DIABLO VALLEY COLLEGE

Contra Costa Community College District

CLASSROOM DESIGN STANDARDS

JANUARY 19, 2018
FINAL REPORT

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CONSULTANTS

ARCHITECTURAL
WRNS Studio

MEP
Interface Engineering

AV/IT
The Shalleck Collaborative

ACOUSTICS
RGD Acoustics

LIGHTING
Watt Lighting

COST
Cumming

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EXECUTIVE SUMMARY

This Classroom Design Standards was commissioned at Diablo Valley College (DVC) to develop a comprehensive set of design standards for future learning environments on the campus. It provides an aggregate foundation for the holistic development of such spaces, for both new constructions and/ or renovations. Three typical classroom sizes were designed - Small: for 30 students, Medium: for 45 students and Large: for 90 students.

Classrooms have evolved over the years from traditional or hierarchical lectures to more collaborative and experiential learning environments. The existing classrooms at DVC are out-dated at 15 sf/student and do not meet the needs of 21st Century Learning Environments. A key to the development of an effective 21st century learning environment is creating a setting where students and faculty are engaged and energized, resulting in 'active' education. Embodying the college's mission statement, these environments are designed for diversity and inclusion that foster personal growth and life-long learning. The campus aims to create collaborative multi-modal learning environments focused on skill-based and community-based learning.

The architectural design for such 21st Century Learning Environments focuses on creating connections with the physical and social context, both inside and outside the classroom, that fosters the innovative and interdisciplinary partnerships. This can be achieved through a spatial organization that emphasizes - 1) incorporating an inventory of flexible furniture and equipment to facilitate the diverse needs of the users; 2) maximizing daylight and thermal/ acoustic comfort to cultivate an environment for user well-being; 3) integrating technology, both digital and analog, to enable seamless collaboration; 4) promoting ideation and tinkering using 'hands-on' learning to encourage students to be masters of theory and practice; and 5) providing an inclusive experience for persons of varying demographics and learning styles.

The design standards included here encompass a synthesis of the foundational work authored by the visionary leadership of all the Stakeholders. Based on the input from all stakeholders, the Executive Steering Committee decided on the following planning parameters for this classroom design standards:

- Small classrooms – 27 ASF/Student
- Medium classrooms – 25 ASF/Student (*while a couple of classrooms on a project by project basis will be at 27 ASF to allow for additional capacity for certain programs only)*
- Large classrooms – 25 ASF/Student

The detailed strategies for a variety of physical layouts, inventory of furnishings and selection of technology and equipment ascertain that the teaching and learning environments on campus are full of choices in a technology-enabled, peer-to-peer community. These standards provide general, best-practice performance criteria rather than prescriptive specifications that can be adopted by the campus for the detailed design and construction of any future learning environment.

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01
INTRODUCTION

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This Classroom Design Standards was developed as a collaboration among student, faculty and staff representatives from various departments at the College.

1.1 PROJECT TEAM

In order to foster an inclusive leadership team, the project had 4 committees, each with its defined responsibility, as follows:

DECISION GROUP
(Make Decisions)
Executive Steering Committee

CORE COMMITTEE
(Provide Input)
Rachel Westlake, VP, Instruction
Obed Vazquez, Dean, Engineering/ Social Science
Despina Prapavessi, Dean, Math/CS/ Business
Mike Holtzclaw, Senior Dean, San Ramon Campus
Kim Schenk, Senior Dean Curriculum
Rick Robison, Dean, Library, Educational Technology and Learning Support
Toni Fannin, Interim Dean, AFA
Beth McBrien, Academic Senate President/ Instructor
John Freytag, Academic Senate Vice President/ Faculty
Anne Kingsley, Faculty (English Department & Distance Education)
Cheryl Wilcox, Faculty (Math)
Mario Tejada, Faculty (CIS Instructor), DE Chair
Lee Rode, Faculty (Psychology)
John Hanecak, Faculty (Communication Studies)
Joan Symonds, Faculty (ECE & AEBG Faculty Co-coordinator)
Daniel Kiely, Librarian, Chair
Newin Orante, VP, Student Services
Percy Roper, IT Manager
James Buchanan, Director, Facilities Management & Operations
Frank Ichigaya, Custodial Manager
David Hagerty, Manager, Disability Support Services
Edward Carney, Chief of Police
Tracy Marcial, District Energy Manager

STAKEHOLDER COMMITTEE
(Provide Direction)
Core Committee Members
Christine Worsley, Dean/ AD
John Nahlen, VP, Business & Administrative Services

PLANNING COMMITTEE
(Day-to-day Management & Coordination)
Ines Zildzic, Associate CFP
Rachel Westlake, Vice President of Instruction
Mitch Fine, Partner, WRNS Studio
Lilian Asperin, Associate/ Project Director, WRNS Studio
Prairna Gupta Garg, Architect, WRNS Studio

In addition, the other participants of the project team include the following consultants:

Ian Hunter, Principal, The Shalleck Collaborative
Scott Krenzke, Senior Consultant, The Shalleck Collaborative
Jason Neches, Principal, WATT Lighting
Timothy Der, Principal, RGD Acoustics Inc.
Hormoz Janssens, Managing Principal, Interface Engineering
Eunice Yoon, Associate/ Senior Mechanical Engineer, Interface Engineering
Robin Roderick, Senior Electrical Engineer, Interface Engineering
Nick Mata, Director, Cumming Corporation

1.2 PROCESS

The design process for this project was designed to gather both quantitative and qualitative data to inform the comprehensive set of design standards for three typical classroom sizes on the campus (Small: 30 students, Medium: 45 students and Large: 90 students).

The quantitative phase of the process was defined by data collection via campus-wide surveys issued to students, faculty and staff. These surveys were designed to solicit information about the current state of the teaching and learning environments as well as desires for the future of these critical spaces within the campus. To capitalize on the extraordinary response rate obtained, the design team organized and led interactive discussions and workshops with the different stakeholder groups (Students, Faculty, Faculty Affairs, Student Affairs, Diversity and Inclusion, AV/IT Services, Accessibility, and Custodial) to identify those unique qualitative attributes that taken together embody the aspirations for "21st century Learning Environments at DVC" in times of changing pedagogies.

The process also emphasized on 'Inclusivity' by launching a project-specific micro-website to share information and solicit any feedback from the larger campus community. (*www.dvcclassroomstandards.com*)

1.3 SUSTAINABILITY

Governing Board Policy 6004 Environmental Stewardship and Sustainability, adopted in 2010, provides the groundwork for institutionalizing sustainability principles into every facet of Contra Costa Community College District. The DVC Sustainability Committee's work will pave the way for integration of these goals and policies into College's Strategic Plan in support of College's commitment to ensure student success as well as meeting the goal of 50% of existing California State buildings being required to be to be Zero Net Energy (ZNE) by 2025.

A thorough sustainability approach was considered throughout the design process to promote healthy and energy efficient learning environments. We prioritized organizing primary building components to benefit from daylight while mitigating heat gain; selecting high-efficiency equipment to conserve energy; specifying

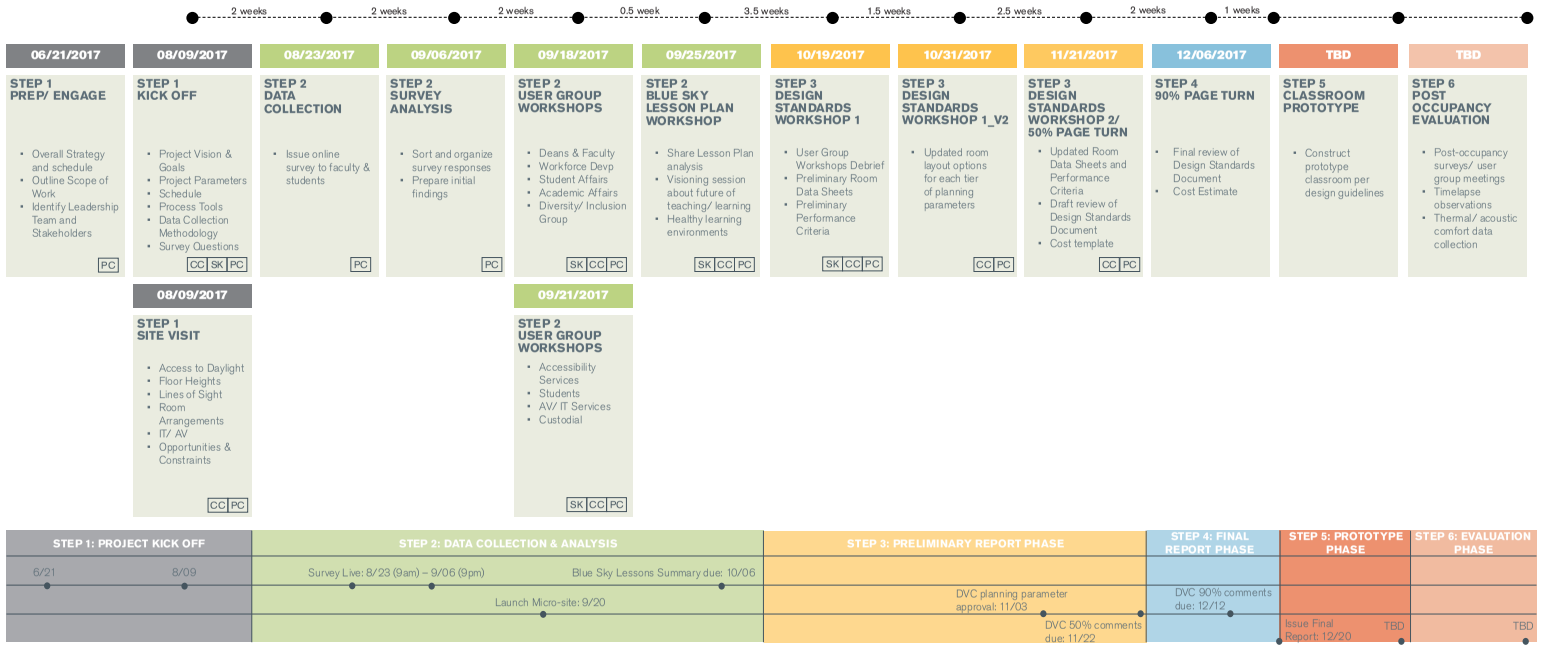
furniture systems that meet green standards; and selecting materials that have recycled content and are durable over time. These strategies will be augmented by the use of non-toxic markers, low-VOC paints and other certified material applications that are congruent with the campus's commitment to green buildings and environmental stewardship.

1.4 SCHEDULE

A project-specific road map outlining the different steps within the process was developed as a working tool to ensure timely completion of the project.

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

CLASSROOM DESIGN STANDARDS ROADMAP



CC CORE COMMITTEE

Rachel Westlake, VP, Instruction
Obed Vazquez, Dean, Engineering/ Social Science
Despina Papavessi, Dean, Math/ CS/ Business
Mike Holtzclaw, Senior Dean, San Ramon Campus
Kim Schenk, Senior Dean Curriculum Rick Robison, Dean, Library, Educational Technology and Learning Support
Toni Fannin, Interim Dean, AFA
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PC PLANNING COMMITTEE

Ines Zildzic, Associate CFP
Rachel Westlake, Vice President of Instruction
Mitch Fine, WRNS
Lilian Asperin, WRNS
Praima Gupta Garg, WRNS

Governance/ Council Meetings TBC

WRNSSTUDIO

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02
SURVEY ANALYSIS

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OVERVIEW

As a key method for data collection, the surveys were designed to solicit information about the current state of the teaching and learning environments and desires for the future of these critical spaces on campus. Three groups of respondents (students, faculty and staff) were invited to participate via campus-wide email outreach.

The survey period lasted two weeks from August 23rd to September 6th, 2017. Responses were collected online through SurveyMonkey*. Gathered responses were used to inform the spatial, functional and operational layouts of each size (Small, Medium and Large) of general-use classrooms.

In total, the survey garnered 1,044 responses. Below are statistics for each group:

Students: 779 respondents
Faculty: 223 respondents
Staff: 42 respondents

SURVEY QUESTIONS

To ensure consistency, a similar set of questions was developed for all respondent groups. The survey included the following areas of inquiry:

1. Identify your primary campus.
   - Pleasant Hill
   - San Ramon

2. For Students: How long have you attended DVC?
   - I am new to DVC (first semester)
   - 2-4 semesters
   - 4-6 semesters
   - 6+ semesters

   For Faculty: Identify your academic area.
   - Full-time
   - Adjunct

   For Staff: What type of unit do you belong to?
   - Instructional
   - Student Services
   - Maintenance & Operations
   - IT
   - Other

2A. For Faculty (only): Identify your academic area.
   - Addiction Studies
   - Administration of Justice
   - Anthropology
   - Architecture
   - Art History
   - Art/Photography
   - Biological Science
   - Business Administration
   - Communication Studies
   - Computer Information Systems
   - Computer Network Technology
   - Computer Science
   - Construction
   - Counseling
   - Culinary Arts
   - Dental Programs
   - Digital Media Studies
   - Drama
   - DSS – Special Education
   - Early Childhood Education
   - Economics/Political Science
   - Electrical/Electronics/Energy Systems
   - Engineering
   - Engineering Technology/Industrial Design
   - English/ESL
   - Foreign Language
   - Geography
   - Geology/Physical Science/Astronomy/Physics
   - Health Science/Nutrition
   - History
   - Horticulture
   - Humanities/Philosophy
   - Journalism
   - Kinesiology/Athletics/Dance
   - Library Tech
   - Mathematics
   - Music/Music Industry Studies
   - Psychology
   - Sociology/Social Sciences

3. Please score each of the following classroom attributes on a scale of 1 (not important to your classroom experience) to 5 (extremely important to your classroom experience).
   - Comfortable/ ergonomic furniture
   - Ability to rearrange and move furniture quickly and without much effort
   - Comfortable room temperature and/or ability to adjust temperature
   - Good acoustics and minimal sound from adjoining spaces
   - Ease of physical movement within the room
   - Ability to subdivide a space/create break-out spaces
   - Ability to control light levels and create different zones within the room
   - Availability of whiteboards or other writable surfaces on the walls
   - Availability of projection screens
   - Availability of multiple electrical outlets
   - Availability of technology that enables interaction between students and/or teacher
   - Having a clear line of sight throughout the room
   - Having access to natural light and views
   - Ability to contact IT, Media Services, evening services, or emergency services from within the room

** SurveyMonkey is an online survey development, cloud-based company that provides customizable surveys.*

4. Please score each of the following technology attributes within the classroom on a scale of 1 (not important) to 5 (extremely important) as it relates to your teaching/ learning experience.
    - Ability to record a lecture by video
    - Ability to use a document camera
    - Ability to digitally record content from writeable surfaces
    - Ability to present digital content and mark/edit it real-time
    - Ability for students to share their work wirelessly on any digital display within the room
    - Having dedicated monitors/ screens for group work, either fixed or movable
    - Having good microphones and speakers in the room
    - Having simple and standardized technology interfaces in all rooms
    - Having reliable and consistent Wi-Fi access

5. Please list three attributes of the classrooms you are currently using that ENHANCE your teaching/ learning experience.

6. Please list three attributes of the classrooms you are currently using that DISRUPT your teaching/ learning experience.

7. What additional considerations would you like the planning committee to keep in mind when thinking about the design and operation of future learning environments?

ANALYSIS METHODOLOGY

Because a primary intent of the survey was to elicit quantitative as well as qualitative information, analyzing the survey required a focused organization. While the first five questions provided responses that could be easily measured and sorted, the last three questions were open-ended and designed to encourage deeper and more elaborate responses. The responses for these questions were sorted into six categories in an effort to standardize the answers and gain key insights.

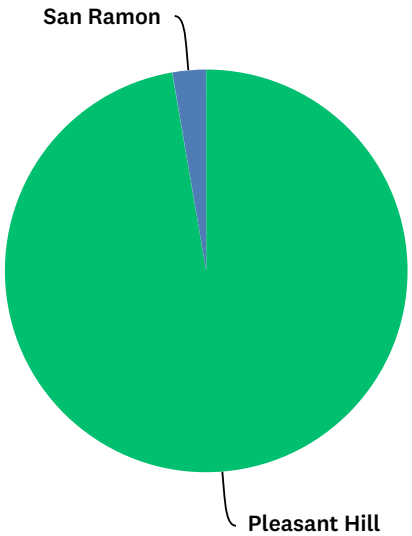
Some of the most elaborate and informative responses were given to question 7 (additional considerations) and often resulted in classification into more than one category. These occurrences were repeatedly counted in multiple categories in an effort to maintain the richness of the comprehensive responses.

The six categories were:

- **Environmental:** Attributes that relate to human comfort like color, natural and artificial lighting, air quality, room temperature, acoustics and lighting/temperature control systems.
- **Equipment:** Attributes that relate to non-technology-enabled equipment such as writable wall surfaces, ergonomic, moveable & accessible furniture and wall clocks.
- **Instructional/Learning:** Non-tangible attributes that relate to teaching methodology and learning outcomes such as faculty/student interaction, smaller class sizes that enhance student engagement.
- **Maintenance:** Attributes that relate to satisfactory facility upkeep such as cleanliness and theft prevention.
- **Room Arrangement:** Attributes that relate to spatial organization such as flexibility of furniture, line of sight, accessibility/ movement within the room and room safety measures.
- **Technology:** Attributes that relate to technology-enabled equipment such as projectors and smart boards, smart podium/ instructor stations, microphones and sound systems, electrical outlets, document camera, wireless internet, computer software and faculty training.

STUDENT RESPONSES

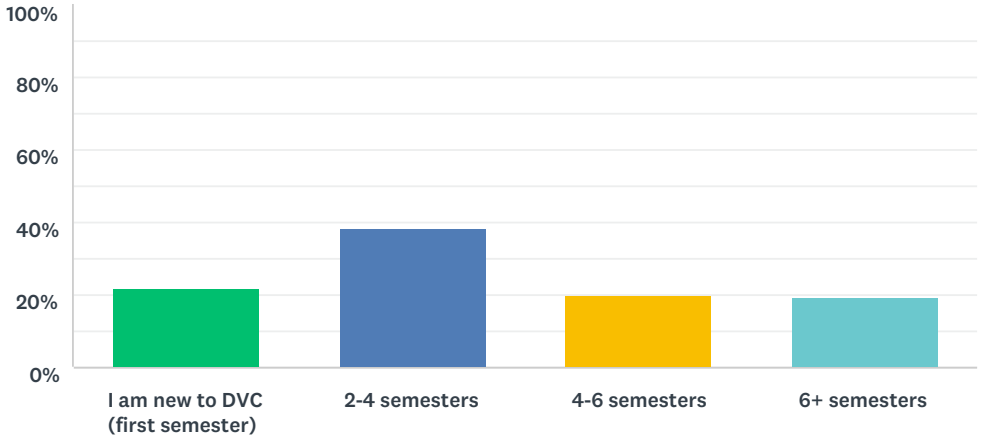
1. IDENTIFY YOUR **PRIMARY CAMPUS**



**The Pleasant Hill campus is significantly larger in population than the San Ramon campus, therefore, the number of responses are proportionately balanced between the two campuses.*

ANSWER CHOICES	RESPONSES	
Pleasant Hill	97.31%	759
San Ramon	2.69%	21
TOTAL		780

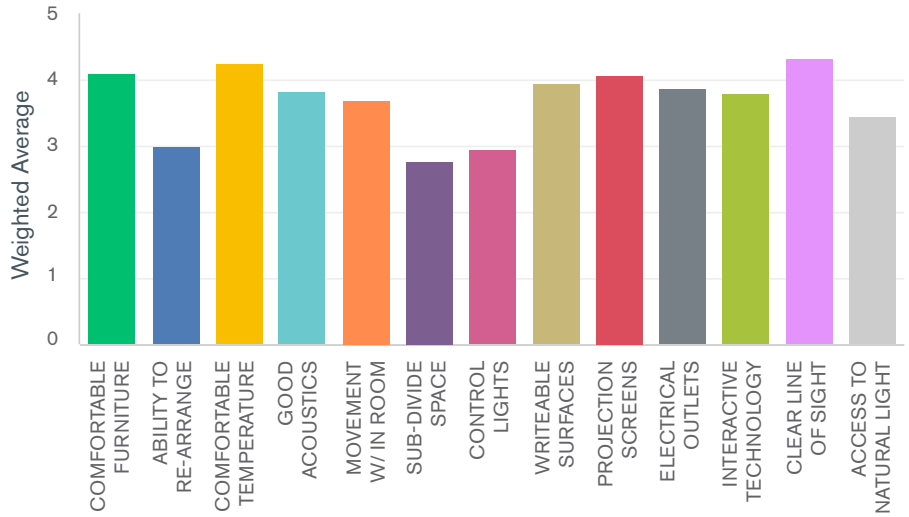
2. HOW LONG HAVE YOU **ATTENDED DVC**?



ANSWER CHOICES	RESPONSES	
I am new to DVC (first semester)	22.18%	173
2-4 semesters	38.46%	300
4-6 semesters	20.00%	156
6+ semesters	19.36%	151
TOTAL		780

STUDENT RESPONSES

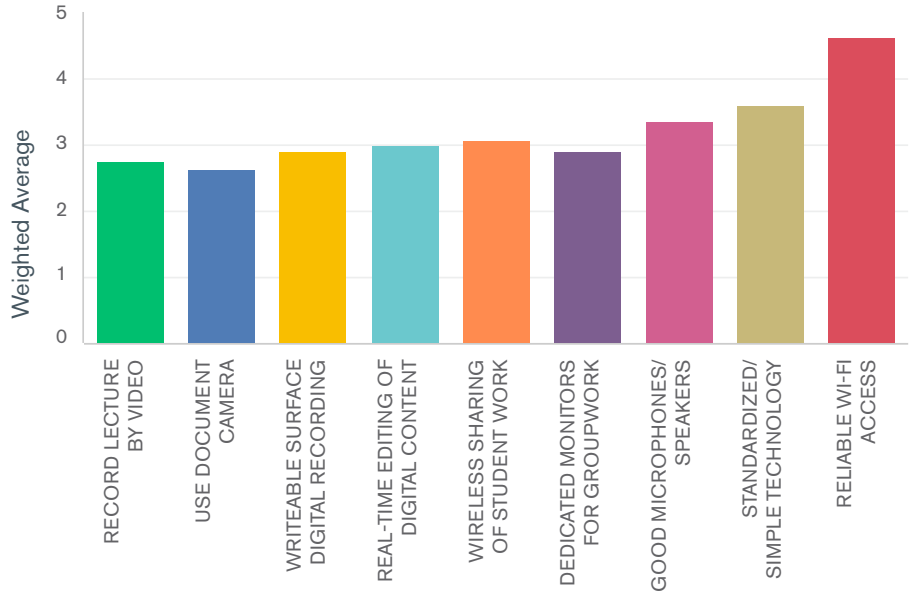
3. SCORE **CLASSROOM ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO YOUR LEARNING EXPERIENCE.



	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Comfortable/ ergonomic furniture	0.90% 7	6.15% 48	19.23% 150	30.26% 236	43.46% 339	780	4.09
Ability to rearrange and move furniture quickly and without much effort	12.69% 99	25.00% 195	29.49% 230	16.54% 129	16.28% 127	780	2.99
Comfortable room temperature and/or ability to adjust temperature	0.77% 6	4.23% 33	13.72% 107	31.41% 245	49.87% 389	780	4.25
Good acoustics and minimal sound from adjoining spaces	2.05% 16	9.62% 75	24.49% 191	30.51% 238	33.33% 260	780	3.83
Ease of physical movement within the room	1.92% 15	11.92% 93	28.59% 223	30.51% 238	27.05% 211	780	3.69
Ability to subdivide a space/create break-out spaces	18.08% 141	27.18% 212	26.03% 203	15.64% 122	13.08% 102	780	2.78
Ability to control light levels and create different zones within the room	15.13% 118	25.38% 198	23.97% 187	19.74% 154	15.77% 123	780	2.96
Availability of whiteboards or other writable surfaces on the walls	1.92% 15	9.36% 73	20.26% 158	27.82% 217	40.64% 317	780	3.96
Availability of projection screens	1.03% 8	6.54% 51	17.95% 140	32.44% 253	42.05% 328	780	4.08
Availability of multiple electrical outlets	3.59% 28	11.41% 89	18.21% 142	26.79% 209	40.00% 312	780	3.88
Availability of technology that enables interaction between students and/or teacher	4.36% 34	11.67% 91	21.54% 168	25.00% 195	37.44% 292	780	3.79
Having a clear line of sight throughout the room	0.90% 7	4.74% 37	13.21% 103	23.46% 183	57.69% 450	780	4.32
Having access to daylight and views	8.08% 63	18.72% 146	23.46% 183	19.36% 151	30.38% 237	780	3.45

STUDENT RESPONSES

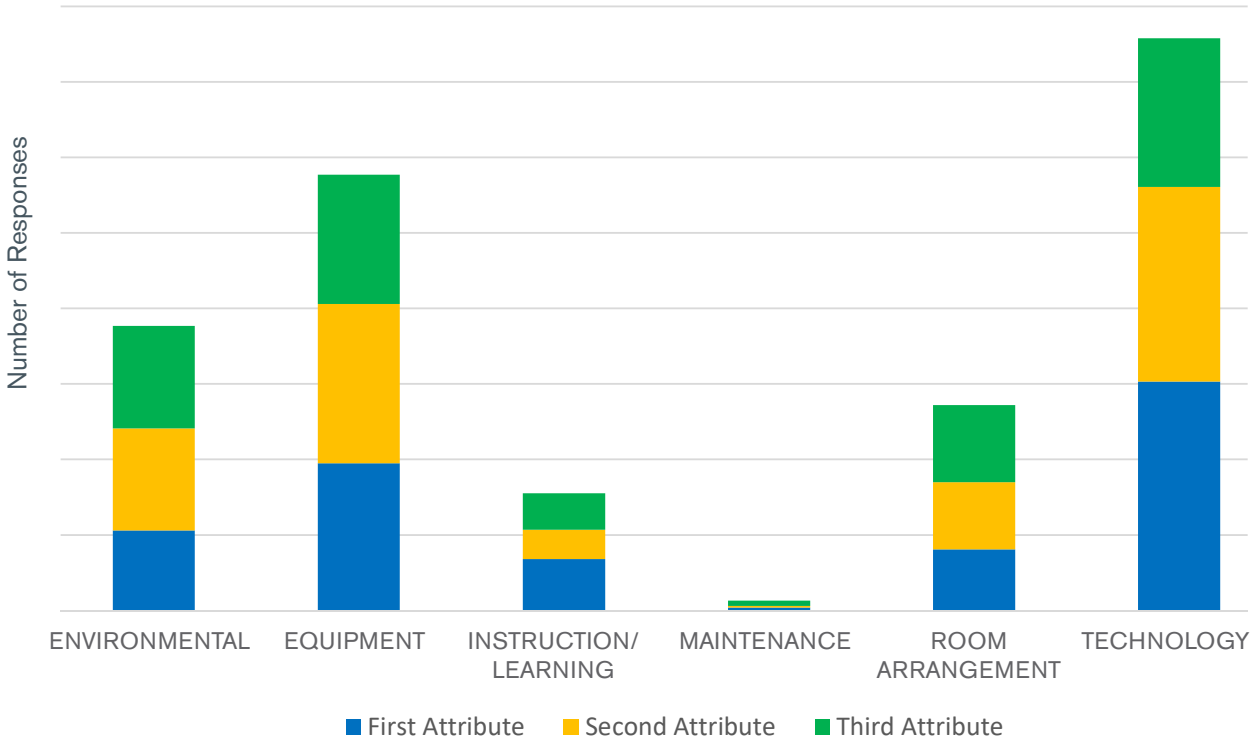
4. SCORE **TECHNOLOGY ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO YOUR LEARNING EXPERIENCE.



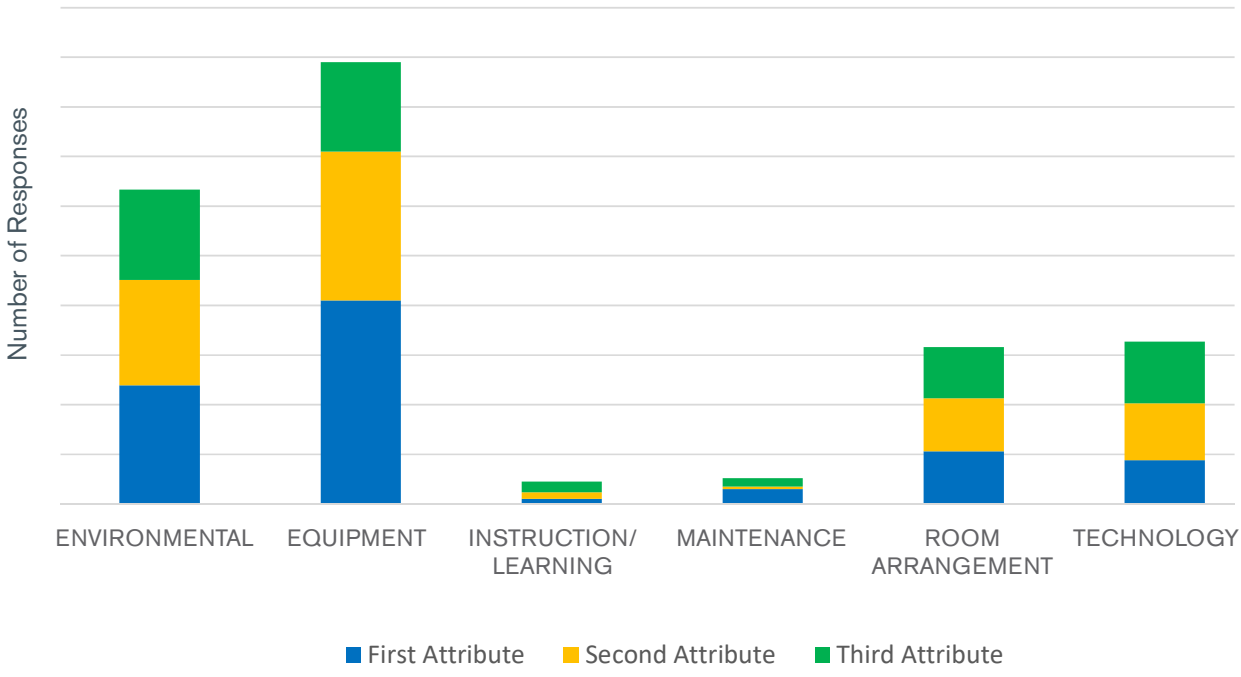
	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Ability to record a lecture by video	22.05% 172	24.23% 189	24.62% 192	13.85% 108	15.26% 119	780	2.76
Ability to use a document camera	24.10% 188	26.28% 205	25.13% 196	12.95% 101	11.54% 90	780	2.62
Ability to digitally record content from writeable surfaces	18.85% 147	21.28% 166	27.31% 213	16.92% 132	15.64% 122	780	2.89
Ability to present digital content and mark/edit it real-time	13.59% 106	23.97% 187	27.95% 218	16.79% 131	17.69% 138	780	3.01
Ability for students to share their work wirelessly on any digital display within the room	13.59% 106	21.28% 166	27.95% 218	17.69% 138	19.49% 152	780	3.08
Having dedicated monitors/ screens for group work, either fixed or movable	15.26% 119	25.26% 197	28.33% 221	15.64% 122	15.51% 121	780	2.91
Having good microphones and speakers in the room	10.13% 79	15.64% 122	27.18% 212	24.10% 188	22.95% 179	780	3.34
Having simple and standardized technology interfaces in all rooms	5.38% 42	12.18% 95	29.49% 230	23.46% 183	29.49% 230	780	3.59
Having reliable and consistent Wi-Fi access	1.15% 9	2.69% 21	5.51% 43	13.59% 106	77.05% 601	780	4.63

STUDENT RESPONSES

5. LIST THREE ATTRIBUTES THAT **ENHANCE** YOUR LEARNING EXPERIENCE.

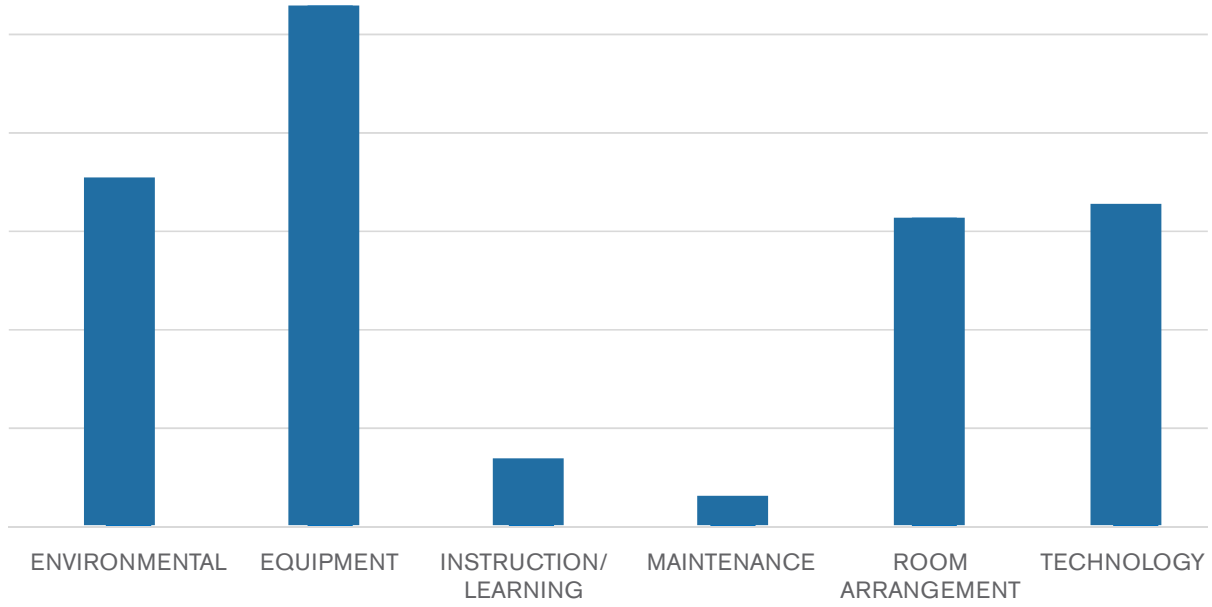


6. LIST THREE ATTRIBUTES THAT **DISRUPT** YOUR LEARNING EXPERIENCE.



STUDENT RESPONSES

7. **ADDITIONAL CONSIDERATIONS** ABOUT THE DESIGN AND OPERATION OF FUTURE LEARNING ENVIRONMENTS?



STUDENT RESPONSES

Analysis

Between the two campuses, the majority of the student responses were from the Pleasant Hill campus and most of the respondents had attended DVC for 2-4 semesters.

For question 3, most of the student respondents found all the classroom attributes as being important, very important or extremely important. The attributes that yielded the highest positive responses included:

- Having a clear line of sight throughout the room
- Comfortable room temperature
- Comfortable furniture
- Projection screens

Following these attributes, the next tier of positive responses included:

- Having good acoustics
- Movement within the room
- Interactive technology
- Writeable surfaces
- Access to electrical outlets

For question 4, there was clearly one technology attribute with the highest responses - reliable wi-fi access. Simple/ standardized technology and good microphones/ speakers were in the second tier of importance within this category.

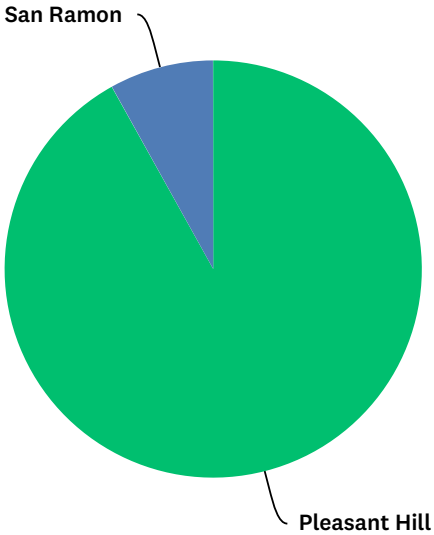
For question 5 (attributes that enhance), the majority of student responses profiled as two categories: Technology and Equipment. Within these, Technology stands out as the outlier, highlighting its positive effect on student learning. The ability to access wi-fi (when available) and work on their own devices as well as the ability to share digital content through projectors (by faculty and students) benefits their learning experience in the classroom. Following this, the students ranked the Equipment category next highest, thereby underlining that furniture and writeable surfaces are also key to their learning environment. The Environmental category was next in priority highlighting that comfortable temperature, good lighting and acoustics in some existing classrooms enhanced their learning. This was followed by the Room Arrangement category displaying that improved flexibility in the current classroom arrangements could augment their learning. The last category with few responses was Instruction/ Learning which emphasized on smaller class sizes as being more effective learning environments.

For question 6 (attributes that disrupt), the majority of student responses highlighted on the two categories: Equipment and Environmental. Unlike question 5, the Equipment category was the most important for students and was attributed to the outdated and poorly functioning instructional toolkits found in the current classrooms. Comfortable/ ergonomic, accessible and movable furniture that provides ample desk space for their materials (laptop, books, notepads etc.) as well as flexibility of movement within the room and large writeable surfaces like whiteboards/ writeable walls are key to their learning experience. The Environmental category ranked second highest by the students signifying that comfort (thermal, light, acoustic, views etc.) is imperative for them to stay focused in the learning environment. Room Arrangement and Technology followed third as disrupting causes with the lack of clear sight lines and insufficient wi-fi connectivity as the key factors compromising their learning.

For question 7, the student responses focused on tangible elements that they value as important in the future learning environments. Their responses were dispersed among four key categories: Environmental, Equipment, Room Arrangement and Technology. Of these, Environmental and Equipment stood out to be the fundamental elements that every future classroom should have according to the students. The need for welcoming and comfortable, non-distracting surroundings that would help them concentrate was noted. Students declared that their attention during instructional activities was enhanced by daylight, fresh air and comfortable room temperatures. Similar to the response to question 6, in terms of Equipment, students expressed a preference for flexible ergonomic furniture that fits ‘all sizes’. Not having enough workspace and circulation space between the desks disrupts their learning. Following this, Technology ranked similar to Room Arrangement confirming that updates to the classroom technology (audio-visual systems, wi-fi, interactive digital media etc) are as important as flexible classroom layouts contributing to better learning environments characterized by collaboration.

FACULTY RESPONSES

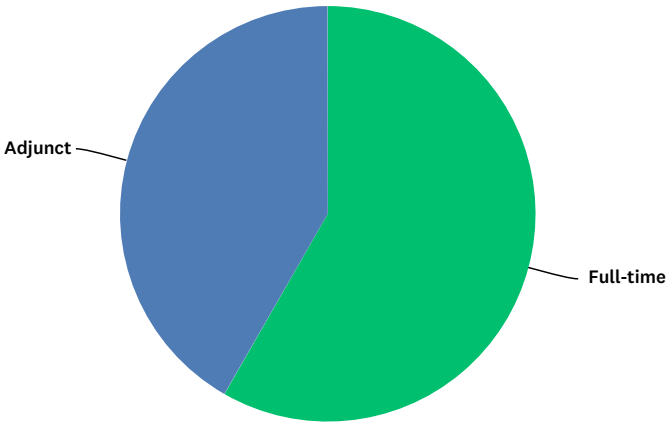
1. IDENTIFY YOUR **PRIMARY CAMPUS**



**The Pleasant Hill campus is significantly larger in population than the San Ramon campus, therefore, the number of responses are proportionately balanced between the two campuses.*

ANSWER CHOICES	RESPONSES	
Pleasant Hill	91.93%	205
San Ramon	8.07%	18
TOTAL		223

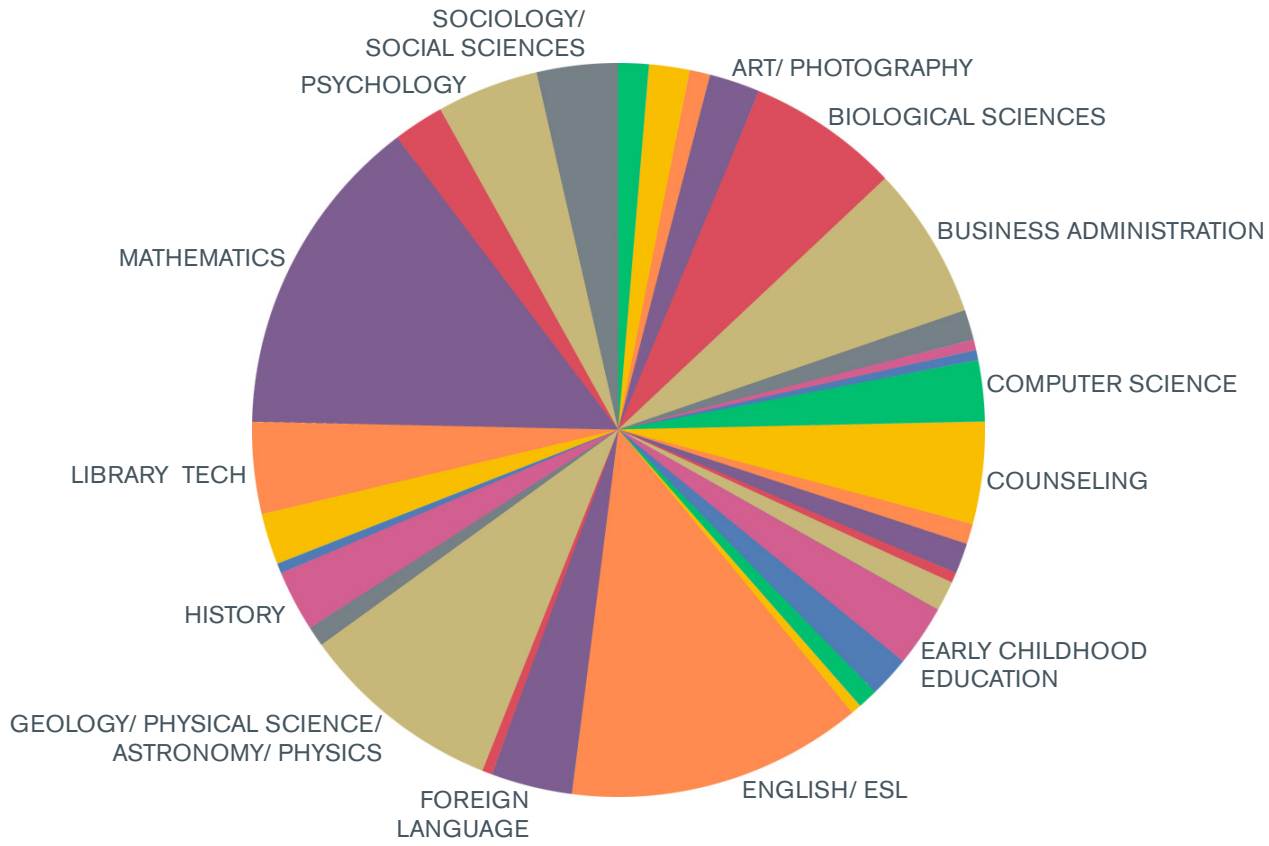
2. IDENTIFY YOUR **FACULTY POSITION.**



ANSWER CHOICES	RESPONSES	
Full-time	58.30%	130
Adjunct	41.70%	93
TOTAL		223

FACULTY RESPONSES

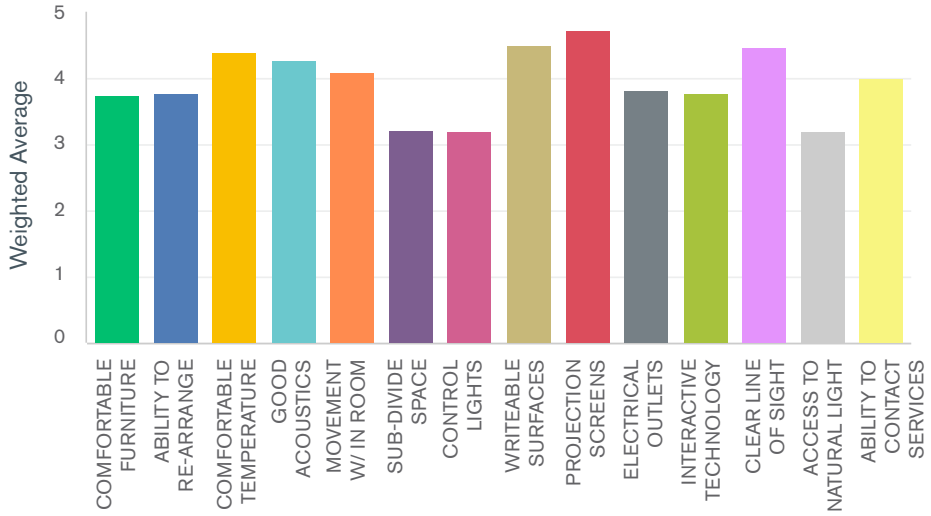
2A. IDENTIFY YOUR **ACADEMIC AREA.**



ANSWER CHOICES	RESPONSES	
Addiction Studies	0.00%	0
Administration of Justice	1.35%	3
Anthropology	0.00%	0
Architecture	1.79%	4
Art History	0.90%	2
Art/Photography	2.24%	5
Biological Science	6.73%	15
Business Administration	6.73%	15
Communication Studies	1.35%	3
Computer Information Systems	0.45%	1
Computer Network Technology	0.45%	1
Computer Science	2.69%	6
Construction	0.00%	0
Counseling	4.48%	10
Culinary Arts	0.90%	2
Dental Programs	1.35%	3
Digital Media Studies	0.45%	1
Drama	1.35%	3
DSS – Special Education	0.00%	0
Early Childhood Education	2.69%	6
Economics/Political Science	1.79%	4
Electrical/Electronics/Energy Systems	0.90%	2
Engineering	0.00%	0
Engineering Technology/Industrial Design	0.45%	1
English/ESL	13.00%	29
Foreign Language	3.59%	8
Geography	0.45%	1
Geology/Physical Science/Astronomy/Physics	8.97%	20
Health Science/Nutrition	0.90%	2
History	2.69%	6
Horticulture	0.45%	1
Humanities/Philosophy	0.00%	0
Journalism	0.00%	0
Kinesiology/Athletics/Dance	2.24%	5
Library Tech	4.04%	9
Mathematics	14.35%	32
Music/Music Industry Studies	2.24%	5
Psychology	4.48%	10
Sociology/Social Sciences	3.59%	8
TOTAL		223

FACULTY RESPONSES

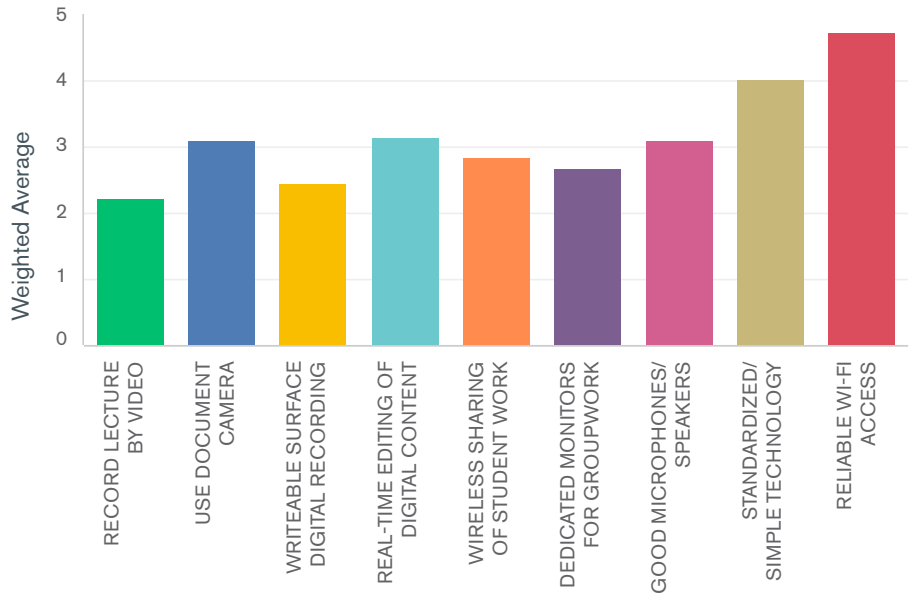
3. SCORE **CLASSROOM ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO YOUR TEACHING EXPERIENCE.



	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Comfortable/ ergonomic furniture	1.79% 4	12.11% 27	24.66% 55	31.39% 70	30.04% 67	223	3.76
Ability to rearrange and move furniture quickly and without much effort	6.73% 15	11.66% 26	16.59% 37	26.46% 59	38.57% 86	223	3.78
Comfortable room temperature and/or ability to adjust temperature	0.45% 1	1.79% 4	9.42% 21	35.43% 79	52.91% 118	223	4.39
Good acoustics and minimal sound from adjoining spaces	0.90% 2	4.04% 9	14.80% 33	27.80% 62	52.47% 117	223	4.27
Ease of physical movement within the room	0.45% 1	4.48% 10	19.73% 44	34.53% 77	40.81% 91	223	4.11
Ability to subdivide a space/create break-out spaces	13.90% 31	21.97% 49	16.59% 37	23.32% 52	24.22% 54	223	3.22
Ability to control light levels and create different zones within the room	11.21% 25	23.32% 52	21.08% 47	21.97% 49	22.42% 50	223	3.21
Availability of whiteboards or other writable surfaces on the walls	0.45% 1	2.69% 6	9.42% 21	20.63% 46	66.82% 149	223	4.51
Availability of projection screens	1.35% 3	1.35% 3	3.59% 8	11.21% 25	82.51% 184	223	4.72
Availability of multiple electrical outlets	6.28% 14	11.66% 26	16.59% 37	24.66% 55	40.81% 91	223	3.82
Availability of technology that enables interaction between students and/or teacher	8.07% 18	12.11% 27	13.90% 31	25.56% 57	40.36% 90	223	3.78
Having a clear line of sight throughout the room	0.00% 0	2.24% 5	7.62% 17	30.04% 67	60.09% 134	223	4.48
Having access to daylight and views	11.21% 25	19.73% 44	26.46% 59	24.22% 54	18.39% 41	223	3.19
Ability to contact IT, Media Services, evening services, or emergency services from within the room	4.93% 11	8.97% 20	16.59% 37	21.08% 47	48.43% 108	223	3.99

FACULTY RESPONSES

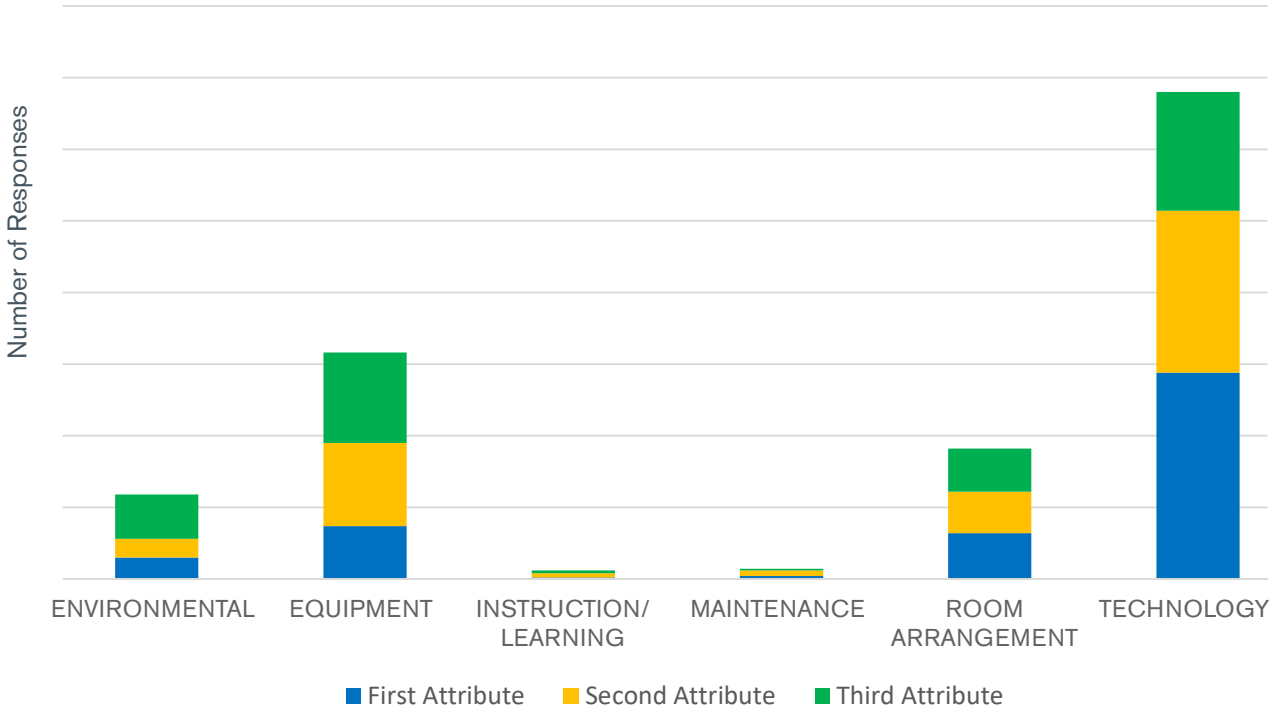
4. SCORE **TECHNOLOGY ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO YOUR TEACHING EXPERIENCE.



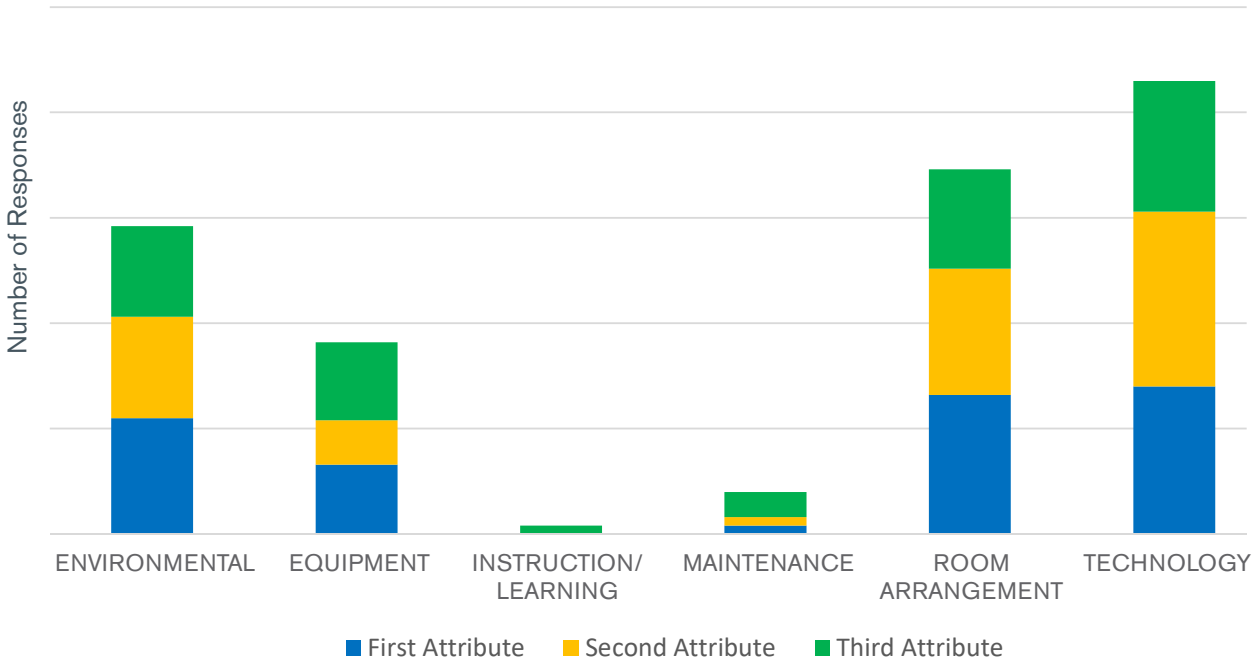
	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Ability to record a lecture by video	35.43% 79	29.60% 66	19.73% 44	7.17% 16	8.07% 18	223	2.23
Ability to use a document camera	20.63% 46	17.94% 40	21.97% 49	11.21% 25	28.25% 63	223	3.09
Ability to digitally record content from writeable surfaces	26.91% 60	30.94% 69	22.87% 51	8.07% 18	11.21% 25	223	2.46
Ability to present digital content and mark/edit it real-time	17.04% 38	17.94% 40	22.42% 50	19.28% 43	23.32% 52	223	3.14
Ability for students to share their work wirelessly on any digital display within the room	20.18% 45	23.77% 53	21.97% 49	20.18% 45	13.90% 31	223	2.84
Having dedicated monitors/ screens for group work, either fixed or movable	27.35% 61	22.42% 50	20.63% 46	15.25% 34	14.35% 32	223	2.67
Having good microphones and speakers in the room	19.28% 43	12.56% 28	26.01% 58	22.42% 50	19.73% 44	223	3.11
Having simple and standardized technology interfaces in all rooms	5.38% 12	7.62% 17	14.35% 32	25.11% 56	47.53% 106	223	4.02
Having reliable and consistent Wi-Fi access	1.79% 4	0.90% 2	4.48% 10	8.97% 20	83.86% 187	223	4.72

FACULTY RESPONSES

5. LIST THREE ATTRIBUTES THAT **ENHANCE** YOUR TEACHING EXPERIENCE.

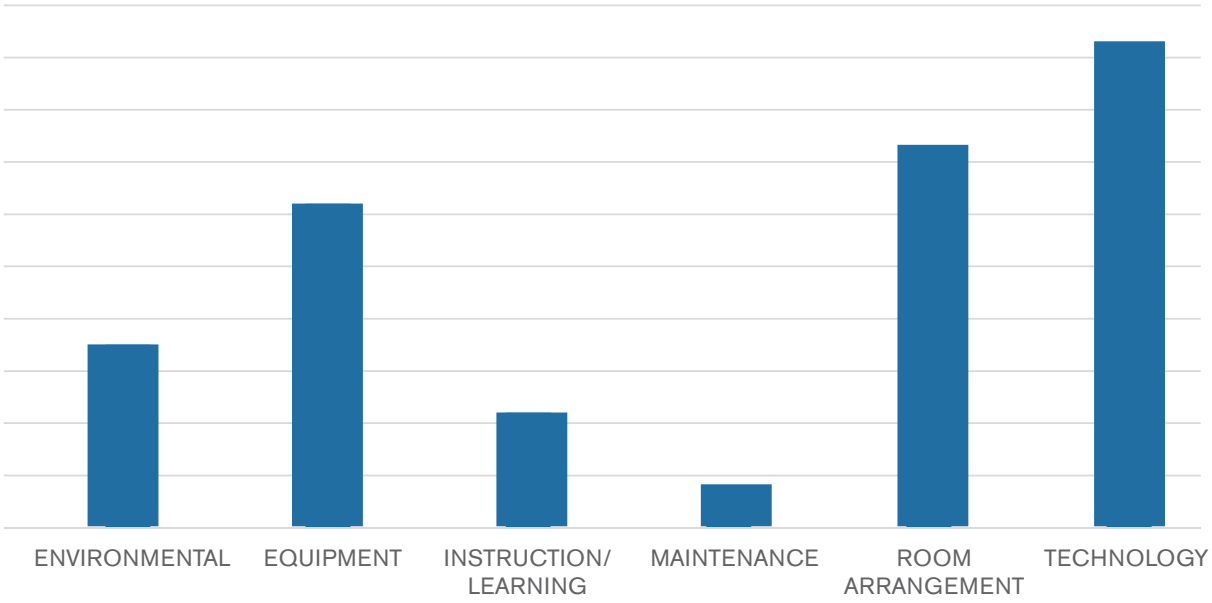


6. LIST THREE ATTRIBUTES THAT **DISRUPT** YOUR TEACHING EXPERIENCE.



FACULTY RESPONSES

7. **ADDITIONAL CONSIDERATIONS** ABOUT THE DESIGN AND OPERATION OF FUTURE LEARNING ENVIRONMENTS?



FACULTY RESPONSES

Analysis

Between the two campuses, the majority of the faculty responses were also from the Pleasant Hill campus with approximately 58% full-time and 42% adjunct faculty members.

For question 2A, the academic departments with the highest faculty responses included Mathematics and English, followed by Geology/ Physical Science/ Astronomy/ Physics, Biological Science and Business Administration.

For question 3, similar to the students, most of the faculty respondents found all the classroom attributes as being important, very important or extremely important. The attributes that yielded the highest positive responses included:

- Having a clear line of sight throughout the room
- Comfortable room temperature
- Writeable surfaces
- Projection screens

Following these attributes, the next tier of positive responses included:

- Having good acoustics
- Movement within the room
- Ability to contact IT services

For question 4, reliable wi-fi access was clearly the technology attribute with the highest faculty responses followed by simple/ standardized technology. It emphasizes the need for upgrading the campus data infrastructure to accommodate the growing use of wireless interfaces in current and future teaching methodologies.

For question 5 (attributes that enhance), Technology stands out as the outlier with the highest number of responses and its positive effect for instruction is evident. Use of the smart podiums and projectors aids the dispersion of knowledge and helps students follow coursework in class. The category of Equipment was ranked second by the faculty which shows that although technology is important in classrooms, writable surfaces and other demonstration equipment are important tools for teaching. Room Arrangement and Environmental concerns averaged similar after Technology and Equipment, thus highlighting the significance of comfort and collaboration in the teaching environment. There were negligible responses for the Instruction/Learning and Maintenance category.

For question 6 (attributes that disrupt), the majority of faculty responses focused on the four categories: Environmental, Equipment, Room Arrangement, and Technology. The outliers in this question were Technology and Room Arrangement, emphasizing that the need for reliable/ standardized technology and collaborative teaching environments. Environmental concerns were ranked next highlighting that natural daylight, improved acoustics and provision of mechanical/ lighting control systems can considerably improve the current classrooms. With, Equipment ranked the lowest of the four attributes, the faculty noted that lack of adequate writeable surfaces and flexible/ movable furniture limited their ability to teach effectively.

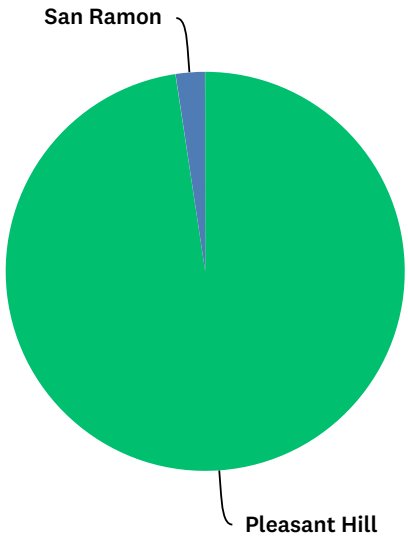
For question 7, the faculty responses were enriching even though they seem similar to question 6 as the faculty were able to share their candid feelings/ un-filtered experience. Technology was mentioned the most frequently as the current systems are outdated and unreliable. In the rooms with the smart podiums, it was mentioned that the bulky design sets an authoritative tone in the classroom which biases towards the instructor and inhibits student sight lines. The limited work area also provides no space for the instructor's course materials/ handouts. These limitations, combined with the inability to freely connect to wi-fi during class which restricts faculty-student interaction/ group share capabilities through interactive media, need to be resolved in future learning environments on campus.

Many faculty members also addressed the need for learning environments that allow faculty to employ a variety of teaching methods, including teacher-directed lectures, formal and informal group discussions, peer-to-peer learning, teacher-student engagement and hands-on skill building. They also stressed the need to have projectors and writeable surfaces located in the room so they are accessible at the same time, unlike the current classroom layouts where the projector screen blocks a large part of the white boards when in use. Thus, Room Arrangement follows as the second focus category for this question.

Equipment was ranked next as the need for writeable surfaces and moveable furniture would help faculty teach better. The Environmental concerns were next in importance followed by Instruction/ Learning. Faculty emphasized the need for upgraded technology to facilitate hybrid/on-line classes as well as provide flexibility to innovate new teaching methodologies that are not dictated by 'the projector' implying more of a 'lecture' mode. All of these unique answers are crucial to the Classroom Design Standards as they identify the ways in which faculty are responding to changes in the educational paradigm.

STAFF RESPONSES

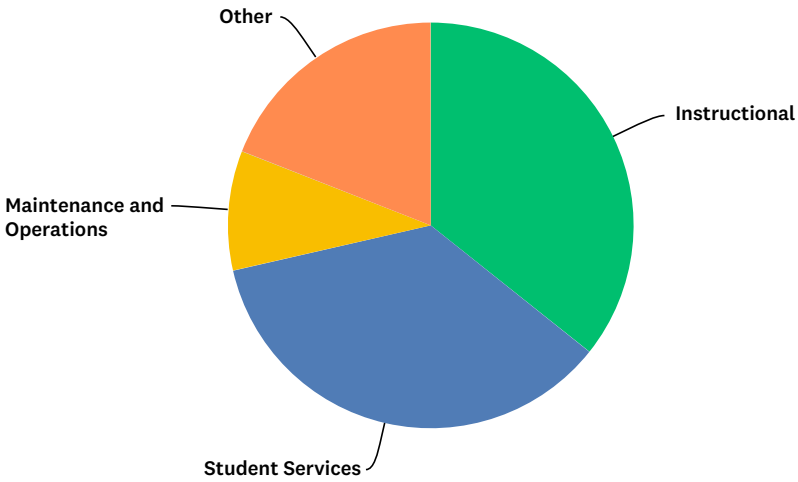
1. IDENTIFY YOUR **PRIMARY CAMPUS**



**The Pleasant Hill campus is significantly larger in population than the San Ramon campus, therefore, the number of responses are proportionately balanced between the two campuses.*

ANSWER CHOICES	RESPONSES	
Pleasant Hill	97.62%	41
San Ramon	2.38%	1
TOTAL		42

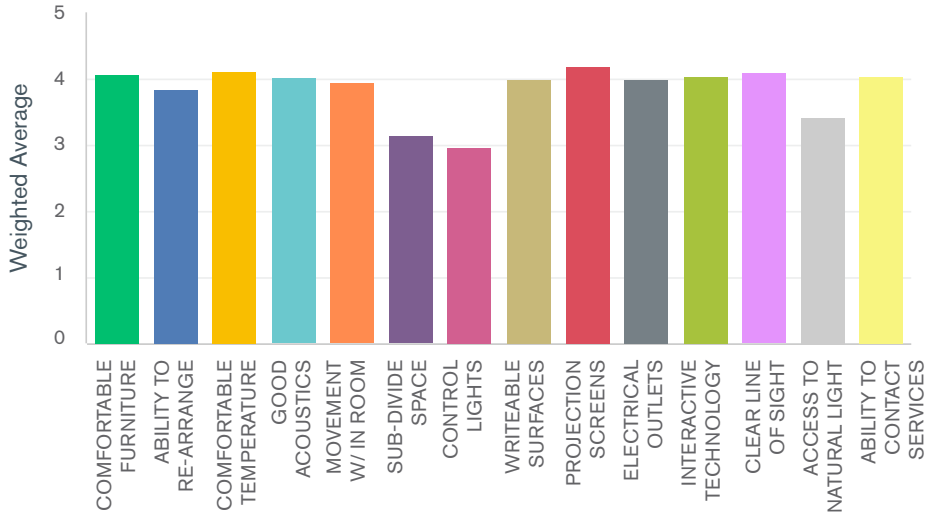
2. WHAT TYPE OF **UNIT** DO YOU BELONG TO?



ANSWER CHOICES	RESPONSES	
Instructional	35.71%	15
Student Services	35.71%	15
Maintenance and Operations	9.52%	4
IT	0.00%	0
Other	19.05%	8

STAFF RESPONSES

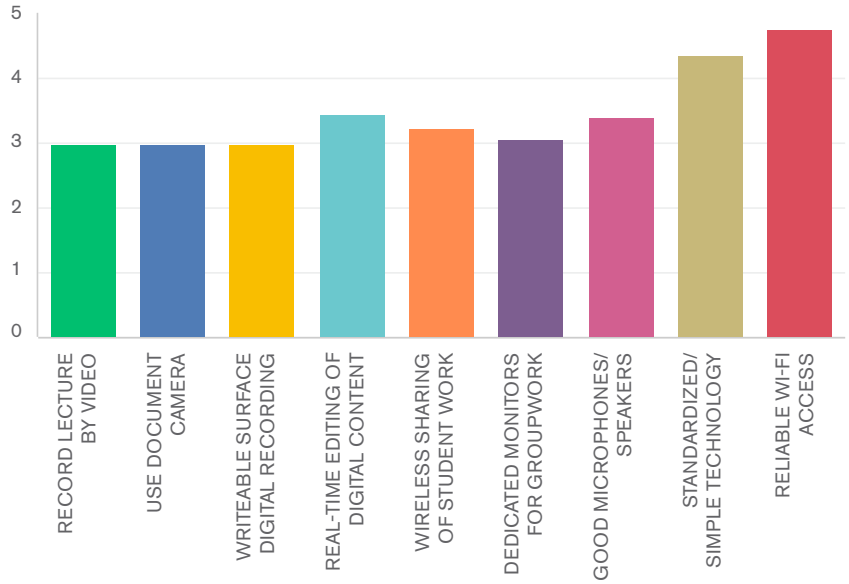
3. SCORE **CLASSROOM ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO THE TEACHING/ LEARNING EXPERIENCE.



	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Comfortable/ ergonomic furniture	0.00% 0	11.90% 5	16.67% 7	23.81% 10	47.62% 20	42	4.07
Ability to rearrange and move furniture quickly and without much effort	0.00% 0	11.90% 5	28.57% 12	21.43% 9	38.10% 16	42	3.86
Comfortable room temperature and/or ability to adjust temperature	2.38% 1	2.38% 1	21.43% 9	28.57% 12	45.24% 19	42	4.12
Good acoustics and minimal sound from adjoining spaces	0.00% 0	4.76% 2	23.81% 10	35.71% 15	35.71% 15	42	4.02
Ease of physical movement within the room	0.00% 0	7.14% 3	26.19% 11	30.95% 13	35.71% 15	42	3.95
Ability to subdivide a space/create break-out spaces	9.52% 4	19.05% 8	33.33% 14	23.81% 10	14.29% 6	42	3.14
Ability to control light levels and create different zones within the room	9.52% 4	26.19% 11	30.95% 13	23.81% 10	9.52% 4	42	2.98
Availability of whiteboards or other writable surfaces on the walls	0.00% 0	9.52% 4	14.29% 6	42.86% 18	33.33% 14	42	4.00
Availability of projection screens	0.00% 0	2.38% 1	16.67% 7	40.48% 17	40.48% 17	42	4.19
Availability of multiple electrical outlets	0.00% 0	12.20% 5	12.20% 5	39.02% 16	36.59% 15	41	4.00
Availability of technology that enables interaction between students and/or teacher	0.00% 0	4.76% 2	23.81% 10	33.33% 14	38.10% 16	42	4.05
Having a clear line of sight throughout the room	0.00% 0	7.14% 3	16.67% 7	35.71% 15	40.48% 17	42	4.10
Having access to daylight and views	11.90% 5	9.52% 4	30.95% 13	19.05% 8	28.57% 12	42	3.43
Ability to contact IT, Media Services, evening services, or emergency services from within the classroom	4.76% 2	11.90% 5	14.29% 6	11.90% 5	57.14% 24	42	4.05

STAFF RESPONSES

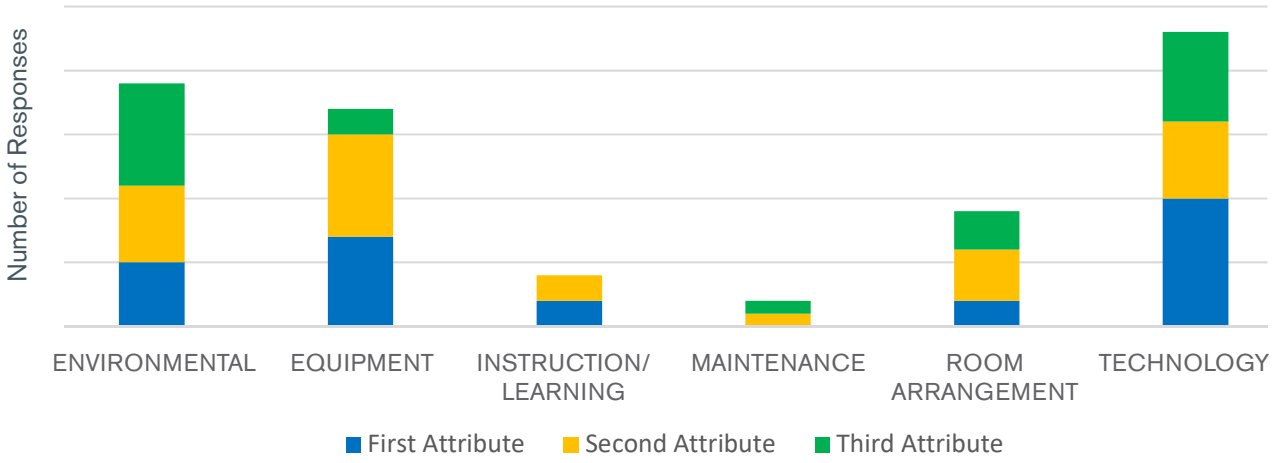
4. SCORE **TECHNOLOGY ATTRIBUTES** ON A SCALE OF 1 (NOT IMPORTANT) TO 5 (EXTREMELY IMPORTANT) AS IT RELATES TO THE TEACHING/ LEARNING EXPERIENCE.



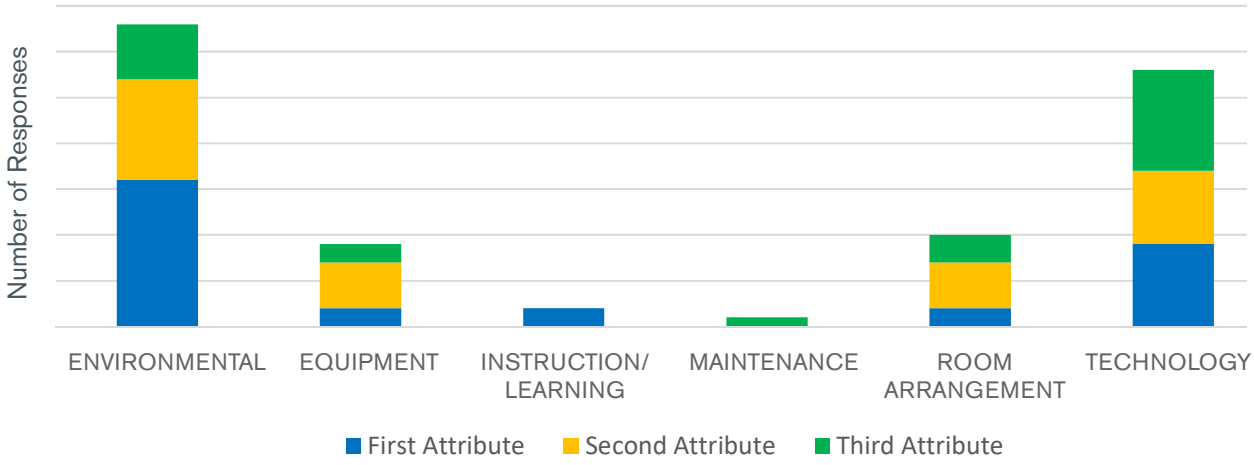
	1. NOT IMPORTANT	2. SOMEWHAT IMPORTANT	3. IMPORTANT	4. VERY IMPORTANT	5. EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Ability to record a lecture by video	5.00% 2	35.00% 14	30.00% 12	17.50% 7	12.50% 5	40	2.98
Ability to use a document camera	2.50% 1	30.00% 12	40.00% 16	22.50% 9	5.00% 2	40	2.98
Ability to digitally record content from writeable surfaces	7.32% 3	31.71% 13	29.27% 12	19.51% 8	12.20% 5	41	2.98
Ability to present digital content and mark/edit it real-time	0.00% 0	21.95% 9	26.83% 11	34.15% 14	17.07% 7	41	3.46
Ability for students to share their work wirelessly on any digital display within the room	2.44% 1	24.39% 10	31.71% 13	31.71% 13	9.76% 4	41	3.22
Having dedicated monitors/ screens for group work, either fixed or movable	0.00% 0	39.02% 16	26.83% 11	24.39% 10	9.76% 4	41	3.05
Having good microphones and speakers in the room	0.00% 0	21.95% 9	31.71% 13	29.27% 12	17.07% 7	41	3.41
Having simple and standardized technology interfaces in all rooms	0.00% 0	7.32% 3	7.32% 3	29.27% 12	56.10% 23	41	4.34
Having reliable and consistent Wi-Fi access	0.00% 0	0.00% 0	4.76% 2	14.29% 6	80.95% 34	42	4.76

STAFF RESPONSES

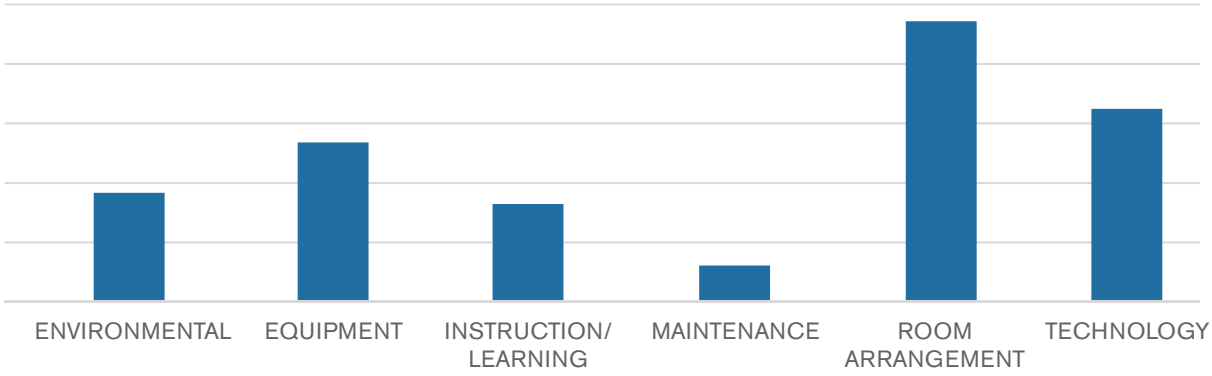
5. LIST THREE ATTRIBUTES THAT **ENHANCE** THE LEARNING/ TEACHING EXPERIENCE.



6. LIST THREE ATTRIBUTES THAT **DISRUPT** THE LEARNING/ TEACHING EXPERIENCE.



7. **ADDITIONAL CONSIDERATIONS** ABOUT THE DESIGN AND OPERATION OF FUTURE LEARNING ENVIRONMENTS?



STAFF RESPONSES

Analysis

Between the two campuses, the majority of the staff responses were also from the Pleasant Hill campus with most input from the Instructional and Student Services units.

For question 3, similar to the students and faculty, most of the staff respondents found all the classroom attributes as being important, very important or extremely important. The attributes that yielded the highest positive responses included:

- Having a clear line of sight throughout the room
- Comfortable room temperature
- Projection screens

For question 4, similar to the students and faculty, reliable wi-fi access was the technology attribute with the highest staff responses followed by simple/ standardized technology.

For question 5 (attributes that enhance), the categories with the highest responses were: Technology, Environmental and Equipment. While Technology was slightly higher than the other two categories, it highlights that all three are critical to the learning environments. Projection screens, good wi-fi, writable surfaces, good acoustics/ daylight, and comfortable furniture are all essential.

For question 6 (attributes that disrupt), the majority of staff responses focused on the two categories: Environmental and Technology. The Environmental category was clearly the outlier emphasizing the need to upgrade the classroom infrastructure for adequate thermal comfort, proper acoustics, access to daylight, and an overall welcoming environment.

For question 7, Room Arrangement was the category with the highest staff responses as they felt that collaboration and group work were limited in the current classrooms due to the existing furniture and equipment. Having adequate space to move around in the room and facilitate interactions was necessary. It was also noted that flexible room arrangements helps the maintenance staff in their cleanliness operations as it is easy to move furniture around. Technology and Equipment were the next highly ranked categories.

CUMULATIVE SURVEY ANALYSIS

Patterns

The similar set of questions issued to all users generated congruent response patterns in some questions and some unique response patterns in others.

In question 3 (general classroom attributes), all respondents identified similar attributes of importance for teaching and learning: clear line of sight, comfortable temperature, comfortable furniture and projection screens.

In question 4 (classroom technology attributes), all respondents identified similar attributes of importance for teaching and learning: reliable wi-fi access and simple/ standardized technology.

In question 5 (enhancing attributes), all respondents identified Technology as the single most important attribute for teaching and learning, followed by Equipment. While the students and staff highlighted Environmental concerns next in line followed by Room Arrangement, the faculty had the opposite response.

In question 6 (disrupting attributes), all respondents had different priorities. For the students Equipment was the most important attribute, for the faculty it was Technology and for the staff it was Environmental. Apart from these, the faculty did note that Room Arrangement was also hindering their teaching.

Similar to question 6, in question 7 (additional considerations for designing future learning environments), all respondents had different rankings and no overlapping patterns were traced. While the students focused on Equipment and Environmental attributes, the faculty and staff focused on Technology and Room Arrangement.

Opportunities

The large pool of survey responses and their analysis above set a rich foundation upon which to build the Classroom Design Standards for Diablo Valley College. The extensive feedback from the students, faculty and staff was helpful in identifying constraints and opportunities on the campus. The qualitative insights from the surveys are grouped into three categories listed below.

Experiential Collaboration

Experiential Collaboration will focus on developing an ideal space plan for different sized classrooms, primarily addressing the needs for visibility and flexibility. The following attributes will be considered:

- Providing clear lines of sight throughout the room by adequately locating writeable surfaces and digital media as well as minimizing glare.
- Specifying furniture that is flexible to arrange and can be modified to suit the needs of different instructional methods within the same space.
- Creating a diverse environment for multi-modal learning including hands-on project work, social interaction and technical knowledge sharing.
- Locating physical elements (such as doors) to enhance and promote circulation in the classrooms.
- Specifying furniture with adequate writable surface as well as capability to accommodate books and digital devices.
- Placing furniture (tables and chairs) to meet accessibility requirements and providing adequate space for movement by users while classes are in session.
- Providing secured storage to allow for demonstration materials and innovative project tools.

Healthy/ Whole

Healthy/ Whole will focus on elements of universal design by developing a comfortable learning environment for all users, primarily addressing the needs for a healthy environment and comfortable furniture that fosters the holistic student development and accommodate individual learning styles. The following attributes will be considered:

- Creating a welcoming environment that is aesthetically pleasing by using clean/simple finishes and color in the classroom.
- Achieving adequate acoustic levels using insulated building materials and voice amplification systems to improve speech intelligibility and mitigate noise reverberation.
- Providing adequate daylight in the classroom by positioning the windows to minimize glare on digital media/writeable surfaces while providing views to the outside.
- Accommodating lighting control systems to provide zones of lighting and the flexibility of switching between lecture/ presentation, group work, report out and/ or meditation modes.
- Upgrading the temperature control mechanisms in the classrooms to render more comfortable spaces.
- Providing ergonomic and flexible furniture to aid comfort and accommodate the diversity within the student population (eg. students with disabilities)

Tech-Enabled

Tech-Enabled will focus on developing a minimum standard for technology and other equipment in the classroom primarily addressing the needs for audio-visual and other technical methods. The following attributes will be considered:

- Furnishing a variety of simple/ standardized instructional equipment in appropriate quantities to support all sizes of classrooms including interactive digital displays and sound systems.

- Establishing a backbone for campus-wide on-demand learning (wi-fi access anytime, anywhere, by any means).
- Providing energy efficient equipment with automated controls to help improve performance and conserve energy.
- Providing for adequate quantity of charging outlets for all users independent of furniture location.
- Specifying flexible un-tethered instructor stations to foster a non-authoritative classroom layout.

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03
TRANSFORMING DVC

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USER GROUP WORKSHOPS

OVERVIEW

The User Group Workshops were held on September 18, 2017 and September 21, 2017 and were well attended by 35 stakeholders from both campuses. These workshops delved deeper into the opportunities and challenges recognized in the survey and were geared towards understanding the needs/ concerns of the different stakeholders on campus. During each hour long session, WRNS Studio engaged all the user groups in similar discussions and activities to gain parallel feedback that captured the essence of the thinking about the future – how teaching and learning can be transformed at DVC.

Participants (per user group) included:

User Group 1: Deans & Faculty
Mike Holtzclaw, Senior Dean, San Ramon Campus
Obed Vazquez, Dean, Engineering/ Social Science
Rick Robison, Dean, Library, Educational Technology and Learning Support
Mario Tejada, Faculty (CIS Instructor), DE Chair
Lee Rode, Faculty (Psychology)
John Freytag, ASUP/ Faculty
Anne Kingsley, Faculty (English Department & Distance Education)

User Group 2: Faculty Affairs
Kim Schenk, Senior Dean, Curriculum and Instruction
Teresa Molnar, Academic Scheduling Specialist
Joy Brucelas, Senior Administrative Assistant, Office of Instruction

User Group 3: Deans & Faculty
Christine Worsky, Dean/ AD
Toni Fannin, Interim Dean, AFA
Joseph Gorga, Interim Dean of Physical, Biological & Health Sciences
Daniel Kiely, Librarian, Chair
Cheryl Wilcox, Faculty (Math)
Joan Symonds, Faculty (ECE & AEBG Faculty Co-coordinator)

User Group 4: Student Affairs
Newin Orante, VP Student Services
Emily Stone, Dean, Student Support Services
Kenyetta Tribble, Dean, Student Services, San Ramon Campus
Beth Hauscarriague, Dean, Counseling and Enrollment Services

User Group 5: Diversity & Inclusion
Rosa Armendariz, Interim Dean, Student Engagement and Equity

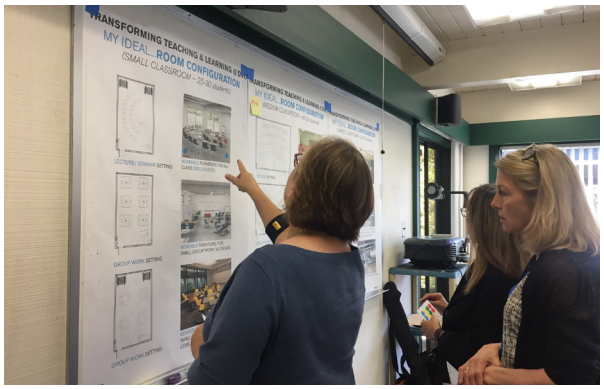
User Group 6: AV/IT Services
Percy Roper, Manager, Technology Systems
John Vohs, Staff, IT
Jeff Jewell, Staff, Media Services

User Group 7: Students
Nastaran Qassemi, Student Ambassador (Psychology)
Isabelle Young, Student Ambassador (Psychology)
Jorge Salinas, Student Ambassador (Psychology)
Leonard Baxa, Veteran Alliance (Business)
Terrence Custer (Computer Science)
Louis Barrios (Civil Engineering)

User Group 8: Accessibility
David Hagerty, Manager, DSS
Carrie Million, Assistive Tech Specialist, DSS
Ron Tenty, Testing Accommodations Coordinator, DSS
Rose Desmond, Alternative Media Coordinator, DSS

User Group 9: Custodial
James Buchanan, Director, Facilities Management & Operations

The products of these sessions are included in the Appendix of this document, inclusive of notes and interactive participation in some cases represented by colored dots reflecting voting by participants. Following is the summary and key insights from the discussions.



Stakeholder engagement photographs

DISCUSSION: CHANGING PEDAGOGY AT DVC

WRNS Studio led the discussions by asking each user group three critical questions to gather input on the changing pedagogy at DVC - What are the key obstacles to innovation in the current classrooms; How can DVC capitalize on the campus's diversity within the classroom; and If you could do more in the classroom, what would you do? The stakeholders input varied with some sharing similar ideas and others bringing new perspective to enrich the discussion. Below is a consolidated summary:

"Obstacle to Innovation"

- Flexibility/ Adaptability
  The integration of group work to enable learning through collaboration was unanimously noted as a key desire for innovative pedagogy at DVC. The current classroom environment does not allow for flexibility with its bulky furniture and lack of space to move around. In order to effectively achieve this vision of collaborative learning, classrooms need to provide furniture and equipment that is easy to move and accommodates various group sizes (2-6 persons) and scenarios (lecture, all class discussion/ dialogue, groupwork/ activity). This would also require a cultural change on campus where students are active participants in the room willing to reconfigure their learning environment and faculty don't feel that they loosing class time to re-arrange furniture.

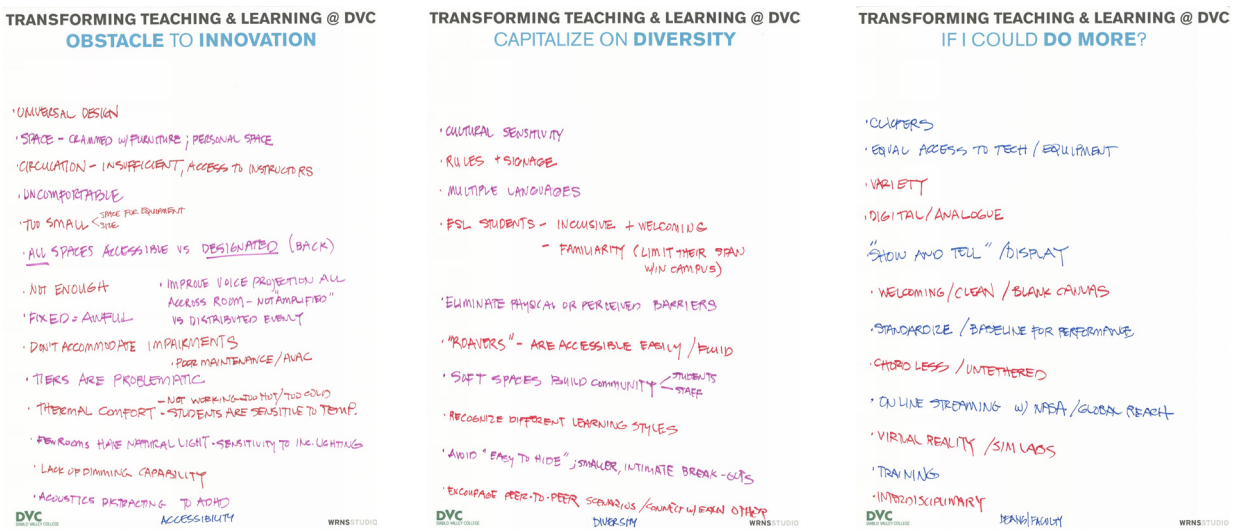
- Reliable Wi-fi: Anytime/ Anywhere
  Reliable wi-fi has become a necessity for 21st century learning environments with faculty wanting to engage students with technology as a part of their instruction. The campus has come a long way in integrating IT/AV into classrooms and upgrading its wireless network to foster a digital learning environment on campus. However, more needs to be done with the growing needs of the students and faculty.

- Simple/ Standardized Technology
  The stakeholders expressed the desire for simple and standardized technology in all the classrooms such that it is easy to use by anyone and campus IT services do not have to be contacted for small issues. The existing control panels are located at the instructor lecterns but are not very intuitive or user-friendly. Faculty waste precious class time trying to get a projector to work and sometime have to even change the nature of their class due to the incompatible technology interface. Along with standardizing the classroom software, the hardware components like projectors, speakers, lighting controls etc should also be standardized to avoid a learning curve for the users. Faculty training can help achieve this goal of seamless technology integration faster.

- Writeable surfaces: Fixed/ mobile
  The walls within a classroom are as seen as important real estate and should be equipped with the maximum possible amount of writeable surfaces for use by faculty and students, formally and informally, during and after class. Currently, there are limited whiteboards in the classroom, many of which are occupied by the faculty/ projector screen as a part of instruction.

- Universal Design
  Since DVC serves a diverse population, it is critical for the learning environments on campus to be accessible to all users. Aspects of Universal Design that provide adequate space for movement to a disabled user within the entire room, provide comfortable/ergonomic furniture to users of all body shapes/sizes, provide a comfortable learning environment that is visually and acoustically appropriate etc. should be incorporated into the design standards.

- Operate at Class Capacity
  Faculty expressed the need to operate the courses at class capacity or increase the size of the classrooms to



Sample Discussion Poster Images. See more in the Appendix.

Stakeholder engagement photographs

accommodate the surge space required. Classes at DVC are packed with approximately 10% extra students beyond the class capacity at the start of the semester to accommodate for peak demand. As the semester progresses, some students drop out and the class reaches its optimum size. However, during the surge period, the room does not function adequately - less space to move around and collaborate, improper sight lines for students etc.

"Capitalize on Diversity"

- Welcoming/ Attractive
  Stakeholders expressed the importance of enhancing the look and feel of classrooms to create a welcoming and attractive learning environment where students feel inspired and motivated. Access to daylight and views, use of color, educational displays like posters/ quotes on walls etc. were described as ways to achieve this goal.

- Inclusive/ Multi-directional
  Beyond creating a vibrant space, faculty values mobility within a classroom as that provides better interaction with students, facilitates eye contact, and fosters engagement. By creating a room that is multi-directional, i.e. digital media and writeable surface on all walls, it breaks away from the traditional classroom layouts that defined a 'front of the room' and makes the learning environment more inclusive where the instructor can move freely and is perceived as less authoritative. This also helps keeping all students engaged in the classroom as there is no 'back of the room' for them to hide. With such layouts and better acoustics/ technology, students from different cultures who are soft-spoken and/or shy of public speaking can feel more comfortable sharing their thoughts.

- Responsive Engagement
  In order to capitalize on the diversity on the campus, the learning environments at DVC need to foster responsive engagement where the instructors are sensitive to the cultural backgrounds and meet the students 'where they are'. This implies faculty understanding the learning styles and pace of all their students and tailoring their course to such that all students are active learners. Flexibility/ mobility through the room can aid this as the instructors can move around helping students even if the students are hesitant to approach.

- Multiple Languages
  Many students at DVC speak different languages and are not fluent in English as their primary language. Hence, they have a longer learning curve in the classroom and often rely on their peers for support. Suggestions like providing lecture recordings to students for later review at their own pace, lecture captioning in popular languages, providing after-class learning support services etc. would greatly help students overcome the language barrier and grow as independent thinkers.

- "Rethink" Rules & Signage
  Signs are an important visual language that should be carefully scripted and designed on a diverse campus such that they do not discriminate against any user. The stakeholders mentioned how the word "No" in front of many rules/ signs on campus creates negativity amongst students and often results in opposite behavior. Also, food/drink are becoming inherent components in 21st century learning enhancing the student learning experience thus restricting refreshments during class is limited their full learning potential. Similarly, an example of the 'person in a wheelchair' sign on the ADA desks was shared as discriminating against other disabled users like pregnant women/ students with back problems who might use the desk.

- Recognize the "Learning Curve"
  More than anything else, today's learners want choice and control. Some students reported feeling left out with regards to the pace of lectures and their challenges with comprehension due to language barriers, environmental conditions within rooms, and poor visibility of class content. They also stressed on how they have different learning styles - visual, auditory, kinesthetic etc. - and need the faculty to be sensitive to and address their styles.

- Peer to Peer Learning
  For students at DVC, learning in the context of the social network is of utmost importance. Since many students are from diverse backgrounds or first generation students, they connect better with their peers than the faculty for in-class and out-of class learning. To facilitate this collaborative learning, room layouts and faculty need to accommodate peer-to-peer interaction.

"If I Could Do More"

- Produce rather than Absorb
  Education has evolved over generations from passive knowledge intake to more active learning. Students are not listening to unidirectional lectures and absorbing content, but are engaging in dialogue and hands-on projects to learn the same content. This pedagogical shift is what the stakeholders would like to see more of in their learning environments.

- "Creative" Space/ Professional Development
  By designing the classrooms with flexible/ modular components, the stakeholders would like to use the learning environments as multi-purpose spaces for retreat activities, professional development and other creative learning sessions. Having access to low-tech movable supplies/ storage carts could help facilitate a magnitude of interactive sessions like seminars/ hackathons.

- Hybrid Learning and Global Reach
  With technology becoming an essential part of 21st century education, the faculty envision conducting hybrid classes that are part on-line and part in-person to maximize on-campus collaborative learning. They also foresee increased use of technology within the classroom to connect with experts/ educators globally via video-conferencing.

  Per David Hagerty, any video content shown for classes must contain captions but the campus is not able to meet requirements of ADA and Section 508 of the Rehabilitation Act.

- Interdisciplinary
  The needs of 21st century student are evolving towards a culture of interdisciplinary partnerships. New academic breakthroughs that are born through the interaction amongst the different departments and need a pedagogical shift in the way academic courses are structured. Groupwork amongst students in multi-discipline classes leads to innovation, ideation and creation, where students learn from each other rather than just the instructor. The stakeholders also stressed on a desire to collaborate with community partners to cultivate holistic student growth.

- Stand-up Class
  A unique model for the classroom which provided for a stand-up configuration was desired by some stakeholders to accommodate different users in the room. Research shows that some students are more attentive when standing, however, provisions for sit/stand modes need to be provided in the room to cater to students with disabilities.

- Mindfulness
  Stakeholders would like to foster mindfulness in the learning environment by creating physical spaces that have ample natural light and ventilation as well as a course structure that provides students with reflection time during their learning.

ACTIVITY: THE CLASSROOM OF THE FUTURE

WRNS Studio led the activities by asking each user group to imagine the 'Classroom of the Future' at DVC through three different lenses for each unique size of the classroom - Equipment Toolkit, Learning Mode, and Room Configuration. The stakeholders used colored dots to vote their preferences on the interactive posters. Below is a consolidated summary of their inputs:

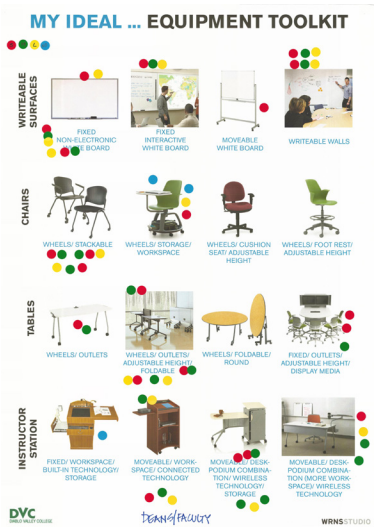
"My Ideal" Equipment Toolkit

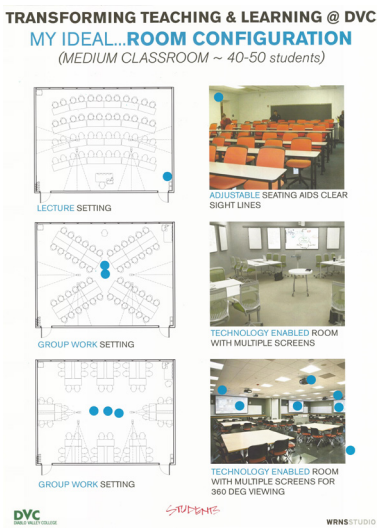
- Writeable Surfaces
  The writeable surfaces that gained the maximum responses for all the class sizes were ones that allow for interactive displays and capturable annotations which can be duplicated on multiple projection screens and/or saved for distribution. For medium and large classroom, moveable whiteboards were also preferred. Walls with writeable paint were preferred by some stakeholders, though their maintenance was highlighted as a concern.

- Chairs
  To maximize student comfort and flexibility, nesting chairs with cushion seat and mesh back that have part wheels and are part gliding were highlighted as preferred. In addition, sit/stand stools to provide for sight lines in large classrooms were noted as 'nice to have'.

- Tables
  Tables on wheels that are easy to move/ reconfigure, adjustable in height, nest/ fold, and allow access to integrated power were unanimously preferred by all stakeholders. For the larger classrooms, sit/stand tables were also highlighted as 'nice to have'.

- Instructor Station
  The faculty expressed a preference for non-bulky and untethered instructor stations that allow them to freely move in class. Also, a combination of a height adjustable work





Sample Activity Poster Images. See more in the Appendix.

desk and podium that facilitates faculty with disabilities and allows adequate desk area for papers/ handouts etc. was requested. It was also mentioned that the work surface at the podium level should be large enough to accommodate the instructor laptop and reading notes along with other control devices. In terms of technology, the instruction station should be able to house a switcher, document camera, DVD player, and room controls for lighting/ sound.

"My Ideal" Learning Mode

- Group Activity
  For all classroom sizes, group activity was the most preferred teaching/ learning mode amongst all stakeholders. Whether it is an all-class discussion, small group discussions, peer-peer learning activities, or hands-on projects, group interaction results in enhanced learning outcomes. More and more faculty are incorporating group activity as a part of their course within each class period or at multiple times during the semester. It was mentioned that groups of 2-6 students is ideal for DVC to foster student engagement.

- Teacher-Student Interaction
  In addition to peer group interactions, students also mentioned that interactions with the instructor was very important to their in-class learning experience. Being able to check-in on their work as a group as well as individually ask questions helped them understand better and feel engaged. Room configurations that allow instructors to freely move through the room and access all student groups should be designed.

"My Ideal" Room Configuration

- Multi-modal/ Multi-directional
  To accommodate the preferred group activity learning mode in all class sizes, the rooms need to be configured with multi-directional digital and analog media and flexible furniture to maximize collaboration. Tech-enabled rooms with 360 degree viewing and hearing allow students and faculty to participate from any location within the room. This multi-modal learning environment represents the pedagogical vision of the stakeholders.

BLUE SKY LESSON PLANS WORKSHOP

OVERVIEW

The Blue Sky Lesson Plans Workshop was held on September 25, 2017 and was attended by stakeholders from both campuses. This all-day workshop was set up to engage with the faculty to catalyze "transformational" thinking about the future of teaching and learning environments.

WRNS Studio shared a brief summary of a few lesson plans that were shared by the campus before leading a series of interactive exercises that focused on understanding the evolving pedagogies through the lenses of Skills, Learning Styles, Experimental, Inclusivity, Mindfulness and Beyond.

Faculty and Deans were then encouraged to create new drafts of an "ideal" lesson plan of the future, taking into consideration two arcs: the semester and the class period. Thereafter, the visioning session and lesson plan insights were overlaid on the three sizes of environments being planned to identify the required toolkit to augment their effectiveness, which include Spatial, Equipment and Function.

Participants included:
Rachel Westlake, Vice President of Instruction
Toni Fannin, Interim Dean, AFA
Joseph Gorga, Interim Dean of Physical, Biological & Health Sciences
Despina Prapavessi, Dean, Math/ CS/ Business
Daniel Kiely, Librarian, Chair
Katy Agnost, English Department Chair
John Freytag, Faculty (Oceanography), Biology Department Chair
Mario Tejada, Faculty (CIS Instructor), DE Chair
Anne Kingsley, Faculty (English Department & Distance Education)
Lee Rode, Faculty (Psychology)
Cheryl Wilcox, Faculty (Math)
Lisa Smiley-Ratchford, Faculty (Sociology)
Kris Koblik, Faculty (Art History)

The products of this session (inclusive of notes and interactive participation by the stakeholders), along with some articles on 'Higher Education Trends' discussed during the workshop, are included in the Appendix. Following is the summary and key insights from the discussions.

EXISTING LESSON PLAN DEBRIEF

Prior to the workshop, WRNS Studio received four lesson plan outlines from different departments at DVC: English, Mathematics, Psychology and Library. Although, the lessons were very different in content, they all portrayed similar pedagogical methods and ideas. Below are the key attributes:

- Less Lecture, More Interaction
  - Eliminate the 'front' of the classroom
- Web and Video Interface
  - Reliable wi-fi for quick data polling and discussion
- Flex Orientations
  - Keep student more engaged in their learning
  - Interdisciplinary activities
- Scales of Discussions/ Activity
  - All class
  - Group work
  - Team Teaching
  - Individual/ Pair
  - Test taking layouts
- Teaching/ Learning Methodologies
  - Demonstrate
  - Observe
  - Examine
  - Simulate
  - Debate
  - Produce
- Learning Through Display
  - Gallery/ Exhibition
  - Class as an event
  - Host a larger audience
  - Showcase student work
  - Provide storage space for display materials

Stakeholder engagement photographs

Stakeholder engagement photographs

- 'Open' Classroom/ Extending Beyond
  - Fostering community-based learning
  - Making the coursework help positively impact the world
  - "Expanding boundaries" of the learning environment by pulling expertise from outside sources into the classroom through video conferencing, engaging in hybrid (partly online) learning, learning through field trips/ real life examples etc.

EXERCISE 1: EVOLVING PEDAGOGIES

The DVC Educational Master Plan is 'student-centered' and highlights the core values of excellence, equity and student learning while broadening the interdependence between the students, the college and the community. The 'Evolving Pedagogies' exercise was designed to align with the campus mission and take it a step further by engaging the faculty in 'out of the box' thinking about pedagogical methods that will foster student success at DVC. Participants were asked to team in pairs and brainstorm over six themes relating to evolving pedagogies and had 10 minutes to provide input on one theme before moving to the other. Below are the salient points from the exercise:

Skills

Skill development is critical to learning as it defines the learning outcomes and is a measure for evaluation. It is not only important to identify what skills need to be developed in college that will help the student excel in their chosen career path and educate them to be a holistic individual ready for the world, but also understand the resources required to facilitate that skill development. Analytical and critical thinking, problem-solving, decision making, project management, big-data simulation and evaluation, research, real-life application, learning in different rhetorical modes, digital literacy, self-challenging, public-speaking and content curation, examining public data/ news, critique and curiosity were discussed to be some of the key skills that students should graduate with. By following this 'skill-based' learning, attendance to class will be more of a rewarding experience than an obligation. Students will want to know the "Why?" and transform data to knowledge, not just "Pass".

Learning Styles

A diverse student body defines the campus and informs their desire to have a 360-degree, didactic atmosphere that is visual, auditory, engaging and kinesthetic. Many students represent various cultural backgrounds and generations, speak different languages, and require a variety of accommodations. This implies that successful learning environments need to provide for all learning styles. The concept of 'layering' was discussed where multiple modes of teaching/ learning are applied, including but not limited to - graphics and words, digital presentation and writing on the board, real life projects and hypothetical scenario-based learning, virtual exploration and critical analysis of course content and many more. Instructors need to be able to explore the possibilities of pedagogical change or use of social media in learning, beyond prohibiting its use in the classroom, in order to create a more involved and engaging learning environment.

Experiential

Experiential learning is the process of learning through experience eg. hands-on and/or real-life projects, where students are actively engaged in problem-solving and learning. Techniques such as hackathons*/ un-conferences** help grow a start-up/ entrepreneur mind set for the students and teach them how to focus on critical issues in a short time-frame. Combining this with community-based learning and/or interdisciplinary project-based learning aids a comprehensive development of their mind. For faculty, the challenge is how to create the right atmosphere for such learning inside and outside the classroom. Inviting guest speakers, doing field-trips, using social media etc. help establish a dynamic learning experience.

** Hackathon is a design sprint-like event with a goal to generate ideas/ create solutions for a specific topic/ focus area.*

*** Un-conference is a loosely structured conference emphasizing the informal exchange of information and ideas between participants, rather than following a conventionally structured program of events.*

Inclusivity/ Learning Communities

For students and faculty at DVC, learning in the context of the social network is of utmost importance, however, many a times students feel intimidated or inhibited by their peers/ instructors who all come from diverse backgrounds. To overcome this, the faculty discussed creating 'brave' spaces/ learning environments where the students not only felt safe to share their opinions but also brave enough to break the socio-cultural barriers and learn with an unbiased filter. Spaces that encourage collegial and dynamic learning among students and with the community at large are preferred. Here, you "build on your experiences" which contribute to the important transition to becoming a mature adult with a firm understanding of your personal point of view. In order to completely transform the classroom and make it inclusive, a mind shift needs to take place for both students and faculty that they recognize the 'student as the expert' instead of defaulting the 'expert' title to the instructor only. By doing so, students will feel more engaged in their learning environments. By encouraging student participation and recognizing failure as an opportunity, the learning environments can feel more welcoming and inclusive. Interdisciplinary courses that connect multiple disciplines help create dynamic learning communities on campus and push towards unknown boundaries.

Mindfulness

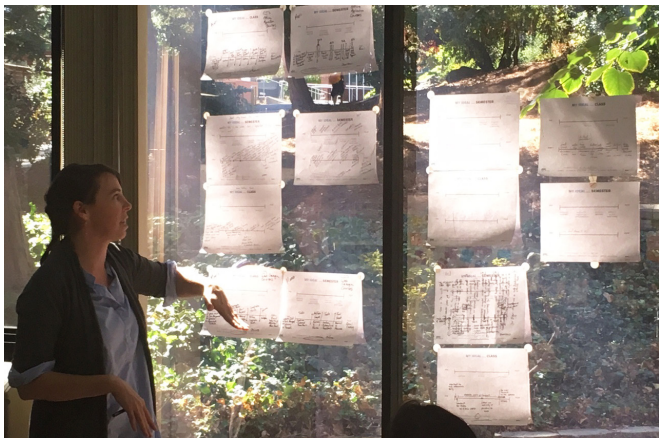
With an increase in 'healthy learning' trends in higher education, campuses are incorporating contemplative and mindful teaching methodologies to help students become more aware, attentive and focused in their learning. This includes the time to debrief a specific topic/ learning concept, asking students to collate the key learning insights from a class, helping students self-pace themselves, eliminating distractions by creating a welcoming and attractive learning environment and structuring the lessons to include mindfulness in the coursework. It also suggests a 'student-first' ideology where the 'classroom belongs to the students' so instructors do not impose their personalities on the learning environment - the room should be reflective of what the students want and who they are. Physical attributes of the room like access to natural light, proper acoustics, ability to control lights and sound etc. all help create a mindful learning environment.

Beyond

With the world becoming more and more connected through technology, the boundaries of the physical classroom are expanding. Instructors are innovating new lesson plans that are hybrid/ partially on-line in order to maximize the in-class time for active engagement/ 'learning by doing' activities. It also implies how instructors are leveraging the technology within the classroom to connect globally using digital media and participating in open/ crowd sourced platforms to gain a breadth of knowledge/ data. Under this concept, the faculty also discussed ways to cultivate 'self-motivated learning' amongst students and keeping them engaged outside the classroom. This could be facilitated through soft spaces outside the classroom such that in-class conversations can continue beyond class time, thereby emphasizing that the future of learning environments is to consider the entire physical campus and all the virtual platforms as a classroom and not just a single room.

EXERCISE 2: MY IDEAL LESSON PLAN

To take the 'transformational' pedagogical thinking a step further, faculty and deans were asked to create new drafts of an "ideal" lesson plan of the future incorporating the aspects of the 'Evolving Pedagogies' exercise that they had just completed. Participants were encouraged to think of their lesson plan in a 'Pre-During-Post' scenario - what outcomes are desired before, during and after - a semester and a class period. Options for different class durations and sizes were provided to the faculty to understand a diverse set of lesson plan types. After individually working on their plans, each participant reported out their vision to the larger group. Although the faculty disciplines and courses were different, their lessons plans had many similarities. This goes to show that students thrive in certain environments that embark the right methodologies to create a comfortable learning atmosphere. Below are the salient points from the exercise:



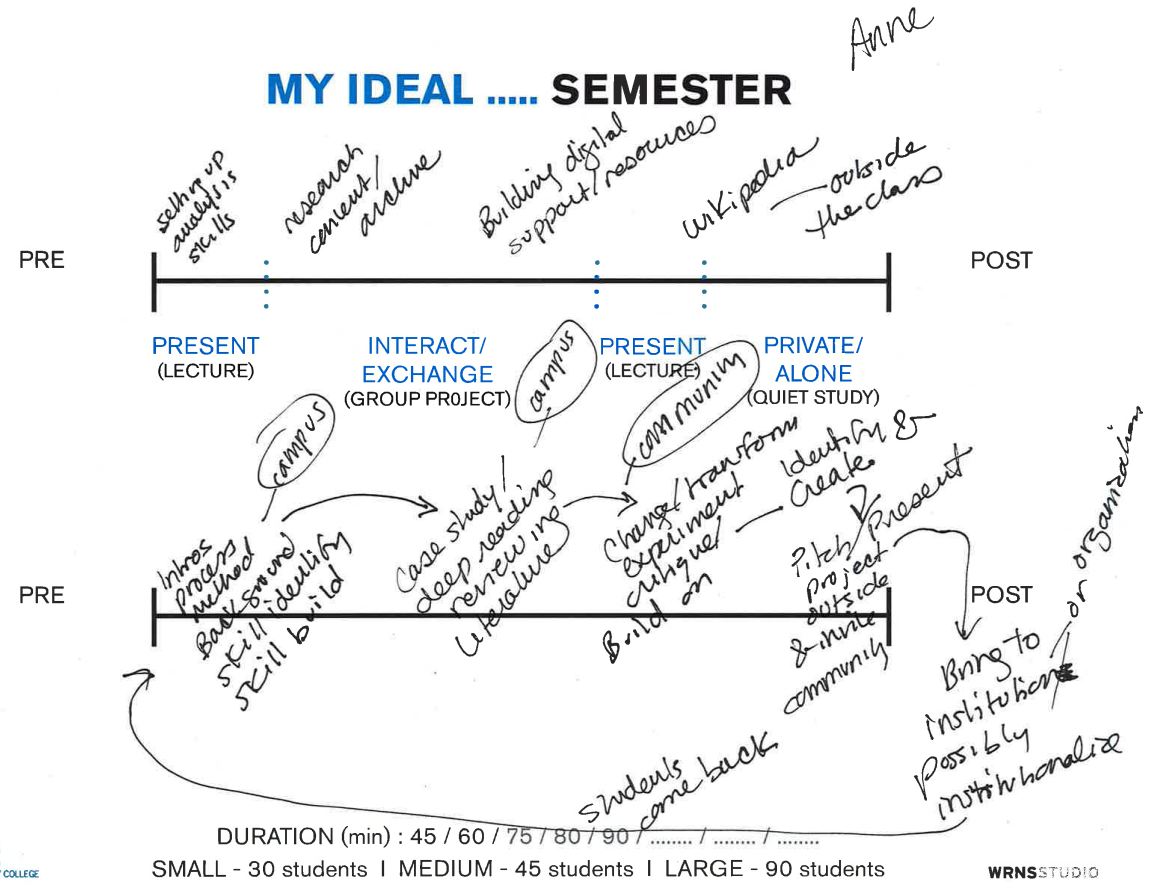
Stakeholder engagement photographs

My Ideal Semester

The 'Ideal Semester' is envisioned as a skill-based structure where the course content is overlaid with critical skills the students need to have upon completion. Understanding the subject material and developing the skills required to excel are both equally important. Students are taught in different ways and given projects/ deliverables that require them to learn new skills. This makes them get out of their comfort zone and exposes them to newer ways of learning. Many faculty also incorporated other course skills or proposed to connect with different disciplines, thus making the student learning experience interdisciplinary. Skills assessment is imagined to be happening throughout the course and is not something kept for the end. This provides students an opportunity to improve during the semester. For pre and post semester, the faculty currently share course learning objectives, reading materials, schedule etc through the campus learning management system (Canvas) or email, but would like to engage students in research/ projects that are not bound by the duration of the semester - something students start in a semester but continue afterwards due to their passion in the subject.

My Ideal Class

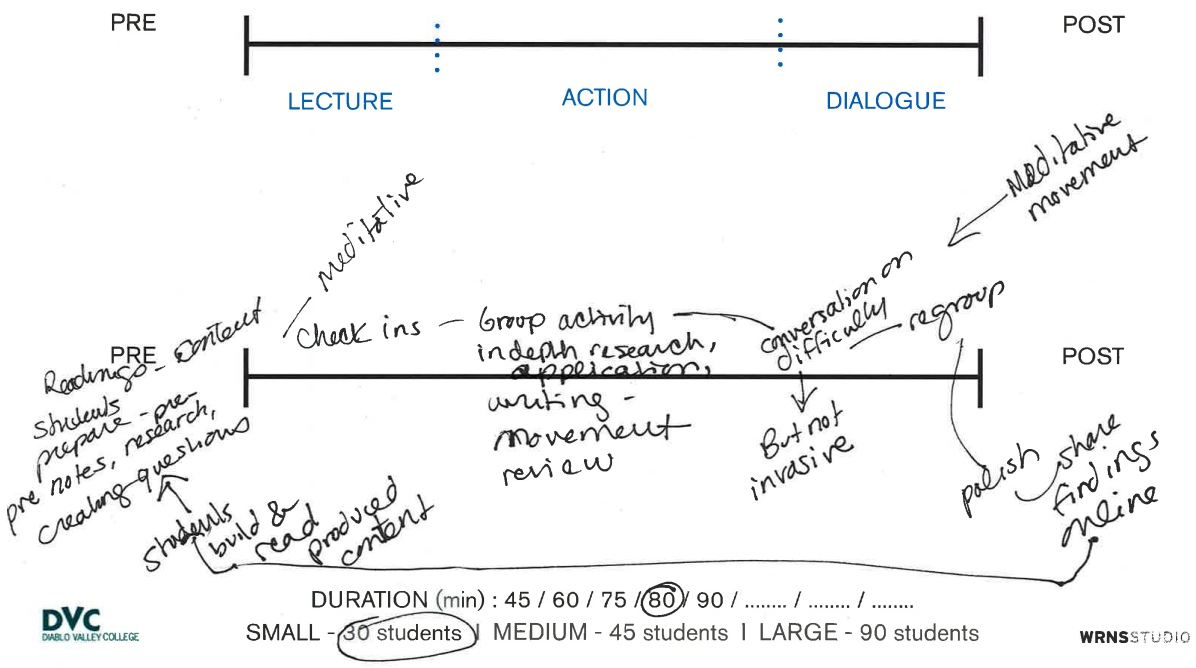
The 'Ideal Class' is envisioned as a multi-modal learning environment with a combination of Lecture, Action and Dialogue that takes place more than once during the course of the class period depending on the content to be covered. A lecture mode is typically when the instructor checks-in with the students, explains key concepts, leads a demonstration, and engages with the entire class in a more one-directional way. During the action mode, students are engaged in some sort of activity - whether it is doing hands-on projects, group-work, watching a video clip, working on in-class hand-outs, etc. These activities range in time allocation depending on the class structure but are always followed by some form of dialogue or discussion. These can be as individual team check-ins by the instructor, an all class discussion, and/or group discussions/ report outs. They are usually set up as a multi-directional exchange of learning outcomes. Though currently the faculty keep the students motivated pre and post class with specified reading material and/or homework, ideally they would like to inculcate 'self-motivation' amongst the students such that students come to/ leave class with a curiosity and conduct their own research beyond what is required for the class. A few instructors for this reason included some time for 'reflection' at the end of their class period where students could take a few moments to absorb what they've learned and ask questions if concepts are unclear.



Sample faculty responses from the exercise. See Appendix for all faculty responses.

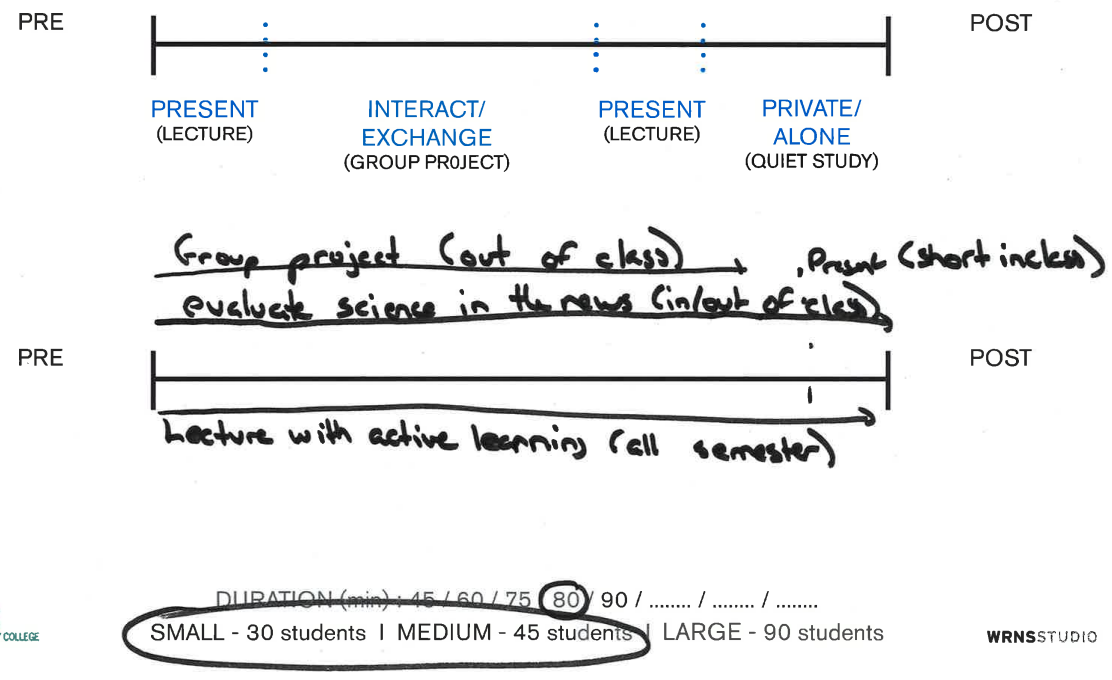
Anne

MY IDEAL ..... CLASS

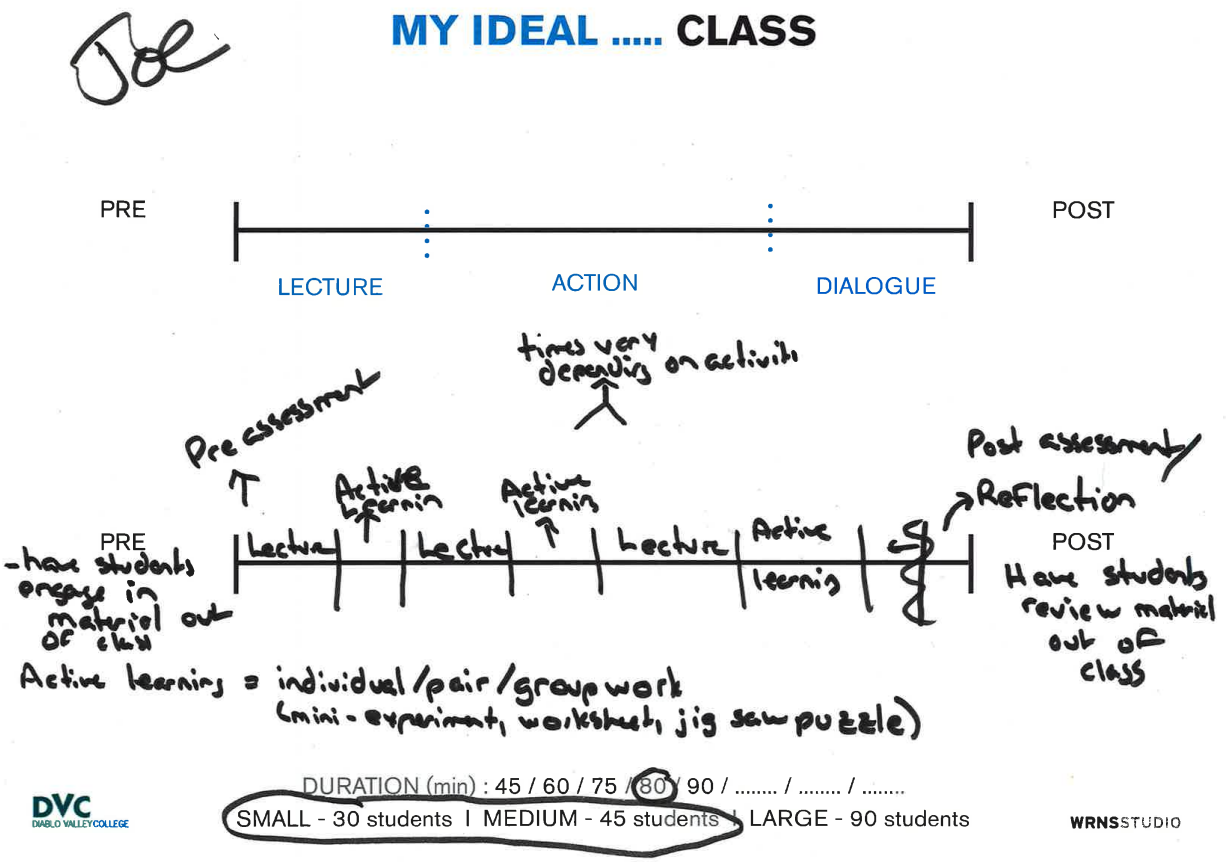


Joe

MY IDEAL ..... SEMESTER



Sample faculty responses from the exercise. See Appendix for all faculty responses.



Sample faculty responses from the exercise. See Appendix for all faculty responses.

PLANNING STRATEGY

PLANNING PARAMETER

As learnt through all the data collected in the surveys and user workshops, academic programs have tremendously evolved with the main educational emphasis on '*learning by doing'.* This popular pedagogy prioritizes creation of collaborative learning environments that move beyond the traditional model of lecture learning. See reference images below.

In-class activities and groupwork requires space for students to engage with each other and equipments such as whiteboards, digital screens and a multitude of their own devices as well as with the instructor. This results in wider desk workspace and adequate space for movement within the room. Also, in order to design a learning environment that is 'Universal' i.e. equally accessible by all users irrespective of their physical, mental or other disabilities, adequate space for movement anywhere within the room needs to be planned for. Hence, a planning parameter of 30 ASF/student is currently recommended as the best practice for Higher Education learning environments.

The existing classrooms at DVC were planned at 15 ASF/student and the current new projects on campus are planned at 20 ASF/student. Though, this is a huge leap from the existing classrooms, it still does not provide adequate space for the needs of the users. The recommended standard of 30 ASF/student is very high (and almost unachieveable for funding) compared to what exists at DVC. To arrive at the appropriate planning parameter for DVC, a series of meetings were conducted with the Core Committee, Academic Senate and Executive Steering Committee. See Appendix for comparative planning parameter analysis presented to the campus. Based on the input from all stakeholders, the Executive Steering Committee decided on the following planning parameters for this classroom design standards:

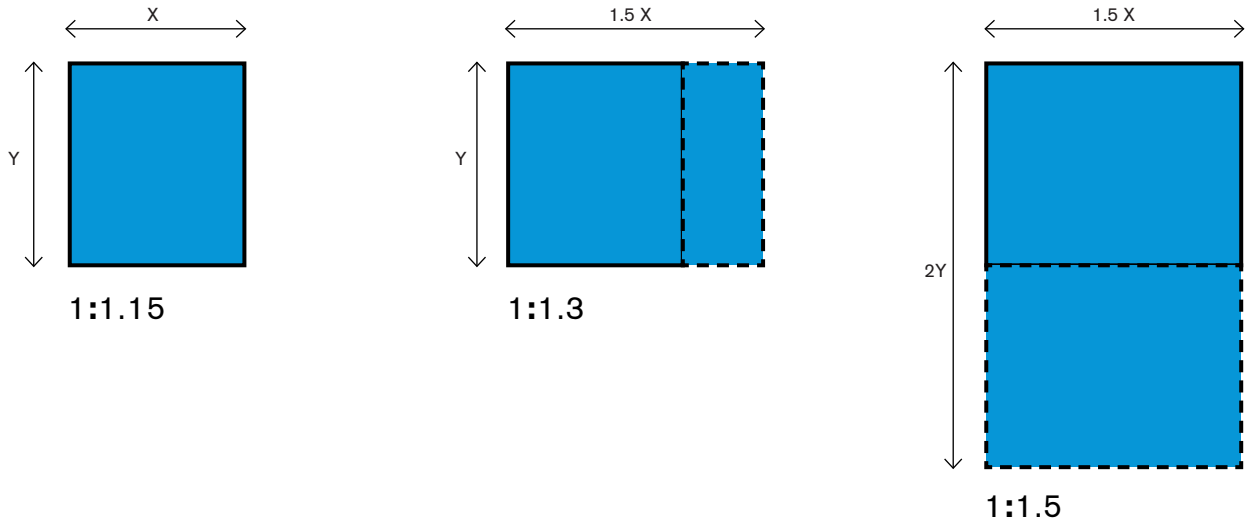
- Small classrooms – 27 ASF/Student
- Medium classrooms – 25 ASF/Student (*while a couple of classrooms on a project by project basis will be at 27 ASF to allow for additional capacity for certain programs only)*
- Large classrooms – 25 ASF/Student

A key parameter for this decision was the choice of 18" deep desks as opposed to 24" deep. The amount of worksurface for students is lesser in the thinner desks, however, more space is made available for movement and circulation within the room, thereby allowing easy access for all users (disabled or not) to move around and fostering the goal of Universal Design.

ROOM PROPORTIONS & MODULAR SIZING

Equity and inclusion are key values in 21st century learning. Hence, the spatial design needs to accommodate and enhance these, such that all users feel fully engaged. Room proportions

Traditional classroom setting vs Collaborative classroom setting



Small - 810 ASF
30 students @ 27 ASF/student

Medium - 1125 ASF
45 students @ 25 ASF/student

Large - 2250 ASF
90 students @ 25 ASF/student

Figure 1: Modular Planning Strategy

that foster sight lines, acoustics, flexibility and movement play an important part in designing such spaces to make sure faculty and students are active participants in their teaching/learning.

While the traditional classrooms were more rectangular in proportion, thereby defining a 'front' of the room, 21st century learning environments break away from this disposition and are trending towards more square proportions given all walls are equally equipped with digital and analog media. A best practice standard of a room not higher than 1:1.5 (width : length) in proportion is recommended to achieve the above results. Exceptions to this may be possible with additional strategies to mitigate aspects of non-inclusivity.

In addition to the above, strategic planning with modular sizing can help create flexibility and future proof campus assets. The design standards established in this report highlight this very strategy for the DVC campus. As the class sizes increase in student capacity from 30 to 45 to 90 students in modular multiples, so should the space they occupy. Keeping one room dimension the same, a 45 student Medium classroom is 1.5 times a 30 student Small classroom and a 90 student Large classroom is twice the size of a Medium classroom. This allows for a regular planning grid and also flexibility for change. For example, a large classroom could be subdivided into two medium classrooms, temporarily with moveable partitions or permanently with a fixed wall. All building systems should be designed to supplement this flexibility. Figure 1 above highlights this modular planning strategy.

Electric lighting for the Diablo Valley College Classroom Standards shall follow the following principles. The goal of these lighting principles is to support a positive, enriching and healthy classroom environment, where lighting can influence classroom behavior, student-teacher and student-student

LIGHTING & HEALTHY LEARNING

engagement and communication, task performance, retention of information, and the visual comfort of all occupants.

LIGHTING QUALITY

- General/ambient lighting system provides soft, shadow-free, uniform illumination throughout classroom. Diffuse light to the occupants and tasks will increase user comfort and satisfaction, reducing distracting shadows from hands, desk objects, and partitions while reducing glare and improving facial modeling.
- Visual comfort and glare control is extremely important, with careful consideration of fixture brightness above 45-degress from Nadir [luminance (cd/m2) and intensity (cd)] to avoid undue discomfort to occupants.
- Good color fidelity (CRI = 90 or greater) from the general lighting system.
- Horizontal AND vertical illumination are both important:
    - Proper visibility of writeable surfaces shall be provided via vertical illuminance from the general lighting system. Researchers @ the University of Illinois Urbana (2003) identified certain "attractors" that aid the learning process and "detractors" that have an opposite event. This research determined that illumination of teaching services such as white boards is an attractor and therefore has a positive correlative relationship with retention of information.
    - Instructors AND students look their best with sufficient vertical illumination, improving student-teacher engagement.
    - Classrooms will feel more spacious with proper vertical illumination (this is especially important if a classroom lacks windows)
- Target light levels, per the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13):
    - Horizontal illuminance @ desk height, 2.5' above finished floor = 500 lux (50fc) average throughout classroom to accommodate a wide range of tasks/uses (15fc for computer use, 40fc for paper tasks/reading, 50fc for art or science projects).
    - Vertical illuminance @ white board (i.e. vertical writable surfaces) = 300 lux (30fc) average.
    - Vertical illuminance @ pin-up walls (aka "tack board") = 150 lux (15fc) average.
    - Vertical illuminance @ background walls (not writable surfaces) = 150 lux (15fc) average.
    - In many situations the classroom/task light levels may be lower (such as A/V presentations or computer use), but the lighting system must be able to achieve average light levels noted above upon demand.
    - Refer to Target Light Level Chart in the appendix for illuminance recommendations based on a wide variety of classroom tasks. It is assumed the lower light levels are achieved via the classroom dimming system.
- Target uniformity of lighting, per the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13):
    - Ratio of average to minimum values across the task surface (not including corners or far edges) should be < 1.4 : 1.
    - Lighting that is uniform tends to reinforce impressions of space, alertness and visual clarity.
    - Uniform lighting allows for flexible classroom use, as it does not favor any instructional orientation or furniture placement. This is especially important in mixed-use, multi-nodal classrooms with no specific "front" where a teacher may lecture from any location in the room.
    - Classroom material finishes:
        - Matte finishes are ideal to diffuse light and minimize reflected glare. Satin finish is an acceptable compromise, but avoid gloss or semi-gloss finishes throughout.
        - Horizontal work surfaces (desks, lab benches,etc) = 25% - 40% reflectance to provide comfortable contrast as surround to white paper or computer tasks. Horizontal work surfaces shall be non-glossy to avoid distracting reflections from windows and overhead lights.
        - Ceiling = minimum 70% reflectance (higher % is better)
        - Walls
          80% reflectance @ window walls (to reduce contrast between windows and adjacent surfaces)
          60%-70% reflectance @ non-window walls
          Small accent walls with color/darker reflectance is acceptable if limited to 10% of any student's visual field.
        - Floors = as light colored as practical

FLEXIBILITY OF USE

- Instructors shall have the ability to control lights locally to set the classroom into various, preset "lighting scenes" to accommodate a variety of learning configurations and/or modes. The lighting scenes could adjust the brightness of lights, the distribution of light within the space (i.e. perimeter -vs- center of room -vs- wall illumination), and the color temperature of light. Suggested preset scenes include the following:
    1. Typical lecture / test taking (same scene could

also be used for "welcome" and "departure" modes)
2. Small group work
3. Classroom group discussion (i.e. sit in a circle)
4. Meditation
5. A/V (i.e. projection)
6. Off

- In addition to preset lighting scenes, the instructor can manually adjust light levels and color temperature via a local controller (i.e. keypad) or smartphone/tablet interface. A smartphone/tablet interface also provides individual fixture control.
- Instead of relying on traditional, hardwire circuiting for control zones, all fixtures are wired to general power and receive illumination/dimming instructions via an individual digital address to each fixture location. Refer to the diagrams of lighting control zones in the appendix. This digital address feature allows lighting to adapt to different teaching modes and room configurations independent of fixture circuiting.
    - Digital addressing allows for daylight-responsive dimming adjacent the windows as required by California Title24 building code), but also the ability to immediately reassign these SAME daylight-responsive light fixtures to different control zones at night or during A/V (i.e. projection) mode when daylight is no longer a variable in the lighting controls.
    - Digital addressing allows for selective tuning (i.e. dimming) of light fixtures located in the center of the room to improve uniformity of task lighting throughout the space. Without this capability, desks in the center of the room will receive higher light levels than those at the perimeter.
- Independent control of wall illumination in medium and large classrooms:
    - In medium classrooms, localized wall illumination is provided at the primary "front" wall to allow use of the writeable surfaces in parallel with the short-throw projectors, while general room lighting is dimmed.
    - In the large classrooms, wall illumination is provided on 3 sides (all walls except the window wall) to increase the sense of spaciousness and provide additional flexibility of use akin to an auditorium. Additionally, localized wall illumination is provided at the primary "front" wall to allow use of the writeable surfaces in parallel with the short-throw projector, while general room lighting is dimmed.
- One exciting, new development in classroom lighting involves the adjustment of lighting spectrum (the color temperature of white light, aka "tunable white") based on learning objectives and/or time of day.
    - A quick definition of color temperature (aka CCT) relates to the "warmth" or "coolness" of white light and is available in architectural lighting equipment between 2200K – 6500K color temperature. Common examples experienced everyday include:
        - "Warm" color temperature: Candlelight (1800K), Incandescent light bulb (2700K)
        - "Neutral" color temperature: Typical office/school lighting (3500K)
        - "Cool" color temperature: Office / school / retail lighting (4000K), Sunny day (5000K), Overcast / cloudy day (6500K).
    - Technology to change electric lighting color temperature is available today, though this involves a small cost premium over a comparable lighting system fixture with a single color temperature. Refer to the case studies on "tunable white" lighting in the appendix. As stated in the September 2017 Department of Energy elementary school case study of tunable white lighting … "Like other classroom upgrades (better furnishings, better instructional technology, better air quality, etc.), the justification for color-tunable systems needs to include non-energy benefits related to a better learning and working environment, possibly linked to student learning outcomes, teacher satisfaction and retention, and human health impacts."
    - Users can assign preset scenes for specific color temperature settings, as well as have real-time override of color temperature settings (i.e. incremental changes to "warmer" or "cooler" settings). In addition, users will have independent control of light fixture dimming (aka intensity) from the color temperature.
    - Examples of preset color temperature scenes include the following. See "Sample Product Cutsheets (Lighting), BLT Series Tunable White" in the appendix for photos of these example lighting scenes:
        - General / Welcome: 4200K color temperature provides a moderate cool white light for an active environment of students arriving or departing class.
        - Testing: 3500K provides a neutral white light (neither warm nor cool) that is good for test taking where students may be seated for extended duration and highly focused.
        - Reading / Calming: 3000K provides a warm, residential color of white light suitable for quiet reading or conversation. Ideally suited for students engaged in quiet group conversation or other activities where the instructor wishes to impart a calming / soothing environment.
        - Energy: 5000K color temperature is a noticeably cool color temperature (akin to daylight) that is useful to counteract

fatigue in the classroom such as during a post-lunch dip / late afternoon. This color temperature is a bit extreme for normal classroom operation and is best reserved for times when the students appear sluggish.

- The influence of lighting spectra on human behavior and health is a highly active area of research. Much of the health-related research involves office workers, hospital workers/ patients, or assisted living residents that spend a majority of daylight hours within a closed environment, with the goal of syncing color temperature and intensity of indoor electric lighting with the daylight cycle and human circadian (bodyclock) rhythms.
- The focus of such research involves improving sleep quality, with the theory that better quality sleep = better mood / focus / alertness / overall health = better performance and productivity metrics as well as decreased injuries in assisted living facilities.
- Given the relatively short time that students and teachers will spend in any classroom, we've focused on research related to behavioral impacts of tunable white lighting systems for the Diablo Valley College Classroom Standards. Within educational facilities tunable white lighting has been primarily tested in K-12 schools though research observations can be applied to the college level.
- Within a classroom environment, suggested uses of tunable white lighting include the following. In effect, the adjustment of lighting color temperature (in addition to dimming settings) can quickly adjust the personality of a classroom to best suit upcoming activities.
    - Encourage student behavior/mood such as calming, focused, engagement, alertness. In effect, changing the color temperature of light incorporates aspects of "nudge theory" of behavioral science, giving behavioral cues to the desired teaching goals. Teachers can be proactive in terms of setting the classroom lighting environment (color AND intensity) appropriate to the learning task.
    - The aspect of variety in a classroom environment is undervalued in this author's view. Lighting cues (such as change in color temperature or intensity such as found in a theater) can facilitate transitions between class activities or class periods, helping to maximize time for learning by focusing the students when class or the next task starts.
    - Morning/daytime classes could be set with cooler color temperatures (4000K or above) to support human circadian needs and work in sympathy with available daylight, while evening/night classes could be set with warmer color temperatures (3000K or lower) to set a proper mood akin to the late hour of class. Conversely, one could employ cool color temperature (5000K) during an evening class to energize the students.

DURABILITY/ LONGEVITY

- Fixtures shall be easily maintainable
    - Compatible with 2x2 ceiling grid for easy access
    - Require minimum cleaning through the use of sealed light diffusers and optical compartments that restrict ability for dust and bugs to settle.
    - Minimum rated life of 60,000 hours per IESNA TM-21 criteria @ L70.
    - Field-replaceable LED engines and drivers/ power supplies, with access to LED engines and drivers from below the fixture or within the plenum (without the need to demount the fixture from the ceiling grid).
- Future-proofing of the lighting
    - Digital addressing of fixtures (explained above) allows for easy reconfiguration / revision of control zones without need for rewiring.
    - Tunable white lighting follows advancements in research in behavioral science and health impacts of lighting on humans (i.e. the impact of light spectra on occupant mood, alertness / wakefulness, and teacher/student engagement).
        - Tunable white lighting is another tool (in addition to overall brightness and distribution of light) that quickly changes a classroom focus and mood at the push of a button.
        - For classrooms lacking natural light / daylight, tunable white lighting is a useful tool to help sync occupant's expectations for time-of-day and provide variation throughout the class period to keep students engaged.

DAYLIGHT

- Daylight in a classroom environment brings physiological and psychological benefits to students and teachers alike.
    - Daylighting can impact people and spaces by providing sensory stimulation (dynamic variation in intensity, color, direction and quality of daylight), connection to nature, time/weather information, full-spectrum light, and an indirect component of light on walls and ceilings that leads to improved modeling of people and spaces and informs a pleasant and comfortable visual environment.
    - Variability in daylight is an important factor

in countering low-level sensory deprivation (i.e. sleepiness, loss of focus/attention, etc.) that could result from being in a windowless, unchanging environment for extended periods. Seasonal and time-of-day variations also enliven and animate interior environments.
    - Daylight apertures allow occupants to occasionally view distant objects outside the classroom that relaxes eye muscles and eases discomfort. Prolonged close viewing stresses the eye muscles while distant viewing causes the eye muscles to relax. The direction of any view to the outside should be widely separated from sightlines to visual tasks (to prevent distraction and/or excessive contrast in one's field of view).
- Research in educational environments suggest a positive impact that daylight may have on student learning rates and test scores. Refer to studies on daylighting in schools in the appendix.
- Daylight design in classrooms requires a balance between the benefits of incorporating daylight (bright, variable, full spectrum light, views to the outside, connection to time of day/weather, energy savings from turning off/dimming electric lights) -vs- user comfort (glare control and unwanted solar heat gain). Emphasis on user comfort is extremely vital to daylighting success.
    - Fenestration (windows, clerestories) are best placed parallel to student/teacher sightlines when classroom desks are set in Lecture Mode. Refer to daylighting diagrams in the appendix.
    - Given the Diablo Valley College Classroom Standard intentionally does not have a pre-assigned "front" of class, recommendations on fenestration types/locations are provided based on a classroom's solar orientation (North, South, East, West) and student/furniture orientation within a typical classroom.
    - Direct sun exposure onto task surfaces (horizontal or vertical) is to be avoided / mitigated as this may lead to visual distractions and/or discomfort.
    - Classroom furniture layout should be arranged so that students do not directly face windows as this may cause visual comfort (excessive contrast) or distraction.
    - Avoid placing whiteboards/writeable surfaces on walls directly opposite windows (clerestories are an exception) as this may cause a veiling reflection on the whiteboard that severely limits visibility by students. If writeable surfaces opposite windows cannot be avoided, window shades will help mitigate veiling reflections on the whiteboard.
- Shading system
    - During A/V mode window shades shall be deployed to darken the room (in addition to dimming of general lighting).
    - Full, black out conditions not recommended due to excessive visual contrast between the projected image and the ambient environment. A common practice is for light fixtures over the screen area to be turned off, and all others operated at a low level sufficient for note taking.

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04
SMALL CLASSROOMS

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Small Classrooms at DVC are those with 30 student stations. This classroom size is used to mainly instruct English and Communication courses. The types of activities range from all-class discussions to smaller group discussions. Some group discussions require students to collaboratively work on a project/ deliverable together while others are simple dialogue exchanges. The intimate size of the small classroom also lends itself to skill building where faculty are able to assess student comprehension of key concepts.

The room is equipped to support a variety of activities and settings, which require a range of lighting levels, analog/ digital displays and interactive lecture display/ annotation capture capability. The use of energy efficient equipment with automated controls helps improve performance and conserve energy. Due to unknown conditions of the exterior wall/ fenestration pattern of the specific project these standards will be applied to, clerestory windows for natural daylight are proposed as a baseline in the classroom layout.

The room is also equipped with surface-mounted, floor raceways along the perimeter and the central area which terminate in access points that can be located throughout the learning space to support a variety of activities and settings.

Hard-wired media access points for plugging in the instructor/ student devices are distributed at three locations (2 wall and 1 floor) in the room.

The proposed classroom inventory aims to be durable, flexible, adaptable, and playful (using the range of colors available for the various products). It consists of nesting chairs on casters and glides to enable free movement; flip-top stackable tables on casters with integrated power outlets to provide maximum flexibility within the space; multi-modal instructor station with lockable storage on casters to provide mobility and a range of teaching postures; and writeboards with seamless short throw digital projection system to integrate active teaching. Accessible furniture, similar to the rest of the classroom inventory, is integrated within the space to eliminate segregation and foster collaboration amongst students. Generous circulation space is provided within the classroom to allow for a wheelchair to freely move in the space.

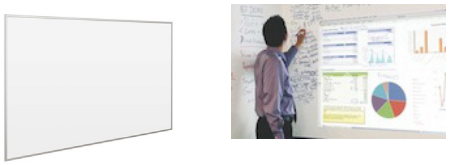
As the maximum classroom occupancy is less than 50 per design standards and code (Refer CBC Table 1004.1.2 - Maximum floor area allowance per occupant for 'Classrooms'), one exit is required (Refer CBC Table 1006.2.1).

CLASSROOM INVENTORY**

CHAIR (1)
Movable on 4 legs (2 casters & 2 slide)
Foldable/ Nesting
Mesh back and Fabric/ Vinyl Seat
Arm/ Armless

TABLE
Foldable/ Nesting
Movable on Lockable Casters
Integrated power outlet
ADA compliant

INSTRUCTOR STATION
Integrated workdesk/ podium with option for larger podium work area
Un-tethered/ On Casters
Integrated power outlet
Adjustable Height of desk and podium worksurface
ADA compliant



WRITEABLE SURFACE (1)
Projection & Dry-erase

***Refer to the Appendix for sample product cutsheets.*

ROOM DATA SHEET (SMALL CLASSROOM)

AREA	810 ASF.
STUDENT STATIONS	30.
PLANNING PARAMETER	27 ASF/ Student.
ROOM PROPORTION	Length : Width ~ 1.1x : 1x
MINIMUM CEILING	10'-6".
FUNCTION	Interactive Lecture / Skill Learning and Collaborative Group work/ Skill Application.

SPECIAL REQUIREMENTS

CEILINGS**	Suspended acoustical ceiling system with smooth texture, light reflective, impact/scratch resistant, 2'x2' or 2'x4', white tiles and tegular lay-in grid, minimum NRC rating of 1.0 (Optima by Armstrong or similar).
WALLS**	Full height metal framing with drywall on both sides. Insulate interior of all wall cavities with non-cellulose sound blankets. At partitions facing corridors, use staggered double studs. *(Upgrade: Full-height glass walls at corridors with translucent writeable film.)* Writeable Surface: High-performance dry-erase whiteboard on all walls as per window layout. 3'-0" minimum bottom of board with 1" x 4" wood marker tray (see sketch detail in layouts). Use high-performance dry-erase and projectable whiteboard for walls with Interactive Short Throw Display Projectors. Paint (Field): Semi-gloss interior paint, No VOC. Use accent color if desired. Base: Resilient, pre-molded corners and straight at carpet flooring.
FLOORS**	4" Raised access floor system with 2'x2' base tiles finished with 2'x2' carpet tile. (Tate ConCore Understructure/ PosiTile Carpet or similar). Carpet tile equal or greater than 10 stitches per inch, yarn weight of 20 to 30 ounces, stain/moisture/wear resistant, impervious type backing material, anti-static, UL Class A.
WINDOWS	Energy-efficient, transparent glazing to provide access to daylight and minimize heat loss or gain. Provide automated solar shading (Mechoshade or similar) to control light and glare while projection equipment is in use. Integrate controls with other AV controls. The exterior wall and fenestration pattern may vary on a project by project basis, hence, clerestory windows are shown as a base in the classroom standard layouts. The clerestory is suggested as a baseline for pricing, so that there is a budget allocation to begin with, which affords a certain allowance for glazing to be integrated. Each room will be particular with regards to existing condition, location on campus, and other considerations so the clerestory is certainly not seen as a final decision. The benefit of the clerestory is that it allows writable surfaces to be maximized.
DOORS	36" wide minimum, solid core, wood doors with narrow vertical tempered glass vision panel and hollow metal frames. No transfer grills or kick plates.
HARDWARE	Mechanical lever locks with means of interior locking (push button) for security. (Upgrade) Electronic locks with mechanical (push button) override from the inside with capability to tie into campus-wide security system. All electronic locks to be placed on the door and not the wall. Door hardware groups across various campuses shall be specified to provide a secured environment during a lock-down scenario, in particular by providing an interior override function as well as remote and local lock down. For existing general-use classrooms, replace mortise style

***Refer to the Appendix for example product cutsheets.*

with hotel style deadbolt locks similar to Corbin Russwin ML2013. For new construction of general-use classrooms, use Corbin Russwin CL 3351 or 3129 series. Where required, electrified locks, including those with HID card access, shall include a push button to override the card access on the exterior, similar to Sargetnt IN120 and IN220 HID, or Schlage AD-400 series. For large classrooms (over 90 students), crash bars must provide a means to override the dogged down feature and electronic lock open feature with a mechanical thumb turn device, similar to Von Duprin crash bar with 2SI feature.

HVAC

Recommended Temparature Range: Summer 74F +-2F / Winter 70F +-2F or per campus standards.
No additional humidity control may be required if RH is within acceptable condition per AHSRAE 55 thermal comfort and not required by Campus.
Low velocity air flow diffusers, especially when corner screen is provided to avoid agitating the screen. Lockable thermostat zone control.
Provide wall mounted zone temperature sensor with LCD display including room temperature, room CO2 level, temperature setpoint control, and after-hour override timer control with user adjustable duration.
Zone occupancy to be monitored by connection to the lighting occupancy sensors.
Where HVAC return paths to classrooms are not ducted, acoustical boots should be used to maintain the composite sound isolation performance of enclosing assemblies.
Ensure that mechanical systems adhere to the guidelines provided in the latest version of the Noise and Vibration Control chapter in the ASHRAE HVAC Applications Handbook.
CO2 Sensors for Demand Control Ventilation required per California Energy Code.
AV rack and laptop storage carts are located in closets outside the classroom. If they are located in the room, provide supply and return passthrough to remove additional heatload in the room.

PLUMBING

Automatic fire sprinklering system as required by California Building Code. Do not route plumbing through or near classroom areas.

LIGHTING

GENERAL REQUIREMENTS

- Target light levels, per the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13):
    - Horizontal illuminance @ desk height, 2.5' above finished floor = 500 lux (50fc) average throughout classroom to accommodate a wide range of tasks/uses (15fc for computer use, 40fc for paper tasks/reading, 50fc for art or science projects).
    - Vertical illuminance @ white board (i.e. vertical writable surfaces) = 300 lux (30fc) average.
    - Vertical illuminance @ pin-up walls (aka "tack board") = 150 lux (15fc) average.
    - Vertical illuminance @ background walls (not writable surfaces) = 150 lux (15fc) average.
    - In many situations the classroom/task light levels may be lower (such as A/V presentations or computer use), but the lighting system must be able to achieve average light levels noted above upon demand.
- Emergency egress lighting shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured at floor level throughout the room (since path of egress varies for different room layouts).
- Light fixtures and controls shall provide simple and affordable solution for classroom lighting.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Daylight photosensors and occupancy/vacancy sensors may be provided by 3rd party manufacturer, but shall be fully compatible with classroom light fixtures and warrantied by the installing electrical contractor.
- All LEDs used in the LED light fixture shall be of proven quality from established and reputable LED diode manufacturers with minimum 5 years experience in the manufacture of LED diodes. LED light fixture supplier shall have minimum 5 years experience designing, selling and supporting installations of LED systems.
- All light fixtures and control gear shall be UL-listed (or equivalent by ETL / CSA) for indoor locations.
- Manufacturer of LED systems shall utilize an advanced production LED binning process to maintain

***Refer to the Appendix for example product cutsheets.*

color consistency within a 4-step MacAdam ellipse per ANSI Standard C78.377 within all luminaires unless otherwise specified.

- Manufacturer shall provide photometric data for all light fixtures based on test results from an independent testing lab including candlepower distribution data in polar graph form, total lumen output per light fixture, and total wattage per light fixture.
- Contractor to consult with the owner and provide if required, back-stock of all led power supplies/ drivers in a quantity to the owners' preference.
- All lighting equipment (including but not limited to light fixtures, LED drivers/power supplies, control interfaces, user interfaces, daylight photosensors, occupancy/vacancy sensors) shall be furnished with 5-year warranty for full replacement (materials and labor) effective from the date of substantial construction completion.
- All electrical lighting shall follow the latest applicable codes and standards (see Appendix for lighting code summary):
    - 2016 California Building Standards Code ("Title 24")
        Part 3 Electrical Code – Installation requirements and egress lighting levels.
        Part 6 Energy Code, Subchapter 4 – Lighting control and dimming requirements.
        Part 6 Energy Code, Subchapter 5 – Energy use (Lighting Power Density)
        Part 9 California Fire Code, Section 1008 Means of Egress Illumination
    - CalGreen Building Standards Code (Part 11 of Title 24)

LIGHTING FIXTURES**

2' x 2' General Light Fixture

- Shall be 2' x 2' square and work within a standard 2' x 2' suspended ceiling grid system. Acuity 2BLT2-40L-ADP-120-EZ1-LP935-N100-LATC or similar for fixed 3500K color temperature. *(Upgrade) Acuity 2BLT2-TUWH-PROR-40L-ADP-120-NLT-LATC or similar for tunable white option.*
- Emergency Lighting fixture shall be same Acuity 2BLT2-40L fixture as others in classroom, but shall incorporate EL14L (1400 lumen) battery pack.
- Light fixture appearance shall have design-neutral aesthetics with clean, refined details to blend into the ceiling. Expressive design statements are discouraged from the general lighting fixtures.
- Powder coat, white finish.
- Minimum rated life of 60,000 hours per IESNA TM-21 criteria @ L70. LED fixture manufacturer shall power the LED diodes at a drive current recommended by LED diode manufacturer to reach minimum 60,000 hour rated life @ L70. LED diodes shall not be "overdriven" at a higher drive current to increase light output to detriment of rated lamp life.
- Field-replaceable LED engines and drivers/power supplies, with access to LED engines and drivers from below the fixture or within the plenum (without the need to demount the fixture from the ceiling grid).
- Sealed light diffusers and optical compartments that restrict ability for dust and bugs to settle within the fixture.
- Fixture provided with a range of fixed lumen outputs ranging from 3000 – 5000 lumens per fixture (@ 3500K) to accommodate classroom ceiling heights ranging from 9'-0" to 12-6". Upon implementation, project design team is responsible for specifying the fixture's lumen output to achieve the required light levels as noted within the Design Standards document.
- For tunable white option, fixture shall provide consistent lumen when varying the color temperature (i.e. constant lumen curve).
- Nominal 4,000 delivered lumens @ delivered lumens per watt (LPW) > 100 LPW.
- CRI = 80+ (basic version) or 90+ (enhanced version) for light fixtures
- Color temperature = 3500K (basic version) or Tunable White with range from 3000K – 5000K (enhanced version).
- Spacing to mounting height ratio (S / MH) > 1.18 in any direction. Typical on-center spacing of 2x2 light fixtures is 8', though 10' spacing is permissible for ceiling heights 10'-6" or taller.
- To control glare to occupants, 2x2 light fixtures shall have the following performance requirements:
    Luminance < 4500 cd/m2 @ 45° above Nadir, <4000 cd/m2 @ 55°, < 3500 cd/m2 @ 65°, < 3000 cd/m2 @ 75°, 2500 cd/m2 @ 85°.
    Intensity < 1000cd at angles 50° or higher above Nadir.

- Dimmable to 5% light output without flicker or jumps in light output.

LIGHTING CONTROLS

General Description

- Acuity nLight system or similar for fixed 3500K color temperature. *(Upgrade) Acuity nTune system or similar for tunable white option.*
- Occupancy/ Vacancy sensor, required per Title24 building code, shall automatically turn off classroom lighting when room is unoccupied.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Light fixtures work together as a single network (within one classroom only) and does not require a centralized (whole-building) control system.
- The system is scalable to multiple classrooms by simply repeating the single-network model.
- Control system shall be easy to install, commission, and maintain. Fixtures and controls work together as a system with "out of the box / plug and play" connectivity.
- Digital addressing of fixtures (explained above) allows for easy reconfiguration / revision of control zones without need for rewiring.
- Classroom lighting control system shall be linkable with campus Building Management System (BMS).
- Classroom lighting control system shall be compatible with California's Title24 Demand Response requirements.
- *(Upgrade) Allows for individual fixture calibration for lumen output or color temperature (if tunable white) should a light engine require replacement or color shift (if tunable white) is observed over time.*
- Allows for integration of 3rd party light fixtures into the classroom lighting control system using industry-standard control protocols.

Emergency Lighting

- Designated 2' x 2' classroom emergency light fixtures (EM fixtures) shall be of same family, type, appearance, digital addressing capability, and lumen output under normal power operation as adjacent 2' x 2' classroom fixtures.
- EM fixtures shall be UL924 listed for emergency operation.
- EM fixtures shall operate as normal light fixtures when normal power is available (i.e. they can dim or turn off according to preset scenes or user override). The EM fixtures shall automatically override to emergency-mode light output (1400lm) upon loss of normal power via automatic transfer to the specified battery backup power source.
- Upon loss of normal power, EM fixtures shall operate with 1400 delivered lumens for a period not less than 90 minutes.

User Controls

- All user controls shall be mounted within the acceptable range for ADA compliance, namely 36" on center, above finished floor.
- Instructor access to lighting controls via localized keypad mounted at instructor station and/or classroom wall.
- *(Upgrade) For tunable white feature, provide side-by-side (double gang) keypad with one keypad hosting preset scenes, and second keypad hosting independent control of color temperature and light level/intensity/dimming for the selected scene.* See "Sample Product Cutsheets (Lighting), Tunable White" in the appendix.
- Preset scenes are customizable by school administration.
- Lighting controls shall permit additional interface/coordination with the classroom A/V control system to automatically control lighting in connection with A/V actions (such as turning on projectors, projection screen and window shade deployment, etc.)

Digital Addressing

- All classroom light fixtures shall allow for individual fixture addressing (aka digital addressing) that is independent of power/control wire configuration.

- Digital addressing features shall allow for individual fixture control of intensity and *(upgrade) color temperature (if tunable white)*, as well as grouping of light fixtures (via software) into control zones that are independent of power/control wire configuration.
    - This feature shall permit individual fixtures to be within MULTIPLE control zones, and such control zone grouping to CHANGE depending on the selected lighting scene.
    - This feature shall permit onsite calibration of individual fixture's lumen output (via software) to balance uniformity of light levels throughout a classroom.

Lighting Control Sensors

- (1x) Acuity daylight photosensor or similar and (1x) Acuity dual technology (PIR and Ultrasonic) occupancy/vacancy sensor or similar. Each single sensor can control multiple fixtures in the classroom.
- Specified light fixture shall offer (as an option) a daylight photosensor as well as an occupancy/ vacancy sensor integral to the light fixture. Each integral sensor can control multiple fixtures in the classroom.
- Compatibility with 3rd party sensors if needed (such as daylight photosensors or vacancy sensors) via hard-wired OR wireless communication.
- Occupancy/ Vacancy sensors for light fixtures shall also trigger HVAC operation (or vice-versa)

ACOUSTICS

SOUND ISOLATION

General Description

- The noise generation potential at all classroom adjacencies should be carefully evaluated when determining the acoustical requirements of both vertical and horizontal classroom partitions. For classrooms that must be located adjacent to spaces expected to generate high sound levels such as music practice/performance rooms, stairwells, elevators, mechanical equipment rooms, active corridors and nearby lobbies, additional acoustical consideration should be paid the STC rating of the partitions, windows and any communicating doors.

Walls

- In general, the sound isolation across the partition will depend on several factors. The primary factor will be the STC performance of the partition assembly itself. Other factors include whether there are doors or windows between the rooms and penetrations such as ductwork and piping. Consideration of these various factors as well as choice of construction systems and methods and cost will ultimately dictate the recommended wall assemblies, type of door gasketing, glazing size and selections, and ceiling systems.
- For the base condition, the walls surrounding the classrooms should be full-height (i.e. slab-to-slab) and achieve a minimum acoustical performance rating of Sound Transmission Class (STC) 50 or Noise Isolation Class (NIC) 45.
- For classrooms adjacent to loud spaces such as lobbies, band rooms and mechanical rooms, a special assessment should be performed to determine the required minimum STC rating of the partition. Depending upon the specific adjacency, the expected range of performance is STC 55 to 60.

Doors

- For the base condition, all classroom entry doors should be fully acoustically gasketed at the jambs and at the bottom. Typical adjacencies such as to a private office or a vestibule, should also include a fully acoustically gasketed door.
- For classrooms that open onto a primary circulation corridor or lobby, the doors should have a minimum acoustic rating of STC 35. For communicating doors between classrooms, specify STC 45 to 50 or greater depending upon the specific adjacency.

Floor/Ceiling Assemblies

- Where classrooms are located below active and potentially noisy spaces, the floor/ceiling assembly should be designed to achieve minimum:
    - Air-borne Sound: STC 50
    - Impact Noise: IIC 45

- For air-borne sound attenuation, an 8" minimum thickness concrete slab with suspended lay-in ceiling will achieve a minimum STC of 50. For wood framed construction, use of light-weight concrete and resilient isolation clips such as resilient channel at the ceiling gypsum board will likely be necessary.
- For impact noise attenuation, carpet without any additional acoustical treatment is conditionally acceptable. Areas with significant amount hard finish will require an additional sound-attenuation underlayment such as rubber or cork.

Exterior Façade/Windows

- Classrooms potentially exposed to excessive outdoor noise sources such as roadway traffic and air-craft flyovers will require an environmental noise survey in order to determine the minimum STC performance requirements of the windows and wall.
- The standard noise level criteria for all classroom due to exterior/outdoor noise sources should be a 15-minute average noise level of 35 dBA (Leq) or less and a maximum noise level of 50 dBA (Lmax-Slow).
- Where the outdoor noise level is found to be 60 dBA or greater, the mechanical air-ventilation system in the classroom must be designed so that the fresh-air requirement can be achieve with operable windows in the closed position.

ROOM ACOUSTICS

The overall acoustical finish scheme in the classrooms should control excessive sound reverberation and support excellent speech-intelligibility.

Base Classroom Design

- Reverberation Time (RT60 at 500 Hz): less than 0.6 sec
- The ceiling is the most cost-effective surface to consider for locating the primary acoustical finish. Typically, a lay-in tile ceiling having a minimum NRC 1.0 such as Optima by Armstrong or similar should be considered.
- Sound absorbing wall panels should be considered as follows:
    1. Wall panels should have a minimum acoustic performance of NRC 0.75 and be at least 2" thick.
    2. Where possible, apply acoustical wall panels on at least one surface of each pair of parallel walls and in the wall area between seated and standing ear height. See layouts for recommended locations of wall panels.

Upgrade or Non-Standard Classroom Considerations

- *In the case where upgraded sound-isolation might require a "hard-lid" ceiling and where a dropped lay-in tile ceiling cannot be installed, then the exposed hard-lid ceiling should be treated with minimum NRC 0.80 and 2" thick acoustic panels.*
- *Sound absorbing wall panels should be considered as follows:*
    1. *When less than 100% of the ceiling area is not acoustically treated, then a remaining equivalent area of acoustical panels having should be applied to the walls.*
    2. *If "front-firing" loudspeakers are being considered, the wall opposite the loudspeakers should be fully covered with acoustical wall panels as feasible.*
    3. *If wood finishes are desired, consider perforated or kerfed acoustic panels having minimum NRC 0.80 such as by RGP Corporation, or slats or grills such as 9Wood Company.*
- *Acoustic treatments may also be required to minimize flutter echoes and control extraneous echoes.*

MECHANICAL NOISE/ VIBRATION CONTROL

- The noise level in the classrooms as generated by mechanical equipment (HVAC, Electrical, Plumbing, Elevator Equipment and AV equipment) should be limited to a maximum noise level of Noise Criteria (NC) 30 in the classrooms.
- All potentially noisy MEP and Elevator equipment located adjacent to, above or below the classroom, including fans, pumps and electrical transformers should be carefully evaluated for both air-borne and structure-borne noise and as required, acoustically treated and/or the intervening

***Refer to the Appendix for example product cutsheets.*

partition or floor/ceiling be acoustically upgraded.

- The air-velocity in ductwork located within the classroom should not exceed 800 fpm. The air velocity in the final branch-duct should not exceed the diffuser neck velocity by more than 150 fpm, unless otherwise noted. The air-velocity at the neck of each supply and return diffuser should not exceed 400 fpm.
- VAV boxes should be sized to limit the total pressure drop to 0.5-inches TSP or less and have both a radiated and discharge sound level of less than NC 30.
- FCU and VAV boxes with radiated noise levels greater than NC 30 must not be located in the ceiling over the classrooms.
- Flexible ductwork shall not be used on medium pressure duct systems upstream of VAV box connections.
- Sheet metal ductwork should be internally lined with 1-inch minimum thickness of acoustical duct-liner.
- Air-transfer boots should be constructed completely of acoustically lined sheet metal, include at least one 90-degree elbow and sized depending upon the degree of sound-isolation required and for maximum 500 fpm.
- Supply and return diffusers should be selected to perform no greater than NC 25.
- Ducts, pipes and conduit attached to vibration isolated equipment should include flexible or resilient type connections and may be required to be vibration isolated from the building depending upon proximity of the duct or pipe to acoustically sensitive spaces and the power of the attached equipment.
- The noise emission from AV Equipment should also be considered. Where noisy AV equipment is unavoidable and is needed to be located in the classroom, then sound-rated ventilated equipment racks should be considered.

AUDIO/VISUAL EQUIPMENT**

AUDIO SYSTEM

(Upgrade) Audio DSP (Digital Signal Processor): *QSC Core 110f or equal (Only required for capture/ conferencing)*

Loudspeakers: QSC AC-C6T or equal

Amplifier: QSC CMX300Va or equal

Wireless Microphone: N/A

Voice Lift: N/A

Assistive Listening: N/A

VIDEO SYSTEM

Minimum viewer distance to digital display (especially in lecture mode) should be equal to the width of the display screen/ projected image.

Projection:

Standard Projection: Panasonic PT-RZ770 or equal – 7000 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 1-chip DLP, Laser Source

Interactive-Short Throw: Epson Brightlink Pro 1460Ui or equal – 4400 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 3 LCD, with output capabilities for mirroring annotation and content onto a larger projection screen. Provide equivalent laser source model if available.

Projection Surface:

Motorized Screen: Draper Access V ceiling-recessed, tab-tensioned, motorized screen or similar for video projection sized 72.5”x116” for viewing from the back of the classroom. The bottom of the viewable image shall be at 4’-0”AFF. Screen material shall be Matte white or equal. *(Upgrade): Screen material shall be TecVision XH900X ALR (ambient light rejecting) or equal for use in moderate to higher ambient light and wider viewing angles.*

***Refer to the Appendix for example product cutsheets.*

Markerboard: Low gloss or matte surface white-dry erase board for interactive short-throw projection. PolyVision projection surface or equal.

Transport and Switching:
Video Matrix Switcher (location: main equipment rack):
Crestron DM-MD8X8 Digital Media Switcher
-Input Cards: (2) DMC-4K-HDCP2, (1) DMC-DVI, (1) DMC-4K-C-DSP-HDCP2
-Output Cards: (1) DMC-4K-HDO

Instructor Station:
Instructor Station Video Switcher: Crestron DM-MD8X1-4K-C with DM output for instructor station
Instructor Station Cable Cubby: Extron Cable Cubby 500
DVD Player: Denon DN-500 or equal at instructor station
Document Camera: Elmo P10HD or equal at instructor station
Wireless Presentation: Mersive Solstice or equal at main equipment rack

Capture/Conferencing (upgrade): Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.
PTZ Camera: Panasonic AW-HE40SWPJ with HDMI output (or equal) located on the back wall of the room.
Capture/Stream Unit: Extron SMP351 or equal (location: main equipment rack)
Conferencing Unit: Extron MediaPort 200 or equal (location: main equipment rack)
In-Room Computer: Dell or equal (location: main equipment rack)
Single Element Ceiling Microphone: (2x) Audix M55 or equal
(Upgrade) Ceiling Array Microphone: (2x) Shure MXA910 or equal

CONTROL SYSTEM
Control Processor: Crestron CP3N control processor or equal. The AV system shall be able to send preset recall signals to the master control units for window shades and lighting so these components can be controlled via one cohesive system (location: main equipment rack).

Touch Screen: Crestron TSW-760 7" Touch Screen on the wall and *placed at instructor's station (upgrade)*. Wireless control shall be configured for controlling the room via an app or laptop. Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.

UTILITY / OTHER
See layouts for recommended locations of data/power and hardwired AV connections.

A campus-standard instructor's station shall be provided. The instructor's station would include the DVD player, document camera, laptop connections, USB thumb drive connections for lecture capture, and other items as needed.

AV equipment shall be installed into a Middle Atlantic MRK-AXS or equal pull-out equipment rack stored in an AV closet located outside the room.

VOICE/DATA**

Six dual ports at wired AV station unless noted otherwise. Wireless internet access required throughout. (1) Wi-Fi Acces Ports: Aruba 220 series Acess Points or per current campus standards.

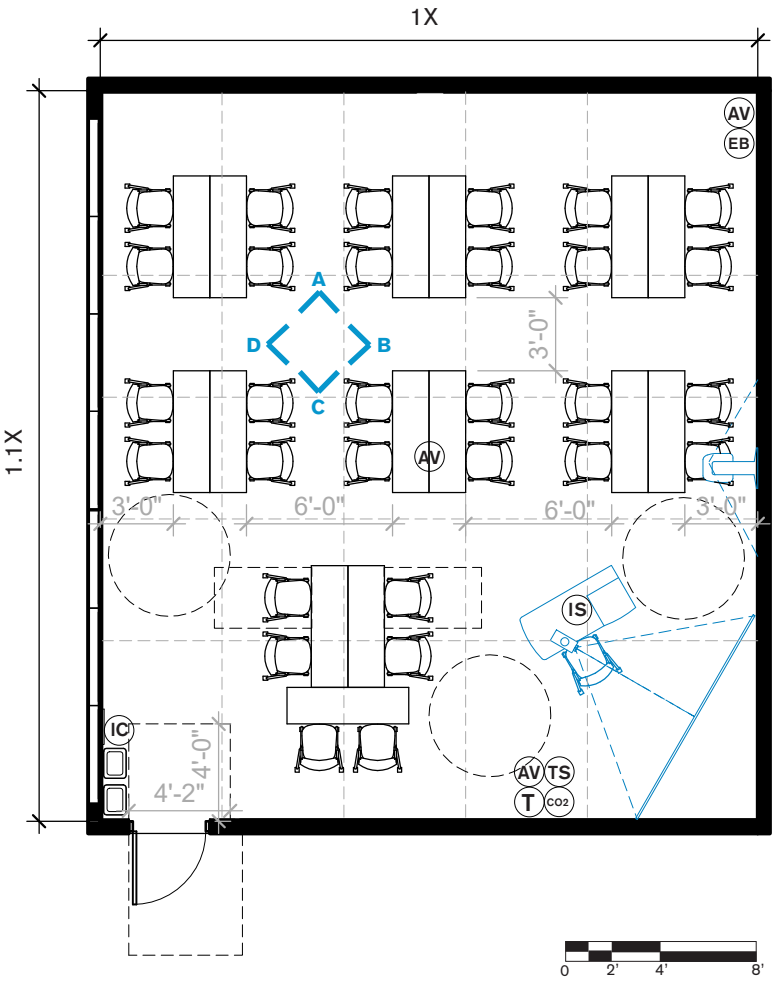
Provide CAT 6 or better connection for the wall mounted IP speaker/clock/ microphone as per campus/ district standard. No separate power conenction required for this product. System to tie into the Building Alarm System. Installation height 8'-0" AFF or as required by manufacturer's manual. Emergency call button (linked to the IP speaker alarm panel) at accessible height of 48" AFF located away from the exit door. See layouts for locations.

POWER

Provide wall power/data fourplex receptacles at +18" AFF, spaced 5'-0" on center. *(Upgrade) Provide continuous, perimeter wall mounted raceway for power/ data/ AV (below the marker tray at +35" AFF),*

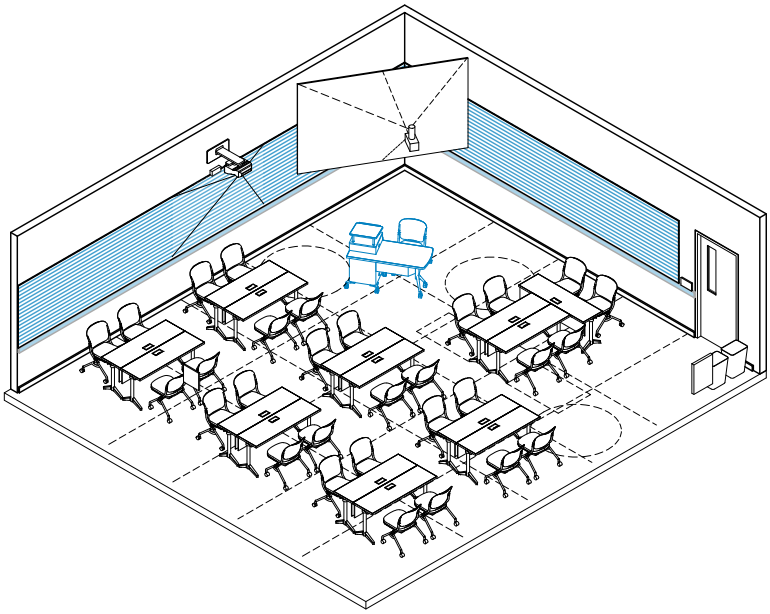
	cover color to match wall color. Receptacles in raceway to be duplex, 5'-0" on center. See layouts for conceptual detail sketch at raceway & writeable surface junction. Provide pop-up, flush-mounted, fourplex floor boxes at 5'-0" on center within the 4" high, raised floor system. Floor boxes fed either down the walls from above ceiling in existing classrooms or from below grade in new construction. Provide adequate power for video projector and other AV equipment. Provide additional outlets at Instructor's station for multiple devices. Provide a provisional recessed receptacle for a wall clock at 8'-0" AFF on one wall in the room, ideally the wall with the short-throw displays. Power for egress lighting will be provided by batteries integral to the fixtures as required to give the egress lighting levels stated. An option would be to provide power from a central battery/ inverter system. Using that option would depend on the building and/or classroom or assembly space type.
SECURITY**	Provide IP speaker with integrated wall clock for campus-wide emergency/ alerts per campus/ district standards. Provide adequate signage for safety instructions.
FURNITURE**	Provide products with active and flexible comfort capabilities while addressing concerns of Universal Design and minimum warranty requirements per campus/ district furniture performance standards.
OTHER CONSIDERATIONS	Do not locate classrooms near or below spaces with loud activities, high impacts and/or high sound pressure level sources, such as fitness areas or mechanical rooms. Do not locate classrooms near electrical transformers, stairwells, elevator shafts, or elevator equipment rooms. Minimize contrast ratio between classroom field and projection screen. Provide 16-gauge pre-notched backing stud with flange fastened with pan head sheet metal screws at partitions with wall-mounted equipment. Provide clear "permanent" use-instructions for furniture and technology in the classroom.
OWNER-PROVIDED SUPPLIES	Multi-pack, eco-friendly non-toxic dry-erase markers and erasers; cleaner spray.

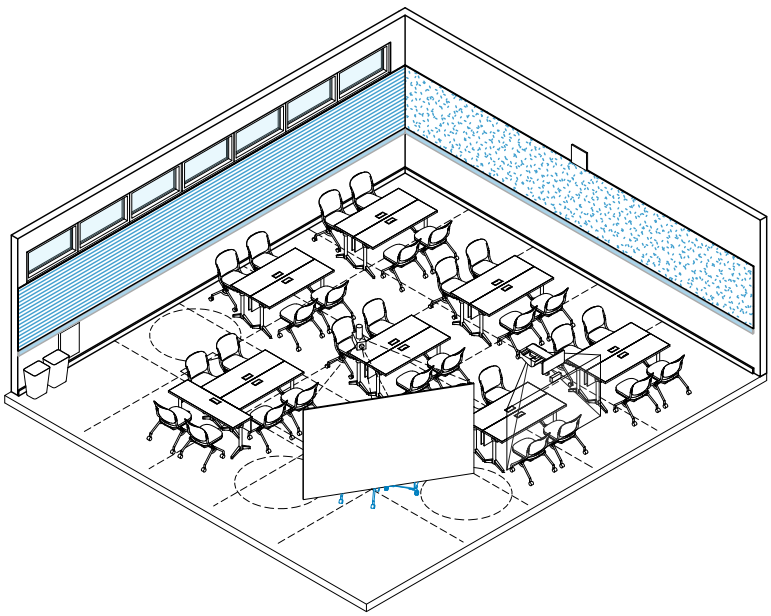
CONCEPTUAL DESIGN (GROUPWORK MODE 1)



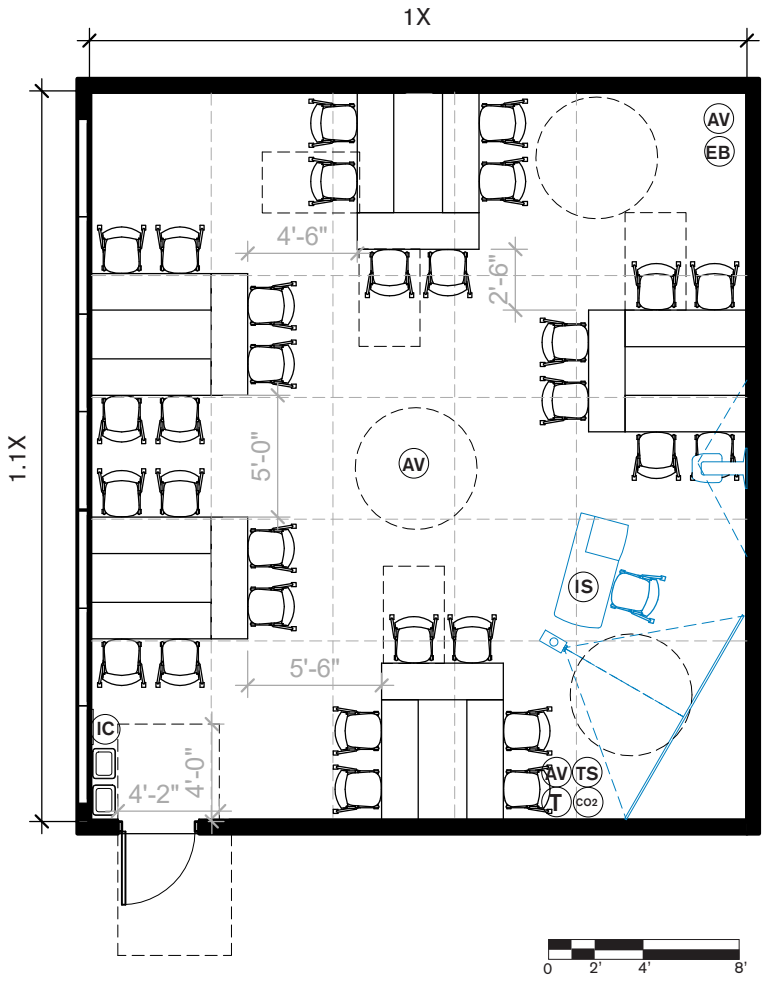
LEGEND

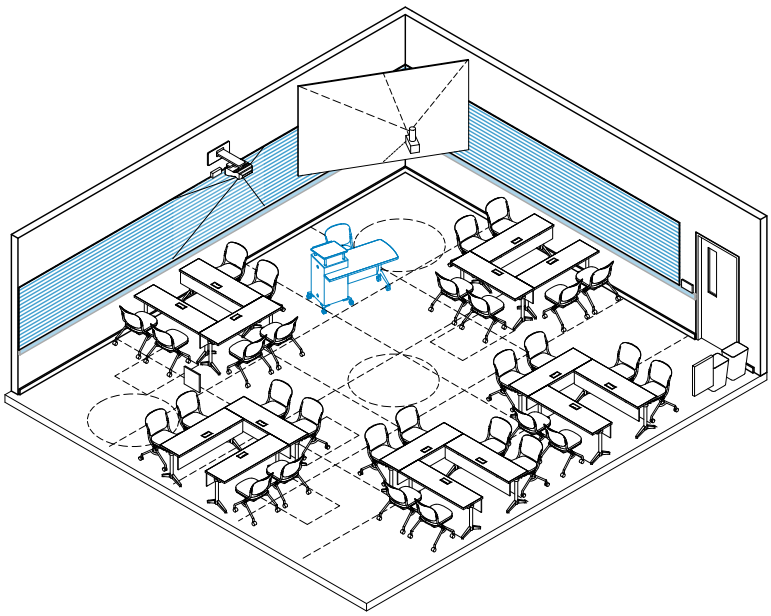
- IS — INSTRUCTOR STATION
- IP — IP SPEAKER
- EB — EMERGENCY BUTTON
- WR — WALL RACEWAY (UPGRADE)
- TS — TOUCH SCREEN CONTROL @48”
- T — THERMOSTAT
- CO2 — CO2 MONITOR
- AV — WIRED AV CONNECTION OUTLET
- IC — WALL HUNG CHAIR FOR INTERPRETER
- SC — STORAGE CONSOLE
- WRITABLE SURFACES
- ACOUSTIC WALL PANELS
- RAISED FLOOR POWER/DATA GRID
- SPRINKLERS
- S — SPEAKERS
- C — CAMERAS (UPGRADE)
- M — VOICE-LIFT MICROPHONES (UPGRADE)
- M — CAPTURING MICROPHONES (UPGRADE)
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2’ x 2’ LIGHT FIXTURES
- EM — 2’ x 2’ EMERGENCY LIGHT FIXTURES
- AIR DIFFUSERS

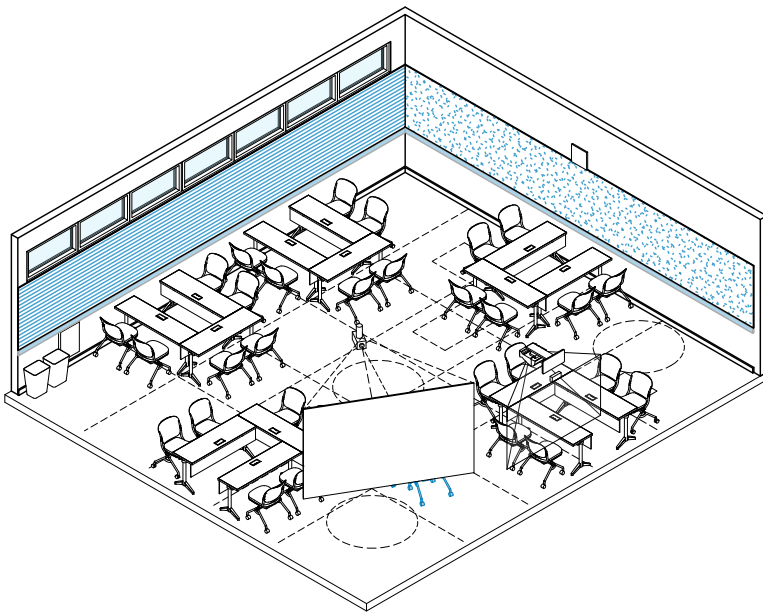




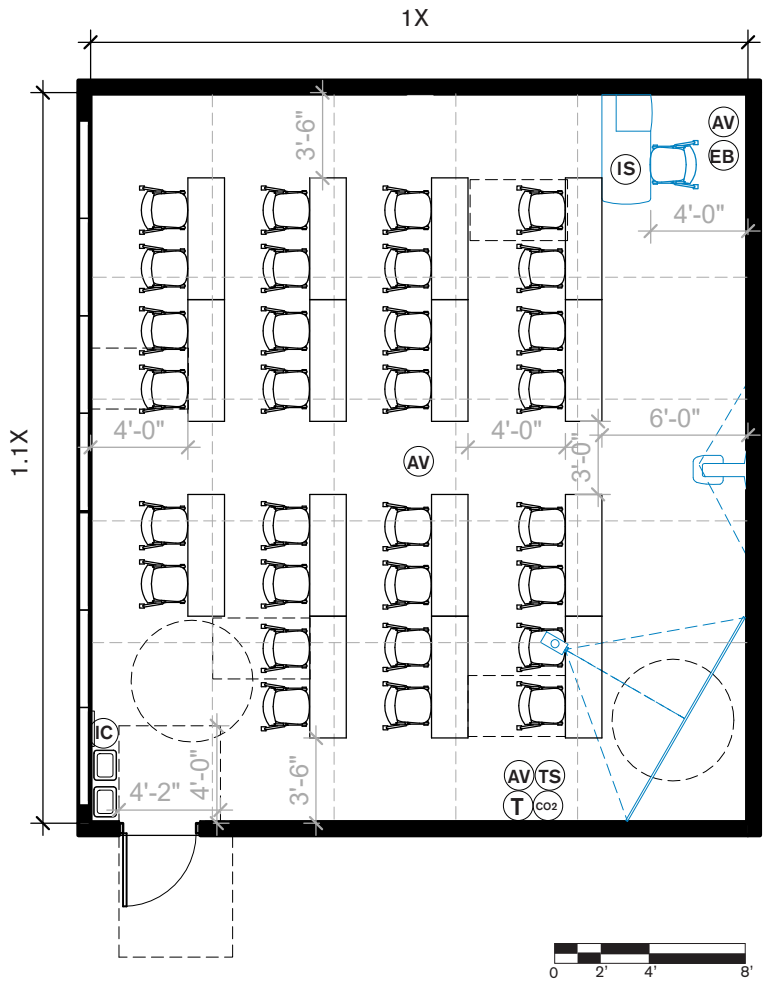
CONCEPTUAL DESIGN (GROUPWORK MODE 2)







CONCEPTUAL DESIGN (LECTURE MODE)



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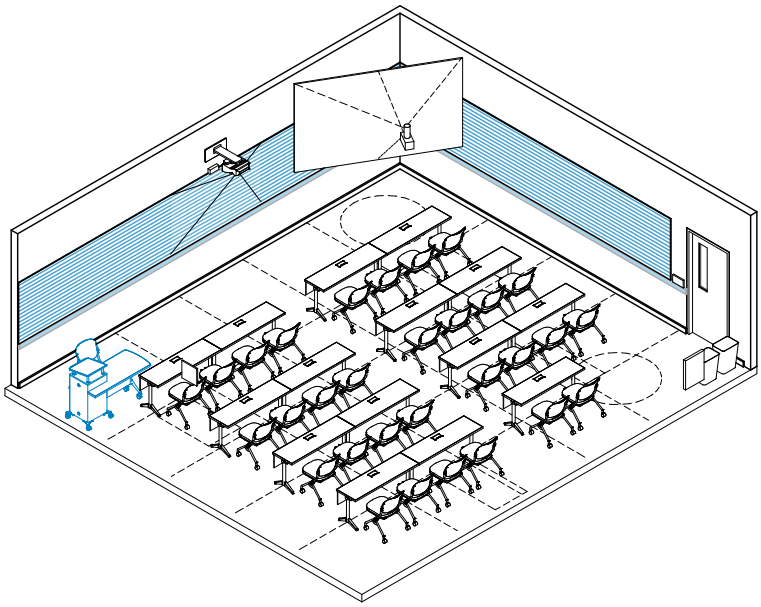
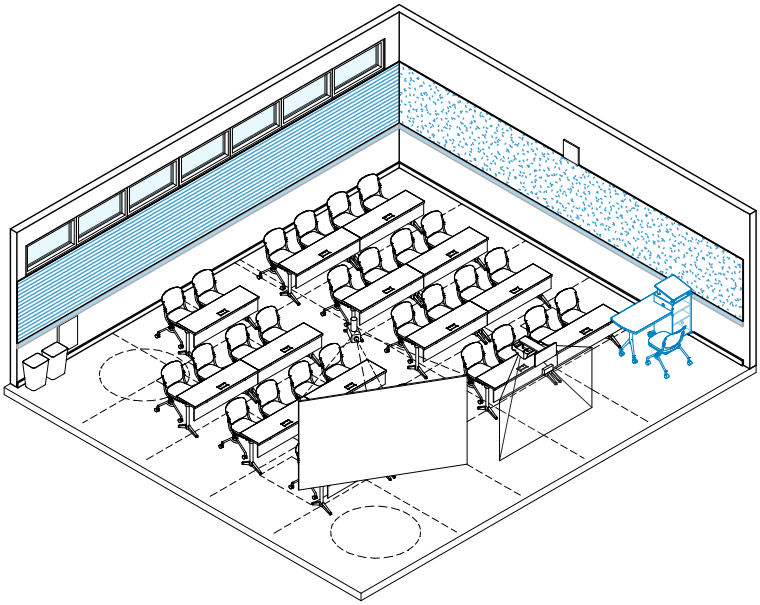
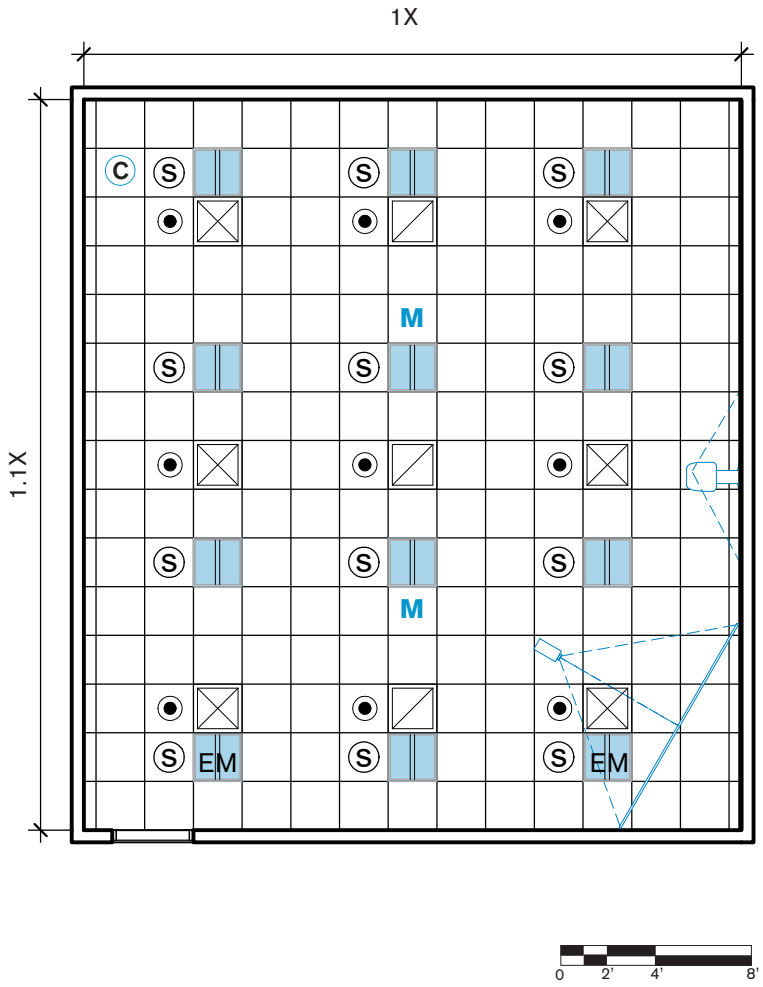




CONCEPTUAL DESIGN (REFLECTED CEILING PLAN)



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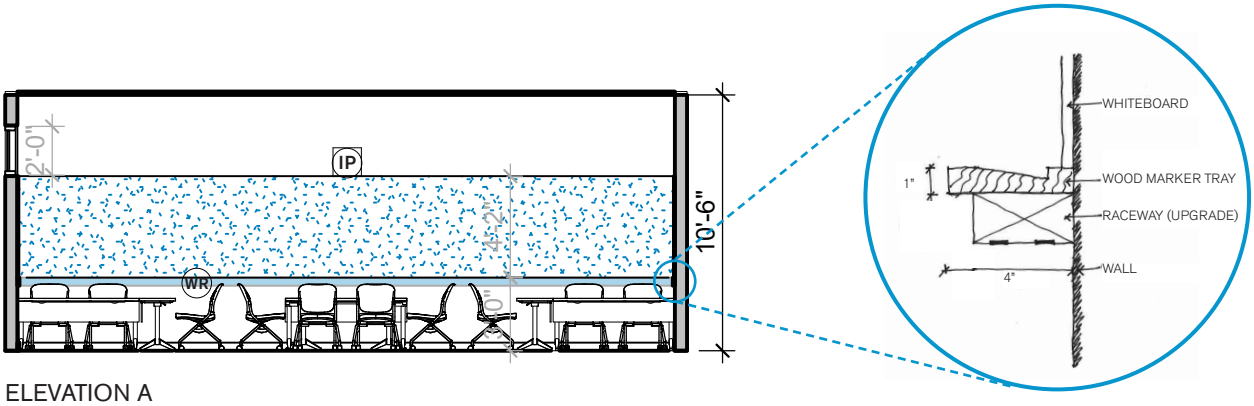
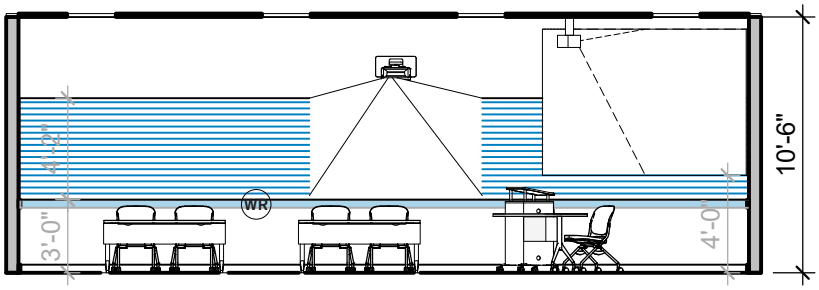
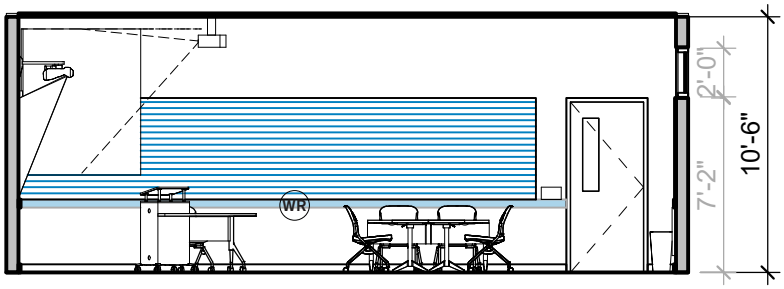
CONCEPTUAL DESIGN (ELEVATIONS)



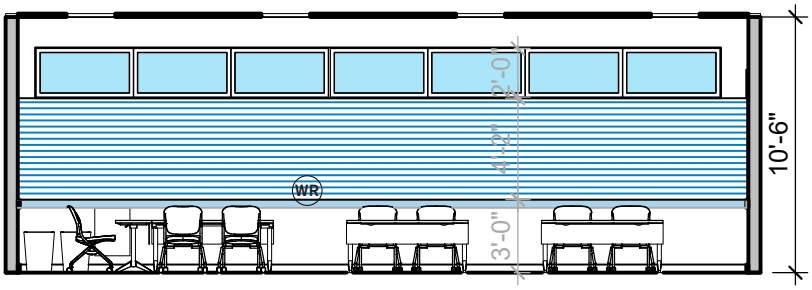
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

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05
MEDIUM CLASSROOMS

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Medium Classrooms at DVC are those with 45 student stations. This classroom size is used to mainly instruct Science and Social Science courses. Since learning styles are as varied as the number of student stations, the room has the capability for multiple furniture settings, all of which can be arranged with the help of students. This would require a behavioral shift at DVC where students and faculty are more engaged in their learning environment.

There is no "front" of the classroom and the space is generally omni-directional, mixed with a range of adjustable furniture options and movable group work easels, and multi-modal with respect to technology to support the 21st century classroom. The room is equipped to support a variety of activities and settings, which require a range of lighting levels, analog/ digital displays and interactive lecture display/ annotation capture capability. The use of energy efficient equipment with automated controls helps improve performance and conserve energy. Due to unknown conditions of the exterior wall/ fenestration pattern of the specific project these standards will be applied to, clerestory windows for natural daylight are proposed as a baseline in the classroom layout.

The room is also equipped with surface-mounted, floor raceways along the perimeter and the central area which terminate in access points that can be located throughout the learning space to support a variety of activities and settings. Hard-wired media access points for plugging in the instructor/ student devices are distributed at three locations (2 wall and 1 floor) in the room.

The proposed classroom inventory aims to be durable, flexible, adaptable, and playful (using the range of colors available for the various products). It consists of nesting chairs on casters and glides to enable free movement; flip-top stackable tables on casters with integrated power outlets to provide maximum flexibility within the space; multi-modal instructor station with lockable storage on casters to provide mobility and a range of teaching postures; and writeboards with seamless short throw digital projection system to integrate active teaching. Accessible furniture, similar to the rest of the classroom inventory, is integrated within the space to eliminate segregation and foster collaboration amongst students. Generous circulation space is provided within the classroom to allow for a wheelchair to freely move in the space.

Although the maximum classroom occupancy is less than 50 per the design standards, it may be calculated as over 50 per code (Refer CBC Table 1004.1.2 - Maximum floor area allowance per occupant for 'Classrooms'). Hence, two exits are provided (Refer CBC Table 1006.2.1).

CLASSROOM INVENTORY**

CHAIR (1)
Movable on 4 legs (2 casters & 2 slide)
Foldable/ Nesting
Mesh back and Fabric/ Vinyl Seat
Arm/ Armless

TABLE
Foldable/ Nesting
Movable on Lockable Casters
Integrated power outlet
ADA compliant

INSTRUCTOR STATION
Integrated workdesk/ podium with option for larger podium work area
Un-tethered/ On Casters
Integrated power outlet
Adjustable Height of desk and podium worksurface
ADA compliant

WRITEABLE SURFACE (1)
Projection & Dry-erase

***Refer to the Appendix for sample product cutsheets.*

ROOM DATA SHEET (MEDIUM CLASSROOM)

AREA	1125 ASF.
STUDENT STATIONS	45.
PLANNING PARAMETER	25 ASF/ Student. *(Some classrooms on a project by project basis will be at 27 ASF/ student to allow for additional capacity for certain programs only.)*
ROOM PROPORTION	Length : Width ~ 1.25x : 1x
MINIMUM CEILING	11'-6".
FUNCTION	Interactive Lecture / Skill Learning and Collaborative Group work/ Skill Application.

SPECIAL REQUIREMENTS

CEILINGS**	Suspended acoustical ceiling system with smooth texture, light reflective, impact/scratch resistant, 2'x2' or 2'x4', white tiles and tegular lay-in grid, minimum NRC rating of 1.0 (Optima by Armstrong or similar).
WALLS**	Full height metal framing with drywall on both sides. Insulate interior of all wall cavities with non-cellulose sound blankets. At partitions facing corridors, use staggered double studs. *(Upgrade: Full-height glass walls at corridors with translucent writeable film.)* Writeable Surface: High-performance dry-erase whiteboard on all walls as per window layout. 3'-0" minimum bottom of board with 1" x 4" wood marker tray (see sketch detail in layouts). Use high-performance dry-erase and projectable whiteboard for walls with Interactive Short Throw Display Projectors. Paint (Field): Semi-gloss interior paint, No VOC. Use accent color if desired. Base: Resilient, pre-molded corners and straight at carpet flooring.
FLOORS**	4" Raised access floor system with 2'x2' base tiles finished with 2'x2' carpet tile. (Tate ConCore Understructure/ PosiTile Carpet or similar). Carpet tile equal or greater than 10 stitches per inch, yarn weight of 20 to 30 ounces, stain/moisture/wear resistant, impervious type backing material, anti-static, UL Class A.
WINDOWS	Energy-efficient, transparent glazing to provide access to daylight and minimize heat loss or gain. Provide automated solar shading (Mechoshade or similar) to control light and glare while projection equipment is in use. Integrate controls with other AV controls. The exterior wall and fenestration pattern may vary on a project by project basis, hence, clerestory windows are shown as a base in the classroom standard layouts. The clerestory is suggested as a baseline for pricing, so that there is a budget allocation to begin with, which affords a certain allowance for glazing to be integrated. Each room will be particular with regards to existing condition, location on campus, and other considerations so the clerestory is certainly not seen as a final decision. The benefit of the clerestory is that it allows writable surfaces to be maximized.
DOORS	(2) 36" wide minimum, solid core, wood doors with narrow vertical tempered glass vision panel and hollow metal frames. No transfer grills or kick plates.
HARDWARE	Mechanical lever locks with means of interior locking (push button) for security. *(Upgrade) Electronic locks with mechanical (push button) override from the inside with capability to tie into campus-wide security system. All electronic locks to be placed on the door and not the wall.* Door hardware groups across various campuses shall be specified to provide a secured environment during a lock-down scenario, in particular by providing an interior override function

***Refer to the Appendix for example product cutsheets.*

as well as remote and local lock down. For existing general-use classrooms, replace mortise style with hotel style deadbolt locks similar to Corbin Russwin ML2013. For new construction of general-use classrooms, use Corbin Russwin CL 3351 or 3129 series. Where required, electrified locks, including those with HID card access, shall include a push button to override the card access on the exterior, similar to Sargetnt IN120 and IN220 HID, or Schlage AD-400 series. For large classrooms (over 90 students), crash bars must provide a means to override the dogged down feature and electronic lock open feature with a mechanical thumb turn device, similar to Von Duprin crash bar with 2SI feature.

HVAC

Recommended Temparature Range: Summer 74F +-2F / Winter 70F +-2F or per campus standards.
No additional humidity control may be required if RH is within acceptable condition per AHSRAE 55 thermal comfort and not required by Campus.
Low velocity air flow diffusers, especially when corner screen is provided to avoid agitating the screen. Lockable thermostat zone control.
Provide wall mounted zone temperature sensor with LCD display including room temperature, room CO2 level, temperature setpoint control, and after-hour override timer control with user adjustable duration.
Zone occupancy to be monitored by connection to the lighting occupancy sensors.
Where HVAC return paths to classrooms are not ducted, acoustical boots should be used to maintain the composite sound isolation performance of enclosing assemblies.
Ensure that mechanical systems adhere to the guidelines provided in the latest version of the Noise and Vibration Control chapter in the ASHRAE HVAC Applications Handbook.
CO2 Sensors for Demand Control Ventilation required per California Energy Code.
AV rack and laptop storage carts are located in closets outside the classroom. If they are located in the room, provide supply and return passthrough to remove additional heatload in the room.

PLUMBING

Automatic fire sprinklering system. Do not route plumbing through or near classroom areas.

LIGHTING

GENERAL REQUIREMENTS

- Target light levels, per the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13):
    - Horizontal illuminance @ desk height, 2.5' above finished floor = 500 lux (50fc) average throughout classroom to accommodate a wide range of tasks/uses (15fc for computer use, 40fc for paper tasks/reading, 50fc for art or science projects).
    - Vertical illuminance @ white board (i.e. vertical writable surfaces) = 300 lux (30fc) average.
    - Vertical illuminance @ pin-up walls (aka "tack board") = 150 lux (15fc) average.
    - Vertical illuminance @ background walls (not writable surfaces) = 150 lux (15fc) average.
    - In many situations the classroom/task light levels may be lower (such as A/V presentations or computer use), but the lighting system must be able to achieve average light levels noted above upon demand.
- Emergency egress lighting shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured at floor level throughout the room (since path of egress varies for different room layouts).
- Light fixtures and controls shall provide simple and affordable solution for classroom lighting.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Daylight photosensors and occupancy/vacancy sensors may be provided by 3rd party manufacturer, but shall be fully compatible with classroom light fixtures and warrantied by the installing electrical contractor.
- All LEDs used in the LED light fixture shall be of proven quality from established and reputable LED diode manufacturers with minimum 5 years experience in the manufacture of LED diodes. LED light fixture supplier shall have minimum 5 years experience designing, selling and supporting installations of LED systems.
- All light fixtures and control gear shall be UL-listed (or equivalent by ETL / CSA) for indoor locations.
- Manufacturer of LED systems shall utilize an advanced production LED binning process to maintain

***Refer to the Appendix for example product cutsheets.*

color consistency within a 4-step MacAdam ellipse per ANSI Standard C78.377 within all luminaires unless otherwise specified.

- Manufacturer shall provide photometric data for all light fixtures based on test results from an independent testing lab including candlepower distribution data in polar graph form, total lumen output per light fixture, and total wattage per light fixture.
- Contractor to consult with the owner and provide if required, back-stock of all led power supplies/ drivers in a quantity to the owners' preference.
- All lighting equipment (including but not limited to light fixtures, LED drivers/power supplies, control interfaces, user interfaces, daylight photosensors, occupancy/vacancy sensors) shall be furnished with 5-year warranty for full replacement (materials and labor) effective from the date of substantial construction completion.
- All electrical lighting shall follow the latest applicable codes and standards (see Appendix for lighting code summary):
    - 2016 California Building Standards Code ("Title 24")
        Part 3 Electrical Code – Installation requirements and egress lighting levels.
        Part 6 Energy Code, Subchapter 4 – Lighting control and dimming requirements.
        Part 6 Energy Code, Subchapter 5 – Energy use (Lighting Power Density)
        Part 9 California Fire Code, Section 1008 Means of Egress Illumination
    - CalGreen Building Standards Code (Part 11 of Title 24)

LIGHTING FIXTURES**

2' x 2' General Light Fixture

- Shall be 2' x 2' square and work within a standard 2' x 2' suspended ceiling grid system. Acuity 2BLT2-40L-ADP-120-EZ1-LP935-N100-LATC or similar for fixed 3500K color temperature. *(Upgrade) Acuity 2BLT2-TUWH-PROR-40L-ADP-120-NLT-LATC or similar for tunable white option.*
- Emergency Lighting fixture shall be same Acuity 2BLT2-40L fixture as others in classroom, but shall incorporate EL14L (1400 lumen) battery pack.
- Light fixture appearance shall have design-neutral aesthetics with clean, refined details to blend into the ceiling. Expressive design statements are discouraged from the general lighting fixtures.
- Powder coat, white finish.
- Minimum rated life of 60,000 hours per IESNA TM-21 criteria @ L70. LED fixture manufacturer shall power the LED diodes at a drive current recommended by LED diode manufacturer to reach minimum 60,000 hour rated life @ L70. LED diodes shall not be "overdriven" at a higher drive current to increase light output to detriment of rated lamp life.
- Field-replaceable LED engines and drivers/power supplies, with access to LED engines and drivers from below the fixture or within the plenum (without the need to demount the fixture from the ceiling grid).
- Sealed light diffusers and optical compartments that restrict ability for dust and bugs to settle within the fixture.
- Fixture provided with a range of fixed lumen outputs ranging from 3000 – 5000 lumens per fixture (@ 3500K) to accommodate classroom ceiling heights ranging from 9'-0" to 12-6". Upon implementation, project design team is responsible for specifying the fixture's lumen output to achieve the required light levels as noted within the Design Standards document.
- For tunable white option, fixture shall provide consistent lumen when varying the color temperature (i.e. constant lumen curve).
- Nominal 4,000 delivered lumens @ delivered lumens per watt (LPW) > 100 LPW.
- CRI = 80+ (basic version) or 90+ (enhanced version) for light fixtures
- Color temperature = 3500K (basic version) or Tunable White with range from 3000K – 5000K (enhanced version).
- Spacing to mounting height ratio (S / MH) > 1.18 in any direction. Typical on-center spacing of 2x2 light fixtures is 8', though 10' spacing is permissible for ceiling heights 10'-6" or taller.
- To control glare to occupants, 2' x 2' light fixtures shall have the following performance requirements:
    Luminance < 4500 cd/m2 @ 45° above Nadir, <4000 cd/m2 @ 55°, < 3500 cd/m2 @ 65°, < 3000 cd/m2 @ 75°, 2500 cd/m2 @ 85°.
    Intensity < 1000cd at angles 50° or higher above Nadir.

***Refer to the Appendix for example product cutsheets.*

- Dimmable to 5% light output without flicker or jumps in light output.

Linear Wallwash / Accent Fixture (Upgrade)

- *Wallwash fixture shall be nominal 4" or 6" wide and available in 2' and 4' lengths.*
- *Accent fixtures shall be nominal 4" or 6" square shape and provide lockable vertical tilt and horizontal rotation to orient the light output towards the target wall surface.*
- *Fixture shall be capable of end-to-end through wire connection for continuous runs (interrupted by ceiling grid where needed).*
- *Color temp matching the 2' x 2' general lighting fixture. If 2' x 2' fixture uses tunable white light engine, standardize the linear wallwasher @ 3500K color temperature (tunable white not needed for the wall washers).*
- *Powder coat, white finish to match the 2' x 2' general lighting fixture.*
- *Max intensity (i.e. CBCP) of wallwash fixture or accent fixture shall exit the fixture at an angle to hit the target vertical wall surface @ 5'-0" AFF given a classroom's ceiling height and light fixture setback distance. Upon implementation, project design team is responsible for specifying the fixture's setback distance to target 5' AFF on the vertical wall surface with the fixture's CBCP.*
- *Accent light fixture shall be aimed at nominal 30° angle from Nadir to the 5' AFF target on the wall/whiteboard surface. Accent fixture shall have CBCP (specified by project design team to match project ceiling height) to achieve the required light levels on the wall/whiteboard surface as noted within the Design Standards document.*
- *Wallwash lens / fixture aperture shall be shielded or angled away from student line of sight (i.e. angled towards the vertical wall surface) to mitigate glare to occupants. Flush lens (to the ceiling plane) is NOT acceptable for the wallwash fixture.*
- *Wallwash fixture provided with a range of fixed lumen outputs ranging from 350 – 675 lumens per foot (@ 3500K) to accommodate variety of layouts (single fixture, dashed line, continuous row). Upon implementation, project design team is responsible for specifying the fixture's lumen output to achieve the required light levels and uniformity on the wall/whiteboard surface as noted within the Design Standards document.*
- *CRI = 80+ (basic version) or 90+ (enhanced version).*
- *Dimmable to 5% light output without flicker or jumps in light output.*
- *Fully compatible with the specified control system, including digital addressing of wallwash / accent fixtures.*

LIGHTING CONTROLS

General Description

- Acuity nLight system or similar for fixed 3500K color temperature. *(Upgrade) Acuity nTune system or similar for tunable white option.*
- Occupancy/ Vacancy sensor, required per Title24 building code, shall automatically turn off classroom lighting when room is unoccupied.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Light fixtures work together as a single network (within one classroom only) and does not require a centralized (whole-building) control system.
- The system is scalable to multiple classrooms by simply repeating the single-network model.
- Control system shall be easy to install, commission, and maintain. Fixtures and controls work together as a system with "out of the box / plug and play" connectivity.
- Digital addressing of fixtures (explained above) allows for easy reconfiguration / revision of control zones without need for rewiring.
- Classroom lighting control system shall be linkable with campus Building Management System (BMS).
- Classroom lighting control system shall be compatible with California's Title24 Demand Response requirements.
- *(Upgrade) Allows for individual fixture calibration for lumen output or color temperature (if tunable white) should a light engine require replacement or color shift (if tunable white) is observed over time.*
- Allows for integration of 3rd party light fixtures into the classroom lighting control system using

***Refer to the Appendix for example product cutsheets.*

industry-standard control protocols.

Emergency Lighting

- Designated 2' x 2' classroom emergency light fixtures (EM fixtures) shall be of same family, type, appearance, digital addressing capability, and lumen output under normal power operation as adjacent 2' x 2' classroom fixtures.
- EM fixtures shall be UL924 listed for emergency operation.
- EM fixtures shall operate as normal light fixtures when normal power is available (i.e. they can dim or turn off according to preset scenes or user override). The EM fixtures shall automatically override to emergency-mode light output (1400lm) upon loss of normal power via automatic transfer to the specified battery backup power source.
- Upon loss of normal power, EM fixtures shall operate with 1400 delivered lumens for a period not less than 90 minutes.

User Controls

- All user controls shall be mounted within the acceptable range for ADA compliance, namely 36" on center, above finished floor.
- Instructor access to lighting controls via localized keypad mounted at instructor station and/or classroom wall.
- *(Upgrade) For tunable white feature, provide side-by-side (double gang) keypad with one keypad hosting preset scenes, and second keypad hosting independent control of color temperature and light level/intensity/dimming for the selected scene.* See "Sample Product Cutsheets (Lighting), Tunable White" in the appendix.
- Preset scenes are customizable by school administration.
- Lighting controls shall permit additional interface/coordination with the classroom A/V control system to automatically control lighting in connection with A/V actions (such as turning on projectors, projection screen and window shade deployment, etc.)

Digital Addressing

- All classroom light fixtures shall allow for individual fixture addressing (aka digital addressing) that is independent of power/control wire configuration.
- Digital addressing features shall allow for individual fixture control of intensity and *(upgrade) color temperature (if tunable white)*, as well as grouping of light fixtures (via software) into control zones that are independent of power/control wire configuration.
    - This feature shall permit individual fixtures to be within MULTIPLE control zones, and such control zone grouping to CHANGE depending on the selected lighting scene.
    - This feature shall permit onsite calibration of individual fixture's lumen output (via software) to balance uniformity of light levels throughout a classroom.

Lighting Control Sensors

- (1x) Acuity daylight photosensor or similar and (1x) Acuity dual technology (PIR and Ultrasonic) occupancy/vacancy sensor or similar. Each single sensor can control multiple fixtures in the classroom.
- Specified light fixture shall offer (as an option) a daylight photosensor as well as an occupancy/vacancy sensor integral to the light fixture. Each integral sensor can control multiple fixtures in the classroom.
- Compatibility with 3rd party sensors if needed (such as daylight photosensors or vacancy sensors) via hard-wired OR wireless communication.
- Occupancy/ Vacancy sensors for light fixtures shall also trigger HVAC operation (or vice-versa)

ACOUSTICS

SOUND ISOLATION

General Description

- The noise generation potential at all classroom adjacencies should be carefully evaluated when determining the acoustical requirements of both vertical and horizontal classroom partitions. For classrooms that must be located adjacent to spaces expected to generate high sound levels such as music practice/performance rooms, stairwells, elevators, mechanical equipment rooms, active

***Refer to the Appendix for example product cutsheets.*

corridors and nearby lobbies, additional acoustical consideration should be paid the STC rating of the partitions, windows and any communicating doors.

Walls

- In general, the sound isolation across the partition will depend on several factors. The primary factor will be the STC performance of the partition assembly itself. Other factors include whether there are doors or windows between the rooms and penetrations such as ductwork and piping. Consideration of these various factors as well as choice of construction systems and methods and cost will ultimately dictate the recommended wall assemblies, type of door gasketing, glazing size and selections, and ceiling systems.
- For the base condition, the walls surrounding the classrooms should be full-height (i.e. slab-to-slab) and achieve a minimum acoustical performance rating of Sound Transmission Class (STC) 50 or Noise Isolation Class (NIC) 45.
- For classrooms adjacent to loud spaces such as lobbies, band rooms and mechanical rooms, a special assessment should be performed to determine the required minimum STC rating of the partition. Depending upon the specific adjacency, the expected range of performance is STC 55 to 60.

Doors

- For the base condition, all classroom entry doors should be fully acoustically gasketed at the jambs and at the bottom. Typical adjacencies such as to a private office or a vestibule, should also include a fully acoustically gasketed door.
- For classrooms that open onto a primary circulation corridor or lobby, the doors should have a minimum acoustic rating of STC 35. For communicating doors between classrooms, specify STC 45 to 50 or greater depending upon the specific adjacency.

Floor/Ceiling Assemblies

- Where classrooms are located below active and potentially noisy spaces, the floor/ceiling assembly should be designed to achieve minimum:
    - Air-borne Sound: STC 50
    - Impact Noise: IIC 45
- For air-borne sound attenuation, an 8" minimum thickness concrete slab with suspended lay-in ceiling will achieve a minimum STC of 50. For wood framed construction, use of light-weight concrete and resilient isolation clips such as resilient channel at the ceiling gypsum board will likely be necessary.
- For impact noise attenuation, carpet without any additional acoustical treatment is conditionally acceptable. Areas with significant amount hard finish will require an additional sound-attenuation underlayment such as rubber or cork.

Exterior Façade/Windows

- Classrooms potentially exposed to excessive outdoor noise sources such as roadway traffic and air-craft flyovers will require an environmental noise survey in order to determine the minimum STC performance requirements of the windows and wall.
- The standard noise level criteria for all classroom due to exterior/outdoor noise sources should be a 15-minute average noise level of 35 dBA (Leq) or less and a maximum noise level of 50 dBA (Lmax-Slow).
- Where the outdoor noise level is found to be 60 dBA or greater, the mechanical air-ventilation system in the classroom must be designed so that the fresh-air requirement can be achieve with operable windows in the closed position.

ROOM ACOUSTICS

The overall acoustical finish scheme in the classrooms should control excessive sound reverberation and support excellent speech-intelligibility.

Base Classroom Design

- Reverberation Time (RT60 at 500 Hz): less than 0.8 sec

***Refer to the Appendix for example product cutsheets.*

- The ceiling is the most cost-effective surface to consider for locating the primary acoustical finish. Typically, a lay-in tile ceiling having a minimum NRC 1.0 such as Optima by Armstrong or similar should be considered.
- Sound absorbing wall panels should be considered as follows:
    1. Wall panels should have a minimum acoustic performance of NRC 0.75 and be at least 2" thick.
    2. Where possible, apply acoustical wall panels on at least one surface of each pair of parallel walls and in the wall area between seated and standing ear height. See layouts for recommended locations of wall panels.

Upgrade or Non-Standard Classroom Considerations

- *In the case where upgraded sound-isolation might require a "hard-lid" ceiling and where a dropped lay-in tile ceiling cannot be installed, then the exposed hard-lid ceiling should be treated with minimum NRC 0.80 and 2" thick acoustic panels.*
- *Sound absorbing wall panels should be considered as follows:*
    1. *When less than 100% of the ceiling area is not acoustically treated, then a remaining equivalent area of acoustical panels having should be applied to the walls.*
    2. *If "front-firing" loudspeakers are being considered, the wall opposite the loudspeakers should be fully covered with acoustical wall panels as feasible.*
    3. *If wood finishes are desired, consider perforated or kerfed acoustic panels having minimum NRC 0.80 such as by RGP Corporation, or slats or grills such as 9Wood Company.*
- *Acoustic treatments may also be required to minimize flutter echoes and control extraneous echoes.*

MECHANICAL NOISE/ VIBRATION CONTROL

- The noise level in the classrooms as generated by mechanical equipment (HVAC, Electrical, Plumbing, Elevator Equipment and AV equipment) should be limited to a maximum noise level of Noise Criteria (NC) 30 in the classrooms.
- All potentially noisy MEP and Elevator equipment located adjacent to, above or below the classroom, including fans, pumps and electrical transformers should be carefully evaluated for both air-borne and structure-borne noise and as required, acoustically treated and/or the intervening partition or floor/ceiling be acoustically upgraded.
- The air-velocity in ductwork located within the classroom should not exceed 800 fpm. The air velocity in the final branch-duct should not exceed the diffuser neck velocity by more than 150 fpm, unless otherwise noted. The air-velocity at the neck of each supply and return diffuser should not exceed 400 fpm.
- VAV boxes should be sized to limit the total pressure drop to 0.5-inches TSP or less and have both a radiated and discharge sound level of less than NC 30.
- FCU and VAV boxes with radiated noise levels greater than NC 30 must not be located in the ceiling over the classrooms.
- Flexible ductwork shall not be used on medium pressure duct systems upstream of VAV box connections.
- Sheet metal ductwork should be internally lined with 1-inch minimum thickness of acoustical duct-liner.
- Air-transfer boots should be constructed completely of acoustically lined sheet metal, include at least one 90-degree elbow and sized depending upon the degree of sound-isolation required and for maximum 500 fpm.
- Supply and return diffusers should be selected to perform no greater than NC 25.
- Ducts, pipes and conduit attached to vibration isolated equipment should include flexible or resilient type connections and may be required to be vibration isolated from the building depending upon proximity of the duct or pipe to acoustically sensitive spaces and the power of the attached equipment.
- The noise emission from AV Equipment should also be considered. Where noisy AV equipment is unavoidable and is needed to be located in the classroom, then sound-rated ventilated equipment racks should be considered.

***Refer to the Appendix for example product cutsheets.*

AUDIO/VISUAL EQUIPMENT**

AUDIO SYSTEM

Audio DSP (Digital Signal Processor): QSC Core 110f or equal
Loudspeakers: QSC AC-C6T or equal
Amplifier: QSC CMX300Va or equal

(Upgrade) Wireless Microphone *(Only required for capture/ conferencing): Shure QLXD24/ SM58 handheld transmitter and receiver, Shure QLXD14 bodypack transmitter and receiver and (2x) countryman B-3 bodypack microphones or equal.* Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.

Voice Lift: N/A

Assistive Listening: Listen Technologies LT-800-072 transmitter and LR-4200-072 receivers (provide 4% of seating capacity) or equal.

VIDEO SYSTEM

Minimum viewer distance to digital display (especially in lecture mode) should be equal to the width of the display screen/ projected image.

Projection:
Standard Projection: (2x) Panasonic PT-RZ770 or equal – 7000 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 1-chip DLP, Laser Source

Interactive-Short Throw: (2x) Epson Brightlink Pro 1460Ui or equal – 4400 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 3 LCD, with output capabilities for mirroring annotation and content onto a larger projection screen. Provide equivalent laser source model if available.

Projection Surface:
Motorized Screen: (2x) Draper Access V ceiling-recessed, tab-tensioned, motorized screen or similar for video projection sized 87.5"x140" for viewing from the back of the classroom in all directions. The bottom of the viewable image shall be at 4'-0"AFF. Screen material shall be Matte white or equal. *(Upgrade): Screen material shall be TecVision XH900X ALR (ambient light rejecting) or equal for use in moderate to higher ambient light and wider viewing angles.*

Markerboard: Low gloss or matte surface white-dry erase board for interactive short-throw projection. PolyVision projection surface or equal.

Transport and Switching:
Video Matrix Switcher (location: main equipment rack):
Crestron DM-MD8X8 Digital Media Switcher
-Input Cards: (3) DMC-4K-HDCP2, (2) DMC-DVI, (1) DMC-4K-C-DSP-HDCP2
-Output Cards: (2) DMC-4K-HDO

Instructor Station:
Instructor Station Video Switcher: Crestron DM-MD8X1-4K-C with DM output for instructor station
Instructor Station Cable Cubby: Extron Cable Cubby 500
DVD Player: Denon DN-500 or equal at instructor station
Document Camera: Elmo P10HD or equal at instructor station
Wireless Presentation: Mersive Solstice or equal at main equipment rack

Capture/Conferencing (upgrade): Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.
PTZ Camera: Panasonic AW-HE40SWPJ with HDMI output (or equal) located on the back wall of the room.
Capture/Stream Unit: Extron SMP351 or equal (location: main equipment rack)
Conferencing Unit: Extron MediaPort 200 or equal (location: main equipment rack)

***Refer to the Appendix for example product cutsheets.*

In-Room Computer: Dell or equal (location: main equipment rack)
Triple Element Ceiling Microphone: (2x) Audix M3 or equal
(Upgrade) Ceiling Array Microphone: (2x) Shure MXA910 or equal

CONTROL SYSTEM

Control Processor: Crestron CP3N control processor or equal. The AV system shall be able to send preset recall signals to the master control units for window shades and lighting so these components can be controlled via one cohesive system (location: main equipment rack).

Touch Screen: Crestron TSW-760 7" Touch Screen on the wall and *placed at instructor's station (upgrade)*. Wireless control shall be configured for controlling the room via an app or laptop. Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.

UTILITY / OTHER

See layouts for recommended locations of data/power and hardwired AV connections.

A campus-standard instructor's station shall be provided. The instructor's station would include the DVD player, document camera, laptop connections, USB thumb drive connections for lecture capture, and other items as needed.

AV equipment shall be installed into a Middle Atlantic MRK-AXS or equal pull-out equipment rack stored in an AV closet located outside the room.

VOICE/DATA**

Six dual ports at wired AV station unless noted otherwise. Wireless internet access required throughout. (1) Wi-Fi Acces Ports: Aruba 220 series Acess Points or per current campus standards.

Provide CAT 6 or better connection for the wall mounted IP speaker/clock/ microphone as per campus/ district standard. No separate power conenction required for this product. System to tie into the Building Alarm System. Installation height 8'-0" AFF or as required by manufacturer's manual. Emergency call button (linked to the IP speaker alarm panel) at accessible height of 48" AFF located away from the exit door. See layouts for locations.

POWER

Provide wall power/data fourplex receptacles at +18" AFF, spaced 5'-0" on center. *(Upgrade) Provide continuous, perimeter wall mounted raceway for power/ data/ AV (below the marker tray at +35" AFF), cover color to match wall color. Receptacles in raceway to be duplex, 5'-0" on center.* See layouts for conceptual detail sketch at raceway & writeable surface junction.

Provide pop-up, flush-mounted, fourplex floor boxes at 5'-0" on center within the 4" high, raised floor system. Floor boxes fed either down the walls from above ceiling in existing classrooms or from below grade in new construction.

Provide adequate power for video projector and other AV equipment. Provide additional outlets at Instructor's station for multiple devices.

Provide a provisional recessed receptacle for a wall clock at 8'-0" AFF on one wall in the room, ideally the wall with the short-throw displays.

Power for egress lighting will be provided by batteries integral to the fixtures as required to give the egress lighting levels stated. An option would be to provide power from a central battery/ inverter system. Using that option would depend on the building and/or classroom or assembly space type.

SECURITY**

Provide IP speaker with integrated wall clock for campus-wide emergency/ alerts per campus/ district standards. Provide adequate signage for safety instructions.

FURNITURE**

Provide products with active and flexible comfort capabilities while addressing concerns of Universal Design and minimum warranty requirements per campus/ district furniture performance standards.

OTHER CONSIDERATIONS	Do not locate classrooms near or below spaces with loud activities, high impacts and/or high sound pressure level sources, such as fitness areas or mechanical rooms. Do not locate classrooms near electrical transformers, stairwells, elevator shafts, or elevator equipment rooms. Minimize contrast ratio between classroom field and projection screen. Provide 16-gauge pre-notched backing stud with flange fastened with pan head sheet metal screws at partitions with wall-mounted equipment. Provide clear “permanent” use-instructions for furniture and technology in the classroom.
OWNER-PROVIDED SUPPLIES**	Multi-pack, eco-friendly non-toxic dry-erase markers and erasers; cleaner spray.

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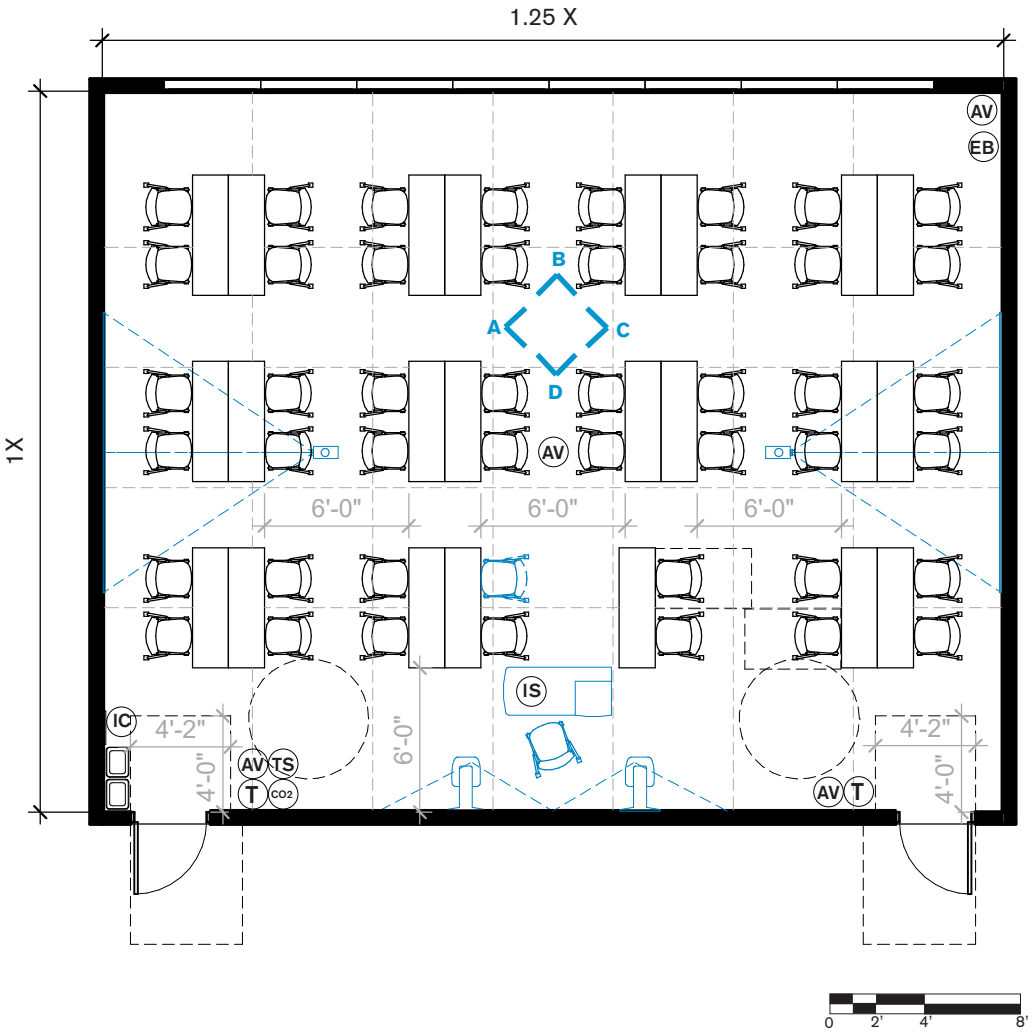
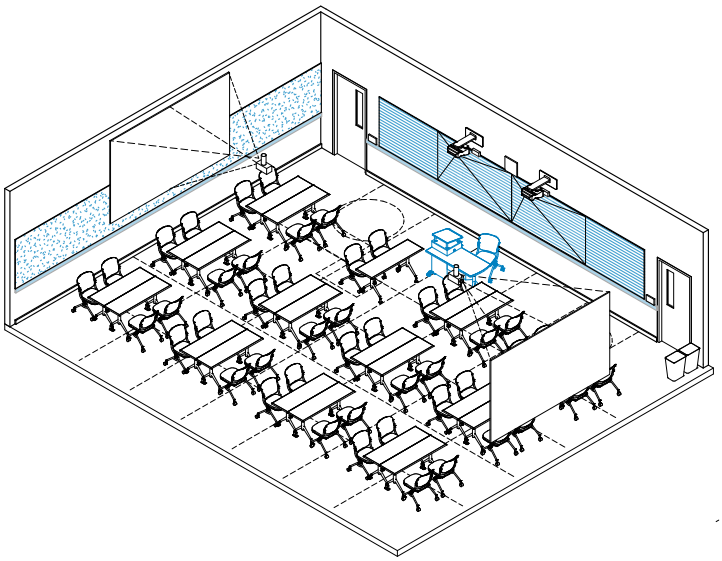
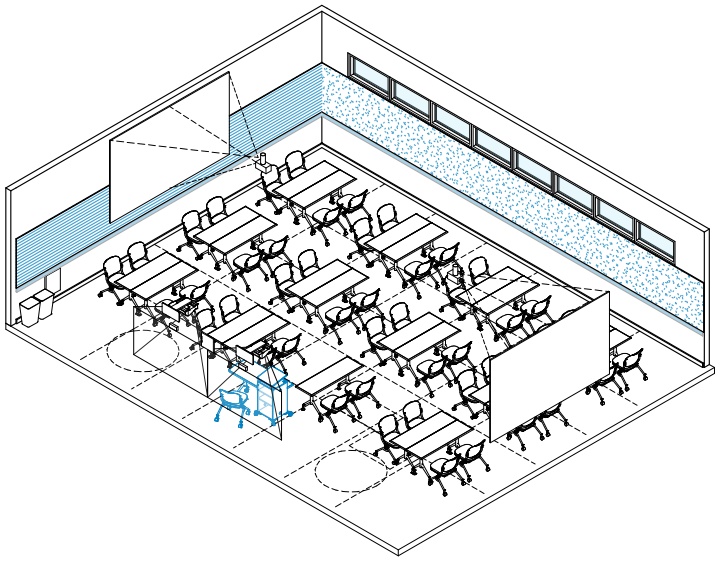
CONCEPTUAL DESIGN (GROUPWORK MODE 1)



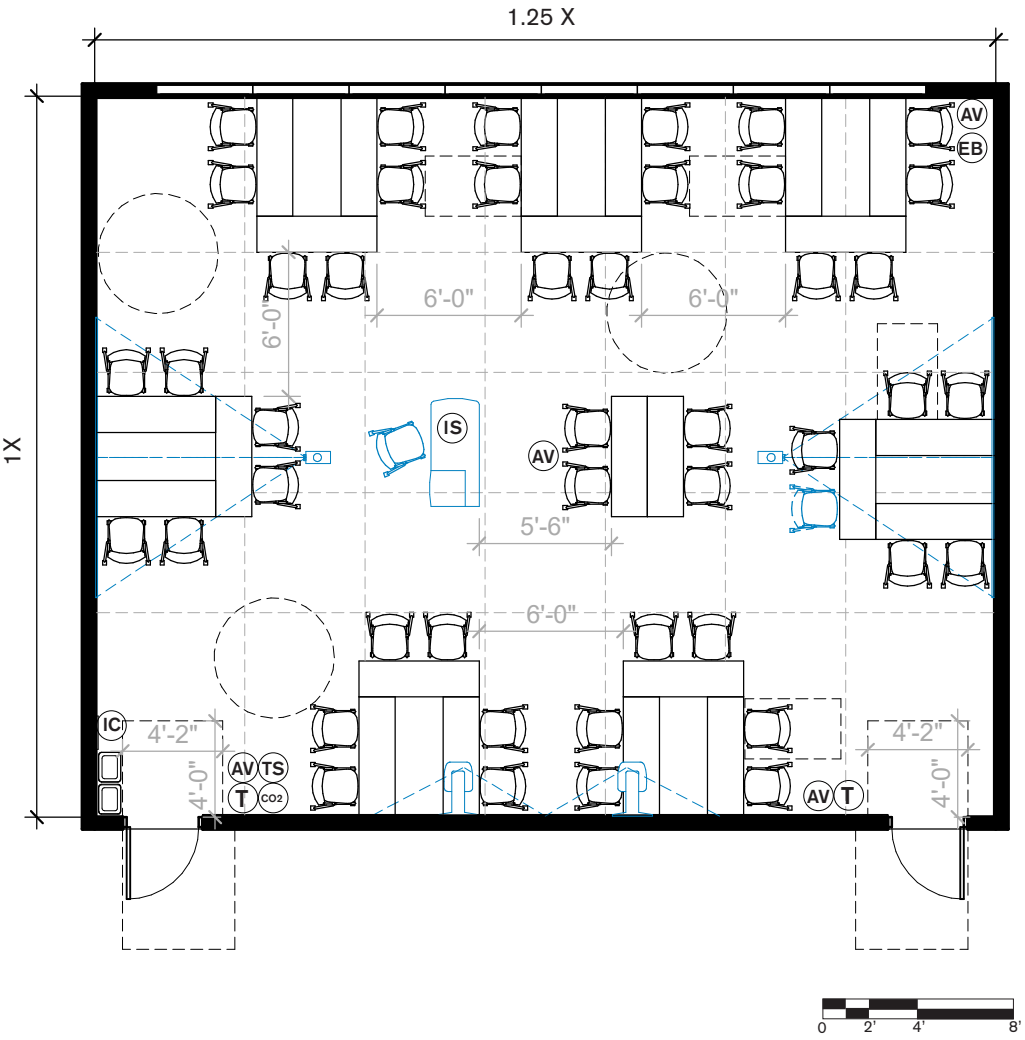
LEGEND

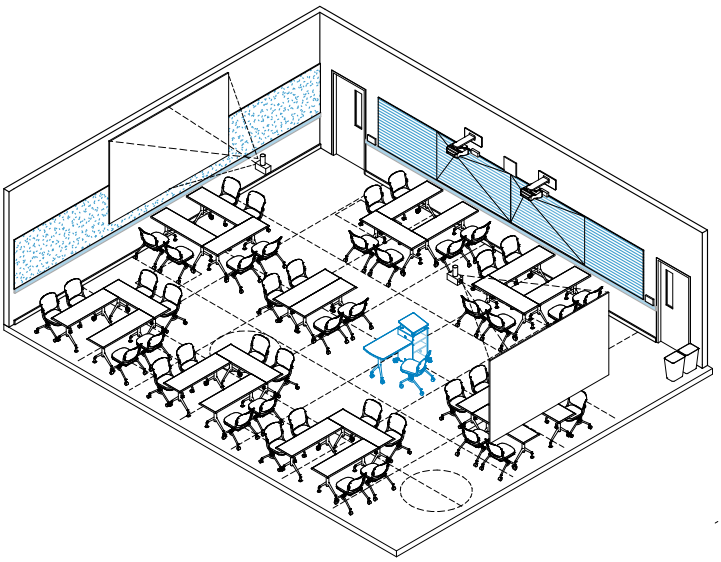
- IS — INSTRUCTOR STATION
- IP — IP SPEAKER
- EB — EMERGENCY BUTTON
- WR — WALL RACEWAY (UPGRADE)
- TS — TOUCH SCREEN CONTROL @48"
- T — THERMOSTAT
- CO2 — CO2 MONITOR
- AV — WIRED AV CONNECTION OUTLET
- IC — WALL HUNG CHAIR FOR INTERPRETER
- SC — STORAGE CONSOLE
- WRITABLE SURFACES
- ACOUSTIC WALL PANELS
- RAISED FLOOR POWER/DATA GRID
- SPRINKLERS
- S — SPEAKERS
- C — CAMERAS (UPGRADE)
- M — VOICE-LIFT MICROPHONES (UPGRADE)
- M — CAPTURING MICROPHONES (UPGRADE)
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2' x 2' LIGHT FIXTURES
- EM — 2' x 2' EMERGENCY LIGHT FIXTURES
- AIR DIFFUSERS

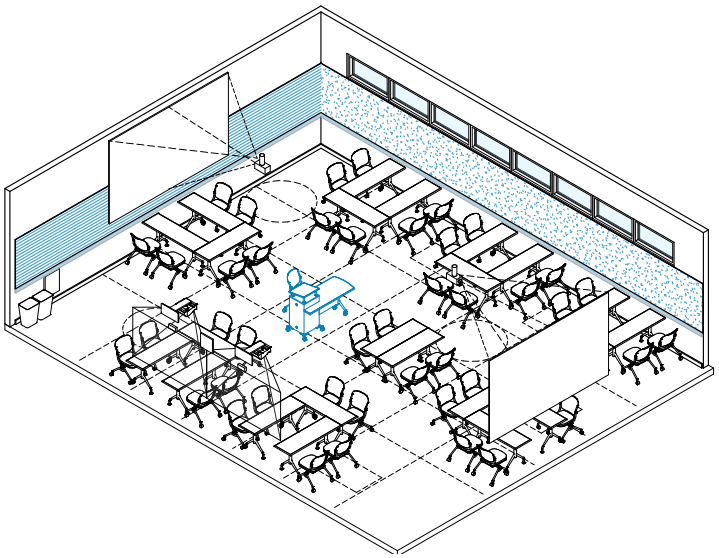




CONCEPTUAL DESIGN (GROUPWORK MODE 2)







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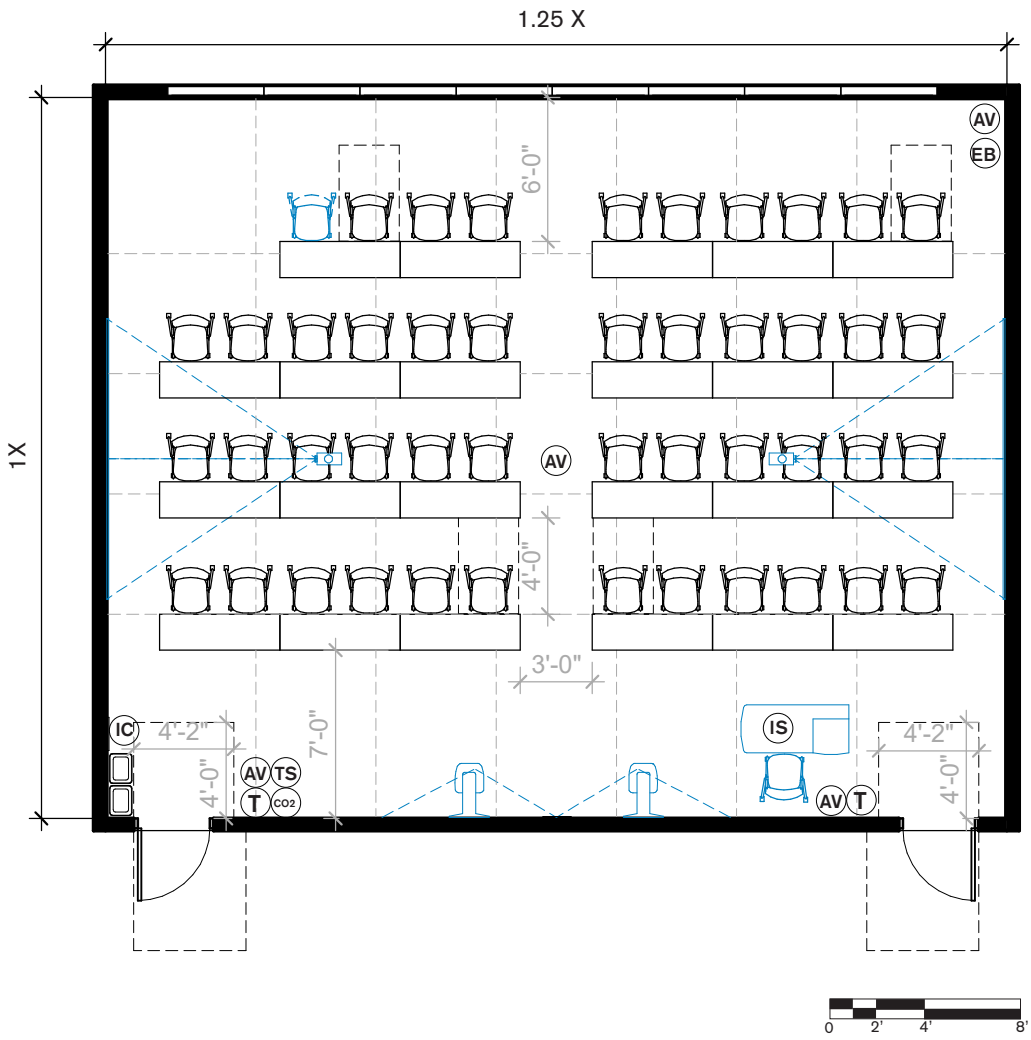
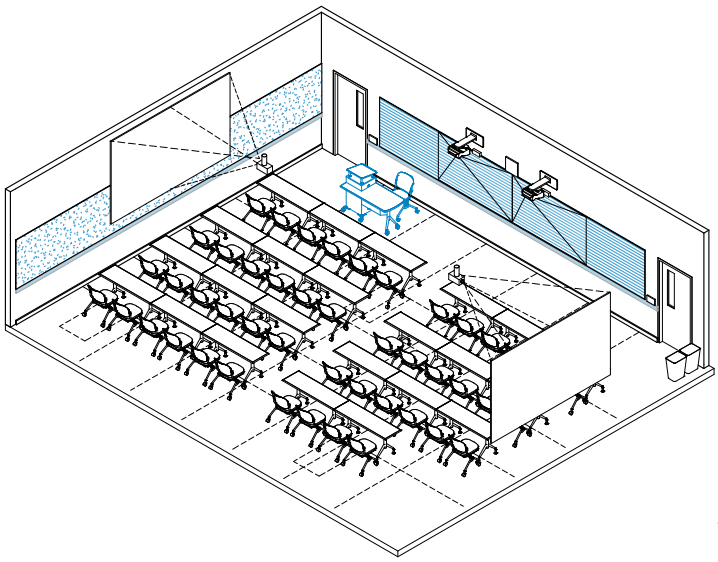
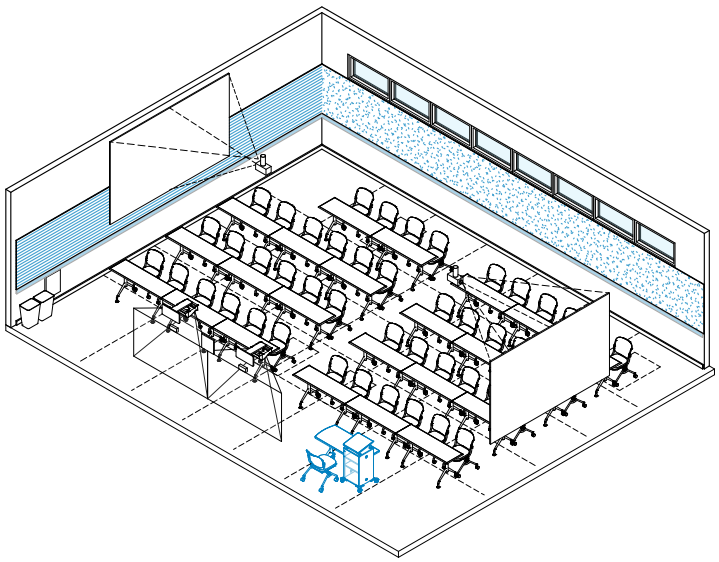


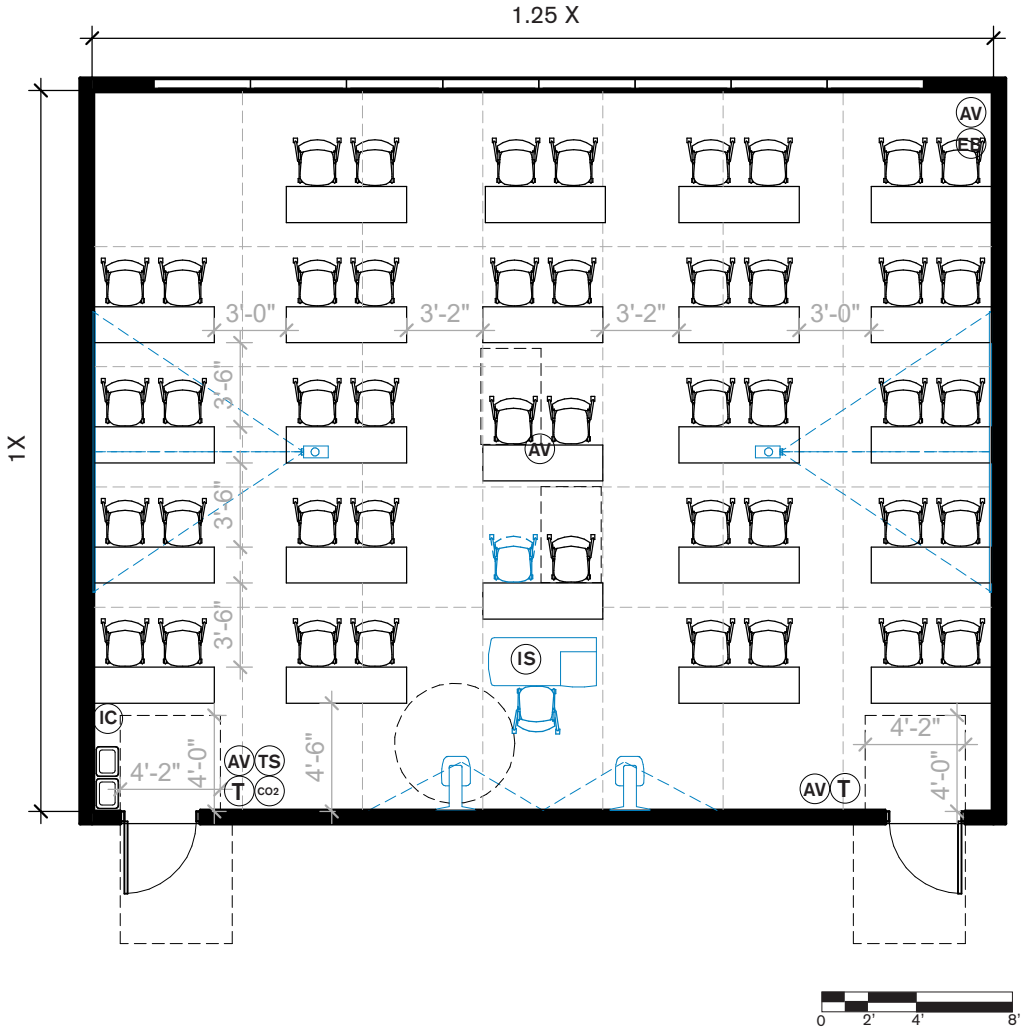
LEGEND

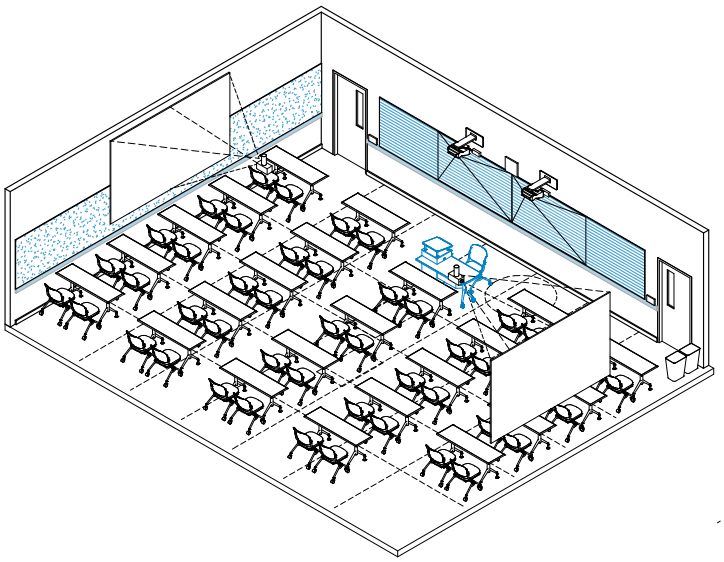
- IS — INSTRUCTOR STATION
- IP — IP SPEAKER
- EB — EMERGENCY BUTTON
- WR — WALL RACEWAY (UPGRADE)
- TS — TOUCH SCREEN CONTROL @48"
- T — THERMOSTAT
- CO2 — CO2 MONITOR
- AV — WIRED AV CONNECTION OUTLET
- IC — WALL HUNG CHAIR FOR INTERPRETER
- SC — STORAGE CONSOLE
- WRITABLE SURFACES
- ACOUSTIC WALL PANELS
- RAISED FLOOR POWER/DATA GRID
- SPRINKLERS
- S — SPEAKERS
- C — CAMERAS (UPGRADE)
- M — VOICE-LIFT MICROPHONES (UPGRADE)
- M — CAPTURING MICROPHONES (UPGRADE)
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2' x 2' LIGHT FIXTURES
- EM — 2' x 2' EMERGENCY LIGHT FIXTURES
- AIR DIFFUSERS

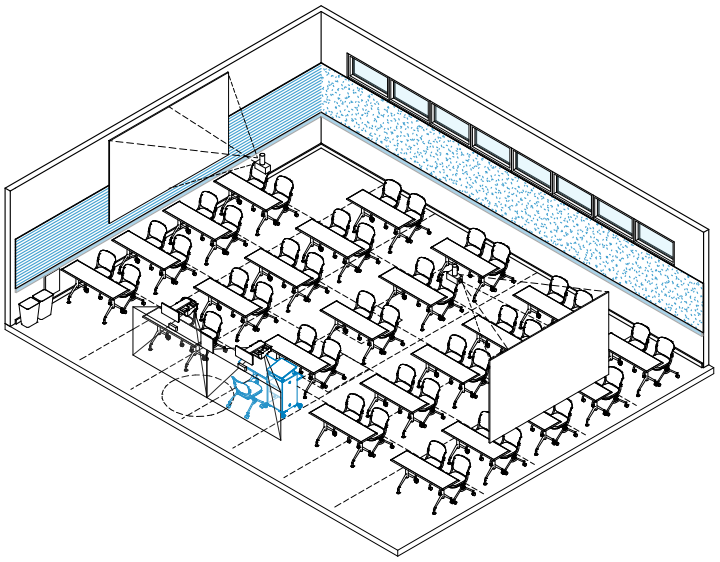




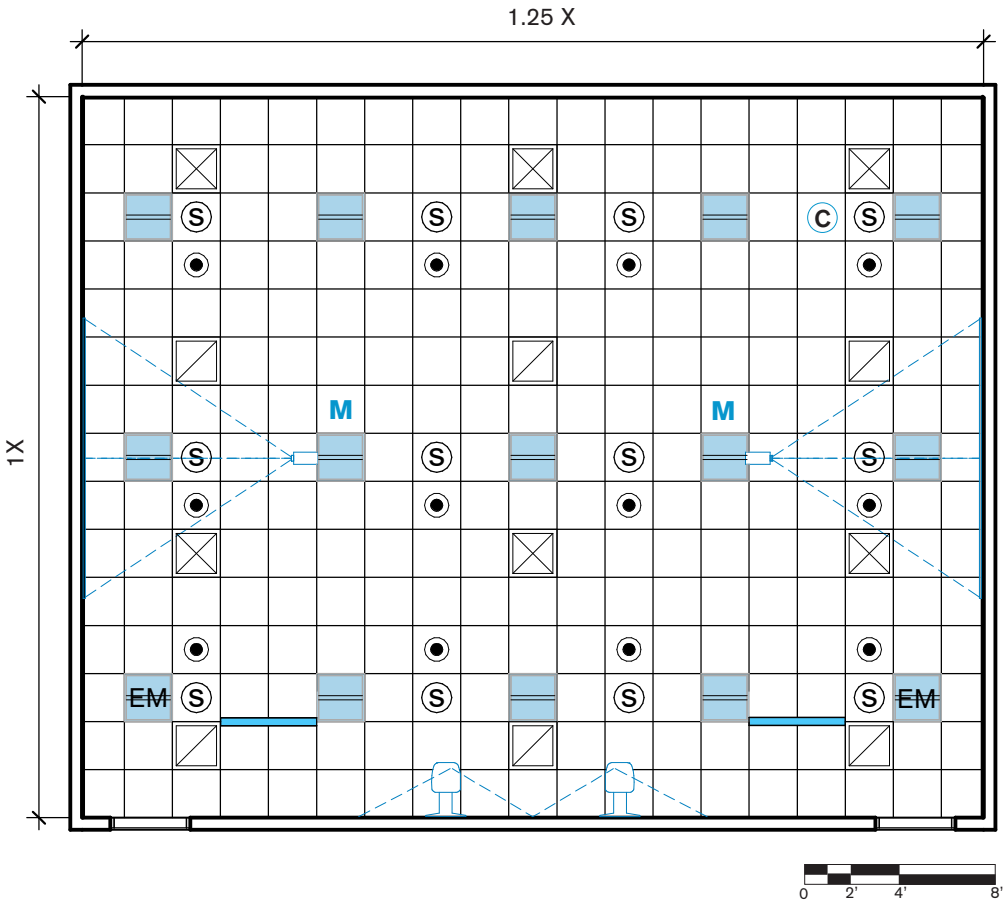
CONCEPTUAL DESIGN (TESTING MODE)







CONCEPTUAL DESIGN (REFLECTED CEILING PLAN)



LEGEND

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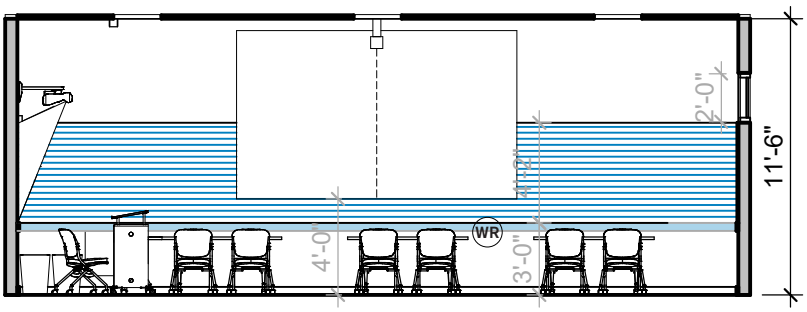
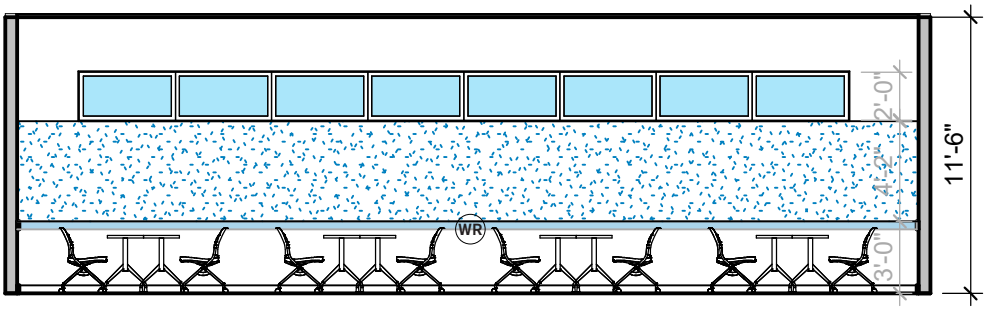
- C — CAMERAS (UPGRADE)
- M — VOICE-LIFT MICROPHONES (UPGRADE)
- M — CAPTURING MICROPHONES (UPGRADE)
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2' x 2' LIGHT FIXTURES
- EM — 2' x 2' EMERGENCY LIGHT FIXTURES

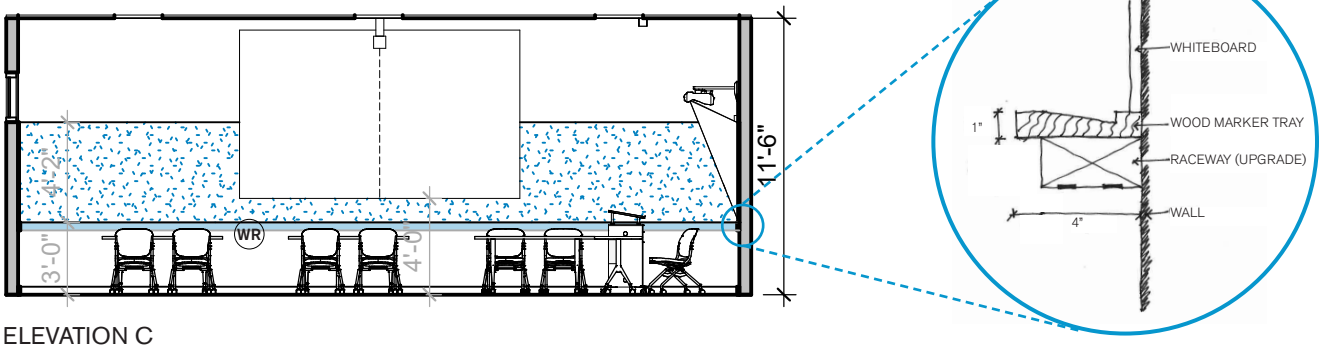
CONCEPTUAL DESIGN (ELEVATIONS)



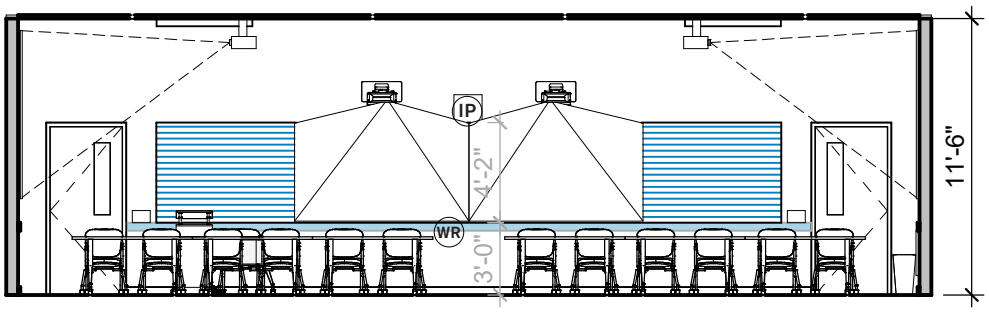
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D

06
LARGE CLASSROOMS

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Large Classrooms at DVC are those with 90 student stations. This classroom size is used to mainly instruct double sections of the medium class courses or triple sections of the small class courses. Since learning styles are as varied as the number of student stations, the room has the capability for multiple furniture settings, all of which can be arranged with the help of students. This would require a behavioral shift at DVC where students and faculty are more engaged in their learning environment.

There is no "front" of the classroom and the space is generally omni-directional, mixed with a range of adjustable furniture options and movable group work easels, and multi-modal with respect to technology to support the 21st century classroom. The room is equipped to support a variety of activities and settings, which require a range of lighting levels, analog/ digital displays and interactive lecture display/ annotation capture capability. The use of energy efficient equipment with automated controls helps improve performance and conserve energy. Due to unknown conditions of the exterior wall/ fenestration pattern of the specific project these standards will be applied to, clerestory windows for natural daylight are proposed as a baseline in the classroom layout.

The room is also equipped with surface-mounted, floor raceways along the perimeter and the central area which terminate in access points that can be located throughout the learning space to support a variety of activities and settings. Hard-wired media access points for plugging in the instructor/ student devices are distributed at four locations (2 wall and 2 floor) in the room.

The proposed classroom inventory aims to be durable, flexible, adaptable, and playful (using the range of colors available for the various products). To enable faculty-student engagement and uninterrupted sightlines in a flat floor classroom, furnishings are adjustable in height. It consists of nesting chairs on casters and glides to enable free movement; flip-top stackable tables on casters with integrated power outlets to provide maximum flexibility within the space; multi-modal instructor station with lockable storage on casters to provide mobility and a range of teaching postures; and writeboards with seamless short throw digital projection system to integrate active teaching. Accessible furniture, similar to the rest of the classroom inventory, is integrated within the space to eliminate segregation and foster collaboration amongst students. Generous circulation space is provided within the classroom to allow for a wheelchair to freely move in the space. Additional flexibility can be added to the classrooms by incorporating acoustically-rated room partitions that would divide the room into two-medium sized classrooms.

The maximum classroom occupancy is over 50 per code (Refer CBC Table 1004.1.2 - Maximum floor area allowance per occupant for 'Classrooms'), hence, two exits are required (Refer CBC Table 1006.2.1).

CLASSROOM INVENTORY**

CHAIR (1)
Movable on 4 legs (2 casters & 2 slide)
Foldable/ Nesting
Mesh back and Fabric/ Vinyl Seat
Arm/ Armless

CHAIR (2)
Adjustable Height for bar height seating with footrest
Movable
Mesh back and Fabric/ Vinyl Seat
Arm/ Armless

TABLE
Foldable/ Nesting
Movable on Lockable Casters
Integrated power outlet
Adjustable Height (for sit/ stand combinations)
ADA compliant

INSTRUCTOR STATION
Integrated workdesk/ podium with option for larger podium work area
Un-tethered/ On Casters
Integrated power outlet
Adjustable Height of desk and podium worksurface
ADA compliant

WRITEABLE SURFACE (1)
Projection & Dry-erase

WRITEABLE SURFACE (2)
Moveable
Double-sided writeable surface

***Refer to the Appendix for sample product cutsheets.*

ROOM DATA SHEET (LARGE CLASSROOM)

AREA	2250 ASF.
STUDENT STATIONS	90.
PLANNING PARAMETER	25 ASF/ Student.
ROOM PROPORTION	Length : Width ~ 1.5x : 1x
MINIMUM CEILING	12'-6".
FUNCTION	Interactive Lecture / Skill Learning and Collaborative Group work/ Skill Application.

SPECIAL REQUIREMENTS

CEILINGS**	Suspended acoustical ceiling system with smooth texture, light reflective, impact/scratch resistant, 2'x2' or 2'x4', white tiles and tegular lay-in grid, minimum NRC rating of 1.0 (Optima by Armstrong or similar).
WALLS**	Full height metal framing with drywall on both sides. Insulate interior of all wall cavities with non-cellulose sound blankets. At partitions facing corridors, use staggered double studs. *(Upgrade: Full-height glass walls at corridors with translucent writeable film.)* Writeable Surface: High-performance dry-erase whiteboard on all walls as per window layout. 3'-0" minimum bottom of board with 1" x 4" wood marker tray (see sketch detail in layouts). Use high-performance dry-erase and projectable whiteboard for walls with Interactive Short Throw Display Projectors. Paint (Field): Semi-gloss interior paint, No VOC. Use accent color if desired. Base: Resilient, pre-molded corners and straight at carpet flooring.
FLOORS**	4" Raised access floor system with 2'x2' base tiles finished with 2'x2' carpet tile. (Tate ConCore Understructure/ PosiTile Carpet or similar). Carpet tile equal or greater than 10 stitches per inch, yarn weight of 20 to 30 ounces, stain/moisture/wear resistant, impervious type backing material, anti-static, UL Class A.
WINDOWS	Energy-efficient, transparent glazing to provide access to daylight and minimize heat loss or gain. Provide automated solar shading (Mechoshade or similar) to control light and glare while projection equipment is in use. Integrate controls with other AV controls. The exterior wall and fenestration pattern may vary on a project by project basis, hence, clerestory windows are shown as a base in the classroom standard layouts. The clerestory is suggested as a baseline for pricing, so that there is a budget allocation to begin with, which affords a certain allowance for glazing to be integrated. Each room will be particular with regards to existing condition, location on campus, and other considerations so the clerestory is certainly not seen as a final decision. The benefit of the clerestory is that it allows writable surfaces to be maximized.
DOORS	(2) 36" wide minimum, solid core, wood doors with narrow vertical tempered glass vision panel and hollow metal frames. No transfer grills or kick plates.
HARDWARE	Mechanical lever locks with means of interior locking (push button) for security. *(Upgrade) Electronic locks with mechanical (push button) override from the inside with capability to tie into campus-wide security system. All electronic locks to be placed on the door and not the wall.* Door hardware groups across various campuses shall be specified to provide a secured environment during a lock-down scenario, in particular by providing an interior override function as well as remote and local lock down. For existing general-use classrooms, replace mortise style

***Refer to the Appendix for example product cutsheets.*

with hotel style deadbolt locks similar to Corbin Russwin ML2013. For new construction of general-use classrooms, use Corbin Russwin CL 3351 or 3129 series. Where required, electrified locks, including those with HID card access, shall include a push button to override the card access on the exterior, similar to Sargetnt IN120 and IN220 HID, or Schlage AD-400 series. For large classrooms (over 90 students), crash bars must provide a means to override the dogged down feature and electronic lock open feature with a mechanical thumb turn device, similar to Von Duprin crash bar with 2SI feature.

HVAC

Recommended Temparature Range: Summer 74F +-2F / Winter 70F +-2F or per campus standards.
No additional humidity control may be required if RH is within acceptable condition per AHSRAE 55 thermal comfort and not required by Campus.
Low velocity air flow diffusers, especially when corner screen is provided to avoid agitating the screen. Lockable thermostat zone control.
Provide wall mounted zone temperature sensor with LCD display including room temperature, room CO2 level, temperature setpoint control, and after-hour override timer control with user adjustable duration.
Zone occupancy to be monitored by connection to the lighting occupancy sensors.
Where HVAC return paths to classrooms are not ducted, acoustical boots should be used to maintain the composite sound isolation performance of enclosing assemblies.
Ensure that mechanical systems adhere to the guidelines provided in the latest version of the Noise and Vibration Control chapter in the ASHRAE HVAC Applications Handbook.
CO2 Sensors for Demand Control Ventilation required per California Energy Code.
AV rack and laptop storage carts are located in closets outside the classroom. If they are located in the room, provide supply and return passthrough to remove additional heatload in the room.

PLUMBING

Automatic fire sprinklering system. Do not route plumbing through or near classroom areas.

LIGHTING

<u>GENERAL REQUIREMENTS</u>

- Target light levels, per the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13):
    - Horizontal illuminance @ desk height, 2.5' above finished floor = 500 lux (50fc) average throughout classroom to accommodate a wide range of tasks/uses (15fc for computer use, 40fc for paper tasks/reading, 50fc for art or science projects).
    - Vertical illuminance @ white board (i.e. vertical writable surfaces) = 300 lux (30fc) average.
    - Vertical illuminance @ pin-up walls (aka "tack board") = 150 lux (15fc) average.
    - Vertical illuminance @ background walls (not writable surfaces) = 150 lux (15fc) average.
    - In many situations the classroom/task light levels may be lower (such as A/V presentations or computer use), but the lighting system must be able to achieve average light levels noted above upon demand.
- Emergency egress lighting shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured at floor level throughout the room (since path of egress varies for different room layouts).
- Light fixtures and controls shall provide simple and affordable solution for classroom lighting.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Daylight photosensors and occupancy/vacancy sensors may be provided by 3rd party manufacturer, but shall be fully compatible with classroom light fixtures and warrantied by the installing electrical contractor.
- All LEDs used in the LED light fixture shall be of proven quality from established and reputable LED diode manufacturers with minimum 5 years experience in the manufacture of LED diodes. LED light fixture supplier shall have minimum 5 years experience designing, selling and supporting installations of LED systems.
- All light fixtures and control gear shall be UL-listed (or equivalent by ETL / CSA) for indoor locations.
- Manufacturer of LED systems shall utilize an advanced production LED binning process to maintain color consistency within a 4-step MacAdam ellipse per ANSI Standard C78.377 within all luminaires

***Refer to the Appendix for example product cutsheets.*

unless otherwise specified.

- Manufacturer shall provide photometric data for all light fixtures based on test results from an independent testing lab including candlepower distribution data in polar graph form, total lumen output per light fixture, and total wattage per light fixture.
- Contractor to consult with the owner and provide if required, back-stock of all led power supplies/drivers in a quantity to the owners' preference.
- All lighting equipment (including but not limited to light fixtures, LED drivers/power supplies, control interfaces, user interfaces, daylight photosensors, occupancy/vacancy sensors) shall be furnished with 5-year warranty for full replacement (materials and labor) effective from the date of substantial construction completion.
- All electrical lighting shall follow the latest applicable codes and standards (see Appendix for lighting code summary):
    - 2016 California Building Standards Code ("Title 24")
        Part 3 Electrical Code – Installation requirements and egress lighting levels.
        Part 6 Energy Code, Subchapter 4 – Lighting control and dimming requirements.
        Part 6 Energy Code, Subchapter 5 – Energy use (Lighting Power Density)
        Part 9 California Fire Code, Section 1008 Means of Egress Illumination
    - CalGreen Building Standards Code (Part 11 of Title 24)

LIGHTING FIXTURES**

2' x 2' General Light Fixture

- Shall be 2' x 2' square and work within a standard 2' x 2' suspended ceiling grid system. Acuity 2BLT2-40L-ADP-120-EZ1-LP935-N100-LATC or similar for fixed 3500K color temperature. *(Upgrade) Acuity 2BLT2-TUWH-PROR-40L-ADP-120-NLT-LATC or similar for tunable white option.*
- Emergency Lighting fixture shall be same Acuity 2BLT2-40L fixture as others in classroom, but shall incorporate EL14L (1400 lumen) battery pack.
- Light fixture appearance shall have design-neutral aesthetics with clean, refined details to blend into the ceiling. Expressive design statements are discouraged from the general lighting fixtures.
- Powder coat, white finish.
- Minimum rated life of 60,000 hours per IESNA TM-21 criteria @ L70. LED fixture manufacturer shall power the LED diodes at a drive current recommended by LED diode manufacturer to reach minimum 60,000 hour rated life @ L70. LED diodes shall not be "overdriven" at a higher drive current to increase light output to detriment of rated lamp life.
- Field-replaceable LED engines and drivers/power supplies, with access to LED engines and drivers from below the fixture or within the plenum (without the need to demount the fixture from the ceiling grid).
- Sealed light diffusers and optical compartments that restrict ability for dust and bugs to settle within the fixture.
- Fixture provided with a range of fixed lumen outputs ranging from 3000 – 5000 lumens per fixture (@ 3500K) to accommodate classroom ceiling heights ranging from 9'-0" to 12-6". Upon implementation, project design team is responsible for specifying the fixture's lumen output to achieve the required light levels as noted within the Design Standards document.
- For tunable white option, fixture shall provide consistent lumen when varying the color temperature (i.e. constant lumen curve).
- Nominal 4,000 delivered lumens @ delivered lumens per watt (LPW) > 100 LPW.
- CRI = 80+ (basic version) or 90+ (enhanced version) for light fixtures
- Color temperature = 3500K (basic version) or Tunable White with range from 3000K – 5000K (enhanced version).
- Spacing to mounting height ratio (S / MH) > 1.18 in any direction. Typical on-center spacing of 2x2 light fixtures is 8', though 10' spacing is permissible for ceiling heights 10'-6" or taller.
- To control glare to occupants, 2x2 light fixtures shall have the following performance requirements:
    Luminance < 4500 cd/m2 @ 45° above Nadir, <4000 cd/m2 @ 55°, < 3500 cd/m2 @ 65°, < 3000 cd/m2 @ 75°, 2500 cd/m2 @ 85°.
    Intensity < 1000cd at angles 50° or higher above Nadir.
- Dimmable to 5% light output without flicker or jumps in light output.

***Refer to the Appendix for example product cutsheets.*

Linear Wallwash / Accent Fixture (Upgrade)

- *Wallwash fixture shall be nominal 4" or 6" wide and available in 2' and 4' lengths.*
- *Accent fixtures shall be nominal 4" or 6" square shape and provide lockable vertical tilt and horizontal rotation to orient the light output towards the target wall surface.*
- *Fixture shall be capable of end-to-end through wire connection for continuous runs (interrupted by ceiling grid where needed).*
- *Color temp matching the 2' x 2' general lighting fixture. If 2' x 2' fixture uses tunable white light engine, standardize the linear wallwasher @ 3500K color temperature (tunable white not needed for the wall washers).*
- *Powder coat, white finish to match the 2' x 2' general lighting fixture.*
- *Max intensity (i.e. CBCP) of wallwash fixture or accent fixture shall exit the fixture at an angle to hit the target vertical wall surface @ 5'-0" AFF given a classroom's ceiling height and light fixture setback distance. Upon implementation, project design team is responsible for specifying the fixture's setback distance to target 5' AFF on the vertical wall surface with the fixture's CBCP.*
- *Accent light fixture shall be aimed at nominal 30° angle from Nadir to the 5' AFF target on the wall/whiteboard surface. Accent fixture shall have CBCP (specified by project design team to match project ceiling height) to achieve the required light levels on the wall/whiteboard surface as noted within the Design Standards document.*
- *Wallwash lens / fixture aperture shall be shielded or angled away from student line of sight (i.e. angled towards the vertical wall surface) to mitigate glare to occupants. Flush lens (to the ceiling plane) is NOT acceptable for the wallwash fixture.*
- *Wallwash fixture provided with a range of fixed lumen outputs ranging from 350 – 675 lumens per foot (@ 3500K) to accommodate variety of layouts (single fixture, dashed line, continuous row). Upon implementation, project design team is responsible for specifying the fixture's lumen output to achieve the required light levels and uniformity on the wall/whiteboard surface as noted within the Design Standards document.*
- *CRI = 80+ (basic version) or 90+ (enhanced version).*
- *Dimmable to 5% light output without flicker or jumps in light output.*
- *Fully compatible with the specified control system, including digital addressing of wallwash / accent fixtures.*

LIGHTING CONTROLS

General Description

- Acuity nLight system or similar for fixed 3500K color temperature. *(Upgrade) Acuity nTune system or similar for tunable white option.*
- Occupancy/ Vacancy sensor, required per Title24 building code, shall automatically turn off classroom lighting when room is unoccupied.
- Light fixtures and controls shall be provided by a single manufacturer as a complete system to ensure full compatibility between components and full warranty for the entire lighting & controls system.
- Light fixtures work together as a single network (within one classroom only) and does not require a centralized (whole-building) control system.
- The system is scalable to multiple classrooms by simply repeating the single-network model.
- Control system shall be easy to install, commission, and maintain. Fixtures and controls work together as a system with "out of the box / plug and play" connectivity.
- Digital addressing of fixtures (explained above) allows for easy reconfiguration / revision of control zones without need for rewiring.
- Classroom lighting control system shall be linkable with campus Building Management System (BMS).
- Classroom lighting control system shall be compatible with California's Title24 Demand Response requirements.
- *(Upgrade) Allows for individual fixture calibration for lumen output or color temperature (if tunable white) should a light engine require replacement or color shift (if tunable white) is observed over time.*
- Allows for integration of 3rd party light fixtures into the classroom lighting control system using industry-standard control protocols.

***Refer to the Appendix for example product cutsheets.*

Emergency Lighting

- Designated 2' x'2' classroom emergency light fixtures (EM fixtures) shall be of same family, type, appearance, digital addressing capability, and lumen output under normal power operation as adjacent 2' x 2' classroom fixtures.
- EM fixtures shall be UL924 listed for emergency operation.
- EM fixtures shall operate as normal light fixtures when normal power is available (i.e. they can dim or turn off according to preset scenes or user override). The EM fixtures shall automatically override to emergency-mode light output (1400lm) upon loss of normal power via automatic transfer to the specified battery backup power source.
- Upon loss of normal power, EM fixtures shall operate with 1400 delivered lumens for a period not less than 90 minutes.

User Controls

- All user controls shall be mounted within the acceptable range for ADA compliance, namely 36" on center, above finished floor.
- Instructor access to lighting controls via localized keypad mounted at instructor station and/or classroom wall.
- *(Upgrade) For tunable white feature, provide side-by-side (double gang) keypad with one keypad hosting preset scenes, and second keypad hosting independent control of color temperature and light level/intensity/dimming for the selected scene.* See "Sample Product Cutsheets (Lighting), Tunable White" in the appendix.
- Preset scenes are customizable by school administration.
- Lighting controls shall permit additional interface/coordination with the classroom A/V control system to automatically control lighting in connection with A/V actions (such as turning on projectors, projection screen and window shade deployment, etc.)

Digital Addressing

- All classroom light fixtures shall allow for individual fixture addressing (aka digital addressing) that is independent of power/control wire configuration.
- Digital addressing features shall allow for individual fixture control of intensity and *(upgrade) color temperature (if tunable white)*, as well as grouping of light fixtures (via software) into control zones that are independent of power/control wire configuration.
    - This feature shall permit individual fixtures to be within MULTIPLE control zones, and such control zone grouping to CHANGE depending on the selected lighting scene.
    - This feature shall permit onsite calibration of individual fixture's lumen output (via software) to balance uniformity of light levels throughout a classroom.

Lighting Control Sensors

- (1x) Acuity daylight photosensor or similar and (1x) Acuity dual technology (PIR and Ultrasonic) occupancy/vacancy sensor or similar. Each single sensor can control multiple fixtures in the classroom.
- Specified light fixture shall offer (as an option) a daylight photosensor as well as an occupancy/ vacancy sensor integral to the light fixture. Each integral sensor can control multiple fixtures in the classroom.
- Compatibility with 3rd party sensors if needed (such as daylight photosensors or vacancy sensors) via hard-wired OR wireless communication.
- Occupancy/ Vacancy sensors for light fixtures shall also trigger HVAC operation (or vice-versa)

ACOUSTICS

SOUND ISOLATION

General Description

- The noise generation potential at all classroom adjacencies should be carefully evaluated when determining the acoustical requirements of both vertical and horizontal classroom partitions. For classrooms that must be located adjacent to spaces expected to generate high sound levels such as music practice/performance rooms, stairwells, elevators, mechanical equipment rooms, active corridors and nearby lobbies, additional acoustical consideration should be paid the STC rating of the partitions, windows and any communicating doors.

***Refer to the Appendix for example product cutsheets.*

Walls

- In general, the sound isolation across the partition will depend on several factors. The primary factor will be the STC performance of the partition assembly itself. Other factors include whether there are doors or windows between the rooms and penetrations such as ductwork and piping. Consideration of these various factors as well as choice of construction systems and methods and cost will ultimately dictate the recommended wall assemblies, type of door gasketing, glazing size and selections, and ceiling systems.
- For the base condition, the walls surrounding the classrooms should be full-height (i.e. slab-to-slab) and achieve a minimum acoustical performance rating of Sound Transmission Class (STC) 50 or Noise Isolation Class (NIC) 45.
- For classrooms adjacent to loud spaces such as lobbies, band rooms and mechanical rooms, a special assessment should be performed to determine the required minimum STC rating of the partition. Depending upon the specific adjacency, the expected range of performance is STC 55 to 60.

Doors

- For the base condition, all classroom entry doors should be fully acoustically gasketed at the jambs and at the bottom. Typical adjacencies such as to a private office or a vestibule, should also include a fully acoustically gasketed door.
- For classrooms that open onto a primary circulation corridor or lobby, the doors should have a minimum acoustic rating of STC 35. For communicating doors between classrooms, specify STC 45 to 50 or greater depending upon the specific adjacency.

Floor/Ceiling Assemblies

- Where classrooms are located below active and potentially noisy spaces, the floor/ceiling assembly should be designed to achieve minimum:
    - Air-borne Sound: STC 50
    - Impact Noise: IIC 45
- For air-borne sound attenuation, an 8" minimum thickness concrete slab with suspended lay-in ceiling will achieve a minimum STC of 50. For wood framed construction, use of light-weight concrete and resilient isolation clips such as resilient channel at the ceiling gypsum board will likely be necessary.
- For impact noise attenuation, carpet without any additional acoustical treatment is conditionally acceptable. Areas with significant amount hard finish will require an additional sound-attenuation underlayment such as rubber or cork.

Exterior Façade/Windows

- Classrooms potentially exposed to excessive outdoor noise sources such as roadway traffic and air-craft flyovers will require an environmental noise survey in order to determine the minimum STC performance requirements of the windows and wall.
- The standard noise level criteria for all classroom due to exterior/outdoor noise sources should be a 15-minute average noise level of 35 dBA (Leq) or less and a maximum noise level of 50 dBA (Lmax-Slow).
- Where the outdoor noise level is found to be 60 dBA or greater, the mechanical air-ventilation system in the classroom must be designed so that the fresh-air requirement can be achieve with operable windows in the closed position.

ROOM ACOUSTICS

The overall acoustical finish scheme in the classrooms should control excessive sound reverberation and support excellent speech-intelligibility.

Base Classroom Design

- Reverberation Time (RT60 at 500 Hz): less than 1.0 sec
- The ceiling is the most cost-effective surface to consider for locating the primary acoustical finish. Typically, a lay-in tile ceiling having a minimum NRC 1.0 such as Optima by Armstrong or similar should be considered.

***Refer to the Appendix for example product cutsheets.*

- Sound absorbing wall panels should be considered as follows:
    1. Wall panels should have a minimum acoustic performance of NRC 0.75 and be at least 2" thick.
    2. Where possible, apply acoustical wall panels on at least one surface of each pair of parallel walls and in the wall area between seated and standing ear height. See layouts for recommended locations of wall panels.

Upgrade or Non-Standard Classroom Considerations

- *In the case where upgraded sound-isolation might require a "hard-lid" ceiling and where a dropped lay-in tile ceiling cannot be installed, then the exposed hard-lid ceiling should be treated with minimum NRC 0.80 and 2" thick acoustic panels.*
- *Sound absorbing wall panels should be considered as follows:*
    1. *When less than 100% of the ceiling area is not acoustically treated, then a remaining equivalent area of acoustical panels having should be applied to the walls.*
    2. *If "front-firing" loudspeakers are being considered, the wall opposite the loudspeakers should be fully covered with acoustical wall panels as feasible.*
    3. *If wood finishes are desired, consider perforated or kerfed acoustic panels having minimum NRC 0.80 such as by RGP Corporation, or slats or grills such as 9Wood Company.*
- *Acoustic treatments may also be required to minimize flutter echoes and control extraneous echoes.*

MECHANICAL NOISE/ VIBRATION CONTROL

- The noise level in the classrooms as generated by mechanical equipment (HVAC, Electrical, Plumbing, Elevator Equipment and AV equipment) should be limited to a maximum noise level of Noise Criteria (NC) 30 in the classrooms.
- All potentially noisy MEP and Elevator equipment located adjacent to, above or below the classroom, including fans, pumps and electrical transformers should be carefully evaluated for both air-borne and structure-borne noise and as required, acoustically treated and/or the intervening partition or floor/ceiling be acoustically upgraded.
- The air-velocity in ductwork located within the classroom should not exceed 800 fpm. The air velocity in the final branch-duct should not exceed the diffuser neck velocity by more than 150 fpm, unless otherwise noted. The air-velocity at the neck of each supply and return diffuser should not exceed 400 fpm.
- VAV boxes should be sized to limit the total pressure drop to 0.5-inches TSP or less and have both a radiated and discharge sound level of less than NC 30.
- FCU and VAV boxes with radiated noise levels greater than NC 30 must not be located in the ceiling over the classrooms.
- Flexible ductwork shall not be used on medium pressure duct systems upstream of VAV box connections.
- Sheet metal ductwork should be internally lined with 1-inch minimum thickness of acoustical duct-liner.
- Air-transfer boots should be constructed completely of acoustically lined sheet metal, include at least one 90-degree elbow and sized depending upon the degree of sound-isolation required and for maximum 500 fpm.
- Supply and return diffusers should be selected to perform no greater than NC 25.
- Ducts, pipes and conduit attached to vibration isolated equipment should include flexible or resilient type connections and may be required to be vibration isolated from the building depending upon proximity of the duct or pipe to acoustically sensitive spaces and the power of the attached equipment.
- The noise emission from AV Equipment should also be considered. Where noisy AV equipment is unavoidable and is needed to be located in the classroom, then sound-rated ventilated equipment racks should be considered.

AUDIO/VISUAL EQUIPMENT**

AUDIO SYSTEM

Audio DSP (Digital Signal Processor): QSC Core 110f or equal
Loudspeakers: QSC AC-C6T or equal
Amplifier: QSC CMX300Va or equal

***Refer to the Appendix for example product cutsheets.*

Wireless Microphone: Shure QLXD24/SM58 handheld transmitter and receiver, Shure QLXD14 bodypack transmitter and receiver and (2x) countryman B-3 bodypack microphones or equal.

Voice Lift: *Meyer Sound Constellation (Upgrade). If selected, Audio DSP, loudspeakers, amplifier and wireless microphones above would be removed. All classroom audio would utilize constellation speakers, amplifiers and processor.* Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.

Assistive Listening: Listen Technologies LT-800-072 transmitter and LR-4200-072 receivers (provide 4% of seating capacity) or equal.

VIDEO SYSTEM
Minimum viewer distance to digital display (especially in lecture mode) should be equal to the width of the display screen/ projected image.

Projection:
Standard Projection: (3x) Panasonic PT-RZ770 or equal – 7000 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 1-chip DLP, Laser Source

Interactive-Short Throw: (2x) Epson Brightlink Pro 1460Ui or equal – 4400 ANSI lumens, 1920x1200 (WUXGA), 16:10 Aspect ratio, 3 LCD, with output capabilities for mirroring annotation and content onto a larger projection screen. Provide equivalent laser source model if available.

Projection Surface:
Motorized Screen: (3x) Draper Access V ceiling-recessed, tab-tensioned, motorized screen or similar for video projection sized 87.5"x140" for viewing from half of the classroom depth in the long direction and full classroom depth in the short direction. The bottom of the viewable image shall be at 4'-0"AFF. Screen material shall be Matte white or equal. *(Upgrade): Screen material shall be TecVision XH900X ALR (ambient light rejecting) or equal for use in moderate to higher ambient light and wider viewing angles.*

Markerboard: Low gloss or matte surface white-dry erase board for interactive short-throw projection. PolyVision projection surface or equal.

Transport and Switching:
Video Matrix Switcher (location: main equipment rack):
Crestron DM-MD16X16 Digital Media Switcher
-Input Cards: (4) DMC-4K-HDCP2, (2) DMC-DVI, (1) DMC-4K-C-DSP-HDCP2
-Output Cards: (3) DMC-4K-HDO

Instructor Station:
Instructor Station Video Switcher: Crestron DM-MD8X1-4K-C with DM output for instructor station
Instructor Station Cable Cubby: Extron Cable Cubby 500
DVD Player: Denon DN-500 or equal at instructor station
Document Camera: Elmo P10HD or equal at instructor station
Wireless Presentation: Mersive Solstice or equal at main equipment rack

Capture/Conferencing (upgrade)*:* Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.
PTZ Camera: Panasonic AW-HE40SWPJ with HDMI output (or equal) located on the back wall of the room.
Capture/Stream Unit: Extron SMP351 or equal (location: main equipment rack)
Conferencing Unit: Extron MediaPort 200 or equal (location: main equipment rack)
In-Room Computer: Dell or equal (location: main equipment rack)
Triple Element Ceiling Microphone: (4x) Audix M3 or equal

***Refer to the Appendix for example product cutsheets.*

(Upgrade) Ceiling Array Microphone: (4x) Shure MXA910 or equal

CONTROL SYSTEM

Control Processor: Crestron CP3N control processor or equal. The AV system shall be able to send preset recall signals to the master control units for window shades and lighting so these components can be controlled via one cohesive system (location: main equipment rack).

Touch Screen: Crestron TSW-760 7" Touch Screen on the wall and *placed at instructor's station (upgrade)*. Wireless control shall be configured for controlling the room via an app or laptop. Backend infrastructure for 'upgrade' system to be installed in the base classroom to avoid re-wiring.

UTILITY / OTHER

See layouts for recommended locations of data/power and hardwired AV connections.

A campus-standard instructor's station shall be provided. The instructor's station would include the DVD player, document camera, laptop connections, USB thumb drive connections for lecture capture, and other items as needed.

AV equipment shall be installed into a Middle Atlantic MRK-AXS or equal pull-out equipment rack stored in an AV closet located outside the room.

VOICE/DATA**

Six dual ports at wired AV station unless noted otherwise. Wireless internet access required throughout. (2) Wi-Fi Acces Ports: Aruba 220 series Acess Points or per current campus standards.

Provide CAT 6 or better connection for the wall mounted IP speaker/clock/ microphone as per campus/ district standard. No separate power conenction required for this product. System to tie into the Building Alarm System. Installation height 8'-0" AFF or as required by manufacturer's manual. Emergency call button (linked to the IP speaker alarm panel) at accessible height of 48" AFF located away from the exit door. See layouts for locations.

POWER

Provide wall power/data fourplex receptacles at +18" AFF, spaced 5'-0" on center. *(Upgrade) Provide continuous, perimeter wall mounted raceway for power/ data/ AV (below the marker tray at +35" AFF), cover color to match wall color. Receptacles in raceway to be duplex, 5'-0" on center.* See layouts for conceptual detail sketch at raceway & writeable surface junction.

Provide pop-up, flush-mounted, fourplex floor boxes at 5'-0" on center within the 4" high, raised floor system. Floor boxes fed either down the walls from above ceiling in existing classrooms or from below grade in new construction.

Provide adequate power for video projector and other AV equipment. Provide additional outlets at Instructor's station for multiple devices.

Provide a provisional recessed receptacle for a wall clock at 8'-0" AFF on one wall in the room, ideally the wall with the short-throw displays.

Power for egress lighting will be provided by batteries integral to the fixtures as required to give the egress lighting levels stated. An option would be to provide power from a central battery/ inverter system. Using that option would depend on the building and/or classroom or assembly space type.

SECURITY**

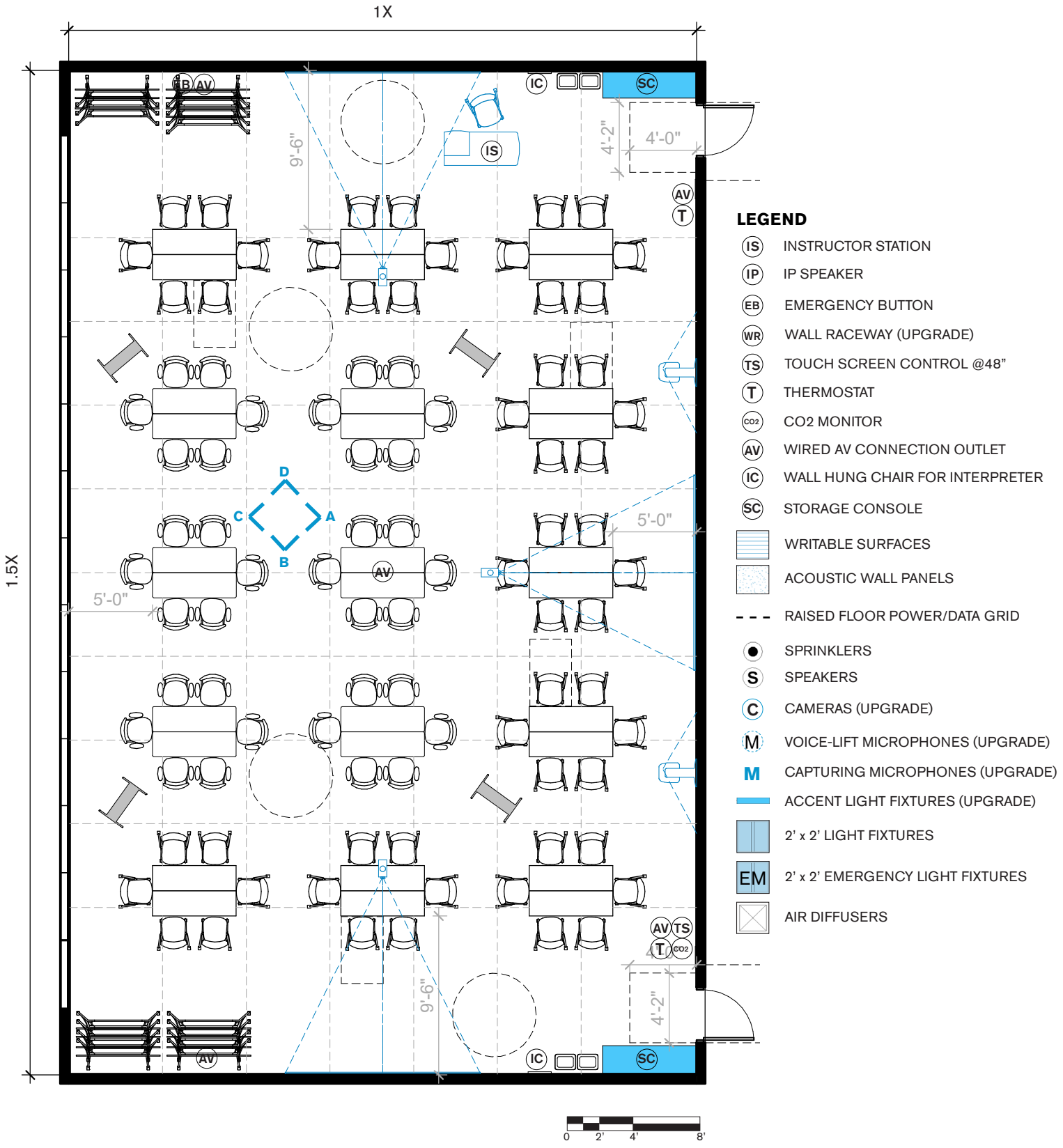
Provide IP speaker with integrated wall clock for campus-wide emergency/ alerts per campus/ district standards. Provide adequate signage for safety instructions.

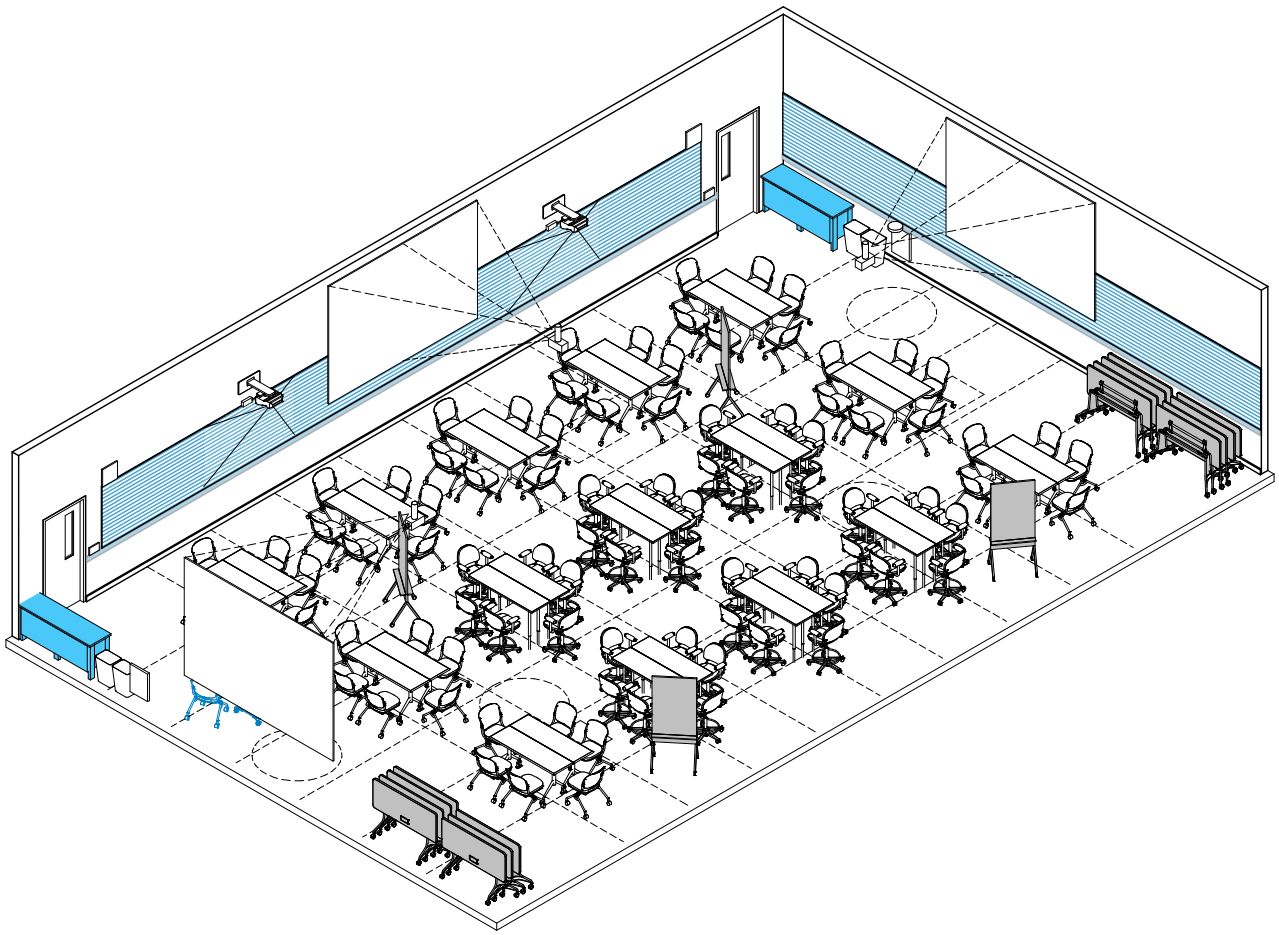
FURNITURE**

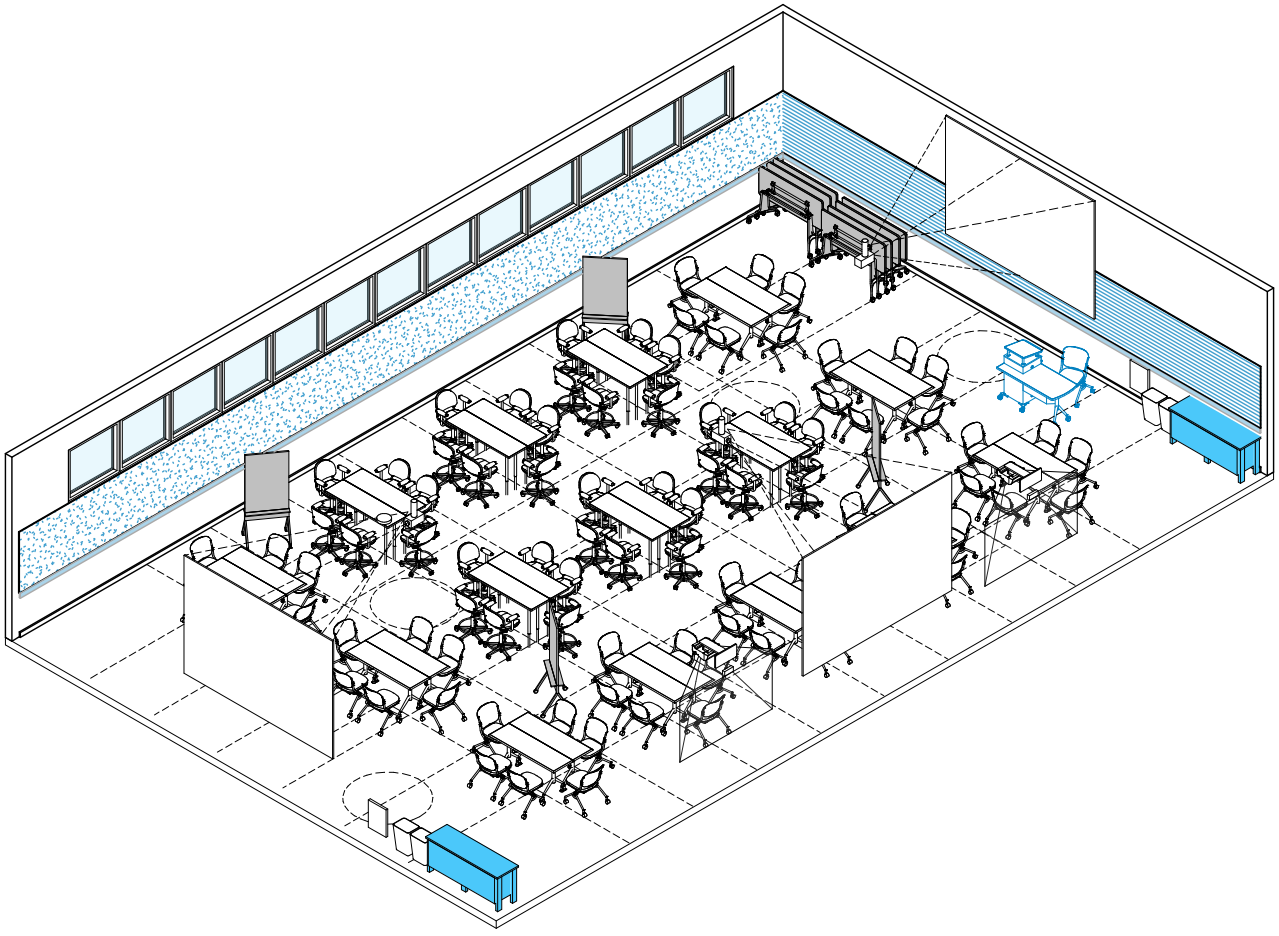
Provide products with active and flexible comfort capabilities while addressing concerns of Universal Design and minimum warranty requirements per campus/ district furniture performance standards.

OTHER CONSIDERATIONS	Do not locate classrooms near or below spaces with loud activities, high impacts and/or high sound pressure level sources, such as fitness areas or mechanical rooms. Do not locate classrooms near electrical transformers, stairwells, elevator shafts, or elevator equipment rooms. Minimize contrast ratio between classroom field and projection screen. Provide 16-gauge pre-notched backing stud with flange fastened with pan head sheet metal screws at partitions with wall-mounted equipment. Provide clear “permanent” use-instructions for furniture and technology in the classroom.
OWNER-PROVIDED SUPPLIES**	Multi-pack, eco-friendly non-toxic dry-erase markers and erasers; cleaner spray.

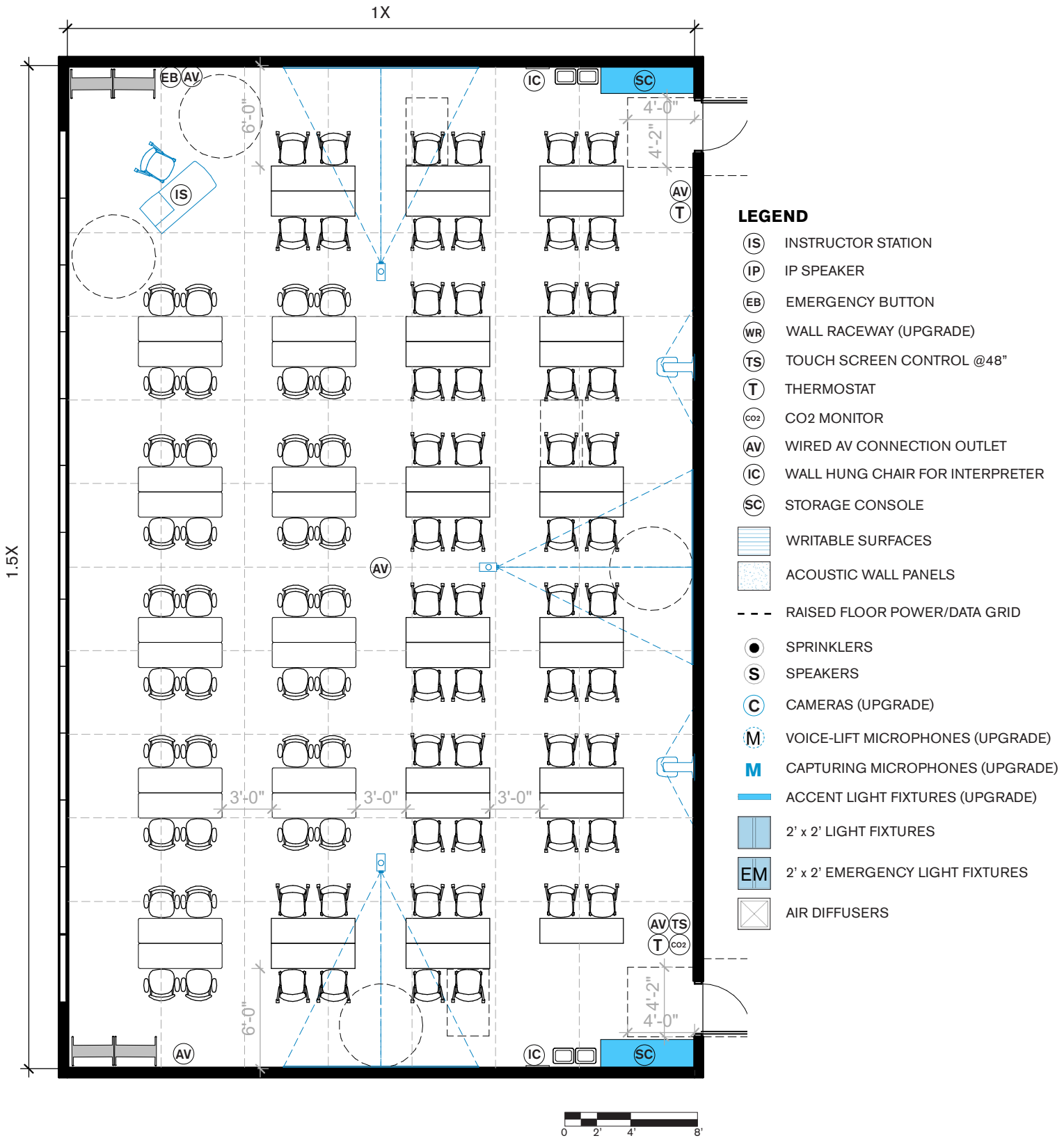
CONCEPTUAL DESIGN (GROUPWORK MODE 1)





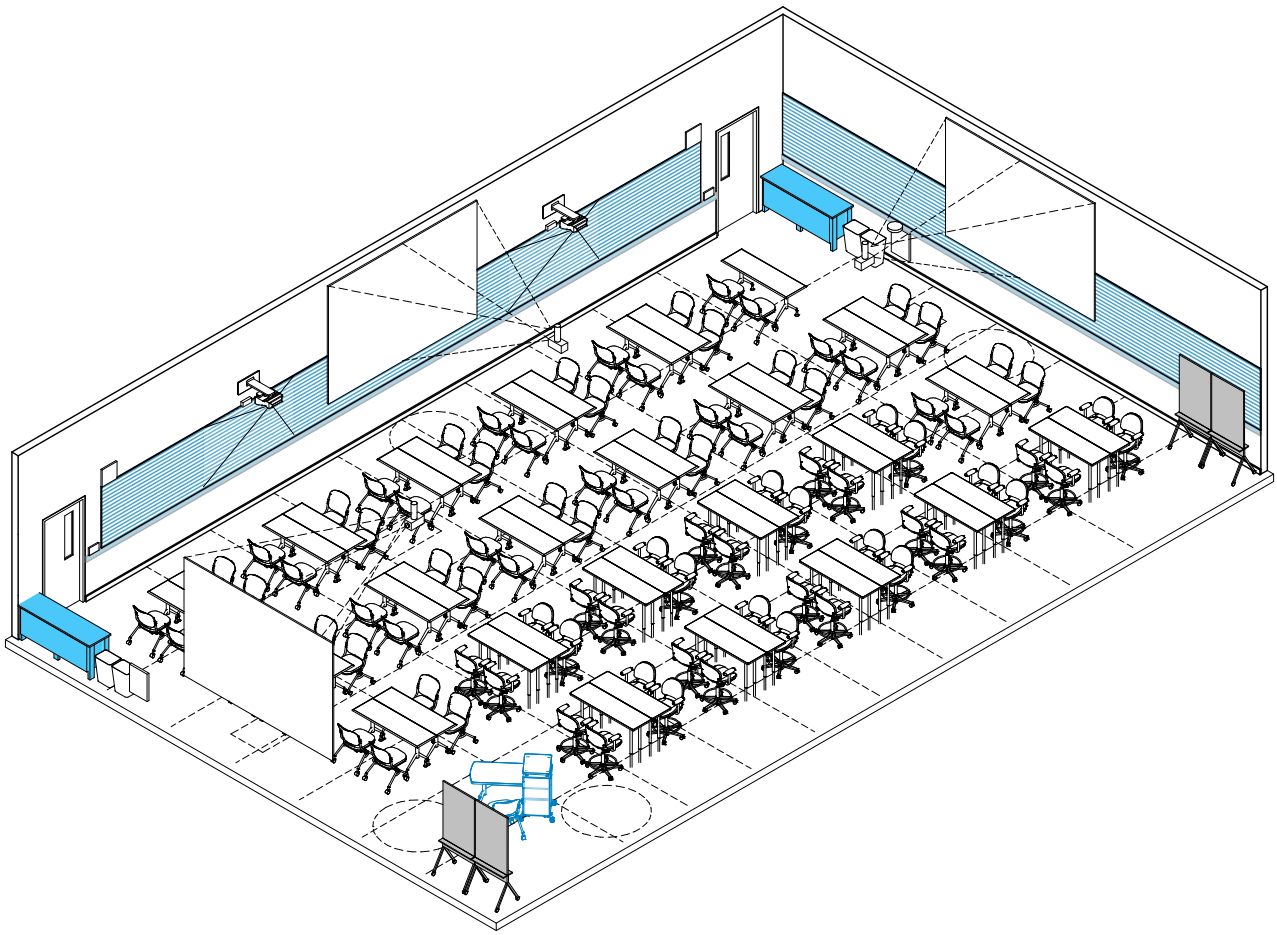


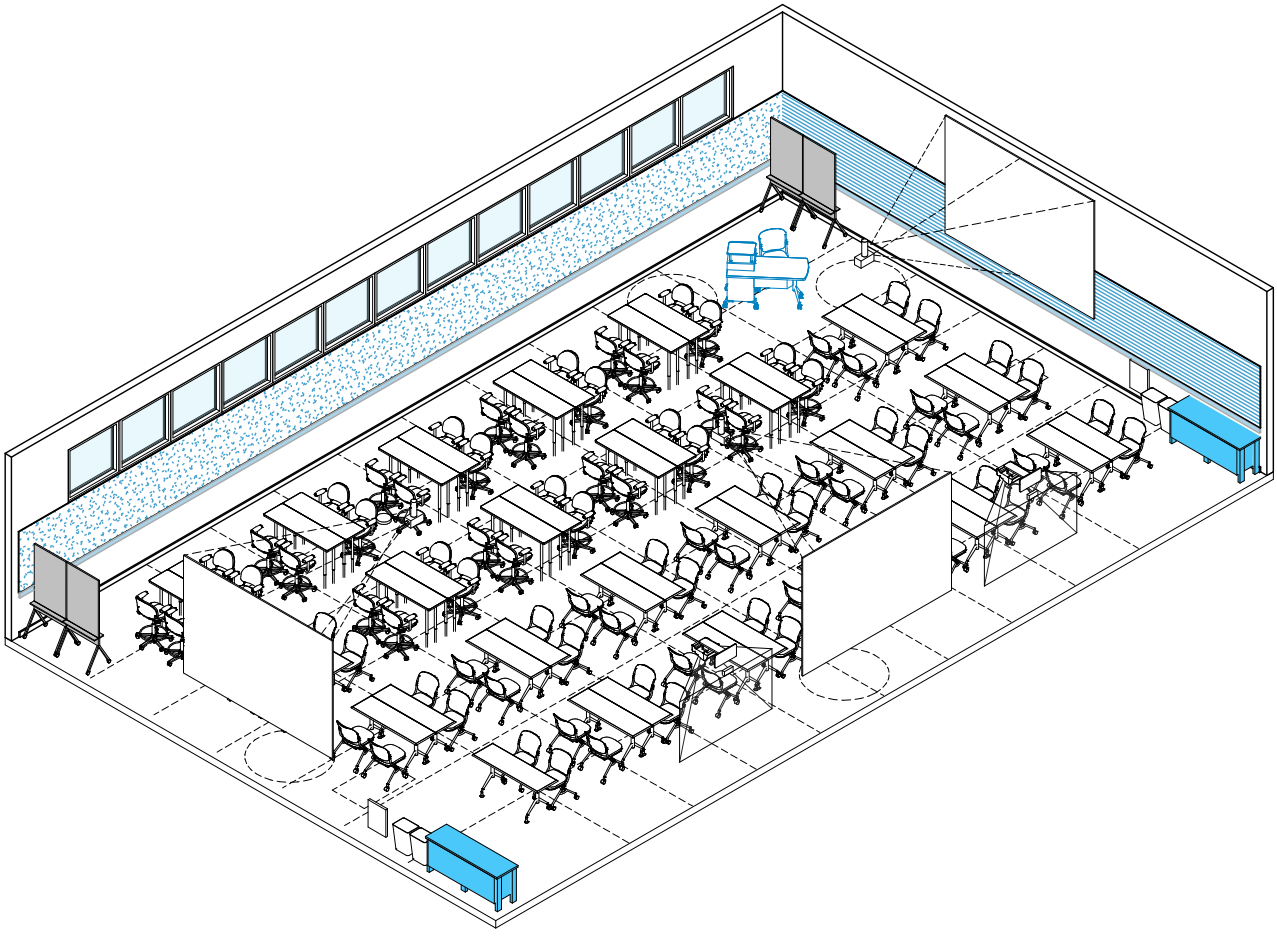
CONCEPTUAL DESIGN (GROUPWORK MODE 2)



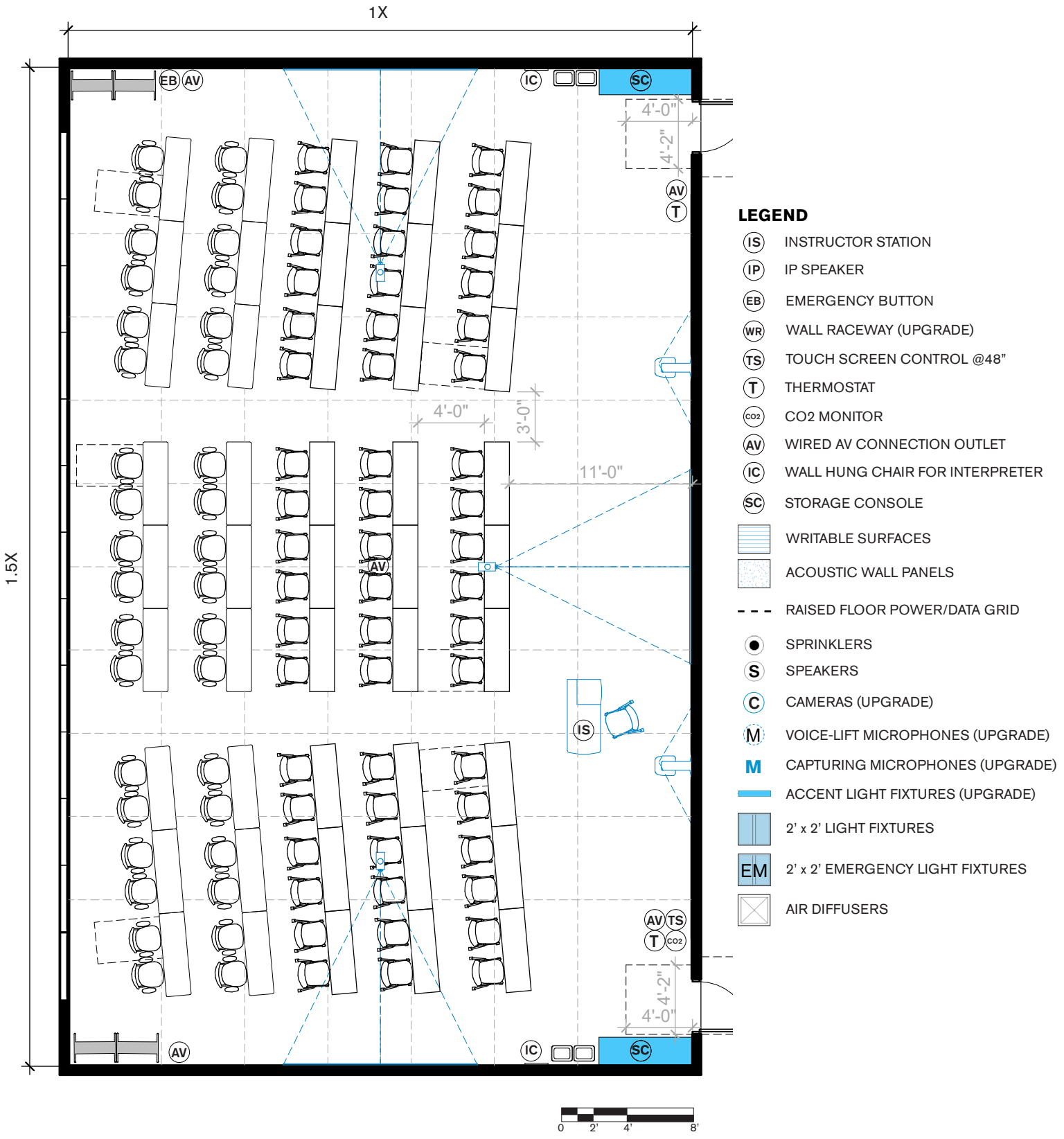
LEGEND

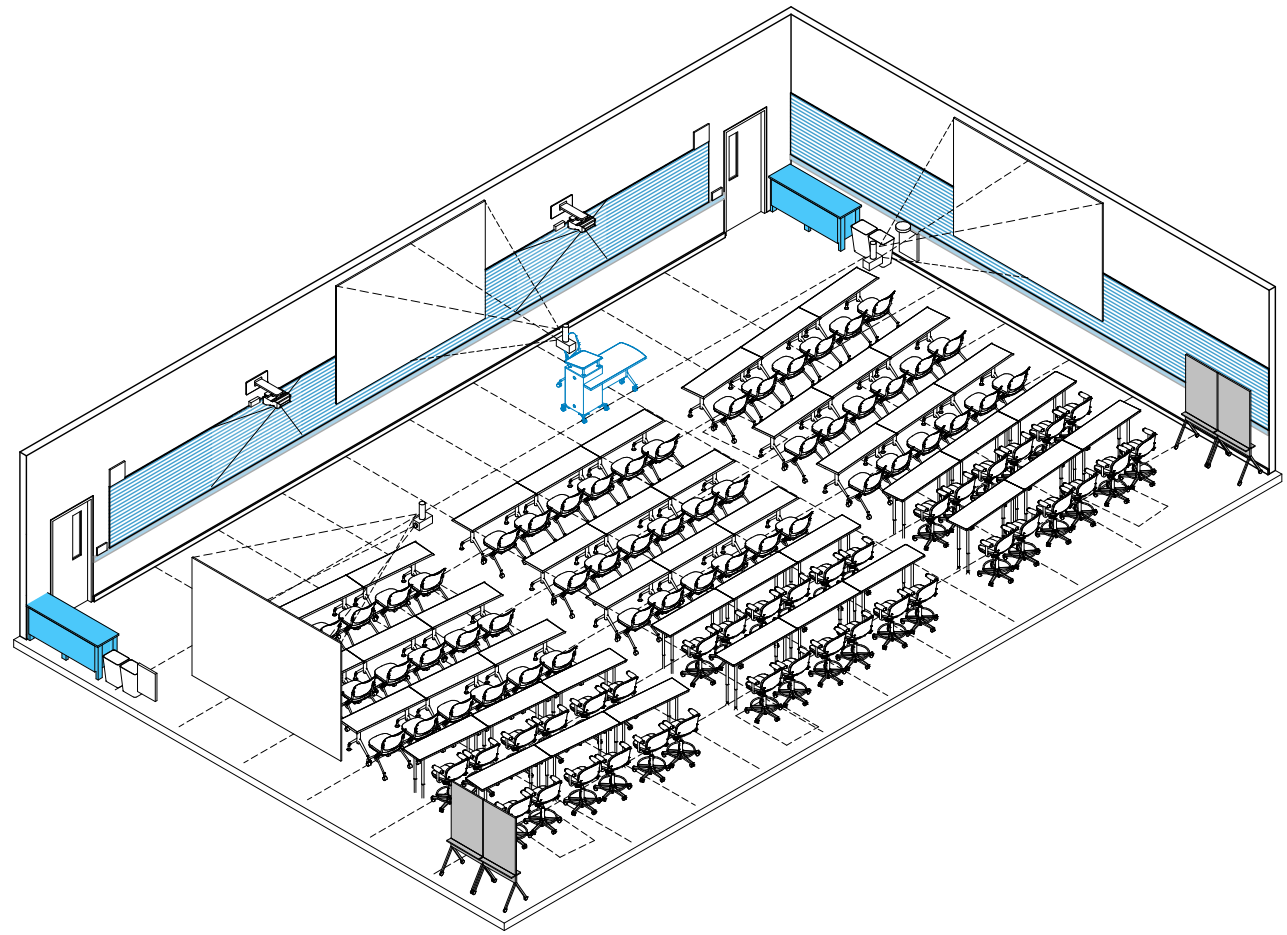
- IS — INSTRUCTOR STATION
- IP — IP SPEAKER
- EB — EMERGENCY BUTTON
- WR — WALL RACEWAY (UPGRADE)
- TS — TOUCH SCREEN CONTROL @48"
- T — THERMOSTAT
- CO2 — CO2 MONITOR
- AV — WIRED AV CONNECTION OUTLET
- IC — WALL HUNG CHAIR FOR INTERPRETER
- SC — STORAGE CONSOLE
- WRITABLE SURFACES
- ACOUSTIC WALL PANELS
- RAISED FLOOR POWER/DATA GRID
- SPRINKLERS
- S — SPEAKERS
- C — CAMERAS (UPGRADE)
- M — VOICE-LIFT MICROPHONES (UPGRADE)
- M — CAPTURING MICROPHONES (UPGRADE)
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2' x 2' LIGHT FIXTURES
- EM — 2' x 2' EMERGENCY LIGHT FIXTURES
- AIR DIFFUSERS

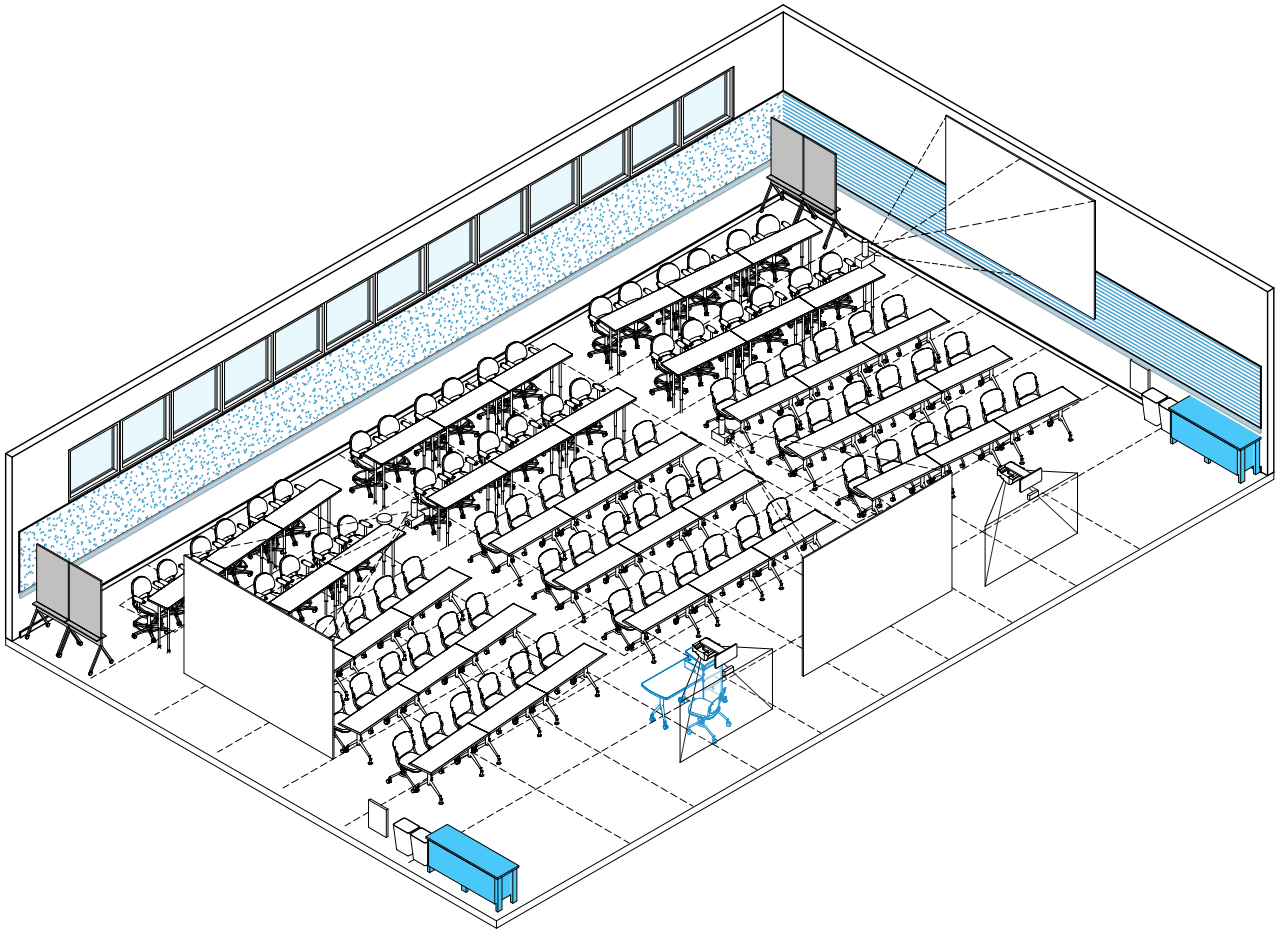




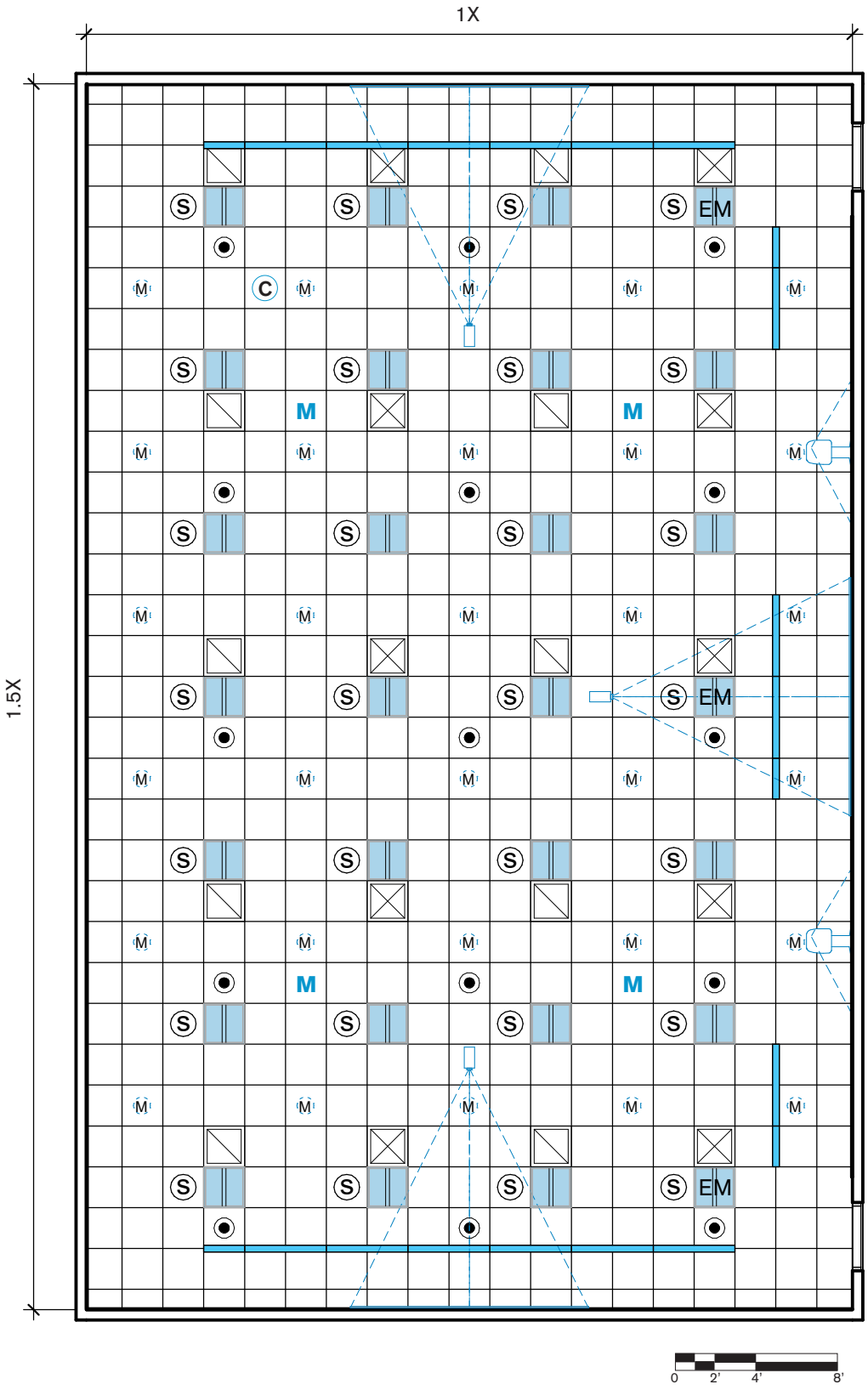
CONCEPTUAL DESIGN (LECTURE MODE)







CONCEPTUAL DESIGN (REFLECTED CEILING PLAN)



LEGEND

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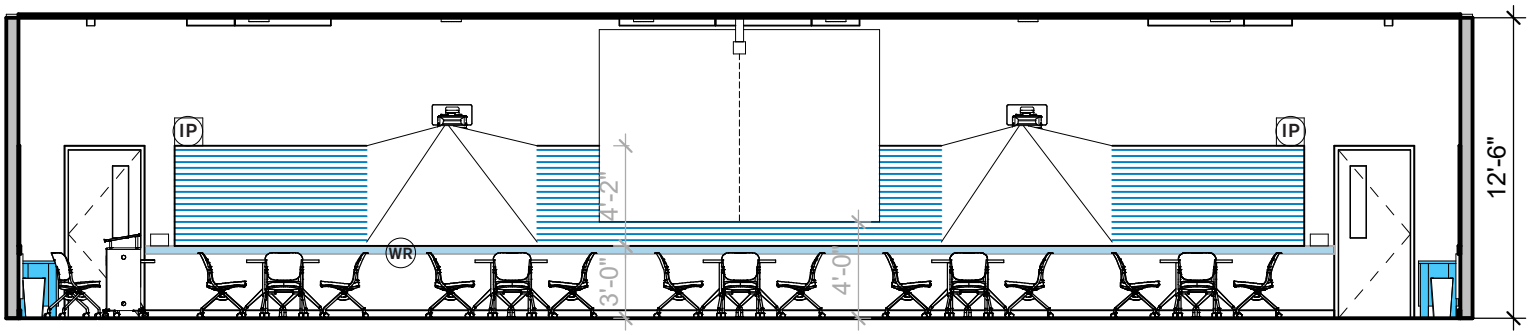
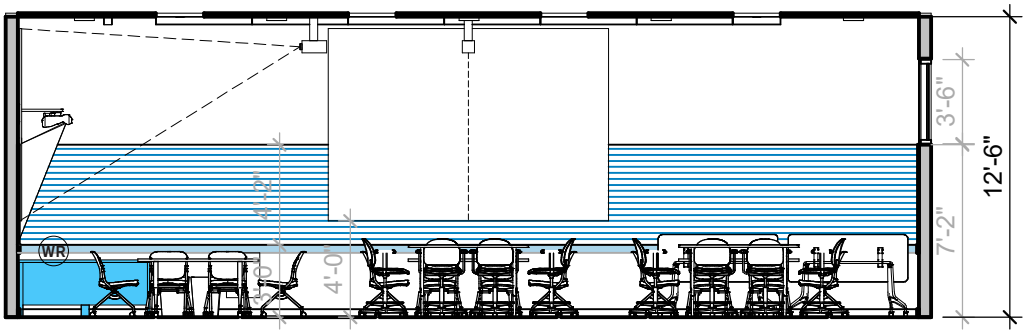
- ACCENT LIGHT FIXTURES (UPGRADE)
- 2’ x 2’ LIGHT FIXTURES
- EM — 2’ x 2’ EMERGENCY LIGHT FIXTURES
- AIR DIFFUSERS

CONCEPTUAL DESIGN (ELEVATIONS)



ELEVATION A



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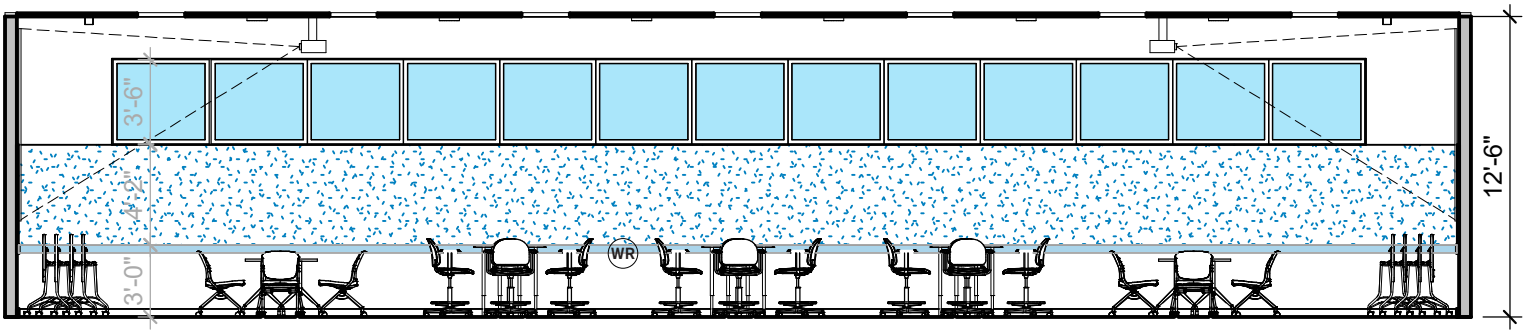

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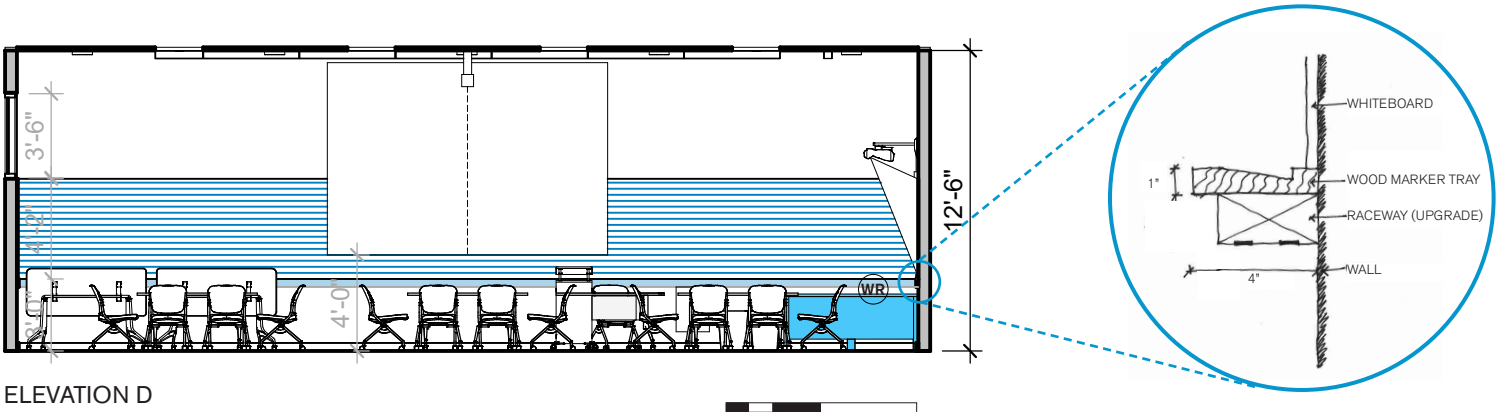

ELEVATION D

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07
APPENDIX

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HIGHER EDUCATION TRENDS

Learning environments need to adapt to the changing pedagogy that focuses on 'learning by doing'. Many campuses are moving in this direction to maximize student engagement. This section highlights some research articles and case studies, shared by the stakeholders and WRNS Studio, that reflect a few current and future trends in Higher Education. To access the full articles, visit the project mircowebsite: www.dvcclassroomdesignstandards.com

Rethinking the Classroom, Herman Miller Solution Essay, 2008

This research article explains the relationship between active teaching/ learning methods and student retention rates. It emphasizes on a holistic learning environment that physically and physiologically promotes experiential learning, problem-solving/ communication skills and builds a sense of identity/ belonging.

Reimagining the Modern Classroom, The Atlantic, 2016

This research article underlines the pedagogical shift from the traditional hierarchical classroom layout to the current, more democratic group layouts. It lays stress on the 'student-centered' environments that help build 'skills for life' with art, plants, color, light, air etc. as important elements enriching the learning space.

Odegaard's Active Learning Classrooms, SCUP 2017 Pacific Conference

This session explored how Odegaard's 24-hour active learning classrooms have become sites for pedagogical transformation and unexpected collaborations. It showcases that resource-rich environments with robust support can multiply opportunities for students, faculty, and staff to learn and collaborate. A two year post-occupancy study was conducted to analyze the pros and cons of the project.

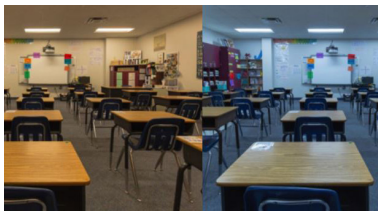
"Transformations: Putting the Student First", SCUP 2017 Pacific Microsymposium, Stanford University

The microsymposium investigated how learning environments can best support innovative, supportive, and experiential learning. A panel of thought leaders discussed the importance of considering physical space, curriculum development and the unique experiences of first-year and/or first-generation students. Further, a series of tours exemplified a range of spaces, including how technology can be leveraged in a multi-purpose room to enhance collaborative learning, how flexibility can be created within a space with minimal intervention and how these innovative learning environments impact student learning.

LIGHTING PRINCIPLES & TRENDS

Lighting has proven to have positive impacts on the learning environments by improving student behavior, attention and health. Many campuses are moving to maximize the benefits from lighting, both through natural and artificial light. This section highlights some research articles and case studies, shared by WATT Lighting, that reflect a few current and future trends in Higher Education. To access the full articles, visit the project mircowebsite: www.dvcclassroomdesignstandards.com

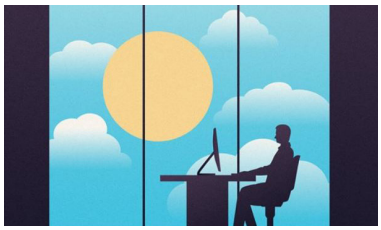
Tuning the Light in Classrooms, Department of Energy, 2017
This research article for an elementary school highlights the faculty response and impact of color change on student behavior/ learning.



Tunable White Case Studies, Technology Development Workshop, Department of Energy, 2016
This presentation of case studies showcases renderings highlighting different light fixture color temperature and impact on the room environment.

Lighting Up Learning, 2015
This research article underlines the concept of human-centric lighting improving learning environment and student health.

The Benefits of Natural Light, 2014
This article reinforces the benefits of daylight on human efficiency and productivity thereby suggesting higher learning and retention rates for students.



Windows and Classrooms, 2003
This study investigates whether daylight and other aspects of the indoor environment in elementary school student classrooms have an effect on student learning, as measured by their improvement on standardized math and reading tests over an academic year.

Lighting Code Summary

WATT
memo

PROJECT:	Diablo Valley College (DVC 17004)
DATE:	11/10/17
MEMO OBJECT:	Lighting Code Summary – 50% Page Turn

Memo Distribution:

NAME	ORGANIZATION
Jason Neches	WATT
Prairna Gupta-Garg	WRNS
Lilian Asperin	WRNS

Electric lighting for the Diablo Valley College Classroom Standards shall follow the following codes / standards:

Applicable Lighting Codes & Standards:

1. **2016 California Building Standards Code (aka "Title 24") – Effective 1/1/17**
    a. **Part 3 Electrical** Code – Installation requirements and egress lighting levels. The California Electrical Code (CEC) contains electrical design and construction standards. Provisions contained in the CEC provide minimum standards to safeguard life or limb, health, property, and public welfare, and to protect against hazards that may arise from the use of electricity by regulating and controlling the design, construction, installation, quality of materials, location and operation of electrical equipment, wiring, and systems. This volume is pre-assembled with the National Electrical Code of the National Fire Protection Association (NFPA) with necessary California amendments.
    b. **Part 6 Energy Code, Subchapter 4** – Lighting control and dimming requirements. The California Energy Code contains energy conservation standards applicable to all residential and non-residential buildings throughout California, including schools and community colleges
        i. Occupancy/Vacancy Sensors (turns of electric lights after a period of vacancy)
        ii. Daylight Dimming (dimming of electric lights if sufficient daylight is available in prescribed daylighting zones)
        iii. Demand Response (dimming of lighting upon request of local power utility)
            1. For new construction …. "Buildings greater than 10,000 ft² shall be capable of automatically reducing lighting power in response to a Demand Signal. Total lighting power must have the ability to automatically be lowered by a minimum of 15% of the installed wattage upon receipt of a demand response signal sent by demand response program implementers."
            2. For renovation with 10% or more of existing luminaires in enclosed space are "altered" (replaced, relocated) or new fixtures are added, then lighting must comply with Demand Response requirement.
            3. Exception to Demand Response requirement in existing building renovation is when new lighting < 85% of lighting power allowance per the "Area Category Method" in Section 140.6(c)2.
    c. **Part 6 Energy Code, Subchapter 5** – Energy use (Lighting Power Density, aka LPD)
        i. Using "Complete Building Method"
            1. 0.95W/sf for "School Buildings" per Table 104.6-B

Lighting Code Summary

WATT
memo

2. Power adjustment factors (PAF) may be available for typical classrooms (if needed) for additional wattage allowance under certain control scenarios per Table 104.6-A.
    a. Note that only one PAF may be used for each qualifying light fixture (aka luminaire) unless otherwise noted.
    b. Lighting controls that are required for compliance with Part 6, Subchapter 4, shall not be eligible for a PAF.
    c. Daylight Dimming plus OFF Control:
        i. 10% additional wattage for the luminaires in the primary sidelit daylight zone.
    d. Institutional Tuning (presetting of light fixtures to max 85% of full light output or full power draw). This PAF allowance CAN be added to other PAFs:
        i. 10% additional for luminaires in non-daylight areas
        ii. 10% for luminaires in daylight areas.
    e. Demand Responsive Control for building types less than 10,000sf. This PAF allowance CAN be added to other PAFs:
        i. 5% additional wattage for affected luminaires.

ii. Using the "Area Method"
1. 1.20W/sf for "Classroom, lecture, training, vocational areas" per Table 140.6-C
2. Additional lighting power allowance "per linear foot of white board or chalk board" = 5.5W/LF per Table 140.6-C.
3. This additional power allowance for the white board is not permissible if Complete Building Method or Tailored Method is used for any area in the building.

iii. Using the "Tailored Method"
1. The Tailored Method is not permitted for "Classroom, lecture, training, vocational" area types.

d. **Part 9 California Fire Code, Section 1008 Means of Egress Illumination**.
    i. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured along the path of egress at floor level.
    ii. Illumination levels shall be permitted to decline to 0.6 footcandle (6 lux) average and a minimum at any point of 0.06 footcandle (0.6 lux) at the end of the emergency lighting time duration.
    iii. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.
    iv. The large classroom is classified as a "place of assembly" per the California Fire Code and egress lighting for the large classroom shall comply with any additional "place of assembly" requirements (if any).

2. **CalGreen Building Standards Code (Part 11 of Title 24) – Effective 1/1/17**. The California Green Building Standards Code contains standards applicable to residential and non-residential buildings throughout California, including schools and community colleges.
    a. For energy efficiency mandatory measures, CalGreen refers back to Title24 Part 6.
    b. Appendix A5 of CalGreen describes "Voluntary Measures" (aka Tiers) for Non-Residential Buildings that allow a project to go beyond basic CalGreen requirements if mandated by owner / local jurisdiction.
    c. Tier 1 mandates 90% of Title 24 allowance for total indoor energy budget
    d. Tier 2 mandates 85% of Title 24 allowance for total indoor energy budget
    e. Both Tier 1 and Tier 2 mandates 90% of Title24 outdoor lighting power

Lighting Code Summary

WATT
memo

f. Appendix A6 of CalGreen includes large chapter on Lighting (A5.209) within “Voluntary Standards for Health Facilities” that is referenced as part of the voluntary Tier 1 / Tier 2 aspect of CalGreen.
g. Owner to clarify if these additional “Voluntary Tiers” are required for the project as part of CalGreen compliance.

3. The project lighting shall comply with LEED requirements if instructed.
4. The project lighting shall comply with Diablo Valley College Classroom Standards.
5. The project lighting shall comply with the Illuminating Engineering Society of North America (IESNA) Recommended Practice on Lighting for Educational Facilities (RP-3-13). For quick reference, target light levels and uniformity ratios are provided with the Diablo Valley College Classroom Standards document.

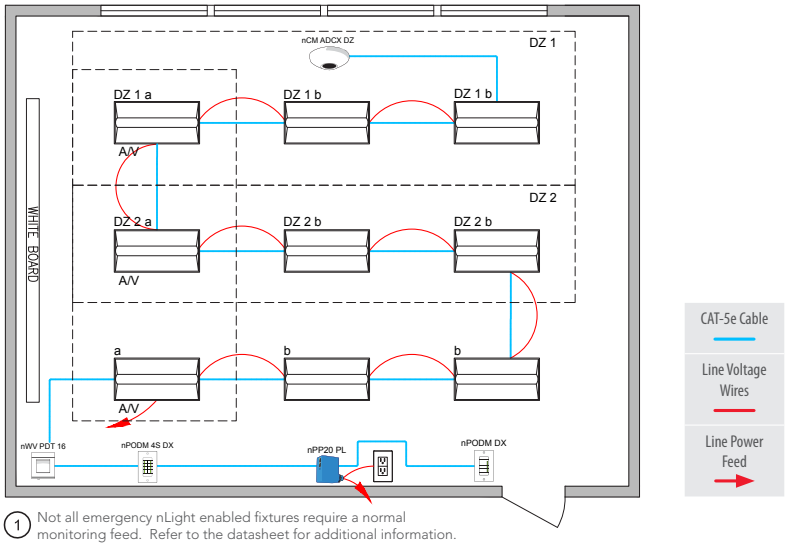
Lighting Control Diagrams

Typical Classroom wiring diagram and control schematic for digital addressable fixtures

14 CLASSROOM* with nLight Enabled Fixtures

Supports the Following Requirements:

- Local Switch (Section 130.1a)
- Multi-Level Lighting (Dimming) Control (Section 130.1b)
- Automatic Full-Off and Partial On via Occupancy Sensors (Section 130.1c)
- Areas with less than 120W in the primary Daylight zone do not require automatic daylight harvesting (Section 130.1d)
- Automatic Demand Response (ADR) ready (Section 130.1e)



(1) Not all emergency nLight enabled fixtures require a normal monitoring feed. Refer to the datasheet for additional information.

Bill of Materials

Symbol	Qty	Product #	Description
	9	See Appendix A	nLight Enabled Fixture
	1	nPP20 PL	Plug Load Relay Pack
	1	nPODM DX	On/Off & Raise/Lower WallPod
	1	nCM ADCX DZ	Automatic Dimming Control Photocell
	1	nWV PDT 16	Dual Technology Wide View Occupancy Sensor

Options

	1	nPODM 4S DX	Teacher Station - 4 Scene Control & Master On/Off/Raise/Lower

OPERATION DETAILS:

Lights:
- All lights are dimmable
- Each fixture independently controllable
- Maximum level can be limited (i.e., task tuned) to 80%
- Optional Automatic lumen compensation

Occupancy Control:
- Partial-On Occupancy Sensors automatically activate between 50-70 percent of controlled lighting power or fixtures must be turned on manually
- Lights automatically turn off when room becomes vacant

Daylight Control:
- Smooth continuous dimming
- Custom grouping of fixtures into separate daylight zones (max. number of zones = number of fixtures)

Manual Control:
- Master on/off & raise/ lower control of entire room
- Optional 4 scene control

ADDITIONAL OPTIONS:

- Surface or recessed mount sensors also available
- Add Graphic WallPod (model **nPOD GFX**) to add up to 16 manual controls and 16 scenes
- Room can be connected to nLight backbone to enable network control or ADR (see pg. 26)
- Occupancy sensors can be used to control HVAC systems via an optional relay contact "AR" or through a system wide BACNET control interface option on the Eclypse controller.

**Apply this design to classrooms, lecture halls or training rooms.*

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Lighting Control Diagrams

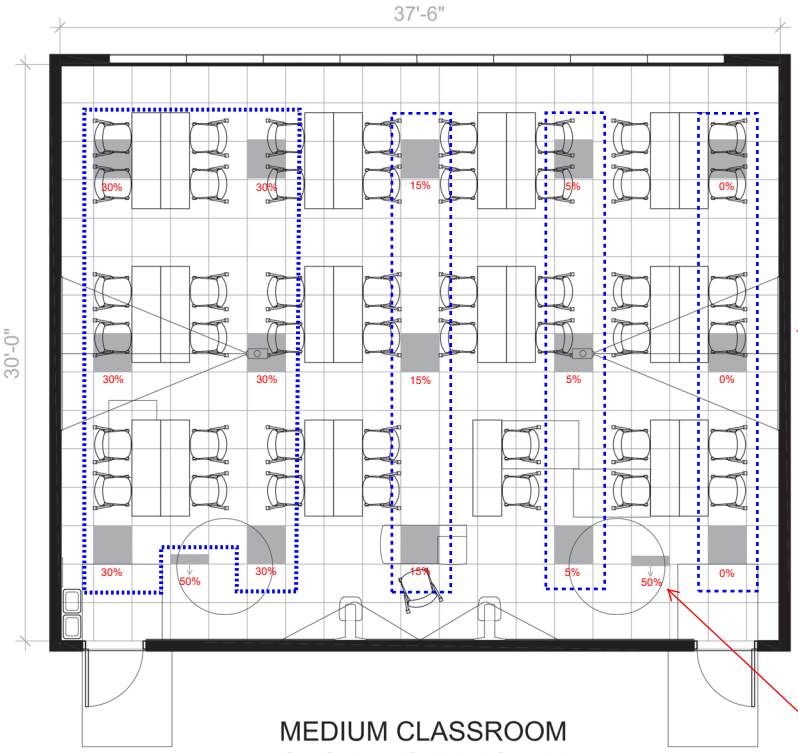
Lighting Control Diagram using "digital addressing" feature

Lighting control groups running parallel to the window wall in the conventional zoning strategy. This strategy also works well when the primary A/V projection wall is directly opposite the windows.

These two rows of lights closest to the clerestory windows are dimmed automatically if available daylight per Title24 requirements (aka *daylight dimming*)

MEDIUM CLASSROOM
GROUPWORK MODE 1

Scene 1
Classroom welcome/exit (with daylighting)



During A/V mode, the window wall shades are lowered, overriding the daylight dimming requirements. With digital addressing of light fixtures, control zoning is no longer limited to daylight zones.

Primary projection wall is now this wall. Light fixture zoning immediately reconfigures due to the digital addressing of individual light fixtures.

These wallwashers can be independently controlled to provide some direct light on writable surfaces during A/V mode

MEDIUM CLASSROOM
GROUPWORK MODE 1

Scene 2
Large format projection

Lighting Control Diagrams

Lighting Control Diagram using "digital addressing" feature

MEDIUM CLASSROOM
GROUPWORK MODE 1

Scene 3
Center bright (i.e. gather in center of room)

Any grouping of light fixtures becomes possible with digital addressing. Decisions about control zoning are unrelated to fixture wiring, and can be changed at any time via software interface (rather than electrical wiring).

Target Light Level Chart

Table 3b: Illuminance values for educational facilities.

Applications and Tasks[a]	Notes	Recommended Maintained Illuminance Targets (lux)[b, c, d] Horizontal (E_h) Targets: Visual Ages of Observers (years) where at least half are <25	25-65	>65	Gauge	Vertical (E_v) Targets: Visual Ages of Observers (years) where at least half are <25	25-65	>65	Gauge	Uniformity Targets[e] Over Area of Coverage: 1st ratio $E_h/2^{nd}$ ratio E_v if different uniformities apply Max:Avg	Avg:Min	Max:Min	Typical Area of Coverage[h]: Task Area	Room or Area
		Category				Category								
AUDITORIA	(Multipurpose continued)													
· No AV	E_h @2' 6" AFF; E_v @4' AFF	R	250	500	1000	Avg	O	100	200	400	Avg		3:1	
· Dancing (Social)	E_h @dance floor; E_v @5' AFF	K	25	50	100	Avg	I	15	30	60	Avg		3:1	
· Exhibition	E_h @2' 6" AFF; E_v @5' AFF	P	150	300	600	Avg	O	100	200	400	Avg		3:1	
· Study	Typical paper and/or laptop	P	150	300	600	Avg	M	50	100	200	Avg		3:1	
· Testing	E_h @2' 6" AFF; E_v @4' AFF													
· Combination	Typical paper and/or laptop	P	150	300	600	Avg	M	50	100	200	Avg		2:1	
· Laptop only	CSA/ISO Type I and II negative polarity screens.[i]	N	75	150	300	Avg	K	25	50	100	Avg		2:1	
· Paper only	Variety of paper tasks[i]	Q	200	400	800	Avg	N	75	150	300	Avg		2:1	
· Performance	Dedicated to artistic performances (likely fixed seating); For dedicated theaters see **IES HB, 10th Edition, Chapter 28 | LIGHTING FOR HOSPITALITY AND ENTERTAINMENT**													
· House	As the architect coordinates contrast markings with steps, curbs, and ramps, localized lighting may be deemed appropriate.													
· During event	E_h @floor; E_v @4' AFF		2	2	2	Min	F	5	10	20	Avg		5:1/3:1	
· Pre/Post event	E_h @floor; E_v @5' AFF	L	37.5	75	150	Avg	K	25	50	100	Avg		3:1	
· Stage														
· Access ramps/stairs	See AUDITORIA/Circulation													
· Amateur productions														
Dance (performance)	E_h and E_v @5' AFF	P	150	300	600	Avg	R	250	500	1000	Avg		1.5:1	
Demonstration	E_h @3' AFF; E_v @4' 6" AFF	T	500	1000	2000	Avg	R	250	500	1000	Avg		3:1	
Music	E_h and E_v @4' AFF	P	150	300	600	Avg	R	250	500	1000	Avg		2:1	
Theater	Simple, no stage lighting cues.. E_h and E_v @5' AFF	P	150	300	600	Avg	P	150	300	600	Avg		2:1	
Professional productions	Stage lighting as determined by production crew; See IES DG-20 | Stage Lighting **A Guide to the Planning of Theatres and Auditoriums** for guidance on architectural and electrical infrastructure													
· Prefunction	Anteroom or transition space adjoining auditorium													
· During event	E_h @floor; E_v @4' AFF	K	25	50	100	Avg	I	15	30	60	Avg		3:1	
· Pre/Post event, intermission	E_h @floor; E_v @5' AFF	N	75	150	300	Avg	L	37.5	75	150	Avg		3:1	
· Sound and light lock	Transition from lobby or foyer space adjoining auditorium													
· During event	E_h @floor; E_v @5' AFF		2	2	2	Min	I	15	30	60	Avg		5:1/3:1	
· Pre/Post event, intermission	E_h @floor; E_v @5' AFF	M	50	100	200	Avg	K	25	50	100	Avg		3:1	
BUILDING ENTRIES	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS**													
CLASSROOMS														
· Arts														
· Art Studios	E_h @2' 6"; E_v @4' AFF	R	250	500	1000	Avg	P	150	300	600	Avg		3:1	
· Graphic Arts														
· Displays														
Fine art	See **IES HB 10th Edition, Chapter 21 | LIGHTING FOR ART**													
· Permanent/Temporary	Awards, student art, plaques													
Dimensional	E_h and E_v @artworks													

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Table 3c: Illuminance values for educational facilities.

Applications and Tasks[a]	Notes	Recommended Maintained Illuminance Targets (lux)[b, c, d] Horizontal (E_h) Targets: Visual Ages of Observers (years) where at least half are <25	25-65	>65	Gauge	Vertical (E_v) Targets: Visual Ages of Observers (years) where at least half are <25	25-65	>65	Gauge	Uniformity Targets[e] Over Area of Coverage: 1st ratio $E_h/2^{nd}$ ratio E_v if different uniformities apply Max:Avg	Avg:Min	Max:Min	Typical Area of Coverage[h]: Task Area	Room or Area
		Category				Category								
CLASSROOMS	(continued)													
Dark finish	<50% reflectance	Avg = 5 times E_h of surrounding space				Avg = 5 times E_h of surrounding space					4:1			
Light finish	≥50% reflectance	Avg = 3 times E_h of surrounding space				Avg = 3 times E_h of surrounding space					4:1			
Flat														
Horizontal	E_h and E_v @artworks													
Dark finish	<50% reflectance	Avg = 5 times E_h of surrounding space									4:1			
Light finish	≥50% reflectance	Avg = 3 times E_h of surrounding space									4:1			
Vertical	E_h and E_v @artworks													
Dark finish	<50% reflectance					Avg = 5 times E_h of surrounding space					4:1			
Light finish	≥50% reflectance					Avg = 3 times E_h of surrounding space					4:1			
· Drafting and Design	On drafting board or table													
· Blueline blueprint	Also see READING AND WRITING/Xerograph	R	250	500	1000	Avg	M	50	100	200	Avg	see **IES HB Table 12.6**		
· CAD (exclusively)	See READING AND WRITING/VDT Screen and Keyboard													
· CAD/paper mixed	See READING AND WRITING, establish tasks and normalize to illuminance of most important task or most common task; use controls to provide illuminance variability if tasks so demand.													
· Light table	On light table	M	50	100	200	Avg	I	15	30	60	Avg		2:1	
· Photographs (inspection)														
Color and B+W prints	E_h @2' 6"; E_v @4' AFF	R	250	500	1000	Avg	M	50	100	200	Avg	see **IES HB Table 12.6**		
· Negative lightbox	Architectural lighting illuminances on front of backlit light box	K	25	50	100	Max	K	25	50	100	Max	2:1 ee **IES HB Table 12.6**		
· Kiln Room	E_h @2' 6"; E_v @4' AFF	R	250	500	1000	Avg	P	150	300	600	Avg		3:1	
· Music Room	E_h and E_v @4' AFF	P	150	300	600	Avg	O	100	200	400	Avg		2:1	
· General Classrooms														
· Learning/teaching	Interactive experience													
· AV (dedicated AV viewing)	E_h @2' 6"; E_v @4' AFF	K	25	50	100	Avg	I	15	30	60	Avg		2:1	
· Chalkboard							Q	200	400	800	Avg		3:1	
· Dedicated VDT screens	CSA/ISO Type I and II negative polarity screens.[i] E_h @2' 6"; E_v @4' AFF	N	75	150	300	Avg	K	25	50	100	Avg		2:1	
· Hardcopy and writing	Variety of paper tasks.[i] E_h @2' 6"; E_v @4' AFF	Q	200	400	800	Avg	N	75	150	300	Avg		2:1	
· Tack board							N	75	150	300	Avg		3:1	
· White board							P	150	300	600	Avg		3:1	
· Home Economics	At all food prep and detailed work areas		500	500	500	Min	O	100	200	400	Avg	see **IES HB Table 12.6**		
· Lecture Halls	See AUDITORIA/Lecture Hall													
· Science Lab														
· Bench	E_h @3'; E_v @4' 6" AFF	R	250	500	1000	Avg	P	150	300	600	Avg	see **IES HB Table 12.6**		
· Demonstration Area	E_h @3' AFF; E_v @4' 6" AFF	T	500	1000	2000	Avg	R	250	500	1000	Avg		3:1	
· Seminar Rooms	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS/CONFERENCING/Meeting**													

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Target Light Level Chart

Table 3d: Illuminance values for educational facilities.

Applications and Tasks[a]	Notes	Recommended Maintained Illuminance Targets (lux)[b, c, d] — Horizontal (E_h) Targets — Visual Ages of Observers (years) where **at least half** are <25	25-65	>65	Gauge	Vertical (E_v) Targets — Visual Ages of Observers (years) where **at least half** are <25	25-65	>65	Gauge	Uniformity Targets[e] — Over Area of Coverage — 1st ratio $E_h/2^{nd}$ ratio E_v if different uniformities apply Max:Avg	Avg:Min	Max:Min	Typical Area of Coverage[h] — Task Area	Room or Area
		Category				Category									
CLASSROOMS	(continued)														
• Shops	E_h @3' AFF; E_v @4' AFF. Also see 30 | LIGHTING FOR MANUFACTURING.														
• Assembly	Difficult process	T	500	1000	2000	Avg	R	250	500	1000	Avg	see **IES HB Table 12.6**			
• Inspection	Difficult process	T	500	1000	2000	Avg	R	250	500	1000	Avg	see **IES HB Table 12.6**			
• Machining	Medium benchwork	T	500	1000	2000	Avg	R	250	500	1000	Avg	see **IES HB Table 12.6**			
• Woodworking	Fine process	T	500	1000	2000	Avg	R	250	500	1000	Avg	see **IES HB Table 12.6**			
• Study Halls		P	150	300	600	Avg	O	100	200	400	Avg	2:1			
CONFERENCING	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS**														
DORMITORIES															
• Circulation	See TRANSITION SPACES/Circulation Corridors														
• Dorm Room															
• Casual Reading	E_h @2' AFF; E_v @4' AFF	O	100	200	400	Avg	M	50	100	200	Avg	see **IES HB Table 12.6**			
• Desk	E_h @2' 6" AFF; E_v @4' AFF	Q	200	400	800	Avg	N	75	150	300	Avg	see **IES HB Table 12.6**			
• General	E_h @floor; E_v @5' AFF	J	20	40	80	Avg	G	7.5	15	30	Avg	4:1			
• Elevators	See TRANSITION SPACES/Elevators														
• Entries	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS/BUILDING ENTRIES**														
• Escalators/Moving Walkways	See TRANSITION SPACES/Escalators/Moving Walkways														
• Gallery (student work)	E_h and E_v @artworks	P	150	300	600	Avg	P	150	300	600	Avg	3:1			
• Game Room															
• Electronic	E_h @2' 6" AFF; E_v @4' AFF	K	25	50	100	Avg	I	15	30	60	Avg	3:1			
• Traditional	E_h @tables; E_v @4' AFF	P	150	300	600	Avg	K	25	50	100	Avg	see **IES HB Table 12.6**			
• Kitchen															
• In-suite	E_h and E_v @3' AFF	R	250	500	1000	Avg	L	37.5	75	150	Avg	see **IES HB Table 12.6**			
• Institutional	See 22 | LIGHTING FOR COMMON APPLICATIONS/Food Service														
• Student-use	E_h and E_v @3' AFF	R	250	500	1000	Avg	L	37.5	75	150	Avg	see **IES HB Table 12.6**			
• Laundry	E_h and E_v @3' AFF	P	150	300	600	Avg	K	25	50	100	Avg	3:1			
• Living Room	E_h @floor; E_v @4' AFF	P	150	300	600	Avg	K	25	50	100	Avg				
• Lobbies	See TRANSITION SPACES/Lobbies														
• Mailboxes	E_h @floor; E_v @mailbox faces	K	25	50	100	Avg	M	50	100	200	Avg	3:1			
• Media Lounge	E_h @2' 6" AFF; E_v @4' AFF	M	50	100	200	Avg	K	25	50	100	Avg	3:1			
• Multipurpose	E_h @2' 6" AFF; E_v @display walls	P	150	300	600	Avg	M	50	100	200	Avg	3:1			
• Toilets	See TOILETS/LOCKER ROOMS														
FOOD SERVICE	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS**														
IT	See **Table E1 | LIGHTING FOR COMMON APPLICATIONS**														
LIBRARIES	See **IES HB, 10th Edition, Chapter 29 | LIGHTING FOR LIBRARIES**														
PARKING	See **IES HB, 10th Edition, Chapter 26 | LIGHTING FOR EXTERIORS**														
PEDESTRIAN WAYS	See **IES HB, 10th Edition, Chapter 26 | LIGHTING FOR EXTERIORS**														

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Target Light Level Chart

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Table 3 notes

Notes

The table column headings are discussed in detail in the Illuminance Criteria Section. Refere to the discussion on procedures for establishing illuminance targets for a project.

a. Applications, tasks, or viewing specifics encountered on any given project may be different from these and may warrant different criteria. Refer to IES Lighting Handbook, Section 29.3.1 Applications and Tasks. The designer is responsible for making final determinations of applications, tasks, and illuminance criteria. Outdoor tasks are so noted.

b. Values cited are to be maintained over time on the area of coverage.

c. Values cited are consensus and deemed appropriate for respective functional activity. IN a few situations, code requirements are within 10% of IES recommendations. This is apparently an artifact of metrification. Footcandle conversions of any values cited in this table should be made at 1 fcc to 10 lx. Regardless, codes, ordinances, or mandates may supersede any of the IES criteria for any of the applications and tasks and the designer must design accordingly.

d. Targets are intended to apply to the respective plane or planes of the task.

e. Illuminance uniformity targets offer best results when planned in conjunction with luminance ratios and surface reflectances. Any parenthetical uniformity values reference respective parenthetical applications or tasks, such as a curfew situation associated with nighttime outdoor lighting.

f. Applications and tasks cited with a sunburst icon are candidates for strategies employing any combination of daylighting and electric lighting to achieve target values during daylight hours. Daylighting may require unconventional approaches.

g. Tasks with specular components, like computers with CSA/ISO Type III screens or printed tasks with glossy ink or glossy paper, are prone to veiling reflections. The likelihood of an application's or task's predisposition to veiling reflections is indicated by the reflected-light icon: black and white signals high likelihood; gray and white signals moderate likelihood; pale gray and white signals some likelihood; and all-white signals little-to-no likelihood.

h. The designer must establish areas of coverage to which targets apply. Green highlight identifies task proper or task area as the typical area of coverage for respective cited targets. Amber highlight identifies room or designated areas as the typical area of coverage for respective cited targets.

i. Nighttime illuminance targets are intended for application during dark hours of operations where lighting is deemed necessary or desirable. At curfew (client-or-jurisdiction-defined), if lighting is still deemed necessary or desirable, then reduce lighting as indicated.

j. Alternatively, design to specific tasks, if known, from READING AND WRITING.

k. For applications where task position is indefinite, such as some types of flexible meeting rooms, the typical area of coverage is "Room or Designated Area." For applications where task position is known, such as an office desk or a reading chair, a more efficient approach is likely achieved when target illuminance is applied to the "Task Proper or Task Area."

l. E_h and E_v elevations are based on conventional worksurface and seated eye height. Where other elevations are programmed, designer must adjust illuminance-criteria planes of interest accordingly.

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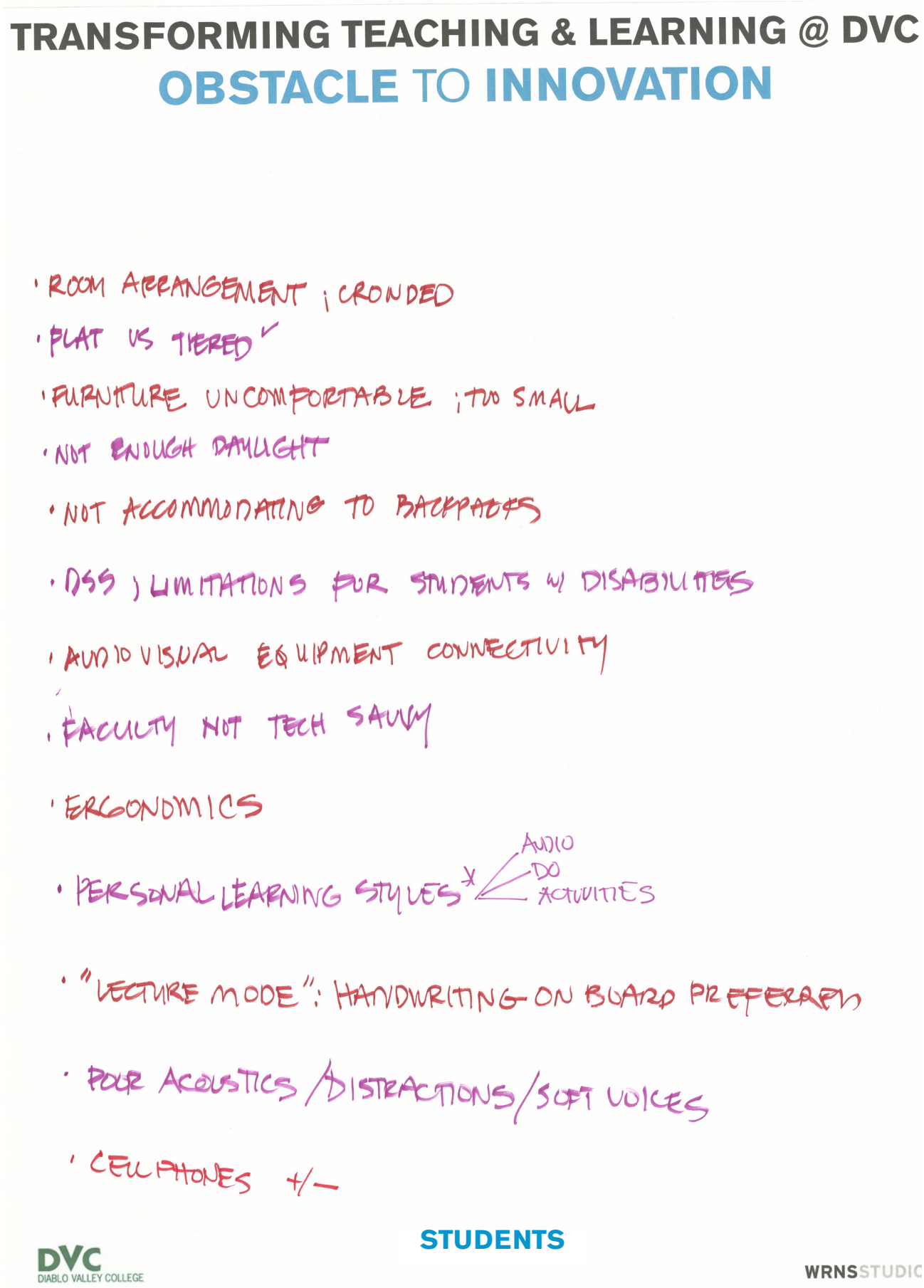
Debrief Posters from User Group Workshop (Sept 18, 2017)



Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

- CONNECT TO OTHER CAMPUS
  - ↳ SHARED HELP.
  - ↳ ONLINE COMMUNICATION.
  - ↳ VIDEO TELE CONF.
  - ↳ MORE CLASSES AT SAN RAMON.
- AUGMENT LANGUAGE FOR STUDENTS.
  - ↳ TRANSLATION DIAGRAM.
- GROUP PROJECTS. — FOSTER SOCIAL. (5-6)
- MOVE AROUND CLASS FOR DISCUSSIONS.
- COUNSELING | ADVISING DEPT. — MORE FROM 1st GEN STU.
- MENTORSHIP PROGRAM.
  - ↳ MENTOR TO REACH OUT FIRST.
- HELP HIGH SCHOOL STUDENTS.
- SAFETY / SECURITY / EMERGENCY SCENARIOS

STUDENTS

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- MORE SOCIALLY CONNECTED / FRIENDSHIPS
- CONNECTING MORE W/ PROFESSORS
- INTEGRATE CELLPHONES (INTENTIONALLY)
- CONNECTIVITY
- ENERGIZED, MOBILITY, ENGAGED
- RANGE OF ACTIVITIES - MULTI-MODAL
- LEARN BY DOING
- "TAGGING"
- ACCESS TO DATA (RATING SYSTEM)
- FEEDBACK TO FACULTY (FREQUENT)
- SURVEYS

STUDENTS

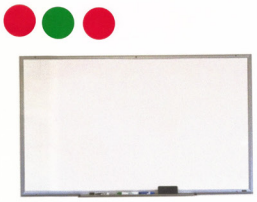
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

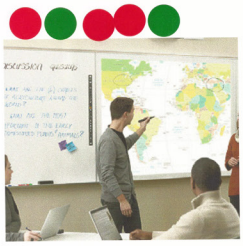
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

WRITEABLE SURFACES



FIXED
NON-ELECTRONIC
WHITE BOARD



FIXED
INTERACTIVE
WHITE BOARD

MOVEABLE
WHITE BOARD

WRITEABLE WALLS

CHAIRS

WHEELS/ STACKABLE

WHEELS/ STORAGE/
WORKSPACE

WHEELS/ CUSHION
SEAT/ ADJUSTABLE
HEIGHT

WHEELS/ FOOT REST/
ADJUSTABLE HEIGHT

TABLES

WHEELS/ OUTLETS

WHEELS/ OUTLETS/
ADJUSTABLE HEIGHT/
FOLDABLE

WHEELS/ FOLDABLE/
ROUND

FIXED/ OUTLETS/
ADJUSTABLE HEIGHT/
DISPLAY MEDIA

INSTRUCTOR STATION

MOVABLE
FIXED/ WORKSPACE/
BUILT-IN TECHNOLOGY/
STORAGE

MOVEABLE/ WORK-
SPACE/ CONNECTED
TECHNOLOGY

MOVEABLE/ DESK-
PODIUM COMBINA-
TION/ WIRELESS
TECHNOLOGY/
STORAGE

MOVEABLE/ DESK-
PODIUM COMBINA-
TION (MORE WORK-
SPACE)/ WIRELESS
TECHNOLOGY

DVC DIABLO VALLEY COLLEGE

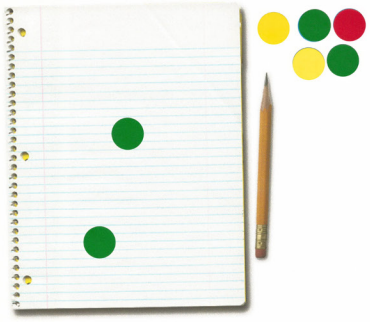
STUDENTS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

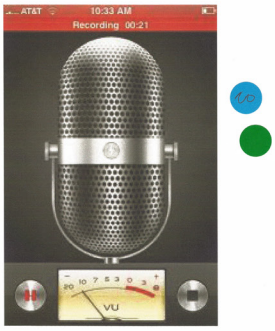
MY IDEAL ... LEARNING DEVICE

SMART PHONE

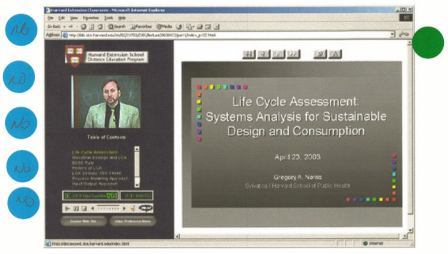


NOTEBOOK

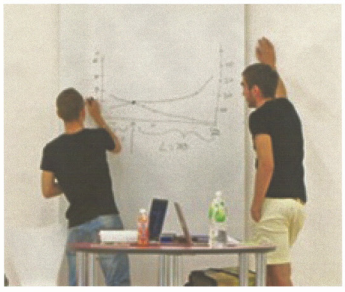
LAPTOP



AUDIO RECORDING



LECTURE CAPTURE



WRITEABLE SURFACES

STUDENTS

DVC
DIABLO VALLEY COLLEGE

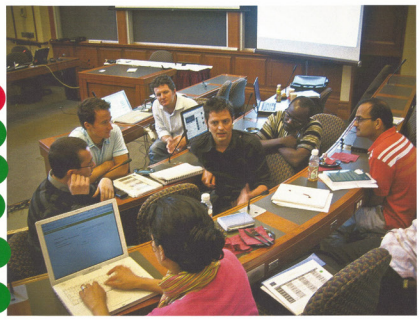
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

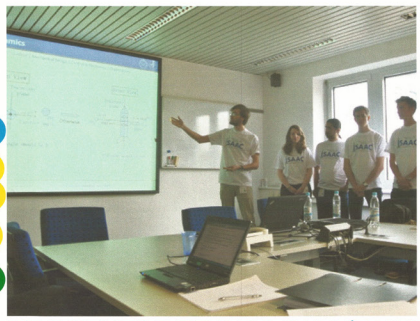
LECTURE

TEACHER-STUDENT ENGAGEMENT



SMALL GROUP DISCUSSIONS

IN-CLASS GROUP WORK



PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

DVC DIABLO VALLEY COLLEGE

STUDENTS

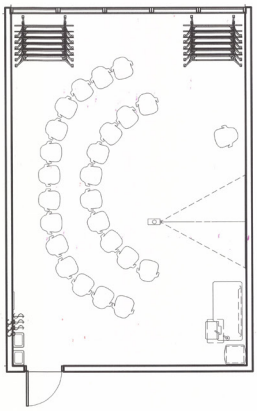
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

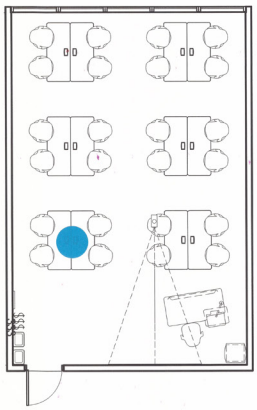
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



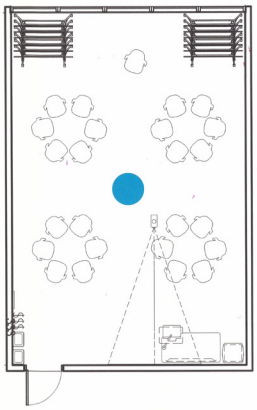
LECTURE/ SEMINAR SETTING

MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

COLOR.
POSTERS.
QUOTES.
(in class+ hallway).
MURALS

STUDENTS

DVC DIABLO VALLEY COLLEGE

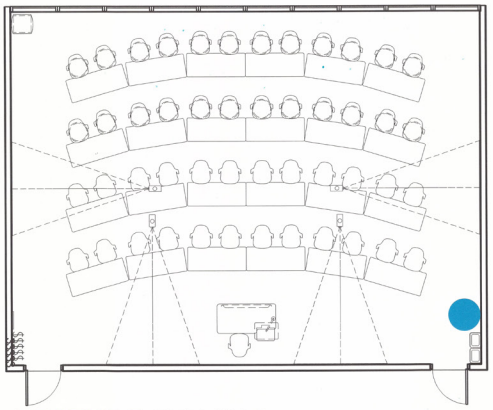
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

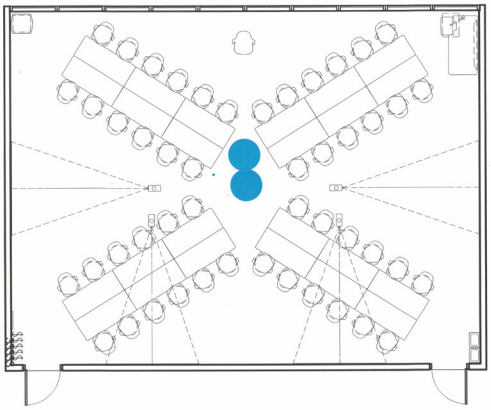
MY IDEAL...ROOM CONFIGURATION

(MEDIUM CLASSROOM ~ 40-50 students)



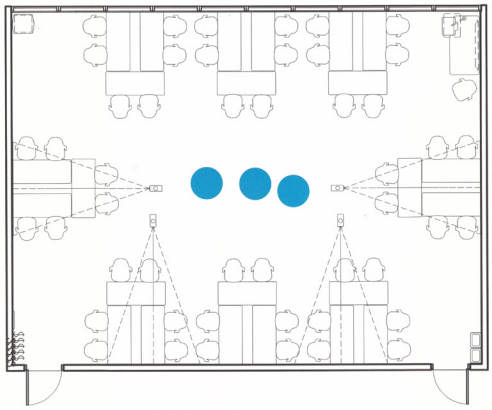
LECTURE SETTING

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

STUDENTS

DVC DIABLO VALLEY COLLEGE

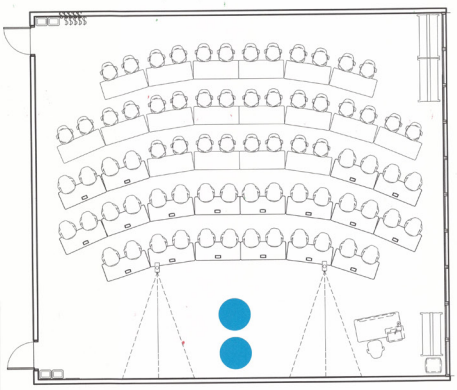
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

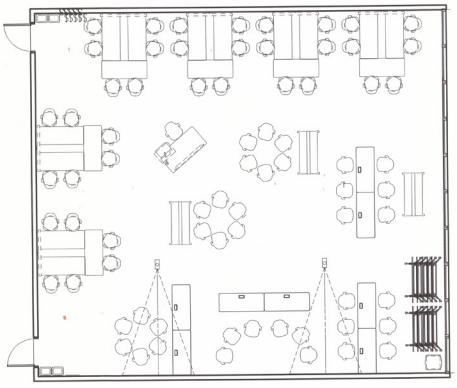
MY IDEAL...ROOM CONFIGURATION

(LARGE CLASSROOM ~ over 50 students)



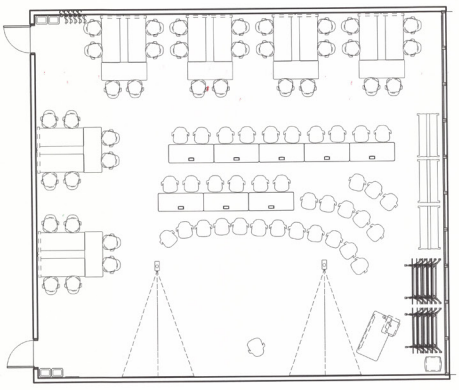
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

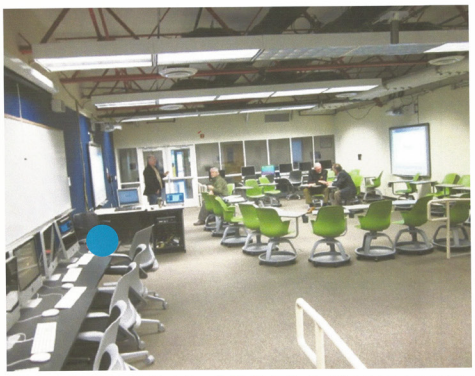


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

STUDENTS

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ D

OBSTACLE TO INNOVATION

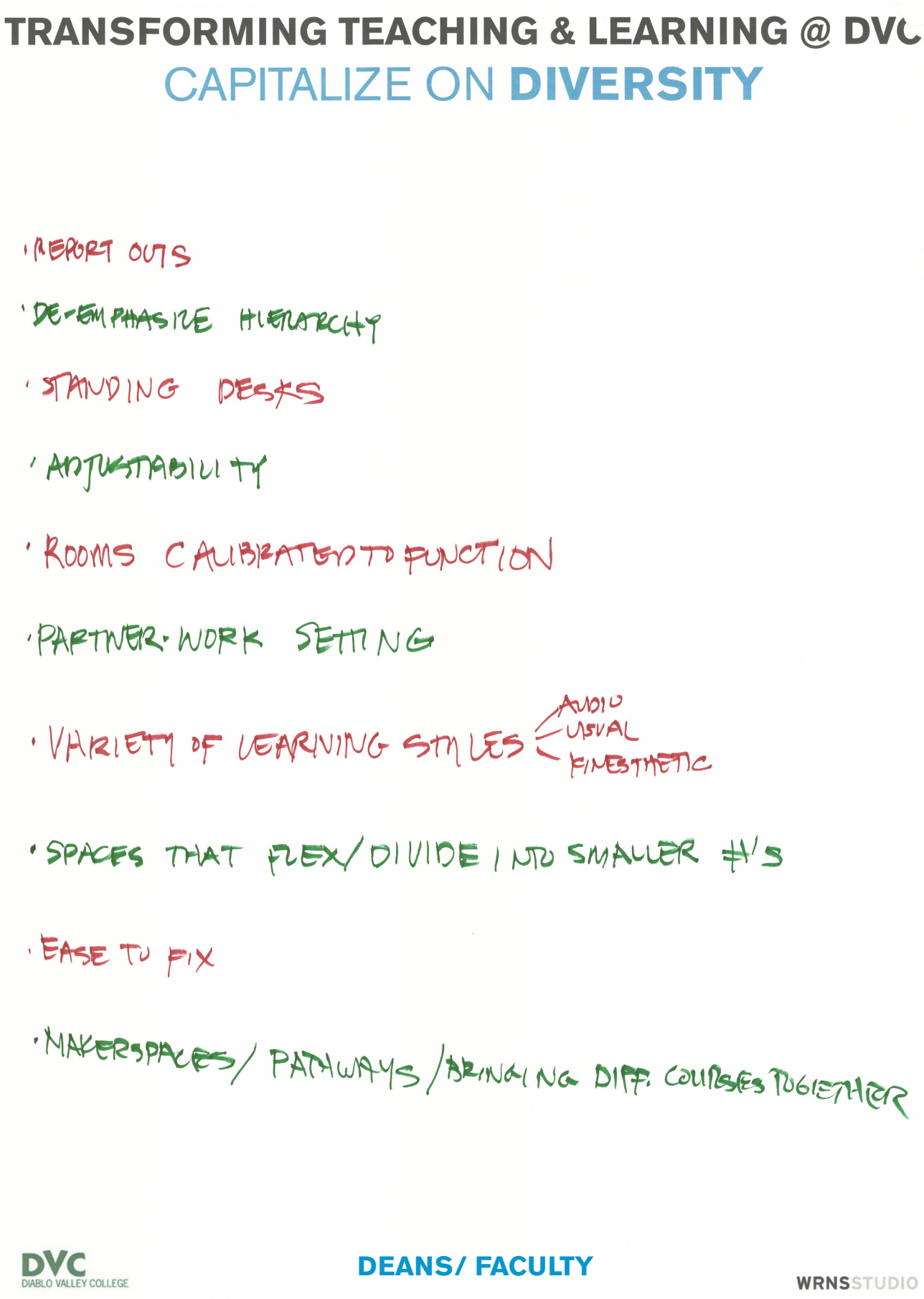
- LAYOUT OF PRESENTATION MEDIA.
- SHARED ROOM USE
- A+M – WHEN IT'S NOT WORKING.
- RIGIDITY OF CLASS SETUP. – 'BLOW IT UP'
- TOO MANY. STUDENTS FOR CLASS SIZE.
  ↳ LIMITED ACCESSIBILITY TO STUDENTS.
- OVERLOADING OVER CAPACITY.
- SIGHT LINES FOR 'ALL CLASS' DISCUSSIONS. (35-45
- PORTABLE / STACKABLE FURNITURE. (STORAGE IN CL
- ACOUSTICS (DUCT) + OUTSIDE.
- TECHNOLOGY
- STORAGE (SUPPLIES)
- MAKE A DYNAMIC ENVRNT.
- NOT BE BOUND TO INSTR. ST.
- FLEX LAYOUT FOR REPORT OUT (NO FRONT OF ROOM)

DEANS/ FACULTY

DVC DIABLO VALLEY COLLEGE

WRNSST

Debrief Posters from User Group Workshop (Sept 18, 2017)



Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- CLICKERS
- EQUAL ACCESS TO TECH / EQUIPMENT
- VARIETY
- DIGITAL / ANALOGUE
- "SHOW AND TELL" / DISPLAY
- WELCOMING / CLEAN / BLANK CANVAS
- STANDARDIZE / BASELINE FOR PERFORMANCE
- CHORD LESS / UNTETHERED
- ON LINE STREAMING w/ NASA / GLOBAL REACH
- VIRTUAL REALITY / SIM LABS
- TRAINING
- INTERDISCIPLINARY

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

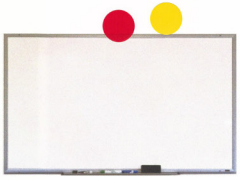
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

S M L N2

WRITEABLE SURFACES



FIXED NON-ELECTRONIC WHITE BOARD

FIXED INTERACTIVE WHITE BOARD

MOVEABLE WHITE BOARD

WRITEABLE WALLS

CHAIRS

WHEELS/ STACKABLE

WHEELS/ STORAGE/ WORKSPACE

WHEELS/ CUSHION SEAT/ ADJUSTABLE HEIGHT

WHEELS/ FOOT REST/ ADJUSTABLE HEIGHT

TABLES

WHEELS/ OUTLETS

WHEELS/ OUTLETS/ ADJUSTABLE HEIGHT/ FOLDABLE

WHEELS/ FOLDABLE/ ROUND

FIXED/ OUTLETS/ ADJUSTABLE HEIGHT/ DISPLAY MEDIA

INSTRUCTOR STATION

FIXED/ WORKSPACE/ BUILT-IN TECHNOLOGY/ STORAGE

MOVEABLE/ WORK-SPACE/ CONNECTED TECHNOLOGY

MOVEABLE/ DESK-PODIUM COMBINA-TION/ WIRELESS TECHNOLOGY/ STORAGE

MOVEABLE/ DESK-PODIUM COMBINA-TION (MORE WORK-SPACE)/ WIRELESS TECHNOLOGY

DEANS/ FACULTY

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

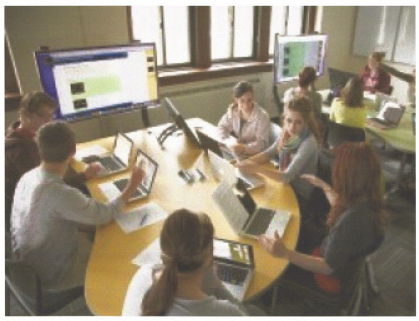
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

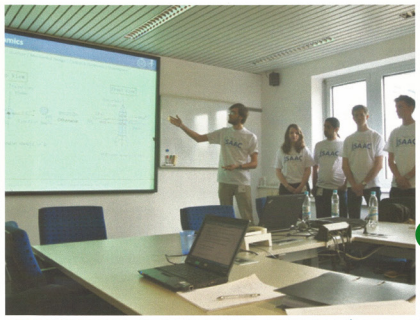
LECTURE

TEACHER-STUDENT ENGAGEMENT

SMALL GROUP DISCUSSIONS



IN-CLASS GROUP WORK



PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

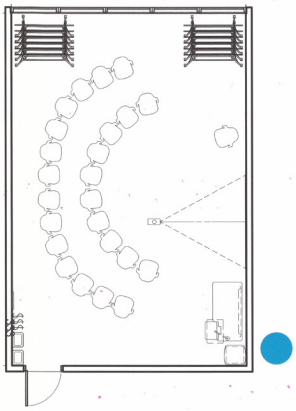
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

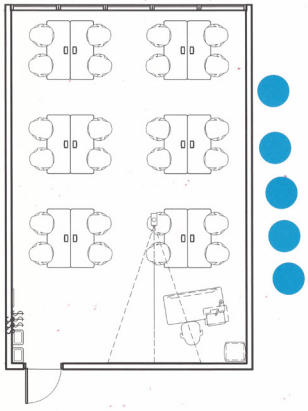
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



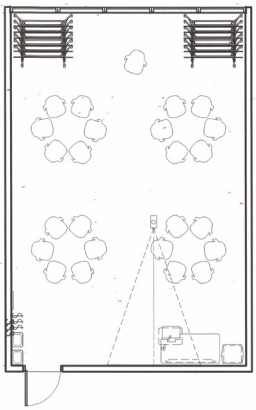
LECTURE/ SEMINAR SETTING

MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

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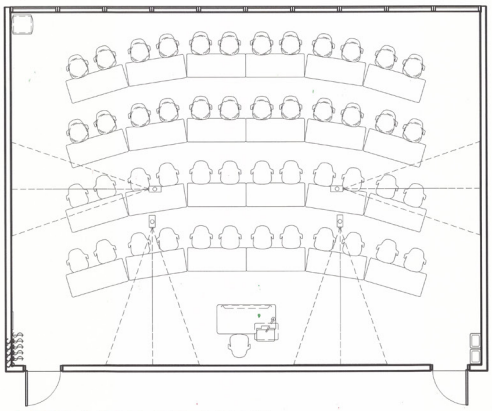
TRANSFORMING TEACHING & LEARNING @ DVC

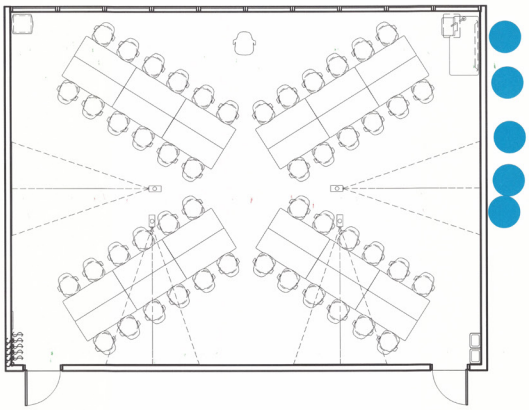
MY IDEAL...ROOM CONFIGURATION

(MEDIUM CLASSROOM ~ 40-50 students)



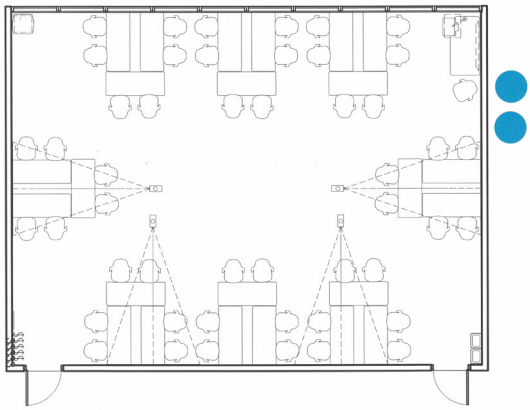
LECTURE SETTING

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

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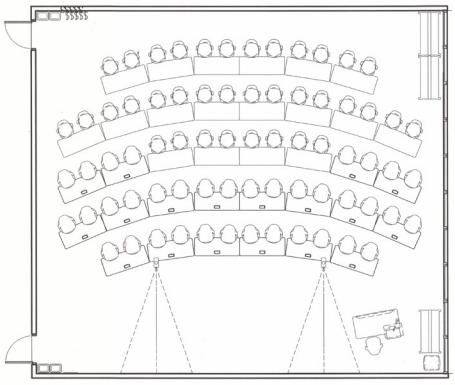
TRANSFORMING TEACHING & LEARNING @ DVC

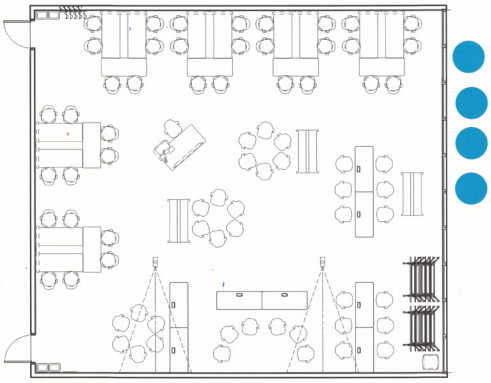
MY IDEAL...ROOM CONFIGURATION

(LARGE CLASSROOM ~ over 50 students)



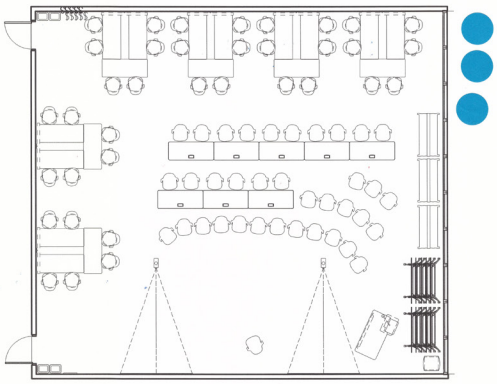
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

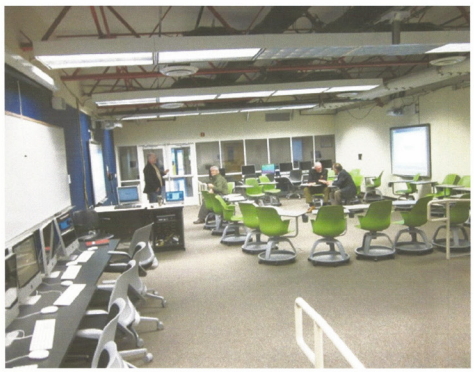


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

OBSTACLE TO YOUR INNOVATION

INSTRUCTOR STATIONS - "BULKY SMART PODIUMS", TECH ENABLED
- INTERNAL WIRING / TETHERED

FURNITURE - NOT MOVABLE, NOT LARGE ENOUGH
- TOO MANY DESKS IN LITTLE ROOM
- ADJUSTABLE HEIGHTS
- STYLE + SIZE OF DESKS
- "FINNICKY" = DISTRACTION; BREAK

LACK OF ABILITY TO GO BACK AND FORTH

LACK OF UNIFORMITY

MISSING ELEMENTS/EQUIPMENT

LACK OF EASE OF MOBILITY; INABILITY TO CHANGE SETTINGS

"LOSS TIME" - DELAYS SYNCING, SETTING UP

ACCESS TO COMPUTERS/CLUSTERS

FASTER FOR STUDENTS TO MOVE VS MOVING FURNITURE

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

ACOUSTICS - DIFF. LVLS OF HEARING.
- SPEAKERS / MIC.

LEARNING CURVE FOR FACULTY. - 'EASY' TECH.

CLASSROOM ARRANGEMT - CREATES HEIRARCHY.
- NOT LINEAR ROWS.

MEET STUDENTS WHERE THEY ARE WHEN THEY COME TO DVC.
↳ TECH. TO BE ABLE TO REAL TIME CHECK-IN.
↳ COMFORT / MEANS TO TECH (FOR STUDENTS)
↳ POLLING.

EASY FOR INSTRUCTOR TO GET TO STUDENTS.
↳ FLEXIBILITY TO MOVE.

MINIMIZE THE ABILITY FOR STUDENT TO HIDE.

HARNESSING POWER OF HYBRID CLASSES
↳ USE ONLINE MODE w/ PHYSICAL CLASSRM.
(FLIPPED CLASSRM)

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DV(

IF I COULD **DO MORE**?

- HYBRID ENVIRONMENTS
- HACKATHONS
- "UNCONFERENCES" - HANDS ON, HIGH ENERGY
- CANVAS LEARNING MGMT SYSTEM
  - SOME ORGANIZATION; SOME FLEX
- "PITCH"
- REAL TIME; "UNSCRIPTED"
- WHAT YOU CAN LEARN; WHAT YOU CAN TEACH
- SOCIAL; GROUP (SELF ORGANIZED; INTEREST BASE)
- STAND-UP CLASSROOM - "COCKTAIL TABLES"
- ELEMENT OF SURPRISE
- A PROJECT: PRODUCE RATHER THAN ABSORB

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

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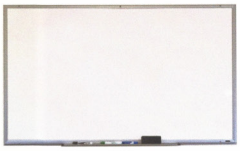
MY IDEAL ... EQUIPMENT TOOLKIT

WRITEABLE SURFACES



FIXED NON-ELECTRONIC WHITE BOARD

FIXED INTERACTIVE WHITE BOARD

MOVEABLE WHITE BOARD

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WHEELS/ STORAGE/ WORKSPACE

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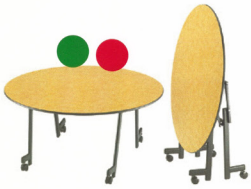
WHEELS/ OUTLETS

WHEELS/ OUTLETS/ ADJUSTABLE HEIGHT/ FOLDABLE



WHEELS/ FOLDABLE/ ROUND

FIXED/ OUTLETS/ ADJUSTABLE HEIGHT/ DISPLAY MEDIA

INSTRUCTOR STATION

FIXED/ WORKSPACE/ BUILT-IN TECHNOLOGY/ STORAGE

MOVEABLE/ WORK-SPACE/ CONNECTED TECHNOLOGY

MOVEABLE/ DESK-PODIUM COMBINA-TION/ WIRELESS TECHNOLOGY/ STORAGE

MOVEABLE/ DESK-PODIUM COMBINA-TION (MORE WORK-SPACE)/ WIRELESS TECHNOLOGY

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

ADJUSTABLE HT OF WORKSURFACES.

WRNSSTUDIO

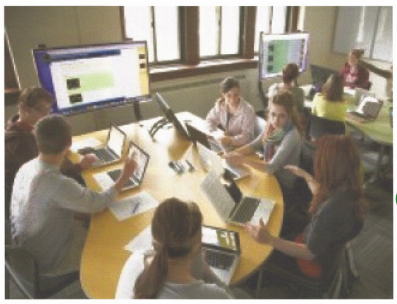
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

LECTURE

TEACHER-STUDENT ENGAGEMENT

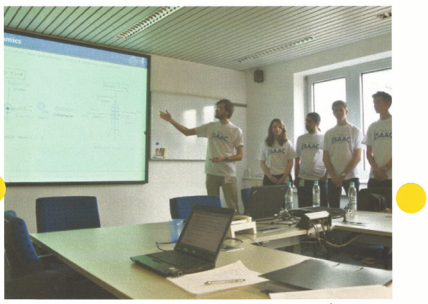
SMALL GROUP DISCUSSIONS



IN-CLASS GROUP WORK

SPEED TO CONNECT W/ TECH.

FUTURE-PROOF TECH. BUILT-IN CAPACITY.



PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

S M L

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WRNSSTUDIO

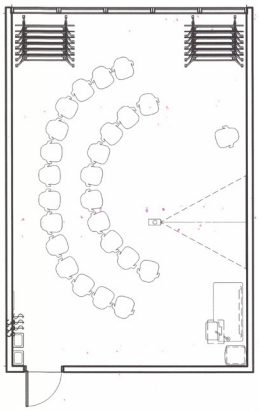
DEANS/ FACULTY

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

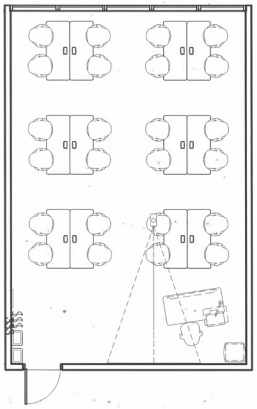
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



LECTURE/ SEMINAR SETTING

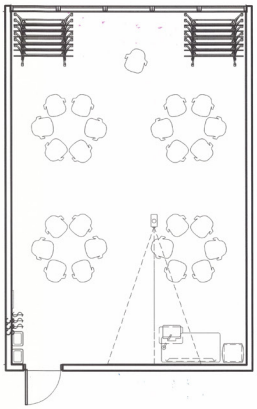
MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS

- UNIVERSAL DESIGN
- SAFETY / SHELTER IN PLACE
- ACCESS TO SECURITY / CAMPUS POLICE
- LOCK DOORS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

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DEANS/ FACULTY

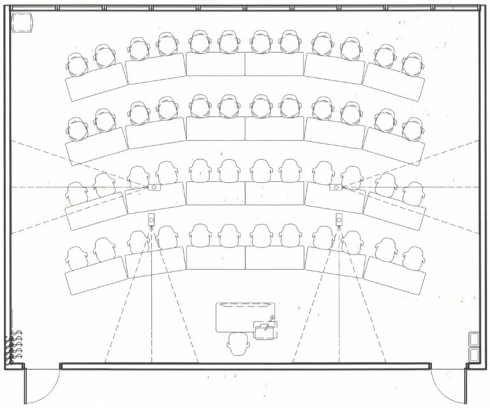
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

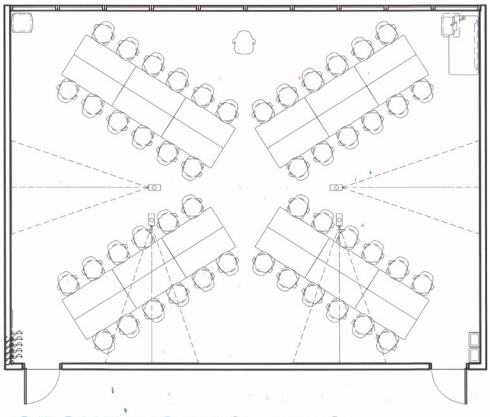
MY IDEAL...ROOM CONFIGURATION

(MEDIUM CLASSROOM ~ 40-50 students)



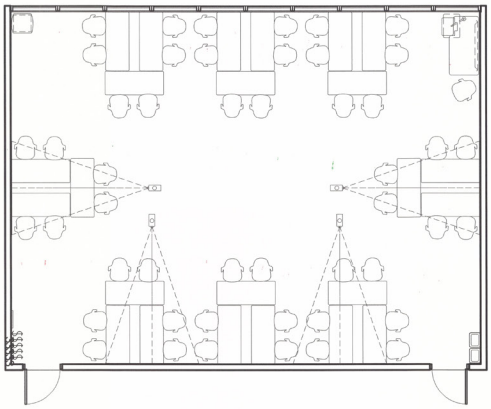
LECTURE SETTING

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

ABILITY TO CONTROL LIGHTING. + EMERGENCY LIGHTS CLOSE TO SCREEN.

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

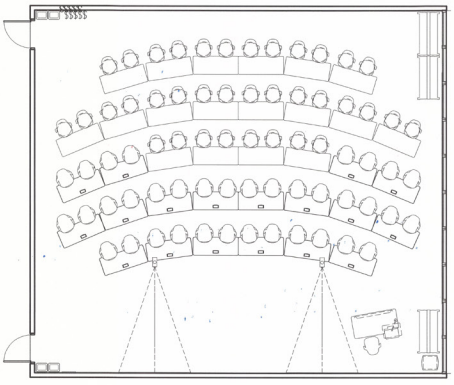
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

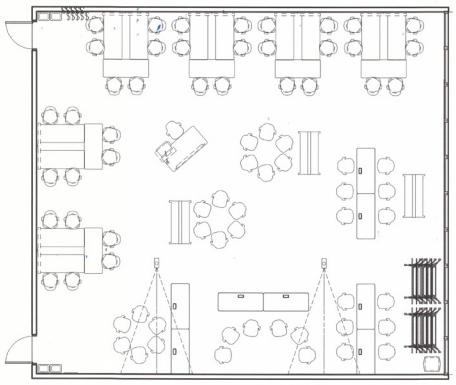
MY IDEAL...ROOM CONFIGURATION

(LARGE CLASSROOM ~ over 50 students)



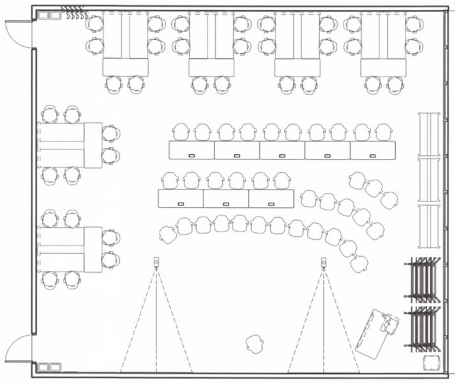
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

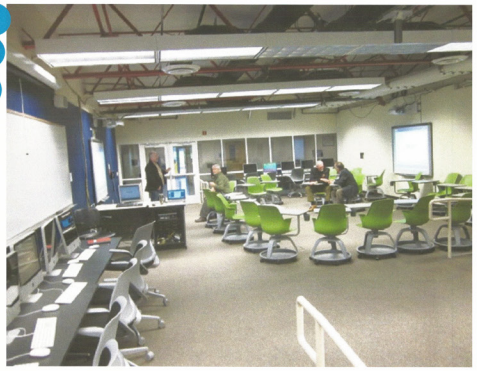


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

DVC DIABLO VALLEY COLLEGE

DEANS/ FACULTY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

OBSTACLE TO INNOVATION

- ACOUSTICS / NOISE / SEPARATION
- ACCESSIBILITY TO CONTROLS
- CLASSROOM SIZE + CLASS MAX / CAPACITY
- LIGHTING - LACK OF ACCESS TO NATURAL LIGHT / DARK / CAVE LIGHT
  - WIN CLASSROOMS ; DISTRIBUTION OF LIGHT
  - ABILITY TO CONTROL: ON/OFF/DIM
- ABILITY TO REORIENT ROOM
- FURNITURE: LARGE, HEAVY, BULKY, "HODGE PODGE"
- LACK OF STANDARDIZATION
- LACK OF "FIT" / ERGONOMICS
- INSUFFICIENT STORAGE
- SECURED / KEYS / ACCESS TO FOBS / LOGISTICS
- LACK OF SPEAKERS / ACCESS TO AUDIO/VIDEO EQUIPMENT
- ERGONOMICS

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

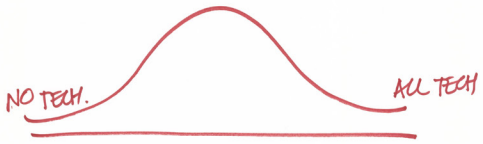
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

- RETURN TO "TYPICAL" SET UP
- FOOL PROOF STRATEGIES
- SYSTEMATIZE : FIRST VS LONG TERM COST
- GENERATION GAP.
  - ↳ LEARNING CURVE. (MAKE TECH EASY).
- KEEP IT SIMPLE
- FUTURE PROOF (FEW SETTINGS).



- NO ROOM TO INCREASE CAPACITY.
  - ↳ STUDENTS MORE THAN CAP.
- FURNITURE NEEDS TO FIT ALL.
- WELCOMING | ATTRACTIVE SPACE.

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- SMART PODIUM W/SMALL FOOTPRINT
- SEAMLESS INTEGRATION OF RESOURCES/CAPABILITY
- CONTROL STATION
- CREATIVE SPACE
- "DO STUFF"
- WRITEABLE
- FURNITURE THAT "GO AWAY" - FOLD UP
- MODULARITY
- INTIMATE SETTINGS
- TBD: LECTURE CAPTURE
- ACCOMMODATE HYBRID/ONLINE
- TABLET USE
- MOBILITY TO CIRCULATE IN ROOM
- FURNITURE LAYOUTS/SIGHTLINES

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

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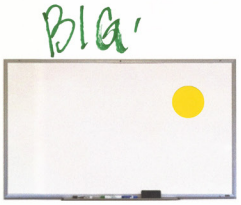
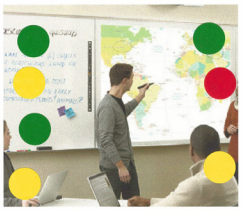
WRITEABLE SURFACES

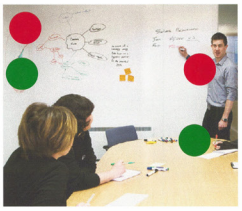


FIXED NON-ELECTRONIC WHITE BOARD



FIXED INTERACTIVE WHITE BOARD

MOVEABLE WHITE BOARD



WRITEABLE WALLS

CHAIRS

WHEELS/ STACKABLE

WHEEL/ FIXED COMBO

WHEELS/ STORAGE/ WORKSPACE

WHEELS/ CUSHION SEAT/ ADJUSTABLE HEIGHT

WHEELS/ FOOT REST/ ADJUSTABLE HEIGHT

TABLES

WHEELS/ OUTLETS

WHEELS/ OUTLETS/ ADJUSTABLE HEIGHT/ FOLDABLE

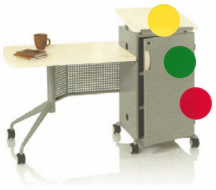
WHEELS/ FOLDABLE/ ROUND
TABLES W/ LAPTOPS.

FIXED/ OUTLETS/ ADJUSTABLE HEIGHT/ DISPLAY MEDIA

INSTRUCTOR STATION

FIXED/ WORKSPACE/ BUILT-IN TECHNOLOGY/ STORAGE

MOVEABLE/ WORK-SPACE/ CONNECTED TECHNOLOGY



MOVEABLE/ DESK-PODIUM COMBINA-TION/ WIRELESS TECHNOLOGY/ STORAGE

MOVEABLE/ DESK-PODIUM COMBINA-TION (MORE WORK-SPACE)/ WIRELESS TECHNOLOGY

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

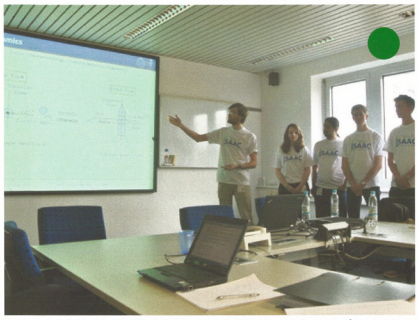
MY IDEAL ...
TEACHING/ LEARNING MODE

LECTURE

TEACHER-STUDENT ENGAGEMENT

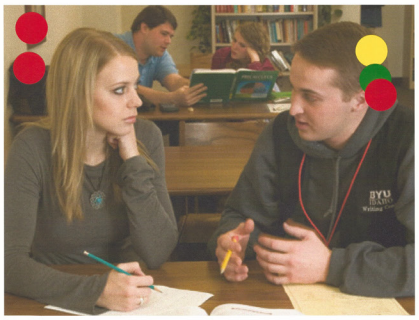
SMALL GROUP DISCUSSIONS

IN-CLASS GROUP WORK

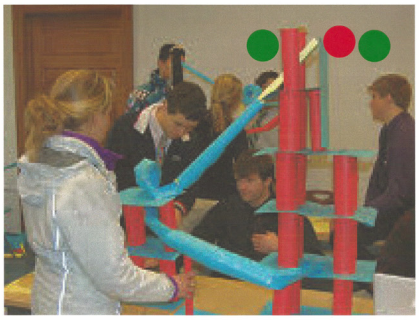


PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)



'PEER-PEER' LEARNING



HANDS-ON PROJECTS

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

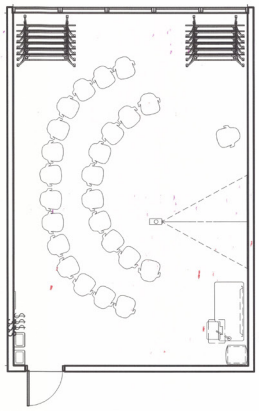
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

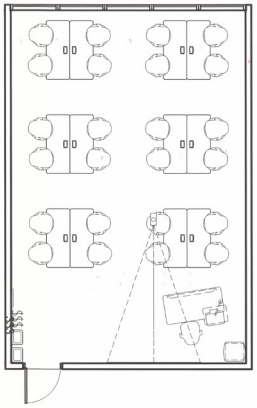
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



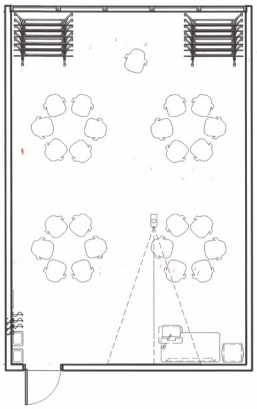
LECTURE/ SEMINAR SETTING

MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

WRNSSTUDIO

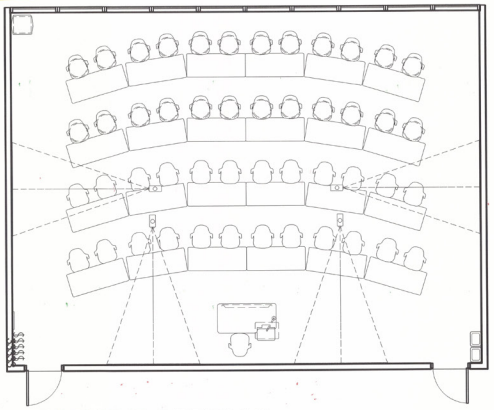
Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

MY IDEAL...ROOM CONFIGURATION

ET 114

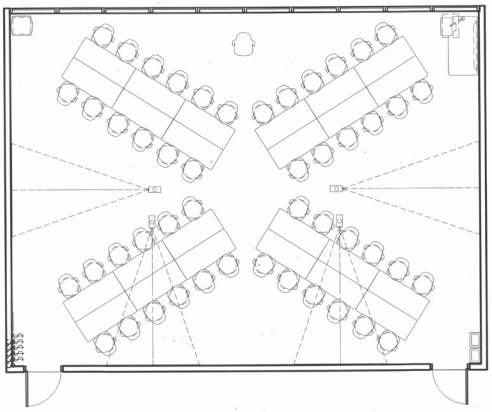
(MEDIUM CLASSROOM ~ 40-50 students)



LECTURE SETTING

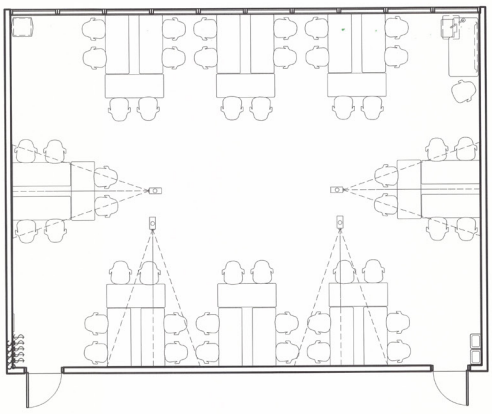
MORE CIRCULATION & SPACE TO PUT STUFF.

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

WRNSSTUDIO

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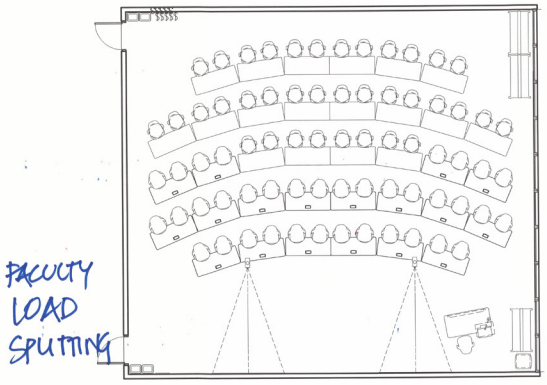
TRANSFORMING TEACHING & LEARNING @ DVC

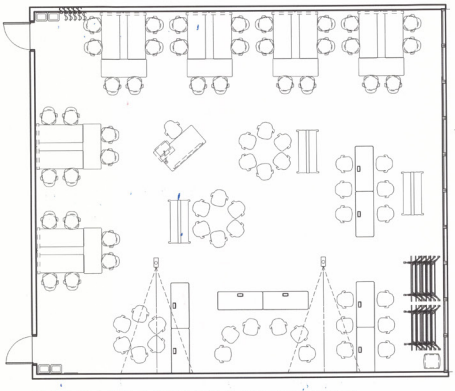
MY IDEAL...ROOM CONFIGURATION

(LARGE CLASSROOM ~ over 50 students)



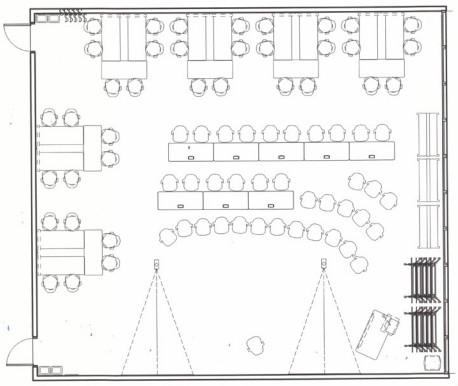
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

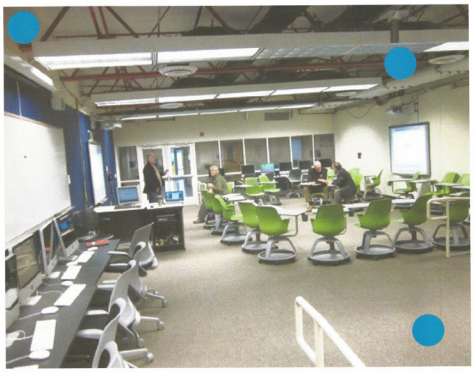


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

DVC DIABLO VALLEY COLLEGE

FACULTY AFFAIRS

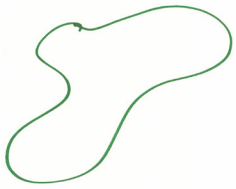
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

- CULTURALLY RESPONSIVE CLASSRM (WELCOMING).
  - ↳ MULTI-DIRECTIONAL.
- INSTRUCTOR ENGAGING IN ALL SPACES.
  - ↳ NO PODIUM
- MAXIMIZE FLEX.
- LIGHTING / TEMP.
- LAPTOPS AVAILABLE ~~OK~~ IN CLASS.
- COMPREHENSION OF STUDENT MOTIVATION.
  - ↳ PSYCHOLOGY THINKING eg STUDENT LEGS HANGING.
- MULTIPLE SEATING & RESPONSIVE ENGAGEMENT.



- DIFFERENT WAY OF SAYING "NO" – SIGNAGE, WORD CHOICE
  - CREATE ACCOUNTABILITY

DVC DIABLO VALLEY COLLEGE

STUDENT AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

OBSTACLE TO INNOVATION

- TECHNOLOGY / WIFI / REMOTE IT TROUBLESHOOTING / EVENING SUPPORT
- DESKS NOT BIG ENOUGH
- UNCLEAR SIGNAGE FOR DSS
- LACK OF UNDERSTANDING RE CONFIGURATIONS + GUIDELINES
- LACK OF FLEXIBILITY FOR GROUP WORK
- LACK OF PODIUM - LARGE ENOUGH FOR RESOURCES
- LACK OF CONSISTENCY OF FURNITURE
- TEMPERATURE, COMFORT
- ACCESS TO + CAPACITY FOR POWER
- OUTDATED
- SELF TIMERS / AUTO OVERRIDE TURN OFF
- EXCESS FURNITURE

DVC DIABLO VALLEY COLLEGE

STUDENT AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- RESPONSIVE / CHANGEABLE ENVIRONMENTS / WHAT MOTIVATES PEOPLE + LEARNING
- CRITICAL PEDAGOGY / PROFESSIONAL DEVELOPMENT
- MINDFULNESS IN CLASSROOMS (K-12)
- SOUND
- LIGHT LEVELS ; BONES
- LESS "ALL OR NONE"
- 360 SOUND
- UPWARD BOUND ; TALENT SEARCH → RECRUITING ; "HOOK"
- EXPOSURE TO "COLLEGE" - NEXT CHAPTER
- LESS "ARCHIVAL" - DIGITAL + CURRENT
- ELEMENT OF SURPRISE
- FLEX SEATINGS / MULTIPLE EVENTS

DVC DIABLO VALLEY COLLEGE

STUDENT AFFAIRS

WRNSSTUDIO

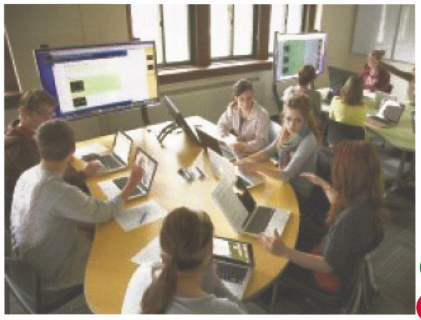
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

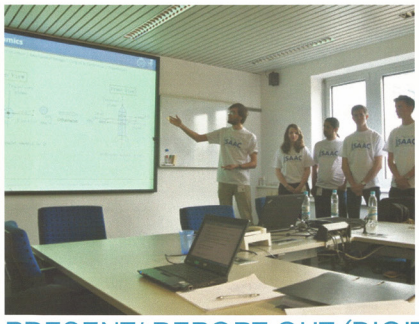
LECTURE

TEACHER-STUDENT ENGAGEMENT

SMALL GROUP DISCUSSIONS



IN-CLASS GROUP WORK



PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

DVC
DIABLO VALLEY COLLEGE

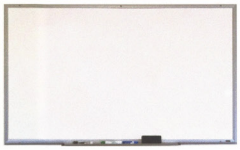
STUDENT AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

WRITEABLE SURFACES



FIXED NON-ELECTRONIC WHITE BOARD

FIXED INTERACTIVE WHITE BOARD

MOVEABLE WHITE BOARD

WRITEABLE WALLS

CHAIRS

WHEELS/ STACKABLE

WHEELS/ STORAGE/ WORKSPACE

WHEELS/ CUSHION SEAT/ ADJUSTABLE HEIGHT

WHEELS/ FOOT REST/ ADJUSTABLE HEIGHT

TABLES

WHEELS/ OUTLETS

WHEELS/ OUTLETS/ ADJUSTABLE HEIGHT/ FOLDABLE

WHEELS/ FOLDABLE/ ROUND

FIXED/ OUTLETS/ ADJUSTABLE HEIGHT/ DISPLAY MEDIA

INSTRUCTOR STATION

FIXED/ WORKSPACE/ BUILT-IN TECHNOLOGY/ STORAGE

MOVEABLE/ WORK-SPACE/ CONNECTED TECHNOLOGY

MOVEABLE/ DESK-PODIUM COMBINA-TION/ WIRELESS TECHNOLOGY/ STORAGE

MOVEABLE/ DESK-PODIUM COMBINA-TION (MORE WORK-SPACE)/ WIRELESS TECHNOLOGY

DVC DIABLO VALLEY COLLEGE

STUDENT AFFAIRS

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

OBSTACLE TO INNOVATION

- LACK OF WI-FI
- RELIABLE TECH.
- NO BLACKBOARDS → MODERNIZE.
- THERMAL COMFORT.
- 'INCLUSIVE EXCELLENCE' → FOSTER IT IN THE ENVRNT.
- ENVIRONMENTAL CONCERNS
- IT SUPPORT
- STUDY ROOMS. — HOW THEY HELP LEARNING.
  - ↳ DIFF. STUDENT NEEDS.
- MOVABLE FURNITURE.

DVC DIABLO VALLEY COLLEGE

DIVERSITY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

- CULTURAL SENSITIVITY
- RULES + SIGNAGE
- MULTIPLE LANGUAGES
- ESL STUDENTS - INCLUSIVE + WELCOMING
  - FAMILIARITY (LIMIT THEIR SPAN W/IN CAMPUS)
- ELIMINATE PHYSICAL OR PERCEIVED BARRIERS
- "ROAMERS" - ARE ACCESSIBLE EASILY / FLUID
- SOFT SPACES BUILD COMMUNITY < STUDENTS / STAFF
- RECOGNIZE DIFFERENT LEARNING STYLES
- AVOID "EASY TO HIDE" ; SMALLER, INTIMATE BREAK-OUTS
- ENCOURAGE PEER-TO-PEER SCENARIOS / CONNECT W/ EACH OTHER

DVC DIABLO VALLEY COLLEGE

DIVERSITY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- UPDATE TECH + MODERNIZE.
- INTERACTIVE MEDIA FOR DOCUMENTING/SHARING.
- BUILD ROOMS TO FOSTER LEARNING → NO BAND-AIDS
- MORE MTG + STUDY ROOMS.
- CREATIVE SPACE.
  - ↳ VISUALIZE
  - ↳ SUPPLIES STORAGE.
  - ↳ RETREAT-TYPE MTGS.
  - ↳ MESSY / MAKING.
- NO RULES / LESS CONSTRICTING.

DVC DIABLO VALLEY COLLEGE

DIVERSITY

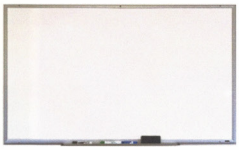
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

S M L NO

WRITEABLE SURFACES



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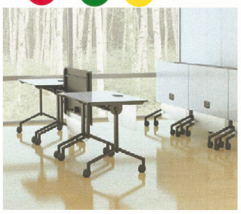

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DVC DIABLO VALLEY COLLEGE

DIVERSITY

WRNSSTUDIO

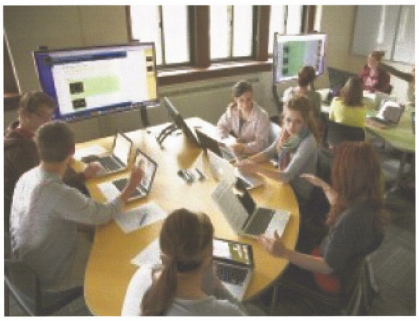
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

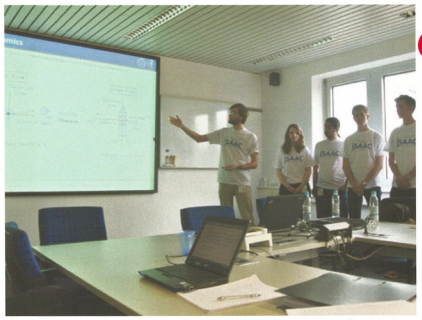
LECTURE

TEACHER-STUDENT ENGAGEMENT

SMALL GROUP DISCUSSIONS



IN-CLASS GROUP WORK



PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

DIVERSITY

DVC DIABLO VALLEY COLLEGE

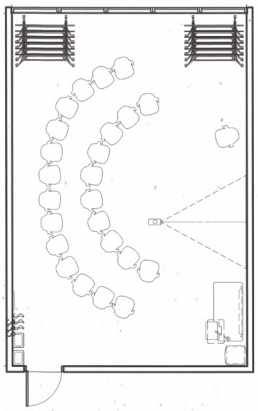
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

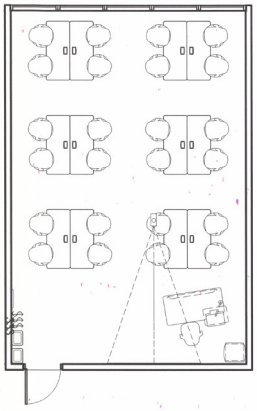
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



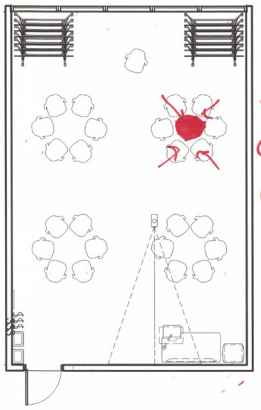
LECTURE/ SEMINAR SETTING

MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

DVC DIABLO VALLEY COLLEGE

DIVERSITY

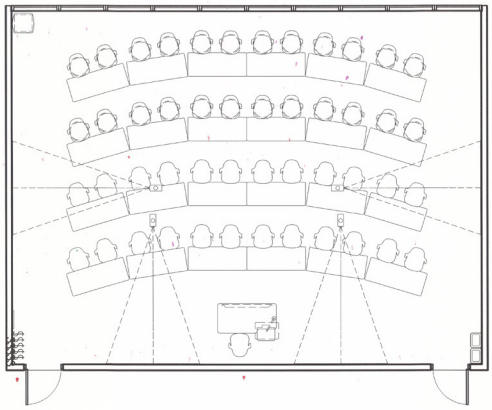
WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

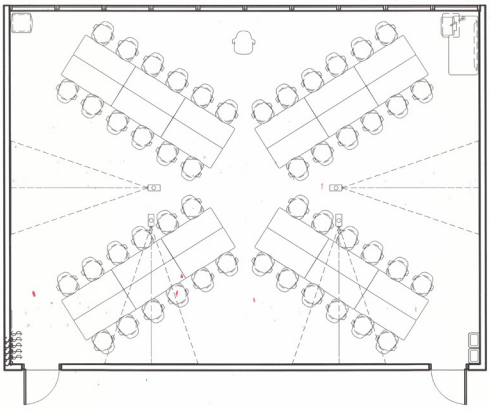
MY IDEAL...ROOM CONFIGURATION

(MEDIUM CLASSROOM ~ 40-50 students)



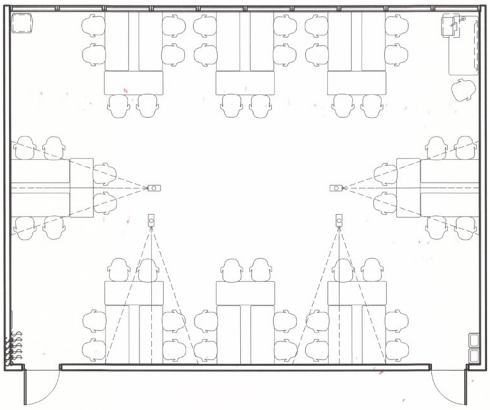
LECTURE SETTING

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

DIVERSITY

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

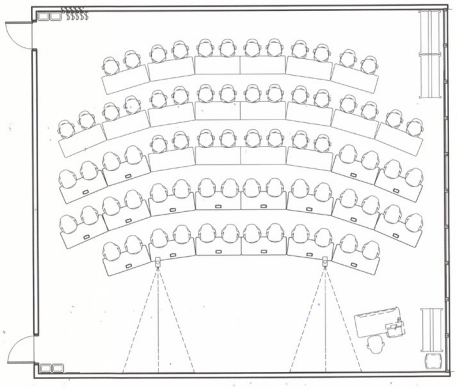
Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

MY IDEAL...ROOM CONFIGURATION

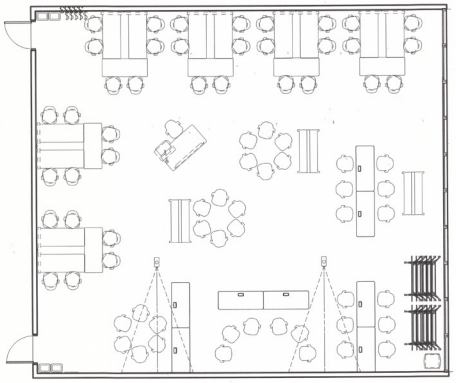
(LARGE CLASSROOM ~ over 50 students)

(CASE STUDIES)



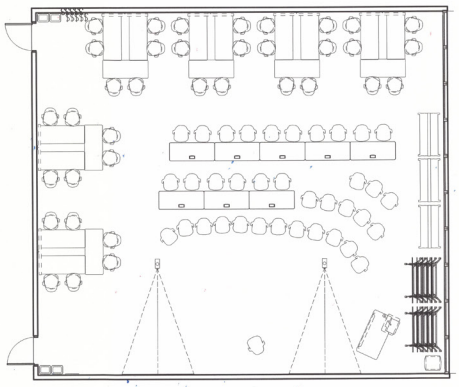
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

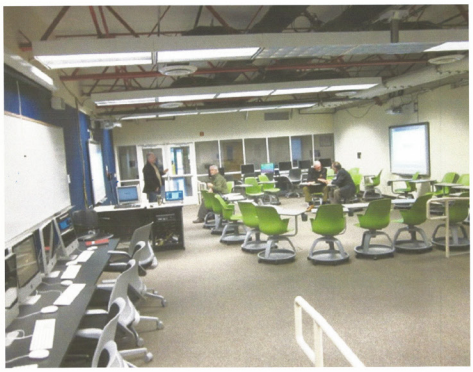


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

DIVERSITY

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

OBSTACLE TO INNOVATION

- UNIVERSAL DESIGN
- SPACE - CRAMMED W/ FURNITURE ; PERSONAL SPACE
- CIRCULATION - INSUFFICIENT, ACCESS TO INSTRUCTORS
- UNCOMFORTABLE
- TOO SMALL < SPACE FOR EQUIPMENT / SIZE
- ALL SPACES ACCESSIBLE VS DESIGNATED (BACK)
- NOT ENOUGH
- FIXED = AWFUL
- DON'T ACCOMMODATE IMPAIRMENTS
- IMPROVE VOICE PROJECTION ALL ACCROSS ROOM - NOT "AMPLIFIED" VS DISTRIBUTED EVENT
- POOR MAINTENANCE / HVAC
- TIERS ARE PROBLEMATIC
- THERMAL COMFORT - NOT WORKING - TOO HOT / TOO COLD - STUDENTS ARE SENSITIVE TO TEMP.
- FEW ROOMS HAVE NATURAL LIGHT - SENSITIVITY TO INC. LIGHTING
- LACK OF DIMMING CAPABILITY
- ACOUSTICS DISTRACTING TO ADHD

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

CAPITALIZE ON **DIVERSITY**

- MINIMIZE DISTRACTIONS - SMALLER/INTIMATE STUDENT-FACULTY INTERACTION. (BOX DESK)
- FLEXIBILITY TO STAND & MOVE.
- STOOLS THAT HAVE MULTIPLE FLEX MODES.
- SMART BOARDS - SEND INFO TO STUDENTS
- PLAY CAPTIONED VIDEO.
- SIGNAGE FOR DISABILITY SYMBOL.
- AUTOMATIC TRANSLATION (eg GOOGLE TRANSLATE).
  - ↳ ONLINE INSTRUCTIONS FOR CLASS.
  - ↳ RECORDING LECTURES & TRANSLATE TO TEXT/LANGUAGE.
- DSS RESOURCE PEER GROUP.

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

IF I COULD **DO MORE**?

- EVERY ROOM CAPTIONED
- *REAL TIME RECORDING
- COMMUNICATE FROM OUTSIDE ROOM TO INDIVIDUAL DESKS - SIGNALING
- "STOP LIGHT" SYSTEM - MONITORING TIME
- VIDEO RECORDING - CAPABILITY, BUILT-IN, ACCESSIBLE ON LINE
- RESOLVE CONFIDENTIALITY BARRIER
- NARRATED POWER POINT SOFTWARE; TRANSLATIONS
- ROOMS W/ "PERSONALITY": COLOR, INTEREST, POSTERS
- STATIONS - EASY + QUICK TO SET UP
- CHALK - BRIGHT; SUPPLIES + RESOURCES
  - EASY TO READ
- MATERIALS SELECTED FOR DURABILITY (HARDWOOD)

DVC DIABLO VALLEY COLLEGE

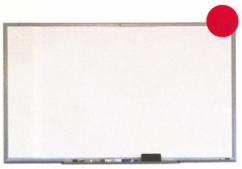
ACCESSIBILITY

WRNSSTUDIO

Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ... EQUIPMENT TOOLKIT

WRITEABLE SURFACES



FIXED NON-ELECTRONIC WHITE BOARD

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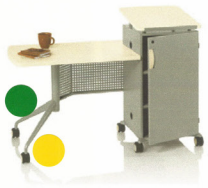

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MOVEABLE/ DESK-PODIUM COMBINA-TION (MORE WORK-SPACE)/ WIRELESS TECHNOLOGY

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

WRNSSTUDIO

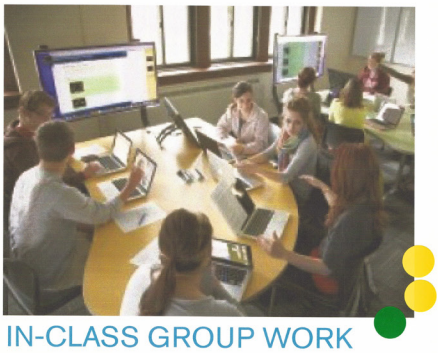
Debrief Posters from User Group Workshop (Sept 18, 2017)

MY IDEAL ...
TEACHING/ LEARNING MODE

LECTURE

TEACHER-STUDENT ENGAGEMENT

SMALL GROUP DISCUSSIONS



IN-CLASS GROUP WORK

PRESENT/ REPORT OUT (DIGITAL)

PRESENT/ REPORT OUT (ANALOG)

'PEER-PEER' LEARNING

HANDS-ON PROJECTS

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

WRNSSTUDIO

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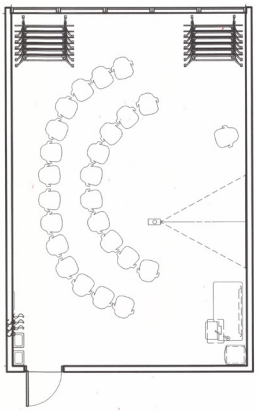
TRANSFORMING TEACHING & LEARNING @ DVC

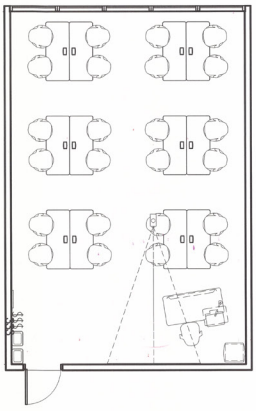
MY IDEAL...ROOM CONFIGURATION

(SMALL CLASSROOM ~ 25-30 students)



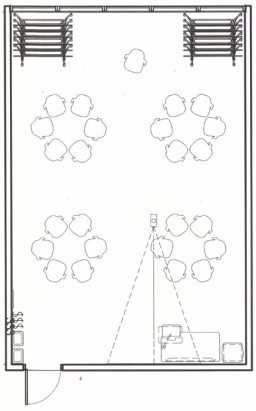
LECTURE/ SEMINAR SETTING

MOVEABLE FURNITURE FOR ALL-CLASS DISCUSSIONS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK W/ DESKS



GROUP WORK SETTING

MOVEABLE FURNITURE FOR SMALL GROUP WORK AND ACCESS TO DAYLIGHT

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

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TRANSFORMING TEACHING & LEARNING @ DVC

MY IDEAL...ROOM CONFIGURATION

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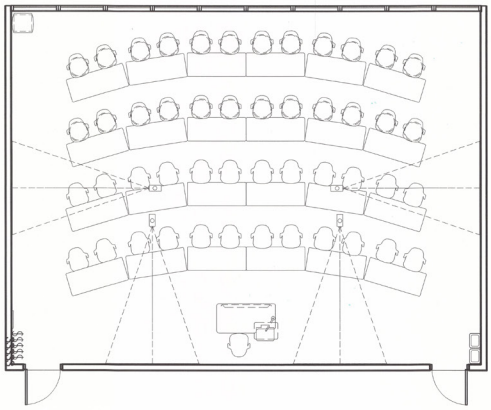
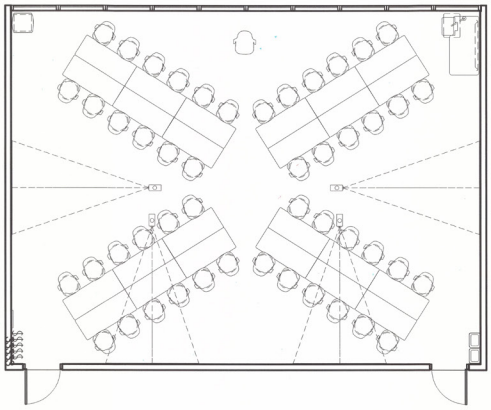


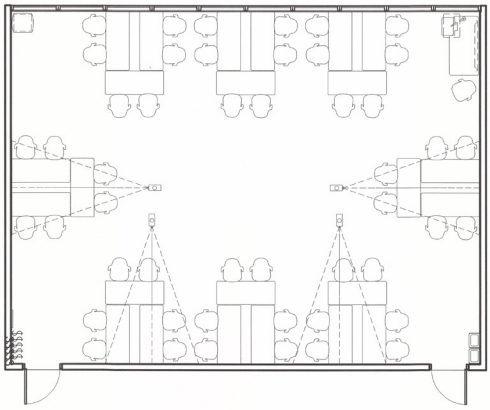
LECTURE SETTING

ADJUSTABLE SEATING AIDS CLEAR SIGHT LINES



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS



GROUP WORK SETTING

TECHNOLOGY ENABLED ROOM WITH MULTIPLE SCREENS FOR 360 DEG VIEWING

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

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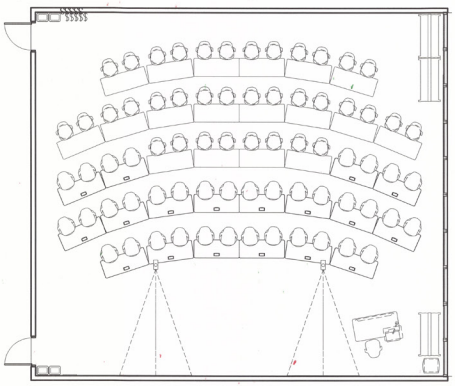
TRANSFORMING TEACHING & LEARNING @ DVC

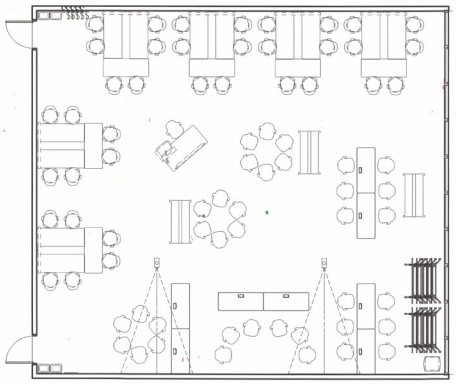
MY IDEAL...ROOM CONFIGURATION

(LARGE CLASSROOM ~ over 50 students)



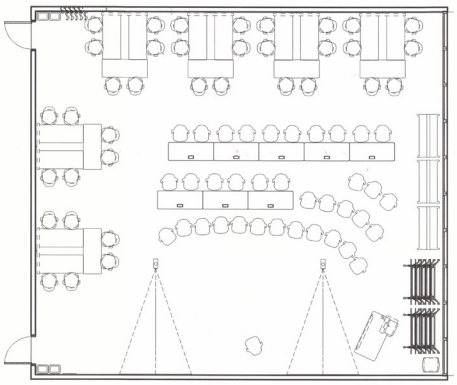
LECTURE SETTING

ADJUSTABLE FURNITURE IN FLAT ROOMS FOR CLEAR SIGHT LINES

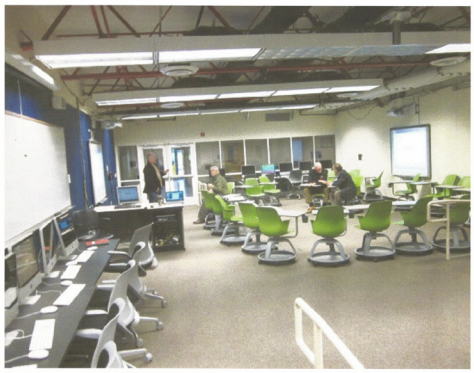


GROUP WORK SETTING

VARIETY OF FLEXIBLE WRITEABLE SURFACES, FURNITURE & DIGITAL MEDIA FOR COLLABORATION



GROUP WORK SETTING



MULTI-MODAL; MULTI-SCALE WITHIN SAME ROOM

DVC DIABLO VALLEY COLLEGE

ACCESSIBILITY

WRNSSTUDIO

Debrief Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

LESSON PLANS_KEY TAKEAWAYS

- LESS LECTURE, MORE INTERACTION
- WEB and VIDEO INTERFACE
  - RELIABLE WI-FI. – QUICK DATA POLLING + DISCUSSION + REPORT UP
- SCALES OF GROUP DISCUSSIONS/ ACTIVITY
  - All Class
  - Group
  - Individual/ Pair
  - Team Teaching
  - – TEST TAKING LAYOUTS
  - – CLASSRM + STORAGE SPACE
  - SHOW HARDDRIVE/ ROCKS.
  - SPACE FOR MOVEMENT.
  - – COMMUNITY-BASED LEARNING.
- TEACHING/ LEARNING METHODOLOGIES
  - Demonstrate
  - Observe
  - Examine
  - Simulate
  - Debate
  - – PRODUCE (THEN MORE ENGAGED) – SPACE IS LIMITED.
  - • BRING LAB INTO CLASSRM
  - • FLEX ORIENTATIONS.
- LEARNING THROUGH DISPLAY
  - Gallery/ Exhibition
  - Class as an event
  - Host a larger audience
  - – SHOWCASE STUDENT PRODUCT.
- "OPEN CLASSROOM"/ EXTENDING BEYOND
  - Wiki edit-a-thon
  - Multi-discipline skills (SWOT analysis/ digital stories)
  - Storytelling
  - PULLING IN EXPERTISE THRU SKYPE.

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Debrief Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

"IF I COULD DO MORE"_KEY TAKEAWAYS

- PRODUCE rather than ABSORB
- "CREATIVE" SPACE
  - Retreat-type
  - Modular
- HYBRID LEARNING (Online & In-class)
  - ZOOM
  - NON CLASS CLASS
- VIRTUAL REALITY
- GLOBAL REACH (eg. NASA)
- INTERDISCIPLINARY
- PROFESSIONAL DEVELOPMENT
- STAND-UP CLASS
- MINDFULNESS (Meditative)

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Debrief Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

TRANSFORMING TEACHING & LEARNING @ DVC

"DIVERSITY"_KEY TAKEAWAYS

- UNIVERSAL DESIGN PEDAGOGY (WEBSITE)
- WELCOMING/ ATTRACTIVE
- INCLUSIVE/ MULTI-DIRECTIONAL
- RESPONSIVE ENGAGEMENT
  - Cultural sensitivity
  - Meet students where they are
  - Flexibility/ Mobility
- MULTIPLE LANGUAGES
- "RETHINK" RULES & SIGNAGE
- RECOGNIZE THE "LEARNING CURVE"
- OPERATE AT CLASS CAPACITY
  - HAVE "EXTRA" SPACE; +25% CAPACITY
- PEER TO PEER
- SOFT SPACES BUILD COMMUNITY
- ACCESSIBILITY; ADDITIONAL PERSONS

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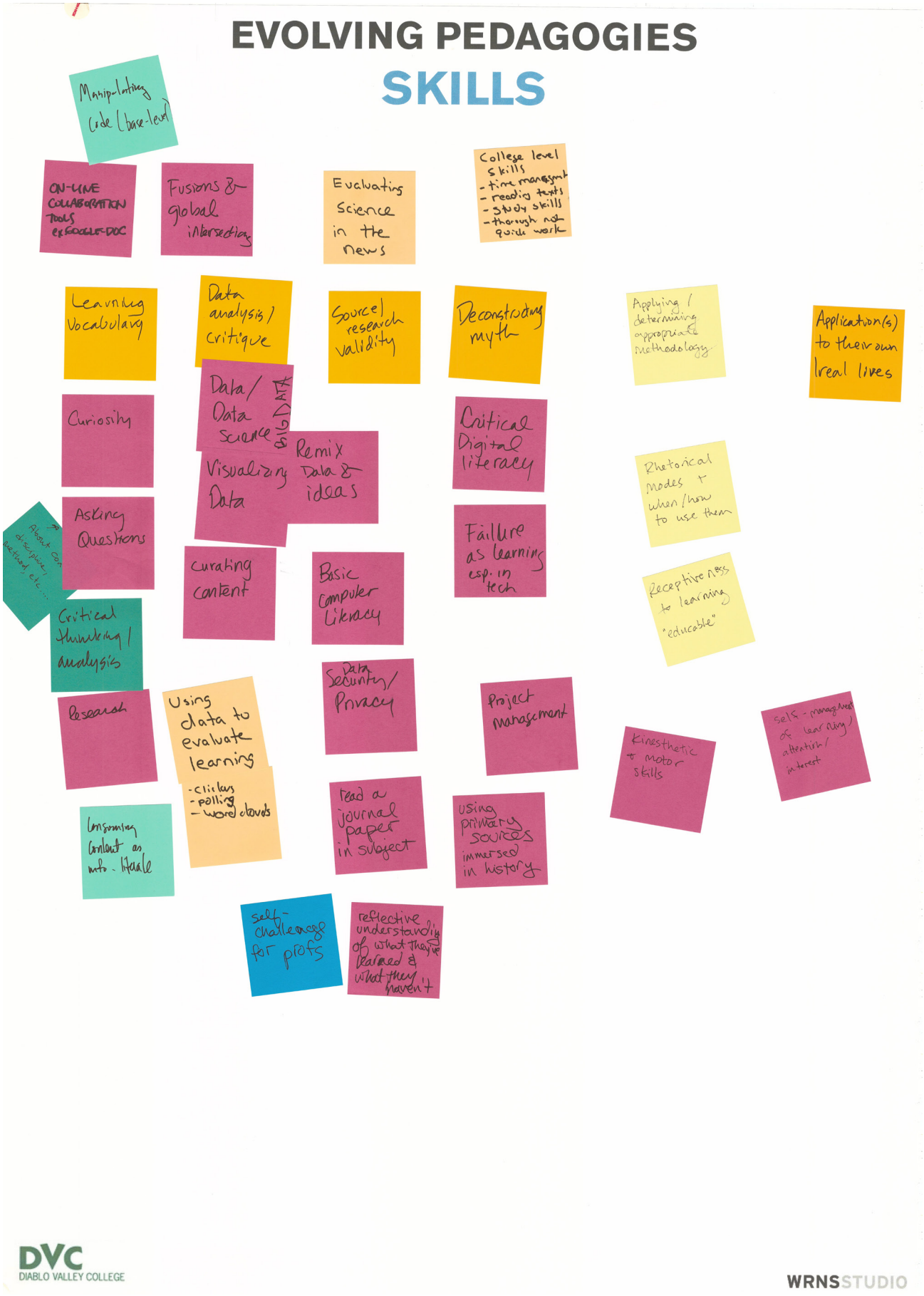
Exercise 1 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)



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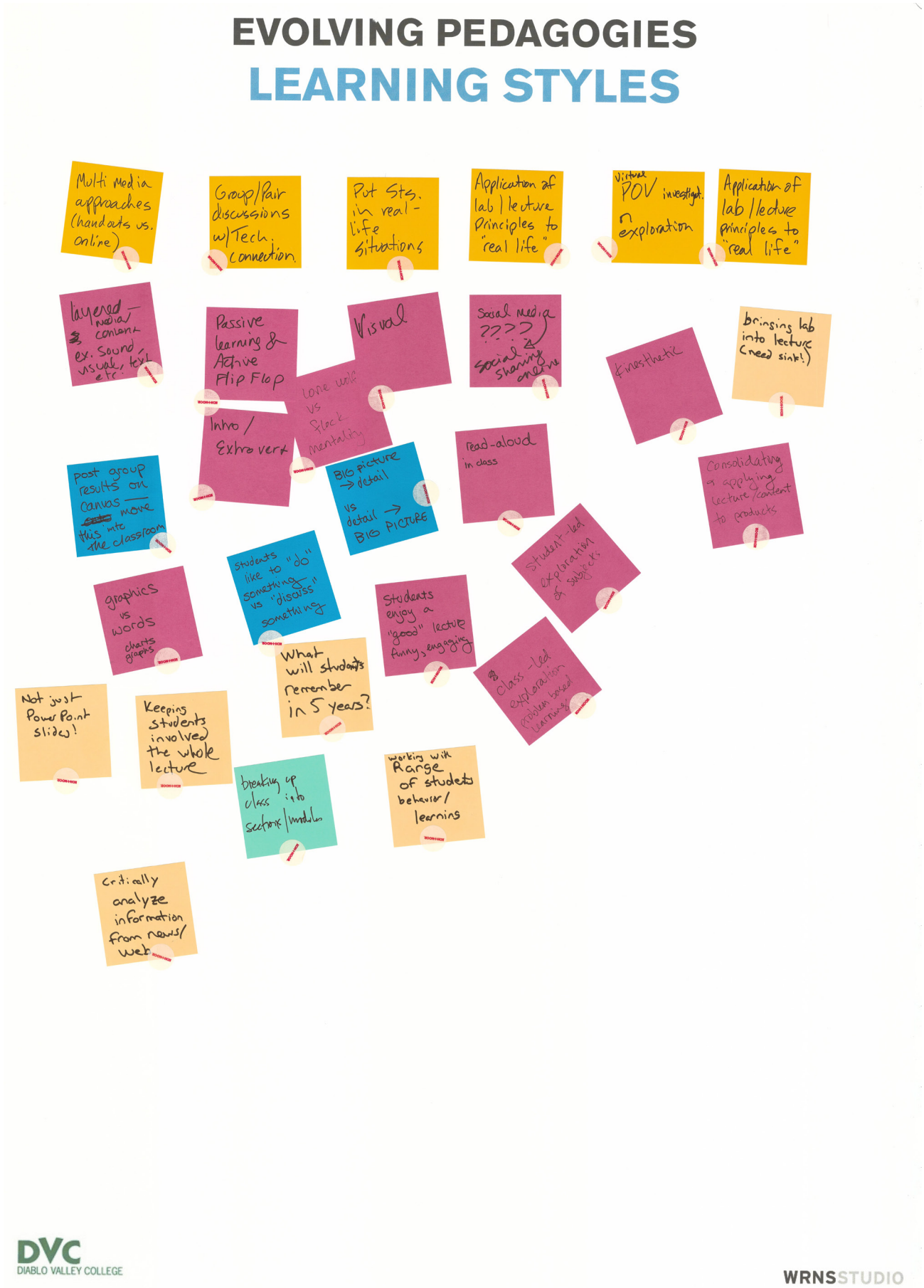

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Exercise 1 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

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Exercise 1 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

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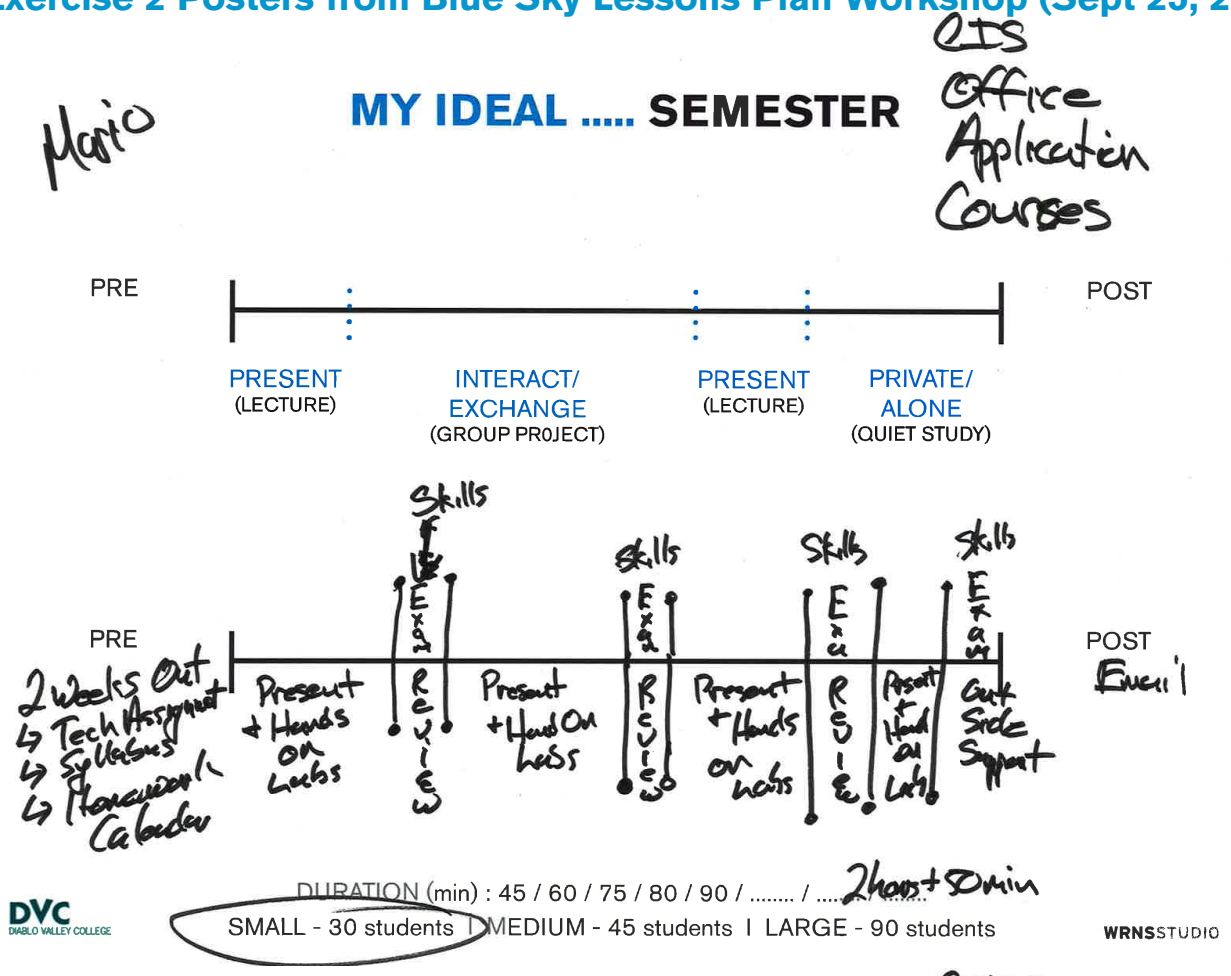
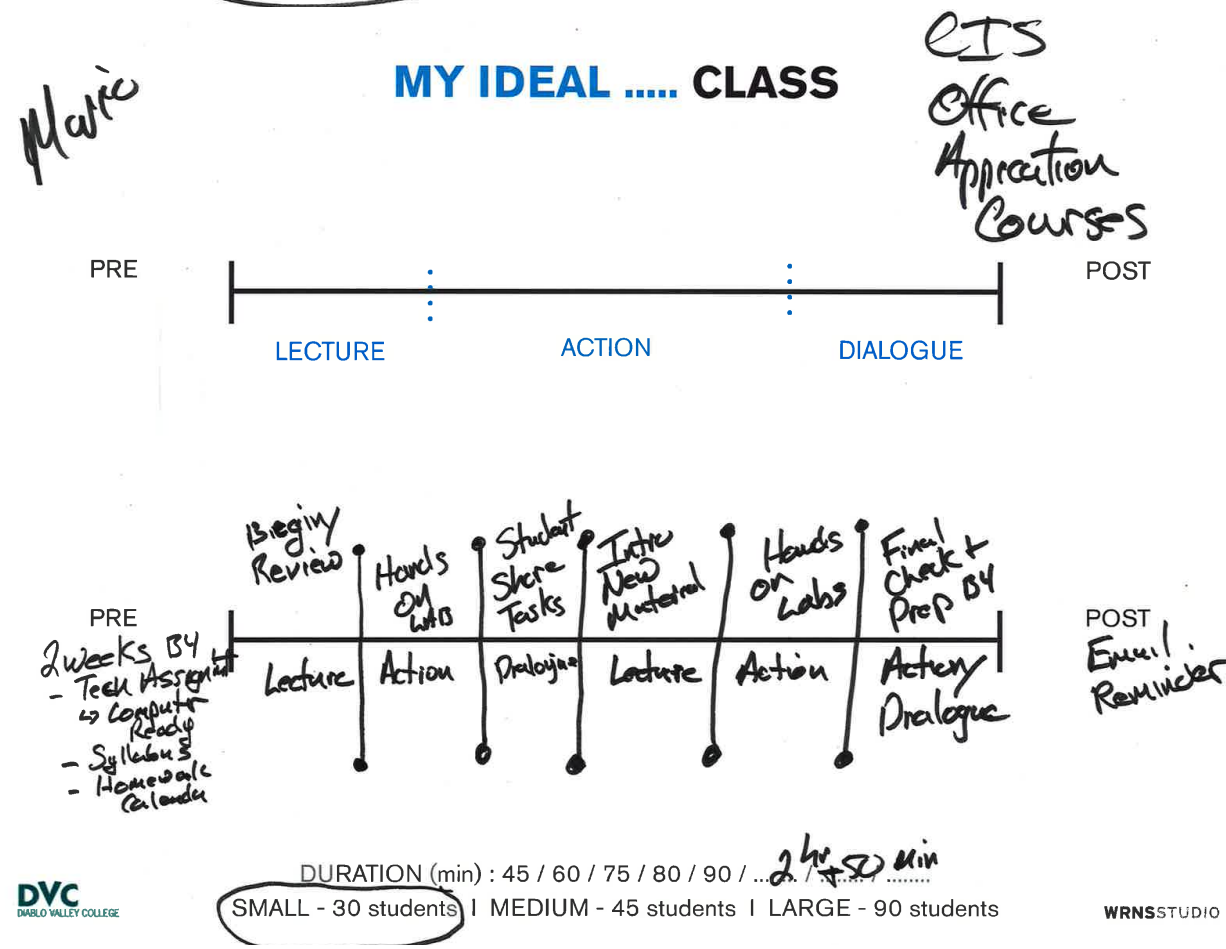
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)





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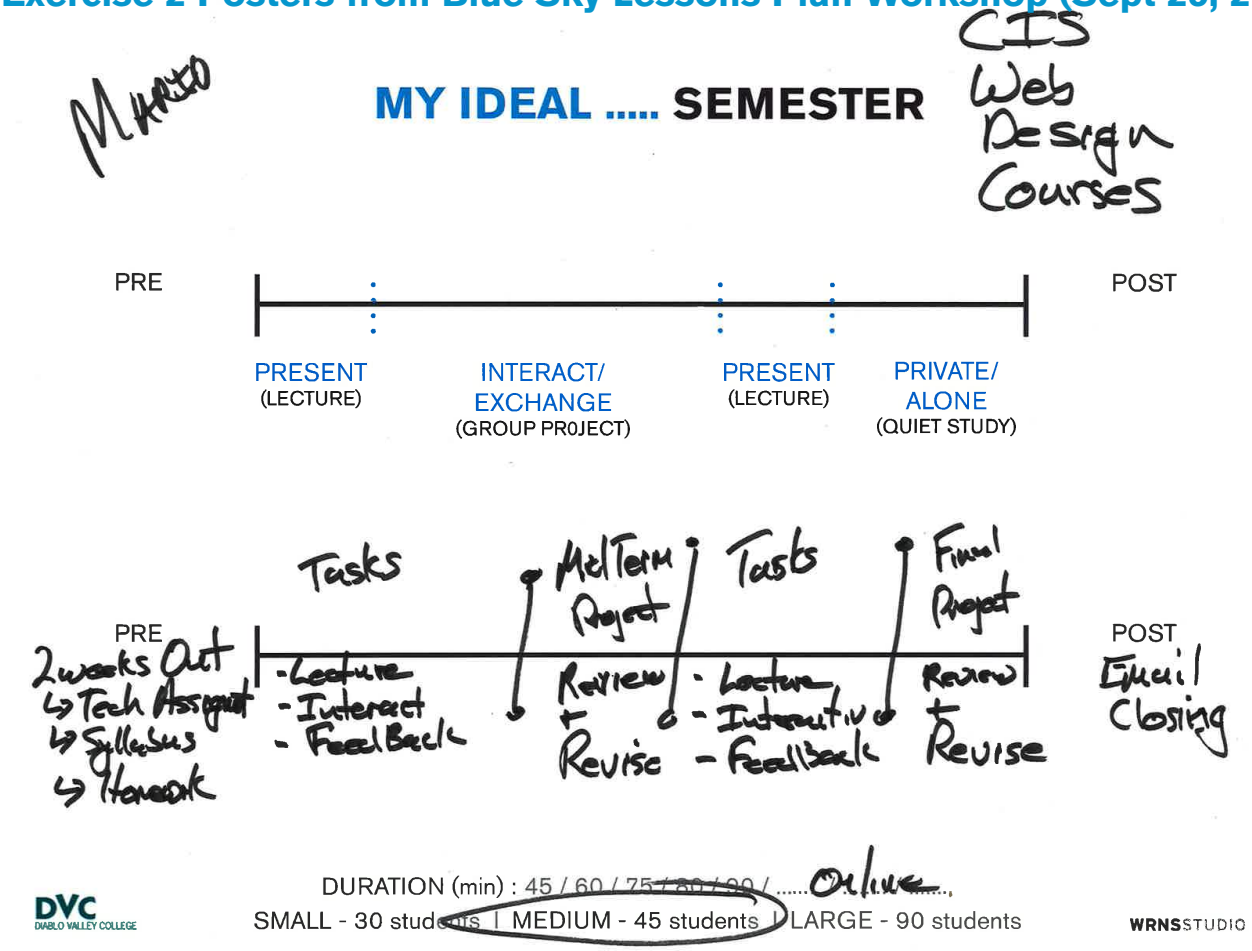
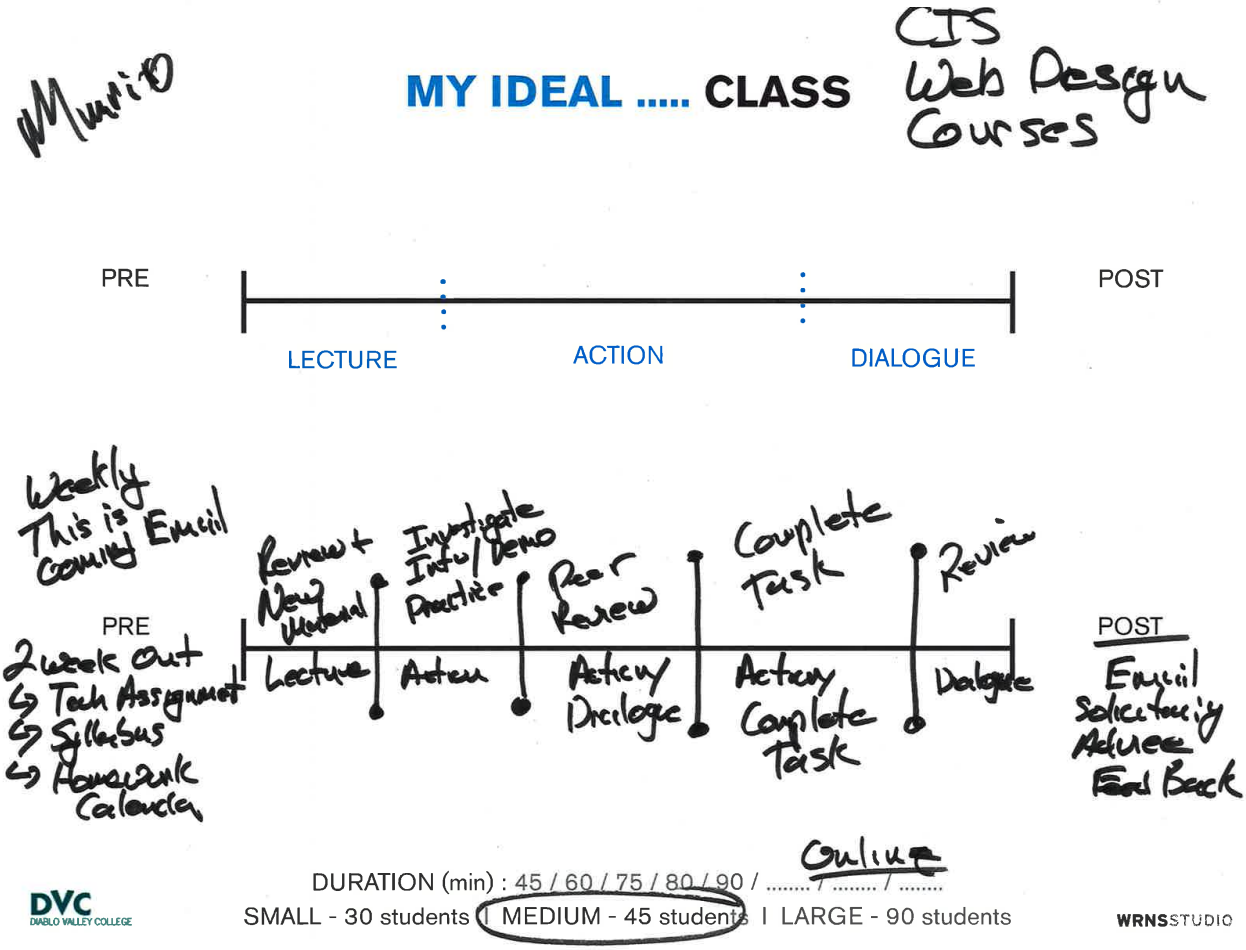
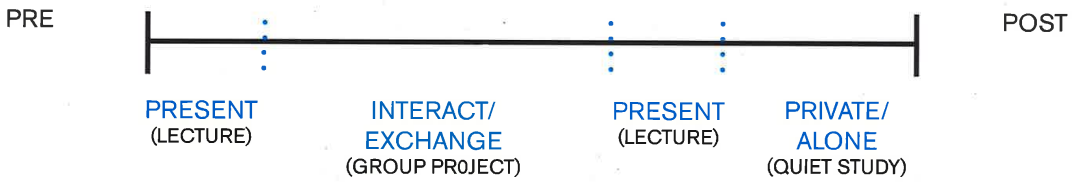


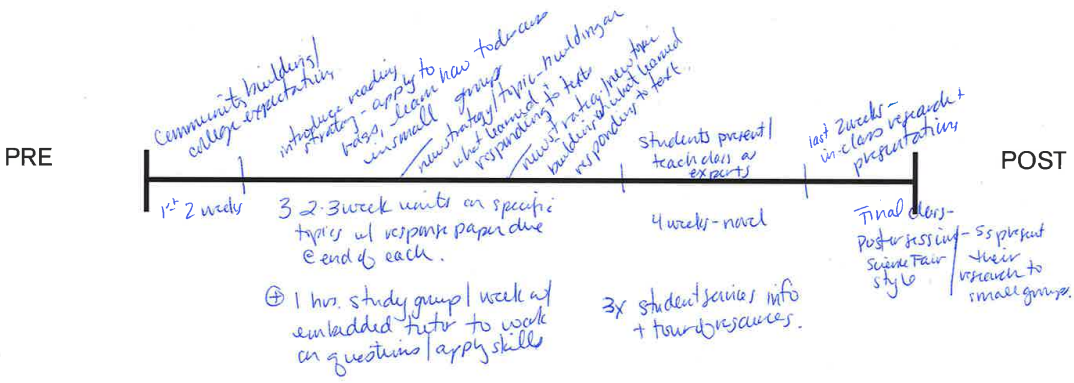


Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

Katy Agnost
Pre-transfer Eng. 96
(2 levels below transfer-
reading strategy).

MY IDEAL ..... SEMESTER





DURATION (min) : 45 / 60 / 75 / 80 / 90 / ..... / ..... / .....
SMALL - 30 students I MEDIUM - 45 students I LARGE - 90 students

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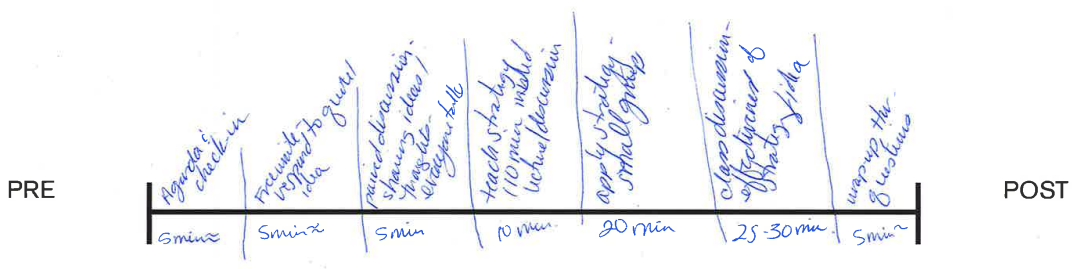
Katy Agnost
Pre-transfer Eng. 96
2 levels below.

MY IDEAL ..... CLASS



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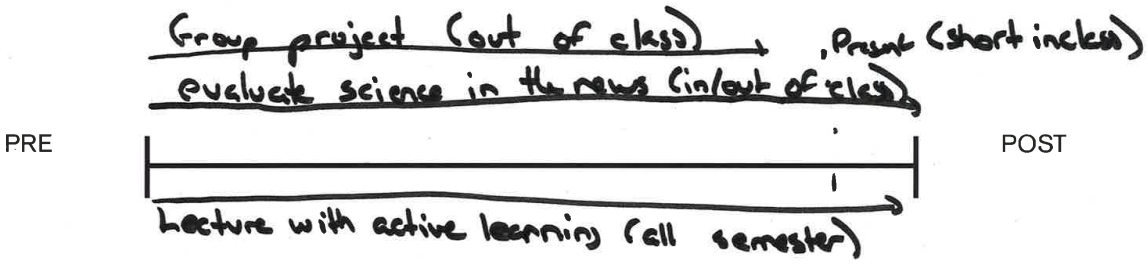
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

Joe

MY IDEAL ..... SEMESTER



DVC DIABLO VALLEY COLLEGE

DURATION (min) : 45 / 60 / 75 / 80 / 90 / ..... / ..... / .....

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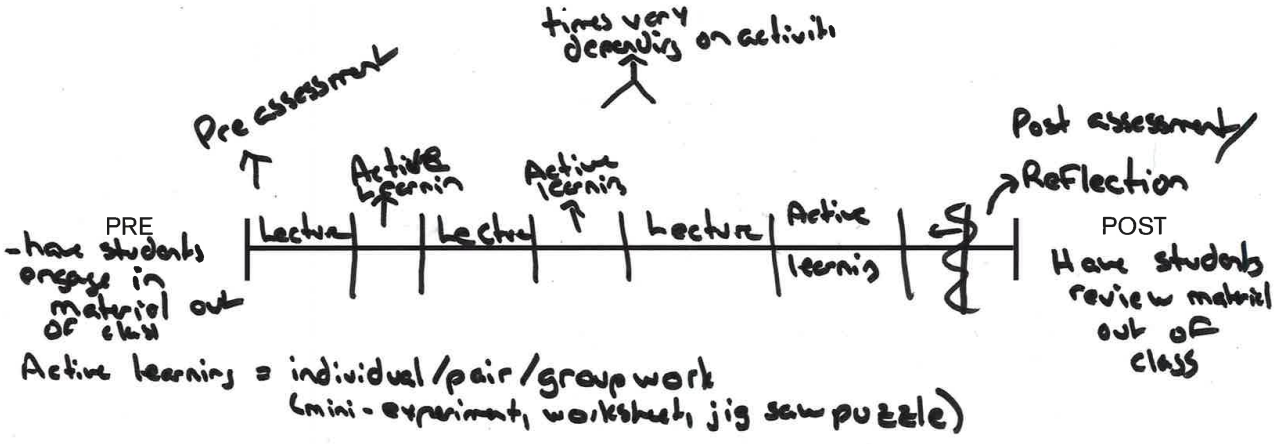
WRNSSTUDIO

Joe

MY IDEAL ..... CLASS



DVC DIABLO VALLEY COLLEGE

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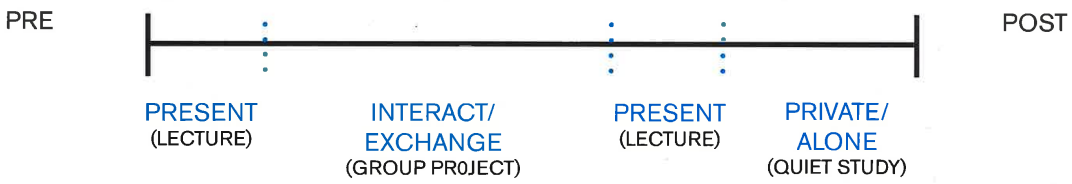
WRNSSTUDIO

Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

MY IDEAL ..... SEMESTER



~~PRE~~ my ideal class X 25 ~~POST~~

DVC DIABLO VALLEY COLLEGE

DURATION (min) : 45 / 60 / 75 / 80 / 90 / ..... / ..... / .....
SMALL - 30 students I MEDIUM - 45 students I LARGE - 90 students

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MY IDEAL ..... CLASS

~~PRE~~ small group discussion 5 min | video clip 5 min | student presentation + large group discussion 15 min | lecture + video clip 20 min | self-assessment 5 min | small group discussion 10 min 5 min | lecture 20 min | large ~~POST~~ group discussion 10 min

DVC DIABLO VALLEY COLLEGE

DURATION (min) : 45 / 60 / 75 / 80 / 90 / ..... / ..... / .....
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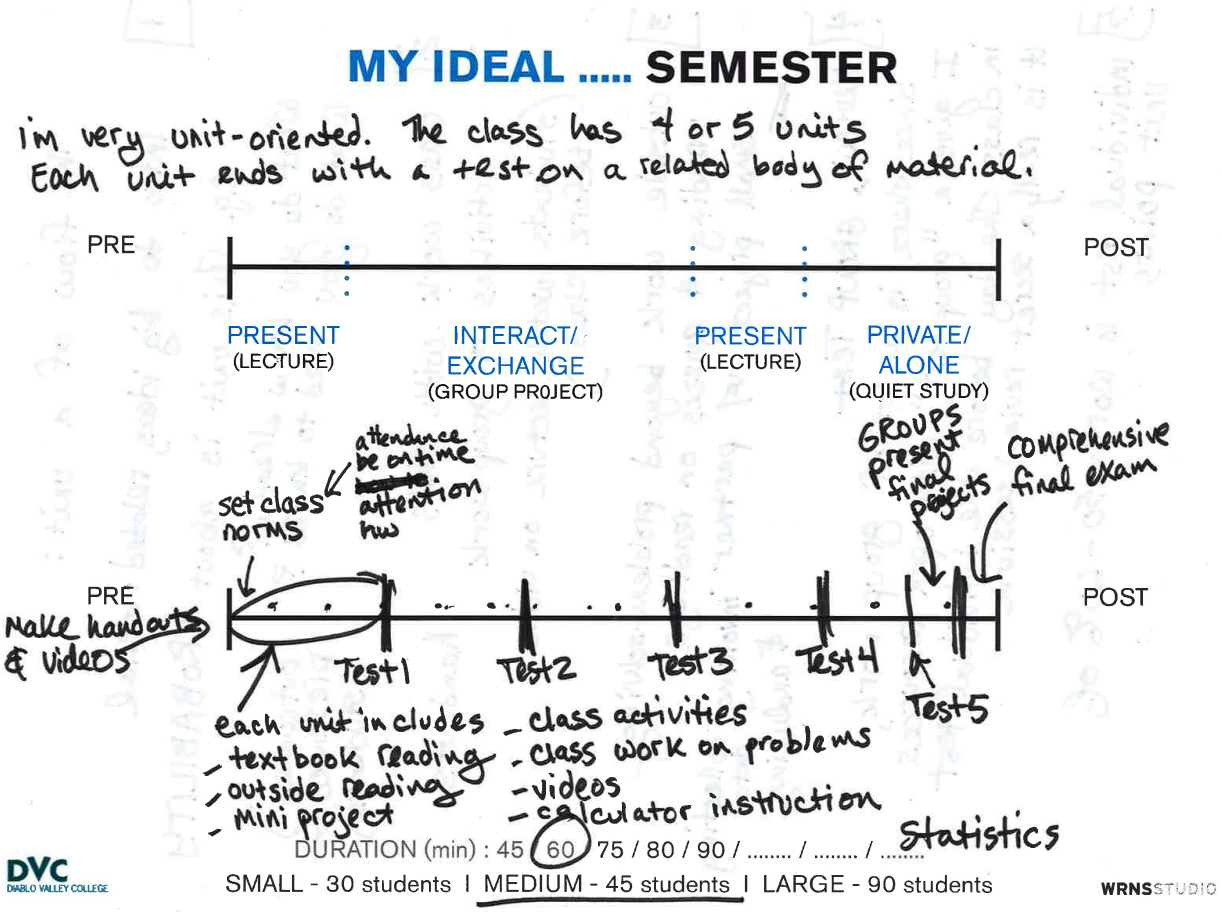
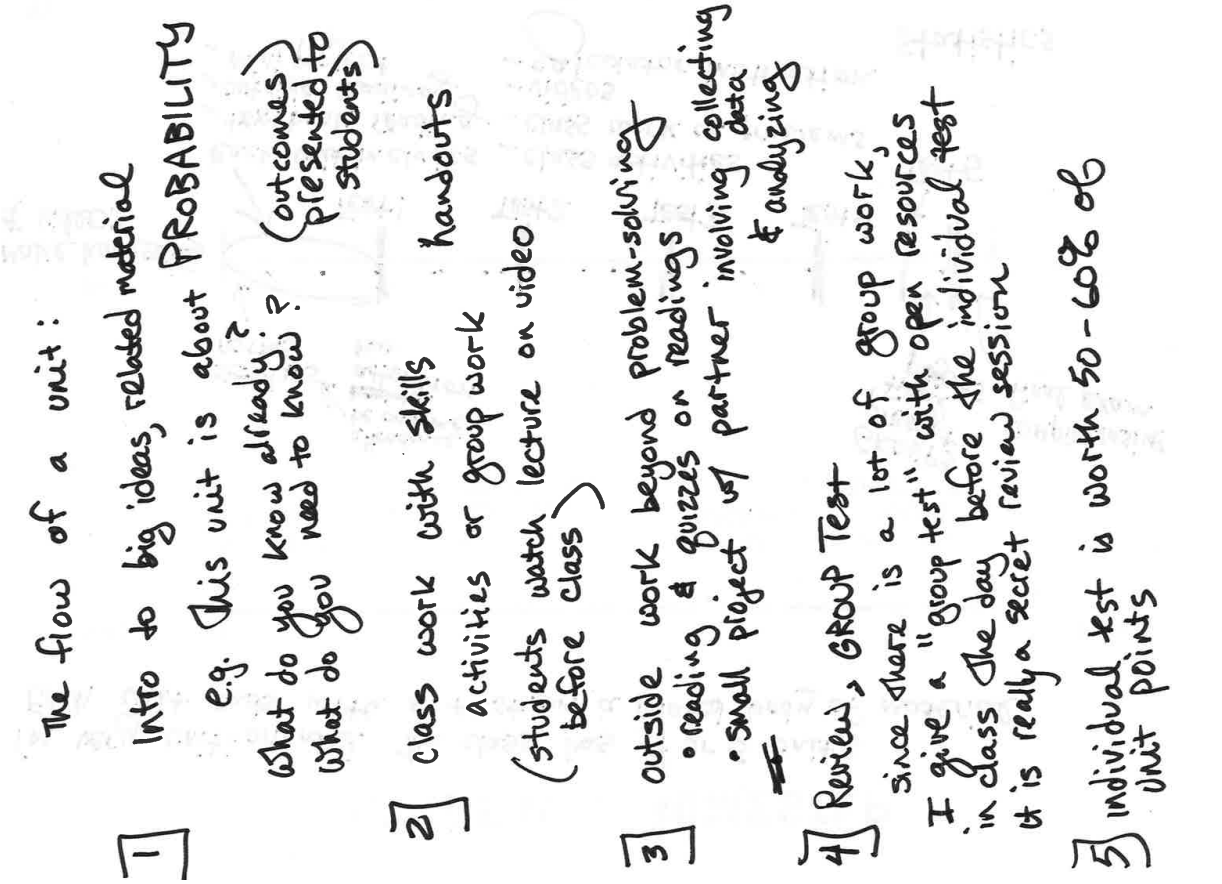
WRNSSTUDIO

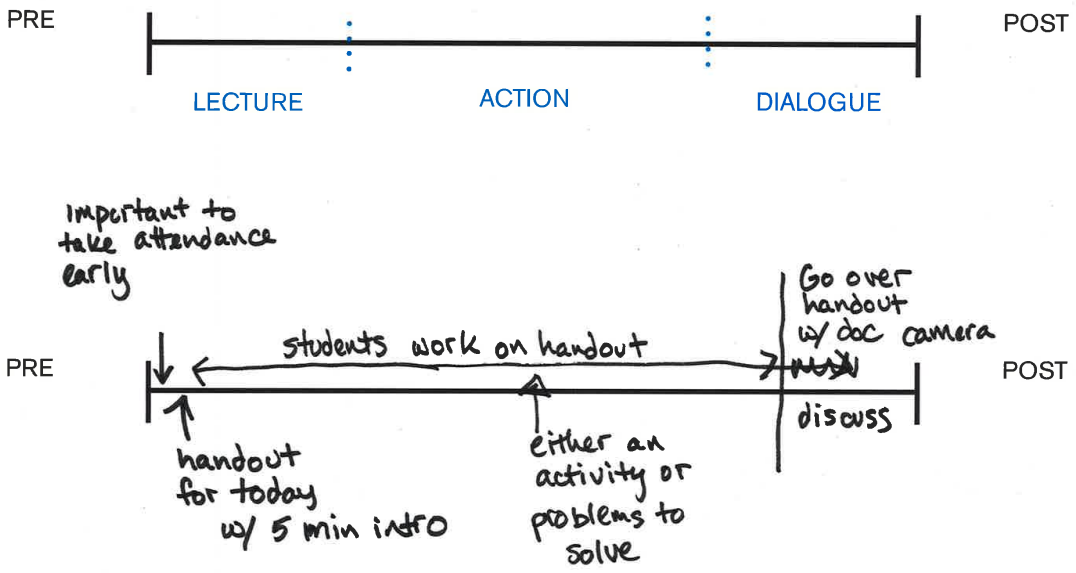
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)





Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

MY IDEAL ..... CLASS



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DVC DIABLO VALLEY COLLEGE

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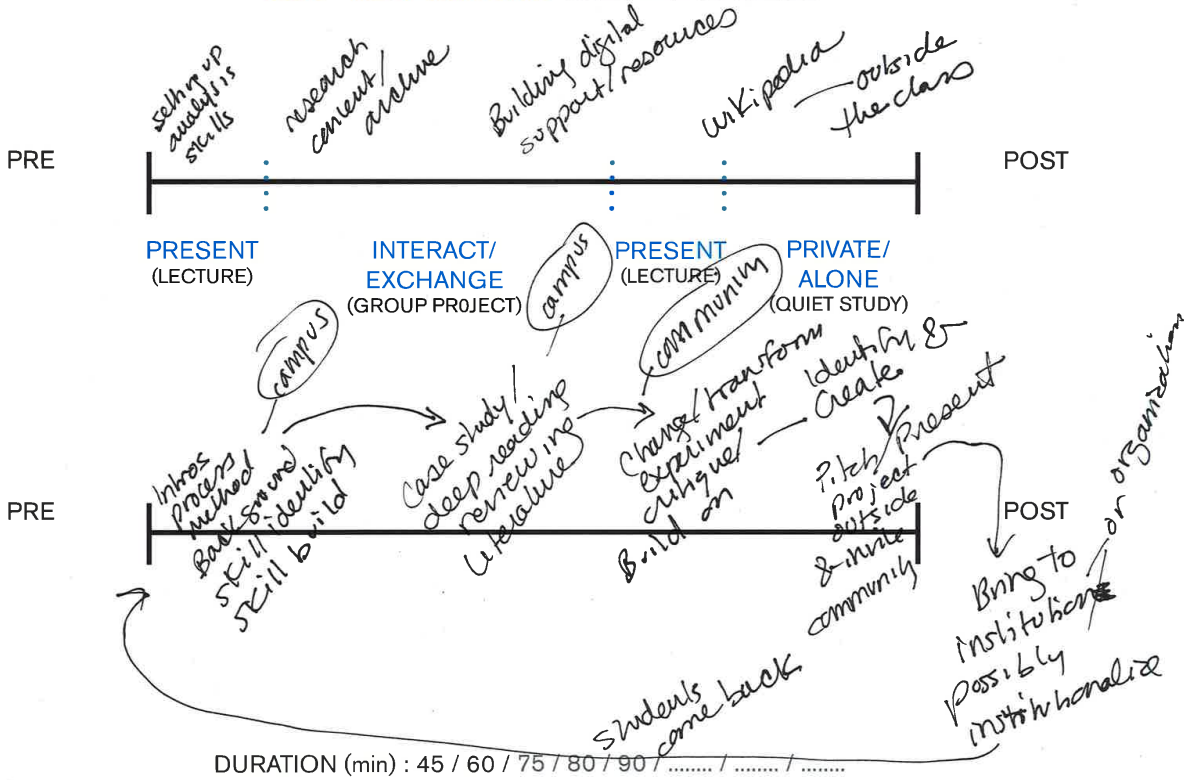
MY IDEAL ..... SEMESTER

Anne



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SMALL - 30 students I MEDIUM - 45 students I LARGE - 90 students

DVC DIABLO VALLEY COLLEGE

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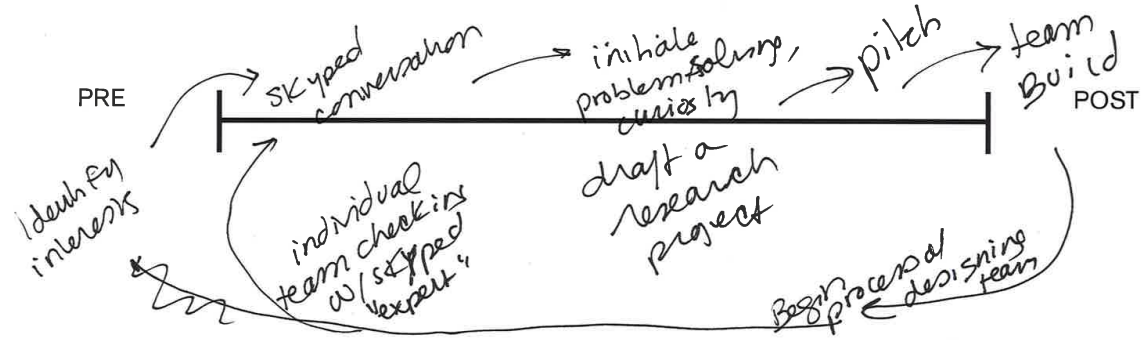
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

MY IDEAL ..... CLASS

Anne



DURATION (min) : 45 / 60 / 75 / 80 / 90 / ..... / ..... / .....
SMALL - 30 students I MEDIUM - 45 students I LARGE - 90 students

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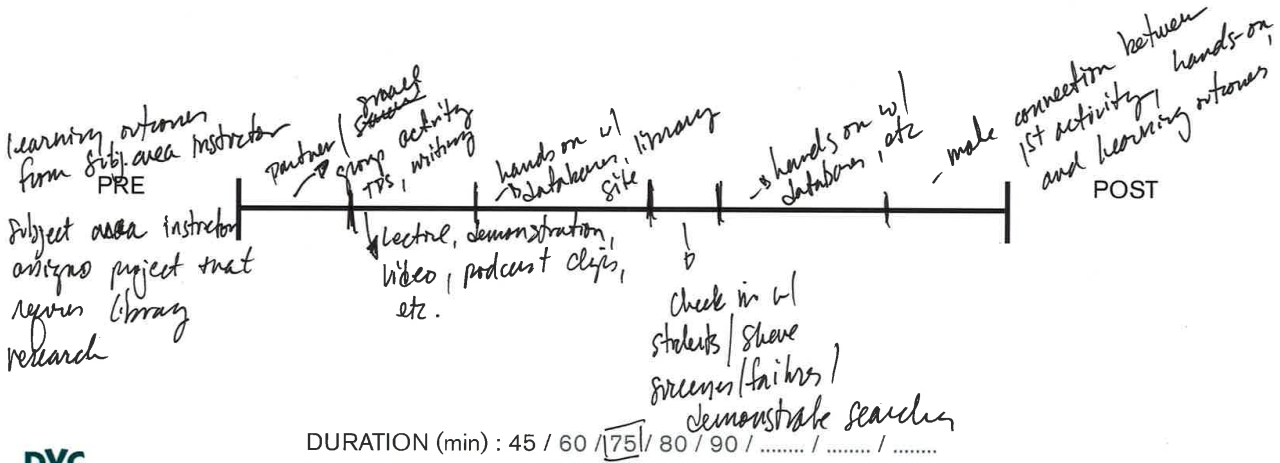
WRNSSTUDIO

Library Workshop Daniel

MY IDEAL ..... CLASS



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SMALL - 30 students I MEDIUM - 45 students I LARGE - 90 students

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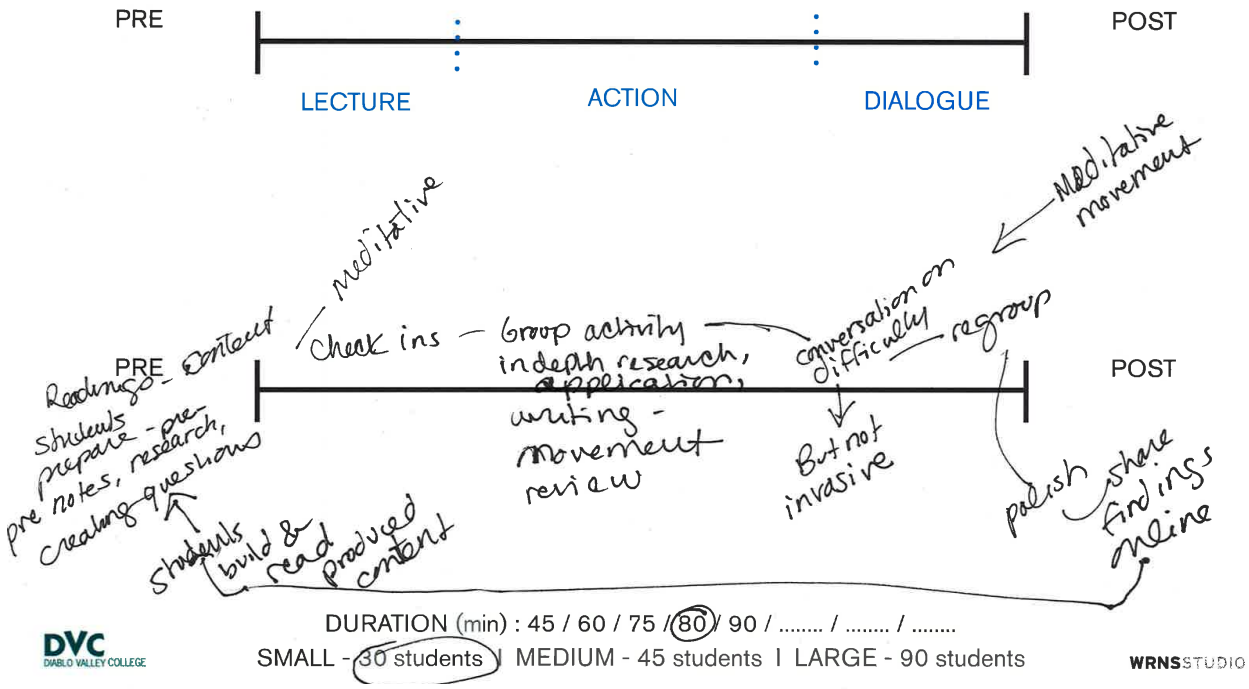
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

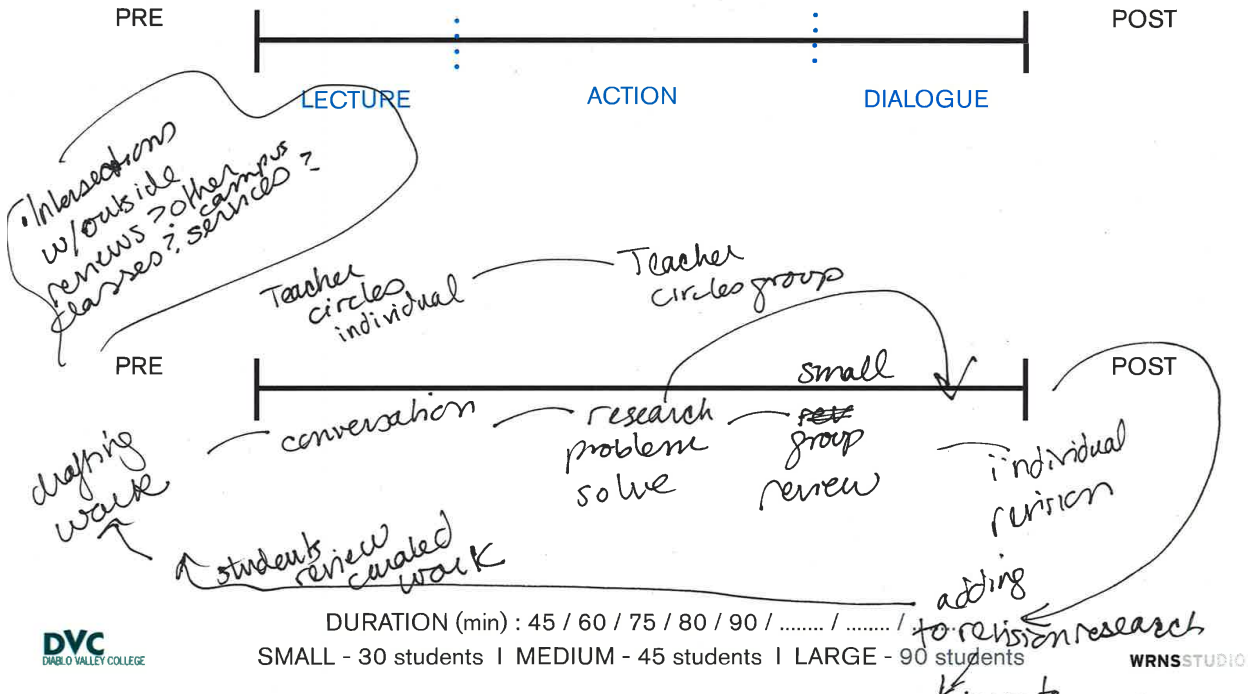
Anne

MY IDEAL ..... CLASS



MY IDEAL ..... CLASS

Anne



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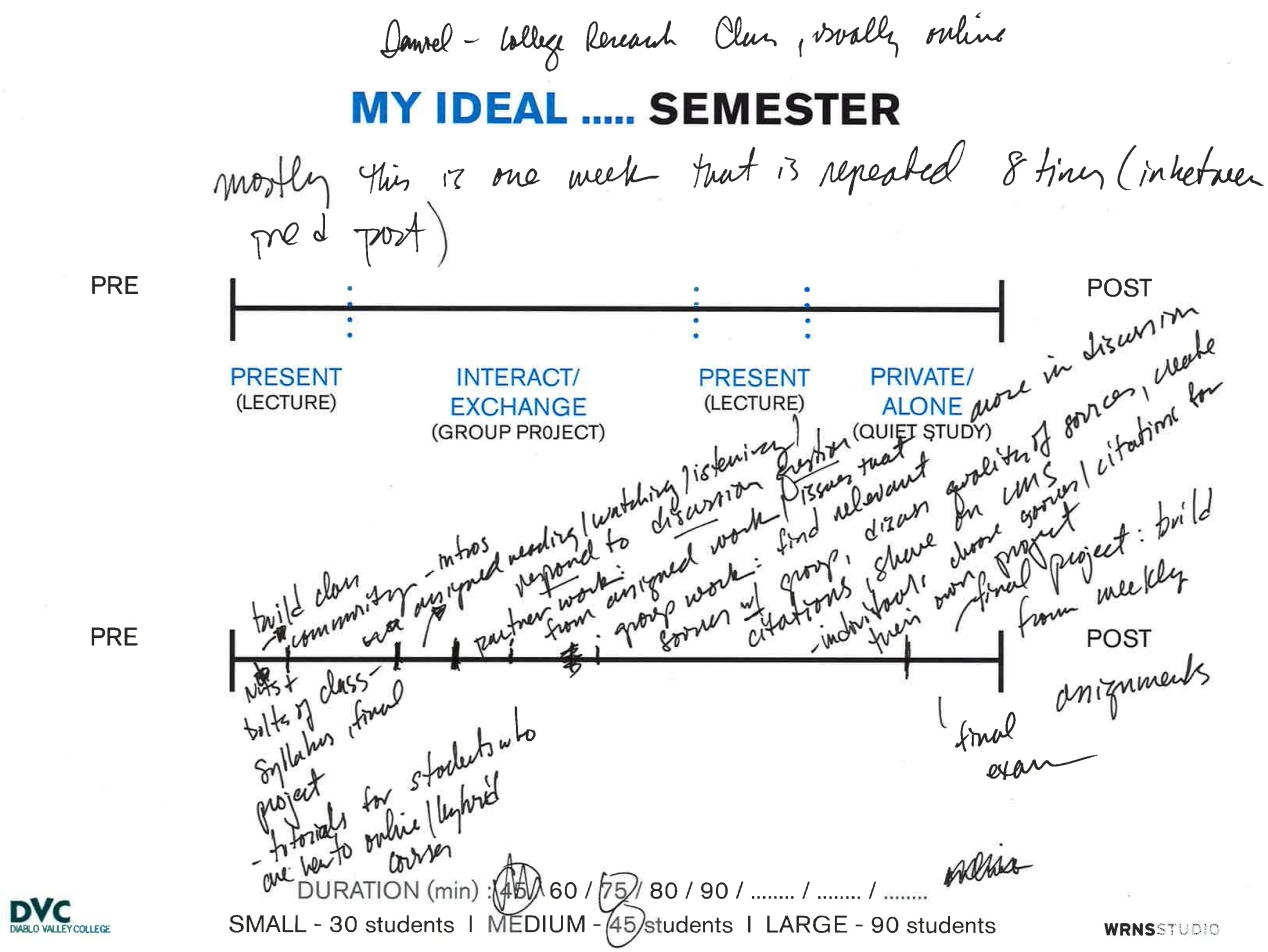
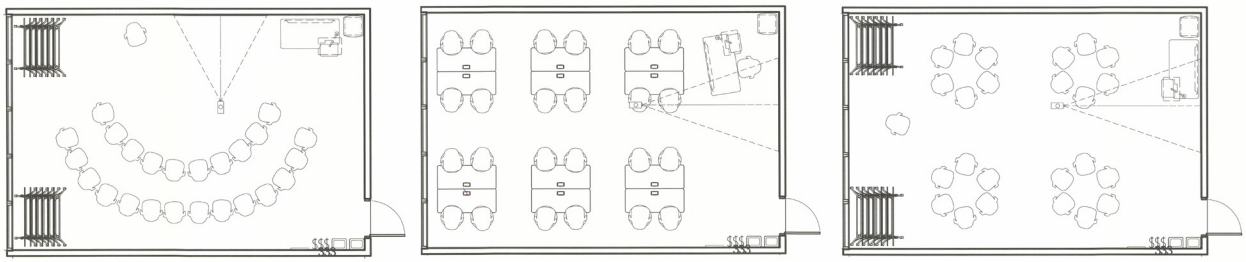


Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

MY IDEAL...LESSON PLAN TOOLKIT

(SMALL CLASSROOM ~ 30 students)



SPATIAL

WALL ACCESS
EXTRA CIRCULATION SPACE
FLEXIBILITY / EASILY TRANSFORMED
THE SMALLER THE BETTER FOR FLEXIBILITY
WINDOWS - GOOD

EQUIPMENT

PAPER BOX/RETURN/DROP OFF
MULTI-DIRECTIONAL A/V
SMART BOARD
LARGER TABLES
COUNTER FOR HANDCUFFS/HANDCUFFS...

FUNCTIONALITY

QUIET
HIGH TECH → LOW QUICKLY
CAMP FIRE VS HIBERNACLE
FURNITURE AND HOW IT'S LEFT FOR THE NEXT CLASS
DEMONSTRATIONS, LAB EQUIP OR HOOK UPS ~~FOR~~ INFRASTRUCTURE
LIGHT CONTROL - MULTI FUNCTION
FRESH AIR OR ~~NO~~ EXTERIOR ACCESS
CLEAN ENVIRONMENTS (AESTHETIC) (OR) CREATE A CAMPUS IDENTITY

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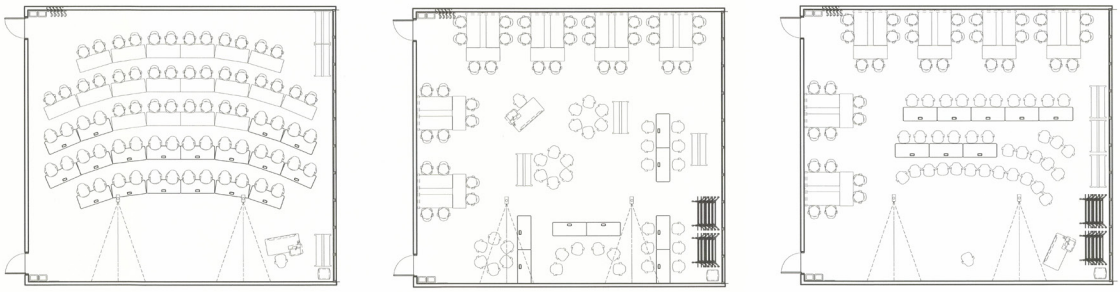
Exercise 2 Posters from Blue Sky Lessons Plan Workshop (Sept 25, 2017)

MY IDEAL...**LESSON PLAN TOOLKIT**

(LARGE CLASSROOM ~ 90 students)



SPATIAL

SIGHTLINES ARE IMPORTANT
CIRCULATION PATHS NEED TO BE MORE FLUID
FLEXIBILITY

EQUIPMENT

SPEAKERS / MICS IMPORTANT - RECORDING - ALL CLASS TYPES
PROJECTION (PROJECT FACES ETC)
MOVEABLE WHITE BOARDS
MULTIPLE SURFACE TYPES

FUNCTIONALITY

SIGHTLINES TO ALL TYPES OF WALL PRESENTATION
↳ FLEXIBLE FOR ALL ORIENTATIONS
FLEXIBILITY IN TEACHING LOCATION
USE AS EVENT - STORAGE
ELEVATED TEACHING PLATFORM
RELIABLE TECH
* DURABILITY / LONGEVITY *
* ADAPTATION FOR FUTURE TECH *

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WRNSSTUDIO

Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Design Workshop #1_Key Comments

- Planning parameter of 30sf/ student is high. Show options for 20/25 sf/student.
- Performance criteria and cost shall be organized in two categories - "Must-haves" and "Nice-to-haves".
- Build in the back-end infrastructure for Hi-Tech enabled rooms. This facilitates phasing based on funding availability for the campus.
- Eliminate "Exhibition Mode" from layout options. Ceiling-hung, unistrut idea more apt for conference rooms than classrooms.
- Clerestory and Sill window options preferred equally by different stakeholders.
- Provide dedicated furniture/ equipment in the classroom. Avoid moving items between rooms.
- Avoid bulky moveable equipment within classroom.
- Consider all aspects of Universal Design - ease of access, liability with moveable furniture, privacy etc.
- Use stackable, 4-legged chairs vs bulky, 5-wheeled chairs. The latter economize space but have limited ergonomic comfort. Explore options to lock back casters.
- Prefer projectable whiteboard vs painted writeable wall - ease of maintainenance.
- Consider projector screen locations to enable simultaneous use of writeable surfaces.

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Design Workshop #1_v2_Summary

1. Planning parameter of 20sf/ student does not enable engaged, active learning environments.

   Limits collaboration

   Inadequate viewing distance to the screen

   Compromises Universal Design

   A 30sf/ student planning parameter would be ideal, however, 25sf/ student with possible expansion to 27 sf/student seems more appropriate and achievable. (Present option to ESC.)
2. The depth of workspace could vary from 18" to 24". This would provide adequate workspace for students in lecture/ groupwork modes as well as space for movement within the Small classrooms. Deeper, 24" wide work surfaces would be 'nice-to-have' if space allows.
3. Ideal group size is 4 students. Might organize as 6 students at times but rarely do groups of 8.
4. Rooms may be designed for actual capacity + 10% extra to accommodate peak student loads at the start of the semester. (Present option to ESC.)
5. Baseline for AV equipment is (1) short-throw and (2) ceiling-hung projectors with ability to show different content in each display. This will scale up with the size of the classroom.
6. Stakeholders would like to engage with prototypes of furniture and AV equipment.

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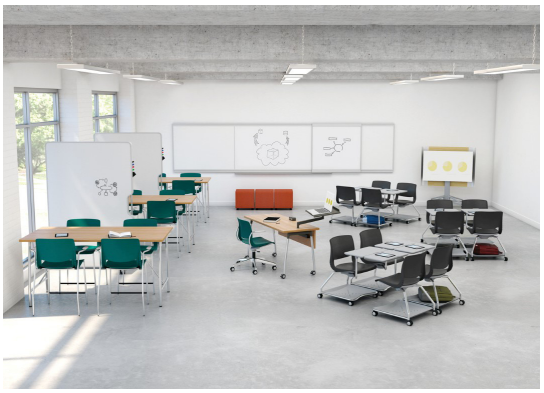
Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

User Input



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Furniture Kit of Parts

CHAIRS

Torsion Air Nesting
Mesh back
Fabric/ Vinyl Seat
Arm/ Armless/ Tablet arm

Torsion Air Stool (Non-nesting)
Mesh back
Fabric/ Vinyl Seat
Arm/ Armless/ Tablet arm

TABLES

Collaborative Rectangle
Nesting Leg
D – 24", 30"
W – 60", 66", 72", 84", 96"

Pirouette Nesting Table
On Casters
Available with integrated power
Not Adjustable Ht

Trek Nesting Table
On Casters
Available with integrated power
Pin Height Adjustable (Customized for Standing Ht)
Can be used for ADA

WorkUp Table
Best for ADA
Counter Balance Height Adjustable (Easy)

INSTRUCTOR STATION

All Terrain Mobile
Intergrated workdesk/ podium
Un-tethered

WRITEABLE SURFACE

Scribe Mobile
Moveable
Double-sided writeable surface

Ultimate Whiteboard
Projection & Dry-erase

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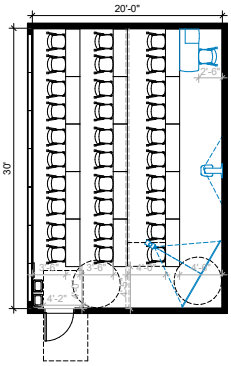
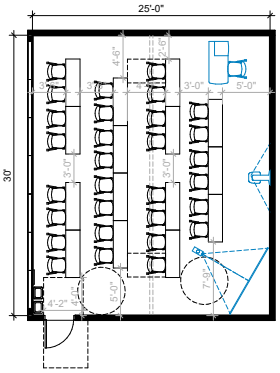
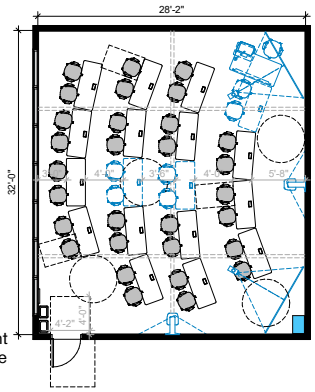
Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Small Classroom (30 students)_Lecture Mode





* 27 sf/student @ SCC space standard



20 sf/student ~ 600sf

+ Area allocation per student closer to current campus projects
- Smaller workspace at desks (18" deep)
- Desks placed close together
- Narrow dead-end aisles
- Limits students in wheelchairs to certain desk locations
- Not easy for students to move in/out of aisle seating
- Limits view for students infront of intsructor station
- Not adequate viewing distance from screen for all students

25 sf/student ~ 750sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks
+ Central aisle breaks help movement
+ More accessible to wheelchairs with some maneuvering
- Smaller workspace at desks (18" deep)
- Some desks placed close together
- Less space for students/ faculty/ disabled users to move around than 30sf/ student
- Higher per student area allocation than current campus projects

30 sf/student ~ 900sf

+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates movement through row seating
+ Universal Design: Entire room easily accessible to wheelchairs with 30 students
+ Wider workspace at desks (24" deep)
+ Allows for moveable storage/ supplies cabinet
+ Accommodates upto 20% extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

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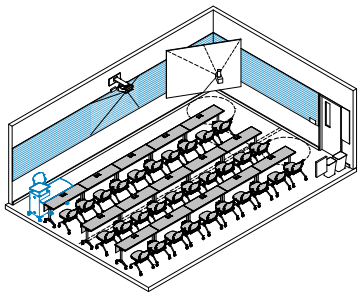
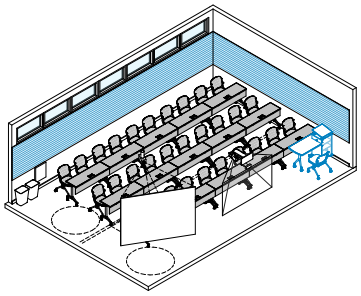
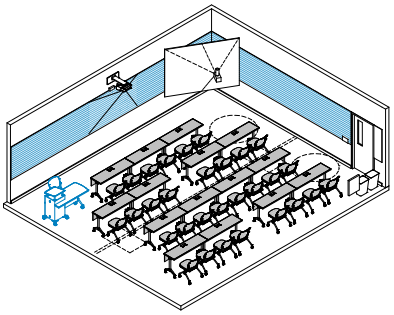
Small Classroom (30 students)_Lecture Mode

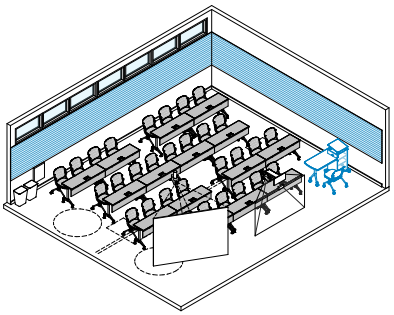
20 sf/student ~ 600sf



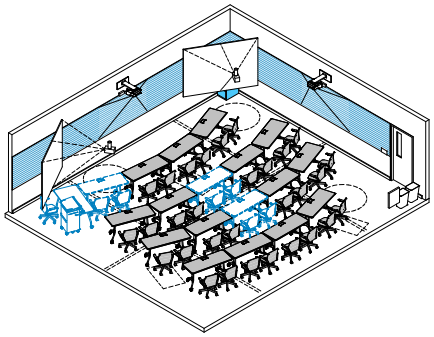


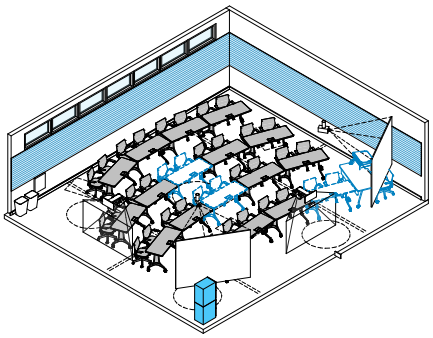
25 sf/student ~ 750sf





30 sf/student ~ 900sf



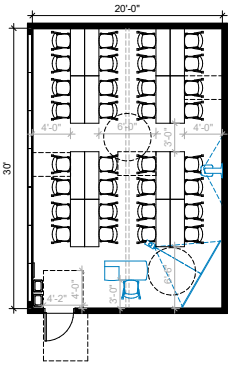


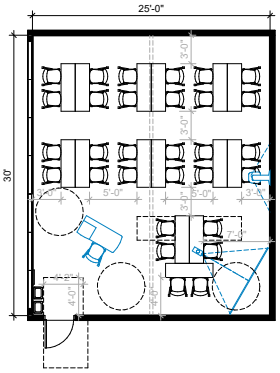
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

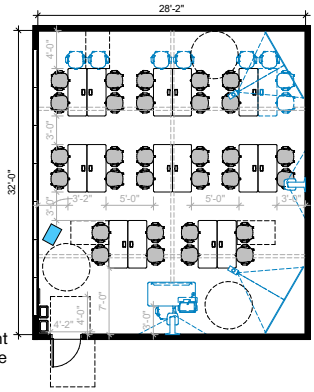
Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Small Classroom (30 students)_Groupwork Mode 1





* 27 sf/student @ SCC space standard



20 sf/student ~ 600sf

+ Area allocation per student closer to current campus projects
- Smaller workspace at desks (18" deep)
- Not adequate space to create groups of 4 with space between desks
- Less space for students/ faculty/ disabled users to move around/ collaborate
- Limits students in wheelchairs to certain desk locations
- Not adequate viewing distance from screen for some students

25 sf/student ~ 750sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks and to move around/ collaborate
+ Front of the room more accessible to wheelchairs with some maneuvering
- Smaller workspace at desks (18" deep)
- Some desks placed close to the wall
- Less space for students/ faculty/ disabled users to move around/ collaborate than 30sf/ student
- Not adequate viewing distance from screen for some students
- Higher per student area allocation than current campus projects

30 sf/student ~ 900sf

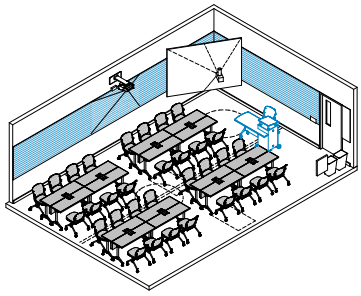
+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates easy movement/ collaboration
+ Universal Design: Entire room easily accessible to wheelchairs
+ Easily accommodates groups of 6 students
+ Wider workspace at desks (24" deep)
+ Allows for moveable storage/ supplies cabinet
+ Adequate viewing distance from screen for all students
+ Accommodates upto 20% extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

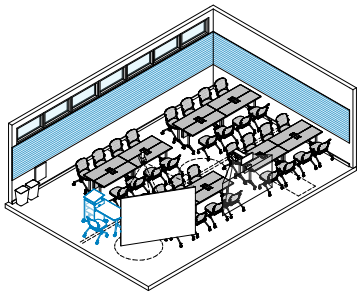
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

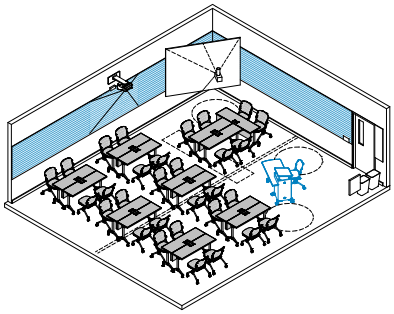
Small Classroom (30 students)_Groupwork Mode 1

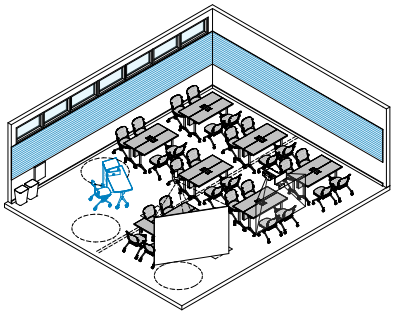
20 sf/student ~ 600sf



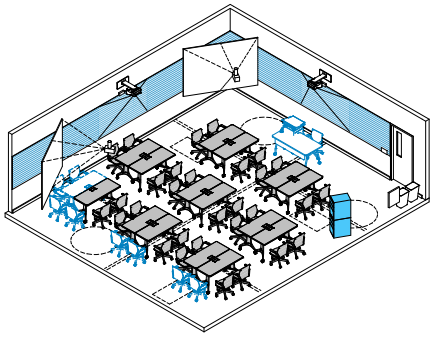


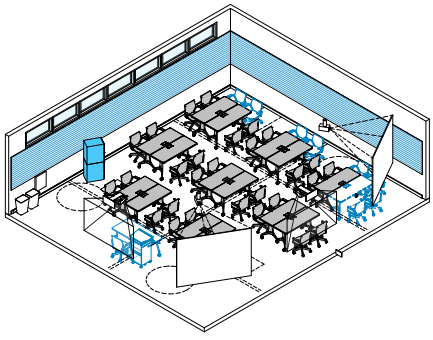
25 sf/student ~ 750sf





30 sf/student ~ 900sf



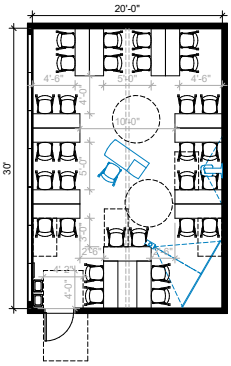


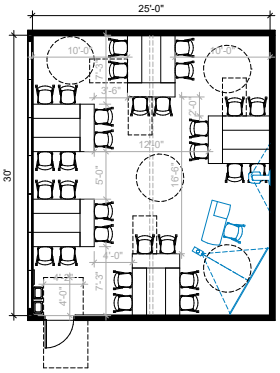
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

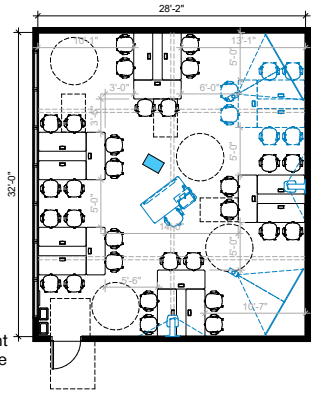
Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Small Classroom (30 students)_Groupwork Mode 2





* 27 sf/student @ SCC space standard



20 sf/student ~ 600sf

+ Area allocation per student closer to current campus projects
- Smaller workspace at desks (18" deep)
- Desks placed close together
- Less space for students/ faculty/ disabled users to move around/ collaborate
- Limits students in wheelchairs to certain desk locations
- Accommodates groups of 4, not ideal to have groups of 6 students
- Not adequate viewing distance from screen for all students

25 sf/student ~ 750sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks and to move around/ collaborate
+ Corners of the room accessible to wheelchairs with some maneuvering
+ Accommodates groups of 6 students
- Smaller workspace at desks (18" deep)
- Some desks placed close together
- Less space for students/ faculty/ disabled users to move around/ collaborate than 30sf/ student
- Not adequate viewing distance from screen for all students
- Higher per student area allocation than current campus projects

30 sf/student ~ 900sf

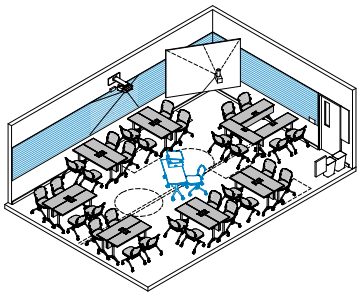
+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates movement/ collaboration
+ Universal Design: Entire room easily accessible to wheelchairs
+ Easily accommodates groups of 6 students
+ Wider workspace at desks (24" deep)
+ Allows for moveable storage/ supplies cabinet
+ Adequate viewing distance from screen for all students
+ Accommodates upto 20% extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

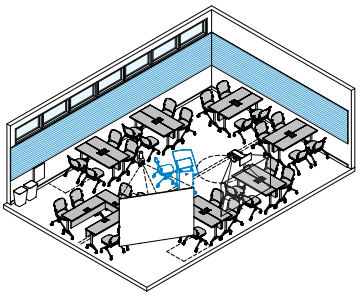
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

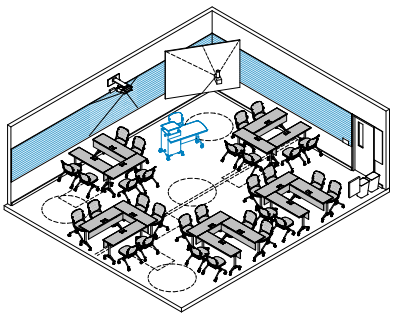
Small Classroom (30 students)_Groupwork Mode 2

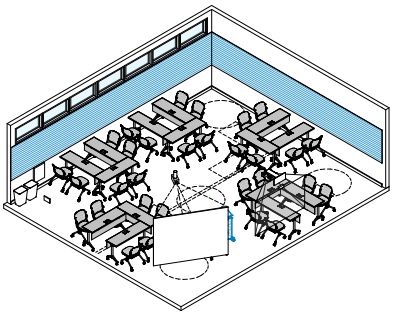
20 sf/student ~ 600sf



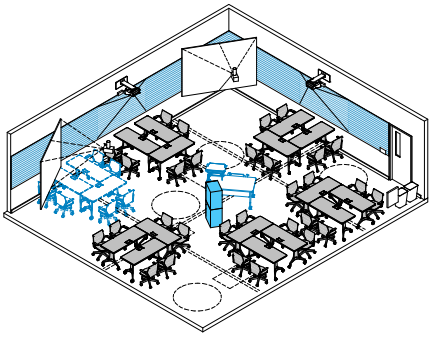


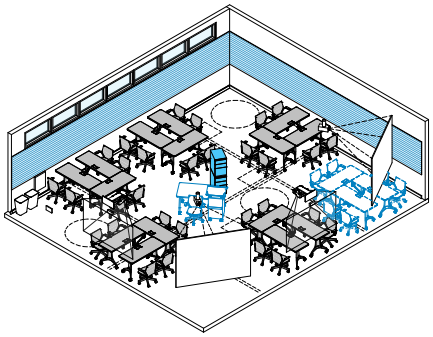
25 sf/student ~ 750sf





30 sf/student ~ 900sf





DVC DIABLO VALLEY COLLEGE

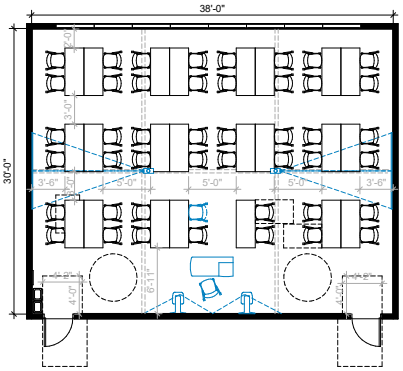
WRNSSTUDIO

Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Medium Classroom (45 students)_Groupwork Mode 1

20 sf/student ~ 900sf

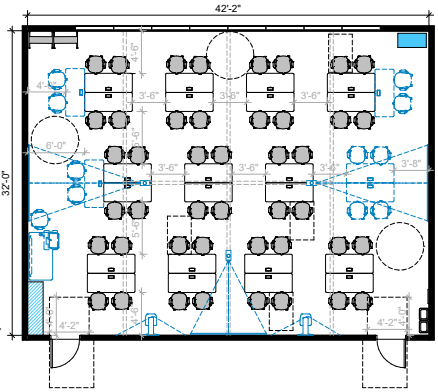
+ Area allocation per student closer to current campus projects
+ Wider workspace at desks (24" deep)
- Desks placed close together
- Not adequate space to create groups of 4 with space between desks
- Less space for students/ faculty/ disabled users to move around/ collaborate
- Limits students in wheelchairs to certain desk locations
- Not adequate viewing distance from screen for some students



25 sf/student ~ 1125sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks and to move around/ collaborate
+ Wider workspace at desks (24" deep)
+ Better viewing distance from screen
- Some desks placed close toto the walls
- Less space for students/ faculty/ disabled users to move around/ collaborate than 30sf/student
- Limits students in wheelchairs to certain desk locations
- Higher per student area allocation than current campus projects

* 27 sf/ student @ SCC space standard



30 sf/student ~ 1350sf

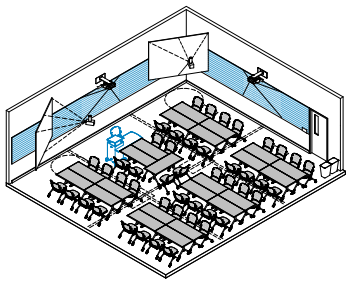
+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates movement/ collaboration
+ Universal Design: Entire room easily accessible to wheelchairs
+ Wider workspace at desks (24" deep)
+ Allows for moveable storage/ supplies cabinet
+ Adequate viewing distance from screen for all students
+ Accommodates upto 20% extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

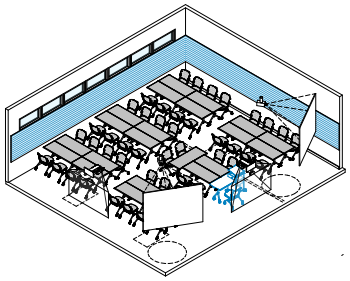
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

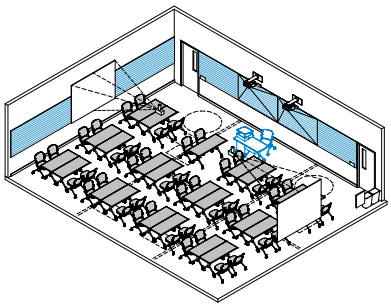
Medium Classroom (45 students)_Groupwork Mode 1

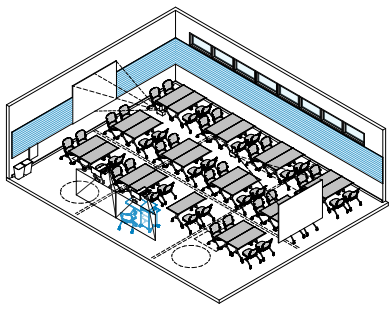
20 sf/student ~ 900sf



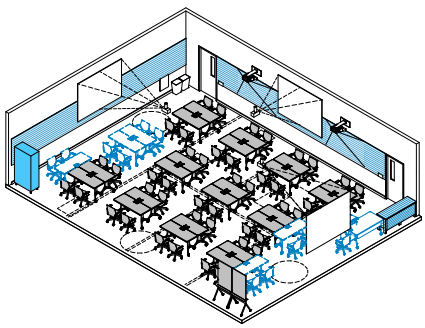


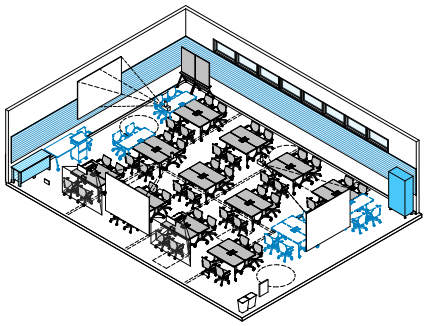
25 sf/student ~ 1125sf





30 sf/student ~ 1350sf



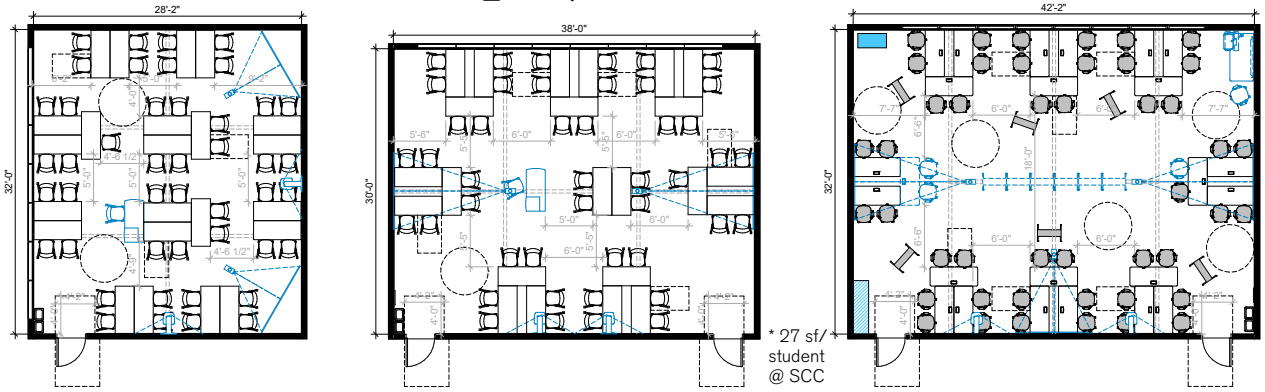


DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Medium Classroom (45 students)_Groupwork Mode 2



* 27 sf/ student @ SCC space standard

20 sf/student ~ 900sf

+ Area allocation per student closer to current campus projects
+ Wider workspace at desks (24" deep)
- Desks placed close together
- Less space for students/ faculty/ disabled users to move around/ collaborate
- Accommodates groups of 4, not ideal to have groups of 6 students
- Not adequate viewing distance from screen for some students

25 sf/student ~ 1125sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks and to move around/ collaborate
+ More accessible to wheelchairs
+ Accommodates groups of 6 students
+ Wider workspace at desks (24" deep)
- Some desks placed close together
- Less space for students/ faculty/ disabled users to move around/ collaborate than 30sf/student
- Higher per student area allocation than current campus projects

30 sf/student ~ 1350sf

+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates movement/ collaboration
+ Universal Design: Entire room easily accessible to wheelchairs
+ Easily accommodates groups of 6 students
+ Wider workspace at desks (24" deep)
+ Allows for moveable storage/ supplies cabinet
+ Adequate viewing distance from screen for all students
+ Accommodates upto 20% extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

DVC DIABLO VALLEY COLLEGE

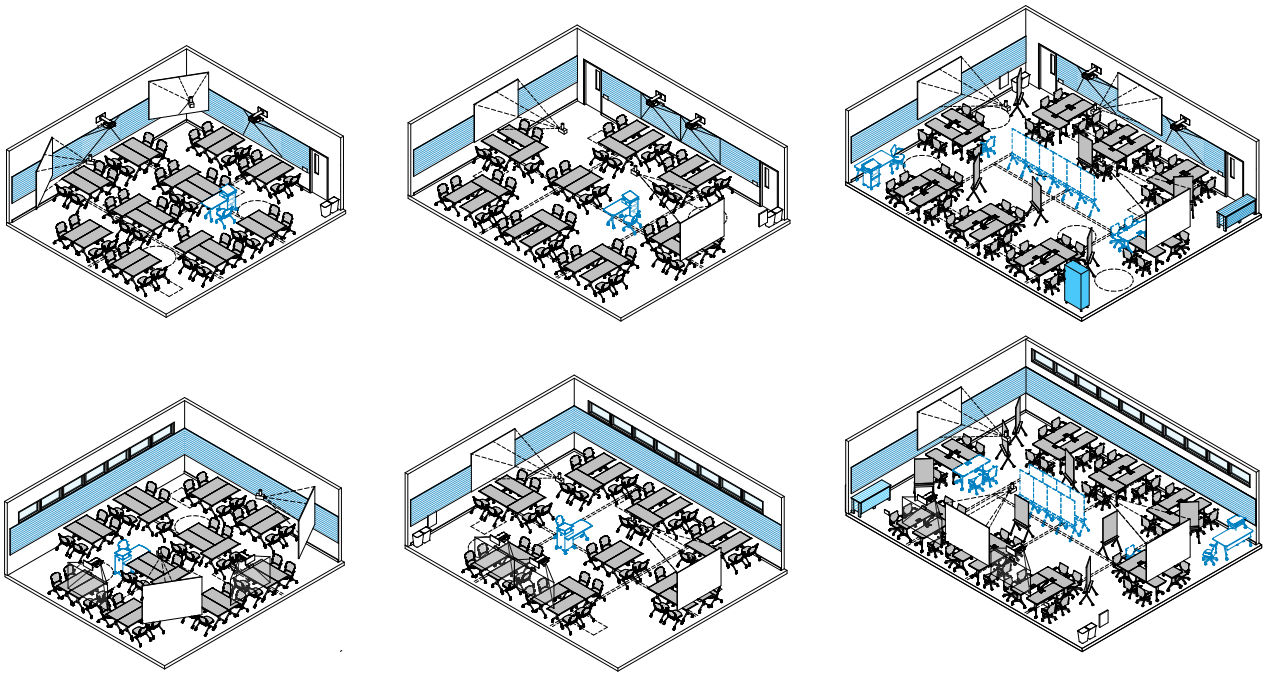
WRNSSTUDIO

Medium Classroom (45 students)_Groupwork Mode 2

20 sf/student ~ 900sf

25 sf/student ~ 1125sf

30 sf/student ~ 1350sf

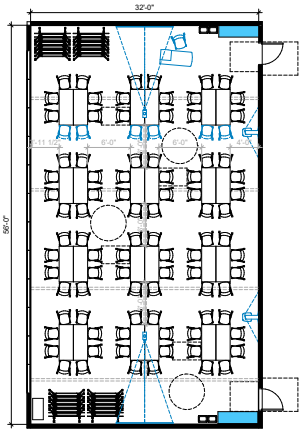


DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

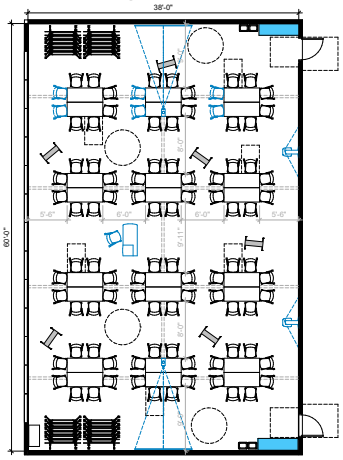
Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

Large Classroom (90 students)_Groupwork Mode



20 sf/student ~ 1800sf

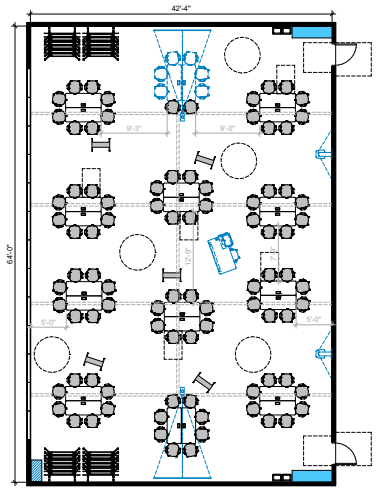
+ Area allocation per student closer to current campus projects
+ Wider workspace at desks (24" deep)
- Desks placed close together
- Less space for students/ faculty/ disabled users to move around/ collaborate
- Limits students in wheelchairs to certain desk locations
- Not adequate space for moveable white boards



25 sf/student ~ 2250sf

+ Area allocation per student closer to but below peer community college standards
+ More space between desks and to move around/ collaborate
+ Universal Design: Entire room easily accessible to wheelchairs
+ Wider workspace at desks (24" deep)
+ Accommodates extra seating
- Less space for students/ faculty/ disabled users to move around/ collaborate than 30sf/student
- Higher per student area allocation than current campus projects

* 27 sf/ student @ SCC space standard



30 sf/student ~ 2700sf

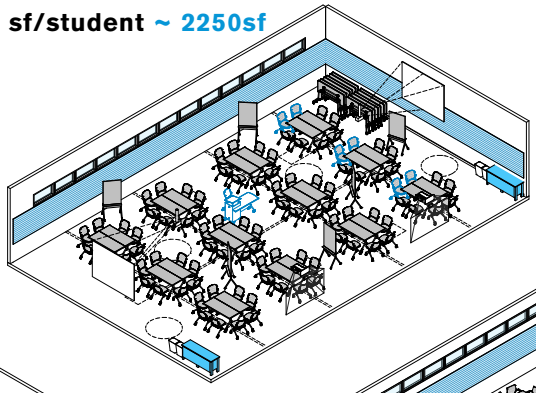
+ Area allocation per student as per Higher Ed trending standards (21st century classroom design standard)
+ More open layout of the room, facilitates movement/ collaboration
+ Universal Design: Entire room easily accessible to wheelchairs
+ Easily accommodates large groups
+ Wider workspace at desks (24" deep)
+ Accommodates upto 20% or more extra student capacity (anticipates peaks in class size)
- Higher per student area allocation than current campus projects

DVC DIABLO VALLEY COLLEGE

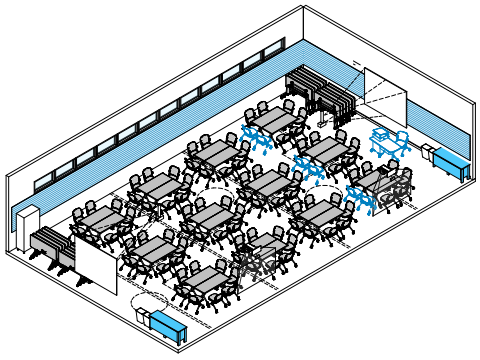
WRNSSTUDIO

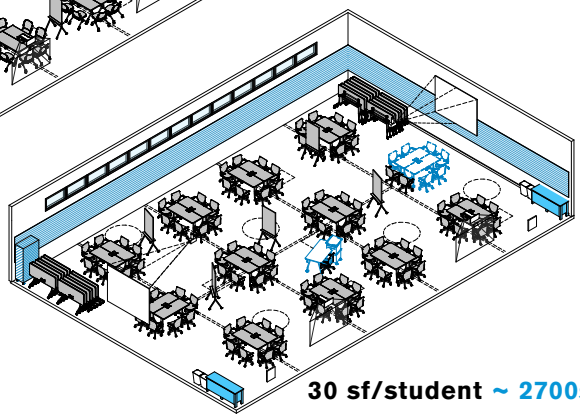
Large Classroom (90 students)_Groupwork Mode

25 sf/student ~ 2250sf



20 sf/student ~ 1800sf





30 sf/student ~ 2700sf

DVC DIABLO VALLEY COLLEGE

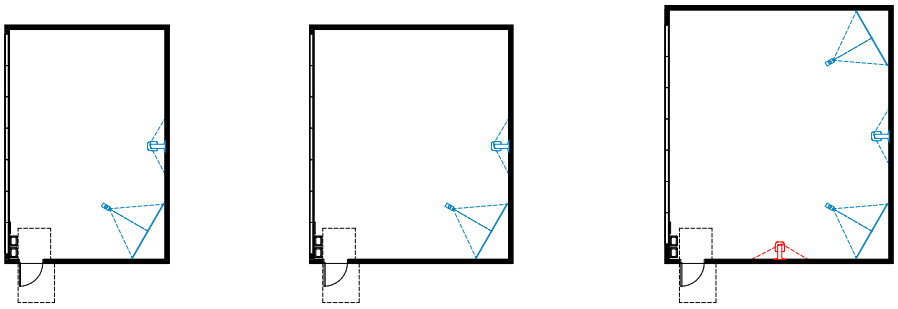
WRNSSTUDIO

Design Workshop 1_ version 2 (October 31, 2017) Planning Parameters

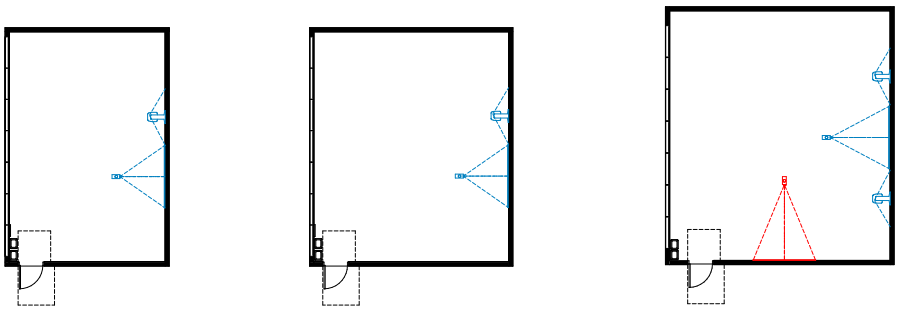
Small Classroom (30 students) AV Layout Options

20 sf/student **25 sf/student** **30 sf/student**

OPTION 1: Angled Screens



OPTION 2: Wall Screens



Phase 1
Phase 2

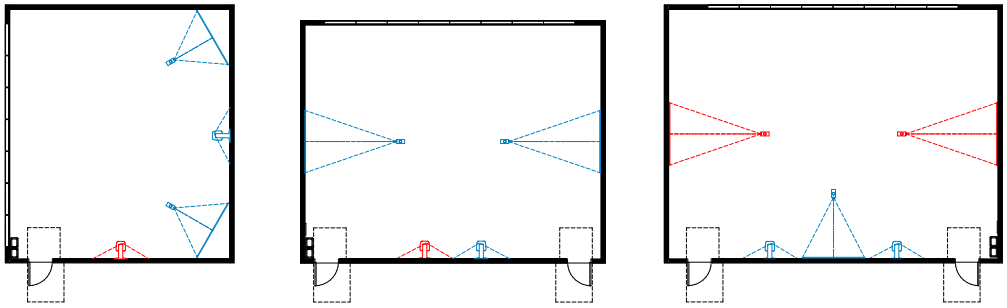
DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

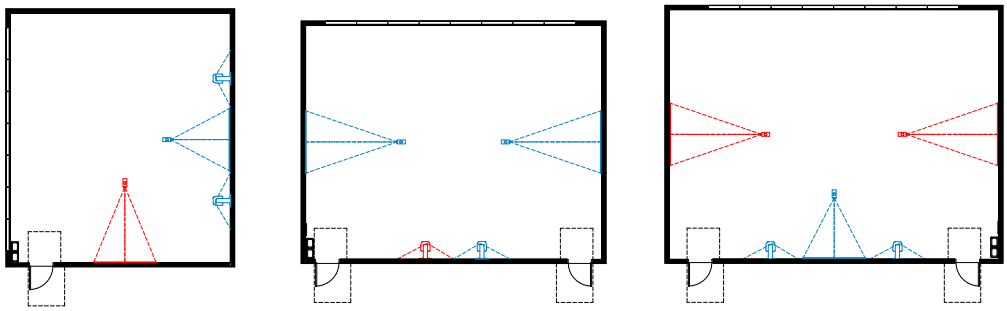
Medium Classroom (45 students) AV Layout Options

20 sf/student **25 sf/student** **30 sf/student**

OPTION 1: Angled Screens



OPTION 2: Wall Screens



Phase 1
Phase 2

DVC DIABLO VALLEY COLLEGE

WRNSSTUDIO

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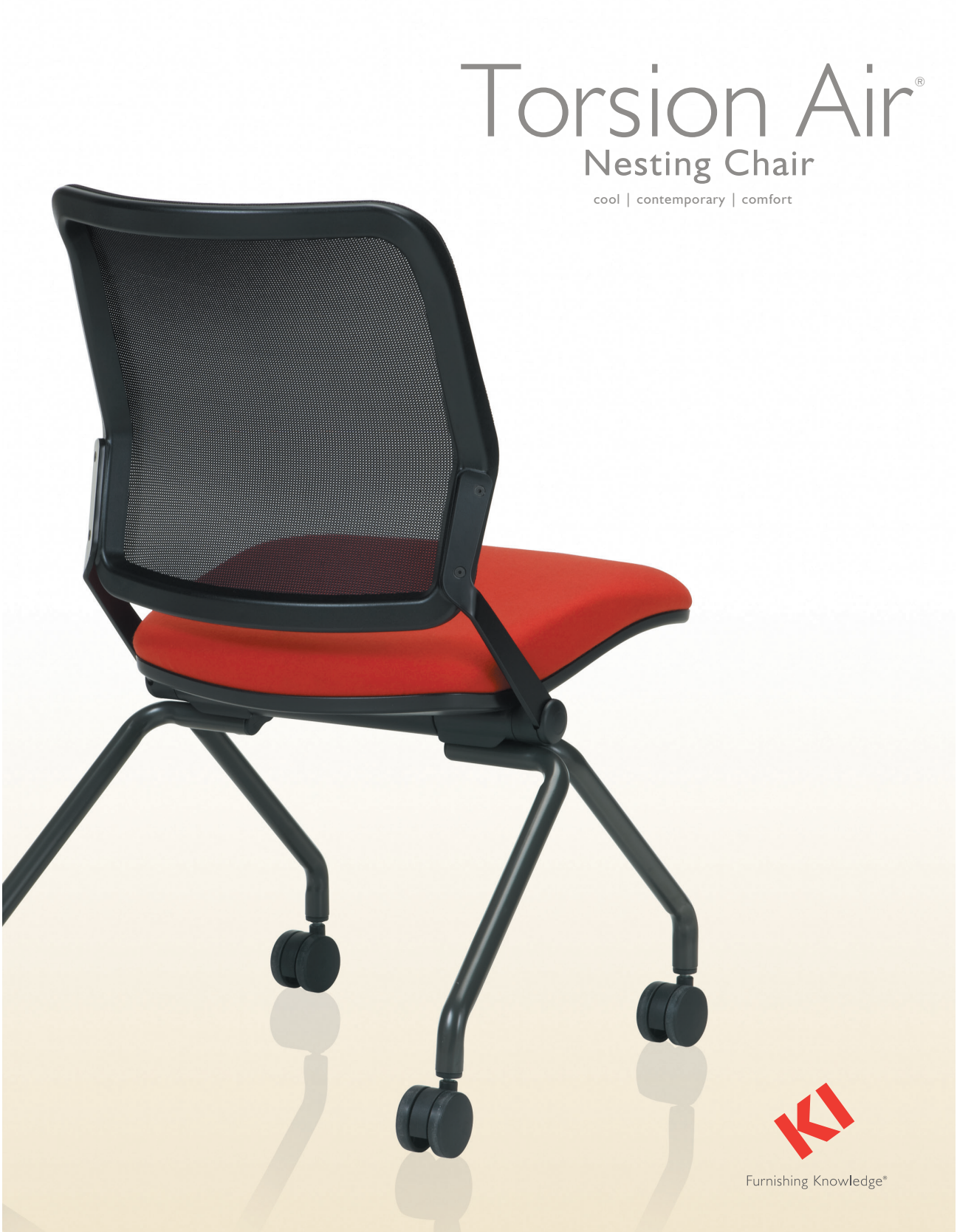
Sample Product Cutsheets (Furniture)



Sample Product Cutsheets (Furniture)

Designed by Giancarlo Piretti, Torsion Air nesting chairs are available with arms, armless, flip-up tablet, or Piretti tablet and provide nesting chair solutions for any application. The Torsion Air seating collection also includes stack chairs, task chairs, and task stools.

Nests for easy storage and mobility.

Patented torsion flex mechanism gradually increases resistance over the full 12 degrees of back flex.

Optional bell glides.

Mesh back available in black or grey mesh.

Learn more about Torsion Air Nesting Chair

Torsion Air® Nesting Chair

Discover the essence of clean, modern, conforming comfort. This fresh interpretation of KI's classic flex-back Torsion combines a lighter visual impression, breathability, and exceptional comfort.

Breathable mesh back allows for air ventilation and natural coolness for reviving comfort. The supple, flexible mesh conforms to the unique curvature of your back and provides integral lumbar support.

Torsion Air is ultra strong and durable. This chair is tested and warranted for use by persons 300 pounds or less.

Specifications:

Seat: W17 D18.5 H18
Back: W17 H16

Armless: W23-7/8 D24.25 H33.5

With Arms: W23-7/8 D24.25 H33.5

With Standard Flip-Up Tablet:
W27 D31 H33.5
Tablet: W20.75 D12.5

With Piretti Tablet:
W25 D30.25 H33.5
Tablet: W22 D12

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Furnishing Knowledge®

Sample Product Cutsheets (Furniture)

Torsion Air®

Task Seating

cool | contemporary | comfort

KI
Furnishing Knowledge®

Sample Product Cutsheets (Furniture)

Designed by Giancarlo Piretti, Torsion Air task chairs and task stools are available with arms or armless and provide task chair solutions for any application. The Torsion Air seating collection also includes stack chairs and nesting chairs. Bases available in polished aluminum, warm grey and black.

Cooling mesh back available in black or grey mesh. Durability assured by KI's 15-year warranty.

Patented torsion flex mechanism gradually increases resistance over the full 12 degrees of back flex.

Learn more about
Torsion Air Task Seating

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Torsion Air® Task Seating

Cool
Discover the essence of clean, modern, conforming comfort. This fresh interpretation of KI's classic flex-back Torsion combines a lighter visual impression, breathability, and exceptional comfort.

Contemporary
Breathable mesh back allows for air ventilation and natural coolness for reviving comfort. The supple, flexible mesh conforms to the unique curvature of your back and provides integral lumbar support.

Comfort
Torsion Air is ultra strong and durable. This chair is tested and warranted for use by persons 300 pounds or less.

Specifications:

Seat: W17 D18.5
Back: W17 H16

W26.5 D26.5 H33.5-38.5
Seat Height: 18-23

Task Stool
W27.5 D26.5 H36.5-44
Seat Height: 23-33.5

Furnishing Knowledge®

Sample Product Cutsheets (Furniture)

Sample Product Cutsheets (Furniture)

NESTING
REDEFINED

The innovative articulating leg of Pirouette Nesting Tables, designed by Giancarlo Piretti, creates a leg-within-leg nesting solution. As the table top is raised, the legs articulate inward for straight-line nesting. This decreases the amount of floor space needed for storage, while maximizing leg room for those seated on both sides of the table. Pirouette's clean design profile stands apart from standard nesting tables.

ACHIEVING
NEW HEIGHTS

Pirouette offers both fixed and nesting tables in three heights. This allows for tiered classrooms, while maintaining the ability to be easily reconfigured. Varying heights offer clear sight lines, ensuring no one feels they are "seated in the back of the room".

LEARNING
RECONFIGURED

Pirouette top shapes provide needed functional benefits. Single Chevron and Double Chevron tops support either focus work or collaboration. Subtle angularity encourages peer to peer interaction, yet creates a division of personal space for focused work.

Shown above: two Single Chevron tables combined.

Sample Product Cutsheets (Furniture)

Guitar Pick

Single Chevron

Double Chevron

Round

Square

Rectangle

120° Scale Up

Half Round

Trapezoid

Learn more about Pirouette

Chevron Fixed
H – 29", 36", 42"
D – 18", 24", 30" (Ends)
D – 21", 27", 33" (Midpoint)
W – 60", 72"

Chevron Nesting
H – 29" D – 18", 24", 30" (Ends)
D – 21", 27", 33" (Midpoint)
W – 60", 72"

H – 36"
D – 24", 30" (Ends)
D – 27", 33" (Midpoint)
W – 60", 72"

H – 42"
D – 24", 30" (Ends)
D – 27", 33" (Midpoint)
W – 60", 72"

Training Rectangle Fixed
H- 29", 36", 42"
D – 18", 24", 30"

W – 36", 42", 48", 54", 60", 66", 72"

Training Rectangle Nesting
H – 29"
D – 18", 24", 30"
W – 36", 42", 48", 54", 60", 66", 72"

H – 36"
D – 24", 30"
W – 36", 42", 48", 54", 60", 66", 72"

H – 42"
D – 24", 30"
W – 36", 42", 48", 54", 60", 66", 72"

Half Round Fixed
H – 29",
W/D – 48"x24", 60"x30", 72"x36"

120° Scale Up Fixed
H – 29", D – 30"
W – 72"

Trapezoid Fixed
H – 29", D – 30"
W – 60"

Half Round Nesting
H – 29",
W/D – 48"x24", 60"x30", 72"x36"

120° Scale Up Nesting
H – 29", D – 30"
W – 72"

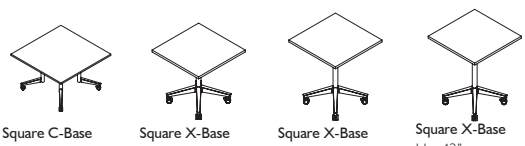
Trapezoid Nesting
H – 29", D – 30"
W – 60"

Round C-Base
H – 29"
D – 48", 60"

Round X-Base
H – 29"
D - 30", 36", 42"

Round X-Base
H – 36"
D - 30", 36", 42"

Round X-Base
H – 42"
D - 30", 36", 42"

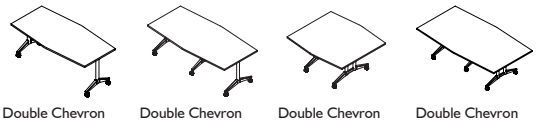


Square C-Base
H – 29"
D – 42", 48", 60"
W – 42", 48", 60"

Square X-Base
H – 29"
D - 30", 36"
W – 30", 36"

Square X-Base
H – 36"
D - 30", 36"
W – 30", 36"

Square X-Base
H – 42"
D - 30", 36"
W – 30", 36"

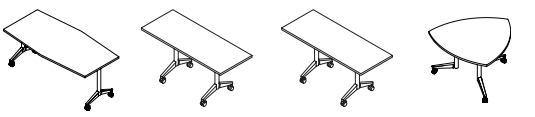


Double Chevron Fixed T-Base (2)
H – 29"
D – 30", 36" (Ends)
D – 36", 42 (Midpoint)
W – 60", 72"

Double Chevron Fixed T-Base (3)
H – 29"
D – 36" (Ends)
D – 42" (Midpoint)
W – 84", 96"

Double Chevron Fixed TT-Base (2)
H – 29"
D – 42", 48" (Ends)
D – 48", 54" (Midpoint)
W – 60", 72", 84"

Double Chevron Fixed TT-Base (3)
H – 29"
D – 42", 48" (Ends)
D – 48", 54" (Midpoint)
W – 96", 120"



Double Chevron Nesting
H – 29"
D – 30", 36" (Ends)
D – 36", 42" (Midpoint)
W – 60", 72"

Collaborative Rectangle Nesting
H- 29",
D – 24", 30"
W – 60", 66", 72", 84", 96"

Collaborative Rectangle Fixed
H- 29",
D – 24", 30"
W – 60", 66", 72", 84", 96"

Guitar Pick
H – 29"
D – 48", 54", 60"
W – 48", 54", 60"

Rectangular Fixed Conf. Tables T-Base
H – 29", D – 36"
W – 84", 96"

Rectangular Fixed Conf. Tables TT-Base
H – 29", D – 42", 48"
W – 60", 72", 84"

Rectangular Fixed Conf. Tables TT-Base
H – 29", D – 42", 48"
W – 96", 120"

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Furnishing Knowledge®

Sample Product Cutsheets (Furniture)

Sample Product Cutsheets (Furniture)

Sample Product Cutsheets (Furniture)

Instructor Desking

700 Series® Instructor's Desk
The desk's durable construction and universal design allows one desk to be used with left or right facing surface for greater flexibility. An integrated bookcase provides storage, keeping users organized while maximizing space.

All Terrain® Instructor's Desk
Peninsula top features integrated storage with a rollout shelf for convenient access. Desk offers a flat lecture surface as well as ample work space. Grommets discreetly hide wires while the modesty panel gives users privacy.

All Terrain® Mobile Instructor's Desk
Its minimal scale and smooth-rolling casters offer exceptional mobility. The binder tower with angled surface provides an area to prop materials for lecturing. Grommets discreetly hide wires while the modesty panel gives users privacy.

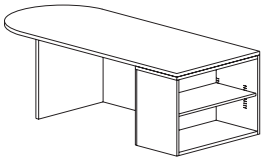
All Terrain® Mobile Lectern
Smooth-rolling casters allow the lectern to be moved easily from space to space. A convenient storage unit holds teaching materials. Its compact scale makes it ideal for any learning environment. Lecterns are available with an angled surface for lecturing ease.

All Terrain® Instruct with RACK Instructor's Desk
A wider cabinet allows utilization of an AV rack.
The lockable vented access doors on the rear of the unit provide permanent storage and ventilation for learning equipment like laptops and projectors. Wires are easily passed through the cabinet for wire management.

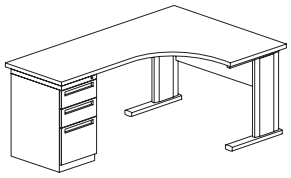
WorkZone® Instructor's Desk
The desk design provides durability and flexibility.
Its pedestal-supported worksurface provides easily accessible storage. The square shoe shape gives ample writing space and a place for office accessories.

Sample Product Cutsheets (Furniture)

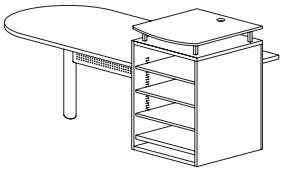
Statement of Line



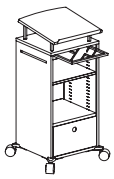
700 Series® Instructor's Desk



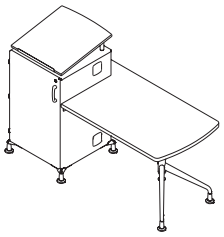
WorkZone® Instructor's Desk



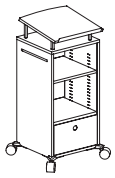
All Terrain® Instructor's Desk



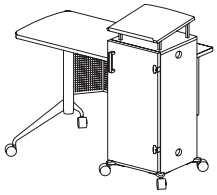
All Terrain® Mobile Lectern – Bowed Front



All Terrain® Instruct with RACK Instructor's Desk



All Terrain® Mobile Lectern – Shaped



All Terrain® Mobile Instructor's Desk

Learn more about
Instruct Desking

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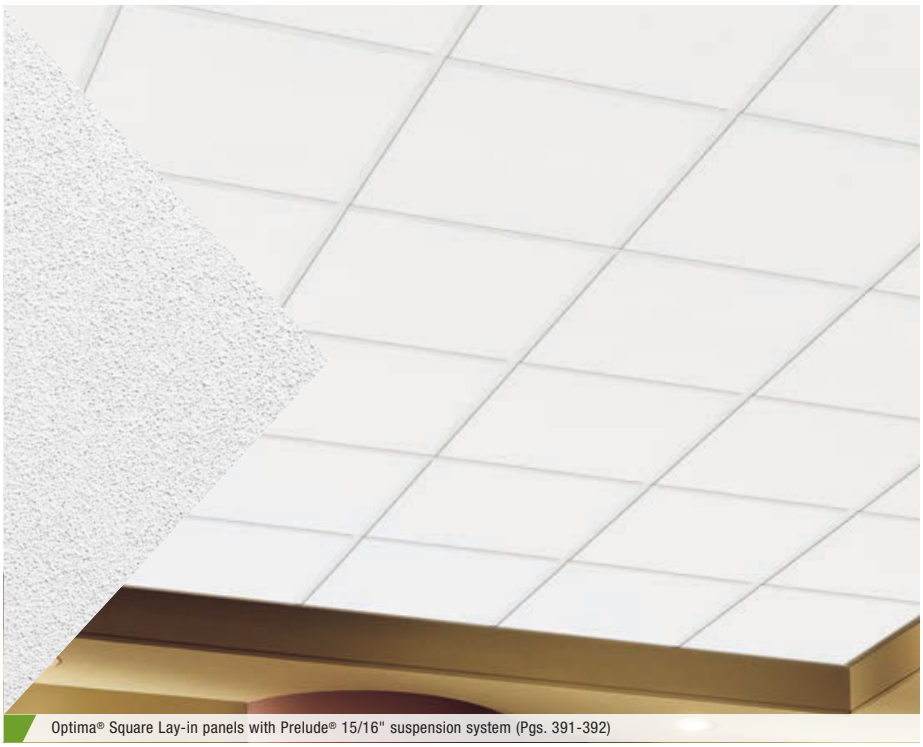
Furnishing Knowledge®

Sample Product Cutsheets (Acoustical)

OPTIMA®

Square Lay-in
fine texture

10-YEAR REPLACEMENT PANEL AVAILABILITY
3152, 3153



Optima® Square Lay-in panels with Prelude® 15/16" suspension system (Pgs. 391-392)

plus... capabilities to do more

armstrongceilings.com/capabilities
See more photos at:
armstrongceilings.com/photogallery

Smooth-textured Optima® panels provide excellent acoustical absorption and more standard-size options than any other texture in the line.

KEY SELECTION ATTRIBUTES

- Outstanding acoustical performance for open plan areas, both Articulation Class (180-200) and NRC (0.90-1.00)
- Items with PB suffix are manufactured with a plant-based binder
- Optima® PB panels are part of the Sustain™ portfolio and meet the most stringent sustainability compliance standards today
- Smooth, clean, durable finish – Washable, Impact-resistant, Scratch-resistant, Soil-resistant
- Energy-saving high light-reflective finish
- Non-directional visual reduces scrap and installation time
- Sag-resistant large-size panels
- Compatible with TechZone® Ceiling Systems (Pgs. 337-344)
- Item 3352 available with Create!™ printed images and patterns, see pages 245-247
- 30-Year Limited System Warranty against visible sag, mold, and mildew

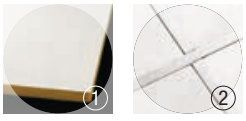
TYPICAL APPLICATIONS

- Open plan offices
- Computer rooms
- Corridors (walls-to-deck)
- Auditoriums
- Waiting rooms/nurses' stations
- Areas with indirect lighting systems

COLOR

White
(WH)

DETAILS



1. Optima® Square Lay-in
2. Optima Square Lay-in with Prelude® 15/16" suspension system

Sample Product Cutsheets (Acoustical)

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER As Noted

Declare℠ Living Building Challenge Compliant PB Suffix Only

SUSTAIN™ High Performance Sustainable Ceiling Systems PB Suffix Only

LEED® UP TO 71% RECYCLED CONTENT — Calculate LEED contribution at armstrongceilings.com/greengenie

energy management ✓ | construction waste mgmt ✓ | regional materials ✓ | design for flexibility ✓ | EPD ✓ | recyclable/ extended producer resp. ✓ | biobased materials ✓ | recycled content ✓ | sourcing of raw materials ✓ | material ingredient reporting ✓ | low emitting/ materials ✓ | lighting quality ✓ | acoustics ✓

▲ LOCATION DEPENDENT ▲ PB ONLY ▲ PB ONLY ▲ PB ONLY

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance. $$$$

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC + CAC =	Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew Bio-Block	Sag Resist Humi-Guard+	Certified Low VOC Emissions	Durability: Wash	Impact	Scratch	Soil	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																		
15/16" Square Lay-in	1	**1462**	4 x 48 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1463**	4 x 60 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1400**	6 x 48 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**1404**	6 x 60 x 1"	N/A	N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3156**	20 x 60 x 1"	0.95 •	N/A	–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3150** **3150PB**	24 x 24 x 3/4"	0.90 •	N/A	–	180 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3152** **3152PB**	24 x 24 x 1"	0.95 •	N/A	–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3352**	24 x 24 x 1"	0.90 •	26	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3159**	24 x 24 x 1-1/2"	1.00 •	N/A	–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

[1] Total Acoustics® ceiling panels have an ideal combination of noise reduction and sound-blocking performance in one product.
Optima items with the PB suffix are included in the Sustain™ portfolio and carry Declare℠ certification.

SUSPENSION SYSTEMS

15/16"

Prelude®

Blizzard White – Suspension System Finish
A color and texture coordinated suspension system to complement Optima® ceiling panels for a monolithic look and feel.

PHYSICAL DATA

Material
3150, 3156, 3159, 1462, 1463, 1400, 1404, 3152 – Fiberglass with DuraBrite® acoustically transparent membrane 3352 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

Surface Finish
DuraBrite with factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type XII, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Mold/Mildew Protection
Ceiling panels with BioBlock® resist the growth of mold and mildew.

VOC Emissions
(PB suffix items only)
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPDs.

High Recycled Content
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Acoustical Details
Some items have CAC backing. CAC backing may be available as a special order. A CAC value of 37 can be achieved by backloading fiberglass products with item 769 or 770.

Insulation Value
1400, 1404, 1462, 1463,
3152, 3156, 3352, –
R Factor – 4.0 (BTU units)
R Factor – 0.70 (Watts units)
3150 – R Factor – 3.0 (BTU units)
R Factor – 0.53 (Watts units)
3159 – R Factor – 6.0 (BTU units)
R Factor – 1.05 (Watts units)

Application Consideration
Do not mix Optima panels and Optima® Health Zone™ panels in the same room.

30-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com

Weight; Square Feet/Carton
1400 – 0.13 lbs/SF; 24 SF/ctn
1404 – 0.16 lbs/SF; 30 SF/ctn
1462 – 0.44 lbs/SF; 16 SF/ctn
1463 – 0.44 lbs/SF; 20 SF/ctn
3150, 3150PB – 0.44 lbs/SF; 128 SF/ctn
3152, 3152PB – 0.45 lbs/SF; 96 SF/ctn
3159 – 0.61 lbs/SF; 64 SF/ctn
3156 – 0.47 lbs/SF; 100 SF/ctn
3352 – 0.46 lbs/SF; 96 SF/ctn

Minimum Order Quantity
1 carton, excludes other size panels

Metric Items Available
3150M, 3152M, 3156M, 3159M –
Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

Sample Product Cutsheets (Acoustical)

FIBERGLASS

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER
As Noted

Declare℠
Living Building Challenge Compliant
PB Suffix Only

SUSTAIN™
High Performance Sustainable Ceiling Systems
PB Suffix Only

UP TO 71% RECYCLED CONTENT

Calculate LEED contribution at armstrongceilings.com/greengenie

LEED®: energy management; construction waste mgmt; regional materials; design for flexibility; EPD; recyclable/ extended producer resp.; biobased materials; recycled content; sourcing of raw materials; material ingredient reporting; low emitting/ materials; lighting quality; acoustics

▲ LOCATION DEPENDENT ▲ PB ONLY ▲ PB ONLY ▲ PB ONLY

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance.

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC	+	CAC	=	Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew Bio-Block	Sag Resist Humi-Guard+	Certified Low VOC Emissions	Wash (Durability)	Impact (Durability)	Scratch (Durability)	Soil (Durability)	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																					
15/16" Square Lay-in	1	**3151** **3151PB**	24 x 48 x 3/4"	0.90 •		N/A		–	180 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3153** **3153PB**	24 x 48 x 1"	0.95 •		N/A		–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3353**	24 x 48 x 1"	0.90 •		26		–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3155**	24 x 48 x 1-1/2"	1.00 •		N/A		–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3356**	24 x 48 x 1-1/2"	0.95 •		26		–	200 •	Class A	0.90 •	•	•	–	•	•	•	•	•	–	•
	1	**3164**	24 x 60 x 3/4"	0.90 •		N/A		–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3161**	24 x 72 x 3/4"	0.90 •		N/A		–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3162**	24 x 96 x 3/4"	0.90 •		N/A		–	180 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3158**	30 x 30 x 1"	0.95 •		N/A		–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3157**	30 x 60 x 1"	0.95 •		N/A		–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**3160** **3160PB**	48 x 48 x 1"	0.95 •		N/A		–	190 •	Class A	0.90 •	•	•	– •	•	•	•	•	•	•	•
	1	**3154**	48 x 96 x 1"	0.95 •		N/A		–	190 •	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

[1] Total Acoustics® ceiling panels have an ideal combination of noise reduction and sound-blocking performance in one product.
Optima items with the PB suffix are included in the Sustain™ portfolio and carry Declare℠ certification.

Sample Product Cutsheets (Acoustical)

OPTIMA®

Square Lay-in
fine texture

PLANT BASED BINDER
As Noted

Declare℠
Living Building Challenge Compliant
PB Suffix Only

SUSTAIN™
High Performance Sustainable Ceiling Systems
PB Suffix Only

UP TO 71% RECYCLED CONTENT

Calculate LEED contribution at armstrongceilings.com/greengenie

LEED®: energy management ✓ | construction waste mgmt ✓ | regional materials ✓ | design for flexibility ✓ | EPD ✓ | recyclable/ extended producer resp. ✓ | biobased materials ✓ | recycled content ✓ | sourcing of raw materials ✓ | material ingredient reporting ✓ | low emitting/ materials ✓ | lighting quality ✓ | acoustics ✓

▲ LOCATION DEPENDENT ▲ PB ONLY ▲ PB ONLY ▲ PB ONLY

VISUAL SELECTION

PERFORMANCE SELECTION

Dots represent high level of performance. $$$$

Edge Profile	Susp. Dwg. Pgs. 407-411 armstrongceilings.com/catdwgs	Item No.	Dimensions (Inches)	UL Classified Acoustics NRC + CAC =	Total Acoustics[1]	Articulation Class AC	Fire Performance	Light Reflect	Anti-Mold & Mildew: Bio-Block	Sag Resist: Humi-Guard+	Certified Low VOC Emissions	Durability: Wash	Durability: Impact	Durability: Scratch	Durability: Soil	Recycled Content	Recycle Program	30-Yr Warranty
OPTIMA®																		
15/16" Square Lay-in	1	FS **FastSize™ Panels**	W: 4" – 48" / L: 4" – 120" 1" Thick	N/A N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**Other Size Panels**	W: 4" – 24" / L: 4" – 96" 3/4" Thick	N/A N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•
	1	**Other Size Panels**	W: 4" – 42" / L: 4" – 120" W: 4" – 48" / L: 4" – 114" 1-1/2" Thick	N/A N/A	–	N/A	Class A	0.90 •	•	•	–	•	•	•	•	•	•	•

[1] Total Acoustics® ceiling panels have an ideal combination of noise reduction and sound-blocking performance in one product. Optima items with the PB suffix are included in the Sustain™ portfolio and carry Declare℠ certification.

FS **FastSize**: Factory-finished, made-to-order sizes, shipped fast (1 carton min.)

SUSPENSION SYSTEMS

15/16"

Prelude®

Blizzard White – Suspension System Finish
A color and texture coordinated suspension system to complement Optima® ceiling panels for a monolithic look and feel.

PHYSICAL DATA

Material
3153, 3155, 3158 – Fiberglass with DuraBrite® acoustically transparent membrane 3353, 3356 – Fiberglass with DuraBrite acoustically transparent membrane; CAC backing

Surface Finish
DuraBrite scrim with factory-applied latex paint

Fire Performance
ASTM E84 and CAN/ULC S102 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).

ASTM E1264 Classification
Type XII, Form 2, Pattern E
Fire Class A

Humidity/Sag Resistance
HumiGuard® Plus ceiling panels are recommended for areas subject to high humidity, up to, but not including, standing water and outdoor applications.

Mold/Mildew Protection
Ceiling panels with BioBlock® resist the growth of mold and mildew.

VOC Emissions (PB suffix items only)
Third-party certified compliant with California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010. This standard is the guideline for low emissions in LEED, CalGreen Title 24, ANSI/ASHRAE/USGBC/IES Standard 189; ANSI/GBI Green Building Assessment Protocol.

Primary (Embodied) Energy
See all LCA information on our EPDs.

High Recycled Content
Contains greater than 50% total recycled content. Total recycled content based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

Acoustical Details
Some items have CAC backing. CAC backing may be available as a special order. A CAC value of 37 can be achieved by backloading fiberglass products with item 769 or 770.

Insulation Value
3153, 3158, 3353, 3154, 3160, 3157 –
R Factor – 4.0 (BTU units)
R Factor – 0.70 (Watts units)
3151, 3161, 3162, 3164 –
R Factor – 3.0 (BTU units)
R Factor – 0.53 (Watts units)
3155, 3356 –
R Factor – 6.0 (BTU units)
R Factor – 1.05 (Watts units)

Application Consideration
Do not mix Optima panels and Optima® Health Zone™ panels in the same room.

30-Year Performance Guarantee & Warranty
When installed with Armstrong® Suspension System. Details at armstrongceilings.com

Weight; Square Feet/Carton
3151, 3151PB – 0.44 lbs/SF; 128 SF/ctn
3153, 3153PB, 3160, 3160PB – 0.45 lbs/SF; 96 SF/ctn
3155, 3356 – 0.61 lbs/SF; 64 SF/ctn
3158 – 0.47 lbs/SF; 75 SF/ctn
3353 – 0.46 lbs/SF; 96 SF/ctn
3154 – 0.45 lbs/SF; 128 SF/ctn
3157 – 0.56 lbs/SF; 100 SF/ctn
3161 – 0.43 lbs/SF; 96 SF/ctn
3164 – 0.43 lbs/SF; 100 SF/ctn
3162 – 0.42 lbs/SF; 128 SF/ctn

Minimum Order Quantity
1 carton, excludes other size panels

Metric Items Available
3151M, 3153M, 3154M, 3155M, 3158M, 3160M, 3353M, 3356M – Metric items are subject to extended lead times and minimum quantities. Contact your representative for more details.

TechLine / 1 877 276-7876
armstrongceilings.com/commercial
(search: optima)
BPCS-3048-517

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Armstrong® CEILING & WALL SOLUTIONS

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FIBERGLASS

Sample Product Cutsheets (Architectural)

Understructure Systems

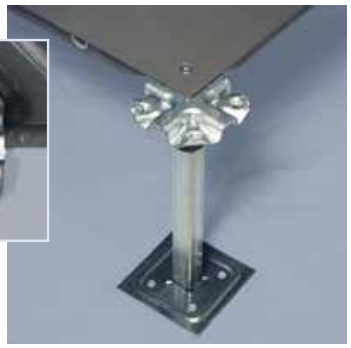
for ConCore and All Steel Systems

PosiLock®

Understructure Features

- PosiLock® design provides self-engagement and positioning of floor panels.
- Self-capturing fastener remains within the panel - will not get lost.
- Steel pedestal head provides maximum strength.
- Pedestal nut provides anti-vibration and locking features.
- Seismic force-resistant pedestals are available that limit or eliminate the need for special bracing.
- Typical floor heights from 6"-16" (15cm-40cm).

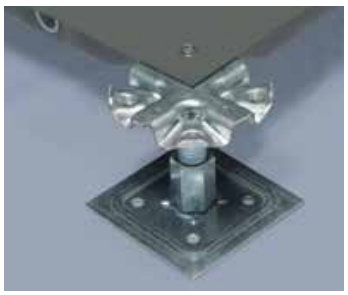
Panel engagement feature viewed from underside



Low Finished Floor Height PosiLock®

Understructure Features

- Available in floor heights from $2^{7}/_{8}$" to 4" (7cm-10cm).
- PosiLock® design provides self-engagement and positioning of floor panels.
- $2^{7}/_{8}$" (7cm) finished floor height is ideal for renovation applications while providing enough space under the floor to allow for easy cable management.
- Excellent for classroom renovations and the creation of training areas.
- Easily levels uneven floors.

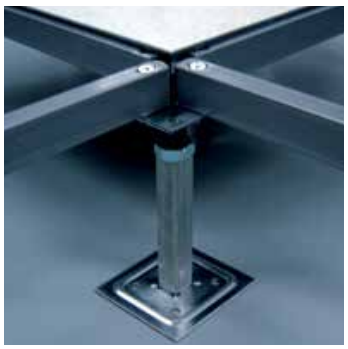


PosiLock® pedestal for low floor height systems

Bolted Stringer

Understructure Features

- Designed for computer rooms, data centers, industrial applications, and heavy rolling load areas.
- Allows floors to be built over 24" (60cm) high.
- Panels can be gravity-held in understructure for fast removal and replacement.
- Stringers provide lateral resistance to heavy rolling loads and seismic loading.
- Seismic force-resistant pedestals are available that limit or eliminate the need for special bracing.
- Typical floor heights from 12"-36" (30cm-90cm).



Hot Dipped Galvanized Pedestals

Seismic Pedestals

Understructure Features

- Available with standard and fillet welded base assembly.
- Steel pedestal head provides optimum strength.
- Seismic force-resistant pedestals are available that limit or eliminate the need for special bracing.
- Vertical supports ranging from 17 gauge 7/8" (2.2cm) galvanized tubing to Schedule 40 pipe.
- Pedestals can accommodate finished floor heights over 36" (90cm).
- Easily levels uneven floors.

Sample Product Cutsheets (Architectural)

Complete Design Freedom

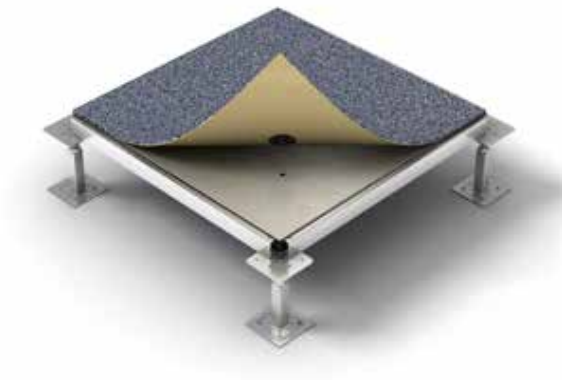
for unique and coordinated interior aesthetics

Concrete

- Offers unique natural finish appeal
- PVC edge banding provides a consistent seam appearance
- Maintains full benefits of a raised access floor
- Smooth concrete surface with exposed aggregate
- High recycled content

PosiTile® Carpet

- 24” and 60cm PosiTile® carpet tiles with four permanently affixed positioning buttons are quickly positioned on access floor panels for one-to-one fit
- No sticky adhesive on floor panels when carpet tiles are removed
- Carpet waste is avoided when floor panels and carpet tiles with matching cutout holes are relocated. No attic stock of carpet required due to planned churn
- A totally sustainable, cradle to cradle carpet tile product



Custom Finishes

Tate has developed an on-line resource of tested and approved finishes for access floor applications. If you do not see a finish style or color you like, Tate can work with you to develop a custom finish.

On the website you will find vendor contact information, application renderings, and product photos to help you select a finish for your facility.

Please visit **www.tateinc.com** If you are interested in using a material or vendor that does not appear on the list . For more information call Tate at **800-231-7788** or e-mail **tateinfo@tateinc.com.**

Sample Product Cutsheets (Lighting)

LITHONIA LIGHTING®

FEATURES & SPECIFICATIONS

INTENDED USE — The BLT Best-in-Value Low Profile LED luminaire features a popular center basket design that offers a clean, versatile style and volumetric distribution. High efficacy LED light engines deliver energy savings and low maintenance compared to traditional sources. An extensive selection of configurations and options make the BLT the perfect choice for many lighting applications including schools, offices and other commercial spaces, retail, hospitals and healthcare facilities. The low profile BLT design (2-3/8") also makes it an excellent choice for renovation projects.

CONSTRUCTION — BLT enclosure components are die-formed for dimensional consistency and painted after fabrication with a polyester powder paint for improved performance and protection.

The reflector is finished with a high reflective matte white powder paint for improved aesthetics and increased light diffusion.

End plates contain easy-to-position integral T-bar clips for securely attaching the luminaire to the T-grid. For additional T-grid security, optional screw on T-bar clips are available.

Diffusers are extruded from impact modified acrylic for increased durability.

LED boards and drivers are accessible from the plenum.

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions and vertical and horizontal work surfaces – rendering the interior space, objects and occupants in a more balanced, complimentary luminous environment. High performance extruded acrylic diffusers conceal LEDs and efficiently deliver light in a volumetric distribution. Four diffuser choices available - curved and square designs with linear prisms or a smooth frosted finish.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 70% LED lumen maintenance at 60,000 hours (L70/60,000).

Non-Configurable BLT: Generic 0-10 volt dimming driver. Dims to 10%

Configurable BLT: available in High Efficiency (HE) versions for applications where a lower wattage (over the standard product) is required. The High Efficiency versions deliver >130 LPW and can be specified via the Lumen Package designations in the Ordering Information below.

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Optional integrated nLight® controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Connection to nLight is simple. It can be accomplished with integrated nLight AIR wireless or through standard Cat-5 cabling. nLight offers unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission, while nLight AIR is commissioned easily through an intuitive model app.

Lumen Management: Unique lumen management system (option N80) provides on board intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

Driver disconnect provided where required to comply with US and Canadian codes.

SENSOR— Integrated sensor (individual control): Sensor Switch MSD7ADCX ((Passive infrared (PIR)) or MSDPDT7ADCX ((PIR/Microphonics Dual Tech (PDT)) integrated occupancy sensor/automatic dimming photocell allows the luminaire to power off when the space is unoccupied or enough ambient light is entering the space. See page 4 for more details on the integrated sensor.

Integrated Sensor (nLight Wired Networking): This sensor is nLight-enabled, meaning it has the ability to communicate over an nLight network. When wired, using CAT-5 cabling, with other nLight-enabled sensors, power packs, or WallPods, an nLight control zone is created. Once linked to a Gateway, directly or via a Bridge, the zone becomes capable of remote status monitoring and control via SensorView software. See page 4 for the nLight sensor options.

Integrated Smart Sensor (nLight Air Wireless Platform): The rES7 sensor is nLight AIR enabled, meaning it has the ability to communicate over the wireless nLight control platform. It is both a digital PIR occupancy sensor/automatic dimming photocell. It pairs to other luminaires and wall switches through our mobile app, CL*AIR*ITY, which allows for simple sensor adjustment. See page 4 for more details on the Integrated Smart Sensor.

INSTALLATION — The BLT's low profile design of only 2-3/8" provides increased installation flexibility especially in restrictive plenum applications. The BLT fits into standard 15/16" and narrow 9/16" T-grid ceiling systems.

Suitable for damp location.

For recessed mounting in hard ceiling applications, Drywall Grid Adapters (DGA) are available as an accessory. See Accessories section.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. IC rated.

DesignLights Consortium® (DLC) Premium qualified product. Not all versions of this product may be DLC Premium qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

NOTE: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

Catalog Number
Notes
Type

BLT Series LED

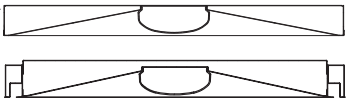
2BLT

2' x 2'
LED

eldoLED nLIGHT

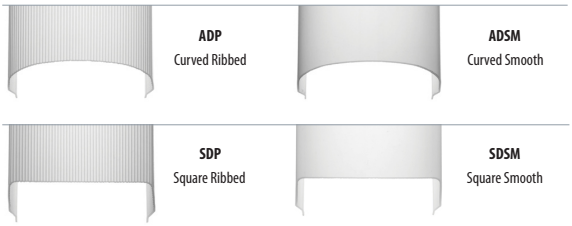
Specifications

Length: 23-3/4 (60.3)
Width: 23-3/4 (60.3)
Depth: 2-3/8 (6.0)
Depth with Air supply/return: 2-3/4 (6.9)



All dimensions are inches (centimeters) unless otherwise specified.

Multiple Diffuser Options



ADP Curved Ribbed

ADSM Curved Smooth

SDP Square Ribbed

SDSM Square Smooth

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

Sample Product Cutsheets (Lighting)

2BLT Volumetric Recessed Lighting 2'x2'

A+ Capable options indicated by this color background.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2BLT2 33L ADP EZ1 LP835

2BLT2

Series	Air function	Lumens[2]	Diffuser	Voltage	Driver	Color temperature
2BLT2 2X2 BLT	(blank) Static A Air supply/ return[1]	**Standard efficiency (>100 LPW)** 20L 2000 33L 3300 40L 4000 **High efficiency[3,4] (>130 LPW)** 33LHE 3300 40LHE 4000 48LHE 4800	ADP Curved, linear prisms ADSM Curved, smooth SDP Square, linear prisms SDSM Square, smooth **Includes trim rings to match sensored version** ADPT Curved, linear prisms ADSMT Curved, smooth SDPT Square, linear prisms SDSMT Square, smooth	(blank) MVOLT 120 120V 277 277V 347 347V[5]	EZ1 eldoLED dims to 1% (0-10 volt dimming) SLD Step-level dimming[6] LE1 Lutron Ecosystem driver dims to 1%[6,7]	LP830 82CRI, 3000 K LP835 82CRI, 3500 K LP840 82CRI, 4000 K LP850 82CRI, 5000 K LP930 90CRI, 3000K LP935 90CRI, 3500K LP940 90CRI, 4000K LP950 90CRI, 5000K

Controls	Occupancy control[10]	Options
(blank) No nLight® N80 nLight® with 80% lumen management N80EMG nLight® with 80% lumen management For use with generator supply EM power[8] N100 nLight® without lumen management N100EMG nLight® without lumen management For use with generator supply EM power[8] NLTAIR nLight AIR enabled[9]	(blank) No sensor control **nLight Wired Networking** NES7 nLight™ nES 7 PIR integral occupancy sensor[11] NESPDT7 nLight™ nES PDT 7 dual technology integral occupancy control[11] NES7ADCX nLight™ nES 7 ADCX PIR integral occupancy sensor with automatic dimming photocell[11] NESPDT7ADCX nLight™ nES PDT 7 dual technology integral occupancy sensor with automatic dimming photocell[11] **nLight Wireless Networking** RES7N nLight AIR PIR integral occupancy sensor with automatic dimming photocell for Networking Capabilities **Individual Control** MSD7ADCX PIR integral occupancy sensor with automatic dimming control photocell[6,12] MSDPDT7ADCX PDT integral occupancy sensor with automatic dimming control photocell[6,12] **nLight Wireless Zone** RES7Z nLight AIR PIR integral occupancy sensor with automatic dimming photocell for zone control	EL7L 700 lumen battery pack[13] EL14L 1400 lumen battery pack[13] EL14LSD 1400 lumen battery pack with self-diagnostic testing feature[13,14] CP Chicago plenum[15] BGTD Bodine Generator Transfer Device[16] PWS1836 6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit PWS1846 6' pre-wire, 3/8" diameter, 18 gauge, 2 circuit PWS1846 PWSLV Two cables: one 6' pre-wire, 3/8" diameter, 18 gauge, 2 circuits; one 6' pre-wire, 3/8" diameter, 18 gauge, purple and gray[17] PWS1856LV 6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit w/low voltage purple and grey wires[17] GLR Fast-blowing fuse[18] GMF Slow-blowing fuse[18] NPLT Narrow pallet RRL_ RELOC®-ready luminaire[19] LATC Earthquake clip DWAM Anti-Microbial paint JP32 Job packaging IP5X Gasketed diffuser compartment to meet IP5X rating[20]

Accessories next page

Non-Configurable BLT

Stock/MTO	Catalog Description *	UPC	Lumens	Wattage	LPW	Color Temperature	Voltage	Pallet Qty
Stock	2BLT2 33L ADP LP835	00190887529708	3241	30	108	3500K/82 CRI	120-277	52
	2BLT2 33L ADP LP840	00190887529739	3313	30	111	4000K/82CRI	120-277	52
	2BLT2 33L ADP EL14L LP835	00190887529890	3241	30	108	3500K/82CRI	120-277	52
	2BLT2 33L ADP EL14L LP840	00190887529937	3313	30	111	4000K/82CRI	120-277	52
MTO	2BLT2 33L ADP 347 LP835		3241	30	108	3500K/82 CRI	347	52
	2BLT2 33L ADP 347 LP840		3313	30	111	4000K/82CRI	347	52

*Generic 0-10V Dimming to 10%.

Notes

1 Consult factory for airflow data.
2 Approximate lumen output.
3 All versions may not achieve 130+ LPW. Refer to photometry on www.acuitybrands.com.
4 Air supply/return option, 90 CRI, and versions with integral sensor trim rings may not achieve 130 LPW.
5 Not available with SLD EL7L, or EL14L options.
6 Not available with N80, N80EMG, N100, N100EMG, NLTAIR, or occupancy control.
7 Not available with controls, occupancy controls, or PWS options. Consult factory for Hi-Lume dimming.
8 nLight EMG option requires a connection to existing nLight network. Power is provided from a separate N80 or N100 enabled fixture.
9 Must order with RES7N or RES7Z sensor. Only available with EZ1 driver.
10 Must specify diffuser with trim rings. See sensor options on page 4.
11 Requires N80, N80EMG, N100, or N100EMG.
12 Only available with EZ1 driver option. 0-10v dimming wires not accessible via access plate.
13 When using pre-wire option, use PWS1846 or PWS1846 PWSLV.
14 For more information, please see the PSSD2 specification sheet.
15 Not available with N80, N80EMG, N100, or N100EMG.
16 Must specify voltage. Requires BSE labeling, voltage specific. Consult factory for options.
17 Not available with nLight wired/wireless network or individual controls.
18 Must specify voltage, 120 or 277, with GLR and GFM fusing.
19 For ordering logic consult RRL_2013.
20 Not available with air supply/return or Wired Networking (NES_) and Individual Control (MSD_) sensors.

LITHONIA LIGHTING®
An AcuityBrands Company

2BLT-2X2

Sample Product Cutsheets (Lighting)

2BLT Volumetric Recessed Lighting 2'x2'

Accessories: *Order as separate catalog number.*

DGA22	Drywall grid adapter for 2x2 recessed fixture

nLight® Wired Control Accessories:
Order as separate catalog number. Visit www.acuitybrands.com/products/controls/nlight.

WallPod stations	Model number	Occupancy sensors	Model number
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 RJB / nCM PDT 9 RJB
On/Off & raise/lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM10 RJB / nCM PDT 10 RJB
Graphic touchscreen	nPOD GFX [color]	Wall switch with raise/lower	nWSX PDT LV DX [color]
Photocell controls	**Model number**	**Cat-5 cable (plenum rated)**	**Model number**
Full range dimming	nCM ADCX RJB	10' cable	CAT5 10FT J1
		30' cable	CAT5 30FT J1

nLight® AIR Control Accessories:
Order as separate catalog number. Visit www.acuitybrands.com/products/controls/nlightair.

Wall switches	Model number
On/Off single pole	rPODB [color]
On/Off two pole	rPODB 2P [color]
On/Off & raise/lower single pole	rPODB DX [color]
On/Off & raise/lower two pole	rPODB 2P DX [color]
On/Off & raise/lower single pole	rPODBZ DX WH[1]

Notes
1 Can only be ordered with the RES7Z zone control sensor version.

Replacement Parts: *Order as separate catalog number.*

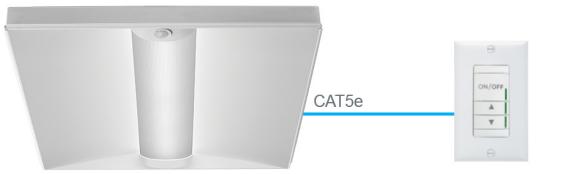
*247WJV	2DBLT24 ADP LENS ASSEMBLY	2 ft. replacement lens
*249P2P	2DBLT24 SDP LENS ASSEMBLY	2 ft. replacement lens
*249P2W	2DBLT24 ADSM LENS ASSEMBLY	2 ft. replacement lens
*249P32	2DBLT24 SDSM LENS ASSEMBLY	2 ft. replacement lens
*237LT1	2DBLT24 ADPT LENS ASSEMBLY	2 ft. replacement lens
*237LT3	2DBLT24 SDPT LENS ASSEMBLY	2 ft. replacement lens
*237LT5	2DBLT24 ADSMT LENS ASSEMBLY	2 ft. replacement lens
*237LT7	2DBLT24 SDSMT LENS ASSEMBLY	2 ft. replacement lens
*237LT9	2DBLT24 ADPT SENSOR LENS ASSEMBLY	2 ft. replacement lens
*237M4Y	2DBLT24 SDPT SENSOR LENS ASSEMBLY	2 ft. replacement lens
*237M57	2DBLT24 ADSMT SENSOR LENS ASSEMBLY	2 ft. replacement lens
*237M5H	2DBLT24 SDSMT SENSOR LENS ASSEMBLY	2 ft. replacement lens

Sample Product Cutsheets (Lighting)

2BLT Volumetric Recessed Lighting 2'x2'

Sensor Options						
Option	Automatic Dimming Photocell	Occupancy Sensing		nLight Wired Networking	nLight AIR Networking	nLight AIR Zone
		PIR	PDT			
MSD7ADCX	X	X				
MSDPDT7ADCX	X		X			
NES7		X		X		
NES7ADCX	X	X		X		
NESPDT7			X	X		
NESPDT7ADCX	X		X	X		
RES7N	X	X			X	
RES7Z	X	X				X

Basic nLight Zone



Integrated Sensor with Individual Control

The MSD7ADCX PIR occupancy sensor/automatic dimming photocell is ideal for areas without obstructions and where daylight harvesting may be desired. Suggested applications include, but not limited to, hallways, corridors, storage rooms, and breakrooms or other areas where people are typically moving.

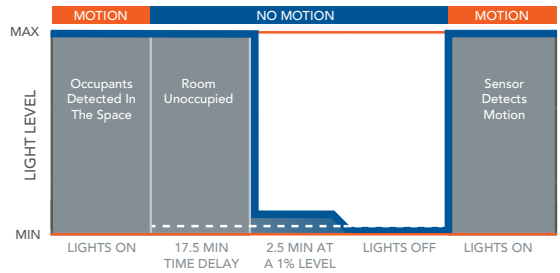
The MSDPDT7ADCX PIR/Microphonics Dual Tech occupancy sensor/automatic dimming photocell is ideal for areas with obstructions and where daylight harvesting is desired. Suggested applications include, but not limited to, open offices, private offices, classrooms, public restrooms, and conference rooms.

nLight Wired Networking

The nES 7 is ideal for small rooms without obstructions or areas with primarily walking motion. Ideal areas include hallways, corridors, storage rooms, and breakrooms. Additionally, the NES7ADCX includes an integrated photocell, which enables daylight harvesting controls.

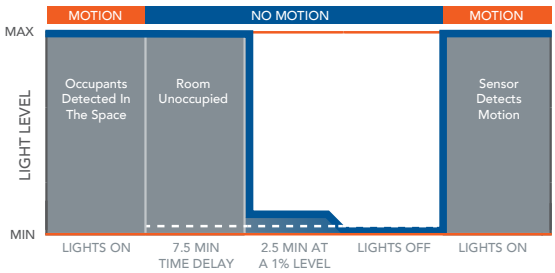
For areas like restrooms, private offices, open offices, conference rooms or any space with obstructions, the nES PDT 7 dual technology sensor is recommended. The nES PDT 7 utilizes both PIR (passive infrared) and Microphonics technologies to detect occupancy. Additionally, the NESPDT7ADCX includes an integrated photocell, which enables daylight harvesting controls which is ideal for areas where windows are present.

Sequence of Operation



*The presetting on the automatic dimming photocell is 5fc.

Sequence of Operation



*The presetting on the automatic dimming photocell is 5fc.

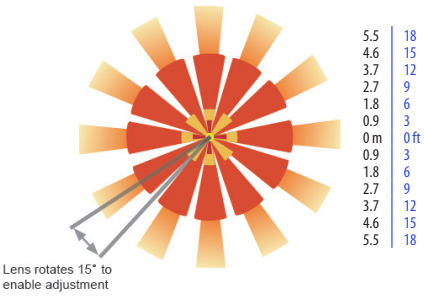
Sensor Coverage Pattern
Mini 360° Lens

- Recommended for walking motion detection from mounting heights between 8 ft (2.44 m) and 20 ft (6.10 m)
- Initial detection of walking motion along sensor axes at distances of 2x the mounting height up to 15 ft (4.57 m) and
- 1.75x up to 20 ft (6.10 m).
- Provides 12 ft (3.66 m) radial detection of small motion when mounted at 9 ft (2.74 m)
- Initial detection will occur earlier when walking across sensor's field of view than when walking directly at sensor

nLight AIR Wireless

nLight AIR is the ideal solution for retrofit or new construction spaces where adding additional wiring can be labor intensive and costly. The integrated rES 7 smart sensor is part of each luminaire in the nLight AIR network, which can be grouped to control multiple luminaires. The granularity of control with the digital PIR occupancy detection and daylight sensing makes a great solution for any application.

9 FT Mounting



Simple as 1,2,3

1. Install the nLight® AIR fixtures with embedded smart sensor
2. Install the wireless battery-powered wall switch
3. With CLAIRITY app, pair the fixtures with the wall switch and if desired, customize the sensor settings for the desired outcome

LITHONIA LIGHTING®
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2BLT-2X2

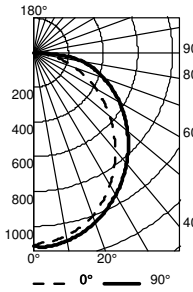
LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 www.lithonia.com © 2015-2017 Acuity Brands Lighting, Inc. All rights reserved. Rev. 03/13/17

Sample Product Cutsheets (Lighting)

2BLT Volumetric Recessed Lighting 2'x2'

PHOTOMETRICS

2BLT2 33L ADP LP835, 3241 delivered lumens, test no. LTL28918P4, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1114	1114
5°	1092	1118
15°	1042	1075
25°	943	996
35°	808	891
45°	653	770
55°	492	638
65°	334	501
75°	177	359
85°	44	147
90	5	2

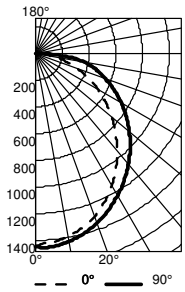
Coefficients of Utilization

RCR	pf 80% pc 70% pw 50%	80% 70% 30%	80% 70% 10%	20% 70% 50%	20% 70% 30%	20% 70% 10%	20% 50% 50%	20% 50% 30%	20% 50% 10%
0		119	119	119	116	116	116	111	111	111
1		108	103	98	100	96	92	96	92	89
2		98	89	82	87	80	75	83	78	73
3		89	78	69	76	68	62	73	66	61
4		81	69	60	67	59	52	65	57	52
5		75	61	52	60	52	45	58	50	44
6		69	55	46	54	46	39	52	45	39
7		64	50	41	49	41	35	48	40	34
8		59	46	37	45	37	31	44	36	31
9		56	42	34	41	33	28	40	33	28
10		52	39	31	38	30	25	37	30	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	852	26.3	26.3
0° - 40°	1385	42.7	42.7
0° - 60°	2440	75.3	75.3
0° - 90°	3242	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3242	100.0	100.0

2BLT2 40L ADP LP835, 4210 delivered lumens, test no. LTL28918P5, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1447	1447
5°	1419	1452
15°	1354	1396
25°	1224	1294
35°	1050	1158
45°	849	1001
55°	640	829
65°	434	650
75°	230	466
85°	57	191
90	7	3

Coefficients of Utilization

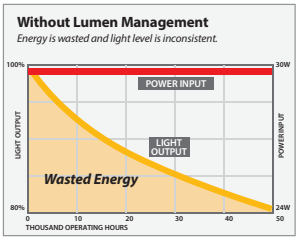
RCR	pf 80% pc 70% pw 50%	80% 70% 30%	80% 70% 10%	20% 70% 50%	20% 70% 30%	20% 70% 10%	20% 50% 50%	20% 50% 30%	20% 50% 10%
0		119	119	119	116	116	116	111	111	111
1		108	103	98	100	96	92	96	92	89
2		98	89	82	87	80	75	83	78	73
3		89	78	69	76	68	62	73	66	61
4		81	69	60	67	59	52	65	57	52
5		75	61	52	60	52	45	58	50	44
6		69	55	46	54	46	39	52	45	39
7		64	50	41	49	41	35	48	40	34
8		59	46	37	45	37	31	44	36	31
9		56	42	34	41	33	28	40	33	28
10		52	39	31	38	30	25	37	30	25

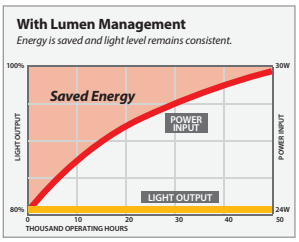
Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1107	26.3	26.3
0° - 40°	1799	42.7	42.7
0° - 60°	3169	75.3	75.3
0° - 90°	4211	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4211	100.0	100.0

Constant Lumen Management

Enabled by the embedded nLight control, the BLT actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.





Performance Data

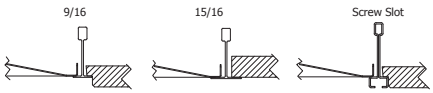
Lumen Package	Lumens	Input Watts	LPW
20L ADP LP830	2157	20	110
20L ADP LP835	2213	20	113
20L ADP LP840	2261	20	116
20L ADP LP850	2373	20	121
33L ADP LP830	3160	30	106
33L ADP LP835	3241	30	108
33L ADP LP840	3313	30	111
33L ADP LP850	3476	30	116
40L ADP LP830	4103	39	106
40L ADP LP835	4209	39	108
40L ADP LP840	4302	39	111
40L ADP LP850	4514	39	116
AIR 20L ADP LP830	2019	20	103
AIR 20L ADP LP835	2060	20	105
AIR 20L ADP LP840	2116	20	108
AIR 20L ADP LP850	2134	20	109
AIR 33L ADP LP830	2957	28	104
AIR 33L ADP LP835	3017	28	107
AIR 33L ADP LP840	3099	28	109
AIR 33L ADP LP850	3126	28	110
AIR 40L ADP LP830	3841	39	99
AIR 40L ADP LP835	3919	39	101
AIR 40L ADP LP840	4025	39	104
AIR 40L ADP LP850	4060	39	104

HE Performance Data

Lumen Package	Lumens	Input Watts	LPW
33LHE ADP LP830	3537	28	126
33LHE ADP LP835	3628	28	130
33LHE ADP LP840	3708	28	132
33LHE ADP LP850	3891	28	139
40LHE ADP LP830	4118	32	127
40LHE ADP LP835	4224	32	131
40LHE ADP LP840	4317	32	134
40LHE ADP LP850	4530	32	140
48LHE ADP LP830	4699	37	128
48LHE ADP LP835	4820	37	131
48LHE ADP LP840	4927	37	134
48LHE ADP LP850	5169	37	140

MOUNTING DATA

Ceiling Type	Appropriate Trim Type
Exposed grid tee (1' and 9/16")	G
Concealed grid tee	G
Plaster or plasterboard	G*



*DGA accessory available to provide ceiling trim flange and fixture support for plaster or plasterboard ceiling. Recommended rough-in dimensions for DGA installation is 24-3/4" x 24-3/4" (Tolerance is +1/8", -0").

LITHONIA LIGHTING®
An AcuityBrands Company

2BLT-2X2

LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 www.lithonia.com © 2015-2017 Acuity Brands Lighting, Inc. All rights reserved. Rev. 03/13/17

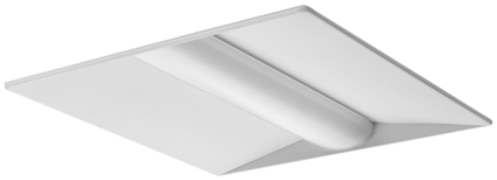
Sample Product Cutsheets (Lighting)

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	

BLT Series LED

2BLT Tunable White



2' x 2'
LED

FEATURES & SPECIFICATIONS

INTENDED USE — The BLT Best-in-Value Low Profile LED luminaire features a popular center basket design that offers a clean, versatile style and volumetric distribution. High efficacy LED light engines deliver energy savings and low maintenance compared to traditional sources. An extensive selection of configurations and options make the BLT the perfect choice for many lighting applications including schools, offices and other commercial spaces, retail, hospitals and healthcare facilities. The low profile BLT design (2-9/16") also makes it an excellent choice for renovation projects.

BLT Tunable White is perfect in classrooms and educational settings as it allows the light color temperature to be adjusted to the optimal light level for student tasks such as reading or test taking.

CONSTRUCTION — BLT enclosure components are die-formed for dimensional consistency and painted after fabrication with a polyester powder paint for improved performance and protection.

The reflector is finished with a high reflective matte white powder paint for improved aesthetics and increased light diffusion.

End plates contain easy-to-position integral T-bar clips for securely attaching the luminaire to the T-grid. For additional T-grid security, optional screw on T-bar clips are available.

Diffusers are extruded from impact modified acrylic for increased durability. Injection molded diffuser light traps add a finished look to the diffuser ends and help seal the diffuser to the housing end plates. Optional diffuser trim rings provide an attractive mounting for integral sensors as well as adding a decorative element to the luminaire aesthetics.

LED boards are accessible from below; driver is accessible from the plenum.

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions and vertical and horizontal work surfaces – rendering the interior space, objects and occupants in a more balanced, complimentary luminous environment. High performance extruded acrylic diffusers conceal LEDs and efficiently deliver light in a volumetric distribution. Four diffuser choices available - curved and square designs with linear prisms or a smooth frosted finish.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 70% LED lumen maintenance at 60,000 hours (L70/60,000).

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Integrated nLight®controls make each luminaire addressable — allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Simply connect all the nLight enabled control devices and the BLT luminaires using standard Cat-5 cabling. Unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission.

Driver disconnect provided where required to comply with US and Canadian codes.

Mainstream Dynamic Tunable White with nTune Technology: Tunable white nTune™ is an all digital light color temperature control within an nLight enabled luminaire. This brings tunable white lighting control into the mainstream with repeatable, consistent results in an economical luminaire form and system already familiar to schools. Designers and facility operators are granted the freedom to tie scenes to specific activities or to complement colors or materials within a visual environment. nTune™ allows color temperature settings through the Productivity Range of 3000K-5000K. Refer to the Programming User's Guide for instructions on customizing to your application with SensorView™.

Integrated Sensor (nLight Wired Networking): This sensor is nLight-enabled, meaning it has the ability to communicate over an nLight network. When wired, using CAT-5 cabling, with other nLight-enabled sensors, power packs, or WallPods, an nLight control zone is created. Once linked to a Gateway, directly or via a Bridge, the zone becomes capable of remote status monitoring and control via SensorView software. See page 2 for the nLight sensor options.

INSTALLATION — The BLT's low profile design of only 2-9/16" provides increased installation flexibility especially in restrictive plenum applications. The BLT fits into standard 15/16" and narrow 9/16" T-grid ceiling systems.

Suitable for damp location.

For recessed mounting in hard ceiling applications, Drywall Grid Adapters (DGA) are available as an accessory. See Accessories section.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. IC rated.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

NOTE: Actual performance may differ as a result of end-user environment and application.

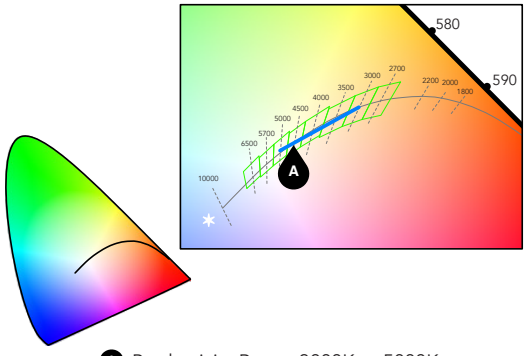
All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

eldoLED nLIGHT

Tunable White GPHD

- **Gamut**: One dimensional Warm-Cool
- **Path**: Direct 3000K to 5000K (Productivity Range)
- **Handle**: Two Natural Language Handles: Intensity and CCT
- **Data**: nLight with nTune technology for both handles of control



A Productivity Range 3000K to 5000K

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

MAINSTREAM DYNAMIC BY ACUITY BRANDS

Sample Product Cutsheets (Lighting)

2BLT Tunable White Volumetric Recessed Lighting 2'x2'

A+ Capable options indicated by this color background.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2BLT2 TUWH PROR 40L ADP NLT

2BLT2

Series	Dynamic feature	Dynamic range	Lumens[1]	Diffuser	Voltage	Control interface type
2BLT2 2X2 BLT	TUWH Tunable white	PROR Productivity range (3000-5000K)	20L 2000 33L 3300 40L 4000	ADP Curved, linear prisms ADSM Curved, smooth SDP Square, linear prisms SDSM Square, smooth **Diffusers w/ trim rings** ADPT Curved, linear prisms ADSMT Curved, smooth SDPT Square, linear prisms SDSMT Square, smooth	(blank) MVOLT 120 120 277 277 347 347[2]	NLT nLight nTune interface[3]

Occupancy control[4]

(blank)	No sensor control
nLight Wired Networking	
NES7	nLight™ nES 7 PIR integral occupancy sensor
NESPDT7	nLight™ nES PDT 7 dual technology integral occupancy control
NES7ADCX	nLight™ nES 7 ADCX PIR integral occupancy sensor with automatic dimming photocell
NESPDT7ADCX	nLight™ nES PDT 7 dual technology integral occupancy sensor with automatic dimming photocell

Options

EL7L	700 lumen battery pack[5]
EL14L	1400 lumen battery pack[5]
BGTD	Bodine Generator Transfer Device[6]
PWS1836	6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit
PWS1846	6' pre-wire, 3/8" diameter, 18 gauge, 2 circuit
GLR	Fast-blowing fuse[7]
GMF	Slow-blowing fuse[7]
NPLT	Narrow pallet
RRL_	RELOC®-ready luminaire[8]
LATC	Earthquake clip
DWAM	Anti-Microbial paint
90CRI	90 CRI
IP5X	Gasketed diffuser compartment to meet IP5X rating[9]

Accessories: *Order as separate catalog number.*

DGA22	Drywall grid adapter for 2x2 recessed fixture

nLight® Control Accessories:
Order as separate catalog number. Visit www.acuitybrands.com/products/controls/nlight.

WallPod stations	Model number	Occupancy sensors	Model number
On/Off	nPODM	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 RJB / nCM PDT 9 RJB
On/Off & raise/lower	nPODM DX	Large motion 360°, ceiling (PIR / dual tech)	nCM10 RJB / nCM PDT 10 RJB
		Wall switch with raise/lower	nWSX PDT LV DX [color]
Photocell controls	**Model number**	**Cat-5 cable (plenum rated)**	**Model number**
Full range dimming	nCM ADCX RJB	10' cable	CAT5 10FT J1
		30' cable	CAT5 30FT J1
Power Supply			
nLight Power Supply	nPS 80		

Replacement parts: *Order as separate catalog number.*

*237LJR	2DBLT24 ADP LENS ASSEMBLY	2 ft. replacement lens (light traps included)
*237LKH	2DBLT24 SDP LENS ASSEMBLY	2 ft. replacement lens (light traps included)
*237LKY	2DBLT24 ADSM LENS ASSEMBLY	2 ft. replacement lens (light traps included)
*237LL7	2DBLT24 SDSM LENS ASSEMBLY	2 ft. replacement lens (light traps included)
*237LT1	2DBLT24 ADPT LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237LT3	2DBLT24 SDPT LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237LT5	2DBLT24 ADSMT LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237LT7	2DBLT24 SDSMT LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237LT9	2DBLT24 ADPT SENSOR LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237M4Y	2DBLT24 SDPT SENSOR LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237M57	2DBLT24 ADSMT SENSOR LENS ASSEMBLY	2 ft. replacement lens (trims included)
*237M5H	2DBLT24 SDSMT SENSOR LENS ASSEMBLY	2 ft. replacement lens (trims included)

Notes
1. Approximate lumen output.
2. Not available with EL7L or EL14L battery packs.
3. Requires power from nLight network bridge or nPS 80.
4. Must specify diffuser with trim rings. See sensor options in ordering information.
5. When using pre-wire option, use PWS1846.
6. Must specify voltage. Requires BSE labeling. Consult factory for options.
7. Must specify voltage, 120 or 277 with GLR & GMF fusing.
8. For ordering logic consult: RRL 2013.
9. Not available with Occupancy Control sensors.

LITHONIA LIGHTING® An AcuityBrands Company

MAINSTREAM DYNAMIC BY ACUITY BRANDS

2BLT-2X2-NTUNE

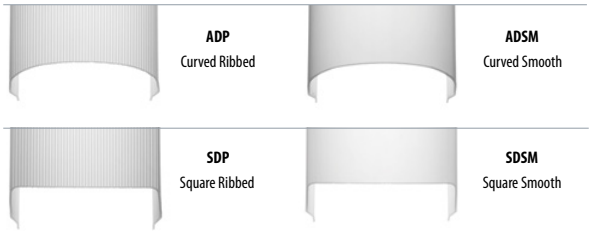
Sample Product Cutsheets (Lighting)

2BLT Tunable White Volumetric Recessed Lighting 2'x2'

Specifications

Length: 23-3/4 (60.3)
Width: 23-3/4 (60.3)
Depth: 2-9/16 (6.5)
All dimensions are inches (centimeters) unless otherwise specified.

Mulitple Diffuser Options



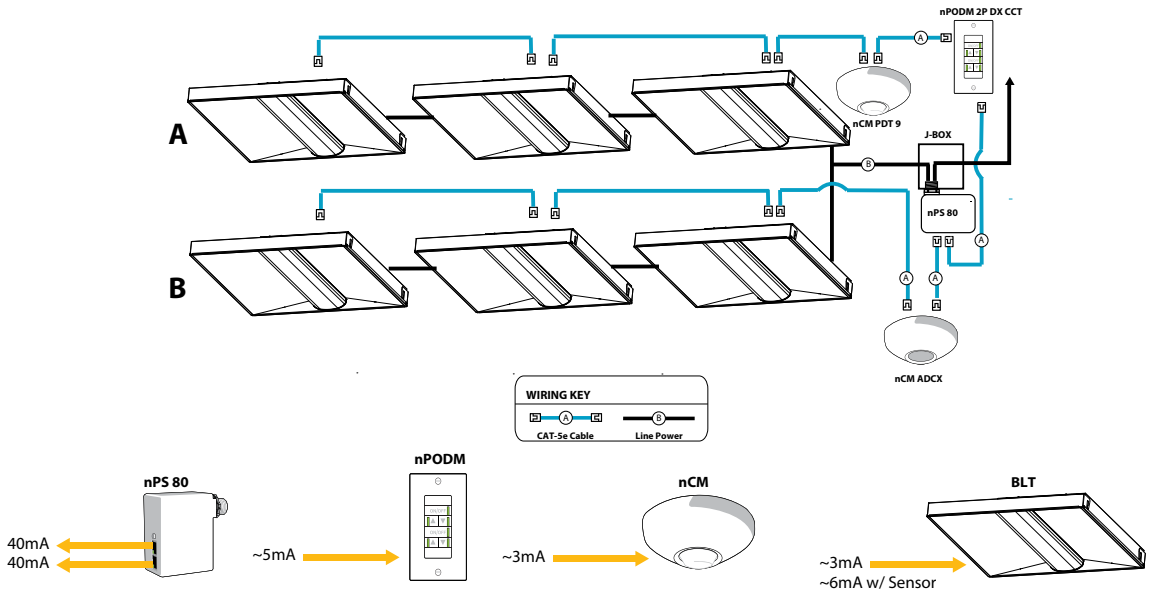
Tunable White Wall Pods

nPODM 2P DX CCT

nPODM 4S DX EDUTW

nPODM 4S EDUTW

Typical nLight network layout with power supply, sensor and wallpod.



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MAINSTREAM DYNAMIC BY ACUITY BRANDS
2BLT-2X2-NTUNE

Sample Product Cutsheets (Lighting)

2BLT Tunable White Volumetric Recessed Lighting 2'x2'

Sensor Options*				
Option	Automatic Dimming Photocell	Occupancy Sensing		nLight Wired Networking
		PIR	PDT	
NES7		X		X
NES7ADCX	X	X		X
NESPDT7			X	X
NESPDT7ADCX	X		X	X

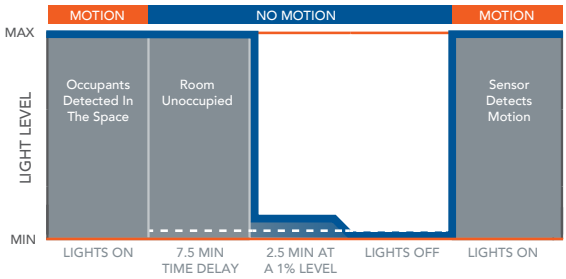
* Requires network to be present for sensors to operate

nLight Wired Networking

The nES 7 is ideal for small rooms without obstructions or areas with primarily walking motion. Ideal areas include hallways, corridors, storage rooms, and breakrooms. Additionally, the NES7ADCX includes an integrated photocell, which enables daylight harvesting controls.

For areas like restrooms, private offices, open offices, conference rooms or any space with obstructions, the nES PDT 7 dual technology sensor is recommended. The nES PDT 7 utilizes both PIR (passive infrared) and Microphonics technologies to detect occupancy. Additionally, the NESPDT7ADCX includes an integrated photocell, which enables daylight harvesting controls which is ideal for areas where windows are present.

Sequence of Operation

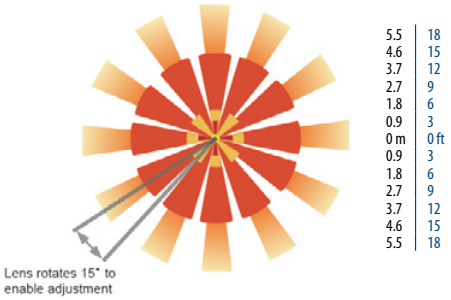


*The presetting on the automatic dimming photocell is 5fc.

Sensor Coverage Pattern
Mini 360° Lens

- Recommended for walking motion detection from mounting heights between 8 ft (2.44 m) and 20 ft (6.10 m)
- Initial detection of walking motion along sensor axes at distances of 2x the mounting height up to 15 ft (4.57 m) and
- 1.75x up to 20 ft (6.10 m).
- Provides 12 ft (3.66 m) radial detection of small motion when mounted at 9 ft (2.74 m)
- Initial detection will occur earlier when walking across sensor's field of view than when walking directly at sensor

9 FT Mounting

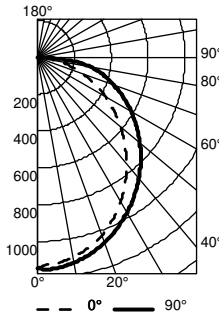


Sample Product Cutsheets (Lighting)

2BLT Tunable White Volumetric Recessed Lighting 2'x2'

PHOTOMETRICS

2BLT2 TUWH PROR 33L ADP @3000K, 82CRI, 3330 delivered lumens, test no. LTL28918P243, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1145	1145
5°	1122	1149
15°	1071	1105
25°	969	1023
35°	831	916
45°	671	792
55°	506	656
65°	344	514
75°	182	369
85°	45	151
90	5	2

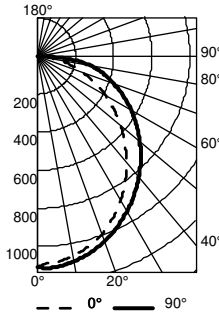
Coefficients of Utilization

RCR	pf pc pw	80% 70%	50%	30%	20% 50%	30%	10%	70% 50%	30%	10%	50% 30%	10%
0		119	119	119	116	116	116	111	111	111		
1		108	103	98	100	96	92	96	92	89		
2		98	89	82	87	80	75	83	78	73		
3		89	78	69	76	68	62	73	66	61		
4		81	69	60	67	59	52	65	57	52		
5		75	61	52	60	52	45	58	50	44		
6		69	55	46	54	46	39	52	45	39		
7		64	50	41	49	41	35	48	40	34		
8		59	46	37	45	37	31	44	36	31		
9		56	42	34	41	33	28	40	33	28		
10		52	39	31	38	30	25	37	30	25		

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	875	26.3	26.3
0° - 40°	1423	42.7	42.7
0° - 60°	2507	75.3	75.3
0° - 90°	3331	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3331	100.0	100.0

2BLT2 TUWH PROR 33L ADP @4000K, 82CRI, 3223 delivered lumens, test no. LTL28918P246, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1108	1108
5°	1086	1112
15°	1036	1069
25°	937	990
35°	804	886
45°	650	766
55°	490	634
65°	333	498
75°	176	357
85°	44	146
90	5	2

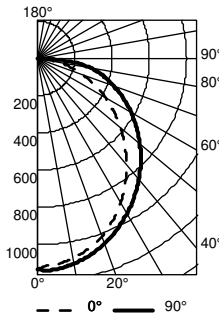
Coefficients of Utilization

RCR	pf pc pw	80% 70%	50%	30%	20% 50%	30%	10%	70% 50%	30%	10%	50% 30%	10%
0		119	119	119	116	116	116	111	111	111		
1		108	103	98	100	96	92	96	92	89		
2		98	89	82	87	80	75	83	78	73		
3		89	78	69	76	68	62	73	66	61		
4		81	69	60	67	59	52	65	57	52		
5		75	61	52	60	52	45	58	50	44		
6		69	55	46	54	46	39	52	45	39		
7		64	50	41	49	41	35	48	40	34		
8		59	46	37	45	37	31	44	36	31		
9		56	42	34	41	33	28	40	33	28		
10		52	39	31	38	30	25	37	30	25		

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	847	26.3	26.3
0° - 40°	1377	42.7	42.7
0° - 60°	2426	75.3	75.3
0° - 90°	3224	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3224	100.0	100.0

2BLT2 TUWH PROR 33L ADP @5000K, 82CRI, 3292 delivered lumens, test no. LTL28918P249, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1131	1131
5°	1109	1136
15°	1058	1092
25°	957	1012
35°	821	905
45°	664	782
55°	500	648
65°	340	508
75°	180	365
85°	45	149
90	5	2

Coefficients of Utilization

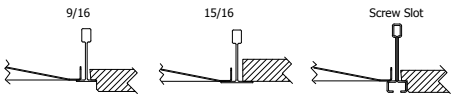
RCR	pf pc pw	80% 70%	50%	30%	20% 50%	30%	10%	70% 50%	30%	10%	50% 30%	10%
0		119	119	119	116	116	116	111	111	111		
1		108	103	98	100	96	92	96	92	89		
2		98	89	82	87	80	75	83	78	73		
3		89	78	69	76	68	62	73	66	61		
4		81	69	60	67	59	52	65	57	52		
5		75	61	52	60	52	45	58	50	44		
6		69	55	46	54	46	39	52	45	39		
7		64	50	41	49	41	35	48	40	34		
8		59	46	37	45	37	31	44	36	31		
9		56	42	34	41	33	28	40	33	28		
10		52	39	31	38	30	25	37	30	25		

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	865	26.3	26.3
0° - 40°	1407	42.7	42.7
0° - 60°	2478	75.3	75.3
0° - 90°	3293	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3293	100.0	100.0

Performance Data			
Lumen Package	**Lumens**	**Input Watts**	**LPW**
20L ADP @3000K, 82CRI	2067	20	103
20L ADP @4000K, 82CRI	2107	15	140
20L ADP @5000K, 82CRI	2152	18	120
33L ADP @3000K, 82CRI	3330	34	98
33L ADP @4000K, 82CRI	3223	27	119
33L ADP @5000K, 82CRI	3293	31	106
40L ADP @3000K, 82CRI	4142	39	106
40L ADP @4000K, 82CRI	4008	30	134
40L ADP @5000K, 82CRI	4094	35	117

MOUNTING DATA	
Ceiling Type	**Appropriate Trim Type**
Exposed grid tee (1' and 9/16")	G
Concealed grid tee	G
Plaster or plasterboard	G*



*DGA accessory available to provide ceiling trim flange and fixture support for plaster or plasterboard ceiling. Recommended rough-in dimensions for DGA installation is 24-3/4" x 24-3/4" (Tolerance is +1/8", -0").

LITHONIA LIGHTING®
An AcuityBrands Company

MAINSTREAM DYNAMIC BY ACUITY BRANDS

2BLT-2X2-NTUNE

Sample Product Cutsheets (Lighting)

LITHONIA LIGHTING

BLT Series Tunable White

The first tunable platform integrated into a mainstream digital control network

Tunable White Lighting Solutions for the Classroom

Research[1] supports that lighting can have a positive effect on learning and attention. Lithonia Lighting® and Acuity Controls bring lighting adaptability in an easy-to-use plug & play platform. With simple elegance, nLight® delivers dimming and color tuning effects at the touch of a button.

Tunable White is perfect in classrooms and educational settings as it allows the light color temperature to be adjusted to the optimal light level for student tasks such as reading or test taking.

Mainstream Dynamic Tunable White

Mainstream Dynamic brings exciting features once reserved for niche applications into everyday lighting systems. The Tunable white features allows for the inclusion of white light into various scenes—matching the optimal light for different activities.

When Tunable White is deployed on our nLight controls network, we call it **nTune**. This allows nLight to control lighting color temperature on the same network that manages motion detection, daylight harvesting and dimming. Customers can build a system of controls and luminaires that work seamlessly together.

BLT Series Luminaire

nLight Tunable White Wallstation

MAINSTREAM DYNAMIC
BY ACUITY BRANDS

1 Supporting research www.acuitybrands.com/blttwresearch

Commercial Indoor

AcuityBrands.

Sample Product Cutsheets (Lighting)

BLT Series Tunable White

MAINSTREAM DYNAMIC
BY ACUITY BRANDS

The ***General*** setting provides cool, crisp light ideal for **collaboration**.

The ***Reading*** setting offers relaxing, warmer light for **personal focus tasks**.

The ***Testing*** setting is a neutral, **non-distracting** color temperature.

The ***Energy*** setting is cooler, **refreshing** light to help combat afternoon fatigue.

Features

- Simple plug & play installation by utilizing the nLight network
- Select pre-set color temperatures or adjust to any CCT in the Productivity Range 3000K-5000K
- Optional pre-set and engraved wallpods available with 4 default settings (General, Reading, Testing and Energy)
- Customize your application with SensorView™

A+ Certified solutions from Acuity Brands help you quickly and confidently select and implement lighting systems that are both compatible and consistent.

BLT Series offers more sizes for greater flexibility

2x2 1x4 2x4

Pre-programmed custom engraved wallpods*

nPODM
2P DX CCT

nPODM
4S DX EDUTW

nPODM
4S EDUTW

*Also available without pre-programming and engraving to configure to your customer's optimized settings.

For more information visit www.lithonia.com

One Lithonia Way | Conyers, Georgia 30012 | Phone: 800.279.8041 | www.acuitybrands.com
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AcuityBrands.

Sample Product Cutsheets (Lighting)

AcuityControls
nLight®

nLight® takes Tunable White Mainstream

nLight® now natively controls lighting color temperature on the same network that manages motion detection, daylight harvesting and dimming.

Tunable White is perfect in classrooms and educational settings as it allows both the light level and color temperature to be adjusted to the optimal setting for student tasks; such as reading or test taking. nTune™ technology is digital control of color temperature and intensity for nLight enabled luminaires, now an option on the BLT LED luminaires from Lithonia.

Features

- Full luminaire color temperature control through the productivity range 3000K – 5000K
- nLight Wallpods available with default of 4 recommended settings (Reading, Testing, Collaboration and Energy Up)
- Luminaires with nTune technology are compatible with all existing nLight devices
- Tunable White is fully programmable with SensorView™
- Available as an option on the BLT Series Tunable White luminaire

BLT Luminaire

Mainstream Dynamic Tunable White

With Tunable White, you can create white light that shifts seamlessly between color temperatures. Designers and facility operators are granted the freedom to tie scenes to specific activities, or to complement colors or materials within a visual environment.

www.acuitycontrols.com

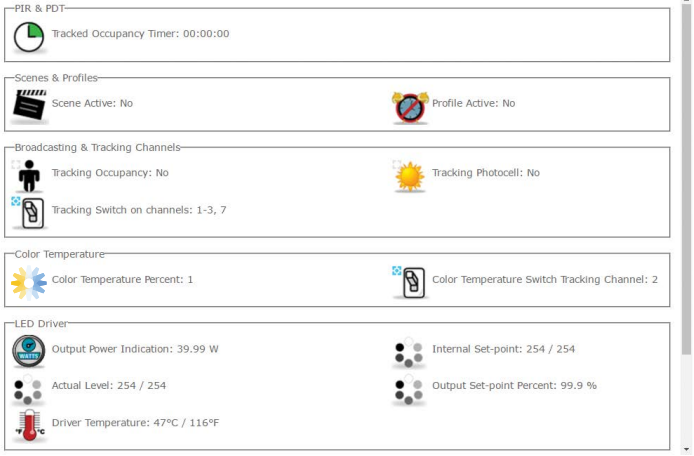
Sample Product Cutsheets (Lighting)

AcuityControls nLight

2qty user keypads @ Instructor Station (side-by-side) for tunable white option:
nPODM 2P DX CCT
nPODM 4S EDUTW

SensorView Features and Status Panel

- Tunable white switch bindings and scenes can be programmed and modified through SensorView
- Real-time tunable white level available
- Digital LED driver connection enabling tunable white control provides additional driver information (e.g. output power reading and internal driver temperature)



Wallpods for Tunable White Applications

Manually adjust light levels (brighter or dimmer), independent of the color temperature of light

Manually adjust color temperature (CCT) in warmer or cooler increments

nPODM 2P DX CCT

nPODM 4S DX EDUTW

Preset scenes with user-defined "recipe" for color temperature and light level

nPODM 4S EDUTW

A+ Certified solutions from Acuity Brands help you quickly and confidently select and implement lighting systems that are both compatible and consistent.

For lighting applications, A+ means verified consistent performance, visual appearance and system interoperability of all luminaires and controls within the certified solutions. For lighting professionals it means confidence that all parts of the lighting system will work together and meet common Acuity Brands specifications.

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AcuityBrands.

Sample Product Cutsheets (Lighting)

ALTERNATE

FINELITE

BUY AMERICAN ACT OF 2009 COMPLIANT

Tuneable White FineTune™ System Wall Controller

INDUSTRY BEST 10 YEAR LED WARRANTY

Fine TUNE™ TUNABLE WHITE SYSTEM

Next Generation LUMINAIRES 2015 "Outstanding User Interface"

Intertek 3196318

Date

Project

Type

Comments

DESCRIPTION

FineTune™ controls are easy to use and are covered by a single source 10-year warranty. The FineTune Wall Controller can tune the color temperature and dim the light levels of the FineTune enables luminaires through presets or incremental controls.

Master On/Off
Turns all FineTune system luminaires On or Off

Color Readout
Displays current color temperature selected

Color Presets
Easily select desired color temperature from 6500K to 2700K

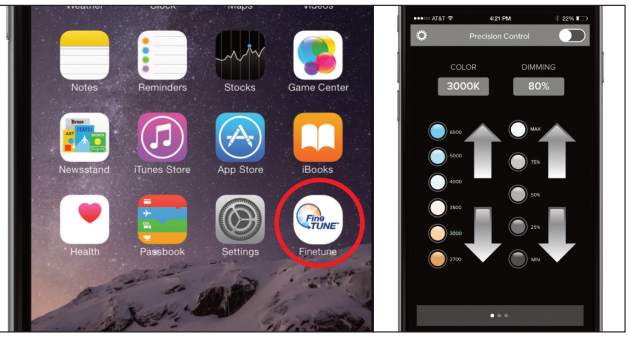
Dimming Presets
Select desired light levels from 100% (MAX) to 0.1%(MIN)

Continuous Dimming
Luminaires dim in 1% increments

Color Tuning
Luminaires change color in 25 CCT increments

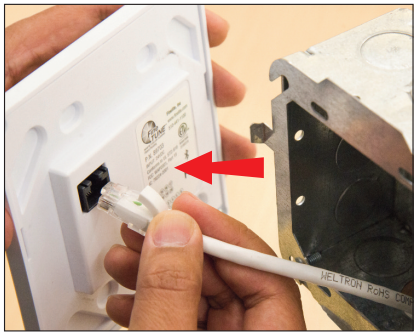
SMART PHONE APPLICATION

Scan this QR code to download app



Free smartphone application provides same level of control as our wall controller. The Smartphone app is available on Apple App store and Google Play just search for Finelite.

PLUG AND PLAY



Connect Cat5 cable to the back of the wall controller.

Finelite, Inc. • 30500 Whipple Road • Union City, CA 94587-1530 • 510 / 441-1100 • Fax: 510 / 441-1510 • www.finelite.com

Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

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Sample Product Cutsheets (Lighting)

ALTERNATE

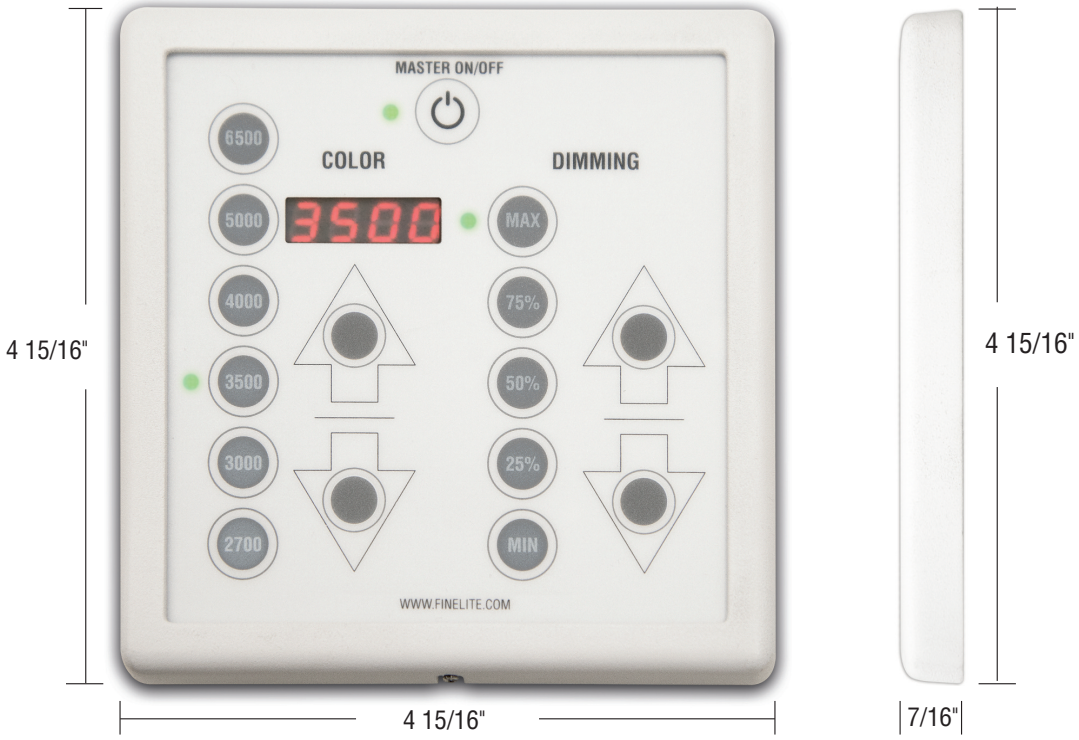
FINELITE

BUY AMERICAN ACT OF 2009 COMPLIANT

Tuneable White FineTune™ System Wall Controller

FINETUNE Wall CONTROLLER

The FineTune™ control interface installs on a 2-gang switch box.



SPECIFICATIONS

CONSTRUCTION: FineTune wall controller is constructed of durable nylon. Connects to system with factory supplied Cat5 cable.

PLACEMENT: Place the wall controller near entrance as per local codes if it is use as the only source of Master On/Off.

PLUG & PLAY CABLES: The user interface is connected to the FineTune Power Control Center (PCC) via plug and play Cat5 cable. Specify length necessary to reach between control and PCC.

FINISH: The control is finished in textured white, minimizing finger prints and dirt.

ELECTRICAL: Plug and play FineTune control is low voltage (24V). Plug and play Cat5 cables connect the control with the Power Control Center (PCC) are plenum rated.

LABELS: Fixture and electrical components are ETL-listed conforming to UL1598 in the U.S.A. and CAN/CSA C22.2 No. 250.0 in Canada. In accordance with NEC Code 410.73 (G), this luminaire contains and internal driver disconnect. Damp location.

WARRANTY: 10-year performance-based warranty on all standard components.

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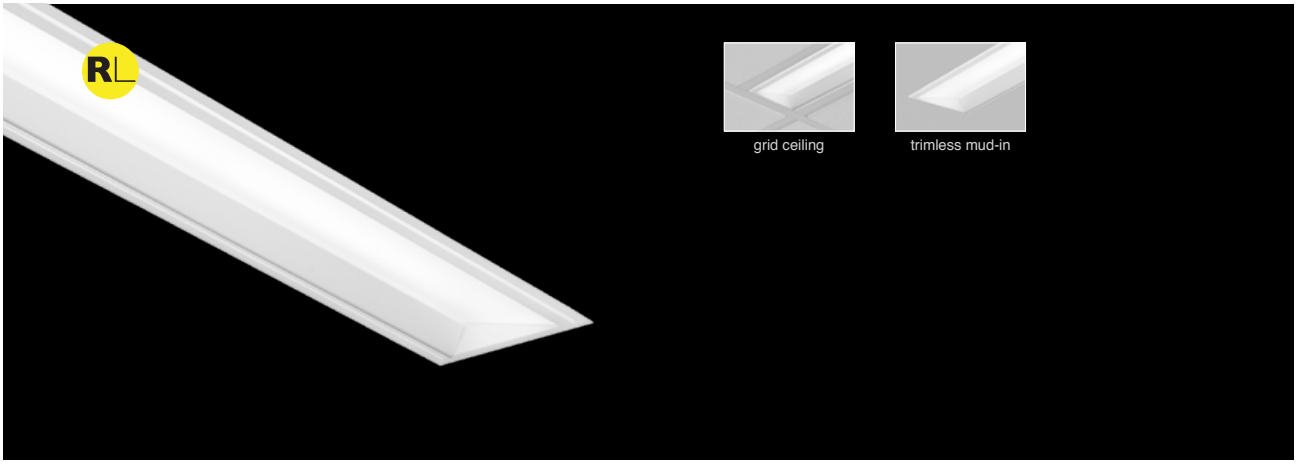
Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

Sample Product Cutsheets (Lighting)

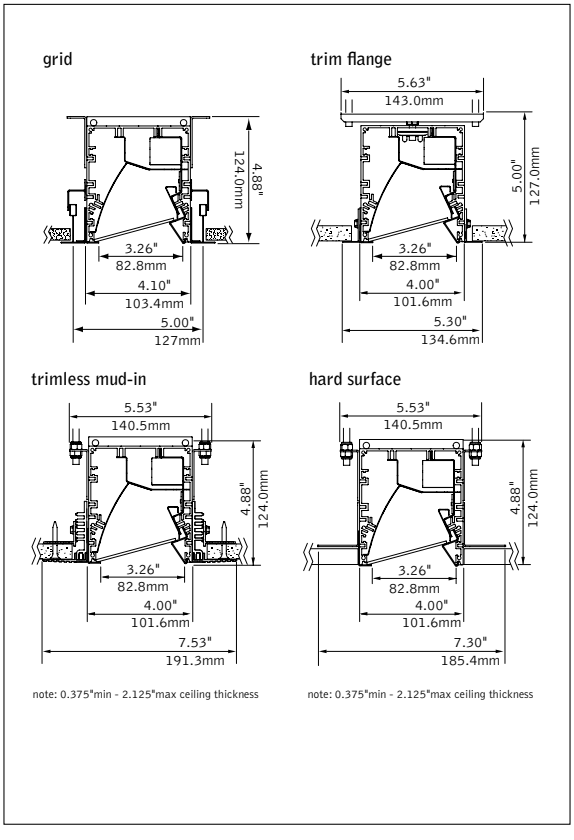
Seem® 4

LED ASYMMETRIC HIGH PERFORMANCE ANGLED LENS

FOCAL POINT®



DIMENSIONAL DATA



FEATURES

Narrow extruded aluminum 4" aperture recessed asymmetric LED luminaire.

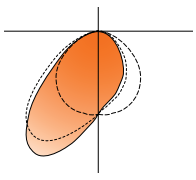
Integrates with ceiling in a variety of mounting styles for a clean, unobtrusive aesthetic.

Individual units and continuous runs in 1' increments.

Angled frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Concealed LEDs provide the perfect blend of high performance and visual comfort.

PERFORMANCE



4' Angeld Frosted Lens
875 Lumens per foot

Delivered Lumens: 3500lm

Total System Watts: 49W

PRODUCT OVERVIEW

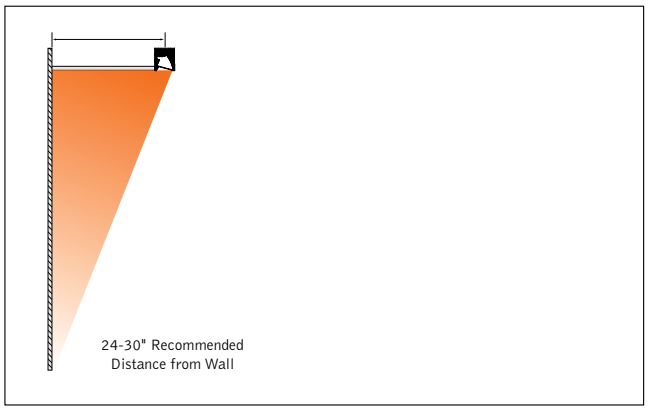
Lumen Output:	1100-3500lm
Wattage:	14-49W
LPW:	71-76
SDCM:	3

Photometric performance is measured in accordance with IESNA LM-79. Visit focalpointlights.com for complete photometric data. Visit designlights.org/QPL for model specifics.

Sample Product Cutsheets (Lighting)

fixture: project:

DETAILS



SPECIFICATIONS

LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 3000K, 3500K or 4000K with CRI>80, 3SDCM. LED modules and drivers are replaceable from below.

Construction

Extruded aluminum housing. 20 Ga. steel end caps. Housing for new construction applications. XFW acceptable for use with wood, Type Non- IC only. 2' unit weight: 18 lbs., 3' unit weight: 24 lbs., 4' unit weight: 30 lbs., 5' unit weight: 36 lbs.

Optic

Reflector fabricated of low iridescent, semi-specular premium grade aluminum. Acrylic lens .098" thick with satin finish, up to 8' continuous.

Electrical

Luminaires are pre–wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Dimming range 100% to 10%. Power factor > .9.

Emergency Battery

IOTA CP12. Emergency output—12W for 90 minutes. Maximum mounting height: 16ft Emergency Circuit maximum mounting height: 16ft

Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

Finish

Polyester powder coat applied over a multi-stage pre–treatment.

Lumen Maintenance

Calculated: L90 at 104,000 hours
Derived from EPA TM-21 calculator

Reported: L90 at >61,000 hours

Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

4' PERFORMANCE CHART

Shielding	Lumens per foot	Delivered Lumens	Tested System Watts	LPW
Angled Frosted Lens	275LF	1100	14	76
	375LF	1500	20	76
	625LF	2500	33	75
	875LF	3500	49	71

Based on 3500k, 4' lengths. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%

Focal Point LLC reserves the right to change specifications for product improvement without notification.

ORDERING

Luminaire Series		**FSM4AL**
Seem 4 Asymmetric LED	FSM4AL	
Shielding		**FL**
Angled Frosted Lens	FL	
Lumen Output		_____
275 Lumens per foot (Not available with Lutron driver)	275LF	
375 Lumens per foot (4' minimum with LU5 & LH1 Drivers)	375LF	
625 Lumens per foot (4' minimum with LU5 & LH1 Drivers)	625LF	
875 Lumens per foot	875LF	
Color Temperature		_____
3000K	30K	
3500K	35K	
4000K	40K	
Circuit		**1C**
Single Circuit	1C	
Voltage		**UNV**
120/277 UNV Volt	UNV	
Control System & Dimming Level		_____
0-10V - 10% Dimming	LD1	
0-10V - 1% Dimming	L11	
Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming	LH1	
Lutron 5-Series EcoSystem (LDE5) - 5% Dimming	LU5	
DALI 1% Dimming	D11	
Ceiling Configuration		_____
Std. 15/16" Lay-in	G1	
Std. 15/16" Tegular	T1	
Std. 9/16" Lay-in	G2	
Std. 9/16" Tegular	T2	
9/16" Slot-tee Tegular	G3	
Tall 15/16" Lay-in	G4	
Tall 15/16" Tegular	T4	
Tall 9/16" Lay-in	G5	
Tall 9/16" Tegular	T5	
Node 9/16" Tegular	T6	
Trim Flange Drywall	TF	
Mud-in Trimless, pre-set for 1/2" Drywall	XF1	
Mud-in Trimless, pre-set for 5/8" Drywall	XF2	
Mud-in Trimless, set thickness in field (Mounting equipment assembled in field)	XFF	
Non-Drywall Hard Surface	XFN	
Hard Surface, Wood	XFW	
Factory Options		
Chicago Plenum	CP	_____
Emergency Circuit (625LF & 875LF only)	EC	_____
Emergency Battery Pack (4' lengths or longer)	EM	_____
6' New York City Flex Whip (120V)	FNY1	_____
6' New York City Flex Whip (277V)	FNY2	_____
6' Flex Whip	FW	_____
Finish		**WH**
Matte White Housing	WH	
Luminaire Length (Lengths are nominal. 2' minimum length.)		_____
Specify luminaire/row length in 1' increments (Smaller increments available. Consult factory for details.)	X'	

For more information visit focalpointlights.com/reference or consult factory.

Sample Product Cutsheets (Lighting)

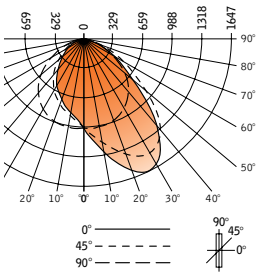
Seem® 4

ASYMMETRIC LED

FSM4AL-FL-625LF-35K-1C-120-LD1-G1-WH-4'

Filename:	FSM4ALFL635LF35K.IES	Lumens:	2493lm
Test #:	18855.0	Watts:	33W
		LPW	75

CANDLEPOWER DISTRIBUTION



Vertical Angle	Horizontal Angle 0°	45°	90°	135°	180°	Zonal Lumens
0°	825	825	825	825	825	
5°	974	937	830	753	721	80
15°	1352	1187	827	655	617	261
25°	1647	1439	793	575	59	453
35°	1341	1413	729	471	412	552
45°	814	1048	588	343	290	492
55°	444	620	434	229	170	355
65°	202	314	261	117	85	209
75°	85	112	109	32	27	84
85°	16	11	11	0	8	8
90°	0	0	0	0	0	
95°	0	0	0	0	0	0
105°	0	0	0	0	0	0
115°	0	0	0	0	0	0
125°	0	0	0	0	0	0
135°	0	0	0	0	0	0
145°	0	0	0	0	0	0
155°	0	0	0	0	0	0
165°	0	0	0	0	0	0
175°	0	0	0	0	0	0
180°	0	0	0	0	0	0

LUMEN SUMMARY

	Zone	Lumens	% Fixture
	0-30°	793	31.8
	0-40°	1345	54.0
	0-60°	2192	88.0
Total Luminaire	0-90°	2493	100.0
	0-180°	**2493**	**100**

CO-EFFICIENTS OF UTILIZATION

Floor		80				70			20				00
Ceiling									50		30	10	
Wall	70	50	30	10	70	50	10	50	10	50	10	50	10	00
RCR 0	119	119	119	119	116	116	116	111	111	106	106	102	102	100
1	111	107	104	101	108	105	99	101	96	97	93	94	90	88
2	103	96	90	86	100	94	85	91	83	88	81	85	79	77
3	95	86	79	74	93	85	73	82	72	79	71	77	70	68
4	88	77	70	64	86	76	63	74	63	71	62	69	61	59
5	81	69	61	55	79	68	55	66	54	64	53	62	53	51
6	74	62	54	48	73	61	48	59	47	58	47	56	47	45
7	69	56	48	42	67	55	42	54	42	52	41	51	41	39
8	63	50	42	36	63	49	36	48	36	47	36	46	36	34
9	58	45	37	31	57	44	31	43	31	42	31	41	31	29
10	54	41	33	28	52	40	28	39	28	38	27	37	27	26

Numbers indicate percentage values of reflectivity.

Go to www.focalpointlights.com for additional photometric data.

note: Photometric testing performed in an independent lab with standard lamps and ballasts. Lamp and ballast type and configuration will affect photometric performance.

Sample Product Cutsheets (Audio-Visual)

Q-SYS Core 110f

Unified Core

Q-SYS Core 110f
Specification Sheet

Features

- 128x128 Network Audio Channels
- 16x16 USB Audio Channels
- 24 Channels of Total Analog Audio
- 8 Configurable Flex Channels
- 16x16 GPIO Logic Ports
- 16 Channels of Routable AEC
- Multiple Instance VoIP Lines
- Single POTS Telephone line
- 3 Year Warranty

The Q-SYS™ Core 110f provides a solution for small, single room allowing the Q-SYS platform to accommodate every-day, simple projects up to the largest Enterprise scale deployments. QSC's software based DSP Platform Q-SYS, gives the systems integrator and end-user a unified software design tool and feature set suitable for projects of any scale. The continuity of the Q-SYS software based DSP platform is unique within the competitor space and allows the Q-SYS Core 110f to leverage all the features that are available across the entire Q-SYS Platform to be used in the following applications: Acoustic Echo Canceling (AEC) and sound reinforcement in small to large meeting or multipurpose rooms, sound reinforcement in performance venues such as house of worship and theater, background music systems, wide area paging in airports, convention centers and hospitals.

The Q-SYS Core 110f is a multipurpose software based digital audio signal processor with a total of 8 balanced analog line level audio inputs and 8 balanced analog line level audio outputs. In addition to the fixed 8x8 analog audio I/O, the Core 110f features a software definable bank of 8 balanced analog audio Input/Output Flex Channels, a unique QSC innovation, where each channel can be independently configured during design or run time as either a microphone/line level input or a line level output. As such, the Core 110f offers class leading 24 analog I/O density plus additional specialized I/O such as VoIP, POTS, Internal Media Playback/Recording HDD and USB.

The Q-SYS Core 110f supports a class leading USB audio device port connection that enables the processor to appear in a Microsoft Windows or Mac OS host operating system simultaneously as both a USB Audio and Communications device. The USB Device port (B type) implementation supports up to 16x16 digital audio channels in a flexible, design time configuration environment that can advertise as multiple virtual USB device instances to the host operating system concurrently over a single physical USB connection. In addition to the USB Device port, the Core 110f provides 6 USB Host ports (A type) which enable the Core to host external USB devices and future Q-SYS peripheral products.

Sample Product Cutsheets (Audio-Visual)

Q-SYS Core 110f

Specification Sheet

Benefits

- **Class leading I/O:** Q-SYS Core 110f has 24 analog I/O + USB, POTS and VoIP simultaneously in a single rack space and one SKU, offering the best cost to I/O ratio in a single chassis product available on the market from any manufacturer.
- **Flex Channels:** Nearly all the flexibility of a card based DSP solution without the cost and inconvenience of multiple SKU's and custom parts ordering.
- **Unified software platform:** Single training investment in one software design tool rather than needing to learn several platforms to scale from small to large systems or support different applications.
- **Industry leading hardware design:** Future proof investment in standards based software and computer technology running on Intel processors.
- **Industry first, software based DSP:** Q-SYS suite of conferencing technology applications built and owned by QSC from the ground up allowing for continued refinement.
  - o Software based routable AEC; no additional hardware needed
  - o SIP Softphones offering multiple instances per Q-SYS Core; no additional hardware needed
  - o Gain sharing and gating automixers
- **True IT Software Integration:** The Core 110f provides more than just networked audio integration and is not just another hardware DSP. Q-SYS is primarily a software platform that offers greater software integration functionality such as native support for LDAP contact server integration, SNMP monitoring, SIP Softphones, and software based routable AEC implementation; it truly is a next generation AV/IT product that is free of the fixed hardware limitations seen in competing products.

Key Features

- 128x128 networked audio channels (Q-LAN / AES67), reduced to 64x64 when using Video Bridging capability on built-in USB-B port.
- Up to 24 configurable analog audio I/O
- 8 mic/line level analog audio inputs
- 8 line level analog audio outputs
- 8 Flex Channel mic/line level analog audio inputs or outputs
- Up to 16 assignable and routeable AEC processor instances
- Dual Gigabit Ethernet ports with assignable application resources offering any combination of VoIP, Q-LAN Control, Q-LAN audio or network redundancy
- Up to 16x16 channels of digital audio in and out via software definable USB instances advertised to the host operating system
- 16 General Purpose Inputs (GPI) x 16 General Purpose Outputs (GPO)
- Internal Universal Power Supply plus 12 Volt DC External Power Supply input for redundancy or non-mains power supply sources
- Single software platform for system configuration, control and monitoring via Q-SYS Designer software over Ethernet with support for static or Auto/DHCP TCP/IP addressing
- POTS telephone interface via a standard RJ-11 connector
- Supports up to 4 VoIP Softphone instances in addition to the onboard POTS telephone interface
- Fully compatible with all existing and future Q-SYS accessories such as IO Frames, Paging Stations, and Touch Screen Control Surfaces running Q-SYS user control interfaces
- CE marked, UL listed, and RoHS compliant
- Covered by QSC Systems 3-year warranty

Sample Product Cutsheets (Audio-Visual)

Q-SYS Core 110f

Inputs	Q-SYS Core 110f
Input Frequency Response	
20Hz to 20kHz @ +21dBu	+0.05% / -0.5%
Input THD+N @ 1KHz	
@ +21 dBu Sensitivity & +21 dBu input	< 0.1%
@ +21 dBu Sensitivity & +10 dBu input	< 0.0015%
@ +10 dBu Sensitivity & +8 dBu input	< 0.0007%
@ -10 dBu Sensitivity & -10.5 dBu input	< 0.0006%
@ -39 dBu Sensitivity & -39.5 dBu input	< 0.007%
EIN (no weighting, 20Hz to 20kHz)	< -121dB
Input to Input Crosstalk @1kHz	> 110dB typical, 90dB Max
Input Dynamic Range	
@ +21 dBu Sensitivity	> 109.5dB
@ +10 dBu Sensitivity	> 106.4dB
@ -10 dBu Sensitivity	> 104.6dB
@ -39 dBu Sensitivity	> 104.6dB
Input Common Mode Noise Rejection	
@ +21 dBu Sensitivity	50.7dB
@ +10 dBu Sensitivity	56.5dB
@ -10 dBu Sensitivity	73.2dB
@ -39 dBu Sensitivity	63.2dB
Input Impedance (balanced)	5K ohms nominal
Input Sensitivity Range (1dB Steps)	-39 dBu min to +21 dBu max
Unbalanced Input Signal Level	+ 8 dBu max
Phantom Power	+48V DC, 10mA per input max
Sampling Rate	48kHz
A/D – D/A Converters	24-bit

Outputs

Output Frequency Response	
20Hz to 20kHz @ all settings	+0.2 / -0.5 dB
Output THD	0.003%, +10 dBu max output level
Output Crosstalk @1kHz	> 100dB typical, 90dB max
Output Dynamic Range	> 108dB
Output Impedance (balanced)	220 ohms
Output Level Range: (1dB Steps)	-39 dBu min to +21 dBu max

USB Inputs & Outputs

USB B		
Bit Depth	16-bit	
Number of Channels	up to 16x16	
Sample Rate	48kHz	
Power Consumption	60 watts, typical. 120 watts max	
BTU/Heat load:	205 BTU/Hour	
Compliance	FCC Part 15B (USA), FCC part 68 / TIA-968-B (USA), JATE (Japan), AS/ACIF S002 (Australia), PTC200 (New Zealand), ES203 021 (Europe), ANATEL Resolution 473 (Brazil), NOM-151-SCTI (Mexico), PSTN01 (Taiwan), Industry Canada CS-03 (Canada), CE marked (Europe), UL and C-UL listed (USA & Canada), RCM (Australia), EAC (Eurasian Customs Union) & RoHS Directive (Europe)	
Overall Dimensions/Weight	Device Height: 1.75 inches (44 mm) Device Width: 19.0 inches (483 mm) Device Depth: 11.12 inches (282.5 mm) Device Weight: 11 lbs. (5.0 kg)	Shipping Height: 6.0 inches (152 mm) Shipping Width: 23 inches (584 mm) Shipping Depth: 14 inches (356 mm) Shipping Weight: 12.4 lbs. (5.6 kg)

Specifications subject to change without notice.

Sample Product Cutsheets (Audio-Visual)

Q-SYS Core 110f

Specification Sheet

A&E SPECIFICATIONS

The system processor shall provide up to 128 x 128 networked audio channels individually configurable as either Q-LAN or AES67 formatted networked audio, channel count will reduce to 64 x 64 when using video bridging capability on the built-in USB-B device port. The system processor shall support 24 total analog I/O capacity and shall be presented in the following groupings; 8 Mic/Line inputs, 8 Line outputs and 8 Flex Channel I/O which shall be software definable analog inputs or outputs in single channel increments in any combination ratio.

The system processor shall have the following front panel controls and indicators: blue monochrome OLED display with page forward capacitive touch button, Unit ID capacitive touch button, Power On blue LED, Two USB A Type ports. The system processor shall provide a monochrome 304x96 blue OLED graphics display displaying the device name, design name and system status, LAN A and B settings, and the firmware version. Device Status shall be displayed on the OLED display including I/O status, muting, level present indication, and system status.

On the rear panel, the system processor shall have one 3-pin RS232 Euro Block Connector, HDMI Video Out, 16 GPI general purpose control inputs on 20-pin Euro Block Connector, 16 GPO general purpose control outputs on 20-pin Euro Block Connector. Q-SYS Network: LAN A RJ45 1000 MBps only, LAN B: RJ45 1000 MBps only. The dimensions of the System processor shall be 1.75” x 19” x 11.12” (44 mm x 483 mm x 356 mm).

The system processor shall store a single design which can be comprised of components, wiring, links, text, and graphics on a single or multiple schematic pages. Designs shall include any of the following DSP function blocks, test and measurement components, control components, and layout components: Acoustic Echo Cancellers, SIP Softphone instances, USB Audio host and device blocks, Audio Players, Audio Streaming components, Crossfaders, Crossovers, Delay components, Auto Gain control elements, Compressors, Gates, Duckers, Expanders, Ambient Noise Compensators, Limiters, Gain blocks, Graphic Equalizers, Parametric Equalizers, FIR Filters, All-Pass Filters, Band-Pass Filters, Band-Stop Filters, High-Pass Filters, Low-Pass Filters, FIR High-Pass filters, FIR Low-Pass Filters, Dual-Shelf Equalizers, Notch Filters, Meters, Matrix Mixers, Gain-Sharing Automatic Mixers, Gated Automatic Mixers, Signal Routers, Public Address Routers, Room Combiners, Signal Presence Meters, Tone Generators, Tone and Noise Generators, Dual Trace FFT Measurement Modules, Real Time Analyzers, Signal Injectors, and Signal Probes.

The system processor shall support custom user control interfaces on either proprietary touch screen controllers, or network computers utilizing a control application, or iOS devices on Wi-Fi. Custom control interfaces shall be capable of having multiple user-selectable pages with different controls on each.

The system processor and control engine shall be the QSC Q-SYS Core 110f Flex Channel Processor.

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Sample Product Cutsheets (Audio-Visual)

QSC

AcousticCoverage™ Series

AC-C6T

Two-way, ceiling mount loudspeaker

Features

- High quality transducers provide exceptional clarity through the critical voice range.
- Improved musicality often not seen in typical BGM class products.
- Ported baffle for increased low frequency extension down to 65 Hz.
- Low saturation 70/100V transformers with 8 ohm bypass.
- 4-pole Euroblock connector eases system wiring.
- Advanced voicing via QSC Intrinsic Correction™, applied using the Q-SYS™ Platform or CXD Series amplifiers platforms.
- White (RAL 9010) with UV inhibitors to match complimenting QSC product families.
- Complete EASE, CF2, CAD, & BIM information available online

Wide Area Paging · Background Music · Distance Conferencing Reinforcement· Healthcare Facilities · Concourses · Transportation Terminals · Ancillary Support in Larger Systems

The QSC AcousticCoverage™ Series AC-C6T is a ceiling-mounted 6" two-way loudspeaker with 70/100V transformer, suitable for a wide variety of audio/video conferencing reinforcement, voice paging and background music applications.

AcousticCoverage™ Series is designed to offer integrators a cost-effective solution for applications where voice reinforced coverage is of primary concern, while providing improved musicality often not seen in typical BGM class products.

The high quality 6-inch polypropylene cone transducer with butyl rubber surround and the sensitivity matched coaxially mounted .86-inch silk dome tweeter offers pristine clarity through the critical vocal range for increased speech intelligibilty. With 110 degrees of conical coverage, the AC-C6T reduces the number of loudspeakers required for even coverage in low ceiling applications.

The easy-to-install blind mount assembly features a ported baffle which optimally tunes the galvanized steel backcan for added musicality, creating low frequency extension down to 65 Hz. To maintain this frequency response, the AC-C6T utilizes a 30-watt low-saturation and low-loss 70/100V transformer with varying selectable taps, including an 8Ω bypass. The rotary tap selector switch is accessible under the painted steel grille.

To further enhance performance and speed of install with optimum result, advanced voicing via QSC Intrinsic Correction™ techniques are obtainable using the Q-SYS™ Platform networked audio processing platforms, including CXD Series amplifiers for a complete QSC systems solution.

Installers will appreciate the 4-pole Euroblock connector for loop-thru wiring, located under a quick access swivel plate. Eliminating the termination hassles of star topology wiring designs, the generous Euroblock of the AC-C6T can accept four 18AWG pairs.

A safety tether tab is affixed to the adjustable conduit clasp plate for seismic-sensitive installations. C-ring and tile rails are included with each pair packed assembly, complete with joining screws and cut-out template.

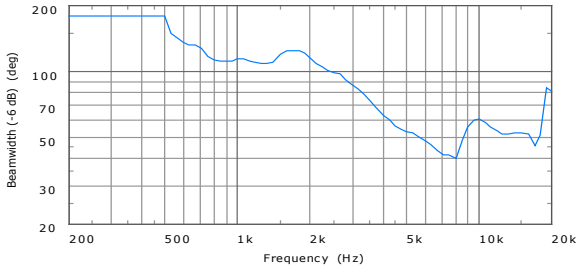
The AC-C6T baffle and grille are QSC standard white (RAL 9010) to match complimenting QSC product families and includes UV inhibitors to prevent discoloration over time. The AC-C6T may also be painted to match any décor.

For your system integration needs, complete EASE, CF2, CAD, and BIM files are available for download at QSC.com.

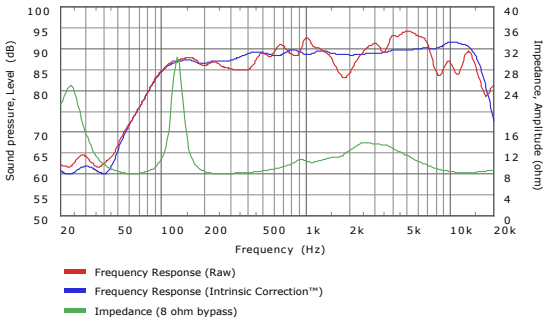
Sample Product Cutsheets (Audio-Visual)

AC-C6T Details

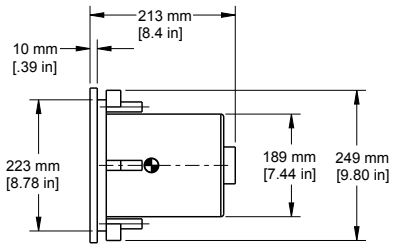
Beamwidth:

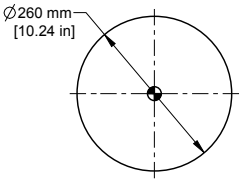


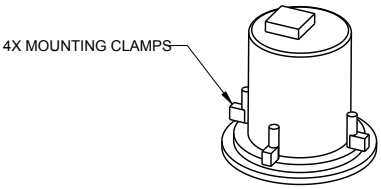
Impedance / Frequence Response:



Dimensions







Specifications:

System Details	AC-C6T
Effective frequency range[1]	65 Hz – 20 kHz
Rated noise power / voltage[2]	30 watts / 15.5 volts (rms)
Broad-band sensitivity[3]	89 dB SPL
Coverage angle (-6 dB)	110° (500 Hz - 5 kHz)
Maximum continuous SPL[4]	104 dB
Maximum peak SPL[4]	110 dB
Rated bypass impedance	8 ohms
Transformer taps	70 V: 30, 15, 7.5, 3.7, 1.9 watts 100 V: 30, 15, 7.5, 3.8 watts 8 ohm bypass
HF transducer	22 mm [.86 in] silk dome tweeter, coaxially mounted
LF transducer	152 mm [6 in] Polypropylene cone with butyl rubber surround
Input connector type	Euroblock connector with parallel output terminals
Baffle material	Painted ABS polymer
Grille material	Painted steel
Back can material	Galvanized steel
Testing	Listed UL1480, UL2043 safe for use in air handling space
Net weight	3.5 kg [7.6 lb]
Product dimensions	Ø260 x 213 mm [Ø10.24 x 8.4 in]
Cut-out Dimensions	Ø229 mm [Ø9 in]
Ceiling Capture Thickness	6.35 - 38.1 mm [0.25 - 1.5 in]
Shipping weight	9.5 kg [21 lb] (pair packed)
Shipping dimensions	622 x 318 x 324 mm [24.5 x 12.5 x 12.8 in]
Included accessories	Rails & C-ring for ceiling tile installation

[1] Half-space, -10 dB from on-axis sensitivity [2] IEC60268-1 noise signal for 2 Hrs
[3] On-Axis, half-space sensitivity, 2.83V, 1 m [4] Calculated from rated noise voltage and sensitivity

As part of QSC's ongoing commitment to product development, specifications are subject to change without notice.

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AC-C6T Spec Sheet 12/02/2016

Sample Product Cutsheets (Audio-Visual)

QSC

CXD-Q Series

CXD4.2Q | CXD4.3Q | CXD4.5Q

Multi-Channel Network Processing Amplifiers

Features

- Seamless Q-SYS integration with audio transport and control via standard Gigabit Ethernet protocols and hardware
- Capable of providing up to 5,000 W continuous and 8,000 W peak with 70V / 100V direct drive on the CXD4.3Q and CXD4.5Q
- Flexible Amplifier Summing Technology™ (FAST) permits total amplifier power to be distributed across one, two, three or all four channels
- PowerLight universal switchmode power supply with PFC for highest effiency, improved audio performance, and low weight.
- Mic/Line input Euroblock connectors and touch-proof Euroblock loudspeaker connections.
- Eight bi-directional GPIO connections that can be used for analog or digital inputs or outputs to/from Q-SYS
- Built-in energy saving modes ensure that the amplifier will draw the minimum amount of AC power while still providing outstanding audio quality
- Q-SYS technical support is available 24/7 - worldwide

The QSC CXD-Q Series represents a revolutionary advancement in amplifier technology and innovation, coupled with outstanding integration capability as part of a Q-SYS system. Designed specifically for the needs of integrators, CXD-Q provides efficient, robust and extraordinarily high fidelity power to drive multiple channels and configurations of loudspeakers – all with optimal energy and rack space efficiency. The CXD-Q Series consists of three powerful, four-channel amplifiers, each a Q-SYS peripheral enabling audio routing, processing, and control. Provided in the amps is the capability to configure and combine channels in various ways to drive a wide range of loudspeaker systems including 70V and 100V without the use of transformers. These amplifiers not only provide the power and processing make your system perform better, they offer outstanding efficiency ensuring that energy costs will be kept to a minimum over the life of the installation.

Flexible Amplifier Summing

CXD-Q amplifiers feature Flexible Amplifier Summing Technology™ (FAST) that actively, two, three or all four outputs. On the CXD4.3Q and CXD4.5Q, this power can also be used to drive 70V or 100V speaker lines directly from any one or all of the four outputs.

This flexibility allows CXD-Q Series amplifiers to drive (for example) two full-range surface mounted speakers along with a subwoofer and one 100V distributed speaker line; or a high-power subwoofer and a bi-amplified full-range loudspeaker; three 70V distributed speaker lines and a low impedance surface mount speaker line; or a single high-power channel driving monster subwoofers.

Q-SYS Connectivity

The CXD-Q amplifiers benefit from the strength of the Q-SYS platform. They are true Q-SYS peripherals meaning that they can connect on a Q-LAN Ethernet network and source and recieve audio signals. In addition to the four Mic/Line input and output channels, the CXD-Q amplifiers affer eight bi-directional Q-SYS GPIO ports for further interfacing with other equipment. It also means that when the CXD-Q amps are in a Q-SYS design the Q-SYS Core manages the system design and amplifiers. If for any reason an amplifier goes off-line or has a fault, the Core can alert the operator and ensure that system retains its integrity.

Power & Space Efficiency

CXD-Q Series amplifiers use QSC's next generation class-D power amp design in combination with a custom power stage utilizing a new output device. These purpose built MOSFET devices provide high voltage operation without needing a full bridge output and offer better audio quality and thermal performance due to co-location of the semiconductors.

CXD-Q amplifiers benefit from the proven PowerLight power supply, made even better with Power Factor Correction (PFC) that aligns the current waveform with the AC mains voltage waveform. PFC enables CXD-Q Series amps to draw current from the wall in a more efficient and controlled manner resulting in incredible power from a single standard AC breaker.

The CXD-Q amplifiers also incorporate several energy conservation and efficiency strategies. One such tool is the unique multi-stage sleep mode that saves energy when possible without sacrificing performance.

With four channels of Mic/Line input and four channels of amplification in just 2RU, the CXD-Q amplifiers replaces equipment taking up as much as three times the rack-space.

Integration Simplicity

Q-SYS is a complete integrated system that encompasses everything from the audio input to the output of the loudspeakers. As part of a Q-SYS system, the CXD-Q amplifiers are just some of the many peripherals that can be intuitively placed in a design and wired into the system. The centralized design maintains operational simplicity because not only does it allow for a "whole system" design philosophy, but the Q-SYS Core configures and manages all peripherals to ensure that all elements of the system are functioning correctly.

With the complete integration facilities provided by Q-SYS, and the power efficiency provided by the custom MOSFET and FAST, the CXD-Q amplifiers are perfect for nearly every installation application.

Sample Product Cutsheets (Audio-Visual)

CXD-Q Series Specifications

		CXD4.2Q	CXD4.3Q	CXD4.5Q
		Peak	Peak	Peak
4 Independent Channels A, B, C, D	70 V	N/A	500 W	1000 W
	100 V	N/A	625 W	1250 W
	8Ω	500 W	900 W	1200 W
	4Ω	700 W	1400 W	2000 W
	2Ω	625 W	1200 W	1600 W
2 Channels BTL Bridged A+B or C+D Doubles Voltage	8Ω	**1200 W**	**2400 W**	**4000 W**
	4Ω	**1500 W**	NR*	NR*
	2Ω	NR*	NR*	NR*
2 Channels Parallel AB or CD Doubles Current	8Ω	500 W	1300 W	1250 W
	4Ω	950 W	**2000 W**	**2400 W**
	2Ω	**1200 W**	**2500 W**	**4000 W**
1 Channel 3CH Parallel ABC Triples Current	8Ω	500 W	1400 W	1400 W
	4Ω	950 W	2400 W	2500 W
	2Ω	1800 W	3500 W	4500 W
1 Channel Bridged/Parallel AB+CD Doubles Current and Voltage	8Ω	**1600 W**	**3500 W**	**4500 W**
	4Ω	**2500 W**	**5000 W**	**7500 W**
	2Ω	NR*	NR*	NR*
1 Channel 4CH Parallel ABCD Quadruples Current	8Ω	500 W	1400 W	1600 W
	4Ω	1000 W	3000 W	3000 W
	2Ω	**1700 W**	**5000 W**	**5300 W**

NR = Not Recommended due to excessive current draw*

BOLD = Optimal configuration for the load and channel count

Sample Product Cutsheets (Audio-Visual)

CXD-Q Series Specifications

	CXD4.2Q	CXD4.3Q	CXD4.5Q
Typical Distortion			
8Ω	0.01 - 0.03%	0.01 - 0.03%	0.01 - 0.03%
4Ω	0.03 - 0.06%	0.03 - 0.06%	0.03 - 0.06%
Maximum Distortion			
4Ω - 8Ω	1.0%	1.0%	1.0%
Frequency response (8Ω)	20 Hz - 15 kHz +/- 0.2 dB 20 Hz - 20 kHz +0.2 dB / -0.7 dB	20 Hz - 15 kHz +/- 0.2 dB 20 Hz - 20 kHz +0.2 dB / -0.7 dB	20 Hz - 15 kHz +/- 0.2 dB 20 Hz - 20 kHz +0.2 dB / -0.7 dB
Noise			
Unweighted Output Unmuted	-101 dB	-101 dB	-101 dB
Weighted Output Muted	-109 dB	-109 dB	-109 dB
Gain (1.2V setting)	34.0 dB	38.4 dB	38.4 dB
Damping factor	>150	>150	>150
Input impedance	>10k, balanced or unbalanced	>10k, balanced or unbalanced	>10k, balanced or unbalanced
Input Sensitivity			
Continuously Variable:	Vrms 1.23mV to 17.35V dBu -56 to 27 dBv -58.2 to 24.8	Vrms 1.23mV to 17.35V dBu -56 to 27 dBv -58.2 to 24.8	Vrms 1.23mV to 17.35V dBu -56 to 27 dBv -58.2 to 24.8
Controls and indicators (front)	Power • Channel MUTE Buttons • Channel SELECT Buttons • Channel Input Signal and CLIP LED Indicators • Channel Output and LIMIT LED Meters • NEXT, PREV, ID Buttons • Control Knob		
Controls and indicators (rear)	AC Power Disconnect		
Input connectors	3-pin Phoenix		
Output connectors	8-pin Phoenix Speaker		
Amplifier and load protection	Short circuit, open circuit, thermal, RF protection. On/Off muting, DC fault shutdown, active inrush limiting		
AC Power Input	Universal Power Supply 100 - 240 VAC, 50 - 60 Hz		
Dimensions (HWD)	3.5" x 19" x 12" (89mm x 482mm x 305mm)	3.5" x 19" x 16" (89mm x 482mm x 406mm)	3.5" x 19" x 16" (89mm x 482mm x 406mm)
Weight, Net / Shipping	18.5 lb (8.4 kg) / 22 lb (10.0 kg)	21.0 lb (9.5 kg) / 25 lb (11.3 kg)	22.0 lb (10.0 kg) / 26 lb (11.8 kg)
Agency approvals	UL, CE, RoHS/WEEE compliant, FCC Class A (conducted and radiated emissions)		
Carton contents	IEC Cable, Quick Start Guide, Phoenix Connectors		

Burst Power- *20 ms 1 kHz sine burst, all channels driven*
Continuous Power- *EIA 1 kHz 1% THD, all channels driven*

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CXD4.5Q Spec Sheet 09/19/2016

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Sample Product Cutsheets (Audio-Visual)

QLX-D™ Digital Wireless Specifications (Note: All specifications are subject to change.)

System	**RF Carrier Frequency Range**	470–937.5 MHz, varies by region
	Image Rejection	>70 dB, typical
	Latency	<2.9 ms
	RF Sensitivity	-97 dBm at 10^{-6} BER
	Working Range	100 m (328 ft.) line-of-sight *Note: Actual range depends on RF signal absorption, reflection and interference.*
	Audio Frequency Range	20 Hz to 20 kHz *Note: Dependent on microphone type.*
	Audio Dynamic Range (System Gain @ +10)	>120 dB, A-weighted, typical
	Total Harmonic Distortion	<0.1% (–12 dBFS input, System Gain @ +10)
	Operating Temperature Range	-18°C (0°F) to 50°C (122°F) *Note: Battery characteristics may limit this range.*
QLXD4 Receiver	**Dimensions**	41 mm x 197 mm x 151 mm (1.63 in. x 7.75 in. x 5.94 in.)
	Weight	777 g (1.71 lbs.), without antennas
	Housing	Steel
	Power Requirements	12 V DC @ 0.4 A, supplied by external power supply (tip positive)
	Spurious Rejection	> 80 dB, typical
	Antenna Connector Type	BNC
	Antenna Impedance	50 Ω
	Gain Adjustment Range	-18 to +42 dB (in 1 dB steps)
	Configuration	¼" (6.35 mm): Impedance balanced (Tip = audio, Ring = no audio, Sleeve = ground) XLR: balanced (1= ground, 2 = audio +, 3 = audio –)
	Antenna Impedance	¼" (6.35 mm): 100 Ω (50 Ω Unbalanced) XLR: 100 Ω
	Full Scale Output	¼" (6.35 mm): +12 dBV XLR: LINE setting = +18 dBV, MIC setting = -12 dBV
	Mic/Line Switch	30 dB pad
	Network Interface	Single Port Ethernet 10/100 Mbps
	Network Addressing Capability	DHCP or Manual IP address
QLXD1 Bodypack Transmitter QLXD2 Handheld Transmitter	**Dimensions**	QLXD1: 86 mm x 65 mm x 23 mm (3.38 in. x 2.57 in. x 0.92 in.) without antenna QLXD2: 256 mm x 51 mm (10.1 in. x 2.0 in.) L x Dia.
	Weight	QLXD1: 138 g (4.9 oz.), without batteries QLXD2: 347 g (12.2 oz.), without batteries
	Housing	QLXD1: Cast aluminum QLXD2: Machined aluminum
	Battery Type	Shure SB900 Rechargeable Li-Ion or AA batteries 1.5 V
	Battery Runtime	(@ 10 mW) Shure SB900 rechargeable: up to 10 hours alkaline: up to 9 hours
	RF Output Power	1 mW or 10 mW
	Occupied Bandwidth	< 200 kHz
	Modulation Type	Shure proprietary digital
	Mic Offset Range	0 to 21 dB (in 3 dB steps)

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LEGENDARY PERFORMANCE™

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05/14

QLX-D™ Digital Wireless Systems

POWERFULLY REFINED WIRELESS

QLX-D™ Digital Wireless Systems

An Elevated Standard.

Transparent 24-bit digital audio.
Incredibly efficient wireless.
Powerful networking.
Rugged, secure systems.

Shure QLX-D™ Digital Wireless is the clear choice for exceptionally detailed wireless audio in widely diverse and demanding environments. A highly flexible system featuring streamlined setup and operation, QLX-D boasts impressive RF efficiency to get more channels on air using less spectrum, while the rugged all-metal construction withstands the rigors of constant use. From corporate seminars to music clubs, classroom lectures to houses of worship, Shure QLX-D Digital Wireless has it covered — delivering confident performance, no matter what the venue.

System Components

QLXD1 Bodypack Transmitter
QLXD2 Handheld Transmitter

- Rugged metal construction
- Backlit LCD with easy to navigate menu and controls
- 2 x AA batteries provide up to 9 hours of runtime
- Optional Shure SB900 lithium-ion rechargeable battery provides up to 10 hours of runtime
- External charging contacts for docked charging
- Multiple microphone cartridges available, including the legendary SM58® (QLXD2)

QLXD4 Receiver

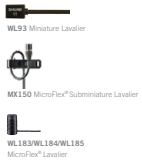
- Transparent, 24-bit digital audio
- 20 Hz – 20 kHz frequency range*
- 120 dB dynamic range
- 64/72 MHz overall tuning bandwidth**
- 17 compatible channels per 6 MHz TV channel
- More than 60 pre-set compatible channels per frequency band**
- AES 256-bit encryption
- Ethernet networkable receivers
- Network Scan finds clean frequencies for networked receivers
- AMX/Crestron control system ready
- ShurePlus™ Channels mobile app compatible
- Wireless Workbench® control software compatible

*Microphone dependent **Region dependent

Systems available with:

Handheld
Interchangeable SM, Beta, and KSM microphone cartridges

Lavalier
Miniature and subminiature lavalier condenser microphones



Headset
Comfortable over-the-ear design

Instrument
Microphone and cable options for instrument and line input

Sample Product Cutsheets (Audio-Visual)

Constellation

Acoustic System

Imagine the Possibilities with Flexible Acoustics

MULTIPLE SONIC ENVIRONMENTS IN ONE ROOM

In acoustics, one size does not fit all. Constellation offers an elegantly simple way for venues to transform architectural acoustics with a finger tap, affording a level of sonic flexibility never before possible.

A BEAUTIFUL MARRIAGE OF SOUND AND ARCHITECTURE

Constellation can seamlessly integrate into an environment, meaning designers can now create an uncompromising, holistic experience for the ear and the eye.

RETOUCHING ACOUSTICS FROM MUSIC HALLS TO CLASSROOMS

With its ability to tailor acoustics, Constellation has been adapted to provide optimal sound across a wide spectrum of environments, elevating listening experiences and reshaping building design.

Sample Product Cutsheets (Audio-Visual)

Enriching Physical Spaces through Engineering

A TECHNOLOGICAL LEAP IN VARIABLE ACOUSTICS

Constellation is a digital approach to controlling reverberation time, early reflections, and other key ingredients vital to the sonic clarity, warmth, and resonance of a space.

ONE POWERFUL PACKAGE

Constellation integrates high-quality loudspeakers, microphones, digital processing, patented algorithms, and proprietary certification techniques in a flexible package available exclusively from Meyer Sound.

USER-CENTERED DESIGN

Through close collaboration with your entire project team, Meyer Sound customizes each system to serve the unique needs of a venue, with easy-to-use presets that allow operators to make instant adjustments.

VISUAL INTEGRATION

System components are available in custom colors to blend seamlessly with your surroundings.

Solutions

Sample Product Cutsheets (Audio-Visual)

LIVE PERFORMANCE SPACES

> "In jazz and almost every form of music, extraordinary concerts can only happen when musicians hear each other clearly, and audiences hear and feel exactly what is happening on stage... If you have a space that is even slightly problematic, do yourself a favor—install Constellation and perfect the experience for both musician and listener."
>
> Wynton Marsalis
> Managing and Artistic Director, Jazz at Lincoln Center

CROSS-GENRE

> "[At SoundBox,] Constellation provides the optimal acoustics for each musical genre and has helped us create a space where audience and musicians can explore a new kind of musical journey together."
>
> Michael Tilson Thomas
> Music Director, San Francisco Symphony

CLASSICAL

> "[With Constellation,] the Meyers have thus had a democratizing influence, allowing ensembles to obtain pleasing results in problematic spaces. They have helped to make classical music a more mobile, adaptable beast, one that is freer to roam the entire cultural landscape. A mirage of the Musikverein can arise almost anywhere, with a few swipes on a screen."
>
> Alex Ross
> Music Critic, *The New Yorker*

Sample Product Cutsheets (Audio-Visual)

LT-800-072-01b
Stationary RF Transmitter (72 MHz)

Configuration:

LT-800-072-01 Stationary RF Transmitter (72 MHz) (North America)

Product Overview:

Offering outstanding audio clarity, digital signal strength, and 57 selectable channels, the LT-800 is a perfect RF transmitter choice for a wide range of applications. Connected to your main audio system, the LT-800 broadcasts strong, reliable audio to both belt pack receivers and stationary receivers, ideal for providing listeners with the best possible assistive listening experience.

Highlights:

- 100% digital signal transmission across up to six (6) channels simultaneously
- Look & Listen (TM) LCD display for quick channel, programming, and channel lock status information
- Balanced and unbalanced audio inputs allow for use with any audio source
- Built-in auto processor optimizes audio (voice or music) prior to transmission
- 57 available, selectable channels
- VU level meter and test tone for simple installation and set up
- 30-day, no-obligation demonstration available for your venue or business
- Backed by Listen Technologies' limited lifetime warranty and hassle-free support

Includes: One (1) LT-800 Stationary RF Transmitter (72 MHz)
One (1) LA-207 Power Supply for LT-800
One (1) Line Cord
One (1) Quick reference card

Product Specification: Stationary RF Transmitter (72 MHz)	
Audio	
Frequency Response	50 Hz - 15 kHz (±3 dB)
Signal-to-Noise Ratio	SQ enabled 80 dB, SQ disabled 60 dB
Audio Input 1	Rear panel, one (1) Female XLR or 1/4 in combo connector, balanced, 0 / -55 dBu (line/mic) nominal input level adjustable, -30 / +21 dBu (line/mic) maximum input level, impedance 20k / 1k ohm (line/mic), phantom power +12 VDC
Audio Input 2	Rear panel, two (2) phono connectors, unbalanced, -10 / +10 dBu nominal input level adjustable, +30 dBu maximum, impedance 100k ohm
Audio Processing	Compression can be turned on/off, slope internally adjustable from 1:1 to 4:1, default 2:1
Contour	Cuts and boosts frequencies above 5 kHz
Distortion	< 2% total harmonic distortion (THD) at 80% deviation
Audio Output	Input 1 and input 2, mixed output (rear panel), two (2) phono connectors, unbalanced, -10 dBu nominal output level, +15 dBu maximum, impedance 10 ohm
Headphone Output	Front panel, one (1) 3.5 mm (0.14 in.) stereo connector, unbalanced, adjustable output level, +3 dBu maximum, impedance 10 ohm
Controls	

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Sample Product Cutsheets (Audio-Visual)

LT-800-072-01b
Stationary RF Transmitter (72 MHz)

Product Specification: Stationary RF Transmitter (72 MHz)	
User Controls	Front Panel: Power, test tone on/off, channel up/down, input levels, mix level, contour, monitor volume controlRear Panel: Input 1 Level, (Line, Mic, Mic-Phantom Power), Input 2 level (-10 / +10 dBu), RF power level (low, mid, high)
Internal Adjustments	Compression ratio for audio processor
Programming	SQ on/off, process on/off, channel lock
Indicators	
LCD	Channel designation, lock status, RF power level, programming (front panel)
Audio Input Status LEDs	Indicates Input 1, Input 2, and Mix audio levels; 10 segment LED's (8 green, 2 red)
Processing	Indicated by a green LED when on (front panel)
Test Tone	Red LED illuminates when test tone is enabled.
RF Power	Indicated on the LCD (low, mid, high)
RF	
Frequency Range	72.025 - 75.950 MHz
Number of Channels	17 wide band, 40 narrow band
Frequency Accuracy	± .005% stability +32º to +122 ºF (0º to +50 ºC)
Antenna Type	Various antennas available
Transmitter Stability	50 PPM
Transmission Range	Up to 305 m (1,000 ft.)
Antenna Connector	BNC
Output Power	80,000 uV at 3 m
Number of Simultaneous Transmitters	6
Power	
Power Supply	In line power supply, Listen part number LA-207 (Line cord is determined by the each Country's AC power standards)
Power Supply Input	100-240 VAC, 50-60 Hz, 0.4 A
Power Supply Output	12 VDC, 1.3 A, 15.6 W
Power Supply Connector	0.02 in (5.0 mm) OD, 0.01 in. (2.5 mm) ID, barrel type
Compliance	UL, CE, GS, TÜV, RoHS
Physical	
Width	21.5 cm (8.50 in.)
Height	4.5 cm (1.75 in.)
Depth	23 cm (9.13 in.)
Color	Dark Grey with white silk screening
Unit Weight with Power Supply	1.6 kg (3.5 lbs.)
Shipping Weight	2.7 kg (6.0 lbs.)
Rack Mounting	One (1) rack space height, 1/2 rack space wide. One (1) or two (2) transmitters can be mounted in one rack space, optional rack mount (LA-326)
Weight	1.2 kg (2.6 lbs.)
Environmental	

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Sample Product Cutsheets (Audio-Visual)

LT-800-072-01b
Stationary RF Transmitter (72 MHz)

Product Specification: Stationary RF Transmitter (72 MHz)	
Temperature - Operation	-10 ºC (14 ºF) to +40 ºC (104 ºF)
Temperature - Storage	-20 ºC (-4 ºF) to +50 ºC (122 ºF)
Relative Humidity	0 to 95% relative humidity, non condensing
Compliance	
Safety	RoHS
RF	FCC Part 15, Part 90, Industry Canada

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Sample Product Cutsheets (Audio-Visual)

LR-4200-072b
Intelligent DSP RF Receiver (72 MHz)

Configuration:

LR-4200-072 Intelligent DSP RF Receiver (72 MHz)

Product Overview:

The LR-4200-072 receiver from Listen Technologies offers outstanding audio clarity and quality with the best range and reception in its class.

Part of our Intelligent Digital Signal Processing (iDSP) line, the LR-4200-072 is the smallest device of its kind, resulting in a compact unit that won't burden the end user. An integrated neck loop/lanyard makes each receiver easy to wear, and the DSP loop driver offers an improved listening experience for anyone with a T-coil-equipped hearing aid. Dual 3.5mm output jacks also allow receivers to be shared between users.

Each receiver is equipped with a micro USB connection which can be used with free iDSP software for charging, set up, programming, inventory management and firmware updates.

Extended speaking sessions, presentations and more can be challenging for other devices, but the LR-4200-072 incorporates advanced Lithium-ion rechargeable batteries that offer long life and reliable power. Charge status, along with channel information and volume level, are easy to read on the integrated OLED display.

From classrooms to boardrooms, conferences and more, the LR-4200-072 is an outstanding receiver choice for any venue looking to offer convenient, reliable assistive listening.

Highlights:

- High performance RF receiver offering best-in-class sensitivity and 20dB less noise than other devices
- Integrated neck loop/lanyard with DSP loop driver for an enhanced T-coil listening experience
- Smallest device of its kind makes it easier to wear and use and for venues to dispense, store and maintain
- OLED display showing channels, battery status, channel status, volume level, and more
- Limited lifetime warranty with hassle-free support
- Lanyard and belt clip options offer convenient and discreet choices for the end user
- Advanced rechargeable battery technology eliminates the costs and hassles associated with frequent battery replacement
- Designed for single-channel applications

Includes: One (1) LR-4200-072 Intelligent DSP RF Receiver (72 MHz)* *The LR-4200-072 comes with a quick start guide and a non-proprietary field replaceable Lithium-ion battery.

Product Specification: Intelligent DSP RF Receiver (72 MHz)	
Audio	
System Distortion	< 2% total harmonic distortion (THD) at 80% deviation
Output/s	Two (2) 3.5 mm (0.14 in.) connectors, unbalanced, 0 dBu nominal output level, 16 mW maximum, impedance 32 ohm
System Frequency Response	50 Hz - 15 kHz (±3 dB)

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Sample Product Cutsheets (Audio-Visual)

LR-4200-072b
Intelligent DSP RF Receiver (72 MHz)

Product Specification: Intelligent DSP RF Receiver (72 MHz)	
System Signal to Noise Ratio	SQ enabled 80 dB, SQ disabled 60 dB
Controls	
User Controls	Power, up/down volume
Programming	Via software and USB port
Set-up Controls	Press and hold up/down volume buttons for 5 seconds to enter channel adjust, use up/down to select channel
Indicators	
LEDs	Flashes when batteries are low or to indicate charging, solid when fully charged
Display	Channel designation, battery level, unit number, charging status
RF	
Frequency Range	72.0250 - 75.9500 MHz
Number of Channels	17 wide band, 40 narrow band
Sensitivity	.6uV typical, 1 uV maximum for 12 dB sinad
Frequency Accuracy	± .005% stability 32 to 122 ºF (0 to 50 ºC)
Squelch	Programmable in 20 steps, automatic on loss of RF signal
Antenna Type	Uses ear phone/neck loop lanyard and short ear phone cable or standard earphone cable
Power	
Power Supply	Micro USB connector, 5 V, 500 mA
Battery Type	Lithium Ion 3.7 Vdc, 1200 mAh
Battery Life	8 Hours of continuous use
Battery Charging Time	Fully charged in 2.5 Hours
Physical	
Color	Black
Unit Weight with Batteries	2.40 oz. (68 g)
Shipping Weight	3.20 oz. (91 g) with 1.0 lbs. (454 g) minimum
Dimensions (H x W x D)	3.75 x 2.00 x 0.64 in. (9.6 x 5 x 1.7 cm)
Unit Weight	1.60 oz. (45 g)
Dimensions with Belt Clip	3.75 x 2.00 x 0.80 in. (9.6 x 5.0 x 2.1 cm)
Environmental	
Temperature - Operation	14 to 104 ºF (-10 to 40 ºC)
Temperature - Storage	(-)4 to 122 °F (-20 to 50 °C)
Relative Humidity	0 to 95% relative humidity, non-condensing
Compliance	
Standards	FCC Part 15, Part 90, Industry Canada, RoHS

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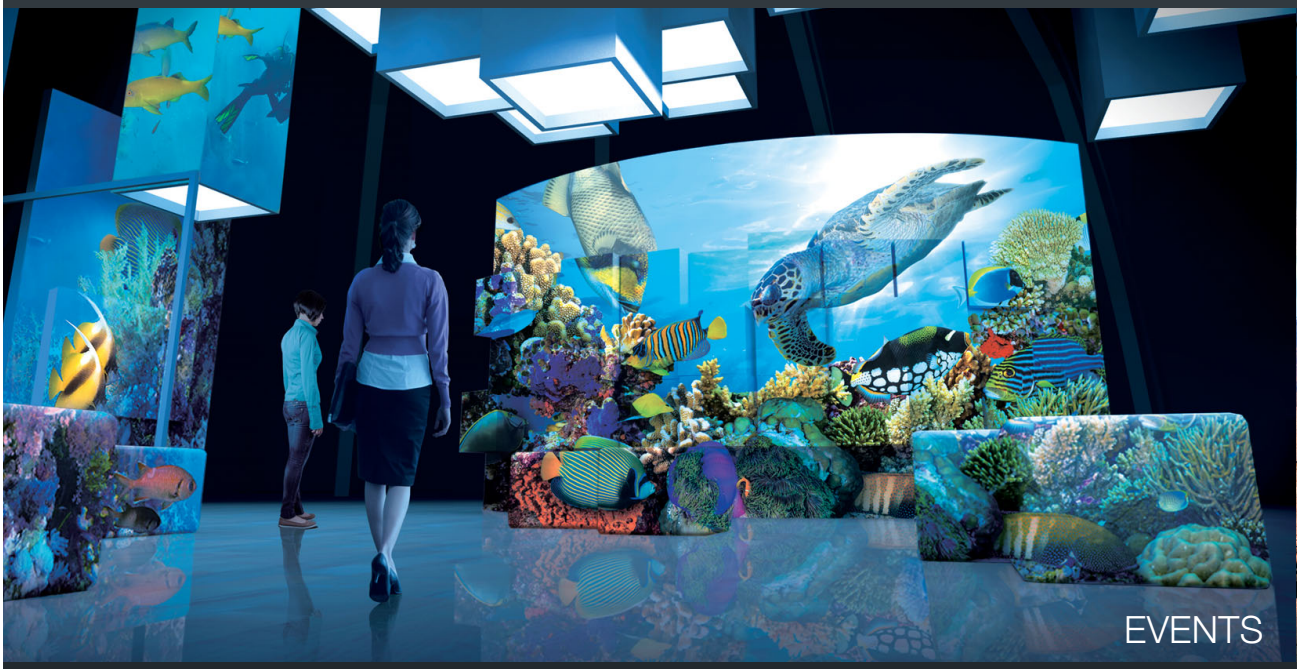
Sample Product Cutsheets (Audio-Visual)

Sample Product Cutsheets (Audio-Visual)



Engineered for Elite Marathon Performance in Permanent or Temporary Installations

With immersive picture quality and practical features, potential application for Panasonic's PT-RZ970 Series projectors extends from permanent installation in museums, theaters, and control rooms through roles in exhibition/rental and staging. Powered by the acclaimed SOLID SHINE Laser drive and latest 1-Chip DLP™ technology, these projectors exceed expectations with low-maintenance stability and vivid color performance maintained for longer than competitive products over years of dependable 24/7 operation. The PT-RZ970 Series: made by professionals, for professionals.

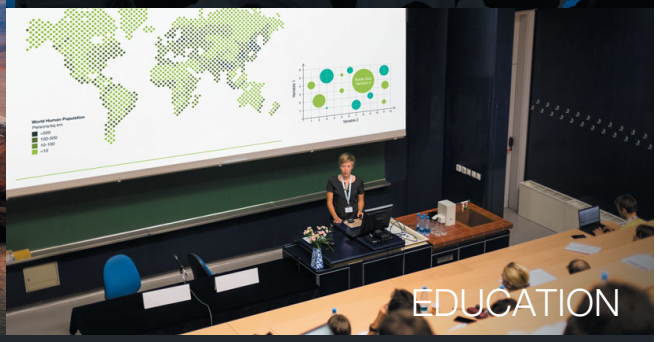
High Picture Quality | **Quick Start and Quick Off** | **Free 360° Install** | **Dust-Resistant Optics** | **Economical** | **20,000 hours*1 Maintenance free**

	PT-RZ970/RW930/RX110 Series			PT-RZ770/RW730 Series		PT-RZ660/RW620 Series	
	PT-RZ970/L	PT-RW930/L	PT-RX110/L	PT-RZ770/L	PT-RW730/L	PT-RZ660/L	PT-RW620/L
Resolution	WUXGA	WXGA	XGA	WUXGA	WXGA	WUXGA	WXGA
Brightness	10,000 lm (Center) 9,400 lm*		10,400 lm (Center) 10,000 lm*	7,200 lm (Center) 7,000 lm*		6,200 lm (Center) 6,000 lm*	
Contrast	10,000:1						

* Measured according to strict international ISO 21118 standards. Note: PT-RZ970L / RZ770L / RZ660L / RW930L / RW730L / RW620L / RX110L do not include a lens.

2

Sample Product Cutsheets (Audio-Visual)



See the Advantages of Panasonic's Laser Technology

SOLID SHINE Laser and DLP™ Projection Balances Image Quality with 20,000-hour Maintenance-free*1 Endurance

SOLID SHINE LASER

Harnessing Full-Spectrum Color with Up to 10,400 lm (Center)*2 Brightness

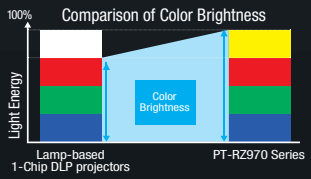
With next-generation DLP™ technology delivering high-resolution detail and dual laser modules outputting up to 10,400 lm (Center)*2 of brightness, Quartet Color Harmonizer to reduce energy loss from the light source, and robust heat-resistant phosphor wheel, the Panasonic SOLID SHINE Laser system produces scintillating images with unfailing reliability.

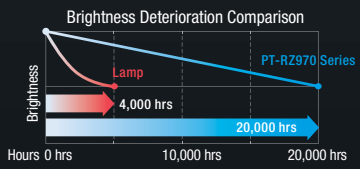
Superior White Balance and Color Reproduction

The Quartet Color Harmonizer wheel mechanism captures a wider color space than comparable projectors, which allows white to be reproduced realistically on screen. Some conventional projectors can't achieve an accurate white balance, so images can appear with a distracting greenish tint. Not the case with Panasonic SOLID SHINE Laser projectors.

SOLID SHINE Laser Maintains Picture Quality for Longer

Thanks to the long-lasting dual solid-state laser modules, there are no lamps to replace, and image color/brightness degrades very gradually in consistent, linear fashion. As well as reducing maintenance hassle, out-of-the-box picture quality is preserved longer.





*1 At this time the brightness will have decreased to approximately half of its original level (Dynamic Contrast Mode: 3, Image Mode: Dynamic). Panasonic recommends cleaning or checkup at point of purchase after about 20,000 hours. Light source lifetime may be reduced depending on environmental conditions. Replacement of parts other than the light source may be required in a shorter period.
*2 PT-RZ970/RW930 features 10,000 lm, PT-RZ770/RW730 7,200 lm, PT-RZ660/RW620 6,200 lm, and PT-RX110 10,400 lm of brightness (measured at center of screen).

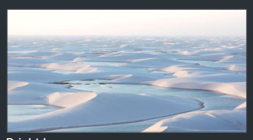
3

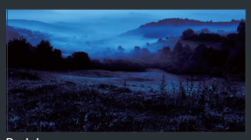
Sample Product Cutsheets (Audio-Visual)

Powerful Brightness, Excellent Picture Quality, Lasting Reliability

Dynamic Contrast Function for High Contrast

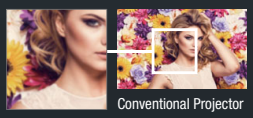
The PT-RZ970 Series directly modulates laser power output to achieve high contrast with low power consumption. Digitally controlled frame-by-frame scene-linking modulation ensures highly precise output adjustment, while accurate 10,000:1*3 contrast is delivered even when bright and dark scenes frequently interchange.

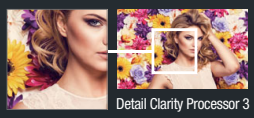

Bright Image


Dark Image

Detail Clarity Processor 3 Sharpens the Finest Details

This unique Panasonic circuit optimizes the sharpness of each image based on the super high, high, medium, and low frequency components of the extracted image information. The resulting images are expressed with natural, convincing realism.


Conventional Projector


Detail Clarity Processor 3

System Daylight View 3 for Sharp and Vivid Images in Bright Environments

Panasonic's premium System Daylight View 3 prevents images from washing out in well-lit environments and enhances brightness perception in multi-projector mapping applications by adjusting sharpness and gamma curves and correcting colors. The result is greater visual impact even in challenging conditions.

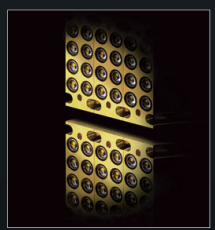
Conventional Projector

System Daylight View 3

Consistent, Stable Performance

Stable 24/7 Operation with Light-source Failover Protection

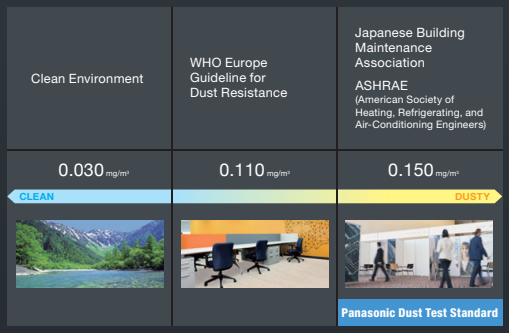
Dual Drive Laser Optical Engine groups laser diodes into two discrete modules. A failsafe redundancy circuit works to minimize brightness- and color-uniformity loss should a laser diode fail, making the PT-RZ970 Series ideal for mission-critical applications. Further, brightness decreases more gradually and consistently than lamp-based projectors over a 20,000-hour*4 maintenance-free projection period.



*3 With Dynamic Contrast Mode set to 3. *4 At this time the brightness will have decreased to approximately half of its original level (Dynamic Contrast Mode: 3, Image Mode: Dynamic). Panasonic recommends cleaning or checkup at point of purchase after about 20,000 hours. Light source lifetime may be reduced depending on environmental conditions. Replacement of parts other than the light source may be required in a shorter period.

Dust-Resistant Airtight Optical Block

The PT-RZ970 Series' optical block is airtight, ensuring consistent, long-lasting image quality for up to 20,000 hours*4 without maintenance. The optical block design passed stringent testing to assure utmost reliability in environments with up to 0.15 mg of particulate matter per cubic meter (based on American Society of Heating, Refrigerating, and Air-Conditioning Engineers [ASHRAE] and Japanese Building Maintenance Association guidelines). The structure prevents brightness degradation from dust intrusion.



Selectable Operational Modes Maintain Image Quality Longer

Approx. 20,000 Hours*4 of Continuous Operation

In Normal Mode, the PT-RZ970 Series can operate continuously for about 20,000 hours*4. In Eco Mode, this is extended to around 24,000 hours*4 of continuous operation. These modes enhance suitability for education and signage applications.

Up to 10 Years*5 Operation with Constant Brightness Modes

In environments where full brightness is not necessary, such as surveillance, control, and simulation rooms, constant operation modes extend light-source replacement to up to 87,600 hours*5 in Long Life 3 Mode—about 10 years of 24/7 projection—with consistent brightness and color.

User Operating Mode

In addition to preset operating modes, the PT-RZ970 Series can be customized to achieve your preferred balance of brightness performance or extended life.

*5 With Operating Mode set to Long Life 3. Long Life Mode is tested in a rear-box projection environment, which is not compliant with ASHRAE. 24 hours/day x 365 days/year x 10 years = 87,600 hours. Replacement of parts other than the light source may be required in a shorter period.

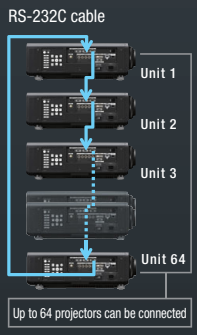
Sample Product Cutsheets (Audio-Visual)

Versatile Installation Flexibility

Unique Contrast Sync and Shutter Sync Function

The PT-RZ970 Series is among the world's first to feature Contrast Sync and Shutter Sync functions (Patent Pending) for multi-screen and mapping applications. Contrast Sync allows the projectors' digitally modulated contrast function to be synchronized over the network for consistent picture quality across screens, while Shutter Sync incorporates a master/slave principle to synchronize shutter on/off timing between all networked projectors. It includes simultaneous fade-in and fade-out functions.

Note: Use of RS-232C straight cable is necessary for all connections. Consult your sales representative for further information.



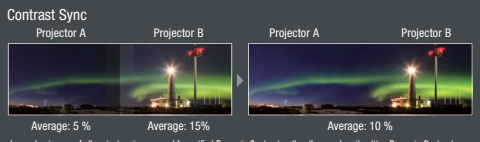
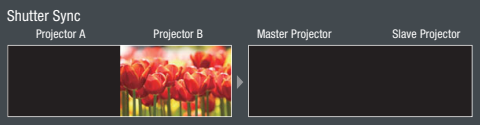


Image luminance of all projectors is averaged for unified Dynamic Contrast, rather than each unit setting Dynamic Contrast separately. Step noise is eliminated in edge-blended areas.



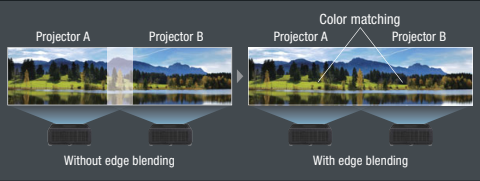
If shutter functions are not linked, shutter ON/OFF timing varies. When shutter functions of slave projectors are linked to a master, shutter ON/OFF timing is uniform*.

* Includes fade-in and fade-out effects. Projector shutter functions can be set to operate individually if desired.

Multi-Screen Support System Seamlessly Connects Multiple Screens

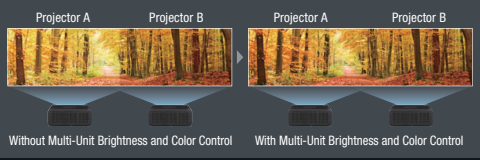
Edge Blending Edges of adjacent screens can be blended and their luminance controlled.

Color Matching Corrects for slight variations in the color reproduction range of individual projectors. PC software assures easy, accurate control.



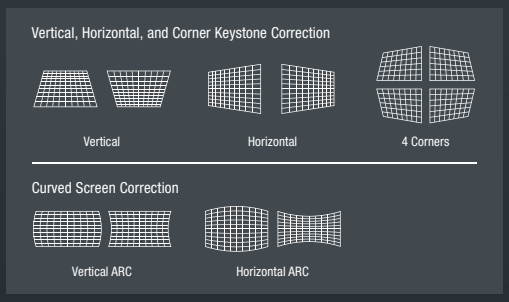
Multi-Unit Brightness and Color Control

This function automatically corrects brightness and color fluctuations that occur over time in individual projectors in a multi-screen system. Control up to eight projectors connected via hub increasing to a maximum of 2,048 projectors with Multi Monitoring & Control Software.



Geometric Adjustment for Custom Screen Surfaces

Geo Adjustment adapts the image for projection onto spherical, cylindrical, and other specially shaped screens. Fine-tuning is performed with the remote control, with no external equipment needed. Paired with Multi-Screen Support System, highly creative mapping presentations are possible in variety of event and staging applications.

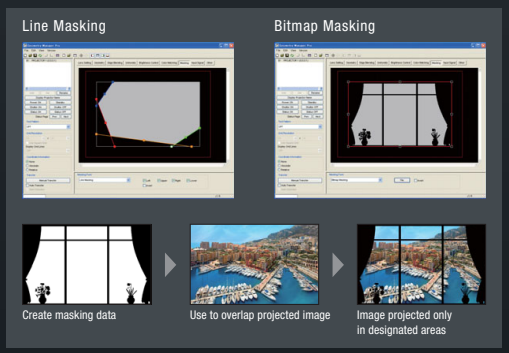


Geometry Manager Pro Software (PT-RZ970/RZ770/RZ660 Only)

Geometry Manager Pro software expands built-in functionality and makes complex adjustments easy. The free software package includes enhanced color matching and edge blending for multi-screen projection and adjustment of multiple screens over the network.

Optional ET-UK20 Upgrade Kit for Geometry Manager Pro (PT-RZ970/RZ770/RZ660 Only)

An optional ET-UK20 Upgrade Kit for Geometry Manager Pro adds creative masking capability using four lines or bitmap data as well as uniformity correction and correction area expansion.



Optional ET-CUK10*6 Series Auto Screen Adjustment Upgrade Kit (PT-RZ970/RZ770/RZ660 Only)

This optional kit activates the Auto Screen Adjustment plug-in software for Geometry Manager Pro, allowing you to set up multiple projectors automatically and simultaneously and save significant amounts of time and money. Performing multi-screen and curved-screen projection calibration in three quick steps using a camera*7 and PC connected to the projector network, this software encompasses geometric adjustment, edge blending, color matching, stacking, brightness, and black level.

*6 Available worldwide except the United States. *7 Supported cameras: Nikon D5200/D5300/D5500.

Reduce Inventory Costs with Shared Lenses

The PT-RZ970 Series shares optional lenses with the Panasonic 1-Chip DLP™ projector range, including the ET-DLE030 Ultra-Short-Throw Lens and ET-DLE085 Zoom Lens for long throw distances, reducing TCO for staging and event companies with large projector inventories. Lenses attach and detach with one-touch ease.

Sample Product Cutsheets (Audio-Visual)

Easy System Flexibility

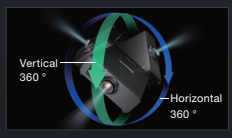
Single-Cable DIGITAL LINK Control and Video Connection

Upward HDBaseT™-compatible DIGITAL LINK supports transmission of uncompressed Full HD video and control commands through a single CAT 5e or higher STP cable for distances of up to 150 m (492 ft)*8. Add an optional DIGITAL LINK Switcher or Digital Interface Box to further simplify installation in large venues while reducing cost and improving reliability at the same time.

*8 150 m (492 ft) transmission available only in Long Reach Mode with optional ET-YFB200G DIGITAL LINK Switcher for signals up to 1080/60p (dot-clock frequency 148.5 MHz). Transmission distance is up to 100 m (328 ft) in other cases.

Free 360-degree Rotation

Projection is possible in any direction vertically and horizontally, and the unit can be rotated 360 degrees for installation at any angle.



Supports Art-Net DMX, Crestron Connected™, and PJLink™

The PT-RZ970 Series is compatible with Art-Net DMX protocol for lighting management. This allows the projector to be connected to a lighting console, opening the door to a range of added functionality and control options. The included LAN/DIGITAL LINK terminal also supports Crestron Connected™ and PJLink™ (Class 1) for easy integration of these projectors into an existing AV network utilizing multiple device brands.

Quick Start and Quick Off

The laser light-source doesn't require any warm-up, so images appear almost instantly (in about 1 second*9) with PT-RZ970 Series projectors. There's also no cool-down period needed when turning the power off at the mains—the projector can be turned on and off any time as necessary.

*9 With Quick Startup Mode set to ON. Quick Startup Mode resets to OFF after duration set in Available Period expires. When Quick Startup Mode is set to ON, the projector continues to warm up, increasing power consumption. Image appears in about 9 seconds on Normal Standby Mode and about 12 seconds on Eco Standby Mode.

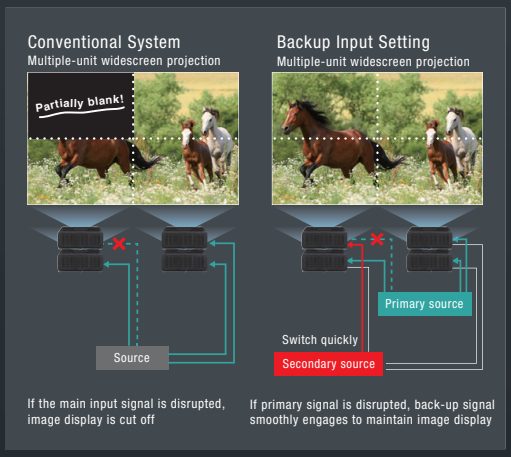
Multi Monitoring & Control Software

This free Panasonic software offers monitoring and control of up to 2,048 devices over a LAN network from a single PC. For monitoring, status for individual devices can be listed in groups, with more detailed information shown separately. Control functions include power ON/OFF, input switching, scheduling, and command inputs.

Backup Input Setting Optimizes Performance

This feature allows smooth switching to a backup input signal should the primary signal be disrupted*10, guaranteeing reliability for mission-critical control rooms, projection mapping, staging, and in other applications where image display must be maintained.

*10 Combination of primary/secondary input terminals is fixed. The Backup Input Setting is enabled only when the input signal to the primary and secondary terminals is the same.



Web Browser Control

These Panasonic SOLID SHINE Laser projectors can be easily operated remotely over a LAN network via a computer's web browser. Projectors can be configured to alert the operator via email if an error has occurred.

Early Warning Software ET-SWA100 Series (Optional)

Early Warning Software monitors the status of projectors and displays connected to an intranet, and informs the operator when an abnormality is detected or predicted, or when there are symptoms of trouble. This minimizes downtime to provide more stable operation.

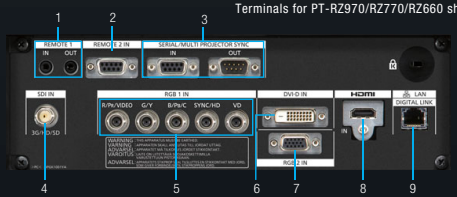
Other Valuable Features

- Quiet Mode to reduce operational noise
- DICOM Simulation Mode offers easy-to-view X-ray photo reproduction*11
- Rec. 709 mode for HDTV projection to provide accurate colors
- Waveform Monitor for simple yet precise calibration
- Lens-centered design and a wide horizontal/vertical lens shift
- Shutter effect with fade in/fade out (configurable in 0.5-second intervals from 0.5 to 4.0 seconds, or to 5-, 7-, or 10-second intervals)
- PJLink™ compatibility
- P-in-P function*12
- Image rotation function
- On-screen menu rotatable in Portrait Mode
- Scheduling function
- 30 m (98 ft) long-range wireless remote control
- Anti-theft features including chain opening and security bar
- Customizable start-up logo
- ID assignment for up to 64 units
- Built-in test pattern
- Selectable 10-language on-screen menu (English, German, French, Spanish, Italian, Portuguese, Russian, Japanese, Chinese, Korean)
- RoHS Directive-compliant

*11 This product is not a medical instrument. Do not use for actual medical diagnosis. *12 The Picture-in-Picture function cannot be used with certain inputs and input signals.

Terminals

Terminals for PT-RZ970/RZ770/RZ660 shown.



1 Remote 1 input/output
2 Remote 2 input
3 Serial/Multi Projector Sync input/output
4 SDI input (PT-RZ970/RZ770/RZ660 only)
5 RGB 1 input
6 DVI-D input
7 RGB 2 input
8 HDMI input
9 LAN/ DIGITAL LINK

Sample Product Cutsheets (Audio-Visual)

Optional Accessories

ET-DLE085
Zoom Lens

ET-DLE105
Zoom Lens

ET-DLE150
Zoom Lens

ET-DLE170*
Zoom Lens
*US/Europe only.
ET-DLE170 is equivalent
of supplied lens.

ET-DLE030
Fixed-Focus
Lens

ET-DLE250
Zoom Lens

ET-DLE350
Zoom Lens

ET-DLE450
Zoom Lens

ET-DLE055
Fixed-Focus
Lens

ET-UK20 (PT-RZ970/RZ770/RZ660 Only)
Geometry Manager Pro Upgrade Kit

ET-CUK10 Series (PT-RZ970/RZ770/RZ660 Only)
Auto Screen Adjustment Upgrade Kit

Note: Available worldwide except in the United States.

ET-SWA100 Series
Early Warning Software

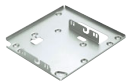
Note: Part number suffix may differ depending on the license type.

ET-PKD120H
High Ceiling
Mount Bracket

ET-PKD120S
Low Ceiling
Mount Bracket

ET-PKD130H
High Ceiling Mount
Bracket with 6-axis
Adjustment Mechanism

ET-PKD130B
Bracket Assembly



ET-YFB200G
DIGITAL LINK Switcher

ET-YFB100G
Digital Interface Box

Note: Use ET-PKD120H, ET-PKD120S, and ET-PKD130H in combination with ET-PKD130B. ET-PKD130H is recommended when used with ET-DLE030.

Projection Distances

Unit: meters (feet)

Screen size (diagonal)		Distance to screen (A)																	
		Zoom lenses																Fixed-focus lens*1	
		ET-DLE085		ET-DLE105		ET-DLE150		Supplied lens/ET-DLE170		ET-DLE250		ET-DLE350		ET-DLE450		ET-DLE055	
		min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.		
PT-RZ970/ RZ770/ RZ660 (16:10 aspect ratio)	1.27 (50")	0.82 (2.7)	1.04 (3.4)	1.03 (3.4)	1.41 (4.6)	1.38 (4.5)	2.01 (6.6)	1.82 (6.0)	2.57 (8.4)	2.42 (7.9)	3.87 (12.7)	3.80 (12.5)	5.81 (19.1)	5.66 (18.6)	9.12 (29.9)	0.83 (2.7)	
	1.52 (60")	1.00 (3.3)	1.25 (4.1)	1.25 (4.1)	1.70 (5.6)	1.66 (5.5)	2.43 (8.0)	2.20 (7.2)	3.10 (10.2)	2.92 (9.6)	4.65 (15.3)	4.59 (15.1)	7.00 (23.0)	6.85 (22.5)	11.01 (36.1)	1.00 (3.3)	
	1.78 (70")	1.17 (3.9)	1.47 (4.8)	1.47 (4.8)	1.99 (6.5)	1.95 (6.4)	2.84 (9.3)	2.58 (8.5)	3.63 (11.9)	3.42 (11.2)	5.44 (17.9)	5.38 (17.6)	8.19 (26.9)	8.04 (26.4)	12.89 (42.3)	1.18 (3.9)	
	2.03 (80")	1.35 (4.4)	1.68 (5.5)	1.68 (5.5)	2.28 (7.5)	2.23 (7.3)	3.25 (10.7)	2.95 (9.7)	4.16 (13.6)	3.92 (12.8)	6.23 (20.4)	6.16 (20.2)	9.38 (30.8)	9.23 (30.3)	14.78 (48.5)	1.35 (4.4)	
	2.29 (90")	1.52 (5.0)	1.90 (6.2)	1.90 (6.2)	2.57 (8.4)	2.52 (8.3)	3.66 (12.0)	3.33 (10.9)	4.69 (15.4)	4.42 (14.5)	7.02 (23.0)	6.95 (22.8)	10.57 (34.7)	10.43 (34.2)	16.66 (54.7)	1.53 (5.0)	
	2.54 (100")	1.70 (5.6)	2.11 (6.9)	2.12 (7.0)	2.86 (9.4)	2.81 (9.2)	4.08 (13.4)	3.71 (12.2)	5.21 (17.1)	4.92 (16.1)	7.81 (25.6)	7.74 (25.4)	11.76 (38.6)	11.62 (38.1)	18.55 (60.8)	1.70 (5.6)	
	3.05 (120")	2.05 (6.7)	2.55 (8.4)	2.55 (8.4)	3.44 (11.3)	3.38 (11.1)	4.90 (16.1)	4.47 (14.7)	6.27 (20.6)	5.91 (19.4)	9.39 (30.8)	9.31 (30.6)	14.14 (46.4)	14.00 (45.9)	22.31 (73.2)	2.05 (6.7)	
	3.81 (150")	2.57 (8.4)	3.19 (10.5)	3.20 (10.5)	4.32 (14.2)	4.24 (13.9)	6.14 (20.1)	5.60 (18.4)	7.86 (25.8)	7.41 (24.3)	11.75 (38.6)	11.68 (38.3)	17.71 (58.1)	17.58 (57.7)	27.97 (91.8)	2.58 (8.5)	
	5.08 (200")	3.44 (11.3)	4.27 (14.0)	4.29 (14.1)	5.77 (18.9)	5.67 (18.6)	8.20 (26.9)	7.50 (24.6)	10.50 (34.5)	9.91 (32.5)	15.70 (51.5)	15.61 (51.2)	23.66 (77.6)	23.54 (77.2)	37.39 (122.7)	3.45 (11.3)	
	6.35 (250")	4.31 (14.1)	5.35 (17.6)	5.37 (17.6)	7.23 (23.7)	7.10 (23.3)	10.26 (33.7)	9.39 (30.8)	13.14 (43.1)	12.41 (40.7)	19.64 (64.4)	19.55 (64.1)	29.61 (97.1)	29.50 (96.8)	46.81 (153.6)	–	
	7.62 (300")	5.18 (17.0)	6.43 (21.1)	6.46 (21.2)	8.68 (28.5)	8.53 (28.0)	12.33 (40.4)	11.28 (37.0)	15.79 (51.8)	14.91 (48.9)	23.59 (77.4)	23.49 (77.1)	35.56 (116.7)	35.46 (116.3)	56.24 (184.5)	–	
	10.16 (400")	6.93 (22.7)	8.59 (28.2)	8.63 (28.3)	11.59 (38.0)	11.39 (37.4)	16.45 (54.0)	15.07 (49.4)	21.07 (69.1)	19.90 (65.3)	31.48 (103.3)	31.36 (102.9)	47.46 (155.7)	47.38 (155.4)	75.08 (246.3)	–	
	12.70 (500")	8.67 (28.5)	10.75 (35.3)	10.80 (35.4)	14.50 (47.6)	14.25 (46.7)	20.58 (67.5)	18.86 (61.9)	26.36 (86.5)	24.90 (81.7)	39.37 (129.2)	39.23 (128.7)	59.36 (194.7)	59.30 (194.6)	93.93 (308.2)	–	
	15.24 (600")	10.42 (34.2)	12.91 (42.3)	12.97 (42.6)	17.41 (57.1)	17.11 (56.1)	24.70 (81.0)	22.64 (74.3)	31.65 (103.8)	29.89 (98.1)	47.25 (155.0)	47.11 (154.6)	71.25 (233.8)	71.22 (233.7)	112.77 (370.0)	–	
PT-RW930/ RW730/ RW620 (16:10 aspect ratio)	1.27 (50")	0.87 (2.8)	1.09 (3.6)	1.09 (3.6)	1.48 (4.9)	1.45 (4.7)	2.12 (6.9)	1.91 (6.3)	2.70 (8.9)	2.54 (8.3)	4.06 (13.3)	4.00 (13.1)	6.11 (20.1)	5.96 (19.5)	9.59 (31.5)	0.87 (2.9)	
	1.52 (60")	1.05 (3.4)	1.32 (4.3)	1.32 (4.3)	1.79 (5.9)	1.75 (5.7)	2.55 (8.4)	2.31 (7.6)	3.26 (10.7)	3.07 (10.1)	4.89 (16.0)	4.83 (15.8)	7.36 (24.2)	7.21 (23.6)	11.57 (38.0)	1.06 (3.5)	
	1.78 (70")	1.23 (4.1)	1.54 (5.1)	1.54 (5.1)	2.09 (6.9)	2.05 (6.7)	2.98 (9.8)	2.71 (8.9)	3.81 (12.5)	3.59 (11.8)	5.72 (18.8)	5.65 (18.5)	8.61 (28.2)	8.46 (27.8)	13.55 (44.5)	1.24 (4.1)	
	2.03 (80")	1.42 (4.7)	1.77 (5.8)	1.77 (5.8)	2.40 (7.9)	2.35 (7.7)	3.42 (11.2)	3.11 (10.2)	4.37 (14.3)	4.12 (13.5)	6.55 (21.5)	6.48 (21.3)	9.86 (32.3)	9.71 (31.9)	15.53 (51.0)	1.42 (4.7)	
	2.29 (90")	1.60 (5.3)	2.00 (6.5)	2.00 (6.6)	2.70 (8.9)	2.65 (8.7)	3.85 (12.6)	3.50 (11.5)	4.92 (16.2)	4.64 (15.2)	7.38 (24.2)	7.31 (24.0)	11.11 (36.4)	10.96 (36.0)	17.51 (57.4)	1.61 (5.3)	
	2.54 (100")	1.78 (5.9)	2.22 (7.3)	2.23 (7.3)	3.01 (9.9)	2.95 (9.7)	4.28 (14.0)	3.90 (12.8)	5.48 (18.0)	5.18 (16.9)	8.20 (26.9)	8.13 (26.7)	12.36 (40.5)	12.21 (40.1)	19.49 (63.9)	1.79 (5.9)	
	3.05 (120")	2.15 (7.1)	2.68 (8.8)	2.68 (8.8)	3.62 (11.9)	3.55 (11.6)	5.15 (16.9)	4.70 (15.4)	6.59 (21.6)	6.21 (20.4)	9.86 (32.4)	9.79 (32.1)	14.86 (48.7)	14.72 (48.3)	23.45 (76.9)	2.16 (7.1)	
	3.81 (150")	2.70 (8.9)	3.36 (11.0)	3.37 (11.1)	4.54 (14.9)	4.45 (14.6)	6.45 (21.2)	5.89 (19.3)	8.25 (27.1)	7.79 (25.5)	12.35 (40.5)	12.27 (40.2)	18.61 (61.0)	18.47 (60.6)	29.38 (96.4)	2.71 (8.9)	
	5.08 (200")	3.61 (11.9)	4.49 (14.7)	4.51 (14.8)	6.06 (19.9)	5.95 (19.5)	8.61 (28.3)	7.88 (25.8)	11.03 (36.2)	10.41 (34.2)	16.49 (54.1)	16.40 (53.8)	24.85 (81.5)	24.73 (81.1)	39.28 (128.9)	3.63 (11.9)	
	6.35 (250")	4.53 (14.9)	5.62 (18.4)	5.65 (18.5)	7.59 (24.9)	7.45 (24.5)	10.78 (35.4)	9.86 (32.4)	13.81 (45.3)	13.03 (42.8)	20.63 (67.7)	20.53 (67.4)	31.10 (102.0)	30.99 (101.7)	49.17 (161.3)	–	
	7.62 (300")	5.45 (17.9)	6.76 (22.2)	6.78 (22.3)	9.12 (29.9)	8.95 (29.4)	12.95 (42.5)	11.85 (38.9)	16.58 (54.4)	15.65 (51.4)	24.77 (81.3)	24.67 (80.9)	37.34 (122.5)	37.25 (122.2)	59.06 (193.8)	–	
	10.16 (400")	7.28 (23.9)	9.02 (29.6)	9.06 (29.7)	12.17 (39.9)	11.96 (39.2)	17.28 (56.7)	15.83 (51.9)	22.13 (72.6)	20.90 (68.6)	33.05 (108.4)	32.94 (108.1)	49.84 (163.5)	49.76 (163.3)	78.85 (258.7)	–	
	12.70 (500")	9.11 (29.9)	11.29 (37.0)	11.34 (37.2)	15.23 (50.0)	14.96 (49.1)	21.61 (70.9)	19.80 (65.0)	27.68 (90.8)	26.14 (85.8)	41.34 (135.6)	41.20 (135.2)	62.33 (204.5)	62.28 (204.3)	98.64 (323.6)	–	
	15.24 (600")	10.94 (35.9)	13.55 (44.5)	13.62 (44.7)	18.29 (60.0)	17.96 (58.9)	25.94 (85.1)	23.78 (78.0)	33.23 (109.0)	31.39 (103.0)	49.62 (162.8)	49.47 (162.3)	74.82 (245.5)	74.80 (245.4)	118.42 (388.5)	–	
PT-RX110 (4:3 aspect ratio)	1.27 (50")	0.81 (2.6)	1.01 (3.3)	1.01 (3.3)	1.38 (4.5)	1.34 (4.4)	1.97 (6.5)	1.78 (5.8)	2.51 (8.2)	2.36 (7.7)	3.78 (12.4)	3.71 (12.2)	5.68 (18.6)	5.52 (18.1)	8.91 (29.2)	0.81 (2.7)	
	1.52 (60")	0.98 (3.2)	1.22 (4.0)	1.22 (4.0)	1.66 (5.4)	1.62 (5.3)	2.37 (7.8)	2.15 (7.0)	3.03 (9.9)	2.85 (9.3)	4.55 (14.9)	4.48 (14.7)	6.84 (22.5)	6.69 (21.9)	10.75 (35.3)	0.98 (3.2)	
	1.78 (70")	1.15 (3.8)	1.43 (4.7)	1.43 (4.7)	1.94 (6.4)	1.90 (6.2)	2.77 (9.1)	2.52 (8.3)	3.55 (11.6)	3.34 (11.0)	5.32 (17.5)	5.25 (17.2)	8.01 (26.3)	7.86 (25.8)	12.60 (41.3)	1.15 (3.8)	
	2.03 (80")	1.32 (4.3)	1.64 (5.4)	1.65 (5.4)	2.23 (7.3)	2.18 (7.2)	3.18 (10.4)	2.89 (9.5)	4.06 (13.3)	3.83 (12.6)	6.09 (20.0)	6.02 (19.8)	9.17 (30.1)	9.02 (29.6)	14.44 (47.4)	1.32 (4.3)	
	2.29 (90")	1.49 (4.9)	1.85 (6.1)	1.86 (6.1)	2.51 (8.2)	2.46 (8.1)	3.58 (11.7)	3.26 (10.7)	4.58 (15.0)	4.31 (14.2)	6.86 (22.5)	6.79 (22.3)	10.33 (33.9)	10.19 (33.4)	16.28 (53.4)	1.49 (4.9)	
	2.54 (100")	1.66 (5.4)	2.07 (6.8)	2.07 (6.8)	2.80 (9.2)	2.74 (9.0)	3.98 (13.1)	3.63 (11.9)	5.10 (16.7)	4.80 (15.8)	7.63 (25.0)	7.56 (24.8)	11.50 (37.7)	11.35 (37.2)	18.12 (59.5)	1.66 (5.5)	
	3.05 (120")	2.00 (6.6)	2.49 (8.2)	2.49 (8.2)	3.37 (11.0)	3.30 (10.8)	4.79 (15.7)	4.37 (14.3)	6.13 (20.1)	5.78 (19.0)	9.17 (30.1)	9.10 (29.9)	13.82 (45.3)	13.68 (44.9)	21.81 (71.5)	2.01 (6.6)	
	3.81 (150")	2.51 (8.2)	3.12 (10.2)	3.13 (10.3)	4.22 (13.8)	4.14 (13.6)	6.00 (19.7)	5.48 (18.0)	7.68 (25.2)	7.24 (23.8)	11.49 (37.7)	11.41 (37.4)	17.31 (56.8)	17.18 (56.4)	27.33 (89.7)	2.52 (8.3)	
	5.08 (200")	3.36 (11.0)	4.18 (13.7)	4.19 (13.8)	5.64 (18.5)	5.54 (18.2)	8.02 (26.3)	7.33 (24.0)	10.26 (33.7)	9.69 (31.8)	15.34 (50.3)	15.26 (50.1)	23.13 (75.9)	23.00 (75.5)	36.54 (119.9)	3.38 (11.1)	
	6.35 (250")	4.21 (13.8)	5.23 (17.2)	5.25 (17.2)	7.06 (23.2)	6.94 (22.8)	10.03 (32.9)	9.18 (30.1)	12.85 (42.2)	12.13 (39.8)	19.20 (63.0)	19.11 (62.7)	28.94 (95.0)	28.83 (94.6)	45.75 (150.1)	–	
	7.62 (300")	5.07 (16.6)	6.29 (20.6)	6.31 (20.7)	8.49 (27.8)	8.33 (27.3)	12.05 (39.5)	11.03 (36.2)	15.43 (50.6)	14.57 (47.8)	23.06 (75.6)	22.96 (75.3)	34.76 (114.0)	34.66 (113.7)	54.97 (180.3)	–	
	10.16 (400")	6.77 (22.2)	8.40 (27.5)	8.43 (27.7)	11.33 (37.2)	11.13 (36.5)	16.08 (52.8)	14.73 (48.3)	20.60 (67.6)	19.45 (63.8)	30.77 (100.9)	30.65 (100.6)	46.39 (152.2)	46.31 (151.9)	73.39 (240.8)	–	
	12.70 (500")	8.48 (27.8)	10.51 (34.5)	10.56 (34.6)	14.18 (46.5)	13.92 (45.7)	20.12 (66.0)	18.43 (60.5)	25.77 (84.5)	24.33 (79.8)	38.48 (126.2)	38.35 (125.8)	85.02 (190.4)	57.96 (190.2)	91.81 (301.2)	–	
	15.24 (600")	10.18 (33.4)	12.62 (41.4)	12.68 (41.6)	17.02 (55.8)	16.72 (54.9)	24.15 (79.2)	22.13 (72.6)	30.94 (101.5)	29.22 (95.9)	46.19 (151.5)	46.05 (151.1)	69.65 (228.5)	69.61 (228.4)	110.23 (361.6)	–	

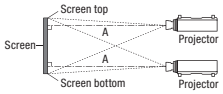
Unit: meters (feet)

Screen size (diagonal)		ET-DLE030 Ultra-Short-Throw Lens*2					
		Projection distance				Close-up system dimensions	
		(A)	(B)	(C)		(D)	(E)
PT-RZ970/ RZ770/ RZ660 (16:10 aspect ratio)	2.54 (100")	0.82 (2.7)	0.65 (2.1)	0.11 (0.4)		0.43 (1.4)	0.63 (2.1)
	3.05 (120")	0.98 (3.2)	0.81 (2.7)	0.28 (0.9)		0.53 (1.7)	0.73 (2.4)
	3.81 (150")	1.23 (4.0)	1.06 (3.5)	0.52 (1.7)		0.68 (2.2)	0.88 (2.9)
	5.08 (200")	1.63 (5.3)	1.46 (4.8)	0.93 (3.1)		0.93 (3.1)	1.13 (3.7)
	6.35 (250")	2.04 (6.7)	1.87 (6.1)	1.34 (4.4)		1.18 (3.9)	1.38 (4.5)
	7.62 (300")	2.45 (8.0)	2.28 (7.5)	1.74 (5.7)		1.43 (4.7)	1.63 (5.4)
	8.89 (350")	2.85 (9.4)	2.68 (8.8)	2.15 (7.1)		1.69 (5.5)	1.89 (6.2)
PT-RW930/ RW730/ RW620 (16:10 aspect ratio)	2.54 (100")	0.86 (2.8)	0.69 (2.3)	0.16 (0.5)		0.59 (1.9)	0.79 (2.6)
	3.05 (120")	1.03 (3.4)	0.86 (2.8)	0.33 (1.1)		0.72 (2.4)	0.92 (3.0)
	3.81 (150")	1.29 (4.2)	1.12 (3.7)	0.58 (1.9)		0.92 (3.0)	1.12 (3.7)
	5.08 (200")	1.71 (5.6)	1.54 (5.1)	1.01 (3.3)		1.25 (4.1)	1.45 (4.8)
	6.35 (250")	2.14 (7.0)	1.97 (6.5)	1.44 (4.7)		1.58 (5.2)	1.78 (5.8)
	7.62 (300")	2.57 (8.4)	2.40 (7.9)	1.86 (6.1)		1.91 (6.3)	2.11 (6.9)
	8.89 (350")	3.00 (9.8)	2.83 (9.3)	2.29 (7.5)		2.24 (7.3)	2.44 (8.0)
PT-RX110 (4:3 aspect ratio)	2.54 (100")	0.80 (2.6)	0.63 (2.1)	0.10 (0.3)		0.41 (1.3)	0.61 (2.0)
	3.05 (120")	0.96 (3.1)	0.79 (2.6)	0.26 (0.9)		0.50 (1.6)	0.70 (2.3)
	3.81 (150")	1.20 (3.9)	1.03 (3.4)	0.49 (1.6)		0.65 (2.1)	0.85 (2.8)
	5.08 (200")	1.60 (5.2)	1.43 (4.7)	0.89 (2.9)		0.88 (2.9)	1.08 (3.5)
	6.35 (250")	1.99 (6.5)	1.83 (6.0)	1.29 (4.2)		1.12 (3.7)	1.32 (4.3)
	7.62 (300")	2.39 (7.8)	2.23 (7.3)	1.69 (5.5)		1.36 (4.5)	1.56 (5.1)
	8.89 (350")	2.79 (9.2)	2.62 (8.6)	2.09 (6.9)		1.60 (5.2)	1.80 (5.9)

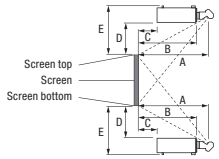
*1 Optical axis shift cannot be operated when using ET-DLE055. *2 Optical axis is fixed to center when using ET-DLE030.

Dimension Definitions

If using lens other than the ET-DLE030

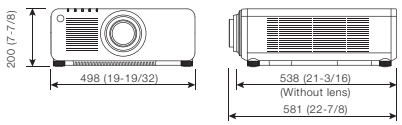


If using the ET-DLE030



Dimensions

unit: mm (inches)



Sample Product Cutsheets (Audio-Visual)

Specifications

Model		PT-RZ970/RZ770/RZ660	PT-RW930/RW730/RW620	PT-RX110
Power supply		AC 100–240 V, 50/60 Hz		
Power consumption		**[PT-RZ970/RW930/RX110]** 1,050 W, Normal*: 742 W, Eco*: 617 W, Long Life 1*: 410–588 W, Long Life 2*: 375–588 W, Long Life 3*: 349–588 W, Shutter*: 82 W; **[PT-RZ770/RW730]** 825 W, Normal*: 593 W, Eco*: 508 W, Long Life 1*: 333–477 W, Long Life 2*: 310–477 W, Long Life 3*: 286–477 W, Shutter*: 72 W; **[PT-RZ660/RW620]** 700 W, Normal*: 499 W, Eco*: 428 W, Long Life 1*: 287–402 W, Long Life 2*: 262–402 W, Long Life 3*: 238–402 W, Shutter*: 69 W; **[Common]** Standby: 85 W with Quick Startup Mode set to ON, 0.3 W with Standby Mode set to Eco, 3 W with Standby Mode set to Normal **In conditions with an operating temperature of 25 °C [77 °F], altitude 700 m [2,297 ft], IEC62087: 2008 Broadcast Content, Picture Mode: Standard, Dynamic Contrast: 2.*		
DLP™ chip	Panel size	17.0 mm (0.67 in) diagonal (16:10 aspect ratio)	16.5 mm (0.65 in) diagonal (16:10 aspect ratio)	17.8 mm (0.7 in) diagonal (4:3 aspect ratio)
	Display method	DLP™ chip × 1, DLP™ projection system		
	Pixels	2,304,000 (1920 x 1200) pixels	1,024,000 (1280 x 800) pixels	786,432 (1024 x 768) pixels
Lens		Powered zoom (throw ratio 1.7–2.4:1), powered focus F 1.7–1.9, f 25.6–35.7 mm	Powered zoom (throw ratio 1.8–2.5:1), powered focus F 1.7–1.9, f 25.6–35.7 mm	
Light source		Laser diodes: Laser Class 1 (Class 3R for US models), light source life*1: 20,000 hours (Normal Mode*) / 24,000 hours (Eco Mode). At this time, brightness will have decreased to approximately half its original level (Operating temperature: 30 °C [86 °F], altitude: 700 m [2,297 ft], dust density 0.15 mg/m^3, Dynamic Contrast Mode: 3) ** Includes Quiet 1/Quiet 2 Mode for PT-RZ970/RW930/RX110.*		
Screen size (diagonal)		1.27–15.24 m (50–600 in), 1.27–5.08 m (50–200 in) with ET-DLE055, 2.54–8.89 m (100–350 in) with ET-DLE030, 16:10 aspect ratio (except PT-RX110), 4:3 aspect ratio (PT-RX110)		
Brightness		PT-RZ970: 10,000 lm (Center)*2 / 9,400 lm*1 / 8,000 lm (Quiet 1)*1 / 6,000 lm (Quiet 2)*1 PT-RZ770: 7,200 lm (Center)*2 / 7,000 lm*1 PT-RZ660: 6,200 lm (Center)*2 / 6,000 lm*1	PT-RW930: 10,000 lm (Center)*2 / 9,400 lm*1 / 8,000 lm (Quiet 1)*1 / 6,000 lm (Quiet 2)*1 PT-RW730: 7,200 lm (Center)*2 / 7,000 lm*1 PT-RW620: 6,200 lm (Center)*2 / 6,000 lm*1	10,400 lm (Center)*2 / 10,000 lm*1 / 8,500 lm (Quiet 1)*1 / 6,400 lm (Quiet 2)*1
Center-to-corner uniformity*1		90 %		
Contrast*1		10,000:1 (Full On/Full Off, Dynamic Contrast Mode: 3)		
Resolution		1920 x 1200 pixels	1280 x 800 pixels	1024 x 768 pixels
Scanning frequency	SD-SDI	SMPTE ST 259 compliant, [YCBCR 4:2:2 10-bit] 480i (525i), 625i (576i)	—	
	HD-SDI	SMPTE ST 292 compliant, [YPBPR 4:2:2 10-bit] 750 (720)/60p, 750 (720)/50p, 1125 (1080)/60i, 1125 (1080)/50i, 1125 (1080)/25p, 1125 (1080)/24p, 1125 (1080)/24sF, 1125 (1080)/30p	—	
	3G-SDI	SMPTE ST 424 compliant, [RGB 4:4:4 12-bit/10-bit] 1125 (1080)/60i, 1125 (1080)/50i, 1125 (1080)/25p, 1125 (1080)/24p, 1125 (1080)/24sF, 1125 (1080)/30p, 2K/24p, 2K/25p, 2K/30p, [YPBPR 4:2:2 10-bit] 1125 (1080)/60p, 1125 (1080)/50p, 2K/48p, 2K/50p, 2K/60p	—	
	HDMI/DVI-D/DIGITAL LINK	525i (480i)*3, 625i (576i)*3, 525p (480p), 625p (576p), 750 (720)/60p, 750 (720)/50p, 1125 (1080)/60i, 1125 (1080)/50i, 1125 (1080)/25p, 1125 (1080)/24p, 1125 (1080)/24sF, 1125 (1080)/30p, 1125 (1080)/60p, 1125 (1080)/50p, 640 x 400–WUXGA*4 (1920 x 1200) (compatible with non-interlaced signals only), dot clock: 25–162 MHz		
	RGB	fH: 15–100 kHz, fV: 24–120 Hz, dot clock: 20–162 MHz		
	YPBPR (YCBCR)	fH: 15.73 kHz, fV: 59.9 Hz [525i (480i)], fH: 15.63 kHz, fV: 50 Hz [625i (576i)], fH: 45.00 kHz, fV: 60 Hz [750 (720)/60p], fH: 33.75 kHz, fV: 60 Hz [1125 (1080)/60i], fH: 28.13 kHz, fV: 50 Hz [1125 (1080)/50i], fH: 27.00 kHz,fV: 24 Hz [1125 (1080)/24p], fH: 33.75 kHz, fV: 30 Hz [1125 (1080)/30p], fH: 56.25 kHz, fV: 50 Hz [1125 (1080)/50p], fH: 31.50 kHz, fV: 59.9 Hz [525p (480p)], fH: 31.25 kHz, fV: 50 Hz [625p (576p)], fH: 37.50 kHz, fV: 50 Hz [750 (720)/50p], fH: 33.75 kHz, fV: 60 Hz [1125 (1080)/60i], fH: 28.13 kHz, fV: 25 Hz [1125 (1080)/25p], fH: 27.00 kHz, fV: 48 Hz [1125 (1080)/24sF], fH: 67.50 kHz, fV: 60 Hz [1125 (1080)/60p]		
	Video/YC	fH: 15.73 kHz, fV: 59.9 Hz (NTSC/NTSC4.43/PAL-M/PAL60), fH: 15.63 kHz, fV: 50 Hz (PAL/PAL-N/SECAM)		
Optical axis shift*5	Vertical (from center of screen)	+50 %, -16 % (powered)	+60 %, -16 % (powered)	+50 %, -13 % (+45 %, -13 % with ET-DLE085/DLE105) (powered)
	Horizontal (from center of screen)	+30 %, -10 % (+28 %, -10 % with ET-DLE085/DLE105) (powered)		
Keystone correction range		Vertical: ±40 ° (±22 ° with ET-DLE085/DLE105/DLE055, +5 ° with ET-DLE030), horizontal: ±15 ° (Cannot be operated with ET-DLE030)		Vertical: ±40 ° (±30 ° with ET-DLE085/DLE105/DLE055, +5 ° with ET-DLE030), Horizontal: ±15 ° (Cannot be operated with ET-DLE030)
Keystone correction range with optional Upgrade Kit ET-UK20		Vertical: ±45 °(±40 ° with ET-DLE150/DLE250/supplied lens [DLE170], ±22 ° with ET-DLE085/DLE105/DLE055, +5 ° with ET-DLE030), horizontal: ±40 ° (±15 ° with ET-DLE085/DLE105/DLE055, Cannot be operated with ET-DLE030), Up to a total of ±55 ° during simultaneous horizontal and vertical correction.	—	
Installation		Ceiling/floor, front/rear, free 360-degree installation		
Terminals	SDI IN	BNC × 1: 3G/HD/SD-SDI input	—	
	HDMI IN	HDMI 19-pin × 1 (Deep Color, compatible with HDCP)		
	DVI-D IN	DVI-D 24-pin × 1 (DVI 1.0 compliant, compatible with HDCP, compatible with single link only)		
	RGB 1 IN	RGB × 1 (BNC × 5): RGB/YPBPR/YCBCR/YC/VIDEO		
	RGB 2 IN	D-sub HD 15-pin (female) × 1: RGB/YPBPR/YCBCR		
	SERIAL/MULTI PROJECTOR SYNC IN	D-sub 9-pin (female) × 1 for contrast sync/shutter sync/external control (RS-232C compliant)		
	SERIAL/MULTI PROJECTOR SYNC OUT	D-sub 9-pin (male) × 1 for contrast sync/shutter sync/RS-232C link control		
	REMOTE 1 IN	M3 × 1 for wired remote control		
	REMOTE 1 OUT	M3 x 1 for link control (for wired remote control)		
	REMOTE 2 IN	D-sub 9-pin (female) × 1 for external control (parallel)		
	LAN/DIGITAL LINK	RJ-45 × 1 for network, DIGITAL LINK connection, 100Base-TX, compatible with Art-Net, PJLink™, Deep Color, HDCP		
Cabinet materials		Molded plastic		
Dimensions (W × H × D)		498 x 200*6 x 581 mm (19 19/32" x 7 7/8"*6 x 22 7/8") (with supplied lens [DLE170]), 498 x 200*6 x 538 mm (19 19/32" x 7 7/8"*6 x 21 3/16") (without lens)		
Weight*7		**PT-RZ970/RW930/RX110/RZ770/RW730**: Approx. 23.2 kg (51.1 lbs.) (with supplied lens [DLE170]), Approx. 22.4 kg (49.4 lbs.) (without lens) **PT-RZ660/RW620**: Approx. 23.1 kg (50.9 lbs.) (with supplied lens [DLE170]), Approx. 22.3 kg (49.2 lbs.) (without lens)		
Operation noise*1		**PT-RZ970/RW930/RX110**: 41 dB (37 dB [Quiet1] / 35 dB [Quiet2]), **PT-RZ770/RW730**: 36 dB, **PT-RZ660/RW620**: 35 dB		
Operating environment		Operating temperature: 0–45 °C (32–113 °F)*8, operating humidity: 10–80 % (no condensation)		
Applicable software		Logo Transfer Software, Multi Monitoring & Control Software, Early Warning Software, Geometry Manager Pro*9 (ET-UK20*9 Upgrade Kit and ET-CUK10*10 Auto Screen Adjustment Kit)		
Supplied accessories		Power cord, wireless/wired remote control unit, batteries (R03/AAA type x 2), software CD-ROM (Logo Transfer Software, Multi Monitoring & Control Software), projection lens cover, lens cover (models with lens only)		

Note: The PT-RZ970L/RZ770L/RZ660L/RW930L/RW730L/RW620L/RX110L delivers the same performance as the PT-RZ970/RZ770/RZ660/RW930/RW730/RW620/RX110, but comes without a lens.

*1 Measurement, measuring conditions, and method of notation all comply with ISO/IEC 21118: 2012 international standards. *2 Measured at center area of projector screen. Measurement method is in compliance with ISO/IEC 21118: 2012. Value is average of all products when shipped. May differ depending on actual unit. *3 Only compatible with dot clock frequency of 27 MHz (pixel repetition signal). *4 WUXGA resolution is supported with CVT-RB signals (WUXGA60RB) and CVT signals (WUXGA50). *5 Optical axis shift is not supported on the ET-DLE055, and the optical axis is fixed with the ET-DLE030. *6 With legs at shortest position. *7 Average value. May differ depending on the actual unit. *8 When used in locations from 0 m to 4,200 m (0 ft to 13,780 ft) above sea level in Normal Mode, and from 0 m to 2,700 m (0 ft to 8,858 ft) above sea level in other modes. If the ambient temperature exceeds 35 °C (95 °F) [30 °C (86 °F) for PT-RZ970/RW930/RX110] when used in locations from 0 m to 2,700 m (0 ft to 8,858 ft) above sea level, or if it exceeds 25 °C (77 °F) when used in locations from 2,700 m to 4,200 m (8,858 ft to 13,780 ft) above sea level, the light output may be reduced to protect the projector. *9 Available only with PT-RZ970/RZ770/RZ660. *10 Available only with PT-RZ970/RZ770/RZ660. Available worldwide except the United States.

The cabinet for each model is available in black or white.

Black models

PT-RZ970B
PT-RW930B
PT-RX110B
PT-RZ770B
PT-RW730B
PT-RZ660B
PT-RW620B

[Models with supplied lens]

PT-RZ970LB
PT-RW930LB
PT-RX110LB
PT-RZ770LB
PT-RW730LB
PT-RZ660LB
PT-RW620LB

[Models without lens]

White models

PT-RZ970W
PT-RW930W
PT-RX110W
PT-RZ770W
PT-RW730W
PT-RZ660W
PT-RW620W

[Models with supplied lens]

PT-RZ970LW
PT-RW930LW
PT-RX110LW
PT-RZ770LW
PT-RW730LW
PT-RZ660LW
PT-RW620LW

[Models without lens]

Panasonic®

For more information about Panasonic projectors, please visit:
Projector Global Website – **panasonic.net/avc/projector**
Facebook – **www.facebook.com/panasonicprojector**
YouTube – **www.youtube.com/user/PanasonicProjector**

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All information included here is valid as of February 2017.

Sample Product Cutsheets (Audio-Visual)

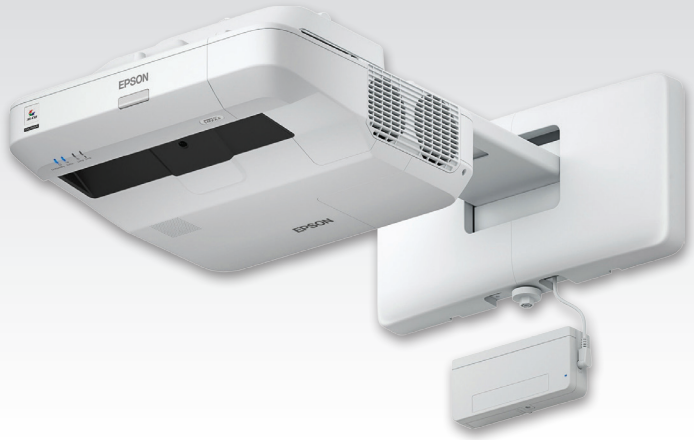
EPSON
EXCEED YOUR VISION

SPECIFICATION SHEET

BrightLink® Pro 1460Ui Full HD Interactive Display

Displays

Interactive



The bright Full HD interactive display for more efficient meetings.

Reinvent your whiteboard — turn any wall or existing dry-erase board into a 100" interactive display for more efficient meetings and collaboration, in the room or across the globe

Bright display — 4,400 lumens color/white brightness[1]

Full HD WUXGA display up to 100" — for an optimal viewing experience and clear readability — 3x as big as a 60" flat panel

Easy-to-use, touch-enabled interactivity — just turn on BrightLink Pro and start writing using your finger or the included pens

Wireless screen mirroring — stream Full HD 1080p content; mirror your Android™ device screen with Miracast®

Capture, save and share — no need to transcribe meeting notes or snap a photo; easily save, print or email directly from your BrightLink Pro

Whiteboard sharing — both local and remote participants can simultaneously annotate content from mobile devices, computers and other BrightLink Pros

Wireless device compatibility — wirelessly display documents, files and photos from your iPad®, iPhone®, and Android mobile devices with the Epson iProjection™ App[2]

Convenient DVI-out connectivity — share whiteboard content to a larger display, videoconferencing system or recording device

DuoLink — install two interactive displays side by side to achieve an even larger interactive display area[3]

Sample Product Cutsheets (Audio-Visual)

EPSON®
EXCEED YOUR VISION

BrightLink® Pro 1460Ui Full HD Interactive Display

Specifications

Display System Epson® 3LCD, 3-chip technology
Display Method Front/wall mount/table
Driving Method Epson Poly-silicon TFT Active Matrix
Pixel Number 2,304,000 dots (1920 x 1200) x 3
Color Brightness Color Light Output: 4,400 lumens[1]
White Brightness White Light Output: 4,400 lumens[1]
Aspect Ratio 16:10
Native Resolution 1920 x 1200 (WUXGA)
Lamp Type 300 W UHE
Lamp Life[4]
Up to 10,000 hours (ECO Mode)
Up to 5,000 hours (Normal Mode)
Throw Ratio Range 16:10 0.27 (Zoom: Wide), 0.37 (Zoom: Tele)
Size (Projected Distance) Area: 16:10 70" – 100"
Keystone Correction (Manual)
Horizontal: ± 3 degrees
Vertical: ± 3 degrees
USB Plug 'n Play
Mac® 10.7 or later
Windows Vista® or later
Contrast Ratio Up to 16,000:1
Color Reproduction 1.07 billion colors

Wireless Specification

Supported Security Mode
Quick Mode: OPEN, WPA2-PSK
Advanced Mode: OPEN, WPA2-PSK, WPA/WPA2-PSK, WPA2-EAP, WPA/WPA2-EAP
Supported EAP Type: PEAP, PEAP-TLS, EAP-TLS, EAP-Fast, LEAP
Supported Speeds
IEEE 802.11b: 11 Mbps*
IEEE 802.11g: 54 Mbps*
IEEE 802.11n: 130 Mbps*
*Maximum speed and range is achievable when used with the same Enhanced Mode technology. Actual data rates, features and performance may vary depending on your computer system, the environment and other factors.

Projection Lens

Type Manual focus
F-number 1.60
Focal Length 4.2 mm
Zoom Ratio Digital zoom 1.0 – 1.35x

Remote Control

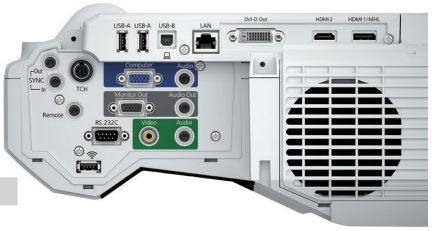
Features Source search, HDMI®, Computer, LAN, Whiteboard, Power, Aspect, Color mode, Volume, E-zoom, A/V Mute, Freeze, Menu, Home, Auto, Enter, Esc, Pointer, User, Pen mode, Split, Home, ID, Link menu, Page-up, Page-down
Operating Angle
Front: Right/left: -30 to +30 degrees
Upper/lower: 0 to +60 degrees
Operating Distance 19.7 ft (6 m)

Other

Speaker 16 W monaural
Operating Temperature 41 ° to 104 °F (5 ° to 40 °C)

Interfaces

Sync In	Audio Out
Sync Out	Video
Remote	Audio
TCH	USB-A x 2
RS-232C	USB-B
Wireless	LAN
Computer	DVI-D Out
Audio	HDMI 2
Monitor Out	HDMI 1/MHL



Other (continued)

Power Supply Voltage 100 – 240 V ± 10%, 50/60 Hz
Power Consumption
520 W (Normal Mode)
430 W (ECO Mode)
<3.0 W Standby (Communication Off)
<0.5 W Standby (Communication Off)
Fan Noise
38 dB (Normal Mode)
30 dB (ECO Mode)
Security Kensington lock provision, security anchor bar, password protection function

Interactive Specifications

Interactive Area (Image Size) 70" – 100" diagonal (16:10, WUXGA)
Input Device Digital pen or finger
Number of Pens Two
Number of Pen Tips Six (4x felt/soft tip, 2x Teflon™ hard tip)
Pen Functions Mouse functions (left and right click), Electronic pen, LED battery status indicator
Pen Specifications
Size: 6.3" (L) x 0.95" (W)
Weight: 1.1 oz (without battery)
Power: AA battery
Compatible battery types: AA x 1. Manganese dry cell, Alkaline dry cell, Panasonic eneloop® BK-3MCCx (The suffix "x" can be blank or A-Z)
Calibration method: Automatic or Manual
Interactive Modes
Whiteboard Mode: 2x pens and 6x fingers
PC-free Annotation Mode: 2x pens and 2x fingers
Computer Interactivity Mode, Easy Interactive Tools: 2x pens and 6x fingers
Requirements for Computer Interactivity
Connection to the computer: Via USB cable or wired/wireless LAN
Software system compatibility: Epson Easy Interactive Driver for Mac only; Windows® driver for Multi Projection and Windows and Linux: No driver required
Mac: Mac OS® X 10.7.x or later

Interactive Software

Epson Easy Interactive Tools for Windows/Mac (available for free unlimited download at Epson.com support page)[5]
System Compatibility
Windows 10, Windows 8/8.1* (all editions except for Starter), Windows 7*, Windows 7 SP1*, Windows Vista SP2** (all editions except for Starter), Windows Vista SP1**, Windows Vista**
Mac OS X® 10.7.x, 10.8.x, 10.10.x, 10.11.x, macOS™ 10.12.x
*32-bit and 64-bit version **32-bit versions only

Dimensions (W x D x H)

Excluding feet 18.7" x 17.6" x 6.3"
Weight
18.7 lb without slide plate
20.1 lb with slide plate

Eco Features

Energy-efficient 3LCD light engine
RoHS compliant
Recyclable product[6]
Epson America, Inc. is a SmartWay® Transport Partner[7]

Support

Epson ConnectionSM
Pre-sales support U.S. and Canada 800-463-7766
Internet website: www.epson.com
www.epson.com/blpro
Service Programs 2-year limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

BrightLink Pro 1460Ui, 802.11 b/g/n wireless module, Quick User's Guide, Power cable, USB A/B cable (x3), Electronic user manual, Interactive driver for Mac, Multi-projection driver for Windows, Epson Easy Interactive Tools, Network Management software, Projector remote control, Control pad with connecting cable, Pen holder, Two (2) interactive pens, Finger Touch Unit with bracket and cable, Two (2) AA batteries (for interactive pens)

Ordering Information

BrightLink Pro 1460Ui	V11H726520
Genuine Epson lamp (ELPLP92	V13H010L92
Replacement air filter (ELPAF49)	V13H134A45
Replacement wireless module	V12H731P02
Easy interactive pen A (orange)	V12H773010
Easy interactive pen B (blue)	V12H774010
Replacement pen tips (Teflon/hard)	V12H775010
Replacement pen tips (felt/soft)	V12H776010
Ultra short-throw wall mount	V12H777020
100" whiteboard	V12H831000
Motorized interactive table	V12H893020

1 Color brightness (color light output) and white brightness (white light output) will vary depending on usage conditions. Color light output measured in accordance with IDMS 15.4; white light output measured in accordance with ISO 21118. | **2** The projector must be configured on a network. Epson projectors can be networked either through the Ethernet port on the projector (check model specifications for availability) or via a wireless connection. Check your owner's manual to determine if a wireless LAN module must be purchased separately to enable wireless connection on your Epson projector. Not all Epson projectors are able to be networked. Availability varies depending on model. Not all files and formats are supported. See www.epson.com for details. | **3** Certain functionality is only available through EIT software. | **4** Lamp life will vary depending upon mode selected, environmental conditions and usage. Lamp brightness decreases over time. | **5** For a list of supported operating systems, visit epson.com | **6** For convenient and reasonable recycling options, visit www.epson.com/recycle | **7** SmartWay is an innovative partnership of the U.S. Environmental Protection Agency that reduces greenhouse gases and other air pollutants and improves fuel efficiency.

See the latest innovations from Epson Business Solutions at **www.epson.com/forbusiness**

Better Products for a Better Future™
eco.epson.com

SmartWay Transport Partner
Getting There With Cleaner Air

Contact:

Epson America, Inc.
3840 Kilroy Airport Way, Long Beach, CA 90806

Epson Canada Limited
185 Renfrew Drive, Markham, Ontario L3R 6G3

www.epson.com
www.epson.ca

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Sample Product Cutsheets (Audio-Visual)

ACCESS V

MOTORIZED, CEILING-RECESSED, TAB TENSIONED PROJECTION SCREEN

The ACCESS V is a motorized, ceiling-recessed projection screen with a steel white case that install s above the ceiling. A trim flange finishes the ceiling opening for a clean appearance. Tab-tensioned viewing surface and roller can be installed at the same time, or can be added at a later time.

FEATURES

- INCLUDES: One 110-220V or 220V 3-position switch.
- CASE DIMENSIONS: 8-1/16" W x 7-3/8" H (20.6 cm x 18.7 cm) including flange.
- BLACK DROP: 12" (30 cm) black drop at top of screen is standard.
- HOISTING BRACKETS: Adjustable or removable hoisting brackets included for easy lifting during installation.
- SLIDING BRACKET: Bracket on inside of case accommodates different sizes of screen.
- HINGED DOOR: Bottom panel with new hinge system allows the closure panel to hang in place when opened, or it can be easily removed.
- WARRANTY: One year against defects in materials and workmanship.
- US PATENTS: *http://www.draperinc.com/legal/patents/*

OPTIONS

- CONTROLS: Can be furnished with *standard options*.
- MOTORS: *Built-in Quiet, Low Voltage* and 220V options available.
- VIEWING SURFACES: Available with *viewing surfaces* from the TecVision (premium engineered), OptiFlex (tensioned), CineFlex (rear projection), and ClearSound (acoustically transparent) families.
- EXTRA DROP: Available above image area. Specify color.
- BLACK CASE: Available on request.

SIZES

- 16:10 FORMAT: 137" (348 cm) to 226" (574 cm) dia.
- 16:9 HDTV FORMAT: from 133" (338 cm) to 220" (559 cm) dia.
- 4:3 NTSC/PAL FORMAT: from 150" (381 cm) to 240" (610 cm) dia.
- AV FORMAT: from 96" x 96" (244 cm x 244 cm) to 144" x 192" (366 cm x 488 cm) viewing area
- CUSTOM SIZES AVAILABLE: For smaller screen sizes see the Access FIT V.

SUPPORTING DOCUMENTS

All instructions, technical drawings and other supporting documents are located at:
www.draperinc.com/Documents.aspx

For more information on this product visit:
www.draperinc.com/go/AccessV.htm

DRAPER®

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Sample Product Cutsheets (Audio-Visual)

TECHNICAL DATA SHEET AV

OPTIFLEX MATT WHITE XT1000V

TENSIONED SCREEN SURFACE

EXTRA WIDE VIEWING CONE / TYPICAL CONTRAST / ON-AXIS GAIN OF 1.0

The perfect matt white diffusing surface. Recommended for use with all types of projectors provided ambient light can be reasonably controlled. Reflects a uniformly bright image over complete 180° viewing cone with precise resolution and accurate color balance. This surface is GREENGUARD GOLD certified. Available with black backing and without.

SURFACE CHARACTERISTICS

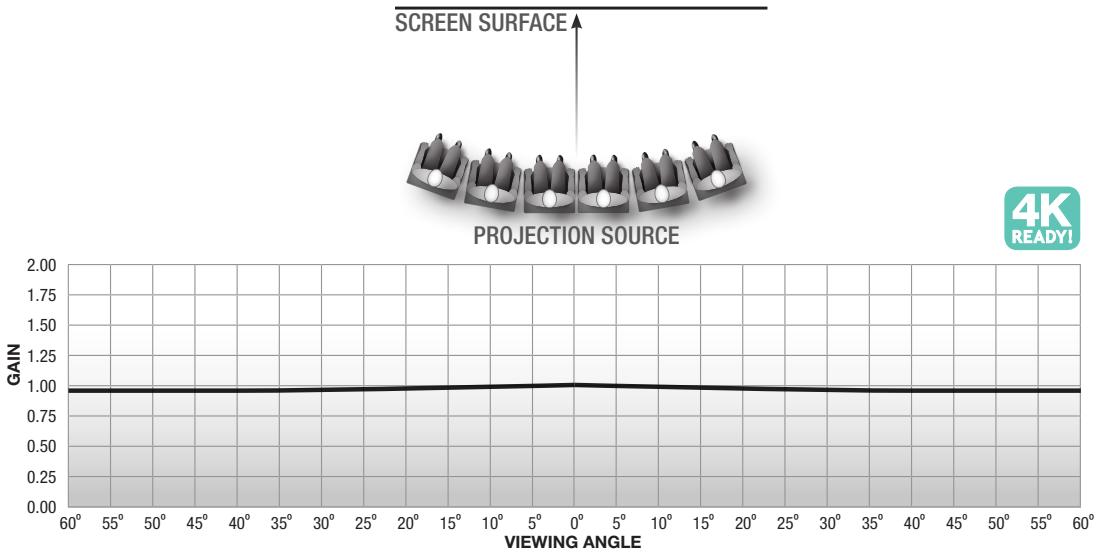
- Maximum Height Without Seams: 187"
- Weight (g/sm): 348
- Thickness (mm): 0.30
- Cleaning: Mild soap and water
- Composition: Flexible PVC

REFLECTIVE PERFORMANCE[1]

- Gain Chart—See below
  0° Gain: 1.0
  Half Gain Angle: Material does not reach half gain.

OptiFlex™ Family of Surfaces
OptiFlex surfaces are suitable for tensioning and are available on permanently tensioned screens and/or tab tensioned roller-operated screens, or both. Choose OptiFlex for the flattest front projection viewing surfaces. All are 4K ready.

[1]Individual test results may vary. Results based on a representative sample in Draper inventory.



GAIN CHART: 0° GAIN: 1.0, VIEWING CONE: 180° OPTIFLEX MATT WHITE XT1000V

Draper, Inc. | 411 S. Pearl St. Spiceland, IN 47385
draperinc.com | 800.238.7999 | 765.987.7999
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Sample Product Cutsheets (Audio-Visual)

TECHNICAL DATA SHEET AV

TECVISION XH900X ALR

REJECTS 60% OF AMBIENT LIGHT

HIGH CONTRAST/WIDE VIEWING CONE/ON-AXIS GAIN OF 0.9

This premium optical surface is engineered for high contrast, precise resolution and color accuracy. XH900X ALR performs very well in spaces where there is moderate ambient light and wide viewing angles. Like all TecVision surfaces XH900X ALR offers superior quality, consistency, uniformity and is 8K ready. Also available with acoustically transparent perforated or nano perforated surfaces in limited sizes.

– Lens/Throw distance ratio for best brightness uniformity: 1.2:1 or longer.

SURFACE CHARACTERISTICS

– Maximum Image Height: 276” (701 cm) Always optically seamless
– Weight (g/sm): 445
– Thickness (mm): .36
– Cleaning: Mild soap and soft cloth
– Flame and mildew resistant
– Composition: Flexible PVC

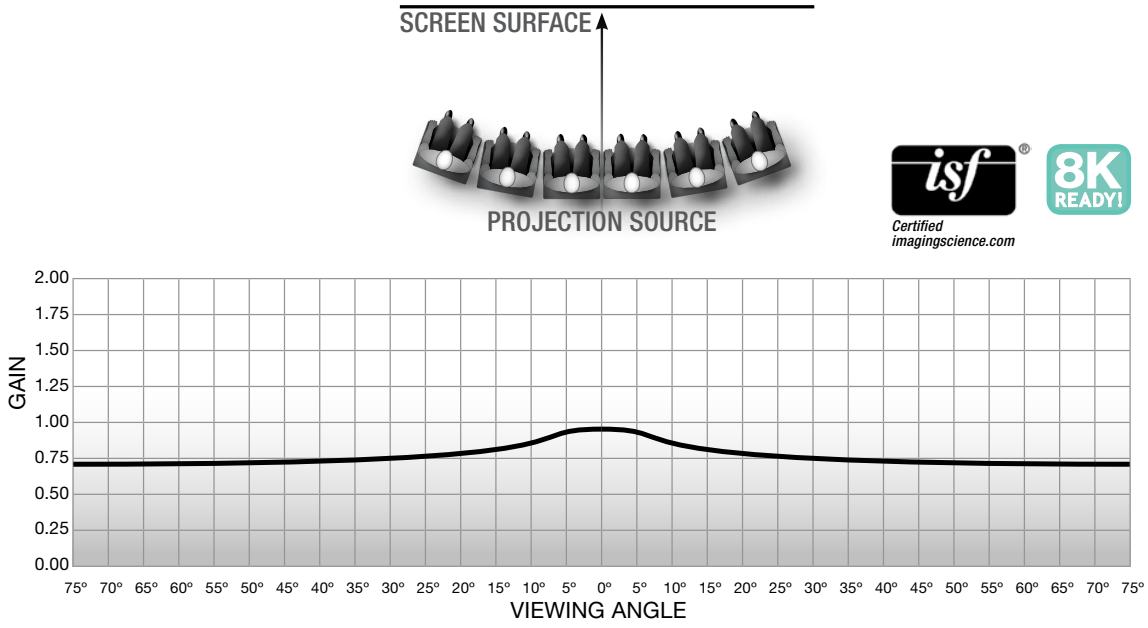
RELECTIVE PERFORMANCE*

– Gain Chart—See below
0° Gain: 0.90
Half Gain Angle: Material does not reach half gain, minimum gain: 0.7
– ALR: 60%

**Individual test results may vary slightly.*

TECVISION

The TecVision Family of Surfaces
TecVision™ Engineered Surface Technology is offered in several exclusive formulations on Draper tab-tensioned and permanently tensioned screens. These formulations are designed to optimize performance and color fidelity in a broad range of settings and at a variety of light levels. White surfaces with gains ranging from 1.0 to 1.8 provide remarkably wide viewing cones. ALR (Ambient Light Rejection) surfaces offer excellent performance under higher room light levels. Other formulations offer performance needed for specific applications like blending and short throw applications in controlled ambient light, or 3-D.



GAIN CHART TECVISION XH900X ALR

Sample Product Cutsheets (Audio-Visual)

CeramicSteel

PolyVision
a steelcase company

POLYVISION e³ CERAMICSTEEL

The world's most popular writing surface

Sample Product Cutsheets (Audio-Visual)

POLYVISION e³ CERAMICSTEEL

FROM CHALKBOARDS TO WHITEBOARDS IN 8 MILLION CLASSROOOMS

PolyVision e³™ CeramicSteel writing surfaces are made for busy offices and boisterous classrooms, providing a super-smooth writing surface that erases like magic and won't scratch, stain or fade for as long as it is in use—guaranteed.

PolyVision e³ is the most popular writing surface for chalkboards and whiteboards, providing superior writability, durability and erasability.

Technical Information

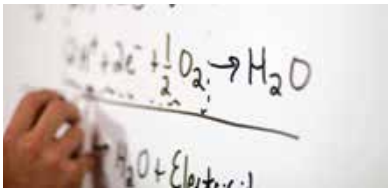
- Can be written on with dry-erase, semi-permanent, water-soluble or permanent marker, chalk, pen or crayon
- Optimum erasability—no ghosting and easy to maintain
- Scratch, bacteria, chemical and fire resistant—will not combust or release toxic fumes in the event of fire
- Greater color contrast
- 99.9% recyclable and Cradle to Cradle Certified™ Silver
- Standard and premium color finishes available
- Colorfast—will not fade
- Safe and clean, releases no harmful chemicals into the environment

Chemical Resistant | Scratch Resistant | Bacteria Resistant

Fire Resistant | Graffiti Resistant | Stain Resistant

Sample Product Cutsheets (Audio-Visual)

A BETTER SURFACE MEANS A BETTER EDUCATIONAL EXPERIENCE



Whiteboard Surfaces: High performance. Low maintenance.

Delivering long-lasting quality with environmental responsibility, PolyVision e³ CeramicSteel is the global choice for whiteboards and markerboards that provide a clean performance and great writing experience for years to come. A smooth surface and resistance to chemicals, scratching and wear ensures unbeatable durability, unmatched erasability and low maintenance throughout a lifetime of use.

Chalkboard Surfaces: Ecological. Durable.

PolyVision e³ CeramicSteel chalkboard surfaces combine an excellent erasability with wear resistance, durability and product lifetime warranty. Our smooth matte finish chalk surfaces will not leave annoying "ghost writing" and yield less chalk dust for a cleaner, healthier environment.

Get creative by adding permanent magnets, or have it delivered with colorful printed patterns, lines, logos or other graphics. Our chalkboard surfaces are a breeze to clean with wet or dry cloths.

Surface Options: The right surface for every need.

The PolyVision e³ CeramicSteel product line offers surface options to meet the precise needs of your environment and product use. For instance, you can specify a super-smooth high-gloss finish for superior dry-erase performance or opt for reduced-glare or low-gloss (matte) surfaces to showcase projected images with exceptional clarity.

Ask your PolyVision representative which e³ surface is right for you. Each one is made for life—and your specific needs.

Our eVision

Today it can be tough to fairly assess what constitutes environmental authenticity. Specifying Cradle to Cradle Certified℠ products ensures that PolyVision's materials live up to the world's toughest standards for human and environmental health.

PolyVision e³ CeramicSteel is safe and clean, contains no VOCs and is 99.9% recyclable.

Don't forget, specifying PolyVision e³ CeramicSteel is a healthy business move.

Our surfaces will help you deliver competitive differentiation in the marketplace and meet the growing demand for green building practices. It leads the market in quality and sustainability—so you can, too!

Sample Product Cutsheets (Audio-Visual)

IMADE FOR LIFE

polyvision.com

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a steelcase company

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Environmental Policy: PolyVision strives for continuous improvement in all areas of environmental stewardship – responsible use of raw materials and natural resources, design processes and operation of all facilities – to protect, replenish, and restore the communities in which we live and serve.

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04-30-14 ENG

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8

8x8 DigitalMedia™ Switcher

Crestron® DM® Switchers provide the foundation for a complete DigitalMedia™ system, delivering an advanced 4K ultra high-definition AV signal routing solution that's extremely flexible and installer-friendly. The DM-MD8X8 affords ultra fast switching and pure, lossless distribution of HDMI® and other signals to support all the digital media players, HDTV receivers, computers, cameras, and display devices that fill any modern home or commercial facility. DigitalMedia thoughtfully manages all of the disparate AV signals and devices to deliver a transparent user experience, and to ensure an optimum video image and audio signal at every location.

The DM-MD8X8 is field-configurable to handle up to eight AV sources of virtually any type. The outputs are also field-configurable to provide up to eight DM, HDBaseT®, and/or HDMI outputs, or up to four H.264 streaming outputs, in a single chassis.[1] A full selection of DM switcher input and output cards, DM transmitters, and DM receivers provides extensive connectivity throughout a residence or commercial facility, supporting a complete range of analog and digital signal types — all through one switcher!

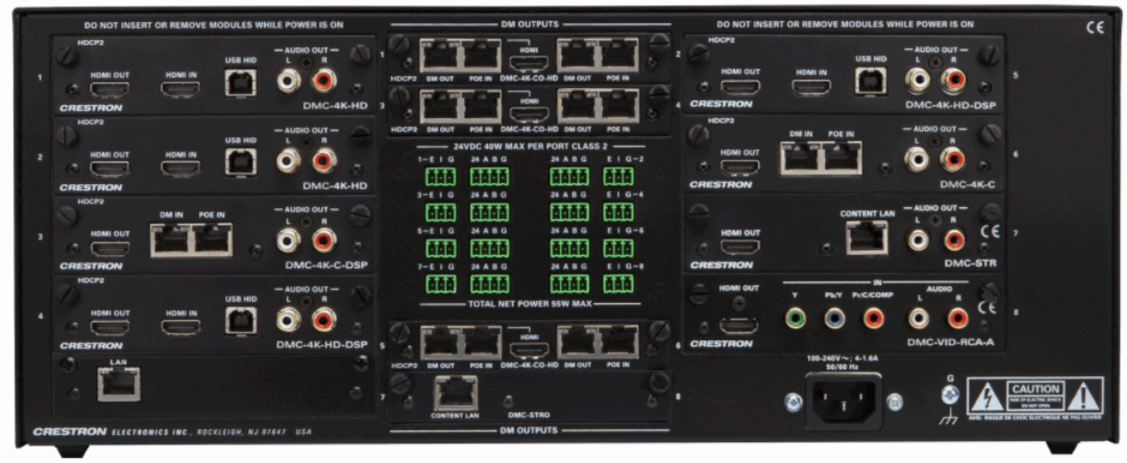
Integrated Ethernet networking and USB distribution provide a complete connectivity solution combined with built-in Crestron control[2] for managing the displays and other room devices without necessitating any additional wiring. User-friendly operation, setup, and troubleshooting tools are provided through the DM-MD8X8 front panel, or via Crestron Toolbox™ software, to make setting up a complete multiroom 4K video distribution system easy.

To configure a DM switcher complete with input and output cards, cables, and other peripherals, please use the DigitalMedia Switcher Configuration Tool.

- *Delivers a unified HD signal distribution solution incorporating both point-to-point wired and IP streaming technologies*
- *Provides lossless HD AV signal routing over twisted pair copper wire or fiber*
- *Integrates video, audio, networking, and control over one wire or fiber strand*
- *Enables high-performance H.264 streaming from any input source up to 1080p or WUXGA*
- *Affords full matrix switching with ultra high 12.5 Gbps backplane data rate*
- *Handles HDMI® with Deep Color, 3D, 4K, and high-bitrate 7.1 encoded audio[3]*
- *HDBaseT® Certified — Enables direct connection to other HDBaseT certified equipment*
- *HDCP 2.2 compliant via compatible 4K input and output cards[3]*
- *Distributes Full HD 1080p, Ultra HD, and 4K signals over CAT type twisted pair cable at distances up to 330 ft (100 m) via DM 8G+® and HDBaseT[4,9]*
- *Distributes 1080p and WUXGA signals over multimode fiber at distances up to 1000 ft (300 m) via DM 8G® Fiber[5,9]*
- *Distributes 1080p and WUXGA signals over single-mode fiber at distances up to 7.5 miles (12 km) via DM 8G SM Fiber[6,9]*
- *Allows streaming of 1080p signals over an IP network with no distance limitations*
- *Also supports all first-generation DM® CAT and DM Fiber products[7,8,9]*
- *Configurable with up to eight DM, HDBaseT, and/or HDMI outputs*
- *Configurable with up to four streaming outputs[1]*
- *Easy output expansion using multiple DM switchers*
- *Modular inputs support a complete range of digital, analog, and streaming signal types*
- *QuickSwitch HD™ technology manages HDCP keys for fast, reliable switching*
- *Auto-Locking® technology achieves rapid switching between disparate sources*
- *Detects and displays detailed video and audio input information*
- *Performs automatic AV signal format management via EDID*
- *Allows independent scaling for every display through select output cards and DM receivers[12]*
- *Enables device control via CEC*
- *Distributes and routes USB HID mouse and keyboard signals[15]*
- *Expanded USB routing capabilities available using USB over Ethernet Extenders[15]*
- *Allows full audio and USB breakaway switching*
- *Supports analog audio embedding and de-embedding*
- *Integrates with analog audio distribution systems*
- *Enables simultaneous output of stereo and surround sound audio*
- *Includes integrated Ethernet switch with Gigabit LAN port*
- *Private Network Mode — requires just one IP address for the complete DM system*
- *Provides easy setup and diagnostics tools via front panel or software*
- *Half-million hour rated internal universal power supply*
- *4-space 19-inch rack-mountable*

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher



DM-MD8X8 – Rear view with I/O cards installed

4K Ultra HD

Crestron DigitalMedia continues to advance the standard for digital AV signal distribution, delivering the world's first end-to-end 4K system solution. From day one, the DM-MD8X8 was designed to meet the extreme bandwidth requirements for handling 4K and Ultra HD video signals. Support for 4K video also ensures support for the latest generation of computers and monitors with native resolutions beyond 1080p and WUXGA.[3]

DigitalMedia 8G™

As the leader in HDMI and control system technologies, Crestron developed DigitalMedia (DM) to deliver the first complete HD AV distribution system to take HDMI to a higher level. DigitalMedia allows virtually any mix of HDMI and other AV sources to be distributed throughout a room, building, or campus. The latest generation of DM is called DigitalMedia 8G (DM 8G®). Engineered for ultra high-bandwidth and ultimate scalability, DM 8G provides a true one-wire lossless transport for moving high-definition video, audio, Ethernet, and control signals over a choice of twisted pair or fiber optic cable.

DM 8G handles uncompressed Full HD 1080p, Ultra HD, 2K, and 4K video signals with support for 3D, Deep Color, and HDCP 2.2.[3] Audio capabilities include the simultaneous distribution of stereo and multichannel surround sound signals, with support for high-bitrate 7.1 audio formats like Dolby® TrueHD, Dolby Atmos®, and DTS-HD Master Audio™ as well as uncompressed linear PCM. All signals are transported over one CAT type twisted pair cable or one strand of multimode or single-mode fiber. DM 8G enables wire distances up to 330 feet (100 m) via DM 8G+® (DM 8G over twsited pair copper wire)[4,9], 1000 feet (300 m) via DM 8G Fiber (DM 8G over multimode fiber)[5,9], or 7.5 miles (12 km) via DM 8G SM Fiber (DM 8G over single-mode fiber)[6,9].

The DM-MD8X8 provides full support for Crestron DM 8G devices as well as all first-generation DM CAT[7,9] and DM Fiber[8,9] products, letting you take advantage of the latest Crestron DM 8G technology without compromising your existing investment.

HDBaseT® Certified

Crestron DigitalMedia 8G+® technology is designed using HDBaseT Alliance specifications, ensuring interoperability with other HDBaseT certified products. Via DM 8G+, the DM-MD8X8 can be connected directly to an HDBaseT compliant device without requiring a DM transmitter or receiver.

H.264 Streaming

High-performance H.264 streaming capability enables enterprise-wide distribution of HD content over an IP network. Streaming expands the capabilities of DM to remove all distance limitations and allow distribution to virtually any device — anywhere in the world. Streaming is an essential component of any complete DM system, allowing for high-definition signal routing to Crestron touch screens, digital signage displays, remote buildings, and global offices without requiring any new or dedicated wiring. Large-scale streaming to computers and mobile devices can be facilitated through integration with a streaming media system such as Wowza® or Kaltura®.

DigitalMedia with streaming affords the ability to distribute any combination of sources to virtually any device anywhere. Each streaming output supports resolutions up to HD 1080p at bitrates up to 25 Mbps. Built-in scaling enables fast, trouble-free switching between sources of any type or resolution up to 1080p or WUXGA. Audio support includes stereo signals, as well as multichannel audio signals downmixed to stereo via any "DSP" type input card.[10] High-quality video and audio is maintained using high-performance H.264 video and AAC audio compression. The encoded video and audio can be output as independent RTP streams or encapsulated in an MPEG-TS (MPEG-2 Transport Stream) container. HDCP management ensures that protected content cannot be distributed via streaming.

Each streaming output is actually fed internally by two separate switcher outputs, allowing any two input sources to appear picture-in-picture or side-by-side in a single stream. Instant, single-frame switching between two full screen images is also possible. The audio signals from both input sources can also be mixed, allowing both signals to be heard simultaneously.

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher

The DM-MD8X8 can receive streaming signals as well as transmit them. Streaming input capability enables IP cameras and other H.264 encoded sources to be distributed via DigitalMedia alongside HDMI and other non-streaming sources. It also allows DM switchers to be bridged together across a campus or around the world, enabling simplified routing of HD content between buildings and global offices.

DigitalMedia provides many deployment options to address a wide range of streaming applications and accommodate each organization's specific IT requirements. DM with streaming supports both unicast and multicast, with or without RTSP (Real Time Streaming Protocol). Streaming connections can be configured to stream directly to one or more specific IP addresses, or to use RTSP to manage the configuration of numerous connections automatically. Any streaming input or output may be configured to stream via the DM switcher's LAN port or via a dedicated "CONTENT LAN" port, allowing the option to combine control and content on a single network or isolate them onto separate networks.

Modular Architecture

The DM-MD8X8 features a modular architecture with 8 input card slots, and 4 dual output card slots. Each card slot on the DM-MD8X8 is field-installable, allowing for easy and flexible system configuration with the ability to make changes to the system as needs change. A wide selection of input cards is offered to support a complete range of digital and analog AV signal types including HDMI, DVI, Dual-Mode DisplayPort [11], SDI, RGB/VGA and analog video, SPDIF and analog audio, HDBaseT, H.264 streaming, and all types of DigitalMedia. Available outputs include all types of DigitalMedia, as well as HDBaseT, HDMI, analog audio, and H.264 streaming.[1]

Output Expansion

An HDMI "pass-through" output is provided on every input card to allow the inputs of up to 5 DM switchers to be daisy-chained, enabling the configuration of very large distribution systems with many outputs. Using five DM-MD8X8 switchers, it is possible to support up to 40 separate outputs.

QuickSwitch HD™

Handling high-definition digital media means handling HDCP (High-bandwidth Digital Content Protection), the encryption scheme that content providers use to protect their DVDs, Blu-ray™ discs, and broadcast signals against unauthorized copying. Viewing HDCP encrypted content requires a source device to "authenticate" each display and signal processor in the system and issue it a "key" before the content can be viewed. Ordinarily this causes a complete loss of signal for up to 15 seconds each time a new source or display is selected anywhere in the system. To make matters worse, every source device has a limited number of keys available, so connect too many displays and the source will simply stop outputting a signal without warning.

Not to worry — Crestron QuickSwitch HD manages the keys for every HDCP-compliant device in the system, maintaining continuous authentication for each device to ensure fast, reliable routing of any source to any number of display devices.

Auto-Locking® Technology

Crestron Auto-Locking Technology enables super fast signal switching by instantaneously configuring every device in the signal path as soon as the signal hits the first device. Whether switching between sources or TV channels, Auto-Locking significantly reduces the time it takes each device to sense the new signal and configure itself to handle the changes, virtually eliminating any noticeable gap while switching.

EDID Format Management

With all of today's varied AV sources comes a multitude of confusing video and audio formats to keep track of, and chances are not every device in your system supports all of the same formats. Such conflicts can wreak havoc any time you route one source to more than one display or audio component. The media source feeding your 1080p or Ultra HD projector in the theater may restrict itself to a lower resolution, or even shut off completely, if someone decides to view the same signal on a smaller TV in another room. And, instead of enjoying your theater's incredible 7.1 surround sound, you may find yourself limited to 5.1 or even plain old stereo.

DigitalMedia eliminates such conflicts by managing the EDID (Extended Display Identification Data) that modern digital devices use to communicate their capabilities. Via Crestron Toolbox software, the format and resolution capabilities of each device can be assessed, allowing the installer to configure EDID signals appropriately for the most desirable and predictable behavior.

A Scaler for Every Display

High-performance scaling capability can be added to any DM system using select output cards and DM receivers with built in HD and 4K scalers. By placing an independent scaler at every display device, DigitalMedia truly delivers the most flexible and user-friendly solution for routing multiple disparate sources to many different display devices. This "Distributed Scaler Approach" ensures an optimal image on every screen no matter what sources are selected. Distributed scaling allows a high-res computer source to be viewed on any display in the building. It also allows an SD, HD, or Ultra HD video source to be viewed simultaneously on the 4K display in your theater and on lower-resolution displays throughout the house.

Versatile Audio Routing

HDMI is the key to handling 7.1 surround sound formats like Dolby TrueHD, Dolby Atmos, and DTS-HD Master Audio. Great for your high-end home theater, but how do you share that same source with other audio zones in the house?

DigitalMedia provides the answer, allowing for the simultaneous distribution of multichannel surround sound and two-channel stereo signals from the same HDMI source. Using a choice of "DSP" type input cards, the DM-MD8X8 employs onboard digital processing to derive a stereo downmix from the original multichannel signal. Both signals can be routed separately or simultaneously from any of the switcher's DM outputs, allowing either signal to be selected for output at each DM receiver location.

Back at the switcher, the digital stereo signal is also converted to analog to enable sharing with every other room in the house via a Sonnex® Multiroom Audio System or any other audio distribution system. The

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher

DM-MD8X8 also allows surround sound processors and amplifiers to be located centrally instead of at the display location via optional local HDMI outputs.

Built-in Ethernet Switch

In addition to transporting digital video and audio, DigitalMedia can also extend 10/100 Ethernet out to each display and source device via select DM receivers and transmitters, providing high-speed connectivity for any room device that requires a LAN connection. Ethernet is also utilized internally by the Crestron control bus to manage the DM devices in the system and provide display control in each room.

Private Network Mode

To streamline its implementation on a corporate or university LAN, the DM-MD8X8 employs Private Network Mode to provide a single-point connection for the complete system. Using Private Network Mode, the DM-MD8X8 requires just one IP address for the complete DM network including all connected DM receivers and transmitters.

USB Signal Routing

Along with video, audio, and Ethernet, DigitalMedia also provides for the routing of USB HID (Human Interface Device) signals, allowing a USB HID compliant keyboard and/or mouse at one location to control a computer or media server at another location. USB HID connectivity is provided through select DM receivers, transmitters, and input cards.

Crestron also offers USB extenders to enable the routing of virtually any type of USB peripheral to any host device, all managed through the DigitalMedia system. Connect a USB over Ethernet Extender host module (USB-EXT-DM-LOCAL [12]) to each computer, media server, game system, annotator, and any other host that you want to control or communicate with. Then, install a device module (USB-EXT-DM-REMOTE [12]) at every display location to connect keyboards, mice, game controllers, whitboards, flash drives, Web cameras, and mobile devices. Every module communicates with the DM switcher over the local Ethernet network or via a direct connection to the LAN port of a DM transmitter or receiver.

CEC Embedded Device Control

The primary objective of every Crestron system is to enable precisely the control desired for a seamless user experience. DigitalMedia provides an alternative to conventional IR and RS-232 device control by harnessing the CEC (Consumer Electronics Control) signal embedded in HDMI. Through its connection to the control system, the DM-MD8X8 provides a gateway for controlling many devices right through their HDMI or HDBaseT connections, potentially eliminating the need for any dedicated control wires or IR emitters.[13]

Easy Setup

Via the front panel or using Crestron Toolbox software, every step of the DM-MD8X8's setup process is designed to be quick and easy, configuring inputs and outputs automatically while letting the installer make intelligent design decisions along the way. The switcher even tests and measures the length of each DM cable, automatically making the appropriate calibrations for optimal signal transmission to every room. With DigitalMedia, an entire 8x8 system can be commissioned in under an hour.

To configure a DM switcher complete with input and output cards, cables, and other peripherals, please use the DigitalMedia Switcher Configuration Tool.

Are you upgrading an existing DM switcher that has older "multi-gang" DMCO-series output cards? Use the online Output Card Additions and Upgrades Tool to update your existing output cards and switcher to the new "single-gang" output card format.

Please refer to the DigitalMedia Resources Webpage at http://www.crestron.com/dmresources/ for additional design tools and reference documents.

SPECIFICATIONS

Maximum DM 8G® Cable Lengths

Cable Type: / Resolution:	DM-CBL-ULTRA DM® Ultra Cable	DM-CBL-8G DM 8G® Cable	3rd-Party CAT5e (or better) UTP or STP
1080p60 Full HD	330 ft (100 m) via any DM 8G+ cards		
1920x1200 WUXGA			
1600x1200 UXGA			
2048x1080 2K DCI @24Hz			
2048x1080 2K DCI @60Hz	330 ft (100 m) via "4K" DM 8G+ cards	230 ft (70 m) via "4K" DM 8G+ cards	165 ft (50 m) via "4K" DM 8G+ cards
2560x1440 WQHD			
2560x1600 WQXGA			
3840x2160 Ultra HD			
4096x2160 4K DCI			

Cable Type: / Resolution:	CRESFIBER8G CresFiber® 8G Multimode Fiber	3rd-Party OM3 Multimode Fiber
1080p60 Full HD	1000 ft (300 m) via DM 8G Fiber cards	500 ft (150 m) via DM 8G Fiber cards
1920x1200 WUXGA		
1600x1200 UXGA		
2048x1080 2K DCI @24Hz		

Cable Type: / Resolution:	CRESFIBER8G-SM CresFiber 8G Single-Mode Fiber	3rd-Party G.652.D (or better) Single-Mode Fiber
1080p60 Full HD	7.5 miles (12 km) via DM 8G SM Fiber cards	
1920x1200 WUXGA		
1600x1200 UXGA		
2048x1080 2K DCI @24Hz		

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher

Video

Switcher: 8x8 digital matrix, modular input/output cards, Crestron QuickSwitch HD™
Input Signal Types: Configurable via modular plug-in cards supporting HDMI® (DVI & Dual-Mode DisplayPort compatible [11]), DVI, 3G-SDI, RGB/VGA, component, S-Video, composite (NTSC & PAL), DM 8G+® & HDBaseT®, DM 8G Fiber, DM 8G SM Fiber, DM® CAT (legacy), DM Fiber (legacy), & H.264 streaming
Output Signal Types: Configurable via modular plug-in cards supporting HDMI (DVI compatible [14]), DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming (All input cards also include HDMI pass-through outputs)
Backplane Data Rate: 12.5 Gbps

Note: For additional specifications, please refer to the spec sheet for each input and output card.

Audio

Switcher: 8x8 digital multichannel audio-follow-video matrix switching, plus independent 8x8 stereo matrix for audio breakaway
Input Signal Types: Configurable via modular plug-in cards supporting HDMI (Dual-Mode DisplayPort compatible [11]), 3G-SDI, analog (stereo 2-channel), SPDIF, DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming
Output Signal Types: Configurable via modular plug-in cards supporting HDMI, analog (stereo 2-channel), DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming (All input cards also include HDMI pass-through outputs, and most digital audio input cards also include analog stereo pass-through audio outputs)

Note: For additional specifications, please refer to the spec sheet for each input and output card.

Communications

Ethernet: 10/100/1000 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, DHCP, Private Network Mode
USB: USB signal routing via select input cards, transmitters, receivers, and extenders [15]; USB computer console port for setup
DigitalMedia: DM 8G+, DM 8G Fiber, DM 8G SM Fiber, DM Fiber, DM CAT, DMNet™, HDCP 2.2 [3], EDID, CEC, PoDM, PoDM+, Ethernet
HDBaseT: HDCP 2.2 [3], EDID, CEC, RS-232, PoH, Ethernet
HDMI: HDCP 2.2 [3], EDID, CEC

NOTE: Supports management of HDCP and EDID; supports management of CEC between connected HDMI and HDBaseT devices and a control system.[13] For additional specifications, please refer to the spec sheet for each input and output card.

Card Slots

1 – 8: (8) DM switcher input card slots;
Each slot accepts (1) DMC-series input card

DM OUTPUTS 1 – 8: (4) DM switcher output card slots;
Each slot accepts (1) DMC-series output card

Connectors

LAN: (1) 8-pin RJ45 female;
10Base-T/100Base-TX/1000Base-T Ethernet port

24ABG / EIG 1 – 8: (8) sets of (1) 4-pin and (1) 3-pin 3.5 mm detachable terminal blocks;
Comprises (8) DMNet ports with "EIG" power selection ports, each set is associated with the corresponding DM CAT output port on any installed DM CAT output card;
Each DMNet port provides power and communications for a DM CAT device connected via DM cable;
Each EIG port connects to an external power supply [16], or to the internal power source via a jumper, to power the DM CAT device connected to the corresponding DMNet port;
Maximum Load: 40 Watts (1.66 Amps @ 24 Volts DC) per port, limited to the available DMNet power from the internal power supply (see "Power Requirements" below) or an external power supply [16]

100-240V~4-1.6A 50/60Hz: (1) IEC 60320 C14 main power inlet;
Mates with removable power cord, included

G: (1) 6-32 screw, chassis ground lug

COMPUTER (front): (1) USB Type B female;
USB computer console port (6 ft cable included)

Controls & Indicators

LCD Display: Green LCD dot matrix, 128 x 64 resolution, adjustable LED backlight, displays inputs/outputs by name, video & audio signal information, Ethernet configuration and setup menus
SOFTKEYS: (4) Pushbuttons for activation of LCD driven functions
HW-R: (1) Recessed pushbutton for hardware reset, reboots the switcher
ROUTE: (1) Pushbutton and red LED, selects ROUTE mode to allow routing changes
VIEW: (1) Pushbutton and red LED, selects VIEW mode for viewing current routes
INFO: (1) Pushbutton and red LED, selects INFO mode for viewing AV and device info
MENU: (1) Pushbutton, steps menu back one level
ENTER: (1) Pushbutton, executes highlighted menu or value
AUDIO: (1) Pushbutton & red LED, selects audio routing view
VIDEO: (1) Pushbutton & red LED, selects video routing view
USB: (1) Pushbutton & red LED, selects USB routing view
Quick-Adjust Knob: (1) Continuous turn rotary encoder, adjusts menu parameters
IN 1 – 8: (8) Pushbuttons and red LEDs, each selects the corresponding input for routing
OUT 1 – 8: (8) Pushbuttons and red LEDs, each selects the corresponding output for routing
LAN (rear): (2) LEDs, green LED indicates Ethernet link status, amber LED indicates Ethernet activity

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher

Power Requirements

Main Power: 4-1.6 Amps @ 100-240 Volts AC, 50/60 Hz
Power Consumption: 220 Watts typical
Available DMNet Power: 55 Watts (2.3 Amps @ 24 Volts DC) from internal power supply
Available PoDM/PoH Power: Refer to the specifications for each DM 8G+ input and output card

Environmental

Temperature: 32° to 104° F (0° to 40° C)
Humidity: 10% to 90% RH (non-condensing)
Heat Dissipation: 750 BTU/hr
Ambient Noise: 31.5 to 37 dBA typical;
30 to 30.5 dBA idle

Enclosure

Chassis: Metal with black finish, vented sides, fan-cooled
Front Panel: Metal, black finish with polycarbonate label overlay
Mounting: Freestanding or 4 RU 19-inch rack-mountable (adhesive feet and rack ears included)

Dimensions

Height: 6.97 in (177 mm) without feet
Width: 17.28 in (439 mm), 19.06 in (485 mm) with rack ears
Depth: 15.71 in (399 mm) without cards

Weight

20.0 lb (9.1 kg) without cards

MODELS & ACCESSORIES

Available Models

DM-MD8X8: 8x8 DigitalMedia™ Switcher

Available Accessories

DMC Series: Input & Output Cards
DM-PSU-8: 8-Port PoDM Power Supply
DM-PSU-16: 16-Port PoDM Power Supply
DM-CBL-ULTRA-NP: DigitalMedia™ Ultra Cable, Non-Plenum Type CMR
DM-CBL-ULTRA-P: DigitalMedia™ Ultra Cable, Plenum Type CMP
DM-CBL-ULTRA-LSZH: DigitalMedia™ Ultra Cable, Low Smoke Zero Halogen
DM-CONN: Connector for DM-CBL & DM-CBL-ULTRA
DM-CBL-8G-NP: DigitalMedia 8G™ Cable, non-plenum
DM-CBL-8G-P: DigitalMedia 8G™ Cable, plenum
DM-8G-CONN: Connector for DM-CBL-8G
DM-8G-CRIMP: Crimping Tool for DM-8G-CONN
DM-8G-CONN-WG: Connector with Wire Guide for DM-CBL-8G
DM-8G-CRIMP-WG: Crimping Tool for DM-8G-CONN-WG
CRESFIBER8G-NP: CresFiber® 8G Multimode Fiber Optic Cable, 50/125 x4 breakout, non-plenum
CRESFIBER8G-P: CresFiber® 8G Multimode Fiber Optic Cable, 50/125 x4 breakout, plenum
CRESFIBER-CONN-SC50UM-12: Connectors for CresFiber® 8G Multimode Fiber Optic Cable, SC 50µm, 12-Pack
CRESFIBER8G-SM-P: CresFiber® 8G Single-Mode Fiber Optic Cable, plenum
CRESFIBER8G-SM-CONN-LC-12: Connectors for CresFiber® 8G Single-Mode Fiber Optic Cable, LC, 12-Pack
CRESFIBER-TK: CresFiber® Termination Kit
USB-EXT-DM: USB over Ethernet Extender with Routing

Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher

Notes:

1. All output types are configured in pairs except for streaming (a single streaming output occupies the space of two outputs of any other type). To configure a complete DM switcher with output and input cards, please use the online DigitalMedia Switcher Configuration Tool. Current DM switchers use DMC-series "single-gang" output cards. For older DM switchers with DMCO-series "multi-gang" output cards, please use the online Output Card Additions and Upgrades Tool to update your existing output cards and switcher to the new single-gang output card format.
2. Crestron control via the DM network requires a Crestron control system, sold separately.
3. 4K, Ultra HD, and HDCP 2.2 are currently supported over HDMI, DM 8G+, and HDBaseT using select input and output cards. Refer to the specifications for each input/output card and each connected device for its full capabilities.
4. The maximum cable length for DigitalMedia 8G+ (DM 8G+) or HDBaseT is dependent upon the type of cable, the choice of input/output card, and the resolution of the video signal. Refer to the "Maximum DM 8G Cable Lengths" table for a detailed overview. Crestron legacy cable models DM-CBL DigitalMedia Cable and DM-CBL-D DigitalMedia D Cable support the same resolutions and cable lengths as CAT5e. Shielded cable and connectors are recommended to safeguard against unpredictable environmental electrical noise which may impact performance at resolutions above 1080p. DM 8G+ is compatible with HDBaseT Alliance specifications for connecting to HDBaseT compliant equipment.
5. The maximum cable length for DigitalMedia 8G Fiber (DM 8G Fiber) is 1000 ft (300 m) using CRESFIBER8G multimode fiber optic cable, or 500 ft (150 m) using CRESFIBER (legacy) or third-party OM3 multimode fiber optic cable.
6. The maximum cable length for DigitalMedia 8G Single-Mode Fiber (DM 8G SM Fiber) is 7.5 miles (12 km) using CRESFIBER8G-SM or third-party G.652.D (or better) single-mode fiber optic cable.
7. The maximum cable length for DigitalMedia CAT (DM CAT) is 450 ft (137 m) using DM-CBL DigitalMedia Cable. Actual cable length depends upon multiple factors. Up to two DM Repeaters (Model DM-DR) may be required.
8. The maximum cable length for DigitalMedia Fiber (DM Fiber) is 1000 ft (300 m) using CRESFIBER (legacy), CRESFIBER8G, or third-party OM2/OM3 duplex multimode fiber optic cable.
9. Refer to the Crestron DigitalMedia Design Guide, Doc. #4546 for complete system design guidelines. All wire and cables are sold separately.
10. Streaming output supports 2-channel stereo audio only. Multichannel surround sound audio sources cannot be streamed unless downmixed to stereo. Stereo downmix capability requires a "DSP" type DM switcher input card, sold separately.
11. Any HDMI input can support a DVI or Dual-Mode DisplayPort signal using a suitable adapter or interface cable.
12. Item(s) sold separately.
13. Control of third-party HDBaseT devices using CEC is only supported via "4K" DM 8G+ input and output cards.
14. DVI output is supported via an HDMI output port using a suitable adapter or interface cable. CBL-HD-DVI interface cables are available separately.
15. Manages the routing of USB HID signals between peripheral DM devices and input cards that are equipped with USB HID ports. Also programmable to manage the routing of USB signals between Crestron USB over Ethernet Extender modules (USB-EXT-DM, sold separately). Refer to the USB-EXT-DM spec sheet for more information.
16. For external DMNet power, use a Crestron CNPWS-75, C2N-SPWS300, or other Cresnet power supply as required. Do not interconnect DMNet with Cresnet.

This product may be purchased from an authorized Crestron dealer. To find a dealer, please contact the Crestron sales representative for your area. A list of sales representatives is available online at www.crestron.com/salesreps or by calling 800-237-2041.

The specific patents that cover Crestron products are listed online at: patents.crestron.com.

Certain Crestron products contain open source software. For specific information, please visit www.crestron.com/opensource.

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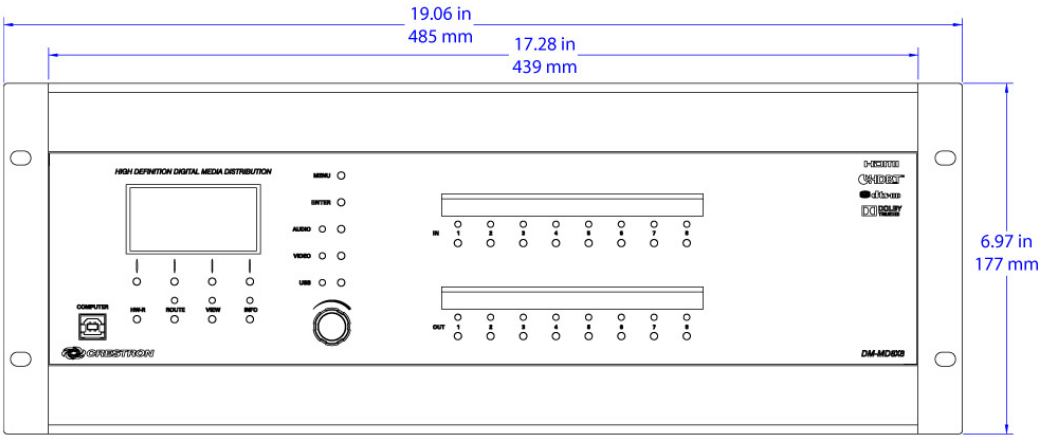
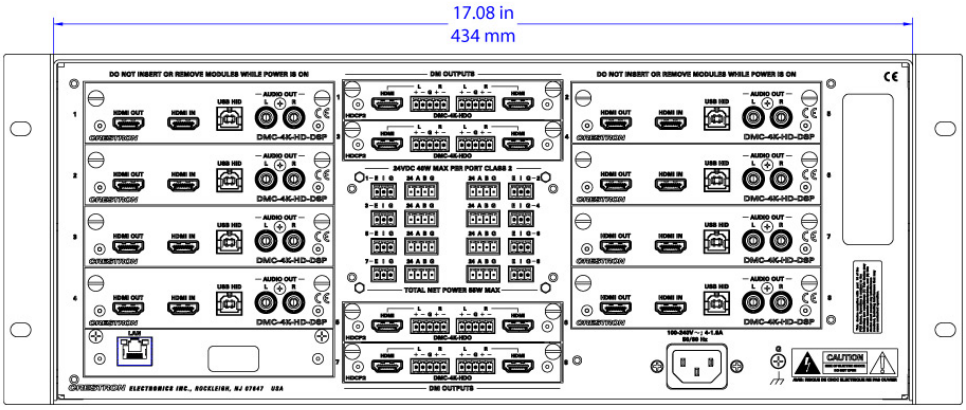
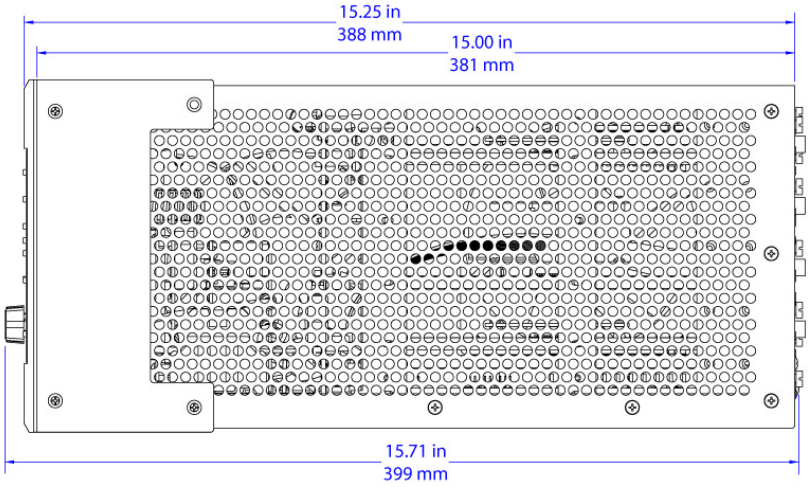
Sample Product Cutsheets (Audio-Visual)

DM-MD8X8 8x8 DigitalMedia™ Switcher







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Sample Product Cutsheets (Audio-Visual)

DM-MD16X16

CRESTRON DIGITALMEDIA

16x16 DigitalMedia™ Switcher

Crestron® DM® Switchers provide the foundation for a complete DigitalMedia™ system, delivering an advanced 4K ultra high-definition AV signal routing solution that's extremely flexible and installer-friendly. The DM-MD16X16 affords ultra fast switching and pure, lossless distribution of HDMI® and other signals to support all the digital media players, HDTV receivers, computers, cameras, and display devices that fill any modern home or commercial facility. DigitalMedia thoughtfully manages all of the disparate AV signals and devices to deliver a transparent user experience, and to ensure an optimum video image and audio signal at every location.

The DM-MD16X16 is field-configurable to handle up to 16 AV sources of virtually any type. The outputs are also field-configurable to provide up to 16 DM, HDBaseT®, and/or HDMI outputs, or up to eight H.264 streaming outputs, in a single chassis.[1] A full selection of DM switcher input and output cards, DM transmitters, and DM receivers provides extensive connectivity throughout a residence or commercial facility, supporting a complete range of analog and digital signal types — all through one switcher!

- *Delivers a unified HD signal distribution solution incorporating both point-to-point wired and IP streaming technologies*
- *Provides lossless HD AV signal routing over twisted pair copper wire or fiber*
- *Integrates video, audio, networking, and control over one wire or fiber strand*
- *Enables high-performance H.264 streaming from any input source up to 1080p or WUXGA*
- *Affords full matrix switching with ultra high 12.5 Gbps backplane data rate*
- *Handles HDMI® with Deep Color, 3D, 4K, and high-bitrate 7.1 encoded audio[3]*
- *HDBaseT® Certified — Enables direct connection to other HDBaseT certified equipment*
- *HDCP 2.2 compliant via compatible 4K input and output cards[3]*
- *Distributes Full HD 1080p, Ultra HD, and 4K signals over CAT type twisted pair cable at distances up to 330 ft (100 m) via DM 8G+® and HDBaseT[4,9]*
- *Distributes 1080p and WUXGA signals over multimode fiber at distances up to 1000 ft (300 m) via DM 8G® Fiber[5,9]*
- *Distributes 1080p and WUXGA signals over single-mode fiber at distances up to 7.5 miles (12 km) via DM 8G SM Fiber[6,9]*
- *Allows streaming of 1080p signals over an IP network with no distance limitations*
- *Also supports all first-generation DM® CAT and DM Fiber products[7,8,9]*
- *Configurable with up to 16 DM, HDBaseT, and/or HDMI outputs*
- *Configurable with up to eight streaming outputs[1]*
- *Easy output expansion using multiple DM switchers*
- *Modular inputs support a complete range of digital, analog, and streaming signal types*
- *QuickSwitch HD™ technology manages HDCP keys for fast, reliable switching*
- *Auto-Locking® technology achieves rapid switching between disparate sources*
- *Detects and displays detailed video and audio input information*
- *Performs automatic AV signal format management via EDID*
- *Allows independent scaling for every display through select output cards and DM receivers[12]*
- *Enables device control via CEC*
- *Distributes and routes USB HID mouse and keyboard signals[15]*
- *Expanded USB routing capabilities available using USB over Ethernet Extenders[15]*
- *Allows full audio and USB breakaway switching*
- *Supports analog audio embedding and de-embedding*
- *Integrates with analog audio distribution systems*
- *Enables simultaneous output of stereo and surround sound audio*
- *Includes integrated Ethernet switch with Gigabit LAN port*
- *Private Network Mode — requires just one IP address for the complete DM system*
- *Provides easy setup and diagnostics tools via front panel or software*
- *Half-million hour rated internal universal power supply*
- *7-space 19-inch rack-mountable*

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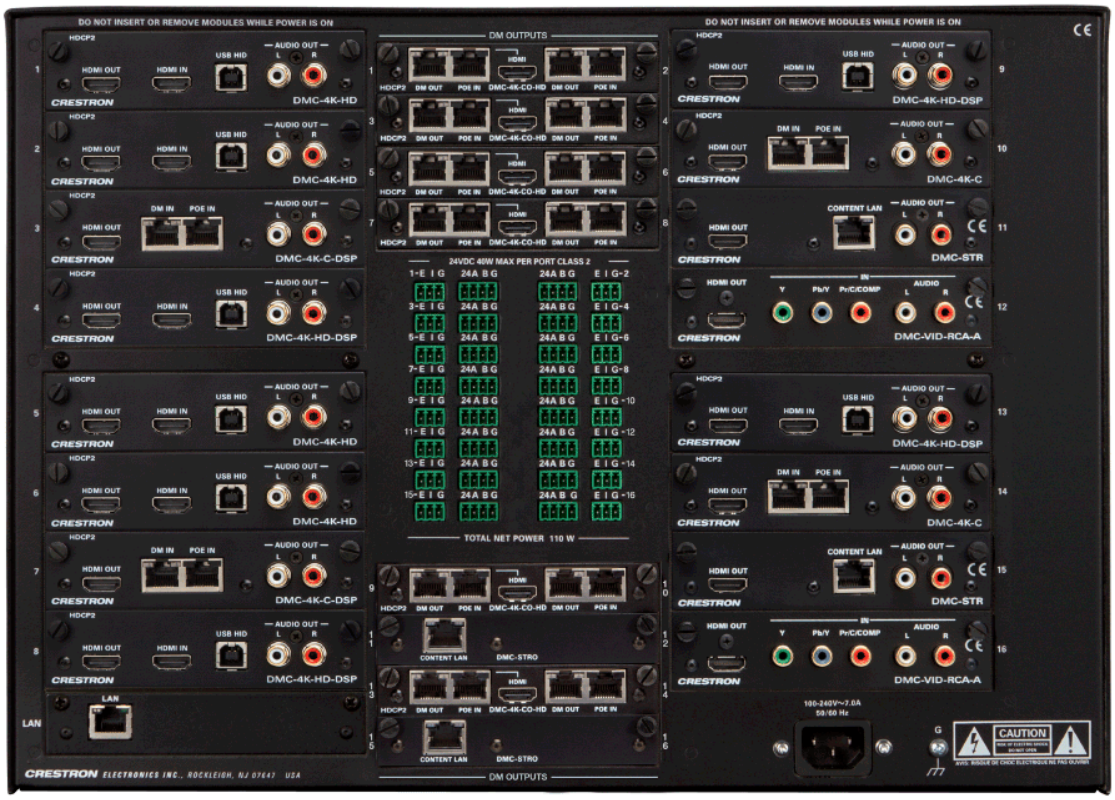
Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher



DM-MD16X16 – Rear view with I/O cards installed

Integrated Ethernet networking and USB distribution provide a complete connectivity solution combined with built-in Crestron control [2] for managing the displays and other room devices without necessitating any additional wiring. User-friendly operation, setup, and troubleshooting tools are provided through the DM-MD16X16 front panel, or via Crestron Toolbox™ software, to make setting up a complete multiroom 4K video distribution system easy.

4K Ultra HD

Crestron DigitalMedia continues to advance the standard for digital AV signal distribution, delivering the world's first end-to-end 4K system solution. From day one, the DM-MD16X16 was designed to meet the extreme bandwidth requirements for handling 4K and Ultra HD video signals. Support for 4K video also ensures support for the latest generation of computers and monitors with native resolutions beyond 1080p and WUXGA.[3]

To configure a DM switcher complete with input and output cards, cables, and other peripherals, please use the DigitalMedia Switcher Configuration Tool.

DigitalMedia 8G™

As the leader in HDMI and control system technologies, Crestron developed DigitalMedia (DM) to deliver the first complete HD AV distribution system to take HDMI to a higher level. DigitalMedia allows virtually any mix of HDMI and other AV sources to be distributed throughout a room, building, or campus. The latest generation of DM is called DigitalMedia 8G (DM 8G®). Engineered for ultra high-bandwidth and ultimate scalability, DM 8G provides a true one-wire lossless transport for moving high-definition video, audio, Ethernet, and control signals over a choice of twisted pair or fiber optic cable.

DM 8G handles uncompressed Full HD 1080p, Ultra HD, 2K, and 4K video signals with support for 3D, Deep Color, and HDCP 2.2.[3] Audio capabilities include the simultaneous distribution of stereo and multichannel surround sound signals, with support for high-bitrate 7.1 audio formats like Dolby® TrueHD, Dolby Atmos®, and DTS-HD Master Audio™ as well as uncompressed linear PCM. All signals are transported over one CAT type twisted pair cable or one strand of multimode or single-mode fiber. DM 8G enables wire distances up to 330 feet (100 m) via DM 8G+® (DM 8G over twisted pair copper wire) [4,9], 1000 feet (300 m) via DM 8G Fiber (DM 8G over multimode fiber) [5,9], or 7.5 miles (12 km) via DM 8G SM Fiber (DM 8G over single-mode fiber) [6,9].

Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher

The DM-MD16X16 provides full support for Crestron DM 8G devices as well as all first-generation DM CAT[7,9] and DM Fiber[8,9] products, letting you take advantage of the latest Crestron DM 8G technology without compromising your existing investment.

HDBaseT® Certified

Crestron DigitalMedia 8G+® technology is designed using HDBaseT Alliance specifications, ensuring interoperability with other HDBaseT certified products. Via DM 8G+, the DM-MD16X16 can be connected directly to an HDBaseT compliant device without requiring a DM transmitter or receiver.

H.264 Streaming

High-performance H.264 streaming capability enables enterprise-wide distribution of HD content over an IP network. Streaming expands the capabilities of DM to remove all distance limitations and allow distribution to virtually any device — anywhere in the world. Streaming is an essential component of any complete DM system, allowing for high-definition signal routing to Crestron touch screens, digital signage displays, remote buildings, and global offices without requiring any new or dedicated wiring. Large-scale streaming to computers and mobile devices can be facilitated through integration with a streaming media system such as Wowza® or Kaltura®.

DigitalMedia with streaming affords the ability to distribute any combination of sources to virtually any device anywhere. Each streaming output supports resolutions up to HD 1080p at bitrates up to 25 Mbps. Built-in scaling enables fast, trouble-free switching between sources of any type or resolution up to 1080p or WUXGA. Audio support includes stereo signals, as well as multichannel audio signals downmixed to stereo via any "DSP" type input card.[10] High-quality video and audio is maintained using high-performance H.264 video and AAC audio compression. The encoded video and audio can be output as independent RTP streams or encapsulated in an MPEG-TS (MPEG-2 Transport Stream) container. HDCP management ensures that protected content cannot be distributed via streaming.

Each streaming output is actually fed internally by two separate switcher outputs, allowing any two input sources to appear picture-in-picture or side-by-side in a single stream. Instant, single-frame switching between two full screen images is also possible. The audio signals from both input sources can also be mixed, allowing both signals to be heard simultaneously.

The DM-MD16X16 can receive streaming signals as well as transmit them. Streaming input capability enables IP cameras and other H.264 encoded sources to be distributed via DigitalMedia alongside HDMI and other non-streaming sources. It also allows DM switchers to be bridged together across a campus or around the world, enabling simplified routing of HD content between buildings and global offices.

DigitalMedia provides many deployment options to address a wide range of streaming applications and accommodate each organization's specific IT requirements. DM with streaming supports both unicast and multicast, with or without RTSP (Real Time Streaming Protocol). Streaming connections can be configured to stream directly to one or more specific IP addresses, or to use RTSP to manage the configuration of numerous connections automatically. Any streaming input or output may be configured to stream via the DM switcher's LAN port or via a dedicated "CONTENT LAN" port, allowing the option to combine control and content on a single network or isolate them onto separate networks.

Modular Architecture

The DM-MD16X16 features a modular architecture with 16 input card slots, and 8 dual output card slots. Each card slot on the DM-MD16X16 is field-installable, allowing for easy and flexible system configuration with the ability to make changes to the system as needs change. A wide selection of input cards is offered to support a complete range of digital and analog AV signal types including HDMI, DVI, Dual-Mode DisplayPort[11], SDI, RGB/VGA and analog video, SPDIF and analog audio, HDBaseT, H.264 streaming, and all types of DigitalMedia. Available outputs include all types of DigitalMedia, as well as HDBaseT, HDMI, analog audio, and H.264 streaming.[1]

Output Expansion

An HDMI "pass-through" output is provided on every input card to allow the inputs of up to 5 DM switchers to be daisy-chained, enabling the configuration of very large distribution systems with many outputs. Using five DM-MD16X16 switchers, it is possible to support up to 80 separate outputs.

QuickSwitch HD™

Handling high-definition digital media means handling HDCP (High-bandwidth Digital Content Protection), the encryption scheme that content providers use to protect their DVDs, Blu-ray™ discs, and broadcast signals against unauthorized copying. Viewing HDCP encrypted content requires a source device to "authenticate" each display and signal processor in the system and issue it a "key" before the content can be viewed. Ordinarily this causes a complete loss of signal for up to 15 seconds each time a new source or display is selected anywhere in the system. To make matters worse, every source device has a limited number of keys available, so connect too many displays and the source will simply stop outputting a signal without warning.

Not to worry — Crestron QuickSwitch HD manages the keys for every HDCP-compliant device in the system, maintaining continuous authentication for each device to ensure fast, reliable routing of any source to any number of display devices.

Auto-Locking® Technology

Crestron Auto-Locking Technology enables super fast signal switching by instantaneously configuring every device in the signal path as soon as the signal hits the first device. Whether switching between sources or TV channels, Auto-Locking significantly reduces the time it takes each device to sense the new signal and configure itself to handle the changes, virtually eliminating any noticeable gap while switching.

EDID Format Management

With all of today's varied AV sources comes a multitude of confusing video and audio formats to keep track of, and chances are not every device in your system supports all of the same formats. Such conflicts can wreak havoc any time you route one source to more than one display or audio component. The media source feeding your 1080p or Ultra HD projector in the theater may restrict itself to a lower resolution, or even shut off

Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher

completely, if someone decides to view the same signal on a smaller TV in another room. And, instead of enjoying your theater's incredible 7.1 surround sound, you may find yourself limited to 5.1 or even plain old stereo.

DigitalMedia eliminates such conflicts by managing the EDID (Extended Display Identification Data) that modern digital devices use to communicate their capabilities. Via Crestron Toolbox software, the format and resolution capabilities of each device can be assessed, allowing the installer to configure EDID signals appropriately for the most desirable and predictable behavior.

A Scaler for Every Display

High-performance scaling capability can be added to any DM system using select output cards and DM receivers with built in HD and 4K scalers. By placing an independent scaler at every display device, DigitalMedia truly delivers the most flexible and user-friendly solution for routing multiple disparate sources to many different display devices. This "Distributed Scaler Approach" ensures an optimal image on every screen no matter what sources are selected. Distributed scaling allows a high-res computer source to be viewed on any display in the building. It also allows an SD, HD, or Ultra HD video source to be viewed simultaneously on the 4K display in your theater and on lower-resolution displays throughout the house.

Versatile Audio Routing

HDMI is the key to handling 7.1 surround sound formats like Dolby TrueHD, Dolby Atmos, and DTS-HD Master Audio. Great for your high-end home theater, but how do you share that same source with other audio zones in the house?

DigitalMedia provides the answer, allowing for the simultaneous distribution of multichannel surround sound and two-channel stereo signals from the same HDMI source. Using a choice of "DSP" type input cards, the DM-MD16X16 employs onboard digital processing to derive a stereo downmix from the original multichannel signal. Both signals can be routed separately or simultaneously from any of the switcher's DM outputs, allowing either signal to be selected for output at each DM receiver location.

Back at the switcher, the digital stereo signal is also converted to analog to enable sharing with every other room in the house via a Sonnex® Multiroom Audio System or any other audio distribution system. The DM-MD16X16 also allows surround sound processors and amplifiers to be located centrally instead of at the display location via optional local HDMI outputs.

Built-in Ethernet Switch

In addition to transporting digital video and audio, DigitalMedia can also extend 10/100 Ethernet out to each display and source device via select DM receivers and transmitters, providing high-speed connectivity for any room device that requires a LAN connection. Ethernet is also utilized internally by the Crestron control bus to manage the DM devices in the system and provide display control in each room.

Private Network Mode

To streamline its implementation on a corporate or university LAN, the DM-MD16X16 employs Private Network Mode to provide a single-point connection for the complete system. Using Private Network Mode, the DM-MD16X16 requires just one IP address for the complete DM network including all connected DM receivers and transmitters.

USB Signal Routing

Along with video, audio, and Ethernet, DigitalMedia also provides for the routing of USB HID (Human Interface Device) signals, allowing a USB HID compliant keyboard and/or mouse at one location to control a computer or media server at another location. USB HID connectivity is provided through select DM receivers, transmitters, and input cards.

Crestron also offers USB extenders to enable the routing of virtually any type of USB peripheral to any host device, all managed through the DigitalMedia system. Connect a USB over Ethernet Extender host module (USB-EXT-DM-LOCAL [12]) to each computer, media server, game system, annotator, and any other host that you want to control or communicate with. Then, install a device module (USB-EXT-DM-REMOTE [12]) at every display location to connect keyboards, mice, game controllers, white-boards, flash drives, Web cameras, and mobile devices. Every module communicates with the DM switcher over the local Ethernet network or via a direct connection to the LAN port of a DM transmitter or receiver.

CEC Embedded Device Control

The primary objective of every Crestron system is to enable precisely the control desired for a seamless user experience. DigitalMedia provides an alternative to conventional IR and RS-232 device control by harnessing the CEC (Consumer Electronics Control) signal embedded in HDMI. Through its connection to the control system, the DM-MD16X16 provides a gateway for controlling many devices right through their HDMI or HDBaseT connections, potentially eliminating the need for any dedicated control wires or IR emitters.[13]

Easy Setup

Via the front panel or using Crestron Toolbox software, every step of the DM-MD16X16's setup process is designed to be quick and easy, configuring inputs and outputs automatically while letting the installer make intelligent design decisions along the way. The switcher even tests and measures the length of each DM cable, automatically making the appropriate calibrations for optimal signal transmission to every room. With DigitalMedia, an entire 16x16 system can be commissioned in under an hour.

To configure a DM switcher complete with input and output cards, cables, and other peripherals, please use the DigitalMedia Switcher Configuration Tool.

Are you upgrading an existing DM switcher that has older "multi-gang" DMCO-series output cards? Use the online Output Card Additions and Upgrades Tool to update your existing output cards and switcher to the new "single-gang" output card format.

Please refer to the DigitalMedia Resources Webpage at http://www.crestron.com/dmresources/ *for additional design tools and reference documents.*

Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher

SPECIFICATIONS

Maximum DM 8G® Cable Lengths

Cable Type: / Resolution:	DM-CBL-ULTRA DM® Ultra Cable	DM-CBL-8G DM 8G® Cable	3rd-Party CAT5e (or better) UTP or STP
1080p60 Full HD	330 ft (100 m) via any DM 8G+ cards		
1920x1200 WUXGA			
1600x1200 UXGA			
2048x1080 2K DCI @24Hz			
2048x1080 2K DCI @60Hz	330 ft (100 m) via "4K" DM 8G+ cards	230 ft (70 m) via "4K" DM 8G+ cards	165 ft (50 m) via "4K" DM 8G+ cards
2560x1440 WQHD			
2560x1600 WQXGA			
3840x2160 Ultra HD			
4096x2160 4K DCI			

Cable Type: / Resolution:	CRESFIBER8G CresFiber® 8G Multimode Fiber	3rd-Party OM3 Multimode Fiber
1080p60 Full HD	1000 ft (300 m) via DM 8G Fiber cards	500 ft (150 m) via DM 8G Fiber cards
1920x1200 WUXGA		
1600x1200 UXGA		
2048x1080 2K DCI @24Hz		

Cable Type: / Resolution:	CRESFIBER8G-SM CresFiber 8G Single-Mode Fiber	3rd-Party G.652.D (or better) Single-Mode Fiber
1080p60 Full HD	7.5 miles (12 km) via DM 8G SM Fiber cards	
1920x1200 WUXGA		
1600x1200 UXGA		
2048x1080 2K DCI @24Hz		

Video

Switcher: 16x16 digital matrix, modular input/output cards, Crestron QuickSwitch HD™

Input Signal Types: Configurable via modular plug-in cards supporting HDMI® (DVI & Dual-Mode DisplayPort compatible [11]), DVI, 3G-SDI, RGB/VGA, component, S-Video, composite (NTSC & PAL), DM 8G+® & HDBaseT®, DM 8G Fiber, DM 8G SM Fiber, DM® CAT (legacy), DM Fiber (legacy), & H.264 streaming

Output Signal Types: Configurable via modular plug-in cards supporting HDMI (DVI compatible [14]), DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming (All input cards also include HDMI pass-through outputs)

Backplane Data Rate: 12.5 Gbps

Note: For additional specifications, please refer to the spec sheet for each input and output card.

Audio

Switcher: 16x16 digital multichannel audio-follow-video matrix switching, plus independent 16x16 stereo matrix for audio breakaway

Input Signal Types: Configurable via modular plug-in cards supporting HDMI (Dual-Mode DisplayPort compatible [11]), 3G-SDI, analog (stereo 2-channel), SPDIF, DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming

Output Signal Types: Configurable via modular plug-in cards supporting HDMI, analog (stereo 2-channel), DM 8G+ & HDBaseT, DM 8G Fiber, DM 8G SM Fiber, DM CAT (legacy), DM Fiber (legacy), & H.264 streaming (All input cards also include HDMI pass-through outputs, and most digital audio input cards also include analog stereo pass-through audio outputs)

Note: For additional specifications, please refer to the spec sheet for each input and output card.

Communications

Ethernet: 10/100/1000 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, DHCP, Private Network Mode

USB: USB signal routing via select input cards, transmitters, receivers, and extenders [15]; USB computer console port for setup

DigitalMedia: DM 8G+, DM 8G Fiber, DM 8G SM Fiber, DM Fiber, DM CAT, DMNet™, HDCP 2.2 [3], EDID, CEC, PoDM, PoDM+, Ethernet

HDBaseT: HDCP 2.2 [3], EDID, CEC, RS-232, PoH, Ethernet

HDMI: HDCP 2.2 [3], EDID, CEC

NOTE: Supports management of HDCP and EDID; supports management of CEC between connected HDMI and HDBaseT devices and a control system.[13] For additional specifications, please refer to the spec sheet for each input and output card.

Card Slots

1 – 16: (16) DM switcher input card slots;
Each slot accepts (1) DMC-series input card

DM OUTPUTS 1 – 16: (8) DM switcher output card slots;
Each slot accepts (1) DMC-series output card

Connectors

LAN: (1) 8-pin RJ45 female;
10Base-T/100Base-TX/1000Base-T Ethernet port

24ABG / EIG 1 – 16: (16) sets of (1) 4-pin and (1) 3-pin 3.5 mm detachable terminal blocks;
Comprises (16) DMNet ports with "EIG" power selection ports, each set is associated with the corresponding DM CAT output port on any installed DM CAT output card;
Each DMNet port provides power and communications for a DM CAT device connected via DM cable;
Each EIG port connects to an external power supply [16], or to the internal power source via a jumper, to power the DM CAT device connected to the corresponding DMNet port;
Maximum Load: 40 Watts (1.66 Amps @ 24 Volts DC) per port, limited to

Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher

the available DMNet power from the internal power supply (see "Power Requirements" below) or an external power supply [16]

100-250V~7.0A 50/60Hz: (1) IEC 60320 C14 main power inlet; Mates with removable power cord, included

G: (1) 6-32 screw, chassis ground lug

COMPUTER (front): (1) USB Type B female; USB computer console port (6 ft cable included)

Controls & Indicators

LCD Display: Green LCD dot matrix, 128 x 64 resolution, adjustable LED backlight, displays inputs/outputs by name, video & audio signal information, Ethernet configuration and setup menus
SOFTKEYS: (4) Pushbuttons for activation of LCD driven functions
HW-R: (1) Recessed pushbutton for hardware reset, reboots the switcher
ROUTE: (1) Pushbutton and red LED, selects ROUTE mode to allow routing changes
VIEW: (1) Pushbutton and red LED, selects VIEW mode for viewing current routes
INFO: (1) Pushbutton and red LED, selects INFO mode for viewing AV and device info
MENU: (1) Pushbutton, steps menu back one level
ENTER: (1) Pushbutton, executes highlighted menu or value
AUDIO: (1) Pushbutton & red LED, selects audio routing view
VIDEO: (1) Pushbutton & red LED, selects video routing view
USB: (1) Pushbutton & red LED, selects USB routing view
Quick-Adjust Knob: (1) Continuous turn rotary encoder, adjusts menu parameters
IN 1 – 16: (16) Pushbuttons and red LEDs, each selects the corresponding input for routing
OUT 1 – 16: (16) Pushbuttons and red LEDs, each selects the corresponding output for routing
LAN (rear): (2) LEDs, green LED indicates Ethernet link status, amber LED indicates Ethernet activity

Power Requirements

Main Power: 7 Amps @ 100-240 Volts AC, 50/60 Hz
Power Consumption: 440 Watts typical
Available DMNet Power: 110 Watts (4.6 Amps @ 24 Volts DC) from internal power supply
Available PoDM/PoH Power: Refer to the specifications for each DM 8G+ input and output card

Environmental

Temperature: 32° to 104° F (0° to 40° C)
Humidity: 10% to 90% RH (non-condensing)
Heat Dissipation: 1500 BTU/hr
Ambient Noise: 31.5 to 36 dBA typical; 29 to 30 dBA idle

Enclosure

Chassis: Metal with black finish, vented sides, fan-cooled
Front Panel: Metal, black finish with polycarbonate label overlay
Mounting: Freestanding or 7 RU 19-inch rack-mountable (adhesive feet and rack ears included)

Dimensions

Height: 12.22 in (311 mm) without feet
Width: 17.28 in (439 mm), 19.06 in (485 mm) with rack ears
Depth: 15.67 in (398 mm) without cards

Weight

28.4 lb (12.9 kg) without cards

MODELS & ACCESSORIES

Available Models

DM-MD16X16: 16x16 DigitalMedia™ Switcher

Available Accessories

DMC Series: Input & Output Cards
DM-PSU-8: 8-Port PoDM Power Supply
DM-PSU-16: 16-Port PoDM Power Supply
DM-CBL-ULTRA-NP: DigitalMedia™ Ultra Cable, Non-Plenum Type CMR
DM-CBL-ULTRA-P: DigitalMedia™ Ultra Cable, Plenum Type CMP
DM-CBL-ULTRA-LSZH: DigitalMedia™ Ultra Cable, Low Smoke Zero Halogen
DM-CONN: Connector for DM-CBL & DM-CBL-ULTRA
DM-CBL-8G-NP: DigitalMedia 8G™ Cable, non-plenum
DM-CBL-8G-P: DigitalMedia 8G™ Cable, plenum
DM-8G-CONN: Connector for DM-CBL-8G
DM-8G-CRIMP: Crimping Tool for DM-8G-CONN
DM-8G-CONN-WG: Connector with Wire Guide for DM-CBL-8G
DM-8G-CRIMP-WG: Crimping Tool for DM-8G-CONN-WG
CRESFIBER8G-NP: CresFiber® 8G Multimode Fiber Optic Cable, 50/125 x4 breakout, non-plenum
CRESFIBER8G-P: CresFiber® 8G Multimode Fiber Optic Cable, 50/125 x4 breakout, plenum
CRESFIBER-CONN-SC50UM-12: Connectors for CresFiber® 8G Multimode Fiber Optic Cable, SC 50µm, 12-Pack
CRESFIBER8G-SM-P: CresFiber® 8G Single-Mode Fiber Optic Cable, plenum
CRESFIBER8G-SM-CONN-LC-12: Connectors for CresFiber® 8G Single-Mode Fiber Optic Cable, LC, 12-Pack
CRESFIBER-TK: CresFiber® Termination Kit
USB-EXT-DM: USB over Ethernet Extender with Routing

Notes:

1. All output types are configured in pairs except for streaming (a single streaming output occupies the space of two outputs of any other type). To configure a complete DM switcher with output and input cards, please use the online DigitalMedia Switcher Configuration Tool. Current DM switchers use DMC-series "single-gang" output cards. For older DM switchers with DMCO-series "multi-gang" output cards, please use the online Output Card Additions and Upgrades Tool to update your existing output cards and switcher to the new single-gang output card format.

Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher

2. Crestron control via the DM network requires a Crestron control system, sold separately.
3. 4K, Ultra HD, and HDCP 2.2 are currently supported over HDMI, DM 8G+, and HDBaseT using select input and output cards. Refer to the specifications for each input/output card and each connected device for its full capabilities.
4. The maximum cable length for DigitalMedia 8G+ (DM 8G+) or HDBaseT is dependent upon the type of cable, the choice of input/output card, and the resolution of the video signal. Refer to the "Maximum DM 8G Cable Lengths" table for a detailed overview. Crestron legacy cable models DM-CBL DigitalMedia Cable and DM-CBL-D DigitalMedia D Cable support the same resolutions and cable lengths as CAT5e. Shielded cable and connectors are recommended to safeguard against unpredictable environmental electrical noise which may impact performance at resolutions above 1080p. DM 8G+ is compatible with HDBaseT Alliance specifications for connecting to HDBaseT compliant equipment.
5. The maximum cable length for DigitalMedia 8G Fiber (DM 8G Fiber) is 1000 ft (300 m) using CRESFIBER8G multimode fiber optic cable, or 500 ft (150 m) using CRESFIBER (legacy) or third-party OM3 multimode fiber optic cable.
6. The maximum cable length for DigitalMedia 8G Single-Mode Fiber (DM 8G SM Fiber) is 7.5 miles (12 km) using CRESFIBER8G-SM or third-party G.652.D (or better) single-mode fiber optic cable.
7. The maximum cable length for DigitalMedia CAT (DM CAT) is 450 ft (137 m) using DM-CBL DigitalMedia Cable. Actual cable length depends upon multiple factors. Up to two DM Repeaters (Model DM-DR) may be required.
8. The maximum cable length for DigitalMedia Fiber (DM Fiber) is 1000 ft (300 m) using CRESFIBER (legacy), CRESFIBER8G, or third-party OM2/OM3 duplex multimode fiber optic cable.
9. Refer to the Crestron DigitalMedia Design Guide, Doc. #4546 for complete system design guidelines. All wire and cables are sold separately.
10. Streaming output supports 2-channel stereo audio only. Multichannel surround sound audio sources cannot be streamed unless downmixed to stereo. Stereo downmix capability requires a "DSP" type DM switcher input card, sold separately.
11. Any HDMI input can support a DVI or Dual-Mode DisplayPort signal using a suitable adapter or interface cable.
12. Item(s) sold separately.
13. Control of third-party HDBaseT devices using CEC is only supported via "4K" DM 8G+ input and output cards.
14. DVI output is supported via an HDMI output port using a suitable adapter or interface cable. CBL-HD-DVI interface cables are available separately.
15. Manages the routing of USB HID signals between peripheral DM devices and input cards that are equipped with USB HID ports. Also programmable to manage the routing of USB signals between Crestron USB over Ethernet Extender modules (USB-EXT-DM, sold separately). Refer to the USB-EXT-DM spec sheet for more information.
16. For external DMNet power, use a Crestron CNPWS-75, C2N-SPWS300, or other Cresnet power supply as required. Do not interconnect DMNet with Cresnet.

This product may be purchased from an authorized Crestron dealer. To find a dealer, please contact the Crestron sales representative for your area. A list of sales representatives is available online at www.crestron.com/salesreps or by calling 800-237-2041.

The specific patents that cover Crestron products are listed online at: patents.crestron.com.

Certain Crestron products contain open source software. For specific information, please visit www.crestron.com/opensource.

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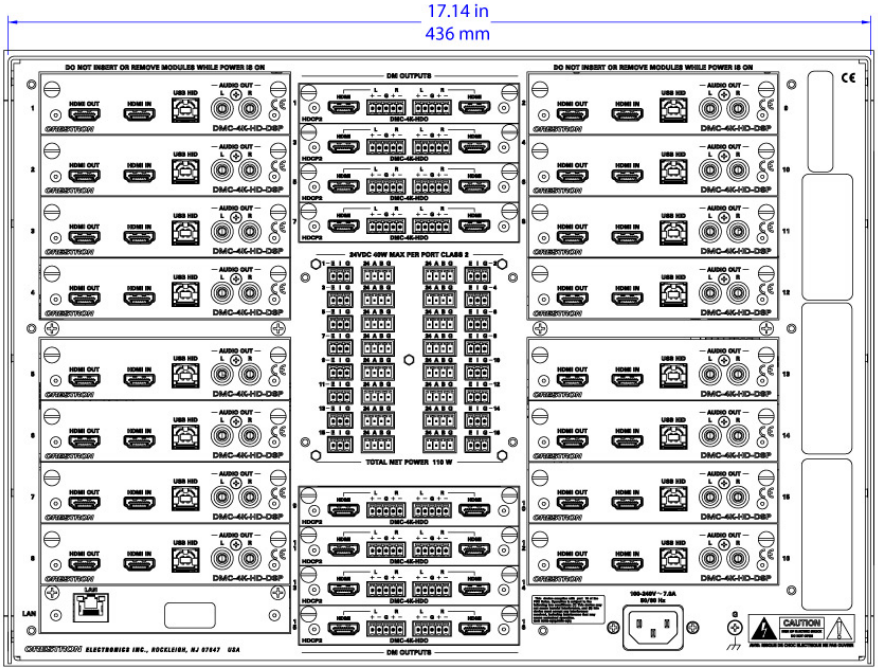
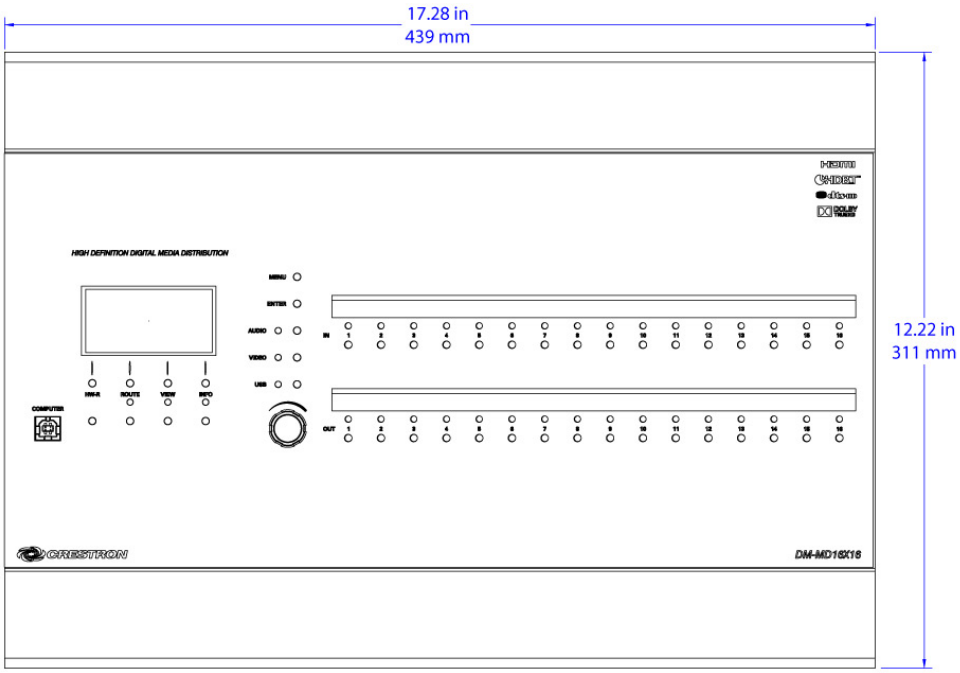
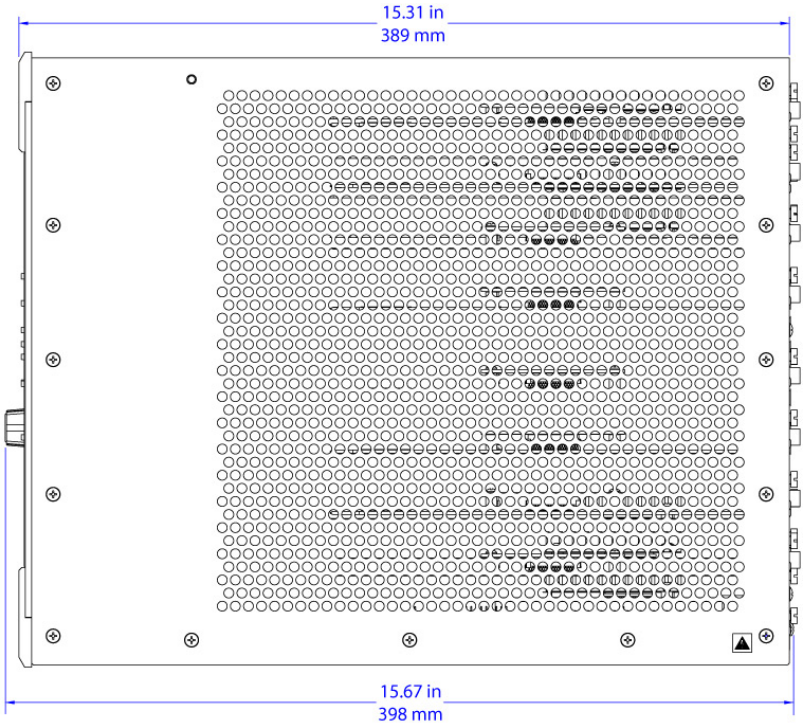


Sample Product Cutsheets (Audio-Visual)

DM-MD16X16 16x16 DigitalMedia™ Switcher





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Specifications subject to change without notice. Revised 03/04/16

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C

4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

The DM-MD8X1-4K-C from Crestron® provides an ultra high-definition presentation switcher with advanced features optimally suited for installation in a huddle room, conference room, or classroom. It integrates a multi-format auto-switcher, 4K video scaler, mic preamp, audio DSP, and control interface, all into one compact device that mounts conveniently under a table or in an equipment rack. Built-in Crestron Connect It™ functionality affords a complete collaboration solution that's easy and affordable to deploy in any meeting space. Built-in DM 8G+® and HDBaseT® connectivity affords a one-wire, long-distance wiring solution for a single display device, or for integration as part of a larger DigitalMedia™ distribution system.

The DM-MD8X1-4K-C works out-of-the-box to provide automatic switching between four HDMI® or VGA sources, plus on/off control of the display device. Outputs include HDMI, DM 8G+ or HDBaseT, and balanced stereo audio. Built-in 4K scaling ensures the highest possible image quality and compatibility with the widest range of sources and displays. Easy web browser setup allows for configuration of the microphone input, audio DSP, and other settings. Centralized monitoring is supported using Crestron Fusion® Cloud, and fully-programmable control can be enabled through integration with a 3-Series Control System®.[1]

Crestron Connect It™

Crestron Connect It is a cost-effective, simple-to-use presentation solution that works seamlessly with the DM-MD8X1-4K-C. Simply add up to four Crestron Connect It Cable Caddies (TT-100 series[2]) to provide BYOD connectivity and one-touch control for multiple participants around a conference table. Four USB ports on the DM-MD8X1-4K-C provide power and communications for each cable caddy.

- *Ultra high-definition, multi-format presentation switcher, scaler, mic preamp, audio DSP, and control interface*
- *Out of the box Crestron Connect It™ collaboration system functionality*
- *Supports up to four TT-100 series Crestron Connect It Cable Caddies[2]*
- *Includes four auto-switching HDMI®, VGA, and stereo analog audio inputs[5]*
- *Also supports Dual-Mode DisplayPort, DVI, and analog video sources[3,4]*
- *Input auto-detection configures each input automatically*
- *QuickSwitch HD™ technology manages HDCP keys for fast, reliable switching*
- *Performs automatic AV signal format management via EDID*
- *Provides adjustable input level compensation on each audio input*
- *Includes a single microphone input with EQ, gating, and compression*
- *Provides parallel HDMI and DM 8G+ outputs for one or more display devices*
- *DigitalMedia 8G+® connectivity enables long-distance wiring over CAT type twisted pair cable[8]*
- *Integrates with DigitalMedia™ matrix switchers to allow facility-wide signal distribution[9]*
- *HDBaseT Certified — Enables direct connection to other HDBaseT certified equipment*
- *Features a built-in, high-performance 4K scaler*
- *Upscales input signals to match the native resolution of any screen — including 4K and Ultra HD displays!*
- *Downscales 4K, UHD, and ultra high-resolution computer signals to fit 1080p and other lower-resolution displays*
- *Handles any input resolution from standard NTSC 480i or PAL 576i, to UHD and 4K*
- *Provides intelligent frame rate conversion, content-adaptive noise reduction, and motion-adaptive de-interlacing*
- *Provides 3D to 2D signal conversion, and passes 3D video (without scaling) to 3D displays[6]*
- *Provides a balanced stereo audio output with graphic EQ, limiting, and delay*
- *Enables analog-to-HDMI audio embedding and de-embedding[5]*
- *Handles Dolby® TrueHD, Dolby Atmos®, DTS-HD®, and uncompressed 7.1 linear PCM audio[7]*
- *Includes onboard IR and RS-232 control ports[10]*
- *Supports universal remotes via built-in RC-5 compatible IR receiver[10]*
- *Provides a 10/100 Ethernet LAN connection*
- *Includes front panel controls for switching and volume adjustment*
- *Includes customizable front panel label strips*
- *Allows complete AV setup and adjustment via a web browser*
- *Fully-controllable over Ethernet from a Crestron® 3-Series Control System®[1]*
- *Communicates natively with Crestron Fusion® Cloud*
- *Features an internal universal power supply for worldwide compatibility*
- *Furnishes Power over DM® or HDBaseT for PoDM/PoH-powered devices*
- *Mounts under the table or in a single 19" rack space*

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CRESTRON

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

DM-MD8X1-4K-C — Rear View

4K Ultra HD

The DM-MD8X1-4K-C handles 4K and Ultra HD video signals, which is essential to ensure support for the latest generation of computers and monitors with native resolutions beyond 1080p and WUXGA.

Multi-Format Auto-Switcher

The DM-MD8X1-4K-C provides high-performance automatic switching between four groups of inputs, each including HDMI, VGA, and unbalanced stereo audio. The HDMI inputs are compatible with DVI and Dual-Mode DisplayPort sources[3], and the VGA inputs can handled RGB, composite, S-Video, and component video sources[4]. Digital audio is supported by the HDMI inputs, plus each analog audio input may be used in combination with its corresponding VGA or HDMI video input.[5] Input auto-detection eliminates the need to configure the inputs — simply connect your source and the DM-MD8X1-4K-C selects the right audio and video combination. The switched video signal is routed to one HDMI output and one DM 8G+ output simultaneously. The DM 8G+ output is compatible with HDBaseT.

4K Scaler

With its high-performance 4K video scaler on board, the DM-MD8X1-4K-C ensures an optimal image from every video source on practically any display device. It allows SD, HD, and all types of computer sources to look their best on Ultra HD and 4K displays, and it allows sources with resolutions above HD 1080p to be viewed reliably on 1080p and lower resolution displays. It accepts any input resolution, from standard definition NTSC 480i to ultra high-definition 4K DCI, and scales it perfectly to match the native resolution of any screen up to 4K DCI (4096 x 2160). Interlaced sources are converted to progressive scan using motion-adaptive deinterlacing. Intelligent frame rate conversion enables support for 24p and PAL format sources. And, 3D to 2D conversion allows 3D content to be viewed on 2D-only displays.[6] The output of the scaler feeds both the HDMI and DM 8G+ outputs.

Flexible Audio Outputs

The switched audio signal is routed to the HDMI output as well as to a separate balanced analog audio output, with individual level adjustments provided for each output. The HDMI output signal is also fed simultaneously to the DM 8G+ output. All inputs and outputs support stereo audio, with the option to configure the analog output for mono. Dolby® TrueHD, Dolby Atmos®, DTS-HD®, and 7.1 linear PCM audio signals can also be routed through the HDMI inputs and output, as well as the DM 8G+ output.[7]

Professional Audio DSP

The analog audio output includes professional digital signal processing, allowing the signal to be adjusted for optimum performance and sound quality. The analog output is ideally designed to be connected to an external power amplifier and used to drive a set of ceiling or wall mount speakers. In addition to volume, bass, treble, and mute controls, the DSP provides 10-band graphic equalization, fully-adjustable limiting, and up to 80 ms of delay. All settings are adjustable using the DM-MD8X1-4K-C's web browser user interface for easy setup. The output volume level is also adjustable using the front panel volume knob.

Microphone Input with DSP

A full-featured microphone preamp is included to support the connection of a single wired or wireless mic. Advanced features include fully-adjustable gating and compression, 4-band semi-parametric EQ, and switchable 48V phantom power. The microphone signal can be routed to the analog output, the digital output (HDMI and DM 8G+), or both, with separate level adjustments provided for each.

DigitalMedia 8G+®

Its DM 8G+ output endows the DM-MD8X1-4K-C with great potential for connecting to a display device and integrating with larger systems. DM 8G+ provides a true one-wire interface for transporting ultra high-definition video, audio, control, power, and networking signals over CAT type cable at distances up to 330 feet (100 meters).[8,9] Connecting a DM 8G+ receiver to the DM 8G+ output provides a streamlined AV and control interface for a single projector or flat panel display located anywhere in the room. DM 8G+ can also provide the interface to a centralized DigitalMedia matrix switcher, allowing the DM-MD8X1-4K-C's output signal to be distributed to multiple displays anywhere in the same room, other rooms, other buildings, or around the world.

HDBaseT® Certified

Crestron DM 8G+ technology is designed using HDBaseT Alliance specifications, ensuring interoperability with other HDBaseT certified products. Via DM 8G+, the DM-MD8X1-4K-C can be connected directly to an HDBaseT compliant display device without requiring a DM 8G+ receiver.

EDID Format Management

The DM-MD8X1-4K-C provides comprehensive management of the EDID (Extended Display Identification Data) information that passes between display devices and input sources, ensuring that each source gets displayed at its optimal resolution and format. Most applications require no changes to the default settings. For applications requiring custom configuration, the DM-MD8X1-4K-C allows for easy assessment of each device's format and resolution capabilities, with the ability to configure signals appropriately for the most desirable and predictable behavior.

QuickSwitch HD™ Technology

Handling digital media signals means handling HDCP (High-bandwidth Digital Content Protection), the encryption scheme used by content providers to protect their DVDs, Blu-ray™ discs, and broadcast signals against unauthorized copying. Viewing HDCP encrypted content requires a source device to "authenticate" each display and signal processor in the system and issue it a "key" before delivering an output signal. Crestron QuickSwitch HD manages these keys to ensure fast, reliable switching and

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

immunity to "blackouts," whether using a single display, or distributing to multiple displays through a larger DigitalMedia system.

Embedded Device Control

The DM-MD8X1-4K-C includes built-in IR and RS-232 control ports, which may be utilized through integration with a Crestron 3-Series Control System to enable programmable control of local AV equipment and other devices. Some video devices can also be controlled through their HDMI or HDBaseT connections using CEC (Consumer Electronics Control). Without a control system, control capability is limited to turning a single display device on and off via CEC, RS-232, or Ethernet based on detection of an active video signal.[1,10]

Note: For a version of the DM-MD8X1-4K-C with built-in 3-Series Control system, see model DMPS3-4K-100-C.

SPECIFICATIONS

Communications

Ethernet: 10/100 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, DHCP
USB: USB host ports for Crestron Connect It devices and firmware update via USB flash drive; USB device port for computer console (setup)
RS-232: 2-way device control and monitoring up to 115.2k baud with hardware and software handshaking [10]
IR/Serial: 1-way device control via infrared up to 1.2 MHz or serial TTL/RS-232 (0-5 Volts) up to 115.2k baud; built-in RC-5 compatible IR receiver [10]
DigitalMedia™: DM 8G+®, HDCP, EDID, CEC, PoDM, Ethernet [9]
HDBaseT®: HDCP, EDID, CEC, PoH, Ethernet
HDMI®: HDCP, EDID, CEC

NOTE: Supports management of HDCP and EDID; supports management of CEC between the connected HDMI and HDBaseT devices and a 3-Series Control System®

Video

Switcher: 8x1 (organized as multi-format 4x1), auto-switching, auto-detecting multi-format digital/analog source inputs, QuickSwitch HD™ technology
Scaler: 4K video scaler, motion-adaptive deinterlacer, intelligent frame rate conversion, Deep Color support, 3D to 2D conversion [6], content-adaptive noise reduction, widescreen format selection (zoom, stretch, maintain aspect-ratio, or 1:1)
Input Signal Types: HDMI w/Deep Color, 3D, & 4K (DVI & Dual-Mode DisplayPort compatible [3]); RGB/VGA (RGBHV, RGBS, RGsB); component (YPbPr); S-Video (Y/C); composite (NTSC, PAL) [4]
Output Signal Types: HDMI w/Deep Color, 3D, & 4K (DVI compatible [3]); DM 8G+ & HDBaseT w/Deep Color, 3D, & 4K
Analog-To-Digital Conversion: 10-bit 165 MHz per each of 3 channels

Maximum Pass-Through Resolutions:

Input Type	Scan Type	Resolution	Frame Rate	Color Sampling	Color Depth
HDMI	Progressive	4096x2160 4K DCI or 3840x2160 Ultra HD	24 Hz	4:4:4	30 bit
			30 Hz	4:4:4	24 bit
			30 Hz	4:2:2	36 bit
			60 Hz	4:2:0	24 bit
		2560x1600 WQXGA	60 Hz	4:4:4	36 bit
		1920x1080 HD1080p	60 Hz	4:4:4	36 bit
	Interlaced	1920x1080 HD1080i	30 Hz	4:4:4	36 bit
RGB/VGA	Progressive	1600x1200 UXGA	60 Hz	n/a	
		1920x1200 WUXGA	60 Hz	n/a	
Component [4]	Progressive	1920x1080 HD1080p	60 Hz	n/a	
	Interlaced	1920x1080 HD1080i	30 Hz	n/a	
Composite or S-Video [4]	Interlaced	480i NTSC or 576i PAL	60 Hz	n/a	

Maximum Scaler Input Resolutions:

Input Type	Scan Type	Resolution	Frame Rate	Color Sampling	Color Depth
HDMI	Progressive	4096x2160 4K DCI or 3840x2160 Ultra HD	24 Hz	4:4:4	30 bit
			30 Hz	4:4:4	24 bit
			30 Hz	4:2:2	36 bit
		2560x1600 WQXGA	60 Hz	4:4:4	36 bit
		1920x1080 HD1080p	60 Hz	4:4:4	36 bit
	Interlaced	1920x1080 HD1080i	30 Hz	4:4:4	36 bit
RGB/VGA	Progressive	1600x1200 UXGA	60 Hz	n/a	
		1920x1200 WUXGA	60 Hz	n/a	
Component [4]	Progressive	1920x1080 HD1080p	60 Hz	n/a	
	Interlaced	1920x1080 HD1080i	30 Hz	n/a	
Composite or S-Video [4]	Interlaced	480i NTSC or 576i PAL	60 Hz	n/a	

Maximum Scaler Output Resolutions:

Output Type	Scan Type	Resolution	Frame Rate	Color Sampling	Color Depth
HDMI, DM, or HDBaseT	Progressive	4096x2160 4K DCI or 3840x2160 Ultra HD	24 Hz	4:4:4	30 bit
			30 Hz	4:4:4	24 bit
			30 Hz	4:2:2	36 bit
		2560x1600 WQXGA	60 Hz	4:4:4	36 bit
		1920x1080 HD1080p	60 Hz	4:4:4	36 bit

NOTE: Common resolutions are shown; other custom resolutions are supported at pixel clock rates up to 300 MHz for digital inputs and outputs, or 165 MHz for analog inputs

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

Audio – General

Switcher/Mixer: 8x1 (organized as multi-format 4x1) stereo source switcher, auto-detecting digital/analog source inputs, single-channel gated mic preamp w/DSP, two independent mic/source mixers (one for analog output, one for digital outputs), stereo DSP for analog output, 4x1 multi-channel source switcher, digital audio mixer bypass mode for multichannel pass-through to digital outputs
Microphone input channel:
Analog-To-Digital Conversion: 24-bit 48 kHz
Digital-To-Analog Conversion: 24-bit 48 kHz
Frequency Response: 20 Hz to 20 kHz ±0.5 dB (digital source);
20 Hz to 20 kHz ±0.5 dB (analog line source);
20 Hz to 20 kHz ±0.7 dB (microphone source)
S/N Ratio: >108 dB, 1 kHz, A-weighted (digital source);
>103 dB, 1 kHz, A-weighted (analog line source)
THD+N: <0.002%, 20 Hz to 20 kHz (digital source);
<0.005%, 20 Hz to 20 kHz (analog line source);
<0.05%, 20 Hz to 20 kHz (microphone source)
Stereo Separation: >108 dB (digital source);
>103 dB (analog source)

Audio – Microphone Input

Input Signal Type: Mono analog mic level
Phantom Power: Enable/Disable
Gain: 0 to +60 dB Gain adjustment, plus Mute
EQ Center Frequencies: 50 to 200 Hz (Band 1); 200 to 800 Hz (Band 2); 800 to 3.2k Hz (Band 3); 3.2k to 12.8k Hz (Band 4)
EQ Gain: ±12.0 dB per band
Gating Threshold: -80 to 0 dB
Gating Depth (Attenuation): -80 to 0 dB
Gating Attack: 1 to 250 ms
Gating Release: 1 to 1000 ms
Gating Hold: 1 to 200 ms
Compression Threshold: -80 to 0 dB
Compression Ratio: 1:1 to 10:1
Compression Attack: 1 to 250 ms
Compression Release: 1 to 1000 ms
Compression Hold: 1 to 200 ms
Compression Curve: Hard or soft knee

Audio – Source Inputs

Typical of 8 source input channels (Audio Inputs 1 – 4 & HDMI Inputs 1 – 4)
Input Signal Types: Analog 2-channel [5], HDMI (Dual-Mode DisplayPort compatible [3])
Analog Formats: Stereo 2-channel
Digital Formats: Dolby Digital®, Dolby Digital EX, Dolby Digital Plus, Dolby® TrueHD, Dolby Atmos®, DTS®, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio™, LPCM up to 8 channels [7]
Input Compensation: ±10.0 dB [7]

Audio – Analog Line Output

Output Signal Type/Format: Stereo 2-channel
Mic: -80 to +10 dB Level adjustment range, plus Mute and Pan
Source: -80 to +10 dB Level adjustment range, plus Mute and Balance
Master Volume: -80 to +10 dB Level adjustment range, plus Mute and Mono
Bass: ±12.0 dB
Treble: ±12.0 dB
Equalization: 10-band graphic
GEQ Center Frequencies: 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz
GEQ Gain: ±12.0 dB per band
Delay: 0.0 to 80.0 ms
Limiter Threshold: -80 to 0 dBz
Limiter Ratio: 1:1 to 10:1
Limiter Attack: 1 to 250 ms
Limiter Release: 1 to 1000 ms
Limiter Curve: Hard or soft knee

Audio – Digital Output

Output Signal Types: HDMI, DM 8G+ & HDBaseT
Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, LPCM up to 8 channels [7]
Mic: -80 to +10 dB Level adjustment range, plus Mute and Pan [7]
Source: -80 to +10 dB Level adjustment range, plus Mute and Balance [7]
Master Volume: -80 to +10 dB Level adjustment range, plus Mute [7]

Connectors – Audio/Video Inputs

VGA IN 1 – 4: (4) HD15 female;
Analog VGA/RGB/video inputs;
Signal Types: VGA, RGB, component, S-Video, or composite [4];
Formats: RGBHV, RGBS, RGsB, YPbPr, Y/C, NTSC or PAL;
Input Level: 0.5 to 1.5 Vp-p with built-in DC restoration;
Input Impedance: 75 Ohms nominal;
Sync Detection: RGBHV, RGBS, RGsB, YPbPr;
Sync Input Level: 3 to 5 Vp-p;
Sync Input Impedance: 2.2k Ohms

AUDIO IN 1 – 4: (4) 3.5 mm TRS mini phone jacks;
Unbalanced stereo line-level analog audio inputs;
Input Impedance: 32k Ohms unbalanced;
Maximum Input Level: 2.8 Vrms unbalanced;
Note: If an HDMI input is selected but no digital audio signal is detected, the corresponding analog audio input is activated (AUDIO 1 for HDMI 1, etc.). Please note, the analog audio inputs do not pass audio if the HDMI video input resolution is higher than 1920x1200.

HDMI IN 1 – 4: (4) 19-pin Type A HDMI female;
Digital video/audio inputs;
Signal Types: HDMI, DVI, or Dual-Mode DisplayPort [3,4]

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

MIC IN: (1) 3-pin 3.5 mm detachable terminal block;
Balanced microphone audio input;
Input Level: -60 to 0 dBV, 1 Vrms maximum;
Input Impedance: 6.5k Ohms balanced;
Phantom Power: 48 Volts DC, software enabled/disabled

Connectors – Audio/Video Outputs

HDMI OUT: (1) 19-pin Type A HDMI female;
Digital video/audio output;
Signal Types: HDMI, DVI [3]

DM OUT: (1) 8-pin RJ45 female, shielded;
DM 8G+ output, HDBaseT compliant;
PoH and PoDM PSE (Power Sourcing Equipment) port;
Connects to an HDBaseT device, or to the DM 8G+ input of a DM receiver or other DM device, via CAT5e, Crestron DM-CBL-8G, or Crestron DM-CBL-ULTRA cable [8,9]

AUDIO OUT: (1) 5-pin 3.5 mm detachable terminal block;
Balanced/unbalanced stereo line-level audio output;
Output Impedance: 200 Ohms balanced, 100 Ohms unbalanced;
Maximum Output Level: 4 Vrms balanced, 2 Vrms unbalanced

Connectors - Control & Power

IR OUT: (1) 3.5 mm mini-phone jack, IR/Serial output port [10];
IR output up to 1.2 MHz;
1-way serial TTL/RS-232 (0-5 Volts) up to 115.2k baud

COM: (1) 5-pin 3.5 mm detachable terminal block;
Bidirectional RS-232 port [10];
Up to 115.2k baud, hardware and software handshaking support

LAN: (1) 8-pin RJ45 female;
10Base-T/100Base-TX Ethernet port

USB 1 – 4: (4) USB Type A female;
USB 2.0 host ports for TT-100 series Crestron Connect It Cable Caddies [2];
Also enables firmware update via USB flash drive

G: (1) 6-32 screw, chassis ground lug

100-240V~1.4A 50/60Hz: (1) IEC 60320 C14 main power inlet;
Mates with removable power cord, included

COMPUTER (front): (1) USB Type B female;
USB computer console port;
For setup only

IR IN (front): (1) Infrared sensor [10];
IR Frequency: 36 to 38 kHz;
IR Formats: Crestron format, RC5;
Allows control from IR wireless remotes using the Crestron or RC-5 command sets

Controls & Indicators

PWR: (1) Bi-color green/amber LED, indicates operating power supplied from AC line power, turns amber while booting and green when operating

MSG: (1) Red LED, indicates internal control system has generated an error message

HW-R: (1) Recessed pushbutton for hardware reset, reboots the control system

SW-R: (1) Recessed pushbutton for software reset, restarts the software program

AUTO INPUT SELECT: (1) Pushbutton and bi-color green/amber LED, selects auto-switching mode

VGA INPUT SELECT 1 – 4: (4) Pushbuttons for manual input selection, and (4) bi-color green/amber LEDs to indicate the current active input and signal presence at each corresponding VGA input

HDMI INPUT SELECT 1 – 4: (4) Pushbuttons for manual input selection, and (4) bi-color green/amber LEDs to indicate the current active input and signal presence at each corresponding HDMI input

VOLUME: (1) Continuous turn rotary encoder, adjusts the analog audio output volume

DM OUT (rear): (2) LEDs, green LED indicates DM link status, amber LED indicates video and HDCP signal presence, for the DM output

LAN (rear): (2) LEDs, bi-color LED (left) indicates Ethernet speed and activity, green LED (right) indicates Ethernet link status

Power Requirements

Main Power: 1.4 Amps @ 100-240 Volts AC, 50/60 Hz
Power Consumption: 36 Watts typical, 26 Watts idle
Power over HDBaseT (PoH): PoH PSE (Power Sourcing Equipment), each DM 8G+ port supplies up to 15.4W (Class 0-3) to one PoH PD (Powered Device)
Power over DM (PoDM): PoDM PSE (Power Sourcing Equipment), each DM 8G+ port supplies up to 15.4W (Class 0-3) to one PoDM PD (Powered Device)

Environmental

Temperature: 41° to 104° F (5° to 40° C)
Humidity: 10% to 90% RH (non-condensing)
Heat Dissipation: 122 BTU/hr typical, 89 BTU/hr idle

Enclosure

Chassis: Metal, black finish, fan-cooled, vented sides
Front Panel: Metal, black finish with polycarbonate label overlay
Mounting: Freestanding, 1 RU 19-inch rackmount, or under-table mount (adhesive feet, rack ears, and under-table mounting brackets included)

Dimensions

Height: 1.74 in (45 mm) without feet
Width: 17.28 in (439 mm);
18.94 in (482 mm) with rack ears
Depth: 10.47 in (266 mm)

Weight

6.4 lb (2.9 kg)

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CRESTRON

Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

DM 8G+ & HDBaseT Maximum Cable Lengths

Cable Type: / Resolution:	DM-CBL-ULTRA DM® Ultra Cable	DM-CBL-8G DM 8G® Cable	CAT5e (or better) UTP or STP [8]
1080p60 Full HD	330 ft (100 m)	330 ft (100 m)	330 ft (100 m)
1920x1200 WUXGA			
1600x1200 UXGA			
2048x1080 2K DCI			
2560x1440 WQHD		230 ft (70 m)	165 ft (50 m)
2560x1600 WQXGA			
3840x2160 Ultra HD			
4096x2160 4K DCI			

MODELS & ACCESSORIES

Available Models

DM-MD8X1-4K-C: 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output

Available Accessories

TT-100 Series: Crestron Connect It™ Cable Caddy
AM-100: AirMedia™ Presentation Gateway
MP-AMP30: Media Presentation Audio Amplifier
MP-AMP40 Series: Media Presentation Audio Amplifiers, 70 or 100 Volt
AMP Series: Commercial Power Amplifiers
DM-RMC-4K-100-C-1G: Wall Plate 4K DigitalMedia 8G+® Receiver & Room Controller 100
DM-RMC-4K-100-C: 4K DigitalMedia 8G+® Receiver & Room Controller 100
DM-RMC-4K-SCALER-C: 4K DigitalMedia 8G+® Receiver & Room Controller w/Scaler
DM-RMC-4K-SCALER-C-DSP: 4K DigitalMedia 8G+® Receiver & Room Controller w/Scaler & Downmixing
DM-RMC-200-C: DigitalMedia 8G+® Receiver & Room Controller 200
DM-RMC-SCALER-C: DigitalMedia 8G+® Receiver & Room Controller w/Scaler
STIRP: IR Emitter Probe w/3.5mm Mini Phone Plug
CNSP-XX: Custom Serial Interface Cable
Crestron Fusion®: Enterprise Management Platform
DM-CBL-ULTRA-NP: DigitalMedia™ Ultra Cable, Non-Plenum Type CMR
DM-CBL-ULTRA-P: DigitalMedia™ Ultra Cable, Plenum Type CMP
DM-CBL-ULTRA-LSZH: DigitalMedia™ Ultra Cable, Low Smoke Zero Halogen
DM-CONN: Connector for DM-CBL-ULTRA
DM-CBL-8G-NP: DigitalMedia 8G™ Cable, non-plenum
DM-CBL-8G-P: DigitalMedia 8G™ Cable, plenum
DM-8G-CONN: Connector for DM-CBL-8G
DM-8G-CRIMP: Crimping Tool for DM-8G-CONN
DM-8G-CONN-WG: Connector with Wire Guide for DM-CBL-8G
DM-8G-CRIMP-WG: Crimping Tool for DM-8G-CONN-WG

CBL Series: Crestron® Certified Interface Cables
MP-WP Series: Media Presentation Wall Plates
MPI-WP Series: Media Presentation Wall Plates - International Version

Notes:

1. Compatible with 3-Series® control systems only. Not compatible with 2-Series or prior generation control systems.
2. Item(s) sold separately.
3. HDMI requires an appropriate adapter or interface cable to accommodate a DVI or Dual-Mode DisplayPort signal. CBL-HD-DVI interface cables are available separately.
4. The VGA inputs can accept component, composite, and S-Video signals using an appropriate adapter (not included). However, input sync detection is not provided for composite or S-Video signal types.
5. When using an analog audio input in combination with an HDMI video input, the source's video resolution must be 1920x1200 or lower. The analog audio input will not pass audio if the source's video resolution is higher than 1920x1200.
6. Automatically passes 3D video if the display device supports it (reverts to pass-through mode without scaling). Provides automatic 3D-to-2D conversion (with scaling) if the display device does not support 3D.
7. Routing of a multichannel audio signal via a digital input and output (HDMI, HDBaseT, or DM) requires the input to be set for "mixer bypass" mode. When that input is selected, all audio controls on the digital output are disabled and the ability to route the microphone signal to that output is defeated. Mixer bypass mode also disables the Input Compensation control on that input.
8. The maximum cable length for DigitalMedia 8G+ (DM 8G+) or HDBaseT is dependent upon the type of cable and resolution of the video signal. Refer to the "DM 8G+ & HDBaseT Maximum Cable Lengths" table for a detailed overview. Crestron legacy cable models DM-CBL DigitalMedia Cable and DM-CBL-D DigitalMedia D Cable support the same resolutions and cable lengths as CAT5e. Shielded cable and connectors are recommended to safeguard against unpredictable environmental electrical noise which may impact performance at resolutions above 1080p. Refer to the Crestron DigitalMedia Design Guide, Doc. #4546 for complete system design guidelines. DM 8G+ is compatible with HDBaseT Alliance specifications for connecting to HDBaseT compliant equipment. All wire and cables are sold separately.
9. The DM-MD8X1-4K-C cannot connect to an Ethernet LAN over a DM connection. It must be connected using its onboard LAN port. Ethernet over DM is only utilized on the DM-MD8X1-4K-C for connecting a single DM receiver.
10. When used without a control system, the IR OUT port and IR IN sensor are not utilized, and the COM port supports only basic display device control. The IR OUT port, IR IN sensor, and COM port may all be utilized for fully-customizable applications through integration with an external 3-Series Control System with custom programming.

This product may be purchased from an authorized Crestron dealer. To find a dealer, please contact the Crestron sales representative for your area. A list of sales representatives is available online at www.crestron.com/salesreps or by calling 800-237-2041.

The specific patents that cover Crestron products are listed online at: patents.crestron.com.

Certain Crestron products contain open source software. For specific information, please visit www.crestron.com/opensource.

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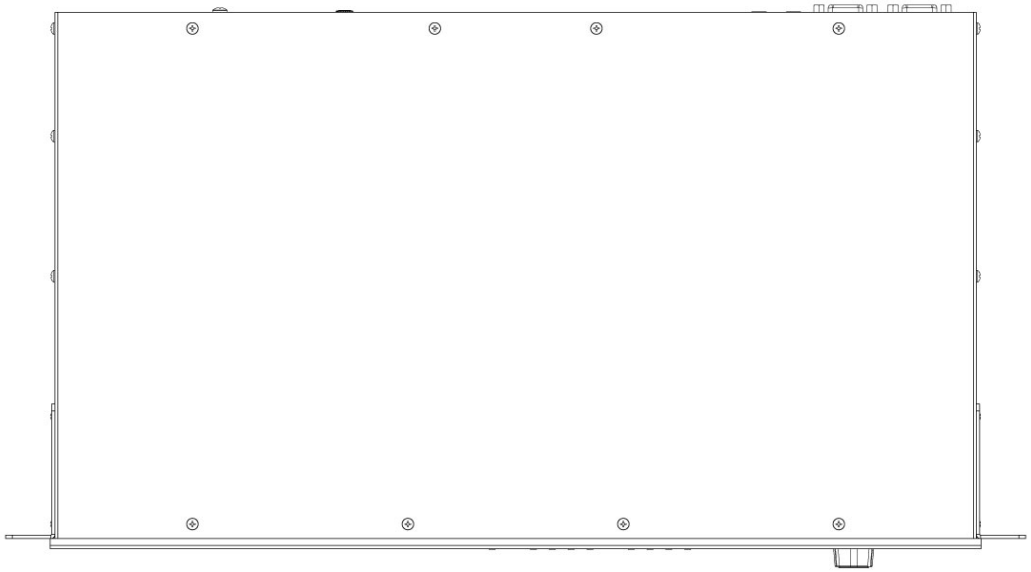
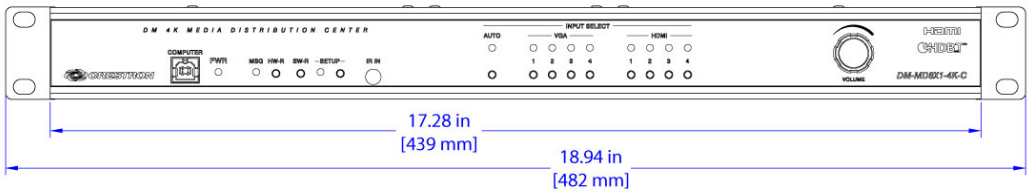
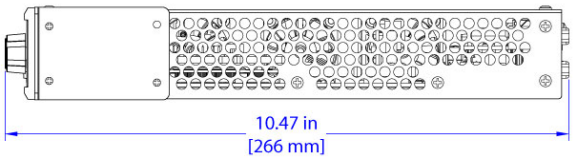
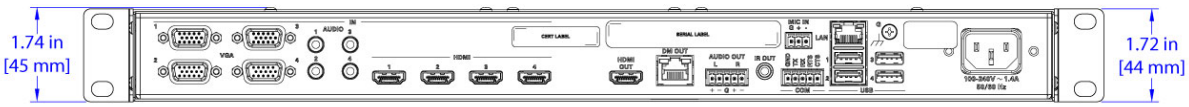
Sample Product Cutsheets (Audio-Visual)

DM-MD8X1-4K-C 4K Scaling Auto-Switcher w/DM 8G+® & HDBaseT® Output









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Sample Product Cutsheets (Audio-Visual)

ARCHITECTURAL CONNECTIVITY

Cable Cubby 500

SERIES/2 CABLE ACCESS ENCLOSURE FOR AV CONNECTIVITY, REMOTE CONTROL, AND POWER

- **Accommodates one Series/2 AC or AC+USB Power Module, plus three Retractors, four AV cables, or two AAP- Architectural Adapter Plates**
- **Patented modular design for fast assembly and serviceability**
- **Retractor, Cable Pass-Through, and AAP brackets included**
- **AC Power and AC+USB Power Modules are available for US, Europe, and other major world markets**
- **Cable Cubby 500 CCB includes buttons that provide convenient control for Extron switchers and other devices that have contract closure control ports**
- **UL/c-UL listed and CE compliant**

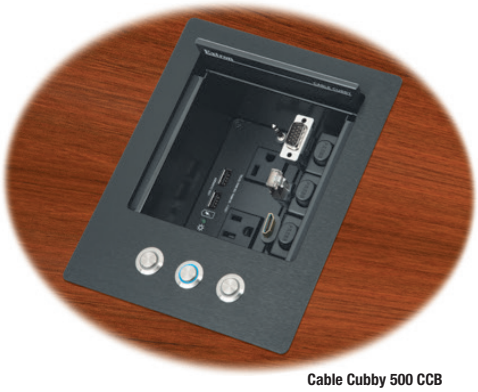
The Extron **Cable Cubby 500** is a compact, modular furniture-mountable enclosure that provides convenient connectivity for AV signals, data, and power. It is ideal for use in training rooms or conference rooms where tabletop connectivity is needed within a user's reach.

Extron Electronics
INTERFACING, SWITCHING AND CONTROL

Sample Product Cutsheets (Audio-Visual)

DESCRIPTION

The Extron **Cable Cubby® 500** is a modular, furniture-mountable cable access enclosure for AV connectivity and power. It accommodates an AC or AC+USB power module and includes mounting brackets for Retractor cable retraction modules, AV cables or AAP - Architectural Adapter Plates. The enclosure's patented modular design allows cables and AAPs to be installed or serviced from the top of the enclosure. For fast installation, the Cable Cubby 500 has a simple, integrated clamp system that quickly secures the enclosure to the furniture surface without the need for additional parts or tools. The **Cable Cubby 500 CCB** includes buttons that provide convenient control for Extron switchers and other devices that have contract closure control ports. Three brushed stainless steel pushbutton switches feature a raised surface for ease of access and tactile feedback, and LED rings around the switches provide illumination for visual feedback. Power modules are available for the US, Europe, and other major world markets. The Cable Cubby 500 is available in a black anodized or brushed aluminum finish.



Cable Cubby 500 CCB

KEY FEATURES

- **Optional Retractor cable retraction system supports most AV and data signal types**
- **Integrated side clamps secure enclosure to the furniture surface**
- **Top surface is available in a black anodized or brushed aluminum finish**
- **Installation routing templates available:**
  – Cable Cubby 500 Routing Template; part #70-1048-80
  – Cable Cubby 500 CCB Routing Template; part #70-1049-80
- **Cable Cubby Builder is available at www.extron.com/cablecubbybuilder** – Intuitive online tool for enclosure selection, pricing, and cable and connectivity selection.

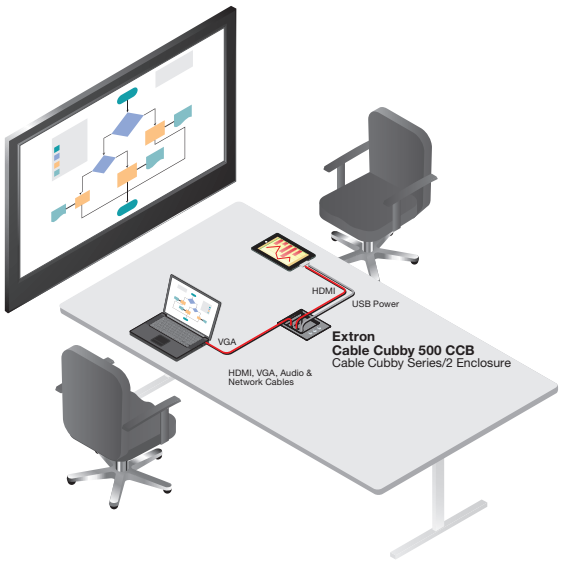
SPECIFICATIONS

SWITCH CONTACT CLOSURE – CABLE CUBBY 500 CCB ONLY	
Quantity/type	(3) momentary single pole, double throw switch
Connectors	(3) 5 pole, 3.5 mm captive screw connector on 4" pigtail
LED color	Blue
NOTE: Each switch can be used to select an input on a connected switcher with contact closure ports. See the Cable Cubby 500 and 700 Installation Guide for details.	
GENERAL	
Enclosure dimensions	
Cable Cubby 500	
Top plate (outer rim)	6.1" L x 6.1" W (15.6 cm L x 15.6 cm W)
Surface cutout (inside rim)	5.75" L x 5.75" W (14.6 cm L x 14.6 cm W)
Cable Cubby 500 CCB	
Top plate (outer rim)	6.4" L x 7.8" W (16.3 cm L x 19.8 cm W)
Surface cutout (inside rim)	5.75" L x 7.1" W (14.6 cm L x 18.1 cm W)
Mounting	
Furniture mount	Yes
Min./max. table thickness	0.50" to 2.50"
Enclosure type	Metal
Regulatory compliance	
Safety	UL, c-UL, CE

Model	Version Description	Part number
Cable Cubby 500	Black-with US AC Power Module	60-1404-02
Cable Cubby 500	Black-AC Module Not Included	70-1045-02
Cable Cubby 500	Brushed Aluminum-AC Module Not Included	70-1045-08
Cable Cubby 500 CCB	Black w 3 Buttons-AC Module Not Included	70-1125-02

For complete specifications, please go to www.extron.com
Specifications are subject to change without notice.

APPLICATION DIAGRAM



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Sample Product Cutsheets (Audio-Visual)

DENON PROFESSIONAL

www.denonpro.com PHONE: [401] 658.3131 November 9, 2017

DN-500BD Blu-Ray, DVD and CD Player

Key Features:

- Panel lock and IR remote lock functions prevent unwanted or accidental operation
- Power-on Play button eliminates extra steps, provides simplified, ultra-fast startup
- OSD (On Screen Display) hiding mode eliminates unwanted disc status updates
- Repeat mode offers an uninterrupted playback loop
- Supports BD-Video, BD-R, BD-RE, DVD-Video, DVD-Audio, DVD+R, DVD+RW
- Default repeat setting
- RS-232C and IP control capability
- XLR balanced audio output
- Discrete 7.1ch analog audio output
- Transport controls located conveniently on the front panel
- Occupies only a single rack space (1RU)

Overview:

DENON PROFESSIONAL'S VERSATILE DN-500BD BLU-RAY PLAYER

The Denon Professional DN-500BD Blu-ray disc player is a compact, high performance unit that handles all popular optical video playback formats for unrivaled capability from a single disc playback device.

The DN-500BD offers a tremendous amount of performance and flexibility in a space-saving single rack unit (1RU) chassis. It provides the wide range of connection and

Specifications:

- Digital System
  - System
    - Digital media player (Blu-ray Disc, DVD, CD, USB device [mass storage class]) AVCHD playback format
  - Supported Disc Formats
    - Blu-ray Disc: BD25, BD50, BD-ROM, BD-R, BD-RE
    - DVD: DVD, DVD+R, DVD-R, DVD+RW, DVD-RW
    - CD: CD, CD-R, CD-RW, DTS Music Disc (DTS Audio CD, 5.1 Music Disc), HDCD, Super Video CD (SVCD), Video CD (VCD)
  - Supported File Formats
    - Video: .3gp, .asf, .avi, .dat, .divx, .mkv, .mov, .mp4, .mpg, .m2ts, .ogm, .rmvb, .tp, .ts, .wmv
    - Subtitles: .ass, .smi, .srt, .ssa, .sub
    - Audio: .ape, .flac, .m4a (AAC), .mp3, .wav, .wma
    - Picture: .gif, .jpg (or .jpeg), .png
  - Supported File Systems
    - FAT16, FAT32, NTFS
    - USB drive (mass storage class) with < 2 TB total capacity
  - Video
    - Resolutions Auto, 480i/576i, 480p/576p, 720p, 1080i, 1080p
    - Aspect Ratios 16:9 Full, 16:9 Normal, 4:3 Pan & Scan, 4:3 Letterbox
    - System NTSC, PAL, Multi (if supported by TV)
    - HDMI Color Space: RGB PC Level, RGB Video Level, YCbCr (4:4:4), YCbCr 4:2:2
    - Output: HDMI > v1.4 (3D), HDCP 1.4
  - Decoding
    - Video: DivX 3, 4, 5, 6; DivX HD; MPEG-1; MPEG-2; MPEG-4; MPEG-4 AVC (H.264); VC-1 (Windows Media Video); Xvid
    - Audio: AAC; Dolby Digital; Dolby Digital Plus; Dolby TrueHD; DTS Digital Surround; DTS-HD; WMA
- Audio
  - Analog Outputs
    - Output Level (balanced XLR): +4 dBu = +1.786 dBV
    - Output Level (unbalanced RCA): +6 dBV

Sample Product Cutsheets (Audio-Visual)

control capabilities that are essential to the professional user, making it ideal for use in corporate A/V, education, theaters, house of worship, and more. These include RS-232C and IP controllability and XLR balanced audio outputs. The DN-500BD also has discrete 7.1 channel analog outputs for simple connection to powered speakers or signal management devices.

The Denon Professional DN-500BD will play virtually every Blu-ray, DVD, and audio CD format, making it easy to utilize multiple disc formats within a system. Supported formats include BD-Video, BD-R, BD-RE, DVD-Video, DVD-Audio, DVD+R, DVD+RW (Video mode, AVCHD format), DVD-R, DVD-RW (Video mode, AVCHD format) and Audio CD (CD-R, CD-RW). Using the built-in LAN port, users may optionally access additional content via BD Live. For even more versatility, a front-loading USB slot delivers access to MP3, WAV, FLAC, MP4, WMV, JPG, PNG, GIF files, and more.

In addition to its extremely high performance and wide range of format playback capabilities, the DN-500BD anticipates your requirements and operational patterns by providing features that maximize the unit's ease of use.

The Denon Professional DN-500BD combines no-compromise performance, wide-ranging connection and control capability, and compatibility with virtually every disc format there is—all in a compact single rack space unit. Its unique combination of performance, versatility and compact size is ideally suited to the professional user.

- Digital Output
  - Output Level (coaxial): 0.5V, 75Ω
  - Signal Format: AES/EBU
- Surround Audio
  - DTS-Master Audio, DTS-HD High Resolution Audio, DTS Digital Surround, Dolby TrueHD, Dolby Digital (AC-3), Dolby Digital Plus (7.1ch)
- Frequency Response: 20 Hz – 20 kHz (+0.5 dB)
- Signal-to-Noise Ratio: > 100 dB (A-weighted)
- Total Harmonic Distortion: < 0.05%
- Dynamic Range: > 100 dB (A-weighted)
- Headroom: 6 dB
- Channel Separation: > 90 dB

- Outputs
  - (2) XLR audio outputs (L/R, balanced)
  - (2) RCA audio outputs (L/R, unbalanced)
  - (8) RCA audio outputs (7.1 surround sound)
  - (1) Coaxial digital audio/visual output
  - (1) HDMI audio/visual output
  - (1) RJ-45 LAN port
  - (1) 9-pin D-Sub female RS-232C port
  - (1) IEC power connection
- Communication
  - Remote Control
    - Infrared protocol, > 200 mV transmission output level
  - Serial Remote
    - Connector: 9-pin D-Sub female, RS-232C
    - Mode: Full duplex
    - Baud Rate: 9600 or 38400 bps (selectable)
  - Ethernet
    - Connector: LAN port
    - Standards: Ethernet (10 Mbps), Fast Ethernet (100 Mbps)
- Environmental Conditions
  - Operating temperature: 41 – 95 °F (5 – 35 °C)
  - Operating humidity: 25 – 85%, no condensation
- General
  - Power
    - Connection: IEC
    - Requirement: 100–240 VAC, 50/60 Hz
    - Consumption: 15 W typical, < 0.5 W standby
  - Dimensions (width x depth x height, with rack ears)
    - 19.00" x 10.75" x 1.73" (483 mm x 273 mm x 44 mm)
  - Weight (with rack ears)
    - 5.9 lbs. (2.7 kg)

Sample Product Cutsheets (Audio-Visual)

Specifications

MAIN CAMERA

LENS	f=4.9mm - 78.4mm F2.7
FRAME RATE	30fps
SHOOTING AREA	max. 15.7" x 12.6" SXGA
ZOOM	16x Optical / 8x Digital
FOCUS	Auto / Manual/ Zoom Sync
IMAGE PICK-UP DEVICE	1/2.8" CMOS
TOTAL PIXELS	H: 2144, V: 1588
EFFECTIVE PIXELS	H: 1920, V: 1536
ANALOG RGB OUTPUT	SXGA, WXGA, XGA, 1080p, 720p
HDMI OUTPUT	1080p, 720p, Audio Output
WHITE BALANCE	Auto / One-Push / Manual
POSI/NEGA CONVERSION	Provided
COLOR/B&W SELECTION	Provided
BRIGHTNESS CONTROL	Auto / Manual
IMAGE ROTATION	180°
IMAGE MODE	Text1 / Text2 / Text3 / Grapics1 / Graphics2
GAMMA SETTING	Provided (Only for graphic mode)
EDGE EFFECT	Provided (Only for graphic mode)
PAUSE	Provided
STILL IMAGE STORAGE	Provided
MOVIE STORAGE	Provided
FLICKER CORRECTION	60Hz/50Hz
ILLUMINATION LIGHT	White LED

GENERAL

POWER SOURCE	12VDC (AC adapter AC100-240V)
POWER CONSUMPTION	21.6W
DIMENSIONS	W14.8" x D19" x H21.6" (Setup) W14.8" x D19" x 7.1" (Folded)
WEIGHT	10.4lbs
INPUT SELECTION	Main / External
OUTPUT TERMINAL	RGB Mini Dsub 15P conn. female x1 HDMI terminal x 1 Line Out terminal 3.5mm x 1
INPUT TERMINAL	RGB Mini Dsub 15P conn. female x1 Mic in/Line Out terminal 3.5mm x1
EXTERNAL CONTROL DEVICE	USB Device (2.0 compliant) x1
MEMORY INTERFACE	SD card slot x1 USB host (2.0 compliant) x1

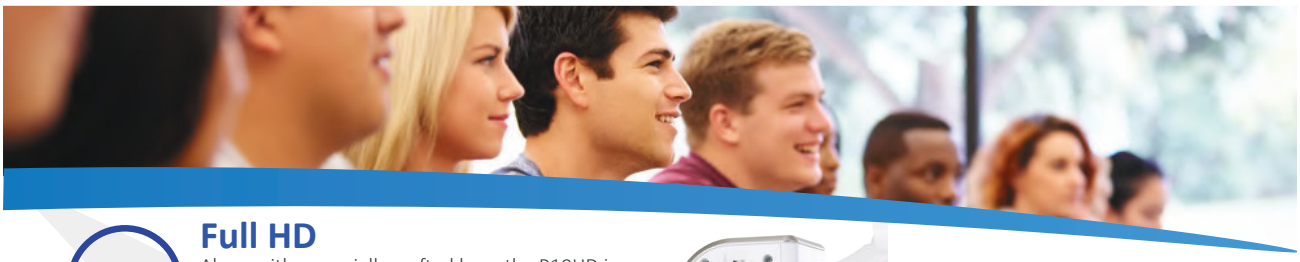
Contact us

For more information visit
www.elmousa.com

Phone:
516.501.1400
1800.947.ELMO

Email:
elmo@elmousa.com

Sample Product Cutsheets (Audio-Visual)



Full HD

Along with a specially crafted lens, the P10HD is equipped with HDMI output to give you a full HD picture.

Platform

The P10HD comes with a large platform to accurately display your documents and objects, giving you the best view with no background distractions.

128x Zoom

The P10HD is equipped with 16x optical and 8x digital zoom giving you an incredible 128x zoom, allowing you to get up close and personal with objects.

Flexible

The P10HD is one of the most flexible platform cameras in its class. The arm, head and light can each bend to give you the view you want

Inputs/Outputs

HDMI Output / RGB Input & Output

Quick Navigation Buttons

Easy access to main menu options

USB/SD Storage

Store your lessons via USB or SD to review later

ELMO

For more information visit
www.elmousa.com

Sample Product Cutsheets (Audio-Visual)

Pod Specs and Reference Material

The Solstice Pod integrates Mersive's award-winning Solstice collaboration software with a dedicated hardware platform to deliver a turnkey wireless content sharing solution. The Solstice Pod connects to any room display via HDMI and attaches to your WiFi/Ethernet network(s). This guide covers all Pod reference material, including:

- Hardware and Technical Specs
- Solstice Network Port Diagram
- Security Specs
- Full Configuration Options
- Licensing and Maintenance Information
- Resetting the Pod to Factory Settings

If you are looking for instructions on how to evaluate, deploy, and manage your Pod(s), refer to the Pod Admin Guide.

Hardware and Technical Specs

Pod Hardware Ports

- Power connector, DC 12V at 3Amps
- HDMI 1.4
- Stereo out, 8-channel 7.1 surround sound
- Gigabit Ethernet
- 2x USB 2.0

Technical Specifications

Dimensions

Hardware Type	Compute Console
Size	126mm x 101mm x 25.8mm
Weight	0.65lbs

System Specifications

Processor	Qualcomm Snapdragon™ S805, Krait 450
Graphics Processor	Adreno™ 420
Internal Storage	3GB RAM, 16GB Flash Storage
Ethernet	RJ45 Gigabit
Wireless	Dual band, 802.11ac 2×2 MIMO
Output	HDMI 1.4 output with Audio, Stereo output (8-channel 7.1 surround sound)
Streaming Video Support	HD (1920×1080), SD (1280×720)

Sample Product Cutsheets (Audio-Visual)

Solstice Datasheet

I/O	2x USB 2.0

Power

Input	DC 12V @ 3A max
Efficiency Level	VI
Adaptor	Switching 100-240VAC, 50/60Hz, changeable plug type (international support)
Adaptor Region Support:	US, EU, AK, AUS

Testing and Certifications

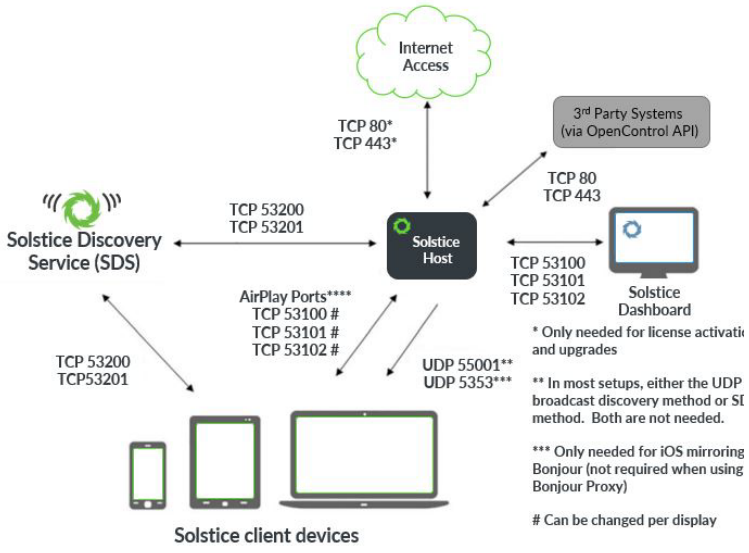
Safety	UL
Emissions Testing	FCC, CE (Home and Office Use)
Regional Certification Marks	USA, Canada, Europe, China, Australia/New Zealand, Singapore, Mexico
Accessibility	WCAG 2.0 AA Compliant. Full VPAT document available here.

Warranty

Hardware Warranty	The Solstice Pod includes a limited 1 year manufacturer's hardware warranty.

Network Port Diagram

Solstice uses standard TCP/IP network traffic to communicate across all the required and optional components of the Solstice system. Depending on your deployment configuration, certain network ports/routes must be open for Solstice to work correctly. The full list of Solstice network ports used can be found in the diagram below.



Inbound AirPlay® traffic to the Solstice Host should be allowed on TCP 6000-7000, 7100, 47000, and 47010, as well DP 6000-7000 and 7011. AirPlay ® traffic inbound to the Solstice client devices on TCP 7001 should also be allowed.

- **TCP ports 53100, 53101, and 53102** are used by default for basic communications between the Solstice host and both end user devices and the Solstice Dashboard. Three sequential ports are required, but the base port (53100 by default) may be changed on a per-host basis through the display's configuration panel or the Dashboard.
- **UDP port 55001** is used for display discovery if broadcast discovery mode is enabled.

Sample Product Cutsheets (Audio-Visual)

- **TCP ports 53200 and 53201** are used by the Solstice host and end user devices to communicate the Solstice Discovery Service (SDS) host if SDS discovery mode is enabled.
- **UDP port 5353** is required for iOS mirroring via the Bonjour protocol. It is not required when using the Solstice Bonjour Proxy.
- **TCP ports 6000-7000, 7001, 47000, and 47010** should allow inbound AirPlay® traffic to the Solstice host.
- **UDP ports 6000-7000 and 7011** should allow inbound AirPlay® traffic to the Solstice host.
- **TCP port 7001** should allow inbound AirPlay® traffic
- **TCP ports 80 and 443** are used if the Solstice host is allowed to connect to the internet for license activation and software upgrades.
- **TCP ports 80 and 443** are used by the OpenControl API to interface with 3rd party systems.

Security Specifications

The Pod was developed with important security features designed to prevent security breaches and minimize risk exposure. However, any network attached devices that are not configured properly can be vulnerable to user and network security breaches.

Prior to deploying Solstice in a security-sensitive environment, please read our Baseline Security Standard document.

Security Features

- **No installation of 3rd party applications** // Software updates must be signed by Mersive's secure certificate before they can be installed on a Pod.
- **Administrator password policy enforcement** // Enterprise password policies are enforced to ensure that Pods are locked with a password that is not susceptible to brute force attacks.
    - Passwords must be at least 8 characters in length, contain at least one uppercase and one lowercase letter, and contain at least one number or symbol. Any password will also not contain three consecutive characters.
    - When changing the password, a minimum of 3 characters must be changed in the new password.
    - When setting a new password, it must be different than the ten previously-used passwords.
- **In-room and web-based configuration access restriction** // Pods can be configured to disable in-room keyboard/mouse configuration as well as browser-based access. This limits configuration access to authorized users through the Solstice Dashboard.
- **Repeated password attempt lockouts** // Users who attempt to unlock a Pod with an invalid password more than 5 times within a 30-minute period will cause the Pod to ignore further login attempts for a period of 30 minutes.
- **Configuration lockout on untrusted networks** // When in dual-network mode, the Pod can be configured to disable any configuration access from one of the two connected networks. This can be used to disallow configuration attempts from installations that support guest wireless access.
- **Command Whitelist Enforcement** // Any command transmitted to the Pod over the network is compared to a whitelist before it is executed. This reduces vulnerabilities related to unauthorized commands and unexpected command payloads.
- **Code Obfuscation** // While access to a Pod's code has been disabled, the Solstice Pod is additionally protected through code obfuscation so that sensitive information cannot be captured even in the event that a Pod's source is compromised.
- **Connection Logging** // The Pod captures logs that include connection information, configuration changes, and other events. These logs can be used for diagnostics and security review.

Encryption

Network traffic between Solstice clients and (a) Solstice Enterprise Edition Pod(s) can be encrypted to provide additional security. This is enabled in the centralized IT management console: the Solstice Dashboard for Enterprise Edition. When enabled, traffic is encrypted using a 2048-bit length encryption key for all network traffic between the Pod and user devices. Encryption is also applied to traffic between the centralized dashboard and the Pod. Browser-based access for Pod Web Configuration utilizes OpenSSL and HTTPS when encryption is enabled.

Operating System Security Considerations

Sample Product Cutsheets (Audio-Visual)

Solstice Datasheet

The Pod appliance has been engineered for secure deployment behind the corporate firewall. Users are not able to access the Pod's underlying operating system or firmware and new software cannot be installed on the Pod unless it is a certified software update from Mersive.

Software Security and Access Options

In addition to system-level security, the Solstice Software itself provides users with the ability to secure their meetings. Both the Solstice Software and the Configuration Panel can be configured to enforce authentication through password access. Some of the security features include:

- **Disable/Enable Local Configuration:** Administrators can disallow configuration of the Solstice Software without the use of an administrator password.
- **Disable Guest Network Configuration:** All configuration options can be disabled for users on a guest network while remaining accessible to those on the enterprise network.
- **Screen Key**: An on-screen key must be entered by users at connection time. The on-screen key is a 4-digit alphanumeric code that is randomly generated. The alphanumeric code is re-generated when users disconnect.
- **Moderation Mode**: A user may choose to moderate a session to restrict which other users are approved into the meeting, and to preview all content posts before it is shared live to the display.

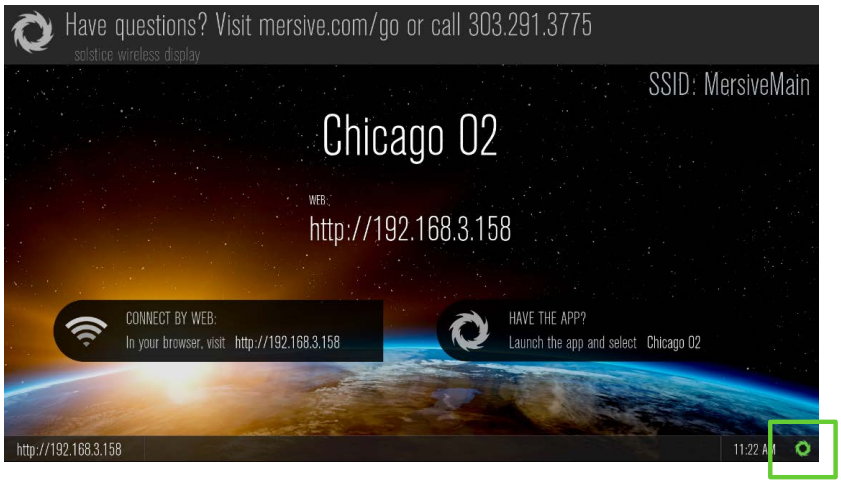
Full Configuration Options

The options below are listed in the order shown in the Pod's local configuration panel, but all these options and more may be managed in bulk through the Solstice Dashboard for large deployments.

The Pod's local configuration panel may be accessed in two ways:

Option 1:

Plug a USB keyboard and mouse into the Pod and click on the settings wheel in the lower righthand corner of the display:



This display menu also lets in-room users manually bring the display out of moderated mode, lock the display, or disconnect all users.

Sample Product Cutsheets (Audio-Visual)

Access Control allows a user with access to the configuration panel to manually remove the display from moderated mode. The display may be put into moderated mode through the Solstice client. This control can be used to manually override moderation in the case that the user with moderator control left the room without closing Solstice and forgot to release the display.

Lock is designed for use by end-user collaborators to use at during their meetings (if needed). Locking the display disables access to the display by any new users for the remainder of the session. Only users already connected to the display can share media.

Disconnect all Users disconnects all users from the session and removes all shared content.

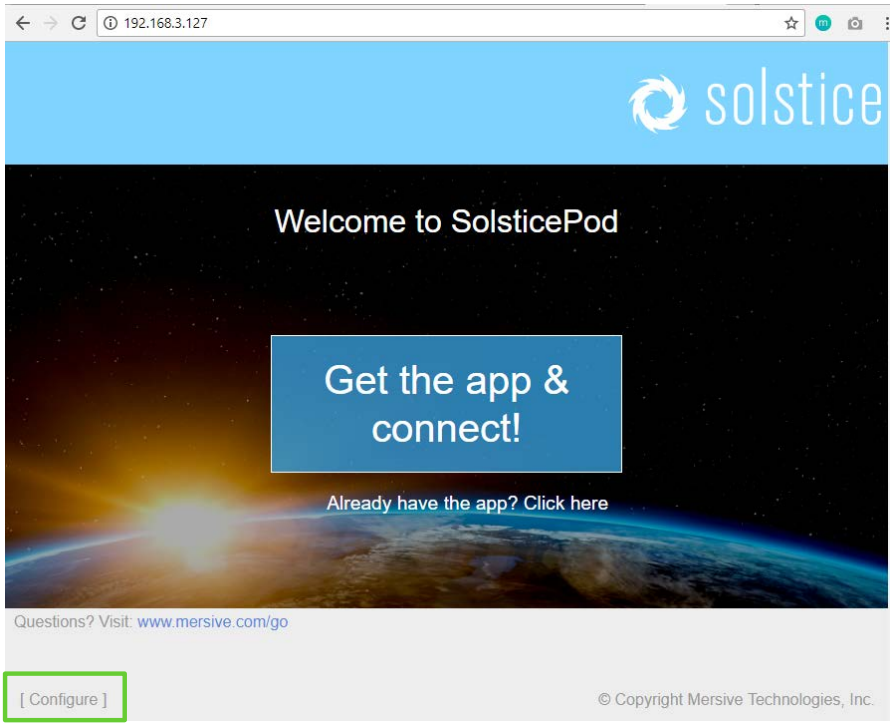
System>Configure provides local access to the Configuration Panel. This is used by admins to configure settings such as appearance and network.

Option 2:

Navigate to the Pod's IP address in a browser and click 'configure' in the lower left-hand corner of the screen:

Sample Product Cutsheets (Audio-Visual)

Solstice Datasheet



The Solstice Pod Configuration Panel

The **Display** tab allows the administrator of the display to change numerous settings and is divided into four sections:

- **Naming and Discovery** allows the administrator to name the Solstice display and configure how the name appears on the display interface and on the network. The Solstice display welcome screen can be customized with options for how and where the display name, IP, and screen key appear on the display interface. Additionally, options are available for how the display name is shared-to/visible-on user devices for users to connect. The options are to broadcast the display name on the network (utilizes UDP broadcast packets) and/or publish the display name to Solstice Discovery Service (for non-UDP-broadcast display discovery).
- **Appearance** (available from the web configuration and the Solstice Dashboard only) allows the Solstice display welcome screen background image to be customized by replacing the default Solstice welcome screen background image with a different image on the computer running the solstice Dashboard or used to access the Pod's web configuration. Standard .jpg and .png image file types can be used for the replacement welcome screen background image.
- **Access Control** designates how users will access the Solstice session, how users will post to the display, and controls user restrictions to accessing the display. The Access Control options include:
    - **Enable Screen Key** allows only those who can see the Screen Key in the bottom left corner of the Solstice display to connect to the session by entering the key. When the Browser Look-In feature is enabled for the display, users that attempt to utilize the browser look-in feature will be required to enter the display's Screen Key. If this is not enabled, anyone on the network that can see the display name may connect. Note that the Screen Key is required to use Multi-Room
    - **Disable Moderator Approval** removes the ability of a connected user to establish a moderated session. Moderation allows anyone to connect to the session, but only the moderator(s) have full sharing rights and control of the display. Non-moderator 'Guest' users can request to join the session, but both joining and sharing media posts must be approved by a Moderator, and Guest users do not have control of posts on the display.

Sample Product Cutsheets (Audio-Visual)

  - **Browser Look-In** allows users to view the Solstice session from a browser on their device without the need for Solstice client software app. This feature is useful when a user wants to view the Solstice display on their device and/or does not require the ability to share or control content on the display. When enabled, users can access the browser look-in via a link from the Solstice client software app or by browsing to the display IP address and selecting 'Browser Look-In' in the bottom left corner of the page.
- **Resource Restriction** enables the administrator to designate what types of posts users can share to the Solstice display, set the maximum number of user connections to the Solstice display, set the maximum number of content posts that may be simultaneously shared on the Solstice display, and elect a size at which Solstice will automatically resize images. For Solstice Small Group Edition (SGE), the maximum number of connections (devices) is limited to four. When the iOS mirroring post-type is enabled, there is an option to 'Enable AirPlay Discovery Proxy' which supports iOS mirroring without the use of broadcast/multicast network traffic. Contact your IT admin or refer to the Network Deployment Guide for more info.
- **System** allows the administrator to elect to automatically set time and date from an Internet time server, enable/disable 24-hour time format, designate a different time server, or set time zone, date, and time manually, and/or password protect the settings. Other options in the System section include customization of the Pod's system/network host name, designation of the admin password, and language selection (currently English and Japanese languages are supported).

The **Network** tab allows the administrator to configure the network settings for the Solstice Pod, including the Pod's Ethernet port, wireless capabilities, various network security options, and more. In addition to the information provided below, please contact your IT administrator and/or review the Network Deployment Guide for questions or assistance with network deployment of your Solstice Pod(s).

- **Ethernet Settings** allows an administrator to enable/disable the Pod's Ethernet port. When the Pod's Ethernet is enabled, configuration options include designating DHCP vs Static IP address. DHCP is recommended for small deployments and those companies/networks with no dedicated IT admin. Contact your network IT admin for questions about settings for Static IP address. When a Static IP address is enabled, additional configuration options include IP Address, Gateway, Network Prefix Length, DNS 1 and DNS 2.
- **Wireless Settings** allows an administrator to enable/disable the Pod's wireless capabilities, either as a standalone Wireless Access Point (WAP) – enabling users to connect directly to an SSID generated by the Pod – or attached to a separate existing network as a wireless client, providing users that have access to the existing network the ability to connect to the Pod.

Additional configuration options are exposed for each of the two wireless modes once that wireless mode is selected/enabled. In WAP mode, a wireless network name (SSID) can be designated, and access security options for users that want to connect to the Pod via the WAP may be configured. When the Pod will be wirelessly attached to an existing network, options to scan/add wireless networks and input a network password appear. The option to designate DHCP vs Static IP address appears again in this mode.

- **Firewall Settings** allows an administrator to block all traffic between the Pod's Ethernet and wireless connections (for network security) or to allow Internet access from the Ethernet port through to the wireless network via ports 80 and 443. This is useful when, for example, the Pod is connected via Ethernet to a corporate network and guest users join a meeting to collaborate alongside corporate users. The guest users can connect to the Pod's WAP and be granted Internet access without the guests compromising the security of the corporate network. This option does not appear unless both Ethernet and Wireless capabilities are enabled.
- **Web Server Proxy** provides a method for Pods to access Solstice software updates via a web server proxy. Both http and https options are available with web proxy IP address, port designation, and login credentials required for both.
- **Traffic and Ports** allows an administrator to specify the base network ports over which Solstice traffic will be transported. Solstice will use the port defined in this field as well as the next two in sequential order, plus port 80 for web configuration and some client-server traffic.

The **Tools** tab allows the administrator to download client Windows and Mac client software, download Windows SDS, and reboot the Pod if needed.

Sample Product Cutsheets (Audio-Visual)

- **Select platform to download client (available via browser Configuration Panel only)** provides an option to download Solstice client apps based on platform (Windows XP, Windows, or Mac). The client(s) can then be installed on the computer or saved to the hard drive and later installed on other devices. The admin can also elect to download versions of the client apps that automatically connect to the specific display/Pod. Note that client apps for iOS and Android devices must be downloaded through their respective app stores.

- **Windows SDS Installer (available via browser Configuration Panel only)** allows an administrator to download and install Solstice Discovery Service onto a Windows PC on the network to facilitate network-compliant (non-UDP broadcast) display discovery. For more information about SDS, refer to the Solstice Discovery Service Reference Guide.

- **Maintenance** allows an administrator to reboot the Pod if needed.

The **Updates and Licensing** tab provides details about your current Solstice software license, including version, release date, license type, installation date, maintenance expiration date, and info about the Pod including device ID, Ethernet MAC address and wireless MAC addresses that are available for both the display software and the different client versions. This tab also provides information about updates that are available, as well as an option to update your Solstice Pod software when a new update becomes available. Information about updates and the ability to update require Internet access. The 'Rollback' option reverts the Pod to the previously installed version of Solstice.

Licensing and Maintenance

The Solstice Software that runs on the Solstice Pod is a licensed Mersive product. Solstice licenses are available for purchase from Mersive and its authorized resellers. Solstice client apps are free. With a Solstice Unlimited software license (for Windows or Pod) an unlimited number of clients/users can connect to the display. With Solstice Small Group Edition (SGE) license (for Windows or Pod), up to four clients/users can connect to the display at one time. Mersive also offers Solstice Enterprise Edition licenses for both Solstice Pods and Windows Software, available in both Unlimited and SGE versions. The Solstice Enterprise Edition license provides support for the Solstice centralized IT management Dashboard and offers additional features designed for the enterprise deployment environment. Non-enterprise Solstice Pods and Windows Software licenses can be upgraded to Enterprise Edition through Solstice Dashboard via the licensing tab of the unit's configuration panel or by visiting https://www.mersive.com/land/enterprise-upgrades.
Solstice Pods include a licensed version of the Solstice Display Software that is activated upon purchase, so the unit is ready for use upon delivery. One-click software updates available through a software maintenance plan provide a continuous upgrade path for the Solstice Pod. You can see when updates are available for the Pod within the Configuration Panel. You will also be notified by email when updates are available at the email address associated with your account.

Reset the Solstice Pod to Factory Settings

The Solstice Pod can be reset to factory settings as needed. This function is used when configuration settings and/or admin passwords need to be reset. Please note that resetting the Pod to factory settings will reset all configuration options to factory, including network configuration settings. You will need to reconfigure your network settings after you complete the factory reset.
To reset your Pod to factory settings, follow these steps:

1. Connect a USB keyboard (wired or wireless) to the Pod via the USB port on the back of the unit.
2. On the keyboard, press and hold SHIFT-CONTROL-ALT. Tap 'R'.
3. After 2-3 seconds, a prompt will appear asking if you would like to reset the Pod to factory settings. Press the right arrow key on the keyboard to highlight the 'Yes' option and press ENTER on the keyboard.

The Pod should reboot and take you back to the Solstice display welcome screen. At this point the unit's factory settings are restored. You can now reconfigure the Pod's network and other settings starting from the default factory state.

Sample Product Cutsheets (Audio-Visual)

Panasonic

AW-HE40SW/SK [SDI Model]
AW-HE40HW/HK [HDMI Model]
HD Integrated Camera

For indoor use

AW-HE40SW/AW-HE40HW
Suspended (Hanging) style

Features 30x optical zoom lens
and support for PoE+*
for outstanding operability
and installation flexibility

AW-HE40SK/AW-HE40HK
Stand-alone (Desktop) style

*Abbreviation of Power over Ethernet Plus.

Sample Product Cutsheets (Audio-Visual)

Full HD camera with integrated pan-tilt for lectures, weddings and a wide variety of applications.

The AW-HE40 series of integrated full HD cameras performs in a wide variety of onsite shooting applications that require high-quality video, such as conferences, lecture capture and other events, thanks to its high-performance zoom, wide angle of view and outstanding color reproducibility.
The AW-HE40 series also offers the flexibility of not requiring any specific installation location thanks to IP transmission and support for PoE+*1, which allows power to be supplied via a LAN cable.

Newly Developed 1/2.3-type MOS Sensor

Equipped with a newly developed 1/2.3-type MOS sensor and DSP (Digital Signal Processor) for high sensitivity and high resolution.

High Performance Optical 30x Zoom Lens/ Super Resolution 40x Zoom

In addition to a 30x optical zoom, the AW-HE40 series can zoom up to 40x while maintaining high resolution thanks to Super Resolution technology. It also features a 16x digital zoom*2 and a 1.4x digital extender, which enables the AW-HE40 series to shoot in large conference halls and classrooms.

Wide side (31.6 mm) Telephoto side (962 mm) Super Resolution (iA Zoom)
* Images are simulated.

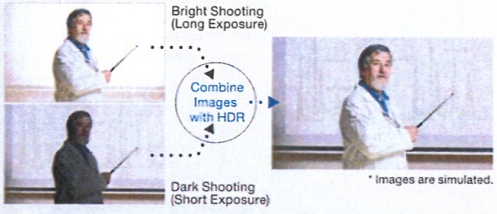
Night Mode (supports automatic switching)

Switching to Night Mode makes shooting possible even in low light conditions in which shooting is normally difficult, such as when observing wildlife. *3
The AW-HE40 series can also be set to switch to the mode automatically depending on surrounding light levels.

* Images are simulated.

Equipped with High Dynamic Range (HDR) mode

In addition to conventional Dynamic Range Stretch (DRS) and Digital Noise Reduction (DNR), the AW-HE40 is newly equipped with High Dynamic Range (HDR) mode. When shooting and synthesizing two images with differing exposure times, the AW-HE40 series can create video with high visibility that corrects for halation and black defects even under backlit conditions.



* Images are simulated.

Outputs Still Image During Preset Movements; Supports One-Camera Operations

The new Freeze During Preset function may be enabled to freezes the video during preset playback. The immediately preceding still image is output during preset movements so that the swiveling movement is not displayed, making operations possible with one camera.

With Freeze During Preset function ON

Selection of SDI model/HDMI model and colors for flexible integration and application

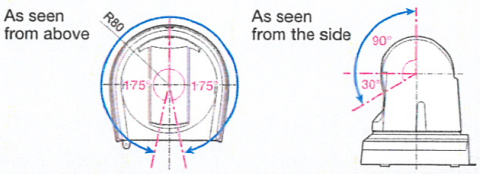
Supports 1080/59.94p (HDMI model only), 29.97p*4, 59.94i, 29,97PsF, 1080/50p (HDMI model only), 25p*4, 50i, 25PsF, 720/59.94p, and 50p video formats. Flexible operation in line with the application is made possible by a lineup that includes an SDI output model (AW-HE40SW/SK), optimal for video content production, and an HDMI output model (AW-HE40HW/HK), optimal for video streaming, both of which come in two body colors (white and black) that can be selected depending on the usage environment.

Audio input function

The AW-HE40 series also supports audio input, embedding and encoding. The input from the camera's switchable mic/line input can be combined with the HD-SDI, HDMI, and streaming outputs for mixing, recording or transmission.

Exceptional pan-tilt performance for smooth shooting over a wide area*5

The pan range of ±175 ° and the tilt range of -30 ° to +90 ° cover a wide shooting area*5. Pan and tilt operate at a maximum speed of 90°/second and respond quickly to remote control operation. They operate quietly at a sound level of NC35 or lower.

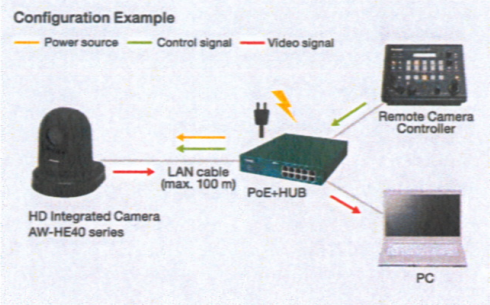


*1. Abbreviation of Power over Ethernet Plus. *2. Picture quality is lower with the digital zoom. *3. Video output is monochrome. *4. Native output. *5. Depending on the position of the pan and tilt, the unit itself may be reflected in the image.

Sample Product Cutsheets (Audio-Visual)

Supporting PoE+*1 for lower installation costs.

By connecting network devices that support the IEEE802.3at PoE+ standard, power can be supplied via LAN cable. Since it is not necessary to install a power supply or even a local AC outlet, installation costs can be significantly reduced.



IP control with image monitoring using PC, Mac and mobile terminals.

Equipped with image compression and IP transmission LSI.
IP video*3 can be transmitted to up to five terminals*2 per camera. Using an IP browser, the camera can be controlled from a remote location, and IP video monitoring and remote camera control can be performed from a PC, Mac or mobile terminals*4 such as an iPhone, iPad or Android device, enabling easy operations.

*For the latest information on supported OS/browsers, please refer to "service and support" section on the Panasonic website (http://pro-av.panasonic.net/en/).

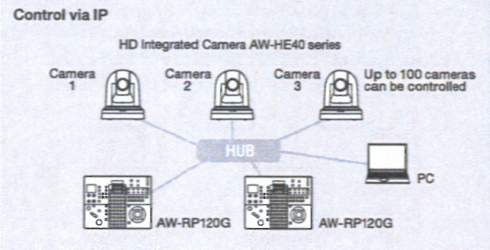
Camera Control Screen (PC)

Mobile Terminal Screen

Live Screen

Flexible IP Control Architecture Simplifies System Design and Operation*5

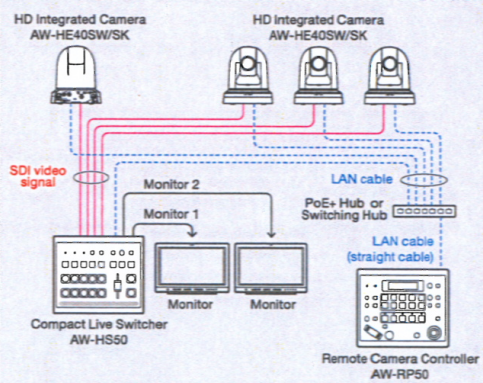
Up to 100 x AW-HE40 series cameras can be controlled via IP from a single AW-RP120G/RP50 or PC. An AW-HE40 series can also be simultaneously controlled by up to five AW-RP120G/RP50's via IP.



Other Functions

- Preset memory up to 100 positions.
- Functions such as freeze during preset, digital extender zoom and color temperature settings can be assigned to the user buttons on Panasonic controllers.
- Equipped with RS422 remote terminal; up to five units can be controlled via serial control from a controller.
- Equipped with RS232C remote terminal (standard serial communication support). Up to seven units can be controlled via daisy chain connection.
- Up to four units can be operated with a wireless remote controller (AW-RM50G sold separately).
- Easy installation thanks to use of turn-lock mechanism.

System configuration example



*The AC adaptor provided with the unit is not shown in the above figure.
*SDI output supported only by AW-HE40SW/SK.
*The camera unit automatically recognizes straight cables and cross cables connected to the LAN terminal.

System Camera Options

As of November 2014

Remote Camera Controller AW-RP50	Remote Camera Controller AW-RP120G (AC adaptor (DC12 V) is required separately.)	Remote Operation Panel AK-HRP200G (AC adaptor (DC12 V) is required separately.)
Wireless Remote Control AW-RM50G ("AA", "R6" or "LR6" battery x 2 are not included.)	Compact Live Switcher AW-HS50	Direct Ceiling Mount Blacket WV-Q105A

*1: Abbreviation of Power over Ethernet Plus.
*2: Depends on your network environment.
*3: Supports only SD video output.
*4: Only one Android™ device can be connected to one camera.
*5: Controller upgrade required. For details, please refer to the "service and support" section on the Panasonic website (http://pro-av.panasonic.net).

Sample Product Cutsheets (Audio-Visual)

Specifications

As of November 2014

GENERAL	Power requirements		DC 12 V (Supplied AC adaptor) DC 42 to 57 V (PoE+ power supply)
	Current consumption		1.2 A (Supplied AC adaptor) 0.4 A (PoE+ power supply)
	Ambient operating temperature		0 °C to 40 °C (32 °F to 104 °F)
	Storage temperature		–20 °C to 50 °C (–4 °F to 122 °F)
	Allowable humidity ranges		20 % to 90 % (no condensation)
	Mass		Approx. 1.5 kg (3.30 lb)
	Dimensions (W x H x D)		160 mm × 186 mm × 166 mm (6-5/16 inches x 7-41/128 inches x 6-17/32 inches) (excluding protrusions, direct ceiling mount bracket)
	Finish		AW-HE40HW / AW-HE40SW: Pearl white AW-HE40HK / AW-HE40SK: Metallic black
	Controller supported*1		AW-RP50, AW-RP120G, AK-HRP200G
INPUT	Power		DC 12 V IN, PoE+ (IEEE802.3at standard)
	MIC/LINE input		Stereo mini-jack (ø3.5 mm) Input impedance: Approx. 2 kΩ (unbalanced) [Mic input] •Supported microphones: Stereo mic (plug-in power,on/off switching via menu) •Supplied voltage:2.5 V ± 0.5 V •Mic input level:–60 dBV ± 3 dBV [Line input] •Input level:–10 dBV ±3 dBV
OUTPUT	Video Output	AW-HE40H HDMI	HDMI connector • HDCP is not supported. • Viera Link is not supported.
		AW-HE40S HD SDI	Compliant with the SMPTE292M standards/75 Ω (BNC x 1)
INPUT/ OUTPUT	Video Output Connnector	LAN	LAN connector for IP control (RJ-45) Equipped with straight/crossover cable auto detection function
		RS-232C	Mini DIN 8-pin (IN) Mini DIN 8-pin (OUT)
		RS-422	CONTROL IN RS422A (RJ-45)
		USB	Mini-B port (Used for maintenance)
		SD card	microSD card slot (Used for maintenance)
FUNCTIONS AND PERFORMANCE	[Camera unit]		
	Imaging sensors		1/2.3-type MOS
	Lens		Motorized 30x zoom, F1.6 to F4.7[f=4.3 mm (11/64 inches) to 129 mm (5-5/64 inches); 35 mm (1-3/8 inches) equivalent: 31.6 mm (1-31/128 inches) to 962.0 mm (37-7/8 inches)]
	Focus		Switching between auto and manual
	Focus distance		Entire zooming range: 1.2 m (3.94 ft) Wide end: 10 cm (0.33 ft)
	Color separation optical system		On-chip color filter system
	Minimum illumination	59.94 Hz	0.7 lx (50 IRE, F1.6, 48 dB,1/60 without accumulation) 0.35 lx (50 IRE, F1.6, 48 dB,1/30 with accumulation [Frame Mix 6 dB])
		50 Hz	0.7 lx (50 IRE, F1.6, 48 dB,1/50 without accumulation) 0.35 lx (50 IRE, F1.6, 48 dB,1/25 with accumulation [Frame Mix 6 dB])
	Horizontal resolution		1000 TV lines Typ (Center area)
	Gain selection*2		Auto, 0 dB to 48 dB (3 dB step)
	Frame mix*3		Auto, Off, 6 dB, 12 dB, 18 dB, 24 dB

FUNCTIONS AND PERFORMANCE	Electronic shutter speed	During Full Auto: 1/30 to 1/2000[59.94 Hz] 1/25 to 1/2000[50 Hz] During Auto: 1/60 to 1/2000[59.94 Hz] 1/50 to 1/2000[50 Hz] During Manual: 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000[59.94 Hz] 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000[50 Hz]
	Synchro scan	59.94 Hz to 660.09 Hz[59.94 Hz] (255 steps) 50.00 Hz to 570.12 Hz[50 Hz] (255 steps)
	Gamma	Off, Normal (Low, Mid, High), Cinema
	White balance	ATW, AWB A, AWB B, 3200K, 5600K, VAR (2400K to 9900K)
	Chroma amount variability	±3 step
	Scene file	Full Auto, Manual1, Manual2, Manual3
	Color bars	FULL BAR
	Output format HD	1080: 59.94p/50p (AW-HE40H only) 1080: 59.94i/50i 1080: 29.97p/25p 1080: 29.97PsF/25PsF 720: 59.94p/50p
	Synchronization system	Internal synchronization
	Image stabilization	Electronic
	[Pan-tilt head unit]	
	Installation method	Stand-alone (Desktop) or suspended (Hanging)*4
	Camera/pan-tilt head control	IP connecting cable When connecting through a hub: • LAN cable*5 (category 5 or above),max. 100 m (328 ft) When using a PoE+ hub: • LAN cable*5 (category 5e or above),max. 100 m (328 ft) When a hub is not used: • LAN cable*5 (category 5 or above),max. 100 m (328 ft) AW protocol connecting cable • LAN cable*5 (category 5 or above,straight cable), max. 1000 m (3280 ft) Standard protocol connecting cable • Mini DIN 8-pin cable, male
	Pan-tilt operation speed	Maximum speed during preset:300°/s Maximum speed during manual:90°/s
	Panning range	±175°
	Tilting range*6	–30° to 90°
	Quietness	During preset: NC40 or less During manual: NC35 or less
	[Network]	
	Image resolution	JPEG VGA (640 x 360), QVGA (320 x 180) Max. 30 fps
	Supported protocol	IPv4: TCP/IP, UDP/IP, HTTP, DHCP, DNS
	i-OS, Android support	JPEG image display

*1: It may be necessary to upgrade the version of the controller in order to support the unit. For the latest information on supported OS/browsers, please refer to "service and support" section on the Panasonic website (http://pro-av.panasonic.net/en/). *2: During Auto, 6 dB to 48 dB (6 dB step) are available for AGC Max Gain setting. *3: During Auto, 0 dB, 6 dB, 12 dB and 18 dB are available for Auto F.Mix Max Gain setting. *4: To ensure safety, the unit must be secured using the mount bracket supplied. *5: Use of an STP (shielded twisted pair) cable is recommended. *6: Depending on the pan or tilt position, the camera may be reflected in the image.

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Please refer to the latest Information, etc. at the following Panasonic web site.

http://pro-av.panasonic.net/

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Factories of AVC Networks Company have received ISO14001:2004-the Environmental Management System certification. (Except for 3rd party's peripherals.)

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Sample Product Cutsheets (Audio-Visual)

AV STREAMING

SMP 300 Series

H.264 STREAMING MEDIA PROCESSORS

Multipurpose Adaptable Platform for Streaming and Recording AV Presentations

- Process two high resolution AV sources from up to five available input signals
- Dual recording and streaming - SMP 352 only
- Stream and record simultaneously
- Produces MP4 media files that are compatible with virtually any media player
- Save recordings to internal solid state drive and external USB storage
- Automated transfer of recordings to network storage
- Stream concurrently at multiple resolutions and bit rates
- RTMP streaming protocol supports popular third party hosting services such as Facebook Live, YouTube Live, and Wowza Streaming Cloud

Works with these hosting services

USTREAM · Wowza Streaming Cloud · YouTube · LIVE

Extron Electronics
INTERFACING, SWITCHING AND CONTROL

Sample Product Cutsheets (Audio-Visual)

Introduction

The convergence of AV and IT continues to create new opportunities for AV systems. The scale, flexibility, and reach of IP networks offer an incredible opportunity to extend live presentations to individuals that are unable to attend an event due to time, distance or other physical barriers. Streaming and recording are effective methods for organizations to communicate and educate, by capturing the presentation experience and delivering the same information and insight that a local participant receives.

Streaming Solutions Require Flexibility

Any organization with a network and an AV presentation system can benefit from streaming. Today's streaming systems must be compatible with high resolution source signals, including high definition cameras. They must reliably interface, switch, and combine video with digital imagery and data to enhance a user's insight into the live experience. Streaming products must also conform to different network policies and operating requirements by supporting multiple transport protocols and session management methods. Additionally, streaming at more than one resolution and bit rate concurrently adds important flexibility, ensuring that media can be delivered to destinations with different viewing requirements or network bandwidth.

Recording Requirements for Presentations

To efficiently produce, manage, and distribute recorded presentations, a variety of requirements must be met. Effective systems record media that can be easily processed and transferred to a variety of storage formats. The recorded media must be efficiently processed with rights-managed user access, operating within an organization's standard network services and conforming to their IT policies. Lastly, the media must be published in a format that can be easily delivered and consumed.

Extron Streaming and Recording Processors

The SMP 300 Series of products are high performance streaming and recording processors for capturing and distributing AV sources and presentations as live streaming and recorded media. They incorporate Extron's FlexOS®, a flexible platform for automating system operation. Accepting HDMI, component, composite, and optional 3G-SDI signals, SMP 300 Series processors can record and stream simultaneously and can stream at two different resolutions and bit rates concurrently using a range of transport protocols and session management options.

- The SMP 351 creates a composited two-window stream and recording from its available sources.
  - An optional LinkLicense® upgrade unlocks SMP 352 functionality within the SMP 351.
- The SMP 352 can create composited or independent recordings and streams from two different sources with independent settings for each channel. It also has advanced audio DSP features for level control, filtering, and dynamics, as well as streaming presets that increase functionality and provide a simplified workflow.

A Cost-Effective Solution

Comprehensive control and configuration features make SMP 300 Series products integration-friendly and easy to control and operate. Requiring no recurring licensing fees, these H.264 processors have a low cost of ownership, making them a cost-effective solution for delivering presentations to a larger audience.

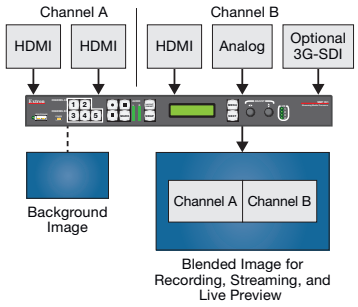
Many Applications Benefit from Streaming and Recording

SMP 300 Series products are ideal for use in virtually any professional environment where AV sources can be streamed live or recorded for future reference, especially when combining multiple AV sources will enhance the message. Streaming and recording AV presentations allows an organization to communicate and train employees and students that cannot be present at an event. Event recording provides everyone with the opportunity to review and gain insight into the live experience. SMP 300 Series products can be adapted to many applications, documenting virtually any meeting, conference, or activity that uses an AV source as a reference. They are ideal for use in corporate, education, government, healthcare, courtroom, house of worship, and rental and staging applications.

Sample Product Cutsheets (Audio-Visual)

Presentation Recording & Streaming

SMP 300 Series products provide a comprehensive combination of signal processing, switching, scaling, and control features that simplify the integration of streaming and recording into AV systems. The versatility of the FlexOS platform makes it easy to adapt them for various applications and their broad feature set delivers quality and performance, making them a superior choice for streaming and recording applications.



SMP 300 Series products provide AV signal processing that produces high quality recorded media and live streaming.

Flexible Source Inputs

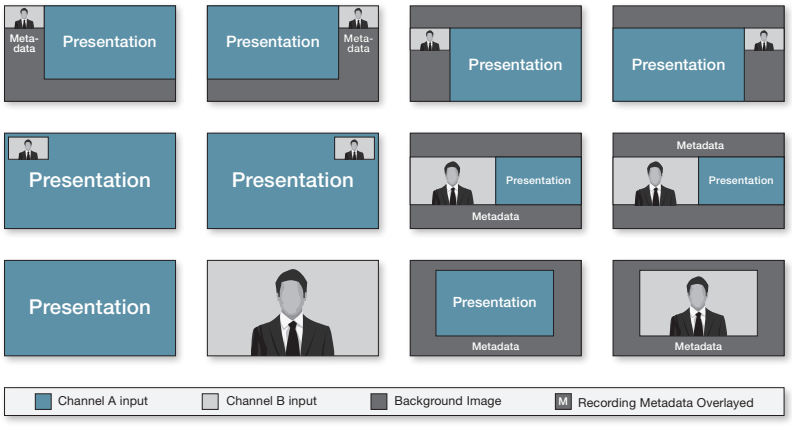
The SMP 300 Series processes two high resolution AV sources from up to five available connections. One of two HDMI signals can be selected from Channel A along with analog or HDMI-embedded stereo audio. Channel A also provides a loop through HDMI and audio connection, which can be passed directly to a presentation display. Channel B inputs support common camera formats including composite, component HD, and HDMI. The SMP 300 Series includes 3G-SDI models that accept serial digital video and audio signals supplied by cameras and other professional video sources. The Channel A and B input connections both support computer-video formats from 640x480 to 1920x1200, and video formats from 480p to 1080p/60. They can be switched live during a presentation.

Signal Processing Simplifies Source Management and Produces High Quality Content

Comprehensive scaling, picture control, aspect ratio management, and HDCP-compliant signal management features ensure that SMP 300 Series products present AV sources with quality and accuracy. Advanced de-interlacing and scaling produce high quality video for both standard definition and high resolution sources as they are scaled up or down. The recording format and HDMI output can be scaled to selectable resolutions from 480p to 1080p/30, and streaming resolutions are available from 512x288 to 1080p/30 supporting use of the optimal resolution for many different applications.

Multi-Source Window Processing

SMP 300 Series products offer highly flexible source presentation options. The Channel A and B input signals can be presented on the output individually at full screen or together in any two-window display arrangement including side-by-side. Up to sixteen customized window presets can be prepared, combining the Channel A and B inputs with a PNG background image and metadata. These flexible, multi-source processing features makes it easy to recreate the live presentation experience. They also provide viewers with greater insight into the event's context, facilitating interpretation and retention of the information presented.



Up to sixteen customizable window layout presets can be saved and quickly recalled from the front panel or an AV control system. Twelve are shown here.

Sample Product Cutsheets (Audio-Visual)

Presentation Recording & Streaming

Quality Multi-Source Audio Processing

SMP 300 Series products offer audio mixing and DSP features that simplify audio management and provide a high quality output. They select or mix the analog or digital signals from Channel A and B sources, based on the input configuration and the source layout. Audio signals are adjusted automatically during source switches, eliminating clicks, pops, and undesired effects, producing a quality audio experience without using external processing equipment. The SMP 352 offers additional control over volume levels, filtering, and dynamics for an enhanced audio experience.

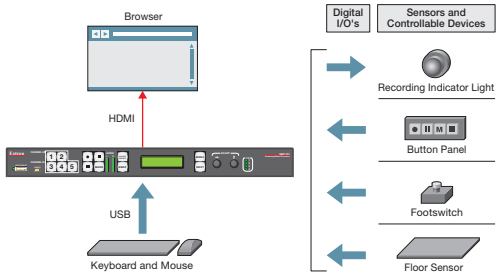
Effective User Control and Integration Options

SMP 300 Series products offer several control options. The front panel controls and LCD display provide an effective interface for configuration and control. The RS-232 port can be used to interface with a control system, and the Ethernet port is available as an additional control interface.

Versatility Delivered by the FlexOS Platform

The Extron FlexOS embedded operating system makes SMP 300 Series products highly adaptable to a multitude of streaming, recording, processing, and control requirements. It provides a platform from which applications can be installed and operated. An integrated web browser application can be viewed and managed using the HDMI output and USB keyboard and mouse connections. This browser application serves as a convenient method to access the embedded web page.

Extron FlexOS control applications can also be installed to automate system operation. These programs interface with four digital I/O ports, accepting triggers from push button controls and sensors to manage specific functions, such as enabling recording sessions or marking a chapter in a recording. The ports can also be used to manage digitally controlled devices such as a recording indicator light.



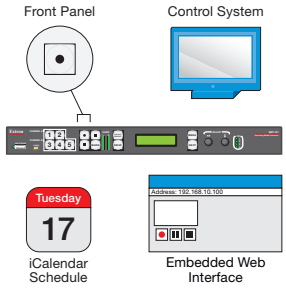
SMP 300 Series products can be directly controlled using a USB keyboard and mouse. Custom applications can be uploaded to manage four digital I/O ports that interface with digitally controlled devices.

Powerful Tools for Scheduling, Monitoring, and Management

Recording schedules can be automatically updated by configuring SMP 300 Series products to periodically upload a centrally managed iCalendar file. Simple Network Management Protocol – SNMP traps, email, and Simple Mail Transfer Protocol – SMTP can deliver messages to support staff or monitoring systems when signal errors or encrypted sources are detected, or when storage nears capacity, allowing for proactive service. Operational system data is logged continually, detailing recording sessions, storage directory use, file names, metadata, and storage capacity. This information provides valuable data for evaluating usage patterns and operating concerns.

Recorded Media Enhanced with Data

SMP 300 Series products produce an MP4 (M4V) file, which can be played from virtually any software media player application or mobile device with a web browser. They can record at 480p, 720p, or 1080p video resolutions as well as 1024x768 and 1280x1024 computer-video resolutions at rates from 1 to 30 frames per second. MP4 files can be recorded at video bit rates from 200 kbps to 10 Mbps, defined using a wide variety of encoding parameters.



Recording sessions can be initiated from the front panel, a control system, the embedded web page, or automatic recording can be scheduled using the iCalendar format.

Recorded file packages include metadata that identifies information such as: Title, Creator, Subject, Description, Publisher, Contributor, and Date. This information makes it easier to search and manage media files. In addition, chapter and event marks can be inserted into recordings, supporting efficient searching and scanning during playback from a media player. JPEG thumbnail images are captured periodically for every chapter or event mark, providing a "snapshot" preview of the video at that point in the timeline. Time-synchronized thumbnails enable efficient scanning and preview of content. They are integrated into the user interface of the **Extron Media Player**, a browser-based media player used for play back of media recorded by the SMP 300 Series products.

Sample Product Cutsheets (Audio-Visual)

RCP 101 Series - Remote Control Panels for SMP Series

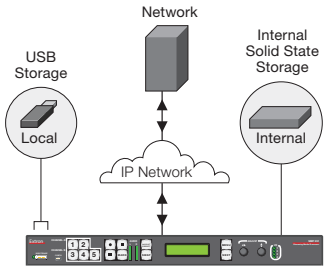
RCP 101 D

RCP 101 EU

Extron **RCP 101 Series** remote control panels feature backlit transport controls for remote operation of Extron SMP Series products. A USB port provides convenient access to a thumb drive or external portable storage. RCP 101 panels have status and alarm indicator lights with an audible buzzer. A 15 foot (4.5 meter) USB cable is included. The RCP 101 panels may be used with Extron **USB Extender Plus** Series twisted pair extenders to support distances up to 330 feet (100 meters). Available in decorator-style, MK, and EU versions; the EU version is compatible with Flex55 enclosures or EU junction boxes. RCP 101 Series panels include black and a white faceplates to compliment a wide range of environments. MK model is available in white only.

Storage Options Serve Different Applications

Presentations can be saved to the internal solid state drive, to a connected USB drive, or uploaded to a network storage location. SMP 300 Series products can also be configured to limit storage to only the internal SSD drive, USB only, or Dual Recording to both devices simultaneously. When network storage is defined, reliable capture is ensured by first saving the recording internally before transferring it to a file server.



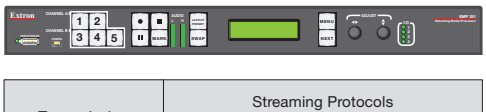
Save AV recordings to internal solid state storage, a locally connected USB storage device or it can transfer files to a network storage directory.

Extensive Streaming Capabilities

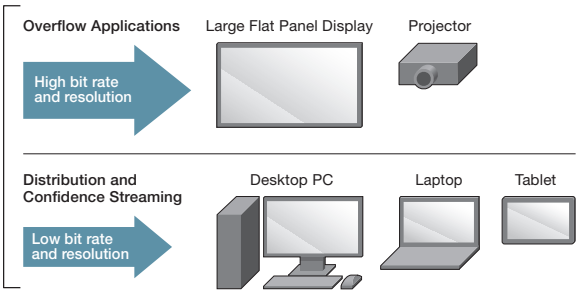
SMP 300 Series products offer extensive streaming capabilities. They can record and stream simultaneously. They can also stream at two different resolutions and bit rates concurrently. High resolution, high bit rate encoding delivers superior quality for large screen overflow applications. Lower bit rates and lower resolutions are more efficient for streaming distribution or confidence viewing applications. Streaming bit rates can range from 200 kbps to 10 Mbps for video and 16 kbps to 384 kbps for audio. SMP 300 Series products support both push and pull streaming session management, and a range of streaming transport protocols can be used to support unique decoding or network requirements.

RTMP Streaming Protocol

Extron's SMP 300 Series processors support live streaming to popular third party hosting services such as UStream, YouTube Live, Facebook Live, Wowza Streaming Cloud and more. Streaming to live services facilitates sharing of events and meetings to a much larger audience.



Transmission Method	Streaming Protocols	
	Transport	Session Management
• Unicast • Multiple Unicast • Multicast	• RTP • RTSP Interleaved • HTTP Tunnelled • TS/UDP • TS/RTP/UDP	• RTSP • SAP • SDP



SMP 300 Series products can support unicast and multicast streaming applications and can apply a variety of streaming transport protocols and session management methods supporting use with a wide variety of viewing applications, decoding devices and network conditions.

Sample Product Cutsheets (Audio-Visual)

Features

Supports input signal resolutions up to 1920x1200, including HDTV 1080p/60
SMP 300 Series products support a wide range of input resolutions, from standard definition up to the high resolutions commonly used for computer video and HDTV.

High Quality Scaling and De-interlacing
SMP 300 Series products use advanced de-interlacing and signal processing to create high quality images. The encoded output signals can be scaled to selectable resolutions from 640x480 to 1080p/30.

Flexible scaling and two window processing
Display one or two high resolution sources in user-defined window arrangements, including side-by-side for optimal interpretation.

Clean switching
Switch with a clean transition free of visual jumps, glitches, and distortion commonly experienced switching between computer and video signals.

Aspect ratio control
The aspect ratio of a source window can be controlled by selecting a FILL mode, which provides a full screen output, FOLLOW mode, which preserves the aspect ratio, or FIT mode which maintains image uniformity and zooms into the source.

RTMP streaming protocol supports popular third party hosting services
Supports RTMP push streaming with stream name or key, and user authentication for services like YouTube Live, Wowza Streaming Cloud, Facebook Live, Ustream, and more.

HDCP-compliant input and output signal management
Encrypted signals can be viewed on compliant displays connected to the loop through, but cannot be recorded. A green signal and HDCP warning message are presented on non-compliant displays and encoded media.

Supports HDMI-embedded audio or analog stereo audio
AV input connections are directly compatible with digital and analog audio signals.

Auto Input Memory
Automatically store size, position, and picture settings based on the incoming signal and recall these settings when the source is reconnected.

EDID Minder®
EDID Minder automatically manages EDID communications between devices, ensuring use of optimal signal formats.

Audio input gain and attenuation
Gain or attenuation can be adjusted for each input signal to eliminate noticeable differences when switching sources.

Integrated audio mixing and DSP
Produce a high quality audio experience without requiring the use of external mixing and DSP equipment.

Schedule streaming and recording using iCalendar
Upload a recording schedule manually, or automatically using the iCalendar format.

Internal test patterns for setup
SMP 300 Series processors include 15 test patterns as well as on-screen display - OSD data overlay including timestamp, average bit rate, frame rate, time and date, and system information to aid in calibration and setup of the encoder.

Extron FlexOS applications automate system operation
Install Extron FlexOS applications that automate system operation using four digital I/O ports interfaced to push button controls, sensors or digitally controlled devices.

Daily recording logs
Provide usage and operating data to aid in system diagnostics and troubleshooting.

Front panel security lockout
Locks out all front panel functions except for input selection; all functions however, are available through RS-232 control.

Window layout presets simplify control
Sixteen standard and customized layouts are available to be recalled quickly from the front panel or an external control system, even while recording and streaming.

Encoding presets for quick recall of specific compression and streaming configurations
Sixteen presets are available for saving specific encoding and streaming settings such as H.264 profile, resolution, GOP, and bit rate, session management configurations, transport protocols, and other network settings.

Dual Recording and Streaming
SMP 300 Series products can record from two different video sources independently, have advanced audio DSP features, and offer streaming presets that simplify workflows (LinkLicense® upgrade required for SMP 351).

Standards-based H.264/ MPEG-4 AVC video compression
SMP 300 Series processors support use of the Baseline, Main, or High Profiles at Levels 5, 4.x, or 3.x facilitating optimization of video encoding for use with various applications and decoding devices.

AES audio de-embedding
An embedded AES stereo audio signal can be extracted from the optional 3G-SDI input for recording and streaming.

Streaming protocol and session management options
Apply pull or push session management options and use a variety of transport protocols in unicast or multicast configurations based on system requirements or network conditions.

Adjustable recording and streaming bit rates
Select video bit rates from 200 kbps to 10 Mbps for video and 16 kbps to 384 kbps for audio based on the storage, streaming, or network requirements.

Metadata text overlay
Data such as title, presenter, course date and time can be presented and embedded within the source layout.

Video time stamping
Insert a time reference (HH:MM:SS format) in the on-screen display to document time and aid navigation during playback sessions.

Compatible with third party content management systems
Manually upload recordings to systems such as Kaltura, iTunes-U, Blackboard LMS, SharePoint, CaptionSync, YouTube, Moodle, and RSS feed.

Sample Product Cutsheets (Audio-Visual)

Overview

Front-mounted USB port
Front-panel USB port makes connecting portable storage devices easy for "capture and carry" recording sessions.

Front panel recording controls
Start, stop, and pause recordings using the front panel transport controls. Identify notable events using the Mark button to aid the search, playback and review of recordings.

Audio level indicator
Left and right channel indicators provide a visual reference for signal level and aid in troubleshooting.

Layout preset button
In Single Channel mode, select one of sixteen blended source arrangements, presenting Channel A, Channel B, metadata, and background image.

LCD control interface, direct access buttons and precise rotary controls
An intuitive LCD interface, direct access buttons, and precise rotary controls simplify system setup.

Enhanced audio DSP
Enhanced Audio DSP adds controls for Dynamics, Filtering, and Level Controls – SMP 352 only.

SMP 352 - Front

Configuration port
The front panel USB port provides convenient access to control the unit directly from a PC.

Input select buttons
Select the Channel A and Channel B source signals that are processed and displayed.

SWAP button
In Single Channel mode, quickly swap Channel A and Channel B source positions in the recording layout. In Dual mode, swaps within the HDMI preview output.

Internal solid state storage
Save recorded content to internal solid state storage and reliably transfer media files to USB or network storage

Digital I/O LED indicators
Highly visual front panel LEDs provide a quick indication of individual port status.

Digital I/O connection
Interface with simple push button controls, sensors, or digitally controlled devices to manage recording and streaming applications or AV devices.

Rear USB storage port
USB port provides no-fuss connection for rack-mounted storage devices.

HDMI, component HD, and composite inputs
Source signal options provide compatibility with commonly used AV and camera signals, and benefit from clean switching transitions across input signals.

Optional 3G-SDI input
SMP 300 Series 3G-SDI models accept serial digital video and audio signals supplied by cameras and other professional video sources.

SMP 352 - Back

USB keyboard and mouse connectors
Direct keyboard and mouse connections provide the means to directly control and configure the unit while viewing the embedded web page from the HDMI output.

Loop through connections
Loop through connections allow for easy integration of presentation sources into AV systems without the need for additional equipment.

HDMI output
In Single Channel mode, provides a local preview of the blended layout. In Dual mode, provides a local preview of Channel A or Channel B as selected by the Swap button.

Ethernet port
Multi-purpose Ethernet port for streaming transport and transfer of recordings to network storage directories. It also serves as the interface for AV control systems and the embedded web interface.

RS-232 serial port
Control and manage the unit from AV control systems and serial RS-232 devices in real-time.

HDCP-compliant signal management
Present encrypted sources on HDCP compliant displays. A green screen and HDCP message is presented if the destination is encoded media, the preview output, or a display that is not HDCP-compliant.

Sample Product Cutsheets (Audio-Visual)

Content Management

STREAMING CONTENT MANAGER

Extron **Streaming Content Manager – SCM** is multi-purpose software that manages the MP4 file, metadata, and JPEG thumbnails produced during SMP 300 Series recording sessions. SCM processes this media into file packages, which provide a rich data experience when played back from the **Extron Media Player – EMP**. SCM also manages recording packages, user groups, and access rights, and provides summary data to the administrator and users. SCM interfaces with standard network directory services to integrate users and access rights into the system.

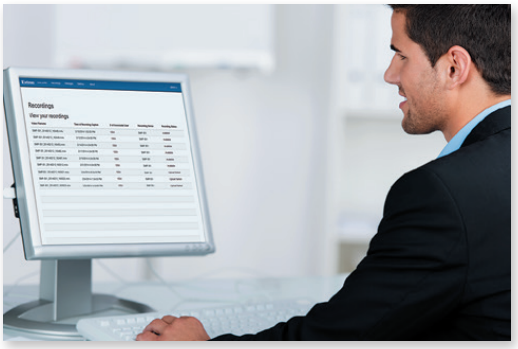
Managing the Recording Workflow

A typical SCM recording session starts with a user entering a unique identifier, such as an email address, into an AV control system touchpanel. This information is transferred to the SMP 300 Series processor and included with the recording metadata.

When the recording session is complete, the media is transferred to a network storage directory where it is processed by SCM. Once SCM has processed the recording package, it is stored on a content server and user access permissions are applied.

Lastly, the email address obtained during the initiation of the recording session is used to notify the user that the recording package has been processed and is available for retrieval.

Users have access to recordings they've produced or to which they have group access privileges. Users can sort recordings based on filename, date and time, recording device, and processing status.



Recording packages are accessed using the Streaming Content Manager web portal.

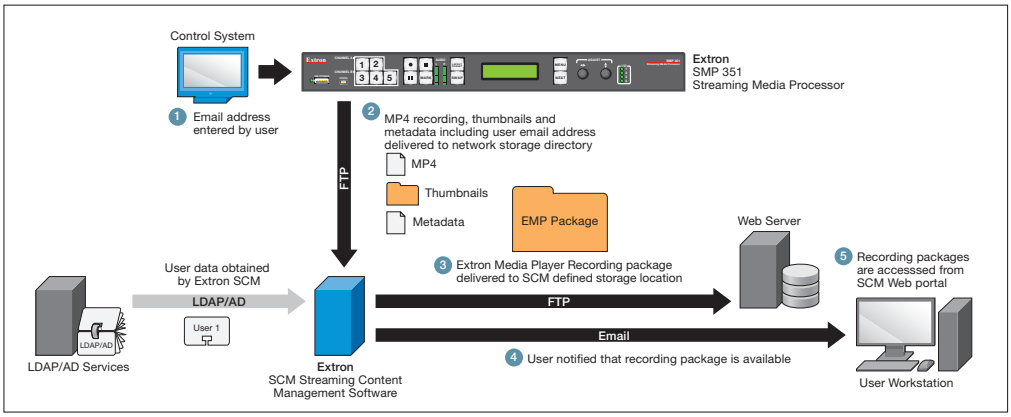
Administering Users and Recording Assets

SCM simplifies management of recorded media, operating within IT systems by leveraging existing network directory services. Administrators can establish user access permissions using data obtained from standard network Lightweight Directory Access Protocol/Active Directory - LDAP/AD services.

SCM can also define custom local user identifications and passwords to manage applications with special user groups that must operate separately from standard network services.

SCM provides summary recording data to administrators, including processing activity, user activity, filenames, storage locations, recording dates, and login activity.

Streaming Content Manager File Processing



Extron Streaming Content Manager processes recordings produced by SMP 300 Series processors. It prepares them into file packages for playback by Extron EMP, applies access rights and notifies the user that the recording package can be accessed from the SCM Web Portal.

Sample Product Cutsheets (Audio-Visual)

Media Playback

EXTRON MEDIA PLAYER

The **Extron Media Player – EMP**, is a browser-based media player developed to provide an enhanced playback experience for recordings produced by SMP 300 Series products. EMP requires no software installation and can be operated from any computer or mobile device using a wide variety of browser applications. The EMP user interface incorporates metadata, time-synchronized thumbnail images, and playback controls that support efficient navigation and review of recorded material. EMP is used exclusively with recording file packages that have been processed by Extron SCM software.

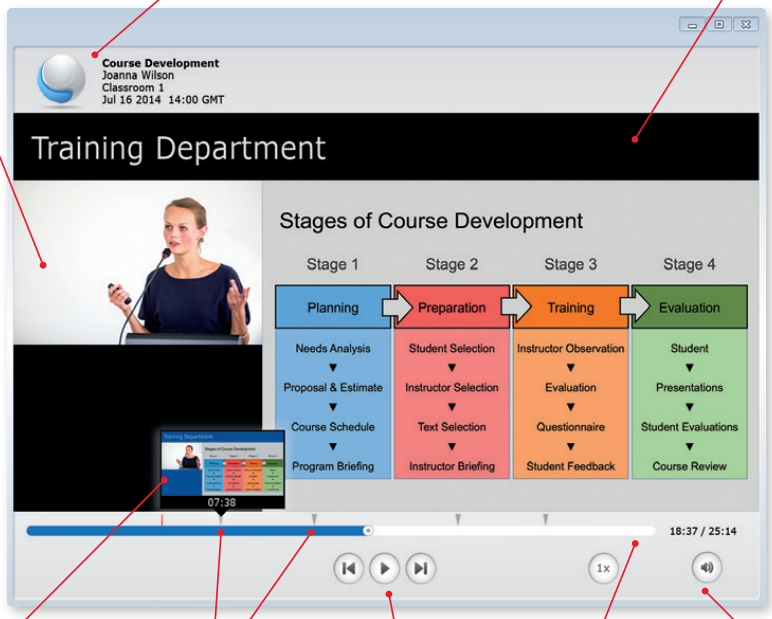
Customization and Accessibility

User interface components of the EMP such as the video playback window, transport controls, and the title banner can be repositioned and customized within the application to meet specific user requirements. The EMP also offers keyboard controls and assistive technology that fulfills Section 508 accessibility standards for individuals with physical impairments and disabilities. Alternative color palettes, high contrast, and zoom modes are available to improve content legibility and visibility, and the EMP can interface with screen reader software.

Standard and Customizable Player Templates
EMP layouts and player elements can be modified to conform to specific application requirements.

Title, Metadata and Banner Area
Present information that provides context to the recorded event such as the presenter, location, date, event title or course name. Identify and present branding for the organization or department.

Video Playback Window
EMP augments the video playback window with metadata and advanced playback controls.



Time-synchronized thumbnail images
A thumbnail image with time reference becomes visible when a user's mouse is placed at any position along the playback bar.

Chapter and Event Marks
Chapter and event marks are inserted into recordings to help identify notable points in time. They aid in efficient file navigation.

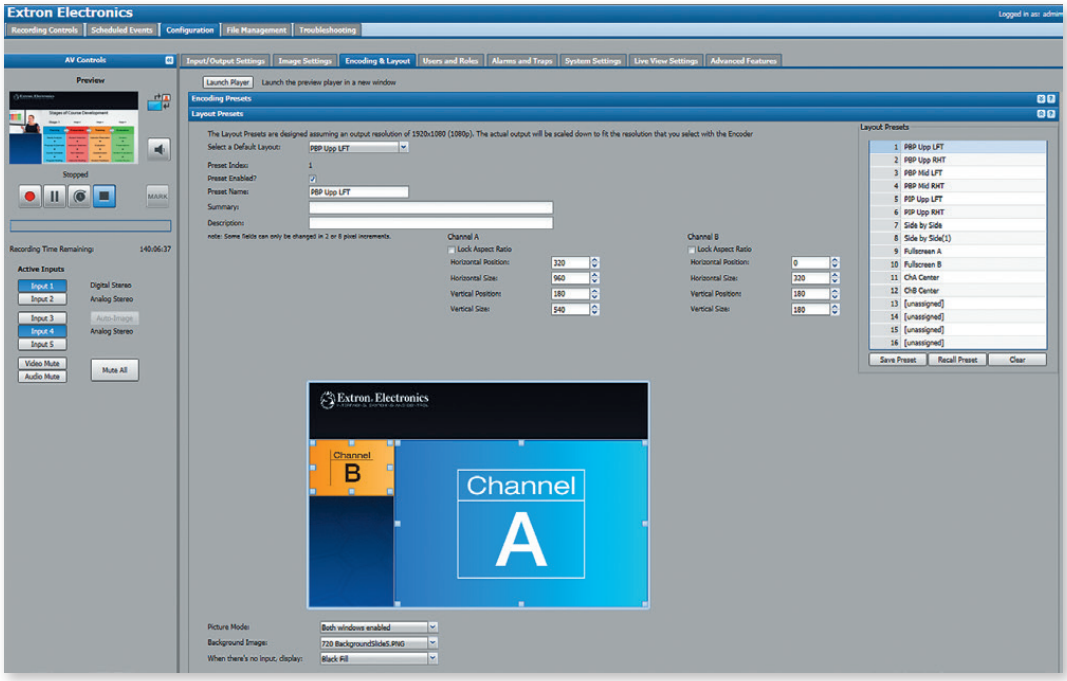
Transport Controls
Manage efficient playback using play, stop, chapter/mark advance and variable speed playback controls.

Playback bar
The playback bar identifies the current time and duration of a media file and allows a user to quickly change position by moving the slider throughout the timeline.

Audio Controls
Mute audio and adjust volume.

Sample Product Cutsheets (Audio-Visual)

Embedded Web Page



Source layouts are created from the embedded web page that integrate Channel A and Channel B inputs with a PNG background image and metadata.

Intuitive Interface for Configuration

SMP 300 Series processors have an embedded web interface, which makes navigating and configuring the wide array of signal processing, recording, streaming, scheduling, and control functions simple. The embedded web page provides a visual overview of recording activity and session schedules. It is used to configure publishing and file transfer parameters and provides valuable tools for managing, monitoring, and troubleshooting. The embedded web page makes it easy for AV support staff and IT departments to control and manage the processor.

Efficient Signal Management and Source Switching

The embedded web page interface clearly presents the controls for managing input and output signals. It identifies the signal type, resolution, AV format, and encryption status for all input signals and the output signal. Intuitive controls adjust brightness, contrast, and overscan values, and custom sampling values can be entered for analog sources as required. Additional signal processing controls are provided for: aspect ratio management, signal and format detection, and audio levels. A small preview window in the embedded web page decodes a live view of the current source layout. The preview window is accompanied by an arrangement of buttons for selecting input signals, analog or digital audio formats, and audio mixing configurations.

Preparing Layouts to Capture Effective Presentations

The recording layout page features the adjustments that produce the largest visual impact. Up to sixteen layouts can be customized and saved from this page.

Channel A and Channel B source windows are easily positioned and sized using a mouse, or by entering numeric values from a keyboard. Previously uploaded PNG image files can be selected to serve as the background image. Six common metadata element positions can be selected, typically near the sides, top, or bottom of the output image so the text does not distract from critical visual content.

A media player window can be launched from the layout page that decodes a live stream from the SMP 300 Series processor. This provides the user with a live view of the source layout during system programming and testing activities.

Sample Product Cutsheets (Audio-Visual)

Embedded Web Page

Encoding Presets Simplify Streaming Management

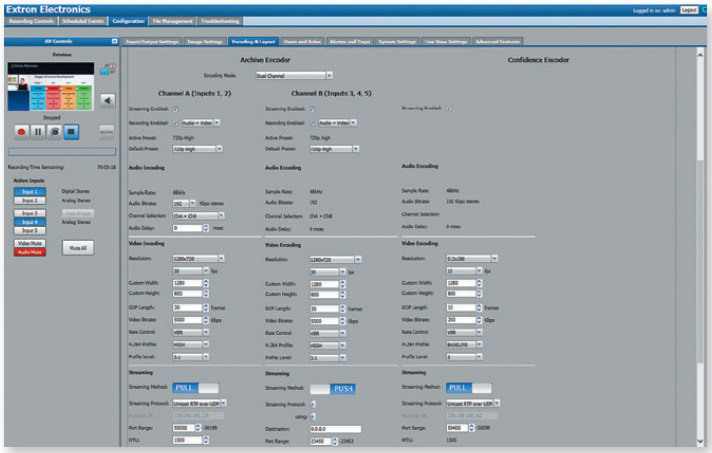
The many encoding parameters and protocols used in streaming applications can introduce undesirable complexity for system programmers. The embedded web page provides a simple interface to define two separate channels of live streaming. The Archive Encoder uses the same resolution and bit rate as the recording session. The Confidence Encoder typically uses a lower resolution and bit rate. Independent values can be defined for bit rate, frame rate, H.264 profile and level, and Group of Pictures – GOP for each encoder.

Unique menus define pull and push streaming configurations. Both must define unicast or multicast operation, transport protocol, maximum transmission unit – MTU, destination addresses, and application ports, where appropriate. The pull streaming menu also identifies the number of active client sessions. The push streaming menu provides additional configuration for Session Description Protocol – SDP and Session Announcement Protocol – SAP, Quality of Service – QoS, and Time to Live - TTL.

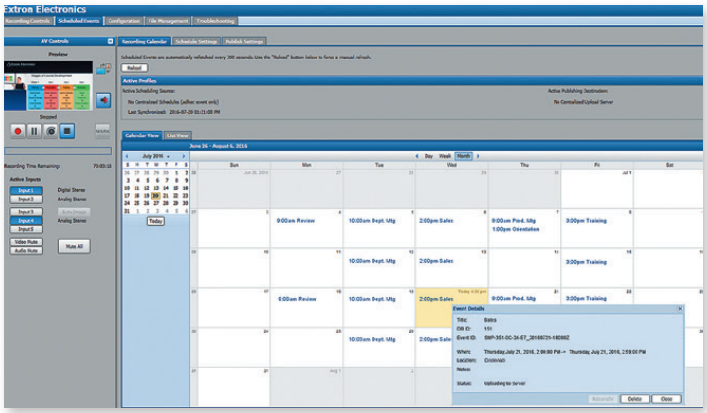
The encoding parameters are saved in a preset which can be recalled from an external control system, streamlining the number of variables to be managed by control systems.

Session Scheduling and Publishing Configuration

The embedded web interface includes an internal calendar, which identifies future recording sessions and references all past sessions. Recording schedules can be manually or periodically uploaded using the iCalendar file format with File Transfer Protocol - FTP from a defined file and pathname. The scheduling menu is also used to integrate with Opencast Matterhorn.



Parameters for two different streaming configurations are defined from the encoding preset page.



The embedded web page includes a calendar that identifies all past and future recording sessions.

System Data and Diagnostics Support Efficient Management from the Network

Diagnostic tools provided by the embedded web page aid AV and IT staff with support and troubleshooting activities. Daily system logs document recording sessions, usage conditions, and operating concerns, such as recording starts, or storage errors.

The embedded web page presents real-time streaming bit rates, and offers ICMP ping and traceroute diagnostics, giving AV and IT staff powerful tools and data for diagnosing network issues. Proactive service and maintenance activities can be supported by system alarms delivered to support staff or monitoring systems using email, SNMP traps or SMTP protocol.

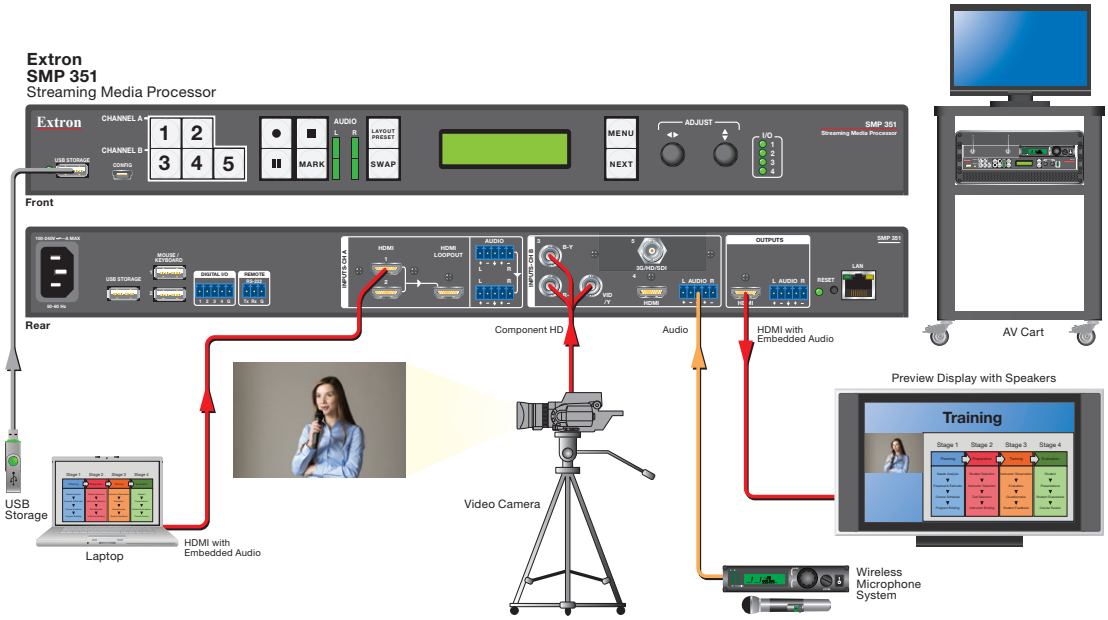
Sample Product Cutsheets (Audio-Visual)

Applications

PORTABLE AV RECORDING SYSTEM

Presentations that use AV sources can occur virtually anywhere within a building, however it may not be practical to install an AV recorder in every location a presentation may be held. An **SMP 351** can be combined with a microphone, wireless receiver and a small, flat panel display into a recording system that can accept a variety of source inputs and be moved from location to location on an AV cart.

The advanced AV signal processing, front panel controls, and HDMI confidence output from the SMP 351 make it an effective product to use in a portable recording system. It will quickly capture and process video and audio signals from computers, personal devices, cameras or AV systems. The portable system illustrated in this diagram has been connected to a laptop and camera to record a presentation from a guest speaker. When the presentation is complete, an MP4 file is saved to a USB storage device connected to the front panel. It can be immediately removed and replayed for others. A different source combination may be used for the next event.

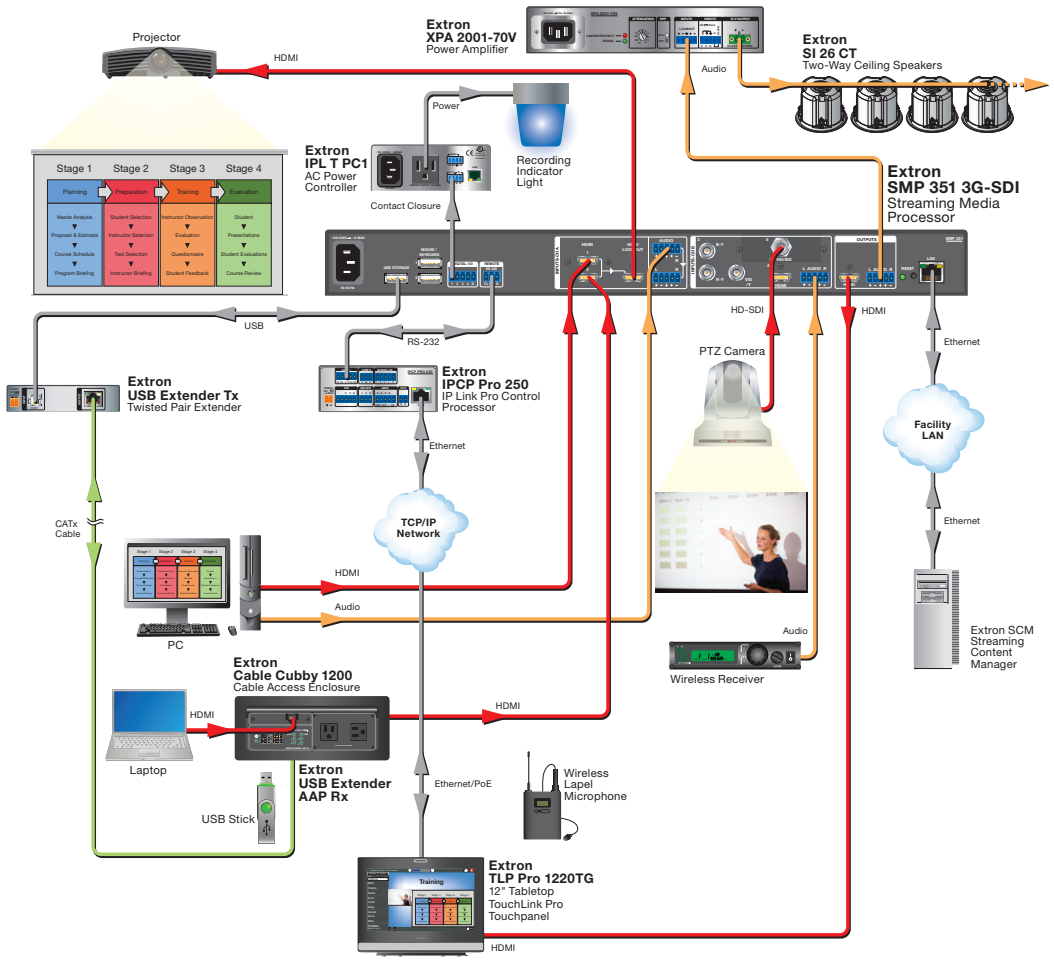


Sample Product Cutsheets (Audio-Visual)

Applications

AV PRESENTATION AND RECORDING SYSTEM

The **SMP 351** can serve as the central switching and processing device for an AV system. This system uses the **SMP 351 3G-SDI** to manage AV sources and record an HD-SDI camera, together with a PC or laptop source connected through an Extron **Cable Cubby 1200** enclosure. An Extron **TLP Pro 1220TG** touchpanel and **IPCP Pro 250** control processor provide an interface for the user to select the AV source to present and blended layout that will be used during a recording session. The HDMI output from the SMP-351 3G-SDI displays a preview of the recording layout. It is connected to the HDMI input on the TLP Pro 1220TG touchpanel. An Extron FlexOS application has been installed on the SMP 351 for managing a recording indicator light. The FlexOS application interfaces with the digital I/O port and triggers an Extron **IPL T PC1** power controller, supplying power to the light during a recording session. Mixed, processed audio is supplied from the SMP 351 to an Extron **XPA 2001-70V** amplifier and **SI 26CT** speakers. Users have the option to save MP4 files directly to a USB thumb drive, or they are processed by the Extron Streaming Content Manager – **SCM** software and saved to a network storage directory. SCM notifies the presenter that the recording package is available for retrieval using an email address that is obtained from the AV control system during preparation for the recording session. The recording package is accessed over the network through the SCM web portal.



Sample Product Cutsheets (Audio-Visual)

Applications

CLASSROOM PRESENTATION, RECORDING, AND STREAMING SYSTEM

The **SMP 352** Dual Recording H.264 Streaming Media Processor can be a valuable asset for any sizable classroom or auditorium. Live streaming and on-demand playback of recorded presentations and courses can capture and share an experience for individuals who cannot be present at the live event. This AV system includes a lectern that houses an Extron SMP 352 and an Extron **DTP CrossPoint 84 IPCP MA 70V**. Together, they manage the AV presentation system for local participants and distant observers. Lectures and presentations are recorded and manually uploaded to a content management system for on-demand access.

Presenters select from a variety of source devices to present supporting media from a Blu-ray player, a media player, and a PC. Additionally, support for personal devices is facilitated by an HDMI connection from an Extron **Cable Cubby 1200** located at the lectern. A high-definition camera with PTZ control provides a visual of the presenter and an Extron **DTP HDMI 230 D Tx** is used to extend the camera signal to the CrossPoint 84. Any source can be routed to the classroom projector through the CrossPoint 84 using an Extron **DTP HDMI 330 D Rx** extender. Two HDMI source signals are routed from the Crosspoint 84 to the SMP 351 to be processed, recorded, and streamed.

The CrossPoint 84 manages audio from the HDMI input connections and from a wireless microphone receiver incorporating lavalier or handheld microphones. The active audio signal is supplied to the internal amplifier, which distributes the signal to several Extron **SI 26CT** speakers equipped with 70V transformers. This audio signal is also embedded into one of the two HDMI signals fed to the SMP 352.

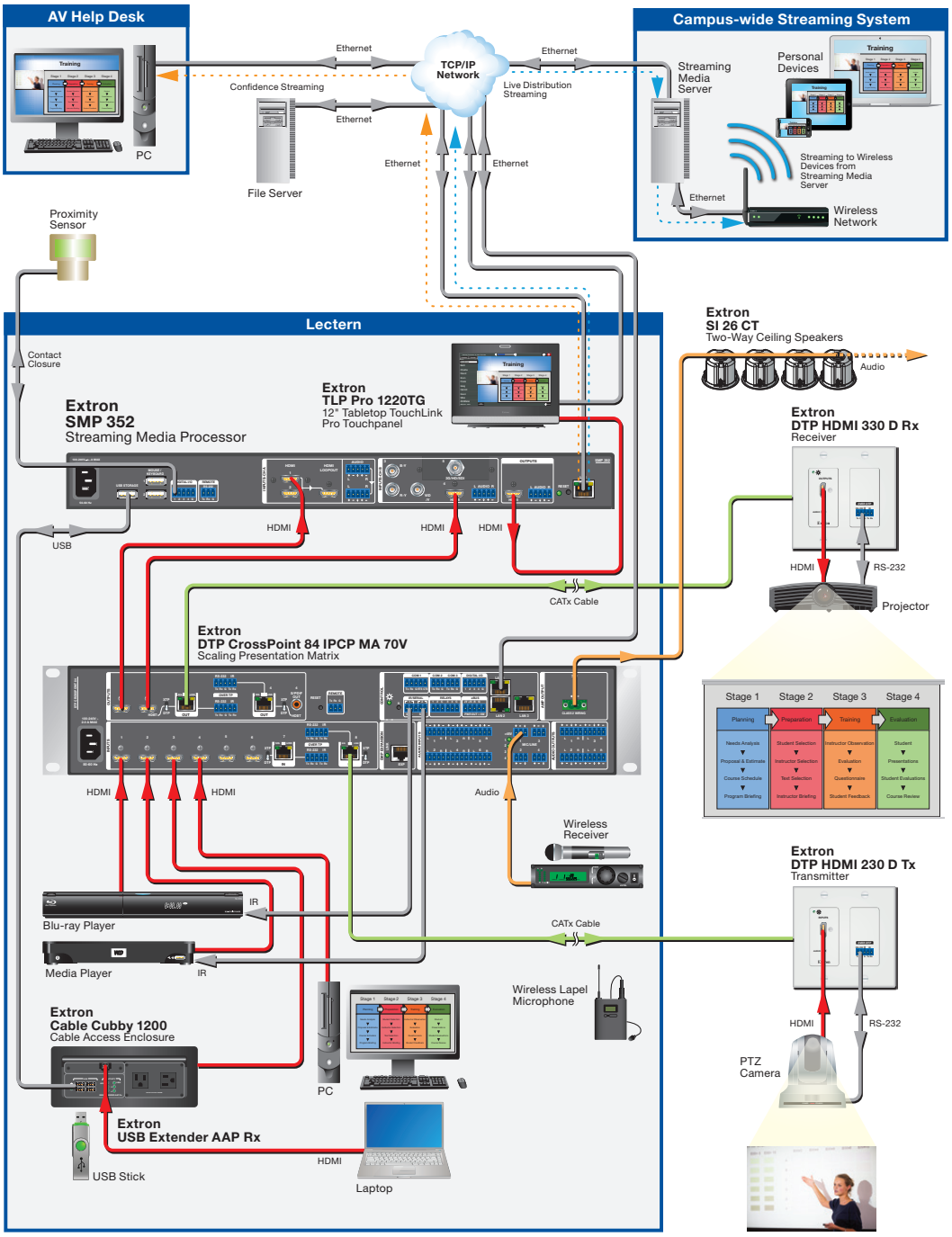
An iCalendar file with the classroom recording schedule is periodically uploaded to the SMP 352. This schedule initiates recording sessions during meetings and training courses. The SMP 352 receives two HDMI signals with embedded audio from the DTP CrossPoint 84, and simultaneously streams and records both signals independently at 720p, empowering users to select their preferred presentation layout. Typically, a PowerPoint presentation is placed in a large window and camera video of the presenter is placed in a smaller window arranged in a picture-by-picture or picture-in-picture layout. When the recording session is complete, a file package is prepared, which includes the MP4 files, metadata, and a folder with JPEG thumbnail images. This file package is then transferred to a defined storage directory on a file server. A custom application uploaded to the SMP 352 interfaces with a room sensor to ensure recording is not initiated if a presenter is not detected.

The SMP 352 also streams AV presentations to a media server at 720p for live unicast streaming to other meeting rooms or individuals across campus who could not attend the event. Live streaming is typically viewed from PCs or personal devices. IT and AV support staff can also access live streaming at a lower resolution, such as 512x288, to verify that the system is functioning properly. While HDCP-encrypted sources can be presented locally in the classroom from the CrossPoint 84, the SMP 352 will not stream or record HDCP-encrypted signals. Encrypted sources will appear as a green screen with an HDCP message indicating that the source image cannot be presented.

A **TLP Pro 1220TG** touchpanel serves as the user interface for this AV system. It provides source selection, source control, and other functions in addition to presenting a live preview of the SMP 352 encoded source layout. Thumb drives or portable USB storage devices can connect to the SMP 352 via the Cable Cubby 1200, giving presenters the ability easily “capture and carry” their presentations directly from the lectern rather than saving them to a file server.

Sample Product Cutsheets (Audio-Visual)

Applications



Sample Product Cutsheets (Audio-Visual)

Specifications

INPUT	
Number/signal type	3 HDMI digital video (HDCP compliant), 1 component video (Y, R-Y, B-Y; interlaced, progressive, HD), or composite video Optional: 1 SDI, HD-SDI, or 3G-SDI digital component video
Resolution range	640x480 to 1920x1200 (reduced blanking), 480p, 480i, 576p, 720p, 1080i, 1080p, NTSC, and PAL, sampled pixel for pixel
VIDEO PROCESSING	
Digital processing	4:2:2, 8-bits per color
Compression	H.264/AVC (ITU H.264, ISO/IEC 14496-10) 4:2:0, 8-bit color Encoding profiles: High, Main, Baseline; Encoding levels: 4.1, 4.0, 3.2, 3.1, 3.0; configurable GOP
Bit rate	200 kbps to 10 Mbps
VIDEO OUTPUT	
Number/signal type	
SMP 351, SMP 351 3G-SDI	2 H.264/AVC digital video over Ethernet 1 HDMI digital video (HDCP compliant)
SMP 351 Series with LinkLicense, SMP 352 Series	3 H.264/AVC digital video over Ethernet 1 HDMI digital video (HDCP compliant)
Scaled resolution	Archive/record: 480p, 720p, 1080p, 512x288, 1024x768, 1280x1024, custom Confidence: 480p, 720p, 1080p, 512x288, 1024x768, 1280x1024, custom
Frame rate	Up to 30 fps for all output rates
Formats	H.264/AVC (Profile type: High, Main, Baseline. Profile level: 4.1, 4.0, 3.2, 3.1, 3.0)
RECORDING AND STORAGE	
File system for USB storage	FAT32, NTFS, VFAT long file name extensions, EXT2, EXT3, EXT4
File types	H.264 and AAC in an MP4 container, JPEG, JSON, XML
File transfer protocols	FTP, SFTP, CIFS
Network file share protocols	CIFS/SMB, NFS
Internal storage capacity	
SMP 351 Series	80 GB (75 GB for recording files) or 400 GB (400 GB for recording files)
SMP 352 Series	400 GB (400 GB for recording files)
External USB ports	1 (front panel), 1 (rear panel), USB 2.0 (Each port is current limited to 1.5 A.)
AUDIO INPUT	
Analog	
SMP 351, SMP 351 3G-SDI	2 stereo, balanced or unbalanced, 1 with loop-through
SMP 351 Series with LinkLicense, SMP 352 Series	Ch. A: 1 stereo, balanced or unbalanced, with loop-through Ch. B: 1 stereo, balanced or unbalanced, or 2 mono, unbalanced
Digital	3 stereo, digital de-embedded from HDMI 1 loop-through from HDMI 1 stereo, digital de-embedded from SDI (optional)

AUDIO PROCESSING	
Sampling rate	16 bit, 48 kHz or 44.1 kHz sampling
Compression	AAC-LC MPEG-4 (ISO/IEC 14496-3:2005)
Bit rate	80 kbps to 320 kbps, stereo
AUDIO OUTPUT — ANALOG	
Number/signal type	1 stereo, balanced/unbalanced
AUDIO OUTPUT — DIGITAL	
Number/signal type	1 stereo, HDMI (re-embedded local preview) 1 AAC-LC digital audio over Ethernet
DIGITAL I/O CONTROL	
Number/signal type	4 digital input/output (configurable)
COMMUNICATION	
USB	
USB configuration ports	1 front panel female mini USB B
Mouse and keyboard port	2 rear panel USB type A
Serial control	
Serial control port	1 bidirectional RS-232, rear panel 3.5 mm captive screw connector, 3-pole
Ethernet control	
Ethernet host port	1 female RJ-45
Ethernet data rate	10/100/1000Base-T, half/full duplex with autodetect
Protocols	
Streaming	Pull:RTP/RTCP (RFC 3550), RTSP (RFC 2326), Interleaved RTSP (RTP/RTSP), RTP/RTSP tunneled through HTTP unicast or multicast Push:MPEG2-TS/UDP* (ISO/IEC 13818-1), MPEG2-TS/RTP* (RFC 2250, IPTV-ID-0087, ETSI TS 102 034), Direct RTP (RFC 3984), SAP (RFC2974), SDP (RFC4566), unicast or multicast, RTMP
Transport	TCP, UDP, multicast IGMPv3 (RFC 3376) or unicast
All supported	IGMPv3 (RFC 3376), IP, UDP, SSL, DHCP, HTTP, HTTPS, RTP, RTSP, SNMP V2 (RFC 1213), SAP (RFC2974), SDP (RFC4566), QoS (RFC 2474), NTPv4 (RFC 4330)
GENERAL	
Power supply	Internal Input: 100-240 VAC, 50-60 Hz
Power consumption	30 watts typical
Enclosure dimensions	1.7" H x17.5" W x 11.5" D (1U high, full rack wide) (4.3 cm H x 44.4 cm W x 29.2 cm D) (Depth excludes connectors.)
Regulatory compliance	
Safety	CE, c-UL, UL
EMI/EMC	
SMP 351 Series	CE, C-tick, FCC Class A, ICES, KCC, VCCI
SMP 352 Series	CE, C-tick, FCC Class A, ICES, VCCI

Model	Version Description	Part number
SMP 351	Standard Version – 80 GB SSD	60-1324-01
SMP 351 3G-SDI	with 3G-SDI Input – 80 GB SSD	60-1324-02
SMP 351	Standard Version – 400 GB SSD	60-1324-11
SMP 351 3G SDI	with 3G-SDI Input – 400 GB SSD	60-1324-12
SMP 352 - 400 GB SSD	Dual Recording – 400 GB SSD	60-1634-11
SMP 352 3G-SDI - 400 GB SSD	Dual Recording w/3G-SDI – 400 GB SSD	60-1634-12

For complete specifications, please go to www.extron.com
Specifications are subject to change without notice.

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Sample Product Cutsheets (Audio-Visual)

USB FOR PRO AV

MediaPort 200

HDMI AND AUDIO TO USB
SCALING BRIDGE

Pro AV Integration for Software
Videoconferencing Applications

Skype for Business · BlueJeans · Cisco webex · skype · GoToMeeting · zoom

- Seamlessly integrates pro AV sources or systems into software codec applications
- USB 2.0 device connection uses generic USB drivers for universal compatibility
- Video scaling provides USB output from 320x180 to 1080p/15 to match common software codec requirements
- Integrated audio DSP with AEC reference output
- HDMI input with HDCP-compliant loop through

Extron Electronics
INTERFACING, SWITCHING AND CONTROL

Sample Product Cutsheets (Audio-Visual)

Introduction

The Extron **MediaPort 200** is an HDMI to USB bridge for integrating pro AV sources or systems with software codec conferencing applications. It works seamlessly with a computer using generic USB video and audio drivers. The MediaPort 200 features an HDMI input with HDCP-compliant loop through, accepts signals up to 1920x1200, and scales video to a USB 2.0 output. Audio features include program and mic inputs, HDMI audio de-embedding, and USB bidirectional audio, plus AEC reference and line level outputs. The MediaPort 200 also includes DSP with EQ, filters, mixing, dynamics, and ducking. This allows the MediaPort 200 to serve as a complete soft codec interface, with the added flexibility of integrating into larger hardware codec or DSP systems. The MediaPort 200 enables versatile integration of conferencing computers into pro AV system designs.

The MediaPort 200 bridges the gap between simple Webcam-to-computer solutions and traditional hardware videoconferencing systems. For small meeting spaces with just a computer and display, the MediaPort 200 is ideal for enhancing audio and video quality by adding support for professional-grade equipment such as videoconferencing PTZ cameras, boundary microphones, and sound reinforcement systems.

In boardrooms and large conference rooms, the MediaPort 200 easily integrates a conferencing computer into a fully equipped AV system with a hardware codec, video distribution and processing, control, DSP, microphones, and full sound reinforcement. In addition to conferencing, the connected computer can be used with a software application to record meeting sessions, presentations, or lectures.

Streamlined Installation

The MediaPort 200 connects to Windows® or Mac®-based computers with USB plug-and-play simplicity, using industry standard UVC - USB Video Class and UAC - USB Audio Class drivers. It can be used with popular software and cloud-based communications platforms including Microsoft® Skype®/Skype® for Business, Adobe® Connect™, BlueJeans, Cisco® WebEx®, Citrix® GoToMeeting™, Zoom, and more.

Optimal Video Processing for Soft Codecs

To ensure an HDMI source is presented with the highest possible image quality to a soft codec, the MediaPort 200 incorporates video processing technology specifically engineered for optimized image scaling and frame rate conversion that preserves detail and legibility of source content. Output resolutions range from 320x180 to 1080p/15, and are dynamically configured by the software codec as it responds to real-time CPU usage and bandwidth conditions between near-end and far-end locations.

Versatile Audio Integration with DSP

The MediaPort 200 accepts a microphone input and program sources as analog audio and de-embedded HDMI two-channel audio. The USB connection provides a 4x2 channel audio interface with a personal computer, similar to a standard USB sound card with send and return audio capability. This allows the MediaPort 200 to send a two-channel mix of the microphone, analog program, HDMI audio, and USB playback audio to the computer. The interface also allows the MediaPort 200 to receive four audio channels from the computer, including program audio plus two-channel communication audio from the soft codec's far-end.

The audio DSP can be used to optimize mic and program source signals, as well as outgoing signals bound for the computer, sound reinforcement systems, or outboard DSPs. The MediaPort 200 also delivers far-end audio as a dedicated AEC reference output to an AEC-equipped DSP, such as the DMP 128 C.

Works with these and other conferencing applications:

Skype for Business · skype · BlueJeans · GoToMeeting · Cisco webex · zoom

Sample Product Cutsheets (Audio-Visual)

Features

OVERVIEW

Seamlessly integrates pro AV sources or systems into software codec applications
The MediaPort 200 sends AV signals from a presentation source or switcher to a computer, for integration with software and cloud-based communications platforms.

USB 2.0 device connection uses generic USB drivers for universal compatibility
Industry standard UVC - USB Video Class and UAC - USB Audio Class drivers provide compatibility with Windows®, Mac OS®, Linux, and other operating systems.

Supports popular software communications platforms including Microsoft® Skype®/ Skype® for Business, Adobe® Connect™, Apple FaceTime, BlueJeans, Cisco® WebEx®, Citrix® GoToMeeting™, Google Hangouts, Lifesize® Clearsea, and Zoom

Video scaling provides USB output from 320x180 to 1080p/15 to match common software codec requirements
Ensures optimal quality of camera or computer video content for far-end participants. The video output is delivered as an MJPEG-encoded stream over USB 2.0.

Integrated audio DSP
The MediaPort 200 provides audio mixing and signal processing capabilities, including mixing and routing for 4x2 audio. The DSP is optimized for integration with mic and program audio sources as well as software codecs, hardware codecs, external DSP, and sound reinforcement.

AEC reference output
This output provides far-end audio to an external AEC-equipped DSP. This audio is used by the external DSP as a reference signal for AEC - acoustic echo cancellation processing, to ensure echo-free conferencing for far-end participants.

HDCP-compliant HDMI input and loop-through
Provides an output signal for a local display, an AV system, or a hardware codec, enabling the content to be monitored or shared without the need for a separate distribution amplifier. Both the HDMI input and loop-through are HDCP compliant.

VIDEO

Accepts HDMI computer and video resolutions up to 1080p/60 and 1920x1200

Aspect ratio control
The aspect ratio of the video output can be controlled by selecting a FILL mode, which provides a full screen output, or a FOLLOW mode, which preserves the original aspect ratio of the input signal.

Auto Input Memory
When activated, the unit automatically stores size, position, and picture settings based on the incoming signal. When the same signal is detected, the image settings are automatically recalled from memory.

Internal video test patterns and pink noise generator for calibration and setup
The MediaPort 200 offers several video test patterns to facilitate proper system setup and calibration, and can provide an active output when an input video source is not available. The pink noise generator is selectable for all audio outputs, including USB audio to the computer, and aids in optimizing audio output signals.

Logo image display
The MediaPort 200 can be set to automatically display a user-supplied image file whenever no signal is present at the HDMI input.

High performance deinterlacing for signals up to 1080i
Features highly accurate deinterlacing for 480i/576i/1080i signals. This ensures absolute detail and fidelity in the reconstructed progressive video frames, including 3:2 and 2:2 pulldown for interlaced signals originating from film content.

HDCP Visual Confirmation
A full-screen green signal is sent when HDCP-encrypted content is routed to the USB output, or to a non-HDCP compliant display on the HDMI loop output, providing immediate visual confirmation that protected content cannot be viewed.

EDID Minder®
EDID Minder ensures that the source powers up properly and reliably outputs content for display.

AUDIO AND CONTROL

HDMI audio de-embedding
Embedded HDMI two-channel PCM audio can be extracted to the integrated DSP for processing and mixing.

USB 4x2 audio interface
The USB connection provides a 4x2 channel audio interface with a computer, similar to a USB sound card with send and return audio capability. This allows the MediaPort 200 to send a two-channel source mix to the computer, and the computer to deliver its program audio plus communication audio from the far-end to the MediaPort 200.

Gain, parametric EQ, filters, and dynamics on inputs and outputs
Essential DSP processing tools are included for room tuning, clip prevention, managing wide source signal variations, and setting proper gain structure.

Mic and USB audio ducking
Ducking automatically reduces program audio when a microphone or far-end USB audio signal is detected, eliminating the need for separate audio ducking.

Live DSP configuration
Using the Extron PCS software application, live parameter adjustments can be made while previewing or metering them in real-time. This avoids the need to compile and upload a configuration file to the device.

Two digital input and two digital output control ports
These ports allow external triggering such as mic activation and muting, as well as illuminating mic status LEDs. Digital inputs can also be used for recalling DSP presets and adjusting volume via contact closure.

Front panel LED indicators for HDMI and USB signal status
These LED indicators provide visual feedback for HDMI input and loop-through signal presence, HDCP status, plus USB signal presence for the host computer, video send, audio send, and audio return.

Extron PCS - Product Configuration Software
Extron PCS features an intuitive, user-friendly GUI which allows for expedited setup and commissioning, real-time operation and monitoring, firmware updates, plus full configuration of the DSP and its audio processing tools.

Sample Product Cutsheets (Audio-Visual)

Overview

HDMI status indicators
Provide video signal and HDCP presence status for input and loop-through connections.

Integrated audio DSP
Manage gain, mixing, EQ, filtering, dynamics, and ducking for HDMI, USB, and analog audio.

Front panel controls with LCD display
Allows convenient access to configuration and status of the MediaPort 200.

MediaPort 200 - Front

Front panel configuration port
Allows easy access for system configuration using Extron PCS software.

USB status indicators
Indicate host presence, video send, and audio send and return status.

Compact enclosure
The half rack width enclosure can be installed underneath a conference table, inside a credenza, or in a lectern. Under-table mounting hardware is available separately.

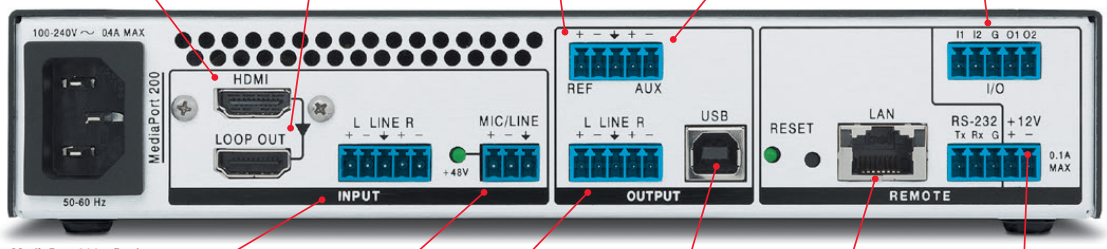
HDMI input
Accepts input signals up to 1080p/60 and 1920x1200, with 480i/576i/1080i deinterlacing and audio de-embedding.

HDCP compliant HDMI loop-through
Provides output signal for a local display, an AV system, or a hardware codec.

AEC reference output
Provides a dedicated output of the far-end audio to serve as an AEC reference signal for an external DSP.

Auxiliary output
Provides a dedicated output of the mic/line input for connection to a hardware codec.

Two digital input and two digital output control ports
Allow mic activation and muting, as well as mic status LED illumination.



MediaPort 200 - Back

Stereo line input
Accepts program audio from a source device, or an external audio mixer, switcher, or processor.

Mic/line input
Includes selectable 48 volt phantom power, allowing use of professional-grade condenser microphones.

Analog audio output
Provides a two-channel output signal for a hardware codec, an external DSP, or sound reinforcement.

USB 2.0 output
Delivers video and bidirectional audio to a computer using generic USB video and audio drivers.

Ethernet and RS-232 control
The MediaPort 200 can be controlled over Ethernet or RS-232, and configured or updated through the Ethernet port using Extron PCS software.

+12 VDC, 100 mA remote power
Provides remote power for various applications, including mic status LED illumination.

Sample Product Cutsheets (Audio-Visual)

Audio

The audio DSP in the MediaPort 200 includes essential processing features that facilitate sound quality optimization for participants in a conferencing session. The DSP allows an AV integrator, engineer, or technician to establish proper gain structure, normalize signal levels for microphones and other audio sources, and fine-tune frequency response in the room. Effective DSP implementation helps ensure clean, distortion-free audio presentations with intelligible speech – a very important foundation of a good conferencing experience.

DSP for Conferencing Applications

DSP is the core of traditional conferencing systems with hardware codecs, microphones, and sound reinforcement. The MediaPort 200 streamlines integration of videoconferencing computers into these AV systems with its own high performance DSP. It also simplifies designs for new, smaller meeting spaces without the need for dedicated audio processing. Additionally, the MediaPort 200 is ideal for upgrading a basic hardware codec installation to include soft codec capabilities and an audio system.

Versatile and Powerful Capabilities through User-Friendly Software

Audio processing tools, input and output gain, and mix levels are readily accessible through a user-friendly interface in the Extron PCS software application. Graphical sliders facilitate gain and level adjustments, while peak level meters allow signal monitoring in real-time. Any adjustment in gain or processing is also immediately audible through the system. The user interface provides direct controls for master volume at the near-end, incoming audio from the far-end, as well as mic and program level adjustments for the far-end. Soft limits can be set on master controls to ensure that end users can safely adjust levels as necessary.

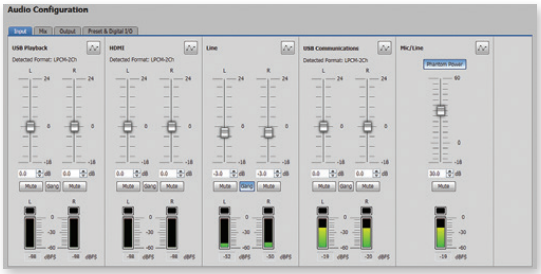
The software provides intuitive access to all of the audio processing tools in the MediaPort 200, including parametric EQ, tone controls, low-pass and high-pass filters, compression, limiter, and ducking.

Saving DSP Configurations

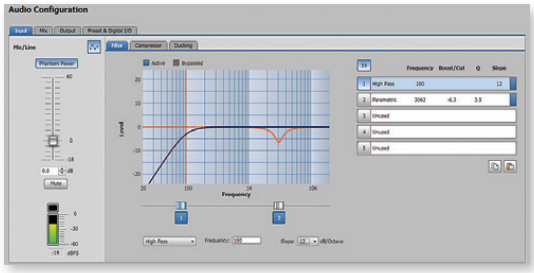
DSP parameter adjustments can be stored to any of 16 preset locations, allowing quick recall of common audio configurations. Additionally, DSP, video processing, and other system settings can be saved to a configuration file, which can then serve as a system backup, or used to quickly set up additional units in a facility.

Control System Integration

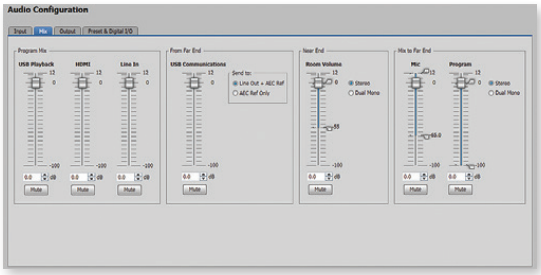
The MediaPort 200 can be integrated with a control system to enable user control of near-end and far-end audio levels, as well as recalling DSP presets. This allows easy access to essential audio conferencing controls as in a traditional hardware codec system.



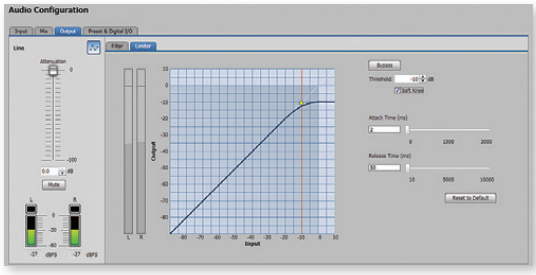
Input Gain



Input EQ



Mixer



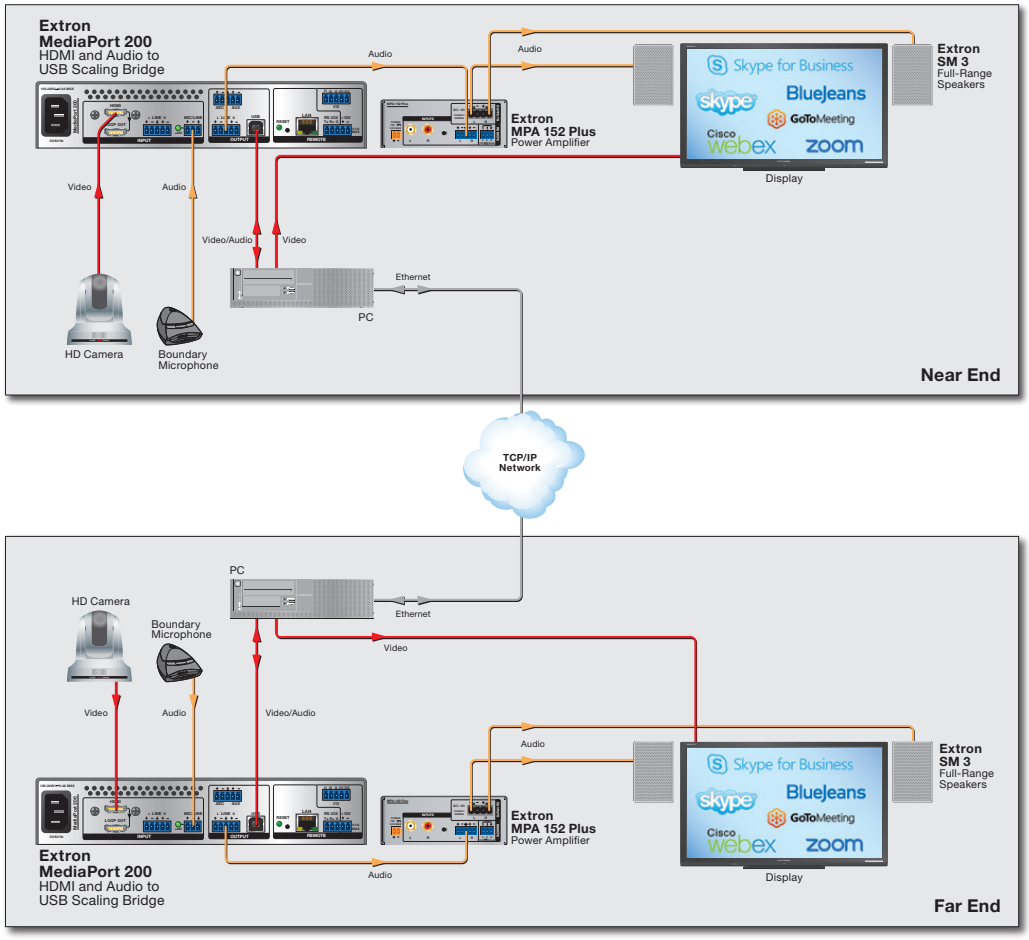
Output Limiter

Sample Product Cutsheets (Audio-Visual)

Applications

SMALL MEETING ROOM

A MediaPort 200 in a small meeting room provides a quality AV experience for software conferencing sessions with the incorporation of professional-grade conferencing sources and sound reinforcement. An HD camera at the near-end location provides sharp, detailed video content to the MediaPort 200, which scales the image to a size appropriate for the available CPU resource as well as network bandwidth to the far-end. A high quality boundary microphone delivers optimal audio fidelity to the far-end participants, enhanced by the audio DSP integrated into the MediaPort 200. The DSP also processes the far-end return audio before passing the signal to an Extron MPA 152 and SM 3 speakers. A similar system configuration at the far-end ensures all participants experience high performance video and audio during the conferencing session.



Sample Product Cutsheets (Audio-Visual)

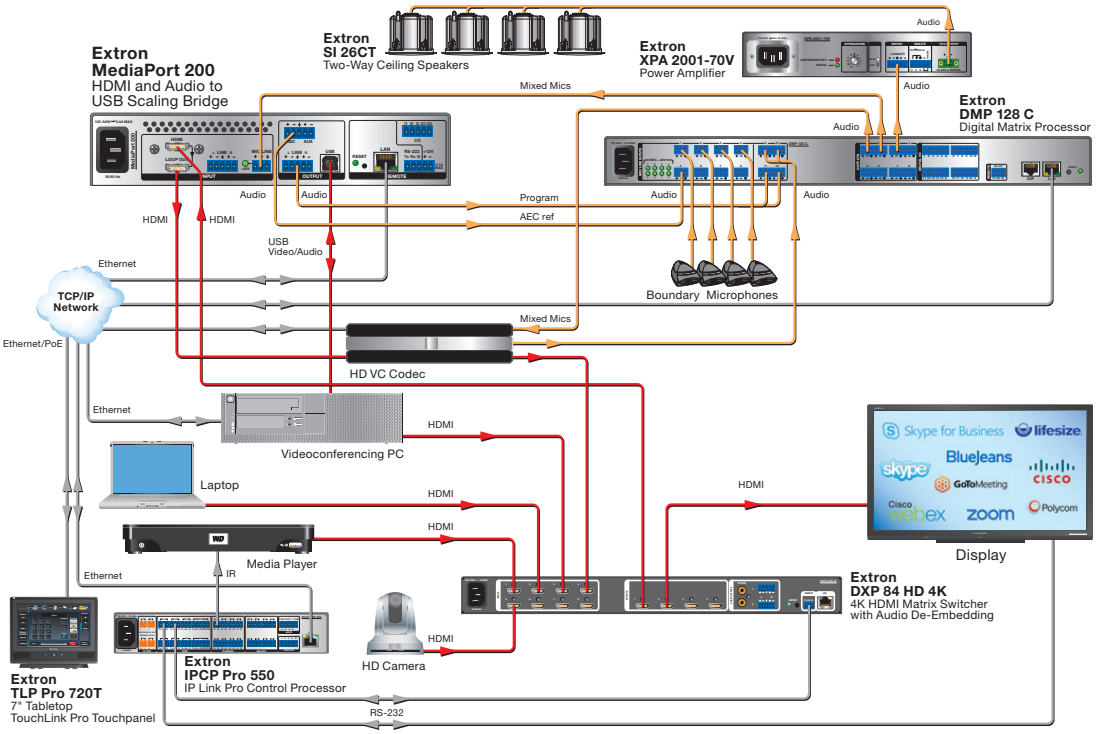
Applications

LARGE CONFERENCE ROOM

A large conference room system utilizes the MediaPort 200 and a matrix switcher to integrate hardware and software videoconferencing codecs into one system. Multiple room sources including a laptop, media player, and a high quality HD camera connect to an Extron DXP 84 HD 4K matrix switcher for routing signals to the MediaPort 200. The HDMI loop output of the MediaPort 200 makes the current source simultaneously available to the hardware codec.

The MediaPort 200 unit's USB 2.0 output provides video and audio to the videoconferencing computer, and receives return audio from the far-end conference session. The integrated audio DSP is augmented by an Extron DMP 128 C digital matrix processor, which provides an audio mix of the four room microphones to the MediaPort 200 and hardware videoconferencing codec, while receiving their program audio outputs. The unit's AEC reference output sends far-end audio to the DMP 128 C processor. This audio is used by the processor as a reference signal for AEC processing, to eliminate echo through the room's sound system.

Both the videoconferencing computer and the hardware videoconferencing codec can be routed to the local display. Source selection, audio management, and device control are simplified with an Extron TouchLink® touchpanel and IPCP Pro 550 control processor.



Sample Product Cutsheets (Audio-Visual)

Specifications

VIDEO INPUT AND LOOP THROUGH	
Number/signal type	1 HDMI/DVI (HDCP compliant) 1 HDMI/DVI loop-through (HDCP compliant)
Connectors	1 female HDMI 1 female HDMI loop-through
Horizontal frequency	15 kHz to 100 kHz
Vertical frequency	24 Hz to 75 Hz
Resolution range	640x480 through 1600x1200, 1920x1200 (with reduced blanking), 480i, 576i, 480p, 720p, 1080i, and 1080p
Digital pixel data bit depth	8, 10, and 12 bits per channel; 165 MHz pixel clock
Standards	DVI 1.0, HDMI 1.4, HDCP 1.3
VIDEO PROCESSING	
Colors	11 million (8-bit 4:2:2 processing)
VIDEO OUTPUT	
Number/signal type	1 USB digital video
Connectors	1 female USB type B
USB scaled resolutions	320x180[1,2], 320x240[1,2], 424x240[1,2], 640x360[1,2], 640x480[1,2], 848x480[1,2], 960x540[1,2], 720p[1,2], 1080p[1] [1] = at 15 Hz, [2] = at 30 Hz
USB ENCODING	
Number/signal type	1 USB (scaled, non-HDCP compliant)
Vertical frequency	15 Hz, 30 Hz
Video encoding	MJPEG
Resolution	320x180 through 1080p
Audio	PCM, 24-bit, 48 kHz
Bit rate	Up to 60 Mbps
USB standards	USB 2.0, high speed (USB 1.1 is not supported.)
AUDIO	
Gain	Unbalanced output, -6 dB; balanced output, 0 dB
Frequency response	20 Hz to 20 kHz, ±0.2 dB
THD + Noise	<0.03%, 20 Hz to 20 kHz at maximum level
S/N	>90 dB, 20 Hz to 20 kHz, at maximum balanced output (unweighted)
AUDIO INPUT	
Number/signal type	1 stereo, de-embedded from HDMI (PCM only) 1 stereo line level, balanced or unbalanced 1 mono mic/line level, balanced or unbalanced (with available phantom power) 2 stereo USB, embedded (communications and program audio)
Connectors	1 female HDMI (1) 3.5 mm, 5 pole captive screw, for line level (stereo) (1) 3.5 mm, 3 pole captive screw, for mic/line level 1 female USB B
Nominal level	Line inputs: +4 dBu, -10 dBV, adjustable Mic/line inputs: -60 dBV, +4 dBu, -10 dBV, adjustable
Maximum level	+21 dBu, balanced, when input gain is set to 0 dB, at rated THD+N
DC phantom power	+48 VDC ±10% (can be switched on or off for the mic/line input)

AUDIO OUTPUT	
Number/signal type	1 stereo, balanced or unbalanced, on a 3.5 mm, 5 pole captive screw connector. Can be configured as stereo or dual mono (variable). 2 mono, balanced or unbalanced (variable), on a shared 5 pole captive screw connector 1 stereo USB (embedded) 1 HDMI (loop output embedded)
Connectors	(2) 3.5 mm, 5 pole captive screw 1 female USB type B 1 female HDMI
THD	<0.03%, 20 Hz to 20 kHz at maximum level
Maximum level (Hi-Z)	>+21 dBu, balanced; >+15 dBu, unbalanced
Output volume range	-100 dB to 0 dB, in 0.1 dB increments
COMMUNICATIONS	
Serial control port	1 bidirectional RS-232 on (1) 3.5 mm, 5 pole captive screw connector, shared with +12 V remote power on rear panel
Digital I/O control	2 digital inputs on (1) 3.5 mm, 5-pole captive screw connector, shared with two digital outputs and a common ground 2 digital outputs on (1) 3.5 mm, 5-pole captive screw connector, shared with two digital inputs and a common ground
Remote power	(1) +12 V DC power on (1) 3.5 mm, 5 pole captive screw connector, shared with RS-232 port; 100 mA
USB control port	1 female USB mini-B (front panel Config port)
Ethernet control port	1 female RJ-45
Ethernet data rate	10/100/1000Base-T, half/full duplex with autodetect
Ethernet protocol	ARP, ICMP (ping), IP, TCP, DHCP, HTTP, SFTP, SNMP, Telnet
GENERAL	
Power supply	Internal Input: 100-240 VAC, 50-60 Hz
Temperature/humidity	Storage: -40 to +158 °F (-40 to +70 °C) / 10% to 90%, noncondensing Operation: +32 to +122 °F (0 to +50 °C) / 10% to 90%, noncondensing
Mounting	
Rack mount	Yes, with optional rack shelf
Furniture mount	Yes, with optional under-desk or through-desk mounting kit
Enclosure dimensions	1.66" H x 8.68" W x 9.5" D (1U high, half rack wide) (4.2 cm H x 22.1 cm W x 21.6 cm D) (Depth excludes connectors.)
DIM weight	7 lbs (3 kg)
Regulatory compliance	
Safety	CE, c-UL, UL
EMI/EMC	CE, C-tick, FCC Class A, ICES, VCCI
Environmental	Complies with the appropriate requirements of RoHS and WEEE.
Warranty	3 years parts and labor

NOTE: All nominal levels are at ±10%.

Model	Version Description	Part number
MediaPort 200	HDMI and Audio to USB Scaling Bridge	60-1488-01

For complete specifications, please go to www.extron.com
Specifications are subject to change without notice.

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Sample Product Cutsheets (Audio-Visual)

M55 HANGING CEILING MICROPHONE

OVERVIEW

The M55 is an innovative, hanging ceiling microphone system designed for applications where aesthetics, sound quality, and ease of installation are critical. The primary applications for the ceiling mounted M55 include Video Teleconferencing (VTC), distance learning, hospital rooms, surveillance and ambient room miking.

The M55 accommodates interchangeable capsules with cardioid, hypercardioid, omnidirectional and supercardioid (shotgun) coverage patterns. All electronics are fully integrated with high sensitivity and low noise. The signal output is balanced to eliminate RF interference caused by cell phones and mobile devices.

Installing the M55 requires drilling just one 5/8-inch hole in the ceiling, with no additional tools needed. The M55's mounting hardware easily adjusts the hanging height up to four feet from the ceiling surface without removing ceiling tiles. An optional aiming clip (MCHANGER) easily makes any additional angular adjustments. The cable assembly is equipped with terminal block connectors. For installations where plenum rated cable is to be used a UL rated, metal plenum junction box is available.

MODEL VARIATIONS

All M55 mics are manufactured in white finish with 4 ft cable terminating in terminal block connector. Several capsule configurations below.
M55W - cardioid (white)
M55WHC - hypercardioid (white)
M55WS - supercardioid (shotgun) (white)
M55WO - omnidirectional (white)

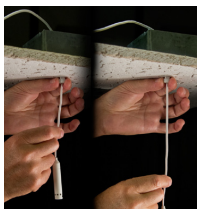
SUPPLIED ACCESSORIES

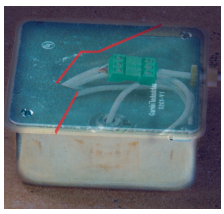
CONN170F - 1' integrated mic cable with terminal block connector
CONN170M - Mating terminal connector for solder-less connection
JBM55 - Metal plenum junction box with seismic and fire safety cable restraint where required by code.

OPTIONAL ACCESSORIES

MCHANGER - Clear plastic clip to adjust mic angle
WS20W - White foam windscreen to reduce wind noise

MCHANGER


Adjustable Cable


JBM55

FEATURES

- High output allows distance miking
- Optimized for voice recognition
- Immunity from RF interference
- Fingertip height adjustment and rotation control
- Low noise preamp circuitry
- Designed, assembled & tested in the USA
- 3 year warranty

APPLICATIONS

- Video Teleconferencing (VTC)
- Distance Learning
- Board Rooms
- Surveillance
- Hospital and medical procedures
- Ambient room miking

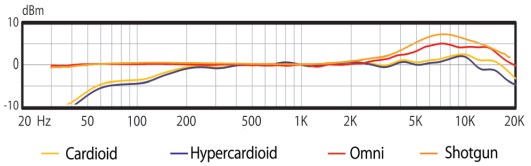
M55

Sample Product Cutsheets (Audio-Visual)

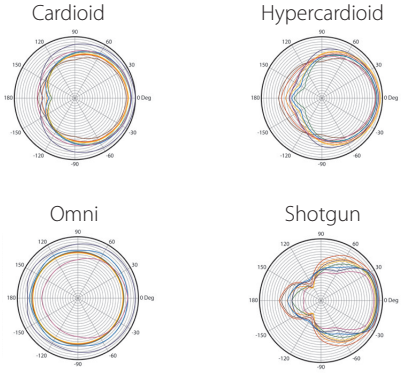
SPECIFICATIONS

Transducer Type	Condenser
Frequency Response	60 Hz - 10 kHz
Polar Pattern	Cardioid / Hypercardioid / Omni/ Supercardioid
Output Impedance	150 ohms
Sensitivity	38 mV (C), 32 mV (HC), 40mV (O), 60 mV (S) / Pa @ 1k
Equivalent Noise Level	22 dB (A-weighted)
Signal to Noise Ratio	72 dB
Maximum SPL	≥130 dB
Dynamic Range	108 dB
Power Requirements	18 - 52 V phantom
Connector	Terminal Block Connector
Polarity	Positive pressure on diaphragm produces positive voltage on pin 2 relative to pin 3 of output XLR connector
Materials / Finish	Aluminum & Zinc Alloy / White Finish
Weight	70 g / 2.4 oz (Mic & Cable) 499 g / 17.6 oz (Junction Box & Safety Cable)
Length	54 mm / 2.1 in

FREQUENCY RESPONSE



POLAR PATTERNS



ARCHITECT AND ENGINEER SPECIFICATIONS

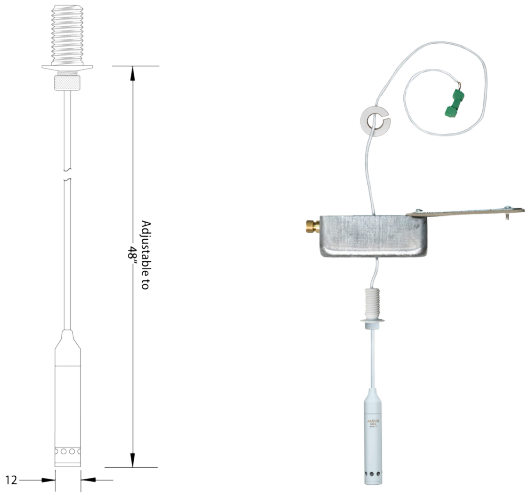
The microphone shall be of the condenser type with a modular threaded capsule available in cardioid, hypercardioid, omnidirectional and supercardioid polar patterns. The microphone shall be protected from RF interference. The microphone shall have a fully integrated preamp circuitry thereby eliminating the need for a remote preamplifier module. The microphone shall operate on 18 - 52 Volts DC and the nominal output impedance shall be equal to 150 Ohms at 1 kHz. The microphone shall have a sensitivity of 38 mV (C), 32 mV (HC), 40 mV (O), 60 mV (S) / Pa at 1 kHz. The microphone shall have a maximum SPL level of ≥ 130 dB with THD of 0.5%. The microphone shall be machined out of brass and the dimensions shall be 12 mm in diameter by 54 mm in length. The microphone shall be the Audix M55.

OPERATION AND MAINTENANCE

The M55 is a low impedance microphone and should be plugged into a mic level input on your console, mixer, or recording device. The M55 requires phantom power (18-52 V), which is available on most professional mic preamps and mixing devices. If phantom power is not available on your equipment, use an external phantom power source such as the Audix APS2. Avoid plugging the microphone into or removing it from the audio system unless the channel is muted or the relevant faders are turned down. Failure to do so may result in a loud popping noise that could seriously damage the speakers.

Further miking techniques may be found at www.audixusa.com.

DIMENSIONS (mm) EXPLODED VIEW



PRODUCT REGISTRATION: Please register your product online at www.audixusa.com/docs_12/about/product_registration.shtml.

SERVICE AND WARRANTY: This microphone is under warranty for a period of 3 years to be free of defects in material and workmanship. In the event of a product failure due to materials or workmanship, Audix will repair or replace said product at no charge with proof of purchase. Audix does not pay or reimburse shipping costs for warranty repairs or returns. The warranty excludes any causes other than manufacturing defects, such as normal wear, abuse, environmental damage, shipping damage or failure to use or maintain the product per the supplied instructions. No Implied Warranties: All implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose are hereby excluded. The liability of Audix, if any, for damages relating to allegedly defective products shall be limited to the actual price paid by Dealer for such products and shall in no event include incidental or consequential damages of any kind. Should your microphone fail in any way, please contact the Audix Service department at 503.682.6933. A Return Authorization is required before returning any product. OTHER THAN THIS WARRANTY, AUDIX MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS, THE USE OF THE PRODUCTS, THE PERFORMANCE OF THE PRODUCTS. AUDIX SHALL NOT BE LIABLE FOR SPECIAL INCIDENTAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES ARISING FROM OR BASED ON THE SALE, USE, STORAGE OR DISPOSAL OF THE PRODUCTS, AUDIX'S SERVICE WORK, BREACH OF WARRANTY, BREACH OF CONTRACT. NEGLIGENCE, OR ANY OTHER THEORY OF LIABILITY, EVEN IF AUDIX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

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AUDIX®

ver 4.0 09-16

Sample Product Cutsheets (Audio-Visual)

M3 Tri-element Hanging Ceiling Microphone

OVERVIEW

The M3 is an innovative, tri-element hanging microphone system designed for applications where aesthetics, sound quality, and ease of installation are critical. The M3 is an ideal audio capture solution for video conferencing, distance learning, courtroom activities, and surgical procedures. It can also be used for ambient room miking and surveillance.

The M3 incorporates three phase coherent hypercardioid capsules with tailored frequency responses optimized for speech intelligibility. This is accomplished by minimizing frequencies caused by noise, vibration, paper shuffling, keyboard strokes, fans, and heating/air conditioning. Low noise preamp circuitry is employed for highest possible signal to noise and studio quality sound. A high-quality silicone jacketed microphone cable ensures a balanced, shielded signal and a very clean look. Electronics above the ceiling are housed within a plenum rated junction box and cable connections are made via an RJ45 connector embedded within a proprietary brass housing for an airtight seal.

The M3 connects to the input of a mixer or dsp console via a breakout cable (provided). The breakout cable consists of a female RJ45 connector that terminates in either three terminal blocks or XLR connectors (optional). A variety of optional shielded CAT7 cable lengths (from plenum rated junction box to break out cable) are available.

Installing the M3 requires drilling just one 5/8-inch hole in the ceiling, with no additional tools needed. The M3 mounting hardware easily adjusts the cable hanging height up to four feet from the ceiling surface without removing ceiling tiles. A wire safety cable provides additional seismic restraint.

MODEL VARIATIONS

M3 - Microphone and cable in charcoal grey color
M3W - Microphone and cable in white

SUPPLIED ACCESSORIES

JBM3 - Plenum rated junction box
ANCHRJB60V2 - Seismic/fire strain relief
CBLM3TERM - Breakout cable consisting of RJ45 female to 3 terminal block connectors

OPTIONAL ACCESSORIES

CBLM3XLR - Breakout cable consisting of RJ45 female to 3 XLR male connectors - 1.57 meters (40")
CBLM307 - CAT 7 Interface cable , 7 meters (23') RJ45 with Plenum cover , twisted shielded pairs
CBLM310 - as above , 10 meters (33')
CMBM315 - as above, 15 meters (49')
CBLM320 - as above , 20 meters (66')
CBLM325 - as above, 25 meters (82')
CLBM30 - as above, 30 meters (98')

FEATURES

- 100% RF shielding and immunity
- Gold diaphragm condenser capsules with studio quality sound
- Low impedance design allows for extremely long cable runs (if required) without cross talk or interference
- Frequency and pattern tailored for voice clarity and rejection of extraneous noise
- Evenly dispersed sound with undetectable phase
- High-quality silicone jacketed microphone cable with adjustable length and position
- Plenum rated junction box with RJ45 connector
- All visible components of the microphone and cable are same color: charcoal or white
- TAA compliant
- Very high output, low self-noise
- Easy to install

APPLICATIONS

- Zone Capture
- Video Conferencing
- Distance Learning
- Hospital and medical procedure
- Courtroom
- Ambient room miking

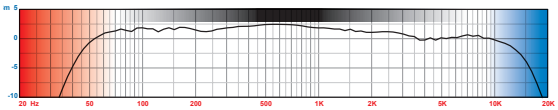
M3

Sample Product Cutsheets (Audio-Visual)

SPECIFICATIONS

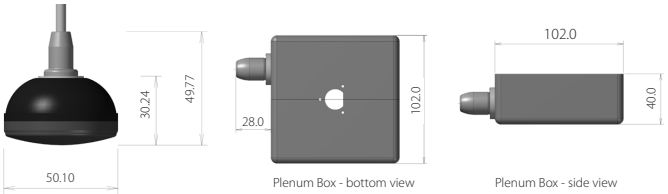
Transducer Type	Pre-Polarized Condenser
Frequency Response	30 Hz – 19 kHz
Optimized Response	70 Hz – 9 kHz (see chart)
Polar Pattern	Hypercardioid
Output Impedance	150 Ohms balanced
Sensitivity	34 mV / Pa @ 1k
Off Axis Rejection	1 capsule >23 dB at 180° relative to 0° 2 capsules >18 dB at 120° 3 capsules >9 dB at 60°
Signal/Noise Ratio (A-weighted)	72 dB
Equivalent Noise Level (A-weighted)	22 dB (A weighted)
Maximum SPL @ .5% THD	≥128 dB
Dynamic Range	106 dB
Power Requirements	18 – 52 Volts phantom
Cable/Connector	Terminal block or XLR
Polarity	Positive pressure on diaphragm produces positive voltage on pin 2 relative to pin 3
Weight	95 grams (mic only) / 3.32 ounces
Diameter	50mm (2 inches)
Length	30mm (1.2 inches)

Frequency Response (see key to the right)



ARCHITECT AND ENGINEER SPECIFICATIONS

The microphone shall be of the condenser type with three elements having a hypercardioid polar pattern. The microphone shall be protected from RF interference. The microphone shall have a fully integrated preamp circuitry housed within a plenum rated junction box. The microphone shall consist of three individual circuits each operating on 18-52 Volts DC and the nominal output impedance shall be equal to 150 Ohms at 1 kHz. The microphone shall have a sensitivity of 34 mV / Pa at 1 kHz and a maximum SPL level of ≥ 128 dB with THD of 0.5%. The microphone housing shall be machined out of brass with a steel mesh protective grill. The outer dimensions shall be 50mm in diameter by 30 mm in length. The microphone shall be the Audix M3. Further miking techniques may be found at www.audixusa.com.

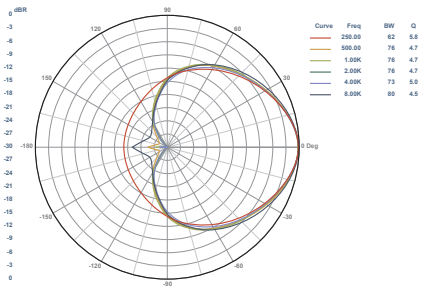


Low Frequency Noise
Frequencies below 70Hz minimized in order to reduce boominess, hum, rumble, table noises, HVAC, ambient interference.

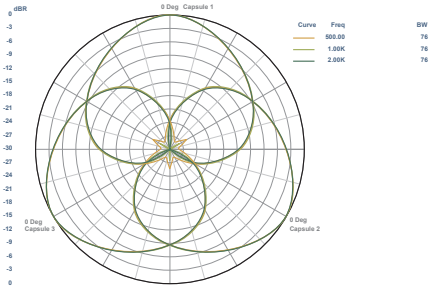
High Frequency Noise
Frequencies above 9 KHz minimized in order to reduce unwanted noise from paper shuffling, keyboards, HVAC, fan noise, ambient interference.

Ideal for Vocal Clarity and Voice Recognition
Frequencies between 200 Hz – 1kHz are optimized for speech.

M3 Polar x 1



M3 Polar x 3



PRODUCT REGISTRATION: Please register your product online at www.audixusa.com/docs_12/about/product_registration.shtml.
SERVICE AND WARRANTY: This microphone is under warranty for a period of 1 year to be free of defects in material and workmanship. In the event of a product failure due to materials or workmanship, Audix will repair or replace said product at no charge with proof of purchase. Audix does not pay or reimburse shipping costs for warranty repairs or returns. The warranty excludes any causes other than manufacturing defects, such as normal wear, abuse, environmental damage, shipping damage or failure to use or maintain the product per the supplied instructions. No Implied Warranties: All implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose are hereby excluded. The liability of Audix, if any, for damages relating to allegedly defective products shall be limited to the actual price paid by Dealer for such products and shall in no event include incidental or consequential damages of any kind. Should your microphone fail in any way, please contact the Audix Service department at 503.682.6933. A Return Authorization is required before returning any product. OTHER THAN THIS WARRANTY, AUDIX MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS, THE USE OF THE PRODUCTS, THE PERFORMANCE OF THE PRODUCTS. AUDIX SHALL NOT BE LIABLE FOR SPECIAL INCIDENTAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES ARISING FROM OR BASED ON THE SALE, USE, STORAGE OR DISPOSAL OF THE PRODUCTS, AUDIX'S SERVICE WORK, BREACH OF WARRANTY, BREACH OF CONTRACT. NEGLIGENCE, OR ANY OTHER THEORY OF LIABILITY, EVEN IF AUDIX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

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503.682.6933 Fax: 503.682.7114
Audix Corporation 9400 SW Barber St. Wilsonville, OR 97070

AUDIX®

ver 2.0 10-15

Sample Product Cutsheets (Audio-Visual)

SHURE®
LEGENDARY PERFORMANCE™

MXA910 | Microflex®Advance™ Ceiling Array Microphone

Specifications

All specifications measured from narrow beam width. Values for all widths are within ± 3 dB of these specifications unless otherwise noted.

Beam Width

Adjustable	Narrow	35 degrees
	Medium	45 degrees
	Wide	55 degrees

Connector Type
RJ45

Power Requirements
Power over Ethernet (PoE), Class 0

Power Consumption
9W, maximum

Weight
4.26 kg (9.4 lbs)

Product Dimensions

MXA910xx	603.8 x 603.8 mm (23.77 x 23.77 in.)
MXA910xx-60CM	593.8 x 593.8 mm (23.38 x 23.38 in.)
A910-25MM	619.7 x 619.7 mm (24.4 x 24.4 in.)

Note: the adapter accessory converts the 600 mm model to fit into a 625 x 625 mm ceiling grid.

Control Application
HTML5 Browser-based

Plenum Rating
Requires Fyrewrap® fire protective wrap system (Included)
UL 2043 (Suitable for Air Handling Spaces)

Dust Protection
IEC 60529 IP5X Dust Protected

Operating Temperature Range
–6.7°C (20°F) to 40°C (104°F)

Storage Temperature Range
–29°C (-20°F) to 74°C (165°F)

Networking

Cable Requirements
Cat 5e or higher (shielded cable recommended)

Audio

Frequency Response
180 to 17,000 Hz

Dante Digital Output

Channel Count	9 total channels (8 independent transmit channels, 1 IntelliMix® Automatic mixing transmit channel)
Sampling Rate	48 kHz
Bit Depth	24

Sensitivity
at 1 kHz
0.75 dBFS/Pa

Maximum SPL
Relative to 0 dBFS overload
93.25 dB SPL

Signal-To-Noise Ratio
Ref. 94 dB SPL at 1 kHz
83 dB A-weighted

Latency
Not including Dante latency
6 ms

Self Noise
11 dB SPL-A

Dynamic Range
82.25 dB

Built-in Digital Signal Processing

Per Channel	Equalizer (4-band Parametric), Mute, Gain (140 dB range)
System	IntelliMix® Automatic mixing, Echo Reduction

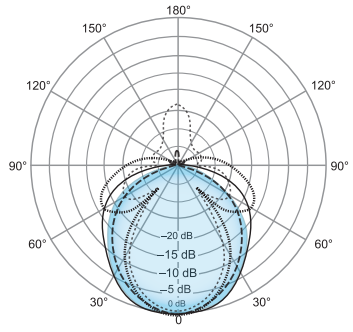
Intelligibility Scale
Equivalent acoustic performance, compared to a cardioid gooseneck microphone (environment dependent)
Cardioid distance multiplied by 1.6

[1] 1 Pa=94 dB SPL

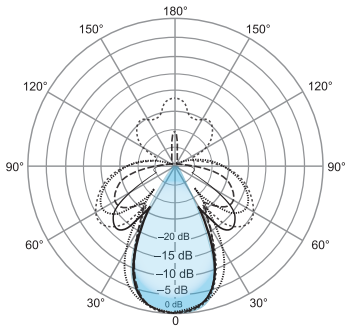
Polar Response

Polar response measured directly on-axis from a distance of 6 feet (1.83 m).

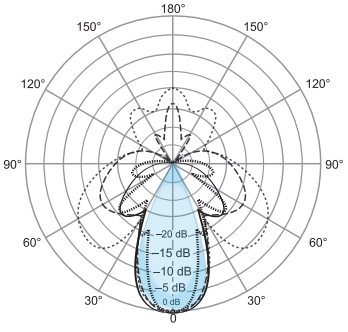
Wide



Medium



Narrow

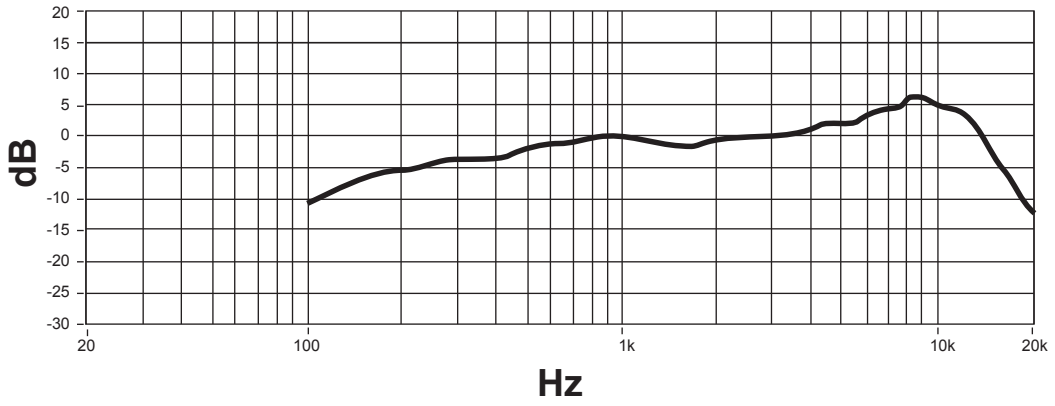


1,000 Hz
1,500 Hz
2,500 Hz
4,000 Hz

Sample Product Cutsheets (Audio-Visual)

Frequency Response

Frequency response measured directly on-axis from a distance of 6 feet (1.83 m).



IP Ports and Protocols

Shure Control

Port	TCP/UDP	Protocol	Description	Factory Default
21	tcp	FTP	Required for firmware updates (otherwise closed)	Closed
22	tcp	SSH	Not supported	Closed
23	tcp	Telnet	Standard console interface	Closed
68	udp	DHCP	Dynamic Host Configuration Protocol	Open
80*	tcp	HTTP	Required to launch embedded web server	Open
427	tcp/udp	SLP†	Required for inter-device communication	Open
443	tcp	HTTPS	Not supported	Closed
161	tcp	SNMP	Not supported	Closed
162	tcp	SNMP	Not supported	Closed
2202	tcp	ASCII	Required for 3rd party control strings	Open
5353	udp	mDNS†	Required for device discovery	Open
5568	udp	SDT†	Required for inter-device communication	Open
8023	tcp	Telnet	Debug console interface	Password
8180*	tcp	HTML	Required for web application	Open
8427	udp	Multcast SLP†	Required for inter-device communication	Open
64000	tcp	Telnet	Required for Shure firmware update	Open

Dante Audio & Controller

Port	TCP/UDP	Protocol	Description
162	udp	SNMP	Used by Dante
[319-320]*	udp	PTP†	Dante clocking
4321, 14336-14600	udp	Dante	Dante audio
[4440, 4444, 4455]*	udp	Dante	Dante audio routing
5353	udp	mDNS†	Used by Dante
[8700-8706, 8800]*	udp	Dante	Dante Control and Monitoring
8751	udp	Dante	Dante Controller
16000-65536	udp	Dante	Used by Dante

*These ports must be open on the PC or control system to access the device through a firewall.

†These protocols require multicast. Ensure multicast has been correctly configured for your network.

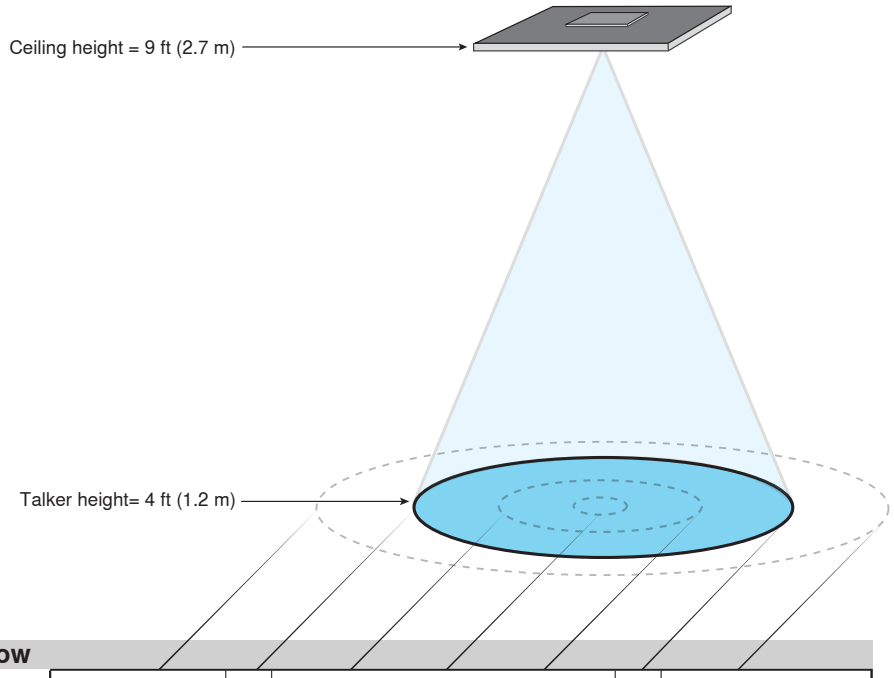
Sample Product Cutsheets (Audio-Visual)

Lobe Sensitivity

The edge of the blue coverage area for each channel in the web application represents where the sensitivity reaches -6 dB. Understanding how lobe sensitivity is displayed helps to:

- Provide complete coverage in a space, either by adding lobes or changing the lobe width. This ensures the sensitivity is within 6 dB in all areas. It is acceptable for lobes to slightly overlap.
- Ensure that spacing and isolation are adequate to reduce noise and maximize automatic mixing performance.

Measured at 1 kHz, on-axis



Narrow							
Centimeters	55	44	30	0	30	44	55
Inches	22	17	12	0	12	17	22
dB	-12	**-6**	-3	0	-3	**-6**	-12
Medium							
Centimeters	69	47	38	0	38	47	69
Inches	27	18	15	0	15	18	27
dB	-12	**-6**	-3	0	-3	**-6**	-12
Wide							
Centimeters	92	62	44	0	44	62	92
Inches	36	24	17	0	17	24	36
dB	-12	**-6**	-3	0	-3	**-6**	-12

Sample Product Cutsheets (Audio-Visual)

CP3N

3 SERIES

3-Series Control System®

- > *Enterprise-class control system*
- > *3-Series® Control Engine — substantially faster and more powerful than other control systems*
- > *Exclusive modular programming architecture*
- > *Onboard 512MB RAM & 4GB Flash memory*
- > *Expandable storage up to 1TB*
- > *Rear panel memory card slot*
- > *High-speed USB 2.0 host port*
- > *Industry-standard Ethernet and Cresnet® wired communications*
- > *Control Subnet — provides a dedicated local network for Crestron® devices*
- > *XPanel with Smart Graphics™ computer and web based control*
- > *iPhone®, iPad®, and Android™ control app support*
- > *Crestron Fusion® Cloud Enterprise Management Service support*
- > *SNMP remote management support*
- > *One RS-232/422/485 COM port with hardware and software handshaking*
- > *Two RS-232 COM ports with software handshaking only*
- > *Eight IR/serial, eight relay, and eight Versiport I/O ports*
- > *Programmable event scheduling with astronomical time clock*
- > *Native BACnet™/IP support[2]*
- > *Installer setup via Crestron Toolbox™ software or web browser*
- > *C#, symbol based, and drag-and-drop programming environments*
- > *Full Unicode (multi-language) support*
- > *Increased network throughput and security*
- > *Secure access through full user/group management or Active Directory integration*
- > *Hardware level security using 802.1X authentication*
- > *TLS, SSL, SSH, and SFTP network security protocols*
- > *FIPS 140-2 compliant encryption*
- > *IIS v.6.0 Web Server*
- > *IPv6 ready*
- > *Front panel USB computer console port*
- > *1-space rack-mountable*

The Crestron® CP3N is an enterprise-class control system with a dedicated Control Subnet port. Featuring the 3-Series® control engine, the CP3N forms the core of any modern networked home or commercial building, managing and integrating all the disparate technologies throughout your facility to make life easier, greener, more productive, and more enjoyable.

3-Series® Control Systems

Today's commercial buildings and custom homes comprise more technology than ever before, and all these systems need to be networked, managed, and controlled in fundamentally new ways. The IP based 3-Series platform is engineered from the ground up to deliver a network-grade server appliance capable of faithfully handling everything from boardroom AV and home theater control to total building management.

3-Series embodies a distinctively robust, dynamic, and secure platform to elevate your system designs to higher levels of performance and reliability. Compared to other control systems, Crestron 3-Series provides a pronounced increase in processing power and speed with more memory, rock solid networking and IP control, and a unique modular programming architecture.

Modular Programming Architecture

Designed for enhanced scalability, the CP3N affords high-speed, real-time multi-tasking to seamlessly run multiple programs simultaneously. This exclusive modular programming architecture lets programmers independently develop and run device-specific programs for AV, lighting, shades, HVAC, security, etc., allowing for the optimization of each program, and allowing changes to be made to one program without affecting the whole. Even as your system grows, processing resources can easily be shifted from one 3-Series processor to another without rewriting any code. The end benefit is dramatically simplified upgradability with minimal downtime, whether implementing changes on site or remotely via the network.

Robust Ethernet & IP Control

IP technology is the heart of 3-Series, so it should be no surprise that its networking abilities are second to none. Gigabit Ethernet connectivity enables integration with IP-controllable devices and allows the CP3N to be part of a larger managed control network. Whether residing on a sensitive corporate LAN, a home network, or accessing the Internet through a cable modem, the CP3N provides secure, reliable interconnectivity with IP-enabled touch screens, computers, mobile devices, video displays, media servers, security systems, lighting, HVAC, and other equipment — whether on premises or across the globe.

Dedicated Control Subnet

The Crestron Control Subnet is a Gigabit Ethernet network dedicated to Crestron devices. Via the CP3N's Control Subnet port, an installer may simply connect a single touch screen or wireless gateway, or add a Crestron PoE switch (CEN-SW-POE-5 or CEN-SWPOE-16)[1] to handle multiple touch screens, gateways, AV components, and other devices. Auto-configuration of the entire subnet is performed by the CP3N, discovering each device and assigning IP addresses without any extra effort from the installer.

crestron.com | 800.237.2041

CRESTRON

Sample Product Cutsheets (Audio-Visual)

CP3N 3-Series Control System®

CP3N – Rear View

A separate LAN port on the CP3N provides a single-point connection to the customer's LAN, requiring just one IP address for the complete control system. The LAN port allows full interconnectivity between devices on the local subnet with other devices, systems, servers, and WAN/Internet connections outside the local subnet. For sensitive applications that require absolute security, the entire Control Subnet can be completely isolated from the customer's LAN using Isolation Mode.

Control Apps & XPanel

Years ago, Crestron pioneered the world's first IP-based control system unleashing vast new possibilities for controlling, monitoring, and managing integrated systems over a LAN, WAN, and the Internet. Today, Crestron offers more ways than ever to control your world the way you want. Using a computer, smartphone, or tablet device, Crestron lets you control anything in your home or workplace from anywhere in the world.

Native to every 3-Series control system, Crestron XPanel technology transforms any laptop or desktop computer into a virtual Crestron touch screen. Crestron control apps deliver the Crestron touch screen experience to iPhone®, iPad®, and Android™ devices, letting you safely monitor and control your entire residence or commercial facility using the one device that goes with you everywhere.

Crestron Fusion® Cloud

Crestron Fusion Cloud provides an integrated platform for creating truly smart buildings that save energy, enhance worker productivity, and prolong the life-span of valuable equipment. As part of a complete managed network in a corporate enterprise, college campus, convention center, or any other facility, the CP3N works integrally with Crestron Fusion Cloud to enable remote scheduling, monitoring, and control of rooms and technology from a central help desk. It also enables organizations to reduce energy consumption by tracking real-time usage and automating control of lighting, shades, and HVAC.

SNMP Support

Built-in SNMP support enables integration with third-party IT management software, allowing network administrators to manage and control Crestron systems on the network in an IT-friendly format.

Cresnet®

Cresnet provides a dependable network wiring solution for Crestron keypads, lighting controls, shade motors, thermostats, occupancy sensors, and other devices that don't require the higher speed of Ethernet. The Cresnet bus offers easy wiring and configuration, carrying bidirectional communication and 24VDC power to each device over a simple 4-conductor cable. To assist with troubleshooting, the CP3N includes our patent-pending Network Analyzer which continuously monitors the integrity of the Cresnet network for wiring faults, marginal performance, and other errors.

Onboard Control Ports

In addition to Ethernet, the CP3N includes three bidirectional COM ports and eight IR ports to interface directly with all of your centralized AV sources, video displays, and other devices. Eight programmable relay ports are included for controlling projection screens, lifts, power controllers, and other contact-closure actuated equipment. Eight "Versiport" I/O ports enable the integration of power sensors, motion detectors, door switches, alarms, or anything else that provides a dry contact closure, low-voltage logic, or 0-10 Volt DC signal.

BACnet™/IP

Native support for the BACnet/IP communication protocol provides a direct interface to third-party building management systems over Ethernet, simplifying integration with HVAC, security, fire & life safety, voice & data, lighting, shades, and other systems. Using BACnet/IP, each system runs independently with the ability to communicate together on one platform for a truly smart building.[2]

SPECIFICATIONS

Control Engine

Crestron 3-Series; real-time, preemptive multi-threaded/multitasking kernel; Transaction-Safe Extended FAT file system; supports up to 10 simultaneously running programs

Memory

SDRAM: 512 MB
Flash: 4 GB
Memory Card: Supports SD and SDHC cards up to 32 GB
External Storage: Supports USB mass storage devices up to 1 TB

Communications

Ethernet: 10/100/1000 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, industry-standard TCP/IP stack, UDP/IP, CIP, DHCP, SSL, TLS, SSH, SFTP (SSH File Transfer Protocol), FIPS 140-2 compliant encryption, IEEE 802.1X, SNMP, BACnet/IP [2], IPv4 or IPv6, Active Directory authentication, IIS v.6.0 Web Server, SMTP e-mail client
Control Subnet: 10/100/1000 Mbps Ethernet, auto-switching, auto-negotiating, auto-discovery, full/half duplex, DHCP server, DNS Server, port forwarding, Isolation Mode
Cresnet: Cresnet master mode
USB: Supports USB mass storage class devices via rear panel USB 2.0 host port, supports computer console via front panel USB 2.0 device port
RS-232/422/485: For 2-way device control and monitoring, all ports

Sample Product Cutsheets (Audio-Visual)

CP3N 3-Series Control System®

support RS-232 up to 115.2k baud with software handshaking, one port also supports hardware handshaking, RS-422, and RS-485
IR/Serial: Supports 1-way device control via infrared up to 1.2 MHz or serial TTL/RS-232 (0-5 Volts) up to 115.2k baud

Connectors & Card Slots

RELAY OUTPUT 1 – 8: (2) 8-pin 3.5 mm detachable terminal blocks;
Comprises (8) normally open, isolated relays;
Rated 1 Amp, 30 Volts AC/DC; MOV arc suppression across contacts

I/O 1 – 8: (1) 9-pin 3.5 mm detachable terminal block;
Comprises (8) "Versiport" digital input/output or analog input ports (referenced to GND);
Digital Input: Rated for 0-24 Volts DC, input impedance 20k Ohms, logic threshold >3.125V low/0 and <1.875V high/1;
Digital Output: 250 mA sink from maximum 24 Volts DC, catch diodes for use with "real world" loads;
Analog Input: Rated for 0-10 Volts DC, protected to 24 Volts DC maximum, input impedance 21k Ohms with pull-up resistor disabled;
Programmable 5 Volts, 2k Ohms pull-up resistor per pin

IR - SERIAL OUTPUT 1 – 8: (2) 8-pin 3.5 mm detachable terminal blocks;
Comprises (8) IR/Serial output ports;
IR output up to 1.2 MHz;
1-way serial TTL/RS-232 (0-5 Volts) up to 115.2k baud

COM 1: (1) 5-pin 3.5 mm detachable terminal block;
Bidirectional RS-232/422/485 port;
Up to 115.2k baud; hardware and software handshaking support

COM 2 – 3: (2) 3-pin 3.5 mm detachable terminal blocks;
Bidirectional RS-232 ports;
Up to 115.2k baud; software handshaking support

MEMORY: (1) SD memory card slot;
Accepts one SD or SDHC card up to 32 GB for memory expansion

USB: (1) USB Type A female; USB 2.0 port for storage devices

LAN: (1) 8-pin RJ45 jack;
10Base-T/100Base-TX/1000Base-T Ethernet port;
Connects to the customer's LAN

CONTROL SUBNET: (1) 8-pin RJ45 jack;
10Base-T/100Base-TX/1000Base-T Ethernet port;
Provides a dedicated local network for Crestron devices

NET: (1) 4-pin 3.5 mm detachable terminal block;
Cresnet master port;
Outputs power to Cresnet devices if a power pack is connected to the 24VDC power input jack;
Receives Cresnet network power if no power pack is connected to the 24VDC power input jack;
See "Power" section for additional specifications

24VDC 2.0A: (1) 2.1 x 5.5 mm DC power connector;
24 Volt DC power input; PW-2420RU power pack included;
Passes through to NET port to power Cresnet devices;
See "Power" section for additional specifications

G: (1) 6-32 screw;
Chassis ground lug

COMPUTER (front): (1) USB Type B female;
USB 2.0 computer console port (6 ft cable included);
For setup only

Controls & Indicators

PWR: (1) Green LED, indicates operating power supplied from power pack or Cresnet network
NET: (1) Amber LED, indicates communication with the Cresnet system
MSG: (1) Red LED, indicates control system has generated an error message
HW-R: (1) Recessed pushbutton for hardware reset
SW-R: (1) Recessed pushbutton for software reset
LAN (rear): (2) Bi-color green/amber LEDs, left LED indicates Ethernet link status and connection speed, right LED indicates Ethernet activity
CONTROL SUBNET (rear): (2) Bi-color green/amber LEDs, left LED indicates Ethernet link status and connection speed, right LED indicates Ethernet activity

Power

Power Pack: 2.0 Amps @ 24 Volts DC;
100-240 Volts AC, 50/60 Hz power pack, model PW-2420RU included

Available Cresnet Power: 24 Watts (1 Amp @ 24 Volts DC) when using power pack

Cresnet Power Usage: 15 Watts (0.625 Amp @ 24 Volts DC) when using Cresnet network power

Environmental

Temperature: 41° to 113° F (5° to 45° C)
Humidity: 10% to 90% RH (non-condensing)
Heat Dissipation: 50 BTU/hr

Enclosure

Chassis: Metal, black finish
Faceplate: Extruded metal, black finish, polycarbonate label overlay
Mounting: Freestanding or 1 RU 19-inch rack-mountable (adhesive feet and rack ears included)

Dimensions

Height: 1.70 in (44 mm) without feet
Width: 17.28 in (439 mm);
19.00 in (483 mm) with rack ears
Depth: 6.56 in (167 mm)

Weight

3.1 lb (1.42 kg)

Sample Product Cutsheets (Audio-Visual)

CP3N 3-Series Control System®

MODELS & ACCESSORIES

Available Models

CP3N: 3-Series Control System®

Included Accessories

PW-2420RU: Power Pack, Desktop, 24VDC, 2A (50 Watts), Regulated, US/International (Qty. 1 included)

Available Accessories

PWE-4803RU: PoE Injector
CEN-SW-POE-5: 5-Port PoE Switch
CEN-SWPOE-16: 16-Port Managed PoE Switch
C2N-HBLOCK: Multi-type Cresnet Distribution Block
CNTBLOCK: Cresnet Distribution Block
CNSP-XX: Custom Serial Interface Cable
IRP2: IR Emitter Probe w/Terminal Block Connector
Crestron® App: Control App for Apple® iOS® & Android™
XPanel: Crestron Control® for Computers
myCrestron: Dynamic DNS Service for Crestron Systems
Crestron Fusion®: Enterprise Management Platform
3-Series® BACnet™/IP Support: 3-Series Native BACnet/IP Interface License
CSP-LIR-USB: IR Learner

Notes:

1. Item(s) sold separately.
2. License required. The CP3N supports a maximum of 1000 BACnet objects when dedicated for BACnet use only. Actual capabilities are contingent upon the overall program size and complexity.

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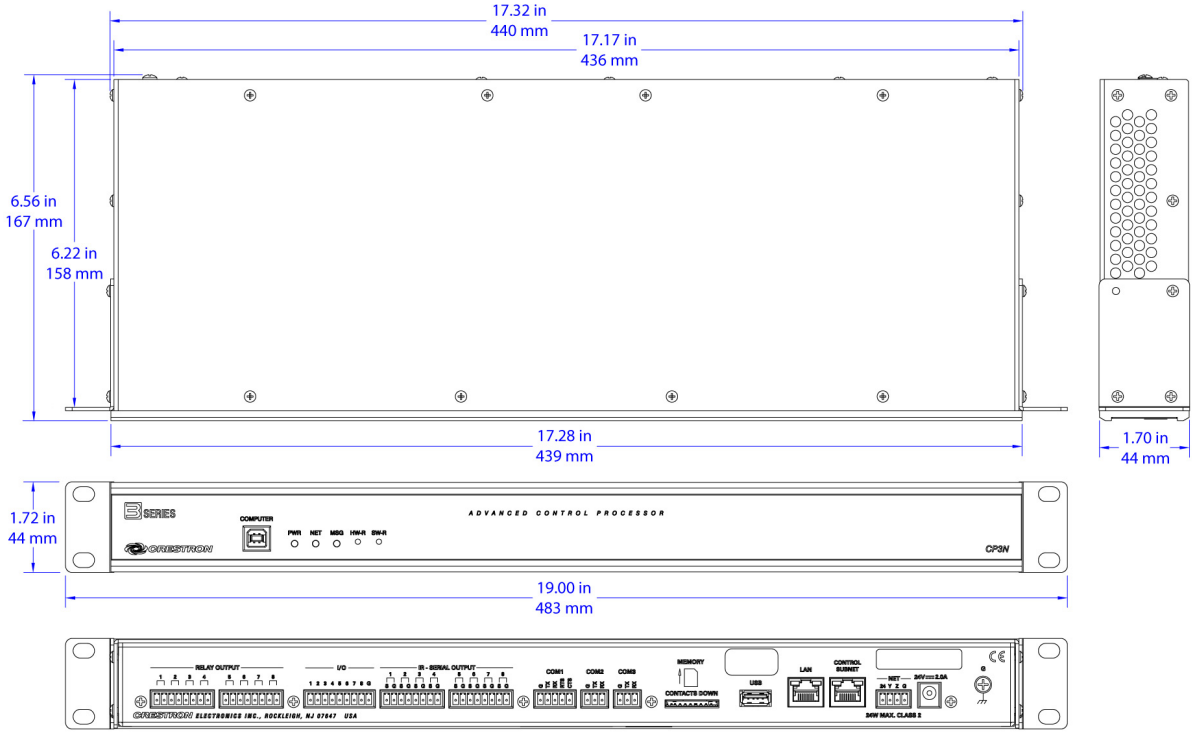

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Sample Product Cutsheets (Audio-Visual)

TSW-760

7” Touch Screen

- > *Ultra clean, modern appearance*
- > *Thin profile and compact footprint*
- > *Affordable and easy to install*
- > *7” widescreen active-matrix color display*
- > *1024 x 600 WSVGA display resolution*
- > *Capacitive touch screen technology*
- > *Multi-touch capable*
- > *Smart Graphics® performance*
- > *Backlit soft-touch capacitive buttons*
- > *Any/all button hide feature*
- > *Auto-brightness control*
- > *Voice recognition capability[1,2]*
- > *H.264 or MJPEG streaming video display*
- > *Built-in 5 MP H.264 IP camera[2]*
- > *Built-in microphone and speakers[2]*
- > *Rava® SIP intercom and phone technology[2]*
- > *Native Sonos® app*
- > *Crestron Fusion® room scheduling[4]*
- > *Built-in PinPoint™ beacon[2,5]*
- > *Customizable audio feedback*
- > *Built-in web browsing[1]*
- > *On-screen multi-language keyboard*
- > *Customizable screensaver*
- > *Single-wire Ethernet connectivity*
- > *PoE or PoE+ network powered (refer to specifications)*
- > *US, UK, or European electrical wall box mounting*
- > *Lectern mount over a rectangular cutout*
- > *Retrofit and masonry mounting options available[6]*
- > *Multi-surface and ADA compliance mounting options available[3]*
- > *Tabletop and swivel mount options available[3]*
- > *3 RU rack mount option available[3]*
- > *Available in smooth black or white finish*

Advanced Touch Screen Control

A Crestron® touch screen offers an ideal user-interface for controlling all the technology in your home, boardroom, classroom, courtroom, or command center. Touch screens simplify and enhance the way you use technology, doing away with those piles of remote controls, cluttered wall switches, disparate smartphone apps, and cryptic computer screens. For controlling audio, video, lighting, shades, HVAC, security, and other systems, Crestron touch screens are fully-customizable with easy-to-use controls and icons, true feedback and real-time status display, live streaming video, voice recognition, web browsing, and a full-featured media player for an enhanced multiroom entertainment experience.

With its clean, contemporary design highlighted by edge-to-edge glass and stunning color graphics, the Crestron TSW-760 touch screen makes an elegant statement on any wall, tabletop, lectern, or equipment rack.

Perfectly at home in the most contemporary residence or modern office building, its high-tech good looks underline its power for simplifying everyday tasks and functions throughout any facility.

The TSW-760 delivers the ultimate touch screen experience in an unobtrusive, space-saving design. It features a brilliant 7 inch capacitive touch screen display with Smart Graphics® and 5 soft-touch buttons. PoE connectivity and a range of mounting options make installation a breeze for both new and retrofit applications. Additional advanced features include the abilities to control any function using voice commands, view security cameras and other video sources, communicate using built-in video intercom and phone capabilities, manage meeting room scheduling, browse the Internet, and enjoy full access to your Sonos® Home Sound System.[1]

Smart Graphics®

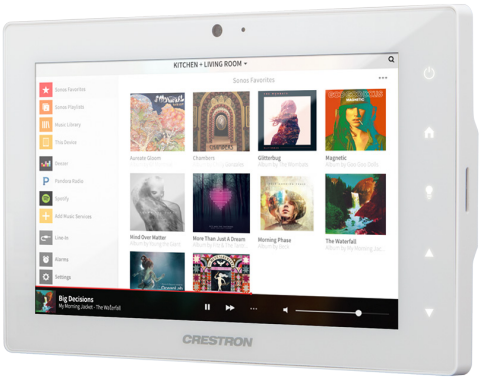
Crestron touch screens use Smart Graphics to deliver the ultimate user experience *and* the ultimate value by enabling the creation of dynamically rich user interfaces with incredible efficiency and unparalleled functionality. Using Smart Graphics, programmers can swiftly integrate fluid gesture-driven controls, animated feedback, rich metadata, embedded apps and widgets, and full-motion video for a deeply engaging and ultra-intuitive touch screen experience.

Crestron Smart Graphics offers these enhancements and more:

- Cool-looking graphical buttons, sliders, knobs, and gauges that are intuitive and fun to use
- Kinetic effects to enhance the feeling of realism, with lists and toolbars that scroll with momentum at the flick of a fingertip
- Drag-and-drop objects that snap into place, offering an easy way to switch sources
- Dashboard widgets to personalize the touch screen with clocks, weather, news, and other information[1]
- A power-saving screensaver that allows display of time, temperature, and other text content at a reduced brightness level

Sample Product Cutsheets (Audio-Visual)

TSW-760 7” Touch Screen



TSW-760-W-S – Shown in White

TSW-760-B-S with TSW-760-TTK-B-S Tabletop Kit

- Customizable themes allowing a completely different look and feel for every user, event, or season
- Fully-developed SmartObjects® that enable sophisticated control over complex devices with minimal programming
- A consistent look and feel across multiple touch screens of varying sizes

Soft-Touch Buttons

The TSW-760 includes five backlit, soft-touch capacitive buttons for quick access to commonly used functions. These buttons are pre-labeled with icons for “Power”, “Home”, “Lights”, “Up”, and “Down” functions. Each button is programmable via the control system for custom functionality, and any unused button can be hidden by simply turning off its backlight.

Auto-Brightness Control

To ensure optimal visibility under varying lighting conditions, the TSW-760 includes a built-in light sensor, which regulates the brightness of the display and button backlighting according to the ambient light level in the room. Separate auto-brightness settings are provided for the display and buttons to allow each to be adjusted or defeated as needed.

Voice Recognition

Some things are easier *said* than *done*, so why not just *say* what you want and let Crestron *do* it for you? With built-in voice recognition, the TSW-760 provides the ability to use spoken commands to control virtually anything. Voice recognition can be used to quickly turn devices on or off, select and play a specific media title or playlist, change the channel, choose a lighting scene, lock the doors, arm the security system, or enter a password. Simply say a command and Crestron does the rest.[1,2]

Streaming Video

High-performance streaming video capability makes it possible to view security cameras and other video sources right on the touch screen. Native support for H.264 and MJPEG formats allows the TSW-760 to display live streaming video from an IP camera, a streaming encoder (Crestron CEN-NVS200, DM-TXRX-100-STR, or similar[3]), or a DigitalMedia™ switcher. Video is delivered to the touch screen over Ethernet, eliminating the need for any extra video wiring.

Rava® SIP Intercom

Rava SIP Intercom Technology enables hands-free VoIP communication with other Rava-enabled touch screens and door stations. Rava works over Ethernet, supporting 2-way intercom, video intercom, and paging without requiring any special wiring. VoIP phone capability is also possible through integration with a SIP-compatible IP phone system or SIP server, allowing hands-free telephone functionality complete with speed-dialing, caller ID, custom ringers, and other enhancements. Built-in echo cancellation affords full-duplex performance for clear, seamless voice communication using the TSW-760’s integrated microphone and speakers.[2]

Built-in Camera

A 5 megapixel camera is built into the TSW-760 to support video intercom and room monitoring capabilities. This feature allows individuals to communicate both verbally and visually between two touch screens, or between one touch screen and a Rava-compatible video door station. It can also be used to visually monitor any room securely using an H.264 compatible decoder (Crestron DM-TXRX-100-STR, DM-RMC-100-STR, or similar[3]) or a third-party video monitoring system. When not needed, the camera feature can be turned off programmatically through the control system. A “no-camera” model is also available.[2]

Sonos® App

Merging technologies from Sonos and Crestron brings a whole-house music experience like no other. From any touch screen in the house, a family can effortlessly browse for tracks, artists, or playlists using all the services available from Sonos and instantly play them in any room using Sonos wireless speakers or a Crestron Sonnex® Multiroom Audio System. The Sonos app runs natively on the TSW-760, enabling enhanced control of Sonos products as part of a complete Crestron system. The app checks for updates nightly so it’s always current.[1]

Room Scheduling

The TSW-760 can provide an invaluable productivity tool for corporate enterprises and other organizations that use Crestron Fusion®, Microsoft® Outlook®, Google Calendar™, or another calendaring application to schedule meetings and manage rooms. Mounted on the wall outside each room, the TSW-760 allows anyone to see at-a-glance if the room is

Sample Product Cutsheets (Audio-Visual)

TSW-760 7" Touch Screen

available or in use, and to view details about the current meeting. A swipe of the finger reveals the room's entire schedule for the day, displaying upcoming meetings and open time slots, and allowing the room to be reserved right on the spot.

Room scheduling functionality is enabled on the TSW-760 using the built-in room scheduling application, which syncs directly over the network with Crestron Fusion, Microsoft Exchange, Office 365®, Google Calendar, or G Suite™. A Room Availability Hallway Sign (model SSC or SSW [3]) can be added for enhanced visibility.[4]

PinPoint™ Beacon (Coming Soon)

The built-in PinPoint proximity detection beacon enhances the intelligence and personalization of a Crestron system by enabling a smartphone or tablet device to always know what room it's in. It works with the Crestron App or Crestron PinPoint App, using Bluetooth® technology to determine when the mobile device is in or near the same room as the beacon, and signals the mobile app to automatically display the appropriate controls and information for that location.[2,5]

Web Browsing

Using its built-in web browser, the TSW-760 provides quick access to online program guides and other web-based services at the touch of a button, allowing enhanced touch screen control of DVRs and other appliances without having to pick up a separate tablet or smartphone. If a device can be controlled or managed through a web browser, it can be integrated into the Crestron system through the TSW-760. Of course, the web browser may also be used to simply browse the Internet, check traffic conditions, or look up a recipe.[1]

On-Screen Keyboard

Typing in passwords, URLs, and text searches is facilitated using the on-screen multi-language keyboard.

Multi-Touch Support

The TSW-760's capacitive touch screen affords enhanced capabilities for browsing web pages using multi-touch gestures.

Audio Feedback

Customized audio files can be loaded to add another dimension to the touch screen graphics using personalized sounds, button feedback, and voice prompts.

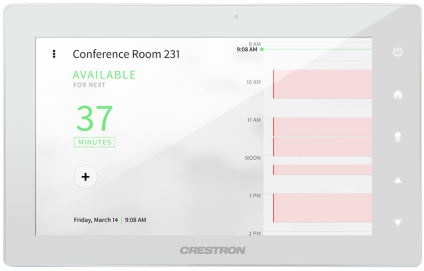
Single-Wire Connectivity

A simple Ethernet LAN connection is all that is required to wire the TSW-760, containing all control, video, intercom, and power signals within a single wire.

Power over Ethernet

Using PoE technology, the TSW-760 gets its operating power right through the LAN wiring. PoE (Power over Ethernet) eliminates the need for a local power supply or any dedicated power wiring. A PoE Injector (PWE-4803RU [3]) simply connects in line with the LAN cable at a convenient location. Crestron PoE switches (CEN-SW-POE-5 or CEN-SWPOE-16 [3]) may also be used to provide a total networking solution with built-in PoE.

Note: Refer to the "Power" specifications for additional details.



Room scheduling application

Wall or Lectern Mounting Options

Using the bracket provided, the TSW-760 is easily installed over a 2-gang or 3-gang electrical box, or a 2-gang European or UK electrical box. The same bracket allows for installation in a wooden lectern or podium over a rectangular cutout. When installed, the touch screen protrudes just 1/2 inch from the mounting surface and latches firmly into its mounting bracket leaving no visible screws for an ultra clean appearance. A security latch option is included to deter unauthorized removal of the touch screen.

Additional mounting options are afforded using the TSW-UMB-60 Universal Mounting Bracket. By itself, the TSW-UMB-60 provides a post-construction solution for retrofitting the TSW-760 into existing drywall. For pre-construction applications that don't require a back box, the TSW-UMB-60 can be used along with a TSW-UMB-60-PMK Pre-Construction Mounting Kit. Masonry and concrete applications are accommodated using the TSW-UMB-60 along with a TSW-UMB-60-BBI back box. The TSW-UMB-60 is compatible with TSW-560, -760, and -1060 model touch screens, making it easy to change devices at any time.[6]

When installing the TSW-760 in place of an older Crestron touch screen (APAD, CT-1000, LC-1000, TPS-4L, or TPS-2000L), Crestron offers Retrofit Mounting Brackets (TSW-60-RMB series [3]), which facilitate replacement without having to tear out the old mounting hardware or patch the wall.[6]

For impenetrable surfaces, such as glass, granite, or marble, or for applications requiring ADA compliance, Crestron offers the Multi-Surface Mount Kit (TSW-760/1060-MSMK [3]). This option allows for attaching securely to virtually any smooth, flat surface without screws, providing an ideal solution for modern offices with glass walls or historically significant spaces where cutting and drilling is prohibited. It can also be mounted over a conventional electrical box. When installed, the touch screen is angled upwards at a 20° tilt to allow for mounting at an ADA approved height.

Tabletop Option

Using the optional Tabletop Kit (TSW-760-TTK [3]), the TSW-760 becomes a stylish, freestanding touch screen that fits perfectly on a table, desk, or countertop. It can even be permanently attached to the surface using the optional Swivel Mount Kit (TSW-560/760/1060-SMK [3]).

Rack Mount Option

The TSW-760 can be mounted in a 19" EIA equipment rack using the optional Rack Mount Kit (TSW-560/760-RMK-1 [3]). When rack mounted, the touch screen occupies three rack spaces.

Sample Product Cutsheets (Audio-Visual)

TSW-760 7" Touch Screen

SPECIFICATIONS

Touch Screen Display

Display Type: TFT active matrix color LCD
Size: 7 inch (178 mm) diagonal
Aspect Ratio: 17:10 WSVGA
Resolution: 1024 x 600 pixels
Brightness: 350 nits (cd/m²)
Contrast: 1100:1
Color Depth: 24-bit, 16.7M colors
Illumination: Edgelit LED w/auto-brightness control
Viewing Angle: ±80° horizontal, ±80° vertical
Touch Screen: Projected capacitive, 5-point multi-touch capable

Buttons

Hard Keys: (5) Projected capacitive pushbuttons, backlit w/auto-brightness control, per-button show/hide (backlight enable/disable), pre-labeled with icons for "Power", "Home", "Lights", "Up", and "Down"
Reset: (1) Miniature pushbutton on rear panel for hardware reset

Graphics Engine

Crestron Smart Graphics, multi-language web browser [1], multi-language on-screen keyboard, screensaver, single scalable streaming video window, native Sonos app [1], native room scheduling application [4], setup and diagnostics via web browser or onscreen UI

Languages

Smart Graphics: Arabic, Chinese (Simplified), Chinese (Traditional), Czech, Danish, Dutch, English (UK), English (US), Finnish, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Portuguese (Brazilian), Romanian, Russian, Slovak, Spanish, Swedish, Thai
On-Screen Keyboard: Arabic, Chinese (Simplified), Croatian, Czech, Danish, Dutch, English (UK), English (US), Finnish, French (Canada), French (Switzerland), German, Hebrew, Hungarian, Italian, Japanese, Norwegian Bokmal, Polish, Portuguese, Russian, Serbian, Spanish, Swedish, Turkish
Voice Recognition: Afrikaans (South Africa); Chinese, Mandarin (China, Simplified); Chinese, Mandarin (Hong Kong, Simplified); Chinese, Mandarin (Taiwan, Traditional); Chinese, Yue (Hong Kong, Traditional); Czech (Czech Republic); Dutch (Netherlands); English (Australia); English (Canada); English (Generic); English (India); English (New Zealand); English (South Africa); English (UK); English (US); French (France); German (Germany); isiZulu (South Africa); Italian (Italy); Japanese (Japan); Korean (South Korea); Polish (Poland); Portuguese (Brazil); Russian (Russia); Spanish (Spain); Turkish (Turkey)
Web Browser: Arabic, Bulgarian, Catalan, Chinese, Croatian, Czech, Danish, Dutch, English, Filipino, Finnish, French, German, Greek, Hebrew, Hindi, Hungarian, Indonesian, Italian, Japanese, Korean, Latvian, Lithuanian, Norwegian Bokmal, Pashto, Persian, Polish, Portuguese, Romanian, Romansh, Russian, Serbian, Slovak, Slovenian, Spanish, Swedish, Thai, Turkish, Ukrainian, Vietnamese
Room Scheduling [4]: Chinese (Simplified), Chinese (Traditional), Danish, Dutch (Netherlands), English (US), English (UK), French, German, Hebrew, Italian, Japanese, Korean, Norwegian, Portuguese (Brazil), Portuguese (Portugal), Russian, Spanish, Swedish

Memory

RAM: 2 GB DDR3L
Storage: Firmware/Application: 4 GB Class 10 microSD card;
System: 4 GB eMMC
Maximum Project Size: 600 MB

Communications

Ethernet: 10/100 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, TCP/IP, UDP/IP, CIP, DHCP, SSL, TLS, SSH, SFTP (SSH File Transfer Protocol), IEEE 802.1X, SNMP, IPv4 or IPv6, IEEE 802.3at compliant
USB: USB 2.0 host for room availability hallway sign [3,4]
Bluetooth: Crestron PinPoint proximity detection beacon [2,5]

Streaming Decoder

Video Formats: H.264 (MPEG-4 part 10 AVC), MJPEG
Audio Formats: AAC stereo
Bitrates: Up to 25 Mbps (20 Mbps maximum recommended)
Streaming Input Resolutions: Up to 1920x1080@30fps
Streaming Protocol: RTSP

Streaming Encoder & Camera [2]

Camera Resolution: 5.0 MP
Field of View: 50º horizontal
Video Format: H.264 (MPEG-4 part 10 AVC)
Streaming Output Resolution: 1280x720
Streaming Protocol: RTSP, ONVIF discovery

Audio

Features: Built-in microphone and speakers, Rava SIP Intercom, multi-language voice recognition [1,2]
Audio Feedback Formats: MP3

Connectors

LAN PoE: (1) 8-pin RJ45 connector, female, with 2 LED indicators;
10Base-T/100Base-TX Ethernet port & PoE+ PD port;
Green and yellow LEDs indicate Ethernet port status

USB: (1) USB Type A connector, female;
USB 2.0 host port;
For optional room availability hallway sign [3,4]

Power

Power over Ethernet:
IEEE 802.3at Type 2 compliant PoE+ PD (Powered Device);
- Requests 15 Watts from an 802.3at Type 2 PSE with LLDP advanced power management;
- Requests 30 Watts (PoE+ Class 4) from an 802.3at Type 2 PSE without LLDP;

Sample Product Cutsheets (Audio-Visual)

TSW-760 7" Touch Screen

- Requests 15.4 Watts (PoE Class 0) from an 802.3af (or 802.3at Type 1) PSE

Environmental

Temperature: 32° to 112° F (0° to 45° C)
Humidity: 10% to 90% RH (non-condensing)
Heat Dissipation: 44 BTU/hr

Enclosure

Construction: Plastic, smooth black or white finish, edge-to-edge glass with black or white surround
Mounting: Surface mount over a 2 or 3-gang US electrical box, 2-gang European (DIN 49073) electrical box, or 2-gang UK (BS 4662) electrical box; lectern mount over a 2-1/5" H x 3-3/4" W (56 mm H x 96 mm W) cutout; 1-3/8" (35 mm) minimum mounting depth; additional wall mount, surface mount, rack mount, and tabletop options available separately

Dimensions

Height: 4.79 in (122 mm)
Width: 7.61 in (194 mm)
Depth: 1.52 in (39 mm)
Dimensions do not include the mounting bracket

Weight

14.1 oz (400 g)

Compliance

UL Listed for US & Canada, IC, CE, FCC Part 15 Class B digital device

MODELS & ACCESSORIES

Available Models

TSW-760-B-S: 7" Touch Screen, Black Smooth
TSW-760-W-S: 7" Touch Screen, White Smooth
TSW-760-NC-B-S: 7" Touch Screen without Camera, Microphone, or PinPoint™ Beacon; Black Smooth
TSW-760-NC-W-S: 7" Touch Screen without Camera, Microphone, or PinPoint™ Beacon; White Smooth

Available Accessories

TSW-760-TTK: Tabletop Kit for TSW-760
TSW-560/760/1060-SMK: Swivel Mount Kit for TSW-760-TTK
TSW-UMB-60: Universal Mounting Bracket for TSW-x60 Series
TSW-UMB-60-PMK: Pre-Construction Mounting Kit for TSW-UMB-60
TSW-UMB-60-BBI: Wall Mount Back Box for TSW-UMB-60
TSW-760/1060-RMB-1: Retrofit Mounting Bracket – Converts APAD, CT/LC-1000, or TPS-2000L to TSW-760 or TSW-1060
TSW-760/1060-RMB-2: Retrofit Mounting Bracket – Converts TPS-4L to TSW-760 or TSW-1060
TSW-760/1060-MSMK: Multi-Surface Mount Kit for TSW-760 & TSW-1060
TSW-560/760-RMK-1: Rack Mount Kit for TSW-560 & TSW-760
PWE-4803RU: PoE Injector
CEN-SW-POE-5: 5-Port PoE Switch
CEN-SWPOE-16: 16-Port Managed PoE Switch
CEN-NVS200: Network Video Streamer
DM-TXRX-100-STR: HD Streaming Transmitter/Receiver
DM-RMC-100-STR: HD Streaming Receiver & Room Controller 100
SSC: Room Availability Hallway Sign, Ceiling Mount
SSW: Room Availability Hallway Sign, Wall Mount
SW-FUSION-C-3: Crestron Fusion® Cloud
SW-FUSION-P-L: Crestron Fusion® On-premises

Notes:

1. Voice recognition, web browsing, weather information, Sonos app, and certain other functions require an Internet connection.
2. The camera, microphone, and PinPoint beacon (Bluetooth) are included on models TSW-760-B-S and TSW-760-W-S only. To ensure privacy, the camera, microphone, and Bluetooth transceiver can each be defeated programmatically at any time. For applications demanding an extra measure of privacy, Crestron offers models TSW-760-NC-B-S and TSW-760-NC-W-S, which have no physical camera, microphone, or Bluetooth transceiver installed.
3. Item(s) sold separately. Refer to each product's spec sheet for complete information.
4. Room scheduling functionality and USB support for the SSC or SSW hallway sign can be enabled using the native room scheduling application or the Room Scheduling SmartObject®. The SmartObject provides a UI similar to the TSS-752 and requires Crestron Fusion. The native application features a newer, more customizable UI, and can be used with Crestron Fusion, or without Crestron Fusion via direct connection to MS Exchange, Office 365, Google Calendar, or G Suite. Refer to http://www.crestron.com/fusion for a list of other calendaring applications that are supported through Crestron Fusion. Using the native application, the TSW-760 must be designated exclusively for room scheduling use, which precludes use of certain other features and functions described in this spec sheet.
5. PinPoint beacon functionality will be enabled through a future update. When enabled, the TSW-760 will provide an integrated, equivalent alternative to the standalone PP-100 beacon. For more details, refer to the PP-100 spec sheet. Bluetooth technology is used solely for proximity detection and does not transmit or receive any control, multimedia, or personal data. PinPoint beacons are only visible to Bluetooth enabled devices that are specifically programmed and configured to work with your system.
6. The TSW-UMB-60, TSW-UMB-60-PMK, and TSW-UMB-60-BBI are all sold separately. The TSW-UMB-60 is also compatible with older TSW-UMB-PMK preconstruction mounting kits and TSW-550-BBI back boxes, allowing the TSW-760 touch screen to be installed in place of a previous generation TSW-5xx series touch screen, or any other device that was originally installed using the a TSW-UMB-PMK or TSW-550-BBI, without modification to the wall. If replacing an APAD, CT-1000, LC-1000, TPS-4L, or TPS-2000L device, use the appropriate TSW-60-RMB retrofit mounting bracket (sold separately).

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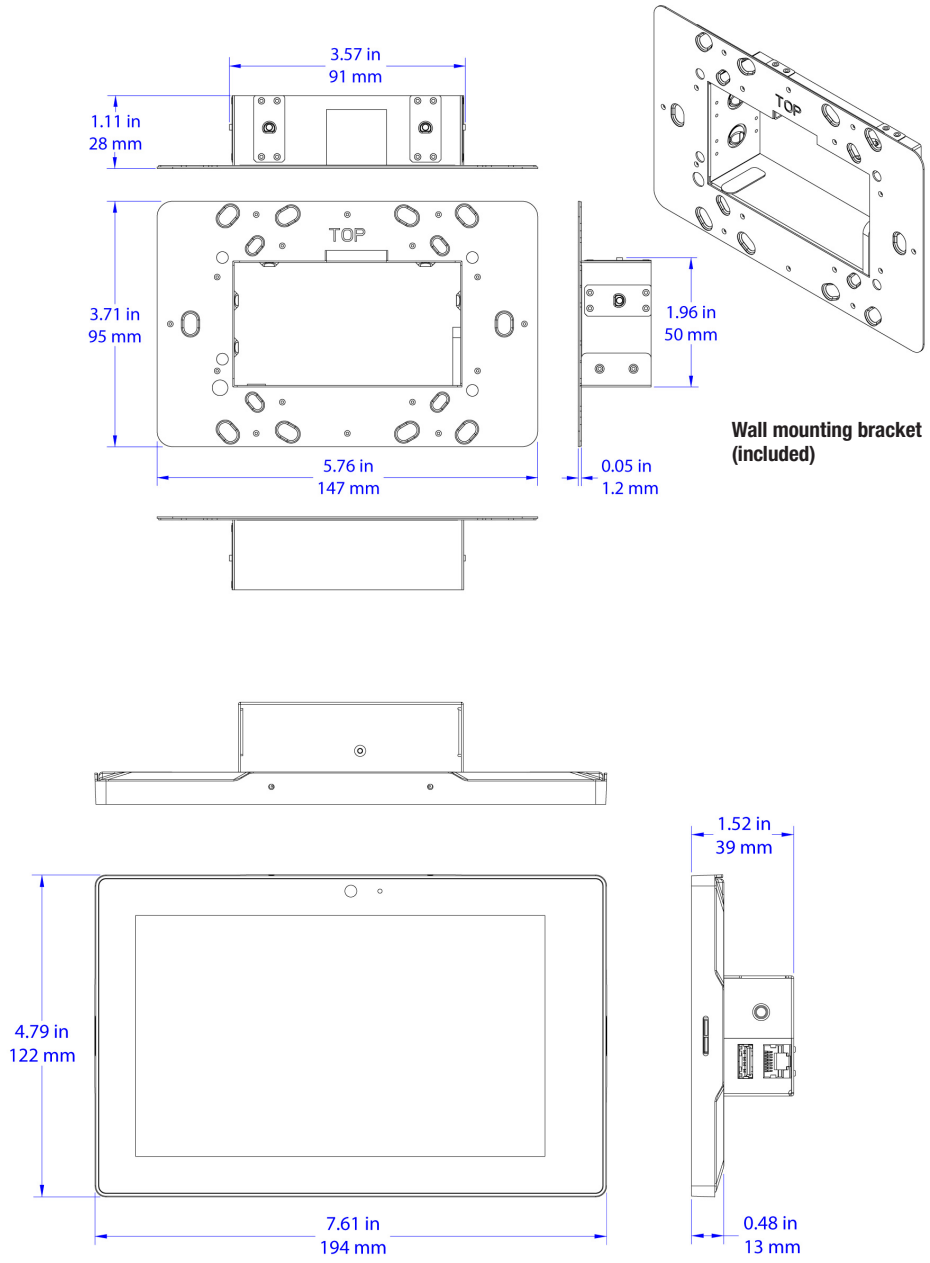
Sample Product Cutsheets (Audio-Visual)

TSW-760 7” Touch Screen



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Sample Product Cutsheets (Audio-Visual)

AXS System
for steel racks

assembled in modified MRK, WRK-SA or ERK enclosures, our AXS system for steel racks allows equipment bays to be placed against walls or back-to-back, solving the challenge posed by space-limiting environments and saving six square feet of floor space per rack!

features:

- Simplifies cabinet installation
- Shortens installation and service time
- Various sizes available - see chart on page 2
- Available with 20" and 26" frame depths (front to rear rail)
- Articulating cable carriers provide effective cable management
- Rough-in pan pre-installed
- Service tracks and leveler are both quick and simple to use
- Gangable when purchased with MRK series gangable racks
- Ball bearings allow the rack frame to roll out effortlessly
- 650 lb. capacity with proper weight distribution
- AXS systems installed in MRK series are seismic certified (when used with included MRK-Z4) with an Ip value of 1.5

MRK-4426AXS shown in service position

Also Available:
WR Series rotating roll-out enclosure, does not require tracks or stands for servicing, please see A&E specification # 96-01005

specifications:

Patented EIA compliant 19" slide-out equipment rack shall be Middle Atlantic Products model # __ (refer to chart). Rack shall consist of outer frame with internal roll-out equipment rack. External frame dimensions shall be __" H x __" W x __" D (refer to chart). Useable rack height shall be __ rackspaces (refer to chart), useable depth shall be __" (20, 26, refer to chart). Entire rack assembly shall have a weight capacity of 650 lbs. External frame shall be constructed of 16-gauge steel with black powder coat finish. Internal frame shall be constructed of 13-gauge steel with black powder coat and 11-gauge steel rackrail with tapped 10-32 mounting holes in universal EIA spacing with black e-coat finish and marked rackspaces. Top and bottom trim panels shall be 11-gauge black brushed and anodized aluminum. Rack top shall have openings to accept up to 2 fans, model # AXS-FAN (one fan) or AXS-FAN-K (two fans). Cable carrier shall be constructed of the following materials: cable carrier and lower hinges shall be constructed of 16-gauge steel, center hinge shall be constructed of 10-gauge steel, cable carrier shall be finished in black powder coat. Specified MRK AXS Series enclosures shall satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) "D" with lateral force requirements for protecting 520 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with the included (MRK-Z4) seismic floor anchor bracket. Service tracks shall be constructed of 13-gauge steel, model # TRACK50. Adjustable track leveler shall be model # TRACKL and shall level service tracks for equipment roll out and servicing. Slide-out equipment rack shall be GREENGUARD Gold Certified. Slide-out equipment rack shall be RoHS EU Directive 2002 / 95 / EC compliant. Slide-out equipment rackshall be manufactured by an ISO 9001 and ISO 14001 registered company. Slide-out equipment rack shall be warrantied to be free from defects in material or workmanship for a period of 3 years.

Customizable specification clips available at middleatlantic.com

EIA/TIA COMPLIANT

SEISMIC CERTIFIED

RoHS

GREENGUARD GOLD

PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS
UL.COM/GG
UL 2818

US PATENT# 5, 185, 818

options:

- Optional slim fan shall be model # AXS-FAN. Kit with 2 fans shall be model #AXS-FAN-K
- Optional 20" and 26" full-depth front and rear mount AXS rackshelf shall be model # SH-5A (20"), SH-5A-26 (26")
- Optional cable management tray shall be model # AXS-WT50

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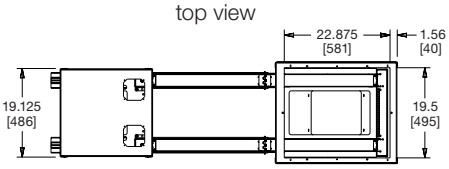
96-055S / rev h / 7-8-16

Sample Product Cutsheets (Audio-Visual)

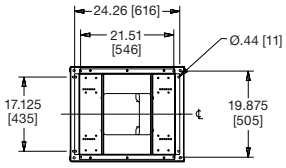
AXS System
basic dimensions

all dimensions in inches unless otherwise noted [all dimensions in brackets are in millimeters]

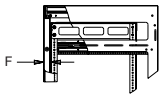
top view



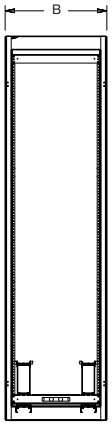
bottom view
floor mounting locations



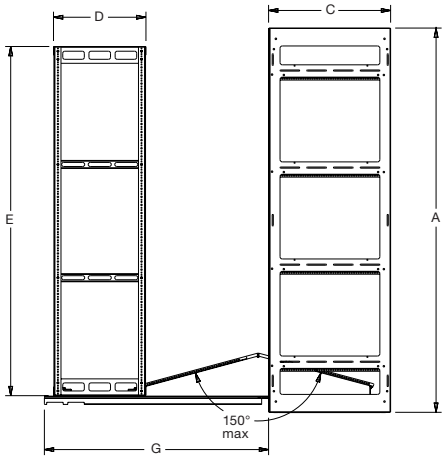
side view
cut away

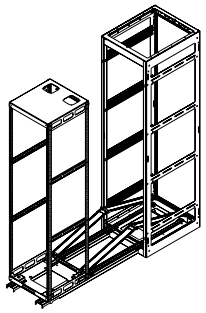


front view

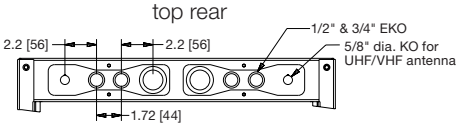


side view
fully extended

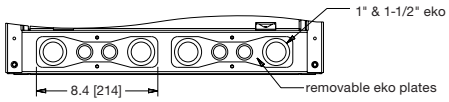




top rear



bottom rear



Part #	Useable Racking Height	A Overall Height	B Overall Width	C Overall Depth	D Frame Depth	E Frame Height	F Minimum Rail Setback	G Frame Roll Out*	Seismic Certified
MRK-4426AXS	41	83.125 [2111]	22.00 [559]**	26.40 [671]	20.00 [508]	75.5 [1919]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
MRK-4026AXS	37	76.125 [1934]	22.00 [559]**	26.40 [671]	20.00 [508]	68.5 [1740]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
MRK-3726AXS	34	70.875 [1800]	22.00 [559]**	26.40 [671]	20.00 [508]	63.25 [1607]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
MRK-4426AXS-Z4	41	83.125 [2111]	22.00 [559]**	26.40 [671]	20.00 [508]	75.5 [1919]	1.50 [38]	47.50 [1207] to 48.50 [1232]	yes
MRK-4026AXS-Z4	37	76.125 [1934]	22.00 [559]**	26.40 [671]	20.00 [508]	68.5 [1740]	1.50 [38]	47.50 [1207] to 48.50 [1232]	yes
MRK-3726AXS-Z4	34	70.875 [1800]	22.00 [559]**	26.40 [671]	20.00 [508]	63.25 [1607]	1.50 [38]	47.50 [1207] to 48.50 [1232]	yes
MRK-4431AXS-26	41	83.125 [2111]	22.00 [559]**	31.40 [798]	26.00 [660]	75.5 [1919]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
MRK-4031AXS-26	37	76.125 [1934]	22.00 [559]**	31.40 [798]	26.00 [660]	68.5 [1740]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
MRK-3731AXS-26	34	70.875 [1800]	22.00 [559]**	31.40 [798]	26.00 [660]	63.25 [1607]	1.50 [38]	47.50 [1207] to 48.50 [1232]	no
WRK-44SA-27AXS	41	83.125 [2111]	24.25 [616]	27.50 [699]	20.00 [508]	75.5 [1919]	.75 [19]	47.50 [1207] to 49.25 [1251]	no
WRK-44SA-32AXS-26	41	83.125 [2111]	24.25 [616]	32.50 [826]	26.00 [660]	75.5 [1919]	.75 [19]	47.50 [1207] to 49.25 [1251]	no
ERK-4425AXS	41	81.125 [2061]	22.00 [559]	25.00 [635]	20.00 [508]	75.5 [1919]	.625 [16]	47.50 [1207] to 49.37 [1254]	no
ERK-3525AXS	32	65.375 [1661]	22.00 [559]	25.00 [635]	20.00 [508]	59.75 [1518]	.625 [16]	47.50 [1207] to 49.37 [1254]	no

* This is the stock setback from the factory, for special knob clearance requirements for the front doors, please call.
** Side panels add .625" (16mm) to each side where applicable.

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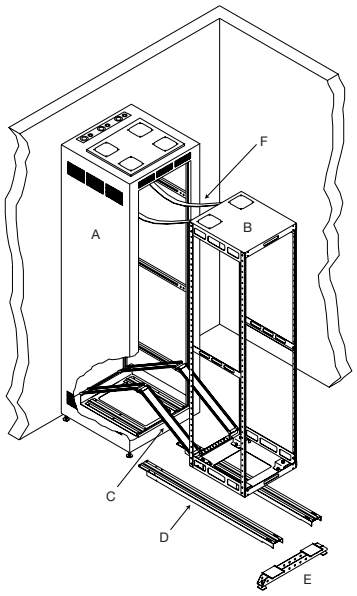
Sample Product Cutsheets (Audio-Visual)

AXS System
basic dimensions

all dimensions in inches unless otherwise noted [all dimensions in brackets are in millimeters]



exploded view
(extended with service stand)

[A] WRK-SA, MRK, or ERK enclosure

[B] Detachable rack frame

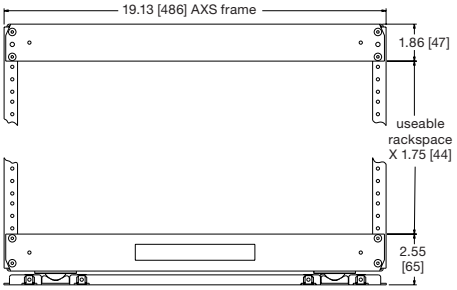
[C] Articulating cable carriers

[D] Service tracks

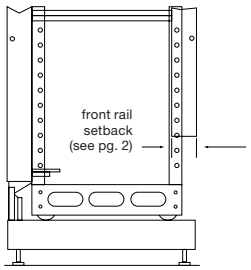
[E] Track leveler

[F] Restraining Straps

front view
(AXS inner frame)



setback

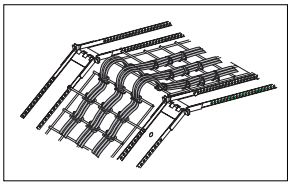


NOTE:
To calculate rail to door clearance, use the numbers in the chart on the previous page in conjunction with the door clearance found in the host cabinet's A&E Specification sheet.

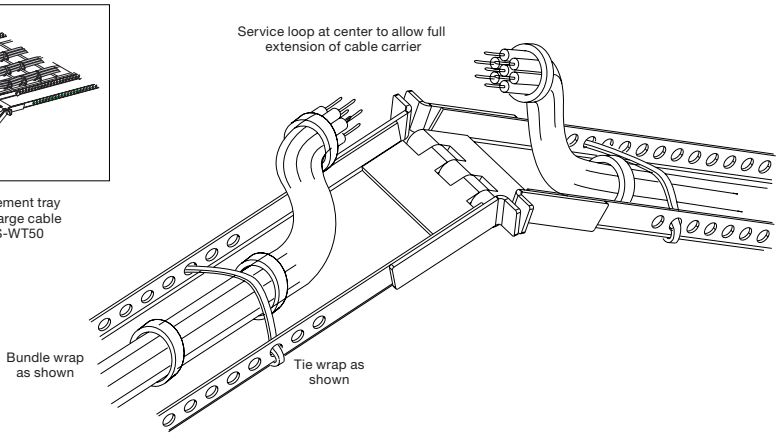
Sample Product Cutsheets (Audio-Visual)

AXS Cable Carrier
basic dimensions

all dimensions in inches unless otherwise noted [all dimensions in brackets are in millimeters]



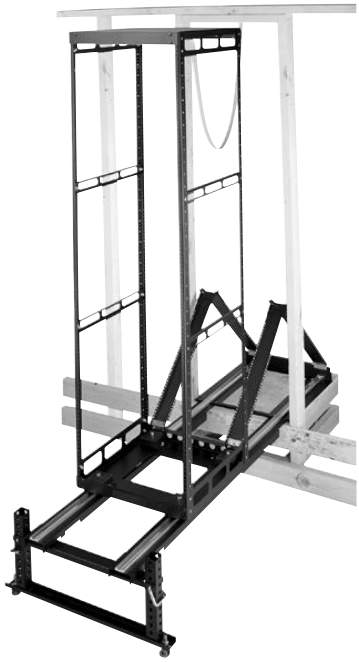
optional cable management tray is available to handle large cable bundles, part #AXS-WT50



also available

WR Series rotating roll-out enclosure, does not require tracks or stands for servicing, please see A&E specification # 96-01005.

AXS System for millwork and in-wall installations, please see A&E specification # 96-055M.



Sample Product Cutsheets (Voice/ Data)

ADVANCED NETWORK DEVICES

IPSWD-RWB

IP Speaker with LED Display and Flashers

IP Speaker Overview

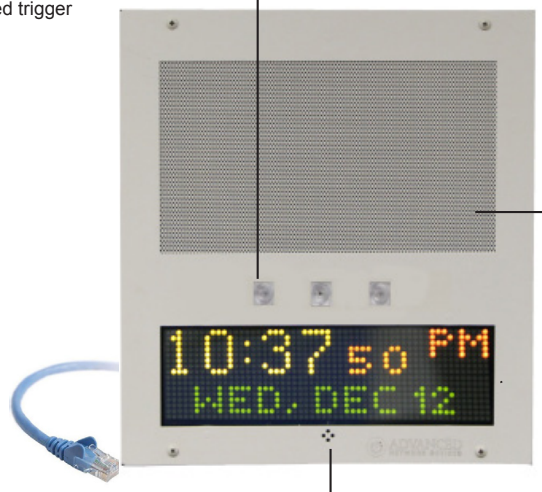
The IP Speaker is a Power over Ethernet (PoE, PoE+) synchronized clock and intercom that requires only an RJ-45 connector to connect to existing data networks. Simultaneously, broadcast to both phones and speakers. The clock auto synchronizes and can be used as a scrolling text display. Standard built in microphone and speaker for two way communication.

Capabilities

Timer/Stopwatch:
- Display 4 or 6 digits
- Configurable fonts and colors
- Count up or down
- Count days, hours, minutes, seconds, 1/100ths of seconds
- Display timer and clock simultaneously
- Event based trigger

Flashers:
- Configurable for emergencies or alerts
- Three individually controlled: one Red, one White, one Blue

Clock:
- 3" numbers/text
- Atomic time
- Never needs setting
- Auto-adjust for Daylight Savings
- Display 4 or 6 digits
- Configurable fonts and colors



Scrolling Text:

Supports multiple types of messages:
- Custom Configuration
- Reminders
- Alerts
- Advertising
- RSS/Twitter/News/Weather/ Stock feeds
- Configurable fonts and colors
- 1 or 2 Line Display

Microphone:
- Monitoring
- Two way talking/Intercom
- Paging Supervision
- Hands-free talk back

Auto Dimming:

Automatically dim for different times of day. Reduce power usage at night to save energy

Audio:
- 8" High efficiency PA Speaker
- Optional ancillary 8-ohm speaker
- Bell scheduling, reminders and alarms
- Clock chimes
- Voice paging from a PC or IP phone, scheduled or ad hoc
- Use provided notifications, alarms, audio files (sport, holiday, traditional, etc.), or your own

Features

Built in Web Server:
- Send text messages to the device from the web page
- Configurable brightness, fonts and volume
- Configurable NTP time server, time zone
- Device Status
- Field upgradable

Line In/ Out:
- Independent line-in.
- Can be configured to send line in audio to the speaker and/or add additional speakers

Easy Installation:
- Only requires CAT 5 connection (up to 300ft) to network
- Power over Ethernet (no power cord or adapter). No other equipment needed

GPIO:
- 2 inputs, 1 output
- Can be activated multiple ways including via telephone or programmatically.

Multicast:
- Full multicast and broadcast support. Send audio and/or scrolling text to individual, multiple, or all devices simultaneously.

Sound Masking:
- Generate configurable pink noise via push button or programmatically.

Two Way Communication:
- Activate via push button
- Allows for full duplex hands free communication
- Optional button for hand-free push to talk capability
- Interoperates with Cisco and other VoIP network and phones

9001 : 2008 ISO Certified

Advanced Network Devices • 3820 Ventura Dr. Arlington Hts. IL 60004 • Phone: 847-463-2236 • Fax: 847-359-5418
Website: www.anetd.com • E-Mail: sales@anetd.com

IPspeaker

Sample Product Cutsheets (Voice/ Data)

IPSWD-RWB

Software Options

- AND devices can operate standalone and do not require external software for atomic timekeeping and sending text messages from the device's web server. However, application software can be used to take advantage of the device capabilities which can then be integrated into applications like mass notification system, a phone network, etc.
- **AND Clockwise: Developed and Supported by AND.** Instantly finds and provide controls for all of you AND devices. The software provides a clock/alarm feature that supports scheduling events, alarms, stopwatch, timer with an optional sound library. It also send News/RSS/Twitter/Weather/Stock feeds, etc. messages to AND devices with a display.
- **Third Party Software:** AND has had a long standing relationship with various third party software providers. AND devices support Informacast (Singlewire), SA-Announce (Syn-Apps), IPSession (IPCelerate), MessageNet Systems, BellComander (Acro Vista), and others. AND devices will work with SIP-compatible products/PBX, such as Asterisk, 3CX, ShoreTel, etc.
- **NOTE: AND Clockwise and 3rd Party Software can run concurrently**

Mounting Options

IPSWD-RWB comes with a separate back box. Choose from surface mount (IPS-SM1) or flush mount (IPS-FM1) options.

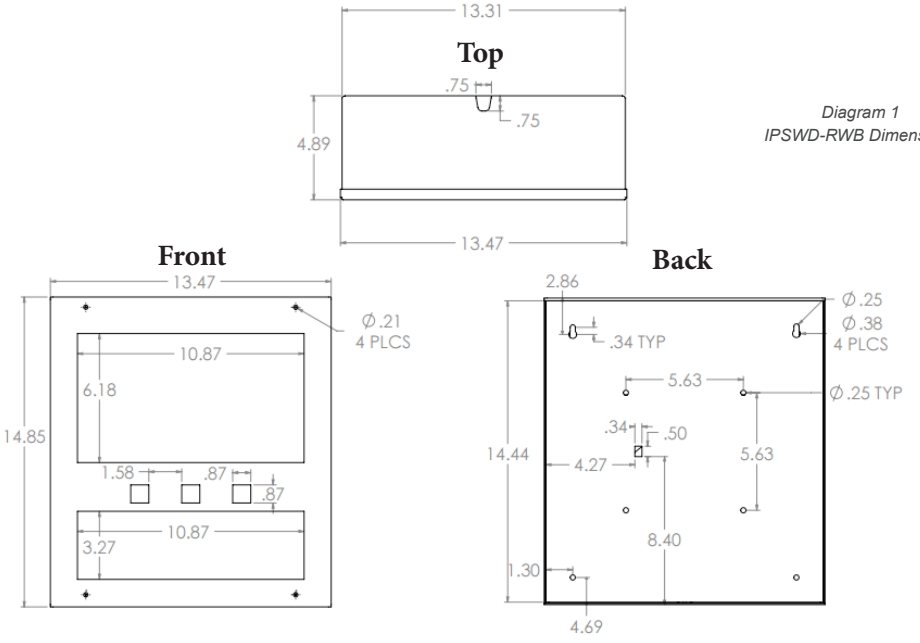


Diagram 1
IPSWD-RWB Dimensions

Specifications

- Weight: 8lbs
- Speaker Size: 8"
- Average Sensitivity: 95dB, 1W/1M
- Audio Power: 8 W/16 W
- Frequency Response: 60 Hz-17 kHz
- PoE (IEEE802.3af) 15.4 W or
- PoE+ (IEEE802.3at) 30.0 W
- 10/100 Mb network connection

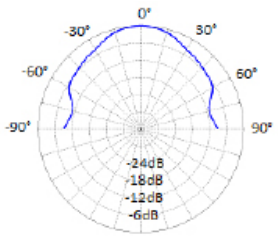


Diagram 2
8" Speaker Polar Plot
2 kHz Octave Band,
Grid Spacing = 6dB/Division

Supported Protocols

- SIP
- IPv4
- HTTP
- SLP
- TFTP
- NTP
- SNMPV1 & SNMPV2c
- DHCP
- IGMP
- ICMP
- TCP/IP
- UDP
- MDNS and MDNS-SD

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Intertek

R1.2

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