

Fig. 1

3, 2, 1, checked

About start-up and diagnostics of CAN systems

In the last few years, CAN (Controller Area Network) has been increasingly used in various devices and systems. Although CAN is meanwhile more or less the standard for networking components in the industrial environment, the installation and start-up of CAN systems involves traps which must be recognized and avoided.

Especially for installers, system integrators and service technicians, a tool is therefore required with which the error-free networking of CAN components can be tested and the basic function of the systems can be analyzed at the physical level. Important requirements for such an "installation tester" are simple operation and a clear, comprehensible display of the test results, based on which an error can be easily localized and eliminated even by inexperienced users.

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Test wiring and terminal resistors

The error-free operation of a CAN system depends on various factors. These include the wiring of the components, correct termination of the bus and observance of the maximum bus length [Fig. 2]. With the wiring, it must be ensured that there is no electrical connection between the lines, that the line resistance and the line impedance are within the allowed range of values and that the resistance between the line shielding and ground is in the defined range.

Due to the topology and the arbitration mechanisms of CAN, however, other sources of errors apart from the wiring also have to be eliminated. To prevent signal reflections, the CAN "bus" has to be terminated at both ends with one 120 Ohm resistor. In addition, the maximum bus length, which depends on the baud rate, must not be exceeded (rule of thumb for line lengths of 100 m or more: length x bit rate in Mbit/s \leq 60).

The above mentioned points can be easily tested with the CANcheck from IXXAT. This is done via individual tests or via an automatic test sequence that carries out the specified tests in order and clearly displays the test results. The CANcheck checks for the existence of the necessary terminal resistors and their value, checks the system for short-circuits, measures the lengths of the lines and tests the line impedance. If the system has successfully passed the first tests, the analysis can be continued when the system is in operation.

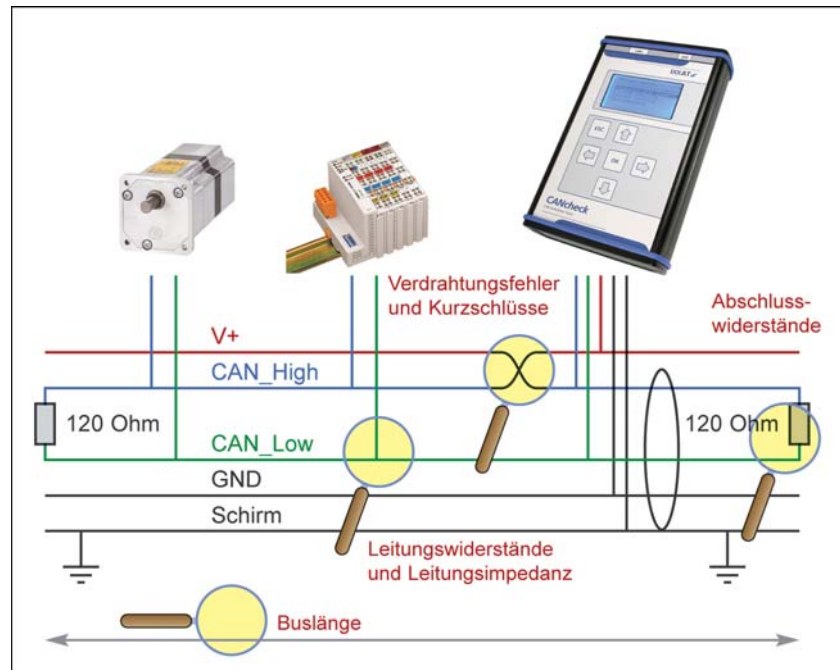


Fig. 2: Test of the lines and of the terminal resistor

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Power on - tests on the system in operation

Further sources of errors that may have an effect on the operability and reliability of the system must now be eliminated [Fig. 3]. An obvious error, for example, could be the interchanging of the signal lines (CAN-high and CAN-low), which leads to communication problems with the relevant node.

In addition, it must be ensured that the transmitted signals are of sufficient quality. To this end, the signal level and the common-mode voltage of the transmitted telegrams are measured. The dominant signal level must be in the range between 1.5 and 3 V in accordance with the standard. With the common-mode voltage, V_{CANL} must be more than -2 V and V_{CANH} less than 7 V. In particular, errors due to the signal quality may sporadically give rise to problems that cause high costs for troubleshooting in the field.

In the system test while the system is in operation, all telegram identifiers are checked by CANcheck. Messages with poor signal quality are detected and displayed. The relevant node can be easily traced via the telegram identifier. In the CANopen mode, the node number of the node is directly displayed.

CANcheck – installation tester for CAN systems

The mobile installation tester CANcheck was specially adapted to the needs and requirements of installers and service technicians and is a useful tool for the start-up and maintenance of CAN systems and for troubleshooting.

The device is simply operated via cursor keys and LCD display and carries out all necessary system test automatically or in step-by-step mode. The test results are displayed in a clear, easily comprehensible way.

The test results can also be displayed, protocolled and saved on the PC via the USB port.

The CANcheck has a high-speed CAN interface in accordance with ISO/IS 11898-2 and can therefore be operated on all conventional CAN systems. System analysis is carried out independently of the protocol, which also allows use in CANopen or DeviceNet systems, for example.

The device is powered by batteries (Mignon, AA) or USB. In the case of battery operation, the operating time is normally approx. 24 hours. The device has a robust aluminum housing specially designed for use in the field.

IXXAT Automation GmbH

Leibnizstrasse 15
88250 Weingarten

Tel.: 0751/56146-0
Fax: 0751/56146-29
e-mail: info@ixxat.de
Internet: www.ixxat.de