SECTION 116170 - PERFORMANCE AUDIO, VIDEO AND COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the engineering, manufacture, furnishing, coordination and installation of an upgraded performance audio, video and intercommunications systems for the following purposes:
   1. Recording of events.
   2. Reproduction of pre-recorded sound.
   3. Amplification or "reinforcement" of performers' voices.
   4. Amplification of lecturers' voices.
   5. Provisions for audio and video monitoring in support and ancillary spaces.
   6. Dedicated Ethernet cabling system for the audio areas.
   7. Visual and audio media distribution to projection and LCD monitor locations.

B. The Performance Sound, Video, and Communications (SVC) System is an integrated grouping of several subsystems. These include:
   1. A sound system
   2. A show relay monitor system which derives it's feed from the sound system or from a separate system.
   3. Paging systems:
      a. In the lobby
      b. In backstage areas
      c. Control booth and Followspot Booth
      d. In the theatre
   4. Intercom system
      a. A four channel analog/digital party line system.
   5. Assistive Listening Systemsincorporation with existing equipment.
      a. incorporation with existing single channel system.
   6. Video
      a. A digital video (SDI) wiring infrastructure.
      b. A High-Definition Video distribution system with encoder/decoder components over ehternet.
      c. A video monitoring system which derives its feed from the show relay system and closed-circuit cameras. These feeds are multiplexed and inserted on the building's CATV system. The feeds include:
         1. Full stage

C. Provision of the following subsystems specified in separate, but integrated sub sections.
   1. Assistive Listening System
   2. Audio Monitoring / Paging for lobby and support areas.
   3. Control Subsystem
   4. Performance Communications.
   5. Speaker Rigging
   6. Video Subsystem

D. Installation of the following owner furnished subsystems.
   1. Wireless microphones
   2. Audio Monitoring / Paging for lobby and support areas.
   3. Performance Communications.
   4. Speaker Rigging
   5. Video Monitoring.
   6. Control System. Coordinate the new control system to provide the same functionality as the existing system.

E. Section Includes:
   1. Materials, components, modifications, assemblies, equipment and services as specified

herein. These include, but are not limited to:
a. Verification of site dimensions and conditions.
b. Submittals of shop drawings, samples, operation and maintenance manuals as specified herein and depicted in the contract documents.
c. Engineering of equipment and systems as specified herein and depicted elsewhere in the contract documents.
d. Manufacture of equipment and systems as specified herein and depicted on the Drawings.
e. Scheduling, sequencing and coordination with other trades.
f. Provision of on site supervision during the installation of systems described herein for the entire period required to complete the work. This work includes verification of wiring, labeling, cable type, grounding scheme and other technical requirements as described herein.
g. Testing, inspection, alignment and final adjustment of completed installation
h. Demonstration for the Owner and Theatre Consultant for acceptance and instruction of the Owner in the systems specified herein.

2. Amplifiers.
3. Loudspeakers.
4. Loudspeaker Support Frames
5. Dead hung speaker mounting systems where speakers mounted by means of a manufactured pre-engineered mounting system.
6. Microphones.
7. Mixing console.
8. Media Players.
9. Racks, Cabinets and Cases.
10. Signal Processing, Equalizers, Digital Delays, Crossover Networks.
11. Audio routing switchers.
12. Wiring and Wiring Devices Including:
    a. Signal wire and cable.
    b. Power distribution from sound system power supply into equipment racks including circuit protection and power sequencing.
13. Ethernet patch panels and switches.
14. Custom receptacle faceplates as indicated on the Drawings.
15. Custom rack panels as indicated on the Drawings.
16. Accessories.

1.2 DEFINITIONS

A. The term “furnish” means to supply and deliver to the job site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. The term “install” is used to describe operations at the job site including the actual anchoring, applying, assembly, cleaning, curing, cutting, erection, finishing, patching, placing, protecting, pulling, terminating, unloading, unpacking, working to dimension, and similar operations that will render the systems complete and ready for the intended use.

C. The term “provide” means to furnish and install.

D. The term "primary components" refer to elements of the system which acquire, modify or reproduce the signal, such as microphones, digital signal processor, mixer and speakers.

E. The term "sensitivity" as used herein for microphones and expressed in dBm (dB referenced to .001 W) is the microphones available electrical input power level, when driven by a sound pressure of 10 dynes/cm2.

1.3 SYSTEM DESCRIPTION

A. Design Requirements: Provide integrated sound, video, and intercommunications systems. These systems are capable of providing the characteristics specified herein.

1. Standards and Regulations
   a. Components must comply with applicable regulations and ANSI Standards.
   b. Provide systems and components that are approved by an accredited independent testing laboratory such as Underwriters Laboratory.
   c. Speakers used for overhead suspension are to comply with ANSI E1.8-2005.
2. Sound Systems
   a. Upgrade wire, cable and terminations as required.
   b. Upgrade the playback and reinforcement performance audio system for the Main Theatre.
      1. Reinforcement will come from microphones and direct feeds
      2. Provide new wireless microphone rack as shown in the drawings. Upgrade existing microphone rack to work on the digital audio network.
      3. Playback will be from a variety of sources including owner furnished equipment.
      4. Provide digital signal processing devices to replace existing processing.
      5. Provide with this system, the capacity to route an alternate signal other than the show relay monitor microphone feed to the Show Relay for the performance space.
      6. Provide at the patch panels at the racks, a bay for external feeds (feed to Show Relay, feeds to other rooms), connection points on equipment, microphone locations and feeds to microphone and line level audio lines.
      7. Upgrade and Install a left / center / right system in the Main Theatre. Provide new loudspeakers that complement the existing speakers.
         a. Left, right, and center array, hung above the forestage.
         b. Provide two portable subwoofers for use on stage.
      8. Incorporate the existing surround speakers in the audience.
      9. Provide additional speaker positions at stage level for stage monitors and throughout the theatre for effects speakers.
   c. Upgrade the playback and reinforcement surround sound system for the Technology Theatre.
      1. Confirm proper operation of the existing loudspeakers and reuse them in their current positions. Repair any failed components.
      2. Reinforcement will come from microphones and direct feeds.
      3. Playback will be from a variety of sources including video feeds, media and Blu-ray players.
      4. Provide digital signal processing devices to replace existing processing.
      5. Provide with this system, the capacity to route an alternate signal other than the show relay monitor microphone feed to the Show Relay in the booth.
      6. Provide at the patch panels at the racks, a bay for external feeds (feed to Show Relay, feeds to other halls), connection points on equipment, microphone locations and feeds to microphone and line level audio lines.
      7. Upgrade the multi channel cinema system.
         a. Three 3-way tri-amp cinema grade speakers located behind the projection screen.
         b. 1 subwoofer mounted behind the projection screen.
         c. Surround sound speakers for Surround Left, Surround Right, Surround Left Rear, and Surround Right Rear signals.
         d. Provide signal and Dolby Digital / DTS surround processing
      8. Upgrade the left / right system for speech reinforcement.
         a. Left / right supported from the ceiling in front of the stage zone.
   d. Provide portable playback and reinforcement performance sound systems for the Choral, Music Ensemble and Dance classrooms.
      1. Reinforcement will come from wired and wireless microphones and direct feeds to a portable mixer.
      2. Playback will be from a variety of sources including media players and compact discs.
      3. Incorporate the existing left / right speaker systems in the Choral Room and dance Classrooms.
      4. Provide new speakers in the Music Ensemble Room.
         a. Speakers to be supported from ceilings in corners of classrooms.
      5. Provide a touch screen control interface to allow inputs for direct microphones, a feed from a portable mixer, or a feed from the Main Theatre show relay.

3. Common Show Relay Feed:
   a. Provide each space with a common relay feed from a central microphone to the monitoring system, video system and to the Assistive Listening System associated with that space.
   b. Provide the input from a microphone routed through the DSP. From this processor route the signal through a distribution amplifier providing isolated signals to associated systems.
4. Ethernet Cabling System
   a. The existing ethernet System is Category 5E as well as proprietary cabling. Provide the facility with a Category 6A compliant Ethernet cabling system, unless otherwise required by the equipment manufacturer.
5. Faceplates:
   a. Provide faceplates as indicated on the drawings and schedules.
   b. Where faceplates are installed in surface mount conditions the edges of the faceplate are to be flush with the edges of the back boxes.
   c. Where faceplates are installed in flush mount conditions the edges of the faceplate are to extend 3/8" beyond the edges of the back boxes.
   d. Verify field conditions prior to faceplate manufacturing and installation so as to confirm that faceplates will match properly. Modify faceplates as necessary to conform to existing conditions.
   e. In onstage, catwalk, control booths, back stage, catwalk, and control booth areas provide faceplates manufactured from black anodized aluminum, horizontally brushed with 120 grit abrasive.
   f. In architecturally sensitive areas (lobby, etc.) provide faceplates manufactured from painted steel. Provide faceplates painted to match surrounding architecture.
   g. Laser engrave legends on dark anodized faceplates without fill.
   h. Engrave painted faceplates and light colored anodized faceplates apply non-yellowing white fill.

B. Performance Requirements:
1. Provide audio transformers used in the system which are of appropriate impedance ratio and power handling capacity for the function intended, and unless otherwise noted herein, have a frequency response within +/- 1 dB from 20-20,000 Hz.
2. Ensure that components are pin 2 hot (XLR) and tip hot ¼” TRS.
3. Microphone System and Accessories:
   a. Ensure outputs of microphones are 150-250 ohms, balanced with respect to ground.
4. Sound System:
   a. Ensure overall performance requirements of the sound amplification system are checked by measurement. Provide each system as designed which meets the following requirements as well as the manufacturer's published specifications. This Contractor is responsible for use of the equipment specified in the manner specified and each component's conformance with its manufacturer's specifications.
   b. Ensure overall system frequency response is +/-2 dB, 250-4,000 Hz, and +/- 4 dB 50-16,000 Hz when measured in 1/3 octave bands at any seat in the space. Measure frequency response using Time Delay Spectrometry or 1/3 Octave Real Time Analyzer.
   c. Ensure residual noise and hum are below the ambient noise levels produced by the air conditioning system and other mechanical systems within the auditorium, for an overall signal-to-noise ratio of 70 dB for the entire system.
5. Ethernet Cabling System
   a. Cabling is Category 6A compliant.
6. Faceplates
   a. Provide faceplates as indicated on the drawings and schedules. Reuse existing faceplates and modify those indicated in the drawings.

1.4 QUALIFICATIONS:

A. The contractor shall be a Specialist in the provision of systems for playback and reinforcement of sound in a performance venue.

B. The Contractor shall have been authorized dealers or representatives of the manufacturers of the primary components for a minimum of two (2) years.

C. Where a manufacturer of a primary component offers factory training in the use of that component the Contractor is to have received that training.

D. The Contractor shall have been involved in Sound Systems Contracting for Entertainment and Worship facilities for a period of five (5) years or more and shall have completed at least three (3) installations of this type and scope which have been in service for not less than two (2) years.

E. The Contractor shall provide, as part of their internal organization, the base system and not less than one (1) of the sub-systems specified. Additional Work in the Contract will be performed under their authority and responsibility as defined in the Contract Documents.

F. The Contractor shall maintain and operate shops for the integration and service of the system components.

G. The right is reserved to inspect previous equipment or systems as furnished or installed by this Contractor. In addition, the right is reserved to reject a Contractor who has failed in any respect to comply with the provisions of previous contracts.

H. No sub-contracting work is permissible, unless the Sub-Contractor is named and included as part of the bid. All terms and requirements herein apply to the Sub-Contractor. The right is reserved to reject the proposed Sub-Contractor based on the terms stated herein.

I. The Design Consultant shall be the final judge of suitability of experience.

1.5 SUBMITTALS

A. Product Data Sheets:
1. Include a title sheet listing sheets in the submittal.
2. Include manufacturer’s product data sheets of equipment to be provided as part of the project only if the equipment is a not called out by make and model in the specification or the equipment is being substituted for a specified model.

B. Shop Drawings:
1. Provide submittals in accordance with Division 1.
2. Submit shop drawings within 90 days of award of contract unless otherwise indicated in Division 1.
3. Show information necessary to explain fully the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation. Include the following drawings as a minimum:
    a. Signal, control and power sequencing Block Diagrams detailing:
        1. Equipment
        2. Faceplates
        3. Interconnecting wires with unique labels
        4. Terminating devices (Connectors or terminal strips)
        5. Where custom wiring is necessary detail each component (Switches, indicators, resistors, power supplies, relays, etc)
        6. Multiconductor wiring
    b. Faceplate & Rack Panel Fabrication Drawings detailing:
        1. Finishes
        2. Devices
        3. Engraving
    c. Mounting Details - where custom mounting systems are employed and as required by the specifications
    d. Patch Panel Layouts detailing:
        1. Layout
        2. Labeling
        3. Normalling

e. Rack Elevations detailing:
   1. Equipment location
   2. Equipment labeling
   3. Security covers
   4. Vent panels
   5. Fans

4. Do not commence fabrication, installation, and erection until shop drawings have been approved by the Consultant and Owner.
5. Provide uniformly sized sheets in the submittal.
6. Include a title sheet listing sheets in the submittal.
7. Include manufacturer's information sheets of proposed equipment to be provided as part of the project.

1.6 QUALITY ASSURANCE

A. Supplementary Standards:
1. Secure equipment, except portable equipment, firmly in place. This includes loudspeakers, conduit, cables, control equipment, rack equipment, etc. Mount components rigidly, except where resilient isolation is required, such as with loudspeaker clusters / arrays. Design and provide fastenings and supports adequate to support their loads with a safety factor of at least three.
2. Clearly mark switches, jacks, outlets, cables, connectors, etc. logically and permanently during fabrication and installation.
3. Where many cables are run in close proximity color code by level and function in a logical manner.
4. Take necessary precautions to prevent and guard against electromagnetic, electrostatic and radio frequency interference.
5. Provide audio system wiring which is continuous from the faceplates to the racks. Employ no splices for entire cable length.
6. Exercise care in wiring, so as to avoid damage to the cables and to the equipment. Between racks, cabinets, consoles or modules ensure cables are well-supported, neatly laced and dressed. Make joints and connections with rosin-core solder or mechanical connectors approved by the Consultant. Between racks, cabinets, consoles or modules, terminate cable in WAGO Cage Clamp or QCP terminal blocks. Execute audio wiring in adherence to standard broadcast practices as detailed in "Recommended Wiring Practices, Broadcast Audio Equipment for AM, FM, Television" (current edition), Radio Corporation of America, Camden, New Jersey.
7. When cable is surface mounted and crossing through fire walls, use the equivalent fire rated plenum cable to the specified cable type.
8. Run power and high level circuits on one side of the racks or cabinets. Run other circuits on the other side.
9. Insulate microphone and 600-ohm lines from the conduit within which they run, and from each other for the entire conduit length. Ground microphone line shields only at the microphone frame and to the control console input connectors. Ground other shields only at the outputs of the associated device and terminate at the "floating" end with "wedge on" collars or plastic tape. Preserve continuity of shields at connecting points. Connect audio grounds in the equipment racks to a common point in the rack; ground the racks to the isolated ground bus located in the electrical control panel servicing the sound system equipment. Ground racks to a single point. As stated above, ground audio shields to ground at a common point.
10. Dedicate a terminal block for use with each audio patch panel. Interface audio circuits terminating in a patch panel through a terminal block. Terminate microphone and line level signals with a QCP punch block or WAGO Cage Clamp terminal blocks. Terminate high level (amplifier output) at a WAGO Cage Clamp terminal block. Wire patch panels so signal sources, inputs and outputs from equipment, are connected in a logical and efficient combination of top and bottom rows.
11. Label terminal strips, punch blocks, wire and cables in a permanent and logical manner
12. Interconnect racks to equipment using multiconductor cables.
    a. In cases where 6 or more channels from a source are terminated, fan from source in to a multiconductor cable, out to a VEAM CIR Series, ELCO/EDAC multipin or Whirlwind

MASS connector. Place a panel in the rack to which equipment is terminated. Install an appropriate VEAM CIR Series, ELCO/EDAC multipin or Whirlwind MASS receptacle in panel labeled to indicate equipment terminated.

b. In cases where 6 or less channels from a source are terminated, fan from source in to multiconductor cable, out to XLR connectors. Place a panel in the rack to which equipment is terminated. Install appropriate XLR receptacles in panel labeled to indicate equipment and channels terminated. Signal from devices flow into receptacles through multiconductor cable out to plugs, connecting to panel mounted receptacles.
c. Where VEAM CIR Series, ELCO/EDAC multipin or Whirlwind MASS connectors are used, shields may not be combined.
d. Multiple wiring levels may not be combined in one conductor nor in one connector. For example low level wiring from a microphone may not be bussed in the same conductor as medium level wiring from a tape deck.
e. Where an individual piece of equipment is being connected employ a dedicated multiconductor and connector.
f. Where 2 racks are located apart and are being interconnected, signals from many pieces of equipment may be connected over a single multiconductor and connector.

13. Final location of equipment is as shown on the Drawings, located in the field by the Architect or as shown on supplementary drawings prepared by the Consultant.

1.7 WARRANTY

A. Special Warranty:
1. In addition to the manufacturer's warranties, warrant systems and equipment to be free of defective components, faulty workmanship or improper adjustment for a period of two years from the date of Owner's acceptance. Paint and exterior finishes are excluded. Replace items showing evidence of defective materials or workmanship (including installation workmanship) within 30 days after notification. Rectify conditions that might present a hazard to human life, well-being and or property within 48 hours of notification. In the case of individual component failure rectify the situation within 48 hours of notification. In the case of catastrophic system failure, rectify the situation within 24 hours of notification. Make replacements without cost to the Owner.
2. Designate warranties on equipment to the Owner on the date of system acceptance.

1.8 MAINTENANCE

A. Provide maintenance service for a period of one year after final acceptance of the installation. This service shall include two semi-annual visits to the site for testing and adjusting of equipment. The first visit occurring six months after the system has been accepted. Arrange visit to be at a time mutually acceptable to the Owner and Contractor.

B. Extra Materials
Provide the following spares:
1. Cable and Wiring:
   a. Runs of 3 - 5 circuits provide 1 spare.
   b. Runs of 5 - 10 circuits provide 2 spares.
   c. Runs of 11 or more circuits provide 15% spares.
2. Patch Points
   a. Provide 10% spares per bay type (Video, Mic Level, Line Level, Speaker).
3. Connectors
   a. Provide 10% spares.
4. Removable Labels
   a. Provide 200% spares.
5. Rack Mounting Hardware
   a. Provide Screws and Clips for 25% of mounting holes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Sound and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the owner.

B. Amplifiers:
1. Crest Audio
2. Crown, Inc
3. Electro-Voice Inc.
4. Lab.Gruppen
5. QSC Audio Products
6. Yamaha International Corp..

C. Media Players:
1. Denon Professional Products
2. Sony
3. Tascam/TEAC Corporation of America

D. Intercommunications Systems:
1. Clear-Com
2. RTS
3. Telex

E. Loudspeaker Systems:
1. Bag End
2. L'Acoustics
3. Eastern Acoustic Works, Inc.
4. Electro-Voice Inc.
5. JBL, Inc.,
6. Meyer Sound
7. Renkus-Heins

F. Microphones:
1. AKG Acoustics, Inc.
2. Audio-Technica US, Inc.,
3. Beyer Dynamic, Inc.
4. Crown
5. Countryman
6. Neumann | USA
7. RODE
8. Sennheiser
9. Shure Brothers, Inc.

G. Audio Mixers - Console:
1. Allen and Heath
2. Crest Audio
3. Soundcraft Electronics
4. Yamaha International Corp.

H. Mixers - Rack Mount:
1. Rane
2. Shure

I. Racks, Cabinets and Cases:
1. Anvil Cases
2. Calzone Case Co.
3. Gator

4. Middle Atlantic Products

J. Configurable Digital Signal Processors
1. BSS Audio Ltd.
2. Bi-Amp
3. QSC Q-SYS

K. Wiring and Wiring Devices:
1. ADC Products,
2. Belden Wire and Cable / Cooper Industries
3. Bittree.
4. Canare Cable, Inc.
5. Hubbell Wiring Devices
6. LynTec
7. Mystery Electronics
8. Neutrik USA. Inc.
9. ProCo Sound, Inc.
10. Siemon Electronics Company
11. SSRC, Inc
12. Steel City
13. WAGO Corporation
14. Whirlwind

2.2 EQUIPMENT AND SYSTEMS

A. General:
1. Provide Systems described herein and on the Drawings.
2. Regardless of the length or completeness of the descriptive paragraphs herein, each device shall meet its published manufacturer's specifications. Certify performance as required. Where two or more acceptable products are listed, the Contractor may use either at his option. Equipment other than that listed shall not be substituted without specific written approval of the Consultant.
3. See Equipment and Component Schedule for manufacturer, model and quantities
4. Quantities of primary components, if not specifically called out in a schedule, shall be as indicated on the Drawings.
5. The Contractor shall provide the higher quantity should a discrepancy between the Drawings, the Schedules and this Section exist.
6. Items are to be provided with necessary modules, components, cables, connectors, and accessories to make them fully functional and interface them with adjacent units as indicated in the contract documents.

B. Performance Sound System:
1. Mixing Console
   a. Provide floor stand.
   b. Provide gooseneck console lights for each outlet.
   c. Incorporate multicables and fanouts for interfacing the console to the portable rack and microphone lines for use in the control booth and house mix positions.
   d. Provide Dante digital audio networking capability.
2. Media Player
   a. Provide Remote control unit
3. Permanent & Demountable Loudspeakers
   a. Speaker Support Frame
      1. Design a support frame from which the speakers are suspended.
      2. Hang the speakers from a support frame in such a fashion that allows their focusing over the full range of the interior areas.
      3. Provide a locking mechanism on the focus system to prohibit the slipping of focus.
      4. Provide a permanent marking system that will indicate the correct focus of the speakers allowing quick remounting of the system.
      5. Systems lacking horizontal or vertical adjustability are not acceptable.

b. Acoustic Vibration Isolation
   1. Provide vibration isolators in the mounting system to minimize transmission of vibration through the hanging system to the surrounding building elements.
c. The following establishes minimum safety requirements for the system. Where Federal, State and Local Legislation address these topics, the more stringent requirements take precedence. Factors listed below in no way relieve this Contractor from the sole responsibility of providing safe systems.
   1. Minimum factor of safety for lifted loads: 10 or a 75% impact factor, whichever is greater.
   2. Minimum factor of safety for static loads: 6.
d. Provide systems designed to reflect safeguards and precautions related not only to normal use of the equipment under ideal operating and loading conditions but, additionally, to anticipate equipment misuse, human error, and misjudgment. Design and intent parameters set forth herein in no way relieve this Contractor from responsibility or liability arising from the Work.
e. Demountable features.
   1. Permanently label components for quick and easy reinstallation.

4. Portable Loudspeaker
   a. Provide with handles.

C. Racks, Patch Panels, and Other Permanent Equipment:
1. Microphone / Line Level Patch Panel. Incorporate existing patch panels, modify as necessary.
   a. Provide Patch Cables
2. Multipatch Panel. Incorporate existing patch panels, modify as necessary.
   a. Rack-mount panel providing Veam CIR Series, ELCO/EDAC or Whirlwind MASS connectors for connecting mixing console and portable rack multicables to the System.
3. Loudspeaker patch panel. Incorporate existing patch panels, modify as necessary.
   a. Rack-mount panel providing Neutrik NL4 type connectors for loudspeaker patching of power amplifier outputs to 1 and 2 channel loudspeaker receptacles.
   b. Provide loudspeaker patch cords of sufficient length to reach the longest patching distance.
   c. In patch fields containing any NL4 connectors with 2 circuit (bi-amped) terminations provide 2 pair patch cables.
   d. In patch fields containing any NL8 connectors with 4 circuit (quad-amped) terminations provide 4 pair patch cables.
4. Equipment racks and panels
   a. Racks. Incorporate existing equipment racks, modify as necessary.
      1. EIA 19" standard modular rack frames providing rack units of panel space as noted in the contract documents, 21" of width, and 26" of depth, minimum.
      2. Provide matching ventilation panels as needed.
      3. Provide matching blank or vent panels in spare rack spaces.
      4. Provide two patch cord holders for each rack group containing mic/line level or loudspeaker patch panels (suitable holders are by Trompeter Electronics, model no. CH50, with 10 cable slots for 1/4" diameter and smaller cables, holding up to 50 cables).
      5. Provide internal power distribution sufficient to power devices contained in the rack providing the sequencing noted in the contract documents.
      6. Floor standing rack groups shall be mounted on wooden frames made from 1" x 3" dimensional oak, laid flat. Frames shall support the entire rack group perimeter, as well as provide center supports for remaining exposed edges of rack bases, as required to isolate rack from building ground.
      7. Approved pan or truss head type panel mounting screws with non-metallic flat washers shall be used to secure rack-mounted equipment.
      8. Provide shoulder washers for isolating rack mounted video equipment from the equipment rack rails.
      9. Racks shall have the same color finish (Textured Black).
   b. Blank Panels
      1. 1/8", flat black aluminum blank panel in 1U through 6U heights.
   c. Vent Panels

1. 16-gauge perforated steel vent panel with 5/32" diameter holes. In 1U through 3U rack heights with black baked enamel finish.

5. Sound Boxes: Faceplates.
   a. Incorporate existing faceplate and boxes. Modify as necessary.
   b. Inspect existing faceplates and replace/repair connectors as necessary.
   c. Custom fabrication, per description below:
      Provide receptacle plates for connection of the Audio, Video and Communications System's devices throughout the facility. Connectors shall be identified as to circuit type and number by clearly engraved and coordinated legends on each plate.
      1. Refer to Drawings for receptacle locations.
      2. Refer to Sound Box Schedule for back box type, size, and depth; plaster ring size; and mounting information.
      3. Back boxes and conduit shall be provided under Division 26. Faceplates shall be provided under 11 61 70. Wire shall be supplied, pulled, and terminated by this Contractor.
      4. Material should be at least 1/2" thick.
      5. Connector: Panel or chassis types, as indicated below. Mount on faceplate as shown on detail drawings and fasten with stainless steel machine screws, hex nuts, and lock washers (screw head style, color, and thread size to match connector body; slot or phillips drive to match wall plate screws). Refer to connector specification paragraph below. Exceptions as noted.
         a. Microphone level ("M" series): Neutrik Female XLR-3.
         b. Broadcast video coax: Canare BNC.
         c. Infrared Emitter Assistive Listening System: (refer to appropriate Manufacturer)
         d. Production communication (headset intercom) "I" series: Neutrik Male XLR-3.
         e. Low voltage/impedance 1 and 2 channel loudspeaker ("S" series): Neutrik NL4 series.
         f. Low voltage/impedance 3 and 4 channel loudspeaker ("S" series): Neutrik NL8 series.
         g. 70.7 volt loudspeaker ("P" series): Neutrik NL4 series where applicable. Note special wiring requirements
         h. RJ45 Ethernet. Neutrik Ethercon.
      6. Engraved legend: Refer to detail drawings. Characters shall be engraved, filled with white enamel, and entire wall plate sealed. Exceptions as noted.
         a. Legends shown on detail drawings are typical. Refer to PAV Systems block diagrams and submit proposed circuit numbers to Consultant for review. Faceplate title is typically labeled with the appropriate signal. Individual connectors are labeled with the corresponding circuit number.
         b. Legend size shall be 0.125" high characters of medium weight unless otherwise noted.
         c. Legend color typically references the specific signal level and follows guidelines found in "Part 3- Execution: Installation- Equipment- Labeling".
      7. Termination: Refer to general termination guidelines in "Part 3- Execution: Installation- Wiring- Termination" for further explanation of the following methods. Exceptions as noted.
         a. XLR-type connectors: Solder wire directly to connector in the field. Or, for ease of field installation, pre-wire with properly sized compression-type butt splices on short "pig tails" of appropriate wire (same type as specified for installation in conduit).
         b. F-type and UHF-type connectors: Attach double crimp-type (crimp-crimp) straight plug to end of coaxial cable for connection directly to the feed-through jack. Ensure integrity of coaxial cable shield isolation from back box by insulating connectors (and/or any adapters) with a shroud or hood of shrink tubing, or similar material. Plastic "electrical" tape is not acceptable.
         c. BNC-type connector: Attach double crimp-type (crimp-crimp) straight plug to end of coaxial cable for connection directly to the feed-through jack. Ensure integrity of coaxial cable shield isolation from back box by insulating connectors (and/or any adapters) with a shroud or hood of shrink tubing, or similar material. Plastic "electrical" tape is not acceptable.

d. Neutrik NL4 and NL8 series connectors: Attach properly sized crimp type female disconnect terminals to large gauge loudspeaker wire and mate with male disconnect terminals on the Neutrik connectors. Securely strain relief loudspeaker wires to connector body or wall plate to ensure integrity of the electrical/mechanical disconnect termination.

D. Connectors:
1. Connectors, as specified below, to properly install and terminate Systems components.
2. Provide captive moisture / dust covers in moist locations.
3. Audio Connectors
   a. XLR Type
      1. XLR-3 (Microphone, Line, Communication): Neutrik NC3MD-L-1-B (male) and NC3FD-L-1-B (female) panel mount connectors; Neutrik NC3MX-B (male) and NC3FX-B (female) cable connectors. Gold contacts and black chrome shells throughout.
      2. Note wiring:
         a. Balanced mic/line: pin 1 = shield (screen), pin 2 = high (hot), pin 3 = low.
         b. Unbalanced mic/line: pin 1 = shield/common, pin 2 = high, pin 3 = tie to pin 1.
         c. Production intercom: pin 1 = shield/common, pin 2 = +30VDC, pin 3 = audio/signal.
         d. In no case shall pin 1 be tied to case of connector.
      3. XLR-4 (Production Intercom Headset/Handset): Neutrik NC4MC-B (male) and NC4FC-B (female) cable connectors. Gold contacts and black chrome shells throughout.
   b. NL4 Type (Loudspeaker)
      1. Neutrik Speakon NL4MP panel mount connector; NL4MPR sealed loudspeaker cabinet chassis connector; and NL4FC cable connector.
      2. Wiring notes: In addition to standard single (ch 1) and dual (ch 1 /ch 2) mode, note the following wiring methods:
         a. Biamp: ch 1: LF ch 2:HF
         b. 70.7 volt lines: single-channel only, pin "1+" = high (hot), pin "2-" = low (common).
   c. 1/4" Phone Plugs and Jacks
      1. Plug: Neutrik NP2C-BAG 2-pole and NP3C-BAG 3-pole cable plugs. Nickel contacts and black nickel shells.
      2. Jack: Neutrik NJ3FC6C-BAG latching 2- or 3-pole cable jack. Silver contacts and black chrome shells.
      3. Note wiring:
         3-pole: Sleeve = ground/shield, ring = low, tip = high (hot).
         2-pole: Sleeve = common/ground/shield, tip = high.
   d. 1/4" / XLR Combo
      1. Combines the features od an XLR and the ¼" TRS as noted above.
      2. Jack: Neutrik Combo Series latching 2- or 3-pole cable jack. Silver contacts and black chrome shells.
   e. 1/8" Mini Plug
      1. 1/8" T/R/S "Walkman-type" stereo mini plug. Metal shell required.
   f. Phono (RCA) plugs and jacks
      1. Plug: Neutrik ProFi NF2C/2 RCA plug (available in pairs of black and red). Gold plated nickel contacts and brass shell.
      2. Jack: Switchcraft 3503 RCA cable jack. Nickel plated brass contacts and shell.
4. Video/RF connectors
   a. UHF Type (Wireless Microphone System Antenna)
      1. Amphenol 31-105 insulated panel 50ohm BNC receptacle (female) for RG-8/U type coaxial cable. Beryllium copper center contact and TR-5 tarnish resistant alloy finish on body and fittings.
   b. 75-ohm BNC Type (Video)
      1. Canare BCJ-JRU insulated double female (feedthru) recessed panel mount connector; BCP-C7 double crimp-type straight plug (with long body sleeve for 75-ohm precision coaxial cable). Gold plated center contact and beryllium copper external contact.

c. 75-ohm F-Type (Video Receiver)
d. Trompeter BJ139 bulkhead feedthru jack: PL130-N wrench crimp-type straight plug. Gold plated center contact and beryllium copper external contact. Connector shall be electrically insulated from the mounting plate.

5. Miscellaneous Connectors
   a. RJ-11
      1. Hubbel C3 Series
      2. USOC Pairing
      3. Panel mount receptacles utilize 110 terminations.
   b. RJ-45
      1. Neutrik Ethercon Series.
      2. T568B Pairing
      3. Panel mount receptacles utilize 110 terminations.

E. Wire and Cable:
1. Conduit Installation
   a. Where the following table and the manufacturer's recommendations conflict follow manufacturer's recommendations.
   b. Where the following table does not indicate a cable type follow manufacturer's recommendations.
   c. Where installation conditions require plenum rated cable use closest plenum rated equivalent.
   d. Cable Manufacturer is Belden unless otherwise noted.

Index	System	Level	Cable	Notes
A	Assistive Listening	High	Belden 8219	
AN	Wireless Mic Antenna	Low	Belden 9913	
AVC	Audio Visual Control	Other	Belden 10GX62F	Or as required by manufacturer
CNQ	Digital Media Distribution	Other	Existing Manufacturer Specified	Replace as necessary with 10GX62F
E	Ethernet	Other	Belden 10GX62F	
I	Intercom	Med	Belden 8760	
L	Line Level Audio	Med	Belden 8451	
LV	Low Voltage Control	Med	Belden 9444	
M	Microphone	Low	Belden 8451	
MMF	Multimode Fiber	Fiber	Belden B9A038	
P	70V	High	Belden 8719	Add (2) #16 THHN for Volume Override
Q	Cue Light	Med	Belden 9444	Or as required by manufacturer
RF	Cable Television	Med	Belden 9114	
S	Speaker	High	WestPenn C207	Use C210 for

				100'+ runs and subwoofer runs
SM	Stage Manager Control	Other	Belden 10GX62F	
SMF	Single Mode Fiber	Fiber	Belden FISD006R9	
SN	Sound Network	Other	Belden 10GX62F	
SR	Show Relay	High	Belden 8719	
V	SDI Video	Other	Belden 4694R	

2. Portable Installation and Use
   a. Refer to "Portable Equipment and Cabling."

F. AC Power Switching System and Receptacle Strips:
1. AC Power Control
   a. Coordinate with existing devices
      1. A custom panel providing simple on-off control of the Sound System AC power switcher, including separate switches for the AV rack room equipment rack. Panel to be mounted on front of AV rack room equipment rack. Switch shall be low voltage momentary push button type with integral LED. AC line switching shall occur in a separate relay-based device which is controlled by this panel and control system. See drawings for panel layout.
      2. Refer to "Motorized Breaker Panel" subsection below for further information.
2. AC Receptacle Strip
   a. Wiremold 20GB Series Plugmold Strip
      1. A painted steel, 3-wire, 1-circuit, prewired outlet receptacle strip with insulated grounding conductor. Unit is available in three (3), five (5), or six (6) foot lengths containing 5 to 12 receptacles.
      2. Receptacle strips shall be permanently mounted inside equipment racks.
      3. Wiring to AC power switcher and intermediate junction boxes shall be in flexible conduit (greenfield).
      4. Provide a sufficient quantity and configuration of AC receptacle strips to support the specified equipment in each equipment rack group, plus a minimum of 50% spare outlets.

G. Portable Equipment and Cabling:
1. See complete schedule for equipment types and quantities
2. General
   a. Portable Cable Labeling
      1. Each cable shall be color coded by length using a heat-shrink polyolifin sleeve near the male end of the cable. This sleeve shall be hot-stamped with the name of the facility, or as directed by the Owner.
3. Loudspeaker Cables
   a. Whirlwind or ProCo loudspeaker cables
   b. Fabricate with Light weight, heavy duty, abrasion resistant, synthetic rubber insulated (similar to STE and SJTE) cable.
      1. Single circuit - 14/2 loudspeaker cable with Neutrik NL4FC connector at each end.
      2. Two (2)-circuit - 14/4 loudspeaker cable with Neutrik NL4FC connector at each end.
4. Standard Microphone / Production Intercom Cables
   a. Whirlwind or Canare
   b. 20-gauge, two-conductor shielded female XLR-3 to male XLR-3 rubber jacket cables.
5. Microphone / Line Level Patch Cords
   a. Three-conductor patch cord with single male 1/4" T/R/S connector (military plug type PJ-051R) at each end. Shielded cable is grounded to each connector. Connector handles are red.

b. Each patch cord shall have a black heat-shrink polyolifin sleeve near one end of the cable. This sleeve shall be hot-stamped with the name of the facility, or as directed by the Owner.

6. Ethernet
   a. Category 6A Shielded compliant cables.
   b. In patch bays provide standard connectors.
   c. In extension cables provide Ethercon Connectors.
7. Audio Adapters and Interface Components (as per the Equipment and Component Schedule)

2.3 SPARE PARTS

A. Spare Parts Package:
1. Provide a package of spare parts for user-serviceable portions of the Systems.
2. A quantity of bulbs, fuses, knobs, switches and other miscellaneous parts shall be supplied equal to 10% of the installed components with a minimum of 1, in addition to any spare parts specifically listed in individual product specifications.
3. Label spare parts with manufacturer's part number, designation and description, and location(s) where used.
4. The spare parts shall be delivered to the Owner after completion of the Commissioning procedure.

2.4 MANUFACTURED UNITS

A. Faceplates:
1. Incorporate existing faceplates. Modify as necessary.
2. Furnish receptacles and faceplates as specified in the Contract Documents.
3. Number circuits as per Contract Documents.
4. Where faceplates are installed in surface mount conditions the edges of the faceplate are to be flush with the edges of the back boxes.
5. Where faceplates are installed in flush mount conditions the edges of the faceplate are to extend 3/8" beyond the edges of the back boxes.
6. Faceplate material in on-stage and technical backstage areas is 1/8" black anodized aluminum.
7. Faceplate material in public areas and architecturally sensitive backstage areas is 16 gauge steel painted to match surrounding architecture.
8. Verify field conditions prior to faceplate manufacturing and installation so as to confirm that faceplates will match properly. Modify faceplates as necessary to conform with existing conditions.
9. Remove sharp edges and burrs on faceplates.
10. Ethernet receptacles are labeled with the maximum portable cable length. This is calculated by subtracting the installed cable length from 368'.
11. Label faceplates as follows, unless otherwise indicated:
    a. Material 1/8" black lamacoid.
    b. Finish: black with white fill.
    c. Engraving: 3/8" high characters with non-yellowing white fill.
    d. Apply labels with appropriate adhesive and rivet to faceplates.
    e. Alternatively, faceplates can be directly engraved providing above guidelines for text height and fill are followed.
12. Label installed cable as follows, unless otherwise indicated:
    a. Material vinyl cloth.
    b. Finish: black with yellow characters.
    c. Size 3/8" high characters.
    d. Acceptable Products:
       1. Brady wire markers.
13. Provide cover screws with slotted holes to accommodate back boxes mounted out of vertical. The slots will be fabricated such that the horizontal clearance is equal to twice the vertical clearance.

B. Microphone and Line Level Audio System Installation and Accessories:
   1. Incorporate existing multi-conductor microphone and line level audio system as indicated on the Drawings and described herein. Employ VEAM CIR Series ELCO/EDAC or Whirlwind MASS multi-conductor plugs and receptacles with gold contacts or an approved substitute. Employ single line XLR connectors with Neutrik NC3_X-B series or an approved alternate with gold contacts.
   2. Cable types are as shown on the drawings and as indicated herein.
   3. In addition to portable cables specified elsewhere, provide one (1) 25' flexible extension cable for each microphone. Fit each flexible extension cable at one end with a Neutrik NC3MX-B connector and a Neutrik NC3FX-B connector at the opposite end.
   4. Provide combining networks and pads as required. They are to be 1/2w 1% composition resistors soldered fixed connection points at each end. Values for pads may vary slightly depending upon signal levels encountered.
   5. Switching and connection facilities required are indicated on the functional diagram. The drawings do not necessarily indicate switches and connectors included in this system. Switches and connectors used in this system whether or not mentioned or shown in this Specification, shall have sufficient voltage and amperage rating to cover the use for which they are required with a safety factory of at least 2. Switches and connectors handling audio circuits shall use gold contacts and unless toggle switches cannot fulfill the function required, shall meet JAN-S-23 or MIL-S-3950A specifications.

C. Equipment Cabinets and Racks:
   1. Incorporate existing permanent racks Provide panel mounting channels with holes on E.I.A. spacing. Rack dimensions: 22" wide x 24" deep by the height necessary to accommodate the specified equipment or as shown on the drawings.
   2. Fill unused panel space with blank black solid panels and/or black ventilating panels. Provide a variety of panel sizes including 1 rack unit, 2 rack unit, and 3 rack unit panels to facilitate the addition of equipment at a later date.
   3. Racks and panels are to be black in color.
   4. Provide hard rubber casters on racks which are not permanently located or require movement to attain rear access.
   5. Build racks, fill and wire and test circuits in the shop before transporting the racks to site.

D. Portable Racks
   1. Meet or exceed A.T.A. Specification 300 Category 1 requirements.
   2. Are Black in color
   3. Interlock when stacked.

E. Loudspeakers and Associated Equipment:
   1. Layout and mounting arrangements of Loudspeakers are as shown on the Drawings and as described herein.
   2. Fabricate and design each loudspeaker to be held rigid and not vibrate loose during operation.
   3. Securely mount the loudspeakers in a manner that will exclude the possibility of falling.
   4. Provide loudspeakers that are easily movable and replaceable in the same position
   5. Provide acoustic vibration isolation.

F. Installed Wire and Cable:
   1. Wire and Cable is to be that specified on the Drawings and/or as described herein.
   2. Multiconductor wire shall exhibit the same characteristics of the single conductor wire specified herein.
      a. Pairs in a multiconductor are to be individually shielded, with the exception of sound system speaker wire which requires no shield.

2.5 SUPPLEMENTARY

A. Furnish equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide racks, furniture, consoles, devices, etc., required for the installation and needed to provide completed working systems. Only to the extent that such ancillary equipment is specified elsewhere is it excluded from these system Specifications.

B. Terminate and install low voltage faceplates.

C. Interface:
1. Contract documents are diagrammatic and indicate general arrangement of systems and work included.
2. Follow drawings in laying out work and check drawings of other trades relating to Work to verify spaces in which work is installed.
3. Maintain headroom and space conditions at all points.

D. Provide factory trained personnel to perform the installation, tests and adjustments as required.

3.2 SUPERVISION OF INSTALLATION OF ELECTRICAL COMPONENTS AND CONDUIT INFRASTRUCTURE

A. Provide instruction and supervision to the Division 26 Contractor as it pertains to the installation of these systems. Provide the necessary personnel for coordination meetings and site visits prior to installation of systems.

3.3 SYSTEM TESTS AND ADJUSTMENTS

A. Perform initial tests and adjustments; include the costs of the testing in the initial bid submittal. Furnish equipment necessary and perform work required to determine or modify the performance of the sound system in accordance with the intent of the Contract Documents.
1. Initial Tests:
Prior to equalization of the sound system, perform the following inspections and submit to the Consultant the written results at each inspection for inclusion on the permanent records of the sound system.
a. Certify signal flow through systems.
b. Measure and record polarity, distortion, and parasitic oscillation. Begin by applying signal to the system's input,(usually a mixer), and observe the devices output. Once the first device has been tested and is operating correctly, connect oscilloscope and oscillator to the next device down the line, proceed with each device until all have been checked.
c. Measure and record the frequency response of each mixer / preamp in the system.
d. Measure and record the impedance of each loudspeaker line before connecting it to the output of its respective amplifier, confirm that it is equal to or above the rated impedance.
e. Measure and record the output of each power amplifier. Employ a sine-wave oscillator with less than 0.5% frequency accuracy and adjusted to 10 dB less than full power output of the amplifier as the input source to each amplifier being measured. Ascertain that full voltage for rated power can be reached without noticeable deformation of the wave form. Inspect the output sine-wave appearing on the oscilloscope for complete freedom from spurious oscillation, hum, noise, radio frequency interference, or other unexpected additional outputs.
f. Measure and record Z(in), Z(load), E(in), and E(out) for each of the power amplifiers.
g. Measure and record input Z(in) and output Z(out) circuit voltage impedance, open circuit voltage E(o), and input E(in) of speech or music equipment, line amplifiers and signal processors.
h. Measure and record the polarity of all loudspeakers.
i. Measure and record the polarity of the microphones used in the system.
j. Test microphone, line and speaker level audio lines and other interconnecting cable for correct wiring, polarity and shorts to ground.

k. Test any remote controls for specified operational requirements. "Remotes" shall include functions between equipment racks and consoles, power sequencing, etc.

2. Initial Settings
   a. Set gain structure to maximize dynamic range using the optimized method. Do this by setting gain structure so all devices in the system clip simultaneously with the mixer.
   b. Balance the levels of the loudspeaker units driven by different amplifiers in the same system to ensure adequate coverage and level of sound from loudspeakers.
   c. Establish the normal settings for level controls. Adjust level controls on rack-mounted equipment for optimum signal to noise ratio and signal balance; then install security covers to prevent tampering.
   d. Aim speakers to maximize even coverage and minimize spill on unoccupied areas, such as walls.
   e. Prior to equalization of the system use a sweeping sine wave at the systems input to check the permanent loudspeakers for extraneous noise. Confirm even coverage of system by use of pink noise and hand held 1/3 octave real time analyzer. Observe variations in both level and spectrum shape while walking the seating area. If coverage problems are evident, attempt to improve coverage by re-aiming the loudspeakers.
   f. Response shall not vary more than +/- 3 dB at any given seat.

B. Equalization:
1. Provide the required testing apparatus specified herein to complete successfully the equalization and tests. The purpose of the equalization is to adjust the acoustical amplitude response of the sound system to a specified uniformity measured throughout the seating area. This adjustment is made to realize maximum acoustics gain and optimum tonal balance from the sound system.
2. Provide the following minimal standard laboratory test equipment.
   a. Sound level meter and calibrator.
   b. Sine and square wave generator
   c. Impedance (CRL) bridge.
   d. Distortion analyzer.
   e. Graphic level recorder.
   f. Calibrated microphone.
   g. 1/3 octave real-time spectrum analyzer.
   h. Random (“pink”) noise generator.
3. Using a calibrated measuring microphone located in the seating area at twice the critical distance (at which direct sound from the source and reverberant sound are in a ratio of 1:1), establish the unequalized acoustic amplitude response to a pink noise source. Bring the observed acoustic amplitude to within +/- 2 dB uniformity (flat) from 40 to 2,000 Hz. Initially set the roll off at the low frequency end at 24 dB/octave below 20 Hz. Initially set the roll off at the high frequency end at 3 dB/octave above 2 kHz. Adjustments to these settings may be required following initial listening tests.
4. Adjust the sound system gain until it reaches regeneration (feedback). Determine the frequency of regeneration. Adjust the appropriate filter until the observed regeneration ceases.
5. At the conclusion of the tuning of the house curve and the feedback corrections, the electrical amplitude response of the equalizers, record first the house-curve filters alone and then the combined house-curve filters and feedback correction filters.

C. Test Documentation:
1. Provide the following documents:
   a. List of personnel and certified test equipment used.
   b. The Impedance and polarity of loudspeaker lines.
   c. The output impedance of active devices used to terminate passive devices and the value of any termination resistor used.
   d. The input impedance of active devices used to terminate passive devices and the value of any termination resistor used.
   e. The variation of acoustic distribution throughout the seating area above and below a reference level at each 1/3 octave center frequency from 80 - 12,500 Hz.
   f. The recorded polarity and phase measurements of the loudspeakers.
   g. The list of microphone polarity tests.

h. The recorded inspection results observed for hum, noise, parasitic oscillation, and RF interference from the output of each power amplifier.
i. The unequalized house curve made with the measuring microphone.

D. Equipment Tests:
1. If any system does not appear to be functioning properly, further tests may be performed on any item of equipment to determine whether it meets the pertinent specifications. Measurements deemed necessary by the Architect's Consultant may be made for determining frequency response, distortion or directional characteristics.

E. Adjustments:
1. In case the need for further adjustments becomes evident during the demonstration and testing, continue the Work until the systems operate properly.
2. If final acceptance is delayed beyond three test days because the system does not fulfill this specification, pay for time and expenses of the Architect's Consultant during any extensions of the acceptance testing period.
3. If more than one (1) visit is required by the Architect's Consultant because the system does not fulfill this specification, pay for time and expenses of the Architect's Consultant during any extensions of the acceptance testing period.

3.4 DEMONSTRATION AND INSTRUCTION

A. Create an initial configuration for test purposes which demonstrates the full capabilities of the system, demonstrates how it meets specification, and demonstrates areas in which it exceeds specification.

B. Provide training to the Owner at times and dates and of durations to be mutually agreed upon by the contractor and the owner.

C. Training will include detailed instruction in the operation of the equipment provided under this section by persons knowledgeable in the operation of the subject components.

D. Training hours are to be divided between multiple sessions.
1. An introductory session that includes an overview of how components work and significant elements / processes.
2. A detailed training session that reviews items in the first session and continues into the minutia of the equipment operation and maintenance.
3. Attendance at one or more cueing sessions to provide support, real time training, review and reinforcement of earlier concepts.

E. Total training hours are listed in the equipment and component schedule. Hours listed in the equipment and components schedule may be re-allocated between columns at the owner's discretion.

3.5 DOCUMENTATION

A. Provide three sets (3) complete as built drawings of the systems including all information submitted in the shop drawings.

B. Provide three sets (3) maintenance manuals for the systems including as summary section detailing actions required and the intervals at which they are to be performed.

C. Provide three (3) copies of operation manual for the systems.

D. Provide three (3) copies of operation manual for paging system documenting its function, and preset usage.

3.6 ADDITIONAL INFORMATION

A. Equipment and component schedule.

B. System drawings.

C. The speaker focus, equipment rack and room plans.

END OF SECTION

SECTION 11 61 70 5 - PERFORMANCE SOUND, VIDEO, AND COMMUNICATIONS SYSTEM ASSISTIVE LISTENING SUBSYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the integration of the existing single channel infrared assistive listening system for the hearing impaired.

B. Section Includes:
1. Modulator
2. Emitters
3. Receivers

1.2 SYSTEM DESCRIPTION

A. Design Requirements
1. Incorporate an existing Assistive Listening System integrated into the overall Performance Sound, Video, and Communications system.
2. Provide each primary space with an Assistive Listening System.
3. Provide an Assistive Listening System that meets or exceeds the criteria outlined for the Americans With Disabilities Act and other applicable legislation and regulations.
4. Where two or more requirements from this document or regulations conflict follow the more stringent requirements thereby ensuring that the system provided meets or exceeds all requirements.
5. Transmission frequencies shall conform to industry standards.
6. The Assistive Listening System shall accept its input from the Common Audio Relay Feed.
7. Confirm proper operation of existing receivers as specified in the documents.

B. Performance Requirements:
1. The systems shall provide a clear, undistorted signal to every seat in each system’s home performance space and not in adjacent performance spaces.
2. Frequency response is 50 - 15,000 Hz ±3dB with less than 2% total harmonic distortion at 800 Hz, 1% at 1600Hz.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Sound and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the owner.
1. Sound Associates
2. Sennheiser
3. Williams

2.2 EQUIPMENT AND SYSTEMS

A. Transmitter
1. Provide rack mount for transmitters

B. IR Emitters
1. Provide mounting hardware

C. Receiver

1. Confirm proper operation of all receivers.

PART 3 - EXECUTION

(unused)

END OF SECTION

SECTION 11 61 70 3 - PERFORMANCE SOUNDAUDIOVIDEO AND COMMUNICATIONS PAGING SUBSYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the engineering, manufacture, furnishing, coordination and installation of a performance audio relay / paging subsystem.

B. Incorporate existing ceiling speakers into the new system.

C. Section Includes:
1. Paging System.
2. Amplifiers.
3. Microphones.
4. 70V Speakers including appropriate mounting, plaster rings / T-grid bridges, back-cans, and baffles as necessary.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Provide a show monitor and paging system as part of the integrated Sound, Video, and Communications system. These systems are capable of providing the characteristics specified herein.
1. Show Monitor System:
a. Provide an interconnected Show Monitor System, for the performance spaces. This system accepts the common show relay feed.
2. Paging System:
a. Provide an interconnected Paging System, for the performance spaces. This system accepts the common show relay feed and inputs from paging microphone locations. Additionally this system is controlled through the central control system.

B. Performance Requirements:
1. Ensure overall performance requirements of the sound amplification system are checked by measurement. Provide each system as designed which meets the following requirements as well as the manufacturer's published specifications. This Contractor is responsible for use of the equipment specified in the manner specified and each component's conformance with its manufacturer's specifications.
2. Ensure overall system frequency response is +/-3 dB, 250-4,000 Hz, and +/- 5 dB 150-16,000 Hz when measured in 1/3 octave bands at any covered location. Measure frequency response using Time Delay Spectrometry or 1/3 Octave Real Time Analyzer.
3. Ensure residual noise and hum are below the ambient noise levels produced by the air conditioning system and other mechanical systems for an overall signal-to-noise ratio of 70 dB for the entire system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Sound and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the owner.

B. Amplifiers:
1. Crest Audio
2. Crown, Inc
3. Electro-Voice Inc.

4. QSC Audio Products

C. Paging (70.7v) Equipment:
1. Atlas Soundolier Inc.
2. Mortronics
3. Electro-Voice Inc.
4. JBL, Inc.
5. Sonance,

D. Configurable Digital Signal Processors
1. BSS Audio Ltd.
2. Bi-Amp
3. QSC Q-SYS – Basis of Design

2.2 EQUIPMENT AND SYSTEMS

A. Relay system:
1. Monitor Microphones
a. Incorporate existing monitor microphones.

B. Show Monitor / Paging System:
1. Loudspeakers
a. Incorporate existing ceiling speakers.
b. Inspeact all existing loud speakers and ensure proper operation.

2.3 MANUFACTURED UNITS

A. Layout and mounting arrangements are as shown on the Drawings and as described herein.

B. Inspect existing paging system speakers for proper operation. Provide paging loudspeakers and transformers that are easily removable and replaceable in the same position.

C. Fabricate and design each loudspeaker to be held rigid and not vibrate loose during operation.

D. Securely mount the show relay microphone to the ceiling in a manner that will exclude the possibility of falling.

E. Supply the show relay microphone in a color to match the surrounding architecture.

PART 3 - EXECUTION
(UNUSED)

END OF SECTION

SECTION 11 61 70 4 - PERFORMANCE AUDIO, VIDEO, AND COMMUNICATIONS INTERCOM SUBSYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the engineering, manufacture, furnishing, coordination and installation of Performance Communication System

B. Section Includes:
1. Main Station Power Supply
2. Headsets
3. Beltpacks
4. Remote Stations

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
1. Provide an intercommunications system as part of the Performance SVC system,.
2. System is a hybrid analog/digital system integrated with the existing analog equipment.
3. Provide remote station units which include talk and listen capacities for all channels.
4. Provide the intercom system with single channel headsets, wall stations and wall mounted speaker boxes.
5. Provide the intercom system with the ability to accept a digital audio input from the common Show Monitor System as program on all channels.
6. Provide the stage manager with the ability to page via the intercom system headset or microphone.

B. Performance Requirements:
1. Frequency response is +/- 2 dB from 150 to 18 kHz. Main station/power supply impedance is 200 ohms, nominal (adjustable to 1000 ohms). Audio voltage level is -15 dB, nominal. System shall operate from a 28 volt power supply, nominal.
2. System shall operate in temperature range of 0-50 degrees C. It shall have short circuit protection against both the main power feed and the intercom line.
3. By connecting a digital audio feed from the sound system into the master station, it is possible to feed a channel with audio from those systems to serve as program monitor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Sound and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the owner.

B. Clear-Com – Basis of design Clear-Com Arcadia. System must work with existing equipment.

2.2 EQUIPMENT AND SYSTEMS

A. Main Station and Power Supply
1. Refer also to show monitor / paging system section

B. Portable Remote Station (Stage Manager’s Case)
1. Refer also to signal riser drawings and show monitor / paging system section for required

components, configuration and interface.

C. Belt-Pack Stations
1. Provide one 25' cable for each Belt-Pack provided.

PART 3 - EXECUTION
(UNUSED)

END OF SECTION

SECTION 11 61 70 6 - PERFORMANCE AUDIO, VIDEO AND COMMUNICATIONS SYSTEMS VIDEO SUBSYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the engineering, manufacture, furnishing, coordination and installation of Performance Video System

B. Section Includes:
1. CCTV
   a. Video cameras
   b. Video projectors
   c. Video monitors
   d. Mounting hardware
   e. Distribution amplifiers.
   f. Video routing switchers.
   g. Video processing gear
2. High Definition Video
3. Encoders / Decoders
4. Digital Signal Processing
5. Network Switches
6. Projection Video System
   a. Blu-ray players.
   b. Television Tuner
   c. Video projectors.
   d. Control of existing projection screens.

1.2 DEFINITIONS

A. CCTV - Closed Circuit Television System

B. CATV - Cable Television System

C. DM – Streaming High Definition Video and Audio.

1.3 SYSTEM DESCRIPTION

A. Design Requirements
1. Provide CCTV and DM systems integrated into the Performance Sound, Video, and Communications System.
2. CCTV System:
   a. Provide a CCTV-type direct video system relay feed permitting a feed from a fixed-position and portable cameras to monitors in front- and back-of-house areas.
   b. Provide video distribution amplifiers and patching as indicated.
   c. Provide wire, cable and terminations for portable video equipment.
3. DM System:
   a. Provide encoders based on HDMI protocols utilizing video from the video system and audio from the Common Show Relay feed.
   b. Transmit digital and analog audio signals to devices, as well as integrated sound system components. Audio signal should transmit without loss, and maintaining original coding information.
   c. Provide repeaters mid-stream as required.
   d. Accept video streams from:
      1. Blu-ray players.
      2. Owner-Provided CATV Interface

3. Future Digital Media Devices
e. Provide output streams to:
1. Lobby video screens
2. Fixed and portable projectors
3. Control System Touch Panels

B. Performance Requirements:
1. CCTV System
a. Ensure field of view on the camera encompasses the stage and as little of surrounding area as possible.
b. Provide a usable image at light levels as low as 0.5 footcandles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Sound and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the owner.

B. CCTV Equipment and Accessories
1. Blonder Tongue Laboratories, Inc
2. Sanyo, Inc
3. Panasconic, Inc
4. Gefen, Inc

C. Video projectors
1. Sanyo
2. Barco
3. NEc
4. Panasonic
5. Sony
6. Digital Projection

D. DM Switching, Processing, and Distribution
1. Crestron
2. Extron
3. QSC Q-SYS – Basis of Design

2.2 EQUIPMENT AND SYSTEMS

A. Production Video System:
1. Video Camera
a. CCD camera capable of color, black and white and infrared. Provide appropriate power supply.
b. Provide mounting bracket for mounting in the position indicated on the drawings.
c. Provide zoom lens with focal length range to ensure a full-stage picture from typical camera positions.
d. Provide security cable.
2. Video Distribution Amplifier
a. Incorporate existing distribution amplifiers
b. Provide with Rack Mount and blank panels.
3. DM Distribution
a. Provide equipment and systems as noted on the drawings.
b. Provide connection cables as required to connect all input and output devices.
c. Provide all equipment with rack mounts, and wall mounting brackets as required.
4. Video Patchbay
a. Incorporate existing patchbay.

b. Provide Patch Cables

B. Main Theatre Projection
1. Provide a Video Projection system integrated into the Performance Audio, Video, and Intercommunications Systems in the Main Theatre, consisting of:
   a. Video projector.
   b. Input connectors for computers, high definition video signals, computer video derived from multiple locations as indicated on the drawings.
   c. Video distribution from sources to projector.
   d. Integration of control into A/V control system.
2. Video Projector
   a. Brightness: Minimum 15,000 ANSI Lumens at 90% uniformity.
   b. Contrast Ratio: Minimum 3000:1.
   c. Provide 4:3 and 16:9 video format, in all standard PC and MAC resolutions, with a maximum computer resolution no less than 1920 x 1080.
   d. Lens
      1. Provide projector with interchangeable lens.
      2. Provide lens with powered zoom and focus, programmable to formats as described herein.
      3. See drawings for projector and screen placement, and lens throw requirements.
   e. Provide video inputs for HDMI, SDI, DVI / HD Compatible signals up to 4K.
   f. Provide projector with Serial interface for control via installed control devices. Provide also a separate IR type remote control.
   g. Provide projector with integrated keystone compensation up to off-axis angles indicated on drawings, but no less than 5 degrees. Provide system that automatically provides compensation, even when projector is powered off.
   h. Basis for Design:
      1. Panasonic PT-REQ15BU
3. Motorized Projection Screen
   a. Screen
      1. Provide control of the existing projections screen.

C. Technology Theatre Projection
1. Provide a Video Projection system integrated into the Performance Sound, Video, and Intercommunications Systems in the Technology Theatre, consisting of:
   a. Video projector.
   b. Input connections for computers, high definition video signals, derived from multiple locations as indicated on the drawings.
   c. Video distribution from sources to projector.
   d. Integration of control into A/V control system.
2. Video Projector
   a. Brightness: Minimum 10,000 ANSI Lumens at 90% uniformity.
   b. Contrast Ratio: Minimum 3000:1.
   c. Provide 16:9 and 4:3 video format, in all standard PC and MAC resolutions, with a maximum computer resolution no less than 1920x1080. Native resolution to be 1920x1080.
   d. Lens
      1. Provide projector with interchangeable lens.
      2. Provide lens with powered zoom and focus, programmable to formats as described herein.
      3. See drawings for projector and screen placement, and lens throw requirements.
   e. Provide video inputs for HDMI, SDI, and DVI / HD Compatible signals up to 4K.
   f. Provide projector with Serial interface for control via installed control devices. Provide also a separate IR type remote control.
   g. Provide projector with integrated keystone compensation up to off-axis angles indicated on drawings, but no less than 5 degrees. Provide system that automatically provides compensation, even when projector is powered off.
   h. Basis for Design:
      1. PanasonicPT-REQ10BU
3. Projection Screen

a. Screen
   1. Incorporate existing fixed projection screen.

PART 3 - EXECUTION

(UNUSED)

END OF SECTION

SECTION 11 61 70 2 - PERFORMANCE AUDIO VIDEO AND COMMUNICATIONS CONTROL SUBSYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes the engineering, manufacture, furnishing, coordination and installation of the control system.

B. Section Includes:
1. Logic Controller
2. Interface to adjacent systems.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Provide integrated audio, video, and intercommunications systems. These systems are capable of providing the characteristics specified herein.
1. This system provides control of the sound system, lighting system, and video system:
a. Distribution of show relay signals.
b. Distribution of video signals.
c. Distribution of high definition video/media
d. Informs other systems of performance status.
e. Sets show relay source (room mics, sound system, etc)
f. Sets subwoofer feed (L&R, Aux buss, etc)
g. Runs an audience recall chime
h. Mutes feeds to the projectors and to the lobby.
i. Switches show relay feed to intercom channels
j. Recalls presets stored in the Architectural Lighting Processor
k. Lowers shades as controlled by the Architectural Lighting Processor
2. All hardware switches and inputs are momentary contacts.

B. Performance Requirements
1. The system exhibits no perceptible lag between button push and response.

1.3 QUALITY ASSURANCE

A. Supplementary Standards:
1. Thoroughly comment code to assist in troubleshooting.
a. Include descriptions of the use of each variable.
b. Include descriptions of processes in each section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are approved manufacturers of Audio Video and Intercommunications System components. Refer to schedule for specific products. Substitutions may not be made without prior written approval by the Owner.

B. Logic Controller
1. AMX
2. Crestron
3. QSC Q-SYS – Basis of Design

PART 3 - EXECUTION

3.1 PROGRAMMING

A. Some communications may require a pause between commands, the shortest possible pause should be provided.

B. Controlled Devices include:
1. Input closures
2. Output closures
3. Stage Manager's Console (Intelligent remote device)
4. Portable devices.
5. Motorized Breaker Panel for power sequencing - Existing
6. DSP Interface
7. Media Players
8. Television Tuner – furnished by Owner
9. Blu-ray Players
10. Solid State Recorders – furnished by Owner
11. CATV Interfaces – furnished by Owner
12. Projection Screen - Existing
13. Video Projectors
14. Fire Alarm - Existing
15. Portable Control Panels
16. Architectural Lighting Controller
17. Routing Switcher Interface

C. Logic Outline:
1. General
   a. When a portable device is plugged in: All synchronized I/O points will be set to mirror the state of the room as determined by the controller, non-synchronized I/O points will be set to their off state.
   b. All indicators regarding all devices are to be synchronized between stations with the exception of the page zone selection.
   c. Work/house lights are to be synchronized with Architectural Lighting Processor.
   d. Intercom
      1. Show relay disable
      2. Show relay feed
   e. Master states
   f. Sound system power
2. Master State
   a. Mastering affects the space within which the controller sits. i.e.: A Master selection in the Main Theatre control booth will affect the entire Main Theatre, but have no effect on services in other spaces.
   b. In the Main Theatre, the system may be in either Post Show, Show, Intermission, Pre Show, Rehearsal, Work, or Night mode at any one moment. These states are mutually exclusive.
   c. In the Technology Theatre the system may be in either Show, Rehearsal, Work, or Night mode at any one moment. These states are mutually exclusive.
   d. The system will switch between these master states when either the appropriate master is pressed, or a string is received from the work light controller indicating that the master state has been entered.
   e. When a master state is entered because of master being pressed a string is be sent to the architectural controller indicating that this mode was entered.
   f. The system will start-up in Night Mode
   g. On entering Night Mode:
      1. All house preset will be faded to off (including the Out house light preset).
      2. All work and Show lights will switch off.
      3. On entering Night mode a submaster associated with night mode will come on and those associated with show and work mode will go off.

4. The Show Relay To Lobby Mute will come on.
5. The Show Relay To Backstage Mute will go off.
6. The School Intercom Mute go off.
7. The Page To House Mute will go off.

h. On entering Show, Post Show, Intermission, Pre Show or Rehearsal mode:
1. A submaster associated with these modes will come on and those associated with work and night modes will go off.
2. If the house is in Cleaning submaster it will switch to Full.
3. All illuminated work lights will switch to their associated Show submasters.
4. Work lights with no associated show submaster turn off.
5. The Page To House Mute will come on.

i. Additionally on entering Rehearsal mode:
1. The Show Relay To Lobby Mute will come on.

j. Additionally on entering Show, Post Show, Intermission, Pre Show mode:
1. The Show Relay To Lobby Mute will go off.
2. The School Intercom Mute will come on.

k. On entering Work mode:
1. A submasters associated with work mode will come on and those associated with show and night mode will go off.
2. Stage-sides works will come on.
3. If the house is in any preset other than Off it will switch to Cleaning.
4. The Show Relay To Lobby Mute will come on.

3. Work / House
a. Calls will be made to the work / house controller associated with the space in which the initiating station sits.
b. Calls to the House/Work/ Light Controller are executed in the order in which they are received.
c. Preset recalls will be sent to the Architectural Lighting Processor based on pre-programmed presets. Coordinate presets and screening with 11 61 61 contractor.
d. The house lights may be at either Full, Half, Glow, Out, or toggled off. These states are mutually exclusive. Only the Out state may be toggled off.
e. House light states switch with cross fades of a set duration (initially 5 seconds). Each house light state will have an associated preset.
f. Master states will not inhibit the function of buttons on the Stage Manager’s Work Light Control Panel or on the Lighting Booth Work Light Control panel.

4. Paging
a. Calls to the Router are executed in the order in which they are received.
b. When Page To House Cutoff is on, pages to house from outside the performance space will be logically inhibited. Pages from the stage manager’s consoles on stage or in that space’s control booths will not be inhibited.
c. When the Audience Recall is on, a chime from the Chime Generator is fed to all public areas for a period of 5 seconds. At the end of 5 seconds the Audience Recall is turned off and closure to the chime is terminated.
d. Paging is initiated through Stations located in:
1. Stage managers portable console.
e. Every paging station is independent. Paging stations may access many zones.
f. Availability of the paging circuit is indicated through an "Avail" indicator. When a station may successfully page, or is successfully paging, this indicator is illuminated.
g. All paging stations are informed of zone status through "In Use" indicators. When a zone is being paged the IN USE indicator is illuminated on all stations.
h. Access to zones is prioritized by station location.
i. Paging to the Backstage areas is prioritized in the following order:
1. Stage manager Stage Left
2. Stage manager Stage Right
3. House Mix
4. Other areas
j. Paging to the Audience areas is prioritized in the following order:
1. Stage manager's control booth
2. Stage manager on stage

3. Other areas

k. Paging to the Lobby is prioritized in the following order:
   1. House Manager
   2. Stage manager Stage Left
   3. Stage manager Stage Right
   4. House Mix
   5. Other areas

l. When paging to the Lobby is not in use and the Audience Recall on, chimes are played in the public areas for a brief period.

m. Default show relay signal:
   1. Backstage areas receive the backstage show relay feed when pages are not active and the show relay to backstage mute is off.
   2. Lobby areas receive the public show relay feed when pages are not active and the show relay to lobby mute is off.

n. Paging and zone selection from Stage Manager's Consoles works as follows:
   1. Pressing zone button toggles that zone between selected (illuminated) and un selected (un-illuminated).
   2. Upon pressing the Stage Announce button the system routes pages from the microphone to the selected, available zones and assigned spaces.

5. Other

a. When a Relay Mute to Intercom button is off: the routing switcher will route the local theatre’s show relay to its associated intercom power supply.

b. When a Mute is on: all audio show relay signals which feed the area will be unrouted and logically inhibited.

c. Miscellaneous Sound System Controls
   1. Relay Feed From:
      Switches the source of signals between the choices in a mutually exclusive.
      The default source on power up is all off – monitor microphones
   2. Subwoofer Feed From:
      Toggles the select feed sources on / off – these pile on
      The default source on power-up is left/right from AV system.
   3. Signal Mute
      a. Mutes the feed from the associated device to the system.
      b. All Mute mutes all inputs. This may be activated by a contact closure from the fire alarm system or by a user. If activated by the fire alarm system, only the fire alarm system may un mute the signal.
   4. Surround Config
      a. Off - Routes L/C/R signals to front speakers, and mutes all surround speakers.
      b. 5.1 - Routes left side to left rear and right side to right rear.
      c. 6.1 - Sums Left Rear and Right Rear and routes them to both rear channels.
      d. 7.1 - Left Rear and Right Rear channels are fed from their individual feeds.
   5. Audience Recall plays the chimes as noted above.
   6. Cinema Configuration
      a. Normal routes individual signals from the console and patch bay to their associated speakers
      b. Media routes audio from the surround processor and mutes inputs from the patch bay.
   7. Reset Levels
      a. Requests a confirmation by displaying the warning box: "Are you sure you want to reset the levels?"
         1. If the user responds by clicking NO - the system returns to its pervious state.
         2. If the user responds YES the system resets all level to the default levels recorded by recalling a preset in the DSP.

d. Power Controls:
   1. Power controls exist on the screens and on the custom faceplates.
   2. Device Power
      a. Toggles power to that device on and off.
      b. In the case of the Projector the warming process is displayed on the screen.
   3. System Power

a. LCD - If the power is currently on - Requests a confirmation by displaying the warning box: "Are you sure you want to power the system off"
    1. If the user responds by clicking NO - the system returns to its pervious state.
    2. If the user responds YES the system opens the power output and adjusts it's status accordingly.
b. Custom Panels – If the power is currently on – Button will blink quickly for 10 seconds prior to powering off. If button is pressed in that time, power off will be cancelled.
c. If the system is powered off, the system closes the power output and adjusts it's status accordingly.
d. Sequences power on in a stepped fashion to avoid unnecessary surges in the system.
e. Sequencing on starts from the signal source and follows the signal path to the amplifier with the amplifiers being the last to step on.
f. The amplifiers may be brought on in groups to minimize the current in-rush on the building electrical system.
g. The off sequence is the reverse of the on sequence
h. The logic controller is not included in the sequencing system
i. Sound System Power
    1. Powers on the reinforcement and effects system.
j. Ancillary System Power
    1. Powers on the paging, show relay, intercom, video, and assistive listening systems.

e. When the School Intercom Mute button is toggled on the system interrupts the signal from the school's intercom system.

6. Level Controls
    a. The system queries the DSP and then the screen displays it's current level
    b. Up increases the level
    c. DN decreases the level
    d. Levels increment and decrement in steps adjusted to give the user an immediate sense of feedback.
    e. The upward range of adjustment is limited by the system to prevent accidental overloading of the system.
    f. When the up or down button is pushed the level bar indicates the progress of the adjustment.
    g. Mute
        1. On Muting
            a. Stores the current level
            b. Mutes the input.
        2. On UnMuting
            a. Restores the stored setting.
7. Screen Controls
    a. Deploy, Stop, or Store the screen
8. Devices.
    a. The automixer output is pile on (mixed with) the output from other AV devices. When a device is chosen it is queried and the appropriate transport control status is displayed.
    b. When a Video device is selected and Unmuted any active video device is automatically muted (video and audio)
    c. Time and track data are constantly updated when the applicable display is active.
    d. Video mutes and unmutes the video output and audio output from the device.
    e. Track selection and status is also displayed where applicable.
    f. Level control and level mute operate as outlined above.
9. Location Selection
    a. Selects the source of the portable AV devices and sets the routing accordingly.
10. Device Selection
    a. Indicates the active device by high lighting its button.
    b. When a device is selected and it isn’t active the device output is muted (audio and video) and the control screen for that device is selected.
11. Main Volume adjusts the Audio output level of all devices.

12. Login
    a. The Login Screen allows the entry of a code to activate the system.
        1. Entering the correct code and pressing enter unlocks the system.
        2. Entering the an inaccurate code and pressing enter results in a message: "Incorrect Code, Try Again" after the first 3 attempts in a 2 minute period. On the 4th unsuccessful attempt the system displays "Incorrect Code, Too Many Attempts" for 45 seconds and then returns to the main menu.
    b. The code may be changed using the password maintenance screen.
        1. On selecting the change code button the Unlock screen is presented.
        2. The user is first prompted for the current code.
        3. Next the user is prompted for a new 6-9 digit code.
        4. The user is prompted to reenter the new code.
        5. If the 2 entry attempts match the user is informed that the code has been change and then returns to the setup screen.
        6. If the 2 attempts do not match the user is informed that the code has not been changed and returned to the setup screen.
    c. The backup code 134376846 always unlocks the system and cannot be changed.

D. Screens
1. After a period of 2 minutes of inactivity the active screen is dimmed.
2. Back returns to the previous screen
3. Welcome is displayed when no one is logged in.
    a. When touched anywhere the Login Screen is displayed.
4. Login Allows entry of an access code.
    a. The code is processed when the user clicks Enter.
    b. The next screen displayed is based on the user access level – see menu map.
5. Technician Control
    a. Functions are as noted above.
    b. Date & time functions are self explanatory.
6. Sound System
    a. Allows setting of sound system parameters as noted above.
7. Password Maintenance
    a. Allows the adding and deletion of users.
    b. Clicking on a name field pulls up the alphanumeric keyboard displaying the existing user name for editing.
    c. Clicking on the Password field pulls up the numeric keypad for password entry – the existing password is not displayed.
    d. Access level defaults to User. Pressing another level switches to that level of access. Access levels are mutually exclusive.
    e. Exiting the line or closing the screen updates the record.
8. User Menu
    a. If entered from the Technician Control Screen the End Session function is changed to Back.
    b. Functions as noted above.
9. Device Screens
    a. Functions as noted above.

3.2 SYSTEM TESTS AND ADJUSTMENTS

A. Test permutations and combinations of logic inputs to ensure predictable system outputs (reactions).

B. Latency - measure time between button push and response.

3.3 DOCUMENTATION

A. Provide three (3) hard copies of all system programming.

B. Provide two (2) electronic copies of all system programming.

3.4 ADDITIONAL INFORMATION

A. See logic controller screen layouts.

END OF SECTION

Item #			Make	Item	Description	Unit	Main Theatre	Technology Theatre	Dance Classrooms	Choral / Ensemble Rooms	Total
	Audio Sources										-
		Media Players									-
1			Denon	DN-500CB	CD / USB / Buetooth Media Player	Each	1	1	2	2	6
	Audio Microphones & Direct Boxes										-
		Microphones - Wireless									-
2			Shure	ULXD4Q	UHF Digital Wireless Four Channel Receiver	Each	6				6
3			Shure	SLXD14/SM35/SM 58	Wireless Combo Pack - Beta 58A & body pack transmitter with headset microphone	Each			2		2
4			Shure	UA844+	Antenna Distribution Amplifier	Each	2				2
5			Shure	UA874	UHF Directional Antenna	Each	2				2
6			Netgear	M4250 8x1G POE+	8-Port Gigabit Managed AV Switch PoE+	Each	2				2
7			Shure	ULXD1	UHF Digital Wireless BodyPack Transmitter Coordinate Frequency	Each	24				24
8			Shure	ULXD2/B58	Wireless Handheld Beta 58 Coordinate Frequency	Each	16				16
9			Shure	MX183	Omnidirectional Lavalier Microphone	Each	24				24
10			DPA	6060 CORE	Subminiature Lavalier Microphone	Each	24				24
11			DPA	6066 CORE	Omnidirectional Subminiature Headset Microphone wired for use with BodyPack	Each	16				16
12			Gator	G-Tour 16U CAST	16RU ATA Wood Flight Case w/ Casters	Each	1				1
13			Yamaha	RSio64-D	64 Channel Dante digital audio console interface rack with 3@MY8-AE96S cards. For installation in existing wireless microphone rack.	Each	1				1
14			Radial	Power-2	19" Rack Mount Power Conditioner & Surge Supressor w/LED Lighting	Each	1				1
	Audio Processing										-

Item #			Make	Item	Description	Unit	Main Theatre	Technology Theatre	Dance Classrooms	Choral / Ensemble Rooms	Total
		DSP Engines									-
15			QSC	Core 510i	Integrated Core with 8 i/o card slots	Each	1				1
16			QSC	Core 110f	Unified Core with 24 local audio I/O channels, 128x128 total network I/O channels with 8x8	Each		1			1
17			QSC	CAES4	4 Channel AES-3 Digital Output Card	Each	2				2
18			QSC	CIML4	4 Channel Mic / Line Input Card	Each	2				2
19			QSC	COL4	4 Channel Line Output Card	Each	1				1
20			QSC	CDN64	Q-SYS Dante Bridge Card, 64x64	Each	1				1
21			QSC	Core 8 Flex	Unified Core with 8 local audio I/O channel 64x64 total network I/O channels, Dante	Each	1				1
22			QSC	QIO-ML4I	Q-SYS 4 Mic/Line Input	Each			2	2	4
23			QSC	TSC-50-G3	Q-SYS 5" PoE Touch Screen	Each			2	2	4
24			QSC	TSC-70-G3	Q-SYS 7" PoE Touch Screen	Each	1	1			2
25			QSC	TSC-101-G3	10" Touch Screen Controller with Desk Mount	Each	2	2			4
26			QSC	QIO-S4	RS232/485 Interface Purple	Each	1	1			2
27			QSC	QIO-GP8x8	I/O Expander Purple	Each		1			1
28			QSC	Q-SYS Programming	Provide all necessary programming. Include licences for all relevant software.	Each	1	1	1	1	4
	Audio Mixers										-
		Digital Mixers									-
29			Yamaha	DM7-EX	Digital Mixing Console with 120 Channels, 32 analog inputs, 16 analog outputs and Dante	Each	1				1
30			Yamaha	DANTE-MY16-AUD2	96k Interface card for: 8 O Analog For DM1000 installation	Each		1			1
31			Yamaha	Rio1608-D2	16 In, 8 Out Stage Box, Dante Provide with Road Case	Each	2				2
	Audio - Amplifiers										-
		Power Amplifiers - Fan Cooled									-
32			QSC	CX-Q 4K4	4-Channel 1000W/CH Q-SYS Network Amplifier - Control Booth	Each	1	4			7

Item #			Make	Item	Description	Unit	Main Theatre	Technology Theatre	Dance Classrooms	Choral / Ensemble Rooms	Total
33			QSC	CX-Q 4K8	8-Channel 500W/CH Q-SYS Network Amplifier	Each	1	1	0.5	0.5	3
		Power Amplifiers - Fan Cooled 70V									-
34			QSC	CX-Q 2K4	4-Channel 500W/CH Q-SYS Network Amplifier	Each	1				1
35			QSC	SPA-Qf 60x2	2 channels, 60 watts 70V Amplifier	Each	1	1			2
	Audio - Speakers										-
		Speakers - Booth Monitor									-
36			JBL	LSR308	8" Active Studio Monitor	Each	2	2			4
		Speakers - Fullrange									-
37			Meyer	UP-4slim	48V Loudspeaker	Each	8				8
38			Meyer	Ultra-X20	Powered Speaker	Each	2				2
39			Meyer	Galileo Galaxy 816	Loudspeaker Management System	Each	1				1
40			Meyer	MPS-488X	8 Channel Signal and Power Module for MM-4XP	Each	1				1
41			Renkus-Heinz	TX81	Passive 2 way Full Range Loudspeaker 120Vx60H	Each				2	2
		Speakers - Subwoofers									-
42			Meyer	900-LFC	LEO Family Subwoofer	Each	2				2
	Assemblies										-
		Stage Manager Portable Rack									-
43			ClearCom	HRM-4X	Helixnet Remote Station	Each	1				1
44			QSC	I/O-8 Flex	I/O peripheral w/ 8 switchable input/outputs, 8x8 GPIO, RS232, USB.	Each	1				1
45			QSC	TSC-70-G3	Q-SYS 7" PoE Touch Screen	Each	1				1
46			Denon	DN-500CB	CD / USB / Buetooth Media Player RK-3	Each	1				1
47			Netgear	M4250 8x1G POE+	8-Port Gigabit Managed AV Switch PoE+ - RKP-31	Each	1				1
48			Radial	Power-2	19" Rack Mount Power Conditioner & Surge Supressor w/LED Lighting	Each	1				1
49			TrippLite	RS-0615-F	6 Outlet Power Strip	Each	1				1
		Portable Mixer Rack 1									-
50			Generic	WAP	Wireless Access Point	Each	1				1

Item #	Make	Item	Description	Unit	Main Theatre	Technology Theatre	Dance Classrooms	Choral / Ensemble Rooms	Total
	Intercom-Digital								-
	Main/Remote Stations								-
51	ClearCom	Arcadia-X4-16P	Digital Intercom Mainstation	Each	1				1
	Belt Packs and Headsets								-
52	ClearCom	HXII-BP	Helixnet Digital 2 Ch. Dual Listen Monaural Beltpack	Each	6				6
53	ClearCom	CC-300-X4	Single Enclosed Ear Headset with Switched Gooseneck Microphone and standard Clear-Com Connection.	Each	6				6
	Ethernet								-
54	NetGear	M4250 24x1G POE++	24-Port Gigabit Managed AV Switch PoE++ 100mb, convection cooled	Each	2	1			3
	Video System								-
	Cameras								-
55	Samsung	SDC-7340BC	Infrared capable camera	Each	1				1
	Media Player								-
56	Denon	DN-500BD MKII	Blue Ray Disk Player	Each	1	1			2
57	QSC	DCIO-H	Digital Cinema Processor for Q-SYS	Each	2	2			4
	Video over IP								-
58	QSC	NV-21-HU	Q-SYS Video Encoder / Decoder With Cable Set	Each	5	2			7
59	QSC	NV-32-H	Q-SYS Video Encoder / Decoder	Each	3	2			5
60	Netgear	M4250 8x1G POE+	8-Port Gigabit Managed AV Switch PoE+ Green	Each		1			1
61	Netgear	M4250 24x1G POE++	24-Port Gigabit Managed AV Switch PoE++ Red	Each	1				1
	Video Format Interface								-
62	Blackmagic Design	SDI to HDMI	Micro Converter SDI to HDMI w PSU	Each	1				1
	Video Projectors								-

Item #			Make	Item	Description	Unit	Main Theatre	Technology Theatre	Dance Classrooms	Choral / Ensemble Rooms	Total
63			Panasonic	PT-REQ10BU	10,000 Lumen Laser 1-Chip DLP Projector with Lens.	Each		1			1
64			Panasonic	PT-REQ15BU	15,000 Lumen Laser DLP Projector. Provide with lens and mounting hardware.	Each	1				1
	Installed Cable										-
65			Custom	Cable Package		Lot	1	1	1	1	4
	Faceplates										-
66			Custom	Lot	Provide Boxes and Faceplates as per Drawings and Scheules	Each	1	1	1	1	4
	Training										-
67			Custom	Training	Total training hours to be scheduled at times and on days to be mutually agreed upon with the owner.	Hour	12	2	1	1	16
	Supplemental										
68			Various	Misc	Materials, devices, and labor required to complete the system in addition to those items outlined above.		1	1	1	1	4
	Sub-Totals										
			Materials								
			Labor								
	Total										
End Of Section											