

Move Over RJ-45: These New Connectors are Built for Industrial Apps

Sponsored by Digi-Key and Amphenol: Venerable RJ-45 Ethernet connectors work fine in clean office environments, but they can be a liability in more harsh settings. Now, new more rugged connectors are ready to take their place.

Ethernet has become one of the most widely used networking technologies in factory automation, process control, and other industrial settings. While the electronic technical features of Ethernet fit nicely into most industrial applications, the standard Ethernet cable and connectors are a weak point. Such cables and connectors were designed for a standard office environment and are typically unsuitable for harsh industrial settings.

Particularly susceptible to damage and failure are the ubiquitous and dated RJ-45 connectors. Numerous improvements and replacements have been tried over the years with mixed results. Now there's a new line of connectors to help overcome this vexing problem.

Ethernet Connectivity

Ethernet relies on unshielded twisted-pair (UTP) cable to transport data from one device to another. Over the years, this type of cable has evolved from an analog signal carrier to a high-speed digital transmission line. This cable is now used to carry data at rates up to 10 Gb/s. One example is CAT6A cable.

A prime limitation involves the connectors used to attach the cables to the various pieces of equipment. Designated as the RJ-45, this decades-old connector was originally designed for analog telephone applications. The RJ-45 is used on all Ethernet equipment, such as hubs, switches, and any other device. The 8-pin connector has succeeded for a long time in clean office environments, but it's been a limiting factor in dirty and unfriendly industrial settings.

Physically protected RJ-45 connectors are available, but they have their own limitations. Experienced connector supplier Amphenol ICC has developed a new connector that meets all



The ND9 ix Industrial connectors, developed by Amphenol ICC, are built to handle harsh environments, and thus serve as upgrade replacements for the less-robust RJ45 connectors in industrial equipment.

Ethernet connectivity requirements. However, it offers special features and benefits for industrial applications.

With Ethernet so popular, the range of applications for the new Amphenol ICC connectors is enormous. Almost any industrial use is a target. Some individual solutions that may benefit are machine-to-machine, Internet of Things, robotics, transportation, building automation, healthcare and medical, networks with sensors and actuators, test equipment, etc.

ND9 to Replace RJ-45

Amphenol ICC's new ix Industrial series ND9 connectors

are designed to replace the RJ-45 in industrial equipment (see figure). This 10-pin connector is available in multiple configurations, such as Type-A and Type-B connections. Key features of these new connectors include:

- 75% smaller than the RJ-45, meaning they're only 25% as large as an RJ-45.
- 10-mm pitch enables higher port density.
- IP20 protection rated.
- Fully compatible with Ethernet 100Base-T, 1000Base-T, and 10GBase-T.
- Supports most Ethernet and IP protocols, including EtherCAT, DeviceNet, Profinet, Modbus, and others.
- Uses CAT6A cable to achieve data rates up to 10 Gb/s.
- Full compatibility with Power over Ethernet (PoE) and PoE+ standards.
- Provides 360-degree shielding of the mated pairs, which helps to reduce EMI in the typically noisy industrial environment.
- Extra-secure snap-in connector latching capability designed for up to 5,000 matings.
- Heavy-duty PCB solder mounting for receptacle connectors available in right-angle and vertical configurations.

There appears to be little doubt about the superior nature of the new ND9 connectors over the RJ-45. Will Ethernet equipment suppliers adopt the ND9s and will these connectors become the new Ethernet standard?

CONNECTOR ALTERNATIVES

YOU DON'T HAVE to put up with the limitations of the standard RJ-45 connector. There are options. The most logical is a hardened or protected RJ-45. These use the standard RJ-45 pin format and connections but have a protective insulated cover over it. Some are moisture-proof and meet IP67 standards.

Another option is to use a legacy DB9 connector. Remember those from the RS-232 serial port popularity days? They're still occasionally used in Europe. DB9s are also moisture-proof and physically strong.

Then there's the M12 connector. It's a circular 8-pin connector that's very robust. The M12 comes standard on some industrial equipment, but it can be an option on others. It's widely used in European industrial applications.

The connector choice for standard office Ethernet is a no-brainer. Go with the RJ-45s. For industrial applications, the connector choice becomes critical. Identify the specific environmental conditions such as moisture, chemical exposure, toxic fumes, excessive heat, etc. Consider the number of likely connector mating operations, stress on the cables, and data-rate limitations. Look at what any deployed fieldbuses use for connectors. Then decide. If you're seeking one good solution, the Amphenol ICC ND9s may be your best choice.

In Summary

Amphenol ICCs ND9s are one good solution for a wide range of applications. An exceptionally reliable connector eliminates many industrial repairs and downtimes simply because it's far more rugged and dependable than other options.

Connectors are far more prone to failure than any of the electronic gear in which they're used. Stress can break them, and contacts can wear, get dirty, or corrode. The ND9s can prevent such problems rather than cause them. Any new next-generation high-speed Ethernet or other standard protocol equipment can be improved with better connectors.

To recap, the ix Industrial connectors have 10 positions, are IEC61076-3-124-compliant, and support data rates up to 10 Gb/s. The package is 75% smaller than a typical RJ45 connector. As a designer, you can fit more connectors into the limited space available for IO ports. The 10-mm connector pitch allows for greater port density in ganged applications.

The ND9s also have 360-degree shielding through the port and a two-point metal latch to maintain connectivity under heavy shock, stress, and vibration. The connectors meet IP20 requirements; IP67 versions will be available in the future. The SMT receptacles come in right-angle and vertical configurations, with heavy-duty solder tabs to secure the connector to the PCB. Plugs can be had with IDC terminations for easy repair or installation in the field, or with solder terminations for high-volume assembly. Three keying options are available for controlled mating.