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THE ELECTRONIC RAILWAY

Britain's railways are at a turning point. The age of contraction that stemmed from Beeching has finally come to an end, with UK railways now achieving the fastest rate of growth of any in Europe. Yet there is still a dilemma as pressure to achieve savings of at least £2.5 billion is balanced against the need to invest to reduce overcrowding, improve customer satisfaction, address safety, and maximise asset optimisation and service connectivity.

The recent Railtex 13 event, held at Earls Court from 30th. April to 2nd. May, which featured over 400 exhibitors, highlighted the important contribution that electronic technology has made in bringing the UK to this transformational turning point. The railways therefore represent an important area of expansion for electronics professionals, with skills now heavily in demand in an industry that has historically suffered from poor innovation and underinvestment.

In this issue of *The Electron* some of the key developments will be examined in an attempt to demonstrate how the electronics professional is helping to put Britain's railways back on track.

LIBERATION FROM CONVENTIONAL RING ARCHITECTURES

Conventional ring architectures have long been regarded by system builders as costly and limited in capability. Now there has been a breakthrough in the form of Moxa's Turbo Chain™ flexible redundant technology. With this Ethernet switches can be daisy-chained together from cabinet to cabinet and each 'chain' is connected to the control centre and broader network by a head and tail switch. No ring coupling switches are needed, which means that the chain architecture can adapt to many topologies.

The Ethernet switches used work reliably in a wide operating temperature range of –40 to +75 degrees Centigrade, so they can easily overcome the conditions in wayside cabinets. In the event of failure in any one chain segment, Turbo Chain™ will activate the blocked path and self-heal the network within 20 milliseconds, creating a highly available network.

Manufacturers Moxa state:

‘Turbo Chain™ maintains highly available networks with fast recovery times while transcending the limitations of conventional redundant ring technology. The flexible Turbo Chain™ topology adapts to circumstances that would frustrate the stricter requirements of a ring redundancy topology.

Compared with conventional ring topology, Turbo Chain™ eliminates the need for kilometres of extra cable and additional Ethernet ports to form ring coupling paths. These savings scale dramatically in large networks, such as a wayside communications network.’

Further information and a case study are available from Moxa Headquarters, Fl.4, No. 135, Lane 235, Pao-Chiao Road, Shing-Tien District, New Taipei City, Taiwan. Telephone: +886-2-8919-1230. Email: info@moxa.com

CITYFLO: A QUANTUM LEAP

Transport for London’s leaflet ‘Our Upgrade Plan: Improving London’s Underground’ outlines ambitious plans for capacity improvement including a 65 per cent increase for the Circle and Hammersmith and City Lines, and 27 and 24 per cent for the Metropolitan and District Lines by 2018.

In order to achieve this a railway engineering simulator (RES) has been deployed, and new trains are to be introduced offering some capacity improvements. The greatest impact, however, is created by the CITYFLO 650 system from Bombardier for which a £354 million contract was awarded in June 2011.

The CITYFLO 650 is a variable moving block Communications Based Train Control (CTBC) system with four main elements:

(i) Automatic Train Protection (ATP)

(ii) Automatic Train Operation (ATO)

(iii) Train to Wayside Communication (TWC)

(iv) Automatic Train Supervision (ATS)

Train location is determined from a combination of tagged base stations and axle-driven tachometers. The system has no external signals, track circuits or trip cocks, hence, unlike most re-signalling schemes, it can be installed with minimal impact to the existing signalling system.

ATP has train and trackside components to perform safety critical tasks, such as train detection, safe train separation and junction control. ATO ensures that the train is operated to a defined speed profile and stops accurately. TWC provides secure radio communications between all elements of the system via leaky coaxial cables or line of sight antennas. A significant level of redundancy is built into all of these systems.

With its ATS functionality, CITYFLO 650 is far more than just a signalling system as it actively manages the train service in accordance with the operator's requirements. This includes start-up, changes to service frequency and the management of headways. Crucially, it controls train movements to ensure that there is no conflict as trains arrive at the junctions, a factor that currently greatly constrains capacity on some lines.

More information is available in *The Rail Engineer*, Issue 85, November 2011, and Issue 103, May 2013.

SELECTIVE DOOR OPENING

With longer trains comes the problem of having platforms of sufficient length to accommodate. Lengthening platforms is an expensive business, especially if signals have to be re-sited along with other lineside infrastructure.

Hima-Sella, a Stockport based company specialising in interactive track-to-train communications technology, has responded to the challenge by revolutionising the selective door opening concept with a new design of beacon called the Trackside III.

In the past such beacons have not been resistant to track maintenance conditions and have thus suffered damage, making the technique unreliable. Design improvements by Hima-Sella have, however, rectified this making the concept once more attractive. A trial on the Reading to Waterloo line from February to May 2012 confirmed the viability of this capacity-enhancing principle.

Technically, the device works by siting the unpowered beacon with its electronic tag at the entry point to every platform. Where reversible lines exist, a beacon is positioned at each end. Every beacon is coded with a unique identifier for the specific platform using a 60-bit code consisting of:

(a) Application Code – 9 bits

(b) Station identifier (3 letter code) – 15 bits

(c) Platform number – 5 bits

(d) Platform length – 10 bits, covering from 0 to 1023 metres

(e) Correct side door enabling (left or right) – 2 bits

(f) Approach direction (up or down) – 2 bits

(g) Selective door system operative – 1 bit

(h) Check bit code – 16 bits

Once a beacon is coded for a particular station and platform, it is encapsulated into its casing and fixed for life. Reprogramming is possible, but Network Rail have decided against this owing to the risk of errors compromising the safety of door operating controls.

The system is rated at Safety Integrity Level 2 (SIL 2), and in the event of changed track or platform conditions a new beacon must be provided. This can be programmed on site by Signal and Telegraph (S and T) technicians with a laptop facility.

Power for the electronic tag is derived from the radio signal transmitted downwards by the train, the signal transmit frequency being of the order of 865.7 to 867.9 MHz utilising frequency hopping radio identification technology. The low level of power required means that there is no requirement for a radio licence and the pilot study confirmed that there is no over-read from adjacent tracks. At 75 m.p.h. 25 ‘reads’ are achieved between the train and the beacon. At slower speeds, as when a train is preparing to stop at a platform, proportionally more ‘reads’ will be obtained.

During the pilot no adverse impact on system operation was found due to rain, brake dust, grease or lineside dirt. Each beacon is around 1.2 metres long and supplied to Network Rail for installation by permanent way staff with signal technicians checking that they are in the correct place. A total of 514 beacons (plus spares) are now due to be installed in three phases.

The Siemans Desiro Class 444 and 450 trains, with which the system is to be deployed, have a modern Train Management System (TMS) that services the whole unit and a reader has been fitted to each cab vehicle.

The reader picks up data fro the beacon and enters this into the TMS via an RS485 communication port. All readers are active but only one is needed to acquire the platform information. The TMS will then know where the train is, if it is due to stop at the station, which side the platform will be and which doors to release if the platform is shorter than the train. The stopping accuracy by the driver is based upon plus or minus 2 metres from the platform marker point. A total of 344 readers are being supplied for the Desiro fleet.

Also being fitted are Class 458 Juniper trains, which are older and have a more limited TMS, and therefore a different mode of operation. With these trains every carriage has to have a reader (not just the cab vehicles). Each reader connects with that carriage’s door control, and every carriage that passes over the entry beacon will have the door opening enabled. The positioning of the beacon and the stopping point of the train is thus more critical as the TMS does not provide the same route-based information.

The readers are powered by the standard 110V dc train supply to RIA12 and 13 specification, and conform to EN50121 and 50155 for EMC limits.

More information is available in The Rai Engineer, Issue 102, April 2013 and from Hima-Sells Limited, Carrington Field Street, Stockport, Cheshire SK1 3JN. Telephone: 0161 429 4500. www.hima-sella.co.uk

IMPROVING SERVICE QUALITY REPORTING ON THE TYNE AND WEAR METRO

The Service Quality Management System (SQMS) by Raspberry Software has provided the Tyne and Wear Metro with the ability to complete Metro Station Quality Surveys using a mobile device.

The device has an over-the-air link to a central database that provides survey questions on a station-by-station basis. Once downloaded the station inspector can complete the survey supporting answers with notes and photographs. For example, if some graffiti is identified at a station then this survey question can be 'failed', backing up the answer with a photograph of the graffiti and a note to say exactly where it is. Once complete the survey is sent 'over-the-air' to the database for on-demand reports to be run to quickly highlight the areas that need to be rectified. In addition the device app provides the ability to report single faults empowering any staff member to take responsibility for quality during their day-to-day activities.

Failure to rectify station faults within a set time can result in heavy fines by Nexus (the Tyne and Wear Metro owner), meaning that reporting on demand against submitted device station surveys is essential for a fast turnaround in rectifying faults.

The success of the station surveys on the Tyne and Wear Metro led to their extended use on the trains, with the application being ported at minimal cost.

The solution has since been commissioned by Deutsche Bahn Germany, with roll-out scheduled for the whole 5,600 DB station network.

More details may be obtained from Raspberry Software, 9 Deben Mill Business Centre, Old Maltings Approach, Melton, Woodbridge, Suffolk IP12 1BL. Telephone: 01394 387 386. www.raspberrysoftware.com

NEW ENERGY RECOVERY SYSTEM FOR RAILWAY TRACTION

ABB, the leading power and automation technology group, showcased a comprehensive display of new products and solutions designed to reduce energy consumption and life cycle costs in the rail sector.

Of particular interest was the Enviline™ Energy Recovery System for direct current traction applications designed to reduce heat generation in tunnels, and the revolutionary PETT traction transformer that uses power electronics to reduce its size and weight whilst at the same time increasing the energy efficiency of the train.

Currently rail vehicles regenerate their braking energy into electrical energy. Most of the time a small amount of this kinetic energy is used to power on-board loads, while the remaining energy is sent back to the network and re-used – if a nearby vehicle is accelerating. If this is not the case, however, the network voltage increases due to the

excess energy and the surplus has to be dissipated into on-board or wayside resistors, which can contribute substantially to tunnel heating.

Recycling or managing this surplus braking energy economically can reduce the overall energy consumption by 10 to 30 per cent without the need to invest in new rolling stock or network control systems.

The Enviline™ Energy Recovery System uses a power electronic inverter installed at the dc substation connected in parallel with existing diode rectifiers. The principle is then to force the energy flow from the dc traction grid back to the alternating current grid.

Some rail transport authorities operate on more centralised networks that are powered using an internal, grid independent medium voltage distribution network. These operators have the opportunity to return the braking energy back to the medium voltage network for internal consumption (such as air conditioning, heating, ventilation, escalators and lighting) with no impact on the local electricity grid. For these authorities Enviline™ provides a low-cost energy inversion solution which is space efficient and provides a rapid payback.

Further benefits include mitigation of reactive power when not pushing the energy back into the ac system, and provision of active filtering to reduce the effect of harmonics on the system.

The new power electronic traction transformer (PETT) is based on an innovative multilevel converter topology that uses insulated gate bipolar transistor (IGBT) power semiconductors and medium frequency transformers to replace the conventional transformer and inverter combination. The medium frequency transformer also reduces noise levels.

The PETT is currently being piloted on a shunting locomotive on the 15kV ac and 1.5kV dc lines at Geneva main railway station. It is being regarded as a breakthrough that achieves one of the railway industry's prime objectives, that of reducing the weight of on-board components. The traction transformer, normally made of iron and copper, is one of the heaviest pieces of equipment on a train.

Further details: www.abb.com

INDUSTRIAL PLCs FOR RAIL INFRASTRUCTURE

As part of the seminar programme for Railtex 13 David Collier of Pilz Automation Technology presented the case for industrially tried and tested safety programmable logic controllers (PLCs) to be considered for proprietary relays.

One of the major concerns of the UK rail industry is the large number of ageing relay interlocking systems. Complex wiring, expensive components and bulky installations make these legacy systems expensive to maintain.

Pilz has responded to this challenge by developing the compact modular TUV SUD certified safety PLC system known as the PSS 4000-R, which meets the requirements of rail standards for communication, signalling and processing systems, such as EN50126 (reliability, availability, maintainability, safety), EN50128 (software), EN50129 (safety-related electronic control and protection), EN50121 (EMC) and EN50155 (rolling stock). This enables the PSS 4000-R to be used in rail safety applications such as level crossings, with the ability to meet harsh requirements for temperature (-40 to +70 degrees Centigrade), vibration, EMC and mechanical load with standard compliant solutions up to SIL4.

The principle behind it is that powerful PLC software can replace complex relay logic wiring and create certifiable function blocks which can be used and re-used in new safety cases. Safe Ethernet communication using fibre optic infrastructure allows long distance communication (and diagnostics) for remote signalling via decentralised Input/Output.

Details are available from Pilz Automation Technology, Pilz House, Little Colliers Field, Corby, Northamptonshire NN18 8TJ. Telephone: 01536 460 766. Email: j.harris@pilz.co.uk

CLOUD BASED TECHNOLOGY FOR RAIL APPLICATIONS

As in other areas cloud computing is advancing into railway operations and a recent development is E-Link, which provides real-time remote monitoring and reporting for depot managers.

The system is optimised for train wash equipment, but it can be installed and used for any PLC-controlled depot equipment. For the train washing application it provides historical data on train washing and faults.

The system is accessed through a web portal making it easy for both the train wash manager and the depot manager to access the data in real-time from any location, and to assess immediately if there is a problem that could impact on the maintenance schedule. The system is supported with E-Portal, which allows information and documents to be stored on a web-based portal.

E-Link ensures that any problems can be identified at the earliest opportunity and that depot equipment is kept running at optimum efficiency. E-Portal then allows documentation such as PPM records, method statements and risk assessments to be stored remotely allowing everyone to gain access quickly and easily.

The use of a web-based system ensures that everyone knows what is happening at the depot at any given time, but, perhaps more importantly, it ensures that nothing is overlooked and that the appropriate records are kept in a place that is accessible to anyone.

More details: www.garrandale.co.uk

IMPROVING IN-SERVICE RELIABILITY WITH RFID

The British based Harting Technology Group is equipping the Hanover ustra suburban trams with an individually tailored Radio Frequency Identification (RFID) system.

Until recently ustra determined the distance that a vehicle has travelled by taking readings from mechanical odometers. The computer services area was then responsible for assigning this data to particular components for maintenance purposes, with a time consuming and error prone process of reading out data and inputting it into the system. Additional challenges for data quality were also presented when repairs and maintenance called for components to be replaced.

In order to help improve reliability ustra worked with Harting to automate data acquisition for both the individual vehicle and its main components. This was intended to ensure swift and accurate traceability of the components relevant for testing and maintenance, whilst at the same time keeping a record of the distance driven with each component.

With this the manual solution is replaced by automatic data recording, with additional consideration given to the complexity of the vehicle configuration. In this way it is possible to minimise mistakes and record the actual vehicle status at all times. The system also has to be suitable for office computer systems, and it must be possible to identify each vehicle while keeping a record of its main components.

In order to optimise business processes, the computer system not only had to control the maintenance and calculate the maintenance requirements, but also had to enable the substantiation of maintenance quality for presentation to public authorities.

Harting RFID transponders with expanded memory and sensor interfaces were used in combination with a microprocessor such that each transponder could be programmed with a sequence controller that converts axle rotations into kilometres.

The low-hanging aprons of the ustra trams proved to be an obstacle in the initial trial in which the RFID reader's antenna would be mounted vertically on a wall. The mounting position was therefore changed such that the antenna is countersunk in the trackbed between the rails. For this it needed to be possible for trucks and buses with a surface load of up to 60 tons to be able to safely drive over it. Also, the antenna box would have to be heated so as to guarantee that the system works during the winter, since snow and ice have a tendency to shield UHF signals.

When driving over an RFID reader antenna that has been placed in the ground at the ustra depot's entry area, the RF800 RFID reader first reliably identifies the vehicle and then automatically reads out the kilometres that the vehicle has driven. The main components, which are given UHF tags (passive high frequency identification transponders), are also identified. Essential maintenance jobs can then be initiated immediately.

More details are available from www.harting.co.uk or on 01604 827 500.

TABLETS IMPROVE RAILWAY OPERATIONS

Panasonic have recently launched the Toughpad family of rugged tablets, the 10.1 inch Windows 8FZ-G1, the 10.1 inch FZ-A1 and the 7 inch JT-B1 Android powered devices, that are especially suited to applications on the permanent way.

The first fully rugged device to use the latest IPS technology, the Toughpad FZ-G1, provides new levels of viewing quality for tablet users working outdoors. This offers extra-wide viewing angles, strengthened glass, high contrast ratio and high brightness coupled with a Panasonic anti-reflection layer and high definition screen designed for any weather and light conditions. It has MIL-STD-810G rating for drops and IP65 ingress protection ratings for resistance to dust and water, as well as extreme temperature ratings. An external antenna connector also allows vehicle-mounted devices to connect to a roof antenna.

With its flexible ports the FZ-G1 can be configured exactly for specific requirements, offering USB2.0, microSD and serial ports, LAN connector with GPS and integrated smartcard reader optional. USB3.0, Bluetooth4.0 and WLAN capabilities are standard. 3G connectivity is optional for the FZ-A1 and 3G/LTE optional for the FZ-A1 and JT-B1 models.

All of the tablets feature front and rear cameras, with a rear camera optional on the FZ-GT, so as to provide high quality images for documentation purposes.

As a toolkit for rail professionals, the new tablets are designed to offer the following benefits:

(i) Electronic documents and schedules mean that stem journeys to the depot are reduced, whilst digital technical manuals and drawings enable assets to be managed on-site.

(ii) Video and photographic imagery can record and share information to inform appropriate repair or maintenance work.

(iii) Specialised diagnostic capabilities and rugged design that enables train drivers and others to have reduced paperwork and files in the cabin, and to receive, record and share digital data quickly and reliably.

(iv) Improved maintenance as maintenance workers are able to carry out repairs more quickly and confirm immediately that the task is complete, with improved updating of back-office systems, so reducing rail possession time and reducing the risk of regulatory penalties.

Further details are available from www.toughbook.co.uk/toughpad or 01273 765 114.

IMPROVEMENTS IN CRITICAL POWER SYSTEMS

Much of the equipment used in the UK rail industry has, until recently, been some two generations behind the critical power systems of other industrial and data centre applications.

In order to try to rectify this differential Socomec have developed the IP+ Rail range, utilising the latest UPS technology for use in railway networks and infrastructure.

This product range has been specifically engineered to provide optimum energy efficiency for high performance critical power applications for challenging operating environments such as those on London Underground. With a niche market, the Socomec Masterys IP+ Rail has become the first and so far the only UPS range product to be listed on the London Underground Product Register and hold 'authorised for use' status. It also complies with the demanding LU Section 12 specification, the LU1-085 Fire Safety Performance of Materials, EMC standards EN50124-4 and EN62040-2, and LUL EMC standards 1-222 and 1-196.

The Socomec Masterys IP+ Rail is housed within a compact, robust steel-framed enclosure that is almost twice the thickness of standard UPS cabinets and has anti-corrosion tropicalised circuit boards. Available with IP31 or IP52 ingress protection, this system will operate in environments where there is conductive dust or dripping water.

The electromagnetic disturbance immunity level is double that required by European standards and the internal components meet the strict, low smoke requirements of the rail sector. Power options range from 8 to 10 kVA for three-phase models and 10 to 60 kVA for single-phase models. Specifically designed to have a very long mean-time-between-failure (MTBF), i.e. Greater than 202,000 hours, modules can be paralleled up to six units. Units can also be customised to meet specific requirements e.g. power supplied from the OLI.

Details may be obtained from Socomec Marketing Manager, Sarah Condie. Email: sarah.condie@socomec.com

IMPROVED DATA COLLECTION ON THE CENTRAL LINE

DPI have won an important contract to help improve data collection on the Central Line of the London Underground. This will involve the supply of 200 embedded computers that will be installed on all Central Line trains.

These embedded computers will link into existing on-board acquisition systems, storing data locally and downloading it to Central Line Wi-Fi points that will be strategically placed along the line.

The new system is expected to enable the Transport for London (TfL) Asset Performance Directorate to acquire data in a much timelier manner and greatly assist in the identification of developing issues before they become serious problems.

Details are available from john.vaines@dpie.com or on 01634 300 900.

THE GROWING USE OF WI-FI

Vehicle-to-vehicle and vehicle-to-ground high bandwidth data transfers are constantly growing and since wiring between carriages or with the ground is expensive and sometimes impossible, Wi-Fi has quickly established itself as the most reliable, efficient and affordable means of communication.

Optimising the running costs of rolling stock and enhancing passenger security are two major issues for train operators, and these issues particularly have resulted in a substantial growth in on-board electronic equipment with Wi-Fi quickly emerging amongst it. In particular this technology allows operators to:

- upload or download data automatically when stationary
- manage real-time data in motion
- develop new on-board services

With these needs in mind ACKSYS Communications and systems has developed a range of rugged Wi-Fi access points, Ethernet bridges and repeaters designed specifically for rail transport.

In particular ACKSYS provides Wi-Fi devices that allow carriages to be coupled together (carriage bridging) with dual radio enabling the management of two networks that are physically separated, such as one that is dedicated to service data (like train announcements and communication between on-board computers) and one broadcasting Wi-Fi to passengers (Internet access, VOD or infotainment).

The latest device is WLn-ABOARD, which enables operators to improve mobile communications in motion and develop a wide range of new in-vehicle networking applications such as wireless Internet access, Voice over IP, passenger Wi-Fi services, streaming video surveillance and smart vehicle diagnostic/maintenance.

Based on the 802.11n standard, the WLn-ABOARD takes full advantage of the MIMO technology offering high throughput (up to 2x300 Mbps) and robustness of the wireless communication. The dual radio design allows for many topologies including redundant Wi-Fi network, management of two independent Wi-Fi networks, 2.4 and/or 5GHz simultaneous communication and static or dynamic (based on IEEE802.11s) mesh topologies.

In order to ensure a continuous transmission of data even in motion, the roaming performances of WLn-ABOARD have been optimised with a handover of 30ms in dual RF mode.

It is designed with a rugged aluminium enclosure and robust Ultra-Lock® M12 connectors and fulfils the most severe operating conditions (shockproof and vibration proof, EN50155 compliant for railway applications, waterproof to IP66 and temperature from –40 degrees Centigrade to +70 degrees.

More details may be obtained from ACKSYS Communications and Systems, Z.A. Val Joyeux, 10 rue des Entrepreneurs, 78450 Villepreux, FRANCE. www.acksys.fr

GSM IMPROVES SAFETY AT LEVEL CROSSINGS

Level crossings have long been a source of danger on the rail network, especially in rural areas.

The installation of telephones at level crossings has often been impeded through the need for power and cabling and the high cost of installation and maintenance.

Recently, however, trials have been conducted of the RA708-GSM/GSM-R telephone, which requires neither power nor cables nor infrastructure and can be located anywhere where there is GSM-R coverage.

In addition the RA708-GSM/GSM-R possesses on-board intelligence that can provide internal health status checks that ensure that serviceability levels are maintained, reporting via SMS.

Details from www.daclimited.co.uk

ADVANCES IN TRAIN COMMUNICATION AND MANAGEMENT SYSTEMS

A Train Communication and Management System (TCMS) is installed in almost every modern train, whether it be a Metro, Diesel or Electrical Multiple Unit, or a High Speed Train. It monitors and collects data from many different parts of the train (doors, HVAC, CCTV, brakes, lights and others) and then converts this data into a format that can be displayed to the driver via a display that is presented in a condensed easy-to-read format. This data is then used:

- to monitor the health of the train
- to identify faulty areas or equipment on the train
- to send diagnostic data to a depot for further analysis

- to receive data from the Operational Control Centre

A modern TCMS is Ethernet based, such that train builders and operators can build and operate trains far more cost-effectively than in the past, with maintenance made both easier and faster.

In the past different subsystems in a train always used their own network, which necessitated complex and expensive wirings and complicated separate software solutions. These separate subsystems also rarely communicated with each other, which resulted in yet further limitations.

The modern approach, by contrast, is to use the same network to perform multiple functions, as a single system, with all subsystems feeding into it, can monitor and diagnose the whole train much better than many separate non-linked systems.

In the White Paper 'EKE-Trainnet® Architecture explained', more detail is provided about the train architectures that support the EKE-Trainnet® V Ethernet backbone to which all subsystems are connected. These architectures can be modified easily to satisfy almost all different needs when designing a new train or refurbishing an old one.

The White Paper is supported with a collection of data sheets for the EKE-Trainnet® and modules, including:

- Train Management System (optional platform for a complete Train Communication, Control and diagnostics system).

- TCN Gateway (consisting of CPU, train bus interface module and vehicle bus module and utilising a highly efficient combination of a dedicated microprocessor and FPGA – or ASIC Logic – with electronic modules communicating with each other through shared memory of IEC 821 VME bus back plane).

- Train Data Recorder (utilising a high capacity solid-state Flash Memory to retain event data and complying with the EN50155 standard for electronics in rolling stock).

- Wire Train Bus Interface Module (implements the WTB Link Layer functions of the IEC 61375-1 Train Communications Network standard and provides the Mapping Server located on the system CPU module with all the necessary primitives for accessing the Wire Train Bus).

- Multifunction Vehicle Bus Interface Module (provides the train networking, diagnostics and control applications of the Coach Computer with all the necessary functions for accessing the MVB Vehicle Bus and implements the MVB link layer functions of the IEC 61375-1 Train Communications Network standard).

- CAN Vehicle Bus Interface Module (provides the train networking, diagnostics and control applications of the Coach Computer with all the necessary functions for accessing two CANopen networks as vehicle buses using two CAN controller chips and the link layer functions within the local CPU on the module).

- Ethernet Switching Unit.

- Ethernet Router Unit (routes traffic between Ethernet Train Backbone and Ethernet Consist Network that are used to send large amounts of information along the length of the train, and handles train inauguration as cars are connected and disconnected).

More details are available from EKE Electronics Limited, Piispanportti 7, 02240 Espoo, FINLAND. Telephone: +358 96130 3308. Also www.eke.com

INTELLIGENT MONITORING OF SIGNALLING POWER SUPPLIES

Network Rail has awarded a £2.7 million contract to Bender UK for the supply of over 400 integrated protection systems to monitor and protect railway electrical systems and equipment.

The Rail Signalling (RS3) integrated insulation monitoring and earth fault location equipment is designed principally for relay rooms and lineside locations and incorporates GSM-enabled data loggers for real-time direct communication with Intelligent Infrastructure for immediate notification of insulation faults.

The ability of the RS3 to identify the location of a fault enables maintenance teams to respond more rapidly so as to improve safety and reduce downtime.

Faults in the power system can arise from a multitude of causes, such as damaged cables, faulty connections, breaks in insulation, damage by pests and, in some cases, cable theft.

The RS3 continually monitors insulation values to show the real-time status of the power system. Should the insulation value drop the RS3 records the fault and a test current signal or pulse is then introduced that will be pulled to earth at the point where the fault is located.

Maintenance teams are guided to the place where the fault is and a portable Bender device is then deployed to pinpoint the exact location by monitoring the pulse on the trackside cable.

Steve Mason, Managing Director of Bender UK comments:

"RS3 continually checks the health of the power system and immediately notifies the Intelligent Infrastructure via the GSM capability if that status changes, indicating a fault or problem in the making. The customer can address the fault immediately or plan maintenance intervention.

Bender UK's field trials to prove the effectiveness of the RS3 system in one case led the maintenance team to a trackside cable which was glowing hot because of an earth fault that could have resulted in serious disruption to the network."

More details are available from www.bender-uk.com/contact

THE ROLL-OUT OF GSM-R

On December 31st. 2012 the old analogue National Radio Network (NRN) was switched off in Southern England, making way for the replacement Global System for Mobile Communications – Railway (GSM-R).

The infrastructure for the new track-to-train radio system is now mainly in place in the form of a Fixed Telecommunications Network (FTN) and 2,200 GSM radio masts along the entire network ranging in height from 5 metres to 29 metres.

GSM-R is only a 2G system, as the specifications have been around for a long time and the European mandating process was complex, but five key benefits are identified over the analogue system, namely

(j) Location dependent addressing (allowing the 'call-my-signaller' function, for example, to route it to the right signaller along different parts of the track.

(ii) Functional addressing

(iii) Group call

(iv) Broadcast calls (similar to group calls, but no-one can respond).

(v) Prioritisation and an 'All trains stop' button (consisting of five levels, with the highest clearing any other call if the 'big red button' is pressed, giving every other train in the area a 'stop' message - the equivalent red button process with the NRN radios was so much slower and involved voice communication with the controller).

As of March 2013 7,231 km of GSM-R were operational, representing 48 per cent completion, with 100 per cent completion being envisaged by the end of 2015.

More details on this may be found at www.networkrail.co.uk/aspx/6386.aspx