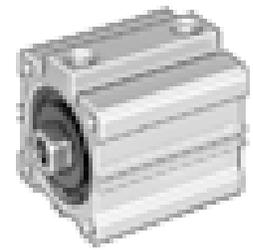
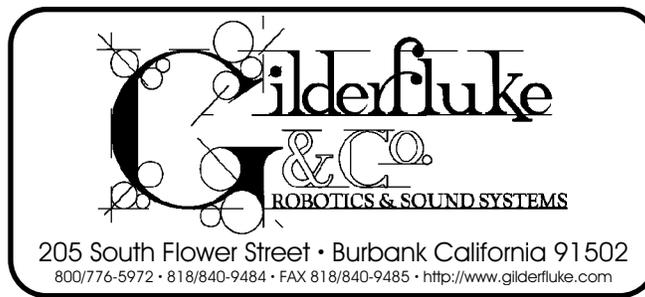
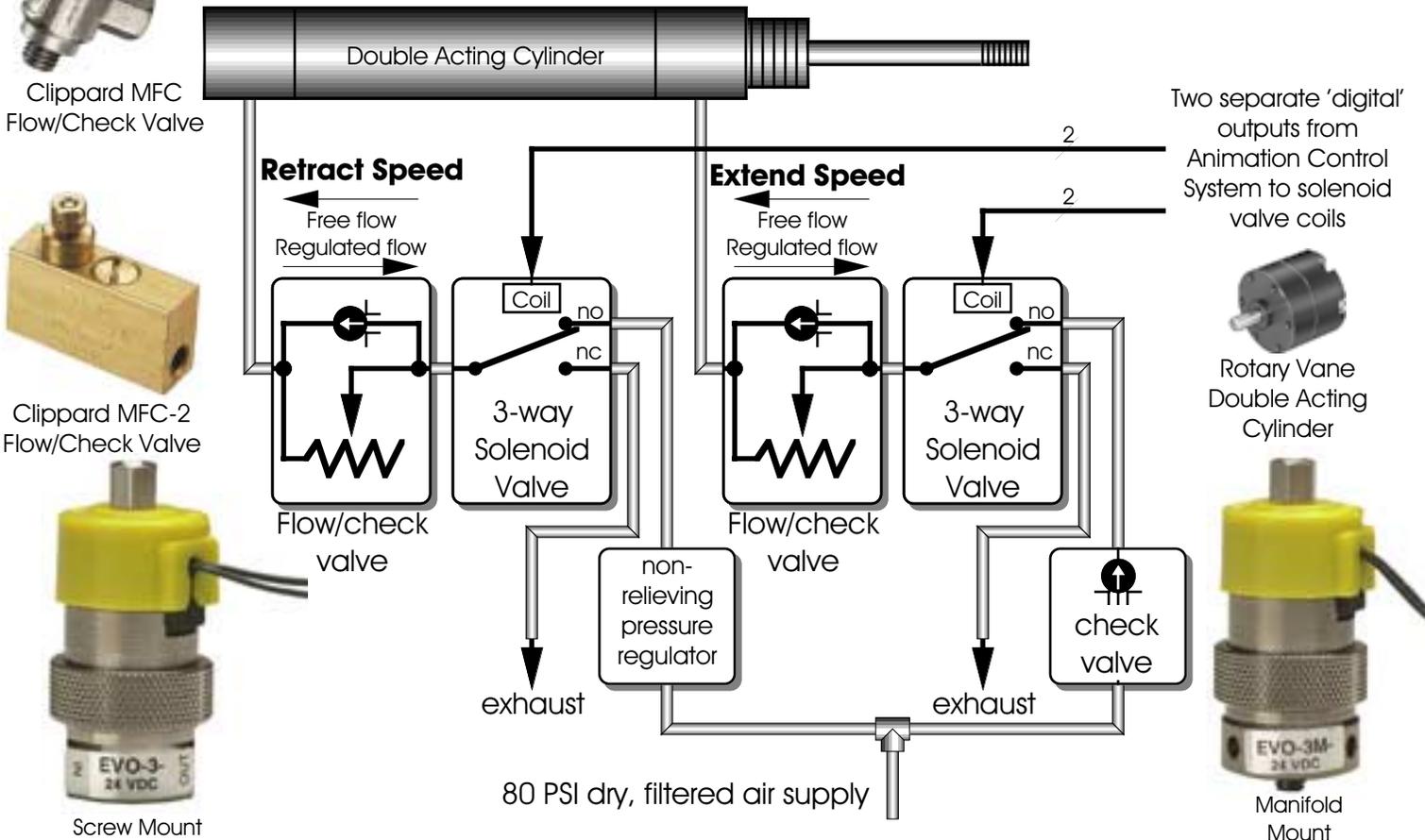


'Flat' Double Acting cylinder



'Compact' Double Acting Cylinder

### Double Acting Reversible Digital (DARD) plumbing (using two 3-way valves):



If you don't have a suitable 5-port, 3-position valve available, you can use two 3-way valves in its place. It will allow certain digital moves to be stopped mid stroke and by the judicious application of 'English' on the programming buttons, can move with a certain range of speed. The minimum speed is set by the flow controls, and the maximum speed is obtained by holding both solenoid valves energized and then releasing one. Since full pressure is normally applied to both sides of the cylinder, this style of hookup usually will have a slightly better response time than traditional plumbing methods. The two flow controls, which regulate flow out of the cylinders, don't interact when you adjust them.

The solenoid valves must be 3-way valves which will allow the 'normally open' port to be used as a pressure input, and the 'normally closed' port to be used as an exhaust port. The low cost Clippard EVO-3 valves fits these requirements. The 'normally open' port is the one which allows air through when the solenoid is not energized. The 'normally closed' port is the one that allows air flow through it only when the valve is energized. They are available from McMaster-Carr (562/695-0677 [www.mcmaster.com](http://www.mcmaster.com)) as their part numbers 4916K22 (12 VDC screw mount), **4916K23** (24 VDC screw mount), 4916K25 (12 VDC manifold mount), **4916K26** (24 VDC manifold mount). Manifolds for mounting 4, 6, 8, or 12 positions are available from Clippard (877/245-6247 [www.clippard.com](http://www.clippard.com)). All plumbing connections are by 10-32 miniature fittings. Miniature air fittings are available from Clippard, McMaster-Carr, and others.

If the solenoid valve you are using will let you do so, you can put simple needle valves on the solenoid valve exhaust ports in place of the flow/check valves shown. The Clippard manifolds don't allow direct access to the exhaust ports.

The regulator is used to minimize 'jumps' when changing directions, and 'creep' when holding still. It compensates for the larger piston surface area on the tail end of a normal pneumatic cylinder. A typical regulator is the Clippard MAR-1NR. These are small enough to mount in line with the flow controls. A 'balanced' type of cylinder (rotary actuator, double rod cylinder, or any other application with the load on both sides of the piston balanced) will let you eliminate the regulator and replace it with a check valve. If you don't have a non-relieving pressure regulator, a second check valve must be put in line supply line. The pressure regulator can be moved downstream of the solenoid valve.