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Using Detectors

The 6890 Series gas chromatograph (the GC) has several detector systems available. Others will be added in the future. See your Agilent sales representative for the latest information.

| Name | Sensitivity | Responds to | Comments |
|------------------------------------|-------------|--|---|
| Thermal conductivity, TCD | Medium | Everything except the carrier gas | The "Universal Detector" for everything |
| Flame ionization, FID | High | Almost all organic compounds | The "Universal Detector" for organics |
| Micro-electron capture, μ -ECD | Very high | Limited range of compounds, mostly halocarbons | Used for trace level pesticide and herbicide analysis |
| Nitrogen-phosphorus, NPD | Very high | Compounds with nitrogen or phosphorus | Used in pharmaceutical and environmental analysis |
| Flame photometric, FPD | High | Compounds with sulfur or phosphorus | Used in environmental and bioscience analysis |

Using hydrogen

WARNING

When using hydrogen (H_2) as the carrier gas or fuel 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

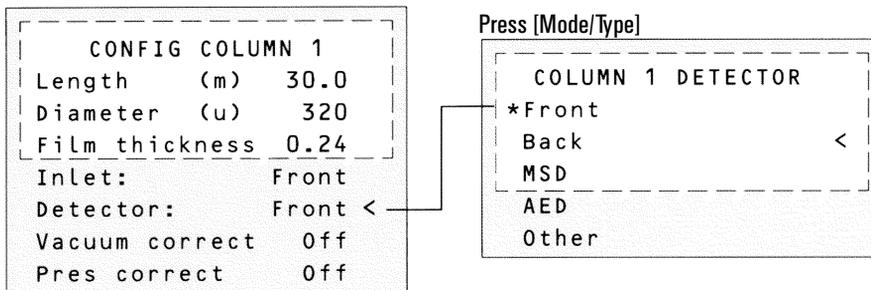
Hydrogen (H_2) is flammable. Leaks, when confined in an enclosed space, may create a fire or explosion hazard. In any application using hydrogen (H_2), leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen (H_2) supply at its source before working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

Procedure: Setting up detector control tables

You must be familiar with this set of control tables to operate your detector. Follow these three steps when setting up all types of detectors.

1. Check your column configuration. (This is normally done when you set up your inlet, but it does not hurt to check this information again.)
 - You must tell the instrument which detector your column is connected to, front or back. If you have only one detector, it is best to have only one column configured to it—unless you actually do have two columns attached to that detector.
 - If you are using a capillary column, you must enter the column length and diameter if you want to have a choice of makeup gas flow modes. This is called *column defined*. If you do not enter these values, it is called *column not defined*, and your control choices are limited.

1. Press [Config] [Col 1] or [Config] [Col 2]:



2. Scroll to Detector : Press [Front] or [Back] or Press [Mode/Type] and choose Front or Back
3. Enter column dimensions, if necessary.

2. Check your detector configuration (makeup gas type).

The main reason for doing this is to verify that the makeup gas entered (or makeup and anode gas on the ECD, reference and makeup on the TCD) is the same as the gas plumbed to your detector.

This is important because:

- When the actual and configured gas types are different for an EPC detector, the calculated flow rate is not correct and the flow rate stability is affected.
- The electronics for some detectors change depending on the gas type configuration. The detector does not operate properly when the actual and configured gas types are different.
- Good laboratory practice. Keep a record of the gas used.

Most of the detectors have other configurable items. These will be described later in this section.

3. Set up your detector control table. The following is a brief description of each line item for the FID. Flow setpoints (right number) and actual values (left number) are displayed.

Press [Front Det] or [Back Det].
(column not defined)

| FRONT DET (FID) | | |
|-----------------|--------------|-------|
| Temp | 250 | 250 < |
| H2 flow | 40.0 | 40.0 |
| Air flow | 450.0 | 450.0 |
| Mode: | Const makeup | |
| Mkup (N2) | 50.0 | 50.0 |
| Flame | | 0n |
| Output | | 15 |

FRONT DET (FID) The title indicates the detector position and the type of detector installed.

Temp This is where you set the temperature - the control setpoint (right number) and actual (left number) values.

H2 flow, Air flow These are the detector gases for the FID.

Mkup (N2) This is where you set your makeup gas flows. The gas type is displayed in parentheses. The lines of the display vary depending on your instrument and the way you have configured it.

Flame This is the on/off control for the FID—also called the Detector Control line. Each detector has its own type of on/off control.

Output This is the actual detector output value. You cannot enter a setpoint here.

Makeup gas flow

Makeup gas enters the detector close to the end of the column. Its purpose is to speed the peaks through the detector—especially with capillary columns—so that the peak separation achieved by the column is not lost through remixing in the detector.

Makeup gas

The makeup gas line of your detector control table changes depending on your instrument configuration.

If you have an inlet with the *column not defined*, the makeup flow is constant. The control table for the detector looks like this:

| | | |
|-----------------|-----|-------|
| Temp | 24 | Off |
| H2 flow | 0.0 | Off |
| FRONT DET (NPD) | | |
| Air flow | 0.0 | Off |
| Mkup (He) | 0.0 | Off < |
| Adjust offset | | Off |
| Output (Off) | | 0 |
| Bead voltage | | 0.0 |

You can enter a flow or press [On] to get the default flow.

If you are operating with *column defined*, you have a choice of two makeup gas modes.

The Const makeup mode provides a constant flow of makeup gas to the detector. If you choose it, your control table looks like this:

| | | |
|-----------------|--------------|-------|
| Temp | 24 | Off |
| Anode | 6.0 | Off |
| FRONT DET (ECD) | | |
| Mode: | Const makeup | |
| Mkup (N2) | 0.0 | Off < |
| Adjust offset | | Off |
| Output | | 0.0 |
| Ref current | | 0.00 |

You can enter a flow or press [On] to get the default flow.

The Col+mkup=const mode provides a variable flow of makeup gas to the detector. As column flow increases or decreases, the makeup flow changes to provide a constant combined flow to the detector. If you choose this option, enter a value under Combined flow. The Combined flow line always displays the same value, while the Mkup line of the control table changes as the actual makeup flow changes.

```
Temp      24   Off
Anode     6.0   Off
FRONT DET (ECD)
Mode: Col+mkup=const
Combined flow  5.0 <
Mkup (N2)      4.2
Adjust offset  Off
Output         0.0
Ref current    0.00
```

You can enter a flow or press [On] to get the default flow.

This number will change as flow from the column changes.

Procedure: Defining the makeup gas

1. Press [Config] [Front Det] or [Config] [Back Det]:
2. Scroll to Mkup gas type and press [Mode/Type].

```
CONFIGURE FRONT DET
Mkup gas type  N2 <
Lit offset    0.5
Electrometer   0n
```

```
FRONT DET MAKEUP GAS
Helium        <
*Nitrogen
Argon
```

3. Scroll to the correct gas and press [Enter].

Procedure: Changing makeup gas flow mode

1. Scroll to Mode :
2. Press [Mode/Type].

```
Temp      24   Off
Anode     6.0   Off
FRONT DET (ECD)
Mode: Col+mkup=const <
Combined flow  5.0
Mkup (N2)      4.2
Adjust offset  Off
Output         0.0
Ref current    0.00
```

```
F DET MAKEUP MODE
*Const makeup flow
Col+makeup=const <
```

3. Choose a flow mode and press [Enter].

Maximum flow rates

The maximum flow rates that can be set with detectors are:

| Detector and gas | Maximum flow rate, mL/min |
|----------------------------------|----------------------------------|
| Flame ionization | |
| Hydrogen | 100 |
| Air | 800 |
| Makeup (nitrogen, helium, argon) | 100 |
| Thermal conductivity | |
| Nitrogen | reference 100; makeup 10 |
| Helium | reference 100; makeup 12 |
| Hydrogen | reference 100; makeup 18 |
| Argon | reference 100; makeup 10 |
| Micro-electron capture | |
| Nitrogen | anode purge 12; makeup 200 |
| Argon/methane | anode purge 12; makeup 200 |
| Nitrogen-phosphorus | |
| Hydrogen | 30 |
| Air | 200 |
| Makeup (nitrogen, helium, argon) | 100 |
| Flame photometric | |
| Hydrogen | 250 |
| Air | 200 |
| Makeup (nitrogen, helium, argon) | 130 |

[Det Control] shortcut key

This is another way to open a Detector control table. Press [Front Det] [Det Control] or [Back Det] [Det Control] to open a Detector control table. If you have only one detector, [Det Control] opens that table.

When you use [Det Control], your table opens at the On/Off control for your detector—FID and FPD, Flame, TCD Filament, NPD, Adjust offset.

Press [Det Control]

| | | |
|-----------------|-----|-------|
| Temp | 24 | Off < |
| H2 flow | 0.0 | Off |
| Air flow | 0.0 | Off |
| Mkup (N2) | 0.0 | Off |
| FRONT DET (FID) | | |
| Flame | | Off |
| Output | | 0.0 |

Turns the detector on or off