LEAK TEST PROCEDURE

DC CHANNEL LIFTERS – DC2 MODEL – REMOTE READY LIFTERS

APPLICABLE TO DUAL VACUUM SYSTEM LIFTERS WITH SERIAL NUMBERS GREATER THAN # 20130765

TESTING AND MAINTENANCE MUST BE DONE BY A QUALIFIED PERSON

KEEP FOR FUTURE REFERENCE

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SYMPTOMS OF VACUUM LEAK

Severe leakage is evidenced by a lifter's inability to draw full vacuum while attached to a clean, smooth, nonporous surface. In such cases, the vacuum pump will run continuously and the vacuum level shown on the vacuum gauges will be less than 16" Hg [-54 kPa], the red zone of the vacuum gauge.

Moderate leakage is indicated by intermittent cycling of the vacuum pump during a lift. If the vacuum generating system turns on more than once every 10 minutes, leakage is serious enough to warrant repairing the lifter's vacuum system.

To determine if your lifter has a vacuum leak, perform the Vacuum Test as described in the Maintenance section of your instruction manual.

When you perform the vacuum test, we recommend that you note the time and leakage rate, such as "lost 5" Hg [-17 kPa] in 10 minutes". Note that, if both the blue/green and red circuits of the lifter's vacuum system are leaking, you should record this information for each circuit. This information can assist in diagnosing the location of the leak because there may be more than one component leaking vacuum. For example, when you are performing maintenance, if an isolated section tests positive for a leak but the leakage rate is less than that of the whole lifter, this indicates that there is still one vacuum leak or more elsewhere in the system.

If the rate of leakage is sufficient to warrant repair, proceed as follows:

To locate the cause of leakage, begin by inspecting the vacuum pads, fittings and hoses of the entire vacuum system. Look for contamination, cuts or abrasions on pad faces, cracks, abrasions or cuts in hoses, damaged fittings and loose hoses at connection points. If leakage is severe, the cause is often a visibly damaged part.

Do not apply soapy water to fittings or vacuum hoses in an attempt to find leaks, since it will only be drawn inside the vacuum system.

If the source of leakage is not immediately evident, the various sections of the entire vacuum system must be systematically isolated and tested to determine the leakage point. The process to accomplish this is described in the tests to follow.

Please note that the information gathered when performing a vacuum test is only valid if the tools used to perform the test are accurate. Be sure that the tools you use are capable of completely sealing the isolated parts of your system when tested. Recommended tools, in addition to an appropriate test surface, are plugs for hoses and fittings, a ball valve with vacuum gauge attached, push-in hose adapters and extra vacuum hose of the required sizes. This procedure is written with the assumption that you have access to the appropriate tools.

If needed, test equipment is available from Wood's Powr-Grip Co. To find out what is available, contact our sales for additional information.

A set of screwdrivers may also be needed if the valve enclosure or pump cover needs to be removed. Note: Always proceed with caution when removing the valve enclosure cover. Since wiring is connected to components in the cover, gentle removal is recommended so as not to damage the attached wiring.

When removing a hose from a barbed fitting, take care to avoid damaging the barbs of the fitting to which the hose is attached. Cuts or nicks in fitting barbs can create a leak that did not previously exist. Additionally, if a hose is removed from a barbed fitting, cut approximately 1/4" [6 mm] off the end of the hose before reinstalling it on the fitting, in order to remove damaged hose ends.

For push-in fittings, the hose end must be cut square and straight to seal properly. To remove a hose from a push-in fitting press the locking collar in towards the fitting and pull out on the hose. If a hose is removed from a push-in fitting, cut approximately 1/8" [4 mm] off the end of the hose before reinstalling it on the fitting, in order to remove damaged hose ends and to provide a fresh point of contact for the locking collar. When installing a hose in a push-in fitting, push the hose in firmly and then gently pull outward on the hose to ensure that it is fully secured (the hose should not pull out). Additionally, when a hose is installed in a push-in fitting, it needs to run reasonably straight out from the fitting, with minimal sideways pressure on the hose locking collar, to reduce the chance of a vacuum leak.

Note: The vacuum system of this model lifter provides release using a “blow off” feature. This is where the pressure side of the vacuum pump is plumbed to the control valve and pumps air into the pad system when release mode is engaged, to help speed the release of the vacuum pads. When testing the lifter for leaks, it is often necessary to seal off the system in some manner (cap off or plug fittings and or lines). Due to this, the use of the release function is not recommended during the repair process, as it will cause pressure to build in the sealed off section and may damage components.

Note: The standard process to determine the location of leakage is to perform the following Preliminary Test. However, since the vacuum tanks are located within the pad system and vacuum leaks in older lifters are more often due to the condition of the vacuum pads, it may be prudent to begin by isolating the vacuum pads from your system first. The method to do this is described in the Pad System Test, steps 2 through 5. If the leak is not due to the vacuum pads, the Preliminary test should be performed. Determining which test to perform first can be based on your knowledge of the lifter and the apparent condition of the vacuum pads.

PRELIMINARY TEST

This test determines whether leakage is located in the vacuum generating system or the pad system. Note that the following assumes you have access to suitable plugs and additional hose to seal off the section being tested.

CAUTION: Disconnect the battery before removing the vacuum generating system cover.

Note: Since the vacuum tanks are part of the pad system, any leakage will appear to be faster than seen in the overall test, due to the reduced system volume.

1) Remove the 4 screws that attach the vacuum generating cover to the channel. Carefully remove the vacuum generating system cover (**1A**) and lay it to one side so that exposed wire terminals do not touch any conductive material.

   See **FIGURE 1**.

   This exposes the 2 filters that are attached to the reducing fittings and control valve assemblies.

2) Remove the hose from the filter that attaches to the vacuum line (reducing fitting) of the affected circuit (**2A** blue/green or **2B** red). Install a short piece of 1/4" O.D. hose that is capped off to create a fitting plug, and install this in the filter as shown in **FIGURE 2.**

   Note that both filters are shown capped off in **FIGURE 2**.

   Note that, since the vacuum gauges are located in the pad system, the digital vacuum switches will be used to indicate whether or not the leak still exists.

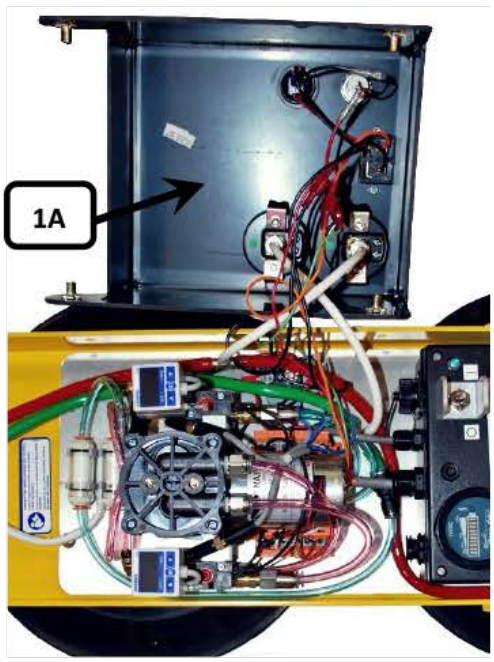


FIGURE 1

   Note: If you are testing only one of the two circuits (only one filter capped off), the lifter will need to be attached to a clean, smooth surface to seal the remaining section during testing.

3) Switch the power on (I) and activate the vacuum generating system by pressing the apply ( ) push button.

4) If the lifter does not shut off automatically, this indicates that the vacuum generating system does leak. Proceed to the Vacuum Generating System Tests.

5) If the lifter does shut off automatically, observe the vacuum switches with the lifter still powered on, to locate the general area of leakage.

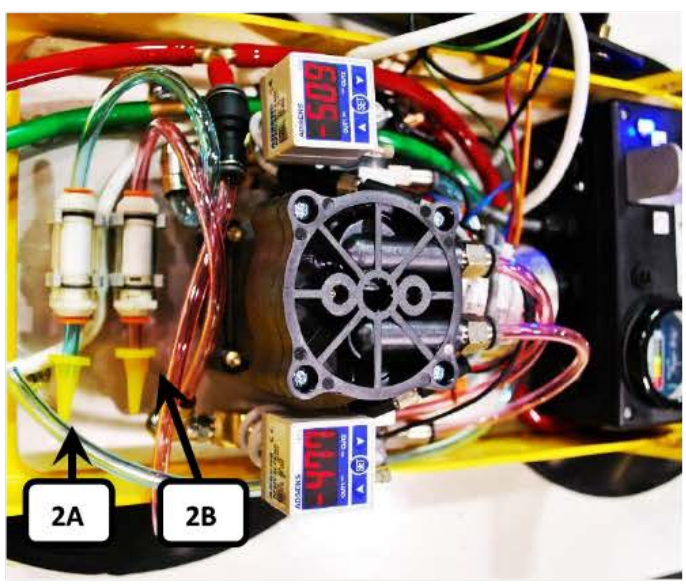


FIGURE 2

6) Note: Vacuum switch scales have changed since the initial implementation of the digital switches. The switches may stop at ≥ 18.0 or ≥ -458, depending on the age of the lifter and the scale used to set the switches. Regardless of the scale used, you will be watching for a drop in the vacuum level shown (decreasing number) and a regular cycling of the vacuum generating system. Additionally, if still at factory settings, the lifter cycles when either vacuum switch reaches -425. On vacuum switches set to the high scale, a drop of approximately 25 points is equivalent to a drop of 1" Hg. [3.3 kPa]. Knowing this, along with the time it takes the system to cycle, allows an approximate evaluation of the leak rate.

- If the vacuum level of one or both vacuum switches decreases rapidly and the vacuum generating system cycles repeatedly, this indicates that the vacuum generating system does leak. Proceed to the Vacuum Generating System Tests.

  Note: If the vacuum level (as indicated on the vacuum switches) drops slightly, but not to the extent that the vacuum generating system cycles in 5 minutes, this indicates that there is a minor leak in the vacuum generating system. Minor leaks can be difficult to locate and not always cost-effective to repair. Due to this, it may be best to proceed to the Pad System Tests, keeping in mind that this minor leak will still exist even if all leaks are located and repaired in the pad system.

  Minor leaks are often caused by faulty hose connections. It may be valuable to check the hose ends and connections prior to proceeding to the Pad System Tests. However, the amount of time invested should match the severity of the problem.

- If both vacuum switches hold steady, this indicates that the vacuum generating system does not leak. Proceed to the Pad System Tests.

Alternate method using ball valve with vacuum gauge:

If you have access to a ball valve with a vacuum gauge and the proper hose adapter, this can be used to seal one filter and provide a clearer reading of the vacuum loss, which is directly comparable to the reading taken from the lifter's vacuum gauges. In this scenario, the lifter can be switched off (◯) while the vacuum gauge of the ball valve is monitored for indications of leakage. Note: due to the vacuum tank being located in the pad system, any leak present will appear faster.

This is shown in **FIGURE 3**, where the ball valve is being used to seal one filter and the other has been capped off. Note that, if it was determined that both circuits (red and blue/green) are leaking, the gauge would be used to determine the problem with one circuit and then used to repeat the tests on the other circuit. The ball valve and gauge can be substituted for any cap or plug.

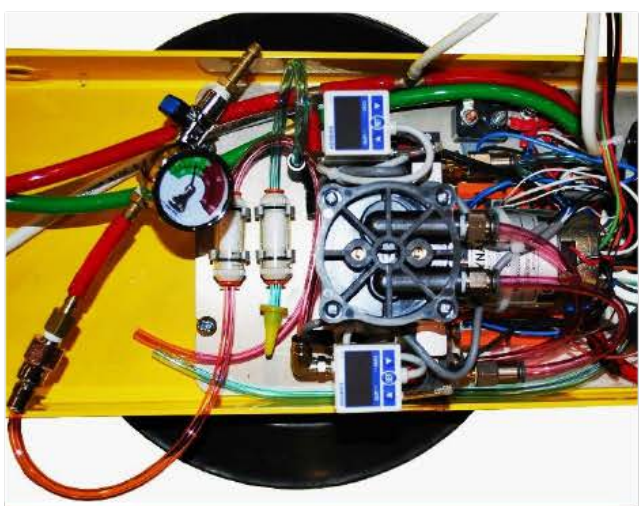


FIGURE 3

In **FIGURE 3**, the ball valve has been fitted with adapters to attach to the 1/4" push-in hose on the end with the vacuum gauge. This end was then attached to the filter of the circuit being tested. Note that the other filter was capped off so the lifter did not have to be attached to a surface to seal the other circuit.

With the ball valve closed (handle turned perpendicular to the valve as shown in **FIGURE 3**), the lifter was applied and then the power was switched to off (O).

Leakage in the circuit with the ball valve attached (shown on red circuit) will be indicated on the ball valve's vacuum gauge.

- If the vacuum level of the ball valve's vacuum gauge starts and continues to drop, this indicates that this circuit of the vacuum generating system does leak. If both circuits originally indicated a leak, repeat the test for the other circuit.

  Once both circuits have been tested and it has been verified that one or both circuits leak, proceed to the Vacuum Generating System Tests.

- If the vacuum level of the ball valve's vacuum gauge holds steady, this indicates that this circuit of the vacuum generating system does not leak. If both circuits originally indicated a leak, repeat the test for the other circuit.

  Once both circuits have been tested and it has been verified that the vacuum generating system does not leak, proceed to the Pad System Tests.

VACUUM GENERATING SYSTEM TEST

Note: The following assumes that you have access to suitable plugs, a ball valve with vacuum gauge, and additional hose and adapter fittings for connecting the ball valve to the lifter's vacuum lines and fittings.

Note: If you are testing only one of the two circuits, the lifter will need to be attached to a clean, smooth surface for the remaining section to seal to during testing.

The most likely leak points in the vacuum generating system are the check valve, the hose connections to the filters, or the control valve. Leave the filters disconnected and test these items as follows:

Isolate the filter from the control valve / check valve assembly:

Based on the Preliminary Test, it should have been determined that, with the filters capped off, the leak is still present. Proceed as follows to determine the location of the leak.

Note: If, during the Preliminary Test, the vacuum level of only one of the vacuum switches indicated a decrease in the vacuum level and the other held or increased when the system cycled, it is the circuit that lost vacuum (red or blue/green) that needs to be tested.

1) Remove the hose from the valve assembly that connects to the filter. Remove the capped hoses from the filters and attach these to the valve assembly where the filter hose was removed.

   See **FIGURE 4**, items **4A** and **4B**.

2) Switch the power on (I), and activate the vacuum generating system by pressing the apply ( ) push button.

3) With the lifter still turned on, observe the vacuum switches to locate the general area of leakage.

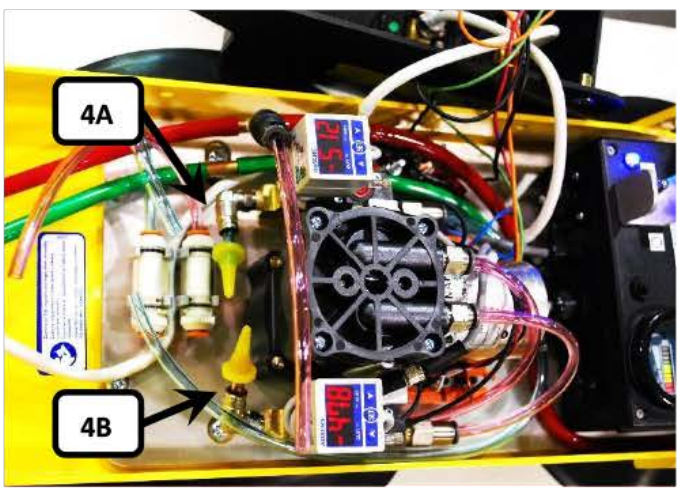


FIGURE 4

- If the vacuum level on the lifter's vacuum switch holds steady, this indicates the filter is the source of the leak. Verify that the O-ring seal of the filter cap is in good shape, that the cap is tight and that the filter housing is clean. Check the filter and the ends of the hoses attached to the filter. Cut approximately 1/8" [4 mm] from the ends of the hoses, ensuring that the cuts are straight and square. Reattach the hoses to the filter in the same manner as done in the Preliminary Test and retest the lifter. If the lifter continues to leak, replace the filter and or hoses.

  Note: when reassembling the lifter, it may be prudent to also replace the hose from the reducing fitting to the filter. Also, when the filter is installed in its holder, it is critical that the hoses be positioned so that there is minimum sideways pressure on the filter hose.

- If the vacuum level on the vacuum switch drops and the lifter cycles repeatedly, this indicates that the leak is located in the control valve assembly. This includes both the control valve and the check valve.

Switch the power off (O) and proceed to next step.

4) Note: This step requires the use of the ball valve with vacuum gauge and appropriate adapters for the 1/4" O.D. hose. If you have only one ball valve assembly, only one circuit (blue/green or red), can be tested at a time. Each circuit can be addressed individually.

5) The ball valve assembly required for the next step consists of the standard ball valve with vacuum gauge and barbed fittings (for 1/4" I.D. hose), two barbed fitting to 3/8" O.D. push-in hose adapters and two 3/8" O.D. push-in hose to 1/4" O.D. push-in hose adapters. See the following graphic.

BALL VALVE WITH VACUUM GAUGE

6) Remove the hose from the control valve that connects to the vacuum pump intake (vacuum) port. This will be the fitting of the control valve with the check valve installed. See **FIGURE 5**.

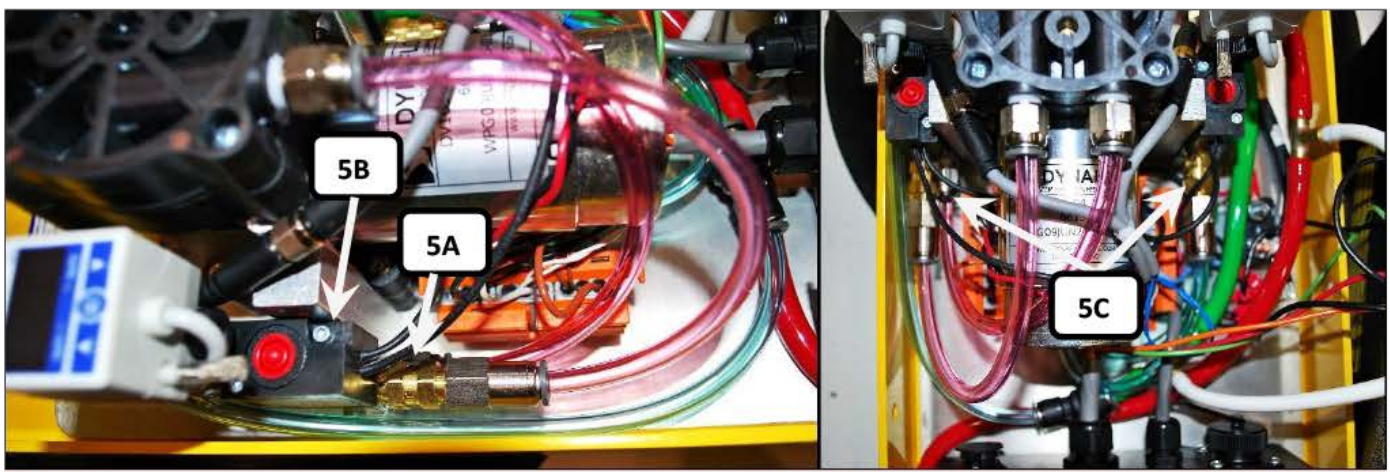


FIGURE 5

In the left panel, the check valve (**5A**) is connected to the control valve (**5B**). See the right panel for the location of the check valves of both valve assemblies, **5C**, shown from the top view.

Remove the hose from the push-in fitting connected to the check valve for the circuit (blue/green or red) being tested.

7) Using additional hose and fitting adapters, attach the end of the ball valve with the vacuum gauge to the control valve port with the check valve (**6A**) where the pump hose was attached. Using fitting adapters, attach the other end of the ball valve to the pump hose (**6B**). See **FIGURE 6**.

8) With the ball valve in the open position (handle in line with the valve), switch the power on (I), and activate the vacuum generating system by pressing the apply ( ) push button.

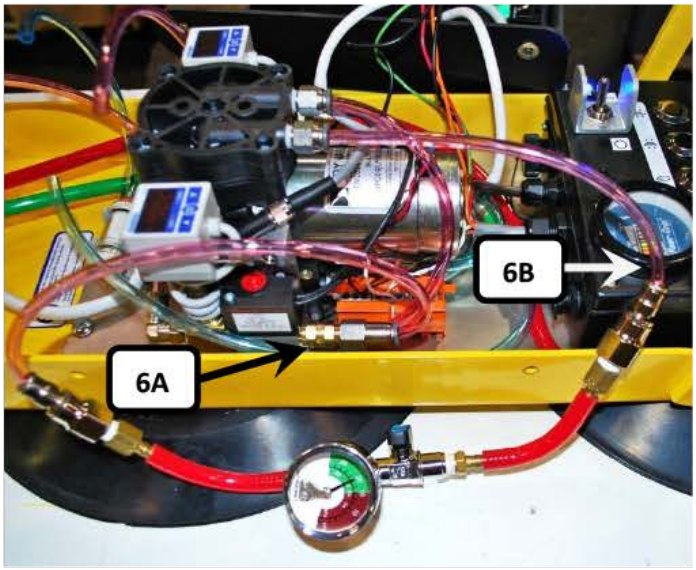


FIGURE 6

9) Allow the vacuum system to reach a suitable vacuum level or to shut off automatically and, with the lifter still on and in apply mode, close the ball valve (turn handle perpendicular to valve) as shown in **FIGURE 6**. Note: With the ball valve closed, if there is a leak, the vacuum level will not recover even though the vacuum pump may be running.

10) Observe the vacuum gauge on the ball valve and the vacuum switch readout, to locate the area of leakage.

- If the vacuum level on both the ball valve's vacuum gauge and the vacuum switch holds steady and does not drop, this indicates that the check valve is the cause of the leak. Replace the check valve.
- If the vacuum level on either the ball valve's vacuum gauge and/or the vacuum switch starts and continues to drop, this indicates that the leak is located in the control valve assembly. The most likely cause is the control valve, so replace the control valve. However, check all the attached fittings of the assembly closely for any indication of damage or cracks as, although less likely, this too could be the cause.

Note: Leaks in the vacuum generating system should be repaired prior to performing repairs to the pad system. Also, although the vacuum generating system can be built as a virtually leak-free system, minor vacuum leaks are not always worth the effort to locate and repair. As mentioned at the start of the Preliminary Test, the vacuum tanks are located in the pad system. This is the area of volume that helps diminish (slow) the effects of vacuum leaks. Due to the difference in volume, when the vacuum generating system is isolated from the pad system, the amount of leakage noted in the vacuum generating system over the course of 5 minutes can take over an hour to have the same result when the pad system is attached. This assumes that the pad system itself is not leaking and that the only leakage is what was noted in the vacuum generating system when it was tested.

Once the vacuum generating system is confirmed to hold (no significant leaks noted per the vacuum readings), reconnect the pad system, proceed to system confirmation and retest the vacuum system as described.

PAD SYSTEM TESTS

Note: This section assumes either that it was determined that the vacuum generating system does not leak or that any existing leaks in the vacuum generating system have been repaired.

Note: The following assumes that you have access to suitable plugs, a ball valve with vacuum gauge, and additional hose and adapter fittings for connecting the ball valve to the lifter's vacuum lines and fittings.

Note: If you are testing only one of the two circuits, the lifter will need to be attached to a clean, smooth surface for the remaining section to seal to during testing.

Isolate the vacuum pads, fittings and vacuum line sections until the leak point can be located, as follows:

1) If the Preliminary Test was performed, reattach the filter lines to reconnect the vacuum generating system to the pad system.
2) Remove each pad fitting from the vacuum pads of the affected (leaking) circuit (**7A** green circuit or **7B** red circuit), disconnecting the pads of this circuit from the vacuum system.
3) Cap the pad fittings of the disconnected pads, to seal off the vacuum lines.

   See **FIGURE 7**.

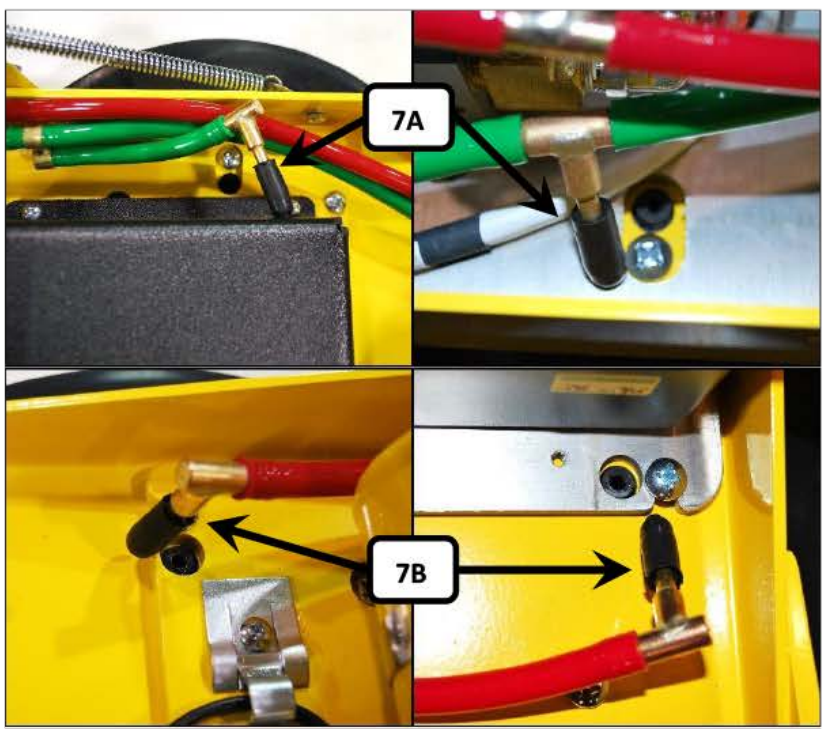


FIGURE 7

4) With the vacuum pads capped off (all or just one set of pads), switch the power on (I) and activate the vacuum generating system by pressing the apply ( ) push button.

   Note: If only one set of pads (green or red circuit) is capped off, the lifter will need to be attached to a clean, smooth surface for the remaining section to seal during testing.

5) Allow the vacuum system to reach a suitable vacuum level or to shut off automatically and switch the power off (O).

   - If the vacuum level on the vacuum gauge of the circuit (red or green) that is being tested holds steady and does not drop, this indicates the leak is in one or more pads of that circuit. Reconnect one pad to its vacuum line and retest. If indications of leakage resume, replace that pad. Continue testing until all pads have been reconnected and all defective pads have been replaced.
   - If the vacuum level on the vacuum gauge of the circuit (red or green) that is being tested starts and continues to drop, this indicates the leakage is in the fittings or vacuum lines between the vacuum pads and the filter.

6) If is determined that the leak is between the pads and the filter, continue testing as follows.

Vacuum line sections and included fittings may be tested by moving up each line (toward vacuum generating system) to the next fitting, removing the hose and plugging it at the fitting or by installing the ball valve assembly (with the gauge end towards the vacuum pads) into the line.

Approach the Y-fittings (used to connect the vacuum tanks) with caution. These are shown in **FIGURE 8** below.

FIGURE 8

Note: The Y-fitting (shown in the center panel) has only a single barb on each hose nipple. Consequently, you must take care when removing a hose from this fitting, so that the single hose barb is not damaged. The locations of the Y-fittings are circled in the left and right panels. If the hose barb becomes damaged when the hose is removed, it may create a leak that did not previously exist.

7) In the first scenario described above, where a hose is removed and the fitting is plugged, if the leak continues it will be located in the direction of the filter. When the leak stops, it will be in the last section removed.

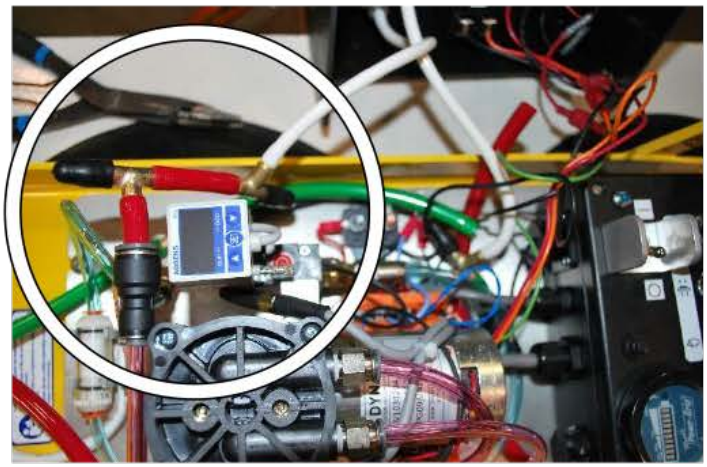
This is shown in **FIGURE 9** below, where, in **SECTION A**, the two tee fittings of the red section are shown capped off. Since the lifter's vacuum gauge for the red circuit is connected via the white hose of the one tee and one red hose connects to the reducing fitting which then connects to the filter, the lifter's vacuum gauge is being used as the indicator.

If the vacuum level on the lifter's vacuum gauge starts and continues to drop, this indicates that the leak is located in either the vacuum gauge assembly, either of the connected tee fittings, the reducing fitting, or the connected hoses, including the hose connected to the filter, since this was not attached when the vacuum generating system was tested.

Conversely, if the vacuum level of the lifter's vacuum gauge holds steady and does not drop, this indicates that none of the attached components leak. This would also indicate that, unless the leak was repaired, it will be located out towards the capped-off pad fittings.

In **SECTION B,** the green section is being tested. Note that only one tee fitting was included in this test, since the reducing fitting is connected directly to the tee that is attached to the green circuit's vacuum gauge. Therefore the components being verified (as indicated by the green circuit's vacuum gauge) would be the tee fitting, reducing fitting, vacuum gauge assembly and the attached hoses up to the filter.

Note to test the vacuum gauge itself requires the ball valve and adapter fittings to go from 1/4" I.D. hose to 1/8" I.D. hose.



SECTION A FIGURE 9 SECTION B

Note: Any time the vacuum tanks are not part of the section being tested, leakage will appear to be faster than seen in the overall test, due to the reduced system volume.

8) In the second scenario, where the ball valve is installed in the line, the vacuum gauges of the ball valve and lifter indicate the location of the leak. If the ball valve (gauge end towards capped pad fittings) is installed and then closed (handle turned perpendicular to the valve) after the lifter is applied, a leak on the ball valve's gauge indicates the leak is between the ball valve and the capped-off pad fitting. A leak on the lifter's vacuum gauge indicates that the leak is between the ball valve and the vacuum generating system.

   Additionally, the section that includes the vacuum tank will leak slower, but will indicate the true leakage rate of the lifter when all parts are attached. In the section without the vacuum tank, the leakage rate will appear faster due to the reduced volume.

9) Note: If it becomes necessary to remove the lifter's vacuum gauge from the system, the ball valve can be used to provide a gauge reading. This would be accomplished by connecting the end of the ball valve with the vacuum gauge to the section being tested and closing the ball valve to act as a plug.

   Whenever a vacuum gauge (either the lifter's or the ball valve's) is used as the indicator, the lifter's power can be switched off (O) and the vacuum level monitored as indicated by the vacuum gauge.

10) Individual fittings can be checked by attaching the ball valve to any active vacuum line. This is shown in **FIGURE 10**, where a Y-fitting is shown attached to the gauge end of the ball valve using a short piece of hose. The hose indicated with the arrow would be connected to the vacuum system. The two open barbs of the Y-fitting have been capped off. Vacuum would be applied and the ball valve closed. Leakage shown on the ball valve's vacuum gauge would indicate whether the Y-fitting leaks.

FIGURE 10

   See **FIGURE 11** for additional information on this method of testing fittings.

11) In **FIGURE 11,** a pad fitting is shown being tested.

FIGURE 11

When the valve end of the ball valve (indicated with the arrow in **FIGURE 10**) is attached to a vacuum source (in this example, the green pad line was used) and vacuum applied, closing the ball valve provides a vacuum test of the fitting. If the vacuum level on the ball valve's vacuum gauge starts and continues to drop, the fitting does leak. If the vacuum gauge holds steady, the fitting does not leak.

This process can be used to verify any individual fitting, section or assembly.

12) Once all leaks have been identified and repaired, proceed to System Confirmation and retest the vacuum system as described.

SYSTEM CONFIRMATION

Once all leaks have been identified and repaired, reassemble all parts of the lifter.

A vacuum test, as described in the instruction manual, should be performed following any repair or service to a vacuum lifter. All parts must be verified in relation to their function and the lifter must pass the vacuum test before returning it to operation.

ADDITIONAL INFORMATION

NOTES:

1) When requesting information on a particular lifter, please have the model number and serial number available, in order for us to properly identify components.
2) **CAUTION:** Always proceed with caution when opening enclosures containing electrical wiring. Wiring is often connected to components in the cover, as well as the enclosure itself.
3) In some cases a leak may be identified to be in an assembly (such as a filter or valve assembly) but the actual cause is not apparent (neither the filter nor the valve itself are the cause). In these cases, the leak may be caused by a cracked fitting. Cracks in fittings may be visible but are often virtually impossible to locate except under factory test conditions. They may appear as dark lines along the seam of female fittings, along the hex nut section of female hose nipples, or at the base of the threads on male fittings. If a leak is traced to an assembly and the cause is not visibly apparent, it may be best to simply replace the whole assembly rather than a single component.
4) If any metal fittings are disassembled during testing, ***always*** apply thread sealant (Teflon tape or similar product) to the male threads prior to reassembly, in order to avoid vacuum leaks.

   For plastic fittings use only Teflon tape; liquid sealants must not be used because they may damage plastic parts.
5) When assembling fittings, do not over-tighten. After first applying adequate thread sealant or tape, the fitting should be finger-tightened as much as possible.

   A straight fitting should be tightened no more than two additional revolutions with a wrench.
   An elbow fitting should be tightened no more than one and one-half additional revolutions with a wrench.
   Once an elbow or tee fitting is tightened with a wrench, the fitting should be aligned in the clockwise direction with a wrench
6) 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 the tools you use are capable of completely sealing your system.

If needed, test equipment is available from Wood's Powr-Grip Co.

There are various ways to approach testing vacuum lifters.

For further suggestions or information, please contact our staff at:

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ALL LIFTERS MUST BE TESTED AFTER MAINTENANCE
SEE INSTRUCTION MANUAL