



DIVISION 27 APPENDIX – CLASSROOM TECHNOLOGY STANDARDS (Revision 22)

The following standards are for classrooms on all Western Michigan University campuses. This document shall be used in connection with any consulting pertaining to classroom technology projects. Outside consultants shall use this standard and adhere to the equipment listed herein to prepare all written bid documentation.

(Submitted by the Classroom Technology Support Group, Division of Support Services
Office of Information Technology, Western Michigan University)

Level 2 Traditional/Hyflex Classroom: Small/medium classroom designed for twenty to ninety-nine students. Mobile seating is typical in these environments. Suitable for Face-to-Face, Hybrid, HyFlex, Partially Synchronous, and Fully Synchronous online classes in classrooms, computer labs, and specialized labs. Classroom can be utilized for instructional session capture and as a broadcast point. ADA (Americans with Disabilities Act) requires speech/program reinforcement and assistive listening devices; these requirements are reflected in the equipment choices.

General equipment list:

- Screen, manual, 16:10 format
- WUXGA LCD laser projector, ceiling mounted
- Crestron 10.1" touch panel
- Classroom technology station
- VOIP two-way communication using Crestron RAVA SIP
- Five (5) building LAN ethernet connections inside technology cart.
- Crestron control system
- Remotely Accessible Switched PDU
- Blu-ray/DVD player
- UHD Document camera
- Audio system (speakers and amplifiers)
- 2 wireless microphones: 1 lapel, 1 handheld
- 1 wireless microphone receiver
- Ceiling Microphone Array
- Biamp Digital Sound Processor
- Crown Audio Amplifier
- Instructor Camera
- Room/Student Camera
- Infrared Assistive listening system for ADA compliance

Level 3 Traditional/Hyflex Classroom: Large classroom designed for one hundred or more students. Fixed auditorium seating is common in these environments. An auditorium would be equipped with items included under Level 2, and additional adjustments made because of room size (i.e. audio system complexity, powered projection screen and dual projection). ADA (Americans with Disabilities Act) requires speech/program reinforcement and assistive listening devices; these requirements are reflected in the equipment choices.



WMU Design Guidelines

General equipment list:

- Screen(s), motorized, 16:10 format
- WUXGA LCD laser projector, ceiling mounted
- Crestron 21.5" touch screen display
- Crestron Digital Graphics Engine
- Classroom technology station
- VOIP two-way communication using Crestron RAVA SIP
- Five (5) building LAN ethernet connections inside technology cart.
- Crestron control system
- Remotely Accessible Switched PDU
- Blu-ray/DVD player
- UHD Document camera
- Audio system (speakers and amplifiers)
- 2 wireless microphones: 1 lapel, 1 handheld
- 2 wireless microphone receivers
- Ceiling Microphone Array
- Biamp Digital Sound Processor
- Crown Audio Amplifier
- Instructor Camera
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AV Component Specifications

1. Screens

- A. Screens shall be mounted flush with the ceiling or above the ceiling in rooms that have 8-foot or lower ceilings. The bottom of the projected image shall be no less than 38" off the floor.
- B. Image size shall be calculated using the following formula:
For HD projection 16:9, or WUXGA projection 16:10, screen height shall equal 1/5 the distance from the screen to the furthest most seat or maximum height less than 38" from the floor.
- C. Screens in level 2 rooms shall be 16:10, minimum 123" diagonal (104" x 65") manual screen.
- D. Level 3 rooms shall be outfitted with a 16:10 ratio motorized screen of sufficient size.
- E. Screen location is determined by locating the screen away from the instructor station. Use the center of the front of the room as a starting point for the edge of the screen (Fig. 1). 2 screen setups shall locate the teaching station in the center of the room. (Fig. 2)

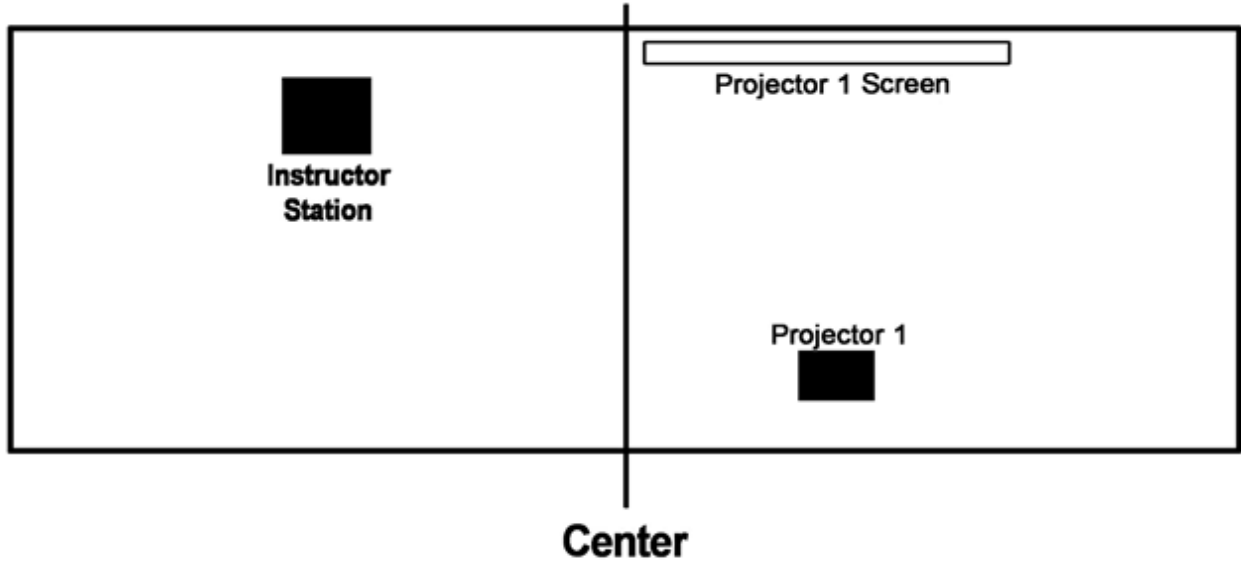


Figure 1

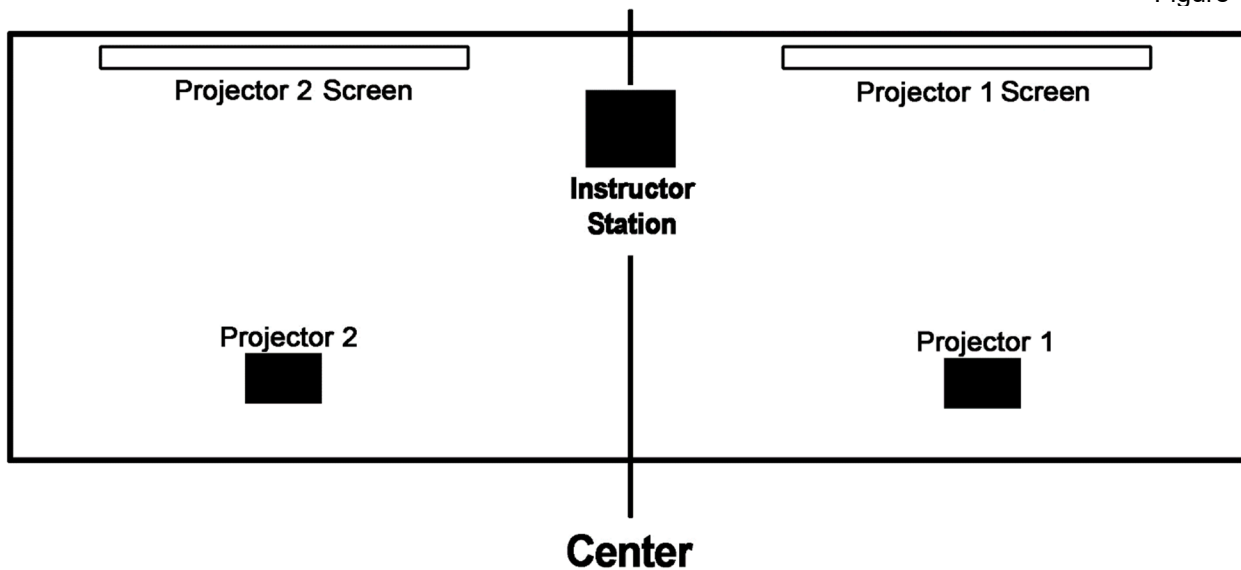


Figure 2

2. Projectors

- A. Projectors are purchased by Western Michigan University under a contract with EPSON America, Inc.
- B. Current projectors being used in classrooms:
 - i) Level 2: Epson Powerlite L630U
 - ii) Level 3: Epson EB-PU2113W
- C. Projectors shall be mounted using above ceiling structure mounts where appropriate, utilizing Chief CMA110. Where not possible (as determined by WMU Facilities), a Chief CMA450 may be substituted.
 - i) The projector shall be mounted as close to the top of the screen in height as possible with



WMU Design Guidelines

- minimal keystone of the image.
- ii) Lecture hall projectors shall be mounted with a Draper SLX series projector lift. Projector lifts shall be mandatory wherever **any** of the following criteria are met:
 - (1) Ceiling heights are greater than fifteen (15) feet from finished floor to finished ceiling
 - (2) Fixed furniture is installed underneath projector such that ladder placement is restricted by furniture.
 - (3) Finished floor is tiered, sloped, slanted, or uneven.
- D. Projection distance can be calculated using EPSON's Distance Calculator:
 - i) <https://epson.com/Support/wa00814>
- E. In a two-projector room, the projectors shall be labeled on the front, facing the instructor, as "Projector 1" to the left and "Projector 2" to the right from the instructor's point of view. (Fig. 2)
- F. The primary projector will be the unit to the left of the instructor, from the instructor's point of view. This projector would be the single image projector if only one source/display is desired, and the second projector would be used only when two projectors are being used.

3. Touch Panels

- A. Touch panels shall be from Crestron Inc.
- B. Current touch panels being used:
 - i) Level 2: Crestron TS-1070-B-S (Fig. 3)
 - ii) Level 3: Crestron TSD-2220-B and Crestron DGE-100
- C. Level 2 panels shall be mounted using TS-770/1070-SMK.



Figure 3 – See drawing: Appendix A.1



4. Classroom Technology Stations

A. Classroom technology stations shall be provided according to the following specifications:

- i) Level 2 Classroom: Spectrum (Model: 55115) (Fig.4) or (Model: 55213) (Fig. 5A).
 - (1) Metal – color and laminate color to be determined by WMU.
 - (2) Flip-Up Shelf (Model: 55540) or (Model: 55269).
 - (3) 15RU Rack Cube (Model: 55384) or 13RU Rack Cube (Model: 55381).
 - (4) Toe Kick Kit (Model: 55110) or (Model: 55382).
 - (5) Customized Logo Panel (Model: 55111) or (Model: 55199).
 - (6) 2RU Rack Rail (Model: 55113).
 - (7) Instructor-Side Door (Model: 55114).
 - (8) Retractable Cord Reel (Model: 99037).
 - (9) Cooling Fan (Model: 99051).
 - (10) Model 55115 Configuration Serial: 55115-XX-XX-X-S2-1-C-8-TK-1-8-3-0-0
 - (11) Model 55213 Configuration Serial: 55213-XX-XX-XX-S1-6-C-TK-1-6-3-0-0

- ii) Level 3 Classroom: Spectrum (Model: 55213) (Fig.5A)
 - (1) Metal – color and laminate color to be determined by WMU.
 - (2) Customized Logo Panel (Model: 55199).
 - (3) Flip-Up Shelf (Model: 55539).
 - (4) 13RU Rack Cube (Model: 55381).
 - (5) Toe Kick Kit (Model: 55382).
 - (6) 2RU Rack Rail (Model: 55113).
 - (7) Retractable Cord Reel (Model: 99037).
 - (8) Cooling Fan (Model: 99051).
 - (9) Security Panel (Model: 55383).
 - (10) Flat Panel Monitor Arm (Model: 95509) or (Model: 95512) or (Model: 95522).
 - (11) Model 55213 Configuration Serial: 55213-XX-XX-XX-S1-6-C-TK-1-6-3-0-0

- iii) Level 3 Auditorium/Lecture Hall: Marshall Trio Series SCM-640 (Fig.5B)
 - (1) Metal – color and laminate color to be determined by WMU.
 - (2) Laminate Top with Edge to Match
 - (3) Ergotron LX Desk Arm
 - (4) Plexiglass Door Upgrade
 - (5) Custom Logo
 - (6) Drop Leaf Flip-Up Shelf
 - (7) External Fan with Vent Slots



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Figure 4 – See drawing: Appendix A.2



Figure 5A – See drawing: Appendix A.3



Figure 5B – See Drawing: Appendix A.4



5. Lighting Zones

- A. Classroom lighting shall have a minimum of two zones:
 - i) Lighting fixtures closest to the projection screens shall be dimmable or on their own switch.
 - ii) Each zone shall be dimmable and controllable from the front of the classroom.
 - iii) Classroom lighting shall be installed so as to allow for the projectors to be mounted as close to the ceiling as possible.
- B. In Level 3 rooms the lighting shall be set to the following presets:
 - i) Scene 1 Default, when room is opened. All lights on 80% but slightly dimmer on screen.
 - ii) Scene 2 All on. 100% on. Evenly bright throughout room.
 - iii) Scene 3 Note taking with projection. 35% on. No light on screen
 - iv) Scene 4 Watching screen with safe lights on. Floor and exit door lights.
 - v) Scene 5 All off.

6. White Boards

- A. White boards shall be mounted on as much front wall surface as is practical.
- B. Allow at least 6' continuous whiteboard space to side of lowered screen, closest to teaching station.
- C. Marker boards shall be provided with a full width tray for erasers and markers and map rail with cork insert.

7. Intercom System

- A. The unit shall utilize the Crestron touch panel's built-in RAVA SIP client.
- B. Programming code shall work in conjunction with the RAVA SIP client to show touch panel help pages during communication.

8. Network Lines

- A. There shall be five (5) Cat-6 network lines used in each classroom technology environment connected to building LAN.
 - i) One (1) for the instructor's laptop.
 - ii) One (1) connected to a router, Cisco ISR C921-4P (Fig. 6).
 - iii) One (1) connected to DMPS AirMedia Content LAN.
 - iv) One (1) connected to Switched PDU.
 - v) One (1) for VoIP/Intercom use.
- B. One (1) network line will run directly into the technology station and be terminated into the router (Fig. 6). A single patch cable should be used to connect the Cisco switch to the Cisco Router. Patch cables shall be used to connect all AV devices to the Cisco PoE switch CBS350-16P-2G-NA (Fig. 7).
- C. One building LAN network line will run directly into the technology station with a single termination and 7' patch cable to the desktop.



Figure 6

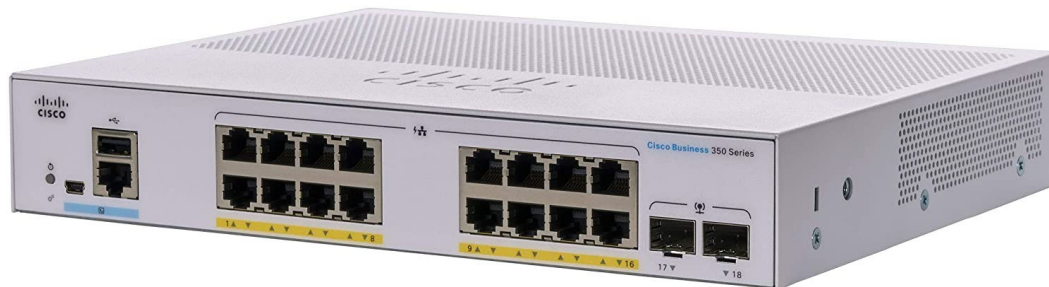


Figure 7

9. Control Units

- A. The control unit shall be a Crestron DMPS series.
 - i) Level 2 & 3 classrooms shall use model DMPS3-4K-350-C.

10. Digital Media Distribution

- A. The media distribution unit shall be a Crestron DM series.
 - i) Level 2 classrooms shall use model DMPS3-4K-350-C.
 - (1) HDBaseT via DM shall be utilized wherever practical, as opposed to utilization of a Crestron RMC. Where an RMC is utilized, it should be powered over DM via a PoDM power supply.
 - ii) Level 3 classrooms shall use model DMPS3-4K-350-C adding DM-MD8X8-CPU3-RPS or larger as needed.
 - (1) HDBaseT via DM shall be utilized wherever practical, as opposed to utilization of a Crestron RMC. Where an RMC is utilized, it should be powered over DM via a PoDM power supply.



11. Crestron Programming

- A. Programming for any non OIT supported classroom shall be based on programming provided by WMU and modified by a certified Crestron programmer. All modifications or deployed programming shall be returned to WMU as source code.
- B. Touch Panel standards and programming will be provided by WMU.
- C. Review of programming shall be done during install.
 - i) A minimum of one review before download for all level of classrooms shall be completed between the programmer and a WMU classroom technology staff member.
 - ii) All corrections are to meet the WMU classroom technology standard and shall be completed in a timely manner with regards to project deadline completions.
- D. Programming will include Crestron's Fusion room symbols and XPanel control.
 - i) The programmer shall use current version of Fusion and establish an IPID matching existing environment IP tables.
 - ii) The programmer will work with classroom technology staff to establish connection from each classroom to on-premise support systems (RavaSIP and Crestron Fusion).

12. Power Requirements

- A. In all retrofitted environments not outfitted with floor-box cable pathway that an umbilical connection does not pose a hazard to foot traffic:
 - i) Floor-boxes shall be installed if AV cable umbilical will pose a hazard to foot traffic.
 - ii) There shall be a standard 2 duplex outlet within 12 inches horizontally from the established AV cable path, to power the classroom technology equipment.
- B. In all new installation environments, those already outfitted with floor-box cable pathway, or those where umbilical connection would pose a hazard to foot traffic:
 - i) Floor-boxes shall be installed if not already existing with conduit infrastructure for all AV cables, and building LAN network connections.
 - ii) There shall be a standard duplex outlet within the floor-box, along with the established AV cable path, to power the classroom technology equipment.
- C. There shall be minimum one outlet available in the cable cubby on the technology station, optioned via the cubby manufacturer and plugged in to the technology station surge protector.
- D. Multi-outlet surge protectors shall be used for equipment power and attached to the rack within the technology station, behind the equipment. Switched PDU will be plugged into the surge protector.
- E. Power at the projector location shall have a standard duplex outlet either directly above the ceiling or flush mounted in a ceiling tile within close proximity of the projector location.



WMU Design Guidelines

13. Cabling

- A. DM-CBL-ULTRA-P shall be used, and audio cabling shall be run from the projector or speakers through the provided conduit down the wall as close to the technology cart as possible, whether that be through a wall grommet/umbilical or floor-box (see Section 12).
 - i) Wall grommet installations will require a two gang extra deep box that has a 2" brush grommet hole on the cover mounted at standard outlet height.
 - ii) Floor-box installations will require a floor-box of adequate size and structure to accommodate power requirements, conduit runs for AV cable, and conduit runs for building LAN.
 - iii) Where possible, building LAN network connections shall be contained within their own conduit meeting applicable standards set by WMU Office of Information Technology, separated from AV pathway/cabling until joined at wall-plate/floor-box.
 - (1) Separate building LAN conduit and cabling shall join at wall grommet/floor-box, and exist as "poke-thru", terminated to patch panel within the AV furniture.
 - iv) Conduit through the floor/wall shall consist of two 1 ½" paths and shall terminate above the finished ceiling at an appropriate location to allow connection to ceiling mounted equipment.
 - v) Additional conduit paths shall be installed to each additional AV component as necessary, utilizing these same parameters.
 - vi) Conduit paths may be foregone, and substituted by loose in-wall cabling only when approved by WMU AV Engineer.
- B. All DM and HDBaseT cabling shall terminate to DM-CONN-ULTRA-RECP RJ45 jacks. DM-CBL-ULTRA-PC patch cables shall be used for all endpoint connections.
- C. All cabling in the 10-foot umbilical shall be sheathed in snakeskin from the wall plate into the technology station with strain relief inside the cart.
- D. Attached to the umbilical shall be a coated steel cable of sufficient size, attached to structure at the wall, and to the structure of the technology station, to provide strain relief for length of umbilical.
- E. The power cord to the technology station shall match the umbilical length and be affixed to the umbilical cord as one run across the floor utilizing Velcro cable management.
- F. All cables shall be labeled at each end according to industry standards.

14. Documentation from Installer

- A. At least two weeks prior to the installation of equipment, preliminary drawings shall be provided electronically for approval by WMU AV Engineer.
- B. Final drawings shall be provided electronically as soon as available, reflecting as-built configurations.
- C. A copy of all manuals and warranties shall be provided within two weeks of installation completion.
- D. Before installation completion, the installer shall provide the make, model, MAC address, and serial numbers for all equipment and in which rooms this equipment has been or will be installed.



- E. At least two weeks prior to the installation of equipment the MAC addresses shall be provided for the Cisco routers. WMU will then assign IP addresses to these units, and in turn give these IP addresses to the installer/programmer (if necessary).
- F. Two complete copies of the system programming/configuration shall be provided on USB flash drive to the WMU classroom technology staff upon system commissioning.
 - i) This includes all configurations, programming, and designs for Crestron, Biamp, Cisco, Shure, and Vaddio components, and shall include any similar files not explicitly listed.
- G. A complete copy of the Crestron programming shall be emailed to the primary contact AV Engineer assigned to the project.
- H. Inventory (make, model, MAC, S/N) of all installed equipment shall be provided for each room.

15. Security

- A. Projector security shall include key-locking projector mount with security screws.
- B. Document Camera security shall include a four-digit combination Kensington style locking cable.
- C. TSD-2220-B security shall include a four-digit combination Kensington style locking cable.

Appendix A

A.1 TS-1070-B-S Bezel and Mounting





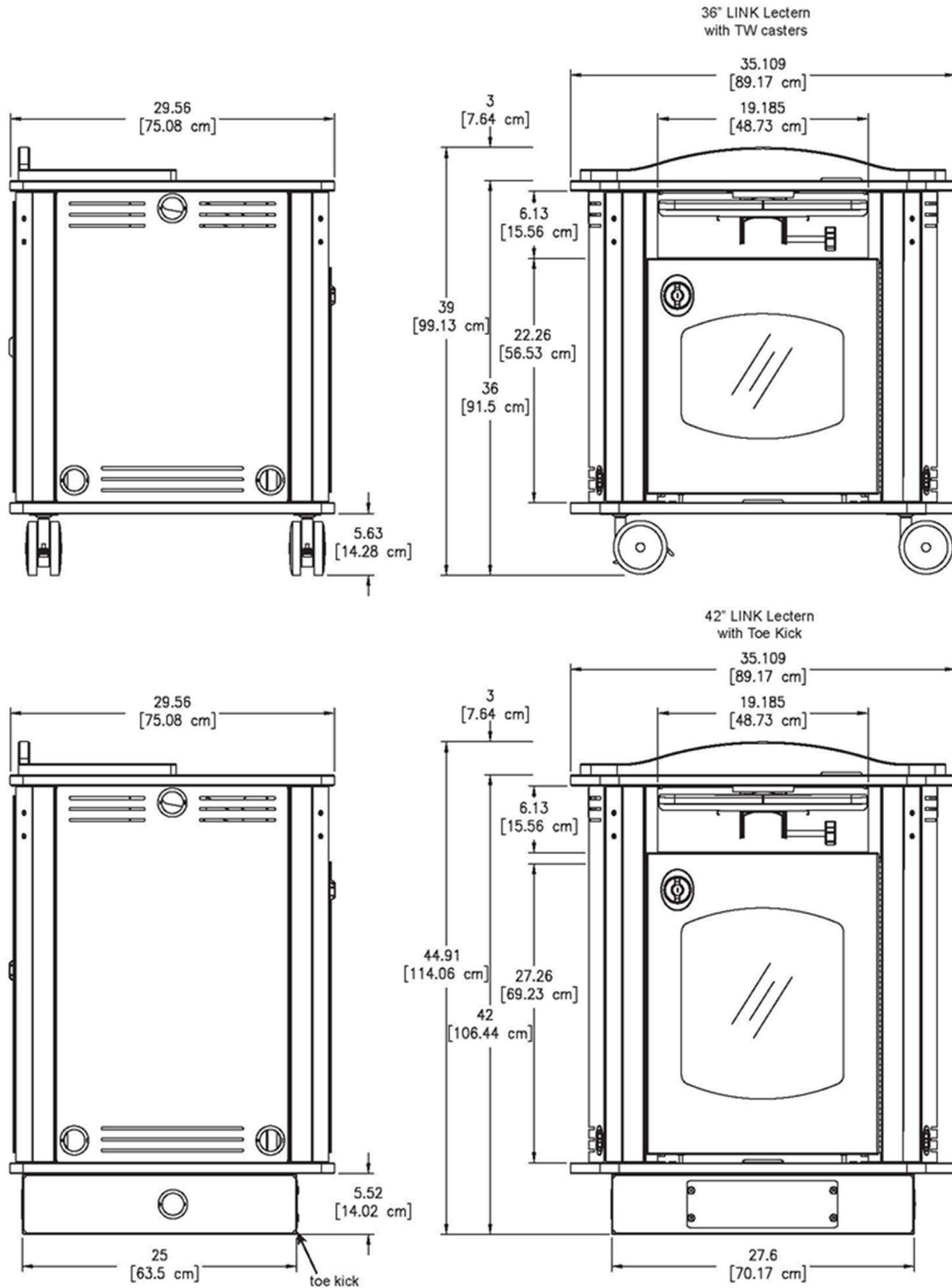
Crestron TS-1070-B-S Touchscreen



Crestron TS-770/1070-SMK Swivel Mount Kit for TS-1070-B-S



A.2 Spectrum Link Lectern – Media Manager Series Technology Station



revised 10/1/15

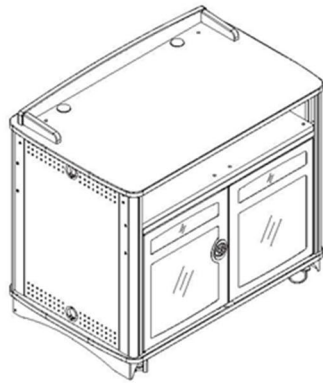


Page 5 of 11

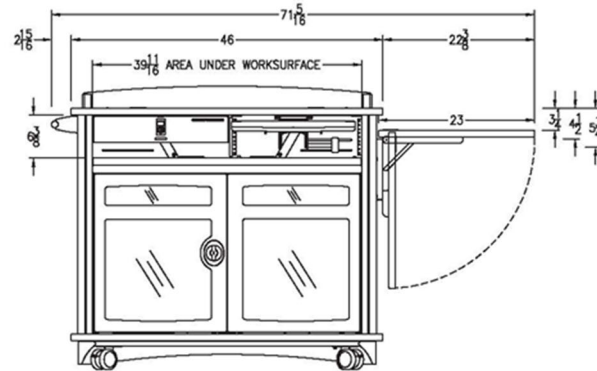
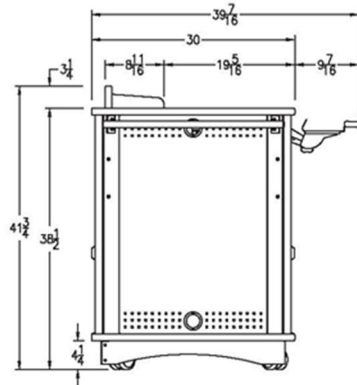
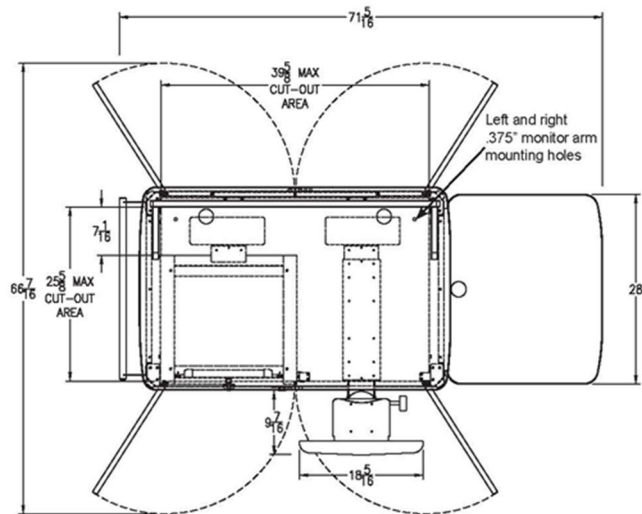


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A.3 Spectrum Director Lectern – Media Manager Series Technology Station



Media Director V2 with TW casters and surround (shown with optional handle, flip-up shelf, pull-out drawer, and adjustable keyboard tray)



Note: Modified worksurface cutouts should be reviewed by Spectrum to ensure clearance of brackets, keyboard slides, or other objects under the worksurface.



A.4 Marshall Furniture Desk – TRIO™ TECH Style Fixed Height Desk

Marshall Furniture, Inc.
Integration-Friendly Furniture®

Drawings Done By Marshall Furniture, Inc.

Project Name:

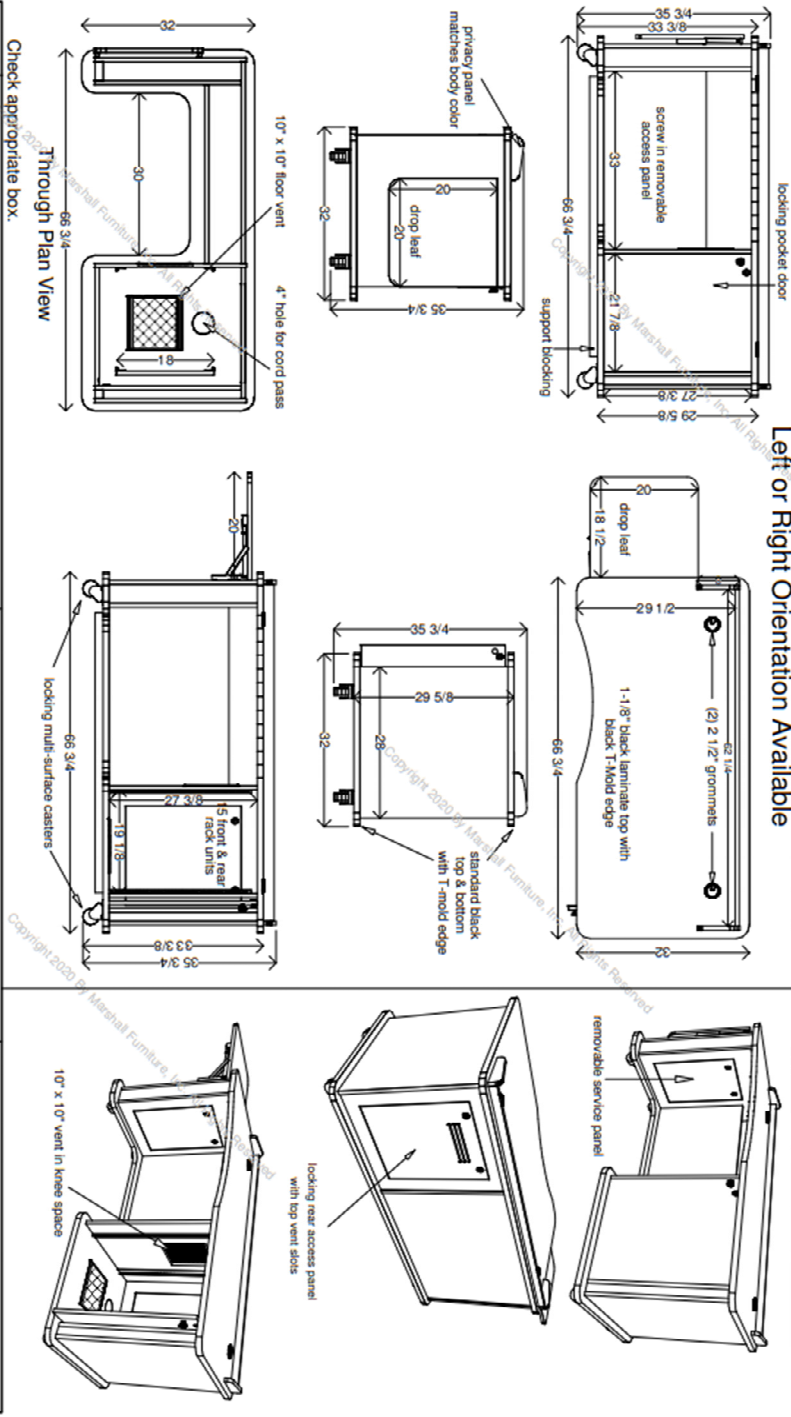
Model: SCM-640 // specifications subject to change without notice

MFI #
Date: August 10 2020

Pages 1 of 1



Left or Right Orientation Available



Check appropriate box.

<input type="checkbox"/> Ok for production <input type="checkbox"/> Ok for production with changes marked, do not resubmit <input type="checkbox"/> Resubmit drawings with changes marked.	Signature _____ Date _____
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END OF APPENDIX