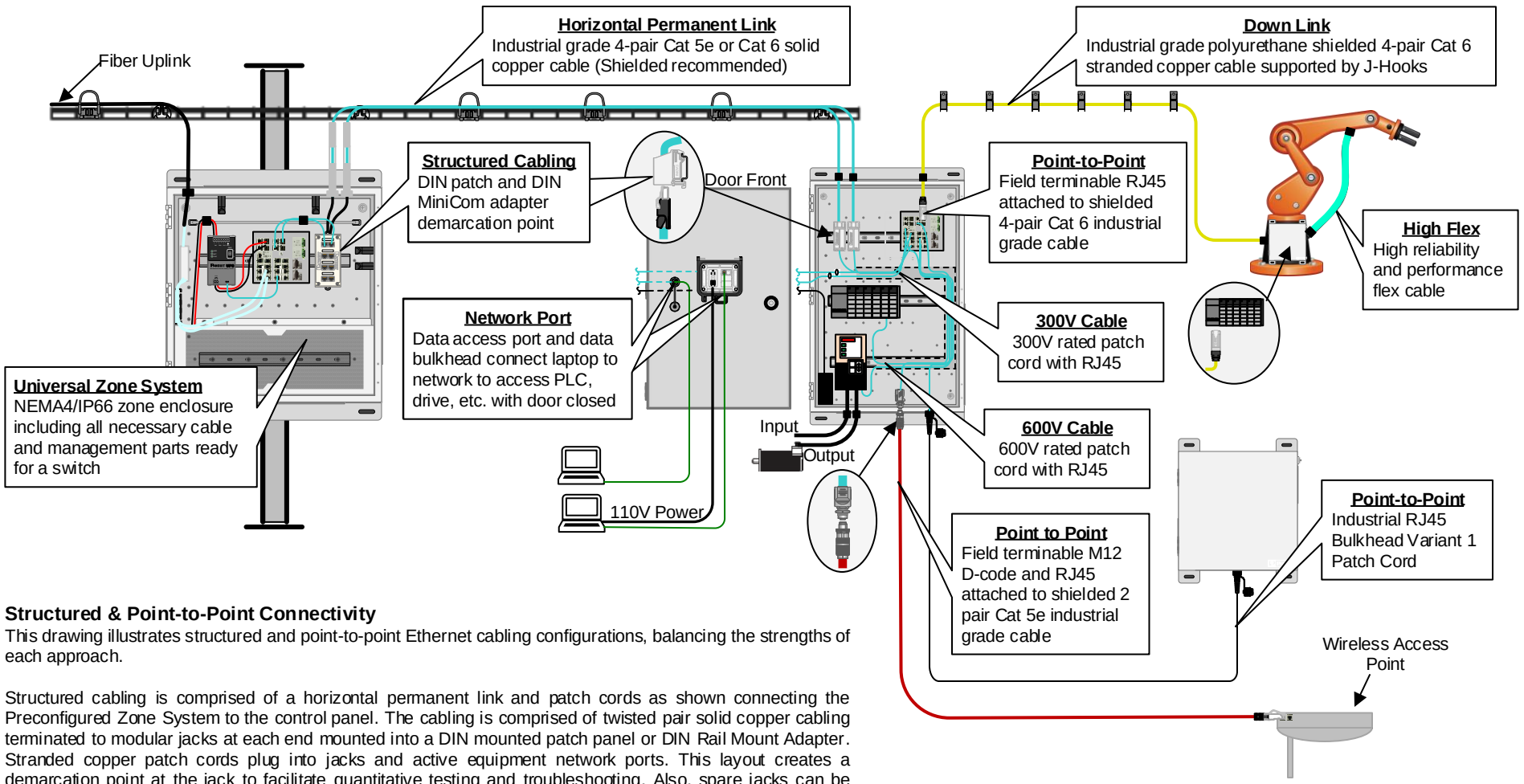
Copper Structured and Point-to-Point Cabling Techniques in an Industrial Environment



Structured & Point-to-Point Connectivity

This drawing illustrates structured and point-to-point Ethernet cabling configurations, balancing the strengths of each approach.

Structured cabling is comprised of a horizontal permanent link and patch cords as shown connecting the Preconfigured Zone System to the control panel. The cabling is comprised of twisted pair solid copper cabling terminated to modular jacks at each end mounted into a DIN mounted patch panel or DIN Rail Mount Adapter. Stranded copper patch cords plug into jacks and active equipment network ports. This layout creates a demarcation point at the jack to facilitate quantitative testing and troubleshooting. Also, spare jacks can be installed for future connections ideal for star network topologies. Adding connections is fast, easy, and low cost with just a patch cord. The drawback is structured cabling uses more cable.

Point-to-point is a direct connect cabling where a plug is directly connected to the device ports on each end. Typically, stranded twisted pair cabling is installed for flex. A 4-pair cable in yellow is shown connected to a field terminable RJ45 plug and a 2-pair in red is shown connected to an M12 D-code connector. A 4-pair RJ45 bulkhead patch cord is shown in black. This point-to-point connection is simpler than found in structured cabling. It is a good approach when chaining devices in a linear or ring topology. However, the stranded cable does not have the same reach due to attenuation as solid copper cable and spare channels are more difficult.

Use this drawing when:

- Laying out structured and point-to-point best practices
- Addressing industrial cabling
- Upgrading control network to Ethernet/IP
- Designing control panels to meet UL 508A

Bill of Materials

Part Number	Description
	Pre-Configured Universal Network Zone System
Z22U-S15	24" x 24"; mild steel enclosure; for one industrial switch; includes (8) Cat 6 UTP copper patch cords and jacks, (2) MM LC fiber uplink patch cords with (6) adaptors, redundant power supplies and maintenance-free UPS.
Z22U*	24" x 24", mild steel enclosure, for one industrial switch, includes (8) Cat 6 UTP copper patch cords and jacks, (2) MM LC fiber uplink patch cords with (6) adaptors and redundant power supplies, battery UPS.
Z23U*	24" x 36", mild steel enclosure, for two industrial switches, includes (16) Cat 6 UTP copper patch cords and jacks, (4) MM LC fiber patch cords with (6) adaptors, backplane and cable management.
FOPPX12Y	50um OM3 12 Fiber Indoor Armored Cable, Plenum (OFCP), 900um buffered fibers
FLCDMCXAQY	LC OptiCam OM3/OM4 10Gig 50/125µm multimode duplex fiber optic connector, intended for 900-micron tight-buffered fiber installations.
	Control Panel
IFC6C04BBL-CEG	Category 6, industrial (CM), 4-Pair, F/UTP copper cable. Conductors are 26/7 AWG construction with HDPE insulation. Conductors are twisted in pairs, surrounded by a metallic foil shield and protected by a flame-retardant PVC jacket.
CADIN1IG	Mini-Com DIN Rail Mount Adapter mounts to standard 35mm DIN rail and accepts any single port Mini-Com Module, international gray. Includes a label and label cover.
CDPP8RG	IndustrialNet, 8-port DIN rail mount patch panel. Includes screws to attach faceplate and Ultimate ID labels and clear label covers.
ISTPHCH1MTL	Patch cord, IndustrialNet, category 5e, shielded, 600V, RJ45 plug to RJ45 plug, teal, 1 meter.
ICAM12DRJS	Category 5e, M12 D-code to RJ45 industrial adapter, panel mount.
ISPS688FA	8-position, IndustrialNet, RJ45 plug, field terminable, for use with solid 24/1 - 22/1 AWG and stranded 27/7 - 22/7 AWG, conductor diameter 1.0 - 1.6mm, Category 6A, UTP and STP copper cable.
IAEBH6	Category 6, RJ45, 8-position, 8-wire black industrial bulkhead connector with protective cover.
IAPNG5EWH	IndustrialNet GFCI Data Access Port, Category 5e coupler & blank, white
CJ688TGBL	Category 6, RJ45, 8-position, 8-wire, UTP Mini-Com universal jack module, TG-style termination, black.
	Machine and Robot
ISFCH5C04ATL-XG	Category 5e, industrial (CM/CMX), 4-pair, 600V, SF/UTP copper cable; stranded copper conductors are 24/7 AWG with HDPE insulation. Conductors are twisted in pairs and wrapped with a foam polypropylene tape to form a core. Both pairs are surrounded by an overall braided shield and metallic foil and covered with a TPE jacket.
ISFCH5C02ATL-XG	Category 5e, industrial (CM/CMX), 2-pair, 600V, SF/UTP copper cable; stranded copper conductors are 24/7 AWG with HDPE insulation. Conductors are twisted in pairs and wrapped with a foam polypropylene tape to form a core. Both pairs are surrounded by an overall braided shield and metallic foil and covered with a TPE jacket.
ISPS5E44MFA	4-position, IndustrialNet, M12 D-Code plug, for use with stranded 26/7 - 22/7 AWG Category 5e, UTP copper cable.
IUTPSP3BL	Patch cord constructed of industrial grade UTP Category 6 stranded cable with modular plugs. Includes dust caps, 3 ft.
ISX6004AYL-LED	Category 6, industrial, 4-pair, S/FTP copper cable. Conductors are 24/7 AWG construction with PE insulation. Conductors are twisted in pairs, each of the 4 pairs are surrounded by a metallic foil with a braided shield and protected by a flame-retardant and halogen free (PUR) jacket, yellow.
JP2SBC50-L20	J-Pro cable support system, with screw-on beam clamp for use with flanges up to 1/2 (12.7mm) thick, 2.00 (50.8mm) max. bundle capacity, nylon 6.6 with metal attachments, black.
PZNWE12	Wireless enclosure designed for traditional AC power applications. Includes UTP connectivity kit.

*Network Zone Enclosures available in mild steel, stainless steel or sloped versions and various levels of integration. For an expanded product offering visit panduit.com/networkpartsamerica or the online catalog at panduit.com.

About this Configuration

There are different ways to deploy copper network cabling in an industrial environment. This drawing reflects best practices for various connectivity options considering the environment.

Network Zone Enclosure Subsystem

Redundant optical fiber uplink cables are routed into the zone enclosure to the fiber surface mount box, which protects terminations and manages cable slack. On the downlink side, copper patch cords are connected to Rj45 jacks in the DIN rail mounted patch panel, which is connected to horizontal cables. The horizontal cables are routed to control panels that connect machine control devices to the manufacturing network. The uplinks and downlinks follow a structured cabling approach. The Network Zone System can be pre-configured with some assembly or universal ready for switch.

Control Panel Subsystem

Redundant horizontal copper cables enter the top of the panel and are terminated to jacks mounting into DIN rail mounted adapters following a structured cabling approach. Two 300V rated patch cords are used to connect to the switch uplink ports. The switch downlinks are point-to-point connections using 600V rated patch cords for the switch to the Variable Frequency Drive (VFD) and to RJ45 to M12 D-code bulkhead adapters (IP20 and IP67 rated) mounted on the lower wall of the control panel. The 600V rated patch cords are used with cabling is in proximity to high voltages in accordance with UL 508A.

Machine Area

Three network cables exit the control panel to the machine area. At the top of the control panel a shielded 4-pair, Category 6, polyurethane cable is connected to the switch, the cable exits the control panel and is connected to the robot enclosure using field terminable plugs. A Category 6 RJ45 bulkhead UTP patch cord is used to connect an enclosure. The last cable is a Category 5e 2-pair shielded cable with an M12 on one end and a field terminable plug on the other end, connected to a Wireless Access Point (WAP). Shielded cable is typically used, and Panduit offers a CM/CMX, outdoor cable with durance TPE jacket in North America, Latin America and Asia Pacific. A zero-halogen, polyurethane jacket is available for EMEA. The cable on the robot is a high flex, 4-pair, shielded, Category 5e, 600V rated, SF/UTP cable.

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For more information contact your local distributor, Panduit Sales Representative, or the Panduit Industrial Network Infrastructure team at networkinfrastructure@panduit.com.