



PC104+ embedded board controller for public address transmitter

Background

Deaf Alerter plc is dedicated to the manufacture, installation and support of fire alarm warning and messaging systems for Deaf and hard of hearing people. Initially, the system just provided for fire alarm warnings and single-transmitter messaging, but the opportunity was there to further expand the functionality to include personal and public address messaging across large sites.

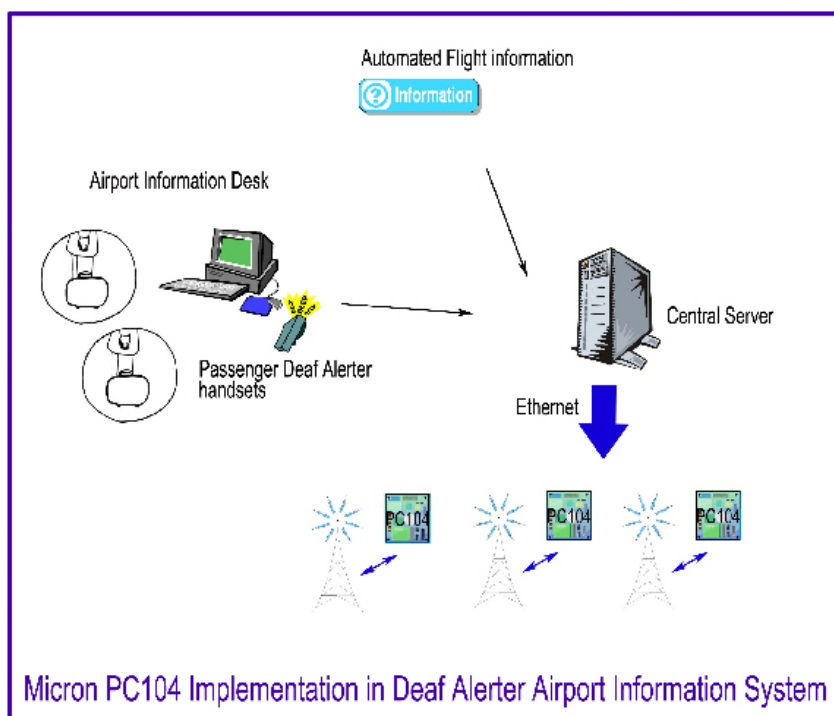
To operate in the public address arena, Deaf Alerter needed a computer board to control signal transmission from multiple transmitters. They had limited experience of the embedded market place and an open mind as to the best solution. They did, however, have a very clear set of working parameters – space limitations, thermal constraints, room to evolve and a market window.

Target Application

The Deaf Alerter system takes public information announcements and sends them to a small robust radio receiver that is carried by the deaf or hard of hearing user. This unit vibrates when it receives a message from a Deaf Alerter transmitter. It has a display on the top where the user

views the information sent to them.

Where the Deaf Alerter system is being used in the context of a large public building – such as an airport, the implementation requires an intelligent processor to schedule radio broadcasts across multiple transmitters. Although the system's implementation is by no means limited to airports, obviously clear and timely customer



communications are paramount in the passenger transport sector. Birmingham Airport in the UK is the pilot installation of the enhanced public announcement Deaf Alerter system.

The diagram shows a typical set up – at check-in, hard of hearing or deaf passengers are notified of the airport Deaf Alerter facility. Passengers can pick up a handheld radio receiver from the Customer Service Desk. The Deaf Alerter software allows each receiver to be registered against the individual passenger on a central server. The server can then interface with the Automated Flight Information system and generate specific announcements for each handset.

The message data is carried to the individual transmitters by a LAN connection. The incoming ethernet signal needs to be stripped of code 'wrappers' and converted to an RS232 signal – which can be picked up by the transmitter. As a passenger can be anywhere in the building, any announcements need to be sent out across all the transmitters. The unique feature of Deaf Alerter is the ability of any Alerter unit, whether owned privately or supplied by the building operator, to receive any public address message on a single nationally-available frequency. By using a controller board to precisely time and stagger message transmission cross interference between adjacent transmitters would be avoided. The signal controller would also need to be passively cooled and small enough to be housed in the transmitter cabinet.

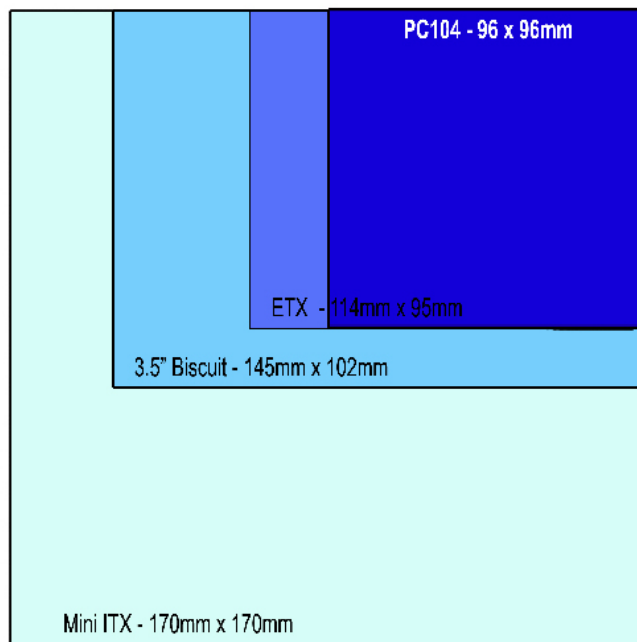
The Candidates

The Deaf Alerter team had a number of possible avenues to explore. Using a microcontroller was one option, a single chip device such as the Renesas H8 series. These chips are extremely small, very low power and cost effective. While today's highly integrated MCUs make system circuit design easier and faster, code development can still easily consume more than 50 percent of the total system design effort. Every MCU supplier's product family has their own unique instruction sets, making the end code not easily portable. Deaf Alerter would need to tackle a steep learning curve to write the code and also buy the associated development tools. However, they already had extensive development experience in the Microsoft environment, as a sister company was a member of the Microsoft Certified Partner program, making it sensible for them to look for a X86 solution running a Windows operating system.

Today there's a proliferation of 'micro motherboards' on the market – micro ATX, FlexATX, BTX and mini ITX to name a few. These all have obvious pricing appeal but the diminutive mini ITX still has a sizable 170 x 170 footprint and an additional PCI slot will be the most you'll get in terms of expansion. Such an option would have been too big and difficult to expand.

The embedded market is seeing an increase in System

Embedded Form Factors Size Comparison



on Module (SOM) standards such as SOM144, ETX etc. Such form factors involve a standard core module, which interfaces to a custom board, offering a relatively quick and upgradeable customisation route. Of course you still need to design the host board; layout, test and prototyping may well add another few months of resource and cost to the project development. This makes less sense when your volumes are not likely to exceed 200 per annum and your application has a fairly basic set of requirements which can all be addressed in an off the shelf product such as PC104.

Additionally, a SOM and host board is unlikely to match the compact footprint of the ubiquitous PC104 form factor. Measuring 96 by 96 mm, PC104 still represents one of the smallest boards on the X86 embedded market.

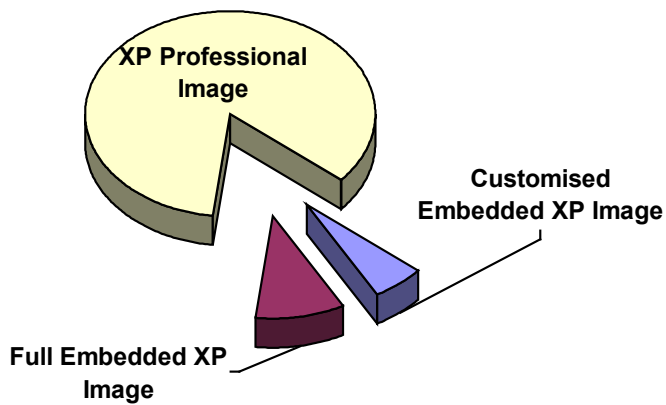
The Solution

By a process of elimination, Deaf Alerter selected the Blue Chip Technology Micron PC104+ single board computer. Running at 200MHz, with 10/100Base-T and two RS232 serial ports, Micron easily met Deaf Alerter's basic requirements.

As Blue Chip Technology offer a full BSP and custom image as standard across their PC104 range, they built Deaf Alerter a custom Windows XP Embedded OS, stripping out unneeded elements – in this case, for example, USB capability. Reducing the final OS image meant the whole application could be supported by the board's flash drive. Using a passively cooled PC104 board with solid state storage makes for a very robust embedded solution.

A custom OS also improves overall system security, decreasing the chance of someone accessing the transmitter's controller over the airport LAN and attempting any malicious interference. The Micron uses a single +5 voltage supply, meaning implementations often don't require an additional power source, really

Operating System Size Comparison



exploiting the compact dimensions of the PC104 form factor.

The PC104 board offers great flexibility in bringing out connectors when and where they are needed. For this particular implementation of PC104, Deaf Alerter utilise the Micron Connect - a small optional PCB board with external connections for VGA, LAN, USB, Digital I/O,

Keyboard, Mouse and Audio. A quick and easy way to bring out the standard external PC104 interfaces.

PC104's longevity and popularity is partly attributed to the ease of board expansion – the stackable modular design makes it very easy to add peripheral boards. Furthermore, the bolted, stacked configuration makes the build more inherently rugged. Deaf Alerter could see Micron PC104+ as a future proof solution where, for example, multi-board stacking could enable more connectivity options – for example an additional RS232 connector if they ever needed to connect two transmitters up to one board.

The PC104 standard continues to deliver a package, which can satisfy the space and power demands of embedded control applications. Yet it is still essentially a PC which means most of the program development tools used for PC's can be used for a PC104 system. This reduces the cost of purchasing new tools and also greatly reduces the learning curve for programmers and hardware designers.



Micron PC104+ and Connect Board