

WELCH

A Gardner Denver Product

OWNER'S MANUAL FOR DRY VACUUM PUMPS MODELS:

2014

2032 / 2042

2034 / 2044

2037 / 2047



ISO9001:
Registered
Company

Agency:



WARNING

Be sure to properly identify intake and exhaust before using the pump. See Section 2.15



CAUTION

Do not pump liquids with the pump. Pumping liquids will cause the pump to stop working.

Gardner Denver Welch Vacuum Technology
5621 W. Howard Street
Niles, IL 60714
Phone: (847) 676-8800
Fax: (847) 677-8606 (Technical Support)
E-Mail: welchvacuum@rt pumps.com
Web-Page: www.welchvacuum.com

Part No
Printed

**INSTRUCTION
WARNING AND CAUTION
PLEASE READ BEFORE OPERATION**

While reading your manual, please pay close attention to areas labeled:
WARNING AND CAUTION.
The description of each is found below.

WARNING
Warnings are given where failure to observe instruction could result in injury or death to people.

CAUTION
Cautions are found where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

These units conform to the SI International system of units of measurement.

The following symbols (with recommendation of IEC1010) of warning will be found on the pu



Caution - refer to accompanying documents



Caution - risk of electrical shock



Caution - hot surface

WARNING
Motor includes a self resetting thermal cutout and the pump could restart without actuation under fault condition.

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Section 1: SAFETY INFORMATION

1.10 Caution: To Prevent Injury...

- 1.11 Never operate this product if it has a damaged cord or plug. If it is not working properly, has been dropped, damaged or has fallen into water, please return the product to a Welch service center for examination and repair.
- 1.12 Keep the cord away from heated surfaces. All electrical products generate heat. To avoid serious burns never touch unit during or immediately after operation.
- 1.13 Never block any air openings or place it on a soft surface where the openings may be blocked. The air openings are for ventilation of the motor inside the housing. Keep all air openings free of dirt and other foreign objects.
- 1.14 Models 2014, 2032, 2034, 2037, 2042, 2044 and 2047 are thermally protected and can automatically restart when the protector resets. Always disconnect power source before servicing.
- 1.15 Never drop or insert fingers or any other object into any openings.
- 1.16 Do not operate this product where oxygen is being administered.
- 1.17 Wear safety glasses and goggles when operating this product.
- 1.18 Use only in well ventilated areas. The motor on all pumps are totally enclosed fan cooled.



WARNING
Do not operate the pumps in an atmosphere containing flammable or explosive gases/vapors.

- 1.19 Be sure to properly identify intake and discharge before using pump. See Section 2.5.

Models 2014, 2032, 2034, 2037, 2042, 2044 and 2047 have one exhaust port on the pump. See Section 2.15



WARNING
Remove plug from Exhaust Port before using.

1.20 Caution: To Reduce Risk Of Electrical Shock...

- 1.21 Do not disassemble. Disassembly or attempted repairs if accomplished incorrectly can create electrical shock hazard. Refer servicing to qualified service agencies only.
- 1.22 Unit is supplied with a three pronged plug. Be sure to connect pump to a properly grounded outlet only.

1.30 Warning: To Reduce Risk of Electrocutation...

1.31 Do not use this product in or near area where it can fall or be pulled into water or other liquids

1.32 Do not reach for this product if it has fallen into liquid. Unplug immediately.

1.33 Never operate this product outdoors in the rain or in a wet area.

1.40 Danger: To Reduce Risk of Explosion or Fire...

1.41 Do not use this pump in or near explosive atmospheres or where aerosol (spray) products are being used.

1.42 Do not use this product near flames.



WARNING

Failure to observe the above safety precautions could result in Severe bodily injury, including death in some cases.

Section 2: INSTALLATION

2.10 Enviromental Conditions

The Pump is rated for indoor use only. Maximum altitude 2000 meters. Operating temperature 10°C to 40°C. Maximum relative humidity of 80% for temperatures up to 31°C decreasing to 50% at 40°C. Rated for +/-10% of supply voltage. Pollution Degree 2, Installation Category II.

2.11 Introduction

This manual has been compiled not only for the care and maintenance of the Welch Dry Vacuum pump now in your possession, but as a helpful reference and guide to prevent many problems that can occur if used improperly.

2.12 Unpacking

Carefully remove the Dry Vacuum pump from the shipping case. Preserve all paperwork for future reference. If damage has occurred from shipment a claim must be filed with the carrier immediately. Preserve the shipping carton for inspection by the carrier. If you are required to communicate with your dealer or Welch Vacuum be sure to include your order numbers for quick identification. Do not return the pump to the factory without first calling for a returned goods number.

2.13 Pump Mounting

Rubber feet are attached to the pump. Rubber feet are excellent for applications involving a semi-flexible surface such as a bench top; they help to isolate noise and eliminate creeping. Dry Vacuum Pump Models 2014, 2032, 2034, 2037, 2042 2044 and 2047 can be installed in any position. However, the horizontal position of the motor shaft should be preferred.

2.14 Pump Location



WARNING
Don't operate this pump in an atmosphere containing flammable or explosive gas.



WARNING
The motor is thermally protected and will automatically restart unexpectedly when the overload device resets.

The Dry Vacuum pump should be located preferably in a clean, dry and well ventilated area. Please ensure not to block the ventilation ports located on the motor housing. The pump should be placed where the surrounding temperature remains between 10°C and 40°C (50°F and 104°F). Always check to ensure the location chosen is protected from direct or indirect moisture contact. Welch recommends the pump be installed at the highest point within the system to prevent possible water condensation from entering the pump. The pump should be located as closely to its system in order to utilize it most efficiently.

2.15 Discharge Provisions

The hose barbs which accepts 3/8" I.D. hose makes it easy to connect the pump to your exhaust. Since all these models operate in the viscous flow regime, the small diameter of the hose will give minimal conductance loss. For best results, Welch recommends the length of the tubing between pump and the chamber be kept as small as possible. Hose clamps should be used to hold the hose in place.

Dry Vacuum Pump Models 2014, 2032, 2034, 2037, 2042 2044 and 2047 come with two hose one Intake and one Exhaust. All hose barb and mufflers are supplied loose with the pump. The hose barb used on all models accepts 3/8" I.D. hose. By threading the hose barb in the exhaust of the pump, a vent line can be attached which allows gases and vapors pumped through the pump piped from the work area into a hood. Vent lines will muffle noise coming from the vacuum pump.

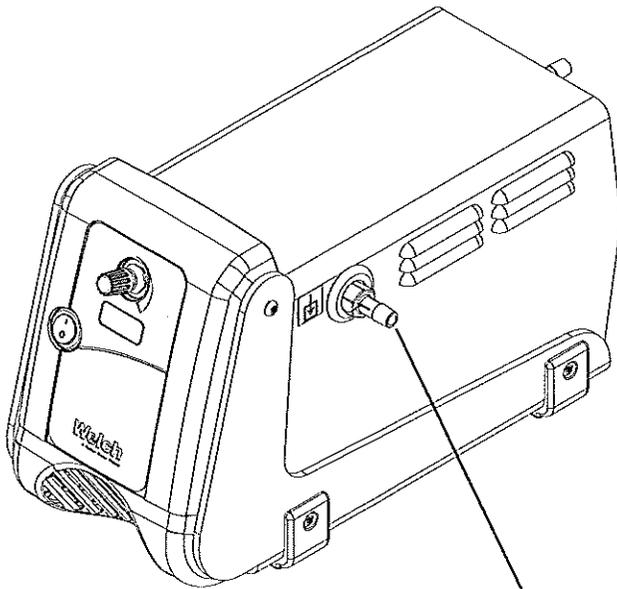


WARNING
Never block the discharge port. If the exhaust is blocked, pressure will build-up in the pump which can lead to the pump head bursting creating the potential of serious injury. Remove plug from exhaust port.

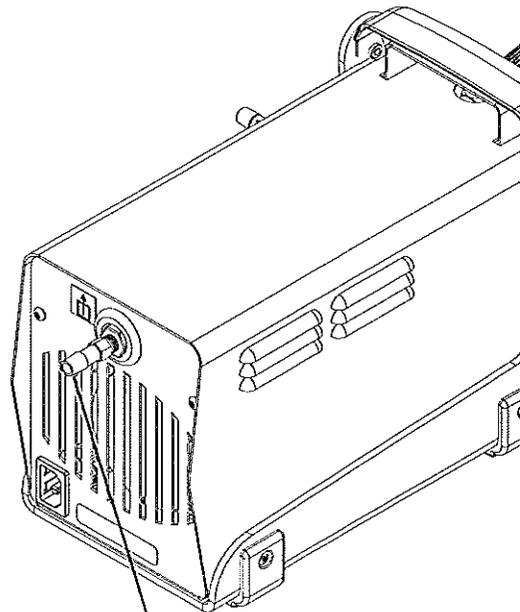


WARNING
Remove plug from exhaust port before operating

Properly identify the intake and exhaust of the pump



Intake



Exhaust

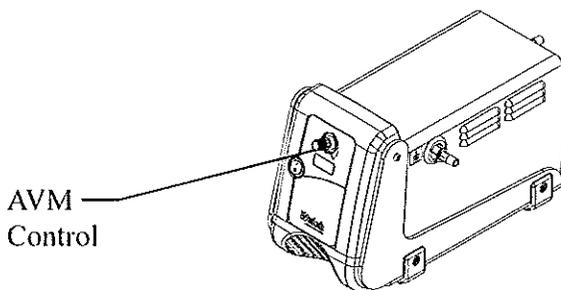
2.16 Electrical Power

2.161 Power Source Review

Review the power source and the motor rating to be sure they agree in voltage, phase and frequency. Serious damage may occur to the motor if it is connected to an improper voltage. All Welch pumps must be grounded. Grounding reduces the risk of electric shock in the event of an electrical short circuit. The plug must be plugged into an outlet properly grounded. Consult your local electrician if you have doubts.

Identification Symbols: ○ OFF (POWER)
| ON (POWER)

2.17 Advanced Vapor Management (AVM)



Advanced Vapor Management (AVM) is provided for precise setting of vacuum level.

- Clockwise revolution increases the vacuum level
- Counter- Clockwise revolution decreases the vacuum level

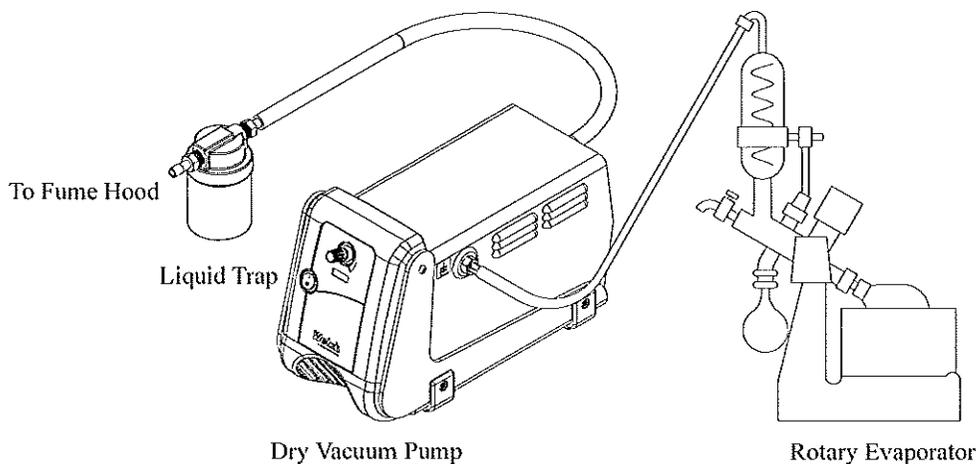
2.18 Traps

2.181 When to Use a Trap

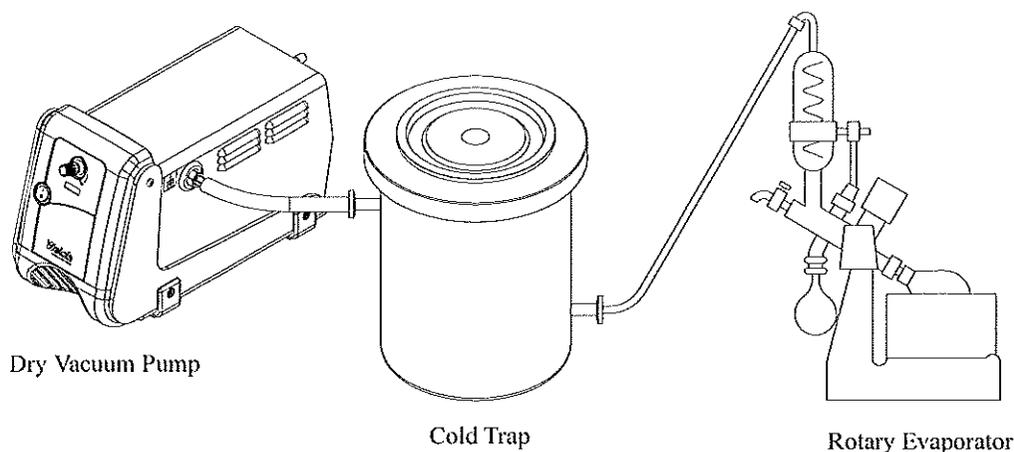
The use of PTFE or fluorinated plastics for all wetted parts resists chemical attack allowing the pump to handle aggressive solvent, base and acid vapors. A totally oil free diaphragm mechanism requires no need for a lubricating and sealing fluid for pulling a vacuum. When pumping gases or low vapor loads a trap is not necessary unless you want to capture vapors evolved from the process.

When a heavy load of water or organic vapor is evolved from the vacuum process, condensate or liquid vapor in the pump mechanism may occur. The reason is the pump is compressing the vapor as it passes through the pump. If the vapor is dense enough, the compression will cause condensation of the vapor in the pump mechanism. The valve system in the pump mechanism is designed to pass the small quantity of liquified vapor formed when pumping heavy vapor loads. The liquid formed will be ejected from the exhaust port. See Section 5 on pump maintenance on suggestions for purging the vacuum pump of condensed liquids prior to shutting it off.

The ejected liquid from the exhaust port can either be collected in a liquid trap attached to the exhaust port or the vapor trapped in a cold trap placed in-line between the pump and the vacuum chamber. A simple, inexpensive liquid trap can be made from a filtering flask. The filtering flask is connected to the exhaust port by using the loose hose barb provided. The muffler need not be attached to the filtering flask. The liquid trap will act to muffle the pump's noise.



The use of a cold trap when pumping heavy vapor loads will eliminate the need for a liquid trap to the exhaust port. The cold trap is installed between the pump and the vacuum chamber. The water or organic vapors evolved from the vacuum process will upon entering the cold trap will come in contact with the surfaces of the trap and condense. Commonly used refrigerants are liquid nitrogen or dry ice with alcohol slurry. Dry ice provides sufficient cooling to freeze out most heavy water vapor loads. A variety of cold traps are available from Welch. Please call our customer service department for additional information at (847) 676-8800.



2.19 The Care of a Liquid Trap

A liquid trap needs no refrigerant. The key maintenance issue when pumping high vapor loads is to regularly drain the trap of liquid ejected from the dry vacuum pump.

2.20 The Care of a Cold Trap

When using a cold trap the refrigerant should be maintained at a high level in the flask to keep it at a uniformly low temperature. If the trap is rewarmed it may allow re-evaporation of the condensate. The refrigerant add tube on the liquid nitrogen trap should not be obstructed as the refrigerant boil-off can produce dangerously high pressures. If the trap becomes saturated it should be disconnected from the system, drained and cleaned. An increase in pressure in the vacuum system will normally indicate that the trap has become saturated. To clean the trap, remove the trap from the system and allow it to warm up and rinse off the condensate with a suitable solvent in a fume hood. Thoroughly dry the trap before reinstalling into the system.

If a liquid nitrogen trap is used, the refrigerant add tube on the liquid nitrogen trap should not be obstructed as the refrigerant boil-off can produce dangerously high pressures.

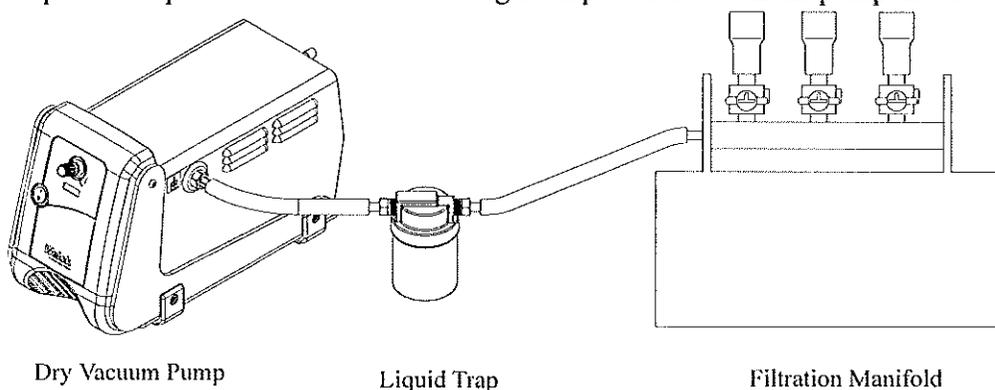
Section 3: OPERATION

3.10 Starting a Welch Dry Vacuum Pump

Before attaching the pump to a system it is well to familiarize yourself with the function and operation of the pressure vacuum pump which you have acquired. Review the power requirements as described in Section 2.6. Welch recommends running the pump for a few minutes to warm it up before use. This warm-up improves the pump's ability to pass water and organic vapor. A warm pump will handle organic vapor without liquifying it than a cold pump.

3.11 Cleanliness

Take every precaution to prevent foreign particulates or liquid from entering the pump. Particulates will damage the pump's performance. If you find that particulates or liquid will come off during the process of evacuation, a simple liquid trap can be made out of readily available material for protection of the pump. The trap would consist of a filtering flask placed between the pump and the vacuum manifold.



3.12 Leak Detection

The importance of eliminating all leaks in a vacuum system is obvious. The pump must remove the added volume of leaked gas to maintain the desired vacuum. Leaks for these pumps can be located by slightly pressuring the system and painting the suspected area with a thick soap solution. Escaping gas will produce soap bubbles.

3.13 Operating Pressure Range

Vacuum pumps are designed to be run from slightly below atmospheric to their maximum vacuum on the intake side. Consult the Specification Table in the back of this manual for the ratings for a specific model.

3.14 The Effects of Unwanted Vapor

Systems which contain undesirable vapors cause difficulty both from the standpoint of attaining the desired ultimate pressures. A vapor is defined as the gaseous form of any substance which is usually a liquid or a solid. Water, oil, and mercury vapors are three of the more common vapors encountered in typical vacuum systems. When such vapors exist in a system, the vapors or mists and gas and vapors are subject to condensation within the pump; the precipitated liquid may thus solidify on the teflon heads and diaphragm causing corrosion.

3.15 Shutdown Procedures

After use, Welch recommends the pump be run for about 2 minutes disconnected from the vacuum process. The air pumped through the mechanism will purge out water vapor or droplets of condensate that may have formed on the inside of the pump. This purge of the pump mechanism prevents build up of solute crystals inside of the pump head. Over time, these crystals will shorten

Section 4: MAINTENANCE

4.10 General Maintenance

Welch dry vacuum units are 100% oil-free. The pump employs a diaphragm with an uninterrupted Teflon® coating. All bearings are sealed and permanently lubricated. Lubrication should not be attempted. The units are built for duty operation just like a water aspirator, but with the quiet performance and durability of a diaphragm.

4.11 Diaphragm Removal



WARNING

Do not remove the diaphragm unless you are wearing hand protection. The steel disc inside the diaphragm may cause harmful injury.

1. Remove the four 4M x 45 screws and washers from the cover plate. Remove the cover plate and head from the aluminum body.
2. Make sure to wear gloves before removing the diaphragm. Grab the diaphragm with both hands and turn counterclockwise to loosen the eccentric screw from the flat on the motor shaft.
3. Remove the diaphragm from the eccentric screw.

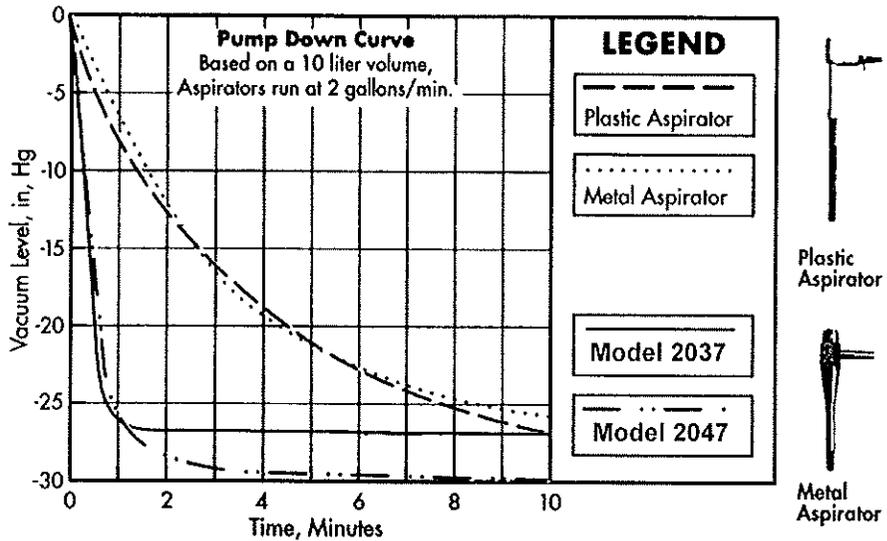
4.12 Installation of New Diaphragm

1. Apply a minute amount of locktite to threaded diaphragm stud and fasten to connecting
2. Slide the bearing / eccentric along the motor shaft until the periphery of the diaphragm with the raised ring on the top of the aluminum body. Tighten eccentric set screw down on to the flat of the motor shaft.
3. Rotate shaft so that diaphragm is at bottom dead center position and aligning periphery diaphragm with aluminum body ring. Place the head and chamber assembly on top of aluminum body so that the peripheral lip of the diaphragm aligns with the groove on the underside of the chamber.
4. Place the cover plate over the head and body using four 4M x 45 screws and washers. Be sure not to over tighten the bolts (no more than 25 in. lb.) or Teflon will deform.

Section 5: APPLICATION

5.10 Operation as a Replacement for Aspirators

Models 2014, 2032, 2034, 2037, 2042, 2044 and 2047 are ideal for replacing common water aspirators used for vacuum distillation/extraction filtration, degassing, low pressure source and/or gas transfer. The six basic models are available with free air displacements from 25 to 70 L/min and vacuum to 30 inches of Hg. water aspirators have been the researchers' traditional source of rough vacuum to 30 inches of Hg. (36 Torr) and pumping speed up to 20 L/min. Compare the pump down curves for Models 2037 and 2047 to a standard water aspirator. See the table below to cross reference the correct Welch DRY pump with your water aspirator.



Note: Plastic and Metal Aspirator run at 30 PSIG water pressure.

5.20 Cross Reference Welch Dry Vacuum Pump with your Water Aspirator

Style of Aspirator Pump	Water Flow (gal/min)	Water Pressure 1 (PSIG)	Matching Welch DRY Pump Catalog Number	Welch Pump Replaces up to
Plastic or Metal	2	30	2032 2042 2034 2044 2037 2047	2 Aspirator 3 Aspirator 4 Aspirator

Note:

1. Common water pressure found when using water aspirator. Water pressure drops as more water aspirators are turned on leading to poor vacuum for all.
2. Higher water flow rates and/or higher water pressure will increase the pumping speed and ultimate vacuum pressure of a water aspirator.

Section 7: WARRANTY

UNPACKING

Inspect the pump carefully. If any damage has occurred, file claim with the carrier immediately.
Save the shipping container for carrier to inspect.

OPERATING PUMP

Refer to the enclosed Instruction/Operation Manual for all information to properly operate and maintain the pump.

WARRANTY

This Welch Vacuum product is warranted to be free from defects in material and workmanship. The liability of Gardner Denver Welch Vacuum Technology, Inc. under this warranty is limited to servicing, adjusting, repairing or replacing any unit or component part which in the judgment of Gardner Denver Welch Vacuum Technology, Inc. has not been misused, abused or altered in a way causing impaired performance or rendering it inoperative. No other warranties are expressed or implied. The method of executing this warranty: servicing, adjusting, repairing or replacing shall be at the discretion of Gardner Denver Welch Vacuum Technology, Inc. Vacuum pumps that have been used for any period, however short, will be repaired under this warranty rather than replaced.

The warranty is effective for one year from the date of original purchase when:

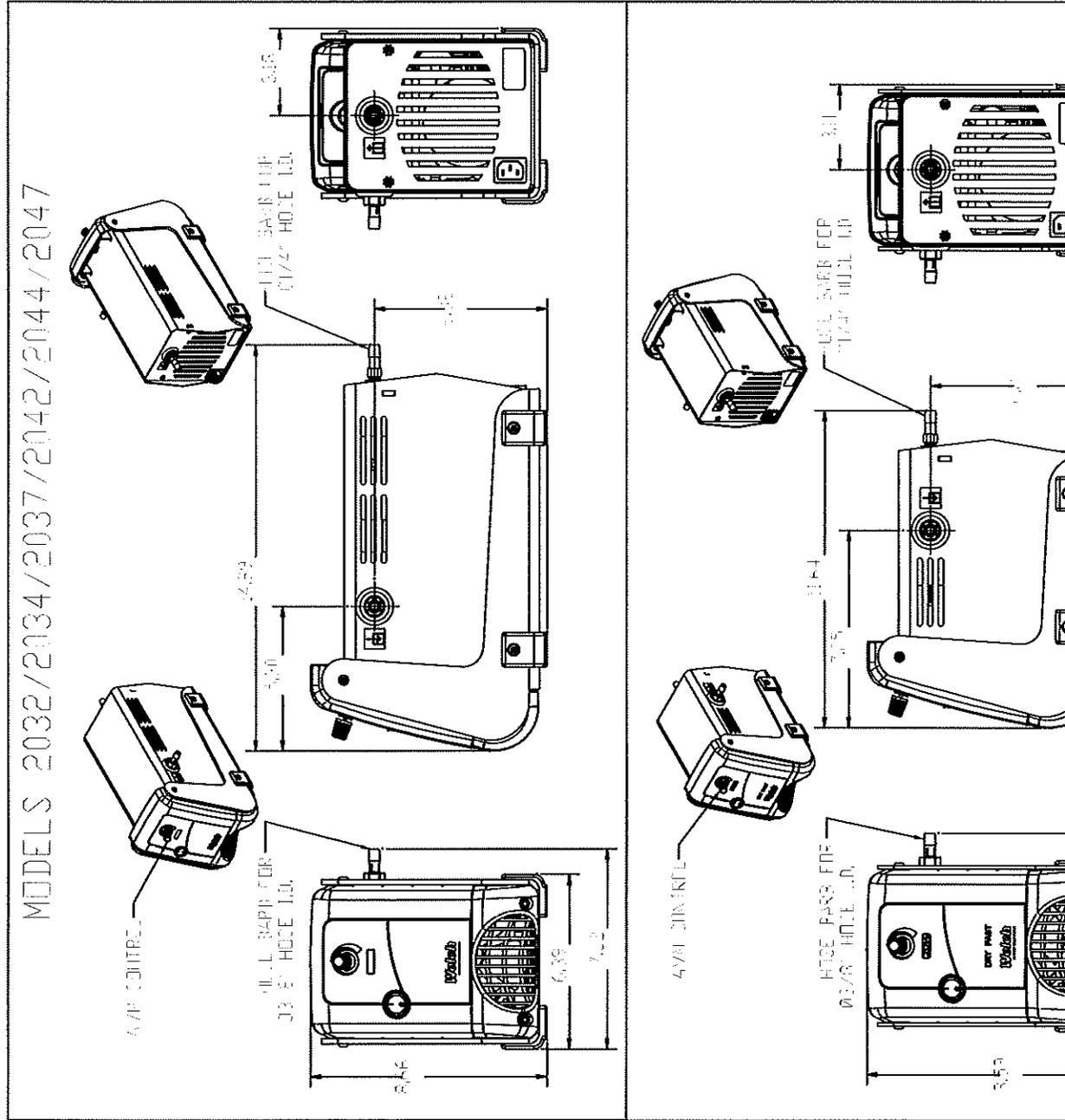
1. The warranty card has been completed and returned.
2. The product is returned to the factory or other designated service centers, freight prepaid.
3. The product in our judgment is defective through no action or fault of the user.

If the product has become defective through misuse, abuse, or alteration, repairs will be billed regardless of the age of the product. In this event, an estimate of the repair costs will be submitted and authorization of charges will be required before the product is repaired and returned.

To reduce additional charges and delays either within or outside of the warranty period, contact Gardner Denver Welch Vacuum Technology, Inc. @847-676-8800 for a return authorization number. Products without an authorization number will be refused by our receiving department. Before shipping, properly pack the product to ensure it against loss or damage, and on the outside of the pump packaging and the packing slip write the return authorization number. Pumps damaged due to improper packaging are the customer's responsibility.

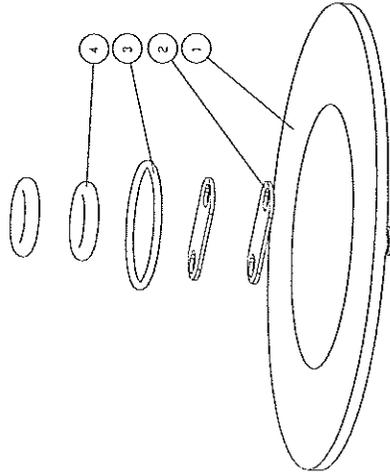
Section 8: DRAWINGS

8.10 Dimensional Drawing

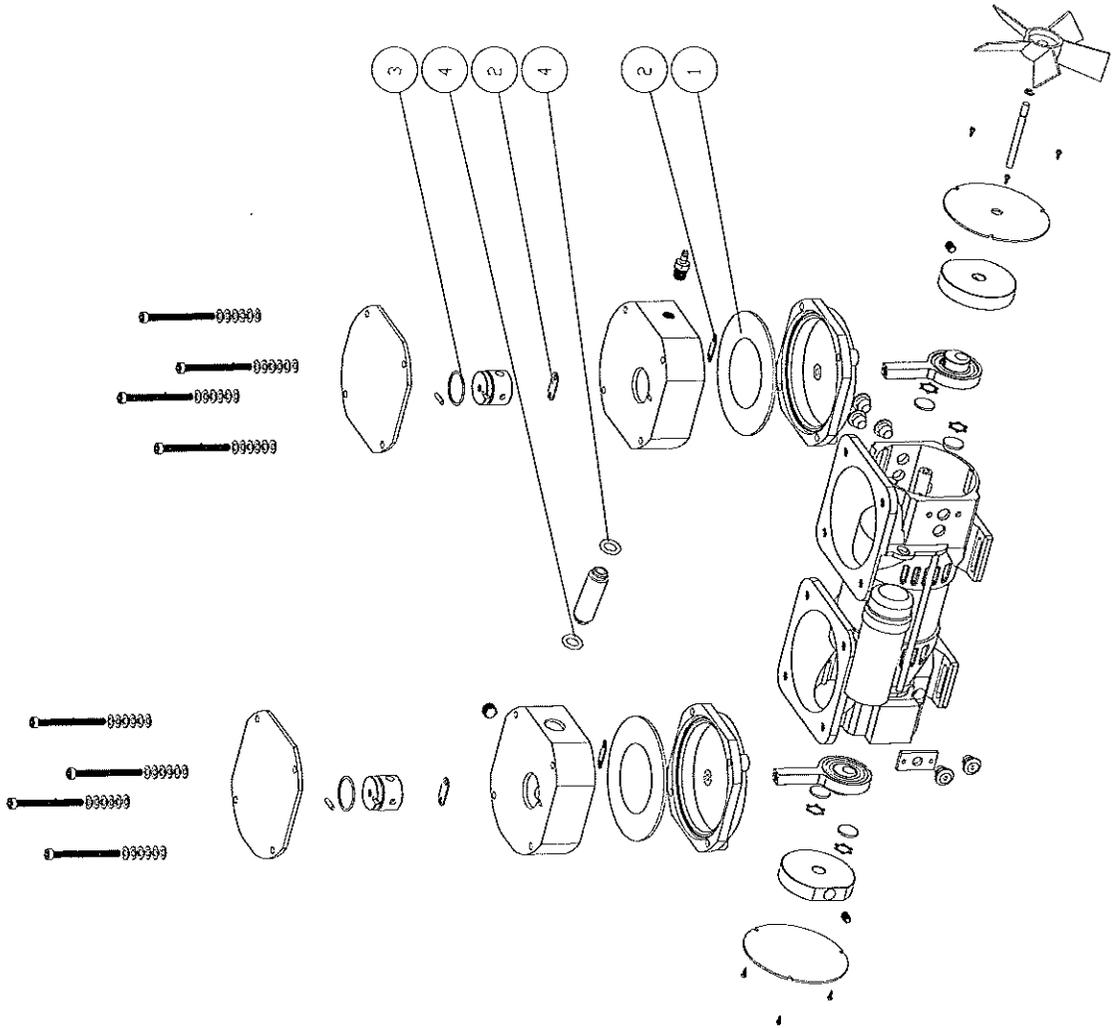


8.20 Exploded View and Kit for Model's 2034 , 2037 & 2044

REPAIR KIT 2037K-01

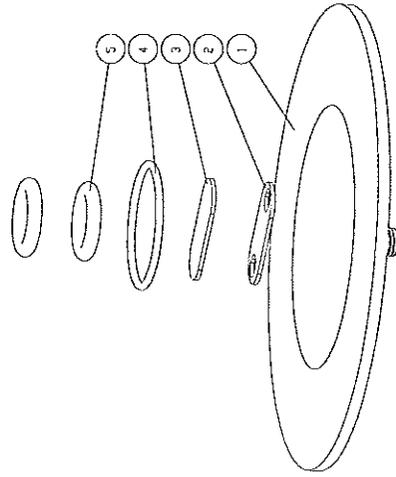


1	151-3059	1	DIAPHRAGM MILD
2	161-3706	2	INTAKE VALVE
3	166-0166	1	O-RING #021, FLUOROELASTOMER
4	166-0167	2	O-RING 10.5 x 3.0, VITON

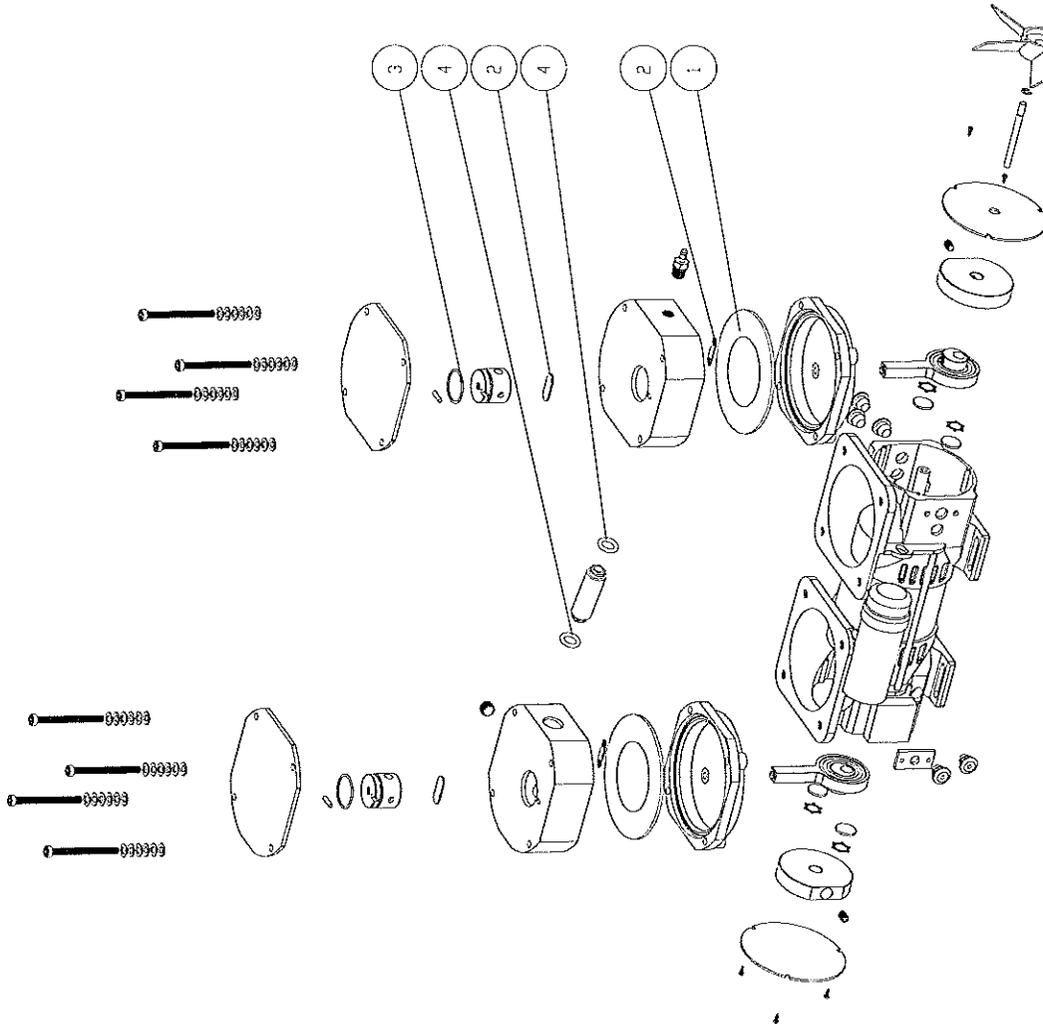


8.30 Exploded View and Kit for Model's 2014, 2032, 2042 & 2047

REPAIR KIT 2047K-01



1	161-3059	1	DIAPHRAGM MOLD
2	161-3706	1	INTAKE VALVE
3	161-3706A	1	EXHAUST VALVE
4	166-0166	1	D-RING #021. FLUROELASTOMER
5	166-0167	2	D-RING 10.5 x 3.0 VITON



**Gardner Denver Welch Vacuum Technology
Vacuum Pump Repair Facility
5621 W. Howard Street
Niles, IL 60714
Phone: (847) 676-8800
Fax: (847) 677-8606 (Technical Support)**