The High Cost of a Low-Cost Cable Certification Tester

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"How much does it cost?" That is typically the first question a cabling contractor or network owner asks when considering a new certification tester for network cabling. It is an important question to consider and one that cannot be answered by looking at the price tag alone. A low-cost cable certification tester may cost up to a few thousand dollars less when originally purchased, but will typically cost the owner tens of thousands of dollars in lost productivity throughout the life of the tool.

In this paper, we unveil the myriad of high hidden costs you may encounter when using a "low-cost" tester.

Types of cable testers

In general, testers used on premises cabling can be divided into three categories.

Verification Testers• – Used to determine if the cable is properly connected.

Qualification Testers• – Help determine if the cabling will support technology requirements like fast Ethernet, VoIP, Gigabit Ethernet, etc. This type of tool is sometimes erroneously called a "Speed Certifier".

Certification Testers• – Test the cabling to ensure that it meets specific cabling performance standards. A good certification tester is easy to use, but has the ability to quickly do complex and accurate calculations.

Even when provided these distinctions, a contractor can be confused by the difference in price within a category, or misinformation caused by test equipment vendors seeking to present their product as something more capable than it really is.

What is a cable certification tester?

Certification test tools answer the question, "Does this cable comply with cabling standards? (e.g. TIA-568-C.2 Category 6A or ISO 11801 2nd Edition Class FA). These tools are used by commercial datacom installers/contractors and enterprise facility managers to ensure that new cabling fully meets performance standards. Cabling manufacturers often require certification before issuing a warranty and enterprises often require certification testing before commissioning an installation.

Figure 1. Certification tools take very precise measurements on parameters spelled out in TIA and ISO standards. Documented results from a high-accuracy certification tool is often the only means of meeting the requirements of manufacturers' warranties.

Certification is the most rigorous of all cable testing. A certification tester makes many types of measurements across predefined frequency ranges and compares the detailed results to standards set by the Telecommunications Industry Association (TIA) {ANSI/TIA-568-C} or International Organization for Standardization (ISO) (ISO/IEC 11801 Ed.2). Testers must meet specific accuracy requirements of ANSI/TIA 1152 or ISO/IEC 61935-1. The results from these measurements determine if a link is compliant with a category or class of cable. Certification tools are the only tools that provide "Pass" or "Fail" information on the cabling, in accordance with TIA or ISO standards.

Good certification testers also typically support performance standards for premises fiber optic cabling, and have diagnostic capabilities for both copper and fiber network cabling. Low-cost certifiers often have little-to-no capabilities to analyze failing links which can result in major lack of productivity.

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The hidden costs of low cost certification testers

Standards-compliant media-test capability: True certification testers must be able to test against the latest cabling performance standards. This includes TIA standards and ISO Standards for twisted pair (UTP) and shielded (STP/FTP) copper, and fiber optic (multimode and singlemode) for premises cabling. It also includes IEEE standards for premises cabling technologies. A low-cost tester that cannot meet the guidelines in these standards and reference them for clear pass/fail results, is not a true certification tester and will have hidden costs when certification testing is necessary.

Accuracy: For cable testers, accuracy is the maximum difference between the value that may be reported by the equipment and the true value. The industry cabling standards have defined many parameters that we test with certification tools to establish that a cabling link or channel is compliant. There are also minimum performance requirements for tester accuracy that are defined in the standards. (See Figure 2) For each category of copper cabling, there is a corresponding accuracy level that has its own set of performance requirements. Using a tester that doesn't meet the required accuracy levels for the type of cabling that you plan to test will cause contractors to lose jobs, and makes testing the cable a waste of time.

Category / Class	Frequency	Minimum Accuracy Requirement
Category 5e / Class D	1-100 MHz	Level IIe
Category 6 / Class E	1-250 MHz	Level III
Category 6A	1-500 MHz	Level IIIe
Class F/F_A	1-600 MHz	Level IV

Figure 2. Tester accuracy levels per industry standards

It is important to note that achieving accuracy for a certain level doesn't guarantee a compliance level with a lower frequency range. This is especially true for Level IV. Since Class F/FA cabling uses special, non-traditional RJ45 connectors, Level IV certification does not imply that the same tester used in a Cat 6A or below UTP system with RJ45 connectors will meet Level IIIe or below. For example, the DTX CableAnalyzer™ Series was independently verified to meet Level III, IIIe, and IV requirements by Underwriters Laboratories® (UL®) Documentation of this with complete data should be available from the test equipment manufacturer. Without the data, it is impossible to know whether the tester truly meets an accuracy level noted in the table above.

Also, Class F (shielded cabling) which is sometimes erroneously called "Cat 7" is field tested to a maximum of 600 MHz per IEC 61935-1. Certification testers like the DTX CableAnalyzer are capable of testing beyond 600 MHz, but to date, there is no field standard that requires testing at higher frequencies.

Efficiency: The total time to certify cabling is a combination of what it takes to set up, run a test, save the result, and make a report. As processor speeds have increased and technology has advanced, significant time savings has become possible due to a dramatic decrease in the time it takes for a tester to run a test. For example, when the DTX CableAnalyzer was introduced, test speed increased dramatically to less than 10 seconds per test. But test speed is only part of the equation. Efficiency gains from ease of use, fewer key strokes, and more intuitive test execution are the other part. A low cost tester may brag to be fast, but the time you lose in efficiency will erode any hopes of saving total time on the job. Some claiming to be faster have proven to be 50% slower when evaluated. It is important to consider how many key strokes it takes to accomplish routine tasks, and how easy it is to prepare test reports.

Test methods: How a test is executed is a critical component to the result that is achieved. One of the most important decisions before running a test is whether a permanent link or channel test should be performed. The best certification testers can efficiently and accurately perform either method per the standards.

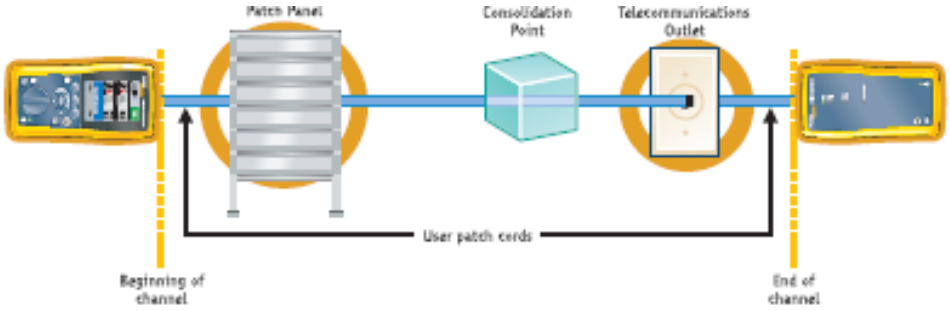

Figure 3. The Permanent Link is part of the permanent installation, from wall plug to patch panel. It does not include patch cords.

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When a new cabling system is installed, the installation crew is typically not responsible for the patch cord or equipment cords. This crew pulls the cables, labels, terminates them, and certifies the performance of the “Permanent Link” or PL. See Figure 3. The Permanent Link is a subset of the linkage between network devices. It does not represent the end-to-end connection between network devices. To certify the complete end-to-end link involves testing the channel. The channel includes the patch cords that will remain installed on both ends of the link. See Figure 4.

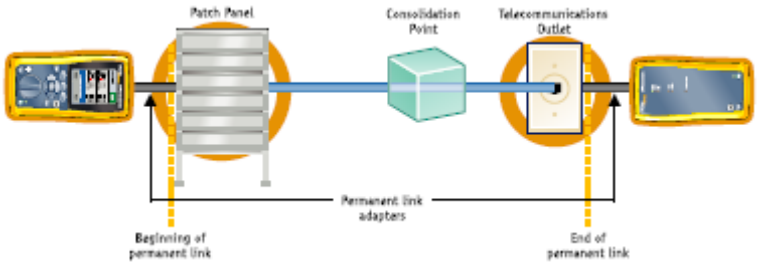

Figure 4. The Channel is the complete end-to-end link, include the patch cords.

The standards allow “channel tests” to be performed with patch cords installed and left behind for the user. Testing the channel would be an acceptable approach if you can guarantee that the patch cords used for the channel certification are going to remain in place for the life of the cabling system – a very unlikely scenario – or can make the commitment to recertify each channel whenever patch cords are replaced or exchanged. For these reasons the permanent link test is used most often. It offers two significant advantages:

The PL certification fits with the typical installation process as described above. The installation crew seldom, if ever, deals 1. with patch cords. And with any greenfield installation it is impractical to leave patch cords attached to each outlet.

Proper testing of the PL delivers true results of the permanent link performance and guarantees that a passing PL will yield a 2. passing channel when known good patch cords are attached to create the channel. This is true for category 3 cabling and for all other levels of performance including augmented category 6 (Cat 6A) cabling.

Some cabling test equipment manufacturers attempt to decrease cost by using random patch cords to run a permanent link and channel testing simultaneously. There are many weaknesses to this technique, the most noteworthy being how difficult and time consuming to reference each patch cord, and the accuracy of the test results. Testing with uncontrolled, generic patch cords produces random results. But if you test with a Permanent Link Adapter like the DTX-PLA-002, it is durable, and produces repeatable, accurate results.

User experience: Certification testers should be an efficient and effective tool for the users. Low cost alternatives often forget basic things that technicians need to get their job done. For example, the battery must last for an entire workday so that an installer can use it for 8-10 hours un-tethered by an AC power supply. And it should charge up in less than half that time without having to be removed from the instrument. The general user interface should be simpler than what the best technicians need. This decreases the learning curve for new installers and makes the experienced technicians more efficient through fewer keystrokes, and an intuitive user interface. Replacement parts, service and technical support should be available and accessible for users wherever they may be. The cost savings of an obscure brand of tester will evaporate quickly when service or support is unavailable.

Troubleshooting capability: A certification tester should have the requisite ability to troubleshoot any links that cannot pass cabling standards. Producing a clear Pass or Fail result is great, but its only the first step if it’s a failure. The link must be fixed so it will perform as intended. The reasons for failing certification tests fall into two distinct categories: connection problems and transmission performance problems.

There are many tools that can provide information regarding the connection problems such as an open, a break, a short, etc. But a good certification tester should also be able to properly locate a break or a short in the cabling as well as identify problems caused by improper pairing of the wires. In addition, certification testers should include advanced troubleshooting diagnostics that identify and locate transmission defects. With this diagnostic information, the installer can dramatically improve troubleshooting productivity and help to restore service quickly.

For example, one important aspect of high-performance cabling installations is that the original twist of the wire pairs must be perfectly maintained into the connecting hardware devices (8-pin modular jacks and plugs and punch-down blocks). Both NEXT and Return Loss are affected by the way in which the wire twist is maintained at the termination into the connecting hardware. Low cost testers cannot troubleshoot NEXT issues like a good certification tester, so when failures are encountered, technicians may have to re-terminate the

connections in order to eliminate the problems. But this trial and error approach to repairing a failing link can cost a significant amount of time and money – and it never guarantees a fix. This “shotgun” method can be avoided with a certification tester that provides expert diagnostics.

When able to quickly identify and pinpoint the source of failures, the technician can immediately implement corrective action. Re-termination might still be the answer but only one re-termination may be called for. Not only would this save time in this example, but it saves the cost of replacing jacks or patch panels.

Warranties and endorsements: If you are a commercial installer who needs to prove to the building owner that all cabling has been installed correctly, you must certify it. To receive the support and financial security of a manufacturer’s warranty, certification to TIA or ISO standards is your only option. If you have a mixture of fiber and copper cabling, and often need to test both, certification tools do that best. A high-quality certification tester like the DTX CableAnalyzer will be endorsed by the manufacturer of connecting hardware or cabling manufacturer, and supports those projects in which the statement of work requires a full certification of compliance with a cabling standard. The DTX CableAnalyzer is also the choice of enterprises and cabling manufacturers when performing audits and troubleshooting problems that may arise with the network cabling.

Documentation: A certification tester must be capable of facilitating documentation of the test results. Certification is incomplete – maybe even invalid – if properly executed test results are not documented.

The best certification testers provide several options to capture, store and upload these results. Data available in a protected database is much more useful than data that has been printed. Often the contractor delivers a huge three-ring binder in which each page contains the test results information of a tested link. Thumbing through those binders can be painstakingly time consuming. A test database program allows the user to view the graphical test results of any parameter of any link in the database with a few mouse-clicks.

Industry standards prescribe the documentation requirements. They allow several options, from minimal documentation requirements to capturing and storing every measurement. While it may be useful later, a lot of memory is needed to save every data point. For example, the test results record for a single Cat 6 link includes approximately 54,000 measurement values. Many certification testers on the market offer a removable memory card to allow the user to store these large amounts of data.

If you are in a position to write the specifications for a cabling installation project, you should describe the test documentation you expect to receive. If you are a contractor and the statement of work for the job does not detail the test results requirements, you should request clarification before the testing phase commences or choose the maximum (store every measurement).

With new automated records analysis programs, there is now a much simpler and more powerful way to analyze and manage your test data. These programs can summarize the performance of a 10,000-link network on a single sheet of paper. It can provide several views of the data that quickly point out performance parameters and configuration discrepancies across an entire installation.

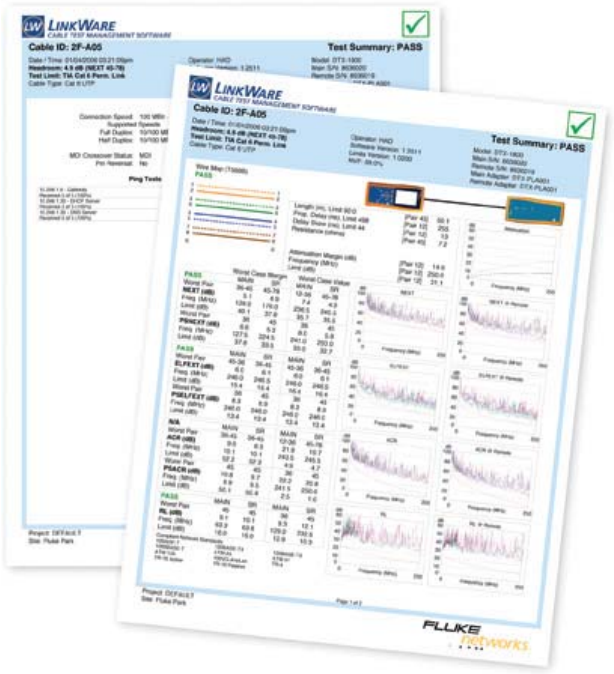

Figure 5. Certification tools should provide an easy means of generating documentation. The user should be able to specify the level of detail collected and presented in both paper and electronic formats.

Figure 6. LinkWare™ Stats summary

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Conclusion

When purchasing a new cable certification tool, smart owners will carefully compare the testers in consideration. Can it test to the latest cabling performance standards and have the diagnostic capabilities to troubleshoot problems? Does it meet the required accuracy levels for the type of cabling being tested? Is it simple to use, easy to learn, and consistent with its test results? Can it troubleshoot a failed certification test? Is it user friendly and backed by accessible technical support? Does the cabling manufacturer endorse it? What do enterprises and cabling manufacturers use for quality audits? Can it help me properly document my test results?

Perhaps the most critical question you should ask yourself when purchasing a cable certification tester is this: Do I want to pay a little more now or do I want to pay a lot more later?

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