University of Victoria | University Systems

Design Requirements for Teaching Technology

Version 1.4

1. Introduction

This document is intended to provide a general description and guidance for implementing audio-visual technology in the three most common configurations deployed at the UVic campus by identifying technical requirements. This document does not discuss any space configuration details or non-technical requirements outside of what is necessary to meet the basic technology implementation needs.

The basic technical requirement categories are:

- **Carpentry** – modifications to millwork and furniture, as well as the installation of any audio-visual equipment securely attached directly to building structures is performed by a Facilities Management trades carpenter or sub-contractor.

- **Electrical** – Data infrastructure, electrical power, and low voltage cabling are installed by a Facilities Management trades electrician or sub-contractor.

- **Environmental –** requirements of the physical space necessary for proper operation of the audio-visual equipment. Some environmental requirements must be present at the time of construction, others can be modified or retrofit later. Not meeting environmental requirements drastically impacts the quality of the audio-visual experience.

- **Equipment** – this is the actual audio-visual technology. Audio visual technology generally has a lifespan of 5 – 10 years and is installed by University Systems Audio-Visual Technicians or sub-contractor.

  The Department requesting the equipment installation is responsible for procurement of the equipment, maintenance costs (one-time or ongoing), and an evergreen plan for the equipment.

- **Software** – Modern audio-visual control systems require customized software to operate and integrate the various audio-visual components, and to provide a simplified interface for the users. Many audio-visual components also require firmware updates to ensure compatibility with evolving standards.

2. Room Types

This section describes the four most common types of audio-visual equipped spaces. While other, non-standard (or variant) technology installations are present on campus, all non-standard configurations require a dedicated review in order to generate technical requirements.

2.1. Standard Meeting/Conference Room

Almost every meeting room requires an audio-visual display for presentations or other collaboration. A basic meeting room is the simplest audio-visual design deployed at UVic.

2.1.1. Overview

A Standard Meeting/Conference room has one wall-mounted display and a standard micro form-factor computer. Users may optionally connect their user-supplied laptop to the system using cables provided at the meeting table location. Audio support is available via the display's internal speakers. The display is controlled by the included factory remote control.

2.1.2. Carpentry

2.1.2.1. The display must be installed such that the image area will be visible to as many meeting participants as possible given the site conditions. The bottom of the screen should never be below the meeting table height. The final display height AFF should be determined on-site.

2.1.2.2. The cable cubby is cut into the meeting table using the manufacturer provided cut-out template. The cable cubby location should be close to the presenters' typical seating location.

2.1.2.3. The micro form-factor computer is mounted on the wall behind the display using the VESA bracket. The computer should be accessible for maintenance.

2.1.3. Electrical

2.1.3.1. A dedicated 15ampre electrical outlet is required behind the display. This outlet should be recessed whenever possible.

2.1.3.2. Three network data jacks are required behind the display.

2.1.3.3. Three network data jacks and one electrical outlet must be available at the meeting table location. The ideal installation is a floor box containing the electrical, data, and AV cabling. If a floor-box is not practical, the services should be installed on a wall as close to the meeting table as possible (300mm AFF) while simultaneously avoiding high-traffic areas. A safety floor-runner is required to protect any cables that run along the floor.

2.1.3.4. Two contiguous Crestron Digital Media (DM) cables terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) must be run from the display location to the meeting table location. The DM cables should be enclosed in 1inch (or larger) EMT wherever possible.

2.1.4. Environmental

2.1.4.1. This section left intentionally blank.

2.1.5. Equipment

2.1.5.1. Below is a listing of the components necessary for a working solution. Due to the short nature of product lifetimes, this list is highly subject to change.

#	Equipment Description (quantity)	Standard Equipment Makes: Models
1	Display (1)	ViewSonic: IFP6550 ViewSonic: IFP7550 ViewSonic: IFP8650 Dell: C8621QT (deprecated) Dell: C7520QT (deprecated) Dell: C6522QT (deprecated) Dell: C5522QT (deprecated) Sharp/NEC: M551 Sharp/NEC: M651 Sharp/NEC: M751 Sharp/NEC: M861
2	Display mount (1) and accessories	Chief: Extra-Large Fusion Micro-Adjustable Fixed Wall Display Mount (XSM1U) Chief: Large Fusion Micro-Adjustable Fixed Wall Display Mount (LSM1U) Chief: FHB5037 adapter kit (optional for XSM1U)
3	PC (1)	Dell: OptiPlex Micro 7020 (subject to frequent change)
4	Display port adapter for PC (0-1)	Extron: DPM-HDF/0.5 4K PLUS (26-713-01) – if required
5	PC VESA mount (1)	Dell: OptiPlex Micro VESA Mount (452-BDUY)
6	Cable Cubby (1)	Extron: Cable Cubby 222 (60-1927-02)
7	Cable Cubby Ethernet insert (1)	Extron: One RJ-45 Female to Female Barrel - CAT 5e (70-314-13)
8	HDMI cable for laptop (1)	Extron: HDMI Ultra/12 (26-663-12) or equivalent
9	USB-C cable for laptop (1)	Crestron: CBL-4K-USBC-HD-12
10	Video transmitter (1)	Crestron: DM-TX-4k-302-C
11	Video Receiver (1)	Crestron: DM-RMC-4KZ-SCALER-C
12	Power injector (1)	Crestron: DM-PSU-ULTRA-MIDSPAN
13	HDMI cable for display (2)	Extron: HDMI Ultra/3 (26-663-03) or equivalent
14	CAT6 patch cables (3)	AMP: TCPC-6RUVB-WT06F (discontinued)
15	Digital Media patch cables (3)	Crestron: DM-CBL-ULTRA-PC-3 (6507646)
16	Wireless keyboard and mouse (1)	(User preference)
17	Miscellaneous items/consumables	(shop supplied)

2.1.5.2. Laptop cables are installed thought the cable cubby and connected to the video transmitter. The video transmitter is mounted to the bottom of the meeting table. The cable cubby is connected to electrical power and the campus network.

2.1.5.3. The video receiver and power injector are mounted behind the display and are connected to the video transmitter using the DM cable infrastructure and patch cables. The video receiver is connected to the display using an HDMI cable. The receiver is also connected to the campus network.

2.1.5.4. The micro form-factor computer is connected to the display using an HDMI cable. The micro form-factor computer is also connected to the campus network.

2.1.5.5. All computers deployed in audio-visual projects must adhere to University Standards. No substitutions will be accepted. Please see https://www.uvic.ca/tsc for additional information.

2.1.6. Software

2.1.6.1. No control software is required for this type of installation.

2.1.7. System Diagram

See https://web.uvic.ca/~clte/standards/*SYST-ACSV-CLTE-AV-004.pdf* for a complete system diagram.

2.1.8. Variant – Basic Video Collaboration for Hybrid Meetings

Some user groups may require the addition of a USB camera to enable basic video collaboration. For small rooms (approx. 6 persons or less) the preferred device is the "Logitech MeetUp (960-001101)". For larger rooms, the preferred device is the "Logitech Rally Plus (960-001225)".

2.1.8.1. If equipped, the Logitech MeetUp is installed immediately below the display and connected to the micro form-factor computer via the supplied USB cable. The height of the display may need to be increased to prevent the camera from being too low. The ideal camera height is at seated eye level.

2.1.8.2. If equipped, the Logitech Rally Plus camera is installed immediately below the display, while the two supplied speakers are installed on either side of the display. The height of the display may need to be increased to prevent the camera from being too low. The ideal camera height is at seated eye level. The Logitech Display hub is mounted behind the display and connects to the camera, speakers, and micro form-factor computer. The Logitech Table hub is either installed under the meeting table or above T-Bar ceiling.

2.1.8.2.1. When the Logitech Table Hub is mounted under the meeting table: it is connected to the Logitech Display Hub via the DM cabling infrastructure and the supplied Logitech Mic pods are connected to Table Hub and placed on the table.

2.1.8.2.2. When the Logitech Table Hub is mounted above T-Bar ceiling: an additional DM cable terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) is required from the display location to the ceiling space. The ceiling space also requires a 15ampre electrical outlet. The supplied Logitech Mic pods are connected to the Logitech Table Hub and installed in the ceiling using Logitech Mic Pod Mounts.

2.1.8.3. The additional equipment for this variant is listed in the table below (in addition to table 2.1.5.1).

#	**Equipment Description (quantity)**	**Standard Equipment Makes: Models**
1	Camera (1)	Logitech: Meetup Logitech: Rally Plus and Rally Mounting Kit
2	Digital Media patch cables (2)	Crestron: DM-CBL-ULTRA-PC-3 (6507646)
3	Microphone Mounts (0-2)	Logitech: Mic Pod Mount

2.1.9. Variant –Basic Video Collaboration for Hybrid Meetings with Additional Display

Some client groups may request an additional display to be installed to enhance the hybrid meeting experience. The additional display increases the infrastructure and technology footprint.

2.1.9.1. The two displays will be mounted next to each other at the same height. The camera will be located between the two displays.

2.1.9.2. An additional dedicated 15ampre electrical outlet is required behind the second display. This outlet should be recessed whenever possible.

2.1.9.3. Two additional network data jacks are required behind the second display.

2.1.9.4. A conduit or cable-path is required between the two displays.

2.1.9.5. The micro form-factor computer is connected to the second display via HDMI. Note that many standard computers will require a DisplayPort to HDMI adapter for the second video output.

2.1.9.6. Due to the difficult nature of controlling multiple displays with one remote control, and simple control system is strongly recommended for meeting rooms with multiple display.

2.1.9.6.1. A Touch panel is installed on the meeting table and connected to the campus network.

2.1.9.6.2. A control system is installed behind the displays and connected to the campus network. The control system is connected to each of the displays via serial (RS-232) cabling.

2.1.9.6.3. The control system and touch panel will use the University of Victoria's standard meeting room software. No substitutions will be accepted.

2.1.9.7. The additional equipment for this variant is listed in the table below (in addition to tables 2.1.5.1 and 2.1.8.3).

#	Equipment Description (quantity)	Standard Equipment Makes: Models
1	Display (1)	ViewSonic: IFP6550 ViewSonic: IFP7550 ViewSonic: IFP8650 Dell: C8621QT (deprecated) Dell: C7520QT (deprecated) Dell: C6522QT (deprecated) Dell: C5522QT (deprecated) Sharp/NEC: M551 Sharp/NEC: M651 Sharp/NEC: M751 Sharp/NEC: M861
2	Display mount (1) and accessories	Chief: Extra-Large Fusion Micro-Adjustable Fixed Wall Display Mount (XSM1U) Chief: Large Fusion Micro-Adjustable Fixed Wall Display Mount (LSM1U) Chief: FHB5037 adapter kit (optional for XSM1U)
3	HDMI cable for display (1)	Extron: HDMI Ultra/3 (26-663-03) or equivalent
4	CAT6 patch cables (2)	AMP: TCPC-6RUVB-WT06F (discontinued)
5	Control System (1)	Crestron: RMC4
6	Touch Panel (1)	Crestron TS-770

2.2. Standard Classroom

The University of Victoria has over 135 Standard 1-Projector and 2-Projector Classrooms that are universally bookable by any department, as well as many others that are intended for department-specific use. Standard classrooms are intended to meet the needs of most audio-visual teaching requirements. 1-Projector and 2-Projector classrooms use the same underlying design, the latter having one additional projector and supporting infrastructure.

2.3.1 Overview

2.3.1.1 A Standard Classroom has one or two ceiling-mounted projectors and one or two wall-mounted projection screens respectively. The projectors are controlled by a 7inch touch panel on the instructors' millwork console. Instructors connect their user-supplied laptop to the audio-visual system using cables provided at the instructor millwork.

2.3.1.2 A document camera and a resident computer (with local monitor) is also available at the instructor millwork.

2.3.1.3 Audio support is provided by a number of ceiling-mounted speakers and the volume is controlled via the touch panel. A wireless microphone is stored inside the instructor millwork.

2.3.2 Carpentry

2.3.2.1 The projection screens must be installed such that the image area will be visible to as many classroom participants as possible given the site conditions. Whenever possible, the projection screens should be mounted to allow for the chalkboards or other writing surfaces to be used while the screens are extended. The projection screens must be mounted free from obstructions such as counters, cupboards, and doors. They must also be away from HVAC air currents or open windows.

2.3.2.2 A number of 70v ceiling-mounted speakers are installed to distribute audio evenly thought the room. The number of speakers typically ranges from 2 to 6, depending on the size of the room. The table below indicates typical speaker quantities.

Room Size (square meters)	**Typical number of speakers**
50 or less	2
Between 50 and 100	4
More than 100	6

2.3.2.3 The projectors are mounted below the ceiling (if any) to the building structure above the ceiling (if any) using the ceiling flanges and a trades-supplied 1.5inch threaded pipe referred to as “masts”. Each mast must be painted or powder coated (typically black) to prevent corrosion. Each mast must be installed 4.25meters from the projection surfaces and centered horizontally with the projection surface. The bottom of the mast musts be level with the top of the screen housing.

2.3.2.4 A UVic “D” cabinet (or variant) will be installed in the room in a location determined by the Facilities Management interior design team. The upper compartment of the “D” cabinet (known as the “instructor cabinet”) will be keyed to hook number 7458 for cabinets inside Ring Road and hook number 7460 for cabinets outside Ring Road. The lower compartment (known as the “technician cabinet”) will be keyed to hook number C029b. The “instructor cabinet” is identified with a Facilities Management provided placard that says: “Instructor Access”.

2.3.2.5 A standard monitor arm (specified/supplied by UVic Facilities management) will be installed on the millwork. The monitor arm (and by extension, the monitor) is placed dependant on site conditions, minimizing obstruction of the classroom participants’ view of the projection screens and writing surfaces. A 2 or 3-inch grommet will be installed beside the base of the monitor arm to accommodate the monitor cables.

2.3.2.6 The cable cubby is cut into the millwork surface using the manufacturer provided cut-out template. The cable cubby will be located in line with the monitor arm and grommet.

2.3.2.7 The touch panel will be installed near the edge of the millwork to allow for accessibility. The manufacturer-supplied template will be used to secure the touch panel to the millwork surface.

2.3.2.8 Two 1/8inch bolt holes and one 1/2inch cable hole will be drilled in the millwork surface to secure and connect the document camera. The document camera is placed dependant on site conditions, minimizing obstruction of the classroom participants’ view of the projection screens and writing surfaces.

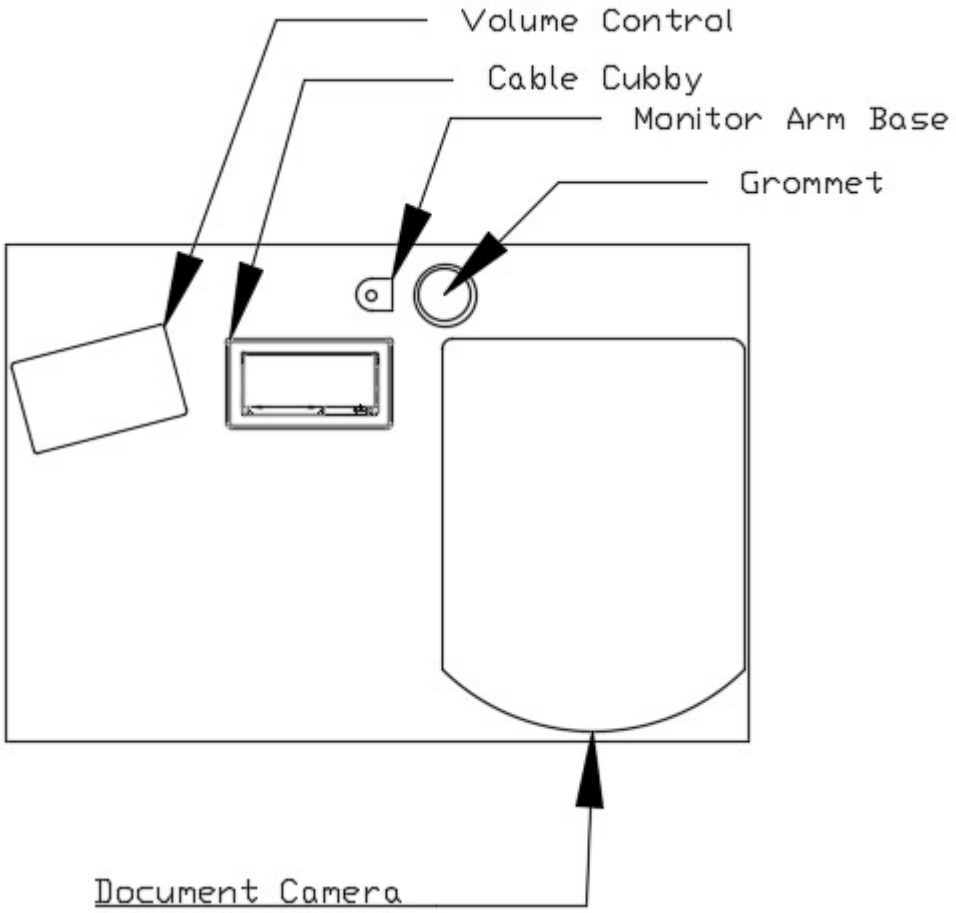

Image 1 – Example “D” cabinet layout (top view)

2.3.3 Electrical

2.3.3.1 A dedicated 15ampre electrical outlet is required above the ceiling (if any) at each projector location.

2.3.3.2 Two network data jacks are required above the ceiling (if any) at each projector location.

2.3.3.3 Two contiguous Crestron DM cables terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) must be run from each projector location to the "technician cabinet". The DM cables should be enclosed in 1inch (or larger) EMT.

2.3.3.4 One contiguous 16AWG plenum speaker cable (unterminated) must be run from the "technician cabinet" into the ceiling space. The speakers will be daisy chained from each other. If the classroom does not have a drop ceiling, the speaker cables should be enclosed in 1/2inch EMT.

2.3.3.5 Six network data jacks and one dedicated 15ampre electrical outlet must be available at the "technician cabinet". If the millwork cabinet is against a wall, the electrical services will be installed flush in the wall (300mm AFF) and the cabinet backing or gable will be cut to allow access to the electrical services. If the millwork cabinet it free-standing, then the electrical services must be installed inside the "technician cabinet" as high as possible to allow room for the audio-visual components.

2.3.4 Environmental

2.3.4.1 The room lighting must be controllable such that the projection screens can have no direct illumination. Lighting controls are required at doorways and at the instructor millwork.

2.3.4.2 Light fixtures must not interfere with the projectors' line-of-site. Hanging light fixtures that are in the projectors' line-of-site must be relocated or replaced.

2.3.4.3 Exterior Windows may require shades to decrease ambient light on the projection surfaces.

2.3.5 Equipment

2.3.5.1 Below is a listing of the components necessary for a working solution. Due to the short nature of product lifetimes, this list is highly subject to change.

	Equipment Description (quantity)	**Standard Equipment Make and Model**
1	Projector (1x-2x)	SHARP/NEC: NP-P547UL
2	Projector mount (1x-2x)	CBM: UPRO-1
3	Projector security kit (1x-2x)	CBM: UPRO-KIT
4	Ceiling speakers (2x-6x)	SAROS_IC6T-W-T-EACH
5	Ceiling flange (1x-2x)	Pierless: ACC 570
6	Screen (1x-2x)	Dalite: Model B 96"x96"
7	Screen mounts (1x-2x)	Dalite: No. 6 (pair) - WHITE
8	Cable Cubby	Extron: Cable Cubby 222 (60-1927-02)
9	Cable Cubby Ethernet insert	Extron: One RJ-45 Female to Female Barrel - CAT 5e (70-314-13)
10	HDMI cables for laptop, and display (2x)	Extron: HDMI Ultra/12 (26-663-12) or equivalent
11	HDMI cables for resident computer (2x) and document camera	Extron: HDMI Ultra/6 (26-663-06) or equivalent
12	USB-C cable for laptop (1)	Crestron: CBL-4K-USBC-HD-12
13	HDMI to USB Bridge	Extron: MediaPort 200 (60-1488-01)
14	Control Buttons	Crestron: C2N-CBD-P (Black)
15	Touch Panel	Crestron: TSW-770

16	OEM Engraved button caps [3-row] (2x)	Crestron: CB2-BTNB-T
17	Video Receiver (1x-2x)	Crestron: DM-RMC-4Kz-SCALER-C
18	HDMI cable for video receiver and HDMI bridge (2x-3x)	Extron: HDMI Ultra/3 (26-663-03) or equivalent
19	Document Camera	Elmo: PX-10e
20	Resident Computer	Dell: OptiPlex Micro 7020 (subject to rapid change)
21	Computer Monitor	Dell: P2225H
22	Microphone	Sennheiser: EW-D ME2 SET (R1-6)
23	Media Control System	Crestron: DMPS3-4k-350
24	Occupancy Sensor	Crestron: GLS-ODT-C-POE
25	Crestron DM patch cables (2x-4x)	DM-CBL-ULTRA-PC-3 (6507646)
26	Lock for projectors, PC, and monitor (3x-4x)	Computer Security Products: Kablit Portable Laptop Lock-MK-C1
27	PoDM injecter	Crestron: PW-5430DUS
28	CAT6 patch cables (5x-6x)	AMP: TCPC-6RUVB-WT06F (discontinued)
29	Power Controller	Middle Atlantic: RackLink RLNK-215
30	Webcam	Logitech: C925e Webcam (960-001075)
31	Power bar	(various)
32	Miscellaneous cable/consumables	(installer supplied)

2.3.5.2 The media control system is installed in the “technician cabinet” and is connected to electrical power via the power controller and the campus network. All other audio-visual components connect to the media control system or the campus network. A PoDM injector is also connected to the control system to power the video receivers.

2.3.5.3 A power controller is installed in the “technician cabinet” and connected to electrical power and the campus network. The control system is connected to output 1, and the PC is connected to output 2.

2.3.5.4 The wireless microphone receiver is installed in the “technician cabinet” and is connected to electrical power. The microphone and microphone receiver must be tuned to a frequency not already used by nearby systems.

2.3.5.5 The laptop cables are installed thought the cable cubby and connected to the media control system. The cable cubby must be connected to electrical power and the campus network.

2.3.5.6 A resident computer is securely installed inside the “instructor cabinet” and connected to electrical power via the power controller and the campus network (available inside the “technician cabinet”). The computer monitor is mounted on the monitor arm and cabling is routed through the grommet hole to the resident computer.

2.3.5.7 A pushbutton interface is installed vertically inside the “instructor cabinet” with two buttons labelled “LOCK” (bottom) and “UNLOCK” (top). The labels must be engraved by the OEM. The buttons must be facing the user.

2.3.5.8 One video receiver is mounted above the ceiling (if any) for each projector and are connected to the audio-visual system using the DM cable infrastructure. Each video receiver is connected to one of the projectors via HDMI and serial (RS-232).

2.3.5.9 A HDMI to USB scaling bridge is installed inside the “technician cabinet”. The bridge is connected to electrical power as well s the control system via HDMI and the PC via USB.

2.3.5.10 Each projector is mounted to a mast using the projector mounts and security kits. Each projector is connected to the campus network.

2.3.5.11 If there is a T-Bar or finished ceiling, the occupancy sensor is installed in the ceiling at approximately the centre of the room. If there is not a T-Bar or finished ceiling, the occupancy sensor is surface mounted in an octagon box on the ceiling. The occupancy sensor is connected to the campus network.

2.3.5.12 A webcam is installed on top of the PC monitor and connected to the PC via USB.

2.3.5.13 The document camera is connected to the control system via HDMI and serial (RS-232) and well as electrical power.

2.3.5.14 All computers deployed in audio-visual projects must adhere to University Standards. No substitutions will be accepted. Please see https://www.uvic.ca/tsc for additional information.

2.3.6 Software

2.3.6.1 The media control system is programmed using the University Systems standard "Standard Classroom" control system code regardless of whether the installation is performed by UVic forces or sub-contractor. No substitutions will be accepted. Firmware on the media control system, touch panel, video receivers, occupancy sensor, and control buttons is updated at the time of installation and may require periodic updates. The media control system is configured to use "time.uvic.ca" as its SNTP server to prevent the RTC from drifting.

2.3.6.2 The touch panel interface is programmed using the University Systems "Standard Classroom" touch panel code regardless of whether the installation is performed by UVic forces or sub-contractor. No substitutions will be accepted.

2.3.7 System diagram

See http://web.uvic.ca/~clte/standards/*SYST-ACSV-CLTE-AV-003.pdf* for a complete system diagram.

2.3.8 Computer Lab Variant

University computer labs use the "Standard Classroom" (1 projector) configuration. Computer labs typically do not require document cameras, therefore item 19 and one of item 11 can be eliminated.

2.3. Standard Large Lecture Theatre

The University has 15 Large Lecture Theatres that are universally bookable by any department. Large Lecture Theatres typically have high seating capacities (~200 – 350) and have additional provisions to support external technologies such as video recording and webcasting from a media booth at the back of the theatre.

2.3.1. Overview

A Large Lecture Theatre has three high powered projectors located inside the media booth. The instructor has the option of using the left and right projectors simultaneously to display two different sources, or, the instructor can use the centre projector to display a single source. The centre projector typically produces a larger and brighter image.

The instructor station is equipped with two document cameras, a resident computer (with local monitor), laptop connections (HDMI and USB-C), and an auxiliary HDMI input. A 3.5mm stereo mini audio-out jack is also available at the instructor station to allow the instructor to connect an audio recording device.

Audio support is provided by two primary driver/speakers on the front wall, and several ceiling speakers. A wireless microphone is stored inside the instructor station and eight auxiliary microphone inputs used during panel presentations are located near the front of the Large Lecture Theatre.

Two PTZ lecture capture cameras are mounded on the ceiling near the back of the room. These cameras are primarily used for capturing the writing surfaces and must be aligned appropriately for the image to be square.

The audio-visual system is controlled using a touch panel interface on the instructor millwork, or from an auxiliary technician touch panel interface located inside the media booth. The media booth is also equipped with auxiliary HDMI video and XLR audio inputs and outputs to accommodate lecture recordings and webcasts.

Each large lecture theatre is equipped with a listen assist device for hearing impaired persons.

The majority of the audio-visual technology in a Large Lecture Theatre is housed in an equipment rack inside the media booth.

2.3.2. Carpentry

2.3.2.1. Each of the three projectors are mounted to the building structure inside the media booth using the ceiling flanges and trades-supplied 1.5inch threaded pipes, each referred to as a “mast”. Each mast must be painted or powder coated (typically black) to prevent corrosion. The masts must be placed 500mm behind the media booth’s primary projection window. The bottom of the mast must be level with the top of the Large Lecture Theatre’s image projection area.

2.3.2.2. A 65inch confidence monitor display will be mounted on the back wall of the Large Lecture Theatre in a position that is clearly visible from the instructor’s station and away from high traffic areas. Due to the lack of Large Lecture Theatre consistency, the exact location of the confidence monitor must be chosen based on site conditions.

2.3.2.3. One primary driver/speaker is installed on each side of the image projection area (two total). The top of the drivers are generally aligned with the top of the image projection area, but may vary depending on bulkhead configuration. The remaining ceiling speakers are installed throughout the Large Lecture Theatre for evenly distributed sound. The quantity of ceiling speakers varies depending on site conditions.

2.3.2.4. A UVic “B” cabinet will be installed in the room in a location determined by the Facilities Management interior design team. The small, upper compartment of the “B” cabinet (known as the “instructor cabinet”) will be keyed to hook number 7458 for cabinets inside Ring Road and hook number 7460 for cabinets outside Ring Road. The remaining two compartments (both known as a “technician cabinet”) will be keyed to hook number C029b. The “instructor cabinet” is identified with a Facilities Management provided placard that says “Instructor Access”.

2.3.2.5. A Facilities Management supplied standard monitor arm will be installed on the millwork. The monitor arm (and by extension, the monitor) is placed dependant on site conditions, minimizing obstruction of the Large Lecture Theatre audience’s view of the projection image area and writing surfaces. A 2 or 3 inch grommet will be installed beside the base of the monitor arm to accommodate the monitor cables. The auxiliary microphone input plate is cut into the side gable of the millwork using the manufacturer provided template at 200mm AFF.

2.3.2.6. The cable cubby is cut into the millwork surface using the manufacturer provided cut-out template. The cable cubby will be located in line with the monitor arm and grommet.

2.3.2.7. Three 1/8inch bolt holes bolt holes and one 1/2inch cable hole will be drilled in the millwork surface to secure and connect the touch panel. The touch panel is installed next to the cable cubby and is placed such that it is accessible to persons who use a wheelchair.

2.3.2.8. Two 1/8inch bolt holes and one 1/2inch cable hole will be drilled in the millwork surface to secure and connect each document camera. The document cameras are placed dependant on site conditions, minimizing obstruction of the Large Lecture Theatre’s audience’s’ view of the projection image area and writing surfaces. A Facilities Management provided placard is placed in front of each document camera labelling them “Document Camera 1” and “Document Camera 2” respectively.

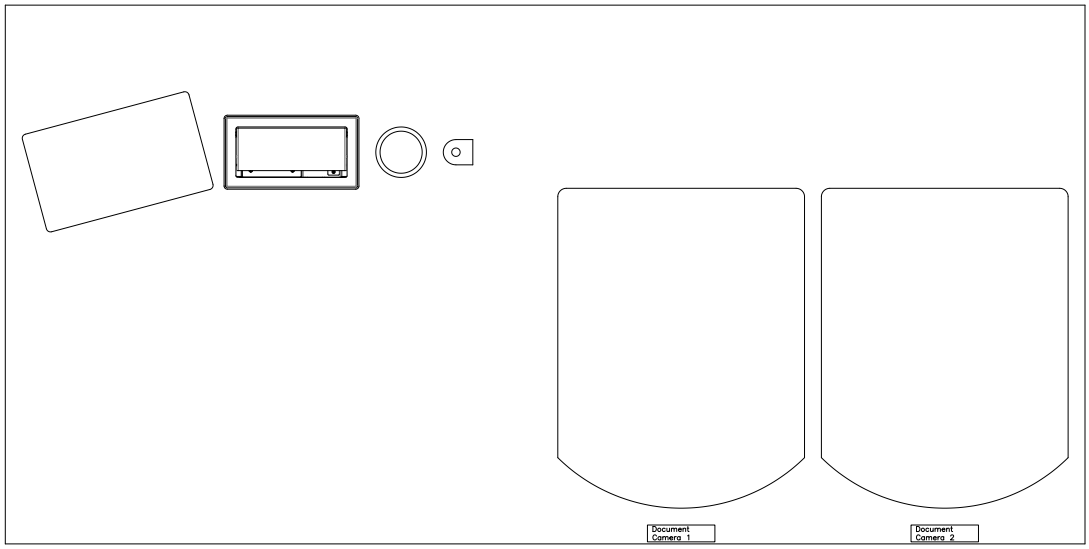

Image 8 – Example “B” cabinet layout (top view)

2.3.3. Electrical

2.3.3.1. A dedicated 20ampre electrical outlet is required above the each of the three projectors in the media booth. Two network data jacks are required at each of the three projector locations (6 total).

2.3.3.2. Six network data jacks and two dedicated 20ampre electrical outlets (on separate circuits) must be available at the rack location in the media booth.

2.3.3.3. Two network data jacks and one dedicated 15ampre electrical outlet must be available at the confidence monitor location.

2.3.3.4. Nine (10) contiguous Crestron Digital Media (DM) cables terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) must be run from the rack location in the media booth to the smaller "technician cabinet". One contiguous Crestron DM cable terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) must be run from the rack location in the media booth to each of the three projectors (three in total). One contiguous Crestron DM cable terminated with 8P8C female jacks (DM-CONN-ULTRA-RECP) must be run from the rack location in the media booth confidence monitor display. All Crestron DM cables should be enclosed in 1/2 inch (or larger) EMT.

2.3.3.5. One contiguous 14AWG speaker cable (unterminated) must be run from an 11-10 box at each of the two front speaker locations to the rack location in the media booth (two cables in total). The speaker cables should be enclosed in 1/2inch EMT. Stainless steel covers with a rubber grommet hole should be provided for each of the 11-10 boxes. The ceiling speakers will be divided in to four zones progressing from the front to the back of the room. One contiguous 16AWG plenum speaker cable (unterminated) must be run from the rack location into the ceiling space for of the four speaker zones (four cables in total). The speakers within each zone will be daisy chained to each other. If the Large Lecture Theatre does not have a drop ceiling, the speaker cables must be enclosed in 1/2inch EMT. The number of ceiling speakers is dependant on the physical space. Each ceiling speaker zone typically requires between 4 and 12 speakers for even sound distribution.

2.3.3.6. Six network data jacks and two dedicated 15ampre electrical outlets (on separate circuits) must be available at the "technician cabinet". If the millwork cabinet is against a wall, the electrical services will be installed flush in the wall (300mm AFF) and the cabinet gable will be cut to allow access to the electrical services. If the millwork cabinet it free-standing, then the electrical services must be installed inside the "technician cabinet".

2.3.3.7. One data jack must be available in the ceiling at each of the two ceiling-mounted occupancy sensors in the Large Lecture Theatre.

2.3.3.8. The Large Lecture Theatre's primary lighting controller must support Crestron control via an Ethernet (TCP/IP) interface or RS-232 serial interface available at the rack location in the media booth. BACNet and similar licensed protocols are not acceptable.

2.3.3.9. If the large lecture theatre has motorized shutters or blinds, they must support Crestron control via an Ethernet interface or RS-232 serial interface available at the rack location in the media booth. BACNet and similar licensed protocols are not acceptable.

2.3.3.10. One network data jack and one dedicated 15ampre electrical outlet must be available at each of the two lecture capture camera location on the ceiling.

2.3.4. Environmental

2.3.4.1. The image projection area must be a flat, vertical, level 5 surface. It is not possible to focus a projector on an angled surface. Angled projection surfaces are not acceptable. The projection surface must be vertical. The image projection area must be on the front wall of the Large Lecture Theatre above the chalkboards or writing surface and must not interfere with the writing surfaces. There must not be any interruptions in the image projection area such as electrical boxes, fire indicators, HVAC ports or sensors, or any other objects. The surface must be painted with a matte white paint. The size of the projection image area must allow for typical occupants to read size 11 *Calibri* font on a projected image from any seat in the Large Lecture Theatre.

2.3.4.2. The room lighting must be controllable such that the image projection area can have no direct illumination and be as dark as possible. Lighting controls should be located at doorways and at the instructor station. Light fixtures must not interfere with the projectors' line-of-site. Hanging light fixtures that are in the projectors' line-of-site must be relocated or replaced.

2.3.4.3. Exterior Windows may require shades to decrease ambient light on the image projection area.

2.3.4.4. The equipment in the media booth can consume up to 3.5kW, producing approximately 12,000BTUs. The media booth must be actively ventilated or cooled to maintain normal office working conditions as there will occasionally be human operators during special events working in the media booth.

2.3.4.5. The media booth must have a single pane angled projection window with antireflective glass to allow all three projectors to project on to the projection image area. The media booth must be large enough (> 12 square metres) to accommodate rigging during special events. The media booth should be accessible from the outside of the Large Lecture Theatre. The media booth must be located at the centre of the back wall of the Large Lecture Theatre.

2.3.5. Equipment

2.3.5.1. Below is a listing of the components necessary for a fully working solution. Due to the short nature of product lifetimes, this list is highly subject to change.

	Equipment Description (quantity)	**Standard Equipment Make and Model**
1	Projector (3)	NEC: NP-PV800UL-W1 with appropriate lens
2	Projector mount (3)	Chief: RPM Elite (RPMC000W)
3	Primary front wall speakers (2)	(Dependant on spatial acoustic modelling of the room)
4	Ceiling Speakers (variable)	(Dependant on spatial acoustic modelling of the room)
5	Ceiling flange (3)	Pierless: ACC 570
6	Confidence Monitor (1)	Sharp/NEC: M551 Sharp/NEC: M651 Sharp/NEC: M751 Sharp/NEC: M861
7	Confidence monitor mount (1)	Chief: Extra-Large Fusion Micro-Adjustable Fixed Wall Display Mount (XSM1U) Chief: Large Fusion Micro-Adjustable Fixed Wall Display Mount (LSM1U) Chief: FHB5037 adapter kit (optional for XSM1U)
8	Cable Cubby (1)	Extron: Cable Cubby 222 (60-1927-02)
9	Cable Cubby Ethernet insert (1)	Extron: One RJ-45 Female to Female Barrel - CAT 5e (70-314-13)
10	HDMI cable for laptop, and monitor (2)	Extron: HDMI Ultra/12 (26-663-12) or equivalent
11	HDMI cable for resident computer, document cameras, and AUX input (4)	Extron: HDMI Ultra/6 (26-663-06) or equivalent

12	USB-C Cable for laptop (1)	CBL-4K-USBC-HD-12
13	Video transmitter for laptop (1)	Crestron: DM-TX-4k-302-C
14	Video transmitter for PC, document cameras, AUX input, cameras (7)	Crestron: DM-TX-401-C
15	Control Buttons (1)	Crestron: C2N-CBD-P (Black)
16	Engraved button caps – 3 row (2)	Crestron: CB2-BTNB-T
17	Video Receivers (7)	Crestron: DM-RMC-4KZ-SCALER-C
18	HDMI cable for video receiver (7)	Extron: HDMI Ultra/3 (26-663-03) or equivalent
19	Document Camera (2)	Elmo: PX-10e
20	Resident Computer (1)	Dell: OptiPlex SFF 7020
21	Computer Monitor (1)	Dell: P2225H
22	Microphone (1)	Sennheiser: EW-D ME2 SET (R1-6)
23	Media Control System (1)	Crestron: CP4 (preferred) or CP4n
24	Occupancy Sensor (2)	Crestron: GLS-ODT-C-POE
25	CAT6 patch cables (17)	AMP: TCPC-6RUVB-WT06F (discontinued)
26	Lock for projectors and monitor (4)	Computer Security Products: Kablit Portable Laptop Lock-MK-C1
27	Audio adapter cable (RCA - PNX) (1)	Extron: CRM 6 (26-575-01)
28	16 port PoDM injector (2x)	Crestron: DM-PSU-16-PLUS
29	Power Amplifier (3x)	Crestron: AMP-X500
30	Sound Processor (DSP) (2x)	Biamp: Tesira Forte AVB AI
31	HDMI to USB Bridge (2x)	Extron MediaPort 200 (60-1488-01)
32	Rack (1)	Middle Atlantic: Slim 5 Series 19-inch Equipment Rack, 29-SPACE, 26-inch Deep Rack (5-29-26)
33	Rack wheel kit (1)	Middle Atlantic: Caster Base, 26"D, Slim 5 Series (CBS-5-26)
34	Rack Lace Bars (1)	Middle Atlantic: Lace Bar, 6" Offset, L-Shaped, 10 pc. (LBP-6A)
35	Rack blank panel (1U) (8)	Middle Atlantic: Blank Panel, 1 RU, Steel, Flanged (EB1)
36	Rack blank panel (6U)	Middle Atlantic: Blank Panel, 6 RU, Steel, Flanged (EB6)
37	Video matrix switcher frame (1)	Crestron: DM-MD8x8-CPU3
38	DM input card for matrix switcher (7)	Crestron: DMC-4KZ-C-HDCP2
39	HDMI input card for matrix switcher (1)	Crestron: DMC-4KZ-HD-HDCP2
40	DM output card for matrix switcher (4)	Crestron: DMC-4KZ-CO-HD-HDCP2
41	Cameras (2)	AW-HE40H HD Professional PTZ Camera (HDMI) – or replacement
42	10inch touch panel (2)	Crestron: TSW-1070-B-S
43	WebCam (1)	Logitech: C925e Webcam (960-001075)
44	Four-Gang AAP Mounting Frame (Black) (1)	Extron: AAP 104 (60-301-02)
45	Blank Plate - Double (Black) (4)	Extron: IN9367D (70-315-12)
46	Blank Plate - Single (Black) (1)	Extron: IN9350 (70-315-11)
47	One-Gang MAAP Mounting Frame (Black) (1)	Extron: CPM101 (60-583-11)
48	1U x Full Rack Width MAAP Rack Mounting Frame (Black) (1)	Extron: CPM112R (60-584-12)
49	One 3.5 mm Stereo Mini Jack to Solder Tabs (Black) (1)	Extron: IN9385 (70-293-11)
50	One HDMI Female to Female Barrel (Black) (3)	Extron: One HDMI Female to Female Barrel - Black (70-617-02)
51	One RJ-45 Female to Female Barrel - CAT 5e (Black with Silkscreen) (1)	Extron: One RJ-45 Female to Female Barrel - CAT 5e - Black with Silkscreen (70-314-14)

52	One XLR 3-pin Male to Solder Cups - Neutrik (Black) (1)	Extron: One XLR 3-pin Male to Solder Cups - Neutrik - Black (70-448-12)
53	One XLR 3-pin Female to Solder Cups - Neutrik (Black) (1)	Extron: One XLR 3-pin Female to Solder Cups - Neutrik - Black (70-296-11)
54	Two XLR 3-pin Female to Solder Cups (Black) (4)	Extron: Two XLR 3-pin Female to Solder Cups - Black (70-103-14)
55	DM patch cable (7 foot) (14)	Crestron: DM-CBL-ULTRA-PC-7 (6507637)
56	DM patch cable (3 foot) (7)	Crestron :DM-CBL-ULTRA-PC-3 (6507646)
57	Miscellaneous consumables	(shop supplied)

2.3.5.2. The media control system, video switcher, power amplifiers, power injectors, microphone receiver, listen assist transmitter, and one of the sound processors are installed in the equipment rack in the media booth and are all connected to electrical power. The media control system, video switcher and sound processor are also connected to the campus network. The wireless microphone and microphone receiver must be tuned to a frequency not already used in close proximity. This sound processor will accommodate the wireless microphone, power amplifiers, listen assist, auxiliary audio input and output, and source audio from the video switcher.

2.3.5.3. Each projector is mounted to a mast using the projector mounts. One video receiver is mounted above each projector and is connected to the video switcher using the Crestron DM cable infrastructure. The video receiver is also connected to the projector using HDMI and serial (RS-232) cables.

2.3.5.4. One video receiver is mounted behind the confidence monitor and is connected to the video switcher using the Crestron DM cable infrastructure. The video receiver is also connected to the confidence monitor using HDMI and serial (RS-232) cables.

2.3.5.5. The remaining video receivers and transmitters are mounted inside the “technician cabinet” and are connected to the video switcher using the Crestron DM cable infrastructure. These receivers and transmitters are then connected to the document cameras, computer monitor, laptop cable cubby, HDMI to USB bridges, and auxiliary input plate.

2.3.5.6. The remaining sound processor is installed in the “technician cabinet” and is connected to electrical power and the campus network. The two sound processors are teamed together using the Crestron DM cable infrastructure. This sound processor will accommodate the 8 auxiliary microphone inputs and the instructor recording output.

2.3.5.7. The laptop cables are installed thought the cable cubby and connected to the laptop transmitter. The cable cubby must be connected to the campus network.

2.3.5.8. A resident computer is securely installed inside the “instructor cabinet” and connected to electrical power and the campus network (network available inside the “technician cabinet”). The computer’s video output is connected to one of the video transmitters. The computer monitor is mounted on the monitor arm and cabling is routed through the grommet hole to the “technician cabinet”. The monitor is connected to electrical power and a video receiver.

2.3.5.9. The pushbutton assembly is mounted inside the “instructor cabinet”. The buttons are labelled “LOCK” and “UNLOCK” using OEM engraved button caps. One touch panel is installed in the media booth at a convenient location for a technician to use while the other is installed on the instructor millwork.

2.3.5.10. If there is a T-Bar or finished ceiling, the occupancy sensors are installed in the ceiling at approximately the centre of the room and front of the room. If there is not a T-Bar or finished ceiling, the occupancy sensors are installed in octagon boxes that are in clear view of the instructor teaching area and seating areas. The occupancy sensors are connected to the campus network. The Large Lecture Theatre front speakers are connected to the power amplifiers in the media both using the 14AWG wiring, and each of the four ceiling speaker zones is connected to the power amplifiers in the media boot using the 16AWG wiring.

2.3.5.11. All computers deployed in audio-visual projects must adhere to University Standards. No substitutions will be accepted. Please see https://www.uvic.ca/tsc for additional information.

2.3.6. Software

2.3.6.1. The media control system is programmed using University Systems standard “Large Lecture Theatre” control system code regardless of whether the installation is performed by UVic forces or sub-contractor.

2.3.6.2. The touch panel interfaces are programmed using University Systems standard “Large Lecture Theatre” touch panel code regardless of whether the installation is performed by UVic forces or sub-contractor.

2.3.6.3. The DSPs are programmed using University Systems standard “Large Lecture Theatre” digital sound processor code regardless of whether the installation is performed by UVic forces or sub-contractor.

2.3.6.4. Firmware on the media control system, video receivers, video transmitters, video matrix switchers, occupancy sensors, touch panels, control buttons, and DSPs is updated at the time of installation and may require periodic updates.

2.3.6.5. The media control system is configured to use “time.uvic.ca” as its SNTP server to prevent the RTC from drifting.

2.4.7 System diagram

See http://web.uvic.ca/~clte/standards/*SYST-ACSV-CLTE-AV-001.pdf* for a complete system diagram.