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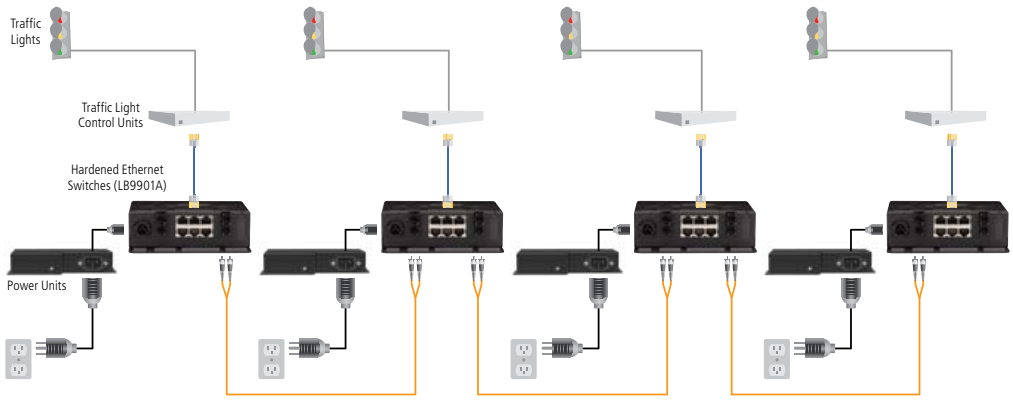
Hardened Ethernet Switches

Where the temperature can't be controlled, these industrial-strength switches do the job.

FEATURES

- Thermal design for use in harsh environments of uncontrolled heat or cold.
- Rugged steel cases act as heat sinks.
- 100-Mbps switching for high-performance LANs.
- Two fiber ports for extended distances.
- Autonegotiating on six copper ports per 802.3u standard.
- AC or DC power options.
- Daisychain units for even greater distance.
- Top-mounted LEDs for easy monitoring.
- Plug-and-play installation.

Daisychain four Hardened Ethernet Switches together over fiber to link traffic data collection and control stations.



OVERVIEW

Ethernet is increasingly being used in "out-of-the-way" and industrial applications, whether it's for heavy manufacturing or roadside traffic control.

But you want to be sure that extreme temperatures and the processes themselves won't adversely affect your network. The BLACK BOX® Hardened Ethernet Switches give you the durability you require.

They're designed specifically for unheated and uncooled applications, such as for use in roadside control boxes, industrial plants, mining and military sites, or anywhere adverse weather or industrial processes can wreak havoc on your expensive circuitry.

Cased in 18-gauge steel, the switches seal out bugs, dirt, smoke, and other elements. The plenum-rated switches come packaged in a metal case and hardware that serves as a heat sink to draw heat away from the internal electronics and dissipate it. To help with this, each switch uses only 10 watts of power.

The switches can be used as standalone units or mounted on a metal shelf, pedestal, or wall. When used in the field, the switches are typically fastened to a metal pedestal or post planted in the ground. This provides an even larger heat sink to normalize the operating temperature of the internal electronics. Although the switches' packages aren't waterproof, they can be placed in waterproof metal enclosures to provide an all-weather outdoor solution.

The ruggedness of the steel case and temperature-control packaging combined with the high reliability of the design—more than 10 years of MTBF!—make for industrial-strength Ethernet products.

The switches provide Fast Ethernet switching on all ports. All models have six 10-/100-Mbps RJ-45 ports that autonegotiate for speed and duplex mode. These ports support twisted-pair copper segment connections with 10- or 100-Mbps speed per the IEEE 802.2u standard.

For extended distance and higher bandwidth through fiber optic cabling, the switches are available with a choice of 100-Mbps fiber port connectors with multimode or single-mode fiber connectors or a combination of both. The fiber ports are set to full-duplex mode. No media converters are required.

The switches perform high-speed filter/forward operations on the traffic to remove faulty packets and minimize traffic congestion while giving each port's segment a full 100 Mbps of bandwidth.

To achieve high performance, each switch is non-blocking on all ports and has 1-MB packet buffers and a 16K-node address table for advanced performance

And you're given a choice of power supplies: standard input for autosensing AC power or DC power. The latter is ideal for high reliability and convenience in out-of-the-way locations. We even offer an AC power supply as a separate item, which you can use as a backup to your primary AC power input or apply it to the DC model. Because the AC power source is surge protected, it can withstand lightning strikes. What's more, it features a military-style screw-lock plug for secure connections to the switch.

Technically Speaking

The Hardened Ethernet Switch chassis houses one main PC board. The front side of the chassis has six RJ-45 twisted-pair ports and two 100-Mbps, full-duplex fiber ports, which operate in full-duplex mode only to provide higher bandwidth and longer distances on fiber.

With the its six 10/100 RJ-45 switched ports, the switch has an architecture that supports a dual- speed switching environment. These copper ports, equipped with autonegotiation capability, operate in full or half-duplex and sense for speed, per the IEEE 802.3u standard.

Autonegotiation occurs when an RJ-45 cable connection is made on the copper ports and each time a link is enabled. When the connected device is 10 Mbps, the Hardened Ethernet Switch obeys all the rules of 10-Mbps Ethernet configurations. 10-Mbps users can share a 10-Mbps traffic domain and can communicate with 100-Mbps users as well as users in the 100-Mbps domain. Similarly, 100-Mbps traffic adheres to 100-Mbps Ethernet rules and can communicate with the 10-Mbps domain, too.

The fiber optic ports are switched ports and perform as a domain, providing a high-bandwidth backbone connection while supporting longer distances, up to 20 km (12.4 mi.) on models with single-mode connections. You can also daisychain the switches in a string application to create an Ethernet network that's hundreds of kilometers long.

You can connect the Hardened Ethernet Switches to the following three types of media: 100BASE-TX, 10BASE-T, and 100BASE-FX.

Packet filtering/forwarding.

Each time a packet arrives on one of the switched ports, the switch either filters or forwards it.

Packets with source and destination addresses on the same port segment are filtered and constrained to one port so the rest of the network doesn't have to process them. A packet that has a destination address on another port segment is forwarded to the appropriate port. But packets that you need for maintaining the network's operation—such as occasional multicast packets—are forwarded to all ports.

Frame buffering.

Because it's a store-and-forward switch, each frame (or packet) is loaded into the switch's memory and inspected before forwarding can occur. This way, all forwarded frames are of a valid length and have the correct CRC.

By eliminating the propagation of bad packets, all of the available bandwidth can be used for valid information during peak traffic times.

The Hardened Ethernet Switches dynamically allocate buffer space from a 1-MB memory pool to minimize the possibility of dropping frames on congested ports. This ensures that heavily used ports receive very large buffer space for packet storage. Allocation of this sort enables the switch to apply its resources to all traffic loads, even when the traffic activity is unbalanced across its ports.

Because network traffic constantly varies in packet density per port and in aggregate density, the switch continually adapts internally to provide maximum network performance with the least dropped packets.

Flow control.

Flow control kicks in when the switch detects that its buffer queue is losing space. It does this by sending industry-standard (full-duplex only) "pause" packets to the devices sending packets, thereby temporarily stopping incoming traffic until existing traffic can catch up without dropping packets. This flow control process is transparent to the user.

You also get a collision-based flow-control mechanism. When operating in at half-duplex, the switch can prevent more frames from entering a full buffer queue by forcing a collision signal on all receiving RJ-45 half-duplex ports.

The Hardened Ethernet Switch, with an address table capacity of 16K node addresses, is suitable for use in large networks. When nodes are added or removed or moved from one segment to another, the self-learning switch automatically keeps up with node locations. In addition, its address-aging algorithm causes least-used addresses to drop out in favor of ones that you use frequently.

Monitor activity via LEDs.

Plug-and-play, the Hardened Ethernet Switch requires no software configuration during installation or for maintenance.

To monitor activity on the switch, you simply view the LED indicators on the unit's top cover. The LEDs conveniently indicate operating status of all ports. There's a power "on" (PWR) indicator, and a self-test at power up. For each RJ-45, there are link/activity (LK/ACT) LEDs indicating traffic and speed, and full-/half-duplex indicators (F/H). The fiber ports have link/activity (LK/ACT) indicators.

Left: LB9902A;
Right: Included AC Power Supply for LB9902A

TECH SPECS

Compliance — FCC Part 15 Class A; UL® 1950; CE; Bellcore GR-63-CORE Sections 4.4.1 and 4.4.3 (for shock and vibration)
Standards — 10BASE-T: IEEE 802.3; 100BASE-TX, -FX: IEEE 802.3u
Connectors — LB9901A, LB9904A:
(6) RJ-45 shielded 10/100;
(2) full-duplex multimode fiber (1300-nm wavelength);
LB9902A, LB9905A:
(6) RJ-45 shielded 10/100;
(1) full-duplex multimode fiber SC, (1) full-duplex single-mode fiber (1300-nm wavelength);
LB9903A, LB9906A:
(6) RJ-45 shielded 10/100;
(2) full-duplex single-mode SC (1300-nm wavelength)
Construction — 18-gauge steel case
Cooling Method — Convection, with case operating as a heat sink
Filtering/Forwarding Rate —
From 100-Mbps ports:
Up to 148,800 pps;
From 10-Mbps ports:
Up to 14,880 pps
Latency — 10 to 100 Mbps or 100 to 10 Mbps: 5 µseconds
Mean Time Between Failure —
> 10 years
Indicators — (1) LED for power (PWR); RJ-45 ports: (1) LED for speed, link activity, transmitting and receiving (LINK/ACT); (1) for full- or half-duplex (F/H);
Fiber ports: (1) LED for link activity
Speed — RJ-45 ports: 10 or 100 Mbps, autonegotiating, half- or full duplex; Fiber ports: 100 Mbps, full duplex
Temperature Tolerance — -40 to +160°F (-40 to +70°C); cold starts as low as -4°F (-20°C)
Humidity Tolerance — 10 to 95% noncondensing
DC Power Supply — 18–70 VDC, autoranging
Size — 9"H x 5.8"W x 1.7"D (22.9 x 14.7 x 4.3 cm)
Weight — 3.5 lb. (1.6 kg)

AC Power Supply Specifications
Electrical Efficiency — 70% minimum
Input — 85–260 VAC, 47–63 Hz, autoranging
Output — 5 VDC, up to 3 amps
Power Dissipation — 3 watts (typical)
Surge Protection — More than 150 joules
Surge Clamping — 800 volts, 50 amps (minimum)
Overload and Short Circuit Protection — Input fuse
Size — 1.5"H x 6.5"W x 6.5"D (3.8 x 16.5 x 16.5 cm)
Weight — 2 lb. (0.9 kg)

What's included

- ✦ Hardened Ethernet Switch
- ✦ Power supply
- ✦ Power cord
- ✦ Users' manual

Item	Code
Hardened Ethernet Switches, AC Power	
(6) 10-/100-Mbps RJ-45 Ports plus	
(2) 100-Mbps Multimode SC Ports	**LB9901A**
(1) 100-Mbps Multimode SC Port, (1) 100-Mbps Single-Mode SC (20-km) Port	**LB9902A**
(2) 100-Mbps Single-Mode SC (20-km) Ports	**LB9903A**
Hardened Ethernet Switches, DC Power	
(6) 10-/100-Mbps RJ-45 Ports plus	
(2) 100-Mbps Multimode SC Ports	**LB9904A**
(1) 100-Mbps Multimode SC Port , (1) 100-Mbps Single-Mode SC (20-km) Port	**LB9905A**
(2) 100-Mbps Single-Mode SC (20-km) Ports	**LB9906A**
You may also need…	
Spare AC Power Supply	**LB9907PS**