CANopen gateway for truck bodybuilders

Ulrich Hiermann is the chairperson of the CiA SIG (special interest group) truck gateway, which has been reawaked beginning of this year. This group maintains the CiA 413 CANopen truck gateway series specifying the interface to CANopen-based bodybuilder networks.

The higher flexibility and configurability of CANopen compared with J1939 fits to the highly-fragmented body application market. Hiermann is responsible for the development of Iveco's gateway between the in-vehicle networks and the body applications. He is working with Iveco for more than 30 years.

Figure 1: Ulrich Hiermann (Source: Iveco)

CAN Newsletter: Since when does Iveco provide a CANopen interface for bodybuilders?

Hiermann: For heavy-duty trucks, Iveco supports CANopen bodybuilder (BB) gateways since 2009. One year later, we equipped the medium-range of our trucks with this gateway. In 2012, the light-range trucks followed.

CAN Newsletter: Which features does this interface support?

Hiermann: Iveco offers a modular BB interface. The Highline version complies to the CiA 413 series of CANopen truck gateway specifications. The Heavy MY2019 version of the CiA 413 gateway supports 462 process data to be transmitted and 91 process data to be received from the body application. This variety of available process data allows developing and integrating seamless advanced BB functions. These process data (some call this signals) are mapped to PDO messages by means of configuration.

CAN Newsletter: What is the feedback from customers?

Hiermann: So far, the customers are satisfied. The feedback is positive confirmed by continuous increasing sales for the CANopen option of our BB gateway. According to our experience, CANopen is suitable for any kind of BB applications. It allows both highly-customized solutions as well as J1939-like solutions. The main benefit is that the CANopen communication can be tailored offering application-specific setups also for low-performance BB controllers. These simple ECUs (electronic control unit) can often just manage a reduced CAN interrupt load.

Customers being familiar with CANopen are profiting on a fully autonomous truck gateway mapping possibility gaining highest flexibility. This protects the know-how of our customers.

CAN Newsletter: What has been improved in the last years?

Hiermann: Additional process data – often named signals – are continuously implemented in the CANopen gateway depending on truck evolution and customer needs. We also add transparency between Truck and BB equipment, keeping our customers informed, whether in-vehicle networks operate without problems. This is especially necessary, when the body application accesses the in-vehicle networks via the CANopen gateway. The embedded firewall in the gateway unit accepts or denies certain functional requests from the CANopen-based body network. To satisfy the various market requirements this firewall can be customized upon bodybuilder specific requests.
Iveco customizes the CANopen gateway, if demanded. For example, the reaction of the vehicle can be tailored, when the Heartbeat message of the body controller is missing. In such cases, the CANopen gateway can transit automatically into NMT stopped state.

Figure 2: Iveco S-WAY truck with HS refuse body (Source: Iveco)

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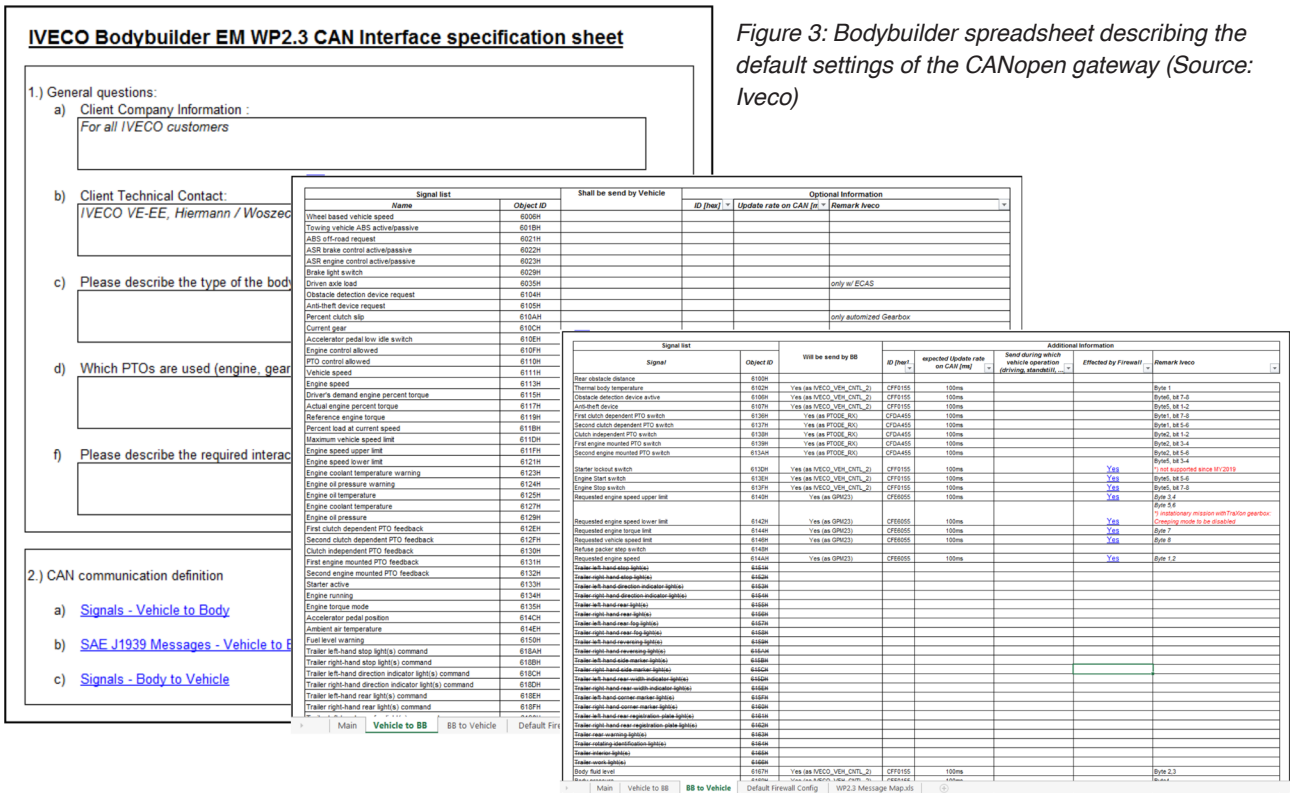

Figure 3: Bodybuilder spreadsheet describing the default settings of the CANopen gateway (Source: Iveco)

Over the years, an easy CANopen gateway configuration process was established. This includes guiding and supporting bodybuilders step by step. The process starts already, when a truck is ordered and the desired truck options are to be selected. Iveco offers a portfolio of branch specific ready-to-use CANopen configurations. For selecting suitable CANopen configuration(s) the customers simply select the needed process data to be transmitted and to be received by the CANopen gateway and receive a list of matching CANopen configuration(s). This simplifies and speeds up the interface development.

CAN Newsletter: What are the next developments?

Hiermann: We plan to identify future needs in close cooperation with bodybuilder associations. This includes for example extended fleet management and telematics features for BB equipment and devices as discussed in DIN. Iveco is committed to support actively CiA specifications to extend the CiA 413 series in this direction specifying the mapping of DIN 4630 parameters to CANopen. Other functional extensions include alternative traction such as compressed natural gas or liquefied natural gas as well as zero emission vehicles. When the CiA 413 series is updated, Iveco will consider them on new developments.

CAN Newsletter: Could you please share some success stories about the CANopen interface?

Hiermann: There are many bodybuilders using our CANopen gateway. It us used in plenty applications, like concrete mixers, liquid-transporting trucks, and bodies using hydrostatic drives. For various BB applications the communication is reduced onto essential parameters, aiming to reduce the CAN interrupt load on the body controller. For example, Europe Zoeller connects its refuse collecting bodies compliant with the CiA 422 application profile via our CANopen network to the in-vehicle networks. There the bodybuilder configures at startup – if needed – the Iveco CANopen gateway. They do not use Iveco RCV CANopen configuration, instead they select only signals needed to manage their features. Adding features – also on vehicles already sold – can be managed easily without any Iveco involvement.

Another success story for proofing our gateway setup process is the Pumpboss project for firefighting trucks in Australia. The challenge was to physically built-up a vehicle in Australia, integrating a US bodybuilder equipment and managing development from Europe.

CAN Newsletter: Does Iveco consider to support other bodybuilder standards such as DIN 4630 and DIN 14704?

Figure 4: Iveco Eurocargo for municipal applications with different bodies (Source: Iveco)

Measuring Unit with CAN FD Interface

MU-Thermocouple1 CAN FD

The MU-Thermocouple1 CAN FD from PEAK-System allows the measurement of 8 temperatures via thermocouples of the types K, J, or T depending on the product version. The measurement data is transmitted via a CAN interface that supports the modern standard CAN FD in addition to CAN 2.0.

Data processing, message transmission, and LED indication are set up with a free Windows software. The configuration created on the computer is transferred via CAN to the device which then runs as an independent CAN node. Multiple devices can be configured independently on a CAN bus.

Specifications

- 8 Mini sockets for thermocouple types J, K, or T
- 4 galvanically isolated measuring modules, each with 2 thermocouple sockets of the same type
- Measuring ranges:
  - J: -210 to +1121 °C (-346 to 2050 °F)
  - K: -200 to +1370 °C (-328 to 2498 °F)
  - T: -200 to +400 °C (-328 to 752 °F)
- Measurement accuracy: 0.2 % or 1 K
- Accuracy of the reference temperature sensors at +25 °C ambient temperature: typically ±0.5 K, maximum ±1.0 K
- Maximum resolution of temperature data: 1/16 °C
- High-speed CAN connection (ISO 11898-2) for data transfer and configuring
  - Complies with CAN specifications 2.0 A/B and FD
  - CAN FD bit rates for the data field (64 bytes max.) from 25 kbit/s up to 10 Mbit/s
  - CAN bit rates from 25 kbit/s up to 1 Mbit/s
  - NXP TJA1044GT CAN transceiver
  - Galvanic isolation up to 500 V
- LEDs for measurement channels and power supply
- Configuration with a Windows software via CAN (requires a PEAK CAN interface)
- Voltage supply from 8 to 30 V
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)

Scope of Supply

- MU-Thermocouple1 CAN FD in aluminum casing
- Mating connector for voltage supply
- Configuration software for Windows
- Manual in PDF format

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PEAK System

Figure 5: Iveco Daily with Kuepper Weisser winter equipment and Unsinn roll on/off system (Source: Iveco)

Hiermann: Iveco appreciates to extend the CiA 413 series, allowing the support of the DIN 4630 and the DIN 14704 parameters. We are always open for bodybuilder requests and to standardize them.

CAN Newsletter: What is the future strategy regarding the bodybuilder interface?

Hiermann: Safety and cybersecurity are mandated by regulations. We are ready to adapt them. Cross system safety – in other words: safety between vehicle and bodybuilder equipment – needs be investigated with bodybuilder associations and standardization bodies. Iveco is committed to support such approaches, which can be referenced by national and international legislation authorities. ◀

Interviewer

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