Measurement Operation(3)

may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

The measurement ranges of DC current are: 200.0mA and 10.00A.

To measure current, do the following:

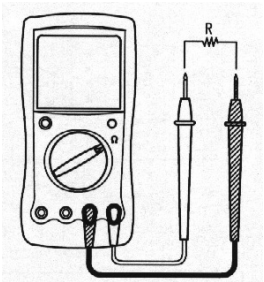
1. Turn off power to the circuit. Discharge all high-voltage capacitors.
2. Insert the red test lead into the mA or 10A terminal and the black test lead into the COM terminal.
3. Set the rotary switch to an appropriate measurement position in A⎓ .
4. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
5. Turn on power to the circuit.
   The measured value shows on the display.

Note

- If the value of current to be measured is unknown, use the maximum measurement position (10A) and 10A terminal, and reduce the range step by step until a satisfactory reading is obtained.
- When DC current measurement has been completed, disconnect the connection between the testing leads and the circuit under test.
- At 10A Range: for continuous measurement ≤10 seconds and interval time between 2 measurements greater than 15 minutes.

Measurement Operation(4)

C.Resistance Testing (see figure 5)



(figure 5)

⚠Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

Never attempt an in-circuit current measurement where the open circuit voltage between terminals and ground is greater than 60V DC or 30V AC rms.

The resistance ranges are: 200.0Ω, 2.000kΩ, 20.00kΩ, 200.0kΩ, 2.000MΩand 20.00MΩ.

To measure resistance, connect the Meter as follows:

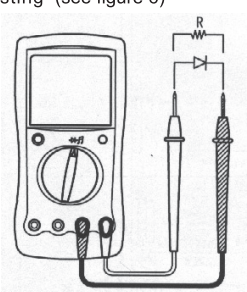
1. Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
2. Set the rotary switch to an appropriate measurement position in Ω range.
3. Connect the test leads across with the object being measured.
   The measured value shows on the display.

Measurement Operation(5)

Note

- The test leads can add 0.1Ωto 0.2Ω of error to the resistance measurement. To obtain precision readings in low-resistance, that is the range of 200Ω, short-circuit the input terminals beforehand and record the reading obtained (called this reading as X). (X) is the additional resistance from the test lead. Then use the equation:
  measured resistance value (Y) – (X) = precision readings of resistance.
- When the resistance reading≥0.5Ωin the short-circuit condition, please check for loose test leads or other reasons.
- For high resistance (>1MΩ), it is normal taking several seconds to obtain a stable reading, and it is better to choose shorter test lead.
- When there is no input, for example in open circuit condition, the Meter displays " OL ".
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

D.Diode Testing (see figure 6)



(figure 6)

Measurement Operation(6)

⚠Warning
To avoid possible damage to the Meter and to the device under test, disconnect circuit power and discharge all high-voltage capacitors before testing diodes and continuity.

Never attempt an in-circuit current measurement where the open circuit voltage between terminals and ground is greater than 60V DC or 30V AC rms.

Use the diode test to check diodes, transistors, and other semiconductor devices. The diode test sends a current through the semiconductor junction, then measures the voltage drop across the junction. A good silicon junction drops between 0.5V and 0.8V.

To test a diode out of a circuit, connect the Meter as follows:

1. Insert the red test lead into the ⊣◀ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to ⊣◀ .
3. For forward voltage drop readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.
   The measured value shows on the display.

Note
- In a circuit, a good diode should still produce a forward voltage drop reading of 0.5V to 0.8V; however, the reverse voltage drop reading can vary depending on the resistance of other pathways between the probe tips.
- Connect the test leads to the proper terminals as said above to avoid error display.
- The open-circuit voltage is around 3V when testing diode.

Measurement Operation(7)

- The LCD will display “OL” indicating open-circuit for wrong connection.
- The unit of diode is Volt (V), displaying the positive-connection voltage-drop value.
- When diode testing has been completed, disconnect the connection between the testing leads and the circuit under test.

E.Continuity Testing (see figure 6)

⚠ Warning

To avoid possible damage to the Meter and to the device under test, disconnect circuit power and discharge all high-voltage capacitors before testing diodes and continuity.

Never attempt an in-circuit current measurement where the open circuit voltage between terminals and ground is greater than 60V DC or 30V AC rms.

To test for continuity, connect the Meter as below:

1. Insert the red test lead into the ⊣⊢ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to ⊣⊢ / .
3. Connect the test leads across with the object being measured.

The buzzer sounds continuously when the resistance value is ≤ 30Ω. The circuit is in good condition.

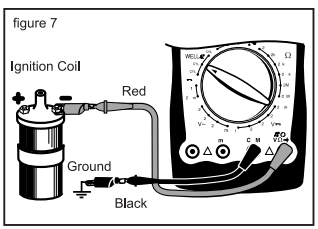
Note

- The LCD displays OL indicating the circuit being tested is open.
- Open-circuit voltage is approx. 3V.
- When continuity testing has been completed, disconnect the connection between the testing leads and the circuit under test.

Measurement Operation(8)

F.Dwell Testing (see figure 7)

figure 7



It was very important in the past to test the dwell of the cut-off switch of an ignition system. The dwell testing means the duration when the cut-off switch remains off when the cam is turning. Now as an automobile is ignited electronically, it is no longer necessary to adjust the dwell. In addition, the dwell testing can also be used to test a mixed-controlled solenoid.
(e.g. GM feedback carburetor).

1. Set the rotary switch to DWELL .
2. As prompted at the LCD connect terminal, insert the red test lead into the terminal and the black test lead into the COM terminal. Connect the ends to be tested as illustrated.
   - If the cut-off switch of an ignition system is tested, connect the red test lead probe to the primary negative end of the ignition coil. (Refer to the automotive servicing manual for the specific position.)

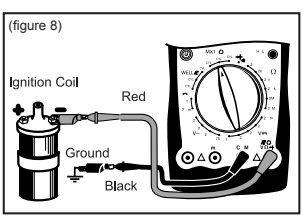
Measurement Operation(9)

- If the GM feedback carburetor is tested, connect the red probe to the ground terminal or the computer drive of the solenoid. (Refer to the automotive servicing manual for the specific position.)
- If the dwell of an arbitrary ON/OFF equipment is tested, connect the red probe to the end of the equipment, fixed with an ON/OFF switch.

3. Connect the black test lead probe to the good ground terminal of the automobile.
4. Read the ignition dwell of the tested automobile directly from the display.

G.Engine Tach (Rotation Speed) Testing "RPMx10" (see figure 8)

(figure 8)



The RPM means the rotating frequency of the main shaft of the engine per minute.

1. Set the rotary switch to RPMx10.
2. As prompted at the LCD connect terminal, insert the red test lead into the terminal and the black one into the COM terminal. Select an appropriate number of cylinders. Connect the ends to be tested as illustrated.

Measurement Operation(10)

- If a DIS ignition system without any distributor board is used in the automobile, connect the red test lead probe to the TACH (tachometer) signal line (which is connected to the computer DIS module of the automotive engine). Refer to the automotive servicing manual for the specific position.
- If an ignition system with a distributor board is used in the automobile, connect the red test lead probe to the primary negative end of the ignition coil. (Refer to the automotive servicing manual for the specific position.)

3. Connect the black test lead probe to the good ground terminal of the automobile.
4. Upon the start of the engine or during its operation, test the rotation speed of the engine and read the displayed value from the display. The actual rotation speed of the automobile to be tested should be equal to the displayed value multiplied by 10. For example, the actual rotation speed of the engine of the automobile should be 2000 RPM (200 x 10) if the displayed value is 200 and the meter is set at the 6CYL (6 cylinders) notch.

H.Data Holding

Under any testing circumstances, the display of the meter holds the testing result as soon as the HOLD is pressed down. When the HOLD is pressed once more, the testing result held in the display of the meter will be unlocked immediately and the meter randomly shows the current testing result.

Measurement Operation(11)

Part 2 Diagnosis of Automotive Troubles

The digital multimeter is a tool for the very effective diagnosis of the troubles with the electronic systems of the automobile. This part gives a special introduction as to how the multimeter is used to diagnose any trouble with a fuse, switch, solenoid, relay, starting and charging systems, ignition system, fuel system and engine sensor.

A.Fuse Testing: Check the fuse to see if it is blown out.

1. Set the rotary switch to 200Ω.
2. As prompted at the LCD connect terminal, insert the red test lead into theΩterminal and the black one into the COM terminal.
3. Short circuit the red and black test lead probes, when the reading of the meter should be displayed between 0.2Ωand 0.5Ω If it is more than 0.5Ω, check the test leads to see whether they are well connected.
4. Connect the red and black test lead probes in parallel to the two ends of the fuse, when the reading of the meter should be displayed less than 10Ω, indicating that the fuse is good. When the display is overload "OL", it is shown that the fuse has been blown out.

- It must be replaced with a fuse of the same type and size.

B.Switch Testing: Check the switch to see if it can work correctly.

1. The same as in Items 1 to 3 (Fuse Testing).
2. Connect the black test lead probe to one end of the switch and the red one to another end. When the switch is connected, the reading of the meter should be displayed less than 10Ω. When the switch is cut off, overload "OL" should be displayed as the reading of the meter.

Measurement Operation(12)

C.Solenoid or Relay Testing

1. The same as in Items 1 to 3 (Fuse Testing).
2. Connect the red and black test lead probes in parallel to the two end of a solenoid or relay. The impedance of most of solenoids or relay coils is less than 200Ω . (See the details in the automotive manual.)

⚠Warning:

- Both ends of a general solenoid or relay are connected with diodes.
- Check to see if there is any damaged coil. Even if the coil is found satisfactory, the solenoid or relay may still be damaged. The relay may be welded or worn due to the frequent sparking of the contacts. The solenoid may be stuck when the coil is in an on-position. Therefore some potential problems cannot be found in testing.

D.Starting/Charging System Testing

The on-off package of the engine starting system consists of a battery, engine starting button, solenoid and relay starting buttons, lead connections and lines. During the operation of the engine, the charging system keeps the battery charged. This system consists of an AC generator, voltage calibrator, lead connections and circuits. The multimeter is an effective tool for the checking of these systems.

1.Load-Free Battery Testing

Before testing the starting/charging system, test the battery to see if it is fully charged.

(1) Set the rotary switch to 20 VDC.

Measurement Operation(13)

(2) As prompted at the LCD connect terminal, insert the red test lead into the V terminal and the black one into the COM terminal.
(3) Turn off the ignition switch.
(4) Turn on the driving lights for 10 sec. to release charges from the battery.
(5) Connect the black test lead probe to the negative pole of the battery and the red one to the positive pole of the battery.

2.The testing results are shown in contrast as follows and if the battery is less than 100%, please use it after charging it.

12.60 V	100%
12.45 V	75%
12.30 V	50%
12.15 V	25%

E.Battery Power Consumption Testing when the Engine Is off

The test is carried out to find the amperage of the power consumption of the battery when both the ignition key and the engine are off. The test is helpful for the determination of the additional consumption of the battery, which may finally lead to the exhaustion of the battery.

1.Turn off and close the ignition key and all its accessories.

Make sure that the bus, engine louver and room lights have been turned off and closed.

2.Set the rotary switch to A⎓10A.

As prompted at the LCD connect terminal, insert the red test lead into the **A** terminal and the black one into the **COM** terminal.