

SECTION 28 21 29  
DATA COMMUNICATIONS SWITCHES AND HUBS  
(Part of the Work for Section 260001)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the GENERAL REQUIREMENTS AND COVENANTS - DIVISION I, and the SPECIAL PROVISIONS - DIVISIONS IIA and IIB, which are hereby made a part of this Specification Section.
- B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 TRADE CONTRACT REQUIREMENTS

- A. Work of this Section is part of the Electrical Trade Contract. Refer to Section 26 00 00 "Electrical Trade Contract Requirements" for additional information about this Trade Contract.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

- A. Section Includes:
  - 1. Managed Ethernet switches.
  - 2. Termination blocks and patch panels.
- B. Related Sections:
  - 1. Section 08 71 00 Door Hardware
  - 2. Division 21 Fire Suppression
  - 3. Division 26 Electrical
  - 4. Division 27 Communications
  - 5. Division 28 Electronic Safety and Security

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- B. Field Test Reports:
  - 1. Upon completion and testing of the installed system, test reports shall be submitted in booklet form and electronic media showing field tests performed on, and adjustments made to each component and field tests performed to prove compliance with the specified performance criteria.
  - 2. Indicate and interpret test results in written form and verbally to Engineer for compliance with performance requirements at a pre-scheduled meeting.

## 1.6 REFERENCES

### A. Abbreviations and Acronyms

1. PoE: Power over Ethernet.
2. DTE: Data Terminal Equipment.
3. MDI: Media Dependent Interface.
4. PSE: Power Sourcing Equipment.
5. PD: Powered Device.
6. BTU: British Thermal Unit

### B. Reference Standards

1. Underwriters Laboratories, Inc. (UL):
  - a. UL Standards and requirements listed.
2. Federal Communications Commission (FCC):
  - a. FCC Part 15, Class B digital device compliance.
3. Institute of Electrical and Electronic Engineers (IEEE):
  - a. IEEE Std 802.3 - Ethernet based LAN, (Ethernet).
  - b. IEEE Std 802.3u - 100 Mb/s (Fast Ethernet), Type 100base-T.
  - c. IEEE Std 802.3ab - 1000 Mb/s Operation over copper, Type 1000Base-T.
4. IEEE Std 802.3af - Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI), Power-over-Ethernet (PoE).
  - a. IEEE Std 802.3at – Power over Ethernet (PoE+)

## 1.7 REQUIREMENTS

### A. Minimum Functional Requirements

1. Power over Ethernet
  - a. Switchable PoE on ports
  - b. Switches without individual control of port PoE power shall not be accepted.
2. Port speed configuration:
  - a. Individually configurable per port
  - b. Detect and Auto-Negotiate
3. Duplex Mode
  - a. Individually configurable per port
  - b. Detect and Auto-Negotiate
4. Auto MDI and MDIX
  - a. Switches requiring separate crossover Ethernet cables shall not be accepted.
5. Layer 2 managed switching

6. Port Mirroring
  7. Multiple Configuration methods:
    - a. Web browser interface
    - b. Software application via direct USB connection
  8. Front panel port label
- B. PoE
1. General
    - a. PoE and PoE+ enabled ports: As required
  2. Power

Switch shall meet or exceed the following:

    - a. Internal PoE power supply: 255 watts (total for ports combined)
    - b. IEEE 802.3at Type 1, Class 0-3
      - 1) Maximum power per port: 15.4 watts
      - 2) Supported by ports simultaneously.
    - c. IEEE 802.3at Type 2, Class 4
      - 1) Maximum power per port: 34.2 watts
      - 2) Supported by ports up to the maximum power capability of the main PoE power supply.
  3. PoE Parameters
    - a. PoE enabled ports shall individually support the following:
      - 1) Force On mode: PoE power is forced to ON for use with PDs that do not meet IEEE PoE requirements.
      - 2) Enable: Enable PoE power to selected port.
      - 3) Enable on Boot: Enable PoE power to selected port on switch boot.
      - 4) Allocated Power: a predetermined PoE power level in watts is allocated from the overall available PoE power supply total.
- C. Control Processor Accessible PoE Parameters
1. The following parameters shall be available to remote control processor.
    - a. PoE power: Enable/Disable
    - b. PoE ports shall be capable of individual PoE power control via remote control processor.
    - c. Switch shall provide status feedback.
    - d. PoE state at switch boot up
- D. Control Processor Accessible PoE Status Feedback
1. Link Status: Good/Down

2. Data Transmission: Full/Half Duplex
  3. Link Speed
  4. PoE device connected
  5. Port PoE power usage in milliwatts
  6. Port PoE power allocated in milliwatts
  7. Port Poe power class
- E. Connectors
1. Ethernet 10/100/1000Base-T ports
    - a. Number of built-in ports: 16
    - b. Connector:
      - 1) Female RJ-45
  2. Power
    - a. Number of connectors: 1
    - b. Connector Type:
      - 1) IEC C14 Appliance Inlet
  3. Chassis Ground
    - a. Number of connectors: 1
    - b. Connector Type:
      - 1) Single 6-32 screw
  4. USB
    - a. Number of connectors: 1
    - b. Connector:
      - 1) USB Type-B female
- F. Front Panel Indicators
1. The following LED indicators shall be provided on the front panel of switch chassis:
    - a. Device Power Status
    - b. Port Speed and Status, one indicator for each port
    - c. Port Activity, one indicator for each port
    - d. Port PoE Status, one indicator for each port
- G. Rear Panel Indicators
1. The following LED indicators shall be integrated into each RJ-45 port
    - a. Port Speed and Status
    - b. Ethernet port activity

H. Power Requirements

1. Internal auto-sensing power supply
2. Voltage:
  - a. Minimum: 100 VAC
  - b. Maximum: 240 VAC
3. Frequency:
  - a. Minimum: 50 Hertz
  - b. Maximum: 60 Hertz
4. Current:
  - a. Minimum Current: 1.6 Amps
  - b. Maximum Current: 3.5 Amps

I. Enclosure

1. Dimensions:
  - a. Height:
    - 1) 1.73 inches (44 mm)
  - b. Width
    - 1) 17.28 inches (439 mm) rack mounting ears removed
    - 2) 19.0 inches (843 mm) rack mounting ears attached
  - c. Depth
    - 1) 10.06 inches (256 mm)
  - d. Weight
    - 1) 6.4 pounds (2.9 kg)
2. Mounting
  - a. Standard 19-inch rack mountable, 1 rack units high.
  - b. Rack mounting ears shall be removable for free standing applications.
3. Ventilation
  - a. Fan cooled
  - b. Vented side panels

J. Environmental

4. Operating Temperature:
  - a. 32-104 degrees Fahrenheit (0-40 degrees Celsius)
5. Humidity:
  - a. 10-90 percent Relative Humidity (non-condensing)
6. Heat Dissipation:

a. 171 BTU/hour

K. Category 6A modular patch panels

1. Patch panels shall accept Category 6A modular jacks with IDC connector terminations on rear.
2. The patch shall have electrical performance guaranteed to meet or exceed TIA/EIA 568-C.2 Category 6A and ISO/IEC 11801 Class EA component and channel specifications.
3. The panel shall be available in flat and angled 24-port 1RU and 48-port 1RU and 2RU configurations.
4. Each modular jack in the panel shall come with universal A/B labeling and IDC termination that ensures 22 to 26 AWG cable conductors are fully terminated by utilizing a termination cap design and terminates to the modular jack through a smooth forward motion without impact on critical internal components for maximum reliability.
5. Each modular jack shall be 100% performance tested, capable of being re-terminated up to 20 times and identified with the performance level and with a individual serial number for traceability.
6. The panel shall have a black powder finish over high-strength steel.
7. The panel shall have a labeling option to comply with TIA/EIA-606-A.
8. The panel shall be equipped with a removable rear mounted cable management bar
9. The panel shall be UL listed and UL-C certified.
10. The panel shall support network line speeds in excess of 1 and 10 gigabit per second and be backward compatible with Category 6, 5e, 5 and 3 cords and cables.
11. The Category 6A modular jack panels shall meet or exceed the Category 6/Class E standards requirements in ISO/IEC 11801, TIA/EIA-568C and shall be UL Listed.
12. The panels shall be rack mountable.

1.8 DESCRIPTION OF WORK

A. General Requirements

1. The Owner shall procure and install non-PoE, PoE, PoE+ and Ethernet switches as required.
2. The Security Subcontractor shall procure and install patch panels.
3. Provide labor, materials, tools, equipment, and services for a complete security system as indicated and in accordance with provisions of the contract documents.
4. Although such work is not specifically indicated, provide and install supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
5. Comply with the provisions of Division 1 for General Requirements.
6. In the event of a conflict between the provisions of this Section and Division 1, the more stringent provisions shall apply.
7. System devices and components included shall be compatible.

8. Units of the same type of equipment shall be products of a single manufacturer. Material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place.

9. Network switches shall be interconnected via multi-mode fiber SFP ports.

#### 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2 years experience installing similar equipment.
- B. Units of the same type of equipment will be products of a single manufacturer. Material and equipment will be new and currently in production. Each major component of equipment will have the manufacturer's model and serial number in a conspicuous place.

#### 1.10 WARRANTY

- C. Manufacturer's Warranty: Submit manufacturer's standard warranty.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's labeled packages. Store and handle in accordance with manufacturer's requirements, in a facility with environmental conditions within recommended limits.

#### 1.12 PROJECT CONDITIONS

- A. Inspect locations where installation work will be performed and verify that conditions found are in accordance with the Contract Drawings and are acceptable for installation work. Report discrepancies in writing to the Engineer requesting clarification.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Network Switches
  - 1. Cisco
  - 2. D-Link
  - 3. Netgear
  - 4. Or Approved Equal
- B. Patch Panels
  - 1. Hubbell
  - 2. Ortronics
  - 3. Panduit
  - 4. Or Approved Equal
- C. Patch Cables
  - 1. Shall be provided by the patch panel, outlet, wire or cable manufacturer
- D. Cable Management
  - 1. Shall be provided by the panel manufacturer

2.2 EXECUTION

A. INSTALLATION REQUIREMENTS

1. The Security Subcontractor shall carefully follow instructions in documentation provided by the manufacturer to ensure steps have been taken to provide a reliable, easy-to-operate system.
2. Equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.

2.3 PROTECTION

- A. Protect installed system from damage during construction.

END OF SECTION