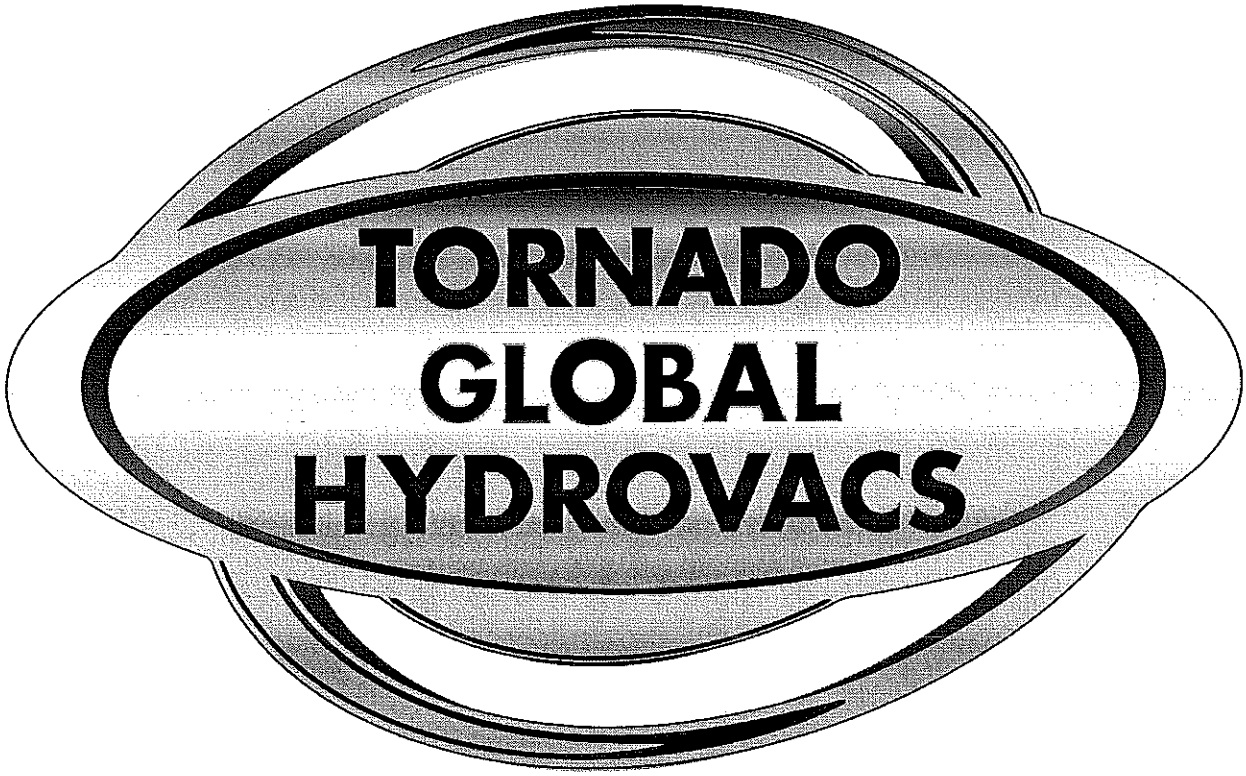


# HYDROVAC OPERATIONS MANUAL

Tornado Global Hydrovacs Ltd: Building Tornado Hydrovacs PO Box 1799, 4102 – 44th Avenue, Stettler, Alberta, Canada T0C 2L0
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# INTRODUCTION

Congratulations on choosing Tornado Global Hydrovacs as your Hydrovac manufacturer. We know there are many other manufacturers you could choose from, and we thank you for giving us the opportunity to demonstrate why Tornado Hydrovacs are the best in the industry. Tornado is proud of the quality and attention to detail that goes into every single unit. When properly cared for, your Tornado Hydrovac will give you many years of excellent service.

The purpose of this manual is to help prevent, trace and solve some of the more commonly found problems that may occur on a day-to-day basis of truck use. With the wide variations of climate and terrain, some of the procedures and preventive maintenance may not apply to certain areas. If you have any questions regarding operation in your climate please call the factory for advice.

**IMPORTANT MESSAGE TO OWNERS!**

***We strongly advise that every operator/mechanic who will work on this Hydrovac signs-off that they have read and understands this handbook completely. Ultimately, it is your investment and liability.***

- **Contact Tornado in Canada**
    - Tornado Global Hydrovacs Ltd
    - Box 1799 (Courier: 4102 – 44th Avenue)
    - Stettler AB, T0C-2L0
    - Toll Free: 877-340-8141
    - Phone: 403-742-6121
    - Fax: 403-742-1905
    - Email: info@tornadotech.com

# COMPONENTS OVERVIEW

## Water Heater

Located in the *van body.* The water heater supplies hot water for digging in frozen conditions and is located in the passenger side van body. The on/off switch for the water heater is on the control panel.

## BOOM

Located on the *top of the truck.* The boom provides removal of the liquefied soil and is located on the top of the tank. The controls for the boom are the wireless remote and the manual controls located on the rear of the passenger side fender.

## CONTROL PANEL

Located in the *van body.* The control panel controls the water heater on/off, water pump manual on/off and the wireless remote on/off and is located in the passenger side vertical box.

## ELECTRICAL PANEL

Located in the *van body.* The electrical panel provides protected power to all the different circuits operating the hydraulic functions as well as other electrical devices. The electrical panel housed the controls for the water heater and the truck's wireless remote.

## HEATERS

Located in the *van body and tool boxes.* The heaters provide warm storage for any work clothing or equipment and are located in the van body and tool boxes if requested. The on/off switch for the heaters is located on the electrical panel (on older model Tornado Hydrovacs, the on/off switch is located on the dash inside the truck cab).

## LIGHTING

The work lights provide illumination for the work area and are mounted along the sides (2), at the back (3) of the tank and on the boom (1). The on/off switch for the work lights is located on the control panel in the van body, passenger side (on older model Tornado Hydrovacs, the on/off switch is located on the dash inside the truck cab). The beacon light provides a visible marker of the trucks position and is located on the backside of the boom mount at the rear of the truck. The on/off switch for the beacon is on the dash inside the truck cab.

# COMPONENTS OVERVIEW – continued…

## VACUUM BREAKER

The vacuum breaker is a Tornado safety feature on the filter housing allowing immediate disengagement of the vacuum. The controls for the vacuum breaker are located on the wireless remote and the manual controls located on the rear of the passenger side fender.

## VACUUM BLOWER

The vacuum blower supplies the suction for removing the debris from the excavation pit into the debris tank. The vacuum blower is located directly in front of the tank and is driven by either an inline drive shaft from the Transfer Case or Hydraulically driven from a pump on the backside of the Transfer Case.

## WATER PUMP

Located in the *van body - passenger side.* The water pump provides high pressure water to liquefy the soil for removal with the dig tube. It is rheostat controlled for pressure (level 1 through 9). The water pump on/off is controlled by the wireless remote or from the control panel. If the on/off switch on the control panel is **ON** the wireless remote on/off switch will **NOT** work.

## WIRELESS REMOTE

The wireless remote controls the boom left/right, up/down and in/out, vacuum breaker open/close, the water pump on/off, ramp high/low and the engine RPM. The remote can also control the dump door latch lock/unlock, dump door open/close and mud sweep extend/retract is optional.

## WATER TANK

The water tank is the forward portion of the main body integrated with the debris tank and separated by an internal bulkhead. The water level is indicated by 5 glass bulbs with the volume sticker next to it on the front passenger side of the tank. See water fill warning note on next page.

# GENERAL OPERATING TIPS

1. Check oil levels DAILY (prior to every operation). The oil level is correct when it reaches the middle of the sight glass.

2. **Running the blower WITHOUT the filter will cause major damage to lobes.**

3. After cleaning the blower filter, let dry *completely* and always place back in filter housing. Before putting it back in the filter housing inspect the rubber seals on each end for damage. If the ends are damaged they can allow dirt to by-pass the filter and enter the blower causing blower damage or failure.

4. DO NOT throw garbage or cans into excavation site; they can cause the filter to plug up.

5. DO NOT use the boom for lifting, it is not a crane.

6. Be aware of overhead obstructions when operating the boom. Watch for power lines, trees, etc. as branches may break off hydraulic fittings on the boom.

7. DO NOT move the truck without the boom in its rest.

8. Make sure the hydraulics have been turned OFF when traveling.

9. When filling the tank with water from a pressurized source using a hose connected to the tank make sure the tank is properly vented. Maximum water filling pressure is 15psi.

10. Make sure you or your helper has control of the wand before engaging the water pump.

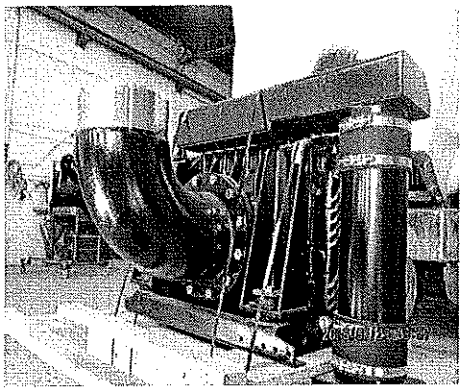
11. When excavating, keep the dig wand moving. Failure to do so increases the possibility of damaging the utility.

12. DO NOT leave the dig wand unattended with the water pump running.

13. Always use the proper grounding/bonding equipment when working around live power lines.

14. Special note for filling water tank using Water Fill Suction Valve: On all newer tanks an internal valve has been fitted to the bulkhead inside the water tank. This valve can be used to fill the water tank from an external tank or clean source. Carry out the following procedure. 1. Connect 3" fill hose to camlock fitting on front of tank and open 3" ball valve, operate suction valve lever to open position. With vacuum pump running , block off boom hose to create vacuum in debris tank. 2. Ensure that 6" top fill valve is closed and over flow valve is closed and tank will begin to fill. When tank is full release vacuum and close "water fill suction valve" and the 3" ball valve as well as the overflow valve.

# VACUUM BLOWER



*For automatic transmission trucks:* See Appendix "A"

## BLOWER ENGAGEMENT (for truck specific operation see operation tag in the cab)

1. Engage the park brake on the truck.
2. Make sure the Vacuum Breaker is OFF.
3. Disengage clutch and select gear.
4. Engage Hydraulics.
5. Engage Blower.
6. Engage clutch.
7. Set operating RPM with control panel or remote
8. Close the vacuum breaker.
9. The blower is now engaged and ready to dig.

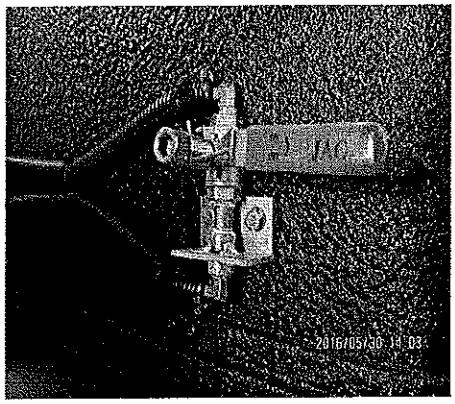
## BLOWER DISENGAGEMENT (for truck specific operation see operation tag in the cab)

1. Release Vacuum
2. Lower engine RPM with control or remote.
3. Disengage clutch.
4. Wait until the SAFE TO SHIFT light is off.
5. Disengage blower.
6. Disengage Hydraulics.
7. Shift transmission into NEUTRAL.
8. Release the clutch pedal.
9. The chassis is now ready to be driven.

# VACUUM BLOWER – continued...

## BLOWER IMPELLER LOBE LUBRICATION

1. Recommended to be done when moisture has built up on the blower lobes.
2. *Never* lube the blower when it is hot.
3. With the blower running and the truck at operating RPM, open the vacuum breaker and let the blower run for 10 minutes.
4. Close the vacuum breaker.
5. Restrict the dig hose inlet so you have suction to draw diesel into the blower.
6. Open the blower lube line valve (usually mounted on front or back of van body – driver's side) for approximately 30 seconds. You may see some white smoke.
7. Close the blower lube line valve. This valve has a spring return, if this valve becomes defective have it replaced immediately.
8. Shut the blower off.
9. The blower is now lubed.



Blower lube line valve

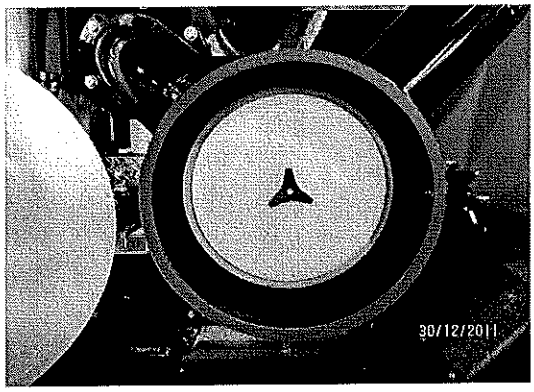
## IMPORTANT

- *Proper disengagement of the blower is critical to preventing damage to this very expensive piece of equipment.*
- If the suction hose is plugged or the suction floats are sucked closed, ***DO NOT*** depress the clutch or disengage the blower drive! Damage to the blower or chassis could occur. Open the vacuum breaker using the wireless remote or manual valve to release the vacuum in the system before disengaging the blower. This prevents the blower from spinning backwards which can cause significant damage!
- The blower requires lubrication when moisture has built up on the blower impeller lobes. This is done with the diesel line and should only be done when the blower is cool. Lubing the blower when it is hot may cause the diesel to ignite, creating a fire in the silencers and/or injury to the operator and bystanders. Failure to lube the blower on a daily basis can lead to premature seal failure and increased lobe wear. In cold climates, failure to lubricate the blower could result in the blower impeller's freezing in place resulting in damage to the drive components when the blower is started.

# VACUUM BLOWER – continued...

## BLOWER – TROUBLESHOOTING

1. **The truck will not suck**



Filter housing, door and filter

- Is the blower indicator light on (dash)?
- Is the blower engaged?
- Is the vacuum breaker closed?
- Is the filter clean? Is the housing door to the filter sealed? (see image)
- Is the cyclone clean?
- Is the tank full?
- Is the float ball in the debris tank or cyclone stuck?
- Is there debris or any obstructions in the boom hose?
- Is the transfer case engaged?
- Are the silencers free of all obstructions?
- Is the blower spinning?
- Are the valves on the dump door closed? Is the dump door closed and locked?
- Are you in the correct gear and or range?

2. **The vacuum system is howling**

- Is the vacuum breaker completely closed and sealed?
- Are there leaks in the boom turret?
- Are all the hose connections properly fastened and sealing?
- Is the debris door sealed and locked?
- Is the cyclone drain closed?

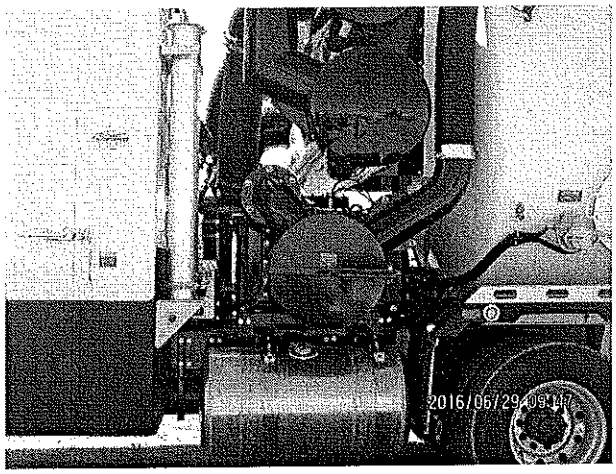
3. **The blower is overheating**

- Is the fluid level in the blower at the correct level?
- Prolonged deadheading should be avoided. When this is necessary to do a job, allow the truck to get some more air from time to time by opening the vacuum breaker, or releasing the dig tube from a sumped position.

4. **The blower will not turn**

- Are the blower lobes frozen to the housing or together?
- Is there debris in the blower?
- Is the transfer case engaging?
- With the transmission in neutral, the blower can be turned by hand to ensure that the blower is frozen or not.
- Is the truck in gear?

# FILTER

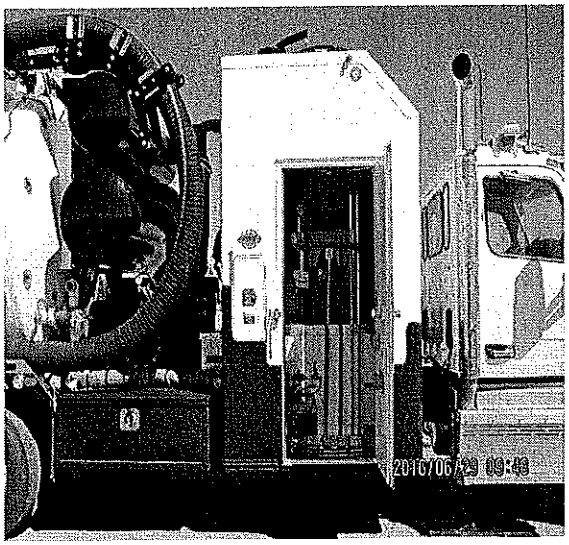


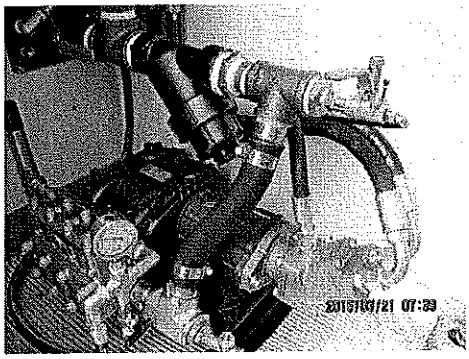


## OPERATION

- Clean the filter and cyclone daily.
- When vacuum power is dropping off check the filter and cyclone.
- Remove the filter from its housing and flush it completely using a garden hose. *DO NOT* use the spray nozzles from your Hydrovac or a pressure washer as the high pressure may tear the filter material. Allow to *completely* dry. It is also in your best interest to keep a spare filter on hand when drying conditions are not great.
- Re-install the filter, making sure the filter is properly seated in the filter housing. If it is not properly seated, particulate may be allowed to get past and cause blower damage. You do not want this to happen.
- Replace the filter if damage has occurred or if it is fouled beyond cleaning.

# WATER PUMP





## OPERATION

The water pump is hydraulically driven. *NOTE: On older Tornado Hydrovacs it is a hydrostatic hydraulic system driven by a Chelsea 489 8-bolt PTO, which must be engaged to operate the water pump, charge oil filter, oil cooler and control joystick.*

1. Make sure the glycol tank and air purge valves are closed.
2. Open the water tank supply valve.
3. *For older hydraulic systems only* – Prime the water pump by opening the ball valve opposite of the water inlet on the water pump until the water comes out.
4. With the dig wand pointed in a safe direction and the water blast valve closed engage the water pump drive by remote, by dial on the panel, or (in older trucks) by pushing the joystick in the appropriate direction.
5. Open the water blast valve to start digging.

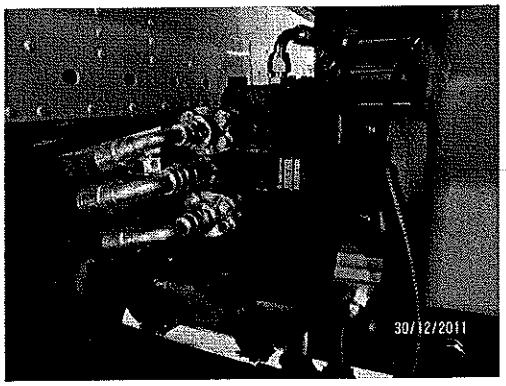
## IMPORTANT

- *Drain all water from the tank DAILY in cold weather to prevent freezing.*
- *Drain all water from the tank ONCE PER WEEK – even in warm weather. This will keep gunk, sand, rust, etc. out of the bottom of the tank.*
- The water pressure can be set with the rheostat with the wand valve open and the dig wand you want to use installed on the blast hose.
- The water system is pressure-compensating, so the pump will not turn over if the wand valve is closed.
- With the water pump engaged, closing the wand valve will deadhead (shut off) the water pump.
- The water system is factory set for a maximum system pressure of 2800 PSI @ 10gpm (or less if specified by the customer).

- **WATER PUMP – continued…**
- Check the water pump pressure gauge with the dig wand attached and the engine running at full working RPM, the water pressure should be approximately 2800 PSI (or a safe operating pressure based on the type of infrastructure being uncovered). Operating at pressures beyond 2800 PSI may result in infrastructure damage.

## WATER PUMP – TROUBLESHOOTING

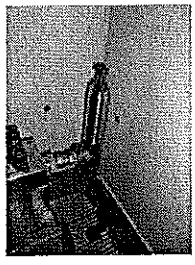
1. **There is no water**




- Is the water valve located on the water tank open?
- Is the water filter clean?
- Is there water in the tank?
- Is the water tank frozen?
- Is the inlet line form the tank to the pump frozen, leaking or restricted?
- Is the pump turning?
- Is the PTO Engaged?
- Are the wand tips free of debris?
- Is the ball valve on the end of the dig wand open?
- Is the valve from the hydraulic tank open to supply pump?
- *For older hydraulic systems only* – Are the belts tight and in place?
- Are the water heater valves open?
- Is the water pump turning? If not actuate the PCP on the pump (see picture) and see if it turns. If it does there may be an electrical problem.

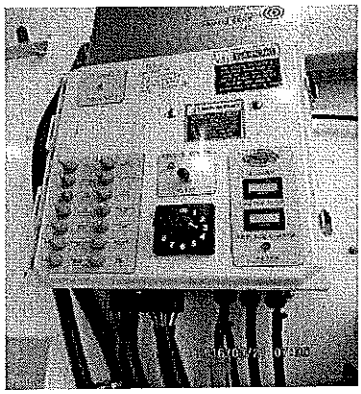
2. **There is inadequate water pressure**

- Please run through the above water source issues first.
- Check wand tips to ensure they have not bored out, or are missing.
- If the above steps do not remedy the problem, please consult the CAT info sheet in the Manual for further instructions.
- *For older hydraulic systems only* – Inspect the water unloading valve to ensure that it is functioning properly.
- Is the PRV dumping water? See picture
- Is the water heater leaking excessively?



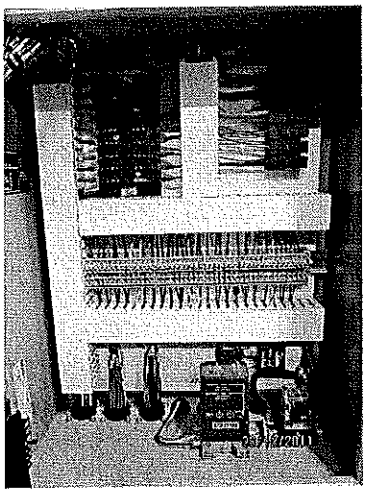
# CONTROL PANEL

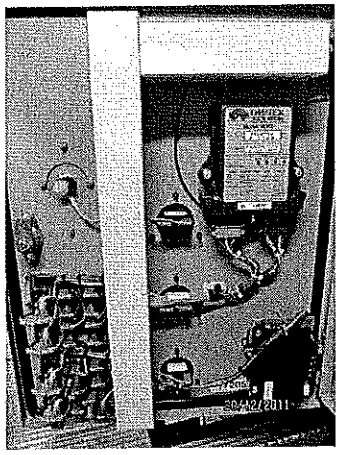
Panel (closed) will vary in appearance



## IMPORTANT

Do not perform any direct water wand washing on the seams of the control panel. The panel is splash-proof, but not fully waterproof.





# CONTROL PANEL – continued...

## CONTROL PANEL – TROUBLESHOOTING

1. **Engine RPM will not increase/decrease**

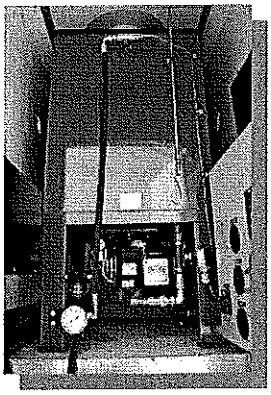
   - Make sure your feet are off the clutch and brake pedals, and they are pulled up.
   - Check to make sure speedometer is reading 0 (Zero) MPH/Km while the blower is engaged.
   - Ensure the parking brake is engaged.
   - Make sure PTO mode switch is ON and press set.
   - Ensure both remote and manual Set/Reset have been tested to rule out a faulty switch.
   - If your foot-feed (throttle) works while the PTO on/off switch is engaged, then the truck ECM is not receiving a signal from the PTO on/off switch. In normal operation this would disable the foot-feed.
   - Check connection wiring of the PTO on/off switch.
   - Other problems may include ECM wiring that has been shorted or disconnected, or possible truck programming issues. Please contact Tornado for assistance.
   - Is your spike (trailer brakes hand valve) on?

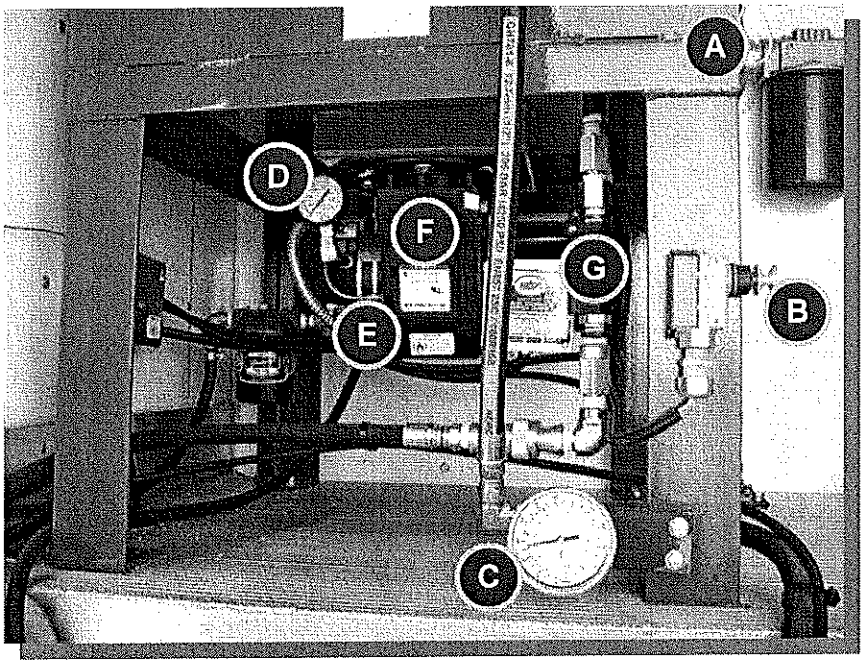
2. **Other control panel functions are not operating**

   - Check your fusing.

# WATER HEATER

Please verify which type of water heater system your truck is equipped with – 12-volt or 120-vdc.






A – Water Heater Vent Lid Cable

B – Water Heater Lid Safety Switch

C – Temperature Gauge

D – Fuel Pressure Gauge

E – Dampers

F – Burner

G – Flow Switch

## OPERATION

1. Turn inverter on for 120v system.
2. Open the water heater vent lid by pulling the vent lid cable (A) down and connecting to the water heater lid safety switch (B).
3. Flip ON the water heater switch on the control panel.
4. Proceed to dig as normal and the water heater will start on its own when heat is needed.
5. When you're going to stop digging, shutoff the water heater BEFORE shutting off the dig wand and continue running the water through the dig wand until the water coming out has cooled off. If you don't do this and the water heater has just gone through a heat cycle shutting off the water will cause the water in the water heater to turn to steam. This can not only damage the water system, it can rupture the hoses and cause severe injury and burns to the operator. Check the water temperature (C) to verify.

# WATER HEATER– continued...

## IMPORTANT

Water Heater control panel located in the van body

- The boiler requires 90-130 PSI fuel pressure on the fuel gauge (D) located on the burner to fire.
- The igniter tips should be 3/32" apart and 3/32" above the fuel nozzle when properly adjusted.
- There are air dampers (E) located on the burner that can be adjusted if the boiler is emitting excessive smoke. Gradually open the dampers until the smoke is minimized. This also helps keep carbon from building up on the coils and maintains heat transfer. You will reach a point when opening the dampers does not affect the smoking. Don't open the dampers anymore than necessary or you will cause boiler inefficiency by introducing excess cold air flow through the boiler.
- Carbon will also build up on the nozzle assembly and requires periodic inspection and cleaning.
- The water heater needs water flow to fire.
- DO NOT ignite the burner with the inspection cover off.
- If there is sufficient diesel fuel pressure and the boiler repeatedly fails to light you must let it air out or disassemble it and dry out the excess diesel fuel. Failure to do this can result in damage to the boiler and injury or death to the operator when the fuel soaked lining ignites.

# WATER HEATER – continued…

## WATER HEATER – TROUBLESHOOTING

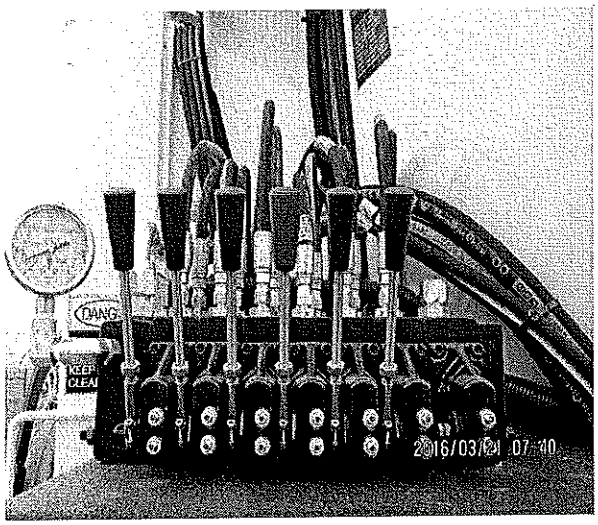
1. **The water heater will not light**

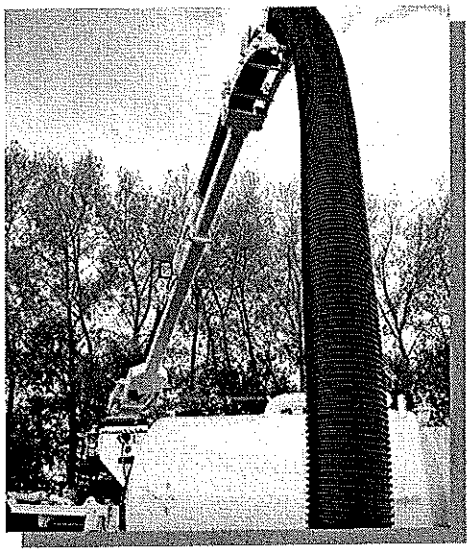
- Ensure that the water heater switch is in the ON position.
- Is the water already at operating temperatures, which will signal the temperature module to not fire?
- Is there pressure at the fuel gauge?
- Check fuel supply if insufficient pressure is present at the gauge. Pump the primer ball and inspect the fuel filter.
- If after priming, fuel remains absent, inspect the fuel lines from the fuel tank to the water pump cabinet to insure that they are intact. Look inside fuel tank on the chassis to insure that the drop tube on the fuel pickup is intact.
- Is the water heater blower motor turning?
- Is the chimney open on top of the blower housing?
- *On older systems:* Is there 500-PSI minimum water pressure? The water heater will not fire if water pressure is less than 500 PSI.
- *On newer systems:* Is there water flow? The water heater will not fire if there is no water flow.
- If the above are all in place, remove the burner nozzle assembly from the water heater housing, and visually inspect electrodes for condition, spacing and moisture. The electrodes should be spaced 3/32" from the burner nozzle and 3/32" apart.
- *For 12-volt systems only:*
- Test pressure switch to insure it is functioning correctly.
- If the boiler squeals, then the ignition system is attempting to light. This would signal that the 12-volt ignition system is functioning correctly.
- If the water heater does not sound like it is attempting to light, then check power supply to the ignition coil. If there is power to the coil, then the ignition coil will need to be replaced.

2. **The boiler lights, but will not continue to function**

- Remove and inspect flame-detection eye. Is the flame eye damaged or covered over? The flame eye is mounted below the ignition coil, inside the burner. If damaged, replace. If dirty, then clean.
- If flame eye is intact, check fuel level in the fuel tank and dip tube level/condition.
- Insure that the chimney is open; otherwise the boiler will fire, but will not have enough air to continue to burn.

# TOPGUN BOOM





## OPERATION

1. Turn on hydraulics
2. Operate the TOPGUN boom either by remote or manual controls (functions are labeled accordingly).

## IMPORTANT

- Check the rock head deflector plate *weekly* for wear damage. If this area fails, further (and much worse) damage can occur to your turret.
- *DO NOT* use the boom for lifting, it is not a crane.
- Be aware of overhead obstructions when operating the boom.
- Watch for trees and over head wires, branches may break off hydraulic fittings on boom.
- *DO NOT* move the truck without the boom in its rest.
- Newer truck do not have the boom pipe

# TOP GUN BOOM – continued...

## TOPGUN BOOM – TROUBLESHOOTING

1. **The boom will not move**

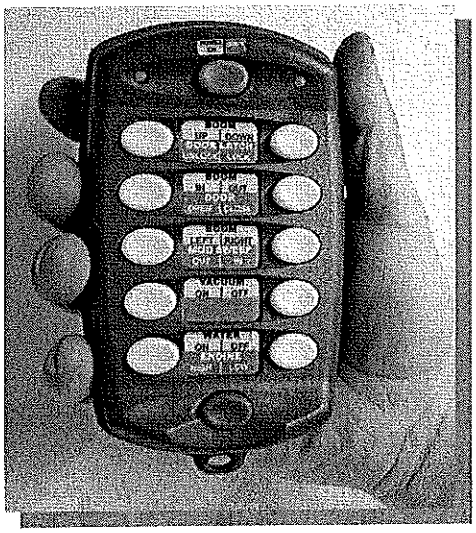
   - First go through the hydraulic troubleshooting steps, as the problem is most likely hydraulic.
   - When very cold outside, the boom may ice up at the turret gear, or the hydraulics may be cold and should be warmed up by running
   - Ensure that the orbit motor which drives the rotation of the boom is functional.
   - If all hydraulic components are sound, review the Remote-Control troubleshooting steps.

2. **The boom is plugged**

   - First check to make sure the tank is not full. Sometimes the float arm may be stuck.
   - Detach dig tube and look through it to ensure there are no obstructions.
   - Detach the hose at the rock head and look for obstructions. At the same time you should visually inspect the wear plate on the backside of the rock head for excessive wear or holes. If any exist, replace wear plate.

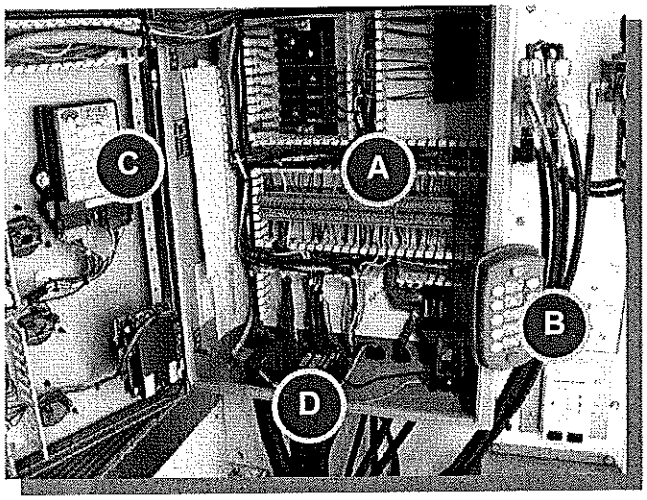
# WIRELESS REMOTE

## OPERATION



Handheld remotes may vary in appearance

1. Turn on the remote ON/OFF switch located on the main control panel
2. Turn on the handheld remote ON switch (green button).
3. Use control as required (functions are labeled accordingly).
4. Green ON must be depressed and held down to use any of the "second function" buttons (green labeled functions).
5. If the remote has not been used for more than 10 min it will automatically shut off and cause the water pump to stop, should it be operating via remote. To turn it on again hit the green button and if necessary you may have to re set the water pressure.
6. The red button shuts the remote off




A – Electrical Panel

B – Handheld Wireless Remote

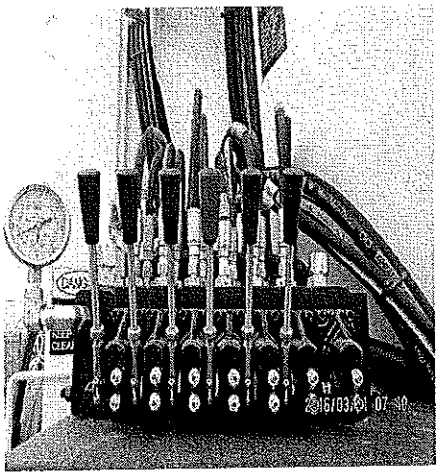
C – Wireless Receiver

D – Water Pump Control Module

# WIRELESS REMOTE – continued...

## IMPORTANT

- If the wireless remote is simply not working, the manual controls on the back of the Hydrovac can be used as a backup.

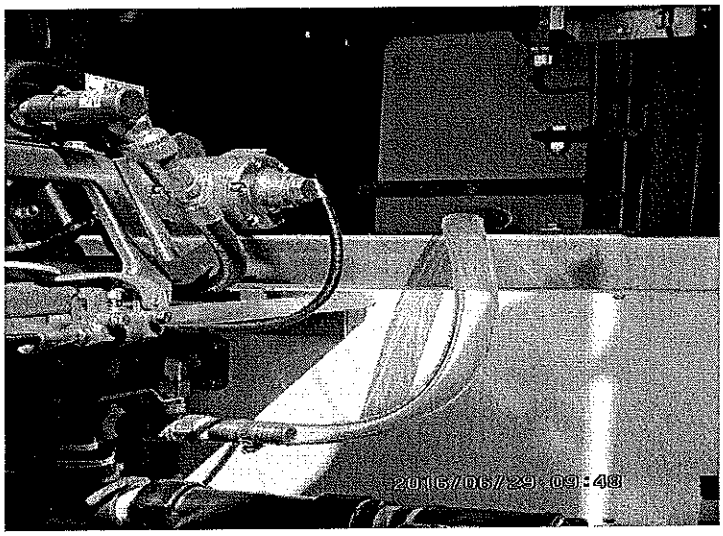


## WIRELESS REMOTE – TROUBLESHOOTING

1. **The wireless remote has stopped working**

   - Does the light on the handheld remote go on when ON button is depressed? If not, change or re-charge the battery.
   - When activating functions on the remote handheld remote, the lights on the receiver should go on, showing that there is a connection between the handheld remote and receiver. First re-test with a fresh battery; if that does not remedy the issue, there is a problem with the handheld remote or the receiver and ground.
   - Insure that the antenna connections are in place.
   - Insure there is power getting to the receiver.
   - If the handheld remote test lights reflect that there is power and signal, when pressing buttons on the handheld remote, but the "output" light does not come on, then there is a receiver problem. This will most likely require a replacement receiver.
   - Does the handheld remote light flash faster when function buttons are depressed? If not, the buttons could have water damage or need replacing. If the receiver does not receive a signal, the handheld remote may need to be reprogrammed to the receiver.
   - If all attempts fail, refer to the Omnex manufacturer's manual for further troubleshooting instruction.

# WINTERIZING SYSTEM




**IMPORTANT**
*The winterizing system (consisting of anti-freeze tank, lines, valves and winterizing solution) needs to be used whenever the temperature drops below freezing. (NOTE: Use winter windshield wash fluid.)*

## PURGING THE SYSTEM

1. Close the water valve on the tank.
2. Put the valve of the wand hose out of the cabinet with the valve open.
3. Open the air supply valve on the *winterizing solution* system slowly if equipped.
4. Leave the air valve open until the water stops coming out.
5. Close the air supply valve.

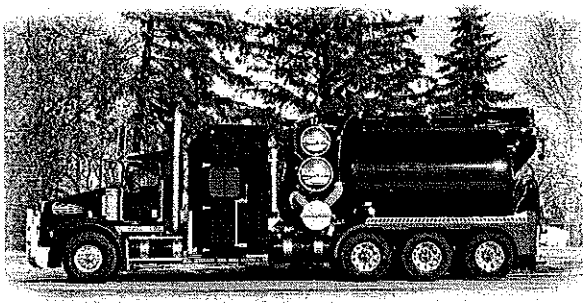
## CHARGING THE SYSTEM WITH WINTERIZING FLUID

1. Open the *winterizing solution* valve.
2. Pump the *winterizing solution* through the water system until it comes out of the valve on the wash hose.
3. Close the *winterizing solution* supply valve.
4. Close the valve on the hose and reel up the hose.

## RECLAIMING THE WINTERIZING FLUID

1. Put the end of the wash hose into the *winterizing solution* tank with the valve open.
2. If equipped with air push the *winterizing solution* out with air pressure.
3. If not equipped with air open your water tank valve and pump the *winterizing solution* put with your pump until you see water then stop. **If you think your fluid has been diluted with water beyond the freezing point replace the winterizing solution.**

# HYDRAULIC SYSTEM



The hydraulic system on your hydrovac consists of a pump, return filter, oil level sight glasses, oil temperature gauge, pressure gauge, valve block and oil tank. The hydraulic system is driven off of the front of the transfer case. The pump is fed oil from the hydraulic tank and has its own pressure line running to the individual system. The hydraulic vane pump supplies oil to the control block on the back corner of the passenger side fender, this controls all of the hydraulic components. The control block is electric over hydraulic and directs oil to the various functions to a maximum of 2000 PSI -2500 PSI. Manual levers are also installed for manual engagement of the valve in the event the electric system fails to operate. The filter should be serviced at regular intervals. Filters should be changed after the first 50hrs of service.

## OPERATION

- Check the oil level sight glasses.
  - The oil should fill the bottom sight glass and be half way up the top sight glass for optimum performance.
  - Do not turn on the hydraulic pump if the oil cannot be seen in the bottom sight glass.
  - Make sure the valves are OPEN from tank to pump.
- Engage the transfer case.
- The hydraulic cooler fan should be ON whenever the truck is operated for more than one hour in ANY weather
  (hot or cold).

*For older PTO-driven hydrovacs:*

- Engage the PTO. Both pumps are engaged with the Chelsea 489 PTO control located on the floor beside the driver' seat or dash. The hydraulic pump for everything except the water pump is driven off the back of the hydrostatic pump for the water pump drive. Ensure the PTO has come to a complete stop before engaging or disengaging the hydraulics.

# HYDRAULIC SYSTEM – continued...

## IMPORTANT

- With the hydraulic pump engaged there should be between 400-600 PSI on the pressure gauge mounted to the control block on the rear corner of the passenger-side rear fender.
- Standard maximum system pressure is between 2000 PSI and 2500 PSI. To check this move the mud sweep control lever in the retract direction until the needle on the pressure gauge stops climbing. This is your maximum system pressure. To increase or decrease this, adjust the pressure relief on the valve block.
- When removing any hydraulic line, the hydraulic system should be turned off. All hydraulic equipment should be in a resting position with line pressure bled off, and valves from the tank shut off. Cap or plug hoses and fittings.
- The hydraulic cooler fan should be ON whenever the truck is operated for more than one hour in ANY weather (hot or cold).
- If hydraulic oil temperature is too high (130°F is normal operating temperature) contact Tornado immediately.
- Notify Tornado of any alterations, or speak to them first before performing any hydraulic alterations.

## HYDRAULIC SYSTEM – TROUBLESHOOTING

1. **The Hydraulics are not working.**

    - Check oil level in hydraulic tank.
    - Make sure valves are open on the tank.
    - Ensure that the suction line valve is in the open position. The valve is located on the hydraulic tank.
    - Is the Hydraulic Switch on?
    - Is the dash light on?
    - Ensure air solenoid is engaging, or check for air pressure. This is located on the main control panel.
    - Operate the Hydraulics manually, to insure that it is not purely a remote control problem.
    - Check Hydraulic Oil Filters.
    - Check for leaks in fittings and hose.
    - Check for leaks in Rams.
    - Ensure that the Hydraulic Pump is functioning.
    - Confirm that the system pressure is operating at least 1800 PSI.
    - The functions work with levers and not via remote, remove and clean the backpressure valve located on the front end of the outlet section.

If you are experiencing any difficulty with either the (a) **Auxiliary Hydraulic System**, or **(b) Water Pump Drive Hydraulic System**, please contact your Tornado service representative.

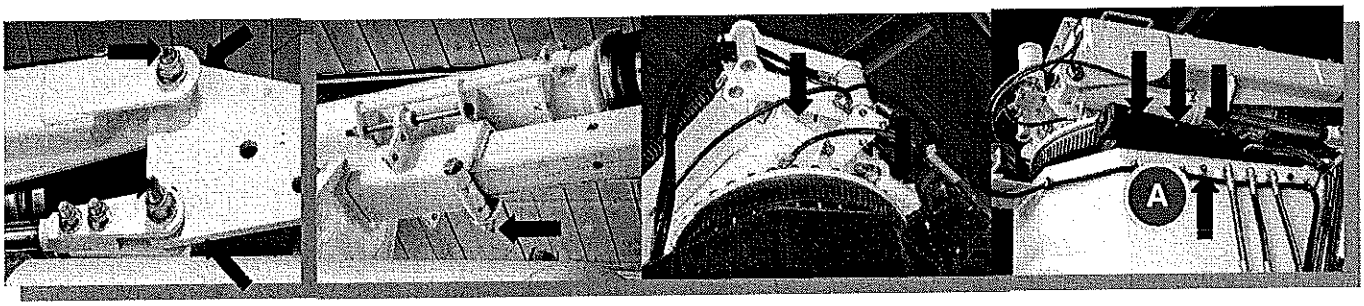
# SERVICE INFORMATION

## GENERAL SERVICE POINTS

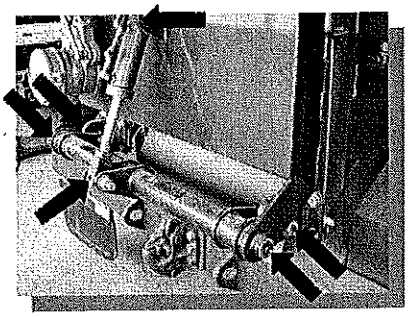
- Check oil level DAILY (prior to every operation). The oil level is correct when it reaches the middle of the sight glass.
- The oil level can only be checked with the machine stopped & everything sitting for at least 5 minutes.
- The first oil and filter change should be conducted after the first 50 hours of operation on the hour meter. (Blower, Transfer Case, Water Pump.)
- Subsequent oil changes should be performed at 500 hour intervals.
- The hydraulic oil does not need replacing unless a component failure occurs or contamination. If this occurs the entire system must be drained, flushed and filters changed.
- Subsequent filter changes should be every 6 months.

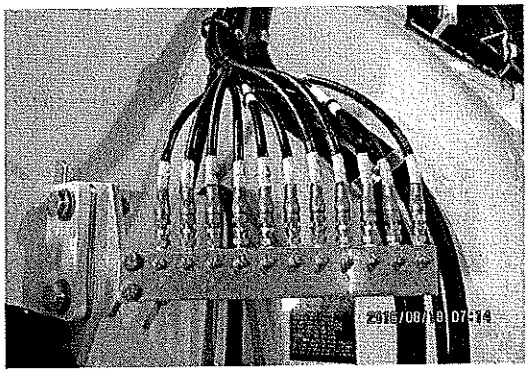
## GREASING

- The bearing at the base of the boom requires grease weekly. To grease the bearing, locate the grease manifold system at the top of the passenger side dump door. Attach the grease gun and start pumping grease. While pumping the grease, rotate the boom around to the driver side. Once the boom reaches the driver side, swing it back around the truck to the boom rest. You should be pumping grease this whole time. Once the boom is back to the rest the bearing greasing is complete.
- The turret fitting (A) grease point requires excess grease – sometimes up to half a tube.
- Periodically grease all pivot points (x6) and roller (x1) on the boom.




- Periodically grease all mud door pivot points (x6).





- Periodically grease all drive line u-joints (x8) – no photo shown.
- Periodically grease all blower drive shaft points (x3) – no photo shown.
- Periodically grease all slip joints. These are different per truck – no photo is shown.
- Grease the chassis according to the manufacturer's specification.
- Starting **Feb 1/2013** all trucks are now fitted with a greasing manifold system mounted at the top passenger side of dump door hinge. A decal posted near indicates intervals' and amounts per grease point. This will eliminate the need to climb on top of the tank.

# SERVICE INFORMATION – continued...

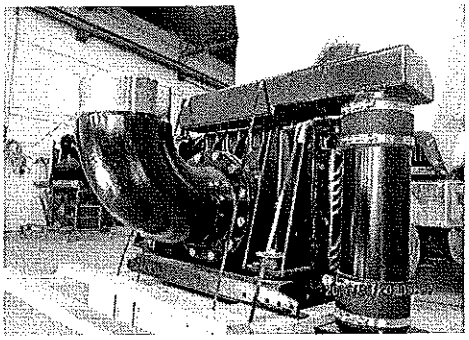
## OIL CHANGE PROCEDURE

1. When the temperature is below 18C/65F, run the equipment (that you're changing the oil in) for 15 minutes to warm up the oil.
2. Shut off the equipment and shut off the truck engine.
3. Remove the drain plug and drain the oil out of the equipment being serviced into a catch pan and dispose of properly.
4. Clean the drain plug off and reapply a thread sealant and reinstall the drain plug.
5. Install the specified amount and type of oil into the equipment. (Every piece of equipment on the hydrovac does a unique job and typically requires a different type of oil for its use. Failure to use the correct amount and type of oil can result in equipment failure)
6. Check the oil level to make sure it's within the normal operating range. (An excess or shortage of oil can cause overheating and equipment damage)

## OIL REQUIREMENTS

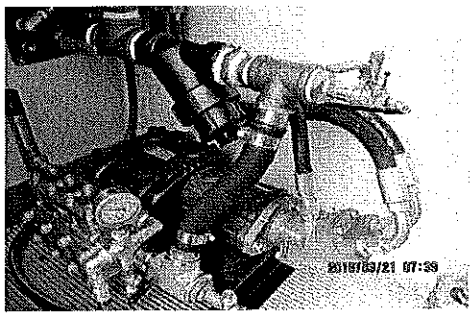
- All oils should be a non-detergent type to prevent foaming and overheating. Tornado recommends using synthetic oils wherever possible to provide maximum component life.

## ROBUSCHI 105, 125, 145 BLOWER



- Use oil with an ISO-VG of 220 if operating above 30˚F and ISO-VG 100 if operating below 30˚F.
- The gear box end needs 3.50L (105), 4.80L (125) 10.50L (145) and the drive end needs 1.60L (105), 2.80L (125) 6.00L (145) of oil.
- The oil level in the blower should be filled until the oil enters the center of the sight glass. Go slow – it takes a few minutes to run down.

## PRATISSOLI WATER PUMP HF 25, KT 28



- Use ESSO TERESSO 220.
- The Pratissoli HF 25 requires 3.8L while the Pratissoli KT 28 requires 2L