



ZEBLE CORP.

New Breakthrough:
LCI™ Technology

by

Wayne Hwang
Director - Technology Development
Zeble Corporation

March 1, 2003

A publication of Zeble Corporation

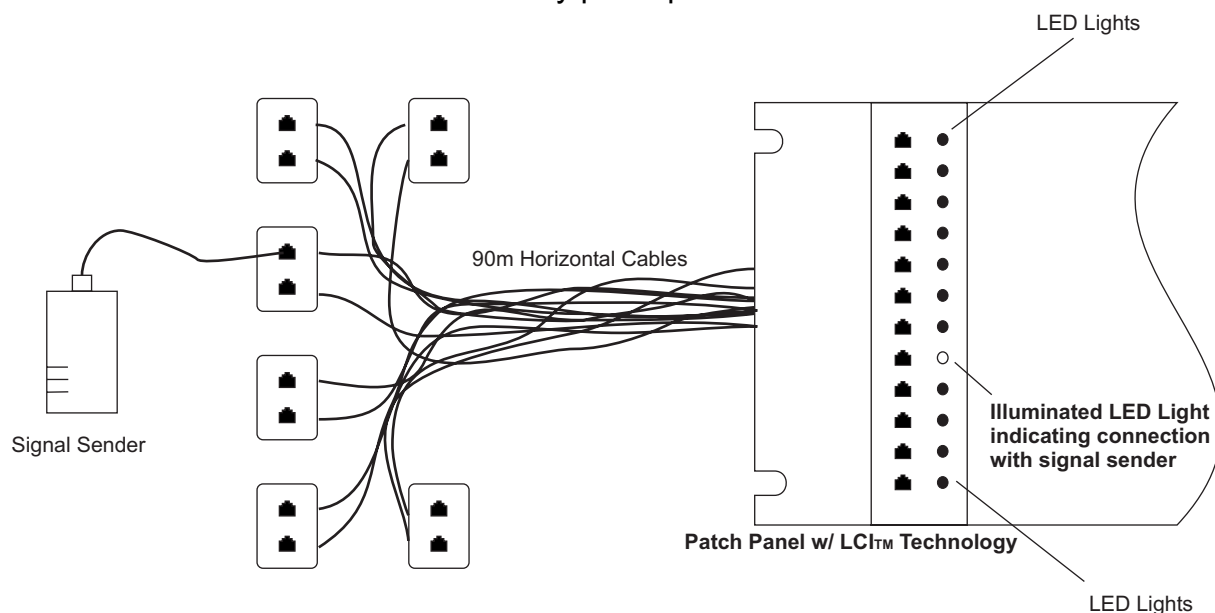
©Copyright 2003 by Zeble Corporation
All Rights Reserved

Introduction

The premise wiring installation process represents a tremendous portion of cost in most premise cabling systems. Unlike equipment costs, which are relatively fixed, the cost of installation can change depending on the time cost of installation labor. If it were possible to save installation time by choosing the right equipment, the deciding factor to use this equipment would be the comparison between the cost increase of the equipment and the cost decrease of the installation. In other words, if a product can save enough money on installation to cover its cost increase, this product would have more value than the competition and thus have a competitive edge in the market.

Zeble Corporation provides this competitive edge in the form of a patent pending breakthrough called LCI™ Technology (Light Cable Identification). Ask any cable installer who has had the experience of pulling bundles of cable through small areas to the communications room what the most time consuming part of his job is, the answer is always the same: "It's the long process of identifying each cable to the work station." Current methods are time consuming and often frustrating: A tone generator can transmit cross talk over 8 other cables, and cable tags often fall off while being pulled through tight spaces and can be easily mis-marked.

With LCI™ Technology, this problem is solved by building indicator lights onto the patch panel over each port. The cable is identified by using a signal sender from a work station to illuminate a light on the patch panel indicating a connection to the corresponding port. LCI™ Technology is a precise, yet simple design that is extremely cost effective and can be built into any patch panel.



With LCI™ Technology built into the patch panel, cable identification becomes the fastest part of the job.

Problems with existing methods

Tone Generators

For decades, phone technicians and electricians have been using tone generators (“Toners”) to quickly locate and identify phone lines and other electrical wiring. This method has been carried over to LAN cabling and, although it has been an acceptable practice for many years, with the introduction of Cat5e and Cat6, network cable being produced to meet the required high bit rate would not pass the low frequency tones to the far end. In order for the cable manufacturers to attain acceptable performance at these high bit rates, the cable pairs had to be so precisely balanced and tuned at the higher frequencies so as to block noise at lower frequencies such as those used in the tone generators. The results were such that the lower tone generator frequencies were forced to the far end as cross talk across as many as 8 other cables. Without actually touching the probe on the copper wire, it was nearly impossible to select the correct cable at the far end.

Labeling Cables

Cabling training classes instructors realized the problem several years ago and started teaching a method of tagging or marking the far end of the network cables prior to the long, harsh pull through small spaces to the communications room. This is a time consuming process that must be carried out with a tremendous amount of care: The tags must be marked correctly with the proper work station designation and put on securely; otherwise, problems and confusion will exist on the far end. The problem is further intensified by the fact that most contractors hire helpers or trainees to do the time consuming work of marking the cables, increasing the chance of mis-marked tags or tags coming off during the pull. Then, in order to start sequentially punching down the cable to the corresponding patch panel port as instructed in the training classes, the cabling tech has to find number “1” out of hundreds, maybe over a thousand lines. All of that time spent sequentially punching down the cable is to be wasted later when adds, changes or moves were implemented thus destroying the sequence.

LCI™ Technology- The solution

The Origin

The concept of using light to identify cables is not a new concept. William C. Fincher and his son Randy, cabling contractors, have been using LED lights in the form of modular plugs to identify cables for some time. On one very large job, their firm, SCCI, saved three weeks of labor time and cost using their “home made” cable locator plugs. In 1996 they decided to apply for a patent on this method and the patent was granted in 1998. Today, this patent is sold as a kit called the DataLite System.

This kit includes a number of modular plugs with LED built-in. During installation, the installer does not need to label the cables before pulling and termination, but instead, inserts these modular plugs into each port of the patch panels. Another installer would then use a power unit to send power from the work station to light up one of the LED modular plugs, thus identifying the port connected to that work station.

LEDs built into the patch panel

Even though the DataLite System offers a solution for identifying cables on a traditional patch panel, installers still have the work of placing the LED plugs into each of the patch panel ports and may find themselves short on plugs in a large installation job. Therefore, working together with the licensee of this patent, Zeble Corporation started work towards a method of placing the LED onto the patch panel without degradation to the performance while keeping the cost under strict control. After 12 months of research and development the project was successful with patents on their way to being granted. The result of this project is the LCI™ Technology.

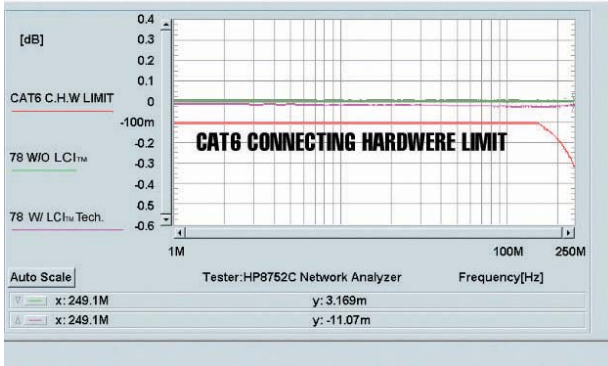
How does it work?

Very much like the DataLite System, patch panels with LCI™ Technology give installers the freedom to begin pulling cables from work stations without having to label them. This also means that installers can finish pulling all the cables to the communications room before starting the job of identifying the cables. This offers installers a more organized environment to work in when identifying the cables because debris and obstacles could be cleaned away as the actual installation work would be completed. To identify the cables, one worker simply walks from one work station to the next plugging in the signal sender to the outlet and communicating via radio to the second installer in the communications room. The second installer identifies which LED on the patch panel lights up, records the connection, and the step is repeated.

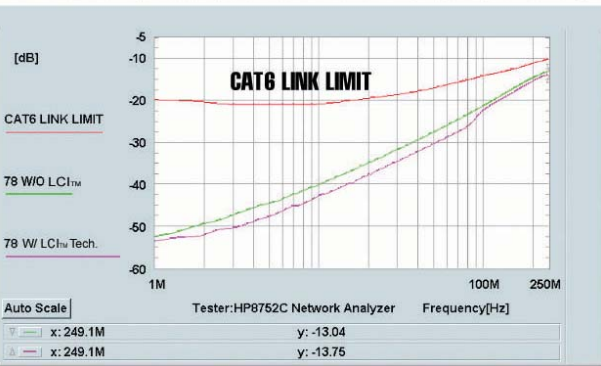
Performance

How well does a patch panel with LCI™ Technology perform against a standard patch panel? Surely, one would think that with an LED built into a passive device the performance. However, in the end, this is the magic behind the LCI™ Technology, and the test results speaks for itself. The test configuration for both the Return Loss and NEXT were setup according to the TIA-EIA-568-B.2-1 final specifications utilizing 90 meters of Zeble's own Cat 6 horizontal cables manufactured in China. The test equipment used was a HP 8752C Network Analyzer.

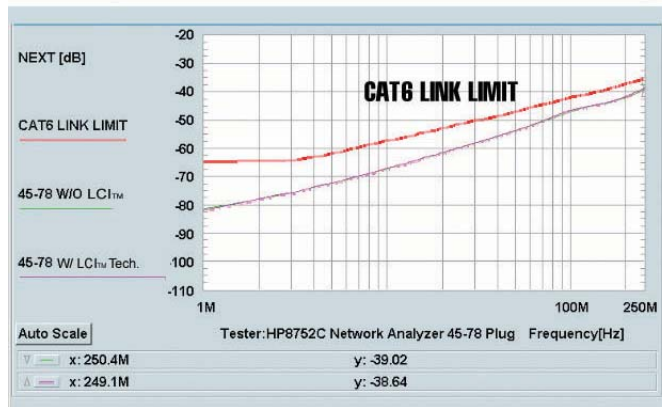
Insertion Loss Comparison Between Patch Panels with and without LCI™ Technology



Return Loss Comparison Between Patch Panels with and without LCI™ Technology



NEXT Comparison Between Patch Panels with and without LCI™ Technology



	Cat 6 connecting hardware Insertion Loss, dB	Cat 6 permanent link Return Loss, dB	Cat 6 permanent link NEXT, dB
Headroom without LCI™ Technology	.11	3.0	3.7
Headroom with LCI™ Technology	.10	3.8	3.3

In each test, the performances of the patch panel with and without LCI™ Technology are identical within tolerance, and both easily exceeded Category 6 requirements.

Production Cost

LCI™ Technology has also been developed with tremendous consideration towards cost. The uniqueness of LCI™ Technology of keeping the design completely passive allows minimum cost increase to the entire production cost of the patch panel. In addition, it does not require any special or dedicated equipment to integrate LCI™ Technology into any patch panel.

Value - How much time and money is actually saved?

Because patch panels w/ LCI™ Technology have not yet been released into the market, we can use an actual documented case history of the DataLite System due to the similarities of its usage. We must remember that the DataLite System is used on standard patch panels so an extra step of inserting the modular LED plugs must be accounted for, therefore, the time saving of using patch panels with LCI™ Technology would be even greater. The following data was obtained by Structured Communications Cabling Corporation at Harris Hospital where cables are installed to 500 work stations:

Identifying cables using a tone generator.	Identifying cables using LCI™ Technology.
24 Ports per patch panel	24 Ports per patch panel
x 3 minutes to identify each cable	x .5 minutes to identify each cable **
x 2 workers	x 2 workers
÷ 60 minutes/hour	÷ 60 minutes/hour
x \$40 per hour wage	x \$40 per hour wage
<hr/>	<hr/>
= \$96 labor to identify cables	= \$16 labor to identify cables

80\$ of saving per 24 port patch panel installed!

This is the value of LCI™ Technology. In some cases, this is more than half the cost of the patch panel. Can anyone really ignore the benefits?

Summary

We have shown that LCI™ Technology increases the value of a patch panel considerably while keeping the costs low. This solution helps the installers save money and time while giving the manufacturer who provides it a competitive edge.

As an installer, who can afford to not use LCI™ Technology? As a patch panel manufacturer, who can afford not to provide it?