

## Tube of the Month

### **Ion Gauges (Tubes that measure vacuums)**

Early vacuum tubes did not have a high vacuum and would not stand very high plate voltages. Often getters were used to improve the vacuum. With the production of high power tubes, a means of measuring the vacuum was needed. Tube builders could see that when they tested a new tube, the current would vary with the amount of vacuum. If it was real bad, the tube turned blue. The first tubes that were designed to measure vacuums were existing types that were open to the atmosphere and could be plumbed into the vacuum pumping system. Tubes like the 35IG are examples. With experimentation, they learned to make tubes that were more sensitive and that could be calibrated to measure even higher values of vacuum. The plate was replaced by a single wire and the grid grew into a large coil.

The blue color in a leaky tube is caused by electrons colliding with ions. The filament of an ion gauge tube emits electrons that are drawn to the large positively charged grid. Any ions that are hit by the electrons will be attracted to the negatively charged plate and causes the current to rise in the plate lead. A typical ion gauge tube would have +150 VDC on the grid and about -30 VDC on the plate. The filament voltage must be variable. A resistor is placed in the plate lead and a sensitive galvanometer measures the current across the resistor. The current will be in the microampere range and can be calibrated to be proportional to the vacuum. A good ion gauge tube will measure vacuums down to 10<sup>-8</sup> mm of mercury.

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