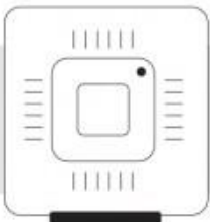


SPEEDMASTER™

EST. 1979

Chevy SB Downdraft

INSTALLATION METHOD FOR DOWNDRAFT



FAST
FUEL AIR SPARK TECHNOLOGY

GENERAL INFORMATION

1. Periodically (every six months or 6000 miles) recheck the torque on the manifold bolts to minimize the possibility of a vacuum leak.
2. If the cylinder heads have been milled or the cylinder block “decked,” the cylinder head faces and the end surfaces of the manifold must be milled to compensate. This is necessary to maintain correct port alignment, minimize the possibility of manifold vacuum leaks, and assure proper engine performance.

DOWNDRAFT INSTALLATION

OLD MANIFOLD REMOVAL PROCEDURE

WARNING: DO NOT ATTEMPT TO REMOVE MANIFOLD FROM A HOT ENGINE. ALLOW THE ENGINE TIME TO COOL DOWN SUFFICIENTLY BEFORE REMOVAL.

1. Disconnect battery ground cable.
2. Tag vacuum and crankcase ventilation hoses leading to air cleaner, if so equipped, making note of routing and connection points. Now remove vacuum and crankcase hoses allowing removal of the air cleaner assembly.
3. Note the routing of remaining vacuum lines from intake manifold. After being tagged, remove vacuum lines.
4. Drain radiator by opening drain plug at lower corner of radiator. If no drain plug is present, it may be necessary to remove the lower radiator hose.

CAUTION: Coolant may be still hot. Allow engine to cool down before proceeding.

5. Disconnect throttle linkage and springs, transmission kick-down/cruise control (if applicable).
6. Remove gas cap to relieve pressure from fuel system. Disconnect fuel line slowly at the fuel rail using wrenches.
7. Tag and disconnect ignition coil and sensor wires. Remove coil and coil bracket, if mounted on manifold.
8. Remove radiator hose, thermostat housing and thermostat.
9. Remove remaining water hoses and fittings from manifold.
10. Remove all manifold vacuum fittings.
11. Remove any remaining brackets from the manifold.
12. Loosen or remove valve cover, if needed to aid in manifold removal.

PREPARATION FOR INSTALLING DOWNDRAFT

1. Clean all mating surfaces thoroughly.
2. **CAUTION:** To prevent gasket pieces from falling into ports and valley when cleaning old gaskets from head surfaces, insert rags into ports and lay rags in lifter valley. When clean, remove rags carefully. Make sure that all particles that fell on rags are completely removed. Wipe surface with lacquer thinner or alcohol soaked rags to remove any oil or grease*.

***NOTE:** This is a must for proper gasket sealing.

INSTALLING DOWNDRAFT

1. Applying a thin coat of spray adhesive to the cylinder head side of the intake gasket surface. Lay manifold gasket in place, aligning ports and bolt holes.
2. Apply a 1/4" wide bead of oil-resistant RTV-silicone sealant to the front and rear block sealing surfaces, making sure to overlap manifold gaskets at all four corners. Do not use cork or rubber seals.
3. Carefully position your intake manifold on engine. Make sure that all bolt holes are centered. If manifold must be moved, re- check gasket placement. Install intake bolts.

NOTE: Thread sealant should be used on all bolt threads.

4. Follow the factory torquing sequence; begin torquing bolts, first to 10 ft-lbs, then 15 ft-lbs, finally torque to 25 ft-lbs. (See Figure 1)

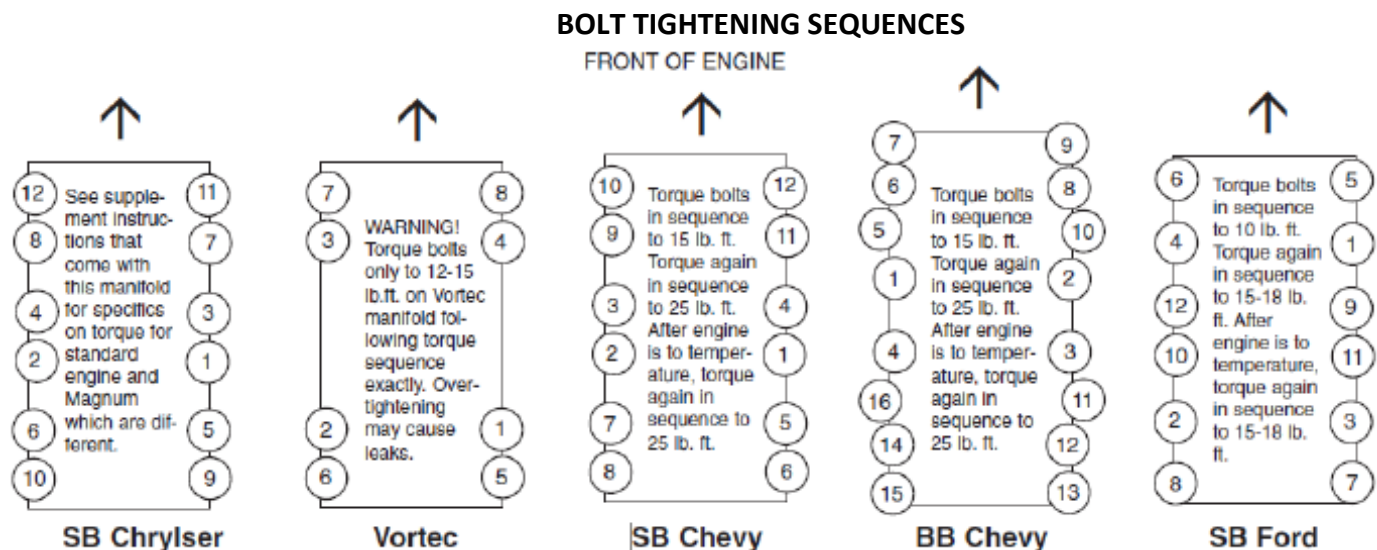


Figure 1

INSTALLING THROTTLE BODY

1. Connect all linkages, throttle springs, and throttle cables.
2. Connect all vacuum and fuel lines. Refer to your tags or drawing for correct placement from Manifold Removal Procedures section (step 3).
3. Automatic transmissions only: Adjust kick-down or throttle pressure linkage for proper shift points. Check all linkages, making sure that they all function properly.

INSTALLING FITTING, PLUGS, AND STUDS

1. Install fittings, plugs, and accessory bolts from your original manifold.

CAUTION: Do not over-tighten or cross-thread fittings, plugs, studs or bolts in manifold. Damage to threads or cranked mounting boss may result unless caution is used when installing.

2. Install all water sensors and vacuum fittings into manifold.
3. Plug all un-used water and vacuum ports in the manifold.

WIRES, BRACKETS, AND VALVE COVERS

1. If valve covers were removed, re-install with new gaskets.
2. Install coil brackets, coil, wires, and all remaining brackets that were removed from manifold.

IGNITION INSTALLATION

NOTE: Remove the fuel rail from the downdraft before installing the distributor to ensure the distributor sits properly. Use a 4mm hex key to remove the socket head cap screw from the downdraft. (See Figure 2)

INSTALLING THE DISTRIBUTOR: Rotate the engine so that the number 1 cylinder is Top Dead Center (TDC) (compression stroke). Drop the distributor into the engine, then “bump” the starter until it engages the oil pump drive while applying a light downward pressure. Once the oil pump drive is engaged, rotate the engine back to either your chosen amount of lead or 0°/TDC. Turn the base of the distributor so that the center of the reluctor aligns with the distributor pole piece. Once aligned, tighten down the distributor. At this point the distributor rotor should point directly at any one of the terminals on the cap; this terminal will be your number one post. You will notice that this means you can make any terminal on the cap number 1 as long as that is where the rotor points. Reinstall the cap and wires. Once your distributor is connected, you can connect your distributor to the Speedmaster 12V HO External Male E-Core Ignition Coil, which is ideal for use with the capacitive discharge (CD) ignition box system (Instructions Separate).

NOTE: Once the distributor, with cap and wires, is installed, the fuel rail can be reinstalled. (See Figure 3)



Figure 2: Correct 4mm socket head cap screw to remove



Figure 3: Fuel rail reinstalled after cap and wires are installed

INSTALLING IGNITION COIL

Once your distributor is connected, you can connect your distributor to the Speedmaster 12V HO External Male E-Core Ignition Coil (See Figure 4) [PCE382.1030]. Connect the center distributor plug to the top terminal. Then connect the positive lead (red) to power and the negative lead (black) to ground.



Figure 4: 12V HO External Male E-Core Ignition Coil

SENSOR INSTALLATION

IDLE AIR CONTROL: An external vacuum canister is needed to run both the Idle Air Control (IAC) and Manifold Absolute Pressure (MAP) sensors. The external vacuum canister connects to the downdraft by disconnecting the 8mm set screw and running a line to the external vacuum canister. (See Figures 5 and 6)



Figure 5: Set screw needs to be removed in order to connect downdraft to external vacuum canister

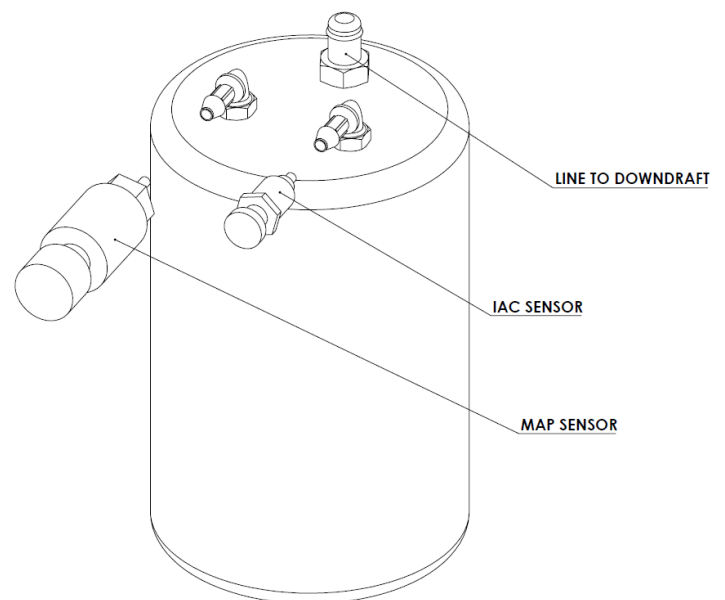


Figure 6: External vacuum canister setup

COOLANT TEMP: The coolant temperature sensor (See Figure 7) monitors engine coolant temperature. It is typically installed in an existing mounting hole on the top of the intake manifold. The sensor has 3/8" NPT threads and an adapter is supplied for installation in manifolds with 1/2" NPT threads. The engine block or cylinder head may have a provision for mounting a coolant temperature sensor. Just be aware that heat radiated from headers may be absorbed by the metal sensor body and skew the temperature readings to the ECU. Also, depending on your application, you may have to drain some coolant before removing the plug in your manifold to prevent overflow. Use thread sealant or tape when installing the sensor and the adapter.



Figure 7: Coolant temperature sensor

O2 SENSOR: Installing the threaded oxygen sensor fitting should be the first step in the installation process. It should be done before you begin removing your existing fuel/induction system. That way, you can still drive to an exhaust shop if needed. Use the supplied block-off plug (not the oxygen sensor) to cap off your new oxygen sensor fitting until you are ready to complete the rest of the EZ-EFI® installation. The Wideband Oxygen Sensor needs to be mounted in the exhaust system. A threaded fitting and block-off plug (See Figure 8) are provided. The fitting needs to be welded into place. To install the fitting, drill a 7/8 " diameter hole and weld the fitting centered in the hole. If you do not have access to a welder, any competent exhaust shop can install the fitting for you. Oxygen sensors use a built-in heater and deposits may build up in the unconnected sensor and cause damage.



Figure 8: O2 sensor block-off plug

WIDEBAND OXYGEN SENSOR INSTALLATION NOTES

1. Install the sensor just upstream of the catalytic converter (if present). The sensor can be installed after the converter, but the readings will register slightly leaner than if measured before the converter.
2. Ideally, the sensor should be mounted at least 10° above horizontal (wire side up, sensor tip down). This prevents moisture from collecting in the sensor. (See figure 9)

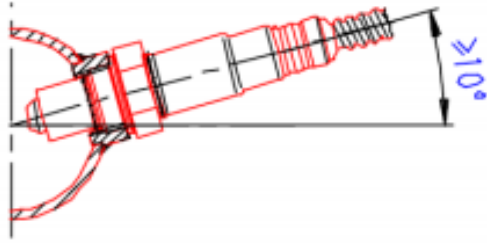


Figure 9: Section view of O2 sensor at 10°

3. The sensor should be installed at least 20 inches from the cylinder head to ensure excessive heat does not damage the sensor.
4. The sensor should be installed in or after the collector. This gives the ECU an average reading across an entire bank instead of from just one cylinder.
5. The sensor should not be mounted near the open end of the exhaust system. At low engine speeds, free air may reverberate into the exhaust and cause false readings.
6. The system will not function properly if there are any exhaust leaks. Any fresh air that gets to the sensor will cause false lean readings. The ECU will respond by adding fuel that the engine doesn't need.

NOTE: The use of leaded fuel will significantly reduce the lifespan of the oxygen sensor.

THROTTLE POSITION SENSOR (TPS): When installing the TPS, a throttle position sensor adapter needs to be installed and orientated in the correct position (See Figure 10). Install the Throttle Position Sensor to the most rear right throttle body in the downdraft when looking at the engine from the front of the car. (See Figure 11) The TPS connects to one throttle body shown in Figure 12.



Figure 10: Throttle Position Sensor adapter in the correct position



Figure 11: Top view of TPS location



Figure 12: Location of the TPS

INSTALLING THERMOSTAT

1. Clean thermostat housing of any old gaskets material before positioning on gasket. Install thermostat. Start bolts by hand, and then tighten.
2. Install heater and radiator hoses.

NOTE: Ensure the radiator drain plug is closed before replacing coolant.

CAUTION: Check that there is adequate clearance for throttle linkages through their range of travel.

IMPORTANT: Check for adequate hood clearance before closing hood. Clearance should be 0.5" minimum.

FUEL SUPPLY SYSTEM INSTALLATION

NOTE: We recommend using the FiTech Command Center 2 with our Chevy SBC 350 Downdraft + FAST EZ-EFI 2.0 Fuel Injection System for ease of fuel supply system installation. Connect the fuel cell to the FiTech Command Center 2, then connect to the fuel rail, and finally back to the fuel cell as a return to complete the system.

IMPORTANT: Use braided lines when installing your fuel lines.

FUEL CELL INSTALLATION

WARNING: GASOLINE VAPORS ARE HIGHLY FLAMMABLE. IT BURNS AND CAN CAUSE BAD INJURIES. DO NOT SMOKE NEAR GASOLINE OR WHEN FUELING. KEEP SPARKS AND FLAMES AWAY FROM GASOLINE.

FUEL CELL: Open the fuel cell lid slowly and wait for the pressure to release before refueling. Fuel cells should be kept well vented to insure they do not build pressure.

PREPARATION FOR INSTALLING FUEL CELL

1. Do not use a hydraulic jack as means of supporting your vehicle while working on it. Instead, use jack stands to rest the weight of the vehicle on when working underneath of it.
2. Always have vehicle and jack stands on a solid, level surface to prevent slipping/shifting and possible injury and/or damages. **DO NOT USE JACK AND OR JACK STANDS ON GRAVEL!**
3. Remove the ground cable from the negative battery terminal, to prevent any accidental injuries or damages from electrical contact.
4. Never run vehicle in enclosed space for extended periods of time due to toxic fumes coming from exhaust. Always make certain work space is well ventilated.
5. Eye and ear protection is recommended when using power tools on your vehicle.

INSTALLING FUEL CELL

1. Mount the fuel cell accordingly
2. Fuel cells should always have a good solid floor support under the cell for the weight of the fuel. You must have support straps all around the cell. The top, bottom, and both sides must have the proper support. Strap kits are available for all fuel cells. Please contact us for purchasing information.
3. Removal of any sharp metal edges from the area around the fuel cell is recommended to prevent penetration of the fuel cell upon impact.
4. Connect outlet the -10 AN fuel line to the fuel pump.

FUEL PUMP INSTALLATION

FUEL PUMP: The best location for mounting any electric fuel pump is the rear of the vehicle. The inlet and outlet of the pump must be mounted below the lowest point of the tank. This is necessary to allow for an adequate fuel supply. The pump is designed to push fuel and not designed to suck fuel out of the tank. It needs to be gravity-fed or if it's pulling from the top of the tank, it needs to develop a siphon feed to the pump. The pump should be mounted on the chassis, in a vertical position with the pump motor on top. Avoid exposure of the pump and fuel lines to moving parts and to any hot areas, such as the exhaust manifold. The pump should not be mounted in a closed area, such as the vehicle's trunk. Follow the steps below for mounting the pump.

WARNING: THE PUMP MUST BE LOCATED SO THAT INTERFERENCE BETWEEN THE VEHICLE'S BODY AND ITS CHASSIS MOVEMENT IS AVOIDED. THE PUMP AND ITS CONNECTING HOSES MUST NOT BE SUBJECTED TO LOW GROUND CLEARANCE, WHERE ANY FLYING ROCKS OR ROAD DEBRIS CAN CAUSE DAMAGE. FAILURE TO AVOID THESE HAZARDS WILL LEAD TO PUMP DAMAGE, WHICH COULD RESULT IN FIRE, PROPERTY DAMAGE, SERIOUS INJURY, AND/OR DEATH.

1. Select a mounting site as close as possible to the fuel supply and away from possible sources of heat, as detailed previously.
2. Mount the pump.
3. Connect the fuel line from the tank to the fuel filter and the filter to the inlet port of the pump. Use the same braided hoses. Avoid unnecessary restrictions such as sharp bends and undersized fuel fittings and hoses. Avoid routing fuel lines in areas that would cause chafing. All fuel line connections must be leak-proof.

FUEL FILTER INSTALLATION

FUEL FILTER: Once the fuel cell and fuel pump have been installed, connect the fuel line to the fuel filter. Then connect the line to the fuel rail.

1. Mount the new fuel filter canister in the location of the old fuel filter canister.
2. Locate the electrical connectors. Replace them with the new connectors.
3. Attach the fuel hose and start routing your fuel lines.
4. Once the fuel hose is attached and the clamps are secured, tighten. Be careful not to over tighten.
5. Make sure all connections are connected.

FUEL PRESSURE REGULATOR INSTALLATION

FUEL PRESSURE REGULATOR: Install the Speedmaster 2 Port Universal Billet Return Style Adjustable Fuel Pressure Regulator (See Figure 13) (PCE139.1007). Both the inlet and outlet of the regulator are -6AN 3/8" NPT fittings.

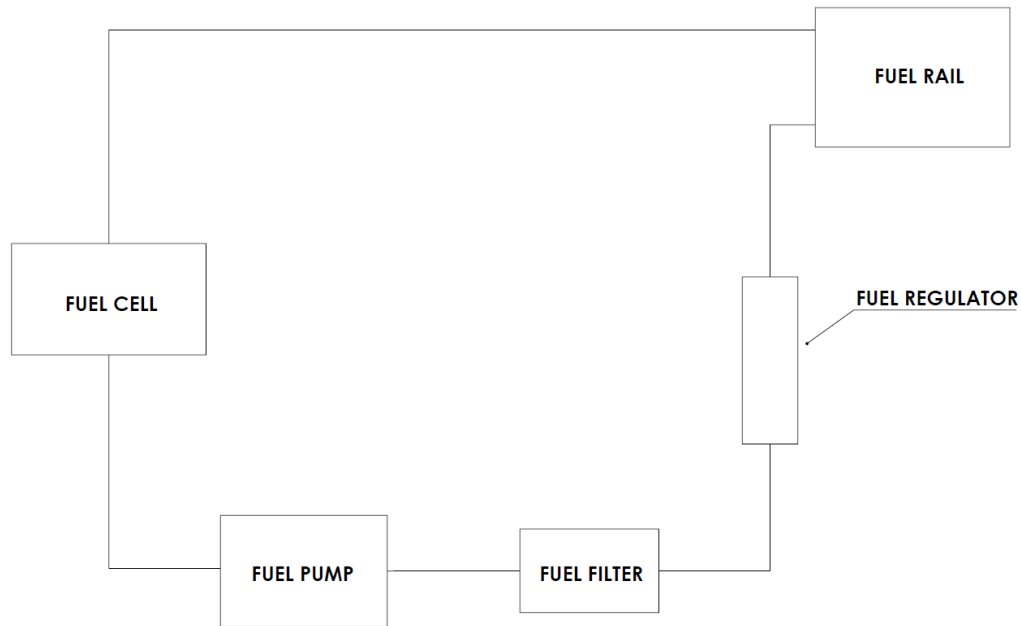
NOTE: Make sure fuel pressure regulator is in line between the pump and fuel rail.



Figure 13: Fuel pressure regulator

NOTE: Gauge sold separately. (PCE357.1004)

FUEL SUPPLY SYSTEM DIAGRAM



ECU (ELECTRONIC CONTROL UNIT) INSTALLATION

1. The ECU is water resistant when the USB port plug is in place. It can be mounted in the engine compartment or in the vehicle's interior.
2. The USB port is used to connect the ECU to a computer in the event that an ECU update becomes available. The USB port is not used in normal operation.
3. Avoid mounting locations that expose the ECU to extreme heat or that confine it to a closed area with no air circulation.
4. The ECU should not be mounted close to electrically "noisy" components. In particular, keep good spacing (try for 2 feet minimum) from ignition components (ignition boxes, coils, distributors, etc.).
5. There are LEDs on the front face of the ECU which can be used to monitor its operation and to signal if the on-board diagnostics has detected a problem. To take advantage of this feature, the ECU will need to be mounted so that the front face of the ECU is visible. The touchscreen hand-held (See Figure 14) will also indicate if any faults have been detected so the ECU does not have to be visible to the driver.
6. Self-tapping screws are included for mounting the ECU.







Figure 14: Touchscreen hand-held





WIRING HARNESS INSTALLATION

1. The main battery wires, labeled “BATTERY POS” and “BATTERY NEG” MUST BE CONNECTED DIRECTLY to the battery. Connecting them anywhere else invites problems with electrical noise. These kinds of problems are difficult to diagnose. The wires may be extended if needed using automotive grade 10 gauge (or larger) wire.
2. Yellow ring terminals are included for making the battery connections. After the ring terminals have been crimped on, use a heat gun or other heat source on the insulation to shrink it and seal it to the wire.
3. Be sure the “12V SWITCHED” wire is connected to a source that is hot with the key in the On/Run and Crank positions. Losing the 12V switched source during cranking can lead to a no start condition and other problems. The green “SW IGN” LED on the ECU indicates power on the “12V SWITCHED” wire and should stay lit during cranking.
4. **DO NOT** connect the “12V SWITCHED” wire to the positive side of an ignition coil.
5. A butt splice is included for tapping into an existing 12V switched wire if necessary. After the splice has been crimped on, use a heat gun or other heat source on the insulation to shrink it and seal it to the wire.
6. The main connector on the wiring harness has an integrated retaining bolt that secures the connector to the ECU. A 4 mm hex key is included with the kit for tightening this bolt.
7. The wiring harness should be kept away from ignition components (ignition boxes, coils, distributors, etc.) as much as possible. There will be places where plug wires run past the wiring harness. That is often unavoidable and not a problem. Just try to keep them – or other parts of the ignition system’s wiring – from running parallel to the wiring harness. And do not bundle the wiring harness together with other “noisy” wiring in the vehicle.
8. As with any wiring, it is good practice to avoid routing the wiring harness around sharp edges or near high temperature components such as headers.
9. A length of loose, braided wire covering is included. It can be used as needed to protect the loose wires in the wiring harness once they have been routed and cut to length. After cutting the wire covering, use a cigarette lighter or other heat source to seal the cut and prevent fraying.
10. The fuse on the red “BATTERY POS” wire is 25A. All other fuses in the harness are 1A.

The connections on the wiring harness are all clearly labeled. They are connected as follows:

LABEL	PHOTO/LOOSE WIRE COLOR	CONNECTS TO...
12V Switched	Pink	Switched ignition source (hot in On/Run and Crank). This turns the ECU on and off. Do NOT connect to the positive side of an ignition coil.
A/C Input	Gray	Air conditioner switch. Feeding power to this wire tells the ECU that the air conditioner has been switched on. Idle speed will be bumped up and the fan outputs will be activated.
Battery NEG	Black	DIRECTLY to negative post of battery.

Battery POS	Red	DIRECTLY to positive post of battery.
CAN Link		CAN enabled devices: FAST™ EZ-LS™, FAST™ XIM™, TCI® EZ-TCU™, etc.
Configurable Input	Gray/Black	Reserved for future use.
Configure Output	Blue/Yellow	Reserved for future use.
Coolant Temp		Coolant Temperature Sensor (CTS) typically installed in intake manifold. (This lead comes from the throttle body harness.)
Crank Trigger		FAST™ Crank Trigger or other 2-wire inductive pickup. This is one option for a crank reference input to allow EZ-EFI® to control ignition timing. If this connector is being used, the “DISTRIBUTOR” connector and “RPM INPUT” wire will not be used.
Distributor		FAST™ Dual Sync Distributor connector or other discrete pickup. This is one option for a crank reference input to allow EZ-EFI® to control ignition timing. If this connector is being used, the “CRANK TRIGGER” connector and “RPM INPUT” wire will not be used.
Distributor Power	Pink	This feeds 12V switched power to the distributor.
Fan 1 Relay	Blue	Negative control side of a relay for powering an electric fan. Do NOT wire directly to fan.
Fan 2 Relay	Blue/White	Negative control side of a relay for powering a second electric fan. Do NOT wire directly to fan.

<p>Fuel Pressure</p>		<p>Fuel pressure sensor.</p>
<p>Hand-Held</p>		<p>Hand-held cable that links the main wiring harness to the hand-held user interface.</p>
<p>Oxygen Sensor</p>		<p>Wideband oxygen sensor (O2) mounted in exhaust.</p>
<p>Points Output</p>	<p>Brown</p>	<p>“Points” input on an ignition box to make it fire. Only used when EZ-EFI® is controlling ignition timing. If this wire is being used, the “RPM INPUT” wire will not be used, and vice versa.</p>
<p>RPM Input</p>	<p>White</p> 	<p>A tach output from an ignition box or other source. This is the RPM input for the ECU when it is not controlling ignition timing. Do NOT connect this wire directly to an ignition coil. If this wire is being used, the “POINTS OUTPUT” wire, “CRANK TRIGGER” connector and “DISTRIBUTOR” connector will not be used.</p>

STARTING YOUR VEHICLE FOR THE FIRST TIME WITH THE SPEEDMASTER EFI SYSTEM

1. Disconnect the fuel pump relay harness from the main wiring harness. Or if you are using your own fuel pump relay, disconnect it from the green control wire from the main wiring harness. This is to prevent the fuel pump from priming at key-on before you've had a chance to select your fuel system type (return or returnless) in the Setup Wizard.
2. Connect the hand-held to the main wiring harness using the hand-held cable.
3. Turn the ignition switch on and wait for the hand-held to power up and display the home screen.
4. Reconnect the fuel pump relay harness.
5. Select Setup Wizard in the hand-held. It will walk you through initial setup and cranking.