CONSOLIDATED VACUUM CORPORATION
Rochester 3, New York
a subsidiary of Consolidated Engineering Corporation, Pasadena, California

OPERATING INSTRUCTIONS FOR THE PIRANI GAUGE (BOTH ONE AND TWO STATIONS)

Installation

A pair of Pirani tubes consists of one closed and one open tube mounted in either a bracket or a metal box with an Amphenol connector attached. The open tube may be connected to the vacuum system in any one of the following ways. It can be attached to the system by means of a short piece of rubber tubing so that a butt joint is formed with the pipe leading to the system, or the end may be slipped inside a larger pipe and vacuum wax used to make the seal. If an all glass system is being used, a Nonex to Pyrex graded seal should be added since the envelope of the Pirani tube is Nonex glass. On special order, tubes may be obtained with glass to metal seals or lapped-in standard taper joints.

On two station units, each pair of tubes is numbered to correspond with the cables leading to the control box and one of the numbers on the 1 - 2 selector switch on the front of the panel. The tubes have been carefully matched and can not be interchanged. With the double units, each pair of tubes should be used with its respective cable to insure proper agreement with the calibration of the gauge.

Power Supply

The gauge will operate from a 60 cycle line which supplies 110 to 120 volts. Avoid the use of a constant voltage transformer because the calibration of the Pirani is affected slightly by the change in wave pattern of the AC input voltage. However, it is possible to use a constant voltage transformer provided the gauge is calibrated under these conditions and that future operations of the gauge include the use of this transformer.

The maximum voltage which can be applied to the bridge circuit is limited to approximately 3.5 volts by a loading resistor across the output of the rectifier. As the rectifier ages, the setting of this resistor (located on the chassis top) may have to be adjusted to permit a bridge voltage of 3.0 volts when the line voltage is unusually low.

Operation

1. The gauge can be turned on at atmospheric pressure without damaging the filaments or the pressure meter, but it is better practice to keep the OFF-MILLIMETER-MICRON switch in the OFF position until the tubes are under vacuum.

2. If the gauge is a two station unit, turn the No. 1 - 2 selector switch to the number corresponding to the tube from which a reading is desired.

3. The red pilot light indicates the gauge is "on" after the selector switch is changed to the MILLIMETER position.

4. The potentiometer knob in the lower right hand corner of the panel is used to adjust the D.C. voltmeter to read 3 volts (the red line).

5. When the pressure as read directly from the meter is less than .025 on the MILLIMETER scale, the selector switch may be turned to the MICRON position.

6. When testing for leaks with a high voltage spark coil in an all glass system, do not bring the spark in contact with the Pirani tube or its lead wires unless the cable has been disconnected.

Leak Detecting

If a Pirani gauge is connected to the forepump side of a system, it can be used effectively as a leak indicator. All joints of the system may be either painted with acetone or sprayed with any gas rich in hydrogen, while the needle on the Pirani is watched for sudden changes in pressure as an indication of a leak. (CAUTION! Acetone and gases rich in hydrogen are inflammable, and the gases are toxic when inhaled in large quantities.)

Zero Shift

The shifting of the zero on the Pirani gauge is not an uncommon occurrence. In some cases it can be as much as 5 - 10 microns on the low scale. This may be corrected by flashing the tubes. If the Pirani is

connected to a system which, as indicated by an ion gauge, is known to be below 1×10^{-3} mm Hg, and the gauge does not read zero after the tubes have been flashed several times, the zero may be reset by removing the cap from the potentiometer identified as MIC-ADJ on the back of the chassis and adjusting the potentiometer with a screw driver. On double units care should be taken so the proper potentiometer is adjusted for each position.

Note: The gauges using the type "C" Pirani tube box will have the zeroing potentiometer mounted in the tube box rather than on the back of the chassis.

The Need for Calibration

The determination of pressure with a Pirani gauge depends on variations in the resistance of the heated filament wires within the tube. A slight change in the color of the surface of the wires due to accumulation of impurities will affect their ability to radiate heat and thus alter the sensitivity of the gauge.

The circuit employed is of the balanced bridge type, and precautions have been taken to insure permanence of calibration. Nevertheless, all Pirani tubes may change calibration over a period of time especially if they have been subjected to vapors of a reactive nature. Changes of this type are generally not serious but are quite outside our control. Therefore, for accurate work the Pirani gauge should be flashed frequently to remove these impurities.

Flashing

During operation, impurities become deposited on the filament of the open Pirani tube and cause the zero of the gauge to shift. These impurities may be removed by flashing the filament (heating it to incandescence). Each CVC cabinet model Pirani gauge has a built-in flasher circuit to simplify this operation. Some panel models used on processing equipment, such as vacuum coaters, do not have this flasher circuit.

To correct the zero of a gauge, flash the filaments as follows:

1. Evacuate the tube to a pressure of 10 microns Hg or less.

2. If the gauge has a flasher circuit, depress the spring-loaded switch on the back of the chassis for a maximum interval of 4 seconds. If the gauge does not have a flasher circuit, apply 25 volts AC or DC across the filament leads for 4 seconds.

3. Recalibrate the gauge.

Calibration

1. The open tube should be attached directly to a system capable of obtaining pressure of the order of 1×10^{-5} mm Hg as measured by a McLeod gauge or untrapped ionization gauge. All vapors from rubber, grease, and "frosted" dry ice traps should be kept out of the Pirani tube by inserting the tubulation until the open end is inside a manifold having a diameter of 2" or more and protected at each end by dry ice or liquid air traps.

2. When the gauge is in the OFF position, the pointer on each meter should read zero. If adjustments are necessary the screw in the base of the meter can be rotated in either direction.

3. When the pressure in the system is below 1×10^{-3} mm Hg, the selector switch may be turned directly to the MICRON position and the filament may be flashed. When the gauge reaches equilibrium at zero, a reading should be taken with the McLeod gauge or ion gauge and then the Pirani should be set according to this value by adjusting the MIC-ADJ potentiometer on the back face of the chassis. See "Note" under section on "Zero Shift."

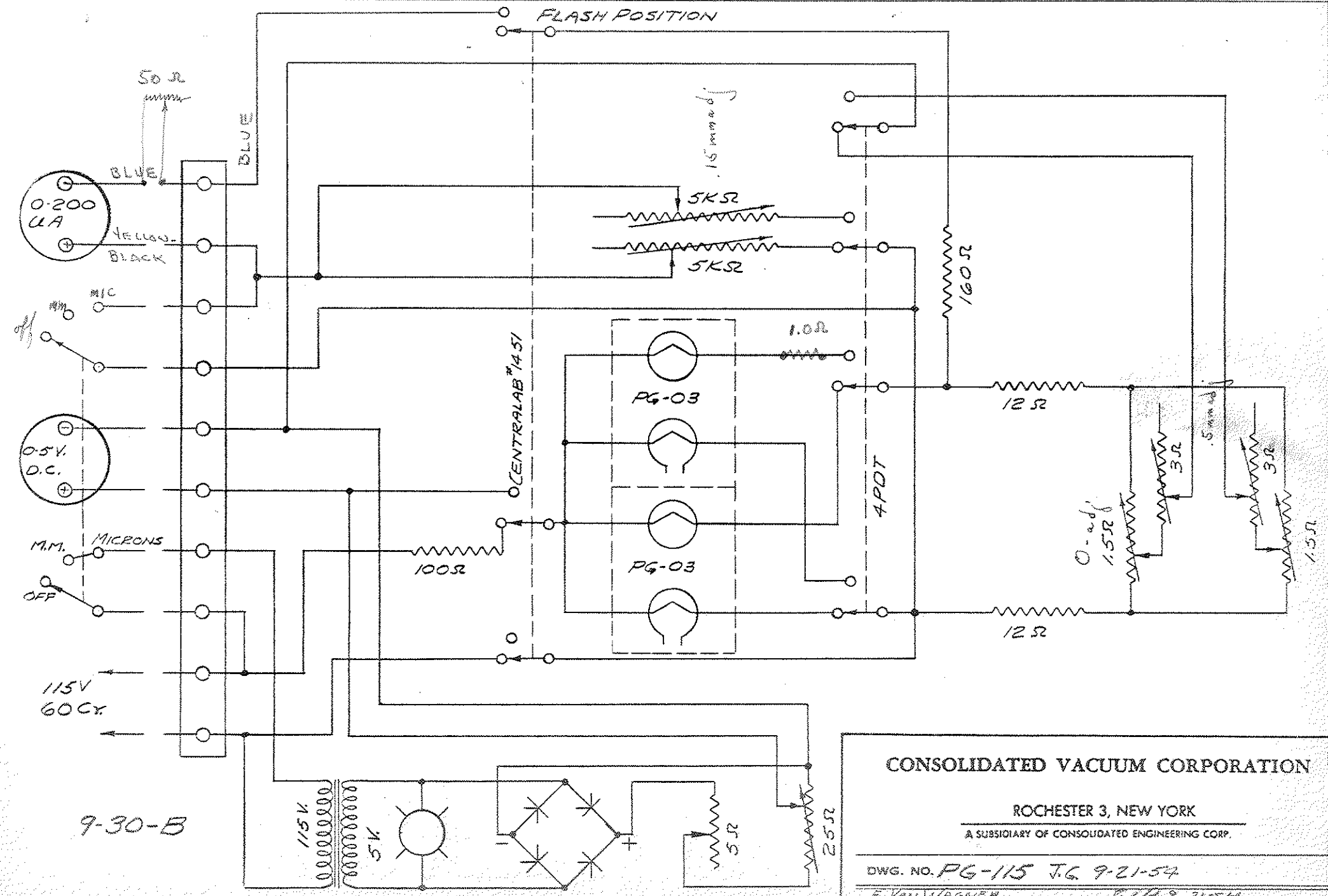
4. The selector switch can then be turned to the MILLIMETER position and air admitted to the system until the pressure rises to about .150 mm Hg. At this point, take a reading with the McLeod and set the Pirani if it does not agree. This adjustment may be accomplished by rotating the 0.15 MM-ADJ potentiometer found on the top side of the chassis. As stated before, numbers will be stamped adjacent to these potentiometers if it is a two station unit.

   The gauge should then be checked against the McLeod at a pressure of approximately .500 mm Hg. If agreement is not obtained at this point, it is possible to bring the gauge into closer agreement with the scale by adjusting the 0.5 MM-ADJ potentiometer shaft on the top of the chassis. In this case, the adjustment of the 0.15 MM-ADJ potentiometer at .150 mm (and in some cases the zero setting) will have to be repeated.

Cleaning

If the inside of the tube itself becomes dirty, it can best be cleaned by rinsing with an oil solvent such as benzene followed by one or two rinses with acetone or some equivalent neutral solvent. The tube should then be dried completely. After cleaning, the tube should be pumped down and the filament flashed.

PIRANI GAUGE, 2 STATION TYPE PG-024
WIRING DIAGRAM



CONSOLIDATED VACUUM CORPORATION

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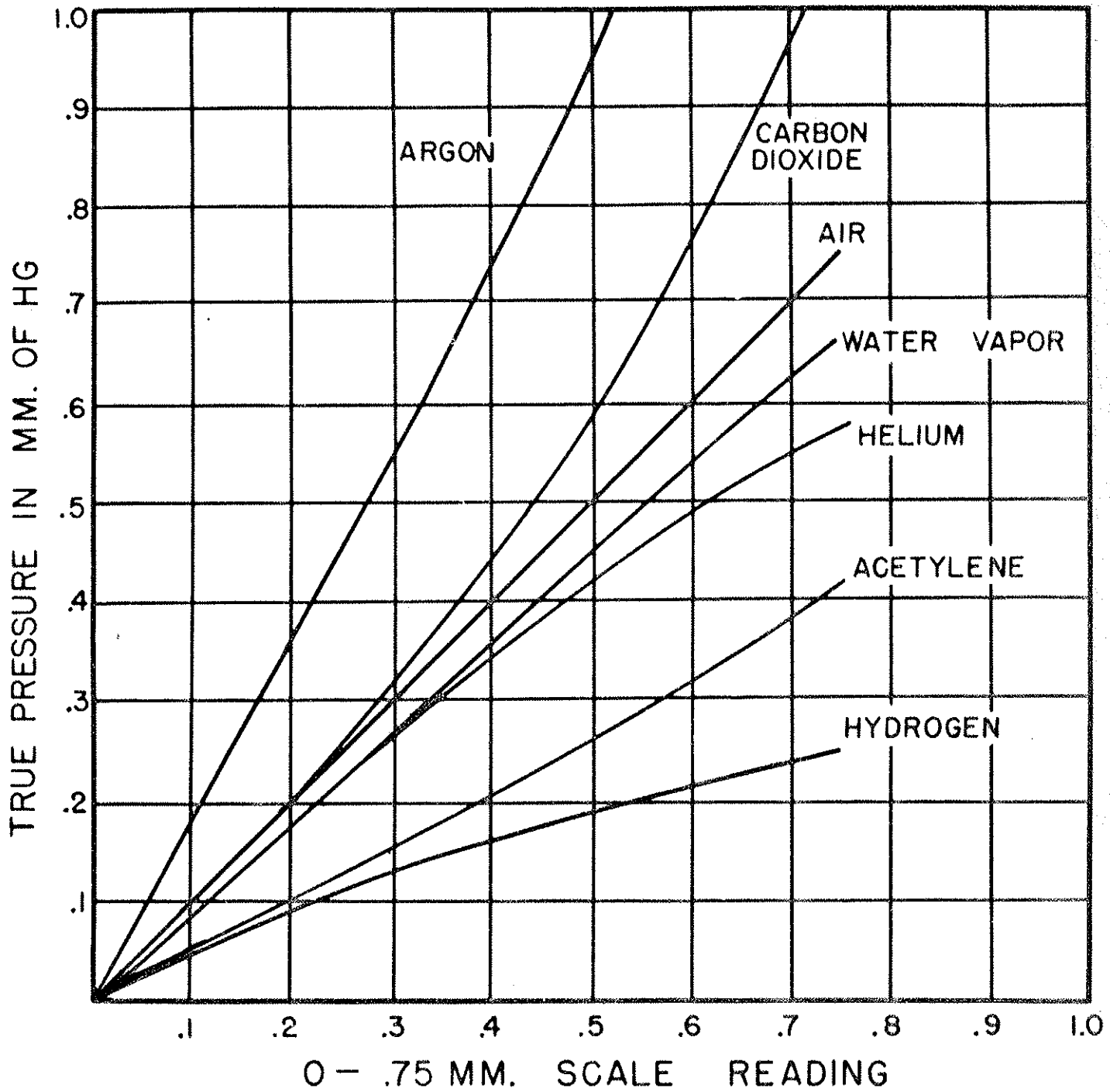
CALIBRATION OF PIRANI GAUGE FOR VARIOUS GASES



Bridge Voltage = 3 volts