TI Automotive

FA1E0016AAF00

BRUSHLESS ELECTRIC IN-TANK FUEL PUMP INSTALLATION INSTRUCTIONS

To use the PWM (Pulse Width Modulation) function the Brushless Controller requires a 100 HZ input.
If 100 Hz input is not available the Brushless Controller can be wired to run either 45% or 100% Duty cycle

PRECAUTIONS FOR FUEL SYSTEM SERVICE

TO REDUCE THE RISK OF FIRE AND PERSONAL INJURY, IT IS NECESSARY TO OBSERVE THE FOLLOWING PRECAUTIONS:

- Perform this repair **ONLY** in a properly equipped service facility.
- Position the vehicle in a clear, level, well ventilated work area.
- Make sure there are no sources of spark or combustion near the work area.
- Perform work in a no-smoking area, or post no-smoking signs in the area selected.
- Have readily available a fully functional Class B fire extinguisher of adequate size (such as a 5 pound CO-2 as a minimum).
- Disconnect the ground cable from the vehicle's battery before performing any operation involving gasoline, gasoline tanks or gasoline lines.
- *Allow the vehicle to cool before performing any operation which could possibly expose gasoline or gasoline vapors to hot parts such as catalytic converters, hot light bulbs, or similar components.*
- Avoid using extension cords or lights which might overheat or cause sparks.
- Avoid inhaling gasoline fumes and prolonged skin contact with gasoline. Promptly wash any body areas which have been in contact with gasoline.
- Wear approved safety glasses while performing any repairs.
- When raising the vehicle to perform under-vehicle services, use proper hoisting or jacking equipment along with approved safety supports.
- When removing the gasoline from a fuel tank, use an OSHA approved pump which is specifically designed for handing gasoline. **DO NOT USE** any other type of pump. Gasoline removed from a fuel tank must be stored in approved gasoline containers.

In addition to the safety concerns listed, please carefully evaluate the hazards involved in such a service procedure and take whatever further precautions may be necessary.

PRECAUTIONARY STATEMENT

This pump is used in modified vehicles **ONLY** and to be installed by an automotive service professional. This brushless electric in-tank fuel pump must be used with a controller. Vehicles in which this pump is to be installed should have the following upgrade performed prior to pump installation:

- **Upgraded fuel pressure regulator**
- **Larger fuel supply and return lines**
- **12 gauge or larger pump wiring**
- **Minimum 25 amp fuse**
- **40 amp relay**

Failure to follow the above noted requirements while using this pump in a stock factory fuel system may cause severe drivability issues and could lead to damage of the vehicle's fuel system.

WARNING: This brushless electric in-tank fuel pump **WILL NOT** work on carbureted fuel systems. It is for electronic fuel injection only.

CAUTION: Read these instructions thoroughly from start to finish before attempting to replace the fuel pump.

MINIMUM TOOL REQUIREMENTS:

- Hoist or end lift jack
- OSHA approved safety stands
- OSHA approved fuel transfer pump
- OSHA approved fuel storage containers
- Variety of mechanics hand tools

FUEL PUMP REPLACEMENT INSTRUCTIONS

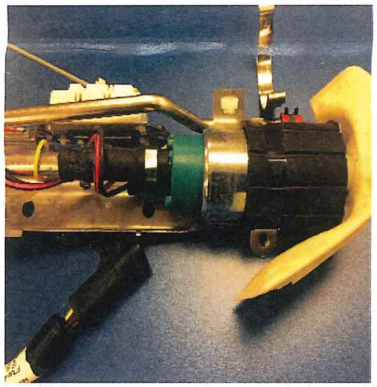
NOTE: The words "pump bracket" used throughout these instructions mean fuel pump mounting bracket and fuel level sender assembly. The word "module" refers to fuel pump module.

PREPARATIONS

- Relieve fuel system pressure **(This procedure is necessary since the fuel system can retain gasoline under pressure for a considerable period of time. Opening a pressurized line could spray fuel creating a risk of fire and/or personal injury.)**
    - Start the engine.
    - Remove the fuel pump relay allowing the engine to run until it quits. When the engine quits, the fuel system pressure has been relieved. Turn the ignition switch off.
    - Remove the battery ground (-) cable for safety.
    - Reinstall the fuel pump relay.

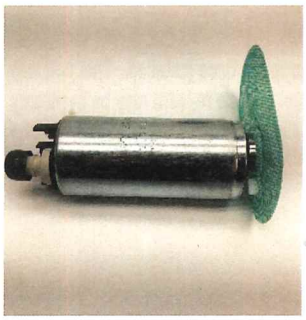
INSTALLATION

- **Locate Fuel Pump Bracket or Module in the Fuel Tank**
    - Some vehicles will require raising the vehicle to remove the fuel tank. Some vehicles will require removal of the rear seat, an access panel, and possibly the trunk liner in order to get to the fuel pump bracket or module. Refer to the vehicle's service manual for specific instructions.
- **Disconnect Electrical Connections**
    - If not done previously, disconnect electrical connections from the pump bracket.
- **Disconnect Fuel Line Connections**
    - **CAUTION:** Fuel lines may still be under slight pressure. Place a rag or shop towel around the fuel line connection to avoid excess fuel spillage.
- **Remove Pump Bracket or Module from the Fuel Tank**
    - Many vehicle fuel pump brackets are L-shaped and attach to the main bracket with a screw and a lock washer. Loosening the screw and removing the L-shaped bracket allows an easier method of removing the hose from the pump and the pump from the bracket. If there is not an L-shaped bracket, cut the hose, remove the clamps, hose pieces and fuel pump from the larger bracket and discard.

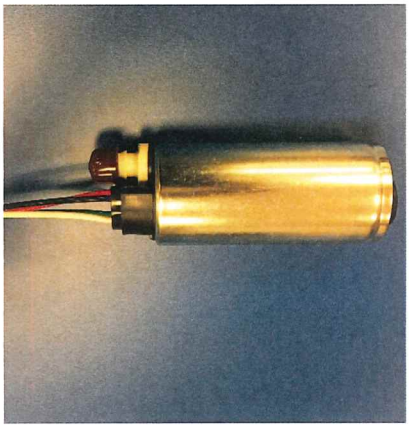


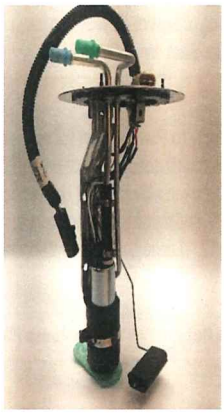
NOTE: Failure to use a new filter on the fuel pump inlet will likely result in premature pump failure and will void the pump warranty if applicable.

- **Filter Installation**
    - Install the new filter on the new pump inlet. Secure the filter to the pump by pressing the filter onto the inlet hob of the pump. In some applications the filter will be secured to the pump after the pump is placed on the isolator in the fuel pump bracket.



- **Install Pump in Bracket or Module**
  - Install new brushless pump into pump bracket or module. Alterations may be necessary to fit. The pump filter may need to be installed after pump is installed into the pump bracket or module. Make sure pump is secure and filter is attached firmly.





PWM Pump Controller Installation

- **Solder/Crimp on New Terminals**
  - The brushless electric in-tank fuel pump will have 4 wire leads required to operate the pump (cut to length if required). If replacing a 2 wire brushed pump, the 4 wire leads from the controller will need to be used to operate the pump.
  - Some pumps will require cutting the wires near the existing connector or terminals and stripping 1/4" of insulation from the wires. Next, crimp on new terminals or soldier connections using the recommended tools. For proper pump performance make sure terminated connections are secure.
  - The flange will need 4 electrical pins to terminate the pump (in tank) to the controller (external to tank).

- **Mounting Pump Controller Box**

  Determine controller mounting location. Area should be in close proximity to the tank and away from heat and extreme weather conditions. Prior to mounting refer to the power source label on the bottom of the controller for polarity. Take note of the 4 wires and phase orientation to be connected to the fuel pump

  Use 4 included self tapping screw to mount the controller box.

  Make sure mounting location leave enough wire length but not straining the wires.

  Be sure to mount the unit away from extreme heat and extreme weather. The trunk area is a good location.

- **Connect Wires and Routing**

NOTE: Use wire harness provided in kit to assure latest revision for controller connection. The brushless electric in-tank fuel pump may fail to run or run backwards if wired incorrectly.

Take note of the 4 wires and phase orientation to be connected to the fuel pump (Output side) and 3 wires on the input side of controller. Terminate wire leads accordingly. Controller leads may need to be cut to shorten to fit mounting location. Cut to length.

Controller wires power input

Red wire – 12V power into controller (Recommended 25 amp fuse with 40 amp relay)

Black wire – Ground power into controller

Orange Wire – Input control wire (required signal at 100 Hz from ECU). Connect to output from ECU / ECM to new TI controller orange wire.. If replacing in a vehicle that currently has a PWM fuel pump this would be the wire from ECU to the fuel pump driver (controller). Remove existing driver and use input wire from ECU.

To use the PWM (Pulse Width Modulation) function, the Brushless Controller requires a 100 HZ input. The new TI controller will run off the stock tune from the OE manufacture, this tune will need to be customized to fit your vehicle application. A professional dyno tune is recommended.

If 100 Hz input is not available the Brushless Controller can be wired to run either 45% duty cycle by grounding the Orange wire or 100% Duty cycle by leaving the orange wire unconnected, protect open wire from shorting.

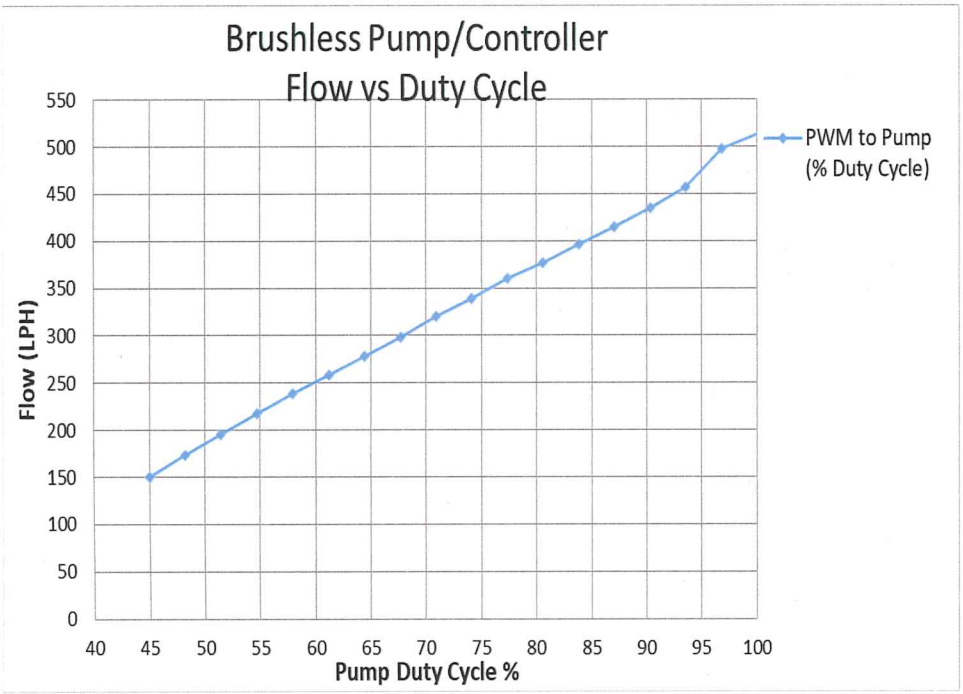
Controller wire power output to pump	Pump wire harness
Controller Blue wire – Phase 1 to pump	Pump Red
Controller Green wire – Phase 2 to pump	Pump Green
Controller White wire – Phase 3 to pump	Pump White
Controller Black wire – Ground	Pump Black

- **ECU Command vs. Duty Cycle to Pump (Chart for reference)**
  - Variable PMW control will need to be customized to your vehicle. Unchanged, the controller will default to the vehicles stock program.
  - This controller can be ran without being connected to the vehicle ECU.
    Option #1 – Ground the orange wire to run controller at 45% constant duty cycle.
    Option #2 - Leave orange wire disconnected to run controller at constant 100% duty cycle.

PWM Cmd (% Duty)	PWM to Pump (% Duty)	
Wired to ground	45	
1-4	0	
5-9	45	
10-95	45-100	* linear transfer function through this range
96-99	100	
Unconnected	100	

Average performance at 13.5 volt @ 400 kPa

PWM Command	PWM to Pump (% Duty)	Avg Flow LPH 13.5v @ 400 kPa	Controller Amps 13.5v @ 400 kPa	Pump Avg Amps 13.5v @ 400 kPa
10	45	150	4.58	8.75
15	48	173	4.73	8.47
20	51	195	4.90	8.33
25	55	218	5.10	8.11
30	58	239	5.32	7.94
35	61	258	5.51	7.84
40	64	279	5.70	7.76
45	68	298	5.90	7.72
50	71	320	6.15	7.66
55	74	339	6.38	7.60
60	77	360	6.62	7.57
65	81	376	6.83	7.44
70	84	396	7.10	7.43
75	87	414	7.34	7.50
80	90	434	7.63	7.51
85	94	457	7.98	7.53
90	97	498	8.62	7.62
95	100	513	8.80	7.72



Reinstall the Fuel Pump Bracket or Module in Tank

- Using the new or existing tank seal, place the pump and the bracket assembly or module into the fuel tank. Tighten the lock ring or tighten the existing nuts to seal into the tank.

- **Install Fuel Tank in Vehicle**
  - Install the fuel tank in the vehicle. Connect the electrical connections and the fuel lines to the proper locations on the fuel pump bracket or module.
- **Check Installation**
  - Start the vehicle and check for leaks. Refer to the vehicle service manuals for information on clearing any resultant error codes.

TROUBLE SHOOTING

Should the brushless electric in-tank fuel pump fail to operate, check the pump fuse and pump relay as outlined in the service manual. If the pump has power and proper polarity, check the pump phase wire orientation to the pump controller (refer to wire color controller to brushless electric in-tank fuel pump).

This product is intended for High Performance Use

Additional modifications to the fuel delivery system may be necessary for the vehicle to perform properly once installed. This unit was designed to provide additional fuel flow at the manufacturer's specified operating pressure. A control module re-learn may be necessary once this unit is installed and should be performed by following the manufacturer's guidelines. Highly modified vehicles may require professional tuning of the on-board computer

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