

Cusco Turbovac Hydro Trencher Series

REVISED JUNE 6, 2014. SEE LAST PAGE FOR REVISION LOG.



Product Overview

- This premier Hydro-Excavator is designed for directional boring and removing liquids, sludge, slurries, mud, gravel and other solid waste. Whether you are excavating around fragile oil & gas pipelines, installing fiber optic cables, repairing utility lines, or excavating in remote areas with limited access, Cusco's Hydro-Trencher is fully equipped to do the job at hand!
- It comes standard with cyclonic filtration technology, a vacuum system with airflow ratings of 3,500 CFM to 5,500 CFM and generating 28" Hg of vacuum, as well as a wash pump capable of 18 gpm at 3,000 PSI and high pressure water jetting.
- **Available Options:** High-pressure wash system, stainless steel tank construction, hydraulic suction boom, hydraulic vibrator, heated valves, enclosed hot water burner system, storage cabinets/stand-up lockers, *DOT 407/412 and TC 407/412 configuration.*

SAFETY
PROVISIONS

COMPONENTS

OPERATING
INSTRUCTIONS

MAINTENANCE

SAFETY PROVISIONS



Static Line



Fire Extinguisher



REAR DOOR STAND



TANK STAND

NOTICE: PLEASE REFER TO INFORMATION BULLETIN DATED JUNE 6, 2014. IT CONTAINS INFORMATION REGARDING THE SAFE USE OF THE TANK STAND AND THE REAR DOOR STAND. YOU CAN FIND THE BULLETIN ON PAGE 11, AND YOU CAN FIND IT ON THE CUSCO WEBSITE.

Static Line

- Electrostatic discharge (ESD).
- Static lines are used when combustible materials are transferred between carriers.
- They are ideally used when a discharge of static (ESD) could cause a spark and subsequent explosion.



Fire Extinguisher

- **A-Rated** extinguishers are used on ordinary combustible materials e.g. wood, paper, cloth, rubber and many plastics.
- **B-Rated** extinguishers are used on flammable liquids and gases e.g. motor oil, paint thinner, gasoline, propane and natural gas.
- **C-Rated** extinguishers are used when live electrical is involved.



REAR DOOR STAND

- Make sure the PTO is disengaged before lowering the rear door onto the prop.
- Do not use the door stand on its own at any time, especially while personnel are performing work inside the tank, or around the rear door. **Always use rear door stand in conjunction with the rear door hydraulic cylinder.**

Note: Prior to each use, the condition and operation of the stand and hydraulic cylinders should be inspected to ensure they are in proper working condition.



DANGER: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN HAZARDOUS WORKING CONDITIONS WHICH COULD INCREASE THE RISK OF PROPERTY DAMAGE, SERIOUS PERSONAL INJURY OR DEATH. IMPORTANT: REFER TO INFORMATION BULLETIN DATED JUNE 6, 2014 FOR INFORMATION. SEE PAGE 11.

TANK STAND

- The tank must be emptied before it can be lowered onto the safety stand.
- Do not use the tank stand on its own at any time, especially while personnel are performing work under or around the tank. **Always use the tank stand in conjunction with its respective hydraulic cylinders.**

Note: Prior to each use, the condition and operation of the stand and hydraulic cylinders should be inspected to ensure they are in proper working condition.



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DANGER

**DO NOT ENTER VESSEL WITHOUT
PROPER BREATHING APPARATUS**

**RELEASE PRESSURE OR VACUUM
FROM VESSEL BEFORE OPENING
INLETS AND OUTLETS**

! DANGER

! PELIGRO

**NEVER GET
UNDER THIS
TRUCK IF
THE ENGINE
IS RUNNING!**



***You may be
hurt or killed.***

**¡NUNCA SE
META DEBAJO
DEL CAMIÓN
CUANDA EL
MOTOR ESTÉ
EN MARCHA!**

Part No. 36M35644 (Rev. 9-06)
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DANGER

HIGH VELOCITY AIR INTAKE

**KEEP CLEAR OF NOZZLES
DURING OPERATION**



INFORMATION BULLETIN

Date: June 6, 2014

From: Cusco Fabricators LLC.

To: All Customers of Cusco Fabricators LLC. and all users of Cusco trucks

Subject: This bulletin is intended to provide you with information regarding the safe use of the tank stand and the rear door stand on all Cusco trucks (except for low profile trucks). The door stand and tank stand are depicted pictorially in figure 1 below.

The tank stand is designed to assist in positioning the tank in the elevated position and the door stand is designed to assist in positioning the rear door in the open position. These stands are designed and constructed to be used in conjunction with the other mechanisms on the tanks, in particular the hydraulic cylinders.

Always use the tank stand and rear door stand in conjunction with their respective hydraulic cylinders, see figure 2 (items 1 and 2).

Do not use the tank stand on its own at any time, especially while personnel are performing work under or around the tank.

Do not use the door stand on its own at any time, especially while personnel are performing work inside the tank, or around the rear door.

Prior to each use, the condition and operation of the stands and hydraulic cylinders should be inspected to ensure they are in proper working condition.

DANGER: Failure to follow these instructions may result in hazardous working conditions which could increase the risk of property damage, serious personal injury or death.



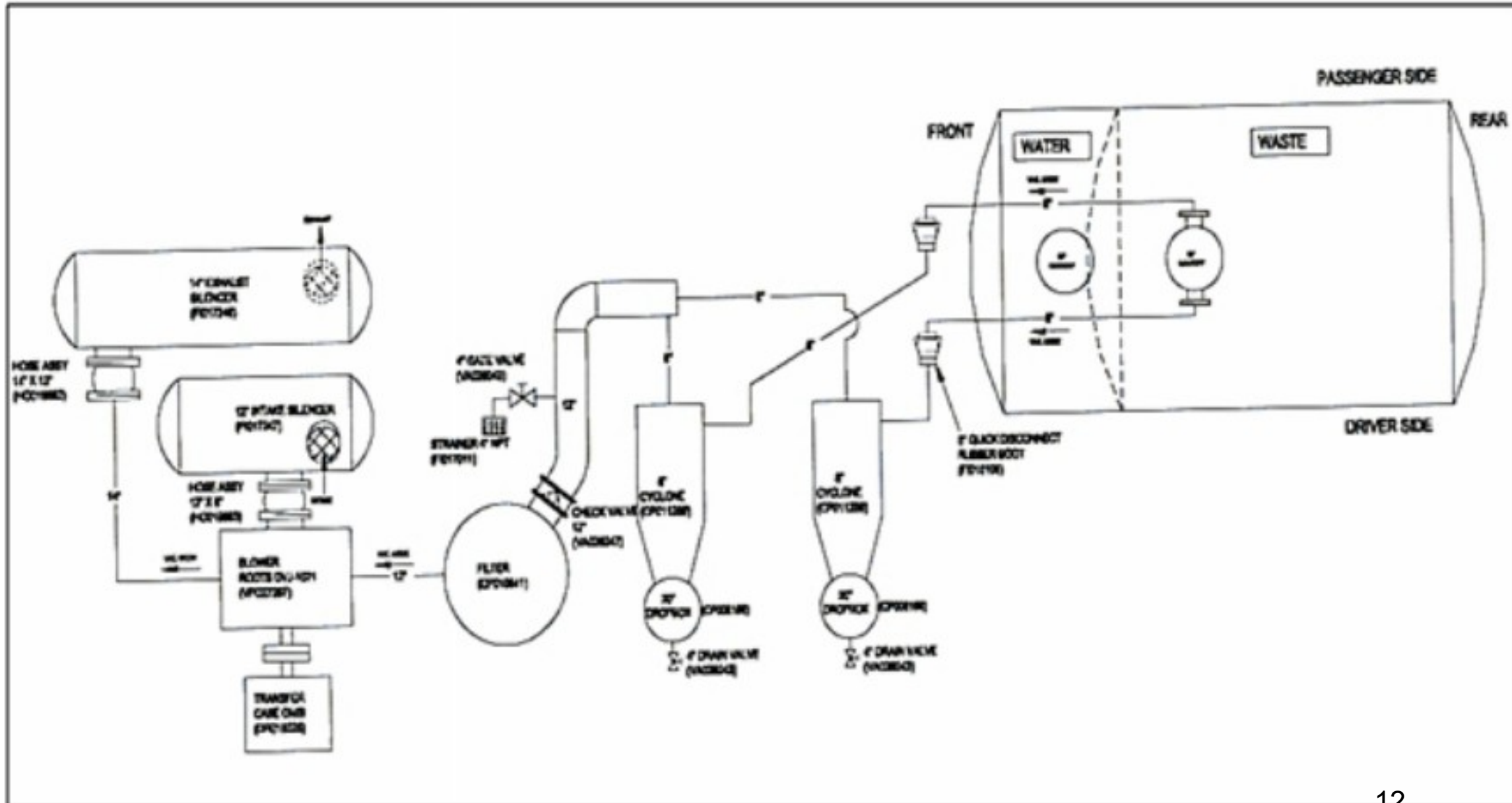
Figure 1



Figure 2

THIS BULLETIN CAN ALSO BE FOUND IN THE CUSCO WEBSITE UNDER BULLETINS

Vacuum System Airflow



Rear Door Valves

- The valves are “air-opened” and “spring-closed” and are operated from the air switch, located at each valve.
- The master emergency switch is located on the driver’s side and at the front of the hose tray.
- The 6” valve with the sand pipe is used for loading product as well as the top 6” nozzle.
- The bottom 6” valve is used for discharge.



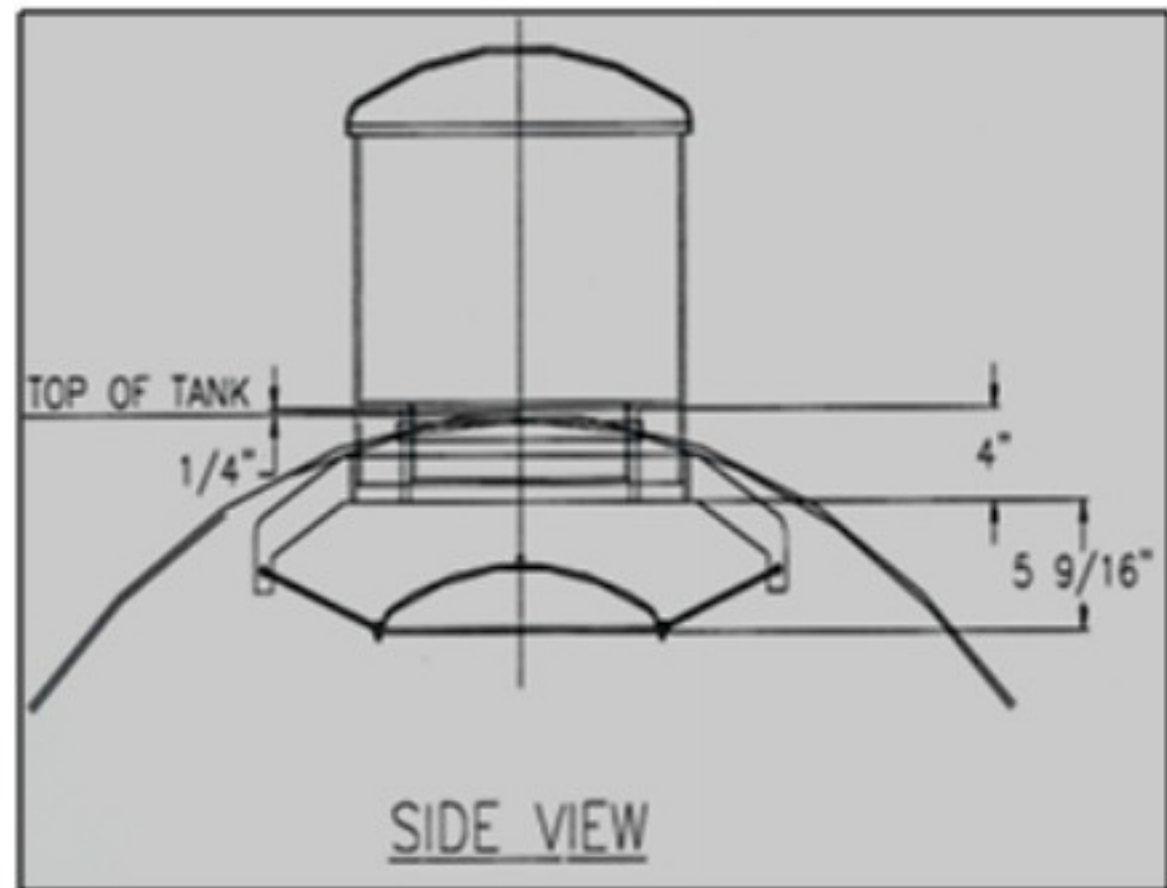
Sand Pipe

- The sand pipe is located on the load nozzle, found on the inside of the rear door.
- It is designed to carry solids that are being loaded and direct them to the front of the tank.
- The sand pipe has a deflector plate at the end of the pipe.
- *Note: The deflector plate and the pipe must be inspected for holes and signs of wear. Failure to do so may cause damage to the top of the tank.*



Primary Internal Shut-Off

- The internal shut-off is located at the top of the vacuum tank and is responsible for preventing fluids from entering the vacuum pump.
- The internal shut-off consists of a 16" stainless steel float disk and a 14" rubber seat.
- The float and rubber seat should be checked periodically.
- Check the float for dents or holes, the rubber seat for sludge buildup and nicks, as well as the chains for signs of wear and loose fasteners.



Rotary Float Gauge



- The rotary float gage is located on the rear door.
- To adjust packing, tighten the top and bottom packing gland adjuster nuts with a $\frac{1}{4}$ of a turn, alternating from top to bottom to top, until the leak has stopped.
- *Note: If the leak will not stop, the graphite packing must be replaced by removing the packing gland and installing new packing.*

Hydraulic Vibrator

- The vibrator system on your unit is operated hydraulically. This hydraulic system incorporates a relief valve set at 2500 psi and a fixed flow control valve. The vibrator is usually located at the front of the unit, on the belly of the vacuum tank and bolted to a mounting channel/reinforcing pad assembly.
- *Note: The vibrator is driven by a hydraulic motor which has been engineered to operate intermittently up to pressures of 2500 psi and with an oil flow of 0.2 – 2.5 gpm.*



Cyclone

- This high capacity cyclone assembly is equipped with a 20" diameter drop box with a bottom mounted door and a 4" brass gate valve for the drain.
- The cyclone is designed to remove heavy material from the airflow that is passing through the piping to the final filter.
- *Note: Cyclones should be drained and cleaned. Failure to do so will flood the blower and clog the filter.*



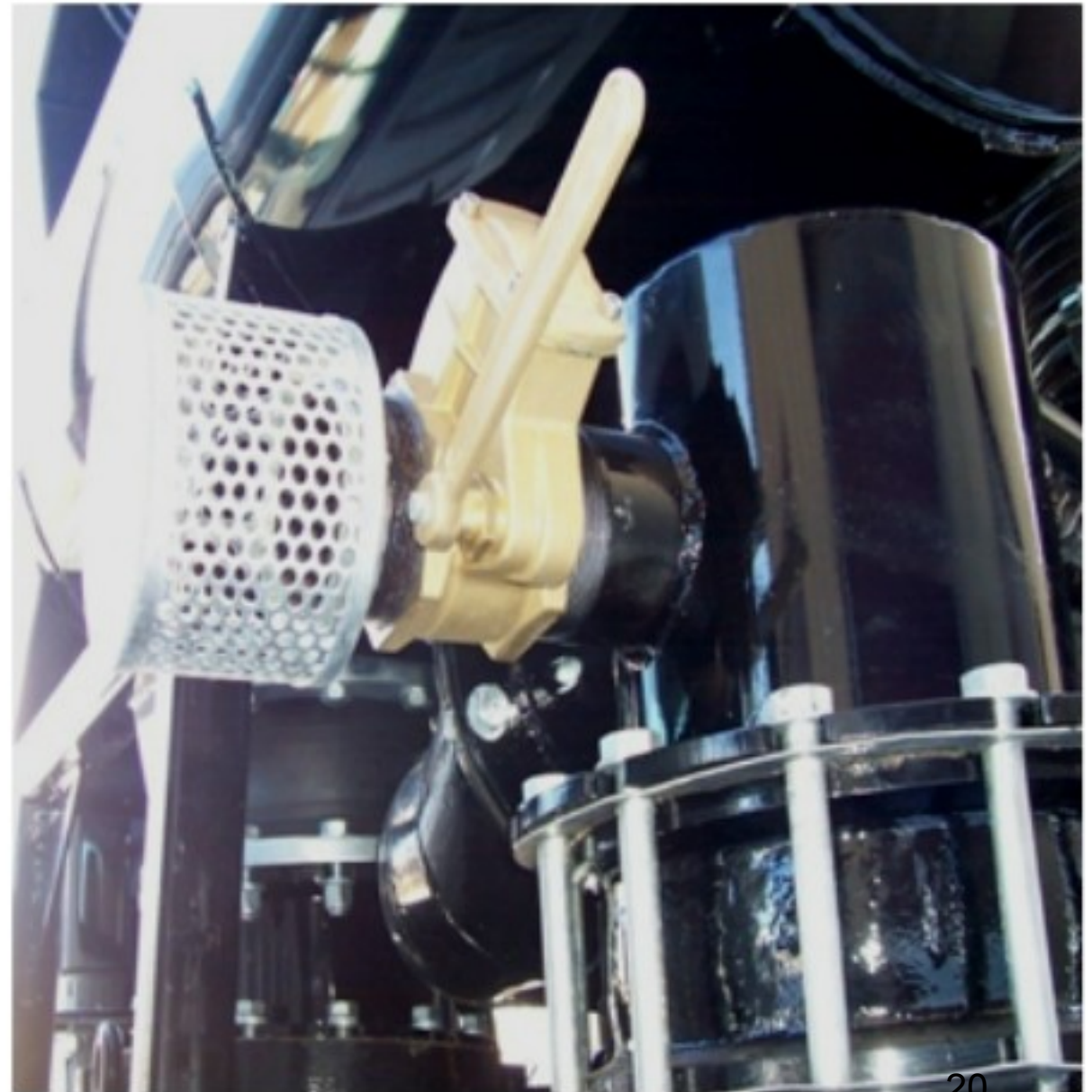
System Pressure Relief Valve

- This is a direct operated poppet and spring type valve. Where the spring constantly opposes the pressure inlet port from the outlet port, at the valve seat.
- The desired set pressure or relief is achieved by turning the adjustment shaft in for more pressure and out for less pressure.
- *Note: The maximum pressure for this system is 15 psi.*



Vacuum Relief Valve and 12" Check Valve Assembly

- The vacuum relief valve is used to release vacuum from the system on startup and shutdown of the blower.
- The 12" check is in the system to stop the blower from rotating backwards when the system is shut down, before releasing the vacuum.



Hydraulic Control Valve

- The hydraulic control valve is located on the driver's side.
- The standard control has three valve spools (one spool is a double acting spool):
 1. Vacuum pump/vibrator
 2. Rear door
 3. Dump cylinder
- The pressure relief valve is located in the inlet section of the valve body.
- The pressure relief is set to 2500 psi.



3627 Series Roots/Hibon Blowers

Blower specifications:

- Hibon and Roots blowers – 3600 CFM & 5300 CFM.

Drive:

- Driven from air shift transfer case.

Silencers:

- 12" intake and exhaust silencers.



Control Panel

- The control panel is located on the driver's side of the unit and will control the following:
 - Tachometer and speed control
 - Blower temperature gauge
 - Product tank gauge
 - Before and after filter gauges



6" & 8" Hydraulic Boom



Boom Pendant Controls

- The boom pendant controls the following:
 - Isolation valve open/close
 - Up/down
 - In/out
 - Rotation left/right

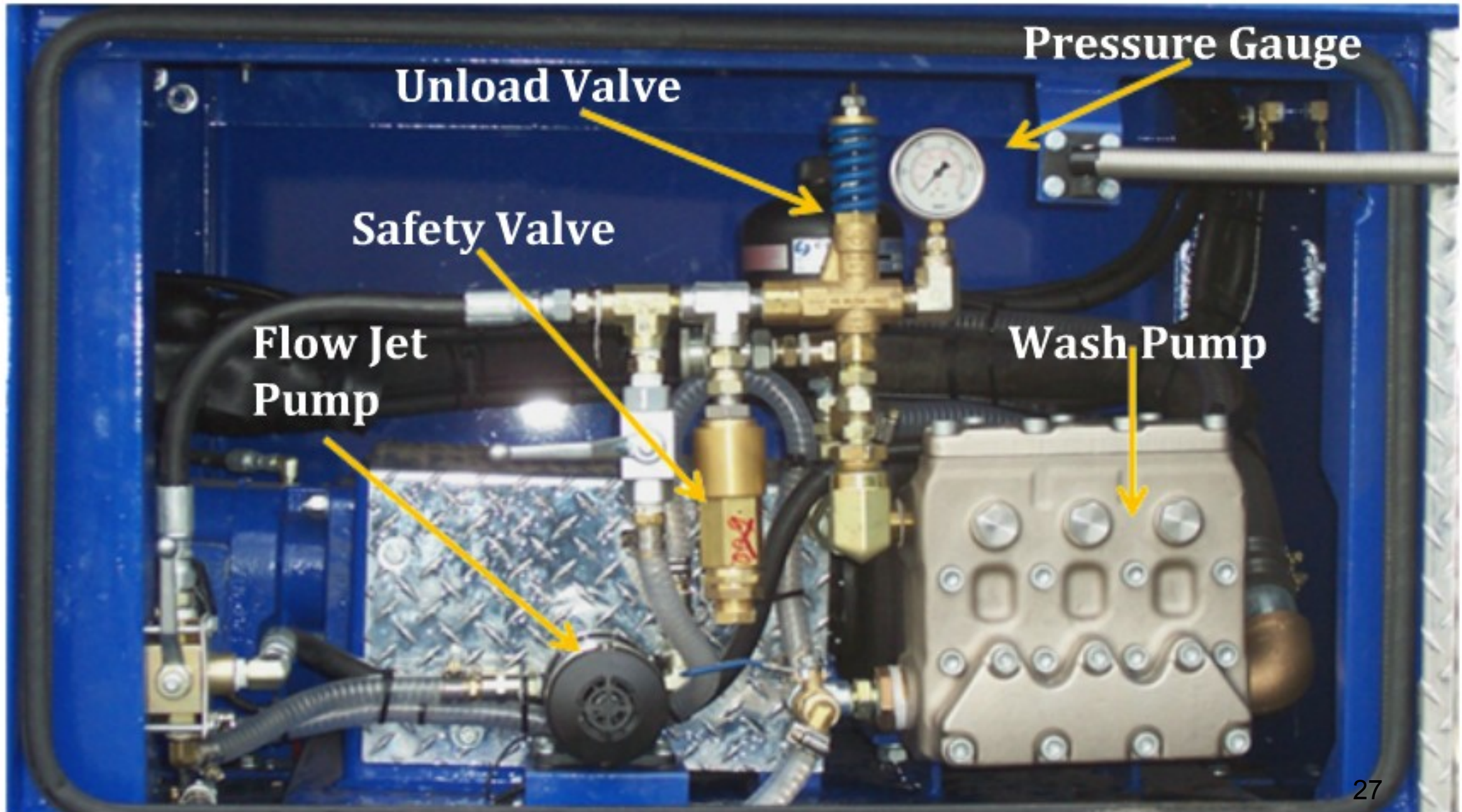


Boiler System

- Hydro Trenchers use pressurized water that will turn the ground into a slurry. The vacuum system is then used to remove the slurry, in order to safely excavate underground utilities for fiber-optic cables and natural gas lines.
- The boiler is used to heat water coming from the high-pressure wash pump. This is beneficial when cutting through ground frost or when hot water is necessary for cleanup.



Wash Pump System



Power Take-Off



Mechanical Transmissions:

- The Power Take-Off is an integral part of the main transmission.
- Before shifting the Power Take-Off into or out of gear, disengage the clutch and wait for the transmission or PTO gears to stop rotating.

Vacuum Loading

To vacuum load using a blower system:

- Enter the truck cab and start the engine.
- *Note: The blower runs at a maximum of 2600 rpm and should not run below 1180 rpm at full vacuum. The truck engine rpm is factory set and is established based on the transmission configurations. The engine rpm setting is shown on the truck dash or transfer case switch mounting bracket.*
- Open the blower vent valve on the 6" piping.
- Depress the clutch pedal and select the proper gear in your transmission, then allow the transmission gears to stop rotating before engaging the transfer case. Wait until the indicator light comes on and all air venting sounds have ceased. Slowly release the clutch pedal.
- *Note: Releasing the clutch pedal too quickly can damage the blower drive system.*

Vacuum Loading

(continued)

- Turn both the cruise control and speed control on in the cab.
- *Note: Do not increase the engine speed before engaging the blower.*
- Bring the engine rpm to required speed.
- Proceed to the rear of the vehicle, open the product loading valve and load product as required.

Blower System Shut-Down

To shut down the blower system after loading:

- Close the product-loading valve.
- Open the manual relief valve to remove excess vacuum from the tank. Run the blower at “0” vacuum for one minute to allow the blower to cool down.
- *Note: Failure to do so may cause the blower to run backwards at high speeds and may damage both the blower and driveline. However, the blower is equipped with a check valve to minimize this occurrence.*
- Reduce engine speed to engine idle and disengage the cruise control from the dash.
- Disengage the blower using the hydraulic control switch, labeled “Blower”.
- Enter the truck cab and switch the blower PTO to the disengage position. Wait until the red indicator light goes out and all air venting sounds have ceased. Slowly release the clutch pedal.

Blower System Shut-Down

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- Reduce engine speed to engine idle and disengage the cruise control from the dash.
- Disengage the blower using the hydraulic control switch, labeled “Blower”.
- Enter the truck cab and switch the blower PTO to the disengage position. Wait until the red indicator light goes out and all air venting sounds have ceased. Slowly release the clutch pedal.

Vent/Pumping Control Valve

Operation of the vacuum vent/pumping control valve:

- If at any time the blower is left running with the loading valves closed, open the manual vacuum relief valve, located near the filter housing. Venting allows extra cooling air to flow to the blower and reduces blower heat from building up which would otherwise reduce the required horsepower level.
- To resume pumping at maximum vacuum, simply close the Manual Relief Valve.

Hydraulic Dump System



Hydraulic Dump System

- The dump system on your unit has a rated lifting capacity of 20 tons, but should never be used for lifting when the tank is fully loaded. All liquids must be drained prior to lifting the tank.
- To lift the tank, proceed as follows:
 1. Drain all liquid products from the tank.
 2. Position the truck or trailer on level and firm ground. Failure to do so will create excessive stress on the dump pivot points, hydraulic reservoir and hydraulic dump cylinder brackets. It can also cause the truck to tip over.
- *Note: Never lift the tank when a strong wind is present, as this may cause the truck to tip over.*

Hydraulic Dump System

(continued)

3. Make sure all of the load and discharge connection hoses have been disconnected and the rear area of the truck or trailer is clear of all personnel and obstructions.
4. Unscrew all of the rear door wing nuts.
5. Slowly pull the rear door hydraulic valve body handle. Do not open it too quickly, as this will cause damage to the rear door cylinder and cause structural damage to the brackets.
6. Operate the lever marked “dump” and slowly raise the tank. If the tank is raised with the rear door closed, make sure the bottom wing clamps are positioned so as not to interfere with the rear frame. Full extension of the dump cylinder with the door closed, may not be possible.

Hydraulic Dump System

(continued)

7. After product has been dumped from the tank, lower the tank slowly. Never allow it to drop quickly, as this will damage the dump cylinder sleeves.
 8. When the dump cylinder has a spongy consistency or operates in a jerking motion, it is an indication that there is trapped air. To remove the air, raise the cylinder 12" and using the bleeder screw (located at the top of the cylinder), bleed off air pressure until a solid stream of oil flows out.
- *Note: You must grease the rear dump pivots and hydraulic dump cylinder pivot points every week.*

Rear Door

- All areas must be clear from personnel and obstructions when closing the rear door.
- The door gasket and mating surface must be clean, or damage could occur to the gasket.
- Go to the hydraulic control and slowly push the lever in. This will power the rear door down. Never push the lever quickly, as it will power the door down too rapidly and cause injury to the operator(s).



Rear Door

(continued)

- Engage both side wing bolts and begin tightening the rear door.
- For ease of closing, the vacuum system can be run to help pull the door in. The remaining clamps can now be tightened. Grease and lubricate the swivel hubs periodically.

Wash Pump

- To ensure the machine operates safely and efficiently, a “pre-start” maintenance inspection must be performed prior to operating the machine. You will get optimum performance from your system only if these instructions and inspections are followed:
 1. Check the pump oil level. Locate the circular site glass on the pump or the dip stick. The oil is at the correct level if the top of the oil is sited at the middle of the site glass or if the dipstick is at the “full” mark.
 2. Inspect all hoses, nozzles and guns to ensure they are in good condition. If replacements are necessary, they must be rated to withstand the machines operating pressure and temperatures.
 3. Inspect the pressure gauge to ensure the glass is intact and the pressure is at zero.
 4. Inspect the suction strainer for any dirt on the screen.

Wash Pump

(continued)

5. Attach the high-pressure gun assembly to the end of the hose reel. This must be done prior to engaging the wash pump. Ensure that the quick disconnect connections are tightly locked together.
6. Engage the hydraulic control valve slowly, so as to not harm the wash pump or the drive coupling.
7. Pull the trigger found on the pressure wand assembly to start cleaning. If hot water is required, then you must turn on the boiler.
8. To stop the pressurized water, release the trigger
9. To stop operation, release the trigger, found on the pressure wand assembly. Turn off the hydraulic system. In order to relieve the pump pressure, release the trigger for a second time.
10. To preheat the water in the water tank, remove the hand gun from the hose reel and install the quick coupling into the bypass line and start the wash-pump and boiler. This will heat the water in the tank.

Wash Pump

(continued)

- *Note: Do not drive the unit with the hydraulic system engaged.*
- *Note: Never operate the system at a psi higher than the maximum rating.*
- This wash system has been adjusted to operate at a specifically rated psi and volume, as per the specifications.
- Pressure may be reduced for lighter use by turning the pressure regulator/unloader valve counter clockwise.
- Always monitor the pressure gauge when adjusting pressure.

Wash Pump

(continued)

Procedure for winter storage and protection:

1. When the pressure washing unit is stored between uses, at temperatures below 0 degrees Celsius/32 degrees Fahrenheit all water must first be drained from the system.
2. Open the antifreeze ball valve connected to the glycol tank of full strength, winter rated , antifreeze or windshield washing fluid, rated for a minimum of -40 degrees Celsius.
3. Connect the pressure wand assembly.
4. Start the wash system and engage the trigger on the pressure gun.
5. Flush all the water out of the wash system and hose reel.
6. Operate the system until the fluid runs the same color as the antifreeze or the windshield washing fluid.
7. Your system is now prepared for storage.

Boiler System

Operating and safety instructions:

Pre start-up

1. Park the unit in a well ventilated and convenient location
2. Complete all hose connections and make sure they are securely fastened; including fuel lines and high-pressure water.
3. Connect high-pressure excavating wand to outlet hose.
4. Lock in all quick couplers used to join wand sections.
5. All power switches should be in the “Off “ position.
6. Provide adequate water supply to the high-pressure pump, then open the inlet valve.
7. Check the pump oil.

Boiler System

(continued)

Start -up

1. Start pump drive system.
2. High pressure water will flow from the pump outlet to the water heater inlet connection and through the heater coil.
3. Allow a couple of minutes for air to purge from the system until you have a good steady stream of water flowing from the pressure wand.
 - *Note: **CAUTION!** High pressure water could cause severe bodily injury.*
4. Turn on the burner switch. Burner ignition can be observed by looking at the exhaust stack. A puff of black smoke may appear for a few seconds until combustion chamber warms up.

Boiler system

(Continued)

5. When the preset water temperature is reached, the thermostat will interrupt the fuel supply to the fuel nozzles. The fuel solenoid will close. The air blower and motor will continue to operate and keep the combustion chamber purged. As the probe senses a drop in water temperature, the thermostat will activate the valve. Burner ignition is automatic and the cycle will repeat to increase or decrease water temperature.

Shut-down

1. To shut down the unit down, turn the burner switch to the “Off” position.
 - *Note: The water pump can remain in operation until the water temperature drops to about 100 degrees Fahrenheit or 38 degrees Celsius.*
2. The entire system can then be turned off.

Regular Maintenance Check

Daily:

- Check the float ball in the tank to ensure the ball has not been punctured or dented, as this will prevent it from working properly.
- Check the float cage for proper operation and ensure the rubber seat is clean.
- Check the cyclone drop box. To prevent liquids from entering the blower, the cyclone drop box must be cleaned and drained of all liquids after each operation.
- Open the filter housing door and check the stainless steel filter canister for excessive debris or damage. Clean or replace it, if required.
- Wash pump suction strainer screen.
- Wash pump oil level.

Regular Maintenance Check

(continued)

Weekly:

- If dirt buildup exists, completely remove the stainless steel filter canister and clean out the body (refer to the Filter Care and Cleaning Instructions section of this manual). Failure to completely remove the stainless steel filter canister once a week will result in the buildup of deposits in the bottom of the body and make it difficult to remove the filter canister.
- Using the sight glass, located at the bottom of the housing, check the oil levels in the ends of the blower. The oil level is correct when it reaches the top of the red point on the sight glass. The oil level can only be checked once the machine has stopped and the oil has settled. Do not overfill. Oil should be clear in color. If the oil is white or murky, contamination has occurred and the oil should be changed immediately.

Hydraulic System Oil Change Intervals

- Maintenance operations shall be limited to routine inspections of the oil level and periodical oil changes. The drain and filling plugs must be cleaned and sealed using Teflon tape or similar, at every oil change.
- The first oil change must be performed after 200 hours of operation.
- Further oil changes should be conducted every 2000 hours of operation or every six months when the truck is operated intermittently.

Hydraulic System

- The 140 micron suction strainer is located under the oil tank filler tube. This should be checked on a yearly basis, especially during cold weather or when oil starvation to the hydraulic pump is evident.
- To check the suction strainer for cleanliness, first remove the 6" pipe cap/hydraulic fill assembly and reach inside the reservoir to access the suction strainer. Then unscrew the filter counter-clockwise.
- *Note: The filter is reusable and may be cleaned. To remove hydraulic oil, clean the filter with compressed air from the inside, out. Then wash the filter in cleaning solvent.*
- The return line filter is located on top of the hydraulic oil tank. The filter should be changed after the first 10 hours and every 2000 hours, thereafter.
- *Note: Replacement filters can be purchase from Cusco.*

Hydraulic System

(continued)

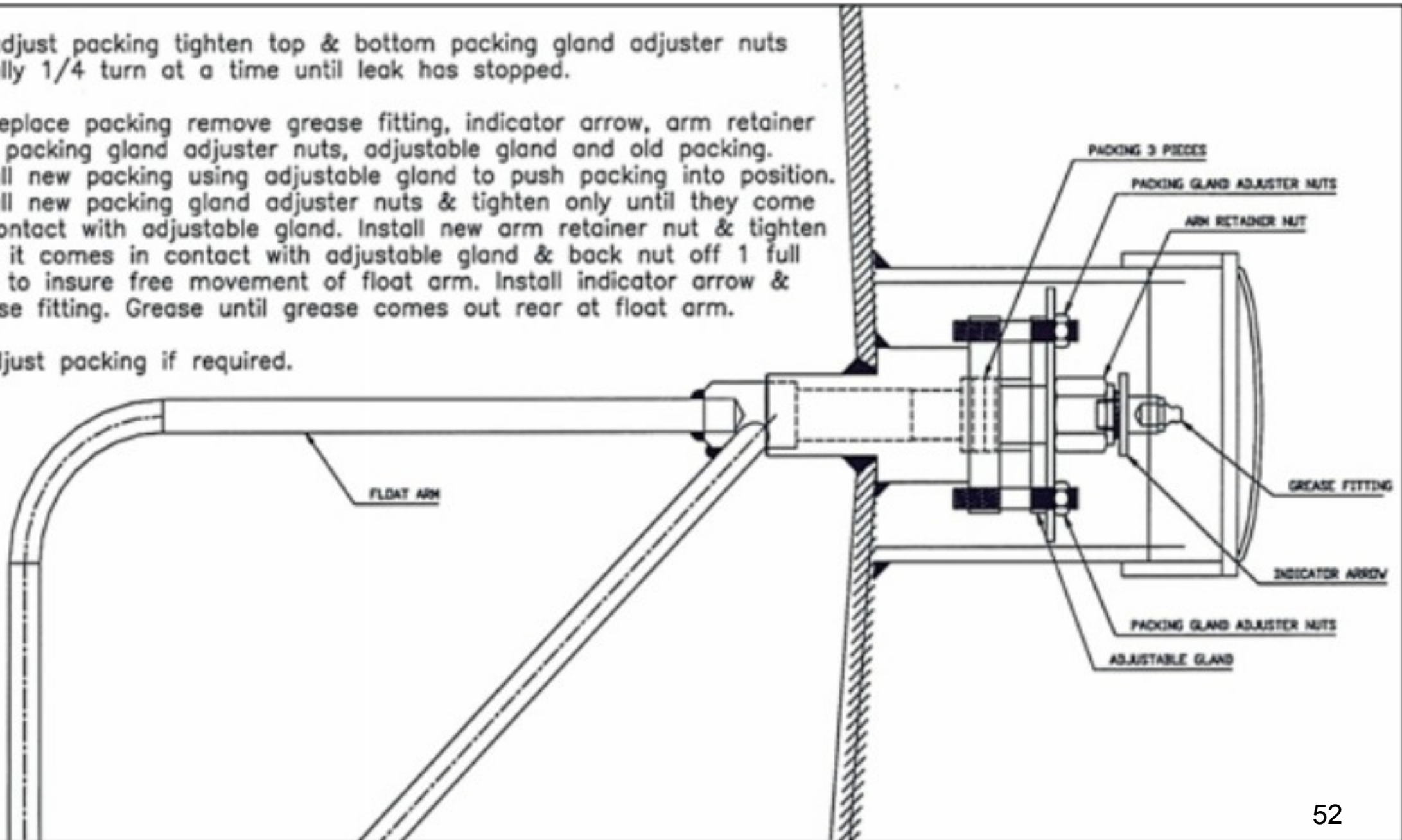
- The pressure relief for the hydraulic system is an integral part of the valve body. Settings are factory set and should therefore not be tampered with to gain higher pressures.
- This type of system requires the hydraulic oil to be changed every 2000 hours.
- There is a sight gauge located on the reservoir to indicate the hydraulic oil level. When refilling or when the hydraulic oil needs topping up, use an AW32 weight oil or equivalent.

Rotary Float Gauge

To adjust packing tighten top & bottom packing gland adjuster nuts equally 1/4 turn at a time until leak has stopped.

To replace packing remove grease fitting, indicator arrow, arm retainer nut, packing gland adjuster nuts, adjustable gland and old packing. Install new packing using adjustable gland to push packing into position. Install new packing gland adjuster nuts & tighten only until they come in contact with adjustable gland. Install new arm retainer nut & tighten until it comes in contact with adjustable gland & back nut off 1 full turn to insure free movement of float arm. Install indicator arrow & grease fitting. Grease until grease comes out rear at float arm.

Readjust packing if required.



Valve Adjustment

- When a valve or the air pot needs to be changed, the valve clevis must be adjusted to ensure the valve is not damaged.
- When the air pot is fully extended, the knife gate (found inside the valve) must be adjusted until the gate is fully opened. This will stop damage from occurring when the product enters through the valve.
- The clevis must also be adjusted to ensure the valve does not leak.



Blower Filter



Filter Care and Cleaning

- You may wish to clean an element and return it to service several times before replacing it.
- Filters can usually be cleaned by soaking them and then agitating them in a bath of neutral detergent mixed in hot water (100 degrees Fahrenheit -160 degrees Fahrenheit). Carpet shampoo may be used and is widely available in supermarkets or retail stores.
- Rinse with clean water and immediately air dry the element in a warm place. Customers have reported excellent success with industry spray wand cleaners. However, if the spray is directed outward from inside the filter and is at a 90 degree angle, the force of the spray may push the filter media away from the deck wire underneath. Spray directed inward from outside of the filter, tends to drive some dirt into the media. A spray directed at a downward angle, from the outside is usually best. Compressed air can also work well. However, while using the air gun you must be careful not to blow apart the fragile fibers (i.e. filters made of felts).

Filter Care and Cleaning

(continued)

- Filter elements have a short service life, and must be replaced once signs of wear are visible.
- Always keep a spare element on hand. To avoid downtime, you can temporarily use the spare element while cleaning the original filter element.

Lubrication Recommendations

➤ Blower Oil:

When the ambient temperature is lower than 0 degrees Celsius, use Mobil Gear SHC 630.

➤ Shell Omala 220.

➤ ISO 150 EP SYN EP.

➤ Texaco Meropa ISO 220.

➤ Castrol Alpha SP 220.

➤ AW 32 Hydraulic oil.

➤ All purpose grease.

June 6, 2014 Revisions:

This manual has been updated with the following changes:

1. Content update in “Product Overview” slide: “Safety Provisions” was “Safety Instruction”
2. Slide renamed: “Safety Provisions” was “Safety components”
3. Slide renamed: New “Rear Door Stand” was “Rear Door Safety Stand”
4. Slide renamed: New “Tank Stand” was “Tank Safety Stand”
5. June 6, 2014 Bulletin added as a slide