

VDSL Fault Troubleshooting Tools

Abstract

The Technical Assistance and Support Center at NTT EAST has developed a very-high-speed digital subscriber line (VDSL) tester and VDSL handheld recorder on the basis of feedback received from its fault-repair department. These devices are used as tools for troubleshooting faults in the VDSL wiring section inside buildings as part of the B FLET'S broadband-connection service.

1. VDSL tester

1.1 Development background

In Japan, NTT offers its B FLET'S broadband-connection service by very-high-speed digital subscriber line (VDSL) access to multi-dwelling units like condominium buildings. However, in such buildings, poor wiring can account for most of the faults that arise in service provision. Troubleshooting during fault-repair work has required maintenance personnel to move about a building while carrying a VDSL modem, and the difficulty of securing a power supply and other problems have hampered the troubleshooting process. The current circumstances of VDSL fault repair can be summarized as follows.

- Searching for a defective section in building wiring takes time.
- A power supply for the VDSL modem used in troubleshooting may not be available at the troubleshooting location (intermediate distribution frame, etc.).
- It is difficult to show communication speeds to customers.
- The signal-to-noise ratio (SNR), communication speeds, and cyclic redundancy check (CRC) error cannot be checked without logging into VDSL aggregating equipment, which requires a personal computer.

1.2 Functions

The new VDSL tester is battery-powered, so it does not require a mains power supply during troubleshooting. It also has a VDSL-link measurement function that enables a link status to be checked quantita-

tively. External views of the VDSL tester are shown in **Fig. 1**. VDSL tester functions are listed below.

- Link establishment with VDSL aggregating equipment
- SNR measurement (downlink/uplink)
- Communication-speed management (downlink/uplink)
- CRC error measurement (downlink/uplink)
- 3-hour continuous operation using built-in battery
- Internet communications check via personal computer connected to local area network interface

1.3 Usage scenarios

The VDSL tester's built-in battery makes it easier for maintenance personnel to troubleshoot while moving about a building and its measurement functions let maintenance personnel check the state of building wiring in practical terms. The VDSL tester can be used in various ways, as shown in **Fig. 2**.

2. VDSL handheld recorder

2.1 Development background

Faults in the B FLET'S service via VDSL do not necessarily occur on a regular basis. Instead, they tend to be unpredictable or mysterious; for example, links occasionally just go down. For faults like these, an analysis of the VDSL aggregating equipment's system log can identify details of a dropped link such as the line and fault occurrence time. However, the system log can store a maximum of only 1000 records, which means that log data at the time of a customer's fault report will eventually be overwritten and lost. Furthermore, even if the dropped link's line and time can be recovered from the system log, the

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Fig. 1. External views of VDSL tester.

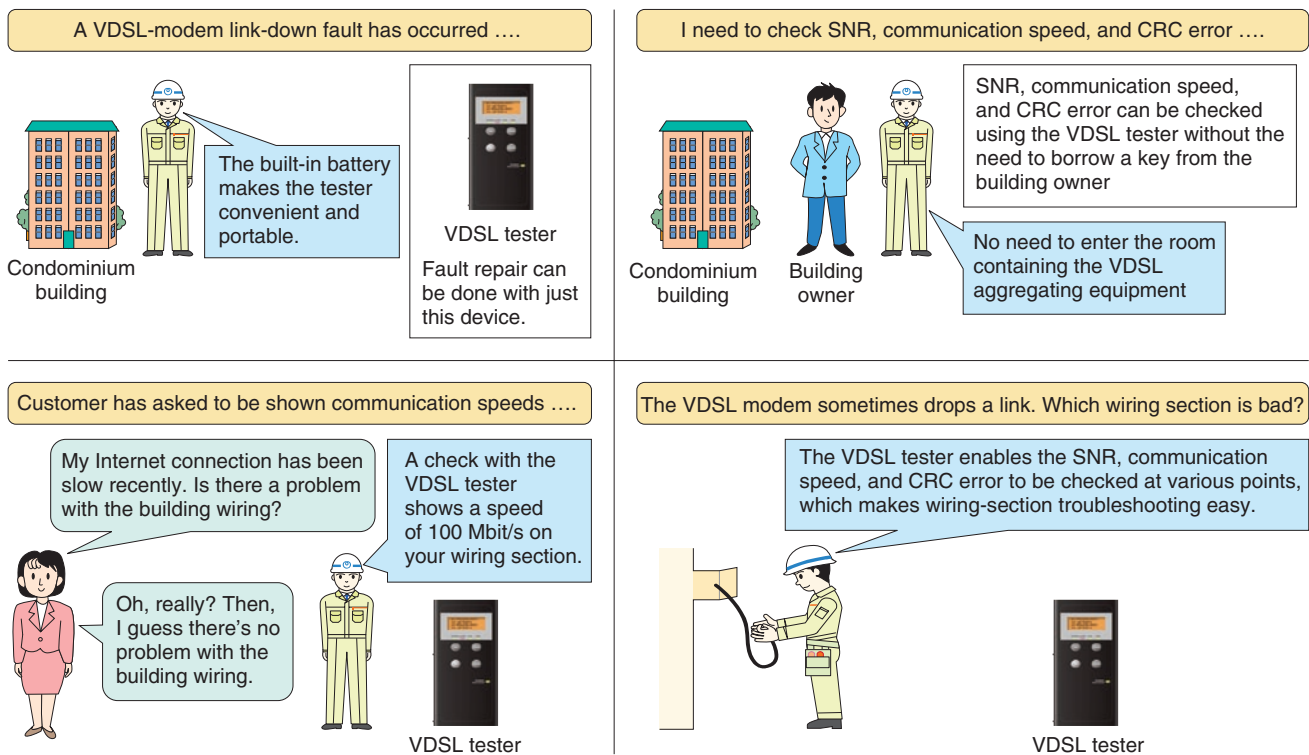


Fig. 2. Usage scenarios for VDSL tester.

cause of the event cannot be inferred from this information.

2.2 Functions

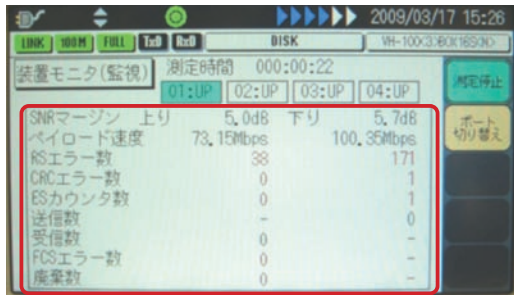
(1) System log monitoring

While the system log of the VDSL aggregating equipment can hold only up to 1000 records, the VDSL handheld recorder can store up to 9999

records, so its log is about ten times the size of the conventional system log.

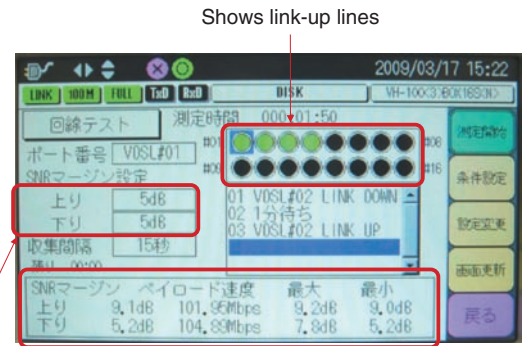
(2) Line-status monitor

The VDSL aggregating equipment stores information reflecting line status. For example, it stores CRC error and noise-margin values that affect noise resistance. Obtaining such information periodically and monitoring changes in line status over time can aid in



Shows information reflecting line status (can obtain information for up to 4 ports simultaneously)

Fig. 3. Line-status monitor.



Shows link-up lines
Shows SNR margin settings
Shows SNR margin, line speed, etc. of tested line

Fig. 4. Crosstalk test.

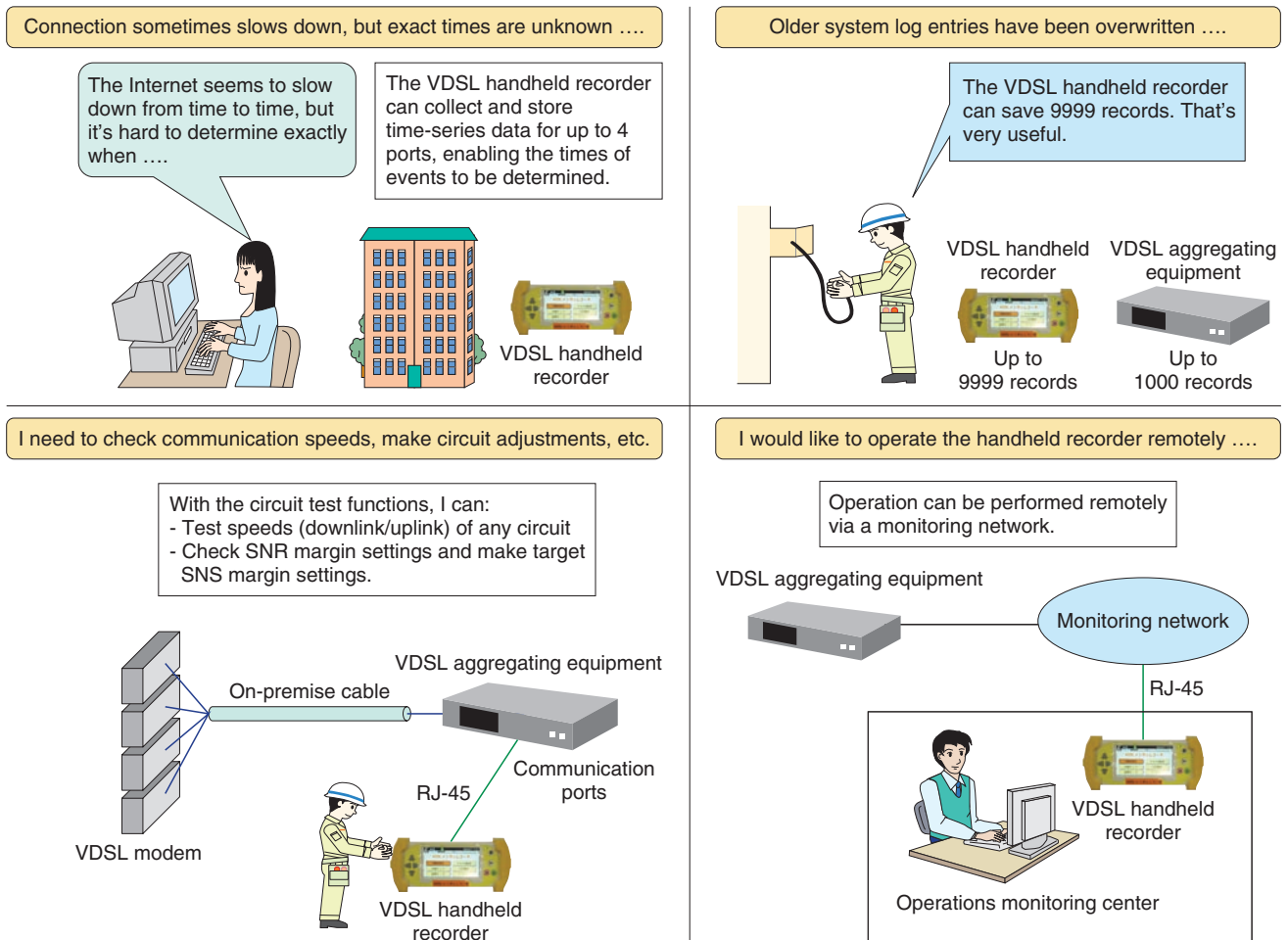


Fig. 5. Usage scenarios for VDSL handheld recorder.

determining the cause of the fault. A screenshot of the line-status monitor is shown in **Fig. 3**.

(3) Crosstalk test

The effects of crosstalk in a cable within the customer's building can be checked by manipulating the link status (up or down) of certain lines and measuring how the line status elsewhere changes as a result. A screenshot of the crosstalk test is shown in **Fig. 4**.

2.3 Usage scenarios

Obtaining system-log data and line-related information in a time-series manner enables maintenance personnel to investigate phenomena leading up to a fault and to infer whether the fault is being caused by crosstalk, noise, or some other problem. Besides

being used while directly connected to VDSL aggregating equipment, the VDSL handheld recorder can be used remotely via a monitoring network. Usage scenarios for the VDSL handheld recorder are shown in **Fig. 5**.

3. Concluding remarks

The VDSL tester was released in April 2009 and by October 2009 about 800 units were in use by the maintenance and service-order departments of NTT EAST, NTT WEST, and affiliated companies. The VDSL handheld recorder is scheduled to be released in fiscal-year 2010 following a trial period.