
Those *unfamiliar* with the test, measurement, and/or the manufacture of computer I/O cards often believe that Ethernet cards are of similar quality (or similar performance characteristics). More simply, the assumption is, “*There is no significant difference between ‘Brand A’ and ‘Brand B’.*”

Another misconception is, “*Since two boards use the same chip set, then performance must be similar.*”

Unfortunately, the world we live in is not that simplistic.

How well a board performs begins well beyond the manufacturing stage, and even past the design phase. It actually begins at conception. The company must make a decision as to how durable and reliable they want their boards to be? Ease of manufacturability, performance, and several other questions need to be answered prior to commencing what could be a significant amount of research. Quite simply, there is a trade off between quality and cost, as two components are very seldom equal.

Component Durability

Resistors, capacitors, and other components that are placed onto a Printed Circuit Board (PCB) are either throughhole or surface mount.

Throughhole components have a wire that is inserted into a hole (or holes) designed in the PCB, then soldered in place. Throughhole components are larger than their surface mount equivalents, and protrude vertically from the PCB far more than surface mount components.

Surface mount components are soldered onto the face of the PCB. The advantage of surface mount components (unlike throughhole) is that internal ribbon cabling and other inner workings of the computer cannot easily be caught on the surface mount component. This greatly reduces the risk of inadvertently damaging the card. Surface mount components increase the durability of the product in question.

Below are examples of throughhole and surface mount technology.¹



Example of a 2-wire throughhole resistor



Example of a surface mount resistors

Noise Reduction

All computers generate noise that degrades electronic signals. Quite simply, the more noise protection an Ethernet card has designed in it, the better it will perform. There are numerous ways to protect against electronic noise and crosstalk. They include:

¹ Pictures are courtesy of RCD Components Inc. www.rcdcomponents.com

PCB Layers...

PCB's are manufactured in layers. The more ground layers a PCB has, the greater the noise protection. Unfortunately, the greater the number of layers, the higher the cost of fabricating the PCB.

Signal Integrity...

The use of resistors and capacitors help to maintain voltage levels and signal integrity. The more resistors and capacitors on the Ethernet card, the higher signal integrity of the board. As the number of resistors, capacitors, and other discrete components increase, the cost to produce the Ethernet card increases commensurately.

High Precision Crystal Oscillator

The Crystal Oscillator generates the clock signals the on Ethernet card. Utilizing a high precision oscillator prevents the frequency of the I/O from drifting. The benefits are improved stability, temperature mode, and tolerances. Oscillators come in a wide range of quality and prices. Obviously, higher quality crystal oscillators are more expensive. AEI uses a High Precision Oscillator in all our Ethernet products to ensure maximum performance and signal integrity.

Integrated Magnetics

AEI utilizes transceivers (connectors) with integrated (or built-in) magnetics that are enclosed by a metallic shield. The reason is to reduce emitted radiation and absorb interference. This results in a clean and noise free transmission and receipt of signal from the Ethernet card.

Design

AEI Ethernet cards are designed to meet certain impedances and tolerances. Our engineers and quality personnel pay the strictest attention to board impedances, layout, and overall design to minimize electrical interference, reduce generated noise, and minimize electronic crosstalk on all layers of the PCB. Unlike many competitors who simply lay lines on the PCB, our designers use modern **scientific equations** to optimize the performance of our boards, especially when compared to other competitors utilizing similar technologies.

Manufacturing

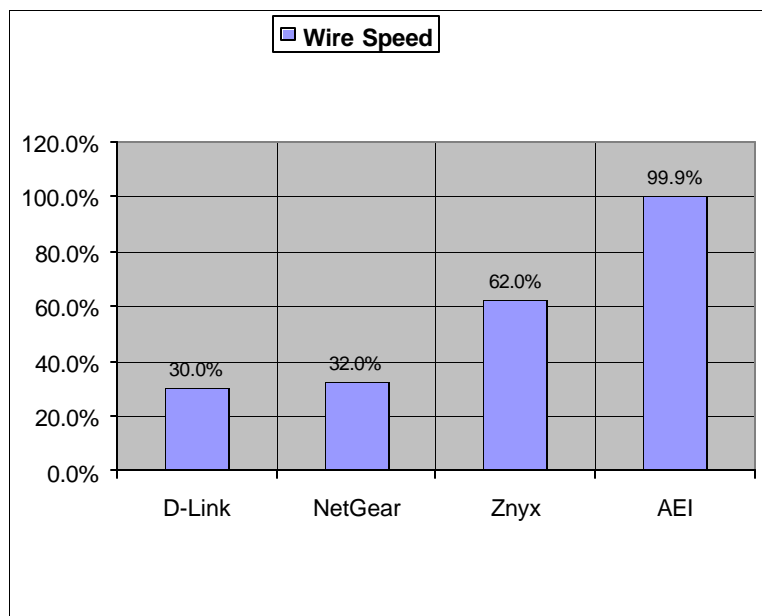
As part of AEI's 'Quality Program', we require our contract manufacturer(s) to be ISO 9002 and EIA-2020 (ESD) certified. AEI has continued the pursuit of Quality System improvements by benchmarking other World-Class systems that include Malcolm Baldrige. AEI recognizes that ISO 9000 is the start of the journey, and currently utilizes the Baldrige Criteria in an effort to achieve our vision of becoming a "True" World-Class partner for our OEM customers.

AEI Ethernet cards are manufactured on the most modern equipment and technology available. Thus, ensuring the solder, wash, and reflow processes are of the highest quality, and minimize contamination. This attention to detail has a positive impact on the performance of our cards.

AEI considers process control the key to predict product reliability. Unlike many other competitors who still sort product and react later, AEI is committed to proactive process control utilizing various proven quality control methodologies. That way our customers can be assured their AEI product's reliability has been ensured throughout the entire processes. 100% of all AEI Ethernet cards are thoroughly tested including (i) visual inspection to ensure quality workmanship and materials, (ii) tested for opens/shorts, (iii) in-circuit testing, and (iv) full functional testing.

Overall Quality

AEI completed a performance analysis using our AEI P130TX Ethernet card against several of the industry leading network interface cards. The test was on a local area network (LAN) running Microsoft Windows 2000. 99 packets were transmitted over the LAN, containing 1024 bytes per packet. The test reflected the P130TX performed at 99.9% wire speed, outperforming all the competition with very significant performance improvements over Znyx, NetGear, and D-Link (pictured below). The test proved AEI's P130TX is up to 333% faster than the competition. Similar tests were performed on AEI's P230TX and P430TX multi-channel Fast Ethernet cards, and these models experienced better results than the "Best in Class" P130TX.



Furthermore, AEI was the only manufacturer whose Ethernet card was:

- Dominantly populated with surface mount components (*except for the transceiver and LED*);
- Employs an integrated magnetic transceiver; AND
- Utilizes a high quality precision oscillator.

As such, AEI's Ethernet cards are far superior to all competitors with regards to durability, noise reduction, signal integrity, and fault tolerance.

AEI's Ethernet cards also come with a unique software suite that includes an On-Line/Off-Line Diagnostic utility, Active Port Failover (in milliseconds), Adaptive & Dynamic Load Balancing, Port Aggregation (Layer 1), and Layer 3/4 Aggregation. The later of which allows users to manage network bandwidth by aggregating traffic via IP Address, http protocol, ftp protocol, and other network and IP protocols.

AEI understands the value of a well-controlled process, high quality components, and the positive effects these have on quality. It is for these reasons more system integrators are incorporating AEI Ethernet cards in their server, workstation, and other industrial applications.