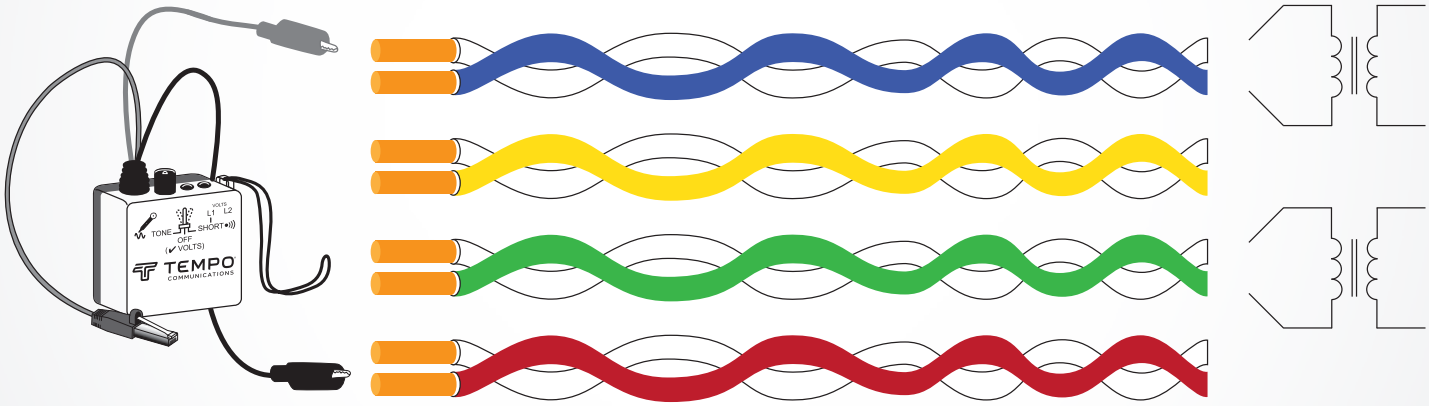
APPLICATION NOTE

TRACING NETWORK CABLES

To trace “Ethernet” or other structured high frequency twisted pair cables takes a couple of tricks, particularly with equipment connected at the far end (e.g. switch or PC). Firstly, if you connect the tracing tone to a “pair” then the signal will be “weak” to detect for two reasons:

1. The twisted pair is well balanced and with multiple twists per inch very difficult to detect any residual electric field any significant distance (> 5mm or ¼”) from the cable.
2. The twisted pair is terminated into a high frequency transformer which appears to be a short to the audio frequency pair tracing tone. There will be near zero tone to detect as you approach this termination.

Overcome both these snags by “splitting” the tracing tone across two different pairs; perhaps use wires 4 and 8 (or wires of the two normally unused Blue and Brown pairs) which are in different pairs and commonly not connected at the far end and if they are, then they are on different transformers.



A Note on Power Over Ethernet

Standards compliant PoE (IEEE 802.3af, IEEE 802.3at or IEEE 802.3bt, Type 1, Type 2 or Types 3 & 4 Power over Ethernet) is “safe” to connect to as the power source is only applying a tiny trace of power unless the start-up protocol is completed. After which time a maximum of 57V is present between some pairs of the cable. All Tempo pair tracing tone generators are designed to withstand at least 60V.

Please note that some equipment operates with “non-standard” power-over-Ethernet; these can pose additional risks to other equipment that may be accidentally plugged in or even to the cable itself. Therefore, beware any such items that do not state that their PoE is IEEE standards compliant or that “you can only use the supplied adaptor”. Maximum voltage must always be below 60V DC and maximum current suitable for the cable gauge. Exceeding these can damage equipment or pose a fire risk.

TOOLS TO MAKE THIS EASIER

PA1902

Tempo have a range of "Modular Adaptors", particularly PA1902 which is designed to allow easy access to the various terminals of a typical "8P8C" socket (often called RJ45) that is used for twisted pair "Ethernet". The conductive tabs of the PA1902 are barbed which helps retain the alligator/crocodile clips of the tone generator.

ALL-IN-ONE

Tempo also specifically make a couple of tone generators exactly for this application, AT8 and AT8L which combine the modular adaptor and tone generator into one compact unit. AT8 is a tone generator combined with the modular adaptor, AT8L adds features that can detect network equipment and remotely activate "activity" LEDs on ports.

PoE

To detect that Power Over Ethernet is correctly provisioned you can take advantage of Tempo's NETcat Pro 2, NC-500 which specifically detects the presence of "PoE" on connected pairs and shows which pairs have power to give you a guide as to the type provided. NETcat Pro 2 also uses TDR to measure the lengths of open cables, works with the included remote to identify and "wire-map" cables, and identifies the presence and capabilities (10M, 100M or 1G b/s, half or full duplex etc.) of connected equipment.



SHIELDED CABLES

Note that Shielded Cables, by design, ensure that near zero electric field can radiate in or out of the cable. If you can isolate the shield from ground at both ends, then you can trace the shield. If you do not yet know the termination point of the cable, then the shield may remain grounded and no electrostatic (voltage) signal will be detectable, particularly as you close in on the terminated end.
If you know which equipment the cable is meant to route to then you can use the "activity LED" function of AT8L or NC-500 to regularly pulse that and spot which cable you're looking for. But if you need to identify the cable at a patch panel or in a bundle then you must apply a completely different technique.
To trace a shielded cable towards an unknown location you must instead use current and the resulting magnetic field detected with a search coil. This can be done using Tempo's 508S. Though you may be able to trace part of the cable's route (until close to the next grounding point) using more standard pair tracing tools connecting the generator between the shield plus one or more cores and a nearby ground. But as soon as another ground is encountered, perhaps at another patch panel or switch the detectable signal will stop.

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