



VIPER FLUSHING SERVICE INSTRUCTIONS **(For Models AF3200, AF3250, AF3400, 7500 and most shop air powered Cooling System Service Units from VIPER and SOLAR)**

GENERAL OPERATING INFORMATION

POWER: The following instructions are designed for units powered by shop air pumps. Units utilizing 12V pumps do not have enough power to perform flushing or back-flushing services. **VIPER** and **SOLAR** Cooling system Service Centers require incoming air pressure be regulated to a minimum of 45 psi and a maximum of 125 psi. Pressures outside of this range will cause operating problems and void the warranty.

CAPACITY: **VIPER** AF3250, AF3400, and **SOLAR** 7500 models have side mounted tanks, each providing a working capacity of 7 gallons and total capacity of 8 gallons. The tanks come with easy to read capacity markings and can be quickly removed for storage and cleaning. Replacement tank kits (Part No. 5030) are available, offering easy conversion between different types of coolants. Each tank has 2 flow tubes placed into it. The pickup tube is the longer tube and pulls fluid from the bottom of the tank. The intake tube is the shorter tube and drops all incoming fluid into the top of the tank. This arrangement allows good mixing of fluid and avoids any tube-to-tube streaming.

Other **VIPER** and **SOLAR** models use internal tanks with differing capacities. Refer to the User's Guide that accompanies each unit for more detailed information.

OPERATION: The **VIPER** AF3250, AF3400 and **SOLAR** 7500 models all utilize an easy-to-use control panel, which includes Service Valves, a System Pressure Gauge and a Rotary Control Knob.

NOTE: Models with recycling capability will also have a Filter Control Knob and a Filter Pressure Gauge. Neither of these will be used during the vehicle service and are only used during the recycling process.

Service Valves are labeled as follows: "Pump From" and "Pump To". Operation of the machine requires only that the user select where the fluid comes from (Used Tank, New Tank or Vehicle) and where the fluid is to be directed to (Used Tank, New Tank or Vehicle).

With the wide selection of fluid direction options, a technician can perform a vehicle service, mix fluid inside one tank, transfer fluid between the 2 tanks, pull fluid from the vehicle or empty the tanks into outside containers.

NOTE: Other **VIPER** and **SOLAR** cooling system service models utilize unique valve control options – refer to the User's Guide that accompanies each unit for specific control function. All steps of service will remain the same.

SERVICE HOSES: Nearly all **VIPER** and **SOLAR** Cooling System Service models utilize 2 Service Hoses, one red and one black. The black service hose is the working hose while the red hose functions as a return hose during vehicle service. The red hose includes a clear segment, allowing the technician to view the fluid exiting the vehicle. Each model comes supplied with quick connect couplers, to be installed on the vehicle end of each service hose. Each hose contains a removable screen (placed in the end of hose closest to the machine) to keep contaminants from flowing into and damaging the machine's pump. To ensure maximum pump life, never run a machine with the screens removed.

ACCESSORIES: Each model includes a variety of cooling system service accessories, including differing sizes of Heater Hose Tees, Radiator Hose Adapters and Radiator Cap Adapters. Also available is an Overflow Evacuation Hose that enables evacuation of fluid from the overflow container.

Heater Hose Tees are designed for permanent installation in a vehicle, such as fleet applications where technicians regularly service the same vehicles. Care must be taken when installing Tees to position them in an easily reached location, providing hassle-free access for future services.

Radiator Hose Adapters come in pairs and include one matching hose for installing an Adapter to either the radiator or to the thermostat housing. Always install the adapter with the open side towards the cooling system component and use hose clamps to secure both the hose to the adapters and to the vehicle.

The Radiator Cap Adapters come in two styles and allow easy connection to the vehicle's radiator. Part No. 5016 is a threaded style Radiator Cap Adapter that fits late model Ford and GM vehicles where the radiator cap is mounted on the coolant overflow container. Part No. 5042 is a universal cone style Radiator Cap Adapter that fits nearly all passenger vehicles. Part No. 5042 allows quick attachment for lowering the fluid level in the radiator or the overflow tank, which allows a spill-free upper radiator hose connection. Use a Male Quick Connect insert, when possible, with a Radiator Cap Adapter to allow quick and easy interface between the Radiator Cap Adapter and Service Hoses.

VEHICLE SERVICE – COLD CAR / REVERSE FLOW SERVICE METHOD

Note; This service procedure requires a cooling system configuration where the thermostat is mounted in the traditional location on the top of the engine. Vehicles using certain engine configurations (such as the older GM Quad 4, late model GM 5.3L V8 and the Jeep / Dodge 4.7L) that utilize a low mounted thermostat need to be serviced using a hot car method as described in the User's Guide found with your coolant machine.

The Cold Car / Reverse Flow Service Method is the recommended way to service most vehicles. In this case, "Cold Car" is a reference to the fact that the vehicle is not running during the service. The key benefits of this style of service are improved cleansing effectiveness and reduced difficulty over other service options.

This service technique results in a quicker, easier service routine, utilizes a back-flush reverse fluid flow for better cleaning action and avoids the complications and technician concerns related to servicing a running vehicle. For even greater cleansing effectiveness, this style of service can be combined with a solvent-based cooling system cleaner (like VIPER Part No. 5090) to create the most effective cleaning action and remove more build-up of contaminants from the inside of the cooling system.

Prior to starting any cooling system service, perform a visual inspection of the cooling system, looking for obvious signs of system failures, such as missing components or leaking fluids. Always inquire from the customer as to the recent operation of system and the service history of the vehicle. Activated service lights, abnormal gauge readings and lack of heat, are all symptoms of greater service needs. Inquiring before beginning the service will save time and result in greater customer satisfaction.

Cold Car / Reverse Flow Service Method: Step 1 – Vehicle Connection

1. Remove radiator cap from vehicle and attach the proper Radiator Cap Adapter with male Quick Connect Insert installed.
2. Connect the Black Service Hose to the Radiator Cap Adapter, and position the Control Valves as follows: “Pump To” Processing Tank; “Pump From” Vehicle. (Some models may have different valve configurations – refer to the User’s Guide for matching valve positioning.)
3. Start the pump, remove fluid from vehicle until the upper radiator hose is completely collapsed and stop the pump. (**Note: Do not exceed 20 inches of vacuum –the pump is powerful enough to collapse radiator and heater cores.**)
4. Remove the Black Service Hose from the Radiator Cap Adapter and replace the Radiator Cap Adapter with the vehicle’s radiator cap. (**Highly recommended practice, as this will allow testing of the cap for proper operation and will act as a safety valve during coolant service**).
5. Remove the upper radiator hose from either the radiator or the thermostat housing (thermostat housing is preferred connection point).
6. Install the correct Cross Flow Adapters into the upper radiator hose and the radiator / thermostat housing. Ensure the closed ends are on the outside connection point. Check that all connections are properly secured with hose clamps.
7. Install a Female Quick Disconnect onto each Cross Flow Adapter.
8. The vehicle is now ready to be tested and serviced.

Cold Car / Reverse Flow Service Method: Step 2 – System Testing

Note: It is recommended that the system test be performed prior to service to ensure the integrity of the cooling system. The detailed vehicle connection steps listed below will help provide a clean vehicle connection minimizing any coolant spillage.

1. Connect the Black Service Hose to the Cross Flow Adapter closest to the radiator. Leave the Red Service Hose disconnected from the vehicle.
2. Turn the pump ON, using care to avoid over-pressuring the vehicle system. Monitor the pressure gauge and listen/watch for signs when the radiator cap is releasing. Ideally, the cap should release within +/- 3 psi of the rated pressure (rating is printed on cap). To determine current pressure relief of cap, listen for air escaping around cap seals or watch for bubbling in overflow tank. It is important, for proper vehicle function, that the radiator cap operate as rated. Caps that are opening at the incorrect pressure ratings can cause overheating and other coolant system circulation problems.
3. As soon as pressure release value is determined, stop the pump and monitor the pressure gauge, watching for leaks. Always replace defective radiator caps and perform any necessary system repairs before proceeding with coolant service. Avoid putting more pressure into the system than the cap is rated for. Excessive pressures may damage the radiator.
4. After finishing the cap test, remove the Black Service Hose from Cross Flow Adapter closest to radiator and connect to the Cross Flow Adapter closest to the thermostat housing. Vehicle is now ready for coolant service.

Cold Car / Reverse Flow Service Method: Step 3a – Solvent Flush (using Cooling System Cleaner) Followed by Coolant Exchange

Note: If not using a cooling system cleaner, skip to the next section.

This optional procedure is recommended for long-life cooling systems that show signs of sludge accumulation. A chemical cleaner will provide maximum cleaning action and restore cooling system performance. **VIPER** Cooling System Cleaner, Part No. 5090, is recommended for a powerful cleaning action and will not damage the cooling system. Please follow all recommended handling instructions.

1. Prior to performing a coolant cleaning service, empty the Processing Tank of all used fluid and add 1 gallon of clean water to the bottom of the tank. Connect the Black Service Hose to the Cross Flow Adapter closest to the thermostat, with the Red Service Hose connected to the other Cross Flow.
2. Add **VIPER** Cooling System Cleaner, Part No. 5090 (use 32 ounces of cleaner for up to 18 quarts of coolant), into to the 1 gallon of clean water in the Processing Tank (follow all directions on **VIPER** Cooling System Cleaner). Set control valves as follows: “Pump From” Processing Tank; “Pump To” Vehicle. (This will enable circulation of fluid from the Processing Tank into the vehicle and back into the Processing Tank again.)
3. Turn the pump ON while monitoring the System Pressure Gauge. It will take approximately 15-18 psi to open the thermostat. (Note that some thermostats will open at much lower pressures – these most likely will be defective and require replacement. Other thermostats may not open until the pressure reaches over 20 psi.) Never introduce more than 25 psi to the vehicle. If a thermostat will not open, stop the process and determine problem before proceeding.
4. The pressure of the fluid will drop as it passes the thermostat and will circulate at about half the rate required to open the thermostat. If pressure builds too high, it will open the radiator cap and fluid will flow into the overflow container. Monitor the overflow container fluid level during the cleaning process to avoid pressure issues and spillage.
5. Monitor the Sight Glass in the Red Service Hose until a small amount of fluid is passing through. A working flow rate of 3 to 4 quarts a minute is recommended. Continue the flushing action for 20-30 minutes or as suggested on cleaner.
6. When cleaning process has been completed, commence the coolant exchange process by switching the “Pump From” Control Valve so that it now indicates: “Pump From” New Tank. Throughout the service, monitor the sight glass. When all cleaner solution/old coolant mixture has been forced out of cooling system and replaced by new coolant, the coolant exchange process is complete.
7. After viewing new coolant in sight glass, turn pump OFF and disconnect the Red Service Hose. The vehicle will be full of new coolant.
8. To provide a clean and easy disconnect process, reverse the hook-up process and reassemble upper radiator hose to vehicle. By vacuuming the fluid out of the upper hose and top of radiator prior to disassembly, this step can be accomplished with minimal fluid loss.
9. Remove the overflow container lid and, if needed, vacuum out any remaining dirty fluid or cleaning solution utilizing the flexible pick up tube (included with unit) attached to the Black Service Hose. Use the following valve arrangement: “Pump From” Vehicle; “Pump To” Processing Tank.
10. To fill the overflow container and top-off the radiator, utilize the Black Service Hose with flexible tube attached. Position control valves as follows: “Pump From” New Tank; “Pump To” Vehicle. Slowly turn on the pump and top off vehicle system as needed.
11. Replace the radiator cap and start the vehicle to ensure proper operation. Check for any system leaks and, after vehicle reaches operating temperature, ensure all fluids are at proper levels. The service is complete.

Cold Car / Reverse Flow Service Method: Step 3b – Standard Coolant Exchange

1. Fill the New Coolant Tank with the correct amount of the proper type of coolant. It is recommended that the New Coolant Tank be filled with at least the rated capacity of the vehicle's cooling system (plus the prime level) and the best practice is to fill 10-20% more new coolant than the vehicle's rated capacity. **Never run the onboard coolant storage tanks dry.**
2. Place the Control Valves in the following positions: "Pump From" New Tank; "Pump To" Vehicle. Connect the Black Service Hose to the Cross Flow Adapter closest to the thermostat, with the Red Service Hose connected to the other Cross Flow Adapter.
3. Turn the pump ON while monitoring the System Pressure Gauge. It will take approximately 15-18 psi to open the thermostat. (Note that some thermostats will open at much lower pressures – these most likely will be defective and require replacement. Other thermostats may not open until the pressure reaches over 20 psi.) Never introduce more than 25 psi to the vehicle. If a thermostat will not open, stop the process and determine problem before proceeding.
4. The pressure of the fluid will drop as it passes the thermostat and will circulate at about half the rate required to open the thermostat. If pressure builds too high, it will open the radiator cap and fluid will flow into the overflow container. Monitor the overflow container fluid level during the cleaning process to avoid pressure issues and spillage.
5. Throughout the service, monitor the Sight Glass. When all cleaner solution/old coolant mixture has been forced out of cooling system and replaced by new coolant, the coolant exchange process is complete.
6. After viewing new coolant in sight glass, turn pump OFF and disconnect the Red Service Hose. The vehicle will be full of new coolant.
7. To provide a clean and easy disconnect process, reverse the hook-up process and reassemble upper radiator hose to vehicle. By vacuuming the fluid out of the upper hose and top of radiator prior to disassembly, this step can be accomplished with minimal fluid loss.
8. Remove the overflow container lid and, if needed, vacuum out any remaining dirty fluid utilizing the flexible pick up tube (included with unit) attached to the Black Service Hose. Use the following valve arrangement: "Pump From" Vehicle; "Pump To" Processing Tank.
9. To fill the overflow container and top-off the radiator, utilize the Black Service Hose with flexible tube attached. Position control valves as follows: "Pump From" New Tank; "Pump To" Vehicle. Slowly turn on the pump and top off vehicle system as needed.
10. Replace the radiator cap and start the vehicle to ensure proper operation. Check for any system leaks and, after vehicle reaches operating temperature, ensure all fluids are at proper levels. The service is complete.

COOLANT SERVICE TIPS

(Designed for VIPER AF3250, AF3400 and SOLAR 7500 – Good suggestions for all units)

1. The fluid required for “Primer Level” is 1 gallon.
2. During normal operation, the rate of fluid flow through a cooling system is approximately 3 – 4 quarts per minute.
3. The internal pump on the shop air powered coolant machines can pull up to 20 inches of vacuum or provide up to 40 psi of pressure. Care must be taken in both cases to avoid damaging cooling system components such as radiators and heater cores.
4. All coolants (except for Sierra brand) are ethylene glycol based but differ with unique additives and colorants. Ethylene glycol will never wear out – only the additives package will. The additives in standard coolants and long-life coolants are not compatible and should not be mixed for extended use.
5. Long-life coolants contain organic additives. These additives coat the inside of a brand new system when first installed and this coating is what gives the coolant its ability to provide longer service intervals. When exposed to air in a low fluid situation, this coating can “grow” and cause blockage in the cooling system, reducing system and vehicle performance. A good coolant flush (using a chemical cleaner) is required to remove this build-up and restore the cooling system to normal operating efficiency. Although many cooling system cleaners contain acid, requiring extra care in handling and use, the **VIPER** Cooling System Cleaner is acid-free. Follow all manufacturer’s recommended practices when using a cooling system cleaner chemical.
6. When long-life coolants are placed into a system that first contained standard coolant, the performance will not act as in a new installation. This is due to the internal cooling system components already being exposed to inorganic additives. A chemical flush will help remove some of the inorganic contaminants and allow the cooling system to perform better using long life coolant than it would if a chemical flush were not performed.
7. Radiator cap manufacturers claims that as many as 1 in every 5 caps in the general vehicle population is operating improperly and should be replaced. Always perform a pressure test to ensure proper cap function – this is a great way to ensure the vehicle owner gets the greatest benefit from a cooling system service and it increases your service revenue.
8. If a **VIPER** or **SOLAR** machine appears to not be circulating fluid properly, remove the hoses from the front of the unit and examine the screens. Partially plugged screens will create a blockage and slow down the coolant exchange process.
9. For optimum performance and longer pump life, periodically rinse out the Used Coolant Tank to remove the debris collecting in the bottom of the tank. These larger particles and pieces can get lodged in the pump or the screens and affect performance.
10. Always perform a cooling system service with the radiator cap installed. This will act as a safety valve during the process and minimize risk of damage to the vehicle’s cooling system if, for any reason, too much pressure develops during the service.