Owner's Record

Date of Purchase: _____

Purchased from: _____

Serial Number: _____

07/98

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Introduction

General Information

About National Vacuum Equipment, Inc.

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 fabricating 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 and fabrication 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/F360–AL

National Vacuum Equipment, Inc.

guarantees that the product it provides is free of manufacturer's defects, including materials and workmanship. Properly installed and maintained product is warranted for a period of one (1) year 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 one (1) 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 one (1) 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 manufacturers 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.

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

- Contact your dealer immediately upon the occurrence of the event and within the warranty period.
- Customer must receive a return goods authorization (RGA) before returning product.
- All serial-numbered products must retain the 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.

NVE/F360–AL Pump

Model-Specific Information

Application

Designed for extended operation

- The NVE/F360-AL is a severe duty vacuum pump, designed to be used in liquid waste pumping systems where extended operation is desired.
- This pump incorporates a fan cooling system with full length cowling to provide superior cooling allowing for extended operation.

Pump Specifications

NVE/F360 PERFORMANCE

		PRESSURE P.S.I.						VACUUM – INCHES OF MERCURY								
RPM		25	20	15	10	5	0	3	6	9	12	15	18	21	24	27
1500	H.P.	38	34	32	29	27	23	23	23	23	22	21	20	20	20	19
	CFM	301	315	324	329	335	342	337	331	327	324	320	313	294	287	256
1250	H.P.	32	29	27	24	23	20	20	20	19	17	16	15	15	15	14
	CFM	252	258	265	269	275	279	277	272	267	261	255	250	247	230	215
1000	H.P	30	26	23	20	18	16	15	15	14	14	14	13	13	13	12
	CFM	198	203	209	212	216	220	218	217	214	211	209	205	196	185	177

System requirements

High quality components

- The NVE/F360-AL is a high performance vacuum pump and requires compatible, high quality components.

Shutoffs

- We recommend the use of our Part # F-801, 12" portal shutoff and our Part # F-901, 12 gallon scrubber/secondary shutoff.

Final filter

- We also recommend the use of a final filter. You can use our remote mounted filter (part # F1001B).

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 relief and vacuum relief valves

- A pressure relief valve and vacuum relief valve should also be incorporated in the system.
- The pressure relief valve should be set for a maximum of 25 p.s.i.
- The vacuum relief valve should be set for 20" hg.

Drive system

- The pump should be mounted on a level, horizontal surface, secured with grade 5 or better fasteners.
- The drive system should be sized to supply the required horsepower to the pump plus a reserve to insure long life.
- 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.
- If during assembly of your unit you find you need the opposite rotation, call the factory for instructions.

Factory Settings

- The automatic oil pumps are set at the factory during pump testing and should require no further adjustment during pump installation.
- The pumps are adjusted to one drop every two seconds per outlet. This oil rate equals 2.7 fluid oz. per hour.

Adjusting Factory Settings

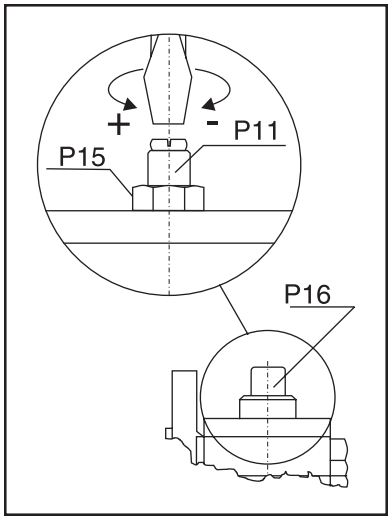
The automatic oil pump is a metered piston-type pump.

If you wish to adjust the pump, please follow these instructions:

Adjusting the oil rate

Oil flow is changed by adjusting the length of the stroke of the piston.

1. To adjust the oil rate, remove cap #P16. Under this cap you will find a jam nut #P15 and adjusting screw #P11.
2. To adjust oil rate loosen jam nut and turn adjusting screw clockwise to reduce oil flow or counterclockwise to increase oil flow.
3. When making adjustments do so one turn of the screw at a time and test before making further adjustments.
4. Be careful to not turn adjusting screw too far counterclockwise as you may disengage the gears and strip them out.



Testing flow rate after adjustment

1. Observe oil drip rate in oil view meter to ensure adequate lubrication.
2. Adjustments should be done gradually so as not to starve the vacuum pump of oil.

Operating Instructions

NVE/F360–AL

Normal Operation

Oil reservoir

- Check oil reservoir daily and fill as required.

Drippers

- When pump is operating, check the dripper to insure proper oil flow to the pump.

Recommended rpm

- Do not operate the pump faster than the recommended rpm.

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 exceeding 24" hg.

Guards

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

Lubrication System

Force feed system

- The NVE/F360-AL is supplied with a force feed type lubrication system which incorporates a piston type pump and two point oiling.

The drip rate is preset at the factory.

- If any adjustments are required please see “Adjusting Factory Settings” on page 14.

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.
- Acceptable oils:

  Penzoil Penzabell 68 T.O.

  Shell Turbo 68

  Mobil D.T.E. Heavy – Medium

  Texaco Regal R.N.O. 68

Maintenance

Washing

- Periodically wash the mud and dirt off your pump. The NVE/F360-AL is an air cooled pump. It must be clean to allow heat to radiate from it.

Flushing

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

1. Remove the 1/8" pipe plug from the intake port of your pump. Install the hose barb and hose supplied.
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 barb and replace the pipe plug.
7. 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.

- Vanes that are worn more than 1/4" should be replaced.
- Vanes should be replaced in sets and it is always a good idea to have an extra set of vanes on hand for emergencies.

Cold Weather Operation

Confirm pump is not frozen.

- Prior to engaging the pump, turn by hand to confirm it is not frozen.

If pump is frozen, thaw it.

- If the pump is frozen, thaw it out by heating the bottom of the pump with a torch or move 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/F360–AL Pump

Pump overheats

- No oil in pump
- Oil adjustment set too lean
- Rpm too fast
- Prolonged operation at excessive vacuum or pressure levels
- Pump dirty

Pump uses too much oil

- Oil pump set too rich; see operating instructions

Pump doesn’t turn

- Broken vane or bearing
- Frozen
- Problem in the drive train

No vacuum

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

System Troubleshooting—Locating the source of the trouble

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

1. Remove the suction and discharge hoses at the pump.
2. Start the pump and run it in vacuum only at its normal rpm.
3. Check the vacuum level at the pump inlet. The NVE/F360-AL in new condition will develop 26-27.5" hg.
4. 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 four-way valve, a short 3" pipe nipple, a 3"pipe cap and a vacuum gage.
2. Drill and tap a 1/4" N.P.T. thread in the pipe cap.
3. Assemble the flange, nipple, pipe cap and vacuum gage.
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.

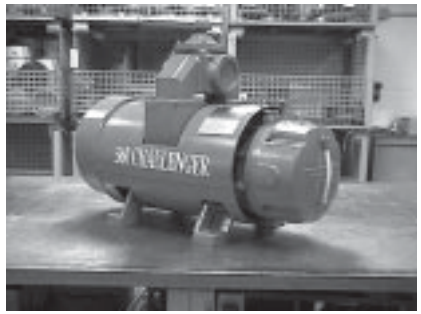
Pump Rebuilding

NVE/F360–AL Pump

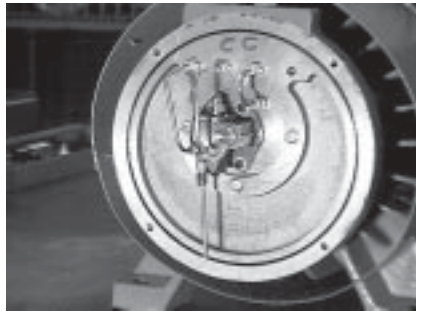
Please read these instructions completely before attempting repair.

There are two types of pump repair—vane replacement and total rebuilding.

Vane Replacement

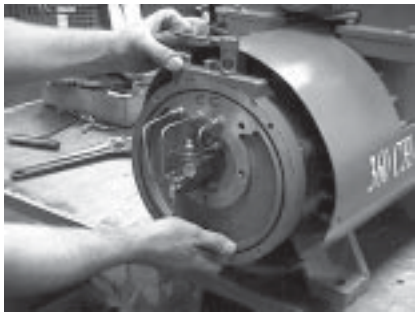


1. Clean off the exterior of the pump, drain and remove oil tank.

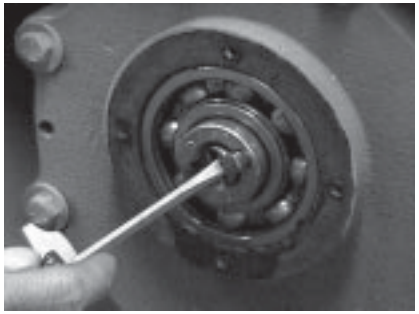


2. On the oil tank end, loosen the shroud by removing the button head cap screw on the top of the shroud that attaches it to the oil pump mount.

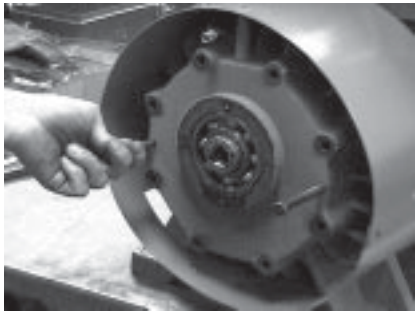
3. Remove the oil line from the oil pump mount that goes to the front of the pump.



4. Remove the four cap screws that attach the oil pump mount to the vacuum pump and remove oil pump and pump mount assembly.



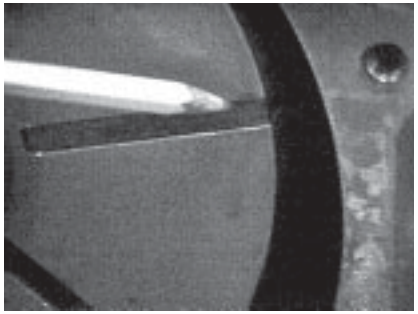
5. Remove the oil pump drive key from the end of the rotor.



6. Remove the eight bolts that attach the endplate to the pump. Secure two 3/8–18 x 2 1/2 inch bolts to screw into pull holes. Screw the bolts into the pull holes evenly . . .

. . . and pull off the endplate.

7. Note the number of gaskets on the end plate. You must use the same number of gaskets during reassembly.



8. Inspect vanes, bearings and seals and replace as necessary.

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

If they are worn more than 1/4" they should be replaced.

We recommend replacing vanes in sets.

If the ends of the vanes are chipped or delaminated they should be replaced.

The seals should be soft and pliable.

The bearing should turn smoothly.

9. Clean the rotor, rotor slots and housing and inspect for wear or damage.

10. Coat the housing and vanes with oil and install the vanes in the rotor.

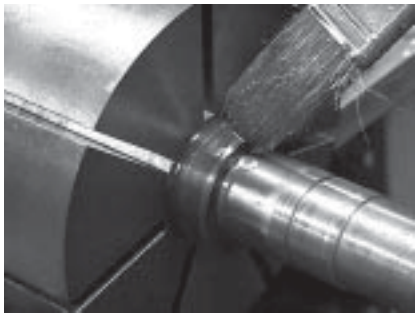
    The vanes should slide freely in the vane slot.

11. Locate the replacement seals and install them in the endplate with the seals positioned back to back.
12. Lubricate and install the bearing in the endplate.

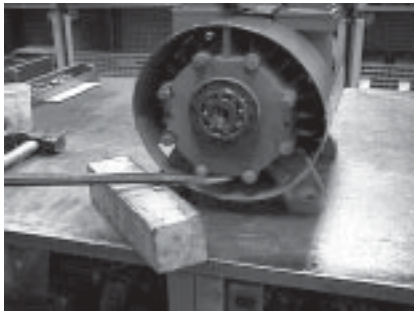
13. Locate the proper number of gaskets and install them on the endplate.

    Do not use any gasket sealer.

    Locate the two 3/8–18x2 1/2 inch bolts used for pulling the endplate and insert them in bolt holes on either side of the endplate.



14. Lubricate seal sleeve and install the endplate on the end of the rotor and carefully drive the endplate on the rotor.



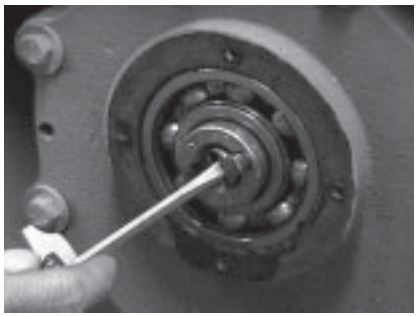
15. When the endplate is close enough to the housing install the endplate bolts lift the endplate-rotor assembly to allow proper alignment of the bolts and bolt holes and start the bolts into the housing.

Just prior to making contact with the housing, lift the endplate-rotor assembly again to insure proper clearance between the rotor and the housing.

Tighten endplate bolts to 35–40 ft. lb of torque.

16. Seat the bearing with a bearing driver or punch.

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



18. Reinstall the oil pump drive key and oil tank mount-oil pump assembly.

    Be sure to line up the oil pump drive key and the oil pump shaft prior to tightening the assembly to the pump.

    Use hardening gasket sealer on the gasket between the assembly and the endplate.

19. Connect the oil line to the oil pump mount assembly from the front of the pump.

20. Reinstall the oil tank and fill the pump with oil. The pump is now ready to run.

21. Start the pump at a slow r.p.m. and allow to run for a few minutes until oil can be seen in the dripper.

    The pump is now ready to go to work.

Complete Rebuild

1. Follow steps 1-7 in the vane replacement instructions.

2. Place a cushion under the rotor to prevent damage when the front endplate is unbolted.

3. From the drive end, remove the four screws that attach the fan cover to the shroud.

Remove the fan by removing the three cap screws that attach the hub to the bushing.

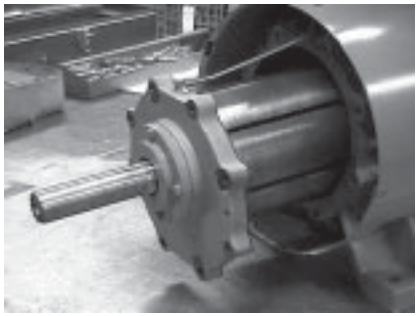
Use two cap screws in the pull holes and separate the hub from the bushing.

Remove the bushing and fan assembly.

4. Place a mark between the steel and aluminum shrouds to aid in line up during reassembly.

Remove the Allen screws that attach the steel shroud to the aluminum shroud.

Remove the four bolts attaching the aluminum shroud to the endplate and remove the shroud.

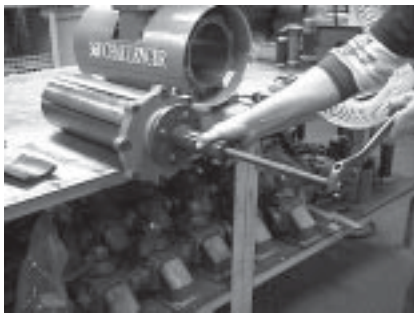


5. Remove the bearing cover.

Remove the eight bolts attaching the endplate to the housing.

Support the rotor shaft prior to loosening the last bolt.

Slide the rotor out and remove the oil line on the endplate.



6. Remove the front endplate from the rotor with a puller or hydraulic press.

   Put an identifying mark on the endplate so as to not confuse it with the rear.

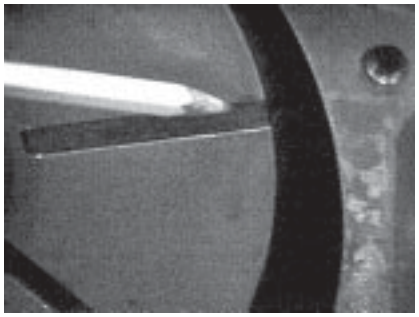
   Count the number of gaskets.

7. Clean the rotor, rotor slots and housing and inspect 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 .060 inch. A new housing has a bore of 7.875 inches.

   If you bore or hone the housing, remove the four way valve assembly and internal check valve prior to machining.



8. Inspect vanes, bearings and seals and replace as necessary.

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

If they are worn more than 1/4" they should be replaced.

We recommend replacing vanes in sets.

If the ends of the vanes are chipped or delaminated they should be replaced.

The seals should be soft and pliable.

The bearing should turn smoothly.

9. Locate the replacement seals and install them in the endplates with the seals positioned back to back.

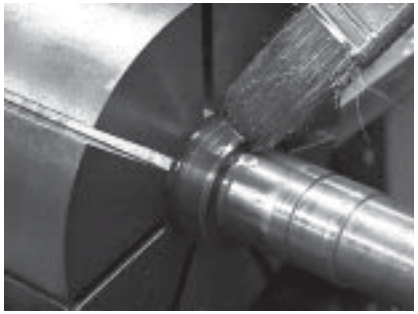
   Replace the seals in the bearing cover with the seals back to back.

10. Lubricate and install the bearings in the endplates.

11. Locate two pieces of threaded rod 3/8–11 thd. to use as guides and screw them into the two top holes in the housing.

Locate proper number of gaskets and slide on the threaded rods.

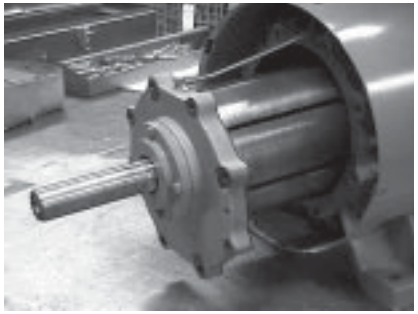
Do not use any gasket sealer.



12. Lubricate the housing bore.

13. Lubricate seal sleeve and drive the proper endplate on the input end of the rotor.

Reassemble oil line on the endplate.



Slide rotor-endplate assembly into the pump housing.

Slide the cushion material (used during disassembly) under the rotor on the opposite end to gain leverage during assembly of endplate to housing.

14. Lift the rotor-endplate assembly and slide over the 3/8 inch threaded guides and install the endplate bolts.

    Tighten the bolts sufficiently to make contact between the endplate and the housing.

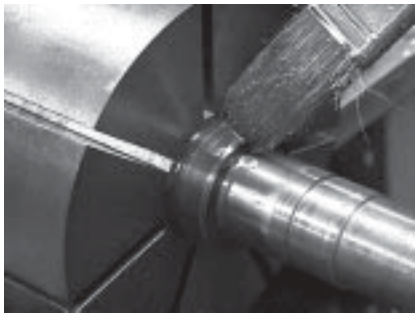
15. Coat vanes with oil and install the vanes in the rotor.

    The vanes should slide freely in the vane slots.

16. Locate the proper number of gaskets and install them on the rear endplate.

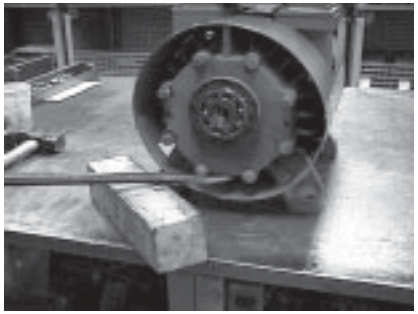
    Do not use any gasket sealer.

    Locate the two 3/8-18x2 1/2 inch bolts used for pulling the endplate and insert them in bolt holes on either side of the endplate to capture the gaskets.



17. Lubricate seal sleeve and install the endplate on the end of the rotor.

    Carefully drive the endplate on the rotor.



18. When the endplate is close enough to the housing, install the endplate bolts.

    Lift the endplate-rotor assembly to allow proper alignment of the bolts and bolt holes and start the bolts into the housing.

    Just prior to making contact with the housing, lift the endplate-rotor assembly allow the endplate to enter the housing.

    Tighten endplate bolts to the point where the endplate just touches the housing.

19. With a prybar and a block of wood, lift the endplate to make certain the seal gap is properly set.

    Tighten the endplate bolts to 35–40 ft. lb. of torque.

    Tighten both endplates in this manner.

20. Seat the bearings on both endplates with a bearing driver or punch.

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

22. Lubricate the seal surface on the rotor and reinstall the front bearing cover.

    Coat the gasket with a hardening gasket sealer.

23. Line up your marks on the aluminum and steel shrouds and attach the shroud to the endplate.

    Attach the steel shroud to the aluminum shroud with the Allen screws.

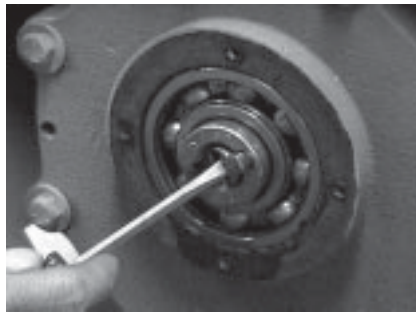
24. Slide the fan and split tapered bushing on the input shaft.

    Screw the bolts into the hub and draw the fan assembly onto the bushing.

    Tighten the bolts several times to make sure the fan is drawn fully onto the bushing.

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

25. Reassemble the fan cover to the fan shroud.



26. Reinstall the oil pump drive key and oil tank mount-oil pump assembly.

    Be sure to line up the oil pump drive key and the oil pump shaft prior to tightening the assembly to the pump.

    Use hardening gasket sealer on the gasket between the assembly and the endplate.

27. Connect the oil line to the oil pump mount assembly from the front of the pump.

28. Reinstall the oil tank and fill the pump with oil.

    The pump is now ready to run.

29. Start the pump at a slow r.p.m. and allow to run for a few minutes until oil can be seen in the dripper.

    Allow the pump to run for a few more minutes.

    The pump is now ready to go to work.

Parts List – NVE/F360–AL Pump

See Parts Diagram Foldout on page 43.

Key	Part #	Description
	360-0	Rebuild Kit
	360-0B	Rebuild Kit w/o Bearings
1	BT29	Button Soc Cap Screw (1/4" x 5/8")
2	360-66-1	Fan Cover
3	360-63CW	Fan Assembly *(Clockwise)*
	360-63CCW	Fan Assembly *(Counterclockwise)*
4	350-65-1	Fan Shroud
5	BT25	Hex Bolt (1/4" x 7/8")
6	WA6	Flat Washer (#12 SAE)
7	360-54	Bearing Cover
8	400-53V	Seal - Viton (40–52–7)
9	400-18V	Seal - Viton (55–72–8)
10	360-60-B	Lower Shroud
11	360-60-T	Upper Shroud
12	350-13F	Gasket
13	350-48	Ball Bearing (6308)
14	360-LP51	Oil Fitting (4mm Tube x 1/8" NPT 90º Elbow)
14A	360-LP56	Oil Fitting (4mm Tube x 1/8" BSPT 90º Elbow)
15	BT3	Hex Bolt (3/8" – 12 x 1 1/2")
15A	BT24	Hex Bolt (3/8" – 4 x 2 1/4")
16	WA4	Flat Washer (3/8")
17	360-3F	Front End Plate *(Right Hand Turning)*
	360-3F/1	Front End Plate *(Left Hand Turning)*
18	350-7	Vane (7 per set)
19	360-5	Rotor
20	LF8	Pump Drive Tab
21	360-4	End Plate Gasket
22	360-1	Pump Housing
23	360-LP1A	Oil Tank Mount
24	360-LP13	O-Ring
25	R31	Gasket
26	LW32D	Oil Pump *(Clockwise)*
	LW32S	Oil Pump *(Counterclockwise)*
27	360-LP52	Oil Fitting (4mm Tube x 80mm x 1)
27A	360-LP57	Oil Fitting (4mm Tube x 1/8" BSPT)

Key	Part #	Description
28	360-3R	Rear End Plate *(Right Hand Turning)*
	360-3R/1	Rear End Plate *(Left Hand Turning)*
29	360-LP93	Oil Line Pickup Tube
30	350-LP1	Oil Tank
31	350-LP3A	Drain Plug
32	BT17	Allen Screw (5/16"–18 x 7/8" Soc Head Cap)
33	360-LP11V	Oil Cap
35	360-LP91	Oil Line
36	BT27	Allen Screw (1/4" x 5/8" Soc Head Cap)
37	360-LP90	Oil Line
38	360-LP50	Oil Fitting (4mm Tube x 1/8" NPT)
39	BT21	Shroud Support (9/16" x 2 1/8"))
40	AWS52	Dripper
41	360-LP55	Fitting (4mm Tube x 1/8" BSPT)
42	360-LP95	Oil Line
43	360-LP94	Oil Line
44	A-311-360	Check Valve
45	AP-311-3/R	Check Valve Retainer
47	AP-312-3/F	Valve Flange
48	AP-312-3FO	O-Ring
50	AP-312-360/H	Valve Housing
51	AP-312-3/TG	Gasket
52	AP-312-3/T	Valve Top
54	AP-312-360/RH	Handle
55	AP-312-3/W	Washer
56	BT9	Hex Bolt (3/8"–16 x 1")
59	AP-312-3/S	Seal
60	AP-312-3/SP	Spring
61	AP-312-3/P	Valve Plug
62	360-39	Gasket (Garlock)
63	360-LP9	Fitting
64	360-LP8A	Tube
65	BT28	Pan Head Screw (#6 x 1/2")
66	BT26	Hex Bolt (1/4" x 1 3/4")

Remove and replace with parts diagram foldout

Remove and replace with parts diagram foldout

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Notes