



Hydraulic Benchmark Test Kit 730350





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Liability:

Customer assumes all liability for damages from accidents caused by or incurred in the use of transportation of said equipment. Customer agrees to indemnify and hold harmless the said Precision Planting, its officers, agents, and employees from any and all damages and/or liability to any person whomsoever arising out of or resulting from the use, storage, or transportation of said equipment by the Customer or anyone else while the equipment is in the custody of the Customer. The Customer acknowledges receipt of the equipment in good working condition and repair. In the event of any accident involving said equipment, Customer shall promptly furnish to Precision Planting a complete report in writing, with names and addresses of witnesses and parties involved and Customer shall make all reports required by law. Customer agrees to review and follow any published safety instructions in the product manual.

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Choice of Law:

Any dispute or claim arising from or related to this Policy, or related to a product governed by this Policy, shall be governed by the laws of the State of Illinois.

Safety Information



Always wash your hands after working on or around agricultural equipment prior to eating, drinking, smoking, chewing, etc...



Always use the proper Personal Protective Equipment (PPE) for any task.

Examples include: Gloves when handling sharp or abrasive materials
Eye protection when handling contents or systems under pressure (ie. Hydraulic, Pneumatic, Water)
Welding helmet, Welding gloves, and welders clothing when welding/torching



Prior to working under or at ground level of any equipment secure the machinery from movement; accidental user operation or simple rolling of equipment. This should involve Lock-Out tags at the battery, removal of the Ignition key, "Do Not Operate" signs placed at key locations, as well as wheel chocks as necessary.



When working on a vehicle or implement's hydraulic system, suspended components may suddenly drop. If you are working on or around the implement at this time serious injury could result. If possible lower the implement or attachment to the ground before beginning any work. Alternatively; use mechanical lock-up devices to secure any components in their lifted positions.



Agricultural equipment may have been exposed to many types of chemicals. Any chemicals or residues should be removed from the planter prior to beginning work. Obey all existing (new & original) warning signs and caution labels on all equipment.



When working on or around equipment that has been or is running many components may get extremely hot. To avoid injury &/or serious burns allow all equipment components to properly cool before working on or around them.



Avoid wearing loose or ragged clothing or jewelry around equipment, with special attention to avoid moving parts.



Route and secure all wires and connections to avoid crimping or damaging. This may result in unexpected shortages and shocks.



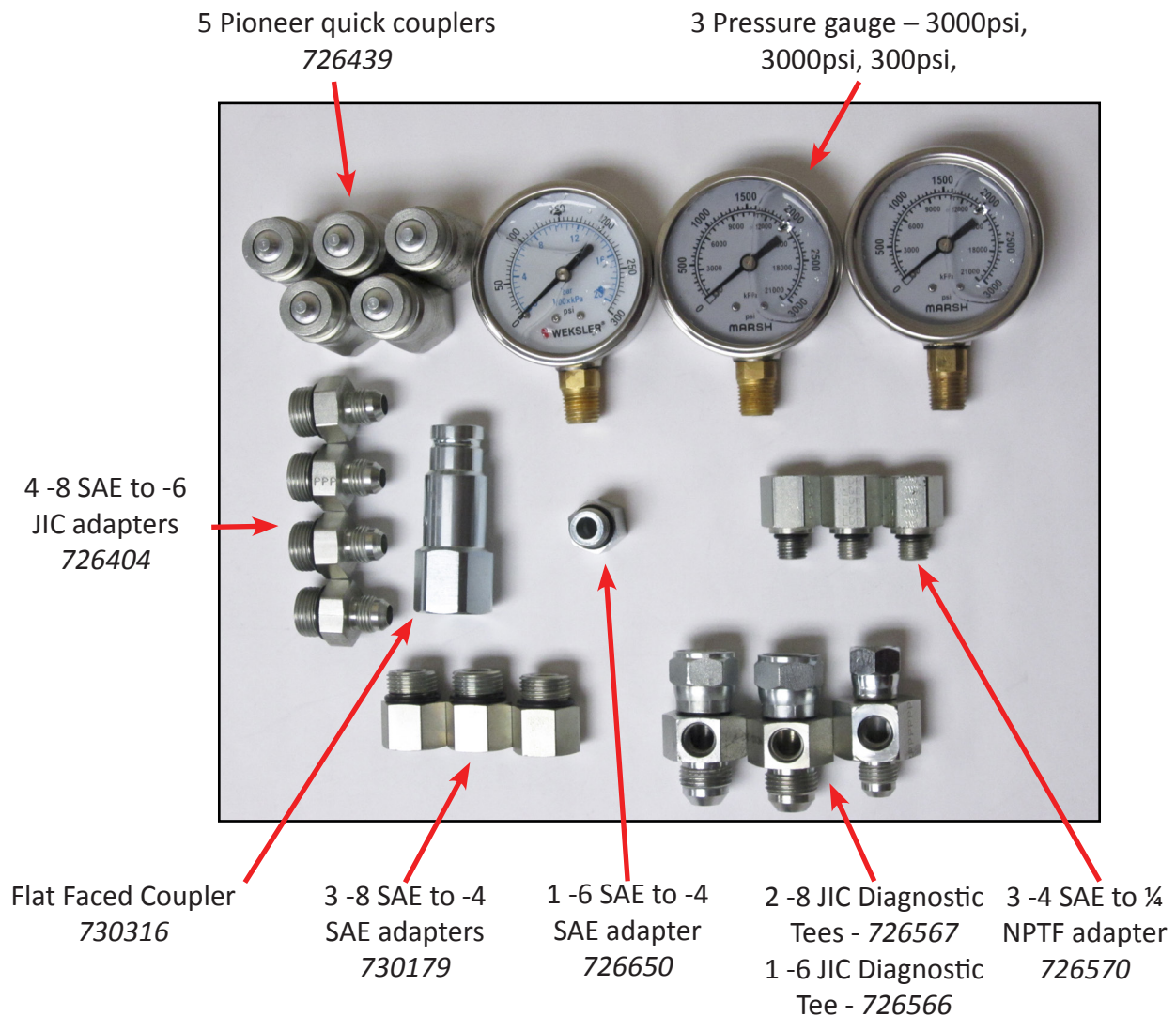
Use extreme caution when working on pressurized systems (Air, Water, Oil). Relieve all pressure from a system before disconnecting lines, fittings, etc... Use a cloth or other obstruction to divert possible spray when disconnecting hose connections, fittings, fill caps, breathers, etc. Always use gloves, NEVER use bare hands. To locate or check for leaks use cardboard, never your hand.



Electrical components and devices may contain high voltages and should be kept dry and closed.

Test Kit Contents

The 730350 test kit is designed to test hydraulic pressure at a variety of locations on the vSet vac blower and also to test the overall hydraulic pressure of the tractor. The vSet blower will need a zero pressure case drain and also a high enough pressure respective of the number of rows per blower. The test kit comes with two 3000 PSI and one 300 PSI pressure gauges and the fittings to adapt the pressure gauges to the most common plumbing of the hydraulics of the tractor and the blower hydraulic lines. It may be necessary on certain systems to acquire different fittings to make it possible to plug the pressure gauges into the system.



Setup

To set the test kit up, 4 of the Pioneer tips will need to be threaded on to the 726404 -8 to -6 adapters and then threaded on to the ends of the jumper hoses as shown in Fig 1 below. Also, all three gauges will need a 726570 -4 SAE to ¼ NPTF adapter. With this adapter, the gauge will be able to attach to any of the diagnostic tees or to the 730179 -8SAE to -4SAE adapters that thread into the quick couplers. Refer to Figures 2-5 for examples. This will be used to test the hydraulic pressure capacity of the tractor.



Fig. 1



Fig. 2

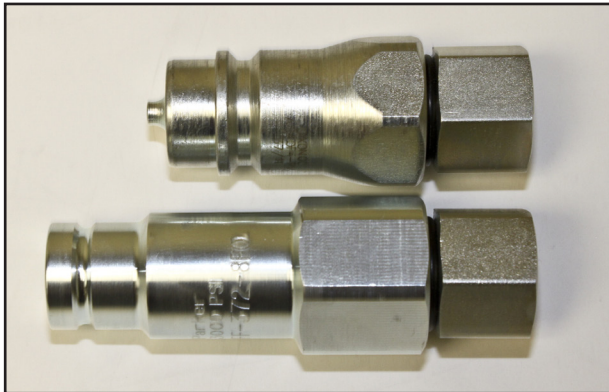


Fig. 3

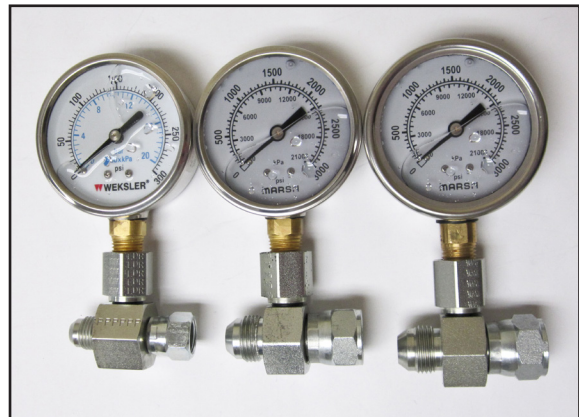


Fig. 4



Fig. 5

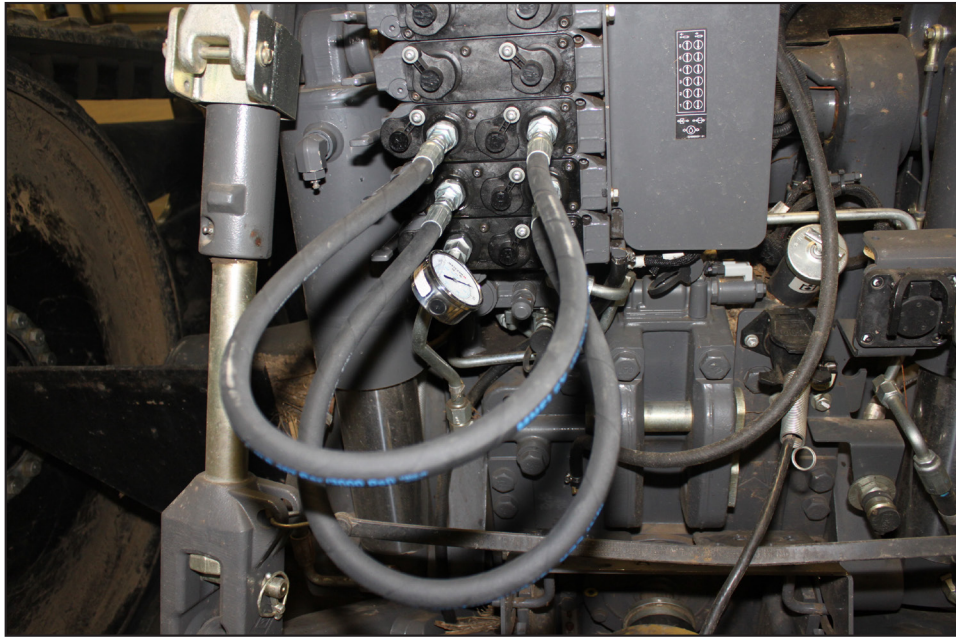
Testing Tractor Hydraulics

The first hydraulic test would be to test the maximum pressure of the tractor hydraulic system to see if it is capable of running the vSet vac blower. For this test you will use the 2 - 36" jumper hoses with quick couplers and the pressure sensor. The 730350 test kit **is not testing the flow of the tractor.** It intended to test the operating pressure of specific circuits of the hydraulic system when it is placed under a full (operational) load. If it is desired to test the flow of the hydraulic system, a flow sensor may be added by placing it in the middle of a jumper hose. This is **not** available from Precision Planting.



Procedure

1. Warm the hydraulic oil to normal operating temperature by installing the two jumper hoses into two of the SCV's (preferably not the one that you desire to run the vacuum motor in) and engaging the circuits to create constant flow. Run the tractor at ≥ 1800 rpm for approximately 5 minutes or until normal operating temperature is met.



Note: your tractor set up may look different than this picture.

2. Disengage the SCV's.
3. Test 1 - Install the pressure gauge into the desired SCV remote or the power beyond port that you intend to install and operate the vacuum blower motor. This remote must be capable of running in continuous flow. Engage the SCV remote and record the pressure (P1) on next page. This will establish the maximum available pressure to the desired remote with the hydraulic oil at operating temperatures. **Note:** A power beyond port may need a flow sense kit as some power beyond ports do not activate until they sense hydraulic flow.
4. Test 2 – With the pressure gauge installed into the desired remote and the jumper hoses installed into the alternate remotes, engage the desired SCV remote (with the pressure gauge installed) and ONE of the remotes with a jumper hose installed. Observe and record the pressure (P2) on next page. This will establish the pressure available to the desired remote while simulating moderate hydraulic flow with the oil at operating temperature.
5. Test 3 - With the pressure gauge installed into the desired remote and the jumper hoses installed into the alternate remotes, engage the desired SCV remote (with the pressure gauge installed) and BOTH of the remotes with a jumper hose installed. Observe and record the pressure (P3) on next page. This will establish the pressure available to the desired remote while simulating full hydraulic flow with the oil at operating temperature.
6. Compare the results of the pressure tests with pressure requirements given in Table 1 on the next page. Generally, P2 is the most relevant test to use to determine the pressure required but P1 and P3 may be used depending on what the flow requirements are (table 1) and what other hydraulic demands from other planter functions.

Procedure

Pressure test #	PSI for test
P1	
P2	
P3	

Front Fold Planter				
	Requirements for Corn		Requirements for Beans	
Number of Rows	Pressure (psi)	Flow (gpm)	Pressure (psi)	Flow (gpm)
8	700	5.3	900	5.6
12	1000	5.8	1400	6.4
16	1200	6.2	1900	7.3
24	1800	7.3	N/A	N/A

Table 1

Notes:

1. Results may vary depending on which SCV circuit is tested. You may want to install the pressure gauge in the other remotes and repeat steps 3 – 8, especially if the first test indicated that the tractor lacks hydraulic capacity for your planter. Also, find out what is the first priority SCV for that tractor from the owner. Not all tractors have SCV #1 as the first priority.
2. Straight bar planters (such as Kinze lift and twist) tend to be a lot more efficient for vacuum power requirements. A 24-row straight bar planter is roughly equivalent to a 16-row front fold in terms of power requirements.
3. Pressure is given in terms of pressure drop across the motor. This is not the same as your system pressure. You will need higher system pressure than what is listed in **Table 1**. Pressure drop in hoses should also be accounted for and can be estimated with the following formula:

Pressure drop in hose (psi) = $(0.45 * \text{Flow (gpm)} - 1) * \text{Round trip hose length (ft)}$. Add the pressure drop in the hose to the required pressure drop of the motor to get a total pressure drop requirement. Compare this to the available pressure of the tractor (system pressure). Example: 16 row planter with 3.5cc motor → flow for beans = 7.3gpm, 80ft hose round trip. $0.45 * 7.3 = 3.29$ $3.29 - 1 = 2.29$ $2.29 * 80 = 183$ psi pressure drop in hose.

Pressure drop in motor (16-row, beans) = 1900

Total Pressure required = $1900 + 183 = 2083$ psi

Testing vSet Blower Motor

The point of testing the vSet blower is to prevent seal failures from occurring and in instances where they have failed to diagnose the root cause. Remember that many factors play into a seal failure. True diagnostics of the system will look at the tractor, the hydraulic plumbing of the pressure lines (including the case drain), the blower motor itself and also the vac plumbing to the meter. The following troubleshooting guides are largely focused on the case drain and the blower motors.

Testing Case Drain

For all tests of the case drain, **Do Not Engage The Hydraulics Unless Directed by Instructions**

1. Plug the 300 psi gauge into the tractor using the flat faced quick coupler assembled as shown in Fig 5. Start the tractor up and the ideal pressure would be 0 psi but may be higher as long as the pressure at the motor when running is not greater than 40 psi. (refer to step 4 to test this)
2. If the tractor does not have a flat faced coupler for the case drain, adapt the pressure gauge to the fittings necessary to plug the pressure gauge into the port on the tractor. Pressure should be the same here as in step 1.
3. If it is not possible to plug the pressure gauge directly into the port on the tractor, insert the -6 JIC diagnostic tee into case drain line right before the coupling going into the tractor and connect the pressure gauge into diagnostic tee as shown in Fig.4. Start the tractor up and leave the hydraulics off. The pressure should still be the same as step 1.
4. Additional testing may be done at different points in the case drain line if desired or if problems occur. The -6 JIC diagnostic tee may be inserted at the case drain fittings right at the blower motor to make sure that the line from the blower to the tractor is clear of obstructions. For this test, the hydraulics should be run as if one was planting (disks loaded, blower spinning at normal speed). Some pressure is expected at the motor but the pressure drop from motor to tractor should not exceed 12 psi (for 1 motor, 25 psi for 2 motors sharing a case drain line). If the pressure drop is too high, it may suggest a blockage in the plumbing or possible high case drain flow. See Testing Motor to determine which is at fault. Perform this test at operating temperatures as oil temp will affect results. Typical oil temp is 140 – 160F.
5. In instances where the tractor case drain is deemed to be a problem (i.e. high pressure in step 1), the tractor dealer should be involved to find a solution. Drilling a hole in the fill cap and attaching a quick coupler is one option. **High back pressure does not automatically mean that the tractor is at fault. Complete troubleshooting before placing guilt on tractor.**

Testing Motor

1. If the motor has excessive internal leakage, the pressure in the case drain will increase. The easiest way to test this is to disconnect the case drain line and let the oil run into a container. Run the blower for 1 minute at same speed and load as when the seal failed. Make sure the oil is warmed to typical operating temperature. Determine how much oil is in the bucket (hydraulic oil roughly weighs 8lbs/gal so you can weigh it if a graduated container is not available). The case drain flow should be less than 1 GPM. If it measures more than 1 GPM, it probably suggests a problem with the motor itself. If flow appears to be normal but high pressure drop was found between the motor and the tractor (in step 4) check for pinched lines or other obstructions in the plumbing that may be causing back pressure.

Testing vSet Blower Motor (Continued)

Testing Pressure to Motor

The following testing can be done to help diagnose vacuum power related problems.

1. Install the -8 JIC diagnostic tee into the pressure line directly before the motor and thread a 3000 psi gauge with the -4 SAE to ¼ NPTF adapter into the diagnostic tee. Install the -8 JIC diagnostic tee into the return line directly after the motor to get the actual back pressure and thread a 3000 psi gauge with the -4 SAE to ¼ NPTF adapter into the diagnostic tee.
2. Once all the fittings are tight, engage the hydraulics. ***(Case drain must be connected at this point and working correctly!)*** Run the system at the same flow and vacuum load as if you were planting. Subtract the return pressure measurement from the supply pressure measurement. The difference between these two is the amount of pressure used by the motor. This can be compared to the pressure drop requirements given in Table 1.
3. If your measured pressure drop is less than the listed requirement, you may want to repeat the test with the gauges at the tractor remote connections. Compare the total pressure drop of the system (as measured at the tractor connection) to the pressure drop you measured at the motor. The difference should be less than 200 psi. Up sizing your hoses would be one way to reduce your pressure loss if it is a problem.
4. If you have adequate pressure drop at the motor in step 2 (based on the table), your problem may be in the vacuum system (rather than the hydraulic system). Check for leaks and look for ways to streamline the air plumbing. Flexible hose is much more restrictive than rigid, so use rigid pipe wherever possible.

Note: the 730350 includes the most common fittings to connect the pressure gauges to the existing lines. This kit will not fit all situations and it will be necessary in some cases to find different fittings to adapt the pressure gauge to the hydraulic lines/tractor ports. It is not possible for Precision Planting to build a kit that will fit every situation and until we see a need to change the kit, we are not adding any more fittings to the 730350 test kit.

Reducing Motor Failures

Here are some ways to reduce the risk of future seal failures:

1. Reduce back pressure on case drain line.
 - Make sure it's connected to the tractor sump.
 - Make sure you're using 3/8" (-06) or larger hose.
 - Check to make sure there are no obstructions in the hose near the crimp connections and fittings at each end. Also check for pinch points and kinks in the line.
 - Use a flat face quick coupling instead of a standard pioneer coupling at the tractor sump connection. These couplings have less pressure drop. Parker FF series is a good option. Nipple P/N: FF-372-8FO and Coupler P/N: FF-371-8FO.
2. Minimize vacuum speed and hydraulic pressure.
 - When starting the blower for the first time, turn the hydraulic flow control way down and gradually ramp up the blower speed until the vacuum pressure is around 10" (meter disks unloaded). When you load the disks, you may have to increase the flow a bit to achieve 20" with the meters loaded and planting. Do not increase the hydraulic flow beyond this unless it proves to be insufficient when planting.
 - Check to make sure there are no major vacuum leaks. This can be done by feeling with your hands for air flow around all couplings and other likely leak sources. Repair leaks as much as possible.
 - Rarely should you ever need vacuum pressure in excess of 20" while planting. Only if you're seeing a lot of skips should you increase your vacuum beyond that. Otherwise, you may want to even reduce your vacuum pressure as long as skipping doesn't become excessive.
 - Avoid reversing flow directions on your SCV without allowing the impeller to coast to a stop. A sudden reverse in pressure from supply to return or vice versa will cause a flow spike in the case drain.
 - Whenever possible, shut down the blower off by switching the SCV to the float position. This is preferred over switching to the closed center position and will reduce flow surges to the case drain during shut down.