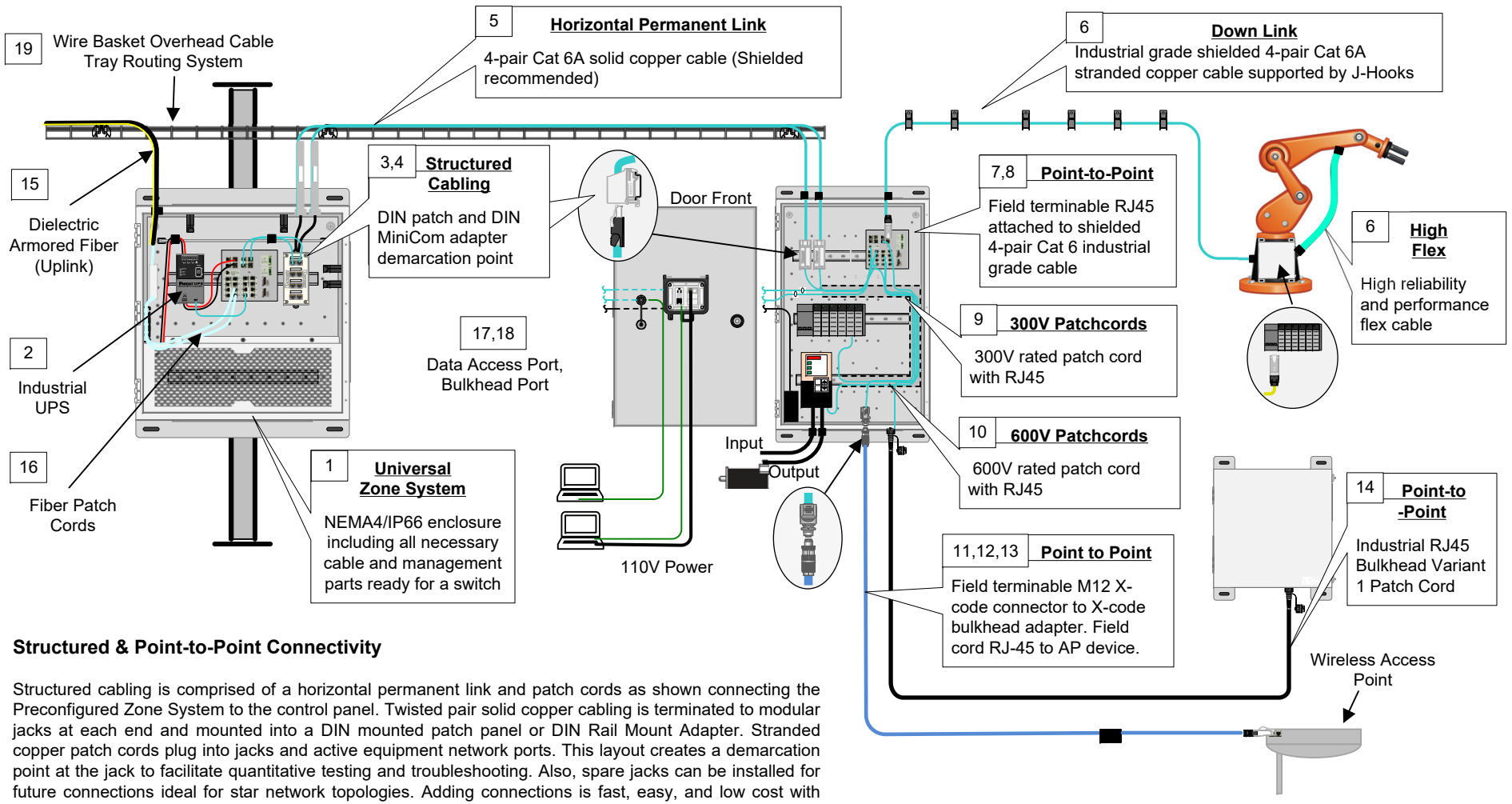
Copper Structured and Point-to-Point Cabling Techniques in an Industrial Environment



Structured & Point-to-Point Connectivity

Structured cabling is comprised of a horizontal permanent link and patch cords as shown connecting the Preconfigured Zone System to the control panel. Twisted pair solid copper cabling is terminated to modular jacks at each end and 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 teal is shown connected to a field terminable RJ45 plug and a 4-pair in blue is shown connected to an M12 X-code connector and field cord at an AP device. 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

Ref.	Part Number	Description
	Pre-Configured Universal Network Zone System	
1	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.
	Z23U-S25	24" x 36"; mild steel enclosure; for two industrial switches; includes (16) Cat 6 UTP copper patch cords and jacks, (4) MM LC fiber uplink patch cords with (6) adaptors, redundant power supplies and (2) maintenance-free UPS's.
2	UPS00100DC	Maintenance-free, No battery, 100 Watts, 24V DC Uninterruptible Power Supply (UPS)
3	CDPP8RG	IndustrialNet, 8-port DIN rail mount patch panel. Includes screws to attach faceplate and Ultimate ID labels and clear label covers.
	Cabling and Connectivity for Machine and Control Panel	
4	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.
5	IFRH6X04TL-UG	Industrial-rated solid conductor, Category 6A, 23/1 AWG, F/UTP, PVC jacket - oil and sunlight resistant, flame retardant, teal color (TL)
	IURH6X04BL-UG	Industrial-rated solid conductor, Category 6A, 23/1 AWG, U/UTP, PVC jacket - oil and sunlight resistant, flame retardant, black color (BL)
6	ISFCH5C02ATL-XG	Copper Cable, Industrial, Category 5e 2-pair, 24/7 AWG Stranded, SF/UTP, CMR, 600V rated, oil resistant, UV resistant, teal
	ISFCH5C04ATL-XG	Copper Cable, Industrial, Category 5e 4-pair, 24/7 AWG Stranded, SF/UTP, CMR, 600V rated, oil resistant, UV resistant, teal
	ISFCH6X04ATL-UG	Copper Cable, Industrial, Category 6A 4-pair, 24/7 AWG Stranded, SF/UTP, CMR, 600V rated, oil resistant, UV resistant, teal
7	FPS6X88MTG	TX6A Shielded Field Term RJ45 Plug is a simple-to-attach plug for field termination of 4-pair shielded twisted pair cable. Category 6A performance, compatible with 6 & 5e shielded systems.
8	MPSI588T	Bulkhead Cat 5e modular plug, for 8-position, 8-wire 24 AWG, STP copper cable; IP67 rated seal.
	IAEBHC6XS	Bulkhead Cat 6A shielded coupler,compatible with 6 & 5e shielded systems; IP67 rated seal.
9	UTP28SP7BU	Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Blue, 7 feet. Also available in other colors, lengths, and wire gauge size.
10	ISTPHCH1MTL	IndustrialNet™, Category 5e, shielded, 600V, RJ45 patch cord
	ISTPH6X1MTL	IndustrialNet™, Category 6A, shielded, 600V, RJ45 patch cord
11	ICAM12DRJS	Category 5e, M12 D-code to RJ45 industrial adapter, panel mount
	ICAM12XRJS	M12 X-Code Female to RJ45 Jack, industrial adapter, panel mount
12	ISPS5E44MFA	IndustrialNet™, 4-position, M12 D-code plug
	ISPS6A88MFA	IndustrialNet™, 8-position, M12 X-Code plug
	ICAM12DRJS	Category 5e, M12 D-code to RJ45 industrial adapter, panel mount
	ICAM12XRJS	M12 X-Code Female to RJ45 Jack, industrial adapter, panel mount
14	IUTP6X5MBL	Bulkhead Cat 6A unshielded patch cord, 5 meters length, 24 AWG, U/UTP, stranded, CMR cable; IP67 rated seal.
17	DAP3BC-S3-5	Data Access Port, 3in. Base, Simplex Outlet, 3 Amp Breaker, CAT 5e Coupler
18	CEST2-E12	Rectangular Terminated Cable Entry System, 2.28" (57.9 mm) W X 5.83" (165.6 mm) Long with 12 small grommet holes
	Field IoT Device Connections	
13	PUP6AHD04BU-G	Vari-MaTriX HD Category 6A Copper Cable, Plenum (CMP), UTP, with 0.23" outside diameter
	FP6X88MTG	TX6A UTP Field Term RJ45 Plug, 22-26 AWG, for field termination of 4-pair twisted pair cable. Category 6A performance, compatible with 6 & 5e systems.
	FC-ICCP0.5MBU	Category 6A UTP FieldCord™ Connector easily connects network devices, especially those with limited space for cords or RJ45 plugs, to network cabling.
	PZNWE12	Zone Cabling Wireless Enclosure 12" x 12" NEMA 4X rated, (305mm x 305mm)
	Fiber Uplink Cabling, Connectivity and Cabling Pathways	
15	FOJDZ12**	OM4 fiber, Dielectric Double Jacketed (indoor/outdoor), Riser, Low Smoke Zero Halogen, Multimode, 12 fiber. **additional fiber counts available.
	FSJD912**	OS2 fiber, Dielectric Double Jacketed (indoor/outdoor), Riser, Low Smoke Zero Halogen, Singlemode, 12 fiber. **additional fiber counts available.
16	FZ2ERLNLNSNM*	Duplex Fiber Patch Cord is OM4 with 1.6mm jacketed cable. Riser (OFNR) rated, LC duplex connectors, standard insertion loss; * determines length in meters
19	PWB2X12BL	Wire Basket Cable Tray Routing System to route and manage copper, fiber optic, or power cables. Part listed: 2" H x 12" W

*Network Zone Enclosures available in mild steel, stainless steel in various configurations. For an expanded product offering visit 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 horizontal cables. The horizontal cables are routed to control panels that connect machine control devices in the manufacturing network. The uplinks and downlinks follow a structured cabling approach. The Network Zone System is available pre-configured with some additional assembly for user supplied switch installation.

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 from the switch to Variable Frequency Drives (VFD) and to connect to external devices, through RJ45 to bulkhead adapter(s) mounted on the lower wall of the control panel. The patch cords as shown are segregated appropriately when in proximity to high voltages in accordance with UL508A.

Machine Area

Three network cables exit the control panel to the machine area. At the top of the control panel a shielded Ethernet cable is attached to the switch, the cable exits the control panel and is connected to the robot enclosure using field a terminable plug. A remote enclosure is attached to the control panel switch using a bulkhead patch cord and bulkhead couplers. And a connection to a wireless access point is enabled using an RJ45 to M12 bulkhead connector, Cat 6A cabling and field cord connection to the end device.

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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.