1.0 GENERAL

1.1 Related UBC Guidelines

.1 UBC Learning Space Design Guidelines

2.0 MATERIALS AND DESIGN REQUIREMENTS

2.1 Design Criteria

.1 Video systems will be required to support VGA/RGBHV type input signals up to 1920x1200 resolution. VGA inputs must provide EDID emulation or management.

.2 All video outputs to display devices shall be digital outputs, with scaling capability provided either by the display device itself or by an external scaler located immediately prior to the display device input. The scalers must be able to maintain the original signal aspect ratio (4:3, 16:10 or 16:9), and should support VGA type computer resolutions and HDTV and 4K resolutions (720P, 1080i, 1080P, Ultra HD, 4K DCI).

.3 All digital video equipment will be HDCP compliant, communicate EDID status and accept signals with a minimum bit depth of 24bits at a resolution of 1920x1080 pixels @60Hz or 1080P. Equipment that is not HDCP compliant, such as a video conferencing codec or lecture capture recorder, shall be reviewed with UBC IT Audio Visual for approval.

.4 Video systems will be required to support TMDS digital inputs (DVI-D/HDMI) with minimum resolution of 4K. The digital signal input, switching and distribution system must be HDCP compliant (minimum of HDCP2.2).

.5 Video projection systems must be designed to deliver a minimum of 600 Lux (56 Lumens/sq.ft or 600 Lumens/m²) in typical learning spaces with multiple zone lighting and typical blind systems. In very large lecture theatres with screens over 14m² image areas, and complete ambient lighting control to a full blackout, special project by project allowances may be considered to reduce that requirement to 375 Lux (35 Lumens/sq.ft or 375 Lumens/m²) to balance projector cost versus performance.

.6 All RF CATV equipment is intended to operate at a nominal level of 0 dBmV to +50 dBmV on 50 ohm or 75 ohm lines.

.7 All composite and component video equipment is nominally intended to operate at 1 V p-p on 75 ohm lines. Provide terminations and interstage and distribution amplifiers as required.

.8 Video projectors must be mounted to minimize risk of vibration or shake, either initiated by mechanical systems or from wall movement caused by doors closing or people walking on the floors above the projector mounts. Structural rigidity should be raised with project structural engineer, especially where lightweight construction methods are being employed.

.9 Projectors and displays will be equipped with Sonic Shock alarms or 4-digit combination padlocks (owners choice) and anti-theft fittings and hardware.

.10 Projection booth glazing and projection ports must have glass with anti-reflective coating on both sides. Use angled glass to prevent a reflected image from being sent back into the
projector lens. A seven degree outward tilt from the perpendicular plane of the projector is recommended.

2.2 Video Source Equipment

.1 Robotic Video Camera

.1 Where robotic PTZ cameras are used in classrooms for lecture capture, overflow connectivity, or remote audiences the cameras will have HD resolution to 1080P, and the output will be available on a suitable TMDS connector (HDMI/DVI-D).

.2 The units should use a VISCA RS-232/RS-485 or Ethernet control protocol and should feature at least 6 internal presets that include PTZ settings and focus.

.3 The units should feature an adequately large optical zoom range so that the widest to narrowest shots required can be achieved without using digital zoom.

.4 The cameras should be usable when mounted upright or inverted.

.5 Approved manufacturers are:

.1 Panasonic
.2 Sony
.3 Vaddio
.4 Clearone

.2 Document Camera

.1 Tabletop mounted document cameras will have a collapsible camera arm and will have integrated top lighting for the object table.

.2 Document cameras will have a minimum resolution capability of 1280x720 on analog VGA and DVI-D/HDMI outputs. The output signal should not be HDCP protected.

.3 The document camera must include secure table top mounting brackets to reduce risk of theft.

.4 Approved manufacturers are:

.1 Elmo

.3 Computer Inputs

.1 VGA inputs will use panel mounted HD-15 connections, and should include an EDID emulator where VGA signals are being scaled to digital inputs. VGA inputs must pass all 15 pins, utilizing an HD-15 pass through connector. RGBHV connectivity (5 BNC connectors) will be rejected.

.2 Input panels mounted on walls, in racks, in lectern troughs, in meeting room tables and any other location must use industry standard Extron modular input plates, in either MAAP or AAP format.

.3 Digital inputs will use panel mounted HDMI connectors, mounted face up or at 90 degrees, and in such a fashion as to relieve stress on HDMI connector when the cable is inserted.
.4 VGA and HDMI inputs must include highly flexible connection cables between plates and laptops. Overly rigid, thick, or otherwise difficult to manage cable types will be rejected.

.5 Laptop cables must include a strain relief and a cable locking system to keep cables attached to AV input plates. When input plates are wall mounted, wall mounted J-hooks will be installed for cable storage. These hooks are to be mounted securely, adjacent the input plate, at a distance of approximately 18” apart. Hooks should be mounted at a comfortable height that is easily accessible, and in such a way that cable loops do not drape over/impede access to either the AV input plate, or nearby power or data outlets.

.4 Blu-Ray DVD with Rack Shelf

.1 Consumer quality Blu-Ray DVD players must include an integral rack mounting chassis or be mounted to a rack shelf with fitted front panel.

.2 Blu-Ray players will be controlled by IR/Serial or wired serial controls. Where the unit uses a remote IR flasher, the flasher must be installed inside the chassis directly over the IR receiver.

.3 Blu-Ray players must be equipped with HDCP compliant HDMI outputs plus stereo analog audio outputs.

.4 Blu-Ray players must have a minimum of 16 HDCP keys.

.5 Provide complete with a Middle Atlantic RSH rack shelf and fitted front panel

.6 Typical manufacturers are:

.1 Panasonic

.5 Wireless Presentation Gateway

.1 The presentation gateway shall provide Ethernet to HDMI conversion of audio and video signals. Portable devices shall be able to connect to the gateway through the local Wi-Fi network.

.2 The presentation gateway shall support up to thirty two (32) user connections.

.3 The presentation gateway shall allow simultaneous display of up to four (4) presentation sources in a quad window.

.4 The presentation gateway shall support the following operating systems:

.1 Windows 7
.2 Windows 8
.3 Windows 10
.4 Mac OS X (v10.5 to v10.11)
.5 Apple iOS
.6 Android

.5 The presentation gateway shall support Apple AirPlay mirroring.

.6 Video Output Resolution: 800x600@60Hz, 1024x768@60Hz, 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x1024@60Hz, 1360x768@60Hz,
1400x1050@60Hz, 1440x900@60Hz, 1600x1200@60Hz, 1920x1080@60Hz
(1080p60), 1920x1200@60Hz, 1920x1080@30Hz (1080i30).

.7 Audio Standards:
   .1 PCM 2-channel

.8 Audio/Video Connector:
   .1 One (1) female 19-pin Type A HDMI
   .2 One (1) HD15 female
   .3 One (1) 3.5 mm TRS mini phone jack

.9 Network Interface:
   .1 One (1) LAN/Ethernet, RJ-45, 10/100/1000 Mbit

.10 Power supply:
   .1 Local DC power source.

.11 Mounting:
   .1 Freestanding.
   .2 Surface mount.
   .3 Built-in to DigitalMedia Presentation System.

.12 Product shall be the following or Approved Equal:
   .1 Crestron AM-200
   .2 Crestron AM-300
   .3 Crestron DMPS3-4K-250-C-AIRMEDIA
   .4 Crestron DMPS3-4K-350-C-AIRMEDIA

2.3 Video Switching and Distribution Equipment

.1 Fiber Optic HDMI Extender Transmitter
   .1 Fiber optic HDMI input extenders will have at least one HDMI input connector, an HDMI
   loop thru connector for a local display, a stereo audio input, and a set of multi-mode
   fiber output connectors. Must be at least HDMI 2.0 compatible.
   
   .2 The unit must be HDCP 2.2 compliant and have the option for EDID management or
   emulation at the transmitter.
   
   .3 Crestron fiber optic distribution does not support 4K resolution. Fiber optic video
   distribution shall only be implemented when transmission distance is more than 100m
   or integrating with an existing fiber optic system, and 4K resolution is not an essential
   system requirement.
   
   .4 Approved manufacturers are:
      .1 Crestron Digital Media 8G+
      .2 Extron Fox Series

.2 Fiber Optic HDMI Extender Receiver
   .1 Fiber optic HDMI output extenders will have at least one HDMI output connector, a
   stereo audio output, and a set of multi-mode fiber input connectors. Must be at least
   HDMI 2.0 compatible.
.2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.

.3 Approved manufacturers are:
  .1 Crestron Digital Media 8G+
  .2 Extron Fox Series

.3 Fiber Optic HDMI Extender Scaler Receiver

  .1 Fiber optic HDMI output extenders will have at least one HDMI output connector, a stereo audio output, and a set of multi-mode fiber input connectors. Must be at least HDMI 2.0 compatible.

  .2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.

  .3 The receiver will have a built in scaler to allow resolutions of different display devices to be matched to the system resolution. The scaler must provide an option to maintain the original source aspect ratio.

  .4 Approved manufacturers are:
    .1 Crestron Digital Media 8G+
    .2 Extron Fox Series

.4 Fiber Optic Digital Video Matrix Switcher

  .1 Fiber optic digital video switcher will accept multi-mode fiber inputs and provide multi-mode fiber outputs. Matrix sizing will depend on system complexity, and should be sized to allow for future expansion.

  .2 The unit will switch TMDS video signals and be HDCP compliant.

  .3 The switcher frame will include power supplies and necessary fiber input and output cards.

  .4 Approved manufacturers are:
    .1 Crestron Digital Media 8G+
    .2 Extron Fox Series

.5 Hybrid Digital Video Matrix Switcher

  .1 Hybrid switchers may combine fiber optic digital video multi-mode fiber inputs and provide multi-mode fiber outputs with copper Shielded Twisted Pair digital video inputs and outputs in the same chassis. Matrix sizing will depend on system complexity, and should be sized to allow for future expansion.

  .2 The unit will switch TDMS video signals and will be HDCP compliant.

  .3 The switcher frame will include power supplies and necessary fiber or copper input and output cards.

  .4 Approved manufacturers are:
    .1 Crestron Digital Media 8G+
    .2 Extron Fox Series
.6 Copper Shielded Twisted Pair Digital Video Matrix Switcher

.1 Switchers using STP copper digital video inputs and outputs. Matrix sizing will depend on system complexity, typically 8x8 to 32x32.

.2 The unit will switch TDMS video signals and will be HDCP compliant.

.3 The switcher frame will include power supplies and necessary fiber or copper input and output cards.

.4 Approved manufacturers are:
   .1 Crestron Digital Media 8G+
   .2 Extron Fox Series

.7 UTP HDMI Extender Transmitter

.1 UTP HDMI input extenders will have at least one HDMI input connector, an HDMI loop thru connector for a local display, a stereo audio input, and UTP output connectors. Must be at least HDMI 2.0 compatible.

.2 The unit must be HDCP 2.2 compliant and have the option for EDID management or emulation at the transmitter.

.3 The extender transmitter will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.

.4 The extender transmitter must support a minimum resolution of 4k at 60hz

.5 Approved manufacturers are:
   .1 Crestron Digital Media
   .2 Extron
   .3 Kramer

.8 UTP HDMI Extender Receiver

.1 UTP HDMI output extenders will have at least one HDMI output connector, a stereo audio output, and a UTP input connectors. Must be at least HDMI 2.0 compatible.

.2 The unit must be HDCP 2.2 compliant and have the option for HDCP key management.

.3 The extender receiver will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.

.4 The extender receiver must support a minimum resolution of 4k at 60hz.

.5 Approved manufacturers are:
   .1 Crestron Digital Media
   .2 Extron
   .3 Kramer

.9 UTP VGA Extender Transmitter

.1 UTP VGA input extenders will have one VGA input HD-15 connector, a VGA loop thru connector for a local display, a stereo audio input, and a set of UTP output connectors.
.2 The unit must include for EDID management or emulation at the transmitter.

.3 The extender transmitter will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.

.4 The extender transmitter must support a minimum resolution of 1920 x 1200.

.5 Approved manufacturers are:
   .1 Crestron Digital Media
   .2 Extron
   .3 Kramer

.10 UTP VGA Extender Receiver

.1 UTP VGA output extenders will have one VGA input HD-15 connector, a stereo audio input, and a UTP input connector.

.2 The extender transmitter will require only one UTP cable, and must support signal transmission over distances of up to 100 meters.

.3 The extender receiver must support a minimum resolution of 1920 x 1200.

.4 Approved manufacturers are:
   .1 Crestron Digital Media
   .2 Extron
   .3 Kramer

2.4 Laser Projectors

.1 The projector must have at least one (1) HDCP compliant digital input, preferably HDMI 2.0. Displays should be specified with adequate input counts for the application.

.2 The projector must have at least one (1) HDMI input, one (1) HDBaseT input, and one (1) RS-232 port.

.3 The projector must have a minimum of 1920 x 1200 native resolution, and support all HDTV resolutions plus standard computer resolutions.

.4 DLP based projectors are preferred, but LCD and other technologies will be considered, as long as they are field serviceable by UBC.

.5 The projectors light source shall be laser diode with an expected half luminance life of 10,000 hours when running in normal mode. The projector shall be minimum 5,000 ANSI lumens.

.6 The projectors will have the ability to have custom UBC logo start-up/no-signal screens loaded by users in the field.

.7 The projectors will have interchangeable lens, and be equipped with horizontal and vertical lens shift as required.

.8 The projectors used in learning spaces must have a noise level of less than 35dBA.

.9 The projectors must be controllable via 3rd party control systems using RS-232 or HDBaseT. Crestron Connected products are preferred.
The projectors must have a minimum of a 3 year warranty.

Approved manufacturers:
1. Panasonic
2. Sony

2.5 Flat Panel Displays

1. The flat panel displays must have at least the following:
   1. One (1) HD-15 VGA input with an analog audio input that can be assigned to work with the VGA or HDMI PC input
   2. One (1) HDCP compliant digital input, preferably HDMI 2.0
   3. One (1) variable audio output

2. Displays should be specified with adequate input counts for the application.

3. The digital inputs must be HDCP compliant

4. The flat panel displays must have a minimum of 1920 x 1080 native resolution, and support all HDTV resolutions plus standard computer resolutions.

5. The display brightness should be a minimum of 400 Nits at full white.

6. The displays should be LED array backlit LCD display

7. The display must be controllable via 3rd party control systems, such as Crestron. Crestron Connected products are preferred. RS-232 or LAN is accepted as a control interface.

8. Professional displays must have a minimum of a 3 year warranty, and consumer or prosumer displays must have a minimum of 1 year warranty.

9. Typical manufacturers are:
   1. Panasonic
   2. Sharp

2.6 Manual Projection Screens

1. Manual projection screens should only be used for screen widths less than 96” or 2450mm wide.

2. Manual screens of any size must have a controlled spring return option included.

3. Manual screens must have a matte white fibreglass screen with a black backside.

4. For screen sizing calculations refer to the UBC Classroom Design Guidelines.

5. Typical manufacturers are:
   1. Draper
   2. Da-Lite

2.7 Motorized Projection Screens

1. Motorized projection screens must be used for screen widths over 96” or 2450mm wide.
.2 Motorized screens that will be integrated into an AV system with a control system must include LV control, integrated with a standard electrical plug. In the case of very large screens that do not allow this option, a power disconnect switch much be installed between the LVC and building power.

.3 Motorized screens must have a matte white fibreglass screen with a black backside.

.4 Screens that are recessed within a finished ceiling must include appropriate trim kit or recessed housing, to allow servicing and replacement from below, without a requirement to modify or damage ceiling.

.5 For screen sizing calculations refer to the UBC Classroom Design Guidelines.

.6 Typical manufacturers are:
   .1 Da-Lite
   .2 Draper

2.8 Video Conferencing Endpoint

.1 The video conferencing endpoint shall digitally compress audio and video streams in real time for point-to-point video conferencing meetings.

.2 The video conferencing endpoint shall have the following minimum performance:
   .1 Protocols:
     .1 H.323
     .2 SIP
   .2 Dual Stream:
     .1 H.239
     .2 BFCP
     .3 Support for resolutions up to 1080p30
     .4 Independent of the main stream resolution
   .3 Bandwidth:
     .1 1080p30 from 1472 kbps
     .2 1080p60 from 2560 kbps
   .4 Video Standards:
     .1 H.263
     .2 H.263+
     .3 H.264
   .5 Video Input Resolution: 1920 x 1080@60 and 59.94 Hz (1080p60), 1920 x 1080@50 Hz (1080p50), 1920 x 1080@30 and 29.97 Hz (1080p30), 1920 x 1080@25 Hz (1080p25), 1920 x 1080@24, and 23.97 Hz (1080p24), 1280 x 720@60, and 59.94 Hz (720p60), 1280 x 720@50 Hz (720p50), 1280 x 1024@60, and 75 Hz (SXGA), 1024 x 768@60, 70, 75, and 85 Hz (XGA), 1440 X 900@60 Hz (WXGA+), 1280 x 768@60 Hz (WXGA).
   .6 Video Output Resolution: 1920 x 1080@60 Hz (1080p60), 1920 x 1080@50 Hz (1080p50), 1280 x 720@60 Hz (720p60), 1280 x 720@50 Hz (720p50)
   .7 Audio Standards:
     .1 G.711
     .2 G.722
     .3 G.722.1
     .4 G.728
     .5 G.729
     .6 ACC-LD
     .7 OPUS
.8 IP Networking:
.1 DNS lookup
.2 IP adaptive bandwidth management
.3 H.245 DTMF tones in H.323 and RFC 4733 DTMF tones in SIP
.4 URI dialing
.5 TCP/IP
.6 DHCP
.7 802.1Q VLAN
.8 802.1p QoS
.9 Network Interface:
.1 One (1) LAN/Ethernet, RJ-45, 10/100/1000 Mbit
.10 Control Interface:
.1 Full application programming interface (APIs) via TCP/IP and RS-232C.

.3 Provide splitter adapter as required to extend camera connection.

.4 Product shall be Cisco, Polycom or Approved Equal.

2.9 Interactive Display System

.1 The interactive display must have at least one (1) HDCP compliant digital input, preferably HDMI 2.0. Display should be specified with adequate input counts for the application.

.2 The interactive display must have a minimum of 1920 x 1080 native resolution, and support all HDTV resolutions plus standard computer resolutions.

.3 The interactive display should have an average brightness of 300 cd/m2.

.4 The interactive display should be LED array backlit LCD display.

.5 The interactive display system shall have 10-point capacitive multi-touch.

.6 The writing surface shall have fingerprint and scratch resistance.

.7 The interactive display must be controllable via 3rd party control systems using LAN or RS-232.

.8 The interactive display must have a minimum of a 3 year warranty.

.9 The interactive display size shall be minimum of 80” diagonal.

.10 The flat panel displays shall be mounted using an appropriate wall mount tilt bracket. The product manufacturer for the mount shall be Chief.

.11 Product shall be Sharp PN-L803C, Christie FHQ842-T, Planar UR8451 or Approved Equal.

2.10 Video Wiring

.1 Duplex Multimode Fiber Optic 50/125 Cables

.1 For all 8 Gbps duplex multimode fiber optics connections, provide 50 micron core, 125 micron cladding multimode duplex fiber optics cable with an overall diameter of 3mm. the cable jacket shall be PVC in orange colour. Insertion loss shall be smaller than 0.5dB and have a ferrule end face radius of less than 30mm. operating temperature
shall be 02 to plus 70 degrees.

.2 Typical products are:
.1 Corning Premium
.2 Crestron DM fiber
.3 Extron OM4 MM P

.2 Duplex Multimode duplex Fiber Optics Patch Cables
.1 For all 8 Gbps duplex multimode fiber optics connections provide 50 micron core, 125 micron cladding multimode duplex fiber optics cable with an overall diameter of 3mm. Insertion loss shall be smaller than 0.5dB and have a ferrule end face radius of less than 30mm. Operating temperature shall be 02 to plus 70 degrees. The patch cable shall be equipped with 2 multimode LC connectors at each end. The patch cables shall be in the following overall length 1m, 2m, 3m, 5m, 10m,

.2 Typical products are:
.1 Corning Premium
.2 Crestron DM fiber
.3 Extron 2LC OM4 MM P

.3 CAT5e Shielded Twisted Pair Video Cable
.1 Must be certified to minimum CAT5e specifications, 350 MHz bandwidth
.2 Must include end to end foil shield with 100% coverage
.3 Must include 4 pairs of 24 AWG solid copper conductors
.4 Maximum overall cable diameter is 0.260"
.5 Must be available in both plenum and non-plenum rated versions
.6 Typical manufacturers are:
.1 Belden
.2 Crestron

.4 HDMI Cables
.1 Must be minimum HDMI 2.0 certified
.2 Must support minimum data transfer rate of 10.2 Gbps, and minimum 48 bit colour depth
.3 Cables shorter than 15’ in length must support a minimum resolution of 2160p/4K UHD at 30hz
.4 Cables greater in length than 15’ must support a minimum resolution of 1080p/Full HD at 60 hz
.5 Must support a minimum of 8 high bandwidth, uncompressed multichannel audio streams
.6 Must include high quality, gold plated connectors
.7 Must be highly flexible. Overly rigid, thick, or otherwise difficult to manage cable types will be rejected.

.8 Where cable runs are longer than those attainable with standard HDMI cabling, appropriate transmitter/receiver extender sets, HD-BaseT extenders, or signal boosters should be specified.

.9 Cables should include factory manufactured ends. Modular cables (Rapid Run, etc.) will be rejected.

.10 Typical manufacturers
   .1 Kramer
   .2 Crestron
   .3 Extron

2.11 Video Connectors

.1 Fiber Optics Connector Modules
   .1 Systems using fiber optic cables must have the fiber trunks be terminated in fiber optic patch bays or modular connector termination boxes in the AV racks and in the lectern.
   .2 Extenders, transmitters, receivers and switchers will be connected to the patch bays or termination boxes using pre-fabricated fiber-optic patch cables.
   .3 Typical: Corning Pretium Plug & Play Classic CCH-CP24-D3 series.

3.0 EXECUTION

3.1 Wiring
   .1 Isolate all BNC video connectors from building ground on all panels, plates and bulkheads.
   .2 Install video cable in a manner that will prevent sharp bends or kinks. Use right angle BNC connectors where necessary to prevent cable kinking in shallow electrical boxes.

3.2 Testing

   .1 Measure, verify, and document proper operation of the high resolution video system by measuring and document the line loss in RGBHV cable as follows:
      .1 Use either a 1280x800 or 1920 x 1200 (match test resolution to main display native resolution), 60Hz vertical computer video test signal generator signal that produces peak white levels, connected at one end of each cable, with red, green and blue test signals operating at 0.7V P-P and the H and V sync signals at TTL levels. At the other end of each cable, measure the signal with an oscilloscope of suitable bandwidth. Line loss should not exceed 2dB.
      .2 Test the video system wide high frequency response using an indicator/generator using the contrast transfer function (CTF)
   .2 Measure RGBHV video distribution amplifier or switcher performance, including frequency response, gain and noise levels:
.1 Check frequency response using either a 1280x800 or 1920 x 1200 (match test resolution to main display native resolution), 60Hz vertical computer video test flat field signal at the input of each device, and with an oscilloscope at each of the red, green, and blue outputs of each device, the signal should not exceed 2dB loss at 150MHz.

.2 Check and adjust gain using either a 1280x800 or 1920 x 1200 (match test resolution to main display native resolution), 60Hz vertical computer video test signal generator with a 75% color bars red, green, and blue output level of 0.7V p-p, at the input of each device, and with an oscilloscope at each of the red, green and blue outputs of each device, adjust for unity gain. ±0.5dB.

.3 Check noise level using the following method. With no signal at the input of each device, measure noise levels at the output(s) on an oscilloscope. Noise voltage levels shall not exceed -55dB, which is 1.0mV p-p ref. 0.7V p-p.

.3 Multi-scan RGB Computer/video Display devices

.1 Set image configuration of the display device according to the setup (front/table, front/ceiling, rear/table, rear ceiling) (to the extent provided by the display device)

.2 Perform optical and electronic focus (center edge and corner) to achieve maximum center-edge focus alignment (to the extent provided by the display device)

.3 Perform geometrical alignment (size and shift adjustments of: horizontal, vertical, tilt, skew, bow, keystone, pincushion, amplitude, linearity, etc.) to achieve optimal image alignment on the specified image area (to the extent provided by the display device).

.4 Adjust static and dynamic R-G-B convergence to achieve pixel alignment of maximal acceptable ½ pixel offset centre and edge (to the extent provided by the display device).

.5 Adjust image aspect ratio as well as blanking settings according to the specified image area/size (to the extent provided by the display device)

.6 Minimize the usage of digital keystone adjustments by aligning the projector physically and properly adjusting the optical keystone correction.

.7 Adjust Black level according to the PLUGE test pattern

.8 Set the Gamma Correction to 2.2 for all video display devices (Make sure all display sources such as cameras are set at 0.4545

.9 Adjust Input Balance (Black/White Balance) by using a source signal with dominant white and white areas and adjust according to the manufacturers specifications size (to the extend provided by the display device).

.10 Adjust the colour balance for correct exposure by using a greyscale. White nor grey shall have color and the waveform shall show no evidence of subcarrier

.11 Check for, and eliminate “hum bars”, “jitter”, ghosting and other visible interference or degradation.
.12 Adjust display device pixel clock and image phase according to the source dot clock (in case of various sources adjust per source and store in display device memory settings).

.4 Measure, verify, and document proper operation of the fiber optic or CAT5e based video system performance in accordance to the TIA/EIA-568-B.3 standards:

.1 Test and document end-to-end attenuation for each simplex and duplex multimode fiber optics link to determine optical power loss between each cable termination point.

.2 Measure and document fiber optics cable systems insertion loss for each connectordized cable link, using a stabilized optical source and an optical power meter to compare the difference in optical power levels in dBm, by measuring how much light is put into the near end and how much light is exiting the far end. Use factory approved 50/125 core test jumpers only. Perform this procedure in accordance to the TIA/EIA OFSTP-14A multi-mode fiber testing specifications.

.3 To prevent high order modes from invalidating the power loss testing they must be attenuated during the referencing step to obtain a valid measure of the optical power travelling along the fiber core using the mandrel wrapping method. Use a mandrel diameter of 22mm for the multimode 3.0mm jacketed 50/125 core fiber optics cabling system.

.4 For all fiber optics cable runs longer than 100m (300feet) conduct and document a signature trace using an optical time domain reflectometer (OTDR) to locate fiber events and measure losses attributable to cable, connectors & splicing.

.5 For all Crestron Digital Media systems, provide a complete Digital Media test report forward to the Owner, or their designated Consultant a complete report detailing test results obtained above, accompanied by a letter certifying that all video components meet manufacturer’s specifications and that the system is complete and ready for inspection.

3.3 Test Equipment

.1 Provide video test equipment on site during check-out where necessary to measure and document the system performance outlined in section 3.8:

.1 800 MHz oscilloscope

.2 Video test generator with analog and digital video signal resolutions up to 1920x1200 pixels, as well as 720P and 1080P HDTV signals

.2 Provide the following fiber optics test equipment on site during check-out where necessary to measure and document the system performance outlined in section 3.8:

.1 Optical meter, optical sources, two test jumpers & adapters, for 850nm & 1310nm multimode & single mode fiber optical systems testing

.2 Optical Time Domain reflectometer (OTDR) and test fiber box for 850nm & 1310nm multimode & single mode fiber optical systems testing

.3 Fiber termination microscope
.3 Provide test equipment of professional quality and in good working order. Substandard equipment will be cause for rejection. The Owner, or their designated Consultant reserves the right to demand proof of equipment accuracy.

***END OF SECTION***