MicroComm DXI

DXI-400 Series
System Description

General

The MicroComm DXI correctional intercom system is designed and built to satisfy the needs of the correctional environment. It is flexible, rugged, reliable, easy to install, and easy to expand.

The basic function of the MicroComm DXI is to provide two-way voice communications; either between master stations, or between a master station and an intercom station. It also includes public address and music distribution, system integration, point monitoring and control, and other ancillary features that enable it to form part of a facility's total operational plan.

System Architecture

The MicroComm DXI system is based upon a flexible modular architecture which allows it to be configured to suit the specific application.

The functional elements used to construct a DXI system are; system processing and administration, switching and control, device interfaces, and devices. These are interconnected with different types of networks and discrete wiring, depending upon their location and communication requirements.

Service, Administration and Control Computer

Service, Administration and Control (SAC) computers provide the processing for the system's operation as well as its configuration and maintenance functions. They also store logs and generate reports.

SAC computers are standard PC type machines running the QNX operating system with MicroComm DXI operating software. They are available in rack mount, desk top, and mini tower packages with a variety of keyboards and monitors.

Communication between the DXI system and other integrated systems is through the SAC computer.

DXI Exchange

A MicroComm DXI system includes from one (1) to twenty (20) exchanges which are comprised of card cages, control cards, input and output cards, and power supplies. The exchanges interface SAC computers to the field devices and provide the system switching and digital processing functions.

Minimum configuration of a single exchange is an I/O card cage, one control card, a power supply, and one or more I/O cards. This can be expanded to include ten fully populated card cages, which may include redundant control cards and power supplies.

Each exchange can be configured to connect various combinations of up to 50 master stations, 2,560 intercom stations, or 7,860 monitor and control points, depending on the cards installed. For example, if half the installed cards are the intercom station type, only enough card slots will be left available to insert cards to interface 3,840 monitor and control points.

Audio Interface Modules

Audio interface modules are used to connect intercom stations, audio inputs, and audio outputs to the DXI processing and control equipment. Inputs may include microphones, program sources, etc. and outputs could be public address, audio monitoring and audio recording equipment. Some audio interfaces incorporate both input and output signals such as telephones, two-way radios, etc.

General function audio boards include Audio Input Boards (AIBs), Audio Output Boards (AOBs), and Audio Input and Output Boards (AIOs). Together, they are designed to transmit and receive a wide range of signal levels and to interface to virtually any audio component. DXI software programming sets the signal range and level of each audio channel, and determines how it will function as part of the system.

Some audio interface modules are specialized and perform a unique function. Station Audio Boards (SABs) connect intercom stations to the system, Paging Amplifier Boards (PABs) provide a direct connection to constant voltage loudspeaker circuits, and Telephone Set Boards (TSBs) allow standard DTMF telephone sets to serve as communication devices.

Monitor and Control Modules

The MicroComm DXI system is able to monitor contact closure type alarm, status, or signal points and to drive output and event control points through voltage source, current sink, LED, and relay outputs. Inputs may be supervised or non-supervised, with each supervised input able to individually detect the status of two distinct switches, as well as open and short circuit faults. Two types of units are available for this purpose; discrete Input/Output (DIO) and Switch Panel Driver (SPD) modules.

The DIO units are available in a card cage, rack mount, and wall mount packages with various input and output options. The SPD is offered in a wall mount configuration and is intended primarily as a high density interface for control panel switches and indicators.

Switches and indicators that are not assigned to call placement and program functions, may also be programmed as system input points and status indicators.

Intercom Master Stations

MicroComm DXI Intercom Master Stations (IMSs) receive calls from, and place calls to, the intercom stations or other master stations. Additionally, they incorporate monitoring and control functions for alarm points, monitor points, and event control.

Intercom master stations are available in rack mount, panel mount and desk top packages and are available with either a standard or large size character LCD display. Custom master stations can be provided in switch panel or graphic panel configurations.

The LCD displays are 4 line by 20 character full alphanumeric type and feature operator selectable text in either English, French, or Spanish.

Operator interface options include a choice of internal microphone and loudspeaker, external gooseneck microphone, telephone handsets, headsets with boom microphones, external signaling devices, and foot switch type press-to-talk switches.

Annunciation and Control Panels

Annunciation and Control Panels (ACP's) are available in the same packages as the intercom master stations, however they include no audio communication features. Their purpose is to provide remote monitoring and control functions for alarm points, monitor points, and event control.

Intercom Stations

Each MicroComm DXI intercom station provides a voice communication link to one or more master stations and has the ability to receive any one of multiple channels of audio program material at multiple volume levels. They may include up to two function switches and an LED indicator, these are used for placing calls, controlling program selection, and indicating station status.

Each intercom station requires only a single shielded pair cable for connection to the system. All the power supply, audio, switch, and indicator signals are multiplexed onto that cable to reduce installation costs.

Intercom faceplates are brushed heavy-duty 11 gauge stainless steel, and fit standard 2 gang or 3 gang electrical masonry boxes. Custom faceplates can also be manufactured to meet any site's specific requirements.

Call Operating Devices

Call Operating Devices (COD's) are used to initiate system calls at locations physically separated from the intercom stations or instead of intercom stations. They can also be used to initiate, acknowledge, cancel, or otherwise control any system action that would respond to any other system switch input or command.

Standard call operating device formats include pushbutton, call cord, and pull cord actuators mounted on single gang plates or switches designed for through the wall mounting in very rugged or secure areas.

System Networking

Several forms of networking and data communication are used to link DXI system components.

SAC computer to card cage connections, called the Exchange Data Network, are made using a LonWorks direct connect or free topology network. Discrete I/O modules, master stations, annunciation control panels, and switch panel drivers communicate with the SAC computers and exchanges via a LonWorks free topology network.

Digital Audio Trunks between exchanges, or between exchanges and remote receiver units, are via a CEPT multi-channel digital audio trunk.

SAC computer data networks between redundant computers and among exchanges are via Ethernet. A variety of media types are supported including single UTP, 10BaseT, coaxial cable, and optical fiber.

Host port network integration to other computer based systems, such as door control, closed circuit television, etc., can be via a variety of Ethernet, serial interfaces, or contact closure I/O.

System Integration

The MicroComm DXI can communicate with virtually any other microprocessor based system through an appropriate port, or ports, installed in a SAC computer. It is commonly integrated with door control systems, touch screen or graphic control panels, CCTV systems, perimeter detection systems, access control systems, etc.

The DXI system can output information on call placement, call status, and call identity as well as alarm point status or any other status indication. Signals are transmitted and received, so that one system responds to control information from the other system, for truly integrated facility control operations.

In addition to microprocessor based systems, the MicroComm DXI can integrate with audio systems including public address, two-way radio, telephone, audio monitoring, etc.

System Operation

The MicroComm DXI system incorporates a wide variety of voice communication and audio functions. It also includes the ability to monitor and control input and output points, perform maintenance and diagnostic functions, and integrate both data transfer and operation with other systems.

Voice Communication Functions

Dial up or direct select calling - Stations can be dialed using the telephone keypad or through a direct select switch panel.

Push-to-talk or hands free operation- Voice communication control can be either push-to-talk or voice operated hands free with a manual push-to-talk override.

Multiple master operation - A DXI system can include as many master stations as required. All master stations are able to communicate with any other station in the system. Multiple masters can share the same call request queue or can have unique call request queues.

Non-blocking voice communication - The DXI's multi-channel back plane is designed so that at least one voice communication channel is available for each master station connected to the system. Therefore, there is never any possibility of a voice communication channel not being available when it is required.

Programmable call routing - Call requests from an intercom station are software programmable to queue at any master station(s) in the system. Routing can be through multiple exchanges and is independent of where devices are physically connected.

Call forward -When a control console is unmanned, the calls that would normally be queued on that console's master station can be redirected to another master station. Both new calls and calls already queued will be redirected.

Programmable call request priority levels - All stations are assigned a priority. On the master station LCD display, call requests from stations with a higher priority will be displayed first regardless of when they were placed.

Single button call answer - For quick and easy system operation, the highest priority call request at a master station can be answered by pushing a single button.

Selective call answer - For maximum flexibility in operation, the system also allows calls to be answered in any order.

Programmable master station priority levels - All master stations are assigned a call priority. Higher level masters will terminate conversations of lower priority masters to establish calls to the same station. The lower priority master will receive a call termination message. Master stations will receive a busy signal when they call a device already connected to a master station of equal or higher priority.

Recall last device - This function is used to recall the last device to which the master station was communicating. It can be used to reselect a device after a busy signal or to reestablish a call after it has been terminated by a higher priority call.

Adjustable volume levels - Each station's output volume can be adjusted through software from a SAC computer, or from a master station during a call. Each master station also has a volume control

Call hold - A master station can place a call on hold, make other calls, and later return to the call on hold.

Call transfer - While a call is in progress, it can be transferred to another master station. The call is re-queued at the new master station.

Conference calls - It is possible to establish conference calls between master stations. Conference calls that are repeated on a regular basis can be predefined to automatically connect groups of master stations.

Other Audio Functions

Paging - The DXI can be programmed to allow paging to user-defined groups of speakers, intercom stations, and/or master stations. Paging announcements can be made from either master stations or a dedicated microphone.

Audio monitoring - Master stations can listen in to small groups of intercoms simultaneously, or any sized group of intercoms sequentially. Audio monitoring operates as a background function with its own sensitivity.

Audio level alarm detection - Operators can use this supplementary tool to alert them to problem situations. Sensitivity levels can be programmed to automatically adjust throughout a clock cycle.

Video visitation - Full host port support for video visitation systems is available with timing, messaging, CCTV interface, recording, and inter-site communications.

Visitor intercom - Stand alone visiting booth intercoms include dual visitor phone capability, on/off control, audio input, and audio output.

Programmable signal tones - The DXI allows the user to activate audio signal tones in a number of ways; manually from a master station, in response to commands from other systems in the facility, or on a timed basis under control of the system clock

Call announce tones - The DXI allows the user to enable or disable the call announce tones which sound at the beginning and end of a call.

Call acknowledge tone - The MicroComm DXI can be configured to periodically sound a tone at each station which has a call request queued.

Music distribution - The DXI can distribute up to 30 music programs to all stations. Several sources may be distributed at several different volume levels. Music distribution to individual stations or groups of stations is enabled and disabled from a master station. The desired program is selected at each station and is automatically suspended during voice communication.

Independent station amplifiers - Each intercom and master station on a DXI system is provided with its own amplifier for communication, music distribution, and paging. Therefore, regardless of how many stations are connected to a signal, the output power to each device remains constant.

Telephone interfaces - The DXI system can interface to standard DTMF telephones which can be used as administrative intercoms or as basic intercom master stations. When the DXI's trunk line module is included in a system, master stations and telephones can access the external telephone network.

Two-way radio interface - Two-way radio systems can be interfaced to the DXI system to provide direct communication between intercom master stations and the radio system. It is also possible to setup cross patches between different radio systems to retransmit messages received on one radio from the other.

Operational, Control, and Monitoring Functions

On-line programming - DXI's multitasking operating system features the ability to configure and reconfigure the system and to run maintenance and diagnostic procedures while the system is in operation. Therefore, modifications can be made in one area without affecting the operation of the rest of the facility.

Password protection - Access to system functions can be controlled through the use of the DXI's system of multiple user-defined passwords.

Operator ID - DXI software allows an operator ID function to be incorporated. This may be required for associating system activity with shift personnel and also enables automatic call searching by an ID number.

Fixed point alarm monitoring - The DXI can collect and annunciate alarm points from a variety sources; tamper alarms, door contacts, emergency push buttons, etc.

Output control - Output control point drivers are available with voltage source, current sink, relay contact and LED interfaces.

Event response - The DXI system can be programmed to control output point status according to the action of monitored points or timed commands to perform event response functions.

Standard interfaces to other equipment - To help provide correctional staff with the tools needed to remain in complete control, the DXI is easily integrated with, and can be controlled from, other security related systems such as door control, access control, fire alarm, perimeter security, lighting control, and CCTV switching systems. It can also interface with other audio equipment such as paging systems, music sources, recording equipment, two-way radio systems, radio pager systems, and telephone systems.

Maintenance and Reliability

The MicroComm DXI ensures years of trouble free operation through high standards of workmanship, durable materials, tamper resistant construction, and hardware and software features designed to simplify installation and maintenance. These features include:

Rugged stations - The DXI intercom stations are vandal proof in design and construction, and feature optional weather resistant components.

System logging - The MicroComm DXI maintains a continuous log of all system activity on the SAC computer hard drive. This log can be viewed on screen, and sections marked and printed on demand. It can also be configured for continuous printing. This provides valuable assistance when starting up a large complex installation or diagnosing problems when the system is in operation.

Separate operational and maintenance logs - Report filters allow logs for system maintenance to be separated from those for system activity. This eliminates the need to wade through irrelevant information when looking for specific data.

Failure detection and protection - In order to ensure rapid detection of system problems, the DXI features detection of open and short circuit faults in station and switch wiring, wiring short circuit protection, communication fault detection, and I/O card failure indication. It also uses short circuit, overvoltage, and polarity protection circuits to prevent these faults from damaging the equipment.

On-line diagnostic testing - DXI software allows testing of system components and networks without disrupting normal operations. A self test feature allows maintenance personnel to quickly determine whether or not a board is operating properly.

Hot swapping - In order to minimize disruption and downtime in the event of a component failure, all I/O cards can be taken out of service without removing power and affecting the operation of the entire system.

Redundancy - In order to avoid failure of the entire system in the event of failure of a single critical component, the DXI supports redundant operation of those critical system components.

On-line factory support and upgrades via modem - With a modem interface to the DXI's Service, Administration and Control computers, diagnostic support is available from the factory for system hardware and software. In addition new releases or modifications can be uploaded

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