

SECTION 275116 - INTERCOM / PUBLIC ADDRESS SYSTEMS

Addendum No. 1 - 2.1.A; 2.5.A.1 through 2.5.A.12; 2.6; 2.7; 2.8

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes equipment, accessories, and materials to provide a complete and operational system for paging, building wide announcements, bell schedule tones, and life safety warnings

1.3 DEFINITIONS

- A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.
- B. VU: Volume unit.
- C. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. The specific item proposed and its area of application shall be marked on the catalog cut sheets.
- B. Shop Drawings: Power, signal, and control wiring.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Console layouts.
 - 4. Control panels.
 - 5. Rack arrangements.
 - 6. Calculations: For sizing backup battery.
 - 7. Wiring Diagrams: For power, signal, and control wiring.
 - a. Identify terminals to facilitate installation, operation, and maintenance.
 - b. Single-line diagram showing interconnection of components.
 - c. Cabling diagram showing cable routing.
 - d. Clearly differentiate between portions of wiring that are manufacturer installed and portions that are field installed.
- C. Delegated-Design Submittal: For supports and seismic restraints for control consoles, equipment cabinets and racks, and components indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of supports and seismic restraints for control consoles, equipment cabinets and racks, and components.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installing Contractor showing factory authorized certification as an authorized distributor.
- B. Qualification Data: For Installer showing factory authorized training.
- C. Seismic Qualification Certificates: For control consoles, equipment cabinets and racks, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Include qualification data for testing agency.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For public address systems to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in "Closeout Procedures" and "Operation and Maintenance Data," include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to operating console location.
 - c. Training plan.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Microphone: One.
 - 2. Microphone Desk Stand(s): One.

1.9 QUALITY ASSURANCE

- A. The system shall be supplied by a manufacturer's authorized contractor who is qualified in the proper installation, operation, and service of the system.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.10 WARRANTY

- A. The contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within one year from date of installation, repair or replace any equipment found to be defective. This warranty shall not apply to any equipment that has been

subject to misuse, abuse, negligence, accident, or unauthorized modification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The existing equipment is manufactured by Bogen Communications and is a Bogen Multicom Quantum IP system. The existing equipment will need modification to accommodate the expansion and modifications in this project. All equipment shall be by Bogen Communications. Existing equipment will be upgraded to the latest Bogen Nyquist Platform and shall be backwards compatible with all existing field wiring and speakers, any new components required to perform this upgrade shall be included for a complete and functions system.
- B. Where equipment is specified herein or on drawings, by manufacturers' names or numbers, this shall denote the Design Basis for the preferred alternate bid and the minimum requirements as to quality, type, capacity, function, and performance.
 - 1. Where a specific model may have been discontinued, the manufacturer's intended replacement shall be substituted. Such substitutions shall be identified in the submittals.
- C. Source Limitations: Obtain public address system from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. System Functions:
 - 1. Selectively connect any zone to any available signal channel.
 - 2. Selectively control sound from microphone outlets and other inputs.
 - 3. "All-call" feature shall connect the all-call sound signal simultaneously to all zones regardless of zone or channel switch settings.
 - 4. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
 - 5. Produce a program-signal tone that is amplified and sounded over all speakers, overriding signals currently being distributed.
 - 6. Reproduce high-quality sound that is free of noise and distortion at all loudspeakers at all times during equipment operation including standby mode with inputs off; output free of nonuniform coverage of amplified sound.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports and seismic restraints for control consoles, equipment cabinets and racks, and components, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Supports and seismic restraints for control consoles, equipment cabinets and racks, and components shall withstand the effects of earthquake motions determined according to the North Carolina State Building Code.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."

2.4 SYSTEM DESCRIPTION

- A. Compatibility of Components: Coordinate component features to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- B. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.
- C. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch (483-mm) housing complying with EIA/ECA-310-E.
- D. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.5 SYSTEM PARAMETERS

- A. The contractor shall supply and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating IP-Based Communications System including but not limited to:
 1. The platform shall provide complete Nyquist E7000 intercom and employ state of the art IP Technology including the minimum functions listed.
 - a. Intercom call between staff locations and classrooms with Unlimited Station capacity
 - b. Interactive Facility Maps
 - c. User customizable Announcements with priority
 - d. Text-to-Speech Announcements
 - e. Emergency Classroom Check-In can be used to enhances campus security
 - f. Emergency or Normal Announcements are capable of being recorded and activated by a speed dial on an administrative console, DTMF, wireless panic button, mobile app, web browser or external IP networked system using HTTPS URL-based Application Programming Interface (API)
 - g. Internal clock is synchronized with NTP network time server whether on the LAN, WAN or Internet keeping the Scheduled events (Bells) and Announcements accurate within milliseconds.
 - h. Audio distribution allow for scheduled or manually activated audio to be activated from the Admin Web UI, contact closure, Admin phone and/or by use of Routines
 - i. Unlimited Schedules
 - j. Unlimited Time, Paging, and Audio Zones
 - k. Unlimited Page Stacking/Queueing
 - l. Unlimited Scheduled events
 - m. Unlimited Scheduled Audio events
 - n. Integrated Internet Radio Source
 - o. Email Notifications and Alerts the system can send an email with a system event, contact closure, or when a Routine has been activated to name a few
 - p. Supervised Station Status system can be setup to send an email when a Nyquist device goes offline.
 - q. Clock / Messaging Display capability improves school communications

- r. Alert Filters – Allow facilities to monitor for such as weather events, earthquakes, tornados, tsunami, volcanoes, public health, power outages, and many other National Weather Alerts emergencies and warnings.
 - s. Multi-Site All Call paging allows authorized users to make normal district wide pages
 - t. Multi-Facility Emergency All-Call paging allows authorized users to make emergency district wide pages
 - u. Administrative Graphical User Interface or GUI that can be used by technicians or Administrative: CoS and Roles define who has access to what parts of the GUI
 - v. Push-to-Talk Microphone
 - w. Ambient Noise Sensing
2. The system shall have a Routines feature that allows staff to activate via Admin Web UI, dial string, panic button, mobile app, API or with an Admin phone touch interface. Routines can automatically launch a procedure, or sequence of actions, that the E7000 system executes as a result of an input trigger. Routines are designed with school security plans and can support crisis plans for situations such as school lockdown, weather events, or emergency evacuation.
3. Direct Inward Station Access or DISA allows administrator or first responder or emergency personnel with proper login codes to call into the system from outside the school into any classroom, zone, or entire facility with customer supplied SIP enabled Telephone Network. DISA is designed to allow remote monitoring, Facility All-Call or Zone Paging, and two-way conversation from outside the facility.
4. Authorized staff can use the Admin Web UI to configure the Clock/Messaging Display function. They can use it to create messages that will display on monitors connected to the 10-Watt plenum-rated Intercom Modules with HDMI 1.3 (max. 1920 x 1080 @ 24/30 Hz) output or the NQ-GA10PV devices in a selected zone, multiple zones, or to specific stations. When creating the message, you can set several options, including when and how long the messages are displayed, priority of messages, and the appearance of the messages. The schedule programming allows the event names to be displayed analog or digital clock along with day and date on an NQ-GA10PV Display. You can also remove messages from the message queue either manually or via a Routine.
5. The ADA requires that title II entities (State and local governments) and title III entities (businesses and nonprofit organizations that serve the public) communicate effectively with people who have communication disabilities. The goal is to ensure that communication with people with these disabilities is equally effective as communication with people without disabilities. With this in mind the Bogen Nyquist E7000 helps people who have vision disabilities with clear audio paging, massaging and hearing disabilities with visual messaging to any display to assist in communicating.
6. Interactive Facility Maps that are intuitive to use. Simply click on a classroom or area of the GUI and it can initiate an intercom, page or drill to another map level. In addition when the system is in Check-In mode the classroom has a pop up of a room's video feed via the Maps view if equipped. The system shall allow authorized staff to use the Map-based Audio/Video room monitoring during emergency check-in. Systems that don't have provisions for this are not considered equal.
7. In the event of wide area network or WAN outage every facility must be capable of operating standalone and allow for all features listed within this specification to work.

Systems that rely on the WAN to operate shall not be considered for comparison in this bid.

8. Manage Check-In functionality that allows staff to quickly verify that they are aware that a check-in event is underway and are reporting classroom status for their assigned classrooms or areas. For staff to check-in all they have to do is press their Call Switch after they have completed their required check-in procedure. Examples of check-in events include but are not limited to weather related shelter-in-place, safety related lockdown, fire evacuation, room occupancy.
 9. The E7000 has a Disable Audio feature that can be activated via contact closure from fire alarm or security system, Admin Web UI, dial string, panic button, mobile app., API or with an Admin phone touch interface. When the E7000 has its Audio Disabled the following features are disabled: programmed or manually activated audio distribution, Zone Paging, normal announcement files, All-Call Paging, manual normal tones and scheduled event tones.
 10. Optional password protection for multi-site emergency all-Call, multi-site all-call, facility page. Emergency all-call page, all-call page, emergency announcement, announcement, zone page, alarm, and tone are used to prevent unauthorized use of the system.
 11. Text-to-Speech option allows Admin Web UI users to add custom announcements into the system by simply typing the text that you want converted to speech for this announcement. The system will then generate a .wav file that can be used by the E7000 system. Systems that don't offer Text-to-Speech options shall not be equivalent.
 12. Installation Wizards are available for installers to reduce the setup time on major components in the system programming. Included wizards are as follows: Customer Information, Dialing Length, Station, User, Time Zone, Network Time Server, and Zones as a minimum.
- 2.6 ADMINISTRATIVE DISPLAY PHONE: Design Basis: Bogen Model Model T1100.
- 2.7 ADMINISTRATIVE VOIP PHONE: Design Basis: Bogen Model T1100.
- 2.8 ADMINISTRATIVE PHONE: Design Basis: Bogen Model T1100.
- 2.9 POWER AMPLIFIERS
- A. Mounting: Rack.
 - B. Corridor speaker zones and outside horn zones: 125 Watt.
- 2.10 CABINET
- A. Comply with EIA/ECA-310-E.
 - B. House amplifiers and auxiliary equipment at each location.
 - C. Cabinet Housing:
 1. Constructed of 0.0478-inch steel, minimum, with front- and rear-locking doors and

- standard EIA/ECA-310-E-compliant, 19-inch racks.
 - 2. Arranged for floor mounting as indicated.
 - 3. Sized to house all equipment required, plus spare capacity, 77" tall.
 - 4. Ventilated rear and sides and solid top. Use louvers in panels to ensure adequate ventilation.
 - D. Power Provisions:
 - 1. Rack mounted surge protection outlet strips.
 - 2. Rack mounted UPS for standby power during power failures. Size for 30 minutes operation for continuous load, 1500 VA minimum.
 - E. Ventilation: A low-noise fan for forced-air cabinet ventilation. Fan shall be equipped with a filtered input vent and shall be plug connected to operate from 105- to 130-V ac, 60 Hz.
 - F. Auxiliary Equipment: AM/FM receiver with compact disc player. Quantity = 1.
- 2.11 LOUDSPEAKERS
- A. Classroom, Corridor, and Administrative Loudspeakers:
 - 1. Flush-Ceiling-Mounted Units: In steel back boxes, acoustically dampened. Metal ceiling grille with white baked enamel.
 - 2. In all administrative areas there shall be an external volume control that is accessible from below ceiling grid for ceiling mounted speaker. Adjustment shall be made with a knob-type control. Mounting height shall match that of the light switches. Label: "PA Volume."
 - 3. Design Basis: Bogen Model CSD2X2VR.
 - B. Horn-Type Loudspeakers:
 - 1. Mounting: Integral bracket.
 - 2. Units in Damp, Wet, or Outdoor Locations: Listed and labeled for environment in which they are located.
 - 3. Design Basis: Bogen Model SPT-15A.
- 2.12 OUTLETS
- A. Volume Attenuator Station: Wall-plate-mounted autotransformer type with paging priority feature.
 - 1. Wattage Rating: 10 W unless otherwise indicated.
 - 2. Attenuation per Step: 3 dB, with positive off position.
 - 3. Insertion Loss: 0.4 dB maximum.
 - 4. Attenuation Bypass Relay: SPDT. Connected to operate and bypass attenuation when all-call, paging, program signal, or prerecorded message features are used. Relay returns to normal position at end of priority transmission.
 - 5. Label: "PA Volume."
- 2.13 SURGE SUPPRESSION
- A. Provide surge suppression protectors for any intercom cables that enter from outside the building and on all exterior horn circuits.
 - B. Provide protectors for any intercom cables that enter the equipment rooms from outside the building. Examples of this would be outside horns and mobile classrooms.

- C. Design Basis: ITW LINX #UP25-39.

2.14 CONDUCTORS AND CABLES

- A. Jacketed, shielded, twisted pair and twisted multipair, untinned solid copper.
1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.
 2. Cables shall be permanently identified at each wire end utilizing a self-laminated wire or cable marker comprised of a white label with black lettering and clear laminate area, in a manner approved by the Owner. Each cable identification shall be a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings provided by the installer and these drawings shall be mounted in each equipment room used to support any part of the entire system.
 3. Design Basis:
 - a. Corridors & Exterior Horns: Belden 5300FE, #18 AWG.
 - b. Classrooms, Admin, & Locations other than Corridors: Belden 5500F #22 AWG.

2.15 PATHWAYS

- A. Conduit, Cable Tray, and Boxes: Comply with Sections "Raceways and Boxes" and "Wire Mesh Cable Trays".
1. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces where unenclosed wiring method may be used. Conceal pathway and cables except in unfinished spaces.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Cable Installation Requirements:
1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
 2. Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
 3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more

- than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
 - 5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 6. Service Loops:
 - a. Provide 10 foot service loops at each equipment termination so that plates, panels, and equipment can be dismantled for service and inspection.
 - b. Provide 3 foot service loops at each loudspeaker.
 - 7. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used.
 - C. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend speaker cable not in a wireway or pathway a minimum of 24 inches above ceiling by cable supports not more than 60 inches apart. Cables shall be installed parallel or at 90 degree angles to the building walls. Diagonal, beeline, or non-supported cable routing is unacceptable.
 - 3. Cable may be run through structural members but shall not be in contact with pipes, ducts, or other potentially damaging items.
 - 4. Utilize wall sleeves, dedicated to low voltage cabling, for penetrations through walls.
 - D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate pathways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other communication equipment conductors as recommended by equipment manufacturer.
- ### 3.3 INSTALLATION
- A. The contractor shall furnish all equipment, accessories, and material required for the installation of a comprehensive communication system in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this specification.
 - B. Coordinate layout and installation of system components and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire- suppression system, and partition assemblies.
 - C. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
 - D. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
 - E. Equipment Cabinets and Racks:
 - 1. Group items of same function together, either vertically or side by side, and arrange

- controls symmetrically. Mount monitor panel above the amplifiers.
 - 2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
 - 3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.
 - 4. Install cables, combed straight and formed in a neat and orderly manner. Tie as required using Velcro cable ties of appropriate type and size.
- F. Volume Limiter/Compressor: Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.
- G. Wall-Mounted Outlets: Flush mounted.
- H. Connect wiring according to Section 270500 "Data Voice Communication".

3.4 GROUNDING

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
- 1. Schedule tests with at least seven days' advance notice of test performance.
 - 2. After installing public address system and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.
 - 4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
 - a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
 - b. Repeat test for each separately controlled zone of loudspeakers.
 - c. Minimum acceptance ratio is 50 dB.
 - 5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
 - 6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five

- locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
 8. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Section 270526 "Grounding and Bonding for Communications Systems."
- C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.
- D. Public address system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
1. Include a record of final speaker-line matching transformer-tap settings and signal ground- resistance measurement certified by Installer.
- 3.6 STARTUP SERVICE
- A. Engage a factory-authorized service representative to perform startup service.
1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
 2. Complete installation and startup checks according to manufacturer's written instructions.
- 3.7 ADJUSTING
- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four visits to Project during other-than-normal occupancy hours for this purpose.
- 3.8 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the public address system and equipment.
- B. Provide a minimum of eight (8) hours of complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.
- C. Installer shall provide programming documentation that reflects the relation to each port, station identifier, and physical location of station.

END OF SECTION 275116