

Digital Pulse Tester

The simple-to-use Gautoprobe makes trouble-shooting fast, easy, and accurate!



Applications

1. Starting & Charging System

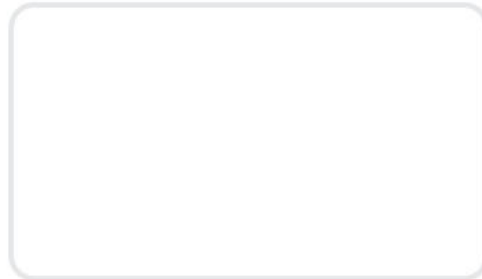
- o Starter Motor
- o Test Battery Load
- o Alternator Capacitor
- o Test Charging Signal

2. Electrical Relay & Actuator

- o Window Motor
- o Windshield Wiper Motor
- o Door Lock Actuator
- o Trunk Lock
- o Fuel Pump Motor
- o Stepping Motor
- o ISA (Idle Speed Actuator)
- o TR (Power Transistor)
- o Fuel Injector
- o Main Control Relay

3. Sensors

- o Power & Ground of Sensors
- o MAP Sensor
- o RPM Sensor
- o Crank Angle Sensor
- o Vehicle Speed Sensor
- o No.1 TDC Sensor
- o Water Temperature Switch
- o Pulse Generator(A/T)
- o ABS—Wheel Speed Sensor
- o Throttle Position Sensor
- o Cam Position Sensor
- o Noise Filter
- o Electric Horn
- o Idle Switch
- o Air Temperature Sensor
- o Barometric Pressure Sensor
- o Inhibitor Switch(A/T)
- o Water Temperature Sensor
- o Solenoid Valve(A/T)
- o Electric Fan Switch
- o Tachometer



INSTRUCTION

– Electric Tester for Car Maintenance Engineers –

The all-purpose automotive electric-solver!

When you get the Gautoprobe,
you can throw those oscilloscopes out!



GAUTOPROBE
T-7205J

Introduction

Warning

⚠ This icon signifies caution. When this symbol is marked on the product, refer to the Safety Information section for precautions to observe. Failure to observe caution information may cause personal injury, data loss or a product failure.

Unpacking

⚠ To avoid electrostatic damage to the Gautoprobe, never touch the exposed pins of the connectors

Instructions for grounding protection

1. Connect ground cable to the Gautoprobe.
2. Connect ground clamps to the car body.
3. Turn on the Gautoprobe.

Safety Information

The following section contains important safety information that must be followed when using the product.

Do not operate the product in a manner not specified in this document. Misuse of the product can be hazardous. Safety protection, built into the product, may be compromised if the product is damaged in any way.

Do not operate the product where there may be flammable gases or fumes. Operate the product only at or below the pollution degree, as stated in the Specifications. Pollution is defined as any foreign matter in a solid, liquid, or gaseous state that can reduce dielectric strength or surface resistivity. The following is a description of the degrees of pollutions:

- "Pollution Degree 1" No pollution or only dry, nonconductive pollution occurs. Pollution Degree 1 has no effect on performance.
- "Pollution Degree 2" Only nonconductive pollution occurs in most cases. Occasionally, however, temporary conductivity caused by condensation may be experienced.
- "Pollution Degree 3" Conductive pollution occurs, or dry nonconductive pollution occurs, that becomes conductive due to condensation.

Signal connections must be insulated for maximum voltage for which the product is rated. Do not exceed the maximum ratings for the product. Remove power from signal lines before connecting them to, or disconnecting them from, the product.

Operate this product only at, or below, the measurement category that is stated in the Specifications.

The following is a description of Measurement Categories:

- "Measurement category I" Are measurements performed on circuits not directly connected to MAINS. This category has a signal level such as voltage on a secondary Printed Wire Board(PWB) of an isolation transformer.

Examples of Measurement Category I are measurements performed on circuits not derived from MAINS and specially protected (internal) MAINS - or derived circuits.

- "Measurement category II" Are measurements performed on circuits directly connected to low-voltage equipment. This category refers to local-level distribution provided by standard wall outlets.

Examples of Measurement Category II are measurements on household appliances, portable tools, and similar equipment.

- "Measurement category III" Are measurements performed in building. This category has a distribution level that refers to hardwired equipment that does not rely on standard building insulation.

Examples of Measurement Category III include measurements on distribution circuits an circuit breakers. Other examples include wiring on cables, bus-bars, junction boxes, switches, socket outlets in the building/fixed measurement, and equipment for industrial use, such as stationary motors with a permanent connection to the building/fixed measurement.

- "Measurement category IV" Are measurements performed at the low-voltage source(>1,000V).

Examples of Measurement Category IV are electric meters, and measurements on primary over-current protection devices and ripple-control units.

Numbers /Symbols

± plus or minus

° degrees

— : Direct current

~ : Alternating current

⏏ : Both direct and alternating current

⏏ : Earth (ground) Terminal

□ : Equipment protected throughout by double insulation or reinforced insulation

V (Direct Current Voltage) : When the Gautoprobe is turned on, the voltage lamp automatically turns on.

The three LED lamps indicate voltage; the 9 different colors represent 9 levels of voltage.

Hz (Alternating Current Frequency) : The Frequency is the number of pulses per second (Unit: Hz).

% (Alternating Current Duty) : The positive period of one pulse cycle is called the duty (Unit: %).

(Power button) : Press the power button once to turn on the Gautoprobe. Press again to turn it off.

(Select button) : Press the select button to toggle between voltage, frequency, and duty modes.

(Light button) : Press the light button to turn on the flashlight.

1. How to connect the Ground Lead

Connect the black ground lead to the end of the Gautoprobe in order to check Voltage, Frequency and Pulse modes.



2. How to check the Probe and Ground Clip

- 1) Connect black ground lead to the end of the Gautoprobe.
- 2) Push power switch to turn on the Gautoprobe.
- 3) Touch probe to the ground clip. You should see the blue light on the bottom LED turn on, and the display screen will change from to .
- 4) When leads are not touching, all LED lamps should be off and the display screen should indicate .
- 5) Except for the above descriptions, if other LEDs are displayed during startup, the test leads must be replaced before using the Gautoprobe. Failure to do so could result in damage to the equipment or electric shock.

3. How to use the buttons

- 1) **Power Button** : Press the button once to turn on the Gautoprobe. Press again to turn off.
- 2) **Voltage Mode** : When the Gautoprobe is turned on, the lamp automatically turn on.
- 3) **Stand-by Mode** : When the Gautoprobe remains in voltage mode, but is not used for 3 minutes, all LED lamps will automatically turn off, with the screen displaying .
- 4) **Illumination Button** : Press the button to on the flashlight.
- 5) **Select Button** : Press the button to toggle between the , , and modes.

4. How to operate Modes

1) Voltage Mode : The three LED lamps indicate voltage; the 9 different colors represent 9 levels of voltage. This wide range of LED colors is the most important feature of the Gautoprobe.

Bottom Lamp (Voltage range : 0.0 V ~ 2.5 V)

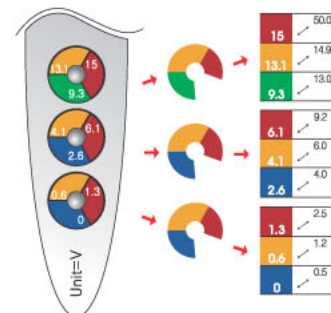
- When the measured value is between 0.0 V and 0.5 V, the bottom LED will turn blue.
- When the measured value is between 0.6 V and 1.2 V, the bottom LED will turn orange.
- When the measured value is between 1.3 V and 2.5 V, the bottom LED will turn red.

Middle Lamp (Voltage range : 2.6 V ~ 9.2 V)

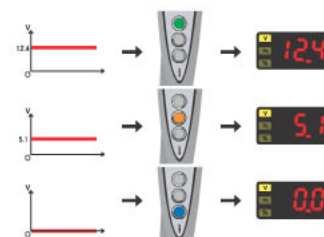
- When the measured value is between 2.6 V and 4.0 V, the middle LED will turn blue.
- When the measured value is between 4.1 V and 6.0 V, the middle LED will turn orange.
- When the measured value is between 6.1 V and 9.2 V, the middle LED will turn red.

Top Lamp (Voltage range : 9.3 V ~ 15.0 V)

- When the measured value is between 9.3 V and 13.0 V, the top LED will turn green.
- When the measured value is between 13.1 V and 14.9 V, the top LED will turn orange.
- When the measured value is higher than 15.0 V, the top LED will turn red.



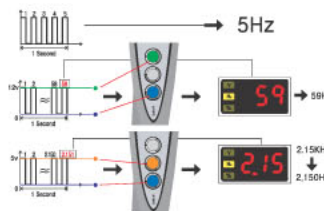
- » The voltage can also be read on the numeric display screen.
- » The numeric display ranges from -45.0 V to +50.0 V. If the measured value is lower than -45.0 V or higher than +50.0 V, the numeric display will show "OL".
- » If the voltage is between -9.9 V and +50.0 V, the display will be given to within one decimal point. If the voltage is under +9.9 V, it will be rounded to the nearest whole number.



2) Frequency Mode

The Frequency is the number of pulses per second (Unit : Hz)

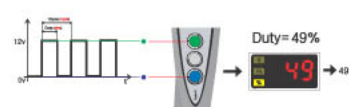
The numbers indicated in the display are the measured frequency up to 999 Hz. Over 1KHz :1.0(Indicated with point)



3) Duty Mode

The positive period of one pulse cycle is called the Duty (Unit : %).

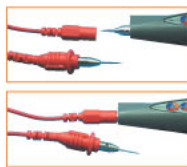
The numbers indicated on the display are measured duty, ranging between 1% ~ 99%.



5. Other features

1) Auto Power OFF Feature

After 3 minutes of non-use, the Gautoprobe automatically shuts itself down to conserve battery life. Press the power button again to restart the Gautoprobe.



2) Changing the probe

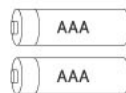
Use the small wrench provided to loosen the screw and change the probe needle.
To use the extension cord, screw it in a clock-wise direction onto the probe.

6. Maintenance

1) Battery replacement

The battery must be replaced when the low battery warning sign, "Lob" appears on the display.

- Before changing the battery, make sure that the power is turned off on the Gautoprobe. Also, ensure that the probe and the ground clip are not connected.
- Remove battery compartment cover.
- Replace the two LR03 ("AAA" size) **alkaline** batteries according to their correct polarity.
- Close cover.



2) Cleaning

Periodically wipe the case with a dry cloth. Do not use solvents or abrasives to clean the Gautoprobe.

⚠ Warning Notice

When there is an error due to replacing the battery without shutting down the Gautoprobe power, remove the battery from the unit for about one hour to return to normal operation

Placing the Probe in contact with spark plug cables may result in serious damage to the Gautoprobe due to its high ignition voltage.

Remove battery from the compartment, if not in use for an extended period of time. Three months of inactivity can lead to the complete discharge of the battery.

■ Specifications

Maximum Working Voltage

Channel-to-earth(ground) : 30VAC or ± 50 VDC, Measurement Category I
Channel-to-channel : 30VAC or ± 50 VDC, Measurement Category I

Environmental

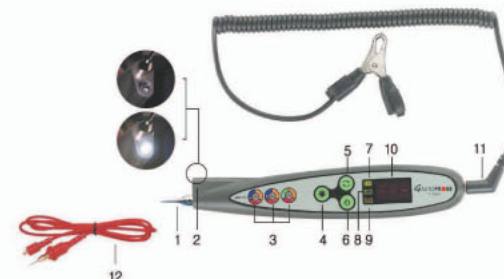
Operating temperature : 0 to 50°C
Storage temperature : -55 to 150°C
Humidity : 5 to 90% RH, non-condensing
Maximum altitude : 2000 meters
Pollution degree : 3

■ Technical Data

Product Name	Multi Logic Probe "Gautoprobe"
Model No.	T-7205J
Controller Type	Digital/ LED Micom
CPU	8Bit Micom, 10Bit A/D Converter: 10~20 MHz Clock Speed
Display	3 Digit FND: 9 Color LED
Display Voltage Range	DC -45 Vd.c. ~ +50 Vd.c.
Frequency	0~20 KHz
Maximum Voltage	± 50 Vd.c., 30 Va.c.
Maximum Transient Overvoltage	500 Vpeak
Electrical Properties	Standby Current: 49 ± 5 μ A Normal Current: $65 \text{mA} \pm 5$ mA Voltage Test Current: $180 \text{mA} \pm 10$ mA Frequency Test Current: $170 \text{mA} \pm 10$ mA Illumination Current: $50 \text{mA} \pm 5$ mA
Impedance	$220 \text{k}\Omega \pm 10 \text{k}\Omega$
Minimum Source Current	220 μ A
Effective Temperature Range	0°C ~ 50°C
Power Requirements	DC 3V, LR03(AAA 1.5V Alkaline) 2EA
Illumination	White LED
Size	201 \times 34 \times 25mm (Including Probe Pin)
Weight	70g
Included Accessories	Ground Clip; Extension Probe

■ Description

- Probe & Probe Holder
- Illumination Light
- LED Display
- Light Switch
- Function Switch
- Power Switch
- Voltage Indicator Lamp
- Frequency Lamp
- Duty % Lamp
- Numeric Displa
- Ground Cable
- Extension Probe



Maintenance Manual

Gautoprobe Maintenance Example #1

Vehicle Speed Sensor & Speedometer Troubleshooting

Trouble and/or Symptoms

Speedometer does not work during normal driving.

Diagnostic Procedure



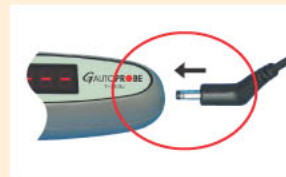
1. Raise the vehicle on a lift, allowing the wheels to move freely.



2. Start the engine.



3. Put the car into gear and let the tires rotate freely.



4. Connect ground cable to the Gautoprobe.

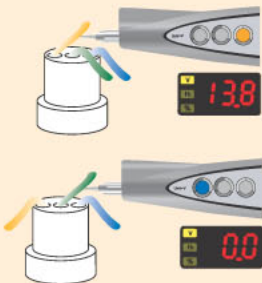


5. Connect ground clamps to the car body.



6. Turn on the Gautoprobe and connect speedometer wiring with the probe.

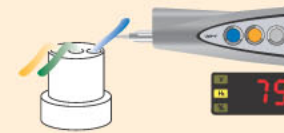
When the Gautoprobe is working normally



1. **Check sensor power:** As in the picture, Gautoprobe's 3rd lamp turns ● with alternator voltage appearing on the numeric display.

2. **Check sensor grounding:** As in the picture, Gautoprobe's 1st lamp turns ● and 0.0 V appears on the numeric display.

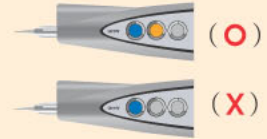
When the Gautoprobe is working normally



3. **Check sensor output:** As in the picture, the 1st ● and 2nd ● lamps on Gautoprobe's display blink alternately, indicating that pulse is the present mode. At this time, pushing the selection button ● once, will change mode to frequency measurement mode Hz and present speed will appear on the numeric display.

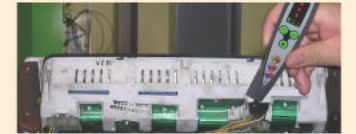
When the Vehicle Speed Sensor has some trouble

1. In its normal state (above), the speed sensor power and grounding will be the same.
2. Check sensor output which is different from the normal state (blinking on and off), one light remains on (no blinking).



When the Speedometer has some trouble

1. Remove the dashboard, and touch the Gautoprobe's probe to the speedometer wiring on the back of the dashboard.
2. If the sensor output is the same as in the normal state, i.e., the 1st ● and 2nd ● lamps blink alternately, this indicates that the signal on the dashboard is normal. If this occurs, it confirms that there is a problem with the speedometer itself.



Gautoprobe Maintenance Example #2

Power Transistor & Ignition Coil Diagnosis

Trouble and/or Symptoms

Car that suddenly stops running, and there is no spark from the spark plug.

If the power transistor will indicate trouble if it overheats, but will perform normal when it cools down. In this situation, technicians will have difficulty identifying the source of the trouble. To overcome this problem, start the engine, and wait for a while. After the engine is sufficiently warm, turn off the engine and immediately check the power transistor.

Diagnostic Procedure



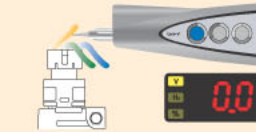
1. Turn on the Gautoprobe, and the ground clamps to the car body.



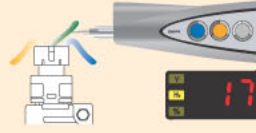
2. Turn the key to engage the starter, and check each wire on the power transistor.



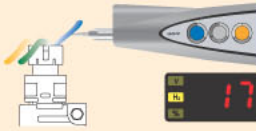
When the power transistor is working normally



1. Check power transistor grounding: As in the picture, the Gautoprobe's 1st lamp turns ●, and 0.0 V appears on the numeric display.



2. Check the power transistor base: The base is the signal from the ECU. As in the picture, the 1st ● and 2nd ● lamps on Gautoprobe's display blink alternately, indicating that 'pulse' is the current mode. At this time, pushing the Gautoprobe's selection button ● one time will change the mode to 'frequency measure' Hz, and the car's present speed frequency will appear on the numeric display.



3. Power transistor collector signal: The collector is the signal from the power transistor to the negative (−) pole of the ignition coil, with a pulse range of 0 to 12 V. As in the picture, the 1st ● and 3rd ● lamps on the Gautoprobe's display blink alternately, indicating that 'pulse' is the current mode.

When the power transistor experiences trouble

Power TR ground



normal

Power TR base



normal

Power TR collector



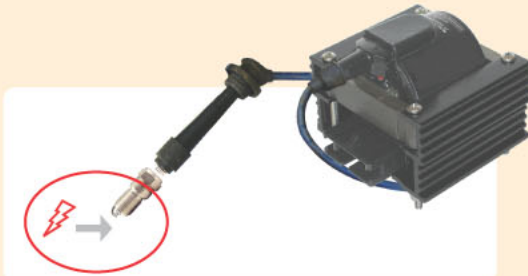
normal faulty

Grounding and base are the same in the normal state, but the 3rd light turns green ●.

When the ignition coil experiences trouble

If the ground, base, and collector signals indicate normal conditions, but there is still no secondary voltage (spark) from the ignition coil, then we can determine that the trouble comes from the ignition coil.

※ If you can see a ⚡ (spark) the ignition coil is working normally, but if you can't, then it's faulty.



Gautoprobe Maintenance Example #3

Battery Efficiency Check

Trouble and/or Symptoms

The engine doesn't start

after the car has been parked for a long time, or on a cold morning.

Diagnostic Procedure



1. Remove the ECU fuse, so fuel is not injected into the system.



2. Connect the ground clamps to the battery's negative (−) pole.



3. Touch the Gautoprobe's probe to the battery's positive (+) pole.



4. Try to start the engine for about 5 seconds.



5. The technician should watch the Gautoprobe's lamps and also watch for any change in voltage.



When battery is working normally

The voltage will go down as time goes by, and the Gautoprobe's 3rd lamp turns green ●.

If the battery experiences trouble

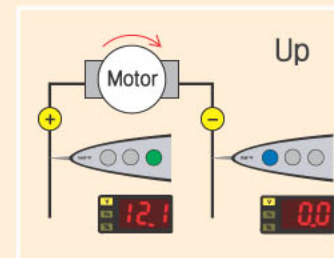
As time goes by, the voltage will go down to under 9.2 V, and Gautoprobe's 2nd lamp will turn red ●.

Repair Tip

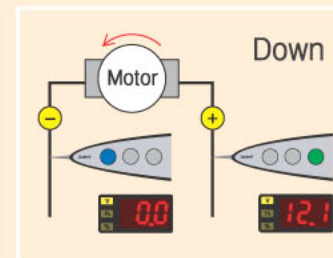
No matter how long you try to charge it, a faulty battery will not charge normally. Replacing the battery is recommended.



When the window motor is working normally (Normal state)



When the window goes up.



When the window goes down.

When there is a problem with the motor

The change in Gautoprobe's lamps is the same as in the normal state, but the motor is not activated.

When there is a problem with the switch

When you operate the switch, the Gautoprobe's lamp remains fixed at a constant color (no blinking), different from the normal state.

Gautoprobe Maintenance Example #4

Window Motor & Switch Diagnosis

Trouble and/or Symptoms

The window motor does not work normally.

Diagnostic Procedure



1. Remove the door trim.



2. Turn the ignition key to the ON position.



3. Connect the ground clamps to the car body.



4. Touch the window motor wiring with the probe, and then operate the window switch.



5. Check the trouble area by watching the Gautoprobe's lamps and for any change in voltage.

Gautoprobe Maintenance Example #5

Injector Diagnosis

Trouble and/or Symptoms

The engine doesn't start and injector operation is in doubt.

Diagnostic Condition

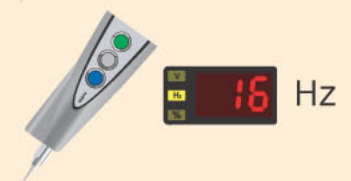
Turn the ignition key to engage the engine.

Diagnostic result

● Power wire : Battery + Voltage.



● Drive Signal wire : 0~12 V Pulse signal.



Neither the injector drive signal or ignition signal are displayed.

Trouble and/or
Symptoms

Diagnostic
Condition

Turn the ignition key to engage the engine.

Diagnostic
result

● Power wire
: Battery + Voltage.



● Ground wire
: Battery - Voltage.



● Crank Position Sensor
: 0~5 V pulse
signal has high frequency.



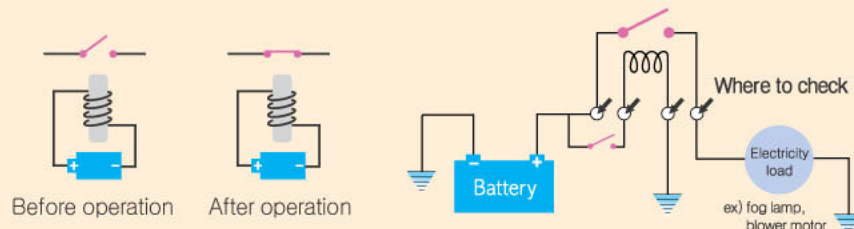
● No.1 TDC Sensor
: 0~5 V signal
has relatively low frequency.



● To make a T-Connector.

The relay
principal

The relay operates on fundamental electromagnetic principles. This means that when an electromagnetic coil is electrified, it becomes magnetized. It is one way of operating a switch.



Since the relay is like an intersection that is charged with electricity, it would be very convenient if you could check all shorts, open contacts, and bad contacts at one place.

The necessity of
T-Connector for
the relay

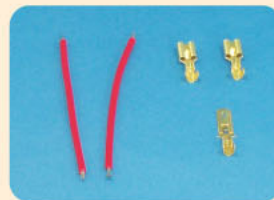
The best way to effectively check relay circuits is to check them while they are still connected to the socket, however this is also the most inconvenient method. You typically need to unfasten the socket assembly, and then turn it over to check wires, due to several relays usually being placed on one socket assembly.



Additionally the above processes involves extra work, i.e. when the assembly is turned over all wires are located in the opposite direction to their normal orientation. In this situation, using the T-Connector can make diagnosis easier and more efficient.

Preparing
T-Connector
for a relay

Prepare 10 cm lengths of wires and terminals as shown in the picture below.



1. Strip 5 mm from both
ends of the wires.



2. Connect the terminals
and wires with appropriate
tool.



3. Insulate terminals by
using a contraction tube:
make a small-sized T-
Connector for a relay in
the same way.

There are various kinds of relays used in automotive vehicles to control electricity. In most cases, if a problem arises, a mechanic examines each terminal with their tester after removing the relay from its socket to inspect the relay circuit. However, if the mechanic does not have the appropriate shop manual, or enough experience in dealing with electric circuits, he often encounters significant difficulties in determining the exact problem.

Usually, when their air-conditioner or heater of a car is turned on and does not work, the car is brought into a repair shop. In this situation, if the blower, blower switch, and register of the car has previously been replaced, but the problem persists.

Let's check an actual vehicle.

Preparation for check

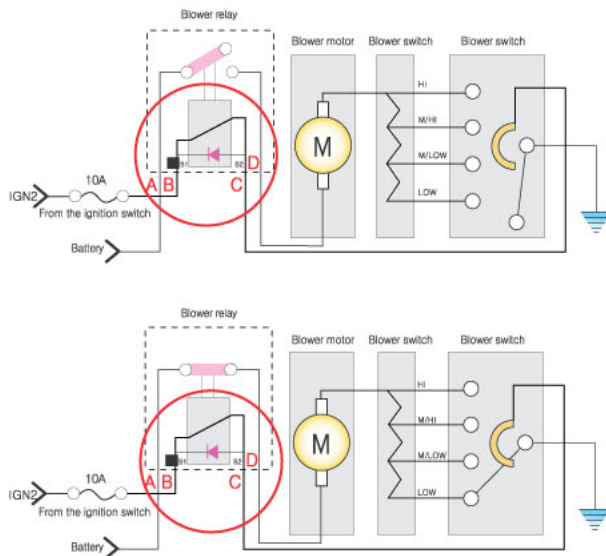
1. Put the T-connector into the blower relay.



2. Operate the blower switch, then prepare the Gautoprobe to check each checkpoint.



Check and Diagnosis 1



Check and Diagnosis 2

- A. Ensure that the power supplied from the battery is on 'Stand-by' at all times.



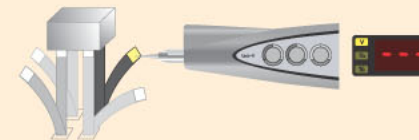
- B. When you turn the ignition key to the 'ON' position, +power is seen.



- C. It is verified that the grounding is normal whenever the blower switch is operated.



- D. When the blower switch is turned on + power is verified, but when the blower switch is turned off, and the 'Gautoprobe' indicates that the circuit is still open (---). Meaning that the wire between the blower motor and the D terminal of the relay is disconnected and needs to be repaired.



Gautoprobe Maintenance Example #8

CRDI System Diagnosis

CRDI Injector Diagnosis

Trouble and/or Symptoms

- Engine fails to start and functioning of the injector is in doubt.

Diagnostic condition

- Turn the ignition key to engage the engine.

Diagnostic result 1

- Power wire: Battery power.



Diagnostic
result 2

- Drive Signal wire
: 0~12V Pulse signal



Hot Film type Air Flow Sensor Diagnosis

Trouble and/or
Symptoms

- The Check Engine Light is on and the AFS Trouble Code is indicated.

Diagnostic
condition

- Turn the ignition key to engage the engine.

Diagnostic
result

- Drive Signal wire: 0~5V Pulse signal



Rail Pressure Sensor Diagnosis

Trouble and/or
Symptoms

- The Check Engine Light is on and the RPS Fail Trouble Code is indicated.

Diagnostic
result

- Sensor Power : +5V Power on.
- Ground : 0V



- Sensor Output : When the Gautoprobe is working normally.
 - Below 1.7V for idling.
 - Rise up to 4.5V for rapid acceleration.



Rail Pressure Control Valve Diagnosis

Trouble and/or
Symptoms

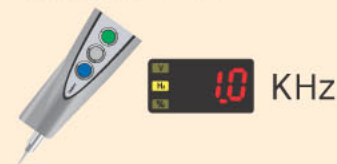
- Not enough acceleration power and operation of the Rail Pressure Control Valve is in doubt.

Diagnostic
result

- Power wire : Battery power



- Control wire : 0~12V



The frequency of Pulse signal is over 1.0KHz.

Gautoprobe
Product Benefits

Product Benefits



LAB-SCOPES



DIGITAL PULSE TESTER
(Gautoprobe T-7205J)

Hard to use	Easy to use
Complicated operation and trouble analysis	Easy, fast and accurate trouble shooting
High price	Low price