The HD-DTDS Specification

Setting the standard for digital system design and installation to assure optimal performance.



Part I: Video Transport

SUMMARY

The HD Digital Transport and Distribution System shall include providing and integrating the following principal systems:

- 1. Audio/Video switching.
- 2. Audio/Video distribution at native resolution without compression.
- 3. Video interface equipment.
- 4. Audio interface equipment.
- 5. HDMI signal transport.
- 6. HDCP support.
- 7. Deep Color support.
- 8. EDID management.
- 9. HDCP KSV handling/management.
- 10. Digital diagnostic tools.

DEFINITIONS

Source – AV equipment connected to the inputs of the AV switching system

Sink – AV equipment connected to the outputs of the AV switching system (i.e. displays, audio processors)

KSV – commonly called an HDCP 'key'. A unique ID for each HDMI sink that must be sent to HDCP-enabled sources in order for the sinks to receive content.

Video timing – a combination of resolution and refresh rate (i.e. 1920x1080@60)

PRODUCTS

AUDIO VIDEO SWITCHING

The AV switching system shall support at least 6.75Gbps of data transfer on each input and output to support 1080p 36-bit (Deep) Color video resolutions without compression.

The AV switching system shall support 8 channel audio.

The AV switching system shall support audio breakaway from video.

The AV switching system shall have less than 5us of latency from AV input to AV output.

The AV switching system shall support the HDMI specification of less than 1 in 1x10⁻⁹ bit errors at 1080p 36-bit (Deep) Color.

The AV switching system shall downmix multi-channel audio into 2-channel audio so that the same audio content may be routed to both multi-channel and 2-channel sinks.

The AV switching system shall be able to dither between standard and deep color video signals on each input and output.

The AV switching system shall support the following AV signal inputs:

- HDMI 1.3a (High Definition MultiMedia Interface)
- DVI 1.1 (Digital Visual Interface)
- DisplayPort Multimode 1.1
- Analog RGB
- YPbPr
- S-Video
- CVBS
- SPDIF
- Analog Stereo Audio

The AV switching system shall transcode the AV signals to a single signal type for distribution.

AUDIO VIDEO DISTRIBUTION

The AV distribution system shall use multimode fiber or shielded twisted pair for AV signal distribution.

The AV distribution system shall route AV signals from any input to any output with less than 1ms of latency.

The twisted pair structured cabling used to carry the AV signals shall be shielded.

The twisted pair structured cabling used to carry the AV signals shall be specified to 1.2GHz of bandwidth or greater.

The AV distribution system shall not require extra cabling to transmit the following control signals for AV sources and sinks:

- RS-232
- Infrared
- Ethernet
- USB Human Interface Device-class devices
- Contact closure

EDID MANAGEMENT

The AV switching system shall allow configuration of the EDID presented to sources on each AV input.

Each input on the AV switching system shall be configured independently.

The AV switching system shall by default present an EDID to each input that includes only the video timings and audio formats common all sinks connected to the outputs.

The AV switching system shall allow the user to enter each input's EDID video timings individually.

The AV switching system shall allow the user to enable and disable support for the following items in each input's EDID.

- Deep color
- 3D support

HDCP MANAGEMENT

The AV switching system shall support HDCP 1.1 or greater.

The AV switching system shall detect the number of KSVs supported by each source.

The AV switching system shall not send a source more KSVs than it supports.

The AV switching system shall cache the KSVs from each connected sink.

The AV switching system shall authenticate all cached KSVs with each source up to the source's KSV limit, so that authentication does not need to be re-started each time content is routed to a new output.

SIGNAL DETECTION

The AV switching system shall report the following incoming signal information to an AV control system:

- Signal detect
- Horizontal and vertical resolution
- Signal refresh rate
- Presence of HDCP

The AV switching system shall report the following information to an AV control system:

- HDCP authentication status for each source and sink
- EDID Preferred video timing for each sink
- Maximum number of KSVs supported by each source

TROUBLESHOOTING

The AV switching system shall report the following information for troubleshooting:

- Maximum number of KSVs supported by each source
- The number of KSVs sent to each source
- EDID indicated Video timings and audio formats supported for each sink
- EDID presented to each source

The AV switching system shall support off-site remote troubleshooting via Ethernet

SYSTEM DESIGN

The contractor shall provide AV source equipment with support for enough KSVs so that it can be routed to all sinks simultaneously.

If a particular AV source cannot be found to support enough KSVs to route to all sinks simultaneously, the contractor shall:

- a. Notify the Engineer
- b. Configure the AV switching equipment so that it shall not send an AV source more KSVs than it supports.

The contractor shall configure the EDID presented to each AV source to indicate only the video timings supported by ALL sinks used for viewing and distributing video.

The contractor shall configure the EDID presented to each AV source to indicate support for only the audio formats actually supported by ALL the sinks used for distributing audio.

The contractor shall verify the data rate supported by each shielded twisted pair cable used for AV distribution.

The contractor shall provide display equipment that does not overscan the video signal when full-pixel sources are routed.

DEMONSTRATION AND ACCEPTANCE TESTING

The demonstration and acceptance tests shall be done by a Crestron DigitalMedia Certified Engineer (DMC-E)

The contractor shall provide a copy of the following information in electronic format in order to verify the AV switching equipment has been installed and configured correctly:

- The number of HDCP KSVs УKeysΦ supported by each source
- The video timing, HDCP use and audio format of each source when operating (not needed for walk-in equipment)
- The video timings and supported audio formats for each connected sink
- The video timings and supported audio formats presented in the EDID to each source the preferred video timing shall be indicated
- The length of cable used on all shielded twisted pair cable used for AV distribution
- The data rate supported by each shielded twisted pair cable used for AV distribution

APPENDIX A: VIDEO FORMATS AND ASSOCIATED DATA RATES

Video Format	Data Rate (Gbps)
1080p Deep Color	6.75
1600x1200	4.86
1920x1200	4.62
1080p	4.44
1360x768	2.54
720p / 1080i	2.22
1024x768	1.91

END OF PART I

PART II: Product Specification

GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

SUMMARY

- This Specification, in conjunction with the Drawings, establishes the requirements necessary to achieve the intended performance, installation and functions of the HD Digital Transport and Distribution System.
- Provide the services necessary to furnish, install, train, and to provide maintenance support for the HD Digital Transport and Distribution System including all required peripheral apparatus conforming to acceptable industry standards. All work shall be in accordance with the true intent of these Drawings and Specifications, and as required to leave the HD Digital Transport and Distribution System complete and in satisfactory operating condition.
- Verify dimensions and conditions at the job site prior to installation, and perform installation in accordance with these Specifications, Manufacturers recommendations and the latest edition or revision of all applicable codes and standards.
- The HD Digital Transport and Distribution System shall include providing and integrating the following principal systems:
 - 1. Audio/Video switching.
 - 2. Audio/Video distribution at native resolution without compression.
 - 3. Video interface equipment.
 - 4. Audio interface equipment.
 - 5. HDMI signal transport.
 - 6. HDMI 1.3 support.
 - 7. Deep Color support.
 - 8. Resolution management.
 - 9. HDCP key handling/management.
 - 10. Fast HDMI switching with keep alive HDCP link.
 - 11. Multi-Channel Surround Sound Audio.
 - 12. Digital diagnostic tools.
- The HD Digital Transport and Distribution System shall operate as a stand alone point-to-point system delivering local content to a far-end sink (display). It shall also operate as part of a larger matrix switching system.

CONFLICT BETWEEN DRAWINGS AND SPECIFICATIONS

It is intended that any contractor furnishing materials and/or labor necessary for the completion of this specification shall furnish it in compliance with this specification. Where conflict exists with other specifications concerning such materials and labor, this specification takes precedence unless otherwise approved in writing by the Engineer.

Drawings pertaining to this specification shall be considered as a part of said specification and shall be a part of the bid documents.

REQUIREMENTS OF REGULATORY AGENCIES

- The system shall be registered under the most current applicable rulings of the Federal Communications Commission (FCC). Provide the FCC registration number with the equipment submittal. All components and installations shall bear an Underwriters' Laboratories (UL) listing and shall conform with the latest edition or revision of the following codes and standards were required:
 - 13. ANSI American National Standards Institute
 - 14. ASTM American Society for Testing and Materials
 - 15. BICSI Building Industry Consulting Services International
 - 16. EIA Electronics Industries Association

- 17. FCC Federal Communications Commission
- 18. ICEA Insulated Cable Engineers Association
- 19. IEEE Institute of Electrical and Electronics Engineers
- 20. ISO International Organization for Standardization
- 21. NEC National Electrical Code
- 22. NEMA National Electrical Manufacturer's Association
- 23. NFPA National Fire Protection Association.
- 24. TIA Telecommunications Industry Association
- 25. UL Underwriters Laboratories, Inc.
- The code or standard establishing the more stringent requirements shall be followed where areas of conflict occur between codes and standards or between codes and standards and Drawings and Specifications.

SHOP DRAWINGS

- Shop Drawings: Within Seven (7) calendar days after award of contract, submit detailed shop drawings to the Engineer for approval. Do not begin installation or fabrication without such approval. All shop drawings shall be marked with the pertaining specification paragraph or drawing number when submitted.
- Shop drawings shall be provided clearly depicting any proposed modification to the project drawings. Any modifications shall be highlighted on the shop drawings.
- Shop drawings shall be provided indicating proposed mounting arrangements and details of all equipment, including positioning devices, framework supports and interface with adjacent architecture.

JOB CONDITIONS

- Keep the job adequately staffed at all times. Unless illness, loss of personnel or other circumstances beyond the control of the contractor, maintain the same individual in charge throughout.
- Cooperate with all appropriate parties in order to achieve well-coordinated progress with the overall construction completion schedule and satisfactory final results.
- Watch for conflicts with work of other contractors on the job and execute, without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or to preserve symmetry and aesthetically pleasing appearance.
- Immediately report to the Engineer any design or installation irregularities, particularly architectural elements that interfere with the intended coverage angles of loudspeakers and projectors, so that appropriate action may be taken.
- Do all cutting, patching and painting necessary for proper and finished installation of the system and repair any damage done as a result of such installation. Cleanup and dispose of trash from all work areas.

QUALITY ASSURANCE

- All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.
- Procure and pay for all necessary permits, licenses and inspections and observe any requirements stipulated therein. Conform in all trades with all local regulations and codes.

Comply with federal, state and local labor regulations and applicable union regulations.

PRODUCTS

HD CONTENT POINT-TO-POINT TRANSPORT SYSTEM

Provide and install as indicated on the drawing an HD Content Point-to-Point Transport System.

- The HD Content Point-to-Point Transport System shall be an advanced signal extender system incorporating the following features:
 - 26. HD Content Transmitter.
 - 27. HD Content Receiver.
 - 28. UTP/STP or Fiber Optic cabling.
 - 29. HDCP 1.1 support.
 - 30. Fast HDMI switching.
 - 31. CEC support.
 - 32. Uncompressed video and audio transport.
 - 33. HDMI 1.3 with Deep Color.
 - 34. 7.1 channel HD lossless audio.
 - 35. Video resolutions up to 1920x1200 or 1080p/60.
 - 36. Advanced video detection on every video type, including resolution, frame rate and color depth.
 - 37. IR and RS-232 control over local device(s) (when used with a control system by same manufacturer).
 - 38. Ethernet support.
 - 39. Signal transmission up to 450 feet via UTP/STP cable.
 - 40. Signal transmission up to 3000 feet via fiber.
- The HD Content Point-to-Point Transport System shall operate as a stand alone system. It shall also integrate with the HD Content Switcher.
- The HDMI Transmitters shall be able to extend HDMI (including audio), DVI-I, RGBHV, RGBS, RGsB, YPbPr, Y/C, Composite, S/PDIF, Analog 2-channel audio, and HID (Human Interface Device) data. Where two or more signal inputs are available, the transmitter shall include integrated switcher with signal sensing. The switcher shall switch to the last detected input (when not used with a control system by the same manufacturer). The HDMI transmitter types shall be as follows:

Transmitter Type 1

а

- 41. The transmitter shall meet the following minimum requirements:
 - One (1) HDMI input (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio.
 - b. One (1) USB HID port.
 - 1) Supports USB 1.1.
 - c. One (1) IR/1-way RS-232 port.
 - d. One (1) 10/100 LAN port.
 - e. One set of UTP/STP HDMI extended signal outputs.
 - 1) Signal transmission up to 450 feet.
 - f. Rack mountable.
 - g. Surface mountable.
- 42. The transmitter shall be a Crestron DM-TX-100 or equivalent.
- Transmitter Type 2

43. The transmitter shall meet the following minimum requirements:

- a. One (1) HDMI input (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio
 - 4) Supports DVI-D
 - 5) Supports Display port
- b. One(1) RGB input
 - 1) RGBS
 - 2) RGsB
 - 3) RGBHV
- c. One (1) Video input comprised of 3 RCA jacks.
 - 1) YPbPr
 - 2) Y/C
 - 3) Composite
- d. Two (2) analog stereo audio inputs.
 - 1) (1) 3.5mm TRS (L/R unbalanced).
 - 2) (1) 2 RCA (L/R unbalanced).
- e. One (1) S/PDIF audio input.

f.

- 1) (1) RCA jack.
- Supports up to 5.1 channel audio. 2)
- One (1) USB HID port.
- Supports USB 1.1. 1)
- One (1) IR/1-way RS-232 port. g.
- One (1) 10/100 LAN port. h. i.
 - One set of UTP/STP HDMI extended signal outputs.
 - Signal transmission up to 450 feet. 1)
- Surface mountable on US 2-gang or EU 1-gang electrical box. i.
- The transmitter shall be a Crestron DM-TX-200 or equivalent. 44.
- Transmitter Type 3
 - The transmitter shall meet the following minimum requirements: 45.
 - One (1) HDMI input (Video & Audio). а.
 - Supports HDMI 1.3 with Deep Color. 1)
 - 2) Supports HDCP 1.1.
 - b. Supports 7.1 channel lossless audio c.
 - One (1) DVI-D input.
 - DVI-D 1)
 - 2) RGB
 - 3) RGBHV
 - 4) RGBS
 - 5) RGsB
 - d. One (1) Video input comprised of 3 RCA jacks.
 - YPbPr 1)
 - Y/C 2)
 - 3) Composite
 - One (1) HDMI monitor output. e.
 - Buffered output of local inputs. 1)
 - Two (2) analog stereo audio inputs. f.
 - (1) 3.5mm TRS (L/R unbalanced). 1)
 - (1) 2 RCA (L/R unbalanced). 2)
 - One (1) S/PDIF audio input. g.
 - 1) (1) RCA jack.
 - 2) Supports up to 5.1 channel audio.
 - One (1) IR/1-way RS-232 port. h.
 - One (1) 2-way RS-232 port. i.
 - One (1) 10/100 LAN port. j.
 - One set of UTP/STP HDMI extended signal outputs. k.
 - Signal transmission up to 450 feet. 1)
 - I. Rack mountable.
 - Surface mountable on standard single gang electrical box. m.
 - 46. The transmitter shall be a Crestron DM-TX-300N or equivalent.

Transmitter Type 4

a.

- The transmitter shall meet the following minimum requirements: 47.
 - One (1) HDMI input (Video & Audio).
 - Supports HDMI 1.3 with Deep Color. 1)
 - 2) Supports HDCP 1.1.
 - Supports 7.1 channel lossless audio. 3)
 - One (1) USB HID port. b.
 - Supports USB 1.1. 1)
 - One (1) IR/1-way RS-232 port. C.
 - One (1) 10/100 LAN port. d.
 - e. One set of fiber HDMI extended signal outputs.
 - Signal transmission up to 1000 feet. 1)
 - Uses two (2) multimode fibers. 2)
 - f. Rack mountable.
 - Surface mountable on standard single gang electrical box.
- 48. The transmitter shall be a Crestron DM-TX-100-F or equivalent.

Transmitter Type 5

a.

- 49. The transmitter shall meet the following minimum requirements:
 - One (2) DVI-I input.

- 1) DVI-D
- 2) RGBHV
- 3) RGBS
- 4) RGsB
- b. One (2) HDMI monitor pass-through outputs.
 1) Buffered output of local inputs.
- c. Two (2) analog stereo audio inputs.
 - 1) (2) 3.5mm TRS (L/R unbalanced).
- d. Óne (1) S/PDIF audio input.
 - 1) (1) RCA jack.
 - 2) Supports up to 5.1 channel audio.
- e. One (1) IR/1-way RS-232 port.
- f. One (1) 2-way RS-232 port.
- g. One (1) 10/100 LAN port. h. One set of fiber HDMI exte
 - One set of fiber HDMI extended signal outputs..
 - 1) Signal transmission up to 1000 feet.
- i. Rack mountable.
- j. Flush mountable.
- 50. The transmitter shall be a Crestron DM-TX-300N-F or equivalent.

Transmitter Type 6

- 51. The transmitter shall meet the following minimum requirements:
 - a. One (1) HDMI input (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio.
 - 4) Supports DVI-D
 - 5) Supports Display port
 - b. One set of UTP/STP HDMI extended signal outputs.
 - 1) Signal transmission up to 450 feet.
 - c. Standard single gang electrical box mountable.
- The HDMI Receiver shall receive any signal sent from the HDMI Transmitter. All video and audio signals shall be output via the HDMI connector. HID data shall be output via the USB connector.
- Receiver Type 1
 - 52. The receiver shall accept the HD signal via UTP/STP wire and convert it to one (1) HDMI output. When used with a supported control system, the receiver shall provide local control to device(s). In addition, when used with the Matrix switcher, the receiver shall provide Ethernet connectivity to any compatible devices.
 - 53. The receiver shall meet the following minimum requirements:
 - a. HDMI digital video/audio output.
 - 1) One (1) 19-pin Type A HDMI female connector.
 - b. One (1) USB 1.1 port for USB HID data.
 - 1) Mouse, keyboard, game controller, or other USB HID device support.
 - 2) USB Type A female connector.
 - c. Two (2) relays.
 - 1) 4-pin 3.5mm detachable terminal block comprising (2) normally open, isolated relays.
 - 2) Rated 1 Amp, 30 Volts AC/DC.
 - 3) MOV arc suppression across contacts.
 - d. One (1) bidirectional RS-232 port.
 - 1) One (1) 5-pin 3.5mm detachable terminal block.
 - 2) GND, TX, RX, CTS, RTS support.
 - 3) Up to 115.2k baud, hardware and software handshaking support.
 - e. Two (2) IR/Serial ports.
 - 1) One (1) 4-pin 3.5mm detachable terminal block.
 - 2) IR output up to 1.1 MHz.
 - 3) 1-way serial TTL/RS-232 (0-5 Volts) up to 19200 baud.
 - f. One (1) 10/100 LAN port.
 - g. One (1) STP input.
 - 1) Two (2) RJ-45 female connectors.
 - h. One (1) power input.
 - 1) (1) 4-pin 3.5mm detachable terminal block.

j.

- i. Shall support transmission distances of up to 450ft.
 - Flush mountable to a 2-gang, 4" square, or Euro electrical box.
- k. One (1) 2-pin 3.5mm detachable terminal block Digital/contact closure sensing input;
 - 1) Rated for 0-24 Volts DC, referenced to GND;
 - 2) Input Impedance: 2.2k ohms pulled up to 5 Volts DC;
 - 3) Logic Threshold: 2.5 Volts DC nominal with 1 Volt hysteresis band.
- 54. The receiver shall be a Crestron DM-RMC-100 or equivalent.

Receiver Type 2

- 55. The receiver shall accept the HD signal via multimode fiber and convert it to one (1) HDMI output. When used with a supported control system, the receiver shall provide local control to device(s). In addition, when used with the Matrix switcher, the receiver shall provide Ethernet connectivity to any compatible devices.
- 56. The receiver shall meet the following minimum requirements:
 - a. HDMI digital video/audio output.
 - 1) One (1) 19-pin Type A HDMI female connector.
 - b. One (1) USB 1.1 port for USB HID data.
 - 1) Mouse, keyboard, game controller, or other USB HID device support.
 - 2) USB Type A female connector.
 - c. Two (2) relays.
 - 1) 4-pin 3.5mm detachable terminal block comprising (2) normally open, isolated relays.
 - 2) Rated 1 Amp, 30 Volts AC/DC.
 - 3) MOV arc suppression across contacts.
 - d. One (1) bidirectional RS-232 port.
 - 1) One (1) 5-pin 3.5mm detachable terminal block.
 - 2) GND, TX, RX, CTS, RTS support.
 - 3) Up to 115.2k baud, hardware and software handshaking support.
 - e. Two (2) IR/Serial ports.
 - 1) One (1) 4-pin 3.5mm detachable terminal block.
 - 2) IR output up to 1.1 MHz.
 - 3) 1-way serial TTL/RS-232 (0-5 Volts) up to 19200 baud.
 - One (1) Digital/contact closure sensing input.
 - 1) One (1) 2-pin 3.5mm detachable terminal block
 - Rated for 0-24 Volts DC, referenced to GND;
 - 3) Input Impedance: 2.2k ohms pulled up to 5 Volts DC;
 - 4) Logic Threshold: 2.5 Volts DC nominal with 1 Volt hysteresis band.
 - One (1) 10/100 LAN port.
 - h. One (1) Fiber input.
 - 1) Two (2) multi-mode fiber inputs.
 - 2) Two (2) SC multimode fiber connectors.
 - i. One (1) power input.
 - 1) (1) 2-pin 3.5mm detachable terminal block.
 - Shall support transmission distances of up to 1000ft.
 - k. Flush mountable to a 2-gang, 4" square, or Euro electrical box.
- 57. The receiver shall be a Crestron DM-RMC-100-F or equivalent.
- Receiver Type 3

f.

g.

j.

C.

- 58. The receiver shall accept the HD signal via UTP/STP wire and convert it to one (1) HDMI output. When used with a supported control system, the receiver shall provide local control to device(s The transmitter shall meet the following minimum requirements:
 - a. One (1) HDMI output (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio.
 - 4) Supports DVI-D
 - 5) Supports Display port
 - b. One set of UTP/STP HDMI extended signal outputs.
 - 1) Signal transmission up to 450 feet.
 - Standard single gang electrical box mountable.
- 59. The receiver shall be a Crestron DM-RX-1G-or equivalent.

Repeater

a.

- 60. The Repeater shall provide signal regeneration when used with the UTP/STP HD Content Point-to-Point Transport System. The Repeater shall be placed in-line, between the Transmitter, Receiver, Content Matrix, or other Repeaters.
- 61. The Repeater shall meet the following minimum requirements:
 - One (1) set of STP/UTP inputs.
 - 1) 8-pin RJ45 female shielded.
 - b. One (1) power input.
 - 1) 4-pin 3.5mm detachable terminal block.
 - c. One (1) set of STP/UTP outputs.
 - 1) 8-pin RJ45 female shielded.
 - d. One (1) power output.
 - 1) 4-pin 3.5mm detachable terminal block.
- 62. The repeater shall be a Crestron DM-DR or equivalent.

HD CONTENT MATRIX SWITCHER

- The HDMI Matrix shall consist of a card-cage type unit, capable of accepting different input and output cards. Any input shall be routable to any output. Matrix shall provide almost instantaneous HDMI switching for sources with HDCP. Breakaway audio, video, and USB switching shall also be available.
- The HDMI Matrix shall be compatible with the HD Content Point-to-Point Transport System.

8x8 Matrix – 8 inputs, 8 outputs

f.

h.

- 63. The matrix shall meet the following minimum requirements:
 - a. Ethernet support.
 - 1) Gigabit uplink.
 - 2) Integrated 10/100 managed Ethernet switch.
 - b. Eight (8) field configurable input card slots.
 - c. Two (2) factory configurable output card slots.
 - 1) Output card accommodates 4 signal outputs.
 - d. Easy software setup tool.
 - e. Front panel LCD diagnostic screen.
 - 1) HDCP key register detection.
 - 2) HDMI Cable test tool.
 - 3) Automatic resolution management via EDID.
 - HDCP digital rights key management.
 - g. Fast HDMI switching with keep-alive HDCP link.
 - CEC signal management.
 - 1) Intercept CEC data being sent from HDMI devices.
 - 2) Send control information.
- 64. The matrix shall be a Crestron DM-MD8X8 or equivalent.

16x16 Matrix – 16 inputs, 16 outputs

- 65. The matrix shall meet the following minimum requirements:
 - a. Ethernet support.
 - 1) Gigabit uplink.
 - 2) Integrated 10/100 managed Ethernet switch.
 - b. Sixteen (16) field configurable input card slots.
 - c. Four (4) factory configurable output card slots.
 - 1) Output card accommodates 4 signal outputs.
 - d. Easy software setup tool.
 - e. Front panel LCD diagnostic screen.
 - 1) HDCP key register detection.
 - 2) HDMI Cable test tool.
 - 3) Automatic resolution management via EDID.
 - f. HDCP digital rights key management.
 - g. Fast HDMI switching with keep-alive HDCP link.
 - h. CEC signal management.
 - 1) Intercept CEC data being sent from HDMI devices.
 - 2) Send control information.
- 66. The matrix shall be a Crestron DM-MD16X16 or equivalent.

32x32 Matrix - 32 inputs, 32 outputs

- 1. The matrix shall meet the following minimum requirements:
 - a. Ethernet support.
 - 1) Gigabit uplink.
 - 2) Integrated 10/100 managed Ethernet switch.
 - b. Thirty Two (32) field configurable input card slots.
 - c. Eight (8) factory configurable output card slots.
 - 1) Output card accommodates 4 signal outputs.
 - d. Easy software setup tool.
 - e. Front panel LCD diagnostic screen.
 - 1) HDCP key register detection.
 - 2) HDMI Cable test tool.
 - 3) Automatic resolution management via EDID.
 - f. HDCP digital rights key management.
 - g. Fast HDMI switching with keep-alive HDCP link.
 - h. CEC signal management.
 - 1) Intercept CEC data being sent from HDMI devices.
 - 2) Send control information.
- 2. The matrix shall be a Crestron DM-MD32X32 or equivalent.
- 6x1 Matrix –6 inputs, 1 output
 - 3. The matrix shall meet the following minimum requirements:
 - a. Ethernet support.
 - 1) Gigabit uplink.
 - 2) Integrated 10/100 managed Ethernet switch.
 - b. One (1) HDMI input (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio
 - c. One(1) RGB input
 - 1) RGBS
 - 2) RGsB
 - 3) RGBHV
 - d. One (1) Video input comprised of 3 BNC connectors.
 - 1) YPbPr
 - Y/C

2)

f.

р.

- 3) Composite
- e. Two (2) analog stereo audio inputs.
 - 1) (2) 5 pin 3.5mm terminal block (L/R balanced/unbalanced).
 - One (1) S/PDIF audio input.
 - 1) (1) RCA jack.
 - 2) Supports up to 5.1 channel audio.
- g. One (1) USB HID port.
 - 1) Supports USB 1.1.
- h. One (1) IR/1-way RS-232 port.
- i. One (1) 10/100 LAN port.
- j. Four (3) sets of UTP/STP HDMI extended signal inputs.
- 1) Signal transmission up to 450 feet.
- k. One (1) set of UTP/STP HDMI extended signal outputs.
 - 1) Signal transmission up to 450 feet.
- I. One (1) HDMI output (Video & Audio).
 - 1) Supports HDMI 1.3 with Deep Color.
 - 2) Supports HDCP 1.1.
 - 3) Supports 7.1 channel lossless audio
- m. One (1) analog stereo audio inputs.
 - 1) (1)5 pin 3.5mm terminal block (L/R balanced/unbalanced).
- n. Easy software setup tool.
- o. One (1) USB port.
 - 1) Supports USB 1.1.
 - 2) Computer console
 - HDCP digital rights key management.
- q. Fast HDMI switching with keep-alive HDCP link.
- r. CEC signal management.
 - 1) Intercept CEC data being sent from HDMI devices.

- 2) Send control information.
- 3) Freestanding rack mountable
- 4. The matrix shall be a Crestron DM-MD6X1 or equivalent
- The HDMI input cards shall be compatible with the HDMI Matrix. Input cards shall accept various signal types. Input signals shall be converted to HDMI format. Input cards shall provide HDMI (connector) buffered output of input signal. Input cards shall be field upgradeable/installable.

HDMI Input Card

- 5. The HDMI input card shall accept an HDMI signal. This signal shall be available as an output on the matrix.
- 6. The HDMI input card shall meet the following minimum requirements:
 - a. One (1) HDMI input.
 - 1) 19-pin type A female HDMI connector.
 - 2) Supports HDCP 1.1.
 - 3) Supports HDMI 1.3 with Deep Color.
 - b. One (1) HDMI output.
 - 1) Buffered output from input.
 - 2) 19-pin type A female HDMI connector.
 - 3) Supports HDCP 1.1.
 - 4) Supports HDMI 1.3 with Deep Color.
 - c. One (1) USB 1.1 port for USB HID data.
 - 1) Mouse, keyboard, game controller, or other USB HID device support.
 - 2) USB Type A female connector.
 - d. Digital to analog converter.
 - 1) 24-bit, 48 KHz
 - e. One (1) stereo analog audio output.
 - 1) Two (2) RCA female connectors.
 - 2) Unbalanced line-level output.
 - 3) Provides pass-through signal converted from HDMI input.
 - 4) Maximum Output Level: 2 Vrms.
 - 5) Output Impedance: 100 ohms nominal.
 - f. Analog shall meet or exceed:
 - 1) Frequency response: 20Hz to 20kHZ ±0.5dB.
 - 2) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
 - 3) THD+N: <0.005% @ 1kHz;
 - 4) Stereo Separation: >90dB
- 7. The input card shall be a Crestron DMC-HD or equivalent.

HDMI Input Card w/DSP

- 8. The HDMI input card shall accept an HDMI signal. It shall provide a 2-channel mix of multi-channel audio sources. The original audio track(s) shall also be preserved and passed through to the matrix. This signal shall be available as an output on the matrix.
- 9. The HDMI input card shall meet the following minimum requirements:
 - a. One (1) HDMI input.
 - 1) 19-pin type A female HDMI connector.
 - 2) Supports HDCP 1.1.
 - 3) Supports HDMI 1.3 with Deep Color.
 - b. One (1) HDMI output.
 - 1) Buffered output from video input.
 - 2) Audio consists of either 2-channel mixed audio or original multi-channel audio track.
 - 3) 19-pin type A female HDMI connector.
 - 4) Supports HDCP 1.1.
 - 5) Supports HDMI 1.3 with Deep Color.
 - c. One (1) USB 1.1 port for USB HID data.
 - 1) Mouse, keyboard, game controller, or other USB HID device support.
 - 2) USB Type A female connector.
 - d. Audio processor.
 - 1) HD audio decoder DSP.
 - 2) Dual 32-bit cores.
 - 3) Support for various audio/surround formats:
 - a) Bypass.
 - b) Stereo.
 - c) PCM 96/24.

- d) MLP Lossless.
- e) Dolby Pro Logic IIx.
- f) Dolby Digital 5.1.
- g) Dolby Digital EX.
- h) Dolby TrueHD.
- i) DTS Neo:6.
- j) DTS Virtual.
- k) DTS Digital 5.1 Discrete.
- I) DTS ES 6.1 Discrete.
- m) DTS ES 6.1 Matix.
- n) DTS 96/24.
- o) DTS-HD Master Audio.
- e. Digital to analog converter.
 - 1) 24-bit, 48 KHz
- f. Provide 2-channel mix of either surround audio or 2-channel pass-thru audio on one (1) stereo analog audio output.
 - 1) Two (2) RCA female connectors.
 - 2) Unbalanced line-level output.
 - 3) Provides pass-through signal converted from HDMI input.
 - 4) Maximum Output Level: 2 Vrms.
 - 5) Output Impedance: 100 ohms nominal.
- g. Analog shall meet or exceed:
 - 1) Frequency response: 20Hz to 20kHZ ±0.5dB.
 - 2) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
 - 3) THD+N: <0.005% @ 1kHz;
 - 4) Stereo Separation: >90dB
- 10. The input card shall be a Crestron DMC-HD-DSP or equivalent.

Video Input Card

- 11. The Video Input Card shall accept an analog audio/video signal and convert it to an HDMI signal. This signal shall be available as an output on the matrix.
- 12. The video input card shall meet the following minimum requirements:
 - a. One (1) Video input.
 - 1) Three (3) RCA female connectors.
 - 2) Auto-sensing multi-format analog video input.
 - 3) Support for the following video types:
 - a) YPbPr (component).
 - b) Y/C (S-Video).
 - c) Composite.
 - 4) Support for the following video formats:
 - a) NTSC
 - b) PAL
 - 5) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - c) 576i
 - d) 576p
 - e) 720p
 - f) 1080i
 - g) 1080p
 - b. Video analog to digital converter.
 - 1) 10 bit, 170MHz.
 - c. One (1) HDMI output.
 - 1) Buffered output from input.
 - 2) 19-pin type A female HDMI connector.
 - 3) Pass through of video input signal (matched format/resolution).
 - d. Audio analog to digital converter.
 - 1) 24-bit, 48 KHz
 - e. One (1) stereo analog audio input.
 - 1) Two (2) RCA female connectors.
 - 2) Unbalanced line-level input.
 - 3) Maximum Input Level: 2 Vrms.
 - 4) Input Impedance: 15k ohms nominal.
 - f. Analog shall meet or exceed:

- 1) Frequency response: 20Hz to 20kHZ ±0.75dB.
- 2) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
- 3) THD+N: <0.005% @ 1kHz;
- 4) Stereo Separation: >90dB
- 13. The input card shall be a Crestron DMC-VID-RCA-A or equivalent.
- Video Input Card w/S/PDIF
 - 14. The video w/S/PDIF Input Card shall accept an analog audio/video signal and convert it to an HDMI signal. This signal shall be available as an output on the matrix.
 - 15. The video input card shall meet the following minimum requirements:
 - a. One (1) Video input.
 - 1) Three (3) RCA female connectors.
 - 2) Auto-sensing multi-format analog video input.
 - 3) Support for the following video types:
 - a) YPbPr (component).
 - b) Y/C (S-Video).
 - c) Composite.
 - 4) Support for the following video formats:
 - a) NTSC
 - b) PAL
 - 5) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - c) 576i
 - d) 576p
 - e) 720p
 - f) 1080i
 - g) 1080p Video analog to digital converter.
 - 1) 10-bit, 170MHz.
 - 1) 10-bit, 170MHz c. One (1) HDMI output.
 - 1) Buffered output from input.
 - 19-pin type A female HDMI connector.
 - 3) Pass through of video input signal (matched format/resolution).
 - 4) Pass through of audio input signal.
 - d. One (1) digital audio input.
 - One (1) RCA female connectors.
 - 2) S/PDIF coaxial input.
 - 3) Pass through to HDMI output.
 - 16. The input card shall be a Crestron DMC-VID-RCA-D or equivalent.

Video Input Card w/BNC connectors

1)

b.

- 17. The Video Input Card shall accept an analog audio/video signal and convert it to an HDMI signal. This signal shall be available as an output on the matrix.
- 18. The BNC video input card shall meet the following minimum requirements:
 - a. One (1) Video input.
 - 1) Three (3) BNC female connectors.
 - 2) Auto-sensing multi-format analog video input.
 - 3) Support for the following video types:
 - a) YPbPr (component).
 - b) Y/C (S-Video).
 - c) Composite.
 - 4) Support for the following video formats:
 - a) NTSC
 - b) PAL
 - 5) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - c) 576i
 - d) 576p
 - e) 720p
 - f) 1080i
 - g) 1080p
 - b. Video analog to digital converter.

C.

- 10 bit, 170MHz. 1)
- One (1) HDMI output.
- 1) Buffered output from input.
- 2) 19-pin type A female HDMI connector.
- Pass through of video input signal (matched format/resolution). 3)
- Audio analog to digital converter. d.
 - 1) 24-bit, 48 KHz
- One (1) stereo analog audio input. e.
 - Two (2) RCA female connectors. 1)
 - Unbalanced line-level input. 2)
 - 3) Maximum Input Level: 2 Vrms.
 - Input Impedance: 15k ohms nominal. 4)
- f. Analog shall meet or exceed:
 - Frequency response: 20Hz to 20kHZ ±0.75dB. 1)
 - 2) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
 - 3) THD+N: <0.005% @ 1kHz;
 - Stereo Separation: >90dB 4)
- 19. The input card shall be a Crestron DMC-VID-BNC or equivalent.
- Security Camera Input Card
 - 20. The Security Camera Input Card shall accept analog video signal, provide image processing, and output the result to an HDMI signal. This signal shall be available as an output on the matrix.
 - 21. The input card shall provide an on-board video processor.
 - Shall support the following display modes: a.
 - Quad Screen. 1)
 - 2) Dual Screen.
 - Full Screen. 3)
 - Sequential switching. 4)
 - b. Shall support text overlay;
 - 1) Dynamic colored window labeling.
 - Time/date. 2)
 - 22. DMI input card shall meet the following minimum requirements: The H
 - Four (4) video inputs. a.

4)

- Four (4) RCA female connectors. 1)
- 2) Auto-sensing analog video input.
- Support for composite video. 3)
 - Input Level: 1 Vp-p nominal. a)
 - Input Impedance: 75 ohms nominal. b)
 - Support for the following video formats:
 - NTSC a)
 - PAL b)
- 5) Support for the following video resolutions:
 - 480i a)
 - 576i b)
- Video analog to digital converter.
- b. 8-bit per color, 27MHz. 1)
- C. One (1) HDMI output.
 - Buffered output from input. 1)
 - 2) 19-pin type A female HDMI connector.
 - 3) Pass through of processed video signal.
 - Matched format/resolution of input signal. 4)
- The input card shall be a Crestron DMC-VID4 or equivalent. 23.

DVI Input Card

- 24 The Video Input Card shall accept a DVI video signal, injected audio and convert to HDMI signal. This signal shall be available as an output on the matrix.
- 25. The HDMI input card shall meet the following minimum requirements:
 - One (1) DVI input. a.

c)

- One (1) DVI-I female connector. 1)
- 2) Auto-sensing multi-format analog video input.
- 3) Support for the following video types:
 - DVI a)
 - b) YPbPr (component).
 - Y/C (S-Video).

- RGB d)
- 4) Support for the following video formats: NTSC
 - a) b)
- PAL 5) Support for the following video resolutions:
 - 480i a)
 - b) 480p
 - 576i C)
 - d) 576p
 - 720p e)
 - f) 1080i
 - 1080p g)
- b. Video analog to digital converter.
 - 10-bit, 170MHz. 1)
- c. One (1) HDMI output.
 - 1) Buffered output from input.
 - 19-pin type A female HDMI connector. 2)
 - Pass through of video input signal (matched format/resolution). 3)
 - Pass through of audio input signal. 4)
- One (1) analog audio input. d.
 - One (1) 5 pin 3.5mm terminal block- detachable. 1) 2)
 - Pass through to HDMI output.
- 26. The input card shall be a Crestron DMC-DVI or equivalent.

UTP/STP Input Card

28.

- The UTP/STP Input Card shall accept UTP/STP signal and convert to HDMI signal and separate 27. audio output. This signal shall be available as an output on the matrix.
 - The UTP/STP input card shall meet the following minimum requirements:
 - One (1) UTP/STP input. a.
 - Two (2) 8 pin RJ45 UTP/STP connectors, female. 1)
 - 2) Support for the following video resolutions:
 - 480i a)
 - 480p b)
 - c) 576i
 - 576p d)
 - 720p e)
 - 1080i f)
 - 1080p g)
 - Video analog to digital converter. b.
 - 10-bit, 170MHz. 1)
 - One (1) HDMI output. C.
 - Buffered output from input. 1)
 - 2) 19-pin type A female HDMI connector.
 - Pass through of video input signal (matched format/resolution). 3)
 - 4) Support for various audio/surround formats:
 - a) Bypass.
 - b) Stereo.
 - PCM 96/24. C)
 - d) MLP Lossless.
 - Dolby Pro Logic IIx. e)
 - Dolby Digital 5.1. f)
 - Dolby Digital EX. g)
 - h) Dolby TrueHD.
 - DTS Neo:6. i)
 - DTS Virtual. j)
 - DTS Digital 5.1 Discrete. k)
 - I) DTS ES 6.1 Discrete.
 - m) DTS ES 6.1 Matix.
 - DTS 96/24. n)
 - o) DTS-HD Master Audio.
 - Pass through of audio input signal. 5)
 - d. One (1) analog audio ouput.

1)

Two (2) RCA female connectors.

- 2) Pass through to HDMI output.
- 3) Digital to analog conversion 24 bit 48 kHz
- 29. The input card shall be a Crestron DMC-CAT or equivalent.

UTP/STP Input Card w/DSP

- 30. The UTP/STP-DSP input Card shall accept UTP/STP signal and convert to HDMI signal and separate audio output as full surround and simultaneous two channel down-mix. This signal shall be available as an output on the matrix.
- 31. The UTP/STP input card shall meet the following minimum requirements:
 - a. One (1) UTP/STP input.
 - 1) Two (2) 8 pin RJ45 UTP/STP connectors, female.
 - 2) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - c) 576i
 - d) 576p
 - e) 720p
 - f) 1080i
 - g) 1080p
 - b. Video analog to digital converter.
 - 1) 10-bit, 170MHz.
 - c. One (1) HDMI output.
 - 1) Buffered output from input.
 - 2) 19-pin type A female HDMI connector.
 - 3) Pass through of video input signal (matched format/resolution).
 - 4) Support for various audio/surround formats:
 - a) Bypass.
 - b) Stereo.
 - c) PCM 96/24.
 - d) MLP Lossless.
 - e) Dolby Pro Logic IIx.
 - f) Dolby Digital 5.1.
 - g) Dolby Digital EX.
 - h) Dolby TrueHD.
 - i) DTS Neo:6.
 - j) DTS Virtual.
 - k) DTS Digital 5.1 Discrete.
 - DTS ES 6.1 Discrete.
 - m) DTS ES 6.1 Matix.
 - n) DTS 96/24.
 - o) DTS-HD Master Audio.
 - Pass through of audio input signal.
 - a) Two channel down-mix
 - d. One (1) analog audio input.

5)

- 1) Two (2) RCA female connectors.
- 2) Pass through to HDMI output.
- 3) Digital to analog conversion 24 bit 48 kHz
- 32. The input card shall be a Crestron DMC-CAT-DSP or equivalent.

Fiber Input Card

a.

- 33. The UTP/STP input Card shall accept UTP/STP signal and convert to HDMI signal and separate audio output as full surround and simultaneous two channel down-mix. This signal shall be available as an output on the matrix.
- 34. The fiber input card shall meet the following minimum requirements:
 - One (1) multimode fiber input.
 - a) Two (2) SC female optical connectors
 - b) Signal transmission up to 1000 feet
 - 2) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - c) 576i
 - d) 576p

e)

720p

- f) 1080i
- 1080p g)
- Video analog to digital converter. b.
 - 10-bit, 170MHz. 1)
- One (1) HDMI output. c.
 - Buffered output from input. 1)
 - 2) 19-pin type A female HDMI connector.
 - Pass through of video input signal (matched format/resolution). 3)
 - 4) Support for various audio/surround formats:
 - Bypass. a)
 - b) Stereo.
 - PCM 96/24. C)
 - d) MLP Lossless.
 - e) Dolby Pro Logic IIx.
 - f) Dolby Digital 5.1.
 - g) Dolby Digital EX.
 - Dolby TrueHD. h)
 - DTS Neo:6. i)
 - DTS Virtual. j)
 - DTS Digital 5.1 Discrete. k)
 - I) DTS ES 6.1 Discrete.
 - DTS ES 6.1 Matix. m)
 - n) DTS 96/24.
 - o) DTS-HD Master Audio.
 - 5) Pass through of audio input signal.
 - Two channel down-mix a)
- d. One (1) analog audio output.
 - Two (2) RCA female connectors. 1)
 - 2) Unbalanced line-level output.
 - Maximum Input Level: 2 Vrms. 3)
 - Input Impedance: 15k ohms nominal. 4)
- Analog shall meet or exceed: e.
 - Frequency response: 20Hz to 20kHZ ±0.75dB. 1)
 - 2) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
 - THD+N: <0.005% @ 1kHz; 3)
 - 4) Pass through to HDMI output.
 - Supports DVI a)
 - 5) Digital to analog conversion 24 bit 48 kHz
- 35. The input card shall be a Crestron DMC-F or equivalent.

Fiber Input Card w/DSP

- 36. The fiber-DSP input Card shall accept optical signal and convert to HDMI signal and separate audio output as full surround and simultaneous two channel down-mix. This signal shall be available as an output on the matrix. 37.
 - The UTP/STP input card shall meet the following minimum requirements:
 - One (1) fiber input. a.
 - 1) Two (2) SC connectors, female.
 - 2) Support for the following video resolutions:
 - a) 480i
 - b) 480p
 - 576i c)
 - d) 576p
 - 720p e)
 - 1080i f)
 - 1080p g)
 - Video analog to digital converter. b.
 - 10-bit, 170MHz. 1)
 - One (1) HDMI output. c.
 - Buffered output from input. 1)
 - 2) 19-pin type A female HDMI connector.
 - Pass through of video input signal (matched format/resolution). 3)
 - 4) Support for various audio/surround formats:
 - Bypass. a) b)
 - Stereo.

- PCM 96/24. C)
- d) MLP Lossless.
- e) Dolby Pro Logic IIx.
- Dolby Digital 5.1. f) Dolby Digital EX.
- g)
- Dolby TrueHD. h) i) DTS Neo:6.
- DTS Virtual. i)
- k) DTS Digital 5.1 Discrete.
- I) DTS ES 6.1 Discrete.
- m) DTS ES 6.1 Matix.
- DTS 96/24. n)
- DTS-HD Master Audio. O)
- 5) Pass through of audio input signal.
 - Two channel down-mix a)
- One (1) analog audio input. d.
 - Two (2) RCA female connectors. 1)
 - Pass through to HDMI output. 2)
 - 3) Digital to analog conversion 24 bit 48 kHz
 - 6) The input card shall be a Crestron DMC-F or equivalent
- The HDMI output cards shall be compatible with the HDMI Matrix. Output cards shall transmit any input signal. Output cards shall have various arrangements of connector types. Output cards shall have up to four (4) outputs per card. Output card types shall be as follows:
- UTP/STP Output Card
 - The UTP/STP Output Card shall provide transmission of any HDMI signal inputted to the matrix. 38
 - 39. The Output Card shall provide four (4) discrete outputs.
 - The Output Card shall interface with unshielded twisted-pair or shielded twisted pair cable. 40.
 - The Output Card shall be a Crestron DMCO or equivalent. 41.
- UTP/STP Output Card w/ HDMI Connectors
 - The UTP/STP Output Card shall provide transmission of any HDMI signal inputted to the matrix. 42
 - 43. The Output Card shall provide four (4) discrete outputs.
 - 44. The Output Card shall interface with unshielded twisted-pair or shielded twisted pair cable.
 - 45. The card shall provide HDMI outputs.
 - Mirrored output of two (2) UTP/STP outputs. a.
 - Two (2) 19-pin Type A HDMI female connectors. b.
 - The Output Card shall be a Crestron DMC-2233 or equivalent. 46.

. Fiber Output Card

- 47. The fiber Output Card shall provide transmission of any HDMI signal inputted to the matrix.
- 48. The Output Card shall provide four (4) discrete outputs.
- 49. The Output Card shall interface with multimode optical cable.
- 50. The Output Card shall be a Crestron DMCO-11 or equivalent

Fiber Output Card- w/ HDMI Connectors

- 51. The fiber Output Card shall provide transmission of any HDMI signal inputted to the matrix.
- The Output Card shall provide four (4) discrete outputs. 52.
- 53. The Output Card shall interface with multimode optical cable.
 - Mirrored output of two (2) optical outputs. a.
 - Two (2) 19-pin Type A HDMI female connectors b.
- The Output Card shall be a Crestron DMCO-1130 or equivalent 54.

HDMI Output Card+

- 55. The HDMI Output Card shall provide transmission of any HDMI signal inputted to the matrix.
- The Output Card shall provide four (4) discrete outputs. 56.
- 57. The Output Card shall interface with 19-pin Type A HDMI female connectors.
- 58. The Output Card shall be a Crestron DMCO-2300 or equivalent

HD SOURCE/SINK CONTROLLER

The HD Source/Sink Controller shall provide control of connected devices (i.e. Blu-Ray Players, LCD Monitors, Projectors, etc.) when used in conjunction with a Crestron Electronics 2-Series Ethernet-enabled Control Processor. It shall support IR and RS-232/422/485 protocols, closed-contact input, low-voltage relay, and HDMI CEC (Consumer Electronics Control). No additional cabling (above the required cabling for the HD Digital Transport and Distribution System) shall be required.

EXECUTION

The HD Digital Transport and Distribution System shall be manufactured by Crestron Electronics, Inc. and shall be Crestron DigitalMedia or engineer approved equal.

END OF PART II