

GC DETECTORS

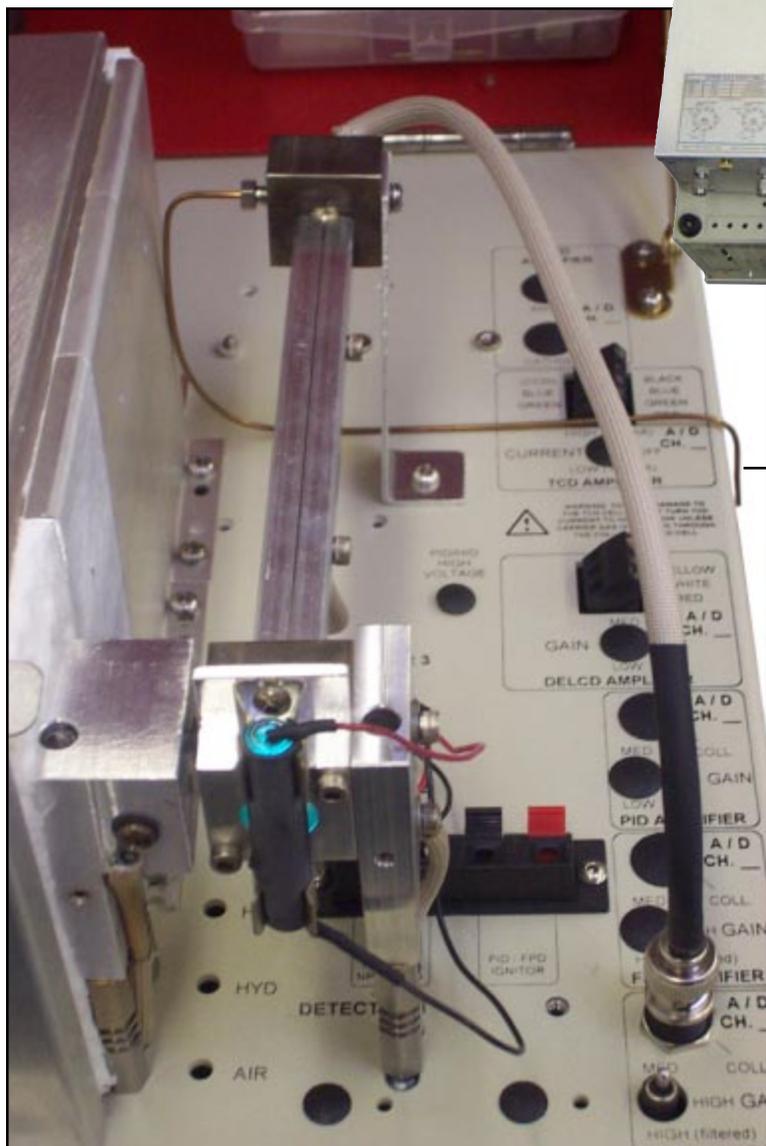
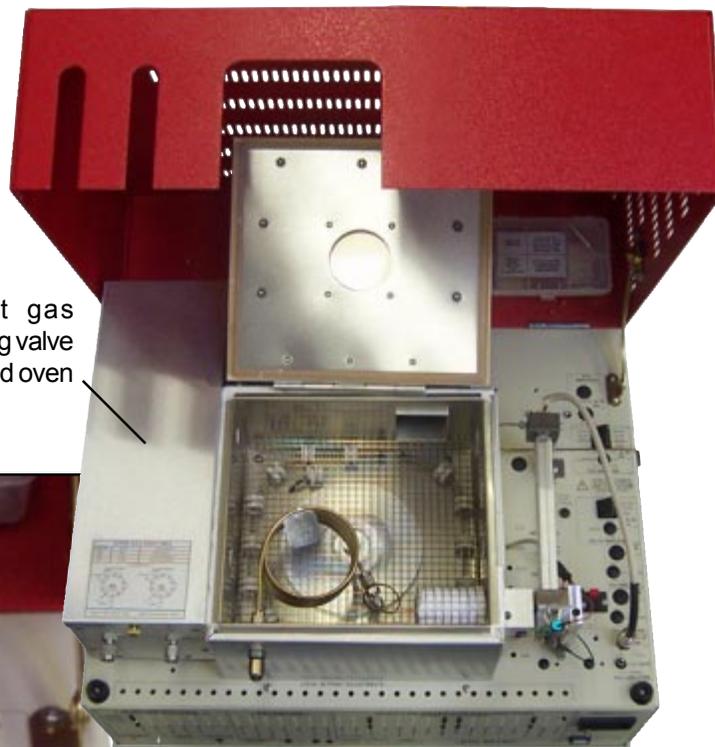
Reduction Gas Detector - RGD

Overview

The SRI Reduction Gas Detector is the most sensitive detector available for hydrogen, carbon monoxide, and other reducing gases. Low ppb detection limits are achievable for hydrogen. Detection limits in the ppt range are achievable for carbon monoxide.

The RGD comes with a 10-port gas sampling valve and 1mL sample loop for injecting samples.

10-port gas sampling valve in heated oven



Exit tube

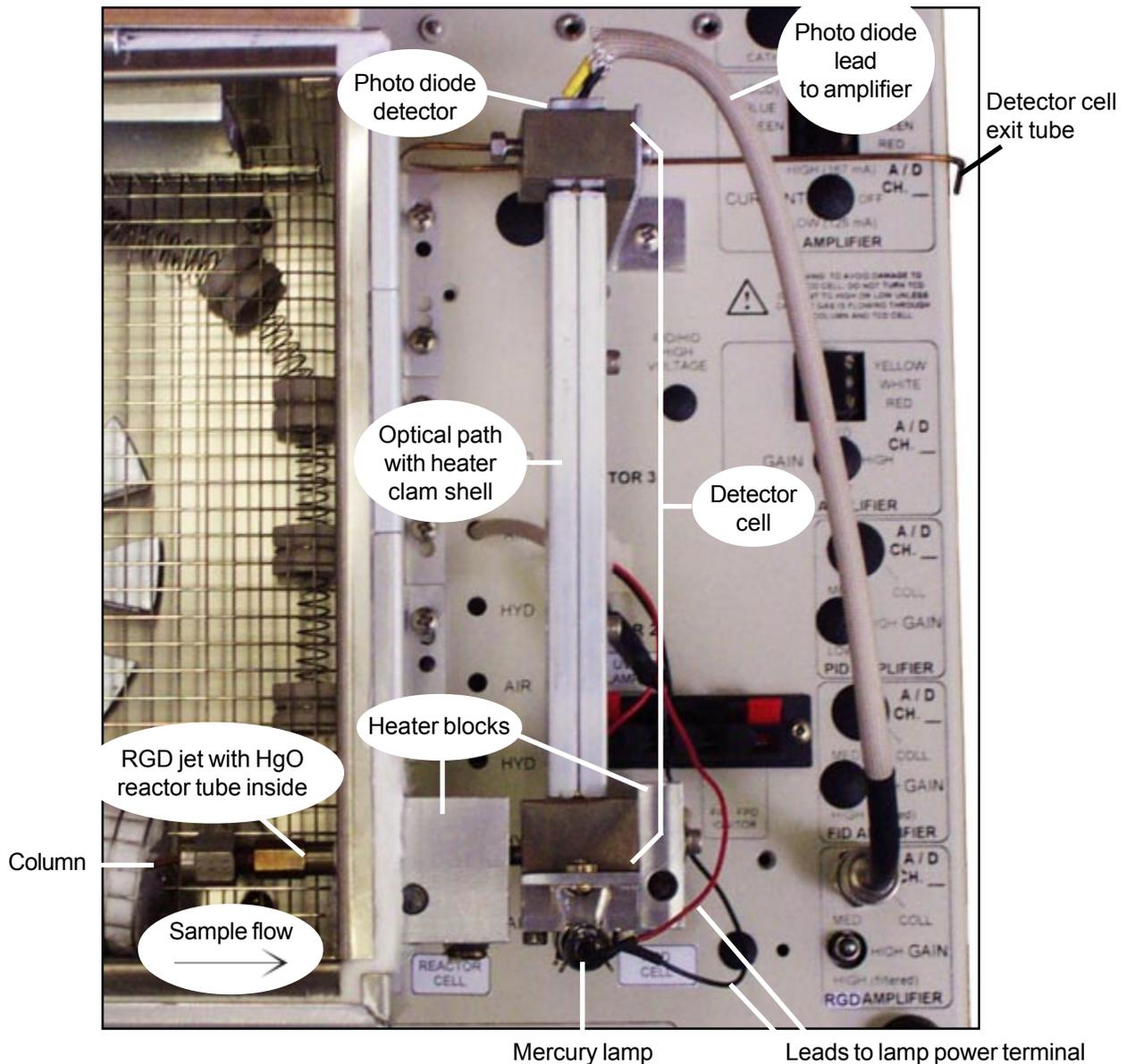
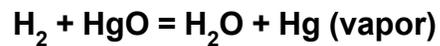
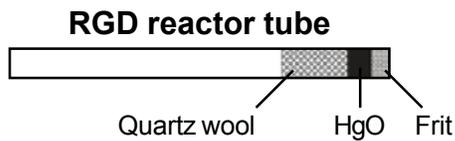
The RGD exit tube is not factory equipped with a mercury vapor filter, since it was designed for trace detection. Depending on the concentration of the reducing gases in the sample, you may want to add a filter for safety. The amount of mercury vapor produced is proportional to the concentration of reducing gases in the sample.

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Theory of Operation

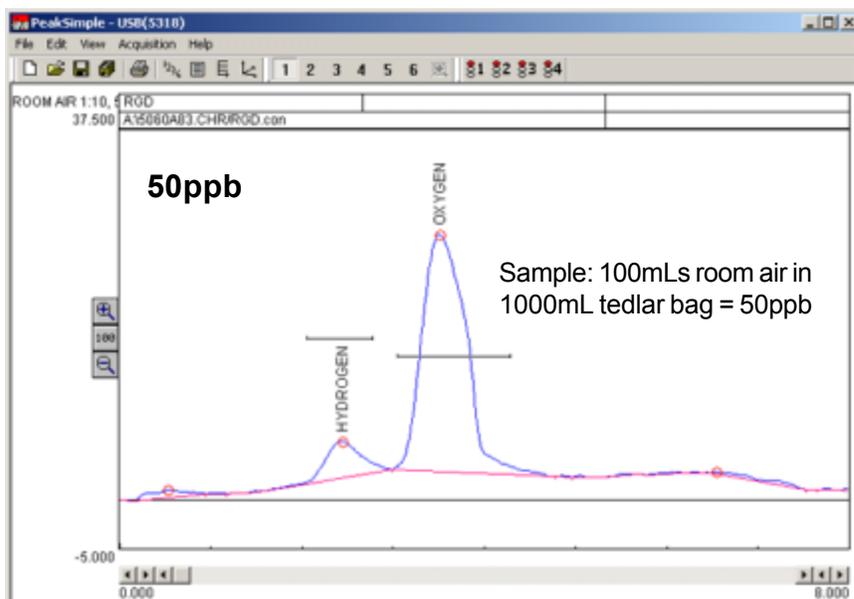
The SRI RGD detector uses a mercuric oxide (HgO) reaction tube and a mercury lamp in a heated UV detector cell. The reaction tube is heated to 260-300°C. Located immediately downstream of the reaction tube, the UV detector cell is heated to 170°C. The UV detector cell is equipped with a mercury lamp and a UV photodiode. When a reducing gas such as carbon monoxide elutes from the GC column, it reacts with the HgO to form gaseous mercury vapor, which is then swept into the UV cell. The gaseous mercury absorbs the UV light from the mercury lamp as it flows through the cell. The change in transmittance is converted by the data system into an absorbance output (1.00 volt per absorbance unit), which is linearly proportional to the amount of reducing gas.



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Expected Performance



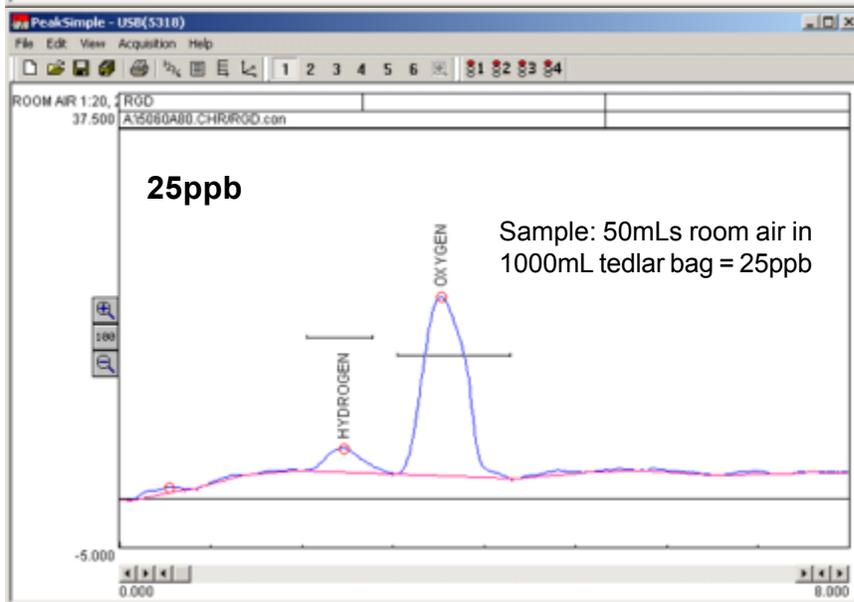
The following two chromatograms were produced with an SRI RGD equipped GC. Room air samples were diluted with nitrogen in tedlar bags, then injected by gas sampling valve onto the Molecular Sieve packed column.

Results:

Component	Ret.Time	Area
HYDROGEN	2.433	100.8250
OXYGEN	3.500	796.4090

Common Analytical Parameters:

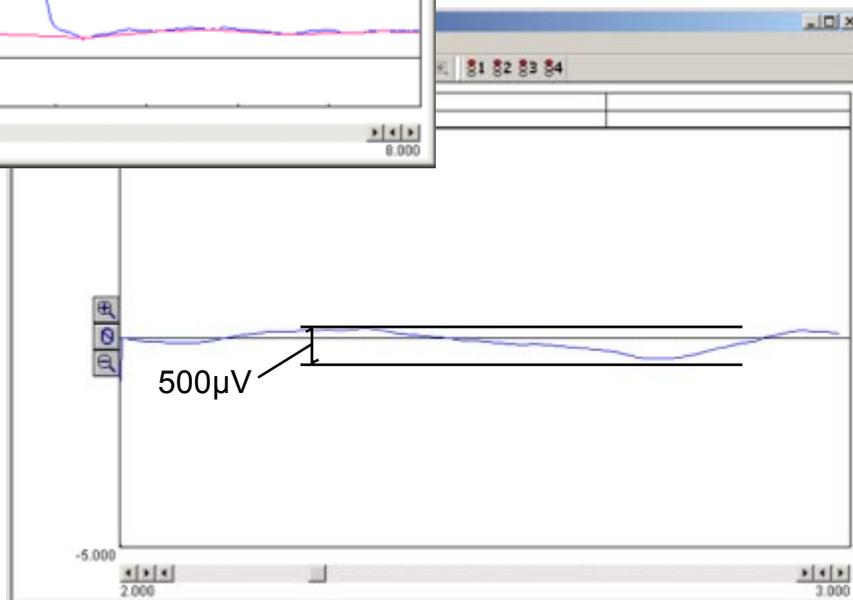
Valve injection; 1mL sample loop
Column: 2-meter Molecular Sieve 13X
Carrier: helium at 5mLs/minute
RGD gain: HIGH
Reactor temperature: 290°C
Detector temperature: 170°C
Valve temperature: 60°C



Results:

Component	Ret.Time	Area
HYDROGEN	2.450	55.2755
OXYGEN	3.516	571.6580

This chromatogram shows the noise level of the RGD detector, which is approximately 500 μ V from peak to peak.



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General Operating Procedure

1. When your RGD GC arrives, the photo diode amplifier leads will have been disconnected for transport. Locate the insulated electrical lead with two protruding wires: 1 black, 1 yellow. These wires plug into the back end of the RGD assembly, where the photo diode is located. The black is the ground wire; plug it onto the upper prong. Plug the yellow wire onto the lower prong.

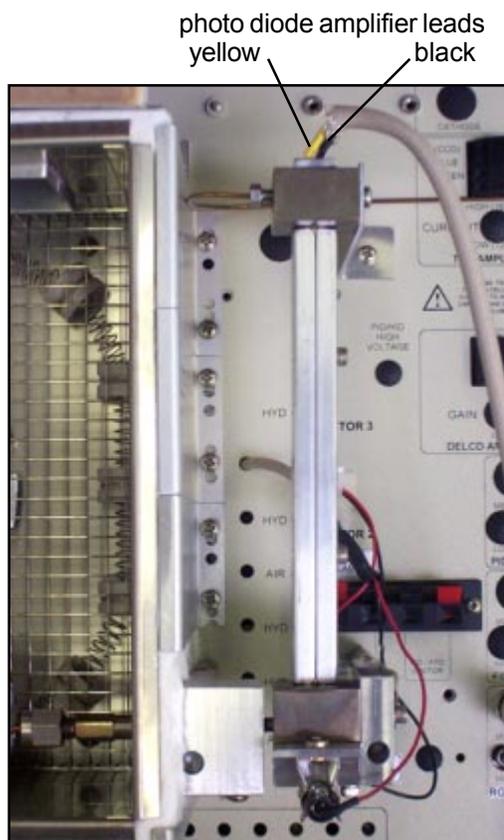
2. Turn ON the main GC power (the switch is located on the left-hand side of the GC).

3. Connect helium or nitrogen carrier gas to the fittings on the left-hand side of the GC. The pressure for the required flow is printed on the right-hand side of the GC. The required flow for the RGD is 5mLs/minute. This flow gives the best response.

4. Turn ON the detector lamp by flipping the switch on the GC's front control panel. Detector heat is factory set at 170°C, which is hot enough to keep the mercury vapor from condensing. The reactor is factory set at 290°C (a higher temperature gives greater sensitivity).

5. The mercuric oxide needs time to equilibrate when it is first installed, or when the reactor tube is changed; 24 hours works well. Leave the reactor and detector temperatures on the above settings continuously with the carrier gas flowing for day to day operation.

6. The first analytical run of the day should be discarded, because the purged reactor will generate unusually high area counts which will not be reproducible once the detector equilibrates. The reactor can also be poisoned by very high sample concentrations. Purge time with clean carrier gas is usually the best cure.

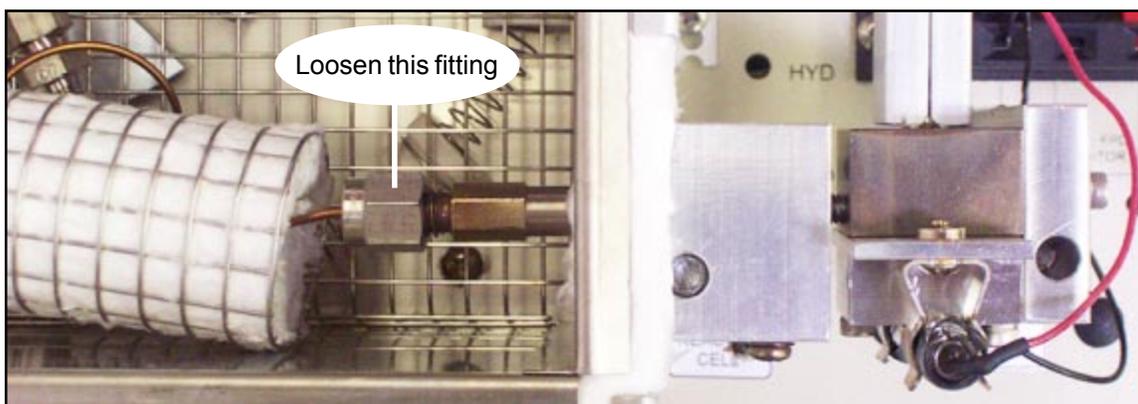


Maintenance

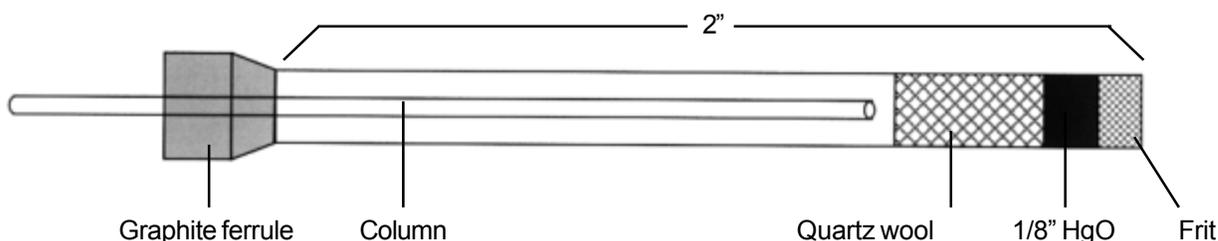
Reaction Tube Packing and Replacement

SRI provides you with one replacement reactor tube in your accessories kit. However, you may also remove the mercuric oxide (HgO) and re-pack the reactor tube, for which you will need fresh HgO and quartz wool. HgO powder is available from Sigma-Aldrich: part #203793-2G: www.sigmaaldrich.com, or call: 1-800-325-5832. Quartz wool is available from Restek: catalog #20999: www.restekcorp.com, or call 1-800-356-1688.

To remove the reactor tube, loosen the fitting that secures it to the column and RGD jet, and pull the reactor tube out.



Remove the quartz wool and HgO with a long sharp object, and dispose of them properly. Wipe any HgO off the sharp object with a disposable wipe or tissue and discard. Re-pack the reactor tube with 1/8" of HgO and add fresh quartz wool. The HgO must cover the face of the frit entirely to force the sample through the HgO and into the UV cell.



The graphite ferrule seals the end of the reaction tube around the column. Change the graphite ferrule when you change the reaction tube.

WARNING! Always avoid contact with the HgO. Wear protective gloves and eyecovers, and take care not to inhale the powder.