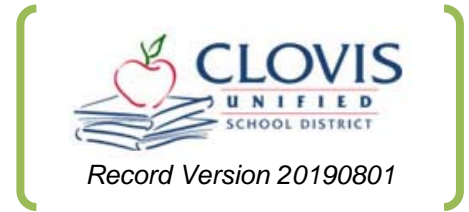


## 274220 - MULTI-PURPOSE SOUND SYSTEM

### Part 1 - General



#### 1.1 Scope of Work

- A. The intent of these Specifications is to provide a complete multi-use sound System and it is the responsibility of the bidding Contractor to provide a complete solution. It is also the responsibility of the Contractor to provide all material necessary to provide a complete system even if the material is not described specifically in the following documentation. All questions concerning non specified product and services will be address to the Owner's Representative before the Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that they [the Contractor] have provided a competent bid for a complete solution.
- B. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of devices, typical installation details, and mounting details will be provided as an attachment to this document. The successful vendor shall meet or exceed all requirements for the systems described in this document.

#### 1.2 Approvals

- A. The system shall maintain the following listings and/or approvals from the following agencies:
  - 1. (UL) Underwriter's Laboratories
  - 2. FCC Federal Communications Commission

#### 1.3 Contractor Qualifications/Quality Assurance

- A. Safety and Indemnity
  - 1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 A. Safety & Indemnity".
- B. Contractor Qualifications
  - 1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 B. Contractor Qualification".
- C. Quality Assurance
  - 1. Contractor shall comply with all requirements as specified in Section 270000 "1.5 C. Quality Assurance".
- D. Warranty
  - 1. Contractor shall comply with all requirements as specified in Section 270000 "1.8. Acceptance & Warranties".

#### 1.4 Submittal Documentation

- A. The successful contractor shall provide their submittal package in accordance with the Section 01 20 00 1.06 Submittal Schedule, and Section 270000 "1.6 Submittal Documentation".
- B. Contractor shall also include in their Submittal Package:
  - 1. A shop drawing depicting all system components and interconnections.
  - 2. Control Panel button/page panel layouts.

#### 1.5 Equivalent Products

- A. The audio systems specified have been engineered to provide superior performance and speech intelligibility, and have been designed for the most accurate sound reproduction available for this environment. Contractors wishing to provide alternate systems must provide industry standard documentation to ensure the owner of similar design quality.
- B. All Product provided in this Specification are those of:
  - 1. Speakers; Electrovoice
  - 2. Audio Video Controller; Extron
  - 3. Wire; Belden, West Penn Wire
  - 4. Audio Amplifier; QSC
  - 5. Wireless microphone; Shure, Senheisser

6. Multi Media Player; Denon DN 300-Z
  7. Personal Listening system; Telex
  8. Power Sequencer; SurgeX
- C. Pre-Approved Equals:
1. Speakers; Electrovoice Evid Series and JBL Control Contractor Series
  2. Audio Amplifier; Electrovoice and Crown, and Yamaha
  3. Wireless microphone; Shure and Senheisser
  4. Personal Listening system; Listen Technologies
  5. Power Sequencer; Middle Atlantic, ETA, and Juice Goose
  6. Audio Mixer: TOA 9000M2 Series, Model M-9000M2 with appropriate number of D-001T and T001T input modules, also Shure SCM800.
- D. Contractors wishing to approve a system other than those specified in this document shall do so in accordance with Section 270000 "1.7 Equivalent Products".

## 1.6 Multi-use System Description

### Sound System Description

The audio visual system shall provide amplified audio signals from a master and remote location to overhead speakers. The system shall be setup to provide three types of venues, and provide the following functions:

- Multi-Point Array System
- Audio mixing and switching of multiple inputs

## Part 2 - Products

The following sections specifically list the acceptable equipment types and items for this project. Where quantities are not noted, they may be obtained from the project drawings. In the event of a discrepancy between the specifications and the project drawings, the greater quantity or better quality shall be furnished.

### 2.1 Audio Visual System Equipment

#### A. Speakers for Multi-use

1. Versatile performance for mains, fills, or monitors
2. Passive crossover
3. High sensitivity, 131 dB maximum SPL
4. Power handling: 600 W continuous, 2400 W peak
5. Up to four anchor-plate attachments M8 mounting inserts (7) Integrated handle
6. Available in black and white
7. Input Connections 2 conductor SJO cable and gland nut
8. Nominal Impedance 8  $\Omega$
9. Speaker Type Full-range
10. Frequency Response (-3 dB) 58 - 15000 Hz
11. Frequency Response (-10 dB) 48 - 20000 Hz
12. Sensitivity 1 W/1 m 97 dB
13. Max. SPL/1m (calc) 131 dB
14. Coverage (Nominal -6 dB) H 90/60  $^{\circ}$
15. Coverage (Nominal -6 dB) V 50/60  $^{\circ}$
16. LF Transducer 12-inch DVX3121A
17. LF Power Handling 500 Watts
18. HF Power Handling 40 Watts
19. HF Transducer 2-inch ND2
20. Crossover Frequency 2000 Hz
21. Minimum Impedance 6.2  $\Omega$
22. Enclosure Material High Impact Polystyrene
23. Height 24.13", Width 15.63", Depth 14.25"
24. Weight Net 43.65 lbs
25. Speaker shall be equal to **Electrovoice ZX3**

#### B. Audio Mixer

1. The unit shall be a analog/digital mixer.
  - 6 microphone/line inputs, plus 3 music source inputs
  - 100 V, telephone and a call station input with priority & VOX
  - 2 zones and 2-channel operation

- Voice-activated emergency override
- 2-tone chime built in, 7 more chimes optional with call station
- The mixer shall have 3 stereo music source inputs on cinch connectors. The inputs shall be converted to mono. The mixer shall have a separate voice (level) activated input for 100v and tele-phone in on a balanced screw terminal. The mixer shall have a separate call station input with zone selection, preannouncement chime, priority and push to talk contact. The mixer shall be able to address two separate zones independently. The mixer shall have 2 channel operation. The mixer shall have a contact activated input selectable on input 1. This input shall accept any microphone with or without a contact output. The mixer shall have a voice activated emergency override on input two. The mixer shall have a voice activated emergency override on input two. The mixer shall have a two-tone chime built in.
- The output of the mixer shall be balanced line level (1V). There will be outputs for zone 1 and for zone two on XLR connectors. The unit shall have a relay that switches with the call activation.
- Input channel 1 and 2 shall be able to take priority over all other microphone and music inputs. Input 1 shall be able to be activated by contact closure on the PTT (push to talk) input or the input shall be able to be switched automatically if a signal shall be fed to the input i.e. if someone speaks into the microphone (VOX activation). A 2-tone chime shall be able to be configured to precede an announcement. Input 2 also shall have a VOX possibility. When one or both inputs shall be configured to have priority, the amount of attenuation (reduction) of all other inputs, mic/line or cinch, shall be able to be set between 0 dB (no attenuation) and  $-\infty$ dB (mute). This provides a talk over or voice over function. To increase intelligibility for announcements, input channels 1 and 2 shall also feature selectable speech filters.
- 
- Mains power supply shall have a tolerance of  $\pm 10\%$ , 50/60 Hz
- The battery power supply shall have a tolerance of  $-20\%$  /  $+10\%$
- The frequency response shall be 30 Hz to 20 kHz ( $+0/ 3$  dB @ 10 dB ref. rated output)
- The Distortion shall be  $<1\%$  @ rated output power, 1 kHz
- The mic/line sensitivity shall be 1 mV for the microphone setting and 200 mV for line setting
- The total dynamic range shall be more than 98 dB
- The speech filter shall have a roll of frequency of  $-3$  dB @ 315 Hz, The mixer shall fit in a 2 unit high standard 19 rack with a depth of 270 or more, excluding connectors.
- The unit shall be the **Rane MLM103**

C. Audio Amplifier

1. The approved Audio Amplifier shall have:

- Four channels in one compact rack-efficient unit
- 500 W per channel
- 70/100 V operation for distributed systems
- Class-D design for optimum efficiency
- Slot for optional RCM-810 module, allowing IRIS-Net control and monitoring
- IRIS-Net selection of each channel's impedance (2-10  $\Omega$  in 0.1  $\Omega$  steps)
- Rear-mounted attenuators
- Switchable 50 Hz high-pass filter (Hi-Z mode)
- Complete protection: thermal, overload, shorts, HF, DC, back-EMF, inrush current
- Phoenix-type input and output connections
- Remote power-on/off contact
- Programmable power-on delay settings
- Front-to-rear fans

Amplifier Gain	32 dB (Lo-Z), 33 dB (70V), 36 dB (100V)
Analog Inputs	4, electronically balanced, Phoenix-type
Audio Network	No

CAN Bus Interface	Optional (RCM-810 card)
Continuous Rated Power (1 kHz, THD 1%) 100v	500 Watts
Continuous Rated Power (1 kHz, THD 1%) 2Ω	500 Watts
Continuous Rated Power (1 kHz, THD 1%) 4Ω	500 Watts
Continuous Rated Power (1 kHz, THD 1%) 70v	500 Watts
Continuous Rated Power (1 kHz, THD 1%) 8Ω	250 Watts
Continuous Rated Power (20- 20 kHz, THD<0,2%) 100v	450 Watts
Continuous Rated Power (20- 20 kHz, THD<0,2%) 4Ω	450 Watts
Continuous Rated Power (20- 20 kHz, THD<0,2%) 70v	450 Watts
Continuous Rated Power (20- 20 kHz, THD<0,2%) 8Ω	225 Watts
Cooling	Front-to-Rear, continuously variable fans
DIM 30	0.02 %
Electronics Type	Amplifier
Frequency Response	15 Hz-30 kHz
Impedance	2/4/8/8 VLD/70 V/100V Ω
Input Impedance (Balanced)	20 kΩ
Input Sensitivity	0 dBu (.775V)-2 Ω, +3 dBu (1.1V)-4/8 Ω, +6 dBu (1.55) 70V/100V
Intermodulation Distortion (SMPTE)	0.05 %
Mains Voltage	220 - 240 V, 50 - 60 Hz or 120 V, 50 - 60 Hz, 50 - 60 Hz
Maximum Bridged Output 4Ω	1000 Watts
Maximum Bridged Output 8Ω	1000 Watts
Maximum Input Voltage	22 9.76 Vrms
Network Control (IRIS-Net)	Optional (RCM-810 card)
Signal-to-Noise Ratio (A-weighted)	100 dB
Slew Rate	28 V/μs
Topology	Class-D
Total Harmonic Distortion	0.05 %
Variable Load Drive (VLD)	Yes
Height	2RU 88.1 mm (3.47")
Width	482.6 mm (19")
Depth	421.5 mm (16.59")
Weight Net	11.1 kg (24.47 lbs)

- The approved Audio Amplifier shall be equal to **Electrovoice, Model# CPS4.5**.

- D. Assistive Listening System shall have the following characteristics:
1. The Assistive Listening Transmitter shall feature 16 user selectable frequencies controlled by a front mounted selector switch, a headphone jack with adjustable level for input signal monitoring, and a peak reading LED display for visual input monitoring.

2. The Transmitter shall have a balanced XLR-3F input with selectable microphone, line, and 70 volt options. The unit shall also have an unbalanced 1/4" input.
3. The Transmitter shall feature an input attenuator and hi/low RF power-switch on the back panel.
4. The System Transmitters shall meet the following performance criteria:
  - RF Frequency Range: 72 to 76 MHz
  - Modulation FM:  $\pm 25$  KHz deviation
  - Signal-To-Noise Ratio: 58 dB (64 dB A weighted)
  - Maximum Deviation:  $\pm 25$  KHz
  - Maximum Rated Power: 50 mW
  - Audio Input: Balanced XLR-3F plus unbalanced 1/4"
  - Antenna: 1/4" wave omnidirectional whip
  - Audio Controls: Audio input level, monitor jack volume
  - Power Requirements: 15-24 Vdc or 13 Vac; 115Vac 60 Hz @ 300 mA plug-in wall pack power supply
  - Dimensions: H 1-3/4" x W 7-1/2" x D 6-7/8"
  - FCC ID: B5DM508
  - Visual Indicators: 5 segment audio level LED, power ON indicator
  - RF Power Switch: 80K  $\mu$ V/m @ 3 m in hi, 25K  $\mu$ V/m @ 3 m in low
5. The Assistive Listening Single Channel Receivers shall operate on one of 16 fixed narrow-band frequencies in the 72-76 MHz band.
6. Receiver shall provide a recessed headphone jack and volume control.
7. Receivers shall operate on two AA batteries for up to 30 hours.
8. The System Receivers shall meet the following performance criteria:
  - Power Requirements: (2) AA batteries, Alkaline or NICAD 30 hours Alkaline, 10 hours NICAD
  - Audio Frequency Response: <3 dB Variation (100 Hz-10 KHz)
  - Sensitivity: 0.5  $\mu$ V typical, 1.0  $\mu$ V maximum, 12 dB SINAD
  - Signal-To-Noise (@ 1 mV Input): >60 dB
  - Distortion: <2% T.H.D.
  - Audio Output @ 10% distortion:  
into 8 Ohms: 2.0V/15mW 3.0V/80mW  
into 32 Ohms: 2.0V/10mW 3.0V/50mW
  - Antenna Type: 1/4 Wave Omni-directional, in earphone cord
  - Controls: Volume/On/Off Switch
  - Dimensions: H 4" x W 2-3/4" x D 1"
  - Visual Indicators: Backlit On/Tuning indicator
  - External Jack: 3.5mm Audio Output/Charger
  - FCC ID: B5DE401
  - The approved Personal Listening system shall be equal to **Telex, Model# ST-300**. Contractor will provide one (1) Battery Charger, Telex # BC-100.

*\*To meet ADA requirements Contractor will provide 4% of the building occupancy with listening devices (SR-50) & ear buds (SEB-1).*

#### E. Wireless Microphone

1. The approved Wireless Microphone shall have:
  - Autoscans on all receivers for simple and secure frequency selection
  - 1440 frequencies within a 36MHz switching bandwidth for greater tuning flexibility
  - Robust metal construction for durability
  - Smaller bodypack transmitters and receivers(30% smaller than current EW)
  - Pilot tone squelch(defeatable for backwards compatibility with original EW systems)
  - New battery concept(AA cells and rechargeable battery accessories)
  - Transmitter battery status telemetry on all models
  - Audio signal metering on transmitter LCD display
  - External charging contacts on 300 and 500 series bodypacks
  - XLR jacks on all rack-mountable units(including 100 series)
  - Provide **ASP2** Antenna Combiner
  - Provide **NT1** Main Power Unit

- Provide **GA 2** Rack Mount Kit
  - Provide **A-1031-U** Omni Directional Antenna
  - Provide **AM2** Cable Kit
  - Provide **AB2** Booster Kit
2. Provide two wireless microphones
- Two handheld microphone equal to Sennheiser ew335G3
- \*Contractor will provide all necessary rack mounting kits and required accessories. Contractor shall include all power supplies, BnC cables, Antenna's, and mounting hardware.*

F. Hand Held Microphone & Accessories:

1. The approved Hand Held Microphone shall have:
- Transducer Type: Condenser (electret bias)
  - Frequency Response: 50 to 18,000 Hz
  - Polar Pattern: Cardioid
  - Output Impedance: 150 Ohms at 1 kHz  
Recommended minimum load impedance: 600 Ohms
  - Sensitivity (at 1,000 Hz) Open Circuit Voltage: -50 dBV/Pa (3.15 mV) (1 Pa = 94 dB SPL)
  - Output Clipping Level: 1000 Ohm Load at 1,000 Hz: +3 dBV (1.41 V)
  - Maximum SPL (at 1,000 Hz): 1000 ohm load (1% THD): 147 dB
  - Self-Noise: 23 dB typical, A-weighted
  - Dynamic Range (1000 ohms): 124 dB (maximum SPL to A-weighted noise level)
  - Signal-to-Noise Ratio: 71 dB at 94 dB SPL (IEC 651)\*  
\*S/N ratio is difference between 94 dB SPL and equivalent SPL of self-noise A-weighted.
  - Polarity: Positive pressure on diaphragm produces positive voltage on pin 2 relative to pin 3 of the output connector.
  - Phantom Supply Requirement: 11 to 52 Vdc, positive at both pins 2 and 3 Current Drain: 5.2 mA
  - Connector: Three-pin (XLR) professional audio
  - Case: Dark gray enamel-painted steel with matte-finished silver colored steel grille
  - The approved Hand Held Microphone shall be equal to **Shure, Model# SM86**. Contractor to provide a quantity of two (2).
2. Full Length Microphone Stand.
- The Microphone Stand shall be constructed of 5/8" and 7/8" dia. heavy-duty welded cold rolled steel tubing with 5/8" - 27male thread termination to accommodate standard microphone holders and accessories.
  - Top and bottom lock-nut rings will be included for versatile and secure positioning.
  - The entire assembly shall be finished in non-reflective ebony epoxy.
  - The approved Full Length Microphone Stand shall be equal to **Atlas Sound, Model # MS-12CE**. Contractor to provide a quantity of two (2).
3. Microphone Cable.
- Microphone Cables shall be Heavy-duty, 25 foot (7.5 m), balanced cable for low-impedance operation.
  - Cables will feature black connectors on microphone end for low visibility.
  - The approved Microphone Cables shall be equal to **Shure, Model# C25B**. Contractor to provide a quantity of four (4).

G. Electrical Power Equipment

1. The approved Power Sequencer shall have:
- Shall be a two-rack-space unit in a magnetic shielding steel enclosure.
  - Shall operate from 120 volts AC and have a 9-foot, grounded, 3-wire #12 line cord.
  - There shall be 12 grounded AC receptacles in three banks of four on the rear panel, each bank sequenced from the previous bank by an adjustable 0 - 40 second delay, and two receptacles always on.
  - Control Inputs: Momentary Switch, Latching Switch,
  - Contact Closure or 5-30 Vdc
  - Input Control Current: 3 mA

- DC Voltage Output: 12 Vdc, 40 mA maximum load
  - Auxiliary Relay Output: 1 amp, 30 Vdc There shall be a back-lit LCD display that shows unit status and AC line voltage, and two screwdriver adjustments to program the unit.
  - Overall dimensions shall be 3.5" H x 19" W x 10.5"D.
  - Weight shall be 16 pounds.
  - Shall have a load rating of 20 amps at 120 volts, a self-test circuit with visual indicator and provide EMI/RFI filtering, inrush current elimination and catastrophic over/under-voltage shutdown.
  - It shall meet Federal Grade A, Class 1, Mode 1 guidelines for powerline surge suppressors and withstand at least 1000 occurrences of surge pulse voltages up to 6000 volts.
  - Thermal circuit breaker overload protection
  - 10-year warranty
  - Made in U.S.A.
  - The approved Power Sequencer shall be equal to the **SurgeX, Model# SEQ.**
2. The approved Secondary Power Strip shall have:
- Shall be a one-rack-space unit in a magnetic shielding steel enclosure.
  - Shall operate from 120 volts AC and have a 9-foot, grounded, 3-wire #14 line cord.
  - There shall be 8 grounded AC receptacles on the back panel, with 6 switched and 2 always on.
  - There shall be connectors and a dimmer for 2 Littlite gooseneck lamps on the front panel.
  - Overall dimensions shall be 1.75" H x 19" W x 10.5" D.
  - Weight shall be 11 pounds.
  - Shall have a load rating of 15 amps at 120 volts, a self-test circuit with visual indicator, and provide EMI/RFI filtering, inrush current elimination and catastrophic over/under-voltage shutdown.
  - It shall meet Federal Grade A, Class 1, Mode 1 guidelines for powerline surge suppressors and withstand at least 1000 occurrences of surge pulse voltages up to 6000 volts.
  - Thermal circuit breaker overload protection
  - Self-test circuit with visual indicator
  - 10-year warranty
  - Made in U.S.A.
  - The approved Power Sequencer shall be equal to the **SurgeX, Model# SX1115RL.**  
*\*Contractor will provide TWO (2) Littlite LED Gooseneck with 3-pin, right angle XLR connector. MODEL:12XR-LED*

H. Sound Equipment Cabinet

1. The approved SER cabinet shall have:
- Rotating design allows enhanced access to rear equipment, simplifying wiring
  - UL Listed in the US and Canada
  - Host enclosure can be pre-installed on-site while detachable rack frame is integrated with equipment off-site, simplifying installation
  - 26" useable depth, rack frame is housed in a 32-7/8" deep host enclosure
  - 750 lb. weight capacity with proper weight distribution
  - 44 space rack frame height
  - Effective cable management system provided
  - Knockouts provided for cable pass-through and ganging multiple racks
  - Engineered ventilation locations optimize passive heat convection
  - Configurable open top accepts a number of options for active thermal management
  - Standard front and rear 11-gauge, 10-32 threaded rackrail with marked rackspace increments
  - Slide out rotating rack system
  - Rear Access Panels available for rear security or to maximize potential of active thermal management
  - The approved Sound Equipment Cabinet shall be equal to the **Middle Atlantic, Model# SR-44-32.**

- Contractor will provide the following Sound System Rack Accessories. Provide quantities as listed and shown on the project drawings, unless other wise noted:
  - Front Door; Vented Plexi-Glass, equal to Middle Atlantic # PVFD-44
  - Duct cool adapter top, equal to Middle Atlantic # MW-DT
  - Horizontal Mount Fan Panel with Thermostatic speed control, equal to Middle Atlantic #UQFP-4D.
  - Power Sequence Controller, equal to Middle Atlantic #USC-6R.
  - Vertical Power Strip, equal; to Middle Atlantic, #MPR-6 quantity (1) one, #RLM-20-1C quantity (1) one, #R-20 quantity (5) five, #J-24X6 quantity (1) one, and #T-80X6 quantity (1) one.
  - Horizontal Power Distribution Panel, equal to Middle Atlantic #PD-920R-NS.

2. Cabinet Accessories

- Rack mount Lockable Drawer, equal to Middle Atlantic #D4LK.
- Universal Connector Panel, equal to Middle Atlantic # UNI-1-C
- Blank panels, equal to Middle Atlantic # EB1 1-3/4" (1 space), EB2 3-1/2" (2 space), EB3 5-1/4" (3 space), EB4 7" (4 space), EB5 8-3/4" (5 space), EB6 10-1/2" (6 space)
- Standard Rack Screws, equal to Middle Atlantic # HP-500

I. Wire & Cables

Audio Cable

1. The approved Ceiling Speaker Cable shall be:
  - 18awg stranded (7x26awg) ASTM bare copper
  - 2 conductor twisted pair cable with PVC insulation and a Gray PVC jacket.
  - The approved Speaker Cable shall be equal to **West Penn, PN# 224.**
2. The approved low frequency Speaker Cable shall be:
  - 12awg stranded (19x25awg) ASTM bare copper
  - 2 conductor twisted pair cable with PVC insulation and a Gray PVC jacket.
  - The approved Game Speaker Cable shall be equal to **West Penn, PN# 227.**
3. The approved Microphone Cable shall be:
  - 20awg stranded (7x28awg) ASTM tinned copper
  - 2 conductor twisted pair cable with PVC insulation and a Gray PVC jacket.
  - Cable shall have an overall 100% aluminum polyester foil shield and a 22awg tinned copper drain wire.
  - The approved Microphone Cable shall be equal to **West Penn, PN# 292.**
4. The approved inter-rack cabling shall be:
  - 20awg stranded (7x28awg) ASTM tinned copper
  - 2 conductor twisted pair cable with PVC insulation and a Gray PVC jacket.
  - Cable shall have an overall 100% aluminum polyester foil shield and a 22awg tinned copper drain wire.
  - The approved cable shall be equal to **West Penn, PN# 452**
  - Connectors: 3.5mm Stereo Male to 3.5mm Stereo Male
  - Fully molded connectors provide strain relief
  - Braided shield prevents unwanted EMI/RFI interference
  - Nickel-plated connectors
  - The approved cable shall be equal to **Cables To Go, PN# 40412**
  - Connectors: (2) RCA Male Plug to (2) RCA Male Plug
  - Bonded construction design for neat, easy connection of audio signals
  - Oxygen-free copper conductors deliver high-quality audio
  - 100% foil and OFC shield protects against noise and interference
  - Twisted pair construction of audio conductors fight noise and hum.
  - Corrosion-resistant, precision 24K gold-plated connectors ensure long-lasting quality



- Ultra-flexible jacket for easy installation
- The approved cable shall be equal to **Cables To Go, PN# 13032**
- Connectors: 3.5mm Stereo Male to 2x RCA Stereo Male
- Fully molded connectors provide strain relief
- Foil shielded to prevent unwanted EMI/RFI interference
- Gold-Plated connectors
- The approved cable shall be equal to **Cables To Go, PN# 40613**

J. Installation Components

1. Mic and Line Device Outlets:

- Input: 3-pin female XLR-type, RCA (phono) type and 1/4" TRS jacks where shown on Drawings.
  - Microphone receptacles shall be Switchcraft J3FS or equal by Neutrik
- Insulate RCA and TRS jacks from plate, do not ground pin 1 on XLRs.
- Output: 3-pin male XLR-type, RCA (phono) type, and 1/4" TRS as specified above.

2. Terminal Blocks:

Loudspeaker and DC Control Lines:

- Terminal blocks providing any of these sets of features:
- Screw-clamp-type terminals with wire guards, designed for max. 8 AWG wires.
- Min. 9/16 in. terminal centers with barriers, 8-32 x 5/16 binder head screws, and closed bottom.
- Variable length modular system designed for wire sizes AWG No. 22 to No. 10, with dual head screws and barrier, retaining track, and end stops no greater than 20 blocks apart.
- Acceptable Products:
  - Electrovert 16 EDS.
  - TRW Cinch Connectors 542 series.
  - AMP Special Industries FLEXI-BLOCK 8 Series Terminal Block System.

3. Connectors:

Microphone and Line Connectors (Panel Mount):

- Balanced Input Receptacles: female gender "XLR"-type receptacles.
  - Acceptable Products:
    - Switchcraft C3F or D3F.
    - Equivalent by Neutrik
- Balanced Output Receptacles: Male gender "XLR"-type receptacles.
  - Acceptable Products:
    - Switchcraft C3M or D3M.
    - Equivalent by Neutrik

Microphone and Line Connectors (Cable Mount):

- Balanced Input Connectors: female gender "XLR"-type connectors.
  - Acceptable Products:
    - Switchcraft A3F.
    - Neutrik NC3FX.
- Balanced Output Connectors: male gender "XLR" type connectors.
  - Acceptable Products:
    - Switchcraft A3M.
    - Neutrik NC3MX.

## Part 3 - Execution

### 3.1 General

- A. All Work described in this specifying document and on the Project drawings shall be performed in accordance with the acknowledged Professional and Industry standards and practices. All installed equipment shall meet and/or exceed the specified manufactures regulations.
- B. The Contractor shall maintain a competent supervisor and Manufacture Certified Technician assigned to this installation for the duration of the Project.
- C. Furnish and install all materials, devices, components and equipment required for a complete and operational system.

- D. It is the contractor's obligation to inform the Owner and/or the Owner's Representative of any and all conflict's, between the project documents and the onsite conditions.
- E. It is the Contractor's responsibility and obligation to coordinate with all necessary trades to ensure the integrity and compliance of the Manufacture and Industry standards are meet during the duration of the installation.

### 3.2 Installation

- A. Furnish components, racks, wire, cabinetry, connectors, materials, parts, equipment, labor, etc. necessary for the complete installation of the systems in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.
- B. Installation shall follow standard broadcast wiring and installation practice, and shall meet or exceed industry standards for such work.
- C. Wire not installed in equipment racks, not portable, unrated ceiling space, or not installed in conduit shall be fire rated and meet all applicable codes.
- D. All signal equipment control cables shall be stranded wire, appropriately shielded, of gauge and number of conductors required by the manufacturer for proper operation of the system or equipment item furnished.
- E. All cables including control, network, low-voltage power, video and audio which are required to be on floor will be properly covered and secured so that they are protected by strain and safe of trip hazards.
- F. Wire and cable for all other devices shall be supplied in accordance with the recommendations of the device manufacturer and the National Electrical Code.
- G. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed so as to provide reasonable safety to the operator. Supply adequate ventilation for all enclosed equipment items which produce heat.
- H. Furnish the system to facilitate expansion and servicing using modular, solid-state components. All equipment shall be designed and rated for continuous operation and shall be UL listed, or manufactured to UL standards.
- I. Shields of audio cables shall be grounded at one end only, at the inputs of the various equipment items in the system.
- J. Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to insure that constant polarity is maintained.
- K. Terminate all unused inputs and outputs with proper precision shielded resistors.
- L. Route cables and wiring within equipment racks and cabinetry according to function, separating wires of different signal levels (video, microphone, line level, amplifier output, AC, control, etc.) by as much physical distance as possible. Neatly arrange and bundle all cables loosely with velcro cable ties. Cables and wires shall be continuous lengths without splices.
- M. All system wire, except spare wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No unterminated wire ends will be accepted. Heat shrink type tubing shall be used to insulate and dress the ends of all wire and cables. Include a separate tube for the ground or drain wire.
- N. All cables in conduits shall be insulated from each other and from the conduit the entire length and shall not be spliced. All cables and wires are to be continuous lengths without splices.
- O. All solder joints and terminations shall be made with resin-core silver solder. Temperature regulated soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns or temperature unregulated irons shall be used on the job site.
- P. Mechanical connections shall be made using approved connectors of the correct size and type for the connection. Wire nuts will not be accepted.
- Q. Each mechanical connector shall be attached using the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
- R. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site.
- S. Label all wires in racks and console as to destination and purpose. Clearly and permanently label all jacks, controls, and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted. Attach laminated

plastic labels with contact cement, being careful to clean off excess or visible cement. Embossed or printed label tape, and press-on or lift-off lettering systems will not be accepted. All labeling shall be completed prior to final system inspection.

- T. Provide a #6 AWG insulated copper ground wire from the main equipment to the building main ground bus.

### 3.3 Programming

- A. Contractor shall provide all necessary programming to provide a complete operating Audio System.
- B. Contractor shall include in their bid three (3) two (2) hour planning meetings with the owner and their Representatives to outline all specific programming issues, as well as, but limited to:
1. Contractor will be informed of any specific requirements for use of the system.
  2. Contractor will provide overview of system capabilities.
  3. Contractor will address all concerns of the Owner and their Representatives.
- C. All Crestron Control System Programming shall be custom produced for this installation by qualified factory-trained installer and software support shall be provided to owner for 12 months after the final acceptance of this project. Contractor to work with the Owner's staff to assign IP addresses and set-up Crestron & other A/V equipment. Software must be capable of scheduling and troubleshooting over the network connection.

### 3.4 Testing

- A. The completed AV systems shall be physically inspected by the Owner's representative to assure that all equipment is installed in a neat and professional manner, and in accordance with these Specifications.
- B. The final system testing and commissioning shall be performed after all installation and initial testing has been completed by the Installer, but prior to any use of the systems.
- C. The Contractor, prior to requesting systems testing and demonstration to the Owner's representative, shall ensure that all systems are in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive hum and noise, RF interference, or instability of any form.
- D. The Contractor shall be responsible for properly performing all setup and alignment of systems, and all assembly and setup of portable equipment.
- E. The Installer shall be responsible for properly performing the equalization of the sound system. After equalization and test the sound system shall meet or exceed the following specifications:
- System shall be free of short circuits, ground loops, parasitic oscillation, excessive system noise, hum, RF interference, and instability of any form.
  - Maximum SPL with band-limited pink noise input to the system shall be 99dB before audible distortion occurs.
  - Acoustic response of the system shall be plus or minus 1.5dB along a line which is flat from 80Hz to 4000Hz and which rolls off at 1dB per octave to 16kHz.

### 3.5 System Commissioning

- A. Audio Visual System Commissioning
1. In the presence of the Owner's Representative the Contractor shall perform the attached functions listed below:
    - (1) Check calculated Sound Pressure Levels (spl) readings at seating
    - (2) Inspection of equipment racks for neatness and proper termination
    - (3) Inspection of all terminations
    - (4) Inspection of all W/P connections
    - (5) Inspection of all inputs and output devices
    - (6) Verify bandwidth of sound system
    - (7) Verify polarity of speaker system and connectors
    - (8) Check wire types at all locations
    - (9) Verify connector types
    - (10) Check Impedance of speaker lines
    - (11) Verify frequency response of speaker system with RTA
    - (12) Verify coverage of speaker system
    - (13) Contractor must provide man lift to speaker location
    - (14) Contactor must provide access to all termination points

- (15) Check cooling system in equipment rack
- (16) Check general operation of control surface
- (17) Check programming of control surface for routing and proper function
- (18) Check power sequencing

2. All testing documentation will be supplied as a part of the Contractors As-built Documentation.

- B. Contractor will include in their bid price six (6) hours for onsite commissioning. Contractor will provide the installation technician who was responsible for this project to be present at the system commissioning to tune, fix, repair, replace all system components that do not operate within the tolerance as set forth in this specification, the project documents, and industry standards.
- C. The final acceptance of the system by the Owner will be based upon the report of the Owner representative following inspection, testing, and commissioning. A list of items in need of completion or correction shall be generated by the owner, which must be corrected by the Installer before final acceptance will be granted.

### 3.6 Training

- A. Contractor shall provide no less than three (3) two (2) hour training sessions.
  - 1. The first training session will be a "Train the Trainer". The owner will appoint their representative to be provided extensive training so that he/she will be able to provide additional support once the project has been completed.
  - 2. The additional training session will be provided as a general overview of the system operation for large groups or several smaller groups as designated by the owner. Usually these additional training events will coincide with a school function when the sound system will be used.
  - 3. Provide sign in sheets for all training events. Deliver to architect in the close out documents.
- B. Contractor shall provide no less than four (4) secondary training sessions as requested by the owner. These secondary training sessions will be for specific owner requests and needs based on usage. There shall be no additional charge for these training sessions during the first year of warranty.

### 3.7 Warranty

- A. Contractor will provide a minimum of a 1 year Workmanship Warranty that includes Parts and Labor.
- B. All equipment provided under this specification shall be warranted to be free from defects in materials and workmanship for a period of 12 months from the notice of completion.
- C. The Contractor shall maintain regular service facilities and provide a qualified technician familiar with the work specified for this project. Contractor will respond to all notice of malfunction from the Owner within 24 hours of receiving trouble call. As part of this warranty, the Contractor shall provide, at no expense to the Owner, all material, devices, equipment, and personnel necessary and resolve malfunction and/or to provide alternate facilities, services, or equipment for the duration of repairs to any defective work as described in this section.
- D. All repairs and service under warranty shall be at the jobsite unless in violation of manufacturer's warranty, wherein contractor shall provide substitute equipment for the duration of repairs. Transportation of substitute or test equipment and personnel to and from the jobsite shall be at no expense to the owner.
- E. All repair and service work under warranty work, except emergency repairs can be performed during regular working hours of regular working days. Emergency repairs shall be made when a system or component malfunctions during use, and shall be performed on an immediate basis. All work shall be performed by personnel in the employ of contractor, having specific experience in the work of this specification and shall not be subcontracted or assigned to another company for service, unless Owner has approved such assignment in writing, in which event contractor shall nevertheless be responsible to the Owner for such work.

### 3.8 System Documentation

- A. Upon completion of the installation, the contractor shall provide four copies (one hardcopy and three electronic copies) of Project Close-Out Documents to the Owner. Documentation shall include the items detailed in the sub-sections below:

1. Maintenance and Operation Manuals
  2. All System source codes and passwords (Crestron Processor Program and Touch Panel Program) must be handed over to, and become property of the Owner upon completion of this project.
  3. As-Built Drawings
- B. The **As-Built** drawings are to include Rack Elevations, Back Board Layout, Equipment Layout and System Single Line Drawings.

**END OF SECTION**