ORIGINAL

SERVICE and OVERHAUL MANUAL

SUPPLEMENT

CHEVROLET

1975 Cosworth Vega

ST 353-75

1975 CHEVROLET COSWORTH VEGA SHOP MANUAL

FOREWORD

This manual is prepared as a supplement to the 1974 Vega Service and Overhaul Manual and 1975 Vega and Monza 2+2 Service and Overhaul Manual Supplement. It contains theory of operation, diagnosis, maintenance adjustments, service operations, and overhaul procedures for the Cosworth Vega.

Diagnostic information in this manual will assist service personnel in properly maintaining the Cosworth Vega. However, it must be understood that it is not possible to anticipate every problem that may occur. When diagnostic procedures for a specific area do not reveal the cause of a problem, related system areas should be considered. For example, an engine misfire condition could be diagnosed under engine electrical, fuel systems or engine. Unless specifically implied, the technician may perform the diagnostic checks in whatever order appears most logical for his particular situation. Also, where diagnostic procedures do not reveal the problem cause, substitution of known good components for the suspected part should be considered.

Any reference to brand names in this manual is intended merely as an example of the types of lubricants, tools, materials, etc., recommended for use. In all cases, an equivalent may be used.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

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CHEVROLET MOTOR DIVISION
General Motors Corporation
DETROIT, MICHIGAN

SECTION INDEX

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IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all motor vehicles. The service procedures recommended by Chevrolet and described in this service manual are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that some warnings against the use of specific service methods that can damage the vehicle or render it unsafe are stated in this service manual. It is also important to understand these warnings are not exhaustive. Chevrolet could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Chevrolet has not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Chevrolet must first satisfy himself thoroughly that neither his safety nor vehicle safety will be jeopardized by the service method he selects.

SECTION 0

GENERAL INFORMATION AND LUBRICATION

GENERAL INFORMATION

The Cosworth Vega is a special performance package featuring computerized fuel control. The use of Electronic Fuel Injection provides the Cosworth Vega with instant response while achieving a maximum of fuel economy.

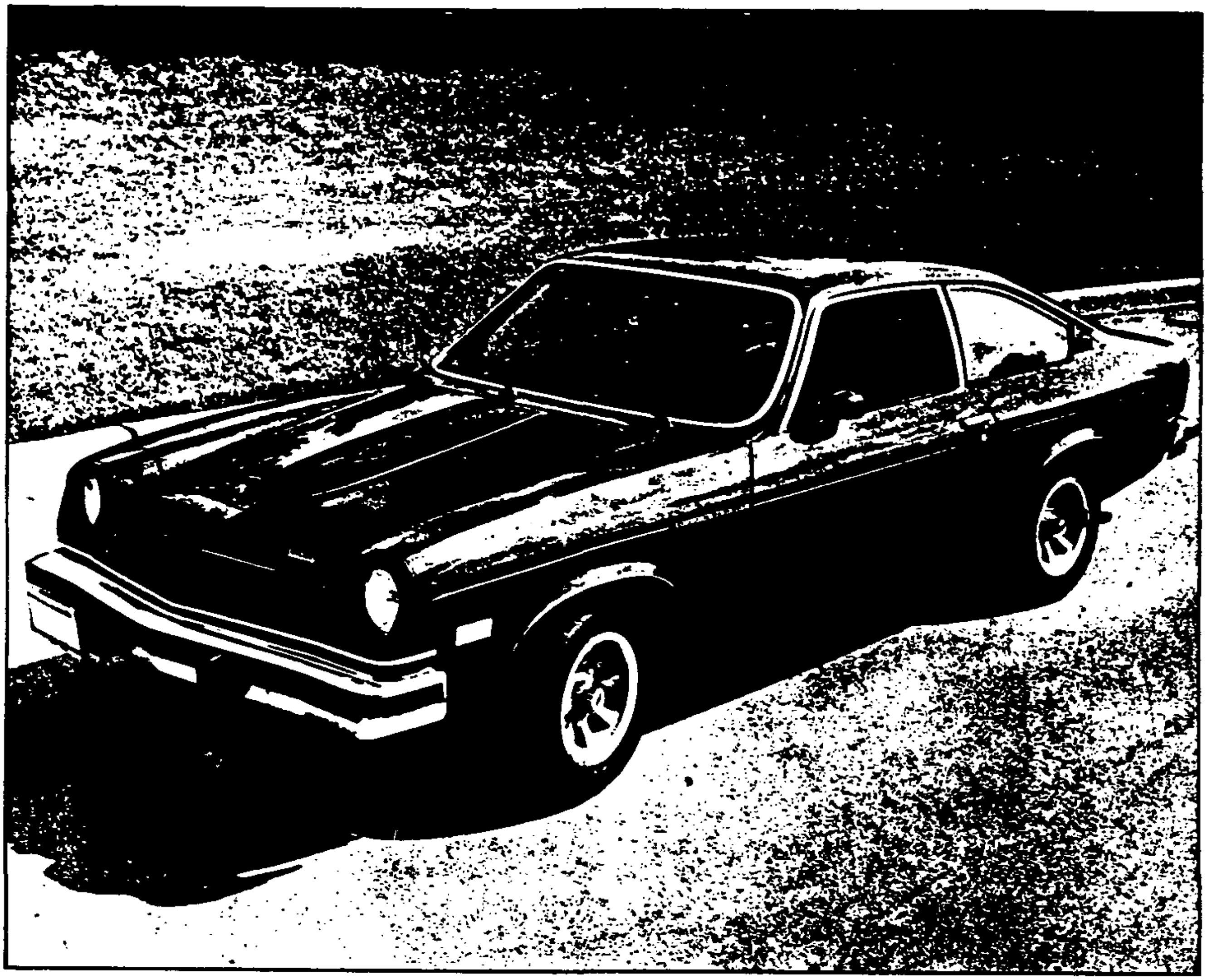


Fig. 1—Cosworth Vega

BODY

The Cosworth package, Option Z09, is available only on the 2-Door Hatchback, model 1HV77 (fig. 1). The body exterior paint and interior trim are available in black only. A choice of four-seat fabrics is available.

The body exterior is enhanced by gold striping, dual sport mirrors, blackened door handle inserts, and blackened headlight bezels, windshield wiper arms and blades.

SUSPENSION

The Cosworth package includes a 'torque arm' rear suspension (fig. 2) which provides optimum rear axle power control. This unit is comparable to the assembly used on the Monza 2+2 and is serviced in the same manner.

The Monza 2+2 axle is also used, providing a 3.73:1 gear ratio from a 7-1/2" ring gear. No other gear ratios are available, but a limited slip differential is optional.

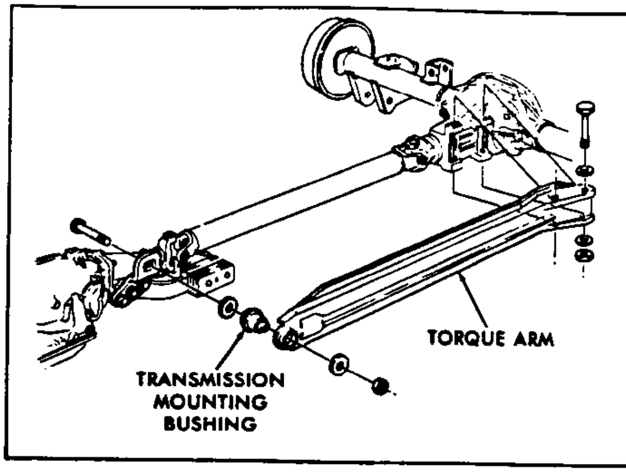


Fig. 2–Torque Arm Suspension

ENGINE

The heart of the Cosworth package is the engine (fig. 3). It features an electronic fuel injection system combined with a 16 valve cylinder head, dual overhead camshafts, forged aluminum pistons, de-stroked Vega four-cylinder aluminum engine and high energy ignition.

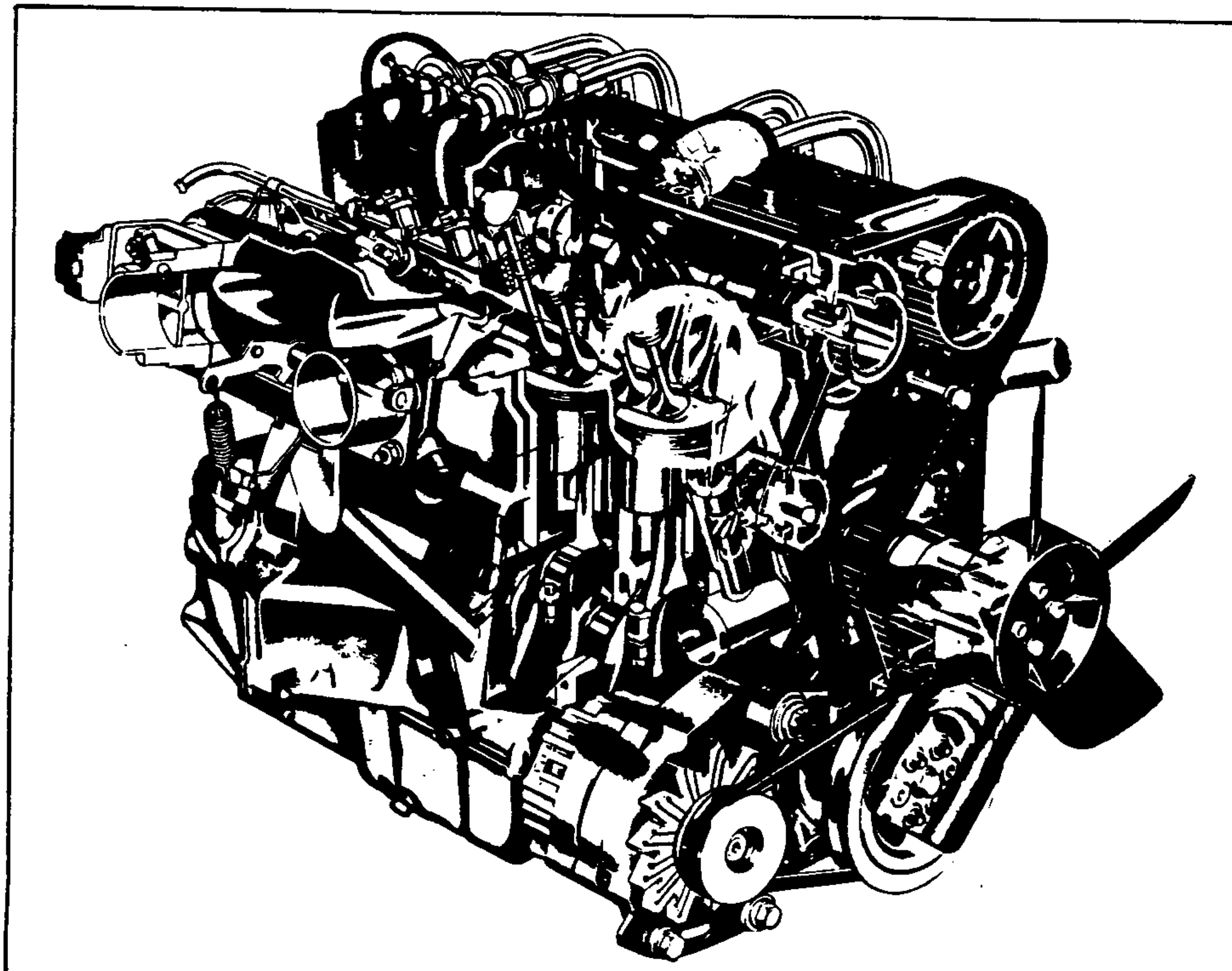


Fig. 3–Cosworth Engine

Cam-Carrier

Upper engine design is different than the standard Vega. The camshafts are held in a removable cam-carrier. This aluminum "holder" (fig. 4) also serves as a guide for the valve lifters. Each camshaft is supported on five bearings and is turned by individual cam gears on the front end. The two overhead camshafts are driven, along with the water pump and fan, by a fiberglass cord reinforced neoprene rubber belt, much like the existing Vega L-4 engine.

Two camshafts are used because of valve placement. Maximum intake and exhaust efficiency requires the valve ports be placed opposite each other at a 40° angle. A single camshaft would require an exotic valve train system that would prove to be power robbing. Therefore, two camshafts accomplish the job more easily, eliminating unnecessary valve train components.

Cylinder Head

Below the cam-carrier is a new 16 valve cylinder head (fig. 5), constructed of an aluminum alloy and using sintered iron valve seats and iron cast valve guides for greater durability.

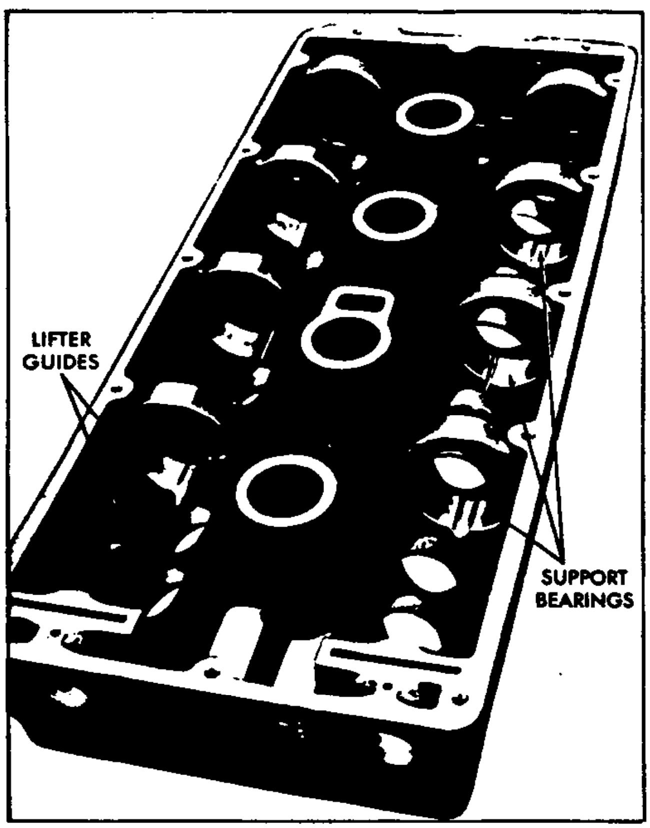


Fig. 4—Cam Carrier

Each cylinder uses two intake and two exhaust valves because of the Volumetric efficiency of this design. Two smaller diameter valves offer less restriction to intake and exhaust flow than would one large valve. A single port, equal in area to the existing two, is prohibitive due to combustion chamber clearances and cooling considerations.

During the intake stroke, the two intake valves allow a more efficient induction of the air-fuel mixture. As a result, the cylinder is closer to atmospheric pressures at the end of the intake stroke (bottom dead center) than would be with a single valve. This gives the cylinder a better charge of combustible air-fuel mixture resulting in efficient combustion, producing greater power.

The exhaust valves, similarly, ensure that at the end of the exhaust stroke (top dead center) there is very little pressure left in the cylinder. Therefore, on the next compression stroke, the combustion chamber will contain comparatively less residual exhaust gas from the previous power stroke.

Pistons

New forged aluminum pistons are used because of their added strength, resulting in improved durability under severe engine operating conditions. A deep chamfer, circumscribing the head, is used to control hydrocarbon (HC) emissions. The deep chamfered piston head design reduces the cooling surface (quench area) between the piston and cylinder wall. This increases the combustible fuel volume in this area, resulting in a reduction of the HC level in the exhaust gases.

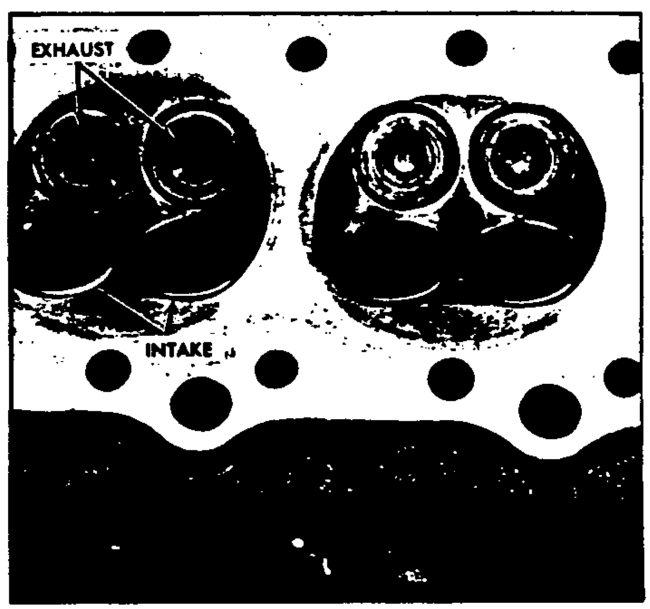


Fig. 5—Cylinder Head

ELECTRONIC FUEL INJECTION

The Electronic Fuel Injection (EFI) is the basis for the Cosworth's quick response and power (fig. 6). The EFI system is a pulse-time manifold injection system that delivers a precise amount of fuel into the cylinder chambers for combustion.

The system consists of four primary areas:

1. Electronic Control Unit (ECU)
2. Fuel Delivery System
3. Air Induction System
4. Engine Sensing System

Each area controls a specific function, but all work simultaneously to control the precise amount of fuel injected for the prevailing engine condition.

Electronic Control Unit

The Electronic Control Unit (ECU) (fig. 7) is a pre-programmed analog computer that controls the amount of fuel being injected into the engine cylinders. All sensor impulses are received in the ECU and evaluated to determine fuel requirements needed for engine operation.

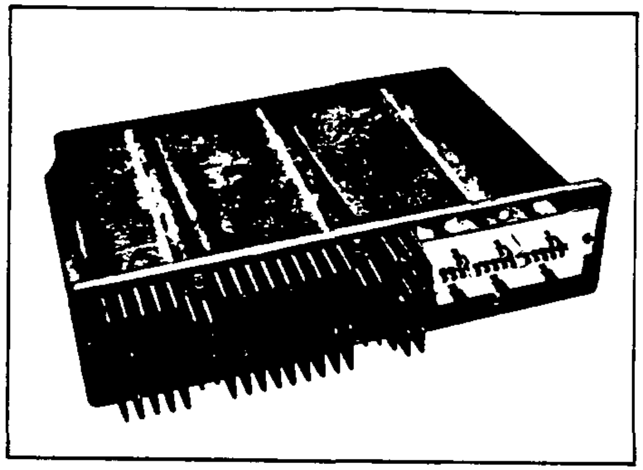


Fig. 7—Electronic Control Unit (ECU)

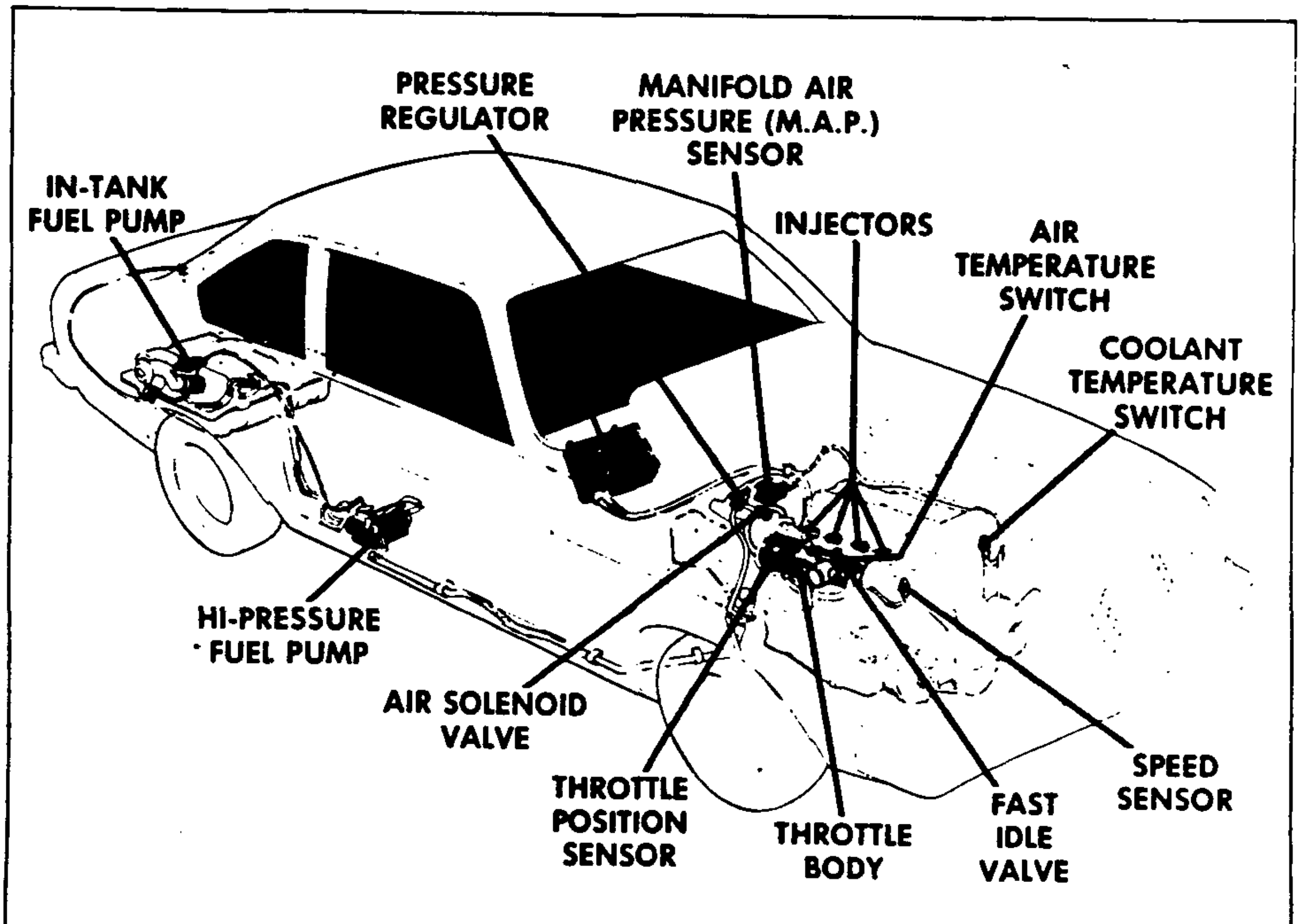


Fig. 6—Electronic Fuel Injection (EFI)

The ECU is calibrated to analyze all combinations of input, to meet all modes of engine operation. The components of the ECU are mounted on a printed circuit board which is protectively coated after calibration (fig. 8).

The exterior housing is of a cast aluminum construction and is mounted under the instrument panel above the glove compartment. The power and control harnesses plug into the ECU at one location.

The harness connectors are designed to plug in one way only.

CAUTION: The battery ground cable should always be disconnected before disconnecting/connecting electrical connectors at ECU. If battery ground cable cannot be disconnected, make sure the black connector of ECU is the *first* one *disconnected* and the LAST one CONNECTED. This will prevent any accidental short circuiting of the ECU components.

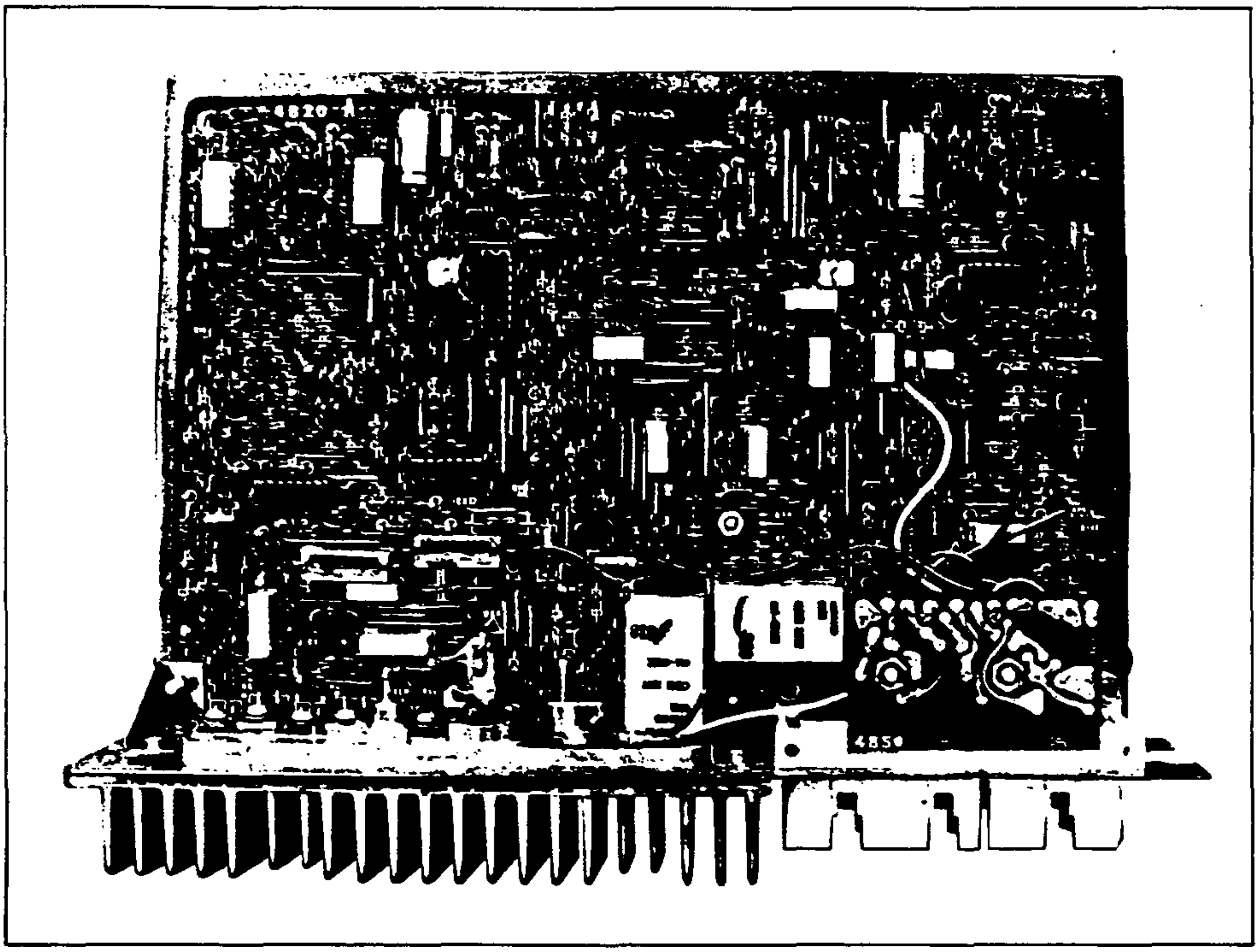


Fig. 8—Electronic Control Unit Circuitry

Fuel Delivery System

Fuel at the injectors is made available by the fuel delivery system (fig. 9). This system consists of:

- two fuel pumps
- a fuel filter
- four injector valves
- a fuel pressure regulator
- fuel lines

The fuel pump circuit is energized through the ECU. The pumps supply fuel from the storage tank through the fuel system to the injectors. Fuel line pressure is maintained by the fuel pressure regulator at 39 pounds per square inch (PSI) above existing manifold pressure. Excess fuel at the pressure regulator is returned to the fuel tank.

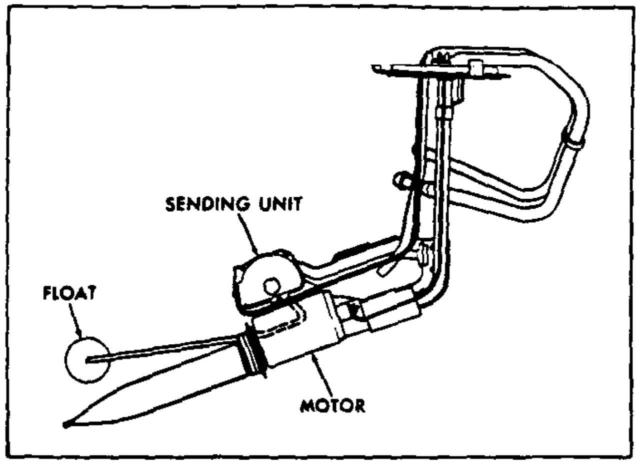


Fig. 10—In-Tank Fuel Pump

In-Tank Fuel Pump

The Cosworth in-tank fuel pump (fig. 10) is a combination fuel gauge metering unit and fuel pump similar to the unit used on other Vega models. The Cosworth unit, however, uses a heavy duty motor and incorporates the fuel return line from the pressure regulator.

This pump is an electrically operated impeller type receiving its initial current from the cranking circuit. The pump can supply fuel at a rate of 35 gallons per hour at a minimal back pressure.

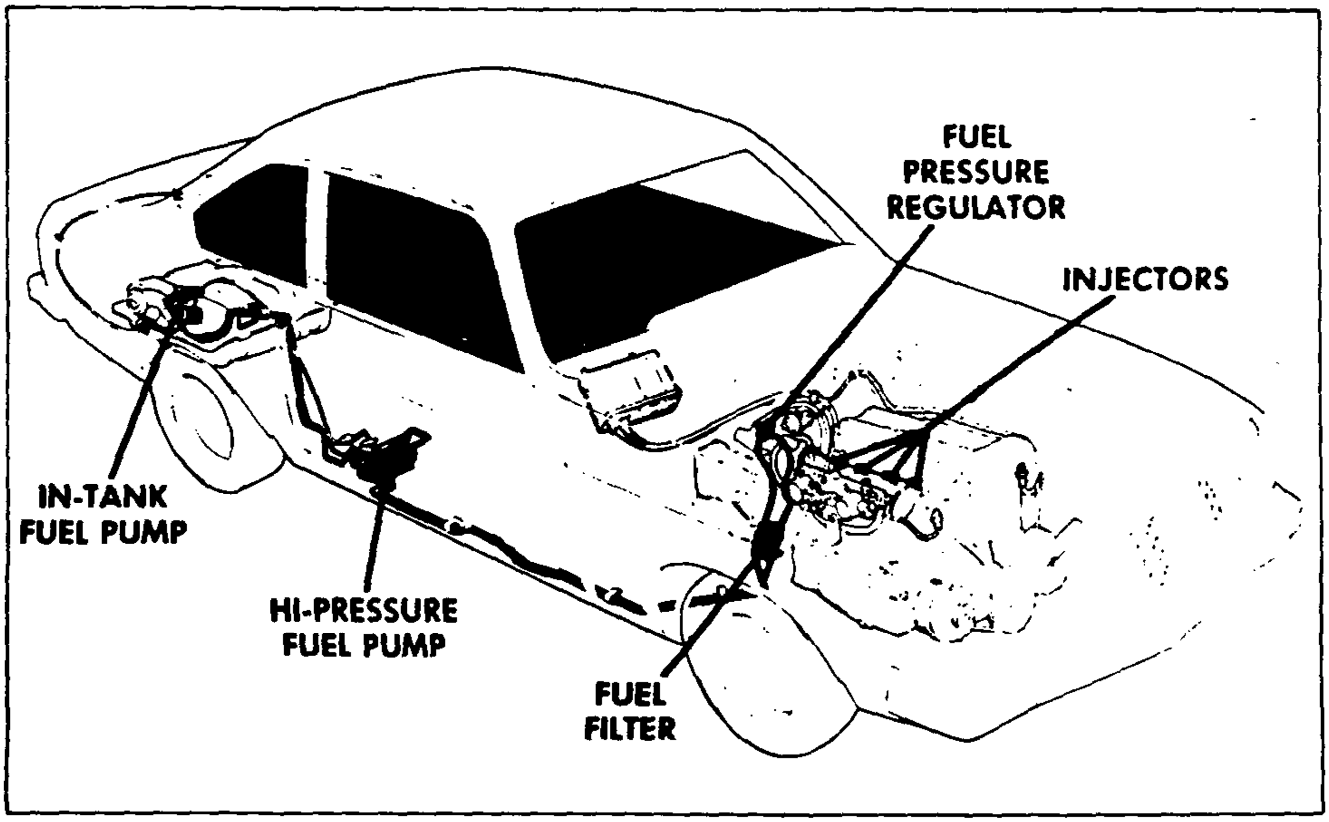


Fig. 9—Fuel Delivery System

High-Pressure Fuel Pump

The high-pressure fuel pump (fig. 11) is a constant displacement, roller-vane type developing up to 90 psi. At operating pressures of 39 psi, the pump will deliver 32 gallons of fuel per hour. Two internal check valves are incorporated, one for overpressure protection and the other to maintain system pressure after the pump is shut off. The pump is mounted on the right side of the underbody adjacent to the front of the right rear wheel.

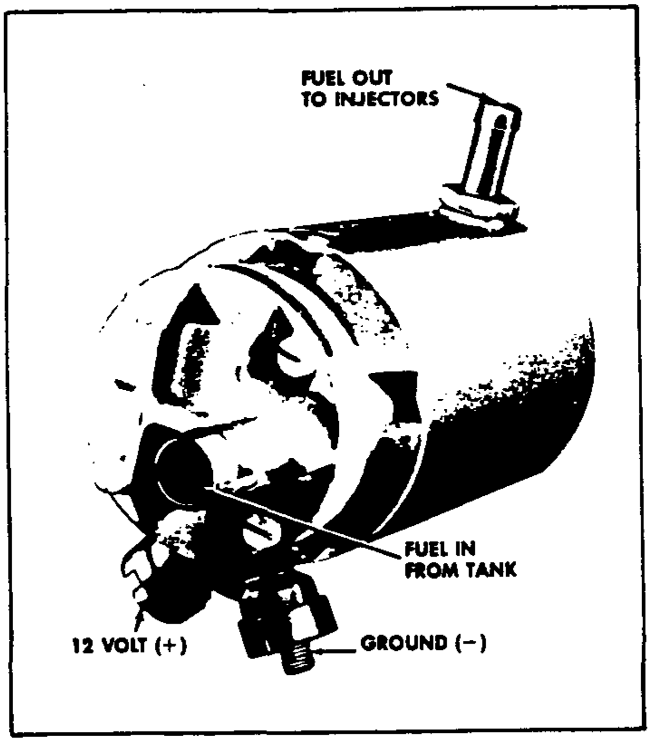


Fig. 11—High Pressure Fuel Pump

Electric current is supplied to the high-pressure pump through a wiring harness from the in-tank pump (fig. 12). The pump is not repairable, but is to be replaced as a unit if found to be defective. No special tools are required but, the wire retaining nuts are metric. The 12 volt and ground connections use a 4mm. and 5mm. nut respectively. Caution should be used when working on this component since the fuel is under high pressure.

Fuel Pressure Regulator

The fuel pressure regulator (fig. 13) is a diaphragm operated relief valve used to maintain fuel rail pressure at a nominal 39 psi. The diaphragm senses fuel pressure on one side while the other side is exposed to intake manifold pressure. A spring mounted at the air pressure side of the diaphragm establishes a nominal pre-load of pressure. With the fuel pumps constantly supplying fuel to the regulator, a situation of too much fuel is created at the pressure regulator. When pressure greater than 39 psi is sensed, the diaphragm moves to allow excess fuel to be routed back to the fuel storage tank by means of a 5/16 inch steel return line.

The regulator is a sealed unit and cannot be repaired; it is to be replaced as a unit if diagnosed to be defective. No special tools are required however, the unit retainer nut is metric. Bracket attachment is made with a 12 mm. x 1.5 mm nut.

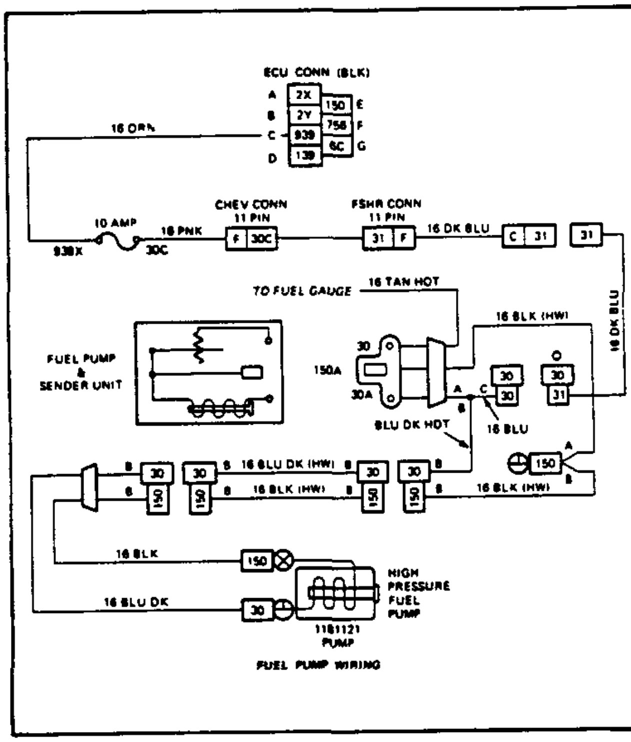


Fig. 12—Fuel Pump Circuit

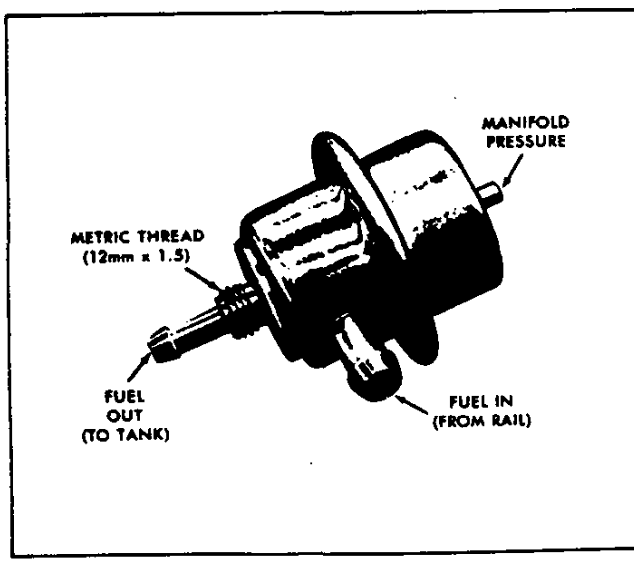


Fig. 13—Fuel Pressure Regulator

Fuel Injector

The fuel injector valve (fig. 14) is an electro-mechanical solenoid used to meter and atomize fuel. The injector solenoid contains a plunger attached to a needle valve which, when activated opens inwardly. A spring holds the valve closed as long as the solenoid is not activated.

The fuel is metered by the valve opening in response to commands received from the electronic control unit (ECU). The injector is capable of opening or closing in a time period of 2 milliseconds. Typical injection time for most engine operations ranges from 2 to 10 milliseconds. The injected fuel is atomized when met with air from the throttle body.

The fuel injectors function in pairs. Cylinders 1 and 2 are Group One, and Cylinders 3 and 4 are Group Two. When the injectors are activated, they are done so in groups for better cylinder priming. In the few milliseconds that the fuel is in the inlet manifold before intake valve opening, the fuel completes atomization and travels the distance to the intake valves. When the valves open, the already moving fuel better packs the cylinder with a burnable mixture. This group injection normally occurs once every 720° of crankshaft rotation. Under a loaded, wide open throttle condition, however, injection occurs simultaneously (all injectors at once) every 360° of crankshaft rotation. This allows maximum power realization under full load conditions.

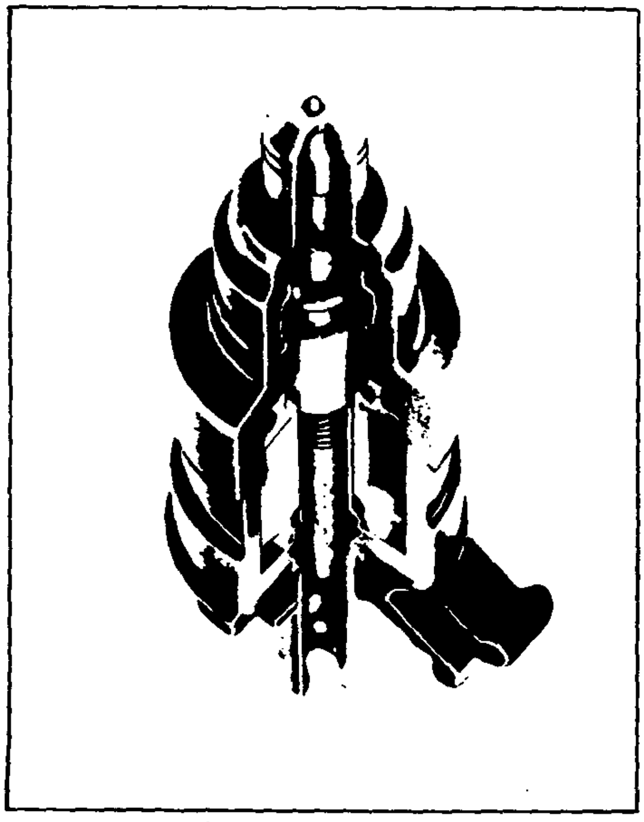


Fig. 14—Fuel Injector

The injectors are mounted in the fuel rail and are positioned to direct the fuel to the top side of the intake valve. The relatively narrow spray-cone angle of the injector minimizes intake manifold wall wetting. The injectors are interchangeable between cylinders and can be mounted one way only. The injectors are not adjustable or serviceable. If diagnosed to be defective, they must be replaced as a unit. It is *not* necessary to replace the injectors in sets or pairs, they are totally independent components. If an injector is being replaced, the new unit *must* be of the identical part number as the defective injector.

Injector valves from other EFI systems, such as found on some European vehicles, are *not* compatible to the Cosworth system. Their fuel flow rates are different than Cosworth's and will not supply the necessary fuel for optimum performance.

Air Induction System

The Air Induction System (fig. 15) provides the necessary air needed for all engine operating modes. The system is composed of:

- air cleaner
- throttle body
- inlet manifold
- fast idle valve
- air solenoid valve

Air required for combustion is filtered through the air cleaner, passes through the throttle body and inlet manifold, to enter the combustion chambers. The fast idle valve provides additional air to the inlet manifold when the engine is cold. The air solenoid valve controls the engine speed during cold starts and engine warm-up.

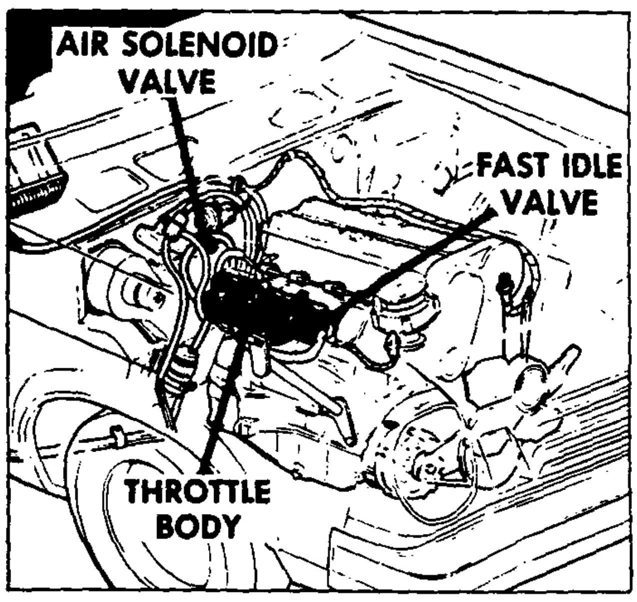


Fig. 15—Air Induction System

Throttle Body

The primary function of the throttle body (fig. 16) is to control engine air flow in response to driver commands. Air flow is controlled by two throttle plates located in the body. One is between the inlet passages of cylinders 1 and 2, the other between cylinders 3 and 4.

A screw and locking nut is provided, on the lower part of the throttle body, for adjusting engine curb idle speeds. It also serves as a vacuum supply for full vacuum and ported vacuum applications.

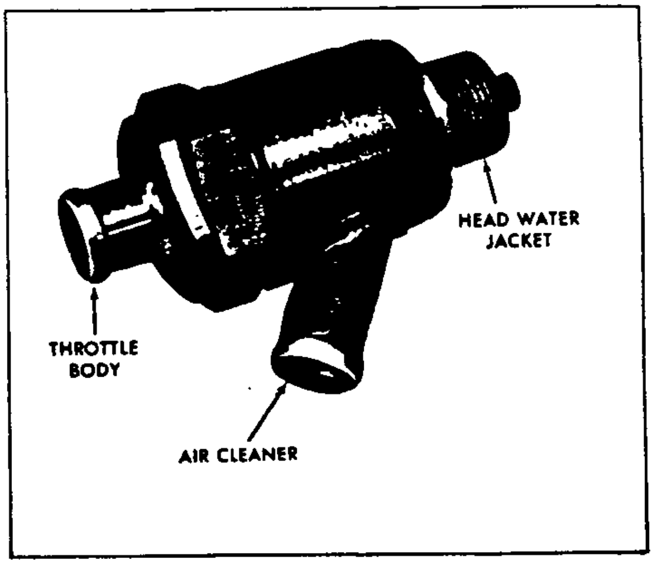


Fig. 17–Fast Idle Valve

Fast Idle Valve

The fast idle valve (fig. 17) is mounted in the right side of the cylinder head under the intake manifold. This valve automatically controls idle speed during cold engine operation by metering idle air into the engine. A thermal transducer senses coolant temperature and converts the temperature signals into fast idle valve travel variations.

As engine coolant temperature rises, the thermal compound in the valve expands, moving the metering valve to close off the air flow to the engine. No pre-setting or moving of the throttle blades is required to achieve this automatic control, since idle air flow is effectively bypassed around the throttle blade.

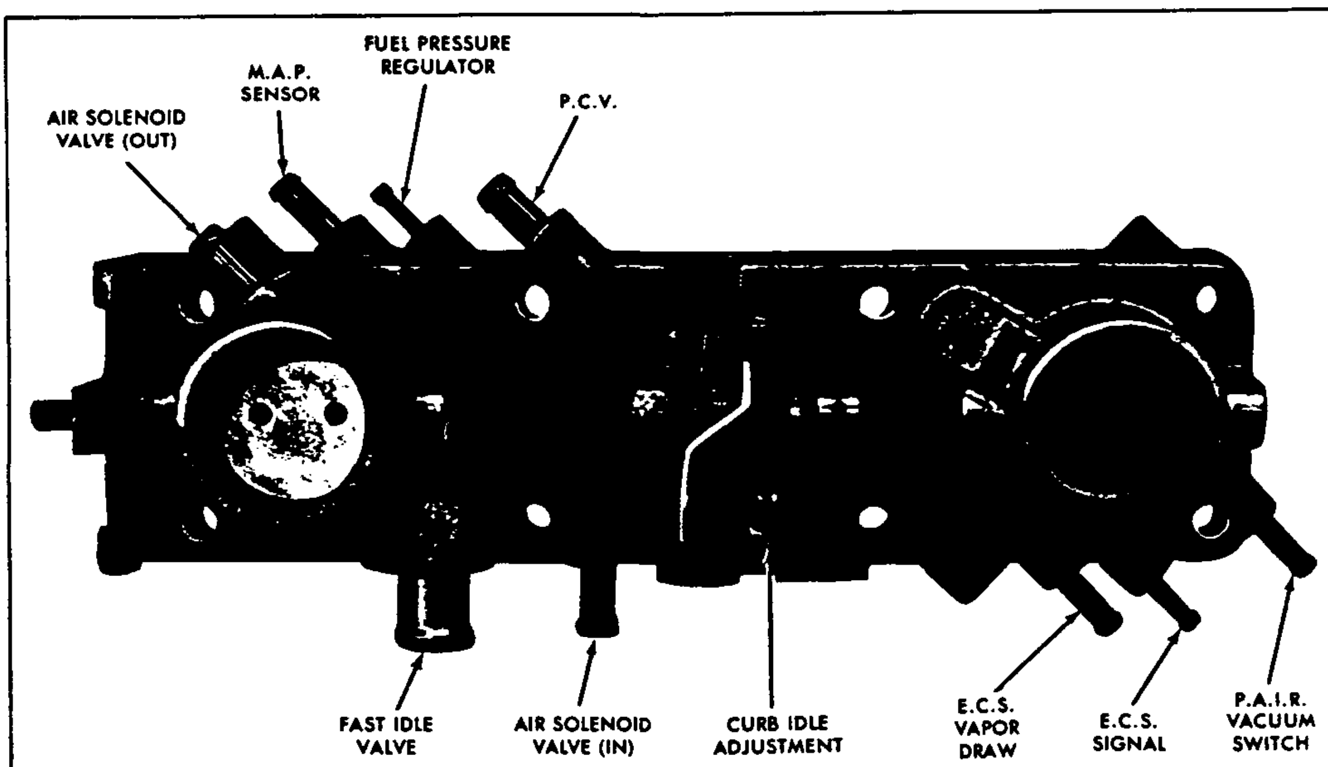


Fig. 16–Throttle Body

Air Solenoid Valve

The air solenoid valve (fig. 18) is an electro-mechanical solenoid that controls engine idle speed during cold operation. The solenoid consists of an internal valve that allows or denies air to the inlet manifold. It receives its signal from the ECU and is directly related to the temperature of the engine coolant. With engine coolant below 160°F., the valve receives a signal to close when engine speed exceeds 2000 RPM. By closing, the valve reduces the air supply to the engine causing engine RPM to drop. When the speed drops to approximately 1900 RPM, the air solenoid receives a signal to open, increasing engine speed. At 2000 RPM, the cycle repeats itself and continues to do so until the coolant reaches a temperature of 160° F. or greater. At that point, the air solenoid valve remains closed. The air solenoid is not repairable. If diagnosed to be defective, it is to be replaced as a unit.

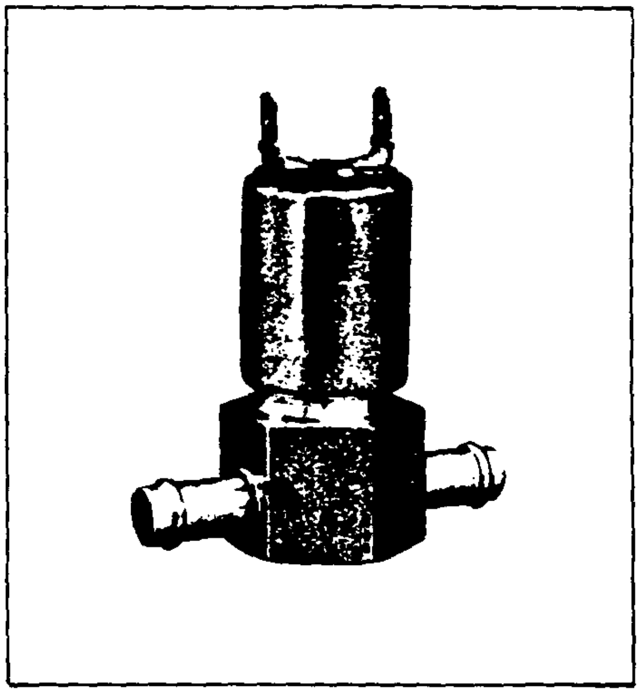


Fig. 18—Air Solenoid Valve

Engine Sensing System

The Engine Sensing System (fig. 19) provides the ECU with details of the engine operating conditions. This information is used by the ECU to determine injector opening duration. Five separate sensors are used.

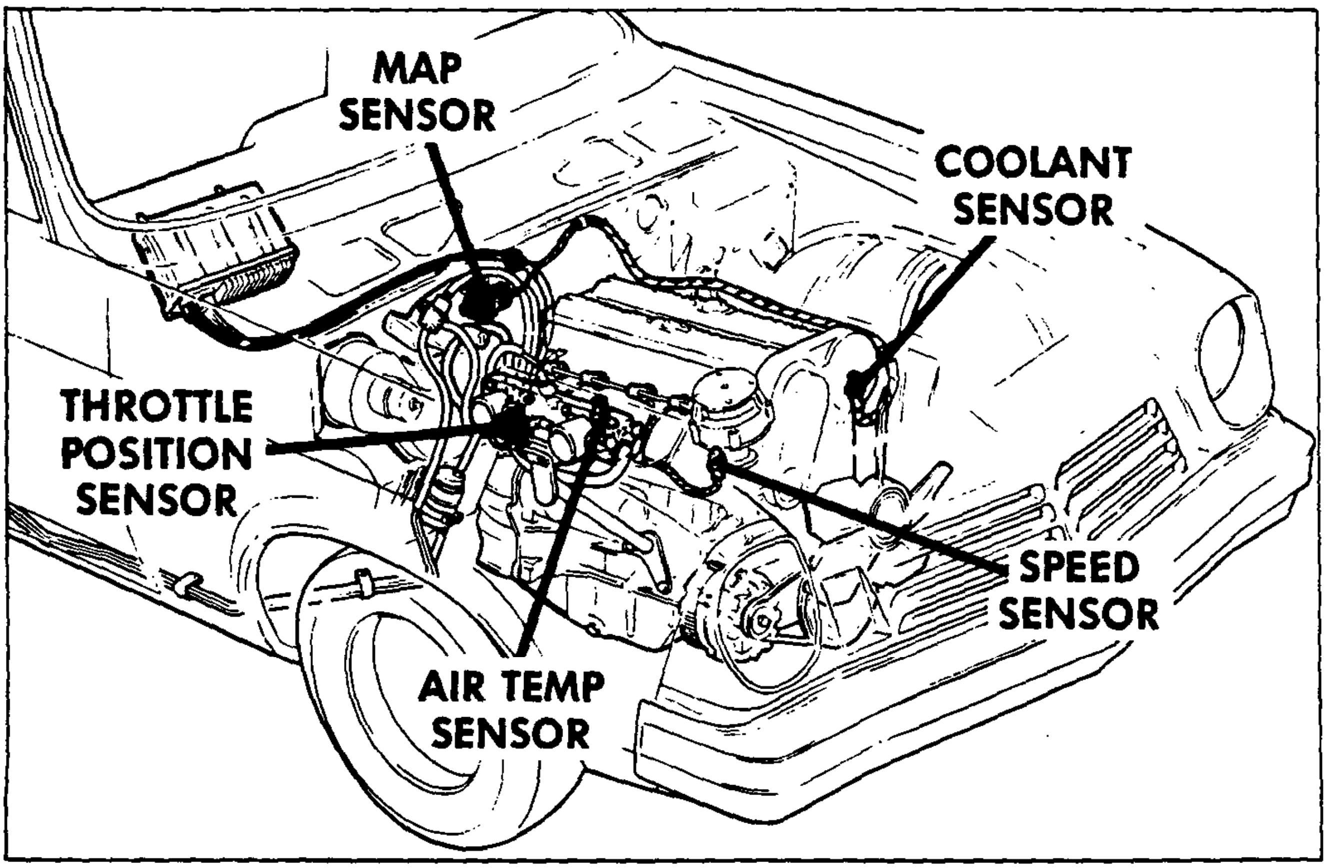


Fig. 19—Engine Sensing System

The components are:

- inlet manifold air pressure (MAP) sensor
- throttle position sensor
- coolant temperature sensor
- air temperature sensor
- speed sensor

Parallel circuits from each sensor to the ECU permit the sensors to operate independent of each other.

Manifold Air Pressure Sensor

The Manifold Air Pressure (MAP) Sensor signals the ECU of varying atmospheric and engine pressures. The sensor is composed of two pressure sensitive aneroids connected to a moveable iron core within a coil wire winding (fig. 20). Changes in atmospheric and engine pressures cause the aneroids to either expand or contract. This movement changes the position of the iron core within the coil, changing fuel calibration. The pressure sensor is not repairable. If diagnosed to be defective, it must be replaced as a unit.

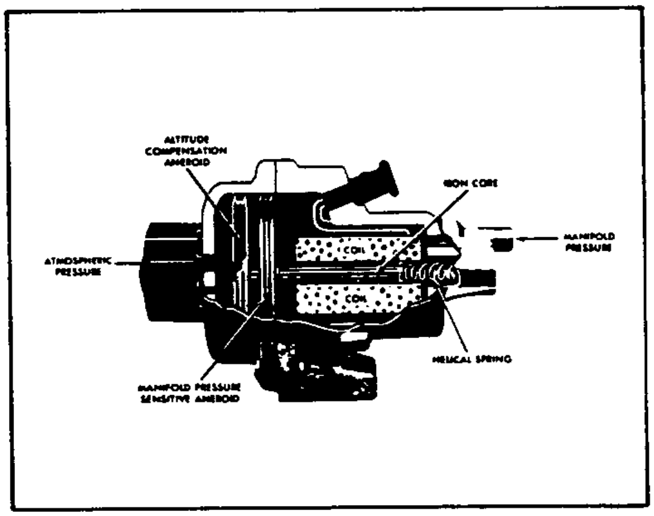


Fig. 20—Manifold Air Pressure (MAP) Sensor

Throttle Position Sensor

The throttle position sensor informs the ECU of throttle position and rate of change of throttle motion. It is mounted on the side of the throttle body with the throttle blade connected to it.

Three internal circuits are used to convey throttle position information (fig. 21). Sliding contacts moving along the circuits are responsible for electrical pulse transmission to the ECU. The acceleration impulse circuit acts like an accelerator pump on a carburetor. As the contact slides along the circuit fingers, it signals the ECU of engine acceleration and that momentary

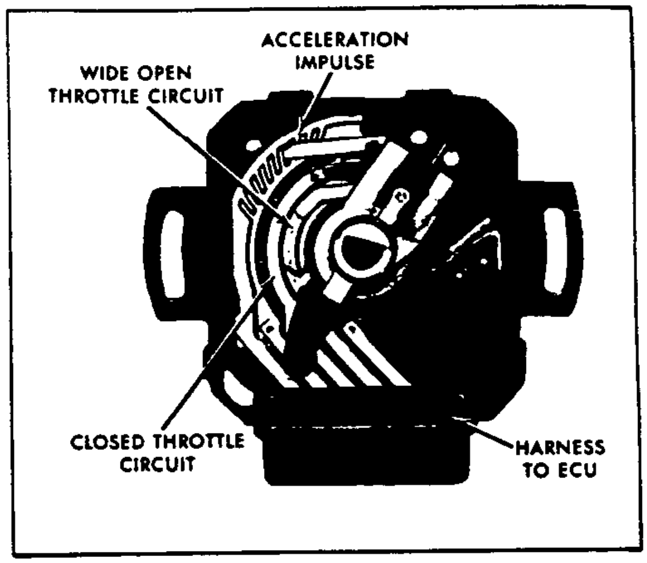


Fig. 21—Throttle Position Sensor Circuitry

enrichment is required. The closed throttle circuit indicates throttle at closed position. The wide open throttle circuit indicates wide open position. Under an engine load condition this is a factor for determining simultaneous injection.

No adjustments can be made to this sensor, except for its basic positioning on the throttle body, nor is it repairable. If diagnosed to be defective, it must be replaced as a unit.

Coolant Temperature Sensor

The coolant temperature sensor (fig. 22) is installed in the engine thermostat housing. When installed, the tip of the sensor is in contact with the engine coolant. The temperature of the coolant contacting the sensor affects the output signal sent from the sensor to the ECU. The ECU receives the signal from the water temperature sensor and uses it as one of

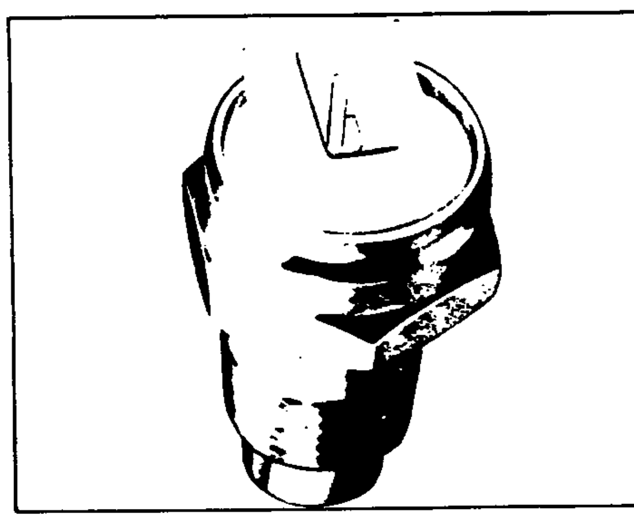


Fig. 22—Coolant Temperature Sensor

the factors in determining the amount of fuel enrichment required. As coolant temperature rises, the output of the temperature sensor is changed. With this change, the ECU recalibrates the need for fuel enrichment and changes the duration of the fuel injector opening. The temperature sensor is not repairable. If diagnosed to be defective, it must be replaced as a unit.

Air Temperature Sensor

The air temperature sensor (fig 23) is located in the bottom of the inlet manifold, in the number 3 intake runner. The sensor incorporates a temperature sensitive transistor that transmits varying amounts of current to the ECU. The current flow becomes a factor in establishing the need for fuel enrichment. Sensor output is operative over a temperature range of -55°F. to + 300° F. The temperature sensor is not repairable. If diagnosed to be defective, it must be replaced as a unit.

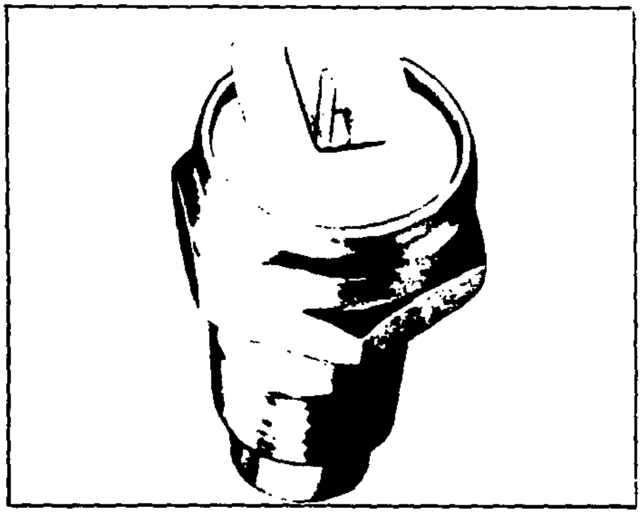


Fig. 23—Air Temperature Sensor

Engine Speed Sensor

The engine speed sensor (fig. 24) provides the ECU with data of engine speed and phase. This data is used by the ECU to determine the frequency of injector opening. The sensor incorporates two magnetic reed switches. These stationary switches are activated by a rotating magnet. The speed sensor is essential for the ECU to determine both where and how often to open the injectors.

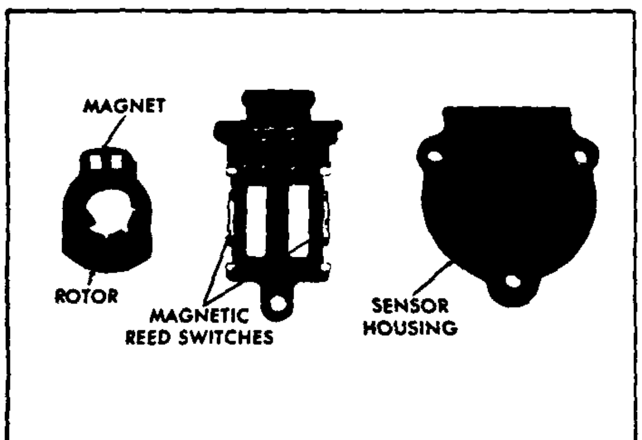


Fig. 24—Engine Speed Sensor

EMISSION CONTROL SYSTEMS

The Cosworth engine itself is an emission control system, that is, only the precise amount of air-fuel mixture needed to satisfy current operating demands is injected into the intake ports. The amount of fuel injected is metered by the opening of an electro-mechanical injector valve. The injector opening duration is controlled by an electric signal received from the electronic control unit, which is preprogrammed to transmit the correct pulse duration. Other features of the Cosworth engine that contribute to total combustion efficiency are: dual intake and exhaust valves, deep chamfered pistons and a high energy ignition system.

As a result of the Cosworth's combustion efficiency only three supplementary emission control systems are required: Positive Crankcase Ventilation (PCV), Pulse Air Injection Reactor (PAIR), and a catalytic converter. In addition, the air pollutants emitted from the fuel supply system are controlled by the Evaporative Control System (ECS). The Pulse Air Injection Reactor is the only emission component not previously or currently used on other Vega models.

PULSE AIR INJECTION REACTOR (PAIR)

The Pulse Air Injection Reactor (PAIR) system is

PULSE AIR REACTOR SYSTEM
CONVENTIONAL AIR CHECK VALVE (FOUR REQUIRED)

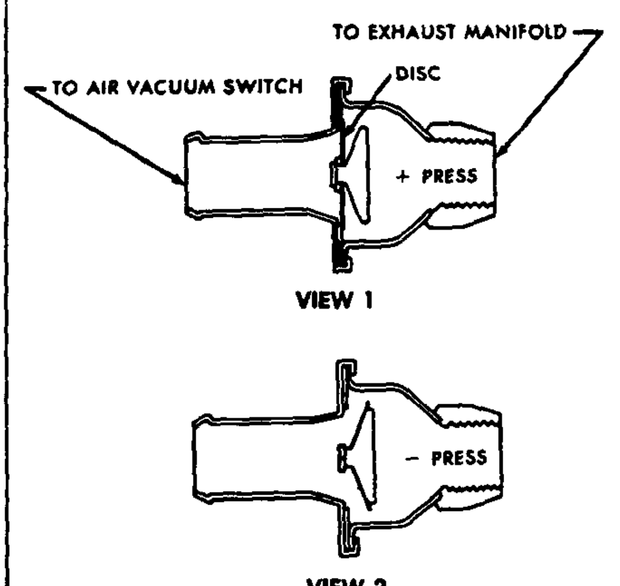


Fig. 25—PAIR Check Valves

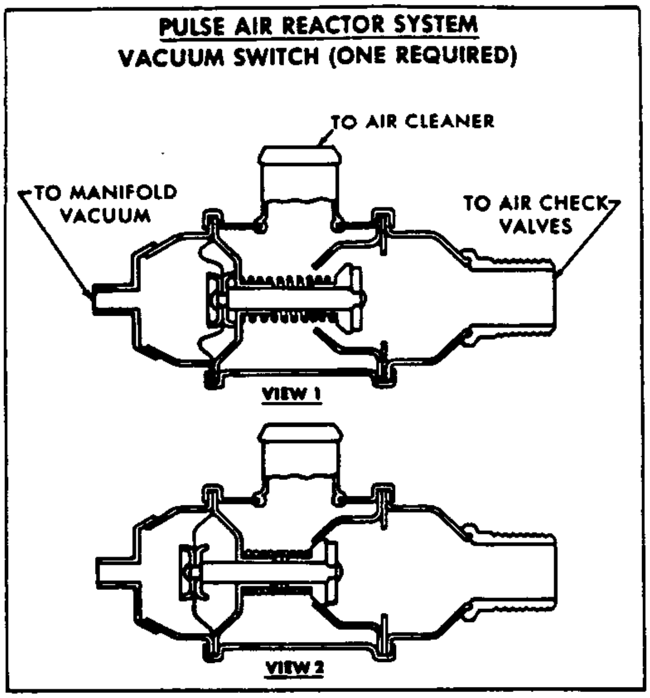


Fig. 26—PAIR Vacuum Switch

an exhaust emission control that is used to reburn engine exhaust gases to reduce the hydrocarbon (HC) and carbon monoxide (CO) content. The PAIR system consists of four conventional air check valves (fig. 25), one located on each of the four exhaust manifold pipes adjacent to the cylinder exhaust port, and a vacuum switch (fig. 26) through which filtered air flows on its way to the four check valves.

Filtered air is used, from the air cleaner, to prevent dirt build-up on the check valve seats and to serve as a muffler for noise reduction.

The firing of the engine creates a pulsating flow of exhaust gases which produce either positive (+) or negative (-) pressures. This pressure draws, through a series of external pipes, fresh air into the exhaust header to be mixed with the hot exhaust gases, causing them to re-ignite. When the exhaust pressure is positive, the check valve closes and does not draw in any fresh air. This prevents the exhaust gases from flowing into the air supply line. When the exhaust pressure is negative (vacuum), the check valve is open allowing fresh air to be drawn into the exhaust header by the exhaust gas pulsation.

The vacuum switch is an override feature used to shut off fresh air flow during engine overrun. Throttle closure at the beginning of deceleration temporarily creates rich fuel air mixtures which would cause engine backfire if mixed with fresh air. The vacuum switch prevents this backfire by blocking any air travel to the check valves.

The vacuum switch is a check valve with an attaching vacuum sensitive diaphragm. The switch is normally held open by a spring during engine operation allowing fresh air to the check valves. On engine over-run, however, manifold vacuum applied to the diaphragm overcomes spring pressure, and pulls the valve closed. This prevents any air flow to the exhaust system until manifold vacuum decreases.

TRANSMISSION

The Cosworth package includes a Saginaw Design 4-speed manual transmission. It is a standard Vega transmission with the same gear ratios. No other type of transmission is available.

STEERING

The Cosworth package has a standard manual steering system with no power steering available.

WHEELS AND TIRES

The Cosworth Vega uses BR70-13 blackwall, steel belted, radial ply tires mounted on 6 inch, gold painted, case aluminum wheels. When removing a tire from the cast aluminum wheel, standard equipment can be used; however, special care must be exercised.

CAUTION: During removal of tires on cast aluminum wheels, make sure the force of the equipment lower bead breaker is directed against only the tire. If bead breaker is not properly positioned, it is possible to apply force against the wheel instead of the tire. If this happens, the pressure transmitted to cone area of equipment may be sufficient to cause damage to the wheel.

CHASSIS ELECTRICAL

The Vega engine overheat protection system (fig. 29) is used on the Cosworth package. This adds *add coolant* and *temp/press* warning lights to the instrument cluster. Should the radiator coolant level become one quart or more low, a sensor, located in the radiator, activates the *add coolant* light. If the coolant temperature reaches 260° F. or greater or, if the engine oil pressure drops below 6 PSI, then the *temp/press* light is activated.

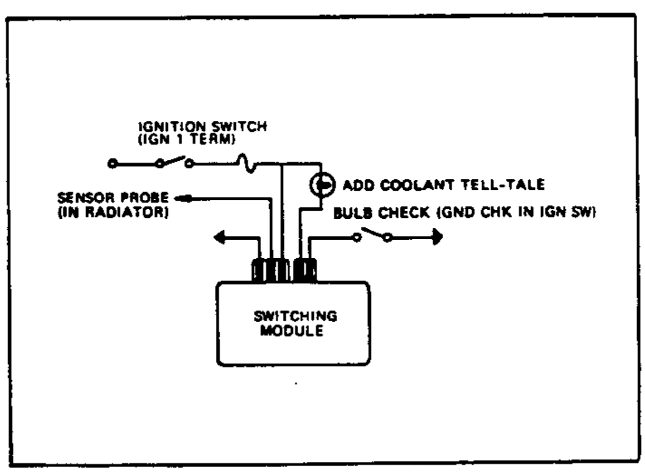


Fig. 27—Low Coolant Warning

COMPLETE VEHICLE MAINTENANCE SCHEDULE

When To Perform Services (Months or Miles, Whichever Occurs First)	Item No.	Services
Lubrication and General Maintenance		
Every 6 Months or 7,500 Miles	1	Chassis Lubrication
	2	●*Fluid Levels Check
	3	*Engine Oil Change
At 1st Oil Chg.—Then Every 2nd	4	*Oil Filter Change
See Explanation	5	Tire Rotation (Steel-Belted Radial)
	6	Rear Axle Lube Change
Every 12 Months or 15,000 Miles	7	*Cooling System Check & Coolant Change
		—Coolant Hose Replacement
Every 30,000 Miles	8	Wheel Bearing Repack
	9	Manual Steering Gear Check
	10	Clutch Cross Shaft Lubrication
Safety Maintenance		
Every 6 Months or 7,500 Miles	11	Owner Safety Checks
	12	Tire and Wheel Inspection
	13	*Exhaust System Check
	14	*Drive Belt Check & Replacement (1)
	15	Suspension and Steering Check
	16	Brake Check
Every 12 Months or 15,000 Miles	17	Drum Brake and Parking Brake Check
	18	Throttle Linkage Check
	19	Underbody Flush & Check
	20	Bumper Check
Every 22,500 Miles	21	*Camshaft Drive Belt Replacement
Emission Control Maintenance		
At First 6 Months or 7,500 Miles—Then at 18 Month/22,500 Miles	22	Fuel Filter Replacement
	23	Engine Idle Speed Adjustment (2)
Every 22,500 Miles	24	Spark Plug Wires Check
	25	Spark Plug Replacement
	26	Engine Timing Adjustment & Dist. Check
	27	High Pressure Fuel Lines & Fuel System
	28	EFI Electronic and Pneumatic Controls—Check
	29	EFI Cold Start Enrichment (Choke)—Check
	30	EFI Controls—Check
	31	Pulse Air Valve Replacement
	32	Fuel Injection Valve Seals and O-Ring Replace
	33	Fuel Rail Bracket Rubber Insulator Replace
	34	PCV Valve Replacement
	35	Mechanical Valve Lifter Adjustment
	36	FEC System Check & Filter Replacement
	37	Fuel Cap, Tank and Lines Check
Every 50,000 Miles	38	Air Cleaner Element Replacement

●Also A Safety Service *Also An Emission Control Service

(1) Replace at 30,000 Miles

(2) This Service Performed At 5,000 Miles

MAINTENANCE SCHEDULE AND LUBRICATION

All information contained in this section of the regular 1974 Vega Service and Overhaul Manual and the 1975 Vega and Monza 2+2 Service and Overhaul Manual applies to the vehicle covered by this publication, with the following exceptions, which are deleted:

- Exhaust Gas Recirculation System (EGR)
- Distributor Lubricator
- Three Speed and Automatic Transmission
- Power Steering
- Air Conditioning
- Head Restraints
- Carburetor
- Carburetor Choke
- Thermal Vacuum Switch and Hoses
- Idle Stop Solenoid
- Air Injection Reactor (AIR) system bores and connections

The following information will also apply under emissions control maintenance.

EXPLANATION OF COMPLETE VEHICLE MAINTENANCE SCHEDULE

Presented below is a brief explanation of each of the services listed in the Complete Vehicle Maintenance Schedule shown on the following pages.

Vehicle operation under conditions such as heavy dust, continuous short trips, or pulling trailers is not considered normal use and therefore more frequent maintenance will be required. Such additional maintenance requirements are included where applicable. Refer to the appropriate section of this manual for additional details on specific services. A listing of recommended lubricants and fluids is included at the end of this listing.

LUBE & GENERAL MAINTENANCE

ITEM No. SERVICES

1 **CHASSIS**—Lubricate all grease fittings in front suspension and steering linkage. Also lubricate transmission shift linkage, hood latch, hood hinges, and parking brake cable guides and linkage.

2 **FLUID LEVELS**—Check level of fluid in brake master cylinder• battery, engine*, axle, transmission* and windshield washer•. Engine coolant should be checked for proper level and freeze protection to at least -20° F or to the lowest temperature expected during the period of vehicle operation.* Proper engine coolant also provides corrosion protection.

Any significant fluid loss in any of these systems or units could mean that a malfunction is developing and corrective action should be taken immediately. A low fluid level in the brake master cylinder front reservoir could also be an indicator that the disc brake pads need replacing.

3 **ENGINE OIL***—Change each 6 months or 7,500 miles whichever occurs first under normal driving conditions, or each 3 months or 3,000 miles when the vehicle is operated under the following conditions: (a) driving in dusty conditions, (b) trailer pulling, (c) extensive idling or (d) short trip operation at freezing temperatures (with engine not thoroughly warmed-up).

4 **ENGINE OIL FILTER***—Replace at the first oil change and every other oil change thereafter.

5 **TIRES**—Steel-belted radial tires should be rotated at first 7,500 miles and then at every 15,000 miles thereafter. To equalize wear, rotate tires, and adjust tire pressures as shown on tire placard on rear face of driver's door.

6 **REAR AXLE**—Check at each oil change, fill as required. Change lubricant at first 15,000 miles on Positraction axles. Change lubricant every 15,000 miles on rear axle when using vehicle to pull a trailer.

7 **COOLING SYSTEM***—Every 12 months or 15,000 miles, drain, flush, and refill the cooling system with a new coolant solution.* At 12-month or 15,000-mile intervals, wash radiator cap and filler neck with clean water, pressure test system and radiator cap for proper pressure holding capacity, tighten hose clamps and inspect condition of all cooling and heater hoses. Replace hoses every 24 months or 30,000 miles, or earlier if checked, swollen or otherwise deteriorated.

Also each 12 months or 15,000 miles, clean exterior of radiator core.

8 **WHEEL BEARINGS**—Clean and repack front wheel bearings with a lubricant as specified in the "Recommended Fluids and Lubricants" chart in this section.

9 **MANUAL STEERING GEAR**—Check for seal leakage around the pitman shaft and housing. If leakage is evident (solid grease oozing out-not just oily film), it should be corrected immediately.

10 **CLUTCH CROSS SHAFT**—Lubricate clutch cross shaft lever.

•Also a Safety Service
*Also an Emission Control Service

SAFETY MAINTENANCE

NOTE: Items 11a thru r can be checked by the owner, while Items 12 thru 21 should only be checked by a qualified mechanic. It is particularly important that any safety systems which may have been adversely affected in an accident be checked and repaired as necessary before the vehicle is returned to use.

11 SAFETY CHECKS TO BE PERFORMED BY OWNER– The following checks should be made regularly during operation at no greater interval than 6 months or 7,500 miles, whichever occurs first, and more often when the need is indicated. Any deficiencies should be brought to the attention of your dealer or another service outlet, as soon as possible, so the advice of a qualified mechanic is available regarding the need for repairs or replacements.

(a) STEERING COLUMN LOCK–Check for proper operation by attempting to turn key to LOCK without depressing inhibitor lever with car stationary. Key should turn to LOCK position only with inhibitor lever depressed. Key should be removable only in LOCK position.

(b) PARKING BRAKE–Check parking brake holding ability by parking on a fairly steep hill and restraining the vehicle with the parking brake only.

CAUTION: Before making the check below, be sure to have a clear distance ahead and behind the car, set the parking brake and firmly apply the foot brake. Do not depress accelerator pedal. Be prepared to turn off ignition switch immediately if engine should start.

(c) STARTER SAFETY SWITCH–To check, place the shift lever in neutral, depress the clutch halfway, and attempt to start. The starter should operate only when clutch is fully depressed.

(d) STEERING–Be alert to any changes in steering action. The need for inspection or servicing may be indicated by "hard" steering, excessive free play or unusual sounds when turning or parking.

(e) WHEEL ALIGNMENT AND BALANCE–In addition to abnormal tire wear, the need for wheel alignment service may be indicated by a pull to the right or left when driving on a straight and level road. The need for wheel balancing is usually indicated by a vibration of the steering wheel or seat while driving at normal highway speeds.

(f) BRAKES–Be alert to illumination of the brake warning light or changes in braking action, such as repeated pulling to one side, unusual sounds when braking or increased brake pedal travel. Any of these could indicate the need for brake system inspection and/or service.

(g) EXHAUST SYSTEM–Be alert to any change in the sound of the exhaust system or a smell of fumes which may indicate a leak.

(h) WINDSHIELD WIPERS AND WASHERS–Check operation of wipers, as well as condition and alignment of wiper blades. Check amount and direction of fluid sprayed by washers during use.

(i) DEFROSTERS–Check performance by moving controls to "DEF" and noting amount of air directed against the windshield.

(j) REARVIEW MIRRORS AND SUN VISORS– Check that friction joints are properly adjusted so mirrors and sun visors stay in the selected position.

(k) HORN–Blow the horn occasionally to be sure that it works.

(l) LAP AND SHOULDER BELTS–Check belts, buckles, adjustable latch plates, retractors, interlock and reminder systems, guide loops, clips, and anchors for proper operation. Check to make certain that anchor mounting bolts are tight.

(m) SEAT BACK LATCHES–Check to see that seat back latches are holding by pulling forward on the top of each folding seat back with doors closed if equipped with automatic seat back latches.

(n) LIGHTS AND BUZZERS–Check all instrument panel illuminating and warning lights, seat belt reminder light and buzzer, ignition key buzzer, interior lights, license plate lights, side marker lights, headlamps, parking lamps, tail lamps, brake lights, turn signals, backup lamps, and hazard warning flashers. Have headlamp aim checked every 12 months or 15,000 miles, or more often if light beams seem to be aimed improperly.

(o) GLASS–Check for broken, scratched, dirty or damaged glass on vehicle that could obscure vision or become an injury hazard.

(p) DOOR LATCHES–Check for positive closing, latching and locking.

(q) **HOOD LATCHES**—Check to make sure hood closes firmly by lifting on the hood after each closing. Check also for broken, damaged or missing parts which might prevent secure latching.

(r) **FLUID LEAKS**—Check for fuel, water, oil or other fluid leaks by observing the ground beneath the vehicle after it has been parked for a while. If gasoline fumes or fluid are noticed at any time, the cause should be determined and corrected without delay because of the possibility of fire.

12 **TIRES AND WHEELS**—To equalize wear, rotate tires as illustrated in Section-10 of the 1975 Vega and Monza 2+2 Service Overhaul Manual Supplement. Adjust tire pressures as recommended on tire placard on left door. Check disc brake pads and condition of rotors while wheels are removed. Check tires for excessive wear or damage. Make certain wheels are not bent or cracked and wheel nuts are tight. Check tire inflation pressure at least monthly, or more often if daily visual inspection indicates the need.

13 **EXHAUST SYSTEM***—Check complete exhaust system and nearby body areas and rear compartment lid for broken, damaged, missing or mispositioned parts, open seams, holes, loose connections or other deterioration which could permit exhaust fumes to seep into the passenger compartment. Dust or water in the rear compartment may be an indication of a problem in one of these areas. Any defects should be corrected immediately.

14 **ENGINE DRIVE BELT***—Check belt driving fan, and Delcotron, for cracks, fraying, wear and tension. Adjust or replace as necessary.

It is recommended that belt be replaced every 24 months or 30,000 miles, whichever occurs first.

15 **SUSPENSION AND STEERING**—Check for damaged, loose or missing parts, or parts showing visible signs of excessive wear or lack of lubrication in front and rear suspension and steering system. Questionable parts noted should be replaced by a qualified mechanic without delay.

16 **BRAKES**—Check lines and hoses for proper attachment, leaks, cracks, chafing, deterioration, etc. Any questionable parts noted should be replaced or repaired immediately. When abrasion or wear is evident on lines or hoses, the cause must be corrected.

17 **DRUM BRAKES AND PARKING BRAKE**—(See Item 12 for Disc Brake Check) Check drum brake linings and other internal brake components at each rear wheel (drums, wheel cylinders, etc.). Parking brake adjustment also should be checked whenever drum brake linings are checked.

NOTE: More frequent checks should be made if driving conditions and habits result in frequent brake application.

18 **THROTTLE LINKAGE**—Check for damaged or missing parts, interference or binding. Any deficiencies should be corrected without delay by a qualified mechanic.

19 **UNDERBODY**—In geographic areas using a heavy concentration of road salt or other corrosive materials for snow removal or road dust control, flush and inspect the complete under side of the car at least once each year, preferably after a winter's exposure. Particular attention should be given to cleaning out underbody members where dirt and other foreign materials may have collected.

20 **BUMPERS**—Check the front and rear bumper systems at 12-month/15,000 mile intervals to be sure that impact protection and clearance originally designed into these systems remain in a state of full readiness. They also should be checked whenever there is obvious bumper misalignment or whenever the vehicle has been involved in a significant collision in which the bumper was struck, even when slight or no damage to the bumper system can be seen.

21 **CAMSHAFT DRIVE BELT***—Replace camshaft drive belt every 22,500 miles as outlined in Section 6 of this publication.

EMISSION CONTROL MAINTENANCE

NOTE: Additional recommended maintenance instructions relating to vehicle use, evidence of maintenance, and service replacement parts are included in the New Car Warranty Information folder.

22 **FUEL FILTER**—Replace filter at indicated intervals or more frequently if clogged.

23 **ENGINE IDLE SPEED**—Adjust engine idle speed accurately as outlined in Section 6 of this manual.

24 **SPARK PLUG WIRES**—Clean exterior of wires; remove any evidence of corrosion on end terminals. Inspect spark plug wires for evidence of checking, burning, or cracking of exterior insulation and tight fit at distributor cap and spark plugs or other deterioration. If corrosion cannot be removed or other conditions above are noted, replace wire.

25 **SPARK PLUGS**—Replace plugs at 22,500-mile intervals with type specified in Section 6 of this manual.

26 **TIMING AND DISTRIBUTOR CAP**—Adjust ignition timing following the specifications shown on label under the hood. Also, carefully inspect the interior and exterior of the distributor cap and rotor for cracks, carbon tracking and terminal corrosion. Clean or replace as necessary.

●Also a Safety Service
*Also an Emission Control Service

27 **HIGH PRESSURE FUEL SYSTEM AND FUEL LINES**— At 22,500-mile intervals, inspect the high pressure fuel system and fuel lines to insure proper fuel pressure, that all injection valve seals and 0-rings have not deteriorated and that all hose clamps are tight. Also, inspect fuel pump rubber mounts and bumpers for tightness. Repair all leaks and replace any parts found defective.

28 **ELECTRONIC FUEL INJECTION (EFI), ELECTRICAL AND PNEUMATIC CONTROLS**— At each interval, check for proper wire and hose connections throughout EFI system. All hoses are inspected for deterioration and attaching clamp tightness. Replace and/or repair components as required.

29 **ELECTRONIC FUEL INJECTION COLD START ENRICHMENT (CHOKE)**—Check the fast idle valve (choke), fast idle valve air hose, idle control valve and idle control valve hoses for proper operation. Check hoses for deterioration, air leakage, or clamp looseness and repair or replace as necessary.

30 **ELECTRONIC FUEL INJECTION CONTROLS**— Using the EFI diagnostic service unit, check out the electronic control unit and all other electronic systems for proper function. This "go"-"No-go" service unit will isolate any malfunctioning part. Replace as required.

31 **PULSE A.I.R. VALVE REPLACEMENT**— Check all air induction tubes for signs of leakage or cracks and replace if necessary. Install new check and air shut off valves as outlined in Section 6T of this manual. Make sure all hoses are tight and all mounting brackets are secure.

32 **FUEL INJECTION VALVE SEAL AND O-RINGS**—At designated intervals, the injection valve seals and 0-rings are replaced as outlined in Section 6M of this manual.

33 **FUEL RAIL BRACKET RUBBER INSULATORS**— At designated intervals, the fuel rail bracket rubber insulators are replaced as outlined in Section 6M of this manual. Replace deteriorated hoses.

34 **POSITIVE CRANKCASE VENTILATION SYSTEM (PCV)**—Check the PCV system for satisfactory operation and replace the PCV valve at 22,500-mile intervals. Replace deteriorated hoses.

35 **MECHANICAL VALVE LIFTERS**—Adjust valve lifters at 22,500-mile intervals, as outlined in Section 6 of this manual.

36 **FUEL EVAPORATION CONTROL SYSTEM (FEC)**— Check all fuel and vapor lines and hoses for proper connections and correct routing as well as condition. Remove canister and check for cracks or damage. Replace damaged or deteriorated parts as necessary. Replace filter in lower section of canister.

37 **FUEL CAP, FUEL LINES AND FUEL TANK**— Inspect the fuel tank, cap and lines for damage which could cause leakage. Inspect fuel cap for correct sealing ability and indications of physical damage. Replace any damaged or malfunctioning parts.

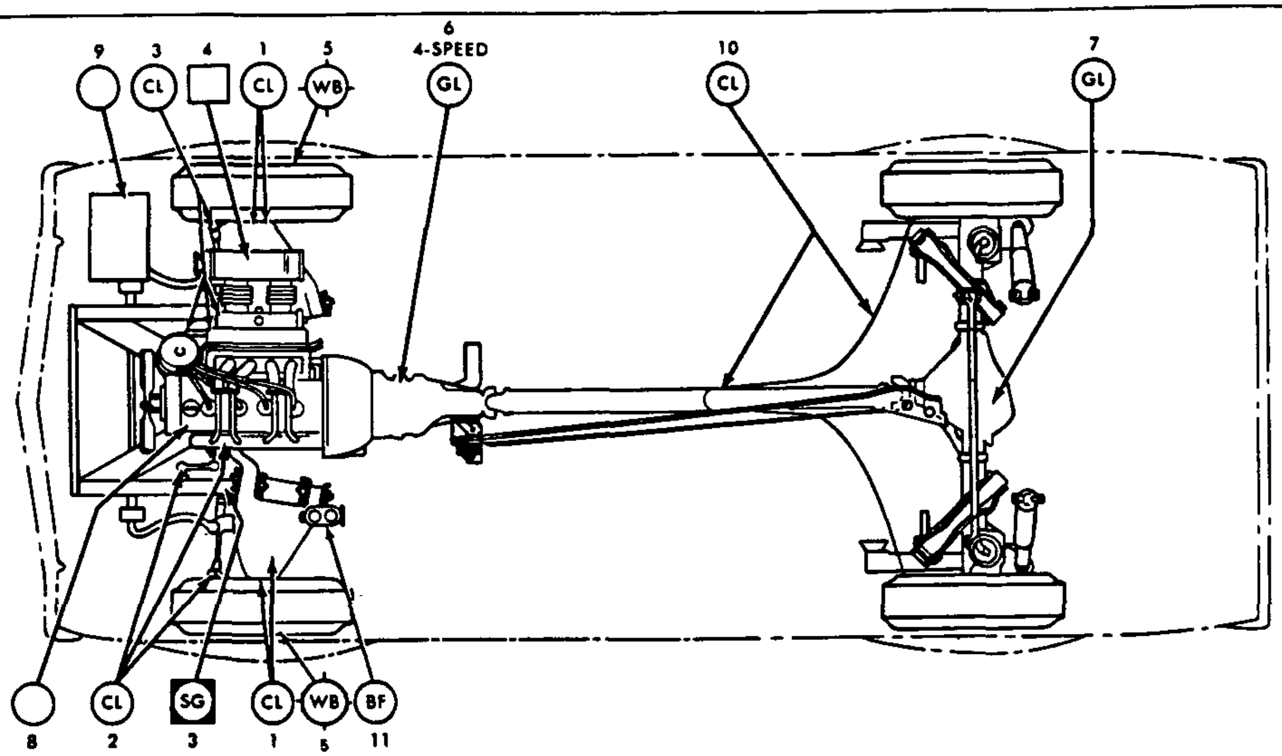
38 **AIR CLEANER ELEMENT**—Replace the engine air cleaner element under normal operating conditions every 50,000 miles. Operation of vehicle in dusty areas will necessitate more frequent element replacement.

CAUTION: Do not operate the engine without the air cleaner unless temporary removal is necessary during repair or maintenance of the vehicle. When the air cleaner is removed, backfiring can cause fire in the engine compartment.

RECOMMENDED FLUIDS & LUBRICATIONS

USAGE	FLUID/LUBRICANT
Differential—Standard	SAE-80 or SAE-90 GL-5 gear lubricant (SAE-80 in Canada)
Differential—Positraction	Lubricant GM Part No. 1051022
Manual steering gear	Lubricant GM Part No. 1051052
Manual transmission	SAE-80 or SAE-90 GL-5 gear lubricant (SAE-80 in Canada)
Brake system and master cylinder	Delco Supreme 11 fluid or DOT-3
Clutch linkage	
a. Pivot points	Engine oil
b. Push rod to clutch fork joint, and cross shaft pressure fitting	Chassis grease meeting requirements of GM 6031-M
Shift linkage, floor shift	Engine oil
Chassis lubrication	Chassis grease meeting requirements of GM 6031-M
Hood hinges	Engine oil
Hood latch assembly	
a. Pivots and spring anchor	Engine oil
b. Release pawl	Chassis grease
Parking brake cables	Chassis grease
Front wheel bearings	Wheel bearing lubricant GM Part No. 1051344
Body door hinge pins, rear compartment lid hinges	Engine oil
Windshield washer solvent	GM Optikleen washer solvent Part No. 1051515 or equivalent
Energizer (Battery)	Colorless, odorless, drinking water
Engine coolant	Mixture of water and high quality Ethylene Glycol base type anti-freeze conforming to GM Specifications 1899-M

NOTE: Fluids and lubricants identified with GM part numbers or GM specification numbers may be obtained from your Chevrolet dealer.



LUBRICATE EVERY 7,500 MILES

REPACK EVERY 30,000 MILES

CHECK FOR GREASE LEAKAGE EVERY 30,000 MILES

REPLACE ELEMENT EVERY 50,000 MILES

GL — MULTI-PURPOSE OR UNIVERSAL GEAR LUBRICANT*

WB — WHEEL BEARING LUBRICANT

*REFILL POSITRACTION REAR AXLE WITH SPECIAL LUBRICANT ONLY

CL — CHASSIS LUBRICANT

BF — BRAKE FLUID

SG — STEERING GEAR LUBRICANT

1. Front Suspension
2. Steering Linkage
3. Steering Gear
4. Air Cleaner
5. Front Wheel Bearings
6. Transmission
7. Rear Axle
8. Oil Filter
9. Battery
10. Parking Brake
11. Brake Master Cylinder

SECTION 1A

HEATER

Heater components, system operation and diagnosis are the same as outlined in the 1974 Vega Service and Overhaul Manual with the exception of heater hose routing (fig. 1).

Blower Motor and Heater Air Distributor and/or core replacement procedures are new due to the location of the air cleaner and inlet manifold.

COMPONENT PART REPLACEMENT

HEATER BLOWER MOTOR

Replacement

1. Disconnect the battery ground cable.
2. Loosen air cleaner seal to inlet manifold clamp screws.
3. Remove air cleaner bracket screws and rotate filter assembly up out of the way.
4. Disconnect the blower motor lead wire.
5. Scribe the blower motor flange to case position.
6. Remove blower to case attaching screws and remove the blower and wheel as an assembly. Pry the flange gently if the sealer acts as an adhesive.
7. Remove the blower wheel nut and separate the motor and wheel.
8. To install, reverse steps 1-7 above, lining up the scribe marks made at removal.

   NOTE: Assemble the blower wheel to the motor with the open end of the wheel away from the motor. Replace sealer at the motor flange if necessary.

AIR DISTRIBUTOR DUCT AND/OR HEATER CORE

Replacement

1. Disconnect the battery ground cable.
2. Place a pan under the vehicle. Loosen the heater hose clamps at the core. Remove the hoses from the core tubes and secure the ends of the hoses in a raised position. Plug the core tubes to prevent coolant spillage during core removal.
3. Remove nuts, lockwashers and plain washers from heater air distributor studs on engine side of dash panel.
4. Remove the defroster duct to air distributor duct screw.
5. Remove the floor outlet to air distributor duct screw and remove the outlet.
6. Remove the air distributor to dash panel screws. Pull rearward on the air distributor duct assembly until the core tubes clear the dash openings. Tilt the assembly down to gain access to bowden cable attachments. Be careful not to kink the bowden cables.
7. Disconnect the air-defrost and temperature door bowden cables at the air distributor assembly. Disconnect the resistor wiring harness and then remove the air distributor assembly from the vehicle.
8. Remove the core retaining strap screws and remove the core.
9. To install a new core, reverse Steps 1-8 above.

   NOTE: Be sure the core to case sealer is intact before replacing core. Replace with new seals if necessary.
10. Check and adjust bowden cables if necessary.
11. Check and refill coolant system to proper level.

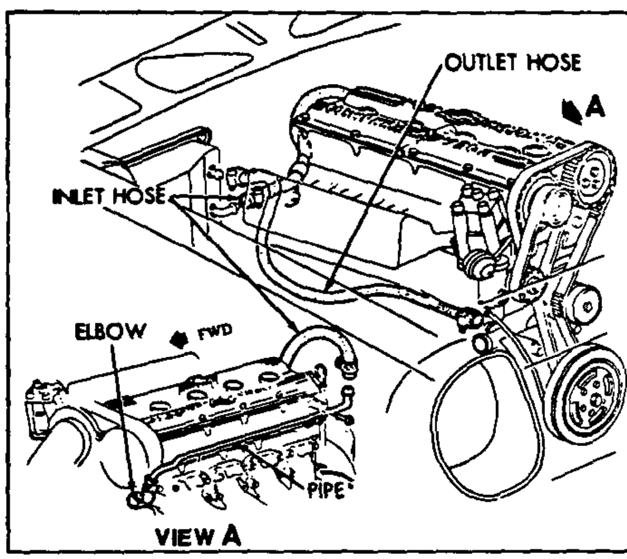


Fig. 1—Heater Hose Routing

SECTION 6

ENGINE

CONTENTS OF THIS SECTION

ENGINE TUNE-UP

INDEX

GENERAL DESCRIPTION

The engine tune-up is important to the modem engine with its vastly improved power and performance. Emission system requirements, interrelated system functions, improved electrical systems and other advances in design, make today's engines more sensitive and have a decided effect on power, performance and fuel consumption.

It is seldom advisable to attempt a tune up by correction of one or two items only. Time will normally be saved and more lasting results assured if the technician will follow a definite and thorough procedure of analysis and correction of all items affecting power, performance and economy.

The tune up will be performed in two parts. The first part will consist of visual and mechanical checks and adjustments, the second part will consist of an instrument checkout that can be performed with any one of the units of service equipment available for this purpose. Always follow the instructions provided by the manufacturer of the particular equipment to be used.

Additional checks and adjustments are included the latter part of this section for use as required. Many of these operations can be used to isolate and correct trouble located during the tune-up. Where conditions are uncovered requiring major corrective action, refer to the appropriate section of this manual for detailed service information.

Typical illustrations and procedures are used except where specific illustrations or procedures are necessary to clarify the operation. Illustrations showing bench operations are used for clarification, however, all operations can be performed on the vehicle.

MECHANICAL CHECKS AND ADJUSTMENTS

Spark Plug Removal

Remove any foreign matter from around spark by blowing out with compressed air, then disconnect wires and remove plugs. To disconnect wire at spark plug, grasp the boot portion of the wire and apply only enough force to remove the boot. Do not pull on plug wire.

Test Compression

The compression check is important because an engine with low or uneven compression cannot be tuned succesfully. It is essential that improper compression be corrected before proceeding with the engine tune-up.

1. Remove air cleaner and block throttle in wide open position.
2. Hook up starter remote control cable and insert compression gauge firmly in spark plug port.

   CAUTION: Whenever the engine is cranked remotely at the starter, with a special jumper cable or other means, the distributor primary lead connector must be disconnected from the coil.
3. Crank engine through at least four compression strokes to obtain highest possible reading.
4. Check and record compression of each cylinder.
5. If one or more cylinders read low or uneven, inject about a tablespoon of engine oil on top of pistons in low reading cylinders (through spark plug port). Crank engine several times and recheck compression.
   - If compression comes up but does not necessarily reach normal, rings are worn.
   - If compression does not improve, valves are burnt, sticking or not seating properly.
   - If two adjacent cylinders indicate low compression and injecting oil does not increase compression, the cause may be a head gasket leak between the cylinders. Engine coolant and/or oil in cylinders could result from this defect.

NOTE: If a weak cylinder cannot be located with the compression check, see "Cylinder Balance Test" under "Additional Checks and Adjustments" in this section.

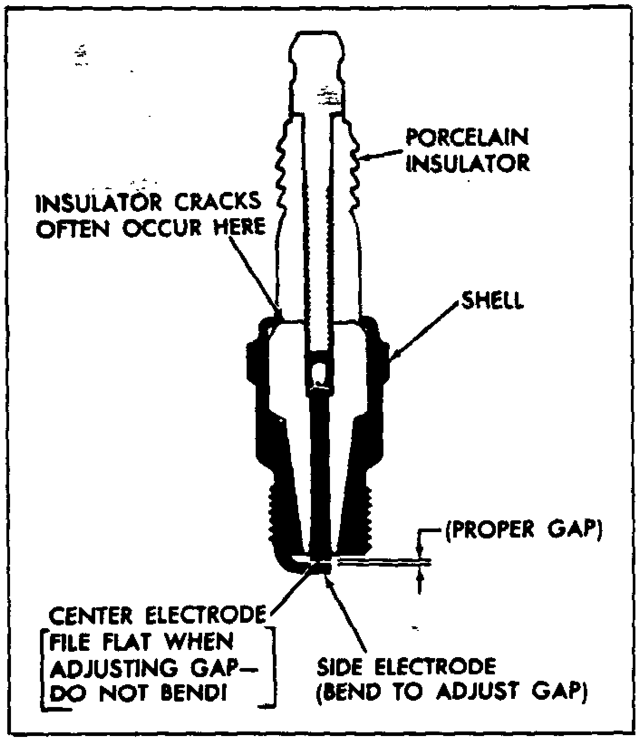


Fig. 1—Spark Plug Detail

Service and Install Spark Plugs (fig. 1)

1. Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelains and replace plugs where necessary.
2. Clean serviceable spark plugs thoroughly, using an abrasive-type cleaner such as sand blast. File the center electrode flat.
3. Inspect each spark plug for make and heat range. All plugs must be of the same make and number.
4. Adjust spark plug gaps to specifications using a round feeler gauge.

   CAUTION: Never bend the center electrode to adjust gap. Always adjust by bending ground or side electrode.
5. If available, test plugs with a spark plug tester.
6. Inspect spark plug hole threads and clean before installing plugs. Corrosion deposits can be removed with a 14 mm. x 1.25 SAE spark plug tap (available through local jobbers) or by using

a small wire brush in an electric drill. (Use grease on tap to catch chips.)

CAUTION: Use extreme care when using tap to prevent cross threading. Also crank engine several times to blow out any material dislodged during cleaning operation.

7. Using an anti-seize compound, install spark plugs and torque to specifications.

NOTE: The following are some of the greatest causes of unsatisfactory spark plug performance:

- Installation of plugs with insufficient torque to fully seat.
- Installation of the plugs using excessive torque which changes gap settings.
- Installation of plugs on dirty seat.
- Installation of plugs into corroded spark plug hole threads.

8. Connect spark plug wiring.

Service Ignition System

1. Remove distributor cap, clean cap and inspect for cracks, carbon tracks and burned or corroded terminals. Replace cap where necessary.
2. Clean rotor and inspect for damage or deterioration. Replace rotor where necessary.
3. Replace brittle, oil soaked or damaged spark plug wires. Install all wires to proper spark plug. Proper positioning of spark plug wires in supports is important to prevent cross-firing.
4. Tighten all ignition system connections.
5. Replace or repair any wires that are frayed, loose or damaged.

Distributor (fig. 2)

1. Check the distributor centrifugal advance mechanism by turning the distributor rotor in a clockwise direction as far as possible, then releasing the rotor to see if the springs return it to its retarded position. If the rotor does not return readily, the distributor must be disassembled and the cause of the trouble corrected.
2. Install rotor and distributor cap. Press all wires firmly into cap towers.

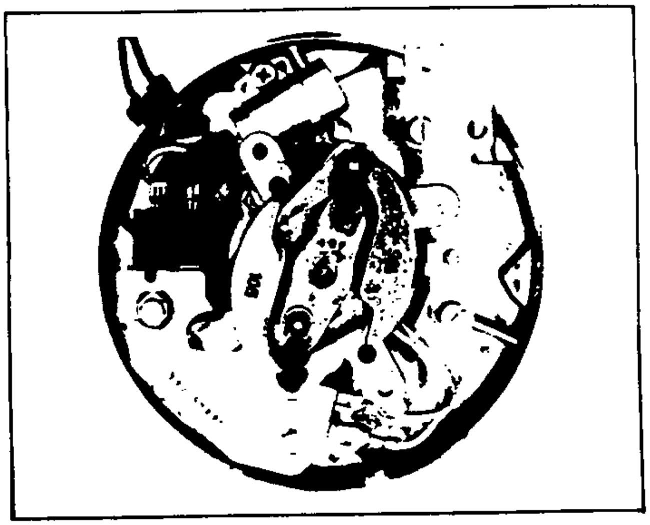


Fig. 2—Ignition Distributor

Service Battery and Battery Cables

1. Measure the specific gravity of the electrolyte in each cell (fig. 3). If it is below 1.230 (corrected to 88° F.), recharge with a slow rate charger, or if desired, further check battery.
2. Connect a voltmeter across the battery terminals and measure the terminal voltage of the battery during cranking (disconnect the coil primary lead at the negative terminal during this check to prevent engine from firing). If the terminal voltage is less than 9.0 volts at room temperature, approximately 80° ± 20°F., the battery should be further checked. See Section 6Y for further tests.

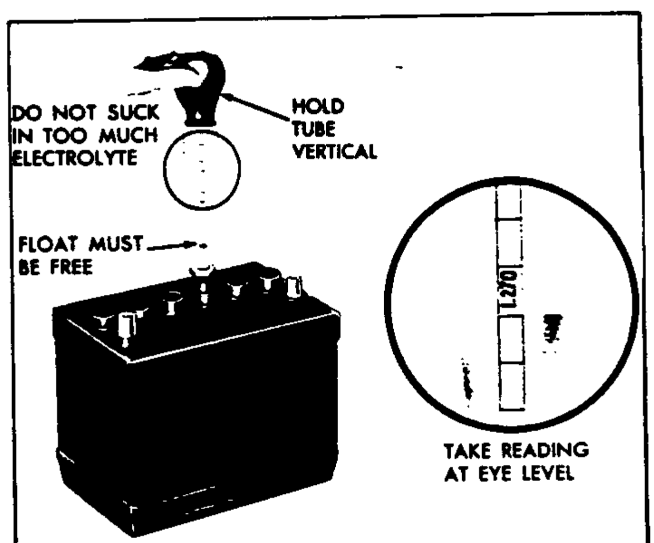


Fig. 3—Testing Specific Gravity of Battery

3. Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with colorless, odorless, drinking water.

The top of the battery should be clean and battery hold-down bolts properly tightened. Particular care should be taken to see that the top of the battery is kept clean of acid film and dirt. When cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present and then flush off with clean water. Keep vent plugs tight so that the neutralizing solution does not enter the cell. The hold-down bolts should be kept tight enough to prevent the battery from shaking around in its holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

To insure good contact, the battery cables should be tight on the battery. If the battery cable terminals are corroded, the cables should be cleaned separately with a soda solution and wire brush.

If the battery has remained undercharged, check for loose or defective fan belt, defective Delcotron or high resistance in the charging circuit. If the battery has been using too much water, the voltage output is too high.

Service Delcotron and Regulators

The Delcotron and integral regulator tests during tune up consist of the above battery tests. The condition of the battery will indicate the need for further tests and adjustments. Refer to section 6Y for charging circuit diagnosis and repair.

Service Accessory Drive Belts

Inspect belt condition.

Check and adjust if necessary for correct tension of belt, as follows:

- Using a strand tension gauge, check the belt tension.
- Adjust belt until the specified tension is reached. (See Tune Up Chart in Specifications section.)

Service Timing Belt

The timing belt requires no periodic adjustment once belt is properly adjusted.

Service Fuel Lines and Fuel Filter

1. Inspect fuel lines for kinks, bends or leaks and correct any defects found. Refer to Section 8 for the correct fabrication and replacement procedures of fuel lines.
2. Inspect filter and replace if plugged.

   NOTE: If a complaint of poor high speed performance exists on the vehicle, fuel pump tests described in Section 6M should be performed.

Service Cooling System

1. Inspect cooling system for leaks, weak hoses, loose hose clamps and correct coolant level, and service as required.

   NOTE: A cooling system pressure test, as described in "Additional Checks and Adjustments" in this section, may be performed to detect internal or external leaks within the cooling system.

Service Crankcase Ventilation

All engines have "Closed Positive" ventilation utilizing manifold vacuum to draw fumes and contaminating vapors into the combustion chamber where they are burned. Since it affects every part of the engine, crankcase ventilation is an important function and should be understood and serviced properly.

In the "Closed Positive" ventilation system, air drawn through the engine crankcase into the manifold, (through a regulating valve) (fig. 4) drawing crankcase vapors and fumes with it to be burned. This ventilation system draws the clean air from the engine air cleaner and has a nonvented oil filler cap.

1. Inspect ventilation valve to make sure that it is not plugged, valve should be tested (using tester such as AC CT-3 or equivalent) and/or replaced at intervals specified in Section 0.

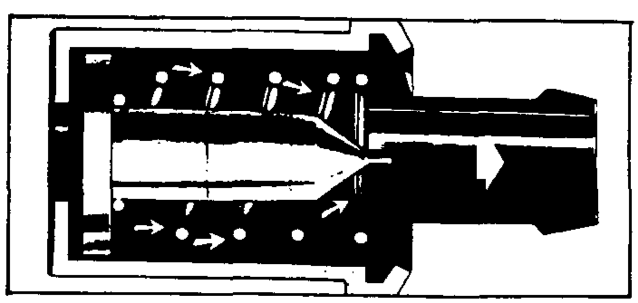


Fig. 4—Crankcase Ventilation Valve

2. Inspect hose connecting valve for signs of deterioration - replace if necessary.

3. Inspect all hose connections for proper sealing.

4. Make sure system is not plugged - with engine running air should be drawn through valve.

Valve Lash Adjustment

1. Remove camshaft cover and gasket.

2. Adjust valve lash with tappet on base circle of camshaft lobe as follows:

   a. Mark distributor housing, with chalk, at number one and number four positions (plug wire) then disconnect plug wires at spark plugs and coil and remove distributor cap and plug wire assembly.

   b. Crank engine until distributor rotor points to number one cylinder. Valve lash can be checked on the following valves with the engine in number one firing position.

      Number one cylinder—Intake and exhaust
      Number two cylinder—Intake
      Number three cylinder—Exhaust

   c. Use a leaf-type feeler gauge and measure clearance between tappet and cam lobe. Record lash for each valve (fig. 5).

   d. Crank engine until distributor rotor points to number four cylinder position. Valve lash can be checked on the following valves with the engine in number four firing position.

      Number two cylinder—Exhaust
      Number three cylinder—Intake
      Number four cylinder — Intake and exhaust

   e. Measure and record lash as outlined in step c.

   f. On those valves that require lash adjustment, rotate the cam until the lobe fully depresses the tappet.

   g. Install tool J-24704 to hold tappet in depressed position, rotate cam to provide clearance, and remove tappet adjusting shim (fig. 6).

NOTE: Do not depress tappet with J-24704, rotate cam to depress tappet, then use J-24704 to hold tappet in depressed position.

   h. Select and replace shim with a suitable thickness to provide proper valve lash.

   i. Again rotate camshaft so that cam lobe fully depresses valve just adjusted and remove Tool J-24704.

   j. Repeat valve adjustment for each individual valve that requires adjustment as recorded in steps c and e.

3. Install distributor cap and spark plug wire assembly.

4. Install cam cover gaskets and cover.

5. Start engine and adjust engine idle speed as required.

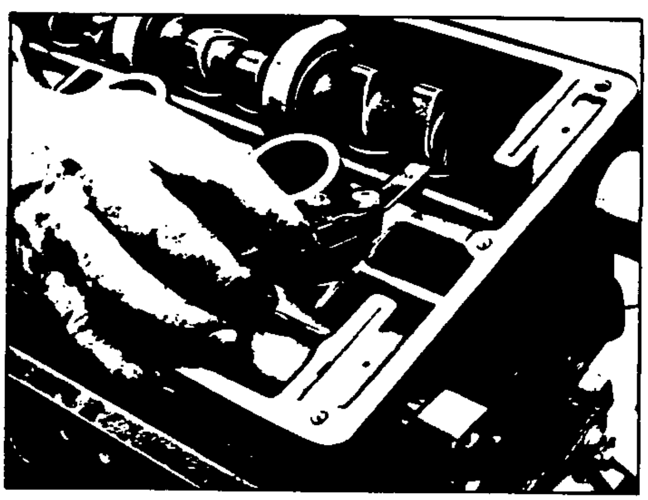


Fig. 5—Measuring Valve Lash

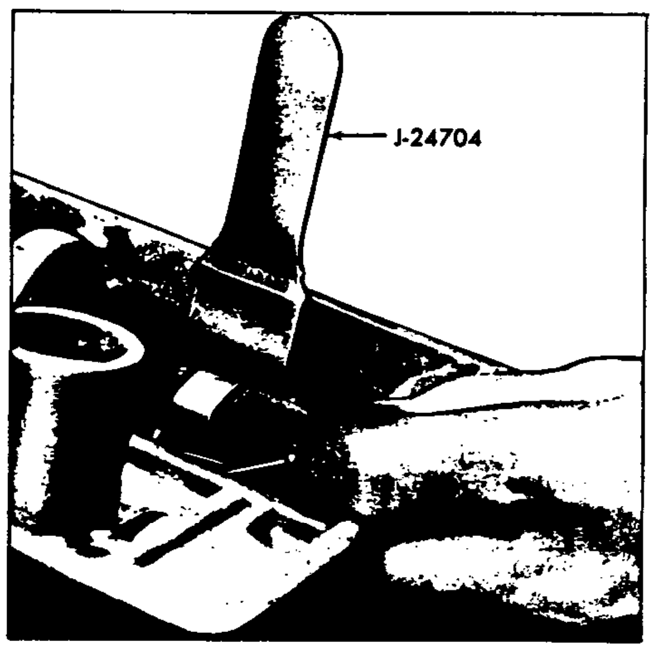


Fig. 6—Removing Tappet Adjusting Shim

Idle Speed Adjustment

NOTE: Make all engine idle speed adjustments at normal operating temperature, choke cycle complete, and transmission in neutral *without* clutch pedal depressed.

PART I

1. Connect tachometer to vehicle.
2. Start engine, and bring up to operating temperature per warm-up note.
3. Loosen idle stop adjusting screw locknut on throttle body.
4. Adjust idle stop adjusting screw clockwise or counterclockwise to respectively decrease or increase engine idle speed to the desired RPM.
5. After obtaining desired engine idle speed, tighten locknut securely to lock adjusting screw in position.

PART II

1. Connect EFI Diagnostic Analyzer to vehicle.
2. Set the analyzer position switch to position #11.
3. Loosen two (2) throttle position switch mounting screws to permit rotation of the unit.
4. Insert a .016" feeler gauge between the throttle stop lever and throttle body adjusting screw.
5. Rotate the switch just to the point where the analyzer needle indicates "Meter Zero".
6. Tighten mounting screws to 11 inch-lb. and remove feeler gauge.
7. Disconnect the analyzer.

PART III

1. Restart engine, and following warm-up check engine idle speed to insure that it has not changed. (If speed has changed, repeat all steps).
2. Disconnect tachometer.

ENGINE MECHANICAL

INDEX

GENERAL DESCRIPTION

The Cosworth Vega engine is a 122 cubic inch, 4-cylinder, 90° cylinder axis design, featuring a die cast aluminum cylinder and case assembly and an aluminum, 16-valve cylinder head. Twin cams are housed in an aluminum cam carrier which is bolted to the cylinder head (fig. 7).

The valve train is contained in two separate housings. The cylinder head contains dual inlet and exhaust valves positioned so that inlet and exhaust valves operate from separate cam shafts.

The overhead cams, located in a separate carrier above the valves, drive mechanical tappets, which in turn actuate the valves (fig.8).

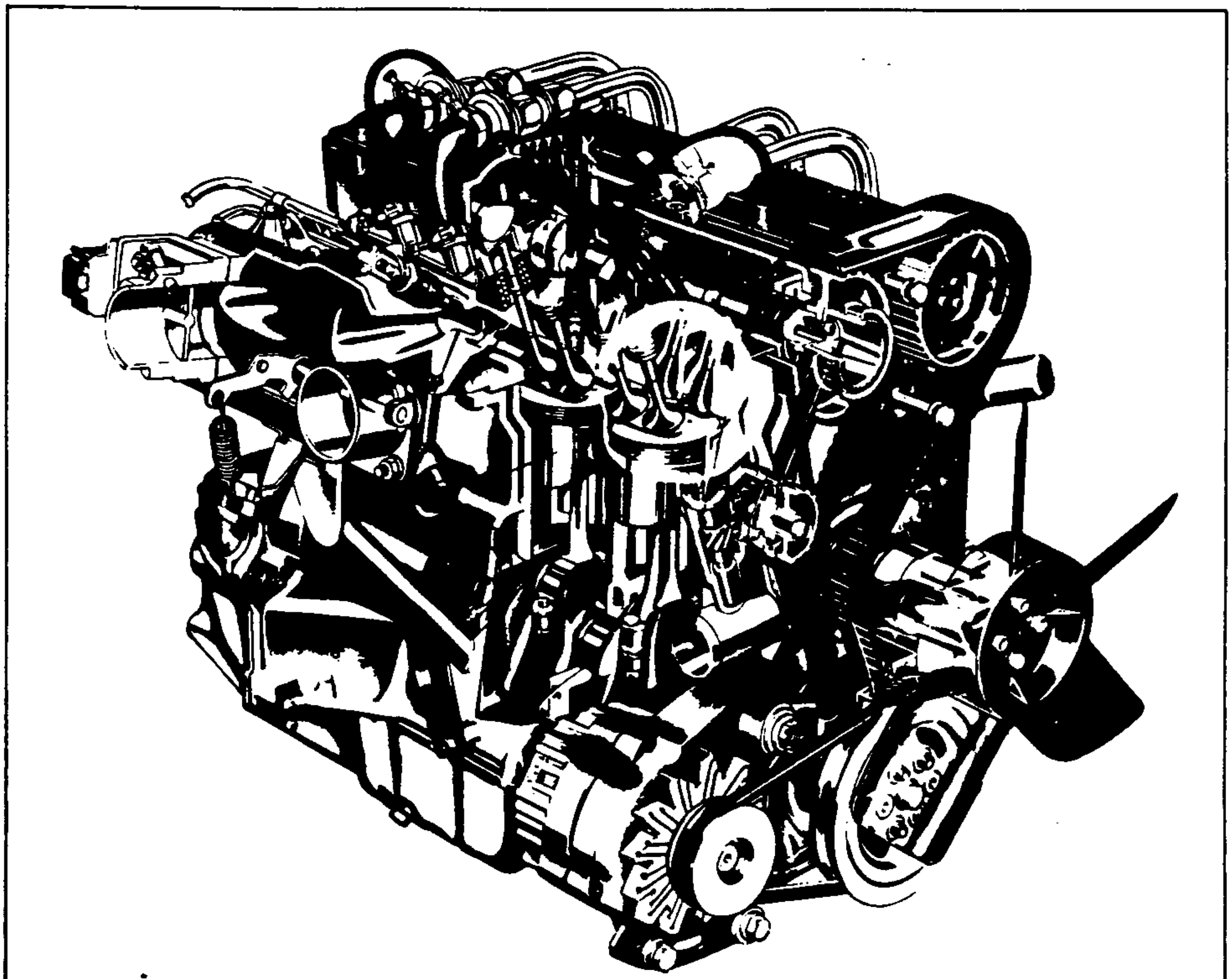


Fig. 7—Engine-Sectional View

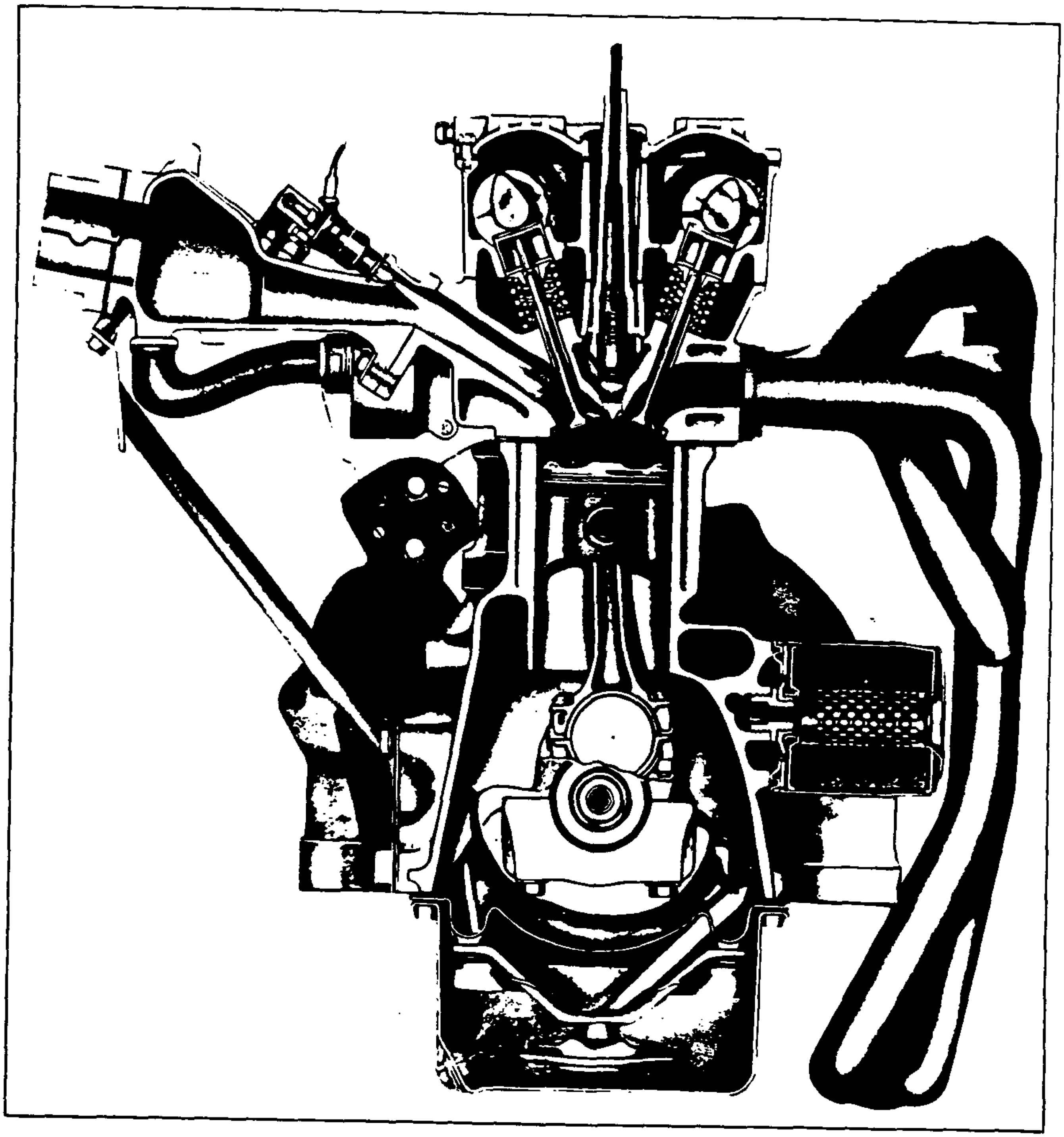


Fig. 8—Engine-Valve and Piston Arrangement

SERVICE OPERATIONS

ENGINE ASSEMBLY

Removal

1. Remove hood.
2. Disconnect battery positive cable at battery.
3. Disconnect battery negative cable at engine block.
4. Drain engine coolant at radiator.
5. Remove engine cooling fan and spacer.
6. Disconnect engine coolant hoses at thermostat housing and at water pump — disconnect coolant overflow hose at radiator.
7. Disconnect heater hose at water pump.
8. Remove radiator shroud and radiator.
9. Disconnect electrical leads at oil pressure switch and at water temperature switch at thermostat housing — disconnect wiring harness at engine block and position out of way.
10. Disconnect water temperature sensor lead, located between the number 3 and 4 exhaust runner, and position lead out of the way.
11. Disconnect air cleaner bellows at throttle body, remove the air cleaner-to-fender skirt attaching bolts and remove air cleaner from vehicle.
12. Disconnect accelerator cable at throttle body and position cable out of way, being careful not to kink cable housing.
13. Remove intake manifold-to-support attaching bolts on the underside of the manifold.
14. Remove intake manifold-to-head attaching bolts and stud nuts.
15. Position intake manifold and attached electrical leads and hoses on the fender skirt. Secure manifold to fender skirt in a position to provide maximum clearance for engine removal.
16. Disconnect electrical leads at starter solenoid, starter and Delcotron.
17. Disconnect fuel supply and return lines.
18. Disconnect PCV hose at engine cover.
19. Disconnect vacuum, sensor and electrical leads at ignition distributor.
20. Raise vehicle on a hoist.
21. Disconnect exhaust pipe at manifold.
22. Remove flywheel housing-to-engine retaining bolts.
23. Loosen engine front mount retaining bolts at frame attachment, and lower vehicle on hoist.
24. Install floor jack or other suitable support under transmission.
25. Install engine lifting adapter and raise engine slightly to take weight from engine mounts — remove engine front mount retaining bolts.
26. Remove engine from vehicle. Pull engine forward to clear transmission while slowly lifting engine. While raising engine turn engine sideways (rotate front of engine towards left side of vehicle) to obtain maximum clearance. Check frequently to make sure that all disconnects are made and to ensure that clearance with surrounding components is maintained.
27. Loosen clutch cover-to-flywheel bolts alternately a turn at a time (to prevent distortion of clutch cover) until spring pressure is released.
28. Remove flywheel from crankshaft and install engine to engine stand — remove lifting adapter.

Installation

1. Attach lifting adapter to engine brackets and remove engine from engine stand.
2. Install flywheel to crankshaft — see "Flywheel Removal and Installation" procedures.
3. Install clutch disc and pressure plate as outlined in Section 7.
4. Install two guide pins (one on each side) in engine block at clutch housing attaching points. (Pins can be made from 3/8 inch bolts with heads removed.)
5. Position engine over engine compartment with front of engine towards left side of vehicle. Slowly lower and turn engine to align engine with vehicle.
6. Align engine with transmission housing and index clutch gear shaft into clutch disc and engine.
7. Align engine front mounts with frame pads and loosely install mount bolts.
8. Remove engine guide pins and install clutch housing-to-engine retaining bolts.
9. Raise vehicle on a hoist.
10. Install and torque remaining engine-to-housing bolts, check alignment of front mounts and torque bolts to specifications.
11. Connect exhaust pipe at manifold and lower vehicle on hoist.
12. Connect electrical leads at starter solenoid, starter and Delcotron.

13. Connect vacuum, sensor and electrical leads at ignition distributor.
14. Install inlet manifold to head and loosely install stud nuts and bolts to manifold.
15. Install manifold brace bolts to manifold, then torque manifold attaching nuts and brace to specifications.
16. Install air cleaner and bellows to throttle body.
17. Connect throttle cable, fuel supply and return lines, and PCV hose to cover.
18. Install water temperature sensor lead, temperature sender lead, oil pressure switch lead and secure harness to clip at block.
19. Install radiator, radiator shroud, engine fan and spacer.
20. Connect heater hoses, coolant hoses and fill cooling system.
21. Connect battery cables, start engine check for leaks and lower hood.

ENGINE FRONT COVER

Removal

1. Raise hood to the fully open position and install the hood hold-open link to positively retain hood in open position.
2. Disconnect battery negative cable at battery.
3. Remove fan and fan spacer.
4. Remove the two, cover lower screws, remove the three, cover attaching bolts (fig. 9); then lift up on right side of cover and pull forward to clear accessory drive belt and water pump hub. Push downward on left side of cover to disengage cover from support — lift cover from engine.

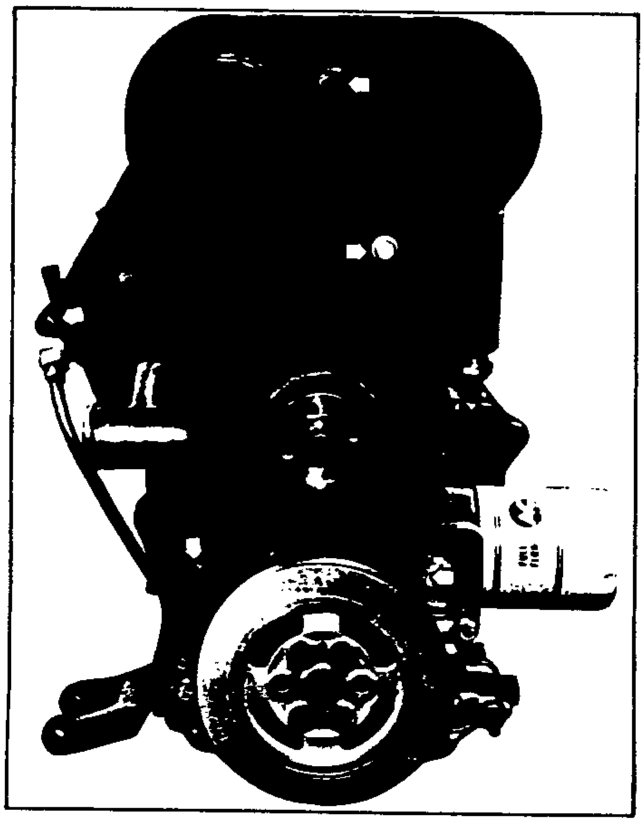


Fig. 9—Engine Front Cover Attaching Bolts

Installation

1. Place left side of cover under support, raise right side of cover and position rearward over accessory drive belt and water pump hub.
2. Align and install the three bolts and two cover lower screws, check for clearance between surrounding components and torque attaching fasteners.
3. Install fan spacer and fan — torque bolts to specifications.
4. Connect battery cable, remove hood hold-open link and close hood.

TIMING BELT

Removal

1. Remove engine front cover and accessory drive pulleys as previously outlined.

   NOTE. Align timing marks before belt is removed.
2. Drain engine coolant and loosen water pump bolts to relieve tension in timing belt.
3. Using a wood or plastic spatula or similar tool, pry gently on distributor drive belt to remove belt from drive sprocket.
4. Remove the timing belt lower cover then remove timing belt from camshaft and crankshaft sprockets.

Installation

1. Position No. 1 piston at T.D.C. and align all timing marks on camshaft sprockets so that they are all in a straight line when an appropriate straight edge is used (fig. 10).

2. An additional camshaft sprocket alignment feature is provided and that is to align the small hole in the tooth space of the sprocket with the

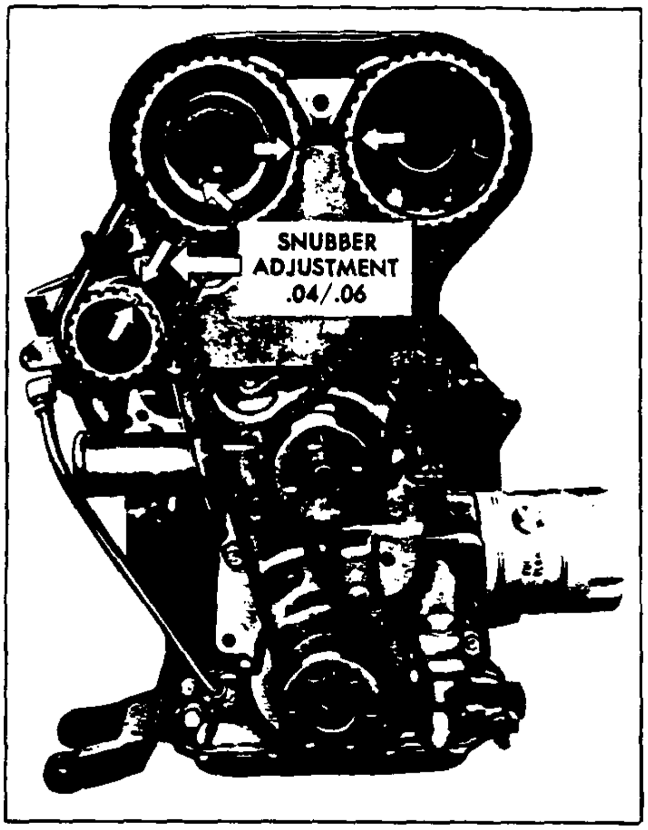


Fig. 10–Timing Alignment Marks

'V' notch of the upper sheet metal cover. This is provided to aid in setting the camshaft timing properly when the engine is in the chassis.

3. With all sprockets aligned correctly and the water pump loose and slid to the extreme right position when viewed from the front; install the timing belt over the crankshaft sprocket and water pump pulley. Stretch the belt tight and start meshing the belt over the camshaft sprockets; starting with inlet sprocket.

4. Using tool J-23654, slide the water pump to the left (viewed from the front) with approximately 15 ft. lbs. torque and tighten two of the four water pump attaching bolts.

5. Rotate engine clockwise two or three revolutions and then back the engine up approximately 10° in a counter clockwise direction. This puts the long slack side of the belt in tension.

6. Loosen the two water pump attaching bolts and again apply *exactly 15 ft. lbs. torque* to tool J-23654 and while this torque is being applied, tighten all four of the water pump attaching bolts to 15 ft. lbs. torque.

7. Rotate engine clockwise to TDC No. 1 cylinder and re-check camshaft sprocket alignment. All four marks should be on the same horizontal line.

8. Check tolerances between snubbers and timing belt (fig. 10).

TIMING BELT LOWER REAR COVER (Fig. 11)

Removal

1. Remove engine front cover and torsional damper as previously outlined.
2. Drain engine coolant and loosen water pump bolts to relieve tension in timing belt.
3. Remove the timing belt lower cover then remove timing belt from crankshaft sprocket. Mark position of crank and cam sprockets to make sure that they are not moved.
4. Remove the Delcotron bracket-to-engine block bolt that passes through the splash shield.
5. Remove the nut from the oil pump attaching stud.
6. Remove the water pump attaching bolts, while holding the water pump in position, withdraw splash shield and reinstall two diagonally opposite water pump bolts.

Installation

1. Remove the two water pump bolts used to retain pump, and position splash shield to front of engine.

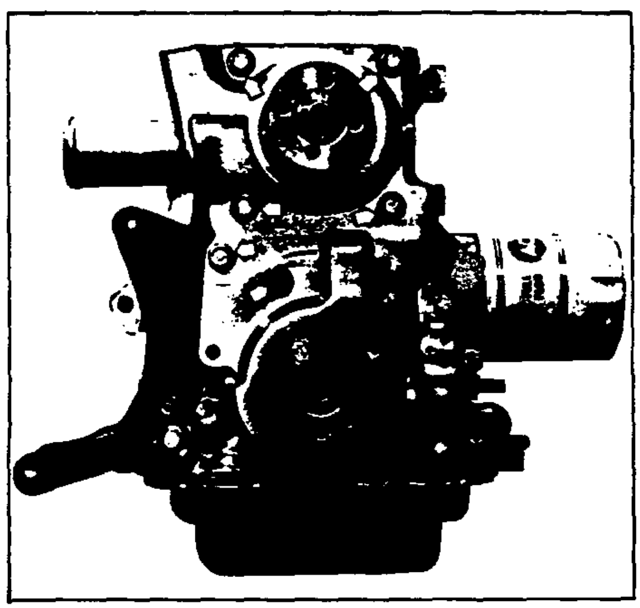


Fig. 11–Timing Belt Lower Rear Cover

2. Loosely install the water pump bolts.
3. Install Delcotron bracket-to-engine block bolt.
4. Install nut to oil pump attaching stud.
5. Torque all fasteners (except water pump bolts) to specifications — checking to make sure that splash shield is properly seated.
6. Check cam and crank sprockets to make sure that they have not been rotated out of position (fig. 10).
7. Install timing belt and adjust as previously outlined in "Tune-Up".
8. Fill engine cooling system, install torsional damper, adjust drive belt to specification and install engine front cover as previously outlined.

DISTRIBUTOR DRIVE BELT REPLACEMENT

1. Remove engine front cover as previously outlined.
2. Using a wood or plastic spatula or similar tool, pry gently on belt to remove from distributor drive sprocket, then remove belt from cam sprocket.
3. Make sure that distributor drive sprocket is in alignment with cam sprocket, position belt over cam sprocket; then install belt over distributor drive sprocket (fig.10).
4. Install engine front cover as previously outlined.

DISTRIBUTOR DRIVE SPROCKET REPLACEMENT

1. Remove engine front cover as previously outlined.
2. Loosen distributor drive sprocket retaining bolt, then remove drive belt as previously outlined — remove bolt and sprocket and sprocket retaining key.

   NOTE: Drive sprocket may be seated on shaft, if so reinstall retaining bolt and rap lightly on bolt head to shock sprocket from shaft.
3. Position key in shaft and install drive sprocket and retaining bolt.

   NOTE: Be sure to tighten retaining bolt to torque as outlined in specifications at the end of this section.
4. Install distributor drive belt and engine front cover as previously outlined.

DISTRIBUTOR DRIVE HOUSING AND/OR SEAL REPLACEMENT

1. Remove engine front cover and distributor drive belt as previously outlined.

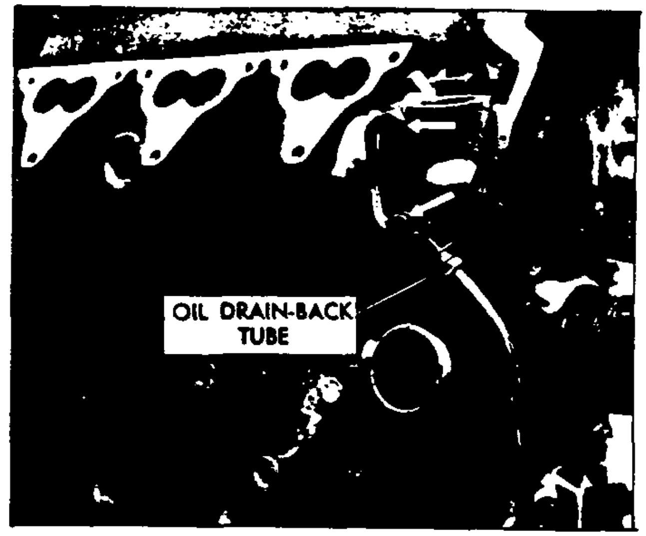


Fig 12—Oil Drain-Back Tube

2. Disconnect distributor drive housing, oil drain-back tube from carrier (fig. 12).
3. Disconnect speed sensor terminal at rear of housing.
4. Bend bolt lock tabs away from bolt head and remove housing-to-head bolts.
5. Remove housing and transfer parts to new housing.
6. Install new seal using Tool J-24777 (fig. 13).
7. Install housing to head, making sure that "0" rings are installed in housing mounting face and that guide pins are aligned with corresponding holes in head.
8. Install and torque retaining bolts and secure by bending lock tabs over bolt.
9. Connect oil drain-back tube and connect speed sensor terminal.
10. Install distributor drive belt and engine front cover as previously outlined.
11. Check and adjust ignition timing as required.

CAMSHAFT TIMING SPROCKET(S)

Removal

1. Remove engine front cover and distributor drive belt as previously outlined.

   NOTE: Align timing marks before belt is removed.

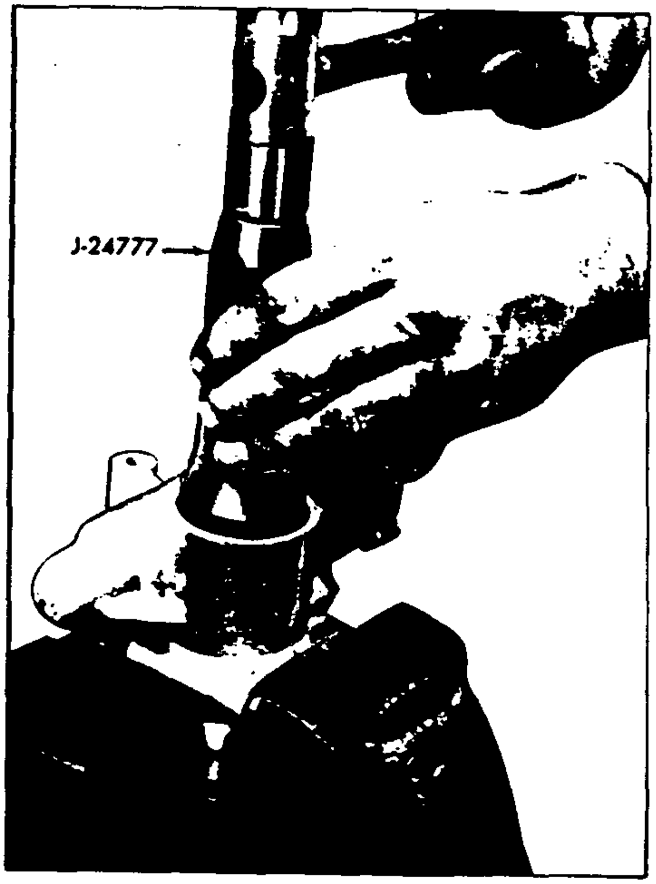


Fig. 13—Installing Distributor Drive Housing Seal with J-24777

2. Drain engine coolant, loosen water pump attaching bolts and remove timing belt from cam sprockets.
3. Disengage cam sprocket bolt lock tabs and remove sprocket bolts.
4. Remove distributor drive sprocket and belt retainer assembly from right cam sprocket.
5. Remove cam sprocket(s) from camshaft.

Installation

1. Position cam sprocket on end of cam, align sprocket locating hole with dowel pin in end of cam. On right sprocket also install distributor drive sprocket, aligning sprocket with dowel pin.
2. Install lock plate and sprocket bolts — torque bolts and bend lock tabs over bolt.
3. Align cam sprockets so that timing marks are both towards center of engine and directly opposite each other (fig. 10).
4. Align timing mark on crank sprocket with cast tab on oil pump cover.
5. Install timing belt on crankshaft sprocket — position back of belt in water pump track — then install belt to camshaft sprockets, making sure that timing marks maintain their indexed positions.
6. Adjust timing belt as outlined in Timing Belt Installation.
7. Install distributor drive belt as previously outlined.
8. Fill engine cooling system, and install engine front cover as previously outlined.

CAMSHAFT SEAL REPLACEMENT

1. Remove camshaft timing sprocket from the cam(s) that require seal replacement.
2. Pry seal from cam carrier, being careful not to damage carrier surfaces.
3. Coat outside diameter of new seal with an approved sealing compound and position seal over cam and into carrier.
4. Install seal, using Tool J-24777 (fig. 14).
5. Install camshaft sprocket(s) timing belt (adjust tension) and engine front cover as outlined in previous procedures.

CAMSHAFT CARRIER COVER

Removal

1. Raise hood to the fully open position and install the hood hold-open link to positively retain hood in open position.
2. Disconnect battery negative cable at battery.
3. Disconnect PCV hose from right side of cover.
4. Remove spark plug wires from plugs and position plug wires out of the way.
5. Remove screws securing pulse air pipe brackets to cam cover.

Fig. 14—Installing Camshaft Oil Seal

6. Remove the four hoses that go from pulse air manifold to pulse air pipe check valves.
7. Remove the cover-to-cam carrier attaching screws and washers and remove carrier cover and gasket from vehicle.

Installation

1. Apply a thin coat of gasket sealer to cover gasket and spark plug port gasket, position gaskets to cam carrier.
2. Carefully slide cam carrier cover under the engine front cover tabs and align cover with tabs and carrier bolt holes.
3. Install cover retaining screws and washers and torque screws alternately and evenly to produce a uniform draw on cover (use sequence shown in figure 18).

   CAUTION: During installation of hoses, be sure to position hose clamps rearward and no more than 30° upward from cam cover. If hose clamps are not positioned properly, damage to hood will result at closing.
4. Install PCV hose, spark plug wires, pulse air hoses, pulse air pipe brackets, connect battery cable and close hood.

CAMSHAFT CARRIER

Removal

1. Remove camshaft sprockets as outlined in previous procedures.
2. Remove timing belt upper cover.
3. Remove the cam carrier cover as outlined in previous procedures.
4. Remove the cam carrier-to-cylinder head retaining screws.

   NOTE: Loosen the screws in small increments as shown in the torque sequence pattern (Fig. 18) to prevent distortion caused by valve spring tension.
5. Rotate camshafts to a position that will expose the holes in the tapped body wall (fig. 15).
6. Position tappets so that holes are approximately 15 degrees from center of carrier.
7. Install Tool J-24705 (one tool for each tappet) into the tappet hole and over the camshaft, as shown in figure 16.
8. Carefully lift cam carrier from the cylinder head and place on a smooth level surface.

Disassembly

1. Carefully remove tappet holding Tool J-24705 from tappet, and identify each tappet and adjusting shim so that they can be installed in the original position during reassembly.
2. Pry camshaft seal from carrier, being careful not to damage carrier or camshaft.
3. Remove camshaft retainer (thrust) key from the keyway at the front of carrier.
4. Remove camshaft from carrier being careful not to damage journals and bearing surfaces in carrier.

Reassembly

1. Position camshaft in cam carrier, being careful not to damage journals or bores during installation.

   NOTE: Camshaft are identified by raised letters cast near the front of the cam.
2. Install camshaft retainers (thrust keys) in the carrier, making sure that they are fully seated in the cam retainer grooves.
3. Install camshaft oil seal as in previous procedure.
4. Install tappets and adjusting shims in proper tappet bores.

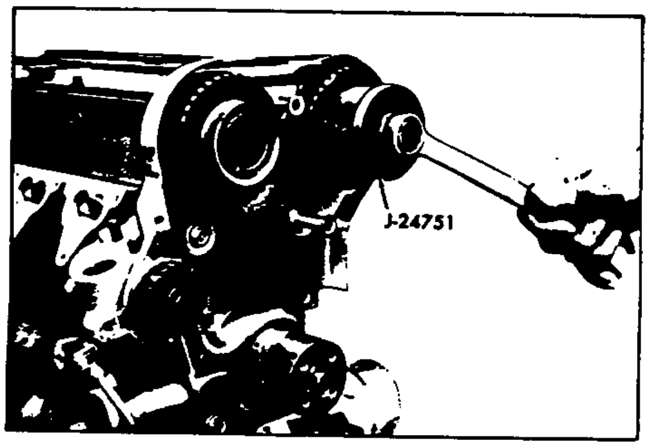


Fig. 15—Rotating Camshaft with J-24751

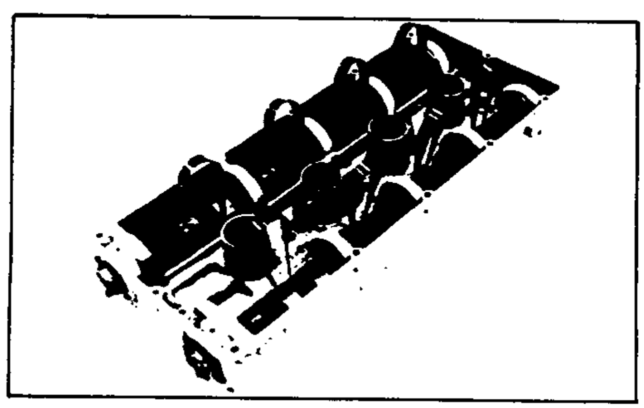


Fig. 16—Tappet Holding Tool J-24705

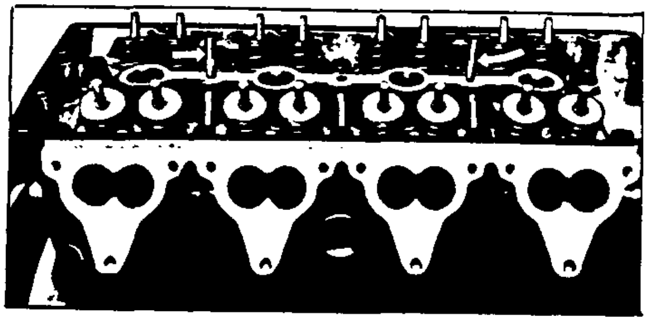


Fig. 17—Camshaft Carrier Guide Pins Installed

5. Install new cam carrier outer gasket to cylinder dead.
6. Install new carrier (inner) spark plug port gaskets.
7. Install tappet holding Tool J-24705 to each tappet so that each tappet is retained by holding tool (fig. 16).

Installation

1. Install two guide pins, made from 1/4-20 bolts, to outer holes of inner (plug port) gasket (Fig. 17).
2. Position cam carrier over cylinder head, aligning tappets with valve stems and aligning carrier over guide pins.
3. Remove tappet holding tools and install carrier retaining screws. Torque screws alternately and evenly in the sequence shown in Figure 18.
4. Install camshaft sprockets and timing belt, adjust tappets as specified in "Tune-Up".
5. Install cam cover, fill cooling system and install engine front cover as previously outlined.
6. Check and adjust ignition timing as required.

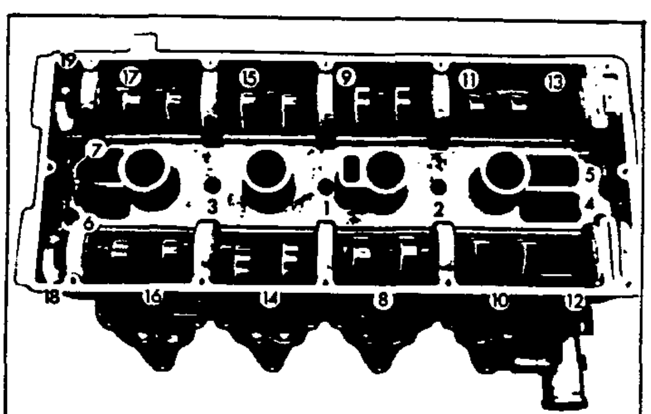


Fig. 18—Camshaft Carrier Bolt Torque Sequence

VALVE STEM OIL SEAL AND/OR VALVE SPRING

Replacement

1. Remove cam carrier following procedures outlined under "Camshaft Carrier Removal".
2. Remove spark plug at the cylinder to be serviced.
3. Install Tool J-24824-1, Spring Depressor Holder to the cylinder head and secure with the provided screws (Fig. 19).
4. Install air line adapter Tool J-23590 to spark plug port, and apply compressed air to adapter to hold valves in place.

   NOTE: Apply an approved anti-seize compound to threads on air line adapter tool.
5. Using Tool J-24824-2 to compress the valve spring, remove the valve locks and release compression on spring and remove tool (fig. 19).
6. Remove the valve spring cap, valve inner and outer springs, the valve stem oil seal and the spring seat.
7. Install the spring seat, and install a new valve stem oil seal over the valve stem and valve guide.
8. Install inner and outer springs and cap; compress spring and install valve locks, making sure that locks seat properly in the valve stem groove. Release spring and remove tool.

   NOTE: Grease may be used to hold the locks in place while releasing the spring.
9. Remove spring depressor holder and air line adapter, install spark plug and torque to specifications.
10. Install cam carrier following procedures outlined under "Camshaft Carrier Installation."

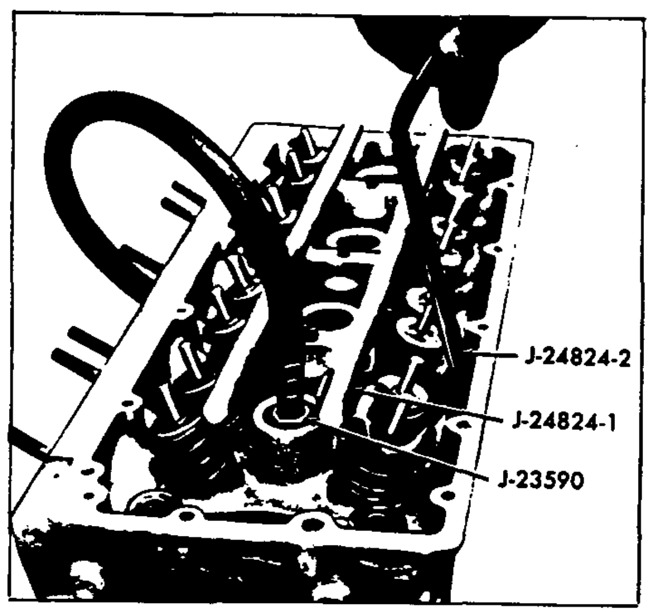


Fig. 19—Compressing Valve Spring

MANIFOLD REPLACEMENT

Intake

1. Raise hood to the fully open position and install the hood hold-open link to positively retain hood in open position.
2. Disconnect battery negative cable at battery.
3. Disconnect inlet manifold harness at air temperature sensor, at throttle body air enrichment valve, at ignition distributor and at fuel injectors — position harness out of the way.
4. Disconnect air cleaner bellows at throttle body.
5. Disconnect fuel inlet line and fuel return line at fuel rail.
6. Disconnect pressure sensor lines at throttle body.
7. Remove the two bolts retaining inlet manifold to engine mounted brace.
8. Disconnect accelerator cable at throttle body, at cable support and position cable out of way, being careful not to kink cable.
9. Disconnect PCV valve hose at camshaft cover and position hose out of the way.
10. Remove fuel rail and throttle body from manifold.
11. Loosen the manifold-to-head stud nuts and bolts. Remove bolts and nuts and remove manifold from engine compartment.
12. Clean gasket surfaces on cylinder head and manifold.
13. Position new gasket over manifold studs on cylinder head and carefully install the manifold, making sure that the gasket remains in place.
14. Apply an approved anti-seize compound to threads of all manifold bolts; install and torque manifold bolts and nuts to specifications (Fig. 20).

    CAUTION: To prevent undue stress being applied to inlet manifold during installation, steps 15 through 17 must be followed exactly.
15. Loosen lower nuts on inlet manifold brace. Make sure brace is free to move.
16. Attach brace to underside of inlet manifold and tighten screws to 15-20 ft-lbs.
17. Tighten lower nuts on inlet manifold brace. During tightening sequence, make sure no undue stress is applied to inlet manifold.
18. Install throttle body and accelerator support — connect accelerator cable.
19. Install fuel rail, fuel injectors and connect harness to injectors, air temperature sensor, throttle body air enrichment valve and ignition distributor.

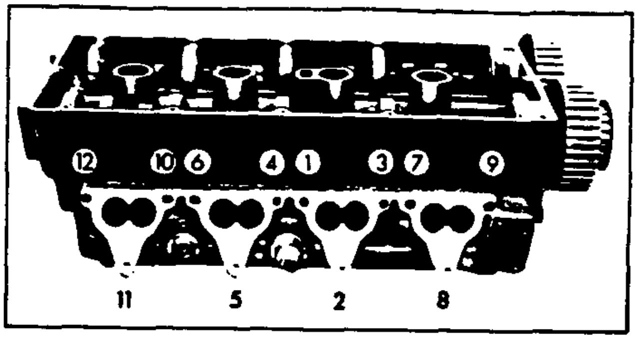


Fig. 20—Intake Manifold Bolt Torque Sequence

20. Connect fuel inlet line and return line, connect air cleaner bellows at throttle body.
21. Connect pressure sensor lines at throttle body and install PCV valve hose to camshaft cover.
22. Connect battery negative cable, start engine and check for proper operation — close hood.

    NOTE: When replacing inlet manifold to cylinder head gasket only, steps #10, #18, and #19 may be omitted.

Exhaust

Removal

1. Raise vehicle on a hoist and disconnect exhaust pipe at manifold — lower vehicle.
2. Raise hood to the fully open position and install the hood hold-open link to positively retain hood in open position.
3. Disconnect battery negative cable at battery.
4. Remove water temperature sensor shield and engine lift bracket — disconnect oil level dipstick bracket at manifold.
5. Remove remaining exhaust manifold bolts and remove manifold from engine compartment.

Installation

1. Apply an approved anti-seize compound to threads of all manifold bolts.
2. Install new gasket and french locks.
3. Position manifold to cylinder head and loosely install bolts to retain manifold to cylinder head.
4. Install water temperature shield and torque all bolts to specifications (fig. 21).
5. Raise vehicle on hoist and install exhaust pipe, using sealer #998304 (or equivalent) on mating surfaces.

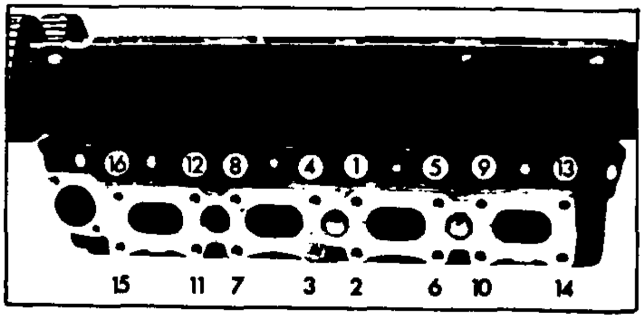


Fig. 21—Exhaust Manifold Bolt Torque Sequence

6. Connect battery negative cable, start engine and check for proper operation, remove hood hold-open link and close hood.

CYLINDER HEAD ASSEMBLY

Removal

1. Remove engine front cover and camshaft carrier cover as previously outlined (fig. 22).
2. Remove engine timing belt and camshaft timing sprockets as previously outlined.
3. Remove timing belt upper cover and camshaft carrier as previously outlined.
4. Disconnect intake manifold and position on right fender skirt as outlined in "Engine Removal" procedures.
5. Raise vehicle on a hoist and disconnect exhaust pipe — lower vehicle.
6. Remove exhaust manifold and cylinder head.
7. Place cylinder head on two blocks of wood to prevent damage to valves.

Disassembly

1. Using Tool J-8062, compress the valve springs and remove the valve stem key. Release the spring compressor tool and remove the valve cap, valve inner and outer springs the valve stem oil seal and the spring seat.

2. Remove valves from cylinder head and place them in a rack in their proper sequence, so that they can be assembled in their original positions.

Cleaning

1. Clean all carbon from combustion chambers and valve ports.

   NOTE: Do not wire brush the cylinder head, use an approved cleaning solvent and scraper, being careful not to nick or gouge the metal.

2. Thoroughly clean the valve guides, using Tool J-8101.
3. Clean valve stems and heads on a buffing wheel.
4. Clean carbon deposits from head gasket mating surface.

Inspection

1. Inspect the cylinder head for cracks in the exhaust ports, combustion chambers, or external cracks to the water chamber.
2. Inspect the valves for burned heads, cracked faces and damaged stems.

   NOTE: Excessive valve stem to guide clearance will cause excessive oil consumption and may cause valve breakage. Insufficient clearance will result in noisy and sticky functioning of the valve and disturb engine smoothness.

3. Measure valve stem clearance as follows:
   Clamp a dial indicator on one side of the cylinder head gasket rail, locating the indicator so that movement of the valve stem from side to side (crosswise to the head) will cause a direct movement of the indicator stem. The indicator stem must contact the side of the valve stem just above the valve guide. With the valve head dropped about 1/16" off the valve seat; move the stem of the valve from side to side, using light pressure to obtain a clearance reading. If clearance exceeds specifications it will be necessary to ream valve guides for oversize valves as outlined.
4. Check valve spring tension, using Tool J-8056 spring tester.

   NOTE: Springs should be compressed to the specified height and checked against the specifications chart. Springs should be replaced if not within 10 lbs. of the specified load.

Repairs

Valve Guide Bores

Valves with oversize stems are available in .003 oversize for service replacement. To ream the valve guide bores for oversize valves use Tool J-24703.

Valve Seats

Reconditioning the valve seats is very important, because the seating of the valves must be perfect for the engine to deliver the power performance built into it. Another important factor is the cooling of the valve heads. Good contact between each valve and its seat in the head is imperative to insure that the heat in the valve head will be properly carried away.

Several different types of equipment are available for reseating valves seats. The

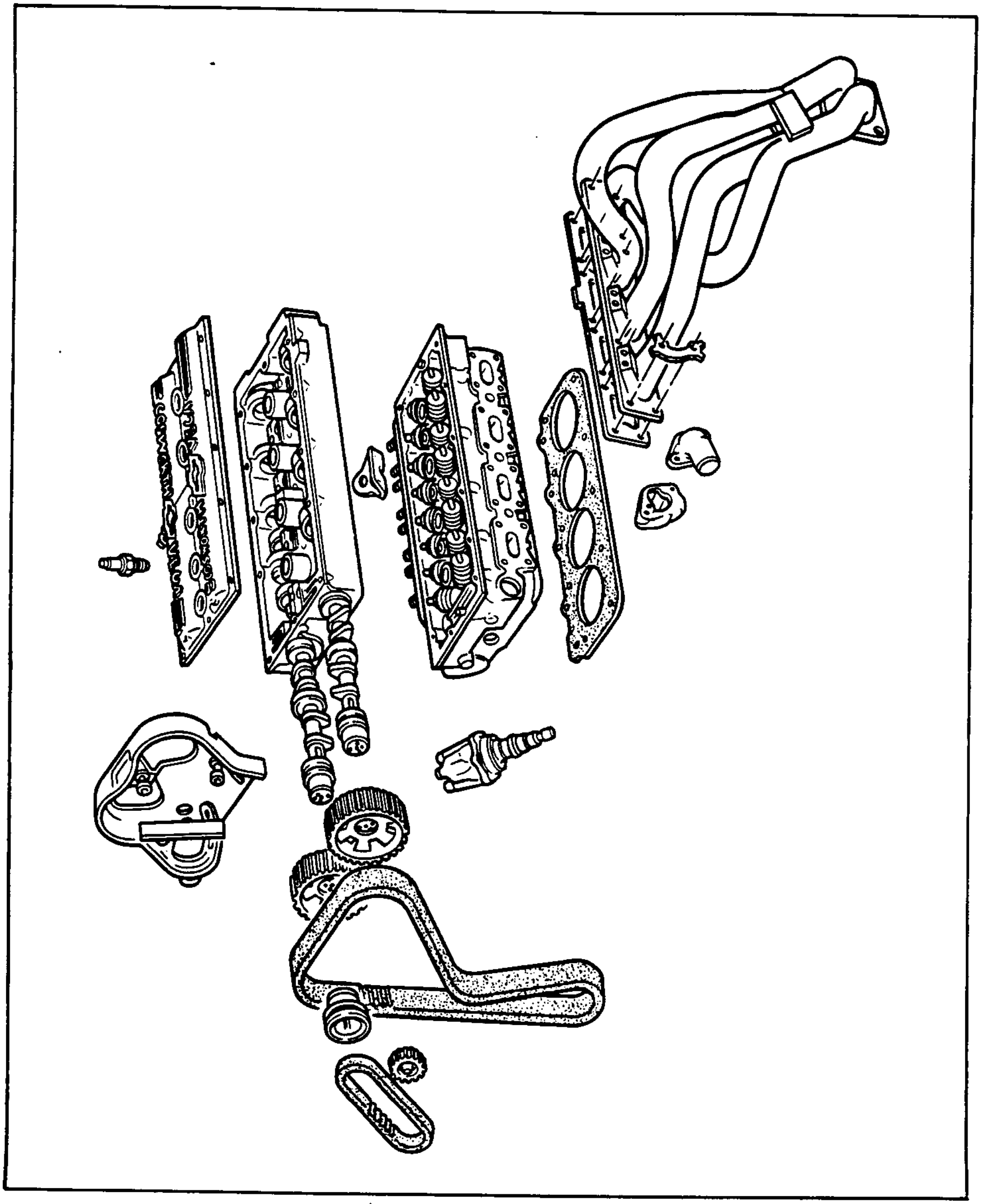


Fig. 22—Engine Components

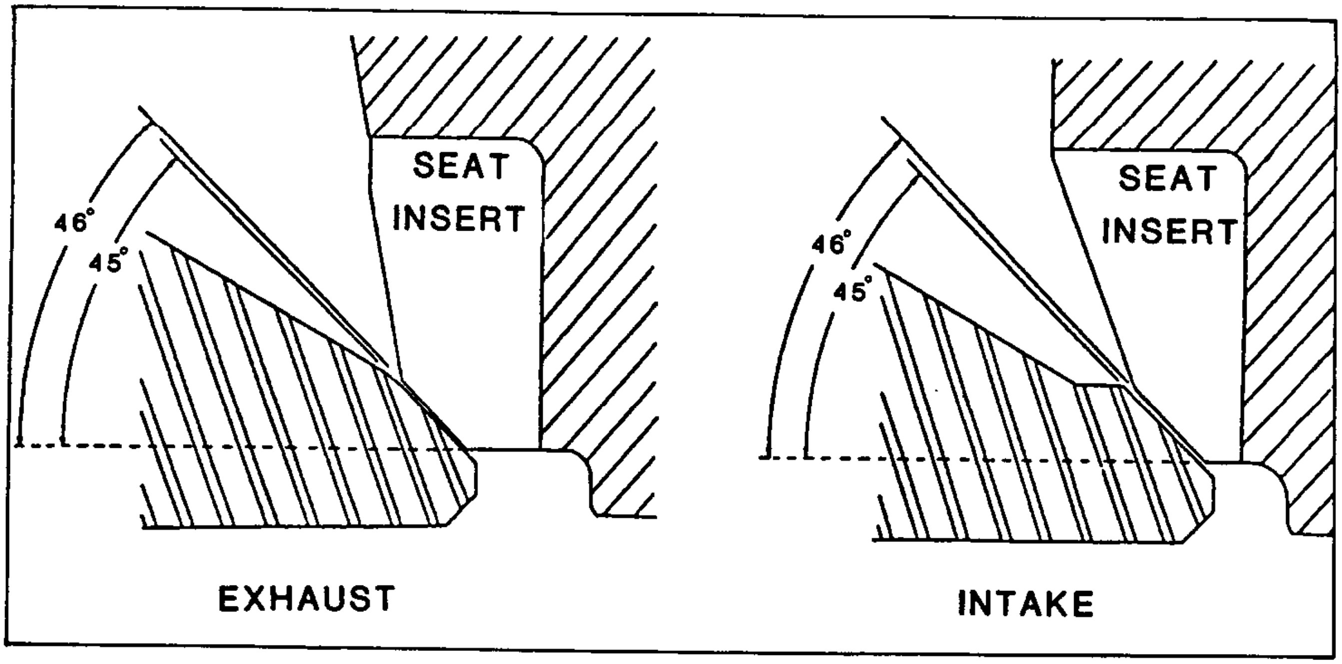


Fig. 23—Relationship of Valve and Seat Angles

recommendations of the manufacturer of the equipment being used should be carefully followed to attain proper results.

Regardless of what type of equipment is used, however, it is essential that valve guide bores be free from carbon or dirt to insure proper centering of pilot in the guide.

1. Install expanding pilot in the valve guide bore and expand pilot.
2. Place roughing stone or forming stone over pilot and just clean up the valve seat. Use a stone cut to specifications.
3. Remove roughing stone or forming stone from pilot, place finishing stone, cut to specifications, over pilot and cut just enough metal from the seat to provide a smooth finish. Refer to specifications.
4. Narrow down the valve seat to the specified width.

   NOTE: This operation is done by grinding the port side with a 30° stone to lower seat and a 60° stone to raise seat.

5. Remove expanding pilot and clean cylinder head carefully to remove all chips and grindings from above operations.
6. Measure valve seat concentricity.

   NOTE: Valve seats should be concentric to within .002" total indicator reading.

Valves

Valves that are pitted can be refaced to the proper angle, ensuring correct relation between the head and stem on a valve refacing mechanism. Valve stems which show excessive wear, or valves that are warped excessively should be replaced. When a valve head which is warped excessively is refaced, a knife edge will be ground on part or all of the valve head due to the amount of metal that must be removed to completely reface. Knife edges lead to breakage, burning or pre-ignition due to heat localizing on this knife edge. If the edge of the valve head is less than 1/32" thick after grinding, replace the valve.

Several different types of equipment are available for refacing valves. The recommendations of the manufacturer of the equipment being used should be carefully followed to attain proper results.

1. If necessary, dress the valve refacing machine grinding wheel to make sure it is smooth and true. Set chuck at angle specified for valve. Refer to figure 23 and specifications.
2. Clamp the valve stem in the chuck of the machine.
3. Start the grinder and move the valve head in line with the grinder wheel.
4. Turn the feed screw until the valve head just contacts wheel. Move valve back and forth across the wheel and regulate the feed screw to provide light valve contact.

5. Continue grinding until the valve face is true and smooth all around the valve. If this makes the valve head thin (1/32" min.) the valve must be replaced as the valve will overheat and burn.

6. Remove valve from chuck and place stem in "V" block. Feed valve squarely against grinding wheel to grind any pit from rocker arm end of stem.

   NOTE: Only the extreme end of the valve stem is hardened to resist wear. Do not grind end of stem excessively.

7. After cleaning valve face and cylinder head valve seat of grinding particles, make pencil marks about 1/4" apart across the valve face, place the valve in cylinder head and give the valve 1/2 turn in each direction while exerting firm pressure on head of valve.

8. Remove valve and check face carefully. If all pencil marks have not been removed at the point of contact with the valve seat, it will be necessary to repeat the refacing operation and again recheck for proper seating.

9. Grind and check the remaining valves in the same manner.

Reassembly

1. Insert a valve in the proper port.

2. Install the spring seat, and install a new valve stem oil seal over the valve stem and valve guide.

3. Install inner and outer springs and cap; compress spring and install valve locks, making sure that locks seat properly in the valve stem groove. Release spring and remove tool.

   NOTE: Grease may be used to hold the locks in place while releasing the spring.

4. Install the remaining valves as outlined above.

5. Check the installed height of the valve springs, using a narrow thin scale. Measure from spring seat to the top of the valve spring. If this measurement is found to exceed the specified height, install a valve spring seat shim approximately 1/16" thick. Spring must not be shimmed to give an installed height under the specified minimum.

Installation

1. Install exhaust manifold.
2. Install cylinder head gasket over dowel pins, then with the aid of an assistant, carefully guide cylinder head assembly into place over dowel pins and gasket.
3. Install washers and coat threads of cylinder head bolts with an approved anti-seize compound and install finger tight.
4. Tighten cylinder head bolts in small increments as shown in the torque sequence chart, until the specified torque is reached (See Vega Service Manual).
5. Install exhaust manifold and french locks.
6. Install intake manifold as outlined under "Engine Installation" procedures.
7. Install camshaft carrier as previously outlined.
8. Adjust valve tappets as outlined in "Tune-Up".
9. Install cam carrier cover and engine front cover as previously outlined.

SPECIFICATIONS

Engine Tune-Up

COMPRESSION*	170 PSI
SPARK PLUGS	
Standard	AC R43LTSX
Cold	N.A
Hot	N.A.
Gap	.060
DISTRIBUTOR	
Timing	12.0° BTC
VALVE LASH	
Intake	.014
Exhaust	.014
IDLE SPEED – RPM	1600
FUEL PUMP	
In-Tank PSI @ Volts Capacity	5.5 @ 12.8
External PSI @ Volts Capacity	6.6 @ 13.5
BELTS	
Timing	SEE NOTE
Delcotron	50 Min. 75 ± 5# (New)
AIR CLEANER	A505C

*PSI at cranking speed, throttle wide open – Maximum variation – PSI between cylinders.

NOTE: The use of conventional tension gauges for timing belt adjustment is not possible due to space limitations. Timing belt tension adjustments must be accomplished as outlined in this section, under timing belt installation, steps 1 thru 8.

General Engine Data

DISPLACEMENT (CU. IN)	122	
HORSE POWER @ 5,600 RPM	110	
COMPRESSION *	170 PSI	
TORQUE @ 4,800 RPM	107 Ft./Lbs.	
STROKE	3.16	
COMPRESSION RATIO	8.50 : 1	
CYLINDER BORE		
Diameter	3.5000 – 3. 5020	
Out of Round – Production	.0005 MAX	
Service	.0020 MAX	
Taper – Production	.0005 MAX	
Service	.005 MAX	
PISTON		
Clearance – Production	.0020 – .0030 MAX	
Service	.0020 – .0030 MAX	
PISTON PIN		
Diameter	.9270 – .9273	
Clearance – Production	.00045 – .00055	
Service	.00045 – .00055	
Fit To Rod Interference	.0008 – .0018	
PISTON COMPRESSION RING	Production	Service
Grove Cleareance – Top	.012 – .027	Hi Limit Production +.001
2nd.	.012 – .027	
Gap – Top	.015 – .025	
2nd	.009 – .019	
PISTON RING		
OIL	Production	Service
Groove Clearance	.000 – .005	Hi Limit Production +.001
Gap	.010 – .030	
CAMSHAFT		
Intake Lobe Lift ± .002 T/R	.355	
Exhaust Lobe Lift ± .002 T/R	.355	
Journal Diameter	1.8740 – 1.8735	
Runout	.0015	
End Play	.001 – .004	
VALVES	Intake	Exhaust
Lash	.014	.014
Face Angle	45°	45°

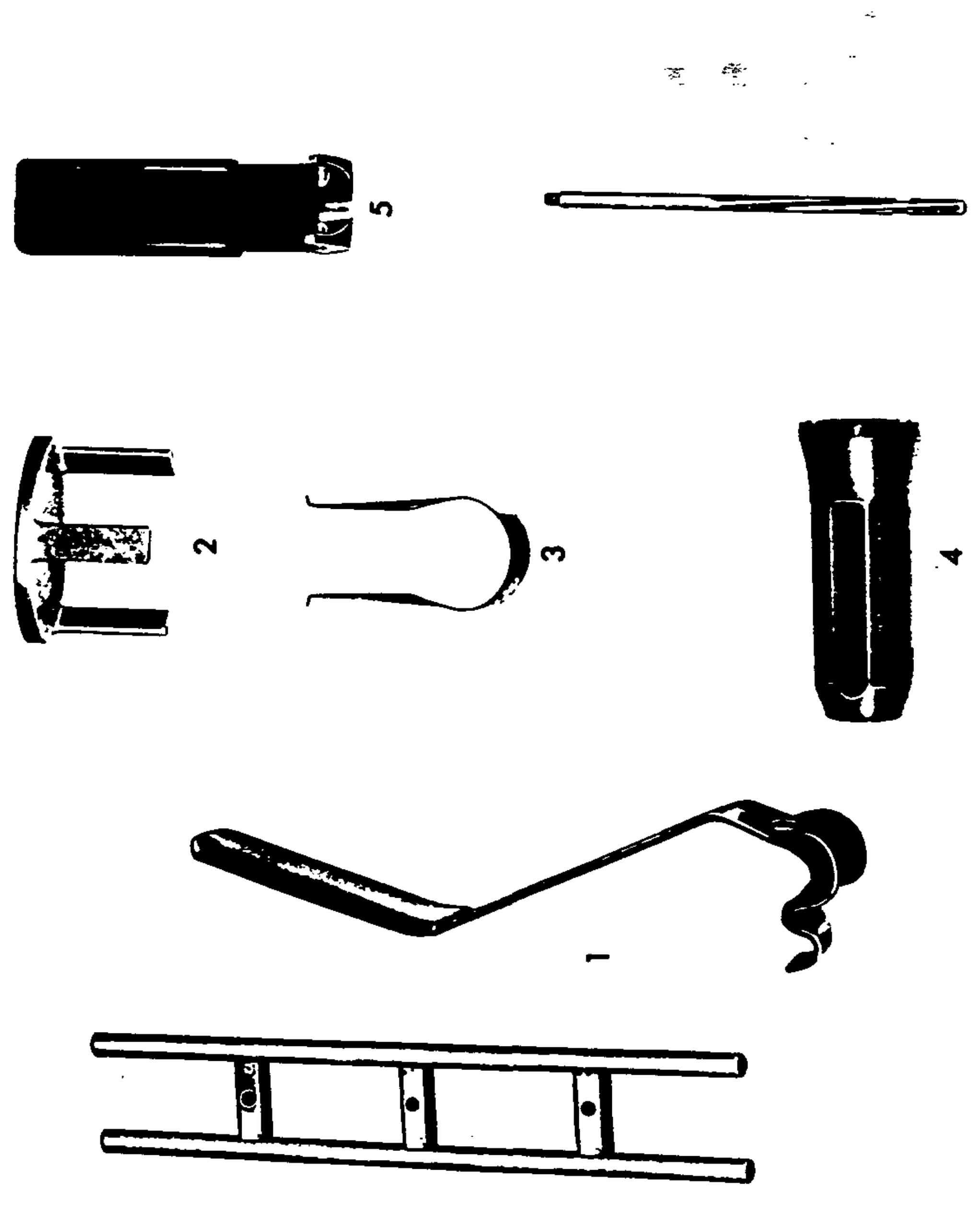
*PSI at cranking speed, throttle wide open – maximum variation – PSI between cylinders.

Seat Angle	46°	46°
Seat Runout	.002	.002
Seat Width	.073 – .065	.072 – .064
Stem Clearance – Production	.0010 – .0027	.0010 – .0027
Service	Hi Limit Prod. +.001	Hi Limit Prod. +.002
VALVE SPRINGS		
OUTER	Open	Closed
Pressure LBS. @ Inches	110.0# @ .92 in	45.0# @ 1.30 in
Free Length	1.578	
Installed Hight	1.300	
Approx. No. of Coils	5.00	
INNER		
Pressure LBS @ Inches	84.5# @ .875	30.0# @ 1.255
Free Length	1.478	
Installed Hight	1.255	
Approx. No. of Coils	6.24	
CRANKSHAFT		
MAIN JOURNAL		
Diameter	2.2993 – 2.2983	
Taper – Production	.0002 MAX	
Service	.001 MAX	
Out of Round – Production	.0002 MAX	
Service	.001 MAX	
MAIN BEARING CLEARANCE	Production	Service
#1 #2 #3 #4 #5	All .0003 – .0019	
End Play	.002 – .007	
CRANKPIN		
Diameter	2.000 – 1.999	
Taper – Production	.0003 MAX	
Service	.001 MAX	
Out of Round – Production	.0002	
Service	.001	
Rod Bearing Clearance – Production	.0020 – .0027	
Service	.003	
Rod Side Clearance	.0085 – .0135	

Bolt Torques

USAGE	TORQUE
Camshaft Carrier Bolts	65 in-lbs
Camshaft Cover Bolts	65 in-lbs
Camshaft Sprocket Bolts	105 in-lbs
Clutch Housing Bolts	25 ft-lbs
Clutch Housing Dust Cover Bolts	80 in-lbs
Clutch Pressure Plate Bolts	35 ft-lbs
Connecting Rod Cap Nuts	40 - 45 ft-lbs
Crankshaft Damper/Sprocket Bolts	15 ft-lbs
Cylinder Head Bolts	60 ft-lbs
Distributor Drive Sprocket Retaining Bolt	15 - 20 ft-lbs
Distributor Clamp Nut	25 ft-lbs
Distributor Housing to Engine Bolts	15 ft-lbs
Exhaust Manifold Bolts	15 ft-lbs
Fan Blade to Pump Bolts	20 ft-lbs
Flywheel Bolts	60 ft-lbs
Front Cover Bolts	50 in-lbs
Intake Manifold Bolts	20 ft-lbs
Main Bearing Cap Bolts	65 ft-lbs
Oil Drain Tube Nut	25 ft-lbs
Oil Drain Plug	20 ft-lbs
Oil Filter	20 ft-lbs
Oil Filter Connector-to-Case Bolt	30 ft-lbs
Oil Pan Bolts	25 ft-lbs
Oil Pump Bolts	30 ft-lbs
Spark Plug	12 - 15 ft-lbs
Water Pump-to-Case Bolts	15 ft-lbs
Water Outlet to Thermostat Housing – Thermostat Housing to Cylinder Head Bolts	65 in-lbs

SPECIAL TOOLS



1. J-24824 Valve Spring Compressor
2. J-24751 Camshaft Rotator
3. J-24705 Tappet Holder
4. J-24777 Camshaft Seal Installer
5. J-24704 Valve Tappet Holder
6. J-24703 Valve Guide Reamer (.003 O.S.)

SECTION 6T

EMISSION CONTROL SYSTEMS

CONTENTS OF THIS SECTION

Introduction

The Cosworth engine itself is an emission control system, that is, only the precise amount of air-fuel mixture needed to satisfy current operating demands is injected into the intake ports. The amount of fuel injected is metered by the opening of an electrically operated injector valve. The injector opening duration is controlled by an electric signal received from the electronic control unit, which is preprogrammed to transmit the correct pulse duration. Other features of the Cosworth engine that contribute to total combustion efficiency are: dual intake and exhaust valves, deep chamfered pistons and a high energy ignition system.

As a result of the Cosworth's combustion efficiency only three supplementary emission control systems are required; Positive Crankcase Ventilation (PCV). Pulse Air Injection Reactor (PAIR); and a catalytic converter. In addition, the air pollutants emitted from the fuel supply system are controlled by the Evaporative Control System (ECS), which functions similar to other Vega models.

POSITIVE CRANKCASE VENTILATION-PCV

The Positive Crankcase Ventilation (PCV) system removes the cylinder blow-by gases from the crankcase and routes them to the combustion chamber (Fig. 1a). Blow-by gases enter the crankcase during the last part of the combustion stroke. These gases include small amounts of unburned fuel, and other products of combustion, that leak past the piston rings into the crankcase. The gases leak or blow-by the pistons due to any of several reasons: high combustion chamber pressure, necessary working clearance of piston rings in their grooves, and normal ring shifting, that sometimes lines up clearance gaps of two or more rings. Over a period of time these gases can cause oil sludging that can result in corrosion and premature wear. Removal of these harmful gases is accomplished by purging the crankcase with filtered air from the air cleaner.

The Cosworth routes clean air from the air cleaner into the crankcase. This filtered air combines with the blow-by gases in the crankcase and is then routed up through the camshaft carrier, through the inlet manifold, and into the combustion chamber where it becomes part of the new air-fuel mixture. This mixing of ambient air and blow-by gases exists from the moment the engine operation begins, until it is completely shut down.

The only maintenance required is checking and/or replacing the PCV valve and hose.

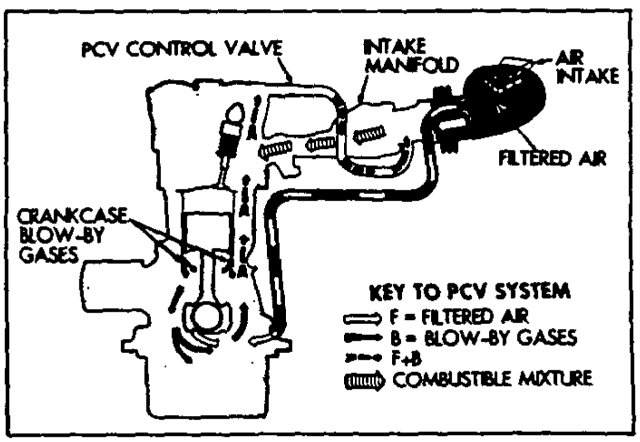


Figure 1a – Positive Crankcase Ventilation (PCV) System

PULSE AIR INJECTION REACTOR - PAIR

The Pulse Air Injection Reactor (PAIR) System is an exhaust emission control device which utilizes the exhaust pressure pulsation to draw air into the exhaust system. The fresh air is drawn from the clean side of the air cleaner through the engine fresh air vent lines to supply filtered air to avoid dirt build-up on the check valve seat and to serve as a muffler for noise reduction.

The PAIR System consists of four conventional air "check valves", one located on each of the four exhaust manifold legs directly adjacent to the engine cylinder head exhaust port and a pulse air shut off valve through which all the filtered air flows on its way to the four "check valves".

The internal mechanism of the PAIR check valves may assume two distinct positions discussed by the following:

The firing of the engine creates a pulsating flow of exhaust gases which are of positive or negative pressure depending if the exhaust valve is seated or not.

This pressure or vacuum is transmitted through a series of external pipes to the check valve.

1. If the pressure is positive, the disc is forced to the closed position and no air (exhaust gas) is allowed to flow past the valve and into the air supply line (fig. 2a, View 1).

2. If there is a negative pressure (vacuum) in the exhaust system at the valve, the disc will open allowing fresh air to mix with the exhaust gases (fig. 2a, View 2). The disc, due to the inertia of the system, fails to follow the pressure pulsations at high engine RPM's. At this point, the disc would remain closed preventing any further fresh air flow. The pulse air shut off valve incorporates a design feature that permits this valve to assume a position described as follows:

3. An override feature to shut off fresh air flow during engine overrun is also included to prevent exhaust after fire (fig. 3a, View 2). Throttle closure at the beginning of deceleration temporarily creates fuel air mixtures which are too rich to burn. These mixtures would become burnable when combined with fresh air. The next firing of the engine would ignite this mixture causing an exhaust explosion. Momentary diverting of the pulse air from the exhaust prevents this from occurring. This is accomplished by applying manifold vacuum to a diaphragm which closes a valve. A spring is used to hold the valve open during idle, part throttle, and wide open throttle. The valve is calibrated to close only at vacuums exceeding idle vacuum which only occurs during engine overrun conditions.

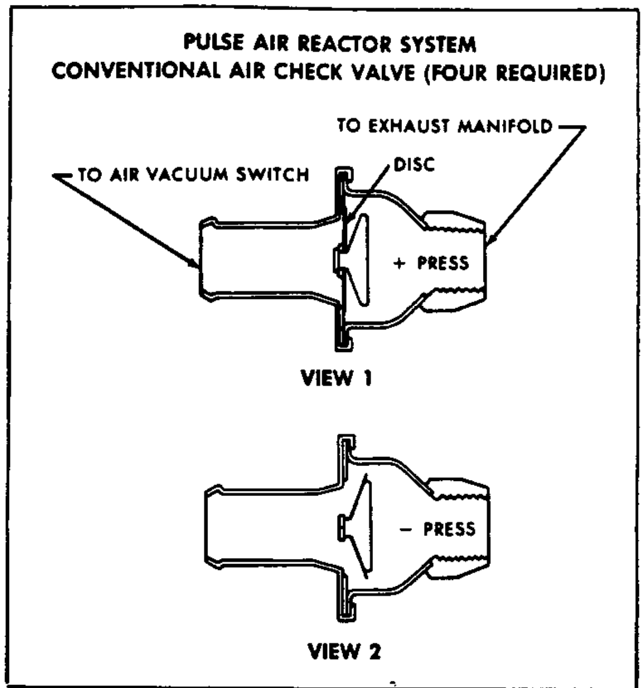


Figure 2a — Air Check Valve

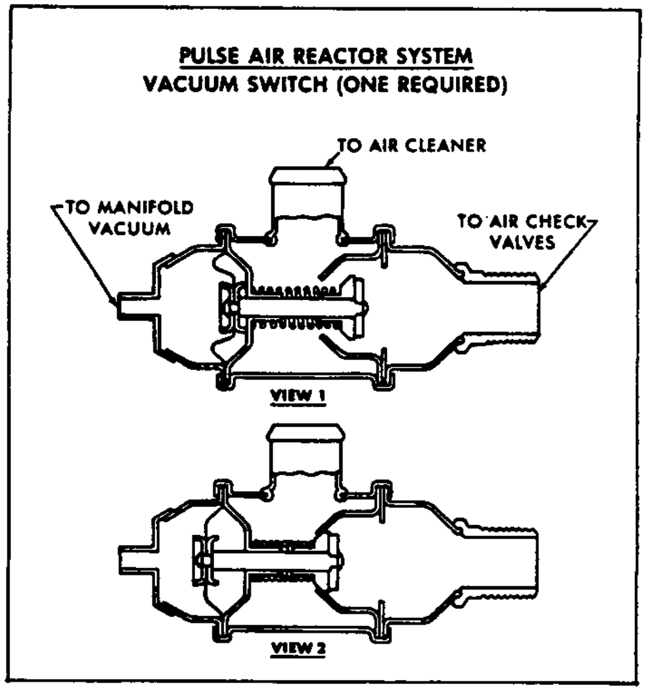


Figure 3a — Pulse Air Shut Off Valve

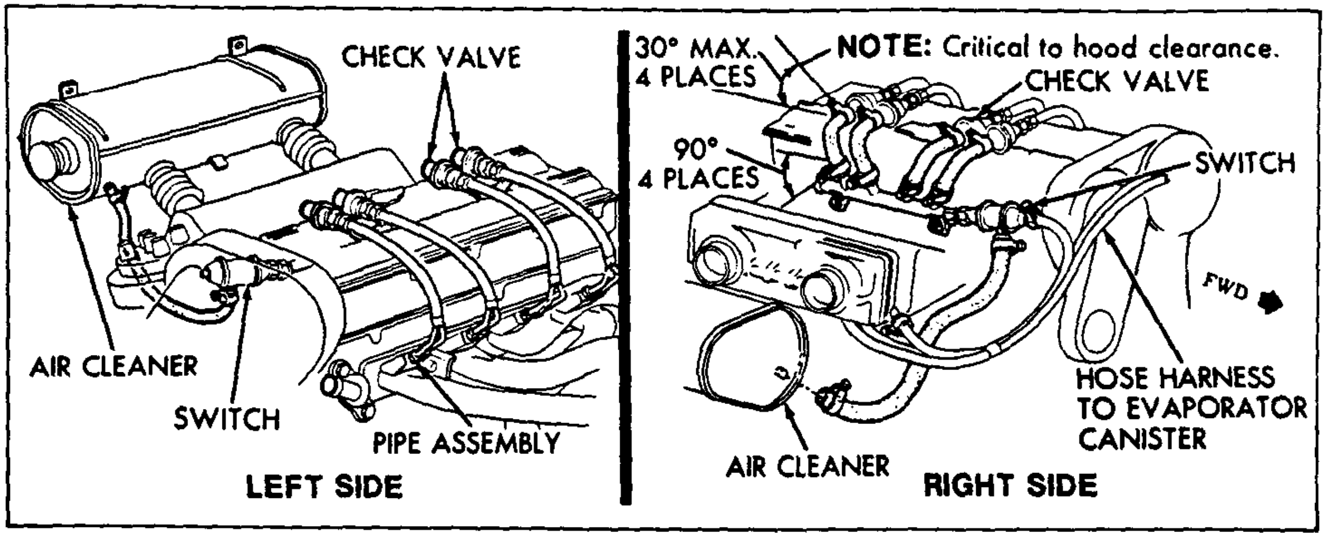


Figure 4a – PAIR System

PULSE AIR CHECK VALVES

Replacement (Fig. 4a)

1. Loosen four clamps securing hoses to pulse air check valves and disconnect hoses from valves.

   CAUTION: When reassembling pulse air hoses to check valves, make sure that hose clamp screws are positioned toward the rear of the engine compartment at an angle no greater than 30° from the surface of the camshaft carrier cover.

2. Remove pulse air check valves from pulse air pipes.
3. To replace, reverse steps 1 and 2.

PULSE AIR SHUT OFF VALVE (Air Switch)

Replacement (Fig. 4a)

1. Loosen two clamps securing vacuum hose and air intake hose to pulse air shut off valve, and disconnect hoses.
2. Remove pulse air manifold to engine mounting stud nuts, and rotate manifold away from engine.
3. Remove pulse air shut off valve by rotating counterclockwise.
4. To replace, reverse steps 1 thru 3 above.

CATALYTIC CONVERTER

The catalytic converter is an emission control device added to the exhaust system to reduce hydrocarbon and carbon monoxide pollutants from the exhaust stream. The converter contains beads which are coated with a catalytic material containing platinum and palladium. Use of the catalytic converter has allowed the engine to be designed for improved fuel economy and driveability.

The catalytic converter requires the use of unleaded fuel only.

Periodic maintenance of the catalytic converter is not required; however, if the car is raised for other service, it is advisable to check the general condition of the catalytic converter.

Refer to 1975 Vega Service Manual for replacement of catalytic converter bottom cover.

Refer to Section 8 for replacement of the catalytic converter.

CAUTION: When jacking or lifting vehicle from frame side rails, be certain lift pads do not contact catalytic converter as damage to the converter will result.

EVAPORATIVE CONTROL SYSTEM ECS

The Evaporative Control System (ECS) is designed to minimize the loss of vaporized gasoline into the atmosphere. The system is composed of a fuel tank vapor dome, vapor pipe and a storage canister (fig. 5a). Vapors are collected through these components and are fed into the combustion chamber.

In order to collect as much vapor as possible, the fuel level was reduced by lowering the filler neck from the highest point of the tank by approximately one inch. This allows room for liquid expansion and vapor collection on top of the liquid.

In order to prevent a vacuum collapse or pressure expansion, the fuel tank cap has been modified to release excess pressure or allow additional ambient air to enter during stages of high vacuum. The cap has a dual locking action. The second set of locking ears on the cap provides a slow bleed of any residual fuel tank pressure when the cap is removed.

The vapor dome on top of the fuel storage tank is where the vapors collect. From the tank they route to the front of the vehicle to the charcoal canister through the vapor lines.

The canister is located in the engine compartment and contains approximately 1 1/2 pounds of activated charcoal. During periods of vehicle inoperation, vapors from the fuel tank are absorbed and stored on the charcoal.

The canister has a staged purge system which has two means of drawing vapors into the engine. At closed throttle, only vapors from the fuel tank are drawn into the engine. When the throttle is opened, a ported vacuum source operates a valve in the canister which allows the engine to consume the vapors stored in the canister in addition to the fuel tank vapors.

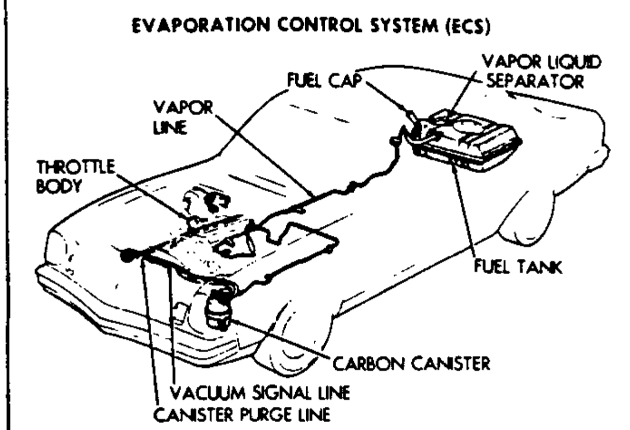


Figure 5a – Evaporation Control System (ECS)

The same canister is used on the Cosworth Vega as on a basic Vega. The hose on canister connection marked "CARB" goes to signal connection on throttle body. The hose on canister connection marked "PCV" and held with a red clamp goes to vapor draw connection on throttle body. The hose on canister connection marked "FUEL TANK" is fuel vent pipe and is held with a yellow clamp. The canister connection marked "CARB BOWL" is plugged.

The Evaporation Control System should not require any maintenance other than the charcoal canister filter replacement. Refer to Section 8 for replacement of filter.

Diagnosis

POSITIVE CRANKCASE VENTILATION – PCV

COMPLAINT	CAUSE	CHECK
Rough Idle Oil Present in Throttle Body and/or Air Cleaner Oil Leaks Excessive Oil Sludging or Diluting	Improper operation of PCV System	PCV Valve — Remove and shake the valve. If a clicking sound is heard, this indicates the valve is free. If no clicking sound can be detected replace the valve. Also refer to maintenance schedule in Section 0

PULSE AIR INJECTION REACTOR – PAIR

COMPLAINT	CAUSE	CHECK
Exhaust Afterfire on Vehicle or Engine Deceleration	Air shut off valve not operating properly	All Connections and Routings Replace damaged valve. Also refer to maintenance schedule in Section 0
Exhaust Noise	Improper operation of pulse air valve diaphrams	Replace damaged valve Also refer to maintenance schedule in Section 0

EVAPORATIVE CONTROL SYSTEM – ECS

COMPLAINT	CAUSE	CHECK
Fuel Odor or Loss	Leaking Connections	All Connections and Routings
	Pinched or Plugged Purge Lines	Replace
	Improper Fuel Tank Cap	Replace
	Plugged Canister Filter	Replace
Collapsed or Bulged Tank	Plugged Vent Pipes	Replace
	Plugged Fuel Tank Cap	Replace

SPECIFICATIONS

TORQUE VALUES

Pulse Air Hose Clamps	12-18 in-lbs
Pulse Air Manifold Attaching Nuts	15-20 ft-lbs
Pulse Air Shut Off Valve	30-45 ft-lbs
Pulse Air Check Valve to Pipe	100-125 in-lbs
Pulse Air Pipe to Manifold	150-175 in-lbs

SECTION 6Y

ENGINE ELECTRICAL

HIGH ENERGY IGNITION SYSTEM

The Cosworth distributor and coil is the same as used in 1975 Vega and Monza 2+2 except that Cosworth does not use a vacuum can (vacuum advance). Refer to Section 6Y of the 1975 Vega and Monza 2+2 Service and Overhaul Manual Supplement for all service procedures.

SPECIFICATIONS

BATTERY

Model No.	Application	Cold Crank Rate	Cranking Power @ 0° F. (Watts)	25 Amp. Reserve Capacity (Minutes)
1980407 (Y87P)	All (Base)	275A @ 0°	2500	60
1980408 (R87P)	All (With UA1)	350A @ 0°	3200	80

GENERATOR

Model No.	Application	Delco Remy Spec. No.	Field Current Amps (80° F) @ 12 Volts	Cold Output* Amps @ 5000 RPM	Rated Hot Output** Amps
1102850	All (Base)	4521	4 - 4.5	38	42
1102853	All (With C49)	4522	4 - 4.5	57	61

*Generator temperature approximately 80° F.
**Ambient temperature 80° F.

DISTRIBUTOR

Model No.	Application	Emiss. Class.	Engine Usage	Centrifugal Advance	Vacuum Advance	Initial Timing	Spark Plug
1110649	All	L.D.	Nationwide	0° @ 2000 17° @ 3650	NONE	12° BTC	R43LTSX (.060)

STARTING MOTOR

Model No.	Application	Spec. No.	Free Speed		
			Volts	Amperes	RPM
1108773	All	C-3500	9	50 - 75*	6,500 - 10,000

*Includes Solenoid

SECTION 8

FUEL TANK AND EXHAUST SYSTEM

CONTENTS OF THIS SECTION

FUEL TANK

SERVICE OPERATIONS

DRAINING FUEL TANK

The absence of a gas tank drain plug makes it necessary to siphon fuel from the tank when draining is needed. The following procedure is recommended:

If a car is to be stored for any appreciable length of time, the gasoline should be drained from the complete system, including fuel pumps, all fuel lines, and the fuel tank in order to prevent gum formations and resultant improper engine performance.

WARNING: Before attempting fuel tank draining, always; remove battery negative cable from battery, place "NO SMOKING" signs and a CO2 fire extinguisher near work area, wear safety glasses, and siphon or pump fuel from tank into an explosive proof container.

1. Using 3/8" I.D. X 5/8" O.D. hose allow 4 feet to be inserted in the tank for draining.
2. Insert a 4" piece of 3/8" copper line into the end of the hose, so the hose will more easily fit through the tank baffle and extend to the bottom of the tank.
3. A hand operated pump device should be used to drain fuel tank. The manufactures instructions should be carefully followed for the particular equipment being used.

NOTE : Never drain or store gasoline in an open container.

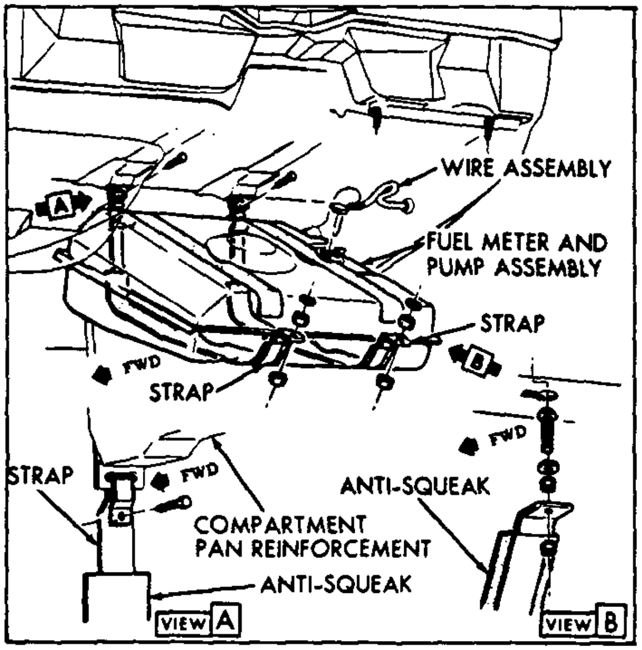


Fig. 1 – Fuel Tank

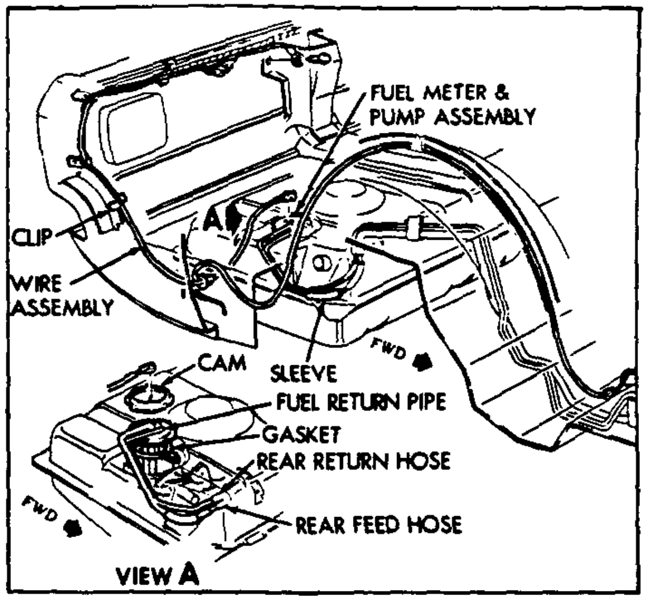


Fig. 2 – Fuel Meter and Pump

FUEL TANK

Replacement (Fig. 1)

> WARNING: Before attempting fuel tank removal, always remove negative cable from battery, place "NO SMOKING" signs and a CO_2 fire extinguisher near work area, wear safety glasses, and siphon or pump fuel from tank into an explosive proof container.

1. Disconnect negative cable from battery post.
2. Drain fuel tank.
3. Raise vehicle on hoist.
4. Disconnect fuel feed and return hoses at gauge unit pickup pipes (fig. 3).
5. Disconnect tank vent hose at fuel tank (fig. 3).
6. Remove tank strap bolts and lower tank carefully.
7. Disconnect connector at fuel meter and pump assembly.
8. To install, reverse Steps 1 through 7.
9. Remove vehicle from hoist.

FUEL METER AND PUMP

Replacement (Fig. 2)

1. Follow Fuel Tank Replacement procedure, and remove fuel tank.
2. Use Tool J-24187 to remove cam lock.
3. Remove unit and gasket.

   CAUTION: Remove unit carefully to avoid damage to screen at end of pickup pipe.
4. Clean strainer screen by blowing out with compressed air.
5. Reverse removal procedure to install.

   CAUTION: When installing cam lock, it may be necessary to compress gasket slightly by pressing down on Gauge Tool. Once cam lock is started under retaining tangs, pressure may be released.

   Always use a new gasket when replacing or installing a new gauge unit.

FUEL FILLER NECK

Replacement

Refer to 1975 Vega Service Manual for replacement of fuel filler neck.

FUEL TANK PURGING AND LEAK TEST PROCEDURE

Refer to 1974 Vega Service Manual for procedure.

FUEL AND VAPOR PIPES

General

The fuel feed, fuel return and vapor pipes are routed along the right underbody (fig. 3). They are secured with clamp and screw assemblies. Flexible hoses are located at the fuel tank, fuel pressure regulator, filter and rear vapor pipe-to-front vapor pipe. Refer to Section 6M for replacement of the external high pressure fuel pump. Refer to figure 4 for replacement of fuel filter assembly.

The pipes should be inspected occasionally for leaks, kinks or dents. If evidence of dirt is found on a disassembly, the pipe should be disconnected and blown out.

Replacement

If replacement of a fuel pipe is required use only double wrapped and brazed steel tubing meeting GM Specification 123M or its equivalent. Under no condition use copper or aluminum tubing to replace steel tubing. Those materials do not have satisfactory fatigue durability to withstand normal vehicle vibrations.

Steel tubing should be flared using the upset (double lap) flare method which is detailed in the 1974 Vega Service Manual, Section 5, hydraulic brake tubing.

Repair

WARNING: Do not use rubber hose repair procedure that would allow repaired area within four inches of any part of the exhaust system.

1. Cut out damaged portion of fuel line.
2. In repairable area, cut a piece of fuel hose 4" longer than portion of line removed. Use hose marked "EVAP" meeting GM Specification 6107M or its equivalent.
3. Slide clamps onto pipe and push hose 2" onto each portion of fuel pipe.
4. Clamp hose to pipe on each side of repair.

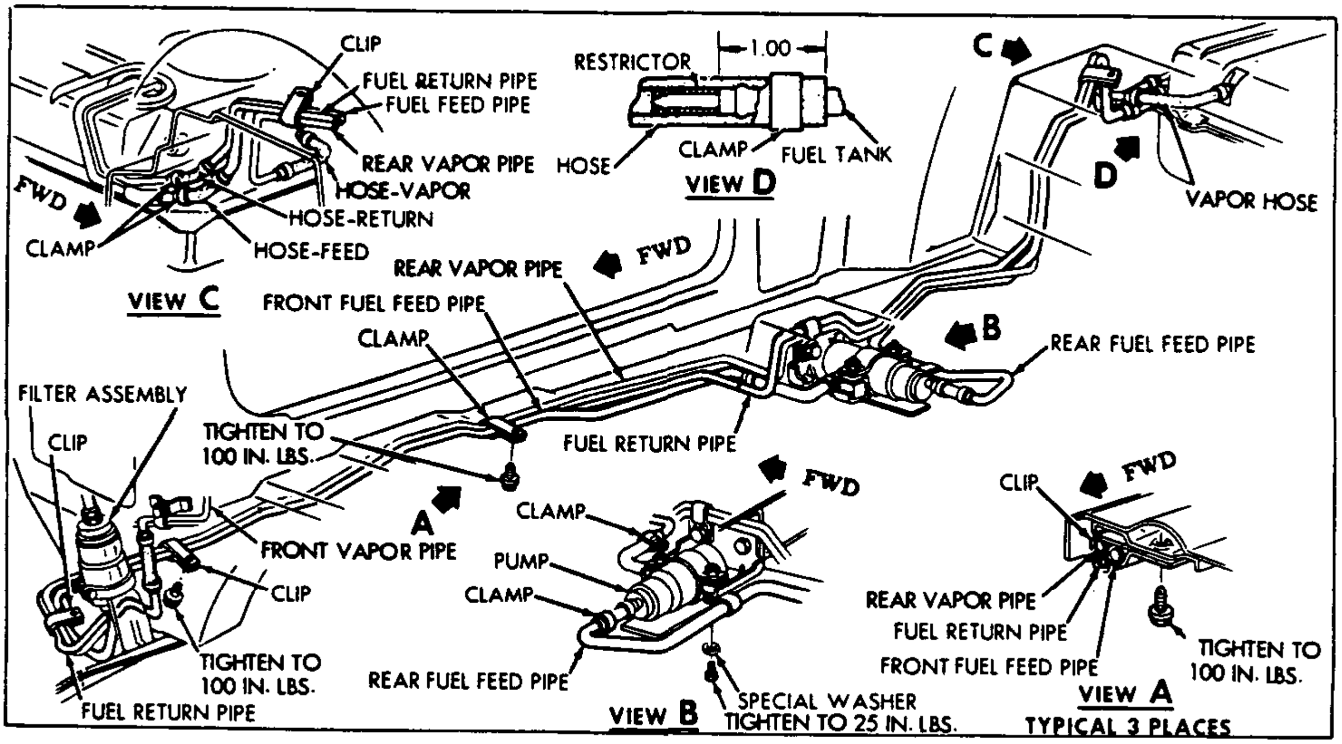


Fig. 3 – Fuel & Vapor Pipes

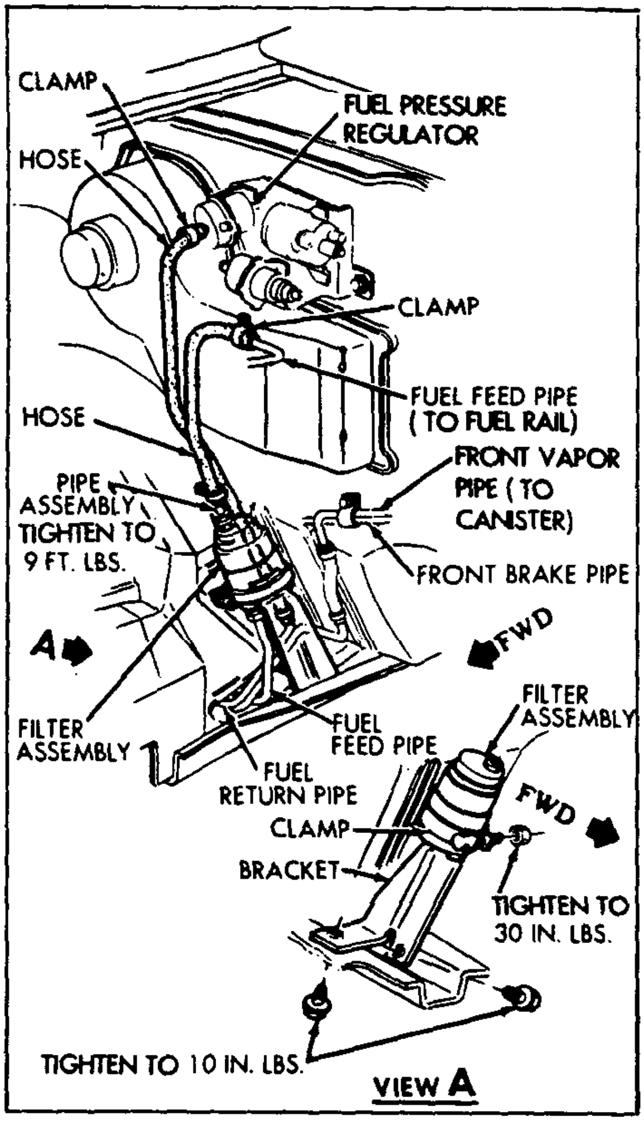


Figure 4 – Fuel Filter Assembly

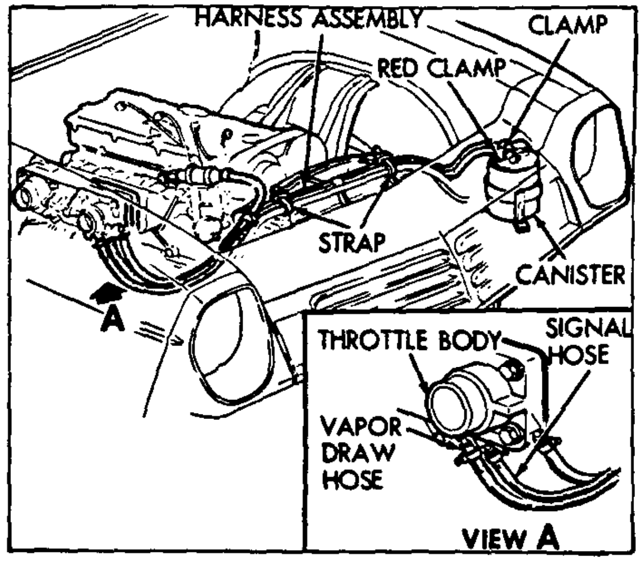


Fig. 5 – Evaporation Control System Canister and Hoses

EVAPORATION CONTROL SYSTEM (ECS)

GENERAL

The Cosworth Vega has a staged purge system which uses a canister having two means of drawing vapors into the engine. At closed throttle, only vapors from the fuel tank are drawn into the engine. When the throttle is opened, a ported vacuum source operates a valve in the canister which allows the engine to consume the vapors stored in the canister in addition to the fuel tank vapors.

The same canister is used on the Cosworth Vega as on a basic Vega. Refer to figure 5 for canister hose routing. The hose on canister connection marked "CARB" goes to signal connection on throttle body. The hose on canister connection marked "PCV" and held with a red clamp goes to vapor draw connection on throttle body. The hose on canister connection marked "FUEL TANK" is fuel vent pipe and is held with a yellow clamp. The canister connection marked "CARB BOWL" is plugged.

The Evaporation Control System should not require any maintenance other than the charcoal canister filter replacement.

CANISTER FILTER

Removal

1. Remove windshield washer reservoir.
2. Note installed position of hoses on canister.
3. Disconnect hoses from top of canister.
4. Loosen clamps and remove canister.
5. Replace filter by removing from bottom of canister with your fingers.

Inspection

1. Check hose connection openings. Assure that they are open.
2. Check operation of purge valve by applying vacuum to the valve. A good valve will hold vacuum.

Installation

1. Install new filter.
2. Install canister and tighten clamp bolts.
3. Connect hoses to top of canister in same position as in Step 3 above.

NOTE: If replacing hose, use only replacement hose marked, "EVAP" or meeting GM Specification 6107M or its equivalent.

4. Install windshield washer reservoir.

EXHAUST SYSTEM

DESCRIPTION

The exhaust system consists of a front exhaust pipe, catalytic converter, rear exhaust pipe and a transverse mounted muffler with short duel tail pipes exhausting behind left rear wheel.

The catalytic converter is an emission control device added to the exhaust system to reduce hydrocarbon and carbon monoxide pollutants from the exhaust gas stream. The converter contains beads which are coated with a catalytic material containing platinum and palladium.

The catalytic converter requires the use of unleaded fuel only.

Periodic maintenance of the exhaust system is not required; however, if the car is raised for other service, it is advisable to check the general condition of the catalytic converter, pipes and mufflers.

CAUTION: When jacking or lifting vehicle from frame side rails, be certain lift pads do not contact catalytic converter as damage to converter will result.

SERVICE PROCEDURE

MUFFLER AND TAIL PIPE (Fig. 6)

NOTE: When replacing a muffler, it is necessary to replace the tail pipe at the same time.

Removal

1. Raise vehicle on hoist.
2. Remove exhaust pipe clamp at muffler.

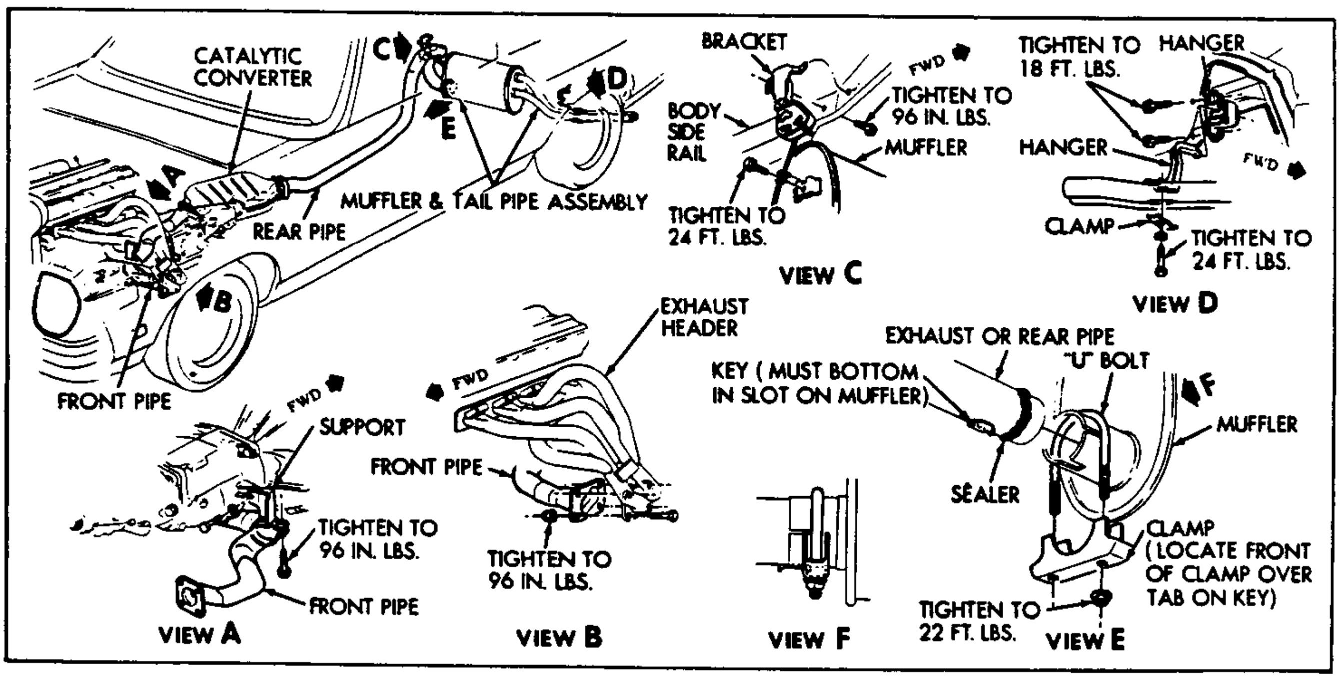


Fig. 6 – Exhaust Pipe, Muffler and Tail Pipe

3. Remove tail pipe hanger clamp at the pipe.
4. Remove muffler hanger from muffler.
5. Remove muffler and tail pipe.
6. Inspect muffler and tail pipe hanger. Replace bracket mounting insulator assembly if fatigued.

Installation

1. Install tail pipe to hanger. Do not tighten hanger screws.
2. Apply exhaust sealing compound to exhaust pipe, install muffler onto exhaust pipe and add clamp - do not tighten clamp.
3. Attach muffler hanger to muffler. Do not tighten screw.
4. Check all clearances.
5. Tighten tail pipe clamp and muffler hanger to 25 foot pounds. Tighten clamp at muffler 20 to 25 foot pounds.
6. Lower vehicle and remove from hoist.

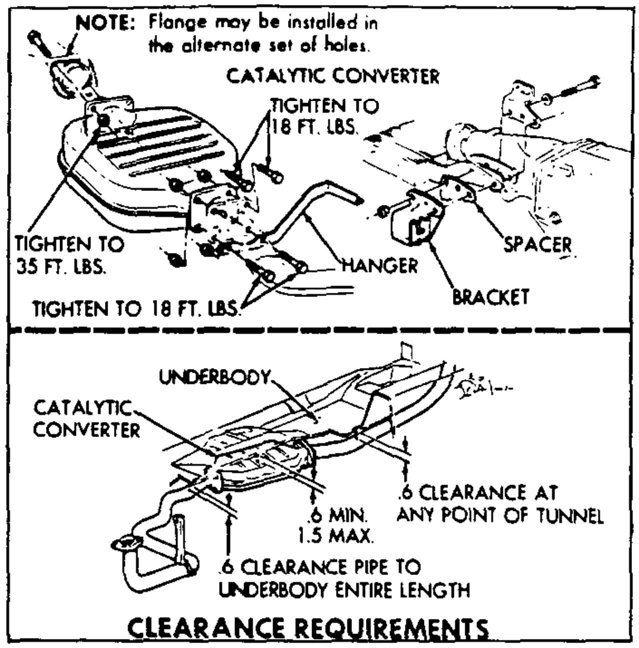


Fig. 7 – Catalytic Converter

REAR EXHAUST PIPE

Replacement (Fig 6)

1. Raise vehicle on hoist.
2. Remove clamp from pipe-to-muffler.
3. Disconnect pipe at catalytic converter.
4. Remove pipe.
5. Reverse removal procedure to install.

FRONT EXHAUST PIPE

Replacement (Fig. 6)

1. Raise vehicle on hoist.
2. Disconnect front exhaust pipe at exhaust header.
3. Remove support.
4. Disconnect pipe at catalytic converter and remove pipe.
5. Reverse steps 1 through 4 to install.

CATALYTIC CONVERTER

Replacement (Fig. 7)

To remove converter, disconnect at front and rear exhaust pipes. Install catalytic converter so that fill plug is located down and forward.

Catalyst Replacement

If necessary, the catalyst in the converter can be replaced on the car with Tool No. J-25077. Refer to 1975 Vega Service Manual for catalyst replacement procedure.

Catalytic Converter Bottom Cover Replacement

If, for any reason, the bottom cover of the converter is torn or severely damaged, it can be replaced with a repair kit. Refer to 1975 Vega Service Manual for catalytic converter bottom cover replacement.

SECTION 12

ELECTRICAL—BODY AND CHASSIS

Service procedures for Cosworth Vega body and chassis electrical components are identical with those of the base Vega. Refer to Vega service and overhaul manual for service procedures.

Wiring diagrams that differ with those of the base Vega are shown in this section (Figs. 1 through 5).

Specifications for Cosworth Vega body and chassis electrical are listed immediately following the wiring diagrams.

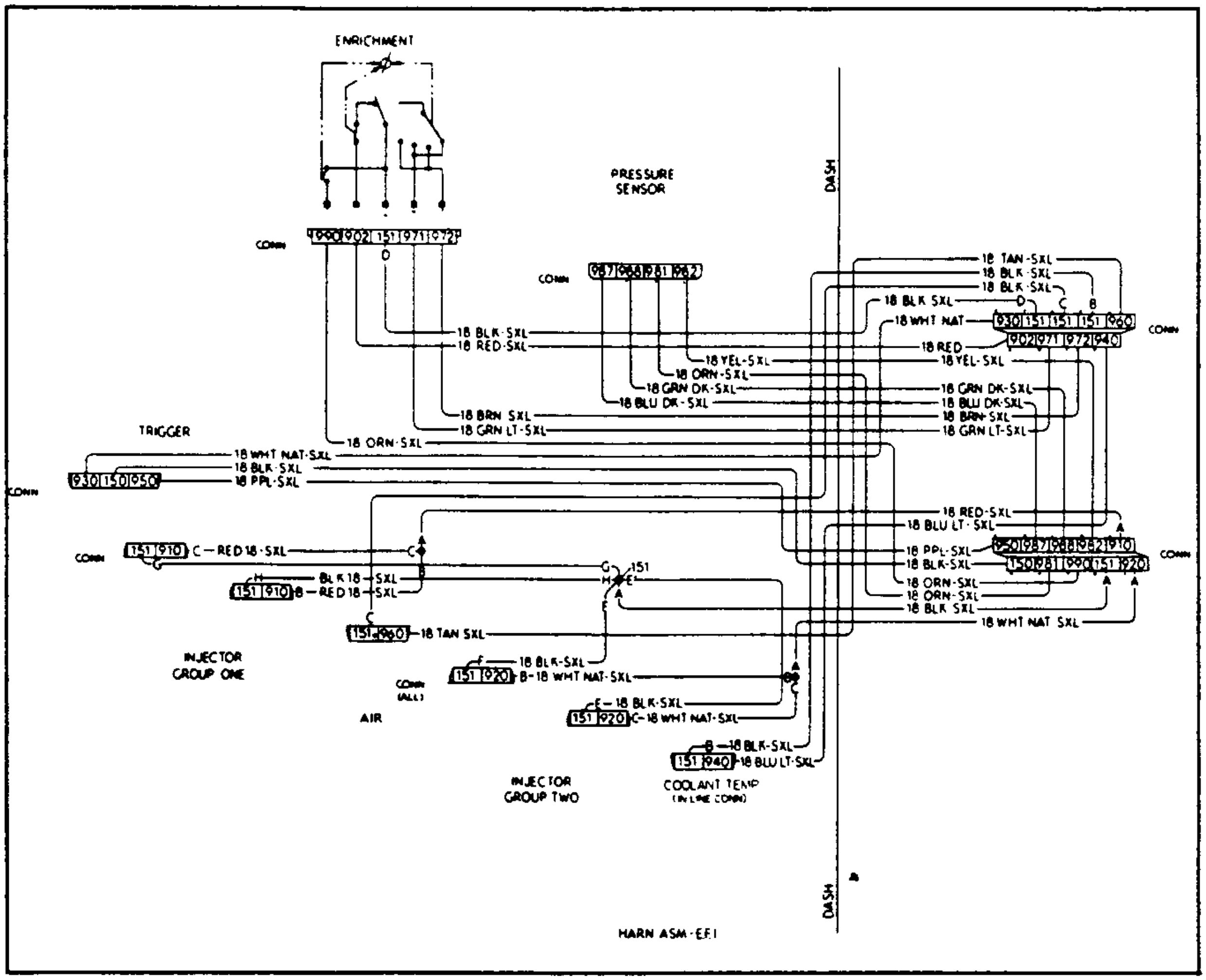


Fig. 12-1 Electronic Fuel Injection Harness

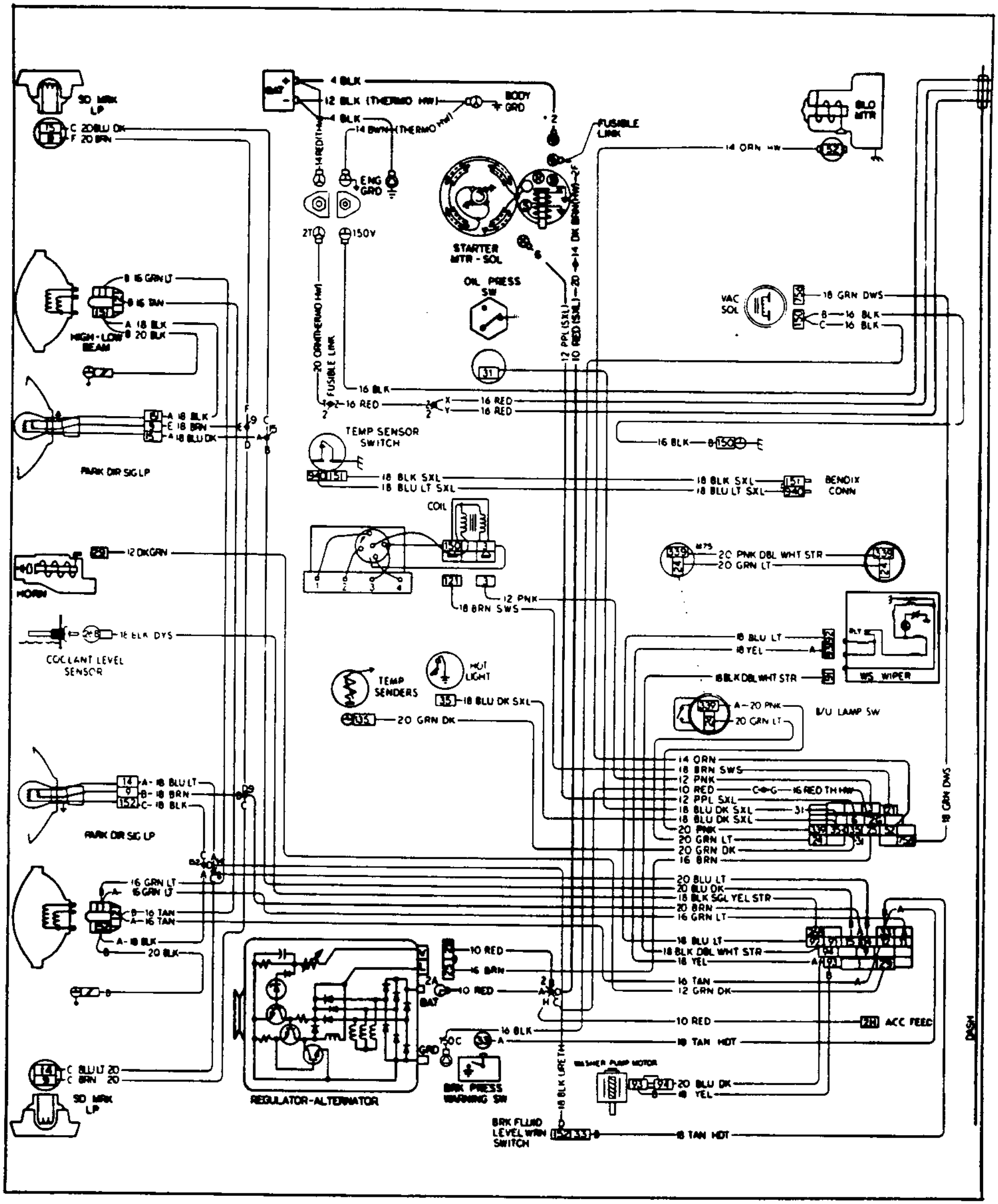


Fig. 12-2 Engine Compartment

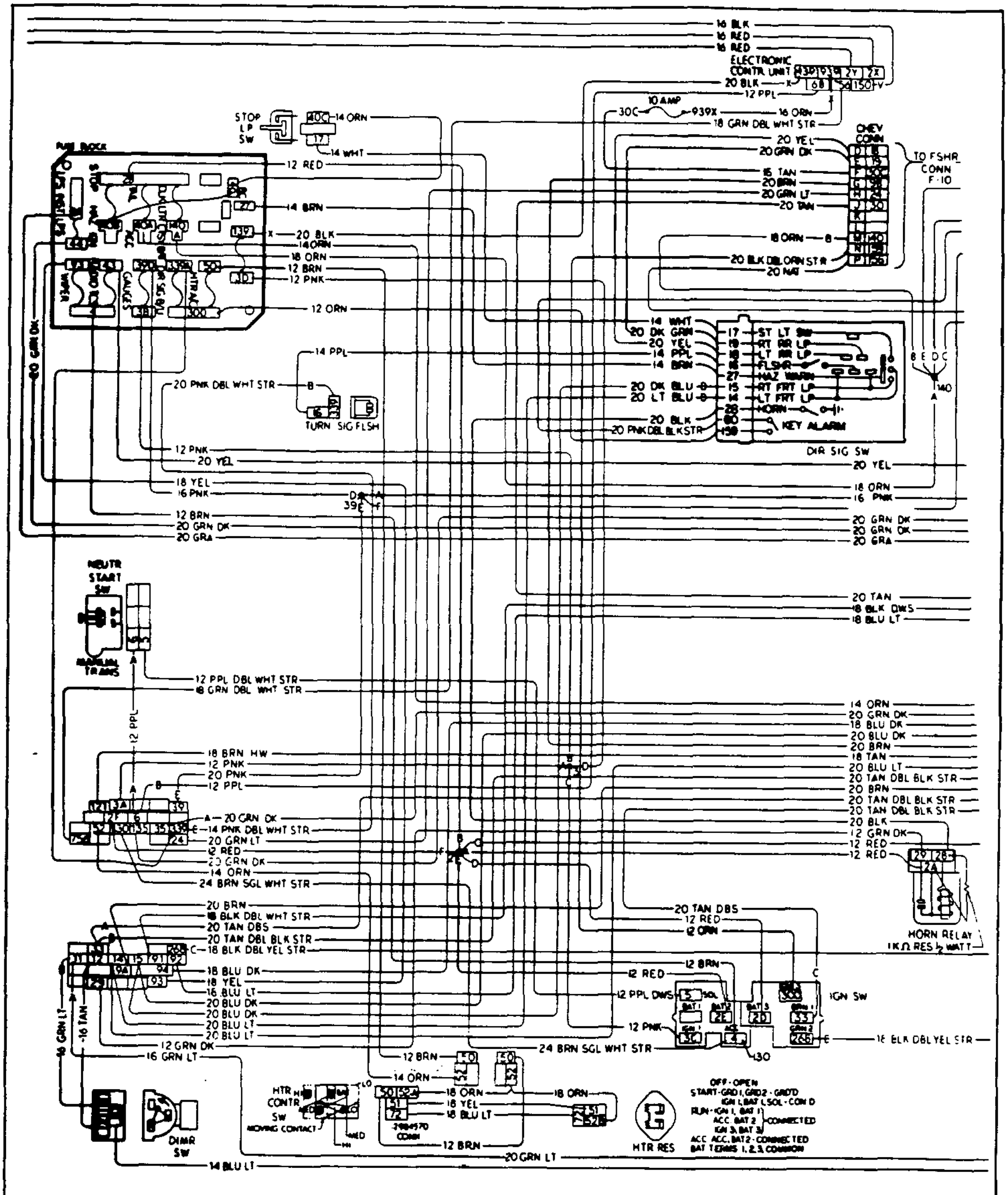


Fig. 12-3 Instrument Panel

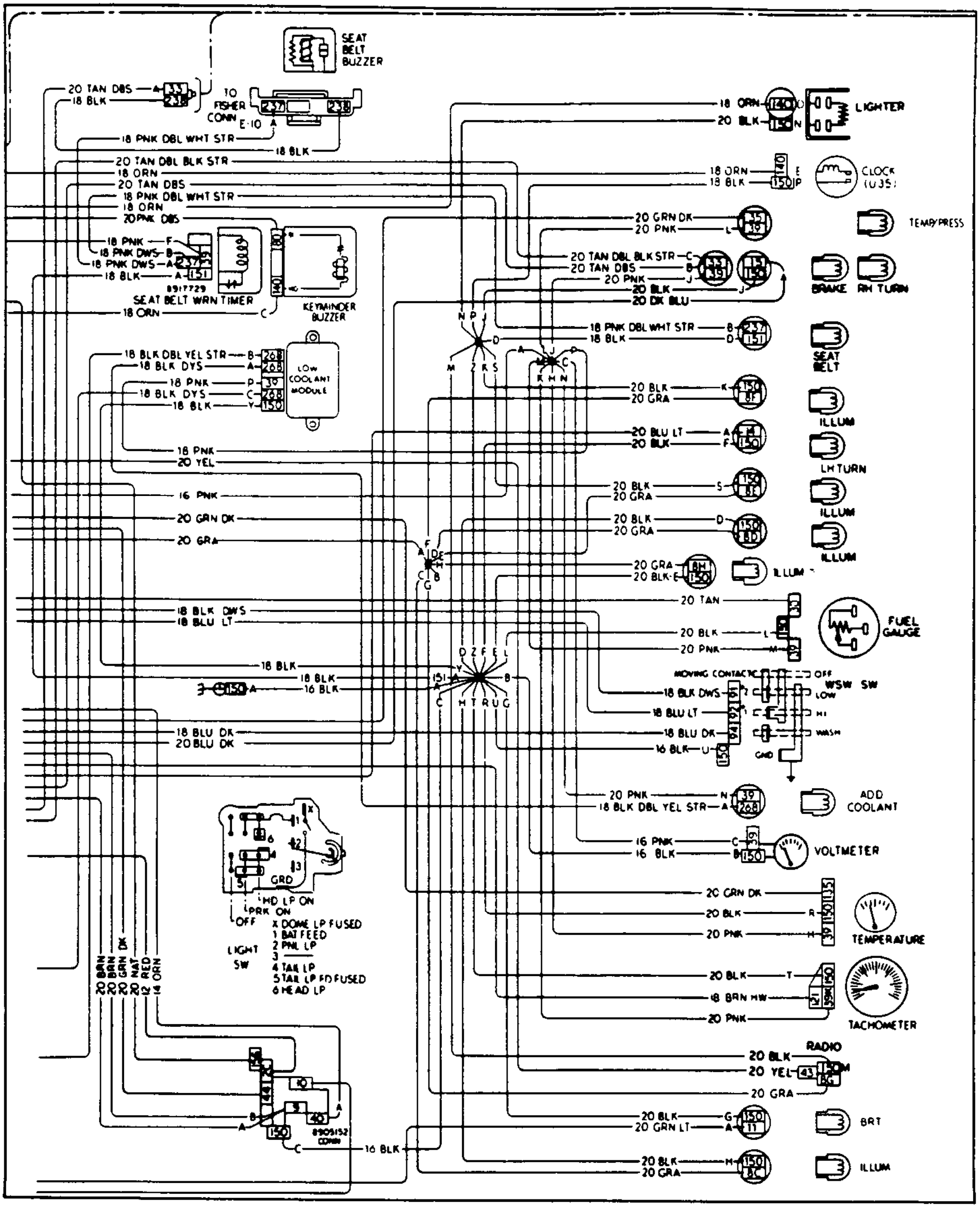


Fig. 12-4 Instrument Cluster

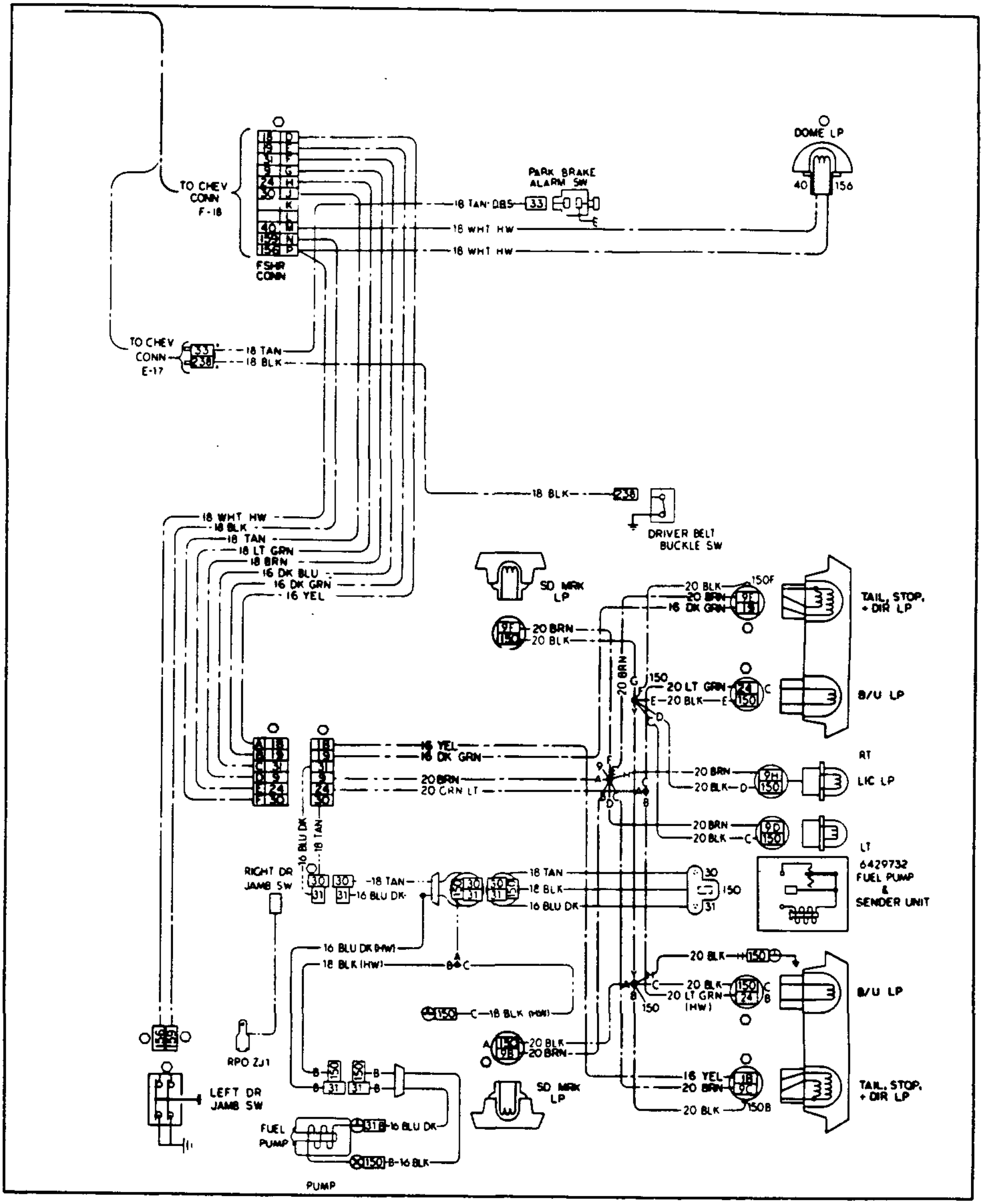


Fig. 12-5 Body & Rear Lighting

SPECIFICATIONS

FUSED CIRCUITS

COSWORTH VEGA

ITEMS	CP	QTY	AMP	Instrument Lamps	Directional Signals Back-Up	Gauges	Tail	Heater & A/C	Elect. Fuel (Inline)	Wiper	Stop Hazard	Courtesy Clock-Lighter	Radio TCS
ITEMS		QTY	AMP	8	339	39	40	50 ·	60	93	140	140	141
Key Wrng. Buzzer		1	.60									.60	
Cigarette Lighter		1	8.5									8.5	
Clock		1	5.1									5.1	
Defogger Rear		1	2.0		2.0								
		1											
Gauge Fuel		1	.35			.35							
		1											
Gauge Temp.		1	.27										
Heater		1	8.0					8.0					
Seat Belt Wrng Buzzer		1	.60			.60							
		1											
Wiper W/S 28.6 Stall 6.1 on Low		1	6.1							6.1			
Radio U63 1.5 U69 2.5			2.5										2.5
Fuel Pump (Primary)		1	4.8						4.8				
Fuel Pump (Secondary)		1	1.0						1.0				
Electronic Control Unit (ECU)		1	3.0			3.0							
Lamps	CP												
Backing	32	2	2.10		4.20								
Brake Alarm	2	1	.27			.27							
Cluster	2	5	.27	1.35			1.35						
Dome	12	1	.95									.95	
Generator Wrng.	2	1	.27			.27							
License	3	2	.59				1.18						
Oil Press. Wrng.	2	1	.27			.27							
Parking	3	2	.59				1.18						
Radio Dial Ind.	3	1	.50	.50			.50						
Seat Belt Wrng.	2	1	.27			.27						.27	
Seat Sep. Shift Ind.	2	1	.27	.27			.27						
Side Marker (Front)	2	2	.27				.54						
Stop	32	2	2.10								4.20		
Tail	3	2	.59				1.18						
Side Marker (Rear)	2	2	.27				.54						
Traffic Hazard													
Rear	32	2	2.10								4.20		
Front	32	2	2.10								4.20		
Front FDR Marker	2	2	.27								.54		
Indicator (I.P.) LP	2	2	.27								.54		
Direction Signal													
Front	32	2	2.10		2.10								
Rear	32	2	2.10		2.10								
Front FDR Marker	2	2	.27		.27								
Indicator (I.P.) LP	2	2	.27		.27								
TOTAL LOAD MAXIMUM				2.12	10.94	6.02	6.74	8.0	5.8	6.1	9.48	15.42	2.5
FUSE RELEASED				4	20	10	20	25	10	25	20	20	10

SECTION 6M

ENGINE FUEL

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The Electronic Fuel Injection (EFI) system is a conventional pulse-time manifold injection system that injects a precise amount of fuel into the cylinder chamber for combustion. The system has four main areas: (1) Electronic Control Unit; (2) Fuel Delivery System; (3) Air Induction System; (4) Engine Sensing System. Each area controls a specific function, but all work simultaneously to control the precise amount of fuel injected for the prevailing engine condition.

The Electronic Control Unit (ECU) is energized when the ignition switch is in the ON position. The ECU receives electronic signals from the engine sensing system, analyzes the information and sends electrical signals to the injector valves.

The Fuel Delivery System incorporates two fuel pumps, a fuel filter, four injector valves, a fuel pressure regulator and fuel lines. The fuel circuit is energized through the ECU. The pumps supply fuel from the fuel tank through the fuel system to the injectors. Fuel line pressure is maintained at 39 pounds per square inch (PSI) above existing manifold pressure by the fuel pressure regulator. Excess fuel at the pressure regulator is returned to the fuel tank.

The Air Induction System is composed of a throttle body, a fast idle valve, an air solenoid valve and an intake manifold. Air required for combustion reaches the cylinder by way of the throttle body and intake manifold. The fast idle valve provides additional air to the manifold when the engine is cold. The air solenoid valve controls the engine speed during cold starts and engine warm-up.

Five separate sensors form the Engine Sensing system: an inlet manifold air pressure sensor, a throttle position switch, a coolant temperature sensor, an air temperature sensor and a speed sensor. Parallel circuits from each sensor to the ECU permit the sensors to operate independent of each other. Each sensor transmits a signal to the ECU, relating its prevailing operating condition. The ECU analyzes the signals and transmits the appropriate commands to the injector valves.

The EFI system was developed to satisfy stringent emission control requirements and market demands for a technologically advanced responsive vehicle. The EFI system provides instantaneous response to throttle demands by injecting the required precise amount of fuel in the inlet passage, directly above the inlet valve, greatly enhancing vehicle performance.

THEORY OF OPERATION

When the ignition switch is in the ON position, all sensors transmit an electric signal to the prime component of the system; the Electronic Control Unit (ECU). At the same time, the fuel system is activated. Current is supplied to the ECU and then to both, the in-tank fuel pump and the external fuel pump.

The ECU analyzes the information received from the engine sensors and sends electrical signals to the injector valves in the form of controlled pulses. The duration of the pulse varies depending on engine conditions, determined by the ECU from the input of the sensor group, resulting in a precise amount of fuel being injected into the cylinders.

Throughout the entire operating cycle, the ECU receives electric signals from the engine sensor group. The combination of all these sensor signals are summarized by the ECU. A "decision" is made to open the injectors for a specific length of time and, accordingly, an electric signal is transmitted to the injectors. The operating conditions that change the injection pulse duration are: air temperature, engine coolant temperature, inlet manifold air pressure, RPM change and position of throttle body blade.

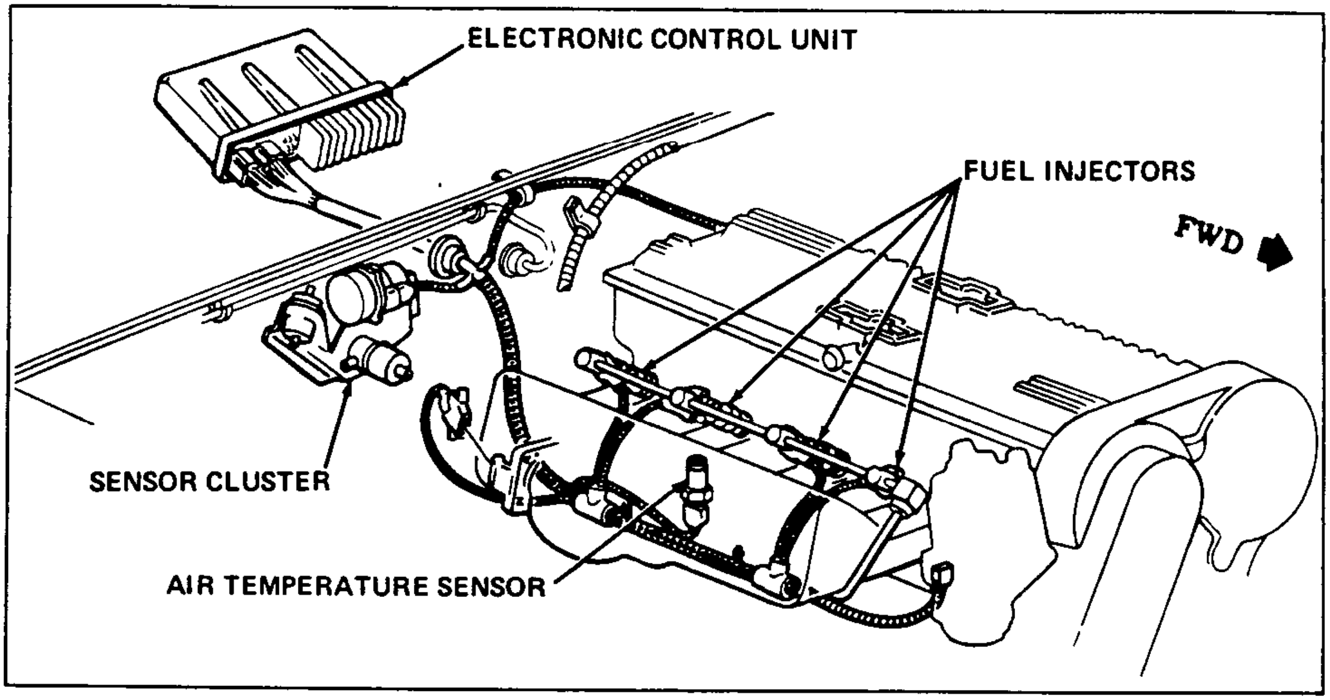


Figure 6M-1—Electronic Fuel Injection System

ELECTRONIC CONTROL UNIT (Fig. 1)

The Electronic Control Unit (ECU) is the heart of the EFI system. This is where all sensor impulses are received, evaluated and summarized to determine what fuel requirements are necessary, before the appropriate impulse is sent to the fuel injectors. Output of all sensors is input to the ECU. The control unit is calibrated to analyze all combinations of input, to meet all modes of engine operation. The components of the control unit are mounted on a printed circuit board which is protective coated after assembly and calibration.

The control unit exterior is of cast aluminum construction and is mounted under the instrument panel just above the glove compartment. The harness that connects to the sensors and injectors all plug into the control unit at one location. The harness connector is designed so that the connector will plug-in one way only. The unit can be checked by operating the engine and using the system analyzer. The components of the control unit cannot be serviced. When a control unit is diagnosed to be defective, a known good unit must be installed.

AIR TEMPERATURE SENSOR (Fig. 1)

The air temperature sensor is located in the bottom of the intake manifold, in the number 3 inlet port, with the tip protruding inside the manifold enough to sense the density of the inducted air. The sensor incorporates a temperature sensitive transistor that transmits varying amounts of current to the control unit. The amount of current flow becomes a factor in establishing the need for fuel enrichment, which results in the length of time the fuel injectors are opened. Sensor output is operative over temperature range of -20° to +300°F. Even under the most critical of temperature conditions, the sensors are accurate to within ±2°F; with a slightly broader tolerance being allowed at the two extremes. This sensor must be replaced with a known good unit if it is found to be defective.

FUEL INJECTOR (Fig. 1)

The injector valves are electromagnetically actuated and serve to both meter and atomize the fuel. The injector is composed of a solenoid with the plunger attached to a needle valve. The needle valve is a pintle type and opens inwardly. A helical spring holds the valve closed as long as the solenoid is not actuated.

The fuel is metered by the valve opening in response to commands received from the electronic control unit (ECU). The injector is capable of opening or closing in a time period of one thousandth of a second. Typical injection time for most engine operations ranges from 2 to 10 thousandths of a second. The injected fuel is atomized when met with air from the throttle body.

The injectors are mounted in the fuel rail and are positioned to direct the fuel to the upstream side of the intake valve. The relatively narrow spray-cone angle of the injector minimizes intake manifold wall wetting. The injectors are interchangeable between cylinders and can be mounted one way only. The injectors are not adjustable or serviceable. If diagnosed to be defective, they must be replaced as a unit. It is NOT necessary to replace in sets or pairs since they operate totally independent of one another.

FUEL PRESSURE REGULATOR (Fig. 2)

The fuel pressure regulator is mounted underhood on the sensor cluster bracket in series with the fuel rail. It maintains fuel at a constant pressure to the fuel rail in relation to the inlet manifold pressure. The regulator is a diaphragm operated relief valve in which one side of its diaphragm senses fuel pressure while the other side is exposed to intake manifold pressure. A spring mounted at the top of the diaphragm establishes a nominal pre-load of pressure. With the fuel pumps constantly supplying fuel to the regulator it creates a situation of too much fuel at the pressure regulator. When the pressure between the inlet manifold and the fuel line as sensed by the pressure regulator is greater than 39 psi, the diaphragm moves to allow excess fuel to be routed back to the fuel tank. The excess fuel is returned from the fuel pressure regulator to the fuel tank by means of a 1/4 inch steel pipe. The regulator is a sealed unit and cannot be serviced. If regulator is diagnosed to be defective, it must be replaced as a unit.

AIR SOLENOID VALVE (Fig. 2)

The air solenoid valve is mounted underhood on the sensor cluster bracket at the cowl. The function of this valve is to supplement the air supply from the fast idle valve to the throttle during engine warm-up. The idle solenoid consists of a pintle valve that is electrically controlled to allow or deny air to the throttle body. This solenoid receives its signal from the ECU and is directly related to the temperature of the engine coolant. During cold operation it cycles open and closed to maintain proper fast idle speed. The solenoid remains closed when the choke cycle is complete and curb idle is obtained. Air solenoid is not serviceable. If diagnosed to be defective, it must be replaced as a unit.

MANIFOLD AIR PRESSURE SENSOR (Fig. 2)

The vacuum pressure sensor is mounted underhood on the sensor cluster bracket at the cowl. This unit senses the absolute pressure in the intake manifold so that all engine demands are met regardless of atmospheric pressure change. The pressure sensor is composed of two aneroids which are connected to a movable iron core within a coil wire winding. As a predetermined amount of electricity is supplied to the coil winding, the iron core moves within the winding, varying the amount of current sent out from the sensor to the ECU. At low manifold vacuum the spring tension overpowers the vacuum sensitive aneroids and gives additional movement to the iron core, causing a high current output to the ECU which it interprets as a factor for more fuel enrichment. The pressure sensor is not serviceable. If diagnosed to be defective it must be replaced as a unit.

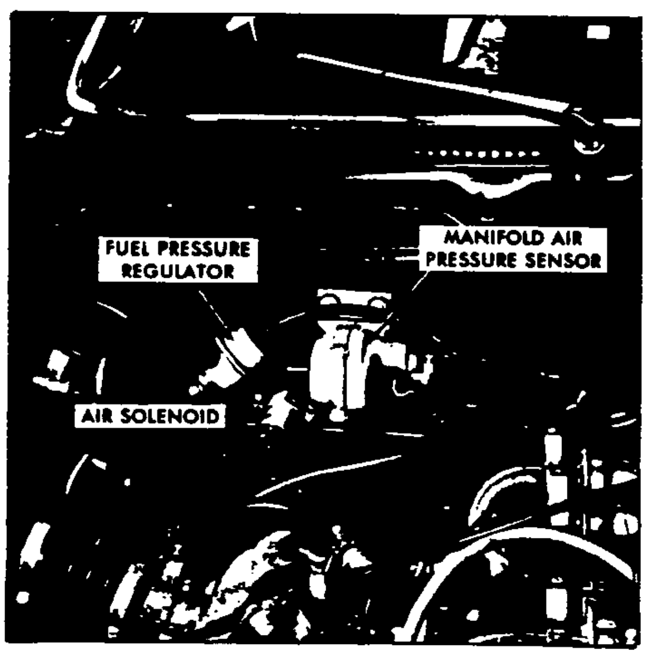


Figure 6M-2 – Sensor Cluster

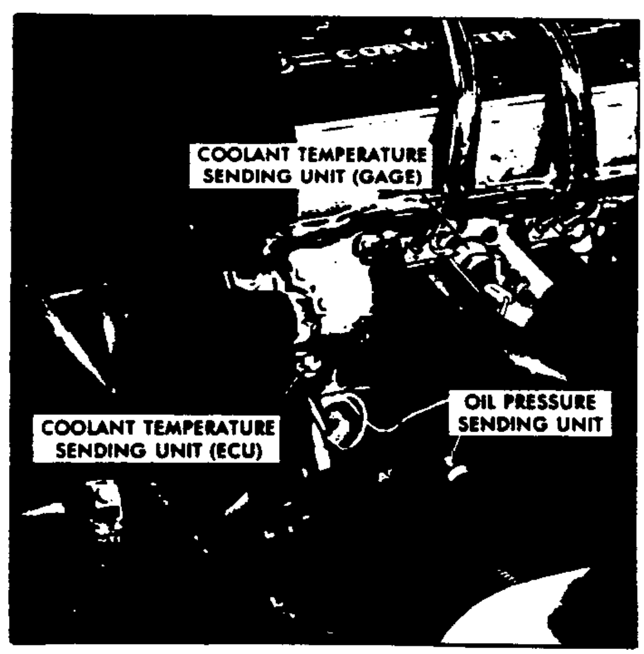


Figure 6M-3 – Coolant Temperature Sending Unit

COOLANT TEMPERATURE SENSOR (Fig. 3)

The coolant temperature sensor is installed in the bottom of the thermostat housing. When installed, the tip of the sensor is in contact with the engine coolant. The temperature of the coolant contacting the sensor affects the output signal sent from the sensor to the ECU. The ECU receives the signal from the coolant temperature sensor and uses it as one of the factors in determining the amount of fuel enrichment required. As coolant temperature rises, the output of the temperature sensor is reduced. With less current, the ECU recalibrates the need for fuel enrichment and changes the duration of the fuel injector opening. The temperature sensor is not serviceable. If diagnosed to be defective, it must be replaced as a unit.

THROTTLE BODY (Fig. 4)

The primary function of the throttle body is to control engine air flow in response to driver commands. Air flow is controlled by two conventional butterfly valves, which are actuated by the throttle pedal. Idle air is preset at the factory by positioning the idle stop on the main throttle blade. The throttle body serves as a vacuum supply for full-vacuum and ported-vacuum applications.

THROTTLE POSITION SENSOR (Fig. 4)

The throttle position sensor is mounted on the side of the throttle body with the throttle blade connected to it. This sensor senses throttle position and rate of change of throttle motion, and conveys this information precisely and instantaneously to the electronic control unit. The sensor is designed so that the mechanical operated sliding contacts, which are electrically energized, divide the throttle angle into multiple, but discreet, voltage leads. These are processed by the ECU to determine the required fuel supply. No adjustments can be made to this sensor, except for its basic positioning on the throttle body, nor is it serviceable. If diagnosed to be defective, it must be replaced as a unit and repositioned accurately in respect to curb idle throttle blade position.

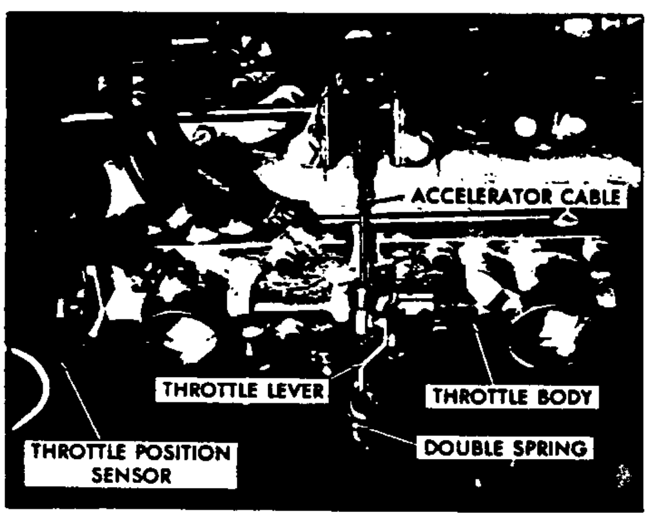


Figure 6M-4 – Throttle Body

FAST IDLE VALVE (Fig. 5)

The fast idle valve is mounted in the right side of the cylinder head under the intake manifold. This valve automatically controls idle speed during cold engine operation by metering idle air into the engine. A thermal transducer senses coolant temperature and converts the temperature signals into fast idle valve travel variations. As engine coolant temperature rises the thermal compound in the valve expands, moving the metering-valve to close-off the air flow to the engine. No pre-setting or moving of the throttle blades is required to achieve this automatic control, since idle air flow is effectively bypassed around the throttle blade. The fast idle valve is supplied with filtered air direct from the engine air cleaner and then to the inlet manifold through 3/4 inch diameter rubber hoses. If the valve is found to be defective, it must be replaced as a unit.

ENGINE SPEED SENSORS (Fig. 5)

The engine speed sensor provides the electronic control unit with data of engine speed and phase. This data is used by the control unit to determine the frequency of injector opening. The sensor incorporates two magentic-reed switches. These stationary switches are activated by a rotating, belt driven, magnet. The speed sensor is essential for the control unit to determine both, where and how often to open the injectors to supply the cylinders with fuel. All components of the speed sensor are serviceable. It is not required that the speed sensor components be replaced in sets or combinations.

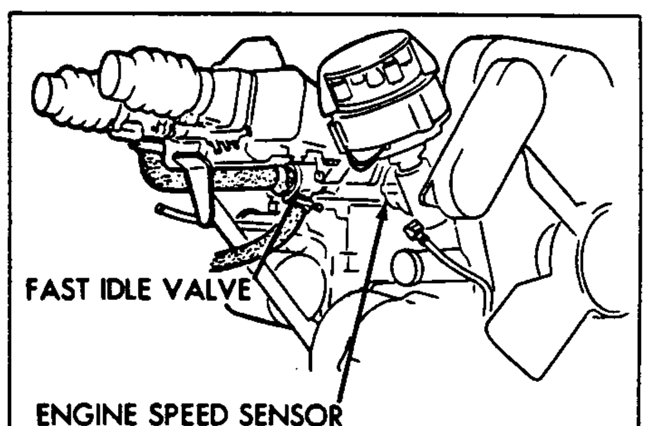


Figure 6M-5 – Fast Idle Valve & Engine Speed Sensor

IN-TANK FUEL PUMP (Fig. 6)

The in-tank fuel pump has the capability of supplying fuel at the rate of approximately 18 gallons per hour. It is an electrically operated impeller type pump, receiving its initial current from the cranking circuit. With the ignition in the ON position, electric current is supplied to the fuel pump by way of the ECU. The combination fuel gauge metering unit and in-tank pump is similar to the unit used in other Vega models.

EXTERNAL FUEL PUMP (Fig. 6)

The external fuel pump is a roller-vane type pump, driven by a 12 volt direct current motor. The pump develops a nominal pressure of 39 psi, and can deliver 33 gallons per hour at that pressure. The pump requires 3.5 amperes to produce the required 39 psi. The pump incorporates two internal check valves. One for over-pressure protection and the other to maintain system pressure after the pump is shut off. The pump is mounted on the right side of the underbody near the front of the right rear wheel.

Electric current is supplied to the external fuel pump through a wiring harness from the in-tank pump. The inlet tube of the external fuel pump is 7/16 inch in diameter and the outlet tube is 5/16 inch in diameter. The pump is not serviceable. If found to be defective, it must be replaced as a unit. No special tools are required, but, correct service procedures must be followed to prevent accidents when working on this component due to fuel being present in this area.

FUEL FILTER (Fig. 6)

The fuel filter consists of a casing with internal relief valve and filter element. The relief valve opens to bypass fuel from the filter element to ensure fuel flow in the event that contamination trapped by the element restricts or prevents flow. The fuel filter is a throw-away type and should be replaced at first 6000 miles and then at every 24,000 mile intervals. The filter is mounted to the vehicle frame in the engine compartment.

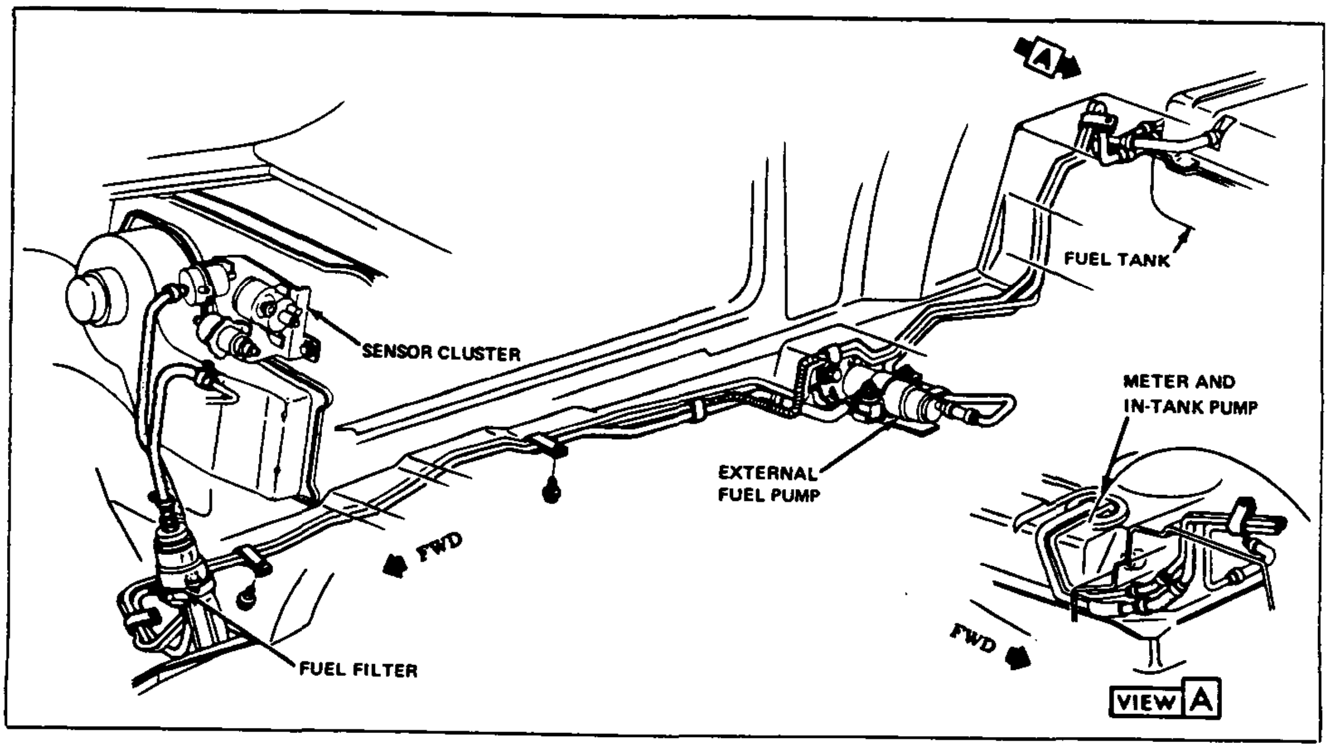


Figure 6M-6 — Fuel System

MAINTENANCE AND ADJUSTMENTS

ADJUSTMENTS

Throttle Position Switch Adjustment

1. Connect diagnostic analyzer and place analyzer test selector switch in position #11 (Closed Throttle).
2. Loosen the two throttle position switch mounting screws to permit unit to be rotated.
3. Insert a 0.016" feeler gauge between the closed throttle stop lever and throttle body.
4. Rotate the throttle position switch just to the point where the analyzer meter needle indicates METER ZERO.
5. Tighten throttle position switch mounting screws to 11 in-lbs.
6. Remove feeler gauge and disconnect diagnostic analyzer.

SERVICE OPERATIONS

FUEL SYSTEM

Electronic Control Unit Replacement (Fig. 7)

1. Disconnect battery ground cable.
2. Remove four screws around upper edge of glove box and then two screws at lower inside of glove box and remove glove box.
3. Reach through glove box opening and remove a screw attaching left mounting bracket of ECU to instrument panel reinforcement.
4. Use one hand to prevent ECU from falling and remove a screw attaching right mounting bracket of ECU to support. ECU is now free and may be removed by tilting to one side to clear support and pushing to back of instrument panel.

   NOTE: If support prevents ECU from being removed, hold ECU in place and remove the one screw that secures support and remove support.
5. After ECU has been lowered from instrument panel, remove electrical connector at rear of ECU.
6. Install replacement ECU in reverse order of removal.

Vacuum Pressure Sensor Replacement (Fig. 2)

1. Disconnect battery ground cable.
2. Disconnect vacuum line and electrical harness at vacuum pressure sensor.
3. Remove two screws at top and one at bottom of vacuum pressure sensor and remove vacuum pressure sensor.
4. Install replacement vacuum pressure sensor in reverse order of removal.

Manifold Air Temperature Sensor Replacement (Fig. 1)

1. Disconnect battery ground cable.
2. Disconnect electrical connector from tip of sensor.
3. Remove manifold air temperature sensor.
4. Install replacement air temperature sensor in reverse order of removal.

Engine Coolant Temperature Sensor (ECU) (Fig. 3)

1. Disconnect battery ground cable.
2. Disconnect electrical connector from tip of sensor.

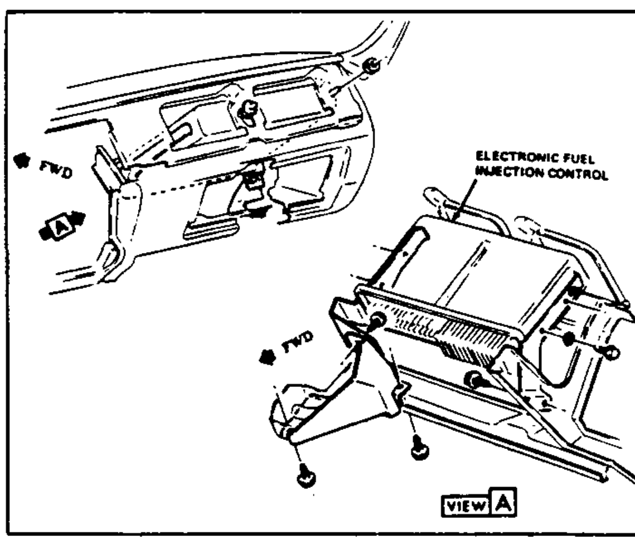


Figure 6M-7—Electronic Control Unit Replacement

3. Remove engine coolant temperature sensor (ECU).
4. Install replacement engine temperature sensor in reverse order of removal.

Throttle Position Switch Replacement (Fig. 8)

1. Disconnect battery ground cable.
2. Disconnect electrical connector at throttle position switch.
3. Remove two screws securing throttle position switch and remove throttle position switch.
4. Install replacement throttle position switch in reverse order of removal and adjust switch as prescribed in the Maintenance and Adjustments paragraph of this section.

Speed Sensor Replacement

1. Disconnect battery ground cable.
2. Disconnect electrical connector at speed sensor.
3. Remove three screws securing speed sensor retainer and remove retainer.
4. Note position of electrical receptacle of speed sensor and remove speed sensor.
5. Install replacement speed sensor in reverse order of removal, making sure electrical receptacle is positioned properly.

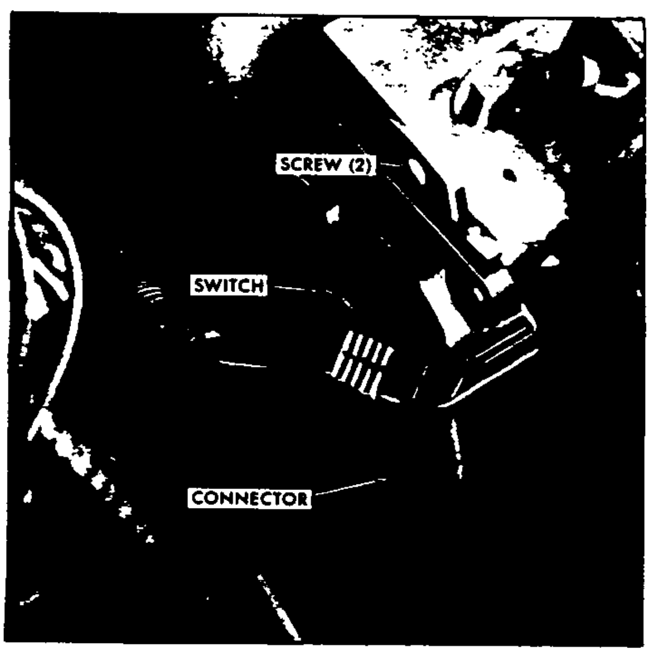


Figure 6M-8 – Throttle Position Switch Replacement

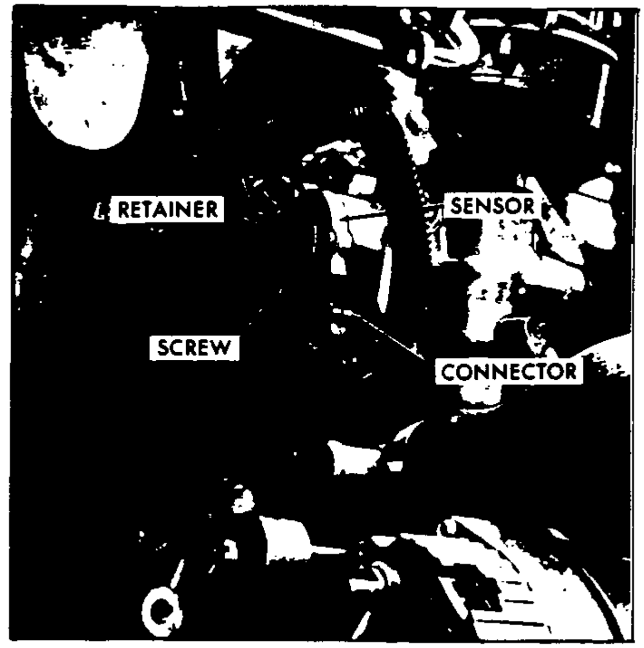


Figure 6M-9 – Speed Sensor Replacement

FUEL DELIVERY SUBSYSTEM

In-Tank Fuel Pump Replacement

The in-tank fuel pump is replaced in the same manner as the base Vega. Refer to Vega Service Manual.

External Fuel Pump Replacement (Fig. 10)

1. Disconnect battery ground cable.
2. Raise vehicle on a hoist.
3. Disconnect fuel inlet and outlet lines.
4. Remove two screws in shield.

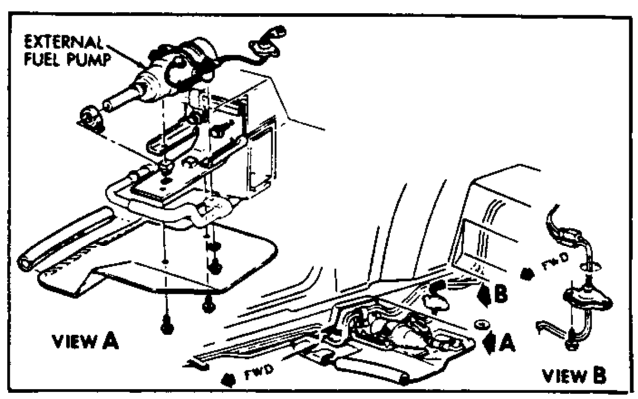


Figure 6M-10 – External Fuel Pump Replacement

5. Remove cable strap securing electrical harness to pump assembly.
6. Disconnect two electrical connectors and remove pump assembly.
7. Install replacement external fuel pump in reverse order of removal.

Fuel Filter Replacement (6)

1. Disconnect battery ground cable to prevent accidental electrical sparks while fuel lines are open.
2. Disconnect inlet and outlet fuel lines from fuel filter.
3. Loosen strap securing fuel filter in position and remove fuel filter.
4. Install replacement fuel filter in reverse order of removal.

Fuel Injector, O-Ring or Fuel Rail Replacement (Fig. 11)

1. Disconnect battery ground cable to prevent accidental electrical sparks while fuel lines are open.
2. Disconnect fuel lines at fuel rail.
3. Disconnect engine ventilation hose at cam cover.
4. Remove bolts attaching fuel rail support to manifold.
5. Lift fuel rail away from fuel injectors.
6. Disconnect electrical connectors from fuel injectors.
7. Remove (pull) fuel injectors from manifold.
8. Remove and discard all "O" rings. Install all new "O" rings at assembly.
9. Install replacement fuel injector, "O" ring or fuel rail in reverse order of removal.

CAUTION: *Use special care when handling fuel injectors to avoid possible damage to the metering tip.*

Fuel Pressure Regulator Replacement (Fig. 2)

1. Disconnect battery ground cable.
2. Disconnect fuel and vacuum lines at pressure regulator.

   CAUTION: Fuel is under pressure.

3. Remove nut at left of sensor cluster bracket securing regulator to bracket and remove fuel pressure regulator, noting position of fuel inlet tube.

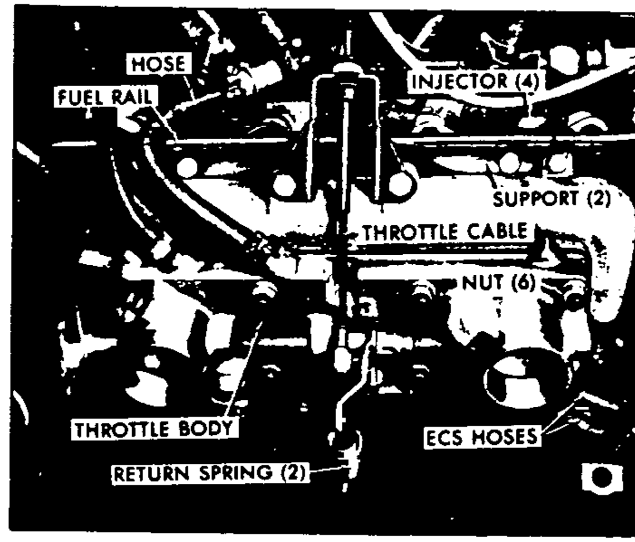


Figure 6M-11—Fuel Rail and Throttle Body

4. Install replacement fuel pressure regulator in reverse order of removal.

AIR INDUCTION SUBSYSTEM

Throttle Body Replacement (Fig. 11)

1. Disconnect battery ground cable.
2. Disconnect engine ventilation hose.
3. Disconnect throttle cable and return springs.
4. Disconnect air cleaner boot.
5. Disconnect electrical connector at throttle body.
6. Remove throttle body retaining nuts and remove throttle body with gasket from manifold.
7. Disconnect vacuum hoses from throttle body.
8. Remove throttle position sensor.
9. Install replacement throttle body in reverse order of removal.
10. Adjust throttle position sensor as described in Maintenance and Adjustments of this Section.

Fast Idle Valve Replacement (Fig. 12)

1. Remove hoses and clamps from throttle body to fast idle valve, and from air cleaner to idle valve.
2. Remove fast idle valve by turning counter-clockwise, noting the position of the filtered air inlet tube.
3. Install replacement fast idle valve in reverse order of removal.

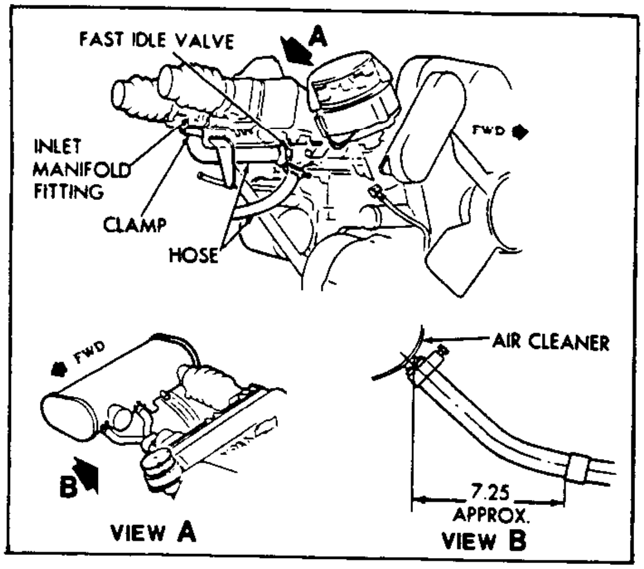


Figure 6M-12—Fast Idle Valve Replacement

Air Cleaner Assembly Replacement (Fig. 13)

1. Loosen clamps that secure the boots to the air cleaner and pull boots away from air cleaner.
2. Remove other hoses and clamps also connected to the air cleaner.
3. Remove two screws that secure air cleaner assembly to fender inner panel.
4. Remove screw securing air cleaner assembly to fender well, and remove air cleaner assembly.
5. Install replacement air cleaner assembly in reverse order of removal.

Air Cleaner Element Replacement (Fig. 14)

1. Remove four screws and two washers as described in air cleaner assembly replacement.
2. Lift up on air cleaner assembly and remove wing nut and cover. Pull air cleaner element out of air cleaner body.
3. Clean inside of air cleaner body.
4. Install replacement air cleaner element in reverse order of removal.

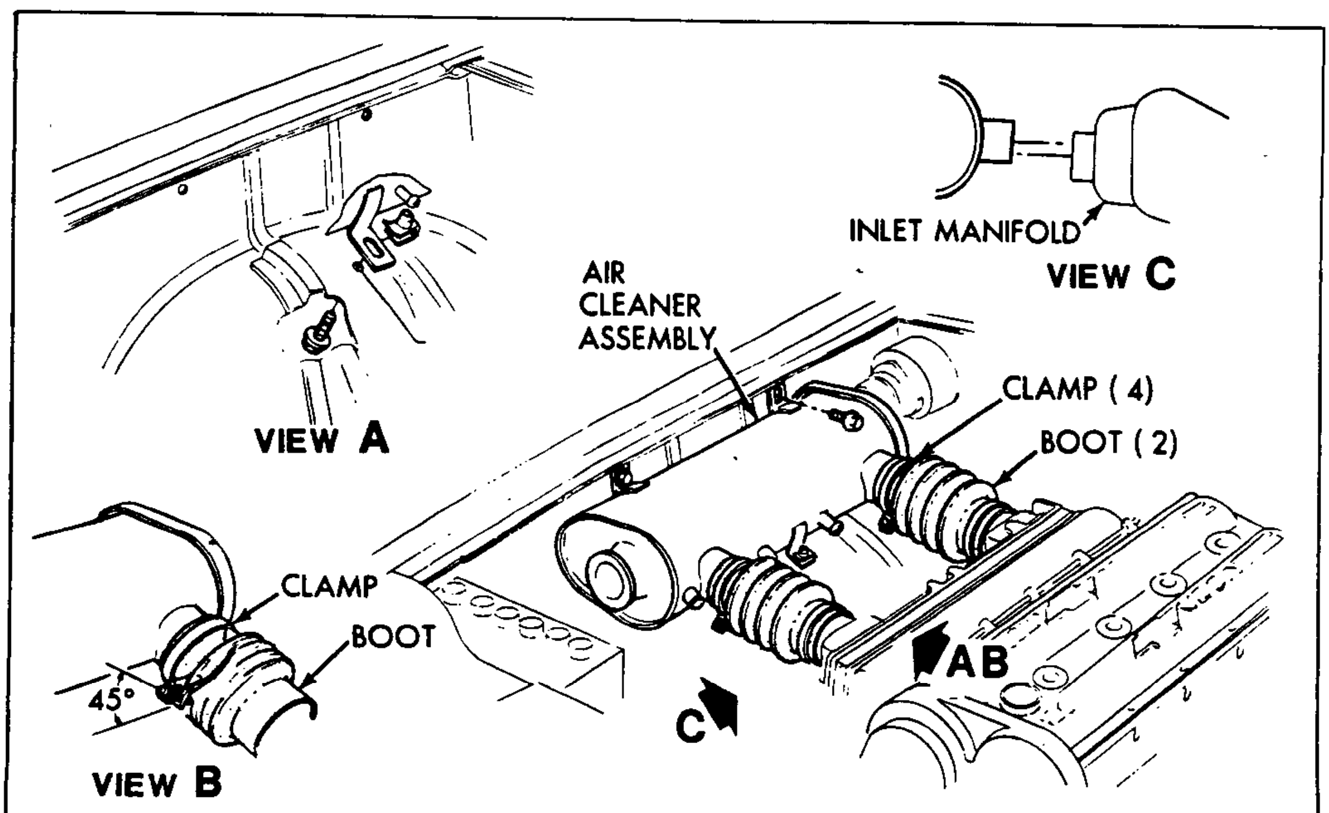


Figure 6M-13—Air Cleaner Assembly Replacement

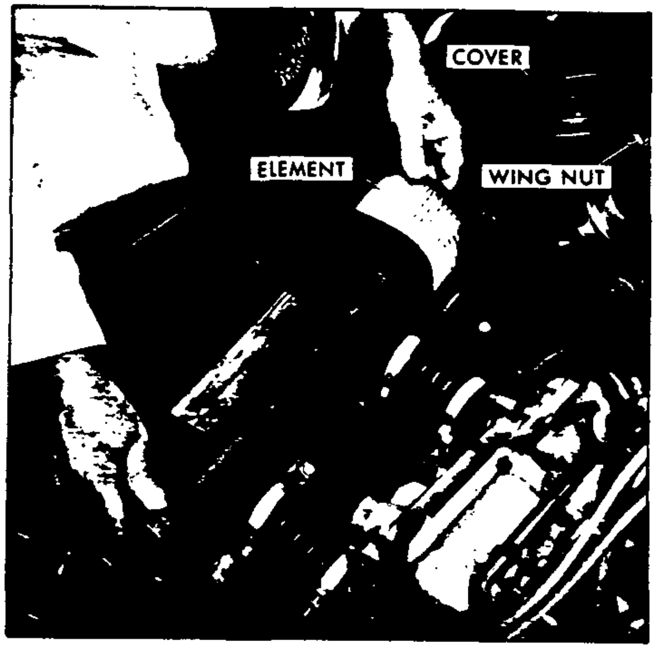


Figure 6M-14 – Air Cleaner Element Replacement

DIAGNOSIS

INTRODUCTION

NOTE. An EFI Diagnostic Analyzer equivalent to Bendix J-24706 must be used to perform the following system checks.

To properly diagnose the Electronic Fuel Injection (EFI) system a special analyzer unit (fig. 15) is utilized. The analyzer is a portable unit designed for rapid and accurate diagnosis or isolation of malfunctioning EFI components. This unit requires only one service technician to operate.

The diagnostic analyzer will test each electrical component of the EFI system except the Electronic Control Unit (ECU). The analyzer contains a supplemental electronic control unit that functions similarly to the ECU installed in the vehicle. While the analyzer will not test the vehicle ECU, it can be used to isolate the ECU as the probable cause. The analyzer operates off of vehicle battery power through a harness connection.

The analyzer consists of: (1) Diagnostic analyzer with cable and connector, (2) Fuel pressure gauge with hose and tee fitting, (3) Shorting connector.

GENERAL DESCRIPTION

Before any analysis is performed using this analyzer, the service technician must be aware of all functions and controls of the unit. These controls and functions are described below:

1. Analyzer Connector – The push-pull connector mates with the vehicle harness connectors, providing operating power and the electrical interface with the EFI system components for testing.
2. ON/OFF Switch – The toggle switch activates and deactivates the diagnostic analyzer.
3. ON/OFF Lamp – Illuminates when analyzer is switched on and is connected to the engine harness.
4. PUSH TO ZERO Switch – The pushbutton switch activates the meter needle to check or adjust the meter zero set (meter calibration) at test position 7 or higher.
5. ZERO SET – The rotary switch provides accurate adjustment of the meter needle to the meter zero set position for calibration (Tests 7 through 21).
6. Meter Adjustment Screw – Provides adjustment of the meter needle in the METER REST position.
7. FUEL PUMP – The pushbutton switch energizes the vehicle fuel pumps for fuel delivery subsystem testing.
8. INJECTORS – GROUP 1 – The pushbutton switch energizes the two Group 1 injectors for testing mechanical operation.

   GROUP 2 – The pushbutton switch energizes the two Group 2 injectors for testing mechanical operation.

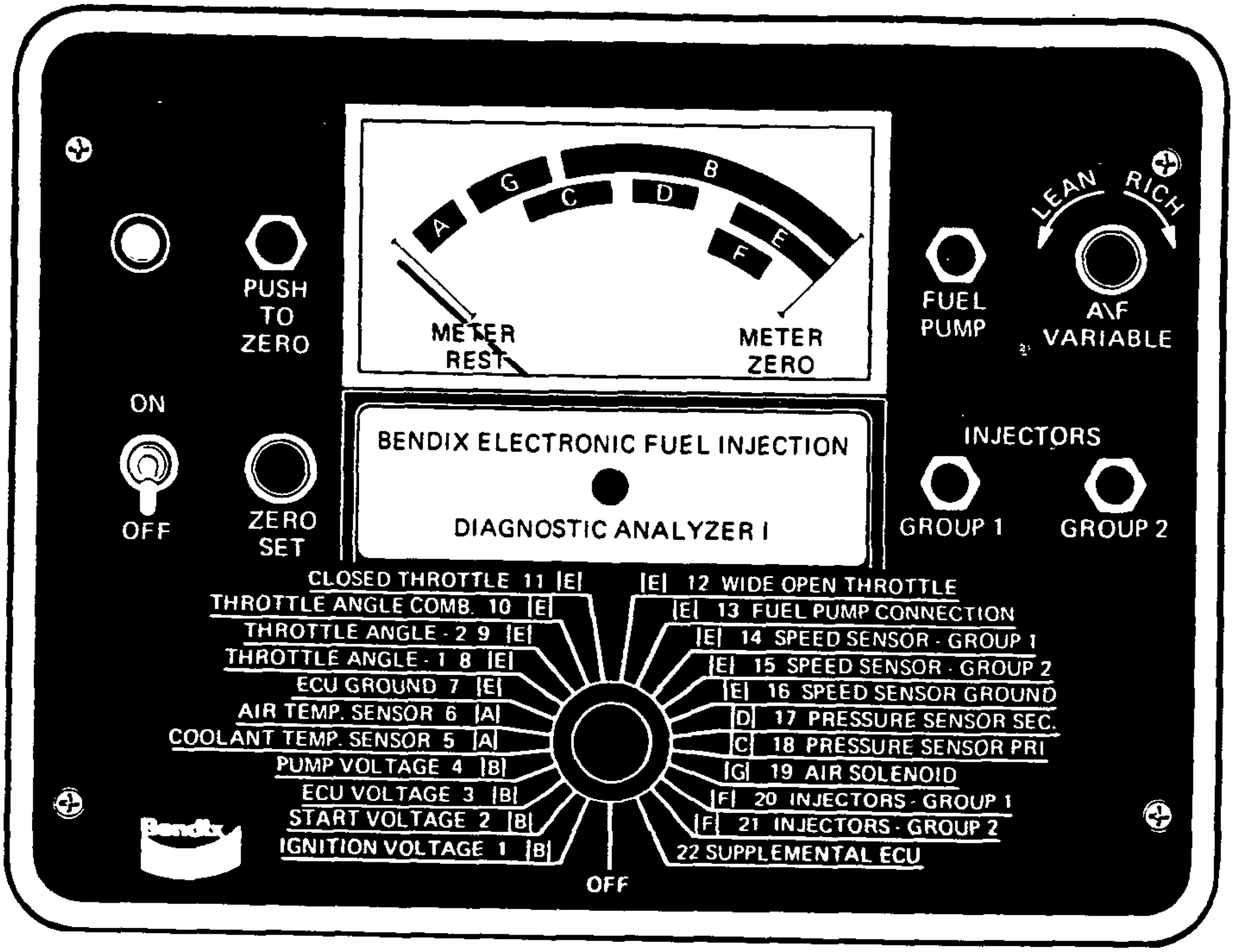


Figure 6M-15—Diagnostic Analyzer

9. A/F VARIABLE — The rotary switch is used with test selector switch on position 22 to vary the air/fuel ratio while using the supplemental Electronic Control Unit.

10. Test Selector Switch — The large rotary switch indicates which component or component function being tested. Each position function is as follows:

  a. OFF — Selector switch is off.

  b. IGNITION VOLTAGE 1 (B) — Checks for sufficient battery voltage from ignition switch to activate the ECU. Ignition switch must be in ON position and the needle should read in the B (Red) scale.

  c. START VOLTAGE 2 (B) — Checks for sufficient battery voltage to start the vehicle. While cranking the engine, meter needle should read in the B (Red) scale.

  d. ECU VOLTAGE 3 (B) — Checks for sufficient voltage from the battery to operate the ECU. Meter needle should read in the B (Red) scale.

  e. PUMP VOLTAGE 4 (B) — Checks for sufficient voltage from battery to ECU for supplying voltage to fuel pumps when ECU is activated. Without sufficient fuel supply to the injectors, engine will not operate properly. Meter needle should read in the B (Red) scale.

  f. COOLANT TEMP SENSOR 5 (A) — Checks coolant temperature sensor for correct output. Meter needle should read in the A (Blue) scale.

  g. AIR TEMP SENSOR 6 (A) — Checks air temperature sensor for correct output. Meter needle should read in the A (Blue) scale.

h. ECU GROUND 7 (E) — Checks the EFI system ground path to battery. Meter needle should read at METER ZERO scale. If meter needle reads in the E (Black) scale, use ZERO SET switch to align needle in the METER ZERO position.

i. THROTTLE ANGLE 1 8 (E) — Checks for proper operation and sensing of throttle movement by the throttle position sensor. Meter needle should deflect 10 times from meter rest to meter zero when slowly moving the throttle from closed position to wide open position. After the last deflection meter needle should stop at the meter rest position.

j. THROTTLE ANGLE 2 9 (E) — Checks for proper operation and sensing of throttle movement by the throttle position sensor. Meter needle should deflect 10 times from meter rest to meter zero when slowly moving the throttle from closed position to wide open position. Do not count the closed throttle meter zero setting as the first deflection. On the last deflection meter needle shloud stop in the E (Black) scale.

k. THROTTLE ANGLE COMB. 10 — Checks for short circuits between the two throttle angle circuits. Meter needle should remain at meter rest position when slowly moving the throttle from closed position to wide open position.

l. CLOSED THROTTLE 11 (E) — Checks for proper adjustment and function of throttle position sensor. When making this check, the throttle must be in the closed (or idle) position. A meter reading on the E (Black) scale should be received with the throttle in closed position. If throttle is opened during the test, meter needle should return to the rest position.

m. WIDE OPEN THROTTLE 12 (E) — Checks operation of throttle position switch at the wide-open position. When making this check, place throttle in wide-open position. Meter needle should read in the E (Black) scale.

n. FUEL PUMP CONNECTION 13 (E) — Checks for proper fuel pump electrical connections and fuel pump motor operation. Meter needle should read in the E (Black) scale.

o. SPEED SENSOR GROUP 1 14 (E) — Checks speed sensor group 1 to ensure proper RPM sensing of the engine for fuel injectors in group 1 (Cylinders #1 and #2). When making this check, engine should be rotated by quick short start bursts until a constant meter needle reading in the E (Black) scale is obtained.

p. SPEED SENSOR GROUP 2 15 (E) — Checks speed sensor group 2 to ensure proper RPM sensing of the engine for fuel injectors in group 2 (Cylinders #3 and #4). When making this check, engine should be rotated by quick short start bursts until a constant meter reading in the E (Black) scale is obtained.

q. SPEED SENSOR GROUND 16 (E) — Checks speed sensor ground path. This check is made when checks #14 and #15 indicate failure. Meter needle should deflect as engine is cranked. When cranking action is stopped, meter needle should read in the E (Black) scale.

r. PRESSURE SENSOR SEC 17 (D) — Checks for proper electrical connections of the vacuum pressure sensor. The pressure sensor has a primary and secondary wiring system. This check is for the secondary portion of the electrical system. Meter needle should read in the D (Brown) scale.

s. PRESSURE SENSOR PRI 18 (C) — Checks for proper electrical connections of the vacuum pressure sensor. The pressure sensor has a primary and secondary wiring system. This check is for the primary portion of the electrical system. Meter needle should read in the C (Green) scale.

t. AIR SOLENOID 19 (G) — Checks for proper electrical connections of the air solenoid. Meter needle should read in the G (Yellow) scale.

u. INJECTOR GROUP 1 20 (F) — Checks electrical continuity and resistance of the injector valves. Each injector valve has to be tested individually. The injectors are in two groups; cylinders #1 and #2 are in group 1, cylinders #3 and #4 are in group 2. This position checks group 1 for electrical operation. Test each injector for electrical continuity and resistance separately by disconnecting the electric terminal from the opposite injector in that group. Meter needle should read in the F (Orange) scale.

In addition to the electrical checks of the fuel injectors, a mechanical check is also performed to test the injectors' operation. This mechanical test of the injectors can be performed with the control dial in any position except 22, but is most directly related to test positions #20 and #21. Connect the fuel pressure gauge to the fuel system by removing the pressure fuel line from the inlet side of the fuel rail, and attaching the pressure gauge"T" fitting. Depress the switch on the analyzer labeled PUMP and monitor the system's fuel pressure while the switch is depressed until approximately 40 PSI is achieved. When the pump switch is released, the fuel pressure should slowly decrease or maintain a lower pressure. Disconnect the electrical connections from all of the injectors in each group except the one that is actually being tested. Depress the INJECTORS GROUP 1 switch. As switch is depressed, the fuel pressure should decrease very rapidly. Release the switch immediately when the fuel pressure begins to decrease. Perform this test as fast as possible so that the engine cylinders are not filled with fuel. Repeat this procedure until all injectors in group 1 have been tested. A pressure drop should be obtained on the fuel pressure gauge while the meter needle is in the F (Orange) scale.

v. INJECTOR GROUP 2 21 (F) – Checks electrical continuity and resistance of the injector valves. Each injector valve has to be tested individually. The injectors are in two groups; cylinders #1 and #2 are in group 1, cylinders #3 and #4 are in group 2. This position checks group 2 for electrical operation. Test each injector for electrical continuity and resistance separately by disconnecting the electric terminal from the opposite injector in that group. Meter needle should read in the F (Orange) scale.

In addition to the electrical checks of the fuel injectors, a mechanical check is also performed to test the injectors' operation. This mechanical test of the injectors can be performed with the control dial in any position except 22, but is most directly related to test positions #20 and #21. Connect the fuel pressure gauge to the fuel system by removing the pressure fuel line from the inlet side of the fuel rail, and attaching the pressure gauge"T"fitting. Depress the switch on the analyzer labeled PUMP and monitor the system's fuel pressure while the switch is depressed until approximately 40 PSI is achieved. When the pump switch is released, the fuel pressure should slowly decrease or maintain a lower pressure. Disconnect the electrical connections from all of the injectors in each group except the one that is actually being tested. Depress the INJECTORS GROUP 2 switch. As switch is depressed, the fuel pressure should decrease very rapidly. Release the switch immediately when the fuel pressure begins to decrease. Perform this test as fast as possible so that the engine cylinders are not filled with fuel. Repeat this procedure until all injectors in group 2 have been tested. A pressure drop should be obtained on the fuel pressure gauge while the meter needle is in the F (Orange) scale.

w. SUPPLEMENTAL ECU 22 – This check is used after all other components have been checked and failures repaired. Selection of position #22 replaces vehicle ECU with the analyzer. This test allows the engine to be started and run to ensure that all components are functioning properly and the engine is in mechanical operating condition. The vehicle can be driven using the analyzer as the ECU, but will require manual control of the air-fuel variable switch to supply a sufficient amount of fuel needed for various engine load conditions. This check in effect, isolates the ECU as the probable cause when all other components check satisfactorily.

11. Fuel Pressure Gauge (Fig. 16) – The fuel pressure gauge monitors fuel pressure during testing of the fuel delivery subsystem components The gauge is housed in a metal container with a hose and tee fitting attached. Connect the fuel pressure gauge to the fuel system by removing the pressure fuel line from the inlet side of the fuel rail, and attaching the pressure gauge "T" fitting.

12. Shorting Connector (Fig. 17) – The shorting connector is designed to fit all connectors on the

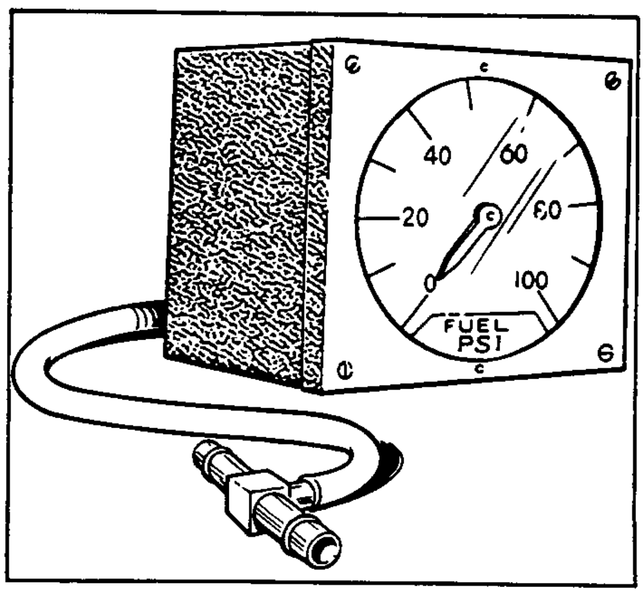


Figure 6M-16—Fuel Pressure Gauge

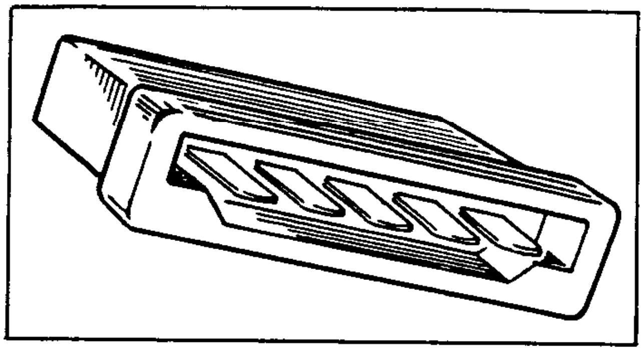


Figure 6M-17–Shorting Connector

EFI engine harness and is used when the diagnostic analyzer indicates that a malfunction exists. When used properly, this connector will aid in isolating a failure in the component being tested or in the wiring harness. The shorting connector is to be used only as specified in diagnostic procedures instructions.

The two components that the analyzer can not diagnose are the fast idle valve and the fuel filter. These units are to be serviced in accordance with the schedule in the Section 0 of this manual.

DIAGNOSTIC PROCEDURE

General

Before connecting the diagnostic analyzer to troubleshoot the EFI system, a visual inspection should be made to determine if the malfunction is visually obvious. Check wiring harnesses for (1) detached connections, (2) loose or corroded wire terminations, (3) damaged wires. Check vacuum lines for (1) broken, cracked or crimped lines, (2) secure connections. Check fuel lines for kinks or bends in the steel or rubber lines and for leakage at (1) injection valve inlet, (2) fuel rail connections, (3) fuel supply lines, (4) fuel filter, (5) fuel pump, (6) fuel return line. When troubleshooting the EFI system, make sure vehicle being tested is not connected to any external equipment or power supply other than the diagnostic analyzer.

> **CAUTION:** *A leaking injection valve will cause engine flooding and can result in a hydrostatic lock. Flooded cylinders must be cleared of fuel and oil inserted through the vacated spark plug port to preclude excessive cylinder wear. If the engine oil is contaminated with fuel, the oil and oil filter must be changed immediately.*

Specific Test Procedure

Disconnect the three harness connectors from the Electronic Control Unit, located above the glove compartment, in the following sequence; (1) black, (2) red, (3) blue. When reconnecting, use the following sequence; (1) blue, (2) red, (3) black. The reconnecting sequence is the reverse of the disconnecting sequence.

> **CAUTION:** *Do not pull wires when disconnecting harness. Firmly grasp and pull connector body while depressing locking clasps for disengagement.*

Connect the three harness connectors to the analyzer connector. Perform specific tests by following the procedures listed in the Diagnostic Procedure Chart. The diagnostic procedure chart indicates all tests that can be performed with the diagnostic analyzer and the normal meter indication for components that check satisfactorily. During tests if meter indication is other than the normal indication, reference should be made to the Fault Isolation Procedure Chart, that follows the Diagnostic Procedure Chart, for corrective action to be taken to remedy the problem. The Isolation Procedure Chart and the Diagnostic Procedure Chart are numbered in the sequence of diagnostic analyzer function test switch positions. That is, if a problem is encountered in step 5 of the diagnostic procedure chart, the possible remedy will be listed in step 5 of the isolation procedure chart.

DIAGNOSTIC PROCEDURE CHART

Select Switch Position	Test Function	Special Test Instructions	Normal Meter Indication	Comments
1	Ignition Voltage	Set Ignition Switch to ON	Red (B)	
2	Start Voltage	(A) Depress clutch and crank engine	Red (B)	Engine will operate if fuel is in manifold or cylinder. Allow to run until fuel is depleted.
		(B) Set Ignition Switch OFF	—	
3	ECU Voltage Input		Red (B)	
4	Fuel Pump Voltage Input		Red (B)	
5	Coolant Temperature Sensor Output		Blue (A)	
6	Air Temperature Sensor Output		Blue (A)	
7	ECU Ground	Align meter needle to METER ZERO	Meter Zero	
8	Throttle Angle 1	Slowly depress accelerator to wide open position.	Ten (10) Needle Deflections From Meter Rest to Meter Zero	Deflections shall occur ONLY while going from closed to wide open throttle. Replace throttle position switch if deflections are observed while closing throttle. Meter needle deflection should stop on BLACK (E) band.
9	Throttle Angle 2	Slowly depress accelerator to wide open position.	Ten (10) Needle Deflections From Meter Rest to Meter Zero (Do not count closed throttle meter zero setting as first deflection.	Deflections shall occur ONLY while going from closed to wide open throttle. Replace throttle position switch if deflections are observed while closing throttle. Meter needle deflection should stop on BLACK (E) band.
10	Throttle Angle Comb	Slowly depress accelerator from closed to wide open position	Meter Rest	
11	Closed Throttle	Accelerator in normal (UP) Position	Black (E)	
12	Wide Open Throttle	Depress Accelerator to wide open position	Black (E)	

DIAGNOSTIC PROCEDURE CHART (Cont'd.)

Select Switch Position	Test Function	Special Test Instructions	Normal Meter Indication	Comments
13	Fuel Pump		Black (E)	
14	Speed Sensor Group 1	(A) Crank Engine	Repeated Deflections	(A) Proceed to step 15 if no meter deflections are observed.
		(B) Rotate engine in quick, short start bursts until constant meter indication is obtained.	Black (E)	
15	Speed Sensor Group 2	(A) Crank Engine	Repeated Deflections	(A) Proceed to step 16 if no meter deflections are observed.
		(B) Crank engine in quick, short bursts until constant meter indication is obtained.	Black (E)	
16	Speed Sensor Ground	(A) Crank Engine	Repeated Deflections	(A) If no deflections are observed in either steps 14, 15, or 16, proceed to fault isolation procedure chart for trouble shooting
		(B) Turn Ignition OFF		
17	Pressure Sensor Secondary		Brown (D)	
18	Pressure Sensor Primary		Green (C)	
19a	Air Solenoid Valve		Yellow (G)	
19b	Fuel Delivery Mechanical	(A) Depress fuel pump Switch for approx. 5 seconds	40 PSI (approx.)	Fuel Pressure Gauge Reading
		(B) Release fuel pump switch	—	Fuel pressure will hold or slowly, decrease
		(C) Restrict rubberline ahead of fuel pressure regulator and monitor the fuel pressure gauge	55-95 PSI	Turn on Fuel Pump
		NOTE The injection valves are to be tested individually		
20	Injector Gp. 1 Electrical	(A) Disconnect injector No. 1 electrical connector	Orange (F)	

DIAGNOSTIC PROCEDURE CHART (Cont'd.)

Select Switch Position	Test Function	Special Test Instructions	Normal Meter Indication	Comments
		CAUTION *The following steps shall be performed as rapidly as possible to prevent fuel from filling the cylinders.*		
	Injector Gp. 1 Mechanical Operation	(B) Depress fuel pump switch and hold until fuel pressure stabilizes (approx. 40 PSI). Release switch.	—	Fuel pressure gauge should indicate slow pressure decrease
		(C) Depress injector Group 1 switch releasing immediately when rapid decrease in fuel pressure is observed.		
		(D) Connect injector No. 1 and disconnect injector No. 2 Repeat steps A, B, and C, above, for injector No. 2. Connect Injector No. 2 upon completion of test sequence.		
21	Injector Gp. 2	(A) Disconnect Injector No. 3 Electrical Connector.	Orange (F)	
		CAUTION *The following steps shall be performed as rapidly as possible to prevent fuel from filling the cylinders.*		
	Injector Gp. 2 Mechanical Operation	(B) Depress fuel pump switch and hold until fuel pressure stabilizes (approx. 40 PSI). Release switch.	—	Fuel pressure gauge should indicate slow pressure decrease
		(C) Depress injector Group 2 Switch, releasing immediately when rapid decrease in fuel pressure is observed.	—	

DIAGNOSTIC PROCEDURE CHART (Cont'd.)

Select Switch Position	Test Function	Special Test Instructions	Normal Meter Indication	Comments
		(D) Connect injector No. 3 and disconnect injector No. 4. Repeat steps A, B, and C, above for injector No. 4. Connect injector No. 4 upon completion of test sequence.	—	
22	System Operation with supplemental ECU (system ECU isolation)	Select Switch Position No. 22 permits starting and driving of the vehicle using the diagnostic analyzer supplemental ECU. This step is performed to: (1) Isolate a possible ECU malfunction when all components indicate satisfactory operation (2) To verify system operation upon completion of failure correction. **NOTE** The vehicle should be driven only when absolutely necessary using the supplemental ECU		
		(A) Turn A/F variable rotary switch fully clockwise and start engine. Turn the A/F variable rotary switch counter-clockwise until desired engine RPM is achieved.	Engine Operates normally	If vehicle operates satisfactorily, disconnect the analyzer and connect the vehicle ECU to the engine harness. If unsatisfactory operation is evident, refer to fault isolation procedure chart step 22.

FAULT ISOLATION PROCEDURE CHART

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
OFF	(1) Lamp does not illuminate when Diagnostic Analyzer Power Switch is set to ON.	
	A. Connector not mated properly	A. Remate connector
	B. Lamp burned	B. Replace lamp
	C. Fuse burned (back of analyzer)	C. Replace fuse
	D. Fusible link burned	D. Replace fusible link
	E. Undercharged or defective battery	E. Recharge or replace battery
	F. Battery terminals corroded or loose	F. Clean/tighten or replace
	G. Short or open circuit	G. Perform continuity tests. Repair or replace faulty component
	NOTE The Diagnostic Analyzer I utilizes the ECU voltage input (black 7-way connector, Pin A) for its power and the ECU ground.	
1	(1) METER REST indication	
	A. Ignition OFF	A. Turn ignition switch to ON
	B. Vehicle fuse burned.	B. Replace FUSE labeled "GAUGES" in vehicle fuse block.
	NOTE If FUSE continually fails, disconnect the black 7-way connector. If FUSE still fails, refer to vehicle wiring diagram. If FUSE does not fail test system for short circuit.	If no malfunction exists in the vehicle electrical circuits interfacing with the fuse, replace the ECU.
	C. Faulty ignition switch	C. Repair or replace switch
	(2) Meter out of scale	
	A. Undercharged or defective battery	A. Recharge or replace battery
	B. Battery terminals corroded or loose.	B. Clean/tighten or replace
2	(1) METER REST indication during cranking	
	A. Faulty ignition switch	A. Repair or replace switch
	B. Shorted or open circuit	B. Perform continuity tests. Repair or replace faulty component.
	(2) Meter out of Red Band (B) Scale during engine crank.	
	A. Battery terminals corroded or loose	A. Clean/tighten or replace
	B. STARTER-MOTOR current draw HIGH	B. Repair or replace starter
	C. Undercharged or defective battery	C. Recharge or replace battery
	D. Harness connectors not correctly mated	D. Inspect and repair or replace

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
3	(1) METER REST indication	
	A. Fusible link burned	A. Replace fusible link
	B. Battery terminals corroded or loose	B. Clean/tighten or replace
	C. Broken wire or wire terminal	C. Inspect and repair or replace wire or terminal
	(2) Meter indication out of Red Band (B) Scale	
	A. Undercharged or defective battery	A. Recharge or replace battery
	B. Loose or corroded wire terminations	B. Inspect and repair or replace terminals
4	(1) METER REST indication	
	A. Fusible link burned	A. Replace fusible link
	B. Battery terminals corroded or loose	B. Clean/tighten or replace
	C. Broken wire or wire terminal	C. Inspect and repair or replace wire or terminal
	(2) Meter indication out of Red Band (B) Scale	
	A. Undercharged or defective battery	A. Recharge or replace battery
	B. Loose or corroded wire terminations	B. Inspect and repair or replace terminal
5	(1) METER REST indication	
	A. Defective Sensor	A. Disconnect the harness from the COOLANT SENSOR. If meter indicator is within Red Band (B) Scale, replace sensor.
	B. Defective wiring	B. Disconnect the harness connector from COOLANT SENSOR. If METER REST is indicated, inspect wiring for short circuit.
	(2) Meter indication within Red Band (B) Scale	
	A. Defective sensor	A. Disconnect the harness from the COOLANT SENSOR and install SHORTING CONNECTOR on COOLANT SENSOR harness connector.
	B. Defective wiring	B. If meter indicates within Red Band (B) Scale, inspect wiring for broken, loose, or properly connected wire.
	(3) Meter indicates out of Blue Band (A) Scale (other than Red Band (B) Scale)	
	A. Defective sensor	A. Disconnect the harness from the COOLANT SENSOR Meter will indicate within Red Band (B) Scale. Install SHORTING CONNECTOR on sensor harness connector. Meter should return to METER REST position (adjust needle to METER REST position if required). Connect the harness to the sensor. If the meter indicates out of the Blue Band (A) Scale, replace COOLANT TEMPERATURE SENSOR.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
6	(1) METER REST indication	
	A. Defective sensor	A. Disconnect the harness from the AIR TEMPERATURE SENSOR. If meter indicator is within Red Band (B) Scale, replace sensor.
	B. Defective wiring	B. Disconnect the harness from the AIR SENSOR. If there is METER REST indication inspect wiring. Repair or replace faulty wire.
	(2) Meter indication within Red Band (B) Scale	
	A. Defective sensor	A. Disconnect the harness from the AIR TEMPERATURE SENSOR and install SHORTING CONNECTOR on the harness connector.
	B. Defective wiring	B. If meter indicates within Red Band (B) Scale, inspect wiring for broken or loose wire.
	(3) Meter indicates out of Blue Band (A) Scale (other than Red Band (B) Scale)	
	A. Defective sensor	A. Disconnect the harness from the AIR TEMPERATURE SENSOR. Meter will indicate within Red Band (B) Scale. Install SHORTING CONNECTOR on harness connector. Meter should return to rest position (adjust meter to METER REST position is required). Connect the harness to the sensor. If the meter indicates out of the Blue Band (A) Scale, replace the AIR TEMPERATURE SENSOR.
7	(1) Diagnostic Analyzer will not adjust to METER ZERO	
	A. Undercharged or defective battery	A. Recharge or replace battery
8	(1) Other than ten (10) meter deflections	
	A. THROTTLE POSITION SWITCH out of adjustment	A. Adjust switch.
	B. Defective THROTTLE POSITION SWITCH (within adjustment)	B. Replace switch and retest.
	C. New switch indicates other than 10 meter deflections (within adjustment)	C. Replace EFI engine harness. Install original THROTTLE POSITION SWITCH. Retest.
	(2) No meter deflections	
	A. Defective throttle position switch	A. Disconnect the harness from the THROTTLE POSITION SWITCH and install the SHORTING CONNECTOR. If the meter needle indicates METER ZERO, replace the THROTTLE POSITION SWITCH.
	B. Defective wiring	B. If METER REST indication is observed, inspect the wiring. Repair or replace defective wiring.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	(3) No meter deflection; indicates constant meter zero	
	A. Defective THROTTLE POSITION SWITCH	A. Disconnect HARNESS connector from THROTTLE POSITION SWITCH. If meter needle returns to rest position after connector removal, replace THROTTLE POSITION SWITCH.
	B. Defective wiring	B. If METER REST is indicated, inspect wiring for short circuit.
	(4) Meter indicates out of Black Band (E) Scale	
	A. Meter requires adjusting	A. Depress PUSH TO ZERO switch. Readjust meter if required.
	B. Defective THROTTLE POSITION SWITCH	B. Install SHORTING CONNECTOR on throttle position switch harness connector. If the meter needle indicates METER ZERO, replace the THROTTLE POSITION SWITCH.
	C. Defective wiring	C. If meter needle does not indicate METER ZERO, inspect wiring for corroded or loose wire terminations. Repair or replace as required.
9	(1) Other than ten (10) meter deflections	
	A. THROTTLE POSITION SWITCH out of adjustment	A. Adjust switch.
	B. Defective THROTTLE POSITION SWITCH (within adjustment)	B. Replace switch.
	C. New switch indicates other than ten(10) meter deflections (within adjustment)	C. Replace EFI engine harness. Install original THROTTLE POSITION SWITCH. Retest.
	(2) No meter deflections	
	A. Defective THROTTLE POSITION SWITCH	A. Disconnect the harness from the THROTTLE POSITION SWITCH and install the SHORTING CONNECTOR on the harness connector. If the meter needle indication METER ZERO, replace the THROTTLE POSITION SWITCH.
	B. Defective wiring	B. If METER REST indication is observed, inspect the wiring. Repair or replace defective wiring.
	(3) No meter deflection; indicates constant METER ZERO	
	A. Defective THROTTLE POSITION SWITCH	A. Disconnect HARNESS connector from THROTTLE POSITION SWITCH. If meter needle returns to METER REST after connector removal, replace THROTTLE POSITION SWITCH.
	B. Defective wiring	B. If there is no meter indication, check wiring for short circuit. Repair or replace defective wire.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	(4) Meter indicates out of Black Band (E) Scale	
	A. Meter requires adjusting	A. Depress PUSH TO ZERO switch. Readjust meter if required.
	B. Defective THROTTLE POSITION SWITCH	B. Install SHORTING CONNECTOR on THROTTLE POSITION SWITCH harness connector. If the meter needle indicates METER ZERO with the shorting connector installed in the harness connector, replace the THROTTLE POSITION SWITCH.
	C. Defective wiring	C. If meter needle does not indicate METER ZERO, inspect wiring for corroded or loose wire terminations. Repair or replace as required.
10	(1) Needle deflects	
	A. Defective THROTTLE POSITION SWITCH	A. Replace THROTTLE POSITION SWITCH
	(2) Constant METER ZERO	
	A. Defective THROTTLE POSITION SWITCH	A. Disconnect THROTTLE POSITION SWITCH harness connector. Replace THROTTLE POSITION SWITCH if meter indicates METER REST.
	B. Defective wiring	B. If meter indicates METER ZERO with harness disconnected, inspect wiring for shorted wires or termination. Repair or replace.
11	(1) Meter of Black Band (E) Scale	
	A. Meter requires adjustment	A. Depress PUSH TO ZERO switch. Readjust meter if required.
	B. Defective THROTTLE POSITION SWITCH	B. Install SHORTING CONNECTOR on throttle position switch harness connector. If meter needle indicates meter zero, replace THROTTLE POSITION SWITCH.
	C. Defective wiring	C. If the meter needle indicates other than METER ZERO inspect wiring for loose or corroded wire terminations. Repair or replace as required.
	(2) METER REST indication	
	A. THROTTLE POSITION SWITCH out of adjustment	A. Adjust switch.
	B. Defective THROTTLE POSITION SWITCH (cannot be adjusted)	B. Install SHORTING CONNECTOR on THROTTLE POSITION SWITCH harness connector. If meter indicates METER ZERO, replace the throttle position switch.
	C. Defective wiring	C. If there is a METER REST indication, inspect the wiring for loose corroded or broken wires or terminals. Repair or replace as required.
	(3) Constant Meter Indication with THROTTLE DEPRESSED	
	A. Defective switch	A. Disconnect harness from switch. If there is a METER REST indication replace THROTTLE POSITION SWITCH.
	B. Defective wiring	B. If there is a constant meter indication, inspect the wiring. Repair or replace as required.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
12	(1) Meter out of Black Band (E) Scale	
	A. Meter requires adjustment	A. Depress PUSH TO ZERO switch. Readjust meter if required.
	B. Defective THROTTLE POSITION SWITCH	B. Install SHORTING CONNECTOR on THROTTLE POSITION SWITCH harness connector. If meter needle indicates meter zero, replace THROTTLE POSITION SWITCH.
	C. Defective wiring	C. If the meter needle indicates other than METER ZERO, inspect wiring for loose or corroded wire terminations. Repair or replace as required.
	(2) METER REST indication	
	A. Defective THROTTLE POSITION SWITCH	A. Install SHORTING CONNECTOR on THROTTLE POSITION SWITCH harness connector. If meter indicates METER ZERO, replace the THROTTLE POSITION SWITCH
	B. Defective wiring	B. If there is a meter REST indication, inspect the wiring for loose, corroded or broken wires or terminals. Repair or replace as required.
	(3) Constant Meter Indication with Throttle CLOSED (accelerator up).	
	A. Defective switch	A. Disconnect harness from switch. If there is no meter indication replace throttle position switch.
	B. Defective wiring	B. If there is a constant meter indication, inspect the wiring. Repair or replace as required.
13	(1) Meter out of black Band (E) Scale	
	A. Meter out of calibration	A. Depress PUSH TO ZERO Switch and reset the METER ZERO.
	B. FUEL PUMP motor resistance	B. Depress fuel pump switch for seconds and release. If meter does not read on Black Band (E), proceed to next step.
	C. Defective wiring	C. Inspect wiring for loose, corroded or broken wire termination. Repair or replace.
	D. Defective FUEL PUMPS	D. Disconnect FUEL PUMP electrical connection. If meter needle indicates METER ZERO or within Black Band (E) Scale, replace the external fuel pump. If the meter indicates out of Black Band (E) Scale, replace the INTANK booster fuel pump.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	(2) METER REST indication	
	A. FUEL PUMP fuse burned	A. Inspect in-line fuel pump fuse located near ECU connector. If burned, replace.
	B. Defective wiring	B. Inspect wiring for loose or broken termination. Repair or replace.
	C. Defective EXTERNAL fuel pump	C. Check the external Fuel Pump for an open circuit by shorting the two terminals together. If the meter indicates METER ZERO, replace the external fuel pump.
	D. Defective IN-TANK booster pump	D. Check the IN-TANK booster pump for an open circuit by shorting the positive terminal to ground. If the meter indicates METER ZERO, replace the booster pump.
14 PART I	(1) No meter deflection during engine cranking (needle remains at METER REST)	
	A. Defective SPEED SENSOR	A. Disconnect SPEED SENSOR harness connector and install SHORTING CONNECTOR.
	B. Defective wiring	B. If there is METER REST indication, inspect the wiring for loose, corroded, or broken wires or terminations. Repair or replace as required.
	(2) Constant METER ZERO indication during engine cranking (other than METER REST position).	
	A. Defective SPEED SENSOR	A. Disconnect SPEED SENSOR harness connector. If the meter returns to METER REST position, replace the SPEED SENSOR.
	B. Defective wiring	B. If the meter has a constant reading, inspect wiring for shorted wires.
	C. Intermittant short	C. If steps A and B above fail to identify the problem, shake the HARNESS while observing the meter. If no deflection is observed replace the SPEED SENSOR. If deflections are observed, replace the HARNESS.
PART II	(3) Meter out of Black Band (E) Scale	
	A. METER out of adjustment	A. Depress PUSH TO ZERO switch. Adjust meter if required.
	B. Defective SPEED SENSOR	B. Disconnect SPEED SENSOR harness and install SHORTING CONNECTOR.
	C. Defective wiring	C. If the meter indicates METER ZERO with the Shorting connector installed on the harness connector, replace the SPEED SENSOR. If the meter needle does not indicate METER ZERO, inspect the wiring for loose, corroded or broken wires or terminations. Repair or replace as required.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
15	(1) No meter deflection during engine cranking (needle remains at METER REST)	
	A. Defective SPEED SENSOR	A. Disconnect SPEED SENSOR harness connector and install SHORTING CONNECTOR. If the meter needle indicates METER ZERO with the SHORTING CONNECTOR installed on the harness connector replace the SPEED SENSOR.
	B. Defective wiring	B. If there is no meter indication, inspect the wiring for loose, corroded, or broken wires or terminations. Repair or replace as required.
	(2) Constant METER ZERO indication during engine cranking (other than METER REST position).	
	A. Defective SPEED SENSOR	A. Disconnect SPEED SENSOR harness connector. If the meter returns to METER REST position, replace the SPEED SENSOR.
	B. Defective wiring	B. If the meter has a constant reading (no deflections) with harness connector disconnected, inspect wiring for shorted wires.
	C. Intermittant short circuit	C. If steps A and B above fail to identify the problem, SHAKE the HARNESS while observing the meter. If no deflection is observed replace the SPEED SENSOR. If deflections are observed, replace the HARNESS.
	(3) Meter out of Black Band (E) Scale	
	A. Meter out of adjustment	A. Depress PUSH TO ZERO switch. Adjust meter if required.
	B. Defective SPEED SENSOR	B. Disconnect SPEED SENSOR harness and install SHORTING CONNECTOR. If the meter indicates METER ZERO with the SHORTING CONNECTOR installed on the harness connector, replace the speed sensor.
	C. Defective wiring	C. If the meter needle does not indicate METER ZERO, inspect the wiring for loose, corroded or broken wires for terminations. Repair or replace as required.
16 PART I	(1) No meter deflection during engine crank	
	A. Defective SPEED SENSOR	A. Disconnect the SPEED SENSOR harness connector and install the SHORTING CONNECTOR. If the meter indicates METER ZERO with the SHORTING CONNECTOR installed replace the SPEED SENSOR.
	B. Defective wiring	B. If no meter indication is observed, inspect the wiring for broken wires or terminals. Repair or replace.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	(2) Constant METER ZERO indication DURING engine crank.	
	A. Defective SPEED SENSOR	A. Disconnect the SPEED SENSOR harness connector. If the meter indicates METER REST, replace the SPEED SENSOR.
	B. Defective wiring	B. If the meter indicates a constant reading with the SPEED SENSOR harness connector disconnected, inspect the wiring for shorted wires and terminations. Repair or replace wiring.
PART II	(3) Meter out of Black Band (E) Scale	
	A. Meter out of calibration	A. Adjust METER ZERO setting
	B. Defective SPEED SENSOR	B. Disconnect the SPEED SENSOR harness connector and install the SHORTING CONNECTOR. If the meter indicates METER ZERO, replace the SPEED SENSOR.
	C. Defective wiring	C. If the meter does not indicate METER ZERO after Step B, inspect the wiring for corroded, loose or broken wires or wire terminations. Repair or replace wiring.
17	(1) Meter indicates out of Brown Band (D) Scale	
	A. Meter out of adjustment	A. Depress PUSH TO ZERO switch. Adjust meter if required.
	B. Defective MAP SENSOR	B. Disconnect the MANIFOLD AIR PRESSURE (MAP) SENSOR harness connector and install SHORTING CONNECTOR. Depress PUSH TO ZERO switch. If the meter indicates METER ZERO, replace the MAP SENSOR.
	C. Defective wiring	C. If meter indicates other than METER ZERO with SHORTING CONNECTOR installed, inspect wiring for corrosion or damage. Repair or replace wiring.
	(2) METER REST indication	
	A. Defective MAP SENSOR	A. Disconnect MAP SENSOR harness connector and install SHORTING CONNECTOR. If the meter needle indicates METER ZERO, replace the MAP SENSOR.
	B. Defective wiring	B. If there is a METER REST indication, inspect the wiring for loose, corroded or broken wires or terminations. Repair or replace as required.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	(3) Meter indicates METER ZERO	
	A. Defective MAP SENSOR	A. Disconnect MAP sensor from the harness connector. If there is a METER REST indication, replace the MAP SENSOR.
	B. Defective wiring	B. If the meter needle indicates METER ZERO, inspect the wiring for shorted condition. Repair or replace as required.
18	(1) Meter indicates out of Green Band (C) Scale	
	A. Meter out of adjustment	A. Depress PUSH TO ZERO switch. Adjust meter if required.
	B. Defective MAP SENSOR	B. Disconnect the MANIFOLD AIR PRESSURE (MAP) SENSOR harness connector and install SHORTING CONNECTOR. Depress PUSH TO ZERO switch. If meter needle indicates METER ZERO, replace the MAP SENSOR.
	C. Defective wiring	C. If meter indicates other than METER ZERO inspect wiring for loose corroded, or broken wires or terminations. Repair or replace as required.
	(2) No meter indication	
	A. Defective MAP SENSOR	A. Disconnect MAP SENSOR harness connector and install SHORTING CONNECTOR. If the meter needle indicates METER ZERO, replace the MAP SENSOR.
	B. Defective wiring	B. If there is no meter indication, inspect the wiring for loose, corroded or broken wires or terminations. Repair or replace as required.
	(3) Meter indicates METER ZERO	
	A. Defective MAP SENSOR	A. Disconnect MAP SENSOR from the harness connector. If there is a METER REST indication, replace the MAP SENSOR.
	B. Defective wiring	B. If the meter needle indicates METER ZERO, inspect the wiring for shorted wires or terminations. Repair or replace as required.
19 PART I	(1) No meter indication	
	A. Defective AIR SOLENOID VALVE	A. Short the AIR SOLENOID VALVE terminals together. If the meter indicates METER ZERO, replace the AIR SOLENOID VALVE.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	B. Defective wiring	B. Disconnect wire No. 750 at the AIR SOLENOID VALVE. Connect a jumper between terminal 750 and the battery negative terminal. If there is a METER REST indication, inspect the wiring for broken or detached wires. Repair or replace.
	(2) Meter out of Yellow Band (G) Scale	
	A. Meter out of calibration	A. Depress PUSH TO ZERO switch and adjust to METER ZERO.
	B. Defective AIR SOLENOID VALVE	B. Short the AIR SOLENOID VALVE terminals together. If the meter indicates METER ZERO, with the VALVE terminals shorted together, replace the AIR SOLENOID VALVE.
	C. Defective wiring	C. Disconnect wire No. 750 at the AIR SOLENOID VALVE. Connect a jumper between terminal 750 and the battery negative terminal. If the meter does not indicate METER ZERO, inspect the wiring for loose, corroded, or broken wires or wire termination. Repair or replace.
	(3) Meter indicates METER ZERO	
	A. Defective wiring	A. Disconnect both AIR SOLENOID VALVE wire terminals. If the meter indicates METER ZERO, inspect the wiring for a short circuit to ground. Repair or replace.
	B. Defective AIR SOLENOID VALVE	B. (1) Connect the positive wire terminal to the AIR SOLENOID VALVE. If the meter indicates METER ZERO, replace the AIR SOLENOID VALVE. (2) Connect the ground wire terminal the AIR SOLENOID VALVE. If the meter indicates METER ZERO, replace the AIR SOLENOID VALVE.
PART II	(1) No fuel pressure indication where FUEL PUMP switch is depressed. (Due to burned fuse).	
	A. Burned in-line fuse	A. Replace 10 amp in-line fuse at Black ECU connector.
	B. Defective external fuel pump	B. If replacement fuse burns, disconnect the harness from the external fuel pump located ahead of the vehicle right rear wheel. If fuse does not burn when FUEL PUMP switch is depressed, replace the external fuel pump.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	C. Defective IN-TANK booster fuel pump	C. If replacement fuse burns, disconnect the harness from the IN-TANK booster fuel pump and sending unit. If fuse does not burn when the FUEL PUMP switch is depressed repair or replace the IN-TANK pump and sending unit.
	D. Defective wiring	D. If replacement fuse burns, inspect and test wiring for a short circuit. Repair or replace wire.
	(2) No fuel pressure indication when FUEL PUMP switch is depressed (fuse not burned)	
	A. Depleted Fuel Tank	A. Observe Vehicle fuel level. If required, replenish fuel supply and re-test.
	B. Defective EXTERNAL fuel pump	B. Test for voltage at POSITIVE (+) terminal of external fuel pump. If voltage is present, connect a jumper from the negative terminal to a clean ground. Replace the fuel pump if it does not operate.
	C. Defective wiring	C. If the pump operates, or, if no voltage is present, inspect and test the wiring for open circuits, loose or broken wires or terminations, or excessive corrosion. Repair or replace defective wires.
	D. Defective FUEL PRESSURE REGULATOR (EXTERNAL fuel pump normal)	D. Restrict the fuel flow ahead of the FUEL PRESSURE REGULATOR. If the pressure gauge indicates fuel pressure, replace the FUEL PRESSURE REGULATOR. If no fuel pressure is observed on the pressure gauge proceed with Step E.
	E. Defective IN-TANK fuel pump or associated wiring	E. Disconnect the fuel supply line at the external fuel pump inlet. Immediately attach a length of tube to the Fuel Tank Outlet Line, suspend it HIGHER than the Fuel Tank to prevent fuel tank siphoning. Locate a suitable container under the exposed fuel line. Depress the FUEL PUMP switch. If no fuel is pumped into the container, inspect the wiring for loose, corroded or broken wires or terminations. Repair or replace defective wiring. If the wiring is normal, replace the in-tank fuel pump and sending unit. If fuel is pumped into the container connect the supply line to the external fuel pump and proceed with Step F.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
	F. Defective external fuel pump	F. Disconnect the fuel delivery line from the external fuel pump fitting. Attach a hose to the pump fitting and route to a container. Switch on fuel pump. If there is no fuel flow, replace the external fuel pump.
	G. Defective fuel delivery line	G. If fuel flows into the container, inspect the fuel delivery lines for restrictions or obstruction. Repair or replace damaged fuel line.
	(3) Fuel pressure indicates between 45 PSI and 69 PSI when FUEL PUMP switch is depressed.	
	A. Defective FUEL PRESSURE REGULATOR	A. Disconnect fuel return line from the FUEL PRESSURE REGULATOR. Connect a hose to the regulator outlet fitting and route to a container. Depress the FUEL PUMP switch. If the pressure indicates between 45 and 69 PSI and there is no fuel flow, replace the FUEL PRESSURE REGULATOR.
	B. Defective fuel return line	B. If the pressure indicates between 39 and 41 PSI and fuel flow is observed, inspect the fuel return lines from the REGULATOR to the fuel tank for restrictions or obstructions. Repair or replace damaged fuel line.
	(4) Fuel pressure decreases rapidly	
	A. Defective FUEL PRESSURE REGULATOR	A. Restrict the fuel flow by "Kinking" hose between the FUEL RAIL and the FUEL PRESSURE REGULATOR. If NO rapid DECREASE in fuel pressure is observed, replace the FUEL PRESSURE REGULATOR.
	B. Defective external fuel pump	B. Restrict the fuel flow by "Kinking" hose between the FUEL FILTER and the FUEL RAIL. If the fuel pressure does not change, replace the external fuel pump.
	C. Defective INJECTION VALVE **CAUTION** *A leaking injection valve will cause engine flooding and can result in hydraulic engine lock. Flooded cylinders must be cleared of fuel and oil inserted through the vacated spark plug port to preclude excessive cylinder wear. If the engine oil is contaminated with fuel, the oil and oil filter should be changed immediately.*	C. If, while maintaining the restriction between the FUEL FILTER and FUEL RAIL a rapid DECREASE in pressure is observed, inspect each INJECTION VALVE for excessive leakage. Replace any injector from which leakage is observed.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
20 PART I	(1) Meter indication out of Orange Band (F) Scale	
	A. Both Group INJECTORS connected	A. Check to ensure that ONLY ONE INJECTOR in the group is connected.
	B. Meter out of adjustment	B. Depress PUSH TO ZERO switch. Adjust meter if required.
	C. Defective INJECTION VALVE (perform this step with EACH INJECTION VALVE)	C. Disconnect the harness connector from the INJECTOR being tested and install the SHORTING CONNECTOR on the harness connector. If the meter needle indicates METER ZERO depress the PUSH TO ZERO switch. If the needle indicates METER ZERO, replace the defective INJECTION VALVE.
	D. Defective wiring (perform this step in conjunction with Step B, above)	D. If the meter needle does not indicate METER ZERO, inspect the wiring for loose, broken, or corroded wire terminations or connectors. Repair or replace defective wiring.
	(2) No meter indication	
	A. Defective INJECTION VALVE	A. Disconnect the engine harness from the INJECTOR being tested and install the SHORTING CONNECTOR on the harness connector. If the meter needle indicates METER ZERO, replace the defective INJECTION VALVE.
	B. Defective wiring	B. If, with the SHORTING CONNECTOR install, there is a METER REST indication, inspect and test the wiring for an open circuit.
	(3) Meter indicates METER ZERO	
	A. Defective INJECTION VALVE	A. Disconnect the harness connector from the INJECTOR being tested. If there is a METER REST indication, replace the INJECTION VALVE.
	B. Defective wiring	B. If, with the harness disconnected, the meter needle indicates METER ZERO, inspect and test the wiring for a short circuit. Repair or replace the defective WIRE.
PART II	(4) NO decrease in fuel pressure or NO change in decrease of fuel pressure	
	A. Contaminated INJECTION VALVE	A. Ensure that INJECTOR being tested is connected and is in the Group (1 or 2) being tested. Remove malfunctioning INJECTOR and inspect for dirt or obstruction of the inlet filter. Clean or replace.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
21 PART I	(1) Meter indication out of Orange Band (F) Scale	
	A. Both Group INJECTORS connected	A. Check to ensure that ONLY ONE INJECTOR in the group is connected.
	B. Meter out of adjustment	B. Depress PUSH TO ZERO switch, adjust meter if required.
	C. Defective INJECTION VALVE (perform this step with EACH INJECTION VALVE)	C. Disconnect the harness connector from the INJECTOR being tested and install the SHORTING CONNECTOR on the harness connector. If the meter needle indicates METER ZERO depress the PUSH TO ZERO switch. If the needle indicates METER ZERO, replace the defective INJECTION VALVE.
	D. Defective wiring (perform this step in conjunction with Step B, above)	D. If the meter needle does not indicate METER ZERO, inspect the wiring for loose, broken, or corroded wire terminations or connectors. Repair or replace defective wiring.
	(2) No meter indication	
	A. Defective INJECTION VALVE	A. Disconnect the engine harness from the INJECTOR being tested and install the SHORTING CONNECTOR on the harness connector. If the meter needle indicates METER ZERO, replace the defective injection valve.
	B. Defective wiring	B. If, with the SHORTING CONNECTOR installed, there is a METER REST indication inspect and test and wiring for an open circuit.
	(3) Meter indicates METER ZERO	
	A. Defective INJECTION VALVE	A. Disconnect the harness connectors from the INJECTOR being tested. If there is a METER REST indication, replace the INJECTION VALVE.
	B. Defective wiring	B. If, with the harness disconnected, the meter needle indicates METER ZERO, inspect and test the wiring for a short circuit. Repair or replace the defective wire.
PART II	(4) NO decrease in fuel pressure or NO change in decrease in fuel pressure	
	A. Contaminated INJECTION VALVE	A. Ensure that INJECTOR being tested is connected and is in the Group (1 or 2) being tested. Remove malfunctioning INJECTOR and inspect for dirt or obstruction of the inlet filter. Clean or replace.

FAULT ISOLATION PROCEDURE CHART (Cont'd.)

SWITCH POSITION	PROBLEM/CAUSE	CORRECTIVE ACTION
22	(1) Engine operates normally with supplemental ECU but NOT with the vehicle ECU	
	A. Vacuum line leak	A. Inspect MANIFOLD AIR PRESSURE SENSOR Vacuum lines for loose fittings, kinked or leaking lines. Repair or replace.
	B. Defective MANIFOLD AIR PRESSURE SENSOR (engine rough and excessive black, exhaust)	B. Disconnect the vacuum line from the MANIFOLD AIR PRESSURE SENSOR and block the line end with thumb. If the vehicle continues to operate rough, replace the SENSOR.
	C. Defective ELECTRONIC CONTROL UNIT	C. (1) If, as a result of B above, the vehicle STALLS when the vacuum line is disconnected, replace the ECU. (2) If the engine operates normally with the supplemental ECU but roughly with the vehicle ECU (no black exhaust) replace the vehicle ECU.

No Start

COMPONENT	CHECK	ACTION
Storage Battery	Electrical Connections Low Voltage Charge	Clean and Fasten Securely Recharge or Replace
Electronic Control Unit	Electrical Connections Low Voltage Input	Clean and Fasten Securely Check Electric Circuit Continuity
Fuel System	Fuel Supply Depleted Fuel Supply Components	Replenish Check for Proper Connection and Operation

Poor Cold Performance

COMPONENT	CHECK	ACTION
Fast Idle Solenoid	Hose Routing & Connections Filter Condition	Correct as Required Replace as Required
Air Solenoid Valve	Hose Routing & Connections Electro-Mechanical Operation	Correct as Required Replace as Required
Engine Temperature Sensor	Electric Connections Voltage Output	Clean and Fasten Securely Replace as Required
Manifold Temperature Sensor	Electric Connections Voltage Output	Clean and Fasten Securely Replace as Required

Poor Performance

COMPONENT	CHECK	ACTION
Fuel Pump	Electric Connections Pumping Capacity	Clean and Fasten Securely Replace as Required
Fuel Filter	Corroded or Plugged	Replace
Fuel Pressure Regulator	Pressure Holding Capacity	Replace as Required
Ignition Coil	Secondary Voltage Output	Replace as Required
HEI Distributor	Primary Voltage Output	Replace as Required
Spark Plugs	Adjustment & Resistance	Adjust or Replace
Throttle Position Sensor	Electrical Connections Primary Circuit, Secondary Circuit	Clean and Fasten Securely Replace as Required
Vacuum Pressure Sensor	Electrical Connections Vacuum Hoses Routing & Connections	Clean and Fasten Securely Correct as Required
Injector Valves	Electrical Connections Fuel Pressure Drop when Activated	Clean and Fasten Securely Replace as Required
Electronic Control Unit	Electrical Connections Voltage Input Continuity Voltage Output Continuity	Clean and Fasten Securely Repair or Replace Circuit Defect Repair or Replace Circuit Defect
Throttle Body	Dirty and Plugged Passages	Remove Throttle Body and Clean Passages. Reinstall with New Gasket
Air Cleaner	Air Cleaner Restriction	Remove Air Cleaner Bellows and Monitor Engine Speed. If Speed Changes, Repair or Replace Air Cleaner and Element as Necessary.

High Speed Misfire

COMPONENT	CHECK	ACTION
Spark Plugs	Adjustment & Resistance	Adjust or Replace
Ignition Coil	Electrical Connections Secondary Voltage Output	Clean and Fasten Securely Replace as Required
HEI Distributor	Electrical Connections Primary Voltage Output	Clean and Fasten Securely Replace as Required
Fuel Pump	Electrical Connections Pumping Capacity	Clean and Fasten Securely Replace as Required
Fuel Filter	Corroded or Plugged	Replace
Fuel Pressure Regulator	Pressure Holding Capability	Replace as Required
Injector Valves	Electrical Connections Fuel Pressure Drop when Activated	Clean and Fasten Securely Replace as Required

SPECIFICATIONS

Installation	Torque
Fuel Pump (mounts to bracket)	16 in-lbs
Fuel Filter Fittings	28 ft-lbs
Fuel Rail (to manifold)	11 ft-lbs
Fuel Rail (to fuel line)	28 ft-lbs
Fuel Line (to manifold)	45 in-lbs
Throttle Body	11 ft-lbs
Throttle Body Fitting	11 ft-lbs
Air Temperature Sensor	20 ft-lbs
Fast Idle Valve (to engine block)	28 ft-lbs
Fast Idle Valve Inlet Fitting (to manifold)	20 ft-lbs
Speed Sensor	18 in-lbs
Coolant Temperature Sensor	28 ft-lbs
Manifold Air Pressure Sensor	50 in-lbs
Fuel Pressure Regulator	50 in-lbs
Air Solenoid Valve	50 in-lbs
Throttle Position Switch	11 in-lbs

1975
MVMA
Specifications Form

Passenger Car

Manufacturer	Car Line	
Chevrolet Motor Division General Motors Corporation	VEGA	
Mailing Address	**Model Year**	**Issued:**
Chevrolet Engineering Center 30003 Van Dyke Warren, Michigan 48090	1975	September, 1974 Revised (e)

MVMA Specifications Form
Passenger Car

Table Of Contents

NOTES:
1. The General Specifications herein are those in effect at date of compilation and are subject to change without notice by the manufacturer.
2. UNLESS OTHERWISE INDICATED:
   a. Specifications apply to standard models without optional equipment. Significant deviations are noted.
   b. *Nominal design dimensions are used throughout these specifications.*
   c. All dimensions are in inches.

Zone:

Additional Comments

CHEVROLET NEVER

PRODUCED A PRODUCTION

VEGA ENGINE WITH

TEEL SLEEVES IN THE CYLINDER

WALLS. # FOR A REPAIR

ENGINES WERE BEING

REMANUFACTURED (BY AN OUTSIDE

CO) WITH EITHER .030

OVERSIZE PISTONS OR

SLEEVES. — PER RALPH MARKS.

JH 3.21.85

Dealer

Date

Signature

Date

MVMA Specifications Form
Passenger Car

Car Line VEGA
Model Year 1975 Issued 9/74 Revised (•)

Car Models

Model Description	Make, Car line, Series, Body Type (Mfgr's Model Code)	Max. Number of Passengers (Front/Rear)	
	Models	Front	Rear
VEGA			
2-Door Notchback (Coupe)	1HV11	2	2
2-Door Hatchback (Coupe)	1HV77	2	2
2-Door Station Wagon 2-Seat	1HV15	2	2
2-Door Panel Express	1HV05	1	-

NOTE: ANY SPECIFICATIONS ON THE FOLLOWING PAGES THAT ARE SPECIFIC TO CALIFORNIA REQUIREMENTS ARE INDICATED ACCORDINGLY.

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Car and Body Dimensions

See Key Sheets, Pgs 30-33

All dimensions to ground are for comparative purposes only. Dimensions are to be shown for 4-Dr. Sedan, 2-Dr. H.T., 4-Dr. H.T., Convertible and Station

<table>
<tr><th></th><th></th><th colspan="4">Body Type</th></tr>
<tr><th></th><th>SAE Ref. No.</th><th>2-Door Notchback Coupe</th><th>2-Door Hatchback Coupe</th><th>2-Door Station Wagon</th><th>2-Door Panel Delivery</th></tr>
<tr><td colspan="6">Width</td></tr>
<tr><td>Tread - Front</td><td>W101</td><td colspan="4">54.8</td></tr>
<tr><td>Tread - Rear</td><td>W102</td><td colspan="4">53.6</td></tr>
<tr><td>Maximum overall car width</td><td>W103</td><td colspan="4">65.4</td></tr>
<tr><td>Body width at No. 2 pillar</td><td>W117</td><td colspan="4">64.6</td></tr>
<tr><td>Max. front doors open</td><td>W120</td><td colspan="4">146.8</td></tr>
<tr><td>Max. rear doors open</td><td>W121</td><td colspan="4">--</td></tr>
<tr><td colspan="6">Length</td></tr>
<tr><td>Body "O" to front of dash</td><td>L 30</td><td colspan="4">- 0.8</td></tr>
<tr><td>Wheelbase</td><td>L101</td><td colspan="4">97.0</td></tr>
<tr><td>Overall car length</td><td>L103</td><td colspan="4">175.4 (with Impact Strips 176.4)</td></tr>
<tr><td>Overhang - front</td><td>L104</td><td colspan="4">35.2 (with Impact Strips 35.7)</td></tr>
<tr><td>Overhang - rear</td><td>L105</td><td colspan="4">43.2 (with Impact Strips 43.7)</td></tr>
<tr><td>Body upper structure length</td><td>L123</td><td>93.2</td><td>95.02</td><td colspan="2">108.0</td></tr>
<tr><td>Body "O" line to C/L of rear wheel</td><td>L127</td><td colspan="4">86.0</td></tr>
<tr><td>Body "O" line to w/s cowl point</td><td>L130</td><td colspan="4">10.9</td></tr>
<tr><td colspan="6">Height</td></tr>
<tr><td>Passenger Distribution (front & rear)</td><td>*</td><td colspan="3">2-2</td><td>1-0</td></tr>
<tr><td>Trunk/Cargo load (lbs.)</td><td>*</td><td colspan="4">0</td></tr>
<tr><td>Overall height</td><td>H101</td><td>51.8</td><td>50.0</td><td>51.8</td><td>51.7</td></tr>
<tr><td>Cowl height</td><td>H114</td><td colspan="3">35.3</td><td>35.6</td></tr>
<tr><td>Deck height</td><td>H138</td><td>4.3</td><td>3.7</td><td colspan="2">4.4</td></tr>
<tr><td>Rocker panel - front: To ground</td><td rowspan="2">H112</td><td colspan="3">6.7</td><td>6.9</td></tr>
<tr><td>Rocker panel - front: From front wheel C/L</td><td colspan="3">--</td><td>--</td></tr>
<tr><td>Bottom of front door to ground</td><td>H133</td><td colspan="3">8.9</td><td>8.7</td></tr>
<tr><td>Rocker panel - rear: To ground</td><td rowspan="2">H111</td><td colspan="3">6.2</td><td>5.9</td></tr>
<tr><td>Rocker panel - rear: From rear wheel C/L</td><td colspan="3">--</td><td>--</td></tr>
<tr><td>Bottom of rear door to ground</td><td>H135</td><td colspan="4">--</td></tr>
<tr><td>Windshield slope angle</td><td>H122</td><td>55.0°</td><td>58.0°</td><td colspan="2">55.0°</td></tr>
<tr><td colspan="6">Ground Clearance</td></tr>
<tr><td>Bumper to ground - front</td><td>H102</td><td colspan="3">14.9</td><td>15.7</td></tr>
<tr><td>Bumper to ground - rear</td><td>H104</td><td colspan="2">13.2</td><td>16.3</td><td>15.5</td></tr>
<tr><td>Angle of approach</td><td>H106</td><td colspan="2">20°16'</td><td></td><td>21°32'</td></tr>
<tr><td>Angle of departure</td><td>H107</td><td colspan="2">21°14'</td><td>20°17'</td><td>19°49'</td></tr>
<tr><td>Ramp breakover angle</td><td>H147</td><td colspan="2">15° 6'</td><td>15° 8'</td><td>15°10'</td></tr>
<tr><td>Rear axle differential to ground</td><td>H153</td><td colspan="3">6.3</td><td>5.4</td></tr>
<tr><td>Min. running clearance (Specify)</td><td>H156</td><td colspan="4">4.9(a)</td></tr>
</table>

*All measurements are made at the stated passenger and trunk/cargo loadings

(a) Catalytic Converter.

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Car And Body Dimensions *See Key Sheets, Pgs 30-33*

Body Type

	SAE Ref. No.	2-Door Notchback Coupe	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery
Front Compartment					
H Point to body "O" line	L31	43.7	43.6	43.7	43.5
Effective head room	H61	38.8	37.1	38.9	38.1
Effective T Point head room	H75	38.6	37.2	38.6	38.2
Max. eff. leg room - accelerator	L34	43.5			43.1
H Point to Heel point	H30	8.1	7.8	8.1	9.0
H Point travel	L17	6.5			5.7
Shoulder room	W3	51.3			
Hip room	W5	46.9	47.2	46.9	46.8
Upper body opening to ground	H50	47.2	45.9	47.02	
Steering Wheel Angle Vertical	H-18	18.0°			
Back Angle Front	L-40	26.0°			
Rear Compartment					
H Point couple distance	L50	27.4			--
Effective head room	H63	38.0	35.3	38.3	--
Effective T Point head room	H76	38.2	34.7	38.5	--
Min. effective leg room	L51	30.2	29.6	30.2	--
H Point to Heel point	H31	10.5	10.4		
Min. knee room	L48	-3.4	-3.5	-3.4	--
Rear Compartment room	L3	25.3	24.3	24.4	--
Shoulder room	W4	49.2			--
Hip room	W6	42.5			--
Upper body opening to ground	H51	--			
Luggage Compartment					
Usable luggage capacity (cu. ft.)	V1	8.7	--	--	--
Liftover height	H195	29.03		22.07	21.08
Position of spare tire storage		Flat in recessed area of compartment floor.			
Method of holding lid open		Telescoping gas springs		Torsion Rods	

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Car And Body Dimensions See Key Sheets, Pgs. 30-33

Body Type

	SAE Ref. No.	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery
Station Wagon — Third Seat				
Shoulder Room	W85			
Hip room	W86			
Effective leg room	L86		NOT	
Effective head room	H86		APPLICABLE	
Effective T Point head room	H89			
Seat facing direction				
Station Wagon — Cargo Space				
Cargo length at floor - front seat	L202		65.3	67.5
Cargo length at belt - front seat	L204		57.2	57.2
Cargo width - Wheelhouse	W201		42.5	42.5
Opening width at belt	W204		47.0	47.0
Maximum cargo height	H201		28.6	28.6
Rear opening height	H202		25.7	25.7
Cargo volume index (cu. ft.) (W4 x L204 x H201) / 1728	V2		46.6	46.6
Hatchback — Cargo Space				
Front Seat Back to Load Floor Height	H197	18.1		
Cargo Length at Front Seat Back Height	L208	37.6		
Cargo Length at Floor - Front Seat	L209	64.8		
Cargo volume index (cu. ft.) ((L208 + L209)/2 x W4 x H197) / 1728	V3	26.5		

MVMA Specifications Form
Passenger Car

Car Line VEGA
Model Year 1975 Issued 9/74 Revised (•)

Power Teams (Indicate whether standard or optional)

SAE Net bhp (brake horsepower) and net torque corrected to 85° F and 29.38 in. Hg atmospheric pressure.

SERIES AVAILABILITY	ENGINE						TRANSMISSION	AXLE RATIO ** (Std. first) (Indicate A/C ratio) #	
	Displ. cu. in.	Carb.	Compr. Ratio	SAE Net @ RPM BHP	SAE Net @ RPM Torque	Exhaust System*		A	B
All Models (Standard) (Not available in California)	140L4 (L13)	One; 1-bbl	8.0:1	78 @ 4200	120 @ 2000	S 2.00	3-Spd. manual (3.11:1 low)	2.92	--
							4-Spd. manual* (3.11:1 low)	2.92	--
							3-Spd. Automatic		
All Models Optional (All States)	140L4 (L11)	One; 2-bbl	8.0:1	87 @ 4400 80 @ 4400 (Cal.)	122 @ 2800 116 @ 2800 (Cal)	S 2.00	3-Spd. manual (3.11:1 low)	2.92	--
							4-Spd. manual* (3.11:1 low)	2.92	3.42
							3-Spd. automatic*	2.92	3.42

* - Optional
** - Positraction available optionally for all models
\# - Same ratios available with Air Conditioning

A - Base
B - High Altitude Option

*S — Single D — Dual

MVMA Specifications Form
Passenger Car

Car Line VEGA
Model Year 1975 Issued 9/74 Revised (•)

Engine Displacement

L4-140 C.I.

Engine — General

Type, no. cyls., valve arr.		In-line 4-cyl. overhead camshaft
Bore and stroke (nominal)		3.501 x 3.625
Piston displacement, cu. in.		140
Bore spacing (C/L to C/L)		4.00
No. system (front to rear)	L. Bank	1-2-3-4
	R. Bank	In line
Firing Order		1-3-4-2
Cylinder Head Material		High chrome cast alloy iron
Cylinder Block Material		Die cast high - silicon aluminum alloy
Cyl. Sleeve-Wet, dry, none		None
Number of mtg. points	Front	Two
	Rear	One
Engine installation angle		3°50'
Taxable horsepower	Dia.² x No. Cyl. / 2.5	19.6
Recommended fuel regular — premium		Unleaded
Cylinder Head Volume (cc)		73.50
Head Gasket Thickness (Compressed)		.044
Head Gasket Volume (cc)		7.26
Deck Clearance (minimum) (above or below block)		.01149 (above)
Minimum Combustion Chamber Volume (cc)		71.1

Engine — Pistons

Material			Cast aluminum alloy
Description and finish			Flat head, iron plated open skirt
Weight (piston only) oz.			14.08
Clearance (limits)	Top land		.0300-.0360
	Skirt	Top	.0018-.0028(a)
		Bottom	--
Ring groove diameter	No. 1 ring		3.130-3.140
	No. 2 ring		3.130-3.140
	No. 3 ring		3.080-3.090

(a) Measured 1.50 from top of piston

.MVMA Specifications Form
Passenger Car

Car Line ______ Model Year 1975 Issued 9/74 Revised (•) ______

Engine Displacement

L4-140 C.I.

Engine - Piston Rings

Function (top to bottom)	No. 1, oil or comp.	Compression
	No. 2, oil or comp.	Compression
	No. 3, oil or comp.	Oil
Compression	Description - material, coating, etc. Upper	Cast alloy iron, barrel face; chrome plated
	Lower	Cast alloy iron, barrel face, inside bevel; chrome flash
	Width	.0775-.0780
	Gap	Upper .015-.025; Lower .009-.019
Oil	Description - material, coating, etc.	Multi-piece (2 rails and 1 spacer expander) Rails-steel, chrome plated OD; expander-stainless steel
	Width	.1870-.1890 (assembled)
	Gap	.010-.030
Expanders		In oil ring assembly

Engine - Piston Pins

Material			Chromium steel
Length			2.740-2.760
Diameter			.9270-.9273
Type	Locked in rod, in piston, floating, etc.		Locked in rod
	Bushing	In rod or piston	None
		Material	None
Clearance	In piston		.00030-.00040
	In rod		--
Direction & amount offset in piston			Major thrust side .060

Engine - Connecting Rods

Material		Drop forged steel
Weight (oz.)		14.24
Length (center to center)		5.695-5.705
Bearing	Material & Type	Steel backed with aluminum or copper lead lining equivalent
	Overall length	.807
	Clearance (limits)	.0007-.0027
	End Play	.0009-.0013

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Engine Displacement
L4-140 C.I.

Engine—Crankshaft

Material			Cast nodular iron
Vibration damper type			None
End thrust taken by bearing (No.)			4
Crankshaft end play			.002-.008
Main bearing	Material & type		Steel backed insert; copper lead alloy lining Precision removable
	Clearance		.0003-.0029
	Journal dia. and bearing overall length	No. 1	2.3004x.752
		No. 2	2.3004x.752
		No. 3	2.3004x.752
		No. 4	2.3004x.760
		No. 5	2.3004x.864
		No. 6	None
		No. 7	None
	Dir. & amt. cyl. offset		None
	No. bolts/main brg. cap		10 bolts/5 caps
Crankpin journal diameter			1.999-2.000

Engine—Camshaft

Location			In cylinder head
Material			Cast alloy iron
Bearings	Material		Steel backet babbit
	Number		5
Type of Drive	Gear or chain		Fiberglass reinforced cog timing belt
	Crankshaft gear or sprocket material		Sintered iron sprocket
	Camshaft gear or sprocket material		Sintered iron sprocket
	Timing chain	No. of links	91 teeth
		Width	.954-1.031
		Pitch	.500

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Engine Displacement

L4-140 C.I.

L13 | L11

Engine—Valve System

				L13	L11
Hydraulic lifters (Std., opt., NA)				NA	
Valve rotator, type (intake, exhaust)				None	
Push rods (dia., length, material)				None	
Rocker ratio					
Operating tappet clearance (indicate hot or cold)	Intake		(cold)	.015	
	Exhaust		(cold)	.030	
Timing (based on top of ramp points)	Intake	Opens (°BTC)		22°	28°
		Closes (°ABC)		58°	70°
		Duration (deg.)		260°	278°
	Exhaust	Opens (°BBC)		92°	91°
		Closes (°ATC)		48°	55°
		Duration (deg.)		320°	326°
	Valve open overlap (deg.)			70°	83°
Intake	Material			Alloy steel with coated face	
	Overall length			4.590-4.610	
	Actual overall head dia.			1.615-1.625	
	Angle of seat & face (deg.)			46°seat;45°face	
	Seat insert material			None	
	Stem diameter			.3410-.3417	
	Stem to guide clearance			.0010-.0027	
	Lift (@ zero lash)			.4199	.4367
	Outer spring press. & length	Valve closed (lb. @ in.)		71-79-1.746	
		Valve open (lb. @ in.)		183-197@1.310	
	Inner spring press. & length	Valve closed (lb. @ in.)		Spring damper	
		Valve open (lb. @ in.)		Spring damper	
Exhaust	Material			High alloy steel, chrome plated stem	
	Overall length			4.576-4.596	
	Actual overall head dia.			1.370-1.380	
	Angle of seat & face (deg.)			46°seat; 45°face	
	Seat insert material			None	
	Stem diameter			.3410-.3417	
	Stem to guide clearance			.0010-.0027	
	Lift (@ zero lash)			.4302	.4379
	Outer spring press. & length	Valve closed (lb. @ in.)		71-79@1.746	
		Valve open (lb. @ in.)		183-197@1.310	
	Inner spring press. & length	Valve closed (lb. @ in.)		Spring damper	
		Valve open (lb. @ in.)		Spring damper	

MVMA Specifications Form Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

		Engine Displacement: L4-140 C.I. L13	L11

Engine — Lubrication System

Type of lubrication (splash, pressure, nozzle)	Main bearings	Pressure	
	Connecting rods	Pressure	
	Piston pins	Splash	
	Camshaft bearings	Pressure	
	Tappets	Splash	
	Timing gear or chain	None	
	Cylinder walls	Splash	
Oil pump type		Eccentric inside-outside gear driven by crankshaft	
Normal oil pressure (lb @ engine rpm)		40 PSI @ 1000 RPM	
Oil press. sending unit (elect or mech.)		Electric	
Type oil intake (floating, stationary)		Stationary	
Oil filter system (full flow, part., other)		Full flow	
Filter replacement (element, complete)		Complete	
Capacity of c/case, less filter-refill (qt.)		3.5	
Oil grade recommended (SAE viscosity and temperature range)		20°F and above-10W-30, 10W-40, 20W-20, 20W-40, 20W-50 0° to 60°F-10W; 5W-30, 10W-30, 10W-40 Below 20°F-5W-20, 5W-30	
Engine service reqmt (SD, SE, etc.)		SE	

Engine — Exhaust system

Type (single, single with cross-over, dual, other)		Single with single converter
Muffler No. & type (reverse flow, straight thru, separate resonator)		One reverse flow
Exhaust pipe dia (O.D., wall thick.)	Branch	2.00x.084 (a)
	Main	2.00x.072
Tail pipe dia. (O.D & wall thickness)		2.00x.057

(a) Laminated

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Passenger Car

Car Line VEGA

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Engine Displacement

L4-140 C.I.

Engine — Fuel System

(See supplemental page for Details of Fuel Injection, Supercharger, etc. if used)

Induction type: Carburetor, fuel injection, supercharger.			Carburetor
Fuel Tank	Refill capacity (U. S. gals.)		16 approximately
	Filler location		Right rear quarter panel
Fuel Pump	Type (elec. or mech.)		One electric
	Locations		Mounted in fuel tank
	Pressure range		3-4 1/2 PSI @ 12.5 volts
Vacuum booster (std., optional, none)			None
Fuel Filter	Type		Mesh plastic strainer
	Locations		In fuel tank (a)
Carburetor	Choke type		Automatic
	Intake manifold heat control (exhaust or water)		Water
	Air cleaner type	Standard	One piece welded unit
		Optional	None
	Idle speed (spec. neutral or drive)	Manual	700
		Automatic	750
		Idle A/F mix.	Not specified

Carburetor Supplementary Information

Model Usage	Engine Displ.	Transmission	Carburetors Make	Carburetors Model	No. Used and Type	Barrel Size
All Models	140 L13	Manual	Rochester	7045025	One; 1-bbl	1.44
		Automatic		7045024		
	140 L11	Manual	Holley	348659 (348661)	One; 2-bbl	Prim 1.24 Sec. 1.40
		Automatic		348660 (348662)		

Note: Data bracketed () pertains to engine application specific to California

(a) Additional paper element in carburetor inlet

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Engine Displacement	L4-140 C.I.	
	L13	L11

Engine — Cooling System

			L13	L11
Type system (pressure, pressure vented, atmospheric, other)			Pressure-vented thru coolant recovery system	
Radiator cap relief valve pressure			15±1PSI	
Circulation thermostat	Type (choke, bypass)		Choke	
	Starts to open at (°F)		192°-198°	
Water pump	Type (centrifugal, other)		Centrifugal	
	GPM 2000 pump rpm		14.7	
	Number of pumps		One	
	Drive (V-belt, other)		Multiple 'V' drive in backside of camshaft timing belt	
	Bearing type		Permanently lubricated double row ball	
By-pass recirculation type (inter., ext.)			Internal	
Radiator core type (cross-flow, vertical, cellular, tube and fin, other)			Tube and center; cross flow	
Cooling system capacity	With heater (qt.)		8	
	Without heater (qt.)		-	
	Opt. equipment-specify (qt.)		8	
Water jackets full length of cyl. (yes, no)			Yes	
Water all around cylinder (yes, no)			Yes	
Radiator hose	Lower	Number and type (molded, straight)	One, molded	
		Inside diameter	1.75	
	Upper	Number and type (molded, straight)	One, molded	
		Inside diameter	1.28	
	By-pass	Number and type (molded, straight)	None	
		Inside diameter	---	
Fan	Number of blades & spacing		5 blade, staggered	
	Diameter		14.0	
	Ratio-fan to crankshaft rev.		1:07:1	
	Fan cutout type		None	
	Bearing type		None	
*Drive belts (indicate belt used by letter)	Fan		A	A
	Generator or alternator		B	B
	Water Pump		A	A
	Power Steering		C	C
	Air Conditioning		D	D
	Crankshaft		AB	AB
	Air injection		-	E

*Drive Belt Dimensions	A	B	C	D	E	F	G	H	I	J	K
Angle of V	52°(a)	38°	38°	38°							
Nominal length (SAE)	45.50	36.00	53.25	36.25							
Width	1.031	.380	.380	.380							

(a) 6 'V' groove,

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Vehicle Emission Control

			Engine Displacement: L4-140 C.I. L13 All states except California	L4-140 C.I.-L11 All states except California	L4-140 C.I.-L11 California only
Exhaust Emission Control	Type (Air injection, engine modifications, other)			Engine modification	Air injection
	Air Injection Pump	Type	Not		Semi-articulated vane type
		Displacement		controlled	19.3cubic inch
		Drive ratio			1.15:1
		Drive type	APPLIC-		Crankshaft pulley
		Relief valve (type)		COMBUSTION	Diverter valve
		Filter (describe)			Centrifugal air cleaner
	Air Injection System	Air distribution (head, manifold, etc.)	ABLE	SYSTEM	MANIFOLD
		Point of entry			Exhaust ports
		Injection tube i.d.			.2200
		Check valve type			Pressure plate system
		Backfire protection (type)			Diverter valve
	Exhaust Gas Recirculation System	Type (controlled flow, open orifice, other)	Controlled flow		
		Valve type	Vacuum modulated shut off and metering valve		
		Valve location	Left front of inlet manifold		
		Control energy source	Carburetor vacuum		
		Exhaust source	Manifold		
		Exhaust cooler type	None		
		Orifice no. and size	One: .030		
		Point of exhaust injection (spacer, carburetor, manifold, other)	Inlet manifold		
	Other	Carburetor Heated Air	Thermostatically controlled air cleaner regulates and mixes heated air with incoming cold air to reduce hydrocarbon emission.		
		Under Floor Converter	Catalyst encased in a structural steel shell with an aluminized steel cover and a felt insulating blanket between. Exhaust gas flows down through the catalyst that effectively controls the hydrocarbon and carbon monoxide to a more desirable emission		

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Car Line VEGA
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Engine Displacement

Vehicle Emission Control (Continued)

Crankcase Emission Control	Type (ventilates to atmos., induction system, other)		Standard	Induction system
			Optional	---
	Control Unit	Make and model		AC Spark plug 6486955
		Location		Front camshaft cover
		Energy source (manifold vacuum, carburetor, other)		Manifold vacuum
		Control method (variable orifice, fixed orifice, other)		Variable orifice,
	Complete System	Discharges (to intake manifold, other)		Intake manifold
		Air inlet (breather cap, other)		Carburetor air cleaner
		Flame arrestor (screen, other)		Screen
Evaporative Emission Control	Fuel Tank	Thermal expansion volume (cu. ft.)		.0410
		Relief pressure (psi) and location		Filler cap 25-35" of water
		Vacuum relief (psi) and location		Filler cap 5-14" of water
		Vapor-liquid separator type		Integral chamber with fuel tank
		Vapor vented to (crankcase, canister, other)		Canister ---
	Carburetor	Vapor vented to (crankcase, canister, other)		Canister ---
	Vapor Storage	Storage provision (crankcase, canister, other)		Canister ---
		Volume (cu. ft.) or capacity (grams)		50-130 grams
		Control valve type		Vacuum diaphragm controlled-constant orific

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Engine Displacement

Electrical — Supply System

Battery	Make and Model		Delco Remy 1980199
	Voltage Rtg & Total Plates		12 volts (2300 watts)-54 plates
	SAE Designation No. and/or capacity		Cold cranking rating 0°-275 amps;-20°-210 amps 60 minutes reserve capacity
	Location		Right side front of engine compartment
	Terminal grounded		Negative
Generator or Alternator	Make		Delco Remy
	Model		1100545
	Type and rating		Diode rectified-32 amps
	Output at engine idle (neutral)		9-17 amps
	Ratio—Gen. to Cr/s rev		2.73:1
Regulator	Make		Delco Remy
	Model		---
	Type		Micro circuit unit, integral with generator
	Cutout relay	Closing voltage @ generator rpm	None
		Reverse current to open	None
	Regulated	Voltage	13.8-14.8@85°F
		Current	---
	Voltage test conditions	Temperature	Operating
		Load	3-8 amperes
		Other	None

Electrical — Starting System

Starting Motor	Make			Delco Remy
	Model			1108195
	Rotation (drive end view)			Clock wise
Motor Drive	Engagement type			Positive shift solenoid
	Pinion engages from (front, rear)			Rear
	Number of teeth	Pinion		9
		Flywheel	Manual	153
			Auto.	153
	Flywheel tooth face width		Manual	.4010-.4130
			Auto.	.4010-.4130

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Engine Displacement

Electrical — Ignition System — Distributor

Breaker gap (in.)		Not applicable
Cam angle (deg.)		Not applicable
Brkr. arm tension (oz.)		Not applicable
Distributor	Manual	1112862
	Automatic	1112862
Timing	Manual	10° BTC @ 700
	Automatic	12° BTC @ 750

Distributor Model	CENTRIFUGAL ADVANCE Crankshaft Degrees at Engine RPM			VACUUM ADVANCE Crankshaft Deg. at In. of Mercury	
	Start	Intermediate	Maximum	Start	Maximum
1112862	0° @ 1620	5 @ 2000	22 @ 4800	0° @ 5	24 @ 11

Engine Displacement

Electrical—Ignition System

Type	Conventional - Std., Opt., N.A.		- -
	Transistorized - Std., Opt., N.A.		- -
	Other (specify) standard		High energy Ignition System (H.E.I.)
Coil	Make		Delco Remy
	Model		1115430
	Amps	Engine stopped	4.0
		Engine idling	1.8
Spark Plug	Make		AC Spark Plug
	Model		AC R43TSX See bulletin showing
	Thread (mm)		14 plug gap change
	Tightening torque (lb. ft.)		25 (original) 15 (replacement) .60 - .35
	Gap		...060 E.S.L. 1975
Cable	Conductor type		Fiberglass core impregnated with electrical conducting materia
	Insulation type		Rubber
	Spark plug protector		Silicone Rubber

Electrical—Suppression

Locations & type	Non-metallic high tension ignition cables

Electrical—Instruments and Equipment

Speedometer	Type	In-line with pointer
	Trip odometer (std. opt., N. A.)	NA
Charge indicator - type		Tell-tale
Temperature indicator - type		Tell-tale
Oil pressure indicator - type		Tell-tale
Fuel indicator - type		Electric gauge
Windshield wiper	Type - Standard	Electric 2-speed
	Type - Optional	None
Windshield washer	Type - Standard	Push-button-manual
	Type - Optional	None
Horn	Type	Vibrator
	Number used	One
	Amp draw (each)	4.5-6.0 @ 12.5 volts
Other		Parking brake warning light and brake failure warning light. Restraint system warning light and buzzer. Coolant warning light.

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Car Line VEGA

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Engine Displacement

	L4-140 C.I. L13	L4-140 C.I. L11

Drive Units—Clutch (Manual Transmission)

Make & type		Chevrolet single dry disc	
Type pressure plate springs		Diaphragm	
Total spring load (lb.)		1250-1450	
No. of clutch driven discs		One	
Clutch facing	Material	Woven type asbestos	
	Manufacturer	Chevrolet	
	Part Number	6262868	
	Rivets/Plate	36	
	Rivet size	.184 x .208	
	Outside & inside dia	8.00x6.00	9.12x6.12
	Total eff. area (sq. in.)	43.98	71.82
	Thickness	.135	
	Engagement cushioning method	Flat spring steel between facings	
Release bearing	Type & method of lubrication	Single row ball, packed and sealed	
Torsional damping	Methods, springs, friction material	Coil springs	

Drive Units—Transmissions

Manual 3-speed (std., opt., N.A.)	standard
Manual 4-speed (std., opt., N.A.)	optional
Automatic (std., opt., N.A.)	optional

Drive Units — Manual Trans.

Number of forward speeds			3	4
Transmission ratios	In first		3.11	3.11
	In second		1.84	2.20
	In third		1.00	1.47
	In fourth		--	1.00
	In reverse		3.22	3.11
Synchronous meshing, specify gears			All forward gears	
Shift lever location			Floor mounted	
Lubricant	Capacity (pt.)		3	
	Type recommended		Meeting military specs MIL-L-2105B	
	SAE viscosity number	Summer	SAE 80	
		Winter	SAE 80	
		Extreme cold	SAE 80	

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Engine Displacement

L4-140 C.I.

Drive Units—Automatic Transmission

Trade name		Turbo Hydra-matic
Type (describe)		3-Speed torque converter
Selector location		Floor mounted
Gear Ratios	P	Park
	R	1.94
	N	Neutral
	D	2.52-1.52-1.00
	L2	2.52-1.52
	L1	2.52
Max. upshift speed - drive range		73
Max. kickdown speed - drive range		70
Torque convertor	*Number of elements*	3
	Max. ratio at stall	2.60
	Type of cooling (air, liquid)	Air
	Nominal diameter	10.00
Lubricant	Capacity - refill (pt.)	8
	Type recommended	A suffix A
Special transmission features		

Drive Units—Axle

Type (front, rear)			Rear
Description			Semi-floating with hypoid overhung pinion gear
Limited Slip differential, type			Cone clutch
Drive Pinion Offset			1.50 vertical
No. of differential pinions			Two
Pinion adjustment (shim, other)			Shim
Pinion bearing adj. (shim, other)			Collapsible sleeve
Wheel bearing type			single row, cylindrical roller
Lubricant	Capacity (pt.)		2.8
	Type recommended		Meeting Military Specs MIL-L-2105B
	SAE viscosity number	Summer	SAE 80
		Winter	SAE 80
		Extreme cold	SAE 80

Axle Ratio Tooth Combinations (See page 4 for axle ratio usage)

Axle ratio		2.92	3.42
No. of teeth	Pinion	13	12
	Ring gear	38	41
Ring Gear O. D.		6.50	

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Engine Displacement

Drive Units—Propeller Shaft

Number used			One
Type (straight tube, tube-in-tube, internal-external damper, etc.)			Straight tube
Outer diam. x length* x wall thickness	Manual 3-speed trans.		3.25 x 56.75 x 0.065
	Manual 4-speed trans.		3.25 x 55.92 x 0.065
	Automatic transmission		2.75 x 49.56 x 0.065
Intermediate bearing	Type (plain, anti-friction)		None
	Lubrication (fitting, prepack)		--
Slip Yoke	Type		Yoke
	Number of teeth		27
	Spline O. D		1.1755 - 1.1765
Universal joints	Make and Mfg. No.		Chevrolet 1285
	Number used		Two
	Type (ball and trunnion, cross)		Cross
	Rear attach. (u-bolt, clamp, etc.)		Flange type
	Bearing	Type (plain, anti-friction)	Anti-friction
		Lubric. (fitting, prepack)	Pre-pack
Drive taken through (torque tube or arms, springs)			Rear suspension control arms
Torque taken through (torque tube or arms, springs)			Rear suspension control arms

*Center to center of universal joints, or to centerline of rear attachment.

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Body Type And/Or Engine Displacement, Etc.

Drive Units — Tires And Wheels (Standard)

TIRES	Size, load range, ply		A 78-13 B
	Type (bias, radial, etc.)		Bias ply
	Inflation pressure (cold) for recommended max vehicle load	Front *	24
		Rear *	26
	Rev/mile @ 45 mph		884
WHEELS	Type & material		Short spoke spider-steel
	Rim (size & flange type)		13x5
	Wheel offset		.45
	Attachment	Type (bolt or stud)	Stud
		Circle diameter	4.00
		Number & size	4 hex nuts 7/16-20 UNF-2B
	Spare wheel (same or other)		Same

Drive Units — Tires And Wheels (Optional)

Size, load range, ply	BR 78x13B
Type (bias, radial, etc.)	Steel belted radial
Wheel type & material	Short spoke spider-steel
Rim (size, flange type, and offset)	13x6
Size, load range, ply	A78x13B
Type (bias, radial, etc.)	Bias belted
Wheel type & material	Short spoke spyder
Rim (size, flange type, and offset)	13x5
Size, load range, ply	
Type (bias, radial, etc.)	
Wheel type & material	
Rim (size, flange type, and offset)	
Size, load range, ply	
Type (bias, radial, etc.)	
Wheel type & material	
Rim (size, flange type, and offset)	
Size, load range, ply	
Type (bias, radial, etc.)	
Wheel type & material	
Rim (size, flange type, and offset)	

Brakes — Parking

Type of control		Grip handle
Location of control		On tunnel between front seats
Operates on		Rear service brakes
If separate from service brakes	Type (internal or external)	---
	Drum diameter	---
	Lining size (length x width x thickness)	---

*Full rated pressures shown, selected tire pressures are contingent on weight of vehicles.

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Body Type And/Or Engine Displacement

Brakes — Service

Brake Type (std., opt., N.A.)	Drum	Front	--
		Rear	Standard
	Disc	Front	Standard
		Rear	--
Self adjusting (std., opt., N.A.)			Standard
Special Valving	Type (proportion, delay, metering, other)		Metering and proportioning
Power Brake (std., opt., N.A.)			Optional
Booster Type (remote, integral, etc.)			--
Effective area (sq. in.)*			66.06
Gross lining area (sq. in.)**			65.9
Swept area (sq. in.)***			237.8
Drum	Diameter (nominal)	Front	--
		Rear	9.0
	Type and material		Composite, cast iron rim and steel web
Rotor	Outer working diameter		9.88
	Inner working diameter		6.40
	Thickness		0.50
	Material & type (vented/solid)		Cast iron-solid, integral with hub
Wheel cylinder bore	Front		1.875
	Rear		0.75
Master Cylinder	Bore		0.75
	Stroke		1.159
Pedal arc ratio			Manual 6.47 Power 4.00
Line pressure at 100 lb. pedal load			12.70
Shoe Clearance	Front		Self-adjusting
	Rear		Self-adjusting
Anti-skid device type (std., opt., N.A.)			Not available

Brake lining	Bonded or riveted, rivets/seg.			Bonded
	Rivet size			--
	Manufacturer			--
	Part number			--
	Front Wheel	Material		Molded asbestos
		Size (length x width x thickness)	Prim. or out-board	4.00x1.60x0.370
				--
			Second. or in-board	4.00x1.60x0.370
				--
		Segments per shoe		One
		Shoe thickness		
	Rear Wheel	Material		Molded asbestos
		Size (length x width x thickness)	Prim. or out-board	9.18x1.20x0.20
				--
			Second. or in-board	9.18x1.20x0.20
				--
		Segments per shoe		One
		Shoe thickness		

* Excludes rivet holes, grooves, chamfers, etc.

** Includes rivet holes, grooves, chamfers, etc.

*** Total swept area for four brakes. (Drum brake: Widest lining contact width for each brake x its contact circumference.) (Disc brake: Square of Outer Working Dia. minus square of Inner Working Dia. multiplied by π/2 for each brake.)

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Steering

Manual (std., opt., NA)				Standard
Power (std., opt., NA)				Optional
Adjustable steering wheel (tilt, swing, other)	Type and description			Not available
	(std., opt., NA)			--
Wheel diameter	Manual			14.75x14.25
	Power			14.75x14.25
Turning diameter (feet)	Outside front	Wall to wall (l. & r.)		38.4
		Curb to curb (l. & r.)		35.8
	Inside rear	Wall to wall (l. & r.)		
		Curb to curb (l. & r.)		
Manual	Gear	Type		Semi-reversible, recirculating anti-friction bearings
		Make		Saginaw Steering
		Ratios	Gear	20.9:1
			Overall	22.5:1
	No. wheel turns (stop to stop)			4.4
Power	Type (coaxial, linkage, etc.)			Integral gear and power piston with vane type pump
	Make			Saginaw Steering
	Gear	Type		Same as manual
		Ratios	Gear	16.0:1-13.0:1
			Overall	16.5:1-13.5:1
	Pump driven by			Belt from crankshaft pulley
	No. wheel turns (stop to stop)			2.82
Linkage	Type			Parallelogram
	Location (front or rear of wheels, other)			Front
	Drag link (trans. or longit.)			Transverse
	Tie rods (one or two)			Two
Steering Axis	Inclination at camber (deg.)			8.55 @ 25°
	Bearings (type)	Upper		Sintered steel spherical
		Lower		Sintered steel spherical
		Thrust		None
Whl Align (range at curb wt & preferred)	Caster (deg.)			N 3/4 ± 1
	Camber (deg.)			P 1/2 ± 3/4
	Toe-in (outside track inches)			1/4 ± 1/16
Steering spindle & joint type				Spherical joint steering knuckle pivots
Wheel Spindle	Diameter	Inner bearing		1.25
		Outer bearing		0.687
	Thread size			11/16- 20 NEF - 3 (modified)
	Bearing type			Taper roller

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Body Type And/Or Engine Displacement

Suspension — General

(See Supplement page for details on Air Suspension)

Provision for car leveling		None
Provision for brake dip control		Front suspension geometry
Provision for acc. squat control		Rear suspension geometry
Special provisions for car jacking		Position jack in bumper slot in lower face of front and rear bumpers
Shock absorber front & rear	Type	Direct double acting hydraulic
	Make	Delco products
	Piston dia.	1.00
Other special features		--

Suspension — Front

Type and description		Independent SLA type, coil springs
Travel	Full Jounce	2.15
	Full Rebound	3.24
Spring	Type (coil, leaf, other)	Coil
	Material	Steel alloy
	Size (coil design height & I.D., bar length x dia.)	8.70 x 3.50; 98.58 x .562 (a)
	Spring rate (lb. per in.)	325 (a)
	Rate at wheel (lb. per in.)	
Stabilizer	Type (link, linkless, frameless)	Link
	Material & bar diameter	HR steel o.875

Suspension — Rear

Type and description			Salisbury rear axle with coil springs
Drive and torque taken through			Control arms
Travel	Full Jounce		2.75
	Full Rebound		4.32
Spring	Type (coil, leaf, other)		Coil
	Material		Chrome carbon steel heat treated
	Size (length x width, coil design height & I.D., bar length & dia.)		10.24 x 4.24; 91.79 x .474 (a)
	Spring rate (lb. per in.)		130 (a)
	Rate at wheel (lb. per in.)		
	Mounting insulation type		Rubber pad - top and bottom
	If leaf	No. of leaves	--
		Shackle (comp. or tens.)	--
Stabilizer	Type (link, linkless, frameless)		Linkless (b)
	Material & bar diameter		0.75
Track bar type			None

(a) For base equipped model. Springs for all models are computer selected b[illegible] size and rate according to vehicle weight including optional equipment.
(b) Used with special performance option RPO F41.

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Body Type

2-Door Notchback Coupe	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery

Frame

Type and description (Separate frame, unitized frame, partially - unitized frame): Integral Body - Frame

Body — Miscellaneous Information

Drs hinged (front, rr.)	Front doors	Front
	Rear doors	None
Type of finish (lacquer, enamel, other)		Acrylic Lacquer
Hood counterbalanced (yes, no)		No
Hood release control (internal, external)		Internal
Vehicle Indent. No. location		Top left hand of instrument panel pad.
Engine No. location		Pad; upper left hand corner on right side of cylinder case opposite number three cylinder.
Theft protection - type		Lock; mounted on steering columns; locks steering wheel, transmission shift levers and ignitions.
Vent window control method (crank, friction pivot)	Front	--
	Rear	--
Seat cushion type	Front	Formed full foam pad
	Rear	Formed wire and full foam construction
	3rd seat	--
Seat back type	Front	Formed full foam pad
	Rear	Formed wire and full foam construction
	3rd seat	--
Windshield glass type (i.e., single curved - laminated plate)		Curved laminated plate
Side glass type (i.e., curved - tempered plate)		Curved - tempered plate
Backlight glass type (i.e., compound curved - tempered plate, three piece)		Curved - tempered plate

	2-Door Notchback Coupe	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery
Windshield glass exposed surface area	1116.2	1143.9	1116.2	1116.2
Side glass exposed surface area	1545.4	1334.4	2062.0	956.4
Backlight glass exposed surface area	973.8	1071.3	662.5	662.5
Total glass exposed surface area	3635.4	3549.6	3840.7	2735.1

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (●) ____

Body Type

2-Door Notchback Coupe	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery

Convenience Equipment

Power windows	Side windows	N A
	Vent windows	N A
	Backlight or tailgate	N A
Power seats (specify type as well as availability)		N A
Reclining front seat back (R-L or both)		2-position included in package option
Radios (specify type as well as availability)		Optional-AM-Push-button, AM-FM-Push-button, -AM-FM Stereo, 2-speakers, (exc. panel delivery).
Rear seat speaker		Optional (except panel delivery)
Power antenna		N A
Clock		Optional
Air conditioner (specify type and availability)		Optional-Four season, with manual control.
Speed warning device		N A
Speed control device		N A
Ignition lock lamp		N A
Dome lamp		Standard
Glove compartment lamp		Optional
Luggage compartment lamp		Optional, station wagon & panel delivery
Underhood lamp		Optional
Courtesy lamp		N A
Map lamp		N A
Cornering light lamp		N A
Rear window ~~defroster~~ defogger electrically heated		Optional
Rear window defogger		N A
Windshield antenna		Available with factory installed radio, also with tinted windshield gl
tinted body glass		Optional
swing out rr qtrwindows		Optional with Notchback & Hatchback coupes only
Auxiliary seat		Optional with panel delivery

Lamp Height And Spacing*

			2-Door Notchback Coupe	2-Door Hatchback Coupe	2-Door Station Wagon	2-Door Panel Delivery
Height above ground to center of bulb or marker	Headlamp (H125)	Highest**	26.6			27.
		Lowest	--			
	Tail (H126)	Highest	25.05		25.0	24.1
		Lowest	--			
	Sidemarker	Front	22.7			23.4
		Rear	21.8			21.1
Distance from C/L of car to center of bulb	Headlamp	Inside	--			
		Outside**	25.48			
	Tail	Inside	--			
		Outside	23.32			
	Directional	Front	17.92			
		Rear	23.32			

*Measured with passenger load and trunk/cargo load specified in Car and Body Dimension section.

**If single headlamps are used enter here.

MVMA Specifications Form
Passenger Car

Car Line VEGA
Model Year 1975 Issued 9/74 Revised (•)

Vehicle Weights

Model	Curb Weight * (Pounds)			% Pass. Weight Distribution				Shipping Weight ** (Pounds)
				Pass. in Front		Pass. in Rear		
	Front	Rear	Total	Front	Rear	Front	Rear	
2-Door Notchback coupe 1HV11	1339	1156	2495	44.6	55.4	14.6	85.4	2415
2-Door Hatchback coupe 1HV77	1352	1206	2558	44.6	55.4	16.0	84.0	2478
2-Door Station wagon 1HV15	1339	1272	2611	44.6	55.4	14.6	85.4	2531
2-Door Panel delivery 1HV05	1317	1164	2481	44.6	55.4	--	--	2401

Reference - SAE Aerospace-Automotive drawing standards, Section E 1.02 (d).

** Shipping weight definition -

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Optional Equipment Weights

Equipment Differential Weights	WEIGHT (Pounds) Front	Rear	Total	Remarks
Air Conditioning	+ 77	+ 8	+ 85	
Auxiliary Seat	+ 11	+ 16	+ 27	Panel delivery only
Front & Rear floor mats	+ 4	+ 5	+ 9	
Spec. Perf. frt. &rr. susp.	+ 12	+ 8	+ 20	
Power steering	+ 36	+ 1	+ 37	
Radio AM Push-button	+ 5	+ 1	+ 6	
Radio AM/FM Push-button	+ 6	+ 2	+ 8	
Radio AM/FM Stereo	+ 8	+ 3	+ 11	
Battery heavy duty	+ 2	0	+ 2	
Exterior soft roof cover	+ 2	+ 3	+ 5	2-Door hatchback coupe 1HV77 only (included in RPO ZO4 for notchback coupe)
Deluxe interior & exterior	+ 2	+ 1	+ 3	
Special deluxe equipment	+ 8	+ 5	+ 13	
Custom interior	0	+ 6	+ 6	2-Door notchback coupe 1HV11
	+ 1	0	+ 1	2-Door hatchback coupe 1HV77
	+ 1	0	+ 1	2-Door station wagon 1HV15
GT sport package	+ 3	+ 3	+ 6	2-Door hatchback coupe and wagon
Roof luggage carrier	+ 1	+ 11	+ 12	2-Door wagon and panel delivery
Wheel trim rings	+ 3	+ 3	+ 6	
Wheel covers	+ 2	+ 2	+ 4	
4-Speed transmission	+ 4	+ 1	+ 5	2-Door notchback coupe 1HV11
				2-Door hatchback coupe 1HV77, wagon 1HV15, panel 1HV05.
Turbo Hydra-matic trans.	+ 16	+ 6	+ 22	2-Door notchback coupe 1HV11
				2-Door hatchback coupe 1HV77, wagon 1HV15, panel 1HV05.
140 Cu.In. Engine L11	+ 4	0	+ 4	

MVMA Specifications Form
Passenger Car

Car Line VEGA

Model Year 1975 Issued 9/74 Revised (•)

Body Type

Vehicle Fiducial Marks

Fiducial Mark Number *	Define Coordinate Location
Front	X - Fiducial Mark to Centerline of Car - Front, Width measurement made from centerline of car to fiducial mark located on top of the front seat adjuster mounting bolt.
	Y - Fiducial Mark to Vertical Body Zero Line - Front, Measured horizontally from the body zero line to the front fiducial mark located on top of the front seat adjuster mounting bolt.
	Z - Fiducial Mark to Horizontal Body Zero Line - Front, Measured vertically from body zero line to the front fiducial mark located on top of the front seat adjuster mounting bolt.
Rear	X - Fiducial Mark to Centerline of Car - Rear, Width measurement made from centerline of car to fiducial mark located on the rear underbody crossbar.
	Y - Fiducial Mark to Vertical Body Zero Line - Rear, Measured horizontally from body zero line to the rear fiducial mark located on rear underbody crossbar.
	Z - Fiducial Mark to Horizontal Body Zero Line - Rear, Measured vertically from body zero line to the rear fiducial mark located on the rear underbody crossbar.

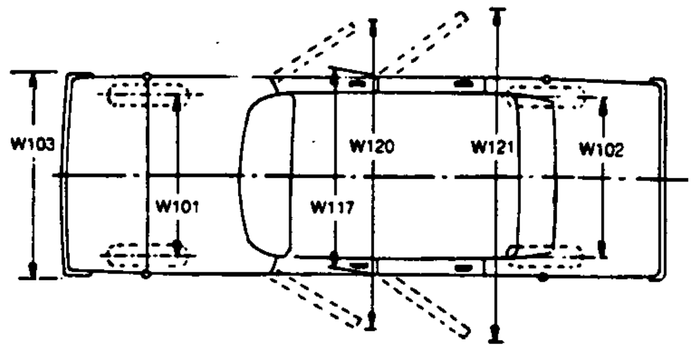
Fiducial Mark Number	Coordinate Location of Fiducial Mark			Fiducial Mark to Ground at Curb	
	X	Y	Z		
Front	19. 86	29. 39	4. 08	Coupes	9. 06
				Station Wagons	9. 06
				Panel Delivery	9. 18
Rear	8. 25	121. 50	9. 06	Coupes	13. 80
				Station Wagons	13. 81
				Panel Delivery	12. 99

* Reference — SAE Recommended Practice, J182

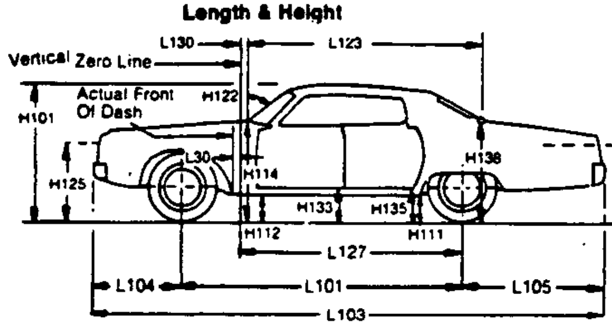
MVMA Specifications Form
Passenger Car

Exterior Car And Body Dimensions — Key Sheet

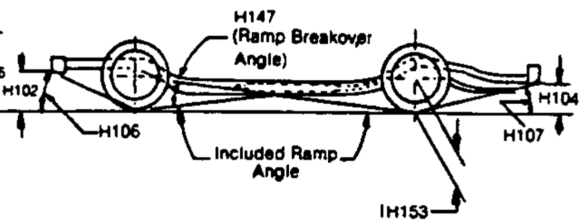
Width



Length & Height

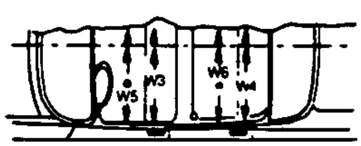


Ground Clearance

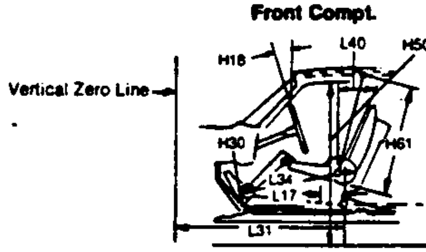


Interior Car And Body Dimensions — Key Sheet

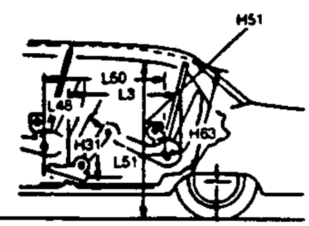
Width



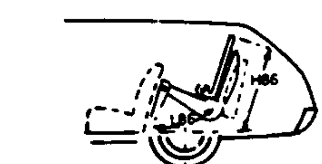
Front Compt.

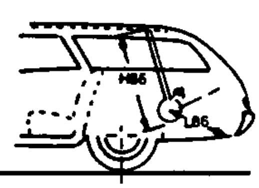


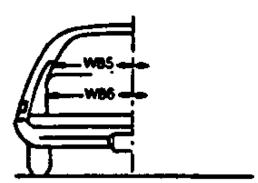
Rear Compt.



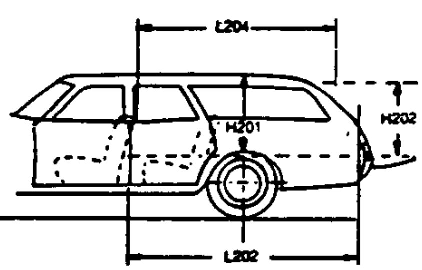
Third Seat

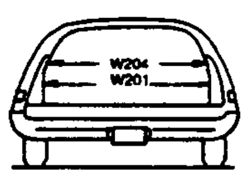




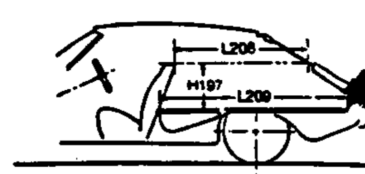


Cargo Space





Station Wagon



Hatchback

MVMA Specifications Form
Passenger Car

Exterior Car And Body Dimensions — Key Sheet
Dimension Definitions

Width Dimensions

W101 WHEEL TREAD — FRONT. Measured at centerline of tires, with nominal camber, at ground.

W102 WHEEL TREAD — REAR. Measured at centerline of tires at ground.

W103 MAXIMUM OVERALL CAR WIDTH. Include bumpers, moldings, or sheet metal protrusions. Measured to outside of metal.

W117 MAXIMUM BODY WIDTH AT NO. 2 PILLAR. Measured across body at No. 2 pillar, excluding hardware and applied moldings.

W120 MAXIMUM OVERALL CAR WIDTH, FRONT DOORS OPEN is measured to outside of sheet metal with front doors in maximum hold-open position.

W121 MAXIMUM OVERALL CAR WIDTH, REAR DOORS OPEN is measured in same manner as W120.

Length Dimensions

L30 VERTICAL ZERO LINE TO ACTUAL FRONT OF DASH. If actual Front of Dash is to the rear of Body Zero Line, it is identified by a minus (—) sign.

L101 WHEELBASE.

L103 OVERALL LENGTH. Include bumper guards if standard equipment.

L104 OVERHANG — FRONT. Measured from C/L of front wheels to front of car, including bumper guards if standard equipment.

L105 OVERHANG — REAR. Measured from C/L of rear wheels to rear of car, including bumper guards if standard equipment.

L123 BODY UPPER STRUCTURE LENGTH AT CAR CENTERLINE. The horizontal dimension from the Cowl Point to the Deck Point.

L127 VERTICAL ZERO LINE TO CENTERLINE OF REAR WHEELS. A horizontal dimension.

L130 VERTICAL ZERO LINE TO WINDSHIELD COWL POINT. The horizontal dimension from the vertical zero line to the theoretical intersection of extended windshield glass plane and normal cowl surface.

Height Dimensions

H101 OVERALL HEIGHT — DESIGN. Measured with the vehicle in Manufacturer's Design Weight attitude.

H114 COWL POINT TO GROUND. Measured at vehicle centerline.

H138 DECK POINT TO GROUND. Measured at vehicle centerline.

H112 ROCKER PANEL TO GROUND — FRONT. The vertical dimension from ground to bottom of rocker panel, excluding flanges. Measured to the outside of sheet metal at foremost point of rocker panel.

H133 BOTTOM OF DOOR TO GROUND, CLOSED — FRONT is the same point on the door as H132 dimension, with door closed.

H111 ROCKER PANEL TO GROUND — REAR. The vertical dimension from ground to bottom of rocker panel, excluding flanges. Measured to the outside of sheet metal at front of rear wheel opening.

H135 BOTTOM OF DOOR TO GROUND, CLOSED — REAR is measured in same manner as H133.

H122 WINDSHIELD SLOPE ANGLE. The angle between a vertical line and the windshield surface at car centerline. On compound-curved windshields the chord of the arc is used and limited to that section of the windshield comprehended by an 18-inch chord.

H125 HEADLAMP CENTERLINE TO GROUND is measured vertically to the center of the upper lamp.

H126 TAILLAMP CENTERLINE is measured vertically from ground to the centerline of the upper bulb.

Ground Clearance Dimensions

H102 BUMPER TO GROUND — FRONT. Minimum dimension, includes bumper guards.

H104 BUMPER TO GROUND — REAR. Minimum dimension, includes bumper guards.

H106 ANGLE OF APPROACH. The angle between ground and a line tangent to the front tire static loaded radius arc and the first point of interference, i.e., bumper, guard, gravel deflector, fender or other component, excluding license plate. This dimension may be determined graphically for reporting purposes.

H107 ANGLE OF DEPARTURE. The angle between ground and a line tangent to the rear tire static loaded radius arc and the first point of interference, i.e., bumper, guard, gravel deflector, tail pipe, fender or other component, excluding license plate. This dimension may be determined graphically for reporting purposes.

H147 RAMP BREAKOVER ANGLE. The supplement of included ramp angle (180° minus included ramp angle) over which car can pass without interference; measured with car sitting on a level surface, using lines tangent to arcs of front and rear static loaded radii and intersecting at point on underside of car which defines the smallest angle.

H153 REAR AXLE DIFFERENTIAL SYSTEM TO GROUND is a minimum clearance.

H156 MINIMUM RUNNING GROUND CLEARANCE. Location of measurement on the car is to be clearly recorded.

MVMA Specifications Form
Passenger Car

Interior Car And Body Dimensions — Key Sheet
Dimension Definitions

Front Compartment Dimensions

L31 H POINT TO VERTICAL ZERO LINE — FRONT is a horizontal dimension.

H61 EFFECTIVE HEAD ROOM — FRONT. The dimension from H Point to the headlining, plus a constant of 4.0 inches, measured along a line 8° to rear of vertical.

H75 EFFECTIVE T POINT HEADROOM — FRONT. The arc dimension from the T Point to the headlining plus 30 inches.

L34 MAXIMUM EFFECTIVE LEG ROOM — ACCELERATOR. Measured along a diagonal line from the Manikin ankle pivot center to the H Point plus a constant of 10.0 inches. For treadle type accelerator pedals, the leg room is measured with the Manikin's right foot on the accelerator pedal and the Manikin Heel Point at Accelerator Heel Point. All other types of accelerator pedals will be measured with the Manikin foot angle set at 87° and the shoe touching the pedal.

H30 H POINT TO HEEL POINT — FRONT. The vertical dimension from the H Point to the Accelerator Heel Point.

L17 H POINT TRAVEL. The horizontal dimension between the H Point in the most forward and rearward seat positions.

W3 SHOULDER ROOM—FRONT. The minimum dimension measured laterally between the trimmed surfaces on the "X" plane through the H-point—front within the belt line to 10 inches above the H-point—front.

W5 HIP ROOM—FRONT. The minimum dimension measured laterally between the trimmed surfaces on the "X" plane through the H-point—front within 1.0 inches below and 3.0 inches above the H-point height and 3.0 inches fore and aft of the H-point.

H50 UPPER BODY OPENING TO GROUND — FRONT. The vertical dimension from a point on the trimmed body opening to the ground, measured at the H Point station.

H18 STEERING WHEEL ANGLE — VERTICAL. The angle measured from a vertical to the surface plane of the steering wheel.

L40 BACK ANGLE — FRONT. The angle measured between a vertical line through the H-Point-Front and the torso line.

Rear Compartment Dimensions

L50 H POINT COUPLE DISTANCE. The horizontal dimension from the front seat H Point to the rear seat H Point.

H63 EFFECTIVE HEAD ROOM — REAR. The dimension from the H Point to the headlining, plus a constant of 4.0 inches, measured along a line 8° to rear of vertical.

H76 EFFECTIVE T POINT HEADROOM — REAR. Measured in the same manner as H75.

L51 MINIMUM EFFECTIVE LEG ROOM — REAR. Measured along a diagonal line from the ankle pivot center to the H Point plus a constant of 10.0 inches, with the foot positioned to the nearest interference between the seat structure and toe, instep or lower leg.

H31 H POINT TO HEEL POINT — REAR. The vertical dimension from the H Point to the Manikin Heel Point on the depressed floor covering.

L48 KNEE CLEARANCE. The minimum dimension measured from the knee pivot center to the back of front seatback minus 2.0 inches.

L3 REAR COMPARTMENT ROOM. The horizontal dimension from the back of front seat to front of rear seat back at height tangent to the top of rear seat cushion.

W4 SHOULDER ROOM—SECOND. The minimum dimension measured laterally between trimmed surfaces on the "X" plane through the H-point—second within 10.0-16.0 inches above the H-point—second.

W6 HIP ROOM—SECOND. Measured in the same manner as W5.

H51 UPPER BODY OPENING TO GROUND — REAR. The vertical dimension from a point on the trimmed body opening to the ground, measured 13.0 inches forward of the H Point.

Luggage Compartment Dimensions

V1 LUGGAGE CAPACITY — USABLE. The total luggage compartment luggage capacity in cubic feet with the tire and tools in place.

H195 LIFTOVER HEIGHT. Vertical dimension from the highest point on the luggage compartment lower opening to ground, excluding corner radii.

Station Wagon — Third Seat Dimensions

W85 SHOULDER ROOM—THIRD. Measured in the same manner as W4.

W86 HIP ROOM—THIRD. Measured in the same manner as W5.

L86 EFFECTIVE LEG ROOM — THIRD SEAT. Measured along a diagonal line from ankle pivot center to H Point plus a constant of 10.0 inches. With rear-facing third seat, foot is positioned in foot well or to nearest interference with rear end or rear closure.

H86 EFFECTIVE HEAD ROOM — THIRD SEAT. The dimension from H Point to the headlining, plus a constant of 4.0 inches. Measured along a line 8° to rear of vertical.

H89 EFFECTIVE T POINT HEADROOM — THIRD SEAT. Measured in the same manner as H75.

Passenger Car

Interior Car And Body Dimensions — Key Sheet
Dimension Definitions

Station Wagon — Cargo Space Dimensions

L202 CARGO LENGTH AT FLOOR — FRONT SEAT. The horizontal dimension, measured at the floor level from the rear of the front seat back to the normal inside limiting interference on the tailgate, on the car centerline.

L204 CARGO LENGTH AT BELT — FRONT SEAT. The horizontal dimension measured from the top rear of front seat back to a vertical extension line from the normal inside limiting interference at the top of the tailgate, on the car centerline.

W201 CARGO WIDTH — WHEELHOUSE. The minimum horizontal dimension, measured between wheelhousings at floor level.

W204 OPENING WIDTH AT BELT. The minimum horizontal dimension, measured between the nearest normal inside limiting interferences of the rear opening at the top of the tailgate.

H201 MAXIMUM CARGO HEIGHT. The maximum vertical dimension, measured from the top of the floor covering to the headlining, on the car centerline.

H202 REAR OPENING HEIGHT. The vertical dimension measured from the top of the floor covering to the normal inside limiting interference at the top of the rear opening, on the car centerline, with both tail and liftgates fully open.

V2 CARGO VOLUME INDEX BEHIND FRONT SEAT. The total volume in cubic feet above the normal load floor and behind the front seat with the liftgate and tailgate closed.

$$\frac{W4 \times L204 \times H201}{1728}$$

Hatch Back — Cargo Space Dimensions

All hatch back cargo dimensions are to be taken with the front seat in full down and rear position, and the rear seat folded down. The hatch back door is in the closed position (For electrically adjusted seats, see manufacturer's specifications for Design 'H' Point).

H197 FRONT SEAT BACK TO LOAD FLOOR HEIGHT. The dimension measured vertically from the horizontal tangent to the top of the seat back to the undepressed floor covering.

L208 CARGO LENGTH AT FRONT SEAT BACK HEIGHT. The horizontal dimension measured from the top rear of front seat back to the inside limiting interference of the hatch back door on the car centerline.

L209 CARGO LENGTH AT FLOOR — FRONT SEAT. The horizontal dimension measured at floor level from the rear of the front seat back to the normal limiting interference of the hatch back door on the car centerline.

V3 HATCH BACK — CARGO INDEX VOLUME. Hatch back cargo index volume is to be determined by the following formula, and expressed in terms of cubic feet.

$$\frac{\frac{L208 + L209}{2} \times W4 \times H197}{1728}$$