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Introduction to Inlets

Inlet types

The 6890 GC has five types of inlets available. All are offered with electronic pneumatics control (EPC) and two are offered without.

Table 28 Inlet Types

Inlet type	Gas control
Split/splitless	EPC and nonEPC
Purged packed	EPC and nonEPC
Cool on-column	EPC only
Programmed temperature vaporization	EPC only
Volatiles interface	EPC only

Using hydrogen

WARNING When using hydrogen (H_2), as the carrier gas, be aware that hydrogen (H_2) gas can flow into the oven and create an explosion hazard. Therefore, be sure that the supply is off until all connections are made, and ensure that the inlet and detector column fittings are either connected to a column or capped at all times when hydrogen (H_2) gas is supplied to the instrument.

WARNING Hydrogen (H_2) is flammable. Leaks, when confined in an enclosed space, may create a fire or explosion hazard. In any application using hydrogen (H_2), leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen (H_2) supply at its source before working on the instrument.

Table 29 An Overview of Inlets

Inlet	Column	Mode	Sample concentration	Comments	Sample to column
Split/splitless	Capillary	Split	High		Very little
		Pulsed split	High	May be useful with large injections	Very little
		Splitless	Low		All
		Pulsed splitless	Low	Useful with large injections	All
Cool on-column	Capillary	n/a	Low or labile	Minimal discrimination and decomposition	All
Purged packed	Packed	n/a	Any		All
	Large capillary	n/a	Any	OK if resolution not critical	All
Programmed temperature vaporization	Capillary	Split	High		Very little
		Pulsed split	High		Very little
		Splitless	Low		All
		Pulsed splitless	Low		All
		Solvent vent	Low	Multiple injections concentrate analytes and vent solvent	Most
Volatiles interface	Capillary	Direct	Low	Lowest dead volume	All
		Split	High	Max flow = 100 mL/min	Very little
		Splitless	Low		All

Table 30 Column Size and Carrier Gas Flow Rate

Column type	Column size	Carrier gas flow rate	
		Hydrogen	Helium
Packed	1/8-inch		30
	1/4-inch		60
Capillary	50 µm id	0.5	0.4
	100 µm id	1.0	0.8
	200 µm id	2.0	1.6
	250 µm id	2.5	2.0
	320 µm id	3.2	2.6
	530 µm id	5.3	4.2

These flow rates, in mL/min at normal temperature and pressure (25°C and 1 atm) are recommended for all column temperatures.
For capillary columns, flow rates are proportional to column diameter and are 20% lower for helium than for hydrogen.

Procedure: Pressure units: Select psi, kPa, bar

You can display pressure in psi, bar, or kPa. To check the units you are using, pressing the [Info] key while the cursor is on the Pressure line of a control table. To change the display units:

1. Press [Options].
2. Scroll to `Keyboard & Display` and press [Enter].

```
        OPTIONS
Calibration
Communication
Keyboard & Display  <
Diagnostics
```

3. Scroll to `Pressure units:` and press [Mode/Type].

```
Keyboard lock     Off
Key click          On
Warning beep       On
Method mod beep   Off
  KEYBOARD OPTIONS
Pressure units:  psi <
Radix type:        .
```

```
    PRESSURE UNITS
*psi                <
 bar
 kPa
```

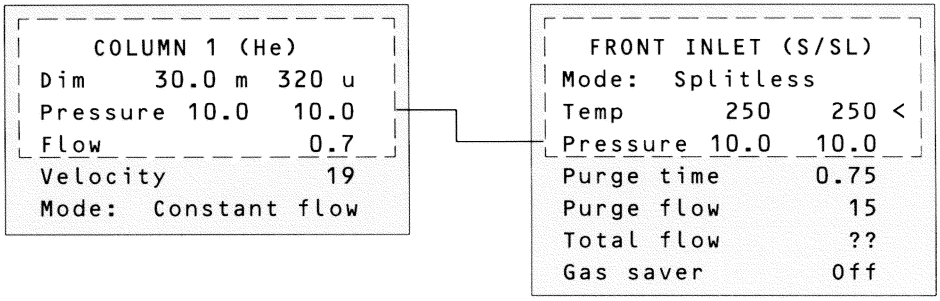
4. Choose a new pressure unit and press [Enter].

Table 31 Pressure Unit Conversions

To convert	to	Multiply by
psi	bar	0.0689476
	kPa	6.89476
bar	psi	14.5038
	kPa	100
kPa	psi	0.145038
	bar	0.01

The inlet and column control tables

The tables for the inlet and column are interrelated. If you set a pressure at the column control table, that same pressure setting is active on the inlet control table, and vice versa. Although pneumatics can be controlled from either the column or the inlet, the column should be considered first.



Note that the pressure readings—both setpoint and actual—are identical on the column and inlet control tables.

The column control tables

The control tables change depending on your column configuration. The next few pages describe the column control tables for the two types of columns, capillary and packed.

The column control table—defined capillary columns

If your column is defined, your control table will be similar to Figure 38.

The title This heading identifies the column—Column 1 or Column 2— and the type of carrier gas configured to the inlet (in parentheses).

`Dim` This line shows the column dimensions you have specified. Column length is in meters (`m`) and column inside diameter is in microns (µ).

Pressure, flow, and velocity are related. If the column is defined, enter any one of them and the GC computes and displays the other two.

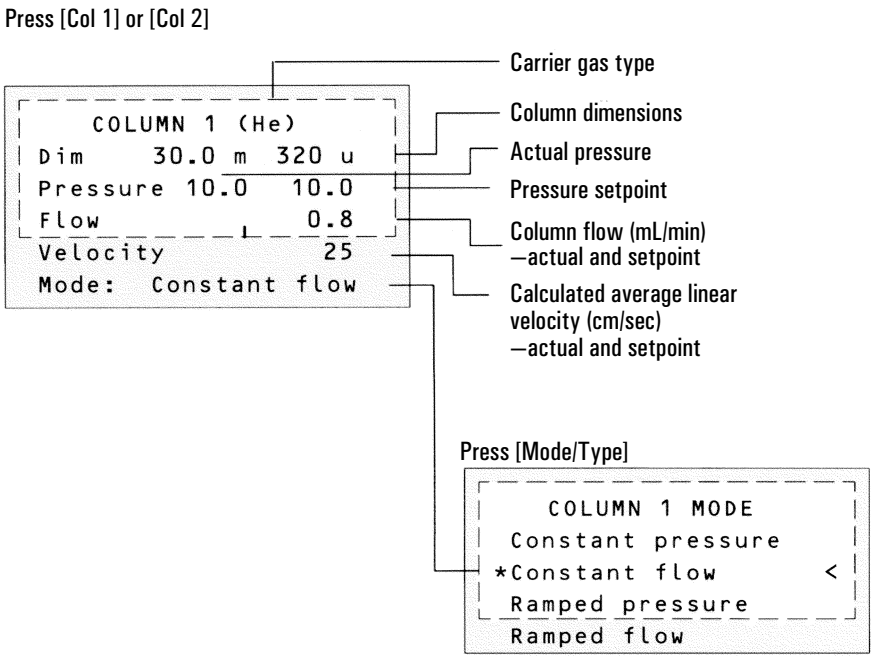
`Pressure` The setpoint appears at the far right. The number at the left shows the actual pressure value. When you enter a pressure value, the values for flow and average linear velocity are calculated and displayed.

`Flow` If you enter a flow (in mL/min) here, pressure and velocity are calculated and adjusted.

`Velocity` If you enter average linear velocity (in cm/sec), pressure and flow are calculated.

`Mode`: There are four column modes: constant flow, constant pressure, ramped flow, and ramped pressure. To change the mode, scroll to `Mode`: and press [Mode/Type].

"Flow and Pressure Control" explains how to set pressure and flow programs.



Mode: Your control table also has one of these, depending on Mode:

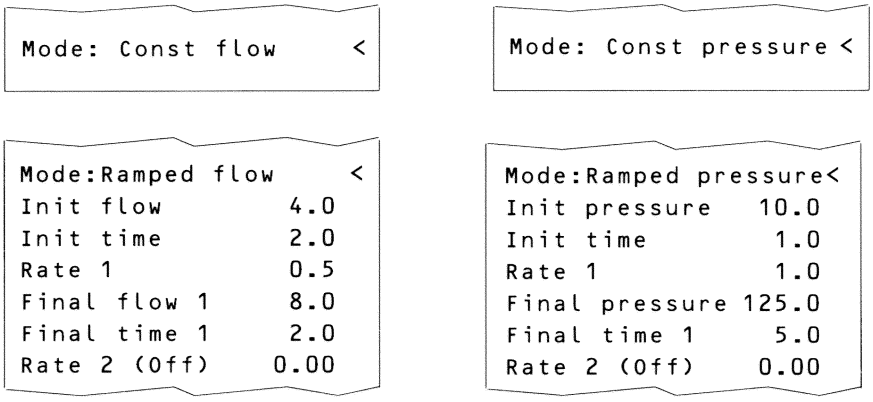


Figure 38 Column display — defined capillary columns

The column control table—packed or undefined capillary columns

If you have not defined your column or if your inlet selection is `Unspecified`, your column control table will be similar to Figure 39.

The title This heading identifies the column—Column 1 or Column 2— and the type of carrier gas configured to the inlet (in parentheses).

`Dimensions unknown` This line tells you that you have not defined your column.

`Pressure` The *split/splitless* inlet and the *cool on-column* inlet are pressure controlled. Because the column is unknown, flow and average linear velocity cannot be computed.

The *purged packed* inlet is flow controlled. The actual pressure is displayed, but is not controllable by the user.

`Mode:` You have a choice of three modes if using a split/splitless or cool on-column inlet—constant pressure, constant flow, and ramped flow. The packed inlet gives you only the two flow modes—constant and ramped.

"Flow and Pressure Control" explains how to set pressure and flow programs.

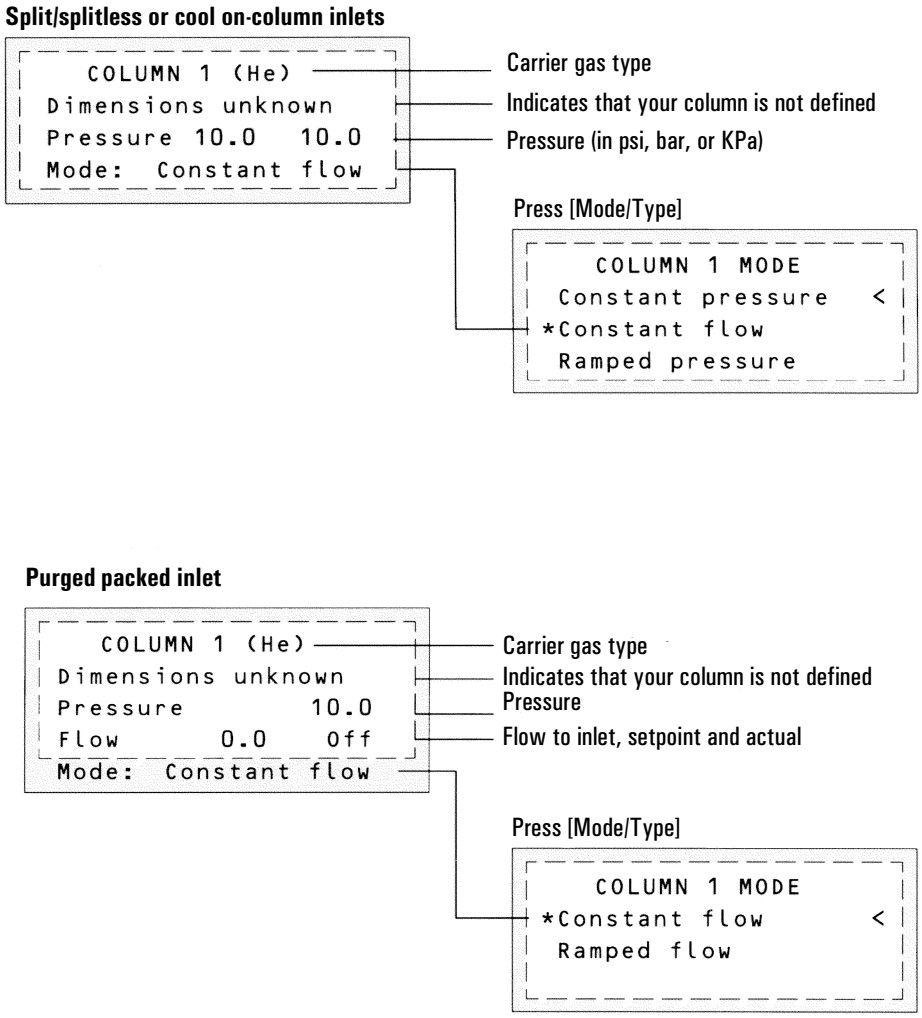


Figure 39 Column display — Packed or undefined capillary columns

What is gas saver?

Gas saver reduces carrier gas flow from the split vent after the sample is on the column. Column head pressure and flow rate are maintained, while purge and split vent flows decrease. Flows—except column flow—remain at the reduced level until you press [Prep Run].

You can use gas saver in all modes of operation of the Split/Splitless and PTV inlets and in the split and splitless modes of the Volatiles Interface.

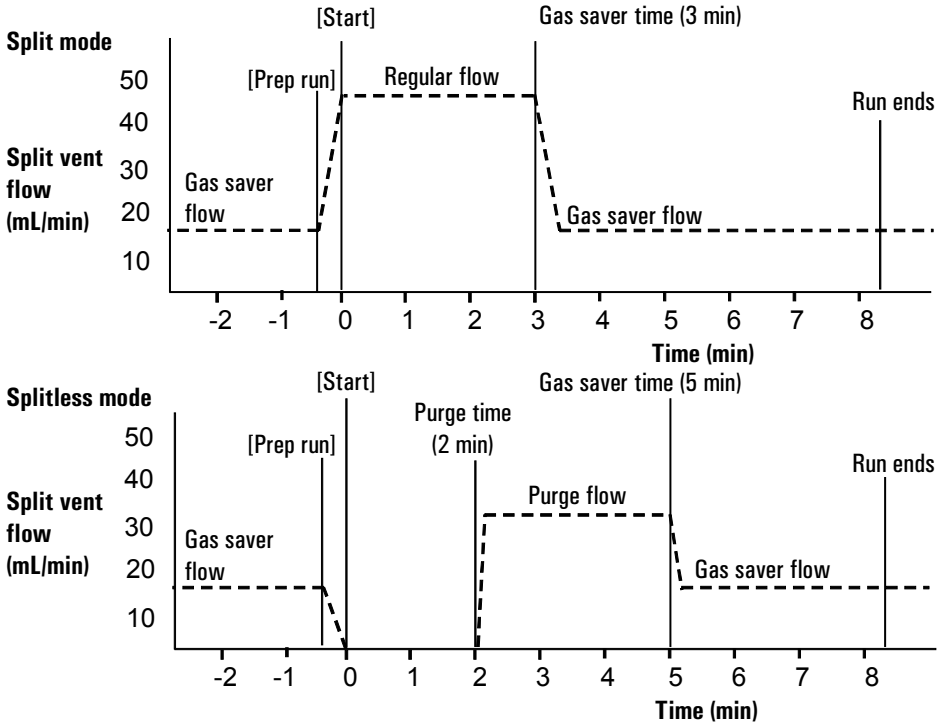
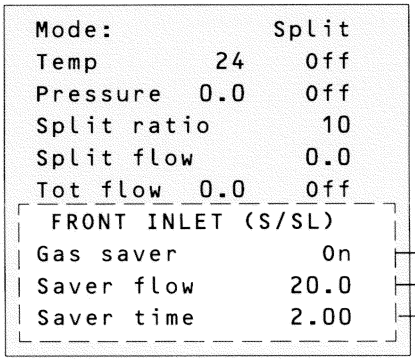


Figure 40 Gas saver operation

The pulsed modes of the split/splitless and PTV inlets are similar except for the pressure pulse starting at [Prep Run] and ending at `Pulse time`. The solvent vent mode of the PTV is more complex; see "Using the Solvent Vent Mode" for details.

Procedure: Using gas saver

Press [Front Inlet] or [Back Inlet].



1. Turn on gas saver.

2. Set a flow. Must be at least 15 mL/min greater than the column flow.

3. If in split mode, set after injection time. In all other modes, set after purge time.

Pre Run and Prep Run

With some inlets and operating modes, certain instrument setpoints are different between runs than during an analysis. To restore the setpoints for injection, you must place the GC into the Pre Run state.

You must use the Pre Run state when:

- Using gas saver with any inlet.
- Using splitless mode with any inlet.
- Using a pressure pulse mode with any inlet.
- Using the solvent vent mode of the PTV inlet.
- Using the direct or splitless mode of the Volatiles Interface.

There are two ways to begin Pre Run—manually push the [Prep Run] key before each run or configure the GC to enter the Pre Run state automatically. The two methods are discussed below.

During the Pre Run state:

- The Pre Run light blinks and Not Ready is on.
- Setpoints change to the correct values for injection.
- Inlet, detector, and oven equilibration times begin.

When all equilibration times expire, the Pre Run light is on steadily. When all criteria for a run are met, the Not Ready light turns off. The GC is now ready for sample injection.

The [Prep Run] key

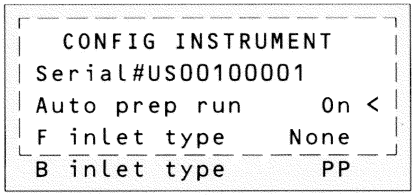
Press the [Prep Run] key before you inject a sample manually. The GC enters the Pre Run state. When the Pre Run light is steady and the Not Ready light goes off, begin the analysis.

Procedure: Auto Prep Run

With most automatic injection systems, you do not need to use the [Prep Run] key. If your sampler or automation controller (for example, an integrator or workstation) does not support the [Prep Run] function, you must set the GC to Auto Prep Run. To do this:

1. Press the [Config] key to view a list of configurable parameters.

2. Scroll to the `Instrument` parameter and press [Enter].
3. Scroll to `Auto prep run` and press [On].



Septum purge

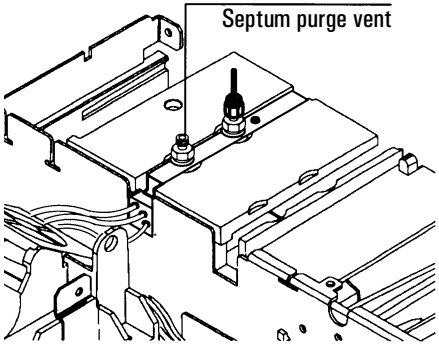
The septum purge line is near the septum where the sample is injected. A small amount of carrier gas exits through this line to sweep out any bleed.

Each inlet has a different septum purge flow. The GC automatically sets the purge flow for EPC inlets, but you can measure it from the septum purge vent at the flow manifold if you like.

Table 32 Septum Purge Flows

Inlet	Carrier	Septum purge (mL/min)
Split/splitless, all modes	He, N_2, Ar/5%Me	3
	H_2	6
Purged packed	All	1 to 3
Cool on-column	He, N_2, Ar/5%Me	15
	H_2	30
PTV	He, N_2, Ar/5% Me	3
	H_2	6
Volatiles interface	He, N2, Ar/5%Me	3
	H_2	6

Split/splitless inlet
PTV inlet
Violates interface



Purged packed inlet
Cool on-column inlet

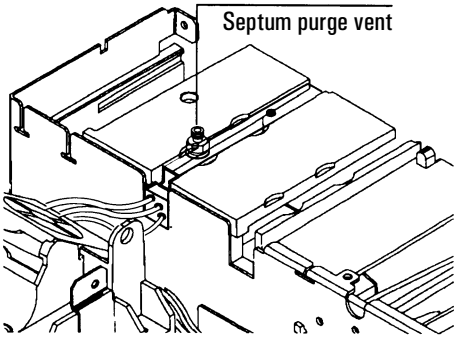


Figure 41 Septum purge vents