PANDUIT®

INDUSTRIALNET™ SOLUTION

Integrated Technology For Industrial Network Applications

Industrial Ethernet facilitates the convergence of production, data acquisition, purchasing, quality, logistics, sales and building automation systems on one common infrastructure; improving network efficiency, reducing operational costs and increasing manufacturing productivity.

The *PANDUIT® INDUSTRIALNET™* Solution is a reliable, high performance network cabling infrastructure designed to support industrial networking applications in harsh factory environments. When used with *PANDUIT* communications and electrical wiring products, customers can deploy a truly integrated system – with lower cost of ownership.

- *Rated for factory environments*
- *Fully integrated solution*
- *Reduced Total Cost of Ownership (TCO)*

What is Ethernet?

Ethernet is the network transmission protocol, developed in 1973, that has evolved into the adopted standard for the overwhelming majority of office communication systems.

While Ethernet was evolving, so were the networks for automation control. The development and growth of these two types of networks were based on significantly different demands.

Over the years many protocols, both open and proprietary, have evolved for factory automation. This is problematic as industrial protocols are not interoperable, either between each other or to the Ethernet in the front offices.
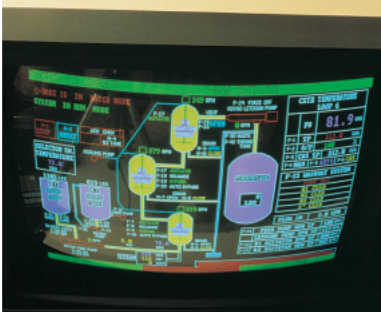
Industrial Ethernet

Industrial Ethernet solves this problem. Industrial Ethernet was developed to provide a common platform to improve Computer Integrated Manufacturing (CIM) processes, among the various processing equipment manufacturers, as well as to offer a seamless cross-transfer of critical data between the plant floor and support offices.

Typical Applications

Industrial Ethernet improves communication between devices, streamlining critical processes:

- Monitoring the manufacturing operations and processes
- Controlling the manufacturing operation and processes locally and remotely
- Data acquisition for ERP (Enterprise Resource Planning), production, purchasing, quality, logistics and sales
- Transfer of design files or engineering parameters

Environmental Considerations

IP Ratings are necessary for most plant applications (as defined in IEC 60529). This ensures components have adequate protection against the ingress of solid foreign objects, such as dust and temporary immersion in water (which is required in applications where wash-down occurs).

Specifying an Industrial Ethernet network involves the selection of a system that can protect critical control data from the demands of the harsh industrial environment, namely: vibration, high temperature, humidity, dust, debris, wash-down, abrasive chemicals, weather, impact, spark, induced voltages, and many others.

IP Enclosure Ratings

The Degree of Protection is indicated by two letters (IP) and two numerals (see Example below). International Standard IEC 60529 contains descriptions and associated test requirements that define the degree of protection each numeral specifies. The following table indicates the general Degree of Protection.

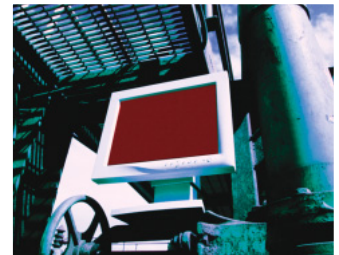| First Numeral [1] Protection of persons against access to hazardous parts and protection against penetration of solid foreign objects.	Second Numeral [1] Protection against ingress of water under test conditions specified in IEC 60529.
0 Non-protected **1** Back of hand; objects greater than 50mm in diameter **2** Finger; objects greater than 12.5mm in diameter **3** Tools or objects greater than 2.5mm in diameter **4** Tools or objects greater than 1.0mm in diameter **5** Dust-protected (dust may enter during specified test but must not interfere with operation of the equipment or impair safety) **6** Dust-tight (no dust observable inside enclosure at end of test)	**0** Non-protected **1** Vertically falling drops of water **2** Vertically falling drops of water with enclosure tilted 15 degrees **3** Spraying with water **4** Splashing with water **5** Water jet **6** Powerful water jets **7** Temporary submersion **8** Continuous submersion
Example: IP41 describes an enclosure that is designed to protect against the entry of tools or objects greater than 1mm in diameter and to protect against vertically dripping water under specified test conditions.	
Note: All first numerals and second numerals up to and including characteristic numeral **6**, imply compliance also with the requirements for all lower characteristic numerals in their respective series (first or second). Second numerals **7** and **8** do **not** imply suitability for exposure to water jets (second characteristic numeral 5 or 6) unless dual coded; e.g., IP_5/IP_7.	
[1] The IEC standard permits use of certain supplementary letters with the characteristic numerals. If such letters are used, refer to IEC 60529 for the explanation.	

IP/NEMA Comparison

IP	NEMA
10	1
11	2
14	3R
30	1
31	2
32	3R
52	5
52	12 & 12K
54	3
54	3S
54	13
56	4 & 4X
64	3
65	12, 12K & 13
66	4 & 4X
67	6 & 6P

This chart shows the relative comparisons between the IP and NEMA ratings. Some of the testing for the individual ratings are different, so to secure the rating in each organization, full testing must be done.

Performance Issues

Effectively integrating Industrial Ethernet into an existing or new manufacturing or processing facility can be challenging. Along with environmental protection there should be consideration of interoperability, deployment, security, reliability, electrical performance and cost. These challenges are accommodated when Industrial Ethernet components are tuned and integrated with one another as a complete solution.

To satisfy the expanding network needs of manufacturing businesses, *PANDUIT* has a family of IP rated products specifically designed to withstand the harsh conditions encountered in industrial networking applications.

INDUSTRIAL*NET*™ Bulkhead Connectors, Couplers and Plugs

- IP67, NEMA 6 and 6P sealed industrial Ethernet connectors
- Connectors utilize *PANDUIT*® patented *GIGA-TX*™ termination technique for consistent, reliable terminations
- Bulkhead anti-rotation washer eliminates the potential for connector rotation
- Gasket and seal made of inert, chemically resistant material
- Connector components are made of high temperature rated material
- Tethered caps maintain IP67 seal during unmated connection

- Meets the specifications of the TIA and Open DeviceNet Vendor Association (ODVA) joint draft for Sealed Ethernet/IP RJ45 connections
- Compatible with leading switch manufacturers' equipment
- Connectors terminate 4-pair 24 and 22 AWG solid twisted pair cable
- Plug terminates 24 gauge, stranded or solid conductor with maximum conductor insulation diameter of .040 inches
- Coupler provides a convenient plug to plug connection point between the hardened switch and automation device

IP67

IAEBH5E
(Connector)

MPI588T
(Plug)

IAEBHC5E
(Coupler)

Part Number	Part Description	Std. Pkg. Qty.	Std. Ctn. Qty.
INDUSTRIAL*NET*™ TX6™ UTP Bulkhead Connector			
IAEBH6	Category 6, RJ45, 8-position, 8-wire black industrial bulkhead connector with protective cover.	1	10
INDUSTRIAL*NET*™ TX6™ Shielded Bulkhead Connector			
IAEBH6S	Category 6, RJ45, 8-position, 8-wire shielded black industrial bulkhead connector with protective cover.	1	10
INDUSTRIAL*NET*™ TX5e™ UTP Bulkhead Connector			
IAEBH5E	Category 5e, RJ45, 8-position, 8-wire black industrial bulkhead connector with protective cover.*	1	10
INDUSTRIAL*NET*™ TX5e™ Shielded Bulkhead Connector			
IAEBH5ES	Category 5e, RJ45, 8-position, 8-wire shielded black industrial bulkhead connector with protective cover.*	1	10
INDUSTRIAL*NET*™ TX5e™ Plug			
MPI588T	Category 5e industrial plug with protective cover.**	1	10
INDUSTRIAL*NET*™ TX5e™ Shielded Plug			
MPSI588T	Category 5e shielded industrial plug with protective cover.**	1	10
INDUSTRIAL*NET*™ TX6™ Coupler			
IAEBHC6	Category 6, RJ45, 8-position, 8-wire black industrial bulkhead coupler with protective cover.	1	10
INDUSTRIAL*NET*™ TX5e™ Coupler			
IAEBHC5E	Category 5e Bulkhead Coupler with protective cover.	1	10

*The *INDUSTRIAL*NET*™ Bulkhead Connectors can be terminated with standard slip-lock pliers, or optional termination tool (EGJT).
**The WPT-8 Wire Preparation Tool and MPT5-8 modular plug installation tool are required for *INDUSTRIAL*NET*™ Plug termination.
Not suitable for direct UV applications.

‡ Order number of pieces required, in multiples of Standard Package Quantity.

INDUSTRIALNET™ TX5e™ Patch Cords

- Exceeds TIA/EIA-568-B.2 Category 5e and ISO 11801 Class D standards
- Constructed of Industrial Category 5e, 24 AWG UTP solid cable and PAN-PLUG® Modular Plugs for superior performance
- Patch cords are 100% factory tested for insertion loss
- Plug contacts plated with 50 microinches of gold for improved durability
- Plug meets all applicable FCC part 68 Subpart F requirements and exceeds IEC 60603-7 specifications

- Bulkhead provides IP67/IP65 seal when mated to an IP67/IP65, NEMA 6 or 6P bulkhead connector
- Patch cords are pre-terminated and provide IP67/IP65 seal when mated to IP67/IP65 bulkhead connectors
- Available with caps and without

IUTPCH*BL

IUTPCHNC*BL

Part Number	Part Description	Length*	Std. Pkg. Qty.	Std. Ctn. Qty.
IUTPCH3BL	Category 5e UTP Patch Cord with INDUSTRIALNET™ TX5e™ Modular Plugs on both ends – with tethered caps.	3'	1	10
IUTPCHNC3BL	Category 5e UTP Patch Cord with INDUSTRIALNET™ TX5e™ Modular Plugs on both ends – without tethered caps.	3'	1	10
ISTPCH1MBL	Category 5e STP Patch Cord with INDUSTRIALNET™ TX5e™ Modular Plugs on both ends – with tethered caps.	1m	1	10
ISTPCHNC1MBL	Category 5e STP Patch Cord with INDUSTRIALNET™ TX5e™ Modular Plugs on both ends – without tethered caps.	1m	1	10

*Additional lengths: UTP patch cords are available in 3', 5', 7', 10', 15' and 20' lengths. To order lengths other than 3', substitute the 3 in the part number (IUTPCH3BL) with the desired length (IUTPCH5BL for 5' length).
Shielded patch cords are available in 1m, 2m, 3m and 5m lengths. To order lengths other than 1m, substitute the 1 in the part number (ISTPCH1MBL) with the desired length (ISTPCH3MBL for 3m length).
Not suitable for direct UV applications.

Self-Laminating Labels for IUTPCH INDUSTRIALNET™ Patch Cords
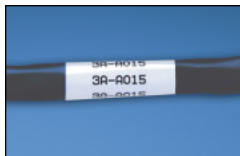
Suggested Label Solutions for TIA/EIA-606-A Compliance		
Laser/Inkjet Desktop Printer Label	PANTHER™ LS8E Hand-Held Printer Label	COUGAR™ LS9 Hand-Held Printer Label
S100X150YAJ	S100X150VAC	T100X000CBC-BK

For complete label solutions and product information, refer to the full-line Network Connectivity Solutions Catalog, SA-NCCB34, at www.panduit.com

INDUSTRIALNET™ LC Fiber Optic Bulkhead Adapter and Patch Cords

- Bulkhead provides IP67 seal when mated to an IP67 plug
- INDUSTRIALNET™ Patch Cords are pre-terminated and provide IP67 seal when mated to IP67 bulkhead jacks
- Patch cords built with 62.5µm duplex multimode industrial-grade jacketed fiber cable

- Ideal for daisy-chaining hardened industrial switches between IP66 rated enclosures
- Pigtails are ideal for routing fiber through conduit
- Patch cords are 100% factory tested for insertion loss
- Insertion loss data is recorded for every multimode patch cord, providing lifetime traceability to a QC number, labeled on each patch cord

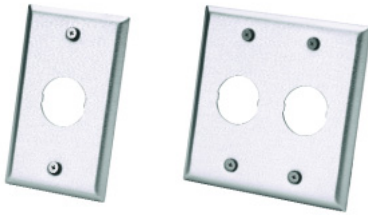| Part Number	Part Description	Std. Pkg. Qty.	Std. Ctn. Qty.
INDUSTRIALNET™ LC Fiber Optic Bulkhead Adapter			
IAEF7JMA‡	Industrial LC fiber optic bulkhead adapter.	1	10
INDUSTRIALNET™ LC Fiber Optic Patch Cord and Pigtail			
IAEF617P-7PM1*	Industrial duplex multimode 62.5µm LC to LC patch cord.	1	10
IAEF617P-NM1**	Industrial duplex multimode 62.5µm LC to pigtail.	1	10

IAEF7JMA   **IAEF617P-7PM1**

‡Bulkhead includes duplex multimode LC adapter with phosphor bronze split sleeves.
*Available in 1m, 2m, 3m, 10m, 20m and 30m lengths.
**Contact Customer Service for pigtail lengths and/or discrete length patch cords with LC fiber interface.

‡ Order number of pieces required, in multiples of Standard Package Quantity.

INDUSTRIALNET™ Stainless Steel Faceplates

- Accept INDUSTRIALNET™ Bulkhead Connectors
- Impact resistant for industrial environments
- Rear gasket provides tight seal
- IP67 seal is achieved when used with INDUSTRIALNET™ connectivity

IAEFP1 **IAEFP2-2G**

Part Number	Part Description	Std. Pkg. Qty.‡	Std. Ctn. Qty.
IAEFP1	Vertical faceplate accepts one INDUSTRIALNET™ Bulkhead Connector.	1	10
IAEFP2-2G	Double gang, vertical faceplate accepts two INDUSTRIALNET™ Bulkhead Connectors.	1	10

INDUSTRIALNET™ Ethernet Enclosure

- NEMA 4X/IP66 rated when used with one of the required gland plate options
- Accommodates populated or unpopulated gland plates (sold separately – see table)
- 35mm DIN rail equipped for mounting of a hardened Industrial Ethernet switch and power supply: length 14 3/4" (375mm)
- Power supply included (115/230 V to 24 VDC) with built-in circuit breaker (installation required)
- Vibration mitigating back plate for improved switch integrity
- Four welded mounting flanges for convenient and secure installation
- Optional fan/filter kit available for enclosures in high temperature environments; enclosure is IP54 rated when the fan/filter kit is installed
- Enclosure supplied with a cable routing accessory kit for copper
- Optional fiber uplink kits available for addition of fiber uplinks (sold separately – see table)
- Enclosure latches are lockout capable and will accommodate shackle diameters 5/16" or smaller; PANDUIT lock part number PSL-3.
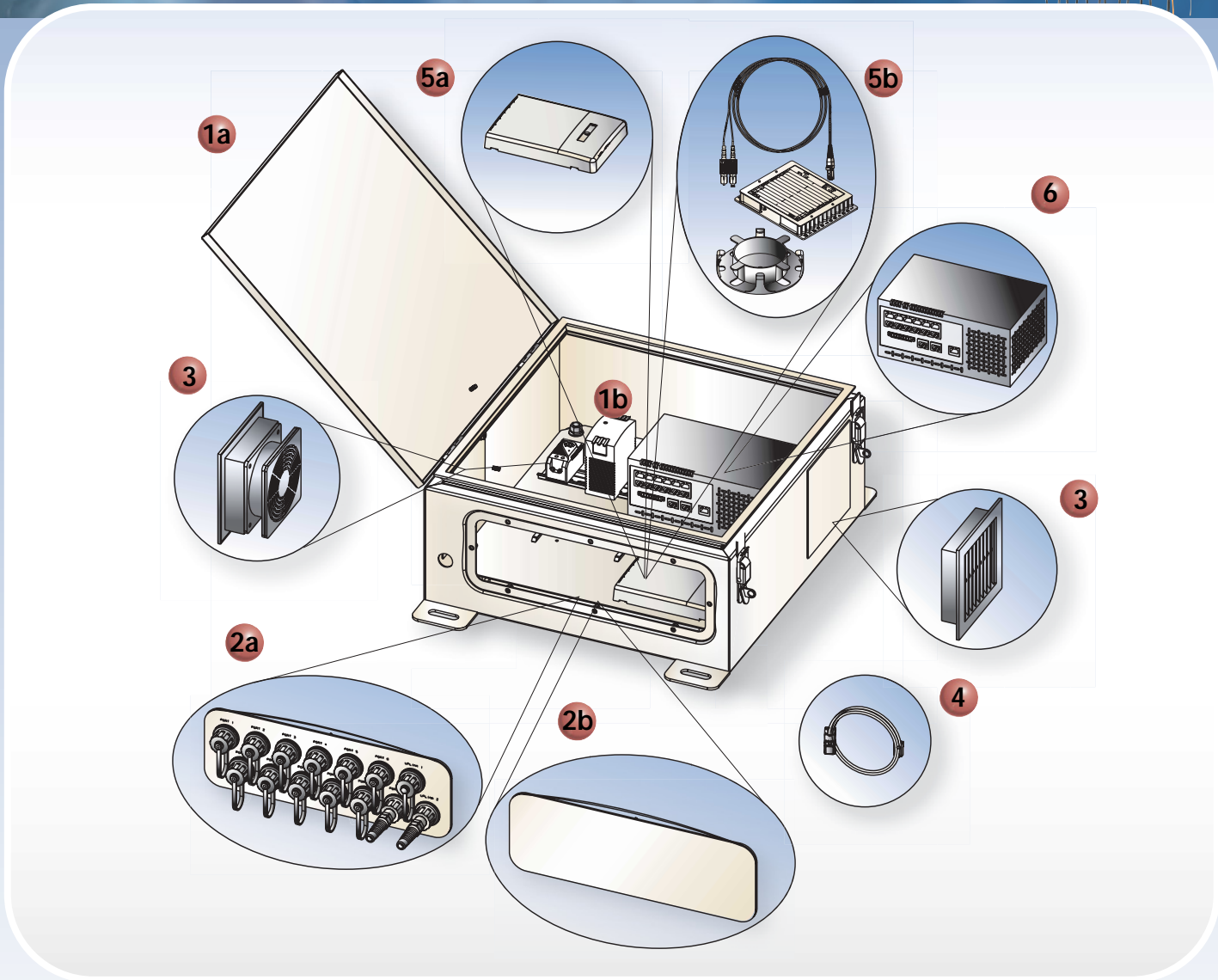
IAEIP66

1.110 [28.19]
.555 [14.10]
.015 R [0.38]
1.203 Ø [30.56]
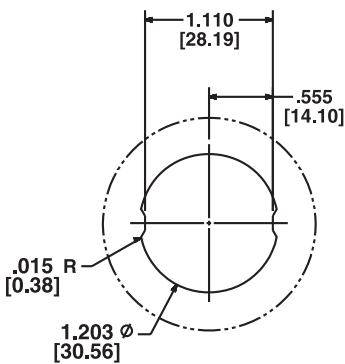
Standard NEMA Knockout

	Part Number	Part Description	Std. Pkg. Qty.‡	Std. Ctn. Qty.
1	IAEIP66	Industrial Ethernet enclosure. Accepts one gland plate (required to achieve IP66 rating). Supplied with power supply (115/230 V to 24 VDC) and accessories kit. Dimensions 18.5" x 18.5" x 8" (470mm x 470mm x 203mm).	1	1
2a	IAECGP	Industrial Ethernet connector gland plate. Fully populated with fourteen bulkhead fittings, fourteen internal enclosure patchcords for twelve downlink ports and two copper uplink ports.	1	1
2b	IAEBGP	Industrial Ethernet blank gland plate.	1	1
3	IAEFK54	Industrial Ethernet fan/filter kit, 24 VDC. powered. Includes DIN rail mount thermostat. IP54 rated when fan/filter kit is installed.	1	1
4	IUTPCHBH1.25BL	Industrial Ethernet internal enclosure patch cords/bulkhead assembly. RJ45 Plug to INDUSTRIALNET™ TX5e™ Jack Module. UTP, solid wire, 15" in length. Used to connect switch to gland mounted bulkhead.	1	10
5a	IAEFKSC	Industrial Ethernet SC fiber uplink kit allows termination of four SC connectors onto two duplex fiber uplinks and connection to the MT-RJ ports on the switch, while maintaining an IP67 rating.	1	1
5b	IAEFKSP	Industrial Ethernet fiber uplink splice kit supports splicing of two duplex fiber uplinks to MT-RJ or SC ports on the switch, while maintaining an IP67 rating.	1	1

For complete lockout/tagout solutions and product information, refer to the PANDUIT Lockout/Tagout Products Catalog, SA-IDCB06, at www.panduit.com

INDUSTRIALNET™ Ethernet Enclosure

The *PANDUIT*® *INDUSTRIALNET*™ Ethernet Enclosure is a key component in an Industrial Ethernet System. In distributed topologies, the switch is relocated out of a central control cabinet and into the *INDUSTRIALNET*™ Ethernet Enclosure on the factory floor and into work cells. The *INDUSTRIALNET*™ Ethernet Enclosure provides the protection needed for hardened switches to withstand harsh environments. By moving the switch out of the control cabinet, topologies become more flexible and cost-effective.

1a Industrial Ethernet Enclosure (IAEIP66)		**4** Industrial Ethernet Internal Enclosure Patch Cords (IUTPCHB1.25BL)	
1b 24 VDC Power Supply (included with Enclosure)		**5a** Industrial Ethernet SC Fiber Uplink Kit (IAEFKSC)	
2a Industrial Ethernet Connector Gland Plate (IAECGP)		**5b** Industrial Ethernet Fiber Uplink Splice Kit (IAEFKSP)	
2b Industrial Ethernet Blank Gland Plate (IAEBGP)		**6** DIN Rail Mount Industrial Ethernet Switch (switch not sold by *PANDUIT*)	
3 Industrial Ethernet Fan/Filter Kit with Thermostat (IAEFK54)			

Industrial Ethernet Topology
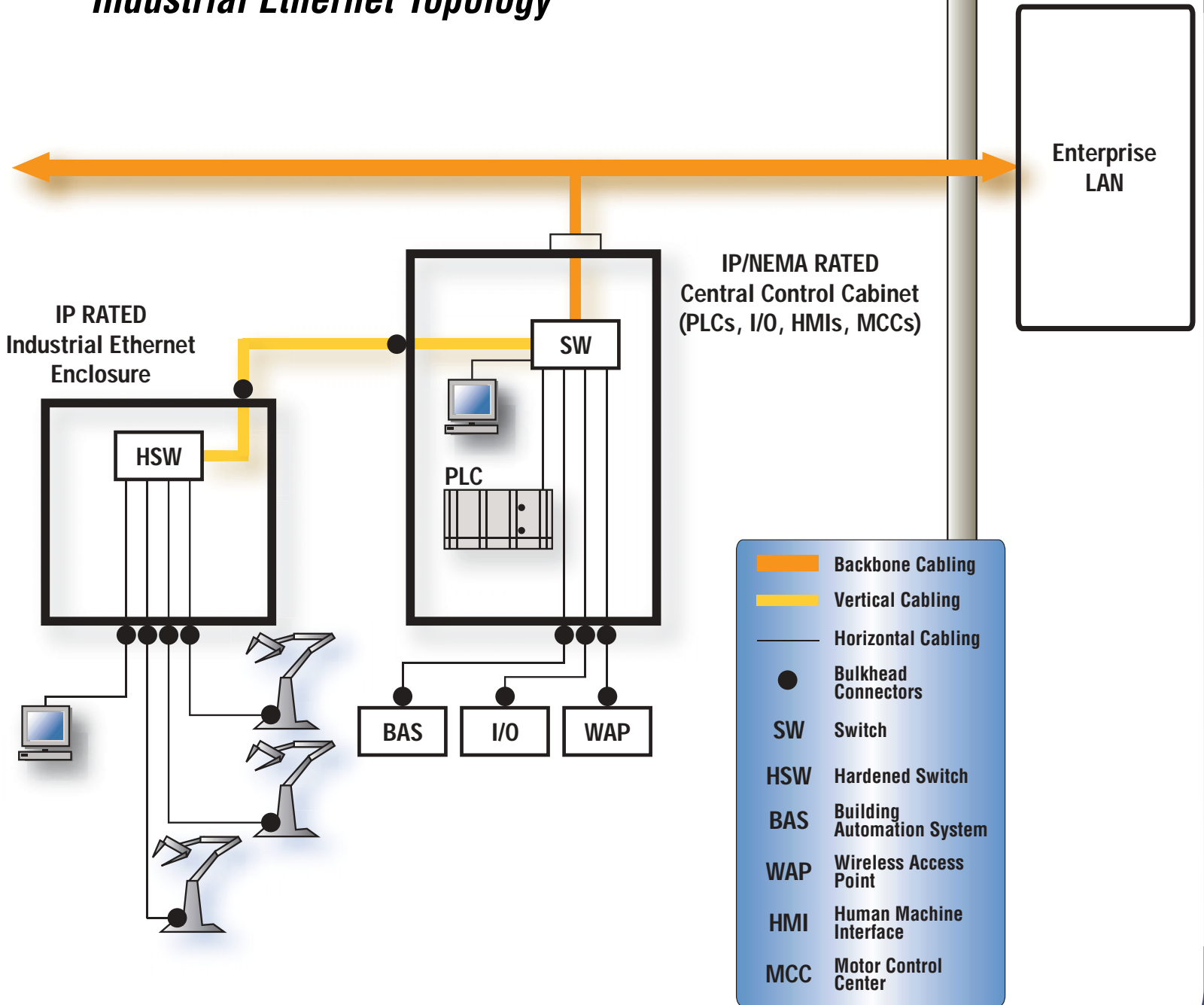
Enterprise
LAN

IP/NEMA RATED
Central Control Cabinet
(PLCs, I/O, HMIs, MCCs)

SW

PLC

IP RATED
Industrial Ethernet
Enclosure

HSW

BAS   I/O   WAP

▬▬	**Backbone Cabling**
▬▬	**Vertical Cabling**
──	**Horizontal Cabling**
●	**Bulkhead Connectors**
SW	**Switch**
HSW	**Hardened Switch**
BAS	**Building Automation System**
WAP	**Wireless Access Point**
HMI	**Human Machine Interface**
MCC	**Motor Control Center**

10
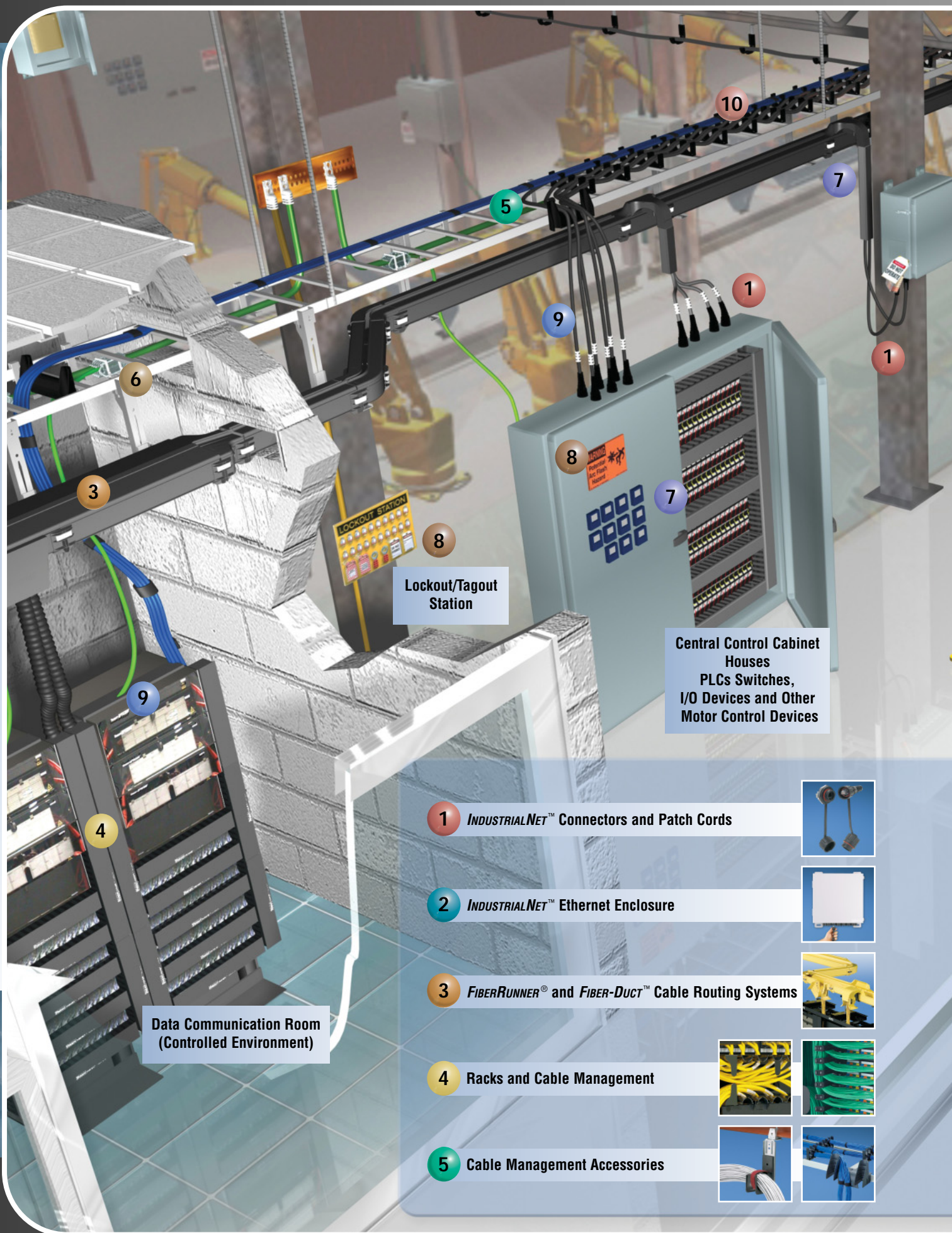
Lockout/Tagout
Station

Central Control Cabinet
Houses
PLCs Switches,
I/O Devices and Other
Motor Control Devices

Data Communication Room
(Controlled Environment)

1 *INDUSTRIALNET*™ Connectors and Patch Cords

2 *INDUSTRIALNET*™ Ethernet Enclosure

3 *FIBERRUNNER*® and *FIBER-DUCT*™ Cable Routing Systems

4 Racks and Cable Management

5 Cable Management Accessories

With nearly 50 years of experience in designing products for the complexities of these diverse industrial environments, *PANDUIT* offers the ideal solution to support your applications from the Local Area Network (LAN) based support offices to the processing devices on your plant floor. *PANDUIT* has the most extensive solution set in the world for connecting, routing, and managing network cabling throughout your entire facility.
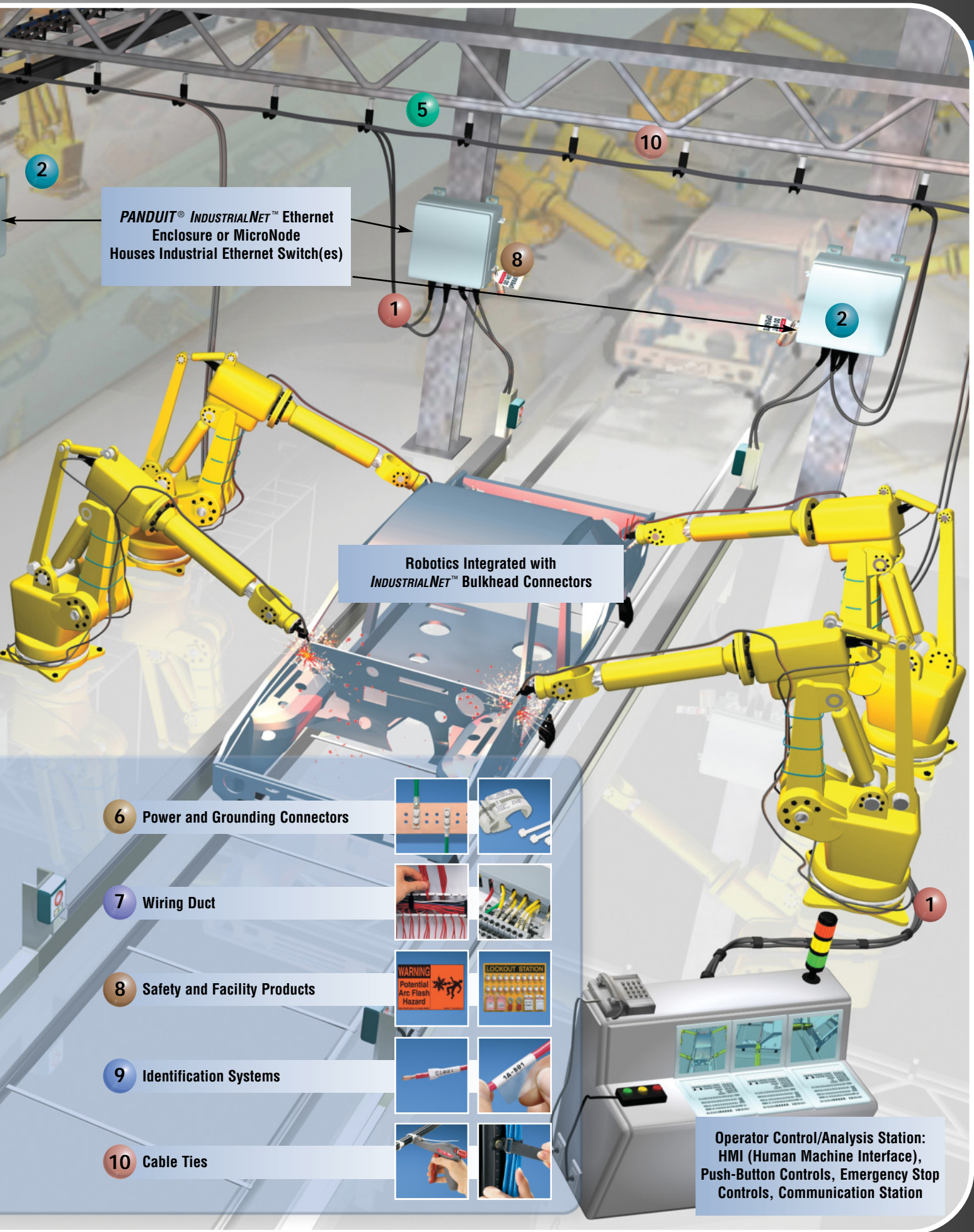
PANDUIT® INDUSTRIALNET™ Ethernet Enclosure or MicroNode Houses Industrial Ethernet Switch(es)

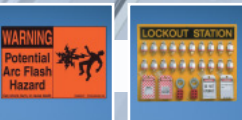**Robotics Integrated with INDUSTRIALNET™ Bulkhead Connectors**

6 Power and Grounding Connectors
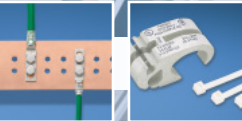
7 Wiring Duct

8 Safety and Facility Products

9 Identification Systems

10 Cable Ties

Operator Control/Analysis Station: HMI (Human Machine Interface), Push-Button Controls, Emergency Stop Controls, Communication Station

PANDUIT ®

PANDUIT Corp.
Tinley Park, Illinois 60477-3091

For more information
Visit us at www.panduit.com
Contact Customer Service by email: cs@panduit.com
or by phone: 800-777-3300

PANDUIT Europe Ltd.
London, UK
cs-emea@panduit.com
Phone: 44.20.8601.7200

PANDUIT Japan
Tokyo, Japan
cs-japan@panduit.com
Phone: 81.3.3767.7011

PANDUIT Singapore Pte. Ltd.
Republic of Singapore
cs-ap@panduit.com
Phone: 65.6305.7575

PANDUIT Latin America
Jalisco, Mexico
cs-la@panduit.com
Phone: 52.333.777.6000

PANDUIT Australia Pty. Ltd.
Victoria, Australia
cs-aus@panduit.com
Phone: 61.3.9794.9020

PANDUIT Canada
Markham, Ontario
cs-cdn@panduit.com
Phone: 800.777.3300

WORLDWIDE HEADQUARTERS

For a copy of *PANDUIT* product warranties, log on to www.panduit.com/warranty