MOTORVAC®
CARBONCLEAN®
SYSTEM

Fuel System Service & Diagnostic Equipment

OPERATOR'S MANUAL

MCS 245

PDF VERSION

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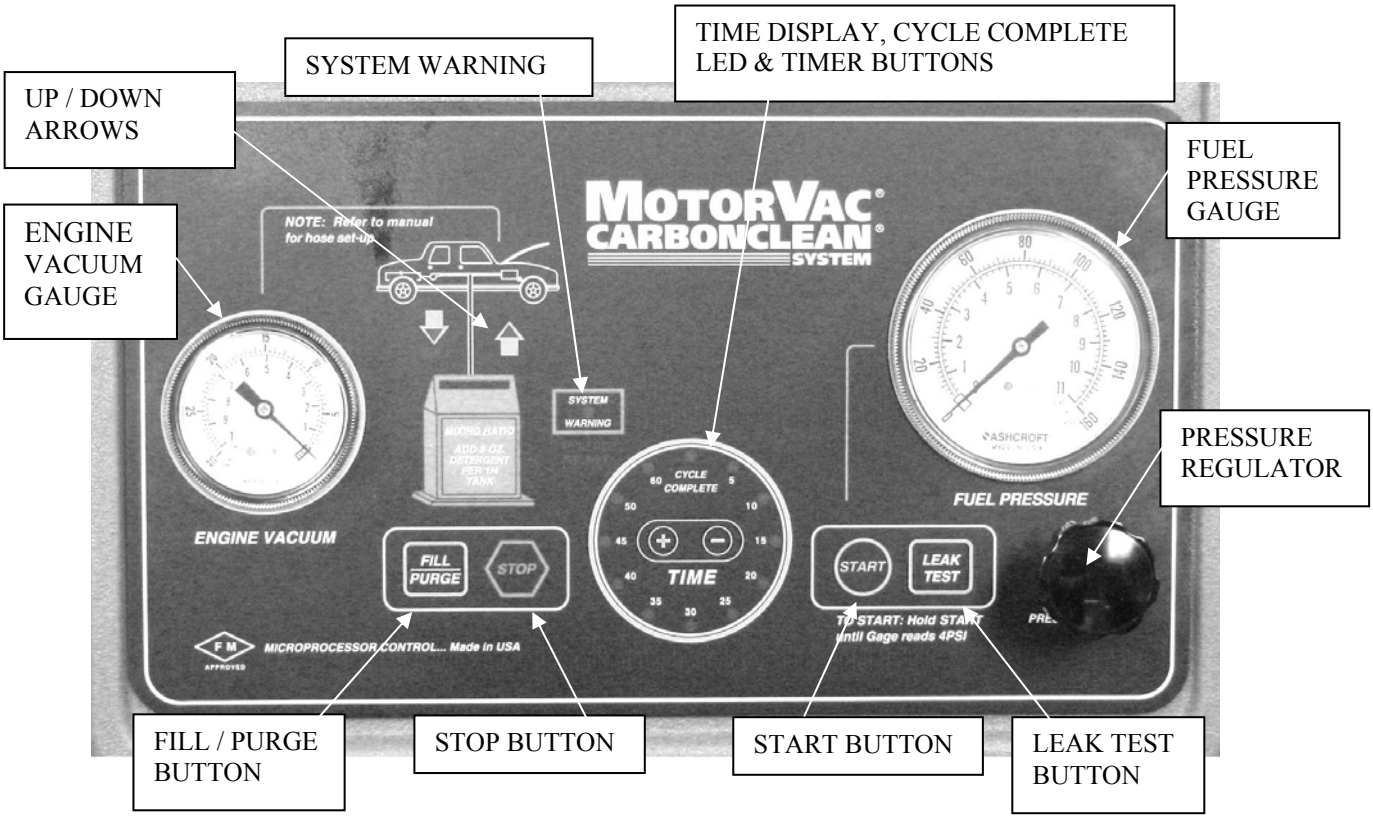
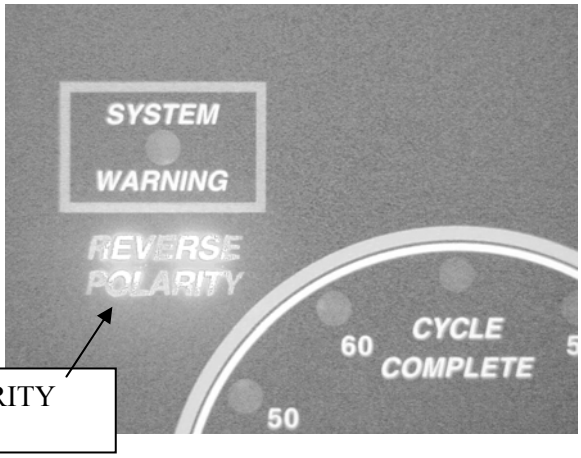
System Features and Functions

The front of the **MotorVac CarbonClean System** cabinet contains a software-driven control panel, the opening for the fuel reservoir, and storage drawers for adaptors and other system accessories.





REVERSE POLARITY LED

System Features and Functions

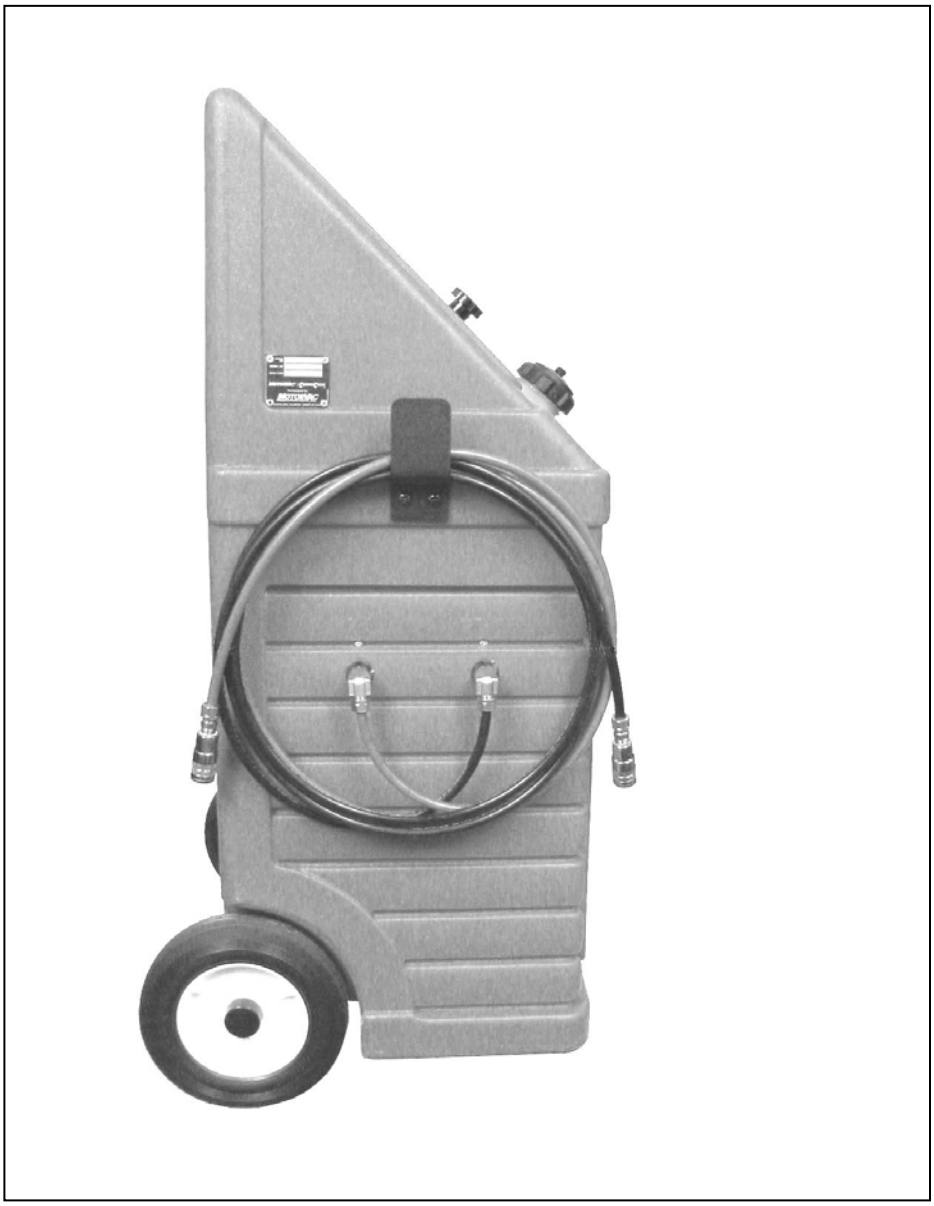
Descriptions of the gauges, control buttons, and LED indicators that make up the control panel are listed below. Please become familiar with these control panel features and functions before using the unit**.**

Stop Button	Stops all run conditions.
Fill/Purge Button	**Fill:** Transfers fuel from the fuel tank of the vehicle being serviced to the unit's reservoir. **Purge:** Relieves fuel lines of remaining pressure by transferring fuel back into the unit's reservoir.
Engine Vacuum Gauge	Displays vacuum pressure on the vehicle being serviced.
Reverse Polarity LED	Illuminates when: • Polarity is reversed on the connection between the vehicle battery and the unit.
Down Arrow LED	Illuminates when the fill/purge process is under way.
Up Arrow LED	Illuminates when the service is under way.
System Warning LED	Illuminates when: • The fuel/detergent mixture runs out before run time expires. • Vehicle or unit pressure drop (less than 5psi) is detected.
Warning Alarm	Sounds when the service is complete, or when the vehicle or unit's pressure drops below 5psi.
Fuel Level Window	To view the amount of fuel/detergent mixture remaining in the unit's reservoir.
Cycle Complete LED	Illuminates when the service ends.
Fuel Pressure Gauge	Displays output pressure of the unit's output hose, or system pressure of the vehicle being serviced.
Start Button	Begins the service.
Pressure Adjust Regulator	Used to adjust the system pressure during the cleaning process. Turn clockwise to close (increase the pressure); counterclockwise to open (decrease the pressure).
Leak Test Button	Begins the Leak Test.
Timer Buttons	Allows the increasing or decreasing of time on the timer. The **+** button increases the time, and the **—** button decreases the time.
Time LED	A circle of LEDs displaying the time in five-minute increments.

FRONT VIEW

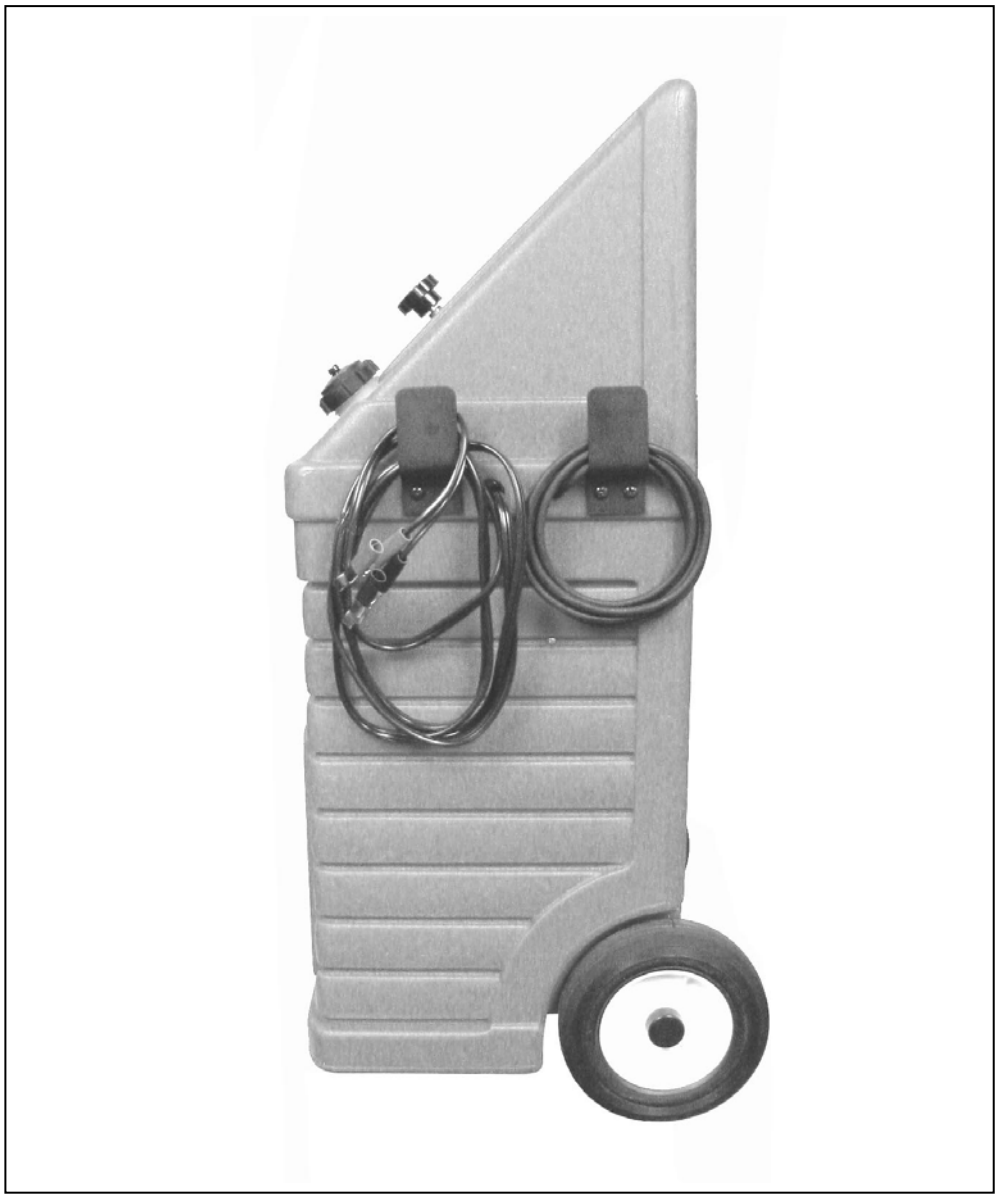
LEFT VIEW

As you face the system, the left side of the unit's cabinet holds the fuel return and output hoses, while the right side of the unit's cabinet holds the battery cables and vacuum pressure hose.



Output Hose (red)	Connects to the input side of the vehicle's engine fuel system.
Return Hose (black)	Connects to the return side of the vehicle's engine fuel system.
Quick Couplers	Secures the unit's return/output hose connections to the vehicle's engine fuel system.

RIGHT VIEW



Vacuum Hose — Forms a connection between the vacuum pressure from the vehicle engine and the vacuum pressure gauge on the unit.

Battery Cables — Positive (red) and negative (black) battery connections (12-16 VOLTS DC and 8 AMPERES)

BACK VIEW

The back of the unit's cabinet contains an easy access area for the fuel filter, along with storage slots for shop towels, detergent bottles, etc. Please see **Appendix A** for information on replacing the unit's fuel filter.

Theory of Operations

Detailed descriptions of the various operations, control buttons, and LED indicators are listed below.

Fill Operation:

- Press and Hold the FILL/PURGE button. This opens the solenoid and starts the pump motor in the Fill/Purge direction. Releasing the button stops the motor and closes the solenoid.

- Whenever the motor is pumping in the Fill/Purge mode, the DOWN ARROW LED (Pointing down away from the picture of the car on the panel) is on.

Cleaning (Service) Operation:

- Press and hold the START button. This opens the solenoid and starts the pump motor in the Service direction

- Release the START button after the pressure gauge reads at least 5 PSI. The pump will continue to run and TIME LED will display time remaining.

- When the run time is complete, the pump motor stops and warning beeper will sound for 6 seconds. One second after the pump motor stops, the pump motor will start and run in the purge mode (reverse) direction for 5 seconds. The solenoid remains open during the purge mode. When the purge is complete, the pump motor stops and the solenoid closes.

- If the pressure drops below 4 PSI while the engine is running, or the START button is released before the pressure reaches 4 PSI, the motor will stop for one second, then run in the purge mode (reverse direction) for 5 seconds with the solenoid open. When the purge is complete, the pump motor stops and the solenoid closes.

- Whenever the unit's motor is pumping in the clean mode the UP ARROW LED (Pointing up towards the picture of the car on the panel) is on. This LED will blink while the pressure switch is open (less than 4 PSI) and stays on solid when the pressure switch is closed (greater than 4 PSI).

Leak Test Operation:

- While in the service mode, press and release the LEAK TEST button. The solenoid will close and the TIME LED will show the leak test time remaining.

- During the leak test, only the TIME LED display will be on.

- To end the leak test mode and begin the cleaning service, press the start button.

- To end the leak test mode, press and release the STOP button. This will open the solenoid and begin the purge mode.

Pressure Switch Operation:

- The pressure switch is opened when the pressure is less than 4 PSI and is closed when the pressure is 4 PSI or greater.

- The internal pressure switch is not adjustable.

Solenoid Operation:

- The solenoid opens when the pump motor is running in either fill/purge or cleaning (service) mode. Note: The solenoid is normally closed.

Stop Operation:

- Whenever the STOP button is pressed, the unit's pump motor will stop and TIME LED display is turned off. The unit will automatically go into purge mode.

Timer Operation:

- LED will blink in five-minute increments. For example, if 12 minutes are left in the run cycle, the 15-minute LED will flash until the timer reaches 10 minutes.

- When the timer reaches 0 minutes left, the CYCLE COMPETE LED will go on and the end of service alarm will sound.

Service Time Operation:

- The TIME **+** and the **—** buttons are used to adjust the service time, while the cleaning or leak test is in progress.

- The maximum time available is 60 minutes; the minimum time available is 5 minutes. The time is adjusted in increments of 5 minutes. There is a 10-minute increment between 50 and 60 minutes, so a time of 55 minutes cannot be set.

- When the timer starts, the time can be adjusted. The first minute after setting the timer, the unit will check to see if the time has changed. If it has, this new time will be stored as the cycle time for the current run. This applies to cleaning and leak test times.

- If the **—** button is continuously pressed until the time reaches zero, the end of service alarm will sound and the CYCLE COMPLETE LED will turn on.

- When the unit is powered on, the CYCLE COMPLETE LED is displayed.

Fuel Level Window Operation:

- The FUEL LEVEL WINDOW shows the amount of fuel in the tank.

- The FUEL LEVEL WINDOW indicates the fuel level in 1/8-tank increments. From the empty to the full mark is approximately one gallon.

- When the FUEL LEVEL WINDOW is at the empty ("E") level there is approximately one and a half quarts of fuel in reserve below the reservoir empty level, in the filter, pump, tank, and lines.

Safety Information and Precautions

/!\ DANGER

Vehicle exhaust gases contain Carbon Monoxide, which is a colorless and odorless lethal gas.

Only run engines in well-ventilated areas and avoid breathing exhaust gases.

Extended breathing of exhaust gases will cause serious injury or death.

/!\ WARNING

Exhaust gases, moving parts, hot surfaces, and potent chemicals are present during the use of the fuel system cleaner.

Read and understand the operator's manual before using the fuel system cleaner.

When using chemicals always refer to the MSDS sheets and manufacturer's instructions for the proper procedure to handle emergency medical treatment, cleanup, handling, and storage requirements.

Improper use of the fuel system cleaner or exposure to exhaust gases or cleaning chemicals can cause injury.

Flammable fuel chemical and vapors can ignite.

Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.

Always keep fully charge fire extinguisher nearby. The extinguisher should have a class B rating and be suitable for gasoline, chemical, and electrical fires.

Cleanup any fuel or chemical spills immediately.

Dispose of contaminated cleanup material according to governing environmental laws.

Never look directly into the air induction plenum or carburetor throat when the engine is operating.

Always plug or cap any open fuel lines during service.

Keep Cleaner and Detergent container closed except when filling reservoir.

Explosion or flame or exposure to flammable liquid and vapors can cause injury.

Flammable liquid can splash out of reservoir when pump is on and/or unit is being moved.

Always keep Reservoir Cap secure except when filling reservoir.

Explosion or flame can cause injury.

Many fuel systems maintain residual pressure in fuel lines even after the engine has been turned off.

Wear safety goggles.

Wear chemical resistant gloves when connecting or disconnecting fitting and adaptors.

Obtain ZERO psi before connecting or disconnecting any fuel lines or adaptors.

Explosion or flame or exposure to flammable liquid and vapors can cause injury.

Chemicals can cause harmful byproducts.

Use only approved chemicals (refer to operator's manual).

Do not swallow or ingest any chemicals.

Use with adequate ventilation. Avoid breathing vapors.

Do not store chemicals on the machine.

Improper use of chemicals can cause injury.

Over exposure can have harmful effect on eyes, skin, respiratory system and possible unconsciousness and asphyxiation.

Improperly blocked vehicles can move.

Set the parking brake and chock the wheels.

Moving vehicles can cause injury.

Moving engine parts.
The engine cooling fan will cycle on and off depending on the coolant temperature and could operate without the engine running.
Wear safety goggles.
Always keep objects, clothing, and hands away from the cooling fans and engine parts.
Moving engine parts can cause injury.

Hot surfaces are present during and after running the engine.
Do not contact hot surfaces such as, manifolds, pipes, mufflers, catalytic converters, or radiators and hoses.
Hot surfaces can cause injury.

Catalytic converters become extremely hot.
Do not park a converter-equipped vehicle over dry grass, leaves, paper, or any other flammable material.
Do not touch a catalytic converter until the engine has been off for at least 45 minutes.
For tests allowing unburned hydrocarbons or service involving operation of an overly rich condition, minimize the time of rich operation, monitor the catalytic converter temperature, and allow at least two minutes of operation at normal mixture subsequent to testing or service for converter cooling.
Catalytic converters can cause burns.

Cracked fan blade can become airborne.
Examine fan blades for cracks. If found, do not service the vehicle.
Flying objects can cause injury.

Batteries produce explosive gases and can explode.
Wear safety goggles when working on or near batteries.
Use in a well-ventilated area.
Keep sparks and flames away from the battery and never lay tools, equipment, or other conductive objects on the battery.
When tools or equipment is connected to the battery, make sure the equipment power switch is off.
Connect the positive lead of the equipment to the positive lead battery first; connect the negative lead of the equipment to a solid ground point as far from the battery as possible.
Keep battery acid away from skin or eyes. In case of eye contact, flush with clean water for 15 minutes and get medical attention.
Battery explosion and ignited gases can cause injury.

Before You Begin

First Time Operation

> **NOTE**
>
> **The following process is used to flush factory testing fluids out of your new machine, and is only necessary before the first time you use the unit.**
>
> **Remember to send in your warranty card to properly register your machine.**

1. Verify that the unit's fuel filter is connected and securely in place on the filter base assembly at the rear of the cabinet**.**

2. Check the output/return hoses, battery connections, and all external components for damage**.**

3. Turn the **Pressure Adjust** regulator on the unit control panel counterclockwise until it is completely open**.**

4. Attach the unit to a motor vehicle battery by connecting the **red** battery clip to the positive (**+**) battery terminal and connect the **black** battery clip to a solid ground point as far from the battery as possible.

5. Fill the unit's reservoir with **clean gasoline** until the **Fuel Level Window** indicates 1/4 tank**.**

6. Connect the unit's output (**red**) hose and return (**black**) hose together by using the #060-1100 and #060-1400 adaptors and securing them with a clamp. Follow the procedures below to flush fuel through the system:

- Press and hold the **Start** button for five minutes. This will thoroughly flush the system with clean gasoline.
- Release the **Start** button.

7. Disconnect the output and return lines.

8. Connect the #060-1100 adaptor to the (**red**) output hose. To flush the gasoline from the unit's reservoir using the following procedure:

- Direct the adaptor on the (**red**) output hose into an appropriate container.
- Press and hold the **Start** button until the unit's reservoir is empty.
- Release the **Start** button.
- **Dispose of the fuel in an environmentally approved method.**

9. The unit's reservoir is now completely drained of fuel. Follow the steps below before performing the first cleaning service:

- If necessary, Repeat **Steps 3-4** from the previous page.
- Pour **20 oz**. of detergent to the unit's reservoir.
- Add clean gasoline to the unit's fuel reservoir until the mixture of fuel and detergent reaches 1/4 tank according to the **Fuel Level Window**.
- The unit is now ready to perform a cleaning service.

NOTE: When adding detergent to reservoir, pour in the 8oz. bottle of detergent first. For each 8oz. bottle, bring fuel level to ¼ level. When tank is at zero, add four 8oz bottles of detergent first, then fill reservoir to top with fuel. From the empty level to the full level is approximately one gallon.

Fuel System Cleaning Procedures

Determining the Vehicle's Fuel System Type

It is very important to determine the fuel system type of the vehicle to be serviced before performing any setup or cleaning procedure on the vehicle. The unit can be used with any of the four different types of fuel systems listed below:

Carburetion

Carburetors come in a variety of sizes and shapes. Locating the choke plate in the air horn can easily identify these.

Throttle Body Injection (TBI)

Throttle bodies are centrally mounted, as are carburetors, and use one or two electronic injectors mounted in the throttle body.

Port Fuel Injection (PFI)

This system uses one electronic injector per cylinder, mounted so that fuel spray is directed into the intake port.

Continuous Injection System (CIS)

Noting the fuel distributor and the solid steel or flex steel lines running from the fuel distributor to each individual injector easily identifies a Continuous Injection System. The fuel distributor controls the amount of fuel sprayed into the intake port while the injectors control the opening and closing pressure.

Returnless Injection System

Returnless fuel systems are similar to Port Fuel Injection systems with a few exceptions. Returnless systems do not have a pressure regulator on the fuel rail & do not use a fuel return line leading back to the fuel tank. Because these systems do not control pressure at the rail assembly (Pressure is regulated inside the fuel tank) and do not have a provision for a return line connection, the rail flush procedure is not performed. Refer to the Returnless fuel section for specific procedures.

NOTE

Once you have determined the fuel system type, turn to the appropriate section in this chapter for instructions on how to perform the fuel line setup and cleaning procedure for that system.

Carburetor Setup Procedure

Follow the steps below to connect the unit to the vehicle's fuel system in order to obtain fuel from the vehicle for use during the cleaning procedure. Make sure the vehicle has at least 1/8 tank of fuel before beginning this process.

1.Start the vehicle and allow the engine to reach normal operating temperature**.**

> **IMPORTANT**
>
> **Do not perform the setup or cleaning process if the vehicle's engine oil or coolant level is low. If necessary, add oil and/or coolant to the vehicle.**

2. **Turn the vehicle OFF** when normal operating temperature has been reached.

3. Turn the **Pressure Adjust** regulator counterclockwise until the regulator is completely open.

4. Attach the unit to the vehicle's battery by connecting the **red** battery clip to the positive (**+**) Battery terminal and the **black** battery clip to a solid ground point as far from the battery as possible.

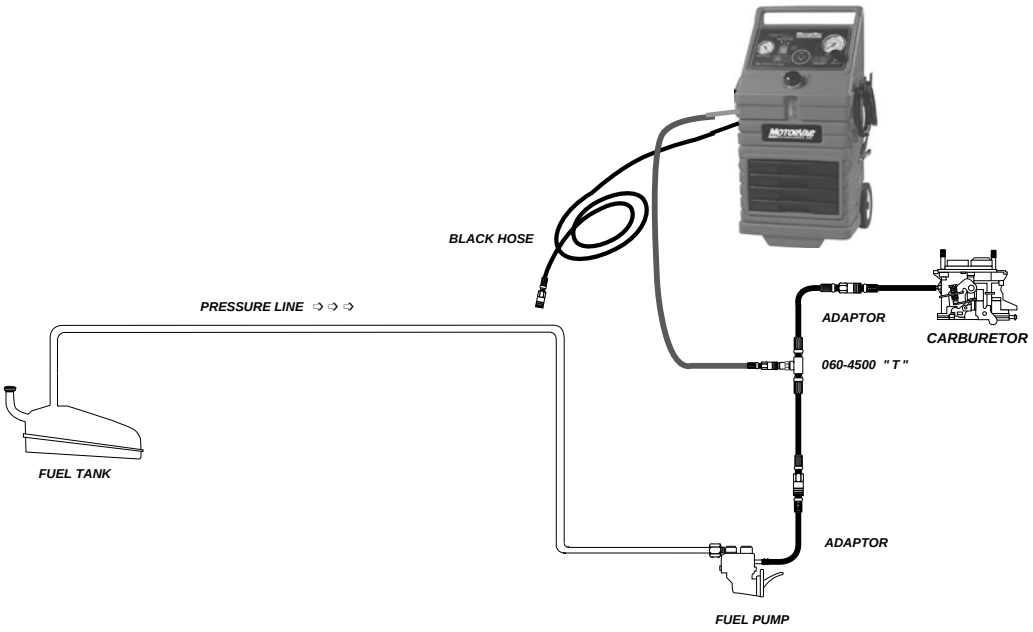
   If the **Reverse Polarity** LED comes on, make sure the connections to the vehicle's battery are correct as described above.

5. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

6. **Verify that the engine is no longer running.**

7. Disconnect the vehicle's fuel line at the carburetor inlet or at the fuel pump outlet. There should now be two open ends to work with:
   - one coming from the fuel pump.
   - the other going into the carburetor.

8. As shown below, connect the appropriate adaptors at the two points listed in **Step 7.**



9. As shown in the previous figure, attach the ends of the T-adaptor (#060-4500) to both adaptors, and then attach the output (**red**) hose to the center connection on the T-adaptor. The return (**black**) hose on the unit is not used at this time.

10. **Start the vehicle's engine** and check all connections for leaks. Make a note of the **Fuel Pressure** gauge on the unit to test system pressure, since pressure loss can indicate a leak.

DIAGNOSTICS

The vehicle's fuel system is now prepared to perform diagnostic tests if desired. For instructions on how to perform these tests, go to the next chapter titled Vehicle Diagnostics.

If vehicle diagnostics are not desired, continue the cleaning procedure beginning with Step 11 below.

11. When filling the reservoir, add 8 oz. of detergent first for every 1/4 tank of fuel added.

12. Press and hold the **Fill/Purge** button on the control panel until the **Fuel Level Window** indicates a combined increase of 1/4 tank in the unit's fuel reservoir.

NOTE

If the vehicle's engine stalls, restrict pressure in the fuel line by turning the gate valve on the T-adaptor (#060-4500) clockwise 1/4 turn. Re-start the car and repeat Step 12. If the vehicle's engine stalls again, repeat this procedure until Step 12 is completed.

13. **Turn off the vehicle's engine.**

14. Verify the **Pressure Adjust** regulator on the unit is completely open.

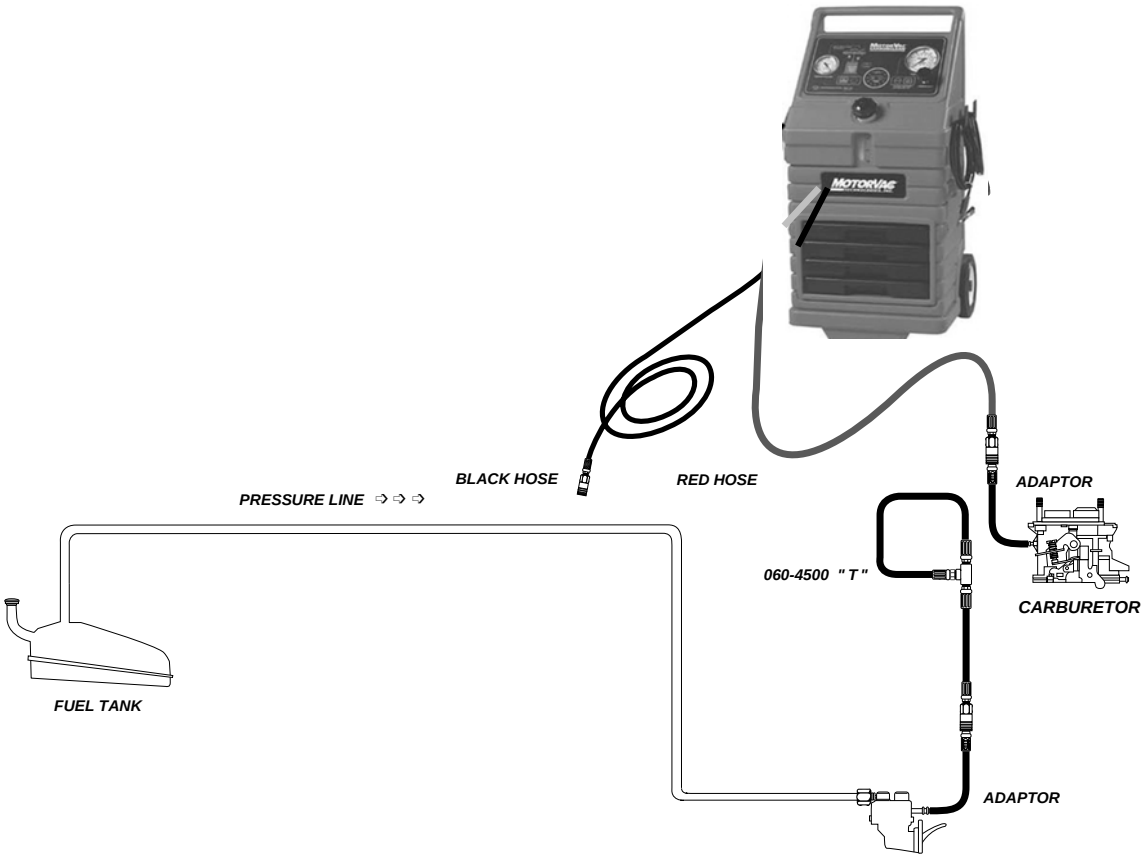
15. Press and hold the **Fill/Purge** button for five seconds. This will relieve pressure in the output (**red**) hose. Release the **Fill/Purge** button.

/!\ WARNING

Flammable Liquid can squirt out of pressurized lines when connecting or disconnecting.
Wear Safety goggles.
Obtain ZERO pressure before connecting or disconnecting any fuel lines or adaptors.
Wear chemical resistant gloves when connecting or disconnecting fittings and adaptors.
Wrap shop towel around pressure fittings and adaptors when disconnecting.
Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.
Explosion or flame or exposure to flammable liquid and vapors can cause injury.

16. Close the gate valve on the T-adaptor (#060-4500), and then carefully remove the output (**red**) hose from the T-adaptor (#060-4500).

17. As shown in the next figure, disconnect the female end of the T-adaptor (#060-4500) from the carburetor and connect it to itself at the male fitting**.** This stops the flow of fuel from the vehicle to the carburetor during the cleaning process.



18. As shown in the previous figure, connect the output (**red**) hose from the unit to the adaptor going into the carburetor.

You are now ready to perform the carburetor cleaning procedure.

Carburetor Cleaning Procedure

Follow the steps below to circulate the fuel/detergent mixture through the vehicle's carburetor.

1. Verify that **Carburetor Setup Steps 1-18** above have been completed.

2. Refer to the vehicle's service manual for the manufacturer's recommended PSI.

- **At this point, refer to appropriate Intake System Cleaning Procedure section for proper intake cleaning, and Vacuum gauge connections in the vehicle diagnostics chapter.**

3. Press and hold the **Start** button.

4. Turn the **Pressure Adjust** regulator clockwise until the **Fuel Pressure** gauge reads **4 PSI,** or the equivalent of the manufacturer's recommended specifications. It may be necessary to increase the pressure to the level previously noted in **Step 10** of the **Carburetor Setup Procedure**.

5. Release the **Start** button.

6. Press the **+** button to increase the time, or the **—** button to decrease the time until the **Time** LED displays 30 minutes. (Run time may be adjusted depending on the condition of the vehicle's fuel system.)

7. **Start the vehicle** to begin the fuel system cleaning process.

- When the cleaning process is halfway completed (check **Time** LED display), step on the vehicle's accelerator quickly three or four times. **Then, maintain RPM at 1500 - 2000 for 30 seconds.**

8. When the run time expires, the cleaning is complete. The unit will automatically shut off and purge the pressure lines for five seconds. The **Cycle Complete** LED on the control panel will illuminate, and the unit's alarm will sound.

9. **Turn OFF the vehicle's ignition.**

10. Turn the **Pressure Adjust** regulator counterclockwise on the unit to open it. Press and hold the **Fill/Purge** button for four seconds to relieve pressure from the output (**red**) hose. Release the **Fill/Purge** button.

11. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

IMPORTANT

Wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

12. Disconnect the battery leads, hoses, and adaptors. Return the vehicle's fuel system to its normal operating condition by re-connecting the vehicle's fuel lines.

13. **Start the vehicle** and verify that there are no leaks.

14. Test drive the vehicle for three miles immediately following the cleaning service to flush all detergent from the vehicle's fuel and exhaust systems.

Throttle Body Injection (TBI) Setup Procedure

Follow the steps below to connect the unit to the vehicle's fuel system in order to obtain fuel from the vehicle for use during the cleaning procedure. Make sure the vehicle has at least 1/8 tank of fuel before beginning this process.

1. Start the vehicle and allow the engine to reach normal operating temperature**.**

IMPORTANT

Do not perform the setup or cleaning process if the vehicle's engine oil or coolant level is low. If necessary, add oil and/or coolant to the vehicle.

2. **Turn the vehicle OFF** when normal operating temperature has been reached.

3. Turn the **Pressure Adjust** regulator counterclockwise until the regulator is completely open.

4. Attach the unit to the vehicle's battery by connecting the **red** battery clip to the positive (**+**) battery terminal and the **black** battery clip to a solid ground point as far from the battery as possible.

   If the **Reverse Polarity** LED comes on, make sure the connections to the vehicle's battery are correct as described above.

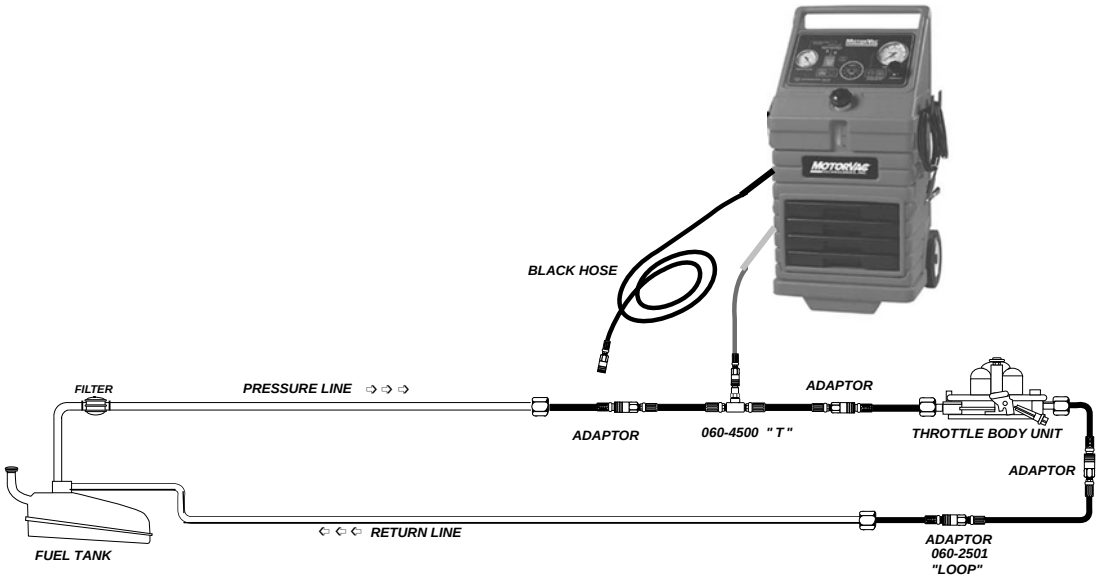
5. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

6. **Verify that the engine is no longer running.**

7. Disconnect the vehicle's fuel lines from the throttle body. There are now four open ends to work with:

Pressure Line:	**Return Line:**
From the tank	From the throttle body
To the throttle body	To the tank.

8. As shown in the next figure, connect the appropriate adaptors at the points listed in **Step 7**.



9. As shown in the previous figure, attach the T-adaptor (#060-4500) and the loop adaptor (#060-2501) as follows:

- Attach the ends of the T-adaptor (#060-4500) to both pressure line adaptors, then attach the output (**red**) hose to the center connection on the T-adaptor.

- Attach the loop adaptor (#060-2501) to both return side adaptors. The return (**black**) hose on the unit is not used at this time.

10. **Start the vehicle** and check connections for leaks. Watch the **Fuel Pressure** gauge on the control panel to test system pressure, since pressure loss could indicate a leak.

DIAGNOSTICS

The vehicle's fuel system is now prepared to perform diagnostic tests if desired. For instructions on how to perform these tests, go to the next chapter titled Vehicle Diagnostics.

If vehicle diagnostics are not desired, continue the cleaning procedure beginning with Step 11 below.

11. When filling the reservoir, add 8 oz. of detergent first for every 1/4 tank of fuel added.

12. Press and hold the **Fill/Purge** button on the control panel until the **Fuel Level Window** indicates a combined increase of 1/4 tank in the unit's fuel reservoir.

NOTE

If the vehicle's engine stalls, restrict pressure in the fuel line by turning the gate valve on the T-adaptor (#060-4500) clockwise 1/4 turn. Re-start the car and repeat Step 12. If the vehicle's engine stalls again, repeat this procedure until Step 12 is completed.

13. **Turn off the vehicle's engine.**

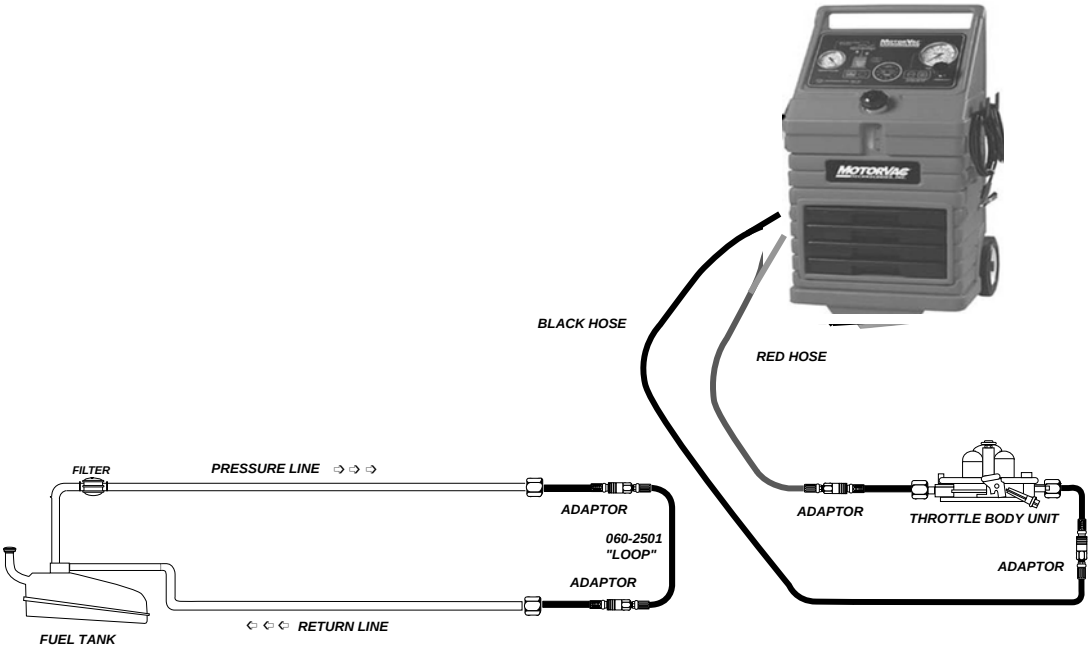
14. Press the **Fill/Purge** button. Wait four to five seconds to relieve the pressure in the output (**red**) hose. Release the **Fill/Purge** button.

/!\ WARNING

Flammable Liquid can squirt out of pressurized lines when connecting or disconnecting.
Wear Safety goggles.
Obtain ZERO pressure before connecting or disconnecting any fuel lines or adaptors.
Wear chemical resistant gloves when connecting or disconnecting fittings and adaptors.
Wrap shop towel around pressure fittings and adaptors when disconnecting.
Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.
Explosion or flame or exposure to flammable liquid and vapors can cause injury.

15. Carefully disconnect the loop adaptor (#060-2501) from the return lines. Close the gate valve on the T-adaptor (#060-4500) and then carefully disconnect the T-adaptor (#060-4500) from the output (**red**) hose and the pressure lines.

16. As shown in the next figure, connect one end of the loop adaptor (#060-2501) to the pressure line coming from the vehicle's fuel tank. Connect the other end of the loop adaptor (#060-2501) to the return line going back to the fuel tank. This forms a tank-to-tank loop, making it unnecessary to disconnect the fuel pump.



17. As shown in the previous figure, connect the output (**red**) hose from the unit to the adaptor on the pressure line going into the TBI unit.

18. As shown in the previous figure, connect the return (**black**) hose from the unit to the adaptor on the return line coming from the TBI unit.

You are now ready to perform the TBI cleaning procedure.

Throttle Body Injection (TBI) Cleaning Procedure

Follow these steps to circulate the cleaning mixture through the **TBI** unit to clean the throttle body, injector screens, and pressure regulator.

1. Verify that **TBI Setup Steps 1-18** above have been completed before continuing

2. Refer to the vehicle's service manual for the manufacturer's recommended PSI.

3. Press and hold the **Start** button.

4. Close the **Pressure Adjust** regulator clockwise until the **Fuel Pressure** gauge on the unit displays the vehicles operating pressure and the **Up Arrow** LED stays illuminated without flashing. This will clean the TBI unit and filter the particles through the unit's filtering system.

5. Release the **Start** button.

- Make a note of the fuel pressure reading; this is the true opening pressure of the vehicle's pressure regulator without vacuum assist when the engine is at normal operating temperature.
- **At this point, refer to appropriate Intake System Cleaning Procedure section for proper intake cleaning, and Vacuum gauge connections in the vehicle diagnostics chapter.**

6. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED displays 10 minutes.

7. After the 10 minutes has expired on the **Time** LED display, press and hold the **Start** button until the pressure rises and then release.

8. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED display indicates 30 minutes. (Run time may be adjusted depending on the condition of the vehicle's fuel system.)

9. **Start the vehicle** to begin the fuel system cleaning process.

10. When the run time expires, the cleaning is complete. The unit will automatically shut off and purge the pressure lines for five seconds. The **Cycle Complete** LED on the control panel will illuminate, and the unit's alarm will sound.

11. **Turn OFF the vehicle's ignition.**

12. Turn the **Pressure Adjust** regulator counterclockwise on the unit to open it. Press and hold the **Fill/Purge** button for four seconds to relieve pressure from the output (**red**) hose. Release the **Fill/Purge** button.

13. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

IMPORTANT

Wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

14. Disconnect the battery leads, hoses, and adaptors. Return the vehicle's fuel system to its normal operating condition by re-connecting the vehicle's fuel lines.

15. **Start the vehicle** and verify that there are no leaks.

16. Test drive the vehicle for three miles immediately following the cleaning service to flush all detergent from the vehicle's fuel and exhaust systems.

Port Fuel Injection (PFI) Setup Procedure

Follow the steps below to connect the unit to the vehicle's fuel system in order to obtain fuel from the vehicle for use during the cleaning procedure. Make sure the vehicle has at least 1/8 tank of fuel before beginning this process.

1. Start the vehicle and allow the engine to reach normal operating temperature**.**

> **IMPORTANT**
>
> **Do not perform the setup or cleaning process if the vehicle's engine oil or coolant level is low. If necessary, add oil and/or coolant to the vehicle.**

2. **Turn the vehicle OFF** when normal operating temperature has been reached.

3. Turn the **Pressure Adjust** regulator counterclockwise until the regulator is completely open.

4. Attach the unit to the vehicle's battery by connecting the **red** battery clip to the positive (**+**) battery terminal and the **black** battery clip to a solid ground point as far from the battery as possible.

   If the **Reverse Polarity** LED comes on, make sure the connections to the vehicle's battery are correct as described above.

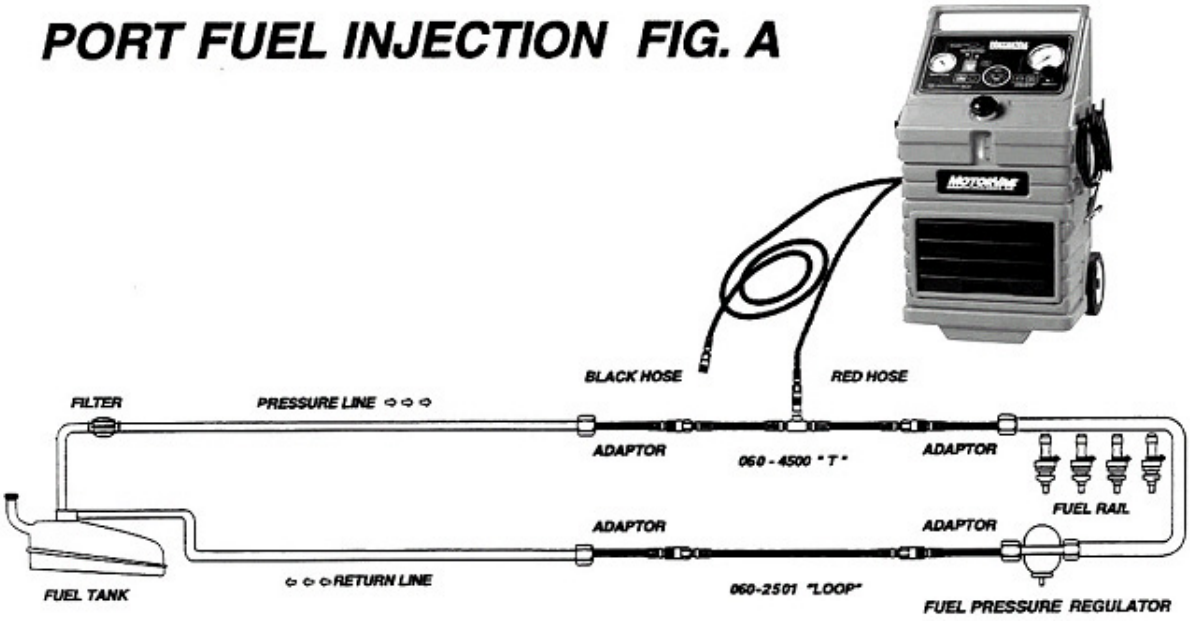
5. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

6. **Verify that the engine is no longer running.**

7. Disconnect the vehicle's fuel lines from the fuel rail. There are now four open ends to work with:

Pressure Line:	**Return Line:**
From the fuel tank	From the fuel rail
To the fuel rail	To the fuel tank

8. As shown in the next figure, connect the appropriate adaptors at the points listed in **Step 7**.



9. As shown in the previous figure, attach the T-adaptor (#060-4500) and the loop adaptor (#060-2501) as follows:

- Attach the ends of the T-adaptor (#060-4500) to both pressure line adaptors, then attach the output (**red**) hose to the center connection on the T-adaptor.

- Attach the loop adaptor (#060-2501) to both return side adaptors. The return (**black**) hose on the unit is not used at this time.

10. **Start the vehicle** and check connections for leaks. Watch the **Fuel Pressure** gauge on the control panel to test system pressure, since pressure loss can indicate a leak.

DIAGNOSTICS

The vehicle's fuel system is now prepared to perform diagnostic tests if desired. For instructions on how to perform these tests, go to the next chapter titled Vehicle Diagnostics.

If vehicle diagnostics are not desired, continue the cleaning procedure beginning with Step 11 below.

11. When filling the reservoir, add 8 oz. of detergent first for every 1/4 tank of fuel added.

12. Press and hold the **Fill/Purge** button on the control panel until the **Fuel Level Window** indicates a combined increase of 1/4 tank in the unit's fuel reservoir.

NOTE

If the vehicle's engine stalls, restrict pressure in the fuel line by turning the gate valve on the T-adaptor (#060-4500) clockwise 1/4 turn. Re-start the car and repeat Step 12. If the vehicle's engine stalls again, repeat this procedure until Step 12 is completed.

13. **Turn off the vehicle's engine.**

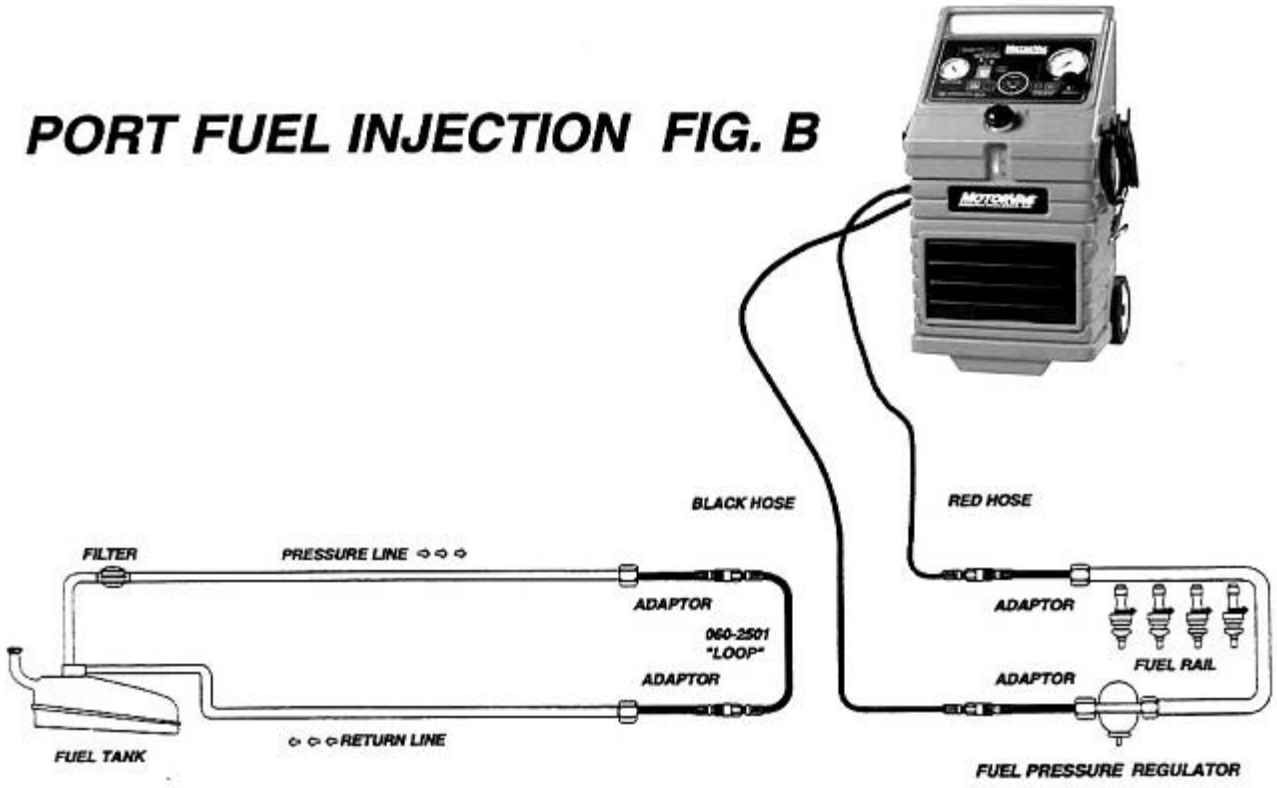
14. Press the **Fill/Purge** button. Wait four to five seconds to relieve the pressure in the output (**red**) hose. Release the **Fill/Purge** button.

/!\ WARNING

Flammable Liquid can squirt out of pressurized lines when connecting or disconnecting.
Wear Safety goggles.
Obtain ZERO pressure before connecting or disconnecting any fuel lines or adaptors.
Wear chemical resistant gloves when connecting or disconnecting fittings and adaptors.
Wrap shop towel around pressure fittings and adaptors when disconnecting.
Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.
Explosion or flame or exposure to flammable liquid and vapors can cause injury.

15. Carefully disconnect the loop adaptor (#060-2501) from the return lines. Close the gate valve on the T-adaptor (#060-4500) and then carefully disconnect the T-adaptor (#060-4500) from the output (**red**) hose and the pressure lines.

16. As shown in the next figure, connect one end of the loop adaptor (#060-2501) to the pressure line coming from the vehicle's fuel tank. Connect the other end of the loop adaptor (#060-2501) to the return line going back to the fuel tank. This forms a tank-to-tank loop, making it unnecessary to disconnect the fuel pump.



17. As shown in the previous figure, connect the output (**red**) hose from the unit to the adaptor on the pressure line going into the fuel rail.

18. As shown in the previous figure, connect the return (**black**) hose from the unit to the adaptor on the return line coming from the fuel rail.

You are now ready to perform the PFI cleaning procedure.

Port Fuel Injection (PFI) Cleaning Procedure

Follow these steps to circulate the cleaning mixture through the Port Fuel Injection unit to clean the
fuel rail, injector screens, and pressure regulator.

1. Verify that **PFI Setup Steps 1-18** above have been completed before continuing

2. Refer to the vehicle's service manual for the manufacturer's recommended PSI.

3. Press and hold the **Start** button.

4. Close the **Pressure Adjust** regulator clockwise until the **Fuel Pressure** gauge on the unit displays the vehicles operating pressure and the **Up Arrow** LED stays illuminated without flashing. This will clean the PFI unit, injector screens, fuel rail, and pressure regulator and filter the contaminants through the unit's filtering system.

5. Release the **Start** button and continue to turn the **Pressure Adjust** regulator clockwise until it is completely closed.

- Make a note of the fuel pressure reading; this is the true opening pressure of the vehicle's pressure regulator without vacuum assist when the engine is at normal operating temperature.
- **At this point, refer to appropriate Intake System Cleaning Procedure section for proper intake cleaning, and Vacuum gauge connections in the vehicle diagnostics chapter.**

6. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED displays 10 minutes.

7. After the 10 minutes has expired on the **Time** LED display, press the **Start** button until the pressure rises to the previous system pressure, and release.

8. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED display indicates 30 minutes. (Run time may be adjusted depending on the condition of the vehicle's fuel system.)

9. **Start the vehicle** to begin the fuel system cleaning process.

- If the vehicle is equipped with a **Cold Start Injector**, you may use a **Injector Pulser** to energize the **Cold Start Injector** a few quick times during the run cycle to clean it.

10. When the run time expires, the cleaning is complete. The unit will automatically shut off and purge the pressure lines for five seconds. The **Cycle Complete** LED on the control panel will illuminate, and the unit's alarm will sound.

11. **Turn OFF the vehicle's ignition.**

12. Turn the **Pressure Adjust** regulator counterclockwise on the unit to open it. Press and hold the **Fill/Purge** button for four seconds to relieve pressure from the output (**red**) hose. Release the **Fill/Purge** button.

13. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

IMPORTANT

Wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

14. Disconnect the battery leads, hoses, and adaptors. Return the vehicle's fuel system to its normal operating condition by re-connecting the vehicle's fuel lines.

15. **Start the vehicle** and verify that there are no leaks.

16. Test drive the vehicle for three miles immediately following the cleaning service to flush all detergent from the vehicle's fuel and exhaust systems.

Continuous Injection System (CIS) Setup Procedure

Follow the steps below to connect the unit to the vehicle's fuel system in order to obtain fuel from the vehicle for use during the cleaning procedure. Make sure the vehicle has at least 1/8 tank of fuel before beginning this process.

1. Start the vehicle and allow the engine to reach normal operating temperature**.**

> **IMPORTANT**
>
> **Do not perform the setup or cleaning process if the vehicle's engine oil or coolant level is low. If necessary, add oil and/or coolant to the vehicle.**

2. **Turn the vehicle OFF** when normal operating temperature has been reached.

3. Turn the **Pressure Adjust** regulator on the unit counterclockwise until the regulator is completely open.

4. Attach the unit to the vehicle's battery by connecting the **red** battery clip to the positive (**+**) battery terminal and the **black** battery clip to a solid ground point as far from the battery as possible.

   If the **Reverse Polarity** LED comes on, make sure the connections to the vehicle's battery are correct as described above.

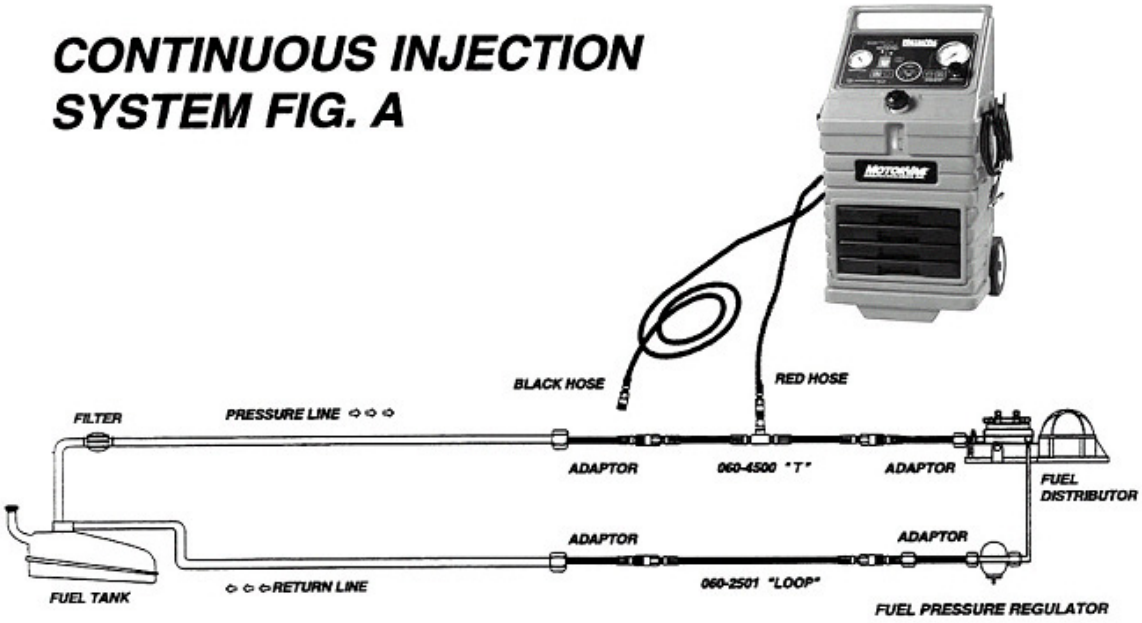
5. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

6. **Verify that the engine is no longer running.**

7. Disconnect the vehicle's fuel lines from the fuel distributor. There are now four open ends to work with**:**

Pressure Line:	**Return Line:**
From the fuel tank	From fuel distributor
To the fuel distributor	To the fuel tank

8. As shown in the next figure, connect the appropriate adaptors at the points listed in **Step 7**.



9. As shown in the previous figure, attach the T-adaptor (#060-4500) and the loop adaptor (#060-2501) as follows:

- Attach the ends of the T-adaptor (#060-4500) to both pressure line adaptors, then attach the output (**red**) hose to the center connection on the T-adaptor.

- Attach the loop adaptor (#060-2501) to both return side adaptors. The return (**black**) hose on the unit is not used at this time.

10. **Start the vehicle** and check connections for leaks. Watch the **Fuel Pressure** gauge on the control panel to test system pressure, since pressure loss can indicate a leak.

DIAGNOSTICS

The vehicle's fuel system is now prepared to perform diagnostic tests if desired. For instructions on how to perform these tests, go to the next chapter titled Vehicle Diagnostics.

If vehicle diagnostics are not desired, continue the cleaning procedure beginning with Step 11.

11. When filling the reservoir, add 8 oz. of detergent for every 1/4 tank of fuel.

12. Press and hold the **Fill/Purge** button on the control panel until the **Fuel Level Window** indicates a combined increase of 1/4 tank in the unit's fuel reservoir.

NOTE

If the vehicle's engine stalls, restrict pressure in the fuel line by turning the gate valve on the T-adaptor (#060-4500) clockwise 1/4 turn. Re-start the car and repeat Step 12. If the vehicle's engine stalls again, repeat this procedure until Step 12 is completed.

13. **Turn off the vehicle's engine.**

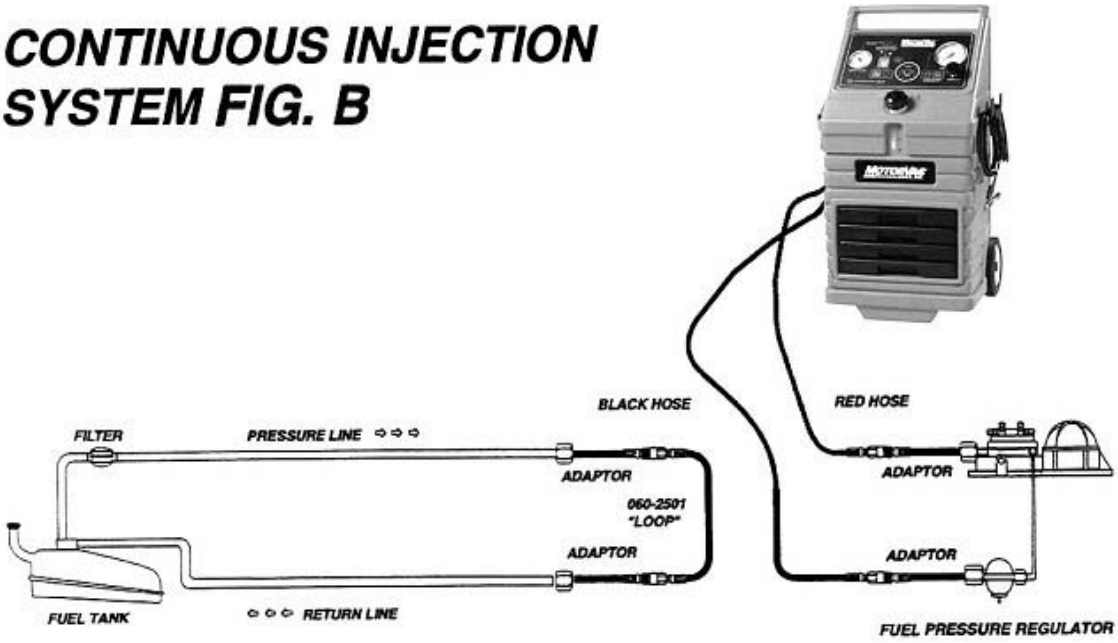
14. Press the **Fill/Purge** button. Wait four to five seconds to relieve the pressure in the output (**red**) hose. Release the **Fill/Purge** button.

/!\ WARNING

Flammable Liquid can squirt out of pressurized lines when connecting or disconnecting.
Wear Safety goggles.
Obtain ZERO pressure before connecting or disconnecting any fuel lines or adaptors.
Wear chemical resistant gloves when connecting or disconnecting fittings and adaptors.
Wrap shop towel around pressure fittings and adaptors when disconnecting.
Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.
Explosion or flame or exposure to flammable liquid and vapors can cause injury.

15. Carefully disconnect the loop adaptor (#060-2501) from the return lines. Close the gate valve on the T-adaptor (#060-4500) and then carefully disconnect the T-adaptor (#060-4500) from the output (**red**) hose and the pressure lines.

16. As shown in the next figure, connect one end of the loop adaptor (#060-2501) to the pressure line coming from the vehicle's fuel tank. Connect the other end of the loop adaptor (#060-2501) to the return line going back to the fuel tank. This forms a tank-to-tank loop, making it unnecessary to disconnect the fuel pump.



17. As shown in the previous figure, connect the output (**red**) hose from the unit to the adaptor on the pressure line going into the fuel distributor.

18. As shown in the previous figure, connect the return (**black**) hose from the unit to the adaptor on the return line coming from the fuel distributor.

You are now ready to begin the CIS cleaning procedure.

Continuous Injection System (CIS) Cleaning Procedure

Follow the steps below to circulate the cleaning mixture through the CIS fuel distributor to clean the
pressure regulator and the top portion of the fuel distributor.

1. Verify that **CIS Setup Steps 1-18** above have been completed before continuing.

- **At this point, refer to appropriate Intake System Cleaning Procedure section for proper intake cleaning, and Vacuum gauge connections in the vehicle diagnostics chapter.**

2. Refer to the vehicle's service manual for the manufacturer's recommended PSI.

3. Press and hold the **Start** button.

4. Close the **Pressure Adjust** regulator clockwise until the **Fuel Pressure** gauge on the unit displays the vehicles operating pressure and the **Up Arrow** LED stays illuminated without flashing. This will clean the CIS system and filter the contaminants through the unit's filtering system.

5. Release the **Start** button and continue to turn the **Pressure Adjust** regulator clockwise until it is completely closed.

- Make a note of the fuel pressure reading; this is the true opening pressure of the vehicle's pressure regulator without vacuum assist when the engine is at normal operating temperature.

CAUTION:

Do not open or move sensor plate / air door on the engine when the fuel distributor is pressurized. The CIS system will spray fuel into the engine while it is not running.

6. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED displays 10 minutes.

7. After the 10 minutes has expired on the **Time** LED display, press the **Start** button until the pressure rises to the previous system pressure, and release.

8. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED display indicates 30 minutes. (Run time may be adjusted depending on the condition of the vehicle's fuel system.)

9. **Start the vehicle** to begin the fuel system cleaning process.

- When the cleaning process is halfway completed (check **Time** LED display), step on the vehicle's accelerator quickly three or four times. **Then, maintain RPM at 1500 - 2000 for 30 seconds.**

- If the vehicle is equipped with a **Cold Start Injector**, you may use a **Injector Pulser** to energize the **Cold Start Injector** a few quick times during the run cycle to clean it.

10. When the run time expires, the cleaning is complete. The unit will automatically shut off and purge the pressure lines for five seconds. The **Cycle Complete** LED on the control panel will illuminate, and the unit's alarm will sound.

11. **DO NOT ALLOW *CIS* VEHICLES TO RUN OUT OF FUEL. TURN OFF THE VEHICLE'S IGNITION IMMEDIATELY UPON COMPLETION OF THE RUN CYCLE.**

12. Turn the **Pressure Adjust** regulator counterclockwise on the unit to open it. Press and hold the **Fill/Purge** button for four seconds to relieve pressure from the output (**red**) hose. Release the **Fill/Purge** button.

13. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

IMPORTANT

Wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

14. Disconnect the battery leads, hoses, and adaptors. Return the vehicle's fuel system to its normal operating condition by re-connecting the vehicle's fuel lines.

15. **Start the vehicle** and verify that there are no leaks.

16. Test drive the vehicle for three miles immediately following the cleaning service to flush all detergent from the vehicle's fuel and exhaust systems.

Returnless Fuel System Setup Procedure

Follow the steps below to connect the unit to the vehicle's fuel system.
Make sure the vehicle has at least 1/8 tank of fuel before beginning this process.

IMPORTANT

Do not perform the setup or cleaning process if the vehicle's engine oil or coolant level is low.
If necessary, add oil and/or coolant to the vehicle.

1. Start the vehicle's engine and allow the engine to reach normal operating temperature.

2. Turn the vehicle's engine off when normal operating temperature has been reached.

3. Turn the pressure regulator knob counterclockwise until the regulator is completely open. Verify that the power is switch is turned off.

4. Attach the unit to the vehicle's battery by connecting the red battery clip to the positive (**+**) battery terminal and the black battery clip to a solid ground point as far from the battery as possible.

5. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

6. Disconnect the vehicle's fuel line at the fuel rail or at the fuel pump outlet.
There should now be two open ends to work with (single Pressure Line), one coming from the fuel pump & one going into the fuel rail.

7. Add gasoline and detergent mixture to the reservoir (See Reservoir Filling / Vehicle Diagnostics).

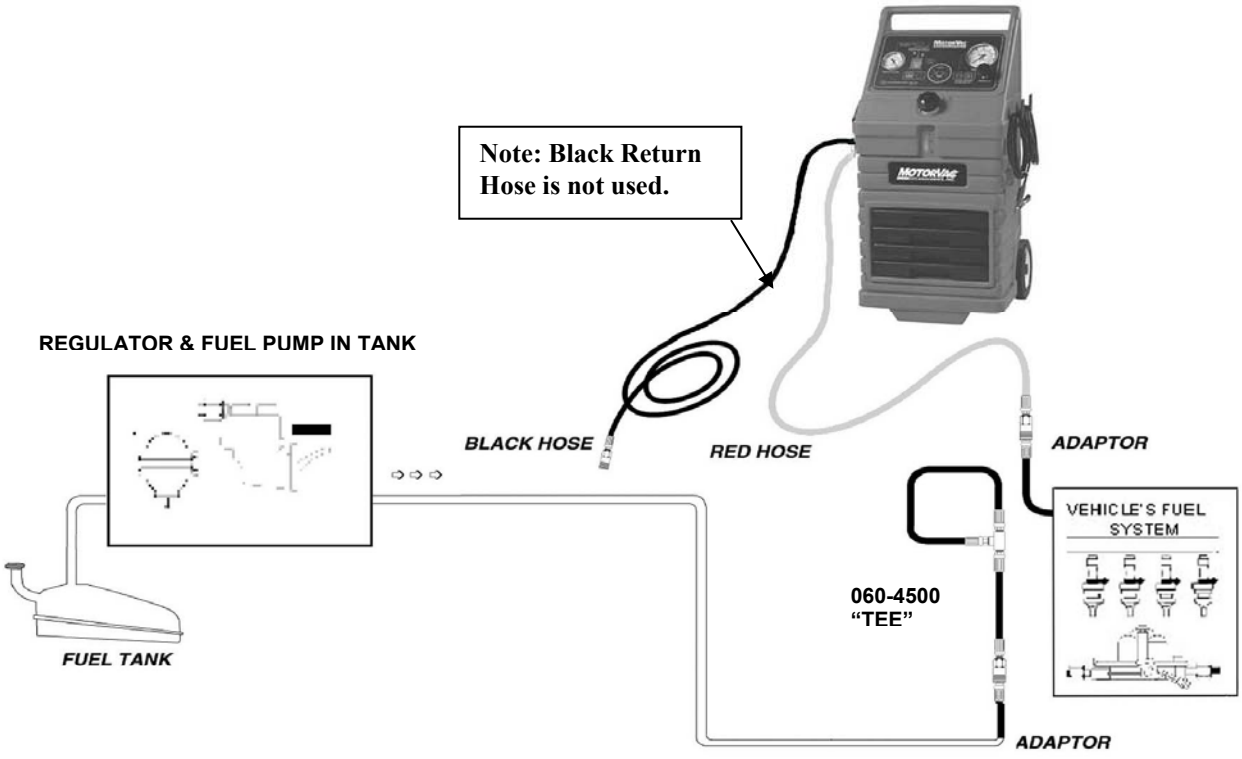
/!\ WARNING

Flammable Liquid can squirt out of pressurized lines when connecting or disconnecting.
Wear Safety goggles.
Obtain ZERO pressure before connecting or disconnecting any fuel lines or adaptors.
Wear chemical resistant gloves when connecting or disconnecting fittings and adaptors.
Wrap shop towel around pressure fittings and adaptors when disconnecting.
Avoid exposure to flames, sparks, hot engine parts, and other ignition sources.
Explosion or flame or exposure to flammable liquid and vapors can cause injury.

8. As shown in the figure on the next page, connect the output **(Red)** hose to adaptor leading to the fuel rail. The return **(Black)** hose is not used. Deadhead the fuel line coming from the vehicle's fuel pump by looping the T-adaptor (060-4500) back unto itself. On most vehicles it is not necessary to disable the fuel pump causing unnecessary fault codes. The fuel pressure regulator is in the fuel tank and will purge / regulate the fuel pressure automatically***. Ford vehicles and Jaguar with ford engines will require that the fuel pump be disabled. DO NOT 'DEADHEAD' FORD SINGLE LINE SYSTEM!***

Returnless System Cleaning Diagram

Note: To perform a leak down check, verify the vehicles fuel pump pressure, and/or fill the unit's reservoir; connect the TEE adaptor 060-4500 inline between the fuel rail and fuel pressure line from tank. The unit's RED output hose would connect to the ball valve of the TEE adaptor. The BLACK return line is not used at this time.



You are now ready to perform the Returnless System cleaning procedure.

Returnless System Cleaning Procedure

Follow the steps below to feed the fuel/detergent mixture into the vehicle's fuel injector system.

1. Verify that the Returnless System Setup Steps 1- 8 above have been completed.
NOTE: The ***rail flush procedure*** is not performed on a Returnless System.

2. Refer to the vehicle's service manual for the manufacturer's recommended PSI.

- **Refer to appropriate Intake System Cleaning Procedure chapter for system cleaning at this point, and Vacuum gauge connections in the vehicle diagnostics chapter.**

3. Press and hold the **Start** button until unit builds pressure (See step 4).

4. Turn the **Pressure Adjust** regulator clockwise until the **Fuel Pressure** gauge reads the equivalent of the manufacturer's recommended specifications. It may be necessary to increase the pressure to the level previously noted .

5. Press the **+** button to increases the time, or the **—** button to decreases the time until the **Time** LED displays 30 minutes. (Run time may be adjusted depending on the condition of the vehicle's fuel system. Add additional run time to compensate for no rail flush.)

6. **Start the vehicle** to begin the fuel system cleaning process.

- When the cleaning process is halfway completed (check **Time** LED display), step on the vehicle's accelerator quickly three or four times. **Then, maintain RPM at 1500 - 2000 for 30 seconds.**

7. When the run time expires, the cleaning is complete. The unit will automatically shut off and purge the pressure lines for five seconds. The **Cycle Complete** LED on the control panel will illuminate, and the unit's alarm will sound.

8. **Turn OFF the vehicle's ignition.**

9. Turn the **Pressure Adjust** regulator counterclockwise on the unit to open it. Press and hold the **Fill/Purge** button for four seconds to relieve pressure from the output (**red**) hose. Release the **Fill/Purge** button.

10. Loosen the vehicle's gas cap to relieve fuel tank pressure, and then re-install cap.

IMPORTANT

Close the gate valve on the T-adaptor and wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

11. Disconnect the battery leads, hoses, and adaptors. Return the vehicle's fuel system to its normal operating condition by re-connecting the vehicle's fuel lines.

12. **Start the vehicle** and verify that there are no leaks.

13. Test drive the vehicle for three miles immediately following the cleaning service to flush all detergent from the vehicle's fuel and exhaust systems.

Vehicle Diagnostics

Although vehicle diagnostic tests are not a mandatory part of the cleaning procedure, they can help determine if poor engine performance is caused by other conditions related to the fuel system.

Carburetors The following tests may be performed for this system**:**

- Fuel System Pressure Test
- Fuel Volume Test
- Vacuum Test

TBI Systems; The following tests may be performed for this system**:**

- Fuel System Pressure Test
- Fuel Volume Test
- Deadhead Test
- Leakdown Test
- Vacuum Test

PFI Systems ;The following tests may be performed for this system**:**

- Fuel System Pressure Test
- Fuel Volume Test
- Deadhead Test
- Leakdown Test
- Vacuum Test

CIS Systems: The following tests may be performed for this system**:**

- Fuel System Pressure Test
- Fuel Volume Test
- Leakdown Test
- Vacuum Test

Do NOT perform the Deadhead test on CIS vehicles.

Fuel System Pressure Test

1. **Verify that Setup Steps 1-10 from the appropriate previous chapter have been completed for the specific fuel system type to be tested**.

2. Verify that the vehicle's engine is running and check connections for leaks.

3. Note the vehicle's fuel system pressure reading from the **Fuel Pressure** gauge on the control panel of the unit.

- This is the vehicle's running pressure. If the pressure is erratic or the vehicle is slow to reach maximum pressure, the vehicle's fuel filter may be clogged or its fuel pump may be weakening.

4. Return to the appropriate previous chapter, **Fuel System Cleaning Procedures**, to continue the cleaning process. Otherwise, conclude the test as described below.

5. Turn the vehicle off.

IMPORTANT

Close the gate valve on the T-adaptor and wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

6. Disconnect the battery leads, hoses, and adaptors. Return the vehicle fuel system to its normal operating condition by re-connecting the vehicle fuel lines.

Fuel Volume Test

1. **Verify that Setup Steps 1-10 from the appropriate previous chapter have been completed for the specific fuel system type to be tested**.

2. Verify that the vehicle's engine is running and check connections for leaks.

3. Press and hold the **Fill/Purge** button.

- You should observe a strong flow of fuel from the vehicle into the units fuel reservoir. The **Fuel Level Window** should show a 1/4 tank in the unit's fuel reservoir within 15 to 20 seconds. This indicates sufficient fuel volume.

- If the vehicle stalls during this test, adjust the gate valve on the T-adaptor (#060-4500) with a 3/4 turn in the counterclockwise direction to close it. Re-start the vehicle and slowly turn the gate valve clockwise to open it until the engine begins to labor slightly while idling. Resume the test by repeating **Step 3**.

4. Release the **Fill/Purge** button.

- If the proper fuel level was not reached within 15 to 20 seconds, this could indicate a blocked fuel filter or fuel line on the vehicle.

5. Return to the appropriate previous chapter, **Fuel System Cleaning Procedures**, to continue the cleaning process. Otherwise, conclude the test as described below.

6. Turn the vehicle off.

IMPORTANT

Close the gate valve on the T-adaptor and wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

7. Disconnect the battery leads, hoses, and adaptors. Return the vehicle fuel system to its normal operating condition by re-connecting the vehicle fuel lines.

Deadhead Test

Do NOT perform the Deadhead test on CIS vehicles.

1. **Verify that Setup Steps 1-10 from the appropriate previous chapter have been completed for the specific fuel system type to be tested**.

2. Verify that the vehicle's engine is running and check connections for leaks.

3. Bend the loop adaptor (#060-2501) in half for one second to restrict pressure and then release it.

4. Observe the **Fuel Pressure** gauge on the unit.

- This will give a good indication of the maximum pump output capabilities.

5. Return to the appropriate previous chapter, **Fuel System Cleaning Procedures**, to continue the cleaning process. Otherwise, conclude the test as described below.

6. Turn the vehicle off.

IMPORTANT

Close the gate valve on the T-adaptor and wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.

7. Disconnect the battery leads, hoses, and adaptors. Return the vehicle fuel system to its normal operating condition by re-connecting the vehicle fuel lines.

Leakdown Test

1. **Verify that Setup Steps 1-10 from the appropriate previous chapter have been completed for the specific fuel system type to be tested**.

2. Verify that the vehicle's engine is running and check connections for leaks.

3. Turn off the vehicle.

4. Note the pressure reading on the unit's **Fuel Pressure** gauge.

- The pressure should be maintained or increased due to heat expansion.
- On CIS systems the pressure will drop to a point then stabilize (see manufactures specifications for this amount).

If a pressure drop occurs, this indicates a leak in the system. To isolate the leak you will need to re-pressurize the system. Use the procedures below to re-pressurize the system:

- Press and hold the **Start/Run** button.
- Turn the **Pressure Adjust** regulator clockwise until the unit's **Fuel Pressure** gauge displays **3/4** of the pressure noted in **Step 4**.
- Release the **Start/Run** button.
- Press the **—** button to decreases the time until the **Time** LED displays five minutes.
- Press the **Leak Test** button on the unit's control panel.

Use the procedure above to re-pressurize the system whenever there is significant drop in pressure during the Leakdown test.

Once you have re-pressurized the system, use the procedures below to isolate the leak.

- Locate the pressure line adaptor closest to the T-adaptor (#060-4500) and the vehicle's fuel tank. Bend the pressure line adaptor in half and squeeze tightly. If the pressure stabilizes, this indicates a leak in either the pressure fuel line or a bad one-way check valve in the vehicle's fuel pump.

- Locate the return line adaptor close to the pressure regulator. Bend the return line adaptor in half and squeeze tightly. If the pressure stabilizes, this indicates a leak in the vehicle's pressure regulator. This problem is generally dirt-related and should be resolved by the cleaning process. However, if fuel is present in the vacuum line from the regulator, this indicates a leaking diaphragm.

- If the above procedures do not stop the leakdown, bend both adaptors simultaneously. If a leakdown is still present, the leak is probably the result of one or more injectors leaking. This problem is generally dirt-related and should be resolved by the cleaning process.

    5. Return to the appropriate previous chapter, **Fuel System Cleaning Procedures**, to continue the cleaning process. Otherwise, conclude the test as described below.

    6. Turn the vehicle off.

> **IMPORTANT**
>
> **Close the gate valve on the T-adaptor and wrap a shop towel around pressure fittings before disconnection to protect against residual fuel spray.**

    7. Disconnect the battery leads, hoses, and adaptors. Return the vehicle fuel system to its normal operating condition by re-connecting the vehicle fuel lines.

Vacuum Test

This test should be performed in conjunction with the cleaning process.

1. **Verify that Setup Steps 1-10 from the appropriate previous chapter have been completed for the specific fuel system type to be tested**.

2. Verify that the vehicle's engine is running and check connections for leaks.

3. Attach the vacuum hose from the unit to a manifold vacuum source on the vehicle and leave it in place throughout the cleaning process.

4. Make a note of the reading on the **Vacuum** gauge before you begin the cleaning process and again after the process is complete.

- The **Vacuum** gauge on the unit has been added to allow **before** and **after** confirmation of the positive results of the **MotorVac CarbonClean System** cleaning process without the use of any other diagnostic equipment. The readings on the **Vacuum Pressure** gauge should indicate a substantial improvement in the engine performance after the cleaning process is complete.

Intake Cleaning System Procedures

Port Fuel, Tuned Port and CIS Systems

WARNING:

Extreme care must be taken when performing this process. Failure to take the necessary precautions may result in mechanical engine failure.

IMPORTANT:

Wear suitable OSHA approved safety goggles before starting this or any other MotorVac CarbonClean Service.

1. Warm up vehicle to operating temperature.

2. Shut off vehicle.

3. Fill the ICS container with a **MAXIMUM** of 4 ounces of MotorVac detergent. (See page B-10 in Appendix B for ICS kit breaksown .)

4. Pressurize the container with shop air to a minimum of 80 PSI. **Do not exceed 185 PSI.**

5. Shake the ICS container to aerate the mixture.

NOTE:

If the ICS container has too much cleaner in it, there may not be enough air volume to force the cleaner out with sufficient velocity to contact the intake air plenum walls. Always be sure to maintain at least 80 pounds of pressure in the ICS container.

6. Be certain that the ICS 30-inch spray tube is free from any kinks or bends.

7. Attach the spray tube to the end of the ICS container.

8. Measure the length of the engine air intake manifold by laying the spray tube outside the manifold.

9. At the throttle plate, grip and hold the tube.

NOTE:

This will be the maximum length that the tube may be inserted into the manifold.

CAUTION:
CIS FUEL SYSTEMS

Do not open or move sensor plate / air door on the engine when the fuel distributor is pressurized. The CIS system will spray fuel into the engine while it is not running.

10. With the engine off and the engine's air duct removed, open the throttle plate wide open or have someone hold it open.

11. Insert the ICS spray tube into the manifold up to the point measured in step 8 and 9.

12. While holding the container upright, press and hold the nozzle of the ICS container and quickly pull the spray tube to the open end of the manifold near the throttle plate.

13. Release the nozzle once the tip of the spray tube gets near the throttle plate.

NOTE:

Do not spray outside of the throttle bore housing.

14. If the MotorVac CarbonClean System is in use at the time, press the **STOP** button or **Turn the timer knob to the zero position** to depressurize the engine's fuel system.

NOTE:

It is recommended that after each pass with the ICS container, the engine should be "bumped over" using the starter.
DO NOT ALLOW THE ENGINE TO START

15. Quickly turn the ignition to the start position then back to the off position to rotate the engine over slightly.

NOTE:

Disconnecting and grounding the secondary ignition will also keep the engine from starting.

16. Repeat these procedures a **maximum** of 3 times.

17. After the air intake tract has been cleaned, it will be necessary to start the engine and continue with the cleaning process.

The continuation of the cleaning service will require the installation of the 6-inch spray tube to clean the Idle Air Control passage while the engine is running.

NOTE:

If you do not understand these instructions completely or have any questions contact MotorVac Technical support at 800-841-8810 BEFORE performing this procedure.

Throttle Body and Carburetor Systems

1. Warm up vehicle to operating temperature.

2. Shut off vehicle and remove air cleaner.

3. Open the **ICS Spray Bottle** and add 4 oz. of intake cleaning detergent. Pressurize with shop air and insert the short (6") **Spray Tube** into the **Nozzle**.

IMPORTANT

DO NOT EXCEED 185 PSI
USE SAFETY GLASSES

4. Spray any exposed areas, air horn, choke plate, etc....with a generous amount of cleaner (one or two ounces) and let soak.

5. Once the exposed areas are coated, insert the 30" **Soak Tube** into the **nozzle**. Open the throttle plate and slide the **Soak Tube** into the manifold through the carburetor or **TBI**. Spray the inside of the intake manifold with cleaner making sure to move the **Soak Tube** in a circular motion so that as much of the floor of the manifold as possible will be soaked with cleaner.

IMPORTANT

Use only half the contents (4 oz.) at this time. Using too much may fill a cylinder in smaller engines.

6. Start the vehicle. While the vehicle is running, spray the remainder of the cleaner in through the throttle plate in several short bursts. If the vehicle seems to be stalling, stop spraying for a moment to allow the engine to return to a normal idle and repeat.

7. Re-install air cleaner, start the vehicle and test drive, or return to appropriate cleaning process.

Cleaning Through a Vacuum Port for Added Carbon Removal Capabilities

1. Warm up vehicle to operating temperature.

2. Open the **ICS Spray Bottle** and add 8 oz. of intake cleaning detergent. Pressurize with shop air and insert the short (6") **Spray Tube** into the **Nozzle**.

IMPORTANT

DO NOT EXCEED 185 PSI
USE SAFETY GLASSES

3. Start the vehicle. Locate a suitable vacuum port as close as possible to the throttle plate and insert the short **Soak Tube** into the vacuum hose (in some cases it may be necessary to use the PCV hose as an inlet).

4. While the engine is idling, hold the **ICS Spray Bottle** upright and begin spraying cleaner into the engine. If the vehicle seems to be stalling, stop spraying for a moment to allow the engine to return to a normal idle and repeat.

5. When the **ICS Spray Bottle** is empty remove it from the engine, re-install the vacuum hose (or PCV hose) and test drive the vehicle, or return to appropriate cleaning process.

Troubleshooting and Additional Help

Refer to the list below in the unlikely event that you have problems with your **MotorVac CarbonClean System.**

Problem:	Solution:
1. Reverse Polarity LED is ON and the unit is not operational.	Polarity is reversed on vehicle battery connection. Check connections for correct polarity.
2. Pressure Gauge on the unit displays maximum pressure upon start up.	Output and Return hoses may be reversed. Press the **Stop** button on the unit and check hoses for correct connection.
3. Rapid loss of fuel from the unit reservoir.	Return hose connection may be incorrect, allowing fuel/detergent to return to the vehicle's fuel tank.
4. The unit will not power up.	Check that the **Power Leads** are connected correctly. Verify 12.5 volts at battery.
5. START button is pressed but unit will not build pressure.	With both hoses diconnected, close the **Pressure Regulator** clockwise, then open ¼ turn. Hold Start button down until pressure builds. Verify that filter and fittings are snug, use flashlite to look for small air bubbles in lines near fittings. Look for good return flow from top of reservoir.
6. The unit performs poorly.	Check all hoses and wires for cuts or frays. Check cabinet for dents or impact markings. Verify that the fuel filter has recently been replaced. (Refer to the maintenance log in **Appendix A** for dates of services performed.)

ADDITIONAL HELP

Please verify that items 1-6 above have been reviewed before calling for additional assistance.

In the unlikely event that problems persist with the unit call Technical Support, have your model and serial numbers available before you call. ***Remember to send in your warranty card, otherwise service will delayed.***

In the U.S. call (714-558-4822, 800-841-8810)
E-MAIL: techsupport@motorvac.com

Maintenance Procedures

The following maintenance procedures should be performed on a routine basis:

1. Drain the unit's fuel reservoir and replace the fuel filter after every 30 cleaning services, as described in the next section.

2. Clean the exterior with a plastics cleaning agent or similar product to keep the cabinet looking new. Check the cabinet for dents or impact markings**.**

3. Check all hoses and wires for cuts or frays.

Replacing the unit Fuel Filter

The unit's fuel reservoir should be drained and the fuel filter replaced after every 30 cleanings to ensure maximum system performance and pump life.

Drain the Fuel Reservoir

1. Turn the **Pressure Adjust** regulator on the control panel clockwise until it is completely closed**.**

2. Attach the unit to a motor vehicle battery by connecting the **red** battery clip to the positive (**+**) battery terminal and connect the **black** battery clip to a solid ground point as far from the battery as possible.

3. Connect the #060-1100 adaptor to the (**red**) output hose. To flush the gasoline from the unit's reservoir using the following procedure:

- Direct the adaptor on the (**red**) output hose into an appropriate container.
- Press and hold the **Start** button until the unit's reservoir is empty.
- Release the **Start** button.
- **Dispose of the fuel in an environmentally approved method.**

Replace the Fuel Filter

1. Unscrew the old fuel filter from the mounting station on the back of the unit's cabinet.

2. Lightly grease the seal of the new filter and hand-tighten it onto the mounting head.

3. Add 16 ozs. of **MotorVac CarbonClean Detergent and Top Engine Cleaner** to the fuel reservoir and then fill the unit's fuel reservoir with **clean gasoline** until the **Fuel Level Window** indicates 1/4 tank.

4. Check the filter for leaks.

5. Enter your initials, the date, and a check mark in the appropriate boxes of the Maintenance Record at the end of this chapter.

The unit is now ready for the next cleaning service.

Maintenance Record

Use the following table to keep a record of maintenance performed on the unit.

Initial/Date	DRAIN FUEL RESERVOIR ✓	REPLACE FUEL FILTER ✓	CLEAN EXT. CABINET ✓	CHECK HOSES AND WIRES ✓	OTHER ✓
/					
/					
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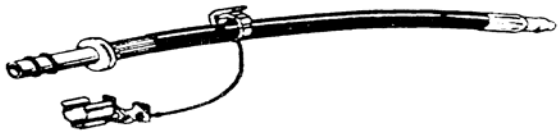
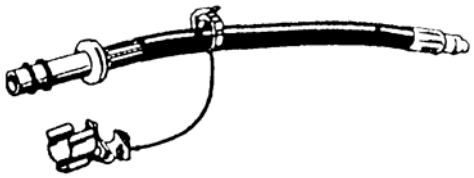
Appendix B - System Accessories

Standard Adaptor Kit (200-3025A) CarbonClean

The standard adaptor kit is included with your system. MCS-245 & MCS-352.
The most commonly used application is listed however, other applications may apply.

PART & NO.	QTY	APPLICATION
 060-1000	2	GENERAL APPLICATIONS UTILIZING 1/4" FUEL LINE - MALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1100	2	GENERAL APPLICATIONS UTILIZING 5/16" FUEL LINE- MALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1200	2	GENERAL APPLICATIONS UTILIZING 3/8" FUEL LINE - MALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1300	2	GENERAL APPLICATIONS UTILIZING 1/4" FUEL LINE - FEMALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1400	2	GENERAL APPLICATIONS UTILIZING 5/16" FUEL LINE - FEMALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1500	2	GENERAL APPLICATIONS UTILIZING 3/8" FUEL LINE - FEMALE. (USE WITH SUITABLE HOSE CLAMPS.)
 060-1700	1	CARBURETED VEHICLES WITH 5/16" FLARE FUEL INLETS. USE WITH 060-3304 FOR SOME FUEL INJECTED VEHICLES - RETURN LINE.
 060-1800	1	CARBURETED AND EARLY FUEL INJECTED VEHICLES WITH 3/8" FLARE FUEL INLETS.

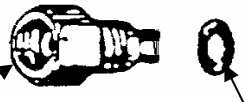
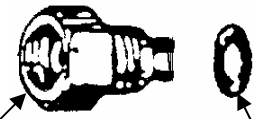
PART & NO.	QTY	APPLICATION
 060-2501	1	FORMS "TANK TO TANK" LOOP ON ALL VEHICLES. USED TO EXTEND VEHICLE'S RETURN LINE DURING DIAGNOSTICS.
 060-2800	1	1/4" MALE. LATE MODEL VEHICLES TBI AND/OR PORT FUEL. (GM-CHRYSLER-JEEP/EAGLE).
 060-3100 080-3402 (O-Ring)	1	TBI AND/OR PORT FUEL PRESSURE LINE - MALE. G.M. VORTEC M16 x 1.5
 060-3105	1	TBI AND/OR PORT FUEL PRESSURE LINE - FEMALE. G.M. VORTEC M16 x 1.5
 080-3302 060-3300 (O-Ring)	1	TBI AND/OR PORT FUEL RETURN LINE - MALE. G.M. VORTEC M14 x 1.5
 060-3305	1	TBI AND/OR PORT FUEL RETURN LINE - FEMALE. G.M. VORTEC M14 x 1.5
 080-3402 (O-Ring) 060-3500 080-3501 (Clip)	1	3/8" MALE SPRING LOCK WITH CLIP (GREY). PORT FUEL-RETURN LINE. (USE AS PRESSURE LINE ON SOME RANGERS AND BRONCOS)
 060-3505	1	3/8" FEMALE SPRING LOCK. PORT FUEL - RETURN LINE. (USE AS PRESSURE LINE ON SOME RANGERS AND BRONCOS)

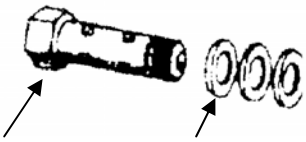
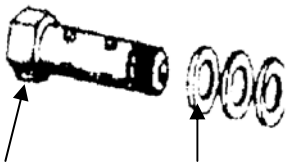
PART & NO.	QTY	APPLICATION
 060-3600 080-3602 (O-Ring) 080-3601 (Clip)	1	1/2" MALE SPRING LOCK WITH CLIP (BLACK). PORT FUEL - PRESSURE LINE. FORD
 060-3605	1	1/2" FEMALE SPRING LOCK PORT FUEL - PRESSURE LINE. FORD
 060-3901 080-3904 (Clip)	1	3/8" QUICK DISCONNECT PORT FUEL AND TBI
 060-4200	1	5/16" MALE TBI AND/OR PORT FUEL (GM-CHRYSLER-JEEP/EAGLE).
 060-4300	1	3/8" TBI AND/OR PORT FUEL (GM-CHRYSLER-JEEP/EAGLE-FORD).
 060-3902	1	1/4" FEMALE TBI AND/OR PORT FUEL (GM-CHRYSLER-JEEP/EAGLE-FORD).

 060-4501		Tee Adaptor For Single Line Fuel Injection Systems
 060-0440  060-0450	2 2	HOSE CLAMPS. USE WITH 060-1000 THROUGH 060-1500.

Deluxe Adaptor kit (200-3026A), CarbonClean

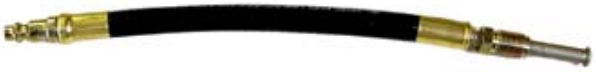
The Deluxe adaptor kit is included with your system. **MCS-245 & MCS-352.**
The most commonly used application is listed however, other applications may apply.

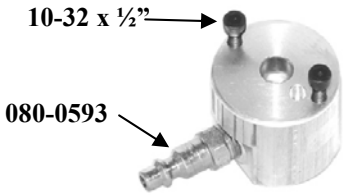
PART & NO.	QTY	APPLICATION
 060-1600	1	12MM BANJO FITTING CIS OR EFI SYSTEMS. IN CONJUNCTION WITH 060-1900, 060-1901, 060-1902.
 060-1602	1	12MM 90° BANJO FITTING CIS OR EFI SYSTEMS. IN CONJUNCTION WITH 060-1900, 060-1901, 060-1902
 060-2402	2	14MM BANJO FITTING BMW AND LATE MODEL VW PRESSURE LINE.
 060-3304 080-3302 (O-Ring)	1	USED WITH MV0601700 TBI AND/OR PORT FUEL RETURN LINE - MALE M14 x 1.5
 060-3400 080-3402 (O-Ring)	1	USED WITH 060-1800 TBI AND/OR PORT FUEL RETURN LINE - MALE M16 x 1.5
 060-3508	1	"TEST PORT/SCHRADER VALVE" CONNECTION - FORD. **NOTE:** THE SCHRADER VALVE CORE MUST BE REMOVED.
 060-3700 080-3701 (Viton Seal)	1	"TEST PORT/SCHRADER VALVE" CONNECTION - GM.
 060-3900 080-3903 (Clip)	2	5/16" QUICK DISCONNECT PORT FUEL AND TBI FORD 5 LITER

 060-3901 080-3904 (Clip)	1	3/8" QUICK DISCONNECT PORT FUEL AND TBI
 060-4300	1	3/8" TBI AND/OR PORT FUEL (GM-CHRYSLER-JEEP/EAGLE).
 060-1900 (Bolt) 060-1901 (Washer) 060-1902 (Nut)	2 6 2	CONNECTS 12MM BANJO FITTINGS FOR DIAGNOSTICS AND/OR CREATING A LOOP.
 060-2740 (Bolt) 060-2741 (Washer) 060-2742 (Nut)	1 3 1	CONNECTS 14MM BANJO FITTINGS FOR DIAGNOSTICS AND/OR CREATING A LOOP

New / Optional GAS Adapters offered by MotorVac

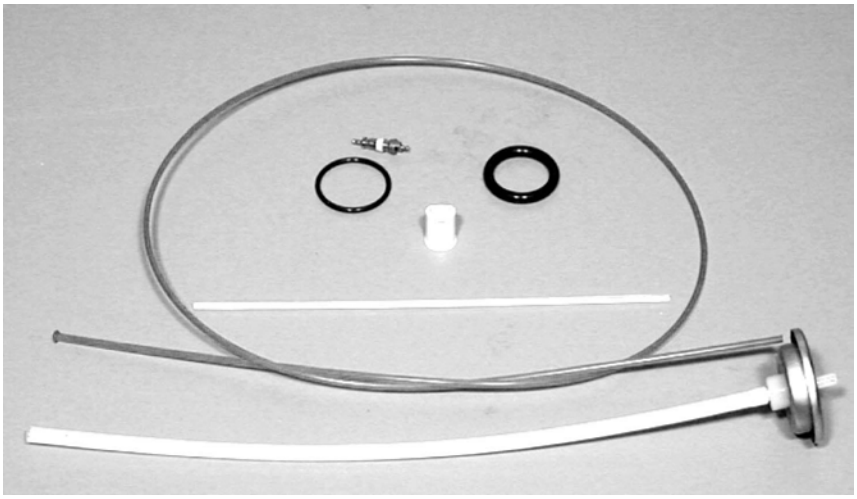
The following GAS adapters have been added to the CarbonClean adaptor line-up. The adapters listed are not included with any configured adapter sets & may be purchased separately from MotorVac Technologies, Inc.

PART & NO.	APPLICATION
 **060-4800 / Male Side**	Late Model Mitsubishi Products (Also includes Chrysler Imports, various Kia, Suzuki, & Hyundai Gas Powered Models)
 **060-4805 / Female Side**	Late Model Mitsubishi Products (Also includes Chrysler Imports, various Kia, Suzuki, & Hyundai Gas Powered Models)
 **060-2310 / Female Side**	"Bubble Flare" Type Adapter / 14 mm x 1.5 Common Applications Include: Mercedes-Benz, Volkswagen, Audi, & others with C.I.S. Fuel Injection Systems
 **060-2315 / Male Side**	"Bubble Flare" Type Adapter / 14 mm x 1.5 Common Applications Include: Mercedes-Benz, Volkswagen, Audi, & others with C.I.S. Fuel Injection Systems
 **060-2320 / Female Side (O-Ring P/N: 080-2321)**	Japanese / Toyota 14 mm x 1.5 Flare Type Adaptor (Pressure Side)
 **060-2325 / Male Side**	Japanese / Toyota 14 mm x 1.5 Flare Type Adaptor (Pressure Side)
 **060-3101 / Male Side** **080-3402 O'Ring**	2000 & Newer Nissan Products (Includes Nissan Quest & Maxima)

 **060-3102 / Female Side**	2000 & Newer Nissan Products (Includes Nissan Quest & Maxima)
 060-2300	17MM WRENCH SIZE WITH 14MM THREADS - EUROPEAN CARS INLET AND/OR RETURN. MAY BE USED WITH 060-2700. CIS SYSTEMS, MERCEDES, AUDI A-6
 060-2600	19MM WRENCH SIZE WITH 16MM THREADS - EUROPEAN CARS INLET AND/OR RETURN. MAY BE USED WITH 060-2700.
 060-2700	14MM X 16MM UNION. USE IN CONJUNCTION WITH 060-2300 AND 060-2600 FOR CIS APPLICATIONS.

I.C.S. (Intake Cleaning System) Complete Kit.
Ordering number 200-8667, (Red Bottle)

One Repair Kit #200-5046 includes all the components shown below



"Repair" Kit#200-5046

Schrader valve with Viton seal	**Qty. 1**
Top "valve" O-ring	**Qty. 2**
Neck base O-ring	**Qty. 2**
Spray Nozzle	**Qty. 5**
6" Spray tube	**Qty. 5**
30" spray tube	**Qty. 5**
Valve with 9" siphon tube	**Qty. 2**

Available Parts not included in "repair kit".

Bottle neck assembly. # 200-5034 includes air filler housing & base o-ring.

Separate KITS available:
30" Wands with Nozzles pack of 10 order #200-5044.

6" Straws with nozzles pack of 10 order #200-5043

This "update" list effective as of 7/10/2006.

Appendix C - Parts

Service Parts for the MotorVac MCS 245 CarbonClean System

Please refer to the part numbers below when ordering parts for the unit.

Part #	Description
010-0027	Wheel
010-6060	Reservoir Cap
020-8043	Harness, Power
030-0193	3/8”Compression Nut, Ni (Hose to Machine)
050-0095	Filter, 10 Micron (Baldwin #BT839-10)
050-0007	**Lens**, Pressure Gauge -3½ inch.
200-8012	Pressure **Gauge** Assembly – 3½ inch
050-1910	**Lens** - Vacuum Gauge - 2½ inch
050-0006	Vacuum **Gauge** Assembly - 2½ inch
070-0100	Vacuum Hose 5/32”I.D - (11.5 feet)
030-4004	Vacuum Tee (Universal)
080-0230	Female Quick Disconnect Coupler, 1/4”, Ni
200-8667	ICS (Intake System Cleaning) Kit -**Complete**

100-5044	ICS 30” Intake Spray Tube
100-5034	ICS Bottle Neck (black plastic)
100-5009	ICS Air Filler Valve Housing
100-5010	ICS Viton Valve Core
200-5046	ICS Repair Kit (Spray valve and Nozzle)
200-0300	(Black) Return Hose Assembly
200-0400	(Red) Output Hose Assembly
200-8036	Drawer assembly, Plastic-Black
050-0018	Solenoid, 2-way, (Normally Closed)
200-7006	Pressure regulator assembly
200-8031	Tuthill Pump Assembly
200-8239	Operators Manual
200-8300	Quick Reference Cards
200-3025A	Standard Adaptor Kit
200-3026A	Deluxe Adaptor Kit

ORDERING PARTS

Parts for the unit may be ordered by calling Customer Service, have your model and serial numbers available:

In the U.S. call: (714-558-4822, 800-841-8810)
E-MAIL: techsupport@motorvac.com