GENERAL AV SPECIFICATIONS

PART 1 - AUDIO

1.1 AUDIO REQUIREMENTS

A. Feedback Suppressor and 3-band EQ on each speech output *
B. High-Pass Filter and a 3-Band EQ on each speech input *
C. Program inputs and outputs must be stereo
D. Lecture Capture needs a discreet audio record feed
E. The Installed Computer needs an audio record feed (can be from an AV bridge in the form of USB)
F. 75dB SPL from speech sources in room without feedback at 90% on the touch panel
G. 85dB SPL from program sources in room at 95% on the touch panel.
H. Dartmouth receives the DSP file before it’s delivered in the room
I. One aux LINE level input in each room
J. Have the mutes for reinforced audio also function for the mixed audio out/VTC/audio conferencing. In other words, have the mixed audio out be Post mute for speech and program. If you mute the program sound from the main touch panel page, that function should mute the program fader in the mixed audio out page.
K. Do not have any code overwrite any levels/gains/EQ/dynamics.
L. Do not use gating mixers.
M. Do not use auto mixers unless it’s specified

* In rooms that have discreet DSP like Bi-amp or Q-SYS.

1.2 AUDIO PROGRAMMING

A. Mic channels change the individual mics’ channels in DMPS systems. In cases where only one mic is used, still follow this principal, instead of having the mic volume on the touch panel control the mic master in the DMPS.

B. No level, EQ, compressor, gate, or limiter levels should be initialized.

1.3 AUDIO MIXED AUDIO OUTPUTS

A. No gates or auto mixers

B. Where Lecture Capture service is applicable, Dartmouth needs a discreet (not through a DA) audio aux path.

1.4 AUDIO LECTURE CAPTURE

A. Front of room microphones should be installed

B. When handheld or lavalier mic is used, the room microphones should duck out
1.5 AUDIO TEAM STATIONS AND SHARED AUDIO SYSTEMS

When a Dartmouth room has two or more team stations sharing the same zone program speakers, have them both play through. In other words, do NOT prioritize which source passes to the speakers. That said, Dartmouth will treat this on a room by room basis. This may warrant further discussion.

1.6 AUDIO INPUT SOURCES

All input sources should be roughly the same volume while reinforced. It is expected that each input will be adjusted, while listening to the same source material, to match the previous acceptable input volume. It is important to note that the adjustment shouldn’t be a copied setting. Each input should be tested with an SPL meter, and any necessary adjustments should be made.

1.7 AUDIO DOCUMENT CAMERA (FOR DEDICATED INPUT ONLY)

Please do not have the document camera call an audio source. Meaning, please maintain the audio source that was last routed when the document camera is selected.

PART 2 – CABLES

2.1 CABLES GENERAL REQUIREMENTS

A. All cable installations shall conform with NEC code that is in force at the time of installation. Furthermore, Communication Systems (i.e. low voltage wiring) shall not only conform to Chapter 8 of the NEC but shall also embrace the requirements of Chapter 3: Wiring Methods and Materials (see below for standards and specifications regarding DM cabling).

B. Generic brands should be avoided. Ideally cables provide the transmission of content with minimal losses or degradation.

C. Testing of cables should be employed wherever possible, from cable pull to cable termination.

D. Correct type of cable should be selected for each application. Cables constructed (jacket) to be run in conduit and plenum spaces, should not be used for “cord and plug” applications. The former may be considered installation and the latter user-serviceable. User-serviceable cables have jackets constructed of more flexible yet durable material to serve this purpose. Examples of acceptable brands of user-serviceable cables include:

- HDMI – Extron Ultra Series
- VGA - Extron MHR VGA Type
- AUDIO – Mogami or Canare

C. Cables should be installed for user’s ease of use.

- One cable per hole in cable cubby
- Cables passing through cable cubbies should do so freely
2.2 DM SERVICE CABLING

In addition to the above mentioned cabling standards, all DM service cabling shall conform to the following standards and shall follow IT industry best practices for installation of cable:

- ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard
- ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard
- ISO/IEC 11801, Information technology — Generic cabling for customer premises

2.3 DM CABLE AND INSTALLATION SPECIFICATIONS

A. All DM cabling shall be terminated using the TIA/EIA T658B wire map configuration.

B. Each individual DM signal path should be considered as consisting of two parts: the “permanent link” portion (permalink), and the “channel” portion, which consists of the permalink and all patch cables and interconnection devices, i.e., patch panels, wall jacks, etc. In other words, the “channel” consists of the entire signal path between two endpoints. Please see the diagram below for further details:

C. The permalink shall not exceed 90 meters in length nor shall the overall channel exceed 100 meters in length. The permalink portion of the signal path shall consist of the following Crestron DM cable— Crestron DigitalMedia® Ultra Cable, DM-CBL-ULTRA-(P/NP)*

The patch cables consist of the following— Crestron DigitalMedia® Ultra Patch Cable, DM-CBL-ULTRA-PC-(#)**

*Plenum/Non-Plenum, as needed - **Length, as needed

D. The DM Ultra cable shall be installed with a bend radius of no less than 8x the cable diameter.

E. As a general rule, the permalink cable should only be terminated with the following female keystone jacks:

- DigitalMedia™ Ultra Keystone RJ45 Jack, DM-CONN-ULTRA-RECP
The Keystone jacks will fit industry standard mounting hardware for patch panels and wall plates. When securing the keystone jacks in the equipment rack, please use hardware/jack panels that offers support/strain relief of the DM Ultra cable. Crestron offers the following jack panel for their Keystone jacks:

- DigitalMedia™ 24-Port Keystone Patch Panel, DM-RPP-K24

Although the jack count on this patch panel will be overkill for most of our installations, it offers the type of cable support/strain-relief that is needed for the DM Ultra cables. Other manufacturer patch panels may be substituted, as long as there is adequate support for the cables.

F. All DM inputs to and outputs from the DM-MD8x8/DMPS3 switcher shall consist of the above mentioned Crestron Ultra patch cables. Patch cables will also be used to connect DM endpoints to wall/floor plates. Please see the graphic below for further clarification:

G. When the endpoint is securely mounted in either a wall/electrical box or a floor box, one end of the DM Ultra cable shall be terminated with the following connector for connection to the endpoint:

- DM-CONN

The other end shall be terminated with the DM Keystone jack and secured in the patch panel.

H. When other DM endpoints are co-located in the same equipment rack as the DM switcher, the connection from the endpoint to the DM switcher may be made with the above mentioned DM Ultra patch cables.
2.4 DM CABLE CERTIFICATION

All DM cable shall be certified and tested per industry standards for CAT7a cable. A test report shall be delivered, as part of the overall system deliverables, which details the test results for all DM cables in the system. This report shall detail the following criteria:

- Wiremap test – Conforms to TIA/EIA T658B
- Cable length
- SNR – Greater than 26dB
- BER (Bit Error Rate) Test – Pass/Fail, based on ≤ one error per billion

2.5 CABLE COVERINGS (LOOMED)

A. Bundles of cables should be loomed where visible to users and should be in the color covering specified.

- White: Where multiple cables extend from wall or ceiling.
- Black: All other locations

B. Bundles of cables not visible to users should be secured with cable ties.

2.6 CABLE TIES

With the exception of DM and Ethernet/network cables, all cables should be installed with an appropriate cable tie tool that has adjustable tension settings. The correct tension should be applied for each specific cable application. DM and Ethernet/network cables should be secured only with Velco-type fasteners. This is Dartmouth’s preferred method for securing cables within racks.

2.7 CABLE MANAGEMENT

In general, cables susceptible to interference should be routed separately from others.

2.8 CABLE NETWORK SERVICE

Network cables connecting directly to a device should be one continuous cable. Network cables provided for portable device, example for laptop through cable cubby, should employ a coupler: to allow for ease of replacement in case of failure.

2.9 CABLE TERMINATION AND ADAPTERS

A. Generic brands should be avoided. Acceptable brands of connectors include:

- AMP
- Amphenol
- Canare
- Extron
- Kings
- Switchcraft
B. The same applies to adapters. In the case of computers, Apple and Extron are preferred brands. Adapter cables are preferred, where possible: e.g. Extron MDP series.

2.10 CABLE STRAIN RELIEF REQUIREMENTS

A. In general, acceptable strain relief should be provided where cables enter or exit: junction boxes (j-boxes), equipment racks, and teaching lecterns/carts.

B. Dartmouth’s preferred Kellem grips to use for cables entering or exiting j-boxes, equipment racks, and teaching lecterns/carts are Hubbell

C. Additionally, acceptable strain relief should be provided within equipment racks and teaching lecterns/carts.

2.11 CABLE SERVICE LOOP REQUIREMENTS

These afford us both additional strain relief and extra cable in the event of a connector failure. Good places for these include: junction boxes, above ceilings when cables are not run in conduit, and within equipment racks and teaching lecterns/carts.

PART 3 - CONTROL

3.1 GRAPHICAL USER INTERFACE (GUI)

GUI should provide controls for all features for the AV system and should be free of any grammatical errors. Before system installation, an approval guide should be sent to Dartmouth for sign-off and approval.

3.2 GUI GENERAL PERFORMANCE/FEATURES:

A. POWER ON
   When source is sent to the projector, power on the projector and lower the appropriate screen

B. BLANK
   Mute the projector

C. HOME/MAIN SCREEN
   Environment for majority of system control

D. HOME BUTTON
   Returns the user back to the Main Page

E. SYSTEM SHUTDOWN
   Upon shutdown, the projectors should power off, screen raised, and presets recalled

F. BUTTON STATES
   Active state should be indicated with a solid color background with an appropriate text color pairing to maintain optimal contrast.

G. AUDIO LEVEL CONTROLS
   Percentage should be indicated as well as an audio up and down control with a mute button. Mute button should perform a true mute instead of a -100 DB command. Volume should resume at the last set level.
H. AUDIO
   Audio should follow last selected source
I. TEXT
   Needs to be readable and a sans-serif typeface.
J. PADDING
   Appropriate padding from the edge is required for content in buttons as well as all elements in the GUI
K. COLORS
   Consult with Dartmouth on color choices
L. TERMINOLOGY/LABELS
   Please notify Dartmouth of any discrepancies for further clarification.
M. CONSISTENCY
   Elements and text need to be sized consistently throughout GUI and sized appropriately to promote visual hierarchy as necessary.
N. ICONS
   Provide examples to Dartmouth for sign-off

3.3 INTEGRATION
Room environment controls including lighting, shade control, and screen control should be integrated into the GUI

3.4 AUTOMATION
System should be automated where possible to provide single button prompted processes that power on, power off, and set additional system states driven by user operation preferences.
PART 4 – DELIVERABLES

4.1 REQUIRED DELIVERABLES

A. As-built drawing in both DWG and PDF formats
B. Xpanel on processor
C. Documentation of all physical system settings and adjustments including:
   1. Signal gain settings
   2. DSP and other software settings
   3. Codec settings
   4. Projector settings
   5. List of all static IP’s
   6. All programming and equipment set-up/configuration files
D. Manufacturer’s user’s guides and manuals, alphabetized, bound in 3-ring binders with index. Include CD-ROM of any electronically available manuals.
E. Working/fully-tested web-based and executable X-panel files
F. Excel spreadsheet of all equipment provided with all options and serial numbers noted.
G. DM cable certification test report.
H. List of consumable spare parts (lamps, filters, etc.)
I. Description of recommended service needs and intervals
J. Warranty statement, including:
   1. System warranty start date, conditions, and term
   2. Summary of manufacturer’s warranty coverage
   3. Description of extended warranties and service plans as purchased with the system

PART 5 - DISPLAYS

5.1 DISPLAY - PROJECTOR(S)

Please refer to specific Project Scope/Statement of Work for current preference.
- Laser
- HDBaseT
- WUXGA
- Crestron Connected

5.2 DISPLAY - PROJECTOR(S) HARDWARE

A. Chief Products are preferred

B. Auxiliary devices require to be installed at projector location should follow manufacturer recommended installation methods and use manufacturer specific accessories. Using cable ties or Velcro to attach such devices to the projector or mount are not acceptable methods.
5.3 DISPLAY - PROJECTON SCREEN(S)

A. IDEAscreen (for all display wall boards)

B. Dartmouth expects new projection screens to arrive from manufacturers in a condition that enables them to operate properly – motors and tensioning systems – and that they will present correctly sized and shaped viewing areas with no imperfections (distractions) visible to members of the audience.

C. Proper alignment of data/video projector and projection screen are critical to the proper presentation of information to the audience. Dartmouth requires the AV Vendor (AVC) to be responsible for making sure this is done correctly. New equipment should appear new upon completion of its installation: free from any blemish or defects beyond manufacturer documented tolerances. The viewable image area of projection screens should have the proper aspect ratio, proper masking (within tolerance), and be free of blemishes or defects that are outside the manufacturer’s tolerance and which may be visible to any member of the audience. AVC will take responsibility for any remedies required to achieve this result. Owner will retain similar responsibility for OFE equipment.

5.4 DISPLAY - PROJECTON SCREEN(S) PROGRAMMING

A. Projector(s) powered on - screen(s) automatically descend
B. Projector(s) powered off - screen(s) automatically retract.
C. Source “send to projector” – Screen(s) automatically descend
D. Screen controls to be included in GUI design for manual operation.

5.5 DISPLAY - PROJECTION SCREEN(S) VIEWING SPECIFICATION

A. Careful consideration should be given to most distant viewer and screens should be sized accordingly to AVIXA standard; 202.01:2016 Display Image Size for 2D Content in Audiovisual Systems.

B. Furthest viewer should be measured based off of seating chart if provided, or back wall averaged from two corners and center.

PART 6 - DRAWINGS

6.1 DARTMOUTH GENERATED DRAWINGS

A. Dartmouth provides base CAD drawings which the vendor should verify on site; any discrepancies should be communicated immediately.

B. Engineering drawings based on Dartmouth approved equipment. Vendor is responsible for confirming appropriateness of equipment to the existing conditions and/or making requests for needed changes to existing conditions.
C. Prior to issuing PO Dartmouth may request that the vendor provide room elevations, rack front/side/rear elevations, and plan views.

6.2 VENDOR GENERATED DRAWINGS

A. When generating drawings, please use manufacturer model numbers not distributor SKU numbers. In instances where the SKU is needed, please add the manufacturer model number.

B. Dartmouth requires a review of submittal for Equipment Lists and AV Flow. In some cases, Dartmouth may require Elevation, Detail, Plan, or RCP submittals for review before installation.

C. To issue reqPO, Dartmouth will need to approve AV Flow Submittals and Equipment List Submittals.

PART 7 - EQUIPMENT DISASSEMBLY/DISPOSAL

Vendor will be responsible for disassembly of old equipment. Dartmouth will review disassembled equipment for retention and be responsible for the disposal of non-recovered items.

PART 8 - INSTALLATION

A. Dartmouth expects installation to follow manufacture requirements.
   - Ventilation
   - Orientation
   - Recommended accessories and methods

B. We expect to receive component boxes, shipping materials, manuals/papers, and unused accessories.

C. Equipment installed on ceilings and walls should be white in color unless otherwise specified.

D. Cover plates should be stainless steel unless otherwise specified. In cases where these are on walls or ceilings, devices they cover should be white.

PART 9 - LIGHTING

The specifications should provide guidance on achieving the optimal viewing and audience comfort in the following scenarios.

9.1 USE CASES

- General class discussion - Faculty and students participate in a full room discussion and need to view each participant
- Group work – Students work in groups on faculty provided activity. Students and faculty need to be visible as well as writing surfaces.
- Presentation with projection - Single presenter provides dialogue to a projected image. Audience needs to be seen for participation
• Presentation with board work - Single presenter provides dialogue along with formal board work. Board, presenter, and audience need to be visible

• Focused media presentation (no audience participation) – Media is being shown as the primary focus. Distractions should be minimized to provide best attention to material being presented.

9.2 USER EXPERIENCE

Users should be able to identify scenes through accurate labeling on the touch panel or printed labels on the wall. The order of presets should be intuitive so that the brightest settings are on the top and the dimmest settings are on the bottom. The order should reflect the most popular use case after brightness. Users should have the option to dim the lights manually and have control over the minimum of two zones (front of room and audience).

Example:

1. All on
2. Front of room on (100), audience dimmed (60)
3. Front of room off (0), audience dimmed (60)
4. Front of room off (0), audience dimmed (20)
5. All off

9.3 CONTROL LOCATIONS

Physical controls should be available by the entrance of the room and by the presentation station. Physical controls by the door should provide at minimum, all on and all off. The physical controls by the presenter should provide all scene controls and manual dimming capabilities.

Touch panel controls should mimic physical controls in the room with the same labeling and order. If lighting control integration is not available on the touch panel, directions should be included to use the closest physical controls.

![Room Layout Lighting Example](image)

PART 10 - NETWORKING
10.1 NETWORK SPREADSHEET

Provide Dartmouth with editable spreadsheet that can be shared between Dartmouth and AV vendor as Dartmouth works toward activating equipment on the site network. Information (columns) to include:

- Manufacturer
- Model #
- Device Description
- Location
- Type IP: Fixed/Dynamic
- MAC Address
- Serial Number
- IP Address
- IP Subnet Mask
- Gateway / DNS Server
- Default Router
- Host/Device Name
- Jack#/Color
- Location
- Notes

PART 11 - OWNER FURNISHED EQUIPMENT (OFE)

A. When owner furnished equipment is provided. Please consult with Dartmouth Project Manager on what to do with the original or OEM packaging.

B. PoE/PoDM
Dartmouth prefers these over AC power adapters wherever possible. In some cases, this might mean Dartmouth will buy an upgraded device in order to get this feature. When such devices are not available Dartmouth would prefer PoE injectors over AC power adapters. Please specify accordingly.

PART 12 - SECURITY

Installed projectors should make use of either security hardware or locks. When not possible, Dartmouth will provide a cable lock.

PART 13 - RACKS

Prior to offsite or onsite rack build, rack elevations should be sent to Dartmouth for approval. Review of rack build should be scheduled prior to onsite installation to confirm cable management compliance.

PART 14 - UPS

Should be sized to serve all equipment in their respective enclosures except for audio amplifiers, which need only be surge protected.