

# Energy and Water Solutions

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## DEIL

### CNG EFI Feed-Back System Owners Manual Model CNGFBS

#### General Description

The DIEIL Feed-Back System is used for the exact feeding control of CNG in vehicles equipped with Electronic Fuel Injection and with a lambda oxygen sensor in the exhaust system. Usually named "Closed Loop", this system processes the signals of different vehicle sensors, such as RPM, Lambda Oxygen, and Throttle Position Sensor (TPS), to establish the exact and necessary control of the CNG flow by a variable stepper motor. The stepper motor receives information from the control module and opens and closes to allow the proper flow of CNG to the engine.

#### Principal Characteristics

The controller permits automatic recognition of the main parameter for the optimal regulation without software in many vehicles.

Software for advanced regulation with a real time visualization of the lambda sensor and stepper motor signals.

Direct connection to a computer by cable without additional interfaces

Software and software instructions available form out Website at [www.ewsews.com/cnghow.html](http://www.ewsews.com/cnghow.html)

#### Electrical Characteristics

Voltage: 12 VDC

Max Switch Current: 2 Amps

Protection Fuse: 5 Amps

Max Power Consumption: 60W

#### Packaging

DIEIL Control Module

Stepper Motor

Change Over Switch with Level Gauge

Pressure Gauge with Sensor

Wiring Harness


Owners Manual

### System Components

#### DIEIL Control Module

It is the main control of the system receiving all the signals of the vehicle sensors and processes them by means of a microprocessor to obtain the ideal values of the Stepper Motor. Inside are the necessary electronics to accomplish functions such as the Change-Over Switch fuel change and CNG Level Indicators.



<p><b>Stepper Motor</b>  Actuator Valve consisting of a STEP-BY-STEP Motor to regulate the necessary CNG flow that the vehicle needs during different conditions. The Stepper receives information from the Control Module to adjust itself with a range of 500 different positions. This control is calculated by the Control Module according to the vehicles TPS, RPM, Lambda Oxygen sensor values.</p>	
<p><b>Change-Over Switch with CNG Level Indicator</b>  The change over switch is designed to operate the Control Module providing the functions of fuel change and indicating the CNG level. The Pressure Gauge sensor signal is input to indicate the level. Four Green LED are on when the pressure is at maximum and one LED will go out as the pressure decreases. The Red LED will come on after the last Green LED is off, indicating reserve fuel.</p>	
<p><b>Pressure Gauge with Fuel Level Sensor</b>  The Pressure Gauge with the Fuel Level Sensor indicates the pressure in the Storage Tank and sends the fuel level signal to the Change-Over Switch, which is displayed by the LEDs on the top row.</p>	
<p><b>Wiring Harness</b>  Wiring Connections are provided to all the equipment and connected to the DIEL Control Module</p>	
<p><b>DIEL Application Software</b>  The DIEL Application Software is developed to provided diagnostics and advanced configurations. The Oxygen or Lambda Sensor and the Steps of the Stepper Motor can be seen in real time. See our Software instructions for detailed instructions.  <b>The Software and the Software Instructions are free and are available on our Website at:</b>  <a href="http://www.ewsews.com/cnghow.html">www.ewsews.com/cnghow.html</a></p>	

### Recommendations Before Installing

The feedback system is an intelligent electronic device capable of regulating the ideal fuel mixture even when there are deficient conditions of some elements of the vehicle such as CNG regulators, mixers, and air filters. It is recommended that the following items are checked before the installation to allow for easy regulation and optimal performance.

1. Verify the correct functioning of the Lambda Oxygen Sensor.
2. The Exhaust System is in original condition. Any aftermarket exhaust system must have an applicable catalytic converter and oxygen sensors intact and operating properly.
3. The Air Filter is in excellent condition.

4. Verify the TPS is functioning properly.
5. The Ignition System is in good condition. The deterioration of high-tension cables, coils, and other ignition components can produce undesirable electronic noises for the feedback system.
6. The CNG regulator and mixer are suitable for the vehicle. The feedback system provides good performance with the majority of CNG regulators and mixers, however it is important that they have the capability to regulate the fuel required in all conditions for the vehicle.

### Correct Installation

The control module must be installed far from sources of heat, high tension, and humidity.

The stepper motor is installed between the regulator and mixer as close to the mixer as possible and within 45 degrees of vertical as shown in the wiring diagram.

Avoid installing the cables near and high-tension spark plug wires, near any heat source or where they may become damaged.

Feed the equipment only with a 12 VDC ignition voltage and a good chassis ground connection.

### Switch Settings

#### Switch 1

**OFF:** Closed Loop Lambda Sensor – Standard Function

**ON:** Open Loop Lambda Sensor - use only for special events

#### Switch 2

No Function

#### Switch 3

**OFF:** Change to CNG in DECELERATION Mode

**ON:** Change to CNG in ACCELERATION Mode

#### Switch 4

**OFF:** Programming Blocked

**ON:** Programming Open

**IMPORTANT:** When programming or tuning, switch number 4 must be in the ON position. When you finish programming, don't forget to change switch 4 to the OFF position otherwise the successful setting allowed in the configuration will be lost when the ignition is turned off.

### Status Indicators Function

**Green LED:** Programming Stage Status Indicator

1 blink each 5 sec = Step 1 of programming

2 blinks each 5 sec = Step 2 of programming

3 blinks each 5 sec = Step 3 of programming

4 blinks each 5 sec = Step 4 of programming

5 blinks each 5 sec = Step 5 of programming

**Yellow LED:** Programming Step is Finished Indicator

It will light every time the step configuration is finished.

It will turn off when the push-button is pressed to pass to the next programming step.

**Red LED:** Lambda Sensor Status Indicator

**ON:** Fuel mixture is rich

**OFF:** Fuel mixture is lean

### Programming

After installation is completed, follow the programming steps below to acquire the proper parameters for the vehicle.

STEP	OPERATION	DESCRIPTION
<b>0</b>	Set switch 4 to ON. Start the engine and let it idle.	The three LEDs remain on for an instant. Next the Green and Yellow LEDs turn off. The Red LED blinking indicates functioning of the Lambda Sensor. If the engine is cold, wait several minutes to pre-heat the temperature of Lambda Sensor. Wait for Yellow LED to turn on (about 30 sec.) Programming Begins
<b>1</b>	Press the Push-Button until the Yellow LED turns off.	Green LED blinks 1 time every 5 seconds Indicating 1 <sup>st</sup> Programming step. * Throttle Position Sensor's recognition (TPS) Yellow LED turns on indicating end of this step.
<b>2</b>	Press the Push-Button until the Yellow LED turns off. Accelerate the engine to 2000 RPMs.	Green LED blinks 2 times every 5 seconds Indicating 2 <sup>nd</sup> Programming step. * RPMs & Quantity of Ignition Coils recognition Yellow LED turns on indicating end of this step.

		This operation should take 3 to 5 seconds.
<b>3</b>	Press the Push-Button until the Yellow LED turns off. Hold the engine at 2000 RPMs.	Green LED blinks 3 times every 5 seconds Indicating 3 <sup>rd</sup> Programming step. *Lambda Sensor type recognition Yellow LED turns on indicating end of this step. This operation should take 15 to 20 seconds
<b>4</b>	Press the Push-Button until the Yellow LED turns off. Hold the engine at 2000 RPMs. The engine switches to the CNG Mode.	Green LED blinks 4 times every 5 seconds Indicating 4 <sup>th</sup> Programming step. *CNG mode recognition Yellow LED turns on indicating end of this stage. This operation is instant
<b>5</b>	Press the Push-Button until the Yellow LED turns off. Hold the engine at 2000 RPMs.	Green LED blinks 5 times every 5 seconds Indicating 5 <sup>th</sup> Programming step. *Lambda Sensor parameters recognition Yellow LED turns on indicating end of this step. This operation should take 60 to 90 seconds. If after 90 seconds The Yellow LED does not come on, let the engine idle for 10 Seconds and repeat 2000 RPM hold.
<b>6</b>	Press the Push-Button one time to Exit programming. Set switch 4 to OFF to block Programming.	Green and Yellow LEDs will be on. End of Programming. Proceed to adjusting CNG Regulator idle while monitoring the Red LED.

**Note:** If anytime while running on CNG while programming and the engine stalls, the stepper motor may be closed and you will need to use the software to open the stepper motor while programming. Alternatively, you can remove the stepper motor while programming and replace it with a coolant flushing tee and replace the stepper motor after programming. To verify the stepper motor position remove a hose at one end and look to see if it is open or closed.

## Change Over Switch with CNG Level Gauge Indicator

The change over switch is designed to operate the control module providing the functions of fuel change and indicating the CNG level. Initial programming can be accomplished from the change over switch instead of the above procedure if desired. The programming procedure is below under Programming with the change over switch.

### INITIAL SETTING

Once the installation is completed and the initial programming is completed, the engine will start in gasoline mode and the fuel will change to CNG at 2000 RPMs is deceleration mode.

### FUEL CHANGE MODE

#### Switch 3

**OFF:** Change to CNG in DECELERATION Mode

**ON:** Change to CNG in ACCELERATION Mode

### RPM CHANGE

Programming only by the Software

Software Route: Setting – Change Over Switch

### OPERATION (With Default Parameters)

In this mode the vehicle engine will start in the gasoline mode and automatically change the fuel to CNG as soon as the engine reaches 2000 RPM in acceleration or deceleration phase, according to the previous setting. The gasoline fuel gauge (Green LED) remains on and CNG fuel gauge (Yellow LED) blinking until the mode is changed to CNG. Then the Green Gasoline LED will remain off and the Yellow CNG LED will remain on.

### FUEL CHANGE

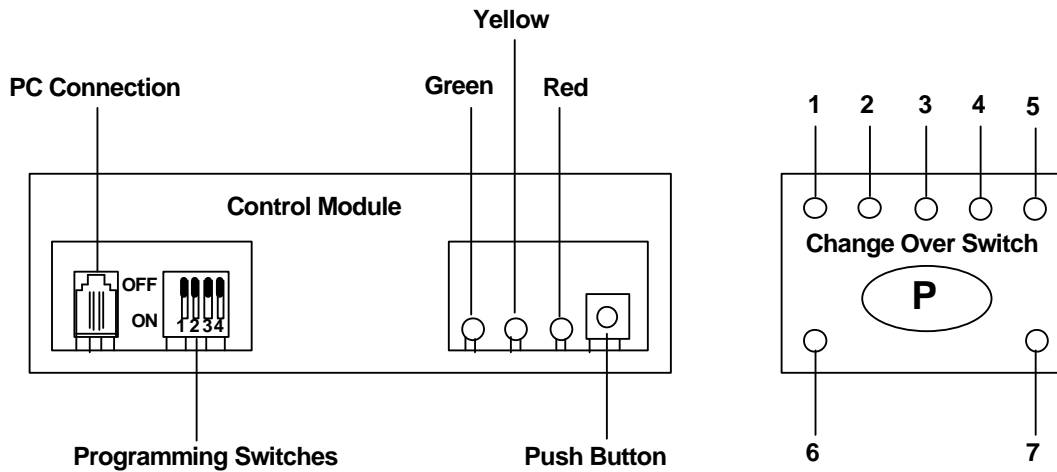
Push the button, while the engine is running, anytime you want to make a fuel change.

**Caution:** Changing fuel while the engine is at low RPMs may cause the engine to stall.

### EMERGENCY START

This Change Over Switch has an emergency start in the CNG mode in case of problems with the gasoline system. To start the engine in the CNG mode, press and hold the button while starting the engine. The Yellow CNG LED will be on after starting.

**Note:** This emergency state will be permanent until the gasoline mode is selected again by pushing the button.



### PROGRAMMING WITH THE CHANGE OVER SWITCH

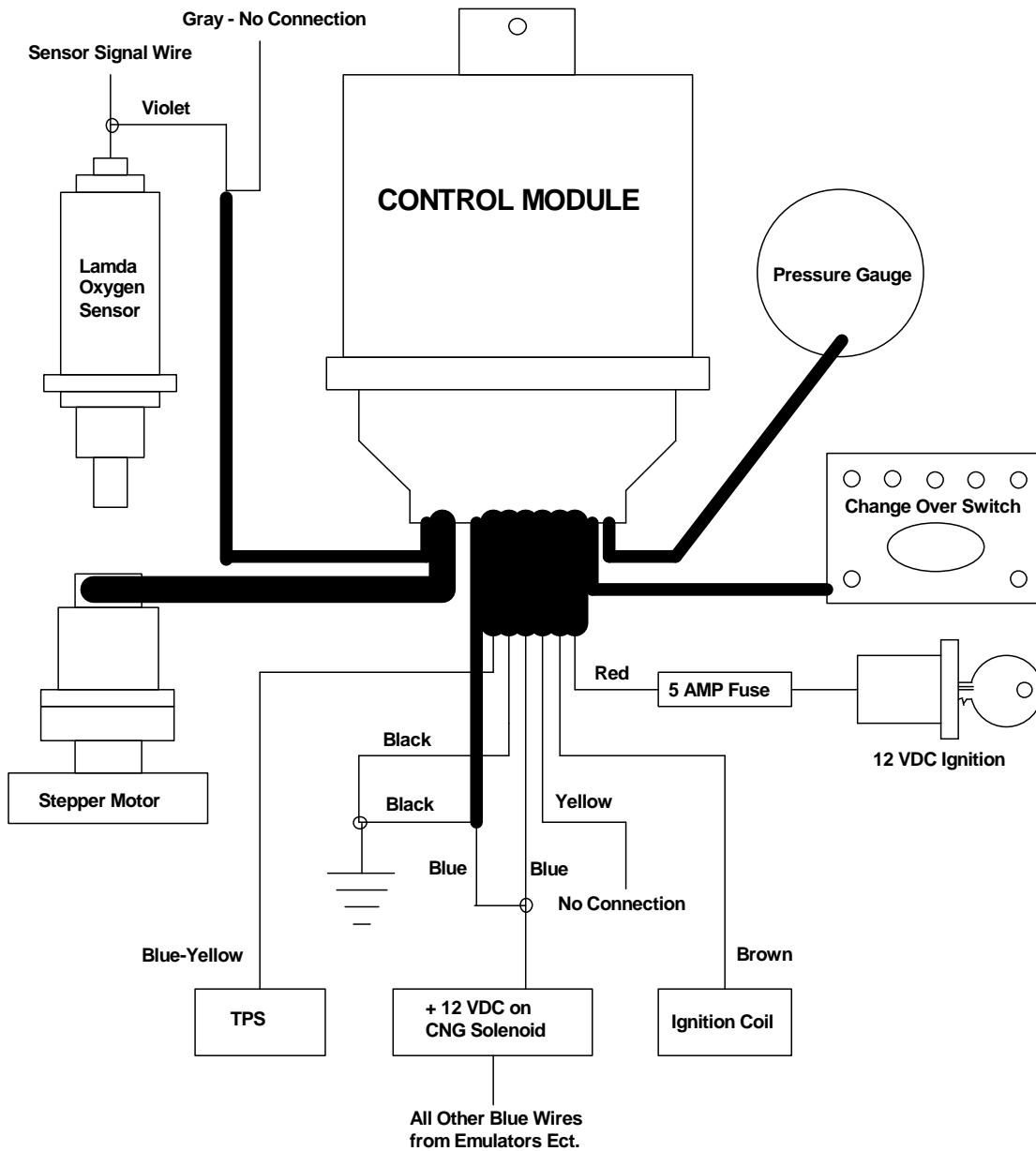
Programming using the change over switch may be easier than programming from the control module, especially for one person, as you can do everything from the drivers seat.

1. Set switch 4 on the control module to ON. Start the engine and let it idle.
2. Press the Push-Button (P) until LED 1 (Red) turns on and wait until LED 6 (Yellow) is on indicating 1<sup>st</sup> programming stage is finished (Throttle Position Sensor recognition –TPS)
3. Press the Push-Button (P) again and LED 2 turns on. Accelerate and hold the engine at 2000 RPMs and wait until LED 6 turns on again indicating 2<sup>nd</sup> programming stage is finished (RPMs and ignition coil recognition)
4. Press the Push-Button (P) again and LED 3 turns on. Hold the engine at 2000 RPMs and wait until LED 6 turns on again indicating 3<sup>rd</sup> programming stage is finished. (Lambda Sensor type recognition) This step takes 15 to 20 seconds.
5. Press the Push-Button (P) again and LED 4 turns on. Hold the engine in 2000 RPMs and wait until the engine changes from Gasoline to CNG mode and LED 6 turns on indicating 4<sup>th</sup> programming step is finished. (Gasoline to CNG mode recognition)
6. Press the Push-Button (P) again and LED 5 turns on. Hold the engine in 2000 RPMs and wait until LED 6 turns on again Indicating 5<sup>th</sup> programming stage is finished. (Lambda Sensor Parameters Recognition) This step takes 60 to 90 seconds. If after 90 seconds the Yellow LED does not come on, let the engine idle for 10 seconds and repeat the 2000RPM hold.
7. Press the Push-Button (P) one time to get out of programming model. Set switch 4 on the control module to OFF to block programming.

Note: LED 7 will be blinking indicating programming mode. If anytime while running on CNG while programming and the engine stalls, the stepper motor may be closed and you will need to use the software to open the stepper motor while programming. Alternatively, you can remove the stepper motor while programming and replace it with a coolant-flushing tee and replace the stepper motor after programming. To verify the stepper motor position remove a hose at one end and look to see if it is open or closed.

## Wiring Diagram

Read and follow your CNG Kit Instructions before wiring.



## Programming Trouble Guide

Problem	Solution
No LED lights come on Control Module	Verify the following connection: 12 VDC During Ignition Fuse is installed and not blown. Good Chassis Ground
Red LED does not blink.	Verify a good connection to the Oxygen Sensor and that it is in good working condition and has had time to warm.
No Yellow LED during step 1 of programming.	Verify TPS connection. If the sensor is a "Drive by Wire" TPS take the signal from the Accelerator Potentiometer.
No Yellow LED during step 2 of programming.	Verify RPM or negative coil signal to Brown wire.
No Yellow LED during step 3 of programming.	Verify a good connection to Lambda Oxygen Sensor Verify the good operation of the Lambda Oxygen Sensor.
No Yellow LED during step 4 of programming.	Verify CNG Regulator Solenoid Valve connection. Verify CNG Solenoid Ground connection.
No Yellow LED during step 5 of programming.	Verify Lambda Oxygen Sensor is the correct type selected in the Software. The voltage should be 0 to 1 VDC. If not, Inverted Lambda (5 to 0 VDC) must be selected using the software. Unstable Idle - Adjust the low RPM regulation of the CNG regulator and visualize at real time with the software. The Red LED should blink during idle. Red LED on = Rich Fuel Mixture. Red LED off = Lean Fuel Mixture. Verify the Lambda Sensor signal and the Stepper Motor signals with the software's real time graph. The Stepper Motor should move toward closed as the Lambda voltage increases. Verify the Stepper Motor Limits are not restricting the travel of the Stepper Motor. Verify the Mixer is the proper size and that all the intake air is flowing through it.
When fuel pass to CNG Mode the Engine Stops.	Verify the Stepper Motor Voltage and ground. Verify the Stepper Motor Limits using the software. The upper limit should be at least 300 so the fuel is not restricted during programming. Verify Regulator Solenoid is operating properly and makes a click sound when voltage is applied to it.

**Do not call your dealer or EWS with installation questions unless you are sure there is a problem with your conversion kit. It is your responsibility to install your kit. Call a friend for help or take your car to a repair shop for help if needed.**