SECTION 27 41 16

INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

Equipment Specified in this section:

DMPS3-4K-150-C

Table of Contents

SECTION 27 41 16 4

PART 1 GENERAL 4

1.1 SECTION INCLUDES 4

A. Presentation System – 4

B. Integrated Controller – 4

C. Host Processor – 4

D. Device Controller – 4

1.2 RELATED REQUIREMENTS 4

A. Section 25 08 00 4

B. Section 25 10 00 5

C. Section 25 11 13 5

D. Section 25 13 13 5

E. Section 25 13 16 5

F. Section 25 13 19 5

G. Section 25 15 16 5

H. Section 26 09 43.13 5

I. Section 27 15 00 5

J. Section 27 41 00 5

1.3 REFERENCES 5

A. Abbreviations and Acronyms 5

B. Definitions 5

C. Reference Standards 6

PART 2 PRODUCTS 7

2.1 MANUFACTURERS 7

A. Basis-of-Design Manufacturer: 7

2.2 DIGITAL MEDIA PRESENTATION SYSTEM 7

A. Basis of Design Product: 7

B. System Architecture 7

C. Front Panel Control Interface 7

D. Out of box functionality 8

2.3 AUDIO MATRIX SWITCHER 8

A. Switcher Signal Routing 8

2.4 MICROPHONE PREAMPLIFIER 8

A. Microphone Input 8

2.5 MICROPHONE AND PROGRAM AUDIO MIXER 8

A. Independent Mixes 8

2.6 VIDEO SWITCHER 9

A. Auto detecting 9

B. Switcher Signal Routing 9

2.7 ANALOG TO DIGITAL VIDEO TRANSCODER 9

A. Resolution 9

2.8 SINGLE CABLE SIGNAL TRANSMISSION 9

A. Transmitter and Receiver 9

B. Supported signal and data types: 9

C. Cable and Connectors 10

D. Maximum Cable Lengths 10

E. Devise Power 10

2.9 SYSTEM CONTROL PROCESSOR 10

A. Control Processor 10

B. Minimum Characteristics: 10

C. External Ports 11

2.10 SYSTEM FUNCTIONS AND SEQUENCES 12

A. Audio-Video Control Functions 12

B. Lighting and Shade Control Functions 12

2.11 USER INTERFACE CONTROL FUNCTIONS 12

A. As Specified in Division 25. 12

2.12 USER INTERFACE CONTROLLERS 13

A. As Specified in Division 25. 13

PART 3 EXECUTION 14

3.1 INSTALLERS / TECHNICIANS / ENGINEERS 14

A. Digital Media System Contractors/Sub Contractors 14

3.2 SYSTEM TESTING AND COMMISSIONING 14

A. Testing 14

B. Commissioning 14

END OF SECTION 27 41 16 15

SECTION 27 41 16

INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

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1. GENERAL
	1. SECTION INCLUDES
		1. Presentation System –

A single unit integrated digital media presentation system. The single central switching and control unit integrates audio switching, 4K video switching, audio mixing and amplification, and complete system control.

SPECIFIER: Retain the following article if the AV controller specified in this section is controlling:

* A building lighting system (lighting system may be a stand-alone system connected via network interface).
* Lighting equipment connected to other systems (any lighting equipment whose primary controller is not the controller specified in this section but is connected to it via some type of control interface).
* Lighting equipment specified in other sections.
* Existing Lighting equipment.
	+ 1. Integrated Controller –

Advanced control functions and sequences for integrated lighting **[**systems**] [**equipment**]**.

SPECIFIER: Retain the following article if the AV controller specified in this section is connected to or integrated with user interfaces (keypads, touchpanels, Browser GUIs, etc.) specified in other sections.

* + 1. Host Processor –

Host control processor for user control interfaces.

SPECIFIER: Retain the following article if the AV controller specified in this section is connected to or integrated with a system scheduling and management server such as Crestron FUSION, where the controller in this section provides interfacing and control of equipment being scheduled and managed.

* + 1. Device Controller –

Device and equipment controller for scheduling and management servers.

* 1. RELATED REQUIREMENTS
		1. Section 25 08 00

Commissioning of Integrated Automation

* + 1. Section 25 10 00

Integrated Automation Network Equipment

* + 1. Section 25 11 13

Integrated Automation Network Servers

* + 1. Section 25 13 13

Integrated Automation Control and Monitoring Network Supervisory Control

* + 1. Section 25 13 16

Integrated Automation Control and Monitoring Network Integration Panels

* + 1. Section 25 13 19

Integrated Automation Control and Monitoring Network Interoperability

* + 1. Section 25 15 16

Integrated Automation Software for Control and Monitoring Networks

* + 1. Section 26 09 43.13

Digital-Network Lighting Controls

* + 1. Section 27 15 00

Communications Horizontal Cabling

* + 1. Section 27 41 00

Audio-Video Systems

* 1. REFERENCES
		1. Abbreviations and Acronyms
			1. CEC: Consumer Electronics Control
			2. EDID: Extended display identification data
			3. HDCP: High-bandwidth Digital Content Protection
			4. HDMI: High-Definition Multimedia Interface
			5. IDF: Intermediate Distribution Frame
			6. KSV: Key Selection Vector
			7. MDF: Main Distribution Frame
			8. NVP: Nominal Velocity of Propagation
		2. Definitions
			1. Channel: The end-to-end transmission path between two points including all patch or extension cords. The path at which application-specific equipment is connected.
			2. Permanent Link: The installed twisted pair cable link excluding test and patch cords.
			3. Permalink: see Permanent Link.
			4. Nominal Velocity of Propagation: (NVP) expresses the speed of the electrical signals along the cabling link in relation to the speed of light in vacuum (3x108 m/second). Insulation characteristics and twist rate of the wire pair influence NVP in minor ways.
		3. Reference Standards
			1. ANSI/TIA-568-C “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”
			2. ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard”.
			3. ANSI/TIA-1152 “Generic Telecommunications Cabling for Customer Premises”
1. PRODUCTS
	1. MANUFACTURERS
		1. Basis-of-Design Manufacturer:

Subject to compliance with requirements, provide products of Crestron Electronics, Inc., Rockleigh, NJ 07647, Phone 800-237-2041, Fax: 201-767‑1903, [www.crestron.com](http://www.crestron.com) **[**or comparable products from a single manufacturer approved by A/E prior to bidding**]**, with the following components and characteristics.

* 1. DIGITAL MEDIA PRESENTATION SYSTEM
		1. Basis of Design Product:
			1. **Crestron, DMPS3-4K-150-C** 3-Series, 4KDigital Media Presentation System.
		2. System Architecture
			1. The Digital Media Presentation system shall be a single central switching and control unit integrating the following:
				1. Audio matrix switching
				2. Microphone pre-amplification
				3. Microphone and program audio mixing
				4. Front panel user interface
				5. 4K Scaling (both up to 4K and down from 4K)
				6. Analog to digital video transcoding
				7. 4K multi-format video switching
				8. Single Cable HDBaseT compatible signal transmission
				9. System control processing
				10. Built-in power supply
			2. The Digital Media Presentation system shall integrate with the following:
				1. External USB one-touch table top user interfaces
				2. External touch screen user interfaces
				3. External keypad user interfaces
				4. Browser based user interfaces
				5. Mobile iOS and Android apps
				6. External Single Cable HDBaseT compatible signal transmission transmitter and receiver units
				7. AV source devices
				8. HDMI Video display devices
				9. System devices under control
		3. Front Panel Control Interface
			1. The front panel user interface shall control the following system functions:
				1. Volume control
				2. Source select
		4. Out of box functionality
			1. External USB one touch table top user interfaces by same manufacturer, providing source selection
			2. External Ethernet touch screen user interface by same manufacturer
			3. Reporting to enterprise management platform by same manufacturer
	2. AUDIO MATRIX SWITCHER
		1. Switcher Signal Routing
			1. Any stereo input signal shall be routable to:
				1. Stereo analog output
				2. Digital outputs

HDMI output

External Single Cable HDBaseT compatible signal transmission receiver units

* + - 1. The dual internal stereo switchers shall have multiple stereo inputs.
			2. Each internal stereo switcher input shall be internally connected to one of three external input connection types.
				1. Type 1

19-pin Type A HDMI female connector with stereo audio

* + - * 1. Type 2

3.5mm TRS mini phone jack with stereo line level analog audio

* + - * 1. Type 3

8-pin RJ-45 shielded female HDBaseT compatible connector

* 1. MICROPHONE PREAMPLIFIER
		1. Microphone Input
			1. The internal microphone preamplifier input shall be connected to a detachable terminal block supporting balanced microphone level analog audio with switchable 48 volt DC phantom power.
	2. MICROPHONE AND PROGRAM AUDIO MIXER
		1. Independent Mixes
			1. The analog audio output and the digital audio outputs shall be capable of outputting independent audio mixes.
				1. All stereo sources and the microphone source shall be available simultaneously.
				2. All stereo sources and microphone source shall have controllable levels in each of the two output mixes.
	3. VIDEO SWITCHER
		1. Auto detecting
			1. Video switcher shall support auto signal detecting.
		2. Switcher Signal Routing
			1. The internal video switcher shall have multiple inputs:
				1. Four analog VGA inputs
				2. Four 4K HDMI inputs
				3. Two 4K HDBaseT compatible inputs
			2. All video input signals shall be routable to video outputs.
			3. Each internal switcher input shall be internally connected to one of four external input connection types.
				1. Type 1

DB15HD female connector.

* + - * 1. Type 2

19-pin Type A HDMI female connector.

* + - * 1. Type 4

8-pin RJ-45 shielded female HDBaseT compatible connector

* 1. ANALOG TO DIGITAL VIDEO TRANSCODER
		1. Resolution
			1. Convert all analog video to digital video at source resolution
				1. Analog to digital conversion: 10-bit 165 MHz
	2. SINGLE CABLE SIGNAL TRANSMISSION
		1. Transmitter and Receiver
			1. Integrated transmitter and receiver connections for single cable signal transmission.
			2. Single cable signal transmission shall be HDBaseT compatible
			3. Single cable signal transmission shall support the following communication standards between presentation system and transmitters and receivers by same manufacturer:
				1. Ethernet
				2. Serial RS-232
				3. Infrared control
		2. Supported signal and data types:
			1. Uncompressed video and audio
			2. HDMI with HDCP
			3. 100Mbps Ethernet
			4. USB HID
			5. Bidirectional device control signals
		3. Cable and Connectors
			1. Cat5e or Cat6 LAN cable.
			2. RJ-45 modular connectors.
		4. Maximum Cable Lengths
			1. Cable Type 1 – Manufacturer Ultra type
				1. 330 feet (100 meters)
			2. Cable Type 2 – Manufacturer 8G type
				1. 330 feet (100 meters) for 2K resolution
				2. 230 feet (70 meters) for 4K resolution
			3. Cable Type 3 – CAT5e
				1. 330 feet (100 meters) for 2K resolution
				2. 165 feet (50 meters) for 4K resolution
		5. Device Power
			1. The single cable signal transmission technology shall be capable of providing power for compatible remote transmitter and receiver devices.
	3. SYSTEM CONTROL PROCESSOR
		1. Control Processor
			1. The Central Switching And Control Unit shall include an integrated microprocessor based control processor.
		2. Minimum Characteristics:
			1. Utilize a real time, preemptive, multi-threaded/multi-tasking kernel; Transaction-Safe Extended FAT file system; supports up to 10 simultaneously running programs. Processor shall communicate directly with Ethernet, control ports and proprietary control network utilizing high-speed, parallel bus infrastructure.
			2. Control processor shall utilize Transaction-Safe Extended FAT file system.
			3. Control System shall support the following Ethernet features:
				1. 10/100/1000 Mbps
				2. Auto-switching
				3. Auto-negotiating
				4. Auto-discovery
				5. Full/half duplex
				6. Industry-standard TCP/IP stack
				7. UDP/IP
				8. CIP
				9. DHCP
				10. Private Network Mode
				11. SSL
				12. IEEE 802.1X
				13. SNMP
				14. BACnet/IP
				15. IPv4 or IPv6
				16. Active Directory authentication
				17. RSTP
				18. SMTP e-mail client
				19. IIS v.6.0 Web Server
				20. Installer setup via manufacturer software or MSIE
		3. External Ports

The control system shall be equipped with the following external connection ports:

* + - 1. Infrared/Serial
				1. One-way device control

IR output up to 1.2 MHz

One-way serial TTL/RS-232 (0-5 Volts) up to 115.2k baud

* + - 1. Infrared Input
				1. Built-in front panel IR receiver

Supports RC-5 IR commands via external IR transmitters

* + - 1. Digital Input
				1. One 3-pin 3.5mm detachable terminal block

Comprised of 2 digital/contact closure inputs

* + - 1. Relay
				1. One 4-pin 3.5mm detachable terminal block

Comprised of 2 normally open, isolated relays

Rated 1 Amp, 30 Volts AC/DC

MOV arc suppression across contacts

* + - 1. Serial Communication Port
				1. One 5-pin 3.5mm detachable terminal block

bidirectional RS-232 ports up to 115.2k baud, hardware and software handshaking support for communication with serial devices.

* + - 1. Ethernet
				1. One 8-wire RJ45

10/100/1000BaseT Ethernet port

* + - 1. Communication Network
				1. One 4-pin 3.5mm detachable terminal blocks

Master net communications ports

24W available 24VDC device power

* 1. SYSTEM FUNCTIONS AND SEQUENCES
		1. Audio-Video Control Functions

Specifier:

Retain the following article if Division 26 Lighting System integration is required in the project.

All Room/area sensor feedback (occupancy, daylight, etc.) provided by the lighting system control processors via the Crestron Remote System Definition (.rsd) file.

* + - 1. Room occupancy status shall be based on sensor data provided by Lighting system as specified in Section 26 09 43.13

Specifier: AV control system programming functionality is project specific, add required functionality here.

* + - 1. Room modes: TBD
			2. System control functions: TBD
		1. Lighting and Shade Control Functions

Specifier:

Retain the following articles if Division 26 Lighting System integration is required in the project.

All lighting and shade systems are to be controlled by the lighting system(s) specified in Section 26 09 43.13. This system (AV Control system) will have complete control of the lighting and shades system via the Remote System Definition (.rsd) file provided by the lighting system contractor/installer. Coordination with lighting system contractor is required in order to integrate required functionality into the .rsd intersystem communication file.

* + - 1. Access to full control capability of integrated lighting and shade systems shall be provided by: Custom Software Control Interface as specified in Section 26 09 43.13.
			2. Basic System Control Functions - Lighting system functions as defined by Section 26 09 43.13 shall be accessible by the AV Automation Control Processor. All stored information shall be maintained by the lighting system control processors and only accessed and edited by the AV Automation Control Processors.
			3. Advanced System Control Functions – Lighting system functions as defined by Section 26 09 43.13 shall be accessible by the AV Automation Control Processor. All stored information shall be maintained by the lighting system control processors and only accessed and edited by the AV Automation Control Processors.
	1. USER INTERFACE CONTROL FUNCTIONS
		1. As Specified in Division 25.
	2. USER INTERFACE CONTROLLERS
		1. As Specified in Division 25.
1. EXECUTION
	1. INSTALLERS / TECHNICIANS / ENGINEERS
		1. Digital Media System Contractors/Sub Contractors
			1. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests specified in this section.

SPECIFIER: Insert additional certifications/credentials as required based on project needs.

* + - 1. Training Certifications:

SPECIFIER: Crestron offers three DigitalMedia training courses/certificaitons.

DigitalMedia Certified Designer (DMC-D-4K) - A DM Certified Designer understands the fundamental differences between analog and digital systems and the unique design considerations needed to ensure reliable operation.

DigitalMedia Certified Technician (DMC-T-4K) - A DM Certified Technician can perform all of the copper and fiber termination options available for DM systems, perform cable plant certification and install and test the performance capabilities of a Crestron DigitalMedia system.

DigitalMedia Certified Engineer (DMC-E-4K) – The DMC-E-4K Certified Engineer program includes the DMC-D-4K certification and DMC-T-4K Certification. A DM Certified Engineer can perform DMC-D-4K and DMC-T-4K roles as well as commissioning, system setup, diagnostics, testing and reporting. Only a DMC-E-4K is equipped to fully execute and support a DM project.

* + - * 1. Technicians performing Cable Installation and termination shall hold a Crestron DigitalMedia Certified Technician (DMC-T-4K) certification.
				2. Engineers Commissioning the digital media system shall hold a Crestron DigitalMedia Certified Engineer (DMC-E-4K) certification.
	1. SYSTEM TESTING AND COMMISSIONING
		1. Testing
			1. A DigitalMedia Certified Engineer (DMC-E-4K) shall perform the contractor verification tests.
			2. Contractor shall verify that all components of the system are installed according to manufacturers specifications and are compliant with Division 27 specifications.
		2. Commissioning
			1. A DigitalMedia Certified Engineer (DMC-E-4K) shall perform acceptance testing and commissioning.

SPECIFIER: Retain the following for DigitalMedia modular i/o matrix switchers.

* + - 1. The contractor shall provide a copy of the system commissioning Test Report in electronic format.
				1. All reported information shall be generated by the digital media matrix unit and the configuration software.
			2. Commissioning engineer shall run all available tests and include all installed system components.
			3. Commissioning Test Report shall include the following:
				1. Tests Failures and Notices

Sink Device EDID Test – Open items or failures shall not be accepted.

Cable Length Test - Open items or failures shall not be accepted.

HDCP KSV Limitations – Limitations shall not be accepted.

Cable Limitations – Limitations shall not be accepted.

EDID Limitations – Limitations shall not be accepted.

Cable Length Limits exceeded – Failing cables shall not be accepted.

* + - * 1. Device Model Number, Serial Number, and Firmware Version for main chassis and each input and output card.
				2. Device Model Number, Serial Number, and Firmware Version for connected transmitter and receiver devices.
				3. EDID – Input Resolution and 3D support status for each input.
				4. EDID – Supported Output Resolution and 3D support status for devices connected to each output.
				5. EDID – Supported Audio formats for each input.
				6. EDID – Supported Audio formats for devices connected to each output.

END OF SECTION 27 41 16