank filter is still dirty. Fresh Flush will not clear message. Cause: light material like plastic bags, bottles, hygiene products, etc. carrying over ejector plate and sticking to the filter.	When in a sewer that contains these items, run water level in debris body lower to prevent any carryover.

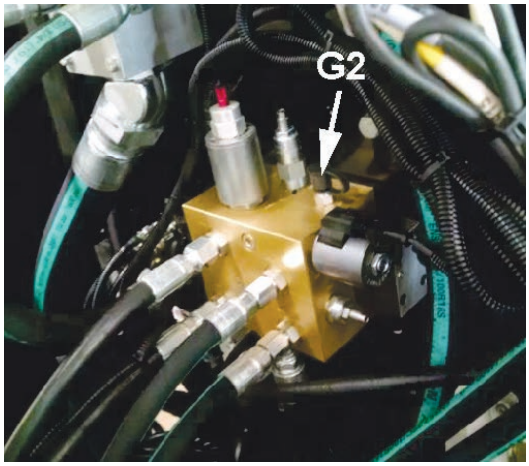
Table 5-3: Recycling Troubleshooting			
Function	**Symptom**	**Probable Cause**	**Remedy**
		Electrical solenoid PV1 failed on recycling hydraulic manifold.	Perform a manual override by screwing in the red override on PV1, to determine if the failure is electrical. Use I/O Status to determine root cause. Water level could be too low in body with level switch malfunctioning, causing a pressure drop. Fill body with water from sewer using Acculevel. Check Recycling I/O Status for diagnosis of electrical issue.
		Level Switch is defective.	
		Pressure Sensor failed.	Check analog pressure gauges and compare to values on front display screen. If analog gauges do not match values on display screen, sensor could be faulty.
		Low or no hydraulic pressure to charge pump.	Use pressure gauge to check pressure at “G1” port on recycling hydraulic manifold.
		Clog between filter outlet and pump inlet (rare).	Engage vacuum pump, activate Vac Boost door, and open drain valve in front of charge pump on passenger side.
	Tank filter not oscillating.	Recycling system not on.	Turn recycling system on.
		Physical obstruction.	Verify there is no physical obstruction blocking rotation.
		Reversing valve failed, or needs adustment.	See Tank Filter Oscillation Settings at end of this chapter.
		No hydraulic pressure.	See Hydraulics in standard Camel Troubleshooting.
		Electrical solenoid failure at SV1 on the hydraulic recycling manifold.	Use I/O diagnostics and electrical troubleshooting basics to determine root cause.
		Broken hydraulic hose.	Check hydraulic fluid level. If low level, check hoses in body.
Low water limit switch	Control system is indicating Not Enough Water to Recycle alarm.	Water low in the body.	Fill body with water to clear message. Use Acculevel to gauge water level.
		Low flow sewer.	Line may be low flow. Stop jetting and fill body using vacuum.
		Switch is defective.	Repair or replace switch.
	Acculevel reads full, body is full but low water alarm is still active.	Truck may be in very greasy or dirty application clogging paths for water around the ejector plate.	Turn off recycling and vacuum. Slowly move the ejector plate to break the grease seals around the ejector plate.

Table 5-3: Recycling Troubleshooting			
Function	**Symptom**	**Probable Cause**	**Remedy**
Y-Strainer	Y-Strainer Needs Cleaning alarm appearing on control panel display screen.	Y-Strainer is dirty.	Clean Y-Strainer.
		Tank filter is dirty.	A plugged tank filter will cause the Y-Strainer to indicate it needs cleaning.
		Pressure sensor failed.	Check analog pressure gauges and compare to values on front control panel display screen. If analog gauges do not match values on display screen, sensor may be faulty.
Fresh Flush	No or low pressure on flush line.	Water redirected to body flush or 50’ reel.	Turn off 50’ reel and body flush.
	Water not redirecting to internal flush bar.	Air adjusted values located at back of cab not shifting.	Verify by performing a Fresh Flush and observing operation of the valves. If valves do not shift they can be manually shifted to clean the filter. If water is still going to the reel: flush solenoid valve is not shifting (driver side). If water is not going to the reel but you are building pressure: reel solenoid valve is not shifting (passenger side).
		Leak in air line.	Check pressure gauge, if low repair or replace air line.
		Electrical failure.	Solenoid or wiring failure: repair or replace.
	Internal flush is developing pressure but flow is low.	Nozzles on internal flush are getting plugged.	If flow through the pump is too low (less than 40 GPM) and the filter is not benefiting from a Fresh Flush, internal nozzles may need to be cleaned. Disassemble tank filter and clean internal nozzles.
Fresh Water Supply	Not Enough Fresh Water to Flush message or Low Water alarm message appears.	Not enough fresh water in the tanks.	Fill the fresh water tanks.
		Low water level sensor defective.	Verify sight gauge shows water in the tank. If water is in the tanks, check diagnostic I/O. If sensor is defective, repair or replace.
		Obstructed supply hoses.	Remove and inspect all hoses for obstructions.
Acculevel	Acculevel is not reading on startup.	The Acculevel can take up to a minute to acquire the signal on startup.	Wait for the Acculevel to acquire a signal before determining further action.
	Acculevel always reading full.	Acculevel is dirty from debris sticking to the lens.	When dumping, clean the Acculevel off using the wash down wand.

Table 5-3: Recycling Troubleshooting			
Function	**Symptom**	**Probable Cause**	**Remedy**
Water Pump and Sewer Hose	Water pressure on sewer hose is steady but flow is dropping.	Nozzles on sewer hose clogged with debris (lint).	Pull sewer hose and clean or replace nozzle.
	Water pump not developing pressure.	Check valves worn from recycled water.	Perform leak-down test on pump to determine if pump is holding pressure.
		Inlet check valves stuck open or installed backwards.	Check inlet line for excessive pressure. LVDT would continually move.
		Prime check valve has failed allowing pressure to the inlet side.	Inspect and replace check valve if necessary.
	Hose “Bucking” or “Jumping”. Pressure going up and down rapidly and LVDT moving quickly then slowing. Cannot prime pump.	Pump is not primed.	Turn the pump pressure dial to Prime/Purge to work air out of the system.
		Leak on suction line is allowing air into the system.	Identify any leaking water on low pressure supply lines that may allow air into the system. Repair leak and attempt priming again.
		Prime check valve has failed.	If water is in the sewer hose you will not be able to prime without an operating check valve. If check valve has failed and priming is needed, blow out the system completely including sewer hose, and prime the pump again. Replace check valve at end of shift.

Tank Filter Oscillation Settings

1. With the truck turned off, locate recycling manifold mounted in front of debris body on power frame.
2. Insert hydraulic pressure gauge on gauge port G2, locaterd on top of manifold.

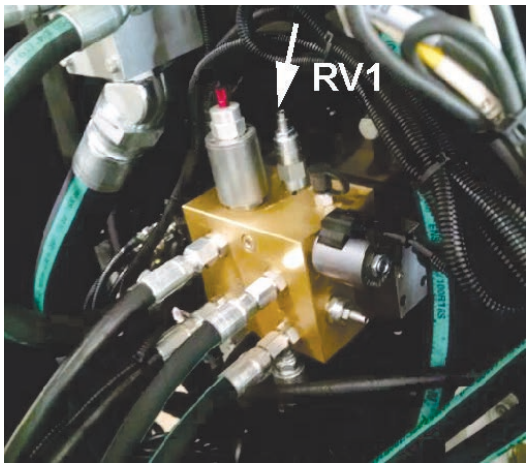


3. Locate Bucher Reversing Valve on passenger side of manifold.
   a. Remove white cap from bottom of adjustment screw.
   b. Using 3mm Allen wrench, turn adjustment screw all the way in. This deadheads the reversing valve.

4. Start truck and enter Work Mode.
5. Turn on recycling at front panel.
6. Record hydraulic pressure at G2.

Pressure Adjustment Procedure

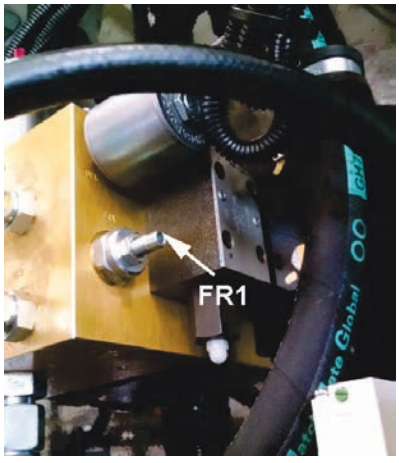
1. If different than 150-200 psi, follow these steps for pressure adjustment.
2. With Bucher Reversing Valve deadheaded (adjustment screw all the way in), locate relief valve marked RV1 on top of the manifold.



3. Loosen jam nut (3/4 wrench) and turn screw (1/4 Allen wrench) in to adjust pressure to 150-200 psi.
4. On bottom of Bucher Reversing Valve, turn adjustment screw all the way out.
5. Recheck filter to see if it is rotating.

Rotation Speed Adjustment Procedure

1. If filter is functioning correctly, it should take 2.0 - 2.5 seconds before it reverses direction. This can be observed through the inspection port of the body by listening for a tapping sound on the body as the filter bracket contacts the rotation stop. If speed needs to be adjusted, follow these steps.
2. Locate flow control valve on passenger side of truck marked FR1.
3. Loosen jam nut (9/16 wrench).



4. Turn screw (3/16 Allen wrench) in to decrease filter rotation speed, out to increase speed.
5. Re-tighten jam nut when adjustment is complete.

Chapter 6

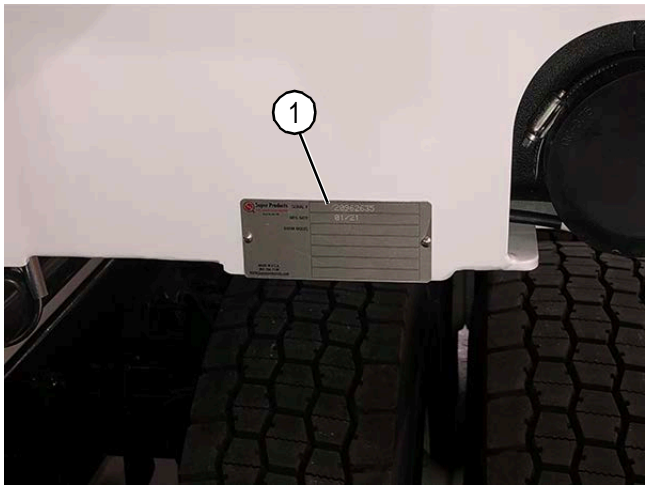
Lubrication and Maintenance

General Information

Operators of this truck should have a good understanding of the required equipment maintenance and normal sequence of operation. Refer to other sections of this manual as required.

Extreme care must be taken when adjustments or repairs are made to this truck. Observe all applicable decals and safety precautions.

The serial number placard (1) is located on the driver's side frame rail in front of the debris tank.



Serial Number Placard

Figure 6-1

Preventive Maintenance Instructions

Preventive maintenance routines assist in keeping all equipment in proper working condition.

Preventive maintenance and inspection schedules are not only desirable but also necessary to ensure continued trouble-free operation of the equipment. They can also prevents and reveal mechanical, hydraulic, or electrical problems that might otherwise develop into equipment malfunction.

We urge you to protect your investment by servicing it according to the lubrication and maintenance schedule listed on the following pages. Regular maintenance will ensure maximum truck performance, long life, safety, reliability, and full warranty protection.

Lubrication Recommendation Chart

Table 6-1:

Component	Lubricant	Capacity
Grease	Super Products Spec 3060-00023 White Lithium	As Required
Hydraulic System	Super Products Spec 3060-00048 Chevron Rando HD Premium Oil MV	70 Gallons
Transfer Case	Super Products Spec 0041276 BP AUTRAN ATF TES-295 Oil	14 Quarts
Vacuum Pump	Super Products Spec 3060-00047 Chevron Clarity Synthetic Machine Oil ISO 150	**624** 2.5 Quarts **721** 3.75 Quarts **824/827** 1.25 Quarts
Trash Pump	Super Products Spec 3060-00005 Automatic Transmission Fluid Type A Dexron 3	As Required
Di-Electric Grease	Super Products Spec 0000988 Super Lube White Silicone	

DEF Maintenance

The cab and chassis supplied with your Camel™ sewer cleaner is equipped with a diesel exhaust after-treatment system that must be maintained properly to ensure proper operation of the truck.

Always make sure the diesel exhaust fluid (DEF) tank (1) has adequate DEF fluid. The truck's emissions system is constantly consuming this fluid to perform the exhaust aftertreatment.

NOTE

The DEF tank may be located in different locations on the truck depending on the specific cab and chassis configuration.

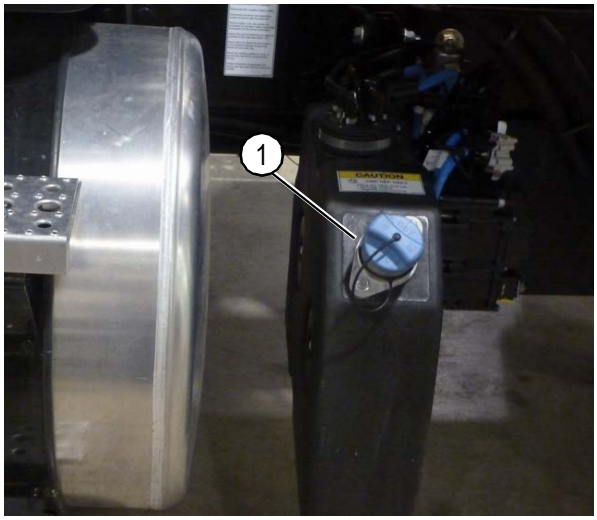


Figure 6-2

Exhaust Aftertreatment Regeneration Information

When the truck needs to go into a regen cycle, a series of alarms and warning messages will be displayed on the front control panel display screen to instruct the operator to shut down work operations and put the truck into a regen cycle.

NOTE

For specific regen instructions and DEF specifications, see the owner's manual supplied with the OEM chassis.

1. A REGEN Required Now warning message will be displayed when a REGEN cycle is currently required. At this time the operator must cease all work operations, put the truck into road mode, and perform a REGEN cycle.

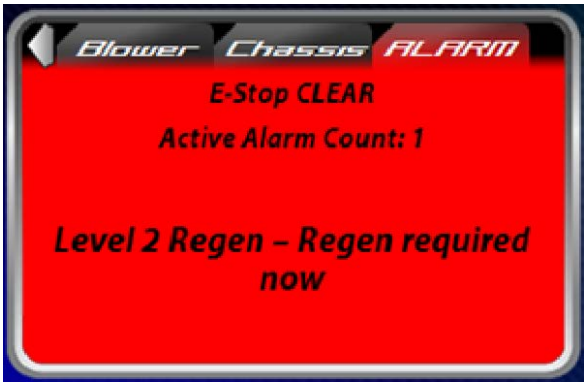


Figure 6-3

2. If a regen cycle is not performed after the second message is displayed, a REGEN OR Engine Stops message will be displayed. This is the operator's final opportunity to perform a regen cycle before the engine stops.

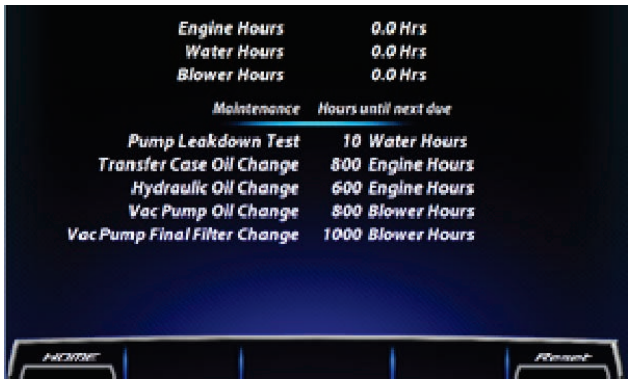
Figure 6-4

3. If both regen messages are ignored, a STOP ENGINE Now message will be displayed. The operator will no longer be able to perform a regen cycle, and functions of the truck become limited. The engine must be turned off to prevent damage, and the truck will need to be serviced by a dealer before it can be restarted.

Figure 6-5

Maintenance Schedule

To help maintenance personnel track the critical maintenance items on the truck, a maintenance schedule is available from the Operator Menu of the cab control panel display screen.



Maintenance Schedules

Figure 6-6

The Maintenance Schedules screen displays the remaining hours until each service item is due for maintenance. When an item other than leakdown test has eight hours or less remaining, a warning message will appear in the information window of the main screen to alert the operator. When maintenance has been completed on a particular item, the remaining hours can be reset by pressing the Reset menu button. The leakdown test maintenance reminder can only be reset by completing a leakdown test.

Maintenance Alarm

Figure 6-7

Maintenance Schedule

	DAILY	WEEKLY	MONTHLY	EVERY 1,000 HOURS OR YEARLY
BOOM				
Remote Grease		Grease		
Boom Bearing			Inspect	
DEBRIS BODY				
Body Interior	Clean			
Tailgate Seal	Clean	Inspect		
Tailgate Latches	Clean	Inspect/Lubricate		
Tailgate - Remote Grease		Grease		
Drain Valve &Hose	Clean	Inspect		
Debris Level Indicator	Clean	Inspect		
Float Ball	Clean	Inspect		
Body Pivot		Grease		
Body Lift Cylinder		Inspect/Grease		
Ejector Plate Side Pads & Wipers	Clean	Inspect/Adjust		
HOSE REEL				
Pillow Bearings		Grease		
Rotary Elbows		Grease		
Rotation Bearing		Grease		
Reel Drive Chain		Adjust/Grease		
Manual Level Wind Pivot & Rollers		Grease		
Auto Level Wind Chain & Scroll Mech.		Clean/Grease		
POWER FRAME				
Transfer Case Oil	Inspect			Replace Vac/Trans Oil
Vacuum Pump Oil	Inspect			Replace Vac/Trans Oil
Vacuum Relief Valves		Inspect		
Vacuum Pump Final Filter		Clean		Inspect/Replace
Driveline Shafts & U-joints		Inspect	Grease	

	DAILY	WEEKLY	MONTHLY	EVERY 1,000 HOURS OR YEARLY
HYDRAULIC SYSTEM				
Hydraulic Oil	Inspect			Replace Hydraulic Oil *For extended hydraulic oil life perform an oil sample analysis and consultation with a lubrication expert*
Return Filter				Replace
Case Drain Filter				Replace
WATER SYSTEM				
Accumulators (500 - 1250psi)				Inspect/Adjust
Drain Valves			Clean/Inspect	
Handgun Connectors	Clean			
Y-strainer	Clean			
Water Pump Check Valves	Test			Inspect
Air Purge Valve	Clean		Inspect	
ELECTRICAL SYSTEM				
Lights	Inspect			
Wired Pendant Receptacles			Clean/Dielectric Grease	
Cables & Harnesses		Inspect		
RECYCLING SYSTEM				
See Chapter 5 Start/End of Day Procedures	Clean			

Recommended Lubricants and Filters
Grease - Super Products P/N 3060-00023 White Lithium
Hydraulic Oil - Super Productts P/N 3060-00048 Chevron Rando HD
Vac/Trans. Oil - Super Products P/N 3060-00047
Return Filter Element - Super Products P/N 0031304
Case Drain Filter Element - Super Products P/N 0031305
Dielectric Grease - Super Products P/N 0000988

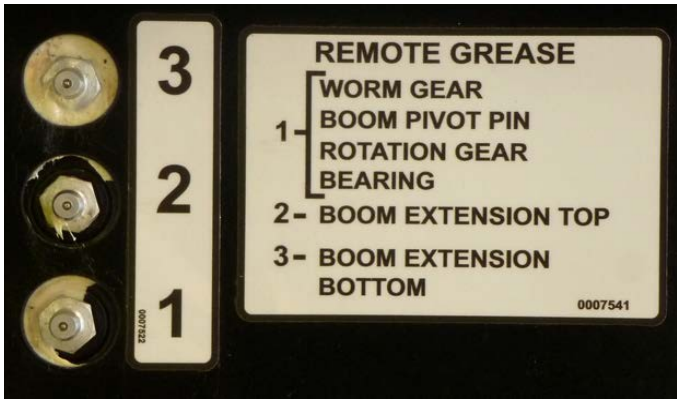
Maintenance Items

NOTE

See Lubrication Recommendation Chart for servicing the Camel™ truck. If a product is unavailable, contact Super Products for a recommendation of alternate products.

Boom

- Apply grease through the distribution fittings weekly.



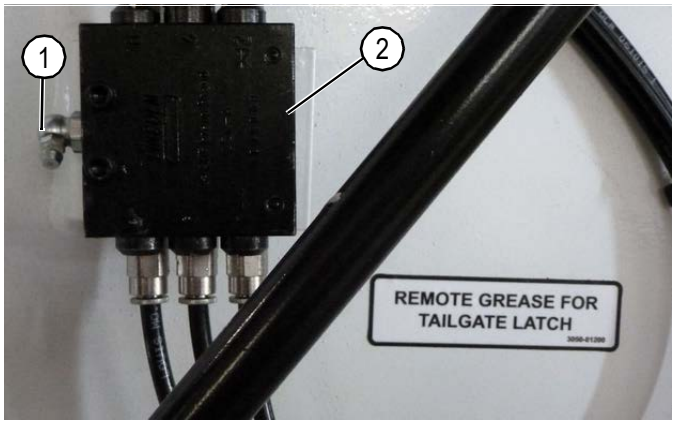
Boom Grease Distribution Fittings

Figure 6-8

- Inspect boom bearing teeth for wear or cracking.
- The boom extension joint is a lifetime polymer slide. No lubrication is necessary.

Debris Body

- **Body Interior —** Empty debris body daily and clean interior using spray bar flushing system (if equipped) or handgun. Clean tailgate sealing surface.
- **Tailgate Seal —** Clean the tailgate seal after each discharge of debris with the use of the handgun. Inspect the seal weekly for rips, tears, and proper alignment with the body. Replace as necessary.
- **Hydraulic Tailgate Latch Rollers —** Clean the tailgate latch rollers after each discharge. Lubricate the rollers by hand with grease weekly and inspect their condition. Repair or replace as necessary.
- **Hydraulic Tailgate Latches —** Clean any debris off the latches daily. Lubricate the latch pivots and rollers with grease weekly.
- **Tailgate Lift Cylinder Pin —** Inspect for wear. Repair or replace as necessary.
- **Float Ball —** Clean the float ball daily or after each load. Inspect the float ball weekly for dents and proper sealing.
- **Tailgate Hinge —** Grease tailgate latch through the grease zerk fitting (1) and distribution manifold (2) weekly.



Tailgate Grease Distribution Manifold

Figure 6-9

- **Body Drain Valve and Hose —** Inspect the valve for proper sealing and the hose for leaks and wear weekly. This applies to both rear and front drain (if equipped).
- **Debris Level Sensor (Option) —** Make sure the sensor is cleaned daily and after every debris dump.

Hose Reel

- **Pillow Bearings** - Grease bearings that support the reel axle weekly.
- **Rotary Elbows** - Weekly grease the two rotary elbows on the water line, at the reel axle and under the reel base.
- **Rotation Bearing** - Grease the reel rotation bearing at two points on the reel base weekly.
- **Reel Drive Chain** - Grease the reel drive chain weekly. Adjust tension as needed.
- **Manual Level Wind Rollers** - Clean weekly.
- **Auto Level Wind Mechanism** - Grease chain and scroll mechanism weekly.

Electrical System

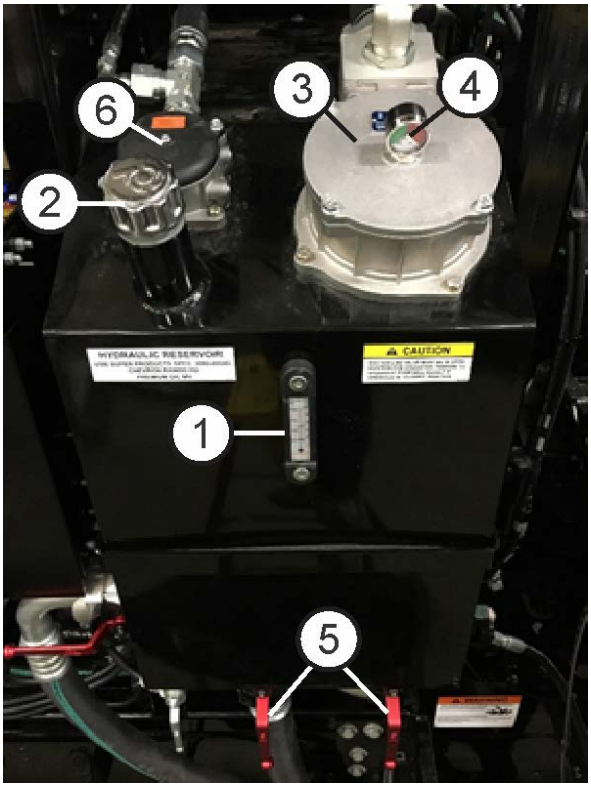
- **Lights —** Make sure that all vehicle lights are working properly.
- **Pendant Plugs and Receptacles —** Inspect the pendant plugs and receptacles for proper contact and alignment. Clean the terminals monthly and lubricate them with dielectric grease.

NOTE

Avoid directly spraying electrical enclosures and components with high-pressure water.

Hydraulic System

- **Hydraulic Oil —** Inspect the hydraulic oil level in the reservoir daily. The oil level should be at the center of the sight glass (1) with all of the hydraulic cylinders retracted.
  - Remove cap (2) and add hydraulic oil to correct level as needed.
  - Hydraulic oil should be changed yearly or after every 1,000 hours of use.
- **Hydraulic Filter —** Replace the hydraulic filter (3) yearly, after every 1,000 hours of use, or when the filter indicator (4) is in the red area.
- **Case Drain Filter** - Replace the Case Drain Filter (6) yearly or after every 1,000 hours of use.
- **Hoses and Fittings —** Inspect all hoses and fittings for leaks weekly. Check hoses for cracks, fraying, and rubbing. Close valves (5) and replace the necessary hoses and/or tighten fittings.



Hydraulic Oil Reservoir

Figure 6-10

Power Frame

- **Vacuum Pump Final Filter** - Clean the final filter element (1) weekly by removing it from the filter housing and using low-pressure water or air to remove any debris. Once clean, the filter should be allowed to dry before installing. Inspect the final filter element for wear and damage every 1,000 hours or yearly. Replace as needed.

NOTES

Make sure the canister filter element is properly seated in the housing before tightening the filter element retaining wing nut.

Make sure the two jam nuts are properly adjusted so that the filter housing door will not cut the filter housing seal when vacuum is applied.

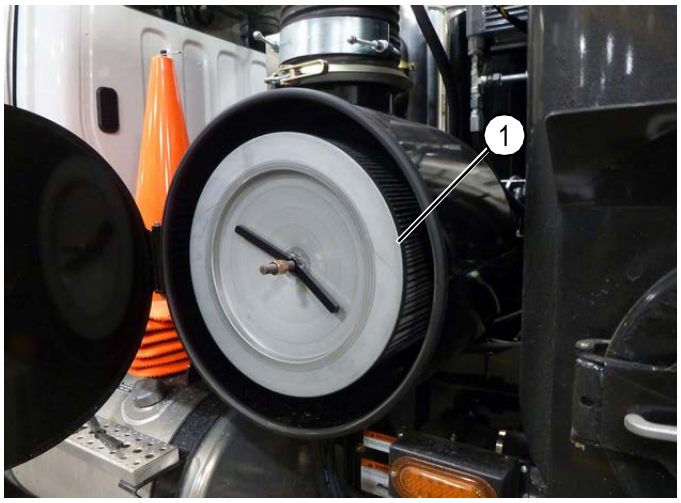
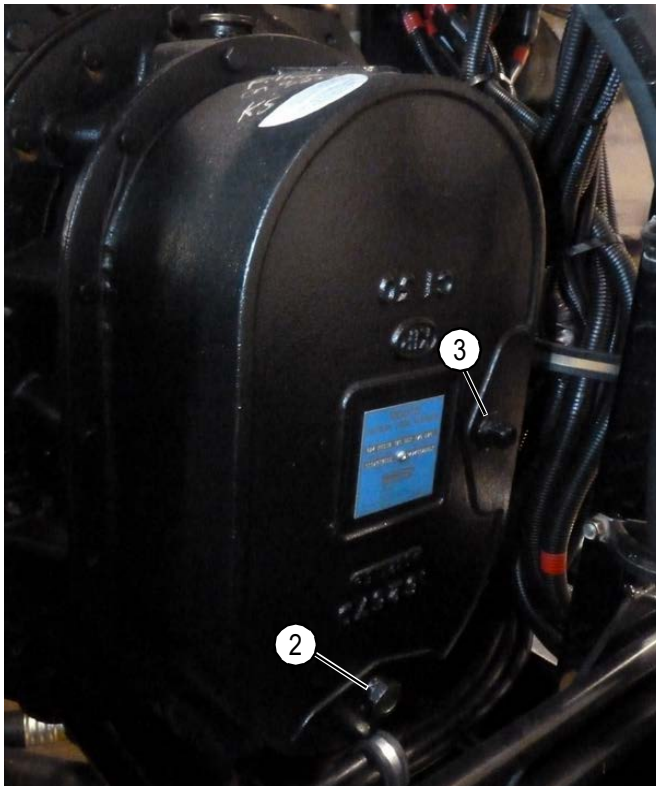


Figure 6-11

- **Vacuum Pump Oil —** Inspect the oil level of the vacuum pump daily. The sight glass (2) on the vacuum pump should be half full. Add oil through the fill plug (3) as necessary. Initially change the oil in the vacuum pump after 30 days of use and then yearly or after every 1,000 hours of service, whichever occurs first. Refer to “Lubrication Recommendation Chart” on page 6-1.



Vacuum Pump

Figure 6-12

- **Vacuum Relief Valves** - Inspect the vacuum relief valves weekly to ensure unobstructed movement when pressure is applied to the bottom of valve. Lubricate as needed to ensure free movement.

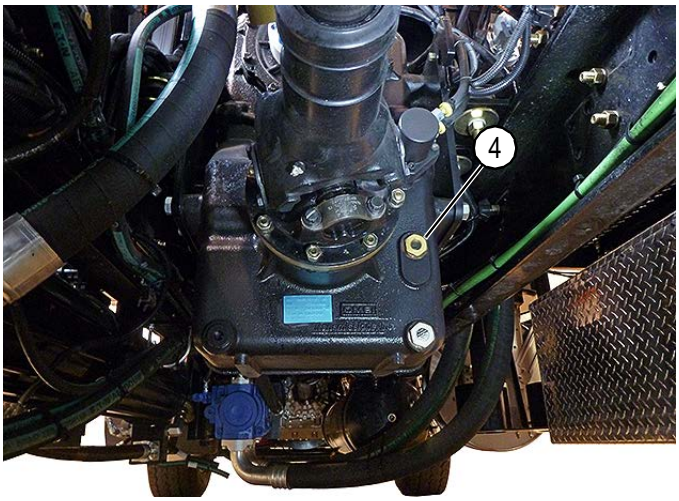
4.

Figure 6-13

- **Transfer Case —** Inspect the oil level of the transfer case weekly. The sight glass (4) located on the back of the transfer case should be half full. Add oil if necessary. Change the oil in the transfer case yearly or after every 1,000 hours of service, whichever comes first.

Checking the Transfer Case Oil Level. Full oil capacity is 11 quarts for units equipped with only a transfer case; and 14 quarts for units with a transfer case, cooler, and filter. It is normal for the sight glass to appear over-full if the truck has not been run in work mode for a while because the oil in the transfer case cooler will slowly drain back into the transfer case. To account for this, the proper method of checking the oil level is:

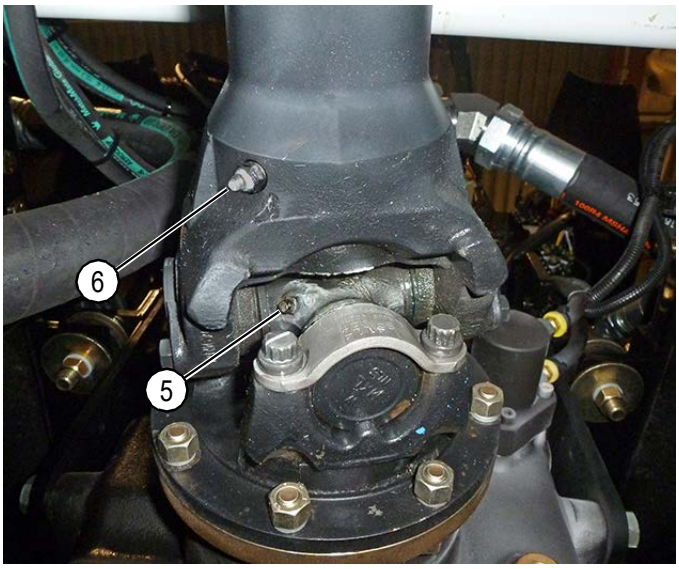
1. Run the transfer case in work mode for at least 1 minute.
2. Stop the transfer case by either shutting off the truck or putting the transmission into Neutral.
3. Check oil level at the sight glass at 5 minutes after stopping the transfer case.



Transfer Case

Figure 6-14

- **Drive Shafts —** Inspect the universal joints (5) and drive shaft weekly. Grease the universal joints and drive shaft slip yolks (6) monthly.



Drive Shaft Sip Yolk And U-joint Grease Points.

Figure 6-15

Water System

- **Y-Strainer —** Remove and clean the Y-strainer filter element (1) when prompted by the front control panel HMI screen or at the end of every workday.

Y-Strainer Filter Element with Cover Removed

Figure 6-16

- **Water Tank Connections —** Inspect water tank connections for leaks, damage, or wear monthly. Repair or replace as required.
- **Ball Valves —** Inspect ball valves for proper operation and wear weekly. Adjust stem packing if leaks occur. Rebuild or replace valves if necessary.
- **Handgun Connections —** Clean and inspect handgun connections (2) for proper operation or leaks daily. Lubricate connections weekly.

Passenger Side Hose Reel Handgun Connection

Figure 6-17

Front Bumper Handgun Connection

Figure 6-18

- **Drain Water System —** In freezing weather, drain the water system and all hoses. See various drain system instructions located in this manual.
- **Hoses —** Inspect the hose for cracks, tears, or other damage.
- **Nozzles —** Inspect nozzles for worn or plugged orifices and cracked housing. Repair or replace as necessary. Make sure the nozzle pressure rating matches the water pump pressure rating.

Air Purge

- **Ball Valve —** Inspect the ball valve for proper operation and wear. Adjust the stem packing if leaks occur. Repair or replace the ball valve as necessary.
- **Check Valve —** Drain for water in air tanks. If present, check that the valve is positioned or operating properly.

Cabinet & Toolbox Doors

- **Hinges —** Lubricate panel hinges with oil monthly.
- **Latches —** Lubricate panel latches with oil monthly. Adjust latches to ensure proper panel retention.

Ejector Plate Slide Pad Adjustment/Replacement

DANGER

- **Do not enter the debris body if hazardous materials are suspected inside. Take the truck to a certified tank cleaning facility for cleaning.**
- **Follow OSHA 1910.146 where applicable.**

NOTE

The ejector plate slide pads should be adjusted or replaced whenever the end of the angle iron guard over the compaction cylinder can be moved up and down 1/2 inch or more by hand while the plate is at the narrowest point of its travel.

NOTICE

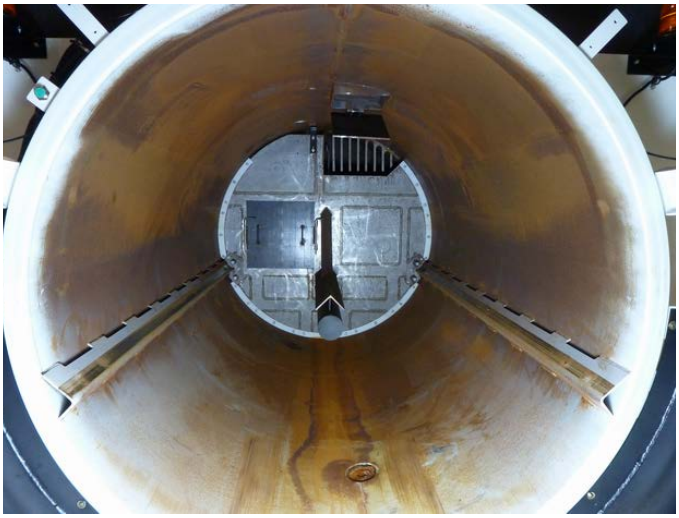
Failure to maintain proper slide pad adjustment can result in premature ejector plate failure not covered by warranty.

1. Open and support the tailgate using the tailgate props. Clean the debris body, ejector plate, and slide pad assemblies with pressurized water.

DANGER

Failure to securely support the tailgate whenever working beneath it may cause injury or death. Shut the truck engine off and pocket the keys EACH TIME the body must be reentered or when working under the raised tailgate. Failure to do this could result in injury or death.

2. Fully retract the ejector plate. Stop the engine and remove the key from the ignition.



Ejector Plate in the Home Position

Figure 6-19

3. Remove the slide pad cover (1) by removing the three mounting bolts and washers (2). Check the slide pad thickness to determine if replacement is necessary. The slide pads should be replaced when there is less than 1/4 inch of pad (3, see Figure 6-21) behind the slide pad covers. If the pads require replacement, proceed to the next step. If the pads have sufficient material, proceed to step 8 for the proper adjustment procedure.

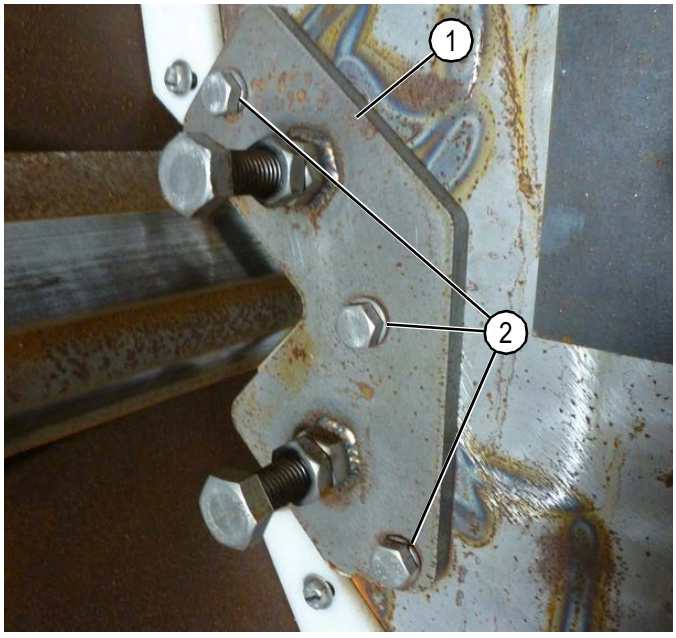


Figure 6-20

Figure 6-21

4. Thread a self-taping screw with slide hammer (Super Products P/N 3000-03254) (4) into the lower slide pad and tap out.

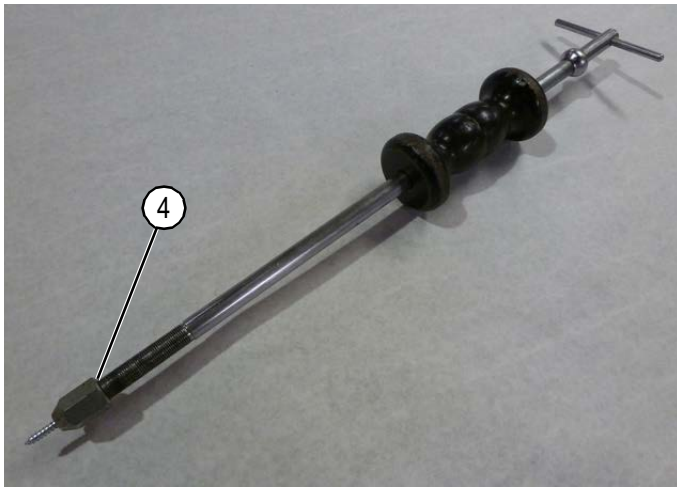


Figure 6-22

5. Use a pry bar (6) to lift the ejector plate (7). Follow the same steps to remove the upper slide pad.

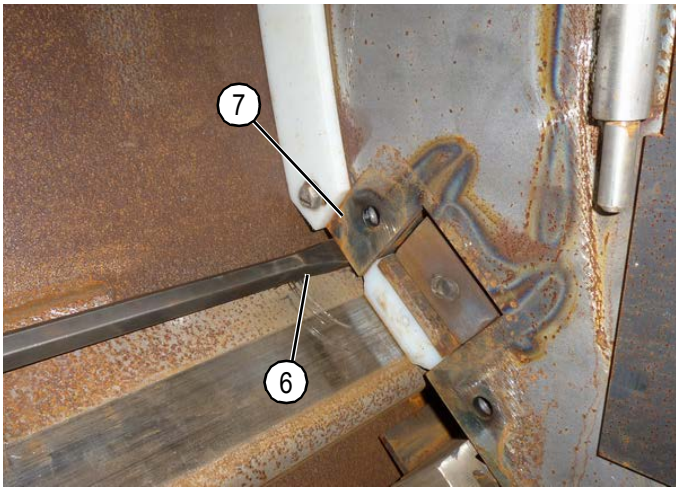


Figure 6-23

6. Insert backup bars (8) and slide pads, with the beveled edge (9) toward the guide rail. Follow the same steps for the opposite side.

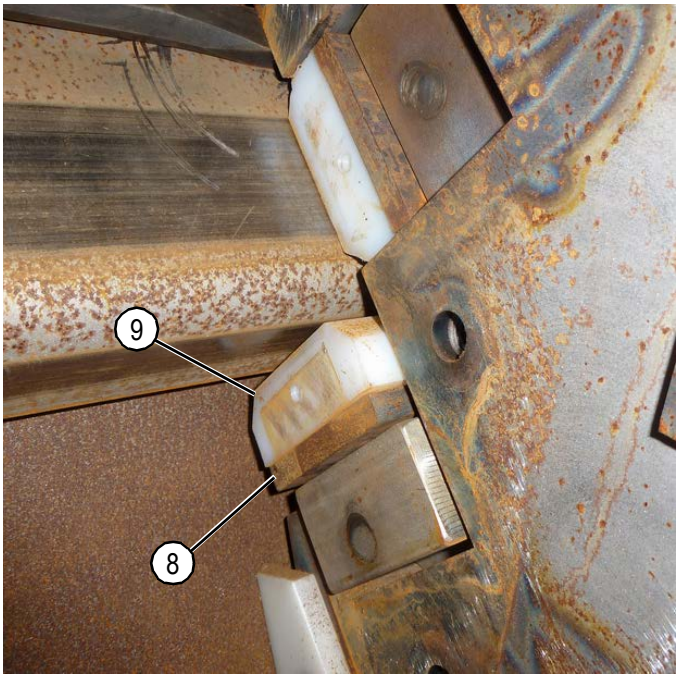


Figure 6-24

7. Loosen the jam nuts (10) and the upper and lower adjustment bolts (11) on the slide pad cover.

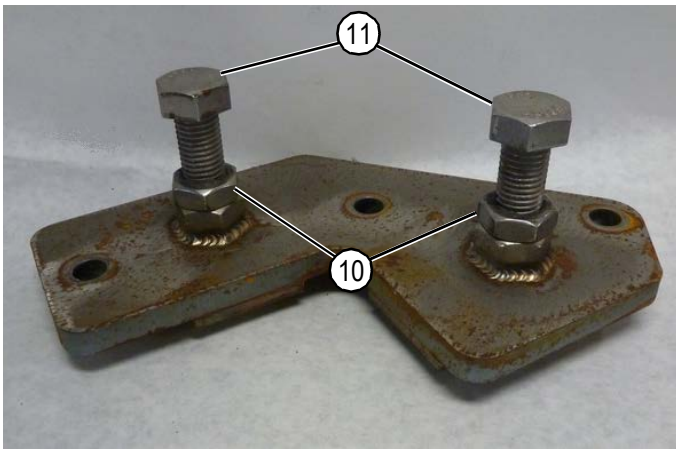


Figure 6-25

8. Reinstall the pad covers. See Figure 6-20.
9. Tighten the upper slide pad adjusting bolts (12) until there is 1/4 inch of the slide pad showing (13) on each side of the slide rail.

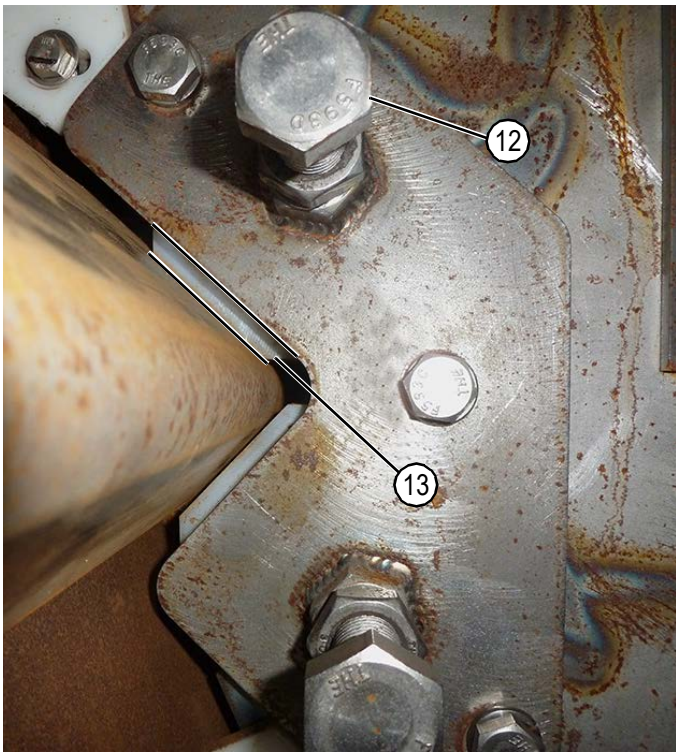


Figure 6-26

10. Position the ejector plate side to side with a pry bar so there is an equal gap on both sides of the body.
11. Tighten the bottom slide pad adjusting bolt to 40 ft-lb on each side.
12. Move the ejector plate backward two feet and then return it to the narrowest point.
13. Tighten the bottom slide pad adjusting bolt to 75 ft-lb on each side.
14. Move the ejector plate backward two feet and then back to the narrowest point.
15. Loosen the bottom adjustment bolt two turns each and tighten the lock nuts.
16. Restart the engine and check for binding of the plate throughout its full stroke. If any binding occurs, evenly back off the lower adjusting bolts one half turn each.

Ejector Plate Wiper Inspection and Adjustment

1. Inspect the clearance between the wiper segments (1) and the debris body (2) to determine if adjustment is necessary.

NOTE

Wiper segments should be adjusted as close to the inside perimeter of the debris body as possible without making contact.

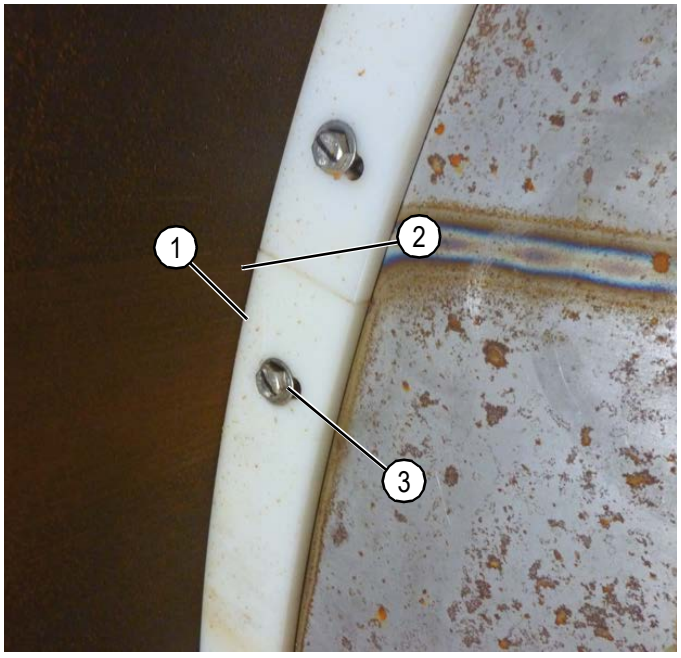


Figure 6-27

2. If adjustment is necessary, extend the ejector plate two inches from the rear edge of the debris body.
3. Loosen the wiper segment adjusting bolts (3) slightly to allow for movement.
4. Using a block of wood and a hammer, knock wiper segments outward as needed.

NOTES

- *It is important to adjust the wiper segments as close to the inside perimeter of the debris body as possible to achieve optimal performance.*
- *If minor contact is made between the wiper segments and the debris body, the operation of the ejector plate will wear the wipers to a proper clearance.*

5. If any jamming occurs, back off the wiper segments until proper operation is achieved.

Water Pump Check Valve Leak Test

Perform this procedure daily to check for wear on water pump check valves. If ten pump hours has elapsed since last performing a leak test a confirmation screen will be displayed to prompt the user that a leakdown test is due. The test can be started by pressing the OK button on the confirmation screen. Pressing Cancel will suppress the confirmation screen for one minute to allow the operator to begin to prepare for the test. The leak test may also be started by selecting LEAKDOWN TEST from the Operator Menu.

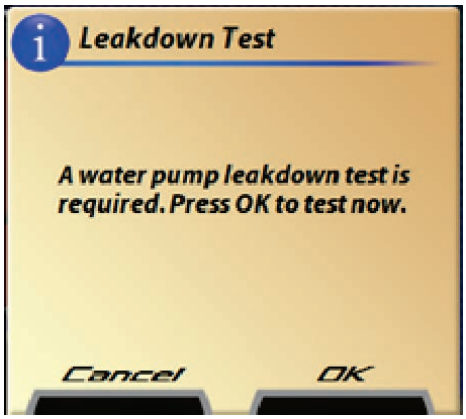


Figure 6-28

- The user will be prompted by instructions on the screen to set up sewer hose
- Pressing OK will continue to the next step.

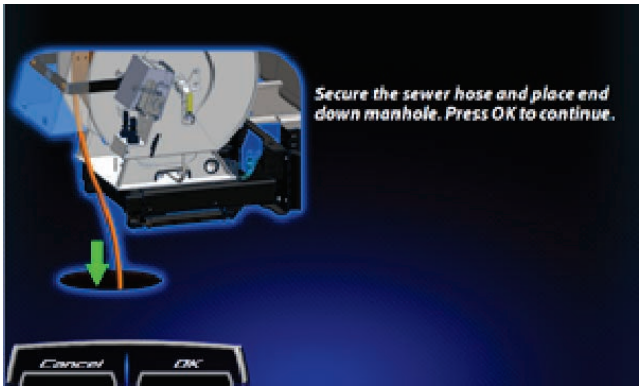


Figure 6-29

- Make sure the water pump is fully primed and the prime/purge valves are closed.
- Using the water pressure dial, turn the water pump on to the Purge/Prime setting (1).

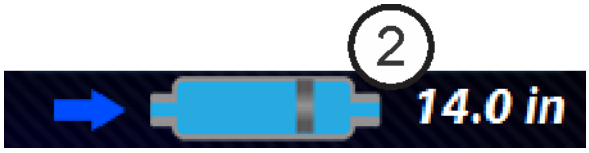
- Observe LVDT position on the front control panel display. (2) It will be recording pump movement either upward from approximately 0 to 17 inches (going forward), or counting down from 17 to 0 inch (going backward).

Figure 6-30

Prime Purge Dial Zone

Figure 6-31

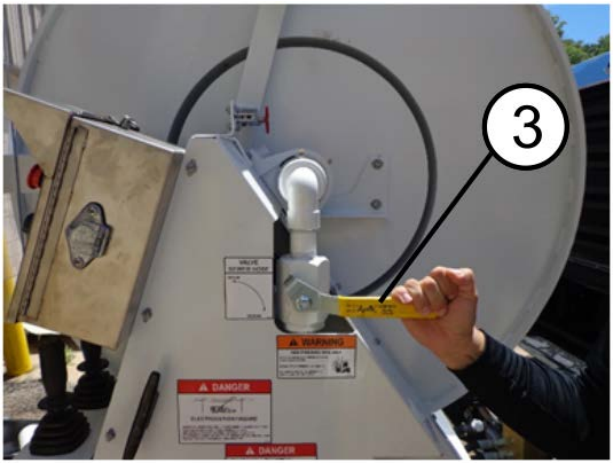
.



LVDT Position

Figure 6-32

- The user will be instructed to position valves to perform the test when priming is complete.



Hose Reel Ball Valve

Figure 6-33

- After positioning the valves and pressing OK, the control system will start to stroke the pump in both directions to build pressure while measuring movement

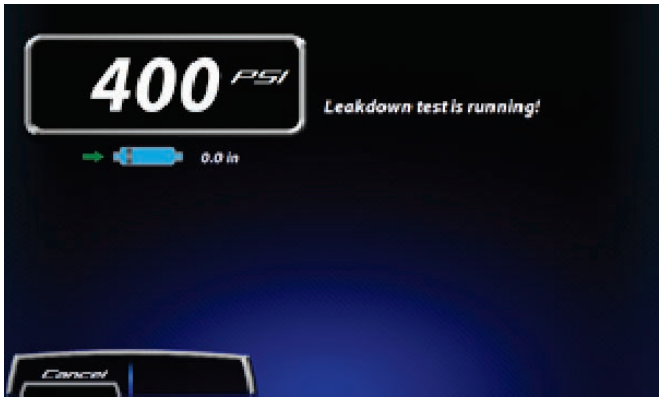


Figure 6-34

- The results will be displayed on the screen when the test is complete.
- If excessive movement is detected during the test, the check valves associated with the movement will be highlighted in red and immediate replacement should be scheduled.
- Call Customer Service for replacement parts at 1-800-837-9711.

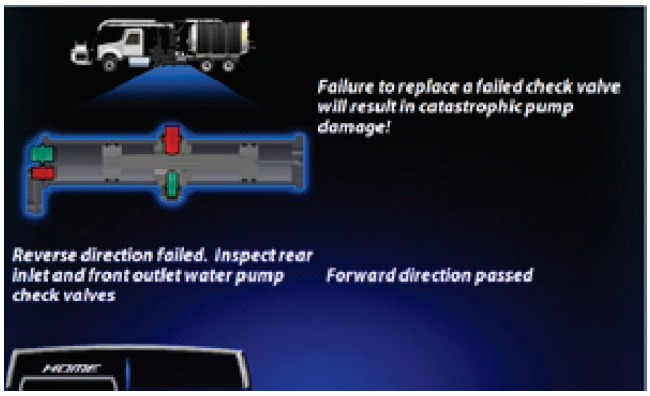


Figure 6-35

- An alarm message will be displayed on the on the display screens when a leak test has failed. The alarm message will continue to be displayed until a successful leak test is completed.
- Continuing to operate the water pump with a leaking valve may result in valve failure and water pump damage.

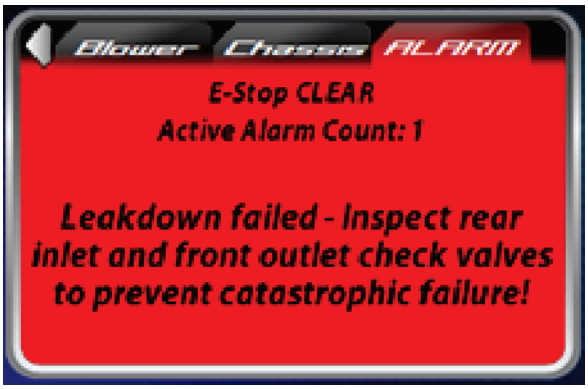


Figure 6-36

- If the leak test is canceled, the previous test results will be displayed.

Water Pump Check Valve Inspection

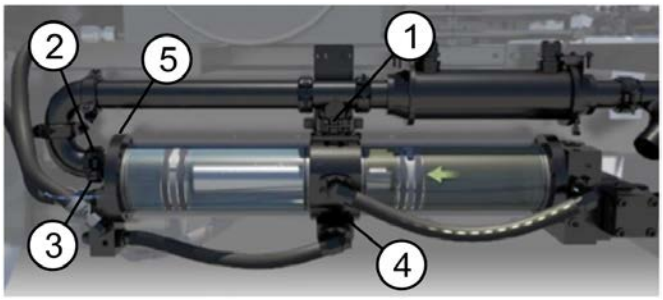


Figure 6-37

The water pump check valves must be inspected at a minimum every 600 hours to prevent damage to the pump through wear. Wear on the valves is caused by using water that is not perfectly clean or recycled water. Figure 6-31 below shows an example of an eroded valve seat.

Figure 6-38 Example of a worn check valve seat

1 & 2 Low pressure check valve - Located at the top and front side of the pump. Take note of how the valve was taken out and very no sealing surfaces are damaged. These valves should open into the pump to allow water into the pump.

3 & 4 High pressure check valve - Located at the front side and bottom of the pump enclosed in high pressure manifolds. Take note of how the valve was taken out and very no sealing surfaces are damaged. These valves should open out of the pump to allow water out of the pump and into the sewer hose.

5. Prime Purge Valve - Quarter turn valve should be opened to prime the pump and closed after pump is primed. This valve prevents premature wear to the priming check valve.

6. Prime Check Valve – This check valve allows air to escape out of the pump more efficiently this should be inspected to identify any missing parts or wear

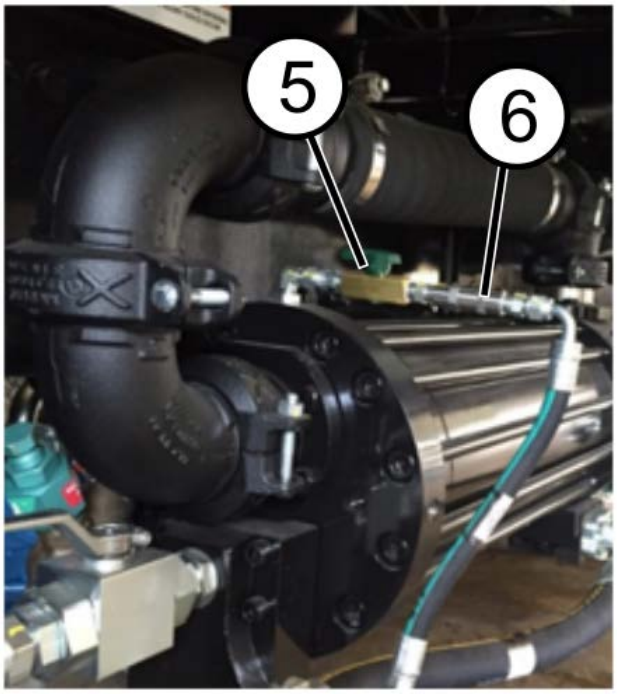


Figure 6-39

Chapter 7

Troubleshooting

Troubleshooting Overview

This guide is intended as a quick reference to aid operators and technicians in troubleshooting potential issues with the Camel™ sewer and catch basin cleaners.

This guide describes symptoms and lists several probable causes and their solutions. The primary rule of troubleshooting is to check the simple things first; therefore, the probable causes are generally listed in order of simplest to most complex.

Before attempting any repair, read, understand, and follow the operator's manual instructions, warnings, and safety messages.

All repairs should be performed by a qualified technician.

Before attempting any Troubleshooting you must call our Customer Service Representatives at 262-784-7100

The Basic Troubleshooting Process

1. Prepare tools, information, and safety equipment.
2. Define the symptom.
    - What is the problem?
    - When does it occur?
    - When did it work properly?
    - When did it stop working properly?
    - What was done in between those times?
3. Reproduce the symptom.
4. Narrow it down to the root cause.
    - Proceed logically.
    - Check the simple things first.
    - Divide and conquer — rule out what is not the problem. This is especially important to define if the root cause is human error, electrical, hydraulic, or mechanical.
    - Believe your evidence — if all else is eliminated, that which remains must be true.
    - Never assume anything — check it yourself.
    - Check everything — you could have multiple faults.
5. Repair or replace the defective component.
6. Educate and train the operator when it is a case of human error.
7. Verify the symptom is gone.

Table 7-1:

Typical Hydraulic Functions Pressures and Times		
Function	**Pressure (psi)**	**Time (sec.)**
Body Raise (Ejector)	1000	9
Body Lower (Ejector)	800	14
Body Raise (Dump)	600	22
Body Lower (Dump)	800	25
Boom Rotation - 90°	400	28
Boom Raise	900	22
Boom Lower	600	22
Tailgate Unlatch and Raise	500/1000	19
Tailgate Lower and Latch	1900/500	25
Ejector Plate Extend	<500	39
Ejector Plate Retract	<500	35
Hose Reel Extend	200	7
Hose Reel Retract	500	4
Hose Reel Payout/Retrieve	500	_

Control System Diagnostics

To aid in diagnostics of the control system, the status of the inputs, outputs, and network state of the control modules can be viewed on the control panel Status screens. By pressing the Status menu button from the main display screen, in-depth status information about each function group can be selected by using UP/DOWN navigation arrows and pressing the CENTER navigation button to confirm the selection. Refer to Chapter 3 for more information about navigating the Status screens.

Status Menu

Figure 7-1

On the control system Status screens, digital inputs and outputs will be shown as ON or OFF.

Analog inputs will display the raw analog data value. If an analog value has been detected that is outside the normal operating parameters for the sensor, and ERROR will be displayed.

Analog outputs will display the output value that the control system is trying to output.

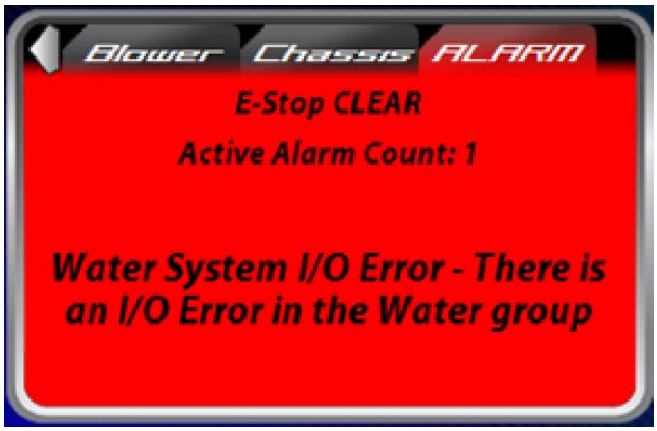
If a fault is detected, faulted inputs or outputs will display the type of fault that is detected.

Network components will show whether or not they are ONLINE or OFFLINE. Use the UP/DOWN navigation arrows to highlight a component to see its location and detailed state or value information.

Control System Status

Figure 7-2

If the control system detects a faulted input or output, an alarm message will appear on the control panel display screens indicating which control group contains the fault. When the System I/O Error alarm appears, the user should navigate to the group for which the I/O error is occurring to find which components are causing the error.



Control System Status

Figure 7-3

Mechanical Troubleshooting

Table 7-2: Troubleshooting

Function	Symptom	Probable Cause	Solution
Road mode: starting truck	Engine will not start when in road mode	Engine problems	Have engine mechanic check for problems.
Emergency stop at Panel or Emergency stop on remote pendants	1) Engine will start but all functions will not operate 2) Vent door opens and engine RPM drops to idle 3) Emergency stop message displayed on the front control panel display screen 4) Mechanical functions do not work.	Emergency stop switch pushed at front panel or curbside panel	Reset the emergency stop switch by twisting the knob.
		Pendant emergency stop is active.	Clear Emergency Stop mode by resetting the emergency stop button - Press the E-Stop button on the pendant for three seconds to clear the pendant E-Stop.
Control system	Control system not turning on	Main fuse blown	Check fuses at power distribution panel.
		Control System fuse blown	
		Ignition enable signal failed.	Check ignition enable fuse at chassis fuse panel
Transfer Case	Cannot shift between ROAD and WORK mode	Chassis air pressure too low	Run engine until control system air pressure reaches 100 psi
			Press the cab MODE button to switch to ROAD and back to WORK mode
		Manual override is engaged on the air solenoid	Release the manual override
		Air solenoid failure	Locate and repair or replace
		No signal from rear axle disengage confirm switch	Verify the position of the shift cylinder. Locate and repair or replace the confirm switch
Throttle control	Engine RPM will not increase or decrease for engine speed or water pressure dials	Dials are already turned up	Turn dial back to zero and then turn it back up.
		Emergency Stop is enabled	See "Emergency Stop" function in this table
		Engine speed potentiometer failure	• Use alternate controls: Pendant or screen back-up controls. • Repair or replace the engine speed potentiometer

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Hydraulics	No main hydraulic oil pressure	Work mode not enabled, still in road mode	Enable work mode and select VAC or DUMP mode.
		Hydraulic pump not engaged	
		Supply valve closed	Open the hydraulic supply valve.
		Low oil level in hydraulic reservoir	Add oil as required. Check for leaks.
		Oil pump suction line plugged or hose liner collapsed (very rare)	Repair or replace as required.
	Boom, hose reel, and body functions not moving	Hydraulic valve fouled with debris	• Shift the hydraulic valve using the manual override. This may free the fouled valve. A dirty cartridge valve may need to be cleaned or replaced. • Change the hydraulic filter.
		Directional valve not controlling the function	• Set the manual override on the associated proportional valve by turning the screw inward, starting at about 25%. • If the directional solenoid LEDs are lit and the function moves, the directional valve and coil are good. • If the directional solenoid LEDs are not lit and if using manual directional overrides moves the function, the directional valves are good. • If the function does not work using the directional valve overrides, then the directional or proportional valve may have failed.
		Failed directional or proportional valve	Connect pressure gauge to manifold port and check for pressure.
		LED on solenoid connector not lit when function is enabled	• Verify that the proper VAC or DUMP mode is selected for the desired function. • Locate repair or replace as required

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Hydraulics *(Continued)*	Hydraulic oil foamy or milky	Air in hydraulic oil tank	Inspect suction hose and fittings from hydraulic oil tank to pump for any air leaks.
		Water in oil	• Drain all oil in system and replace oil and oil filter. • Inspect or replace hydraulic reservoir fill cap. • Inspect hydraulic oil for water replace if necessary.
Boom	Boom not functioning	VAC Mode is not enabled	Enable WORK and VAC modes.
		Work Mode not enabled, still in ROAD mode.	Select Work mode on Cab Control Panel.
		Control System component failure	Use alternate controls: Joystick, pendant or screen back-up controls
	Boom speed too fast or too slow	No hydraulic pressure	See “Hydraulics” function in this table.
		Pinched, plugged, or broken hydraulic hose	
		Boom Speeds affected by variations in internal and ambient temperatures.	Go to Valve Settings HMI screen and adjust each function either positive or negative to compensate
Vacuum system	Vacuum pump does not engage	WORK Mode not enabled, still in ROAD mode	• Enable WORK and VAC modes. • Verify that the transfer case has shifted.
		VAC Mode is not enabled	Press the VAC MODE/ENGAGE button once in VAC mode at the front control panel to engage the vacuum pump
		Transmission not enabled	Shift the transmission into D drive.

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Vacuum system *(Continued)*	Vacuum pump does not draw vacuum	Vacuum relief door open	Close vacuum relief door
		Float ball stuck closed	Free and clean the float ball
		Float ball is closed Debris Level sensor shows Body full of material (liquid or solids)	Dump load or perform debris compaction function
		Intake hose restricted or plugged	Remove obstructions from hose
		Filter plugged	Clean or replace filter
		Ducting in body plugged or filled with material.	Clean ducts
		Debris body raised	Lower body fully down
		Inspection doors open	Close doors
	Vacuum pump does not draw full vacuum:	Holes worn in hose or dig tube	Repair or replace as required
		Hose coupler assembly gasket(s) missing or damaged	Adjust, repair or replace any missing or leaking gaskets
		Gasket from inspection door missing or damaged	Repair or replace gasket
		Tailgate gasket damaged or not sealing	
		Filter housing door seals damaged or not sealing	Repair or replace seal
		Hose between filter and cyclone separator damaged or not sealing	Repair or replace hose.
		Hose between make-break and boom cannon damaged or not sealing	
	Vacuum Pump RPM not displayed.	Failed speed sensor on transfer case.	Replace speed sensor.
Vacuum pump	Dust in vacuum pump discharge **Note:** *Operating while this condition exists could cause significant damage to vacuum pump and void warranty*	Missing or damaged filter	Replace filter.
		Filter not sealing properly	

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Vacuum vent door	Vacuum vent door will not function	Vacuum pump not engaged	Enable WORK and VAC modes.
Vacuum vent door *(Continued)*		Vacuum relief open due to debris level sensor sensing full load	Dump the load and clean the sensor or perform a debris compaction
		Control system is still waiting to acquire signal from debris level sensor	Wait until debris level is displayed
		Lack of chassis air pressure to operate vent door	Check chassis air pressure. Run engine until pressure rises.
		Air solenoid failure	Locate and repair or replace
		Electric signal not present	
		Control system is in Emergency Stop Mode	See "Emergency Stop" function in this table
Power take-off	PTO not engaged	No PTO enable signal present at solenoid	Check PTO engage output and PTO Confirm input signals on Chassis Status Display screen Locate and repair or replace
		No signal from PTO pressure confirm switch	
	Display shows PTO error on screen and alarm sounds	Engine speed greater than 900 RPM when enabling VAC mode on front panel	Reduce engine speed to idle before enabling VAC mode
		PTO pressure confirm switch indicated PTO did not shift	Make sure PTO Shaft is Spinning Locate and repair or replace
		PTO failure	Locate and repair or replace
	PTO not disengaged	PTO Override switch is on	PTO Override switch is on
Debris level sensor	Will not sense debris level in body	Sensor turned off in ROAD mode	Select WORK mode on Cab Control Panel and either VAC or DUMP mode on the front or curbside control panels
		Sensor antenna covered with debris	Sensor antenna covered with debris
		Sensor signal interfered with by ejector plate	Sensor signal interfered with by ejector plate
Tailgate	Leaking tailgate	Tailgate unlatched	Latch tailgate.
		Damaged gasket	Replace gasket.
		Dirt around gasket or mating surface on tailgate	Clean gasket and mating surface of tailgate.
		Damaged gasket retainer or tailgate surface	Repair or replace.

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Tailgate *(Continued)*	Tailgate will not close	Front or Curbside panel not in DUMP mode.	Set mode on front or curbside control panel to DUMP mode.
		Ejector plate not fully retracted (obstruction)	• Retract ejector plate. • Clean debris from in front of ejector plate. • Clean ejector plate guides.
		Wireless or Wired pendant malfunction	• Check transmitter/receiver communication. • Test other body functions at curbside panel or use screen back-up controls
		No hydraulic oil pressure	• Velocity fuse in protection mode. • See “Hydraulics” function in this table.
		Hydraulic line pinched, plugged, or broken	Securely support tailgate, slowly disconnect hydraulic hoses. Replace failed hose.
		Hydraulic cylinders failed	Replace hydraulic cylinders.
		Retract proximity switch failed	Make sure Eject Home input is ON in the Body Status of the control panel display screens. Make sure proximity switch LED is lit
		Metal sensor bracket not actuating proximity sensor	Adjust bracket until proximity switch is enabled
	Ejector plate latch will not close	Dirt or material accumulated on collar, shaft, roller, or tailgate surface	Remove all accumulated dirt and material.
		Rollers or shaft are binding or frozen	Lubricate rollers and shaft. Free binding parts.
		Tailgate closed proximity switch failed	Check proximity switch bracket for adjustment Make sure Tailgate Closed input is ON in the Tailgate Status of the control panel display screens Make sure proximity switch LED is lit when a metal object touches the sensor face Perform manual override to verify electrical issue

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Tailgate *(Continued)*	Tailgate will not unlatch	Front or Curbside panel not in DUMP mode.	Set mode on front or curbside control panel to DUMP mode.
		Tailgate closed proximity switch failed	Check proximity switch bracket for adjustment Make sure Tailgate Closed input is ON in the Tailgate Status of the control panel display screens Make sure proximity switch LED is lit when a metal object touches the sensor face Perform manual override to verify electrical issue
		LED on solenoid valve connector not lit when given command	Perform manual override to verify electrical issue
	Tailgate will not open	Unlatch LED on solenoid connector lit when given command but no movement	Make sure latched proximity switch LED is lit
		Latched proximity switch failed	Locate and repair or service
	Ejector Plate will not eject	Tailgate up proximity switch failed	Make sure Tailgate Open input is ON in the Tailgate Status of the control panel display screens Check if tailgate up proximity sensor LED is still lit Perform manual override to verify electrical issue

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Ejector plate	Ejector plate will not move	WORK Mode not enabled, still in ROAD mode	Select WORK mode on Cab Control Panel and either VAC or DUMP mode on the front or curbside control panels
		Ejector plate guides worn	Adjust Pads out to close gap in proximity bracket
	Ejector plate not fully retracted	Home proximity switch not sensing it fully retracted	• Clear out debris in front of ejector plate. • Proximity bracket out of adjustment. • Proximity switch is defective.
		Defective proximity switch or wiring	Make sure Ejector Home input is ON in the Body Status of the control panel display screens
		Debris in front of the ejector plate	Clean out debris tank.
		Ejector plate guides worn	• Ejector plate needs adjustment. • The slide pads need replacement.
Compaction	Compaction/De-water function not working	Ejector plate problem	See “Ejector plate” function in this table.
		Home or compact proximity switches not working	

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Water pump	No water pressure **Note:** *Water pump function should be available in both vac mode and dump mode.*	Water pressure knob left turned up	Turn water pressure knob down to zero and then back up.
		Water supply valve closed	Open supply valve.
		Water tanks empty	Fill water tanks.
		No selection made on front panel MODE button	Select VAC or DUMP mode.
		Drain valve open	Close drain valve.
		Plugged or dirty water supply.	Clean water supply.
		Nozzle too big or worn out	Replace nozzle.
		Water hose leaking	Replace hoses.
		Sewer hose and water pump "jumping" or "bucking" , Pressure inconsistent and LVDT moves rapidly then slows	Water Pump is not Primed, shut down the pump and use the Prime Purge function to work air out of the system
		PTO failure error message	• Engine speed greater than 900 RPM. • PTO hydraulic enable solenoid failure or failed confirm switch.
		Water pump directional valve issue	Remove solenoid cables and use manual override to move water pump.
		Hydraulic pressure to water pump not enabled by load sense valve	Perform a manual override and verify the water pump is stroking by watching the LVDT movement on the front control panel display screen
		Water pump position stuck at one end	Check LVDT for proper movement from 0 to 17.3 inches using manual override If the LVDT is Defective LVDT Position may read a fixed 22.4 inches
		Water pressure potentiometer failure	Use alternate controls: Curbside panel, pendant or screen back-up controls. Repair or replace the water pressure potentiometer
		Load sense valve failed	Repair or replace the load sense valve
		No hydraulic pressure	See “Hydraulics” function in this table.

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Water pump *(Continued)*	No Reading for Water Pressure at HMI Screen	Water Pressure Sensor Failed on Water Pump but still able to develop pressure HMI reads "0" Pressure	Water Pressure sensor is display only. Sensor Failed, Repair or Replace
	Cannot Vary Water Pressure Setting	Pilot Valve on Hydraulic Pump stuck open	Pump will operate at full pressure but user will not be able to adjust pressure down, Test by decreasing water pressure on HMI and using handgun, if no decrease is felt component(s) have failed Repair or replace Components
		Water pump is in winter recirculation mode	Turn off winter recirculation mode on the front control panel
	Low or No Water Pressure	Check Valves on Pump Worn or Damaged	Test pump by shutting off flow to the reel to dead head the pump, if the pressure does not maintain and drops and the LVDT moves the check valves are worn or damaged, replace water pump check valves
		Pilot Valve or Hydraulic Pump Failure	Test Pump by shutting off flow to reel to dead head pump, If the pump dead heads at operating pressure decrease flow to 40 GPM, if you have full pressure at low flow one of the two hydraulic pumps or pilot valves is defective
	Low pressure hoses on water feed blowing off	Check Valves on Pump Worn or Damaged	Replace Water pump Check Valves
Winter recirculation	Water pump will not run	Winter recirculation mode is off	Turn winter recirculation rocker switch on.
Wireless pendant	Wireless pendant not functioning	Truck not in WORK mode. Battery is dead.	Enable cab panel WORK mode. Charge pendant on charging base.
		Not in VAC or DUMP mode	Set MODE on control panel to VAC or DUMP mode
		Electrical malfunction (loss of communication)	Check transmitter/receiver communication link LED.
Wired pendant	Wired pendant not functioning	Pendant plug not fully engaged in receptacle	• Re-seat pendant plug. • Plug into alternate receptacle.
		Damaged pendant cable	Replace wired pendant.

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Chassis air	Low air pressure. Never reaching one hundred (100) PSI.	Solenoid valve or diaphragm valve on filter stuck open	Clean, repair, or replace as required.
		Faulty compressor or regulator on truck	Repair or replace compressor or regulator.
		Leak in the air lines, pneumatic valves, cylinders, or tanks	Locate the leak and repair or replace as required.
		Defective dash air pressure gauge	Replace dash air pressure gauge.
Lights	Lights will not work	Too much current load	Determine the cause of the over-current condition
		Fuse blown	
Electrical Troubleshooting	Loss of power immediately	Fuse blown by a short to ground	Fuse blown by a short to ground
		Device connected to output is exceeding the maximum current rating.	Determine cause of over-current
	Loss of power after period of time	Fuse blown by device drawing too much current that is too close to the maximum amperage rating	Determine cause of over-current
	Loss of power after period of time	Fuse blown by device drawing too much current that is too close to the maximum amperage rating	Determine cause of over-current
	Control signal not present	Output not on due to missing input command	Check for proper input command and LED illumination
	Output on but function not working	Device failure	Check for proper input command and LED illumination
		Output module in over-current protection mode	Check the Status on the control panel display screens
	Electrical connection failed	Loss of electrical connection	Power, signal, or ground return wire failure

Table 7-2: Troubleshooting (Continued)

Function	Symptom	Probable Cause	Solution
Electrical Troubleshooting *(Continued)*		Cut, broken or dislodged wire	Locate and repair or replace
		Connector pin not fully seated inside connector	Re-seat pin into connector
		Wire pulled out of crimped pin	Wire pulled out of crimped pin
		I/O Module has failed to operate	Check module power or power input LEDs
	Analog signal not working	Special control signal not readable with a voltmeter	Check the Status on the control panel display screens
		Loose wire connection	Connect an incandescent lamp to the circuit and wiggle wires.
	Function will not work using wired or wireless pendants	Electrical Coil Failure	If the solenoid LEDs are lit but function does not move, try again by setting the manual override on the proportional valve
		Electrical malfunction. If at least one of the control devices makes the function work properly, then the root cause is not hydraulic.	If the function works with manual override, and the LED light on the coil connector lights up, then the solenoid coil may have failed.

Table 7-3: Control System - Warning/Error Messages

Warning/Error Message	Trigger	Action	Possible Cause/Notes
PTO Error - PTO cannot engage because the engine speed is greater than 900 RPM	Engine speed above 900 RPM	PTO will not turn ON	-Water pressure and/or engine speed pots are not fully CCW. -Defective pot
PTO Engage Solenoid Failure - PTO has tried to engage but the PTO confirm signal was not received.	Control system not receiving confirmation from PTO pressure switch.	PTO will not turn ON	-PTO Solenoid problem -Low oil pressure within PTO -Defective PTO switch
PTO Disengage Solenoid Failure - PTO has tried to disengage but the PTO confirm signal was still received.	Control system receiving confirmation from PTO pressure switch when it should be off.	PTO will not turn OFF	-PTO Override switch is on -PTO Solenoid problem -Defective PTO switch
PTO Consent Failure - The transmission did not give consent to engage the PTO	Control system not receiving consent from the transmission that it is OK to engage the PTO	PTO will not turn ON	-Transmission problems -Transmission configuration parameters -Network issues
Low Transfer Case Pressure Detected - Check transfer case oil	Sensor detects low transfer case oil pressure	Displays warning message	Transfer case oil is low
Hydraulic Oil Overtemperature	Sensor detects hydraulic oil temperature above acceptable limit	Displays warning message	-Cooler is plugged with debris -Cooling fan is defective
Low Air Pressure - The air pressure is too low to switch pneumatics	Sensor detects system air pressure below acceptable limit	Transfer case and blower shifts are not allowed	Leaking pneumatic system
Vacuum Pump Overtemperature	Sensor detects blower exhaust temperature above acceptable limit.	Opens vent door until temperature drops to acceptable level.	-Drawing high vacuum for extended periods of time in hot ambient conditions -Wiring problem -Defective sensor
Vacuum Pump Error - Vacuum Pump cannot engage because the engine speed is greater than 900 RPM	Engine speed above 900 RPM	Vacuum pump will not turn ON	-Water pressure and/or engine speed pots are not fully CCW. - Defective pot

Table 7-3: Control System - Warning/Error Messages

Warning/Error Message	Trigger	Action	Possible Cause/Notes
E-Stop ACTIVE: Front	System lost emergency stop input	Goes to safe mode	Front, Curbside, or pendant Panic button pressed.
Low Water Level	System senses fresh water tanks low.	Displays warning message	-Water level actually low -Clogged/defective water sensor
Y-Strainer Needs Cleaning - Low pressure detected at the Y-Strainer	System senses Y-strainer clogged or restricted	Displays error message	-Strainer actually clogged -Clogged/defective pressure sensor
Tank Filter Needs Cleaning - Low pressure detected at the tank filter	System senses tank filter clogged or restricted	Displays error message	-Filter actually clogged -Clogged/defective pressure sensor
Debris Body Full!	System senses level in debris tank at maximum acceptable level.	Opens vent door	-Debris tank actually full -Debris on face of radar unit
Backup HPU Cool Down - The HPU has run for the maximum allowed time and is in a cool down cycle.	Run time of HPU exceeds set time limit	HPU shuts down for preprogrammed cool down time period.	The HPU will not operate if the engine is running.
System I/O Module is not communicating over the Control System CAN bus	A message from a device or module has not bee received within the expected time	Displays warning message	-Blown fuse -Wiring problem -Defective module
Water System I/O Error - There is an I/O Error in the Water Group	A sensor within the indicated group is reporting a faulted state	Displays warning message	Defective sensor Wiring problem

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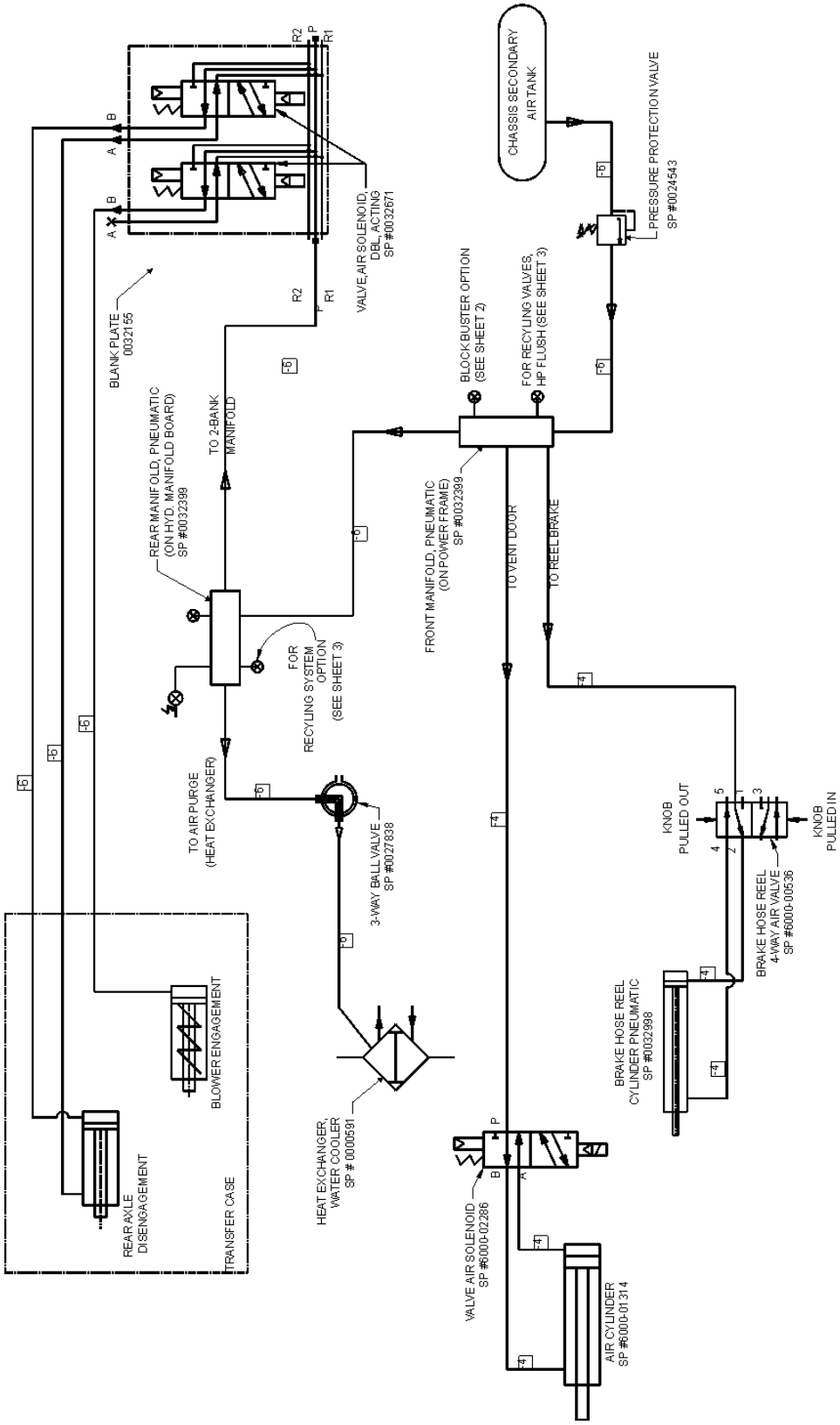
Table 7-4: Control System - REGEN Alert Warning Messages

Warning/Error Message	Trigger	Action	Possible Cause/Notes
Level 2 Regen - Regen required now	Engine transmitted message for Level 2 Regen	Display warning message	Most engines allow performing a parked regen at level 2. Always check dash for REGEN light. If light is ON, parked regen should be performed ASAP
Level 3 Regen - Regen or engine stops	Engine transmitted message for Level 3 Regen	Display warning message	NOTE:
Level 4 Regen - Stop engine now	Engine transmitted message for Level 4 Regen	Display warning message	NOTE: Highly recommend performing parked regen at this level ASAP. Engine may start derating as it nears level 5. At level 5, engine shuts down. May get one final chance to regen before calling the big, expensive wrecker!

Pneumatic-Camel - Dwg. No. 0032957-Sheet 1 of 3



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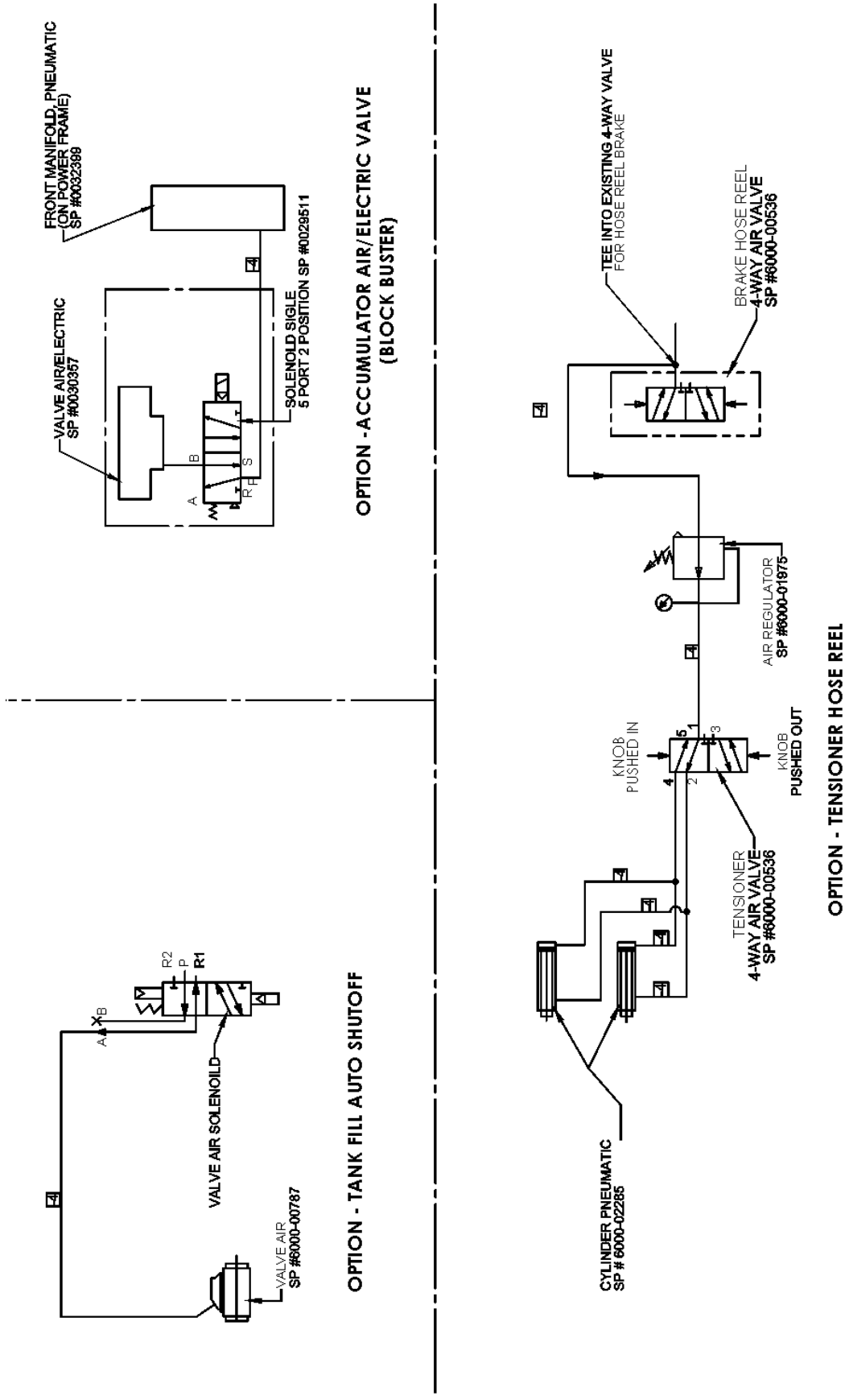

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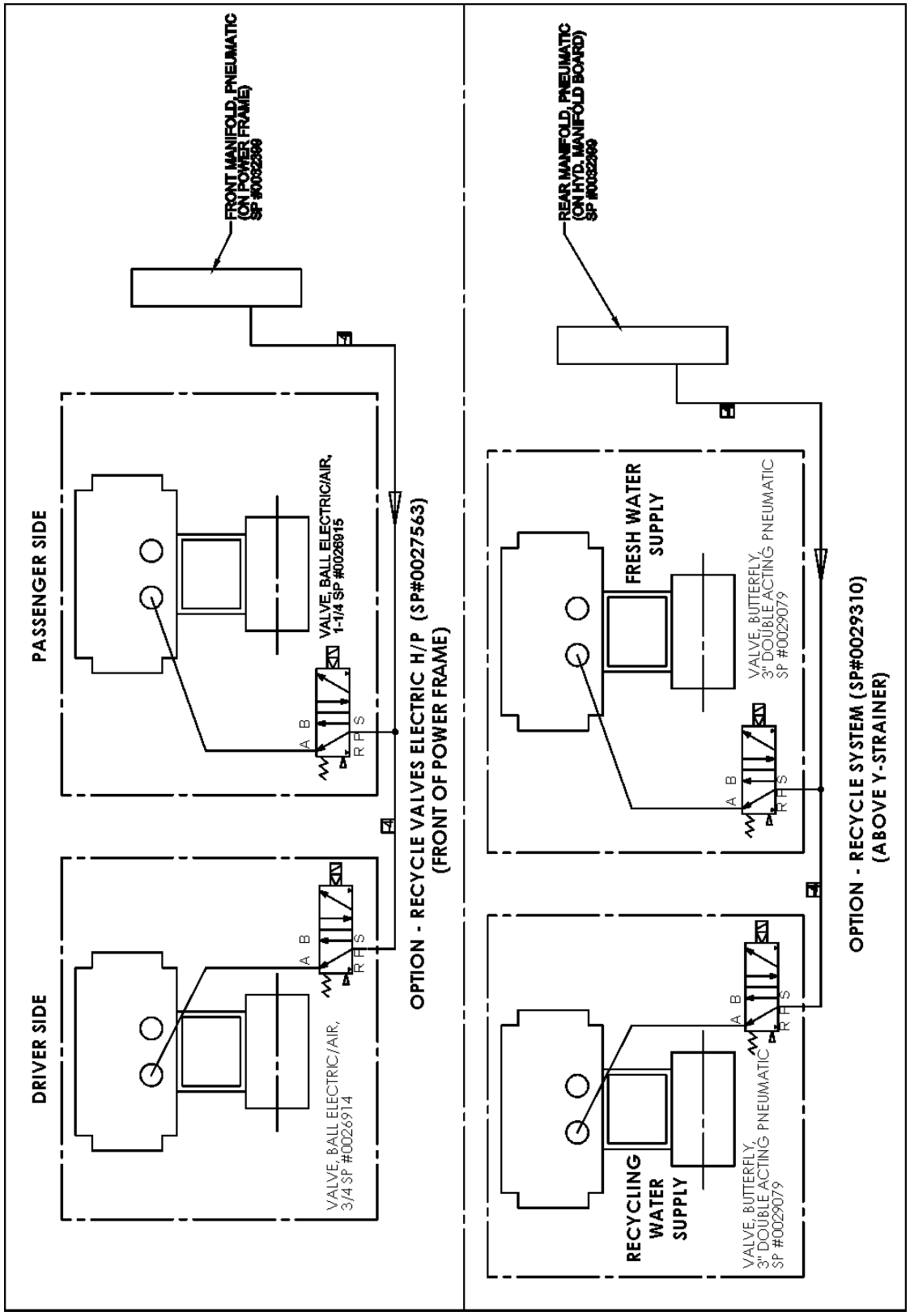

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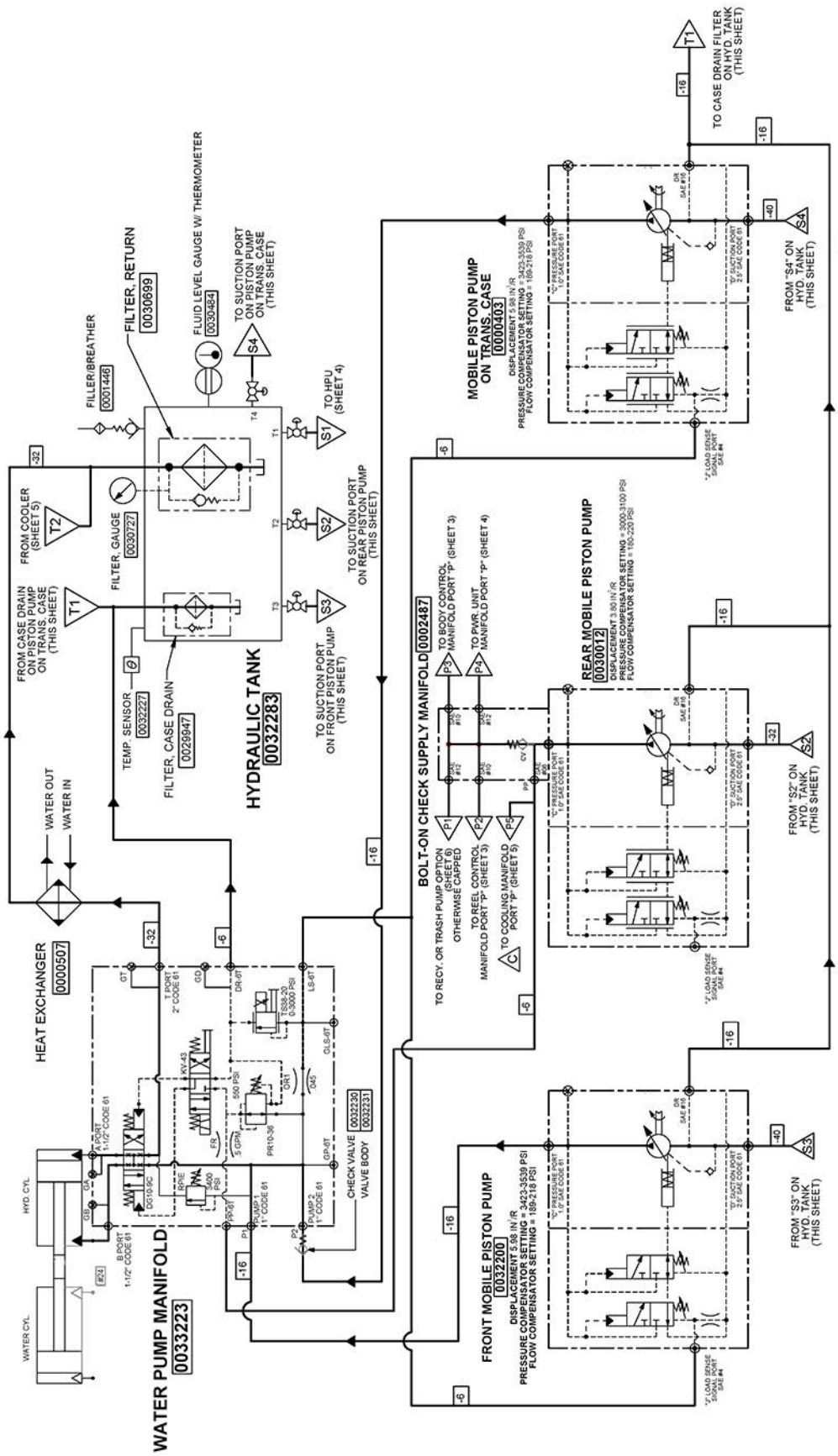

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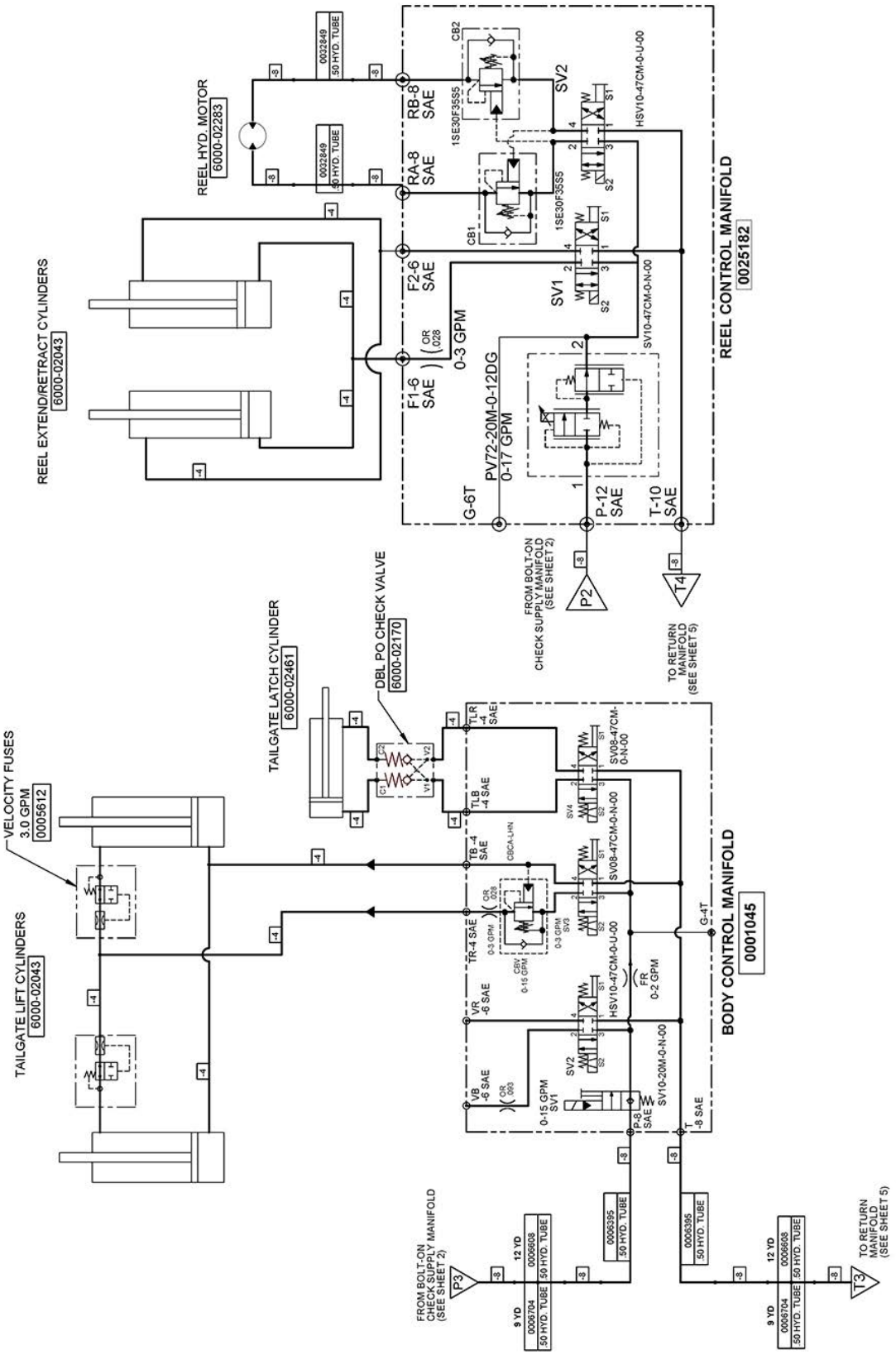

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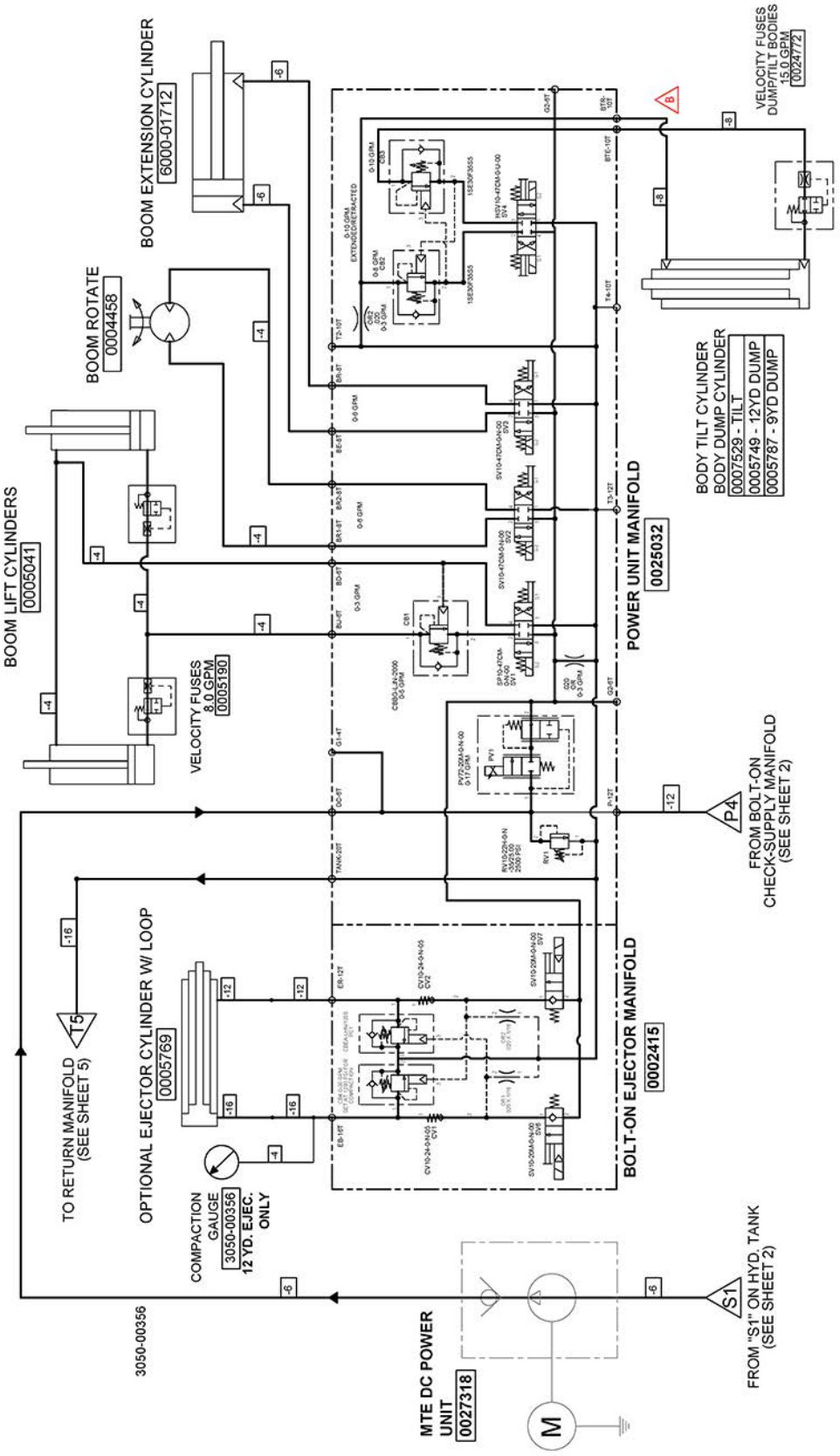

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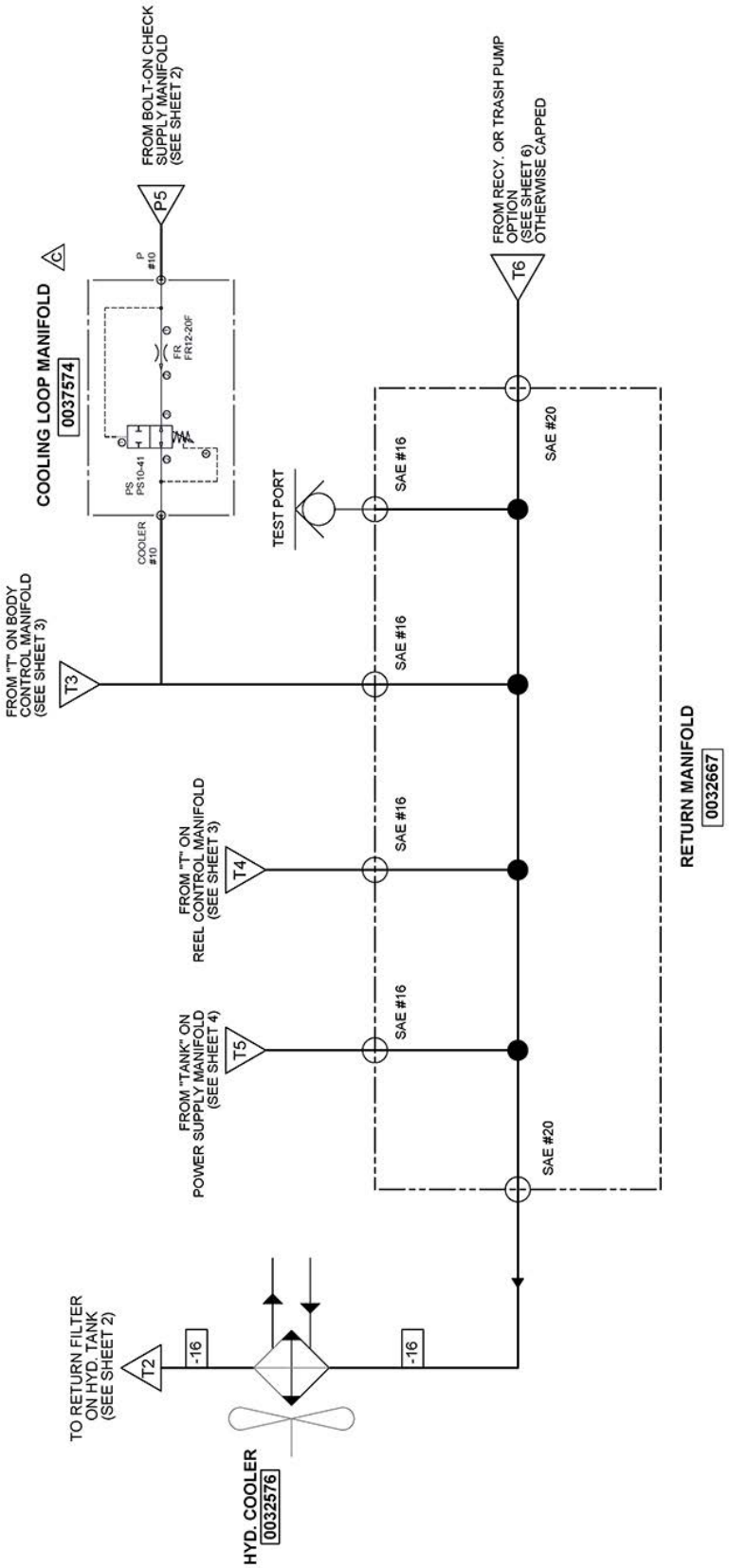

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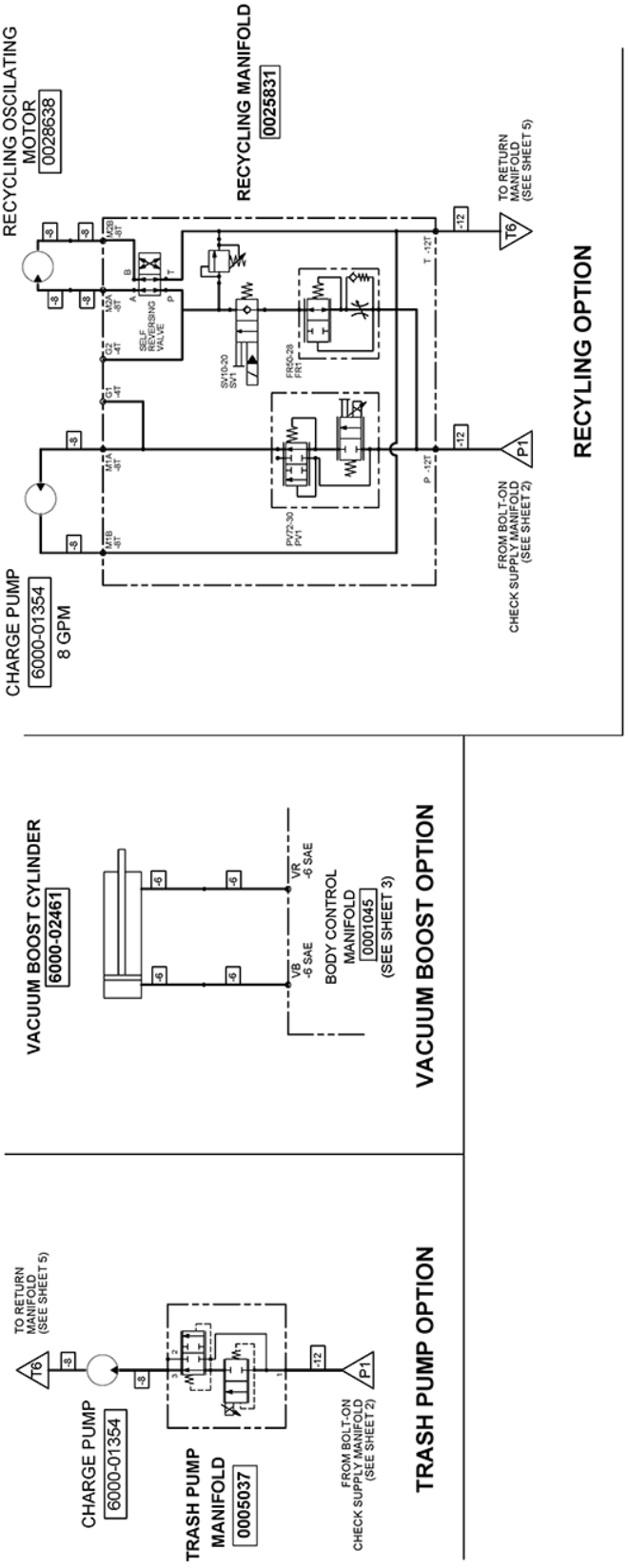
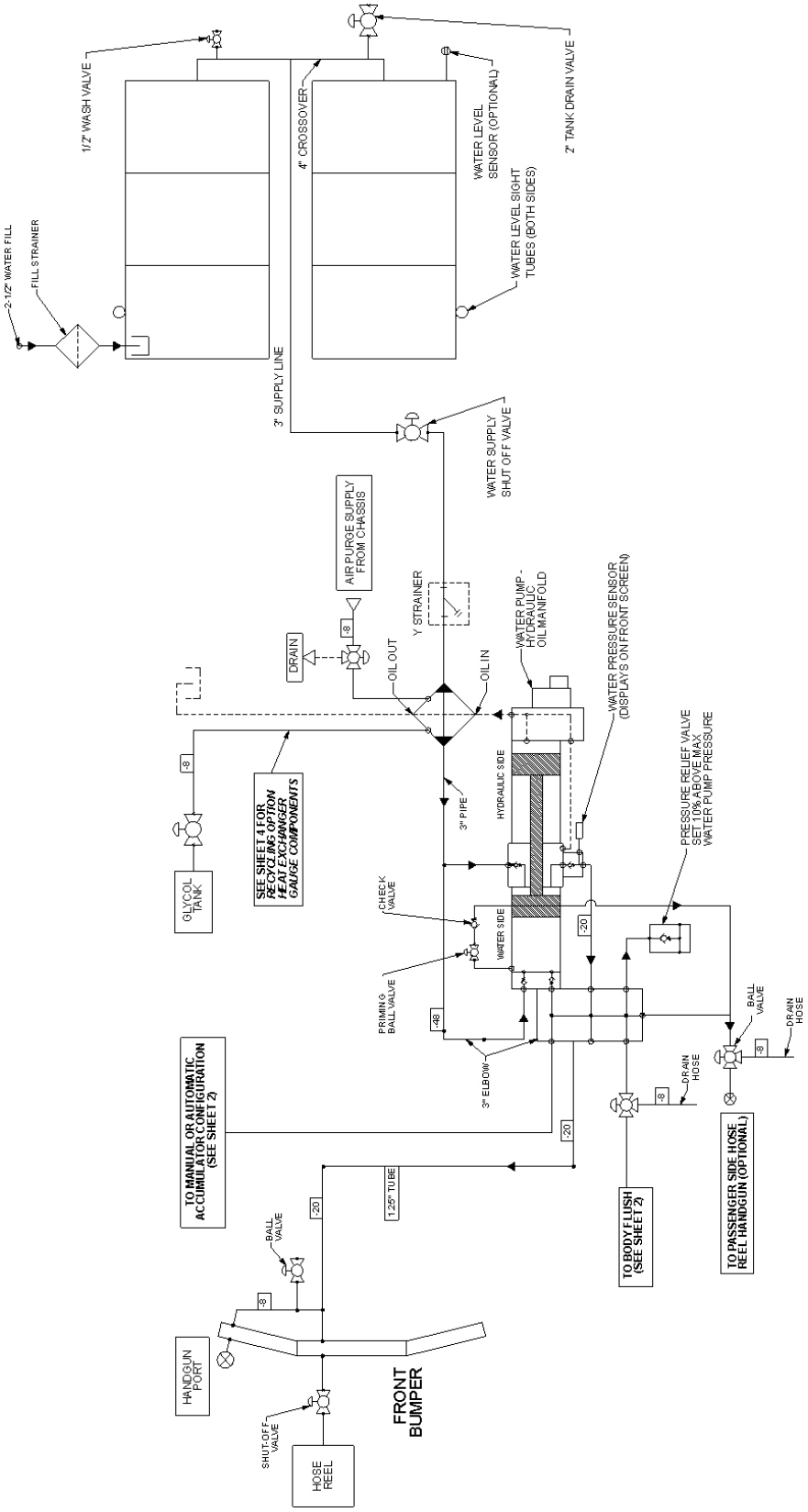


Camel Water System - Dwg. No. 0032971 Sheet 1 of 4



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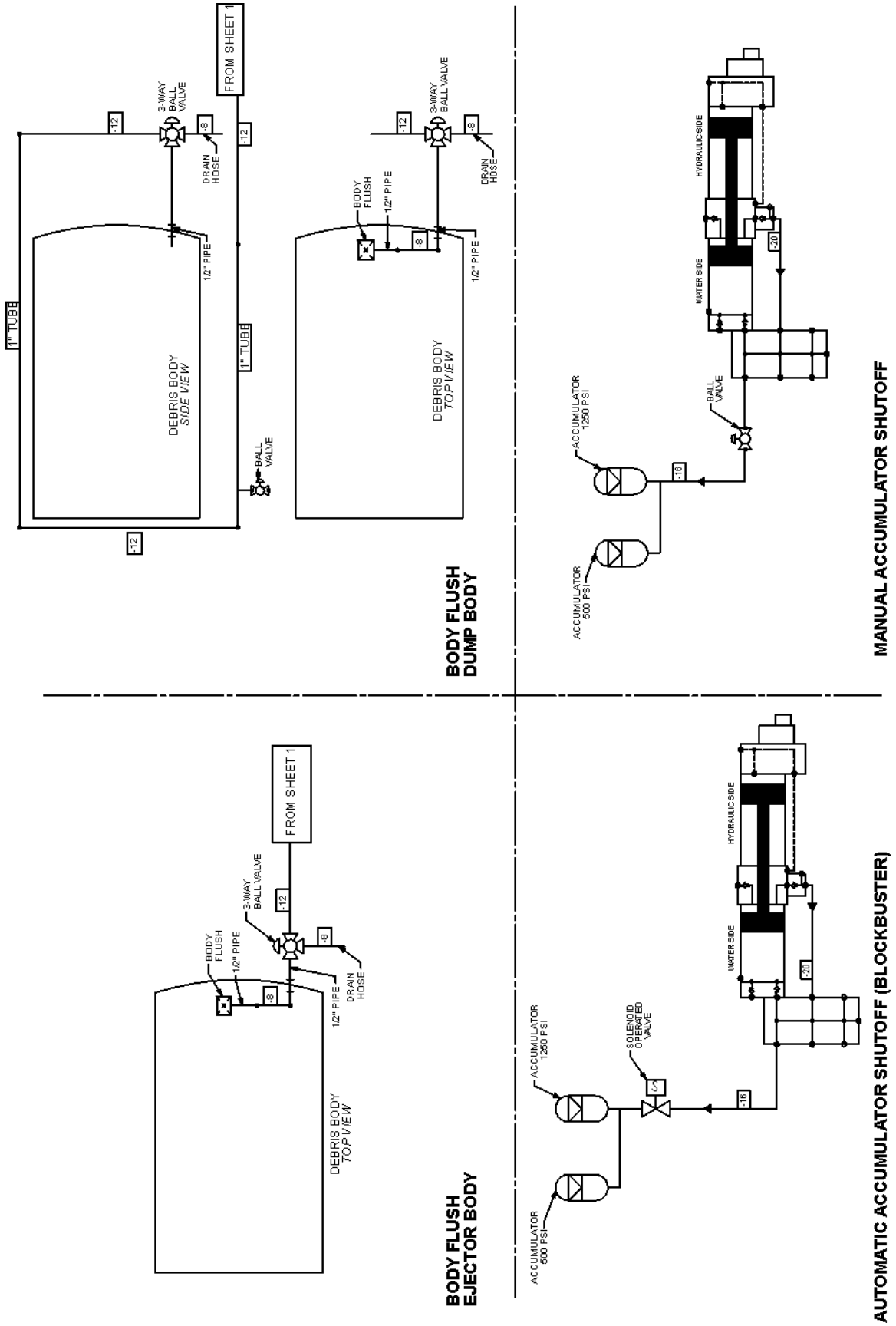
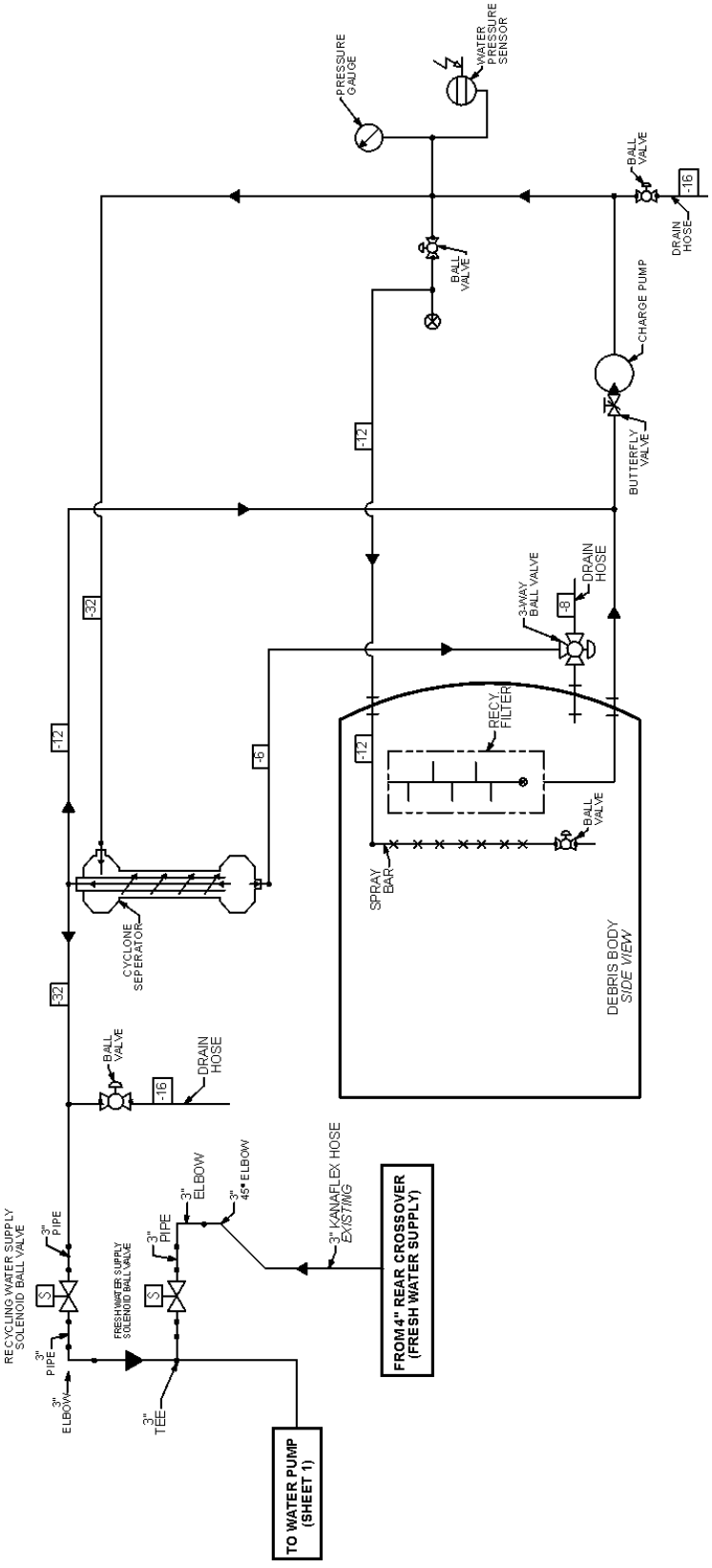


Camel Water System - Dwg. No. 0032971 Sheet 3 of 4



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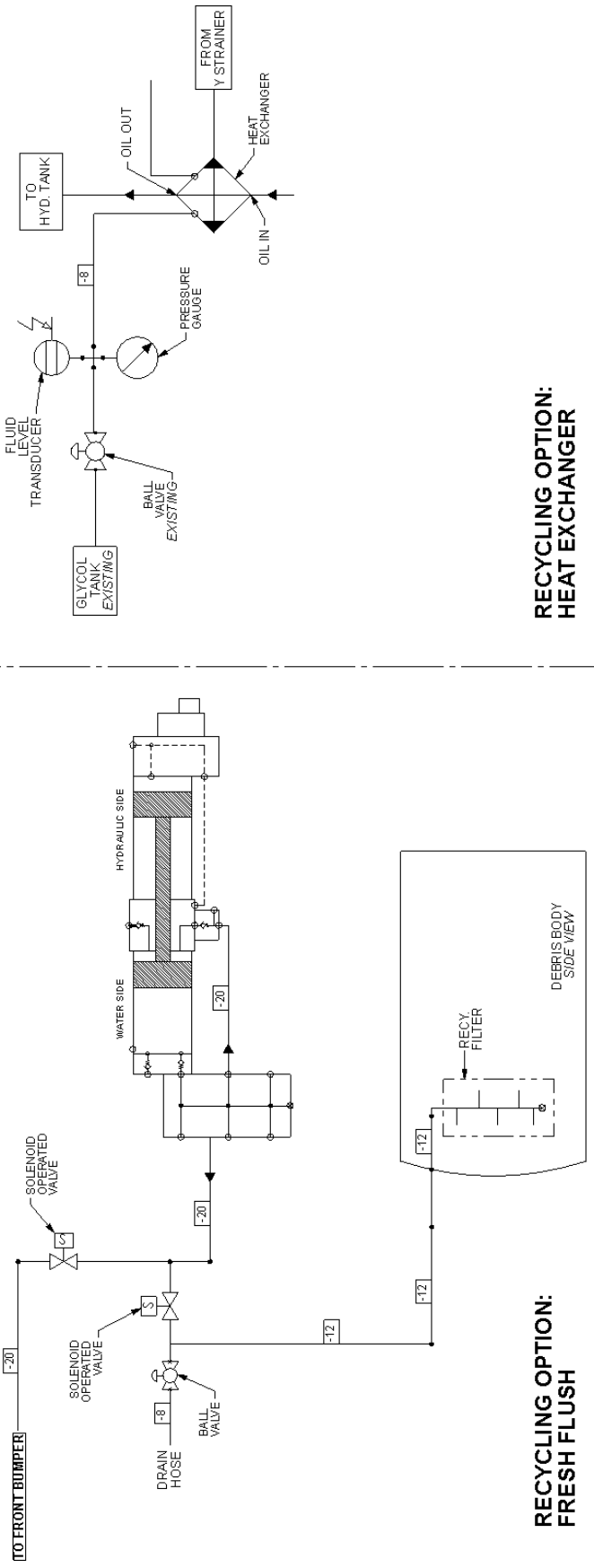
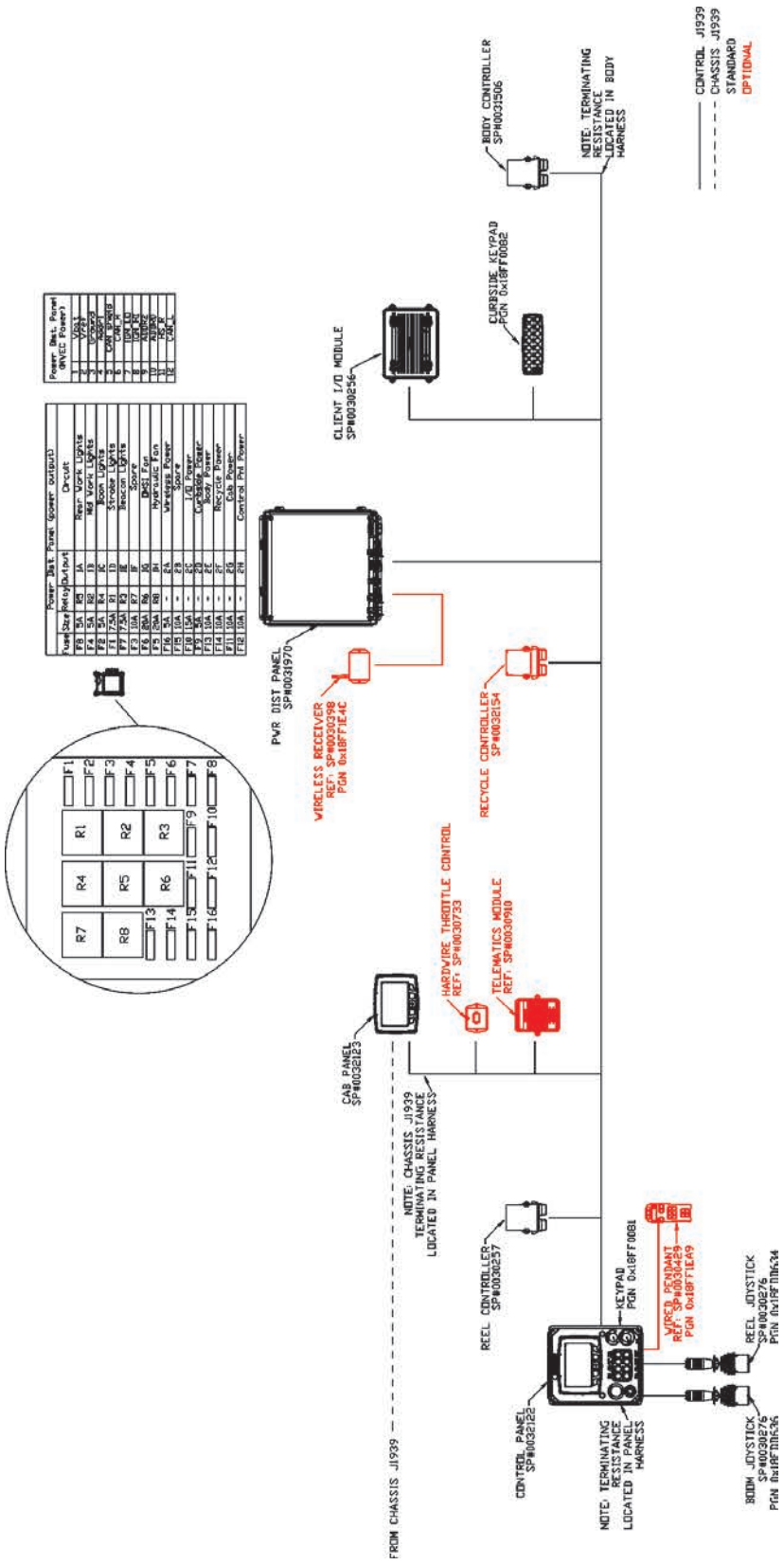
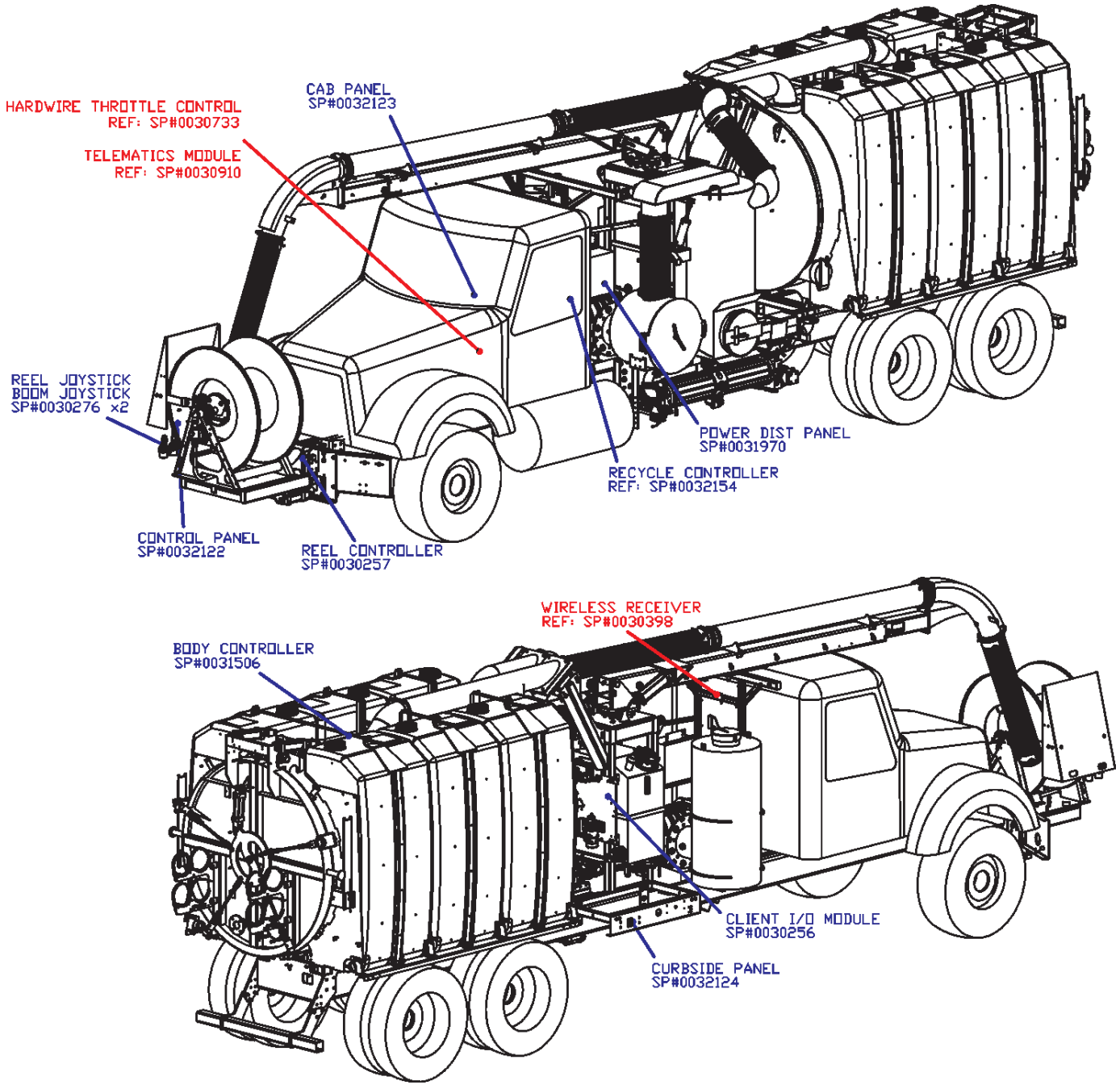


Control System, Camel - Dwg. No. 0031446 Sheet 1 of 2



Control System, Camel - Dwg. No. 0031446 Sheet 2 of 2



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Service and Spare Parts

First Year Spare Parts	
Description	**Part Number**
Air Filter	3000-02991
Air Filter Door Gasket	0005155
Hydraulic Filter Element	0030505
Case Drain Filter Element	0031305
Y-Strainer Complete	0020239
Y-Strainer Lid Gasket	0025680
Y-Strainer Screen	0026277
Y-Strainer Screen Gasket	0026279
Y-Strainer Lid	0026280
Y-Strainer Cap Clamp	0026281
Gasket (Cyclone Separator Door)	7300-02795
6" Lock Ring (Steel)	3000-00011
6" Lock Ring (aluminum)	3000-00824
8" Lock Ring (aluminum)	3000-00825
8"m x 6"f Reducer (alum.)	3000-02948
8" x 36" Tube	8510-01373
8" x 60" Tube	8510-01374
8" x 84" Tube	8510-01375
6" Dig Tube	9010-00859
Double Make/Break Gasket	0004461
Make Break Spring	0001971
Make Break Shoulder Bolt	0004540-00300
6" O-ring Gasket	3500-00206
8" O-ring Gasket	3500-00205
6" Flat Coupling Gasket	3500-00002
8" Flat Coupling Gasket	3500-00001
ISO 150 Synthetic Oil (5 Gal.)	3060-00047

First Year Spare Parts	
Description	**Part Number**
Pusher Plate Guide & Wiper Kit	9810-00425
Handgun extension .50 x 30" SS	9010-01194
Handgun extension .50 x 60" SS	9010-01195
Handgun W/SS couplings 1/2"	9010-01146
Wash Down Handgun W/Lance	0023397
6" inline vacuum relief	3000-02615
6" Tube Handle W/24" OD Handle	0026946
8" Clean Out Port Gasket	3500-00189
Switch Blade Nozzle (Quad)	0030514
Nozzle Pills #3 for Quad Nozzle	0030453
Rip Saw Rotary Nozzle	0027694
Rip Saw Rotary Nozzle Rebuild Kit	0027695

Super Accessories	
Description	**Part Number**
NOZZLES	
3/4" Radial Cleaning Nozzle - 50GPM @ 3000PSI	6000-02072-5030
3/4" Chisel Nozzle - 50GPM @ 3000PSI	6000-02011-5030
3/4" Grenade Nozzle - 50GPM @ 3000PSI	6000-02065-5030
3/4" Grand Slam Nozzle - 50GPM @ 3000PSI	6000-02017-5030
1" Radial Cleaning Nozzle - 65GPM @ 2000PSI	6000-02072-6520
1" Chisel Nozzle - 65GPM @ 2000PSI	6000-02011-6520
1" Grenade Nozzle - 65GPM @ 2000PSI	6000-02065-6520
1" Grand Slam Nozzle - 65GPM @ 2000PSI	6000-02017-6520
1" Superior Penetrator Nozzle - 65GPM @ 2000PSI	6000-02012-6520
1" Small Flying Nozzle - 65GPM @ 2000PSI	6000-02076-6520
1" Large Flying Nozzle 65GPM @2000 PSI	6000-02075-6520
1" Radial Cleaning Nozzle - 80GPM @ 2000PS	6000-02072-8020
1" Chisel Nozzle - 80GPM @ 2000PSI	6000-02011-8020
1" Grenade Nozzle - 80GPM @ 2000PSI	6000-02065-8020
1" Grand Slam Nozzle - 80GPM @ 2000PSI	6000-02017-8020
1" Superior Penetrator Nozzle - 80GPM @ 2000PSI	6000-02012-8020
1" Small Flying Nozzle - 80GPM @ 2000PSI	6000-02076-8020
1" Large Flying Nozzle 80GPM @2000 PSI	6000-02075-8020

Super Accessories	
Description	**Part Number**
SEWER ACCESSORIES	
3/4" standard nozzle extension	9050-00038-0001
3/4" finned nozzle extension	9050-00039
1" standard nozzle extension	9050-00038-0002
1" finned nozzle extension	9050-00058
Hose, 25', plastic - Single Jacket Filler Hose	0025085
Hose, 50', plastic - Single Jacket Filler Hose	3500-00245
Hose, 25', cotton - Single Jacket Filler Hose	0027059
Hose, 50', cotton - Single Jacket Filler Hose	3500-00259
Leader Hose 3/4" x 10'	3736-12000-0012
Leader Hose 1" x 10'	3736-12000-0016
Grabber assembly (replaces 3000-01029)	9510-00016
1/2" dia x 35' Whip Hose with quick disconnects	9410-02179
Handgun rated at 3000 PSI	9010-01146
Cleaning Lance (For Handgun) w/ Adjustable Nozzle	9010-01150
Tigertail Sewer Hose Guide	3000-02601
Upper manhole roller shoe assembly	9410-00001
Lower manhole roller guide with pipes	3000-02226
Hydrant wrench	3000-01242
Puller hook	3000-01244
Assy, Wash Down Handgun W/Lance, Adjustable	0023397

Other Service Parts	
Description	**Part Number**
BODY & VACUUM	
6" Female Intake Plug	3000-03257
8" Boom Seal	6000-01251
8" Hose End Adapter	8510-01473
8" Hose End flange (vactor)	3000-03051
8" Hose Flange	8510-02994
8" hose Flange	0020040
8" hose Shackle Clamp	8510-00407
8" Male Hose End	8500-02868
8" Spiral Clamp	0258-00007
8" Vactor Style Clamp	3000-02276
8" Vactor style Gasket	3000-03064
8" x 54" Boom Elbow Hose	3906-06054
8" x 69" Mid Boom Hose	3906-06069
Body Inlet Duct Gasket	0001682
Body Inlet Elbow	0002072
Body Inlet Elbow Gasket	0002055
Boom Elbow Weldment	0031925
Boom Slides	3500-00668
Flange Seal Retainer	4510-00190
Float Ball	3000-02208
Float Ball Support X2	0002321
Inner Boom Tube 102"	8510-01679-1020
Pneumatic Vacuum Relief Gasket	0025124
Tail Gate Gasket	3500-00258
Tail Gate Latch Rod	1010-00967
Tail Gate Latch Roller Kit	0002609
Vac Relief Door Lever	0001959
Vac Relief Inner Cover	0001923
Vac Relief Outer Cover	0001921

Other Service Parts	
Description	**Part Number**
ELECTRICAL	
Hose Reel Encoder	0008208
Light, LED, Amber Clearance	0008713
Light, LED, ID, ASSY	9000-00958
Light, LED, License, Assy	5500-01881
Light, LED, Red Clearance	0006227
Light, LED, Stop, Tail, Turn	0006413
Light, Safety Director Bar, Amber	0005914
Pressure Sensor, Low Water Level	0032190
Pressure Sensor, Water	0032409
Proximity Sensor	0005940
Blower Tach Sensor	9016-00098
Wired Remote Control Pendant	0030402
Wireless Remote Control Pendant	0030401

Other Service Parts	
Description	**Part Number**
HYDRAULIC & PNUEMATIC	
Air Solenoid Valve	6000-02286
Boom Extension Cylinder 2.5" x 96"	6000-01712
Boom Lift Cylinder	0005041
Heat Exchanger, Oil to Water	0029416
Hose Reel Brake Pneumatic Cylinder	0032298
Hose Tensioner Pneumatic Cylinder	0031047
HYD. Pressure Gauge	6000-00260
HYD. Pressure Gauge w/ QD	0031397
Tail Gate Latch Cylinder 2.5" x 6"	6000-02461
Tail Gate Lift Cylinder 3" x 8"	6000-02043
Vac. Relief Pneu. Cylinder 3" x 6"	6000-01314

Other Service Parts	
Description	**Part Number**
WATER SYSTEM	
2.5" x 25' Fill Hose	0025085
4" Rubber Hump Hose for Water Tanks	3000-01953-0003
Kit, Seal, Oil Side	0026094
Kit, Seal, Water Pump, Full Rebuild	0026095
Kit, Seal, Water Side	0026093
Kit, Water Pump Valves	0031809
Kit, Water Pump Valves, High Wear	0031810
Purge/Prime 1/4 Valve	6000-02112
Water Fill Strainer 2" Assy	20152-003
Water Fill Strainer Bowl	7350-00097
Water Fill Strainer Gasket	7350-00098
Water Fill Strainer Screen	7350-00099
Water Pump Inlet Valve	0026088
Water Pump Inlet Valve High Wear	0030642
Water Pump Inlet Valve, O-Ring	0027246
Water Pump Outlet Valve	0026089
Water Pump outlet Valve High Wear	0030643
Water Pump Outlet Valve, O-Ring	0027247

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Contact Super Products if you require additional information regarding the operation of your Camel Combination Sewer Cleaner.

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