



National Vacuum Equipment

■ Part of Atlas Copco Group



Owner's Manual

607 PRO Rotary Vane Vacuum Pump

Challenger Series
VACUUM PUMPS & BLOWERS



MADE IN THE USA

Designed. Built. Supported in the USA.

800-253-5500 | www.natvac.com

607 PRO CHALLENGER

Owner's Record

Date of Purchase: _____

Purchased from: _____

Serial Number: _____

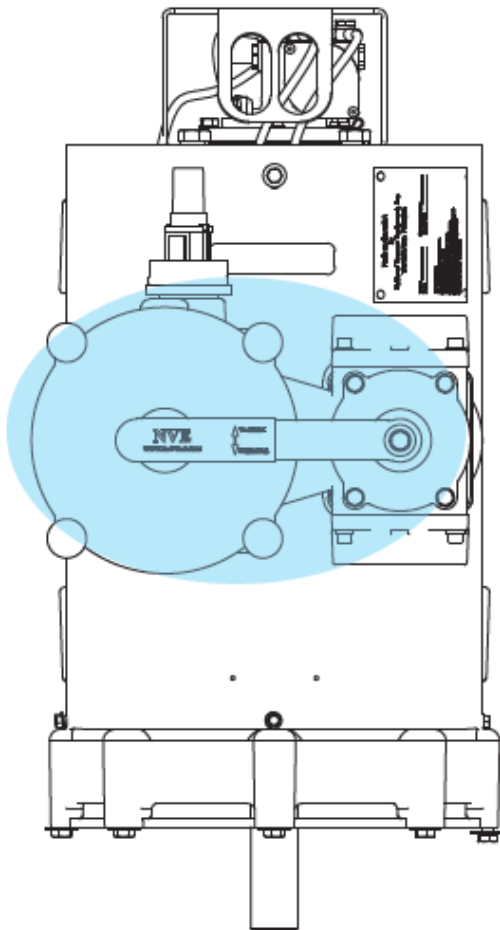
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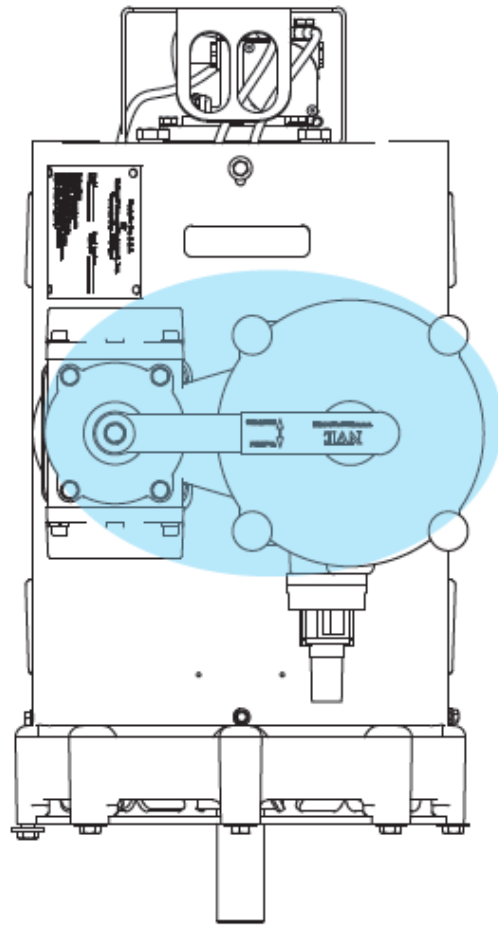
IMPORTANT INFORMATION FOR INSTALLING PUMP

607 PRO CHALLENGER SERIES PUMPS AERIAL VIEW

SHADED AREA MUST BE KEPT CLEAR
FOR SERVICING THE FILTER



Counter Clockwise
Rotation



Clockwise
Rotation

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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 putting your trust in National Vacuum Equipment.

Our Mission

We are dedicated to the production 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 of 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.

LIMITED WARRANTY

NVE PRO 607 Vacuum Pump



Warranty

National Vacuum Equipment, Inc.

Guarantees that the product it provides is free of manufacturer's defects, including materials and workmanship. When properly installed and maintained this product is warranted for a period of two (2) years subject to the following conditions:

1. A properly completed warranty registration card must be received by us within 30 days of sale to end user for pump sales to be considered warrantable. All pumps received for warranty consideration must retain the original NVE serial number tag.
2. The two (2) year period shall begin the day the product is shipped from our warehouse, unless we are provided with an authentic copy of the original resale invoice, in which case the two (2) year period shall begin at such invoice date.
3. The covered product must be used in an application for which it was intended. We do not recommend our product for particular uses or applications.
4. Vane breakage, or damage caused by vane breakage, is not warrantable.
5. Damage caused by improper use or lack of proper maintenance is not warrantable.
6. Manufacturer's liability under this or any other warranty, whether express or implied, is limited to repair of or, at the manufacturer's option, replacement of parts which are shown to have been defective when shipped

7. Manufacturer's liability shall not be enforceable for any product until National Vacuum Equipment, Inc. has been paid in full for such product.
8. Except to the extent expressly stated herein, manufacturer's liability for incidental and consequential damage is hereby excluded to the full extent permitted by law.
9. Manufacturer's liability as stated herein cannot be altered except in writing signed by an officer of National Vacuum Equipment, Inc.
10. Certain products provided by National Vacuum Equipment, Inc. are covered by their respective manufacturer's warranties (e.g., engines used in the NVE engine drive packages). These products are not covered by the National Vacuum Equipment, Inc. Manufacturer's Warranty.
11. Final assemblers responsibility. NVE goes to great lengths to insure the quality and proper functionality of the products it supplies. Many products we supply are purchased for resale or are impossible or impractical to test prior to the installation of the item in a vacuum system. It is therefore the responsibility of the final assembler to thoroughly test the vacuum system and components supplied to the assembler by NVE prior to the delivery of the final product to the end user.
12. NVE is not responsible for pump coupling tightness or alignment. Customer needs to inspect periodically to ensure proper alignment and to check tightness of set screws.

Any items found to be defective after delivery to the end user that should have been discovered prior to delivery will qualify replacement of the defective part only with absolutely no compensation for outside labor or travel expenses. Any subsequent damage to other components caused by the defective part will be the sole responsibility of the assembler.

Warranty Procedures

Should a potential warranty situation arise, the following procedures must be followed:

- Contact your dealer or NVE immediately upon the occurrence of the event and within the warranty period.
- Customer must receive a return materials authorization (RMA) form from NVE before returning product.
- All serial-numbered products must retain the original NVE serial number tag to be qualified for warranty.
- Product must be returned to NVE intact for inspection before warranty will be honored.
- Product must be returned to NVE freight prepaid in the most economical way.
- Credit will be issued for material found to be defective upon our inspection, based upon prices at the time of purchase.

The maximum allowable operating vacuum will vary depending on R.P.M., ambient temperature, altitude and time running. The basic principle to keep in mind is - faster R.P.M., higher air temperature and longer run time all equal more heat in pump. When installing an NVE 607 Pro pump we recommend a normal R.P.M. of 1250. Other speeds are ok as long as exhaust gas temperatures read on the supplied thermometer do not exceed 380 degrees F.

Weights and measurements are for reference only.

607 PRO CHALLENGER

Model-Specific Information



Application

Designed for extended operation

- Duty cycle will vary depending on several factors, such as altitude, RPM & ambient temperature.
- The 607 PRO Challenger is a heavy duty vacuum pump, designed to be used in liquid waste pumping systems where extended operation is desired.
- Proven applications are:
 - Oil field
 - Restaurant Grease
 - Septic
 - Industrial Waste

Pump Specifications

607 PRO Calculated Flow Data

RPM		Pressure (PSI)				Free flow		Vacuum (inches of Mercury)				
		20	15	10	5	0	5	10	15	20	25	27
1500	Hp.	34	32	29	27	23	23	22	21	20	19	19
	CFM					380						
1250	Hp.	29	27	24	23	20	20	19	16	15	14	14
	CFM					320						
1000	Hp.	25	23	20	18	15	15	14	14	13	12	12
	CFM					245						

* Recommended RPM 1000-1250

** Maximum of 1500 RPM is for intermittent operation only.

*** Ambient temperature, altitude, and a variety of other factors will affect the values listed in this table

System Requirements

High Quality Components

- The 607 PRO Challenger is a high performance vacuum pump and requires compatible, high quality components as manufactured by NVE.

Shutoffs

- We recommend an 8" cage and a 6" stainless steel ball which is standard in all of our primary and secondary shutoffs.

Hose

- Use 3" or larger hose to plumb your system. We recommend you use a hose that can withstand high temperatures such as hot tar-asphalt hose.

Pressure and Vacuum Relief Valves

- A properly adjusted pressure relief and vacuum relief valves should also be incorporated in the system between the secondary shutoff and the pump.
- The relief valves should be set to where the pump operates at a maximum temperature of 375 degrees Fahrenheit and should also be set to the values determined by the tank manufacturer.

Pressure and Vacuum Relief Valve Setting Instructions

Pressure Relief Valve

Picture 1.

1. Unscrew the lock nut "A"

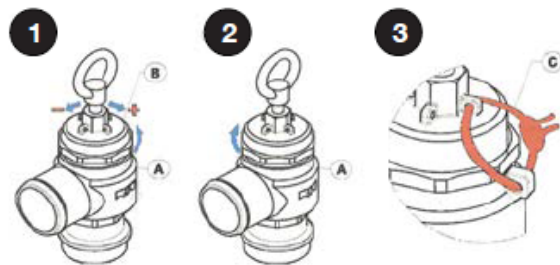
2. Turn the spring-tightener "B"

Picture 2.

Once obtained the desired pressure, screw down the lock nut "A"

Picture 3.

Fix the setting, using the rings "C" Situated on the body and on the spring tightener



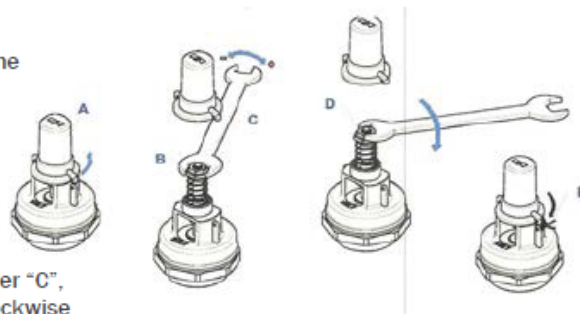
Vacuum Relief Valve

1. Remove the protection cap "A"

2. Turn the spring-tighter "B", through a spanner "C", Clockwise to increase the pressure, Anti-clockwise to reduce the pressure

3. Once obtained the desired pressure, screw down the lock nut "D"

4. Screw down the protection cap and fix it using the rings "E" situated on the valve body and on the cap



Drive System

- The pump should be mounted on a level, horizontal surface, secured with grade 8 fasteners.
- The drive system should be sized to supply the required horsepower to the pump plus a reserve to insure long life.
- The power take off (PTO) must be slowly engaged or it will damage the pump and drive components.
- Immediate engagement at working rpm for any rotating equipment will cause failure or premature wear. It is the responsibility of the installer and user to ensure the vacuum pump or blower is not being over torqued at start up.
- Make certain that all shafts, pulleys or turning parts are properly guarded.
- Check the ratio of the drive system prior to installation to verify that the pump will be turning at the proper speed.

Direction of Rotation

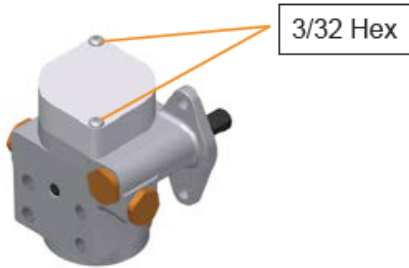
- The direction of rotation and RPM are marked on the front of the pump.
- The direction of rotation required by your drive system should be determined prior to ordering the pump. Please pay special attention to the orientation of the final filter, which varies with rotation.

Factory Settings

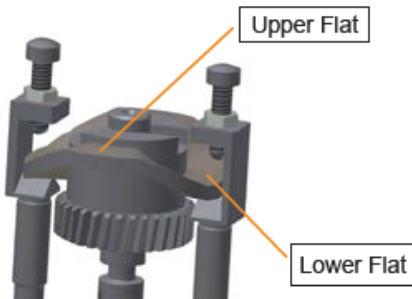
- The automatic lubrication pumps are set at the factory during pump testing and should require no further adjustment during pump installation. The oil pump is easily adjustable 5-24 ounces per hour. The 607 should use between 10-12 oz/hr.
- It is the responsibility of the installer to ensure proper vacuum and pressure settings and RPM.

Oil Pump Flow Rate Adjustment Procedures

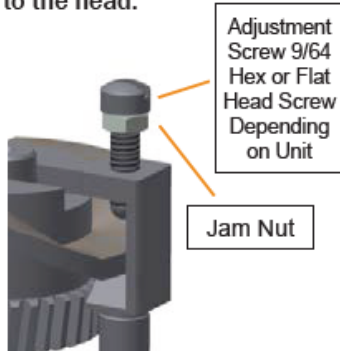
1. Remove oil pump cap (3/32 hex).
Ensure o-ring stays intact.



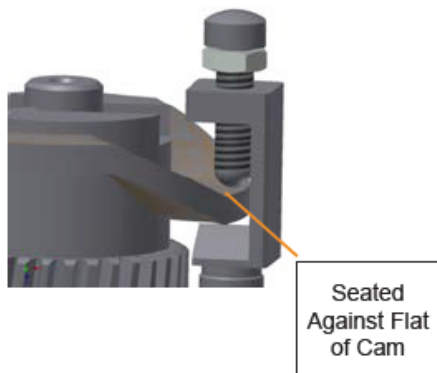
2. Move cam so adjustment screws are resting on lower flats



3. Hold adjustment screw (9/64 hex or flat head screw) while loosening jam nut (1/4" wrench). Spin jam nut all the way up to the head.



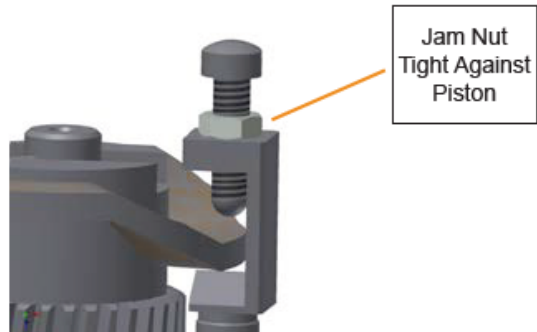
4. Tighten adjustment screw (CW) until it seats on the cam. (Do not force!)



5. Back the screw off the desired amount of turns (CCW) - 6.5 turns for operation at 1100 rpm.

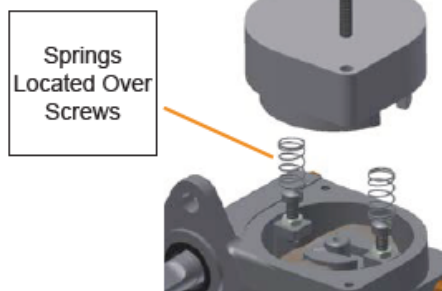
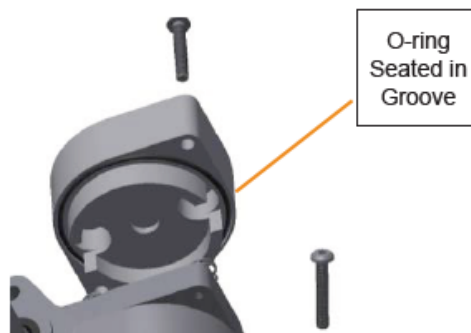
Tip: More turns out equals less oil flow.
Fewer turns out equals more oil flow.

6. Retighten jam nut while holding adjustment screw.



7. Repeat process for other adjustment screw.

8. Reassemble cover onto pump assuring o-ring does not fall out of groove, and springs are located over adjustment screws



If oil pump requires further adjustment, the rule is 1/2 turn CCW = 1 oz/hr higher oil flow.

NVE 4 Port Oil Pump Adjustment Rate Chart Tested at 1100 RPM

Turns From Bottom	Ounces Per Hour
7.5	6
7.25	7
7	8
6.75	9
6.5	10
6	11
5.5	12
5	13
4.75	14
4.5	15
4.25	16

OPERATING INSTRUCTIONS

607 PRO Challenger



Normal Operation

Oil Reservoir

- Check oil reservoir daily and fill as required.
- Drain and clean periodically depending on use.

Temperature

- Check exhaust temperature. It must not exceed 375 degrees Fahrenheit at any time.

Recommended RPM

- Do not operate the pump faster than the recommended RPM of 1000-1250. 1500 RPM is for intermittent use only.
- Too low of an RPM can cause the vanes to clatter (inconsistent contact with the housing) causing wear.

Suction Valve

- To operate the suction valve, move the handle in the appropriate direction for either vacuum or pressure; center is neutral.

Vacuum Levels

- Do not operate your pump for extended periods of time at vacuum levels which cause the pump to exceed 375 degrees Fahrenheit exhaust gas temperature.

Guards

- Make certain all guards are in place prior to running your pump.

Think Safety!

Recommended Lubricant

- We recommend that turbine oil be used in our pumps. Turbine oil is much more resistant to breakdown due to heat than normal motor oil, thereby avoiding the problems associated with motor oil such as lacquering and excessive wear.
- NVE ISO 150 Oil is our recommended pump oil for the Challenger series vacuum pumps. Challenger Vacuum Pump Oil is sold by the case, six-1 gallon containers of oil per case.

Although we recommended using a turbine oil for optimum use, you may use any type of oil you prefer, as long as you monitor your operating temperatures and keep your pump within the proper operating range (must not exceed 375 degrees). Using a non-turbine oil outside of the recommended range may cause problems such as overheating, lacquering and excessive wear, which can lead to severe damage to your equipment.

Washing

- Periodically wash the mud and dirt off of your pump as it must be clean to allow heat to radiate from it.

Flushing

We recommend periodic flushing of your pump. To do this:

1. Connect the hose to the flush valve located on the side of the inlet port.
2. Put the end of the hose in a one pint container of diesel fuel. Start your pump and run as slow as possible.
3. With the suction valve in the vacuum position, monitor the diesel flow to your pump.
4. When the diesel fuel is gone, switch the suction valve to neutral and run the pump for 2 minutes.
5. Speed the pump up to normal RPM, switch the suction valve to vacuum.
6. Remove the hose and close the valve.
7. Drain oil catch muffler and properly dispose of used oil and flushing fluid.

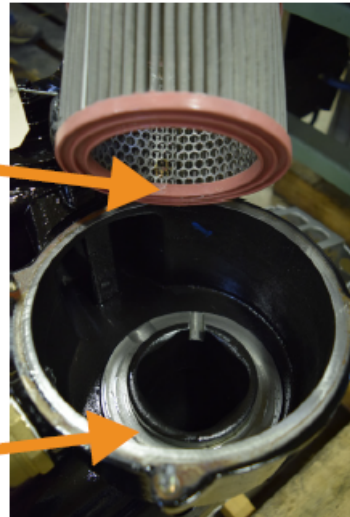
Checking Vane Wear

- We recommend checking vane wear at least every 12 months.
- A new vane is flush with the outside diameter of the rotor.
- Remove the plug from the vane check port, insert a rod to rotor O.D., rotate rotor until the rod falls into one of the vane slots. If the rod falls more than a 1/4" into any of the 7 vane slots, it's time to replace the vanes.
- Vanes should be replaced in sets and it is always a good idea to have an extra set of vanes on hand for emergencies.

- Check filter regularly
- Clean filter with compressed air or a cleaning solution.
The filter is made of stainless steel, please keep that in mind when choosing your cleaning solution.
- Before reinserting the filter into the housing, lube the inside end of the filter that will fit over the lip in the bottom of the housing.

Properly apply lube here on the inside lip of the filter...

...before reinserting here.



Cold Weather Operation

Prior to engaging pump.

- Confirm pump is not frozen.

If pump is frozen, thaw it.

- If the pump is frozen, thaw it out by moving the truck into a heated building.

Avoid freezing problems

- You can avoid freezing problems by putting a small amount of diesel fuel into the pump at the end of the day.

TROUBLESHOOTING

NVE 607 PRO Vacuum Pump



Problem: Pump overheats

Causes:

- No oil in pump
- Oil adjustment set too lean
- RPM too fast
- Prolonged operation at excessive vacuum or pressure levels
- Pump is dirty
- Inlet filter is clogged.

Problem: Pump uses too much oil

Causes:

- Oil pump set too rich
- Leaving pump under vacuum between jobs
- Product running through pump

Problem: Pump doesn't turn

Causes:

- Broken vane or bearing
- Pump is frozen
- Problem in the drive train

Problem: No vacuum

Causes:

- Suction valve is in neutral
- Worn seals or vanes
- Pump is not turning fast enough
- Check valve or suction valve is clogged
- Leak in the tank or fittings
- Collapsed hose between the pump and shutoffs
- Inlet filter clogged

System Troubleshooting

Locating the source of the trouble

If you notice a decrease in pump performance, start troubleshooting at the pump.

- Remove the suction and discharge hoses at the pump.
- Start the pump and run it in vacuum only at its normal RPM
- Check the vacuum level at the pump inlet. The 607 PRO Challenger in new condition will develop 27-28.5" hg.
- If the pump checks out ok, check the vacuum level at the secondary, then the primary shutoff. Keep working your way back until you find the problem.

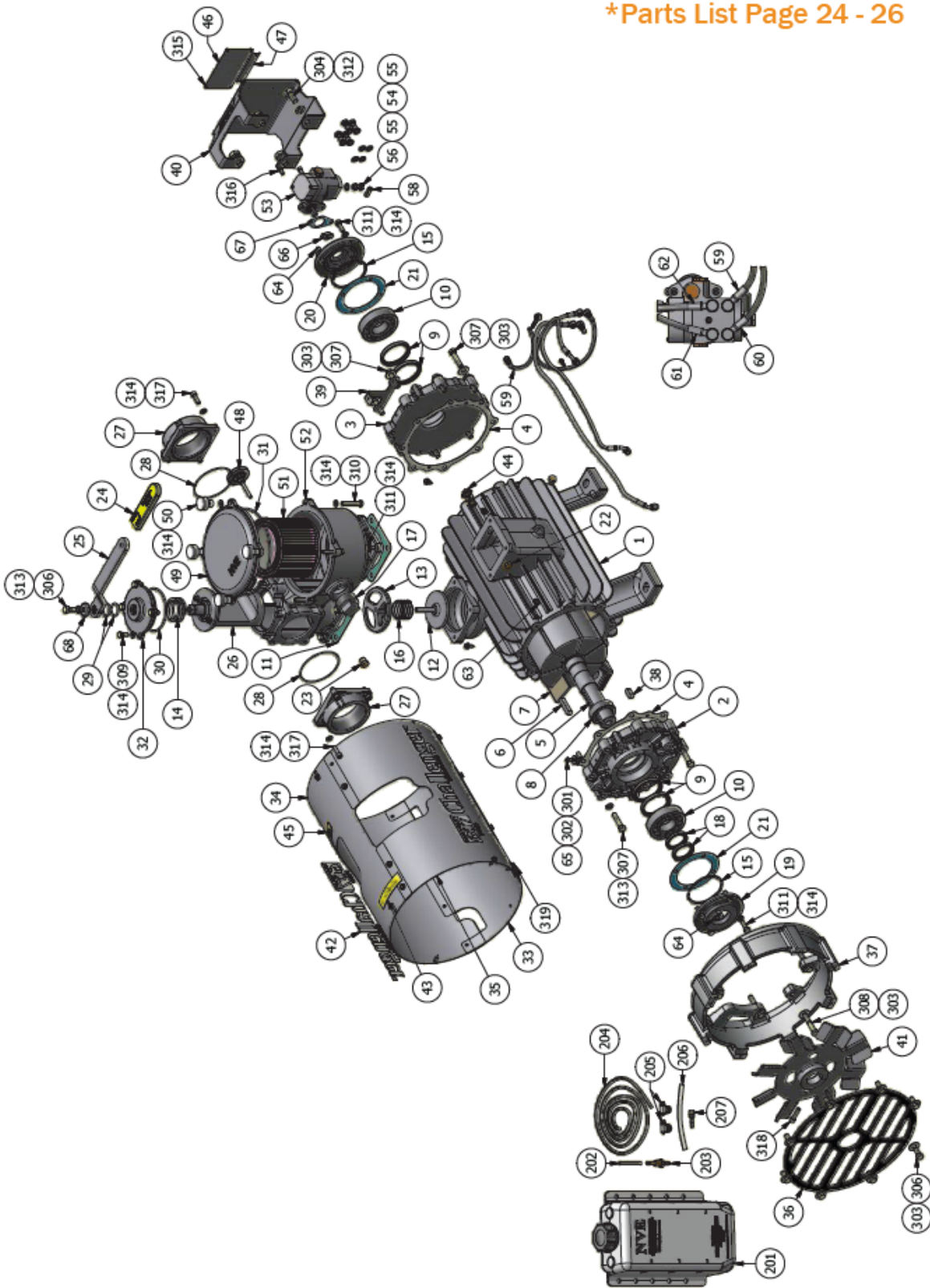
Making a Vacuum Tester

1. Procure a flange to mount on your 4-way valve, a short 3" pipe nipple, a 3" pipe cap and a vacuum gauge.
2. Drill and tap a 1/4" N.P.T. thread in the pipe cap.
3. Assemble the flange, nipple, pipe cap and vacuum gauge.
4. Remove a flange from the four-way valve on your pump.
5. Start the pump and confirm the location you have chosen to test from is at vacuum.
6. Using the existing O-ring, fasten the testing flange to your pump.
7. Start your pump and read the vacuum level on the gauge.

[illegible]

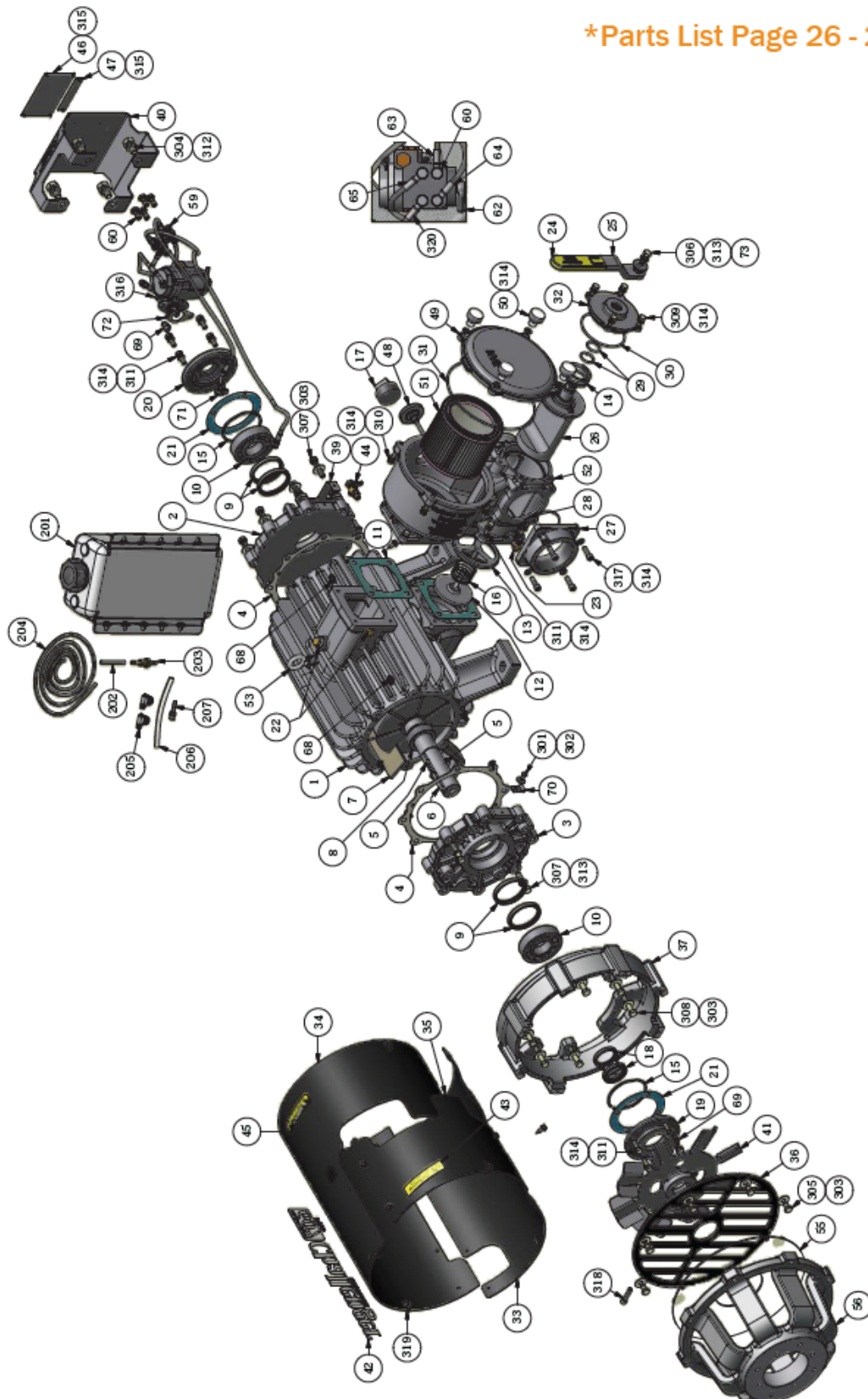
NVE 607 PRO Challenger Fan Cooled | Parts Diagram

*Parts List Page 24 - 26



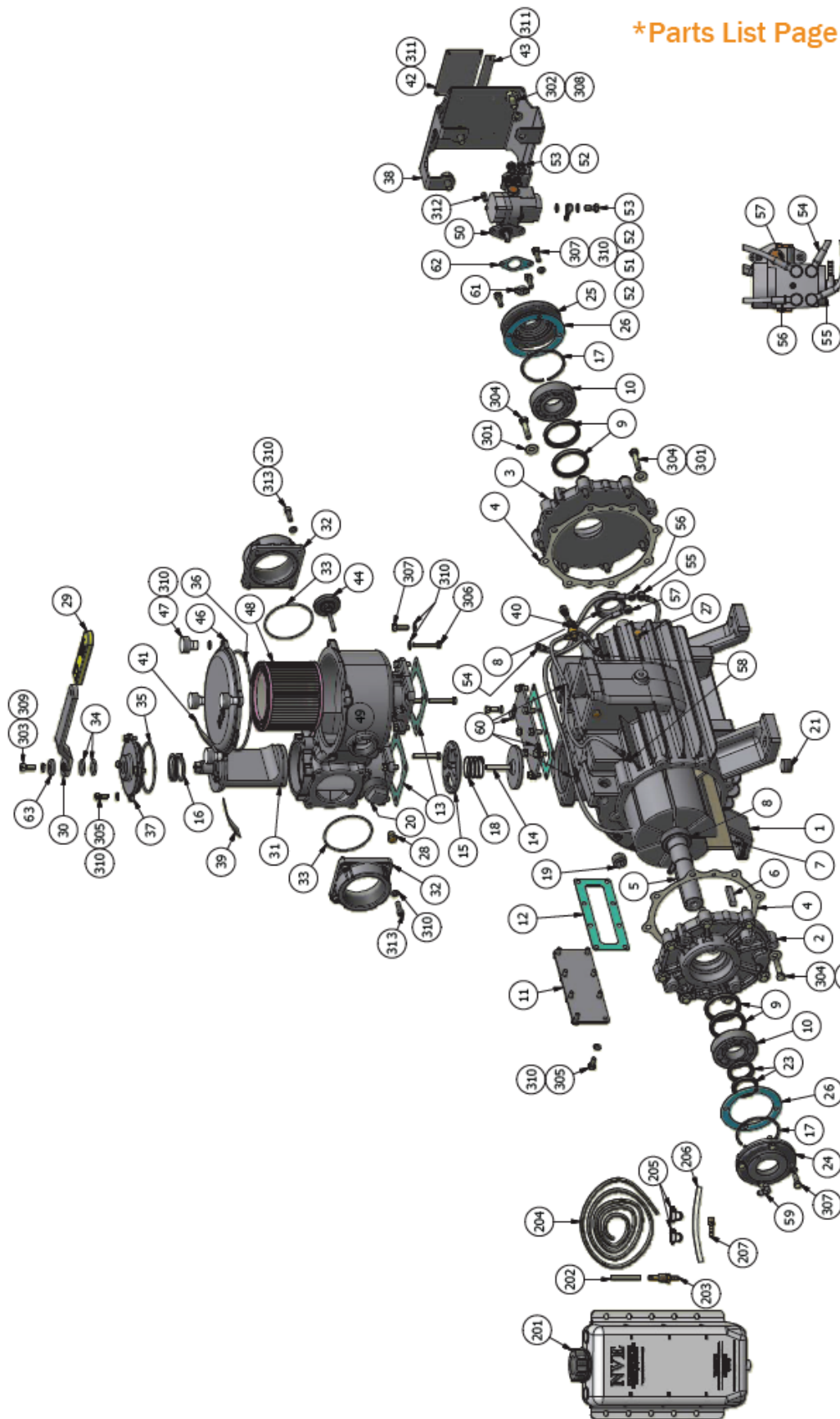
NVE 607 PRO SV Challenger Fan Cooled | Parts Diagram

*Parts List Page 26 - 28



NVE 607 PRO Challenger Liquid Cooled | Parts Diagram

*Parts List Page 29 - 30



NVE 607 PRO Challenger Fan Cooled | Parts List

ITEM		PART NUMBER	DESCRIPTION
1	1	120-001-367	HOUSING 607
2	1	120-003-002 120-003-003	ENDPLATE 607 (CW PUMP) ENDPLATE 607 (CCW PUMP)
3	1	120-003-003 120-003-002	ENDPLATE 607 (CW PUMP) ENDPLATE 607 (CCW PUMP)
4	4	120-004-367	GASKET ENDPLATE 607
5	1	120-005-367	ROTOR 607
6	1	120-006	KEY 3/8" X 3/8" X 2"
7	7	120-007-367	VANE 607
8	2	120-009-367	SEAL SLEEVE 607
9	4	120-018-367	SEAL 60 X 72 X 8 VITON SGL LIP
10	2	120-019-367	BEARING NJ308 C3
11	2	120-039-367	GASKET 607 INTAKE/EXHAUST
12	1	120-041-367	CHECK VALVE 3"
13	1	120-042-367	RETAINER RING CHECK VALVE 3"
14	1	120-045	SPRING 4-WAY FTR VALVE
15	2	120-045-001	SPRING WAVE WIRE 3.50" DIA
16	1	120-046-367	SPRING CHECK VALVE
17	1	120-047-004	PLUG 1.5" NPT SQ CORED GALV
18	2	120-053	SEAL 40 X 52 X 7 VITON
19	1	120-054-001	BEARING COVER 607
20	1	120-054-002	BEARING COVER 607 OIL PUMP
21	2	120-055-367	GASKET, FRONT BEARING COVER
22	2	120-058	PLUG BRASS HEX HEAD 1/8" NPT
23	1	120-059	PLUG BRASS HEX HEAD 1/4" NPT
24	2	120-060-005	GRIP 3/8" HANDLE W/ LOGO
25	2	120-060-006	HANDLE 3/8"
26	1	120-062-002	PLUG 4-WAY FOR 3/8" HANDLE
27	2	120-063-367	FLANGE 4-WAY 3" NPT
28	2	120-064-001	O-RING, 2-154 VITON
29	2	120-064-002	O-RING, 2-214 VITON
30	1	120-064-003	O-RING, 2-240 VITON
31	1	120-064-004	O-RING, 2-265 VITON
32	1	120-065-002	TOWER 3" 607
33	1	120-070-004	SHROUD LOWER 607
34	1	120-071-004	SHROUD UPPER 607
35	1	120-072-004	SHROUD SERVICE PANEL 607
36	1	120-073-E	E-COAT FAN GUARD, 367, 460, 466 & 506
37	1	120-074-001	FAN SHROUD 607
38	1	120-076	KEY 3/8" X 3/8" X 1"
39	1	120-077-004	SHROUD SUPPORT PLATE 607
40	1	120-079-008	GUARD NVE OIL PUMP 607/887 W/ SN TAG MOUNT

NVE 607 PRO Challenger Fan Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
41	1	120-083-002 120-083-001	FAN ASSY, CW 607 FAN ASSY, CCW 607
42	2	120-100-005	DECAL 607 PRO CHALLENGER HEAVY DUTY
43	1	120-101-003 120-101-004	DECAL CW ROTATION ARROW DECAL CCW ROTATION ARROW
44	1	120-102	VALVE, DRAIN 1/8" NPT
45	1	120-103-367	DECAL, IMPORTANT, MAX OPERATING TEMP
46	1	120-105-607	NAME PLATE SS, 607
47	1	120-107-001	SERIAL TAG SS
48	1	120-220	THERMOMETER, 50- 400 DEG, 2" FACE
49	1	120-310-001	COVER, FILTER 607/866
50	4	120-312-002	KNOB, 5/16-18UNC
51	1	120-314-001	FILTER ELEMENT 607/866
52	1	120-320-003	HOUSING FILTER 607 W/ RELIEF BOSS
53	1	123-000-004	OIL PUMP 4 PORT BIDIRECTIONAL
54	1	123-408-017	BANJO ADAPTER TO 0.250" HB
55	10	123-013-001	WASHER 3/8" SEALING NBR
56	5	123-408-014	BANJO BOLT 1/8" BSPP
58	1	320-083-011	CAP OIL PUMP FEED LINE FITTING
59	1	320-407-005Z	OIL LINE -3 SST FEMALE JIC TO BANJO 6.75"
60	1	320-407-006Z	OIL LINE -3 SST 90 DEG JIC TO BANJO 17.5"
61	1	320-407-008Z	OIL LINE -3 SST 90 DEG JIC TO BANJO 24.00"
62	1	320-407-035Z	OIL LINE -3 SST 45 DEG JIC TO BANJO 29.75"
63	2	320-408-016	FITTING STR -3 MJIC X 1/8 MNPT
64	2	320-408-017	FITTING ELBOW -3 MJIC X 1/8 MNPT
65	1	320-409-003	P-CLIP, OIL LINE 1/4" X 5/16
66	1	320-LF8	DRIVE TAB
67	1	320-R31	GASKET, OIL PUMP
68	1	412-020-001	WASHER, CUP 4-WAY
200	1	OWNERS MANUAL - 607	OWNERS MANUAL - 607
201	1	320-082-001	OIL TANK, 5QT, W/ LOGO
202	1	320-083-009	OIL TANK FILTER, 100 MESH
203	1	320-083-010	FILTER FITTING, OIL TANK 1/4 NPT
204	5 FT	320-407-003	OIL LINE, BLK 1/4" ID 30R7
205	2	416-025-1WC	CLAMP, WORM, 1/4" DIA
206	6 IN	320-R102	OIL LINE, 3/8" X 1/4" ID X 6" LG
207	1	310-LP5	HOSE BARB 1/4" X 1/8" NPT STRAIGHT
301	1	BHCS - 1/4-20 UNC X 0.50	BHCS - 1/4-20 UNC X 0.50
302	1	FW - 1/4 USS	FLAT WASHER - 1/4" USS
303	22	FW - 3/8	FLAT WASHER, 3/8"
304	4	HHCS - 1/2-13 UNC X 1.00	HHCS - 1/2-13 UNC X 1.00
306	9	HHCS - 3/8-16 UNC X 0.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 0.75

NVE 607 PRO Challenger Fan Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
307	10	HHCS - 3/8-16 UNC X 1.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 1.75
308	6	HHCS - 3/8-16 UNC X 2.25	HEX HEAD CAP SCREW - 3/8-16 UNC X 2.25
309	4	HHCS - 5/16-18 UNC x 0.75	HEX HEAD CAP SCREW - 5/16-18 UNC x 0.75
310	4	HHCS - 5/16-18 UNC X 2.00- FULL THREAD	HEX HEAD CAP SCREW - 5/16-18 UNC X 2.00 FULL THREAD
311	16	HHCS - 5/16-18 UNC x 1.00	HEX HEAD CAP SCREW - 5/16-18 UNC x 1.00
312	5	LW - 1/2	LOCK WASHER, 1/2"
313	3	LW - 3/8	LOCK WASHER, 3/8"
314	36	LW - 5/16	LOCK WASHER, 5/16"
315	6	RVT 3/32 D X 1_4L SS	BLIND RIVET, 3/32 DIA X 1/4 GRIP, SS
316	2	SHCS - 1/4-20 UNC X 0.50	SHCS - 1/4-20 UNC X 0.50
317	8	SHCS - 5/16-18 UNC X 1	SHCS - 5/16-18 UNC X 1
318	1	SHCS - 5/16-24 UNF X 1.25	SHCS - 5/16-24 UNF X 1.25
319	16	TAPSCR - 1/4-14 X 0.75	HEX HEAD SELF TAPPING SCREW 1/4-14

NVE 607 PRO SV Challenger Fan Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	120-001-607A	HOUSING 607 SIDE MANIFOLD
2	1	120-003-002 120-003-003	ENDPLATE 607 (CCW PUMP) ENDPLATE 607 (CW PUMP)
3	1	120-003-003 120-003-002	ENDPLATE 607 (CCW PUMP) ENDPLATE 607 (CW PUMP)
4	4	120-004-367	GASKET ENDPLATE 607
5	1	120-005-367	ROTOR 607
6	1	120-006	KEY 3/8" X 3/8" X 2"
7	7	120-007-367	VANE 607
8	2	120-009-367	SEAL SLEEVE 607
9	4	120-018-367	SEAL 60 X 72 X 8 VITON SGL LIP
10	2	120-019-367	BEARING NJ308 C3
11	2	120-039-367	GASKET 607 INTAKE/EXHAUST
12	1	120-041-367	CHECK VALVE 3"
13	1	120-042-367	RETAINER RING CHECK VALVE 3"
14	1	120-045	SPRING 4-WAY FTR VALVE/
15	2	120-045-001	SPRING WAVE WIRE 3.50" DIA

NVE 607 PRO SV Challenger Fan Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
16	1	120-046-367	SPRING CHECK VALVE
17	1	120-047-004	PLUG 1.5" NPT SQ CORED GALV
18	2	120-053	SEAL 40 X 52 X 7 VITON
19	1	120-054-001	BEARING COVER 607
20	1	120-054-002	BEARING COVER 607 OIL PUMP
21	2	120-055-367	GASKET, FRONT BEARING COVER
22	2	120-058	PLUG BRASS HEX HEAD 1/8" NPT
23	1	120-059	PLUG BRASS HEX HEAD 1/4" NPT
24	1	120-060-005	GRIP 3/8" HANDLE W/ LOGO
25	1	120-060-006	HANDLE 3/8"
26	1	120-062-002	PLUG 4-WAY FOR 3/8" HANDLE
27	2	120-063-367	FLANGE 4-WAY 3" NPT
28	2	120-064-001	O-RING, 2-154 VITON
29	2	120-064-002	O-RING, 2-214 VITON
30	1	120-064-003	O-RING, 2-240 VITON
31	1	120-064-004	O-RING, 2-265 VITON
32	1	120-065-002	TOWER 3" 607
33	1	120-070-006	SHROUD LOWER 607 SIDE VALVE
34	1	120-071-006	SHROUD UPPER 607 SIDE VALVE
35	1	120-072-006	SHROUD SERVICE PANEL 607 SIDE VALVE
36	1	120-073-E	FAN COVER 607/866 E-COAT
37	1	120-074-001	FAN SHROUD 607
38	1	120-076	KEY 3/8" X 3/8" X 1"
39	2	120-077-004	SHROUD SUPPORT PLATE 607
40	1	120-079-008	GUARD NVE OIL PUMP 607/887 W/ SN TAG MOUNT
41	1	120-083-001 120-083-002	FAN ASSY 607 CCW FAN ASSY 607 CW
42	1	120-100-005	DECAL 607 PRO CHALLENGER HEAVY DUTY
43	1	120-101-003 120-101-004	DECAL CW ROTATION ARROW DECAL CCW ROTATION ARROW
44	1	120-102	VALVE, DRAIN 1/8" NPT
45	1	120-103-367	DECAL, IMPORTANT, MAX OPERATING TEMP
46	1	120-105-607	NAME PLATE SS, 607
47	1	120-107-001	SERIAL TAG SS
48	1	120-220	THERMOMETER, 50- 400 DEG, 2" FACE
49	1	120-310-001	COVER, FILTER 607/866
50	4	120-312-002	KNOB, 5/16-18UNC
51	1	120-314-001	FILTER ELEMENT 607/866
52	1	120-320-003	HOUSING FILTER 607 W/ RELIEF BOSS
53	1	120-351-002	LIFT EYE SHOULDERED 3/8-16 PLATED
54	1	123-000-004	OIL PUMP 4 PORT BIDIRECTIONAL
55	1	123-408-017	BANJO ADAPTER TO 0.250" HB
56	10	123-013-001	WASHER 3/8" SEALING NBR

NVE 607 PRO SV Challenger Fan Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
57	5	123-408-014	BANJO BOLT 1/8" BSPP
59	1	320-083-011	CAP OIL PUMP FEED LINE FITTING
60	1	320-407-005Z	OIL LINE -3 SST FEMALE JIC TO BANJO 6.75"
61	1	320-407-006Z	OIL LINE -3 SST 90 DEG JIC TO BANJO 17.5"
62	1	320-407-007	OIL LINE -3 SST FEMALE JIC TO BANJO 30.75"
63	1	320-407-008Z	OIL LINE -3 SST 90 DEG JIC TO BANJO 24.5"
64	2	320-408-016	FITTING STR -3 MJIC X 1/8 MNPT
65	2	320-408-017	FITTING ELBOW -3 MJIC X 1/8 MNPT
66	2	320-409-003	P-CLIP, OIL LINE 1/4" X 5/16
67	1	320-LF8	DRIVE TAB
68	1	320-R31	GASKET, OIL PUMP
69	1	412-020-001	WASHER, CUP 4-WAY
200	1	OWNERS MANUAL - 607	OWNERS MANUAL - 607
201	1	320-082-001	OIL TANK, 5QT, W/ LOGO
202	1	320-083-009	OIL TANK FILTER, 100 MESH
203	1	320-083-010	FILTER FITTING, OIL TANK 1/4 NPT
204	5 FT	320-407-003	OIL LINE, BLK 1/4" ID 30R7
205	2	416-025-1WC	CLAMP, WORM, 1/4" DIA
206	6 IN	320-R102	OIL LINE, 3/8" X 1/4" ID X 6" LG
207	1	310-LPS	HOSE BARB, 1/4" X 1/8" NPT STRAIGHT
301	1	BHCS - 1/4-20 UNC X 0.50	BHCS - 1/4-20 UNC X 0.50
302	1	FW - 1/4 USS	FLAT WASHER - 1/4" USS
303	22	FW - 3/8 USS	FLAT WASHER - 3/8 USS
304	4	HHCS - 1/2-13 UNC X 1.00	HHCS - 1/2-13 UNC X 1.00
305	8	HHCS - 3/8-16 UNC X 0.50	HEX HEAD CAP SCREW - 3/8-16 UNC X 0.50
306	1	HHCS - 3/8-16 UNC X 0.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 0.75
307	10	HHCS - 3/8-16 UNC X 1.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 1.75
308	6	HHCS - 3/8-16 UNC X 2.25	HEX HEAD CAP SCREW - 3/8-16 UNC X 2.25
309	4	HHCS - 5/16-18 UNC x 0.75	HEX HEAD CAP SCREW - 5/16-18 UNC x 0.75
310	4	HHCS - 5/16-18 UNC X 2.00 - FULL THREAD	HEX HEAD CAP SCREW - 5/16-18 UNC X 2.00 FULL THREAD
311	16	HHCS - 5/16-18 UNC x 1.00	HEX HEAD CAP SCREW - 5/16-18 UNC x 1.00
312	4	LW - 1/2	LOCK WASHER, 1/2
313	3	LW - 3/8	LOCK WASHER, 3/8"
314	36	LW - 5/16	LOCK WASHER, 5/16"
315	6	RVT 3/32 D X 1_4L SS	BLIND RIVET, 3/32 DIA X 1/4 GRIP, SS
316	2	SHCS - 1/4-20 UNC X 0.50	SHCS - 1/4-20 UNC X 0.50
317	8	SHCS - 5/16-18 UNC X 1	SHCS - 5/16-18 UNC X 1
318	1	SHCS - 5/16-24 UNF X 1.25	SHCS - 5/16-24 UNF X 1.25
319	15	TAPSCR - 1/4-14 X 0.75	HEX HEAD SELF TAPPING SCREW 1/4-14

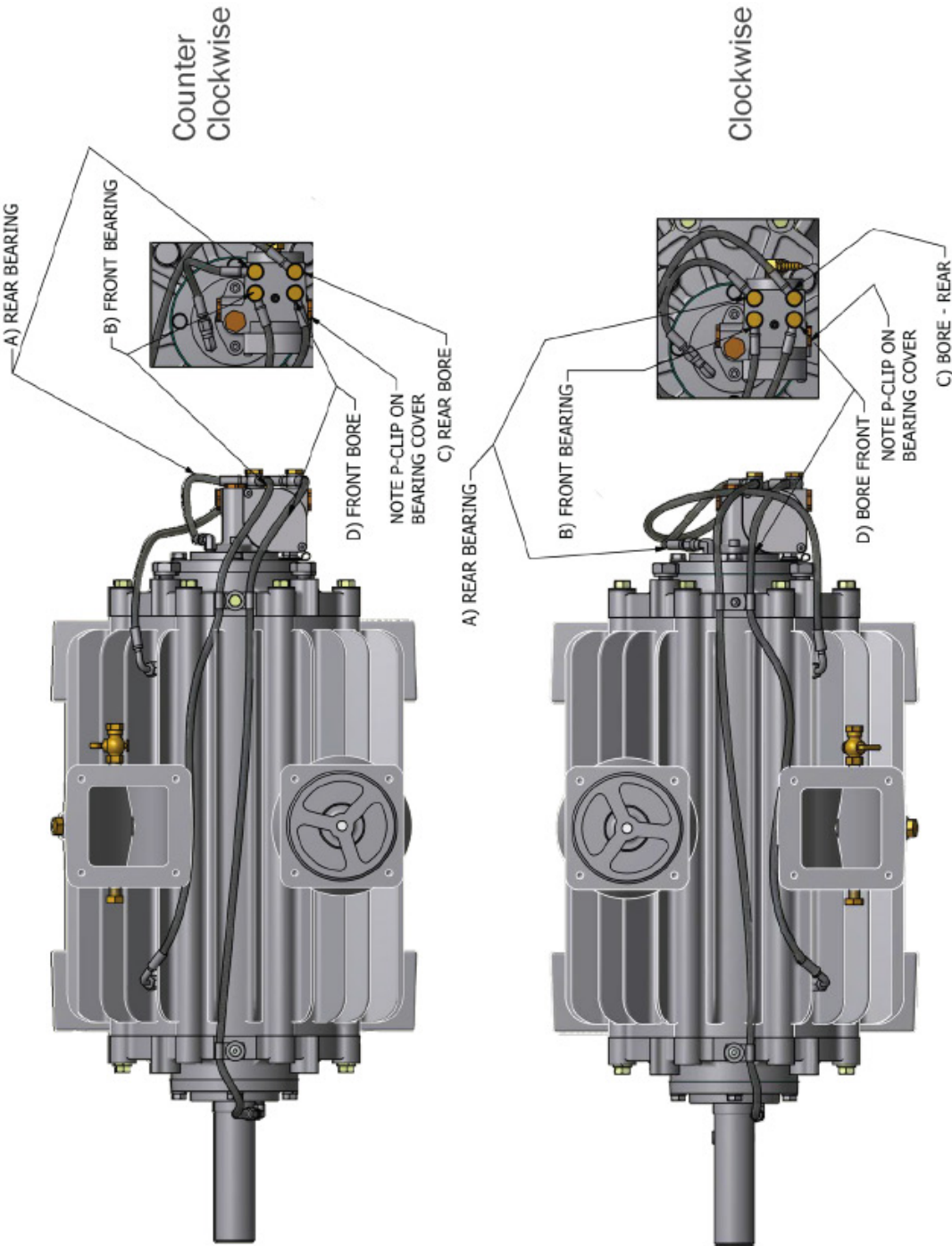
NVE 607 PRO Challenger Series Liquid Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	120-001-367-L	HOUSING 607 LIQ
2	1	120-003-002 120-003-003	ENDPLATE, CW MACHINED 607 (CW PUMP) ENDPLATE, CCW MACHINED 607 (CCW PUMP)
3	1	120-003-003 120-003-002	ENDPLATE, CCW MACHINED 607 (CW PUMP) ENDPLATE, CW MACHINED 607 (CCW PUMP)
4	2	120-004-367	GASKET ENDPLATE 607
5	1	120-005-367	ROTOR 607
6	1	120-006	KEY 3/8" X 3/8" X 2"
7	7	120-007-367	VANE 607
8	2	120-009-367	SEAL SLEEVE 607
9	4	120-018-367	SEAL 60 X 72 X 8 VITON SGL LIP
10	2	120-019-367	BEARING NJ308 C3
11	2	120-021-367	COVER PLATE, 367 WATER JACKET
12	2	120-022-367	GASKET, 367/506 COVER PLATE
13	2	120-039-367	GASKET 607 INTAKE/EXHAUST
14	1	120-041-367	CHECK VALVE 3"
15	1	120-042-367	RETAINER RING CHECK VALVE 3"
16	1	120-045	SPRING 4-WAY FTR VALVE
17	2	120-045-001	SPRING WAVE WIRE 3.50" DIA
18	1	120-046-367	SPRING CHECK VALVE
19	1	120-047	DRAIN PLUG, 3/4" NPT
20	1	120-047-004	PLUG 1.5" NPT SQ CORED GALV
21	1	120-047-1	DRAIN PLUG, 3/4" NPT MAGNETIC
22	1	120-049	BUSHING, 3/4" NPT X 1/8" FNPT
23	2	120-053	SEAL 40 X 52 X 7 VITON
24	1	120-054-001	BEARING COVER 607
25	1	120-054-002	BEARING COVER 607 OIL PUMP
26	2	120-055-367	GASKET, FRONT BEARING COVER
27	2	120-058	PLUG BRASS HEX HEAD 1/8" NPT
28	1	120-059	PLUG BRASS HEX HEAD 1/4" NPT
29	1	120-060-005	GRIP 3/8" HANDLE W/ LOGO
30	1	120-060-006	HANDLE 3/8"
31	1	120-062-002	PLUG 4-WAY FOR 3/8" HANDLE
32	2	120-063-367	FLANGE 4-WAY 3" NPT
33	2	120-064-001	O-RING, 2-154 VITON
34	2	120-064-002	O-RING, 2-214 VITON
35	1	120-064-003	O-RING, 2-240 VITON
36	1	120-064-004	O-RING, 2-265 VITON
37	1	120-065-002	TOWER 3" 607
38	1	120-079-008	GUARD NVE OIL PUMP 607/887 W/ SN TAG MOUNT
39	1	120-101-003	DECAL CW ROTATION ARROW
40	1	120-102	VALVE, DRAIN 1/8" NPT
41	1	120-103-367	DECAL, IMPORTANT, MAX OPERATING TEMP
42	1	120-105-607	NAME PLATE SS, 607

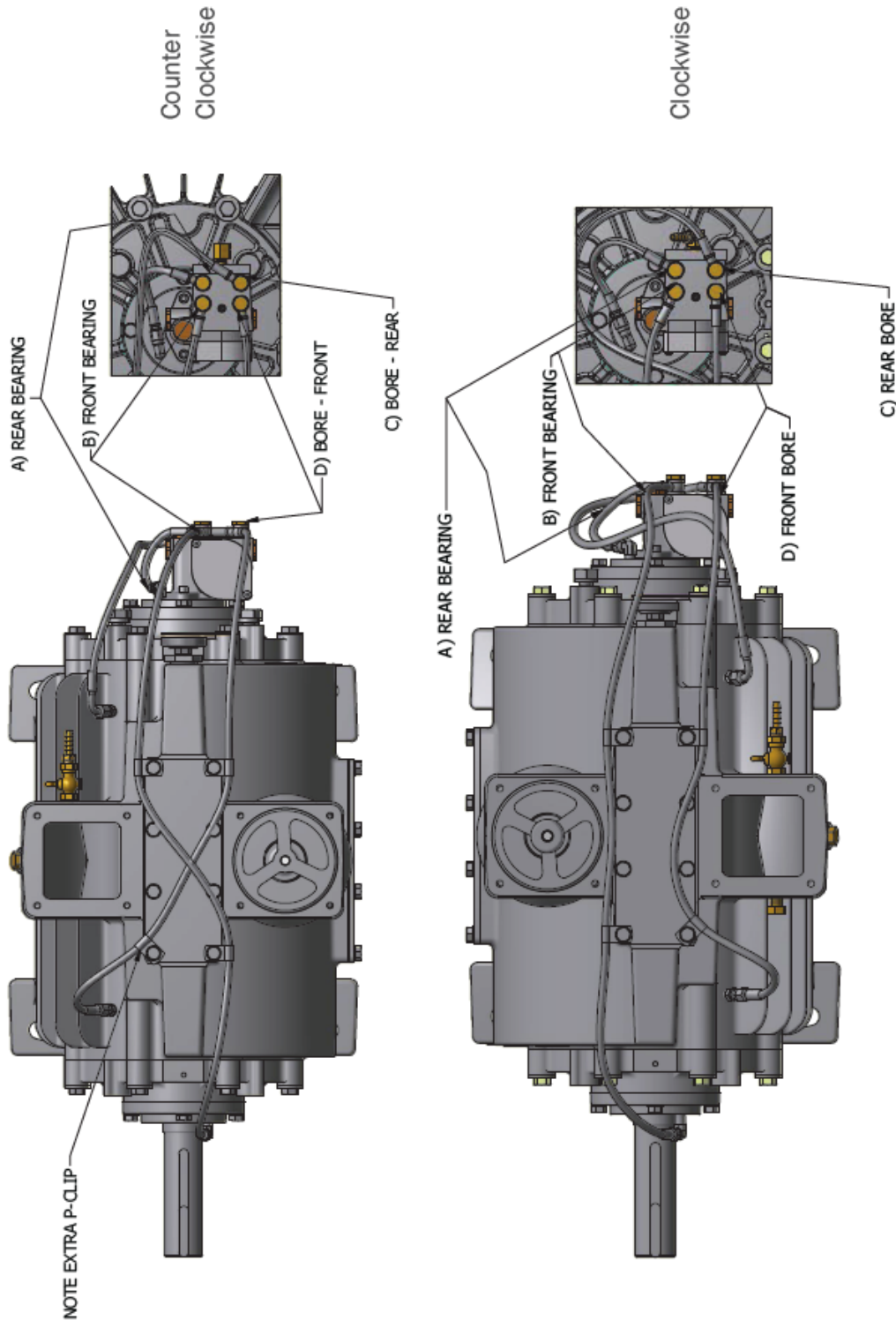
NVE 607 PRO Challenger Series Liquid Cooled | Parts List

ITEM	QTY	PART NUMBER	DESCRIPTION
43	1	120-107-001	SERIAL TAG SS
44	1	120-220	THERMOMETER, 50- 400 DEG, 2" FACE
45	1	120-220-1	THERMOMETER 220 F 1/8" NPT
46	1	120-310-001	COVER, FILTER 607/866
47	4	120-312-002	KNOB, 5/16-18UNC
48	1	120-314-001	FILTER ELEMENT 607/866
49	1	120-320-003	HOUSING FILTER 607 W/ RELIEF BOSS
50	1	123-000-004	OIL PUMP 4 PORT BIDIRECTIONAL
51	1	123-408-017	BANJO ADAPTER TO 0.250" HB
52	8	123-013-001	WASHER 3/8" SEALING NBR
53	4	123-408-014	BANJO BOLT 1/8" BSPP
54	1	320-407-005Z	OIL LINE -3 SST FEMALE JIC TO BANJO 6.75"
55	1	320-407-006Z	OIL LINE -3 SST 90 DEG JIC TO BANJO 17.5"
56	1	320-407-008Z	OIL LINE -3 SST FEMALE JIC TO BANJO 28.75"
57	1	320-407-035Z	OIL LINE -3 SST FEMALE JIC TO BANJO 32.25"
58	2	320-408-016	FITTING STR -3 MJIC X 1/8 MNPT
59	2	320-408-017	FITTING ELBOW -3 MJIC X 1/8 MNPT
60	4	320-409-003	P-CLIP, OIL LINE 1/4" X 5/16
61	1	320-LF8	DRIVE TAB
62	1	320-R31	GASKET, OIL PUMP
63	1	412-020-001	WASHER, CUP 4-WAY
200	1	OWNERS MANUAL - 607	OWNERS MANUAL - 607
201	1	320-082-001	OIL TANK, 5QT, W/ LOGO
202	1	320-083-009	OIL TANK FILTER, 100 MESH
203	1	320-083-010	FILTER FITTING, OIL TANK 1/4 NPT
204	5 FT	320-407-003	OIL LINE, BLK 1/4" ID 30R7
205	2	416-025-1WC	CLAMP, WORM, 1/4" DIA
206	6 IN	320-R102	OIL LINE, 3/8" X 1/4" ID X 6" LG
207	1	310-LPS	HOSE BARB 1/4" X 1/8" NPT STRAIGHT
301	16	FW - 3/8	FLAT WASHER, 3/8"
302	4	HHCS - 1/2-13 UNC X 1.00	HHCS - 1/2-13 UNC X 1.00
303	1	HHCS - 3/8-16 UNC X 0.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 0.75
304	16	HHCS - 3/8-16 UNC X 1.75	HEX HEAD CAP SCREW - 3/8-16 UNC X 1.75
305	20	HHCS - 5/16-18 UNC x 0.75	HEX HEAD CAP SCREW - 5/16-18 UNC x 0.75
306	4	HHCS - 5/16-18 UNC X 2.00 - FULL THREAD	HEX HEAD CAP SCREW - 5/16-18 UNC X 2.00 FULL THREAD
307	16	HHCS - 5/16-18 UNC x 1.00	HEX HEAD CAP SCREW - 5/16-18 UNC x 1.00
308	4	LW - 1/2	LOCK WASHER, 1/2
309	1	LW - 3/8	LOCK WASHER, 3/8"
310	52	LW - 5/16	LOCK WASHER, 5/16"
311	6	RVT 3/32 D X 1_4L SS	BLIND RIVET, 3/32 DIA X 1/4 GRIP, SS
312	2	SHCS - 1/4-20 UNC X 0.50	SHCS - 1/4-20 UNC X 0.50
313	8	SHCS - 5/16-18 UNC X 1	SHCS - 5/16-18 UNC X 1

607 PRO Challenger - Fan Cooled - Oil Line Routing



607 PRO Challenger - Liquid Cooled - Oil Line Routing





National Vacuum Equipment

Vane Replacement & Complete Rebuild Manual

Challenger Series Rotary Vane Vacuum Pumps



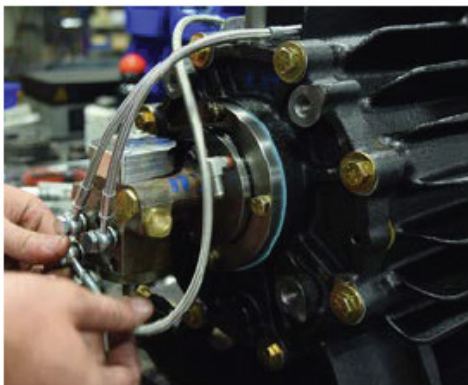
VANE REPLACEMENT

607 PRO Fan and Liquid Cooled

Also note that you can visit:
<https://natvac.com/videos/>
to view a step by step video
walkthrough with instructions on
vane replacement and maintenance.



1. Clean off the exterior of the pump

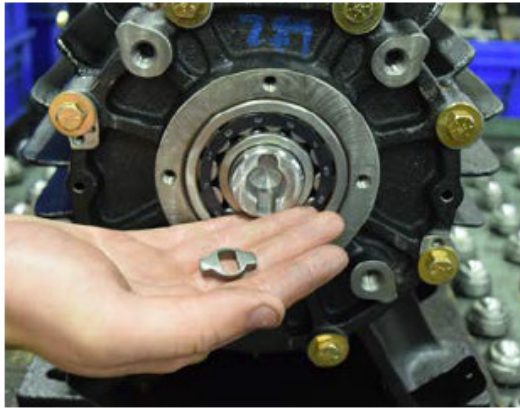


2. Remove the oil pump guard.
Disconnect all oil lines feeding
from the oil pump

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.



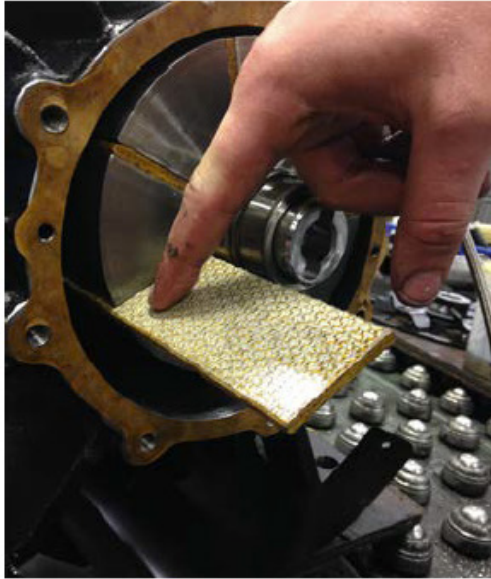
5. (Fan Cooled Only) Remove the fan shroud supports connecting the shroud "tin" to the rear endplate.



6. Remove the endplate bolts.



7. Remove the rear endplate with a gentle "wobble", 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 down-time.



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



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.

(Fan Cooled Only) Reinstall the self-tapping screws for holding the fan shroud)

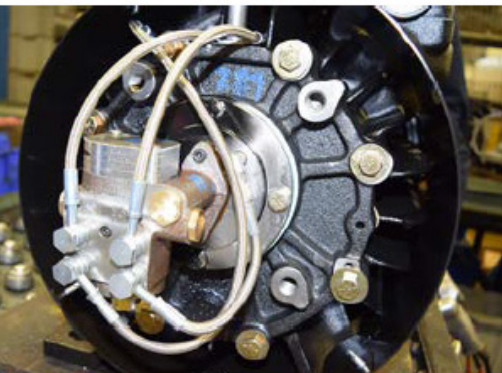
At this point you should be able to turn the rotor by hand.

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, (Do not overtighten fittings)

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



COMPLETE REBUILD

607 PRO Fan and Liquid Cooled

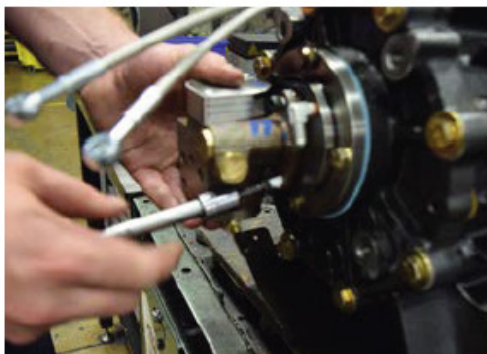
Also note that you can visit:

natvac.com/vane-replacement

to view a step by step video walkthrough with instructions on vane replacement and maintenance.

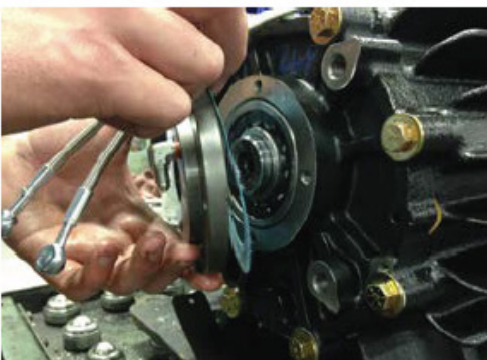


1. Clean off the exterior of the pump



2. Remove the oil pump 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 end plate and remove the shroud.



11. Gently guide the front end plate 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.

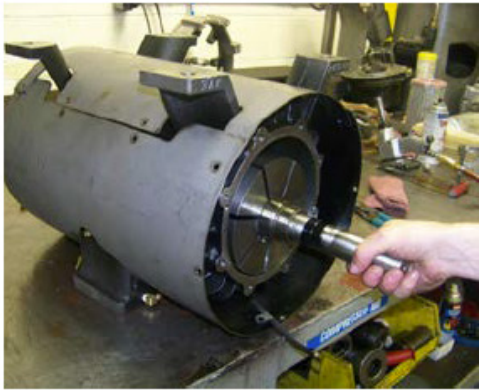
If you bore or hone the housing, remove all connected accessories, including the fan shroud, 4-way valve, gaskets, etc.



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.

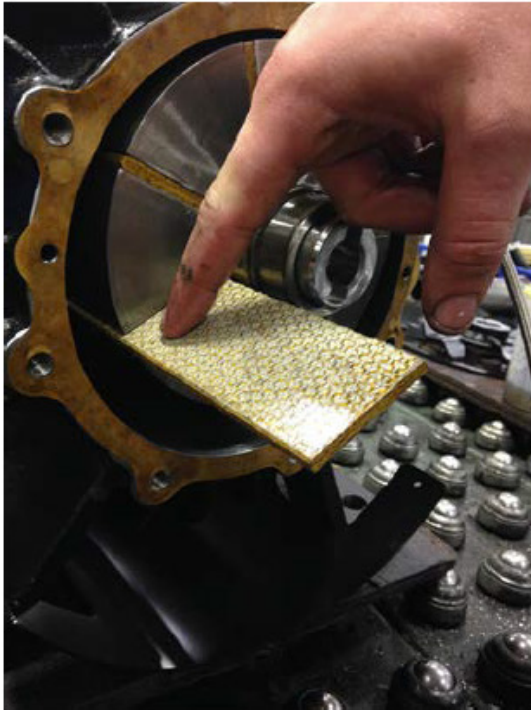


Use a welding glove to take the hot inner race from the hot plate and slide it onto the rotor shaft.

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.



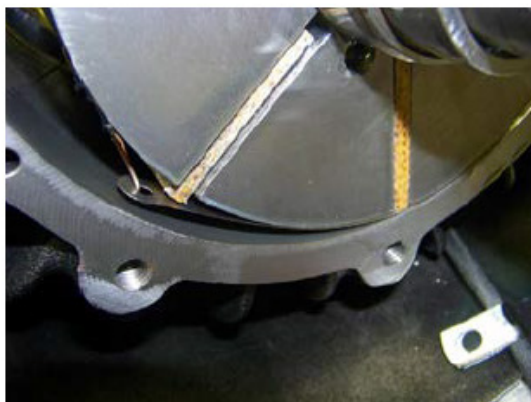
18. Inspect the original vanes for any delamination, chipping or other damage.

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

If any of the vanes are worn more than $\frac{1}{4}$ ", 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)





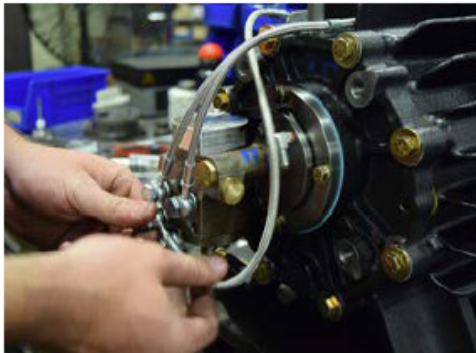
26. Reinstall the oil pump drive key in the non-drive end of the rotor.

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.

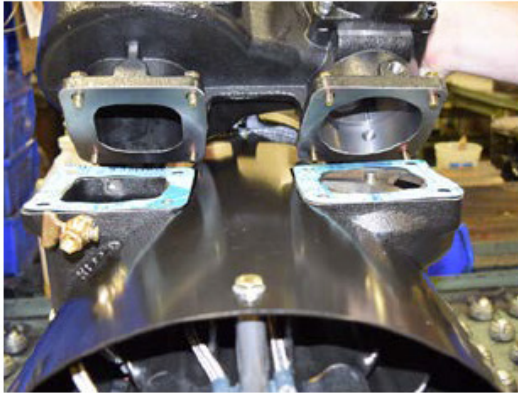
Do not overtighten fittings.



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.

The pump is now ready to go to work!



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