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Network Termination Issues: The Terminator (Part 2 of 2)

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Proper Termination, "Self-Termination," and LEDs

All LocalTalk network connectors use mini-transformers to couple devices to the network and provide electrical isolation from noise and potentially harmful surges. All currently available network connectors--LocalTalk, PhoneNET, TurboNET, and so on -- offer these features. However, each one of these connectors is also very different:

- The Apple LocalTalk Connector Box. Apple added a unique feature to their LocalTalk connector box, a terminating resistor, which is mechanically disengaged when the shielded cable connecting one connector to another is inserted in an open port. All connectors in a daisy chain have cable plugged into both ports, except, of course, the connectors at each end of the chain, precisely where termination is necessary. Thus the simple genius of Apple's approach. LocalTalk connector boxes, which are limited to shielded cable, daisy chain topologies, and distances no longer than 1,000 feet, are the ONLY true self-terminating connectors for AppleTalk networks.

- The PhoneNET Connector. The PhoneNET Connector is unterminated by design, allowing the network manager to properly terminate the network by installing the recommended 120 ohm terminating resistors where needed. It is important to emphasize that only 120 ohm terminating resistors provide the correct value of termination. Placed at the ends of network segments, the 120 ohm terminating resistors packaged with PhoneNET Connectors will effectively prevent signal reflections, while allowing for a variety of network topologies.

PhoneNET Connectors disperse voltage spikes by use of "MOVs" (metal oxide varistors). MOVs are circuits that respond much faster to transient voltage spikes than neon bulbs, which disperse spikes as light. This means that during a surge, PhoneNET Connectors disperse spikes as heat and allow much less energy to bypass the protection circuit and enter the isolation transformer.

- LED-Based Connectors. Neon bulbs, such as those found in the Nuvotech ST Connector and others, glow when they encounter network spikes. However, the technology of neon bulbs is both slower than MOVs and also doesn't offer any quantitative information about network voltage status.

LEDs form part of the "self-termination" circuit. The value of termination is not constant, however, but varies depending on signal strength. Unfortunately, in no case is the termination of the correct value, and therefore reflections can occur, causing the predictable problems in longer network segments, or when traffic is heavy.

Finally, LEDs tell the network manager very little about how the network is working. LEDs measure all electrical signals passing through the connector, without differentiating between new signals and bad packets reflected back onto the network. For detailed assessment of network activity, inexpensive management software like Farallon's CheckNet or TrafficWatch are far better tools than blinking LEDs. These management tools offer reliable, quantifiable information which can be charted and tracked over time.

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Self-terminating connectors are attractive in that they make manual termination of the network unnecessary. But the fact is that manually terminating the network allows network managers to construct networks that perform reliably even while expanding and changing in unexpected ways. With terminating resistors in the connectors, the network manager faces the risk that someone will interfere with the correct termination of the network simply by removing his machine (and its attached connector). The network could malfunction because someone took his Mac home for the night, or away on a trip. LocalTalk networks typically undergo lots of spot changes, steadily increasing usage, and unplanned expansions (like an extra device temporarily added to the network). PhoneNET Connectors were designed with these changes in mind.

Besides very short, lightly trafficked networks, there is one other case when the convenience of self-terminating connectors poses no threat to the proper functioning of the network. If your customer's network is built around one or more PhoneNET StarControllers, with one user (branch) per port, reflections on any one branch effect only the user on that port. Overall network performance won't suffer if that user mistakenly removes his connector, because each StarController port supports a separate physical network. The one user/port active star network offers significant advantages for the network manager, who gains greater control over the growth of the network, and thereby its reliability. Stay tuned for more news from Farallon on connectors for active star topologies.

Article Change History:

- 27 July 1993 - Company title updated from Focus Enhancements to Focus Enhancements, Inc.
- 19 June 1992 - Focus Enhancement acquired the Nuvotech connectivity products.

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