POWERWISE® EXTENDED DISTANCE FREQUENTLY ASKED QUESTIONS

This document covers 4-pair copper PowerWise® 1G and 10G data cables being used beyond the TIA 100m distance limitation. If the deployment requires performance beyond the limitations described within this document, a PowerWise® hybrid cable solution should be employed. Unlike the PowerWise® 1G and 10G copper 4-pair data cables, the copper conductor(s) within a PowerWise® hybrid cable is used to transmit power (not data) with length limitations based on voltage drop calculations. PowerWise® hybrid cables can be used with many fiber connector types including LC or SC connectors.

CAN I DEPLOY A POWERWISE® 4-PAIR COPPER CABLE IN LENGTHS GREATER THAN 100M AND STILL MEET INDUSTRY STANDARDS?

Industry standards exist to ensure all components within a communications system work together no matter what variables exist. With PoE extended distance, there are many variables to consider: wattage, bandwidth, quality of signal, distance, temperature, configuration, etc. When these variables are balanced, they can produce a system that works for a particular application, even if those variables exceed industry specification limits. PoE extended distance does not meet industry specifications as the intent is to work in lengths greater than 100m, but with the proper components it can reliably meet extended distance applications.

HOW DOES A TECHNICIAN PERFORM A FIELD TEST ON A POWERWISE® 4-PAIR COPPER CABLE RUN THAT EXCEEDS THE 100M STANDARDS?

In your cable certifier, use the following test limits for extended distances:

- Superior Essex PowerWise 1G Perm Link Ext Dist
- Superior Essex PowerWise 10G Perm Link Ext Dist
- Superior Essex PowerWise 1G MPTL Ext Dist
- Superior Essex PowerWise 10G MPTL Ext Dist
- Superior Essex PowerWise 1G CH Ext Dist
- Superior Essex PowerWise 10G CH Ext Dist

These custom test limits can typically be found with a “custom,” “manufacturer,” or “vendor” specification subfolder depending on the field tester. Using these custom test limits ensure your cables are connected well. If you cannot find these test limits in your handset, check to make sure you have the latest update from your testing device manufacturer or contact tech.support@spsx.com. (Please note that if you are NOT deploying the cable over 100 meters, you should continue to use the TIA test limits within your cable certifier.)

IS THERE A WARRANTY AVAILABLE FOR POWERWISE® EXTENDED DISTANCE DEPLOYMENTS?

Yes. Please see www.superioressexcommunications.com/warranties-policies as well as the tables below for details. Superior Essex supports the configurations listed within this document as warrantable so long as the requirements within this document and all other warranty requirements are met.

WHY IS THERE A SMALL COPPER WIRE UNDER THE JACKET OF THE POWERWISE® 4-PAIR COPPER CABLE?

The PowerWise® copper products have a small copper wire located just under the cable jacket. This wire is enameled and therefore does not need to be bonded or grounded as the enameling serves as insulation. It assists the cable’s ability to dissipate heat. The wire can be trimmed back flush with the jacket for termination.

CAN ACTIVE COMPONENTS, SUCH AS POWER OVER ETHERNET (POE) EXTENDERS AND MEDIA CONVERTERS, BE IN A ZONE BOX?

Per the NEC codes, all active equipment in the plenum space must be enclosed and must conform to *UL 2043: UL Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air Handling Spaces*. Zone boxes were originally developed as a cross connection point for open office flexibility. However, these have been recognized in the most recent *ANSI/BICSI-007-2020 Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises* standard allowing active components in zone boxes.

CAN THE POWERWISE® 10G CABLE RUN LONGER DISTANCES THAN THE POWERWISE® 1G?

No, in fact the PowerWise® 10G cable runs shorter than the PowerWise® 1G cable because of the lay length and twist ratio of the pairs. A Category 6A cable is manufactured with a tighter twist rate to reduce signal interference or "crosstalk" between pairs within the jacket and with pairs in adjacent cables. This also adds to the NVP (Nominal Velocity of Propagation) of the cable, which is the time it takes for the signal to travel from one end to the other (noted as a percentage of the speed of light). One should always confirm the NVP in a field tester as that will also measure the length of the cable.

WHAT TYPE OF CONNECTORS DO I NEED FOR PROPER TERMINATION?

Most standard 8P8C modular plugs (commonly referred to as RJ45 connectors) will fit the PowerWise® copper cable as most are manufactured to accept 22-26 AWG conductors. Refer to tech guide *TG079 Modular Plug and Cable Compatibility Guide* for additional information on recommended modular plugs. Please also check warranty terms and conditions for accepted connectors and installation environments. Check end point devices to ensure a proper fit with connectivity and appropriate protection if being installed on an outside device.

WHAT DISTANCES CAN I RUN POWERWISE® FOR DIFFERENT APPLICATIONS?

Testing cable performance is based on both external and internal factors such as environmental external effects as well as internal effects such as heat generated inside the jacketing, especially when cables are bundled. To prevent aging of the cable due to excessive heat, PowerWise® copper cables are constructed with high quality heat stable materials and with 22 AWG conductors which lowers resistance and therefore generates less heat than typical 23 AWG or 24 AWG Category 5e, 6, or 6A cables.

Superior Essex PowerWise® copper cables were tested by UL to assure data transmission properties and maximum power efficiency and safety. The tables below indicate the maximum distances each of the PowerWise® copper cables can support for different applications based on testing at UL. Only the configurations listed below are supported by Superior Essex with the use of PowerWise® Extended Distance applications.

Bit Error Rate was employed in this testing because it is the best test available to see how far a signal is readable by any protocol. BER shows the true real-world performance of a network, inclusive of active components, as it transmits real data over the appropriate protocol. BER testing shows how well the cable network really performs in combination with the active equipment.

POWERWISE® EXTENDED DISTANCE MAXIMUM SUPPORTED LENGTHS

PERMANENT LINK (PL)

Permanent Link

		PowerWise® 1G		PowerWise® 10G	
PL Application	Transmission/ Standard	BER @ Ambient[1] (Type 1 & 2)	BER @ LP[2] (Type 3 & 4)	BER @ Ambient[1] (Type 1 & 2)	BER @ LP[2] (Type 3 & 4)
Data & Power (Bandwidth & Speed)	Max Distance @ 1 Gb/s	160 m	140 m	—	—
Data & Power (Bandwidth & Speed)	Max Distance @ 2.5 Gb/s	160 m	140 m	—	—
Data & Power (Bandwidth & Speed)	Max Distance @ 5 Gb/s	160 m	135 m	—	—
Data & Power (Bandwidth & Speed)	Max Distance @ 10 Gb/s	—	—	110 mw	105 m
Power Efficiency	—	89.30%	88.50%	87.70%	86.80%

Data generated by UL using test methods UL 4299 and TIA TSB-184A.
See https://verify.ul.com/verifications/421 and https://verify.ul.com/verifications/422 for more details.

[1]Simulates cable exposed to Type 1 or Type 2 PoE.
[2]Simulates cable exposed to Type 4 PoE.

BER = Bit Error Rate

CHANNEL

One Connector Channel

	PowerWise® 1G BER @ Ambient[1] (Type 1 & 2)				PowerWise® 1G BER @ LP[2] (Type 3 & 4)			
Transmission / Standard	One Connector Channel	Horizontal Cable	Stranded Patch Cord[3,6]	Solid Patch Cord[5,6]	One Connector Channel	Horizontal Cable	Stranded Patch Cord[3,6]	Solid Patch Cord[5,6]
Max Distance @ 1 Gbps	160 m	152 m	8 m	8 m	140 m	132 m	8 m	8 m
Max Distance @ 2.5 Gbps	160 m	152 m	8 m	8 m	140 m	132 m	8 m	8 m
Max Distance @ 5 Gbps	160 m	152 m	8 m	8 m	135 m	127 m	8 m	8 m

	PowerWise® 10G BER @ Ambient[1] (Type 1 & 2)				PowerWise® 10G BER @ LP[2] (Type 3 & 4)			
Transmission / Standard	One Connector Channel[6]	Horizontal Cable	Stranded Patch Cord[4,6]	Solid Patch Cord[5,6]	One Connector Channel[6]	Horizontal Cable	Stranded Patch Cord[4,6]	Solid Patch Cord[5,6]
Max Distance @ 10 Gbps	107 m with stranded patch cord	105 m	2 m	—	108 m with stranded patch cord	105 m	3 m	—
	108 m with solid patch cord		—	3 m	110 m with solid patch cord		—	5 m

Data generated by UL using test methods UL 4299 and TIA TSB-184A.
See https://verify.ul.com/verifications/421 and https://verify.ul.com/verifications/422 for more details.

[1]Simulates cable exposed to Type 1 or Type 2 PoE.
[2]Simulates cable exposed to Type 4 PoE.
[3]PowerWise® 1G Stranded Patch Cords shall be 24 AWG or larger conductor.
[4]PowerWise® 10G Stranded Patch Cords shall be 26 AWG or larger conductor.
[5]Solid Patch Cords shall be 22 AWG.
[6]Total allowable Patch Cord length per channel configuration

BER = Bit Error Rate

If testing one connector channel prior to the addition of the patch cord, test with corresponding MPTL extended distance test limits.

Two Connector Channel

	PowerWise® 1G BER @ Ambient[1] (Type 1 & 2)				PowerWise® 1G BER @ LP[2] (Type 3 & 4)			
Transmission / Standard	Two Connector Channel[6]	Horizontal Cable	Stranded Patch Cord[3,6]	Solid Patch Cord[5,6]	Two Connector Channel[6]	Horizontal Cable	Stranded Patch Cord[3,6]	Solid Patch Cord[5,6]
Max Distance @ 1 Gbps	160 m	154 m	6 m (qty 2 x 3 m)	6 m (qty 2 x 3 m)	140 m with stranded patch cords	128 m	12 m (qty 2 x 6 m)	—
					140 m with solid patch cords	124 m	—	16 m (qty 2 x 8 m)
Max Distance @ 2.5 Gbps	156 m	150 m	6 m (qty 2 x 3 m)	6 m (qty 2 x 3 m)	140 m with stranded patch cords	128 m	12 m (qty 2 x 6 m)	—
					140 m with solid patch cords	124 m	—	16 m (qty 2 x 8 m)
Max Distance @ 5 Gbps	135 m with stranded patch cords	129 m	6 m (qty 2 x 3 m)	—	130 m with stranded patch cords	124 m	6 m (qty 2 x 3 m)	—
	145 m with solid patch cords	135 m	—	10 m (qty 2 x 5 m)	130 m with solid patch cords	120 m	—	10 m (qty 2 x 5 m)

	PowerWise® 10G BER @ Ambient[1] (Type 1 & 2)				PowerWise® 10G BER @ LP[2] (Type 3 & 4)			
Transmission / Standard	Two Connector Channel	Horizontal Cable	Stranded Patch Cord[4,6]	Solid Patch Cord[5,6]	Two Connector Channel	Horizontal Cable	Stranded Patch Cord[4,6]	Solid Patch Cord[5,6]
Max Distance @ 10 Gbps	107 m	95 m	12 m	12 m	105 m	95 m	10 m	10 m

Data generated by UL using test methods UL 4299 and TIA TSB-184A.
See https://verify.ul.com/verifications/421 and https://verify.ul.com/verifications/422 for more details.

[1]Simulates cable exposed to Type 1 or Type 2 PoE.
[2]Simulates cable exposed to Type 4 PoE.
[3]PowerWise® 1G Stranded Patch Cords shall be 24 AWG or larger conductor.
[4]PowerWise® 10G Stranded Patch Cords shall be 26 AWG or larger conductor.
[5]Solid Patch Cords shall be 22 AWG.
[6]Total allowable Patch Cord length per channel configuration

BER = Bit Error Rate

WHAT POWER SOURCING EQUIPMENT AND POWERED DEVICES WILL WORK WITH POWERWISE® EXTENDED DISTANCE?

Not all PoE switches, PoE NVRs, and PoE media converters (PoE power sourcing equipment or PSE) are configured to provide their full guaranteed powerwith the default settings. If the PSE is not providing enough power to the end device, call the PSE device manufacturer's support to ensure correct power supply settings and to make sure the latest software updates are applied. Only reputable PSEs should be used for any PoE deployment, especially with extended distances. Some end devices may require a specific PSE to work properly as a system. The horizontal cable portion of the system is passive where power transmission limitations can be determined by voltage drop calculations.

Because of the highly variable construction of lesser known camera manufacturers, only reputable camera brands limited to Bosch, Hanwha, Axis, and i-PRO (formerly Panasonic) can be covered for the above stated extended distances. Type 1 PoE <=5 Mbps type cameras contain highly variable chips amongst manufacturers, some of which are not designed to properly accept the correct power. Therefore, they cannot be contained within warrantable extended distance applications.

HOW CAN I DETERMINE THE DATA AND POWER REQUIREMENTS OF THE END DEVICE?

To determine the power and data (bandwidth) requirements of an end device, look at the individual end device's specification sheet. The power requirements are commonly listed in a section called "Power" or "Environmental and Electrical" and will be stated as "Typical" and "Max." They should be stated as a watt (w) unit of measure. Use the "max" power to determine the PoE type to follow in the above tables per configuration. Data or bandwidth requirements should be listed in the units of measure Mbps, Gbps, or XBASE-T and are commonly found on the end device's specifications under section "Network" or similar. The megapixel rating of a camera does not indicate data requirements. Please note that most end devices never use the full bandwidth stated requirements, but the worst case should still be the default to ensure a conservative approach in determining warrantable lengths. If the above tables do not exactly fit the data and power requirements spelled out in the detailed specification for the end device, use the next highest level to get a conservative approach to the guaranteed distances per cabling configuration. Contact tech.support@spsx.com for assistance in determining guaranteed lengths per end device and configuration.

WHAT DOES "LP" MEAN?

UL defines Limited Power or LP listing as follows, "The LP cable designation indicates that the cable has been evaluated to carry the marked current under reasonable worst-case installation scenarios without exceeding the temperature rating of the cable. The certification takes into account large bundle sizes, high ambient temperatures and other issues related to environmental effects, such as enclosed spaces or conduits."

CAN OTHER CATEGORY CABLES THAT ARE NOT POWERWISE® PRODUCTS BE USED IN LENGTHS GREATER THAN 100M?

No. If you choose to use a non-PowerWise® cable for extended distance applications, do so at your own risk. PowerWise® products are optimized to provide the best power efficiency (reduced voltage drop), to prevent heat rise and material degradation, etc. by employing larger AWG copper and more robust materials.

ARE THERE SPECIAL INSTRUCTIONS OR GUIDELINES FOR INSTALLING THE POWERWISE® COPPER PRODUCTS?

- See *TG114 Installation of CMP/CMX & CMP/Indoor/Outdoor Rated Cables in Conduit* for those PowerWise® products where limited indoor / outdoor installations are applicable.
- Because extended distance installations are pushing some variables beyond the worst case scenarios accounted for in TIA standards, following installation good practices (terminations, bending, etc.) are critical to the success of the deployment.
- The maximum pulling tension for PowerWise® products is 40 lbf because the copper conductors are 22 AWG.
- Other installation guidelines such as bend radius and crush resistance can be found in *TG002 Premises Cable Installation Guide*.

IN WHAT ENVIRONMENTS CAN I INSTALL POWERWISE® EXTENDED DISTANCE?

A variety of PowerWise® cables is available to fit different installation environments: premises, OSP, and indoor/outdoor. Please see each individual product's data sheet and *TG114 Installation of CMP/CMX & CMP/Indoor/Outdoor Rated Cables in Conduit* for more information.

When selecting which PowerWise® product is right for the application, consider the worst case ambient temperature and match the cable selection to the cable operating temperature rating per *TG029 Premises Cable Temperature Guidelines*.

HOW WILL THE ADDITION OF SURGE PROTECTION AFFECT GUARANTEED DISTANCES?

The addition of surge protection devices can detrimentally affect the ultimate lengths that can be achieved when using PowerWise® 4-pair copper cable products in an extended distance application. This field is still under investigation to determine how much guaranteed lengths will be reduced with the addition of one or two surge protection devices. Significant variability amongst manufacturers and models has been observed. Therefore, the addition of surge protection device(s) cannot be included in the guaranteed length limits at this time.