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Wiring tester 2.0

Modern cabling testers are the “Swiss army knife” of the modern network installer

IT Networks

CableMaster 450

CableMaster 200

"Ethernet is everywhere!"

Today, there is absolutely no denying this dictum expressed by an active network component manufacturer. Not only has Ethernet now moved into the office environment as a transport protocol; it has also assumed a solid position in data centers, industrial applications and even at home. The passive infrastructure required for transferring data is established using both copper and fiber optic links as well as an increasing number of WLAN systems.

Measuring and testing

Various levels of test equipment are available for testing these transmission paths. For copper lines, the product portfolio ranges from simple wiring testers, through the increasingly popular qualifiers that assess data links using packet error rates, to the classic high-frequency measurement devices, known as certifiers, which assess installations in accordance with EIA/TIA, ISO/IEC or EN/DIN-EN standards and which are used as baseline measurements for warranties given by the manufacturer.

Wiring test as a basis for all tests

There is no doubt as to the importance of "determining the polarity of stranding elements", as the wiring test on copper LAN data links in accordance with the standards is officially called, the baseline test both in the case of new installations and when troubleshooting on existing structured cabling. In order to carry out these initial tests, simple manual testers are generally used; these testers are, in turn, separated into different price/performance classes.

The task of understanding whether the engineer has connected all 8 data lines correctly with a ratio of 1:1 between the two junction boxes, together with the screen connection, as is customary here, does not sound all that difficult at first. It can, however, turn out to be tricky if the connection does not work despite successful test runs or if the various error possibilities need to be recognized.

When we look more closely at the three classic price/performance levels of the wiring testers, we often find right at the bottom simple no-name products that generally consist of two individual devices that are connected to both ends of the link to be tested. The only connector face on the device is an RJ45 socket. A TEST button or automatic function begins the test run and different-colored LEDs usually signal the result. Printed tables help when interpreting the respective connection errors. Although the LEDs show which pairs are affected and the problems that are affecting them, they are unable to accurately locate the error. In this way, the installer again has to rely on a "trial and error" approach to precisely situate the connection problem.

As long as the error(s) is(are) located at the ends of the link, you will find the cause of the error at the latest upon opening the second side. If, however, the error is situated along the link, generally the only useful option is to completely replace the link once you have, unsuccessfully, looked at each end. The consequences of this are the significant amount of time, and therefore money, that is required. The money originally saved in purchasing is soon found to have run out. What's more, not every wiring error will be found. As these small testers generally investigate the wiring via ohmic test procedures, they are fully unable to detect an error such as the infamous "split pair", whereby the prescribed wire system has broken up. Although the test may issue a "passed" result, the link would not be usable for Ethernet communication as the high-frequency properties are destroyed.

Wiring test as a basis for all tests

Devices that find errors of this type often employ capacitive test methods. These "mid-range" devices, such as the CableMaster 400/450 from Softing, are, at first glance, individual devices; however, on closer inspection, you can see that the terminator for the opposite side is removable and is located at the bottom of the device. These devices already have an LCD display and an operating menu that allows you to select the measurement port and test type. The devices are operated using just a few fixed-function buttons.

Once a test run has been completed, the wiring diagram detected is depicted alphanumerically, together with additional plain text reports. The devices generally already have some additional functions, such as a tone generator for cable assignment, hub flash option and a length measurement function. However, they are only able to provide a result when performing capacitive length calculation if the cables are correctly terminated or open. Although this method is very helpful for error locating, it fails in the event of short circuits. This leads us back to the question of price/ performance in professional usage.

In order to locate short circuits as well, a further process must be used: this process is known as a TDR measurement. When using Time-Domain-Reflectometry, the reflection behavior of signals at error locations, whether open or short-circuited, is used to determine the location. One of these high-end devices is the CableMaster 800/850, the latest output from the Softing IT Networks range of verifiers.

The principle behind the wiring test is the same here as when using smaller testers. The main device is attached to one side of the cable link while a coded terminating plug is positioned at the other end. The results are displayed via a color LCD screen. The user interface works with several graphical symbols and result depictions.

The device itself is operated using icons and selection menus, that are selected either using softkeys or using the ENTER/Escape button in connection with arrow keys.

This device has some particularly comprehensive additional functions, including the option of actively joining the network and performing various tests on already-active ports. This range of functions makes devices of this type the first choice today for professional network installers, who not only lay cables and connect junction boxes, but also install the active components and bring the network into operation. In the case of small systems, this today falls within the area of competence of the installer, particularly among young installers, who no longer shy away from the active network world.

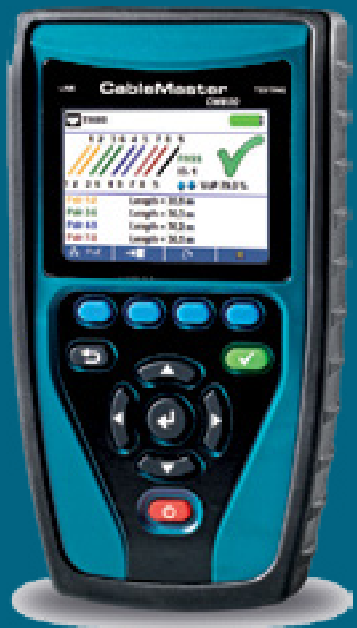
Launching and troubleshooting on Ethernet networks

As already mentioned above, in the new generation of high-end verifiers particular emphasis was placed on the active functions for launching and troubleshooting on Ethernet networks. Here, there are two different test scenarios available: on the one hand, a simple link test, which identifies the options available for a port; and, on the other hand, a detailed network test, in which the device is connected to the active network.

When performing a link test, the tester, e.g. the CableMaster 800/850, is connected to an active switch port and/or the relevant junction box. The device identifies the service and tests various active parameters. This includes the link speeds that are supported, e.g. 10 Mbit, 100 Mbit or 1000 Mbit (1 Gbit) Ethernet, or information is provided as to whether the connection is straight-through or crossover (MDI or MDIX) and whether autonegotiation is active.

The link light function allows you to assign the outlet used to the corresponding switch port via a constant, slow blinking of the status LED on the switch.

CableMaster 800



An important test today is the Power-over-Ethernet load test, which gives information on the standard applied, either pursuant to IEEE 802.3af (12.95W/"PoE") or IEEE 802.3at (25.5W/"PoE+"). The feed mode use, either A or B, is displayed. Mode A uses pins 1 and 2 for positive voltage and pins 3 and 6 for negative voltage. Mode B uses pins 4 and 5 for positive voltage and pins 7 and 8 for negative voltage.

The test identifies the voltages in different load cases and, on that basis, provides information regarding the load capacity of the respective switch port. This is important as, in the case of defects at the output stages of the active components, although the open-circuit voltage is present and availability is suggested, this will immediately break down under load.

When conducting a network test, the CableMaster 800/850 will, at the touch of a button, seek to obtain an address via DHCP (automated address assignment) and connect to the network. This can also take place via a static IP address, if a DHCP server is not available. Once successfully connected, the device displays the connection data and now allows the user to perform further tests within the network.

In this way, the user has access to comprehensive ping tests as aids to launching and troubleshooting. By creating a ping list consisting of IP and URL addresses, you have the option to test a port's connectivity at the touch of a button, i.e. can all servers and printers that are necessary for that workstation be reached and is there an external connection to the internet? An important function, especially for MACs (Moves, Adds, Changes) within a company. Individual stations can, of course, also be searched for.

This allows you to quickly find out whether, for example, access to individual terminals, email servers or list printers is possible.

To gain more information on the individual active stations within a network, the NDP protocol can be used to create a map. The stations identified can now be incorporated into ping lists for subsequent ping runs. In order to gain more detailed information (including VLAN type and ID) relating to individual switch ports, the device has an option for analyzing CDP and LLDP protocols: the information content in this case is heavily dependent on the switch used.

All tests conducted are saved in the device and can be converted directly to PDF or CSV format using a piece of PC software that is supplied with the device. This allows you to easily document a network, both following new installation and when troubleshooting.

Conclusion

As you can see, when choosing a simple cabling tester, it is critical to accurately weigh up the price and performance of a device. It becomes quickly apparent that any supposedly saved money is in fact not saved, if you take the time for troubleshooting into account. What's more, the range of functions also needs to be tailored to the work situation. The many test options mean that a verifier quickly becomes a universal device for cabling, covering various requirements, up to and including launching a network. For this reason, spending a little more for a universal device is always a future-proof investment for installing and operating Ethernet networks.

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Über Softing IT Networks

Softing IT Networks, vormals Psiber Data, ein Schwesterunternehmen der Psiber Data Systems Inc. USA, wurde 2003 gegründet und gehört seit 2014 zur Softing AG. Softing IT Networks bietet elektronische Testgeräte auf Spitzenniveau zur Leistungsqualifizierung, Zertifizierung und Dokumentation komplexer IT- Verkabelungssysteme.

Die Softing AG ist ein börsennotiertes deutsches Unternehmen, das Hard- sowie Software für die industrielle Automatisierung und Fahrzeugelektronik entwickelt und fertigt. Das Unternehmen wurde 1979 gegründet, die Zentrale ist am Standort Haar bei München. Im Geschäftsjahr 2016 erwirtschaftete das Unternehmen mit insgesamt 430 Mitarbeitern einen Umsatz in Höhe von 80,4 Millionen Euro.

Die Kompetenzen von Softing IT Networks werden ergänzt durch die Expertise zur Vernetzung von Industriewelten des Geschäftsbereichs Industrial und das Know-how zur Funktionsbewertung elektronischer Fahrzeugkomponenten von Softing Automotive

Kompetenzen & Spezialisierungen

Softing IT Networks ist Spezialist für Messtechnik zur Qualifizierung, Zertifizierung und Dokumentation der Leistungsfähigkeit von Verkabelungen in IT-Systemen basierend auf weltweiten technologischen Standards.

Ob für die Telekommunikation, für Datenbanken, für Großrechner oder für den Anlagenbau in der industriellen Automation, mit der professionellen Messtechnik von Softing IT Networks optimieren Sie die Leistungsfähigkeit Ihrer Datenkommunikation durch schnellere und sicherere Verbindungen über den gesamten Lebenszyklus des Netzwerks hinweg.

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