



Technical Note PAL-xt 01/2017

Trouble Shooting DLW (pump) Module

Original Instructions



1. Preface

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2. Trouble Shooting DLW (pump) Module

2.1. Overview

The PAL System is one of several components that make up a complete chromatography system. This Service Note highlights issues that may occur with the DLW System when using dirty samples. One of the primary things to check to ensure trouble-free DLW operation is that the two solvent lines are free of air bubbles. If the solvent lines are being connected for the first time or during a solvent change, it is necessary to prime the solvent lines properly until air bubbles are no longer visible. Solvent degassing and filtering is recommended. A simple check is available to determine if the pumps are performing correctly. This check is recommended prior to starting a new sequence. Please refer to the DLW Manual for detailed installation instructions and further information.

2.2. Priming the DLW

The priming of the PAL DLW Option is done directly from the local terminal. There are several functions which can be executed from the 'Utilities' section to accomplish this task. It is recommended to use the function of the "Wash Station" first, followed by 'Clean Syringe'. A syringe with an adapter can also be used to connect directly to the DLW pump solvent lines for priming which might be more convenient in the field.

Prime the PAL DLW System with the Utilities function 'Wash Station':

Select Menu | Utilities | Wash Station | select Wash 2 | Function Key 'F3' 'Move to Wash' | Function Key 'F2' 'Activate Valve' |

Observe the green LED as an indicator that the DLW Actuator is activated. Prime with Solvent 2 until no further air bubbles are observed.

The DLW pumps are membrane pumps and are normally self-priming. In some cases however, the membranes can become blocked by air pressure and the air cannot be pressed out of the system without manual intervention. This can occur if the pumps are not primed with solvent to start with or are not used for several weeks. In either case, the membrane can dry out and get stuck. This can also happen if the solvent bottles runs out of liquid, the system is relocated or stored for a long period of time. If the pumps cannot be primed just by performing the procedure listed above, we recommend using a syringe for aspirating or pressing the air out of the system.

2.3. Clogging

A typical problem is a clogged injection valve. The source of the clog is most likely the “dirty samples” themselves, but it can also be caused by small particles from the vial septum or even the wash solvents. It is very important to use wash solvents that are appropriate and dedicated to the application being run (see also wash steps for biological samples). It is also recommended that the inlet filters on the solvent lines should not be removed at any time, unless they are being changed.

- Use the check valve kit for protecting the pumps.
- If possible use an injection valve with 0.4mm bore size.

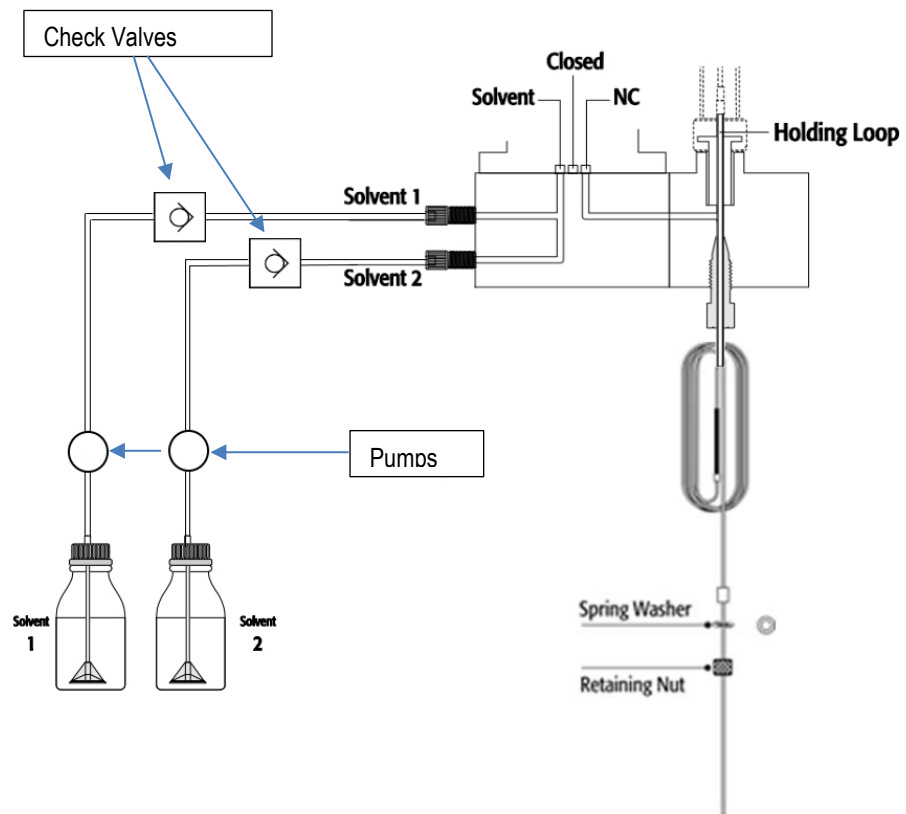
Wash steps for biological samples as implemented in the DLW cycles

- 1st Wash cycle: Aqueous solvent.
- 2nd Wash cycle: Organic solvent.
- 1st Wash cycle before next sample:
Pre-wash with aqueous solvent
(Eliminate organic solvents in syringe and valve).

If there is not enough washing with aqueous solvents, the sample can precipitate in the needle or holding loop and clog the valves later on.

2.4. Check Valves and syringe for priming

Operating a clogged system over a long period of time can damage the membranes of the DLW pumps. In order to protect the pumps, it is possible to add check valves in the solvent lines between the pump and the DLW manifold.



Picture: DLW Manifold with Loop and check valve

2.5. Kit Check Valves with syringe

There is a Check Valve kit available for the PAL3 LCMS tool and Fast Wash module. The same kit can also be used for the DLW Option.

Content:

- 2 pcs Check valves outlet 0.2bar (3 psi)
- 1 pc Plastic syringe for purging of pumps
- 1 pc Adapter for check valve

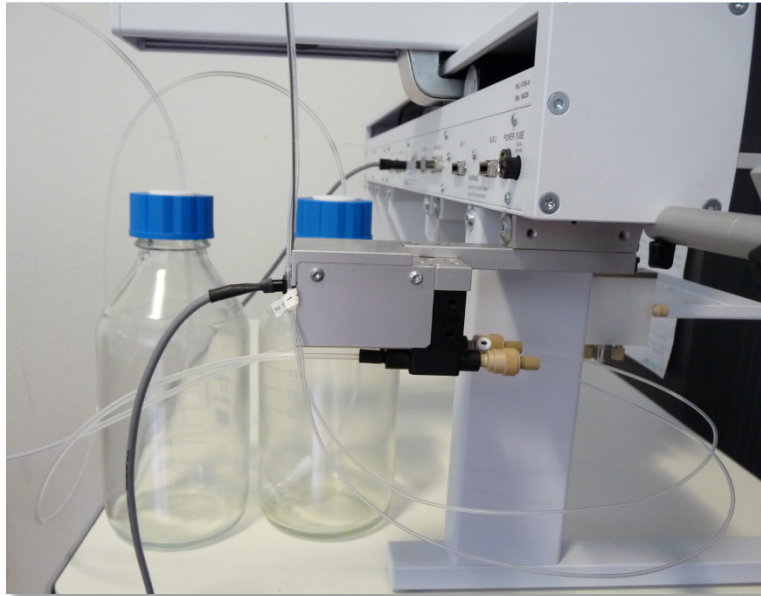


Picture: Content of Check valve Kit

Part No.	Description
PAL3-Kit-ChkVlve	Check Valve Kit for protection of LCMS-P pumps 2 pcs Check valves outlet 0.2bar (3 psi) 1 pc Plastic syringe for purging of pumps 1 pc Adapter for check valve

2.6. Priming the DLW option with installed check valves

1. Before installing the check valves, prime the DLW as described above. This ensures, there is no air left in the solvent tubing.
2. Install the check valves.



3. Repeat priming procedure with mounted check valves and check for flow at the end of the needle.

In an unlikely event this procedure is not working, there are two possible reasons:

1. Check valve is completely blocked.
2. A pump or only a membrane of pump is damaged.

Check valves can get blocked due to two different reasons. Either a check valve was run dry or the connected tubing was full of air. In the last case, the pump is not able to build up enough pressure with the compressed air to open the check valves.

The best practice to unblock a Check valve is to press solvent in the Flow direction through the Check valve.

In this case please perform this next steps.

Make sure check valve is not blocked:

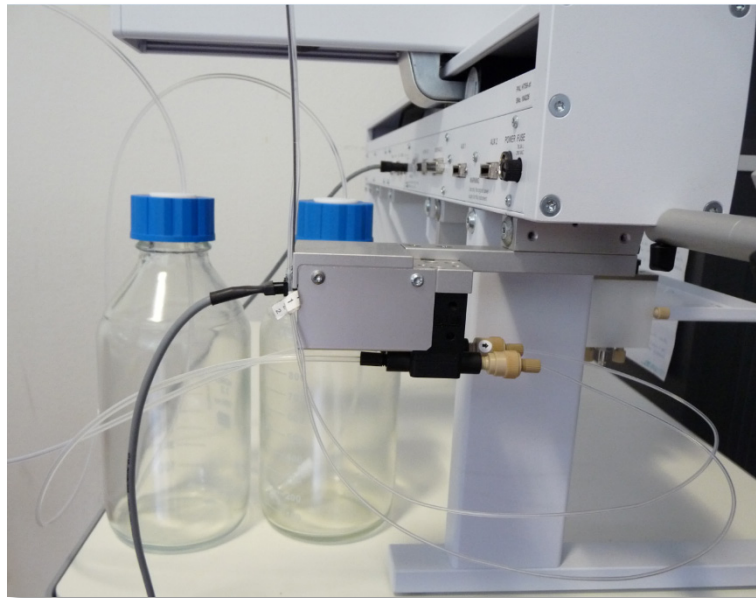
- Disconnect the Check Valve with solvent line from the DLW Wash Pump.
- Disconnect the tube at the side of the DLW Syringe Holder and place it inside a waste container.

- With the filled priming syringe manually press solvent through the check valve.



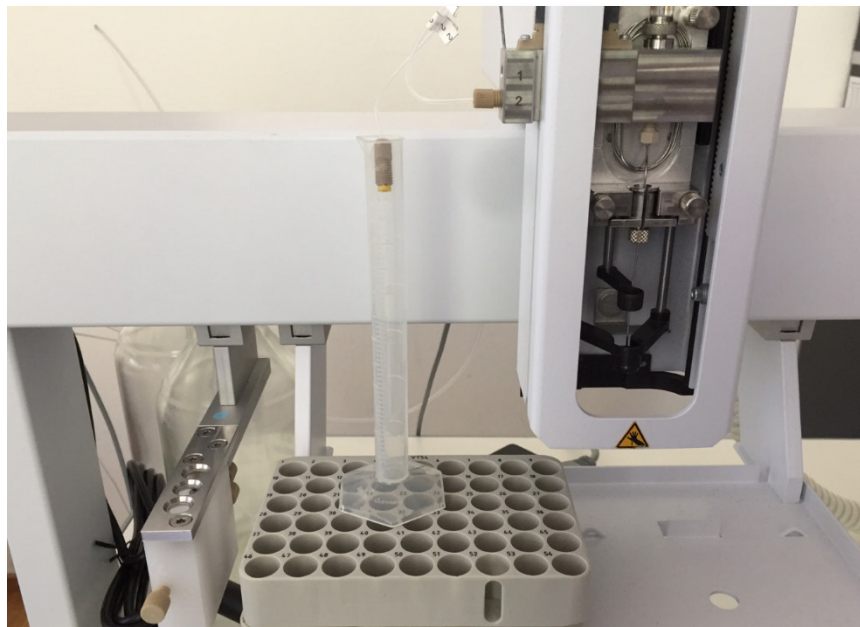
Make sure pump is not damaged and functions properly.

- Reconnect the Check Valve and the solvent line to the DLW pump and syringe adapter respectively.



- Press **Act Valve** again and let the waste from the side connector of the DLW syringe Holder directly flow into the waste container.
- Collect the pumped water in a graduated cylinder.
- Expected Result: Within 30 seconds the pump should deliver approximately 10 mL of water. Note: Other solvents will show different flow rates.

- If the pump can't deliver the necessary flow rate although the "check valve" is unclogged and no restriction present from solvent tubes, replace the respective wash pump.



- Reconnect the solvent line to the side port of the syringe holder and run clean syringe step from Handheld Terminal.
Menu/Utilities/Syringe/F2 → **Clean Syr**