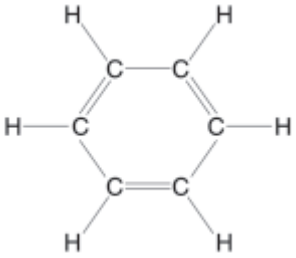
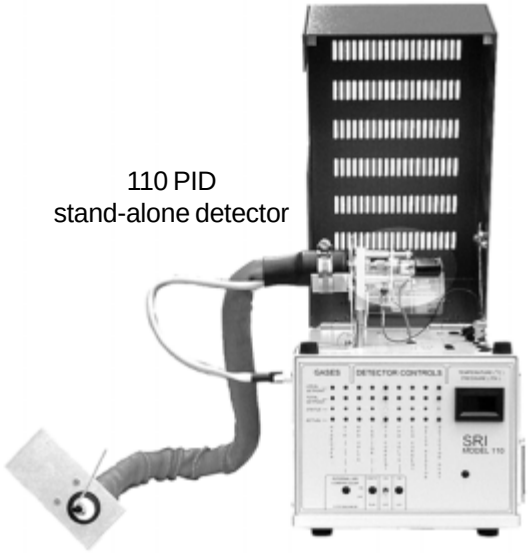


Benzene

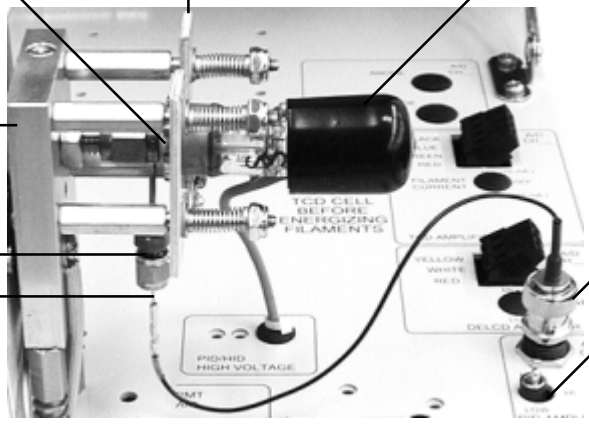
Overview

The Photo Ionization Detector (PID) responds to all molecules whose ionization potential is below 10.6eV, including aromatics and molecules with carbon double bonds. The PID is nondestructive, so the sample can be routed through the PID and on to other detectors. It is often used in series with the FID and / or DELCD. PID detection limits for aromatics are in the ppb range; purge and trap concentration of the sample can lower detection limits to the ppt range. Because of its selective sensitivity, use of the PID is mandated in several EPA methods. The PID detector consists of a 10.6 electron volt (eV) UV lamp mounted on a thermostatted, low-volume (100µL), flow-through cell. The temperature is adjustable from ambient to 250°C. Three detector gain levels (LOW, MEDIUM and HIGH) are provided for a wide range of sample concentrations. The PID lamp is held in place by a spring-loaded plate, so that the lamp may be quickly removed for cleaning and replaced without any special tools. The PID can run on air carrier for gasless operation, or for stream monitoring applications where the entire stream of sample is directed through the detector (no column is used).


PID in series with a DELCD and an FID on an SRI 8610C chassis



110 PID
stand-alone detector



100µL detector cell (the area in the center of the Teflon™ seal ring)

Spring-loaded retaining plate

High voltage band in black plastic hood over lamp anode ring

Heater block

Collector electrode support union

Collector electrode

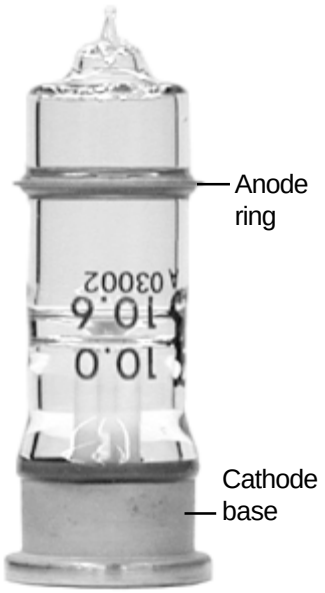
BNC connector to amplifier

Amplifier gain switch

DETECTORS
Photo Ionization Detector - PID

Theory of Operation

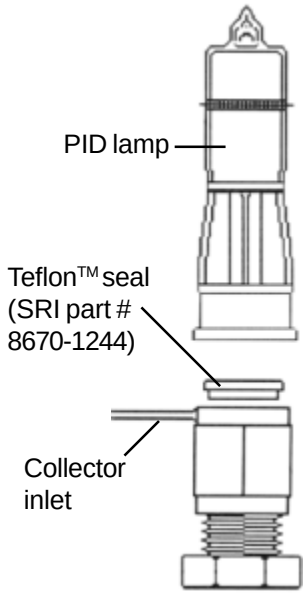
10.6eV PID Lamp (SRI Part # 8670-1242)



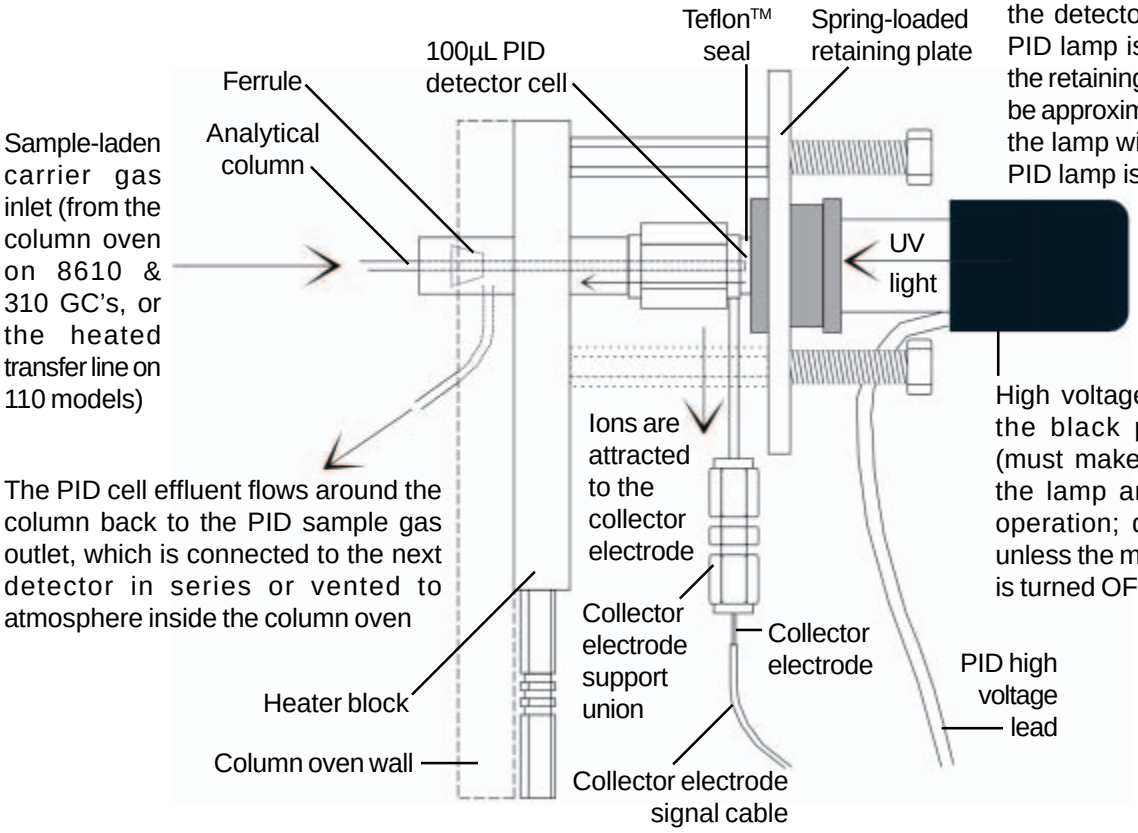
The SRI PID design uses a 10.6eV lamp with a high voltage power supply. Sample laden carrier gas flows from the analytical column into the PID sample inlet, where it is streamed through a 100µL flow-through cell. When sample molecules flow into the cell, they are bombarded by the UV light beam. Molecules with an ionization potential lower than 10.6eV release an ion when struck by the ultraviolet photons. These ions are attracted to a collector electrode, then sent to the amplifier to produce an analog signal, which is acquired by the PeakSimple data system.

Unlike other PID designs that heat the entire lamp, only the lamp window of the SRI PID is heated. This results in a longer lamp life for SRI PID detectors.

Partial PID Assembly - Exploded View



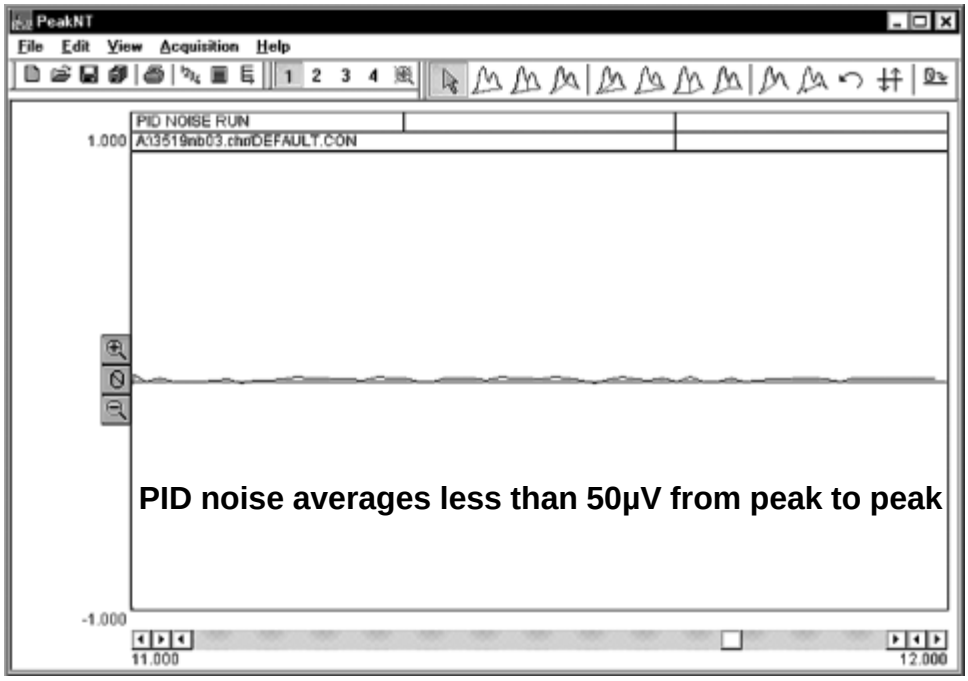
Simplified PID Operational Diagram



NOTE: The end of the column must be visible in the detector cell when the PID lamp is removed from the retaining plate. It should be approximately 1mm from the lamp window when the PID lamp is in place.

High voltage band inside the black plastic hood (must make contact with the lamp anode for PID operation; do not adjust unless the main GC power is turned OFF)

Expected Performance



PID Noise Run

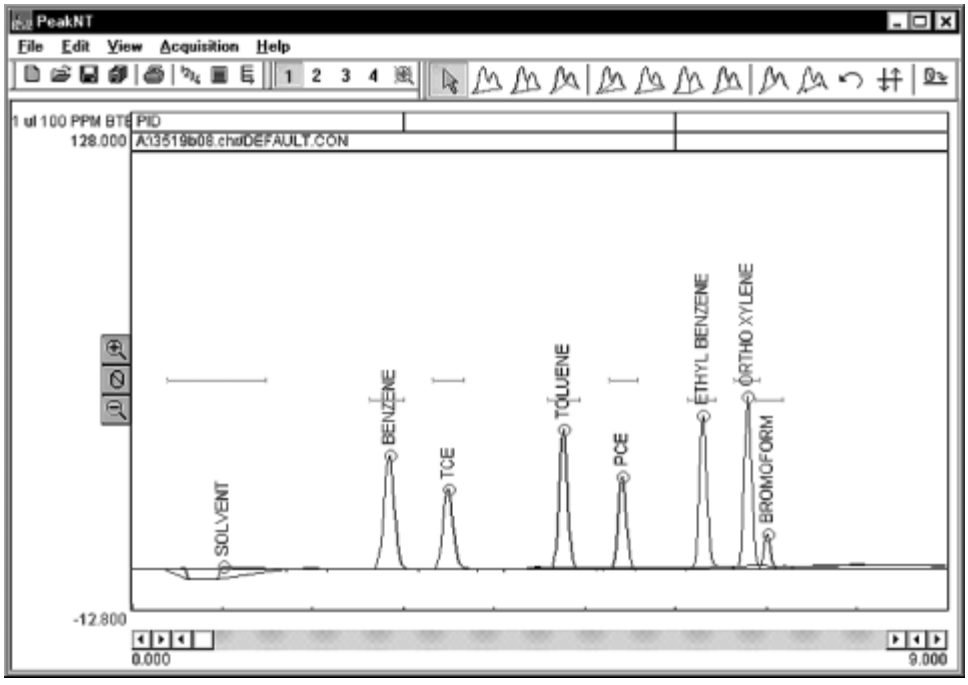
Column: 15m MXT-VOL
Carrier: Helium @ 10mL/min
PID gain: LOW
PID temp: 150°C
PID current: 70

PID BTEX Analysis (in series with FID and DELCD)

Sample: 1µL 100ppm BTEX plus
Column: 15m MXT-VOL
Carrier: Helium @ 10 mLs/min
PID gain: LOW
PID temp: 150°C
PID current: 70

Temperature program:

Initial	Hold	Ramp	Final
40°C	2.00	15.00	240°C
240°C	10.00	0.00	240°C



Results:

Component	Retention	Area
Benzene	2.416	313.0540
TCE	3.066	231.5120
Toluene	4.600	309.2120
PCE	5.433	216.6230
Ethyl Benzene	6.700	286.0900
Ortho Xylene	7.383	298.9190
Bromoform	7.650	55.9460
	Total	1711.3560

General Operating Procedure

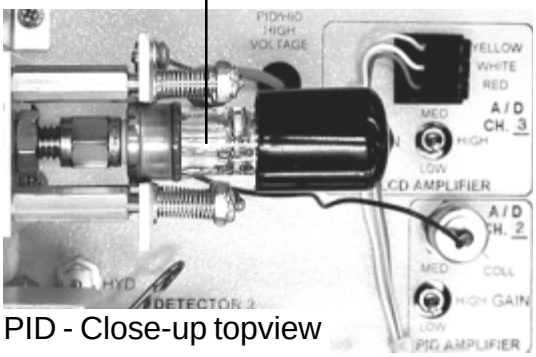
The capillary column enters the PID cell from inside the column oven through the bulkhead fitting in the insulated oven wall. The column may be installed with the lamp in place. Insert the capillary column into the PID detector inlet until the column stops at the lamp window inside the PID cell, then pull it back about 1mm from the lamp window. Tighten the 1/8" nut with the graphite ferrule at the PID inlet to secure the column in place. The collector electrode is positioned at the factory and should not touch the column under normal circumstances.

1. Always ensure that the black plastic hood is in place on the lamp prior to operating the PID detector. The hood contains the high voltage band which is maintained at a high potential; never attempt to adjust the PID high voltage band unless the main GC power is turned off.

2. Turn ON the GC. Turn ON the PID lamp current with the flip switch on the GC's front control panel.

3. Set the PID current to 70 (= 0.70ma) with the trimpot setpoint on the top edge of the GC's front control panel. Use the flat blade screwdriver provided with your GC to adjust the trimpot. The lamp should emit a violet-colored light visible down the center of the tube.

The violet light is visible here when the lamp is on



PID - Close-up topview

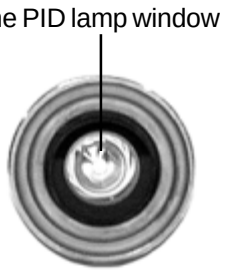
4. Confirm that the lamp is operating at or near 0.70ma by pressing the PID detector ACTUAL display button on the front control panel. The sensitivity of the lamp increases proportionally to the current applied, but operation at higher currents reduces lamp life. The PID operating current range is 70-125. A setting of 70 should provide the user with sufficient sensitivity and lamp durability. Most PID applications can be performed using LOW gain.

5. Set the PID temperature to 150°C.

6. Once the detector has reached temperature and the signal appears stable, sample may be introduced.

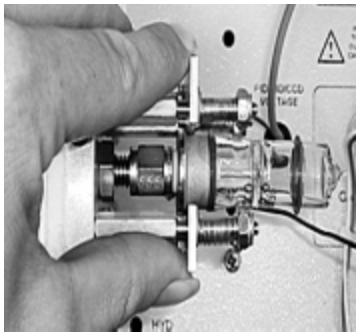
NOTE: Lamps are a consumable part of the PID detector. It is recommended to have a spare lamp available if critical analyses are being performed at remote field sites. Spare and replacement 10.6eV PID lamps are available under SRI part number 8670-1242. Teflon seals are available under SRI part number 8670-1244.

Troubleshooting and Maintenance
Cleaning the PID Lamp



Over time, during normal operation, a film of contaminants will condense on the PID lamp window. Typically, this film is a result of stationary phase column bleed. To minimize contaminant condensation and thus lamp window cleaning, avoid heating the column any higher than absolutely necessary. Contaminant condensation can block the photons, reducing lamp emissions and sensitivity. Therefore, the PID lamp window must be cleaned when an appreciable change in sensitivity has been observed by the operator. Because the response change resulting from cleaning the lamp window usually requires detector recalibration, frequent cleaning is not recommended.

1. Turn the PID current OFF with the switch on the GC's front control panel. Turn the GC OFF and let the PID detector assembly cool enough to touch it without getting burned.

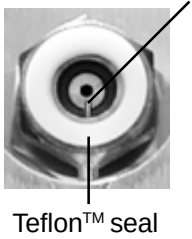


2. Disconnect the high-voltage band from the lamp anode by removing the black plastic hood.

3. Grasp the spring-loaded retainer plate with the fingers of one hand and push or pull it toward the PID lamp; it doesn't take much force to move the plate enough for lamp removal. Slide the PID lamp up and out of the PID detector assembly.

4. Clean the lamp window using a mild abrasive cleanser like Bon Ami or Comet. Wet your finger, and make a paste with a small amount of cleanser. Scrub the lamp window clean in a circular motion with your finger.

5. Rinse the lamp window clean with water. Dry the lamp with a paper towel.



6. Inspect the Teflon™ seal for cuts or nicks. A damaged seal will not affect the PID response, but it may provide a leak site that will reduce the amount of sample delivered to any subsequent detector.

7. With the lamp removed, the collector electrode is visible where it protrudes into the cell. Check the collector electrode for any visible residues, films, discolorations, etc. If present, they may impede the flow of ions from the sample molecules to the collector electrode. To clean the collector electrode, gently use a small file to remove any residues from its tip. Blow the residue off the collector electrode and surrounding areas.

8. Open the spring-loaded retainer plate and replace the PID lamp snug against the seal. The lamp window has a slightly larger diameter than the seal; try to center it against the seal. Replace the high voltage band / black plastic lamp hood.

9. Recalibrate the PID detector before returning it to service.