CASELLA
CEL

NOISE

NOTES

CONTENTS

01 BACKGROUND & HISTORY

Regent House Circa 1920's

Finishing Shop

200 YEARS OF CASELLA HISTORY

Cesare Tagilabue established the company in Holborn, London in 1799 during the reign of George III. Within just a few years Louis Pascal Casella joined Cesare in a partnership and the new Casella name was born.

In the early years the product ranges being exported around the world included exploration, navigation, photographic, meteorological and medical research instruments. Our early customers included Charles Darwin and Dr. Livingstone.

During the 19th century, the product range continued to grow and Casella exhibited instruments including theodolites and surveying equipment at the first 'Great Exhibition' held in the Crystal Palace, Hyde Park London in 1851.

As the two World Wars of the last century raged, our expertise in optics, compasses and photogrammetry equipment was put to good use by the military. By the 1950's Casella had designed and built a significant amount of dust monitoring equipment for the deep mining industry, including a number of industry standard products.

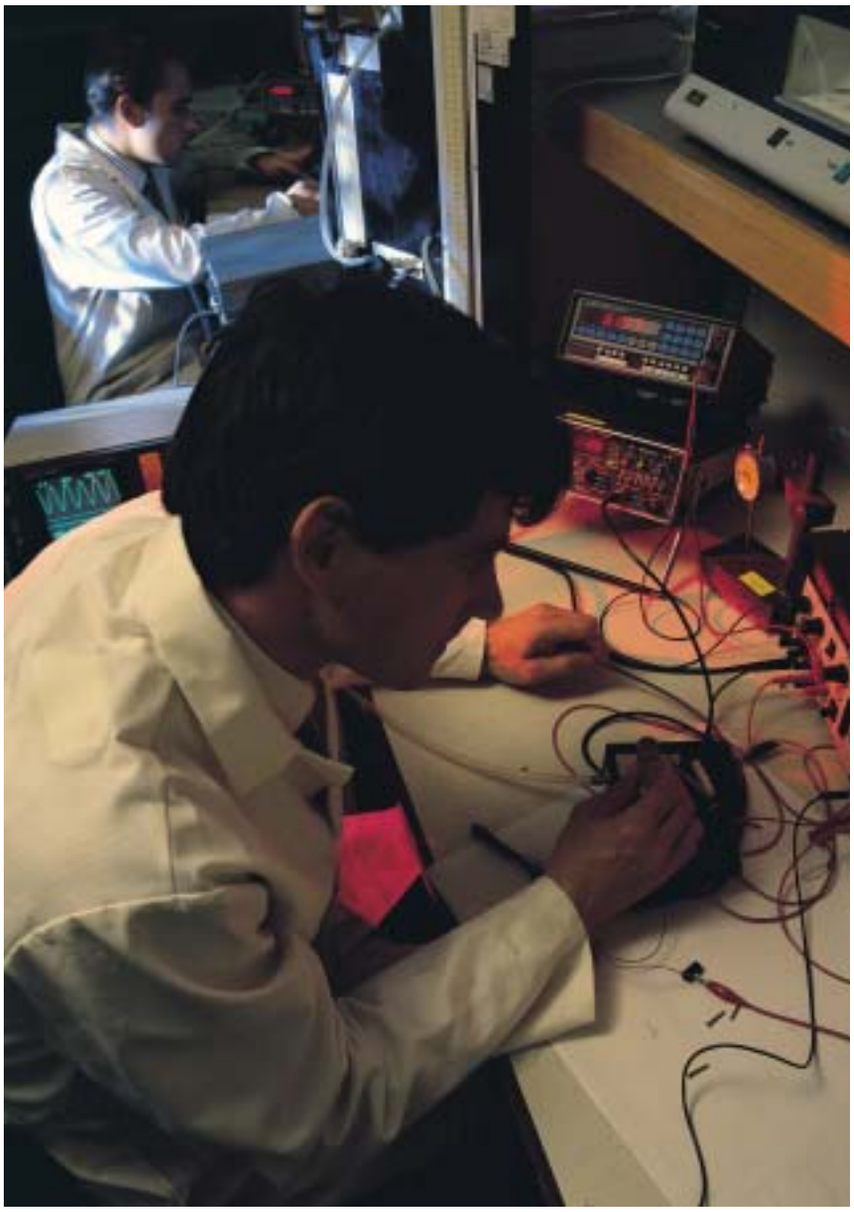
Show Room

CEL HISTORY

CEL Instruments have been manufacturing high quality instrumentation for the measurement of noise and vibration since the early 1970's. Originally formed from the company Computer Engineering Limited, a British company specialising in the design and manufacture of computer related equipment, CEL rapidly became well known for designing state of the art noise products in the UK.

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490



In 1998, Casella acquired CEL Instruments, manufacturers of innovative noise monitoring equipment. The natural synergy formed from this integration allows Casella CEL to offer a broader and more comprehensive product range to both the occupational and environmental market sectors.

To keep one step ahead of an ever-changing market, Casella CEL is committed to an extensive programme of ongoing research and product development. The development programme involves considerable integration with Industry and Research bodies, to ensure the utilisation of the latest techniques and technologies available. It is this commitment that has enabled us to build an impressive product portfolio, allowing us to focus on the following areas:

Air Quality

Indoor Air Quality

Professional Meteorology

Recreational Meteorology

Noise

From our modern facilities in the UK we work continuously to improve and expand our business. Our products are now exported world-wide through an extensive network of distributors and agents. With measurement division offices in both America and Spain, and with further expansion planned, this confirms Casella CEL as a truly International organisation.

Casella CEL is part of Casella Measurement - A division of the Casella Group.

‘We have a commitment to you the customer to provide a ‘total’ service, which exceeds your expectations’

3.1 WORKPLACE NOISE MEASUREMENTS

This term encompasses everything from personal noise dosimetry to the correct specification of personal protection devices and is mainly concerned with the international regulations laid down in different countries around the world. The prime driving force here is the need to protect workers' hearing from the damaging effect of excessively high noise levels. Regulations exist in all industrially developed countries that require the noise exposure of individual workers to be assessed and compared to national limiting values.

The common technique of including all of the noise exposure during a working shift and then normalising it to a standard working day exists on both sides of the Atlantic. However, the exact methodology has sufficient differences to make considerable differences in the way that noise is measured. A standard working day is taken to be exactly 8 hours whether or not the individual is at risk of actual noise exposure during this time. All of the noise must be included and then normalised to give the 8-hour time weighted average level.

European style measurements specify several action levels, according to 'European Directive regarding the exposure of workers to the risks arising from physical agents (Noise)'. All the noise from at least 80 dB using the 'A' weighting response must be included with no threshold applied and averaged using the equal energy principal. In this case the usual time weighting or meter response should not affect the overall result since it is the direct energy contained in the noise that is accumulated. An overall peak level expressed as a 'C' weighted dB value is used to limit the damaging effect of any single large impulse.

In the USA current national regulations require a slightly different approach in that a 5 dB exchange rate is mandated as the trade-off between noise level and time. This means that every increase in the noise level of 5dB must be accompanied by a halving of the exposure time to keep the risk of damage the same. Since the original regulations were written when hand held sound level meters were the only devices available for monitoring there exists a requirement to sample the 'A' weighted, slow response setting of a meter and exclude any noise levels below a certain threshold value. Currently two main thresholds exist at 80 dB and 90 dB. The first produces a potentially greater answer for any given situation since it includes all the noise between 80 dB and 90 dB in terms of the time weighted average level than does the average level with the 90 dB threshold. The first threshold is used to produce an answer that determines the need for a hearing conservation program while the second threshold level is used as the basis for any engineering control methods that may be initiated in the workplace.

Noise measurement results produced by these two methods are not directly interchangeable therefore any monitoring device that is selected must be able to be either setup correctly just for the local requirements or must be dual purpose and able to function according to both methods simultaneously. The Casella CEL Noise Dosimeters are dual purpose and are able to be setup to gather the data using the correct measurement protocols simply by selecting the appropriate named Setup in the menu before a run commences. Fixed standard measurement methods and user definable methods can be selected by the user from the keypad at the start of a run in the Casella CEL dosimeters.

Once an individual's noise exposure has been established using a personal noise dosimeter or a hand held sound level meter control techniques may be necessary depending on the measured levels. Simple control of noise at source will always be the preferred route for decreasing personal noise exposure. However, this is not always immediately possible and so personal hearing protection will need to be specified according to established and acceptable criteria.

The simplest method to establish the type of hearing protector that can be used is to use the single number Noise Reduction Rating value. This requires the 'C' and the 'A' weighted sound levels to be measured and the difference calculated between them. Many, if not all, hearing protectors give a single number rating figure for the NRR which is printed on the packaging for the device. This simple technique allows fairly simple sound level meters that have the 'A' and 'C' weightings to be used for this purpose while engineering control methods are sought for the long term.

A full octave band survey of the noisiest machines or processes will give the best guide to which hearing protectors should be used. This is achieved by comparing the octave band noise levels with the assumed protection afforded by a chosen protector to establish if it is suitable for that noise source. If the sound level meter has the capability of performing third octave band frequency analysis then it will also provide sufficient information to allow engineering methods to reduce the original noise to an acceptable level. The specification of barriers or enclosures will be aided by the knowledge of the third octave band noise level readings.

Suitable instruments for these types of measurements are the CEL-254, CEL-320&360 Dosimeter, CEL-440.B Octave band sound level meter.

3.2 COMMUNITY NOISE MEASUREMENTS

Generally this term is used to consider the measurement of noise levels out of doors. This type of noise is usually characterised by the fact that a nuisance may be thought to exist or that a complaint has been received. In this case the noise levels are not considered dangerous to hearing but may materially impair a person's enjoyment of their surroundings. Measurements are often required in an area before any new construction is allowed close to existing residential properties.

Transportation sources are the predominant noise source in these circumstances such as highways, airports or train movements. Local regulations and ordinances will often limit the acceptable noise levels during different parts of the day since people's likelihood of disturbance is a time dependant factor. Night and evening time periods are usually more sensitive than during the day so there will be different noise limits for different parts

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

of the day. The measurements will often be needed to confirm planning decisions as to the suitability of a parcel of land when new building is planned. The type of use the land is going to be put to will affect the limits that are imposed and the noise levels monitored.

Noise intrusion into domestic properties gives rise to a different set of problems in that a nuisance may exist in one dwelling but is it caused by unreasonable behaviour or by the inadequacy of the building elements and faults in construction? In this case, difficult decisions will need to be resolved bearing in mind the perception of a noise problem and its tonal characteristics. At least octave, and more likely third octave band, frequency analysis will be necessary to establish the causes of a problem. Information on the acoustic behaviour of a partition or floor based on transmission loss measurements and the reverberation time of receiving rooms will be required to adequately assess a difficult problem.

Many outdoor measurements require an extra element of consideration when choosing equipment to use since the measurements will have to be taken over extended time periods. This requires physical protection for the meter, the microphone and additional power supplies to run the system for the required interval of time. The ability to start and stop measurements automatically at different times of the day to collect the noise levels only when needed can be achieved with instruments that have delayed timer functions.

Data sets for environmental noise measurements can be enhanced by collecting results at regular intervals such as every hour during a 24-hour survey. For additional detail time history profiles enable an appreciation of the pattern of noise variations to be studied on a minute-by-minute or even second by second basis.

Triggering of significant events whenever the noise level rises above a predetermined threshold will give valuable insight to the impact of short duration acoustic interference in the background noise levels. Linking the event recognition system to an audio tape recorder will allow the source to be confirmed if measurements were made in an unattended fashion. Even greater confidence can be put on measurements if the spectral distribution of the noise levels is obtained using real time logging analysers.

Suitable meters for these types of measurements are the CEL-360 Logging dosimeter, CEL-480.C Logging sound level meter and the CEL-593.C100 Logging and event analyser.

3.3 PRODUCT NOISE MEASUREMENTS

The primary purpose of these types of noise measurements is to achieve a reduction in the level of noise that a particular source produces. Frequency analysis is imperative for this to be effective since any method of reduction will be more successful at certain frequencies than others. Often subtle changes in a noise source can make it more acceptable than before particularly if tones can be reduced or lowered in their frequency contribution to the overall level.

A real time frequency analyser is the ideal measurement instrument for noise reduction since all of the frequencies are measured in parallel. This means that if there are small changes of noise level with respect to time then a real time third octave band analyser will follow them continuously and still obtain all the necessary spectral distribution of sound. Serial frequency analysers that measure each octave band one after another are perfectly adequate for steady noise level sources but will not be able to follow the fluctuations if the noise level changes. A real time analyser will be able to cover both situations equally well, and if the noise is indeed steady then a complete set of measurements can very often be obtained in a fraction of the time that it would take if a traditional serial filter method was used to carry out he investigation.

The subtleties of a noise depend on how it is perceived. How should it sound for a source of that type? Everyone expects a top of the range luxury vehicle to sound better than a medium range family model. But what is “better” and how is it measured? The subjective decisions that we all make based on the sound quality of a source are a feature of both the noise level and the frequency distribution and how they vary in time. What may sound acceptable will depend on whether we are in good health when we make the judgement or if we have a head cold that may affect our ability to hear a sound in the same way as a week ago.

Measuring noise objectively can now be achieved in a real time hand held analyser that takes away the variations of a human who may suffer from a cold from time to time. The Loudness of the sound measured in Sones or Phons can be used as a very powerful quality tool for vehicle noise analysis, washing machine development or any other typical domestic appliance that we are likely to bring into our homes. The real time loudness option available with the top of the range Casella CEL real time analysers is a valuable development tool for the engineers tasked with manufacturing quality products to offer to the general public. When all products appear to offer similar functionality it is often the subtleties of how a product sounds that can make the difference between a customer choosing one item over another.

Suitable meters for these types of measurements are the CEL-440.C Third octave band sound level meter, CEL-553.C Real time third octave analyser.

3.4 ANCILLARY AND RELATED EQUIPMENT

A noise meter requires additional equipment to keep it in full working order. Most regulations state that the meter must be calibrated before a measurement is undertaken using an approved device. Some standards require that the meter is re-calibrated after the measurement is finished to ensure that no drift has occurred during the measurement process. Generally, the grade of accuracy of the meter will determine what grade of accuracy of calibrator is to be used. All Casella CEL noise measurement kits are assembled with the appropriate acoustic calibrator to allow field checks to be carried out when needed. Usually a single point calibration is performed at a single frequency and level stated on the calibrator. This is sufficient for day to day operation of the meter in normal circumstances but a more thorough check of both the calibrator and the meter will be required to ensure that both stay within manufacturer's specification during the lifetime of the instruments.

Any noise meter that is going to be used out of doors for extended periods will need to be fitted in a suitable weatherproof case and Casella CEL are able to provide an appropriate case for all of the meters that have a data logging facility. These cases are designed to be lockable and to have sufficient space to store the instrument, calibrator, cables and power supplies in a custom foam interior. Waterproof connectors are provided to connect any external items such as microphone extension cables.

Suitable products for external weather protection are the CEL-6760, CEL-6723/6728 and the CEL-6627 Environmental enclosures.

Many workers use hand tools that have excessive levels of vibration which research has shown can lead to damage in the hands and fingers with prolonged exposure.

Casella CEL are able to offer a portable hand arm vibration meter with features that make it suitable for routine monitoring of this potential damaging hazard. Compliant with national standards and offering easy to use menu driven displays the Hand Arm vibration meter will be invaluable to anyone concerned that vibration levels could be dangerous to workers. Storage of runs and download to computer at the completion of measurements enable a comprehensive monitoring strategy to be implemented to control excessive vibration dangers at work.

A suitable instrument for this measurement is the CEL-90259 Hand-Arm vibration meter.

Noise nuisance recording in domestic premises is covered by the provision of a range of tape recorder based systems that use the popular DAT format as the recording medium. A number of different systems enable all requirements to be covered from a simple record only kit to a full record, replay and measurement kit based on a logging Casella CEL sound level meter.

Suitable kits for these types of measurements are the CEL-6770 Kit and the CEL-480/6750 Kit.

All the Casella CEL meters with data logging capability are provided with PC software to retrieve the results and review them on the user's computer. For each instrument family a basic text only software package is provided as standard and a more sophisticated text and graphics package is available as an option. Dedicated analysis and reporting software is available for the direct calculation of important parameters in the field of architectural acoustics based on the ISO and corresponding ASTM standards used by acoustic professionals around the world. The software programs are based on the popular Microsoft Windows operating system and feature the familiar graphical user interface and such features as cut and paste options.

Suitable software products include dB10/12 for the dosimeters, dB21/22 for the sound level meters and dB1/2/3/4/5 for the real time analysers.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

4.1 THE CEL-200 SERIES SIMPLE SOUND LEVEL METERS

The CEL-200 Series includes the CEL-231 and CEL-254 sound level meters designed as low cost and simple to use digital sound level meters. These meters are ideal for the user who is new to noise measurement and those who only require an overall reading of the noise level to gain a better understanding of a noise problem.

The CEL-200 series are ideal instruments for simple workplace noise monitoring or general checks of noise levels from machines or from fire alarms etc. They feature the 'A' frequency weighting which simulates the typical hearing response of humans and have the Slow and Fast time weightings as specified in many international standards. The CEL-200 series are designed and manufactured to satisfy the accuracy requirements of the international standards in the type 2 classification. Noise measurements are performed over the range 30 to 135 dB in two overlapping 70 dB ranges covering the most popular levels typically encountered.

An output socket provides the ac and log dc analogue signals that can be fed to other recording devices. Power for the two instruments is provided from 4 AAA alkaline batteries for up to 20 hours continuous operation.

The CEL-231 measures and displays the instantaneous sound pressure level on a large liquid crystal display. The display is updated 3 times a second and the meter is best suited for reading steady noise levels from such sources as pumps, fans or compressors. A low battery indicator in the display warns the user when the batteries need to be replaced.

The CEL-254 instrument has all the capabilities of the CEL-231 meter with the added benefit of a maximum hold facility to capture the highest level during the reading. The Impulse time weighting is also provided together with an on screen overload indicator that warns of any noise readings above the current range of the instrument. The battery voltage level is switch selectable to allow the operator to monitor the condition of the batteries at any time during the measurements. In addition to the standard 'A' weighting the CEL-254 is also provided with the 'C' broadband weighting allowing the meter to be used for a wider range of measurement tasks that call for both 'A' and 'C' frequency weightings.

CEL-200 Series

Specification

Feature	CEL-231	CEL-254
Accuracy IEC 60651 & ANSI S1.4	Type 2	Type 2
Microphone type	1/4 inch fixed electret	1/4 inch fixed electret
Total measurement range (dB)	30 to 135	30 to 135
Measurement ranges (dB)	30 to 100, 65 to 135	30 to 100, 65 to 135
Frequency weighting	A	A & C
Time weighting	Slow & Fast	Slow, Fast & Impulse
Measured parameter	Instantaneous level	Instantaneous level
Maximum level	Overload detector	Yes
Display	3 1/2 digit LCD, 12.7 mm character height	3 1/2 digit LCD, 12.7 mm character height
Analogue ac output	7.25 V rms at FSD	7.25 V rms at FSD
Analogue dc output	25 mV/dB	25 mV/dB
Powered by	4 x AAA batteries	4 x AAA batteries
Typical battery life (hours)	20	20
Low battery indicator	Yes	Yes
Size mm (in)	258 x 70 x 21 (10 x 2 3/4 x 7/8)	258 x 70 x 21 (10 x 2 3/4 x 7/8)
Weight gm (oz)	230 (8 1/4)	230 (8 1/4)

Ordering Information

CEL-231	Digital sound level meter
CEL-254	Digital impulse sound level meter

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

4.2 THE CEL-300 SERIES DOSIMETERS AND SOUND LEVEL METERS

The CEL-300 Series includes the CEL-320 and CEL-360 dosimeters which can be converted to the CEL-320S and CEL-360S sound level meters by simply exchanging the cable microphone assembly for a traditional stalk microphone and preamplifier. They are the ideal instruments for any form of personal worker surveys when considering the possible risk of hearing loss in the workplace. Conversion to a compact sound level meter enables comprehensive noise measurements to be carried out with the possibility of storage of the results for later recall from memory. Using the logging capabilities of the CEL-360 a medium term data recording system can be realised in conjunction with a small weatherproof enclosure and battery pack.

When used as noise dosimeters the CEL-320 and 360 are the ideal solutions to personal workplace monitoring and comply with all the current requirements of the European ISO and American OSHA and ACGIH methodologies. The instruments feature a wide 30 to 140 dB total measurement range in three 70 dB spans. They have the 'A' and 'C' frequency weightings and have the Slow, Fast and Impulse time weightings and can measure with the Q = 3, 4 5 and 6 dB exchange rates.

The CEL-320 personal noise dosimeter is the ideal instrument for straightforward dosimetry measurements having 7 pre-programmed measurement setups included to suit the most popular protocols used throughout the world. The dosimeter remembers the last used setup and so it is ready to start monitoring as soon as it is switched on. Simply perform a field calibration, fit the unit to the operator and start the run. The dosimeter keypad can be locked to prevent tampering during the measurement and once fitted over a belt or in a pocket the unit will collect the noise data completely automatically. At the end of the required measurement period remove the dosimeter and readout the overall levels in the required units.

Two threshold levels and a single criterion level are provided and the unit produces results that include the measured dose, the 8-hour projected dose, the time weighted average level, measured time weighted average level, maximum, minimum and peak levels. Five user selectable statistical or exceedance levels provide a breakdown of the variability of the noise during the run and the total duration is recorded for the whole of the measurement.

Variations to the included standard setups are made using a Casella CEL software package, (dB10) allows changes to threshold, criterion levels and parameters. It can be set to lock the dosimeter setup so that it cannot be altered from the keypad. This ensures foolproof operation even by untrained staff. Once a dosimeter is configured it cannot be altered by unauthorised users, thereby ensuring integrity of the measured results. There is storage space in the dosimeter for up to 50 complete runs before results need to be downloaded to a computer or directly printed.

CEL-300 Series

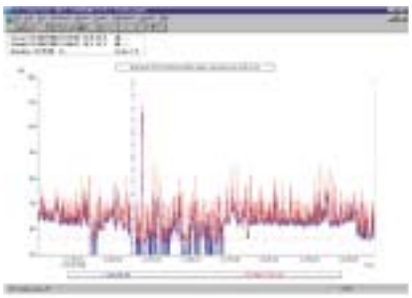
The CEL-360 contains all of the features of the simpler CEL-320 plus it has the important additional facilities that use the real time calendar clock function for automatic measurements so that runs can be carried out unattended. Fixed duration timers provide standardised measurement run times so that it is only necessary to start a run using the keypad and then the instrument will stop measuring when the chosen duration time is reached. Once a pair of start and stop timers are set the CEL-360 can be set to work with up to 49 repeats at the same times to collect identical sets of results over a consecutive number of days.

Additional storage space is provided in the memory of the CEL-360 to allow in excess of 220,000 profile data points to be saved during the runs. Up to 10 parameters can be selected at intervals ranging from 1 second to 1-hour resolution. Any single run can have up to 99,999 period intervals attached to it and these time history profiles can be downloaded to the enhanced computer program to allow the occupational hygienist or environmental engineer to study the variations in the noise levels during the run.

Both the CEL-300 series dosimeters can be converted into comprehensive hand held sound meters by removing the cable microphone assembly and substituting the stalk microphone assembly in its place. All of the features outlined above are still present with the added advantage that for simplicity the dosimeter functions such as noise dose and TWA results can be disabled from the computer software program.

Intrinsically safe versions of the instruments are available meeting the requirements of EEx ia IIC T4 to EN50020, certificate number Ex97E2110X. This makes the Casella CEL dosimeters and sound level meter versions particularly suitable for use in hazardous areas such as flourmills, printing works, petro chemical plants and other areas that require safe monitoring instruments.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490



Example of the time history profile graph showing two noise parameters Leq and Lmax simultaneously

Example of the instrument Setup screens

WINDOWS SOFTWARE FOR THE CEL-300 DOSIMETERS

Introduction

The CEL-6702 and CEL-6704 software packages are designed to be used in conjunction with the CEL-320 and CEL-360 range of noise dosimeters and sound level meters. It allows instruments to be pre configured with the most appropriate settings for a variety of measurement protocols and result download to a PC. The CEL-6702 (DB10) is the text version supplied as standard with the CEL-320 kits, whilst the CEL-6704 (DB12) is the graphical and reprocessing package supplied as standard with the CEL-360 kits.

Simply connect the dosimeter to the serial comm port of a standard computer running MS Windows and choose from a list of stored Runs. Runs can be downloaded one at a time or in groups and saved in a datafile directory for further inspection and manipulation.

The overall Run data can be viewed in a standard report format which allows the user to inspect the noise exposure measurements quickly and easily.

When the measurements have been made with a CEL-360 Logging dosimeter up to two profiles may be recorded and inspected to see the time history of the varying levels.

A built in word processor is provided as standard to allow for the simple preparation of report ready documents containing all the necessary graphics and text.

The software also allows the dosimeters to be configured from the computer. A setup file can be sent to the instrument to carry out measurements according to user specified methodologies.

Three user setups are available to transmit to an instrument together with the four factory default setups.

Key Features

- Windows 95, 98, NT, ME, 2000, XP compatible
- provides download capability of the results at the end of a run
- shows the noise results as graphs or text screens
- time history profile noise level data can be exported to an external spreadsheet package such as MS Excel
- recalculate time average levels defined by cursors
- calculate any percentile values from histogram data
- load user defined setups to the instruments for special measurements
- change Y axis scale and alter the colour scheme to suit preferences
- features a built in word processor to allow user specified hard copy output to attached printers
- save customised reports in RTF format for import into word processors such as MS Word

Specification	CEL-320 (CEL-320S)	CEL-360 (CEL-360S)
IEC 60651 – 1979 Type 2* IEC 60804 – 2000 Type 2* ANSI S1.4 – 1983 Type S(1)* ANSI S1.3 – 1997 –* * temperature range 0˚ to 40 ˚c		
IEC 1252, ANSI S1.25	Noise dosimeter	Noise dosimeter
Total measurement range (dB)	30 to 140 in 3 ranges	30 to 140 in 3 ranges
Measurement ranges	30 to 100 50 to 120 70 to 140	30 to 100 50 to 120 70 to 140
Frequency weightings rms	A & C	A & C
Frequency weightings peak	C & Lin (Z)	C & Lin (Z)
Time weightings	Slow, Fast & Impulse	Slow, Fast & Impulse
Amplitude weightings Q	3, 3+4, 3+5 & 3+6	3, 3+4, 3+5 & 3+6
Measured Parameters, Dosimeter mode x = amplitude weighting y = time weighting z = amplitude weighting	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Lxyavz, Dose%, Proj dose%, $L_{EP,d}$, 5 x LN%, Pa^2hr, TWA, Duration	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Lxyavz, Dose%, Proj dose%, $L_{EP,d}$, 5 x LN%, Pa^2hr, TWA, Duration
Thresholds 70 to 90 (dB)	2 settable in 1 dB steps	2 settable in 1 dB steps
Criterion 80 to 90 (dB)	1 settable in 1 dB steps	1 settable in 1 dB steps
Measured parameters, Sound meter mode x = frequency weighting y = time weighting z = amplitude weighting	Lxy, Lxyeq, Lxyavz, LxE, Lxymx, Lxymn, Lxpk, Duration	Lxy, Lxyeq, Lxyavz, LxE, Lxymx, Lxymn, Lxpk, Duration
Runs stored	50	50
Profiles available	None	At least 220,000
Parameters per profile	None	Up to 10 maximum
Default setups	7 predefined from OSHA, MSHA, DoD, ACGIH, ISO85, ISO90, METER	7 predefined from OSHA, MSHA, DoD, ACGIH, ISO85, ISO90, METER
User setups	13 available using CEL software	13 available using CEL software
Fixed elapsed timers	None	5, 10, 15, 30, 60 min, 2, 4, 8, 12, 16, 24 hours
Delay timers	None	16 pairs of start and stop times up to 31 days in advance
Calibration information	Stores pre and post run calibration date/time and level	Stores pre and post run calibration date/time and level
Pause during run	Yes	Yes
Security lockout	Yes via keypad or software	Yes via keypad or software
Output - parallel	Preformatted report direct to printer via adaptor	Preformatted report direct to printer via adaptor
Output - serial	Control, Setup, Download from CEL software package	Control, Setup, Download from CEL software package
Power supply	9 V battery	9 V battery
Battery life (hours)	>40	>40
Size mm (in)	120 x 65 x 30 (4.8 x 2.6 x 1.2)	120 x 65 x 30 (4.8 x 2.6 x 1.2)
Weight gm (oz)	220 (8)	220 (8)

Ordering Information

CEL-320	Noise dosimeter with remote cable microphone c/w dB10 control & download software and PC cable
CEL-320X	Noise dosimeter with remote cable microphone
CEL-320S	Sound level meter with stalk microphone c/w dB10 control & download software and PC cable
CEL-320SX	Sound level meter with stalk microphone
CEL-360	Logging noise dosimeter with remote cable microphone c/w dB12 control & download graphics software and PC cable
CEL-360X	Logging noise dosimeter with remote cable microphone
CEL-360S	Logging sound level meter with stalk microphone c/w dB12 control & download graphics software and PC cable
CEL-360SX	Logging sound level meter with stalk microphone
CEL-6702	dB10 control and download software for MS Windows
CEL-6704	dB12 control and download and graphics for MS Windows

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

4.3 THE CEL-400 SERIES CLASSIC SOUND LEVEL METERS

The CEL-400 series consists of 12 versions based on a common instrument platform that provide a comprehensive family of sound level meters. The multi function meters satisfy many of the classical requirements for sound level meters to measure broadband noise levels in terms of the ‘A’ weighted results. They can also be used to analyse tonal noises into whole octave or third octave frequency bands. Designed to fulfil the international requirements as a type 1 or type 2 instrument (depending on the microphone assembly in use) the CEL-400 series meters are easy to use and versatile in their operation.

CEL-400 Series

Two main instrument types are available, called the CEL-440 and the CEL-480 with the latter being a logging version of the simpler CEL-440 meter.

The CEL-440 has a large dot matrix graphical display giving the user a logical, clear display of up to 5 of the main noise parameters at the same time. A concise menu system enables the operator to navigate through the various instrument options. Text menus are available in 5 major languages to localise the instruments for English, French, German, Italian and Spanish speaking areas. A factory default setup and up to 4 user definable set-ups are available for every operating mode in each instrument to configure the meter to carry out repetitive tasks quickly and easily. Icons are used in the display to guide the new and experienced user through the operations and results are displayed clearly and concisely with appropriate abbreviations to satisfy the latest draft of the international sound level meter standards.

The instantaneous level is displayed together with up to four secondary parameters chosen by the user. The broadband ‘A’, ‘C’ and ‘Z’ (unweighted) weightings are available together with the Slow, Fast and Impulse time weightings for the rms. Levels. A peak detector with both the ‘C’ and ‘Z’ frequency weighting is available as a separate channel. Calculated values include the maximum, minimum and time average levels Leq, Lavg (when Q=5 is selected) and single event level. 5 user definable statistical levels with 0.1% resolution can be measured with default settings of L10%, L50%, L90%, L95% and L99%.

Measurements are stored as separate runs and every instrument can save up to 999 sets of results in a large non-volatile 512kb memory. A real time calendar clock tags all runs with the start date and time to the nearest second so that any individual run can be quickly identified at the time of data recall. A pause control allows unwanted sound to be excluded from the middle of a run and runs can be reset or stopped when completed.

The CEL-480 Logging versions of the sound level meters feature the added advantage of regular interval recording based on short to medium length periods from 1 minute to 1 hour. Up to 9999 periods can be stored per run. For even greater detail the CEL-480 is fitted with a system that allows very short time history profiles to be recorded in addition to the period data sets. Two noise profiles from 1 second to 1 minute can be saved up to a maximum of over 220,000 values. A standard computer package is provided with every CEL-480 instrument that allows run data to be downloaded to a Microsoft Windows computer operating system. This is an optional extra for the CEL-440 models.

Outputs from the CEL-400 series include an unweighted analogue signal suitable for audio tape recording and a digital output suitable for connection to computers and, via an interface adaptor, to a standard office parallel printer. An electrical input connector is provided to allow signals from DAT tape recorders to be analysed after the event when recordings have been made using other instruments.

Also for long term monitoring GSM communication can be used to remove the requirement of site visits to retreive data.

WINDOWS SOFTWARE FOR CEL-400 SERIES SOUND LEVEL METERS

Introduction

The CEL-6726 and CEL-6727 software packages are designed to be used in conjunction with the CEL-440 and CEL-480 range of sound level meters. The CEL-6726 (DB21) is the text version whilst the CEL-6727 (DB22) is the graphical and reprocessing package.

The dB22 software is used to provide a download capability for the CEL-400 sound level meter family following completion of measurement runs. Simply connect the sound level meter to the serial comm port of a standard computer running MS Windows and choose from a list of stored Runs. Files can be downloaded one at a time or in groups and saved in a data directory for further inspection and manip-ulation.

The broad band Run data can be viewed in a wide variety of ways to allow the user to inspect the measurement graphically in the form of the overall result, the period results and any time history profiles that may have been recorded.

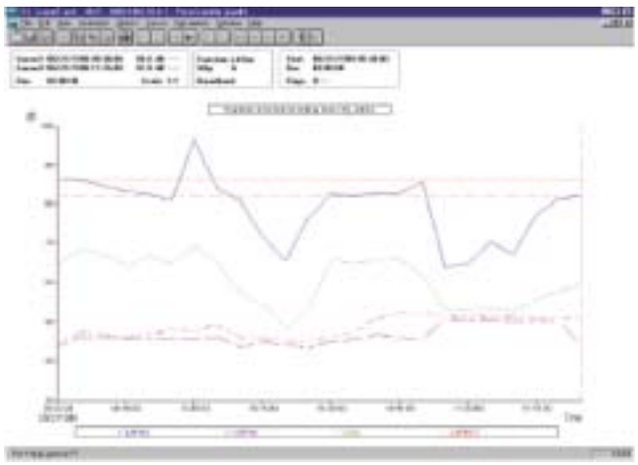
Where octave or third octave band spectra have been recorded it is possible to view the records in terms of level against frequency or level against time for a chosen frequency band.

Options are provided to add a title to the graphs and to alter the scale and colour schemes to personalise the displayed results as required.

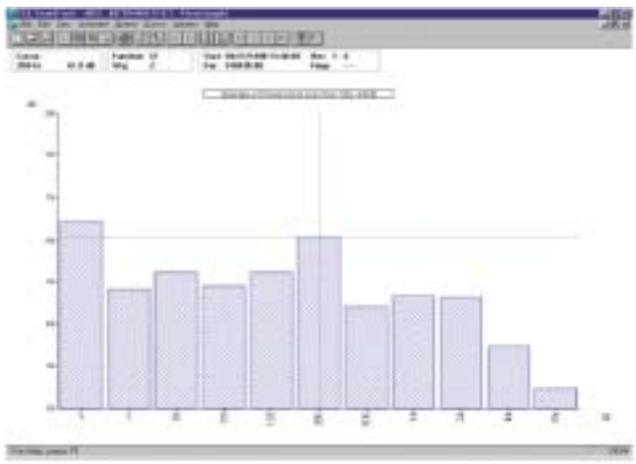
Run results can also be viewed as text and can be exported as simple ASCII format files to allow the data to be used in spreadsheet programs when further re-calculation or data manipulation is needed. A built in word processor is provided to allow the full preparation of report ready documents containing all the necessary graphs and text.

Key Features

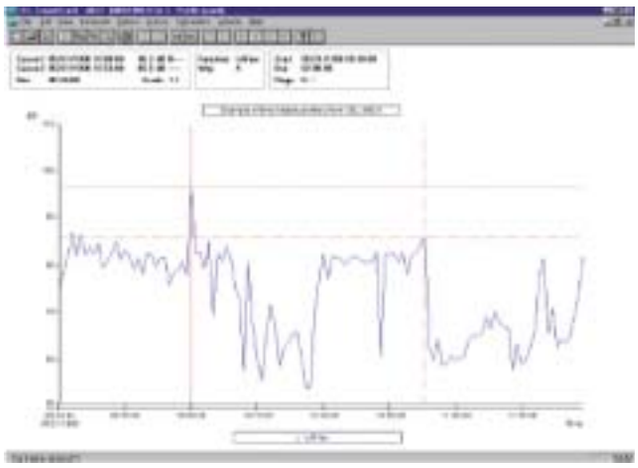
- Windows 95, 98 compatible
- Provides download capability for the results at the end of a run
- Shows the noise results as graphs or text screens
- Enables noise level data to be exported to an external spreadsheet package for further recalculation
- Can be used to show broad band data and octave or third octave band results
- Changes Y axis scale and alters the colour scheme to suit preferences
- Features a built in word processor to allow user specified hard copy output to attached printers



Example of the Period Profile result screen showing up to four noise parameters simultaneously



Example of the Octave band screens



Example of a time history profile recording

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

Specification	CEL-440	CEL-480
IEC 60651 – 1979 Type 1 & 2 IEC 60804 – 2000 Type 1 & 2 ANSI S1.4 – 1983 Type S(1) & S(2)	Type 1 & 2 Sound level meter	Type 1 & 2 Sound level meter
Total measurement range (dB)	10 to 140 in 7 ranges	10 to 140 in 7 ranges
Frequency analysis range	31 Hz to 8 kHz Octaves, 25 Hz to 12.5 kHz 1/3 Octave	31 Hz to 8 kHz Octaves, 25 Hz to 12.5 kHz 1/3 Octave
Measurement ranges	10 to 80 20 to 90 30 to 100 40 to 110 50 to 120 60 to 130 70 to 140	10 to 80 20 to 90 30 to 100 40 to 110 50 to 120 60 to 130 70 to 140
Frequency weightings rms	A, C & Z (Lin)	A, C & Z (Lin)
Frequency weightings peak	C & Z (Lin)	C & Z (Lin)
Time weightings	Slow, Fast & Impulse	Slow, Fast & Impulse
Amplitude weightings Q	3, 3+4, 3+5 & 3+6	3, 3+4, 3+5 & 3+6
Measured Parameters, Broadband mode x = frequency weighting y = time weighting z = amplitude weighting	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Ltm3, Ltm5, Lxyavz, $L_{EP,d}$, 5 x LN%, TWA, Duration	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Ltm3, Ltm5, Lxyavz, $L_{EP,d}$, 5 x LN%, TWA, Duration
Measured parameters, Frequency analysis mode x = frequency weighting y = time weighting	Lxy, Lxyeq, Lxymx Duration	Lxy, Lxyeq, Lxymx Duration
Runs stored	999	999
Periods per run	None	9999
Parameters per period	None	Up to 14
Period times	None	1, 5, 10, 15, 20, 30 sec, 1, 5, 10, 15, 30, 60 min
Profiles available	None	At least 220,000
Profile times	None	1, 5, 10, 15, 30, 60 sec
Parameters per profile	None	Up to 2
Histogram for run	145 cells at 0.5dB class width	145 cells at 0.5dB class width
Default set-ups	1 for each operating mode	1 for each operating mode
User setups	4 user setups for each mode	4 user setups for each mode
Fixed elapsed timers	None	1, 5, 10, 15, 20, 30, 60 min, 2, 4, 8, 12, 24 hours
Delay timers	None	7 pairs of start and stop times up to 31 days in advance
Calibration information	Stores pre and post run calibration date/time	Stores pre and post run calibration date/time
Pause during run	Yes	Yes
Output - parallel	Preformatted report direct to printer via adaptor	Preformatted report direct to printer via adaptor
Output - serial	Download to CEL software package	Download to CEL software package package
Power supply	4 x AA batteries	4 x AA batteries
External power supply	12 V dc at 150 mA	12 V dc at 150 mA
Battery life (hours)	25hrs in Broadband	25hrs in Broadband
GSM communication	Optional	Optional
Size mm (in)	340 x 100 x 40 (13.5 x 4 x 1.5)	340 x 100 x 40 (13.5 x 4 x 1.5)
Weight gm (oz)	500 (17)	500 (17)
Tripod socket	1/4 inch Whitworth	1/4 inch Whitworth

Ordering Information

CEL-440.A1	Sound level meter (Type 1)	CEL-480.A1	Logging sound level meter (Type 1)
CEL-440.B1	Octave band sound level meter (Type 1)	CEL-480.B1	Logging octave band sound level meter (Type 1)
CEL-440.C1	Third octave and octave band sound level meter (Type 1)	CEL-480.C1	Logging third octave and octave band sound level meter (Type 1)
CEL-440.A2	Sound level meter (Type 2)	CEL-480.A2	Logging sound level meter (Type 2)
CEL-440.B2	Octave band sound level meter (Type 2)	CEL-480.B2	Logging octave band sound level meter (Type 2)
CEL-440.C2	Third octave and octave band sound level meter (Type 2)	CEL-480.C2	Logging third octave and octave band sound level meter (Type 2)
CEL-6726	dB21 download and export Windows software		
CEL-6727	dB22 download, export and graphing Windows software		

Note: that all CEL-480 meters are supplied with dB21 download software and PC cable.

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

4.4 THE CEL-500 SERIES REAL TIME ANALYSERS

The CEL-500 series of real time analysers is based on the power of digital signal processing (DSP) techniques to provide simultaneous measurements of the entire frequency domain parameters required in a top of the range instrument. The common hardware platform supports a wide range of possible configurations allowing models to be upgraded when different options and applications are required. Three basic versions exist in three standard bandwidths, designated by the suffix A, B or C. These provide broadband only, broadband and octave band and broadband, octave and third octave band analysers respectively. The three versions offer different data storage options in the form of manual only, manual plus automatic and manual plus automatic plus event recording.

Each instrument features a large dot matrix display with backlight plus a simple keypad with a minimum of keys. Menus control the instruments and context sensitive commands are displayed depending on the operator's selected choice. Localisation is available in 5 major languages for the menu screens to assist users in the correct operation of the instrument. The modular design of key components allows an instrument to be configured with the required hardware to satisfy almost all typical users' needs. Interchangeable input amplifiers control the accuracy standards; output modules control the way the instruments communicate with external equipment.

The DSP technology allows the user to simultaneously select 2 broadband frequency weightings from a choice of 'A', 'C' or 'Lin', two time weightings from a choice of Slow, Fast or Impulse and two amplitude weightings (Q exchange rate) from a choice of 3, 4, 5 or 6. In octave band mode 11 full octave bands from 16Hz to 16kHz are calculated and displayed on the large 128 by 192 pixel screen. In third octave band mode the range extends from 12.5Hz to 20kHz bands making a total of 33 bands in all. Two simultaneous broadband levels can be measured at the same time allowing both the overall level and the detailed frequency analysis to be obtained in parallel in either frequency analysis mode.

Three main models are available offering completely manual storage of data under the control of the operator, using the clock function to add a regular logging facility for extended runs and an event based data capture using a threshold level exceedance to store significant noise levels. Any of the main models can be fitted with a rapid data storage option called Fastore (included as standard with the CEL-593 instruments) that will save spectra at up to 100 screens per second. This is ideal for the analysis of transient noises such as aircraft over flights or impulsive signals from gunfire or blasting. The parallel nature of the data capture is ideal for the collection of spectral information when investigating building acoustics in enclosed spaces such as

CEL-500 Series

cinemas or concert halls. Transmission loss and reverberation time data can be gathered very quickly saving time and simplifying the process when out in the field. Sound quality measurements in terms of the measurement of Loudness enable the analysers to be used for the quantitative assessment of noise from such sources as vehicles without relying on the subjective impression of a human observer. Finally, versions of the type 1 analysers are available with dual range preamplifiers which allow broadband measurements over a 100 dB dynamic range for extended environmental data logging situations. Extensive remote control and data transfer options are built in to allow an operator to view noise results at a distance in real time and stored on the local hard disk of the controlling computer.

The CEL-553 is the basic analyser with manual data storage. It is ideal for factory noise surveys and enables a user to store up to 999 runs each of which can contain up to 9999 snapshot records. The timing for each record can be controlled by the operator or can be set to be a fixed time interval from 0.5 second to 1 hour. A typical factory can be surveyed very quickly and a comprehensive noise map produced using the data from the CEL-553 model. For the engineer concerned with noisy products or processes the CEL-553 is fitted with third octave filters enabling a full analysis to be carried out around a machine for the determination of sound power levels or for noise reduction purposes. Using the octave band mode it is possible to investigate heating and ventilation problems and compare results against noise rating or noise criterion curves.

The CEL-573 model has all of the features of the CEL-553 model and adds the benefits of automatic data storage and statistical L_N Values. This is implemented by using the built in real time calendar clock to set fixed intervals for the data capture. Each run can have up to 9999 regular periods that can be from 0.5 second to 1 hour in duration. Runs can be programmed using delay timers to begin and end without the operator needing to be present and a repeat facility allows similar data sets to be collected over many days or weeks. In the broadband mode a 1 second profile of either the maximum level or the Leq can be stored to provide a built in level recorder trace of the noise trends during a run.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

The CEL-593 has all of the features of the CEL-553 and CEL-573 models and adds a comprehensive event based detection system to the environmental mode found in the CEL-573 analyser. Using the event recording a threshold level can be set in 1 dB steps within the chosen measurement range such that the analyser will store only the contribution to the overall level whenever a significant noise occurs. This is saved with the start time, duration, and maximum level and energy contribution such that its effect can be determined on the regular period answer for the Leq. Information gathered in either octave or third octave band modes gives a spectrum of the event noise that can then be used to identify the source. This is particularly useful if linked to a suitable DAT tape recorder system for an audio analysis of what occurred. In addition the CEL-593 models are equipped with the Fastore mode for extra detail of transient noise analysis.

The CEL-553/573/593.100 Dual range analysers are enhanced versions of the standard models and feature a new wide range preamplifier that allows broadband measurements to be made over a 100 dB dynamic range for 'A' or 'C' weighted recordings in the Logging mode. This is a combination of the environmental and event modes found in the CEL-593 models with additional control over the triggering of events and the ability for the analyser to be connected in real time to a remote computer. Connection can be made via a direct cable link or by radio modems or GSM modems as appropriate to the local conditions. Runs can be started and downloaded whenever required rather than only at the end of a measurement and the current levels can be viewed on the computer in real time. This makes the models suitable for long term applications away from the readout position when monitoring construction sites or transportation noises such as airports. In industrial situations the third octave band results can be viewed on the external computer for such tasks as engine test cell monitoring and other similar situations. The real time data can be stored on the local computer hard disk as a simple text file that can subsequently be loaded into a spreadsheet program for further calculations.

The modular design of the CEL-500 series allows a unit to be upgraded to grow with the user. Even the simplest CEL-553 meter can be transformed into a comprehensive CEL-593 by a simple firmware upgrade process available from approved Casella CEL customer service departments around the world. Upgrades include model enhancements, frequency analysis enhancements and application improvements. The following application options are available for specific measurement applications.

Fastore Option - A rapid data capture mode that allows storage of samples as fast as 200 per second in broadband mode or 100 spectra per second in narrow band mode. Ideally, suited to the measurement of transients such as gunshots, impulses, aircraft flyovers etc.

Building acoustics Option - Capture measurements simply and easily to obtain the reverberation times in rooms or the transmission loss across a partition. Up to 20 measurement positions can be setup in the meter together with the measurement duration at each position. The system will control a suitable pink noise generator such as the CEL-513 to turn on and off the noise signal at the correct time to synchronise with the capture of the decay curves. Alternatively, the system can be used with an impulse source such as a pistol or balloon and will trigger above a fixed threshold level.

Loudness Option - The assessment of the affects of noise on humans is a complex process. Attempts to quantify these affects have often resulted in a frequency correction called the 'A' weighting curve. This weighting is applied equally to all levels of noise. While this is a satisfactory approach for checking compliance with many standard measurement protocols, studies have shown that the perceived impression of a sound is dependent both upon its frequency and its amplitude. A more meaningful psycho-acoustic unit requires considerably more processing power. Up until now these kinds of results have largely been limited to large and sophisticated laboratory analysers. The advent of a Digital Signal Processor based analyser in the form of a low-cost, hand-held, battery-operated unit now offers users a convenient means of measuring the sound quality in terms of the Loudness of the sound - in real time - under field conditions, on the production line or in the laboratory.

Loudness is a means of combining, frequency and amplitude dependent variables to give a single number descriptor of the sound quality of a noise. Loudness provides an objective measurement rather than a subjective measurement - one that is considered a closer approximation to the human perception of sound than other single number units such as the 'A' weighted overall level.

The loudness option when fitted into C versions of the CEL-500 series allows measurements to be made in Sones and Phons and offers a fully portable sound quality package that can be used for the analysis of automotive vehicles, aircraft passenger cabins, domestic white goods etc. In fact any noise that needs to be assessed for quality or acceptability can be tackled by the CEL Loudness option. Results are available for the overall 'A' and Linear spectrum and all the 1/3 octave filter bands are stored for archival purposes.

Logging Option - The Logging option converts a standard CEL-500 series instrument into a long-term instrument with a wide 100 dB dynamic range in broadband mode and 75 dB in narrow band mode. A specially designed preamplifier, the CEL-526, features a built-in heater element to keep the microphone from being affected by moisture and is powered when the meter is connected to an external 12 V dc supply. Period data can be collected in terms of daily, hourly values and a comprehensive threshold event recognition system logs the exceedance levels above user selectable dB levels. Remote operation from a personal computer allows runs to be started and stopped and results downloaded without having to visit the measurement site where a permanent power supply is available.

WINDOWS SOFTWARE FOR CEL-500 SERIES SOUND LEVEL METERS

Introduction

The CEL-6694 and CEL-6695 software packages are designed to be used in conjunction with the full range of 500 series range of sound level meters. The CEL-6694 (dB1) is the text version whilst the CEL-6695 (dB2) is the graphical and reprocessing package.

The dB2 software is used to provide a download capability for the CEL-5X3 real time analyser family following completion of measurement Runs. Simply connect the instrument to the RS232 serial comm port of a standard computer running MS Windows and choose from a list of stored Runs. Files can be downloaded one at a time or in groups and saved in a data directory for further inspection and manipulation.

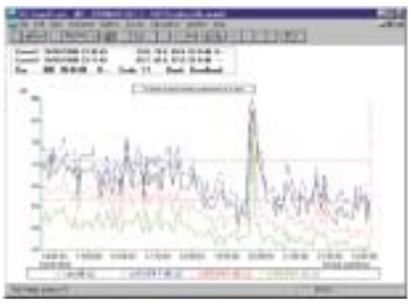
The broad band Run data can be viewed in a wide variety of ways to allow the user to inspect the measurement graphically in the form of the overall result, the period results and any time history profiles that may have been recorded.

Where octave or third octave band spectra have been recorded it is possible to view the records in terms of level against frequency or level against time for any chosen band. Options are provided to add a title to the graphs and to alter the scale and colour schemes to personalise the displayed results as required.

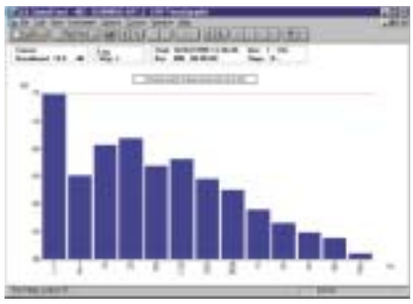
Run results can also be viewed as text and can be exported as *.wk1 format files to allow the data to be used in external spreadsheet programs when further re-calculation or data manipulation is needed. A built in word processor is provided to allow the full preparation of report ready documents containing all the necessary graphs and text.

Key Features

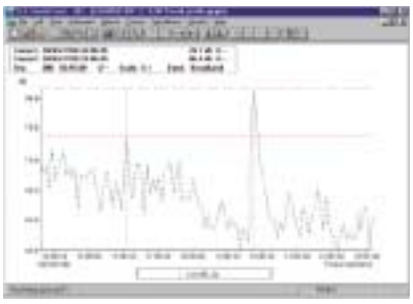
- Windows 95, 98, NT, 2000, ME compatible
- For the SLM, ENV and EVT modes
- Provides download capability for the results at the end of a run
- Shows the noise results as graphs or text screens
- Enables noise level data to be exported to an external spreadsheet package for further recalculation
- Can be used to show broad band data and octave or third octave band results
- Changes Y axis scale and alters the colour scheme to suit preferences
- Features a built in word processor to allow user specified hard copy output to attached printers



Example of the Period Profile result screen showing up to four noise parameters simultaneously



Example of the Octave band screens



Example of a time history profile recording

WINDOWS SOFTWARE FOR CEL-500 SERIES FASTORE APPLICATION

Introduction

The CEL-6696 software is designed for use in conjunction with the CEL-553, 573 and 593 range of real time analysers in the Fastore mode.

The dB3 software is used to provide a download capability for the CEL-5X3 real time analyser family following completion of Fastore measurement Runs. Simply connect the instrument to the RS232 serial comm port of a standard computer running MS Windows and choose from a list of stored Runs. Files can be downloaded one at a time or in groups and saved in a data directory for further inspection and manipulation.

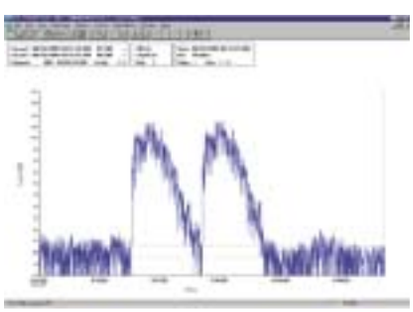
The broad band Run data can be viewed in a wide variety of ways to allow the user to inspect the measurement graphically in the form of the individual event results and the time history profiles that have been recorded.

Where octave or third octave band spectra have been recorded it is possible to view the records in terms of level against frequency or level against time for any chosen band. Options are provided to calculate Leq and SEL results for any user selected period from the profile data. Simple RT60 values can also be calculated.

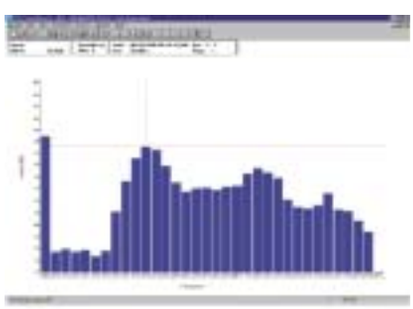
Run results can also be viewed as text and can be exported as ASCII *.txt format files to allow the data to be used in external spreadsheet programs when further re-calculation or data manipulation is needed. A built in word processor is provided to allow the full preparation of report ready documents containing all the necessary graphs and text.

Key Features

- Windows 95, 98 compatible
- For the FST mode
- Provides download capability for the results at the end of a run
- Shows the noise results as graphs or text screens
- Enables profile noise level data to be exported to an external spreadsheet package for further recalculation
- Can be used to show broad band data and octave or third octave band results
- Features a built in word processor to allow user specified hard copy output to attached printers
- Runs can be started and stopped remotely from the PC



Example of the Profile result screen for the 1/3 octave band of the event



Example of the third octave band result screen

Example of a time history profile results exported to a spreadsheet

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

WINDOWS SOFTWARE FOR CEL-500 SERIES BUILDING ACOUSTICS

Introduction

The CEL-6697 software is designed for use in conjunction with the CEL-553, 573 and 593 range of real time analysers in the Building Acoustics mode.

The dB4 software is used to provide a download capability for the CEL-5X3 real time analyser family following completion of measurement runs. Simply connect the instrument to the RS232 serial comm port of a standard computer running MS Windows and choose from a list of stored runs. Files can be downloaded one at a time or in groups and saved in a data directory for further inspection and manipulation.

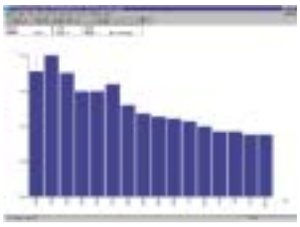
The broad band run data can be viewed in a wide variety of ways to allow the user to inspect the measurement graphically in the form of the decay times, the decay profile results, the source room levels, the receive room levels and any background level measurements.

Many international standards are covered in the software utilising the downloaded results, such as ISO-140, ISO-717, ASTM E336, ASTM E413 etc. Details of the rooms can be entered for the volume and surface area to calculate relevant parameters. Options are provided to control the starting and stopping of measurement runs remotely from a PC or to select a new Setup.

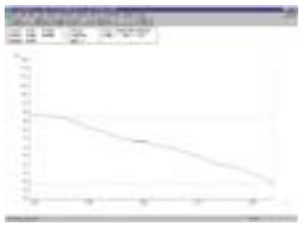
Run results can also be viewed as text and can be cut and pasted to allow the data to be used in external spreadsheet programs when further re-calculation or data manipulation is needed. A built in word processor is provided to allow the full preparation of report ready documents containing all the necessary graphs and text.

Key Features

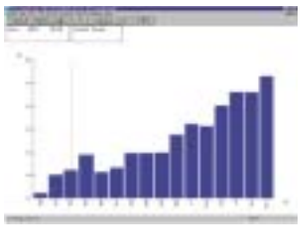
- Windows 95, 98 compatible
- For the RTC, RTI, TMS & RCS modes
- Provides download capability for the results at the end of a run
- Shows the noise results as graphs or text screens
- Enables noise level data to be cut and pasted to an external spreadsheet package for further recalculation
- Can be used to show broad band data and octave or third octave band results
- Controls the collection of data remotely from the PC
- Features a built in word processor to allow user specified hard copy output to attached printers



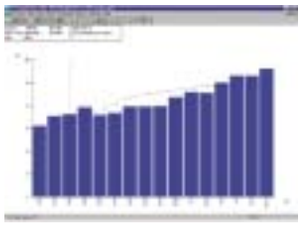
Example of the decay time result screen showing 1/3 octave band values from 100 Hz to 3k15 Hz



Example of the 160 Hz to 1/3 octave decay curve



Example of the transmit minus receive noise levels



Example of the Dnt,w result from ISO-717 Part 1

DB5 WINDOWS SOFTWARE FOR THE CEL-500 SERIES ANALYSERS WITH EXTENDED LOGGING

Introduction

The CEL-6701 software is designed to be used in conjunction with the dual range versions of the CEL-5X3.100 range of Real Time Analysers.

The dual range versions of this series analysers are available with the capability to perform long term noise measurements over an extremely wide 100 dB range.

dB5 software is a Windows based program that enables the analysers to be set-up remotely from the master computer where all of the key settings of the instrument can be changed remotely.

Settings can be saved in the user configured memories of the instrument for use at a later stage.

The microphone heater in the CEL-526 preamplifier can be remotely controlled from the software to provide the system with some extra protection against adverse weather conditions.

A measurement run can be started and stopped from the instrument's keypad or remotely from the computer.

At any time during the run the results up to that time can be downloaded to the computer running dB5 software.

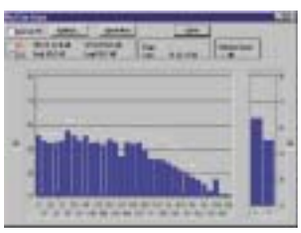
During the run the real time noise levels can be viewed on the PC screen as a time history trace.

Both the Leq and the instantaneous levels are available at a rate of 20 samples per second for broad band recordings.

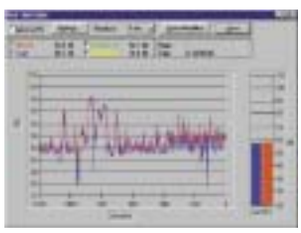
Key Features

- Windows 95, 98 compatible
- Provides setup capability for the instrument prior to a run
- Provides download capability for the results during or at the end of a run
- Provides a remote real time trace of noise levels on the PC screen
- Enables noise level data to be exported to an external spreadsheet package for graphing and recalculation
- Narrow band recordings in octaves or third octaves can be viewed at a rate of two complete spectra per second. These samples can be saved to the hard disk in the PC for further analysis if required.

Example of the Setup and Profile result screens



Example of the Real Time screens



Example of level against time trace

Specification	CEL-553	CEL-573	CEL-593
IEC 60651 – 1979 IEC 60804 – 2000 ANSI S1.4 – 1983	Type 1 & 2 Real time analyser	Type 1 & 2 Real time analyser	Type 1 Real time analyser
Third party Approvals (PTB type 1)	21.21 99.01	21.21 94.93	21.21 94.94
Third party Approvals (PTB type 2)	21.22 99.02	21.22 95.96	21.22 95.97
Total measurement range (dB)	5 to 140 in 7 ranges	5 to 140 in 7 ranges	5 to 140 in 7 ranges
Frequency analysis range A version Broadband only, B version Whole octaves, C version Third octaves	10 Hz to 25 kHz Linear, 16 Hz to 16 kHz Octaves, 12.5 Hz to 20 kHz Third octave	10 Hz to 25 kHz Linear, 16 Hz to 16 kHz Octaves, 12.5 Hz to 20 kHz Third octave	10 Hz to 25 kHz Linear, 16 Hz to 16 kHz Octaves, 12.5 Hz to 20 kHz Third octave
Measurement ranges (dB)	5 to 80,15 to 90, 25 to 100, 35 to 110, 45 to 120, 55 to 130, 65 to 140	5 to 80,15 to 90, 25 to 100, 35 to 110, 45 to 120, 55 to 130, 65 to 140	5 to 80,15 to 90, 25 to 100, 35 to 110, 45 to 120, 55 to 130, 65 to 140
Frequency weightings rms	A, C & Lin	A, C & Lin	A, C & Lin
Frequency weightings peak	C & Lin	C & Lin	C & Lin
Time weightings	Slow, Fast & Impulse	Slow, Fast & Impulse	Slow, Fast & Impulse
Amplitude weightings Q	3, 3+4, 3+5 & 3+6	3, 3+4, 3+5 & 3+6	3, 3+4, 3+5 & 3+6
Measured Parameters, Broadband mode x = frequency weighting y = time weighting z = amplitude weighting	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Lxyavz, Ltm3, Ltm5, $L_{EP,d}$, 5 x LN%, TWA, Duration	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Lxyavz, Ltm3, Ltm5, $L_{EP,d}$, 5 x LN%, TWA, Duration	Lxy, Lxymx, Lxymn, Lxpk, Lxeq, Lxyeq, LxE, Lxyavz, Ltm3, Ltm5, $L_{EP,d}$, 5 x LN%, TWA, Duration
Measured parameters, Frequency analysis mode x = frequency weighting y = time weighting	Lxy, Lxyeq, Lxymx, Duration	Lxy, Lxyeq, Lxymx, Duration	Lxy, Lxyeq, Lxymx, Duration
Runs stored	999	999	999
Periods per run	None	9999	9999
Period times	None	1, 5, 10, 15, 30 sec 1, 5, 10, 15, 20, 30, 60 min	1, 5, 10, 15, 30 sec 1, 5, 10, 15, 20, 30, 60 min
Profiles available	None	At least 220,000	At least 220,000
Profile times	None	1, 5, 10, 15, 30, 60 sec	1, 5, 10, 15, 30, 60 sec
Parameters per profile	None	Leq or Lmax	Leq or Lmax
Events per run	None	None	999
Event profiles	None	None	1 second resolution
Histogram for run	None	145 cells at 0.5dB class width	145 cells at 0.5dB class width
Default set-ups	1 for each operating mode	1 for each operating mode	1 for each operating mode
User set-ups	6 customised set-ups for each mode	6 customised set-ups for each mode	6 customised set-ups for each mode
Fixed record timers	0.5, 1, 5, 10, 15, 30, 60 sec, 5, 10, 15, 20, 30, 60 min	0.5, 1, 5, 10, 15, 30, 60 sec, 5, 10, 15, 20, 30, 60 min	0.5, 1, 5, 10, 15, 30, 60 sec, 5, 10, 15, 20, 30, 60 min
Delay timers	None	24 pairs of start and stop times up to 23 h 59 m in advance	24 pairs of start and stop times up to 23 h 59 m in advance
Calibration information	Stores run calibration date/time	Stores run calibration date/time	Stores run calibration date/time
Pause during run	Yes	Yes	Yes
Output - Analogue	Yes via phono	Yes via phono	Yes via phono
Output - parallel interface (optional)	Preformatted report direct to printer via interface module	Preformatted report direct to printer via interface module	Preformatted report direct to printer via interface module
Output - serial	Download to CEL software package (standard dB1)	Download to CEL software package (standard dB1)	Download to CEL software package (standard dB1)
Power supply	8 x AA batteries	8 x AA batteries	8 x AA batteries
External power supply	12 V dc at 250 mA	12 V dc at 250 mA	12 V dc at 250 mA
Battery life (hours)	Up to 14	Up to 14	Up to 14Size
mm (in)	400 X 105 x 54 (15.7 x 4.1 x 2.1)	400 X 105 x 54 (15.7 x 4.1 x 2.1)	400 X 105 x 54 (15.7 x 4.1 x 2.1)
Weight gm (oz)	750 (22)	750 (22)	750 (22)

Options for CEL-500 Series	CEL-553	CEL-573			CEL-593		
Analysis version	C	A	B	C	A	B	C
Memory	2 Mb	2 Mb	2 Mb	2 Mb	2 Mb	2 Mb	2 Mb
Fastore	Opt	Opt	Opt	Opt	Std	Std	Std
Building Acoustics	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Loudness	Opt			Opt			Opt
Logging	Opt	Opt	Opt	Opt	Opt	Opt	Opt

Ordering Information	
CEL-553.C1	Real time third octave analyser (Type 1)
CEL-553.C2	Real time third octave analyser (Type 2)
CEL-573.B1	Real time environmental octave analyser (Type 1)
CEL-573.C1	Real time environmental third octave and octave analyser (Type 1)
CEL-573.B2	Real time environmental octave analyser (Type 2)
CEL-573.C2	Real time environmental third octave and octave analyser (Type 2)
CEL-593.B1	Real time logging and event octave analyser (Type 1)
CEL-593.C1	Real time logging and event third octave and octave analyser (Type 1)
CEL-573.C100	Real time logging third octave and octave analyser with 100dB dynamic range
CEL-593.C100	Real time logging third octave and octave analyser with 100dB dynamic range
CEL-6694	dB1 Download and control software for all modes except LOG mode*
CEL-6695	dB2 Download and control software for SLM, ENV & EVT modes
CEL-6696	dB3 Download and control software for FST mode
CEL-6697	dB4 Download and control software for RTC, RTI, TMS & RCS modes
CEL-6701	dB5 Download and control software for LOG mode (+)

Note: that all standard 5X3 analysers are supplied with dB1 Windows software and PC cable.
(*) dB1 is included with all standard 5X3 analysers,
(+) dB5 is included with all dual range 5X3 analysers.

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

4.5 THE CEL-900 SERIES PC BASED ANALYSERS

CEL-920 FREQUENCY ANALYSER

Introduction

The CEL-920 Frequency Analyser incorporates new technology that changes the rules of the game as far as frequency analysis is concerned.

The CEL-920 system makes sophisticated analysis and display techniques available to all by simplifying the process and by providing these facilities at a new, low price.

Narrow band frequency analysis is a very powerful and useful tool for environmental assessment, source identification, noise and vibration control, machine fault diagnosis and many other applications. The main barriers to widespread use have been a combination of cost and the sheer "user hostility" of most FFT analysers. This has now changed.

Benefits

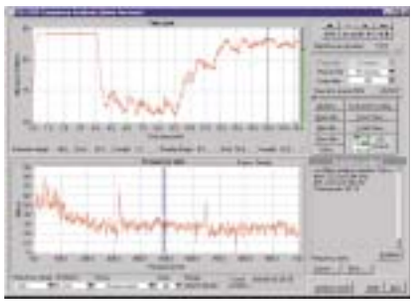
- Simplicity – No jargon, no arcane settings just intuitive simplicity. All the power and sophistication you need – with none of the complexity. Analyse "live" or record a time sample [dB(A) vs time plot] and play-back selected sections for subsequent analysis at your leisure.
- Speed – It's like riding a bicycle, You'll never forget how to obtain the results you need, making even occasional users much more productive. It takes just 4 minutes; install software, run live demonstration, analyse the test file.
- Calibration and accuracy – Automated routines take the hassle out of calibration; high quality hardware ensures you get accurate results.
- Application Intelligence – Designed by a team who use the system for real applications – with the facility to plug-in A.I. modules for bespoke use.
- Technical Support – Regular free workshops are available for users with a high level of technical support available from CEL engineers.
- Reduced Costs – In addition to the low purchase price, the high productivity derived from the above features adds enormous value to your investment.
- Flexibility – Convert existing sound level meters, tape recorders or vibration meters into sophisticated analysers.

Typical Applications

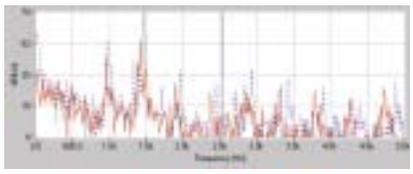
The following are typical application areas for the CEL 920 Frequency Analyser. The list will be extended as new Application Intelligence modules becomes available.

- Environmental Noise
- Environmental Vibration
- Occupational Noise and Vibration Control
- Personal Protective Equipment (PPE) Selection
- Source Identification
- Production Line Testing of Products
- Machine Noise and Vibration
- Commissioning of Plant
- Engineering Development and Laboratory Analysis
- Education

"Simple" analysis 1/1 and 1/3 octave bands



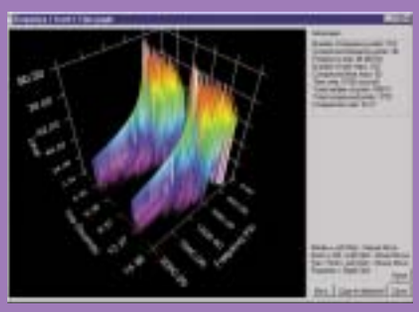
Narrow band analysis



Your report is ready including instant comparisons

Techinical Details

Facility Summary	CEL-920 Live time display of SPL fast: Lin or "A" weighted Overload detection Narrow band spectra from any part of trace or "Live" data Independent selection of frequency range and resolution "A" or "Lin" spectra (instant switching without recapture) Auto-calculation of tonal contribution to overall level 1/1 and 1/3 octaves to Type 1 Overlay of frequency traces for reporting Overlay test or specification criteria Copy and paste traces into other applications PC based "DAT" recorder 3D full colour waterfall/surface plot of all frequency/time data Context sensitive help A.I. Application Intelligence



View your data with instant 3D plots

Hardware Specification

CEL-920	Signal-to-noise ratio 85dB (typical standard system maximum input voltage 2 volts rms) Frequency range 2Hz - 20kHz +/- <0.1dB (typical standard system) Line input, Digital input Line output (headphones, speakers etc) USB connector: true "plug-and-play" Full Type 1 hardware (upgrade option)

PC Requirements

Feature	AT compatible PC with USB connector Pentium 233MMX or better 64MB RAM Microsoft Windows 98 SE or Windows 2000/XP

Ordering Information

CEL-920	Frequency Analyser
CEL-940	Environmental Noise Analyser

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CEL-513 Pink noise generator

The CEL-513 is a wide frequency range random noise generator that produces a signal that is weighted with a frequency filter to provide a pink noise output. It can be used as part of the building acoustics application to act as the stimulus signal for continuous noise measurements. It will accept control signals to switch the noise on and off when linked to a CEL-500 Series analyser fitted with the Building Acoustics option. A variable output control is provided to match the output to the required acoustic levels needed. It can also be used as a general-purpose source of random noise for use in office spaces to provide background noise for privacy purposes when used in conjunction with an amplifier and loudspeaker system.

CEL-6760 Mini environmental kit case

The small environmental case is used with the logging versions of the Casella CEL noise dosimeters to form a simple low-cost monitoring system. A rechargeable battery pack is included that will power the system for up to 7 days and store noise levels at regular intervals. Run data sets can be downloaded to the relevant Casella CEL software package for analysis and reporting. Up to 220,000 data points can be recorded with the CEL-360 Dosimeter when configured in its logging mode.

CEL-6723 Environmental kit case

The CEL-6723 (or CEL-6728) cases are designed for use with the CEL-440 and 480 sound level meters and form a rugged and useful long-term noise monitoring system. The case has space for a 30 Ahr rechargeable battery pack and all the relevant power and connection cables and calibrator. When used with a CEL-480 Logging sound level meter stand-alone recordings can be made for up to a week saving results of either broadband weighted results or octave or third octave scans (depending upon the sound level meter version). The CEL-6728 case has all the facilities of the simpler CEL-6723 case but with the addition of waterproof connectors for including an external radio modem in the system. This allows the meter to be remotely called and the results downloaded without needing to visit the site.

CEL-6627 Environmental kit case

The comprehensive CEL-6627 case is designed to suit the requirements of the CEL-500 Series of real time analysers and with a 30 Ahr battery pack will power the system for up to 5 days of continuous recording. Space is available to fit a DAT recorder or other piece of equipment to form a complete measurement package that is rugged enough to be left on site in harsh conditions.

CEL-6770 Basic Noise nuisance recorder kit case

The basic noise nuisance recorder kit consists of a SONY D8 DAT tape recorder (or equivalent) together with a simple microphone and stand, mains power supply and external single button remote control handset. All items fit into the small kit case and the system can be used in a complainant's property to record any intrusive noises under the complete control of the home owner. A single range is covered from about 30 to about 100 dB and there is enough recording space in total for up to 4 hours of audio recording per DAT tape. When the system is recovered the tape can be reviewed for any offending noises that are then investigated more thoroughly by a visit to the property at the time indicated by the tape recorder log.

CEL-90326 Intermediate Noise nuisance recorder kit case

This kit expands the capabilities of the basic kit by including the possibility of performing calibrated recordings using a type 1 microphone system with the DAT recorder. A reference tone is recorded at the start of the tape and this can be used for later replay of the recording through a suitable sound level meter if actual noise level values are required. A fixed measurement range from 30 to 105 dB is achieved and again a remote handset is used to control the recording time of the system. The tape recorder stores that date and time of the recording to allow the noise events to be correlated with the complaint log produced by the user.

CEL-6750 Logging Noise nuisance recorder kit case

The advanced logging recording kit again features a DAT recorder but also includes a logging sound level meter as part of the standard items. Mains power supplies the recorder and meter allowing longer recordings up to the 4-hour total of the DAT tape format. The sound level meter can be set to measure and store the noise levels as they occur to provide an on the spot set of results measured in real time. Audio signals recorded by the DAT recorder give additional information on the likely causes of the noise levels and since an original analogue recording is available then the tape can be rewound to a particular event to hear what was occurring at the time the complainant made the recordings. Since the audio calibration signal is also stored on the tape recorder it is possible to replay any section of the tape to obtain a frequency analysis of a noise if needed for identification purposes.

CEL-282 and CEL-284 Acoustic Calibrators

The Casella CEL acoustic calibrators are the ideal devices for field checking Casella CEL sound level meters. The CEL-282 is designed to satisfy the requirements of calibrators as class 2 devices and has an accuracy of +/- 0.5 dB under reference conditions. A single level of 114.0 dB nominally at 1 kHz is produced making it quick and easy to setup a suitable meter fitted with a standard half inch or quarter inch microphone capsule using the CEL-4725 coupler provided with every unit. The CEL-284 calibrator is designed as a class 1 device with an accuracy of +/- 0.3 dB to suit the range of precision sound level meters or monitoring systems fitted with the preferred half-inch microphones. An electrical output is also available providing a 100 mV rms voltage at 1 kHz.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490


CEL-6750

CEL-594 and CEL-6737 Outdoor protection systems

These are available as accessories for the CEL-500 and CEL-400 series of instruments respectively and offer a degree of protection for the microphone and preamplifiers against the worst effects of wind and rain. This allows the meters to be used in harsh weather conditions since the careful design prevents rain from falling directly on the delicate microphone diaphragm when positioned correctly inside the unit. A material fixed over a stainless steel framework prevents wind noise from affecting the measurements and stops the damage to the microphone that would occur if a standard foam windshield were to be used.

CEL-90259 Hand Arm Vibration meter

The CEL-90259 vibration meter can be used where a risk to an operator is suspected from problems associated with vibration white finger. The meter has the frequency weightings according to ISO 8041 in order to calculate the correct weighted time average level of the vibration in units of acceleration that are displayed according to ISO 5389. A simple menu structure guides the user through the correct setup and use of the meter and there is storage space for up to 99 separate runs. In the simplest method of operation up to 7 different activities can be monitored and the duration that an operator would spend at each one can be entered using the keypad. From this information the meter is able to calculate an overall daily exposure value for comparison with allowable limits. In the case of assessing a single tool, measurements can be carried out in the tri-axial mode where three sequential readings are taken that represent the X, Y and Z axes of vibration. The CEL-90259 will then calculate the resultant magnitude using the square root of the sum of the squares to classify the level at each hand position. If one of the three axes is found to be dominant compared to the other two then subsequent measurements can be made for checking purposes in just a single axis.

Stored runs can be recalled to the large dot matrix screen and then to a printer via a parallel cable or to a computer using a serial RS232 connection. The software can control the data capture of an instrument if required and will provide a real time output for logging purposes. The meter is provided as a single axis kit complete with a general purpose accelerometer chosen specifically for its capabilities for this type of work. A tri-axial kit is also available with another pair of accelerometers, cables and a switching box that allows measurements to be made in three mutually perpendicular axes on a test object.

Three measurement ranges covering the levels from 0.003 to 100 ms-2 are available with each range covering a 70 dB span, plus an optional extended 300ms-2 range is available upon request. The hand arm weighting and a linear response are provided together with a 1 second averaging time in the rms detector. The meter records the average, maximum and minimum levels for each measurement and tags the run with the start date and time for later recall from the memory. A 1 second vibration profile can be selected in the menu to record the time variation of the signal for later analysis or inspection and the whole meter is powered from two 9 V batteries. The unit can be calibrated by an internal method or using an external vibration calibrator.

V200000 Better Noise Assessment Video

The video features two top experts in noise assessment in the workplace, Keith Broughton, the Principal Specialist Inspector (Noise & Vibration) for the Health and Safety Executive and David Bull, Chief Examiner for the Institute of Accoustics Workplace noise assessments and one of the country's most experienced noise consultants.

Features

The video and workbook covers:

- the different sorts of meter and what they do
- who is "competent" (as defined by the Regulations) to do different sorts of noise assessments and the training available
- how to approach a noise assessment
- how to do a noise assessment so that it complies with Regulations
- how to use the various sorts of noise meters in a better way
- how to write up a better noise assessment

The video is suitable for non-specialist safety executives planning to do their own noise assessments, noise consultants or those planning to become noise consultants, those who employ others to do noise assessments of the workplace.

ORDERING INFORMATION (Part No.)

V200000 Better Noise Assessment Video
V200001 Better Noise Assessment DVD

06 GLOSSARY OF TERMS

Acceleration
The rate of change of velocity of an object when subject to a vibration stimulus.

Accelerometer
Transducer typically used to convert mechanical vibration movements into an equivalent electrical signal so that a vibration meter may measure it.

Accuracy
The numerical difference between an instrument reading and the true value of the quantity being measured. Often expressed as limits that will not be exceeded when the instrument is used within it's stated operational conditions, i.e. ±5°C or ±1dB

Acoustic calibrator
A battery-powered device which emits a known sound pressure level at a known frequency, when mechanically connected to a compatible microphone, for the purpose of simple field-checking the accuracy of a sound measuring instrument.

Action level
A sound level limit at which certain duties have to be carried out according to local regulations in a country.

Actual pressure
The atmospheric pressure at the level of measurement.

ACGIH
American Conference of Government Industrial Hygienists

Ambient noise
Encompassing sound, at a given location, usually made up from the sounds from many sources, both distant and close-by.

Ambient pressure
The pressure of the ambient air sometimes referred to as barometric pressure.

Analogue to digital converter
A device or circuit that outputs a digital number corresponding to an analogue signal input at that level.

Anechoic room
A room whose boundary surfaces absorbs substantially all the incident sound energy thereby affording non-reverberant conditions.

Anemometer
An instrument for measuring the speed of wind or air.

ANSI
The American National Standards Institute

ASCII
American Standard Code for Information Interchange; a seven or eight bit code used to represent alphanumeric characters.

Audible sound
Sound of such character as to excite the sensation of hearing.

Audiometer
An instrument for the measurement of certain characteristics of hearing, particularly, the hearing threshold level and hearing loss.

'A' weighting
One of the standard frequency response correction curve as specified in international standards. Used to simulate the human hearing capability.

Background noise
The noise level in an area without the offending noise being present.

Back plate
The fixed plate of a microphone that forms part of the condenser that produces an electrical output when placed in a sound field.

Baud rate
Identifies the speed of serial communication in terms of bits per second.

Bel
A unit of level of a power quantity proportional to the base-ten logarithm of the ratio of two values of the quantity, where one value is usually a reference power. In acoustics, sound power is proportional to the square of sound pressure and the bel is also used to express the ratio of two pressures. The reference sound pressure is 20 micropascals.

BS
British Standards

CE
A mark to identify conformity to European Standards.

Celsius
Temperature scale where the ice point of water is 0°C and the boiling point of water is 100°C at sea level.

CENELEC
European Committee for Electrotechnical Standardisation.

Communications port
A serial or parallel connection used to input/output information from a computer or a piece of hardware.

Community noise equivalent level (CNEL)
A 24 hour single number Leq value that takes into account different sensitivities to noise during the day, evening and night time periods.

Condenser microphone
A microphone formed from the two plates of a capacitor where an incident sound wave moves one of the plates, thereby proportionately varying the capacitance and producing a voltage output proportional to the incident sound pressure.

Criterion level
The sound level which when maintained for a reference time period, usually 8 hours, produces a noise dose of 100%.

Cumulative data
A measured sound level data set obtained over a run-time time interval.

'C' weighting
One of the standard frequency response correction curves as specified in international standards. Used for the measurement of high impact noise levels.

Daily personal noise level (LEP,d)
The individual noise exposure received during a complete working day expressed as a noise exposure normalised to a standardized working day of 8 hours.

Day night level (LDN)
A 24 hour single number Leq value that takes into account different sensitivities to noise during the day and night time periods.

Decibel
One tenth of the Bel.

Diaphragm
The moving part of a microphone that oscillates when subjected to sound pressure variations in a sound field.

Diffuse sound field
A sound field which in a given region has statistically uniform energy density, for which the directions of propagation at any point are randomly distributed.

Digital signal processing
The process whereby electrical signals are sampled at high rates to generate a digital time record which may be mathematically processed to simultaneously generate many measured quantities.

Displacement
The oscillating movement of a vibrating body about a central rest position.

DoD
Department of Defence

Dose meter
See Noise Dosimeter

Dosimeter
Any instrument that measures dose or exposure over a given period of time. See Noise Dosimeter

Echo
A sound wave that has been reflected and arrives with a magnitude and time delay such that it can be distinguished to be a representation of the original.

Electret microphone
An electrostatic microphone in which the electrostatic field results from an internal permanent charge in one of the capacitor electrodes.

EMC
Electro Magnetic Compatibility - European Standards.

EN
European standards prefix.

EPA
Environmental Protection Agency (USA).

EPROM
Erasable Programmable Read Only Memory. A semi-conductor memory device often used to hold the program of a microprocessor based instrument.

Equal loudness contour
The frequency response curve that shows the sound pressure level at a given frequency required to cause a given level of loudness for a listener having normal hearing.

Equivalent sound level (Leq)
The sound level which when maintained continuously for an interval is energy-equivalent with a varying sound level for the same interval. (See time-average sound level).

Event
A noise profile above pre-defined threshold levels

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

Exceedance level
A statistically generated quantity which notionally corresponds with a sound level defining an interval of time during which the actual sound level is greater in magnitude than the stated exceedance level. See Statistical Analysis.

Exchange rate
In a dose/response relationship the amount by which an increase in sound level corresponds with a halving of the exposure time to maintain a constant response/exposure effect.

Fahrenheit
In a dose/response relationship the amount by which an increase in sound level corresponds with a halving of the exposure time to maintain a constant response/exposure effect.

Fast
A time weighting used in the rms section of a sound level meter with a 125-millisecond time constant.

Frequency
The number of cycles of a wave passing a fixed point in one second.

Frequency analysis
The process of analysing a complex sound into its constituent frequency components.

Frequency bandwidth
The difference between the upper and lower frequencies of a defined range.

Frequency filter
An electrical or mechanical circuit possessing the ability to respond to the range of frequencies at it's input with a fixed range of different sensitivity. Specific implementations are able to reject frequencies outside a defined bandwidth thereby filtering the signal.

Frequency weighting
A specific implementation of a filter possessing defined and standardized characteristics in the audible bandwidth, used in Sound Level Meters and Noise Dosimeters and designated "A", "B", "C" etc.

GSM
Global System for Mobile communication.

Hearing protector
A protective device designed to protect the hearing of the wearer by reducing the sound pressure generated at the eardrum.

Hertz
The unit of frequency representing cycles per second.

HSE
Health and Safety Executive - UK

HSL
Health and Safety Laboratory - UK

IEC
International Electrotechnical Commission.

Infrasound
Acoustic oscillation whose frequency is below the low-frequency limit of audible sound (typically below 16Hz).

Instantaneous sound pressure
At a point in a medium, difference between the pressure existing at the instant considered and the static pressure.

Intrinsically safe (IS)
An instrument that will not cause ignition in a specified gas mixture under specific conditions, i.e. can be used in potentially flammable areas subject to individual instrument compliance.

IP
Ingress Protection codes - as per EN 60529: 1992

ISO
International Standards Organisation.

Lavg
See equivalent continuous sound level and time-average sound level for definition except the Q factor can be user definable

LEP,d
See daily personal dose

Leq
See equivalent continuous sound level and time-average sound level using a Q factor of 3

Loudness
The attribute of auditory sensation in terms of which sound may be subjectively ordered on a scale extending from soft to loud.

Loudness level
The level of a sound measured in Phons judged by listeners to be equally loud as a reference sound.

Maximum level
The highest rms. Value of the instantaneous sound pressure level with a stated frequency and time weighting applied to the signal.

Microphone
The greatest sound level observed during a stated period of observation.

Minimum level
The lowest rms. Value of the instantaneous sound pressure level with a stated frequency and time weighting applied to the signal.

Modem
Modulator/Demodulator. A device that allows computers or electrical equipment to communicate using telephone lines.

MSHA
The Mines Safety and Health Administration in the USA.

NIOSH
National Institute of Occupational Safety and Health - USA.

NIST
National Institute for Standards and Technology in the USA.

Noise
Sound, especially a disagreeable or undesired sound or other disturbance.

Noise dosimeter
An instrument for the determination of noise exposure in accordance with a prescribed dose/response relationship.

Noise event
The period of time during which the sound level measured exceeds a threshold level.

Noise profile
A time-history of reported values of a chosen level parameter.

Noise Rating Curve (NR)
A set of curves plotted on octave band results for a given noise source. The NR single number value is the highest curve just touched by the octave band readings.

Noise Reduction Rating
A single number rating value for a hearing protector found by subtracting the 'A' weighted noise level from the 'C' weighted noise level for a given source and then comparing with the value given for the protector.

Occupational hygiene
The science associated with the anticipation and recognition of workplace hazards and the evaluation and control of subsequent risks to health.

Octave
A frequency bandwidth defined by the upper and lower frequencies having the ratiometric relationship of 2.

Octave band
A frequency filter with nominal bandwidth equal to an octave.

Octave band analyser
A sound level meter fitted with a series of octave band filters to analyse the given noise into its component parts of the audible spectrum.

Omni-directional Microphone
A microphone for which the sensitivity is largely independent of the direction of sound incidence.

Parallel frequency analysis
see real time analysis

Parameter
A measured or calculated value.

PCMCIA
Personal Computer Memory Card International Association. A card interface system, e.g. networks, modems.

Peak sound level
The greatest instantaneous value of a standard-frequency-weighted sound pressure level, within a stated time interval.

Peak sound pressure
The greatest absolute instantaneous sound pressure during a given time interval.

Period data results
A measured sound level data set generated over an interval of observation which is shorter than a run-time interval and which may be repeated many times during the run-time.

Personal sound exposure level
Monitoring an individual or individuals in a workplace to assess the level of noise they may be exposed to over a full working day. The overall level can then be compared with the legal Action levels in place for that country.

Phon
The unit of subjective loudness.

Pink noise
Broadband noise with equal energy per octave or third octave.

Pressure
Atmospheric (pa) Pressure exerted by the weight of the air, it is 760mmHg at sea level and decreases with altitude and increases with depth.

Real time
The monitoring of changes to parameters as they occur.

Real time analyser
An instrument specifically designed to measure the whole audio spectrum simultaneously.

Real time analysis
The analysis of a sound into its component parts across the whole of the audio spectrum so that all of the information is collected in parallel.

Repeatability
The ability of an instrument to record the same consecutive output value, from the same input values operating under the same conditions.

Resolution
Smallest incremental change that can be measured by an instrument.

Response time
The dynamic characteristic of a sound level meter display governed by international standards when subjected to real sound level variations. See also Time weighting.

Reverberation
The characteristic of a sound to decay in a space when the source of the sound is suddenly stopped.

Reverberation room
A room specially designed to generate a diffuse sound field and to possess a long reverberation time.

Reverberation time
This is the time taken for sound energy within a space to be absorbed by the materials within the space to the point where the sound pressure level of a particular frequency band has reduced by 60dB.

Root mean square (rms)
The average-energy level of a quantity which possesses both positive and negative values which is obtained by first squaring all values to obtain positive integers which are then averaged over a specified interval and then returned to their original dimensions by taking the square root.

Run time
The measurement time elapsing from start to finish.

Slow Time Weighting
Time weighting used in the rms. Section of a sound level meter with a 1000 millisecond time constant.

Sone
The unit of subjective loudness equal to 40 phons.

Sound
Oscillation in an elastic medium, usually air, about an equilibrium position.

Sound analyser
Equipment for the analysis into specific frequency bands of the frequency spectrum of a sound.

Sound exposure
The time-integral of the square of the instantaneous sound pressure.

Sound exposure level
The calculated level obtained by averaging the sound exposure over 1 second and expressing the result in decibels by taking the base-ten logarithm of the ratio of the square of the instantaneous pressure to the square of the reference pressure of 20 micropascals.

Sound field
Region of an elastic medium containing sound waves.

Sound level
A sound pressure level frequency-weighted by a standardised frequency weighting.

Sound level indicator
A low cost instrument not designed to meet any accuracy standards but to allow a general idea of the likely noise level in a particular area.

Sound level meter
A measurement instrument designed to satisfy the requirement of international standards with regard to the accuracy of the results under specified circumstances. Different levels of accuracy are defined in the standards.

Sound pressure
Root-mean-square value of the instantaneous sound pressures over a given time interval defined by standardised time weightings, unless specified otherwise.

Sound pressure level
The base-ten logarithm of the ratio of a given sound pressure to the reference sound pressure of 20 micropascals. Such pressure level in decibels is twenty times the base-ten logarithm of the ratio.

Sound Power (LW)
The acoustic power (w) radiated from a sound source. This power is independent of the surroundings, while the sound pressure depends on the surroundings (reflecting surfaces) and distance to the receiver.

Sound spectrum
Representation of the magnitudes of the frequency components of a complex sound typically into specified frequency bands.

Statistical analysis
The classification of the magnitudes of sound levels into a statistical cumulative distribution from which various statistical levels can be derived.

Statistical level
A notional sound level value corresponding to a value in the cumulative frequency distribution usually expressed as a percentage of all the classified data points.

Time history profile
see Noise profile

Threshold level
A discriminating sound level below which data may be ignored, or which may be used to trigger a noise event.

Threshold of hearing
The minimum sound pressure level of a specified sound that for an individual is capable of evoking the sensation of hearing.

Threshold of pain (Sound)
The minimum sound pressure level of a specified sound that for an individual is capable of evoking in the ear a definite sensation of pain.

Time averaged sound pressure level
The calculated sound level generated by obtaining the time-integral of the square of the instantaneous pressure.

Time constant
See time weighting.

Time weighting
The Slow, Fast and Impulse responses in a sound level meter.

Transducer
A device that converts one form of energy into another, for example sound pressure into an equivalent electrical signal in a microphone.

Time weighted average (TWA)
The 8 hour normalised time average sound level that includes all of an individual's exposure to noise in the workplace.

UKAS
United Kingdom Accreditation Service.

Ultrasound
Acoustic pressure wave oscillation which has frequency above the high-frequency limit of audible sound.

Velocity
The rate of change of displacement of a mechanical body when subjected to a vibration stimulus.

Vibration
The process of mechanical motion of a body that may give rise to transmission of energy from one place to another in a structure. It may also cause a resultant noise to be produced.

Weighted sound pressure level
See sound level.

Hand-arm vibration
Vibration of hand tools that may typically cause damage to the operator's fingers or hands after long exposure.

Whole body vibration
The vibration experienced by a human when seated on a moving object.

Windscreen
A foam ball fitted over the measurement microphone to prevent erroneous results due to distortion caused by wind blowing across the diaphragm.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

NOTES

Your local distributor is:

Head Office:
Casella CEL
Regent House
Wolseley Road
Kempston
Bedford
MK42 7JY
UK

Tel: + 44 (0)1234 844100
Fax: + 44 (0)1234 841490
Email: info@casella.co.uk

23680