



## ***Callan: A Closefield Television Audio Monitor*** ***John Watkinson***

The Celtic Callan is an active precision close-field monitor loudspeaker jointly developed by Celtic Audio Ltd and Television Systems Ltd. Occupying only 2U of rack space, this speaker offers a comprehensive range of inputs and sound quality not matched by conventional speakers many times larger. Here John Watkinson explains how this little powerhouse was developed and suggests applications.

The quality of audio in television has recently improved dramatically. The availability of Digital VTRs with digital audio soundtracks has eliminated the problems of analogue recording, and the AES/EBU interface and SDI video with embedded audio allow full quality to be maintained across routing systems.

This is probably just as well because the expectations of the Consumer has also risen. The introduction of the Compact Disc set new standards for consumer audio, and NICAM has made it possible to deliver virtually the same quality alongside television programs.

As the consumer's standards rise, then the quality of audio production equipment must follow suit. This has happened in microphones, ADCs, recorders, DACs and amplifiers, but by and large loudspeakers seem to have made less progress.

Audio monitoring in television is more difficult than in an audio only environment. Often there isn't space to build a suitable listening environment with the result that the room acoustic is impaired and equipment noise intrudes. Large speakers block the view of the picture monitors. Often the user adopts headphones to monitor in noisy surroundings, but these give a false impression of stereo imaging. A further concern is that general purpose loudspeakers often produce strong magnetic fields and this plays havoc with CRT displays.

TSL makes a growing range of audio monitoring products for the television environment and in reviewing what products to develop, it became clear that an all-in-one unit combining comprehensive input facilities, accurate metering and a high quality stereo loudspeaker would be able to satisfy a number of requirements where there was previously no product available.

The Celtic Callan is designed to solve those difficult audio monitoring problems. It has an optimum listening distance of about eighteen inches away. At that close range, a considerable amount of external noise can be masked, and the direct sound from the speaker arrives so far ahead of any reverberation that the acoustic environment is virtually irrelevant.

Effectively the Callan delivers a monitoring capability normally only available with large speakers in a specially treated room, yet it only requires 2U of rack space. Put it below a Grade 1 television monitor and you have the ability critically to check audio and video quality simultaneously. Stray magnetic fields aren't a problem because instead of having traditional ferrite magnets with high leakage, the drive units all incorporate neodymium rare-earth magnets which are inherently leakage free and weigh less into the bargain.

The feature list for the product was comprehensive: Serial Digital audio De-embedding, AES/EBU and analogue inputs, full signal selection with dim/cut and line outputs, accurate metering and full frequency range audio performance at realistic SPL. In a 4U box that would have been difficult, but to do it in the target of only 2U required a quantum leap in performance. The space requirements for controls, electronics, power supply and meters meant that the remaining space for the loudspeakers was vanishingly small. Versions with AES and Analogue, or Analogue only inputs ensure that the Callan fits easily and economically into many applications. In addition the Analogue only version is available without metering.

Conventional loudspeaker technology would have been quite incapable of delivering the required performance in the available space. Celtic Audio Ltd who are building a reputation for loudspeakers of uncanny precision which don't require a large enclosure have responded to this challenge. It was soon established that a product previously thought impossible was perfectly viable and agreement was rapidly reached with TSL, whereby they would engineer the enclosure and interfacing and control electronics and Celtic would handle the drive units, amplifiers, crossovers and the industrial design.

Close-field monitoring only works if the polar diagram of the speakers is precise. Otherwise small head movements cause large image shifts as the ears move into peaks and dips in the response. Most speakers have sharp corners which diffract sound and confuse the stereo image. The Celtic Callan has distinctive diffraction control contouring on its front surface which allows it to deliver precise stereo imaging. At the designed listening distance, the tweeters subtend the same angle to the listener as a full size pair of speakers further back. The result is a stereo image so precise that you can mix with it. In addition to producing excellent technical performance, the Callan also makes a statement by its appearance.

A conventional speaker only 2U high would be somewhat lacking in bass response. Not this one. The advanced active technology of the Callan was developed in Celtic Audio's larger loudspeaker models and allows genuine response down to 30 Hz. It's so good that whenever it is demonstrated people look for the subwoofer!

Fundamental loudspeaker research by Celtic Audio showed that conventional approaches to low frequency reproduction were based more on tradition than on fact. For example, the traditional bass reflex loudspeaker uses resonance to extend its frequency range and so can only work on sustained notes. On transient material such as percussion, or effects such as gunshots and door slams, the reflex speaker is quite unable to reproduce the input waveform. Reflex loudspeakers remove energy from the leading edges of transients, distorting the attack. This energy is returned later as hangover. Apart from accuracy problems, the reflex principle uses air masses in ports and is clearly unsuitable for miniaturisation.

Traditional loudspeakers are passive, requiring separate amplifiers. This approach was rejected as resulting in too many compromises. Passive loudspeakers offer complex loads which vary wildly from model to model. Trying to drive such a load with an amplifier designed elsewhere is too much of a gamble. The presence of a passive crossover network between the amplifier and speakers impairs the damping factor and prevents tight coupling of the amplifier and the drive unit.

To achieve the highest audio performance the unit is fully active. The precision crossover network is implemented at line level and each drive unit then has its own amplifier. This approach allows the highest performance and renders the crossover frequency inaudible. The proprietary aperiodic technology of the Callan woofer is a breakthrough in loudspeaker design. Not only does it allow precision reproduction of low frequencies, but this is done in an enclosure which is ridiculously small for its performance.

The applications of the Celtic Callan are limitless. It can be used to give high quality monitoring in the smallest space and the poorest acoustic environment. It is ideal for Master Control Rooms where cooling fans and air conditioning produce a high background noise level. The close field approach allows that noise to be substantially rejected. Quality monitoring is enhanced because small defects in the sound which would normally go unnoticed are instantly revealed. With a Callan connected to the main router, the quality of the whole installation can easily be checked.

In large television Outside Broadcast vehicles, there is often a separate, very small, compartment for sound. In many of these there is only just room for the operator, let alone quality monitoring. In smaller vehicles, based on light vans, audio monitoring was done with a combination of headphones and tiny, poor quality, speakers mounted where space allowed. The Celtic Callan fits perfectly, allowing the sound operator to hear exactly what he is doing. A full monitoring and speaker system is available in the amount of rack space used up by some twin Peak Programme Meters!

Telecine machines are large, usually dominating the room they occupy and making conventional audio monitoring impossible. VTR areas are just as problematical, generally suffering from noise and poor acoustics, yet audio quality monitoring is still important. With the Callan there's no problem.

Non-linear editors are often PC based and usually come with a pair of moulded plastic speakers which are useless for serious work. The Celtic Callan allows an easy upgrade for serious monitoring.

The Celtic Callan is a precision active audio monitor speaker giving full size performance from an impossibly small enclosure. It solves many television audio monitoring problems because it is insensitive to background noise and poor room acoustics.