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Trantek · MST

EASY INTEGRATION AND FAULT RESILIENCE

Your partner in solutions

Passenger Information solution for Railway & Transport

October 2016

Content of AMT5 Passenger Announcement System

AMT5 – PA	Public Address
AMT5 – ECB	Emergency Call Box
AMT5 – PID 2560	Passenger Information Display
AMT5 – CN	Controlling Node
AMT5 – RPT	CAN Repeater
AMT5 – SDK	Software Development Kit
AMT5 – Engineering	Turn key solution & Tailor made development

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Trantek AMT5-PAS concept

AMT5 PAS over CAN bus

- The AMT5 concept has been designed for working over dual redundant CAN 2.0B network
- The CAN (Controller Area Network) is a message oriented multi-master protocol about quick serial data exchange for real time control applications in the automotive and transport industries
- CAN Bus replaces speaker cables
- CAN uses 12 V to 24 V DC supply
- The AMT5 uses its own high level protocol to manage all the AMT5 devices on a CAN network and supports dual redundant CAN links, automatic device discovery, default or customer assigned addressing, master/standby operation or peer multi master operation with up to 6 simultaneous controlling nodes

CAN bus v2.0B

General Spec.

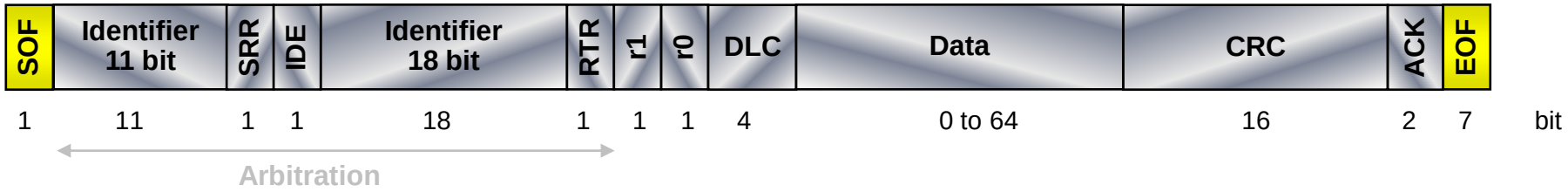
- CAN bus is a vehicle bus standard designed to allow microcontrollers & devices to communicate with each other within a vehicle without any host computer
- CAN is a multi-master broadcast serial bus standard
- CAN is a serial Asynchronous communications protocol which efficiently supports distributed real time control with a very high level of security ([1])
- 2 wires balanced interface bus (STP or UTP cabling – 120 Ω - DB9 connector)
- Data Link Layer defined according to the ISO-11898-1…-5
  - LLC
  - MAC
  - Part of physical layer
- The AMT5 system uses its own high level network protocol that provides features allowing audio and data to be easily routed over IP networks

([1]) : Total residual error probability for undetected corrupted messages: is less than $4.7 * 10^{-11}$

CAN bus v2.0B

Framing

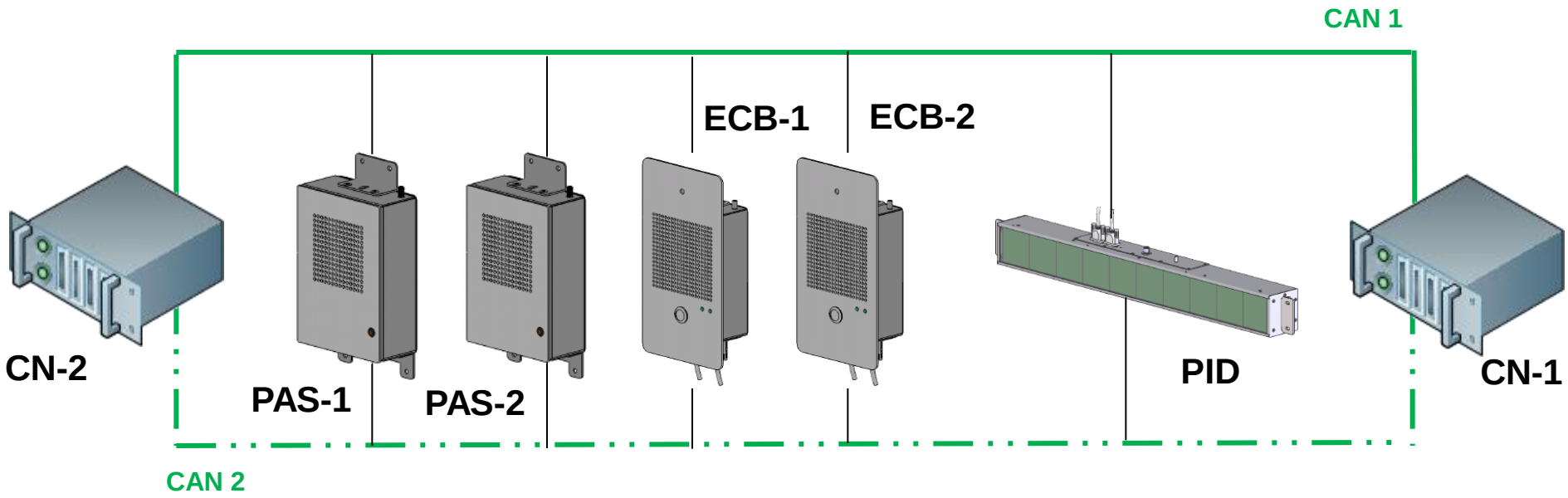
Extended Data frame format



- CAN has four frame types:
  - Data frame: a frame containing node data for transmission
  - Remote frame: a frame requesting the transmission of a specific identifier
  - Error frame: a frame transmitted by any node detecting an error
  - Overload frame: a frame to inject a delay between data and/or remote frames
- Bandwidth & cable length for AMT-5 use
Bandwidth	bus length
1MbpS (Max)	40m
400KbpS	90m
125KbpS	500m

The AMT5-PAS concept

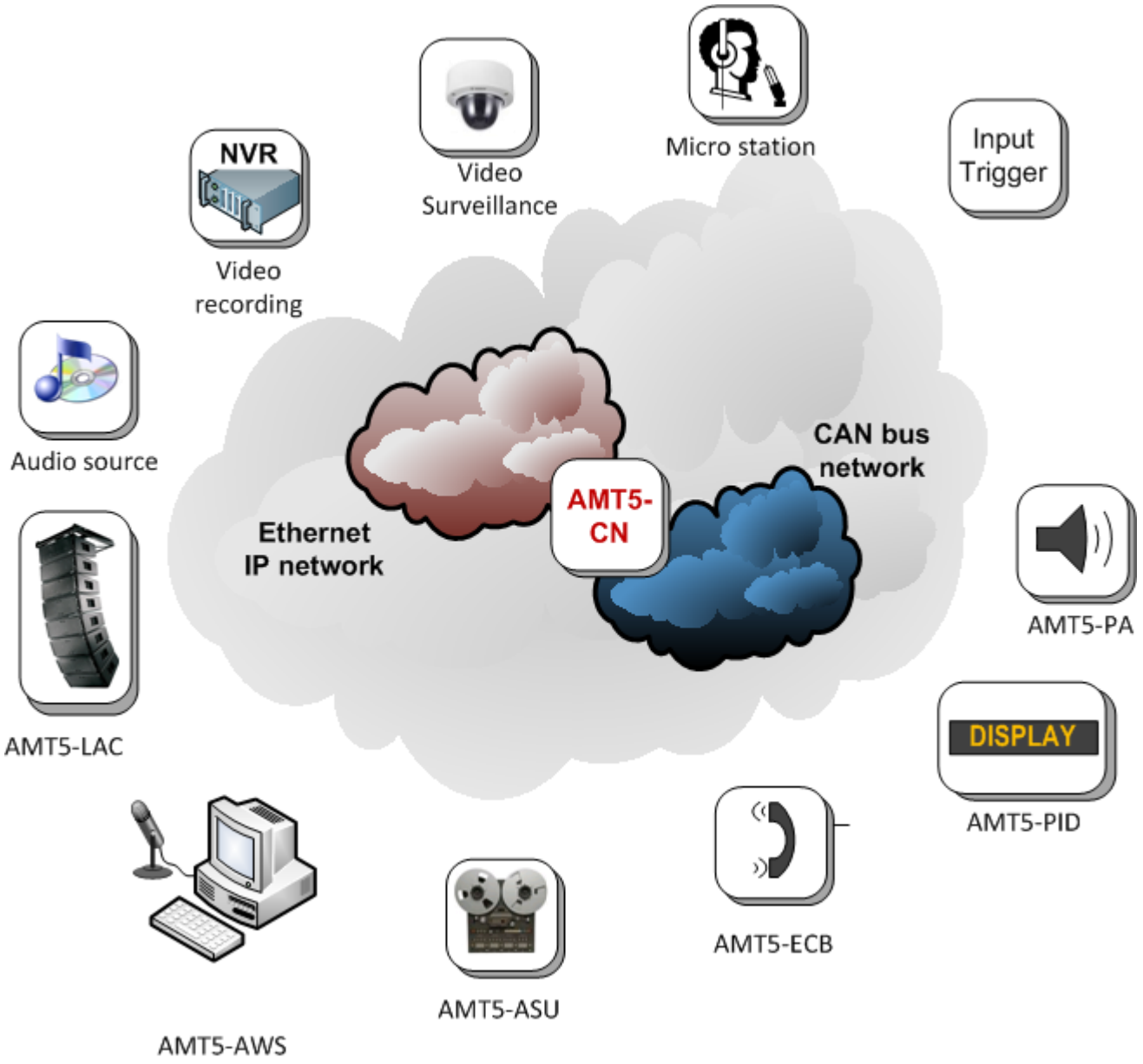
Dual CAN architecture



Benefits

- Software configurable architecture
- Inexpensive cabling to speakers
- Fault tolerant
  - Dual network cabling
  - Separate dual power feeds
  - Speaker and PSU failure alarms
  - Multiple gateways
- Easy service and maintenance
- Volume adjusts automatically on each speaker and not just per zone (Each speaker senses its own output with built-in microphone to detect failure automatically and to adjust volume)

The AMT5-PAS concept



Passenger Information & security Solutions

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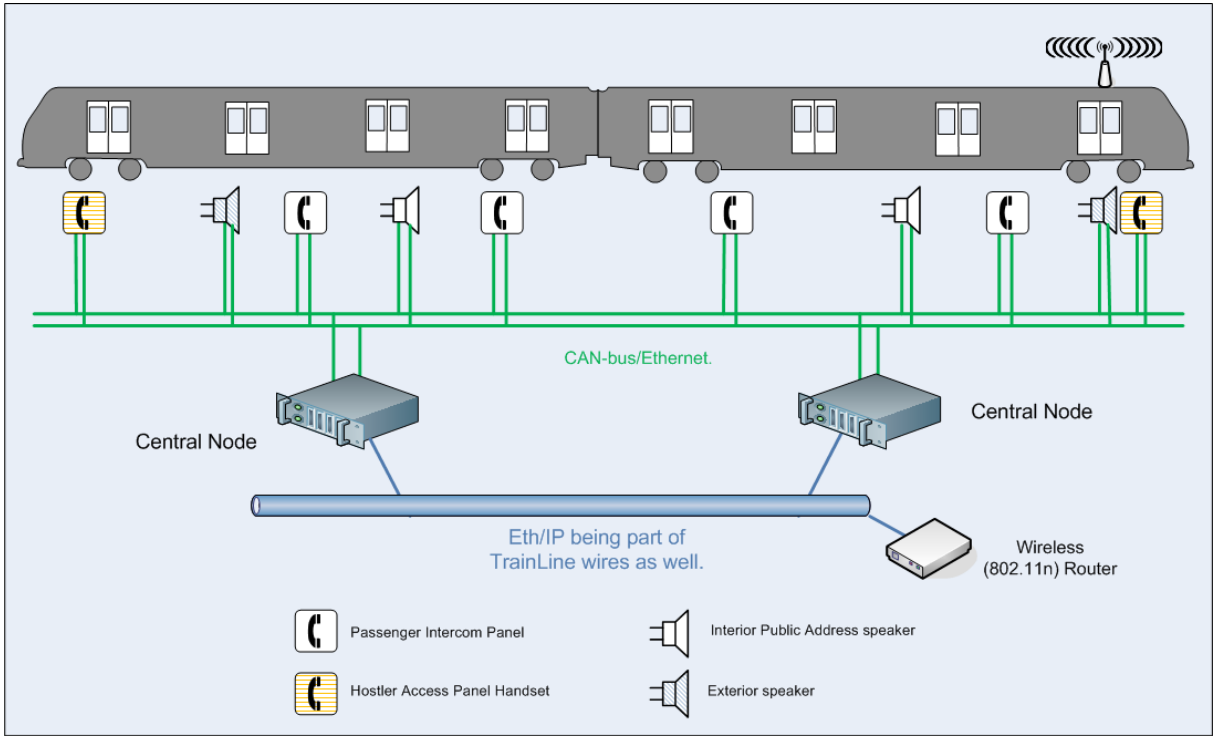
AMT5 - PA

Public Address

On-board communication



Source audio is delivered to the speakers through the AMT-5 Controlling Node or integrated into a 3rd party vehicle controller system using the AMT API software and drivers

Multi-zone Public Address System Features (I)

- Public Address Speaker; has full digital sound distribution, modular and scalable (*The unit receives configuration information from the control unit relating to the audio zone that it belongs)*
- Multiple groups & zones (*Messages to audio groups are broadcast on the CAN network to a group of addresses)*
- Volume Control (*the unit monitors background sound levels and adjusts the amplifier volume set point according to the desired volume)*
- Sound Synchronization *(is achieved by virtue of the way the CAN bus is operated)*
- Self-Test for diagnostic capabilities at each speaker
- Built-in hearing aid loop (option)

Multi-zone Public Address System Features (II)

- Pre-recorded voice announcements
- Pre-recorded background music
- Recordings in a variety of formats
- Configurable announcement priorities
- Automatic discovery of new unit on the system

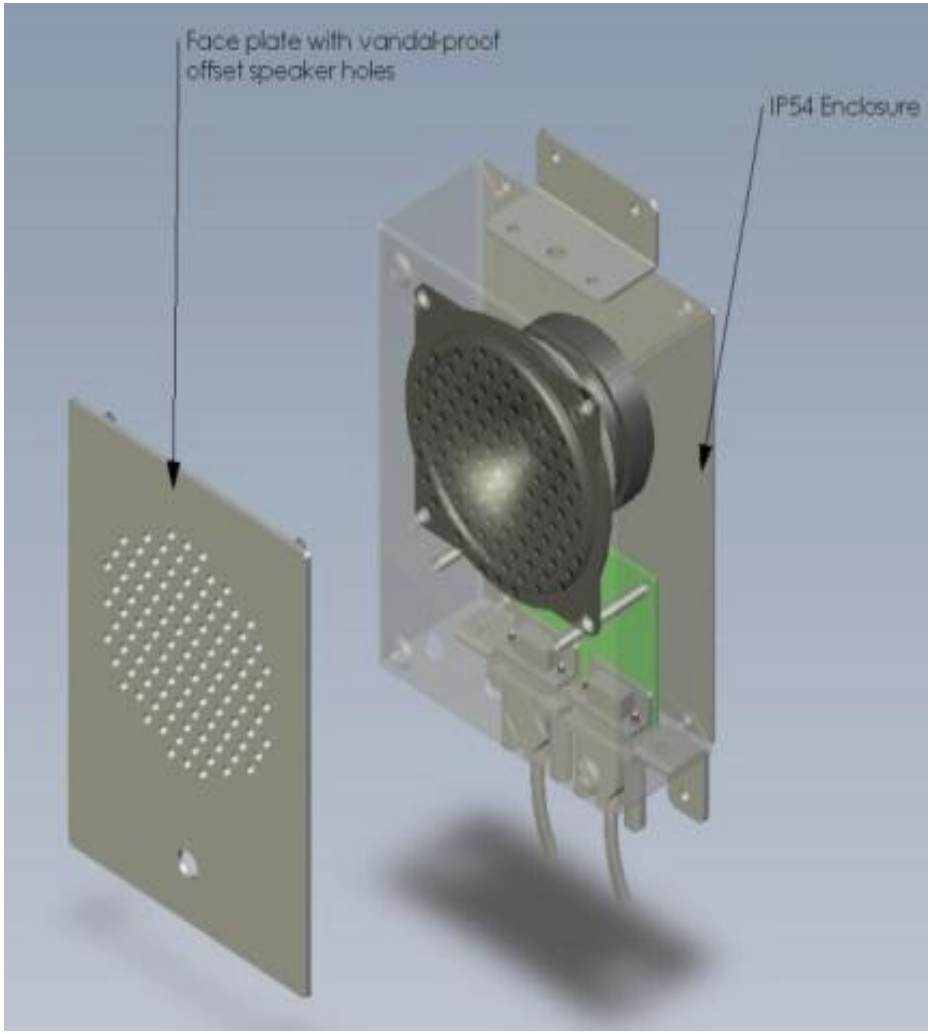
Technical Specifications (I)

- Network of self-amplified speakers and audio sources
- Distributed amplification:
  - Controlling nodes use CAN bus to distribute audio
  - Speakers have built-in 6W class D amplifier (100Hz – 15KHz)
  - Options: MP3 decoder – digital inputs – local storage (for event-triggered pre-recorded announcements)
- Software defined audio zones
- Speakers can belong to sound delivery groups of many audio zones. Individually adjustable and addressable speakers for flexible audio zoning
- Audio & digital sound distribution over Ethernet and dual CAN networks
- 4 x Opto-isolated inputs (Customer option for volume delivery)
- 4 x Relays outputs (Customer option for volume delivery)

Technical Specifications(II)

- Adaptative volume control:
  - Background Noise Volume Compensation (BNVC)
  - BNVC sensor in each speaker modifies each speaker's volume independently of the others
- Speaker output is individually monitored during announcements
- Choice of speaker driver (100mm and 165mm) models
  - Power within distribution cable
  - Built-in DSP for individual sound shaping and noise analysis
- EN50155 compliant
- IP54 enclosure

Technical Specifications (III)



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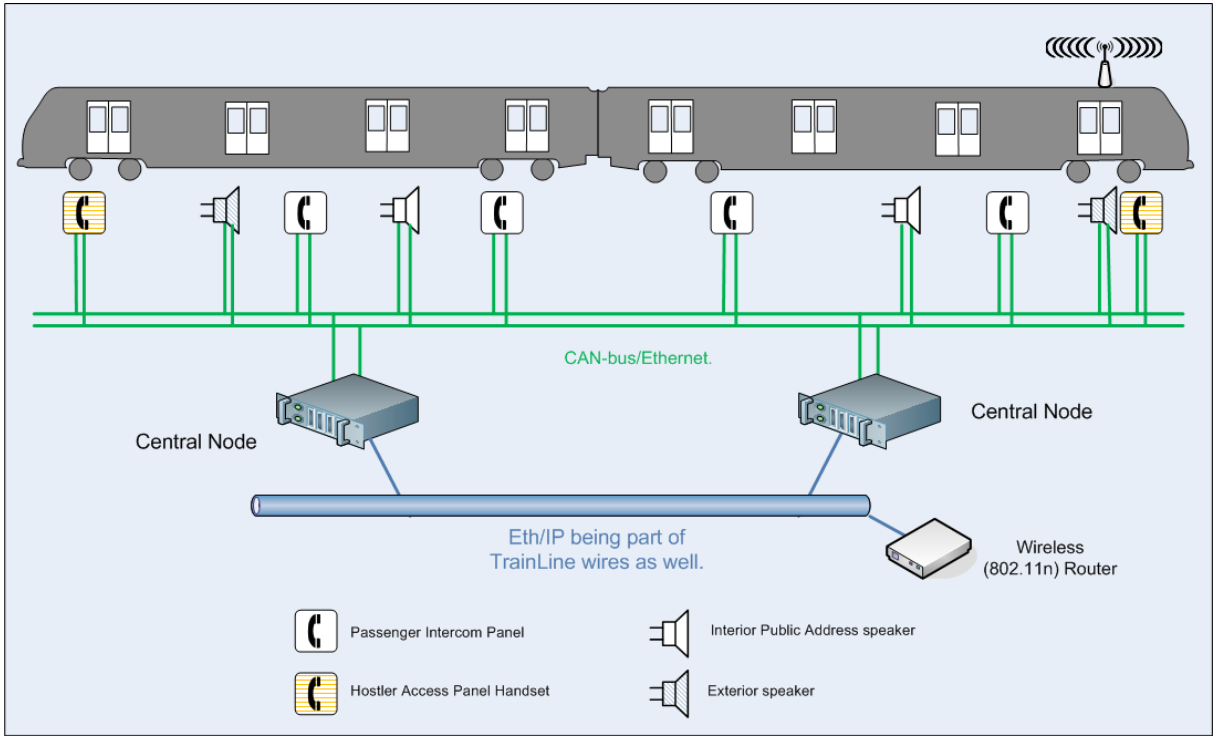
AMT5 - ECB

Emergency Call Box

On-board communication

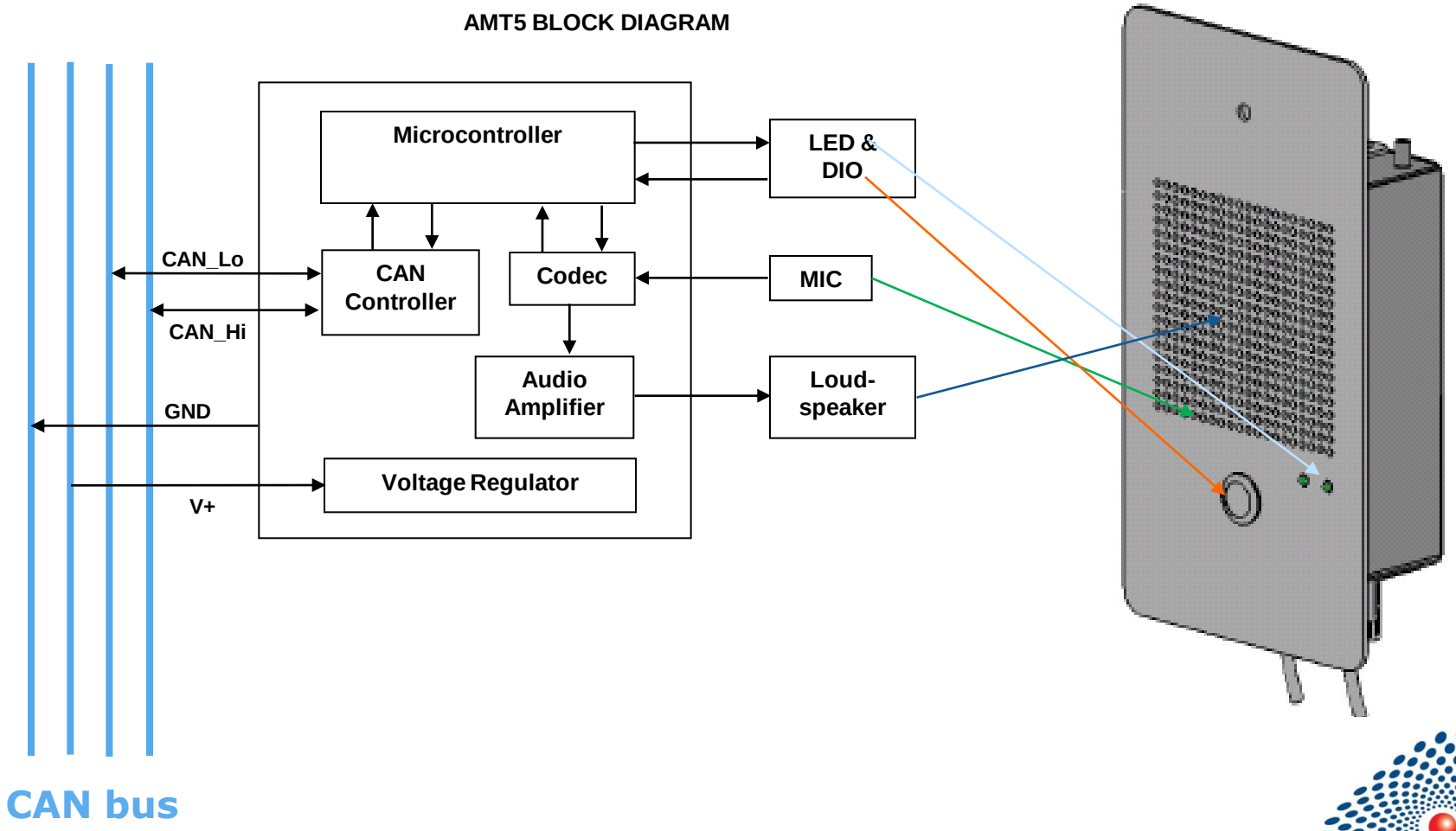


The AMT5-ECB-A is the intercom device through which a driver or through the train radio a central control operator or emergency center operator can have a two-way communication with the passengers

Emergency Call Box Features

- The AMT5 – ECB-A Intercom device is based on the AMT5 – PA device, and offers in addition:
- Two way communication (pushing the button only for calling and then full duplex communication)
- Can be part of a normal audio zone PA – for example for door open and close announcements
- Closed loop, user scheduled, self test ensures all device functions are fully tested

Technical Specifications



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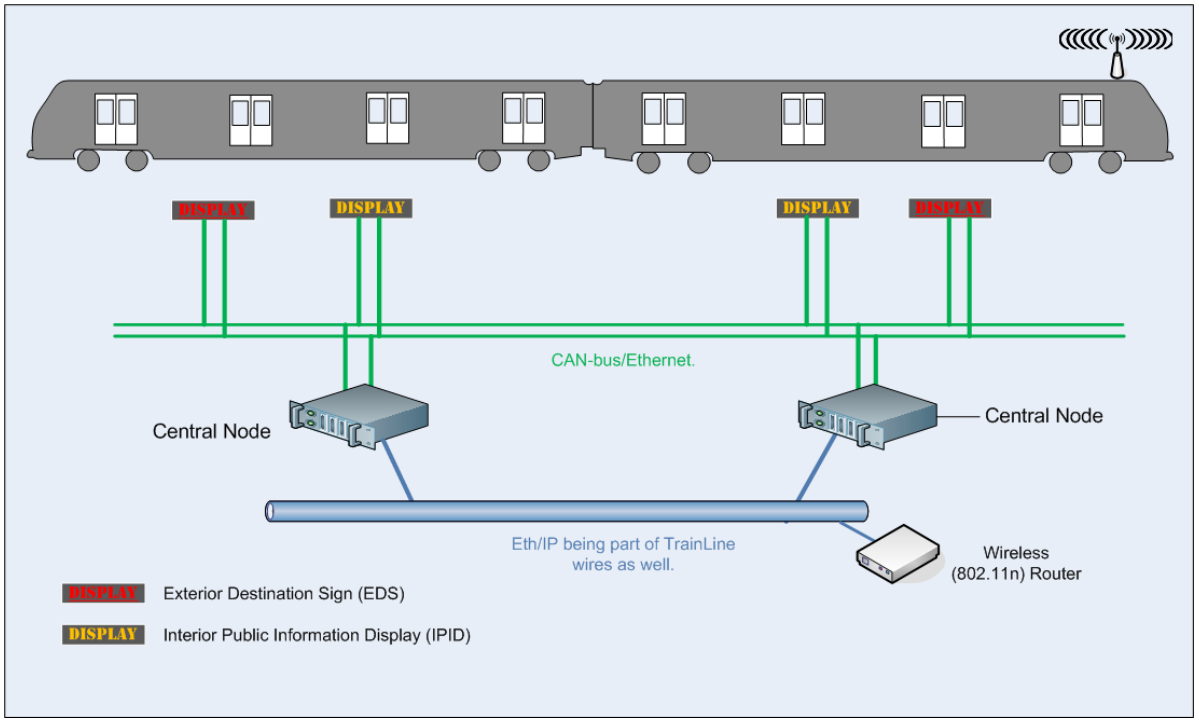
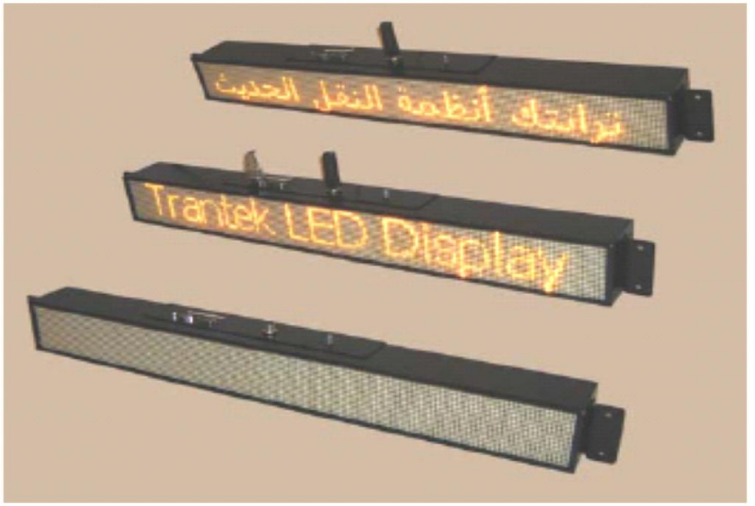
AMT5 - PID

Passenger Information Display

On-Board Passenger information





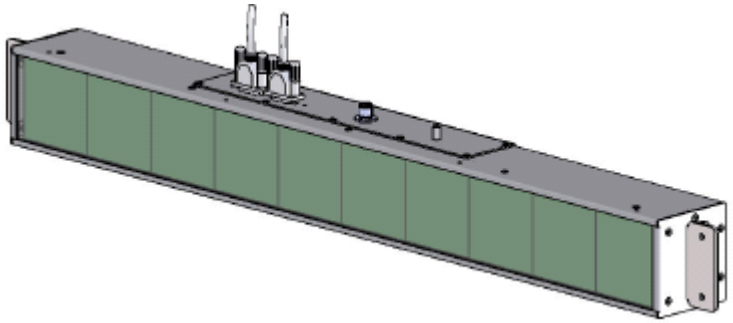
The AMT5-PID device offers a 16x160 LED high brightness display. It connects to the same dual CAN network as the AMT5-ECB and the AMT5-PA units and integrates using the same API and CN protocol

Passenger Information Display Features (I)

- 16x160 LED high brightness display device for up to 20 latin characters
- Character size of MAX 65 mm is viewable at a maximum distance of 30 m
- Full digital display distribution, modular and scalable. (*The unit receives configuration information from the control unit relating to the zone that it belongs)*
- Multiple groups & zones (*Messages to display groups are broadcast on the CAN network to a group of addresses)*
- Works over dual redundant CAN 2.0B network connections
- Character sets : unicode latin & arabic (other character sets possible)
- Colors available: Amber, Red, green, tri-colour (Red, green, amber) or full colour

Technical Specifications (I)

- The LED system is designed to comply with EN50155 requirements and the visual performance recommendations for LED signage for transport vehicles (bus) of the US Department of Transport
- DC supply (customer specified or standard 70 V to 110 V DC for the LED area external M12 connector) and the 12 V to 24 V DC for the CAN supply built-in
- Exists in monochrome, tri-colors (amber, red, green) or full color
- LED Supply Consumption: 20W
- The LEDs are driven by high current pulses in a multiplexed fashion to deliver maximum brightness with minimum power consumption
- Automatic network discovery
- Remote diagnostics providing internal control power supply status and reports LED failures to single LED lamp



Technical Specifications(II)

- The maximum average display brightness of 1109 cd/m^2 for Amber display
- 120 degree viewing angle
- LED pitch: 4,5mm
- EN50155 compliant

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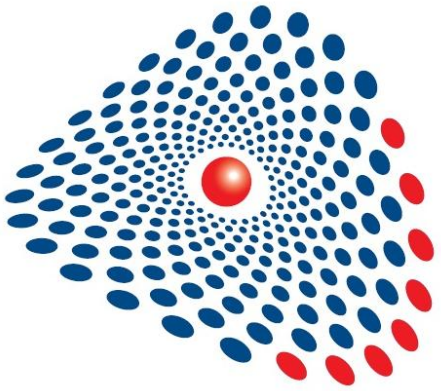
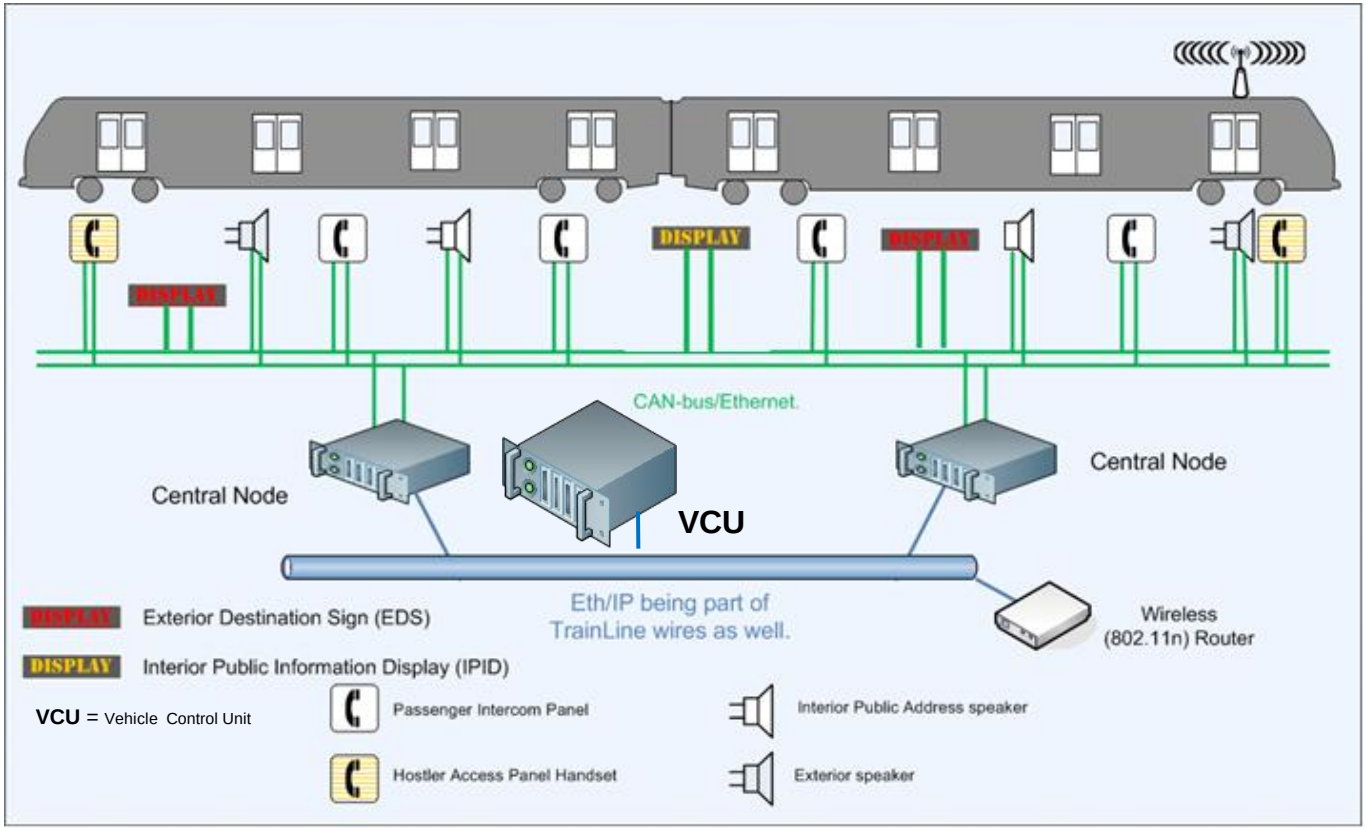
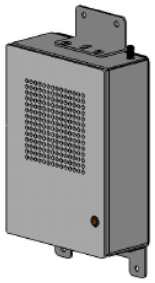
AMT5 - CN

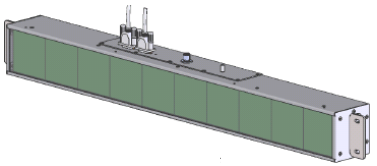


Controlling Node

Controlling Node



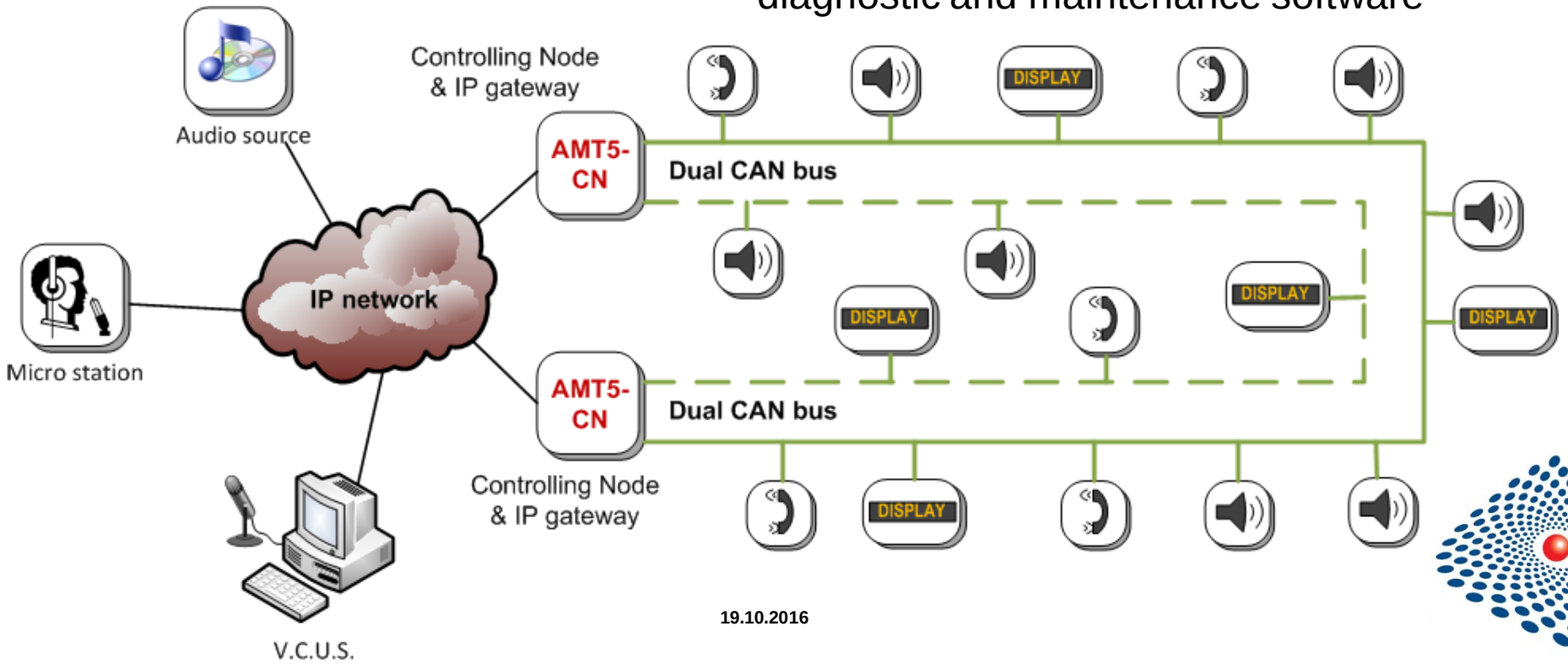




The controlling Node takes the audio input for the PA and the audio input and output for the ECB, control the data to the PIDs and manage all the devices within the AMT5-PAS

AMT5 - CN

- The Controlling Nodes act as IP Audio Gateways. The Controlling nodes can receive audio through IP network
- Dual CN devices for dual CAN bus (*one control unit at each end of the train for redundancy and ease of operation)*
- Holds the configuration for the amplified speakers PA & ECB and PID units
- The CN unit is configured either via the Ethernet port, or by using a web interface, or the Trantek diagnostic and maintenance software



Controlling Node features:

- Configuration functions for automatic speaker discovery, audio zone creation
- Test and diagnostic functions
- Management functions. Speaker and microphone control. Speaker On-line/Off-line selection
- Audio program control
- Pre-recorded announcement selection
- Connecting the console microphone to the speakers for announcements
- Establishing Emergency phone (ECB) communications
- PID display management

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AMT5 – RPT
AMT5 - SDK

CAN repeater & Software Development Kit

AMT5-RPT

CAN Repeater

- The AMT-5 Repeater is a two port CAN bus store and forward repeater designed to maintain a specified signaling bit rate on an AMT-5 CAN network beyond the physical limits imposed by the cable length
- Operates at all supported AMT bit rates (Auto speed detection)
- IP54 rating
- EN50155-2001 compliant

Software Development Kit

- The supported API is developed for Windows CE and Windows XP (other O.S. possible on request)
- The functions of the AMT-5 CN can be incorporated into the train's own Vehicle Control Unit System Unit using the AMT-5 SDK. It consists of a Windows-CE API, software driver for CAN interfaces using the Intel or Bosch CAN chipsets, API documentation and examples.
- The AMT-5 API provides management functions for streaming over a dual CAN bus configuration and for arbitrating control of the two CAN buses and multiple control units

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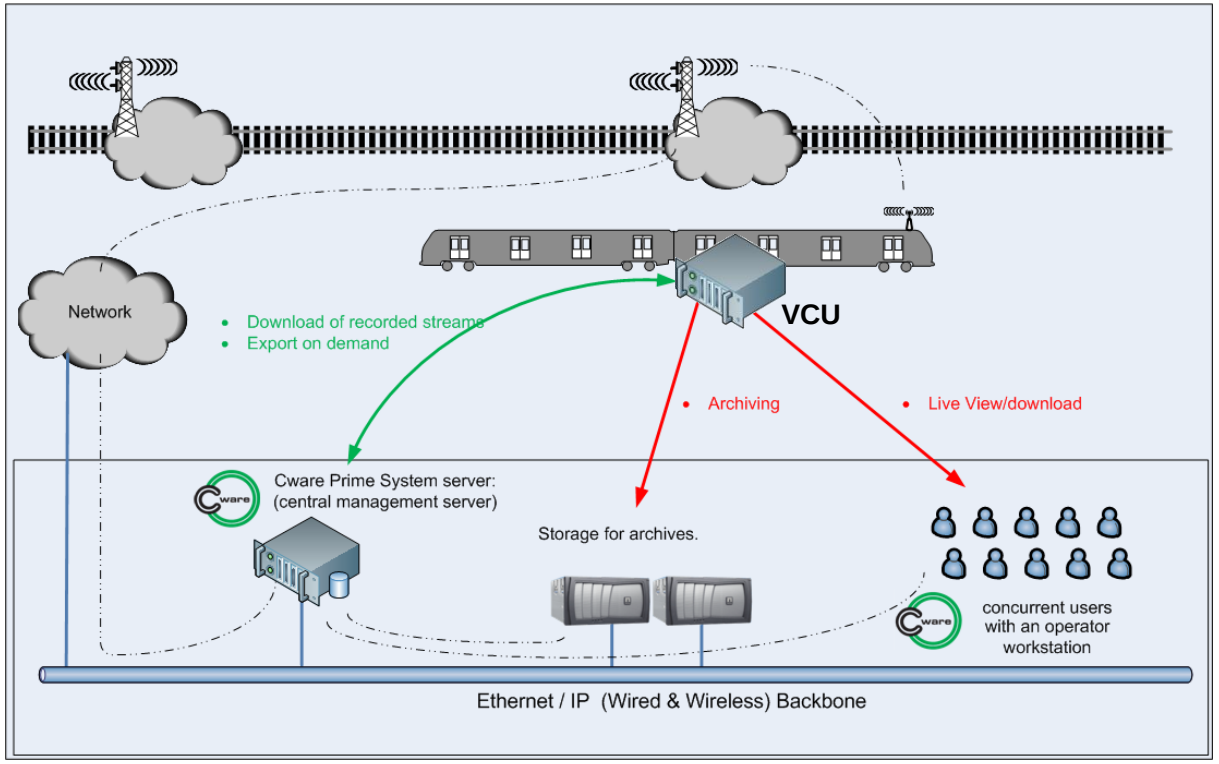
AMT5 – Engineering

Third party Vehicle Controller Unit System



Non recurring Engineering service for integrating the AMT5-CN functions in the Vehicle Control Unit System as well as other on board train services

Typical applications with Trantek competencies

- Internal and external Voice Communication in a vehicle (ECB)
- Internal and external Public address in a vehicle (PA)
- Internal and external Information display in a vehicle (PID)
- Internal and external video surveillance in a vehicle (camera, recording, video analysis)
- Alarm management
- Control Centre supervision and monitoring (at wayside)
- Wireless communication to the wayside

AMT5-PAS Concept

Advantages

- Modular construction
  - Build the public address without consideration for amplifier sizing or speaker cable capacity
- System reliability (dual CAN : redundant communication paths)
- Improved availability
- Redundancy
- Enhanced maintainability
- Distributed power
- Easily replace individual failed units in the field
- Sound Distribution over robust CAN network
- API sware (SDK) for integration into 3rd party Control System
- Adaptive & automatic volume control compensates for changes in background noise levels (Low Noise)
- IP Network Routing flexibility
- CAN Network supports very inexpensive cabling
- Self-diagnostics at the individual speaker level
- Very flexible unlimited audio zoning capability. Each speaker can be addressed individually or as a member of a user defined group
- New additional units are discovered automatically

Certifications, codes & standards

- The AMT-5 components have a number of certifications to allow them to be deployed in public areas and difficult environments, including deployment in rolling stock vehicles
- For application inside train vehicles, the AMT-5 system is designed for on-board applications within –25° C to 70°C and complies with the following standards:
- EN50155: 2001 Railway applications - used on rolling stock.
  EN50121-1: 2006 EMI/RFI (EMC)
  EN50121-3-2: 2005 EMI/RFI (EMC)
  EN55011: 2007 EMI/RFI (EMC)
  IEC61000-4-2: 1995 EMI/RFI (EMC)
  IEC61000-4-3: 2002 EMI/RFI (EMC)
  IEC61000-4-4: 2004 EMI/RFI (EMC)
  IEC61000-4-5: 1995 EMI/RFI (EMC)
  IEC61000-4-6: 2003 EMI/RFI (EMC)
  EN61373:1999 Shock & vibration
  IP 54 (in accordance with IEC-60529) enclosure protection
  RohS, CE, UL

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Thank you very much for your attention!
Merci beaucoup pour votre attention!
Vielen Dank für Ihre Aufmerksamkeit!
Gracias por su atención!
Bedankt voor uw aandacht!
Obrigado pela sua atenção!

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