Precautions

- Always refer to instructions before use.
- When using the multimeter please observe al normal safety precautions concerning protection against the dangers of electrical current.
- Do not used the test leads if they are damaged or the insulation or wires are bared in any way.
- Take care when working with voltages above 35V DC or 25V AC rms; these voltages are regarded as a shock hazard.
- Before rotating the Function / Range rotary switch (F) to another function, disconnect the test leads from the circuit under test.
- Do not use the multimeter in a potentially explosive atmosphere or where flammable gases or material are present.
- Do not perform resistance, diode or continuity tests on live circuits. Always discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
- Never apply voltage or current to the multimeter that the exceeds the specified maximum as shown in the tables above.
- Always refit the test probe covers when finished with meter.
- Observe standard workshop safety procedures when using the tester.
- Do not let the tester get wet or use in damp or wet conditions.

Safety First. Be Protected.

Our products are designed to be used correctly and with care for the purpose for which they are intended. No liability is accepted by the Tool Connection for incorrect use of any of our products, and the Tool Connection cannot be held responsible for any damage to personnel, property or equipment when using the tools. Incorrect use will also invalidate the warranty.

If applicable, the applications database and any instructional information provided has been designed to offer general guidance for a particular tool's use and while all attention is given to the accuracy of the data no project should be attempted without referring first to the manufacturer's technical documentation (workshop or instruction manual) or the use of a recognised authority such as Autodata.

It is our policy to continually improve our products and thus we reserve the right to alter specifications and components without prior notice. It is the responsibility of the user to ensure the suitability of the tools and information prior to their use.

RoHS Compliant

Manufacturer: The Tool Connection Ltd
EU Authorised Representative:
Comply Express Unipessoal Limitada, StartUp Madeira, EV141, Campus da Penteada, 9020 105 Funchal, Portugal

Guarantee

If this product fails through faulty materials or workmanship, contact our service department direct on: +44 (0) 1926 818186. Normal wear and tear are excluded as are consumable items and abuse.

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www.lasertools.co.uk

Part No. 5990

LASER®

Automotive Multimeter

Instructions

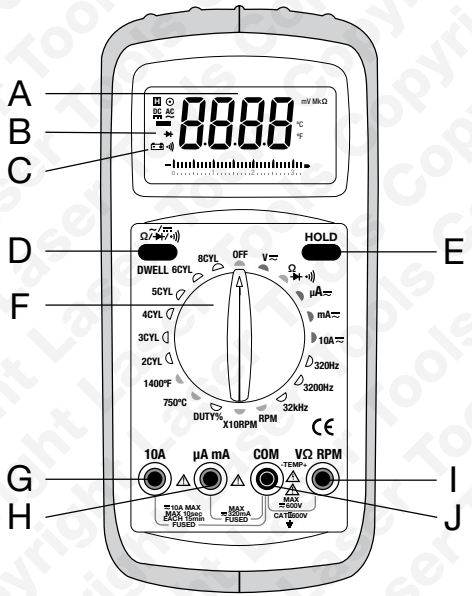
RoHS Compliant

www.lasertools.co.uk

Automotive Multimeter

The new 5990 multimeter features large LCD display with large digital readout. Measures DC voltage and current, AC voltage and current, resistance and frequency. For automotive testing it measures duty cycle, engine RPM (tachometer), dwell angle, diode and continuity. Also features temperature measurement capability, data hold and auto power off function. Shock-resisting soft grip case with probe storage and integral stand, suitable for tough workshop conditions.

Controls



Code	Description
A	Digital display
B	Symbols / legends
C	Low battery alert symbol
D	Function / selection button
E	Data hold button
F	Function / Range switch
G	10A socket (red lead)
H	Milliamps socket (red lead)
I	Multifunction socket (red lead)
J	Common socket (black lead)

Instructions

Testing AC / DC Voltage:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the V≈ position, press the function/ selection button (**D**) to select DC or AC (DC or AC symbol will be displayed).
3. DC: Touch the black test probe tip to the negative side of the circuit. Modern cars have negative earth (ground) electrical systems although some classic cars may still be operating with a positive earth system.
4. Touch the red test probe tip to the positive side of the circuit and read the voltage on the display. If the polarity is reversed, the display will show a (**-**) minus before the value.
5. Do not measure DC voltages if a motor or component on the circuit is being switched on and off; large voltage surges can occur that may damage the multimeter.

(**AC Testing Caution**: Risk of electric shock. The probe tips may not be long enough to contact live parts with a 240V outlet because the contacts are recessed deep in the outlets. **Make sure the probe tips are touching the metal** contacts before assuming that no voltage is present).

Tacho (rev counter):

Range	Scope (RPM)	Resolution	Accuracy
RPM	0~3260	1 RPM	+/- (2.5% + 5)
10 X RPM	10 X (0~3260)	10 RPM	

Dwell Angle (manual range):

Range	Scope (degrees)	Resolution	Accuracy
2 cylinder	0~180	0.1°	+/- (2.5% + 5)
3 cylinder	0~120		
4 cylinder	0~90		
5 cylinder	0~72		
6 cylinder	0~60		
8 cylinder	0~45		

Duty Cycle:

Range	Scope (%)	Resolution	Accuracy
Duty	1~99	0.1	+/- (2.5% + 5)

Input voltage: 3Vp-p ~ 10Vp-p

Frequency range: 10Hz ~ 10kHz

Temperature:

Range	Resolution	Accuracy
750°C	1°	-20~0°C (-4~32°F): +/- (6% + 5) 0~400°C (32~752°F): +/- (1.5% + 5)
1400°F	1°	401~750°C (752~1382°F): +/- (1.8% + 5)

See note (above) on range of thermocouple supplied. Accuracy does not include error of thermocouple probe.

Accuracy specification assumes ambient temperature is stable to +/- 1°C. For ambient temperature changes of +/- 5°C, rated accuracy applies I hour after the temperature change.

Replacing the battery

If the 'low battery alert' symbol (**C**) appears on the digital display it indicates that the battery should be replaced. To access the battery first peel back and remove the shock-resisting cover. Then remove three screws to release the rear case cover. The 9V battery can then be replaced.

AC Voltage (autorange):

Range	Resolution	Accuracy
3.26V	1mV	+/- (0.8% + 5) (40~200Hz)
32.6V	10mV	+/- (1.2% + 7) (200~400Hz)
250V	0.1V	+/- (1.0% + 5) (40~200Hz) +/- (1.5% + 7) (200~400Hz)

Input impedance: 10MΩ
Frequency: 40Hz to 400Hz
Overload protection: 250V DC/AC

DC Current: (µA and mA are autorange):

Range	Resolution	Accuracy
326µA	0.1µA	+/- (0.4% + 10)
3260µA	1µA	
32.6mA	10µA	+/- (1.2% + 5)
326mA	0.1mA	
10A	10mA	+/- (2.0% + 5)

Overload protection:
10A range: Fuse, 10A/250V, fast action (for inputs >2A: measurement duration <10 seconds per 15 minute interval).
Other ranges: Fuse, 500mA/250V fast action.

AC Current: (µA and mA are autorange):

Range	Resolution	Accuracy
326µA	0.1µA	+/- (5% + 10) (40~400Hz)
3260µA	1µA	
32.6mA	10µA	+/- (1.5% + 5) (40~200Hz)
326mA	0.1mA	+/- (1.8% + 7) (200~400Hz)
10A	10mA	+/- (3.0% + 7)

Overload protection:
10A range: Fuse, 10A/250V, fast action (for inputs >2A: measurement duration <10 seconds per 15 minute interval).
Other ranges: Fuse, 500mA/250V fast action.
Frequency: 40Hz to 400Hz

Resistance (autorange):

Range	Resolution	Accuracy
326Ω	0.1Ω	+/- (1.0% + 8)
3.26kΩ	1Ω	+/- (1.0% + 5)
32.6kΩ	10Ω	
326kΩ	0.1kΩ	
3.26MΩ	1kΩ	
32.6MΩ	10kΩ	+/- (3.0% + 7)

Frequency (manual range):

Range	Resolution	Accuracy
320Hz	0.1Hz	+/- (2.5% + 5)
3200Hz	1Hz	
32kHz	0.01kHz	

Testing DC / AC Current:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into µAmA Milliamps socket (**H**). If the current to be measured is between 326mA and 10A, connect the red test lead to the 10A socket (**G**) instead.
2. Set the Function / Range rotary switch (**F**) to the µA≈, mA≈, or 10A≈ position, press the function/ selection button (**D**) to select DC or AC (DC or AC symbol will be displayed).
3. Remove power from the circuit under test, then open up the circuit at the point where you intend to measure current.
4. Connect test leads in series with the circuit.
5. Apply power to the circuit and read the display.

(**Caution**: Risk of electric shock. **Do not** measure AC current on any circuit where voltage exceeds 250V AC. Do not make current measurements on the 10A scale for longer than 10 seconds in 15 minute intervals.

If the magnitude of the current to be measured is unknown, select the highest range and then reduce it range by range, until a satisfactory resolution is obtained).

Testing Resistance:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the Ω position. The polarity of the red test lead is positive. The display shows OL.
3. Touch the test probes across the circuit or component under test. Components should be disconnected from their circuit so that the circuit does not interfere with the resistance reading.

(**Caution**: Risk of electric shock. Disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements, If applicable, remove any batteries).

Testing a Diode:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the Ω position, press the function/ selection button (**D**) to display the diode symbol ⊣◁. The polarity of the red test lead is positive.
3. Connect the test leads across the diode - red lead to the positive pole (anode) of the diode, black to the negative pole (cathode).
4. Read the forward voltage on the display. The multimeter will show the forward voltage drop between the two test leads. If the diode is reversed, the display shows OL. If both readings display OL, the device has gone open circuit.

(**Caution**: Risk of electric shock. Do not test a diode that has voltage on it).

Audible Continuity:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the Ω position, press the function/ selection button (**D**) to display the ⏭ symbol. The polarity of the red test lead is positive.
3. Touch the test probes to the wire or circuit you wish to check. If the wire or circuit has continuity, the audible signal will sound. If there is no continuity (open circuit) the display will show OL.

(**Caution**: Risk of electric shock. Never measure continuity on circuits or wires that have voltage on them).

Frequency Measurement:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to 320Hz, 3200Hz, or 32kHz as applicable.
3. Connect the test leads and read the frequency value displayed.

Measuring Temperature:

Note: Although the multimeter is rated for -20ºC to 750 ºC and -4ºF to 1382ºF, the K type thermocouple supplied with the multimeter is only rated to 250ºC. To measure temperatures outwith that range, a higher rated professional thermocouple is required.

1. Set the Function / Range rotary switch (**F**) to 1400ºF or 750ºC. The F or C symbols will be displayed and the display will show the ambient temperature.
2. Connect the black plug of the K type thermocouple to the into COM socket (**J**) and red plug into VΩ RPM (Multifunction) socket (**I**).
3. Touch the thermocouple probe to the object to be measured and read off the temperature.

(Caution: Risk of electric shock. Ensure that the thermocouple has been removed before changing to another function / measurement).

Dwell Angle Measurement:

On conventional contact breaker type ignition systems, the dwell angle is the number of degrees (º) through which the distributor cam rotates while the breaker points are closed.

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the to the desired DWELL range according to the number of cylinders on the engine to be measured.
3. Connect the black test lead to car battery negative (ground) or chassis, and the red test lead to the distributor side terminal of the ignition coil.
4. When the engine is started the dwell angle will be displayed.

Note: To reduce the dwell angle reading the points gap must be increased; to increase the dwell angle the points gap must be reduced. Refer to the owner's handbook, workshop manual or other manufacturer's documentation for detailed procedures for dwell settings and adjustments.

Duty Cycle:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to the DUTY position.
3. Connect the negative (black) test probe tip to earth (ground).
4. Connect the positive (red) test probe tip to the signal wire circuit (for example, a fuel injector or fuel mixture control solenoid).

RPM (Tachometer) Measurements:

1. Remove covers from test probe tips, insert black test lead into COM socket (**J**) and red test lead into VΩ RPM (Multifunction) socket (**I**).
2. Set the Function / Range rotary switch (**F**) to either the RPM or x10RPM position.
3. Connect the black test lead to car battery negative (ground) or chassis, and the red test lead to the distributor side terminal of the ignition coil.
4. Start the engine. Divide the displayed reading by the number of cylinders of the engine. On x10RPM position, also multiply the displayed reading x 10 to get the actual RPM.

General Specifications:

Polarity:	Auto polarity indication.
Over range indication:	OL on digital display.
Auto zeroing function	
Sampling rate:	3 times per second (approximately).
Operating temperature:	0º - 40ºC
Storage temperature:	-10º - 50ºC
Battery:	single 9V.
Low battery indication:	(Refer to diagram: symbol C on display).

Auto power-off: Automatically turns off if no control is operated for 10 minutes. Beeps to warn of auto power-off. Press hold button (**E**) to reactivate.

DC Voltage (autorange):

Range	Resolution	Accuracy
326mV	0.1mV	+/- (0.5% + 5)
3.26V	1mV	+/- (0.8% + 5)
32.6V	10mV	+/- (0.8% + 5)
250V	0.1V	+/- (0.8% + 5)

Input impedance:	10MΩ (for 326mV range: >100MΩ
Overload protection:	250V DC/AC