GASTEC

HIGH PERFORMANCE FUEL PROCESSOR MODEL FP31

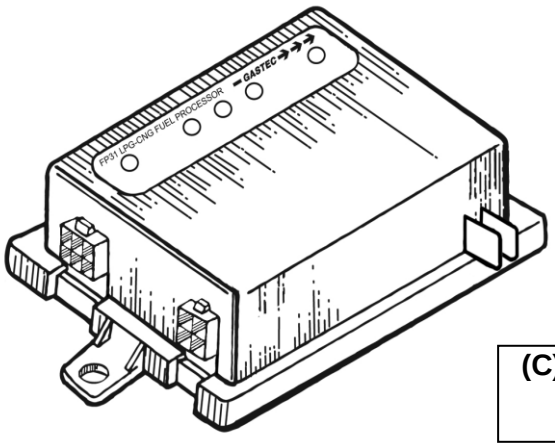
FP31 (Standard Model) FP31-PS (with Petrol Start)

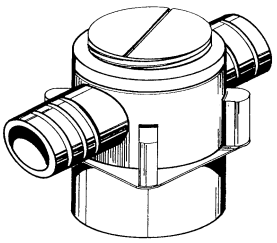
FP31-PS-E (with Petrol Start and Injector Emulation)

Suitable for 1.3 to 6.2 litre vehicles

The FP31 is a high performance gaseous fuel processor that (under acceleration) fully opens the stepper valve (CV30) from fully closed in just 0.55 seconds. This places the FP31 in a new performance class which is only exceeded by electronic fuel injection systems.

The FP31 is a fully closed loop (lambda) processor requiring both oxygen sensor and throttle position sensor inputs. The installer has the option of allowing the Fuel Processor to run in either closed or open loop mode at idle. The Processor has oxygen analysis on board to indicate to the installer when the vehicle is running rich or lean.





The processor incorporates a high quality stepper motor driven valve (CV30) to control the gas mixture accurately via a 90 degree rotational barrel. This valve operates continually whilst driving on LPG or CNG. It rotates slowly unless it receives an increased load signal from the throttle position sensor (in which case it opens very much faster). **The CV30 is made with brass sintered bearings and contains no gears or worm drives to wear out. The design life of the valve is in excess of 500,000km.**

WIRING CONNECTIONS

The FP31 is supplied with two looms. Each loom snaps into the connector on the side of the processor box. The first loom has the CV30 valve connected to it and the second loom is connected to the various vehicle sensors.

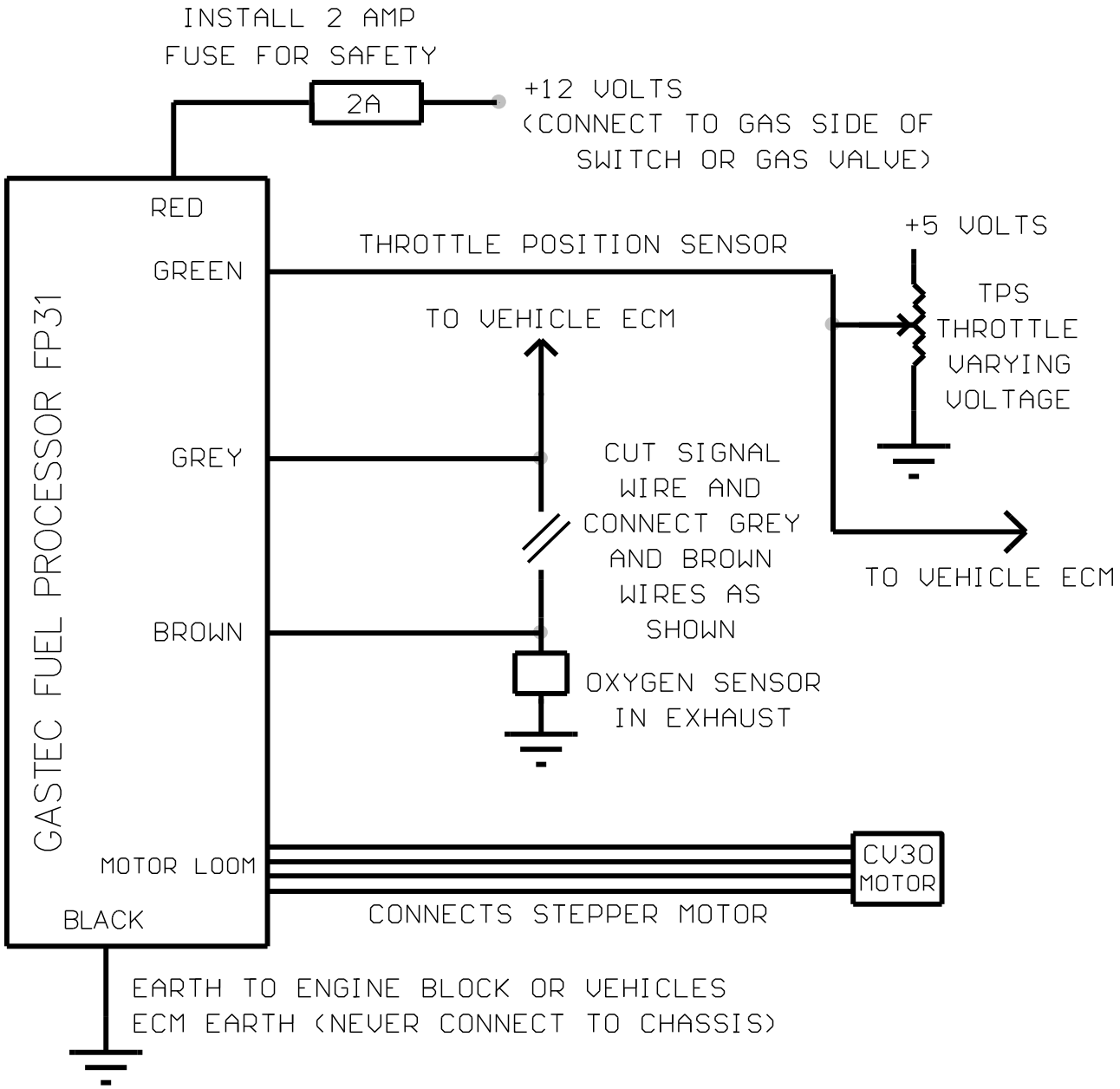
The CV30 should be installed in the vapour line in place of the manual high speed adjuster (power valve). For performance reasons, the vapour line should be kept as short as possible. Do not install the CV30 near large amounts of radiated heat, particularly around the exhaust manifold.

The second loom containing five wires is connected as follows;

Red wire
This wire should be connected the +12 volt side of the gas switch. This wire should only be powered up when the driver wishes to run the vehicle on gas. The power supplying the gas/petrol switch should come from a "clean" power source (ie the ignition switch) **NEVER** from the positive side of the coil. This red wire should be protected with a 2 Amp fuse (not supplied) to comply with automotive safety requirements.

Black wire
This should either be connected to the vehicles OEM computer earth or to the engine earth. The **vehicle chassis must not be used** as the FP31 must be referenced to the oxygen sensor correctly. Do not earth this wire close to electrical noise generators such as high tension wires or alternators.

Green wire
This should be connected to the throttle position **sensor** (not a throttle position **switch**). This sensor should, with the throttle at idle, read approximately 0.25 to 1.6 volts. When the throttle is slowly depressed the voltage should slowly increase to around 2.5-5.0 volts. If the vehicle does not contain a suitable sensor as described, the FP31 should not be installed.



Brown wire
The packaging label will indicate the O2 rich and lean voltage limits for this particular FP31. A second label can be found on the rear of the unit if the FP31 is specially programmed for an O2 sensor other than the standard unit of 0.0 volts lean and 0.9 volts rich.

The 02 signal wire should be isolated from all other wires leading from the O2 sensor, then cut. The Brown wire should then be soldered to the cut signal wire that leads directly to the O2 sensor. This wire provides the FP31 with the rich/lean signals from the oxygen sensor. If the O2 signal wire is shielded, make sure the shield is not broken. Also make sure the shield wire is not shorted (connected) to the O2 signal wire.

Grey wire
This wire should be soldered to the cut oxygen sensor signal wire that leads directly back to the vehicle's ECM. This wire supplies an oxygen emulation signal to the vehicle's ECM to prevent the injector "block learn" from logging different values when operating on gas. Should the "block learn" parameters move significantly, rough idling, stuttering during acceleration and surging while cruising may occur when next operating the vehicle on petrol again.

OPERATION & ADJUSTMENTS

Green light
The green light should come on when the accelerator is depressed quickly. This indicates an increasing load condition to the processor. The processor will now open the CV30 at a much faster rate than normal to ensure excellent performance. The green light will stay on for varying times depending on how far and how fast the accelerator is depressed. The green light must not flicker when the accelerator is held at a constant position (when vehicle is above idle).

Left orange light
The left orange light indicates that the engine is running LEAN (ie not enough gas).

Right orange light
The right orange light indicates that the engine is running RICH (ie too much gas).

When the RED **(Open Loop**) or GREEN **(Accel**) lights are lit, the orange **rich** light should also be predominantly on (as the CV30 is being held open). When above idle, with no GREEN or RED lights on, the two orange lights should toggle back and forth. This indicates that the Lambda (or stoichiometric) region is being maintained.

TUNING THE GASTEC FP31 FUEL PROCESSOR

1. Turn on the ignition but do not start the engine. Ensure that the gas/petrol **switch is in the gas position**.

2. Adjust the "**Idle" potentiometer** (at the rear of the box) until the **red "idle" light just comes on** (it should not flicker). **Wait for 5 seconds**, during which the CV30 valve will fully open. **Turn off the ignition** and then **disconnect the CV30 valve** from the processor box.

3. Now restart the vehicle and changeover to run on gas. Follow the tuning instructions set out below, **still with the CV30 disconnected.**

4. AFTER DETERMINING THAT THE ENGINE IS IN GOOD CONDITION, rev the motor to approximately **2500 rpm** with no load being applied (ie in neutral). Now **adjust the power valve** (the large screw adjustment on the CV30) until the mixture is **CONSTANTLY JUST RICH**. Now allow the engine to fall back to idle before **unscrewing the power valve 1/4 of a turn further**. **Rev the vehicle several times from idle** and observe the processor lights. The **lean light should not come on at all or should only come on for 1/4 of a second or less** (while accelerating). **If the lean light comes on for more than 1/4 of a second then unscrew the power valve another 1/4 of a turn and test again**. Continue this process until the lean light is

lit for 1/4 of a second or less. Now **tighten the locking ring firmly** on the power valve. This then sets the maximum richness point. The CV30 will then lean the mixtures from this point.

5. The **CV30 valve** should still be **disconnected**. Now **adjust the idle mixture** on the convertor (vapourisor) to obtain a **JUST RICH** reading (the rich light on the processor should be on). **Ensure the engine idles smoothly with the air-conditioning on, lights on, the wheels turned to the full lock position (if power steering is fitted) and with the automatic transmission (if fitted) in DRIVE (obviously with your foot securely on the brake).**

6. Turn off the engine. Reconnect the CV30.

7. Restart the engine again and operate on gas. To check that the CV30 is operating correctly, **hold the revs steady at about 2000rpm and observe the rich and lean lights. The two orange (rich/lean) lights should toggle back and forth.**

8. Red light - Open Loop Idle Adjustment
Don't forget to plug the hole with the plastic stopper!
Carefully place a small screwdriver through the hole (in the rear of the box) to engage the potentiometer on the circuit board. If you wish to operate the vehicle in **open loop mode at idle**, adjust the potentiometer labeled "Open Loop Idle" (with the vehicle idling on gas) until the **red "Idle" light just comes on fully.** The CV30 will now be held fully open at idle. This will reduce the likelihood of backfire on hard acceleration from idle and will increase the performance when accelerating from idle. Open loop at idle will however slightly reduce the vehicle's fuel economy. Check that the red light does not flicker when the vehicle is above idle with a constant throttle. If you wish to operate the vehicle in **closed loop mode at idle**, adjust the "open Loop" potentiometer until the **red "idle" light goes off**. Install the supplied plastic plug after adjustment to ensure no water enters the box.

9. Check that the engine idles smoothly. If not, check the status of the orange mixture lights. If the **idle becomes "lumpy"** while either the rich or the lean lights are lit, then **readjust the idle mixture screw on the convertor**.

10. Red light - Petrol Start Adjustment (optional - FP31-PS & FP31-PS-E models only)
Don't forget to plug the hole with the plastic stopper!
If the Petrol Start option is fitted, the processor will have two terminals exiting from the front RHS of the box. These terminals are labeled "**Injector Shutdown Relay**". An internal relay (with normally closed contacts) will turn the petrol injectors off when operating on gas. When starting the vehicle, the relay will allow the injectors to operate for a short time to richen the mixture. This will ensure the engine starts more easily and will also reduce the incidence of backfiring during cranking (due to lean mixtures).

Cut the +12 volt wire that feeds the vehicle's injectors. Firmly crimp the 6.3mm female spade connectors (supplied) on to each wire and firmly push these onto the male terminals. It is not important which way around the wires are connected to these terminals.

Adjust the "Petrol Start" potentiometer from the rear of the box. Adjust the potentiometer so that the vehicle starts easily. You should not depress the accelerator when starting the vehicle. The actual **injection time** is indicated by the **red "Petrol Start" LED**. If you have **too little petrol injection**, the **vehicle will stall as soon as the red "Petrol Start" light turns off**. If you have **too much petrol injection**, the **vehicle will stall while the red "Petrol Start" light remains on**. Install the supplied plastic plug after adjustment to ensure no water enters the box.

If vehicle flooding is experienced when the engine is warm, please advise the customer to wait for half a second after turning on the ignition before commencing to crank the engine. This will in effect, reduce the amount of petrol injection by approximately half a second. Advise the customer to crank immediately after turning on the ignition when the engine is cold to ensure full petrol start occurs.

NOTE

LPG contains only 26 Megajoules of energy per litre compared with 32 Megajoules for Unleaded Petrol. To ensure maximum power while accelerating the FP31 will allow the engine to run richer on LPG. This is governed by the TPS sensor.

FP30 OPERATIONAL PROBLEMS AND HOW YOU MIGHT CURE THEM

FP30 LEAN LIGHT IS ON ALL THE TIME

First unscrew the power valve almost all the way. Confirm that the lean light is still on. Now confirm that the CV30 is in fact fully open. To do this, allow the vehicle to run on gas at approximately 1500 rpm for 10 seconds. After 10 seconds have elapsed (but still holding the revs at approximately 1500 rpm) immediately turn the engine off. Remove the power valve completely. Check that the rotational barrel in the valve is fully open (so the gas can pass through the slot in the middle).

IF THE PISTON IS IN THE FULLY OPEN POSITION the problem lies with the mechanical gas system, not the FP31. Areas to examine would be: A/ the correct mixer is fitted to the vehicle, B/ no air leaks exist in the vehicle's intake system, including around the mixer, C/ the vapour hose has not collapsed inside or is kinked, D/ the convertor is delivering gas without fault, E/ the tank has a useable amount of gas and the excess flow valve has not triggered..

IF THE BARREL IS NOT IN THE FULLY OPEN POSITION the problem is likely to be a wiring fault, or the processor, or valve itself. Check the following: A/ the fuel processor is earthed to the engine or the vehicles ECM and not the vehicle chassis, B/ the loom connector to the CV30 is fully plugged in. If the above areas have been checked carefully, change the CV30. If the problem remains change the FP31.

FP30 RICH LIGHT IS ON ALL THE TIME

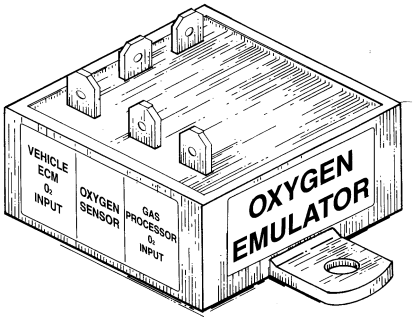
Check that the FP31 is earthed to the engine or ECM not the chassis. Ensure that the oxygen sensor wire is not connected to the oxygen sensor heater wire. This will give a constant rich reading while the oxygen sensor is being electrically heated. On some vehicles the heater wire will contain +12 volts for several minutes. If the heater is turned off when the sensor is hot the FP31 will then read a constant lean signal from this time on.

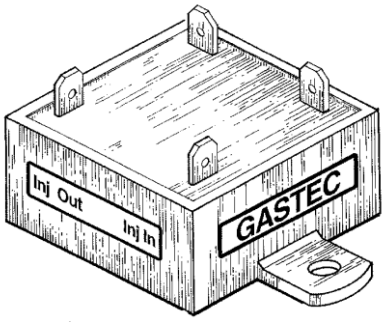
Check that the red idle light on the processor is not on (unless you require the vehicle to run open loop at idle). If the red light is on above idle, adjust the "idle" potentiometer as previously described. If you are unable to turn the red light off the throttle position sensor may be worn or you have chosen an incorrect TPS wire.

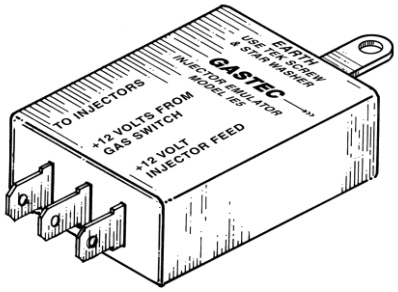
Check that the green "accel" light is not on and is not flashing while at idle and while at constant revs. If so, check that you have the correct TPS output wire. You may have connected the green TPS input wire to the TPS earth wire or to a throttle position **switch** (which does not give a slow rising voltage on acceleration). For the standard FP31 the minimum TPS voltage at idle is 0.25 volts and at maximum TPS voltage with the accelerator fully depressed is 5.0 volts.

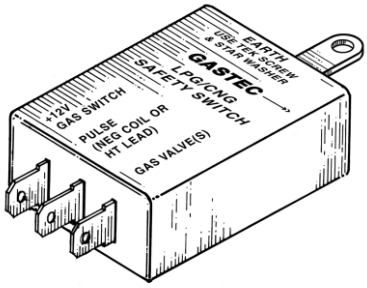
Finally check the CV30. At revs ensure you can lean the mixture by screwing in the power valve. Check that the CV30 is actually fully closed. Run the vehicle on gas at 1500 rpm for 10 seconds. Immediately stop the engine and remove the CV30 power valve. If the rotational barrel is fully closed then problem does not lie with the fuel processor. Check the convertor. If the rotational barrel is in the fully open position then replace the CV30. If the rotational barrel remains fully open replace the FP31.

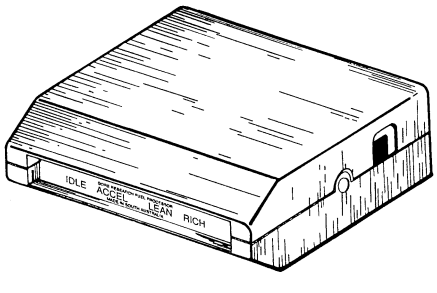
OTHER GASTEC PRODUCTS

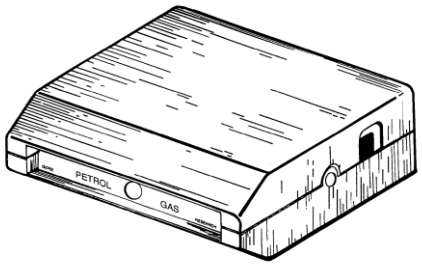


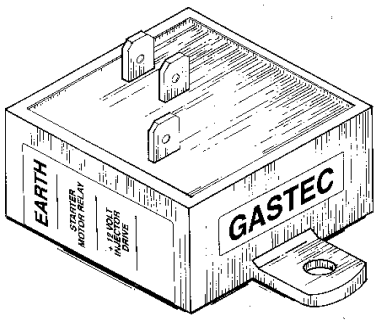


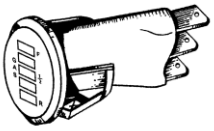




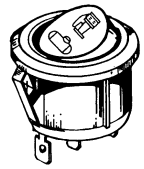








- **O2E - Oxygen Emulator**
- **IE2 - Injector Emulator**
- **IE5 & IE6 - Injector Emulators**
- **SD40 - 10 Amp Gas Safety Switch**
- **IMP6 - Fuel Processor for American Convertors**
- **905 - 5 Light 90 ohm Gauge**



- **IHO1 - Petrol Start Unit**
- **PS1 - Petrol Start Unit**
- **PG90R - 20mm 90 ohm Gauge**
- **SW2, SW3 - 2 & 3 Position Switch**
- **Specialised Processor Programming to meet EURO3 and EURO4 Emission Laws**