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White Paper

Infrastructure and PoE Considerations for Security Device Deployment

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When Power over Ethernet (PoE) devices fail, the root cause is often difficult to find. This is especially true when it comes to physical security and life safety devices. Because of the criticality of these devices, all parties with a vested interest in maintaining their operational status must do what they can to identify PoE problems ahead of time. Failing to do so usually means getting bogged down with time consuming troubleshooting steps.

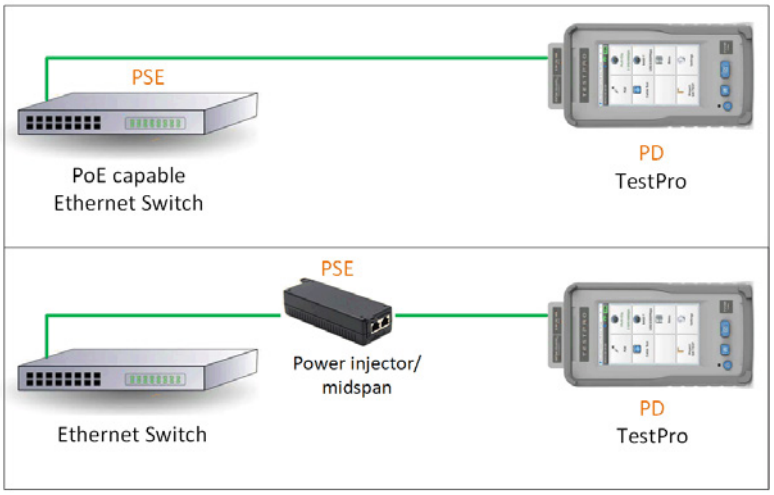
In this paper, we will explore reasons why physical security and life safety devices must be treated with special care when it comes to PoE. We'll also point out why PoE problems for these types of devices are often cable related. Lastly, we'll show how PoE stakeholders can best test and troubleshoot for all types of PoE issues to quickly identify and remediate problems with the least amount of expense and downtime.

The importance of physical security and life safety PoE devices

More than ever, physical security and life safety Internet of Things (IoT) technologies have relied on PoE as an alternative to traditional power sources. Having the ability to deliver power and data needs over a single twisted pair cable allows for increased installation flexibility at a much lower

cost. Yet, it's important to remember that these technologies commonly push the capabilities of PoE far beyond traditional PoE devices. For example, physical security and life safety devices:

- Must be operational at all times. A failure to do so can be dangerous to those that rely on them.
- Are often deployed in harsh physical environments. These are locations with large swings in temperature, high humidity and are often difficult to gain physical access.
- Need more power compared to other common IoT devices. Newer physical security and life safety devices often require Power Sourcing Equipment (PSE) and Powered Devices (PD) to be capable of 802.3bt power delivery standards up to 90 Watts. Here is a diagram showing two different PSE deployment methods with a TestPro acting as a powered device (PD) endpoint.



PoE PSE switch/midspan with TestPro acting as a PD

As mentioned previously, many physical security and life support devices have more demanding PoE requirements compared to others. Surveillance cameras, for example, often require extra power for heating elements, blowers and LED illuminators – all of which are enabled on an as-needed, intermittent basis. Thus, not only is the power draw requirement higher than most other PoE devices – the amount of power needed at any one time is unpredictable.

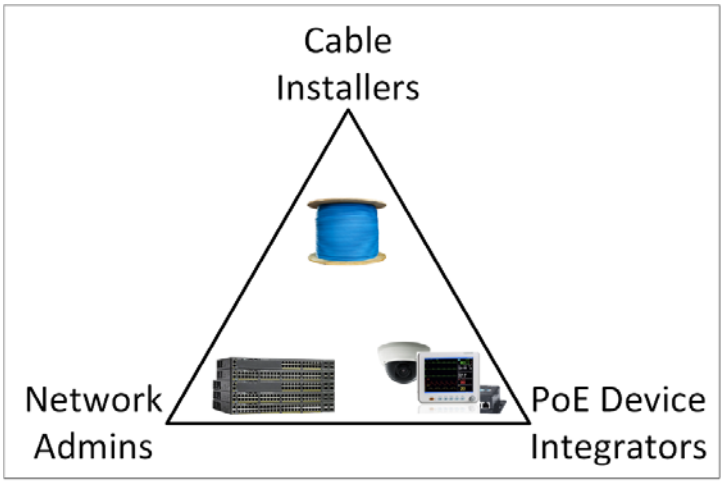
Common causes of PoE failures and their stakeholders

Because of the added demands of PoE, physical security and life safety devices often push beyond the limits of commonly installed twisted pair cabling such as Category 5e, Category 6 and low-quality or poorly installed/tested Category 6A cabling. When this occurs, it can lead to intermittent PoE device failures which can be a challenge to troubleshoot. However, it's important to note that it's not always the cabling that's at fault. The three primary PoE failures are:

1. Bad cabling
2. Nonfunctioning PoE end device (PD)
3. Nonfunctioning or over-budgeted power sourcing equipment (PSE)

As is often the case, cabling, PoE edge devices and the power sourcing equipment are installed or managed by different groups. Thus, when PoE problems occur, it is common for the cable installer to blame the edge device manufacturer or the power sourcing equipment manufacturer for the failure. Likewise, both the edge device and power sourcing equipment manufacturers point the blame on the other groups. Another major factor occurs when the team responsible for power delivery – commonly accomplished using PoE-capable Ethernet switches – does not receive enough information regarding maximum load requirements for each PD. This can lead to situations where the power budget of a switch is intermittently overtaxed, causing sporadic outages of edge-devices. Ultimately, when the finger pointing between these stakeholder groups begins, you can bet that the issue will likely take far longer to troubleshoot and find the true root cause of the failure.

In the following diagram, we can see each PoE stakeholder and what part of the infrastructure they're responsible for:



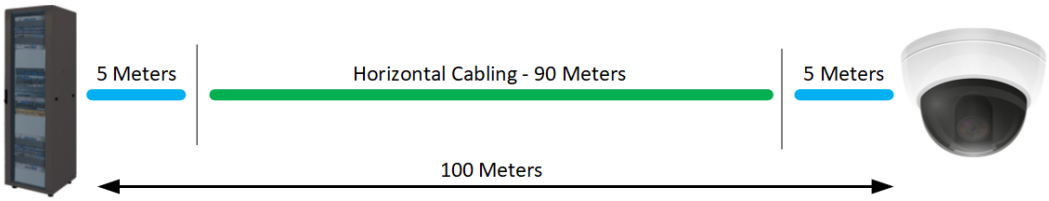
PoE Stakeholders

Problems between stakeholders occur when proper verification testing isn't performed ahead of time. For example, when PoE device integrators install physical security and life support systems, it's routine for them to assume that existing twisted pair cable plants will be up to the task from a power delivery standpoint. If the integrator plugs their endpoint in and it powers up, it's commonly assumed the cabling will work. However, it's often forgotten that varying circumstances can cause the PD to request more power than what is needed at the initial device bootup. Thus, failures can emerge long after the integration is complete. Additionally, many of these physical security and life support IoT devices don't offer integrators the ability to test maximum power loads manually. Therefore, even if the integrator did want to run a maximum power draw test on twisted pair cabling, they would not be able to do so without the appropriate PoE test equipment.

Ensuring that both new and existing cable plants are ready for PoE should be the first step in any PoE project. Having the ability to know if the cabling can handle both data and power demands is the first step to success. Without visibility, cabling issues may end up being problematic in the short and long term resulting in project delays and frustration. Besides the chance of cabling causing an immediate PoE failure, it's also common for issues to arise only when the device endpoint begins requiring more and more power. This is when conditions such as longer cable

lengths and having too many cable jumps between the PSE and PD will begin to emerge as the root cause of intermittent outages. Also remember that quality of both the horizontal and patch cabling can significantly impact the maximum length a cable can be run while still delivering the required amount of power. While some cable installers go off the simple adage of 100 meter (328 feet) maximum twisted cable lengths, the true ANSI/EIA/TIA 568-B specification is more complex than that. Specifically, the 568-B standard specification states:

"*The maximum distance between the telecommunications outlet and the horizontal cross connect shall be no more than 90 meters. The maximum length of all patch cords and jumpers in the telecommunications closet shall be no more than 5 meters, and the total length of all patch cords both in the telecommunications closet and at the work area shall be no more than 5 meters.*"



Twisted Pair Ethernet Maximum Length

Of course, adhering to this strict specification is easier said than done. It's not uncommon for these rules to be broken for one reason or another. A second factor is the impact that running continuous power – especially at higher wattages – will have on the longevity of cabling. Over time, the wiring, patch panel components and connectors will wear out due to higher power demands. Thus, it's important to point out that simple cable length tests will never definitively answer whether power delivery will operate as it should. Instead, specialized PoE tests will more accurately verify whether power can be run over existing cabling for extended periods of time.

Three ways to address PoE cabling issues

When the twisted pair cabling comes into question during PoE device failures, there are three ways to address it. The first is to abandon PoE as a power delivery mechanism and instead run local power to every location where it's needed. A second is to abandon the existing cabling and run new and better quality cabling. These two options are obviously not ideal as they can become incredibly expensive.

The third and best approach is to use a PoE test tool such as the TestPro multifunction tester. This test tool can be used to accurately verify whether the existing cabling can deliver the required PoE device power draw at varying cable lengths and with different cable qualities/standards. In fact, the tester can be used to troubleshoot and find the root cause of any of the PoE issues mentioned in this paper. Not only can it test the cabling, but also the true capabilities of the power sourcing equipment and the maximum draw requirements of the powered device. Thus, before abandoning the installed cable plant, a TestPro can offer the following:

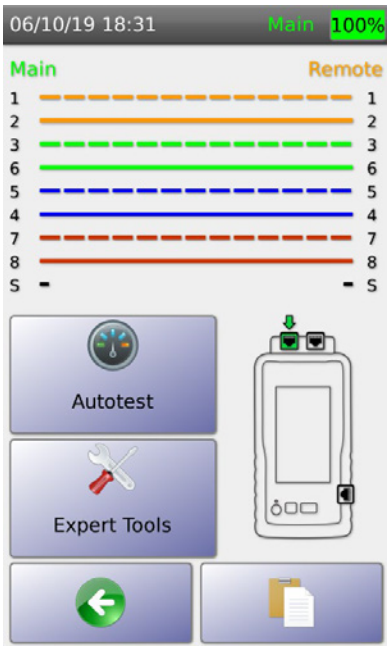
- Acts as an actual PoE device on the end of the wire to test true power draw capabilities up to 802.3bt standards at 90 W.
- PoE tests provide a high degree of certainty that a cable can or cannot deliver the required amount of power of cables of varying types, qualities and lengths.

- Certification or validation tests also ensure a cable can run at the necessary data transport speeds required by the end device.
- Performs a DC Resistance Unbalance test which is critically important for higher-wattage delivery requirements that generate added heat on the copper pairs. The DC Resistance Unbalance test verifies the heat increase will not impact data transport performance.
- Can run optional TCL and ELTCL tests as part of a TIA certification test to further validate the cabling can operate properly with added electrical interference.

It's also important to note that the TestPro can run a twisted-pair certification test (including the optional TCL/ELTCL tests) and a PoE tests in single multifunction tool. What's more, it can run the entire battery of certification tests in [an industry-best 6 second time](). Thus, instead of spending hours and hours pointing fingers at others, the TestPro can eliminate all those headaches in just 6 seconds.

Who should have a TestPro as part of their IT tool kit?

Without the proper test tools, troubleshooting PoE issues often includes time consuming phone calls between the cable installer, PSE switch manufacturer and PoE device manufacturer. It can also lead to multiple site revisits to troubleshoot the various components, project delays and cost overruns. Instead of running into these types of situations, having the ability to certify the physical infrastructure as well as perform PoE load tests provides the ability to immediately determine whether an issue is related to the cable or PSE output. Having this information would go a long way to identifying and resolving the root cause of any PoE issue.

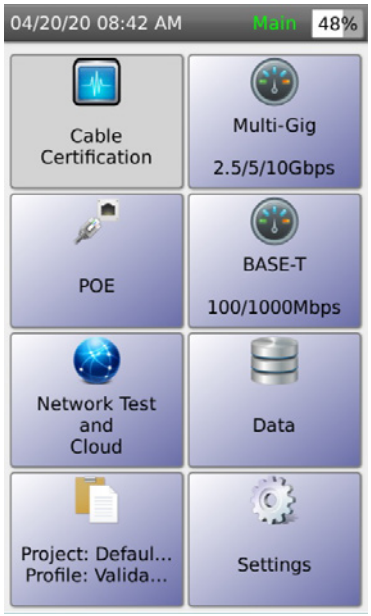


TestPro Autotest

Because of the growing importance of PoE in virtually any office or industrial setting, test tools like the TestPro are useful for all three PoE stakeholders – although the type of kit required may vary. Here's why:

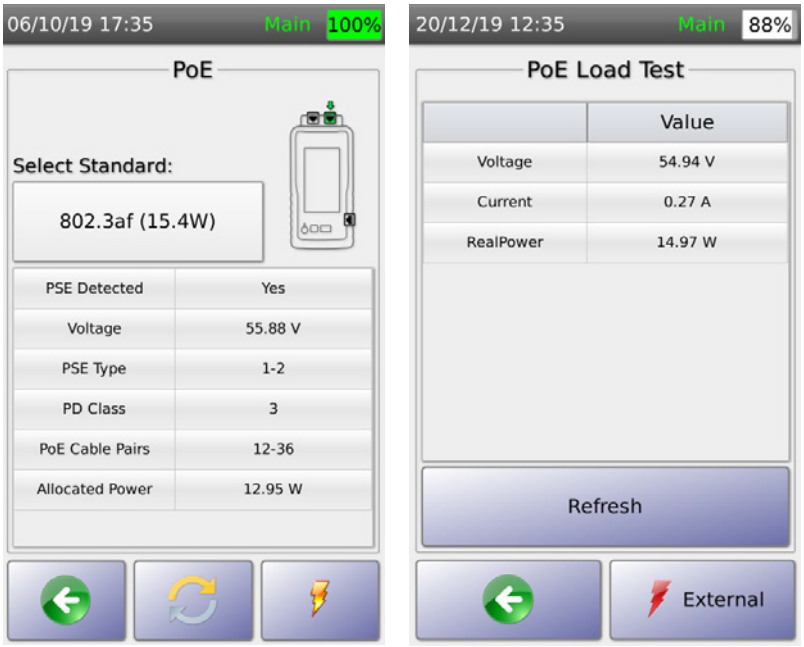
Cable installation professionals are concerned with not only the troubleshooting aspects of a multifunction tester, they also need the ability to be able to properly certify cabling for warranty purposes. Because of this, cable installers would want to choose a TestPro kit that provides features such as being able to save cable certification test results and upload them to the TestDataPro management software. This allows the installer to be able to organize and print results to all that need them.

On the other hand, security and low voltage datacom integrators along with network administrators may appreciate the ability to perform a standards compliant certification test with view only Pass/Fail indication, without having to incur the cost of a full-blown cable certifier as the ability to save and print certification test results is typically not needed. Combine that with the ability to perform SNR based Multi-gigabit link speed testing as well as BASE-T and Wi-Fi network connectivity testing, and users have a complete, purpose-built smart building test solution.



TestPro with Cable Certification, PoE and Multi-Gig Capabilities

These are the exact same 6 second certification tests that are run on the more expensive test kits apart from not being able to save or upload test results to the TestDataPro management software. Of course, all PoE-capable test kits also provide that exact same PoE testing capabilities including power load tests that show both RealPower Wattages and precise voltage being received from a PSE over any twisted pair cable, as shown here:



PoE Load Test

The ability for all PoE stakeholders to have access to the exact test capabilities they require in a single multifunction tool is something unique that AEM brings to the cable test market. These tests can go a long way to avoiding PoE device failure finger pointing. Ultimately, the TestPro has proven to be a wise investment for cable installers, PoE device integrators, network administrators – and anyone else that has a vested interest in maintaining the operational status of PoE endpoints.

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