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MICROPROCESSOR BASED SOUND LEVEL METER

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INTRODUCTION

Considerations relating to the design requirement for a new generation of full specification sound level meters are discussed as a prelude to the presentation of a new concept in acoustic instrumentation.

The sound level meter is perhaps the basic and most essential tool for the acoustic engineer. Since the first instruments that became generally available some thirty years ago there have been massive strides made by the instrumentation industry, in improving and developing their instruments. Early instruments were simple devices using valves and were hence very bulky. The advent of transistors enabled smaller instruments to be manufactured whilst simultaneously increasing applications standards resulted in more facilities and features being included. Further developments within the electronics industry resulted in integrated circuits and thick film technology allowing further reduction in size and a further increase in complexity. Current generations of instruments are universally accepted as having in addition to conventional sound level measurement functions a range of functions including integration, maximum and peak capture and facilities for a number of add on accessories such as frequency analysers. Careful standardisation work has enabled users to compare accuracy of sound level meters from various manufacturers by reference to the IEC-651 'Class number' with the result that selection of instruments is being related to operational considerations and facilities provided. The pressure is on therefore to provide more features in a more convenient package.

In developing the next generation of instruments we are looking to provide these facilities. It is therefore natural for us to turn to the microprocessor to provide the next step forward. These devices will easily provide all of the time history descriptors in current use as well as providing such additional functions as autoranging, data storage and frequency analysis. They also allow another major change in sound level meter design by enabling different types of display to be employed. These are the new generation of liquid crystal displays that provide both the traditional 'analogue' displays associated with measuring sound levels in addition to digital displays that are better suited to the time history descriptor that are now being more widely used. The problems associated with micros has always been associated with their power consumption as the instruments have by definition to be battery operated over long periods with constraints on the maximum instrument size limiting battery capacity. New generations of CMOS processors overcome the power supply problems allowing 'micro based' sound level meters to be realised.

After careful consideration the best location for the 'micro' has been identified as following the RMS detector. The output of the detector is arranged to be sampled at approximately 10ms intervals and these samples are processed by the software to provide a wide range of parameters with the results being stored until required. The next generation of instruments will therefore comprise conventional 'front ends' using current miniaturisation techniques followed by an all digital processor. One major branching of the signal path would be necessary to provide frequency analysis function as it is well within the capabilities of the processor to control ancillary digital frequency filters within the main instrument enclosure.

During 1983, therefore, we will see the introduction of hand held instruments measuring 285mm x 75mm x 28mm that will provide analogue and digital readouts of sound level, Leq, Ltm (3 & 5), Lax, L10, L50, L90 and noise dose. All of these results will be available over approximately 24 periods of a duration selected by the operator, all stored within the instrtument. Within this instrument will also be located the octave and third octave filter arrangements. Obviously selecting all of these functions and results would call for a very complex switch arrangement so the opportunity has been taken to use a specially designed keypad that will give more than adequate selection combinations and the provision of a data output will allow answer strings to be directly fed to printers etc.

The pocket acoustic analyser will become a reality in 1983 but that is by no means the end of matters. We can now turn our attention to the next step forward. Acoustics of the nose cone area, size of the human finger and the requirements to have a legible display probably limit further miniaturisation. If we do not have any new measurement units introduced that would require a fundamental rethink of instrumentation requirements then the next big step forward will be placing the digital conversion directly behind the microphone. Solving the technical problems associated with this would be rewarded by an instrument that is almost universally reprogrammable, however that is the next project.

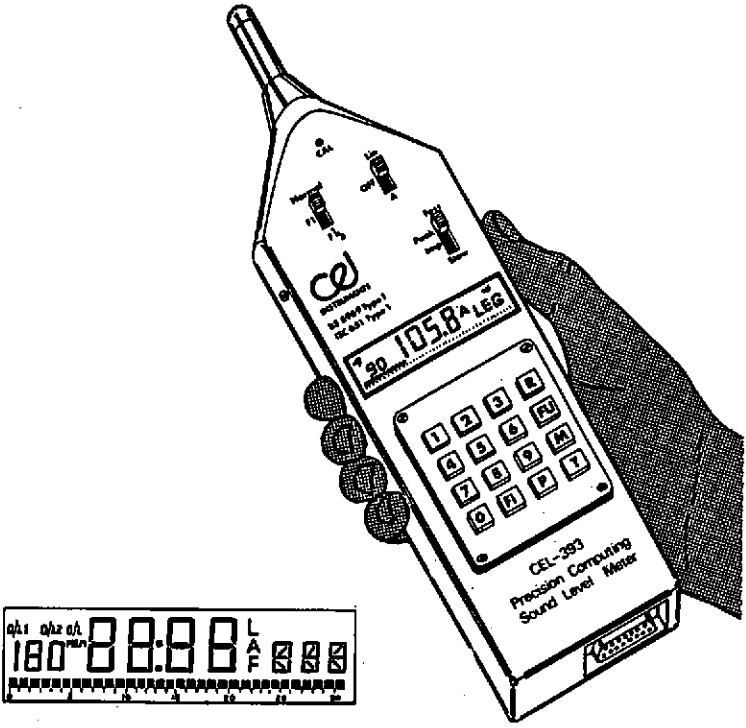

Fig.1. CEL-393 Precision Computing Sound Level Meter with inset showing display.