E - THEORY/OPERATION

1989 ENGINE PERFORMANCE Honda Theory & Operation

INTRODUCTION

This article covers the basic description and operation of engine performance related systems and components. Prior to diagnosing vehicles or systems with which you are not completely familiar, read through this article.

AIR INDUCTION SYSTEM

CARBURETED

Air Intake System

The air intake system used on carbureted vehicles supplies fresh, filtered, temperature-controlled air to the carburetor. System consists of an air cleaner, air intake pipe, carburetor, intake manifold and intake air control system. The intake air control system maintains a uniform air temperature inside the air cleaner. Carburetor receives fresh air, controlled within a narrow temperature range, regardless of outside temperature.

Carburetor

Carburetor is a 2-barrel downdraft fixed venturi type. Carburetor consists of 3 layers, a choke valve and air horn make up the top layer; the venturi, float chamber, accelerator pump, actuator, and choke housing make up the middle layer; and the primary and secondary throttle valves, secondary diaphragm, and pilot screw are part of the throttle body, or bottom layer of the carburetor.

FUEL INJECTION

Air Intake System

The air intake system used on fuel injected vehicles, supplies air for all engine needs. System consists of an cleaner, air intake pipe, throttle body, Electronic Air Control Valve (EACV), by-pass control system, fast idle mechanism (except TBI) and intake manifold. All models incorporate a resonator chamber in the air intake pipe that provides silencing as air is drawn into the system.

By-Pass Control System

The by-pass control system consists of 2 separate intake paths in the intake manifold, a by-pass valve, a by-pass control diaphragm and a by-pass control solenoid valve. The ECU selects the air intake path most favorable for engine performance by operating by-pass valves to direct airflow through a long or short intake path. A long intake path is used for high torque at low RPM. A short intake path is used for high power at high RPM.

Throttle Control System

The dashpot diaphragm functions as a cranking opener. When the engine is at idle, intake manifold vacuum is applied on the dashpot diaphragm and pulls up the diaphragm rod, so that the throttle valve is in the idle position. During cranking with the starter, the spring in the dashpot diaphragm pushes the throttle valve open a certain amount for assisting engine starting.

Throttle Body

The throttle body is a single-barrel sidedraft type. Lower portion of throttle valve is heated by engine coolant from cylinder head. The idle adjusting screw (to increase and decrease by-pass air) and canister/purge port are both located on top of throttle body. A dashpot is used to slow the throttle valve as it approaches the closed position, preventing rich mixtures on deceleration.

COMPUTERIZED ENGINE CONTROLS

The computerized engine controls are used to control the fuel, ignition, and emission control systems. The Electronic Control Unit (ECU) used for each system accepts input signals from a variety of input components. The ECU compares each of the input signals it receives to a preprogrammed parameter preset into the ECU memory. It instantly analyzes each of the input values and adjusts output signals accordingly. This response allows the vehicle to perform optimally under a wide variety of operating conditions.

ELECTRONIC CONTROL UNIT (ECU)

Carbureted

The control unit used on Accord carbureted vehicles is located under the driver's seat. The control unit accepts input signals from various input components and compares each signal to adjust and control operation of the following: the idle system, carburetor feedback system, fuel cut-off system, starting (cranking) system, anti-afterburn system, air suction system, evaporative system, and the Early Fuel Evaporation (EFE) system.

The control unit uses input signals in conjunction with vacuum and fuel regulating solenoids to maintain proper air/fuel ratio during most engine operating conditions. The control unit operates an idle boost system which compensates for engine loads on vehicles equipped with automatic transmission and/or air conditioning. The control unit also controls the fuel cut-off system. In order to provide the vehicle with a stoichiometric air/fuel ratio and give a simultaneous reduction of hydrocarbons, carbon monoxide and oxides of nitrogen, the control unit also controls the feedback control system.

NOTE: **For ease of understanding, components will be grouped into 2 categories. The first category, INPUT DEVICES, are components which control or produce voltage signals that are monitored by the ECU. The second category, OUTPUT DEVICES, are components that are controlled by the ECU (this is usually accomplished by the ECU grounding individual circuits).**

INPUT DEVICES

All vehicles are equipped with different combinations of input devices. Not all devices are used on all models. To determine the input usage on a specific model, see **L - WIRING DIAGRAMS** article. The available input signals include the following:

A/C Switch Signal

This switch signals the control unit when there is a demand for air conditioning in the A/C switch circuit, so that control unit can change engine RPM to compensate for the extra load.

Alternator (FR) Signal (Except Carb.)

This signals the ECU when the alternator is charging, so that ECU will compensate for the low battery voltage condition that can cause injector lag (duration/injector opening).

Atmospheric Pressure (PA) Sensor (Except Carb.)

The PA sensor converts atmospheric pressure into electrical signals and inputs the ECU.

Automatic Transmission Shift Position Signal

This signals the control unit when the transmission selector lever is in the Park, Neutral or "D4" position.

Battery Voltage (Carb.)

This provides the control unit with a constant battery voltage signal from the battery.

Battery Voltage (IGN.1)

This provides the control unit with a battery voltage signal from the ignition circuit when ignition switch is in the "ON" position.

Clutch Switch Signal (M/T With Carb.)

This signals the control unit when the clutch is engaged.

Coolant Temperature (TW) Sensor

The coolant temperature sensor is a temperature dependant resistor (thermistor). The resistance of the thermistor decreases as the coolant temperature increases.

Exhaust Gas Recirculation Valve Lift Sensor (Calif.)

The EGR valve lift sensor detects the amount of EGR valve lift and sends the information to the ECU. The ECU uses this information, along with other sensor inputs, to determine regulation of the EGR control solenoid valve.

Ignition Coil Output Signal (Carb.)

This signal allows the control unit to monitor the engine RPM through the ignition circuit. This signal also controls the fuel pump cut-off relay. If signal is lost, relay will stop electric fuel pump.

Intake Air Temperature (TA) Sensor

The intake air temperature sensor is a temperature dependant resistor (thermistor). The resistance of the thermistor decreases as the intake air temperature increases.

Manifold Absolute Pressure (MAP) Sensor (Except Carb.)

The MAP sensor converts manifold absolute pressure into electrical signals and sends the signals to the ECU. MAP sensor signals are a reflection of engine load.

Oxygen (O2) Sensor

The oxygen sensor detects the oxygen content of the exhaust gases and sends that signal to the control unit. The ECU receives the signals from the sensor and varies the air/fuel ratio to maintain a 14.7:1 air/fuel ratio under most operating conditions. This ratio is most efficient for combustion and catalytic converter operation. Both Prelude and Accord PFI models use 2 oxygen sensors.

Power Steering Pressure Switch

This switch signals the ECU when the power steering load is high, so that ECU can compensate for the load by increasing engine RPM.

Starter Signal

This signals the control unit when the engine is cranking.

Throttle Angle Sensor

The throttle angle sensor is a 3-wire potentiometer that is connected to the throttle valve shaft. As the throttle angle changes, the throttle angle sensor varies the voltage signal which is monitored by the control unit. Sensor voltage will range from about one volt at closed throttle, up to about 5 volts at wide open throttle.

TDC/CYL Sensor (PFI)

The TDC/CYL sensor consists of a pair of rotors, TDC and CYL, and includes a pick-up for each rotor. Since the rotors are coupled internally to the distributor shaft, they turn together as a unit as the camshaft rotates. The CYL sensor detects the position of the No. 1 cylinder as the base for the sequential injection, whereas the TDC sensor serves to determine the injection timing for each cylinder. The TDC sensor also supplies the engine RPM signal to the ECU.

Vacuum Switch "A" (Carb.)

The vacuum switch "A" signals the control unit when vacuum is less than 3.1 in. Hg.

Vacuum Switch "B" (Carb.)

The vacuum switch "B" signals the control unit when vacuum is less than 1.2 in. Hg.

Vehicle Speed Sensor/Pulser

This signal is generated by the speed sensor (or speed pulser on some models) which produces 4 pulses (switch closures to ground) for each revolution of the speedometer cable.

OUTPUT DEVICES

NOTE: Each vehicle may be equipped with different combinations of computer controlled components. The following listed components may NOT be used on all models. For theory and operation on each output component, refer to the system indicated in brackets, to the right of each component.

- A/C Compressor Clutch Relay Delay (Idle Speed)
- A/C Idle Boost Solenoid Valve (Idle Speed)
- Air Leak Solenoid Valve - Accord (Emission Systems)
- Air Leak Solenoid Valve - Prelude (Fuel Control)
- Anti-Afterburn Control Solenoid Valve (Emission Systems)
- Air Suction Control Solenoid Valve (Emission Systems)
- Air Vent Cut-Off Solenoid Valve (Emission Systems)
- By-Pass Control Solenoid Valve (Air Induction)
- "CHECK ENGINE" Light (Self-Diagnostics)
- Cranking Leak Solenoid Valve (Idle Speed)
- Early Fuel Evaporative Heater Relay (Emission Systems)
- Electronic Air Control Valve (Idle Speed)
- Exhaust Gas Recirculation Control Solenoid Valve (Emission Systems)
- Fast Idle Control Solenoid Valve (Idle Speed - Fuel Injected)
- Feedback Control Solenoid Valve (Fuel Control)
- Frequency Solenoid Valve "A" (Fuel Control)
- Frequency Solenoid Valve "B" (Fuel Control)
- Frequency Solenoid Valve "C" (Idle Speed)
- Fuel Cut-Off Relay (Fuel Delivery)
- Idle Boost Solenoid Valve (A/T) (Idle Speed)
- Ignition Control Solenoid Valve (Ignition System)
- Ignitor Unit (Ignition System)
- Injector (Fuel Control)
- Inner Vent Cut-Off Solenoid Valve (Emission Systems)
- Lock-Up Control Solenoid Valve (Miscellaneous)
- Main Relay (Fuel Delivery)

- Primary Slow Mixture Cut-Off Solenoid Valve (Fuel Control)
- Purge Cut-Off Control Solenoid Valve (Emission Systems)
- Tandem Valve Control Solenoid Valve (Air Induction)
- Vacuum Holding Solenoid Valve (Idle Speed)
- Vacuum Piston Control Solenoid Valve (Fuel Control)

FUEL SYSTEM

FUEL DELIVERY

Carbureted

The fuel system consists of an low-pressure in-tank electric fuel pump, 2 fuel filters and a fuel pump cut-off relay. This system delivers pressurized fuel to the carburetor when the engine is running.

Fuel Injected

The fuel system consists of an in-tank high pressure electric fuel pump, main relay, fuel filter, pressure regulator, injectors (on 1.5L TBI engines, there are 2 injectors; main and auxiliary) and injector resistor(s). This system delivers pressure regulated fuel to the injectors and cuts the fuel delivery when the engine is not running.

Fuel Pump

Fuel pump is comprised of a DC motor, a circumference flow pump assembly, an internal relief valve for protecting the fuel line system, an internal check valve for retaining residual pressure, an inlet port and discharge port. The pump assembly consists of the impeller (driven by motor), pump casing (which forms the pumping chamber), and the pump cover.

Fuel Pump Cut-Off Relay

The fuel pump cut-off relay applies battery voltage (IGN. 1) to the fuel pump whenever ignition pulses from ignition coil are applied to the fuel cut-off relay. During deceleration with the throttle valve closed, current is cut off at speeds greater than 1200 RPM to improve fuel economy and reduce emissions. Fuel cut-off also takes place when engine speed exceeds 6600 RPM (Accord) or 7000 RPM (Prelude) regardless of the position of the throttle valve, which protects the engine from overrunning.

Injector Resistor(s)

The injector resistor(s) lowers the current supplied to the injectors to prevent damage to the injector coils. This allows the injectors a faster response time.

Main Relay (Fuel Injection)

The main relay actually contains 2 individual relays. One relay is energized whenever the ignition is on, which supplies battery voltage to the ECU, power to the injectors and power for the second relay. The second relay supplies power to the fuel pump. The second relay is energized for 2 seconds when the ignition switch is initially turned on and when the engine is running.

Pressure Regulator (Fuel Injected)

The fuel pressure regulator maintains a constant fuel pressure to the injectors using spring pressure. Pressure is modified by a vacuum diaphragm which is connected to manifold vacuum. When manifold vacuum is high, vacuum diaphragm is drawn back, overcoming spring pressure. At this time, excess fuel passes through the pressure regulator and is returned to the tank via the fuel return line. When manifold vacuum decreases (engine load increases), spring pressure closes off the return passage, thereby maintaining fuel pressure and volume.

FUEL CONTROL (CARBURETED)

The feedback control system is designed to provide as close to a stoichiometric air/fuel ratio as possible, allowing the Three-Way Catalyst's (TWC) reduce hydrocarbon (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) emissions. Feedback control system consists of 3 sub-systems. The X-system, the M-system, and the idle feedback control system. Sub-systems provide air to the intake manifold to lean the air/fuel ratio which has a relatively rich setting. For sub-systems relationship, see appropriate vacuum diagrams in **M - VACUUM DIAGRAMS** article.

X-System

The X-system consists of an air control valve "B", a feedback control solenoid valve, frequency solenoid valve "B", Constant Vacuum Generator (CVG), check valve, vacuum chamber and silencer. This system controls the air/fuel mixture ratio by controlling the opening of air control valve "B" according to the amount of vacuum at the diaphragm chamber of the valve. The frequency solenoid valve is modulated by the control unit and controls the amount of vacuum to air control valve "B".

The CVG provides a stable vacuum level to the frequency solenoid valve "B" to more closely control the vacuum to air control valve "B". The accumulator and check valve also contribute to providing a stable vacuum signal for the control valve. The vacuum chamber eliminates vacuum pulsation in the diaphragm chamber of air control valve "B" caused by the operation of frequency solenoid valve "B".

The feedback control solenoid valve is provided to stop feedback operation at low engine speed, such as idling. Frequency solenoid valve "B" gets signals through the control unit from the oxygen sensor, located in the exhaust manifold. Air control valve "B" is opened only when the oxygen content is less than stoichiometric (rich air/fuel ratio).

M-System

After being controlled by the X-system to a near stoichiometric air/fuel ratio, the mixture is more finely controlled by the M-system based on the engine load. The M-system consists of an air control valve "A" and frequency solenoid valve "A". The diaphragm chamber of air control valve "A" receives the same carburetor vacuum as the EGR valve, and air is supplied to the intake manifold in proportion to the carburetor intake air volume. Frequency solenoid valve "A" gets signals from the oxygen sensor through the control unit and opens the valve when the air/fuel mixture is richer than stoichiometric.

Idle Feedback Control System

The idle feedback control system consists of an air bleed valve "B" and the air leak solenoid valve. The air bleed valve "B" (located in the air cleaner case) senses intake air temperature and rises from its seat, introducing air into the intake manifold. The air leak solenoid valve supplies additional air to the intake manifold.

The solenoid valve opens when the engine is running at idle with high intake air temperature. Both the air bleed valve "B" and the air leak solenoid valve operate to decrease idle emissions when air injection to the exhaust manifold is cut off.

Air Jet Controller

The air jet controller is an atmospheric pressure sensing device that controls the amount of airflow into the slow and main air jets of the carburetor throat. As atmospheric pressure is reduced by increasing altitude, the bellows expand to open the valve in the air jet controller, increasing airflow to the jets to maintain an optimum air/fuel ratio.

Feedback Control Solenoid Valve

The feedback control system is designed to provide a stoichiometric air/fuel ratio whenever possible, allowing the Three-Way Catalyst (TWC) to reduce hydrocarbon (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) emissions. The feedback control solenoid valve is provided to stop feedback operation at low engine speed (engine idle).

Frequency Solenoid Valve "A"

The frequency solenoid valve "A", a part of the M-system, gets signals from the oxygen sensor through the control unit and opens air control valve "A" whenever the air/fuel mixture is richer than stoichiometric.

Frequency Solenoid Valve "B"

The frequency solenoid valve "B", a part of the X-system and receives its signals from the control unit to open air control valve "B" when there is a rich air/fuel mixture.

Power Valve

A power valve circuit is provided in the carburetor, to enrich the air/fuel ratio when the engine is operated in the power (performance) mode. Power valve circuit is controlled by manifold vacuum, for enrichment at low manifold vacuum (wide open throttle) and no enrichment at high manifold vacuum (deceleration).

Primary Slow Mixture Cut-Off Solenoid

The primary slow mixture cut-off solenoid valve is provided to cut off the idle mixture passage between the air/fuel passage and by-pass port to prevent run-on when the ignition switch is turned to the "OFF" position. The solenoid valve also functions to cut-off the mixture flow under deceleration.

FUEL CONTROL (FUEL INJECTED)

Programmed Fuel Injection (PGM-FI) ECU

The PGM-FI ECU is the main controlling device of the electronic fuel control system. The basic fuel injector duration is read from calibration tables built into the ECU's internal memory. The ECU modifies the basic injector duration according to input signals from various sensors to obtain the final injector duration for fuel delivery.

Injector

The fuel injector consists of a solenoid, plunger needle valve, and housing. When current is applied to the solenoid coil, the valve lifts up and pressurized fuel is injected close to the intake valve. Since the needle valve lift and the fuel pressure are constant, the air/fuel ratio is determined by the length of time that the valve is open (duration of current supplied to solenoid coil). On TBI models, injector is sealed by 2 "O" rings and a mount rubber. On PFI models, injector is sealed by an "O" ring and seal ring at each end (top and bottom). All seals, "O" rings and mount rubbers help to reduce injector operating noise and heat transfer.

IDLE SPEED (CARBURETED)

Idle Control System (A/T)

System maintains a stable idle speed under different engine loads. System consists of 2 vacuum operated throttle controllers, the idle boost throttle controller (with A/C, this controller has a dual diaphragm) and the throttle controller. The control unit monitors inputs and directs voltage to 3 different solenoid valves:

Idle Boost Solenoid Valve

Energized when transmission is in gear or when the air temperature is less than a preset temperature, applying vacuum to idle boost throttle controller.

A/C Idle Boost Solenoid Valve

Energized when A/C compressor is energized, applying vacuum to the outer diaphragm of the idle boost throttle controller.

Frequency Solenoid Valve "C"

Solenoid is energized when the engine speed is outside of the range of 680-780 RPM, or when coolant temperature is greater than 140°F (60°C). Frequency valve "C" controls vacuum to the throttle controller diaphragm.

Cranking Leak Solenoid Valve

The cranking leak solenoid is activated when cranking (starting) the engine. When activated, the solenoid valve bleeds vacuum from the choke opener.

IDLE SPEED (FUEL INJECTED)

The idle speed of the engine is controlled by the Electronic Air Control Valve (EACV) and the fast idle valve.

Electronic Air Control Valve (EACV)

The idle speed of the engine is controlled by the EACV and the fast idle valve. The EACV changes the amount of air by-passing the throttle plate (into the intake manifold) in response to signals sent from the ECU. After the engine starts, the EACV opens for a short time to increase idle speed. Activation time is dependent upon engine coolant temperature. When coolant temperature is low, the EACV is held open to obtain the proper fast idle speed. After engine reaches normal operating temperature, EACV is activated only to maintain minimum idle speed. The amount of by-passed air (on and off EACV time) is thus controlled in relation to engine coolant temperature.

Fast Idle Valve

When the coolant temperature is less than a preset temperature, the fast idle valve opens. This allows additional air to be by-passed into the intake manifold, increasing engine idle speed. The fast idle valve increases engine RPM to prevent the engine from running erratically during warm-up. The valve is controlled by a thermowax plunger, which is contracts when cold and expands when hot.

IGNITION SYSTEM

Battery voltage is supplied through ignition switch to the ignition coil and to the ignitor unit. The ignitor is located inside the distributor and triggers the ignition coil based upon its own pick-up signals. When triggered, induced voltage from ignition coil is distributed to each spark plug by the distributor.

IGNITION TIMING CONTROL

Ignition timing is mainly controlled by the distributor centrifugal and vacuum advance units. Vacuum to vacuum advance diaphragm is controlled by engine load (available vacuum) and coolant temperature. Distributor has 2 separate vacuum advance diaphragms ("A" and "B") which operate on manifold vacuum.

On carbureted engines, vacuum advance to diaphragm "B" is controlled by a solenoid valve (ignition control solenoid valve) that is operated by the ECU. On fuel injected engines, a thermovalve is used to control vacuum to diaphragm "B". Both systems provide improved driveability during cold engine temperatures and optimize ignition timing during engine warm-up.

Ignition Control Solenoid Valve (PFI)

The Ignition Control Solenoid Valve (ICSV) opens and closes off vacuum to diaphragm "B" (vacuum advance diaphragm), that advances ignition timing in the distributor. The ICSV is operated by the ECU which receives signals from engine speed, coolant temperature and manifold vacuum inputs to provide maximum performance and fuel economy, while protecting the engine by preventing detonation from occuring.

Ignitor Unit

The ignitor receives power from the ignition switch when it is in the "ON" position. Ignitor controls the ground circuit for the ignition coil, which also receives power from the ignition switch. Ignitor triggers the ignition coil based upon pick-up coil (carbureted), or control unit (fuel injection) signals.

EMISSION SYSTEMS

AIR INJECTION SYSTEM (CARBURETED)

The Air Injection System (AIS) is designed to improve emission performance by supplying fresh air from the air cleaner into the exhaust manifold via the air suction valve.

Air Leak Solenoid Valve

The air leak solenoid valve supplies additional air to the intake manifold. The solenoid valve opens when the engine is running at idle with high intake air temperature. The solenoid valve operates to decrease idle emissions when the air injection to the exhaust manifold is cut off.

Air Suction Control Solenoid Valve

When the air suction control solenoid valve is activated, manifold vacuum raises the diaphragm valve of the air suction valve and fresh air from the air cleaner is induced to the exhaust manifold. The fresh air is induced into the exhaust manifold through the reed valve of the air suction valve by the pulsation of exhaust gases.

Anti-Afterburn Control Solenoid Valve

Anti-afterburn control solenoid valve is provided to control the operation of the anti-afterburn valve by introducing vacuum to the diaphragm holding the valve closed. The anti-afterburn valve senses intake manifold vacuum changes during gear shifting or deceleration and supplies fresh air to the intake manifold in order to prevent the escape of unburned fuel.

EARLY FUEL EVAPORATOR (EFE) SYSTEM

EFE Heater & Relay (Carb.)

The carburetor insulator includes a heater in the primary bore that promotes improved engine operation while the engine is warming up. The electronic control unit energizes the heater relay when coolant temperature is low. When energized, relay provides battery voltage to heater. The maximum temperature of the heater is regulated by the electrical resistance of the heating element.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

The EGR system is designed to reduce oxides of nitrogen (NOx) emissions by recirculating exhaust gases through the EGR valve, through the intake manifold, and back into the combustion chambers.

On fuel injected models, the system is composed of the EGR valve, Constant Vacuum Control (CVC) valve and EGR control solenoid valve. The system is operated by the control unit, which has analyzed input signals from the EGR valve lift sensor and various other sensors, in order to provide optimum EGR flow.

On carbureted models, the system is composed of the EGR valve, EGR control valves "A" and "B", and thermovalve "A". The EGR valve is operated by ported vacuum and provides an EGR function that is proportional to engine load by a balanced operation of both EGR control valves "A" and "B". An EGR cut-off function is provided on carbureted models to respond to low engine coolant temperatures. EGR flow is cut off when combustion gas temperatures are low (when engine emits a relatively low NOx emission) to assure good cold driveability. EGR flow is cut off by the thermovalve "A".

EGR Valve

When opened, the EGR valve circulates burned exhaust gases through the intake manifold, and back into the combustion chamber. Manifold vacuum pulls the burned exhaust gases into the combustion chambers to cool and dilute the air/fuel mixture.

EGR Control Solenoid Valve

When the control unit has determined that it is necessary to recirculate exhaust gases, it grounds the EGR control solenoid valve, regulating vacuum that controls the EGR valve. By regulating the vacuum to the EGR valve, EGR flow is adjusted for optimum control of NOx.

EGR Control Valves "A" & "B"

The control valve "A" opens when ported vacuum is directed to its diaphragm. When control valve "A" opens, manifold vacuum is bled into the air filter through an orifice in the air passage. This generates vacuum across an orifice in the air passsage which applies vacuum to the upper diaphragm of the EGR control valve "B", causing it to open. See **Fig. 1** .

As EGR control valve "B" opens, ported vacuum is bled off to the carburetor venturi. This makes composite vacuum which is applied to the diaphragm of EGR control valve "A". As this composite vacuum decreases, EGR control valve "A" begins to close and the vacuum in the air passage decreases, causing the EGR control valve "B" to begin to close. See **Fig. 1** .

As EGR control valve "B" closes, composite vacuum increases, causing the EGR control valve "A" to begin to open, completing the cycle which repeats very rapidly.

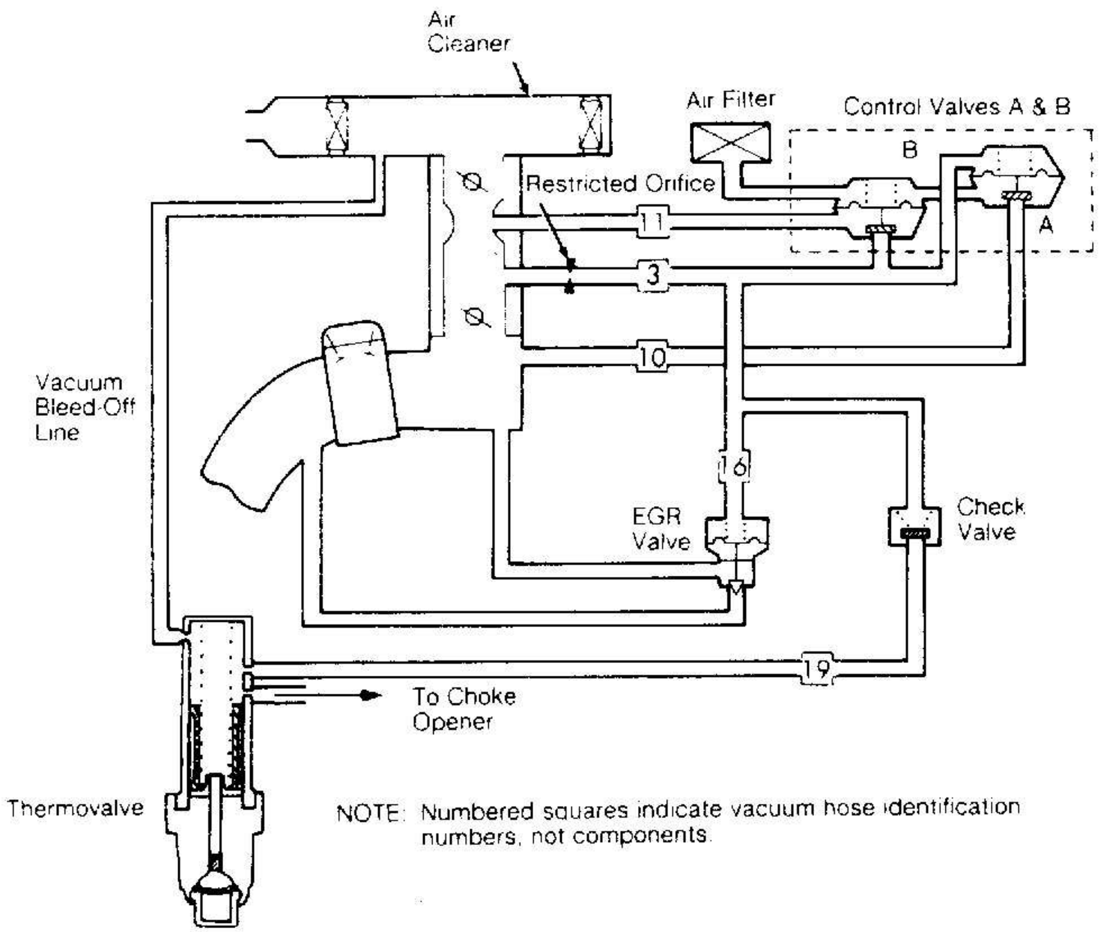

Fig. 1: Exhaust Gas Recirculation (EGR) System Diagrams (Carb.)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Exhaust Gas Recirculation Valve Lift Sensor (Calif. Except Carbureted)

The EGR valve lift sensor detects the amount of EGR valve lift and sends the information to the ECU. The ECU uses this information, along with other sensor inputs, to determine regulation of the EGR control solenoid valve.

FUEL EVAPORATION (EVAP) SYSTEMS

The fuel evaporation systems used are designed to minimize the amount of fuel vapor escaping into the atmosphere. For emission control applications and components used for each model and engine, see **B - EMISSION APPLICATIONS** and **M - VACUUM DIAGRAMS** articles. The various components used for all Honda fuel evaporation systems are as follows:

Carburetor Vapor Control System

The carburetor vapor control system consists of an air vent cut-off diaphragm, vacuum holding solenoid valve, and inner and outer vents. Fuel vapor from the carburetor float bowl is directed into the charcoal canister through the outer vent passage when the engine is not running and the thermovalve in the air vent cut-off diaphragm is above its set temperature value. If the engine is running, fuel vapor is directed into the air cleaner. Inner vents are always open to the air cleaner.

Charcoal Canister

The canister is a container for temporary storage of fuel vapor until it can be purged from the canister, drawn into the engine, and burned in the combustion chamber.

Fuel Tank Vapor Control System

The fuel tank vapor control system consists of a fuel cut-off valve, liquid/vapor separator, a 2-way valve, and a fuel filler cap. All fuel vapor inside the fuel tank is directed to the charcoal canister through the fuel cut-off valve and liquid/vapor separator. The fuel cut-off valve and liquid/vapor separator prohibit liquid fuel from entering the 2-way valve. When fuel vapor pressure in the fuel tank is greater than the set value of the 2-way valve, the valve opens and regulates the flow of fuel vapor into the canister. The 2-way valve regulates both pressure and vacuum in the tank. The filler cap contains a relief valve in case of an excessive build-up of pressure or vacuum.

Vacuum Holding Solenoid Valve (Carb.)

The vacuum holding solenoid valve controls vacuum to the air vent cut-off diaphragm. Vacuum is held when ignition is on and is released when ignition is off.

Vapor Purge Control System

The vapor purge control system controls when the canister is to be purged. On some models, canister purging is accomplished when ECU activates the purge cut-off solenoid valve, allowing fresh air to be drawn through the bottom of charcoal canister and into a port on the throttle body. On other models, canister purging is temperature controlled by a thermovalve that directs manifold vacuum to the purge control valve, allowing venturi vacuum to purge the charcoal canister.

INTAKE AIR CONTROL SYSTEM

Thermostatic Air Cleaner (TAC)

When air temperature in the air cleaner is less than a predetermined temperature, the air bleed valve will remain closed, directing manifold vacuum to the air control diaphragm. When vacuum is applied to the air control diaphragm, it closes off incoming ambient air and directs heated air from the hot air intake duct (from exhaust manifold) into the air cleaner. As under-hood temperatures increase, air bleed valve will gradually open, bleeding vacuum from air control diaphragm until the air delivery door closes off hot air delivery.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The Positive Crankcase Ventilation (PCV) system is designed to prevent blow-by gas (in engine crankcase) from escaping into the atmosphere. The PCV valve contains a spring loaded plunger. When the engine starts, the plunger in the PCV valve is lifted in proportion to intake manifold vacuum and the blow-by gas is drawn directly into the intake manifold.

SELF-DIAGNOSTIC SYSTEM

"CHECK ENGINE" LIGHT & LED INDICATOR

PFI

When the ignition is initially turned on, the ECU supplies ground to illuminate the "CHECK ENGINE" warning light, and will allow light to ramain on until the vehicle starts. When an abnormality occurs in a signal from a sensor, the ECU lights the "CHECK ENGINE" warning light, stores the failure code in erasable memory and indicates the code with an LED (located on ECU) anytime the ignition is on. ECU is located under the driver's seat.