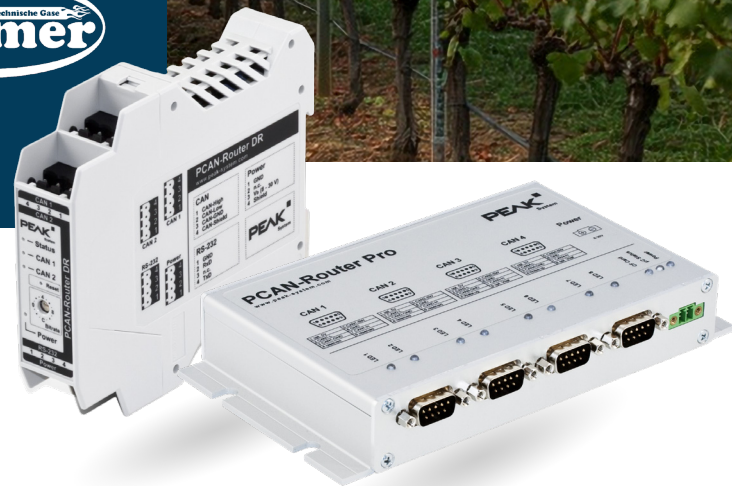


Customer: Kremer Energy

Solution: PCAN-Repeater DR, PCAN-Router Pro

Country: France

Industry: Agriculture



CAN Network in an Electric Vehicle Design

Reliable CAN communication is essential for ensuring the safe and efficient operation of electric vehicles. When communication between electronic control units (ECUs) is disrupted, vehicle performance and reliability can be severely affected.

To resolve recurring communication failures, PEAK-System France worked with Kremer to analyze the existing CAN network and implement a solution based on the PCAN-Repeater DR and PCAN-Router Pro. This study presents the customer's application, the root causes of the network instability, and the implemented communication architecture.

Following a detailed analysis of the CAN network, PEAK-System France identified several factors that contributed to the CAN network failures. The existing cabling was not suitable for the electro magnetic environment of a high-power electric vehicle. In addition, the ECUs were not connected using a proper CAN bus topology, with excessive stubs and incorrectly positioned termination resistors. Further more, the power controllers generated electromagnetic interference that introduced numerous CAN error frames. Finally, insufficient electrical isolation between the motor, battery packs, motor controllers, and chassis created unwanted ground loops.

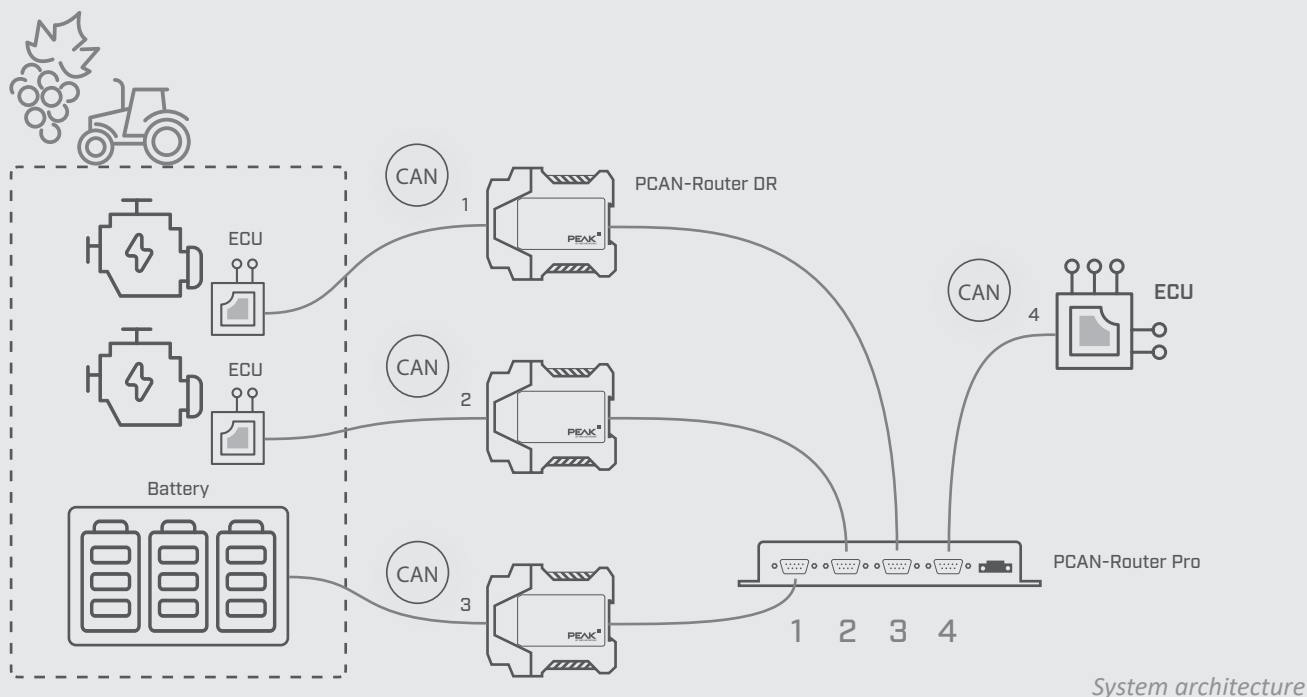
THE CHALLENGE: ELIMINATING RANDOM CAN COMMUNICATION FAILURES

Kremer, which specializes in the design of electric tractors, was experiencing random CAN network failures that caused a complete loss of communication between the vehicle's ECUs.

These communication interruptions temporarily rendered the vehicle inoperative and raised concerns about the reliability of the onboard electronic architecture.

CUSTOMER BENEFITS

- ✓ Elimination of random CAN communication failures.
- ✓ Improved network stability through optimized CAN wiring and topology.
- ✓ Reduced electromagnetic interference using galvanic isolation.
- ✓ Lower CAN bus load through intelligent message filtering and routing.
- ✓ Robust and reproducible network architecture for future vehicle platforms.



THE SOLUTION: NETWORK OPTIMIZATION WITH GALVANIC ISOLATION AND INTELLIGENT ROUTING

PEAK-System France implemented the solution in three stages. The CAN network was first rewired using shielded twisted-pair cables designed for EMC applications. The network topology was redesigned so that each ECU was connected directly to the main CAN bus, and the 120 Ω termination resistors were repositioned at both ends of the network.

PCAN-Repeater DR modules were then installed between the power controllers and the rest of the CAN network. The galvanic isolation reduced the electromagnetic disturbances generated by the power controllers and significantly decreased the number of CAN error frames.

Finally, a PCAN-Router Pro was integrated to filter and route CAN messages. By ensuring that each ECU received only the messages intended for it, unnecessary network traffic was reduced, improving overall communication performance.

THE COMMUNICATION SETUP IN DETAIL

The communication architecture combined optimized CAN cabling, galvanic isolation, and intelligent message routing. Shielded twisted-pair cables and a corrected CAN bus topology provided a stable physical network. PCAN-Repeater DR modules electrically isolated the power controllers from the rest of the system, preventing electromagnetic disturbances from propagating across the CAN bus.

The PCAN-Router Pro filtered and routed CAN traffic so that only relevant messages were delivered to each ECU, reducing bus load and minimizing the risk of communication collisions.

CONCLUSION

By redesigning the CAN network architecture and integrating the PCAN-Repeater DR and PCAN-Router Pro, PEAK-System France eliminated the random communication failures affecting the electric tractor. The resulting CAN network became stable, reliable, and suitable for deployment across the manufacturer's entire range of electric tractors.

FURTHER INFORMATION IS AVAILABLE AT
www.peak-system.com