MX Series

PC Command System

MX-5000 Installation Instructions

J9DA0202-001, Rev A
First edition
September 4, 2009

SENSTAR™

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MX-5000 SERIES

1 QUICK START FPS-2-2M

Qualified technicians may follow these simplified procedures to install and test the typical MX-5000/ Fence Protection System, including installation of the MX-5000, FPS-2-2M fence protection, and MPS microwave system. Prerequisites for using the quick start procedures are:

- Attendance at one or more Senstar MX-5000 training class.
- Prior MX-5000 field installation experience.

Before proceeding, VERIFY that you have a complete site layout showing zone extents, processor locations, and conduit interconnections. If you are not familiar with any of the procedures described in this section, refer to the appropriate manual for more detailed information.

NOTE: If you are installing a G-Line system, please contact the factory for additional instructions.

IMPORTANT PROCEDURES

Throughout the installation it is very important that certain procedures are observed:

Install ground rods and proper grounding at the MX-5000, all FPS processor, and all microwave locations.

Use only the approved multiconductor shielded cable for connecting the MX-5000 to the FPS and MPS units.

Terminate wiring and shields *exactly* as shown. Improper terminations will cause system noise and degrade performance.

Installation

Figure 1 shows the typical wiring interconnection of components.

- The interconnect wiring should be run in conduit, either underground or along the base of the fence.
- The interconnect cable must be an approved three-pair, 18-gauge, individually shielded twisted pair cable, with overall foil shield, braid shield, and high density polyethylene jacket, such as the Senstar Interconnect Cable or factory-approved equal.

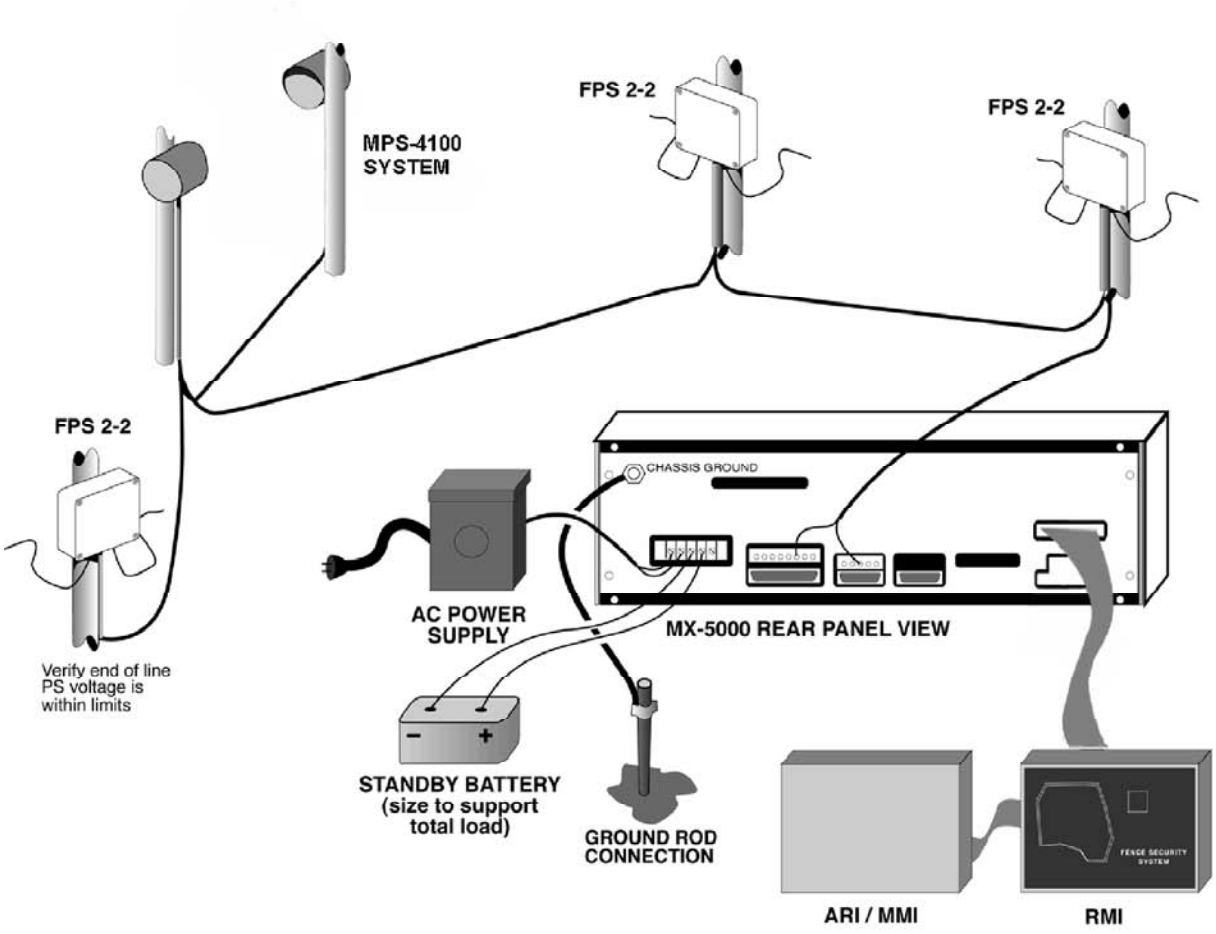


Figure 1. Typical MX-5000 / FPS System Connections

Mount each FPS processor as shown in Figure 2.

- Use metal brackets or Unistrut-type mounting material to provide a solid backing. A fence post will provide a solid mounting.
- Arrange the conduit/control wiring entrance as shown.
- Install a copper-clad ground rod at each processor location, and connect a minimum 8-gauge ground wire to the processor bolt as shown. IMPORTANT: Connect the ground wire directly to the processor bolt as shown.

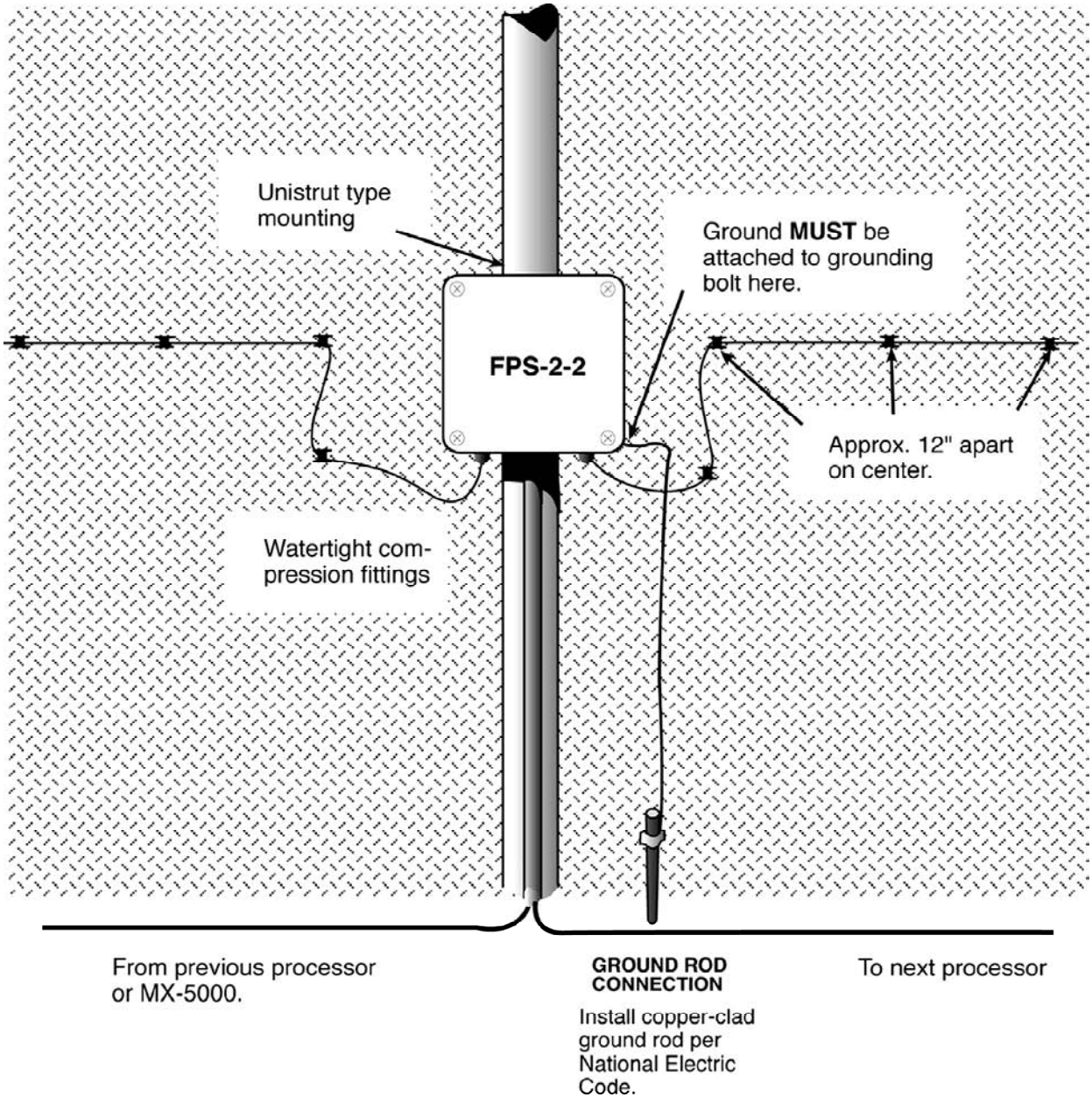


Figure 2. Fence Mounted FPS Processor

Run the sensor cable from each FPS processor as shown in Figures 2 and 3.

NOTE: Your installation may utilize either standard "black" sensor cable or Helisensor. Observe special requirements for each type sensor.

- Attach the sensor cable to the fence at approximate 12-inch intervals with black UV cable ties as shown in Figure 3. Use ONLY the approved black UV-protected cable ties.
- Provide loop at each fence post and increased sensitivity loops at each corner or end post. Provide cable overlap at adjacent zones. Install TSK termination boxes at each sensor end-of-line and splices if necessary.

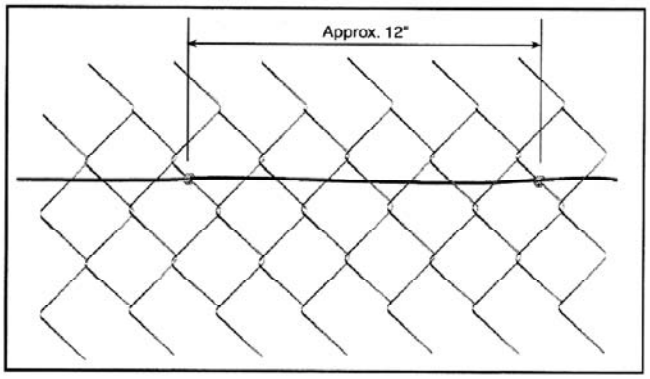
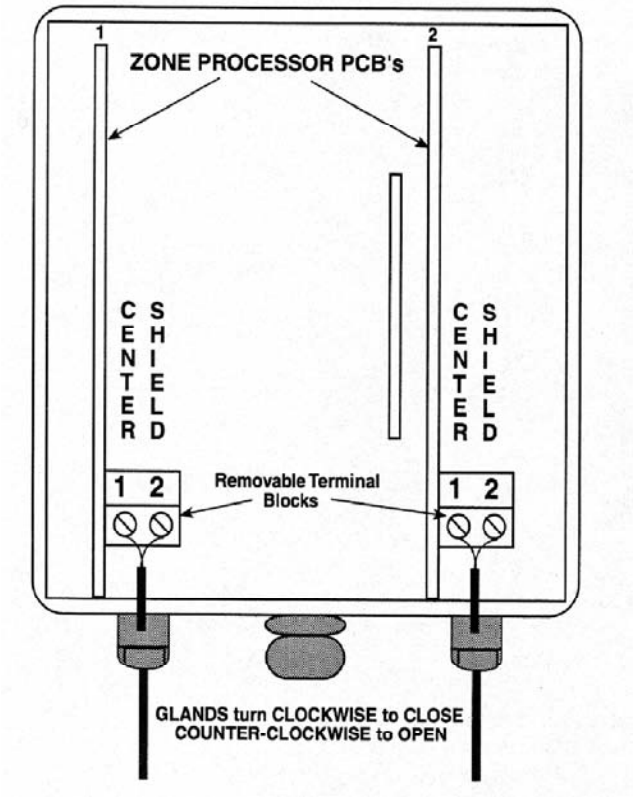


Figure 3. Cable Tie Installation



- Connect each sensor cable to the processor as shown in Figure 4.

Figure 4. Transducer Cable Connections

Connect the control wiring to each processor as shown in Figure 5.

- Verify that all shields are connected as shown. Keep the shields separate as shown. *DO NOT* connect the individual cable shields to one another.
- Install a short wire jumper between terminals 1 and 3.
- Set the correct transmit and receive address for each processor. Refer to the FPS processor installation manual or the MX-5000 manual, Table 5, for processor switch settings.

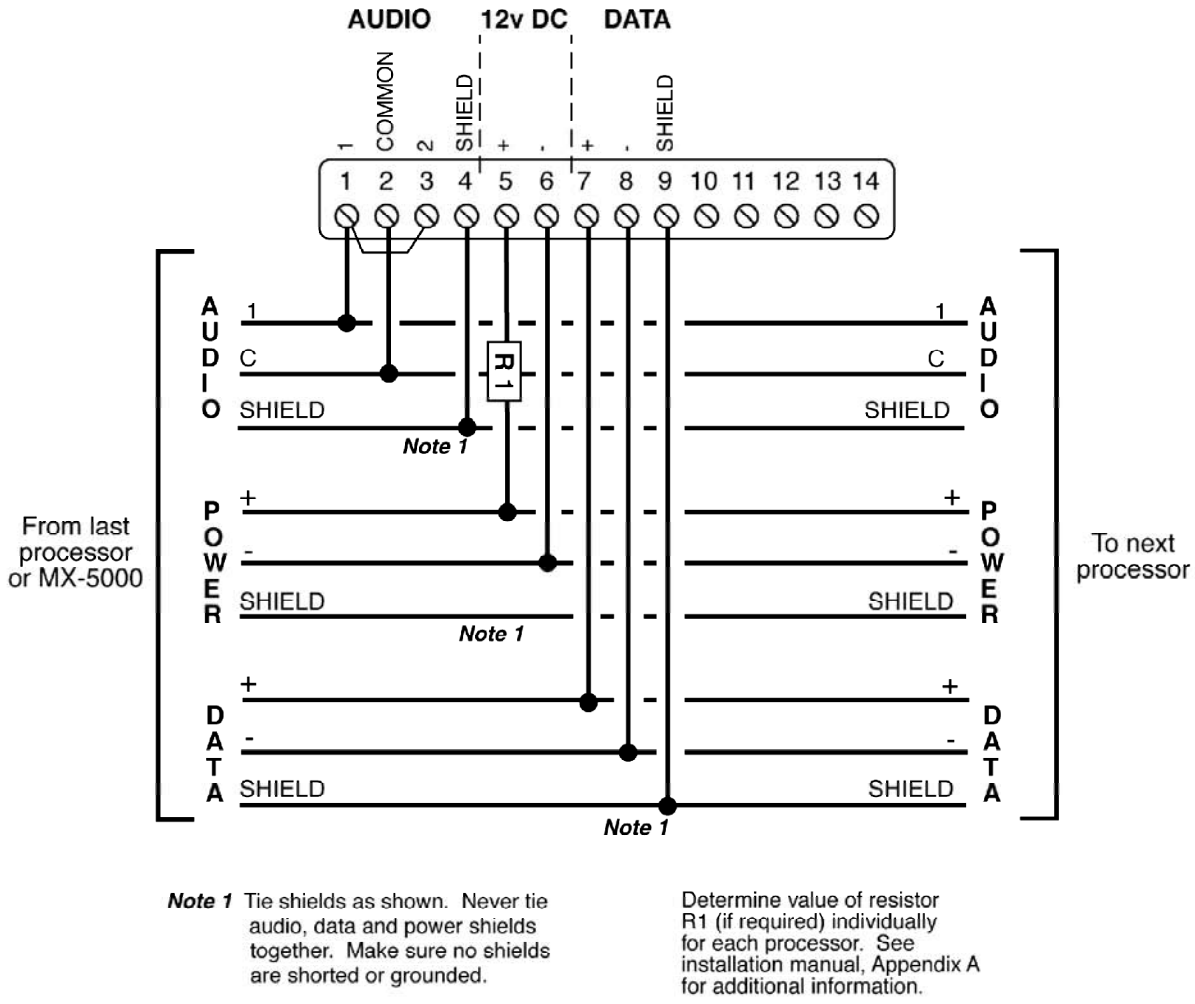


Figure 5. FPS Processor Wiring Connections

Mount each MPS microwave unit (pair) as shown in Figure 6. Note that the installation includes the microwave pair and the stand-alone transponder.

- Install each piece of equipment generally as shown.

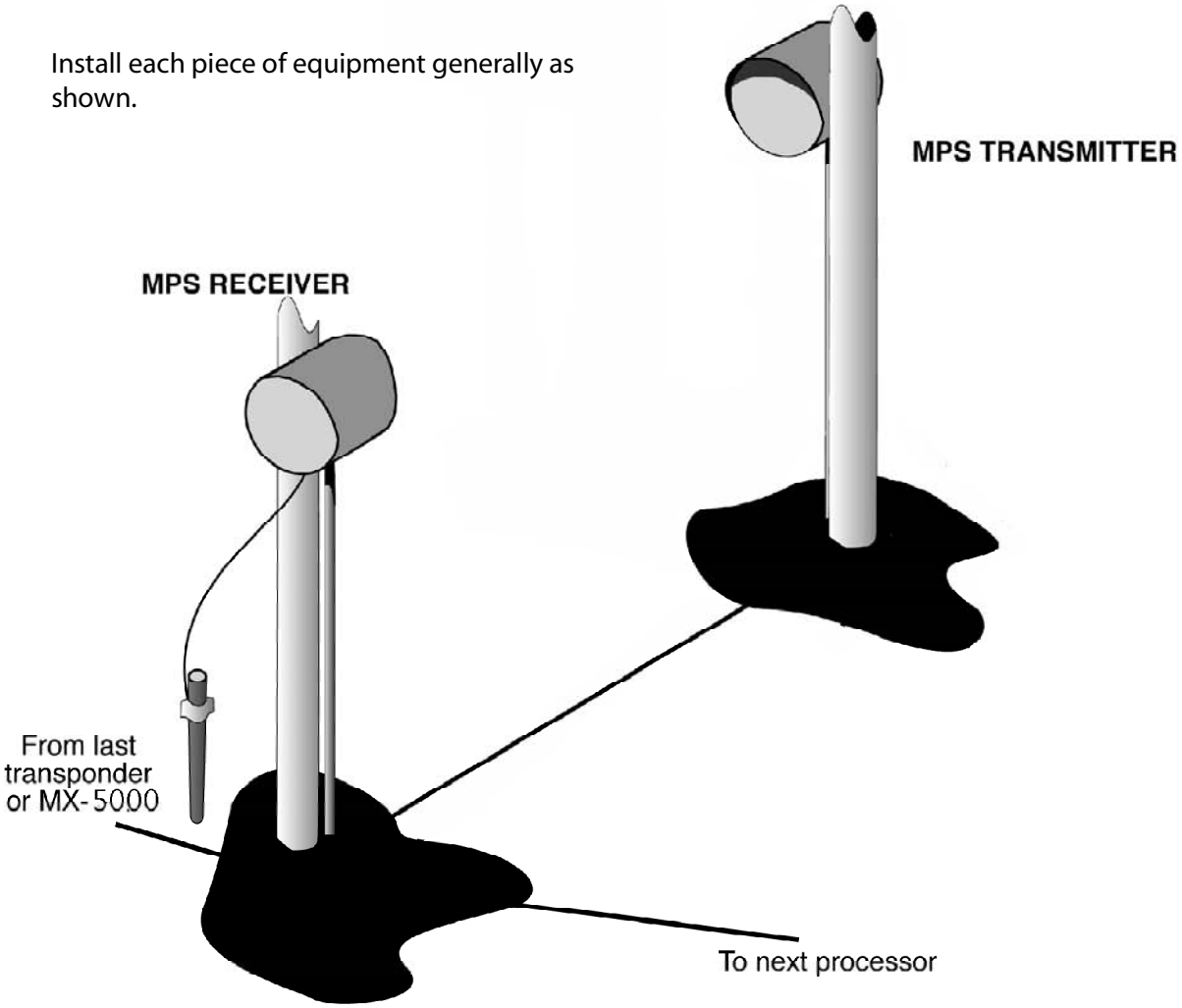


Figure 6. MPS Microwave Installation

- Run interconnecting cables and connect as shown in Figure 7.

Position the MX-5000 Control Unit in the control room as appropriate for proper viewing and operation. Connections will be made to the MX-5000 rear panel as shown in Figure 1.

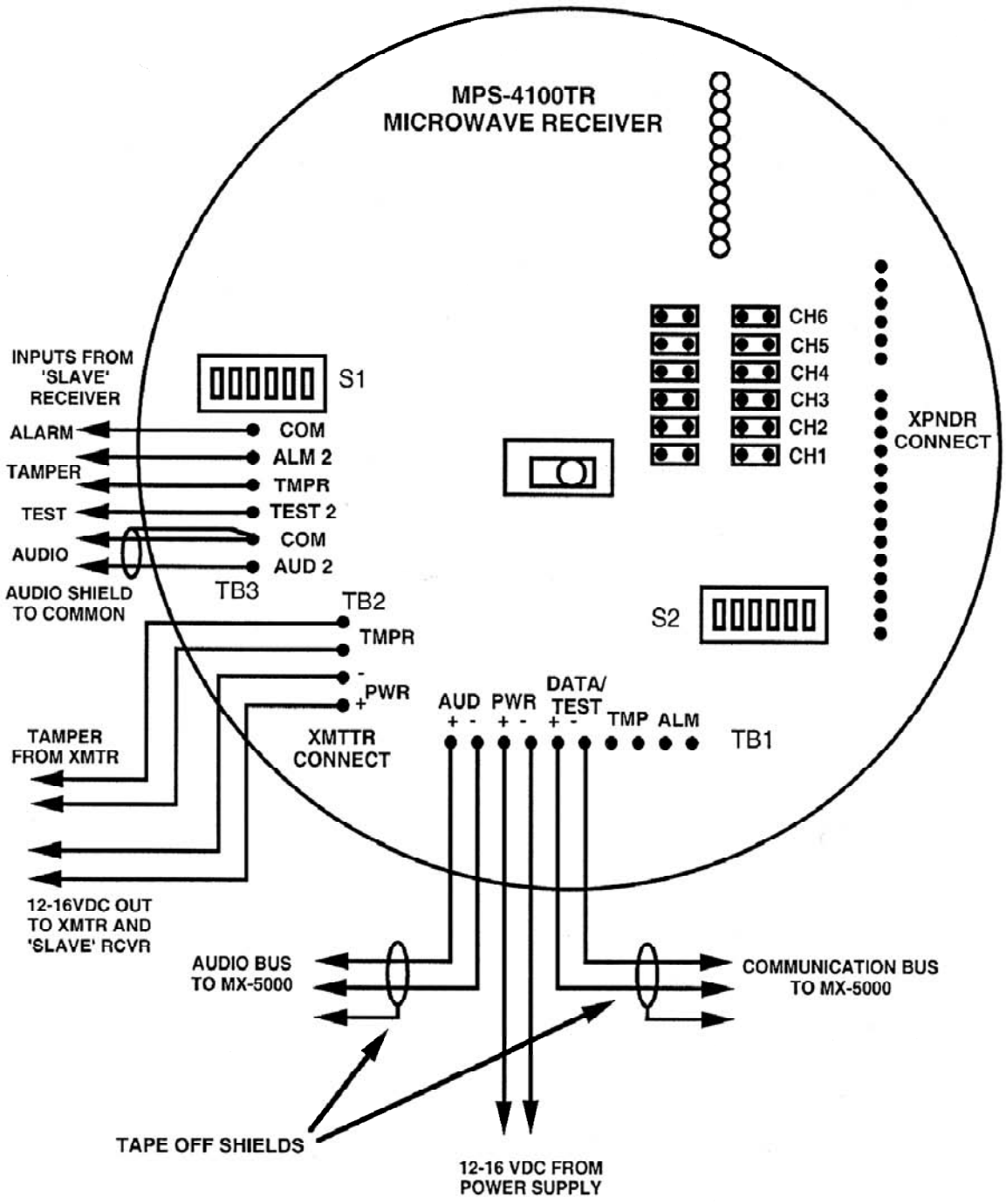


Figure 7. MPS Connections

Connect the power supply transformer and battery as shown in Figure 8.

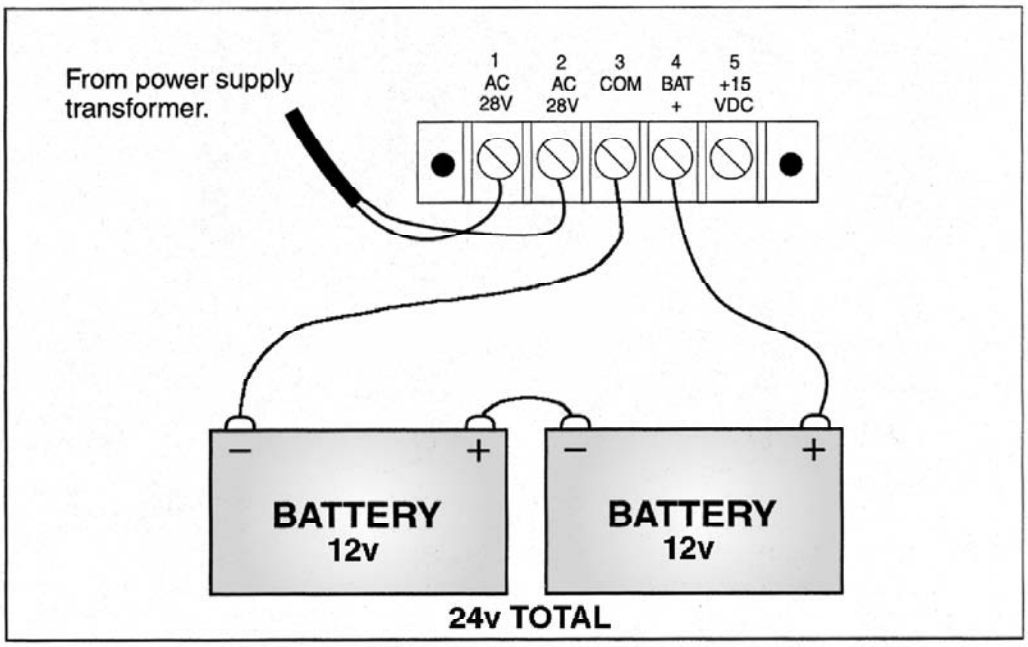


Figure 8. MX-5000 Power Supply Connections

- Connect the transponder loop cable as shown in Figure 9. Perform the connections for each transponder loop connected to your system.
- Connect the ribbon cable for the Map Interface and Relay/Mobile Map/RANS interface as shown.

Apply power to the MX-5000 by connecting the AC power first, then the battery system. Perform initial programming to acknowledge initial alarms.

Measure voltage at the end processor. Record voltage and adjust MX-5000 voltage to bring end-of-loop- processor to 12 VDC. Check the voltage at each other processor starting with the unit closest to the MX-5000. Add resistors at each processor where needed to provide correct processor operating voltage.

Complete MX-5000 programming by performing the programming steps needed for your system. For programming reference, refer to Installation Manual, Table 4.

Perform initial testing of each zone, and perform fence quieting procedure if necessary. Adjust the count and gain switches in each processor to provide required climb and cut detection.

Perform final testing, including climb test, in each zone as required by the system specifications.

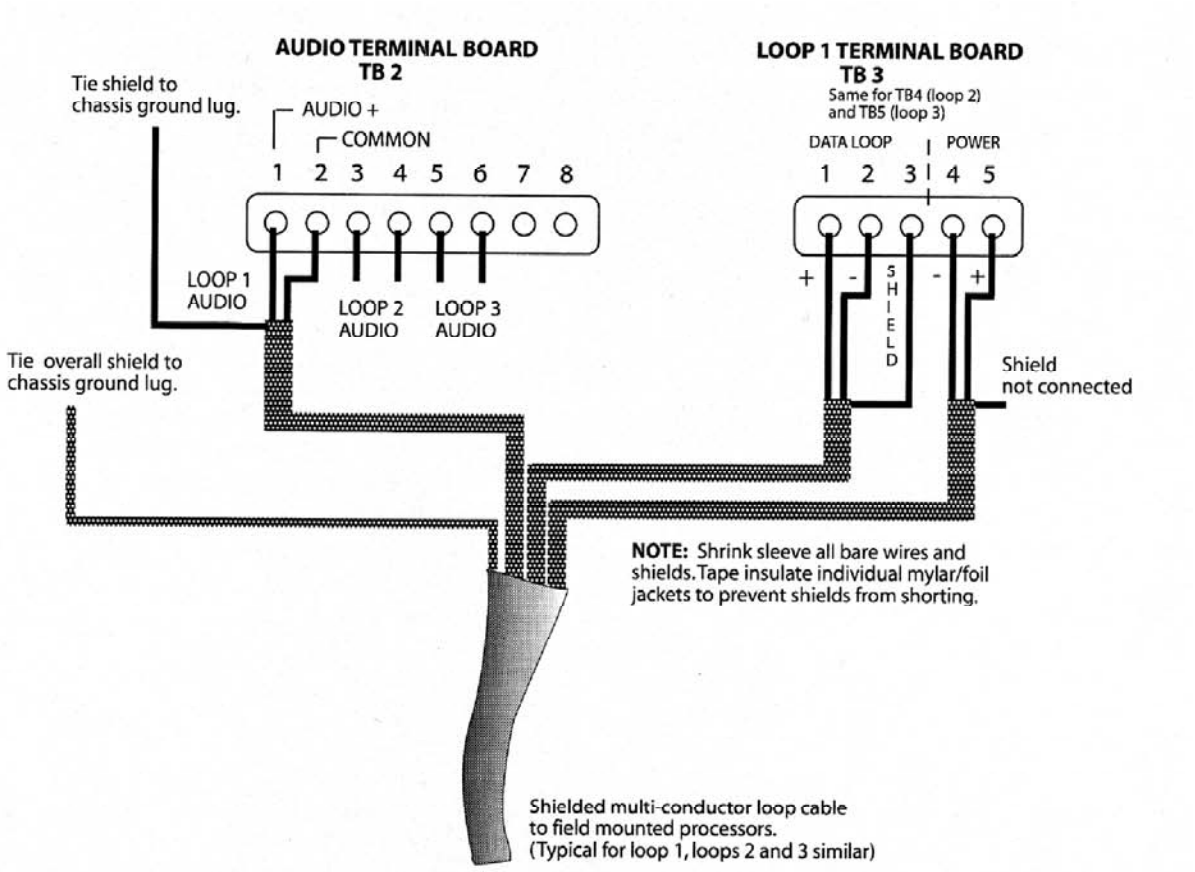


Figure 9. MX-5000 Loop Connections

Reference Documents

The MX-5000 is designed to operate with many other Senstar systems. If the system being installed utilizes other Senstar components, obtain additional documentation and manuals as follows:

System	Documentation
❒ FPS-2-2M Fence Protection Systems	Installation and Operation Manual
❒ GL-M 3 wire or Multi-wire G-Line Systems	Installation and Operation Manual
❒ MPS Microwave Systems	Installation and Operation Manual
❒ EDAPT System	Installation and Operation Manual
❒ Stand-alone Transponders	Technical Brochure
❒ Remote Display Unit	Installation and Operation Manual
❒ Super-Transponder	Installation and Operation Manual
❒ PC Command (PSYCON) System	Installation and Operation Manual
❒ Alarm Recordkeeping (ARKS) System	Installation and Operation Manual
❒ Weather Station	Operation Manual
❒ Hardwire Interface	Technical Note
❒ Remote Map Interface (RMI)	Technical Note
❒ Relay Interface Unit (RMI)	Technical Note
❒ Mobile Map Interface Unit (MMI)	Technical Note
❒ Host Computer Connection	Technical Note
❒ Remote Printer Connection	Technical Note
❒ Mobile Map Plus System	Installation and Operation Manual
❒ RANS-Voice System	Installation and Operation Manual
❒ RS-422 port Protocol Adapter	Technical Note

2 QUICK START FPS-3

Qualified technicians may follow these simplified procedures to install and test the FPS-3 Fence Protection System. Prerequisites for using the quick start procedures are:

- Attendance at one or more Senstar FPS-3 training class.
- Prior MX-5000 or MX-5300 field installation experience.

Before proceeding, VERIFY that you have a complete site layout showing zone extents, processor locations, and conduit interconnections. If you are not familiar with any of the procedures described in this section, refer to the appropriate manual for more detailed information.

IMPORTANT PROCEDURES

FPS-3 Operation

MX-5300 series units are for use with the FPS-3 fence mounted detection system and will directly replace any existing MX-3000 unit while providing all of the other benefits of the MX-5000 series. The MX-5300 differs from other MX-5000 models in that it includes a FPS-3 Communication & Power card in one of the loop card positions. This card provides the 15 VDC power and parallel data connection (DB-25) to operate the FPS-3 controller (see Figure 18 for connections). External bus connections to auxiliary equipment such as the Alarm Relay Interface and Remote Map Interface are accomplished through the JP13 port at the rear of the MX. This is a departure from the connection scheme used in the MX-3000 where the FPS-3 Controller and auxiliary devices shared the JP13 port.

Throughout the installation it is very important that certain procedures are observed:

Install ground rods and proper grounding at the MX-53OO, all FPS-3 fence-mounted pre-amps, and all microwave locations.

Use only the approved multiconductor shielded cable for connecting the MX-5300 FPS-3 Central Controller to the FPS and MPS units.

Terminate wiring and shields *exactly* as shown. Improper terminations will cause system noise and degrade performance.

The FPS-3 Central Controller must be installed within 100 feet of the MX-5300.

Installation

Figure 10 shows the typical wiring interconnection of components.

- The interconnect wiring should be run in conduit, either underground or along the base of the fence.
- The interconnect cable must be an approved two-pair, 24-gauge, individually shielded twisted pair low capacitance cable, with high density polyethylene jacket, such as the Senstar FPS Interconnect Cable or factory-approved equal.

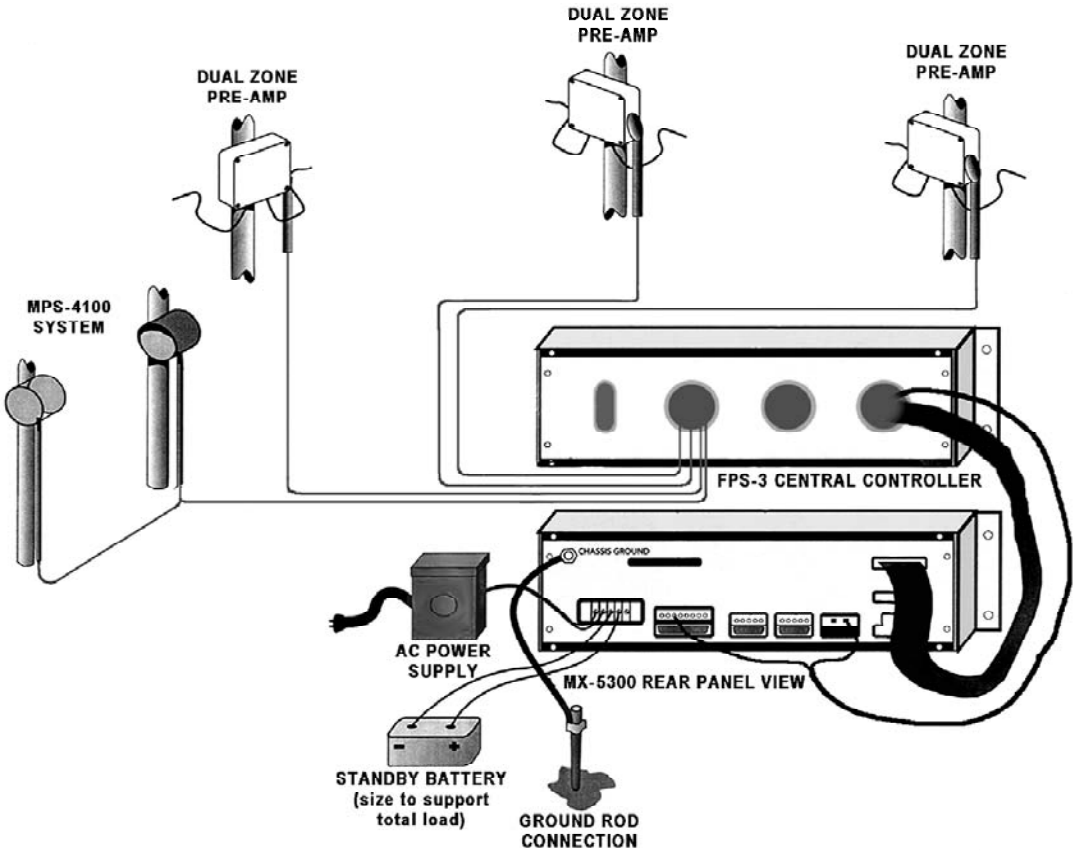


Figure 10. Typical MX-5300 / FPS System Connections

Mount each FPS-3 Dual Zone Pre-Amp processor as shown in Figure 11.

- Use metal brackets or Unistrut-type mounting material to provide a solid backing. A fence post will provide a solid mounting.
- Arrange the conduit/control wiring entrance as shown.
- Install a copper-clad ground rod at each processor location, and connect a minimum 8-gauge ground wire to the processor bolt as shown. IMPORTANT: Connect the ground wire directly to the enclosure stud as shown.

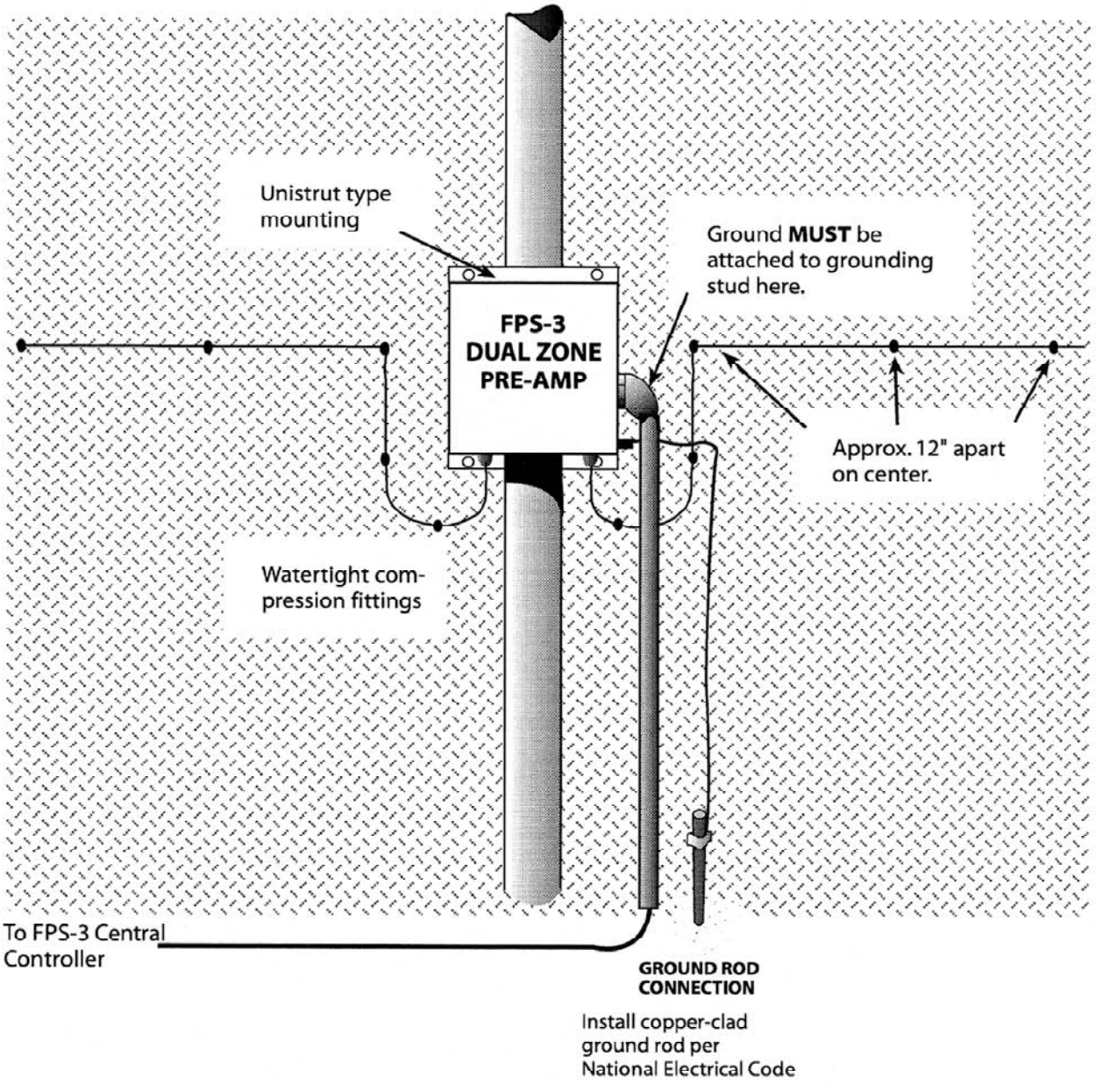


Figure 11. Fence Mounted Dual Zone Pre-Amp

Run the sensor cable from each FPS-3 dual zone pre-amp as shown in Figures 11 and 12.

NOTE: Your installation may utilize either standard "black" sensor cable or Helisensor. Observe special requirements for each type sensor.

- Attach the sensor cable to the fence at approximate 12-inch intervals with black UV cable ties as shown in Figure 12. Use ONLY the approved black UV-protected cable ties.
- Provide service loops every 50 feet and increased sensitivity loops at each corner or end post. Provide cable overlap at adjacent zones. Install TSK termination boxes at each sensor end-of-line (single-run cable) and splices if necessary.
- Connect each sensor cable to the Pre-Amp as shown in Figure 13.
- Connect the control wiring to each dual zone pre-amp as shown in Figure 13.

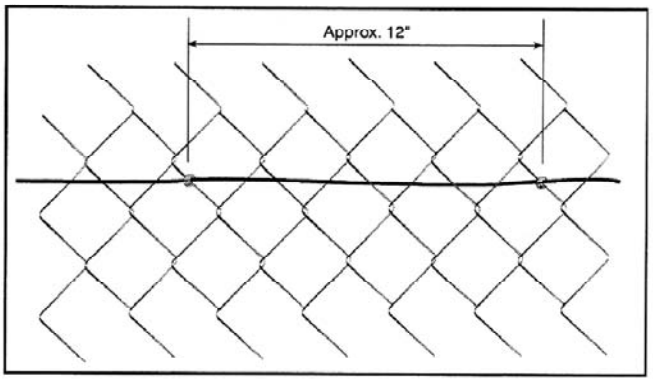


Figure 12. Cable Tie Installation

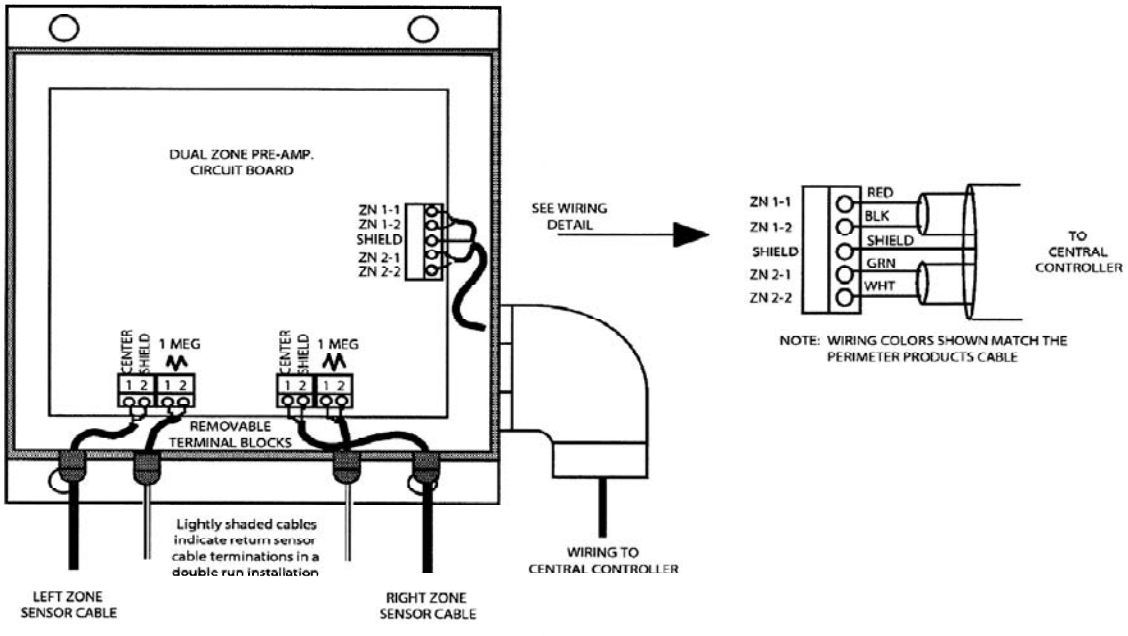


Figure 13. Pre-Amp Cable Connections

Mount each MPS-4100 microwave unit (pair) as shown in Figure 14.

- Install each piece of equipment generally as shown.

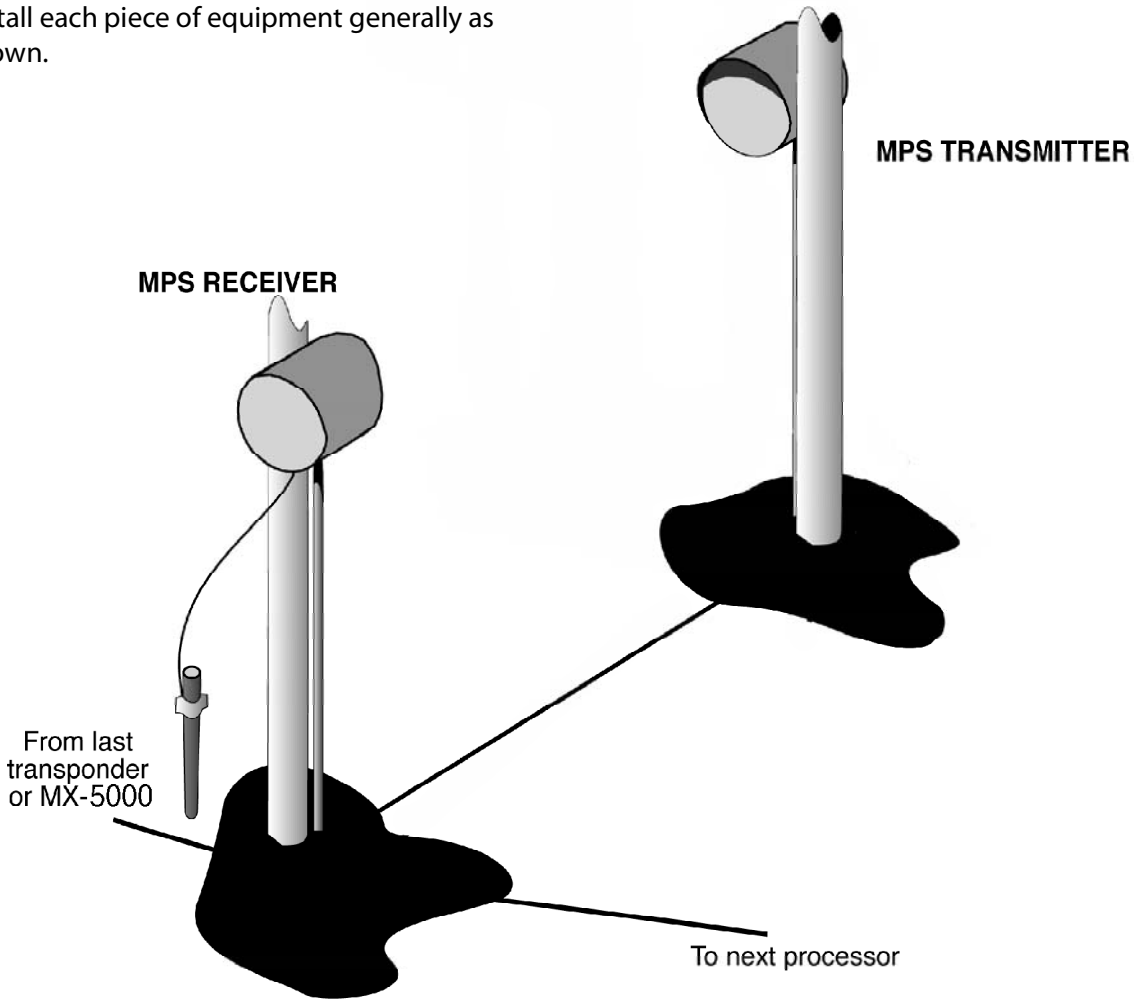


Figure 14. MPS-4100 Microwave Installation

- Run interconnecting cables and connect as shown in Figure 15.

Position the FPS-3 Central Controller and the MX-5300 Control Unit in the control room as appropriate for proper viewing and operation.

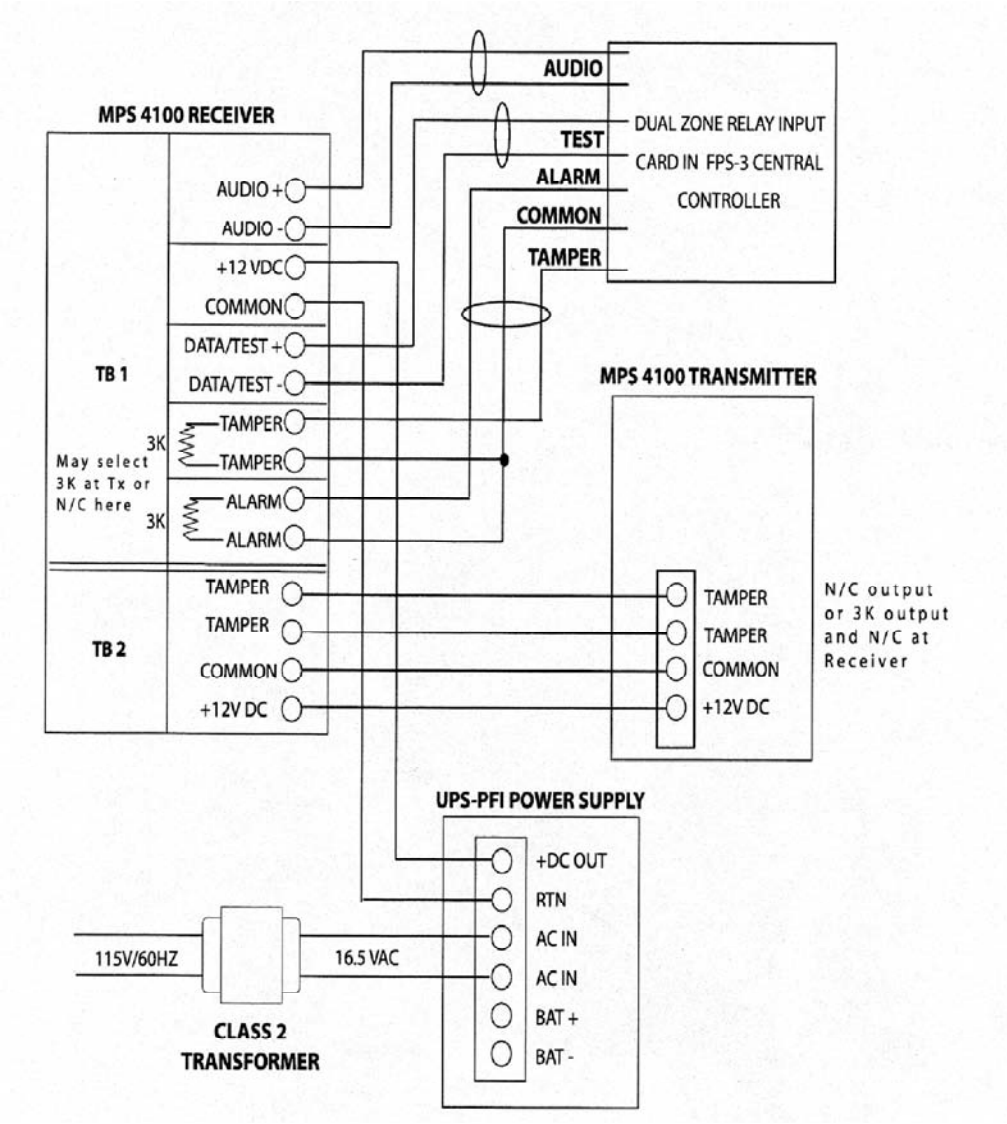


Figure 15. MPS Connections to FPS-3 via Dual Zone Relay Input Card

Connect the power supply transformer and battery as shown in Figure 16.

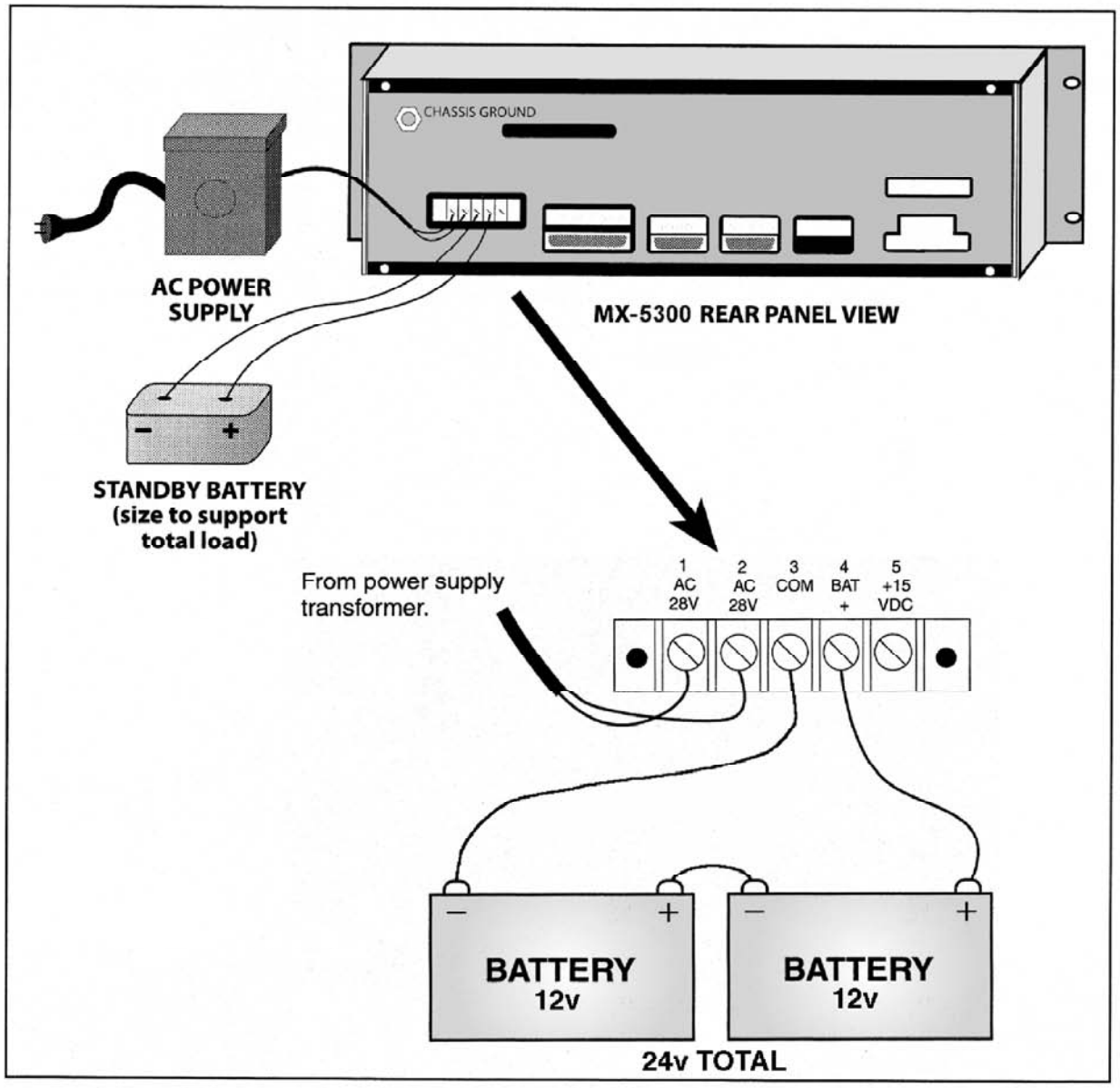


Figure 16. MX-5300 Power Supply Connections

Field wiring connections to the FPS-3 Central Controller will be made as shown in Figure 17.

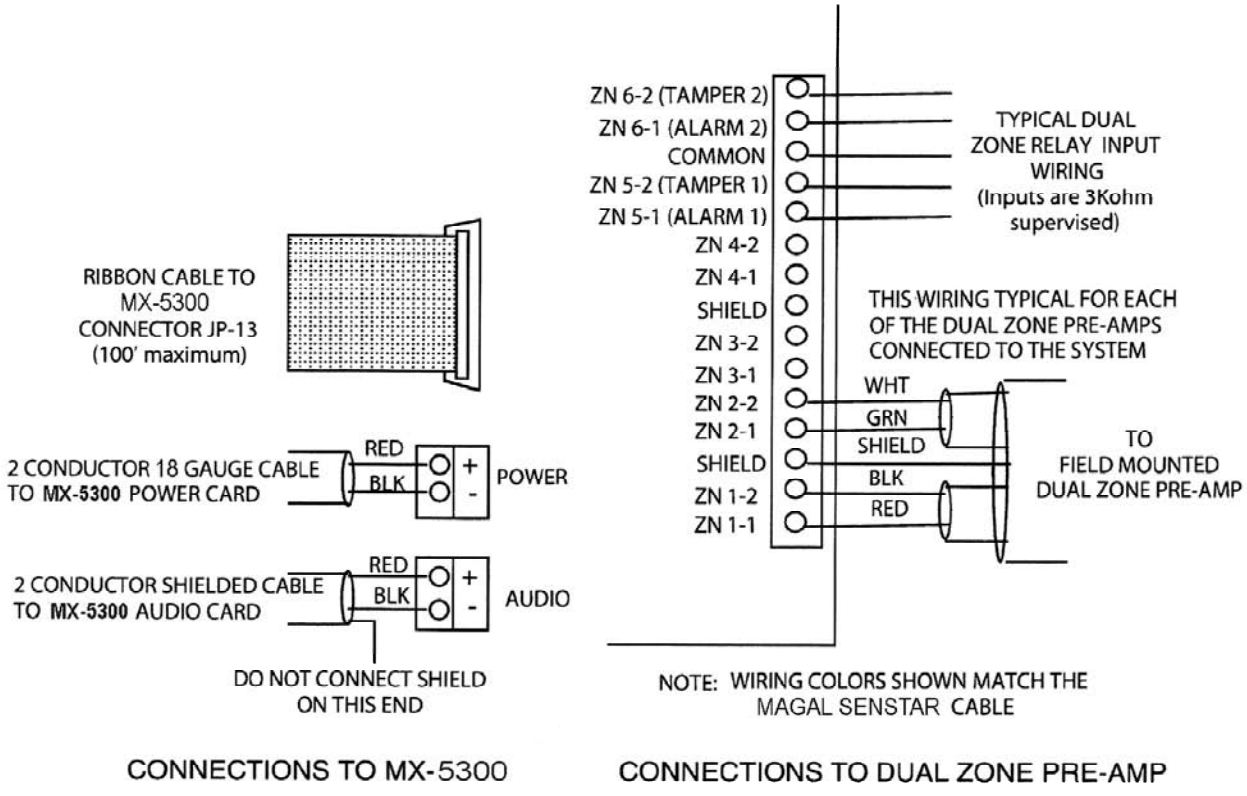


Figure 17. Central Controller Connections

Connections from the FPS-3 Central Controller to the MX-5300 will be made as shown in Figure 18.

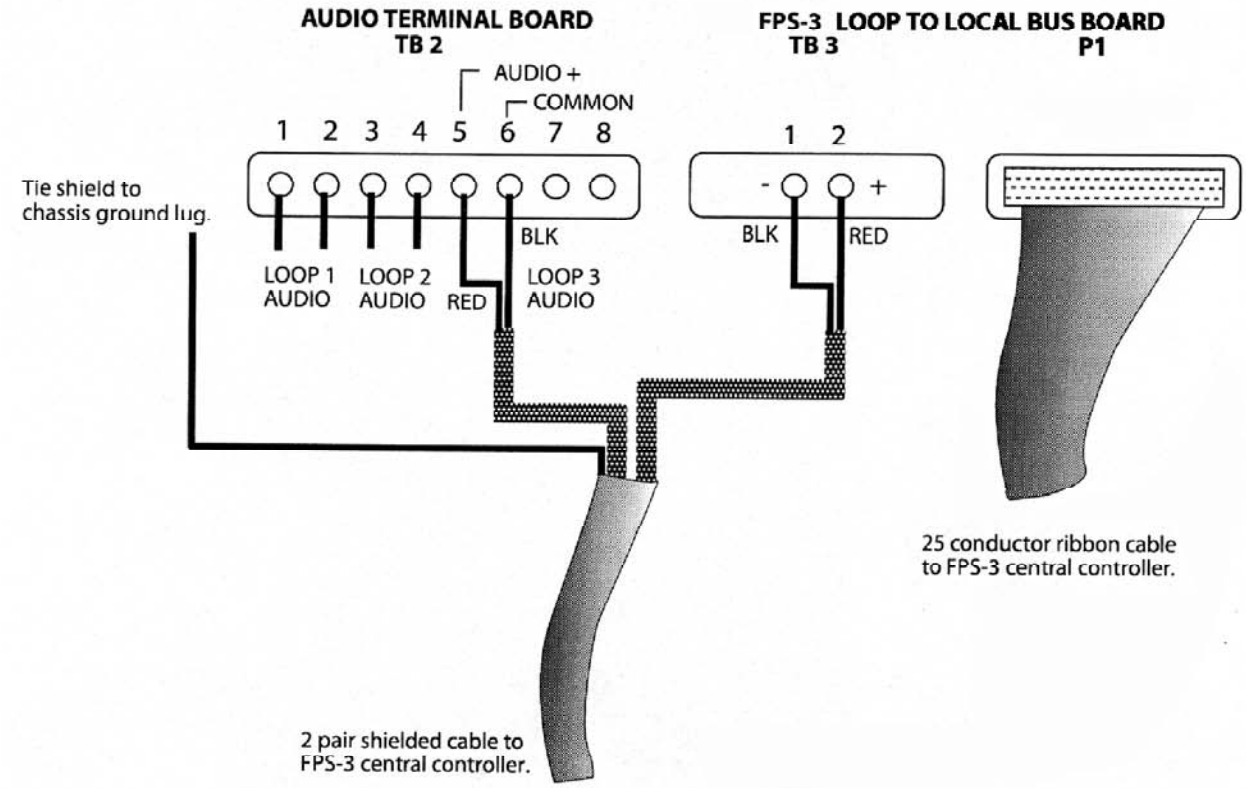


Figure 18. MX-5300 Loop Connections

Apply power to the MX-5300 and FPS-3 Central Controller by connecting the AC power first, then the battery system. Perform initial programming to acknowledge initial alarms.

Perform initial testing of each zone using the self-test function and audio probe of the FPS-3 Central Controller. Measure the optimum gain and count at each dual zone pre-amp using the Field Performance Analyzer (FPA). Perform fence quieting procedure if necessary.

Complete MX-5300 programming by performing the programming steps needed for your system. For programming reference, refer to MX-5300 Installation Manual, Table 4.

Set the FPS-3 dual zone card gain switches for each zone based on your field measurements using the FPA. Program the counts for each zone on the MX-5300.

Perform final testing, including climb test, in each zone as required by the system specifications.

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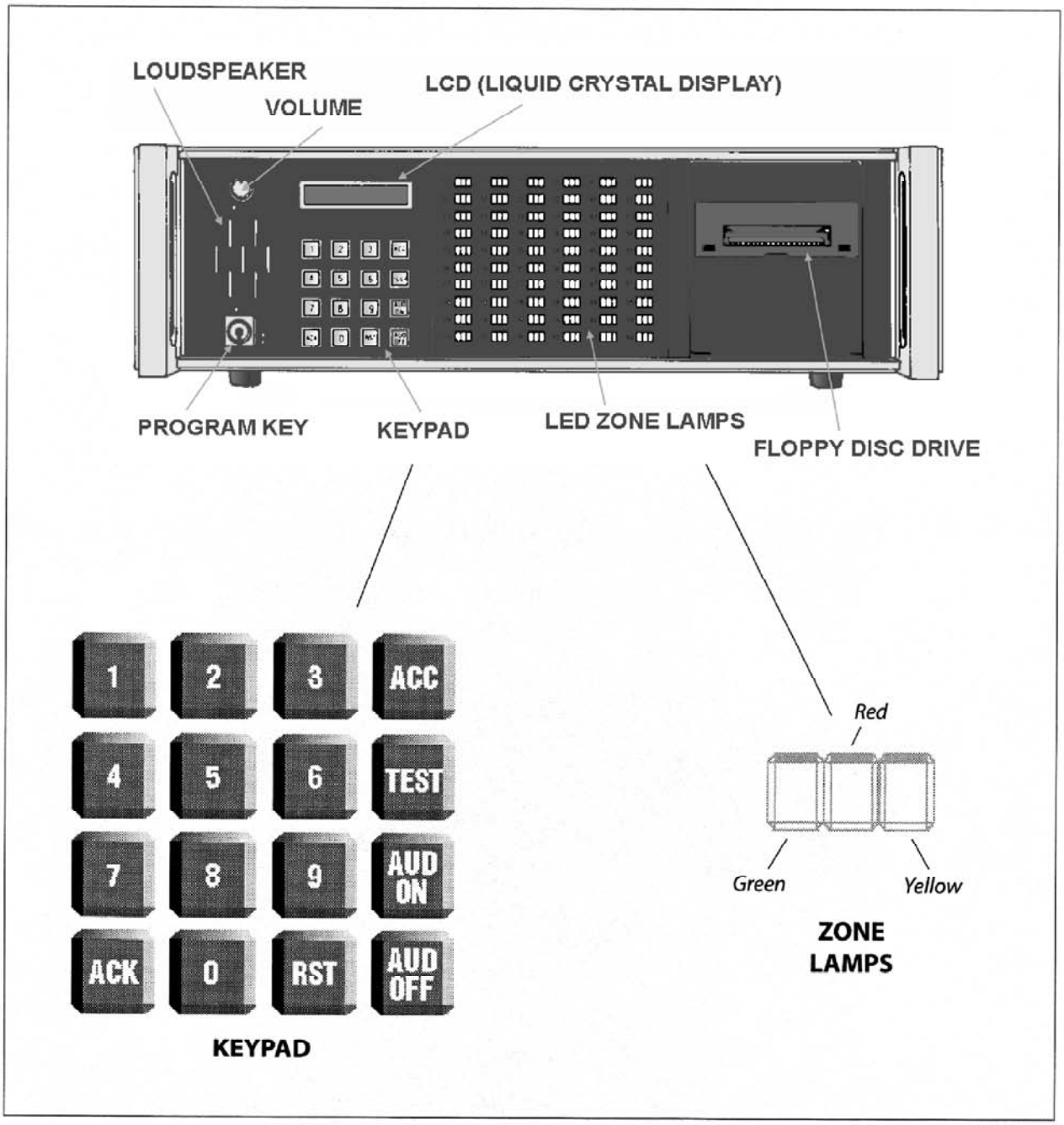
3 OPERATOR INSTRUCTIONS

The MX-5000 is your Perimeter Protection System Control Center. The MX-5000 annunciates alarms audibly and visually, provides control of each zone, allows listening to each zone, and provides a permanent event record (if optional printer is installed).



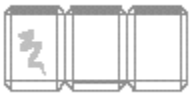
FRONT PANEL CONTROLS

For . . .

- **Normal operation . . . see page 30**
- **Special Display Indications & Operations . . . see page 32**
- **Printer operations . . . see page 34**

Normal operation

Secure



Solid GREEN indicates zone is operational and secure.

Alarm

Slowly flashing RED and slowly pulsating tone (Audible Alarm) indicates an alarm. The display window shows the zone # in alarm, and GREEN flashes to indicate that audio from that zone is on loudspeaker.

Display will read:

ALARM 1

current zone in alarm

When more than one alarm is on the system, the display will flash between each alarm. PRESS zone # on keypad and ACK to silence audible alarm and change lamp from flashing to steady. Each zone must be handled individually.

Display will read

ALARM ACK 1

PRESS zone # and RST to reset alarm.

NOTE: When there is more than one alarm on the system, GREEN flashes on the last zone alarmed and the audio from that zone is on loudspeaker.

Tamper Alarm

Rapidly flashing RED and rapidly pulsating tone (Audible Alarm) indicate trouble on a zone. The display window shows the zone in trouble, and GREEN flashes to indicate that the audio from that zone is on loudspeaker.

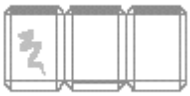
Display will read | TAMPER 1 |

PRESS zone # and ACK to silence alarm, and report to maintenance.

Display will read | TAMPER ACK 1 |

RED alarm lamp will continue to flash rapidly until the zone problem is repaired.

Audio Listening

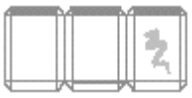


Flashing GREEN lamp indicates the audio signal from that zone is coming from loudspeaker.

PRESS AUD OFF to turn off audio and flashing lamp.

PRESS zone # and AUD ON to turn on audio from any zone.

Zone Access



Solid or slowly flashing YELLOW indicates a zone is in access or removed from alarm operation. Zones can only be placed in access at the console.

To access a zone, PRESS zone # and ACC. The YELLOW lamp will begin to flash slowly, accompanied by a slow beeping tone, indicating access is being requested.

Complete access by PRESSING zone # and ACK. The lamp will glow steady YELLOW, and the audible tone will be silenced.

To remove a zone from access at any time, PRESS zone # and RST. The YELLOW light will go out, and a steady GREEN will appear, indicating the access has been removed and the zone is secure.

NOTE: Zones may automatically return to the alarm monitoring state after a specified time period if programmed to do so. Refer to the programming manual for more information.

Communication Failure

Rapidly flashing YELLOW lamp and rapidly beeping tone indicate a communication failure to that zone.

Display will read | Comm Fail 1 |

PRESS the zone number and ACK to silence the audible alarm. The flashing YELLOW turns to solid RED and YELLOW. Refer the problem to maintenance.

Display will read | Comm Fail ACK 1 |

The RED and YELLOW lamps will not be extinguished until the problem is repaired.

Special Display Indications

05/01/95 11:01:30
date *time*

The display shows date and time when no other actions are present.

AC Power Loss

Indicates that AC power has been interrupted.

PRESS ACK to silence audible alarm, and report problem to maintenance.

Check Battery

Indicates that stand-by battery power has been lost or battery is low.

PRESS ACK to silence audible alarm, and report problem to maintenance.

Entering operator number

Supervisors should enter operator numbers when a shift begins.

To enter operator number . . .

TURN program key to PROGRAM.

PRESS AUD OFF so the display reads | OPER NO. | .

ENTER operator number and PRESS ACK .

RETURN program key to normal.

Self-test

A self-test can be performed on all sensors equipped with self-test capabilities.

To test all zones . . .

PRESS **0**, then TEST . The display will show | ACCESS | .

PRESS **00** and ACK . The display will show | TESTING __ | .

The display will show | TEST FAILED __ | and the printer will print any zone(s) failing the self-test.

To test an individual zone …

PRESS zone number and TEST on keypad.

Display will read | TESTING |.

The printer (optional) will print Test Started. If the test passes, the display will show time and date, and the printer will print Test Completed.

If the test fails, the display will show | TEST FAILED |, and the printer will print the Test Failed message.

NOTE: Zones that fail self-test will display solid GREEN, RED and YELLOW lights and can only be reset by completing a successful self-test. Contact the maintenance department.

External Printer operation — optional

The printer responds to every action on the console.

Date 05/01/89 *Time* 11:01:30

Alarm Ack *Reported Condition*

OP #5 *Operator Number*

05/01/89 — 11:01:30
Alarm Ack 1 OP# 5
05/01/89 — 11:02:30
Alarm RST 1 OP# 5
05/01/89 — 11:03:30
Access ACK 1 OP# 5
05/01/89 — 11:04:30
Access RST 1 OP# 5
05/01/89 — 11:05:30
Listen Reset 1 OP# 5
05/01/89 — 11:06:30
Tamper ACK 1 OP# 5

Printer Output

Printing system status

You may print a status of all MX-5000 zones at any time. This feature may be useful at shift changes to inform the new operator of the system status. Enabling print status will immediately print out the current status of all zones, showing the individual secure, alarm, access, or tamper zone conditions.

To print the system status, PRESS "0" and ACC. The LCD screen will display | PRINT STATUS ? |.

PRESS ACK, and the printer will immediately print your system status report.

Optional features

Alarm Classification

This function is especially valuable if your system includes the Alarm Recordkeeping System (ARKS). When programmed to do so, your MX-5000 will prompt you to classify alarms as belonging to one of six user defined categories.

To classify an alarm:

Proceed in the normal operating sequence when an alarm occurs: Press zone # on keypad and ACK to silence the alarm, then zone # and RST to reset the alarm.

Display will read Alarm Type:___

Enter the category number from 1 to 6 corresponding to the type of alarm as established for your facility. This information will be printed along with the alarm time and date, and also recorded by your ARKS for future review.

Priority alarm operation

This function is available if your system has been programmed to include joint domain operation. Joint domain operation provides priority alarms when associated zones are both alarmed.

Rapidly flashing RED and YELLOW lamps and a rapidly beeping tone indicate a priority alarm, meaning alarms have occurred in two associated zones. The flashing RED and YELLOW lamps appear in both alarmed zones.

Display will read PRIORITY 3 .

Zone #

PRESS the zone number and ACK to silence the audible alarm.

Display will read PRIORITY ACK 3 .

Zone #

PRESS the zone number and RST to reset alarm.

NOTE: The ACK and RST procedures must be repeated for the companion priority alarm zone.

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4 GENERAL

The MX series is a modular, microprocessor-based communications and control center designed to monitor and control up to 60 zones of outdoor perimeter security sensors.The MX series includes models MX-5000, MX-5300, MX-5400 and MX-6000. The MX-6000 is specially designed to operate with the PAS series personal alarm system and is discussed in a separate manual.

The MX series is designed to monitor and control the complete line of Senstar fence protection sensors as well as interface to alarm and control equipment by other manufacturers. All references to the MX-5000 in this manual apply equally to all models unless specifically noted.

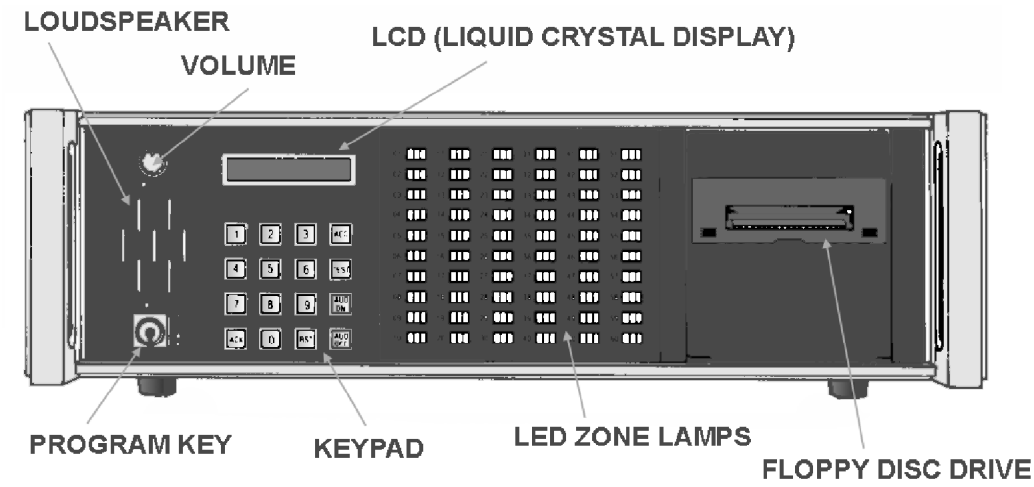

Figure 19. MX-5000 Front Panel

5 THEORY OF OPERATION

The MX-5000 operation is a state-of-the-art microprocessor-based control center. Alarms generated by field-mounted sensors are processed and displayed, while providing operator control of the security system. The MX-5000 microcomputer system is "bus connected," meaning that the microprocessor communicates to all the other circuits inside the MX-5000 using a common set of wires or a "bus." See the block diagram (Figure 20) for the MX-5000 internal bus connections.

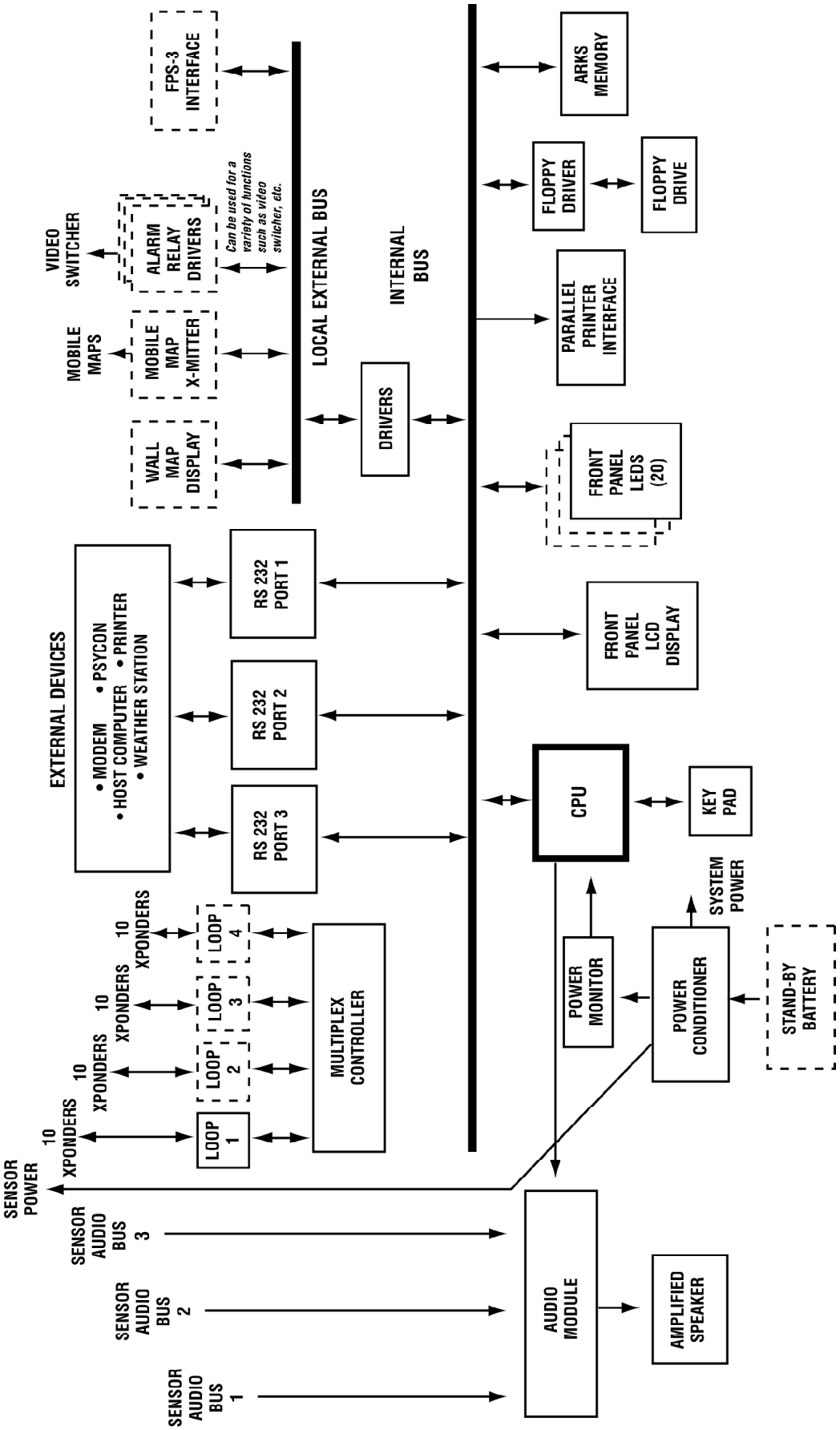

Figure 20. MX-5000/5300 Block Diagram

6 INSTALLATION

PLEASE NOTE: Before attempting field installation, the complete security system should be interconnected and tested in your shop. Because outdoor security systems are often installed over thousands of feet, troubleshooting in the field can be very time-consuming and expensive. Use the procedures shown in the Initial Setup and Adjustment section for testing and adjustment in your shop before beginning field installation and checkout.

The MX-5000 is installed in conjunction with one or more of the following systems. Review the manuals of the systems included in your installation before proceeding.

- ▷ FPS-2-2M Fence Protection Systems
- ▷ FPS-3 Fence Protection Systems
- ▷ GL-M 3 wire or multi-wire G-Line Systems
- ▷ MPS Microwave Protection Systems
- ▷ Stand-alone Transponders
- ▷ Remote Display Unit
- ▷ Super-Transponder
- ▷ EDAPT System
- ▷ Psycon Control Unit
- ▷ Alarm Recordkeeping (ARKS) System
- ▷ Weather Station
- ▷ Mobile Map Plus Systems
- ▷ Rans-Voice Systems
- ▷ Hardwire interface for replacement of older FPS Systems or for relay inputs

The initial installation planning should have been completed, which includes the general layout of the complete system, a determination of where each piece of equipment will be installed and where each alarm zone will be located. The location and length of each alarm zone should be determined in accordance with the manuals for the type of sensor/transponder used. The numbering of zones and the way they are connected to the external multiplex buses will affect the programming of the MX-5000. Refer to Appendix B for initial planning information.

Mounting

Position the MX-5000 control center in a location that:

- ▷ Provides operators with easy and comfortable access to the front panel controls.
- ▷ Allows the internal speaker to be clearly audible.
- ▷ Makes both the LED and LCD displays easily visible in the work area.
- ▷ Provides easy access for replacement of the printer paper.

AVOID installing the MX-5000 in areas that:

- ▷ Are near heating systems or in direct sunlight. This ensures that the operating temperatures of the unit remain within specifications.
- ▷ Face direct sunlight that would make the displays difficult to see.
- ▷ Restrict the top case ventilation openings.

Wiring

Use only the recommended wire and cabling type and sizes. Use only three-pair trunk cable between processors and central control point: individually shielded twisted pairs, 18-gauge, with overall foil and braid shield and high density polyethylene jacket rated for direct burial. This cable can be procured locally or from Senstar.

NOTE: The cable with the high density polyethylene jacket must be used in all under ground conduit where water may collect in the conduit system.

CAUTION: When more than one multiplex loop is necessary, each loop should be in its own conduit. If two or more multiplex loops must share a conduit, cable with individual shielded pairs, and an overall shield must be used. Consult factory for details.

Keep wiring away from fluorescent lighting and electrical devices such as large transformers and transmitters which can interfere with the multiplex and audio signals.

The system must be supplied with transient and interference-free prime power. **Power conditioning transient suppressors suitable for computerized equipment must be employed between the MX-5000 and the prime power line as required by good commercial practice to provide the highest level of protection from power spikes and surges.**

Make sure the chassis ground lug provided on the rear panel is returned to a true electrical ground in accordance with the National Electrical Code. **The MX requires a low impedance, low noise earth ground to ensure proper system operation and transient protection. This may be provided by a ground rod, cold water pipe, or an isolated "signal" ground circuit.**

The wiring distances required by outdoor perimeter protection systems often cause a substantial voltage drop between the MX-5000 and the processors. Each processor (FPS-2-2M, GL-M, or SAT) requires 12-16 VDC for proper operation. The MX-5000 has built-in capability to compensate for the voltage drop and make all processors function correctly. The procedure for providing the correct voltage at each processor is provided in Appendix A.

Power Connections

GENERAL. The MX-5000 unit may be powered from either 120 volt 60Hz or 220 volt 50/60 Hz power facilities.

OPERATION FROM 120-VOLT SERVICE. The unit is correctly wired at the factory for 120-volt operation. See Figure 21.

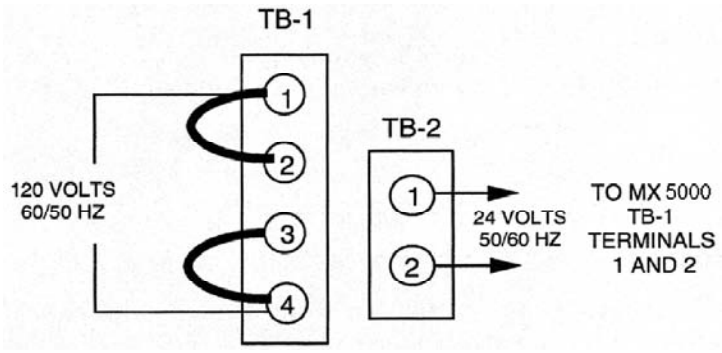

Figure 21. 120 Volt Connection for 24v Transformer

OPERATION FROM 220-VOLT SERVICE. To operate the system from 220-volt services, connect as in Figure 22.

OPERATION FROM 220-VOLT SERVICE.
To operate the system from 220-volt services, connect as in Figure 22.

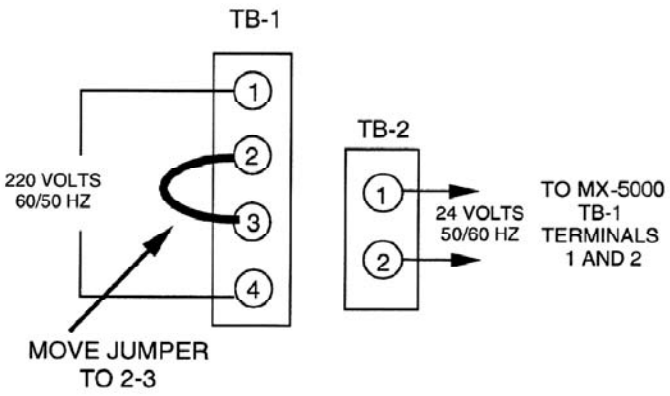

Figure 22. 220 Volt Connection

BACKUP BATTERY CONNECTIONS. The optional 24VDC backup battery pack maintains MX operations if AC power is lost. Connect the battery as shown in Figure 8 on page 16.

Connections to Field Equipment

All connections of field wiring to the MX-5000 are made to the plug-in connections at the rear panel. See Figure 1 on page 10.

Figure 23 on page 42 details terminations of loop wiring. Figure 25 on page 43 details terminations of audio loop wiring.

Grounding

Careful attention to grounding procedures is necessary to ensure proper operation of the system.

The shield of the data cable must be connected to the designated shield terminal on each of the units and must be isolated from ground along its entire path. Failure to observe this precaution may result in ground loops that will severely degrade system performance.

The audio bus is treated in the same fashion as the data bus. Attach the shield to the designated terminal in each unit and make sure this shield is isolated from ground along its entire length.

DO NOT under any circumstances tie the data cable shield, audio cable shield, and power cable shield together at any location other than at the MX control.

Connecting and Testing the Processors

Connect the processor to the MX-5000 as follows:

- ▷ Refer to Figure 1,Typical MX-5000/FPS System Connections.
- ▷ Using #18 twisted shielded pair cable connect the data terminals of the MX-5000 multiplex loop 1, terminals 1 (data+), 2 (data-), and 3 (shield) to the data terminals of the processor. Refer to the processor manual for the location of the appropriate terminals. Figure 23 shows the typical bus connections.
- ▷ Set the transponder and receiver address on the test processor to the addresses for transponder 1 (XPO-1). Refer to Table 3 for switch setting illustrations.

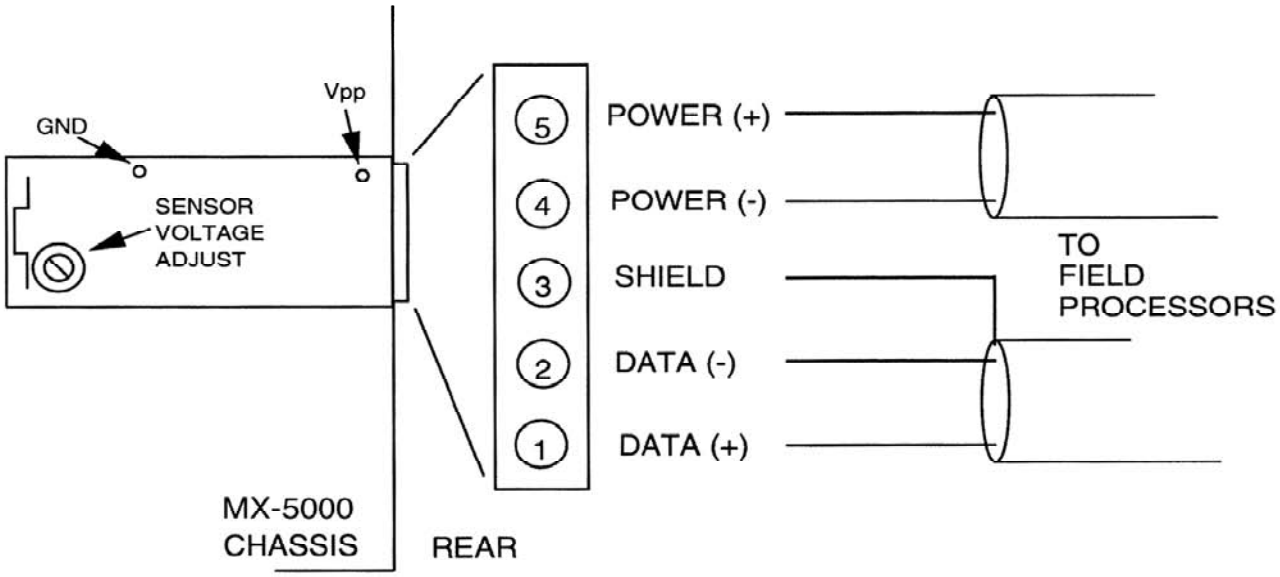

Figure 23. Processor Loop Connections (Typical for TB-3, TB-4, and TB-5)

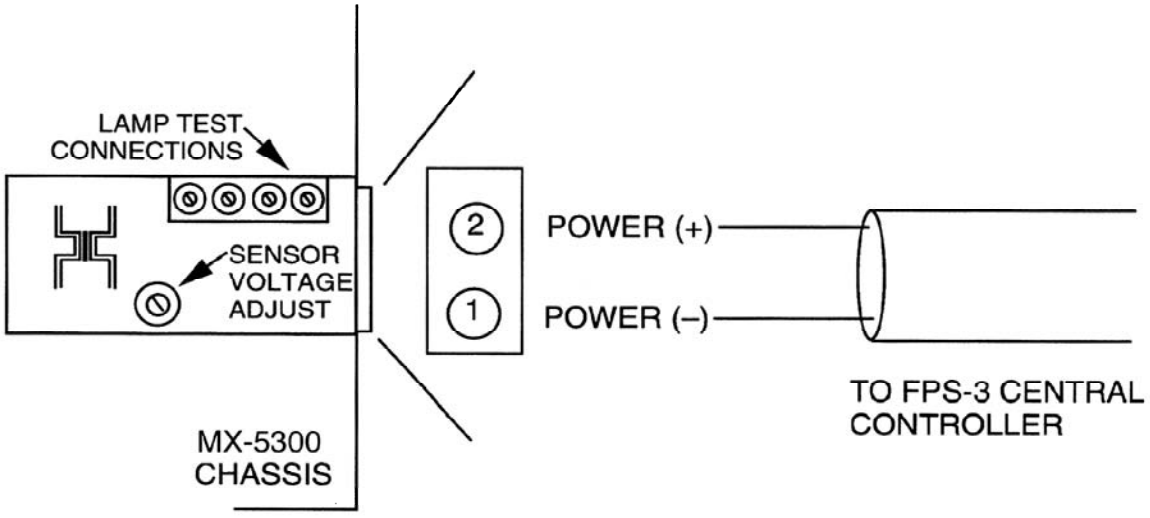

Figure 24. FPS-3 Power Supply Board Connections

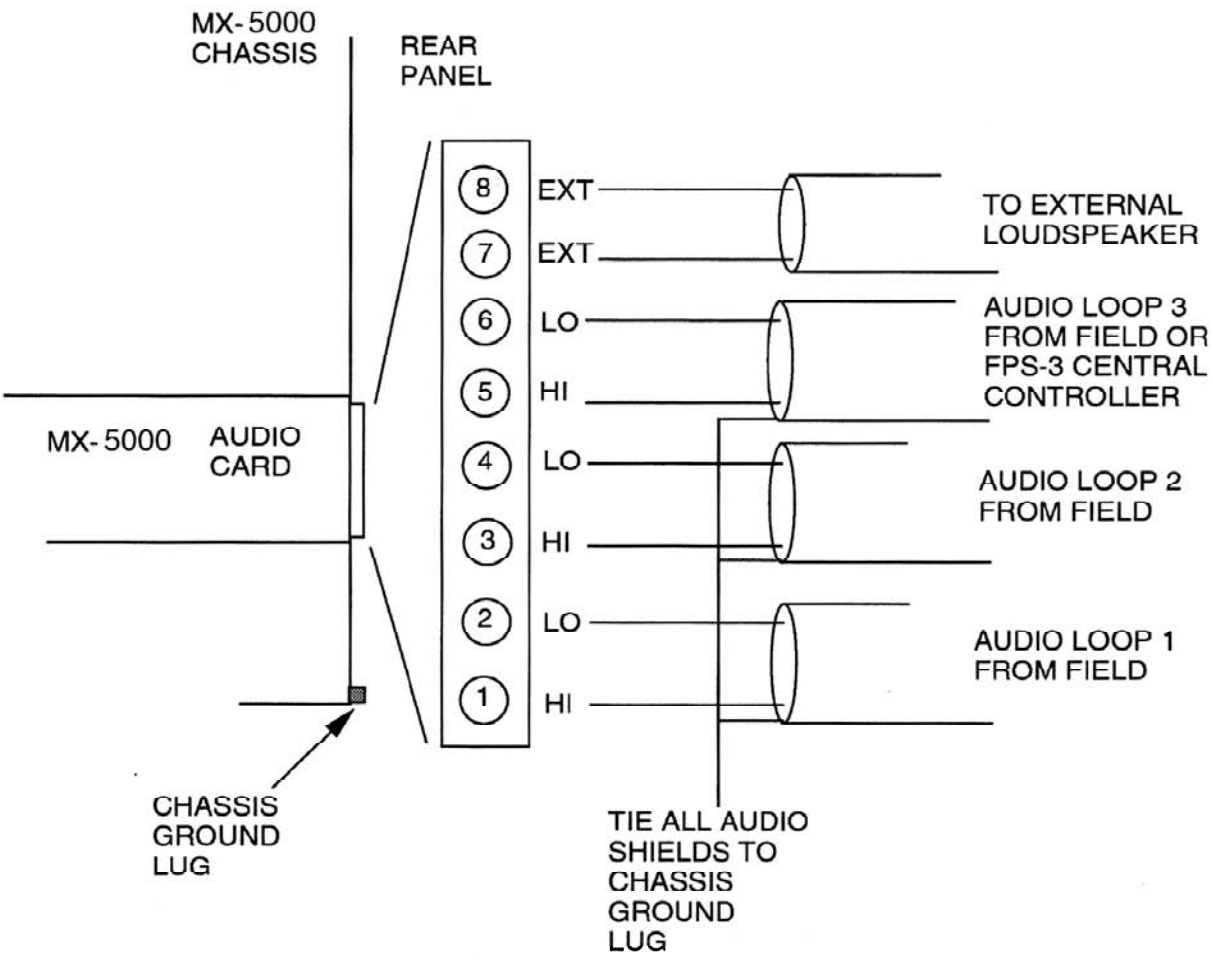

Figure 25. TB-2 Audio Input Connection

Using #18 twisted pair cable, connect the MX-5000 power terminals of the MX-5000 multiplex loop 1, terminals 4 (-) and 5 (+) to the appropriate LOCAL power terminals of the processor. Refer to the appropriate processor manual and Figure 14. Verify that the power selection jumpers (if so equipped) in each of the processors are in the local power (TP) position.

If you are connecting to an FPS processor, connect the audio input by connecting the MX-5000 terminal board TB2 pins 1 and 2 to the appropriate FPS terminals. Refer to Figure 15. Use #18 twisted shielded pair cable. Connect the shield at the MX-5000 end to the chassis ground terminal lug located on the back panel.

Measure the power supply voltage at the processor terminals. Adjust the sensor voltage adjust control on the loop card for +16 volts DC. Refer to Figure 23.

Lamp Test Connections

The MX-5000 contains a feature for testing the front panel and externally mounted lamps utilizing a remotely mounted push button. To utilize the lamp test feature, the optional "general input" loop card or FPS-3 power supply board must be installed in loop card #3 location. Connect an external 12 volt power supply and momentary switch as shown in Figure 26. If your system does not contain a card for loop # 3 (i.e., only one or two loop cards), one loop card must be installed in the #3 card location and the modem and zone programming (Codes 8 and 0) must be changed accordingly. When the lamp test switch is activated all lamps will light, the LCD screen will show "Lamp Test" and the printer will print lamp test with time, date and operator number. This feature must be enabled under Program Code 2. Please see system programming Table 1.

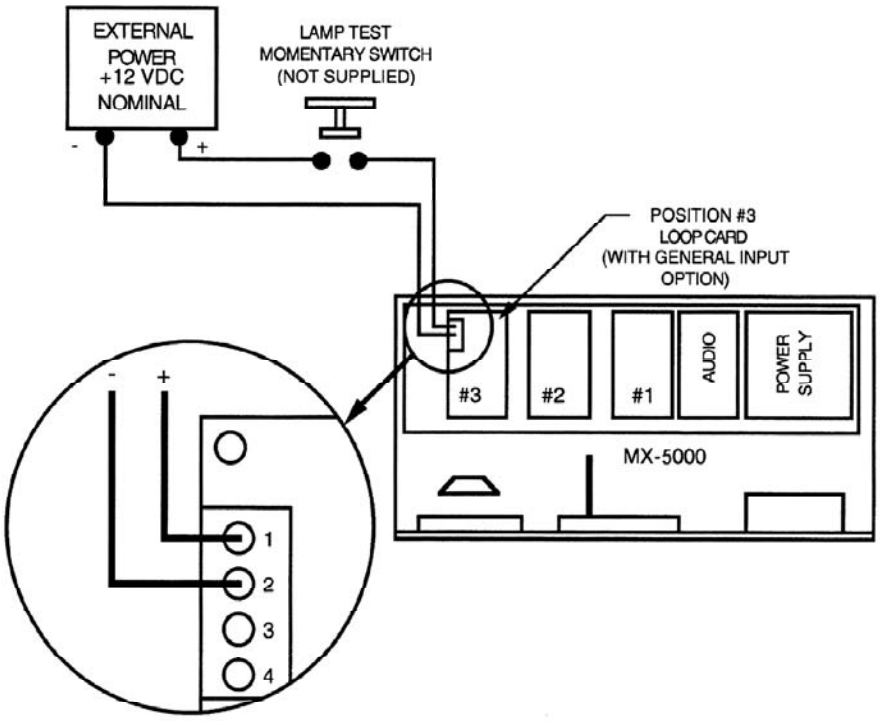

Figure 26. Lamp Test Connections

Setting the Correct Transponder Addresses

Each processor contains a transponder with a specific address that is related to the zones that the processor is reporting. The address switch settings for each transponder are provided in Table 3. Set the correct transponder and receiver address for each transponder card and reinstall each in one of the processors. The zone settings of the processor must match the initial site layout and the MX-5000 modem and zone configuration settings detailed from Configuring Modems and Zones. At this time, each processor will have a specific mounting location on the perimeter and should be marked with that location.

Testing Each Processor at its Zone Address

Test each processor on its external multiplex loop before equipment is taken to the field for installation.

To test each processor, proceed as follows:

- ▷ There are up to three external multiplex loops from one MX-5000. Each processor should be tested on the loop where it will be connected in normal operation.
- ▷ Identify all the processors that you have arranged to connect on loop 1. The order that they are tested does not matter but all loop 1 units must be tested on loop 1.
- ▷ If the processor and transponder card are operating properly, the green front-panel LEDs will light indicating the assigned zones of this processor, i.e., if this processor is programmed for zones 11 and 12, the green LEDs for zones 11 and 12 will be lit. All other zones will show a steady red and yellow LED indicating no communications (COMM FAILURE) with other processors, i.e., they are not installed.
- ▷ Simulate an alarm on one or both zones.
- ▷ If the operation is not as described, verify the transponder and address switch settings on the transponder card. Check the power supply voltage for the +16VDC. If a problem still exists, swap the transponder card with another with the same switch settings. If the problem continues, replace the processor with another. If the problem still exists, contact the factory for assistance.
- ▷ Unplug the tested processor from the MX-5000 and replace with one of the units remaining to be tested.
- ▷ Continue testing for each of the transponders that are to be connected to multiplex loop 1.
- ▷ Proceed to test the transponders to be connected to external multiplex loop 2.
- ▷ Proceed to test loop 3 processors in following the same procedures.

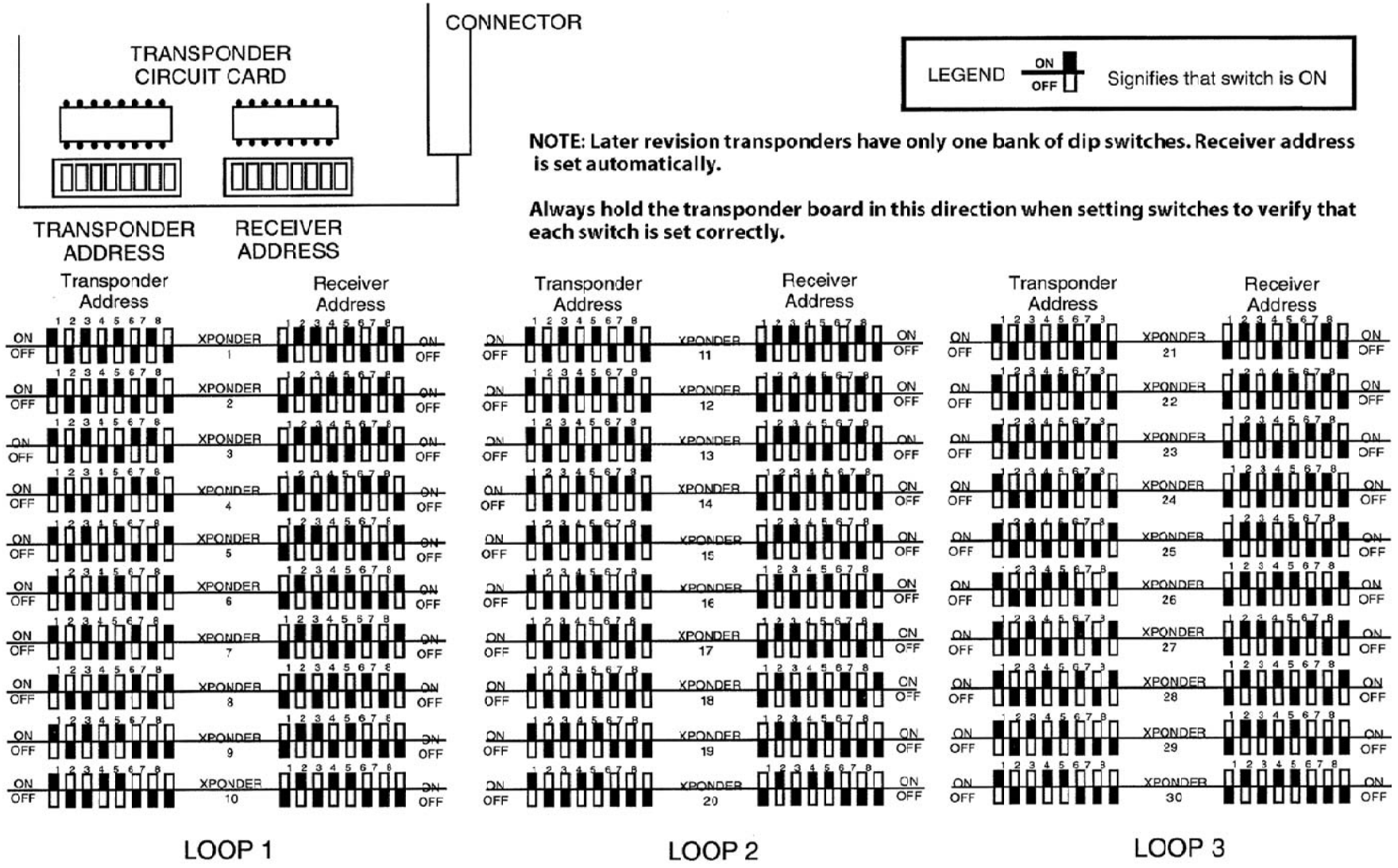

Table 1. Transponder Address Settings

7 INITIAL SETUP AND ADJUSTMENT

General

A complete security system requires that the MX-5000 Multiplex Control Center be programmed to work with the configuration of transponders and sensors necessary for the total project. Since the requirements of each facility are different, each installation requires some amount of special programming.

It is strongly recommended that all initial programming, adjustments, and testing be accomplished in your shop. Outdoor security systems are normally installed over large areas with fences and locked gates making access for adjustment and troubleshooting difficult and time consuming. Initial testing in your shop facilitates easy programming and adjustment since all equipment can be located in very close proximity.

The following initial setup and adjustment procedure assumes that the work is being accomplished in your shop. If initial setup and adjustment in the field is required, the procedure should be changed to match the field conditions.

NOTE: During these procedures, the words "processor" and "transponder" are often used to describe the field units. The processor is generally the complete field-installed sensor system. The transponder is the circuit card inside each processor which controls all communications with the MX-5000.

Beginning Procedures

- ▷ Check each unit for physical damage. Check for loose parts and connectors.
- ▷ Remove the top cover of the MX-5000 by removing the two screws and sliding the cover toward the rear of the unit. Assure that all modules are securely in place and that all connectors and wiring are in place.
- ▷ Remove the front covers from all the sensors, FPS, G-Line, and stand-alone transponder as applicable to your installation. Choose one processor that will be your primary test unit. Refer to the manual of each processor for detailed instructions.
- ▷ Arrange enough workbench space for the MX-5000 and several of the processors side by side.
- ▷ Approximately 10 feet of #18-gauge, twisted-pair wire will be used for power connections and 20 feet of #18 gauge, shielded twisted pair for data and audio connections.

Power Connections

Verify that the MX-5000 power connections are correctly wired for the proper voltage.

MX-5000 System Programming

The MX-5000 programming functions control system operation and display. The MX-5000 contains a default program which can be used for most installations.

The programming matrix, Table 1, provides a simplified flow chart and description of the programming codes. This manual contains a paragraph describing the step-by-step use of each programming code. As you proceed through the matrix, if you do not understand the operation of a programming code, refer to the paragraph where the programming step is explained in a step-by-step manner.

Initial Power Up

- ▷ Apply AC power to the MX-5000.
- ▷ Connect the backup battery.

Entering Programming Mode

You must enter the initial program access code before programming the MX-5000. This step is ***required*** before proceeding with any programming step.

To gain initial program access for ANY programming change proceed as follows:

- ▷ Turn key switch on front panel to PROG.
- ▷ Press the *AUD/ON* key. The LCD screen will read Prgm Code__.
- ▷ Press 99 and press the *ACK* key on the keypad. The LCD screen will read ACCESS.
- ▷ Enter the system default password/access code 0000. If you have changed the program access code, enter it instead of 0000. The LCD display will read Prgm Code__.
- ▷ You may now enter your programming activity. Remember that this procedure is required before any programming activity.

This flowchart shows all the MX-5000 software programming functions. The functions are divided into Initial Set-up and Troubleshooting categories. The Initial Set-up functions are performed with every MX-5000 program setup. The Troubleshooting functions are typically used for maintenance operations. Some of the Initial Set-up functions may be required only if your system includes that special feature.

INITIAL SET-UP

Acknowledge all alarms (Code 7)
▶ During system startup, allows you to turn off all initial system alarms.

Configure Modems (Code 8)*
▶ Allows you to set the number of zones connected to each data line.

Configure Zones (Code 0)
▶ Allows you to assign the zone numbers to each alarm zone in the system.

EDAPT Enable/Disable (Code 14)
▶ Allows you to turn on or turn off EDAPT or CONTACT operation for any FPS2-2 or FPS-3 transponder.

Count Lvl for EDAPT Zones (Code 12)
▶ Allows you to set count level for all zones operating under EDAPT supervision.

General Configuration (Code 2)
▶ Allows you to set several general operating parameters.

Set Date (Code 3)
▶ Allows you to set the correct date on the system clock.

Set Time (Code 4)
▶ Allows you to set the correct time on the system clock.

Relay Interface (Code 9)
▶ Allows you to energize selected zone relays upon alarm or tamper.

Self Test Configuration (Code 10)
▶ Allows you to set the alarm zones that are to be tested under self test.

Weather Station (Code 13)
▶ Allows you to turn on or turn off weather station printout indications when your system is connected to the optional weather station.

Audio Enable/Disable (Code 16)
▶ Allows you to turn on or turn off the audio listen-in feature on any system zone.

Zone Association (Code 17)
▶ Allows you to select primary zones and associated zones for high priority alarm indication.

Configuration Printout (Code 1)
▶ Allows you to obtain a printout of all the software settings of your system program.

New Program Access Code (Code 99)
▶ Allows you to install a new access code in your system.

Zone Classification (Code 23)
▶ Allows you to turn on or turn off the zone classification feature.

OTHER PROGRAMMING OPTIONS

Software Restart (Code 18)
Enables a restart or reset of the system software.

Weather Station Printing (Code 88)
Allows you to print the current weather status when your system includes the optional weather station.

Transponder Test (Code 11)
Allows you to perform a test of an individual transponder connected. to your system.

* Code 8 should be entered only once during initial programming. Subsequent entry will erase custom programming and reset the system to factory default values.

Table 2. MX-5000 Programming Flow Chart

Acknowledging All Alarms (Code 7)

Code 7 allows the operator to acknowledge all alarms at the same time.

▷ Enter programming mode.

▷ Press 7 and the *ACK* key. All alarms will acknowledge in sequence.

▷ Return key to normal.

NOTE: PROGRAM CODE 7 will not acknowledge that a battery failure has occured if external batteries are not connected, you will be required to return the key to normal and press the *ACK* key to silence battery alarm tone.

Configuring Modems and Zones

The MX-5000 must be configured to reflect the transponders and zones that will be installed in this facility.

Configuring Modems (Code 8)

Program the number of zones installed on each loop card.

▷ Enter programming mode.

▷ Press 8 and press the *ACK* key. The LCD screen will read Modem 1: 20.

▷ Enter the number of zones connected to modem loop 1 and press the *ACK* key (e.g., 18 ACK).

LCD will read Modem 2: 20. This is Modem 2. Enter the number of zones connected to modem loop 2 and press the *ACK* key. If loop 2 has already been programmed for 0 zones, the LCD screen will read Modem 2 : 0 . Press the ACK key.

LCD will read Modem 3: 20. This is Modem 3. Enter the number of zones connected to modem loop 3 and press the *ACK* key. If loop 3 has already been programmed for 0 zones, the LCD screen will read Modem 3 : 0 . Press the ACK key.

The LCD screen will read Rly Off.

If the MX-5000 relay interface is used, proceed with the following steps. If not, press the *ACK* key on the keypad.

▷ To configure a relay output for alarm only on **ALL** zones:

- Press the *AUD/ON* key once. The LCD screen will read Rly On Alarm.
- Press the *ACK* key.

▷ If both alarm and tamper outputs are required:

- Press the *AUD/ON* key twice. LCD will read Rly On AIm &Tam.
- Press the *ACK* key.

The LCD screen will read XPO TYPE: STD.

This is the global option to select **ALL** zones for either Standard, Edapt, or Contact operation.

▷ To configure EDAPT for **ALL** zones:

- Press the AUD/ON key once. The LCD will read XPO TYPE: EDAPT.
- Press the ACK key to select.

▷ To configure CONTACT for **ALL** zones:

- Press the AUD/ON key twice. The LCD will read XPO TYPE: CONTACT.
- Press the ACK key to select.

Special note for MX-5300 programming code 8:

The MX-5300 allows up to 30 input zones from conventional multiplex transponders such as FPS-2-2M. These zones may be connected to loops 1 and 2 as follows:

Loop 1: Up to 20 zones or 10 multiplex transponders
Loop 2: Up to 10 zones or 5 multiplex transponders
Loop 3: FPS-3 zones only

When programming conventional multiplex zones, each loop must be programmed for the number of conventional inputs as described. However, FPS-3 zones are not restricted to any "loop" and may be programmed into any loop along with conventional inputs up to 20 zones maximum. Loop 3 is reserved for FPS-3 zones only.

As you completed configuring the modems, the MX-5000 should have automatically initiated a software restart. The software restart is indicated by a blank LCD screen, and all front-panel lamps extinguished except for two. Following the automatic software restart, the MX-5000 will show alarms since new conditions are present. Acknowledge these alarms by repeating the Acknowledge All Alarms procedure. The MX-5000 will show solid red and yellow front-panel LEDs indicating Communications Failure in each zone since the processors are still not connected.

NOTE: Once MX programming is complete, do not re-select Program Code 8 to check your configuration or programming will revert to default condition. To check your zone programming, print the configuration using Program Code 1, or view zone programming with Program Code 0.

Setting Zone Configuration (Code 0)

The MX-5000 contains a default program that sets all transponders and zones in sequential ascending order. Program Code 0 allows the system zone configuration to be tailored to accommodate site requirements. In this mode each zone can be identified with any transponder alarm output. The default configuration is as follows:

Zones 1-20: Loop 1 addresses 01.1 to 10.2
Zones 21-40: Loop 2 addresses 11.1 to 20.2
Zones 41-60: Loop 3 addresses 21.1 to 30.2

The MX-5300 series units are for use with the FPS-3 fencemounted detection system and will directly replace any existing MX-3000 unit while providing all of the other benefits of the MX-5000 series. The MX-5300 differs from other MX-5000 models in that it includes a loop to local bus card in one of the

loop card positions. this card provides the 15 VDC power and parallel data connection (DB-25) to operate the FPS-3 Controller. External bus connections to auxilliary equipment such as the Alarm relay Interface and Remote Map Interface are accomplished through the JP13 port at the rear of the MX. This is a departure from the connection scheme used in the MX-3000 where the FPS-3 Controller and auxilliary devices shared the JP13 port.

The zone configuration scheme for the MX-5300 is also changed from that employed on the MX-3000. The MX-5300 fully supports all existing multiplexed sensors (FPS-2-2M, G-Line M, MPS-4100/TR and SAT) as well as FPS-3 sensors. Multiplexed sensors are addressed as described in the MX-5000 manual using transponder designations 1-30 (designations 1-10 for Loop 1; 11-20 for Loop 2; and 21-30 for Loop 3). FPS-3 zones are addressed as transponders 101-115 for the first FPS-3 Controller, and 201-215 for the second FPS-3 Controller if installed. So the MX-5300 can accomodate up to 60 FPS-3 zones, 60 multiplexed zones, or any combination thereof. All of the FPS-3 sensor connections remain as shown in the FPS-3 manual.

Table 3 is provided to record the zone configuration required for your system if the default configuration cannot be used. Zones are not required to be in sequential order. If desired one or more zone numbers may be left blank to meet site requirements or to allow for future expansion.

To custom configure the system:

- ▷ Enter programming mode.
- ▷ Press 0 and press the *ACK* key. The LCD screen will read Zone 01 : 01.1 This means zone 1 alarm information is being received from Transponder #1, sensor 1.
- ▷ Enter the MX-5000 Program Code corresponding to detection zone No. 1 from Table 3 and press the *ACK* key.
- ▷ To skip a zone number, press the *Aud On* key until 'DISABLED' appears in the LCD screen and press the *ACK* key.

Repeat the procedure for each remaining zone in the system using the MX-5000 program codes contained in Table 3. Following the last transponder zone assignment, the LCD will read Zone __ DISABLED. Press the *0* key or *Aud On* key until 'DONE EDITING' appears in the LCD screen. Press the *ACK* key and the software will restart itself with the new configuration.

Note: FPS-3 Central Controller inputs are addressed from 101.1 to 115.2.

Enabling EDAPT Operation (Code 14)

This programming code selects EDAPT or STD (standard) operation for all compatible FPS zones by their transponder (XPO) number. To enable EDAPT for each transponder proceed as follows:

- ▷ Enter programming mode, or if in programming mode:
- ▷ Press 14 and the ACK key. The LCD will display XPO 1: STD.
- ▷ Press the AUD ON key. LCD will read XPO 1: EDAPT.
- ▷ Press the ACK key. The LCD will advance to XPO 2.
- ▷ Continue through all XPO numbers.

MX-5300 programming offers a third option called CONTACT input for relay type devices connected to the FPS-3 system via the Dual Zone Relay Input (DZRI) Card. To enable CONTACT for relay input devices such as the MPS-4100 proceed as follows:

▷ Press the AUD ON key until the display reads: XPO_ _: CONTACT.

▷ Press the ACK key. The LCD will advance to the next XPO.

▷ Continue through all XPOs.

When finished setting the XPO types, the LCD screen will read: Combined Tampers. This is the factory setting for tamper output for EDAPT enabled transponders. Systems equipped with the newest rev D main boards in the FPS processor can be programmed for separate tampers so that a tamper is annunciated only in the zone that is actually in tamper. To select Separate Tampers, proceed as follows:

▷ The LCD will read: Combined Tampers.

▷ Press the AUD ON key. The LCD will read Separate Tampers.

▷ Press the ACK key. The LCD will read to PRGM CODE.

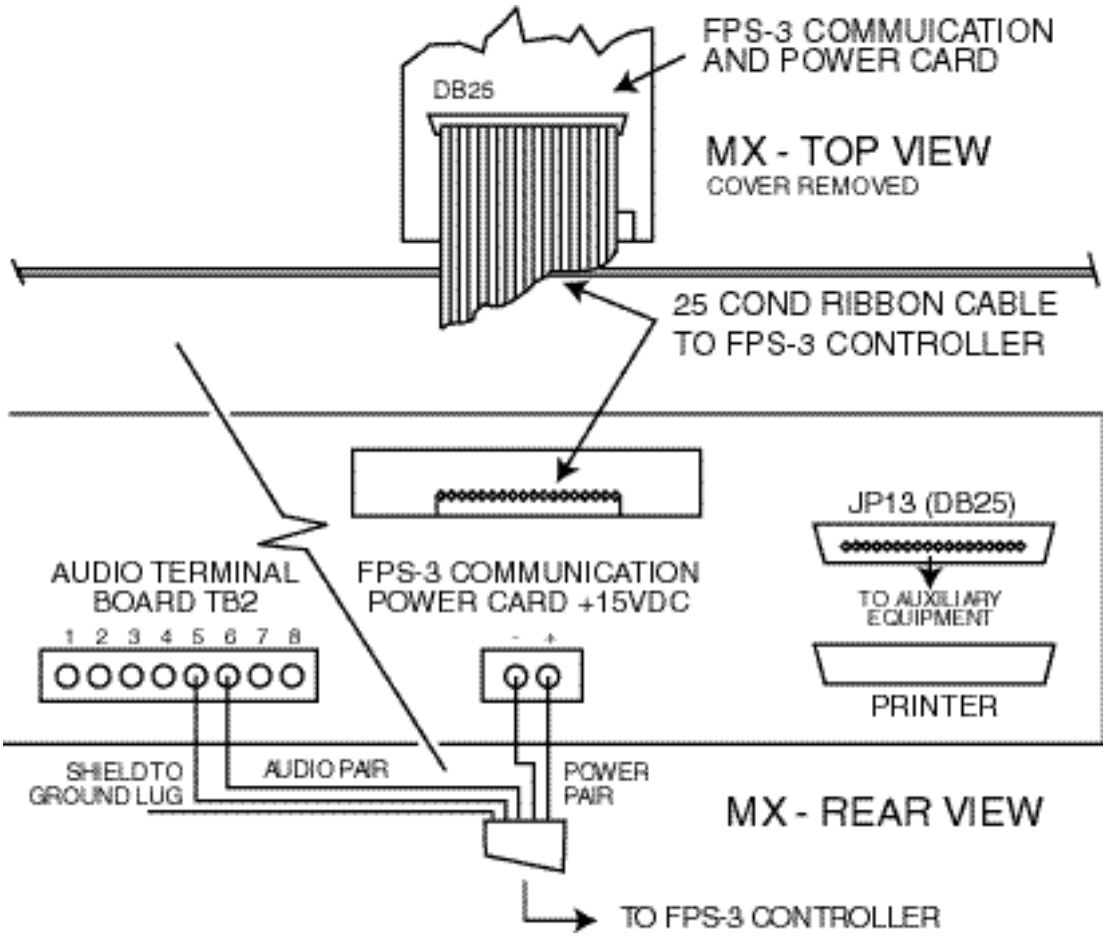

Figure 27. FPS-3 Power Card to MX Connections

Table 3 Sample Zone Configuratiion

DETECTION ZONE	DEFAULT ZONE CONFIGURATION	CONNECTED TO TRANSPONDER #	TRANSPONDER SENSOR NO.	MX-5000 PROGRAM CODE
1	01.1			
2	01.2			
3	02.1			
4	02.2			
5	03.1			
6	03.2			
7	04.1			
8	04.2			
9	05.1			
10	05.2			
11	06.1			
12	06.2			
13	07.1			
14	07.2			
15	08.1			
16	08.2			
17	09.1			
18	09.2			
19	10.1			
20	10.2			
21	11.1			
22	11.2			
23	12.1			
24	12.2			
25	13.1			
26	13.2			
27	14.1			
28	14.2			
29	15.1			
30	15.2			

Table 3 cont'd

DETECTION ZONE	DEFAULT ZONE CONFIGURATION	CONNECTED TO TRANSPONDER #	TRANSPONDER SENSOR NO.	MX-5000 PROGRAM CODE
31	16.1			
32	16.2			
33	17.1			
34	17.2			
35	18.1			
36	18.2			
37	19.1			
38	19.2			
39	20.1			
40	20.2			
41	21.1			
42	21.2			
43	22.1			
44	22.2			
45	23.1			
46	23.2			
47	24.1			
48	24.2			
49	25.1			
50	25.2			
51	26.1			
52	26.2			
53	27.1			
54	27.2			
55	28.1			
56	28.2			
57	29.1			
58	29.2			
59	30.1			
60	30.2			

Setting EDAPT Counts (Code 12)

The MX contains the count circuit for all FPS processors set for EDAPT operation. The factory default setting is 4. The count may be changed by zone number as follows:

- ▷ Press 12 and the ACK key. The LCD will display Zone 1 Level 4.
- ▷ Enter the new count number. The display will show the new level.
- ▷ Press the ACK key. The LCD will advance to Zone 2.

Note: The LCD will display only those zones whose XPO type has been previously programmed for EDAPT operation. Program code 12 cannot be accessed if EDAPT has not been selected for any XPO.

General Configuration Programming (Code 2)

The general configuration programming mode contains several items associated with peripheral interface, communications port selections, operator number assignment, automatic alarm acknowledgment for servicing purposes, and time out of access conditions. The following programming selections are all contained under Code 2. Proceed through each step and select the required programming changes.

To enter the general configuration programming mode, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 2 and the *ACK* key. You are in the general programming mode. The LCD display will indicate COM 1: Printer.

If you don't wish to change any particular programming step, pressing the *ACK* key will move to the next programming step.

Configuring the Communication Ports (RS232 ports 1,2 & 3)

This port can be used to connect the MX-5000 with an external printer, host computer, weather station, modem, video switch, remote display unit or the alarm recordkeeping (ARKS) system. If you are connecting one of these systems, refer to that system's manual before proceeding.

- ▷ Press the AUD/ON key to select; Disabled, Printer, Host I/F, Weather, RDU, Remote MX, modem, video switch, Ultimeter, or ARKS. When you have made your selection, press the *ACK* key.
- ▷ The LCD screen will show Baud: 2400. Press the *AUD/ON* key to select between 2400 and 9600. Press the *ACK* key to make the selection.
- ▷ The LCD screen will show Parity: None. Press the *AUD/ON* key to select between None, Odd or Even. Press the *ACK* key to make the selection.
- ▷ The LCD screen will show Data bits 8. Press the *AUD/ON* key to select between 8 and 7. Press the *ACK* key to make the selection.
- ▷ The LCD screen will show Stop bits 2. Press the *AUD/ON* key to select between 2 and 1. Press the *ACK* key to make the selection. Upon pressing the ACK key the LCD screen will read COM 2: Disabled.

When HOST I/F is selected, an additional option for sending status messages appears. This programs the MX to send a continuous supervisory data stream to the PSYCON. This option may be set to AUTO, ON or OFF. Systems with PSYCON NT should be set to AUTO. In this mode, the MX waits until prompted by PSYCON to start the data stream. For systems with Windows 3.1 PSYCON, set status to ON. When connecting the MX to other computer based controls such a a PLC, this data stream may not be desired and can be set to OFF.

To set status:

The LCD screen will read STATUS:(ON, AUTO, or OFF)
Press AUD ON until the desired setting appears in the LCD display
When you have made the selection, press the ACK key

NOTE: Only one port can be chosen for each function. For instance, COM2 and COM3 cannot both be *ARKS* ports.

Adding and Deleting Operator Identification Numbers.

To enter a new operator identification number, enter the number of the operator to be added and press the *ACK* key. Repeat this process for each new operator number and press the *ACK* key when all have been entered.

To remove an operator number that has already been entered into the system, press the ACK key until the display reads Remove Operator. Enter the number of the operator and press the *ACK* key. Repeat for each operator number to be removed and press the *ACK* key when done.

Setting the printer output to reverse print.

This command is used only when an external printer is used which must be fed the print information in reverse to the normal operation. This command is normally not used and the default is RVRS PRINT: OFF.

▷ Press the *AUD/ON* key to select either RVRS PRINT: ON or RVRS PRINT: OFF.

▷ When you have made the selection, press the *ACK* key.

Activate/Deactivate Automatic Acknowledge.

The MX-5000 contains a convenient means of automatically acknowledging alarms as they occur. This feature is invaluable during start-up, maintenance, or during unattended operation. While in the Automatic Acknowledge mode, the MX-5000 will acknowledge each alarm, reset and log all activity on the printer without operator intervention. Please note: This feature should NOT be used during normal system operation. Operator acknowledgement during normal system operation is required to assure all alarms are identified, and properly acted upon.

▷ To enable the Automatic Acknowledge mode, press the *AUD/ON* key until the LCD screen reads Auto ACK: On.

▷ To disable the Automatic Acknowledge mode, press the *AUD/ON* key until the LCD screen reads

Auto ACK: Off.

▷ Press the *ACK* key.

Setting the MX-5000 to the Host Mode.

The Host Mode is utilized whenever the MX-5000 is being installed with another computer system that must control the MX-5000 operations. The default condition is Host Mode: OFF.

▷ Press the *AUD/ON* key to select either HOST MODE: ON or HOST MODE: OFF.

▷ When you have made the selection press the *ACK* key.

NOTE: When Host Mode is enabled, all normal command functions are transferred to the host and the keypad is disabled. Connect host terminal or computer BEFORE you select HOST MODE: ON.

Setting the MX-5000 for Hardwire Operation.

The MX-5000 contains the provisions for a hardwire interface that enables control of up to 20 of the FPS Hardwired systems, or other systems which require a hardwire interface. The default setting is for Loop 3 operation. Select Loop 3 for Hardwire Interface as follows:

▷ Press the *AUD/ON* key to select either LOOP 3: LOOP, or LOOP 3: HARDWIRE.

▷ When you have made the selection, press the *ACK* key.

Selection of Access Timeout Period

The MX-5000 contains a provision that does not allow zones to be placed permanently in the Access Mode. The Access Mode time period is selectable at the MX-5000 from 1 hour to 99 hours. The default time period is 0 hours(no timeout period). To select a different Access Mode timeout period proceed as follows:

▷ The LCD display reads ACC TIMEOUT: 0. Enter the preferred timeout period (in hours) using the MX-5000 keypad.

▷ When you have entered the selection. press the *ACK* key.

Lamp Test Function

▷ The LCD screen reads LAMP TEST: Dis.

▷ Press the AUD/ON key. The LCD screen will read LAMP TEST: On. If you wish to disable the function, press the AUD/ON key so the LCD screen reads LAMP TEST: Dis.

▷ Press the ACK key.

Operator Control Language

The MX operator control language may be set for English or Spanish as follows:

▷ The LCD screen reads LANGUAGE:ENGLISH

▷ Press the AUD ON key. LCD will read LANGUAGE:SPANISH

▷ Press the ACK key.

Tamper Restoral: Auto or Manual

Tamper alarm restoral may be set to auto or manual reset as follows:

▷ The LCD reads Tamper RST: Auto

- ▷ Press the AUD ON key. The LCD will read Tamper RST: Man
- ▷ Press the ACK key. The LCD screen reads PRGM CODE_ indicating all Code 2 programming steps are complete.

Return key to Normal or continue with other programming options.

Setting the Correct Time and Date (Codes 4 and 3)

To set the time, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 4 and press the *ACK* key. The LCD screen will read HH:MM.
- ▷ Enter the time in hours and minutes. NOTE: This is a 24-hour clock.
- ▷ Press the *ACK* key. The LCD screen will read Prgm Code _ and the time is reset.
- ▷ Return key to normal.

To set the date, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 3 and press the *ACK* key. The LCD screen will read MM/DD/YY.
- ▷ Enter in two-digit sequence the month, day and year.
- ▷ Press the *ACK* key. The LCD screen will read Prgm Code _.
- ▷ Return key to normal.

Relay Interface Configuration (Code 9)

The MX-5000 has an optional relay interface that provides a dry circuit signal relay capability for each zone monitored. Program Code 8 provides a global command to configure relays for ***all*** zones. To configure individual relay points:

- ▷ Enter programming mode.
- ▷ Press 9 and the *ACK* key. The LCD screen will read Rly 1 Off.
- ▷ Press the *AUD/ON* key. The LCD screen will read Rly1 Alrm Only.
- ▷ Press the *AUD/ON* key again. The LCD screen will read Rly 1 Alrm & Tam.
- ▷ Press the *AUD/ON* key until the desired operation appears on the LCD screen.
- ▷ Press the ACK key to move to the next zone.
- ▷ Repeat the above four steps for all zones.
- ▷ Return key to normal.

Establishing the Self-Test Configuration (Code 10)

The MX-5000 provides a self-test feature that can electronically command a test of any one sensor or all sensors at the same time. If there are sensors in the system without self-test capability the configuration must be changed to exclude those sensors. To disable self-test for a specific zone:

- ▷ Enter programming mode.
- ▷ Press 10 and the *ACK* key. The LCD screen will read Zone 1 Test ENA.
- ▷ Press the *AUD/ON* key. The LCD screen will read Zone 1 Test DIS. Pressing the *AUD/ON* key again (toggle) will cause the LCD screen to read ZONE 1 Test ENA. Press the *AUD/ON* key until the desired operation appears on the LCD screen.
- ▷ Press the *ACK* key. The LCD screen will read Zone 2 Test ENA.
- ▷ Repeat the two steps for all zones.
- ▷ Return key to normal.

NOTE: Attempts to test zones which are not self-test capable will result in test failures which can only be cleared by restarting the system software (Code 18). Disable the self-test feature for all zones which are not self-test capable.

Enabling Weather Status Printing (Code 13)

This programming code is used only when the optional weather station is installed. The MX-5000 program default is Weather Printing is OFF. To program weather status printing, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 13 and press the *ACK* key. The LCD display will read: WTR-OFF.
- ▷ Press the *AUD/ON* key. WTR-ALARM ONLY will appear on the display. Press the ACK key to select printing of weather status each time an alarm is printed.
- ▷ If not, press *AUD/ON* again. The LCD display will read WTHR ALARM AND HOURLY. Press the *ACK* key to select printing of weather status each time an alarm is printed AND printing of weather status every hour on the hour.
- ▷ Turn the key to normal.

Audio Signal Enable/Disable (Code 16)

This programming code allows you to select which alarm zones will have automatic listen-in capability. Alarm zones using a microwave unit or stand-alone transponder typically do not have audio capability, and the automatic listen-in capability should be disabled. The MX-5000 default program has set all zones for automatic listen-in capability. To enable or disable individual alarm zones, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 16 and the *ACK* key. The LCD display will read: Zone 1 AUD: ON (indicating enabled)
- ▷ Press *AUD/ON* and the display will read OFF (disabled) Additional pressing will toggle between

ON and OFF. Select the operation for this zone and press *ACK*. The LCD screen will read Zone 2 AUD: ON.

▷ Repeat for each zone in your system.

▷ When all zones are complete, return the key switch to normal.

Setting Zone Associations (Code 17)

This programming function is used when your system is being set up for joint domain operation. Joint domain operation means that alarm zones are associated with other alarm zones so that an alarm on any primary zone followed by another alarm on an associated zone within the specified time interval will cause a HIGH PRIORITY alarm.

During this programming step you will select primary zones and the other zones (associated zones) that will be associated with the primary zones.

To program the zone association of each alarm zone, proceed as follows:

▷ Enter programming mode.

▷ Press 17 and the *ACK* key. The LCD screen will read Assoc Time: 0.

▷ Enter the desired time interval for the association of the primary and associated zones from 1 to 99 minutes, then press the *ACK* key.

▷ The LCD screen will read Zone 1: PRIMARY. Press the *AUD/ON* key to toggle between Primary and Not Primary. Make your selection then press the *ACK* key. The LCD screen will read Zone 2: PRIMARY.

▷ Repeat for each zone in your system. When you have completed all zones in your system, press the *ACK* key one final time.

▷ The LCD screen will read ASSOCIATIONS: Press the *ACK* key. The LCD screen will show the first primary zone you selected followed by spaces for up to three associated zones (i.e., 00 00 00).

▷ Enter the first associated zone for the indicated primary zone and press the *ACK* key. The LCD screen cursor will move to the second associated zone location (i.e., 00 00 00).

▷ Enter the second associated zone and press the *ACK* key. If there is no other associated zones, just press the *ACK* key without entering a zone number.

▷ Likewise enter the third associated zone number, or just press the *ACK* key. An OK indication will appear on the LCD screen. Press the *ACK* key.

▷ The LCD screen will show the next primary zone with the same prompt as before. Continue by entering the associated zones as in the four previous steps.

▷ After the associated zones for the last primary zone have been selected, the LCD screen will show Pgrm Code __.

▷ Return key to normal.

Restarting or "Re-booting" the System Software (Code 18)

The MX-5000 has a software restarting feature very similar to the rebooting feature of your personal computer. This feature is very useful during start-up and maintenance because a restart will clear all

temporary memories that contain old alarm information and allow the system a fresh start.

To accomplish a software restart, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 18 and press the *ACK* key. The system will perform a self-restart, and the printer will print system startup.
- ▷ Return key to normal.

Getting a Configuration Printout (Code 1)

The MX-5000 will provide a printout of the current system configuration, listing zone assignments, alarm relay programming, port configuration and option functions. Before executing this step, it may be beneficial to reboot the MX using Code 18. This clears the buffer of previously accumulated information.

To generate a configuration printout, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 1 and press the *ACK* key. Printer will print configuration.
- ▷ Return key to normal.

Obtaining a Weather Status Printout (Code 88)

This programming code is used only when the optional weather station is installed as part of your MX-5000 system. If you wish to print the current weather status, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 88 and press the *ACK* key. The MX-5000 printer will print the current weather status.
- ▷ Turn the key to normal.

Entering a New Program Access Code (Code 99)

The MX-5000 protects all system programming with a four-digit password. This password is necessary to gain access to all system programming functions. Each MX-5000 is shipped with a default password of 0000. The new access code must be a four-digit number.

To change the current access code to a new access code, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 99 and press the *ACK* key. The LCD screen will read Old Access.
- ▷ Enter the old code (e.g., 0000). The LCD screen will read new Access.
- ▷ Enter the new code.
- ▷ Press the *ACK* key.
- ▷ Return key to normal.

Configuration Control (Code 24)

Once the MX-5000 is programmed, a back-up copy of the operating configuration can be made on a floppy disc. Should the programming in the MX be lost for any reason, this back-up diskette can be used to restore it. This program code also provides utilities to erase the existing MX program configuration reverting to the default settings, and to restore the MX configuration from a floppy disc. Finally, Code 24 allows ARKS (Alarm Record Keeping System) data downloads to floppies.

To enter the configuration control mode, proceed as follows:

Press 24 and the acknowledge key. You are in the configuration control mode and the LCD will indicate Exit. Press the ACK key to exit Code 24 and return to the Prgm Code prompt, otherwise press the AUD/ON key to select among the other choices of Save Config, Load Config, Erase Config or Make ARKS Disk.

Saving the Configuration Information

This process will make a copy of your current configuration to a floppy disc.

- ▷ Press the AUD/ON key until the LCD reads Save Config. Press the ACK key. The LCD will read SAVE Config?NO.
- ▷ Toggle to YES with AUD/ON key, and press ACK. The LCD will prompt you to insert an empty floppy disk, then press the ACK key. The LCD will read Format?NO.
- ▷ Toggle to YES with the AUD/ON key, press ACK and the LCD will read Save Complete when the copy process is done. Press ACK to return to the Prgm Code prompt.

Restoring the Configuration Information

This process transfers the configuration information from your back-up diskette to your MX-5000.

- ▷ Press the AUD/ON key until the LCD reads Load Config. Press the ACK key. The LCD will read Load Config?NO.
- ▷ Toggle to YES with the AUD/ON key and press ACK. The LCD will prompt you to insert the diskette then press ACK.
- ▷ When the LCD reads Restore Complete, remove the diskette and press the ACK key. The MX will restart using the restored configuration.

Erasing the Configuration Information

This will delete the existing configuration information and the MX will revert to the default settings.

- ▷ Press the AUD/ON key until the LCD reads Erase Config. Press the ACK key. The LCD will read Erase Config?NO.
- ▷ Toggle to YES with the AUD/ON key and press ACK.
- ▷ When the LCD reads Erase Complete, press the ACK key. The MX will restart in default programming mode.

Erasing the Current Configuration Information

This will delete the existing configuration information and the MX will revert to the default settings.

- ▷ Press the AUD/ON key until the LCD reads Erase/Config. Press the ACK key. The LCD will read Erase Config?NO.
- ▷ Toggle to YES with the AUD/ON key and press ACK.
- ▷ When the LCD reads Erase Complete, press the ACK key. The MX will restart in default programming mode.

Downloading ARKS Data to a Diskette

If your MX-5000 is equipped with the ARKS Data Recording option, this will allow you to copy data by way of the floppy drive for analysis.

- ▷ Press the AUD/ON key until the LCD reads Make ARKS Disk. Press the ACK key. The LCD will read From MM/YY.
- ▷ Enter the starting month and year of the time period for which you will download. Press ACK. Enter the ending month and year for the time period of interest. Press ACK again. The LCD will display the time interval you selected then the LCD will read Insert Disk.
- ▷ Insert an empty, formatted disk and press ACK. When complete, the LCD reads Archive Done and then returns to the Prgm Code prompt. Remove the floppy for analysis.

PLEASE NOTE: The MX-5000 will **NOT** display the password at any time. Record the access code in a **secure** place. If the password is misplaced or forgotten, you cannot access the MX-5000 program and should contact the factory immediately.

This concludes the initial setup and adjustment of your MX-5000 system. Shut down the system. Carefully disconnect your temporary wiring, remove external backup battery, and reinstall the MX-5000 cover. Your system is now ready to be field installed.

8 SYSTEM START-UP AND TESTING

General

This section of the manual covers the start-up and testing of the field-installed system.

This section assumes that the MX-5000 has been set-up and programmed in the shop in accordance with manual Section 7, the MX-5000 has been installed in the field in accordance with manual Section 6, and the alarm processors and sensors including interconnecting cabling have been installed in accordance with the appropriate installation and operation manuals.

Applying Power

In most cases, the MX-5000 provides the power source for all field processors and sensors.

Before applying power to the MX-5000, verify with an ohmmeter that the power, data, and audio wiring for each external multiplex loop are not shorted or grounded.

Verify that all connections at the MX-5000 rear panel are secure. Verify that all connections to external control room mounted equipment are secure.

Verify the connection of the ground terminal to a suitable electrical ground. This ground must be an independent ground rod or a water pipe in accordance with the National Electrical Code.

Turn the printer (internal and/or external) switch off.

Apply power to the MX-5000 by plugging in the modular transformer. The transformer should be plugged into an approved plug strip containing suitable transient suppression. Connect the backup battery to the two battery terminals on the rear of the MX-5000.

Upon power-up, the MX-5000 will attempt to initialize the modem and zone configuration that you previously programmed in Section 7. Undoubtedly, there will be some alarm on the system, and some clean-up programming may be necessary. Proceed by accessing the MX-5000 program and acknowledging the alarms (see Section 7).

Alarms may occur while the system is being adjusted. These alarms can be acknowledged and reset using the zone number, ACK key, RST key, and the AUD/OFF key in accordance with the Operator Instructions.

Before proceeding, take a look at the alarms appearing on the front-panel LEDs. The lamps will give you some idea of the parts of the system that need adjustment. However, do not attempt to resolve these items until you have measured the voltages on each external multiplex loop and have made the necessary adjustments to the voltages at each sensor.

Loop Voltage Adjustments

The external multiplex loops connect the MX-5000 to the processors located on the perimeter of the facility. Due to the wiring distances and the number of transponders that can be installed on a loop, there can be a significant voltage drop between the MX-5000 and the last processor in a loop.

The processors are designed to compensate for some of the voltage variation. However, the voltage at any processor cannot be lower than 12 volts or more than 16 volts. When you completed your power distribution calculations in accordance with Appendix A, you arrived at a value for Vpp, the required value for the voltage from the MX-5000 loop card. You should have a value for each loop in the system. The voltage should be a minimum of 16 volts and a maximum of 22 volts. If your value is not within these limits, recheck your calculations. You may call the factory for assistance.

***WARNING:** You must not exceed 16 volts at any processor at any time or the processor will be damaged. Proceed carefully.

The value of Vpp you calculated for each of the external multiplex loops should be set in the MX-5000 at this time. If your calculations require resistors at any processor, install them before proceeding. If you have not made the Appendix A calculations, DO NOT change the MX-5000 loop voltages until you have measured the processor voltages as described below.

▷ Remove the top cover of the MX-5000 by removing the two screws and sliding the cover toward the rear of the unit.

▷ Starting with loop 1, attach a multimeter to terminals 4 and 5 on TB-3 (loop 1). Refer to Figure 28.

Adjust the sensor voltage adjust potentiometer (Figure 28) until the voltage at the test point reads the voltage you calculated for the loop. Repeat for each of the MX-5000 loop cards.

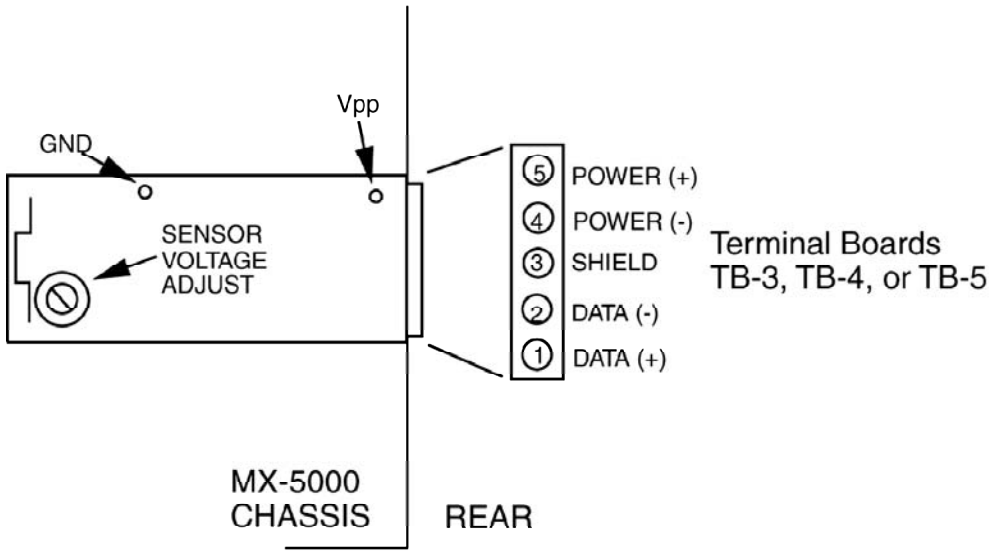

Figure 28. Loop Voltage Adjustment (Typical for all loop cards)

The voltage at each of the processors in the field must be checked to verify that the voltage at each location is a minimum of 12 VDC and not more than 16 VDC. Proceed as follows:

Starting with loop 1, go to the furthest processor and measure the incoming voltage, +PP, where the power cable connects to the processor. This processor should have no dropping resistor. (See Figure 29.)

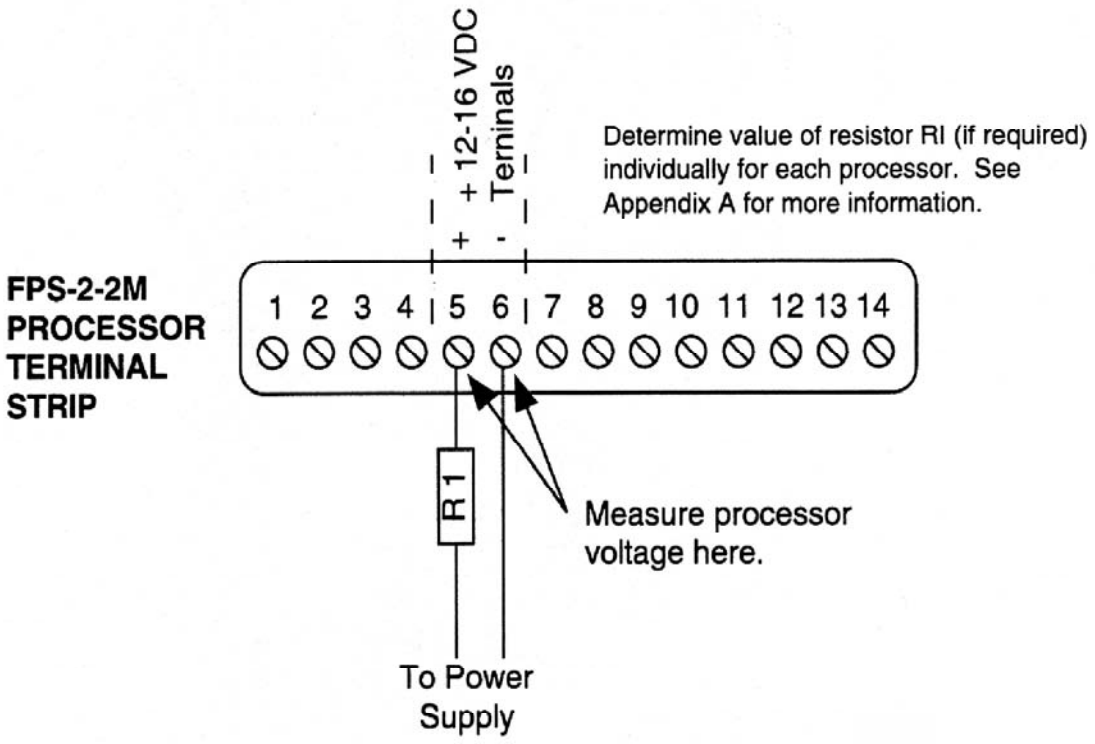

Figure 29. Processor Voltage Measurement

The voltage should be not less than 12 VDC. If the voltage at this point is lower than 12 VDC, the voltage at the MX-5000 must be raised by the amount that will allow the voltage at the end processor to be raised to 12 VDC. For example, if the measured +PP voltage at the end processor is 11.2 VDC, there is a 0.8-volt difference. The MX-5000 loop output voltage must be raised 0.8 VDC to compensate.

Raising the MX-5000 loop output voltage above 16 volts will probably require resistors at the first few processors on the loop to avoid exceeding 16 volts at any processor. Measure each processor voltage starting with the processor located closest to the MX-5000. If the processor voltage is high enough that the voltage increase required for the end processor will make the processor voltage greater than 16 volts, a resistor must be installed.

Add the voltage increase required by the end processor to the voltage at this processor. Install the correct resistor value, as shown in Appendix A, based on the value of this voltage. (Example: If the end processor requires a voltage increase of 3.5 volts and the voltage at this processor is 16 volts, the new processor voltage will be 19.5 volts (16 + 3.5) requiring a 200 ohm resistor. Install the correct resistor.

Proceed to the next processor in line, repeat the voltage measurement and install a resistor if required. Continue to the next processor in line until the voltage at the processor plus the voltage increase required by the end processor does not exceed 16 volts (i.e., no resistor is required)

Repeat the voltage measurements (end processor, then first processor and so on) for each of the other loops in the system.

Return to the MX-5000 and readjust the loop sensor voltages for each loop, adding the difference in voltage that you measured at the end processor of each loop.

Return to each of the end-of-line processors and verify that the voltage at each is a minimum of 12 VDC. If the voltage is not a minimum of 12 VDC, recheck the field wiring and repeat the measurement and adjustment steps above.

Resolving Communications Problems

The MX-5000 should be communicating with all processors at this time. There should be no yellow rapidly flashing LEDs with audible warning tone nor steady red and yellow (simultaneous) LEDs indicating Comm Failure.

If there are, this means that the zones showing Comm Failure are not communicating with the MX-5000. Proceed through the steps below to determine what the problem may be.

- ▷ Perform a software restart.
- ▷ Inspect the wiring at the suspect processors for broken or loose connections.
- ▷ Inspect the transponder and receiver codes at the suspect processors. If necessary, review the Configuring Modems and Zones procedure contained in Section 7.
- ▷ Review Initial System Planning. Verify that each zone has been properly designated and programmed into the MX-5000.

If, after performing the steps above, you continue to have a Comm Failure problem, contact the factory.

Initial Testing

At this point, all processors should be communicating with the MX-5000, but there may be some alarms coming from the processors. These may be obvious (e.g., a tamper alarm because the processor faceplate is removed for testing, or an alarm defect that must be repaired).

Depending on the number of alarms on the system, you may wish to turn the printer on at this time. If so, perform a software restart (removes old alarm garbage) and activate the printer. If, for some reason, you have changed the MX-5000 configuration, you may also wish to print a Configuration Report.

Place the MX-5000 in the Automatic Acknowledge mode (Code 2). This will eliminate the requirement for an operator during initial testing.

Run a system self-test (see Operator Instructions). The printout of the self-test may be helpful in resolving field problems.

Refer to the processor manuals for processor testing criteria. Test each processor in accordance with the manual. Repeat the testing of each processor until you are assured that each is operating correctly. Your initial testing should include climb and simulated cut testing since these tests will be necessary during final testing.

Following the testing of each zone, proceed to test the other systems that are tied to the MX-5000. Test the wall annunciator, the external relay outputs, the mobile map interface, and any other system that is connected.

You may wish to run a self-test again at the completion of the initial testing. Present the self-test printout to the owner's representative as an indication that the system is ready for final testing. Remember to deactivate the Automatic Acknowledge feature at the completion of initial testing.

Operator Training

Following final testing and acceptance, at least one operator training session should be conducted. As you are aware, many of the first service calls on any system are from operators who do not understand the system operation. An informed operator and maintenance technician are your best spokespersons. Provide reference copies of the MX-5000 Operators Manual to each operator.

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9 MAINTENANCE/TROUBLESHOOTING

General

The MX-5000 is part of the total security system and should be tested as part of the complete system. Refer to the manuals for the processors and sensors to determine how testing should be conducted.

Periodic Tests

The MX-5000 self-test of all zones should be conducted weekly, and at any other time when a system malfunction is suspected. Conduct the self-test before making any field tests of processors. The self-test will not only test the MX-5000 operation but will give you a test of each field processor that contains self-test capabilities.

Systematic Testing

Problems sometimes occur due to equipment failures. However, in most cases, problems are caused by human- or installation-related items such as:

- Shipping damage
- Disturbed wiring or connections
- Incorrect connections
- Physical damage
- Defects in the fence mechanical installation.

Always look for the simplest problem first. For example, always check for power supply voltages before starting any further testing.

When approaching a system malfunction, look first for a related activity that could have caused the problem. This will help you go directly to the possible problem areas and/or obtain more accurate factory assistance. Examples are:

- Recent maintenance actions or installations of other equipment in the same area or equipment rooms.
- Water or lightning damage.

Factory customer assistance is available to help you find and correct system errors. It is important that you keep your as-built documentation and test records so the factory will have the data needed to help resolve your problem.

Problem Identification and Resolution

Table 4 is provided to help you find and resolve system defects. The MX-5000 is the control center for the entire security system; therefore, defects reported on the MX-5000 may result from problems in the other equipment. Be sure to refer to the technical data for the other equipment as well. Before making more detailed tests, proceed as follows:

- ▷ Use the MX-5000 self-test function first.
- ▷ Before proceeding further, check all power supply voltages, both at the MX-5000 and at any questionable field-installed processors.

A maintenance code (Code 11) is provided to test individual transponders. When intermittents involving one or more processors occur, Code 11 will allow the MX-5000 to communicate just with those units to isolate the problem. To activate the maintenance code, proceed as follows:

- ▷ Enter programming mode.
- ▷ Press 11 and press the ACK key. The LCD screen will display XPONDER:.
- ▷ Enter the number of the transponder that you wish to test, and press ACK.
- ▷ The MX-5000 is now communicating with only the transponders on all loops with that number. The LCD screen will read "ACK to stop test."
- ▷ Monitor as necessary. Press the ACK key to reset system to normal operation.
- ▷ For expanded uses of this maintenance code, contact the factory.

> **CAUTION:** While the Code 11 test is activated, the MX-5000 is not communicating with other processors. Therefore, alarms on other processors will not be received. DO NOT leave the system in this configuration for any time without proper facility supervision.

Repair

Perform system repairs using good commercial practice. It is recommended that repairs be performed by personnel who have received factory training in both the MX-5000 **AND** the alarm processors used in the installation. Improper repairs or system damage caused by untrained personnel can affect the warranty.

Isolate defective components by swapping field connections with known good components or by using spare components reserved for maintenance actions. Repairs to equipment and circuits contained inside the MX-5000 are not recommended in the field unless authorized by a factory technician. Consult the factory before attempting testing inside the MX-5000 or removing MX-5000 internal components. Perform testing and repair of field-installed components in accordance with the applicable manuals.

TABLE 4
TROUBLESHOOTING GUIDELINES

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED SOLUTION
Self test or COMM Failure in one zone	Defective sensor or processor	Refer to manual for processor and sensor
	Defective MX-5000 programming	Print configuration report and examine for defects
	Defective MX-5000	Set another processor to the code of the defective unit and retest
Self test or COMM failure on all zones on one loop card	Loose wiring at rear of MX-5000	Check wiring
	Defective wiring on loop	Check wiring
	Low voltage on loop	Check voltage @ pins 4 & 5 of loop card
Irratic alarms or tamper alarms from one or more processors	Defective sensor, processor or fence	See processor manual for troubleshooting procedure Disconnect and test for opens, shorts, and/or grounds
AC LOSS appears on LCD screen	AC main power lost	Check circuit breakers and AC input wiring for correct voltage
	Power supply defective	Check fuse located in MX-5000 transformer assembly. If fuse is blown check MX-5000 before installing new fuse

TABLE 4
TROUBLESHOOTING GUIDELINES

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED SOLUTION
AC loss (con't)	Loose wiring	Check wiring at back of MX-5000
CHECK BATTERY appears on LCD screen	Battery defective or discharged	Disconnect and check battery voltage (load test is recommended)
	Fuse on Power Supply Card blown.	Replace fuse
	Battery connector loose or broken	Check wiring at rear of MX-5000
Hum in audio	Audio cable grounds not properly connected	Check for proper connections and good earth ground
	Audio cables shorted or grounded in field	Disconnect wiring and check for grounds and shorts
Audio level low	Audio cable shorted or grounded	Disconnect wiring and check for shorts and grounds. Be careful of high resistance shorts
	Audio level set low	Adjust gain controls on MX-5000 audio board. There are three controls; one for each loop.
No audio	Audio wiring broken or disconnected	Disconnect and check audio wiring for open circuits
	Defective processor	Refer to processor manual and check processor
	Defective MX-5000 audio card	Swap audio cable from one loop to another and check to see whether MX-5000 or field is defective

TABLE 4
TROUBLESHOOTING GUIDELINES

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED SOLUTION
Printer not functioning	Out of paper	Inspect and replace paper roll if necessary
	Ribbon cartridge defective	Inspect and replace printer ribbon if necessary
	Printer not selected properly in software	Refer to General Configuration Programming and check printer settings
	Printer defective	Perform self test on printer. If defective, return to factory for repair
Printer functioning but print is weak	Printer ribbon dry or out of ink	Rotate ribbon and retest. If there is no change, replace ribbon cartridge

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APPENDIX A

Multiplex Loop Power Distribution Calculations

General

The MX-5000 in most cases provides the power for all the field processors that are connected to it. Providing the system power from one central location (the MX-5000) enables full control of the system from central control and simplified battery backup.

However, providing the power to the field units from the central location causes a voltage drop in the power feed line because of the long distances normally encountered in the installation of a perimeter protection system.

The field processors and the MX-5000 are designed to compensate for the voltage drop over very long distances. Additional voltage compensation in the form of dropping resistors needs to be installed at some processors on a long external multiplex loop.

The procedure contained in this Appendix enables you to quickly calculate the voltage drop on a loop of any length and with any number of processors. The result of these calculations will be:

- ▷ The selection of one of three resistor values to be installed at specific field-installed processors will be determined.
- ▷ The output voltage level at which each MX-5000 external multiplex loop should be set will be determined.
- ▷ The values of the calculated loop voltage at each processor will be determined. These can be used to double check your installation during Initial System Testing.

Loop Power Distribution Calculations

This design approach uses engineering approximations to simplify the calculations. The accuracy of the approximations are sufficient to allow proper operation of the system.

The resistance (Rc) between any two transponder (XPO) locations depends upon the distance between these locations as follows:

Rc = (14) (Dc) for #18 wire

where Dc is the distance between two XPOs in thousands of feet.

For Example:

Rc = 14 (2) = 28 ohms if the XPO locations are 2000 feet apart.

Procedure

The voltage at the XPO which is the farthest cable distance away from the MX-5000, is set to the minimum voltage of 12 volts. The voltage drop between the furthest XPO and next closest XPO (XPO 2) is calculated assuming a flow of 30 ma through the resistance of the cable since the typical processor requires a 30 ma. current.

Vc1 = (0.03) (14Dc1) = (0.03) (28)

= 0.84V for 2000 ft. spacing

The voltage at XPO 2 is then the voltage at XPO 1 (or node 1) plus the drop between XPO 1 and 2 (Vc1 above).

V2 = V1 + VC1

= 12 + 0.84 = 12.84 volts

Shorter distances will result in less voltage drop.

This procedure is carried out in turn for each processor position and the voltage at each location is determined. This node voltage will appear at TB 1-5 (+) and 6 (-) of each processor connected to the Power Bus. A series resistor (Rs) is connected between processor TB 1-5 and the field wiring to reduce this node voltage (the processor voltage) to a value between 12 and 16 volts.

Selection of Rs

The series resistance Rs is determined as follows:

If: $12 \leq Vs \leq 16$ Rs = 0 (no resistor required)

$16 < Vs < 18$ Rs = 100 ohms

$18 < Vs \leq 21$ Rs = 200 ohms

$21 < Vs < 24$ Rs = 300 ohms

The following example shows the power distribution of a typical maximum sector length system of five processors (10 zones), spaced 2000 cable feet apart, with the MX-5000 located 1000 cable feet from the closest processors.

The design for this system will establish the following:

(1) The voltage at each node (TB 1-5 with respect to TB 1-6 which is the power input to the processor).

(2) The value of the additional series resistor (Rs) if required.

(3) The voltage required at the output of the MX-5000 (Vpp).

The design routine is as follows:

(1) Draw the equivalent resistance network (see Figure A-1)

(2) Set V1 = 12 volts

(3) Calculate Vc1 (voltage drop by cable between XPO 1 and XPO 2) with 30 ma (current flowing between node 1 and node 2) through 28 ohms (resistance of Cable #1 between XPO 1 and XPO 2)

Vc1 = (I1) (Rc1) = (0.03) (28) = 0.84V

(4) Calculate V2 (voltage at node 2)

V2 = V1 + Vc1 = 12 + 0.84 = 12.84V

(5) Calculate Ic2 (current thru cable #2)

Ic2 = I1 + I2 = 0.03 + 0.03 = 60 ma

(6) Calculate Vc2

Vc2 = (Ic2) (Rc2) = (0.06) (28) = 1.68V

(7) Calculate V3

V3 = V2 + Vc2 = 12.84 + 1.68 = 14.52

(8) Calculate Ic3

Ic3 = I1 + I2 + I3 = 0.03 + 0.03 + 0.03 = 90 ma

(9) Calculate voltage drop across Rc3

Vc3 = (Ic3) (Rc3) = (0.09) (28) = 2.52V

(10) Calculate V4

V4 = V3 + Vc3 = 14.52 + 2.52 = 17.04V

(11) Calculate Ic4

Ic4 = I1 + I2 + I3 + I4 = (4) (0.030) = 120 ma

(12) Calculate voltage drop across Rc4

Vc4 = (Ic4) (Rc4) = (0.12) (28) = 3.36V

(13) Calculate V5

V5 = V4 + Vc = 17.04 + 3.36 = 20.4V

(14) Calculate Ic5

Ic5 = I1 + I2 + I3 + I4+ I5 = (5) (0.03) = 150 ma

(15) Calculate voltage drop across Rc5

Vc5 = (Ic5) (Rc5) = (0.15) (14) = 2.1V

(16) Calculate the Processor Power voltage (Vpp) from the MX-5000

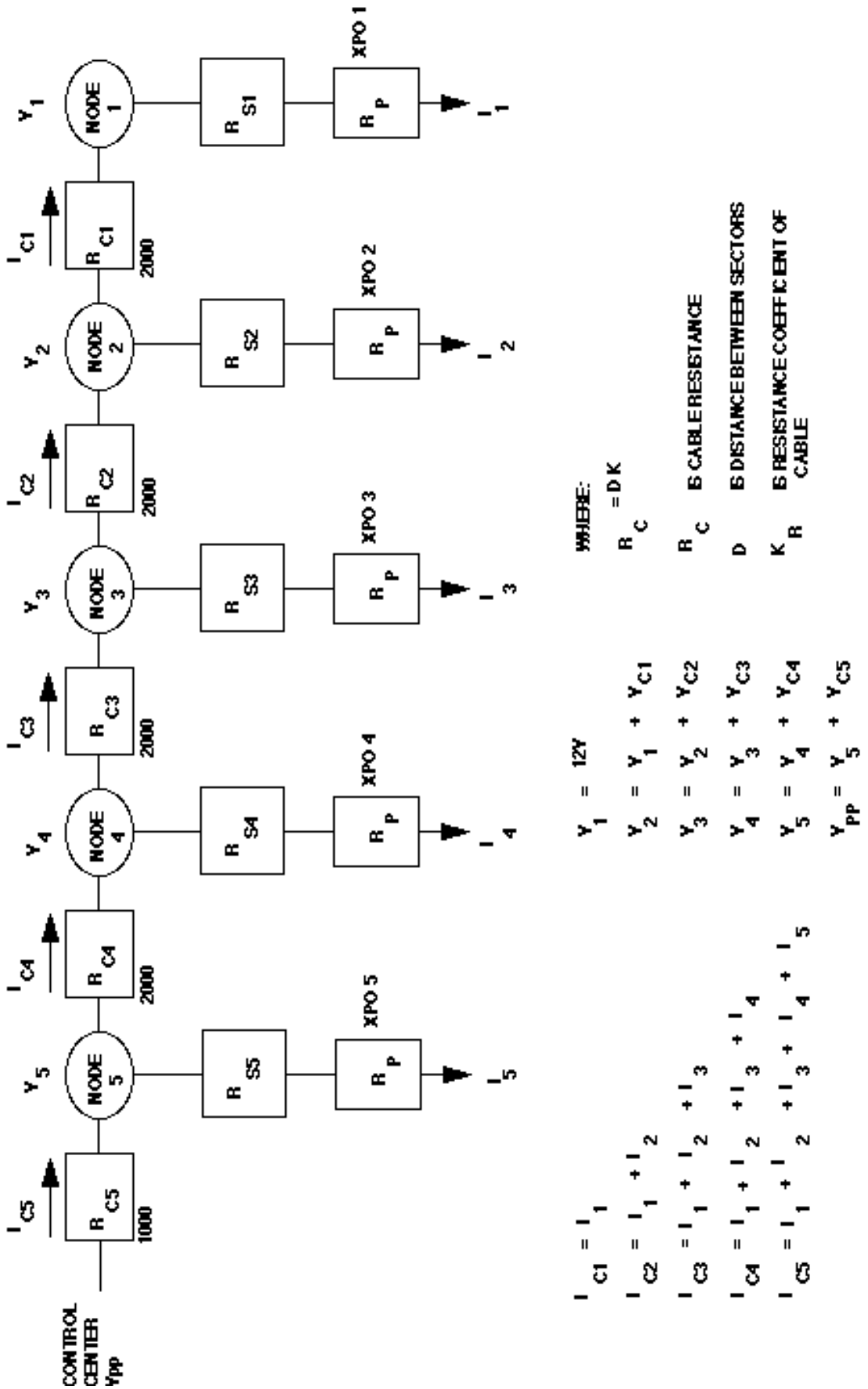
Vpp = V5 + Vc = 20.4 + 2.1 = 22.5V

(17) Set Rs = 0 for all node voltages greater than 12V but less than16V

Set Rs = 100 ohms for node voltages greater than or equal to 16V but less than 18V

Set Rs = 200 ohms for node voltages greater than or equal to 18V but less than 21V

Set Rs = 300 ohms for node voltages greater than or equal to 21V but less than or equal to 24V


CONTROL CENTER Vpp
I C5
R C5
1000
NODE 5
Y5
R S5
XPO 5
R P
I 5
I C4
R C4
2000
NODE 4
Y4
R S4
XPO 4
R P
I 4
I C3
R C3
2000
NODE 3
Y3
R S3
XPO 3
R P
I 3
I C2
R C2
2000
NODE 2
Y2
R S2
XPO 2
R P
I 2
I C1
R C1
2000
NODE 1
Y1
R S1
XPO 1
R P
I 1
WHERE:
Y1 = 12V
RC = D K
Y2 = Y1 + YC1
RC = Ω CABLE RESISTANCE
Y3 = Y2 + YC2
D = Ω DISTANCE BETWEEN SECTORS
Y4 = Y3 + YC3
KR = Ω RESISTANCE COEFFICIENT OF CABLE
Y5 = Y4 + YC4
YPP = Y5 + YC5
IC1 = I1
IC2 = I1 + I2
IC3 = I1 + I2 + I3
IC4 = I1 + I2 + I3 + I4
IC5 = I1 + I2 + I3 + I4 + I5

APPENDIX B

Initial Installation Planning

The MX-5000 security system is easiest to install, program, and service when the system design is simple and logical. The following general rules apply to installation planning:

- ▷ Alarm zones typically proceed in order, clockwise, or counterclockwise around the security perimeter, beginning at the main gate.
- ▷ The FPS-2-2M and GL-M fence protection systems each contain two protection zones, which should be used in order (e.g., zones 1 and 2 or zones 11 and 12, etc.)
- ▷ Since some protection zones are a considerable wiring distance from the central control point, the amount of power loss through the system wiring must be calculated in accordance with Appendix A.
- ▷ The MX-5000 has up to three external multiplex buses, each capable of connecting to ten transponders or 20 alarm zones. The MX-5020 has one external multiplex bus for 20-zone capability; the MX-5040 has two, or 40-zone capability; and the MX-5060 has three, or 60-zone capability.

An example system layout with 12 fence protection zones and one microwave zone is shown in the figure on the following page. The accompanying table indicates which alarm zone is connected to which FPS processor. This information will be used directly to program the MX-5000.

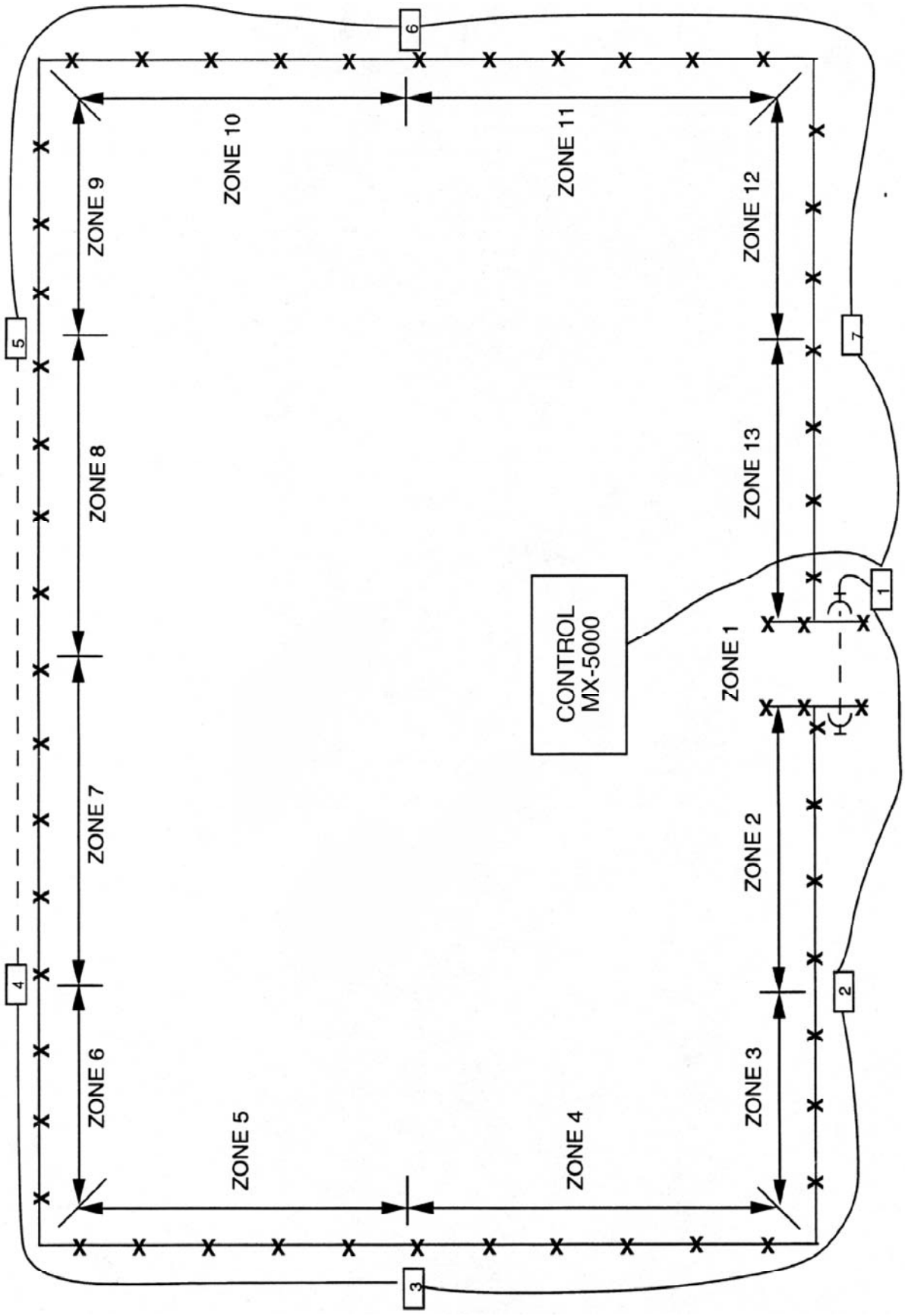
Brief description of figure and table:

This is a 13-zone system with one microwave and 12 FPS zones. The 12 FPS zones are connected to 6 processors (XPOs), and the microwave is connected to a stand-alone transponder (SAT). Zone 1 is the microwave zone. Since there is no other zone nearby, the other zone contained in the SAT will not be used. Zones 2 and 3 are served by transponder (XPO) 2, zones 4 and 5 by transponder (XPO) 3, and so on to zones 12 and 13 by transponder (XPO) 7.

Conduit connects the transponders from the central control building to each transponder on the string. For convenience and to keep the wire length as short as possible, two cables are run from control to the fence line, where it splits and runs clockwise and counterclockwise around the perimeter. No wire is needed between XPO 4 and XPO 5 because each is already connected to the loop. However, this additional connection will ensure all transponders will still work if there is a single line break in the loop (a form of Class A wiring).

CAUTION: When more than one multiplex loop is necessary, each loop should be in its own conduit. If two or more multiplex loops must share a conduit, cable with individual shielded pairs and an overall shield must be used. Consult factory for details.

The table shows which zones are connected to which transponder. For example: zone 1 is connected to transponder (XPO) 1, sensor 1. Transponder 1, sensor 2 has no connection and is not used. Zone 2 is connected to transponder 2, sensor 1; zone 3 to transponder 2, sensor 2, and so on around the loop. The default configuration is shown to give you an idea of the amount of program changes that will be necessary.



Example System Layout

Table 1
Sample System 1 Layout
Zone Configuration Programming

DETECTION ZONE	DEFAULT ZONE CONFIGURATION	CONNECTED TO TRANSPONDER #	TRANSPONDER SENSOR NO.	MX-5000 PROGRAM CODE
1	01.1	1	1	01.1
2	01.2	2	1	02.1
3	02.1	2	2	02.2
4	02.2	3	1	03.1
5	03.1	3	2	03.2
6	03.2	4	1	04.1
7	04.1	4	2	04.2
8	04.2	5	1	05.1
9	05.1	5	2	05.2
10	05.2	6	1	06.1
11	06.1	6	2	06.2
12	06.2	7	1	07.1
13	07.1	7	2	07.2

MX-5000 and zone configuration examples:

01.1 means transponder 1, sensor 1
01.2 means transponder 1, sensor 2
16.2 means transponder 16, sensor 2

When programming this system, configure modem 1 with 13 zones. Modems 2 and 3 will be set to DIS (disabled) or 0 zones. Set the zone configuration using the information in the table as follows:

- Zone 1:01.1, meaning zone 1 is located on transponder (XPO) 1, sensor 1:
- Zone 2:02.1;
- Zone 3:02.2; and so on until zone 13:07.2.

When calculating the power loss in the field cabling, ad detailed in Appendix A, you will have two strings of transponders from the central control point, as follows:

- String 1: XPO 1, XPO 7, XPO 6, XPO 5
- String 2: XPO 2, XPO 3, XPO 4.

Calculate the loss in each line and specify the correct resistor for each unit in accordance with Appendix A.

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APPENDIX C

Special MX Functions

Several special functions are available to the operator including zone status printout and restoring the MX configuration from a back-up diskette.

Printing System Status

You may print a status of all MX-5000 zones at any time. This feature may be useful at shift change to inform a new operator of the system status. Enabling print status will immediately print out the current status of all the zones showing the individual secure, alarm, access, or tamper zone conditions.

To print system status, press "0" followed by the ACC key. When this is done the LCD will read Exit. Press ACK to return to normal operation, otherwise press the AUD/ON key to select among the other options.When the LCD reads Print Status, press ACK and the printer will immediately print the zone status report.

Restoring MX Configuration from a Back-up Disk

If for any reason your MX configuration is lost, it can be restored from a back-up disk which was copied earlier. To resore the MX zone configuration, press "0" followed by the ACC key. When this is done the LCD will read Exit. Press ACK to return to normal operation, otherwise press the AUD/ON key to select among the other options. When the LCD reads Restore Config, press ACK. The LCD will read Load Config?NO.

Press the AUD/ON key again so the LCD reads Load Config?YES. Press the ACK key and the LCD will prompt you to insert the back-up floppy disk. Insert the disk and press ACK again.

When the LCD reads Restore Complete, remove the diskette and press ACK. The MX will restart with the restored configuration.

Parallel Printer Connections

A parallel type printer can be connected to the "printer" port on the back of the MX-5000. No special setup or configuration steps are involved, the port is automatically enabled. The printer output is compatible with all printers supporting Epson FX-100/FX-80 protocol.