



National Vacuum Equipment, Inc.



Owner's Manual

B250 Tri-Lobe Blower

Challenger Series
VACUUM PUMPS & BLOWERS



MADE IN THE USA

Designed. Built. Supported in the USA.

800-253-5500 | www.natvac.com

B250 BLOWER

Owner's Record

Date of Purchase: _____

Purchased from: _____

Serial Number: _____

© 2020 National Vacuum Equipment, Inc.

Revision: 1 (Release) January 2020

No part of this manual may be reproduced without the written permission of National Vacuum Equipment, Inc.

CONTENTS

Introduction 5

 About National Vacuum Equipment, Inc.....5

 Our History5

Limited Warranty 6

 Warranty.....6

 Warranty Procedures7

Disclaimer 7

Condition Of Sales 7

Safety Instructions..... 8

 Safety Precautions10

B250 Tri-Lobe Blower..... 11

 General Blower Operation.....11

 Location of Serial Number11

Specifications.....12

 Operating Environment..... 12

 Operating Limits 12

 Performance 13

 Airflow Control 13

 Sound Control 13

 Rotation and Airflow 14

 Handling 15

 Preservation 16

 Limitations of Use..... 17

Installation Considerations18

 Belt Drive System..... 19

 Drive Shaft System 20

 Diesel Engine Precautions..... 20

 Direct Coupler Installation & Alignment 21

 Hydraulic Drive..... 21

 Plumbing and Piping 22

Recommended Accessories..... 22

Exhaust Silencer	22
Intake Filter	23
Four-Way Valve	23
Inlet Check Valve	24
Primary Shutoff	24
Secondary Shutoff/Moisture Trap	24
Operation	24
Preliminary Check on Stored Units	24
Initial Start Up	25
Prior To Regular Start Up	25
Operating The Blower.....	26
Stopping The Blower	26
Cold Weather Operating.....	27
Maintenance	28
Before Beginning Maintenance	28
Procedure for Removal of Pressure Retaining Device	28
Four-Way Valve Adjustment	29
Relief Valve Setting Instructions	30
Pressure Relief Valve	30
Pressure Relief Valve Adjustment Procedure.....	30
Vacuum Relief Valve	31
Pressure Relief Valve Adjustment Procedure.....	31
Maintenance Schedule.....	32
Clean Out Procedure If Flooded	33
Rebuilding.....	33
Maintenance Notes	34
Troubleshooting	35
Change Sump Gear Oil	37
Approximate Oil Capacities	39
Blower Dimensions Diagram	40
Blower Parts Diagram	41
Blower Parts List.....	42

INTRODUCTION

General Information



About National Vacuum Equipment

Congratulations! You now own a quality vacuum/pressure blower 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 components, purchased and developed its own line of vacuum pumps and blowers, 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

Warranty

National Vacuum Equipment, Inc. guarantees that the product it provides is free of manufacturer defects, including; materials and workmanship. Equipment must be installed by a trained and qualified installer according to guidelines established by National Vacuum Equipment, Inc. 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 blower sales to be considered warrantable. Or use the QR code on the right to fill out warranty registration online (<https://natvac.com/warranty-registration/>). All blowers 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. Damage caused by improper use or lack of proper maintenance is not warrantable.
5. Manufacturer's liability under this, or any other warranty whether expressed or implied, is limited to repair of or at the manufacturers' option, replacement of parts which are shown to have been defective when shipped.
6. Manufacturer's liability shall not be enforceable for any product until National Vacuum Equipment, Inc. has been paid in full for such product.
7. Manufacturer's liability for incidental and consequential damage is hereby excluded to the full extent permitted by law.
8. Manufacturer's liability as stated herein cannot be altered except in writing signed by an officer of National Vacuum Equipment, Inc.
9. Certain products provided by National Vacuum Equipment, Inc. are covered by their respective manufacturers' warranties (e.g., engines used in the NVE engine drive packages). These products are not covered by the National Vacuum Equipment, Inc. Manufacturers' Warranty.
10. Equipment must be installed by a trained and qualified installer according to guidelines established by National Vacuum Equipment, Inc.



Warranty Procedures

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.

DISCLAIMER

The information presented in this owner's manual is accurate per the date of publication. National Vacuum Equipment reserves the right to make product design and documentation material changes without notice.

Furthermore, National Vacuum Equipment is not obligated to implement the aforementioned alterations into already manufactured equipment. Should any discrepancy in documentation or design arise, contact should be made with National Vacuum Equipment for clarification. The information presented in this manual is meant for reference only. This manual cannot represent every possible application for this NVE product. Thus, it is the installer and/or end user's responsibility to ensure the system is designed, installed, and operated in a safe manner. Furthermore, this manual is applicable only to the NVE product(s) documented herein. It is not applicable to the entire system of which the NVE product is a component of. Thus, the system designer should be consulted for proper, safe, and efficient operation of any system containing NVE components. NVE cannot assume any responsibility for damage and/or injury resulting from improper system operation.

SAFETY INSTRUCTIONS

National Vacuum Equipment considers safety an essential component in the use of its products. There is no replacement for proper training of personnel who will be in contact with NVE products. This manual should be thoroughly read and understood prior to installing, operating, maintaining, or servicing the NVE product documented herein. Furthermore, as this NVE product is only a component in an engineered system, the system designer and any affiliated documentation should also be consulted. Equipment safety decals should also be referenced and kept in a clean, and easily visible condition. Contact NVE for replacement labels if needed.



WARNING

It is the installer's and end user's responsibility to read and understand the inclusions of this, affiliated manuals, and related documentation before operating the associated equipment.



WARNING

Failure to operate any system containing NVE components according to OEM specifications and proper training can result in serious injury or death! ALWAYS provide all users with proper training.



This symbol is a "safety attention symbol" and appears with most safety statements in this manual. Pay special attention to these symbols and associated text as they highlight a hazard that, if not avoided, can result in equipment damage, injury, and/or death.

SAFETY INSTRUCTIONS

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a hazardous situation which can cause damage to machine, personal property, and/or the environment, or cause the equipment to operate improperly.

Safety Precautions

It is vitally important that safety considerations be implemented in the operation and service of this and other NVE products. While outlining every safety precaution is beyond the scope of this manual, some of the most important precautions include the following:



WARNING

It is the installer's and end user's responsibility to read and understand the inclusions of this, affiliated manuals, and related documentation before operating the associated equipment.

- The blower and associated drive system include rotating components. Before any service, ensure the equipment is locked out and that accidental startup cannot occur. Also, ensure proper guarding is present on the components.
- This blower and associated components operate at elevated temperatures that can cause severe burns. Be sure equipment is cool before conducting any service or maintenance operations.
- Never operate the system without adequately sized and functional pressure relief valves in position. This blower is capable of producing pressures above most tank manufacturers' specifications.
- Use suitable lifting equipment to lift & move the blower/blower package. Improper lifting can cause injury and/or damage to the equipment.
- Do not expose any part of your body to vacuum. This blower is capable of producing vacuum levels that can cause serious injury.
- Never disconnect any fittings/hoses with the blower operating.
- Ensure that appropriate Personal Protective Equipment is being worn when operating and/or servicing the equipment.
- This system must not be used to convey explosive, toxic, dangerous, or unstable gases/media.
- This system should only be operated and/or serviced by properly trained individuals. NVE cannot be held responsible for damage and/or injury caused by improper equipment use/service.
- Ensure all operating limitations are understood and followed in the installation, operation, and maintenance of the entire system.

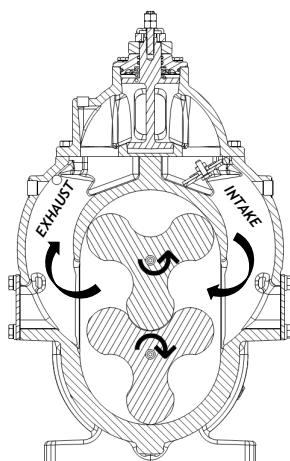
B250 TRI-LOBE BLOWER

NVE B250 TRI-LOBE BLOWER



General Blower Operation

NVE B250 positive displacement blowers operate with two tri-lobe rotors to reduce pulsation levels. These are non-ballast ported machines, which limits the continuous vacuum levels that can be maintained. These blowers operate on the principal of the opening and closing of “pockets” that trap air and convey it from the intake port to the exhaust port. The opening of the lobes creates a vacuum that pulls air into the intake of the blower. The air is then trapped between the rotor lobes and the housing and conveyed to the exhaust port where, by the lobes coming together, the air is forced out the exhaust port. Timing gears control the positions of the two rotors relative to each other and maintain precision clearances inside the machine. This allows the unit to operate without lubrication inside the pumping chamber. The airflow capacity of the machine (in Actual Cubic Feet/Minute) is nearly proportional to the rotational speed of the machine and is nearly indirectly proportional to the pressure differential across the machine.



Location of Serial Number

Each NVE B250 blower will have a stainless-steel blower tag bolted to the non-drive end plate of the blower as shown in the figure to the right. This serial number should be referenced in any contact with NVE regarding the unit.



SPECIFICATIONS

Operating Environment

NVE B250 blowers are designed to move atmospheric air. Do NOT use this blower to move explosive, toxic, or corrosive gases or operate the blower in an area with explosive gases. Contamination in the intake air must be filtered and/or separated from the air by means of an intake filter, moisture trap and/or a cyclonic filter. These filtration and separating devices must be regularly maintained to ensure proper operation of the blower. Excessive pressure drop across these devices can cause overheating of this blower. The blower package should be shielded from excessive sources of dust and debris. A special emphasis should be placed on the atmospheric outlet location of the system as this becomes the inlet of the blower when running in pressure mode. The blower exterior should be kept clean to promote maximum heat transfer to the surrounding air.

Operating Limits

The NVE B250 is a non-ballast ported machine. Thus, this blower has a limited pressure differential rating across its intake and exhaust ports for continuous operation. The blower must always be operated within this limit. Operation above this limit will cause the blower to overheat and may cause catastrophic failure of the blower. This limit is affected by several parameters. These parameters include the following: The RPM of the machine, ambient air temperature, inlet & outlet restrictions of the machine, altitude of the machine, and the run time duration of the machine.

As a general rule, higher machine input speeds, higher ambient air temperatures, and longer operation times will result in higher blower operation temperatures. The system should be designed to result in a continuous blower exhaust temperature not exceeding 370°F or 280°F over ambient (whichever is lower). This measurement should be made on the exhaust side of the blower housing.

Input Speed	Exhaust Temperature	Δ Pressure	Inlet Vacuum
1800-2400*	280°F over ambient or 370°F	15 PSI +	≈ 15" Hg (Corrected) +

* RPMs up to 2500 are acceptable pending exhaust temperatures are tested and found to be within specifications shown above.

+ This should only be used as a reference. The system must be calibrated so that the blower exhaust temperature does not exceed the rating shown in the table above. This is dependent on many factors and may cause actual inlet vacuum to vary from the value presented above.

Performance (Reference Only)

B250 RPM		Vacuum (Inches of Mercury)							Pressure (PSI)		
		0	4	8	10	12	14	15	5	10	15
2000	HP	3.1	3.5	4.9	5.6	6.6	7.5	7.8	6.4	14.5	38.0
	TORQUE	8.2	9.2	12.8	14.7	17.4	19.6	20.5	16.8	26.5	38.0
	CFM	228									
2200	HP	3.8	4.1	5.6	6.5	7.3	8.3	8.8	8.1	12.1	16.5
	TORQUE	9.1	9.8	13.3	15.4	17.6	19.9	21.1	19.3	28.9	39.5
	CFM	240									
2400	HP	4.6	5.4	6.2	7.1	8.1	9.0	9.5	8.5	13.2	18.1
	TORQUE	10.1	11.8	13.5	15.5	17.7	19.6	20.7	18.7	28.8	39.5
	CFM	262									
2600	HP	5.9	6.5	7.2	8.1	9.1	10.1	10.7	10.0	14.4	20.2
	TORQUE	12.0	13.1	14.6	16.4	18.4	20.5	21.6	20.2	29.1	40.9
	CFM	285									

Performance of your NVE B250 blower may deviate from the aforementioned data for numerous reasons. These reasons include things such as: ambient temperature, oil condition, bearing condition, cleanliness of the media being pumped, etc. Thus, the performance values presented above should only be used for reference purposes. Actual operating conditions may vary and it is the system designer's responsibility to account for these variations.

Air Flow Control

The airflow rate of the blower can be adjusted by changing the speed of the blower. This can be accomplished by changing the PTO ratio, the gearbox ratio, pulley ratio (on belt drives), hydraulic pump/motor displacement, or driving engine speed. The blower input speed is nearly proportional to the airflow of the machine.

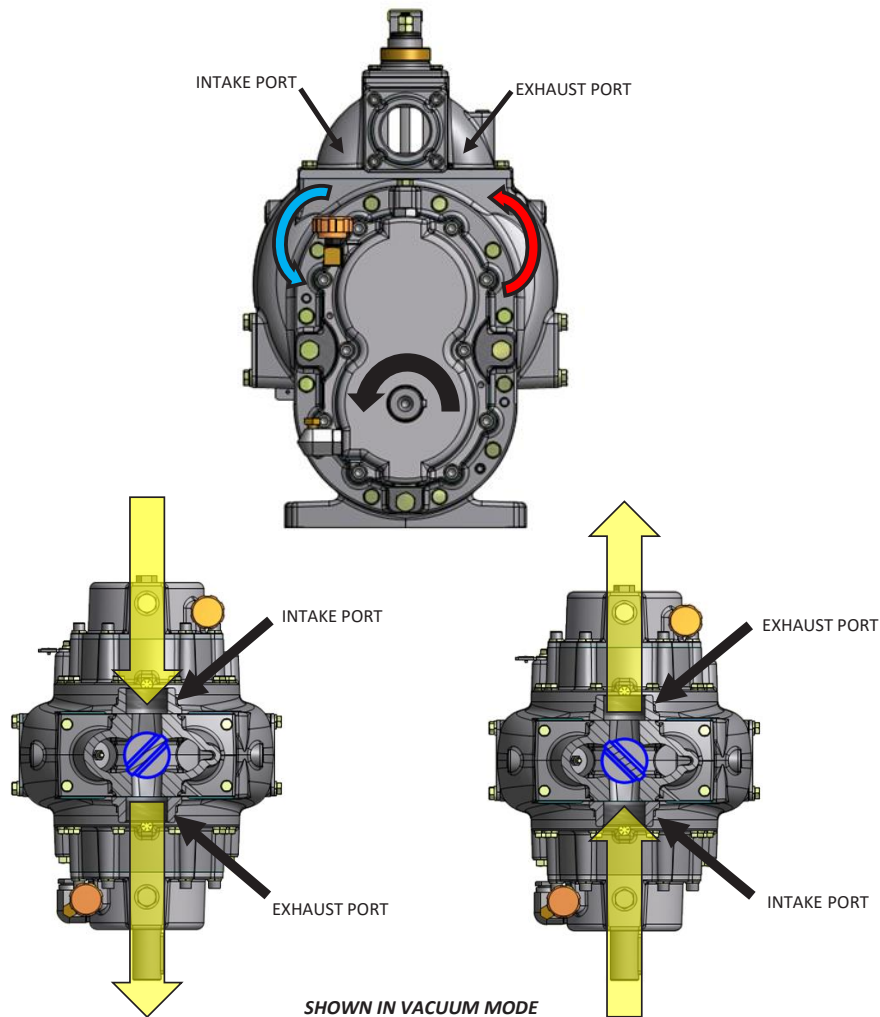
Sound Control

It is recommended the operator monitor the blower while running and listen for resonances (increased levels of noise) that may occur at certain RPMs and operate the blower at speeds above or below the resonance speeds to reduce excess noise. Resonance areas are dependent on many factors and tend to be application specific.

The noise level of the blower will increase with higher levels of vacuum and RPM. To minimize noise, operate the blower at the minimum speed and vacuum level required to achieve the desired performance.

Rotation & Airflow

Either port can be used for intake and exhaust connection to the blower. However, the handle position for vacuum and pressure will vary accordingly. In the “vacuum” position, the four way valve must be positioned to connect the intake port to the intake connection (the tank). The following graphics portray this hookup and airflow information as it relates to the B250 blower.



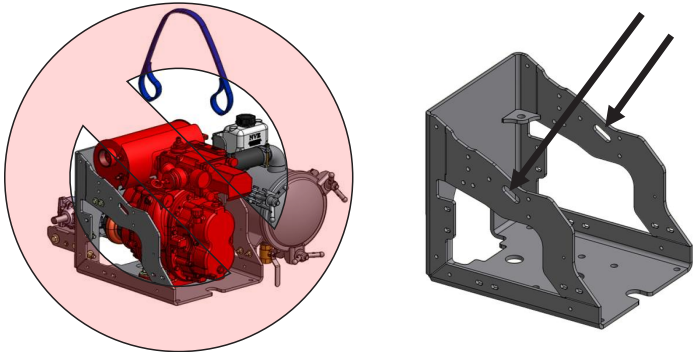
Handling

When unpacking the blower or blower package from the skid, verify the packing list matches the product supplied and that no visible damage has occurred during shipping. In the event damage has occurred, first file a claim with the carrier and then contact NVE for assistance.

Keep all intake and exhaust ports covered to prevent accidental ingestion of materials into the blower.

Use an appropriately sized lift strap for the weight of the blower or package being lifted.


Do NOT use lift points on the blower to pick up blower packages. The blower was not designed to be used as a pick point for packages. Damage to the blower and/or package will likely result. The blower stand includes lifting pockets that can assist in lifting the package.




The dry weights of the B250 and associated packages are given in the table below:

PART NUMBER	DESCRIPTION	DRY WEIGHT
131-B250-LSM	Blower, B250, Low Shaft, CCW, Manifold	242 LBS
147-B250-001	B250 Frame Mount Gearbox Drive, RH MT & Exhaust Silencer Package	531 LBS
147-B250-002	B250 Frame Mount Hydraulic Drive A Face Kit, RH MT & Exhaust Silencer Package	490 LBS
147-B250-003	B250 Frame Mount Hydraulic Drive B Face Kit, RH MT & Exhaust Silencer Package	496 LBS

Table 1: B250 Blower & Packaging Dry Weights



**CAUTION**

Improper handling of the blower can cause blower damage and/or dropping of the blower. Ensure the load is balanced before picking.

Preservation

Keep all intake and exhaust port coverings in place to prevent debris or liquids from entering blower. Reapply rust preventative oil to all metal parts, including the pumping chamber every six months or more frequently if the relative humidity is greater than 80%.

While in storage, rotate the shaft three to four revolutions every two weeks to keep gears coated in oil. Before installing a blower that has been stored for any length of time, remove the intake and exhaust covers and inspect the rotors and cylinders to insure the absence of rust. In addition, remove the oil fill plug on the drive oil tank and inspect the gear for any evidence of rust.



WARNING

Use a rust preventative oil with a flash point over 400°F. Drain oil prior to putting unit in service.



NOTICE

Dispose of used rust preventative oil according to local and EPA regulations in an environmentally friendly manner.

Limitations of Use

Limitation of Use	Reason for Limitation and/or Risk	Corrective Actions
Operation of the blower in an explosive environment.	Fire and/or explosion can result.	DO NOT USE
Using blower to move explosive, toxic, or dangerous gases.	Fire and/or explosion can result. Pollution of the environment. Health and injury risks to operator(s).	
Liquid drawn into blower intake.	Blower seizure, damage to blower, and possible ejection of parts.	Install a moisture trap or cyclonic separator before the intake port of the blower. If liquid is suspect in the blower, remove before starting blower.
Operation above 15 in Hg* of intake vacuum. *Value may vary slightly depending on application.	Overheating of blower. Eventual catastrophic failure of blower. Potential Fire.	Install a properly sized vacuum relief to keep blower exhaust temperatures within specifications. Keep intake filter clean.
Operation with exhaust port blocked off or restricted.	Overheating & potentially dangerous system pressure.	Remove blockage and minimize restriction in the exhaust circuit.
Rotation of the blower in the wrong direction.	Damage to the blower.	Change the direction of rotation of the drive. (Jog blower to confirm correct rotation at first startup).
Operation of blower in excess of recommended speed.	Overheating & potential seizure of blower. Blower damage & ejection of parts possible.	Operate the blower within the recommended speed range.
Operation of blower below minimum speed.	Potential seizure of blower. Blower damage & ejection of parts possible.	
Operating at excessively hot inlet & atmospheric conditions.	Overheating of blower. Eventual catastrophic failure of blower.	Monitor the blower operating temperature & adjust intake vacuum and/or RPM to get operating temperatures within specification. Keep blower & intake filter clean.
Operating at excessively cold inlet & atmospheric conditions.	Damage to, and potential seizure of, the blower. Ejection of parts possible.	Review precautions in cold weather conditions. Use recommended lubrication.
Operating above the exhaust temperature upper limit.	Overheating of blower. Potential fire. Damage to, and potential seizure of, the blower.	Reduce intake vacuum level. Reduce the blower speed. Remove restrictions in intake & exhaust circuits (clean inlet filter!).
Operation of drive with excessive misalignment.	Damage to, and potential seizure of, the blower. Ejection of parts possible.	Remove misalignment & replace wearing components in drive system.

INSTALLATION CONSIDERATIONS

Any B250 blower package should be mounted to the frame of the truck in a sufficient manner. Truck manufacturers' should be consulted for proper mounting. NVE cannot take responsibility for the mounting of any NVE product.

The exhaust discharge of the blower silencer should be considered in the installation of the package. Remember, this becomes the intake when the blower is operated in pressure mode, so ensure hot and/or dirty air is not going to be pulled into the silencer.

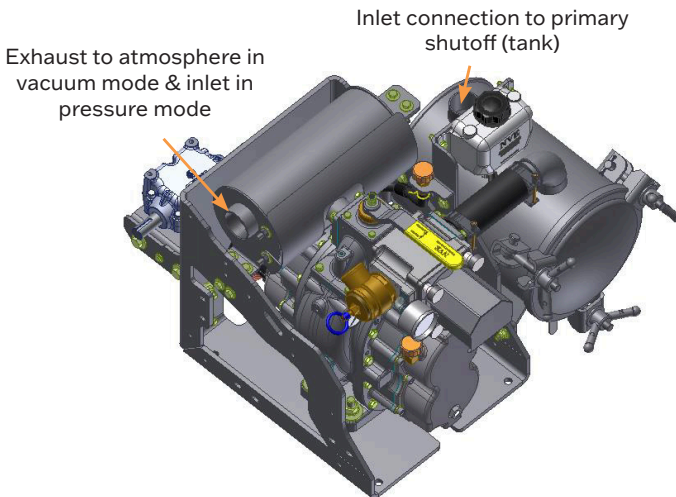
The moisture trap, if equipped, should be plumbed to the primary shutoff and, ultimately, the tank. The connection must be vacuum, pressure, and temperature rated.

Ensure proper ground clearance is maintained with installation location.



WARNING

Never block or restrict exhaust discharge. Dangerous style pressures are possible.



Fill out the blower registration form and email to sales@natvac.com.

Fill out the installation check list & warranty validation form and email it to sales@natvac.com.

Belt Drive System

The B250 blower is able to accommodate a V-Belt drive system. It is recommended to mount the prime mover on the intake side of the blower. This prevents unloading of the blower bearings at low load levels and also helps reduce the moment load on the bearings. The pulley should be mounted as close to the oil sump cover of the blower as possible (with a minimum ¼" gap). Some method of belt tension adjustment must be installed to take up belt wear. Belts should be matched to insure uniform torque transmission. Belts should be replaced in sets. Due to the inherently higher hub loads generated, synchronous drive systems should not be used on a B250 blower.



WARNING

Belts and pulleys must be fully guarded to prevent entanglement and ejection of parts.

CAUTION

Excessive or insufficient belt tension could damage the blower and/or prime mover.

Regularly check all bushing fasteners for proper torque, especially after initial run in or after any belt drive service.

A belted drive specialist should be consulted for design review of a belted drive system incorporating NVE components.

Drive Shaft System

U-Joint operating angles at each end of the shaft should always be to manufacturers' specifications to prevent yoke bearing failure. Do not exceed the manufacturers maximum or minimum recommended angles for the operating RPM.

U-Joint operating angles on each end of a drive shaft should always be equal within manufacturers' specification of each other to cancel any angle vibration. A drive line specialist should be consulted for the design of this system from a torque transfer and geometric approach. The drive shaft should be balanced to manufacturers' specification.



WARNING

A drive shaft loop should be used to catch the shaft in the event of failure and to prevent the ejection of parts.

Drive shafts represent rotating parts and pose entanglement hazards.

NEVER approach a rotating system.

It is recommended that overload protection be incorporated on the driveline.

Diesel Engine Precautions

CAUTION

This blower should not be operated with a diesel engine running at low RPMs. Diesel engines at low RPMs are capable of producing damaging torque pulses that can cause rotor lobe contact and/or accelerated wear of bearings and gear components.

When driving the blower with a diesel engine, it is recommended to bring the engine up to normal operating RPM and then engage the blower via a clutch. The blower should be started under a “no load” condition (i.e. neutral valve position).

Use caution when using a diesel engine that is significantly oversized for the operating point of the blower. Doing so can result in inertial mismatch, excess torsional vibrations at low RPMs, and possible blower lobe contact.

With increased regulation in regards to diesel engines, NVE strongly recommends consulting a diesel engine specialist to assist in the design of a diesel driven system using NVE components.

Ensure diesel engine exhaust is not increasing the intake and/or ambient air conditions of, or around, the blower. Otherwise, overheating of the blower could occur.

Direct Coupler Installation & Alignment

Reference the coupler manufacturers’ installation instructions to ensure proper install of the coupler system. Ensure coupler specifications conform to the HP/torque relationship of the blower/prime mover. It is the installer’s responsibility to ensure proper drive system installation and alignment.

CAUTION

Do NOT use a hammer to slide couplers onto, or off of, the blower shaft as this may result in blower damage.

Failure to properly align couplers can cause premature wear of the blower bearings, coupler components, and other drive system members.

Couplers should be routinely inspected for wear and replaced according to manufacturers’ recommendations.



WARNING

Couplers must be guarded to prevent entanglement and ejection of parts.

Hydraulic Drive

The B250 can be driven with an appropriated sized, and matched, hydraulic system utilizing a motor with an SAE A two-bolt or SAE B two or four bolt face. NVE offers B250 packages with both of these hydraulic adapters. It is the installer's responsibility to design the hydraulic system, including the hydraulic motor and associated couplers, to connect to the blower.



WARNING

Couplers must be guarded to prevent entanglement and ejection of parts.



CAUTION

A hydraulic specialist should be consulted in the design of the hydraulic system.

Failure to properly align couplers can cause premature wear of the blower bearings, coupler components, and hydraulic motor.

Plumbing and Piping

Do not hang plumbing from blower flanges. Use isolating flanges or isolating hose to couple the blower to piping to prevent dead weight from hanging off the blower and to allow for thermal expansion. Failure to do so may result in rotor contact with housing and/or premature wear and/or leaking of connection points. Use only clean piping that is free of dirt, scale, cuttings, weld spatter, and foreign materials of any kind.

The intake and exhaust system can be plumbed with 2" or larger hose. The hose should be rated for the maximum exhaust temperature of the blower. Incorrect specification of hose could result in hose failure and possible overheating of the blower.

Hose on the intake side of the blower must be vacuum rated up to maximum desired system vacuum. The intake components, and blower itself, should not be subjected to excessive heat sources.

WARNING

Incorrect specifications on plumbing components can cause failure of the blower, ejection of parts, and/or expelling of dangerously hot air/media.

A specialist should be consulted in the selection of plumbing components.

RECOMMENDED ACCESSORIES

Exhaust Silencer

Positive displacement blowers are inherently noisy due to their design. NVE offers compatible silencers for the exhaust system of the B250 blower to reduce decibel levels in the operating environment. If using a non-OEM silencer, it should be tested for effectiveness by running at the desired vacuum level and RPM and monitoring exhaust gas temperature with the blower running for at least one hour. The blower should not exceed specified exhaust gas temperatures. Be sure the exhaust silencer is not restricted at free (maximum) air flow as this could cause damaging back pressure in the blower.

WARNING

Discharge from the exhaust silencer can reach temperatures capable of causing injury.

The exhaust silencer and associated plumbing pose a burn hazard during, and after, operation.

Maintain an air gap around the exhaust silencer and associated plumbing.

Intake Filter

NVE offers an intake filter manifold for the B250 blower. It includes a stainless steel mesh type filter that is designed to maximize efficiency and keep unwanted, and potentially damaging, debris from being ingested into the pumping chamber. An improperly sized, or excessively dirty intake filter can cause actual inlet vacuum of the blower to rise above specification and can cause the blower to overheat. It is good practice to keep a spare filter on hand for emergency use.

CAUTION

A clogged inlet filter can cause the blower to overheat.

Keep the inlet filter clean.

Replace the filter if damaged.

Four-Way Valve

The B250 blower features an integral four-way valve in the blower manifold. Thus, this blower is capable of vacuum and pressure modes right from the factory.





WARNING

This blower is capable of producing dangerous pressure levels that may exceed the limits of the tank (and other system components) to which it is attached.

It is the system designer's responsibility to install properly sized and positioned relief valves into the system.

Inlet Check Valve

The B250 blower features an integral inlet check valve in the blower housing. This check valve is always on the intake side of the blower (whether in pressure or vacuum mode). This feature prevents the blower from spinning backwards should the system be disengaged with vacuum on the unit being evacuated. Jog the system at first startup to verify the blower is rotating in the correct direction.

	<div data-bbox="511 380 913 448"> WARNING</div> <p data-bbox="476 480 945 565">Spinning the blower in the wrong direction will close the inlet check valve and can produce dangerous pressures inside the blower.</p>
---	---

Primary Shutoff

A primary shutoff is to be used with the blower as a first line of defense to prevent liquid from entering the blower. It is critical that an appropriately sized primary shutoff is used. Contact NVE for assistance with selecting the shutoff.

Secondary Shutoff/Moisture Trap

The secondary shutoff or moisture trap should also be appropriately sized for the airflow application. Contact NVE for assistance with selecting the shutoff. Many B250 blower packages come standard with a moisture trap installed.

OPERATION

Preliminary Check on Stored Units

Before operating a B250 blower that has been stored for any length of time, remove the intake and exhaust port covers and inspect the rotors and cylinders to verify the absence of rust. Make sure nothing falls into the pumping chamber when the covers are removed.

Remove the oil fill plug on the drive side of the blower. Inspect the timing gears for the presence of any rust. If any inclusions are noticed in the gear oil, the gear oil should be replaced prior to putting the unit into service.

Verify the blower spins by hand. Due to the positive lip seals in the B250, there will be some resistance to rotation. This is normal.


Initial Start Up

Verify the blower is setup to spin in the correct direction. At first start up, jog the blower to confirm rotation.

Verify all connections between the plumbing system and the blower flanges are in place and tight.

Blower should be started in a “no-load” condition.

Blower speed should be ramped up slowly to minimize system shock.

	! CAUTION
Do not rotate the blower in the reverse direction. Hot shift PTOs are not recommended in driving the blower.	

Set the vacuum relief system to keep the blower exhaust temperature at a maximum of 280°F above ambient air temperature (or 380°F – whichever is lower). This vacuum level is dependent on many factors, but should be around 15 inches of mercury.

During the first eight hours of operation, special attention should be given to the unit to ensure there are no vacuum leaks, oil leaks, vibrations, or strange noises.


*See page 39 for proper gear oil.

Prior To Regular Start Up

Verify oil levels through the sight eyes on both ends of the blower. If additional oil is required, see the maintenance section for details.

Verify all guards are in place.

Blower should be started under a “no load” condition and input speed should be ramped up slowly.

	! WARNING
Operators must wear PPE including, but not limited to, eye and hearing protection as noises levels can exceed 85 dB.	

Operating The Blower

After starting the blower under a “no load” condition and bringing up to operating RPM, the four-way valve handle can then be placed in either vacuum or pressure mode. Put the handle fully in pressure or vacuum. Never feather the four-way valve on the blower to regulate vacuum or pressure. This allows hot exhaust air to be pulled into the intake of the blower and will quickly overheat the blower. Blower exhaust temperature is usually the first sign of trouble in a blower. If the temperature rate is abnormal or the operating temperature is high, shut the system down in a quick, but safe manner. Strange noises also are an indicator of trouble.

Check the appropriate parameters listed in the maintenance schedule under the Maintenance section of this owner’s manual.

CAUTION

Improper operation of the blower can cause equipment failure and/or injury.

Feathering the four-way valve between vacuum and pressure will overheat the blower.

Do not operate the blower outside of the recommended temperature and/or RPM ranges.

Blower system should only be operated by trained individuals.

Stopping the Blower

Before stopping the blower system, all vacuum or pressure should be removed from the blower (if possible). This reduces the system shock of the shutdown. Furthermore, this system should not be used to hold vacuum and/or pressure when the system is not engaged.



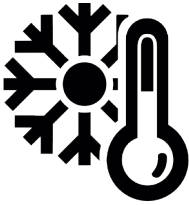
CAUTION

Remove vacuum and/or pressure from the blower system before disengaging.

Do NOT keep vacuum and/or pressure on the blower system while disengaged.

Do NOT transport the system with vacuum and/or pressure present.

Cold Weather Operation



NOTICE

During very cold weather conditions, always warm the blower before operating at full rated vacuum or pressure.

Damage to the blower can result from operating for short intervals to near rated exhaust temperatures in very cold weather conditions.

If using a coupler system with a rubber jaw or sleeve in shear applications in extremely cold weather, take note that elastomeric materials become stiffer in cold weather. This results in a reduction of the shear protection in the event of a lock up of the blower because the jaw or sleeve can handle more torque before giving way.

If hydraulically driving the blower, allow the hydraulic fluid to warm up before operating the blower at full load. Use the correct viscosity of hydraulic oil for the operating temperature as recommended by the manufacturer of your system. Contact a hydraulic specialist to determine optimal system design for cold weather environments.

Before starting blower, verify the shaft rotates freely by hand. Water can condense and freeze in the pumping chamber without warning causing a stall condition at start up.

Check the intake filter and air intake daily. If snow is present, check the air intake more frequently.

Do NOT thin out the oil in the gear cases with any other fluids such as Kerosene. Use the recommended oil for the operating temperatures.



A suitable, safe, and compatible flushing fluid can also be used in cold weather applications to keep the blower pumping chamber lubricated and “freeze-protected.” A fluid specialist should be consulted to determine an appropriate flushing fluid product and procedure. Flushing between jobs and at the end of the day can help reduce the chances of moisture inside the pumping chamber of the blower from “freezing up.”

If temperatures are so cold that the blower cannot warm up, enclose the blower allowing for sufficient clearance from parts to prevent contact with hot or moving components.

MAINTENANCE


Before Beginning Maintenance

Before beginning any maintenance procedure, the system must be shut down and locked out to eliminate the possibility of accidental startup. Most systems that include NVE components have rotating members that can cause entanglement, injury, and/or death. Many NVE components also obtain high levels of temperature during, and for a period after, operation. The entire system must be allowed to cool below 100°F before beginning any service procedure. Also, all pressure or vacuum must be removed from the system before beginning maintenance.

	<div data-bbox="525 496 902 565"> DANGER</div> <p>Lock out equipment before beginning any maintenance procedure. Rotating equipment can cause entanglement, injury and/or death.</p> <p>Allow all system components to cool below 100°F before beginning any maintenance procedure. Severe burns are possible.</p> <p>Safely remove all pressure/vacuum from the system before beginning any maintenance procedure. Injury/death can occur.</p>
---	---

Procedure for Removal of Pressure Retaining Device

1. Make certain all pressure is relieved from system prior to loosening any device/component.
2. Four-way valve should be in neutral position.
3. Check vessel gauge and ensure absence of pressure.
4. Only **LOOSEN** all mechanical holding devices.
5. Wiggle lid, cap, or component to ensure the absence of pressure.
6. Pressure retaining device can then be removed after aforementioned process ensured no contained pressure.

	<div data-bbox="568 1344 859 1412">NOTICE</div> <p>Only properly trained personnel should service systems containing NVE components.</p>
---	---

Four-Way Valve Adjustment

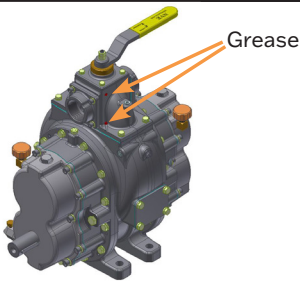
The B250 blower features an integral four-way valve in the blower manifold. This valve has a tapered plug and may require adjustment. However, before adjusting a “sticky” valve, it is recommended to grease the valve. Greasing should be part of a routine maintenance program for this blower. There are two grease ports on the drive side of the manifold (see graphic below). These are flush style grease fittings and thus require a tip style adapter. A 90° angle adapter will be the easiest style to use. Do not over grease the valve. A small amount of grease is all that is necessary to sufficiently grease the plug.



! WARNING

Ensure system is free of vacuum and pressure before beginning any maintenance.

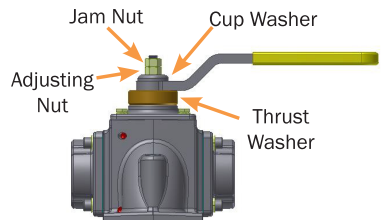
Allow blower and system components to cool below 100°F before beginning any maintenance.



90° Grease Dispensing
Tip Adapter

If it is determined that the valve needs adjustment (either for excessive tightness or excessive looseness), the following list outlines the procedure that should be used.



1. Back the jam nut off one turn.
2. Turn the adjusting nut CCW to remove tension. This will force the plug down (tight).
3. Slowly turn the adjusting nut CW to lift/loosen the plug.
4. Move the valve by hand and adjust so there is some resistance.
5. Once desired resistance is achieved, tighten the jam nut against the adjusting nut while holding the adjusting nut in position with a wrench.



*A valve that is too loose may allow the valve to “creep” while the blower is running and may allow air leaks from the exhaust to intake side of the blower – both undesirable conditions.

Relief Valve Setting Instructions

Pressure Relief Valve

	<div data-bbox="511 212 916 285"> WARNING</div> <p>Pressure relief valves should only be adjusted and/or serviced by trained individuals.</p> <p>Pressure relief valves are not pre-set. They must be properly set at time of install.</p> <p>Improperly set/installed pressure relief valves can cause potentially dangerous system pressures to be generated.</p> <p>NVE assumes no responsibility of quantity and/or setting of any pressure relief valves on any associated system.</p>
---	---

Pressure Relief Valve Adjustment Procedure

Picture #1

Step #1: Unscrew lock nut “A.”

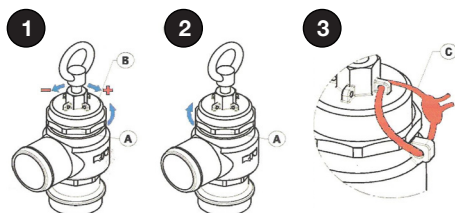
Step #2: Turn the spring-tightener “B.”

CW = Increased Pressure

CCW = Decreased Pressure


Picture #2

Step #3: Once desired pressure is obtained, retighten lock nut “A.”



Picture #3

Step #4: Fix the setting by using the rings “C” that are situated on the body and the spring-tightener.

	<div data-bbox="570 1304 862 1377">NOTICE</div> <p>Only properly trained personnel should service systems containing NVE components.</p>
---	---

Vacuum Relief Valve



WARNING

Vacuum relief valves should only be adjusted and/or serviced by trained individuals.

Vacuum relief valves are NOT factory set by NVE. They must be properly set at time of install.

NVE assumes no responsibility of quantity and/or setting of any vacuum relief valves on any associated system.

Improperly set/installed vacuum relief valves can cause potentially dangerous blower exhaust temperatures to be generated that can lead to catastrophic blower/system failure.

Vacuum Relief Valve Adjustment Procedure

Step #1: Remove the protection cap "A."

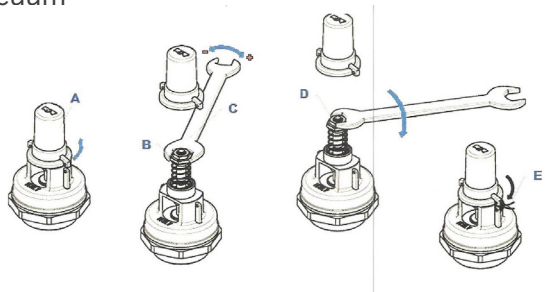
Step #2: Turn the spring-tightener "B" through a spanner "C."

CW = Increased Vacuum

CCW = Decreased Vacuum

Step #3: Once desired vacuum level is obtained, screw down the lock nut "D."

Step #4: Screw down the protection cap and fix it using the rings "E" that are situated on the valve body and on the cap.



NOTICE

Only properly trained personnel should service systems containing NVE components.

Maintenance Schedule

Disclaimer: This maintenance schedule is meant to be a reference only. Many applications will require more frequent maintenance (and some less). It is up to the operator to look over this schedule and amend it to fit their application based on its' specifics.

Maintenance Schedule						
Check	Parameter	Frequency				Comments
		Hr	Dy	Wk	Mn	
Visual	Pressure		1			Blower Running
	Temperature		1			
	Noise		1			
Lubrication	Oil Level		1			Blower
	Oil Leakage			1		
	Oil Change-Initial	400				
	Oil Change-Normal					
	Four-Way Valve			1		
Filter	Vacuum		1			<1 in Hg
	Clogging			1		
Right Angle Gearbox	Oil Change-Initial	50				Blower
	Oil Change-Normal	500				
Moisture Trap/Secondary	Drain Fluid		1			
Inspection	Driveline			1		
	Couplers			1		

Clean Out Procedure If Flooded

1. Remove the inlet filter and exhaust silencer.
2. Remove the timing cover plates on the sides of the blower.
3. With high pressure water, clean intake and exhaust areas.
4. Have an assistant slowly turn the input shaft as you clean the lobes with water.
5. Run the blower at the lowest speed possible and continue to spray water into the inlet of the machine until the discharge shows only clean water.
6. With the blower running, spray a small amount of penetrating oil into the intake and run until no liquid comes out the exhaust. **DO NOT SPRAY OIL INTO THE BLOWER WITH THE SILENCERS IN PLACE.**
7. Disassemble and clean the manifold/four-way valve assembly. Allow to dry, then reassemble.
8. If the blower was flooded, it is highly probable the exhaust silencer has material in it as well. Clean it out as best you can. Drain all fluids from the silencer and allow it to dry.
9. When everything is clean and dry, reassemble the manifold and silencers. Make sure flange bolts on the blower are tightened evenly.

Rebuilding

Rebuilding is beyond the scope of this owner's manual and should be performed only by trained technicians. Consult an authorized distributor or NVE to arrange rebuilding of the blower.

Maintenance Notes

[illegible]

TROUBLESHOOTING

Operating Problem	Probable Cause (Next Table)
Blower does not spin by hand.	A, B, C, K, M, N, V, AG
Inlet vacuum is not what's expected.	D, E, G, H, AA, AB, AC, AD
Outlet pressure is not what's expected STOP THE BLOWER TO PREVENT DAMAGE.	E, F, AB
Outlet temperature is not what's expected STOP THE BLOWER TO PREVENT DAMAGE.	B, C, D, E, G, H, J, K, W, X, AA, AB, AC, AE, AH
Prime mover (engine or motor) is laboring excessively when driving blower.	A, B, C, E, F, H, K, L, M, N, T, U, V, AA, AB, AG, AH
Oil or liquid leaking from blower.	L, P, R, S, AE
Oil temperature is high.	B, D, E, F, J, K, W, X, AE, AH
Blower is creating unusual noises or vibrations. STOP THE BLOWER TO PREVENT DAMAGE.	A, B, C, D, E, F, G, H, K, M, N, T, U, V, Y, Z, AB, AC, AD, AG, AH
Oil mist is visible in exhaust.	K, L, W, X, AE, AH

	Probable Cause	Remedy
A	Rotors are contacting each other.	Stop the blower immediately and check the internal clearances of the blower.
B	Deposit build up on cylinder wall.	Clean the cylinder walls and rotors.
C	Object was ingested into the blower.	Remove the object, clean the internal walls of blower and check the internal clearances.
D	Inlet plumbing or filter is clogged.	Check and clean the inlet plumbing and filter.
E	Blower not at correct RPM.	Verify blower RPM and adjust accordingly.
F	Exhaust plumbing clogged.	Clean exhaust plumbing and silencers.
G	Rotors are worn.	Verify internal clearances and replace or rebuild as necessary.
H	Vacuum relief valve improperly set or failed.	Measure system vacuum, reset or replace vacuum relief valve as necessary (Follow safety guidelines).
J	Inlet temperature out of specification.	Verify inlet temperature is within specification and adjust accordingly.
K	Bearings worn.	Rebuild blower.

	Probable Cause	Remedy
L	Oil level too high.	Check required oil level in each tank and remove oil as necessary.
M	Coupler or belts not aligned.	Check alignment and correct as necessary.
N	Improper belt tension.	Check belt tension and correct as necessary.
P	Oil sump gaskets worn.	Replace the oil sump gaskets/rebuild blower.
R	Oil sump shaft seal worn.	Replace the shaft seal for the oil sump.
S	Faulty oil tank plugs or sight-eyes.	Replace the plugs and/or sight-eyes. Use thread sealer on all NPT threads.
T	Blower operated at excessive angle.	Verify blower is as level as possible during operation.
U	Blower operated at excessive driveline angle.	Check driveline angle and correct as necessary.
V	Gearbox bearings worn.	Rebuild/replace gearbox.
W	Oil too thick.	Use correct synthetic viscosity oil.
X	Oil is foaming.	Use correct type of synthetic oil.
Y	Operating diesel engine at too low of an RPM causing torque pulses.	Increase engine RPM and adjust drive ratios accordingly. Use a vibration dampened drive shaft.
Z	Improperly balanced drive shaft.	Inspect drive shaft and balance as required.
AA	Moisture trap or shutoff is full and closed off.	Empty the moisture trap or shutoff of fluid.
AB	Plugged or collapsed hose (not always visible from the outside of the hose).	Unplug and/or replace hose.
AC	Four-way valve plug lifted too far off of seat (adjusted too high).	Inspect and readjust the four-way valve as necessary.
AD	Vacuum leaks on tank or fittings.	Repair leaks as necessary.
AE	Plugged sump vents.	Clean or replace the sump vents.
AF	Four-way valve sticks and/or is difficult to move.	Grease the four-way valve and adjust as necessary.
AG	Rotors fell out of time.	Rebuild blower.
AH	Rotor and endplate are contacting.	Rebuild blower.

Changing Sump Gear Oil

The B250 blower features positive lip sealing technology to keep sump oil from being pulled into the pumping chamber of the blower. Thus, both sumps are vented to atmosphere. The oil sumps should be serviced according to the maintenance schedule under the Maintenance section of this owner's manual. The oil change process is detailed in the procedure below:



WARNING

Lock unit out & allow blower and associated components to cool below 100°F before beginning the sump oil change procedure.

Step #1: Remove the oil sump fill ("A") plug from the non-drive end of the blower (7/8" Wrench).

Step #2: Remove the magnetic oil drain plug ("C") from the bottom of the oil sump and allow the oil to drain completely (5/16" Hex).

Step #3: Inspect the magnetic drain plug ("C") for metallic debris. Some debris is normal, but if amount is excessive contact NVE.

Step #4: Reinstall the magnetic drain plug ("C") (5/16" Hex).

Step #5: Remove the orange breather vent ("B") from the non-drive end of the blower. (By Hand).

Step #6: Using a funnel, slowly pour in recommended gear oil until the liquid nearly fills the sight eye ("F") on the non-drive end of the blower.

Do not overfill the blower sump, a slight air gap should be visible at the top of the sight eye ("F").

*See page 39 for proper gear oil. (See Figure #3)

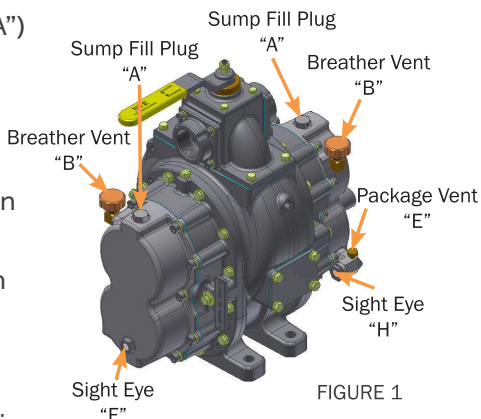


FIGURE 1

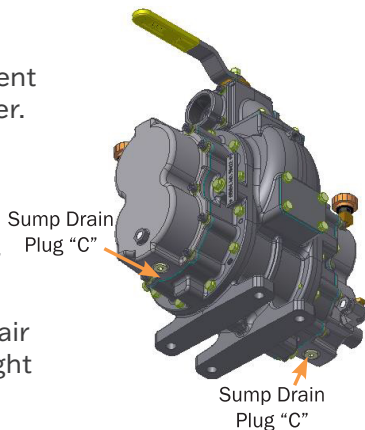


FIGURE 2

WARNING

Improper gear lube levels and/or type can cause catastrophic blower failure and/or damage.

Step #7: Reinstall the oil sump fill plug ("A") on the non-drive end of the blower (7/8" Wrench).

Step #8: Reinstall the orange breather vent ("B") on the non-drive end of the blower (Hand Tighten).

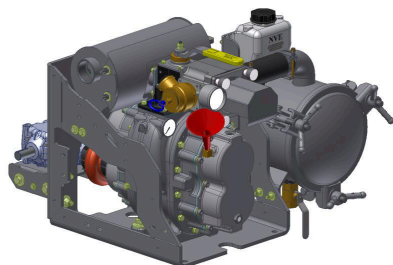


FIGURE 3

Step #9: Remove the drive end package vent ("E") from the sight eye elbow on the drive end of the package. This vents the sump to atmosphere (7/16" Wrench).

(See Figure #4)

Step #10: Remove the remote orange breather vent ("G") from the drive end of the blower (By Hand).

(See Figure #5)

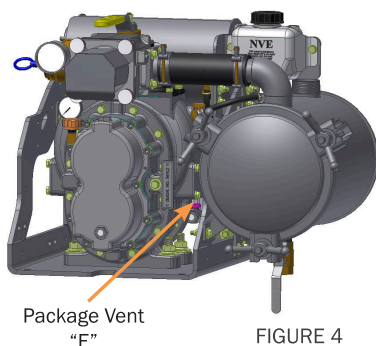


FIGURE 4

Step #11: Using a funnel, slowly pour in recommended gear oil until the liquid nearly fills the drive sight eye ("H") on the drive end of the blower.

Do not overfill the blower sump, a slight air gap should be visible at the top of the sight eye ("F").

(See Figure #6)

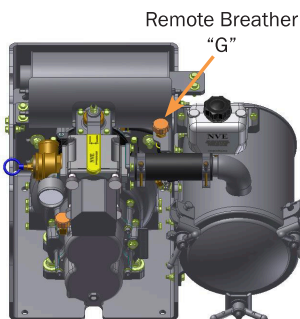
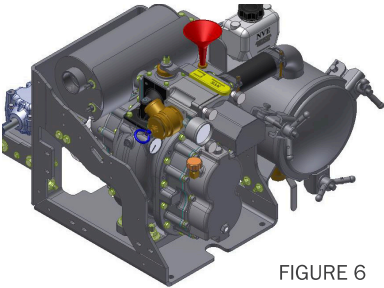


FIGURE 5

*See page 40 for proper gear oil.

Step #12: Reinstall the drive end package vent (“E”) onto the sight eye elbow on the drive end of the blower (7/16” Wrench).

Step #13: Reinstall the remote orange breather vent (“G”) on the drive end of the blower (Hand Tighten).



Step #14: Verify accurate oil levels and monitor for leaks.

Changing Sump Gear Oil


Recommended Oils For Blower Sumps (Synthetic Only)				
Ambient Temperature °F (°C)	Type	Viscosity	Pour Point	Color
Above 90°F (32°C)	Summit Syngear SH-7320	ISO 320	-40 (-40)	Clear
	Mobile SHC 632		-40 (-40)	Orange
32° F to 90° F (0° C to 32° C)	Summit Syngear SH-7220	ISO 220	-45 (-43)	Clear
	Mobile SHC 630		-41 (-42)	Orange
0°F to 32° F (-18°C to 0°C)	Summit Syngear SH-7150	ISO 150	-60 (-51)	Clear
	Mobile SHC 629		-45 (-43)	Orange
Below 0° F (-18°C)	Summit Syngear SH-7100	ISO 100	-60 (-51)	Clear
	Mobile SHC 627		-45 (-43)	Orange

**Ambient temperature is the temperature of the space where the blower is located or enclosed.*

Approximate Oil Capacities

Approximate Oil Capacity For Blower Sumps			
Blower	Drive End (oz.)	Non-Drive End (oz.)	Total (oz.)
B250	6.5	6.0	12.5

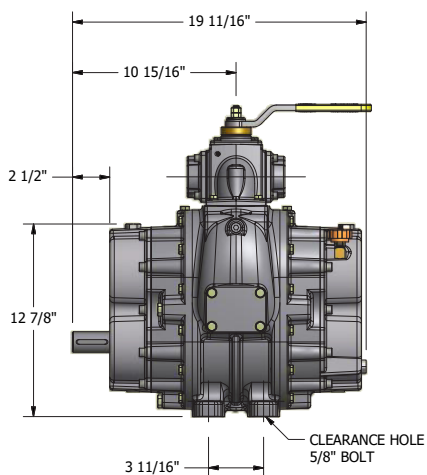
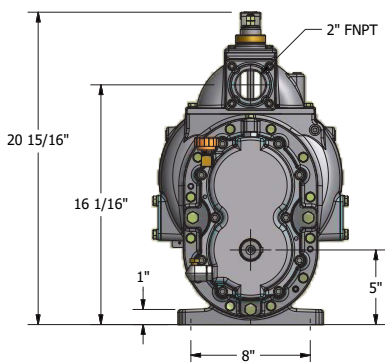
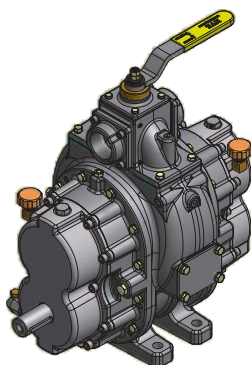
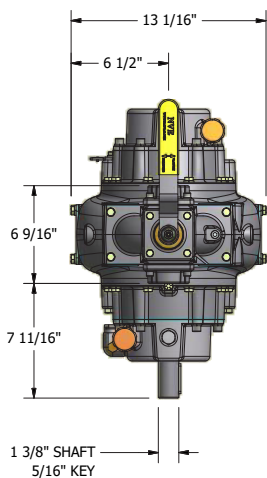
**Amounts are approximate and should be used as reference only. Use sight-eyes!*



NOTICE

Dispose of used oil according to local and EPA regulations.

B250 Blower | Dimensions Diagram



Notes

[illegible]

Notes

[illegible]



National Vacuum Equipment, Inc.

P.O. Box 685
Traverse City, MI 49685 USA

231.941.0215 Phone
231.941.2354 Fax

sales@natvac.com | www.natvac.com | 800.253.5500