SYSTEME und GERÄTE für SCHIENENFAHRZEUGE

Von einzelnen Komponenten bis zu kompletter Lösung mit unserer Erfahrung und voller Kompetenz.

ETHERNET BACKBONE NODE
EBN-600

The EBN-600 Ethernet train backbone node (ETBN) is used to connect an Ethernet consist network (ECN) or directly one or more end devices to the Ethernet Train Backbone (ETB). It entirely fulfills the requirements defined in the IEC 61375 series of international standards.

The main function of the ETBN is to route data packets between the ETB and ECN networks. The IP routing tables and address translation rules are automatically created and updated using TTDP protocol, which detects all changes to the train com- position, such as train shortening or lengthening. A dynamically adapted Network Address Translation based on train backbone topology (R-NAT), makes it possible to connect consists identically configured in terms of device addresses.

Feature highlights
• Compliant with IEC 61375 series of standards
• 100 Mbps Ethernet Train backbone and Consist Network
• 4 ETB ports with bypass function
• Redundancy (optional)
• Power supply voltage 16.8V to 154V DC
• 7 port consist switch (optional)
• Web-based configuration and system diagnostics
• Operating temperature from -40°C to +70°C

TCN GATEWAY
TCN-GW01 / GW03

The TCN Gateway is a key component of the on-board network infrastructure, which is based on the international standard IEC 61375 – Train Communication Network (TCN). This standard, together with the UIC 556 Leaflet, facilitates the interoperability of vehicles from different manufacturers.

The TCN Gateway works as a communication node which ensures the transfer of process data and the routing of messages between the WTB train bus and MVB or the CANopen vehicle bus. It can be used for connection to the WTB bus of both individual vehicles and train sets. The dynamic coupling of vehicles or train units during operation is supported.

Feature highlights
• Compliant with IEC 61375 and UIC 556
• WTB/MVB and WTB/CANopen gateways
• Supports the dynamic coupling of vehicles
• Redundancy (optional)
• Direct inputs/outputs
• Rich configuration and diagnostics tools
• Power supply voltage 16.8V to 154V DC
• Operating temperature from -40°C to +70°C
MOBILE COMMUNICATION GATEWAY

TRL-2

The TLR-2 mobile communication gateway belongs to the family of on-board network devices. It is in-tended for train-to-ground wireless data transmission over mobile and WiFi networks. Based on a modular architecture, it is possible to install up to three wireless/GPS modules. This enables customer specific configurations and the easy upgrade to new wireless standards.

The gateway is supplied with a Linux operating system in the UcBox distribution, which is optimized for industrial applications. UcBox integrates alongside Internet technologies such as VPN, NAT, HTTP and FTP servers, also TCN and CANopen protocols stacks.

Feature highlights
- LTE/HSPA/UMTS/EDGE/GPRS, railway GSM-R
- WiFi 802.11b/g
- GPS receiver
- Ethernet, CAN, RS-232/422/485
- Freescale® PowerPC based CPU 400 MHz
- Linux 2.6 operating system
- Power supply voltage from 16.8V to 154V DC
- Operating temperature from -40°C to +70°C

8-PORT GIGABIT MANAGED ETHERNET SWITCH

ETX-201

The ETX-201 managed Ethernet switch is equipped with four 10/100Mbps M12 ports with full power isolated IEEE 802.3af Power over Ethernet (PoE) and four 10/100/1000Mbps M12 ports.

The integrated UC-Ring technology makes it possible to use the switch in a ring topology to build a fault-tolerant network. The UC-Ring technology allows an unlimited number of switches in the ring while still ensuring a fast fault recovery time of less than 50ms. Moreover, switches with the UC-Ring technology and switches with a bypass relay may be combined. For even more complex redundant networks, a chaining of two rings is supported by the ETX-201.

Feature highlights
- 4x Gigabit Ethernet
- 4x 10/100Mbps Ethernet with POE (optional)
- UC-Ring for fault-tolerant network redundancy
- Fast recovery time under 50ms
- Redundant power supply (optional)
- Power supply voltage from 16.8V to 137.5V DC
- Operating temperature from -40°C to +70°C
ETHERNET TRAIN BACKBONE REPEATER

ETX-401

The ETX-401 is a 4-port Ethernet repeater which is intended to extend two Ethernet Train Backbone (ETB) links for another 100 meters. This facilitates the use of only one Ethernet Train Backbone Node (ETBN) for a group of vehicles where the total length of the ETB segment would exceed 100 meters.

An optional power supply redundancy allows uninterrupted operation in the event of the failure of one power supply. Moreover, such a failure is reported by closing a relay contact; which can be used for remote diagnostics.

Feature highlights
- Dual Ethernet repeater for two ETb links
- Robust M12 Connectors
- Bypass function
- Redundant power supply (optional)
- Low latency
- Power supply 16.8V to 137.5V DC
- Operating temperature from -40°C to +70°C

WIRELESS ACCESS POINT – BRIDGE

ETX-501

The ETX-501 is an industrial grade Wireless Access Point/Bridge. In Access Point mode it allows wireless devices to connect to a wired network using WiFi standards. Used in the bridge mode, the ETX-501 enables the connection of one or more devices which feature a 10/100 Ethernet interface to the WiFi wireless network; it supports both Infrastructure and Ad-Hoc modes. The unit can be also used as a WiFi network repeater (WDS) in order to extend radio coverage.

This product complies with IEEE 802.11a/b/g/h standards (2.4 GHz & 5 GHz) and features a 10/100 auto-sensing Ethernet interface. The nominal range (open space) of the ETX-501, with the antenna included, is 300 m for a transmission power of +20 dBm. Receiver sensitivity is -92 dBm for IEEE 802.11a/g modes and -95 dBm for IEEE 802.11b mode.

Feature highlights
- IEEE 802.11 a/b/g/h & super Ag standards
- Data rate up to 108 Mbps
- Frequency band 2.4 GHz and 5 GHz
- 64/128 bit WEP, WPA-PSK, WPA2-PSK, IEEE 802.1x (RADIUS)
- Web-based configuration and system diagnostics
- 2dbi omnidirectional antenna
- Power supply voltage from 16.8V to 36V DC
- Operating temperature from -25°C to +70°C
**GATEWAY**

**MVB/CANopen**

The MVB-CAN is a gateway designed to interconnect the multifunction vehicle bus MVB and the CAN bus. Up to 126 CANopen enabled devices with slave functionality can be connected to the gateway. The gateway allows the fast transfer of periodic process data between the two networks with a typical period of 10ms.

The gateway supports CANopen NMT master capability and device monitoring using node guarding or heartbeat mechanisms for network start-up and error management. It is able to generate SYNC messages.

**Feature highlights**
- Connection for up to 126 CANopen slaves to the MVB bus
- Fast transfer of periodic process data
- User configurable data mapping
- Node guarding or heartbeat protocols
- 4 integrated digital inputs
- Power supply voltage from 14.4V to 154V DC
- Operating temperature from -40°C to +70°C

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**VEHICLE CONTROL UNIT**

**VCU-01**

The VCU01 is a control unit intended for implementing vehicle and train control functions in railway vehicles. It is equipped with a powerful PowerPC-based CPU and a number of communication interfaces including Ethernet and MVB, which are specified in the international standard IEC 61375 – Train Communication Network (TCN). The VCU01 also features hardware controlled redundancy, which ensures high reliability and availability.

The modular design of the VCU01, consisting of processor cards, a redundancy control unit and a power supply unit, makes it possible to easily integrate these components together with the TCN Gateway (TCN-GW01), Ethernet Backbone Node (EBN-600) and I/O cards (RIO-300) into one 6U rack.

**Feature highlights**
- Freescale® PowerPC based CPU
- Ethernet, MVB, CANopen, RS-232/422/485
- Redundancy (optional)
- UniCAP development environment
- Web-based configuration and system diagnostics
- Power supply voltage from 16.8V to 154V DC
- Operating temperature from -40°C to +70°C
COMPACT CONTROL UNIT
UNINOD

The UniNOD is a compact control unit intended for assembly onto a DIN bar. It is equipped with a powerful PowerPC-based CPU, a number of communication interfaces, and according to the model variant, additionally with integrated digital and analogue I/Os.

The unit is supplied with a Linux operating system in the UcBox distribution, which is optimized for industrial applications. The built-in web server provides easy browser-based configuration and system diagnostics.

Application programming is greatly simplified by using UniCAP IDE - a tool for developing applications in PLC languages in accordance with the IEC 61131-3 standard. For the development of user applications in C/C++ programming languages tools are provided for cross compilation and a set of libraries for work with hardware.

Feature highlights
- Freescale® PowerPC based CPU
- 10/100Mbps Ethernet, CANopen, RS-232/422/485
- Integrated digital and analogue I/Os
- UniCAP development environment
- Attachment to a DIN bar
- Operating temperature from -40°C to +70°C
- Robust design, aluminum enclosure

REMOTE DISPLAY
DIS-110

The DIS-110 is a 10.4” panel mount display unit powered with a Freescale® iMX6 ARM Cortex-A9 dual-core processor at 800MHz with high performance GPU, which makes it ideal for demanding graphics applications including multi-stream video playback. The display is designed in accordance with the UIC 612 Leaflet and is intended for use in the display system in the driver’s cab. The display features a 1GB DDR3 and offers 4GB NAND Flash for storage. It can incorporate an internal 2.5” SATA drive or mSATA SSD module. The storage options are extended by an SD socket supporting full-size SD/SDHC cards of up to 32GB.

The DIS-110 comes with extended connectivity, as it integrates two Gigabit Ethernet ports, MVB, 2x CAN, RS-422/485, USB 2.0 and audio. It can be equipped with 3G/4G LTE, WiFi and GPS modules.

The unit is supplied with a Linux operating system in the UcBox distribution which is optimized for industrial applications. For the development of user applications in C/C++ programming languages tools are provided for cross compilation and a set of libraries for work with hardware components, a Qt library for creation of a graphic user interface, and other libraries.

Feature highlights
- 10.4” color TFT LCD with LED backlight
- Freescale® i.Mx6 dual-core ARM Cortex-A9 processor
- Touch screen or 32 pushbuttons (UIC 612)
- 3G/4G LTE, WiFi, GPS
- Gigabit Ethernet, MVB, CAN, USB, RS-422/485, audio
- SATA II, SD/SDHC card slot
- Power supply voltage from 16.8V to 154V DC
- Operating temperature from -30°C to +70°C
- Robust design, ingress protection IP54
DISPLAY UNIT
DIS-210/218

The DIS-210 and DIS-218 are 10.4" and 18.5" panel mount display units powered with a Freescale®-i.MX6 ARM Cortex-A9 dual-core processor at 800MHz with high performance GPU, which makes them ideal for demanding graphics applications including multi-stream video playback. The displays feature a 1GB DDR3 and offer 4GB NAND Flash for storage. They can incorporate an internal 2.5" SATA drive or mSATA SSD module. The storage can be extended by SD socket for SD/SDHC cards up to 32GB.

The displays come with two 100Mbps Ethernet ports with a bypass relay, which bridges the ports in case the display is without power. This is ideal for daisy-chaining multiple units without the need of an Ethernet switch; which simplifies the installation. The connection possibilities further include CAN, USB 2.0 and audio. It can be equipped with 3G/4G LTE and GPS modules.

The units are supplied with a Linux operating system in the UcBox distribution, which is optimised for industrial applications. For the development of user applications in C/C++ programming languages tools are provided for cross compilation and a set of libraries for work with hardware components, a Qt library for creation of a graphic user interface, and other libraries.

Feature highlights
• 10.4”/18.5” color TFT LCD with LED backlight
• Robust design, ingress protection IP54
• Touch screen (optional)
• Freescale®-i.MX6 ARM Cortex-A9 dual-core processor
• 2x 10/100Mbps Ethernet with bypass function
• 3G/4G LTE, GPS
• CAN, USB, audio
• SD II, SD/SDHC card slot
• Power supply voltage from 16.8V to 154V DC
• Operating temperature from -30°C to +70°C

MULTI - APPLICATION DISPLAY UNIT
DISPL-1

The DISPL-1 is a compact display unit that features a high brightness LED backlit TFT LCD panel with touch screen or pushbuttons housed in a robust panel mounted enclosure. It is equipped with a 400MHz processor and a number of communication interfaces. The display is designed in accordance with the UIC 612 Leaflet and is intended to be used in the display system in the driver’s cab. The unit is supplied with a Linux operating system in the UcBox distribution, which is optimized for industrial applications. The built-in web server provides easy browser-based configuration and system diagnostics.

Application programming is greatly simplified by using UniCAP IDE, a tool for developing applications and GUI in PLC languages in accordance with the IEC 61131-3 standard. For the development of user applications in C/C++ programming languages tools are provided for cross compilation and a set of libraries for work with hardware components, for the support of TCN and CANopen communications, a Qt library for creation of a graphic user interface, and other libraries.

Feature highlights
• 10.4” color TFT LCD with LED backlighting
• Touch screen or 32 pushbuttons (UIC 612)
• Freescale® PowerPC based CPU
• Ethernet, MVB, CAN, USB, RS-232/422/485, audio
• Linux 2.6 operating system
• Power supply voltage from 16.8V to 154V DC
• Operating temperature from -30°C to +70°C
• Robust design, ingress protection IP54
3U MODULAR I/O SYSTEM

RIO-300

The RIO-300 is a modular system of pluggable 3U size cards providing high density remote I/O. The product range includes I/O cards of digital inputs and outputs, relay outputs, voltage and current inputs and outputs, and special purpose I/Os. The wide power supply range enables the system to be used with all onboard network voltages on rolling stock (24V, 48V, 72V and 110V DC).

The I/O cards feature an integrated CANopen communication interface which allows direct communication with the I/O cards using CANopen protocol. In addition, it is possible to connect the RIO-300 to Ethernet and MVB networks with the help of CX-ETH and CX-MVB interfacing cards.

The I/O cards are equipped with auto-diagnostics and individual channel status LEDs allowing straightforward troubleshooting. Depending on the model variant, the I/O cards provide either front panel I/O connectivity via a single connector or rear I/O connectivity through a backplane connector. All I/O cards are isolated from the CANopen bus and power supply.

Feature highlights
- High density isolated I/O cards
- CANopen communication interface
- MVB and Ethernet gateway available
- Front panel or rear I/O connectivity
- Individual channel status LEDs
- Auto-diagnostics
- Power supply voltage from 16.8V to 154V DC
- Operating temperature from -40°C to +70°C

REMOTE I/O SYSTEM

RIO

The RIO system is a universal modular system of remote inputs and outputs which can be connected to the MVB or CANopen bus. The range of I/O modules includes digital and analogue inputs and outputs, inputs for revolution sensors, and others. One RIO system may consist of up to 31 I/O modules, which makes it possible, for example, to connect 496 digital inputs or 248 digital outputs. All I/O modules are isolated.

The modular aluminum enclosure ensures mechanical ruggedness and high EMI immunity. The modules are equipped with overheating protection, diagnostics of inputs and outputs and with protection from the unintentional change of module types and connectors.

The power supply voltage can be within a range of 14.4V to 154V, with a voltage drop tolerance to 9V for the duration of 10s. In addition, it is possible to power each module individually; which makes it possible to combine various technological voltages in one RIO system or to use separately protected circuits.

Feature highlights
- Isolated I/Os
- Auto-diagnostics
- Individual channel status LEDs
- Connection to the MVB or CANopen bus
- Robust aluminum enclosure
- Power supply voltage from 14.4V to 154V DC
- Tolerance of voltage drop to 9V
- Operating temperature from -40°C to +70°C
- Independent power supply of each I/O module possible
LED INFORMATION BOARDS

**ITLU**

External and internal LED information boards from the ITLU series are designed in particular for use in public transport vehicles. They feature a matrix of 20x64, 20x128, 20x192 or 12x64, 12x128, and 12x192 LEDs. On one or two lines, several numerals, texts and pictograms can be displayed.

User-configurable is the placement of texts and pictograms, the font size and thickness, text effects, display time and number of repetitions. The embedded sets of fonts contain both upper-case and lower-case letters, including international characters, numerals, punctuation marks and special characters.

The texts, pictograms and their attributes are transmitted in XML format to the information boards over the CANopen or Ethernet communication interface.

The ITLU information boards are available in two variants. The internal boards are equipped with standard brightness LED diodes. The external boards feature high-brightness LEDs for improved legibility outside the vehicle.

Selected models contain illuminated signs such as WC occupation and WC out of service.

**Feature highlights**

- 12/20 x 64, 128 or 192 dots matrix
- Various font sizes and support for international characters
- One or two lines of text
- WC and WC illuminated signs (selected models)
- Power supply voltage 24V, 48V, 72-110V DC
- User-configurable text placement
- CANopen and Ethernet communication interface
- Robust design, ingress protection IP52

EXTERNAL – LED INFORMATION BOX

**ELB**

The ELB series of external LED information boards are designed in particular for use in public transport vehicles. They feature a matrix of 48x96 up to 64x144 high-brightness LED diodes. On multiple lines they can display several numerals, texts and pictograms.

User-configurable is the placement of texts and pictograms, the font size and thickness, text effects, display time and number of repetitions. The embedded sets of fonts contain both upper-case and lower-case letters, including international characters, numerals, punctuation marks and special characters.

The texts, pictograms and their attributes are transmitted in XML format to the information boards over the CANopen or Ethernet communication interface.

**Feature highlights**

- 48x96 up to 64x144 dots matrix
- Various font sizes and support for international characters
- Multiple lines of text
- User-configurable text placement
- CANopen and Ethernet communication interfaces
- Power supply voltage 24V, 48V, 72-110V DC
- Robust design, ingress protection IP52
INTERNAL LED INFORMATION BOX

ILB

The ILB series of external LED information boards are designed in particular for use in public transport vehicles. They feature a matrix of 21x96 high-brightness LED diodes. On multiple lines they can display several numerals, texts and pictograms. Additionally, they can contain illuminated signs such as WC occupation.

User-configurable is the placement of texts and pictograms, the font size and thickness, text effects, display time and number of repetitions. The embedded sets of fonts contain both upper-case and lower-case letters, including international characters, numerals, punctuation marks and special characters.

The texts, pictograms and their attributes are transmitted in XML format to the information boards over the CANopen or Ethernet communication interface.

Selected models contain illuminated signs such as WC occupation and WC out of service.

Feature highlights

• 21x96 dots Matrix
• Various font sizes and support for international characters
• Multiple lines of text
• User-configurable text placement
• WC and WC illuminated signs (selected models)
• CANopen and Ethernet communication interfaces
• Power supply voltage 24V, 48V, 72-110V DC
• Robust design, ingress protection IP52

SEAT RESERVATION DISPLAY

RS02LCD

The RS02LCD is a seat reservation display intended to inform passengers about occupied seats. It is designed for wall mounting or installation into the overhead luggage rack.

On the two lines display, texts of up to 24 characters per line can be displayed. The text can contain both upper-case and lower-case letters including international characters, numerals, and punctuation marks.

The RS02LCD is available with either a VFD (vacuum fluorescent display) or an LCD display. The brightness of the VFD display is user configurable in four steps from 25% to 100%. The displays are equipped with 3 pushbuttons to set up communication parameters.

The display communicates through the CAN bus using CANopen protocol.

Feature highlights

• LCD or VFD Display
• Dedicated for 2 seats
• A CANopen communication interface
• Power supply voltage 24V DC
• Displays up to 24 characters per seat
• UTF-8 encoding
• Wall mounting or installation into the overhead luggage rack
SEAT RESERVATION DISPLAY
RSD 801

The SRD-801 is a seat reservation display intended to inform passengers about occupied seats. The display is designed for wall or glass mounting in the compartments.

On the eight line display, arranged into 2 columns and 4 rows, texts of up to 20 characters per line can be displayed. The text can contain both upper-case and lower-case letters including international characters, numerals, and punctuation marks.

The SRD-801 is available either with VFD (vacuum fluorescent display) or LCD display. The LCD can be dimmed from 0% to 100% and for the VFD display, in four steps from 25% to 100%. The displays are equipped with 3 pushbuttons to set up parameters.

The display communicates through the CAN bus using CANopen protocol.

Feature highlights
- LCD or VFD display with dimming capability
- Dedicated for 8 seats
- Displays up to 20 characters per seat
- Wall or glass mounting
- A CANopen communication interface
- UTF-8 encoding
- Power supply voltage 24V DC

ELECTRONIC SPEEDOMETER with REGISTRATION
RE1xx

Feature highlights
- Display and recording of speed, distance, time and selected vital signals
- Both needle and numerical speed indicators
- I/Os for analogue and logical signals
- DC777 time signal receiver
- USB for downloading records
- Software for the evaluation of records
- Certified in several EU countries
- Selected functions with safety integrity level SIL2

The RE1XX electronic speedometer is designed to provide reliable and accurate readings and records of speed, distance, time and selected vital signals. Its modular design facilitates the installation in various types of vehicles.

The speedometer can be equipped with both a needle indicator with a circular scale and a numerical LED display complete with indication of acceleration or deceleration. Time, date, distance travelled and other information according to the configuration is displayed on the integrated alpha-numeric LCD display.

The records of speed, distance, time, pressure, and selected logical and analogue signals connected to the inputs provided, are stored into FLASH memory. They can be downloaded using a service PC through a USB cable, or they can be copied to USB FLASH memory via an external USB module.

The RE1XX speedometer provides a CAN interface for integration into the train control and monitoring system (TCMS). The speed information and other data from the speedometer can then be visualized on a driver display unit. Configuration and analyzing tools are provided with the speedometer.
The **ELM-102** energy meter is designed especially for energy metering on-board electric traction vehicles. It can measure both the DC and AC signals of any existing traction supply system (1.5kV DC, 3kV DC, 15kV/16.7 Hz, 25kV/50Hz). Moreover, it is also suitable for multi-system locomotives using more than one electrification system.

The energy meter measures active and reactive energy both consumed and generated, active and reactive power and instantaneous values of voltages and currents. It records load profiles at 1 minute intervals, and monitors the minimums and maximums of values measured.

The **ELM-102** is a certified energy meter in accordance with the latest EN 50463-2:2012 standard. It meets the requirements for accuracy class 0.5R. The energy meter can be supplied with a calibration certificate enabling its use for billing purposes.

**Feature highlights**
- EN 50463-2:2012 certified
- Suitable for all AC and DC traction supply systems
- Accuracy Class 0.5R (EN 50463), Class C (EN 50470)
- Power supply voltage 16.8V to 143V DC
- Four-quadrant energy metering
- Applicable to multi-system locomotives
- Recording load profiles at 1 minute intervals
- Operating temperature from -40°C to +70°C

**GSM / WIFI ENERGY METER**

**ELM-102**

The **ELM-201** energy meter is designed especially for energy metering on board electric traction vehicles. It can measure both the DC and AC signals of any existing traction supply system (1.5kV DC, 3kV DC, 15kV/16.7 Hz, 25kV/50Hz). Moreover, it is also suitable for multi-system locomotives using more than one electrification system.

The energy meter measures active and reactive energy both consumed and generated, active and reactive power and instantaneous values of voltages and currents. It records load profiles at 1 minute intervals, and monitors the minimums and maximums of values measured.

The energy meter can wirelessly transmit the measured data over the GSM/GSM-R/UMTS and WiFi networks. An integrated GPS receiver adds position information to the load profiles and is used for time synchronization.

The **ELM-102** is a certified energy meter in accordance with the latest EN 50463-2:2012 standard. It meets the requirements for accuracy class 0.5R. The energy meter can be supplied with a calibration certificate enabling its use for billing purposes.

**Feature highlights**
- EN 50463:2012-2 certified
- four-quadrant energy metering
- Suitable for all AC and DC traction supply systems
- Applicable to multi-system locomotives
- Accuracy Class 0.5 (EN 50463), Class C (EN 50470)
- Recording load profiles at 1 minute intervals
- wireless data transmission in 3G/4G, railway GSM-R And WiFi Networks
- Power supply voltage 16.8V to 154V DC
- Operating temperature from -40°C to +70°C