SECTION 27 41 60
AUDIO DSP SYSTEMS CONFIGURATION

PART 1 - GENERAL

1.01 SUMMARY

A. Contract Documents

1. The General and Special Conditions are hereby made a part of this Section. Where requirements of this Section are at odds with requirements stated in any Special or Supplementary Conditions, the more stringent requirements shall apply.
2. The Contract Documents are complementary and are intended to include or imply all items required for the proper execution and completion of the work. Any item or work required by the Specification or other portion of the Contract Documents, but not shown on the drawings, or shown on the drawings but not described in the Specification, shall be provided and installed by the Contractor as if shown or mentioned in both.
3. The Consultant may furnish additional instruction or clarification necessary for properly executing the work. Instructions or clarifications shall be consistent with the Contract Documents or agreed-upon modifications thereof, and inferable therefrom. In giving instruction or clarification, only the Project Director shall have the authority to make minor changes in the work that will not entail an increase in the Contract price or time.
4. Copies of drawings and specifications regardless of how furnished are the property of the Agency and are not to be used on any other work or project. No contract documents may be released for publication or to any other party without the written consent of the Agency.

B. Scope of Work

1. Work under this Contract includes the following spaces/systems:
    a. Bettye Davis Room (106)
    b. Max Gruenberg Room (120)
    c. Romona Barnes Room (124)
    d. Butrovich Room (205)
    e. Speaker's Chambers (210)
    f. Senate Chambers (217)
    g. House Chambers (220)
    h. House Finance Room (519)
    i. Senate Finance Room (532)
    j. Beltz Room (in Stewart Building) (105)
2. Refer to "Appendix B: Audio DSP Systems Functional Description" for complete and detailed description of the Audio DSP Systems and associated functional requirements.
3. Work under this Contract includes all labor, materials, tools and equipment, transportation services, supervision, coordination, etc., necessary to complete the

programming and configuration of a high-quality Audio DSP System in excellent working order, as described in these specifications and the associated drawings and following good programming practice, and to maintain the systems throughout the Warranty period.

4. The Contract also includes:
    a. Verification of required cabling, interfacing, and general conditions at the job site.
    b. Preparation of submittal information.
    c. Installation following the contract documents, manufacturer's recommendations, and all applicable code and legal requirements.
    d. Initial tests and adjustments, written report, demonstration for approval, final adjustments, and documentation.
    e. Instruction of operating personnel; provision of manuals.
    f. Maintenance services; Warranty.
5. Notwithstanding any detailed information in the Contract Documents, it is the responsibility of the Audio DSP System Programmer to supply systems in full working order.

C. Products Supplied But Not Installed Under This Section

1. Certain equipment may be supplied but not installed or may be determined as “installed by others” or “installed by Agency”. This may include but not be limited to portable equipment and/or cables.

D. Products Installed But Not Supplied Under This Section

1. Certain equipment may be identified after the bid is awarded as Agency Furnished Equipment (AFE). Agency Furnished Equipment is presently part of the Agency's system, or will be provided by the Agency, and will be delivered to A/V Contractor's or Programmer’s off-site construction facility, delivered to the A/V Contractor's or Programmer’s on-site secured storage area, or otherwise provided on-site, as appropriate, for incorporation into the system.
2. Inspect the AFE equipment and notify the Agency promptly in writing of damage or defect and the extent of repair and/or adjustment required to bring the AFE to original specification. Service AFE only as directed by the Agency, under the arrangements of a separate contract or agreement.
3. Incorporate AFE equipment into the system as if provided new, exempting any warranty coverage. The Contractor shall not be responsible for the warranty of AFE equipment unless specifically covered under a separate agreement.
4. The Contractor shall be responsible for the physical safety and care of any AFE equipment while in their possession. Any damage or destruction of AFE equipment while in the Contractor’s care shall be the responsibility of the contractor to remedy without additional claim.

E. Governing Clause

1. For the sake of brevity these specifications omit phrases such as "Programmer shall furnish and install," "unless otherwise noted or specified," etc.; nevertheless, the requirements of the specifications are mandatory, and these phrases shall be inferred. The mention of materials and operations implies the Programmer shall furnish and install such materials and perform such operations to the overall

standards set by the Contract Documents. Exceptions are noted herein or shown on the drawings.

2. In the event that a Consultant is not a participant in this project after award of contract, all references to “Consultant” in this document shall be replaced with “Agency”.

F. Questions

1. Submit questions about the Drawings and Specification to the Consultant in writing.

G. Related Requirements

1. Section 27 41 16 – Audio Video Systems and Equipment

1.02 REFERENCES

A. Abbreviations and Acronyms

1. DSP
   a. Digital Signal Processing, or Digital Signal Processor.
2. AEC
   a. Acoustic Echo Cancellation
3. dBFS
   a. Decibels relative to Full Scale. Where the level of 0 dBFS is assigned to the maximum possible digital level.

B. Definitions

1. Agency: The designated responsible party with the authority to make final decisions on contract and technical issues and provide final acceptance of the AV Systems. May also include designated representatives and/or subordinates as part of a larger “Agency Team” such as the Project Director, End-users, Facility Managers, AV Technology Managers, Building Committees, Purchasing Agents, and/or Contract Representatives.
   a. State of Alaska
2. Architect: The “Architect” referred to in this specification is the entity who has been hired to design and specify the physical environment the AV systems are to be installed within (e.g. the building, facility, room, and/or space). The architect is generally responsible for hiring and managing the various entities that constitute the design team (architects, engineers, consultants, etc.).
   a. None
3. Consultant: The “Consultant” referred to in this specification is the entity who has been hired to design and specify the AV System as well as work with other design team members and well as contractors/trades to ensure proper collaboration
   a. Salas O’Brien
4. Programmer: The “Programmer” referred to in this specification is the Audio DSP Systems Contractor selected by the A/V Contractor (as a sub-contractor) or the

Agency, through competitive bidding or negotiation, to provide the audio DSP systems programming described by this specification, and to whom a contract has been awarded to do so.

5. A/V Contractor: The “A/V Contractor” referred to in this specification is the A/V Systems Contractor selected by the Agency, through competitive bidding or negotiation, to provide the A/V systems described by this specification, and to whom a contract has been awarded to do so.
6. Configuration: A set of specified individual components (audio, video, control, and networking equipment as well as associated hardware and wiring) designed and configured to operate and one comprehensive system for the conveyance of audio/video content to an audience. AV Systems may include, but are not limited to, the following major items:
    a. Audio mixers, equalizers, amplifiers, program sources, digital recording devices, microphones, and other signal processing equipment;
    b. Loudspeakers and loudspeaker mounting, aiming, rigging, and support hardware;
    c. Video switching, video over IP transmitters/receivers, video display equipment, video conferencing systems, cameras, and other video playback devices.
    d. Network equipment;
    e. Control equipment;
    f. Equipment racks, cabinetry, and furniture;
    g. System accessories;
    h. Cable, connectors, adapters, plates, panels, transformers, and other interface devices.
7. Configure: To define functionality, levels, presets, and settings of DSP device(s) using software and/or firmware.
    a. Also “Set up” or “Program”
8. Fixed Architecture: Referring to DSP software providing fixed processing paths with adjustable processing objects in a predetermined sequence.
9. Open Architecture: Referring to DSP software providing infinitely variable Programmer selected processing paths with adjustable processing objects arranged in any sequence deemed appropriate by Programmer.
10. Masculine Pronoun: In all cases where a masculine pronoun is used within these specifications, the pronoun is used in the interest of simplicity of syntax, and the reference shall be interpreted as genderless.

C. Reference Standards

1. The workmanship of the audio DSP systems programming shall adhere to industry best practices.
2. The following documents, or the versions closest in time prior to the release of this specification, shall constitute recommended reading and form a part of this specification to the extent specified herein. Where the requirements of these documents conflict with the instructions herein, the requirements of this specification shall govern.
    a. Davis Don, Eugene Patronis, and Pat Brown. *Sound System Engineering 4th*

Edition. New York: Focal Press, 2013.

b. McCarthy, Bob. Sound Systems: Design and Optimization 3rd Edition. New York: Focal Press, 2016.

1.03 ADMINISTRATIVE REQUIRMENTS

A. Coordination

1. Coordinate work with Agency personnel involved in this project, Consultants, representatives, and employees/subcontractors employed of/by Agency, including the AV Contractor and the scheduled work of other trades.
2. Cooperate with all trades present on the project, so that lost time, work stoppages, interference, and work inefficiencies do not occur.
3. Assure labor "harmony" among personnel and subcontractors, and with other trades associated with construction, delivery, installation, and testing of the facility.
4. Failures in coordination shall not be a reason for additional payment to correct omissions or errors.
5. Network Coordination
    a. Where connection between components or control features are accomplished over a LAN (either dedicated A/V or Agency's), Programmer shall follow Audio DSP manufacturer's guidelines for setup and configuration.
6. IT Coordination
    a. General
        1. Where connection between components or control features are accomplished over the Agency's LAN, Programmer shall coordinate with Agency's IT department for IP addresses, firewall access, and other issues pertaining to successful integration.
    b. Permission
        1. It is Contractor's responsibility to obtain necessary information and permissions to implement their system. Any delays or problems with gathering information or coordinating access to the LAN or WAN shall be brought to Consultant immediately for resolution.

B. Pre-installation Meetings

1. General
    a. Programmer should expect and permit time for an iterative process whereby multiple smaller submissions are made for review and approval.
    b. Meet with the A/V Contractor (if different) or any other contractor whose work will impact the performance of this contract and coordinate as outlined above.
2. Initial Planning
    a. Programmer shall identify project scope, requirements, and any potential issues at a high level but with enough detail that work and direction can be evaluated and approved.
3. Development
    a. Contractor shall deliver a working DSP framework that addresses the items determined in the initial planning stage and note any non-functional

requirements.

4. Construction
    a. Incrementally fills in the architecture with finished programming produced from initial planning, development, and testing of the functional requirements.
5. Deployment
    a. Delivers/deploys the system into the operating environment and provides full operational testing.

C. Sequencing
1. As required, sequence work with the Agency, the AV Contractor, and all trades present on the project.
2. Notify the Agency and/or Agency's Representative immediately of any issues of sequencing so that lost time, work stoppages, interference, and work inefficiencies do not occur.

D. Scheduling
1. Coordinate and schedule all on-site activities with the Agency and the AV Contractor (if different).
2. Programmer shall work and complete all on-site tasks following the access to the site provided by the Agency.

1.04 SUBMITTALS

A. General
1. Refer to Section 27 41 16 Audio Video Systems and Equipment for additional requirements.

B. Supplemental AV Network Configuration Narrative
1. Audio DSP programmer shall provide a Supplemental AV Network Configuration Narrative for review that details the IP configuration and settings for the Audio DSP configuration and related devices.
    a. Coordinate this narrative as needed with the A/V Contractor and the Audio Video Control Systems Programmer.
2. This shall include, but not be limited to, all IP configurations and settings, proposed (or dovetailed into project) IP address scheme, proposed (or dovetailed into project) VLANs, and proof of compliance with manufacturer's recommended network settings.

C. Software
1. Programmer shall supply the DSP configuration file for all audio digital signal processors (DSP), authored in DSP manufacturer's most current software for review and approval.
2. Copy of or web link to manufacturer download page of configuration software for accessing configuration software.
    a. Submitted software shall be the identical version used to create Audio DSP configuration.

3. Processor power required of DSP shall not exceed 95% total processing capacity.
    a. If processing power required exceeds available processing power, Contractor shall immediately notify Consultant during pre-installation phase.
4. Layouts of physical and virtual user controls in graphical format. This shall include:
    a. Engraved buttons and overlays
    b. Machine-printed adhesive labels
    c. Graphical user interfaces for touch panels or web interfaces

D. Samples

1. Provide DSP programming and code samples as required herein or as requested by Consultant, Architect, or Agency.
2. Submit electronic copies of any custom programming including source code. Include printed copies of all control screens, wiring pages, etc.

E. Delegated Design Submittals

1. Include delegated design submittals for any systems or sub-systems that are not specifically designed by the programmer but are required for review and approval. For example, this might include:
    a. Manufacturer-provided scripts, LUA/Python code, or plug-ins.
    b. Manufacturer-provided EQ settings or Filters (FIR or IIR)

F. Test and Evaluation Reports

1. Shop Testing
    a. After the A/V equipment racks shall be populated, wired, and tested to the fullest extent possible in the Contractor's shop before shipping to the job site the Programmer shall load all audio DSP code into the system and perform initial testing for signal routing and GUI interface controls.
    b. Submit any test reports to the A/V Contractor so any issues with equipment and/or cabling can be remedied.
2. Field Testing and Evaluation Reports
    a. After the A/V equipment racks have been installed, wired, and tested to the fullest extent possible on the job site the Programmer shall load all audio DSP code into the system and perform thorough testing for signal routing and GUI interface controls.
    b. Programmer shall verify complete functionality before scheduling inspections with Consultant, including but not limited to:
        1. DSP control functionality, verification of presets, volume controls, mute controls, etc.
        2. Stable operation, completely free of feedback and distortion throughout entire range of available DSP controls.
        3. Correct routing of all signals to intended destinations.
        4. Unity gain structure.
        5. Output transducer (speaker) protection processing functionality.
        6. AEC functionality.
    c. Submit any test reports to the Consultant and A/V Contractor so any issues with equipment and/or cabling can be remedied immediately.

G. Questions

1. Submit questions about the Drawings and Specifications to the Consultant in writing.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Contracts

1. Provide in writing any maintenance contracts included in the project.

B. Operation and Maintenance Data

1. Provide any operation and maintenance information to be included in the A/V Contractor's closeout submittals as detailed in Section 27 41 16 Audio Video Systems and Equipment.

C. Warranty Documentation

1. Provide any warranty information to be included in the A/V Contractor's closeout submittals as detailed in Section 27 41 16 Audio Video Systems and Equipment.
2. Programmer's Warranty
    a. Include a clear statement of the terms and period of the Programmer's warranty; Programmer's phone and hours.

D. Software

1. Provide a properly licensed working copy of the latest version of all contractor-provided software required to operate or configure the systems specified herein shall be a part of the system supplied. This includes but is not limited to, all software, firmware, and hardware required for configuration, adjustment, diagnosis, and repair.
2. Software shall be fully documented, and that documentation shall be included.
3. Software shall be included in its "installable" state on industry-standard CD-ROM, USB flash drive, or other appropriate format. Back-up of the working software may be provided as an additional inclusion. Disk images are unacceptable.

E. Ownership

1. General
    a. Upon completion of the project, all configuration of DSP devices shall be property of Agency.
2. Property Rights
    a. Programmer assigns to Agency all intellectual property rights and applications made by Programmer, or its agents or employees in connection with the performance of this contract. Programmer also acknowledges and agrees that services rendered in connection with the performance of this contract shall be "work made for hire" within the meaning of Section 201 inventions of the Copyright Law of 1976.

F. Logins and Passwords

1. Contractor shall not use any passwords to prevent access to Audio DSP configuration files in submittal formats.
2. Provide any logins and passwords required for the operation, maintenance, or

modification of the AV Systems. This includes but is not limited to, both hardware as well as software.

a. Audio DSP
b. Control Systems
c. Network Switches and Wireless Access Points
d. Configuration and Maintenance Computers
e. Touch Panel PINs.
f. Any other password-protected equipment.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Refer to RFP documents for qualification requirements.

B. Continuity of Supervision

1. The Programmer shall maintain the same individual in charge of work for the full duration of the project unless illness, loss of personnel, or other circumstances beyond the control of the programmer intervene.

C. Certifications

1. As required, all certifications shall be current and the organization or individual(s) shall be in good standing with the certifying entity.

D. Construction Observation

1. The failure of the Consultant or other representative of The Architect or Agency to condemn any defective work or material shall not release the Programmer from the obligation to debug or reprogram the work at any time before final acceptance upon discovery of said defective work.

E. Safety

1. Site Safety and Personal Protection Equipment

a. Programmer shall adhere to all site safety requirements as directed by the Agency, Agency's Representative, Building or Site Supervisor including, but not limited to general project safety training and/or site-specific training for possible contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.
b. Programmer shall adhere to all PPE (personal protective equipment) requirements.
c. Programmer shall keep all safety certifications in full force until all work is completed and accepted by the Agency.

1.07 UPGRADES

A. Software

1. Software upgrades shall be dated the same as Date of Acceptance. Programmer shall upgrade software as necessary during project so that the latest versions are installed as of Date of Acceptance.

B. Firmware

1. Firmware upgrades shall be dated the same as Date of Acceptance. Programmer shall upgrade firmware as necessary during project so that the latest versions are installed as of Date of Acceptance.

1.08 WARRANTY AND BOND

A. Programmer's Warranty

1. Labor provided under this contract shall be warranted for one (1) year following the date of final acceptance to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Rectify defects occurring in programming within the Warranty period by debugging or reprogramming without charge.
2. Within the warranty period, respond to programming-related calls within twenty-four hours, and correct the problem within forty-eight hours if at all possible.

B. Manufacturers' Warranty

1. Register warranty in the Agency's name for any product with a manufacturer's warranty stipulated in the Contract Documents.

C. Extended Correction Period

1. Six months after final acceptance, the Agency reserves the right to direct additional minor changes to the Audio DSP system software. Such changes shall be made without additional cost to the Agency.

D. Bond Requirements

1. Refer to RFP documents for Bond requirements.

PART 2 - PRODUCTS

2.01 AGENCY FURNISHED PRODUCTS

A. New Products

1. See Section 27 41 16 Audio Video Systems and Equipment

B. Existing Products

1. See Section 27 41 16 Audio Video Systems and Equipment

2.02 EQUIPMENT

A. Description

1. See Section 27 41 16 Audio Video Systems and Equipment, "APPENDIX A: A/V SYSTEMS FUNCTIONAL DESCRIPTION"

B. Equipment

1. See Section 27 41 16 Audio Video Systems and Equipment, "APPENDIX B: A/V SYSTEMS EQUIPMENT LIST"

C. Substitute Equipment

1. Materials and equipment specified herein provide the overall functional sound or

operational quality, part and construction quality, and background of proven desired by the Agency and, therefore, establish the standard of quality required for this project. Substitute equipment will generally not be considered unless the specified item is discontinued.

2. Delay in delivery of any substitute product or material shall not be cause for change to the construction schedule or completion date.

3. The drawings and specifications are based on specific equipment, processes, and arrangements. At no additional cost to the Agency, furnish accessories, parts, and equipment, and perform all work necessary, for the proper functioning and fit of any approved substitute item to the purpose, arrangement, and intent originally indicated.

2.03 ACCESSORIES

A. Equipment lists may exclude minor components in the interest of conciseness and clarity. Where these components are integral to a functionally and aesthetically complete Audio DSP system the A/V Contractor shall without additional compensation provide them as outlined herein. This shall include manufacturer's programming cables, IR emitters, PoE injectors, etc.

PART 3 - EXECUTION

3.01 PROVIDERS

A. General

1. All programming work shall be performed by experienced audio DSP Programmer skilled and practiced in the proper techniques required for the activity involved.

2. Programmers shall demonstrate the qualifications as outlined in RFP documents for qualification requirements.

3.02 EXAMINATION

A. Verification of Conditions

1. Verify all conditions on the job site applicable to this work. Notify the Agency and Consultant in writing of conflicts, discrepancies, or omissions promptly upon discovery.

B. Pre-installation Testing

1. Install software and test before delivery to the job site.

3.03 PREPARATION

A. Protection of In-Place Conditions

1. The programmer shall make reasonable accommodations to protect the surrounding areas and surfaces during the programming of the Audio DSP Systems.

2. If the integrity of the surrounding areas and/or surfaces is in jeopardy, the

Programmer shall notify the A/V Contractor, Agency, or the Agency's Representative, Building, or Site Supervisor immediately and coordinate an appropriate action plan to protect the surrounding areas from damage.

3.04 PROGRAMMING

A. General

1. Coordinate work with all other trades to avoid causing delays in construction schedule. Expedite the delivery of software and provide additional labor if required to meet the construction schedule.

B. Functional Requirements

1. See "Appendix A: DSP PROCESSING BLOCK EXAMPLES" for examples of recommended/required standard processing signal flow (blocks). The provided examples are not intended to be exhaustive, and modifications based on project requirements may be required and should be expected.
2. Functions: The DSP shall be configured to provide (not all may apply):
    a. Pre-amplification
    b. Filtering and Equalization
    c. Dynamics processing
    d. Routing
    e. Mixing, Automatic mixing – gain sharing
    f. Zoning
    g. Mix-minus
    h. Delay
    i. AEC
    j. Volume controls
    k. Emergency/Alarm muting
    l. Signal metering
    m. Logic functions
3. Gain Structure: The DSP shall be configured to obtain and maintain unity gain structure from input pre-amplification stage to output stage or associated end-user volume control.
4. AEC: The DSP shall be configured to provide AEC for all microphones detecting echo in conferencing and specialty DSP applications. AEC shall be configured per DSP Manufacturer's recommendations and best practices.
5. AEC and Pre-AEC: Where microphones used for speech / sound reinforcement are part of a conferencing system requiring AEC processing, the "Pre-AEC" audio path shall be utilized for speech / sound reinforcement while a separate path processed for AEC shall be utilized for conferencing.
6. Organization: Referring to open-Architecture DSP platforms. Processing objects shall be clearly labeled and organized clearly to follow the intended signal path from left to right, top to bottom. Connection lines between objects shall be routed in an organized fashion.
7. Multiple DSP: Where designs include more than one DSP linked via virtual multi-channel audio buss or digital audio network, all signals shall be routed to a central processor for master routing and 3rd party control. All control points being

controlled by AVCS controls shall be located on a single DSP operating as the master unit.

8. Latency: Also known as propagation delay, Programmer shall utilize sufficient and efficient processing paths to achieve intended results whilst minimizing latency from input to output.

C. Controls

1. All interfaces shall be programmed to provide a common standardized graphical interface for ease of operation except where not practical.
2. Audio Video Control Systems (AVCS): Refer to Section 27 41 70 Audio Video Control System (AVCS) programming requirements.
    a. Audio DSP Systems Programmer shall coordinate work of AVCS Programmer.
    b. Volume controls shall be range limited within DSP to provide end-user with adequate adjustment range (typically +/-6dB for microphones and +/-10dB for presentation sources). Operation of DSP from end-user standpoint shall be seamless with AVCS system operation.
    c. Processing objects within Audio DSP configuration shall be clearly identified where controlled by AVCS. Text objects or similar shall identify these objects.

3.05 RE-INSTALLATION

A. The process of acceptance testing may necessitate the debugging, re-programming, or adjustment of certain components; perform without claim for additional payment.

3.06 FIELD QUALITY CONTROL

A. Field Tests and Inspections

1. Verify the following before beginning actual tests and adjustments on the system:
    a. All powered devices have AC power from the proper circuit.
    b. All Audio DSP and related control/networking devices are properly connected.

B. Non-Conforming Work

1. All identified non-conforming work shall be documented and remedied prior to Audio DSP system start-up and testing.
2. Any non-conforming work shall be subject to additional verification prior to acceptance.

3.07 SYSTEM START-UP

A. Audio DSP System Tests

1. Perform the following tests and adjustments as required. Document all tests and test results. If any problems are detected in testing, correct the problem, and retest. Make corrections necessary to bring the system(s) into compliance with the specifications.
    a. Test all functional requirements as outlined above.
    b. Test all control requirements as outlined above.

B. Network Tests

1. Check all paths and outlets for appropriate compliance with the Performance Standards and IP control scheme.
2. Verify network settings as needed (multicast filtering, QoS, VLANs, etc)
3. Verify DSP audio and control functions are accessible to all devices and control system components as required.
4. Note any latency, network traffic, or other irregularities that may influence the performance of the Audio DSP systems.

C. Report

1. Upon completion of the initial tests and adjustments, submit a written report of tests to the Consultant along with any other relevant documents, diagrams, and/or drawings required herein. The Report shall include the date of each test, pertinent conditions such as control settings, etc., test circuit, and test equipment employed. In addition, submit written notification that the installation has been completed in accordance with the requirements of the Contract Documents, and is ready for acceptance testing.

3.08 COMMISSIONING

A. Refer to Section 27 41 16 Audio Video Systems and Equipment for additional requirements.

3.09 CLOSEOUT ACTIVITIES

A. Demonstration

1. Upon completion of the Work, the Agency may elect to verify test data as part of the acceptance procedure. Provide personnel, at the convenience of the Agency, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Agency.
    a. Refer to Section 27 41 16 Audio Video Systems and Equipment for coordination with A/V Contractor and additional requirements.

B. Training

1. Provide instruction to Agency designated personnel on the use and operation of the system. This training must be provided following a schedule acceptable to the Agency. The instructor should be fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete, approved, and on-site at the time of this instruction.
    a. Refer to Section 27 41 16 Audio Video Systems and Equipment for coordination with A/V Contractor and additional requirements.
2. AV contractor shall provide a training plan indicating a proposed schedule and training duration per space.
3. Provide up to two (2) hours instruction per space to Agency designated personnel on the day-to-day use, maintenance and operation for the systems listed below.
    a. Bettye Davis 106

b. Max Gruenberg 120

c. Romona Barnes 124

d. Butrovich 205

e. Speaker Chambers 210

f. House Finance 519

g. Senate Finance 532

h. Beltz Room 105 (in Stewart Building)

4. Provide up to four (4) hours instruction per space to Agency designated personnel on the day-to-day use, maintenance and operation for the systems listed below.

   a. Senate 217

   b. House 220

C. First Use

1. The A/V Contractor shall provide a person familiar with the system programming and technical functionality of all the AV systems to be present in the facility during the first scheduled week of the 2025 General Session.

3.10 PROTECTION

A. The Programmer shall make reasonable accommodation to protect the Audio DSP programming after installation, but before acceptance by the Agency.

B. When the integrity of the programming is in jeopardy (outside influences), the Programmer shall notify the A/V Contractor, Agency, or the Agency's Representative, or Building or Site Supervisor immediately.

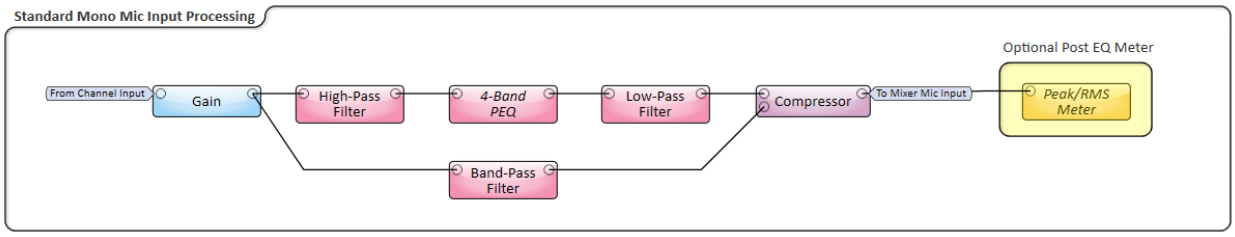
3.11 ATTACHMENTS

A. None

END OF SECTION

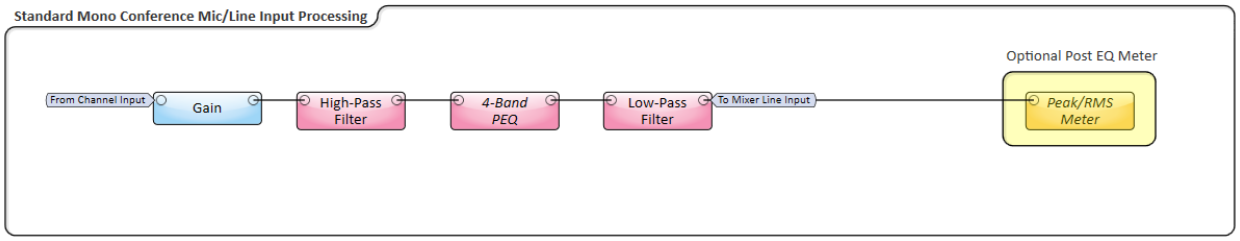
APPENDIX A: AUDIO DSP PROCESSING BLOCK EXAMPLES

Standard Mono Mic Input Processing



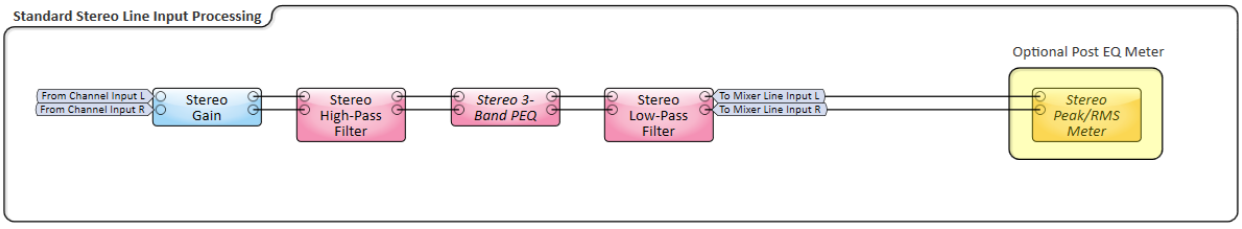
- Recommended to set band-pass filter for speech band only for compressor side chain—center at 1kHz.

Standard Mono Conference Mic/Line Input Processing



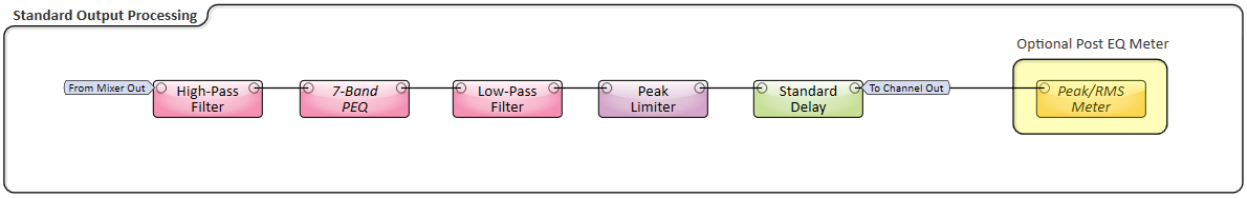
- Use no non-linear processing on conference mic/line inputs (compressors, limiters, levelers, etc)

Standard Stereo Line Input Processing



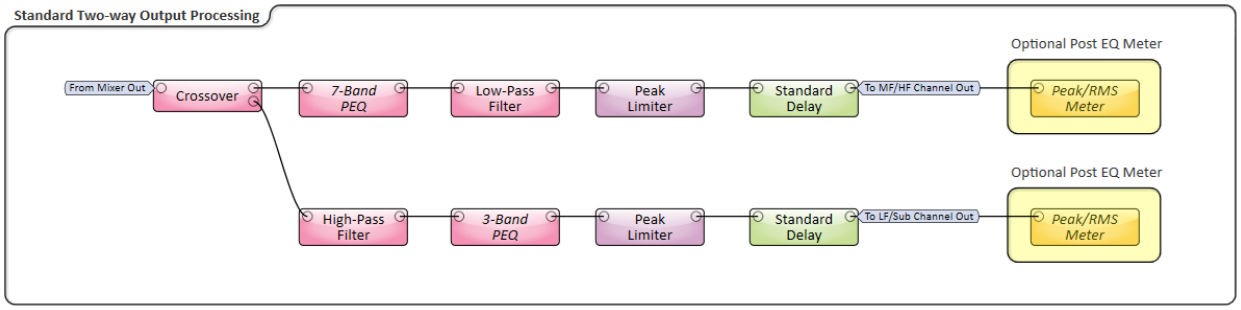
- Gang stereo sources together

Standard Output Processing



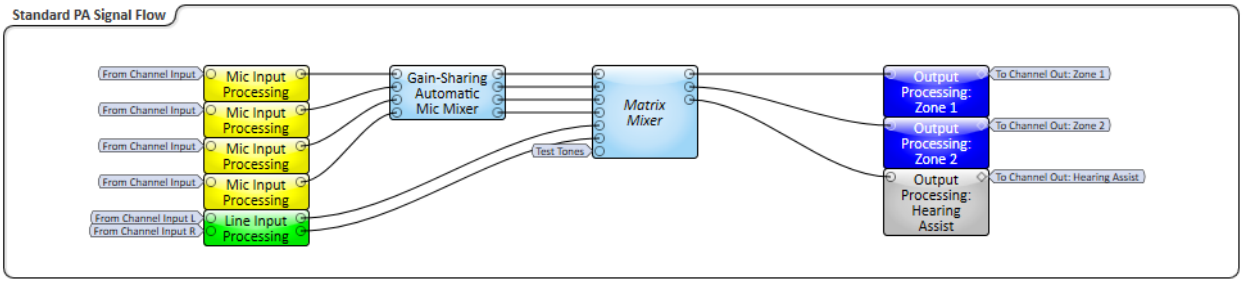
- Use loudspeaker manufacturer's recommended band-pass tunings, filters, and slope.

Standard Two-way Output Processing



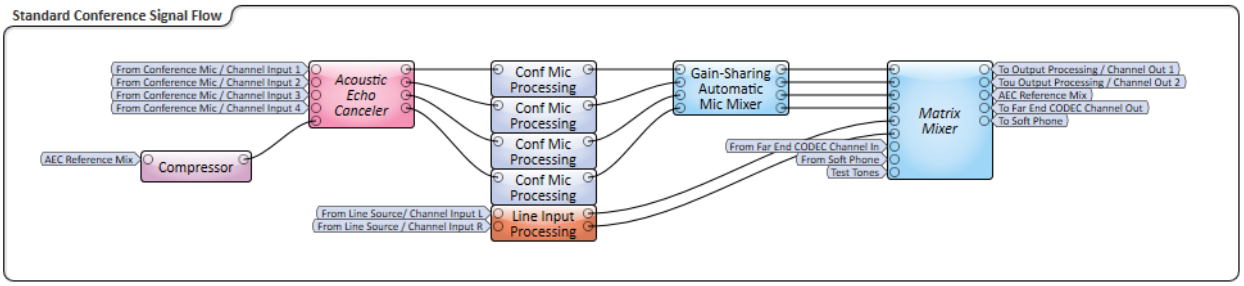
- Use loudspeaker manufacturer's recommended band-pass tunings, filters, and slope.

Standard Public Address (Sound Reinforcement) Signal



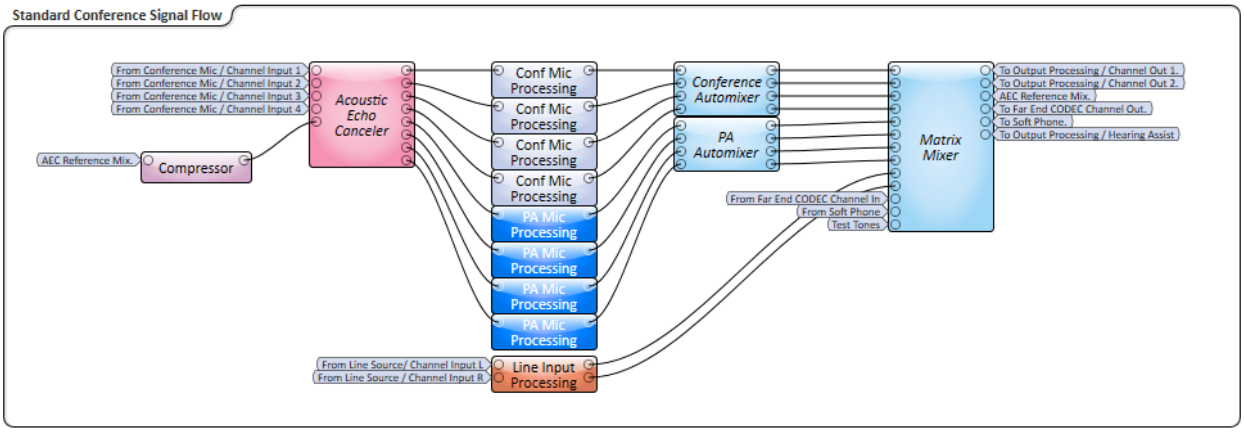
- Use matrix mixer for all routing. Refrain from adding additional "convenience mixers" unless required.
- Use level controls on inputs for individual microphone/line level controls.
- Use level controls on outputs for overall zone level adjustments.
- Set bandpass filter on gain-sharing automatic mic mixer sidechain for speech band—center on 1kHz.

Standard Conference Signal Flow Notes



- Place all EQ after AEC and before gain sharing automatic mic mixer
- Use matrix mixer for all routing. Refrain from adding additional “convenience mixers” unless required.
- Use level controls on inputs for individual microphone/line level controls.
- Use level controls on outputs for overall zone level adjustments.
- Set band pass filter on gain-sharing automatic mic mixer sidechain for speech band—center on 1kHz.
- Mix all far end sources to AEC reference mix.
- Derive AEC reference mix downstream from dedicated Matrix Mixer output.
- Set AEC Reference compressor threshold to 0dB.

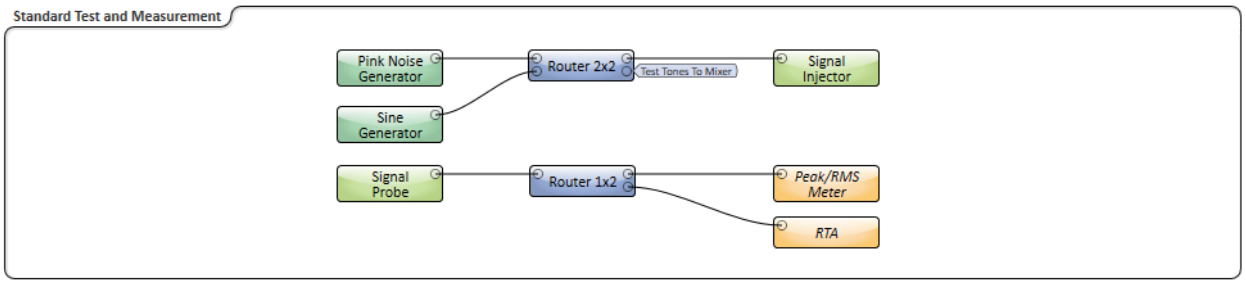
Standard Combined Conference/PA (Sound Reinforcement) Signal Flow



- Use separate (second) signal chain for all PA sources. Use AEC “PA Outs” when provided.
- Use matrix mixer for all routing. Refrain from adding additional “convenience mixers” unless required.
- Use level controls on inputs for individual microphone/line level controls.
- Use level controls on outputs for overall zone level adjustments.
- Set band pass filter on gain-sharing automatic mic mixer sidechain for speech band—center on 1kHz.
- Mix all far end sources to AEC reference mix.
- Derive AEC reference downstream from dedicated Matrix Mixer output.

- Set AEC Reference compressor threshold to 0dB.

Standard Test and Measurement



- Provide at a minimum both Pink Noise and Sine Generators.
- Connect test signals to Matrix Mixer channel.
- Provide signal probe and injectors when possible.

END OF APPENDIX A

APPENDIX B: AUDIO DSP FUNCTIONAL DESCRIPTION

A. Programmer shall reference Appendix A of Section 274116, in conjunction with this appendix, to determine complete programming requirements for each space.

B. AV control system requirements shall be independent of the control hardware and software platform in use for each space except where otherwise noted.

Meeting Rooms

Touch panels shall be programmed with ease of use in mind and intended for use by the Moderator. As such, use of graphical icons is encouraged but must be complemented by text labels and/or descriptions that are clear and unambiguous.

For all rooms, the minimum functionality available through touch panels shall include:

Full system ON and OFF (System Shutdown): Shall include macros to perform all required functions for system virtual shutdown and power up.

1. System ON: Control system shall unmute audio system, turn all displays ON, and present user with options for room operation presets (i.e. presentation only, web conference, etc.)
2. System OFF: Control system shall mute audio system, turn all displays OFF, and end any active remote conferencing sessions (if applicable).
3. *Individual display ON and OFF*
4. *Room mode selection* for spaces with flexible seating, multiple layouts, or different use cases. When room mode is adjusted, control system shall execute any required presets on steerable microphones, loudspeaker zoning, and other adjustable systems.
5. *Room audio controls* including:
    a. Room Mute
    b. Room Level
    c. Individual mute and level controls for AV audio, remote audio, and speech conferencing system audio.
    d. *AV source switching*: Full matrix switching allowing any input to any output functionality. Provide with audio follows video functionality but allow selection of audio-only sources to override AV audio. AV switching shall be provided in two ways:
        1) Simple control on main page allowing a source to be selected to be sent to ALL displays.
        2) A matrix mode control page allowing any input to any output functionality.
    e. *Audio call dialing* controls using audio DSP softphone.
    f. *Private Mode*: Provide users with ability to set room into “Private” mode which shall turn all cameras off and mute any audio feeds leaving the room.
6. Control system shall be programmed to provide feedback on every action. Where available, control system shall always provide true feedback received from end devices. If true feedback is unavailable, momentary, or last-action-memory feedback shall be provided.
7. For AV over IP systems, video routing is to be controlled by switching video streams received by video decoders. Programmer shall coordinate with Contractor to provide a defined and consistent stream numbering scheme for the entire facility. Given that all

systems may be connected to a common AV network, the Programmer shall ensure that no duplicate stream numbers are used.

8. The control system for the Meeting Rooms shall be programmed to provide a very user-friendly interface for the staff and clerk operating the system.
9. Minimal page flips shall be required for actions and single-button actions are preferred. Where required, navigation shall be described through instructions on the panel.
10. AV Control Systems programmer shall coordinate with Agency staff to review touch panel pages from existing installations and develop the control system UIs to provide a similar and consistent functionality to Agency systems.
11. Sources and outputs can be grouped by type in order to minimize clutter on screen. However, page flips shall not be required to toggle between source/output groups for selection.
12. Video preview is required, and it shall follow current source selection. For room entry panels, operators shall also be able to route a specific source for video preview; this will allow them to monitor a particular camera or video source.
13. For all systems, audio shall follow video except if intentionally “broken out” by users. As such, audio selection shall follow current video source sent to main video display outputs.
14. When video is routed to the main video output, control system shall automate routing of that source to auxiliary system outputs including the Teams hub and the audio recorder, the video recorder system, and sent to the designated camera to be encoded onto the Mediornet system.

C. Additional AV Systems Programming Requirements:

1. Programmer, in coordination with AV contractor, shall be responsible for full configuration and testing for optimum performance of the following systems in addition to those listed above:
   a. Video system encoders, decoders, processors, recorders, and any other devices with software-based configuration required for proper operation according to system requirements.
   b. Interfacing and interaction with audio DSP systems
2. Networking Equipment:
   a. The Programmer shall be responsible for configuration and setup of all active networking equipment within the AV systems. If performed by separate entities, audio systems programmer shall coordinate closely with audio DSP control systems programmer to define networking equipment configuration scope and ensure systems are programmed for optimal performance of all networked AV systems.
   b. Networking equipment shall be configured according to the recommendations and guidelines provided and required by:
      1) Audio DSP systems manufacturer
      2) Audio networking protocols in use
      3) AV streaming systems in use
      4) Security requirements from Agency
   c. The following configuration parameters shall be addressed individually, and a report provided to the Consultant describing proposed configuration setup of all networking equipment:
      1) IPv4 configuration: Programmer, in coordination with AV Contractor and other programmers, shall provide proposed IP addressing scheme to Consultant. IP address assignments shall follow the NIH’s standards and available IP address

ranges and shall be coordinated with NIH CIT and other internal IT groups before release.

a) IP assignments shall be organized per IC such that a different IP range is used for each IC avoiding potential conflicts in the future.

2) Configuration of VLANs and subnets:
   a) All logical networks shall be limited to a maximum of 253 host addresses (class C). For systems with more than 253 hosts, network shall be arranged into subnets as necessary.
   b) Within logical networks, avoid unnecessary segregation in VLANs except where required for ease of management, security or to reduce size of large networks. In general, systems are designed to allow multiple protocols (AV, Dante, AES67, QLAN, control) to operate within the same network (VLAN, subnet) and should not be segregated within small systems.
3) Spanning tree: If required, ports shall be configured as edge or non-edge ports (i.e. port fast or similar configuration) to prevent connection delays or similar issues.
4) DHCP: Use of DHCP by reservation (if available) is preferred and should be used versus use of static IP address assignments at devices.
5) Multicast Traffic Management
   a) As most AV systems require multicast traffic for discovery or media distribution, multicast traffic management parameters must be configured according to manufacturer recommendations.
   b) IGMP: Configure multicast filtering and snooping to avoid port flooding and ensure traffic is available where needed.
   c) Multicast routing: Where required, configure multicast routing across VLANs
6) QoS: Configure quality of service as recommended by protocols and manufacturers to ensure priority for clocking across all platforms and avoid any synchronization or packet drop issues.
7) Labeling/Naming: All networking equipment should be configured with device names (system names) in a logic fashion. In addition, programmer shall name all ports internally to describe source/end devices and connections.
8) Administration and Security: Coordinate with the Agency and configure all networking equipment with logical but secure management credentials to prevent unauthorized access.

END OF APPENDIX B