

MX Series

PC Command System

MX Command & Control System Design Guide

J9DA0109-001, Rev A
First edition
September 10, 2009



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MX-5000 FEATURES

The MX Series serves as the central monitor and control point of a security system. The MX-5000 Series monitors outdoor intrusion detection systems. The MX-6000 Series monitors the PAS. (Personal Alarm System)

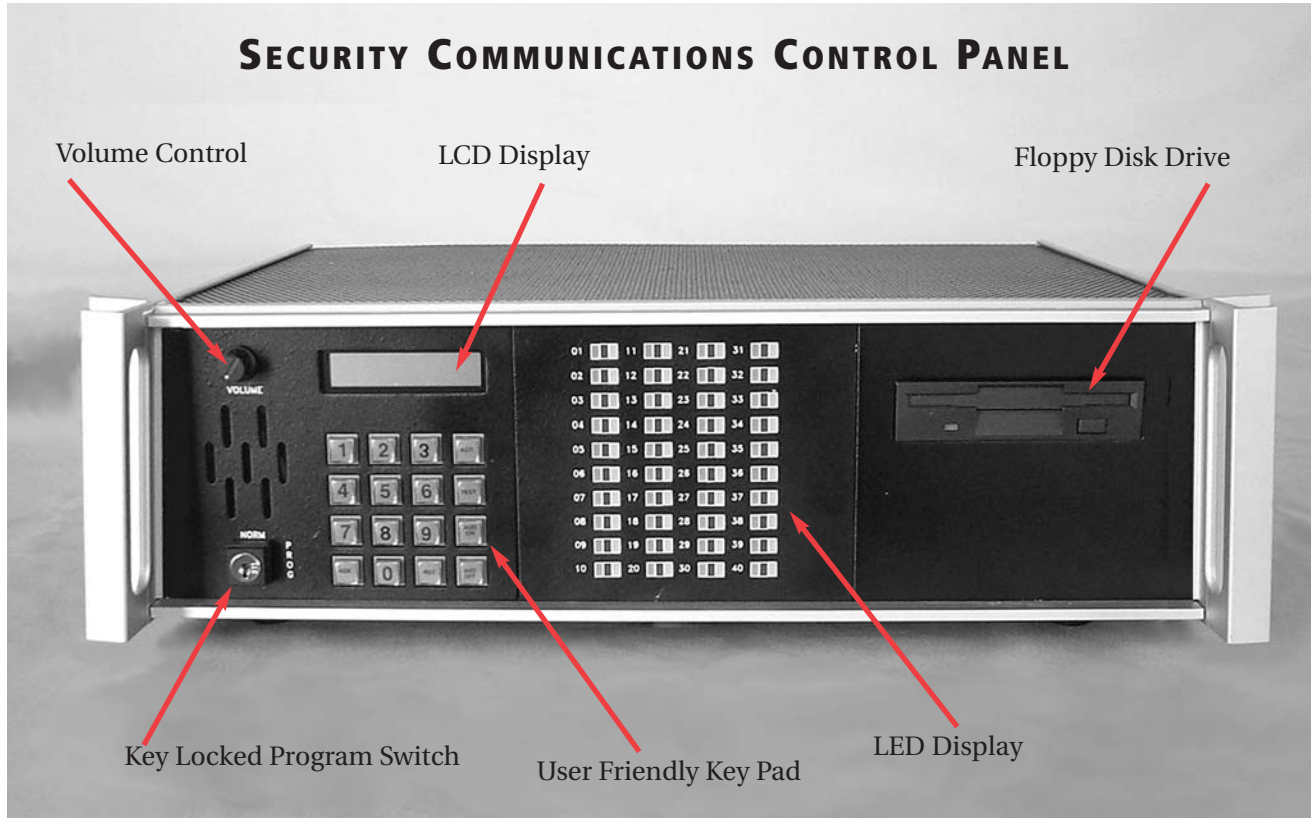
The following main features demonstrate the versatility and capabilities of the MX Series:

- ▶ **LCD and LED Display** - Word as well as red/green/yellow lamp displays
- ▶ **Alarm Classification** - Alarm classifications established by facility. Zones with alarm indication cannot be re-set until classification is selected.
- ▶ **Direct Replacement of Older Equipment** - MX-1000/2000 Series
- ▶ **Zone Association** - Programmable association typically between dual sensor technology perimeter zones. Results in a Standard Alarm (one zone only) and a Priority Alarm (two associated zones in alarm)
- ▶ **EDAPT** - (Environmentally Derived Adaptive Processing Technique). Advanced Global Processing ('smart') Technology (see page 4 for details).
- ▶ **System Status Report** - On command, ex: at shift change, a status report is printed for the entire system
- ▶ **Variable Alarm Thresholds** - Set in software and easily changed by authorized personnel with programming key and password
- ▶ **Integrated Floppy Drive** - Programming for system can be saved and restored via floppy disk
- ▶ **Programming Protected** - Key lock program switch plus password
- ▶ **Flash Program Storage** - Allows upgrades to system software via modem or floppy drive
- ▶ **Multi-Level Security for Operators** - Keypad entry, multi-level password
- ▶ **Modem Accessible Diagnostics** - Access to factory via modem (optional) for diagnostic assistance
- ▶ **Audio Listen-In by Zone** - Audio from FPS sensor or MPS-4100 Microwave signal is presented on MX speaker automatically upon alarm or by manual command
- ▶ **RS-232 Communication** - 3 separate ports for bi-directional communication
- ▶ **Remote Self-Test of Compatible Sensors** - Electronic signal simulates alarm condition to test basic operation of sensors and communications
- ▶ **Uninterruptible Power Supply** - Monitors power status for Control and Sensors. Provides the power for the MX-Control, FPS and G-Line sensors. Sound alarm and indications on LED and LCD panels if primary power is lost. Additional alarm indication, sound and LCD read out for low battery condition.
- ▶ **Built-In Alarm Record Keeping System** - (ARKS) (see page 9)
- ▶ **Zone Access Time-Out** - Allows access (no alarm) for a particular zone for a predetermined time limit established by the facility. MX Control automatically re-secures the zone when time expires, i.e. gate operated during daytime operation 4 hours; typical zone for 20 minutes.
- ▶ **Interchangeable Loop Cards:**
 - Standard - MSI CEnDe Communication
 - Fiber Optic Multiplex - RS-485 communication via fiber translator
 - CAN - Controller Area Network
- ▶ **Optional Interfaces** -
 - TCP/IP - Ethernet capability
 - ARI - Dry contact relay Interface

OPTIONS

MX-5000

Security Communications and Control Center

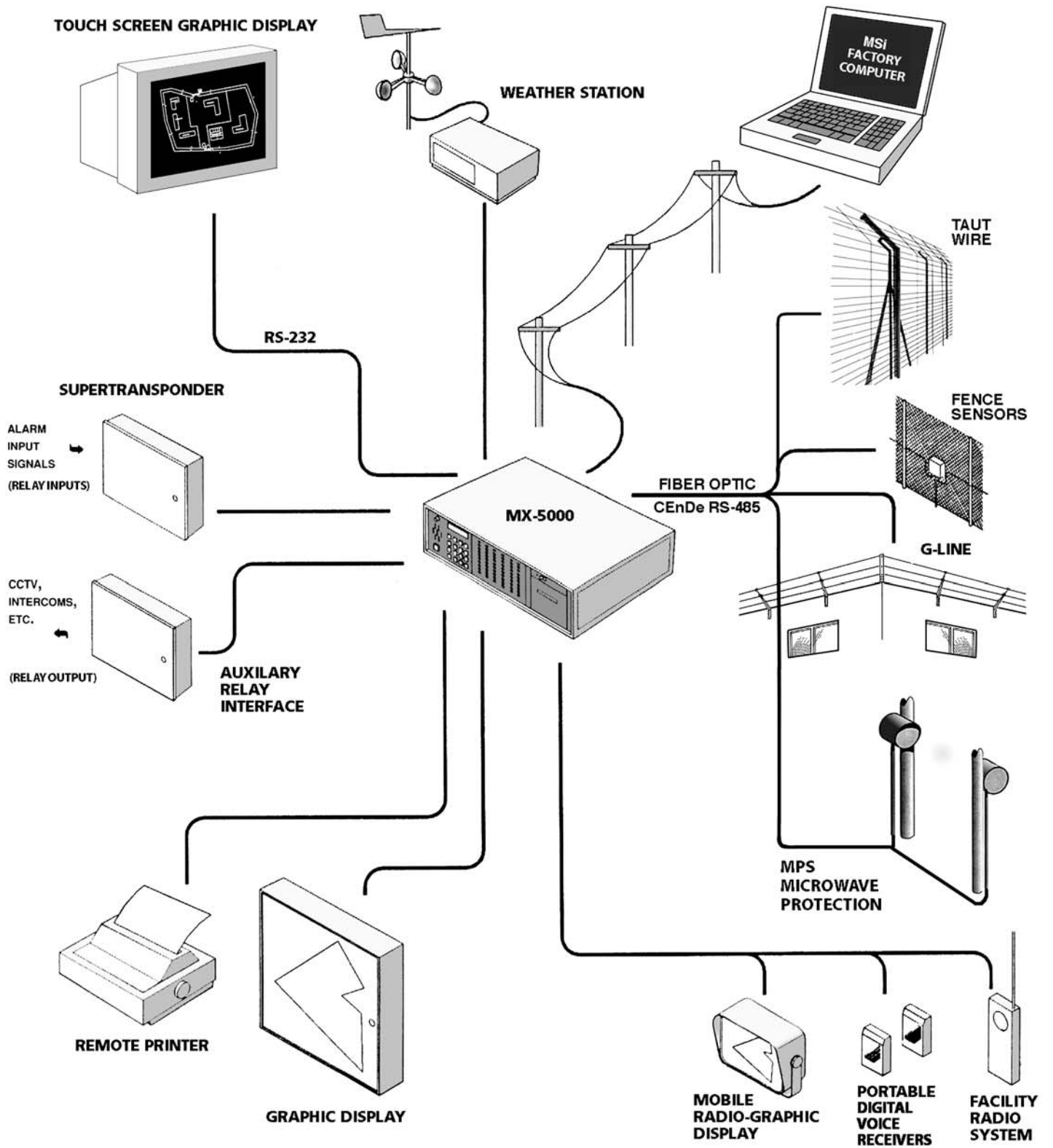


Alarm Displays

Once an alarm or other security system status information is generated, it must be displayed in a manner that will allow operators the most rapid and appropriate response. Each facility is unique and usually has a particular operating procedure for alarm response. For this reason, Magal-Senstar provides a wide array of alarm display methods. One or more can be used to provide the type of display required to match the response procedure.

Built-In

The front panel of each MX-5000 has a built-in LED display that constantly indicates the status of each alarm zone in the system. Three LED's for each zone show alarm (red), secure (green), access (yellow), priority alarm (all flashing lamps both zones), tamper (rapid flashing red), audio monitoring (flashing green), and communications failure (all solid lamps). A text message representing the same event as the LED display is flashed on a LCD display. The convenient front panel keypad allows the operator full control of the MX-5000. When an alarm or other status change occurs, the operator uses the keypad to acknowledge the alarm and, if appropriate, reset the zones in alarm. All of the operator actions are also displayed on the LCD readout.

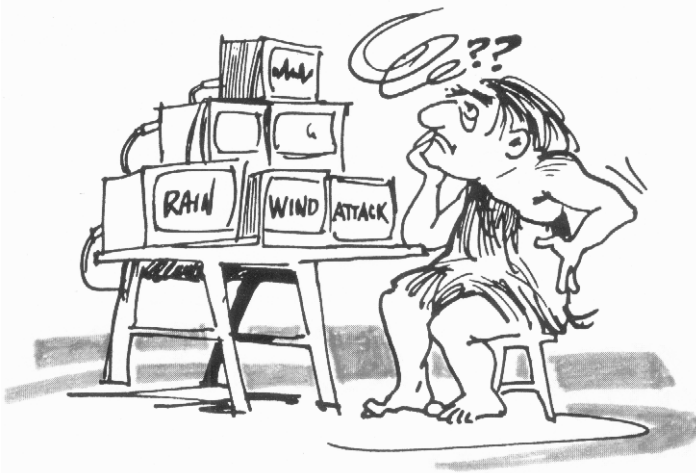


EDAPT

Environmentally Derived Adaptive Processing Techniques

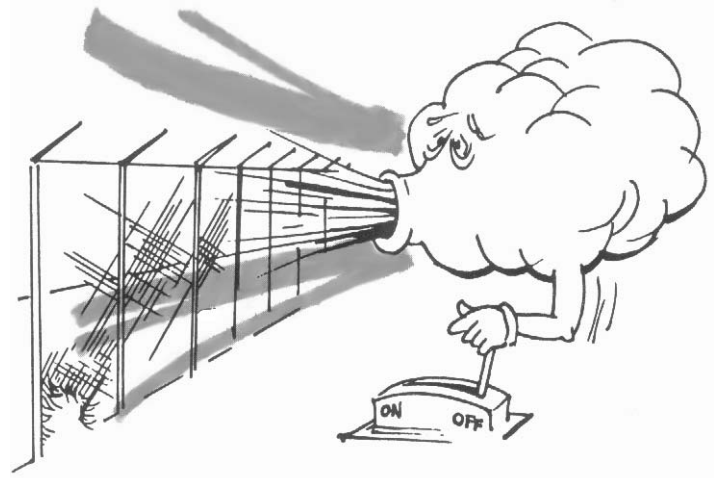
Alarm signal processing for outdoor sensor systems involves separating the sensor signals generated by an attack from those created by the environment. The objective is to reduce the nuisance alarm rate without lowering the probability of detecting an attack. The MX Series Advanced Processor (EDAPT - Environmentally Derived Adaptive Processing Techniques) taps a previously unused source of information - the environmental effects being produced in all zones in the system. Alarm processing parameters and coefficients used to make the alarm decisions are changed in response to the effects of the environment of the TOTAL system. This manner of processing minimizes the environmental effects.

All decisions involve comparative analysis of data from all system sensors as opposed to the information available at a single sensor point. This global processing enables the MX Control Unit to optimize the processing for each signal and to reduce the contributions of the environment to the alarm decision. The EDAPT Advanced Processing moves the alarm decision from an individual zone processor in the field to the MX Control Unit which is collecting all the pre-alarm (event) information for the *entire site*. The alarm threshold is set in the MX Control Unit rather than at the individual zone location and the alarm decision is then made using all the information available.



Various elements in the environment interact. Wind driven rain is different from gusting wind driven rain. Not only do the various environmental effects interact, but they may cause the sensor signal to change. For example, the fabric on a chain link fence tends to become looser as the temperature increases. This 'looseness' can alter the characteristics of the frequency of the fence.

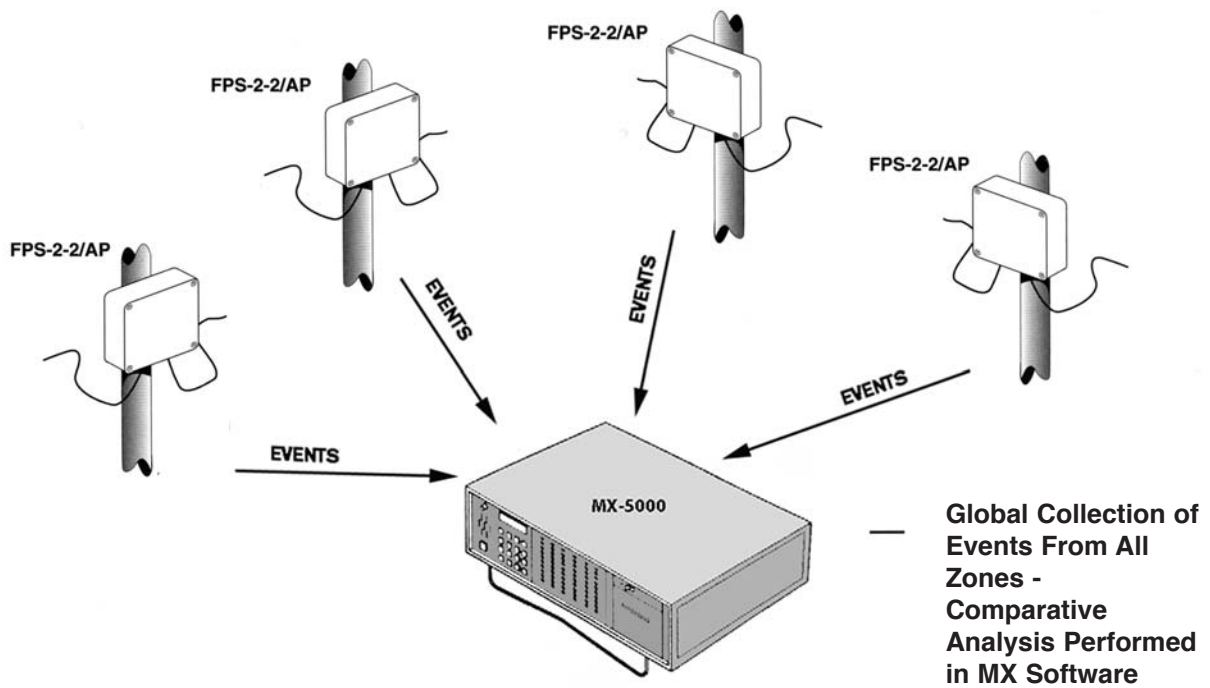
Adopting advanced signal processing techniques without understanding the basic effects may introduce serious vulnerabilities to the system. This is a real risk. For example, take a situation in which the processing is changed when the wind blows. The wind and its effects can be very different over a very small area. If the wind is measured by a single spot anemometer and adjustments are made in areas in which the wind is not affecting the sensors, serious errors can result. The nuisance alarm rate is decreased, as desired, but unfortunately so is the detection. In some systems the effect is very similar to an On-Off Switch.



Extensive trials have demonstrated that environmental effects tend to affect sensors in groups. For example, the wind blowing directly at a section of fence will produce different sensor signal characteristics than one blowing parallel to the fence. The environmental effects common to a large group of sensors may be eliminated in making a basis alarm decision. The EDAPT technique constantly searches for groups of sensors and automatically learns which are likely to be group members at any given time and condition.

The minimum number of members in the group of observed sensors is controlled such that an attacker cannot simulate the required signals in only a few adjacent zones. Sensors are continually grouped and regrouped according to common effects of the weather, changing fence conditions, etc. The alarm decision is then made with more information.

The system learns, over time, the environmental characteristics of the site as well as changing fence conditions. It knows which zones are affected in a like manner and which zones typically suffer lesser effects. This knowledge allows the system to compare zones under varying conditions to achieve a maximum reduction in the nuisance alarm rates while still maintaining critical high detection levels.



MODEL NUMBERS

1. MX - 5000	Multiplexed (least expensive) Advanced Processing (EDAPT) Direct replacement for MX-1000	6. MX-5463	Fiber Optic Multiplex Control Unit that annunciates alarm, tamper and trouble per zone
2. MX-6000	Multiplex control for Personal Alarm System (PAS-120)	7. MX-RF/REM	MX Unit with no built-in display for use with large Ultrasonic/RF receiver systems that require multiple screen graphic displays
3. MX-5000/6000/C	Utilizes CAN (Controller Area Network) protocol	8. MX-0000/FT	Any model Of MX Control Unit with 2 units running simultaneously; 1 as Control Unit, 2 as Monitor continually checking "health" - Will automatically switch if problem occurs.
4. MX-5300	Control Unit for FPS-3 System with EDAPT		
5. MX-5400	Fiber Optic Multiplex w/ EDAPT		

MX-5000

The Magal-Senstar, Inc., MX-5000 Series Controllers are state of the art multiplex control centers designed specifically to meet the demanding needs of outdoor security systems at a very affordable price. The unique bus structures of the MX-5000 Series provide the basis for an extremely flexible design of small to medium size proprietary security control centers.

Each display function (lights, graphic panels, digital voice messages, printers, mobile maps, etc) is provided with a unique address and connected to the internal bus, the local external bus, RS-232 or the CAN (Controller Area Network) bus. The data presented on each of these dis-

plays is then software controlled in a fashion that allows maximum flexibility in choosing what data goes where.

The system maintains the standard field proven MSI proprietary CEnDe (Communication Encoder/Decoder) Multiplex system that is designed specifically for outdoor security sensor use. Most system requirements can be accommodated within the 20,000 foot limit of a standard MX-5000 loop card thereby eliminating the need for expensive repeaters. Other types of communications can be utilized simultaneously with the system's modular loop card design, i.e. CEnDe loop, RS-485 loop, CAN loop.

Two control functions are available at each transponder point allowing remote control of such functions as individual sensor self-test and audio switching.

The integrated audio feature is automatically switched to the sensor in alarm. This overriding of manual control results in minimum errors in times of stress and overload.

Since the MX-5000 is a direct replacement for the MX-1000 Series, the system may be set up to use the MSI distributed field processing to ensure compatibility with previously installed hardware.

A modem port (modem sold separately) provides the ability to run diagnostics software from a remote location (MSI factory) to assist in identifying any problems that may develop in the system operation.

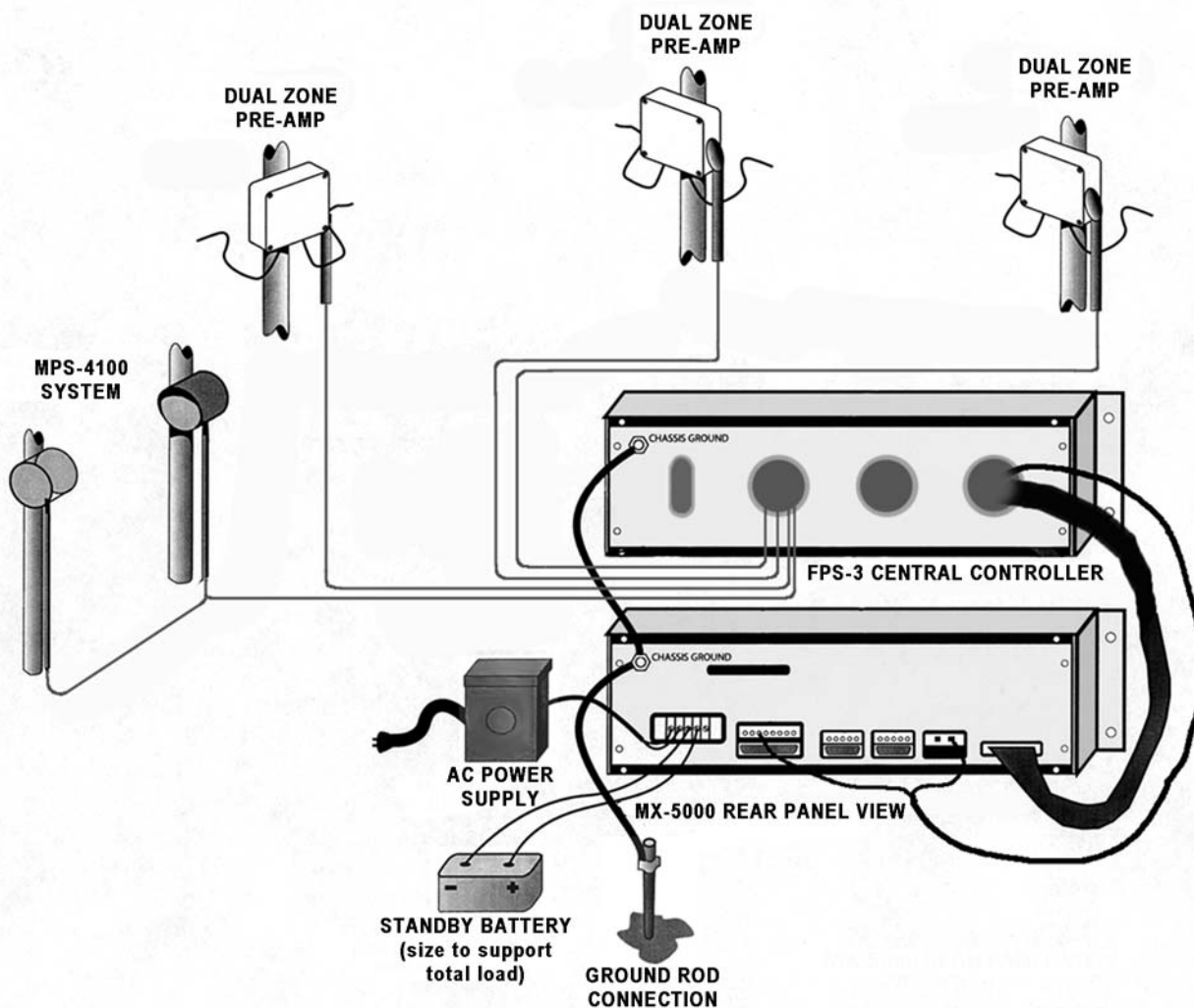
The floppy drive enables the operator to run the diagnostic software locally. The individual site set-up and configuration can be stored on a floppy disk, thus when a software upgrade is installed, the system set-up can automatically be loaded into the new software.

Software upgrades can be installed in the system via the modem port or the floppy drive.

MX-5300

The MX-5300 is the Control and Display Unit for the MSI FPS-3 System. The mechanical disturbance detected by the sensor cable is sent via the Pre-Amp to the FPS Central Controller. Each FPS-3 Central Controller contains up to 30 zones of perimeter protection. The Dual Zone Card contains the circuitry that analyzes the disturbance detected by the sensor cable. The only piece of hardware mounted outside is the Dual Zone Pre-Amp. All other electronics are safely indoors.

The MX-5300 has the ability to communicate with the FPS-3 Central Control via an internal data bus and at the same time have up to 30 zones of multiplexed sensor inputs. This feature provides a range of flexibility for integrating sensors by other manufacturers into a combined system.

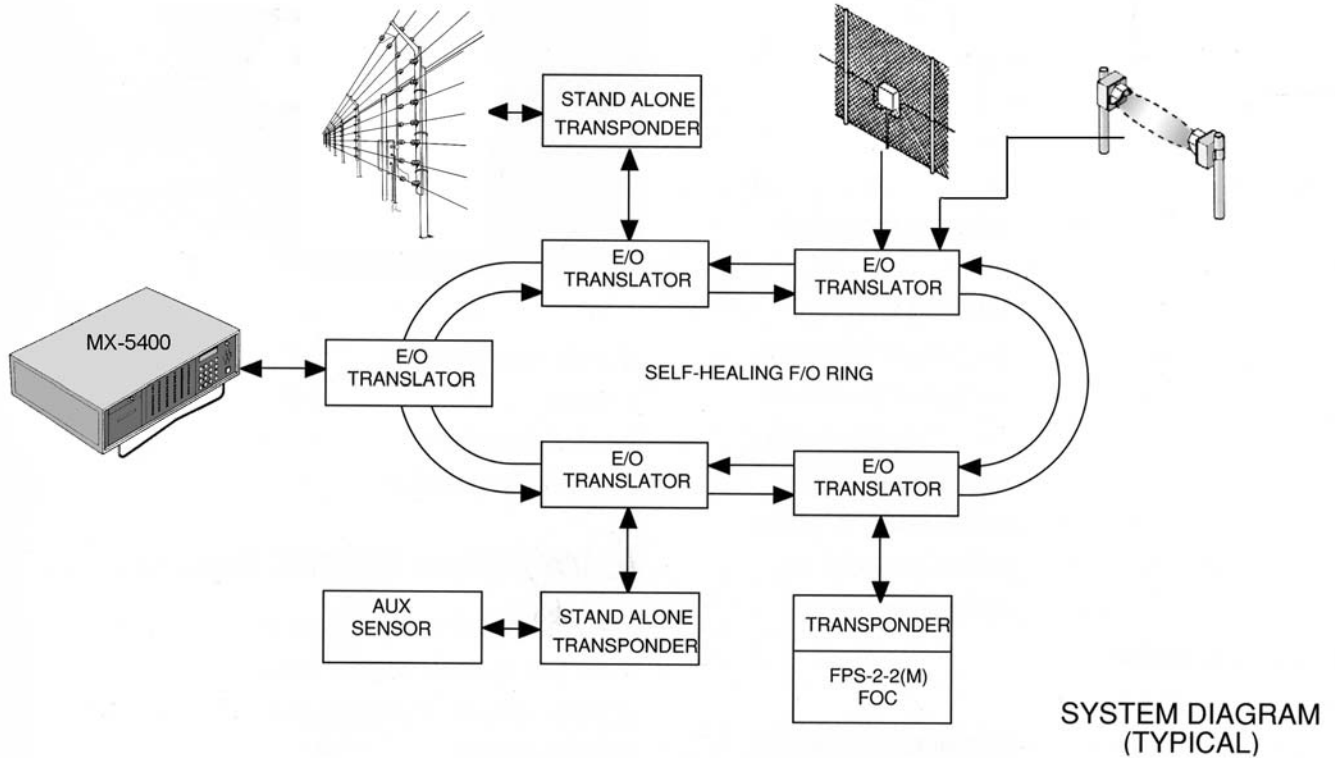


MX-5400

The MX-5400 Series provides the ability to send the multiplex communications of a perimeter system via fiber optic communications rather than copper. This fiber optic communication capability provides EMI/RFI immunity, particularly in long outdoor cable runs and adds a significant capability in high lightning areas. The RS-485 data loop provides a "self healing" ring that maintains network communications with all transponders in the

event of a cable break. As many as four control functions are available at each transponder point allowing remote control of such functions as individual sensor self-test.

The MX communicates with the field devices through an E/O Translator. See Diagram Below.



MX-5000C

The MX-5000/C has a Controller Area Network (CAN) protocol that can communicate over a simple copper network to allow multiple MSI devices to communicate with one or more MX-5000's. This protocol is specifically designed to work reliably in the demanding industrial/institutional environment.

4) Max number of nodes 1600

The MX-5000C software is under development. Please consult the factory for more details.

Other features of this system are:

- 1) It allows the system to attach up to 64 peripheral devices to the MX
- 2) It can provide additional RS-232 Ports
- 3) Max Bus length with moderate number of nodes is 9KM

MX-5000/FT

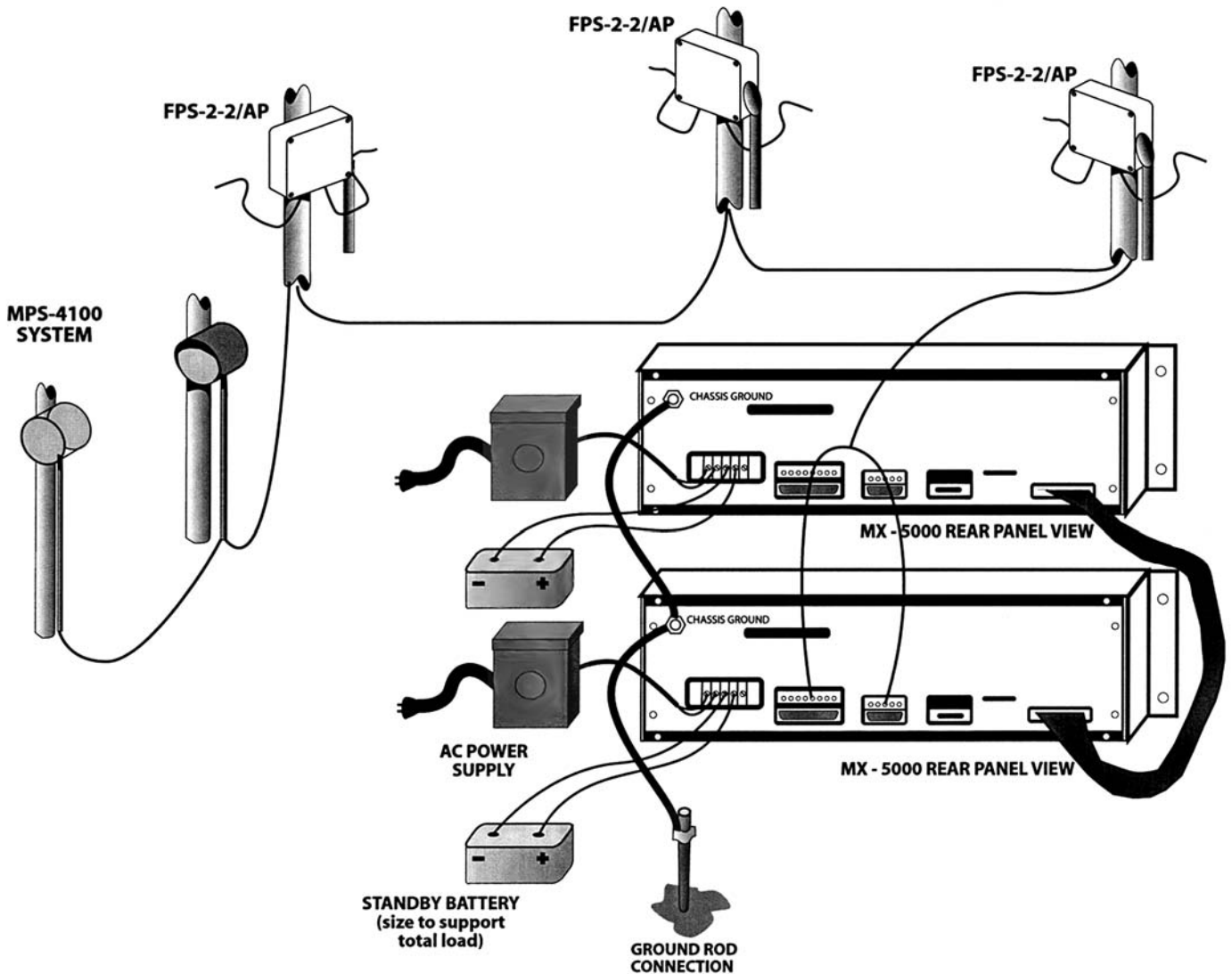
The MX Fault Tolerant Series consists of two identical MX Units (any model) connected to all data loops. The communication between the two MX's and the peripheral devices is via multi-drop data bus. One MX operates as a control unit and the other MX functions as a monitor unit.

The MX Monitor Unit continually verifies the loop communication with the control unit and peripheral devices, provides remote status display and sends a continuous watchdog signal to the MX Control Unit.

The Control Function can be transferred with password protected commands or is automatically switched if the Monitor Unit detects communication failure to the sensors or peripherals.

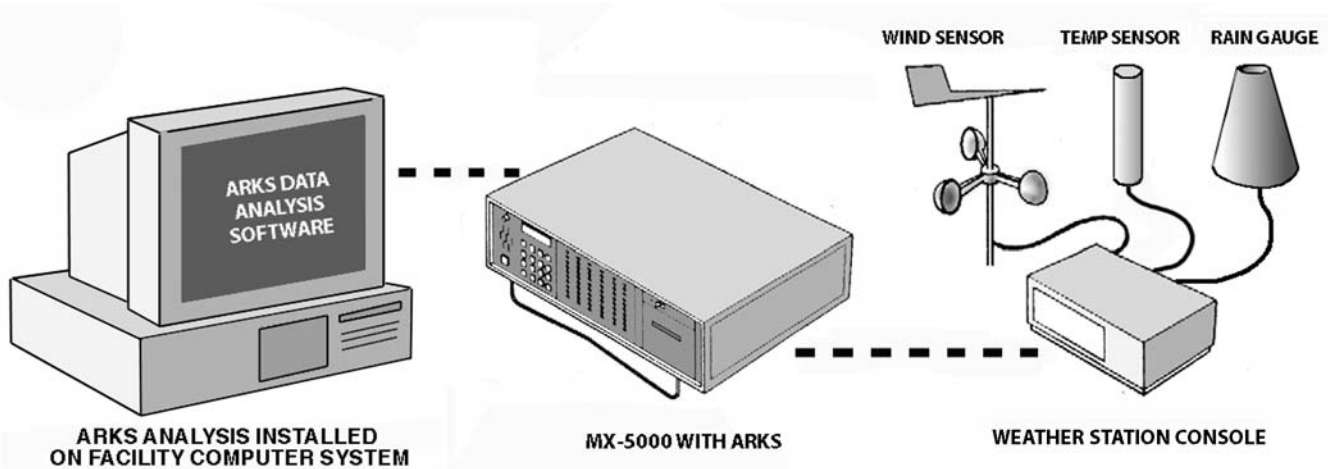
The operator is notified of any problems via the LCD display on the units and through the printer. The MX Fault Tolerant Series is more than just "hot backup"; it assures continued operation of critical applications.

The Fault Tolerant Capability is available in all MX Series Units. Older models of the MX Series can be upgraded.



ARKS

Alarm Record Keeping System - Optional



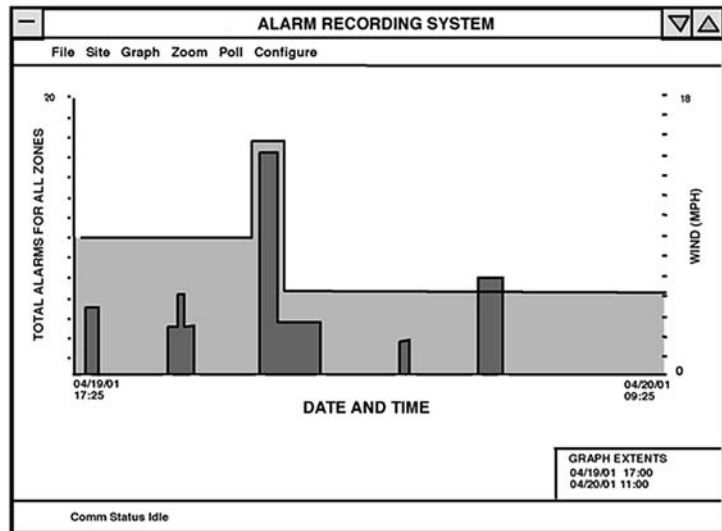
The ARKS (Alarm Record Keeping System) option is a 32MB Flash RAM unit installed inside the MX Unit. The ARKS RAM continuously records all system activity. Alarms, Tamper, Acknowledges, Resets, Self-Test Results, Communications Failures and Alarm Classifications by date, time to the nearest second and the local weather conditions (if the optional weather station is installed). The ARKS information is retrieved through the floppy disk port or via the modem connection.

The ARKS alarm data analysis software installs on a standard PC compatible computer and is designed for operation using the popular Windows Operating System.

The PC with Windows has been acknowledged as being very easy for the computer operator to learn and use. ARKS software reduces the alarm system data to a few important and easy to read graphic displays and reports. A few simple commands from the "pull-down" menus will display the activity of each alarm zone in the system. Displaying alarms by zone quickly shows troublesome zone. Displaying alarm activity of any zone over a period of time indicates when alarms are most likely to occur. Comparing alarm data with the weather conditions (wind, rain, etc.) will help isolate defective fence installations and maintenance requirements.

The 'CHANGE GRAPH PARAMETERS' dialog box contains the following fields and controls:

- GRAPH TYPE:** Radio buttons for 'Events v. Time' and 'Events v. Zone'.
- ZONE:** Radio buttons for 'All Zones' and 'Zone: []'.
- GRAPH START:** Date field (00/00/00) and Time field (00:00).
- GRAPH END:** Date field (00/00/00) and Time field (00:00).
- Buttons:** 'OK' and 'CANCEL'.



WEATHER STATION

Weather information is often a very important factor when evaluating the problems of a security system. Weather such as high winds can affect fences and consequently generate nuisance alarms. A weather station installed in conjunction with the ARKS system will pro-

vide the information needed to properly maintain the fence and perimeter security systems.

Weather information is used for analysis only. It does *not* affect the sensor system.

PSYCON

PC BASED CONTROL UNIT WITH TOUCHSCREEN GRAPHIC DISPLAY

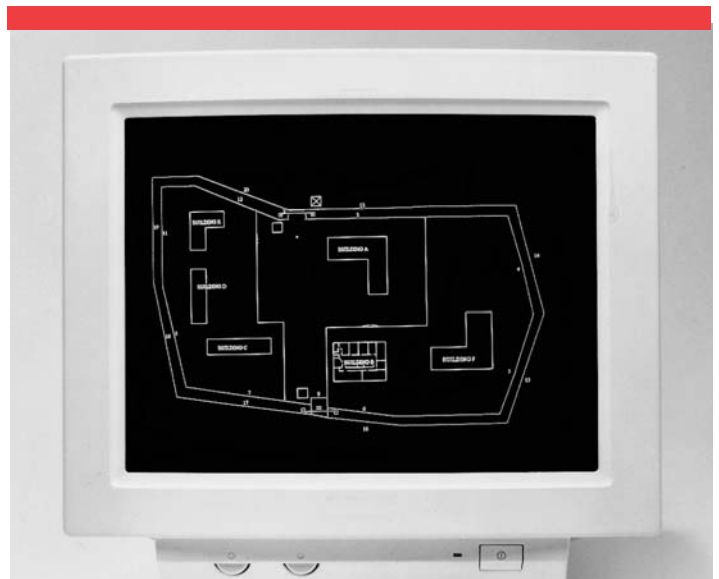
- ▶ **Windows NT Operating System**
- ▶ **Information at the Tips of Your Fingers**
- ▶ **Graphic Display shows Location and Status of Each Alarm Zone**
- ▶ **Alarm Assessment Classification**
- ▶ **Video Picture Integrated into CRT Display (optional)**
- ▶ **Multiple Zoom Feature for Viewing of Detailed Areas**
- ▶ **Map Editor Feature for Quick Map Changes and Additions**
- ▶ **Simple Interface to an MX Based Security System**
- ▶ **Minimizes Training Requirements**
- ▶ **Maximizes Accuracy**
- ▶ **Digital Voice Annunciation of Alarms (Optional)**

PSYCON displays the alarm information received from the Magal-Senstar MX-5000 Series Controllers and allows control of the system with the touch of a finger. Operation of the system is very simple; it is intuitive. If you need data concerning a given area, including the video picture, you merely press that area of the display. There are no complex computer commands to type, menus to understand or typing skills to master. You can move quickly between alarms in complex systems, understand the situations, react accordingly.

PSYCON is designed to operate on a Windows NT operating platform with a Surface Acoustic Wave (SAW) Super-VGA touchscreen monitor.

The Magal-Senstar, Inc. PSYCON System is designed to operate as the command center for one or more Magal-Senstar MX Series Security and Communication Controllers. The operator is provided with the same control capabilities provided on the front panel of each MX, with the added features of a multi-colored graphic map showing the location of each alarm zone in the facility, an optional video picture of the alarm zone and an optional voice announcement of the alarm information. Alarm zones change color and configuration to indicate status changes. The map can be revised easily by the user for both layout and zone configurations as well as colors used. PSYCON monitors are available with 15" screens up to 21" screens.

Control operations using PSYCON are performed in the same general fashion as with the MX Control Unit. The monitor displays control keys similar to the MX and are operated by using a mouse, trackball, or touchscreen.



The map editor function allows the site specific graphic to be locally generated and changed as the features of the facility vary over time. This editor function provides tools to allow the easy construction of buildings, roadways and physical features included in the graphic. An Automatic Zone numbering feature allows repetitive zone number selection. Background screen, zone/condition and line colors are all user selectable to assist in customizing the display.

A special function (FIND) button is available to move quickly between alarms. When the FIND button is activated, the screen moves to an expanded screen showing the next waiting alarm and automatically presents the zone number and condition.

In operation, when an ALARM occurs:

- 1) The zone in alarm on the display changes color.
- 2) The zone number and status is displayed next to the screen touch control pad.
- 3) The Find button changes from gray to red.
- 4) The audio assessment from the MX Controller automatically comes on.
- 5) Digital Voice Announces Alarm (optional).
- 6) Video Picture of Alarmed Zone comes onto the screen (function is optional).

When the reset button on the keypad is touched, an alarm classification chart will appear automatically requiring the operator to classify the cause of the alarm prior to resetting the zone. Six classification categories are available. The classifications are chosen by the facility and can be changed with the proper passwords. Examples of categories for classifications are: Weather, Test, Animals, Maintenance, Unknown. If the ARKS option is selected with the MX Controller, the alarm classifications will be included in the data presentations for easy analysis of the operation of the system. The Psycon utilizes a standard parallel printer. The optional printer

provides for management review of each control center and system event by time of day and operator number.

To prevent a zone from being placed in Access unintentionally, the operator must acknowledge the command. When a zone is in Access, the zone indication changes to a white dotted line which significantly stands out when viewing the graphic display.

The multiple zoom feature allows 8 levels of information to be available upon command. When the map is created, various information such as camera coverage angles, contents of storage locations, access codes and telephone numbers can be inserted at various zoom levels. In normal operation this information is not presented to the operator and does not serve as a source of distraction. If the information is required, the operator merely touches the area to enlarge the information.

The Psycon utilizes multiple layers of password protection to prevent unauthorized changes to the system's operating parameters.

Psycon/DVA Digital Voice Annunciation Option

If the DVA option is selected, the PSYCON will produce a verbal message upon alarm through the computer speakers. Alarm messages can be re-configured and changed in the field. The DVA will stack multiple alarm messages and announce them in the order received. No alarm messages are lost.

GRAPHIC DISPLAY (Hard Panels)

A graphic display provides an easy to read alarm status display of each alarm zone in the system. Because the graphic display shows the relationship of alarm zones to each other and to the facility buildings and gates, the



PSYCON/IV Integrated Video Option

If the Integrated Video feature is selected, a video view of the scene appears in the lower right four inch "window" of the screen. By touching this video insert, the entire scene will spread across the screen and the layout will become the insert section. It is possible to toggle back and forth between a full screen video image and floor layout by simply touching the insert.

control room operator can direct a more rapid response. Some graphic displays also contain other system information that make it easier for the operator to compare intrusion detection alarm information with other conditions in the facility. The MSI graphic displays can be either wall or console mounted. The LED display on the graphic mimics the LED display on the MX-5000. The electronics without the graphic panel are also available for incorporation into integrated maps manufactured by others.

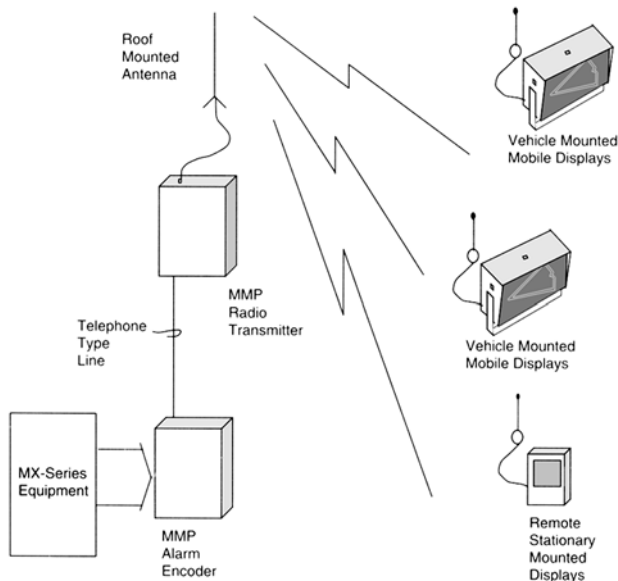
- ▶ **High-Accuracy CAD-Produced Graphics**
- ▶ **Polycarbonate Non-Glare Graphic Surfaces**
- ▶ **Choice of Lamps, Solid State or Incandescent**
- ▶ **Wide Selection of Colors**
- ▶ **Custom Enclosures Available**

REMOTE DISPLAY UNITS



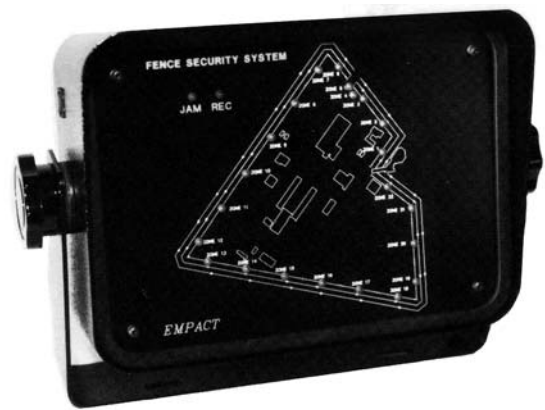
Many facilities use a decentralized response plan where the staff located in remote posts, towers or vehicles provide rapid response to security alarms. This approach is practical because the personnel closest to the alarm point will usually provide the first response on the scene. The MX Series is designed to support a wide variety of remote displays and provide simultaneous information to the information display in central control. This information is provided automatically without any required actions in the control room. One or more Remote Display Units can easily be added to provide the type of display needed; both stationary and mobile.

MOBILE RADIO-GRAPHIC DISPLAYS



The MSI vehicle map display system connects the MX Series Communications and Control Center to a vehicle-mounted display unit. When an alarm occurs, the mobile map radio transmitter immediately sends the alarm information to the vehicle, which is often first to the alarm scene. Radio graphic displays can be installed in one or any number of response vehicles.

The wireless displays can also be used in remote locations where installation of communication wire is cost prohibitive.



- ▶ **Custom CAD-Laser Produced Graphics**
- ▶ **Continuously Supervised "in use" for Both Communication and Jamming**
- ▶ **Optional Programmable Security Code**
- ▶ **Independent Radio Transmitter**
- ▶ **Conventional or Trunked Radio Operation**

PORTABLE ALARM PAGER RECEIVERS



The MSI RANS (Roving Alarm Notification System) is a dedicated pocket pager providing alarm information through a digital voice system whenever an alarm is present on the MX Control Unit. The RANS-

Audio receivers emit a customized audible alarm and an English (or other) language message whenever an alarm is present. The approximate four-second alarm message notifies the wearer of the type and location of the alarm, allowing a precise and rapid response. Portable alarm receivers are small, battery-operated standard pocket pagers. However, each portable alarm receiver is exclu-

sively connected to the MX Control Unit providing uninterrupted voice annunciation of alarm messages.

The digital voice generator can be connected to a standard radio or paging system to transmit the alarm messages through systems made by other manufacturers.

- ▶ **Provides Rapid Alarm Announcement**
- ▶ **Reduces Personnel Required**
- ▶ **Personnel Alerted Regardless of Location**
- ▶ **Alarms are Clearly Spoken English (or any other) Language**
- ▶ **Wall-mounted and Rack-mounted Enclosures Available**

ADDITIONAL INFORMATION

The MX Series has evolved as a direct response to the needs of the market. Distances, electronic environment, terrain, new construction, retrofit, climatic conditions, operational procedures, integration with other equipment are all aspects that must be taken into consideration in the research and development process. Listening to our customers and combining their input with our many years of experience has allowed us to create a communication/control product with a wide range of options and flexibility suitable to virtually any application.

Please contact us to discuss which option may best suit your requirements.

The following related materials and data sheets contain detailed descriptions and specifications:

MSI CD

This CD contains all data sheets, design guides, A&E specifications and installation manuals.

Materials and Guides

- FPS Design Guide
- PAS Design Guide

Data Sheets

- MX-5000 Series including optional CAN and ARKS
- MX-Series Accessories (peripheral devices)
- PSYCON
- FPS-2-2
- FPS-3
- FPS BIPOD
- MPS-4100
- G-Line
- BADD
- PAS-120
- RANS
- Mobile Maps
- Graphic Displays