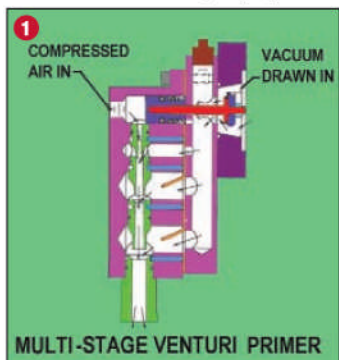


Automatic Fire Pump Priming

By W. PARKER BROWNE

It's a given that suburban and rural fire departments that routinely draft from folding tanks or other static sources must have well-trained pump operators.

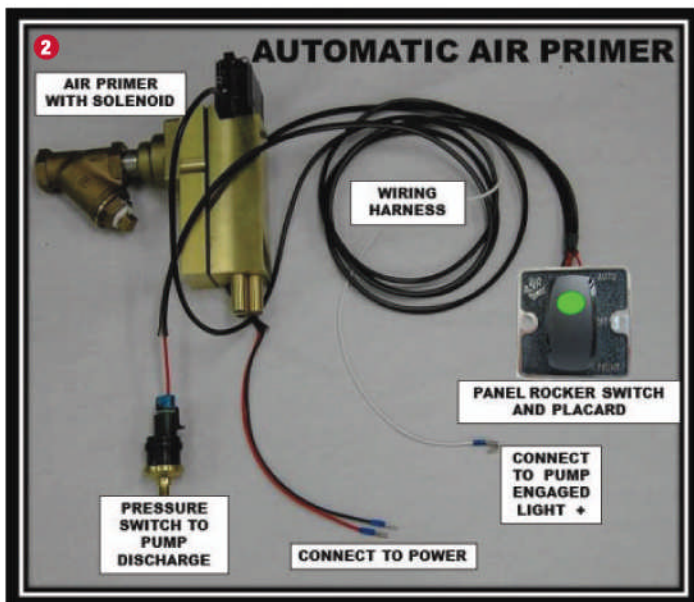


(1) The simplicity of the air-powered primer design is in its ability to create a high vacuum without the use of moving parts or high electrical current draw. Passing the pressurized air through a series of nozzles creates the vacuum. The reliability of a product that has no moving parts and is powered by a vehicle system as carefully engineered and maintained as the air brakes has led to the air-powered primer's growing use on new vehicles as well as its retrofit popularity on older vehicles equipped with air brakes. (Photos and illustrations courtesy of Trident Emergency Products, LLC.)

I have learned during fire pump operations and drafting water from a static source instruction that priming the centrifugal fire pump is generally one of the most challenging and hardest tasks for the student to understand and master. Automatic priming offers ease of operation when priming a centrifugal pump.

Automatic priming was a standard feature and natural benefit for fire pumps installed in most of the early fire trucks built in the United States. These fire pumps were typically positive displacement, either piston or rotary type. Positive displacement fire pumps were truly self-priming because they were able to pump both air and water. The operator just connected a suction line from the pump to the water source, engaged the pump, opened a discharge, and waited for the air to pass through the pump and then for the water to flow. It was that simple.

If the pump swallowed some air during operation because of turbulence at the entrance to the hose, or even a slow leak in the hose itself, the fire pump would move air through and continue to provide water pressure as long as the pump was running and the water supply lasted. With the advent of the centrifugal pump, manufacturers had to find another way to prime because the centrifugal pump cannot move both water and air. When the centrifugal pump came into common use, so did the primer.



(2) The automatic priming system components include an air-powered primer with solenoid, a discharge pressure sensor, the panel rocker switch, and wiring harness.

Conventional Priming

A conventional primer is a small vacuum-producing pump that can remove the air from the suction hose and pump. Since the primer's inception, the pump operator has been required to activate it manually, which can lead to problems if the operator is not trained in its use. If it is shut off too soon, the prime can be lost—if left running too long, the primer can burn out its vanes and seals.

Across the ocean, European fire truck builders also use the centrifugal-style pump. However for the past several decades, they have been providing many of their pumps with an automatic priming feature. Their approach also uses a separate small positive displacement priming pump, but the primer is automatically engaged whenever the pump shaft is rotating and it senses little or no discharge pressure.

Although this approach is not quite as simple as using a truly self-priming water pump, it does automatically tie the separate primer's operation to the water pump's discharge pressure status. The Godiva, Rosenbauer, and Ziegler brands all have fire pumps available with automatic priming.

As the world grows smaller, many of the more useful ideas for firefighting techniques and equipment are crossing the oceans in all directions. The automatic priming idea for centrifugal fire pumps is one of these and makes perfect sense on any fire truck for several reasons:

- It is simple and makes the pump operator's job easier, allowing time for other tasks.
- It will automatically remove any slugs of air that find their way to the pump during operation.
- It will respond immediately and automatically if discharge pressure is lost.

Air-Powered Primer

The simplicity of the air-powered primer design is in its ability to create a high vacuum without the use of moving parts or high electrical current draw. The air pressure available on fire truck chassis equipped with air brakes powers it. Passing

the pressurized air through a series of nozzles creates the vacuum. The reliability of a product that has no moving parts and is powered by a vehicle system as carefully engineered and maintained as the air brakes has led to the air-powered primer's growing use on new vehicles as well as its retrofit popularity on older vehicles equipped with air brakes.

Automatic Air-Powered Primer

According to Jim Maher, president of Trident Emergency Products, LLC, "The simplicity, NFPA 1901 compliance, environmental safety, lack of moving parts, and nearly zero electrical draw of the air-powered primer also make it an obvious choice for use in an automatic priming system."

Every fire department may have its own preferred standard operating procedure (SOP) to employ the benefits of an automatic air priming system. Initial use of such a system should start in the same way as a standard nonautomatic primer, especially until the operator becomes familiar with the automatic primer's operation and its interaction with other control systems on the fire truck.

For example, start by making the initial prime by depressing the rocker switch to the lower "PRIME" position and holding it in that position until the water pump is primed and a steady discharge operat-



(3) Operating the Trident automatic priming system is done from the control switch on the panel. The rocker switch has three positions: OFF, PRIME, and AUTO.

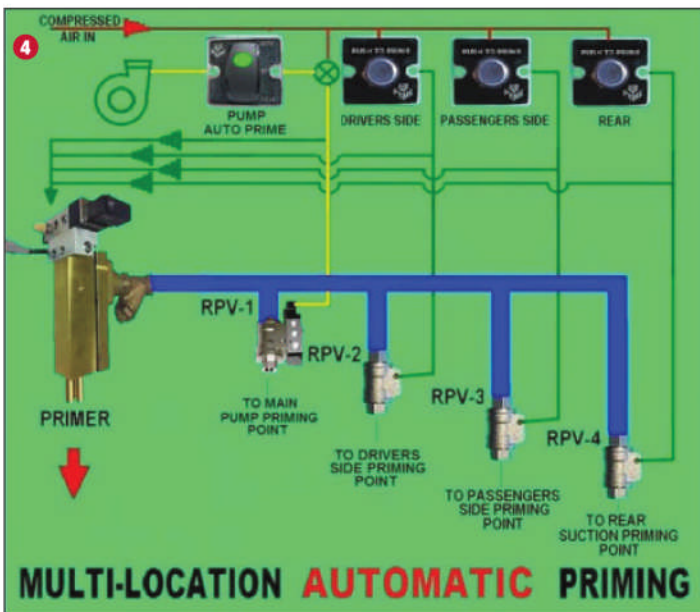
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(4) In many water supply situations, the ability to prime from multiple suction locations on the fire truck has become important. For these applications, Trident has an optional multilocation automatic primer function that can pick up a prime from a number of locations.

ing pressure is established. Once the operator establishes operating pressure and flow, move the rocker switch to the "AUTO" position, enabling the primer to restart any time there is drop in the discharge pressure because of air moving through the pump or a loss of prime for any other reason.

When operating with an engine governor set in the pressure mode, most models will eventually reduce the engine speed to idle when the pressure setting cannot be maintained. A slug of air, a complete loss of prime, or simply running out of water could cause this pressure loss. If the automatic primer is set in the AUTO mode when this occurs, it will instantly start the automatic primer. Depending on the built-in time delay for the engine governor to reduce the speed and the reason for the pressure loss, starting the automatic primer may or may not restore the discharge pressure back to its original setting either because of the reduced engine speed or a depleted water supply.

When operating with a pressure governor set in the rpm mode, most models will not change engine speed with a loss of discharge pressure. With a loss of discharge pressure in the rpm mode and the automatic primer set in the AUTO mode, the automatic primer will start and restore the discharge pressure as long as the water supply is not depleted and prime can be reestablished. Some operators may choose to start in the rpm mode, set the speed to a high idle, immediately set the automatic primer to the AUTO position, and then do something else while the initial pump prime begins and ends automatically.

In every automatic priming system design, understand that if a loss of prime occurs when operating in the AUTO mode, the automatic primer would only engage when the pump discharge pressure drops below 20 psi. That does mean that each discharge flowing water will also have a short loss of pressure until the automatic primer can reestablish a prime and the pump rebuilds the discharge pressure.

The most important point is that the pump operator needs to understand how

the engine governor on each truck reacts to a loss of prime and how the selected governor mode may affect what happens when prime is lost. The fire department should establish SOPs that include the settings for the governor and automatic primer and then train its operators to these SOPs.

Multiple Location Priming

In many water supply situations, the ability to prime from multiple suction locations on the fire truck has become important. For these applications, multilocation automatic primer functions are available that can pick up a prime from a number of locations—the main pump suction plumbing; a front suction inlet; a side suction inlet; a rear suction inlet; or outboard of the master intake valve, for example.

Installing and operating a multilocation automatic primer has several advantages. First is the ability to have only one primer that can prime either the pump or from one of a choice of gated suction intakes based on which panel pushbutton is depressed. Second, you can "preprime" an intake while operating from another water source. Finally, when switching between water sources with the automatic primer set in the AUTO position, the primer will automatically run to remove any air that finds its way to the pump impeller during the switchover.

The true advantage is that the automatic primer will engage instantly and without needing operator intervention. In today's reality of limited staffing, an automatic and instantaneous response to any loss of discharge pressure could be critical to fighting fire.

W. PARKER BROWNE is a certified fire protection specialist. He is retired from a lifelong career in the fire apparatus and equipment industry and fire service education. He specializes in rural/suburban water supply and equipment issues. Browne continues to serve as an educator, advisor, part-time fire chief, and chairman of the Water Delivery Technical Advisory Committee of the Ohio Fire Chiefs' Association Ohio Emergency Response Plan.

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