

Industrial Bus Health testing with Fluke 125 Industrial ScopeMeter®

The Fluke 125 and 2x5C ScopeMeters from Fluke are currently the only instruments available to provide quick, easy assessment of signal quality on a range of buses and networks. This application note describes the use of the 125 Industrial ScopeMeter to successfully troubleshoot a bus problem in an elevator operating at an apartment block administered by the Woonstede Building Corporation, Ede, the Netherlands.

Woonstede Building Corporation

Woonstede owns, administers and maintains more than 10,000 properties in and around the town of Ede. As well as normal residential homes and apartment blocks, its properties include protected accommodation for the elderly. Its Service Department is therefore responsible for maintaining a broad variety of systems, including home automation systems, intercoms, alarm systems, as well as more than 60 elevators and 160 chair lifts.

Case history

The Service Department started to receive regular complaints from tenants in one of the corporation's apartment blocks about an elevator stopping between floors. The fault was intermittent and often had disappeared by the time the service engineer arrived, which meant, of course, that diagnosing its cause was a challenge.

Initial investigations were focused on the control unit located in the basement and on the variable speed drive at the top of the elevator shaft. A check on the line feed levels and contact resistance of the relays revealed no problems. Using a Fluke 1735 Power Logger to log the mains supply for a period of 36 hours, the service engineers discovered a short voltage dip on the supply which was causing the elevator drive to temporarily lock up. The service engineers notified the utility company citing the Fluke 1735 report. Adjustments to the grid by the utility company eliminated the voltage dip, but the problem with the elevator persisted.

Suspicion then centered on the RS-485 bus connecting the control

unit with the motor drive. To investigate this, the service engineers decided to use the Fluke ScopeMeter 125 with the new Bus Health Test function.

Bus Health measurements with the Fluke 125 Industrial ScopeMeter

The Fluke 125 ScopeMeter has been designed for maintenance specialists who may have to deal with several different industrial buses and networks as well as general electronics. Based on the 40 MHz or 20 MHz 120 Series Industrial ScopeMeters, the instrument offers all functions found in the 124 ScopeMeter, with added Bus Health Test capabilities. It can verify the electrical integrity of a range of buses and networks, performing 'physical layer tests' and getting answers quickly and easily. Industrial buses on which it is capable of verifying electrical signal quality include Profibus, Foundation, Modbus, CAN-bus, AS-i bus and RS-485.

Measurements are made with the standard probes provided. After selecting the Industrial Bus Health function, a user only needs to select the bus type. The screen then displays a range of preset measurements relevant to the selected bus as a table. Alternatively, the user may switch over to the so-called 'eye-pattern mode' which gives a waveform display of successive pulses, displayed with persistence, allowing for a visual inspection of the overall signal quality. This is particularly interesting for bus systems as these can be sensitive to external electromagnetic influences caused by, for example, nearby electrical power lines or large electric motors

Application Note



which may induce considerable noise on the bus wiring.

A health check on the RS-485 bus communicating between the control unit and the motor drive immediately revealed that the signal did not comply with the standards for the bus. Specifically, there was far too much noise on the bus with the V-level, jitter and overshoot all showing a "not OK" warning on the display, indicating that they were outside specifications. Signal integrity near the motor drive at the top of the elevator shaft was also checked using the ScopeMeter with

the same result, i.e. there was far too much noise on the bus.

Based on the findings, the Woonstede service engineers carried out a further investigation of the hardware in this section of the bus system and found:

- the routing of the bus cable was close to the power line which is a known source of EM interference
- the bus cabling did not comply with the recommendations of the elevator manufacturer who had specified shielded cable to minimize EM interference

The bus cable was therefore replaced by shielded cable and was re-routed away from the power line.

Following these actions the Bus Health Tests with the 125 ScopeMeter were repeated. The results, displayed in Fig.2, clearly show significant improvement in the bus signals. The positive results were confirmed by the fact that there have since been no further complaints about the elevator stopping between floors.

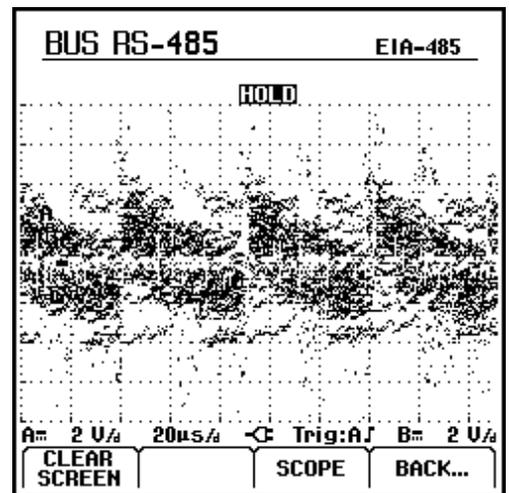
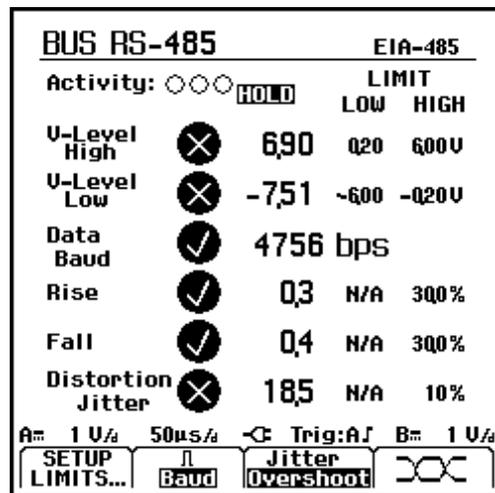


Figure 1 Left: The V-level jitter and overshoot readings were all out of specification for the bus. Right: The alternative way of looking at the bus signals using the eye-pattern mode shows a lot of noise on the bus, indicating an aberration on the signal at this location.

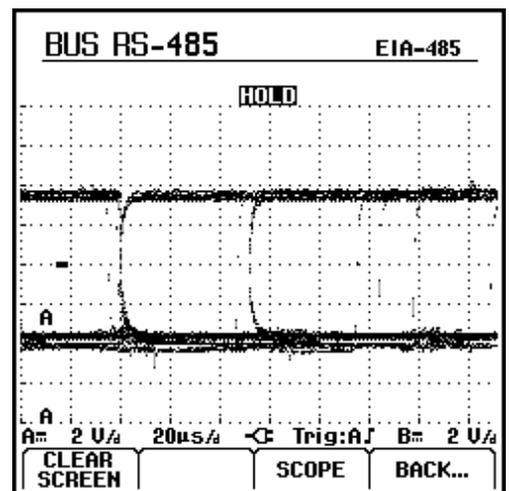
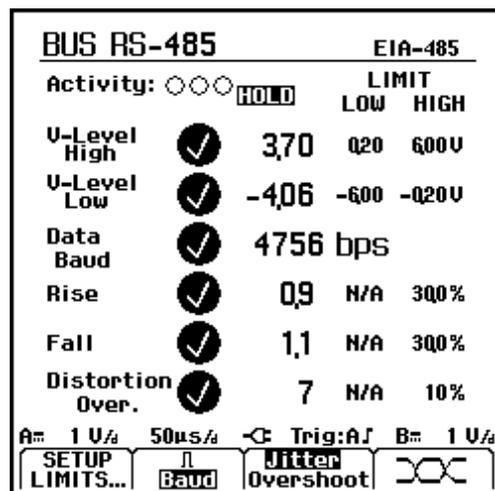


Figure 2 After changing the bus cabling and re-routing the cable away from the power line, new screen images of the Bus Health parameter screen (left) and the eye-pattern screen (right) were recorded. These clearly show improved network performance, with all parameters meeting requirements.

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