

SECTION 285100 – AUDIO COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this section.

1.2 SUMMARY

- A. This section includes the requirements and operational characteristics for an Audio Communication System, which is an integral part of the Security Control System. Audio Communication systems included are:
 - 1. Remote intercom stations, ceiling-mounted speaker assemblies and speaker horns.
 - 2. Audio system head-end and control components utilizing Harding Instruments MicroComm DXL digital intercom system exchange or approved equal.
 - 3. General and Emergency Paging components.
 - 4. Program Distribution
 - 5. GUI control station audio components.
 - 6. Threshold Detection & Monitoring
 - 7. Covert microphone device
- B. All components used in creating the communication system shall be of the same manufacturer and/or approved by the manufacturer for system compatibility. Equipment and specified herein is for the purpose of establishing the types of equipment and the minimum quality of equipment required. It shall be the Security Control System Contractor's responsibility to assure the compatibility of all audio communications equipment, software, programming, cable, mounting methods, etc. that are used in providing a complete system.
- C. Provide a PLC-controlled, facility-wide, digital audio communication system, which is fully integrated with the Security Control System. This system shall provide two-way, remote reply intercommunication between GUI control station(s) and users and remote intercom stations, speakers, and horns. This system shall allow any remote intercom station or ceiling monitoring speaker to be answered by the GUI control station in primary control of that particular area, or by any of the GUI control station(s) in Master Control during a 'take-over' situation.
- D. The audio system will be free from any 'popping', 'cracking' or 'humming' at all times.
- E. Each GUI control station shall have its own dedicated talk path. System shall provide for call forwarding/takeover from one GUI control station to another after an owner specified time.
- F. The audio communication system shall interface with the CCTV system via the PLC System. When an intercom talk path is established, the CCTV system shall automatically call up any CCTV camera(s) on the intercom call-up monitor of the associated GUI control station when the remote intercom station is in the camera(s) field of view.
- G. Each remote intercom station or ceiling monitoring speaker shall be annunciated on any GUI control station in primary control of that intercom station or speaker's area.
- H. When a station or speaker is off, the icon shall be gray.

- I. When a station or speaker initiates a call to the GUI control station, the icon shall flash green and be accompanied by a distinctive audible tone. The intercom shall provide an audible tone to verify to the user that the button push was recognized by the system.
- J. When a station or speaker is on, the icon shall display the intercom connected color and the audible tone associated with the call shall be off. When there is a camera monitoring the location, the associated camera icon shall turn the same color as the intercom.
- K. Use Desktop Intercom Master stations at the GUI control station. Audio from the GUI control station microphone to the remote intercom station or ceiling speaker shall only be active while the GUI control station push-to-talk push button is depressed.
- L. Volume adjustments of master station and remote intercom station levels shall be controllable during communications. Each station's volume level shall be independently software controlled. Level settings shall remain in effect until modified by a future adjustment.
- M. The system shall include audio level alarm detection with adjustable detection settings for each individual speaker. This feature shall be available for all ceiling/wall monitoring speakers and remote intercom stations within the cells. Detection parameters for each station shall be configurable for different time periods and automatically changed by the system master clock. Provide the Enhanced Process Control Card for each Digital Communications Controller or Digital Communications Expander requiring this functionality for attached stations.
- N. Program Distribution:
 - 1. The system shall receive audio program input from tuners, CD players, etc. for program distribution to intercom stations and/or loudspeaker circuits.
 - 2. The system shall be capable of distributing 6 program channels to all exchanges through the digital audio trunk. Additional program sources shall be capable of being connected locally at each exchange.
 - 3. The system shall permit each exchange to distribute up to 6 simultaneous program channels (each having two volume levels) to groups of stations. The program sources may be selected from the 6 programs distributed through by the digital audio trunk or the local exchange sources.
 - 4. Program distribution (channel, volume, on, off) control shall be from the intercom master stations. Each intercom station, station group, or page zone shall be independently controllable.
 - 5. The remote intercom station program button shall be used to cycle through available channels.
 - 6. Program distribution shall be temporarily suspended to affected intercom stations or paging zones during paging announcements.
 - 7. Program distribution to affected intercom stations shall be temporarily suspended during voice communications.
- O. The paging system shall have the capability of reaching individual areas of the facility, or the entire facility.
- P. Paging is a menu selection within the communicate menu area. The operator may select a paging zone or zones through selecting paging icons within a 3 second window of time.
- Q. Paging zones shall be grouped logically and final zone configuration shall be coordinated with the architect and owner during the submittal phase.

- R. Provide an 'All Page' icon for all intercoms, speakers, and horns in the GUI control station's primary control. The GUI control station(s) in Master Control shall have the ability to page the entire facility.
- S. Remote intercom stations and ceiling monitoring speakers shall be programmed to call a designated GUI control station when activated. If the designated GUI control station is disabled or not occupied, the call shall be automatically forwarded to a secondary backup GUI control station. If the call is not answered at the local, enabled sub control panel after 1 minute, the call shall roll over to master control for them to answer. If intercom calls are already in the sub control panels queue and the station is logged off of or disabled then the intercoms in the queue shall roll over to Master control.
- T. Provide a talk-thru communication system, which shall provide a two-way, hands-free duplex audio communications link between a partition.
- U. The Harding Instruments MicroComm DXL digital intercom system or approved equal shall be controlled through an interface with the PLC System. Most equipment referenced in the specifications includes Harding Instruments part numbers and terminology.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. The basis for most of the audio functions in this specification is the Harding MicroComm DXL digital intercom system. The DXL digital intercom system shall consist of Digital Communication Controllers (DCCs) and Digital Communication Expanders (DCEs). A PLC-controlled switching system shall be incorporated for the paging requirements of the facility. The DCC and DCE shall provide for two line-level paging output ports. For additional paging zones, provide all necessary PLC outputs and relay selection panel(s) for an operational paging system. Audio control and field device components manufactured by companies other than those expressly approved shall not be acceptable. This includes hardware manufactured by other integrators.
- B. Remote Intercom Station
 1. Intercom stations shall be designed for mounting on standard 2-gang outlet boxes. Faceplates to be constructed of 11 gauge brushed stainless steel. Internal steel offset grille to restrict inserting objects through speaker grille. Stations shall be ruggedly constructed and resistant to damage from soil and sprays.
 2. Each intercom station shall incorporate an internal loudspeaker, microphone preamplifier and multiplexing circuitry. One pushbutton shall be provided on each station.
 3. Pushbuttons shall be single piece stainless steel construction and shall be backstopped to prevent excessive travel. Switch shall have positive tactile action with 1 million-operation lifetime.
 4. Loudspeakers shall be waterproof mylar cone type.
 5. All intercom station functions shall be transmitted over a single shielded pair cable. Stations to be provided with MTA type insulation displacement connector that requires no wire stripping for installation.
 6. Outdoor intercom stations are to be identical in all respects to standard intercom stations except that all metal plates and hardware shall be stainless steel, and internal circuitry and components to be conformal coated.

7. The station shall include internal termination circuitry for line fault supervision to detect open and short circuit wiring faults. The station shall include a half duplex audio channel to the intercom exchange.
 8. **The remote intercom station shall be a Harding Instruments model ICM-420 ICE-420 (ADDENDUM 04) series. Provide weatherproof remote intercom station when the station is located outside.**
- C. Inmate Emergency Call-In Station (Located inside Sleeping and Holding rooms)
1. Shall be flush mounted in the wall or hollow metal frame jamb of the cell, 18" AFF as shown on drawings.
 2. Shall utilize push button call activation to the appropriate intercom master station.
 3. Inmate Emergency Call-in Station shall comply with the specifications for Remote Intercom Stations.
- D. Call Switch
1. As indicated on contract documents, provide Call Switches made of 11ga stainless steel, with vandal resistant switch that is made to mount to single gang electrical box.
 2. The Call Switch shall be Harding model CSE-210 or approved equal.
- E. Drive-up Intercom/camera Pedestal
1. Provide and install intercom/camera pedestal. SCSC is responsible for coordinating all conduit, wiring, terminations, and surge protection to make this a working system with Division 26.
 2. Unit shall be constructed per detail shown on Drawing SE3.1.
 3. Material shall be 12 gauge cold rolled steel, power coated "safety yellow".
 4. Unit shall be mounted per the detail.
- F. Drive – Up Intercom Buried Detection Loop:
1. Series/Manufacturer:
 - a. Preferred Security components, Inc., Lancaster, PA
 - b. Marsh Products; Batavia, IL
 - c. U. S. Traffic Corp.; Santa Fe Springs, CA
 2. Description:
 - a. The buried vehicle detection loop shall detect the approach of a car or van to the gate and activate 'call-in' function and display the adjacent CCTV camera video to the control console. There is not an intercom associated with these loops. The master control operator shall be able to confirm the vehicle on the CCTV monitor and open the gate.
 - b. The detection loop shall not be activated by a pedestrian and/or by bicycles.
 - c. The detection loop shall utilize a magnetic field for sensing motion of ferrous metal objects. The detector shall be installed such that it can be replaced without destroying concrete/asphalt. (i.e.; PVC conduit under the drive with an access box at the side). The area of coverage shall be adjustable from 0 to 15 feet and have the capability of being located up to 5000 feet away from its control unit.
 - d. The detection loop shall operate within the temperature range of –50 degrees to +140 degrees F.
 - e. The vehicle detection loop, when activated, shall alert Master Control with a flashing icon and voice annunciation that a vehicle is waiting to enter/exit the vehicle sally

port. The nearest camera shall be automatically called up to the alarm monitor for the officer to view the vehicle.

G. Paging Speaker Assembly

1. Ceiling and Wall mounted speaker assemblies shall consist of a Lowell 8C10W-25 speaker, a Lowell SQLK-8 baffle and a Lowell P875X back box for recessed-mount applications and Lowell CB84 back box for surface-mount applications. Exterior applications shall use assemblies rated for exterior use such as the Quam System 6VPS. Approved manufacturer; Quam, Lowell.

H. Intercom Board

1. Intercom station boards shall be used to interface loudspeakers to system station audio boards for two-way voice communication or audio monitoring.
2. Units are to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer.
3. Units are to include pigtail and switch options as required for each location.
4. Provide insulated version for use with ceiling speakers. Provide weatherproof version for use with exterior remote intercom stations or speakers.
5. Provide one intercom board for each ceiling monitoring speaker provided.
6. The intercom board shall be a Harding Instruments model ICB-400 series.

I. Relay Selection Panel

1. The relay selection panel shall provide individual relay control of 25 speaker lines for paging. Provide all required PLC outputs for interface to relay selection panel(s) for a fully-functional audio communications system.
2. The panel shall contain 25 control circuits, one per speaker line that shall provide for the selection of any line for paging. The panel shall provide a common audio input for all 25 speaker lines. The panel shall contain 25 relays that operate to connect the common audio input with the appropriate speaker lines as controlled by the intercom control circuits. The panel shall contain a program bus that shall provide for program distribution to all speaker lines.
3. The 25 panel relays shall be of sealed type construction with a life expectancy of 10,000,000 operations. Relay contacts shall be rated at 2A. Less than 0.75A at 24Vdc shall be required to operate all 25 relays simultaneously.
4. All wire connectors to the panel shall be to insulation displacement connectors. The connectors shall accommodate 22 AWG for speaker line connections and 18 AWG for audio input connections. Provide a minimum of one Dukane model 721-56 wire insertion tool (for use with connectors), or approved equal, to field devices system installer.
5. The relay selection panel shall be a Dukane model 9A1825, or approved equal.

J. Paging Amplifier

1. Provide quantity required to support the number of field devices to be supported.
2. The paging amplifier shall be mounted in a standard 19-inch rack.
3. The paging amplifier shall be a Dukane model 1A4060 or 1A4125, depending on power requirements of installed equipment. Approved equal; Zenitel model 18065 or 18125, depending on power requirements of installed equipment.

K. Digital Communication Controller (DCC)

1. The DCC shall contain all processing, control software and configuration data to operate independently as a stand alone exchange. Exchange networking, host port control, programming, diagnostics, and maintenance shall be performed through the DCC's.
2. Digital Communication Expanders (DCE's) are used to increase the capacity of each exchange. Up to four DCE expander units can be connected to each DCC controller. Each DCC and DCE shall be capable of supporting 32 intercom stations each.
3. Multiple DCC's shall be networked together via digital audio trunks and Ethernet data networks to form larger systems. Each DCC shall contain the following:
 - a. Process Control Card (PCC)
 - b. Master Control Card (MCC)
 - c. Station Control Cards (SCC's)
 - d. Optional Internal PCI card.
 - e. Front panel keypad/display for system setup and maintenance.
4. Process Control Cards shall contain the following:
 - a. USB network ports for exchange expansion.
 - b. Ethernet network ports for system expansion and external control by GUI computers and graphic control panels.
 - c. Fiber optic or copper digital audio trunk ports. See security drawings for requirements.
 - d. Two serial ports.
 - e. An internal modem for transmitting and receiving data over a telephone line.
5. Master Control Cards shall contain the following:
 - a. Ports for any combination of two intercom or telephone set master stations.
 - b. Two line level audio inputs with status and control.
 - c. Two line level audio outputs with status and control.
 - d. Convert incoming audio signals to digital format and outgoing signals to analog format.
 - e. Intercom master station audio, press-to-talk and hook switch status transmitted over two single shielded pair cables with wiring supervision to detect open circuit and short circuit faults.
 - f. Telephone set master station functions all transmitted over a single wiring pair.
6. Station Control Cards:
 - a. Each provides sixteen half-duplex intercom station ports which can be employed in adjacent pairs for full duplex devices.
 - b. Provide an interface for intercom stations. Units to convert incoming audio signals to digital format and outgoing signals to analog format. Each channel shall monitor the status of up to two (2) switches associated with each intercom station.
 - c. Each card interfaces with 16 half-duplex channels. Each channel includes a separate audio power amplifier for non-blocking call operation and sixteen (16) independent software controlled volume settings.
 - d. All station audio, switch, and power functions on 400 Series and 401 Series cards to be transmitted over a single shielded pair cable with supervision to detect open circuit and short circuit faults.
 - e. Audio and switch functions on 300 Series (Generic Intercom) station control cards to be transmitted on separate wiring pairs.
7. System Data Network
 - a. All DCC's in the system shall be connected to each other over a separate system data network via a 10/100BT Ethernet network. Provide switches for communication

equivalent to NetGear FS family. Provide and install a dedicated network card in the Security Management Server PC (reference section 285900) for this network. See security drawings for additional requirements.

8. System Audio Trunk Network
 - a. The MicroComm DXL multi-channel System Audio Trunk shall consist of a bi-directional loop that links all of the DCC's together. For the copper conductor option, the loop shall consist of two pairs of 22 GA twisted cable and can span up to 8200 feet per segment. For the fiber optic network option, the loop shall consist of two 62.5/125mm multimode fibers. For applications where DCCs are located in different buildings, the fiber optic network option shall be required.
 - b. The Audio Trunk communication networks are unidirectional and shall be looped around multiple points. See security drawings for additional requirements.
 9. Provide the required quantity of DCC and DCE units to support the audio field devices as shown on the drawings and to facilitate a fully-functional intercom system.
- L. Digital Communication Expander (DCE)
1. The DCE shall be used to increase the capacity of an exchange. Up to four DCE's can be connected to each DCC through a USB port. The USB shall carry all of the audio and data communications within each exchange.
 2. The DCE shall be capable of supporting two intercom or telephone master stations, 32 intercom stations, and two line-level audio inputs and two line-level audio outputs including control and status.
 3. Each DCE shall contain a slave Process Control Card (PCC) without exchange control or network functions, an optional Master Control Card (MCC), and two Station Control Cards (SCC's).
 4. Provide the required quantity of DCC and DCE units to support the audio field devices as shown on the drawings and to facilitate a fully-functional intercom system.
- M. Administrator Software
1. Administrator Software to function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.
 2. Administrator Software to employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.
 3. Configuration features to include:
 - a. Creation of overall system architecture.
 - b. Creation of multiple device templates.
 - c. Copy and paste functions with auto-numbering and auto-assignment to create device schedules.
 - d. Configuration error detection and alerts.
 - e. Device naming and call routing functions.
 - f. Device setting and performance functions.
 4. Diagnostic and Maintenance features to include:
 - a. Verification of system configuration and installation.
 - b. Verification of system networks.
 - c. Verification of device connections.
 - d. Verification of system operation.
 - e. Diagnostics via modem or Ethernet ports.

5. Logging features to include:
 - a. Display of system activity with filtering options.
 - b. Search by time and date.
 - c. Search by device.
 - d. Search by parameter.
 6. Provide one copy of Harding Instruments Administrator Software to the owner upon final completion of the project.
 7. The Administrator Software shall be installed on the Security Management Server PC (reference Section 285900). The software shall be capable of administering all DCC units in the DXL system network.
- N. GUI Control Station Audio Components
1. Provide the following audio components for each GUI station shown on the drawings.
 2. Desktop Intercom Master Station
 - a. Desktop intercom master stations to consist of display, keypads, internal speaker/microphone, telephone handset with hook switch, headset jack, and external buzzer contacts.
 - b. The display module to consist of 4 line by 20-character alphanumeric LCD display mounted behind a brushed stainless steel faceplate. Display is to include a scratch and impact resistant window, adjustable viewing angle, and adjustable back lighting. Character size 0.19" H x 0.12" W.
 - c. Five function keys to be provided below the display to enter menu selections. Function key action to be labeled on display and vary according to location in the menu structure and current options available.
 - d. Separate 19 button keypad to include standard 12 numeric keypad keys, two scroll keys, enter key, clear key, headset key, mute key, and press-to-talk key.
 - e. Key switch lifetime for all keys, 10 million operations.
 - f. Telephone handset with coiled cord, press-to-talk bar, and hook switch cradle to be mounted on side of master station. Lifting handset from hook switch automatically disconnect loudspeaker/microphone communications.
 - g. Desktop mounted intercom master station top housing assembly to be fabricated with single piece, brushed stainless steel, slope-faced faceplate. Rear, bottom, and side panels to be single piece formed steel with welded joints and matte black finish. Overall housing dimensions, excluding rubber feet, 9.5" W x 10.25" D x 4.5" H.
 - h. Provide quantity of intercom master stations as indicated on the drawings.
 - i. Provide adequate number of intercom master ports on the master control card located in the DCC.
 - j. The intercom master station shall be a Harding Instruments model IMS-440-212.
- O. Talk-thru Communicator
1. The talk-thru communicator shall provide a two-way, hands-free duplex audio communications between a partition.
 2. The talk-thru communicator shall contain two voice channels, each incorporating a microphone amplifier, VOX switch, compressor, background noise monitor, attenuator controls, level detectors, and a bridge amplifier.
 3. The sound amplifier shall not exceed 0.2% THD.

4. The talk-thru communicator shall include an microphone, power on/off switch, power-on green LED, "talk" volume control and "listen" volume control. The exterior shall be equipped with a 2 ¼" ferrite, magnetic speaker and electret microphone.
 5. The Type 1 talk-thru communicator (TTC-1) shall incorporate a Class II bullet-resistive insert, being able to withstand a standard bullet from a .357 Magnum firearm.
 6. The SCSC shall coordinate with the partition or glass provider for the appropriate cutout size for the Type 1 unit. The Division 26 contractor shall provide local 120VAC power for each unit.
 7. Type 1 Talk-thru communicators (TTC-1) shall be equivalent to Haven Technology model #SC-200, or approved equal.
 8. Type 2 Talk-thru communicators (TTC-2) shall be equivalent to Haven Technology model #SC-600, or approved equal.
 9. Installation: Coordinate with hollow metal manufacturer, and construction document details to provide installation into the hollow metal frame section with concealed conduit for the supply of its operating power. Provide low-voltage power to the TTC from the Security Electronics equipment room.
- P. Video Intercom System
1. Manufacturer
 - a. Aiphone JP Series
 - b. Approved equal.
 2. Master Station – Aiphone JP-4MED or approved equal.
 3. Door Station – Aiphone JP-DV, or approved equal.
- Q. Spares:
1. Refer to Section 285000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and areas are ready to receive work.
- B. Verify field measurements are as shown on Drawings and as instructed by manufacturer.
- C. Verify that required utilities are available, in proper location, and ready for use.

3.2 INSTALLATION

- A. All system equipment to be contained within equipment racks, cabinets, or closets. If more or larger equipment racks or cabinets are required than exist or are indicated on the drawings, allow for such additional equipment racks and cabinets in contract price.
- B. All system equipment equipped with plug in power connectors to be connected to a dedicated receptacle. Do not use tap connectors for plugging in multiple plugs into a single receptacle.
- C. All cable within equipment racks, cupboards, and cabinets, or on backboards, to be neatly bundled and secured. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

- D. Factory manufactured interface cables to be provided for each field interface board. Terminal blocks to be provided in cabinet or on backboard for factory cable interface to field wiring.
- E. Wiring shall be executed in strict adherence to standard broadcast practices.
- F. Identify wiring by continuous insulation color. Where multi-conductor cables are used, use the same color-coding system for identification of wiring throughout.
- G. Maintain uniform phasing and color-coding throughout system.
- H. Name identification of wiring:
 - 1. Identify wiring at all equipment locations, pull boxes, junction boxes and outlet boxes.
 - 2. Develop a uniform identification scheme for use throughout the system.
 - 3. Record wire name identification on all applicable drawings and provide wiring tables within the operating and installation manuals.
- I. Use one of the following marking materials:
 - 1. Heat shrink sleeves.
 - 2. Clear plastic tape wrap-on strips with designated labeling section.
 - 3. Slip-on identification bead markers or sleeves.
- J. Replace equipment, components, and wiring as required to achieve a fully functional system.

3.3 ADJUSTING

- A. When requested by the Architect within one year after the date of Substantial Completion, provide on-site assistance in adjusting levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions.

END OF SECTION 285100