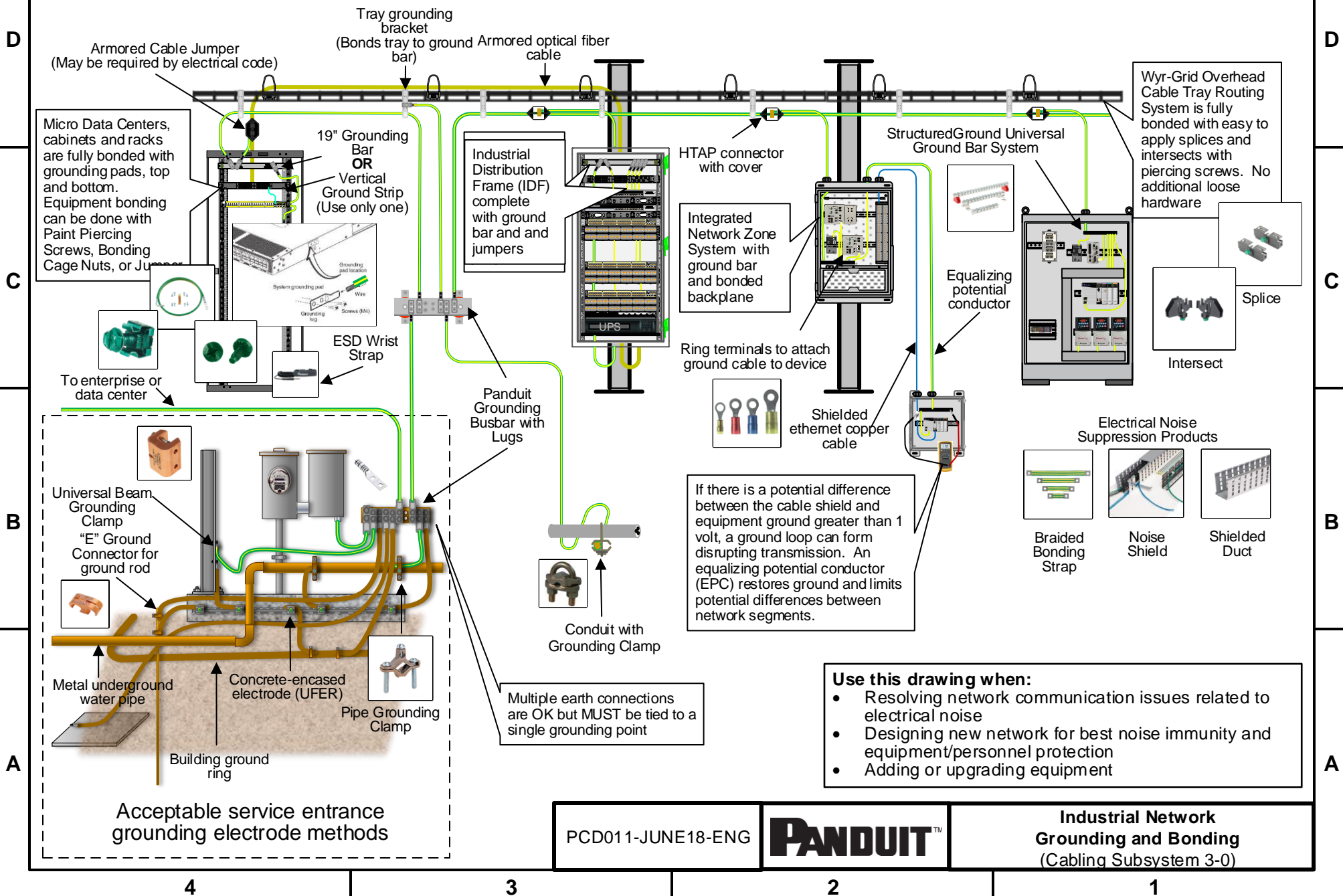


# Grounding and Bonding Industrial Network and Connectivity for Personnel Safety, Equipment Protection, and Reliable Network Communication



Armored Cable Jumper  
(May be required by electrical code)

Tray grounding bracket  
(Bonds tray to ground Armored optical fiber cable)

Micro Data Centers, cabinets and racks are fully bonded with grounding pads, top and bottom. Equipment bonding can be done with Paint Piercing Screws, Bonding Cage Nuts, or Jumper

19" Grounding Bar OR Vertical Ground Strip (Use only one)

Industrial Distribution Frame (IDF) complete with ground bar and and jumpers

HTAP connector with cover

StructuredGround Universal Ground Bar System

Wyr-Grid Overhead Cable Tray Routing System is fully bonded with easy to apply splices and intersects with piercing screws. No additional loose hardware

ESD Wrist Strap

To enterprise or data center

Panduit Grounding Busbar with Lugs

Integrated Network Zone System with ground bar and bonded backplane

Equalizing potential conductor

Splice

Intersect

Ring terminals to attach ground cable to device

Shielded ethernet copper cable

Electrical Noise Suppression Products

If there is a potential difference between the cable shield and equipment ground greater than 1 volt, a ground loop can form disrupting transmission. An equalizing potential conductor (EPC) restores ground and limits potential differences between network segments.

Braided Bonding Strap

Noise Shield

Shielded Duct

Universal Beam Grounding Clamp  
"E" Ground Connector for ground rod

Conduit with Grounding Clamp

Metal underground water pipe

Concrete-encased electrode (UFER)

Pipe Grounding Clamp

Multiple earth connections are OK but MUST be tied to a single grounding point

**Use this drawing when:**

- Resolving network communication issues related to electrical noise
- Designing new network for best noise immunity and equipment/personnel protection
- Adding or upgrading equipment

Acceptable service entrance grounding electrode methods

# Bill of Materials

Part Number	Description
<b>Service Entrance Grounding &amp; Bonding</b>	
GCE250-250	"E" style grounding connector for 1/0 STR – 250 kcmil (70 – 120mm <sup>2</sup> ) main and tap.
GUBC500-6	Universal beam grounding clamp for #6 AWG – 500 kcmil (16 – 240mm <sup>2</sup> ) wire size
GPCH2-2-L	Bronze grounding clamp, heavy duty base, #10 SOL - #2 STR AWG conductor size range, 1 1/4" - 2" (31.8mm - 50.8mm) iron pipe size, 2.22" (56.4mm) pipe clamp screw length.
GB4B0624TPI-1	1/4" x 4" x 20" Grounding Busbar.
LCC2/0-14AW-X	Two-hole, long barrel lug with window, 2/0 AWG wire, 1/4 stud hole, .63 hole spacing
<b>Pathways Grounding &amp; Bonding</b>	
GB2B0306TPI-1	1/4" x 2" x 12" Telecommunications Grounding Busbars.
LCC6-14JAWH-L	Two-hole, long barrel lug with window, #6 AWG wire, 1/4 stud hole, .50 — .63 hole spacing, 45° angle tongue.
GPL-22-X	Bronze grounding clamp, .365-.575" wire dia. range 1 1/4" IPS.
HTWC2-2-1	Kit contains HTCT2-2-1 HTAP and CLRCVR2-1 clear cover, terminates code #2 – #6 AWG STR/SOL Run and Tap 1 or flex #2 – #8 AWG Run and Tap 1, code or flex #8 – #14 AWG Tap 2 and Tap 3
ACG24K	Armored cable grounding kit #6 AWG (16mm <sup>2</sup> ) jumper for armored cable diameter up to 0.84 (21.3mm), 24 (609.6mm) length, factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal, provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
GACB-2	Auxiliary cable bracket, 1.63" (41.4mm) width, 3.95" (100.3mm) height, 5.22" (132.6mm) depth, provided with one mounting screw.
<b>Micro Data Center, Network Zone System and Control Panel Grounding &amp; Bonding</b>	
RGRB19Y	Grounding busbar, 19" (483mm) length, tin-plated, fourteen holes arranged for flexibility in mounting, provided with two each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGS134-1Y	Grounding strip, 78.65" (2m) length, .67" (17mm) width, .05" (1.27mm) thickness, provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
RGTBSM6G-C	Green thread-forming bonding screw, M6 x 15mm.
CNBK	Green bonding cage nut, includes 50 #12-24 bonding cage nuts (.06 – .11 thick panel) and 50 #12-24 x 1/2" bonding screws with #2 Phillips/slotted combo hex head (use 5/16" or 8mm socket).
RGEJ657PFY	#6 AWG (16mm <sup>2</sup> ) jumper, 90° bent lug on grounding strip side, provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2, M6 x 12mm, #10-32 x 1/2 and M5 x 12mm thread-forming screws.
RGESDWS	Adjustable, fabric ESD wrist strap with 4mm snap, connects to the ground via a 6' (1.8 m) coiled cable, banana plug, and 1 megohm resistor and helps protect the wearer from shock hazards.
RGESD2-1	Two-hole ESD Port Kit with 5/8 spacing, includes a .17 oz (5 cc) tube of antioxidant paste, 1 ESD protection sticker, two 12-24 x 1/2 screws, two M6 x 12mm thread-forming screws, and one cleaning pad.
UGB2/0-414-12	Universal ground bar accepts #14 – #4 AWG wire in 12 wire ports and up to a 2/0 AWG main equipment grounding conductor with a compression or mechanical connector, 8.28" (210.3mm) length, 0.62" (15.7mm) width, 0.48" (12.2mm) height.
PNF10-14R-L	Ring Terminal, 12 – 10 AWG, 1/4" stud size, funnel entry, nylon insulated, standard package.
BS100845	Braided Bonding Strap, one-hole, insulated, 8.00" length x 1.06" width (203.2mm x 27.0mm).
G2X2LG6EMI	Shielded wiring duct, 2 W x 2 H, 6' length, PVC, light gray.
SD2EMI	PanelMax noise shield, EMI noise shield kit for 2" height Panduit wiring duct, (2) 3 foot sections, bonding clips, and anti-oxidizing paste, steel, black.

## About this Configuration

A proper grounding and bonding system is essential for personnel safety, equipment protection, equipment operation, and reliable network communication. An appropriately designed grounding and bonding system is intentional (designed, specified), visually verifiable (e.g., green and yellow cable jacket), and consists of adequately sized conductors to safely handle expected electrical currents and dissipate electrical noise.

## Earthing, Grounding & Bonding

The terms earthing, grounding, and bonding are often interchanged. However, there are specific meanings:

- **Earthing** - Earth or a conductive body that is connected to earth.
- **Grounding** – The point at which all "Bonded" conductors come together at "Earth".
- **Bonding** - Electrically connecting all exposed metallic items not designed to carry electricity such as enclosures, trays, racks, cable armor, etc. to a ground.

## Grounding for Safety

Cable trays, enclosures, communication/control cable, chassis, or metallic surfaces can be inadvertently energized by a power cable short or lightning, potentially leading to shock causing injury or equipment damage. A dedicated grounding conductor safely directs the hazardous stray electrical current to ground.

## Ground Loop

A ground loop is an unwanted current in a conductor connecting two points that should be at the same potential. This is a result of multiple ground connections to earth creating a potential difference. This can be DC voltage, AC voltage, EMI noise, power harmonics, etc.

## Grounding & Bonding for Network Communication

Stray electrical noise and ground loops can disrupt electronic equipment, especially Ethernet gear. There are varying methods to suppress. Unshielded Twisted Pair (UTP) Ethernet cable has limited noise cancellation. Shielded Twisted Pair (STP) cable is more effective as it has a metallic sheath that is bonded to dissipate the electrical noise. The challenge is to maintain equipotential (an Equalizing Potential Conductor may be needed). Network cable protected by a grounded noise shield or shielded duct is designed to dissipate electrical noise in an enclosure. Also, a flat, wide bonding strap bonded to the enclosure door and side panels dissipates noise more effectively than standard cable (skin effect of high frequency noise). The goal is to implement a single ground reference throughout.

## Applicable Standards

- NEC Article 250 & 645.15
- TIA 607-B & 1005
- BICSI

