SECTION 27 11 16

Communications CABINETS, RACKS, FRAMES AND ENCLOSURES

Notes to the Specification Writer:

This Section has been written to cover most, but not all, project conditions that you will encounter. Depending on the project, you may need to add material, delete items, or modify what is currently written. Editing instructions are included throughout the document. (If this document is viewed or printed in color, these instructions appear in red italic text.)

Review this entire specification Section and edit it to meet the requirements of the specific project. Options or items where the specification writer’s input is needed are enclosed in <<karats>>.

Before publishing your final version of this specifications, remove all placeholders / instructions in red text.

1. GENERAL
	1. SUMMARY

### This Section includes:

#### The supply, delivery, supervision, coordination, and installation of equipment items specified herein and shown on the Drawings

#### Products supplied but not installed under this section, including loose equipment specified herein, which is to be turned over to the Owner at the completion of this project

### Examine the contract documents in their entirety (including drawings and specification sections in the other divisions) for requirements or work which may affect work under this section, regardless of whether such requirements or work are specifically indicated in this section.

### Contractor Shall Provide and Install

#### The Contractor shall furnish and install telecommunications passive equipment, including:

##### Cabinets

##### Racks

##### Frames

##### Enclosures

#### Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.

#### The Contractor shall provide system demonstration, system documentation, and instruction of Owner personnel, without claim for additional payment.

### Errors or Omissions in Drawings or Documentation

#### If any errors or omissions appear in Drawings, Specifications, or other documents, the bidding Contractor shall notify the Engineer no later than ten (10) days prior to submitting the bid.

#### Should conflict occur in or between Drawings and Specifications, the bidding Contractor is deemed to have estimated the more expensive way of doing the work, unless the bidding Contractor has asked for and obtained written decision (addendum) before submission of the bid as to which method or materials will be required.

### Related Sections:

#### Section 00 00 00 – Procurement and Contracting Requirements –

#### Section 01 00 00 – General Requirements

#### Section 07 84 00 – Penetration Firestopping

#### Section 26 05 26 – Grounding and Bonding for Electrical System

#### Section 27 05 00 – Common Work Results for Communications

#### Section 27 05 26 – Grounding and Bonding for Communication Systems

#### Section 27 05 53 – Identification for Communication Systems

#### Section 27 11 19 – Communications Termination Blocks and Patch Panels

## Definitions

### ANSI – American Northern Standards Institute

### AWG – American Wire Gauge

### BICSI – Building Industry Consulting Service International

### BCT – Bonding Conductor for Telecommunications

### BD – Building Distributor – A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made

### CP – Consolidation Point – A connection facility within Cabling Subsystem 1 for interconnection of cables extending from building pathways to the equipment outlet

### EDA – Equipment Distribution Area – A space allocated for end equipment, including computer systems and telecommunications equipment

### EF – Entrance Facility – An entrance to a building for both public and private network service cables, including wireless, that includes the entrance point of the building and continues to the entrance room or space

### EIA – Electronics Industry Alliance

### ER – Equipment Room – An environmentally-controlled, centralized space for telecommunications equipment that serves the occupants of the building, considered distinct from a Telecommunications Room (TR) because of the nature or complexity of the equipment.

### ESD – Electrostatic Discharge – The sudden flow of electricity between two electrically-charged objects caused by contact, an electrical short, or dielectric breakdown

### ETL – Intertek Certification Services

### IEC – International Electrotechnical Commission

### IEEE – Institute of Electrical and Electronic Engineers

### IDC – Insulation displacement contact

### ISO – International Standards Organization

### HC – Horizontal Cross-connect – A group of connectors, such as patch panels or punch-down blocks, that allow horizontal, backbone, and equipment cabling to be cross-connected with patch cords or jumpers

### HDA – Horizontal Distribution Area – A space in a computer room where a Horizontal Cross-connect (HC) is located, and which may include LAN switches, Storage Area Network (SAN) switches, and Keyboard/Video/Mouse (KVM) switches for the end equipment located in the Equipment Distribution Areas (EDAs)

### IC – Intermediate Cross-connect – A facility enabling the termination of different levels of backbone cabling and interconnection between them or equipment

### MC – Main Cross-connect – A facility enabling the termination of backbone cables and their connection to incoming services, other backbone cabling or equipment

### MDA – Main Distribution Area – The central point of distribution for the structured cabling system, which includes the Main Cross-connect (MC) and, when equipment areas are served directly from the MDA, may also include Horizontal Cross-connect (HC)

### MM – MultiMode Fiber

### NECA – National Electrical Contractors Association

### NFPA – National Fire Protection Agency

### NRTL – Nationally Recognized Testing Laboratory

### TIA – Telecommunications Industry Association

### SM – SingleMode Fiber

### UL – Underwriters Laboratory

### Provide: Furnish, install, terminate, label, test and certify a complete operating cabling system.

### Contract Documents (CD): Design drawings, specifications, sketches and schedules provided by the Engineer as they directly relate to this scope of work and this project.

### Structured Cabling Systems (SCS) wiring is defined as all required equipment and cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber cable installed and configured to provide computer data and voice connectivity.

### Point–of–Entry (POE): Unmarked Manholes/Vaults at property line

### NET–POP Rooms/MPOE (Main Point of Entry): The area where the outside plant media/carrier services appear in the facility. The NET–POP contains equipment used by owner or carrier to hand–off/transition cable from outside plant into inside plant type.

### Network Center/Main Distribution Frame (MDF) Areas: This technology space houses Layer 2/3 network switching gear and other main network distribution equipment and acts as the mid–connection point between the Core/Network and the TR/IDF/access zones for all connections.

### Telecommunications Room (TR)/Intermediate Distribution Frame (IDF): is the location for the termination of backbone cables and for termination of horizontal cables, and for the interconnection of each. The space also hosts access–layer switches and user network connections within each floor.

### Active Equipment: electronic equipment used to develop various WAN, LAN, and voice services, e.g., digital multiplexers, RS–232 controllers, Ethernet hubs, switches, routers, PBX, etc.

### Campus Backbone: cabling system consisting of media and termination hardware interconnecting POE, Net–Pop’s and Future onsite buildings.

### Building Backbone: cabling system consisting of media and termination hardware interconnecting MDFs to IDFs.

### Horizontal: cabling system consisting of media and termination hardware interconnecting the Telecommunication Outlets (TOs) and the TRs.

### Bonding: permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.

### Basket Cable Tray: A cable support and management system fabricated of continuous, rigid, welded steel wire mesh and available in many sizes with attachment hardware suiting multiple installation methods

### Cable Tray: vertical or horizontal open supports, usually made of aluminum or steel, which are fastened to the building structure. Cables are laid in and fastened to the trays.

### Cabinet: free standing, floor–mounted or wall–mounted modular enclosure designed to house and protect rack–mounted electronic equipment and passive terminations.

### Channel: The end–to–end transmission path between two points at which application specific equipment is connected; encompasses all the elements of the horizontal cabling link, plus the equipment cords in the telecommunications spaces and work area.

### Cross–Connect: equipment used to terminate and tie together communications circuits.

### Cross–Connect Jumper: a cluster of twisted–pair conductors without connectors used to establish a circuit by linking two cross–connect termination points.

### Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.

### Jack: receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight–position/eight–contact modular jacks.

### Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

### LAN: Local area network.

### Link: Horizontal cabling link encompassing all components of the horizontal cabling (TO, patch panels, blocks, jumpers and patch cords that join them in the horizontal cross–connect). It is distinguished from a channel because it does not include the equipment cables/cords at the telecom spaces or work area.

### Media: twisted–pair, and fiber optic cable or cables used to provide signal transmission paths.

### Mounting Frame: rectangular steel framework, which can be equipment rack or wall mounted to support wiring blocks, patch panels, and other communications equipment.

### Outside Plant (OSP): generally, any and all portions of the cable system that runs outside of an environmentally enclosed structure and/or building with each end terminated at different buildings. This specifically includes inter–building cables, conduits, manholes, hand–holes, and innerduct.

### UTP: Unshielded Twisted Pair.

### FO: Fiber Optic

### Passive Equipment: non–electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, patch panels, wiring blocks, fiber optic shelves, etc.

### Patch Cords: a length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross–connect.

### Patch Panel: system of terminal blocks or connectors used with patch cords that facilitate administration of cross–connect fields.

### Pathway: facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, under floor systems, overhead systems, raised floor, ceiling support wires, etc.

### Protectors: electrical protection devices used to limit foreign voltages on metallic communications circuits.

### Raceway: an enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wire ways, under floor raceways, overhead raceways and surface raceways; does not include cable tray.

### Racks: An open, freestanding, floor–mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.

### Riser Backbone: The Riser Backbone subsystem links the main cross connect (MDF) in the equipment room to the distribution rooms (TRs).

### Structured Cabling System (SCS): A SCS is defined as all required cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber optic cable installed and configured to provide computer data and voice connectivity from each data or voice device to the network file server or voice network/switch designated as the service point of the local area network.

### Telecommunication Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.

### Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

### Work Area Subsystem: The connection between the telecommunications outlet and the station equipment in the work area is provided by the Work Area Subsystem. It consists of cords, adapters, and other transmission electronics.

### Wireless Access Point (WAP): Telecom outlet designated for use with wireless network devices. Such outlet shall be mounted above ceiling.

### Contractor – The successful bidder engaged to provide the work of this specification

## REFERENCES

### Most recent editions and addenda of the following documents:

### ANSI/TIA 568 series, most recent revisions, addenda and systems bulletins. All applicable

### ANSI/TIA–569 Telecommunications Pathways and Spaces, most recent revision including all relevant addenda and systems bulletins

### ANSI/TIA–606 Administration Standard for Telecommunications Infrastructure, most recent revision including all addenda and systems bulletins

### ANSI/TIA–607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, most recent revision including all addenda and systems bulletins

### ANSI/TIA–862 Structured Cabling Infrastructure Standard for Intelligent Building Systems, most recent revision including all addenda and systems bulletins

### ANSI/TIA–942 Telecommunications Infrastructure Standard for Data Centers, most recent revision including all addenda and systems bulletins

### ANSI/TIA–1179 Healthcare Facility Telecommunications Infrastructure Standard, most recent revision including all addenda and systems bulletins

### ANSI/TIA–4966 Telecommunications Infrastructure Standard for Educational Facilities, most recent revision including all addenda and systems bulletins

### EIA/ECA-310 – Cabinets, Racks, Panels, and Associated Equipment

### TIA–TSB–162 Telecommunications Cabling Guidelines for Wireless Access Points, most recent revision including all addenda and systems bulletins

### TIA-526 Series – Standard Test Procedures for Fiber Optic Systems

### TIA-942 – Telecommunications Infrastructure Standard for Data Centers

### Telecommunications Distribution Methods Manual, most recent edition

### Information Transport Systems Installation Methods Manual (ITSIMM), most recent edition

### National Electric Codes (NEC) – all applicable

### NECA/FOA 301– Installing and Testing Fiber Optic Cables

### OSHA Standards and Regulations – all applicable

### Local Codes and Standards – all applicable

### UL444 – Standard for Safety of Communications Cable

### UL 1666 – Standard for Safety of Flame Propagation Height

### UL 2416 – Standard for Safety Auto/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems

### Local Authority Having Jurisdiction (AHJ)

### Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.

### Manufacturers’ Recommendations - Install all cabling and termination devices per the manufacturers’ recommended installation practices for the applications warranties.

### Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense.

## SYSTEM DESCRIPTION

### This document describes the products and execution requirements relating to furnishing and installing Communications Equipment Room Fittings of cabinets, racks, frames and enclosures.

## SUBMITTALS

### Engineer’s Review

#### The Engineer’s review of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the contract documents.

#### With the shop drawings, the Contractor shall include an index sheet detailing all deviations from the contract documents, and will be held responsible for all deviations, unless the Contractor has received written approval from the Engineer for the specific deviation, separate from general shop drawing approval.

#### The Engineer’s review shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

### General Component Data

#### For all products covered under this Section, the Contractor shall submit the following data for each component:

##### A Specification Section

##### The Manufacturer’s name.

##### The Manufacturer’s model and part number

## QUALITY ASSURANCE

### Standards for Materials and Equipment

#### The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from ANSI, FCC, ASTM, EIA/TIA, IEEE, NEC, NFPA, NEMA, OSHA, REA, and UL.

### Installer Qualifications

#### Refer to Section 27 05 00

## DELIVERY, STORAGE, AND HANDLING

### To prevent damage, theft, soiling, and misalignment, protect equipment during transit, storage, and handling

### The contractor shall coordinate the secure storage of equipment and materials on site, or, if no on-site storage is available, shall provide their own secure storage at the Contractor’s expense.

#### Do not store equipment where conditions fall outside the manufacturer's recommendations for environmental conditions.

#### Do not install damaged equipment. Remove environmental conditions from the site and replace damaged equipment with new equipment.

#### If off-site storage of materials is necessary, this shall be at the Contractor’s expense.

## COORDINATION

### The Contractor shall coordinate with all other trades. The Contractor will submit a schedule for the installation within 10 days of contract award

#### The schedule shall include delivery, installation, and testing for conformance to specific job completion dates.

#### At minimum, the schedule shall provide dates for the start of demolition, the completion of demolition, the installation start date, the completion of copper cabling, the completion of backbone cabling, the completion of testing and labeling, cutover, the completion of the final punch list, final inspection, and acceptance.

### Meeting Attendance and Schedule Adherence

#### The Contractor must attend all project-related meetings and adhere to schedule set by the Project Manager.

### Final Inspection

#### The Contractor is required to notify the Engineer of a proposed appointment for Final Inspection at least 72 hours before the appointment.

#### Within five working days after the final inspection, the Contractor shall send final project documentation and warranty information to the Owner and Engineer. The final project documentation shall include, but may not be limited to:

##### As-Built Drawings, in an AutoCAD format, with legible outlet address and cable paths

##### Outlet location spreadsheets

##### Warranty paperwork

##### A copy of the Final Inspection and Acceptance Signoff Sheet

##### Photos of each ER and TR

## PROJECT CONDITIONS

### Project Environmental Requirements

#### Existing Conditions

##### Verify that all conditions on the project site are acceptable for the Work specified in this Section. Prior to bid opening, notify the Consulting Engineer, in writing, of any discrepancies, conflicts, or omissions. Otherwise, correct these issues at no additional cost to the Owner.

##### Continue to monitor the project site. If conditions develop that require a variance from the Specifications or Drawings, then immediately notify the Owner in writing. Otherwise, make recommendations, submit drawings showing how the Work may be installed, and, upon approval, proceed with the necessary changes without additional cost to the Owner.

### Record Drawings

#### Keep a complete set of all telecommunications drawings in the job site office for demonstration of the actual installation work specified in this Section.

#### Use this set of drawings for no other purpose.

#### Where any material, equipment, or system components are installed differently than what is shown on the drawings, indicate the differences clearly and neatly using ink or indelible pencil.

#### Upon completion of the project, submit the record set of drawings.

## USE OF THE SITE

### Where the Owner deems it necessary to place restrictions, use the site as directed by the Owner.

### When proceeding with the work, do not interfere with the ordinary use of streets, aisles, passages, exits, or operations of the Owner. During the day, set up cones and barriers in hallways and walkways. Do not string cable down the hallways during normal hours.

### Request a hazardous materials worksheet that identifies potentially-hazardous locations. Do not proceed with any work in locations where hazardous materials are known to be. Obtain instructions from the Contractor’s Project Manager on and when to work in these areas.

### Multiple times each day, each contractor shall remove all trash and debris from the site. Before leaving the room each day:

#### The Contractor shall replace all ceiling tiles that they have removed.

#### The Contractor shall place all furniture and equipment that they have moved back into its original location.

#### The Contractor shall return any equipment that they have disconnected to working order.

#### The Contractor’s Job Foreman shall inspect all work locations to ensure that the rooms are clean and that all of the tasks described above have been done.

#### It is recommended that the Contractor inspect the site and take pictures to document the condition of the ceilings and walls.

## CONTINUITY OF SERVICES

### Take no action that will interfere with or interrupt existing building services, unless previous arrangements have been made with the Owner's representative. Arrange all work to minimize shutdown time.

### The Owner's personnel shall perform shutdown of operating systems. When shutdown of systems is required, the Contractor shall give three (3) days advance notice.

### Should building services be inadvertently interrupted:

#### The Job Foreman shall immediately notify the Project Manager of the accidental disruption of services, the remedy, and how long it will take to restore services.

#### The Contractor shall immediately furnish the labor, including overtime, the material, and the equipment necessary to promptly restore the interrupted service at no cost to the Owner.

## WARRANTY

### Refer to Section 27 05 00

# PRODUCTS

## GENERAL

### Refer to Section 27 05 00 for General Requirements

### All materials and products shall be:

#### Appropriate for the intended use

#### Permitted by the Authority Having Jurisdiction (AHJ)

### All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.

### Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.

### Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.

### All components will be approved by the Engineer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:

#### Be in compliance with the Construction Documents

#### Have fit and finish compatible with the existing surrounding structure

#### Be unobtrusive

#### Provide the required functionality

### Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.

### Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.

## SUBSTITUTION POLICY

### This is a performance-based specification developed from the experience of <<ClientName>> IT in providing exceptional solutions for all our facilities and departments. As such, substitution of specified products or systems is not allowed.

### Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

## 2-post racks

### 2-Post Racks shall have the following attributes:

#### Available in Black or White powdered coated aluminum

#### Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 516mm x 76mm).

#### Rack units numbering up from bottom to allow quick and easy location of rack mount items

#### UL listed for 1,000 lbs. load rating.

#### Double-sided #12-24 EIA universal mounting hole spacing with (24) - #12-24 mounting screws included.

#### Accepts all Panduit cable management and patch panel products in addition to any industry standard 19" components.

#### Includes paint piercing washers for assembly to assure electrical continuity between components as per TIA 607 Bonding and Grounding Standard

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved 2-Post racks part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| R2P | Standard Rack - 84” High (2134mm) 45 RU, Aluminum, (24) #12-24 thread screws, hardware kit, paint piercing bonding kit, Black |
| R2PWH | Standard Rack - 84” High (2134mm) 45 RU, Aluminum, (24) #12-24 thread screws, hardware kit, paint piercing bonding kit, White |
| RFAKIT | Rack Floor Anchor Kit |
| RFA3KIT | Raised Floor Anchor Kit |

## 4-post racks – Adjustable Rail Type

### Adjustable Rail 4-Post Racks shall have the following attributes:

#### Available in Black or White powdered coated steel

#### Independent adjustable front and rear mounting rails can be adjusted while the rack is secured to the floor.

#### Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items (shipped numbers up per TIA-606B specifications; can be set to number down by flipping the rails).

#### Available in #12-24 threaded or cage nut rails

#### Available in 23”, 30”, 36” and 42” depths

#### Rack is UL listed for 2,500 lbs. load rating

#### Rear rail construction provides a clear ventilation path for side ventilated switches

#### Multiple mounting holes in top flanges for securing ladder rack

#### Weld nut construction eliminates the need for a second wrench increasing speed and ease of assembly

#### Multiple mounting locations for vertical power strips on any of the four posts or on the adjustable mounting rails

#### Panduit PatchRunner™ 2, PatchRunner™ 2 Enhanced and NetRunner™ Vertical Cable Managers mount directly to the 4-post rack, at any of the four corners, to provide a flexible end-to-end cable management solution

#### Paint piercing washers included to electrically bond rack for simplified grounding

#### Masked and painted areas on top and bottom front-to-back braces for simplified rack grounding

#### Rack meets EIA/ECA-310-E standards

#### Compatible with vertical tie-off panel which creates a pathway for permanent link cable. The panel has expandable height to work with 42RU, 45RU, and 52RU racks.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved 4-Post racks part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| R4P | 4 Post Rack, Steel, 45 RU, 30in deep, #12-24 Threaded Mounting Holes, hardware kit and paint piercing bonding kit, Black |
| R4PCN | 4 Post Rack, Steel, 45 RU, 30in deep, Cage Nut Mounting Holes, hardware kit and paint piercing bonding kit, Black |
| R4PWH | 4 Post Rack, Steel, 45 RU, 30in deep, #12-24 Threaded Mounting Holes, hardware kit and paint piercing bonding kit, White |
| R4PCNWH | 4 Post Rack, Steel, 45 RU, 30in deep, Cage Nut Mounting Holes, hardware kit and paint piercing bonding kit, White |
| RFAKIT | Rack Floor Anchor Kit |
| RFA3KIT | Raised Floor Anchor Kit |
| V4PTOB | Vertical Tie-off Cable Management Panel, Black |
| V4PTOBWH | Vertical Tie-off Cable Management Panel, White |

## 4-post racks – adjustable depth type

### Adjustable Depth 4-Post Racks shall have the following attributes:

#### Available in Black or White powdered coated steel

#### Rack is adjustable in overall depth ranging from 23” to 42” in 0.5” increments

#### Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items

#### Available in #12-24 threaded or cage nut rails

#### Rack is UL listed for 2,000 lbs. load rating

#### Multiple mounting holes in top flanges for securing ladder rack

#### Carriage bolt and PEM stud construction eliminates the need for a second wrench increasing speed and ease of assembly

#### Multiple mounting locations for vertical power strips on any of the four posts or on the mounting rails

#### Panduit PatchRunner™ 2, PatchRunner™ 2 Enhanced and NetRunner™ Vertical Cable Managers mount directly to the 4-post rack, at any of the four corners, to provide a flexible end-to-end cable management solution

#### Paint piercing hardware included to electrically bond rack for simplified grounding

#### Masked and painted areas in all eight corners of the rack for simplified rack grounding

#### Rack meets EIA/ECA-310-E standards

#### Bonus holes in posts and front-to-back braces allow for various accessories to be mounted to the rack

#### Inward facing base angles to reduce overall footprint

#### Compatible with vertical tie-off panel which creates a pathway for permanent link cable. The panel has expandable height to work with 45RU and 52RU racks.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved 4-Post racks part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| AR4P | Adjustable Depth 4 Post Rack, Steel, 45 RU, 23in to 42in deep, #12-24 Threaded Mounting Holes, hardware kit and paint piercing bonding kit, Black |
| AR4PCN | Adjustable Depth 4 Post Rack, Steel, 45 RU, 23in to 42in deep, Cage Nut Mounting Holes, hardware kit and paint piercing bonding kit, Black |
| AR4PWH | Adjustable Depth 4 Post Rack, Steel, 45 RU, 23in to 42in deep, #12-24 Threaded Mounting Holes, hardware kit and paint piercing bonding kit, White |
| AR4PCNWH | Adjustable Depth 4 Post Rack, Steel, 45 RU, 23in to 42in deep, Cage Nut Mounting Holes, hardware kit and paint piercing bonding kit, White |
| RFAKIT | Rack Floor Anchor Kit |
| RFA3KIT | Raised Floor Anchor Kit |
| V4PTOB | Vertical Tie-off Cable Management Panel, Black |
| V4PTOBWH | Vertical Tie-off Cable Management Panel, White |

## cabinets – Switching and Patching, Net-Access™ N-Type

### Switching and Patching Cabinets shall be N-Type Cabinets 800mm wide. Cabinets also have varied depth and RU heights, listed below.

#### The N-Type Cabinet shall be used to provide a neat and efficient means for routing and protecting cables and patch cords in cabinets for network switching and patching applications.

#### The cabinet shall provide vertical cable managers, have provisions for routing cables from under floor and overhead, and shall accept 19” horizontal cable managers, and cable management accessories used throughout the cabling system.

#### The cabinet shall protect network investment by enclosing network cabling and equipment, maintaining system performance, and controlling cable bend radius.

#### Switching and patching cabinets shall have the following attributes:

##### Black or White Powder coated and constructed of steel

##### Fixed front and adjustable rear tapped equipment rails two sets

##### Available with cage nut rails

##### Dual hinge perforated front door opens to the left or right

##### Split perforated rear doors open in the middle to minimize door swing footprint

##### Inset frame for improved cable management

##### Sealed cable entry points extend from the front to back on each side of the cabinet top panel

##### Available Cool Boot® cabinet top sealing fitting for improved thermal management at cable entry points

##### Vertical split hinged side panels

##### Two sets of 6” Cable Management Fingers Included

##### Fully electrically bonded – equipment rails, door, and side panels

##### Single point bonding at top and bottom of cabinet

##### Heavy duty leveling legs can be accessed from top or bottom for faster deployment

##### Static Load Rating - 3000 lbs. & Rolling Load Rating - 2500 lbs.

##### Available in 42, 45, 48 and 51 RU heights

##### Available in 1070mm and 1200mm depths

### Available Top Cable Routing System<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved N-Type Cabinet part numbers. The part numbers and sizes listed are the number of options available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| N8212B | N-Type Network Cabinet, 800mm(W), 42RU, 1070mm(D), Black, No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, #12-24 Tapped Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| N8522B | N-Type Network Cabinet, 800mm(W), 45RU, 1200mm(D), Black, No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, #12-24 Tapped Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| N8822WC | N-Type Network Cabinet, 800mm(W), 48RU, 1200mm(D), White, No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, Cage Nut Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| N8512B | N-Type Network Cabinet, 800mm(W) x 45 RU x 1070mm(D), Black, No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, #12-24 Tapped Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| N8812B | N-Type Network Cabinet, 800mm(W) x 48 RU x 1070mm(D) Black, No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, #12-24 Tapped Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| N8222B | N-Type Network Cabinet, 800mm(W) x 42 RU x 1219mm(D), Black, , No Vertical Blanking Panel, No VED, Two Standard Side Panels, Dual Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, #12-24 Tapped Rails, Two Sets Long Cable Mgmt Fingers, No Left PDU Brackets, No Right PDU Brackets, No Integral Top Pathway, No Casters |
| NVPDUBE | N-Type PDU brackets, sold in pairs. Color: Black |
| NCSTR4 | N-Type Cabinet Casters, Two Fixed Casters for The Front and Two Swivel Casters for The Rear, Black  |
| NAKOSHPD | N-Type Cabinets OSHPD Rack Bracket Anchor Kit brings into OSHPD compliance, Black  |
| NVBP | N-Type Vertical Blanking Panels with Pass-Through Holes for Cabinets 42 RU- 48 RU, Black |
| SN8VCM | Net-Access™ Vertical Cable Management for 42RU –48RU Cabinets, 315mm (12.4”) Wide, Black |

## CABINETS – Server/Switch, Flexfusion XG™ and XGL™

**FlexFusion XG Cabinets**

### FlexFusion XG™, Server Cabinet shall be used to provide a neat and efficient means for routing and protecting cables, patch cords and power cables in cabinets for server applications

### Cabinets shall provide provisions for mounting patch panels and Power Outlet Units (POUs) vertically without blocking the area behind the servers, vertical blanking panels on the outside of the cabinet frame to prevent cold aisle air from bypassing the servers to the hot aisle

### Cabinets shall have provisions for routing cables from under floor and overhead, and shall accept 19” horizontal cable managers, and cable management accessories used throughout the cabling system

### Cabinets shall protect network investment by enclosing cabling and equipment, maintaining system performance, and controlling cable bend radius.

### Server and switch cabinets shall have the following attributes:

#### Black or White Powder coated and constructed of steel

#### Adjustable front and rear cage nut equipment rails with rail position markers(Also available in a tool-less version)

#### Single hinge perforated front door with 80% perforated opening

#### Split perforated rear doors with 80% perforated opening to minimize door swing footprint

#### Mechanical keyed door lock

#### Available 3-digit combination door handle

#### Available SmartZone™ G5 security handle with HID and keypad option

#### Top cab available with brush seal or Cool Boot Cover

#### Available Cool Boot® cabinet top sealing fitting for improved thermal management at cable entry points

#### Lift-up rear cabinet top panel for simplified PDU cable installation and

#### Horizontally split hinged Solid side panels

#### PDU Brackets

#### Tool-less cable management

#### Available 4-inch and 6-inch cable management fingers

#### Available tool-less vertical cable management panels

#### Available front to back cable management trough

#### Available vertical air dam seal kit

#### Fully electrically bonded – equipment rails, door, and side panels

#### Single point bonding at top and bottom of cabinet

#### Heavy duty leveling legs can be accessed from top or bottom for faster deployment

#### Ganging brackets

#### Floor mount brackets

#### Available with or without Casters

#### Static Load Rating - 3500 lbs. & Rolling Load Rating - 2500 lbs.

#### Available in 600mm, 700mm and 800mm widths

#### Available in 42, 45, 48 and 51 RU

#### Available in 1070mm and 1200mm depths

#### Available VED solutions for 800mm cabinets with kit(door and top cap)

#### Available pre-configured cabinets with integrated access control, intelligent infrastructure management, and intelligent power distribution with a single part orderable number.

### **FlexFusion XGL Cabinets**

### FlexFusion XGL™, Lite, Economical Server Cabinet shall be used to provide a neat and efficient means for routing and protecting cables, patch cords and power cables in cabinets for server application.

### Offered in both 600 and 800mm wide versions, 42 and 48 RU, 1070 and 1200mm deep, black and white

### Fast delivery- 2-3 weeks after receipt of order

### Accepts both combination locks and G5 Smartzone locks. Standard locks factory installed.

### Cable Management Fingers only supported on the 800mm version of the cabinets

### Static load supported is 3500lbs and Rolling load is 1000lbs.

### Uses all the same accessories as FlexFusionTM XG with the exception of the doors, side panels and fingers

### The top of cabinet includes brush cable entry points to prevent air leakage

### Cabinet is in compliance with EIA/ECA-310-E, TIA/EIA-942, UL2416

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved FlexFusion™ part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| XG64212BS0001 | FlexFusionXG™ Cabinet, 600mm (W), 42RU, 1070mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Brush Seal Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XG64822WS0003 | FlexFusion XG™ Cabinet, 600mm (W), 48RU, 1200mm (D), White, Two Standard Side Panels, Single Hinge Perforated Front Door, Split Rear Perforated Door, Cool Boot-Ready Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XG74522BS0004 | FlexFusionXG™ Cabinet, 700mm (W), 45RU, 1200mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Standard Keyed Locks, Cool Boot-Ready Top Panel, Front and Back Adjustable Cage Nut Rails, One Set Of 6-Inch Cable Management Fingers, Left PDU Bracket (1 set), Casters |
| XG74822WS0001 | FlexFusionXG™ Cabinet, 700mm (W), 48RU, 1200mm (D), White, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Standard Keyed Locks, Brush Seal Top Panel, Cage Nut Rails, No Cable Management, Left PDU Bracket (1 set), Casters |
| XG84522WS0005 | FlexFusionXG™ Cabinet, 800mm (W), 45RU, 1200mm (D), White, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Standard Keyed Locks, Brush Seal Top Panel, Front and Back Adjustable Cage Nut Rails, One Set Of 6-Inch Cable Management Fingers, Left Vertical Cable Management Panel, Left and Right PDU Brackets, Left Vertical Cable Management Panel, Casters |
| XG84829BS0006 | FlexFusionXG™ Cabinet, 800mm (W), 48RU, 1200mm (D), Black, No Side Panels, Single Hinge Perforated Front Door, Split Rear Perforated Door, Standard Locks, Cool Boot-Ready Top Panel, Front and Back Adjustable Cage Nut Rails, One Set Of 6-Inch Cable Management Fingers, Left and Right PDU Brackets, Left Vertical Cable Management Panel, Casters |
| XGL64222B | FlexFusionXGL™ Cabinet, 600mm (W), 42RU, 1200mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Brush Seal Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XGL64822B | FlexFusionXGL™ Cabinet, 600mm (W), 48RU, 1200mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Brush Seal Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XGL84222B | FlexFusionXGL™ Cabinet, 800mm (W), 482RU, 1200mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Brush Seal Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XGL84822B | FlexFusionXGL™ Cabinet, 800mm (W), 48RU, 1200mm (D), Black, Side Panels on Both Sides, Single Hinge Perforated Front Door, Split Rear Perforated Door, Brush Seal Top Panel, Standard Keyed Locks, Front and Back Adjustable Cage Nut Rails, No Cable Mgmt, Left PDU Bracket (1 set), Casters |
| XG-SPFS482B | Side Panel Kit For XG 48RU, 1200mm Deep, Black Cabinet |
| XG-FMS45B | Cable Management Finger Kit For XG 42RU and 45RU, 4-Inches Long, Black Color |
| XG-VCM48W | Vertical Cable Management Bracket For XG/XGL 48RU Cabinet, White Color |
| XG-FTBW | Front to Back Cable Management Trough For 700mm and 800mm Wide Cabinets, White Color for XG |
| XG-PBRB | PDU Mounting Bracket, Black Color for XG/XGL |
| XG-ADS7W | Vertical Air Dam Seal Kit For 700mm Wide Cabinet, White Color for XG |
| XGL-DRSH642B | FlexFusion XGL™ Door, Single Hinge, 600mm (W), 42RU, Black |
| XGL-SPFS482B | FlexFusion XGL™ Side Panel, 48RU X 48RU, Black |
| XGL-FML42B | FlexFusion XGL™ Cable Management Fingers for 42RU Cabinet, Long(6”), Black |

## Cabinet accessories - AIR-SEALING

### All raised-floor cutouts and top of cabinet knockouts, that allow communications cable to pass through, shall be equipped with a grommet that covers the inside edge of the hole.

#### The grommet shall provide sealing properties for multiple cable bundles placed anywhere within the cable cutout.

#### The grommet shall be designed to allow for new and retrofit applications.

#### The grommet assembly shall be constructed of an electrostatic-dissipative flame-retardant polycarbonate outer ring with electrostatic-dissipative flame-retardant fabric.

### Rack Unit Blanking Panels

#### Tool-Less Rack unit blanking panels shall be used for unused RU, to block the airflow or to reserve future equipment RU

##### Available in 1RU and 2RU

#### Blanking shade – shall be used for blanking unused RU from 4RU spaces up to 51RU spaces

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved Air-Sealing part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

|  |  |
| --- | --- |
| **Part Number** | **Description** |
| CTCN3X5 | Net-Access Cabinet Top Cover and Cable Protection Bezel for 3.5” x 5” Opening, Black |
| CTGN3X5 | Cool Boot® Cabinet Top Air Sealing Fitting for 3.5” x 5” Cabinet Opening, Black |
| CTGN6X6 | Cool Boot® Cabinet Top Air Sealing Fitting for 6.5" x 6.5" Net-Access Cabinet Opening, Black |
| TLBP1R-V10 | Tool-Less Blanking Panel, 1 Rack Unit, Used with Tapped Equipment Rails, White |
| TLBP2S-V | Tool-Less Blanking Panel, 2 Rack Unit, Used with Cage Nut Equipment Rails, Black |
| RFG6X8Y | Cool Boot® Raised Floor Air Sealing Grommet, Integral Mount, 6” x 8”, Navy Blue |
| FLBSIM-51 | Blanking Shade for 1-51 Consecutive Rack Units, Black |
| RFG6X8SMY | Raised Floor Air Sealing Grommet |
| XG-FSK7 | FlexFusion™ XG or XGL Front or Rear Cabinet Seal Kit, 700mm Wide |
| XG-FSEOR2 | FlexFusion™ XG or XGL End-of-Row Floor Seal Kit, 1200mm Cabinet Depth |
| N2EOR1BA1070W1 | Net-Access N-Type End-of-Row Floor Seal Kit, 1070mm Cabinet Depth, White |
| C2FAB08A1200B1 | Net-Access Front or Rear Cabinet Seal Kit, 800mm Wide, Black |

## SHELVES FOR RACKS AND ENCLOSURES

### Shelves shall be:

#### Manufactured of sheet steel

#### Have a black or white epoxy-polyester hybrid powder coat finish

#### From the same manufacturer as the enclosure

#### Have at least two points of support

#### Attach to the equipment mounting rails in the rack or enclosure so that there is support at each front corner of the shelf

#### Have a support surface that extends beyond the mounting rail (cantilever)

#### Be secured to equipment mounting rails with hardware at each attachment point

#### Fixed solid or vented

#### Of a proper size to provide support for the entire width and depth of the equipment placed on the shelf

#### Rated for the load supported

### The combined loads of equipment placed on shelves and of the shelves placed within an enclosure will not exceed the load bearing capacity of the enclosure or rack.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved Shelf part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

|  |  |
| --- | --- |
| **Part Number** | **Description** |
| RSHLF | 19” X 30” Rack Shelf for 4 Post Rack |
| SRM19FM1 | Rack Mount 19” (483mm) Front Mount Shelf 1 RU |

## Thermal Management Solutions

### Choosing the right aisle containment solution depends upon several factors, including:

#### Channeling cold air directly into the switch intake

#### Data center density

#### Uniformity of racks and aisles

#### Whether “raised floor” cooling is employed

#### Availability of a ceiling plenum to accept hot air

#### Room height

### Benefits of containment are:

#### Energy savings: Separate hot and cold air to deliver higher return air temperatures to the cooling system and allow higher room set points. Lower PUE to maintain thermal efficiency.

#### Increased reliability of IT equipment: Lower the fan speed of the switches because they are not required to operate as vigorously.

#### Ability to follow ASHRAE standards: Deploying thermal management solutions automatically allows you to meet standards requirements.

## Net Contain™ Universal Aisle Containment (UAC)

### The Net-Contain™ Universal Containment (UAC) System allows you to reclaim underutilized cooling capacity, reduce energy expense and reduce CapEx by retrofitting your existing data center with an innovative containment system. The system includes independent support structure, sliding doors, vertical blanking panels and roof structure. This offering can be configured in Hot Aisle and Cold Aisle containment and allows the addition of cabinets (Panduit or non-Panduit) of varying sizes and design as your needs dictate, reducing deployment time and capital investment

### The aisle containment system shall have the following attributes:

#### Independent floor supported containment frame structure

#### Available in Black or White powdered coated steel

#### Available in 42RU, 45RU, 48RU and 52RU frame heights

#### Aisle widths of 3-foot (900mm), 4-foot (1200mm) and 6-foot (1800mm)

#### Available Universal Single Row Containment (USRC) structure capable of sealing off against a solid room wall or cage or fence structure with cabinets installed on one side of the contained aisle.

#### Configurable to any length larger than 600mm within 100mm

#### Configurable for both Cold Aisle Containment (CAC) and Hot Aisle Containment (HAC) using common frame members

#### Containment doors frames to be available in clear or black anodized aluminum finish with a full height Polycarbonate viewing panel.

#### Compatible with different height cabinets within the same row

#### Available tool-less above cabinet blanking panels

#### Available tool-less full height blanking panels for gaps where cabinets are not installed

#### Available rigid Polycarbonate roofing system with provision to route fire suppression system into the contained aisle

#### Available with passive heat activated drop away roofing system that can be installed below fire suppression sprinkler heads if approved by local authorities having jurisdiction

#### Available with adjustable vertical wall containment capable of sealing against ceiling heights up to 169.7 inches (259.6cm) from the floor.

#### Fully bonded metal frame structure

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved NET CONTAIN™ UNIVERSAL AISLE CONTAINMENT part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog

| **Part Number** | **Description** |
| --- | --- |
| CUEFRT8W04B1 | UAC End of Row Frame, 1200mm Wide, 42 or 45 RU Height, Black  |
| CUWBPS24ST02W1 | UAC Wall Beam Pair, 2400mm Long, 2-Pieces, White  |
| CURFS08F06HBB1 | UAC Rigid Polycarbonate Roof Section, 800mm Long For 1800mm Aisle Width, Black  |
| CUCGF04DPW1 | UAC Drop Away Roofing Panel, 1200mm Aisle Width, White |
| CUVWA07S07STB1 | UAC Vertical Wall Adapter For 700mm Wide Vertical Wall, Black |
| C2HAC07I2638W1 | Vertical Wall Section, 700mm Wide, 660mm (26”) To 965mm (38”) Height, White |
| C2HACERI3866B1 | End-of-Row Vertical Wall, 1200mm Aisle Width, 965mm (38”) To 1676mm (66”) Height, Black |
| CUVWB12S12STW1 | UAC Vertical Wall Cross Aisle Brace, 1200mm Aisle Width, White  |
| CUD2SDB1 | UAC Dual Sliding Door, 1200mm Wide Door Opening, Black |
| CUTBPR0610HBN1 | UAC Above Cabinet Blanking Panel, 1000mm Wide, Height Up To 600mm, Clear |
| CUFBPR4806HBW1 | UAC Full Height Blanking Panel, 603.6mm (23.76”) Wide, 48RU Frame Height, White |
| CUCMSS03ST01NC | UAC/USRC Mid-Span Cabinet Support Post, 300mm Tall |
| CUSMPR52ST01B1 | UAC/USRC Full Height Mid-Span Floor Support Post, 42RU to 52RU Height, Black |
| CUSREFRT9W1 | USRC Single Row Containment End-of-Row Frame, 900mm (3-foot) Aisle Width, 48RU or 52RU Height, White |
| CUEFRCKITB1 | USRC To UAC End-of-Row Frame Conversion Kit For 900mm (3-foot) Aisle Width, Black |
| CUSRRFS06W1 | USRC Rigid Polycarbonate Roof Section, 600mm Long For 900mm (3-foot) Aisle Width, White  |
| CUCGF03DPB1 | USRC Drop Away Roofing Panel, 900mm (3-foot) Aisle Width, Black |
| CUSRVWA06W1 | USRC Vertical Wall Adapter, 600mm Wide, White |
| CUSRVWBB1 | USRC Cross Aisle Vertical Wall Brace, 900mm (3-foot) Aisle Width, Black |
| CUSRVWERI1626W1 | USRC End-of-Row Vertical Wall, 900mm (3-foot) Aisle Width, 406mm (16”) To 660mm (26”) Height, White |
| CUSRWSK07B1 | USRC Wall Beam to Wall Seal Kit, Used With 700mm Long Wall Beams, Black |
| CUCFS08B1 | Universal Cabinet to Floor Seal, 800mm Width, Black |

## Net - Direct™ Passive In-Cabinet Ducting - Inlet Ducting

### Net-Direct™ Passive In-Cabinet Ducting delivers cooling air directly from the cold aisle into the intake fans of switches. Inlet ducting prevents hot air recirculation within the cabinet and enables reduced inlet temperature for improved performance and cooling efficiency. Inlet ducting is used for containment systems such as VED, CAC, and HAC.

### Use for a containment application in Greenfield and Brownfield environments without disrupting existing in-cabinet equipment and cabling.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved INLET DUCTING part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| CDE1 | Cabinet Air Inlet Duct for 1 RU Cisco 4948, 4928 and 4924 Switches |
| CDE2 | Cabinet Air Inlet Duct for 2 RU Cisco Nexus N2K Switches |
| CID1RU22-23DB1 | Cabinet Inlet Duct for 1RU Cisco Nexus 9372 Switch |
| DIFBA3003S00S | Cabinet Air Inlet Duct for Cisco Nexus 93128 Switch |
| CNLTD52A2 | Cabinet Inlet Duct for Cisco 6504E Switch |
| DIFBA2002S00S | Cabinet Inlet Duct for Cisco 9396 Switch |
| DIFBA3003S00S | Cabinet Inlet Duct for Cisco 93128 Switch |
| DIRBB2007S21W |  Cabinet Air Inlet Duct for Cisco 7004 Switch |
| DIRLC9606RB1 | Cabinet Air Inlet Duct for Cisco Catalyst 9606R Switch |

## NET - DIRECT™ PASSIVE IN-CABINET DUCTING - exhaust DUCTING

### Net-Direct™ Passive Cabinet Exhaust Ducting routes exhaust air from the side exhaust of the switch into the hot aisle, preventing hot air from mixing with cooling air within the cabinet for improved switch performance and cooling efficiency. Exhaust ducts are used for traditional hot and cold aisle applications. Net-Direct™ Passive Cabinet Inlet and Exhaust Ducting are Cisco certified.

### Use for a non-containment application in Greenfield and Brownfield environments without disrupting existing in-cabinet equipment and cabling.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved EXHAUST DUCTING part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| DERLCC7009A | Exhaust Duct for Cisco 7009 Switch  |

## Wall MOUNT Cabinets

### The Wall Mount Cabinet shall be used to provide a neat and efficient means for routing and protecting cables and patch cords in cabinets for network switching and patching applications.

### The cabinet shall have provisions for routing cables from above or below, and shall accept 19” horizontal cable managers, and cable management accessories used throughout the cabling system.

### The cabinet shall protect network investment by enclosing network cabling and equipment, maintaining system performance, and controlling cable bend radius.

### Wall Mount Cabinets shall have the following attributes:

#### Black Powder coated and constructed of steel

#### Adjustable tapped equipment rails

#### Removable and reversible front windowed or perforated door

#### Hinged rear section for easy access to equipment

#### Removable side panels capable of accepting fan kit accessories

#### Lockable front door, rear section, and side panels

#### Fully electrically bonded – equipment rails, door and side panels when using the grounding accessory kit

#### Load Rating - 250 lbs. minimum

#### Available in 12, 18, and 26 RU

#### Available in 25” and 30” depths

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved WALL MOUNT CABINET part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| PZWMC12W | Wall Mount Cabinet, 12RU, 25” deep, windowed front door |
| PZWMC12P | Wall Mount Cabinet, 12RU, 25” deep, perforated front door |
| PZWMCGK | Grounding Kit for Wall Mount Cabinets |
| PZCFK | Fan Kit for Wall Mount Cabinets, 51 cfm |
| PZWMCFKHF | High Flow Fan Kit for Wall Mount Cabinets, 120 cfm |

## zone enclosures

### TrueEdge Vertical Wall Mount Enclosure shall mount active equipment vertically in a low-profile, on-wall configuration.

* + - 1. The enclosure shall be capable of mounting up to 36” of active equipment and provide room for patching.
			2. The equipment brackets shall be adjustable for accommodation of server and/or switch applications.
			3. The enclosure shall be engineered to allow proper ventilation for use with various networking equipment
			4. The enclosure shall be UL2416 certified
			5. The enclosure shall withstand a max 400lb static load rating
			6. The enclosure is offered in 3RU, 6RU, and 9RU.
			7. The enclosure shall have a removable top and bottom for easy installation and equipment access
			8. The enclosure shall be compatible with filter kits that make the enclosure NEMA 1

### Consolidation Point configurations shall be implemented in open office applications where the office area is split into zones and the cabling system utilizes short runs from an intermediate connection to facilitate frequent moves, adds and changes (MACs) as specified per TIA/EIA-568-C. The consolidation point equipment will be chosen to match the horizontal cabling medium and performance category. The same manufacturer shall provide the modular connectors and patch cords.

### A Consolidation Point (CP) serves as a connection between horizontal cabling and the work area cabling, especially in modular furniture pathways. Consolidation Points are not a user interface and preferred for applications where moves are anticipated. No more than one CP are allowed in each horizontal cable run. The recommended location of the CP is greater than 15 meters from the Telecommunications Closet (TC) to reduce Near-end Cross Talk (NEXT). Each CP shall be easily accessible, permanently mounted and serve no more than 12 work areas.

### Consolidation Points shall use ZONE CABLING BOXES to separate the barriers of plenum and non-plenum environments and the workspace.

### In-ceiling boxes shall have the following attributes:

#### UL Listed

#### Approved for use in environmental air handling spaces

#### Compatible with 2' x 6', 2' x 4' and 2' x 2' ceiling grids

#### Shall hold active equipment up to 3 RU and passive hardware up to 6 RU

#### Include 2-keyed locks for security

### All zone boxes shall support standard 19" patch panels and are plenum rated.

### Cable entry and exit openings shall accommodate 96 four-pair UTP cables.

### The boxes shall be made of aluminum or steel.

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved ZONE ENCLOSURES part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** | **Max Number of Rack Units** |
| --- | --- | --- |
| WME3BL | PanZone® TrueEdge Vertical wall mount enclosure. 3RU active with 3RU passive rails. 42”H x 28.6”W x 9.5”D | 6 |
| WME6BL | PanZone® TrueEdge Vertical wall mount enclosure. 6RU active with 6RU passive rails. 42”H x 28.6”W x 14.8”D | 12 |
| WME9BL | PanZone® TrueEdge Vertical wall mount enclosure. 9RU active with 9RU passive rails. 42”H x 28.6”W x 20”D | 18 |
| WME3BL-FKIT | PanZone® TrueEdge Vertical Wall Mount Enclosure 3RU Filter Kit | N/A |
| WME6BL-FKIT | PanZone® TrueEdge Vertical Wall Mount Enclosure 6RU Filter Kit | N/A |
| WME9BL-FKIT | PanZone® TrueEdge Vertical Wall Mount Enclosure 9RU Filter Kit | N/A |
| CPB24BL | PanZone® 24 Port, Consolidation Point Box with removable top cover. Accepts 1RU of 19” passive panels. Mountable on-wall, In-ceiling, or under floor. | 1 |
| CPB48BL | PanZone® 48 Port, Consolidation Point Box with removable top cover. Accepts 1RU of 19” passive panels. Mountable on-wall, In-ceiling, or under floor. | 2 |
| PZICEA | PanZone® active In-Ceiling Enclosure with hinged door gas-assist air cylinders, accepts up to 2 RU of active equipment and 6 RU of standard 19 patch panels, includes mounting brackets and integrated horizontal slack manager, fan assembly, air dam, keys for locking latch, and electrical junction box | 8 |
| PZICE | PanZone® Passive In-Ceiling Enclosure, with hinged door gas-assist air cylinders accepts up to 8 RU of standard 19in patch panels, includes mounting brackets, integrated horizontal slack manager, keys for locking latch | 8 |

## Zone Racks – 2-Post Overhead distribution racks

### The overhead distribution rack shall provide RU space for patching above the rack or cabinet in a data center or telecommunications room.

### Overhead Distribution Rack expands rack space above a rack or cabinet to maximize space in data centers and telecommunication rooms. The Rack can be mounted to Panduit Wyr-Grid, most industry ladders or suspended from the ceiling in numerous configuration

### PANZONE™ Overhead Distribution Racks shall be made of steel and have a universal mounting bracket set to be capable of mounting to the Panduit Wyr-Grid, overhead ladder rack or basket tray

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved 2-POST OVERHEAD RACK part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| PZLRB2U | Overhead 2-Post Distribution Rack Steel, 2 RU, Black |
| PZLRB4U | Overhead 2-Post Distribution Rack Steel, 4 RU, Black |
| PZLRB6U | Overhead 2-Post Distribution Rack Steel, 6 RU, Black |
| PZLRB8U | Overhead 2-Post Distribution Rack Steel, 8 RU, Black |

## ZONE RACKS – 4-POST OVERHEAD DISTRIBUTION Racks

### The overhead distribution rack shall provide RU space for patching above the rack or cabinet in a data center or telecommunications room.

### Overhead Distribution Rack expands rack space above a rack or cabinet to maximize space in data centers and telecommunication rooms.

### Unit will mount to strut type structural steel suspended on threaded rod from the ceiling. Unit does NOT mount to overhead Wyr-Grid, ladder rack or basket rack

### 4-Post Overhead Distribution Racks shall have the following attributes:

#### Available in 6 RU and made of steel

#### Capable of accepting 19” wide EIA equipment

#### Mounting rails shall have tapped #12-24 style mounting and shall have rack unit markings

#### Rack shall be front to back adjustable to accommodate a variety of equipment depths, Adjusts from 18" (457mm) to 30" (762mm) deep

#### Optional vertical cable managers

#### Support up to 150 lbs. of equipment

### <<ClientName>> approved Manufacturer:

#### Panduit

### <<ClientName>> approved 4-POST OVERHEAD RACKS part numbers. The part numbers and sizes listed are a small subset of the number available. For additional information, contact Panduit customer service or refer to the current parts catalog.

| **Part Number** | **Description** |
| --- | --- |
| PZLRB4P6 | Four-post Overhead Rack, 6RU, adjustable equipment rail depth,18in (457mm) to 30in (762mm), Steel, Black |
| PZLRB4P6LR | 6 RU Vertical Manager, Set of 2, Dimensions: 2.5” x 4.5” |
| PZLRB4P6SR | 6 RU Vertical Manager, Set of 2, Dimensions: 1.0” x 3.5” |

## 1.1 WALL MOUNT RACK – ADJUSTABLE DEPTH WALL MOUNT RACK

1. The Adjustable Depth Wall Mount Rack shall have the following attributes
2. Available in Black powdered coated steel and available in 9, 12, and 18 RU
3. Rack meets EIA/ECA-310-E standards and capable of accepting 19” wide EIA equipment
4. The adjustable wall mount rack supports equipment mounting depths from 18", 21.5", and 25"
5. Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items.
6. Available with #12-24 threaded rails.
7. ETL approved, meets UL2416, 9RU and 12RU Support up to 150 lbs. of equipment and the 18 RU supports up to 200 lbs. of equipment.
8. Paint piercing hardware included to electrically bond rack for integrated / simplified grounding.
9. Masked and painted areas in multiple corners of the rack for simplified rack grounding
10. Capable of single person installation.
11. Provisions for routing and securing cables and shall accept 19” horizontal cable managers, and cable management accessories used throughout the cabling system.
12. <<ClientName>> approved Manufacturer:

1. Panduit

1. <<ClientName>> approved WALL MOUNT RACK part numbers.

|  |  |
| --- | --- |
| **Part Number** | **Description** |
| AWMR9 | 9RU Wall Mount Rack, Adjustable Depth, Threaded Rails, Black |
| AWMR12 | 12RU Wall Mount Rack, Adjustable Depth, Threaded Rails, Black |
| AWMR18 | 18RU Wall Mount Rack, Adjustable Depth, Threaded Rails, Black |

# EXECUTION

## GENERAL

### Upon completion of the work, a Registered Communications Distribution Designer (RCDD) shall submit as-built Drawings to the Owner and to the Engineer.

### Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding, and support hardware, etc. needed to facilitate the installation.

### Furnish any special installation equipment or tools necessary to properly complete the installation.

### All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.

### All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact locations of the racks, cabinets, enclosures and cable mangers. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

## Racks 2-POST & 4-POST

### Before placing any racks, frames, or cabinets, verify that all required power, circuit breakers, building grounding electrode system access, and floor space is in accordance with the contract Drawings.

### Where applicable, place each rack or enclosure to allow any floor tiles immediately adjacent to the rear and sides to be removed.

### Racks shall be placed with a 36-inch (minimum) clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

### In spaces that have access flooring installed, attach all racks to the structural floor as follows:

#### Place the rack.

#### Drill through the access floor panel beneath the rack at the four anchor points.

### Fasten the rack to the structural floor with 3/8 inch or larger threaded rod, or as required by local codes, and appropriate anchors and hardware. Threaded rod should protrude no more than 2 inches above the base of the rack.

### For sites without access flooring, fasten enclosures directly to the structural floor at the four anchor points provided by the manufacturer, using appropriate methods and materials to provide a secure, steadfast installation.

### Fasten racks together at three or more evenly-spaced points along the adjoining side using manufacturer-provided or manufacturer-approved bolts, nuts, and lock-washers.

### Horizontally stabilize all equipment racks and bays using materials and methods listed as appropriate for the intended use. Place horizontal stabilizing on at least the first and last racks in a bay and on every second rack. Maximum spacing between horizontal bracing shall be 48 inches.

### On the front and rear of each rack and enclosure, place a machine-generated self-adhesive white label with the identifier, indicated on the Contract Drawings, in black 1” black block letters, Refer to Section 27 05 53 for further labeling instructions.

### Assemble relay racks according to manufacturer’s instructions. Before attaching the rack to the floor, verify that the equipment mounting rails are the proper size for the rack-mount equipment.

### Attach all racks to the floor in four places using appropriate floor-mounting anchors.

### Bond racks to the Secondary Bonding Busbar (SBB) or Mesh-BN using appropriate hardware provided by the Contractor. The ground shall meet TIA 607-C, local code requirements and shall be approved by the Authority Having Jurisdiction (AHJ).

### Cable runway may be attached to the top of the rack, to deliver cables to the rack, but do not drill the rack to attach the runway. Use appropriate hardware from the cable runway manufacturer.

### Evenly distributed and uniformly distribute the equipment load on the rack. Place large and heavy equipment towards the bottom of the rack. Secure all equipment to the rack with equipment mounting screws.

### All racks shall be grounded to the telecommunications ground bus bar in accordance with Section 27 05 26.

## Floor mounted cabinet ENCLOSURES

### Provide all components of the cabinet system (cabinet, front and rear doors, side panels, mounting rails, cable managers, power strips, and accessories) as specified elsewhere in this Section and other referenced sections.

### Position the cabinet so that the front and rear doors and the cabinet body (as applicable) can be fully opened without being obstructed by other building, storage, or architectural components.

### Follow the manufacturer’s installation instructions when securing the cabinet to the floor, wall, and backboard.

### On floor-supported cabinets, the wheeled base must contact the floor. The wheeled base should not be removed or omitted from the installation.

### If the cabinet is not attached to the wall, then the floor, shelf, or tabletop surface on which the cabinet is placed must be able to support the combined weight of the cabinet and the equipment it houses.

### Do not attach the cabinet to gypsum wall board. The cabinet must be attached directly into studs through a ¾ inch (19 mm) plywood backboard. The cabinet may be attached to a masonry wall if the installer provides the hardware. Use included hardware, or the appropriate hardware as defined by local code or the authority having jurisdiction. When installed, the top of the cabinet should be no more than 2.1 m (84 inches) above the finished floor.

### Cables shall enter and exit the cabinet through conduit knockouts in the top and/or bottom of the cabinet. When cables pass through a conduit knockout but are not enclosed in conduit, use edge-protection grommets on conduit knockouts.

### Before installing equipment in the cabinet:

#### Install and adjust the position of all accessories, including vertical cable managers, power strips, equipment-mounting rails, fan kits, lights, etc.

#### Verify that fans, lights, and power strips work prior.

### If shelves are used, they may be installed with the equipment.

### Evenly and uniformly distribute the equipment load within cabinet enclosures. Place large and heavy equipment towards the bottom of the cabinet enclosure. Secure all equipment to the rack with equipment mounting screws.

### Provide a telecommunications bond for equipment in the cabinet.

### Attach a vertical busbar to the equipment mounting rails to provide electrical continuity from the equipment to the SBB or Mesh-BN through the enclosure.

### The ground shall meet TIA 607-C, local code requirements and shall be approved by the Authority Having Jurisdiction (AHJ).

### For additional Grounding and Bonding instructions, refer to Sections 25 05 26

## Floor Supported Aisle Containment Enclosures

1. Provide all components of the aisle containment system, including structural frame, doors, blanking panels, roofing and vertical walls, from a single manufacturer.

### Installation shall be coordinated by installers for alignment with Fire Sprinkler System (wet and dry) heads.

### Installation shall be coordinated by contractor to align containment systems and components with supply and return air grilles.

### Installing contractor to coordinate with ceiling and flooring installation teams to align with floor and or ceiling grid for airflow and other systems (lights, sprinkler heads, fire/smoke detectors, overhead cable tray, overhead power systems, etc.).

### Install the aisle containment enclosure system per manufacturer’s installation instructions. System frame must be secured to the floor using raised floor mount hardware provided by the manufacturer or secured to solid floor using appropriate anchoring hardware provided by the contractor.

### Containment enclosure shall be fitted to match the height of the tallest equipment cabinets that will be installed within the containment enclosure.

### Above cabinet tool-less blanking panels are to be installed above any equipment cabinets that are shorter than the tallest cabinet used to determine the frame height.

### Full height tool-less blanking panels shall be used to fill full height gaps between the floor and the containment frame in places where equipment cabinets are not installed.

### Install aisle containment door using the manufacturer’s installation instructions using manufacturer provided hardware. Door shall be secured to the end-of-row frames structure.

### Contractor is to ensure that all gaps between the containment enclosure and equipment cabinet and rack enclosures are sealed to prevent bypass airflow between the contained aisle and the non-contained aisle.

## ZONE ENCLOSURES

### Wall-Mounted Passive and Active Equipment Zone Enclosures

### Install zone enclosures in compliance with the manufacturer’s instructions.

### Install enclosures square and plumb

### Install enclosures away from obstructions so that the door can be opened fully without being obstruction by other building, storage, or architectural components.

### Mount zone enclosures at convenient working heights.

### Secure zone enclosures, at all manufacturer-provided mounting points, using mechanical fasteners that are appropriate for the material on which the enclosure is being mounted.

### Provide all blocking required to make sure that the enclosure can support the maximum design load.

### Only route cable through manufacturer-supplied points.

### Bond the enclosure to the TBB in accordance as instructed by the manufacturer.

## Ceiling-Mounted Active and Passive Equipment Enclosures

### Attach the enclosure to the ceiling so that the access door can be fully opened without being obstructed by other building, storage, or architectural components.

### Install the enclosure as close as is practical to the center of the cabling zone as shown on the Drawings. Position the enclosure so that it can be accessed without moving furniture and so that disturbance of the workspace is minimized.

### Install the enclosure where the ceiling space is of sufficient height.

### Follow the manufacturer’s installation instructions when securing the enclosure to the ceiling and when installing equipment.

### Attach the enclosure to building structure with threaded rods. Do not use the drop-ceiling grid (T bars) or tiles to support the enclosure unless the enclosure is provided with brackets specifically for this purpose.

### Secure the enclosure to building structure with 3/8” hardware or appropriate hardware as defined by local code or the authority having jurisdiction.

#### Auxiliary framing may be required to position the enclosure as desired.

#### The body of the enclosure should be above the drop ceiling tiles.

#### The access door of the enclosure should be flush with the drop ceiling grid.

#### Seal cable ports with foam sealing kits according to the manufacturer’s instructions for plenum ceilings used as air handling spaces.

## Consolidation Point Boxes

### Position the consolidation point box where the tile over the enclosure can be fully opened without being obstructed by other building, storage, or architectural components.

### Position the box as close as is practical to the center of the cabling zone, as shown on the Drawings. Position the enclosure so that it can be accessed without moving furniture and so that disturbance of the workspace is minimized.

### Prior to installation make sure that the floor space provides sufficient depth for the enclosure.

### Follow the manufacturer’s installation instructions when securing the enclosure to the floor or raised floor pedestals and when installing equipment.

### The body of the enclosure shall be below the raised floor tiles so that the floor tile above the enclosure can serve as the enclosure’s cover and will be flush with the floor.

### Seal cable ports with foam sealing kits according to the manufacturer’s instructions for raised floor plenums used as air handling spaces.

## AIR-SEALING GROMMETS

### Select a location for installation where there are no obstacles.

### Select a location for floor tile cutouts that are in compliance with the floor tile manufacturer’s requirements.

### When cutting the floor tile for placement of the enclosure, make sure that the location does not compromise the strength or integrity of the tile.

### To ensure a pathway to ground to prevent the buildup of an electrostatic charge, secure the outer ring to the raised floor with the self-tapping screws provided.

### Install grommets in compliance with the manufacturer instructions.

END OF SECTION 27 11 16