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Valve Control

The 6890 Series Gas Chromatograph (the GC) holds up to four valves in a heated valve box on top of the oven.

The valve box is the preferred location because it is a stable temperature zone, isolated from the column oven.

The valve box

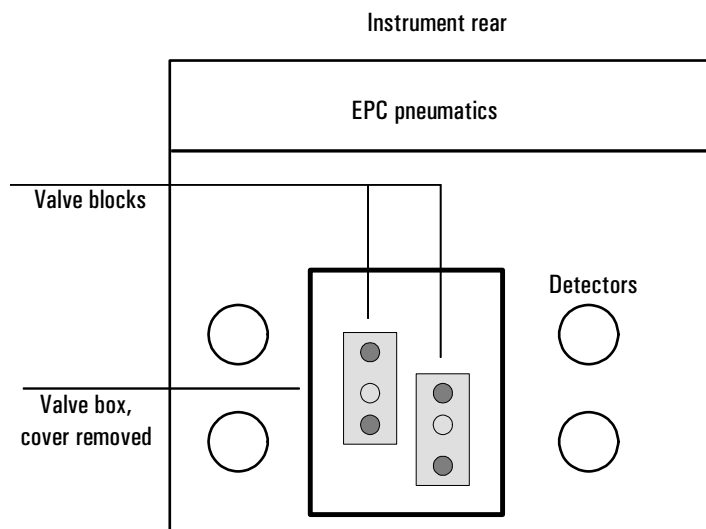


Figure 28 The valve box

Heating the valves

The valve box contains two heated blocks, each with two valve mounting locations (shaded). The middle hole on each block is used to pass tubing into the column oven.

If two valves are used, mount them on the same block. This allows them to be heated using only one control channel (Aux 1 or Aux 2, depending on how the heaters are wired). With more than two valves, both Aux 1 and Aux 2 must be used for heating the two blocks. Set them at the same temperature.

Valve temperature programming

Most valve applications are isothermal; however, you can define three temperature ramps if desired. Press [Aux #], then [1] or [2]. Program this ramp the same as an oven ramp. Refer to *Making a temperature-programmed run* on page 107 for more information.

AUX 1		
Temp	35	150
Init time		0.00
Rate 1		0.00
Final temp 1		00.0
Final time 1		0.00
Rate 2		0.00
Final temp 2		00.0
Final time 2		0.00
Rate 3		0.00
Final temp 3		00.0
Final time 3		0.00

Configuring an Aux thermal zone

To configure a thermal Aux zone (1 or 2), press [Config], then [Aux #]. Press [Mode/Type], then select the type of device to be controlled by the zone and press [Enter].

CONFIG AUX 1	
Valve box	
MSD transfer line	
AED transfer line	
Nickel catalyst	
Unknown	

Valve control

Valves can be controlled manually from the keyboard or as part of a clock or run time program. Note that if a valve position is changed during a run, it is *not* reset automatically at the end of the run unless it is configured as a gas sampling valve. For other valve types, you must include any desired resets in the program.

The valve drivers

A valve driver is the software and circuitry in the GC that controls a valve or related function. There are eight drivers known as Valve 1 through Valve 8.

Table 22 Valve Driver Characteristics

Valve number	Type	Volts	Power or current	Use
1, 2, 3, and 4	Current source	24 VDC	13 watts	Pneumatic valve control
5 and 6	Current source	24 VDC	100 mA	Relays and low-power devices
7 and 8	Contact closure	48 VDC or 48 VAC RMS		Control an external current source

The internal valve drivers

Valve drivers 1 through 4 are usually used to control pneumatically operated valves mounted in the valve box. The wiring for these appears at a set of connectors inside the right cover of the GC.

Pneumatically driven valves are controlled by solenoids mounted near the connectors that control the flow of air to the valve actuators.

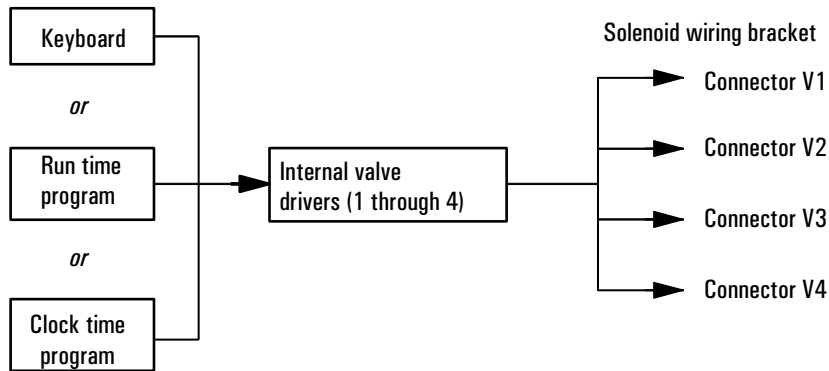


Figure 29 Internal valve drivers

There is no direct relationship between the location of a valve in the valve box and the driver that controls it. This depends on how the solenoids are wired and the actuators are plumbed.

The external valve drivers

Valve drivers 5 and 6 control a current that may be used to drive a relay or other low-power device. Valve drivers 7 and 8 switch a current from an external source. Electrical details are in [Table 22](#) on page [216](#).

These drivers, particularly Valve 7 and 8, may be used to control a motor driven multiposition valve for stream selection.

All four of these drivers appear on the External Event connector on the back of the GC.

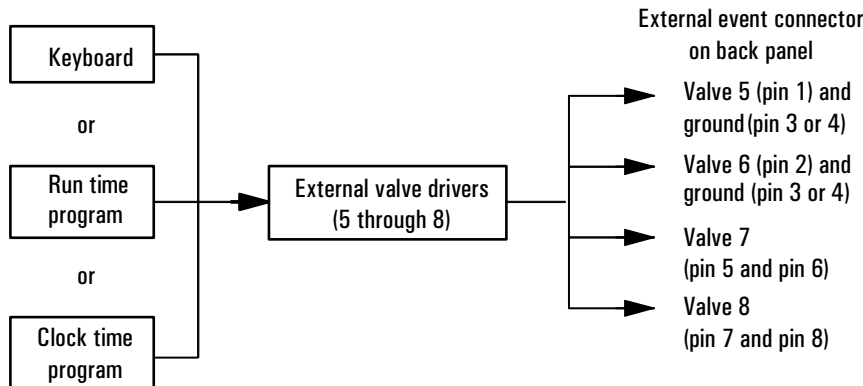


Figure 30 External valve drivers

Valve configurations

There are five possible valve types:

- Gas sampling—a two-position (load and inject) valve. In load position, an external gas stream flows through an attached sampling loop and out to waste. In inject position, the filled sampling loop is inserted into the carrier gas stream. When the valve switches from Load to Inject, it starts a run if one is not already in progress. See the example on page [222](#).
- Switching—a two-position valve with four, six, or more ports. These are general-purpose valves used for such tasks as column selection, column isolation, and many others. For an example of valve control, see page [221](#).
- Multiposition—also called a stream selection valve. It is usually used to select one from a number of gas streams and feed it to a sampling valve for analysis. It has a special actuator that advances the valve one position each time it is activated, or it may be motor driven. An example that combines a stream selection valve with a gas sampling valve is on page [223](#).
- Other—could be anything.
- Not installed—self-explanatory.

Procedure: Configuring a valve

1. Press [Config] [Valve #].

```
CONFIG VALVE
Which valve? (1-8) <
```

2. Specify the valve driver to be configured.
Type the number (1 in this example) and
press [Enter].

3. The present type for this driver is shown.

```
CONFIG VALVE 1
Type: Switching <
```

or

```
CONFIG VALVE 1
Type: Multiposition <
Switching time 1.0
Invert BCD On
```

or

```
CONFIG VALVE 1
Type: Gas sampling <
Loop volume 0.250
Load time 0.5
Inject time 1.00
Inlet: None
```

4. Press [Mode/Type] for the valve choices.

```
VALVE 1 TYPE
Gas sampling
Switching
* Multiposition <
Other
Not installed
```

5. Select a valve type and press [Enter].

Valve control

Procedure: Controlling valves from the keyboard

Valves (except multiposition valves) have two positions controlled by the [On] and [Off] keys. The keyboard commands for two-position valves are:

[Valve #] <scroll to the valve> [On](rotates valve to one stop)

and

[Valve #] <scroll to the valve> [Off](rotates valve to the other stop)

From the run or clock time tables

The Valve On and Valve Off commands can be run time or clock time programmed. See ["Procedure: Programming run time events"](#). See ["Procedure: Programming clock time events"](#).

If a valve is rotated by a run time program, it is *not* automatically returned to its initial position at the end of the run. You must program this reset operation yourself.

Valve control examples

Simple valve—column selection

This is the plumbing for a single valve, configured as a switching valve, that selects one of two columns for analysis. It has no configuration parameters.

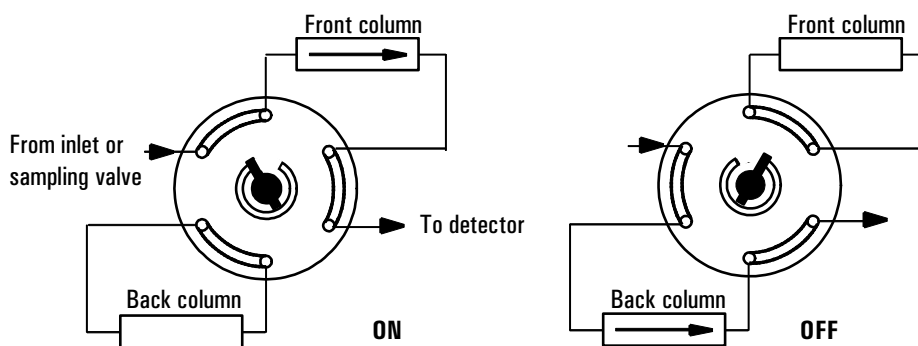


Figure 31 A column selection valve

The column is selected by pressing [Valve #] <scroll to valve 2> [On] (for the front column) or [Off] (for the back column). This run table ensures that the valve is in the Off state between runs:

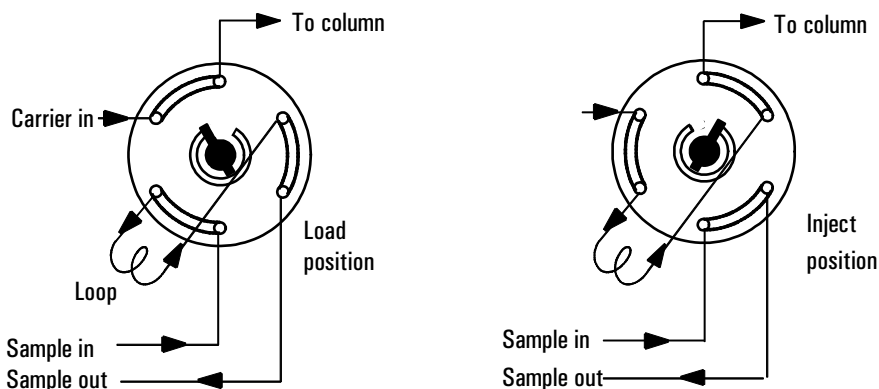
```

RUN TABLE ( 1 of 1 )
Time:      15.00
Type:      Valve #2
Setpoint:  Off
    
```

Ensure that the valve is in the OFF state between runs.

Gas sampling valve

If a valve is configured as a gas sampling valve, it starts a run automatically when it is switched to the Inject position. This can be done with a keyboard command or by a subsequence or clock table entry. You may have two gas sampling valves installed.



Load position—the loop is flushed with a stream of the sample gas. The column is flushed with carrier gas.

Inject position—the filled loop is inserted into the carrier gas stream. The sample is flushed onto the column. The run starts automatically.

Figure 32 A gas sampling valve

Carrier gas may be provided by an (optional) auxiliary gas channel. To do this, configure the column and specify an Aux # channel as the inlet. The Aux # channel then becomes programmable with four operating modes.

CONFIG VALVE 1	
Type:	Gas sampling <
Loop volume	0.250
Load time	0.5
Inject time	1.00
Inlet:	None

Loop volume and Inlet: are information only—they do not affect operation.

Time in minutes that the valve remains in the load position before becoming ready

Time in minutes that the valve remains in the inject position before returning to the load position

The sampling valve cycle is:

1. The sampling valve rotates to the Load position. Load time begins. Valve is not ready.
2. Load time ends. The valve becomes ready.
3. If everything else is ready, the GC becomes ready.
If everything else is not ready:

- If you are using Clock Table or sequence control, the GC waits until everything is ready, then executes the valve inject command.
 - If you are not using Clock Table or sequence control, the valve injection can be made at any time from the keyboard.
4. The sampling valve rotates (keyboard command or sequence control) to the Inject position. Inject time begins. The run begins.
 5. Inject time ends. Return to step 1.

Multiposition stream selection valve and sampling valve

Several manufacturers provide multiposition stream selection valves that can be driven by valve drivers 1 through 4. Only one multiposition valve can be configured. See [Table 22](#) on page [216](#) for the electrical details.

If a valve is configured as a multiposition valve and has a BCD position output connected to the GC, the valve position can be selected directly.

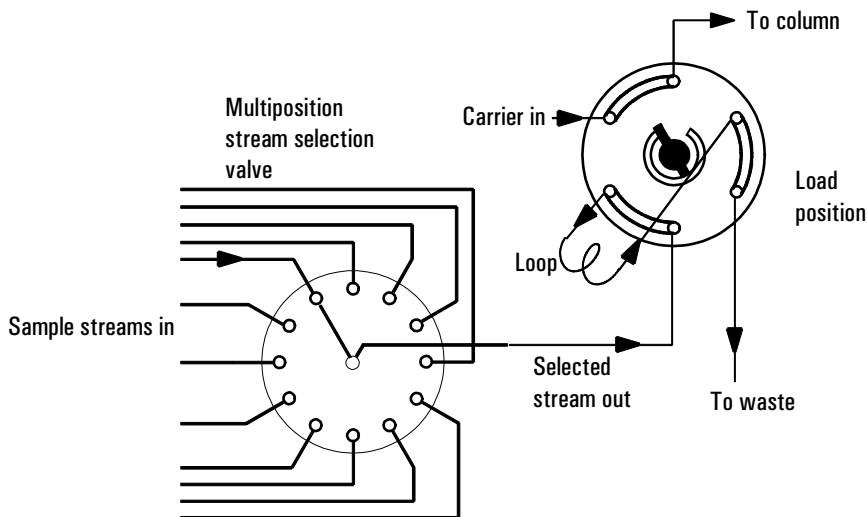
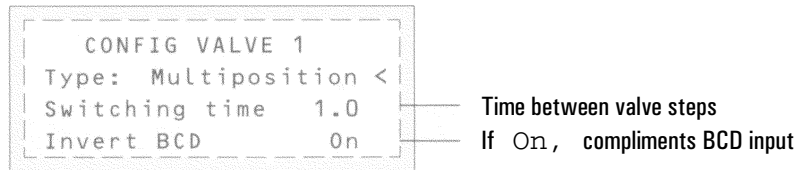


Figure 33 Multiposition valve with gas sampling valve

If the GC has one valve configured as a multiposition valve and another configured as a gas sampling valve, it assumes that they are to be used as shown in [Figure 33](#). This “double configuration” can be used to replace an automatic

liquid sampler and sample tray in an analytical sequence. The multiposition valve becomes the sample tray; the gas sampling valve becomes the injector. See ["Procedure: Creating a valve subsequence"](#).

Two configuration parameters provide mechanical and electrical compatibility with most multiposition valve actuators.



- Switching time, in seconds, is a delay between successive actuator movements. It allows time for the actuator mechanism to prepare for the next movement.
- Invert BCD complements the BCD input—1's become 0's and 0's become 1's. This accommodates coding convention differences among manufacturers.