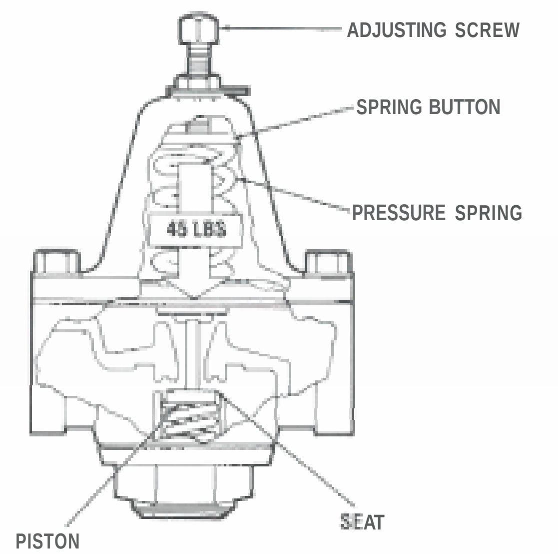
INFOSPEC

CASH ACME®

FIGURE 1



A WORD ABOUT PRESSURE REDUCING AND REGULATING VALVE OPERATION

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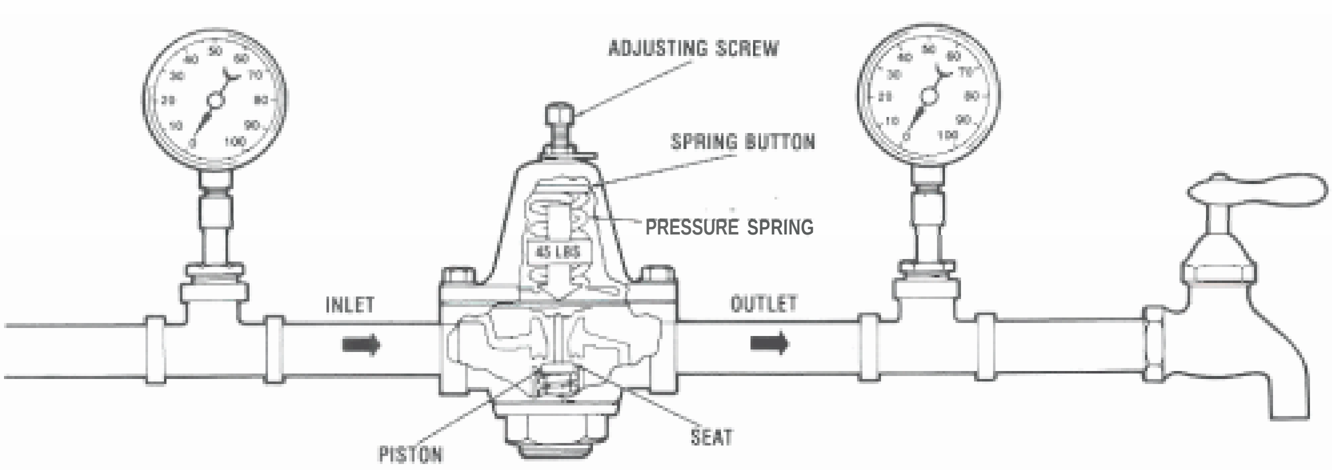
HOW DOES A PRESSURE REDUCING AND REGULATING VALVE WORK?

1. Here is a typical Cash-Acme pressure regulator exactly as it leaves the factory (Figure 1). Note it is shipped in an open position. The internal valve seat is held open by a pressure spring pushing down. Compression is applied to the pressure spring by an adjusting screw working on a spring button. When you order a regulator with a delivery "set" pressure of 45 psi, for example. the adjusting screw is turned down to (in effect) exert 45 psi downward "push". This means, then, the valve is shipped open and remains open until some other force closes it.

2. Now, for purposes of this illustration, let us assume we install this Cash-Acme regulator in the simplest of installations (Figure 2) We hook a pipe up to the regulator inlet to bring in wafer at. say, 100 psi. Then we hook a pipe up to the regulator outlet and on the end of the outlet pipe we install a faucet. Let's assume the regulator is set to deliver water at 45 psi, and that the faucet is closed To better illustrate what happens we've also installed a pressure gauge on the regulator inlet and outlet.

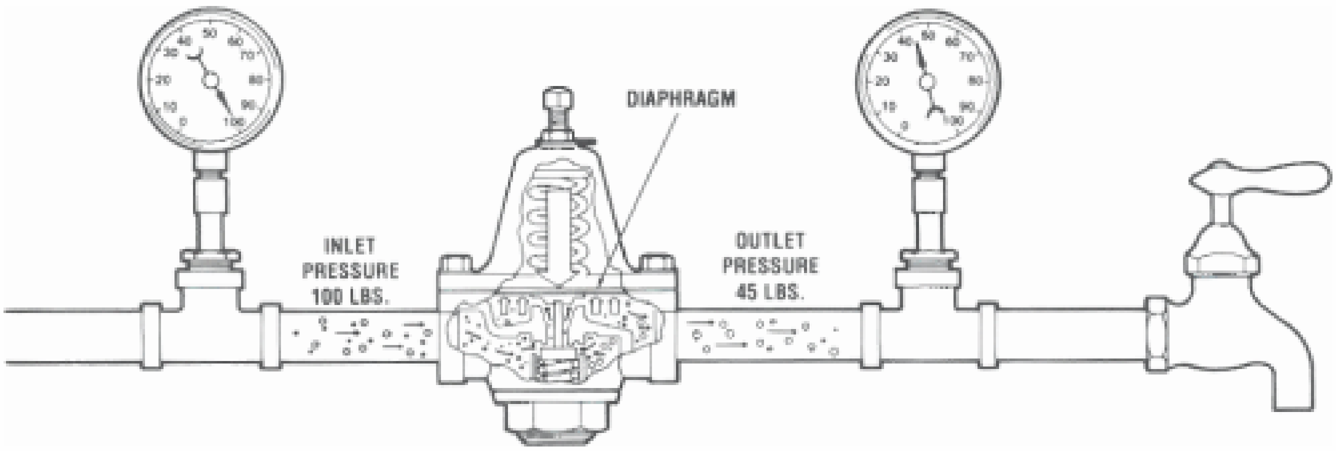
FIGURE 2



GENERAL INFORMATION ON CASH-ACME PRESSURE REGULATORS

ISO 9001 CERTIFIED YEAR 2000 COMPLIANT

FIGURE 3



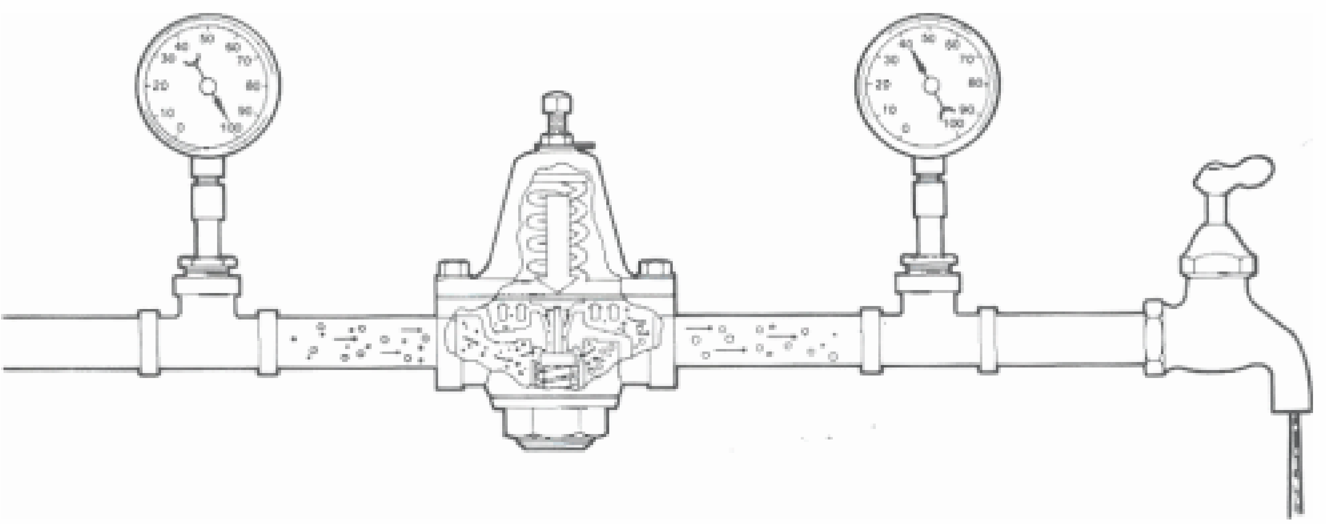
3. As water comes in the inlet pipe at 100 psi. it flows into the regulator, through the open seat, up under the diaphragm and on through the outlet into the outlet pipe stopping, of course, at the closed faucet (Figure 3).

Since the regulator is "set" at 45 psi. just as soon as water pressure (going through the regulator) builds up under the diaphragm to 45 psi, the downward pressure spring force is over come and the regulating valve closes tightly.

Result: 100 psi on the inlet or upstream side of the regulator and 45 psi on the outlet or downstream side.

The condition just described is known as "lock-up" or a *no-flow" condition.

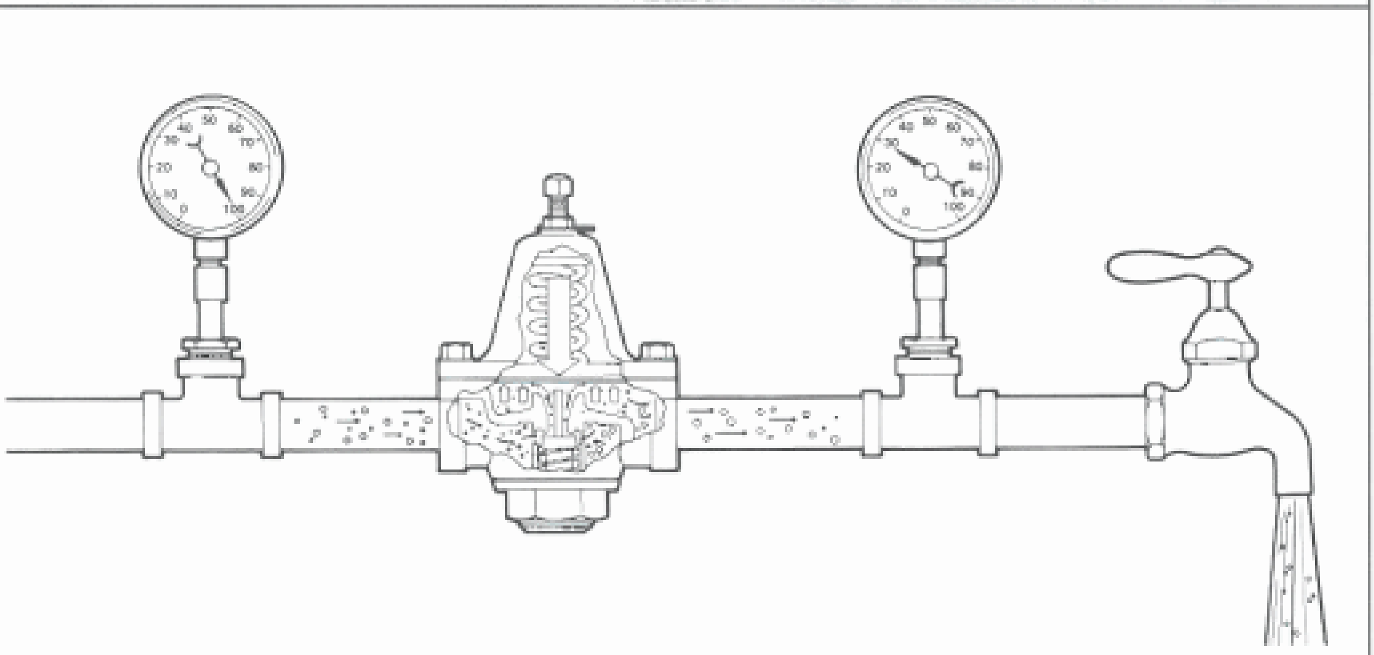
FIGURE 4



4. Now let's see what happens when flow starts. By slightly opening the faucet the "captive" 45 psi water will start to flow out (Figure 4). The moment Row starts, pressure under the diaphragm will start to fall off to below 45 psi which, in turn, will cause the pressure spring to again open the valve seat and allow more water to enter. The regulating valve will open exactly enough to pass only the amount of water flowing out through the faucet, and at a pressure slightly below the 45 psi "set" pressure.

It should be readily understood that it takes a slight pressure drop under the diaphragm to get the regulating valve to open when flow first starts. Obviously, if the faucet is shut off again and flow stops, pressure on the outlet side of the regulator and under the diaphragm again reaches 45 psi and closes off the regulator.

FIGURE 5



5. The previous illustration, of course, is overly simplified. In most actual installations the regulating valve will supply a great many "faucets"... toilets, tubs, showers, sinks, etc., or countless industrial applications, and they will be turning on and off intermittently... thus varying the flow requirements on the regulating valve quite widely. Looking at the sketch again, let's see what happens when the flow requirements do vary.

By turning on the faucet gradually {from a small trickle to full open) and noting the gauge reading on the outlet side of the regulator, it will be immediately noted that **as the flow increases the outlet pressure decreases.**

This characteristic of all of the simpler self-actuated type regulators can be readily understood by recalling that **it is the start of flow... or the opening of the faucet... and the resulting lowering of pressure under the regulator's diaphragm that opens the regulator initially.** Quite obviously, as the flow is increased more and more, pressure under the diaphragm will fall lower and lower, which in turn allows the pressure spring to push open the valve seat wider and wider in an effort to satisly the flow demand. This condition can theoretically keep going until the absolute maximum flow (for the design of the regulator) is reached and conceivably the outlet pressure has fallen off to 0 psi!

6, On actual jobs, of course, the flow requirements through a regulator will vary all the way from a small trickle to a large volume under peak load conditions. It is important to realize, therefore, that the outlet or downstream pressure coming out of the regulator will also vary somewhat with these flow variations. That is why it is said the simpler type regulators wilt hold the desired reduced or "set" pressure "within reasonably close limits". That is also why Cash-Acme offers so many different types of pressure regulators... since the criteria of "goodness"... (and also cost) in a regulator is its ability to deliver the required rate of flow while simultaneously "holding" the desired reduced or "set" pressure. Furthermore, it also becomes apparent why in any critical job it is always necessary to have some idea as to the flow rate... or capacity... required.

7. Now then, what does all this mean to you, the sellers, installers and users of pressure regulators? .

4. Based on the knowledge of how they work, it emphasizes the need for careful sizing and selection of a regulator. It should be clear that where flow requirements and regulator performance are critical, the selection of a regulator should not be based on the size of the inlet pipe that just happens to already be there.

B. It should also be evident as to what the real meaning of the common complaint "won't hold the set pressure" actually is. It simply means that the flow requirements are high and the "set" pressure is falling off below what is acceptable in an effort to satisfy the ftow requirements. Stated another way, the regulator is simply too small (or of the **wrong** type) for the job.

C. It also logically raises this question: If a job has 100 psi inlet and needs 7 gpm at a reduced pressure of exactty 45 psi, why wouldn't it be permissible to use a regulator "set" at perhaps 50 psi so that when the "set" pressure does fall off as flow starts it would fall to the desired 45 psi? The simple answer is that this IS permissible, providing the application is such that under no-flow conditions the system or installation can tolerate the 50 psi pressure. What is described here, of course, is the difference between a 50 psi lock-up or no-flow setting on the regulator and a 45 psi setting under an actual flow of 7 gpm. In field operation the regulator's reduced pressure "set" may be easily adjusted under actual flow conditions by simply turning the top adjusting screw clockwise to raise the setting, or counter-clockwise to lower it, keeping in mind that the outlet pressure will go up when flow stops.

D. It should become obvious that the possession of adequate information on a job requiring a pressure regulator places a person in an advantageous position to sell or recommend a regulator good enough to do the job but not so costly as to lose the contract or sale.

E. And lastly, an understanding of the simple "HOW THEY WORK" principles puts you in a position to enhance your reputation for service and future business prospects.

8. One other point should be stressed in discussing pressure regulators... the inlet pressure. Although it is true that the inlet pressure has a negligible effect on the foregoing matters of "set" pressure fall-off, the Inlet pressure does have an important effect on the regulator's flow or capacity characteristics. As will be quickly seen in looking at any of the Cash-Acme capacity curves or tables in the catalog, the inlet pressure is always taken into consideration.

The important thing to know is exactly what the minimum inlet pressure is at the regulator. All too often the minimum inlet pressure is taken as an off-hand estimate... or is given as a reading perhaps 100 ft. (or more) away from the regulator, completely ignoring all the friction losses involved.

Obviously, it is impossible to correctly size and select a regulator for a critical installation unless the complete facts at the valve are actually known. Note also the emphasis on minimum inlet pressure. If the inlet pressure varies widely... as it does in many cases... then obviously the minimum figure must be used in selecting a regulator that will do the required job.

9. There are several other factors that do enter into the design, performance characteristics and selection of pressure regulators. Suffice it to say, however, that if the foregoing "HOW THEY WORK" information is understood and selection of a pressure regulator is made on the basis of Cash-Acme catalog information, complete satisfaction should result. When in doubt on the proper regulator to use, Cash-Acme stands ready to assist you in every way possible.

10. A word about definitions. There are several words commonly used in discussing pressure regulators that are actually synonymous. For purposes of clarity and better understanding some of them are grouped below:

Inlet Pressure
Initial Pressure
Upstream Pressure
Supply Pressure

Outlet Pressure
Reduced Pressure
Downstream Pressure
System Pressure
Delivery Pressure

Capacity
Flow Rate
Rate of Flow
Demand

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