MicroComm DXI

Architectural & Engineering

Specifications

Full System Version

April, 2002

1. General

1.1. INTENT

1.1.1. The intent of this contract is to provide an integrated intercom and communications system for the _____ facility.

1.1.2. The system to include the following functions:

1.1.2.1. door control intercom

1.1.2.2. cell intercom

1.1.2.3. reception intercom

1.1.2.4. visiting booth intercom

1.1.2.5. administrative intercom

1.1.2.6. intercom station audio monitoring

1.1.2.7. intercom station audio level alarm monitoring

1.1.2.8. zoned public address

1.1.2.9. multi-channel program distribution

1.1.2.10. alarm point monitoring and annunciation

1.1.2.11. output and event response control

1.1.3. The system to integrate with the following other security and communication systems to form a comprehensive facility management network:

1.1.3.1. PLC door control system

1.1.3.2. touch screen graphics control system

1.1.3.3. switch graphic control panels

1.1.3.4. closed circuit television system

1.1.3.5. perimeter detection system

1.1.3.6. two-way radio system

1.1.3.7. PBX telephone system

1.2. SCOPE OF WORK

1.2.1. Work of this contract includes the supply and installation of an integrated intercom and communications system as specified herein.

1.2.2. The system is to include all equipment, installation, installation materials, set up, and testing to form a complete operating system.

1.2.3. Independent system functions and integrated system functions to be fully verified as part of system testing and commissioning.

1.2.4. Work of this contract also includes the provision operating and maintenance manuals, training and demonstration, and extended warranty.

1.3. PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

1.3.1. The following products are required to facilitate the system installation, but are specified in other sections:

1.3.1.1. audio program sources

1.3.1.2. equipment racks and accessories.

1.3.1.3. terminal boards and cabinets.

1.3.1.4. device outlet boxes.

1.3.1.5. ac power sources for system equipment.

1.4. SYSTEM DESCRIPTION

1.4.1. The integrated intercom and communications system to include the following components:

1.4.1.1. service, administration and control computer complete with monitor, keyboard, network cards, integration interface cards, and modem as specified.

1.4.1.2. I/O card cages

1.4.1.3. power supplies

1.4.1.4. audio control boards

1.4.1.5. station audio boards

1.4.1.6. audio input and output boards

1.4.1.7. paging amplifiers

1.4.1.8. telephone interface boards

1.4.1.9. discrete input/output modules

1.4.1.10. intercom master stations

1.4.1.11. intercom stations

1.4.1.12. call operating devic es

1.4.1.13. loudspeakers and horn loudspeakers

1.5. SYSTEM OPERATION

1.5.1. Intercom master station general operation:

1.5.1.1. Display to provide alphanumeric descriptions of functions, station and device names, and current activity. Function key labeling to change depending on the location within the menu structure or options available to the operator.

1.5.1.2. Master station to display, in a defined area, the current number of calls in the queue, number of acknowledged calls, and number of stations removed from service or monitor points in bypass mode.

1.5.1.3. Master stations, through their command functions, to have the ability to:

1.5.1.3.1. answer calls

1.5.1.3.2. place calls

1.5.1.3.3. place calls on hold

1.5.1.3.4. transfer calls to another master station

1.5.1.3.5. place conference calls

1.5.1.3.6. place group calls

1.5.1.3.7. make zoned public address announcements

1.5.1.3.8. monitor intercom stations

1.5.1.3.9. receive intercom station audio level alarms

1.5.1.3.10. control program distribution to stations and zones

1.5.1.3.11. adjust their intercom volume level

1.5.1.3.12. adjust their monitor volume level

1.5.1.3.13. independently adjust each station’s volume level

1.5.1.3.14. disable and enable station switches

1.5.1.3.15. monitor alarm points

1.5.1.3.16. bypass alarm monitor points

1.5.1.3.17. remove stations from service

1.5.1.3.18. recall the last station with a single control

1.5.1.3.19. adjust their display back lighting

1.5.1.3.20. select 12 or 24 hour clock display

1.5.1.3.21. adjust the step rate for switching between monitored stations

1.5.1.4. Volume adjustment of master station and intercom station levels to be controllable during communications. Each station's volume level to be independently software controlled. Level settings to remain in effect until modified by a future adjustment.

1.5.1.5. Master stations to include the ability to be placed in an unmanned mode which automatically routes all of the associated call handling functions to a pre-defined secondary master station.

1.5.2. Call placement from an intercom station:

1.5.2.1. Depressing an intercom station's call push-button to place a call request in the queue of the master station or stations assigned to receive that station's calls. Calls to be queued in order of priority level associated with the intercom station and time the call was placed.

1.5.2.2. Master station to normally display the identity of the top three calls in its call request queue. Call identity to include the device ID number and/or an alphanumeric descriptor. Descriptor to be up to 20 characters.

1.5.2.3. The master station display to indicate the total number of calls currently in its queue. Scroll keys to enable the master station to view all calls in the queue.

1.5.2.4. Calls not answered within a pre-programmed time to place a secondary call request on an assigned master station.

1.5.3. Call answering at an intercom master station:

1.5.3.1. Intercom master stations to be able to answer the top call request in its queue by depressing the 'Next' function key. At the completion of the call, the 'End' function key to close the communication link and remove the call from the queue.

1.5.3.2. Subsequent calls may be similarly handled for the remaining calls in the queue.

1.5.3.3. Queued calls may be answered out of sequence by scrolling through the queue to the desired call. The selected call to flash on the display and may be answered by depressing the 'Enter' key. 'End' key to close the communication link, remove the call from the queue and return the master station display to the top of the queue.

1.5.3.4. A call that is currently connected to a master station to display that the call is connected, the type of device connected, and the identity of the connected device.

1.5.4. Voice Communication

1.5.4.1. Telephone handset voice communication between intercom master stations to be full duplex.

1.5.4.2. Open voice communications between intercom master stations to be automatically switched half duplex with press-to-talk override.

1.5.4.3. Voice communications between intercom master stations and intercom stations to be automatically switched half duplex with press-to-talk override.

1.5.5. Station monitoring:

1.5.5.1. Master stations to be able to monitor an individual intercom station or a pre-defined group of intercom stations. A monitor group may consist of a list of intercom stations that are monitored in a sequential manner, or up to four intercom stations that are monitored simultaneously.

1.5.5.2. System to permit establishing as many station monitor groups as there are unused station ID numbers.

1.5.5.3. Each master station to individually control the rate at which stations in the monitor group are sequenced through, and the level at which their monitor volume is set.

1.5.6. Station audio level alarm detection:

1.5.6.1. System to include station audio level alarm detection with adjustable detection settings for each individual station.

1.5.6.2. Detection parameters for each station to be configurable for different time periods and automatically changed by the system master clock.

1.5.7. Program distribution:

1.5.7.1. System to receive audio program from tuners, tape decks, etc. for program distribution to intercom stations and/or loudspeaker circuits.

1.5.7.2. System to permit distribution of up to 16 simultaneous program channels. Each channel may be of unique program material or program level.

1.5.7.3. Program distribution (channel, volume, on, off) control to be from the intercom master stations. Each intercom station, station group, or page zone to be independently controllable.

1.5.7.4. Program distribution to be temporarily suspended to affected intercom stations or paging zones during paging announcements.

1.5.7.5. Program distribution to affected intercom stations to be temporarily suspended during voice communications.

1.5.8. Paging:

1.5.8.1. Master stations to have the ability to page to pre-determined groups of intercom stations and/or loudspeaker zones.

1.5.8.2. Paging selection to be made by selecting the page function and a group or zone from the selection list. Alternately, the zone number may be entered after the page function has been selected.

1.5.9. Telephone paging:

1.5.9.1. Zoned telephone paging access to enable telephones programmed to access the paging link to make zoned public address announcements.

1.5.9.2. First digit dialed to access the paging function, second digit to select all call or a primary zone, third digit to select a sub-zone. Pressing the # key to indicate zone selection is complete.

1.5.9.3. Upon completion of the zone selection, the intercom system to reply with a page ready signal signifying that all circuits have been freed and connected and are ready to receive the announcement.

1.5.10. Tone signal distribution:

1.5.10.1. System to include the capability to configure at least four distinct signal tones for distribution over intercom and paging loudspeakers.

1.5.10.2. Tone signals may be triggered in response to a system input, or from the system program scheduler.

1.5.10.3. Program scheduler features to include complete 24 hour per day, 7 day per week, 365+ day per year scheduler with full week, weekday, weekend , and holiday configuration.

1.5.11. Pre-recorded message distribution:

1.5.11.1. Each SAC computer to have the ability to add an audio output from its CD Rom drive for distribution of pre-recorded messages.

1.5.11.2. Messages may be triggered in response to a system input, or from the system program scheduler.

1.5.12. Video visitation intercom

1.5.12.1. System to include a host port interface that allows external control for video visitation intercom operation.

1.5.12.2. Video visitation operation to include full duplex communications between handset stations.

1.5.12.3. Features to include off-hook detection, visitation timers, visitation messaging, non-secure visit recording, master station communication to visiting booths.

1.5.13. Two-way radio interface:

1.5.13.1. System to include the capability to interface to facility's two-way radio systems.

1.5.13.2. Interface to allow master station communication directly with two-way radio systems.

1.5.14. Audio logging:

1.5.14.1. System to include the capability to interface to audio logging recorders for archival recording of each master station's communication.

1.5.15. CCTV interface:

1.5.15.1. System to transmit command signals to the CCTV controller to route camera signals to viewing monitors.

1.5.15.2. Whenever a master station answers a call from an intercom station or places a call to an intercom station, the camera associated with the intercom station to be displayed on the monitor associated with the master station.

1.5.16. Alarm handling:

1.5.16.1. System to annunciate alarms and faults at designated intercom master stations.

1.5.16.2. Alarms to be selectively acknowledged and canceled.

1.5.16.3. Event response programming to permit system output action to be automatically initiated upon receipt of each specific alarm.

1.6. FUNCTIONAL REQUIREMENTS

1.6.1. Identification numbers for each category of device, group, zone, etc. to range from 1 to 65,535.

1.6.2. Alphanumeric description for each device, group, zone, etc. to contain up to 20 characters and spaces.

1.6.3. All intercom station field wiring to be supervised for short circuit and open circuit faults.

1.6.4. All system boards to include self diagnostic functions for complete operational and communication testing.

1.6.5. All system boards and devices to be able to be inserted or removed from service while the system is fully operational. Other system activity not directly related to the board insertion or removal to not be affected.

1.6.6. System diagnostics to include the ability to test system communications and devices from the service, administration, and control computer.

1.6.7. System to include the ability to make on-line changes to the system configuration.

1.6.8. System to include logging functions for system activity and system maintenance.

1.6.9. System to include the ability to print, through an optional printer, activity and maintenance logs.

1.6.10. On-line factory support to be available through a modem connection to the service, administration and control computer.

1.7. PERFORMANCE REQUIREMENTS

1.7.1. System frequency response: 300 to 3,500 Hz.

1.7.2. Intercom station output: 82 dB SPL at 3 feet with 82 dB SPL input at face of transmitting station.

1.7.3. Maximum time from call placement to annunciation at intercom master station: 1.0 seconds.

1.7.4. Maximum time to complete call connection upon receipt of command from intercom master station: 1.0 seconds.

1.7.5. All system equipment to comply with the radiation limits for Class A digital devices of FCC Rules Part 15, Subpart B.

1.8. QUALITY ASSURANCE

1.8.1. Intercom system equipment to be designed and manufactured in accordance with ISO-9001 2000 Quality System Standard.

1.8.2. Manufacturer's quality control program to be registered in accordance with the above noted standard.

1.9. OPERATION AND MAINTENANCE MANUALS

1.9.1. Contractor to provide three (3) complete sets of operation and maintenance manuals for system supplied under this contract.

1.9.2. Operation and maintenance data to include:

1.9.2.1. Contractor Design Data including:

1.9.2.1.1. system design criteria

1.9.2.1.2. system and controls descriptions

1.9.2.1.3. system and controls schematics

1.9.2.1.4. site specific operating instructions

1.9.2.2. Installation Instructions: manufacturer's printed instructions describing manufacturer's recommended installation procedures.

1.9.2.3. Operating Instructions: manufacturer's printed instructions describing proper operation.

1.9.2.4. Equipment Identification: name plate information for each piece of equipment.

1.9.2.5. Maintenance Instructions: manufacturer's printed instructions describing manufacturer's recommended maintenance.

1.9.2.6. Spare Parts Lists: parts listing of spares provided under the Contract.

1.9.2.7. Suppliers and Contractors List: list of contractors and suppliers who supplied and installed equipment, systems, materials or finishes. Includes company name, address, and telephone number.

1.9.2.8. Tag Directories: directory identifying tag number and equipment description and location.

1.9.2.9. Drawings List: list of contract drawings.

1.9.2.10. Product Data: manufacturer's product data for equipment, systems, materials and finishes.

1.9.2.11. Certifications: includes the following:

1.9.2.11.1. Copies of inspection reports prepared by authorities having jurisdiction.

1.9.2.11.2. Certified copies of test reports prepared by independent testing agencies.

1.9.2.11.3. Any other certificates required by the Contract Documents.

1.9.2.12. Warranties and Bonds: Owner's copy of contractor's warranty, manufacturer's warranties, maintenance bonds and service contracts.

1.9.2.13. Reports: includes the following:

1.9.2.13.1. Reports documenting the performance of tests required by the Contract Documents and the results of those tests.

1.9.2.13.2. Documentation of other material, equipment or system related information required by the Contract Documents.

1.10. SEQUENCING AND SCHEDULING

1.10.1. Contractor to prepare a sequence and schedule for performance of the work suitable to the Owner and the operations of the facility.

1.10.2. Owner will make reasonable allowances for the shut down and replacement of existing systems.

1.10.3. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative procedures to include, but not be limited to:

1.10.3.1. Preparation of schedules.

1.10.3.2. Installation and removal of temporary facilities.

1.10.3.3. Delivery and processing of submittals.

1.10.3.4. Progress meetings.

1.10.3.5. Contract acceptance procedures.

1.10.3.6. Work with other contractors.

1.11. COORDINATION

1.11.1. Coordinate all construction activities as required to ensure efficient and orderly installation of each part of the Work.

1.11.2. Where installation of one part of the Work is dependent on installation of other components, schedule and coordinate construction activities in the sequence required to obtain the best results.

1.11.3. Where availability of space is limited, coordinate installation of different components to ensure maximum accessibility for required maintenance, service and repair.

1.11.4. Make adequate provisions to accommodate items scheduled for later installation under separate contract or by Owner's own forces.

1.12. PERFORMANCE VERIFICATION BY CONTRACTOR

1.12.1. Contractor to verify and document the full and proper operation of the complete system and system interfaces provided under this contract.

1.12.2. Verification to include testing of all communication links including dialing, call request and cancel functions, volume level, and volume level adjustment. Proper routing of associated camera signals to operator monitors to be confirmed.

1.12.3. System monitoring, paging, and music distribution to be verified for all devices providing those functions.

1.12.4. All applicable intercom master station call handling and system control functions to be verified for each master station.

1.12.5. Performance verification to ensure that system is configured as directed by the Owner for proper support of the facility's operation.

1.13. MANUFACTURER'S SITE SERVICES

1.13.1. Arrange and pay for the site services of appropriately qualified manufacturer's representatives where site training, or testing, adjusting and balancing performed by the manufacturer's representatives is:

1.13.1.1. specified, or

1.13.1.2. otherwise required to ensure compliance with the Contract Documents.

1.14. EXTENDED WARRANTY

1.14.1. Neither the final payment, nor any other provision in the Contract Documents shall relieve Contractor from responsibility for faulty materials or workmanship which appear within one year of the date of final acceptance of the Work, or such other periods as may be specified for parts of the Work, and he shall remedy any defects due thereto. Owner shall give notice of observed defects promptly.

1.15. SPARE PARTS

1.15.1. Provide the following spare parts and maintenance materials:

1.15.1.1.

1.15.1.2.

1.15.2. Proper operation of the spare parts to be verified and documented as part of the system test procedure.

2. Products

2.1. APPROVED MANUFACTURERS

2.1.1. The following manufacturer's and their named products are approved for use in this Work:

2.1.1.1. Harding Instrument Co. Ltd.
MicroComm DXI

2.2. SYSTEM ADMINISTRATION AND CONTROL COMPUTER

2.2.1. The Service, Administration and Control (SAC) computer to provide the processing for the system's operation, configuration functions, and maintenance functions.

2.2.2. Interface to the I/O card cages, master stations, and remote intelligent devices to be via LonWorks free topology networks

2.2.3. Interface to the PLC door control system to be via an industry standard Ethernet (*RS-232 serial or specified PLC manufacturer's custom interface*) port.

2.2.4. Interface to the touch screen graphical control system to be via an industry standard Ethernet (*RS-232 serial or specified touch screen manufacturer's custom interface*) port.

2.2.5. Interface to the CCTV switcher to be via an industry standard RS-232 port.

2.2.6. SAC computer to support the ability to be upgraded to a redundant configuration by adding a second SAC computer and interface cards. No existing equipment to be obsolesced by redundancy upgrade.

2.2.7. SAC computer to be a desk top (*mini-tower, rack mount*) IBM PC/AT compatible with the following minimum configuration:

2.2.7.1. Intel 486 compatible CPU

2.2.7.2. minimum 16 Mbytes RAM

2.2.7.3. minimum 500 Mbyte hard drive

2.2.7.4. 1.44 Mbyte diskette drive

2.2.7.5. CD Rom drive

2.2.7.6. QNX 4.X operating system

2.2.7.7. MicroComm DXI system software

2.2.7.8. one (1) PCLTA card with:

2.2.7.8.1. one (1) LonWorks direct connect port

2.2.7.8.2. one (1) LonWorks free topology port

2.2.7.9. two (2) serial ports

2.2.7.10. one (1) parallel printer port

2.2.7.11. one (1) keyboard port

2.2.7.12. one (1) SVGA monitor driver board and port

2.2.7.13. one (1) internal (*external*) modem

2.2.8. VGA computer monitor to be desk top (*rack mount*) style with nominal 15" (*17", 20*") diagonal CRT.

2.2.9. Computer keyboard to be (*standard, narrow, rugged*) desktop (*rugged panel mount - standard or rugged rack mount*) style with 101 key enhanced layout.

2.3. I/O CARD CAGES

2.3.1. I/O card cages to supply power distribution network connection and digital audio bus connections for the system control and audio I/O boards. Units to support redundant control card configuration and the ability to be interconnected for system expansion.

2.3.2. I/O card cages to be designed to facilitate the insertion and removal of cards while the system is in operation. Units to incorporate fused power input connections to protect cards.

2.3.3. I/O card cages to be designed for mounting in 9U space of standard 19" equipment racks and to meet EMI radiation and susceptibility standards.

2.3.4. Card cage power supply, network and control terminals to be screw type with positive clamping pressure plate providing locking tension.

2.3.5. Back plane of each card cage to have the capacity for routing 512 simultaneous audio channels for communication and program routing.

2.3.6. Cards to be secured in place with front panel screws. Each card rear plate to include securing screws to eliminated stress on connectors. All card field wiring to be made via quick disconnect connectors on rear of card.

2.3.7. Card cage to provide capacity for one (1) control card and 16 I/O cards without redundancy and two (2) control cards and 15 I/O cards in a redundant configuration.

2.3.8. All unused card slots to be provided with front and rear blank panels.

2.3.9. All control and I/O cards to be supplied with factory manufactured cables for interface to field wiring terminal blocks.

2.4. POWER SUPPLIES

2.4.1. Each I/O card cage to be provided with an associated external power supply designed for mounting in 3u space of standard 19" equipment racks.

2.4.2. Input source to 100-120 Vac, 10 A maximum. Outputs to be capable of providing up to 30 A at ± 12 Vdc. Voltage regulation ± 10%. Maximum ripple 1% peak to peak.

2.4.3. Units to include independent dual supplies, front panel power switch and line power indicator, and independent supply status indicators. AC line input to be fused and protection circuitry to be provided for overload and over voltage conditions.

2.4.4. Power supplies to incorporate rear mounted fan and filter assembly and ventilation slots in the front and side panels.

2.5. N+1 REDUNDANT POWER SUPPLIES *(Optional)*

2.5.1. Each I/O card cage to be provided with an associated N+1 redundant external power supply designed for mounting in 3u space of standard 19" equipment racks.

2.5.2. Input source to 100-120 Vac, 10 A maximum. Output modules to be capable of providing up to 45 A at ± 12 Vdc. Failure of any single output module to enable supply to provide 30 A for normal card cage operation. Voltage regulation ± 10%. Maximum ripple 1% peak to peak.

2.5.3. Units to include independent triple supplies for each 12 volt section, independent supply status indicators, and fault condition contact outputs. AC line input to be fused and protection circuitry to be provided for overload and over voltage conditions.

2.5.4. Power supplies to incorporate ventilation slots in the upper and lower panels.

2.6. AUDIO CONTROL BOARDS

2.6.1. Audio Control Boards (ACB's) to mount in I/O card cages and provide the digital audio switching and processing functions for the audio I/O cards. ACB's to also provide card cage link connections for system expansion and copper (*fiber optic*) digital trunk interface to remote card cages and exchanges.

2.6.2. On board digital signal processors (DSP) to control voice channel signal processing, conference calls, station monitoring and to generate signal tones. Units to be provided with one (1) main board DSP module and one (*zero, two*) daughter board(s) with two (2) DSP expansion module.

2.6.3. Units to include full functional test capabilities with self-test that can be operated from the SAC computer. Indicators to be provided for network status and operating status. Front panel pushbuttons to provide control for master reset, card reset, and service functions. Internal fuse to protect circuitry.

2.6.4. ACB's to incorporate flash memory for updating of the CPU and DSP firmware over the network.

2.6.5. ACB's to support redundant operation by adding a second unit in each card cage and duplicating the CEPT audio trunk.

2.6.6. Each ACB to provide 30 full duplex bi-directional CEPT audio channels in non-redundant configuration and 60 full duplex CEPT audio channels in redundant configuration.

2.7. STATION AUDIO BOARDS

2.7.1. Station Audio Boards (SAB's) to mount in I/O card cage, or remote receiver units, and provide the system interface for intercom stations and for master station audio. Units to convert incoming audio signals to digital format and outgoing signals to analog format. Each channel to monitor the status of up to two (2) switches associated with each intercom station.

2.7.2. Station Audio Boards to each incorporate 15 half-duplex channels and one full duplex (master station) channel. Additional master stations may be connected to adjacent pairs of half duplex channels. Each channel to include a separate audio power amplifier for non-blocking call operation and eight (8) independent software controlled volume settings.

2.7.3. All station audio, switch, and power functions to be transmitted over a single shielded pair cable. Station to card cabling with 22 gauge conductors to extend up to 2460 ft. Wiring supervision to detect open circuit and short circuit faults.

2.7.4. Front panel LED's to indicate operating status. Units to support redundant operation.

2.8. AUDIO INPUT AND OUTPUT BOARDS

2.8.1. Audio input and output boards to mount in I/O card cage, or remote receiver units, and provide the system interface for up to eight (8) system audio inputs or outputs. Units to convert incoming analog audio signals to digital format and outgoing digital signals to analog format.

2.8.2. Input or output signal compatibility to be provided from microphone level to line level signals. Each channel to be software selectable for level range and trim level. Each input channel to be balanced and provided with input control and status output signal. Each output channel incorporate external disable control contacts and to have floating status output contacts to maintain isolation from other equipment.

2.8.3. Input and output signal range from 50 mVolt peak to 1 Volt peak. Nominal input impedance 10K Ω, nominal output impedance 200 Ω.

2.8.4. All wiring to be fault protected. Front panel LED's to indicate operating status.

2.9. TELEPHONE SET BOARDS

2.9.1. Telephone Set Boards (TSB's) to mount in I/O card cage and interface up to eight (8) 2500 series compatible DTMF telephones for use as sub-master intercom stations or administrative intercom stations.

2.9.2. Units to provide battery power feed to telephone sets, ringing voltage, DTMF tone detection and generation, and caller ID data signals. for sets with caller ID displays.

2.10. TELEPHONE LINE BOARDS

2.10.1. Telephone Line Boards (TLB's) to mount in I/O card cage and interface up to four (4) analog copper central office telephone lines.

2.10.2. Units to provide standard call progress tones including dial, busy, and call waiting tones, DTMF tone detection and generation, and transient and short-circuit detection on all ports.

2.11. PAGING AMPLIFIER BOARDS

2.11.1. Paging Amplifier Boards (PAB's) to mount in I/O card cage or remote receiver units and provide eight (8) independent audio channels rated at five (5) watts rms per channel into a 70 (25) volt loudspeaker circuit. Units to convert system digital signals to analog output signals.

2.11.2. Independent software audio level control to be provided for each channel. Floating outputs to maintain isolation. Internal fuse to protect circuitry. Front panel LED's to indicate operating status.

2.11.3. Adjacent output channels to be bridgeable to provide larger amplifier sizes.

2.12. TALKBACK AMPLIFIER BOARDS

2.12.1. Talkback Amplifier Boards (TAB's) to mount in I/O card cage or remote receiver units and provide eight (8) independent audio channels rated at five (5) watts rms per channel into a 25 volt loudspeaker circuit. Units to convert system digital signals to analog output signals.

2.12.2. Independent software audio level control to be provided for each channel. Floating outputs to maintain isolation. Internal fuse to protect circuitry. Front panel LED's to indicate operating status.

2.13. DISCRETE I/O MODULES

2.13.1. Discrete I/O (input/output) modules to each interface up to 48 contact closure type input monitor points and 48 solid state (*16 relay, 48 relay*) output control points. Outputs to be current sink (*voltage source, LED driver, form C contact*) type.

2.13.2. Inputs to be supervised (*non-supervised*) for open circuit and short circuit faults in field wiring. With terminating resistors, each supervised input to be able to monitor two contact points for a total of 96 inputs.

2.13.3. DIO modules to be card cage (*rack, wall*) mounted.

2.14. REMOTE DRIVERS AND RECEIVERS

2.14.1. Remote Driver Board (RDB) and Remote Receiver Board (RRB) pairs to be used to locate any system audio board at a location remote from a card cage. Audio communication between the units to be via multi-channel CEPT trunk.

2.14.2. Remote driver board to mount in any audio card cage slot and the remote receiver board to mount in a remote receiver rack, together with the remote audio board. The

audio board to perform as if it were mounted in the same card cage slot as the remote driver board.

2.14.3. Remote receiver rack to be rack (*wall*) mounted.

2.15. NETWORK REPEATERS

2.15.1. Network repeaters to extend LonWorks network cable limits or increase node limits. Each unit to include four network ports. Data received on any port to be re-transmitted on the other ports.

2.15.2. Units to be surface wall mounted and include depluggable screw terminal connectors, redundant power supply connections and internal fuse to protect circuitry.

2.15.3. Six (6) LED's to indicate receiving port, network activity, and power supply status.

2.16. FIBER OPTIC NETWORK ROUTERS

2.16.1. Fiber optic routers to convert LonWorks network transmission medium between copper and fiber optics for transmission over long distances or between buildings.

2.16.2. Units to be surface wall or rack mounted with external low voltage power supply connections.

2.17. DESK TOP INTERCOM MASTER STATIONS

2.17.1. Desk top intercom master stations to consist of display, keypads, internal speaker/microphone, and telephone handset with hookswitch.

2.17.2. Display module to consist of 4 line by 20 character alphanumeric LCD display mounted behind a brushed stainless steel face plate. Display to include scratch and impact resistant window, adjustable viewing angle, and adjustable back lighting. Character size 0.19" H x 0.12" W.

2.17.3. Five function keys to be provided below display to enter menu selections. Function key action to be labeled on display and vary according to location in the menu structure or current options available.

2.17.4. 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.

2.17.5. Key switch lifetime for all keys, 10 million operations.

2.17.6. Internal intercom station audio interface to consist of:

2.17.6.1. network and power supply interface, audio amplification and processing module, network and operating status LED's.

2.17.6.2. connectors and LED's to be rear panel mounted.

2.17.6.3. internal loudspeaker/microphone assembly.

2.17.6.4. external microphone interface with phantom power capability.

2.17.6.5. external loudspeaker interface.

2.17.6.6. headset jack interface.

2.17.6.7. external buzzer contact closure interface.

2.17.7. Telephone handset and press-to-talk bar and hook switch cradle to be mounted on side of master station. Lifting handset from hook switch to automatically disconnect loudspeaker/microphone communications. Handset assembly to incorporate standard coiled cord.

2.17.8. Desk top mounted intercom master station top housing assembly to be fabricated with single piece, brushed stainless steel, slope-faced face plate. 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 .

2.18. PANEL, WALL AND RACK MOUNTED INTERCOM MASTER STATIONS

2.18.1. Panel, wall and rack mounted intercom master stations to consist of display module, master audio interface module, and optional handset and/or loudspeaker/microphone modules mounted on custom faceplates to suit location.

2.18.2. Display module to consist of:

2.18.2.1. 4 line by 20 character alphanumeric LCD display mounted behind a brushed stainless steel face plate. Display to include scratch and impact resistant window, adjustable viewing angle, and adjustable back lighting. Character size 0.19" H x 0.12" W.

2.18.2.2. brushed stainless steel faceplate with overall dimensions of 4.5"H x 9.75" W.

2.18.2.3. five function keys below display that are used to enter menu selections. Function key action to be labeled on display and vary according to location in the menu structure or current options available.

2.18.2.4. 19 button keypad including standard 12 numeric keypad keys, two scroll keys, enter key, clear key, headset key, mute key, and press-to-talk key.

2.18.2.5. key switch lifetime for all keys, 10 million operations.

2.18.2.6. ribbon cable header to master audio interface module.

2.18.3. External master audio interface module to consist of:

2.18.3.1. network and power supply interface, audio amplification and processing module, network and operating status LED's, ribbon cable header for connection to display module.

2.18.3.2. external microphone interface with phantom power capability.

2.18.3.3. external loudspeaker interface.

2.18.3.4. telephone handset with press-to-talk switch interface.

2.18.3.5. headset jack interface.

2.18.3.6. external buzzer contact closure interface.

2.18.3.7. surface wall mount enclosure nominally 9" H x 6.5" W x 1.8" D.

2.18.4. Flush wall mounted handset and loudspeaker/microphone module to consist of:

2.18.4.1. 2 1/2" diameter mylar cone loudspeaker, electret microphone, and handset cradle on a 11 gauge stainless steel faceplate designed for mounting on a standard 4-gang electrical device box.

2.18.4.2. loudspeaker to include offset baffle

2.18.4.3. telephone handset cradle with internal hookswitch and configured for vertically hung handsets.

2.18.4.4. black telephone handset with press-to-talk bar and armored connecting cable.

2.18.5. Flush wall mounted handset module to consist of:

2.18.5.1. telephone handset cradle with internal hookswitch and configured for vertically hung handsets.

2.18.5.2. black telephone handset with press-to-talk bar and armored connecting cable.

2.18.5.3. two-gang, 11 gauge brushed stainless steel mounting plate.

2.18.6. Flush mounted loudspeaker/microphone module consisting of:

2.18.6.1. 2 1/2" diameter mylar cone loudspeaker and electret microphone with offset grille for mounting behind perforated mounting panel.

2.18.6.2. optional 11 gauge, brushed stainless steel faceplate for mounting on two-gang box.

2.19. TOUCH SCREEN INTERCOM MASTER STATIONS

2.19.1. Touch screen intercom master stations to consist of audio interface module and desktop loudspeaker/mic module.

2.19.2. Audio interface to consist of:

2.19.2.1. network and power supply interface, audio amplification and processing module, network and operating status LED's.

2.19.2.2. external microphone interface with phantom power capability.

2.19.2.3. external loudspeaker interface.

2.19.2.4. telephone handset with press-to-talk switch interface.

2.19.2.5. headset jack interface.

2.19.2.6. external buzzer contact closure interface.

2.19.2.7. surface wall mount enclosure nominally 9" H x 6.5" W x 1.8" D.

2.19.3. Desktop loudspeaker/mic module to consist of:

2.19.3.1. Desktop loudspeaker/mic unit to include compact, slim line bottom plate with stainless steel face, and rubber shock isolation mounting feet.

2.19.3.2. Unit to include 12 inch, black, slim line electret gooseneck microphone, front mounted loudspeaker, front mounted rotary volume control, and front

2.20. ANNUNCIATOR CONTROL PANELS

2.20.1. Annunciator Control Panels (ACP's) are to be used to acknowledge, cancel, and reset incoming alarm signals, and to monitor, activate and deactivate executable output points. They are to have the same capability, excluding audio functions, as intercom master stations.

2.20.2. ACP's are to have a similar appearance to intercom master stations but not include telephone handset, microphone, or loudspeaker communication devices.

2.20.3. Desk top mounted annunciator control panel top housing assembly to be fabricated with single piece, brushed stainless steel, slope-faced face plate. 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.

2.20.4. Panel mounted annunciator control panel faceplate to be brushed stainless steel with overall dimensions of 4.5"H x 9.75" W.

2.20.5. Rack mounted annunciator control panel face plate assembly to be fabricated with single piece, brushed stainless steel, face plate. Rear, bottom, and side panels to be single piece formed steel with welded joints and matte black finish. Overall front panel dimensions 19" W x 3.5" H.

2.21. INTERCOM STATIONS

2.21.1. Intercom stations to be designed for mounting on standard 2-gang (*3-gang*) outlet boxes. Faceplates to be constructed of 11 gauge brushed stainless. Internal steel offset grille to restrict inserting objects through speaker grille. Stations to be ruggedly constructed and resistant to damage from soil and sprays.

2.21.2. Each intercom station to incorporate an internal loudspeaker, microphone preamplifier and function multiplexing circuitry. One (*two*) pushbutton(s) to be provided on each station. Pushbuttons to be software assignable for placement of call requests or control of program music.

2.21.3. Pushbuttons to be single piece stainless steel construction and be back stopped to prevent excessive travel. Switch to have positive tactile action with 1 million operation lifetime. (*Pushbuttons to be solid metal piezo-electric type with no moving parts and a 50 million operation lifetime - 3 gang and larger faceplates only*).

2.21.4. Loudspeakers to be waterproof mylar cone type.

2.21.5. All intercom station functions to 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.

2.21.6. Outdoor intercom stations to be identical in all respects to standard intercom stations except that all metal plates and hardware to be stainless steel, and internal circuitry and components to be conformally coated.

2.22. HANDSET INTERCOM STATIONS

2.22.1. Handset intercom stations to be designed for mounting on standard outlet boxes. Faceplates to be constructed of 11 gauge brushed stainless. Handset cradle to include internal hook switch. Handset to be hearing aid compatible with armored cable. Stations to be ruggedly constructed and resistant to damage from soil and sprays.

2.22.2. Handset only stations to be designed for mounting on two-gang outlet boxes.

2.22.3. Four-gang handset intercom stations to also incorporate an internal loudspeaker/microphone with internal offset grille, and one (*two*) pushbutton(s) to be provided on each station. Pushbuttons to be software assignable for placement of call requests, etc.

2.22.4. Pushbuttons to be single piece stainless steel construction and be back stopped to prevent excessive travel. Switch to have positive tactile action with 1 million operation lifetime

2.22.5. Loudspeakers to be waterproof mylar cone type.

2.22.6. All handset intercom station functions to be transmitted over two shielded pair cables. Stations to be provided with MTA type insulation displacement connectors that require no wire stripping for installation.

2.23. CALL OPERATING DEVICES

2.23.1. Call operating devices to be pushbutton (*call cord*) switch actuators that are software assignable to call request, call cancellation, acknowledge, event initiation or other similar system function.

2.23.2. Units to be constructed with single gang 11 gauge brushed stainless steel faceplate suitable for mounting on standard single gang outlet box.

2.23.3. Call pushbutton and plunger to be single piece stainless steel construction with backstop plate to limit excessive button travel. (*Call cord to be 6' long pushbutton type with molded connectors*).

2.23.4. Units to include line supervision circuitry and include conformal coating on components for weatherproof locations.

2.24. THROUGH THE WALL CALL OPERATING DEVICE

2.24.1. Through the wall COD's to be used as switch actuators that are software assignable to call request, call cancellation, acknowledge, event initiation or other similar system functions.

2.24.2. Units to be designed for mounting in concrete or block walls with the switch on the opposite side of the wall from the actuator to provide an extremely high level of ruggedness and security.

2.24.3. Through the wall COD to include a threaded nut and washer assembly for adjustment in mounting in wall thickness ranging from 5"-8" *(7"-10", 9"-12"*).

2.24.4. Units to include line supervision circuitry and include conformal coating on components for weatherproof locations.

2.25. INTERCOM STATION BOARDS

2.25.1. Intercom station boards to be used to interface generic intercom stations and loudspeakers to system station audio boards for two-way voice communication or audio monitoring.

2.25.2. Units to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer.

2.25.3. Units to include pigtail and switch options as required for each location.

2.26. LOUDSPEAKERS

2.26.1. Loudspeakers to be nominal 8" diameter dual cone type units. Loudspeakers to incorporate 6 ounce (*10 ounce*) permanent magnet and include a 5 watt (*10 watt*) multi tap transformer for use on 25 volt and 70 volt constant voltage type distribution systems.

2.26.2. Each loudspeaker to be provided with a standard (*security*) baffle plate and flush (*surface*) mounted enclosure. Baffle and enclosure to be all metal construction and finished in polar white baked on enamel.

2.27. HORN LOUDSPEAKERS

2.27.1. Horn loudspeakers to be weatherproof compression driver units with integral screw driver adjustable multi-tap transformer for use on both 25 volt and 70 volt constant voltage distribution systems. Integral mounting plate suitable for mounting on a standard outlet box to include swivel type alignment bracket.

2.27.2. Units to be rated to handle 15 watts (*30 watts*) input power. Nominal sensitivity 110 dB SPL at 3 feet with 1 watt input.

2.28. WIRE AND CABLE

2.28.1. Factory manufactured field interface cables to be provided, as required, for all:

2.28.1.1. audio control boards

2.28.1.2. station audio boards

2.28.1.3. audio input boards

2.28.1.4. paging amplifier boards

2.28.1.5. telephone line boards

2.28.2. Field wiring to conform to manufacturer's recommendations.

3. Execution

3.1. GENERAL INSTALLATION PROVISIONS

3.1.1. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in and acceptable manner.

3.1.2. Verify the accuracy of all dimensions, allowances, and clearances on site prior to commencing with any work that may be affected by those dimensions, allowances, and clearances.

3.1.3. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

3.1.4. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

3.1.5. Supervise construction activities to ensure that no part of the Work, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.1.6. Precautions shall be taken to guard against electrostatic and electromagnetic susceptibility and interference.

3.1.7. Provide adequate ventilation for all heat radiating equipment.

3.1.8. Install equipment so as to provide maximum safety to the operating and maintenance personnel.

3.2. METHOD OF WORK

3.2.1. Work to be performed by fully competent technicians in a thorough manner.

3.2.2. All workmanship to be of the highest quality and meet recognized standards of craftsmanship.

3.2.3. Areas of installation deemed not acceptable by the Owner to be redone at the Contractor's expense.

3.3. PROTECTION OF EXISTING PROPERTY

3.3.1. Be responsible for protecting all existing property including floors, walls, ceilings, furniture, and furnishings from damage, dust and other construction related activities. Provide all necessary dust covers and protective pads required for performance of the Work.

3.3.2. Remove all debris and protective coverings at the end of each work period. Leave premises in condition found at start of work in each room or area of work.

3.3.3. Except for scheduled activities, do not inconvenience user due to construction operations.

3.4. INSTALLATION

3.4.1. Provide complete integrated intercom and communications system as indicated on the drawings and specified herein.

3.4.2. All material furnished shall be new and conform to the applicable requirements of the Underwriters Laboratories and the National Standards Institute.

3.4.3. Unless otherwise noted, all wiring to be installed in conduit or wireways.

3.4.4. If more or larger conduit is required than exists or is indicated on the drawings, allow for such additional conduit in contract price.

3.4.5. All system equipment to be contained in 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.

3.4.6. All system equipment and field devices to be held securely in place. Fastenings and supports shall be selected to provide a safety factor of three.

3.4.7. 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.

3.4.8. All cable within equipment racks, cupboards, and cabinets, or on backboards, to be neatly bundled and secured.

3.4.9. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

3.4.10. All connections to equipment, except for main power supply connections, to be made with locking plug-in type connectors. Main power supply connections to be screw terminal type with positive clamping pressure plate.

3.4.11. 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.

3.4.12. Wiring shall be executed in strict adherence to standard broadcast practices.

3.4.13. Color identification of wiring:

3.4.13.1. Identify wiring by continuous insulation color.

3.4.13.2. Where multi-conductor cables are used, use same color coding system for identification of wiring throughout.

3.4.13.3. Maintain uniform phasing and color coding throughout system.

3.4.14. Name identification of wiring:

3.4.14.1. Identify wiring at all equipment locations, pull boxes, junction boxes and outlet boxes.

3.4.14.2. Develop a uniform identification scheme for use throughout the system.

3.4.14.3. Record wire name identification on all applicable drawings and provide wiring tables within the operating and installation manuals.

3.4.14.4. Use one of the following marking materials:

3.4.14.4.1. heat shrink sleeves.

3.4.14.4.2. clear plastic tape wrap-on strips with designated labeling section.

3.4.14.4.3. slip-on identification bead markers or sleeves.

3.5. TESTING, ADJUSTING, AND BALANCING

3.5.1. Except where otherwise specified, arrange and pay for testing, adjusting and balancing of system.

3.5.2. If test results do not conform with applicable requirements, repair, replace, adjust, or balance equipment and systems. Repeat testing as necessary until acceptable results are achieved.

3.5.3. Log and tabulate test results on appropriate test report forms and as specified.

3.5.4. Submit forms to Owner prior to use.

3.5.5. Submit copy of completed test report forms to Owner immediately after tests are performed.

3.5.6. Insert a copy of completed test report forms in each copy of the operating and maintenance manuals.

3.5.7. Testing, adjusting, and balancing to verify the full and proper operation of each system component and integrated function.

3.6. DEMONSTRATION AND TRAINING

3.6.1. Provide demonstration and instruction sessions to familiarize Owner's operation and maintenance personnel with systems and their operation and maintenance.

3.6.2. Establish agendas for demonstration and instruction sessions in conjunction with the Owner. Coordinate scheduling of sessions with the Owner.

3.6.3. Provide _____ X-hour seminars to demonstrate operation of the systems.

3.6.4. Provide _____ X-hour technical seminars to demonstrate configuration, troubleshooting, repair and maintenance of the system.