

Warranty and After Sales Service (All)

Castle Group design and manufacture precision instruments, which if treated with reasonable care and attention should provide many years of trouble free service.

In the event of a fault occurring, during the warranty period, the instrument should be returned to Castle Group Ltd, in its original packaging, or to an authorised agent. Please enclose a clear description of the fault or symptom.

Details of the warranty cover are available from Castle Group Ltd or an authorised agent.

All instruments are designed to meet rigid British and International Standards. An annual calibration is recommended to ensure that these high standards are maintained. This is particularly important for cases in which instrument readings are to be used in litigation or compliance work.

For warranty and service return to:

The Service Department
Castle Group Ltd
Salter Road
Cayton Low Road Industrial Estate
Scarborough
North Yorkshire
YO11 3UZ

Telephone	UK:	(01723) 584250
	INT:	44 1723 584250
Fax	UK:	(01723) 583728
	INT:	44 1723 583728

Any misuse or unauthorised repairs will invalidate the warranty.

Damage caused by faulty or leaking batteries is not covered by the warranty.

GA110, GA111, GA156, GA210 and GA254 Pocket Range of Sound Level Meters



Thank you for buying a Castle product, I am sure you will find both the goods and the service to be of the highest quality but if not, then please feel free to write to me personally and I will ensure that your needs are dealt with immediately.

This manual is designed to show you the operation of the goods you have purchased and a very brief insight into acoustics itself. If you would like to become a competent person in the eyes of the law, then you may like to know more about our Competent persons training course for the Noise at Work Regulations.

It is my intention for Castle Group Ltd to provide a complete range of Noise and Vibration products and Services of the highest standard. If you would like to know more about any of our other products and services then please complete the reply paid card in this manual and return it to us for prompt action or telephone on +44(0)1723 584250.

Simon Bull



Sales and Marketing Director

Accessories Available:

KA007 Dosemeter Kit case (5 dosimeters)
GA601 Single level 94dB acoustic calibrator
GA607 Dual level acoustic calibrator 94/104dB
O1MK276DP1B Dosemeter microphone GA110/111
ZL1091-01 Remote microphone cable
PC002 dBdata for Dos includes cables
PC003 dBdata for Windows includes cables
GA505 Portable thermal printer
KA010 Small attache case
ZL1082-01 Printer cable
ZL1101-02 Computer cable
Printer paper
10 X 9V Batteries

CONTENTS

Displayed Parameters:

Parameter	Displayed Range	Instrument
SPL	40 – 140 dBA	GA210/110/111
EXPOSURE TIME	0 – 72 hours	ALL
Leq	40 – 140 dBA	GA210/110/111
MAX	40 – 140 dBA	GA210/110/111
DOSE	0 – 9999%	ALL
LEP,d	0 – 110 dBA	ALL
Pa hr	0 – 320 Pa hr	ALL
PROJ DOSE 8HR	0 – 9999%	ALL
PROJ LEP,d 8HR	0 – 110 dBA	ALL
DOSE/HOUR	0 – 9999%	GA110/156/111
PEAK FLAG TIME	0 – 72 hours	ALL
PEAK DURATION	0 – 1 minute	ALL

Standards:

Where reference is made to type number the applicable type specifications applies.

IEC 61252 Personal Sound Exposure Meters	ALL
BS5969 Sound Level Meters	GA210/110/111
IEC651 Sound Level Meters	GA210/110/111
BSEN6698 (IEC804) Integrating Averaging Sound Level Meters	GA210/110/111

Overall Dimensions: 150 x 60 x 29mm

Weight: 220g with batteries

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Microphone/Preamp:	Pre-polarised 1/2" (12.7mm) Condenser Microphone Sensitivity 50mV/Pa Capacitance 15pF Preamp output impedance 550R
Output Socket:	GA111/156 RS232 Output: 2400 baud, 8 bit, No parity, 2 Stop bits. GA111/156/110 AC Output: 1Vrms for FSD, output impedance <100R. Short circuit protected. GA111/156/110 Connector: Lemo FGG0B307CNAD52Z GA111/156 Printer Interface: Interfaces to the GA505 printer to print graphical and tabular results.
Calibration:	Instrument acoustically calibrated using GA607 at 94dB or 104dB at 1KHz. Potentiometer adjustment.
Batteries:	Type: IEC No 6LR61 Maximum size 48.5mm Life: Duracell MN1604 approx. 15 hrs continuous Ever Ready 6LF22 approx. 15 hrs continuous
Temperature:	Operating range: -10 to +50°C Storage without batteries: -20 to +70°C Effect of temperature: < 0.5dB from -10 to +50°C
Effect of Humidity:	< 0.5dB from 30%RH to 90%RH
Vibration:	A 40Hz 1m/s vibrating force produces no noticeable effect.
Magnetic Field:	No noticeable effect.
EMC Performance:	Radiated emissions to EN50 081-1 No significant emissions from the instrument. Radiated immunity to EN50 082-2 No degradation in performance when subjected to 10V/m unmodulated. No degradation in performance when the instrument was subjected to ESD at 8KV IEC 801-2.

The BAT and GND inputs provide a direct connection to the battery terminals. An auxiliary power supply can be connected, via the LEMO socket, to provide extended running times. Any d.c.voltage between 5.5V to 10.0V with respect to the ground line may be connected to the instrument. The supply must be capable of supplying 50mA.

Instrument Specification (All)

The individual characteristic applies to each instrument unless specifically worded otherwise.

Measuring Range:

GA111/110/210 40 - 140 dBA (Ranged)
 GA254/156 60 - 140 dBA

Detector Characteristics:

GA156/254 RMS
 GA111/110/210 RMS with 200Pa 140dB Peak detector

Frequency Weighting:

GA210/156/254 'A weighted' to IEC651 Type 2
 GA111/110 'A weighted' to IEC651 Type 1

Time Weighting:

GA156/254 Slow(1000ms)
 GA111/110/210 Slow(1000ms), Fast(125ms) to IEC651 Type 1

DOSE Exchange Rate:

3dB/5dB specified when placing order

Criterion Level:

90dBA for 8 hours = 100% DOSE
 85dBA for 8 hours = 100% DOSE
 Default specified when placing order.

Peak Flag:

140dB 200Pa Linear Frequency Weighted

Overload:

Positive overload condition shown when Crest Factor is exceeded.

Display:

Digital 1 x 8 alphanumeric
 Digit size 7mm x 5mm.

Memory:

GA111/156 32KByte ROM
 32KByte RAM

Introduction

The Castle Pocket range has been designed to meet the requirements of the U.K. Noise at Work Regulations and similar Noise at Work Regulations in force throughout the World.

This manual contains complete operating instructions for models GA254, GA156, GA210, GA110 and GA111. Read it carefully and you will quickly become familiar with your instrument. If you have problems with the operation of any model, please call U.K. +44 (0) 1723 584250 or fax +44 (0) 1723 583728.

Using the Manual

Although every Castle instrument is highly specified, some of the instruments in the Pocket Range have more functions than others. Take careful note of the bracketed text in the functional title to find which instruments have the feature.

E.g.

Auto Ranging (GA210/GA110/GA111)

The Auto ranging facility is therefore only applicable for the GA210, GA110 and GA111 instruments.

You are advised to check the listing below for features which are included on your instrument. The shaded boxes indicate that the feature exists. Common features have not been listed.

FEATURES	GA254	GA156	GA210	GA110	GA111
SPL					
Leq					
Lmax capture					
Ranging					
Time Weighting					
Datalogging					
PC communications					
Fixed microphone					
Socket microphone					
Dosimeter microphone				Optional	Optional
Printout					
Clock					

In the course of this manual a named key written in **BOLD** means press that key.
 E.g. **ENTER** means press the ENTER key.

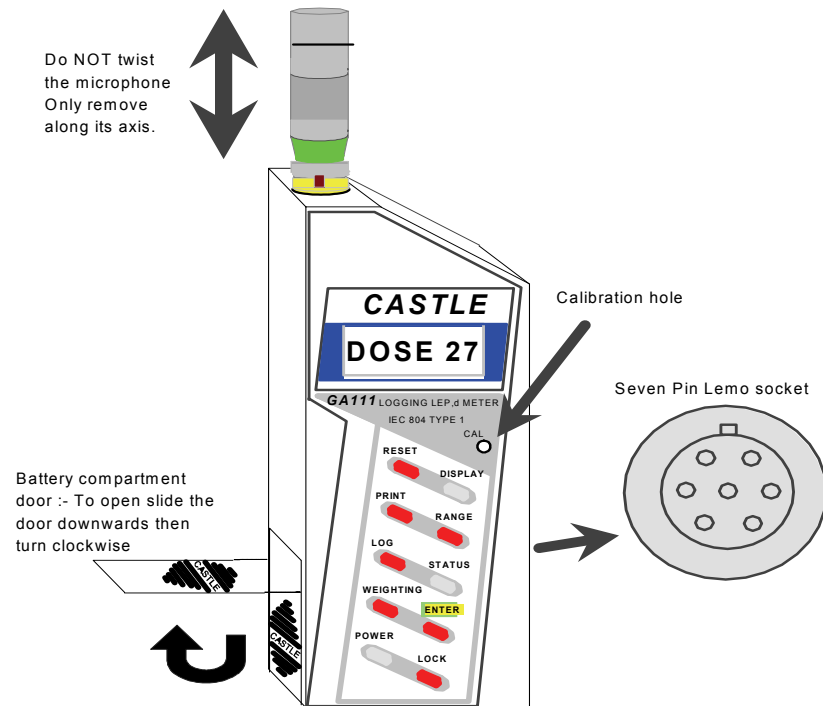
Battery Installation (All)

To prepare the equipment for use a heavy duty battery type 6LR61 should be fitted, such as Ever Ready 6LF22 Gold Seal, Duracell MN1604 or Kodak U9VL.

Open the battery door cover by sliding the cover downward towards the bottom of the instrument. The cover will now swing open exposing the battery compartment. Insert the battery observing the correct polarity as marked on the case wall.

Close the battery compartment door. The instrument is now ready for calibration and use.

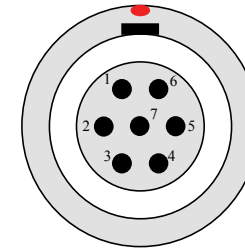
Note: When changing the battery for the GA111 and GA156 it is recommended that the logged memory be reset prior to commencement of another log. Care should however be taken to avoid erasing any previously stored data. Within a five minute period the battery may be changed while still retaining the contents of logged locations within the instruments memory.



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Technical Information (All)

The GA110, GA111 and GA156 are equipped with a seven pin LEMO socket. In the case of the GA111 and GA156 this provides an RS-232 communication port, an AC output, and a power input. The GA110 only has provision for an AC output, and a power input, it has no provision for RS232 communication. The important connection details are shown below.



Seven Pin LEMO

socket

PIN NUMBER	SIGNAL	DESCRIPTION
1	GND	Signal Reference
2	Rx	RS-232 Data input
3	Tx	RS-232 Data output
4	DTR	RS-232 Output
5	CTS	RS-232 Handshaking line
6	BAT	Aux. Power input (6V – 9V DC)
7	AC	AC output – 1V rms at f.s.d. into 600 ohm load

The RS-232 communication port will directly interface to the Castle GA505 thermal printer, via a ZL1082-01 1 meter cable and a PC via a ZL1101-02 2 meter cable.

The AC output is a representation of the sound pressure level incident on the microphone. This output can be used, in conjunction with a tape recorder, to log information for analysis at some later date. A full scale deflection on the meter corresponds to a 1V rms signal into a 600 ohm load.

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Changing Range (GA210/GA110/GA111)

A range change can be performed by the use of the RANGE key.

Press **RANGE**

RANGE

Press **RANGE** repeatedly until the required range comes into view, press **ENTER**.

Auto-ranging selects the optimum range for the ambient sound field and may not be suitable for rapidly fluctuating sound pressure levels.

Press **RANGE** repeatedly until AUTO comes into view, press **ENTER**.

To de-select Auto-ranging. Press **RANGE** repeatedly until the required range comes into view, press **ENTER**.

You will notice that the symbol ➤ indicates the current selection as you move around the range options.

Time Weighting (GA210/GA110/GA111)

The time weighting of the instrument can be changed between Slow and Fast.

Press **WEIGHT**

WEIGHT

Press **WEIGHT** to toggle between Slow and Fast weighting, press **ENTER** to select the required weighted response.

Setting the Clock (GA156/GA111)

This function can only be performed using dBdata ©, refer to your dBdata manual. The clock will only keep the time providing the instrument is left on.

Fitting the Microphone (GA110/GA111)

To insert the microphone align the red dots on the microphone and instrument, grip the microphone's collar and push firmly. To remove the microphone, reverse this process.

WARNING: DO NOT TWIST THE MICROPHONE

Switching On and Off (All)

Press and hold the **POWER** button until the instrument turns on. Wait a few seconds while the instrument runs through its start-up sequence. This will take approximately 15 seconds, however the sequence can be halted by simply pressing the **DISPLAY** key.

If the message CHECK SETTINGS is displayed after power up, then pressing any key other than LOCK or POWER will allow normal operation of the instrument.

Inadvertent power down while the instrument is being used can be prevented by selecting the LOCK mode, refer to the LOCKING THE INSTRUMENT section.

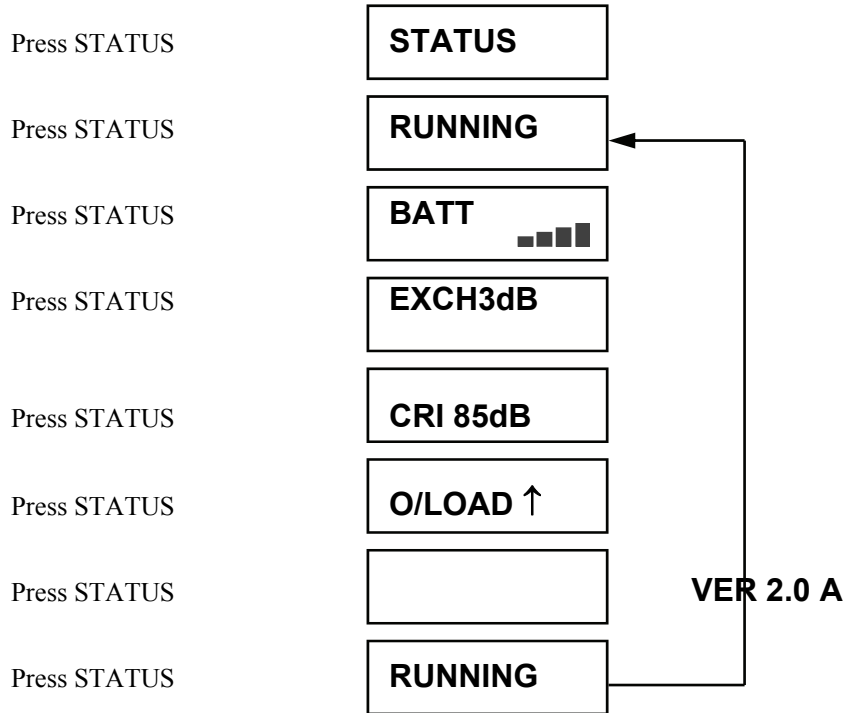
To switch off, press and hold the **POWER** button until the display goes blank.

Note: The GA156/111 have a datalogging function. When the instrument is datalogging the power down facility is disabled thus preventing the instrument being turned off until logging has ended. Refer to the section LOGGING.

Activating Functions (All)

Castle instruments operate with an intuitive menu system. The menu is selected by using the dedicated keys on the keypad. When a key is pressed the name of the key appears on the display, if a scrolling menu exists within this function then successive key presses will allow you to scroll through the menu.

In the example below the displayed messages may vary due to different instrument functions and configurations.



The status menu is therefore circular and can be easily scrolled through by successively pressing the STATUS key.

This format is repeated for the other functional keys on your instrument. It should be noted that the colour matched keys are used with the ENTER key to change an operating mode.

Instrument Status (All)

The status of the instrument can be ascertained by the use of the STATUS key

Press STATUS

STATUS

Repeated presses of the STATUS key will display some or all of the parameters below depending on your instrument type.

RUNNING	Indicates that the instrument is updating parameters	ALL
PAUSED	Indicates that the instrument is not updating parameters	ALL
RUN LOCn/EMPn	Indicates that record n is running	GA156/111
BATT	>70% battery capacity remaining	ALL
BATT	>30% battery capacity remaining	
BATT	>10% battery capacity remaining	
BATT	Instrument specification not guaranteed	
EXCH 3/5 dB	Indicates the Exchange rate being used to calculate Dose	ALL
CRI 90/85 dB	Indicates the Criterion Level being used to calculate Dose	ALL
THR 80/75 dB	Indicates the Threshold Level being used to calculate Dose	ALL
O/LOAD ↑	The ↑ indicates when an Overload has occurred	ALL
VER 2.0A	Indicates the software version number	ALL
NO CLOCK	Indicates the clock has not been set	GA156/111
NO DATE	Indicates the data has not been set	GA156/111

Before commencing a noise survey check the battery Status, and ensure that there is enough battery capacity remaining to enable the survey to be completed.

Sample Printout

User:.....**A. N. Other**.....
 Date:.....**01/01/95**.....
 Location:..**Smith's Industries**.....
 Employee No.1:..**Machine Operator**.....

Instrument Setup

Peak Level: 140 dB (200Pa)
 Criterion Level: 90 dBA
 Exchange Rate: 3 dBA
 RMS Detector: 115 dBA

Cumulative Dose/Lepd

Exposure Time : Not set
 Exposure Date : Not set
 Exposure Duration : 00:30:01
 Dose 259%
 Pa²Hr 8.288
 Lepd 94.2

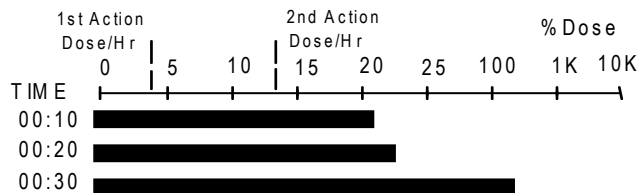


Dose 31.5 100 %
 1st Action Level 2nd Action Level

Projected 8 hour dose:3538%
 Projected 8 hour Lepd: 105.8 dBA

Rms Level was not exceeded
 Overload Level was not exceeded.

Dose Time History



Calibration (All)

The calibrator recommended for use is the Castle GA607, a dual level calibrator which supplies 94dB and 104dB (relative to 20µPa pressure) at a frequency of 1KHz.

Turn the instrument on by pressing the **POWER** key.

Press **STATUS** repeatedly until BATT is displayed. Replace the battery if the indication is low i.e. one or two bars remaining.

Select the 60dB range by pressing the ***RANGE** key until 60 is displayed, if required refer to the CHANGING RANGE section. Press the **ENTER** key.

Press **DISPLAY** and wait for an SPL figure to appear.

Note : The calibration procedure is slightly different for the GA254/154. There is no requirement to select the range simply press the **CAL key and the SPL will be displayed for 30 seconds.*

Position the calibrator firmly over the microphone. Turn the calibrator on to the 94dB or 104dB setting.

Using a screwdriver adjust the CAL control screw until the SPL reads the correct calibrator output (94.0 or 104.0dB).

The instrument is now calibrated.

Reset the instrument by pressing **RESET** until 'ALL' is displayed then press **ENTER** twice. This will clear any acquired dose due to calibration.

Note: Changing the microphone between a fixed microphone or the dosimeter microphone will require the instrument to be recalibrated as the different microphones will have different sensitivities.

Display (All)

Displays the parameters that are being measured. Repeated presses of the **DISPLAY** key scroll round the parameters listed in the table below.

The display will also show the following message when appropriate:

** UR ** when the instrument is Under-range

** OR ** when the instrument is Over-range.

The display will flash when the instrument is Under-range, Over-range or the Crest factor is being exceeded.

You may leave the display menu by pressing any other menu key.

In the case of the GA156 a LOG must have been started before any data is displayed.

SPL	Sound Pressure Level – A weighted	GA210/110/111
00:01:33	Exposure duration	ALL
LEQ	Equivalent continuous level	GA210/110/111
MAX	Maximum SPL	GA210/110/111
DOSE	Noise exposure	ALL
Pa ²	Pascal squared hours noise exposure	ALL
LEP	Displays the $L_{ep,d}$ only valid when worn for the full shift	ALL
DOHR	Dose/hr (5 min inhibit)	GA156/110/111
PROJ	8 hour projected dose (5 min inhibit)	ALL
PLE	8 hour projected LEP.d (5 min inhibit)	ALL
PKT	Time to first peak hrs:mins	ALL
PKE	Peak event time (sec's: hundreths sec)	ALL
RMS	A flag which is only set when the SPL exceeds 115 rms dBA	GA156/111
NO DATA	No data has been logged	GA156/111

To print to the Printer. Ensure that the instrument is connected to a Castle GA505 printer using a ZL1082-01 printer cable.

Press **PRINT** until PRINTER comes into view, press **ENTER**. Then press **PRINT** repeatedly to select the required logged location to print, press **ENTER**. If required ALL can be selected so as to print all logged data, then press **ENTER**.

When printing has terminated you may leave this menu by pressing any other menu key.

To print to the Computer. This option can only be performed using dBdata © software. First ensure that the instrument is connected to the PC with the Castle ZL1101-02 cable, not to be confused with the printer cable ZL1082-01. To allow the instrument to communicate to the PC press **PRINT** until COMPUTER is displayed then press **ENTER** so that the instrument displays the message COM MODE. *Note: Users should refer to their dBdata manual for more detailed information.*

GA111 only: To print to the Screen. This option is used to view the contents of logged data on the screen. Press **PRINT** until SCREEN comes into view, press **ENTER**. Then press **PRINT** repeatedly to select the required logged location. Finally press **ENTER** repeatedly to view the logged data. Cumulative values are listed first, after viewing these interval Dose (INTD) and interval Leq (ILQ) values are shown in sequence. Remember that if the interval was set to 1 min and the logged data lasted for 1 hour you would have to press **ENTER** sixty times to obtain all the logged data for INTD and a further sixty times to obtain all the ILQ values.

* The GA156 does not have the function of printing to the Screen, to view previously logged data on the GA156 refer to the section DISPLAY.

You may leave this menu by pressing any other menu key.

To reset simply scroll round the options until the desired function is found then press the **ENTER** key.

The following message will be displayed:

CONFIRM?

Press **ENTER** to reset the chosen data or another key to decline the RESET.

WARNING: USE THE RESET KEY WITH GREAT CARE AS PREVIOUSLY ACCUMULATED DATA MAY BE LOST.

Note: GA156/GA111 Users.

- *It is recommended that any logged information of importance is downloaded to a printer or computer as soon as possible to avoid accidental loss of data.*
- *It is also recommended that if the instrument is not being used for a long period or new batteries are inserted that the total memory is reset prior to the commencement of a new Log.*
- *The GA156/111 will retain memory contents for 5 minutes with no batteries fitted. This allows the user to change batteries without losing data.*

Print (GA156/GA111)

Print is used to view the contents of previously logged data, it can be performed in three ways. Print to either the Printer, Computer or to the *Screen. If there has not been a logged interval or the logged data has been reset, then when **PRINT** is pressed the message NO DATA will be displayed.

Press **PRINT**

PRINT TO

Pressing **PRINT** repeatedly moves around the options of Printer, Computer and to the Screen.

GA156 Users. The results of previously logged data can be displayed on the instrument, press **DISPLAY** until the required employee record comes into view. Press **ENTER** to select the employee record then repeatedly press **ENTER** to scroll through the logged data.

GA111 Users. The results of previously logged data can be displayed on the instrument by 'Printing to the Screen'. Refer to the PRINT section.

Logging (GA156/GA111)

Used to start, pause or terminate a logging location. Both the GA156 and GA111 have 5 Log records available. Since the GA156 is solely a dosimeter its records are named by Employee numbers (EMPL 1 to 5), the GA111 however has records named by Location numbers (LOC 1 to 5).

Note: When Logging the instrument cannot be turned OFF without first ending the current LOG.

For the purpose of the example the LOC terminology has been used.

Press **LOG**

LOG

Successive presses of **LOG** produce.

LOC 1
LOC 2
LOC 5 etc.

If any of the records already contain data then this is indicated by *.

E.g. LOC 1* means location 1 contains data, it cannot be overwritten until it is reset, refer to the RESET section.

Pressing **ENTER** for one of the empty locations prompts the display:

INTERVAL

Pressing **LOG** repeatedly toggles between the two intervals allowed:

- 1 MIN
- 10 MIN

Pressing **ENTER** for one of these options starts logging at the interval selected. The display shows:

LOGGING

Data can be viewed while logging, simply repeatedly press the **DISPLAY** key.

If the instrument is currently logging repeated presses of the **LOG** key will display:

- LOG
- PAUSE
- END LOC

Pressing **ENTER** when PAUSE is displayed will pause the logging period.

Pressing **ENTER** when END LOC is displayed will terminate the logging period.

If the logging period is paused this menu may be left by pressing any other key, e.g. pressing **DISPLAY** will allow you to look at the logged data. When the **LOG** key is pressed the following options are displayed:

- CONTINUE
- END LOC

Pressing **ENTER** when CONTINUE is displayed will continue logging.

Pressing **ENTER** when END LOC is displayed will terminate the logging period.

To leave this menu press any other menu key.

Locking the Instrument (All)

The LOCK key is used to lock the instrument keypad. All functions are therefore disabled including the POWER key. The function is often used to avoid inadvertent operation or tampering while the instrument is being used.

Press **LOCK**

LOCK?

To LOCK the instrument, press **LOCK** then **ENTER**. The status of the Battery will be displayed while the instrument is locked. To UNLOCK the instrument. Press **LOCK, RESET** then **ENTER**.

Reset (All)

Used to RESET data, and change the Criterion Level of the instrument.

Press **RESET**

RESET

Repeated presses of the **RESET** key will display some or all of the parameters below depending on your instrument type.

MAX	Only resets the maximum RMS SPL	GA210/110/111
PEAK	Only resets the 200Pa detector	GA210/110/111
CURRENT	Resets the current non-logged accumulated data	GA210/110/111/156
CRIT	Allows the default Criterion Level to be changed	ALL
LOC5 (EMPL 5) etc LOC1 (EMPL 1)	Clears the data in individual location/ employee numbers	GA156/111
ALL	Will reset all data, current and all logged data	ALL