CINCINNATI TEST SYSTEMS

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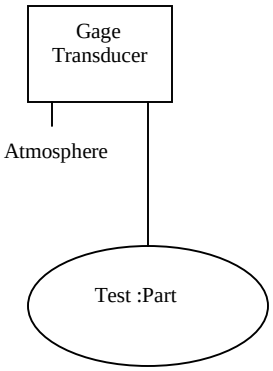
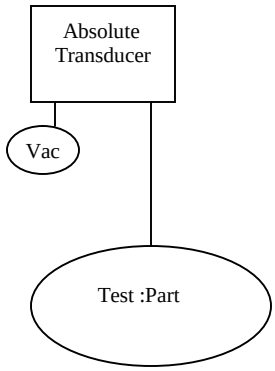
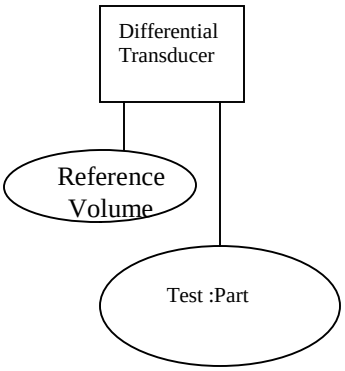
Absolute (or Gage) vs Differential Pressure Decay Instruments

Pressure decay instruments use one of two designs to test parts. They use either gage pressure (or absolute pressure) or differential pressure decay pneumatic circuits. The gage or absolute pressure decay pneumatics offer a simpler pneumatic circuit with fewer valves, fewer transducers, smaller internal volume, fewer potential leak joints, and a fail-safe test circuit. They require a high resolution A/D converter (24 bits – 4,194,304 counts or better) to adequately resolve the very small changes in pressure loss (0.0001 psi or smaller) associated with leaks. The differential pressure decay circuit uses a smaller range differential pressure transducer to detect the changes in pressure loss relative to a reference volume. This type of circuit can utilize a lower resolution A/D converter (16 bits – 65536 counts) to measure the pressure loss associated with leaks.

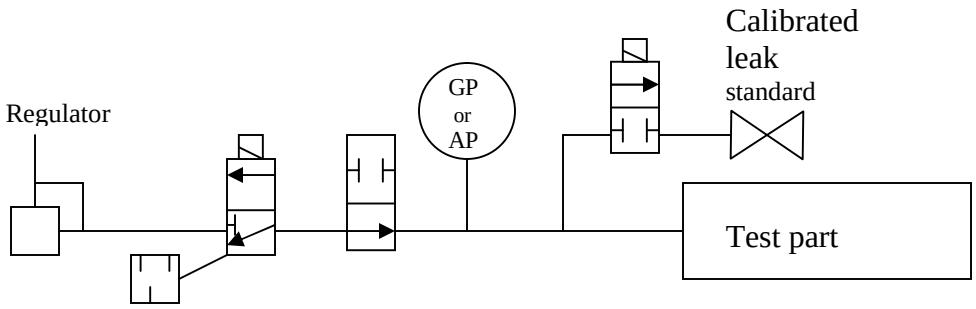






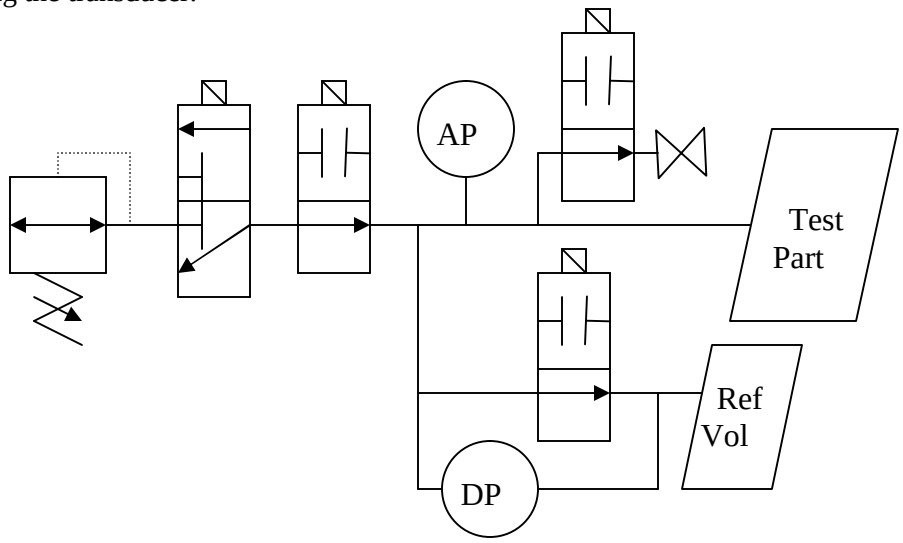
Gage Pressure Transducer *Absolute Pressure Transducer* *Differential Pressure Transducer*

The diagram below shows the gage or absolute pressure decay pneumatic circuit. The difference between gage and absolute is the reference of the pressure transducer. An absolute pressure transducer references the pressure reading to vacuum (0 psia). A gage pressure transducer references the pressure reading to the current atmospheric pressure (approximately 14.7 psia). The Sentinel I24 and M24 instruments use an absolute pressure transducer. The instrument reads the atmospheric pressure value at the beginning of test and displays the pressure and pressure loss readings relative to that atmospheric pressure value. The absolute pressure transducer isolates the pressure readings from any sudden atmospheric pressure changes that might occur during the test cycle. The Sentinel C-20 and I-21 instruments use a gage pressure transducer. A gage pressure transducer displays all pressure values relative to the active current atmospheric pressure during the test. If the instrument has a 100 psig pressure transducer, the 24 bit A/D resolves pressure changes to 0.000025 psi or better.



Absolute (AP) or gage (GP) pressure decay circuit

The diagram below shows a typical differential pressure decay pneumatic circuit. The differential pressure transducer measures the differential pressure between the test part and some reference volume. The differential pressure transducer isolates the pressure loss readings from any sudden atmospheric pressure changes that might occur during the test cycle. The Sentinel I24 instrument offers the differential pressure decay test option. Former CTS models, Sentinel II and Sentinel DP200 instruments, are differential instruments. If the differential pressure transducer has a range of 1 psid, a 16 bit A/D (65536 counts) can resolve a 0.00001 psi change. The 24 bit A/D in the Sentinel I-24 can resolve pressure changes on a 2 psid transducer to 0.0000005 psi change. The range of the differential pressure transducer determines the maximum allowable pressure loss during the stabilization and test cycles before over-ranging the transducer.



Differential pressure decay test circuit

Differential pressure decay with a 24 bit A/D converter offers optimal resolution and repeatability because it measures the pressure change during test with a narrow range transducer. It provides a greater signal to noise output which improves repeatability for higher test pressure applications and it balances some of the test adiabatic effects between the part and reference volume. Differential pressure decay tests may be faster depending on the test part material, test pressure, and leak rate. Absolute or gage pressure decay tests provide a simpler, more economical test solution for most applications involving lower test pressures, larger leak rates, and test conditions that limit test repeatability.