



About the Arctic PowerVolt FICM by GB Remanufacturing, Inc.

GB's Arctic PowerVolt FICM is a remanufactured high performance FICM designed to improve cold weather engine operation, improve injector response time and reduce injector stiction, a common issue on the Ford Powerstroke 6.0L. The APV FICM accomplishes this by increasing the voltage to the injectors from 48 volts to 58 volts and modifies the peak current used to activate the fuel injectors. Unlike some competitive 58 volt FICMs, the GB APV FICM upgrades all of the components and drivers exposed to this higher voltage. In addition to these upgrades, GB corrects many of the original design and manufacturing defects that are present in the original equipment FICMs. The result is a highly reliable unit that improves engine performance.

About Injector Stiction

The 6.0L injector is a hydraulically controlled electronically activated injector. The injector uses high pressure engine oil supplied from the High Pressure Oil Pump. High pressure oil is supplied to the top of the injector during engine operation and can range from 500 psi to over 3,500 psi, depending on engine operating conditions. The spool valve inside the top of the injector controls the oil flow to the lower section of the injector, which in turn controls injector activation. The valve is activated by two solenoids on the side of the injector, an open coil to activate the injector and a close coil to deactivate the injector. The solenoids are activated by the FICM, which is controlled by the vehicle's Powertrain Control Module (PCM).

Injector Stiction occurs when the spool valve "sticks" to the close solenoid, preventing or delaying the valve from moving to the open position. This results in engine misfire and poor engine performance. Stiction is most common during cold engine start up because the oil viscosity is higher which delays or prevents the spool valve from moving freely. In virtually every case, if an engine misfires on cold start up but runs normally once warmed up, stiction is the cause.

Since the spool valve is physically moved by the magnetic field created when the solenoid is energized, increasing the voltage and amperage to the injector can reduce stiction by producing a stronger magnetic field. Note however, that the APV FICM will not correct a constant engine misfire caused by a failed injector, this is likely a result of a permanent injector failure due to an open or shorted coil or internal mechanical failure.

The spool valve and bore tolerances are extremely tight and are measured in .0005" of an inch. One critical step that must be taken to reduce injector stiction is proper engine maintenance, especially engine oil and filter service. A contributing factor to stiction is poor oil quality, contaminated oil and extended oil change intervals. This is especially true with higher mileage engines in which higher combustion blow-by results in faster engine oil contamination. Using aftermarket performance tuners that increase peak cylinder pressure can also lead to quicker oil contamination and injector stiction issues.

In order to achieve the best results possible, it is critical that the engine oil and filter be serviced when the APV FICM is installed.

Fuel Injection Control Module (FICM) Programming

This remanufactured Fuel Injection Control Module (FICM) is pre-programmed with the latest software at the time of re-manufacture. The unit is ready for installation and operation. The latest version of software includes an inductive heating feature that will rapidly heat the injector spool valve by activating the injector coils. This will help reduce injector stiction. This mode of operation is only activated when the PCM senses the engine is started under cold operating parameters.

In some cases, pre-programming may result in Diagnostic Code U0306 being stored in the Powertrain Control Module (PCM). This code will not cause the Malfunction Indicator Lamp (MIL) to illuminate or any adverse driveability symptoms. Code U0306 is the result of having a later version of software in the FICM module than the PCM expects. If desired, code U0306 may be corrected by reprogramming the FICM and PCM together, on the vehicle with the appropriate re-programming equipment and software.

Verifying 58 Volt Operation

All GB APV FICMs are fully tested at the factory prior to shipping. This testing ensures each unit passes a battery of tests which include fully loading the internal power supply, verification of communication between the FICM and PCM, verification of each injector activation and waveform analysis of each injector's coil. A complete self diagnostic and scan test is also performed.

Because the FICM monitors and communicates the voltage supplied to the injectors to the PCM, the 58 volts would be perceived by the PCM as being too high, this would normally result in a diagnostic code P0611 (FICM Performance Failure). Because of this, the FICM has been re-calibrated to transmit 48 volts to the PCM when in fact the voltage to the injectors is 58 volts. This ensures that the self diagnostic capabilities for the FICM and PCM remain intact. If you monitor the "FICM_MPWR" voltage parameter via a scan tool you will see 48 volts. If you would like to verify the FICM is actually delivering 58 volts, you may do so by measuring the injector voltage at the back of the FICM using procedure A on the back side of this document.

Warning: Follow vehicle manufacturer's service procedures for replacement of FICM. If those procedures differ from the procedures below, use the vehicle manufacturer's procedures.

This procedure, while not overly difficult, does require a level of technical skill that not every person may be comfortable performing. Individuals who have not performed similar procedures working on or servicing their vehicles should consult a professional.

WARNING: Never remove the cooling system pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system and or personal injury. Wait until the engine is cooled prior to proceeding.

1. Figure 1: With the engine cool and at ambient air temperature, wrap a thick cloth around the top of the cap (1) of the degas bottle. Slowly loosen the cap. If pressure is present, stop and let the engine cool.

2. Figure 1: After cooling system has been relieved of pressure, remove the engine vent hose (2) and radiator vent hose (3) from the top of the degas bottle. Cap the two ports on the degas bottle and hoses to prevent coolant loss.

3. Figure 1: Remove the two bolts from the degas bottle (4). Slide the degas bottle aside.

4. Figure 2: Remove the turbocharger intake tube bracket (1) by removing the two nuts from FICM (2) and two bolts from intake tube (3).

5. Figure 3: Remove the four retaining bolts holding the FICM in place.

6. Figure 4: Tilt the FICM up and carefully remove the three plugs on the FICM (1), ensuring not to break the locking clasps on the connector plug.

7. Remove the FICM from the vehicle. Remove the rubber mounting bushings and steel spacers from the FICM. Inspect and transfer bushings and spacers to new APV FICM.

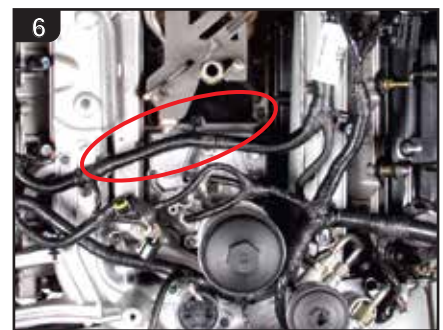
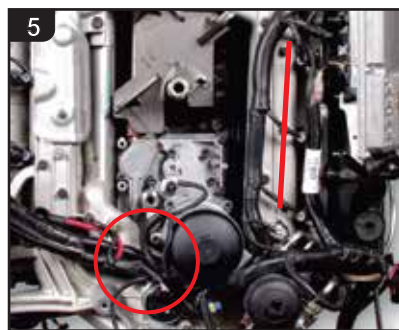
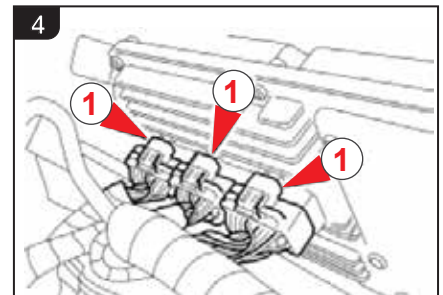
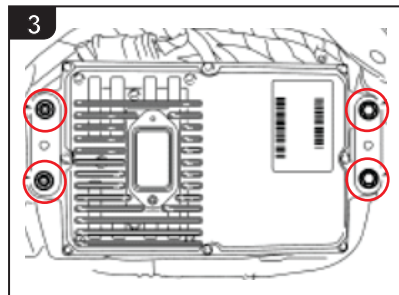
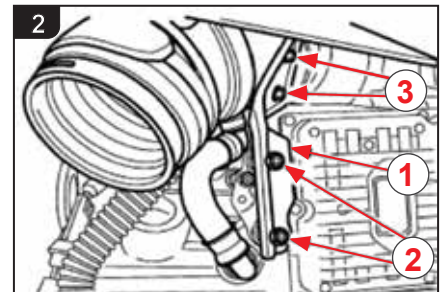
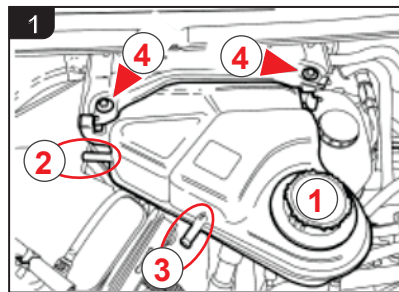
8. WIRING HARNESS INSPECTION - Figures 5-7: A common area of concern with the 6.0L is chafing of the fuel injection harness. Wire chafing can occur between the fuel injection wiring harness and the valve covers, intake manifold and intake manifold mounting bolts. This can result in intermittent poor operating conditions that are difficult to diagnose. Using the images in figures 5-8 carefully inspect the wiring harness and engine contact points shown in red. Any damage to the harness must be corrected BEFORE the GB APV is installed.

9. INSPECT PINS ON THE FICM BEING REMOVED - Figure 8: A common area of failure on the FICM is burnt pins on the 22 pin connector, this is the largest connector of the three. Inspect the FICM being REMOVED for burnt pins. If the pins are burnt it is likely the connector on the injection harness has burnt pin sockets. If not corrected, this will result in damage to the GB APV being installed, which is not covered by GB's limited warranty. Replace any burnt socket pins inside the connector plug prior to installation.

10. Reverse the removal procedure to install the new APV FICM. Ensure any coolant lost during the removal procedure is replaced with compatible fluid. Ensure degas bottle cap is tightened prior to starting engine.

11. PERFORM AN OIL & FILTER SERVICE to ensure improved injector operation and reduce the possibility of stiction.

12. OPTIONAL PROCEDURE A: All APV FICMs are fully tested prior to shipping. However, if you would like to verify 58 volt operation you may perform the steps in procedure A (Also see notes on reverse side).



Procedure A - Verify 58 Volt Operation (Optional)

Although optional, you may want to verify 58 volt operation by taking a direct measurement at the back of the FICM using a multi-meter.

1. With the engine off, remove the two screws securing the access cover on the back side of the FICM (opposite side of the connectors). **DO NOT REMOVE THE SCREWS ON THE FRONT OF THE FICM AS THIS WILL VOID THE WARRANTY.**
2. Turn the key on but do not start the engine.
3. Using a digital multi-meter in DC voltage measurement mode, place the black lead on the screw with the black dot and the red lead on the screw with the red dot. Voltage should be 58 volts (+/- 4). **USE CAUTION NOT TO TOUCH RED METER LEAD TO FICM CASE, DOING SO WILL PERMANENTLY DAMAGE FICM.**
4. Reinstall the access cover ensuring the screws are tight. Failure to tighten cover may result in water intrusion and damage to FICM.

