

CANopen used in medical systems



The CANopen devices from HMS/Ixxat are used in a range of medical application fields. This article describes one and gives a little throwback.

Figure 1: The Econ100 used for mammography (Source: HMS/Ixxat)

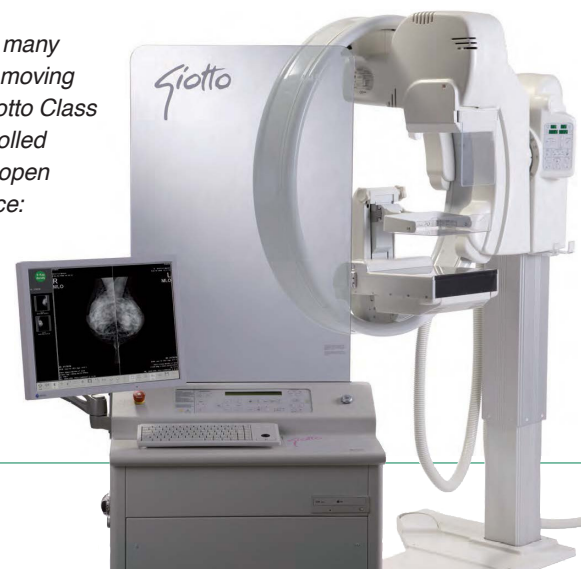
The history of CAN and CANopen in medical technology goes back many years. As early as 1992 the company Philips Medical Systems recognized the advantages of the CAN technology and developed a protocol for use in their medical tables and X-ray systems. This first approach, the CMS protocol, served in the following years as a scaffold for the CAL protocol specified by CAN in Automation which ultimately found its fulfillment in today's CANopen protocol.

The advantages which result to device manufacturers through the use of a bus system, are easily recognizable considering that modern medical equipment nowadays consist of a number of modules that must be connected to a functioning overall system. Individual system components, such as X-ray generators, patient tables or injectors can – with the use of a standardized bus system – be independently developed, modular connected and controlled from a central point. This saves development costs and enables the universal and scalable deployment of components in different systems. It also reduces the number of cables to a considerable extent.

A decisive advantage of CANopen as the communication protocol is the availability of profiles for a variety of medical devices, which ensure the interoperability of the components in an easy way. Due to the nature of CAN, CANopen provides a very high error robustness, short waiting and error-recovery times, a robust data transmission, a variety of possibilities for the modularization of systems and networks, plug-and-play support and standardized system services. Furthermore, the CAN and CANopen technology already is approved by TÜV Germany and the FDA in the US for use in medical systems, since here a number of approved applications are using this technology.

To enable a computer to control medical tasks, the computer must be able to communicate with the CAN/CANopen modules in use. The PC/CAN interfaces from HMS meet the electrical requirements according to IEC 60601-1 and enable the connection of PC-based applications to CAN-based networks. In addition, HMS offers several CANopen driver packages for Windows. For example, by using the Ixxat CAN cards together with the Ixxat CANopen Manager API, medical devices can be controlled via a PC. Also, medical data can be imported for further evaluation. The Ixxat CANopen Manager API also supports the CiA 425 application profile, which allows automated integration of components into complete systems. The CiA 425 application profile allows easy connection of injectors for contrast media to control computers for CT systems. The control computer with the Ixxat CANopen Manager API detects the connected devices and their position in the network, and can automatically configure and control the entire system.

Figure 2: As in many machines, the moving parts of the Giotto Class is mainly controlled using the CANopen protocol (Source: HMS/Ixxat)



In this context, it is particularly interesting that the CT system is frequently supplemented with components – e.g. Injectors – from third parties (3rd party vendors) without impairing the reliable functioning of the overall system. There are many other applications. Various well-known providers in the field of medical technology and laboratory automation rely on the proven quality of CAN/CANopen products from HMS. As an example, Ixxat CAN interfaces or Ixxat control PCs with Ixxat CANopen software are also used in automatic mammography devices.

Mammography

IMS uses the Ixxat Econ100 embedded controller to control movement, X-ray emission, data acquisition, visualization, and safety chain in their Giotto Class mammography machine. This advanced machine can move around the patient taking X-ray photos from several different positions, providing physicians with better pictures for detecting breast cancer at an early stage. The Giotto Class can also be used for stereotactic and tomo biopsy examinations which further increases the importance of reliable and fail-safe motion control.

As in many machines, the moving parts of the Giotto Class is mainly controlled using the CANopen protocol. “The Ixxat Econ100 is the brain of Giotto Class system,” said Paolo Vignoli, Research and Development Manager at IMS. “It is the master for the internal communication network and the logic control unit for about twenty different electronic boards. It controls movement, X-ray emission, data acquisition, visualization, and safety chain inside the machine. It also controls the biopsy accessory ‘Smart-finder’ when it is plugged in to the system.”

The controller features a Xilinx Zynq SoC – dual-core Cortex A9 processor as well as two CANopen ports which make it possible to configure communication at two different speeds – to adjust to different stub lengths within the network. “The Econ100 offers two independent CAN networks with CANopen standard and meets our demands for a four millisecond cycle time – this was very important for us”, explained Paolo Vignoli. ◀

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based on information by HMS/Ixxat

CAN Newsletter Online: Other applications using CAN



Predictive road-condition
**Supplementing by CAN
in-vehicle data**

Bosch plans to combine CAN in-vehicle data with information provided by cloud services. This should improve the road-condition predictions.

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PSA partner program
**Using true CAN data from
PSA cars**

The French carmaker has revealed the Free2move program, which includes the Peugeot i-Cockpit, an app displaying also some CAN data.

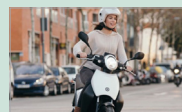
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Electric zero-emission truck
**Control network is based
on J1939**

Many of the ancillary systems that are traditionally driven by the engine were also electrified, including the air compressor, power steering, and HVAC system. The controls were integrated into the vehicle's J1939 network.

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Electric moped
Rental program in New York

Electric scooter share programs are on hype in U.S. cities. In Brooklyn, New York, Revel Transit offers 68 e-mopeds by Tarrot (Spain) with a CAN diagnostic interface.

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Autonomous driving
**Vending vehicle with robot
making coffee**

The Chinese start-up company Pix has developed a self-driving vehicle that implements an embedded CAN network.

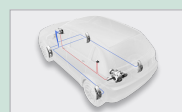
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Advanced driving
**Using human voice warnings
and CAN**

EVoice enables the recording in advance of up to 100 warnings in the driver's native language, that are adapted to various problematic behavior patterns on the road. The EFlash SF driver warning device uses flashing icons to warn the driver of dangerous behaviors.

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Rear-axle transmission
**For off-road and sports
vehicles**

Recently, ZF has introduced the next generation of electronic limited slip differential (eLSD). The heart of this improved active rear axle drive is a control unit that meets cyber-security standards for software updates via the cloud.

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