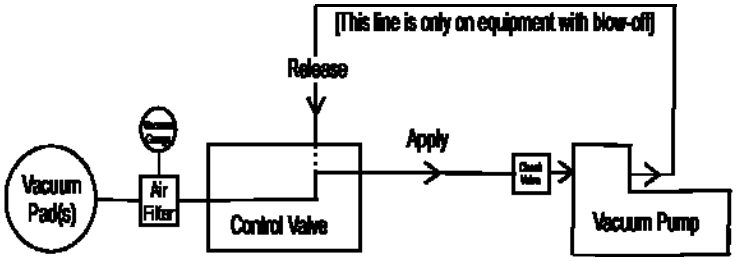
Wood's Powr-Grip CO., INC.

Isolating Vacuum Leaks:

Powered Vacuum Lifters

Guide to Troubleshooting and Repair



This diagram represents the basic plan of vacuum generating systems found on nearly all of Wood's Powr-Grip's vacuum equipment products: When the equipment is in "apply" mode, a vacuum pump (or venturi) draws air through a control valve, evacuating the vacuum pad(s) (see arrows indicating airflow direction in diagram). In "release" mode, the control valve allows air to re-enter the vacuum pad(s). This is accomplished either by opening a valve port to the atmosphere or by pumping air directly into this port from the vacuum pump. The latter function, referred to as "blow-off", is found on equipment that requires faster release times. In addition, an air filter (with adjoining vacuum gauge) typically is located in the vacuum line between the control valve and vacuum pad(s); and a check valve typically is located in the vacuum line between the vacuum pump and the control valve. The check valve prevents air from flowing back along the vacuum line from the vacuum pump.

If the vacuum system has developed a leak, it is necessary to determine the cause and location of the leak, in order to effect repairs. This general guide applies to most types of Wood's Powr-Grip powered vacuum lifters. If a specific guide exists for your model of lifter, please refer to it also, since it provides more detail regarding components and their locations.

Please note: The information that is gathered when performing a vacuum test is only valid if the tools used to perform the test are accurate. Be sure that any testing equipment you use is capable of forming a complete seal with the lifter's vacuum system.

Vacuum Test 1: Determining Whether Leakage is Significant

1) Make sure all vacuum pads are clean (clean them, if necessary).
2) Position the lifter on a clean, smooth, nonporous surface.
3) Turn the lifter on in "apply" mode, and allow the lifter to generate the highest vacuum level it is capable of attaining. (This level can vary, depending on the lifter and the severity of any leak it may have.)
4) While the lifter is still in "apply" mode, turn off (or disconnect) the power source.
5) Follow the directions below, based on the answer to this question: **Is the vacuum level dropping at a noticeable rate (ie, more than 4" Hg [14 kPa] in 10 minutes or less, as shown on the vacuum gauge)?**

NO - This lifter does not have a significant leakage problem.

YES - Leakage is serious enough to warrant repairing the lifter's vacuum system. Write down the rate of leakage (ie, inches Hg or kPa lost in 10 minutes). This information will be needed later to accurately diagnose any problem. Check for obvious damage, including cut pads or vacuum hoses, cracked or broken fittings, etc. Repair or replace any damaged parts. If no indication of damage is found, continue testing.

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Vacuum Test 2: Determining Which Major Section is Experiencing Leakage

The vacuum system of vacuum lifters is comprised of two major sections: the "vacuum generating system" and the "vacuum pad system". The following steps are designed to identify whether a leak is located in either section, and to identify which component is causing the leak. The dividing point for these sections is located at the air filter assembly.

1) Identify the vacuum line that connects the pad system to the air filter assembly. Disconnect this line at the filter assembly and cap the fitting.
2) Turn the lifter on in "apply" mode, and allow the lifter to generate the highest vacuum level it is capable of attaining.
3) While the lifter is still in "apply" mode, turn off (or disconnect) the power source.
4) Follow the directions below, based on the answer to this question: **Is the vacuum level dropping (as shown on vacuum gauge)?**

   NO – The leak is located in the vacuum pad system; proceed to Vacuum Test 5.
   YES – The leak is located in the vacuum generating system. Write down the rate of leakage (ie, inches Hg or kPa lost in 10 minutes) and continue.

5) Follow the directions below, based on the answer to this question: **Is the leakage rate observed during this test approximately the same as that observed during the first test (when the lifter was attached to a clean, smooth, nonporous surface)?**

   NO – If the leak has slowed but has not stopped, this indicates that multiple leaks exist—at least one in each section. Continue tests to determine what repairs should be made. Note: If the leak rate is not significant at this point, you may proceed with repairs to the pad system. However, even when the pad system is repaired, one leak will remain.
   YES - Continue tests to identify which specific component(s) are affected in the vacuum generating system.

Vacuum Test 3: Testing the Vacuum Generating System

At this point, the specific type of lifter will determine what components can actually be tested and what conclusions can be derived from those tests. The standard combinations are as follows:

Type A: Manual control valve connected to air filter/vacuum gauge assembly via vacuum hose
Type B: Electric control valve connected to air filter/vacuum gauge assembly via vacuum hose
Type C: Manual control valve connected to air filter/vacuum gauge assembly directly via fittings (hard connection)

On most lifters, you will lose access to the vacuum gauge once you move beyond the air filter assembly. If you do not have a troubleshooting guide showing specifically how to work around this problem for your type of lifter, we recommend that you obtain a test gauge to continue. The following assumes you have access to a test gauge with appropriate fitting for connecting to the lifter's vacuum lines.

For Lifters with Manual or Electric Control Valve Connected to Filter/Gauge Assembly via Vacuum Hose (Types A and B above):

1) Identify the vacuum hose that connects the air filter assembly with the control valve; disconnect this hose at the control valve and connect a test gauge in its place.
2) Turn the lifter on in "apply" mode, and allow the lifter to generate the highest vacuum level it is capable of attaining.
3) While the lifter is still in "apply" mode, turn off (or disconnect) the power source.
4) Follow the directions below, based on the answer to this question: **Is the vacuum level dropping (as shown on test gauge)?**

NO – This indicates that the leak is located in the filter assembly and/or one of the attached components. Proceed with testing as follows:

(a) Reconnect the vacuum hose to the control valve; disconnect the opposite end of this hose (at filter assembly) and insert the test gauge. Repeat the test above. If leakage is now observed, replace this section of hose; if no leakage is observed, the hose is in good condition and you can continue testing.
Reconnect the hose at the filter assembly. If the lifter's vacuum gauge is connected to the filter assembly with a hose connection, proceed to step (b). If the gauge is part of the filter assembly (hard connection), proceed to step (c).

(b) If the lifter's vacuum gauge is connected to the filter assembly with a vacuum hose, the gauge must be disconnected from the vacuum system, in order to determine whether the leak is in the gauge or the filter assembly: Disconnect the hose from the fitting at the filter assembly and connect the test gauge in its place. (Note: If the test gauge is not compatible with this fitting, you can cap it and connect the test gauge at the fitting where the hose connects for the vacuum pads.) Repeat the test. If the leak persists, proceed to step (c); if the leak has stopped, inspect the vacuum gauge assembly and hose. Repair and/or replace components as needed, and reconnect the hose from the control valve to the filter assembly.

(c) Check the filter bowl to ensure that it is tight. ***CAUTION: Do not use any tools to tighten the bowl; it should only be finger-tight.*** Repeat the test above. If leakage persists, service the air filter according to the maintenance section of the lifter's instruction manual, and check for loose or cracked fittings. If the leak still persists, contact Wood's Powr-Grip for additional suggestions or information.

YES – This indicates that the leak is located in the control valve and/or check valve, depending on the lifter's particular design. Proceed to Vacuum Test 4 to determine which one is leaking.

For Lifters with Manual Valve Connected to Filter/Gauge Assembly Directly via Fittings (Type C above).

1) Check the air filter's bowl to ensure that it is tight. ***CAUTION: Do not use any tools to tighten the bowl; it should only be finger-tight.*** If leakage persists, service the air filter according to the maintenance section of the lifter's instruction manual, and check for loose or cracked fittings. If the leak persists, continue testing.
2) At this point, you have traced the leak back to the control valve assembly. If the lifter has a manual control valve, the leak may be in the check valve; proceed to Vacuum Test 4 below. However, if the lifter has an electric control valve (ie, with solenoids), the tests performed indicate that the leak is located in this assembly. Please contact Wood's Powr-Grip for additional suggestions or information.

Vacuum Test 4: Testing the Check Valve

The check valve is a brass fitting with an arrow pointing towards the vacuum pump (away from the control valve). It is located between the intake port of the lifter's vacuum pump and the vacuum port of the manual control valve. Depending on the lifter, the check valve may connect to the vacuum pump or to the control valve assembly.

1) If the lifter's check valve connects to the vacuum pump and the size of the hose from the vacuum pump is compatible with the fitting on the test gauge, disconnect the hose from the control valve assembly and insert the test gauge in the hose. If the lifter does not meet these conditions, simply replace the check valve and retest (see ensuing discussion).
2) Turn the lifter on in "apply" mode, and allow the lifter to generate the highest vacuum level it is capable of attaining.
3) While the lifter is still in "apply" mode, turn off (or disconnect) the power source.
4) Follow the directions below, based on the answer to this question: **Is the vacuum level dropping (as shown on test gauge)?**

NO – This indicates that the leak is located in the control valve assembly; contact Wood's Powr-Grip for additional suggestions or information.

YES – This indicates that the check valve is leaking. Replace the check valve and retest.

CAUTION: Replacing the check valve involves the disassembly of fittings. When reassembling these parts, thread sealant (Teflon tape or pipe sealant) must be used to achieve a good seal.

Vacuum Test 5: Testing the Vacuum Pad System

If Vacuum Test 2 determined that the leak is located in the vacuum pad system, reconnect the vacuum line to the air filter assembly and continue as follows:

1) Remove each pad fitting, disconnecting all the pads from the vacuum system.
2) Cap all the pad fittings to seal off the vacuum lines.
3) Turn the lifter on in “apply” mode, and allow the lifter to generate the highest vacuum level it is capable of attaining.
4) While the lifter is still in “apply” mode, turn off (or disconnect) the power source.
5) Follow the directions below, based on the answer to this question: **Is the vacuum level dropping (as shown on vacuum gauge)?**

   NO – This indicates that the leak is located in one or more of the vacuum pads. Reconnect one pad to the vacuum system and retest the pad by attaching the lifter to a smooth, clean, nonporous surface. If indications of leakage resume, replace that pad. Continue testing each pad until all pads have been reconnected and tested, and all damaged pads have been replaced.

   YES – This indicates that the leak is located in the fittings or vacuum lines. Pad fittings may be tested in the same manner as the pads, by removing each fitting from its vacuum line and plugging the hose. If the leak stops when retested, reconnect individual fittings until all that leak have been identified and replaced. If the leak persists, continue to test vacuum lines and fittings by moving up each line (ie, towards the filter assembly) to the next fitting, removing the hose and plugging it at the fitting. Continue until all fittings and lines are tested or the leak is located.

Additional Information

There are various ways to approach leak-testing vacuum lifting equipment. For further suggestions or information, please contact Wood’s Powr-Grip Co., Inc.