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CR:250 Series Sound Level Meter User Manual



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code and drawings are all:
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1. Overview.

This manual refers to the CR:250 series of Digital Impulse sound level meters. This range comprises the CR:252B and CR:251B

The CR:250 series are Digital Impulse Sound Level Meters. They meet the full requirements of the electrical requirements of the general purpose grade, IEC 651 (BS 5969) and has 'I' (Impulse), 'F' (Fast) and 'S' (Slow) responses. The CR:251B meets the requirement for Type 1 and the CR:252B the requirements for Type 2. In addition facilities are provided to hold the maximum reading occurring during the measurement period, or freeze the reading at any time.

2. Recommended Accessories.

A full range of accessories are available for the CR:250 series. The most commonly used of these include the following:

Item	Description
CR:513A	Acoustic Calibrator
UA:237	Windshield
CK:250	Attache Case
CP:22	Pouch

These accessories can be purchased at a later date. The attache case allows the sound level meter, acoustic calibrator, windshield and miscellaneous accessories to be transported safely. Please refer to the current Cirrus Research plc price list for full details of accessories available for the CR:250 series.

3. First time use.

The CR:252B or CR:251B should be inspected for any signs of damage. For the CR:251B, fit the MV:200B preamplifier to the socket at the top of the instrument. Take care to ensure that the preamplifier is correctly connected and screwed into the socket.

Two batteries type 6F22 (NEDA 1604 or PP3) should be fitted into the battery compartment.

Ensure that the black HOLD button is OUT. This is the upper of the three push buttons. If this is not done, the display will be held and the central colon illuminated. If the colon is illuminated then the instrument display is held. The lower of the four slide switches, Weighting, should be pushed to the right hand position marked 'dBA'

The upper of the four slide switches, Display, should be pushed to the left hand position marked 'BATT'. The display shows the battery condition which should read above 15.0 for accurate measurements. If so, slide the switch to SPL. Slide the range switch to 50-110 and the response switch to Slow. The meter is now ready to calibrate and use.

4. Fundamental precautions.

Always check the battery before and after each measurement. The CR:250 monitors the battery continuously while operating.

Ensure that the black HOLD button is OUT. This is the upper of the three push buttons. If this is not done, the display will not freeze the last reading and the central colon will be displayed in the LCD.

Always check the instrument calibration before and after each measurement.

To obtain the most accurate readings, the microphone should be pointed at the source of the noise and held away from the observer.

In wind over 15kph a foam windshield should be used. The UA:237 windshield should be used with the CR:250 series instrument.

Do not operate the meter continuously at temperatures greater than 40 degrees celsius or you will get errors of reading and the instrument may suffer deterioration.

Remember to switch off after use or the batteries may leak and rot the case.

Never operate the unit in rain or snow. While the CR:250 series instrument is not affected by damp, actual water in the microphone will cause errors of reading and may permanently damage the capsule.

Keep the instrument still while measurements are being taken.

If the meter is being used out of doors, care should be taken to keep the unit away from large objects which will cause sound reflections and thus give incorrect readings.

When the CR:252B is used inside buildings, thought should be given to the best site. If in doubt make several measurements in different positions.

5. Controls.

5.1. Weighting.

This is the bottom three position slide switch, Marked **OFF dBC dBA**. The left hand position '**OFF**' disconnects all power from the instrument.

The centre position, marked '**dBC**' permits use as a normal sound level meter with the 'C' filter in circuit. The right hand position '**dBA**' permits use as a normal sound level meter with the 'A' filter in circuit.

5.2. Range

This is the three position slide switch which selects the operating range of the meter. In the left hand position, marked **<80**' the instrument measures below 80dB.

In the other two positions, the ranges are 50 - 110 and **>80**. Thus, the total measuring range is about 20 to 140dB. Note:- The lower figure will depend on the microphone capsule in use

5.3. Response

This switch defines the three response speeds "Slow", "Fast" and "Impulse". The IEC 651 standard now calls these 'S', 'F' and 'I' respectively, so that they are the same in any language.

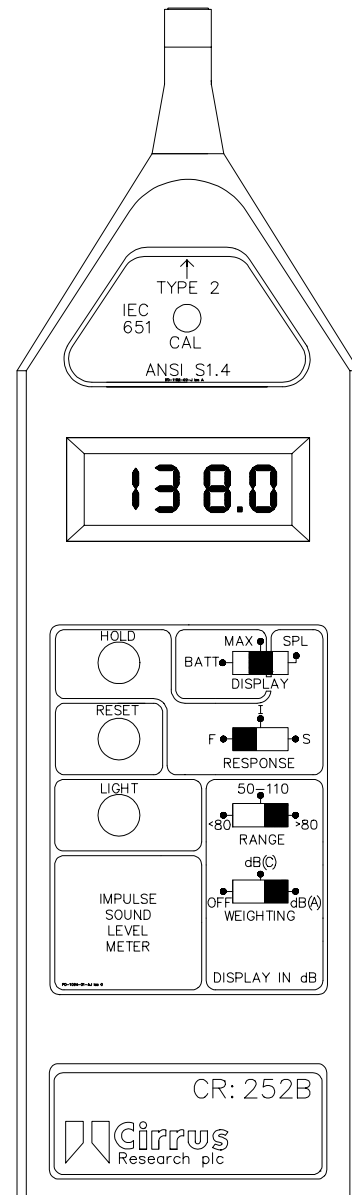
On the "I" response it should be noted that the rise time constant is 35mS but the descent time constant is 1.5 seconds, thus it should only be used for single impulses.

5.4. Display

This is the upper of the three position slide switch which selects the meter function. In the left hand position, marked '**BATT**' the meter is switched to measure the battery voltage which should be greater than 15.0 for normal operation. This voltage testing is in addition to the "LO BAT" annunciator flag in the display, and can be used to give some guide to the power left in the battery.

In the right hand, '**SPL**' position the meter reads the normal sound level at the response speed selected.

In the centre position '**MAX**', the maximum level as selected by the response switch is held and automatically updated by a further incoming signal. This is conventionally called 'Max Hold'. The hold functions has a decay time of better than 1 dB per minute.



The Max Hold function can be reset by pressing the '**RESET**' button.

5.5. Calibration Adjustment

This is fitted above the LCD display and provides an adjustment to the amplifier gain of the CR:252B. This is normally used for calibrating the CR:252B with the appropriate microphone and calibrator.

5.6. Reset

This button, when pressed, clears the value stored by the Max Hold circuit.

5.7. Display Hold

This is the top button, which when pressed holds or 'FREEZES' the display. When pressed, a colon is displayed in the center of the display. While this feature is very valuable for holding a changing signal, it is easy to forget that it is pressed and the meter will then not respond to any signals. The switch is **OUT** for normal operation and **IN** for freeze.

5.8. Backlight

This is the lower button and when pressed illuminates the LCD display to allow it to be read in the dark. To conserve as far as possible the battery power, it is very difficult to tell if it is ON in normal light. However, the illumination level is the optimum for operation in low light level. The use of this button should be limited to conserve the battery life.

6. Display Functions

The LCD display of the CR:252B is scaled in decibels.

There are annunciators in the display as follows:-

<u>Function</u>	<u>annunciator</u>	<u>Cause</u>	<u>Possible Action</u>
Overload	+	Amplifier overload	Move UP one range
Under-range	-	Amplifier at noise floor	Move DOWN one range
Battery volts	LO BATT	Battery capacity low	Replace batteries
Hold	:	The display is frozen	push HOLD to reset.

7. Calibration

It is vital that the calibration of ANY sound level meter is checked before and after each measurement. If this is done, it is reasonable to assume that the calibration during the measurement was correct. If this is NOT done, you will not subsequently be able to be certain that the instrument calibration was correct and you can never be certain the sound level was as measured.

The sound level meter is calibrated acoustically using an external reference, e.g the Sound Level Calibrator CR:513A, which is placed over the microphone. The calibrator generates a stabilised Sound Pressure Level of 94dB (+- 0.3dB) at a frequency of 1kHz.

7.1. Recommended Calibrators

The normal field calibrator is the CR:513A, although the CR:511E and CR:512 units are also compatible with the CR:250 series. All of these acoustic calibrators meet the requirements of IEC 942. The gain of a sound level meter is the same for all weighting networks and thus it can be calibrated on dBA or dBC. However, a calibration correction is required for different microphones.

The CR:252B is fitted with the MK:202 microphone capsule, whilst the CR:251B is fitted with the MK:224 capsule. Both of these microphone capsules have a calibration correction of -0.3dB.

This correction is required because of the differing pressure and free field sensitivities of the microphones. Thus with an MK:202A and CR:513A set on 94 dB, the instrument should be adjusted to read 93.7 dB.

7.2. Procedure

Remove any dust cover or windshield from the microphone, and fit the correct adaptor to the acoustic calibrator.

Check that the battery in the sound level meter is adequate. If not, replace the battery before calibrating the instrument.

Turn on the calibrator and check that the battery condition is adequate in the calibrator by turning it on. A 1kHz signal should be audible and if the Green LED is lit, the calibration signal is accurate.

Place the calibrator over the microphone and select a suitable measurement range on the sound level meter. This range should be the one that covers the 94dB calibration level. Now adjust the front panel **CAL** potentiometer so that the scale reading is 94dB minus the correction factor ie 93.7dB

If this cannot be achieved the microphone or instrument may be at fault and a check should be made with Cirrus Research.

As 'A' and 'C' weightings all have nominal zero correction loss at 1kHz, the reading on these two positions should be nominally the same. However, due to minor instrument

tolerances there will be small divergences so it is recommended that calibration is performed on the actual weighting which will be used for measurement.

8. Replacing the batteries

Power to the CR:250 series is supplied by two 9V batteries. The specification of these batteries is IEC 6F22 or NEDA 1604. This is commonly known as PP3 in the UK.

The use of calculator quality batteries is recommended as these have a better exchange rate of current versus life. Mercury and NiCad batteries can also be used in the instrument and the Nickel Cadium batteries only can, of course, be recharged although it is recommended they are removed from the instrument for this.

9. Rating Plate Information

In addition to the information specifically applied in this manual, certain other data is required to be specified in order to assure compliance with the requirements of IEC 651 and BS 5969. The data below is given in the form and order of the standard. The paragraph numbers refer to IEC 651.

The CR:250 series meet IEC 651, (BS 5969) Types 1, 2 and 3, depending on the microphone fitted.

IEC 11.2.1

For microphone data see separate sheet.

IEC 11.2.2

Reference direction is head on incidence, unless modified for the USA. where it is 30 degree to the axis.

IEC 11.2.3

The range of measurement with a typical assembly is:-

	Continuous Signals	
	CR:251B	CR:252B
Low Range	25dB(A) to 80 dB(A)	32 dB(A) to 80dB(A)
Mid Range	50dB(A) to 110 dB(A)	50dB(A) to 110 dB(A)
Hi Range	80dB(A) to 140 dB(A)	80dB(A) to 140dB(A)
	Crest Factor 3	
	CR:251B	CR:252B
Low Range	25dB(A) to 73 dB(A)	32 dB(A) to 73dB(A)
Mid Range	50dB(A) to 103 dB(A)	50dB(A) to 103 dB(A)
Hi Range	80dB(A) to 133 dB(A)	80dB(A) to 133dB(A)
	Crest Factor 5	
	CR:251B	CR:252B
Low Range	25dB(A) to 68 dB(A)	32 dB(A) to 68 dB(A)
Mid Range	50dB(A) to 98 dB(A)	50dB(A) to 98 dB(A)
Hi Range	80dB(A) to 128 dB(A)	80dB(A) to 128 dB(A)
	Crest Factor 10	
	CR:251B	CR:252B
Low Range	25dB(A) to 62 dB(A)	32 dB(A) to 62 dB(A)
Mid Range	50dB(A) to 92 dB(A)	50dB(A) to 92 dB(A)
Hi Range	80dB(A) to 122 dB(A)	80dB(A) to 122dB(A)

The ranges for dB(C) measurements are the same as above except for the noise floor of the low range which becomes 32dB(C) for the CR:251B and 43dB(C) for the CR:252B

IEC 11.2.4

The reference sound pressure is 1Pa (94dB)

IEC 11.2.5

Frequency response (overall) is 'A' or 'C' weighting as table IV.

IEC 11.2.6

"F", "S" and "I" responses are fitted with a 'Hold' on the max RMS value of each.

IEC 11.2.7

An acceleration of 0.1g over the frequency range 63 - 4kHz results in a reading of less than 50dB on any axis or weighting.

IEC 11.2.8

1 oersted produces a reading of less than 50dB on any weighting.

IEC 11.2.9

The CR:252B will operate from - 10 degree C to + 50 degree C with a maximum reading change of +0.5dB. The computer (dc log) output has a temperature co-efficient of +.20dB/degree C.

IEC 11.2.10

We recommend that the operator should be at least 1m from the microphone during measurement (see 16 below).

IEC 11.2.11

Less than +0.5dB change over 0 to 99% Relative Humidity.

IEC 11.2.12

Maximum storage temperature of +60 degree (+50 degree extended period) and 50% RH should be observed.

IEC 11.2.13

Cirrus Research plc extension cables up to 10 meters in length will not affect the calibration.

IEC 11.2.14

The UA:237 windscreen has negligible effect on calibration up to 12.5kHz.

IEC 11.2.15

The use of a pistonphone (PF 101B) is required to ensure long term compliance. For short term compliance the CR:513A may be used but this should be checked against a secondary or transfer standard annually.

IEC 11.2.16

The optimum position for the case and observer is 30 degree and 45 degree off axis to the microphone pre-amplifier. This implies use of a goose-neck or cable.

IEC 11.2.17

External filters are not possible.

IEC 11.2.18

Outputs are provided on the standard CR:252B. For details of the optional outputs refer to the specification.

IEC 11.2.19

The reference frequency used for calibration is 1kHz.

IEC 11.2.20

The reference range for IEC 651 purposes is the centre range.

IEC 11.2.21

The warm up period is 4 minutes although it is normally ready within 60 secs.

IEC 11.2.22

Not applicable.

IEC 11.2.23

See microphone data.

IEC 11.2.24

See microphone data.

IEC 11.2.25

Dummy microphone impedance is 18 pF in series with 50ohm.

IEC 11.2.26

Primary indicator range is the centre range.

IEC 11.2.27

Manual only.

IEC 11.2.28

+1dB at all frequencies greater than or equal to 31.5Hz.

10. Specification

Measuring range: (CR:252B)	32dB(A) to 143dB (A), 25dB(A) for CR:251B 43dB(C) to 143dB (C)
Noise:	Signal to noise ratio normally better than 5dB at lower limit of capsule sensitivity for quoted range typically 1microV(A) 8µv (C)
Input impedance:	Typically 1 Gigohm
Weighting networks:	'A' and 'C'
Display:	3 ½ digit back lit LCD
Time weighting:	S (Slow) F (Fast) I (Impulse) All to IEC 651 relevant Type
Display functions:	Normal Max hold (S, F and I) Battery volts
Display flags:	Overload (+) Under-range (-) Battery Low (BATT LOW) Hold (:)
Power:	2 x 9V batteries 6F22 (40hr)
Operating Temperature:	-10 degree C to 50 degree C
Storage Temperature:	-20 degree C to +60 degree C
Dimensions:	Length 230mm Width 75mm Depth 25mm
Weight:	0.5kg
Output:	3.5mm 'Stereo jack socket' DC out on tip, 25 mV /dB AC out on ring.

11. CE Certificate of Conformity

Cirrus Research plc Hunmanby UK CE Certificate of Conformity



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Equipment Description

The following equipment manufactured after 1st January 1996:

CR:252B & CR:251B Sound Level Meters

Along with their standard accessories

According to EMC Directives 89/336/EEC and 93/98/EEC

meet the following standards

EN 50081-1 (1992)

Generic emission standard for residential, commercial and light industry

EN 50082-1

RF immunity implies that sound level indications will not be affected by more than ± 0.5 dB at a background level of 74dB(A) or less.

Signed

Dated 1st January 1998

A handwritten signature in blue ink, appearing to be 'S. O'Rourke'.

S. O'Rourke
Director

12. Guarantee

Cirrus Research offer a 12 months guarantee on all of their units. This covers all parts and labour excepting only damage caused by the user. Because of the unique fragility of microphones, only internal short or open circuits are accepted as faults and not accident damage. The guarantee requires the user to return the unit to their nearest Cirrus Research Agent. This guarantee is in addition to any statutory rights in your country.

13. Cirrus Research Offices

The addresses given below are the Cirrus Research plc offices. Cirrus Research plc also have approved distributors and agents in many countries worldwide.

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