

Hall C HMS Spectrometer Vacuum Gauge

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Hall C installed an Edwards Wide Range Gauge (WRG) on the HMS spectrometer to measure the vacuum in the spectrometer's beamline. To convert the WRG's raw voltage output to pressure in torr, a routine was developed for the HMS PLC system.

An Edwards WRG, Fig. 1, which can measure pressures from 1×10^{-9} torr– 7.50×10^2 torr with a single sensor, was added to the PLC system to measure the vacuum in Hall C's HMS spectrometer's beamline.



FIG. 1. Edwards WRG installed on Hall C HMS spectrometer.

WRG's output voltage signal, V , where $V \in (2 \text{ V} - 10 \text{ V}]$, is converted to pressure by the formula

$$P = 10(1.5V - 12.125) \text{ torr.}$$

$V \in [1 \text{ V} - 2 \text{ V}]$ are reserved for the gauge's internal error monitoring. Table I contains the error conditions and their representative voltages.

Error	WRG output [V]
Pirani gauge failure	1.0
inverted magnetron contaminated or short-circuited	1.1
striker filament broken	1.2
inverted magnetron not struck	1.3

TABLE I. List of faults corresponding to voltage signal for Edwards WRG.

The PLC routine developed uses an analog input channel (HMS Q3 I/O chassis slot 3, channel 11) to read the voltage signal from the WRG and a relay channel (HMS Q3 I/O chassis slot 4, channel 0) to provide 24 V to power the WRG. Power supplied through the relay allows the gauge to be remotely power-cycled to reset error conditions.

If the analog input channel reads any of the voltages listed in Table I, then the upper level PLC program indicates that there is a spectrometer vacuum fault; however one can drill down and find the exact cause of the fault, e.g. striker filament broken.

In summary, a PLC routine has been developed for the HMS PLC system to read an Edwards WRG installed on the HMS spectrometer, allowing vacuum measurement in the spectrometer's beamline.