

Defective instruments should be returned carriage paid to the Multimeter Service Dept. Sinclair Radionics Ltd. Careful packing is essential - retain the original packing material. If the guarantee has expired or if the fault is the result of misuse, the repair will be carried out and charged unless other instructions are received.

Customers outside the UK should contact the dealer from whom the meter was purchased to ascertain service arrangements for that country.

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# SINCLAIR

## PDM 35

### Digital Multimeter

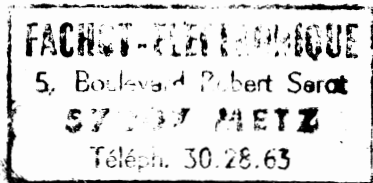
### OWNER'S MANUAL

The Sinclair PDM35 is a very compact portable digital multimeter which combines high performance with ease of operation.

High accuracy, high resolution and high impedance are combined with the precision of a digital readout.

The instrument will measure AC  $\sim$  and DC  $\text{---}$  voltage, DC  $\text{---}$  current and resistance on an LED display reading up to  $\pm$  1999. Operation is via a standard 9 volt battery and a socket is provided for the connection of a Sinclair AC adaptor when required.

Part No 58121 - 060



## SPECIFICATIONS

	<i>Typical Accuracy (of reading) (19°C - 23°C)</i>		<i>Input Impedance</i>		<i>Resolution</i>	<i>Max. Permissible Overload</i>
<b>DC volts</b>	<i>Range</i>		<i>10M Ω</i>	<i>1mV</i>	<i>240V</i>	
	1V	1.0% ± 1 count	<i>10M Ω</i>	<i>10mV</i>	<i>1000V</i>	
	10V	1.0% ± 1 count	<i>10M Ω</i>	<i>100mV</i>	<i>1000V</i>	
	100V	1.0% ± 1 count	<i>10M Ω</i>	<i>1V</i>	<i>1000V</i>	
	1000V	1.0% ± 1 count				
<b>AC volts</b>	1000V	1.0% ± 2 counts	<i>Frequency Range</i>	<i>1V</i>	<i>500V</i>	
<b>DC current</b>	0.1μA	1.0% ± 1nA	<i>40Hz - 5KHz</i>	<i>0.1nA</i>	<i>240V</i>	
	1μA	1.0% ± 1 count		<i>1nA</i>	<i>240V</i>	
	10μA	1.0% ± 1 count		<i>10nA</i>	<i>240V</i>	
	100μA	1.0% ± 1 count		<i>100nA</i>	<i>120V</i>	
	1mA	1.0% ± 1 count		<i>1μA</i>	<i>30mA</i>	
	100mA	1.0% ± 1 count		<i>100μA</i>	<i>500mA</i>	
<b>Resistance</b>	1K Ω	1.5% ± 1 count	<i>Measuring Current</i>	<i>1 Ω</i>	<i>15V</i>	
	10K Ω	1.5% ± 1 count		<i>100μA</i>	<i>120V</i>	
	100K Ω	1.5% ± 1 count		<i>10μA</i>	<i>240V</i>	
	1M Ω	1.5% ± 1 count		<i>1μA</i>	<i>240V</i>	
	10M Ω	2.5% ± 1 count		<i>100nA</i>	<i>240V</i>	

## Power Consumption

9V, 35mA-battery

9V, 45mA-AC adaptor

## Size

6.2" × 3" × 1.25"

157mm × 76mm × 32mm

## Weight

5½ oz (excluding battery)

150 gms.

## Preparing for Operation

The instrument must be fitted with a 9-volt battery of the rectangular or PP3 type. A good quality battery should be used, and a high power or Alkaline version chosen where possible.

The battery is located beneath a snap-on cover at the back. Lift up the back of the cover with a finger nail and press in the direction of the arrow to remove it. Slide it on until it clicks home to replace.

Alternatively, the instrument may be powered from an AC adaptor of an approved type (see later note) by plugging it into the socket on the back.

AC Adaptor socket - connect approved adaptor to run from 117V, 220V or 240V power.

Function Switch - set to mA/V for current and voltage measurements, set to Ω for resistance measurement.

Range Switch - set to the desired range of voltage, current or resistance as written above or below the knob.

## MAKING MEASUREMENTS

### === DC voltage:

Four ranges are available each with an input impedance of  $10\text{ M}\Omega$ . On the  $X1$  range a small zero offset may occur from minute leakage currents. This will disappear when the leads are shorted together and will not affect the reading once a voltage is connected.

If a - sign appears in the display the voltage is negative with respect to the common lead.

CAUTION - do not apply more than 1000 volts.

### AC Voltage

AC voltage is only available on the  $X 1000\text{ V}$  range. The input impedance is  $450\text{K}\Omega$ .

The meter senses the mean value of an input and is calibrated to read the R.M.S. value of a sine wave. Any DC === on the input in addition to the AC  $\curvearrowright$  will affect the reading.

CAUTION - do not apply more than 500 volts R.M.S.

### === DC Current

6 ranges are available each with a voltage drop of  $1\text{mV}$  per count. All ranges are available via the  $\text{mA}-\Omega$  socket and the multiplier for each  $\mu\text{A}$  range is written in the grey blocks above the DCV ranges.

A leakage current of up to  $\pm 1\text{nA}$  may be present in the meter which would cause an error on the  $\times 0.1\text{nA}$  range. The offset must be added to or subtracted from the reading.

CAUTION - a current is measured by making it flow through the meter (by breaking the

circuit and re-connecting it via the test leads). Connecting the current function directly across a voltage source could result in permanent damage.

NOTE - AC current cannot be measured directly with this instrument.

### Resistance

5 ranges of resistance are available each generating a voltage across the unknown resistor of  $+1\text{mV}$  per count relative to the common lead. If the resistor is in place across a semiconductor junction, it may be necessary to reverse the leads to avoid forward biasing the junction.

CAUTION - All power must be removed from a circuit before trying to measure resistances.

### Testing of Semi-conductor Junctions

The instrument measures resistance by forcing a known constant current through the resistor and measuring the voltage developed. The resistance ranges can be used to measure the forward voltage drop of semi-conductor junctions, and to match VBEs of transistors etc.

The current used on each range is as given in the grey blocks at the top of the range information, and the reading on the display is the forward voltage drop in volts. The  $\text{mA}-\Omega$  socket is the positive terminal of the current source.

### Overload

With the exception of the  $\times 1000\text{V}$  DC === and AC  $\curvearrowright$  ranges, all ranges can be used up to

a displayed value  $\pm 1999$ . When this is exceeded the display will show = 000 or  $\equiv 000$ , and the next highest range should be selected.

Positive overload always gives flashing bars. A small negative overload will also give flashing bars (with negative symbol), but a larger one will give fixed bars.

Remember, when switched to resistance the display will show flashing overload until a resistor lower than the maximum reading of the range is connected. Should fixed bars appear on the resistance function, connecting a resistor will restore normal operation – this is not a fault condition.

To avoid damage:

- A. Never connect more than 1000 volts to the DCV  $\equiv$  socket, or more than 500 volts R.M.S. to the ACV  $\cup$  socket.
- B. Never connect a voltage source directly to the mA –  $\Omega$  socket.
- C. Never connect an input greater than the maximum permissible overload (see the specification).

### Selecting a Power Source

The meter operates from a standard 9-volt battery. If possible a high power or Alkaline type should be used – ask your dealer if in doubt.

To obtain long battery life the meter must be switched off whenever measurements are not being made.

The condition of the battery may be checked as follows: Select  $\times 10$ VDC  $\equiv$  and connect

the red test lead to the DCV socket. Remove the battery cover, switch the instrument on and touch the test lead onto the negative battery terminal. With a new battery the reading should be about – 3 volts; if it is close to zero or is positive the battery should be replaced.

**CAUTION** – Never leave a weak or dead battery in the instrument. Even 'leakproof' types can leak chemicals that may cause permanent damage to the instrument – this will void the guarantee.

When continuous operation is required the meter can be operated from AC power via an optional AC adaptor. Plugging this into the socket on the back automatically disconnects the internal battery and increases the display brightness.

For safety reasons only an approved adaptor may be used; use of any other will void the guarantee. In some countries the correct Sinclair adaptor may not be available in which case the dealer will supply an alternative approved unit.

### Safety Precaution

This instrument has been designed to the highest safety standards, but safe operation depends on the user so we recommend the following rules.

1. Never connect a voltage to the instrument which causes the common terminal to be raised more than 1000 volts DC or 700 volts AC RMS above earth ground.
2. Never use anything but an approved AC adaptor to power the instrument.

3. Use extreme caution when working with voltages above 100V. Always disconnect power from the circuit being tested whilst connecting or disconnecting test leads.
4. Never unplug a test lead from the instrument while it is still connected to a high voltage.
5. Use extreme caution when working with AC-DC sets with live or hot chassis.
6. Always ensure that a workbench is clean, dry and covered in non-conductive material.

### **Calibration**

The Sinclair PDM35 comes to you fully calibrated and tested. Under normal use no further adjustment should be necessary.

Re-calibration should only be undertaken by trained engineers with access to specialised equipment, and interference by unauthorised persons will void the guarantee.

Where owners wish to undertake re-calibration or service of the meter themselves, this should be done only in conjunction with the Service Manual which may be purchased either directly from Sinclair Radionics or their agents overseas.

### **Guarantee**

The Multimeter is guaranteed against defects arising in normal use for a period of one year from the date of purchase provided that the fault has not been caused by any type of misuse.

This guarantee is offered as an extra benefit and does not affect consumers' statutory rights.

Le manuel relevant de votre appareil de mesure numérique est rédigé en langue anglaise; la présente notice doit être utilisée en conjonction avec le manuel et fournit une traduction des données essentielles. Retirez donc la notice et la coller dans votre manuel afin de ne pas l'égarer.

### **Generalites**

L'appareil de mesure numérique assure une haute précision, résolution et impédance d'entrée au sein d'un coffret de paume et une lecture numérique précise. Vous serez à même de mesurer la tension CA (ACV), la tension CC (DCV) et la résistance (Resistance  $\Omega$ ) sur un affichage à diode à lueurs sur une gamme jusqu'à 1999 à polarité automatique et indication de surcharge.

Une pile standard de 9 volt est requise; utiliser sinon un adaptateur CA de 9 volt.

### **Specifications**

Les spécifications de l'appareil de mesure sont mentionnées en page 2. De gauche à droite elles mentionnent les fonctions, la gamme, la précision de lecture, la résolution, l'impédance d'entrée et la surcharge maximale admise.

### **Sources d'alimentation**

L'appareil de mesure fonctionne à partir d'une pile ou accu de 9 volt monté sous un couvercle à glissières au dos. Utiliser une pile ou un accu alcalin ou de forte puissance si possible et ne pas oublier de débrancher à moins de faire une mesure afin de conserver la longévité de la pile. Sinon, exploiter l'appareil à partir d'une source CA en utilisant un adaptateur homologué de 9 volt – se référer à votre concessionnaire. Vérifier l'état de la pile en choisissant x 10 DCV et en mettant le fil de test rouge en contact avec la borne négative de la pile. La lecture doit être d'environ -3V, si elle affiche presque zéro ou une lecture positive, installer une pile neuve. Ne jamais laisser une pile faible ou usée dans l'appareil, elle fuira et peut causer des avaries.

### **Utilisation de l'appareil de mesure**

L'appareil est branché en passant le commutateur au dos à la droite. Une fonction donnée ainsi qu'une gamme voulue est choisie par une combinaison des commutateurs à vernier de petite et de grande taille.

Le fil noir doit être relié à la prise COMMON et le fil rouge soit à la prise DCV, ACV ou mA-Ω selon les paramètres visés. (Voir page 4). La lecture présente une décimale fixe, de ce fait il y a lieu de multiplier l'affichage par le chiffre voisin du commutateur afin d'obtenir la lecture réelle voulue. Ainsi, pour la gamme x 10 DCV, un affichage de .987 produit  $0,987 \times 10 = 9,87$  Volt.

### La Surcharge

Vous êtes à même d'utiliser jusqu'à  $\pm 1999$  de la valeur affichée, exception faite de la gamme x 1000 DCV et la gamme ACV. Lorsque vous dépassez  $\pm 1999$ , l'affichage sera =000 ou ≡000 (utiliser la gamme plus élevée suivante si possible).

Afin d'éviter une avarie éventuelle:

- Ne jamais passer plus de 1000 volt CC à la prise DCV ni 500 volt eff. à la prise ACV.
- Ne jamais relier une source de tension à la prise mA-Ω.
- Ne jamais alimenter plus de la surcharge maximale à une entrée d'une gamme quelconque, selon les directives en page 2.

### Etalonnage

Cet appareil de mesure vous parvient parfaitement étalonné et ne devrait nécessiter aucune mise au point supplémentaire pour l'utilisation normale. L'entretien ou les interventions de service par un personnel non-authorized annule la garantie.

### Fonctions supplémentaires

Les gammes de résistance peuvent être utilisées pour la mesure des chutes de tension de semiconducteur dans le sens conducteur, le courant de mesure pour chaque gamme étant mentionné en page 2.

Quatre gammes de courant continu supplémentaires sont également disponibles en utilisant la prise mA-Ω et les gammes DCV. Multiplier la valeur de gamme par  $0,1 \mu A$  pour obtenir chaque gamme de courant. Ces gammes très faibles sont très utiles pour la mesure des fuites, transistor  $\beta$  etc.

