

DFIT
DIESEL FUEL INJECTOR TESTER
USER GUIDE

HICKOK
INCORPORATED

DFIT

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USER GUIDE

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Safety Information

Before using this tester, carefully read, understand and follow instructions and safety messages on equipment and in this manual.

The manual cannot anticipate or provide advice and cautions for all situations encountered by technicians. With this in mind, always follow and refer to the manuals provided by the manufacturer or the vehicle or equipment being tested or used for all information and testing procedures whenever diagnosing, repairing or operating such vehicle or equipment.

Failure to follow the instructions, cautions and warnings provided here as well as those provided by the vehicle and equipment manufacturers can result in fire, explosion, bodily injury and property damage.

In addition to the information listed here, additional warnings and cautions are listed throughout the manual. Please read them carefully.

Safety Information

⚠ Fuel vapors are toxic and explosive, which can cause severe injury or death

- Use proper ventilation to avoid breathing fuel vapors.
- Ethanol fuel and gasoline mixed with ethanol are highly poisonous and chemically active. Blindness and death are possible if exposure to these substances is extensive.
- Minimize prolonged exposure to ethanol as a liquid or vapor. Remember, symptoms of ethanol exposure can occur after a delay of several days.
- Minimize contact with the skin with the use of gloves (such as nitrile gloves) when there is possibility of getting ethanol fuel on your hands. If the skin is directly exposed, wash the area immediately and change any clothes that have become wet with fuel.
- Always wear appropriate protective glasses when testing the pressure of the fuel system or gas caps. Should fuel get into eyes, flush eyes immediately with water and consult your physician.
- Follow all federal, state and local regulation for the safe storage and use of the compressed nitrogen gas used or stored at site.

⚠ Vehicles emit flammable vapors which can ignite

- Keep flames, sparks, cigarettes and other ignition sources away from the vehicle at all times.
- In case of fire, never use water to fight flames caused by gasoline or ethanol blended gasoline. This will cause the flames to spread instead of extinguishing them.
- Use a dry chemical extinguisher to fight flames (preferably one marked ABC, though BC is acceptable). A foam extinguisher is acceptable only if it is ARF grade, which is resistant to alcohol.

⚠ Before beginning any tests, make sure the equipment and the test environment are safe

- Test area should be well ventilated.
- When working on and underneath the vehicle, make sure it is properly supported on a hoist or jack stands.
- When removing the fuel cap , make sure to turn the vehicle off.
- When removing the fuel cap, do so slowly. Allow any pressure to decay before fully removing the cap.

Use the equipment properly

- Do not disassemble the Main Control Unit except to access the fuse or SW1 switch during replacement/update. This will void your warranty.
- Do not disassemble the Drive and Measurement Unit. This will void your warranty.

Check all parts periodically, clean and replace if necessary.

- Make sure the equipment is in good working condition. This tester is a precision instrument—keep it clean and repair (or replace) any damaged parts.

Safety Information

DFIT Hardware

This section illustrates and describes the items included with the DFIT Tester. Be sure you familiarize yourself with all of the equipment and procedures before conducting any tests.

For your reference, the following is a list of acronyms used throughout this guide:

DMU—Drive and Measurement Unit

DTC—Diagnostic Trouble Code

ECM—Engine Control Module

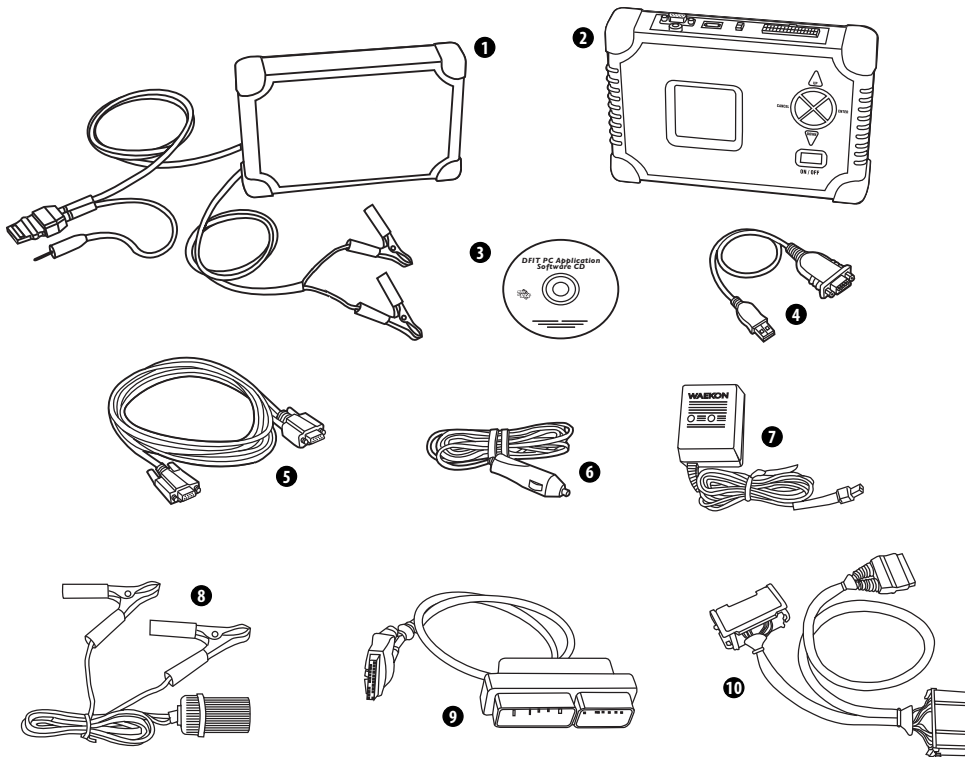
FICM—Fuel Injector Control Module

ICP—Injector Characteristic Performance

MCU—Main Control Unit

DFIT Hardware

Components



- ❶ Drive and Measurement Unit
- ❷ Main Control Unit
- ❸ DFIT PC Application Software CD
- ❹ USB to Serial Port Adapter
- ❺ 6' Serial Cable
- ❻ 12V Power Cord (vehicle)
- ❼ 12V Power Cord (wall outlet)
- ❽ Power Adapter (alligator clip)

- ❾ D-1 Duramax Cable - Later (non-FICM)
- ❿ D-2 Duramax Cable - Early (FICM)

Not shown:

- User Guide
- Software Installation Instructions
- Diagnostic Reference Guide
- Carrying Case

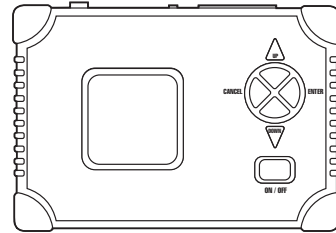
The Main Control Unit (MCU)

The Main Control Unit (MCU) is used for functions such as selecting and starting tests, monitoring the status of a test, interfacing with the vehicle, and reviewing test results.

Using the Keypad

The main functions of the keypad are:

- **UP** and **DOWN**—scroll within a screen
- **CANCEL**—return to the previous screen or to cancel a test
- **ENTER**—start or continue a test
- **ON/OFF**—power the unit on or off



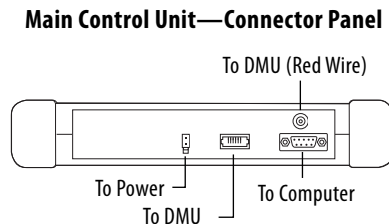
Main Control Unit — Front View

Note: For certain screens, the buttons may have additional functions.

Using the Connector Panel

Use the connector panel on the MCU for power and communication connections:

- **Power**—connect the selected power cord (12V adapter or wall outlet adapter) here to provide power to the unit.
- **DMU Port**—connect the interconnect cable from the DMU to this port to send test signals to and from the MCU.
- **RS-232 Port**—connect the 9-pin serial cable (6' or 10') here to connect the MCU to a computer .
- **DMU Red Wire**—connect the red cable from the DMU here. Note: If not connected, the engine will not crank and you will not be able to continue with the testing.



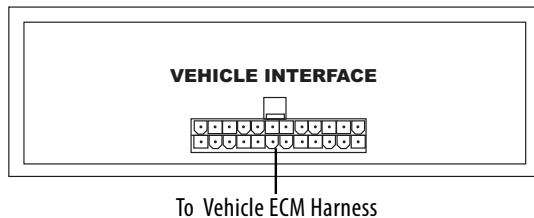
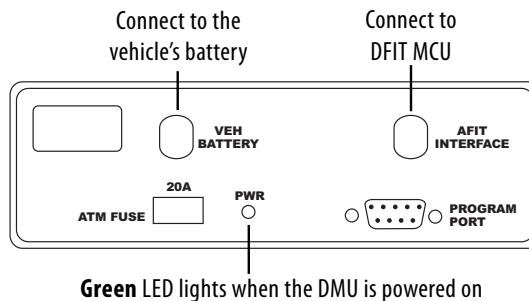
The Drive and Measurement Unit (DMU)

The Drive and Measurement Unit (DMU) allows the DFIT MCU to control the vehicle fuel system components..

Using the Connector Panel

Use the connector panel on the DMU for power and communication connections:

- **Veh Battery**—connect the power cord with clips here to provide power to the unit by connecting to the vehicle’s battery.
- **Program Port**—not used.
- **Vehicle Interface**—use to connect the DMU to the vehicle’s ECM harness.



Cables, Software and Adapters

- **DFIT PC Application Software**—install onto the shop computer. Use to analyze and save the test data uploaded to the computer from the MCU. Also use to download software update files to the MCU.
- **9-pin Serial Cable**—use the 6' cable to connect the MCU to the shop computer.
- **USB to Serial Port Adapter**—if a serial port is not available, use to connect the 9-pin serial cable to a USB port on your computer. Will require installing driver software (located on the DFIT CD).
- **D-1 Duramax Cable (later, non-FICM)**—use to connect the DMU to the vehicle's engine harness.
- **D-2 Duramax Cable (earlier, FICM)**—use to connect the DMU to the vehicle's engine harness.
- **Power Cords**—use the 12V power adapter to supply power to the MCU when testing the vehicle. Use the battery power clips to connect the DMU to power. *Only* use the wall outlet adapter to supply power to the MCU when connected to your computer.

 **IMPORTANT**

Do not use the AC wall outlet adapter for testing the vehicle.

Hookup & Testing

This section illustrates the hookup procedures. Several options are available to complete the basic hookup. Use this section along with the vehicle's Service Information/Shop Manual (or equivalent) to complete the hookup for your vehicle.

This section also explains the DFIT test procedures and the screens you will use to navigate to the tests:

ICP Balance Test—determines if there is a proper balance between the fuel used to move the internal parts of the injector and the amount of fuel injected into the cylinder for combustion.

Return Flow Leakage Test— determines the return flow of the fuel injection system.

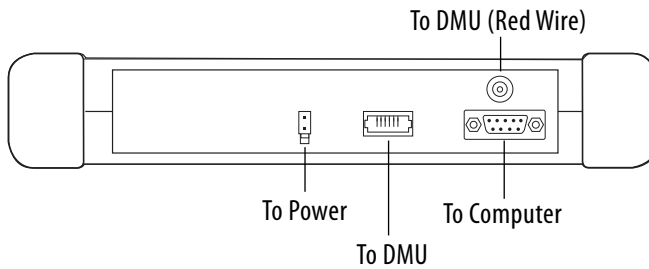
Pump Performance Test— evaluates the ability of the fuel delivery system to provide sufficient fuel to the injectors.

For more detailed information on diagnosing the test results, please refer to the *DFIT Diagnostics Reference Guide*.

Hookup & Testing

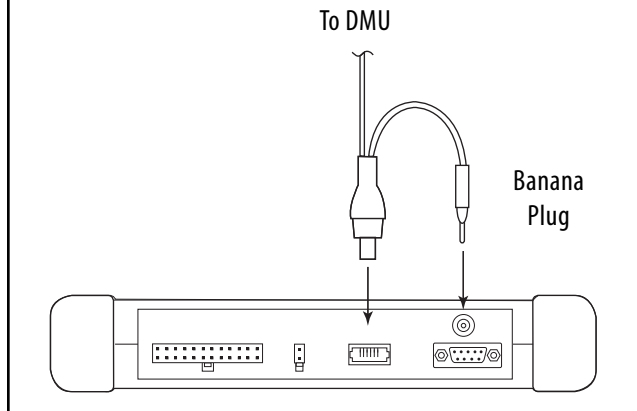
Hookup

Main Control Unit—Connector Panel

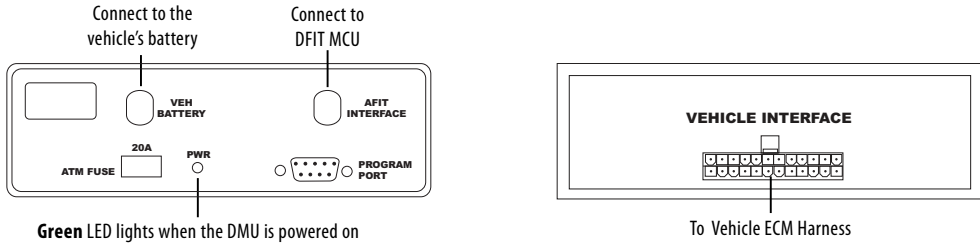


Special Note

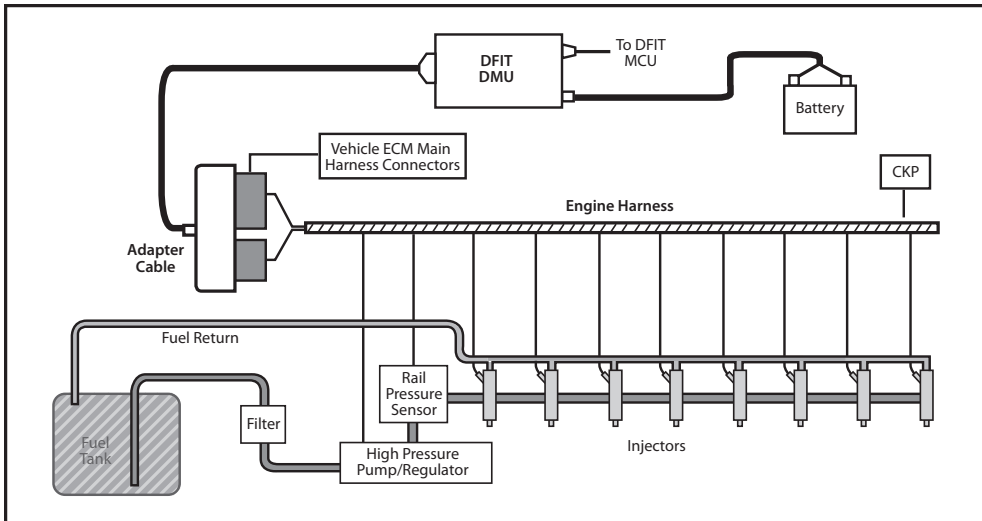
When connecting the DMU to the DFIT MCU make sure to connect both ends of the cable as shown in the illustration below. If not connected properly, the engine will not crank and you will not be able to continue with the test procedure.



Drive and Measurement Unit (DMU)—Connector Panels



Connecting to a Diesel Engine



Hookup & Testing

Procedure

IMPORTANT!

- Do not connect the Direct Injector Adapter (DIA) cables to the vehicle until instructed to by DFIT.
- Before you begin a test make sure the battery is fully charged since it will be necessary to crank the engine several times to complete a full test.

Step 1—Connect to Power

- a. Place the DFIT Main Control Unit (MCU) into the vehicle's cab and plug the power adapter into the vehicle's power port (cigarette lighter) socket.

Note: With some vehicle's, the power port may only work with KEY ON. If that is the case, use the DFIT battery power adapter.

- b. Place the Drive and Measurement Unit (DMU) in the engine compartment and connect the power clips to the vehicle's 12 volt battery.

IMPORTANT! The DMU requires high current to drive the injectors. Therefore, make sure the clips are firmly attached to the battery.

- c. Connect the DMU to the DFIT MCU.

- d. Press the ON/OFF button to power on the DFIT MCU.

Note: The MCU performs a self-test and checks the vehicle's battery voltage. If there is a low amount of voltage in the battery, the tester flashes LOW BATTERY. To avoid losing power during a test, it is recommended to properly charge the battery before proceeding.

- e. After the self-test is complete, press ENTER to continue to VEHICLE SELECTION.

Step 2—Select a Vehicle

- a. When prompted on the DFIT MCU, do one of the following:
 - Confirm a previously selected vehicle.
 - Select a new vehicle to test. *Note: New vehicle selection includes model year (VIN 10th digit), manufacturer, model, body (VIN 5th digit), engine and engine VIN (VIN 8th digit).*
 - Clear a previously selected vehicle.

b. If a previously selected vehicle is used:

- Proceed to **Step 3—Select a Test**.

Note: If you are unsure of which cable to use, from the DFIT main menu select Utility Functions, and then select View Test Specifications.

If a new vehicle is selected:

- DFIT displays the vehicle selected and the cables required to test the vehicle on the confirmation screen. *Important! Do not connect the cables to the engine ECM or disconnect the ECM from the harness at this time.*
- Connect the required Interface Cable to the DMU.
- Confirm the vehicle selected to proceed to the test selection menu.

Step 3—Select a Test

a. At the DFIT MCU Main Menu:

- Select **INJECTOR TEST**
- Select **RUN NEW TEST** when the test selection screen is displayed.

b. Follow the on-screen instructions/prompts to connect to the vehicle. This will include:

- Turn the ignition ON but **do not** crank the engine (ignition on/engine off).
- When asked if the vehicle *STARTS OR RUNS*:

Press **ENTER** for YES or press **CANCEL** for NO.

If YES is selected, start the vehicle when prompted. **Do not** turn the vehicle off until instructed to do so.

- When prompted, with the ignition off, connect the DMU cable to the vehicle ECM harness connectors.

c. After connecting to the ECM harness, select **START TEST** when prompted.

d. Following the on-screen instructions/prompts, crank the engine when required to build fuel pressure. An audible warning and text display on the tool will prompt you when to stop cranking.

Hookup & Testing

Note: If DFIT detects the vehicle is not in park or neutral , the following screen is displayed:

```
INJECTOR FLOW TEST
FUEL RAIL CHARGING
To charge fuel rail
pressure the engine
must be cranked
-VERIFY that vehicle
is in NEUTRAL or
PARK and parking
BRAKE is SET
-If manual trans
PRESS CLUTCH PEDAL
ENTER - CONTINUE
CANCEL - CANCEL TEST
```

WARNING

To avoid serious injury or death, make sure to verify that the vehicle is in neutral or park, the parking brake is set, and that wheels are blocked before you begin cranking.

- e. Repeat the above step for each injector and the fuel rail leak test.

Viewing Test Results

This section explains how to view the results of the last completed test by viewing the data on the MCU, or uploading the results to the shop computer and viewing the data with the DFIT PC Application.

Viewing Test Results

Viewing Results on DFIT

You can view the results of the last completed test by navigating to, and selecting, **View Test Results**. Press **UP** or **DOWN** to scroll through the following results:

ICP Balance Test Results

These screens represent the results of tests that are performed to determine if there is a proper balance between the fuel used to move the internal parts of the injector and the amount of fuel injected into the cylinder for combustion.

The tester measures the fuel consumption of all the injectors and displays the results in two forms: graphically and numerically. The first screen shows all the injector ICP values in a bar graph form with dotted tolerance lines. The second screen displays the same information numerically along with the engine temperature.

If one or more injectors are not using approximately the same amount of fuel as the other injectors it is an indication that the injector is not functioning properly.

Return Flow Leakage Test Results

These screens represent the results of tests that are performed to determine the return flow of the fuel injection system.

The tester compensates for differences in fuel, temperature and other conditions that cause return flow to be different under different conditions. This compensated leak measure is referred to as the **Leak Factor**. The *higher* the Leak Factor the *lower* the return flow amount is. There are four Leak Factor categories: Normal Leak, Above Normal Leak, Significant Leak, and Gross Leak.

Pump Performance

These screens present an evaluation of the ability of the fuel delivery system to provide sufficient fuel to the injectors.

The tester compensates for crank engine speed, system return flow, and other variables to determine if the High-Pressure Pump can supply sufficient fuel under all engine operating conditions. The low-pressure fuel delivery system can effect the Pump Performance measurements if it is restricted or sucking air.

Viewing Test Results

It is important to evaluate the low-pressure system if the Pump Performance result is Marginal or Weak before replacing the High-Pressure Pump.

Crank Volts, Peak PSI and Peak RPM values are presented on this screen as additional information for the technician. The Pump Performance evaluation takes these values, along with the system leakage, into account when determining the Pump Performance result.

Uploading Test Data to a Shop Computer

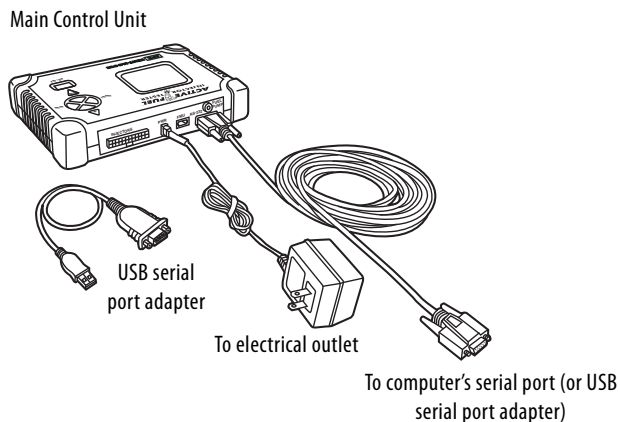
You will use the DFIT PC application software to upload the test data to the shop computer, view, print, and save the tests results. Before you begin, make sure the software is installed on the computer. *Note: If you need to use the USB serial port adapter, you will need to install the USB serial port adapter software driver included on the DFIT CD if you have not already installed it.*

Step 1—Connect the Main Control Unit to the Computer

1. Connect the 6' serial cable to the MCU and to the computer.

Note: If the computer does not have an available serial port, connect the USB adapter to the serial cable and connect to an available USB port on the computer.

2. Use vehicle power or connect the wall outlet adapter to the MCU and plug into an electrical outlet.



Viewing Test Results

Step 2—Upload the Data to the Shop Computer

1. Turn the MCU on.
2. Start the DFIT PC Application (if not already running).
3. Check the **Selected COM Port Num** and **Connectivity Status** at the bottom of the application window.
 - If the Connectivity Status indicator is *green*, proceed to step 4.
 - If the Connectivity Status indicator is *red* or a message is displayed, you need to free the selected COM Port from another application or select another *available* port:
From the Setup menu select **Choose Port** and select one of the available ports.
4. Select **ADD NEW**, or **EDIT** existing customer/vehicle information.

ADD NEW—use to save first record to a new customer file

EDIT—use for adding second test data to an existing customer
5. Click **Load Injector Data** in the DFIT PC application. **IMPORTANT! To avoid corrupting the data, make sure the MCU is powered on before selecting.**
6. On the MCU navigate to, and select **Upload Test Results**. Once DFIT completes the upload, the unit returns to the *Injector Test* menu and the DFIT PC application displays the uploaded test results.
7. In the DFIT PC application, click **SAVE** to retain information, or **CANCEL** to discard. Retained customer records may be printed as reports at anytime.

Step 3—Viewing the Test Results on the DFIT PC Application

You can view the results of any saved test by navigating to, and selecting, **Customer/Vehicle Info Search**. Select the line for the customer or vehicle you wish to view. By default, the most recent upload is displayed.

Maintenance

Periodically, DFIT may require maintenance, such as changing a fuse, or you may need to uninstall the DFIT PC Application software from the shop computer. This section describes those procedures.

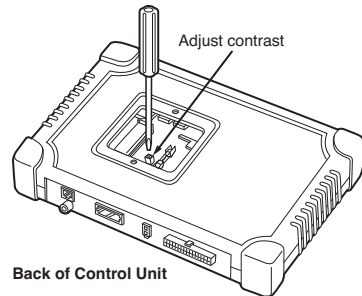
Maintenance

Adjusting the Contrast

Normally you will not need to adjust the LCD screen's contrast. However, over time, you may need to make a minor adjust.

Procedure

1. Unscrew the back panel of the control unit.
2. Locate the control screw.
3. Using a flathead screw driver, carefully rotate the adjustment screw to brighten or darken the LCD screen's contrast.
4. Replace the back panel.



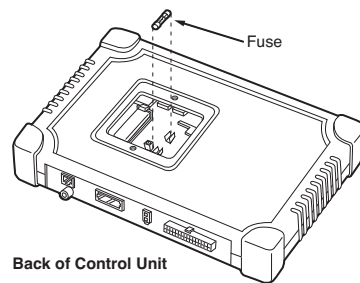
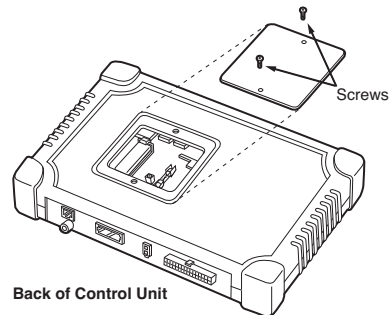
Replacing the Fuse

This fuse is only used to protect the fuel injectors and fuel pump and does not interrupt power for the remainder of the circuitry of the MCU. Access the fuse from the back of the control unit.

The fuse is an 8 amp fast blow AGC 8 fuse.

Procedure

1. Unscrew the back panel of the control unit.
2. Locate the fuse.
3. Carefully remove the old fuse from the clips.
4. Replace the old fuse with a new 8 amp fast blow AGC 8 fuse.
5. Replace the back panel.
6. Discard the old fuse.



Uninstalling the DFIT PC Application Software

1. Delete the DFIT desktop shortcut (if any).
2. Choose **Settings** from the Start menu.
3. Select **Control Panel** from the displayed menu.
4. Double -click **Add or Remove Programs**.
5. Select **Active Fuel Injector Tester** from the list.
6. Click **Change/Remove**.
7. When asked if you are sure you want to remove the program, click **Yes** to start the uninstall.
Note: If a dialog box is displayed asking if you want to delete shared files, select No.
8. When the removal is complete, Windows displays *Program Installation removed*. Click **OK**.
9. Close the **Add or Remove Programs** window.
10. Close the **Control Panel** window.
11. Restart your computer.

Maintenance



Contact Information

If you have any questions about our products including technical assistance, call our customer care department during standard business hours EST. If a customer care representative directs you to return any equipment, be sure to include these items:

- a written description of the problem;
- the name and telephone number of your contact person;
- your shipping address, and
- our return authorization number (from customer care).

Customer care and tech support:	800/342-5080
Service and repair center:	662/453-6212
Fax:	216/761-9879
E-mail:	support@hickok-inc.com repaircenter@hickok-inc.com
Service address:	Hickok Inc. Automotive Group 1716 Carrollton Avenue Dock E Greenwood, MS 38930



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Warranty

Hickok Inc. warrants this instrument of its manufacture to be free from defects in materials and workmanship for a period of thirteen (13) months from the date of original purchase, subject to the following conditions:

- Any instrument found to be defective during the stated warranty period may be returned, transportation prepaid, to the factory for repair or, at the option of Hickok, replaced without charge.
- Any instrument returned must be received by Hickok within the stated warranty period.
- Any instrument that has been repaired or altered by unauthorized persons, or which has been subject to misuse, negligence, or accident will not be covered by this warranty.

This warranty is in lieu of all other warranties whether expressed or implied.

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