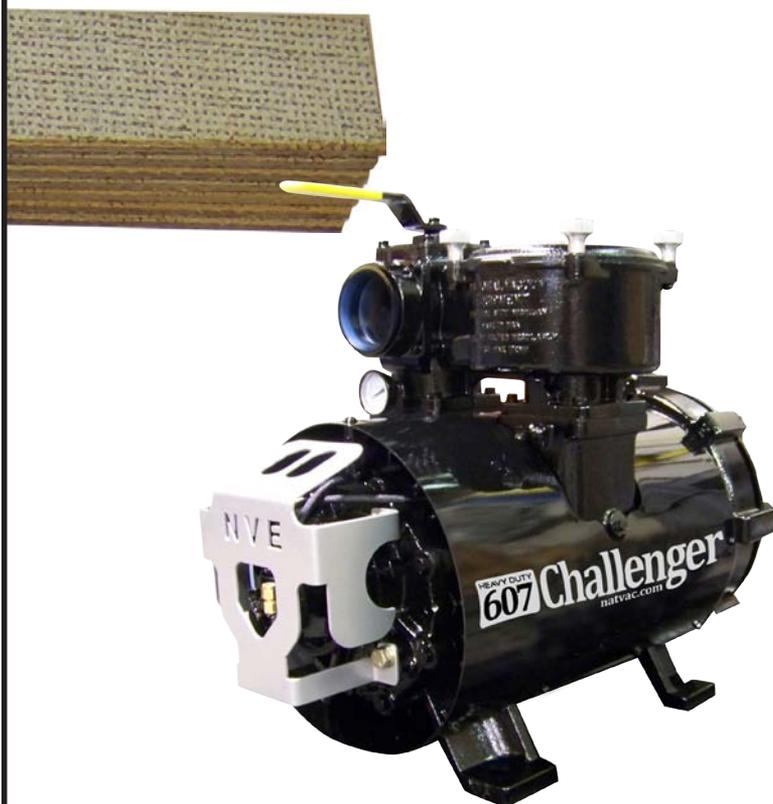


# Vane Replacement & Complete Rebuild Manual

*607 Challenger Series Rotary Vane Vacuum Pumps*



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# 607 Challenger

## Owner's Record

Date of Purchase: \_\_\_\_\_

Purchased from: \_\_\_\_\_

Serial Number: \_\_\_\_\_

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# Introduction

## General Information



### About National Vacuum Equipment

***Congratulations!*** You now own a quality vacuum/pressure pump proudly manufactured in the U.S.A. by National Vacuum Equipment, Inc. You have not only acquired a superior piece of equipment from a qualified dealer, you have hired a team of vacuum experts. We stand ready to work with your dealer to answer your questions and provide you with the information necessary to keep your equipment in peak working condition.

Thank you for using National Vacuum Equipment.

## Our Mission

We are dedicated to the manufacture and wholesale distribution of quality vacuum system products at a reasonable price, on a timely basis. We are a “one-stop shop” for manufacturers and distributors of vacuum equipment.

## Our History

National Vacuum Equipment, Inc. was founded in 1980 by Bruce Luoma. The Company started as a retailer of vacuum pumps. Soon after it started, the Company secured the rights to exclusive distribution of the Battioni vacuum pumps in North America. This helped the Company to evolve into its current status as a wholesale supplier.

To reach the goal of becoming a full service supplier of vacuum system components, the Company began fabrication its own line of componentry, purchased and developed its own line of vacuum pumps, and began purchasing for resale various valves and accessories.

Today, NVE has full service machine, fabrication and powder-coating shops complete with CNC-controlled production equipment designed for close tolerance work. The company has a highly trained staff all of whom are dedicated to quality.

# Pump Rebuilding

## 607 Fan & Liquid Vane Replacement



1. Clean off the exterior of the pump



2. Remove the oil line guard.  
Disconnect all oil lines feeding from the oil pump

Uninstall the oil pump from the rear bearing cover.



3. Remove the four (4) bolts that hold the rear bearing cover to the rear endplate and note that the wave spring seal is to be re-used.



4. Remove the oil pump drive key from the end of the rotor.



5. (Fan Cooled Only)  
Remove the fan shroud supports connecting the shroud "tin" to the rear endplate.



6. Remove the top two end-plate bolts and replace with two (2) 3/8-16 stud/dowels (or de-headed bolts), and then remove the remaining bolts.



7. Remove the rear end-plate with a gentle "wiggle", clean gasket surface and remove the vanes for inspection.



8. Inspect the original vanes for any delamination, chipping or other damage.

If any of the vanes are worn more than 1/4", are chipped or delaminated they should be replaced.

We highly recommend replacing vanes in sets. Apply a liberal amount of lubricant to the vanes before installing in the rotor slots.

It is always a good idea to have a spare set of replacement vanes on hand to reduce pump downtime.



9. Install one (1) new endplate gasket between the housing and the endplate, **do not use any gasket sealer.**

Carefully guide the endplate onto the rotor and threaded dowel pins

**(Fan Cooled Only)** Reinstall the eleven (11) self-tapping screws and holding the fan shroud to the rear end-plate. Fasten the upper fan shroud tin to the fan shroud support on the rear endplate.



10. Insert the two (2) “T-handle” pins provided in your rebuild kit through the endplate and into the locator holes at 3 and 6 O’clock positions on the housing.

Snug the endplate close to the housing.

**(Liquid Cooled Only)** The 3/8 hex bolts located on the water jacket side of the pump housing need to have high temperature (Red) RTV Silicone re-applied.

Install the hex head bolts.

Reseat the outer bearing in the endplate pilot.

Tighten the endplate bolts to 35-40 ft-lbs of torque.



At this point you should be able to turn the rotor by hand.

11. Reinstall the oil pump drive key in the rotor.

Reinstall the oil pump / rear bearing cover. Ensure the oil pump shaft is aligned with the drive key.

Reconnect the oil lines to the oil pump, and front bearing. Do not overtighten fittings.

Reconnect the pump to its oil reservoir and start at a slow R.P.M.

Run the pump for a few minutes to allow oil to fill the lines. Inspect the translucent oil lines to check that oil is flowing.



# Pump Rebuilding

## 607 Fan & Liquid Complete Rebuild



1. Clean off the exterior of the pump



2. Remove the oil line guard.  
Disconnect all oil lines feeding from the oil pump

Uninstall the oil pump from the rear bearing cover.



3. Remove the four (4) bolts that hold the rear bearing cover to the rear endplate and remove the rear bearing cover.



4. Remove the oil pump drive key from the end of the rotor.



5. **(Fan Cooled Only)** Remove the eleven (11) self-tapping screws that fasten the fan shroud “tin” to the pump. Remove the fan shroud support connecting the fan shroud “tin” to the rear endplate.



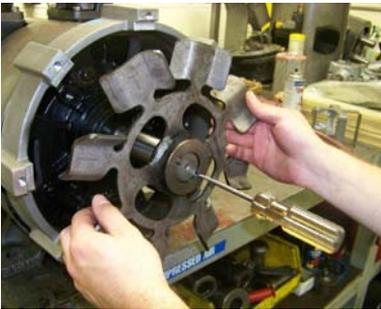
6. Remove the top two (2) bolts that hold the rear endplate to the pump housing and replace with two (2) 3/8-16 threaded dowels. Once in place, remove the lower six (6) 3/8 hex bolts.



7. Remove the rear endplate, gasket, and vanes.



8. Place a cushion beneath the rotor to prevent damage when the front endplate is unbolted (cardboard, rag, etc.).



9. **(Fan Cooled Only)** Remove the fan guard on the drive end side of the pump. Remove the fan and key from the rotor drive end by first loosening the fan hub screw. You may find it necessary to drive the hub apart with a screw driver in order to slide the fan assembly off of the rotor.



10. Repeat step 6 to drop the rear end of the rotor down onto the cushion.

**(Fan Cooled Only)** Remove the six (6) hex bolts holding the aluminum fan shroud to the front endplate and remove the shroud.



11. Gently guide the front endplate off of the (2) 3/8-16 threaded rod segments to fully settle the rotor body on the base of the housing bore.

**Remove the rotor with care from the housing. Place a Tag on the housing side that corresponds to your drive end side!**



12. Remove the four-way assembly, gaskets, and check valve assembly. Carefully turn the housing upside down so that the pump feet are facing the ceiling.

13. Inspect the housing for wear or damage. If the housing needs to be bored or honed, remove only as much material as is necessary to give a smooth clean bore.

The maximum overbore we recommend is 0.060 inches. A new housing has a bore of 7.875 inches.

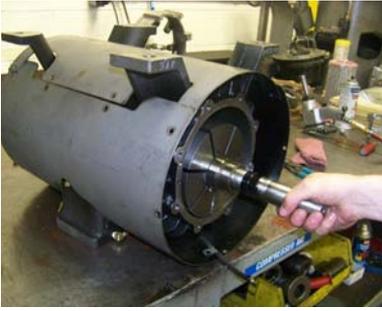
If you bore or hone the housing, remove all connected accessories, including the fan shroud, 4-way valve, gaskets, etc.



14. Clean the housing of any debris and apply a liberal amount of lubrication to the housing bore.



15. (Optional) If there is damage evident to the bearings, they will need to be replaced. Once the rotor is removed, start by cutting off the old bearing inner race on both ends of the rotor. Be sure to line up the cutting wheel with one of the vane slots so as not to damage the rotor or seal sleeve.



16. Clean the rotor and rotor slots and inspect the rotor for wear or damage.

Place the clean rotor inside the housing with the drive end in the same orientation it originally was. This will be the side you tagged in step 11 of this procedure.



17. (Continuation of Step 15)  
Remove the two (2) inner races from the replacement bearings provided in your repair kit.

Place the inner races onto a hot plate and get them hot. Do not leave them on the plate so long that they become discolored.

Use a welding glove to take the hot inner race from the hot plate and slide it onto the rotor shaft.



The bearing race shoulder should be tight against the seal sleeve.

Install on both sides of the rotor.

Allow ample time for the inner races to cool and set onto the rotor before continuing.



18. Inspect the original vanes for any delamination, chipping or other damage.

A new vane is flush with the outside diameter of the rotor.

If any of the vanes are worn more than 1/4", chipped or delaminated they should be replaced.



We highly recommend replacing vanes in sets. Apply a liberal amount of lubricant to the vanes before installing in the rotor slots.

It is always a good idea to have a spare set of replacement vanes on hand to reduce pump downtime.



19. Shift the housing so that the intake (Square port) is hanging slightly off of the rebuild work surface.

Place one of the 0.007" shims between the rotor and rotor bore so that the shim is within the housing and will not interfere with the endplate when they are reinstalled.



Divert the pull wire into the housing cavity and out through the intake port.

Repeat for both ends of the rotor.



20. Remove the seals from the endplates. Inspect for damage, the seals should be soft and pliable.

Clean the endplate as needed. Apply new lubricant along the seal pilot in each of the endplates.

The seals need to be installed back to back. The faces without the oil groove should be touching.

We recommend using a seal driver tool to properly seat the seals in the endplate. Drive the seals into the endplate.

Repeat for both endplates.



21. Lubricate the roller bearing pilot in the endplate. Using a bearing driver, seat the roller bearing into the endplate.

Repeat for both endplates.



22. Install two (2) 3/8-16 threaded dowels so that they can support the weight of the endplate for installation.

Install one (1) new endplate gasket between the housing and the endplate, do not use any gasket sealer.

Carefully guide the endplate onto the rotor and threaded rod segments





23. Insert one (1) of the dowel pin “T-handles” into either of the dowel pin holes on the endplate through into the housing.

Snug the endplate close to the housing and install the 3/8 hex head bolts.

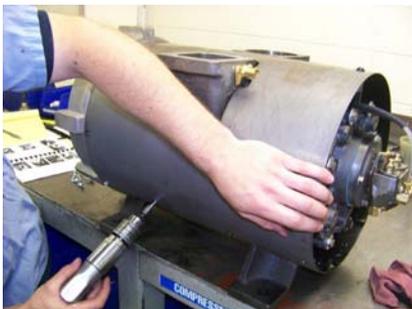
**(Liquid Cooled Only)** The 3/8 hex bolts located on the waterjacket side of the pump housing need to have high temperature (Red) RTV Silicone re-applied.



Tighten the endplate bolts to 35-40 ft-lbs of torque.

Repeat the process for the opposite endplate, but make sure to install the “T-handle” dowel pin on the same side of the housing as the other endplate, so as to prevent the rotor from twisting when the endplates are fully bolted into place

Rotate the housing right side up again, so the pump feet are on the work station.

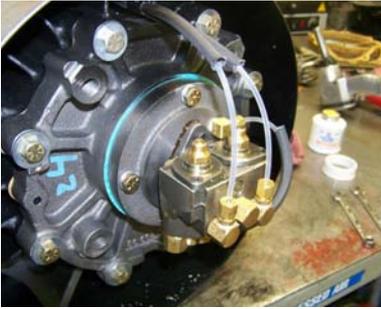


24. Grasp the shim pull wires hanging out of the inlet, and gently pull to remove the 0.007” shims.

You may need to rotate your pump and pull the wires simultaneously to get them to release.



25. Reinstall the bearing cover gaskets, lubricate along the rotor bearing cover interface, reinstall the bearing covers (with wave washers installed)



26. Reinstall the oil pump drive key in the non-drive end of the rotor.

Use hardening gasket sealer on both sides of the oil pump gasket. Apply teflon tape to oil pump bolts.

Install oil pump to the rear bearing cover. Ensure the oil pump shaft is aligned with the drive key.



Reconnect the oil lines to the oil pump, and front bearing.

Do not overtighten fittings to the plastic oil line, or oil flow may be restricted.



27. **(Fan Cooled Only)** Reinstall the fan assembly, the key should be pushed all the way to the end of the key slot on the drive end.

Make sure there is sufficient clearance to mount the fan cover when positioning the fan assembly. Tighten the fan hub screw.

Refer to step 9 for additional information.



28. Install two (2) four-way gaskets to the housing interface.

Reinstall the four way manifold, making sure to line up the square port on the housing with the square port on the four way manifold.

Replace any gaskets / O-rings as needed.



29. We highly recommend pressure testing your pump for leaks before putting it to work. We test our pumps at 20 psi of pressure.

Put a 3" Male NPT plug in the exhaust port and a similar adapter that can connect to a controlled pressurized air supply in the inlet.

Spraying your pump with soapy water while pressurized will expose any bubbling air leaks in your vacuum pump.



30. Reconnect the pump to its oil reservoir and start at a slow R.P.M.

Run the pump for a few minutes to allow oil to fill the lines. Inspect the translucent oil lines to check that oil is flowing.

***The pump is now ready to go to work!***

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