Redundant CAN-BUS Networks using DC-CAN Powerline Communication

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1. General

This article presents the powerline communication (PLC) DC-CAN technology as a redundant data channel to existing CAN-BUS networks in a todays and future vehicle platforms, Aerospace and industrial applications, without increasing the existing harness.

The DC-CAN technology enables seamless CAN communication over exiting powerline. Furthermore, the DC-CAN allows usage of multiple PLC networks over the same powerline using different carrier frequencies. It provides a significant means for CAN-BUS redundancy. The availability of many PLC data channels allow frequency hopping between user's selected channels. The responsibility for the redundancy control is on the data-link upper layer.

The demand for additional reliable CAN-BUS networks has direct effect on harness size, cost and reliability.

The DC-CAN technology is implemented in the DCAN500 powerline transceiver IC.

2. DCAN500 power line communication as a redundant CAN-BUS network

Figure 1 depicts an example of redundancy DC-CAN to exiting CAN-BUS in vehicle power line distributed architecture. In this example, two independent DC-CAN networks coexist on a single power line using two different channels F1 and F2.

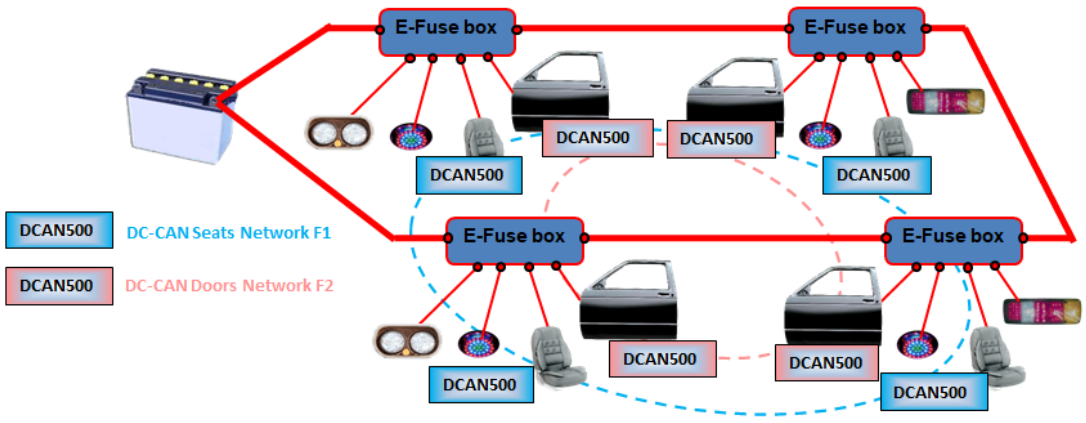

Figure 1 – Redundant DC-CAN network in Vehicle platform application example

Figure 2 depicts an example of adding DC-CAN redundancy to a CAN-BUS network between truck and trailer. One network uses the traditional twisted pair CAN-BUS while the other uses the DC-CAN over PLC network.

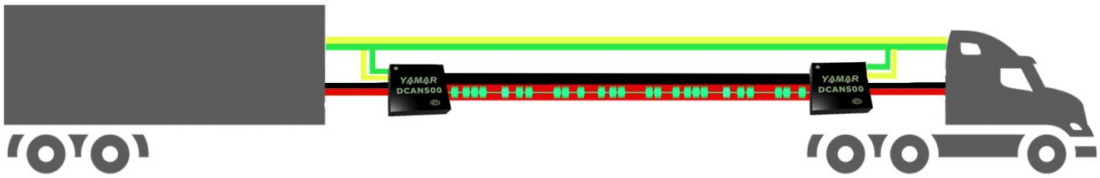

Figure 2 – Redundant DC-CAN network in Truck – Trailer application example

Figure 3 depicts an example of an elevator with redundant DC-CAN to exiting CAN-BUS.

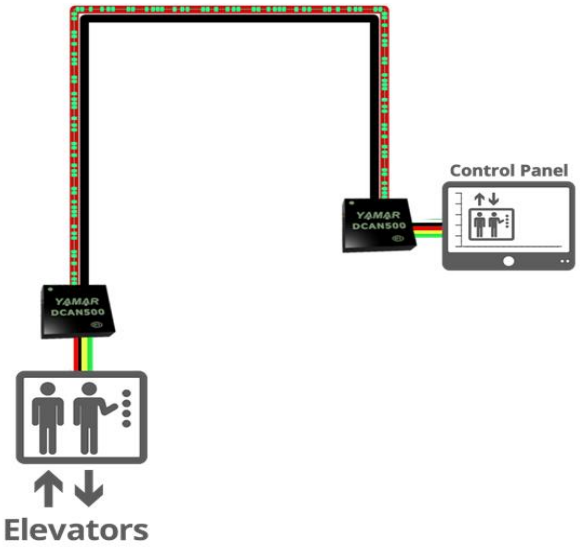

Figure 3 – Redundant DC-CAN netwrok in elivator application example

Figure 4 depicts a redundant smoke detectors network in airplanes. As the powerline is closed loop, cutting the power line at one point does not stop the communication since the data will continue to flow via the complementing power line branch.

Figure 4 – Redundant DC-CAN netwrok in sensors application example

3. The DC-CAN DCAN500 power line transceiver devices

By nature, vehicle powerline is a noisy communication channel with frequency response that varies in time and is highly attenuated data communication environment.

The DC-CAN technology developed taking in mind the powerline communication challenges. It fulfills the following requirements:

- Provide uncompromised reliable communication performance.
- Transparent data interface with existing CAN-BUS network protocol.
- Enable multiple of CAN networks using a single powerline, allowing selecting between many carrier frequencies.
- Meet EMC/EMI regulations.
- Small foot print cost-effective solution.

3.1 DCAN500 operation principle

The DCAN500 device transmits and receives CAN A/B messages from/to CAN controller (ECU) over DC and AC power lines at bitrates up to 500kbit/s. The device operates as part of a power line (DC-BUS) communication network consisting of multiple DCAN500 devices. The CAN messages are error protected and phase modulated by a sine wave at a user predefined carrier frequency and transmitted over the powerline as CAN frames.

Multiple DCAN500 networks can operate over single powerline, whereas each network communicates over different carrier frequency (channel). Moreover, the DCAN500 wide range selection of carrier frequencies allows the user hopping to different redundancy frequency (channel) when required.

The DCAN500 is a powerline CAN gateway device. Each CAN message transferred from the ECU (*CAN-Message*) is constructed into a single DCAN500 CAN frame transmitted over powerline (*CAN-Frame*).

3.2 DCAN500 channel parameters

Carrier frequency:	251 selectable frequencies between 5MHz - 30MHz with 100 kHz spacing.
CAN bitrate:	83.3kbit/s, 125bit/s, 250Kbit/s, 500Kbit/s.
Powerline voltage:	Any, with proper powerline coupling interfacing
Cable length:	Depends on the powerline AC loads signal attenuation (100m is practical)
Cable type:	Any cable.

4. References

DCAN500 Data sheet – DCAN500 CAN OVER DC POWER LINES TRANSCEIVER

Truck Trailer redundancy – Truck-Trailer power line as a redundant CAN channel