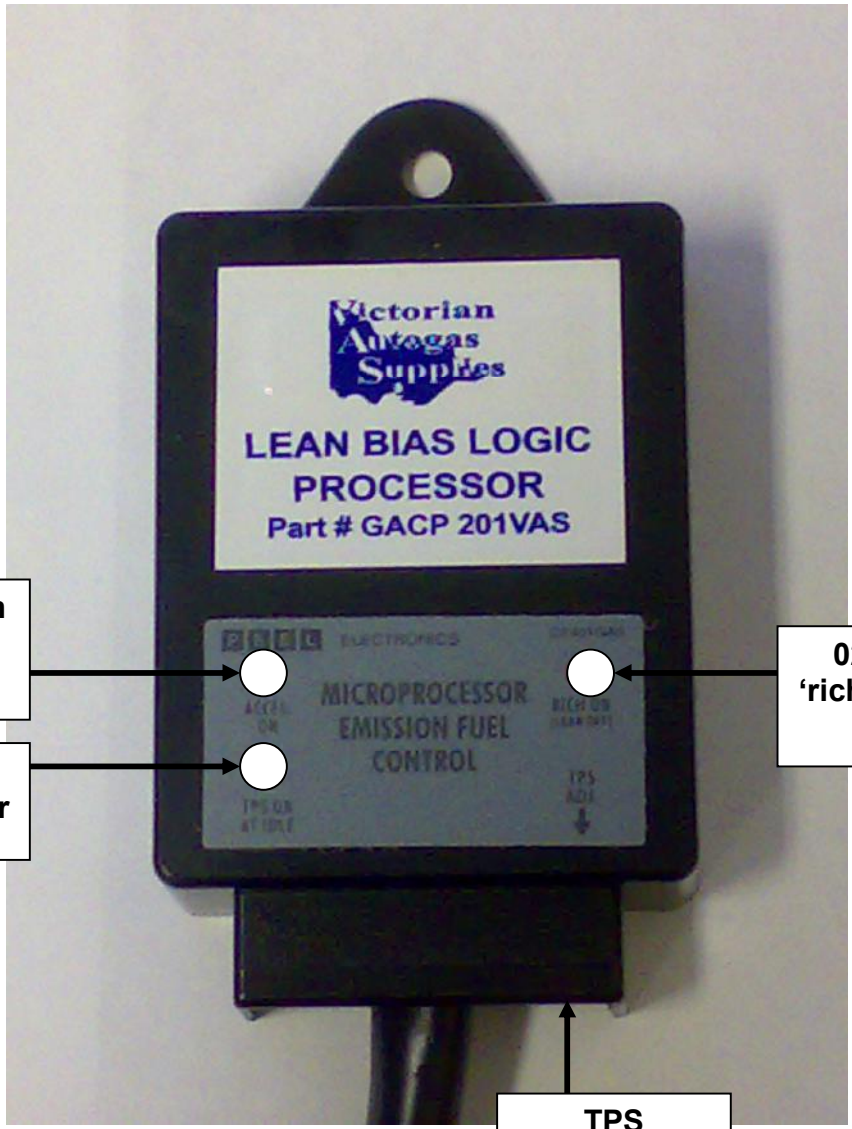
LEAN BIAS LOGIC Mk II
Fuel Control Processor



The LBL MkII sees the introduction of several new features that improve Idle stability, drivability and cold start up conditions.

- **START UP FIXED DUTY CYCLE:**
  When the engine is started the processor will hold the Fuel Control Valve (FCV) at a fixed duty cycle of 40 until an increase in voltage is sensed from the 02. This will stop 'over fueling' when the 02 is cold.

- **TPS ON AT IDLE AT IDLE**:
  The TPS on at idle feature (light on) changes the integration rate of the FCV at idle to reduce RPM 'hunting'. In addition the enrichment rate from is quicker with this feature enabled.

  To activate this feature adjust the TPS adjuster (see above) so as the 'TPS on' light is illuminated at idle and goes OFF immediately the RPM rises above idle. The TPS light should only illuminate at idle.

- **02 SENSOR MALFUNCTION FEATURE:**
  This feature will sense when the 02 sensor ceases to operate (fails to see the 02 sensor voltage change). The processor will revert to a default FCV duty cycle of 40 and the RED LED will flash.

- **The BLUE 'LEAN' LED indicator has been deleted. There is now only a RED indicator LED for a rich signal (> 500Mv). The RED LED will go OFF when a lean signal is sensed. (<500Mv)**

All other connections and plumbing are the same as the LBL Mk 1.

Lean Bias Logic Processor* (201VAS)
Operation Principal

The new Lean Bias Logic (201 VAS) processor for use in automotive LPG systems controls in a completely different manner to the traditional method employed over the past 15 years.

If we consider how mixtures have been controlled in the past, a processor driving a normally closed valve, or Fuel Control Valve (FCV), directs air valve vacuum to the atmospheric port of the converter.

As the open time of the valve is increased (duty cycle) air valve vacuum passed through the FCV lifts the converter secondary diaphragm to close the secondary seat, leaning out the mixtures from the base rich setting. The problem with this type of control is that it actually works against the basic operation of the mixer / converter.

On acceleration, the secondary diaphragm ***should*** be drawn down allowing the secondary valve to open and supply more fuel. However, because of the air valve vacuum being applied to the top of the converter secondary diaphragm, it cannot readily move on demand.

This situation produces 'flat spots' (lean mixtures) and backfires. Devices such as dump valves have been used to try and overcome this phenomenon with limited success.

Lean Bias Logic (LBL)
This system employs a reverse logic processor that drives a normally closed valve (FCV). **Fuel** is **added** via the FCV from the secondary chamber of the converter to the top of the mixer air valve or into the air valve vacuum port (similar to a vacuum power valve VPV).

Instead of employing a RICH bias mixer (FB), the **Lean Bias Logic (LBL)** system uses a lean bias mixer (CA), with **at least one** extra lean shim. The base mixtures are set lean with sufficient fuel added to maintain 15.5 air fuel ratio (AFR). This eliminates the air valve vacuum being applied to the atmospheric port of the converter.

During acceleration (as the processor senses an increase in throttle position voltage from the TPS), the fuel control valve will momentarily open to 60% duty cycle to further enrichen the mixtures. This is achieved via two conditions:

1. Adding fuel into the air stream: and /or

2. As the FCV opens to 60% duty cycle on acceleration, air valve vacuum is 'bled off' the top of the mixer diaphragm allowing the metering spring to push the air valve assembly down. This increases air speed below the air valve, increasing air valve vacuum (depression) thus drawing **more** fuel (vapour) from the converter.

The mixer and converter are now able to operate as they were originally designed to with out restriction.

The dump valve (RCV) is eliminated.

More often than not, **balance lines** are used with the **LBL** system to ensure that the mixtures are kept lean enough for the processor to add sufficient fuel to maintain stoichiometric (15.5 AFR). In some cases, the balance line can lean the mixtures beyond the control of the processor. In this situation a small 'bleed' orifice is drilled into the balance line fitting. Starting at 1.5mm and working up as required.

Restrictors are required in some cases. Small capacity engines (4 cylinder) can suffer from over fueling on hard acceleration. Installing a restrictor in the supply line, between the FCV and the mixer can rectify this.

To correctly set up the LBL Processor an IMPCO Fuel System Analyser (FSA) or a multimeter with a duty cycle function should be used. The processor has rich and lean LEDs to assist with set up, however the duty cycles of the Fuel Control Valve (FCV) is critical to satisfactory operation.

1. Connect the FSA (Yellow wire) or Multimeter (**RED** wire) to the **YELLOW** wire on the FCV. (Connect **BLACK** from multimeter to earth).
2. Connect the FSA (Green wire) to the **BROWN** wire (02) of the processor.
3. Start the engine on LPG.
4. Ensure that the **TPS ON at IDLE** light on the processor is **ON**. The trim pot in the bottom of the processor can be adjusted to turn it **ON**. The LBL processor must run in closed loop at idle and cruise.
5. Observe the FCV duty cycles.
6. Adjust the IDLE mixture screw on the mixer to achieve 30-50% duty cycles.
7. Raise the engine RPM to 2000-2500 and observe FCV duty cycles.
8. The CRUISE duty cycles should ideally be 30-50% however lower numbers are acceptable.
9. A reading of 00 indicates the mixtures are too **RICH**. A reading of 99 indicates the mixtures are too **LEAN**. The addition of a **LEAN SHIM** will assist to overcome over rich idle and cruise mixtures. Fitting a **BALANCE LINE** will also assist to reduce over rich cruise mixtures.
10. Adjust the **MAIN LOAD** on the mixer if required to achieve the correct cruise and WOT duty cycles.
11. Road test or dyno the vehicle with the FSA or multimeter in view. Ensure the FCV duty cycles are with in the correct operating range. Make further adjustments as described above if required.

*Patent Number 2003100906.

PLEASE NOTE:

1. **TPS WIRE OUTSIDE CONNECTOR ON LBL PROCESSOR IS TO BE JOINED TO TPS WIRE ON OUTSIDE OF WIRING LOOM CONNECTOR.**

2. **IT IS ADVISABLE TO CONNECT THE LBL EARTH (GROUND) SEPARATELY (NOT WITH OTHER COMPONENTS OF THE LPG SYSTEM) TO THE 02 SENSOR EARTH WIRE, TPS EARTH WIRE OR ENGINE EARTH.**

3. **IF THIS PROCEDURE IS NOT ADHERED TO THE LBL DUTY CYCLES MAY RAMP UP TO 99 EVEN THOUGH THE 02 SENSOR READS RICH. THIS IS CAUSED BY EXCESS EARTH RESISTANCE ESPECIALLY ON OLDER (HIGH KM) VEHICLES.**