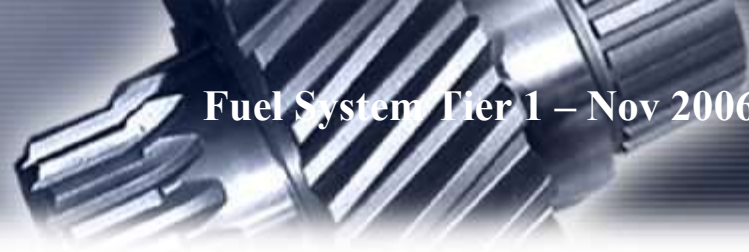


# DGS



Fuel System Tier 1 – Nov 2006 FR - 1

# Fuel system Tier 1

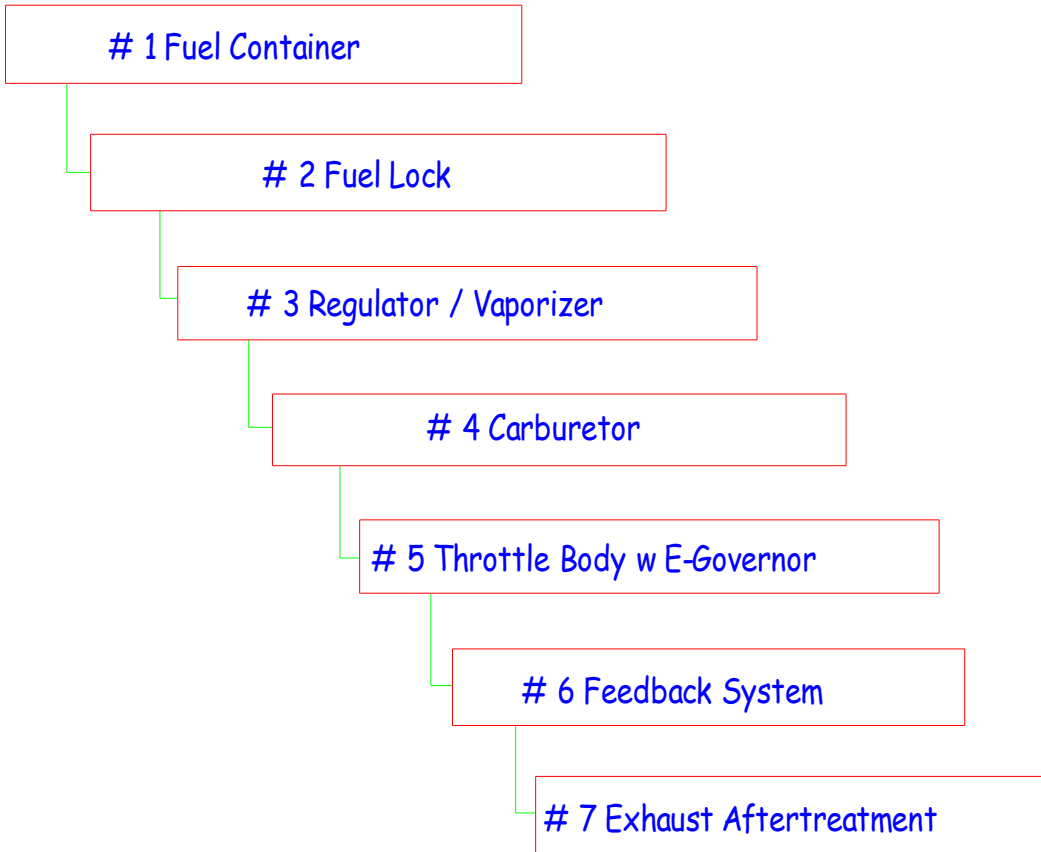
## PSI GAS ENGINES



JOHN DEERE





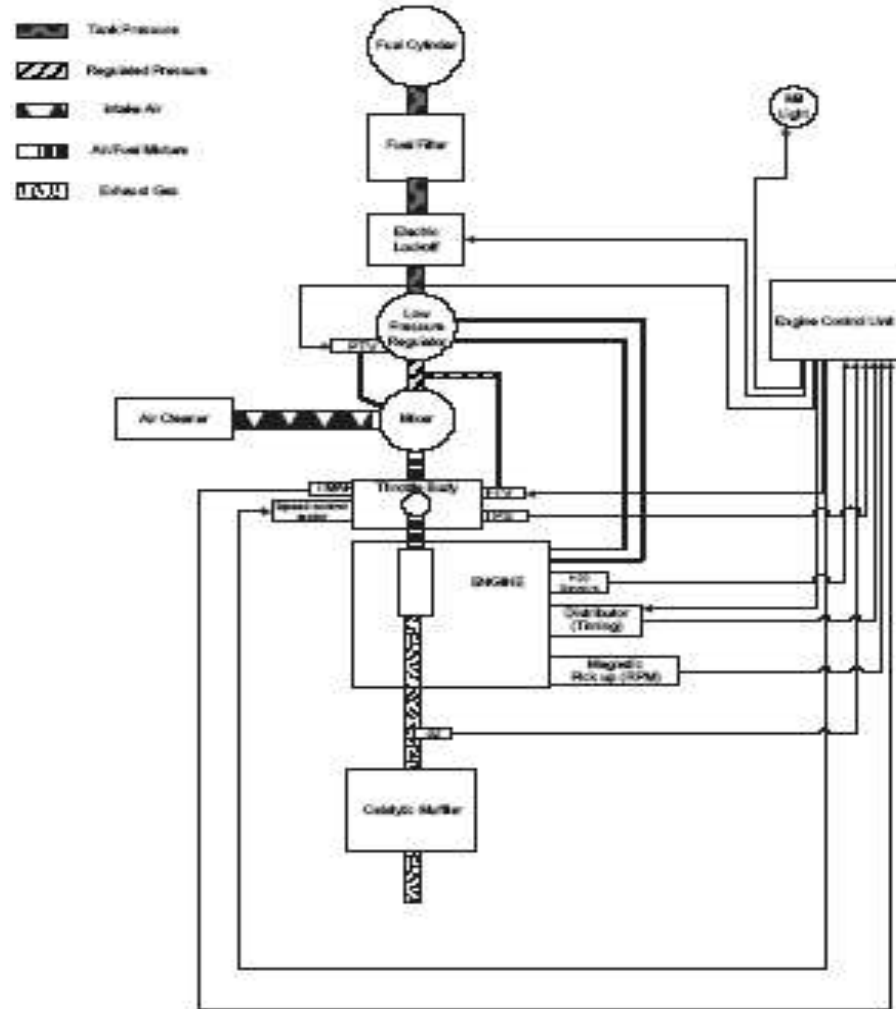


## LPG FUEL SYSTEM SCHEMATIC

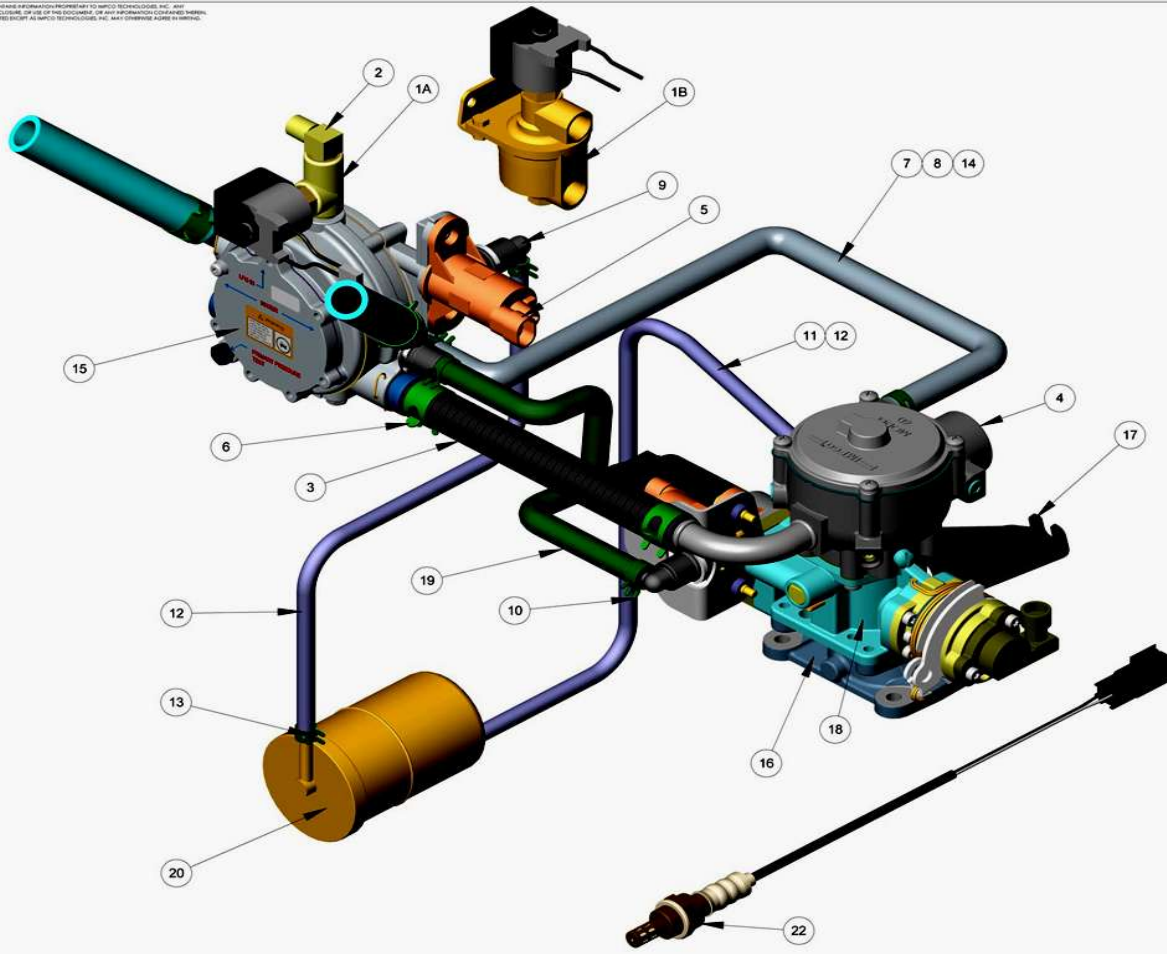


## LPG FUEL SYSTEM

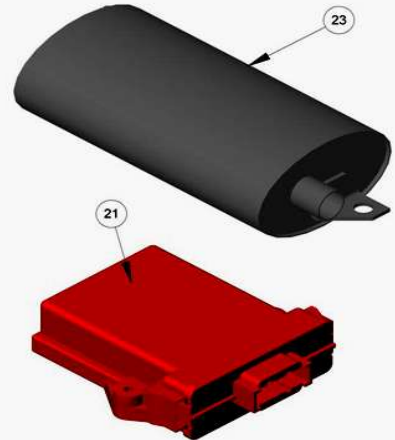
IMPCO SPECTRUM LPG FUEL SYSTEM



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REVISIONS				
REV	EQ#	DESCRIPTION	DATE	BY APP



23	1	MUFFLER, CATALYTIC
22	1	S8-30300-001 SENSOR ASM. EXHAUST GAS OXYGEN
21	1	H000679C ECU
20	1	F44495 FILTER, PLASTIC 4.3MM BARBED
19	1	H1-19231-003 HOSE, 8mm (5/16") I.D.
18	1	AT2-30227-001 THROTTLE BODY ASSEMBLY
17	1	B4-30322-001 BRACKET, THROTTLE CABLE
16	1	AS-30321-001 ADAPTER, LV4 TO MMC 4GB SERIES
15	1	MD-30243-001 REGULATOR, SPECTRUM LV4
14	1	AF4-30125 CHECK VALVE
13	2	7173380 CLAMP, SPRINGS GREEN 11.1(7/16") O.D. HOSE
12	2	H1-19231-002 HOSE, 6.3mm (1/4") I.D.
11	1	F4-2 FITTING, 1/4UNF 1/4HS VAC NIP
10	2	7180190 CLAMP, VENT 3/8 HOSE 5/8"
9	3	12569031 PUSH ON 8mm (5/16") BARB FITTING
8	2	7172020 CLAMP, VENT 3/8 HOSE 5/8"
7	1	H1-19231-004 HOSE, 9.5mm (3/8") I.D.
6	2	C2-16664-2 CLAMP, HOSE
5	2	1997279 PRESSURE TRM VALVE
4	1	CT60M-3 CARBURETOR
3	1	H-809HD HOSE, 15.9 mm (5/8") I.D. FUEL
2	1	7173710 ELBOW, 1/4-18NPT X 1/2-20 90
1B	1	FL-219 LOCKOFF, FUEL, FILTERED (OPTIONAL)
1A	1	FL-205-1 LOCKOFF, FUEL

APPROVALS	DATE	1700 E. 18 Mile Rd Shelby Township, MI 48312 (810) 284-0000
DIS	5-2-02	<b>IMPCO</b>
COMPUTER GENERATED		SPECTRUM LEVEL 4 SYSTEM



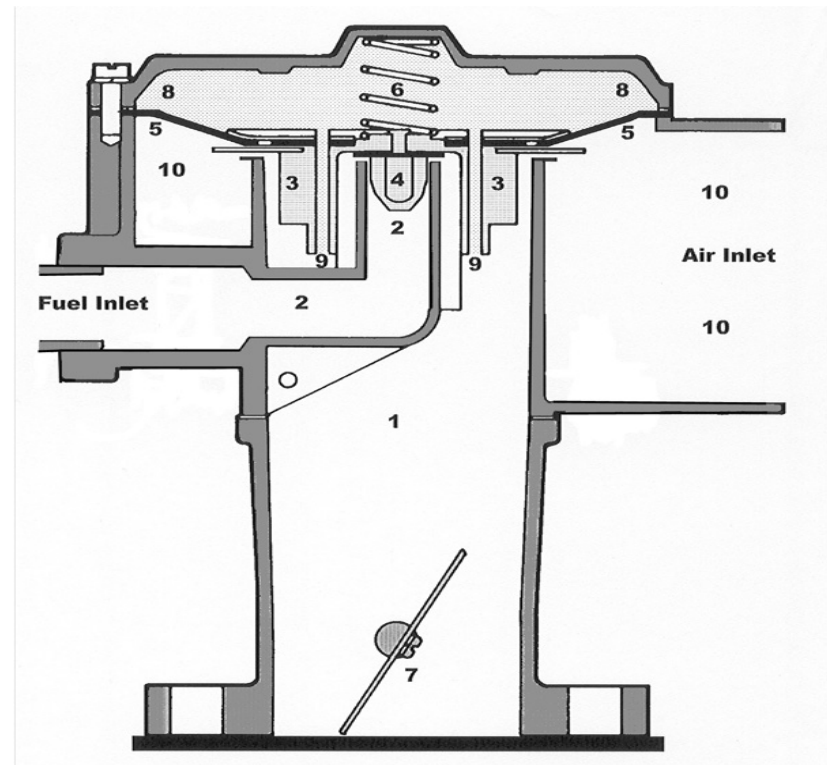
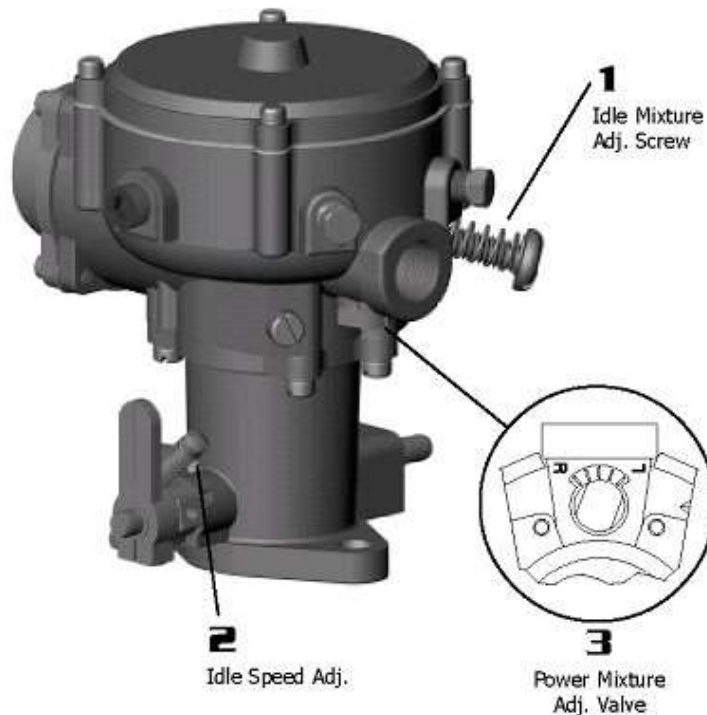
23	1		MUFFLER, CATALYTIC
22	1	S8-30300-001	SENSOR ASM- EXHAUST GAS OXYGEN
21	1	H000679C	ECU
20	1	F54495	FILTER, PLASTIC-6.3MM BARBED
19	1	H1-19231-003	HOSE, 8mm (5/16") I.D.
18	1	AT2-30227-001	THROTTLE BODY ASSEMBLY
17	1	B4-30322-001	BRACKET, THROTTLE CABLE
16	1	A3-30321-001	ADAPTER - LV4 TO MMC 4G6 SERIES
15	1	MD-30243-001	REGULATOR, SPECTRUM LV4
14	1	AF4-30125	CHECK VALVE
13	2	7173380	CLAMP, SPRING GREEN 11.1(7/16") O.D. HOSE
12	2	H1-19231-002	HOSE, 6.3mm (1/4") I.D.
11	1	F4-2	FITTING, 1/4UNF 1/4HS VAC NIP
10	2	7160190	CLAMP, VENT 3/8 HOSE 5/8"
9	3	12569031	PUSH ON 8mm (5/16") BARB FITTING
8	2	7172620	CLAMP, VENT 3/8 HOSE 5/8"
7	1	H1-19231-004	HOSE, 9.5mm (3/8") I.D.
6	2	C2-16664-2	CLAMP, HOSE
5	2	1997279	PRESSURE TRIM VALVE
4	1	CT60M-3	CARBURETOR
3	1	H-600HD	HOSE, 15.9 mm (5/8") I.D. FUEL
2	1	7173710	ELBOW, 1/4-18NPTF X 1/2-20 90
1B	1	FL-219	LOCKOFF, FUEL, FILTERED (OPTIONAL)
1A	1	FL-205-1	LOCKOFF, FUEL

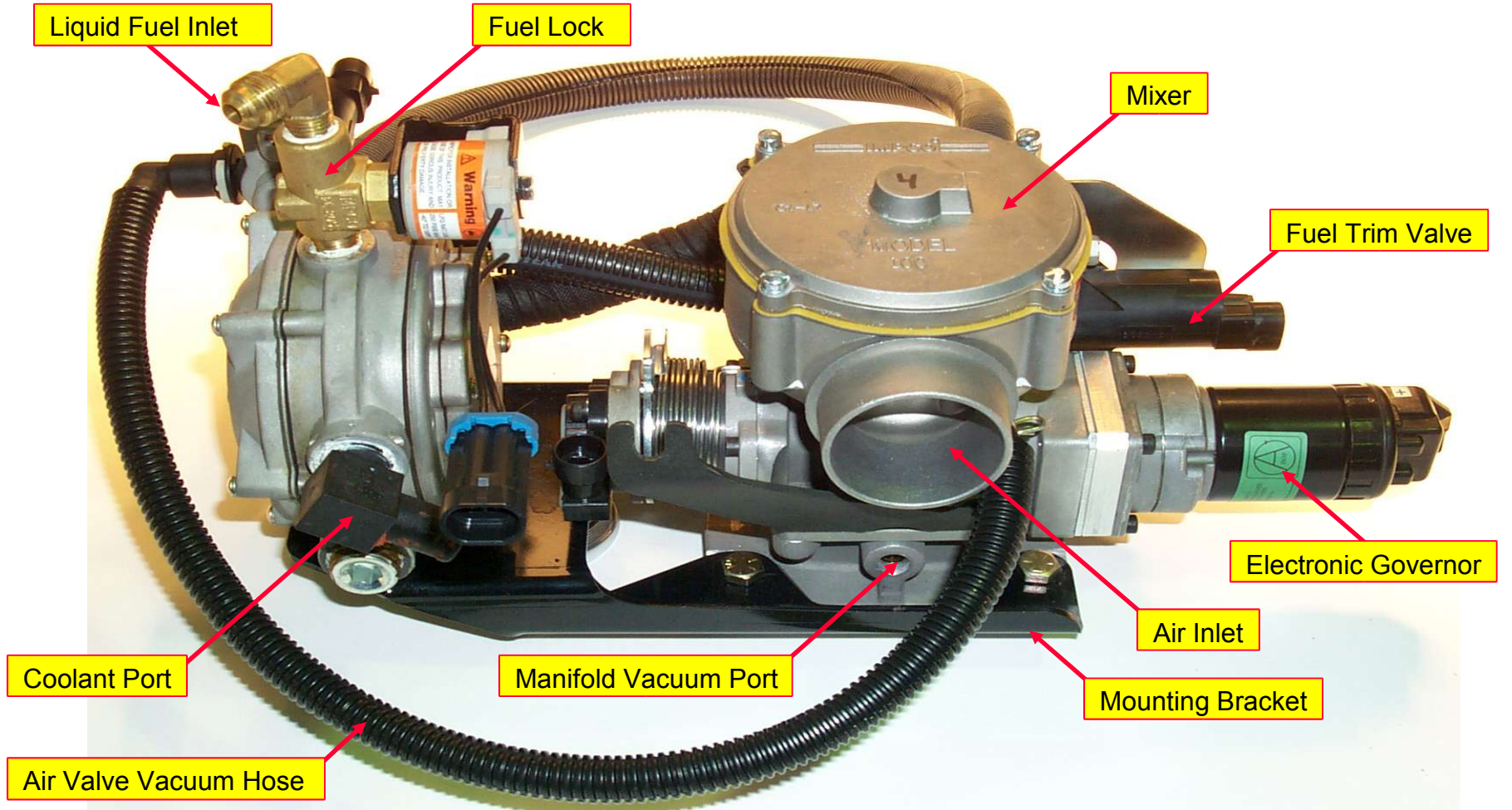
<p>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE GIVEN IN MILLIMETERS DIMENSIONS IN PARENTHESES ARE IN INCHES</p> <p>ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED</p> <p>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED</p>	<p>APPROVALS</p> <p>DER</p>	<p>DATE</p> <p>5-2-02</p>	<p><b>IMPCO</b></p> <p>INDUSTRIAL ENGINE DIVISION</p> <p>1700 E. 15 Mile Rd. Spring Heights, MI 48312 (810) 204-1500</p>
	<p>COMPUTER-GENERATED DRAWING MANUAL CHANGES ARE NOT PERMITTED</p> <p><b>DO NOT SCALE DRAWING</b></p>		<p><b>SPECTRUM LEVEL 4 SYSTEM</b></p> <p>REV. NO. PART NO. QTY.</p> <p>DATE PRICE SHEET 1 of 1</p>



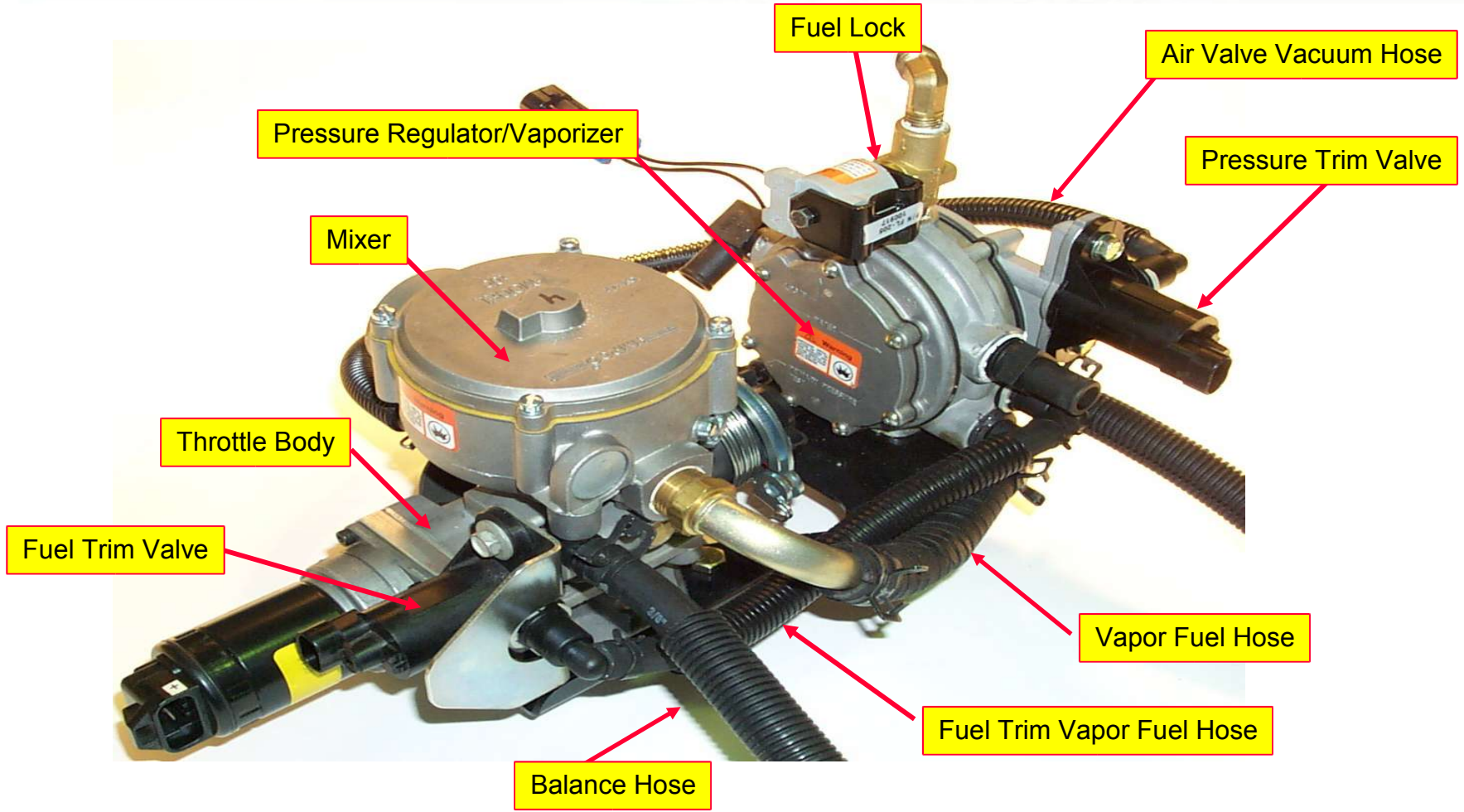
## Mixer – Diaphragm Type

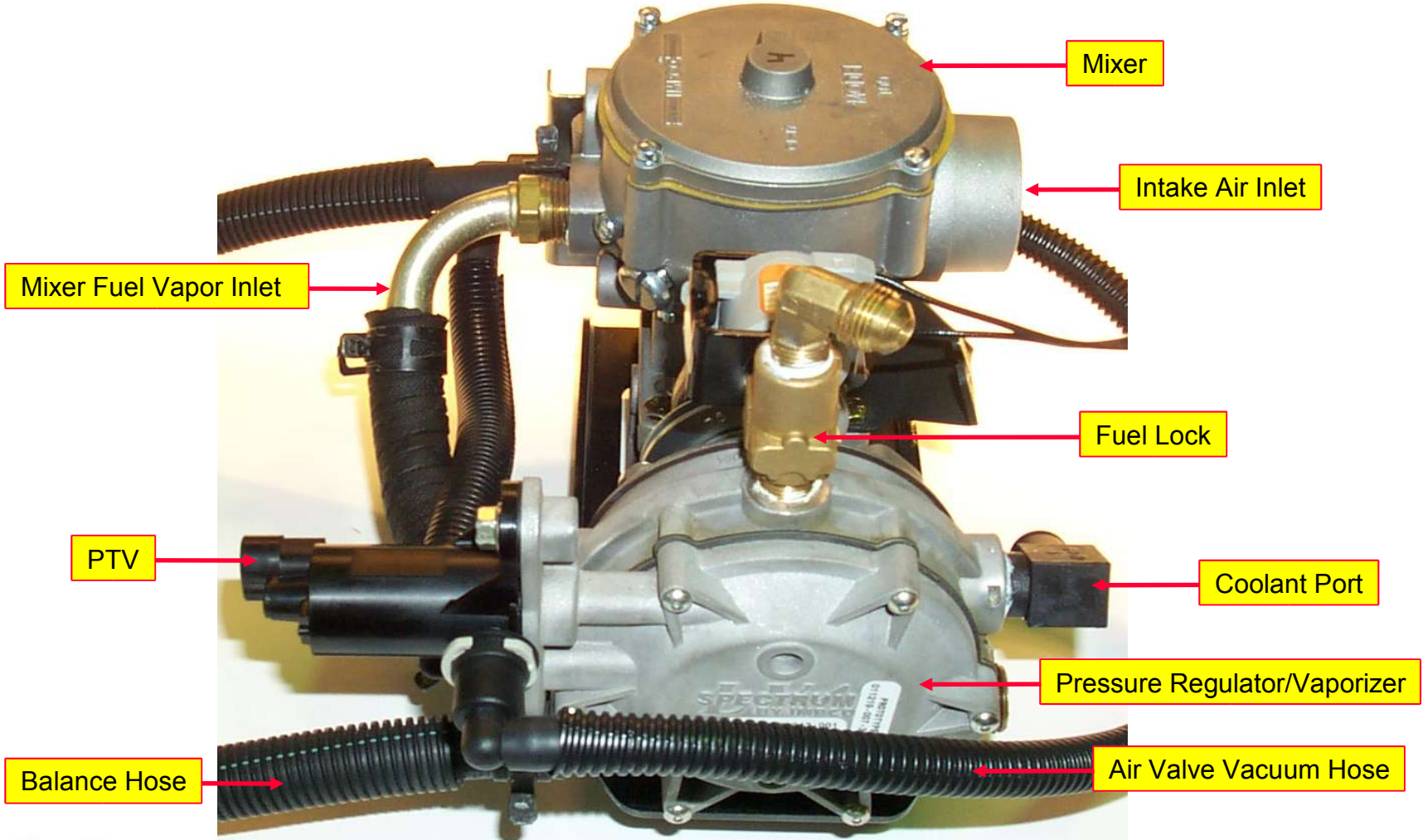
Pressure area 10 mBar  
– 35 mBar

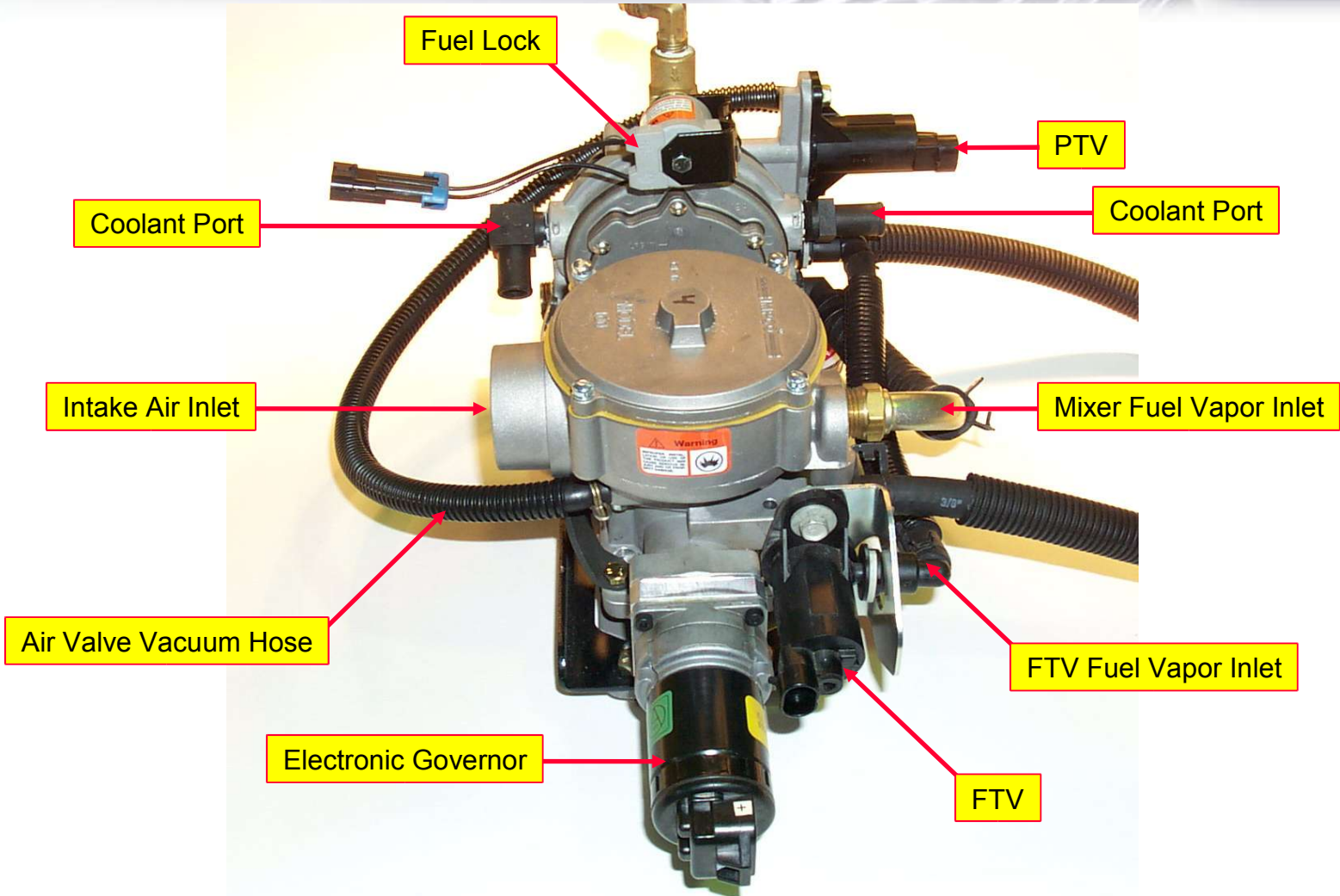






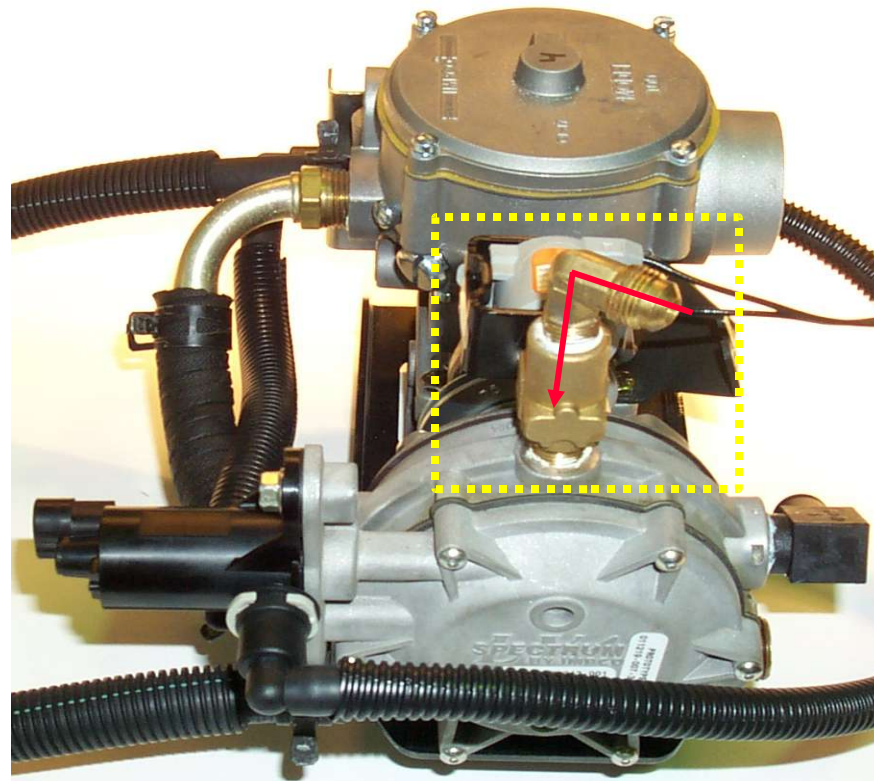




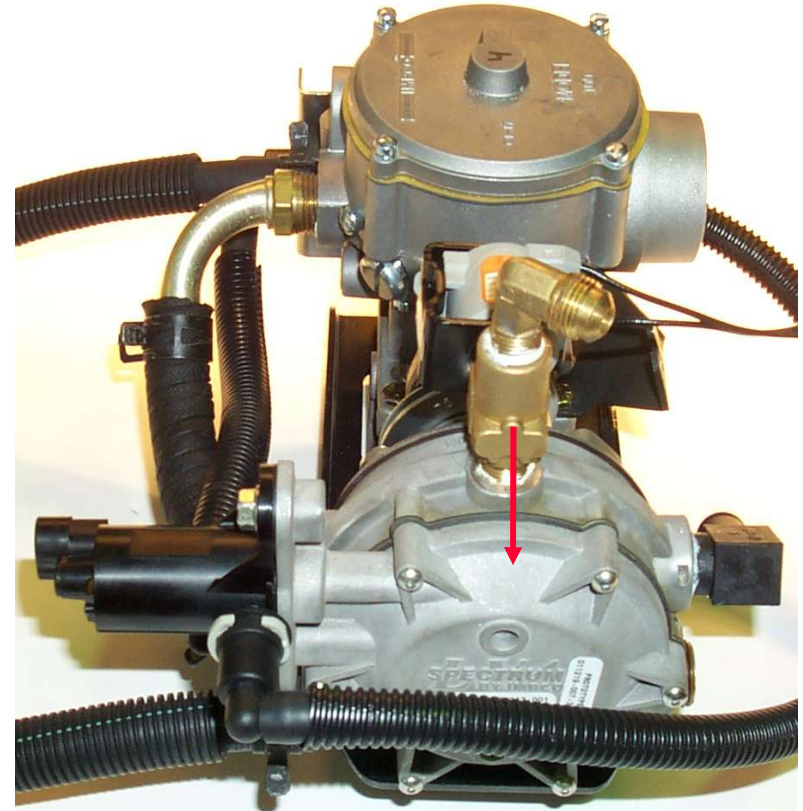


- Controls the flow of LPG from the fuel storage container.
- Vaporizes LPG.
- Regulates LPG fuel pressure.
- Meters correct amount of LPG vapor with intake air.
- Utilizes a feedback loop with pressure and fuel trimming for fine adjustments of the air/fuel ratio.
- Employs a catalyst for exhaust after treatment.

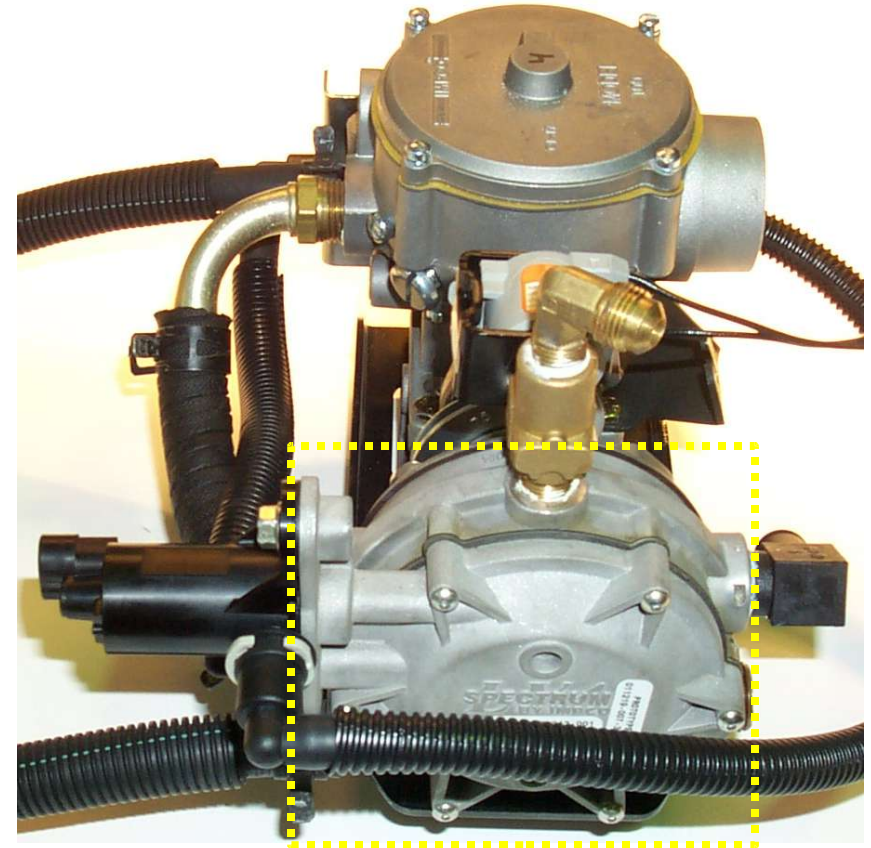
- When the liquid service valve on the fuel storage container is opened, liquid LPG @ tank pressure flows to the fuel lock.



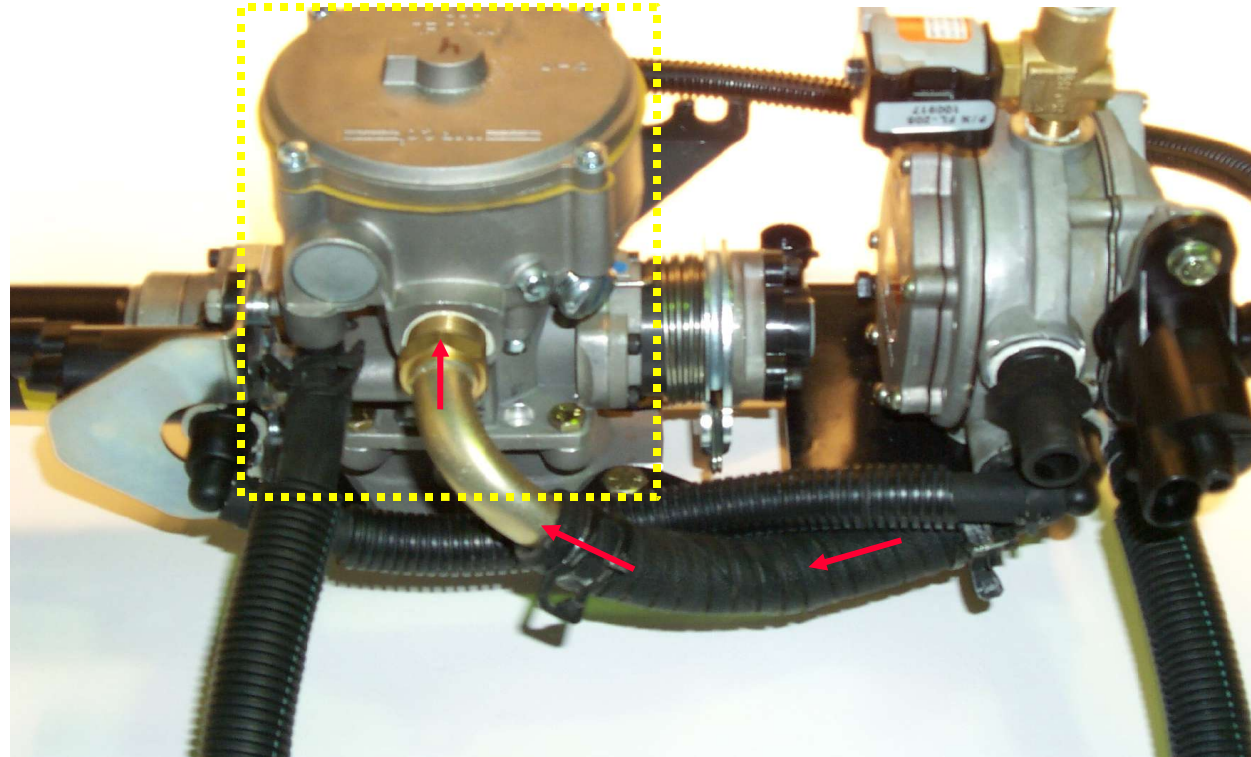
- When the ECM receives a tach signal from the engine cranking it closes the fuel lock electrical circuit.
- As the fuel lock opens it allows liquid LPG @ tank pressure to flow into the pressure regulator/vaporizer.



- The pressure regulator/vaporizer converts the liquid LPG @ tank pressure to vapor LPG @ slightly less than atmospheric pressure.

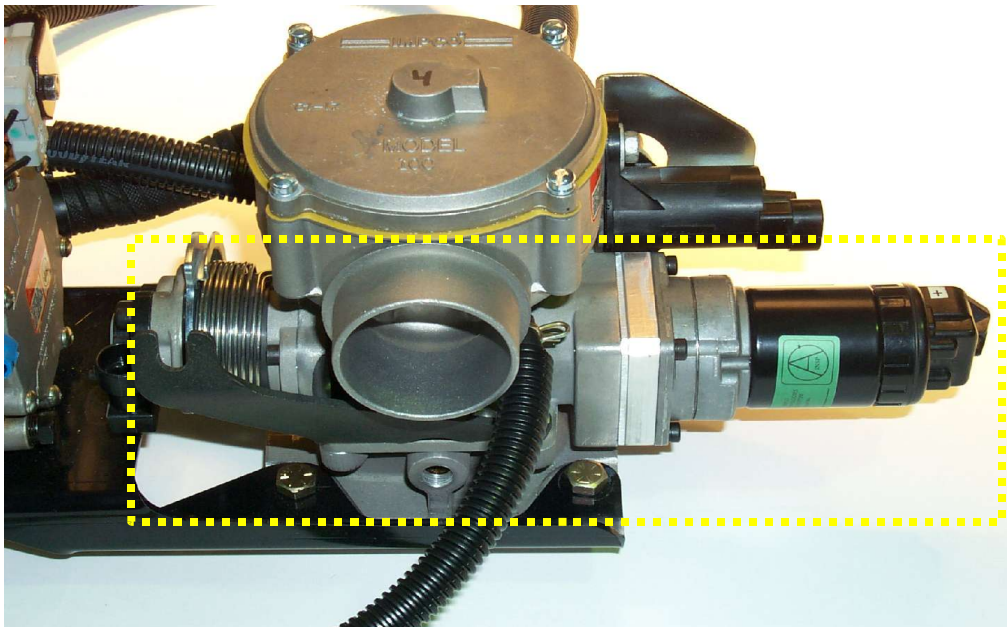


- A vacuum signal from the carburetor draws low pressure vapor LPG from the pressure regulator/ vaporizer to the carburetor where it is metered into the intake air stream.





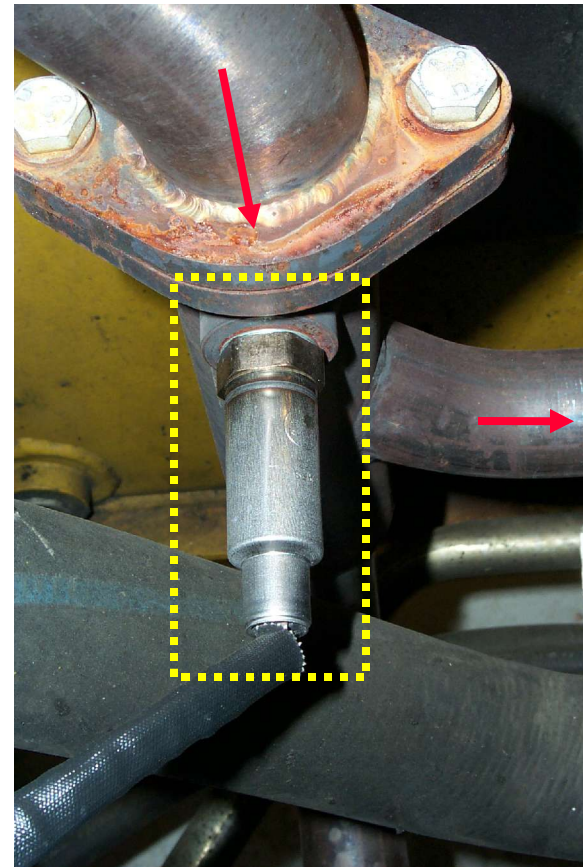
- The air/fuel mixture then flows through the throttle body.
- The throttle body allows the operator to control engine speed with the use of a cable operated butterfly valve.
- An electronic governor incorporated into the throttle body limits max engine RPM.



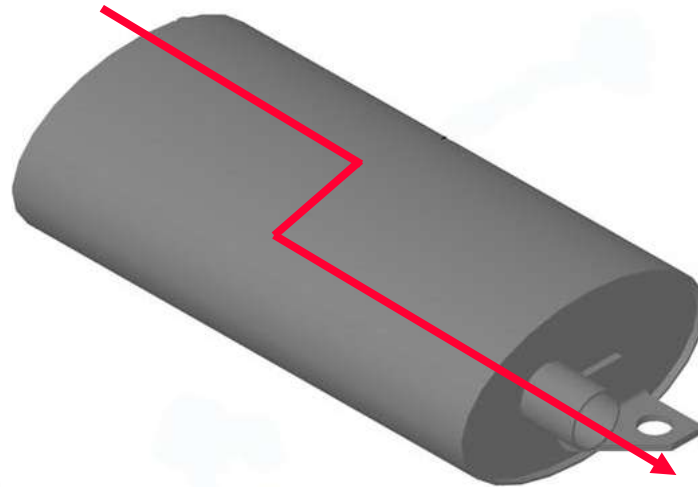
- BOSCH TB



- The air/fuel mixture is burned in the combustion chamber and then flows into the exhaust system past the HEGO.
- The HEGO generates an electrical voltage signal based on the amount of oxygen present in the exhaust gases.
- The HEGO signal is used as an input by the ECM.

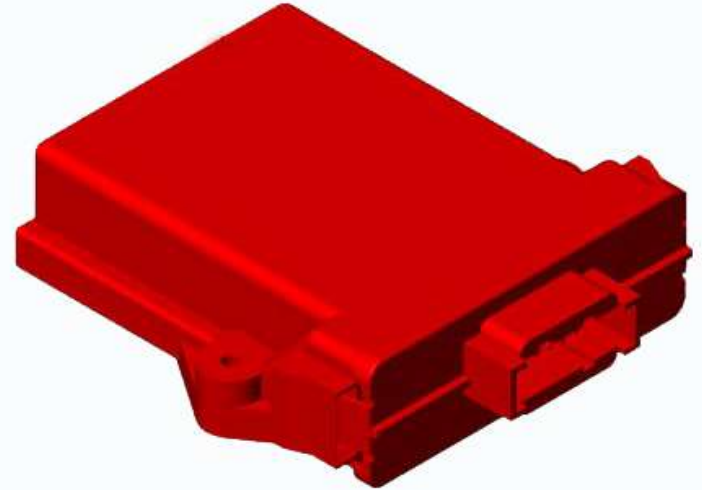


- The exhaust gas then flows through the catalyst where it undergoes conversion and reduction reactions before it is released to the atmosphere.
- The catalyst has a certain air/fuel ratio window within which it can operate effectively.
- An ECM with air/fuel ratio control is required to keep the air/fuel ratio within the catalyst operating window.

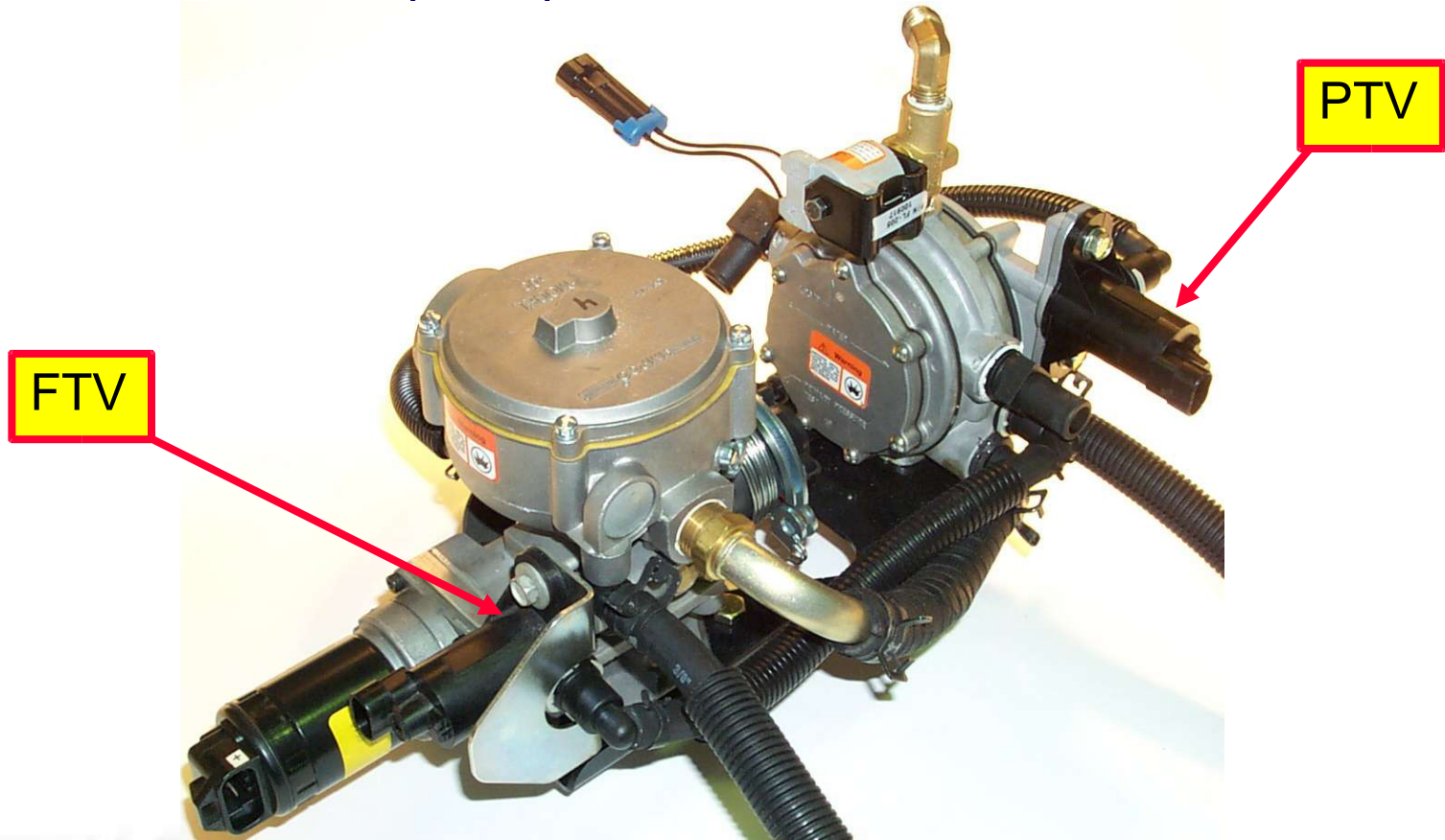




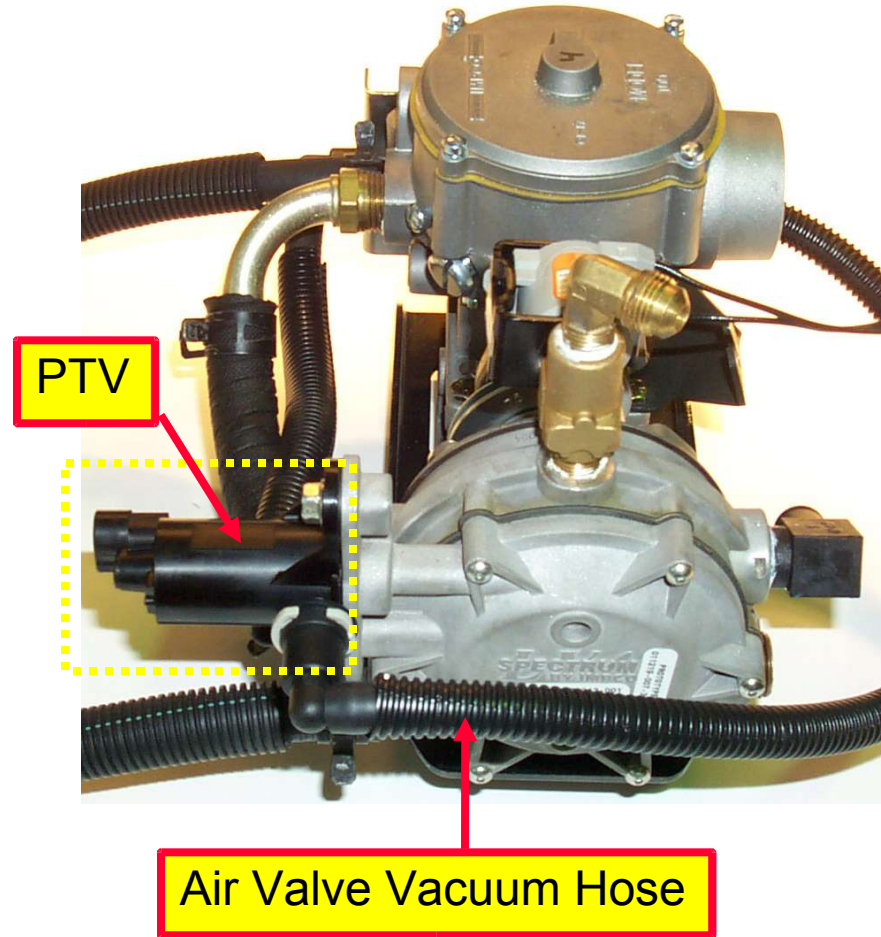
- The ECM monitors the exhaust gas by utilizing the output from the HEGO sensor as an input to the ECM.
- The ECM has the ability to command the air/fuel ratio rich or lean by using two solenoid valves connected to the output side of the ECM.



- Pressure Trim Valve (PTV) can reduce fuel
- Fuel Trim Valve (FTV) can add fuel

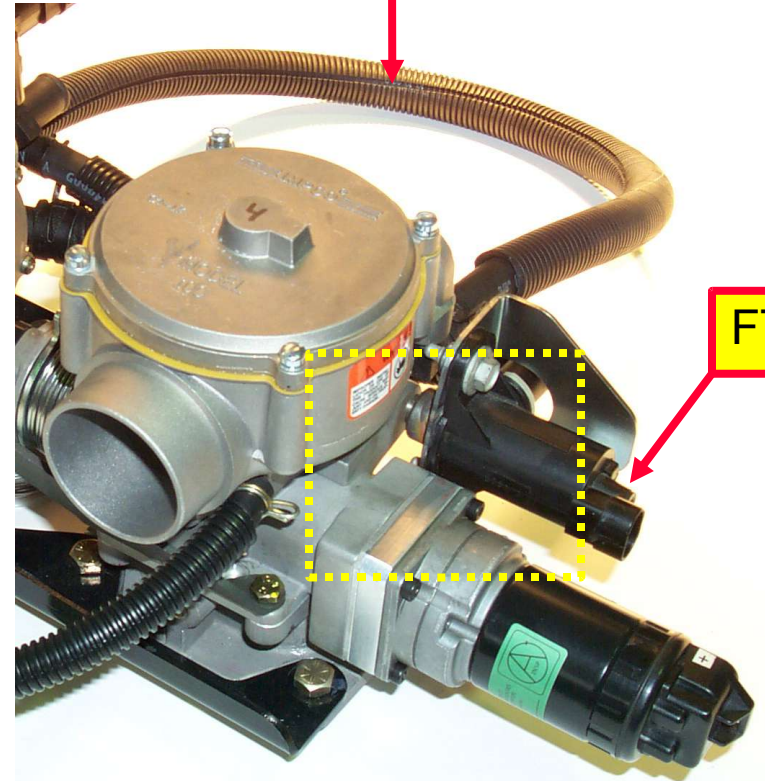


- The PTV manipulates fuel pressure based on a signal from the ECM
- Lowering the fuel pressure leans the air fuel ratio.
- Raising the fuel pressure richens the air/fuel ratio.





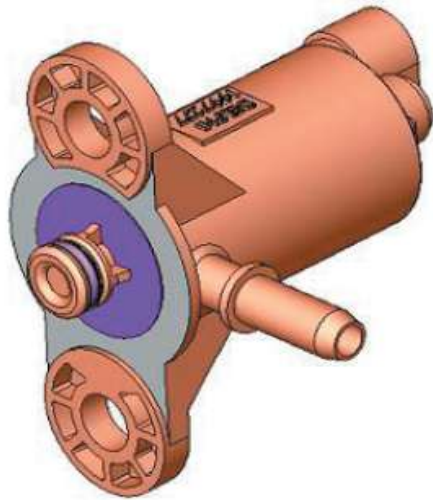
Vapor Fuel Hose



FTV

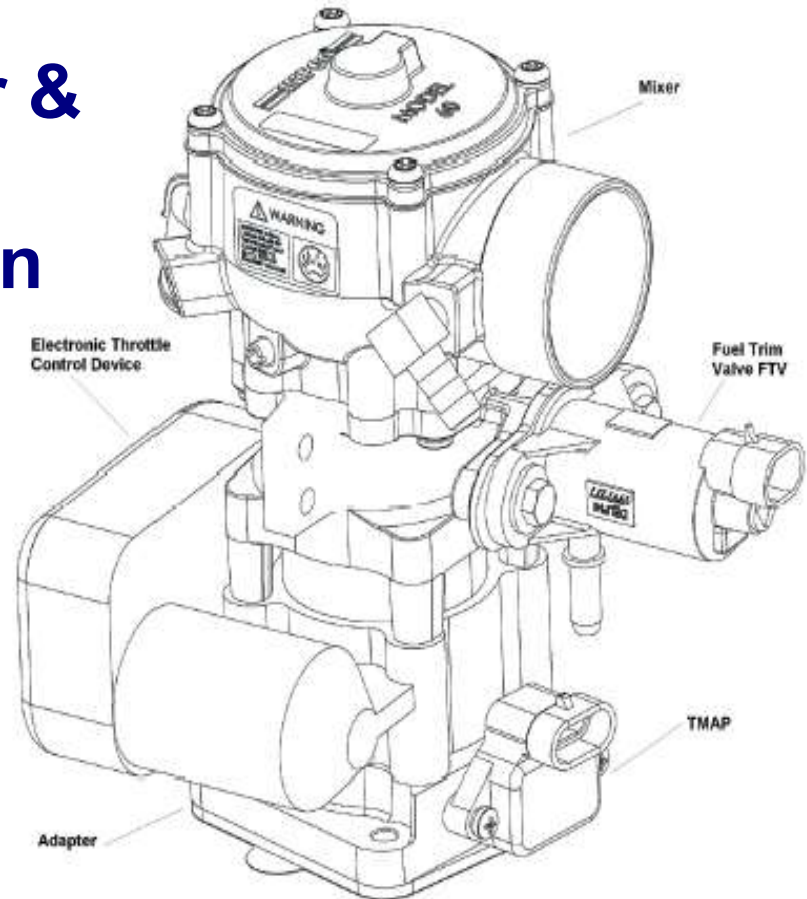
- The FTV manipulates secondary fuel delivery based on a signal from the ECM.
- Adding fuel richens the air/fuel ratio.
- Removing fuel leans the air/fuel ratio.





## Mixer & FTV function

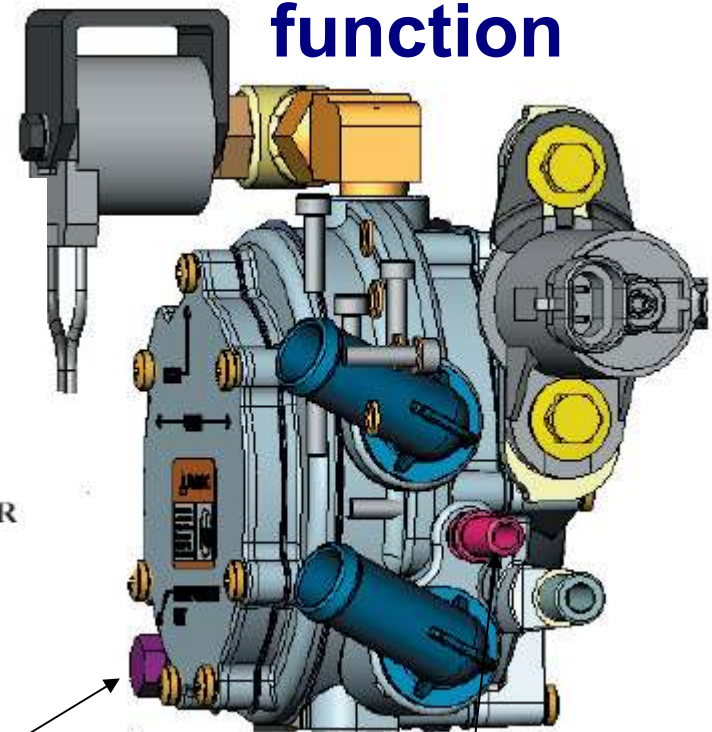
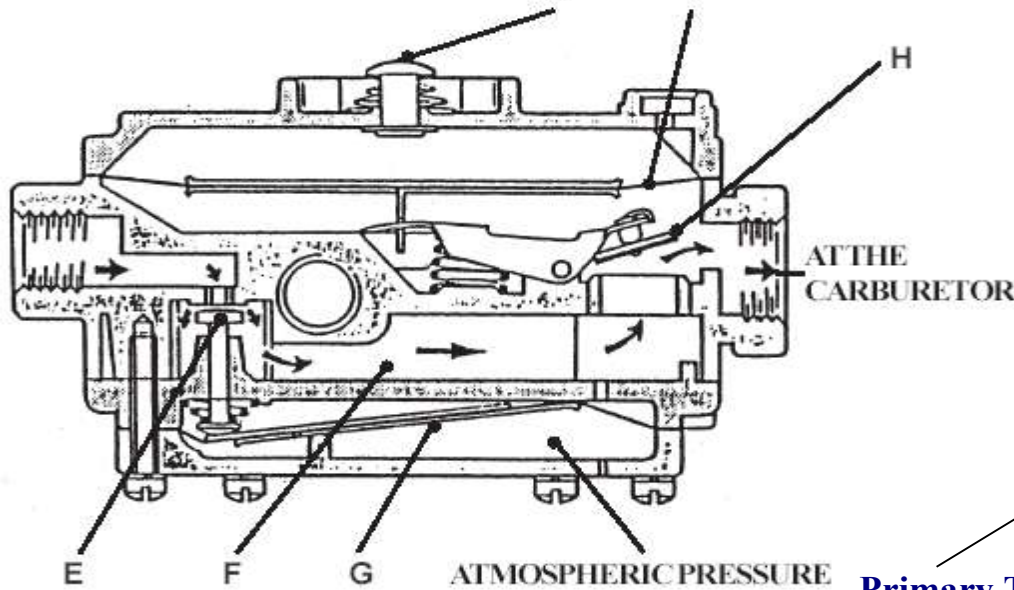
Also mounted on Electronic throttle body assembly is the Fuel Trim Valve (FTV). The FTV is a 12 volt normally closed solenoid valve. During closed loop operation the ECM may send a reference signal to the FTV to open or close to allow more or less fuel to be introduced below the throttle blade to correct the air fuel mixture for proper emission control.





The LPR is a combination vaporizer, pressure regulating device. The LPR is a negative pressure two stage regulator that is normally closed when the engine is not running. When the engine is cranking or running a partial vacuum is created in the fuel line which connects the regulator to the mixer. This partial vacuum opens the regulator permitting fuel to flow to the mixer.

## LPR & PTV function





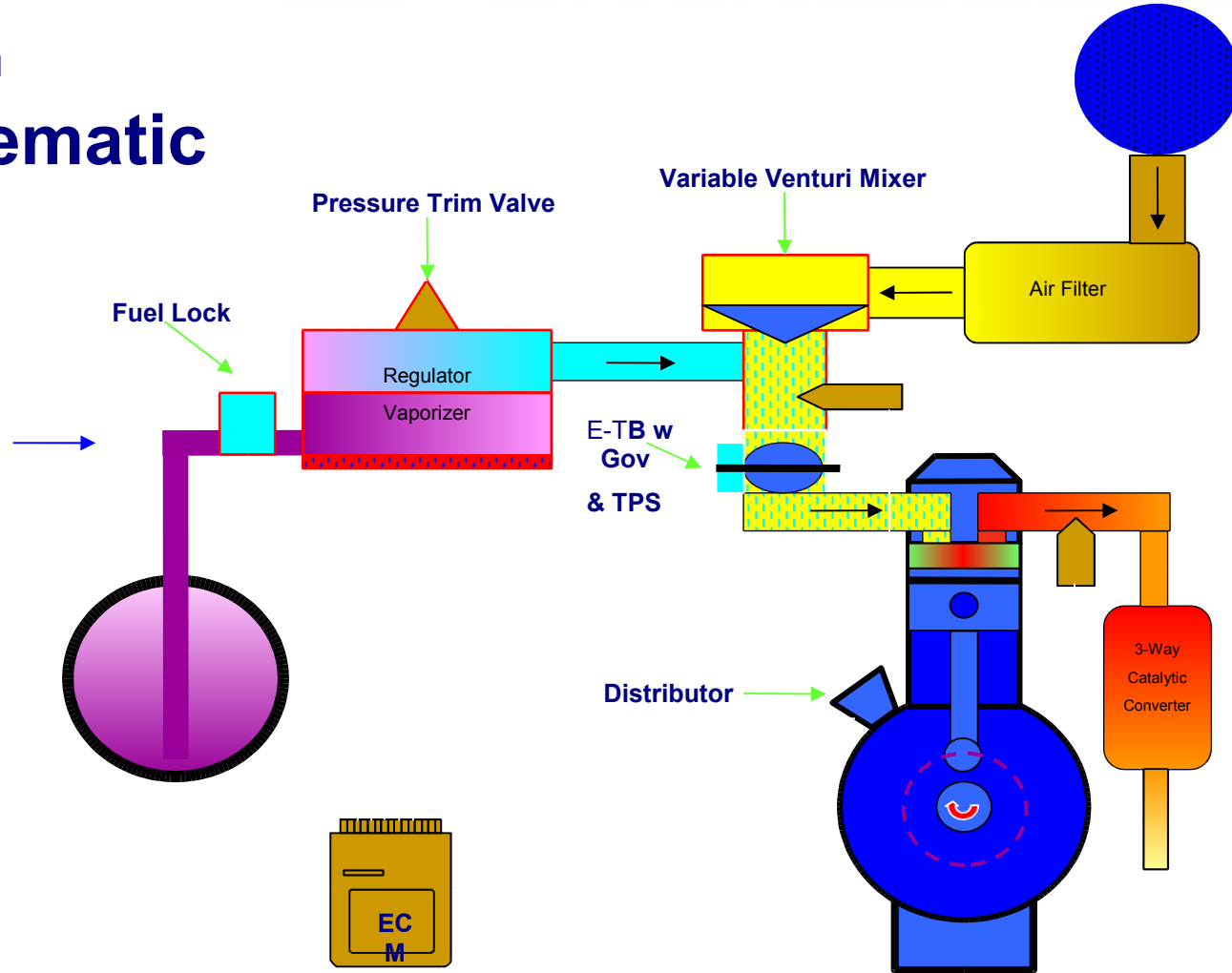
## LPR & PTV function

Propane fuel enters the primary port of the LPR and passes through the primary jet and into the primary/exchanger chamber. As the propane passes through the heat exchanger the fuel expands and creates pressure inside the chamber. The pressure rises as the fuel expands when the pressure rises above 10.34 kpa (1.5 psi), sufficient pressure is exerted on the primary diaphragm to cause the diaphragm plate to pivot and press against the primary valve pin thus closing off the flow of fuel. This action causes the flow of fuel into the regulator to be regulated. When the engine is cranking, sufficient vacuum will be introduced into the secondary chamber from the mixer drawing the secondary diaphragm down onto the spring loaded lever and opening the secondary valve allowing vaporized fuel to pass to the mixer. Increased vacuum in the secondary chamber increases the downward action on the secondary lever causing it to open wider allowing more fuel to flow to the mixer.

The regulator utilized on this emission certified engine is equipped with a unique Pressure Trim Valve (PTV) which is directly mounted to the regulator. This solenoid is a 12 volt normally closed solenoid. The function of this solenoid is to regulate a specific amount of venturi vacuum to the atmospheric side of the secondary diaphragm. By introducing vacuum to the top side of the secondary diaphragm during regulator operation the amount of fuel being delivered to the mixer can be “trimmed” or reduced to allow for correction to the air fuel ratio for closed loop fuel control. The solenoid receives a reference signal from the ECM which causes the solenoid to be pulsed fast or slow depending on the amount of fuel to be trimmed.

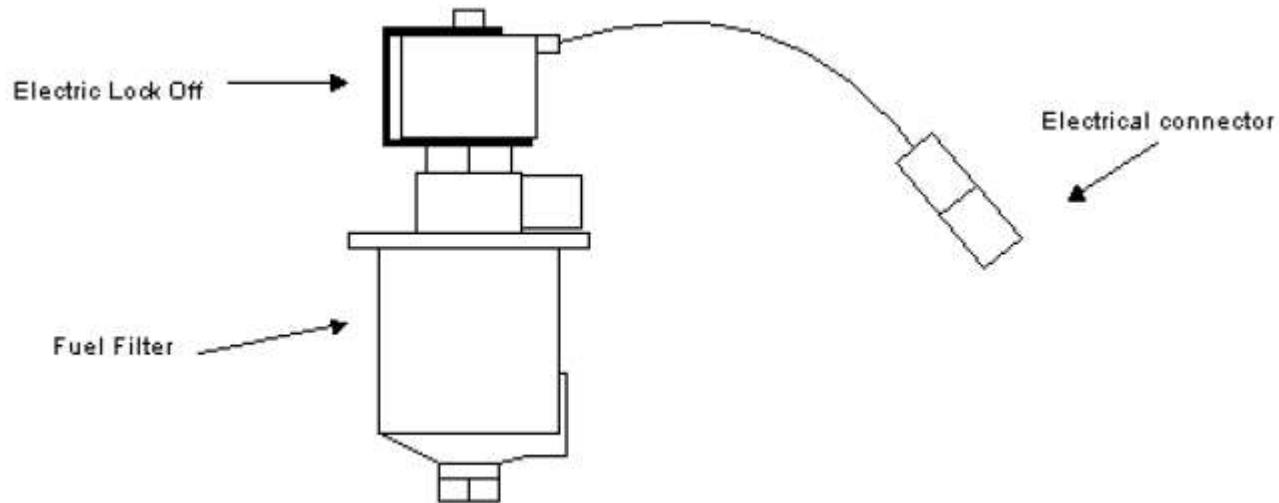


## LPG schematic





## ECM controlled fuel lock off valve incl. fuel filter



**Questions ??**

**Remarks ??**

**Notes ??**