

FERVE F-1860



WARNING

- ◆ Engines produce carbon monoxide which is odourless, causes slower reaction time, and can lead to serious injury through inhalation. Keep service areas **WELL VENTILATED** while the engine is running!
- ◆ Activate the handbrake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-drive vehicles, as the handbrake does not lock the drive wheels.
- ◆ Wear an eye shield when testing or repairing vehicles. Exceeding the limits of the F-1860 is dangerous. It will expose you to serious or possibly fatal injury. Carefully read and take heed of the precautions described in this instruction manual, and make sure that the established limits of the F-1860 are never exceeded.
- ◆ Under absolutely no circumstances must voltage exceed 1000 VDC or 750 VDC between any terminal or ground.
- ◆ Extreme caution must be exercised when measuring voltage above 25 VAC or VDC.
- ◆ Circuits to be tested must be protected by a 20A fuse or circuit breaker.
- ◆ Do not use the F-1860 if it has been damaged.
- ◆ Do not use the test leads if the insulation is damaged or the cable is exposed.
- ◆ Use adequate current clamps when measuring circuits in excess of 10A.
- ◆ To avoid electrical shock, never touch the test leads, tips or circuit while testing.
- ◆ Do not make a voltage measurement with the test leads in the 20A or mA terminal.
- ◆ When testing for voltage or current, make sure that the corresponding function of the F-1860 is the correct one. We recommend you take a test reading of a known voltage or current before carrying out a specific function.
- ◆ Choose the proper range and function for the measurement. Do not try to take voltage or current measurements that may exceed the ratings marked on the function /range switch or terminal.
- ◆ When measuring current, connect the F-1860 in series with the load.
- ◆ Never connect more than one set of leads to the F-1860.
- ◆ Disconnect the live test lead before disconnecting the common test lead (COM).
- ◆ The mA and 20A terminals are protected by fuses. In order to avoid possible injury or damage, use only in circuits not exceeding 400mA, 10A continuous or 20A for a maximum 15 seconds.

IMPORTANT

- ◆ In order to maintain the accuracy of the F-1860, replace the battery as soon as the battery symbol appears on the display.
- ◆ Avoid measuring errors from external interference: keep the F-1860 away from spark plug cables or wire coils.

- ◆ Avoid damage to the F-1860 when testing: disconnect the test leads from the test points before changing functions.
- ◆ Do not exceed the limits shown in the table below:

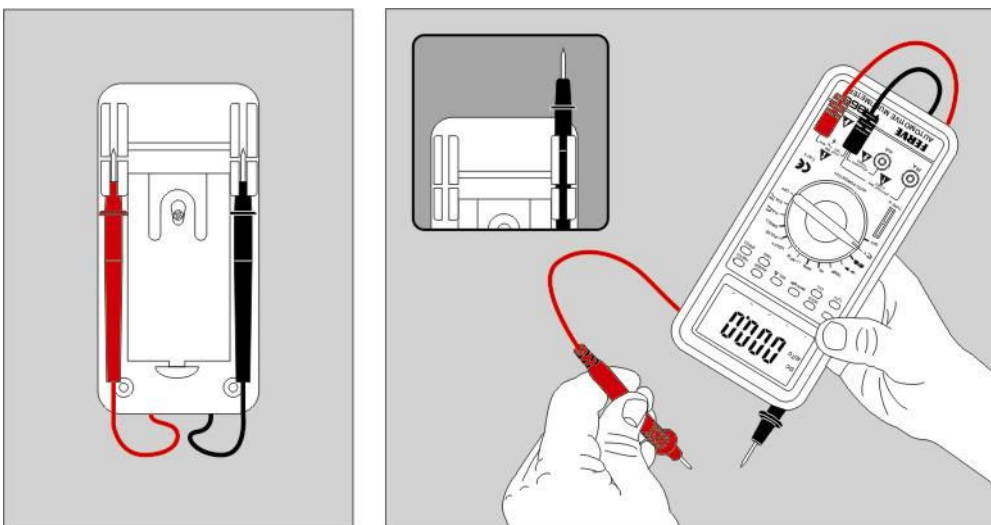
Function	Terminal	Input Limit
AC Volts	V/ Ω / RPM	750 V AC rms
DC Volts		1000 V DC
Frequency	V/ Ω / RPM	500 V AC/DC
Ohm (resistance)		
Diode		
AC/DC 400 mA	mA	400 mA AC/DC
AC/DC 20 A	20 A	*20 A AC/DC
RPM	V/ Ω / RPM	500 V AC/DC
Duty Cycle (%)		
Dwell angle		
*10A continuous measurement or 20A for a maximum 15 seconds		

Ohms cannot be measured when voltage is present. They can only be measured in a non-powered circuit. However, the F-1860 is protected up to 500V.

MEASURING BASICS

Protective Rubber Casing

The rubber casing has been designed to protect the F-1860 when accidentally dropped. Additionally, it provides a convenient storage method for the test probes. It is also useful for holding one of the test probes, while leaving another hand free to operate the other test probe while holding the F-1860 in the other hand. (see figure x).



1. Digital and Analogue Display

Display features:

- Four character digital display
- Symbols indicating functions
- Analogue bar graph

2. Function buttons

Press the button to select the desired function. A symbol confirming your selection will appear.

3. Rotary Selector Switch

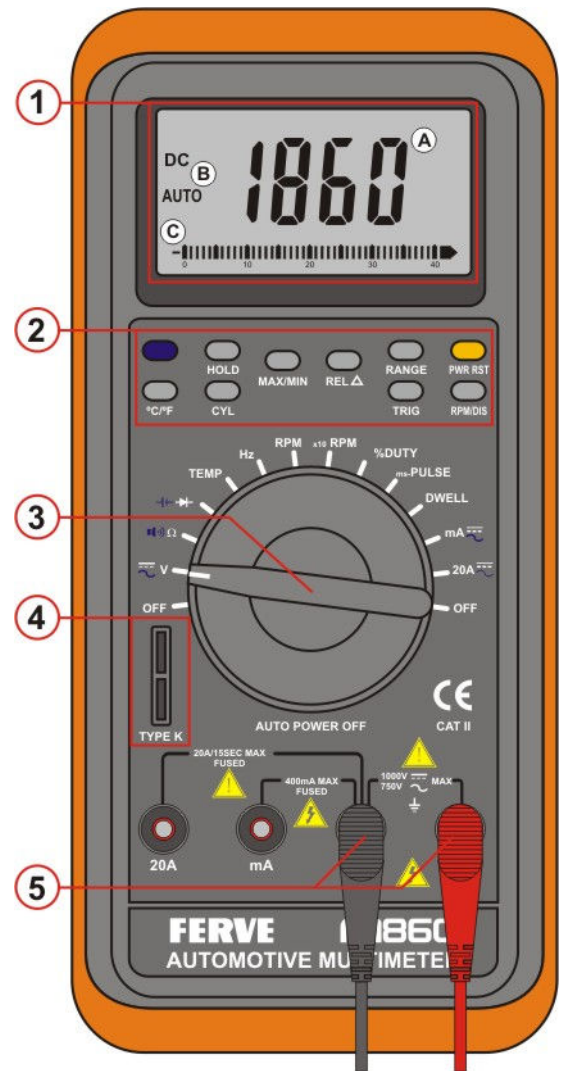
Use this switch to select a function or to turn off the F-1860.

4. Temperature terminal

Insert the temperature probe into this terminal.

5. Test lead terminals

The black (-) test lead is used in the COM terminal for all tests. The red (+) test lead is used to measure Amps or Volts.



Automatic Deactivation feature

- ◆ Automatic Power Off after 30 minutes of inactivity.
- ◆ Automatic Power can be deactivated. This feature must be set when the F-1860 is to record data over a period of time in excess of 30 minutes. In order to deactivate the “Power Off” mode, keep the yellow “PWR RST” button pressed while switching on the F-1860.

Digital and Analogue Display

- * Press HOLD to maintain data on the display
- * Press MAX/MIN to read maximum or minimum stored values
- * Press REL Δ to read the differences between currently displayed reading and stored reading.
- * Press CYL to select number of cylinders after DWELL has been selected with the rotary switch.
- * Diode or continuity test.
- * The F-1860 automatically selects the best range.
- * Analogue bar graph with polarity display
- * Press °C / °F to choose between degrees Celsius (°C) or degrees Fahrenheit (°F).

- * Negative Polarity indicator
- * Press the blue button to choose between AC or DC current
- * Press TRIG± to select positive (+) or negative (-) Trigger level
- * Low battery: change the F-1860 battery when this symbol is displayed

Function and Range Selection

Turn the rotary switch in either direction to select desired function.

The F-1860 automatically selects the range. However, you can also manually select a specific function by pressing the range button.

Always select a range higher than the expected current or voltage. Afterwards a lower range can be selected for improved accuracy.

- ◆ The higher the range selected, the lower the accuracy
- ◆ If the range is too low, the F-1860 blinks "OL" (Over Limit) and beeps.

PUSH-BUTTON FUNCTIONS

Alternate Function

The blue-coloured button is the Alternate Function button. Press this button to alternate between AC, audible and capacitance functions, shown in blue on the front of the F-1860.

RELΔ Function

Press the RELΔ Function button. The F-1860 will display the reading and store it as a reference value. Keep the button pressed for two seconds to exit this mode.

In RELΔ mode, the indicated value is always the difference between the stored reading and the present reading. For example, if the reference value is 24.00 V and the present reading is 12.50 V, the F-1860 will show -11.50 V. If the new reading is the same as the reference value, the F-1860 will display 0.

DATA STORING

The Data Storage feature stores the highest or lowest reading in the memory.

- ◆ First connect the F-1860 test leads to the points to be tested. Press the MAX/MIN key once to start MIN data storage, which will be displayed.
- ◆ Press the MAX/MIN key twice to start MAX data storage, which will be displayed.
- ◆ Press the HOLD button to stop data storage; press again to restart the storage.

Range Selection

The range is automatically selected by the F-1860. However, should you wish to select the range manually, this can be done by pressing the RANGE button.

Range Exit

To exit the manual RANGE function and return to automatic mode, keep the RANGE button pressed for 2 seconds.

NOTE:

- ◆ If the range is too high, the readings will be less accurate.
- ◆ If the range is too low, the F-1860 will blink and show OL (Over Limit)

DATA HOLD

The Data Hold feature stores the last reading in the F-1860's memory.

- ◆ Press the DATA HOLD button once to hold the present reading.
- ◆ Press the DATA HOLD button again to exit and resume readings.

Power Reset (PWR RST)

The Power Reset button switches the F-1860 back on when it has automatically switched itself off.

Power Off Disable

To disable the automatic power off function, keep the PWR RST button pressed while switching on the F-1860.

Temperature (°C/°F)

The temperature can be displayed in degrees Celsius (°C) or in degrees Fahrenheit (°F).

Press the °C/°F button to choose between degrees Celsius (°C) or degrees Fahrenheit (°F).

CYL Cylinder

Select the DWELL function, then press the cylinder button to choose between the 4, 5, 6 or 8 cylinder scale.

Trigger

Select the Duty Cycle and Pulse Width function, then press the ±Trigger button to choose between the negative (-) or positive (+) slope.

RPM / DIS

In the RPM function the F-1860 defaults to RPM (2) for conventional 4-cycle engines.

BASIC DIAGNOSTIC TESTING

This section takes you through a systematic series of tests that check the vehicle's electrical system. These tests should be carried out before testing individual components.

Electrical System Diagnostics

It is important to diagnose vehicle electrical problems thoroughly and efficiently.

The series of tests that follow check primary areas that are responsible for the majority of the electrical problems found in an automobile. These basic tests should always be carried out, even if the vehicle has a trouble-shooting code set in the computer. A component malfunction can be caused by a basic problem in the electrical system. Simply replacing a failed component will not fix the problem if a defective ground caused the component failure.

The tests begin by checking the main source of power and the chassis ground circuit connections. Ground circuits are one of the least understood but potentially most troublesome areas of automotive electronics. An excessive voltage ground in a circuit affects the entire electrical circuit. That is why it is of the utmost importance that the basic circuit is checked before consulting computer trouble codes and individual components.

Battery Testing

(1) Battery Surface Discharge Test

IMPORTANT:

The ignition must be switched OFF in order to avoid damage to the vehicle's computer while connecting or disconnecting battery cables.

Remove the positive and negative battery cables and clean the cable clamps and the battery terminals. Reassemble and begin testing.

This following test checks for a low current discharge on the battery surface:

- ◆ Set the F-1860's rotary switch to the voltage position (V).
- ◆ Insert the black lead of the F-1860 into the **COM** socket, and the red cable into the **V/Ω/RPM** socket.
- ◆ Connect the negative (-) test lead to the negative (-) battery terminal.

- ◆ Press the F-1860's MAX/MIN button.
- ◆ Move the positive (+) test lead of the F-1860 around the positive (+) battery terminal, without touching the terminal, but skimming the surrounding battery surface. Readings of more than 0.5 V indicate excessive battery surface discharge. Dirt, dust, moisture and corrosion are all common causes of battery discharge. Clean the battery surface with a baking soda and water solution, taking care that none of the solution makes its way into the battery.

(2) Static Battery Test (No load)

This test checks the battery charge state.

Turn the vehicle's headlights on for 15 seconds to dissipate battery surface charge.

IMPORTANT:

The ignition must be switched OFF in order to avoid damage to the vehicle's computer while connecting or disconnecting battery cables.

Disconnect the negative (-) battery cable from the battery.

- ◆ Set the F-1860's rotary switch to the voltage position (V).
- ◆ Insert the black lead of the F-1860 into the **COM** socket, and the red cable into the **V/Ω/RPM** socket.
- ◆ Connect the positive (+) test lead to the negative (-) battery terminal.

Readings under 12.4 V indicate an undercharged battery. Recharge the battery before further testing.

NO LOAD TEST FOR STANDARD BATTERIES

F-1860 Reading	Battery charge
12.70 V	100%
12.54 V	75%
12.30 V	50%
12.18 V	25%

NO LOAD TEST FOR GEL BATTERIES

F-1860 Reading	Battery charge
13.00 V	100%
12.75 V	75%
12.50 V	50%
12.25V	25%

(3) Battery Test (Parasitic Load)

NOTE:

Keep the battery disconnected for this test.

This test is for excessive parasitic drain on the battery.

Keep the ignition OFF.

IMPORTANT:

Do not start the vehicle during this test; the F-1860 may be damaged as a result.

- ◆ Set the F-1860's rotary switch to the 20A position.
- ◆ Insert the black lead into the **COM** socket and the red cable in the F-1860's 20 A terminal.
- ◆ Disconnect the positive (+) cable from the battery.
- ◆ Connect the positive (+) test lead of the F-1860 to the positive (+) battery terminal.
- ◆ Connect the negative (-) test lead of the F-1860 to the negative (-) battery terminal.
- ◆ Press the MAX/MIN button on the F-1860.

Parasitic readings should not exceed 100 mA.

If parasitic readings are in excess of this value, remove the circuit fuses one by one, until the fault is located. Also check all non-fused applications such as headlights, relays and capacitors in the instrument panel.

Reconnect the battery cable for the next test.

(4) Battery Test (Load)

This tests the battery's capacity to deliver sufficient cranking voltage.

- ◆ Set the F-1860's rotary switch to the voltage position (V).
- ◆ Connect the positive (+) test lead to the positive (+) battery terminal.
- ◆ Connect the negative (-) test lead to the negative (-) battery terminal.
- ◆ Press the MAX/MIN button on the F-1860.

- ◆ Disable the ignition; crank the engine for 15 seconds.

Check the Min. reading. If this reads less than 9.60 V at 21°C, the battery is weak. Recharge or replace before further testing.

F-1860 Minimum reading	Ambience temperature
10.0 V	33°C
9.8 V	27°C
9.6 V	21°C
9.4 V	16°C
9.2 V	10°C
9.0 V	4° C
8.8 V	-1°C
8.6 V	-7°C

NOTE:

For each 6°C above or below 21°C, add or subtract 0.2 V.

Voltage Drop Testing

Resistance; what is it?

Resistance is an opposing force to the flow of electrical current, created by a circuit or component.

A small amount of natural resistance is encountered when voltage flows through wires, switches, grounds, or connections. This resistance increases beyond acceptable limits if corrosion develops, fittings become loose or wires fray. Resistance increases every time that something is added to the circuit, such as wire, switches, connections, ground, etc.

Voltage Drop; what is it?

Voltage drop is the difference in voltage potential when measured across a circuit or component creating resistance.

The resistance decreases the amount of voltage available. Bulbs will not light up nor will the engine turn over if the voltage is too low.

Maximum Voltage Drop

Maximum voltage drop should not be more than 0.1 V per wire, ground, connection or solenoid.

What should be tested?

Each wire, ground, connection or solenoid as well as the complete circuit should be tested. Each connection point is a potential source of increased resistance.

Voltage Drop Testing

(1) Negative (-) Engine Ground

This test checks for efficiency of engine ground.

- ◆ Set the F-1860's rotary switch to the voltage position (V).
- ◆ Insert the black lead of the F-1860 into the **COM** socket, and the red cable into the **V/Ω/RPM** socket.
- ◆ Touch the positive (+) lead to the positive (+) battery terminal and the negative (-) lead to the negative (-) battery terminal. Take note of the reading, which will be the starting reference for future readings.
- ◆ Connect the positive (+) lead of the F-1860 to a clean screw on the engine block.
- ◆ Connect the negative (-) lead of the F-1860 to the negative (-) battery terminal.
- ◆ Press the MAX/MIN button on the F-1860.
- ◆ Disable the ignition so the engine doesn't start; crank the engine for 2-3 seconds.

A voltage drop in excess of 0.5 V indicates defective ground.

Clean and inspect the battery cable connections and the ground, and test again.

IMPORTANT:

Repeat this test when the engine is completely warmed up. Heat expansion may cause increased resistance.

(2) Negative (-) Chassis Ground

This test checks for chassis ground efficiency.

- ◆ Set the F-1860's rotary switch to the voltage position (V).
- ◆ Insert the black lead of the F-1860 into the **COM** socket, and the red cable into the **V/Ω/RPM** socket.
- ◆ Keep in mind the commented reference reading from the previous engine ground test.
- ◆ Connect the test lead to the point in the wheel arch or wherever the vehicle's ground is connected.
- ◆ Connect the negative (-) lead of the F-1860 to the negative (-) battery terminal.

- ◆ Press the MAX/MIN button on the F-1860.
- ◆ Turn on all the accessories such as headlights, ventilator fan, heated rear window, windscreen wipers....
- ◆ Disable the ignition so the engine doesn't start; crank the engine for 2-3 seconds.

A voltage drop in excess of 0.5 V indicates defective ground.

Clean and inspect the battery cable connections and the ground, and test again.

(3) Battery Power to Starter Solenoid (+)

This test checks battery source efficiency to the starter solenoid.

.Set the rotary switch to Voltage.

.Establish the base voltage that you will compare test voltage against (see base voltage, Volt Drop Test [1]).

.Connect the positive (+) lead to the positive (+) battery terminal.

.Connect the negative (-) lead to the positive (+) terminal on the starter solenoid.

.Set the Min/Max feature on the meter.

.Disable the ignition so the engine doesn't start; crank the engine for 2-3 seconds.

A voltage drop of more than 0.3 volts would indicate a poor ground circuit. Clean and inspect the battery cables and cable connections; test again.

(4) Battery Power to Complete Starter Circuit (+)

This test checks battery power efficiency to the starter through the starter solenoid.

.Set the rotary switch to Voltage.

.Establish the base voltage that you will compare test voltage against (see base voltage, Volt Drop Test [1]).

.Connect the positive (+) lead to the positive (+) battery terminal.

.Connect the negative (-) lead to the positive (+) terminal on the starter motor.

.Set the Min/Max on the meter.

.Disable the ignition so the engine doesn't start; crank the engine for 2-3 seconds.

A voltage drop of more than 0.8 volts would indicate a poor ground circuit. Clean and inspect the battery and starter cables, solenoid and cable connections; test again.

Note: A defective starter solenoid may cause an excessive voltage drop; check the cables and connections before replacing the solenoid.

Important: Repeat this test when the engine is thoroughly warmed up. Heat expansion of metal may cause resistance to increase.

Charging System Tests

[1]Battery (+)

This test checks for alternator output voltage at the battery.

.Set the rotary switch to voltage.

.Connect the positive (+) lead to the positive (+) battery terminal.

.Connect the negative (-) lead to the positive (+) battery terminal.

.Set the MiniMax feature on the meter.

.Make sure all vehicle accessories are turned OFF.

.Start the engine and hold at 1500 RPM.

A reading of 13.1 -15.5 volts is an acceptable charging rate. If the voltage is low check for:

.Loose, cracked, or glazed drive belt.

.Loose or faulty wires or connectors.

.Defective alternator or regulator. See **[2] Alternator Voltage Output (+), Loaded.**

[2]Alternator Voltage Output (+), loaded

This test checks for alternator output voltage. This test is necessary only if the vehicle failed **[1] Battery (+) test.**

.Set the rotary switch to the Voltage setting.

.Connect the positive (+) lead to the battery (B+) output post on the back of the alternator.

.Connect the negative (-) lead to the negative (-) battery terminal.

.Set the MinI Max feature on the meter.

.Start the engine and hold a 1500 RPM.

A reading of 13.1-15.5 volts is an acceptable charging rate.

Ignition System Tests

[1] Ignition Coil, Primary Resistance Test (Ω)

This test checks primary winding resistance.

IMPORTANT: Test the ignition coil cold and hot.

.Set the rotary switch to the Resistance (Ω) setting.

INSERT:

.Black lead in COM terminal.

.Red lead in V/ Ω /RPM terminal.

.Disconnect the coil from the vehicle wiring harness.

.NOTE: The resistance in the meter leads must be subtracted to get an accurate measurement at the 0.50-2.0 range. Short the leads together and press the ZERO Δ Button. The meter will automatically subtract the resistance in the leads.

.Connect the negative (-) lead to the negative (-) terminal on the coil.

.Connect the positive (+) lead to the positive (B+) terminal on the coil.

Typical measurements are between 0.50-2.0 Ω 's consult the manufacturer's specifications for required resistance measurements.

[2] Ignition Coil, Secondary Resistance Test (Ω)

This test checks secondary winding resistance.

IMPORTANT: Test the ignition coil cold And hot.

.Set the rotary switch to the Resistance (Ω) setting.

INSERT:

.Black lead in COM terminal.

.Red lead in V/ Ω /RPM terminal.

- .Disconnect the coil from the vehicle wiring harness.
- .Connect the negative (-) lead to the high tension terminal on the coil.
- .Connect the positive (+) lead to the positive (B+) terminal on the coil.

Typical measurements are between 6,000-30,000 'S Consult the manufacturer's specifications for required resistance measurements.

[3] Secondary Ignition Wire Resistance Test (Ω)

This test checks for open circuits or high resistance in the secondary (sparkplug) wires.

IMPORTANT: Twist and bend the sparkplug wire while measuring the resistance for this test.

- .Set the rotary switch to the Resistance (Ω) setting.

INSERT:

Black lead in COM terminal.

Red lead in V/ Ω /RPM terminal.

- .Connect the test probes to opposite ends of the sparkplug wire.
- .Set the MinIMax feature o the meter.

Typical measurements are approximately 1,000 Ω 's per inch of wire. For example, 10 inch cable = 10.000 Ω .

[4] Distributor Cap/Rotor Resistance Test (Ω)

This test checks for open circuits or high resistance in the distributor cap and rotor.

Set the rotary switch to the Resistance (Ω).

INSERT:

Black lead in COM terminal.

Red lead in V/ Ω /RPM terminal.

Dist. Cap Center connector Test:

Connect the test probes to opposite ends of the distributor cap terminal in general, resistance (Ω) should be 0.1 (Ω) or less. Refer to the manufacturer's specifications.

Rotor Test:

Connect the test probes to opposite ends of the rotor contacts.

In general, resistance should be 0.1 (Ω) or less. Refer to the Manufacture's specifications.

[5] Pick-up Coil Resistance (Ω)/ Voltage Test (Ω)

The resistance test checks for open circuits or high resistance.

The Voltage test compares voltage output to resistance.

Test procedure

Set the rotary switch to the Resistance (Ω).

INSERT:

Black lead in COM terminal.

Red lead in V/ Ω /RPM terminal.

Connect the test probes to the pick-up coil lead

Resistance Specifications

The majority of the pick-up coils will test between 500-1500 Ω 's resistance. See manufacture's specification for required range.

Set rotary switch to volts. Press the Blue, Alternate Function button to select AC.

Crank engine 10-15 seconds at normal speed; measure voltage.

Resistance Test/Voltage output

Resistance (Ω) on a "good" pickup coil will match AC output voltage (Ex., 950 Ω 's = 950mV output). Resistance can be good but voltage low if the magnet has lost magnetism or if the reluctor is too far from the stator (Airgap).

Basic Diagnostic Testing

This chapter describes a computer controlled sensor and actuator system typically Found on today's automobile.

Test procedures are also provided for the basic ground of electrical input and output components commonly found in a computer controlled automotive system. The test procedures are, due to the complexity of components, general theory tests. Be sure to consult the vehicle service manual for component schematics and test specifications.

Computer Controlled Systems

A need for better fuel economy and lower emissions resulted in today's automobiles Utilizing computer controlled functions that were previously activated by mechanical, Electrical and vacuum devices.

Computerized vehicle control systems are made up of three basic component groups. These groups are:

Sensors: they are input devices that supply information about engine operating conditions and the surrounding environment to the vehicle computer.

Engine Control Module: a vehicle computer that processes the information supplied by the sensors, then sends an electronic command to the appropriate components actuators.

Actuators: these are output devices that may be electrical, mechanical or vacuum components controlled by the vehicle computer.

Typical Sensors

Coolant sensor
Vacuum sensor
Throttle position sensor
RPM
Barometric sensor
Oxygen sensor

Actuators

Fuel injection
Ignition spark advance
Air pump
Exhaust gas recirculating valve
Canister purge
Converter clutch

Basic Diagnostics for the Computer Controlled Engine

There are two important steps that must always be followed when diagnosing and repairing vehicles with computer controls.

Do basic engine diagnostics first. Many problems can be traced to lack of routine maintenance on components such as plug wires, filters and spark plugs. Also check for vacuum leaks on any vehicle, new or old, A complete engine diagnosis should precede any electrical system diagnostics.

Follow the published diagnostic Charts EXACTLY through every step to mark a repair on computer component.

Self-Diagnostic Computer Systems

One of the functions of the vehicle computer is to record fault codes produced when a sensor or actuator fails. These failures are usually displayed as a "Current Code" or as an "History Code". Current codes are further grouped into

"Hard Failures" and "Intermittent Failures". Be aware, however, that some vehicle manufacturers use different terminology and older vehicles do not have all of the ground of codes described.

Current Codes are faults that are active.

Hard Failure causes the dash "Check / Engine" light to remain ON.

Intermittent Failure causes the dash "Check Engine" light to flicker and then go OFF after a short period of time. Generally the trouble code stays in the computer memory.

History Codes are stored codes for faults that have occurred in the past.

Failure Codes

When a failure is detected by the computer, it stores the information in the form of "Fault Codes" (also known as Trouble Codes or Service Codes). These Fault Codes are usually a two or three digit number that identifies the electrical circuit effected. Once these codes have been read the vehicle repair can be started. Be sure to closely follow the vehicle service manual diagnostic procedures, repairs and specifications.

Component Testing

Component testing with a meter generally requires detailed schematics and specifications that are provided by the manufacture. The following section provides general information for the main groups of sensors (input) devices and actuators (output) devices.

The primary input devices (sensors) are:

- Temperature sensors
- 2-wire devices
- 3-wire devices
- Oxygen sensor
- Pressure sensors

Primary output devices (actuators) are a form of an electromagnet that is either ON or OFF. The ON/OFF signal, in general, will be in one of three configurations:

- ON or OFF only (switch)
- Pulse width in a specified length of time (fuel injector)
- Duty cycle measured in percent of high or low time or dwell degrees (mixture control solenoid)

Duty Cycle, What is it?

Duty Cycle is the percentage (%) of time a voltage is positive compared to negative: ON compared to OFF. For example; duty cycle measurements are used for Mixture control solenoids. The amount of ON time is measured as a percent of the total ON/OFF cycle. The meter can

read the negative (-) or positive (+) slope and display it as a percent (%) of the total cycle.

Frequency (Hz), What is it?

Frequency is the number of times a voltage pattern repeats positive compared to negative: ON compared to OFF, during one (1) second of time. For example; frequency (Hz) measurements are specified for digitally controlled manifold Absolute Pressure sensors. The frequency of the ON/OFF signals per second are measured and displayed.

Frequency (Hz) is shown as Analog: A continuous positive to negative cycle; or Digital: A positive to negative/ON Dig to OFF cycle.

Pulse Width. What is it?

Pulse width is the length of time an actuator is energized. For example; fuel injectors are activated by an electronic pulse from the engine control module. This pulse generates a magnetic field that pulls the injector nozzle valve open. The pulse ends and the injector nozzle is closed. This "open to close" time is the pulse width and is measured in milliseconds (mS).

Typical Port fuel injectors (PFI) operate with a single ON to OFF electrical pulse.

Typical Port Throttle Body injectors (TBI) operate with an ON to HOLD to OFF electrical pulse. This method creates a double electrical "spike". An oscilloscope is required to measure this type of pulse.

Maintenance

Fuse and Battery Replacement

WARNING:

Avoid electrical shock; remove test leads before opening case.

Do not operate the meter or rotate the meter switch when the case is open.

1. To replace a battery or fuse, loose the three screws in the case back and remove the case by lifting up and forward.

Replace the battery with an 9 volt alkaline battery.

2. To replace fuse, firmly grasp the printed circuit board (PC boards by the edges and lift up and out of the case.

IMPORTANT:

To prevent contamination of the circuits, your hands must be clean and the printed circuit board must be held by the edges.

Replace the fuse with the same type of fuse.

20A is a F20A, 500V high energy, fast acting fuse.

mA is a F500mA, 250V high energy, fast acting fuse.

Make sure the replacement fuse is centered in the fuse holder.

Carefully re-insert the PC boards into the case. Re-assemble the case, then fasten the three screws.

Trouble Shooting

Meter will not turn ON.

Check the battery contacts for a tight fit.

Check for a minimum battery voltage of 8.0 volts.

Make sure the battery wires are not pinched in the case.

Ampere reading is erratic or there is no reading at all.

Disassemble the meter back cover and test the fuses for continuity.

Meter reading is erratic.

Printed circuit board contaminated from handling with hands.

Low battery.

Open circuit in a test lead (frayed or broken wire).

Wrong range selected.

For frequencies below 1 Hz, the display will show 00.00 Hz.

"Blown" fuse.

Meter reading do not change.

"Hold" feature is still toggled ON.