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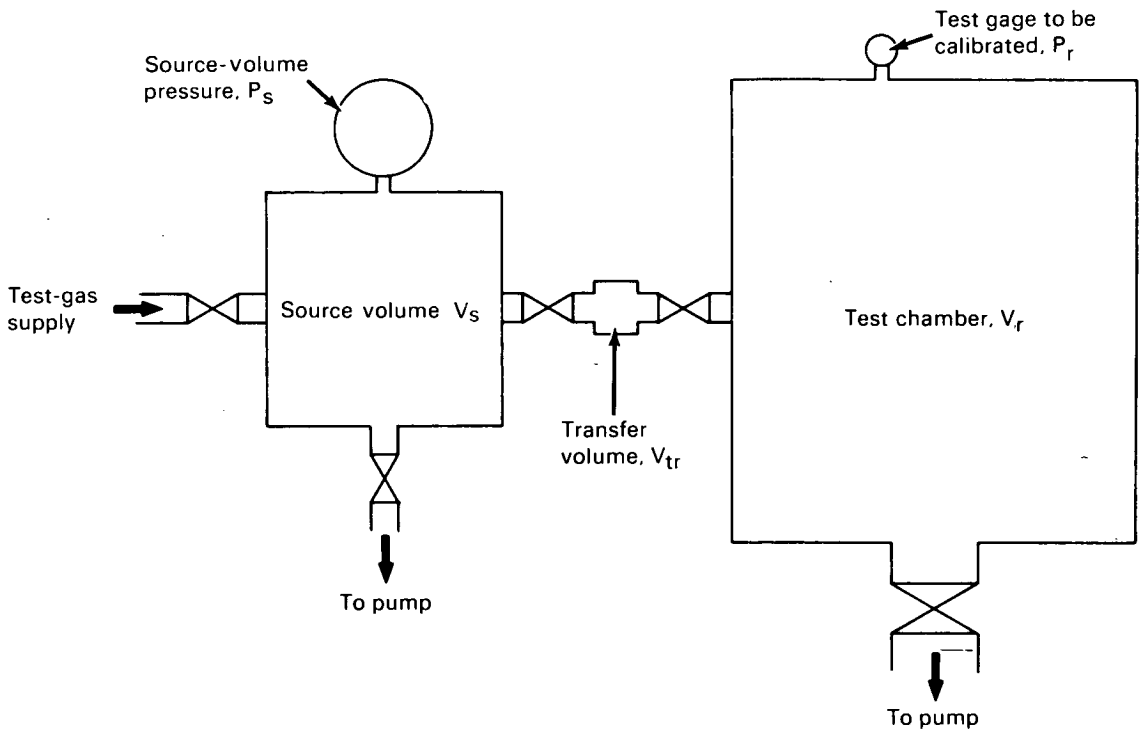
Brief 69-10713

NASA TECH BRIEF

Vacuum Gage Calibration System for 10^{-8} to 10 Torr



Block Diagram of Volume-Ratio Calibration Technique

An evaluation has been made of a calibration system based on the volume-ratio method as a primary standard for pressure-gage calibration in the range from 1×10^{-8} to 10 torr.

The extreme diversity of vacuum gages in common use today requires the existence of a wide-range vacuum gage calibration system. A system described in NASA Tech Brief 66-10640 has been modified to cover as broad a range as possible while still providing accuracy and convenience commensurate with other standards in the field.

As shown in the figure, the system consists of a gas source, a source pressure gage, source volume, transfer volume and test chamber, plus appropriate piping, valves, and vacuum source. Nitrogen was used as the test gas.

After evacuation of the transfer volume and the test chamber with the vacuum source, the test chamber is sealed and a quantity of test gas is transferred from the source volume to the transfer volume and then to the test chamber. Using Boyle's law, the test chamber pressure can be computed from a knowledge of the

(continued overleaf)

transfer volume pressure (measured by the source pressure gage) and the volume ratio between the transfer volume and the test chamber volume.

An error analysis has been made of the effects of temperature nonuniformities; outgassing and adsorption effects of the test chamber surfaces; volume ratio and reference-pressure-gage inaccuracies; residual gas effects; and any effects which the gages to be calibrated might have on the operation of the system.

The result was a calibration system with a limit of error of about $\pm$1-1/2% between 10 torr and 10^{-6} torr, and increasing to $\pm$4% at 10^{-8} torr.

Notes:

1. The following documentation may be obtained from:

   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.65)

   Reference: TND-5406 (N69-35265) Evaluation of a Volume Ratio System for Vacuum Gage Calibration From 10^{-8} to 10 Torr

2. Technical questions may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B69-10713

Patent status:

No patent action is contemplated by NASA.

Source: Raymond Holanda
Lewis Research Center
(LEW-11032)