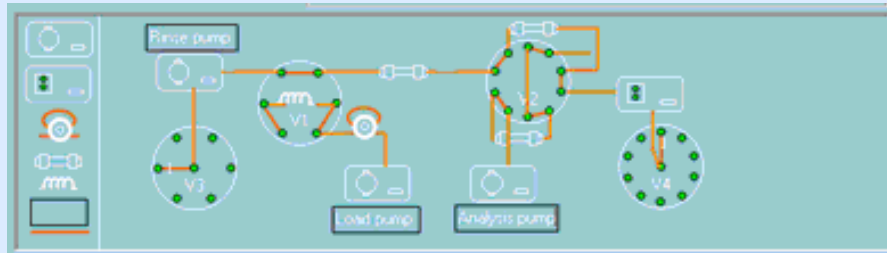




PromoChrom Technologies



## LC-04SP Valve Solutions

*for*

## LC and LC-MS



## LC-04SP Valve System

**LC-04SP valve system** is a new member of LC-04 Cleanup Station. It provides a versatile platform for building valve based solutions. LC-04SP can have up to 4 valves. Each valve can be a 2-position/6-port valve, a 2-position/8-port valve, a 2-position/10-port valve, a 6-position stream selection valve, or a 10-position stream selection valve.

The most outstanding feature of LC-04SP is its editable valve diagram. The software provides a drawing tool box. Users can design and edit the valve diagram according to their applications and the real valve connections. The software will memorize the diagram.

The other special feature of LC-04SP is its high flexibility. Users can choose the number and type of valves according to their needs and can add more valves later.

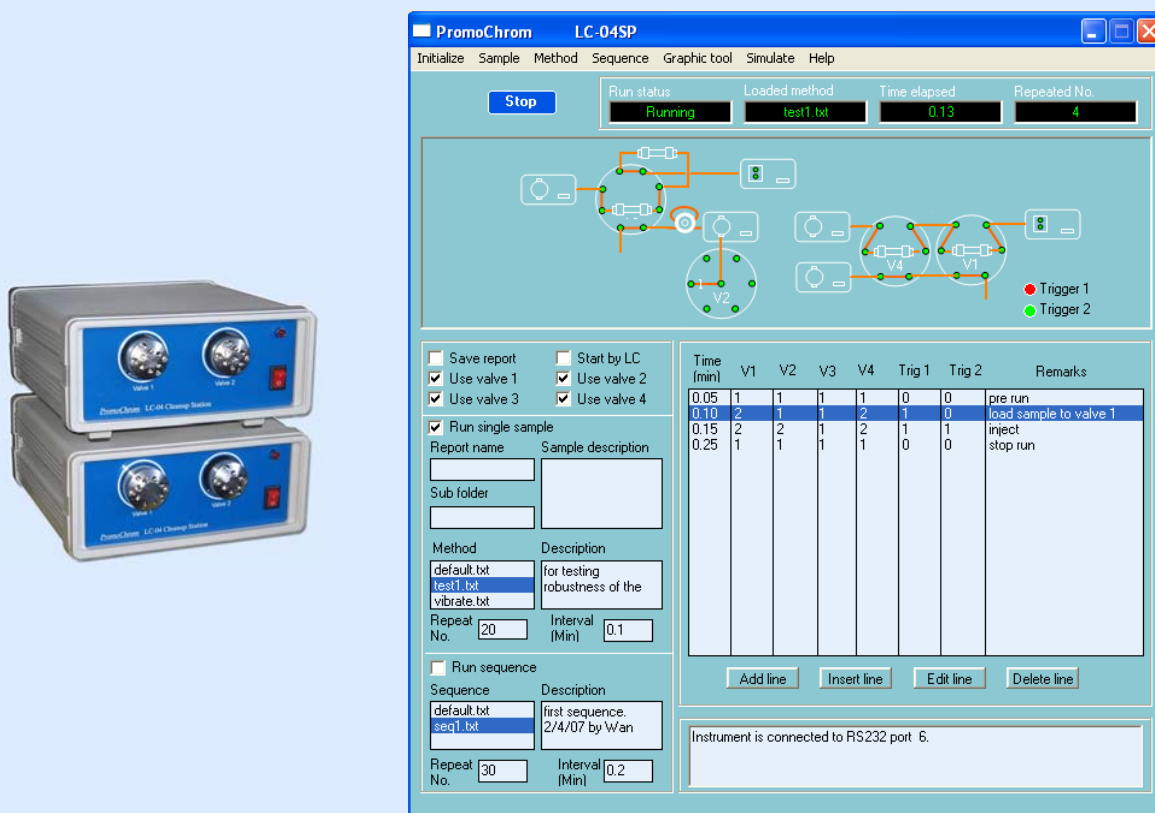


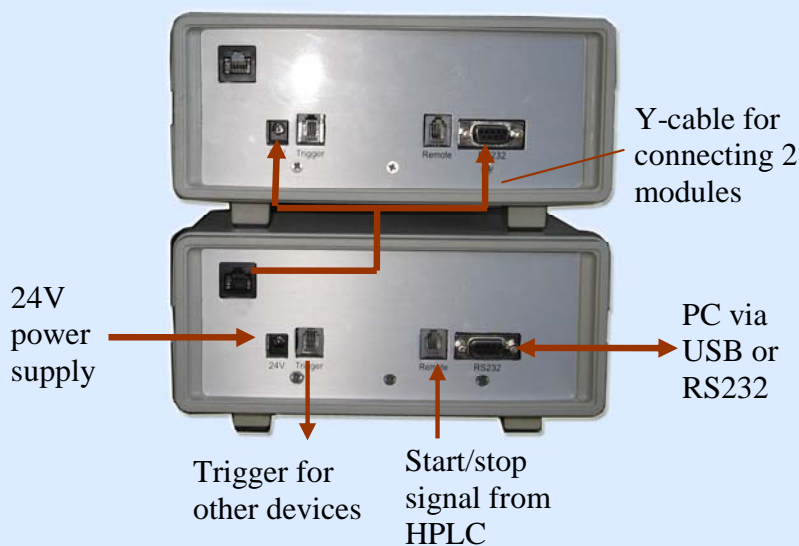
Figure 1. LC-04SP and its control software

### 1. Instrument hardware

LC-04SP can have one or two modules and each module has two valves. Figure 2 shows how the devices are connected. It communicates with computer through a RS-232 port or a USB port using a RS232 converter. The second module communicates with computer through the first module using a Y-cable. Each module has a remote port to obtain start/stop signals from other analytical instruments (such as LC-MS, HPLC, or GC). It also has a trigger port to trigger start and stop of other devices, such as pumps or samplers.

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The two modules are identical. They can either work together as a 4-valve system or as two independent devices.



*Figure 2. Cable connections for LC-04SP*

## 2. Control software

When the software is launched, it will search for the device and check the configurations. The software can detect the valve type and the current position of valves. The valve icons in the graphical user interface tell the valve type and the position of the valves.

The valves can be switched directly by clicking at the valve icons or by using a method or sequence. A method includes time programs for each valve and gives explanation for each step. A sequence allows use of different methods in a batch of runs.

The software has a drawing tool box for users to build their own valve diagrams. It helps users to understand the working principle of the valve system. To use this feature, simply click at the menu bar “graphic tool” and select “edit diagram”. Users can add new elements (pumps, detectors, columns, sample loops, tubing) to the valve diagram and can move the valve icons around according to their real instrument configurations. Clicking at menu bar “finishing editing” hides the tool box and brings the software from editing mode to normal operation mode. The software will memorize the drawing when the software is launched next time.

The control software monitors the status of the hardware regularly. When there is an error such as a loosen cable or a valve fails to switch to the correct position, the software will detect it and give warning and help tips.

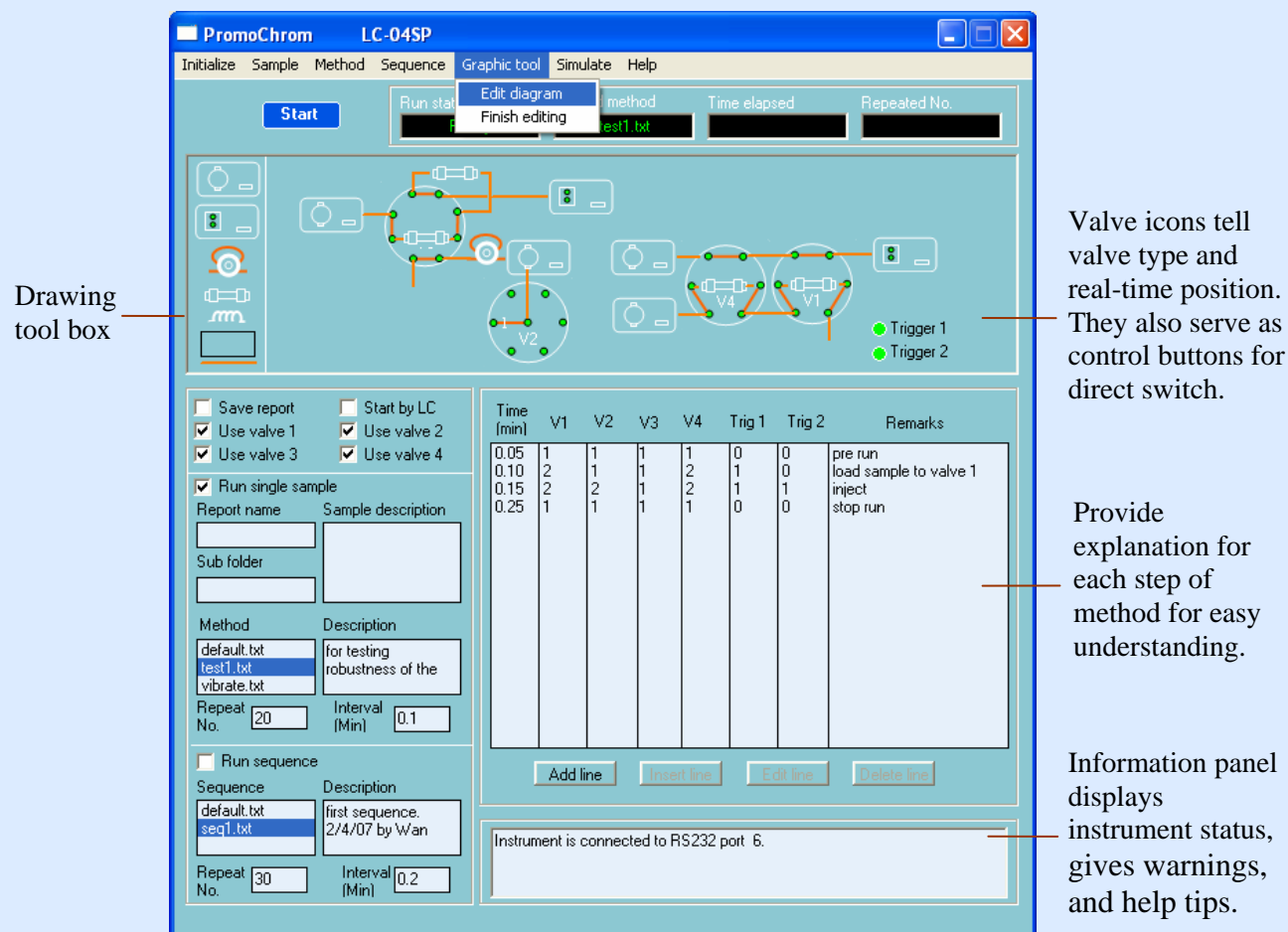


Figure 3. User interface of LC-04SP control software

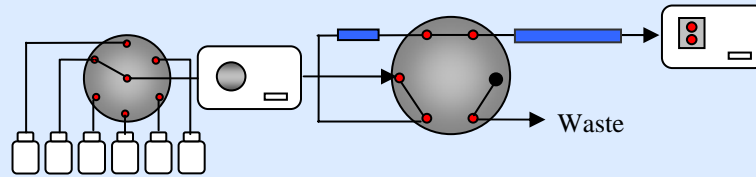
### 3. Integration with other instruments

LC-04SP can work with any HPLC and LC-MS that can provide a contact closure or a TTL output. The remote port on LC-04SP can sense the start/stop signals from other instruments to make synchronized run with the analytical instruments. LC-04SP also has 2 output triggers to trigger start and stop of other devices. This function may be used to start a loading pump for on-line sample cleanup or to trigger the HPLC system for automatic run (it can be very useful when the HPLC does not have an auto sampler and otherwise has to be started manually).

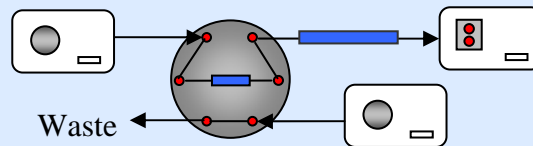
When working with an Agilent chromatographic system (GC, HPLC, or LC-MS), the LC-04SP software will automatically detect the ChemStation in the computer and build necessary macros into the Agilent software. The macros will enable the ChemStation to do dynamic data exchange with LC-04SP. When the chromatographic instrument starts or stops a run, the information will be copied to LC-04SP software for a synchronized action. There is no need for a remote cable. The two software work together seamlessly and there is not manual setting of parameters involved.

## 4. Applications

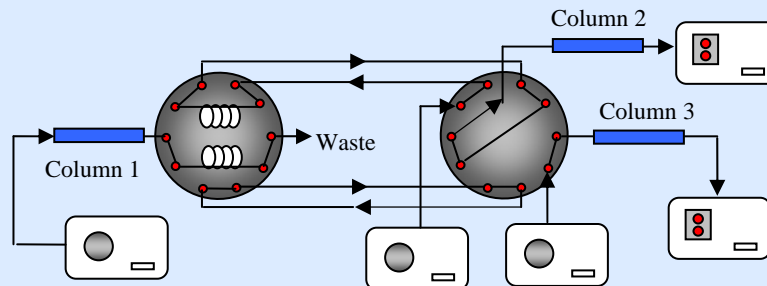
LC-04SP provides a very powerful and versatile platform for building almost any valve based applications. Below are some examples.



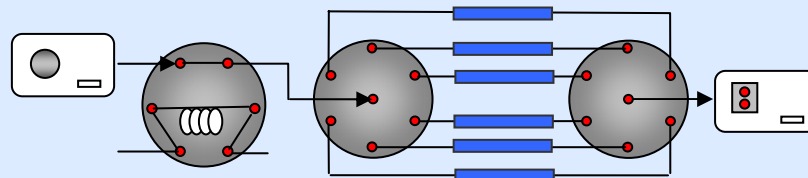
**On-line sample cleanup.** One isocratic pump looks after both sample cleanup and HPLC elution. A 6-position stream selection valve provides stepwise gradient elution. This is the most economical solution for on-line sample preparation.



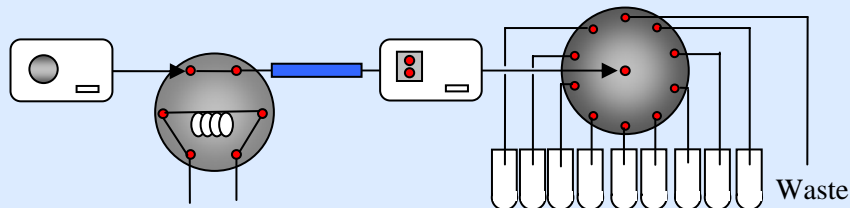
**On-line sample cleanup.** Sample cleanup and HPLC analysis can be carried out at the same time. It provides the best sample throughput. The cost is higher than the above configuration as it needs two pumps.



**Comprehensive 2D HPLC.** All fractions from column 1 are separated and analyzed using column 2 and column 3. When column 2 is analyzing one of the fractions from column 1, the following fraction is stored in one of the 2 loops and column 3 is preparing for next analysis. Column 2 and column 3 look after analysis of fractions from column 1 alternately. Column 1 could be a normal phase column. Column 2 and column 3 could be 2 identical reverse phase column.



**Automatic method development.** Six columns are connected with two 6-position stream selection valves for automatic column selection. One 2-position/6-port valve is used for sample introduction. By controlling the switching time, each time only a portion of the sample in the loop is used for column testing. By using repeated injection, all columns may be tested with only once sample loading. This is very convenient for method development. It saves an auto sampler in this system.



**Large scale purification using an analytical scale HPLC.** Valve 1 is for sample injection and Valve 2 for fraction collection. A large volume of sample is loaded to the loop on valve 1. LC-04SP will inject a small portion of the sample to the column for each run and will start HPLC for the separation. When one run is completed, the LC-04SP will start the next run automatically until all the sample in the loop has been processed. The whole process can be done without attendance.

## 5. Specifications

Power supply	24 VDC
Power consumption	< 0.1A when no valve switching; < 0.8 A during valve switching
Number of valves	1 - 4
Type of valves	2-position/6-port, 2-position/8-port, 2-position/10-port, 6-position stream selection, 10-position stream selection.
Valve head	Chem inert valves from VICI (Valco Instruments)
Valve switching time	< 150 ms for 2-position valves, < 200 ms per step for stream selection valves.
Dimension	21 x 22.5 x 8.5 cm (width x depth x height)
Computer requirements	PC with Windows operation system.

## 6. Ordering information

LC-04SP may be ordered as one or two modules. Each module may have one or 2 valves. Each module includes a RS-232 cable for PC communication and a CD carrying control software and user manual. When two modules are ordered together, a Y-cable is included for connection between the modules.

Following items may be ordered as options: 24-volt power supply, RS232/USB converter, remote cable, trigger cable, and tubing/fittings.



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