Dual-Check™ Valve Basics.

The Dual-Check™ valve contains two check valves that can be air pilot overridden though internal connections. Figure 1 is a functional schematic for a Dual-Check valve.

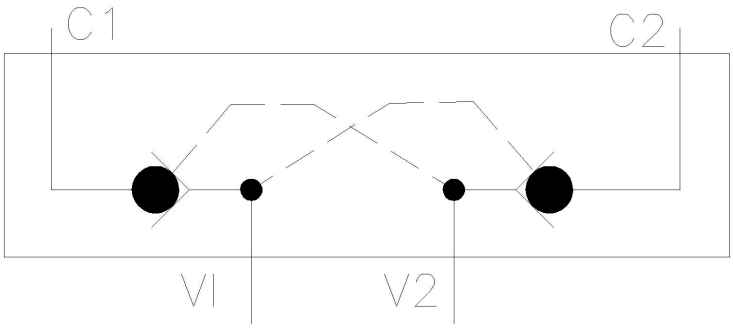

Figure 1. Dual-Check™ Schematic.

In a typical application the V1 and V2 ports are connected to the switching or directional control valve and the C1 and C2 ports are connected to the inlet ports of the pneumatic component.

Air is checked on C1and C2 (component) ports. Both the check valves are engaged when there is no pressure on both the V1and V2 (valve) ports. Either check valve can be overridden when there is enough air pressure on the valve port of the opposite check valve. Therefore, the C2 check valve can be overridden by pressurizing the V1 Port or the C1 check valve can be overridden by pressurizing the V2 Port. In the Dual Check™ valve the air piloting function and connections are all internal to the valve.

The physical components of a Dual-Check™ are illustrated in a cross section model in Figure 2.

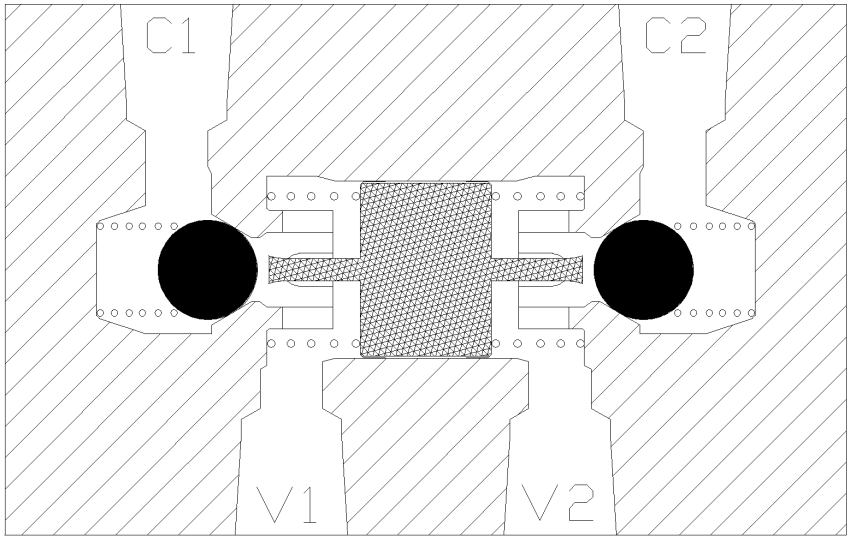

Figure 2. Dual-Check™ Cross Section Model (unpressurized state).

The check valve seals are obtained by spring loaded, Buna-N balls. The two check valves share the same piloting piston, which shuttles between the two check valves. The piston has two arms and is set between two springs that center the piston when the pressure difference between the V1 and V2 ports is low.

It requires approximately a 4 PSI pressure differential between the V1 and V2 ports for the piston to move enough from the centered positioned for an arm to contacts a check ball. When the pilot piston contacts the ball, additional pressure will be needed to move a ball checking pressure. The ratio of the piston area to the ball seating area (Pilot ratio) is approximately 4 to 1. Consequently, the V1-V2 pressure differential needed to uncheck a ball is approximately 25% of the checked pressure plus 4 PSI.

The pilot piston will shuttle almost as rapidly as the pressure differential on the valve ports change. Typical piloting and unpiloting response times can be 5 to 10 milliseconds.