

Solution: Using fiber-optic CAN repeaters and a CAN bridge for data communication in battery test systems

Country: United States

Year: 2023

Sector: Battery test systems



Optimizing battery test systems

A powerful pair: Fiber-optic repeaters and a CAN bridge ensure reliable data communication in battery test systems

Background

In the rapidly evolving field of electromobility, precise and reliable battery tests are crucial in ensuring that battery systems deliver power reliably. A leading technology company specializing in battery test systems faced a challenge. Electromagnetic interference was hampering the communication between their test PC and their battery emulator. The interference resulted in persistent error frames on the CAN line, compromising the precision of their test results. This user report describes how they were able to overcome the challenge with a combination of CAN repeaters, fiber-optic cables as a bus medium, and CAN bridges. The result was high-performance, reliable data communication between all system nodes in the battery test system.

The challenge: CAN error frames caused by EM interference and long distances

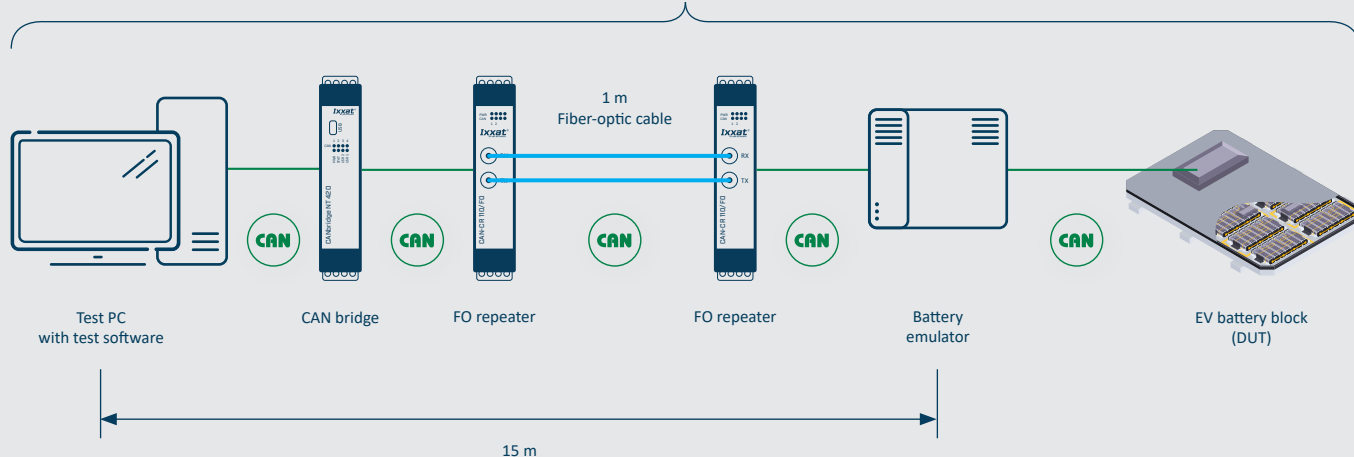
Every battery test system consists of several distinct components. The system's brain is a test PC running the diagnostic and test applications that measure charging cycles, voltages, temperatures, and many other quality assurance parameters.

The PC is connected to a battery emulator, which realistically simulates battery charging and discharging processes and can produce very dynamic load profiles. As a high-stability voltage source, it supports tests that speed up the characterization of electric drive components and improve their reliability. The emulator is directly connected to the battery under test. The company's technical challenge manifested itself in CAN error messages on the CAN line between the test PC and the battery emulator.

CUSTOMER BENEFITS

- ✓ Interference-free data transfer thanks to fiber optics
- ✓ Virtually infinite galvanic isolation
- ✓ Doubled bus length with CAN bridge
- ✓ Quick troubleshooting and expert advice

Data transfer rates up to 1 Mbps



Since the test PC and the emulator are in different places, a CAN line over a distance of 15 meters is needed. The CAN line needs to transfer data at a rate of 1 Mbps. The error messages are triggered by EM interference with the battery emulator. The emulator works under high current loads during electric motor tests, producing large amounts of stray radiation. The resulting CAN error frames on the fieldbus slow down the test processes and cause invalid results.

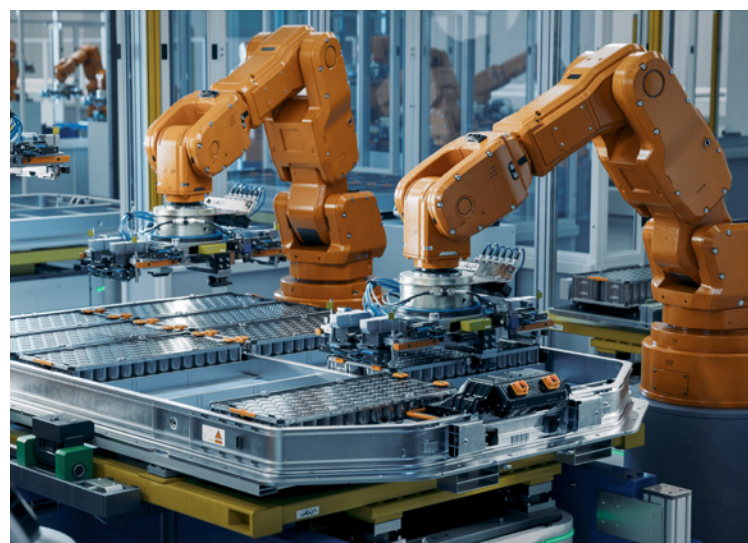
A strong combination: Fiber-optic repeaters and bridge provide stability

To overcome the electromagnetic interference, the company implemented a combination of two CAN repeaters and a CAN bridge. Using fiber-optic repeaters avoids the interference caused by the electromagnetic radiation from the emulator and enables the signals to be transmitted reliably over long distances without loss of quality. The high data transfer rate and the need for two fiber-optic repeaters caused the maximum bus length to be reached. In this situation, another component offered a solution. After the first transmission line, a CAN bridge doubles the maximum bus length and increases the network's efficiency and flexibility.

Technical features in detail: CAN-CR210-FO and CANbridge NT 200

The CAN-CR210/FO repeater is specially designed for use in environments with strong electromagnetic emissions. It converts CAN signals from a copper cable so they can be transmitted through a fiber-optic cable and vice versa. The non-conductive fiber-optic cable has the advantage of virtually infinite galvanic isolation and is also impervious to the

electromagnetic interference that occurs with ordinary copper cables. The repeater is especially effective at minimizing signal losses over long distances, offering a robust solution for complex industrial test systems. In the situation described here, the CANbridge NT 200 plays a key role in extending the bus length. It can double the maximum bus length, allowing greater flexibility in the placement of test equipment and PCs, even over longer distances. It also features advanced functionality like data filtering and routing, which optimize network performance and simplify administration. Combining the fiber-optic repeaters and bridge proved to be an effective solution to prevent interference with data communication during battery tests. By using these technologies, the company significantly improved the precision and reliability of its battery tests.



After production, battery modules are connected to battery emulators and test PCs to check their functionality under full load.

For more information, see <https://www.hms-networks.com/network-gateways>