

CAT III 1000V, true rms, L/C/R

AUTOMOTIVE TESTER

Model : DM-9131



Your purchase of this AUTOMOTIVE TESTER marks a step forward for you into the field of precision measurement. Although this Automotive test is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

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1. FEATURES

- * Meet IEC 1010 CAT III 1000 V safety requirement.
- * LCD with green light backligh, easy reading.
- * 6000 counts A/D, high resolution.
- * Multi function measurement. DCV, ACV, DCA, ACA, Resistance, Capacitance, Inductance, Frequency, Temperature, Diode, Continuity beeper, TACH, DWELL, POINT, 2000A Clamp
- * Max. & Min. measurement value with recall.
- * Relative, Data hold.
- * Auto range with manual range selection.
- * Temperature measurement possibility.
- * V/A/Hz button, when execute the ACV, ACA function also can measure the frequency of signal.
- * Both 10 A, 6A current are build fuse for safety consideration.
- * 10 M ohm impedance for voltage circuit.
- * Operates from 9 V (006P, MIN1604) batteries.
- * Built-in overload protection for most ranges.
- * Photo couple RS 232 computer serial interface.
- * Uses durable, long-lasting components, enclosed in strong, light weight ABS-plastic housing.
- * Full line optional adapters : Clamp adapter, Tachometer adapter, Pressure adapter, Humidity Adapter, Sound level adapter, Anemometer adapter, Light adapter, EMF adapter.

2. SPECIFICATIONS

2-1 General Specifications

Display	60 mm x 39 mm large LCD display
Measurement	DCV, ACV, DCA, ACA, Resistance, Diode, Continuity beeper, Capacitance, Inductance, Frequency, Temperature.
A/D counts no.	6000 counts.
Range selection	Auto range with manual range selecting.
Special function	Relative measurement
Data hold	To freeze the display reading on the LCD display.
Power On/Off management	Auto power of or manual power off. @ <i>Details please refer page 7</i>
Memory recall	Records Maximum & Minimum readings with recall.
Relative measurement	To offset the measurement value.
V/A/Hz button	When execute the voltage or current function also can measure the frequency of signal.
Data output	RS 232 PC serial interface, photo couple.
Polarity	Automatic Switching, " - " indicates negative polarity.
Zero adjustment	Automatic.
Sampling time	Approx. 0.5 to 1 second.
Operating Temp. & humidity	0 °C to 50 °C (32 °F to 122 °F), Max. 80% RH.
Power supply	9 V (006P, MIN1604) DC 9V adapter input *AC/DC Power adapter is optional.
Power consumption	Approx. DC 7.0 mA.
Weight	378 g/0.83 LB (w.o battery).
Dimension	190 x 88 x 40 mm (7.5 x 3.5 x 1.6 inch).

Accessories Included	Red and Black Test Leads..... 1 Set Instruction Manual..... 1 PC
Optional accessories	Full line adapters : ACA/DCA current adapter, Tachometer adapter, Humidity adapter, Pressure adapter, Light adapter, EMF adapter, Sound level adapter, High voltage probe.
	AC to DC 9V Adaptr..... AP-9VA
	Holster..... HS-03
	Type K Temperature probe..... TP-11
	Soft carryinf case..... CA-05A
	RS232 cable to D-Sub 9 connector..... UPCB-06
	RS232 cable to USB connector..... UPCB-11
	RPM inductive pick up sensor..... IP-09
	Data Acquisition software..... SW-U801-WIN SW-E802

2-2 Electrical Specifications (23±5 °C)

DC Voltage		
Range	600.0 mV /6 V/60 V/600 V /1000 V	
Resolution	0.1 mV /0.001V /0.01V /0.1V/1 V	
Accuracy	± (0.5% + 2d)	600 mV
	± (0.8% + 1d)	6 V, 60 V, 600 V, 1000 V
Input impedance	10 M ohm.	
Over load protection	600 mV range	± 380 DCV, 380 ACV
	other ranges	±1000 DCV, 1000 ACV

AC Voltage (True RMS)		
Range	600.0 mV /6 V/60 V/600 V /1000 V	
Resolution	0.1 mV /0.001V /0.01V /0.1V/1 V	
Accuracy	± (1% + 2d)	
	* Spec. are tested under 50/60 Hz.	
Input impedance	10 M ohm.	
Over load protection	600 mV range	± 380 DCV, 380 ACV
	other ranges	±1000 DCV, 1000 ACV

DC Current, AC Current (True RMS)			
Range	10 A / 6 A		
Resolution	0.01 A / 0.001A		
Accuracy		DCA	ACA
	6 A	$\pm (1.5\%+2d)$	$\pm (1.5\%+2d)$
	10 A	$\pm (1.5 \% + 2d)$	$\pm (1.5 \% + 2d)$
<i>* ACA spec. are tested under 50/60 Hz.</i>			
Over load protection	10A fuse.		

Diode (Forward voltage, VF)	
Range	2.9 V DC.
Accuracy	$\pm (0.5\% + 2d)$

Capacitance		
Auto Range	600 pF/6 nF/60 nF/600 nF/6 uF/60 uF/100 uF/600 uF	
Resolution	0.1 pF/0.001 nF/0.01nF/0.1 nF/0.001 uF/0.01 uF/0.1 uF/1uF	
Accuracy	600 pF	$\pm(2.5\% + 5d)$
	6 nF/60 nF/600 nF/6 uF/60 uF	$\pm(1.5\% + 5d)$
	100uF/600 uF	$\pm(2.5\% + 5d)$
Test frequency	100Hz /1KHz /10KHz (Auto frequency configuration)	
Remark	Discharge capacitor before testing.	
Over load protection	± 30 DCV, 30 ACV.	

Inductance		
Auto Range	600 uH/6 mH/60 mH/600 mH/6 H/60 H/100 H	
Resolution	0.1uH/0.001mH/0.01 mH/0.1 mH/0.001 H/0.01 H/0.1 H	
Test frequency	100Hz /1KHz /10KHz (Auto frequency configuration)	
Accuracy	600 uH	$\pm(5\% + 5d)$
	6 mH/60 mH/600 mH/6 H	$\pm(1.5\% + 5d)$
	60 H /100 H	$\pm(2.5\% + 5d)$
Over load protection	± 30 DCV, 30 ACV.	

Frequency	
Range	600 Hz/6 KHz/60 KHz/600 KHz/6 MHz/20 MHz
Resolution	0.1 Hz/0.001 KHz/0.01 KHz/0.1 KHz/0.001 MHz/0.01 MHz
Accuracy	$\pm(0.5\% + 2d)$
Sensitivity	Min. 1 V rms, Max. 5 V rms.

OHMS	
Range	600 Ω /6 K Ω /60 K Ω /600 K Ω /6 M Ω /60 M Ω
Resolution	0.1 Ω /0.001 K Ω /0.01 K Ω /0.1 K Ω /0.001 M Ω /0.01 M Ω
Accuracy	600 ohm : $\pm(1 \% + 2d)$ 6K/60K/600K/6 M : $\pm(1.5 \% + 2d)$ 60 M : $\pm(3 \% + 5d)$
Over load protection	± 350 DCV, 350 ACV.

Continuity Beeper	
Beeper will sound if measured resistance less than 20 ohm.	

Max. & Min. Measurement	
During the operation can memorize the maximum and the minimum measurement value.	

Temperature		
Auto Range	Resolution	Accuracy
-100.0 °C to 199.9 °C	0.1 °C	$\pm(1\% + 1\text{ °C})$
200 °C to 1000 °C	1 °C	
-148.0 °F to 391.9 °F	0.1 °F	$\pm(1\% + 2\text{ °F})$
392 °F to 1832 °F	1 °F	
Temp. probe	The temperature probe (TP-11) is the optional accessory.	

TACH	
Range	500 -30000RPM
Resolution	10RPM
Accuracy	$\pm(1\% + 2d)$
OVERLOAD PROTECTION	24V DC/AC RMS (within 1 min)

DWELL						
CYLINDER	3 CYL	4CYL	5CYL	6CYL	8CYL	DUTY CYCLE
Range	0-120°	0-90°	0-72°	0-60°	0-45°	0-100%
Resolution	0.1°	0.1°	0.1°	0.1°	0.1°	0.1%
Accuracy	$\pm(1\% + 2d)$					
Over load protection	± 200 DC/AC RMS (within 15 sec)					

Point			
Range	$\geq 0.2V$	$< 0.2V$	ACCURACY
60V DC	chang	good	$\pm(1.2\% + 2d)$
Resolution	0.01V DC		
Accuracy	$\pm(1.2\% + 2d)$		

OPTIONAL ADAPTER			
Range	MAX. DISPLAY CAPACITY	PER DIGIT EQUAL	ACCURACY
2000A	2000	1mV DC/AC	$\pm(1.2\% + 2d)$
IR TEMP	600.0	0.1mV DC	

Remark :

* Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.

3. FRONT PANEL DESCRIPTION

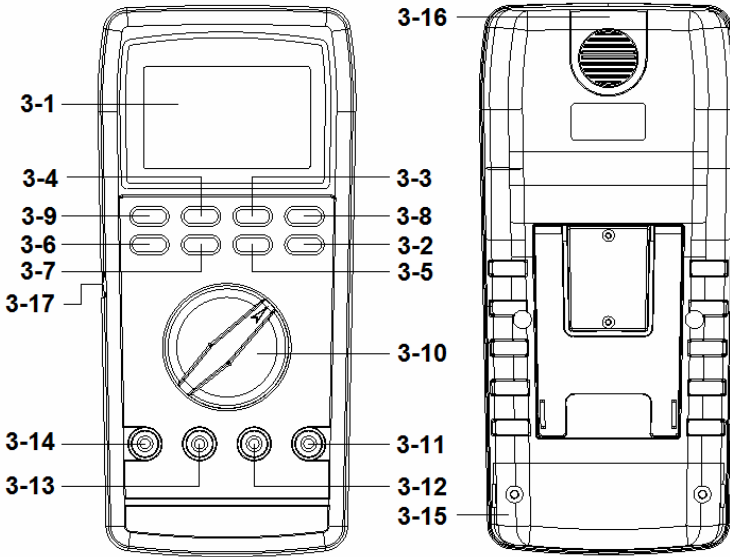


Fig. 1




- | | |
|---------------------------|---------------------------------------|
| 3-1 Display | 3-10 Function rotary switch |
| 3-2 MAX/MIN (▼) button | 3-11 Temp./ohm/V/Cap. input terminal |
| 3-3 TIME (SET) button | 3-12 COM input terminal |
| 3-4 REL(Backlight) button | 3-13 DWELL / TACH input terminal |
| 3-5 HOLD (▲) button | 3-14 10A input terminal |
| 3-6 RANGE button | 3-15 Battery compartment/Cover |
| 3-7 VAHz button | 3-16 RS232 terminal |
| 3-8 ENTER button | 3-17 DC 9V Power Adapter Input Socket |
| 3-9 AC/DC button | |

4. PRECAUTIONS & PREPARATIONS FOR MEASUREMENT

- 1) Ensure that the DC 9 V (006P, MIN1604) batteries are connected with the right polarity and placed in the battery compartment correctly.
- 2) Place the Red & Black Test Leads into the proper input terminal before making measurement.
- 3) Remove either of the test leads from the circuit when changing the measurement range.
- 4) Except operate the " Data Hold " function, it should cancel the " Data Hold " function, otherwise the display reading will freeze permanently.
- 5) Do not exceed the maximum rated voltage and current to the input terminal.
- 6) Always switching the " Function Rotary Switch " to the " Off " position when the instrument is not operation.
- 7) Remove the battery if the instrument is not to be used in a long period of time.
- 8) For safety consideration, when change the new test leads, it should use the replace test leads that already approval of " CATIII-1000 V " at least.
- 9) Power On/Off management :
 - a. When not use the meter, should rotate the " Function rotary switch " (3-10, Fig. 1) to the " OFF " position.
 - b. During the measurement, after 10 minutes the meter will auto power off. If intend to power on again, it should rotate the " Function switch " to " OFF " position then set to the new desiring function position.
 - c. ***Disabling auto power off (not auto power off)***
Press the " TIME button " (3-2, Fig. 1) into the setting mode,the Poff set " no " auto power off function can be lifted.

5. MEASURING PROCEDURE

5-1 Symbols & units of display

Symbols Units	Descriptions
AUTO	Appears when selecting " Automatic range " mode.
MANU	Appears when selecting " Manual range " mode.
DC	Appears when selecting DC mode. (DC voltage or DC current)
AC	Appears when selecting AC mode. (AC voltage or AC current)
HOLD	Appears when the " Data hold " function is operated.
REL	Appears when the " Relative " function is operated.
Max Min	Appears when " Max and Min. value record " function is operated.
	Battery voltage is already under the low condition.
((●))	Appears when the " Continuity beeper " is operated.
mV, V	Units for " voltage " measurements.
Ω,KΩ,MΩ	Units for " resistance " measurements.
A	Units for " Current " measurement.
uH,mH,H	Units for " Inductance " measurement.
pF,nF,uF,	Units for " Capacitance " measurement.
Hz,KHz,MHz	Units for " Frequency " measurement.
	Appears when the " Diode " function is operated.
-	Appears when measuring a DCV or DCA value is negative.
°C °F	Units for " Temperature " measurement.
----	Over range indicator
RPM	Units for " TACH " measurements.
	Appears when selecting " DWELL " mode.
P	%(duty cycle),indicate how high a duty cycle.
Degree	Units for " DWELL " measurement.

5-2 DC Voltage, AC voltage true rms Measurement

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) Connect RED test lead into " V " terminal (3-11, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " V " position.
- 4) Push the " AC/DC button " (3-9, Fig. 1) to select the " ACV " or " DCV " measurement,
- 5) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 6) Under the operation of " auto range " mode, push the " Range button " (3-6 Fig. 1) once will execute the " Manual Range " mode and hold the range, the LCD will show the " MANU " marker.
Under the manual range operation, push the " Range button " (3-6 Fig. 1) > 2 seconds, will return to auto range operation.

Remark :

During the measurement, if push the " VAHz button " (3-7 Fig. 1) once, until the LCD show the " Hz " marker and the display will show the frequency value of the measurement signal.

5-3 Resistance Measurement

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) Connect RED test lead into " Ω " terminal (3-11, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " Ω " position.
- 4) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.

- 5) Under the operation of " auto range " mode, push the " Range button " (3-6 Fig. 1) will execute the " Manual Range " mode and hold the range, the LCD will show the " MANU " marker.

Under the manual range operation, push the " Range button " (3-6 Fig. 1) > 2 seconds, will return to auto range operation.

5-4 DC Current, AC Current ture rms Measurement

A : 10A range, 6A range.

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) For the " 10 A " current measurement, connect RED test lead into " A " terminal (3-14, Fig. 1).

Open the circuit in which current is to be measured. Now securely connect test leads in series with the load in which the current is be measured.

- 3) For the " 10 A " measurement (6A,10A), select the " Function rotary switch " (3-10, Fig. 1) to " A " position.
- 4) Push the " AC/DC button " (3-9, Fig. 1) to select the " ACA " or " DCA " measurement,
- 5) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.

- 6) Under the operation of " auto range " mode, push the " Range button " (3-6 Fig. 1) once will execute the " Manual Range " mode and hold the range, the LCD will show the " MANU " marker.
Under the manual range operation, push the " Range button " (3-6 Fig. 1) > 2 seconds, will return to auto range operation.

Remark :

During the measurement, if push the " V/A/Hz button " (3-7 Fig. 1) once, until the LCD show the " Hz " marker and the display will show the frequency value of the measuement signal.

5-5 Continuity Check

- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into " Ω " terminal.
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " $\cdot||$ " position.
- 4) The LCD display will show the " (\bullet) " marker.
- 5) when the resistance value is less than 20 ohm, the beeper sound will be generated.

5-6 Diode Test

- 1) Connect BLACK test lead into " COM " terminal.
- 2) Connect RED test lead into " V " terminal.
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " $\rightarrow|$ " position.
The LCD display will show the " $\rightarrow|$ " marker.
- 4) a. When connected with polarity as shown in Fig. 2, a forward current flow is established and the approx. Diode Forward Voltage (VF) value in volt will appears on the display reading. If the diode under test is defective, " 0.000 " or near " 0.000 " value (short circuit) " - - - - " (open circuit) will be displayed.

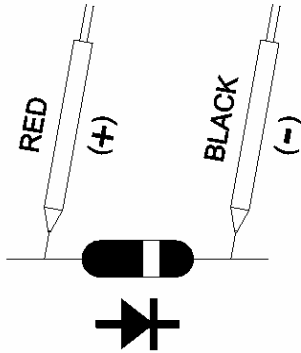


Fig. 2

- b. When connected as shown in Fig. 3, a reverse check on the diode is made. If the diode under test is good, "----" will be displayed. If the diode under test is defective, "0.000" or other numbers will be displayed. Proper diode testing should include both steps a. and b. above.

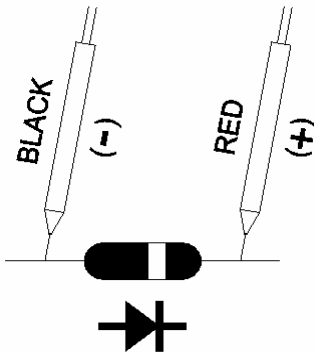


Fig.3

5-7 Capacitance Measurement

- 1) Select the " Function rotary switch " (3-10, Fig. 1) to the " + " position.
- 2) Connect the tested capacitor to " Input terminals " directly.

- * *If the measured capacity existing the polarity, then should connect the " + " polarity of the measured capacitor to the " + " terminal (3-11, Fig. 1), connect the " - " polarity of the measured capacitor to the " COM " terminal (3-12, Fig. 1),*
- * *Full discharge the measured capacitor before the make the measurement.*

- 3) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 4) Capacitance measurement mode, no manual functions, " Range button " (3-6 Fig. 1) is invalid.

5-8 Inductance Measurement

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) Connect RED test lead into " L " terminal (3-11, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " L " position.
- 4) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 5) Inductance measurement mode, no manual functions, " Range button " (3-6 Fig. 1) is invalid.

5-9 L/C Calibration

In order to improve the accuracy of a high / low impedance, Recommend doing open / short calibration Before measurement.

Open / short calibration procedure:

- 1) **Simultaneously push " AC / DC " and " REL " button more** to start open / short calibration, The display will show "OPEN", than 2 seconds, then push "enter" key once, LCD will display 30, and the countdown to zero,
- 2) The display will show " Short ", set the input of a short circuit, then push the "enter" key once, LCD will display 30, and the countdown to zero, then the calibration data is saved to the EEPROM, complete the calibration.

5-10 Frequency Measurement

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) Connect RED test lead into " Hz " terminal (3-11, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " Hz " position, LCD will show the " Hz " marker.
- 4) When LCD show the " AUTO " marker, the meter is under the " auto range " mode. Meter will select the suitable measurement range automatically.
- 5) Under the operation of " auto range " mode, push the " Range button " (3-6 Fig. 1) once will execute the " Manual Range " mode and hold the range, the LCD will show the " MANU " marker.
Under the manual range operation, push the " Range button " (3-6 Fig. 1) > 2 seconds, will return to auto range operation.

5-11 Temperature Measurement

- 1) Plug in the optional " Type K Temperature probe, TP-11 " into the input terminals, " TEMP input terminal " (3-11, Fig. 1) and the " COM input terminal " (3-12, Fig. 1)
- 2) Select the " Function rotary switch " (3-10, Fig. 1) to the " TEMP " position.
- 3) Temperature measurement mode, no manual functions, " Range button " (3-6 Fig. 1) is invalid.

5-12 Tach. Measurement

- 1) Tach. Measurement is with INDUCTIVE PICKUP SENSOR, IP-07 or IP-08 (Optional).
- 2) Connect above INDUCTIVE PICKUP sensor black test into " COM " terminal (3-12, Fig. 1). and RED test lead into " TACH " terminal (3-13, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " TACH. " position.
- 4) Connect the TACH. INDUCTIVE PICK UP SENSOR to the high tension wire of No. 1 SPARK PLUG (or No. 2, No. 3... SPARK PLUG), ref. Fig. 4, then the display will show RPM reading .

NOTE:

- a. *RPM (TACH) used the "Secondary Tech" measuring method, no matter what cylinder is*
- b. *If the display reading is unstable, it may be caused by environment interference. Please readjust the position of RPM INDUCTIVE PICK UP SENSOR or changed the direction of INDUCTIVE CLAMPS.*

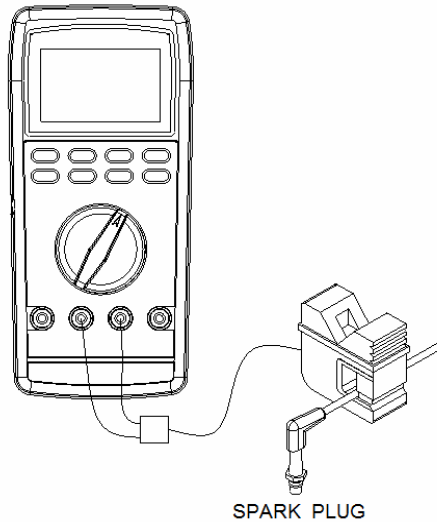


Fig. 4

5-13 "DWELL ANGLE" Measurement

- 1) Select the " Function rotary Switch " (3-10, Fig.1) to the " DWELL " position.
 - 2) Determine the % (duty cycle), 3 cyl, 4cyl, 5 cyl, 6 cyl .
by push the " Range Button " (3-6, Fig.1).
 - 2) Connect black test lead into " COM " terminal (3-12, Fig. 1)
and red test lead into "DWELL" terminal (3-13, Fig. 1).
 - 3) Connect red test probe into " BREAKER POINTS " or
" — " terminal of IGNITION COIL.
Connect black test probe into " GROUND " or " — "
terminal of battery.
- * The wire connection diagram please ref.(Fig. 5)
- 4) Crank engine, the display will show the DWELL ANGLE
of points.

NOTE:

*Only traditional ignition system car that built in
BREAKER POINTS needs to test DWELL ANGLE.
If the car in ELECTRONIC IGNITION SYSTEM need not.*

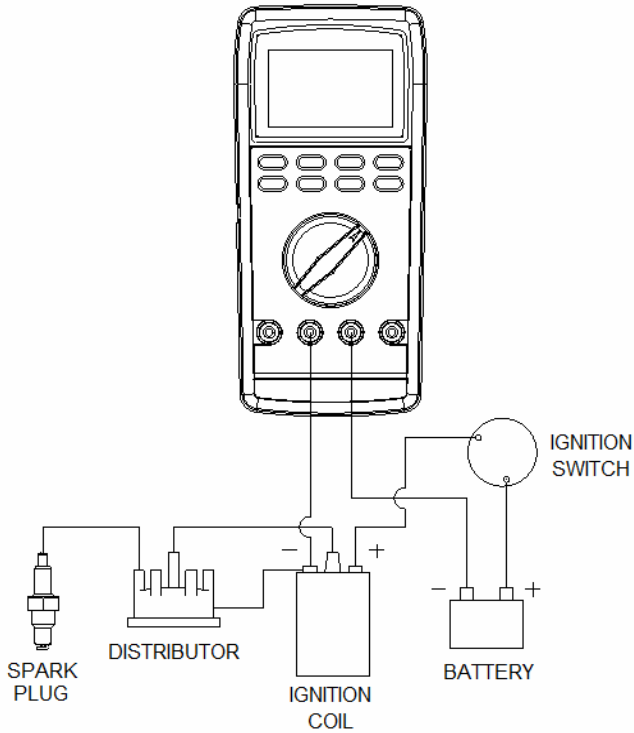


Fig. 5

5-14 Point check

- 1) Connect BLACK test lead into " COM " terminal (3-12, Fig. 1).
- 2) Connect RED test lead into " V " terminal (3-11, Fig. 1).
- 3) Select the " Function rotary switch " (3-10, Fig. 1) to the " POINT " position.
- 4)
 - a. Disconnect " HIGH TENSION WIRE " from distribution cap & ground " HIGH TENSION WIRE " by laying or taping lug to bare metal surface.
 - b. Connect RED TEST PROBE to " — " terminal of ignition coil (or points)The display will show the point condition " **good** " or " **CHg** " and the volatgethat apply to the point.
 - c. Turn ignition switch to ON for a while . Display values should indicate in LOW voltage (should under 1V).if not, bump engine until it reach.
 - d. * If the above (c.) point voltage display showed lower than 0.2V, then the contact resistance of " Break points " is normal, at the same time display will show " good ".
* Though the above (c.) point voltage already under the 1V but larger than 0.2V , then the contact resistance of " Break points " is not good and need to change, at same time dsplay will show " CHg " (chang).

5-15 Optional Adapter

- A. 2000A (2000A DC/AC CURRENT PROBE):
This range is exactly same as " DC 2V " range but without decimal point. It can match the 400 A or 2,000 A range of optional " DC/AC CURRENT PROBE " (such as CA-502, CA-203), then can get current values on the display directly.

B. IR TEMP

This range is exactly same as " DC 200 mV " range. it can match the external adapter (if this adapter is built-in DC 200 mV output), then can get current values on the display directly.

5-16 Relative Measurement

- 1) During the measurement of ACV, ACA, DCV, DCA, ohm, Capacitance, Inductance, Frequency and Temperature, the circuit will memorize the last measured values if push the " REL. button " (3-4, Fig. 1) at once, then LCD will show zero value & a " REL " indicator.
- 2) The input measured values will deduct last measured values automatically, then show those new value on the display.
- 3) It will cancel the Relative Measurement function if push the REL. button at once again, at same time the " REL ." marker will disappear.

5-17 Data Hold Operation

- 1) During the measurement, pushing the " Hold button " (3-5, Fig. 1) once a while will freeze the measured value & the LCD will indicate " HOLD " symbol.
- 2) Push the " Hold Button " again to cancel the data hold function.

5-18 LCD Backlight ON/OFF

During the measurement, press the " REL Button " (3-2, Fig. 1) > 2 seconds will turn ON the " LCD Backlight " .
Press the " REL Button " once again > 2 will turn OFF the " LCD Backlight " .

5-19 Max and Min. value record

- 1) Application : To record the maximum and the minimum reading value during the measurement.
- 2) Push the " MAX/MIN button " (3-2, Fig. 1) at once , the display will show the " REC " markers
Start recording meter the " Max. " and " Min. " value.
- 3) Push the " MAX/MIN button " (3-2, Fig. 1) once again the display will show the " MAX " maker along with the maximum measured value.
Push the " MAX/MIN button " (3-2, Fig. 1) once again the display will show the " Min " maker along with the minimum measured value.
- 4) If intend to cancel the " Max/Min Record function" just push the " MAX/MIN button " (3-2, Fig. 1) > 2 seconds the " REC " marker will disappear.

5-20 RS232 computer interface

- 1) Connect the optional RS232 cable (UPCB-06) of RS232 terminal (3-16, Fig. 1)
- 2) The meter will be the serial data via " RS232 Terminal " is transferred to the computer.

The data output is a 16 digit stream which can be utilized for user's specific application.

The 16 digits data stream will be displayed in the following format :

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
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Each digit indicates the following status :

D15	Start Word (0X02)	
D14	4	
D13	When send the upper display data = 1	
D12, D11	Annunciator for Display	
	DC mV = 18 AC mV = 49 uH = 68	
	DC V = 34 AC V = 50 mH = 41	
	DC uA = 35 AC uA = 51 H = 42	
	DC mA = 37 AC mA = 53 Hz = 31	
	DC A = 36 AC A = 52 KHz = 33	
	Ω = 38 pF = A4 MHz = 67	
	K Ω = 39 uF = 44 °C = 01	
	M Ω = 40 nF = 43 °F = 02	
	DIODE = 46 RPM = 27 Dwegll = 32	
D10	Polarity 0 = Positive 1 = Negative	
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP	
D8 to D1	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234	
D0	End Word (0x0D)	

RS232 FORMAT : 9600, N, 8, 1

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

6. ADVANCED SETTING

Under do not execute the Datalogger function, press the " SET Button " (3-3, Fig. 1) continuously at least two seconds will enter the " Advanced Setting " mode. then press the " SET Button " (3-3, Fig. 1) once a while in sequence to select the six main function, the display will show :

PoFF..... SET Auto power OFF management
bEEP..... Set beeper sound ON/OFF
dAtE..... Set clock time (Year/Month/Date, Hour/Minute/
Second)
t-CF.....Set Temperature unit °C or °F

Remark :

In the implementation of the "Advanced Settings" function, If within 10 seconds without work, will exit " Advanced Settings " function, the LCD will return Normal screen.

6-1 Set Auto power OFF management

When the display show " PoFF "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-2, Fig. 1) to select the upper text to " YES " or " no ".

YES - Auto Power Off management will enable.
no - Auto Power Off management will disable.

- 2) After select the upper text to " YES " or " no ", press the " Enter Button " (3-8, Fig. 1) will save the setting function with default.

6-2 Set beeper sound ON/OFF

When the display show " bEEP "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-2, Fig. 1) to select the upper text to " YES " or " no ".

YES - Meter's beep sound will be ON with default.

no - Meter's beep sound will be OFF with default.

- 2) After select the upper text to " YES " or " no ", press the " Enter Button " (3-8, Fig. 1) will save the setting function with default.

6-3 Set clock time (Year/Month/Date,Hour/Minute/ Second)

When the upper display show " dAtE "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-2, Fig. 1) to adjust the value (Setting start from Year value). After the desired value is set, press the " Enter Button " (3-8, Fig. 1) once will going to next value adjustment (for example, first setting value is Year then next to adjust Month, Date, Hour, Minute, Second value).

Remark :

The adjusted value will be flashed.

- 2) After set all the time value (Year, Month, Date, Hour, Minute, Second), press the " SET Button " (3-3, Fig. 1) once will save the time value, then the screen will jump to " Temp. °C, °F unit " setting screen .

Remark :

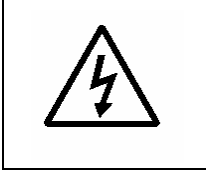
After the time value is setting, the internal clock will run precisely even Power off if the battery is under normal condition (No low battery power).

6-4 Set Change the Temp. °C, °F unit

- a. Use " ▲ button " (3-5, Fig. 1) to select " °C " or " °F ".
- b. After select the desiring text (°C or °F), press the " Enter button " (3-8, Fig. 1) to save the data with default.

7. MAINTENANCE

7-1 Battery replacement



Caution *Remove test leads before opening the battery cover !*

- 1) When the LCD display showing the mark of "~~OL~~", it is necessary to replace the battery, However in-spec. measurement may still be made for several hours after "Low battery indicator" appears before the instrument become inaccurate.
- 2) Open the screw of " Battery Cover " (3-15, Fig. 1) by loosening the screws, then move the battery.
- 3) Replace with 9 V batteries (006P, MIN1604) and reinstate the cover.

7-2 Cleaning



Caution : *Cleaning - Only use the dry cloth to clean the plastic case !*

7-3 Replacement of Fuse



Caution : *When make the replacement, should change the right spec fuse.*

Fuse

Rating : 10 A, Size : 5.2 mm dia. x 20 mm

To be protected the circuit from overload current at " 10 A " range.

- 2) When the μA , mA current range can not operation, please check if the Fuse A is broken or not:
When the 10 A current range can not operation, please check if the Fuse B is broken or not:
- 3) When replace the fuse should take the test leads from the measuring circuit and power off the meter.
- 4) Take the screws away from the down case, loose the housing case, the fuses are install on the fuse socket on the PCB.
- 5) For safety consideration, when replace the fuse according the spec. (should use the approval fuse) and reinstall the cover.
- 6) Make sure the housing case is secured with the screw after replace the fuse.

8. OPTIONAL ACCESSORIES & ADAPTERS

RS232 cable UPCB-06	* Computer interface cable. * Used to connect the meter to the computer (COM port).
USB cable USB-11	* Computer interface cable. * Used to connect the meter to the computer (USB port).

<i>Item</i>	<i>Model</i>
<i>Carrying Case</i>	<i>CA-05A</i>
<i>Light Adapter</i>	<i>LX-02</i>
<i>EMF Adapter</i>	<i>EMF-824</i>
<i>Pressure Adapter</i>	<i>PS-403</i>
<i>Anemometer Adapter</i>	<i>AM-402</i>
<i>Tachometer Adapter</i>	<i>TA-601</i>
<i>Sound Adapter</i>	<i>SL-406</i>
<i>High Voltage Probe</i>	<i>HV-40</i>
<i>1000A CURRENT Adapter</i>	<i>CA-502</i>
<i>2000A CURRENT Adapter</i>	<i>CA-203</i>
<i>Temperature Probe (TYPE K)</i>	<i>TP-11</i>

**9. THE ADDRESS OF AFTER SERVICE
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