Converting mixed sensor data to CAN (FD)

CANmod.input by CSS Electronics allows a parallel measurement of analog, digital, and pulse signals. Measured data can be bundled into CAN FD frame(s) to simplify data analysis. Solutions to log, stream, and analyze the data are provided.

Figure 1: The CANmod.input module (Source: CSS Electronics)

The CANmod.input is a sensor-to-CAN module that produces analog, digital, and pulse measurements from eight input channels. The measurement data is output via CAN or CAN FD network through a 9-pin Dsub connector. The module is able to work in standalone operation, meaning that no PC is required. The unit can be integrated in a CAN (FD) network to provide data for ECUs (electronic control unit) or CAN (FD) tools. For example, it can be used as an add-on for CSS Electronics' CANedge data loggers, which record CAN/LIN data - including from CANmod devices. It is also possible to daisy-chain multiple modules to have 16, 24, 32, and more channels.

The device can either broadcast the data onto the CAN (FD) network or provide it on-request. The available CAN (FD) channel supports 11-bit and 29-bit CAN-Identifiers. Termination can be toggled via a switch. Retransmission of frames that have lost arbitration or been disturbed by errors is supported. The 70-gram module is sized 52,5 mm x 70 mm x 24,5 mm and is IP40-protected.

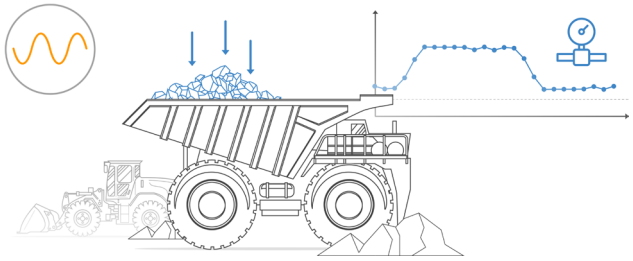

Figure 2: Analog input sensors (Source: CSS Electronics)

Common use cases

A common use case is to measure data from analog sensors. The module supports 0 V_{DC} to 10 V_{DC} analog inputs, which it can sample at 1 kHz with a configurable input range for optimal resolution/amplification. Sensors that produce analog signals can include force, pressure, current, distance, rotation, temperature, hall effect, humidity, acceleration, etc.

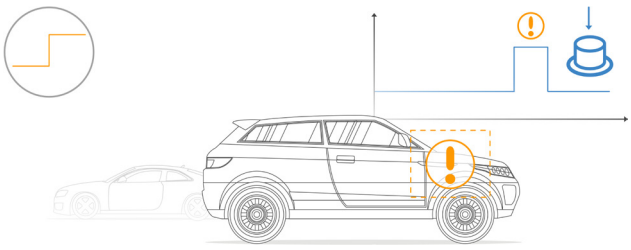

Figure 3: Digital input sensors (Source: CSS Electronics)

In parallel with performing analog measurements, the device can perform digital measurements by allowing the end user to configure the digital high/low thresholds and optional hysteresis. This enables measurement from digital input sensors such as hall effect switches, buttons, reed switches, RTD (resistance temperature detector) sensors, and more.

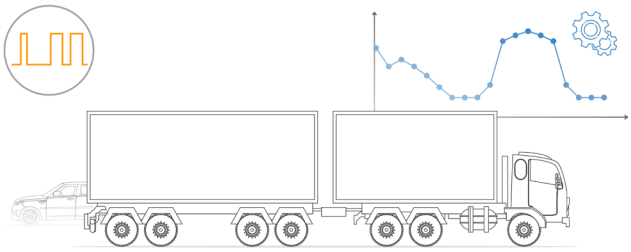

Figure 4: Pulse input sensors (Source: CSS Electronics)

Finally, the device also supports sensors with pulse-oriented outputs. These include e.g. rotational speed sensors, rotational position sensors, buttons, toggle switches (for event counting), and so on. Each pulse channel can be read at 16 kHz with configurable frequency/counter mode.

The device is able to measure the analog, digital, and pulse signals across the eight channels in parallel, which allows for mixing the mentioned sensor types. Further, the module provides a 3,3-V excitation signal for supplying the input sensors.

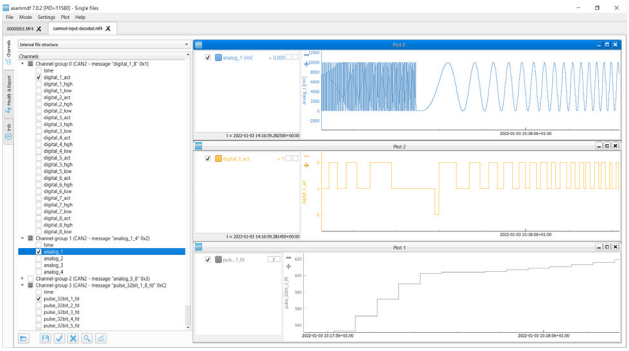

Figure 5: The device measures analog, digital and pulse signals of each input sensor in parallel (Source: CSS Electronics)

Configuration is done via the device USB port and a GUI (graphical user interface) editor. Here, it is possible to customize the output bit rate, the CAN-Identifiers, CAN frame frequencies, and further features. In particular, the CANmod.input optionally supports bundling signals into CAN FD frames. The 64-byte payload of a CAN FD message is suitable for bundling together the high-resolution signals from all eight input channels into a CAN FD frame with a single timestamp. This simplifies the data analysis.

Example use cases

The input-to-CAN module can be used in standalone mode to inject CAN frames with analog/digital/pulse sensor measurements into an in-vehicle/-machine CAN network. This allows other CAN nodes to leverage the sensor data, for example in the ECUs, cabin displays, CAN loggers, or telematics control units (TCUs).

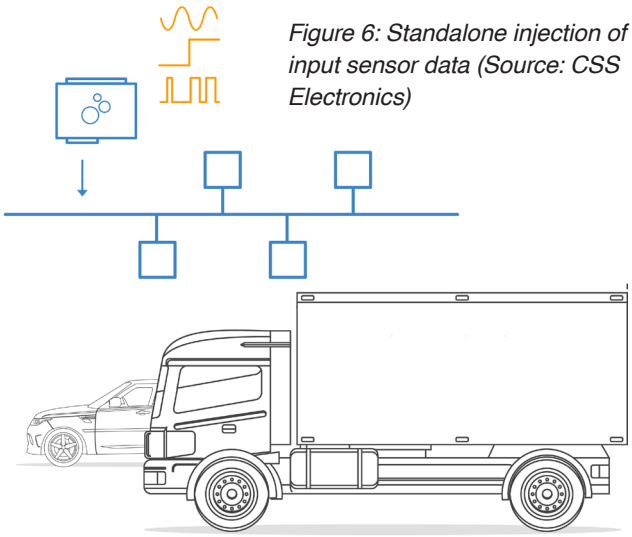

Figure 6: Standalone injection of input sensor data (Source: CSS Electronics)

The device is also often used as an add-on module in CAN data acquisition, meaning a CAN data logger (such as the CANedge or a CAN interface) records the CANmod.input sensor data together with e.g. in-vehicle CAN network data. Here, the input module can be daisy-chained for more channels and/or combined with e.g. the CANmod.gps or CANmod.temp products providing GNSS/IMU (global navigation satellite system/ inertial measurement unit), ▷

and temperature data. The included CANmod.input DBC file allows to decode the CAN frames to scaled engineering values during the post processing analysis.

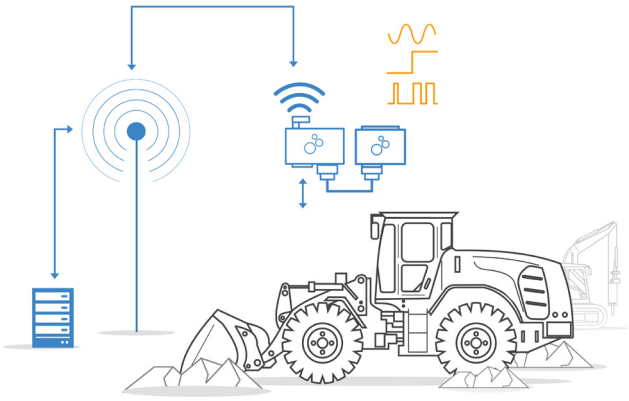

Figure 7: Add-on module for data acquisition and telematics (Source: CSS Electronics)

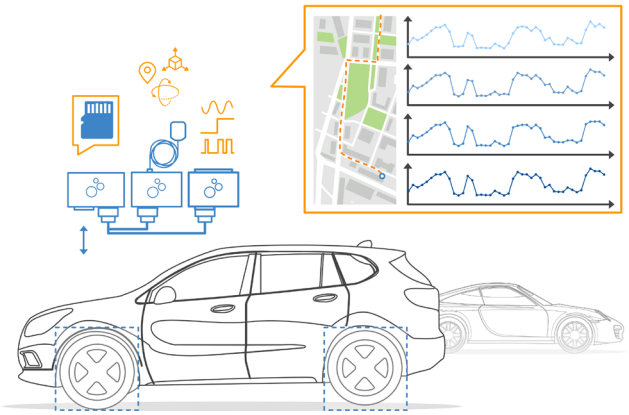

Figure 8: Data acquisition of four wheel-speed sensors (Source: CSS Electronics)

Optionally, the device can also be connected via USB to a PC to enable real-time streaming of raw or decoded CAN data into the SavvyCAN GUI tool.

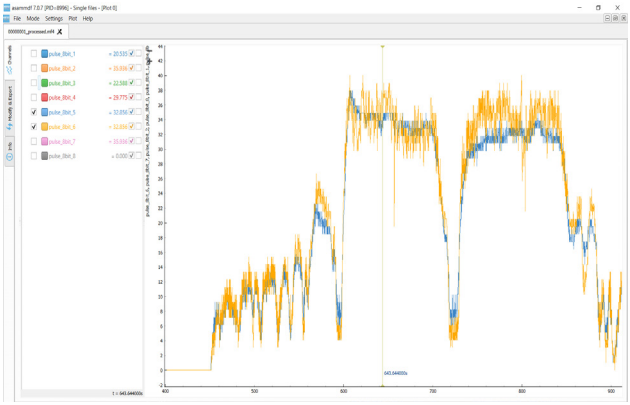

Figure 9: Analyzing the DBC-decoded signals in Asammdf GUI (Source: CSS Electronics)

Case study

ARC Vehicle (UK) is a mix of engineers, designers, and business leaders working across diverse vehicle projects and beyond - including high-performance and luxurious vehicles.

In a case study, they utilize the CANedge1, CANmod.gps, and CANmod.input to collect data from four wheel-speed sensors in a test vehicle. This serves as an example of how the input-to-CAN module can be used for measuring pulse frequency inputs. The team used the open-source Asammdf GUI to analyze the input sensor data in combination with time-synchronized GPS (global positioning system) plots. This enabled a rapid solution for their monitoring needs.

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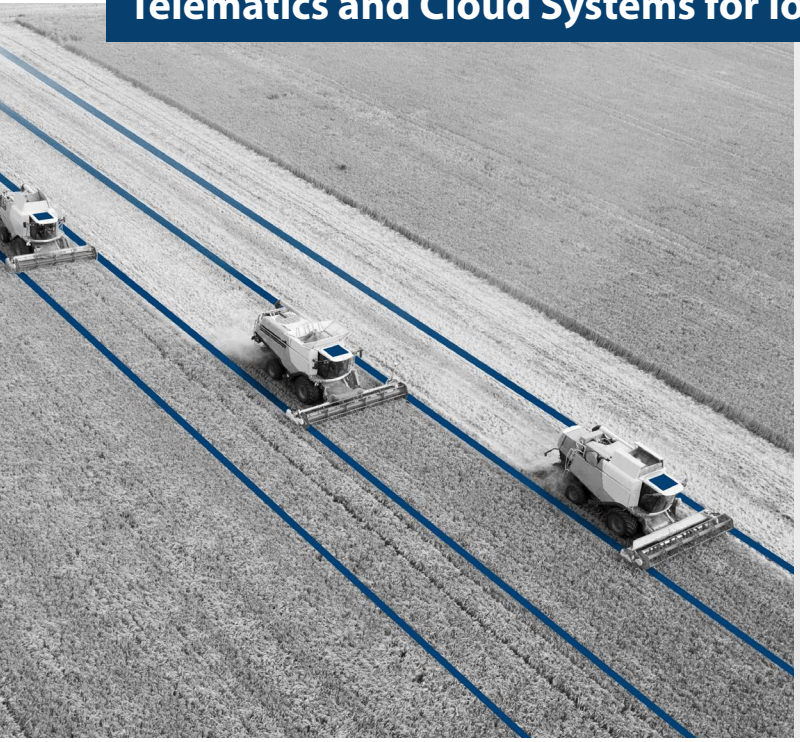

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