Computing for the radiation sentry

The MiniSentry/S is a new advance in radiation monitoring developed by nuclear industry specialists CANBERRA for the French Emergency Services. Its application programme is hosted on Eurotech's fanless ultra low power TITAN single board computer, producing a range of sophisticated capabilities in the vital area of nuclear safety.

Introduction

The nuclear industry is strongly aware of the potential hazards of power generation and release of radioactive materials. It can also point to an excellent safety record. Minor incidents of contamination are rare and are reviewed when they do happen for any means of stopping their reoccurrence. The French Emergency Services have called on the expertise of CANBERRA to increase the effectiveness of radiation monitoring through the deployment of a Portal Monitor. Much like airport passenger scanners in principle, these gateway devices are highly effective in detecting contamination on people passing through for checking.


CANBERRA, which is owned by the French nuclear company Areva, is part of a global company specialising in instrumentation for the nuclear industry. Based on their standard mobile MiniSentry Gamma Portal, the new MiniSentry/S has evolved from being solely gamma sensitive to being able to measure Alpha and Beta contamination on a person's face, hands and feet. The system is due to be trialled extensively by the French Emergency Services over the coming months.

Robust and Flexible in the Field

The new MiniSentry/S is constructed from a rigid plastic tubular support and offers advantages over permanent monitoring installations by being less expensive and more flexible. Its light modular construction coupled to quick release technology makes it easy to transport in shock resistant cases.

Designed to be used effectively in the field, the portals components are light and weatherproof. It can operate at a temperature range from -10°C to +45°C from AC or DC power supplies and has internal backup batteries also allowing the system to run for 12 hours autonomously without power if required.

This capability is in no small part due to the characteristics of the TITAN board. With a power consumption as low as 1.5W, and an industrial operating temperature from -40°C to +85°C it is exceptionally well suited to the type of application found in the MiniSentry/S.
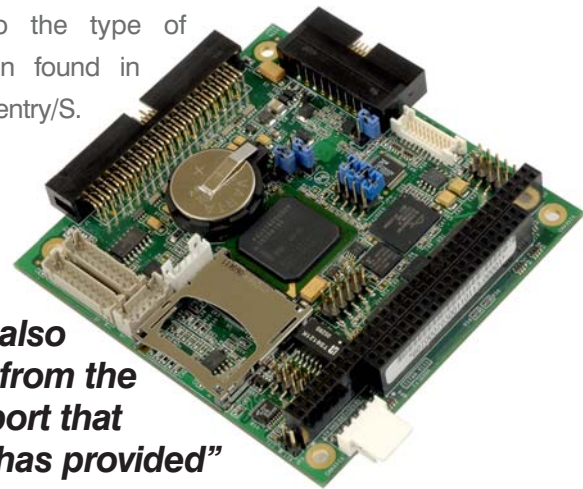
"We have also benefited from the local support that Eurotech has provided"

Probing for Information

There are seven detectors within the monitor to cover the total body surface of the subject:

- Two foot contamination detectors, positioned in the base of the unit to look at the sole of each foot
- Two main body gamma detectors within environmentally sealed modular enclosures fitted to the vertical columns
- A face and two hand detectors, fitted to the vertical column supporting the control unit and independently adjustable by slide adjusters, with the face detector adjustable to individual torso height

Within the system's control unit, the Eurotech TITAN runs the MiniSentry/S application programme, and David Lloyd of CANBERRA described how this single board computer (SBC) provided an excellent low power mobile computing solution with extensive input/output facilities. "The TITAN has ample I/O for connecting to the radiation probe interface using a standard RS232 port. It has parallel I/O for operating the front panel LEDS and also connects to a colour graphics display. Other serial interfaces are used for USB and RS485 applications. With all this, we still did not manage to use all the I/O available!"

The Eurotech TITAN SBC is proving a highly effective component of the MiniSentry/S control unit. It directly drives a colour graphic display showing the human body zones being measured and the radiation count data that is being returned by the probes. The control unit programme will also configure the monitor and set count times and alarm thresholds for each of the probes. Count data for each measurement is stored by the control unit and can be transferred to other systems for off-line analysis via a USB key.

Based on Intel XScale micro-architecture, the TITAN provides a range of peripherals that includes a flat panel graphics controller, USB client/host controller and multiple serial ports. Power consumption is as low as 1.5W which means that no fan or ventilation is required to cool the system. In sleep mode, consumption reduces to the incredibly low level of 100mW. Measuring 96mm x 91mm, the SBC incorporates a PXA270 XScale processor and supports Windows®CE 5.0 and Linux operating systems.

> *"The TITAN's functionality is ideal for us and the MiniSentry/S is one of two ongoing projects involving Eurotech and the TITAN board," said David Lloyd. "We have also benefited from the local support that Eurotech has provided. Our development process was greatly helped by the fact that the TITAN was designed by the Eurotech team in the UK and their contribution has been very helpful."*
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> David Lloyd, of CANBERRA

Eurotech has a wealth of experience in the design and manufacture of embedded single board computers, application ready platforms, configurable systems and ready to use solutions. The company's expertise in developing innovative, integrated and scalable solutions is active in the energy industry, as well as a range of other sectors including defence, medical, industrial engineering and transport.

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