

P+E – The Reliable Alternative to PoE for Drive Thru Order Confirmation Displays

Power over Ethernet (PoE) has been touted by some in the industry as a viable and cost-effective solution for drive thru order confirmation system (OCS) displays in cases where running AC power may be cost prohibitive. While well intentioned, using PoE in this fashion can lead to unreliable operation due to the inherent limitations of this technology when used in outdoor environments for high power devices such as sunlight readable displays. In this paper, we describe an alternative solution to PoE, called P+E that provides the cost benefit of not having to run AC power to the OCS while not compromising the reliability of the system.

Executive Summary

There are three different power connection options available for drive thru OCS displays today:

1. Dedicated **120 VAC power**
2. Power over Ethernet (**PoE**)
3. Power plus Ethernet (**P+E**)

There are advantages and disadvantages of each, which are summarized in the table below.

	120VAC Power	PoE	P+E
Low Cost of Installation		✓	✓
No Electrician Required		✓	✓
Reliable Power Connection	✓		✓
Reliable Data Connection	✓		✓

As the table shows, P+E provides the most reliable and lowest cost option when considering the installation of an OCS in the drive thru – especially in a retrofit application where 120VAC power is not readily available. In this paper, we will describe each power option in detail and provide the pros and cons of each so that the reader can make an informed decision.

What is PoE?

Power-over-Ethernet (PoE) is a technology that enables powered devices, such as a VoIP phone, wireless access point, surveillance cameras, etc., to receive electrical power and data over the same Ethernet cable, supporting the same 100-meter transmission distance. This eliminates the need for a separate AC electrical connection to supply power for the device. For PoE to work, electrical current enters the Ethernet data cable at the power-sourcing equipment (PSE), and exits at the powered device end (PD) in such a way that the power and data communications can coexist on the same cable. The standard was first introduced in 2003 (IEEE 802.3af) which provided up to 15.4 watts of power to the device. It was enhanced in 2009 to PoE+ (IEEE 802.3at) to provide up to 31 watts of power to the device. It has been further enhanced to provide up to 95 watts of power under the IEEE 802.3bt standard.

Limitations of PoE

The most obvious limitation of existing PoE technology is that the power that can be delivered over an Ethernet cable is often insufficient for devices that need to draw more power to stand up to extreme outdoors conditions. For example, outdoor displays need extra power for their high bright backlights and internal heaters, on top of the power needed to drive the display video processing functions. Compared to the older PoE standard, the PoE+ specification almost doubles the amount of power available. However, even that might not be enough for the most demanding outdoor devices.

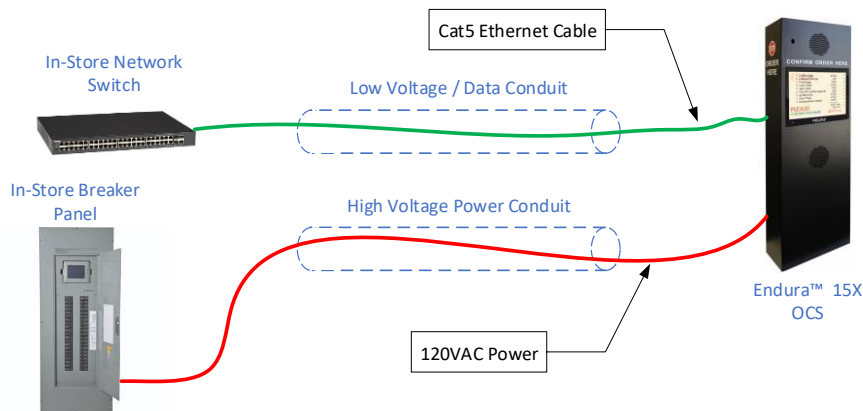
Another significant limitation of PoE is the connection itself. Ethernet cables are terminated with crimp on RJ45 connectors that provide a mechanical connection to the copper wires. For applications where Ethernet cables must be pulled through conduit, they must be terminated onsite by the installation technician. To ensure a reliable connection, the technician must use high quality crimping tools and must be sufficiently skilled in making these terminations. If the Ethernet cable is not terminated correctly, it may work initially but will fail in the field as corrosion builds up on the weak connection points – ultimately leading to premature equipment failure.

P+E – A Reliable Alternative to PoE

In order to overcome the limitations of PoE for outdoor high-power devices, we have developed a solution that provides the cost benefit of PoE with the reliability of hard-wired power connections. We call this P+E or Power plus Ethernet. This solution provides for a hardwire low voltage power connection independent of the Ethernet data connection as follows.

Typical Power Connection

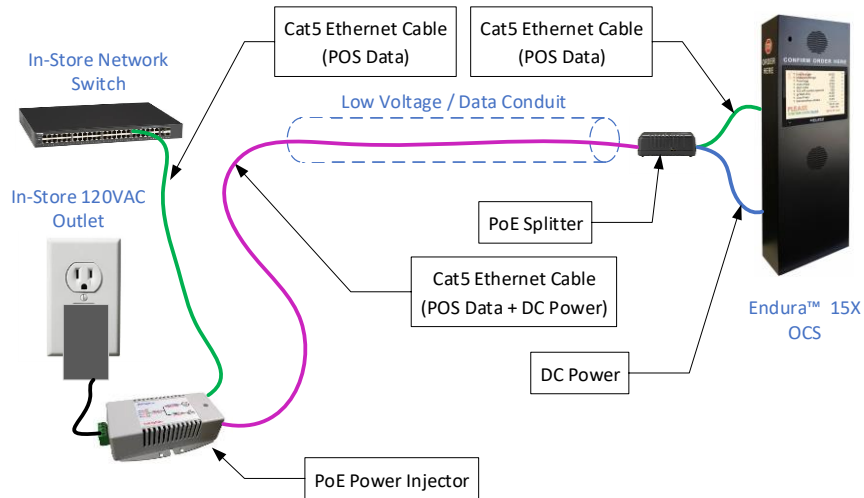
In a typical installation, 120VAC power is run from a dedicated circuit breaker in the store through a conduit out to the OCS located in the drive thru as shown below.



PoE Power Connection

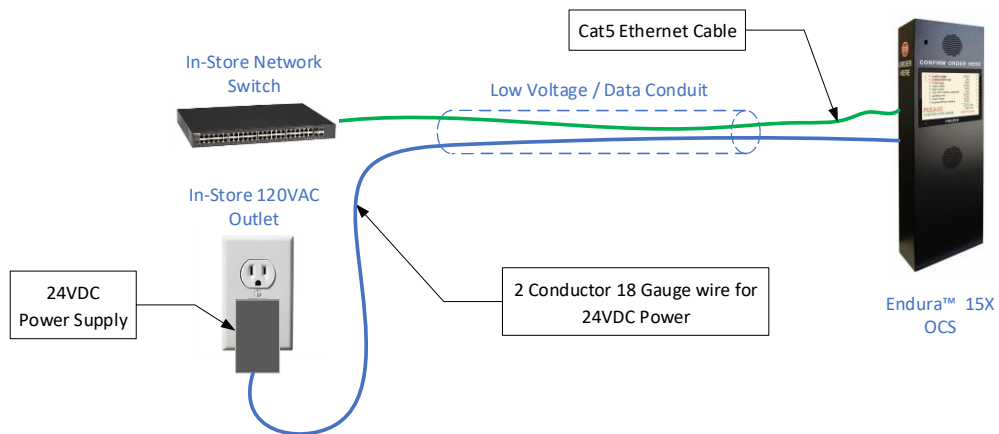
In a typical PoE installation, a Power injector is installed in the store that injects DC power into the CAT5 network cable using two unused wire pairs. Outside at the OCS, a splitter is needed to extract the DC power from the CAT5 network cable as shown below. Note that **no 120VAC power is required** to be run to the OCS in the drive thru,

however multiple network cable termination points are required that use crimp type network connectors. Running DC power over these types of connections can result in premature failures in the field.



P+E Power Connection

A P+E installation utilizes an additional low voltage cable pulled through the existing conduit alongside the Ethernet cable as shown below. As with PoE, **no 120VAC power is required** to be run to the OCS in the drive thru. The low voltage cable is terminated at the OCS using a factory supplied connector with leads that can be terminated to the low voltage power cable using the supplied standard waterproof wire connectors, providing reliable operation for many years in the field. The Ethernet cable is run to the OCS from the network switch in the store and only carries data, which results in reliable operation for many years in the field.



Conclusion

For installations where pulling 120VAC power to the OCS is cost prohibitive, the proposed P+E solution is a cost effective and reliable alternative. By utilizing the existing data conduit for low voltage power and data, the need for a dedicated high voltage power run is alleviated. This provides for a highly reliable power source that is not susceptible to the failure modes of PoE implementations in outdoor environments.