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DESIGN WITH INTELLIGENCE

MZP Series

Paging & Program Systems

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User Manual

www.intelix.com

Introduction

Congratulations on your purchase of the Intelix MZP paging and program routing system.

This manual covers all aspects of the design, use, installation and programming of the Intelix MZP system. Since the MZP system is a unique combination of hardware and software, Intelix strongly advises the installation of an MZP system be undertaken only after the thorough reading of this manual. Customer support is available through Intelix if you encounter problems with your MZP system.

This manual is divided into five sections:

1) The **Introduction** introduces the basic concepts of installing and programming your MZP system.

2) The **Hardware Installation** section takes you from a wired building to a fully installed MZP hardware set, tested and ready for programming.

3) The **Application Creation** section explains how to program the hardware using the MZP Designer software to meet the end user's requirements.

4) **Wiring the Building** is for contractors who have not yet prepared the job site to receive Intelix MZP hardware.

5) The **Appendices** provide detailed technical information on a range of subjects and are referenced from the other sections.

The information below is filled out by the factory. Please keep it in a safe place for future reference.

Model/Serial Number	
Software: crosspointboard ROM	
Application ROM	
Communications ROM	
CDROM/diskette	

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1.0 System Overview

Each Intelix Multi Zone Paging and Program Distribution system (MZP)includes a matrix mixer, and a variety of remote control devices. Remote control devices can be combined, in any desired way, to produce custom-tailored paging and/or program (background music) selection and volume control stations. The stations are connected to the Matrix via a custom serial data bus (the ReO bus). The MZP system can also be controlled via RS232. A complete list of the MZP RS232 protocol can be obtained at www.intelix.com

The hardware components of the System (audio inputs, outputs, zones and Comet remote stations) are configured and their operations programmed using supplied MZP Designer setup and control software. In the programming mode you enter the desired number of audio sources, destinations, paging stations and program selector locations. Exact functional descriptions are added to the system using drop-down lists and by typing descriptive names. Paging levels, routing, remote control personalities, duck level during page and any other parameters of the system are defined in this way. Once the design phase is complete, you download the design to the system hardware and begins to run normally. Changing system functions and altering the existing system is possible at any time (including while the system is in use), using the software.

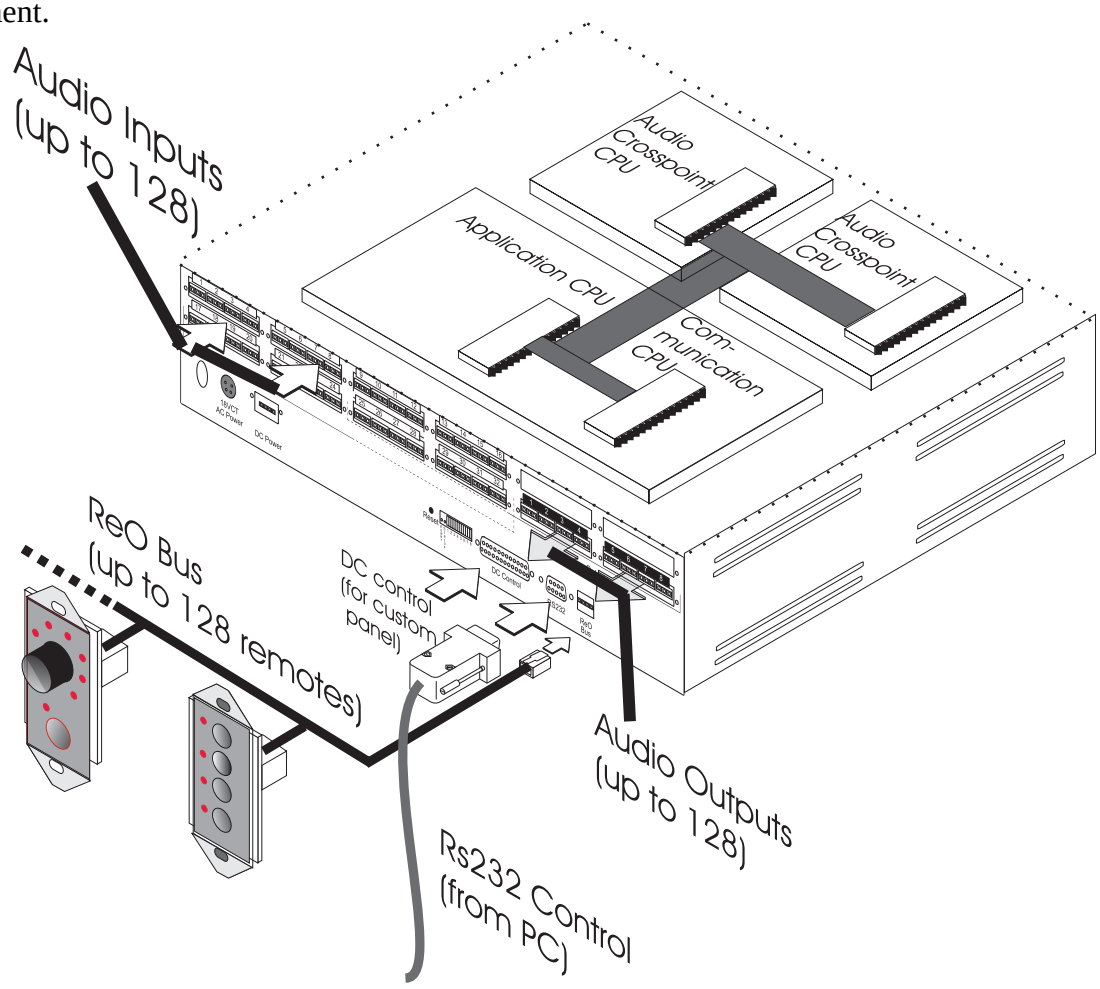
1.1 Matrix Mixer Overview

At the heart of the MZP Matrix Mixer is the **application CPU**, which routes data and contains the software that "runs" the device. The application CPU also contains several "device-level" pieces of information and is responsible for RS-232 communication. As shown in the drawing below, the application CPU off-loads many real-time tasks to other CPUs. These multiple CPUs are tightly coupled to provide real time processing and fast response time.

The audio crosspoint CPUs routes and mixes the audio signals from audio inputs and outputs. Because these functions are distributed among several processors, it is possible to perform complex tasks, such as independent crosspoint ramping, slewing, and implementing nonlinear response curves. These tasks are used by the application CPU to implement higher-level functions such as show control, multi-zone paging, and room combining.

The ReO devices are the user I/O interfaces. The ReO bus has its own CPU (the "Communication CPU") which constantly polls the remotes on the bus and reports to the application CPU. The remote devices are logically grouped together into "stations" to provide flexible, coordinated control locations for paging, audio source selection, and volume control.

The Matrix Mixer contains a 25-pin connection, capable of carrying 8 binary inputs and 8 binary outputs. This I/O is generic, so that the Matrix Mixer can interact with custom panels or other pieces of equipment.



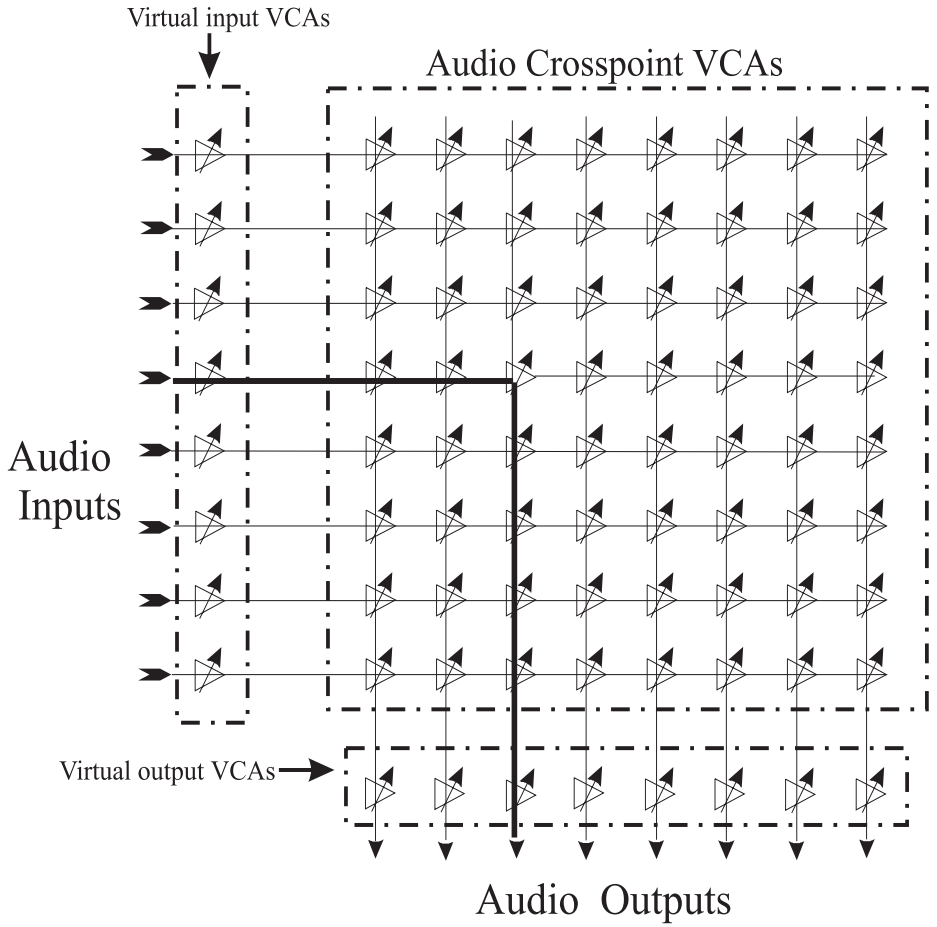
1.1 Matrix Mixer Overview continued

Audio Matrix

The audio matrix is the heart of the MZP used to route and mixes audio signals from multiple sources to multiple destinations. The audio matrix is designed so that *audio inputs can be independently mixed to all outputs simultaneously.*

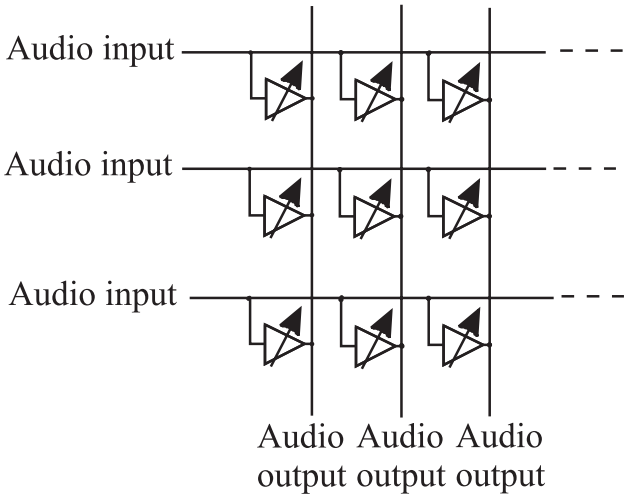
Each “row” of the matrix represents an individual audio input, and each “column” of the matrix represents an individual audio output. As shown in the sketch of an 8 X 8 Matrix below there is voltage controlled attenuator (VCA) at every crosspoint, and “virtual” VCAs on each input and output, giving maximum control flexibility.

On the following pages appear more detailed drawings of individual crosspoints, showing the parameters available for controlling each crosspoint.



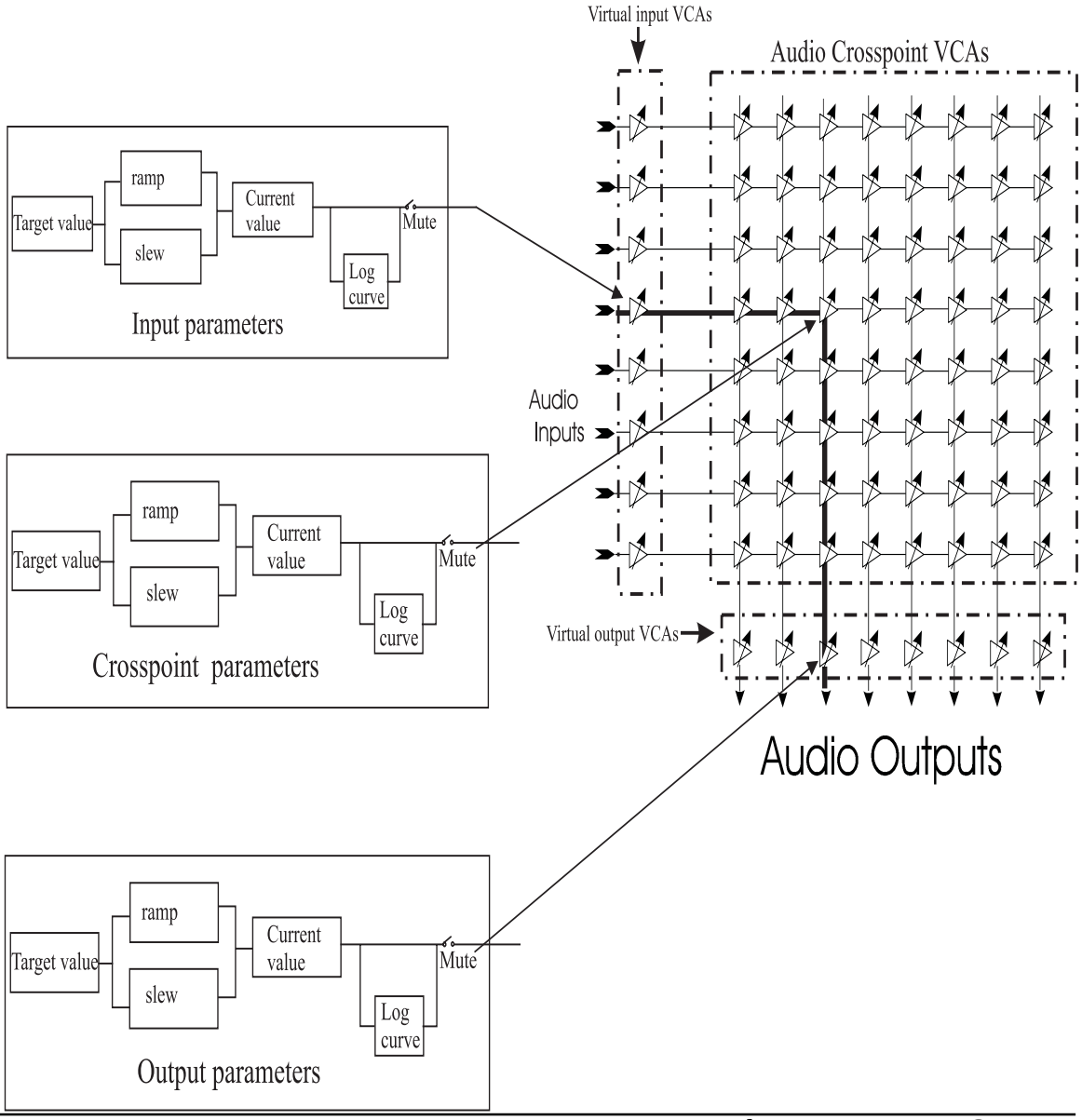
1.1 Matrix Mixer Overview continued

This drawing shows how the matrix is actually wired. Each input and output is independent of each crosspoint; i.e. a crosspoint affects only a single input/output pair.



1.0 System Overview continued

This drawing shows the a typical audio signal path (input 4 to output 3) and the parameters that control each crosspoint in the matrix mixer's grid of crosspoints. Note that each crosspoint has multiple controlling parameters.



1.2 ReO Remote Overview

Intelix Comet Series Remotes are single gang “decora” control modules for the Intelix MZP system. Typically wall-mounted, Comet remotes function as convenient user interfaces for paging, program source selection and volume control.

The carefully optimized design allows the Comet remote controls to conveniently interconnect in LAN bus topology. Up to 128 remotes can be utilized with one MZP matrix mixer via ReO bus communication. Each remote’s “personality” is then easily assigned using the MZP Designer software’s stations screen. This “personality” can easily be reassigned as applications change.

1.2.1 Comet Remote Descriptions

Comet Tail: The Comet Tail is a digital remote control device designed for volume control and mute functions.

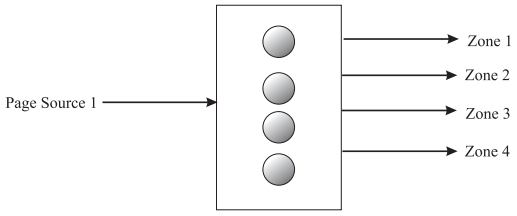
Comet-4: The Comet-4 is a four button digital remote control device designed for source selection or page routing functions.

Comet-0 I/O: The Comet-0 is a version of the Comet-4 remote control that has no buttons or LEDs. This device is used when external contact closures or 5V logic signals are used to trigger a source selection or page routing function. There are four 5V output drivers for triggering external devices.

1.2.2 Station Overview

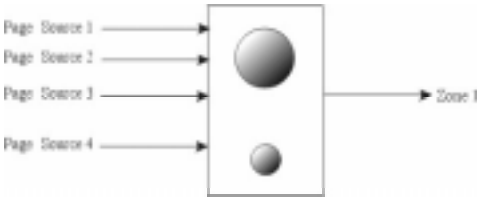
A station is a logical grouping of Comet remotes (Comet-4s and/or Comet Tails) which control the routing and volume of audio inputs into output zones. There can be up to 32remotes in a single station, and up to 128 stations in a single system, up to a limit of 128 total remotes in the system. The remotes are described in detail in Appendix F. There are four types of stations as shown below:

Paging Station



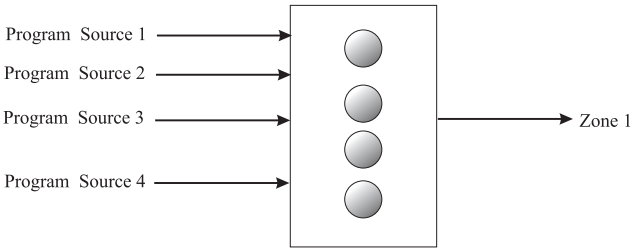
A paging station routes a single paging input (such as a paging microphone) to any of several zones. It is typically located at a receptionist's or secretary's desk. Zones are selected by remote buttons in the paging station. If a zone is already receiving a page when selected, that zones LED will flash. A paging station can optionally contain a Comet Tail to control the level of all outgoing pages.

Page Volume Station



A page volume station controls the volume of all pages into a single zone. The station is located in the zone whose page volume is to be controlled. Using this type of station, different zones can have a page volume station to set a level of page volume appropriate to their ambient noise level.

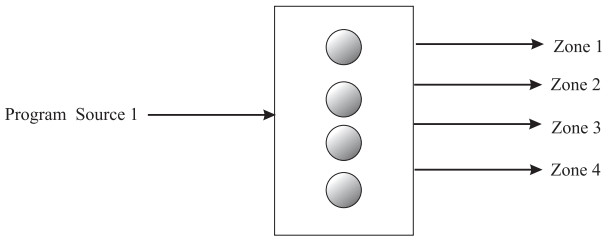
Program Select Station



A program select station routes multiple program sources (CDs, tuners, tapes etc.) into a single zone. The station is located in the zone and contains a Comet-4 button for every program sources needed by that zone. It can also contain a Comet Tail to control program volume in the zone.

There are two types of program select station, a selector and a mixer. The selector selects just one program source at a time. A mixer on the other hand mixes together all program sources that are selected; i.e. each button latches on its program source until that button is pressed again.

Program Distribution Station



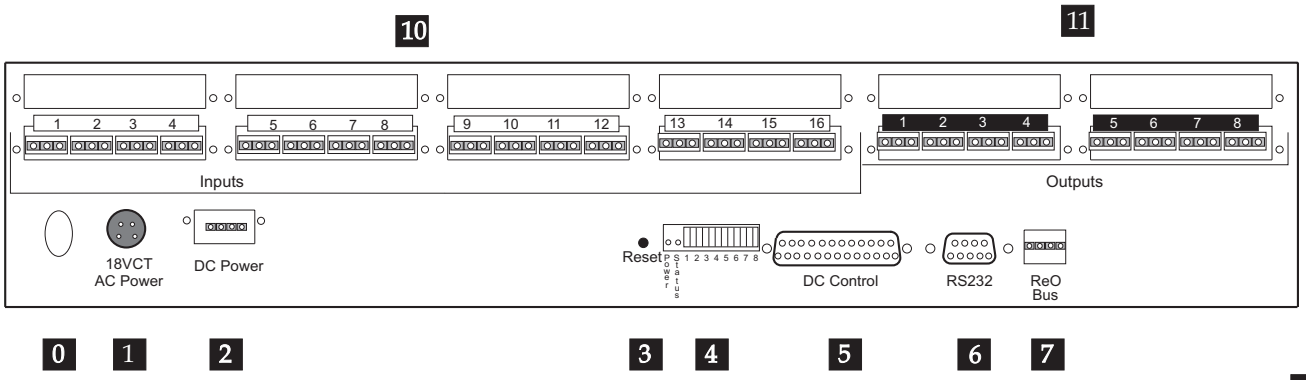
A program Distribution station routes a single program input to many output zones. It is typically mounted in the control room with the MZP, and not accessible to the users. This type of station can save hardware cost, complexity and increase security in certain designs. The MZP automatically keeps the multiple controls on that input in sync, so that the LEDs on a Comet-4 and the bar graph of a Comet Tail always reflect the same information.

1.3 Matrix Mixer Panels

1.3.1 Matrix Front Panel

There is one red LED on the front panel. This LED when lit indicates that there is power to the matrix. **There is no power on/off switch on the Matrix.**

1.3.2 Matrix Rear Panel



0 Ground Lift Jumper Access - Access to ground lift jumper, which connects the chassis to electronic ground.

1 18 VCT 4-pin DIN receptacle - for connection to an AC supply. Power status is indicated by the red LED on the front panel. This is the only means of powering down the matrix.

2 DC power receptacle - for connection to a DC supply (+, - 18 VDC) or batteries

3 Reset button - Restarts Matrix microprocessors, does not reset program information.

4 LED/DIP switch position:

"Power" (red) LED, when lit, indicates that the Matrix CPU is powered.
"Status" (green) LED, whose function depends upon settings made in software.
DIP switches:"up" position indicates the "on" condition "down" position indicates the "off" condition. (see section 3.5.1)

5 DC Control - DB-25, 25-pin (female) receptacle for contact closure input/output driver connections. (See Appendix A.)

6 RS232 - DB-9, 9-pin (female) receptacle through which the Matrix is linked to computer (PC) and other RS232 devices. (See section 3.5)

7 ReO Bus - 6-wire, modular jack receptacle, similar to RJ11 or RJ12, through which the Matrix is linked to the ReO remote unit(s). The communication link is synchronous and serial. (2 ground wires, 2 clock wires, 2 data wires). The wiring connections to all the remote units are direct pin to pin. Any new connection **must** have the same pin order to be functional. (See section 12.1.2)

10 Audio Inputs **11 Audio Outputs**_-Strips of screw-terminal ("Phoenix-type") plug receptacles (male). Each block accommodates four triplet plugs.

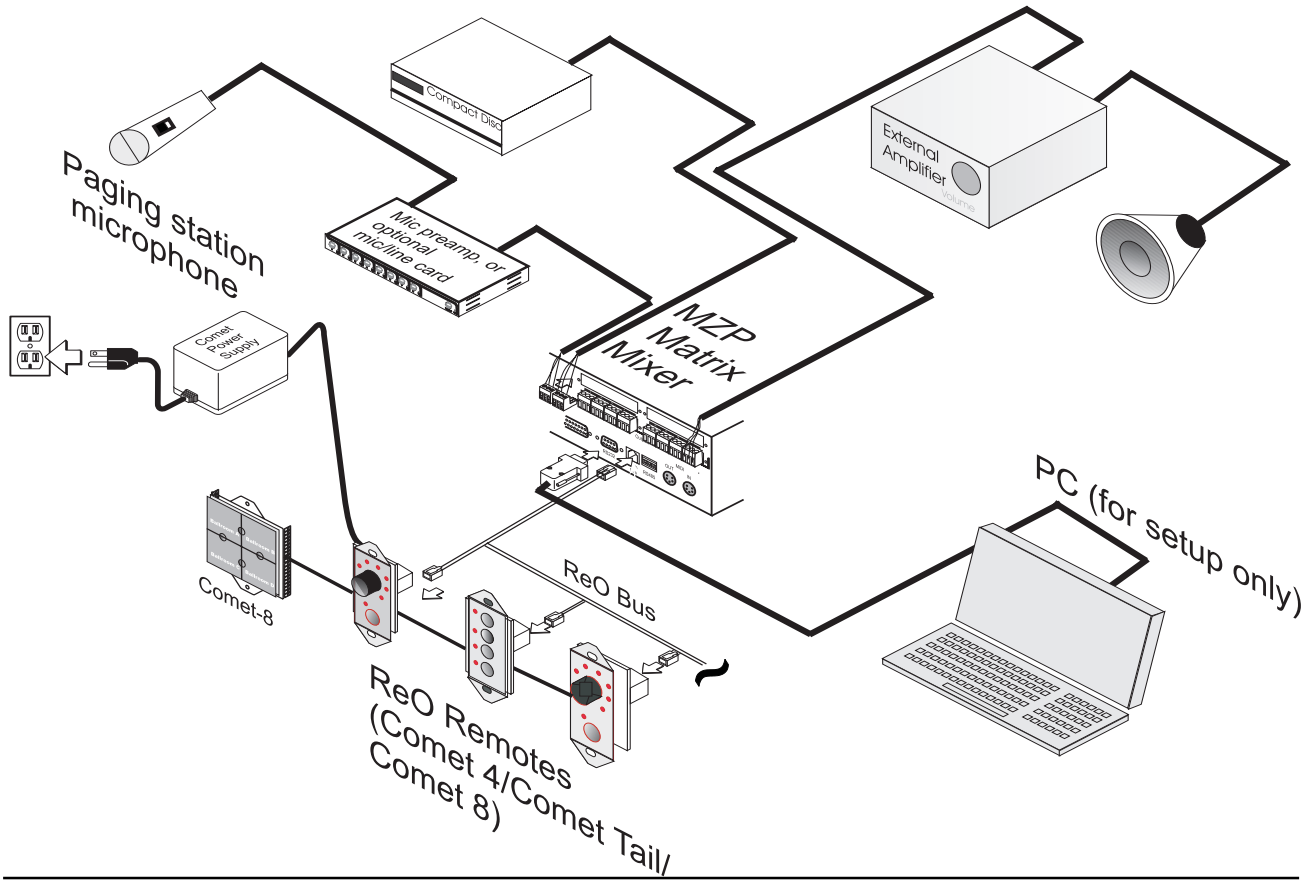
2.0 Quick Start

This section will explain two major concepts: how to physically install the MZP system, and how to program it to create the required application.

The **Hardware Installation** section takes you from the installation of the MZP hardware components through an audio test of the completed hardware installation. It assumes that the job site has been completely and correctly wired.

The **Application Creation** section shows you how to use the installed MZP hardware and Designer software to program and test your customer's application. It assumes that your customer's application has been designed and documented. This manual provides a set of application design templates in Appendix J-Conference Center Design.

The figure below shows the basic components and interconnections of an MZP system. Shown is a mixture of Intelix supplied and contractor supplied components: Intelix supplies the MZP matrix mixer, the Comet remotes, PC software, and optionally, the ReO bus power supply and microphone preamps. Contractor must supply microphones, program sources, external amplifiers, speakers, and PC (needed for setup only).



2.1 Hardware Installation

The physical installation section will guide you from the point at which you begin installation of the matrix mixer and ReO remote controls through an audio test of the installed system. It is assumed that the job site is wired at this point, i.e. all wiring for audio and the REO bus is complete. If the building is *not* wired see the section 4.0. **You will follow these steps:**

2.1.1 Mount and power the MZP Matrix Mixer in the rack.

There should be at least 1-2" of free air space at the sides of the matrix mixer for proper ventilation. Do not install directly above a power amplifier or other significant heat source. If you have unusual grounding requirements, see Appendix C. Ensure that the ReO bus is ***not*** plugged into the matrix mixer.

2.1.2 Connect Audio Sources and outputs

All audio sources and outputs should be connected to the matrix mixer via the (removable) Phoenix connectors on the rear panel. All inputs are line level. Paging microphones must be preamplified to line level. Recommended input connection methods are shown in section 3.4.

2.1.3 Install remote controls in their assigned locations on the ReO bus

The locations for the remotes should be a part of your design documentation. Install each remote in its correct position. Plug in the power connection, verify that the LED single blinks at a rate of about once per two seconds. Now plug the REO bus connection (the RJ12 plug) into each remote. ***The ReO bus should still not be connected to the matrix mixer.***

2.2 Application Creation

This section begins with section 6.0 and will guide you from the end of the physical installation section through a final test and balance of the end user's system.

2.2.1 Connect the control PC to the MZP Matrix Mixer

Connect a DB-9 cable between your PC serial port and the female DB-9 receptacle on the matrix mixer (labelled "RS232"). The cable should be a "null modem" configuration. For details on this connection see section 3.5.

2.2.2 Install and start MZP Designer software on the controller PC

See section 5.0 for program installation. For connection details see section 3.5.

2.2.3 Define the System

Use MZP Designer software to define audio inputs, outputs, zones, and ReO remote stations. For details see section 6.0.

2.2.4 Connect the ReO bus to the MZP Matrix Mixer.

For the *first time* connect the ReO bus to the matrix mixer by connecting the RJ12 connector on the ReO bus into the RJ12 connector on the back of the matrix mixer as shown in the drawing in section 1.3.2.

2.2.5 Perform remote recognition.

Since your remotes have already been programmed, either at the factory on the bench, you may now put the matrix in “Run” mode and begin testing the system. If you are using Discovery Mode for remote recognition, go to section 8.4.

2.2.6 Define and program the remotes

The programming of the remotes is done through the MZP software and is guided by the definition of remote functions in your design. See the section “**Defining Controls**”.

2.2.7 Test and adjust the system

To perform a system test you will need to have connected and turned on all audio sources. Also the MZP matrix mixer *must be in Run mode* (see section 8.3). Testing is be done by exercising each remote and listening to verify correct operation.

3.0 Matrix Wiring Details

3.1 Mounting the MZP in the Rack

The MZP matrix mixer mounts in a standard width rack. The number of rack spaces required depends on the number of I/Os in your particular matrix mixer (standard configurations are 2RU). Because the MZP generates heat at an industrial level, it is important to meet the following ventilating requirements.

1) Make sure that there is at least 2 inches of free air space on both sides of the matrix mixer. The mixer's ventilation slots are on the side of the chassis, so a free air column is required to keep proper ventilation to the matrix.

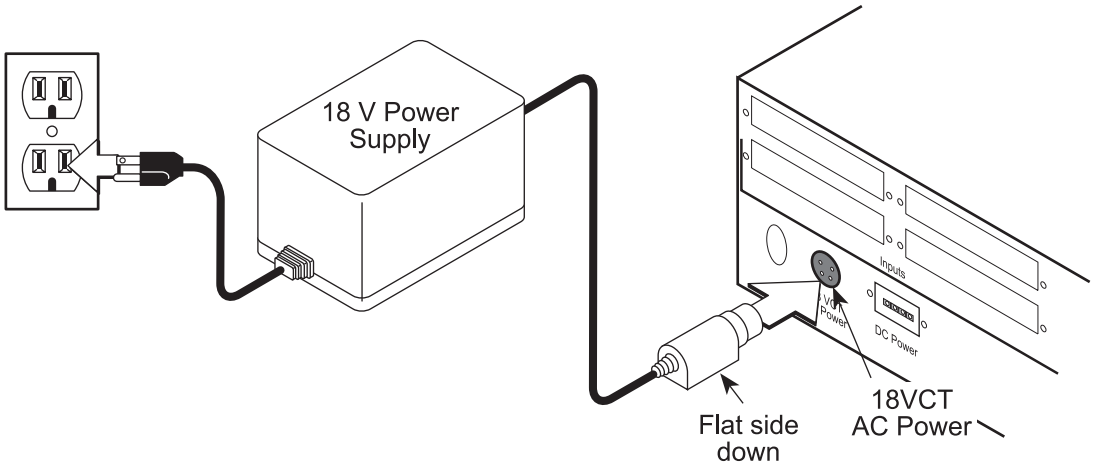
2) All matrix mixers larger than 8 outputs are equipped with a front-mounted fan. The fan must be unobstructed in the front of the matrix, so ensure there are no closeable doors on the rack that might seal the fan from a steady supply of fresh air.

3) Intelix recommends that you not mount the matrix mixer next to a power amplifier or any other source of significant heat. Leave an empty rack space above and below the matrix mixer.

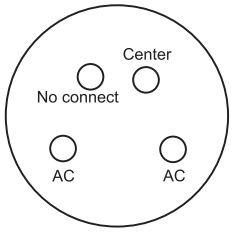
3.2 Connect the Power Supply

1) Plug the power DIN connector into the back of the matrix mixer as shown below.
2) Plug the power supply into a standard 120 VAC outlet.
3) The power LED on the front of the matrix mixer should now be lit.

There is no power switch on the matrix mixer. For information on grounding of the matrix mixer see Appendix C. For information on using a DC power supply, see Appendix B.



Intelix supplies an 18 Volt, 3.0 Amp center-tapped transformer to power the mixer. Large matrix mixers may require a larger power supply. If another AC supply is used instead, it should be of equal voltage and have at least a 60 Volt-Amp rating. The details of the **AC Power Jack** on the rear panel are as shown in the following figure.



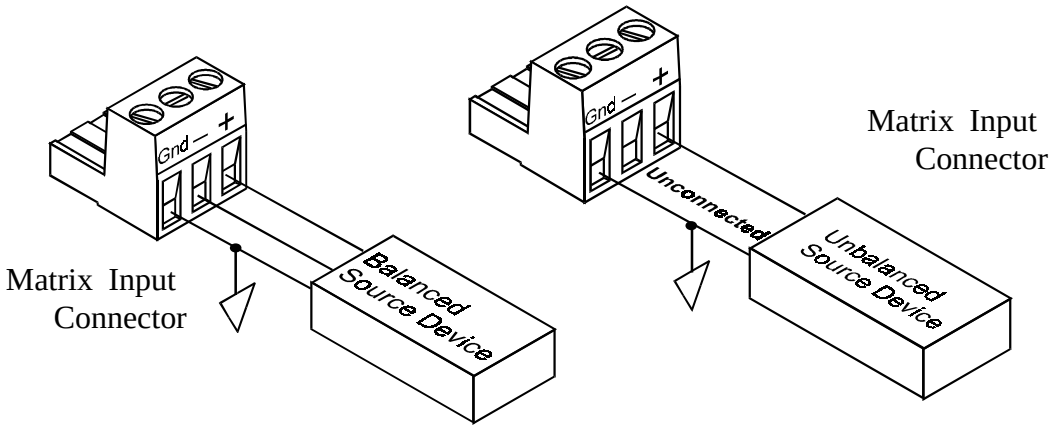
4-pin DIN Connector, viewed from the rear of the Matrix.

3.3 Connecting Audio Inputs and Outputs

3.3.1 Audio Inputs

Any line-level audio input can be routed and mixed using the MZP. The inputs are connected to the Matrix via removable screw-terminal ("Phoenix-type") plug receptacles. The audio input to the Matrix can be either electronically balanced (impedance of 20 KΩ) or you can unbalance it to 10 KΩ. The correct way to unbalance the input is to "float" it, i.e. leave the unused pin open, as shown below. (For other methods of wiring Inputs see sec. 3.4)

Fig. 9. These drawings show how balanced and unbalanced inputs should be connected to the Matrix audio inputs.



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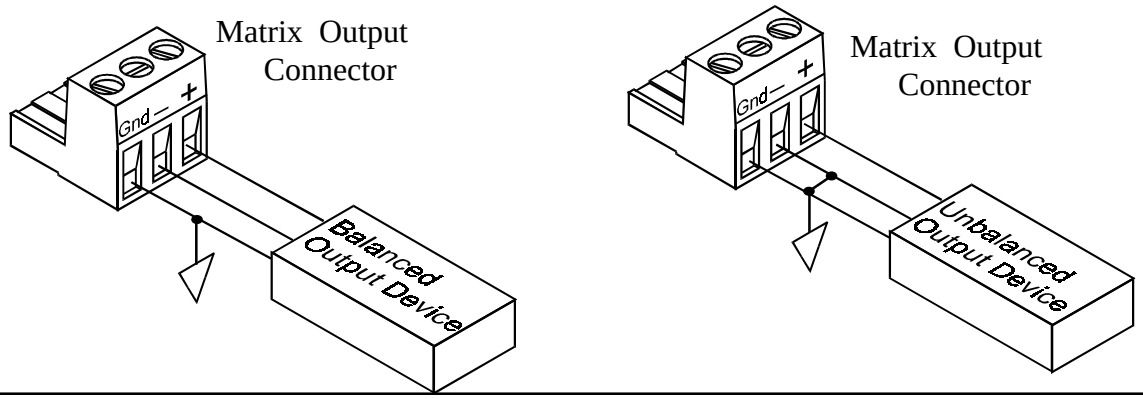
3.3.2 Audio Outputs

Audio output devices are connected to the Matrix via removable screw-terminal ("Phoenix-type") plug receptacles. The audio output from the Matrix is electronically balanced (impedance of 440 Ω), but it can be unbalanced (impedance of 220 Ω) by the user. The correct way to unbalance the output is to tie the negative leg to ground, as shown below.

The Matrix is designed to give a 6 dB boost (which compensates for the signal-level loss due to unbalancing) to a signal unbalanced in this way. *Therefore this method of unbalancing is preferable to floating one side of the pair of leads to unbalance it.*

Fig. 10. Matrix output connections for balanced and unbalanced output devices.

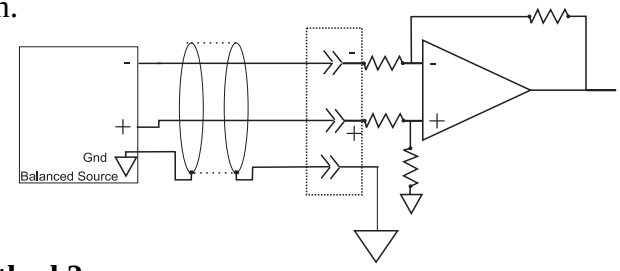


3.4 Recommended Input Wiring Methods

These are the best ways to connect sources to your Intelix mixer. The mixer input is always balanced. From the drawings below choose the wiring method for your input device (either balanced or unbalanced).

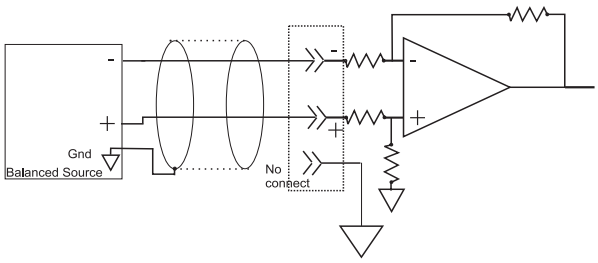
Balanced Source to Balanced Input - normal

Shown below is the normal wiring method for a balanced source device. It has +6 dB gain and excellent ground current and noise rejection.



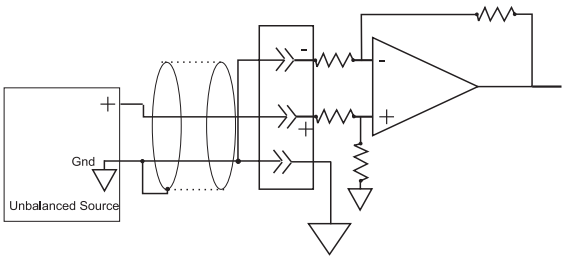
Balanced Source to Balanced Input - method 2

If the method above does not work in your application, use the wiring shown below. This method can solve certain ground loop problems. It has +6 dB gain and good noise and ground loop rejection.



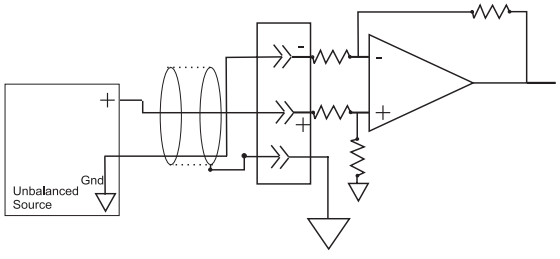
Unbalanced Source to Balanced Input - method 1

For an unbalanced source device, the drawing below shows the best wiring method. Because of the design of the Intelix mixer, this wiring provides a slight (+6 dB) boost, and moderate noise and ground loop rejection.



Unbalanced Source to Balanced Input -method 2

For an unbalanced source device, the drawing below shows an alternative wiring method. Because the grounding of the minus input is not to the mixer ground, this method does not provide the +6 dB boost. Ground current and noise rejection is good.



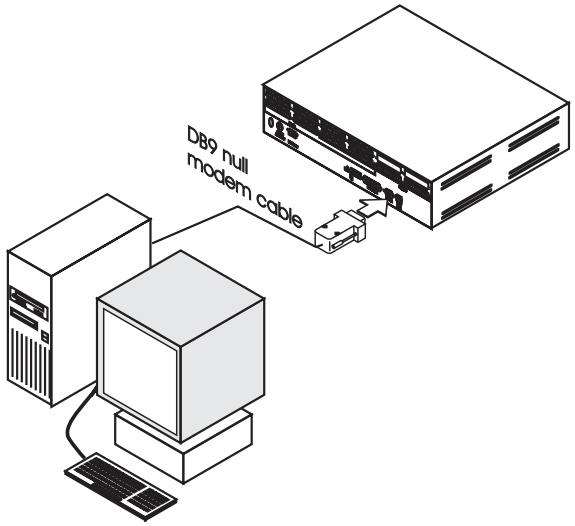
3.5 Connecting the Control PC to the MZP

Before you can program your Matrix Mixer, you need to have a personal computer (desktop or laptop) capable of running the MZP program. Your computer must meet these requirements:

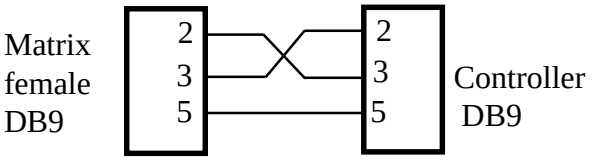
√ PC computer (Pentium 133MHz and 32M RAM or better) with a CD ROM drive
√ Windows '95®
√ Serial port connected to RS232 connector on Matrix Mixer
√ a null modem cable

The connection between the MZP matrix mixer and your control PC is made with a "null modem" cable with a DB-9 connector on the matrix end as shown below. The wiring diagram for a null modem cable is at the bottom of the page. The drawing you use will depend on the connector on your PC. Most PCs have either a DB-9 or a DB-25 on the serial port. The cable wiring for both connectors are shown.

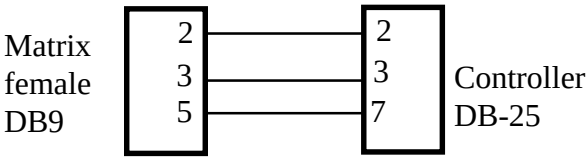
Note: Some devices require that Clear to Send and Ready to send (pins 7 and 8) be tied together.



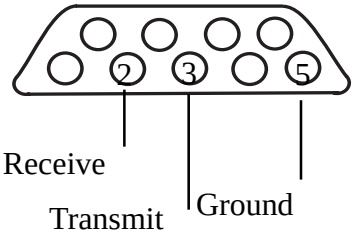
RS232 DB9 to DB9 connections for a null modem cable.



RS-232 DB9 to DB-25 connections for a null modem cable.

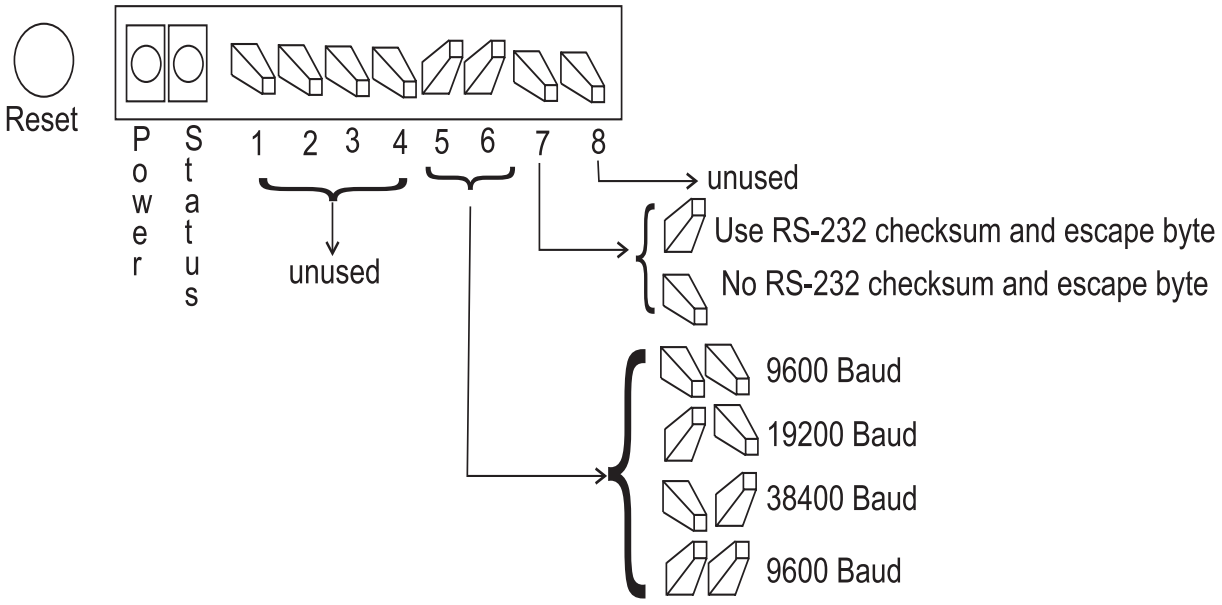


The connections of the MZP's DB9 connector for RS-232 communication.



3.5.1 DIP Switches

There are eight DIP switches on the rear panel of the Matrix (see drawing below). For all DIP switches, the "up" position indicates the "on" condition, and the "down" position the "off" condition. The function of these switches is shown below.



DIP switches 5 and 6 allow the RS-232 baud rate to be fixed at one of three values: 9600, 19200 or 38400. The Windows MZP software does not support 38400 baud. But that speed can be used by AMX, Crestron and custom controllers.

DIP switch 7 allows the RS-232 checksum and "escape" byte to be toggled on or off. These should be turned *off* in installations which include a permanent RS-232 controller, such as AMX, Crestron or custom PC program. The RS-232 checksum and escape byte should be turned *on* in installations where the RS-232 communication may be hindered because of cable length (greater than 50 feet) or lack of shielding from external electronic noise.

Note: *After changing any DIP switches, you must resest the matrix by pressing the reset button on the rear panel. Changes will not take place unless you reset the matrix.*

4.0 ReO Bus and Comet remote Wiring Details

This section is concerned with the wiring of Comet remote devices, including data (ReO bus) and power to the remotes. Data and power should be run with separate cabling to avoid interference.

Whether the system is being installed into a new building or retrofit into an existing one, you must allow for several kinds of wiring.

a) The **ReO bus**. This is the data bus for all remote devices, which are serially connected to the Matrix ReO port.

b) **Power to the remotes**. The ReO devices are powered by 9-18V AC or DC.

4.1 Installation of ReO Bus

4.1.1 Wire Type

Category 3 or 5 (10 Megabits/sec) or better.
Examples are West Penn WP52995 and Belden 1245A (4 pair unshielded solid 24 gauge).

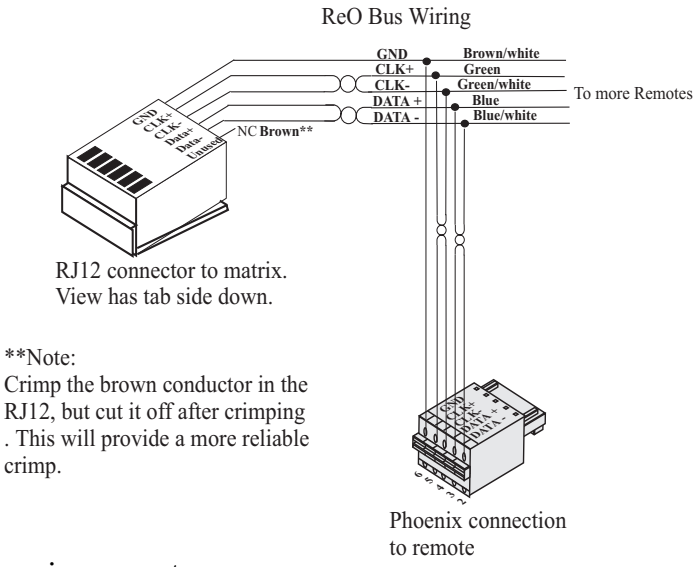
The ReO bus, which interconnects the remote control devices and the Matrix uses a six conductor wire terminated in an RJ12 modular connector . The bus contains two twisted pairs: clock, and data, plus one ground.

4.1.2 Connections

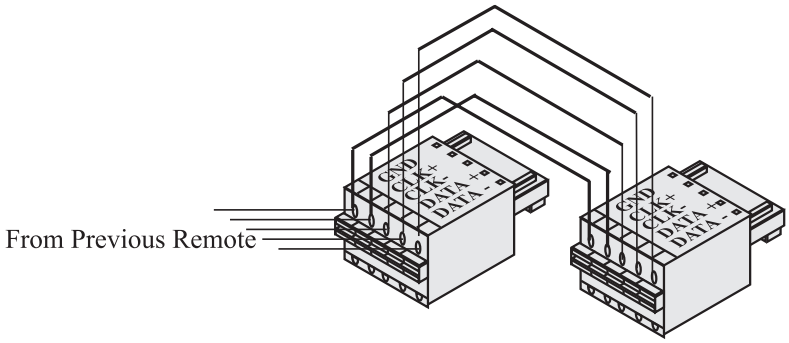
Cables are terminated at the matrix end by an RJ12 modular plug, and at the remote end by a Phoenix type plug.

The ReO bus is a parallel bus, i.e. all pins of a particular number are wired together as shown below. This is a common cause of ReO bus error. Make sure that each cable is wired correctly on *both* ends. Note that twisted pairs should be placed on pins 2 and 3 (data), 4 and 5 (clock).

The actual color code used is arbitrary



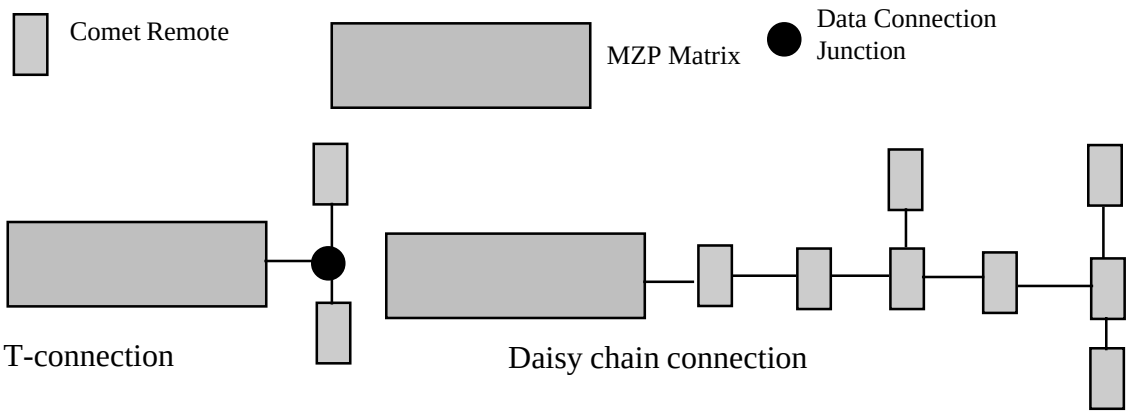
The Phoenix connector allow the daisy chaining of REO bus remotes as shown at the right. Multiple wires inserted in one remote connection should be soldered together. Wire can be released by pressing the orange button for the connection.

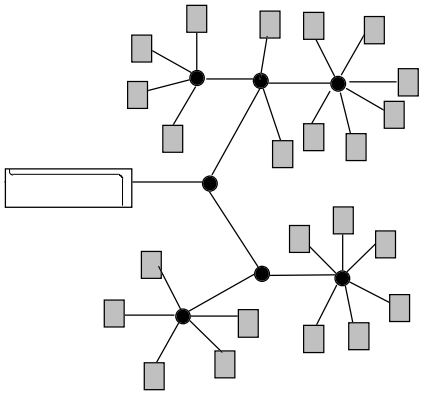


Daisy Chaining Remotes

4.1.3 ReO Bus Topology

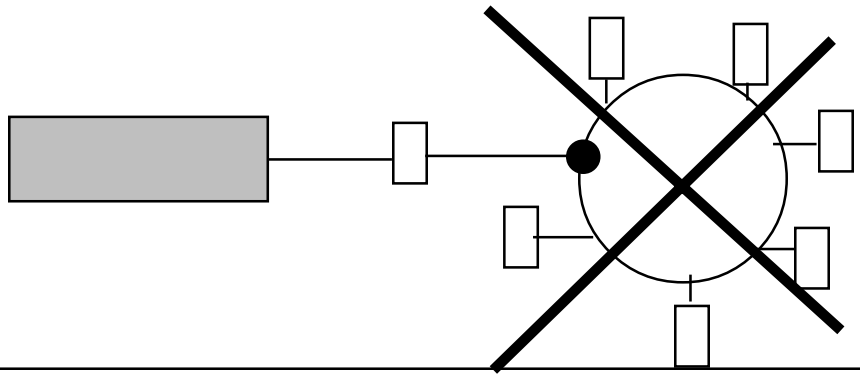
The topology of the ReO bus connections can take many forms to accommodate almost any application. Among the most commonly used forms are T-connections; daisy chains and stars. Each of these connection types are shown below.
Note: *Because of its advantages in troubleshooting and maintenance, Intelix strongly recommends using the star topology whenever possible.*





Star connection.

There is only one forbidden topology: the ring. This is because the ring topology contains redundant paths among remotes. Redundant paths can cause data collision and communication failures. An illegal ring topology is shown below.



4.1.4 Length of ReO Bus Connections

The maximum length of total ReO bus possible is 12,000 feet. With a bus length over 3000 feet, reflections become an issue and it may become necessary to terminate the bus at several points, by adding termination resistors as explained below. For bus lengths over 6000 you must terminate the bus.

4.1.5 Reflections

Reflections are returning signals bouncing back from an impedance mismatch on the ReO bus and causing phase cancellation.

Reflection typically manifests itself as intermittent transmission failures in remotes in the middle of long runs of bus. Often the remotes before and after the problem remote will work correctly. Moving the problem remote to a location that is known to work will isolate a remote hardware problem from a bus problem. Some of these symptoms also appear when a bus has excessive noise present. The solution for all these problems is to terminate the bus as explained in section 4.1.6-4.1.7.

4.1.6 Termination

Termination is a technique for correcting the impendance of a ReO bus to eliminate problems arising from bus reflections and noise problems. Terminating the bus is accomplished by adding resistors at the ends of the bus legs, thus reducing the total impedance of the bus to a level that eliminates reflection. The value of termination resistors depends on the topology of the system. In general you must lower the overall impedance of the bus to 50 Ω. This is done as shown below.

4.1.7 Calculate the value of the terminating resistors

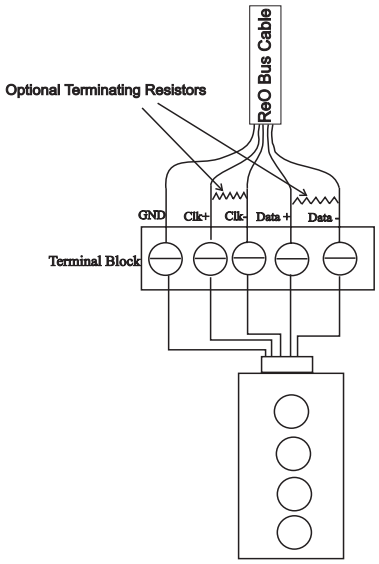
N_{legs} = Number of legs in the system. Legs are defined as the number of home runs plus any sub legs over 500 feet..

$N_{remotes}$ = Total number of remotes in system.

X = the resistor value to be added to *each leg* to lower the system impedance to 50 Ω. The equation below yields X. Examples appear below.

$$X\Omega = \frac{N_{legs}}{[.02 - (.004545 + (N_{remotes} / 48\ K\Omega))]}$$

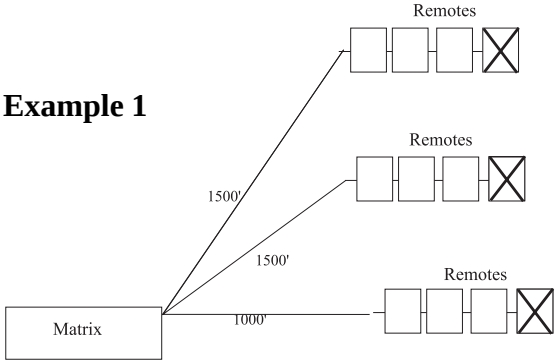
After you have found the value for X, add a resistor of that value across the clock lines and data lines at the remote at the end of every leg. Because the system impedance **must** stay above 50 Ω, the resistor you select should be the next size *higher* than the theoretical value. These resistors are most easily added at the terminal block where each remote is connected to the bus (shown at right).



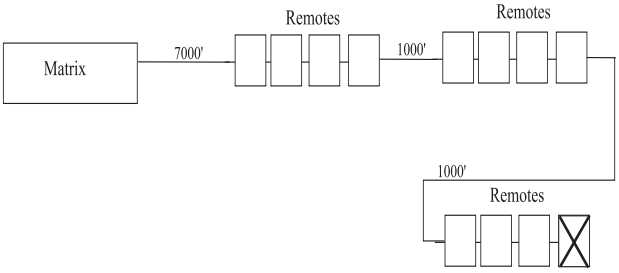
Example 1:

Your system has a total length of 4000 feet of ReO bus wire arranged in a star configuration with three home runs.There are four remotes on each run. The number of bus legs is three and the total number of remotes is 12. This bus falls in the range that may require termination. Using these values in the equation of section 4.1.7 results in a resistor value of 197 Ω. Select the next highest standard value 200 Ω. Install the terminating resistors at the remotes marked by an 'X'.

Example 1



Example 2



Example 2:

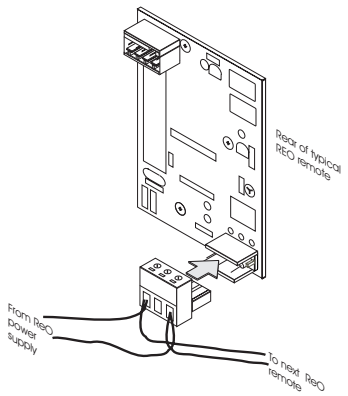
Your system has a total length of 9000 feet of ReO bus wire arranged in a daisy chain. There are twelve total remotes. The number of bus legs is three and the total number of remotes is 12. This bus *must* be terminated. Using the equation of section 4.1.7 results in a resistor value of 415 Ω. Select the next highest standard value 417 Ω. Install the terminating resistors at the remote marked with an 'X'.

4

4.2 Power Connections to the ReO Bus

The ReO devices are *not* powered by the Matrix. They *must* be powered externally. This power must be 9 to 18 V either AC or DC. It should be distributed by stranded wire, 18 gauge or heavier. The Intelix connector is designed for 18 gauge wire, so if a smaller gauge is used, other connectors will be needed.

A single Comet device draws 100 mA. A single supply can service more than one remote but some systems may require multiple supplies. The voltage at any ReO bus device must not fall below 9 volts. Multiple supplies can easily be connected using the Intelix three conductor receptacle.



Rear View of the Comet 4 and Comet Tail devices showing Power Connection. Both AC and DC can be connected to pins 1 and 3. Either pin may be designated as plus, as the remotes all have full-wave bridge rectifiers. However for consistency and easier troubleshooting, *all* remotes should be wired in the same way.

The location of the power supplies with respect to the remotes determines the amount of line loss in the power connections.

Note: If the remotes are located nearer to each other than to the main rack, the line loss can be reduced by locating the power supply closer to the remotes, and not in the main rack.

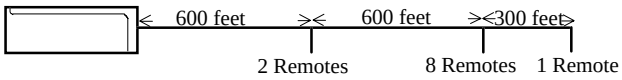
To calculate line loss apply the formula on the next page.

4.2.1 Calculating Line Loss in ReO bus Power Supply

Power Supply Voltage = $\mathbf{V_{loss}}$ + (9 to 18 V)

Example:

In most systems the remotes will be located at various distances from each other and from the main rack. To estimate the loss in such Systems, simply add the losses of the remotes at each distance: e.g. for a system with 11 remotes, 8 remotes at 1200 feet, 2 at 600 feet and 1 at 1500 feet:



V_{loss} = ir = (0.1 A/remote X 11 remotes) (6.2 W/1000 ft. X 600 ft.)

+ (0.1 A/remote X 9 remotes) (6.2 W/1000 ft. X 600 ft.)

+ (0.1 A/remote X 1 remote) (6.2 W/1000 ft. X 300 ft.)

= 4.092 + 3.348 + 0.186 = 7.626 V.

4

This sum should always be less than 20 V. If it is greater than 20 V, then the distance between the power supply and the remotes **must** be reduced **or** the wire gauge increased. Otherwise, the voltage experienced by the first remote in the chain will approach the breakdown voltage of the regulator inside the remote.

4.2.2 Grounding the ReO Bus

Note: Whether the power supply to the ReO remotes is AC or DC, controlled grounding is impossible if either the data connection (LAN) ground or any of the power-supply wires is shorted to the building or conduit ground. **Take care to make sure that such shorts do not occur.**

4.2.3 AC power supply

Usually ReO devices are powered by a 12 VAC transformer. The transformer secondary is connected *in parallel* to all the remotes in the System at pins 1 and 3 of their power connections. (See sec. 4.3.) As the ground lift jumpers (**J1**) of the remotes are not present, the ground return for the data signals is provided by pins 1 and 6 of the RJ11/12 connector (see page 57). In the absence of the ground lift jumper, the remotes' electronics are grounded to the Matrix via the *data* connection ground. *This is connected to neither the building nor conduit grounds.*

4.2.4 DC power supply

If the ReO devices are powered by a DC voltage supply, and the DC supply has *floating or isolated outputs*, then the grounding connections to the ReO remotes should be the same as for an AC supply, as described above.

If *one side of the DC supply output is grounded, the installation of ground lift jumper should be avoided.* This configuration, in the presence of the ground lift jumper, can result in ground loops or large common-mode voltages between the ground of the supply and that of the data connections.

Note: When using a grounded DC supply, the presence of the bridge rectifiers in the remotes will cause there to be a 0.7 V common-mode difference between the DC supply ground and the remote ground. This difference is negligible compared to the common-mode rejection capabilities of the RS485 transceivers.

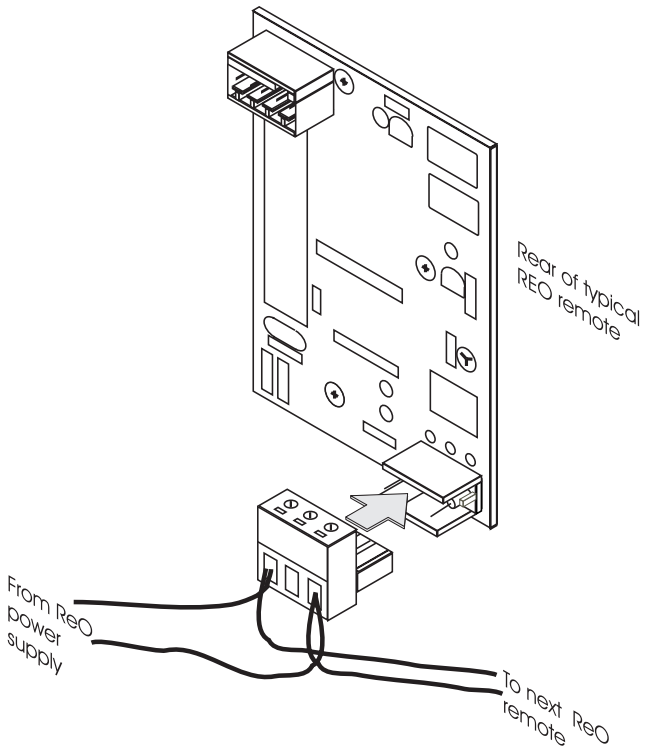
4.3 Installing ReO bus devices

Each ReO remote device required by your installation should be installed in its final location. When doing the initial installation, i.e. before remote recognition takes place, *do not connect the REO bus* to the remotes.

1) Connect the power connector as shown below, then install the remote devices in their wall box, panel or other final destination. The bottom LED on each remote will blink at about once per 2 seconds, indicating that the remote has power and has not received a message from the matrix. If the remote does not single blink, troubleshoot the power supply with a voltmeter. The voltage at the remote should be in the range 9-18 VDC or AC.

2) If you have selected discovery mode as a remote recognition scheme, or if your remotes are already programmed (either by the factory or on your bench), plug the ReO bus (RJ12 connector) into each remote. ***Do not yet connect the ReO bus to the matrix mixer.***

Note: Because the remotes contains a full bridge rectifier, the power connection can be made with the power plug in either orientation. But for ease of troubleshooting, we recommend that all plugs be oriented the same way.



This drawing shows the back of a typical REO remote and indicates how to connect the ReO bus power connector. The ReO bus connections are shown for reference.

5.0 Installing and starting the MZP software

Regardless of where you obtained your MZP Designer software (CDROM, the Intelix web site, or floppy disks) use these instructions to install and start the software.

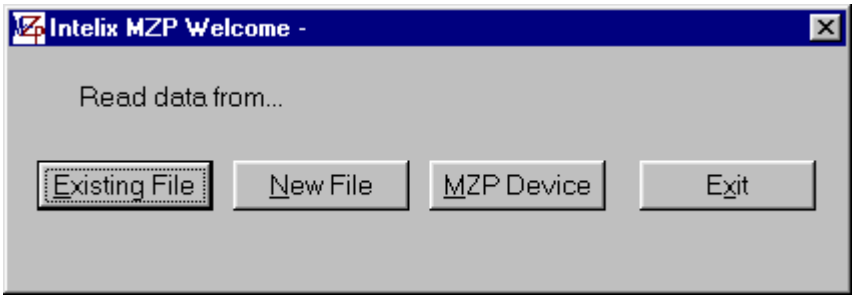
5.1 Installing the MZP software

1) Run the file “mzp.exe”

2)From the main screen click on “MZP designer”, then click on “Install MZP Designer Software”.

5.2 Running the MZP software

Open the MZP software from the Program files option in the Windows Start menu (Intelix MZP). The following screen appears:



5

You must now select an appropriate data source. Your choices are:

1) Existing file: you will be presented with a standard windows file selection screen from which you will choose any existing .mzp file that exists on the PC.

2) New file: this selection will create a new .mzp file and launch the auto-design wizard. (see section 8).

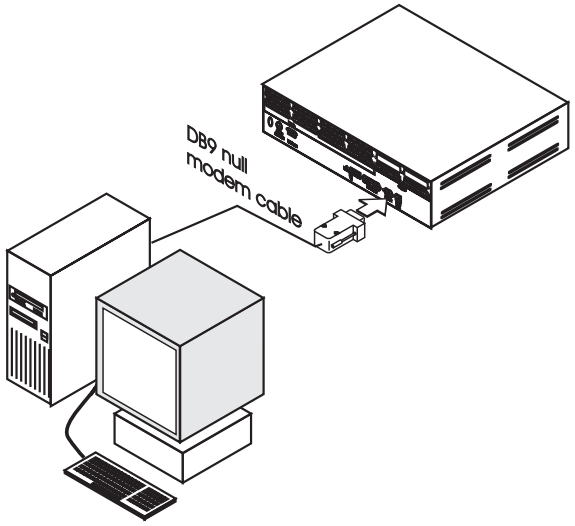
3) MZP: this choice connects you directly to the MZP matrix connected to your PC. The communications link must already be established (see Appendix M.)

After you make your selection you will be returned to the main menu of the MZP software.

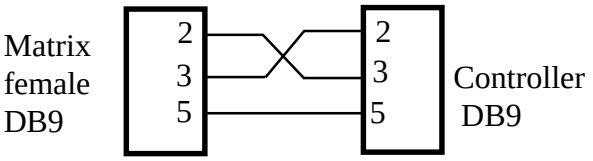
5.3 Connecting the Control PC to the MZP

Before you can program your Matrix Mixer, you need to have a personal computer (desktop or laptop) capable of running the MZP program. Your computer must meet these requirements:
√ PC computer (Pentium 133 MHz 32 M byte RAM or better) with a CD ROM drive
√ Windows ‘95®
√ Serial port connected to RS232 connector on Matrix Mixer
√ a null modem cable

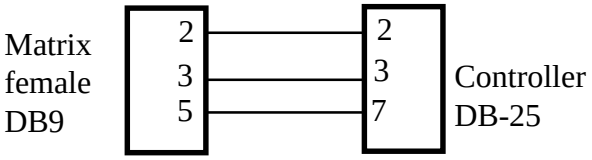
The connection between the MZP matrix mixer and your control PC is made with a “null modem” cable with a DB-9 connector on the matrix end as shown below. The wiring diagram for a null modem cable is at the bottom of the page. The drawing you use will depend on the connector on your PC. Most PCs have either a DB-9 or a DB-25 on the serial port. The cable wiring for both connectors are shown.
Note: Some devices require that Clear to Send and Ready to send (pins 7 and 8) be tied together.



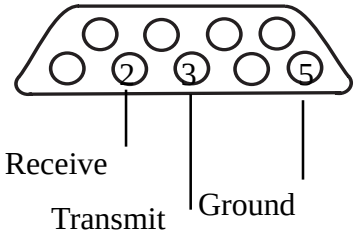
RS232 DB9 to DB9 connections for a null modem cable.



RS-232 DB9 to DB-25 connections for a null modem cable.

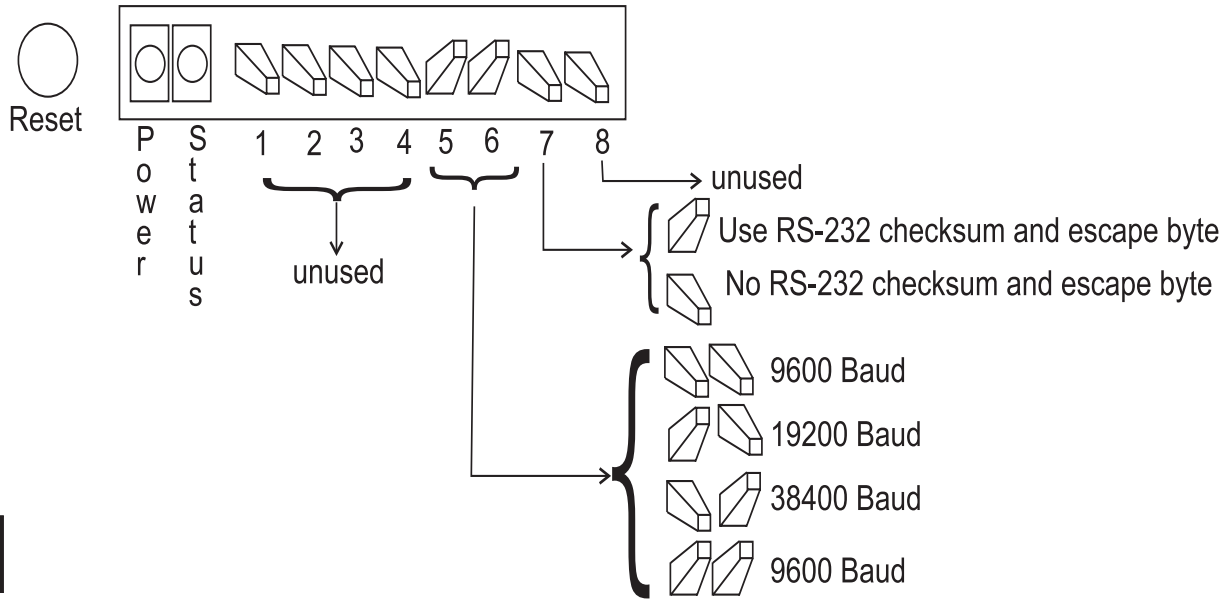


The connections of the MZP’s DB9 connector for RS-232 communication.



5.4 DIP Switches

There are eight DIP switches on the rear panel of the Matrix (see drawing below). For all DIP switches, the “up” position indicates the “on” condition, and the “down” position the “off” condition. The function of these switches is shown below.



DIP switches 5 and 6 allow the RS-232 baud rate to be fixed at one of three values: 9600, 19200 or 38400. The Windows MZP software does not support 38400 baud. But that speed can be used by AMX, Crestron and custom controllers.

DIP switch 7 allows the RS-232 checksum and “escape” byte to be toggled on or off. These should be turned *off* in installations which include a permanent RS-232 controller, such as AMX, Crestron or custom PC program. The RS-232 checksum and escape byte should be turned *on* in installations where the RS-232 communication may be hindered because of cable length (greater than 50 feet) or lack of shielding from external electronic noise.

Note: *After changing any DIP switches, you must resest the matrix by pressing the reset button on the rear panel. Changes will not take place unless you reset the matrix.*

6.0 Auto Design Wizard

This section will walk you through the Windows® screens needed to produce a new MZP design. The Software automatically begins this design sequence when you select “New File”. You should already have designed your system on paper, using the templates supplied in Appendix J-Conference Center Design. **Note:** *All examples in this manual use values from the example design in Appendix J-Conference Center Design.mzp*. This example program is supplied with the MZP Designer Software.

6.1 Starting the Auto Design Wizard

Choose an appropriate file name for yout project and click “OK”. You will be guided through a series of screens:

a) Define the Audio Matrix Size
b) Define Audio Inputs
c) Define Audio Outputs
d) Define Audio Zones
e) Setup ReO Stations
f) Define ReO Paging Stations
g) Define ReO Program Stations
h) Define Paging Volume Stations

6.1.1 Navigating in the Auto-Design Wizard

If you have made an error, or wish to change some part of the design while using the auto-design Wizard, you can move forward and backward in the Wizard sequence using the “Forward” and “Back” buttons on each Wizard screen. Changes can then be made as desired.

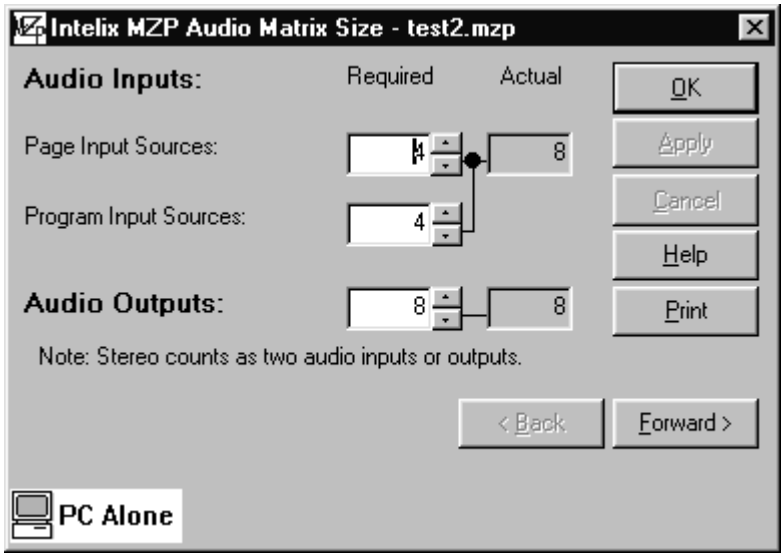
6.2 Define the Audio Matrix Size

The Audio Matrix Size screen requires the entry of page and program input quantities and output quantities. Use the up/down arrows (or direct text entry) on the text boxes to enter the number of audio paging and program inputs your design requires.

The software treats page and program sources differently, so it's important to set input types early on in the design process. Page sources are treated as priority over program sources; in other words, a page will always automatically duck any program source routed to a zone.

In this first screen we determine what size matrix mixer we need by typing the number and type of inputs and outputs. The "actual" number of inputs and outputs, shown on the right, will automatically calculate the matrix mixer size you need to the nearest 8 inputs or outputs. The screen will show you (in the "actual" column) the size of the physical matrix required for your design. Click OK when ready. If you make changes that you wish to reverse, click the Cancel button. Since this is the first screen, only "Forward" is active on this screen.

Note: Stereo audio sources count as two inputs or outputs.

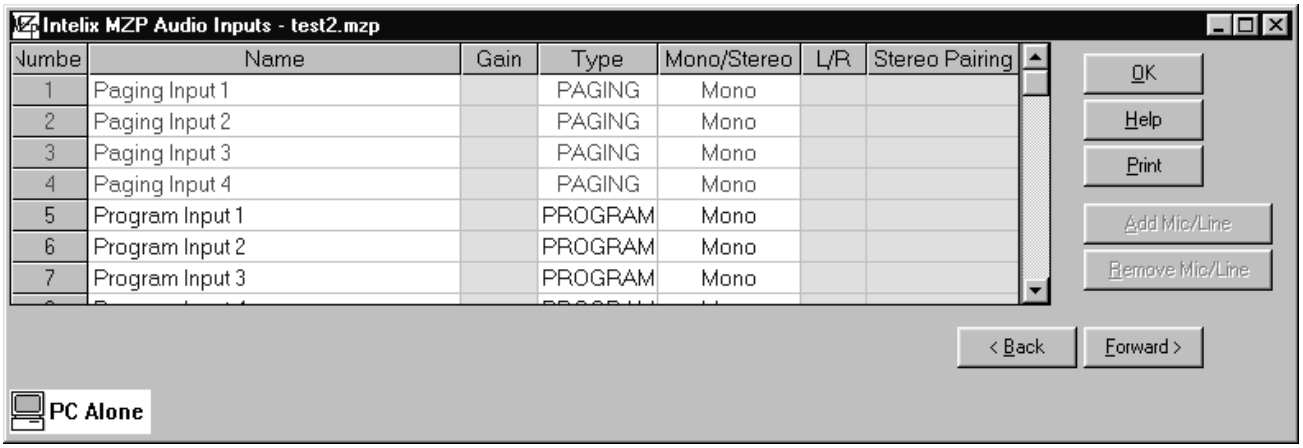


Click OK to proceed to the next screen.

6.3 Audio Input Screen

Inputs are defined as audio sources. Inputs can be one of two types: program material or pages. This section describes how to name and define inputs.

The screen shown below appears. Notice that this screen reflects the number of page and program sources as defined on the previous screen. Paging and program sources are color coded in red and blue respectively.



6

6.3.1 Assign names to inputs

All names in this example are from the example “Conference Center.mzp” in Appendix J.
a) Double-click on the name you wish to set, or arrow to the name and press Enter. A text box appears.
b) Type in the name you want to assign to that input.
c) Click OK or press Enter.

6.3.2 Define all input types

There are two possible input types, page and program. A program input is any background source, e.g. CD player or FM tuner. Page sources are microphones. Page sources always have priority over program sources. When a page input becomes active it ducks and overrides all program sources.

The software has already assigned types based on your previous input. If it is necessary to redefine the type of an output double-click on the inputs “type” column. This will toggle the selection. The color of the input will change to reflect the new type.

Click OK to proceed to the next screen.

6.3.3 Gain control with the mic/line card

You can optionally add a mic/line card to the MZP. The mic/line card provides eight channels of preamplification and software control over a number of features (for hardware details see Appendix N).

6.3.3.1 Adding a mic/line card

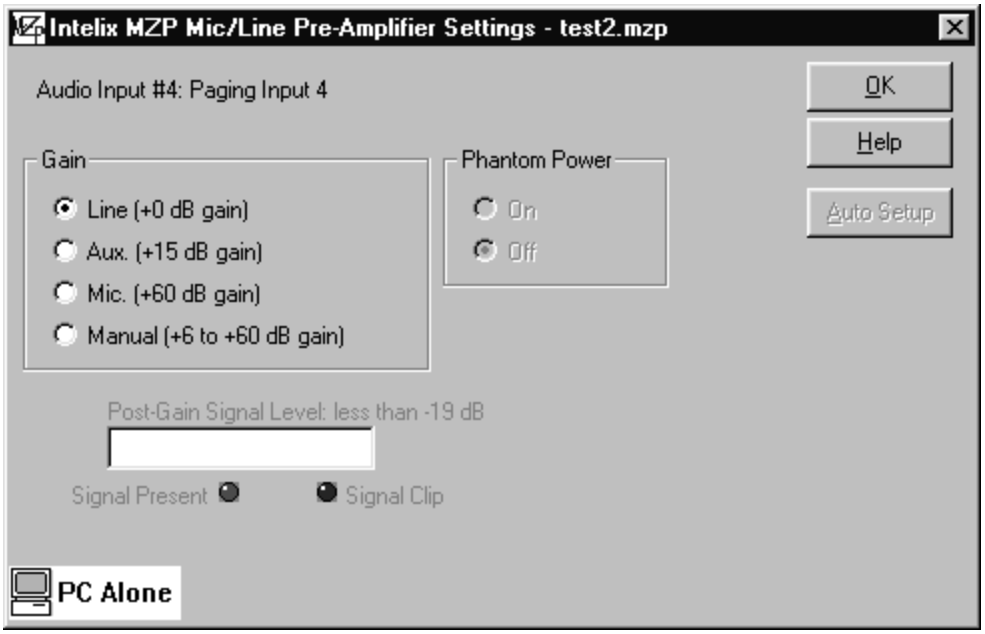
To add a mic/line card to your system software:

a) Click on the “Add Preamp” button. A mic/line card is added; you will see the first 8 inputs with 0 dB gain in the Gain column.

b) To remove a mic/line card, click the “Remove Preamp” button.

c) To set up a channel, double click on the gain column for that channel. The screen below appears. Select a gain range and a phantom power setting. If you click the ”Auto Setup” button, the MZP will examine the input and set the optimum range automatically.

Note that if you are monitoring a signal with this screen’s meter, you should disable your screen saver, since metering stops when the screen saver kicks in.



6.3.4 Set input mono/stereo pairing

This function allows you to link audio inputs together as stereo pairs. Any change made to a member of a stereo pair will be automatically mirrored in the other member of the pair. When you make an input stereo, you will be prompted for more information.

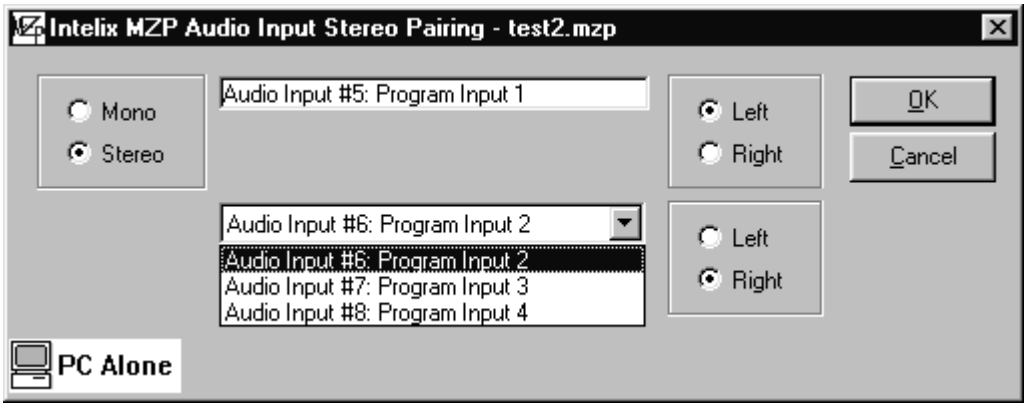
a) double-click on the mono/stereo box for the input to be changed. A dialog box (below) appears.

b) select mono or stereo at the left of the window. If you select stereo, the selection item for left/right and partner become active. If you change a stereo source to mono, the left/ right and partner information is erased from the screen.

c) select a partner for the stereo output. The drop down list will (shown) contain only un-paired mono outputs.

c) select left/right for a stereo channel. The selection you make will be reflected in the choice for the partner.

d) click OK when finished. Your changes will be reflected on the Audio Inputs Screen.

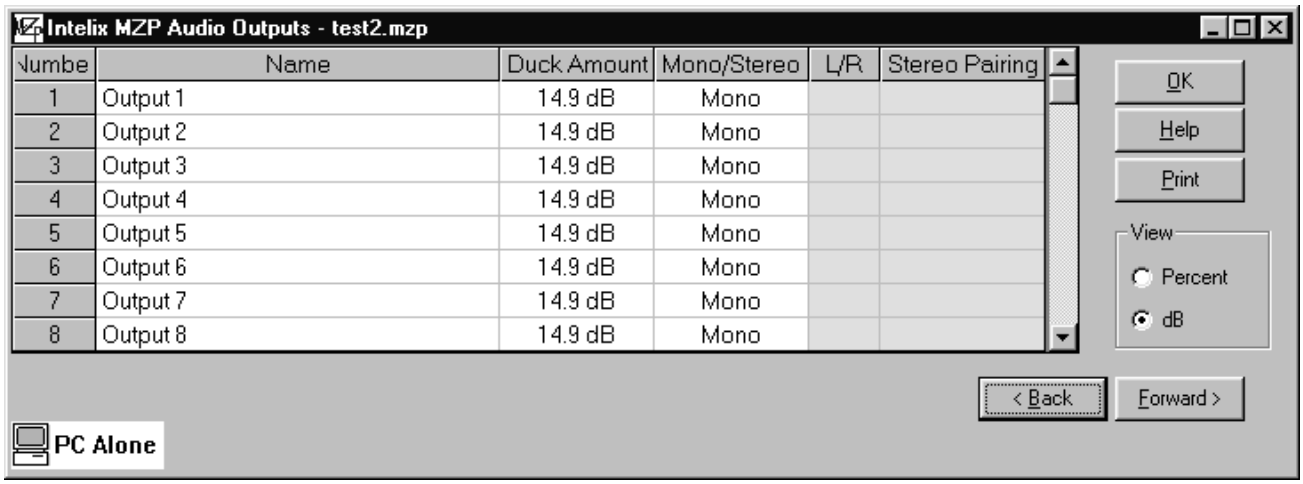


6.3.5 Recap of Audio Input screen

You have now named, typed, stereo'd and "gained" your audio inputs. Click "OK" to proceed to the next screen.

6.4 Audio Output Screen

Outputs are defined as physical connections on the matrix which will provide mixed audio signals to amplifiers or other output devices. They will later be grouped into zones.
The screen shown below appears.



6

6.4.1 Assign names to outputs

a) Double-click on the name you wish to set or arrow to the name and press Enter. A text box appears.
b) Type in the name you want to assign to that output; e.g. Room A.
c) Click OK or press Enter.

6.4.2 Set Duck amounts

Ducking is the amount by which an audio output is lowered in volume when a page is present. To set the duck amount of an output:

a) Double-click the duck amount you want to change. A text box appears.
b) Type the new duck amount you want.
c) Click OK.

6.4.3 View Options

You can choose two ways in which to view the duck amounts; percent (0-100%) or dB (-100 dB to 0 dB). Choose by clicking on the appropriate radio button.

6.4.4 Stereo Options

See section 6.3.4. Output stereo pairing is identical to input stereo pairing.

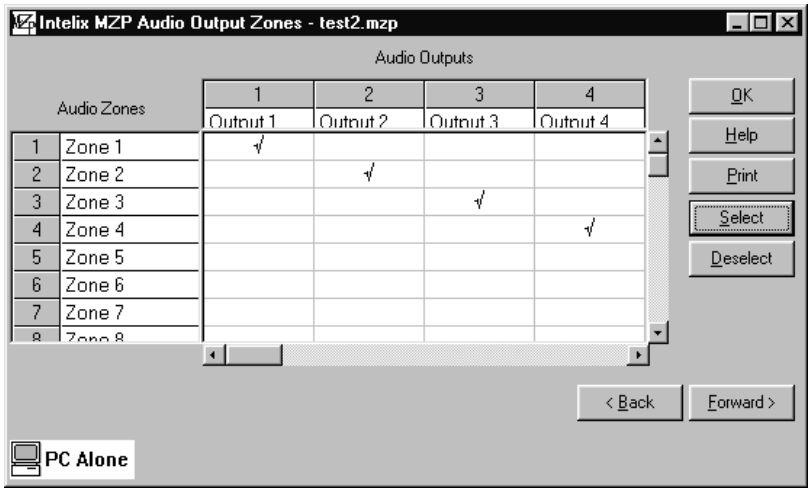
6.4.4 Recap of Audio Output Screen

You have now named, ducked and stereo'd your audio outputs. Click OK to proceed to the next screen.

6.5 Audio Zones Screen

The screen shown below appears. A zone is an arbitrary logical grouping of one or more outputs. Any output can belong to any zone, or multiple zones. Zones are the principle way in which audio is routed in the MZP. All page and program sources are routed to *zones*, not outputs.

This screen allows the naming and defining of zones. Output names are listed across the top of the grid, and zone names are listed down the left. Note that output names and zone names can be (and often are) the same.



6.5.1 Assign names to the zones

a) Click on a zone name. A text box appears.
b) Type in the new zone name.
c) Click OK.
d) note that to accommodate long names, columns can be resized by dragging their boundaries. After dragging the boundary, click on the column.

6.5.2 Define the zones

Zones are collections of audio outputs. Your outputs are listed across the top of the grid. The members of a zone are the columns that are checked (√) in the zone's row. Default settings define include a zone for each output to a separate zone and a zone defined as "All Call". To include or exclude an output from a zone:

a) Click on the cell you wish to change. Use the "Select" and "Deselect" buttons to toggle the output in and out of the zone. Double-clicking toggles a single cell.
b) groups of cells can be selected by click and drag, then Selected or Deselected.

6.5.3 Change output names

This window allows you to change output names if you wish. You need not alter output names. Output name changes here are global and appear on all screens displaying output names. To change an output name:

a) Click on the name. A text box appears.
b) Type the new output name.
c) Click OK.

6.5.4 Recap of zone screen

You have now named and defined audio zones, the single most important concept in the routing of audio in the MZP. Click OK to proceed to the next screen.

6.6 The ReO Station Setup Screen

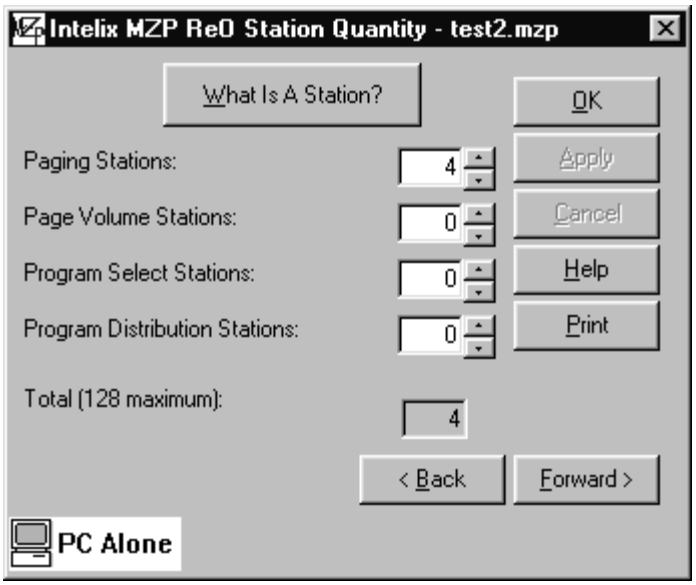
The screen shown below appears. Here you give the program more information about your design; you tell it how many of several different stations types your design needs. A station is a control or group of controls that affect the audio in a zone. A full discussion of stations and their types will be found in sections 6.6.1 – 6.10. In addition, on every station screen (including this one) is a button leading to an explanation of each kind of station.

Use the up/down arrows (or direct text entry) to select the correct number of paging, program, program distribution and page volume stations needed in your design.

If you delete an existing station, a warning box will appear asking for confirmation; this message can be disabled by the user.

Whenever you make a change on this screen, the cancel button becomes active; use it if you wish to undo your changes.

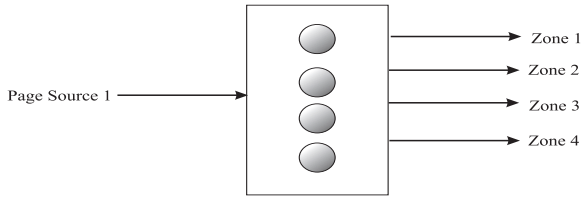
A change to this screen will not take effect until you click the apply button. Clicking this button saves your changes to the active file.
When ready, click OK to proceed to the next screen.



6.6.1 Station Explanation

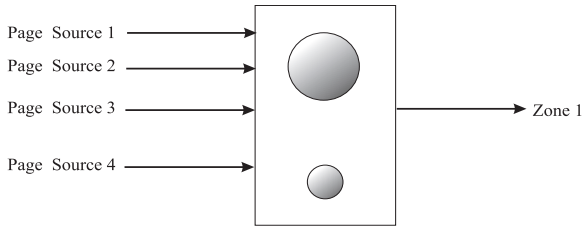
A station is a logical grouping of Comet remotes (Comet-4s and/or Comet Tails) which control the routing and volume of audio inputs into output zones. There can be up to 32 remotes in a single station, and up to 128 stations in a single system, up to a limit of 128 total remotes in the system. There are four types of stations as shown below:

Paging Station



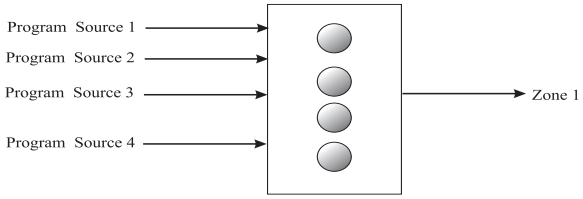
A paging station routes a single paging input (such as a paging microphone) to any of several zones. The paging station has a button for each zone into which a page need be sent. If a zone is already receiving a page when selected, that zones LED will flash. A paging station can optionally contain a Comet Tail to control the level of all outgoing pages.

Page Volume Station



A page volume station controls the volume of all pages into a single zone. Using this type of station, different zones can have a page volume station to set a level of page volume appropriate to their ambient noise level.

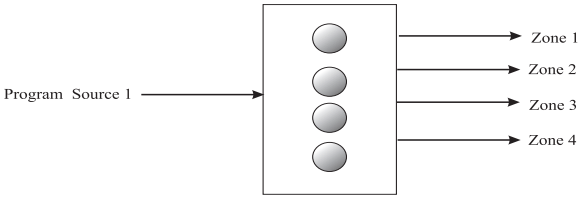
Program Select Station



A program select station routes one of several program sources (CDs, tuners, tapes etc.) into a single zone. The station contains a Comet-4 button for every program source needed by that zone. It can also contain a Comet Tail to control program volume in the zone.

There are two types of program select stations, a selector and a mixer. The selector selects just one program source at a time. A mixer on the other hand mixes together all program sources that are selected; i.e. each button latches on its program source until that button is pressed again.

Program Distribution Station



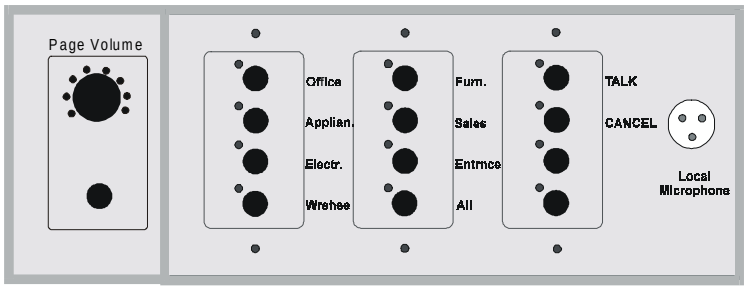
A program Distribution station routes a single program input to many output zones. It is typically mounted in the control room with the MZP, and not accessible to the users. This type of station can save hardware cost, reduce complexity and increase security in certain designs. The MZP automatically keeps the multiple controls on that input in sync, so that the LEDs on a Comet-4 and the bar graph of a Comet Tail always reflect the same information.

6.7 Paging Stations

6.7.1 Paging Station Explanation

The paging station allows the user to page one or more zones within the system. Physically, the paging station consists of Comet-4 remotes and an input audio source (e.g. microphone). Optionally the paging station can include a Comet Tail remote (shown) to control the volume of pages originating in that station. A typical use of a paging station is: press select buttons to select target zones; press the talk button; make the page; it is heard only in the zones selected; release the talk button.

Typical Paging Station



You will route pages using the following four button types.

1. **Zone select** - push-on zone select buttons
2. **Push to Talk (PTT)** - press to page selected zones; resets selected zones on release.
3. **Cancel button** - cancels zone selections
4. **Select and Push-to-Talk** - selects predefined zones and activates page in a single button-press.
5. **Emergency Priority** - emergency page to all zones (overrides all others)

6.7.1.1 Zone-select

Selects zones for paging. An operator selects one or more zones by pressing one or more zone select buttons. When a zone-select button is pressed, the LED indicator associated with that button will light, if zone is available for paging. Access is granted on a first-come basis, among equal priority requests. If a zone is busy, the associated LED will blink to show that access is denied. Upon denial by the system, the operator *must* press the button again to repeat the request. A ten second zone-select time-out is implemented.

6.7.1.2 Push to Talk (PTT)

Pressing the push-to-talk (PTT) button initiates a page into the selected zone(s). First, all program sources currently routed to the selected zones will be reduced in level by the predefined “duck amount.” Second, the page station microphone audio is increased to the “page level” and routed to the appropriate zones. The related page indicator LED will light at the station. Release of the PTT button or a page-length time-out (30 seconds in length) will return the system to its previous state and release the zone selections from that station.

6.7.1.3 Cancel button

Pressing a cancel button will cancel any zone selections that have been granted.

6.7.1.4 Select and Push-to-Talk operation

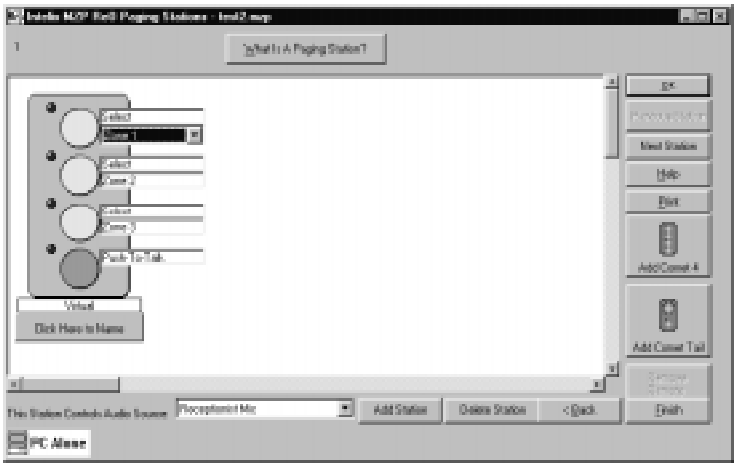
Select and Push-to-Talk (SPTT) buttons combine the functions of a zone select button and a PTT button. Each SPTT button is assigned to an output zone. One and only one SPTT button can be operated at a time in a station. If more than one is pressed, only the button pressed first will activate. The page is active for the duration of the button press, unless a page length time-out occurs. To provide a visual reference, the indicator LED will be “steady-on” when the page request is granted. If not granted, the LED will blink and the operator must release the button and press it again to repeat the request.

6.7.1.5 Emergency Priority

This button operates as a SPTT button with priority override. Pressing this button cancels and replaces all ongoing pages in the selected zone with the audio from the local microphone. The page indicator LED on the affected page stations will blink to indicate to other operators that their pages have been overridden. One or more of the paging stations may have a button assigned as emergency page. Emergency pages are not affected by the 30 second time-out, they may last as long as required.

6.7.2 ReO Paging Stations Screen

The ReO paging station screen appears as shown below. The software has already inserted the name of the only paging station (“Receptionist Mic”) inserted one Comet-4, and assigned paging buttons to the first two zones as well as the “push to talk” function.



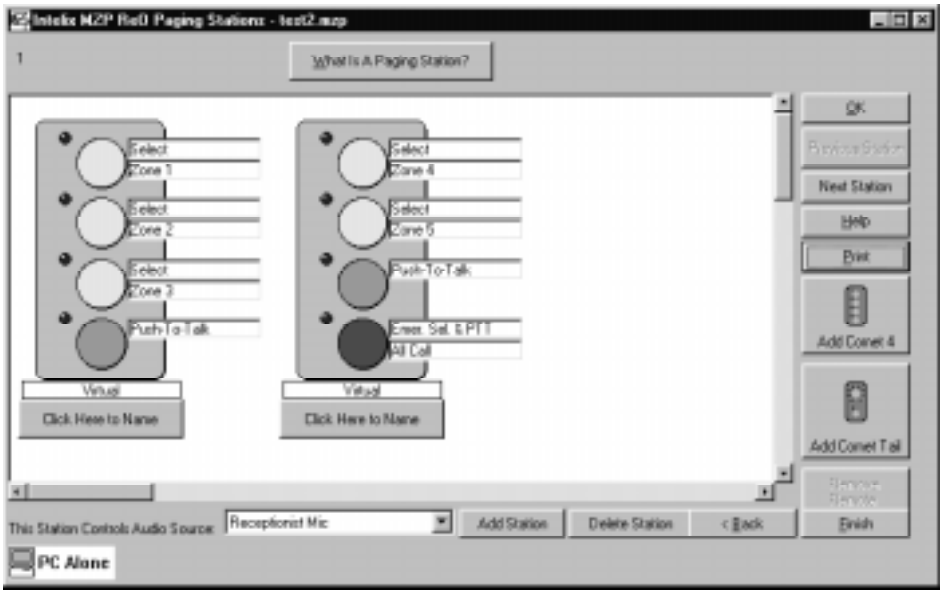
Because this design (from Appendix J-Conference Center Design) has 5 zones to be paged, another Comet-4 is needed in the paging station. To add the Comet-4, click the “Add Comet 4” button. A new and unassigned Comet-4 appears.

Now you will assign audio sources to buttons and name the remotes.

6

6.7.2.1 To Assign inputs to buttons

1) in the label box next to the top button of the new remote, choose “Select”.
2) In the drop box below select “Room C” or the zone into which this button will enable pages.
3) Repeat for each button needed. Unused buttons will retain their “none” label.



This picture shows the Paging Station screen after the addition of a Comet-4 and assignment of inputs to buttons and names to remotes. Note that the station number appears in the upper left hand corner (in this case number “1”). The station number will be used in the future for configuring new features.

6.7.2.2 To Assign names to the remotes

1) Click on the Name button, usually filled by the “Virtual Remote N” label.
2) Type the remote’s name in the text box and click OK
3) Repeat for each remote.

6.7.2.3 Adding and Deleting Remotes

To add a remote to a paging station, click either the “Add Comet 4” or “Add Comet Tail” button. The new remote will appear in the station screen, ready to be configured as explained above (section **6.7.2.1**).

To delete a remote from a paging station, select the remote by single clicking on any button (the remote will highlight with a blue box around it). Now click the “Remove Remote” button. The remote is removed from your design.

If you right-click on the name box of any remote whose status is either “responding” or “not responding” a popup appears, showing the bus address and unique ID of that remote.

6.7.2.4 Naming the remotes

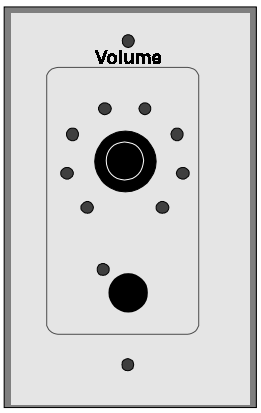
It is highly recommended that you assign descriptive names to your remotes at the design stage. Try to name them in such a way that their intended location is clear; e.g. “West side of Ballroom” and not “selector #1”. This will dramatically reduce the time needed to program the hardware during the Discovery process.

To name a remote, locate the name field located below the remote’s status label. The name field defaults to “Click Here to Name”. Click on the field, type the remote’s new name and click OK. repeat for each remote.

6.8 Page Volume station

Each zone can have a paging volume control. This control will vary all paging volumes (and *not* program volume) *into* that zone including emergency pages.

Typical Page Volume Station



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Comet Tail remote control units adjust the level of the incoming page to each zone.
Any or all zones in the system can have a page volume station. During setup, PC software defines the maximum level of the page source to each zone. In grid-based zone systems, the ratios between the different matrix outputs within the zone are maintained.
The volume control is *always enabled*, even when a page is not occurring within a zone. This means that if the volume control is turned all the down no page can be heard, including emergency pages.
An associated LED bargraph always shows the current level setting (0-100%).

6.8.1 Duplicate stations

Any activity at one station for a zone will be reflected at all other duplicate station for that zone. For example, adjusting the audio level at a station on one side of a room will have the identical effect on the duplicated Comet Tail across the room. The buttons, LEDs and volume controls have identical functions on duplicated stations.

6.8.2 Paging Volume Station Screen

The page volume station contains only Comet Tail(s). Its purpose is to provide control over the volume of pages entering a particular zone. This can be useful in a system that has different levels of ambient noise. For example pages into an office area zone might be set at a fairly low volume, while the same pages into a punch press zone might need to be much louder.

6.8.2.1 Adding a Page Volume Station

2) Click the “Add Program Station” button. The screen above appears.
2) From the drop down list of audio zones at the bottom of the screen, select the zone to which you wish to add the page volume station.
The page volume station is now added to the selected zone.

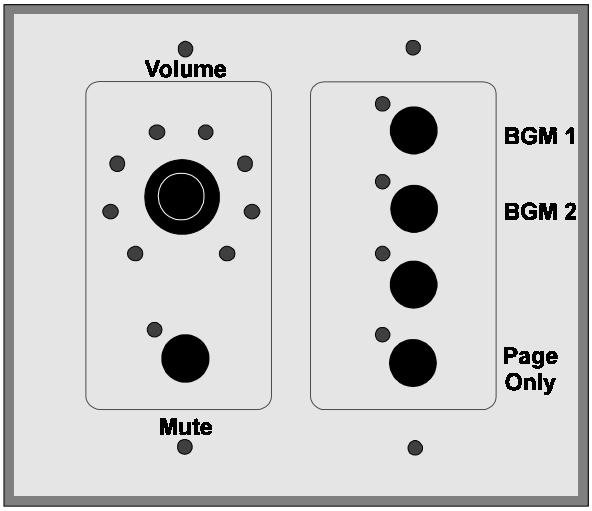
If you right-click on the name box of any remote whose status is either “responding” or “not responding” a popup appears, showing the bus address and unique ID of that remote.

6.9 Program Stations

6.9.1 Program station explanation

Program select and control stations are used to select among the various program sources available to the zone and to control the program volume in a zone. These stations are normally located in the zones they control.

Typical Program Station



A program station can have two types of select operation. They are:

1. **Program Select**
2. **Program Mixer**

6.9.1.1 Program Select

Pressing a button on this type of station will cause the program source selected to be routed to the zone for that station. In addition, the associated indicator LED on the station will light to indicate the action while the previously-selected program will be canceled and its LED is turned off. One of *N* selectors allow only one program to be routed to the zone at any time.

6.9.1.2 Program Mixer

More than one program can be routed to the zone. The buttons on this type of station operate as push-on and push-off (latching function) selectors. The LEDs associated with selected programs light to indicate that they have been selected. Programs selected are mixed into the zone(s) at relative levels set by the PC.

6.9.1.3 Program volume control

This optional volume control will alter the volume of the program(s) currently selected. During setup, a PC sets the maximum level of a program source to each zone and the relative levels between different matrix outputs within a grid-based zone system. The matrix mixer operates as a 0 to 100 percent (of maximum) controller. To illustrate current level, an LED bargraph always shows the current level setting (0-100%). Volume controls are *disabled* while a page is occurring in a zone.

6.9.1.4 Mute button

This function turns off the program source in a zone. *The mute button has no effect on the volume of incoming pages.* The button located under the program volume control is a latching function "mute" push-button. It lowers the audio to zero level for the zone and disables the volume control. Program routing selections for the zone are not affected by muting. The LED associated with the mute button will be lit while the mute button is active. When the button is pressed again to "unmute" the zone, program material will return at the same volume as when it was muted, and the LED will go out.

6.9.1.5 Duplicate stations

Any activity at one station for a zone will be reflected at all other duplicate stations for that zone. For example, adjusting the audio level at a station on one side of a room will have the identical effect on the duplicated Comet Tail across the room. The buttons, LEDs and volume controls have identical functions on duplicated stations.

6.9.2 ReO Program Stations Screen

When the Program Stations screen appears it is blank, and only the “Add Station” button is active. As soon as you press “Add Station” the drop down list of zones becomes active, and selects the first audio zone. This means that the first station you add will be associated with zone “Room A”.

The example design has 5 audio sources, so each program station requires a second Comet-4. Press the “Add Comet 4” button, and a new Comet-4 appears. Now assign audio sources to buttons, and name the remotes.

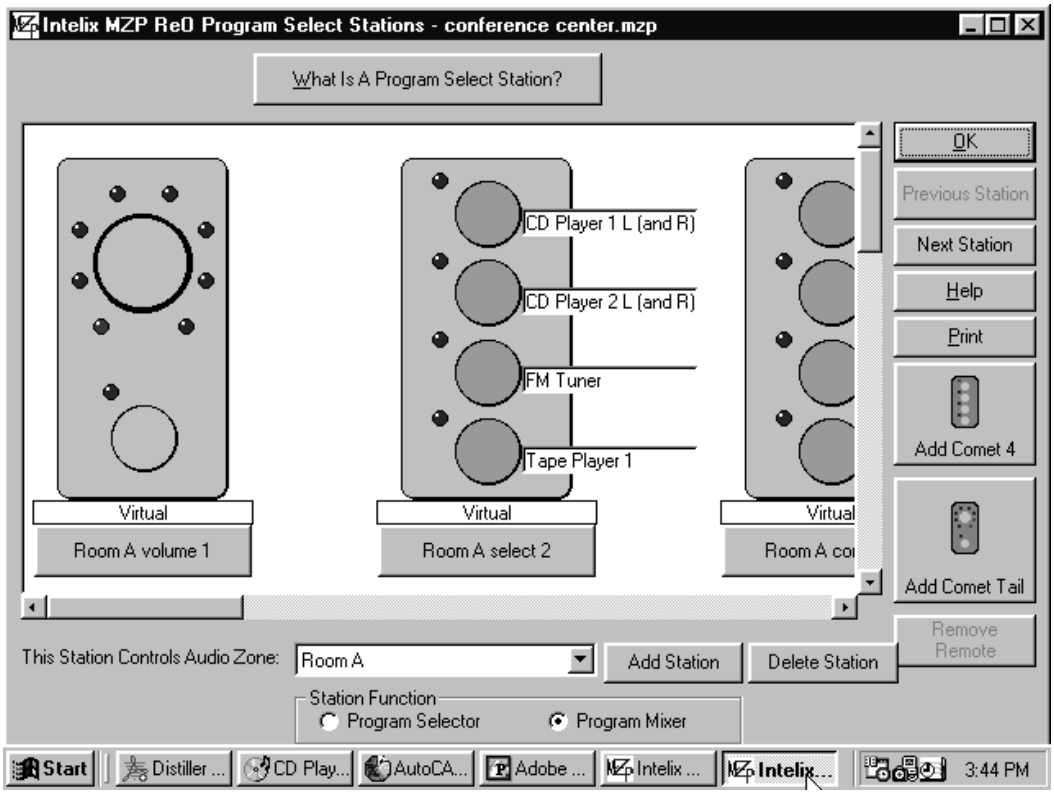
6.9.2.1 To assign audio inputs to buttons

1) From the drop down list next to each button choose the audio source you want to assign to that button.
2) Repeat for each button requiring assignment.

6.9.2.2 Naming Remotes

We highly recommend that you add names to remotes; follow these steps:
1) Click on the remote’s name box, usually filled by the “Click Here to Name” label.
2) In the resulting text box, type the name you want to assign to that remote. Click OK.
3) Repeat for all remotes.

If you right-click on the name box of any remote whose status is either “responding” or “not responding” a popup appears, showing the bus address and unique ID of that remote.



This picture shows the Program Station for Room A after the addition of a Comet-4 and the assigning of sources and names as explained above.

6.9.2.3 Adding More Program Stations

To add program stations:

1) Click the “Add Program Station” button.

2) In the Audio Zone drop down box at the upper left, select the zone you wish to contain the new station.

3) Assign sources to buttons and names to remotes as explained above.

4) Add other stations using this method, using the “Next Program Station” and “Previous Program Station to navigate among them.

6.8.2.4 Deleting Remotes

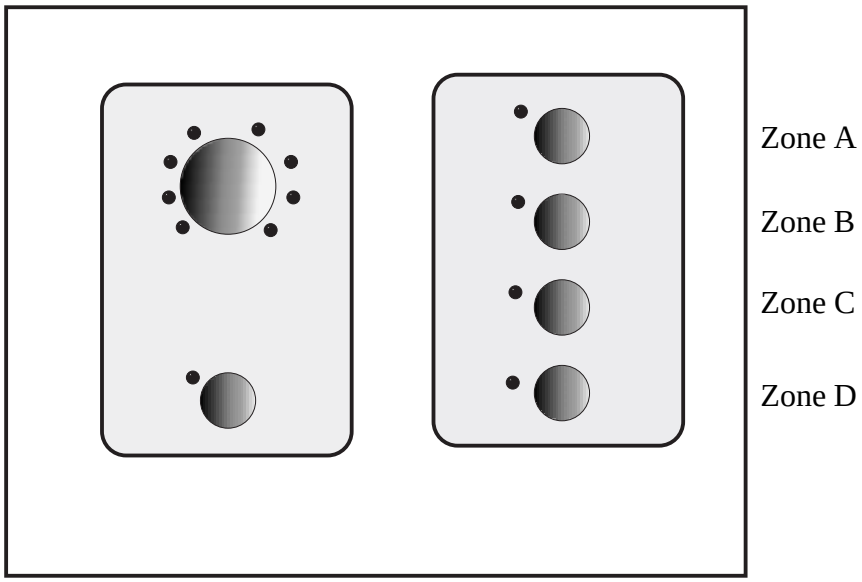
Select a remote by clicking on one of its buttons; it highlights with a blue box. Click the “Remove Remote” button.

6.10 Program Distribution Station

A program distribution station controls a single audio source and can route it to many zones. This type of station is useful under certain circumstances in reducing hardware costs and increasing security. A program distribution station is normally installed at the master rack and is not directly accessible to users. If a program distribution station sends an audio input to a zone and that input is also included in that zone's definition, the ReO remotes in the program distribution station and the program select station in the zone will mirror each other's actions and state.

If a program distribution station includes a Comet Tail (shown), the Comet Tail will set the level of the audio input to all zones to which the input is sent.

Typical Program Distribution Station



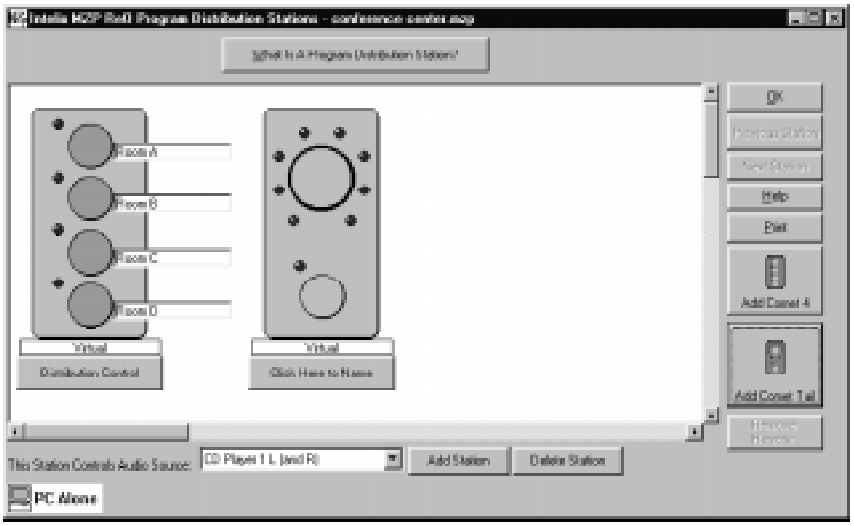
6.10.1 Program Distribution Screen

A program distribution station allows the routing of a single audio source to multiple zones at a time. To add a program distribution station to an existing design, follow these steps:

1) Click the "Add Station" button.

2) From the drop down box at the bottom of the screen (shown below), select the input to be distributed.

3) Clicking on the drop down boxes next to each Comet-4 button, select the zone into which that button will route the distributed input.



If you right-click on the name box of any remote whose status is either "responding" or "not responding" a popup appears, showing the bus address and unique ID of that remote.

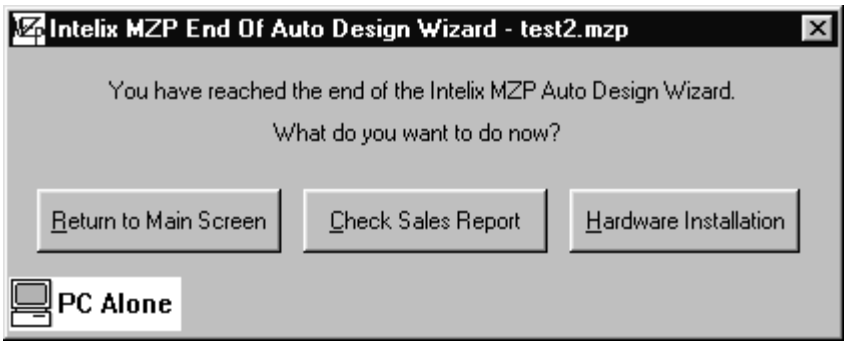
6.11 The End of the Auto Design Wizard

You have now reached the end of the auto design wizard. Your MZP design is complete. You have three choices:

a) Return to the Main Screen, returns you to the MZP's main menu screen.

b) Check Sales Report: This selection displays the hardware needed to implement your design. The report may be printed for ordering or documentation purposes.

c) Hardware Installation: This item starts the Hardware Installation Wizard. Using this wizard you can load your design into existing MZP hardware.



6.12 Recap of Auto Design Wizard

You have specified the size and configuration of your design. You have specified and programmed ReO remote stations You are ready to order hardware for the design, or to load the design into existing hardware.

7.0 The Hardware Installation Wizard

7.1 Hardware Wizard Introduction

The Hardware Wizard is an integral part of the MZP Windows design software. There are two main groups of user who may want to use the Hardware Installation Wizard.

1) Users who have completed a .mzp design file using the auto-designer or any other path through the MZP software and wish to load the design into an MZP matrix mixer, program and test it. This includes contractors programming on the bench or on site. These users will be writing a design file to the MZP hardware.

2) User who wish to test the integrity of an installed wiring system, but are not loading a .mzp file. This group includes wiring contractors as separate from the system designers. These users will be reading a design file from the MZP hardware.

You should know before you begin the Wizard which of these groups you belong to, since the first screen requires that you choose between the two options before proceeding.

To maneuver through the Wizard, use the “Next and “Previous” buttons. At any time you can exit the Wizard with the “Exit Wizard” button. If you decide you have made a mistake, or forgot an instruction on a previous screen, you can move to that screen and back again using “next” and “previous”.

7.1.1 Wizard Outline

The Hardware Wizard will consist of 5 major divisions:

1) RS232 Connection
2) Audio Wiring Test
3) Remote Discovery
4) Virtual Remote Assignment
5) Fine Tuning of page and program levels

7.1.2 Accessing the Install Wizard

1) For user of the auto-designer, the button labelled “Hardware Installation” on the popup at the end of the auto-design Wizard will start the Hardware Install Wizard.

2) For other users there is a “Hardware Installation Wizard” item under the Install menu (Main -> Install -> Hardware Installation Wizard).

7.2 The Hardware Wizard Start screen

The first screen of the Hardware Wizard functions as a welcome and data select screen. You must know how you will use the Wizard:

If you are downloading a new .mzp file from the auto-design sequence, you will press the “Write data to MZP device” button.

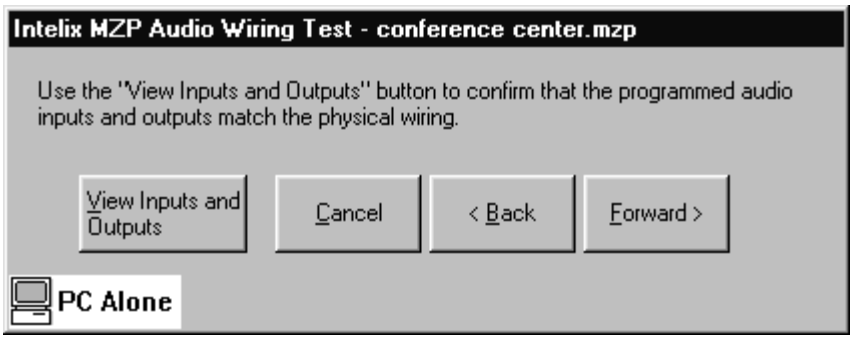
If you are accessing the Wizard from the main menu item (Main -> Installation -> Hardware Installation Wizard), you will click the “Open a file for installation” button.

If you will be reading an existing file from a programmed or blank (unconfigured) MZP, you will press the “Read data from MZP device into a new file” button.

7.3 Audio Wiring Test screen

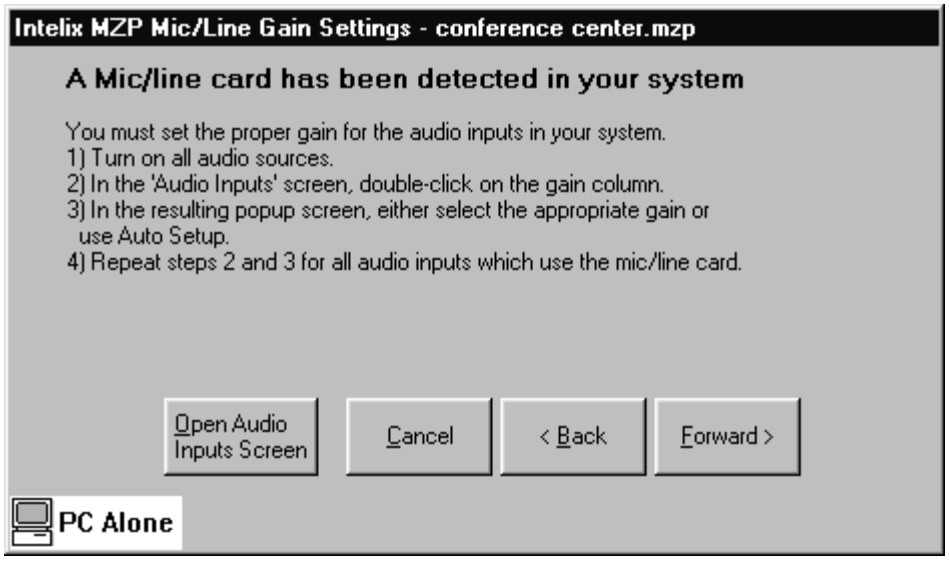
In this screen you can check to make sure that you have correctly defined all audio inputs and outputs. By clicking on the View I/O button, you can look at the inputs and outputs by name in two columns. Verify that you have wired the audio equipment as defined on the screen.

When finished click the Next button.



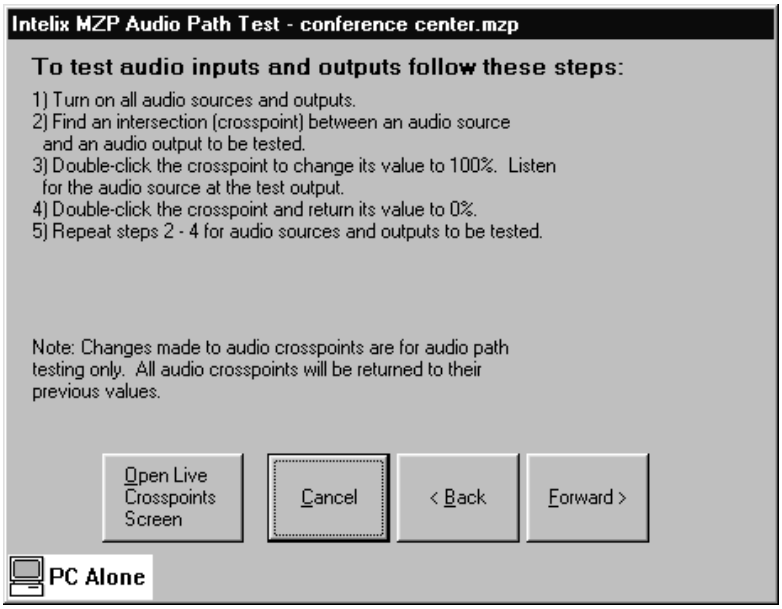
7.4 Mic/Line screen

If a mic/line card is detected in your system, this screen appears. If no mic/line card is detected the screen is skipped. The screen allows you to open the “Audio Inputs” window where you can set the gain levels of inputs. Set the gain ranges by doubleclicking on the “gain” column for an input. In the resulting popup, either select a gain range manually or click Auto setup, to have the MZP set up the optimum gain range. Repeat for each input. If you accidently close the Audio Inputs screen, click the “ Open Audio Input screen” button. Click Next button when ready.



7.5 Audio Path Test screen

At this point in the Installation Wizard you can test all audio path wiring. From this screen you can open the Live Crosspoint screen. By following the instructions on the Wizard screen, you can test and verify all audio path wiring.



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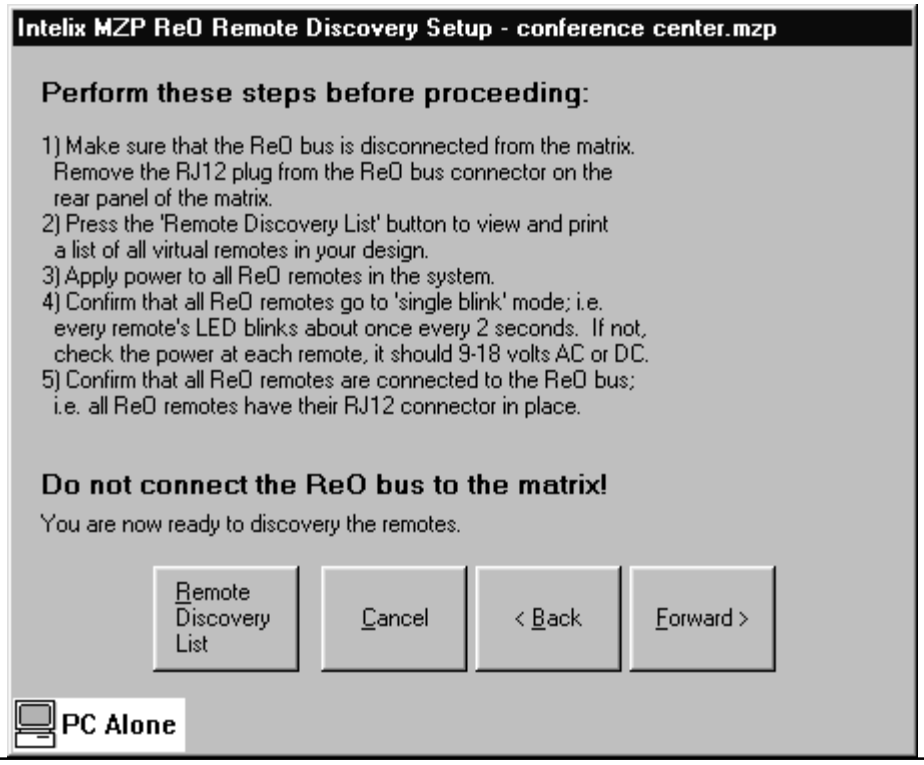
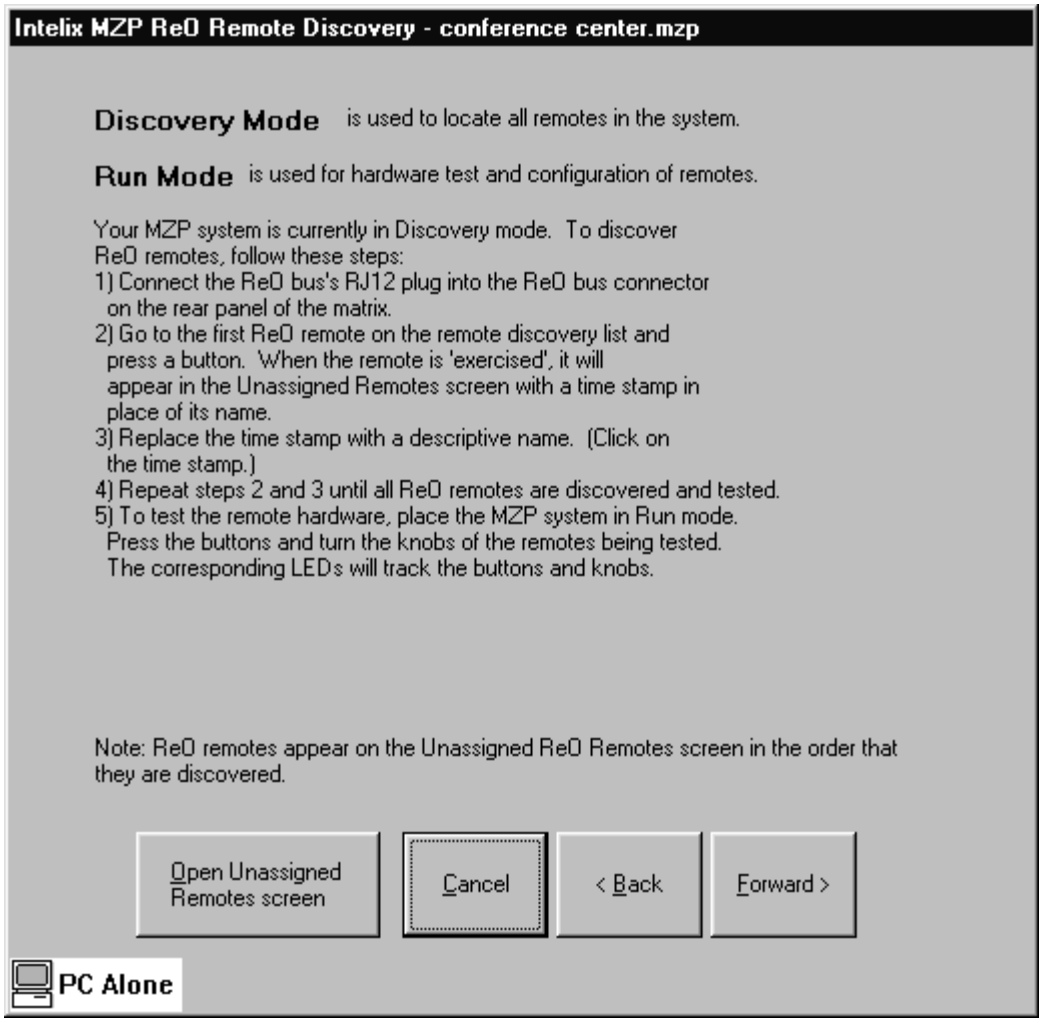
7.6 Remote Discovery Setup screen

This screen instructs you to power and check the MZP system in a particular sequence as preparation for discovering system remotes. When you have finished the instructions, click the “Remote Discovery List” button and print out the resulting remote list. This list will help you in exercising the remotes. Now click the “Next” button.



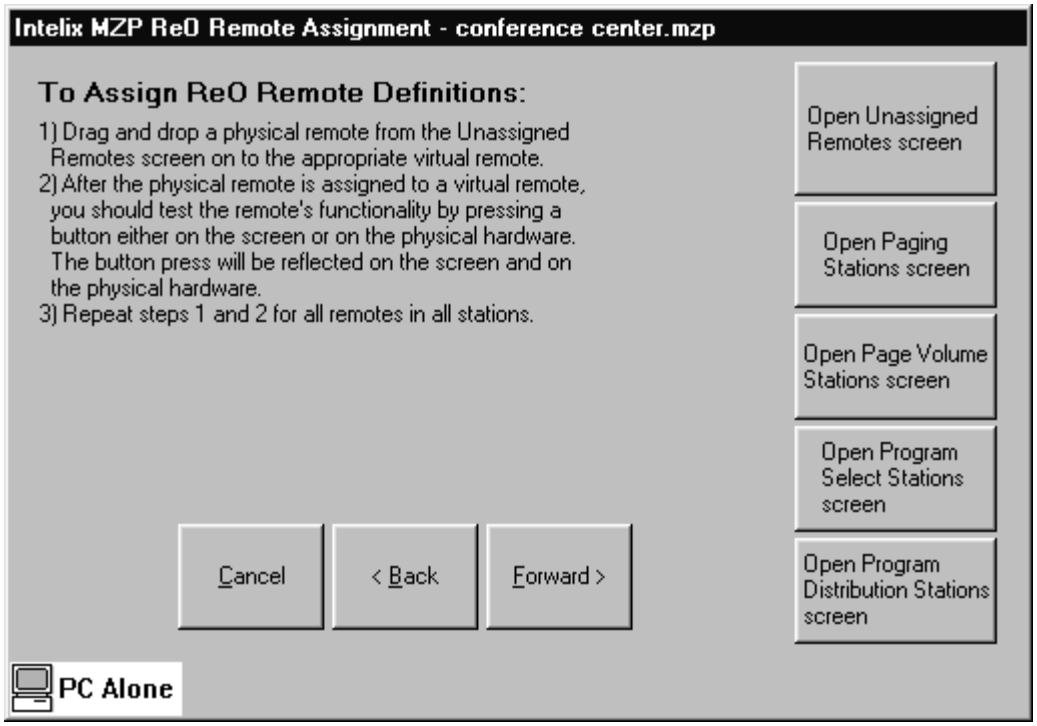
7.7 Discover Remotes screen

This screen gives directions on how to "discover" your system's remotes. Follow the directions on this screen to allow the MZP to correctly discover all the remotes in the system. After reading the instructions on this screen, click on the "Open Unassigned Remotes" button. Now execute the instructions presented on this screen. Discover and name all remotes in your system. Now click the "Forward" button.



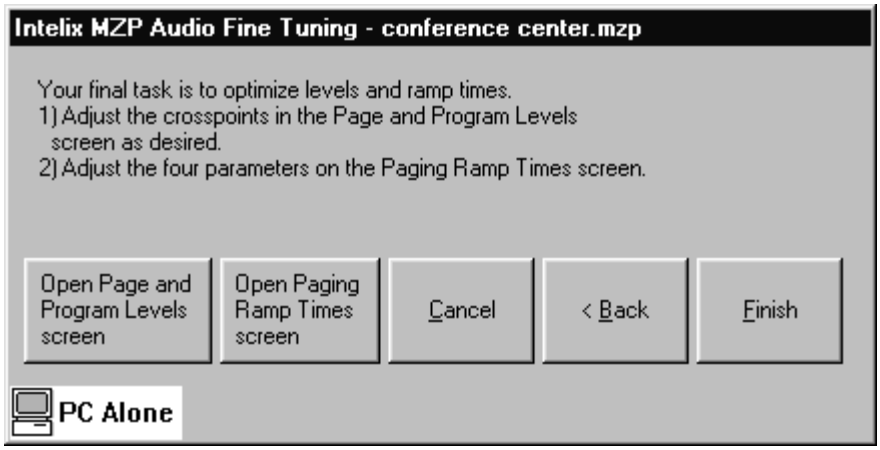
7.8 Remote Assignment screen

On this screen you will learn to assign physical remotes to the virtual remotes in your design file. First read the instructions on this screen. Then open the Unassigned Remotes screen by clicking the "Open Unassigned Remotes" button. Open the stations you wish to program first, by clicking the appropriate "Open ... station screen". After finishing each station type, open the next station type until all remotes are programmed. Dragging and dropping the physical remote onto the virtual remote programs the remote completely.



7.9 Fine Tuning screen

This screen allows you to open the Page and Program Level screen, where you can optimize the audio crosspoint values for your design. When you have completed the adjustment of crosspoints, click the Open Paging Ramp Times" button. Adjust the four paging ramp times parameters as needed by your design.



8.0 ReO Bus Modes

8.1 Bus Modes

There are two modes in which the MZP system can operate, Run mode and Discovery mode.

8.2 Changing bus modes

To change between Run and Discovery modes, open the Unassigned Remotes screen (Main -> Installation -> Unassigned Remotes). Click either the “ReO Run” button or the “ReO Discovery” button.

8.3 Run Mode

Run mode allows the system to function normally, i.e. it polls each remote in the system on a round-robin basis and processes the remote commands. *This is the mode in which the system must be left after programming.*

Run mode also allows system alteration to a limited degree. If a single remote control is added to the system while it is in Run mode, that remote will be recognized and correctly added to the system. If multiple remotes are to be added at one time, the system should be put in Discovery mode as explained below.

8.4 Discovery Mode

Discovery mode allows the addition of multiple ReO remotes at a time, as when a new system is first programmed. Each remote so added must be exercised in a known sequence to allow them to be correctly discovered by the MZP matrix.

Discovery mode is normally used only during initial setup and programming of a system.

In the discovery process, the MZP will be told to discover and report all ReO remote devices connected to it. *Remotes are discovered in the order they are exercised* (a knob turn or button press), so it is critical to have an ordered list in which you will exercise them. As each remote is discovered it is displayed on the Unassigned Remotes screen. They can then be assigned to the stations in your design by clicking and dragging on screen. After discovery and assignment are complete, you will put the MZP in Run mode to test operation of the system.

8.4.1 Using Discovery Mode

To use discovery mode take the following steps:
1) In the MZP software open the Unassigned remote screen (Installation -> Unassigned ReO Remotes).
2) Click on the " ReO Mode Discovery" button.
3) Obtain the ordered remote list from the menu item (Reports -> Stations -> Remote Installer's List ->Print).
4) Using the list go to each physical remote and take these steps:
a) Verify that the remote's LED is in double blink mode (see Blink Code list in section 8.7).
b) Locate the remote on your ordered list of remotes. The list should contain a virtual remote with a name that corresponds to the physical remote's location. Mark this remote in the visitation order column, so that you can determine the order you exercised the remotes.
c) Exercise the remote (press a button or turn a knob).
d) Verify that the remote's LED goes to steady off, indicating that the remote has been recognized.
4) Repeat steps 4a-4d for all remotes. After all remotes have been exercised and have appeared as "responding" on the "Unassigned remotes" screen
5) Return to the PC. You should now name each remote on the unassigned remote screen with an indicator of its physical location, e.g. "west side of Room A".

The process of programming the physical remotes consists of dragging the image of the physical remote from the Unassigned remote screen and dropping it on the corresponding virtual remote in the station screen.

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If the names of the physical and virtual remotes are a good match; i.e. are easy to match with one another, this process can go very quickly. If the names do not correspond well, you may need to do some searching to determine which ones correspond. The Intelix software provides a number of diagnostic tools to simplify this process.

8.4.2 Why Naming and Discovery Sequence are Critical

Remotes are discovered by the MZP in the order that they are exercised. When remotes are first discovered by an MZP matrix, the remotes are undifferentiated; that is the matrix cannot tell the difference between one Comet 4 and another. In order for the installer to assign physical remotes to correct virtual remotes in the design program on the PC, there must be a way to differentiate the remotes.
As you visit rooms and stations, the remotes you exercise are recognized and appear on the PC screen in the order visited. They will appear in the Unassigned Remotes window in order of discovery, left to right and top to bottom.
When you return to the PC to assign virtual remotes to the newly recognized physical remotes, you must be able to distinguish among the remotes on the screen.
There are two things you should do to make this process simple. First carry the Remote Installer's list (generated from Reports -> Stations -> List -> Print). Every time you exercise a remote, mark on the list its physical location and its sequence number; that is for the first remote visited, mark it as sequence #1, and an appropriate name; e.g. "west side of Ballroom".
The second thing to do is to make sure that you have given good descriptive names to both the

physical remote (like “west side of ballroom” above) and to the virtual remotes in the design program on the PC. Ideally, the virtual names should be the same as the physical ones. Names of virtual remotes can be changed at any time, right up to Discovery. Spend some time now to ensure that you have descriptive, useful names for all remotes.

8.5 Non Responding Remotes

If any remotes in the Unassigned Remotes window have a status indicator reading “Not responding” they have lost communication since you exercised them and should be repaired before proceeding. There are two main causes for the problem: power and ReO bus. Pull and replug the power plug. The remote’s LED should go to single blink, then double blink. This indicates that communication has been restored. If the remote still does not respond, there is a problem in the ReO bus; either an intermittent problem in the ReO connector at that remote, or noise and reflections on the bus.

8.5.1 Searching for a lost remote

If you have a physical remote in the unassigned remotes screen that you cannot match with a virtual remote on the PC screen, double click on an LED of the mystery remote in the unassigned remote screen. This will cause that LED to blink at about .5 Hz both on the PC screen and on the remote in the real world. Now leave the PC and search for a remote with its LED blinking at that rate. When you find it note its location, return to the PC and rename it in the Unassigned remote screen with a name that makes its location obvious. You can now assign it to its corresponding virtual remote.

8.5.2 Retracting a mistaken drag and drop

If you accidentally drag and drop a physical remote to a virtual one, and realize that you have dropped it on the wrong remote, you can undo the error, simply by dragging and dropping the remote back to the unassigned remote screen. It is now unprogrammed again and ready to be dropped on the correct virtual remote.

8.6 Testing remotes with a two person team

If there are two people available to test the system, it is efficient to do as follows: On the PC bring up the station to be tested (Paging station or program station screen) send the second person to the physical remote, and have him press the buttons and turn the knob (if any). The actions at the physical remote will appear on the PC screen, verifying that the remote is working correctly.

8.7 Remote Blink Codes

The LEDs on remotes have 5 main blink codes that assist you with determining the state of a remote (these codes appear only on the physical remotes, not on the PC screen):

a) **All LEDs off**: either not powered or normal run state; if new system check power supply to remote.

b) **Single blink**: powered but no communication. ReO data bus problem or not yet exercised. If new system, there is a problem in the ReO bus to that remote.

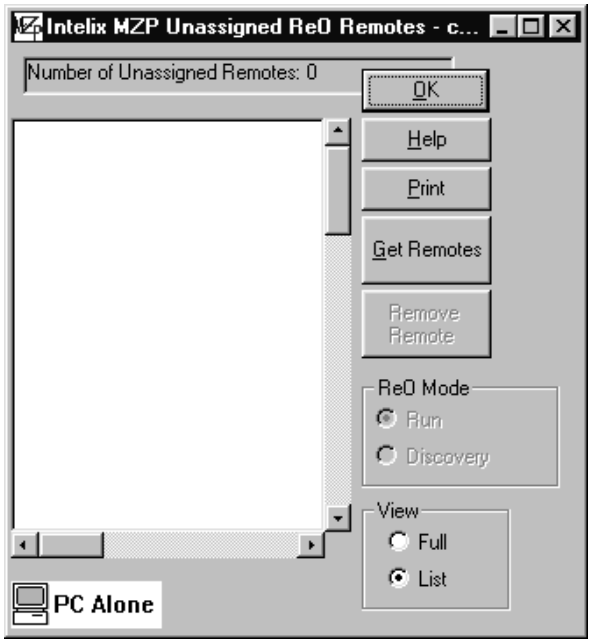
c) **Double blink**: powered up and received a message from the Matrix.

d) **Triple blink**: This state means that a message has been lost between the Matrix and the remote. This indicates a ReO bus problem. Check for noise or reflection conditions on the bus (see Appendix K).

e) **Steady on**: custom programmed state, unknown meaning.

Remember that for correct operation of the system you must go to Run mode after all modifications are complete.

8.8 A drag and drop example



This page shows the three screens open in preparation for drag and drop during the discovery process: The unassigned remote screen (at top) Also pictured are the cursor as seen during the drag and drop process, when you are between windows.

To program the physical remotes with the properties of the virtual remotes, click on a physical remote from the unassigned remote screen and drag it over the corresponding virtual remote in the paging or program station screen and when the cursor removes the red slash, drop it. The physical remote is now programmed with the characteristics you specified for the virtual remote.

Repeat this process for every remote in the system.

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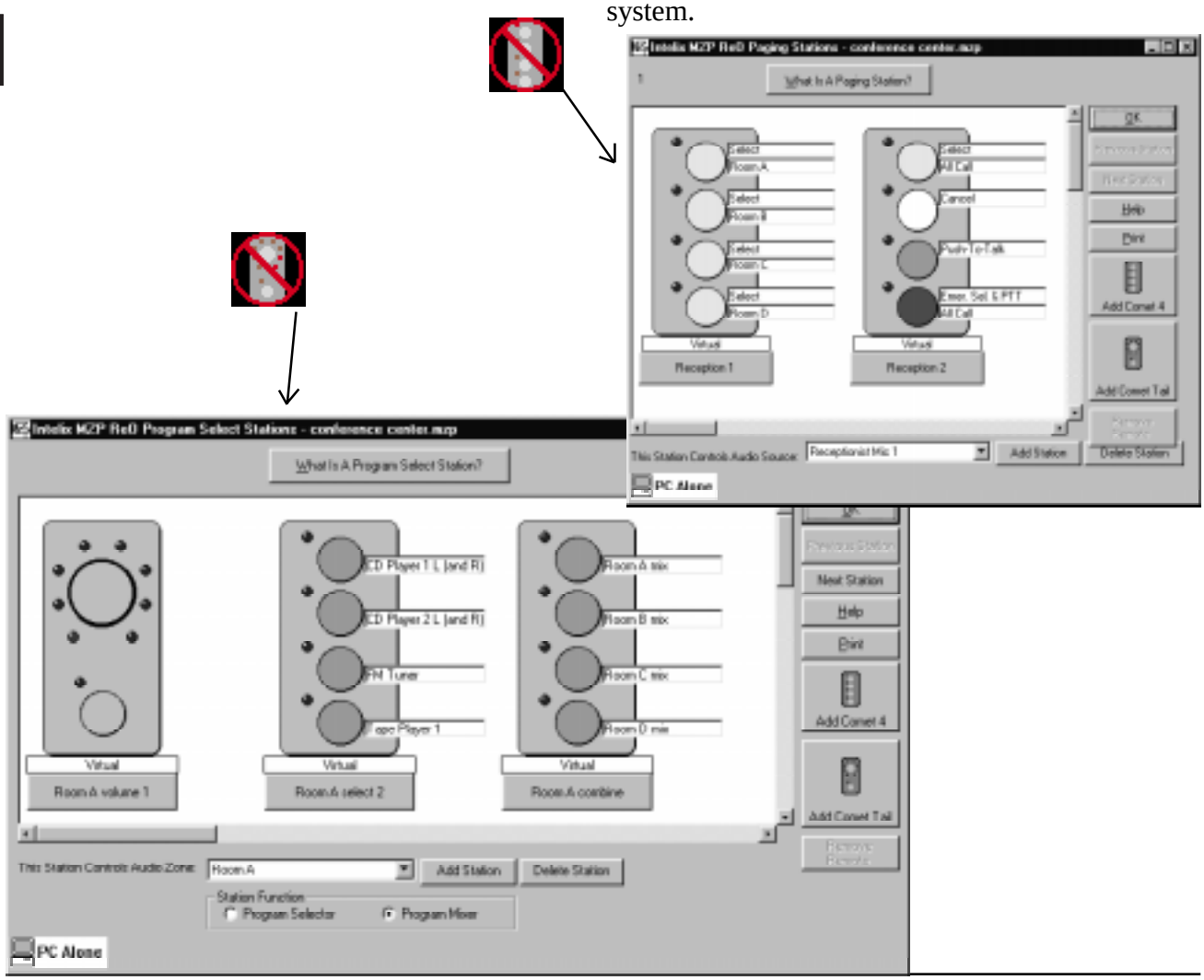
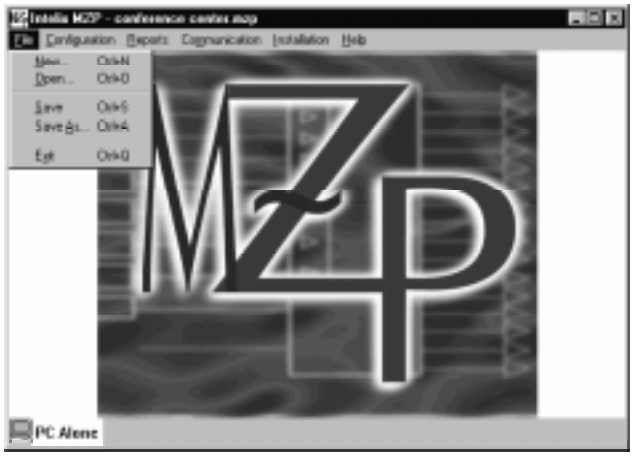


9.0 MZP Windows® Reference

This section is organized by menu items. For each item on the main MZP menu there is a section detailing the uses of the selections under that item. The major items are:

1) File
2) Configuration
3) Reports
4) Installation
5) Help

9.1 The File Menu



9.1.1 The New Item

Selecting the New item from the file menu causes a prompt for the path and name of the new file to be created. After you have specified a name and path, the software starts the auto-design process, which is a series of screens presented in sequence to guide you through the design process. You are informed that auto-design is about to begin. If you click OK, the auto-design process begins. During auto-design the new file is automatically saved after every window in the sequence. If you click Cancel you are returned to the MZP main screen.

9.1.2 The Open Item

Selecting the Open item from the file menu causes the software to prompt you for the path and name of the file you wish to open. After you have specified the path and filename, the software opens that file, showing progress as it does so. On a fast machine or a small file, this progress indicator may be barely visible.

9.1.3 The Save Item

Choosing the Save item from the File menu causes the software to save the currently open file to disk. All changes since the last save are updated. Note that during auto-design (triggered by the New item) the file being created is automatically saved after every screen. *This is only true during auto-design.*

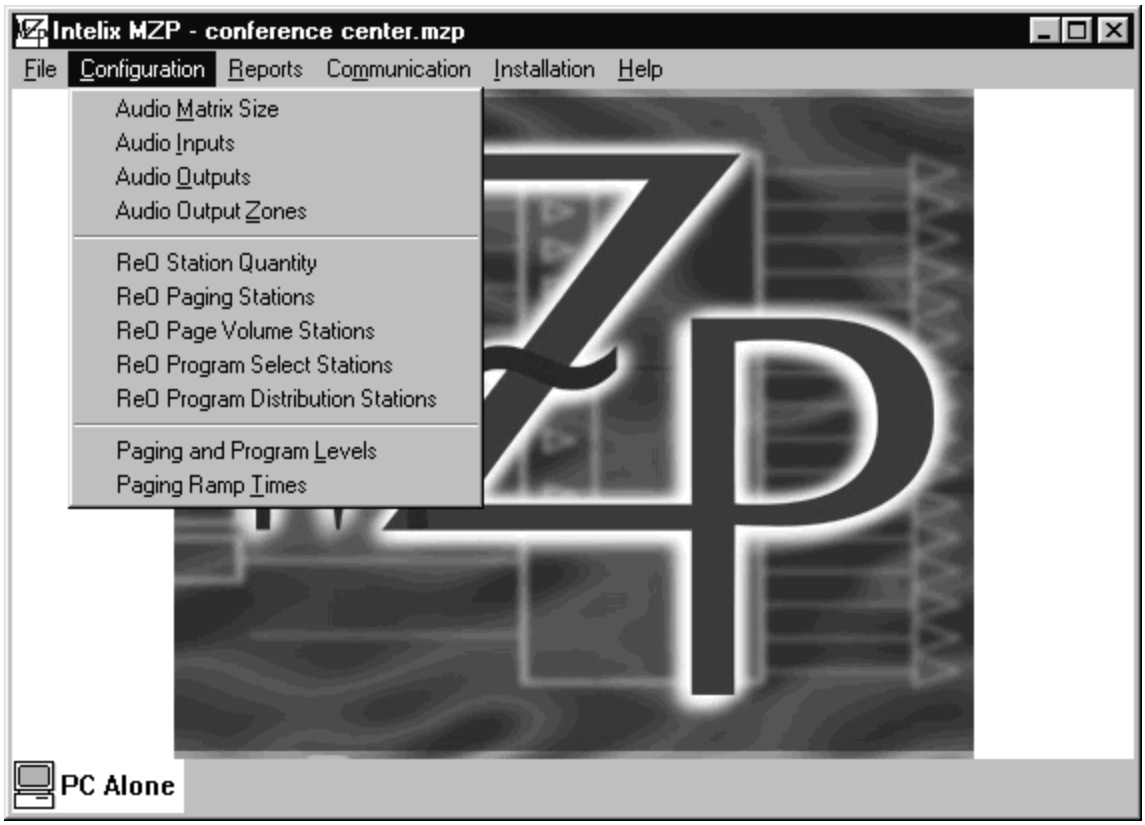
9.1.4 The Save As... Item

Selecting Save as from the File menu allows the user to create new file based on existing ones. If a new program requires only a single change to an existing file, open that file with the Open item, make the change and select the Save As.. Item. You will be prompted for a path and filename. The new file will then be saved under the new name and the original file unchanged under the old filename.

9.1.5 The Exit Item

Selecting the Exit item from the file menu closes the MZP software and returns you to the desktop. If you have made changes to a file, the program will ask you if you wish to save the changes.

9.2 The Configuration Menu



9.2.1 Audio Matrix Size Item

The audio matrix size window allows the designer of an MZP system to define the size of the matrix required for the design. Using either the scroll button or direct “typing” entry set the desired number of Paging Inputs, Program Inputs and Audio Outputs. The windows keeps track of the total size of the matrix needed to accommodate the specified numbers. This size is displayed in the “actual” column.

The “Help” button pops up a help screen for this screen.

The “Print” button sends the matrix size report to your printer.

9.2.2 Audio Inputs Item

The audio inputs screen allows the designer to define all inputs in the system. All parameters of the inputs can be set (except the number):

9.2.2.1 Name

Name (up to 20 characters) is changed either by doubleclicking the name, or using arrow keys to select it and pressing Enter. Type the new name and click OK or press Enter again.

9.2.2.2 Adding a Preamp

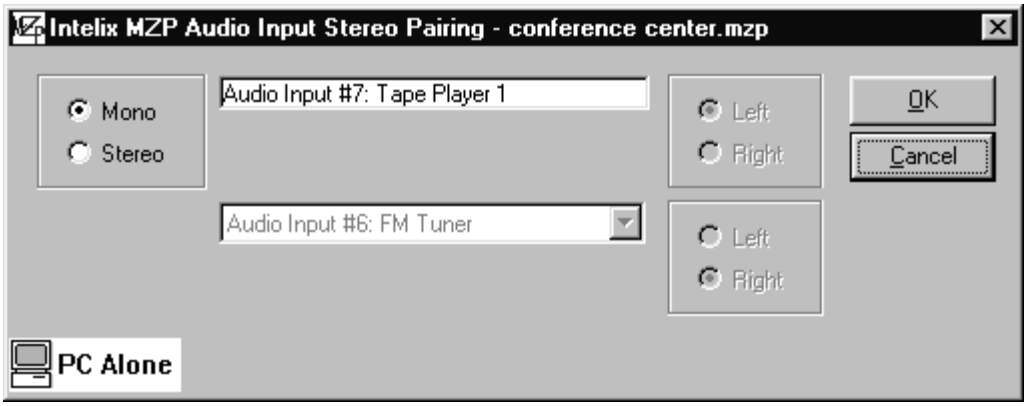
Click on the gain column to enable the “Add Preamp” button. After a mic/line card has been added, clicking on a gain column allows the setting of gain and other input parameters.

9.2.2.3 Input Type

Type must be one of two choices: page or program. A paging source is a microphone, while a program type is a music or other audio source such as a CD player or tuner. An input’s type is changed by doubleclicking on the type, which toggles between the two types.

9.2.2.4 Stereo Pairing

Stereo pairing allows the user to define an input as monaural or as a member of a stereo pair. To change the mono/stereo setting of an input, click on the cell to be changed. The resulting popup presents a choice of stereo or mono as shown below.



If you select stereo, then the boxes for selecting a stereo partner and let/right choices become active. When you click OK, the changes will be reflected in the mono/stereo, L/R and stereo pairing columns.

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9.2.3 Audio Outputs Item

The outputs item allows the designer to configure the system's audio outputs. All parameters of the outputs can be altered (except the number):

9.2.3.1 Name

To change the name of an output either double-click the name, enter the new name and click OK; or use the arrow keys to reach the name you want, press Enter, type the new name and press Enter again.

9.2.3.2 Duck Amount

Duck amount is the amount by which an output is ducked (lowered) when a page into that zone becomes active. To change the value, double-click or arrow to the desired cell, press Enter, type the new value and press Enter.

9.2.3.3 Mono/Stereo

Doubleclicking on this column allows the user to define an output as monaural or as a member of a stereo pair. The "L/R" and Stereo Pairing columns reflect the assignment of stereo pairs.

9.2.3.4 Help button

pops up a help screen for this screen.

9.2.3.5 View options

The values in the output screen can be viewed in two different ways: in percent of full scale (range 0 to 100%) or in decibels (range -100 dB to 0 dB). Choose your preference by clicking the appropriate option button at the right of the screen.

9.2.4 ReO Station Quantity Item

The ReO station quantity screen allows the designer to input the number of the various types of stations required by the design. These types include:
Paging Stations (route a single paging source to multiple zones)
Program Stations (route multiple program sources to a single zone)
Paging Volume Stations (control page volume into a single zone)
Program Distribution Stations (route a single program input to multiple zones)

Use the up/down arrows or direct text entry to change the values.
You can have any combination of station types as long as the *total* number of stations in a system is less than 128. A warning will appear if you attempt to exceed the 128 station limit.

9.2.5 Audio Output Zone Item

This screen allows the designer to specify what outputs are present in each zone. A zone is an arbitrary collection of outputs; any output can be included in multiple zones.
The screen shows a grid of outputs (across the top) and zones (down the left side). If the intersection of a row (zone) and column (output) is checked that output is a member of that zone.

9.2.5.1 To toggle a single cell

Double-click on the cell. This toggles the output into and out of the zone. You can also select the cell by single clicking on it, then use the “Select” and “Deselect” buttons.

9.2.5.2 To change a range of cells

Click and drag to select the group of cells (they highlight). Now click on “Select”/ “Deselect”.

9.2.5.3 To change zone names

Click on the name (the row highlights). Click the “Zone Name” button, type the new name and click OK.

9.2.5.4 To change output names

Click on the name (the column highlights). Click the “Output Name” button, type the new name and click OK. *Note that you can drag the column boundaries to accommodate long names.*

9.2.6 ReO Paging Stations Item

This item allows the designer to define the hardware and its programming for each paging station in the system. Fully defining a station consists of two steps: assembling the remotes needed, and programming the remotes. Both steps are accomplished in this screen.

For each paging source defined in your file (from the audio inputs screen) the software will create a paging station automatically. You will need to look at each station and make the modifications your design requires and program each station. **Move through the list of paging stations** by clicking the "Next Paging Station" and "Previous Paging Station" buttons. The title of each paging input will appear in the text box at the top of the screen as its station is displayed.

9.2.6.1 To add a remote to a paging station

Click on the "Add Comet-4" or "Add Comet Tail" buttons.

9.2.6.2 To delete a remote from a station

Select that remote by clicking on any button of the remote (the remote will highlight), then click the "Delete Remote button".

After you have assembled the remotes required for a station, it is time to program that station's remotes.

9.2.6.3 To assign a function to a button

Click on the drop list next to the button. A list of possible functions drops down. Select the function you wish the button to have. Note that each function changes the color of the button for easy reference. The button functions are described below:

1) Select and Talk – enables pages into a specific zone and begins the page at normal page priority. (blue)
2) Select – the button will enable pages into a specific zone but does not begin the page. The selection is latched on and can only be deselected with a cancel button. (yellow)
3) Talk – enables the station's microphone into the zones that have been selected. (green)
4) Emergency Select – enables pages into a specified zone at emergency priority but does not begin the page. The selection is latched on and can only be deselected with a cancel button. (red)
5) Emergency Select and Talk – enables pages into a specified zone at emergency priority and begins the page at emergency priority. (red)
6) Cancel – deselects all zones currently selected. (white)
7) None – the button has no current function. (grey)

When you choose any function that requires an associated zone, a list of zones (as defined in the audio zones screen) appears (in a list box below the function type). Click on the zone to be selected by this button. Repeat this process for each button in the paging station.

9.2.6.4 To name a remote

Click on the name box (initially containing "Click Here to Name") type in the new name and click OK.

The **status indicator** (above the name) will have one of three labels:
virtual – not connected to an MZP matrix, all remotes in PC stand-alone mode
responding – connected to an MZP matrix and responding correctly to system messages
non responding – connected to an MZP matrix but not responding correctly to system messages.

9.2.6.5 Adding a Comet Tail

adding a Comet Tail to a paging station gives the operator of the paging station control over the volume of all pages originating at that station. *Warning: if a paging station's volume control is set at a low level, pages may go unheard* ***including emergency pages.***

The **print button** will print a report on the displayed station to the local printer.

The **Help button** will display a help file for the Paging Station Screen.

9.2.7 The Paging Volume Station Item

This screen allows the designer to specify each paging volume station in the system. A paging volume station controls the volume of all pages into a zone.

Each paging volume station consists of a single Comet Tail remote, or multiple Comet Tails that are functionally identical. **Move among the paging program stations** by clicking the "Next" and "Previous" buttons.

9.2.7.1 Programming the Comet Tail

Click on the drop down list next to the Comet Tail and select the zone to be associated with the station.

9.2.7.2 Adding a Comet Tail

Click the "Add Comet Tail" button.

9.2.7.3 Delete a Comet Tail

Click on a button of the remote to be deleted (it will highlight), then click the "Delete Remote" button.

9.2.7.4 Changing the name of a remote

Click on the name box, enter the new name and click OK.

9.2.7.5 Deleting a station

Use the "Next" and "Previous" buttons to select the station, then click the "Delete station" button.

9.2.8 ReO Program Stations Item

This item allows the designer to define and program the hardware for each program station in the system. Defining a program station requires two steps: assembling the remotes needed, and programming the remotes. Both steps are accomplished in this screen.

When you select the ReO Program Stations item, initially only the "Add Program Station Screen" button will be active. You will need to add stations, modify and program them as required by your system.

9.2.8.1 Adding a remote to a program station

Click on the "Add Comet-4" or "Add Comet Tail" buttons.

9.2.8.2 Deleting a remote from a station

Select that remote by clicking on any button of the remote (the remote will highlight with a blue box), then click the "Delete Remote button".

9.2.8.3 Deleting a program station

Click on the "Delete Program Station" button, the currently displayed station will be deleted, after confirmation.

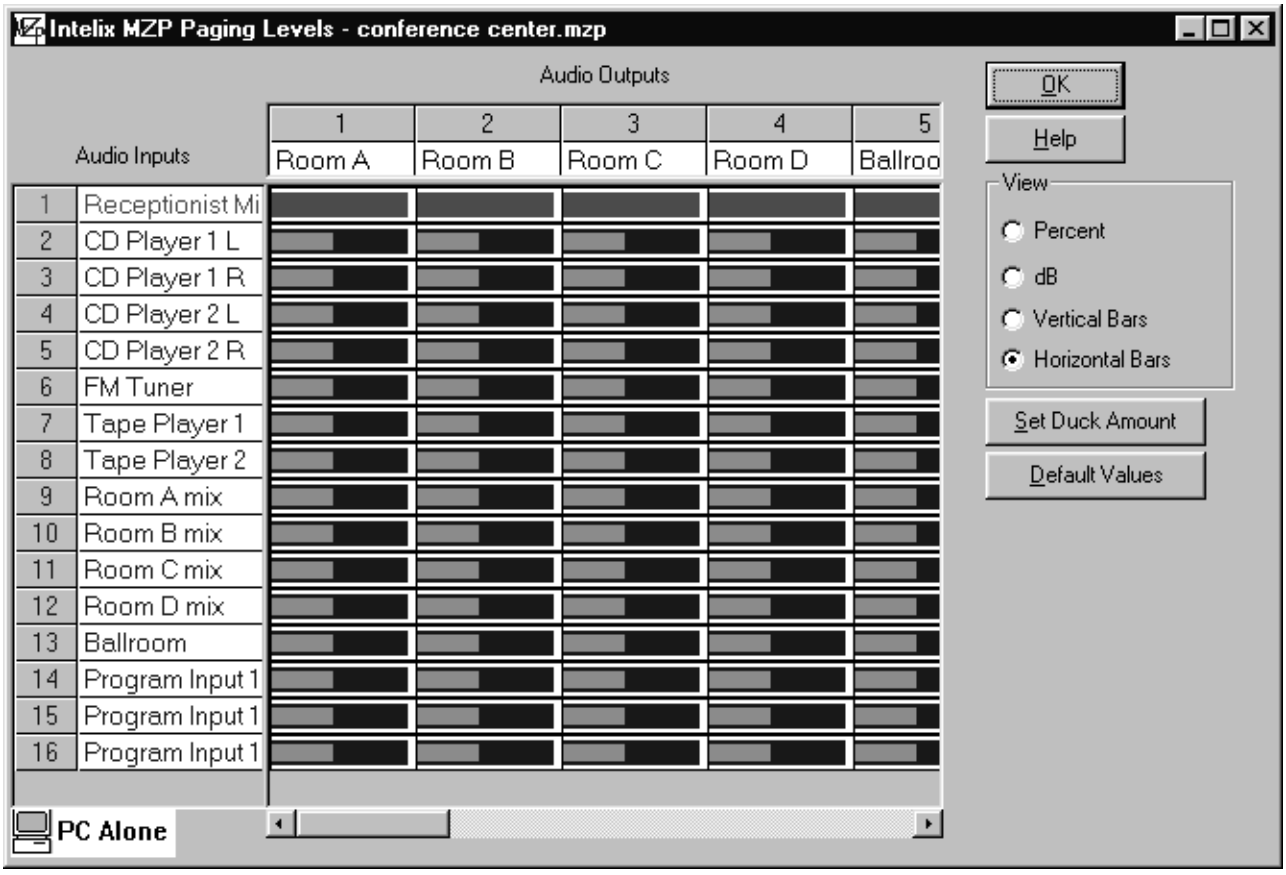
After you have assembled the remotes required for a station, it is time to program that station's remotes.

9.2.8.4 Choose the type of program station
(with the option select button at the top of the screen):
1) A **program select station** selects a single audio source at a time.
2) A program mixer station selects multiple audio sources and mixes them according to the crosspoint levels for those sources in the page and program level screen.
Comet Tails require no programming. By assigning a Comet Tail to a station, it is completely defined.
9.2.8.5 Assigning an input source to a button
Click on the drop list next to the button. A list of input program sources appears. Click on the desired source. Repeat for each button in the station. **Move among the system's program stations** by clicking on the "Next Program Station" and "Previous Program Station buttons.
9.2.8.6 Naming a remote
Click on the name box (initially containing "Click Here to Name") type in the new name and click OK.
The **status indicator** (above the name) will have one of three labels:
virtual – not connected to an MZP matrix, all remotes in PC stand-alone mode
responding – connected to an MZP matrix and responding correctly to system messages
non responding – connected to an MZP matrix but not responding correctly to system messages.

9.2.8.7 Changing the zone associated with a station
Use the previous and next button to display the station you wish to reassign. Then from the drop down list of zones at the top of the screen, select the new zone name.

9.2.9 The Program Distribution Stations Item
This screen allows the designer to specify the hardware and programming for each program distribution station in the system. A program distribution station allows the routing of a single audio input to multiple zones.
9.2.9.1 Adding A Comet Tail
Click the "Add Comet 4" button.
9.2.9.2 Adding a Comet Tail
Click on the "Add Comet Tail" button.
9.2.9.3 Removing a Remote
Highlight a remote by clicking on any of its buttons. It highlights (becomes surrounded by a blue box); click the "Delete Remote" button.
9.2.9.4 Moving Among Stations.
Maneuver among the stations using the "Next Station" and Previous Station" buttons.
9.2.9.5 Adding and Deleting Stations
Click on the "Add Station" or "Delete Station" buttons.
9.2.9.6 Audio Source
The text box at the top of the screen displays the Audio Source distributed by this station.

9.2.10 Paging and Program Levels Screen



This screen allows you to set the volume of all crosspoints in the audio matrix. The crosspoints are represented as a grid of inputs (listed down the left) and outputs (listed across the top). Changing a crosspoint alters the volume of that input to the *specified output only*.

9.2.10.1 Changing a crosspoint level

1) Double-click on the crosspoint you wish to alter. A text box appears.
2) Type the value you want. Click OK.
3) Repeat for all crosspoints desired.

9.2.10.2 Setting Default Values

To set all crosspoints to the full on setting (100% or 0 dB) click the “Default Values” button. After a confirmation, all crosspoints will be set to 100%.

9.2.10.3 Viewing Crosspoints

You can view crosspoint settings in percent, dB, vertical bars or horizontal bars. Select the desired view by selecting an option button in the “view” at the right edge of the screen.

9.2.11 Paging Ramp Times Screen

After the system is assembled, the remotes are programmed, and page and program levels set, there are two items left to adjust before testing: duck amounts and ramp times. MZP implements auto-ducking, meaning that pages into a zone automatically duck (reduce) the volume of program material, so that the page can be more clearly heard. This section explains how to set the parameters associated with ducking: duck amount (how much the program material is reduced during a page), ramp up and ramp down times (the rates at which the program material is ducked), and page ramp times. There are four parameters associated with ramp times:

1) Program source duck time. The amount of time the program material ramps down when a page becomes active.
2) Program source return time. The time the program material takes to return to its prepage level after a page.
3) Page source ramp up. The time for a page input to reach full paging volume.
4) Page source ramp down. The time a page input to return to zero volume after a page.

As shown below the screen allows entry of values for all four parameters. An interactive graph shows the magnitude and relationship among the four parameters. The parameters are limited to values between 0 and 30 seconds.

The “Set Duck Amount” button allows you to change the amount of ducking for each output from this screen. Duck amounts can also be set in the Audio Output screen.

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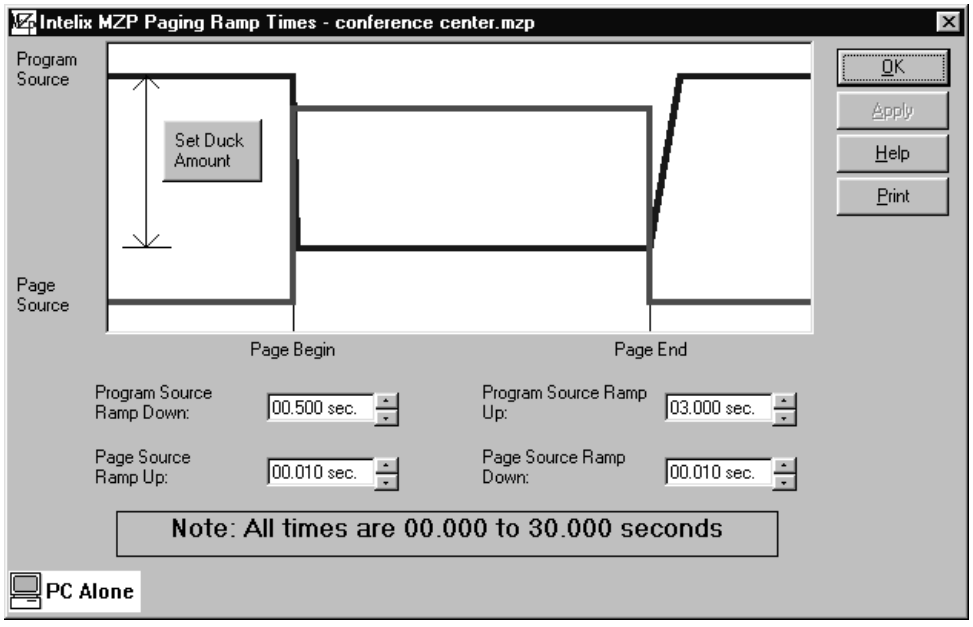
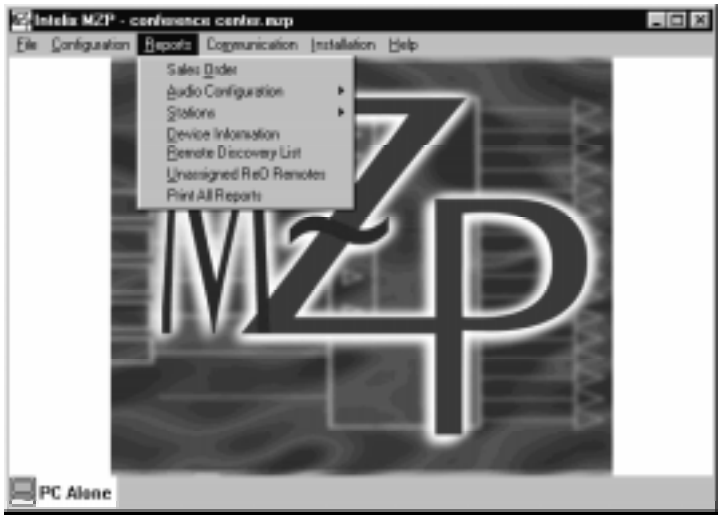
9.2.11.1 Changing the paging ramp time parameters

1) Either click and hold down the up/down arrows on the spin boxes, or make direct text entry into the boxes. If you use the arrow method, you can watch the graph interactively change to the new values.

2) If you wish to alter ducking amounts, click the “duck amount” button, and enter the new values in the resulting screen.



9.3 The Reports Menu



9.3.1 Sales Order Item

This form generates an order for the hardware based on your design. The To field is fixed in the PC registry and can be changed, but defaults to the Intelix Order Department. The Bill To field is also stored in the registry, so that you need only fill it in once (but change it if needed).

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Ship To field defaults to the “Bill To” field data but can be changed on a file basis. Part numbers and quantities are filled in by the MZP software automatically, based on the design in the current file.

9.3.2 The Audio Configuration Item

This menu sends selected reports to the printer.

a) **All audio parameters item –** this item will send all audio parameter reports (audio matrix size, audio inputs, audio outputs and audio zones) to the local printer.
b) **Audio matrix size** – prints the audio matrix size screen.
c) **Audio Inputs** – prints the audio inputs screen.
d) **Audio Outputs** – prints the audio outputs screen.
e) **Audio Zones –** prints the audio zones screen.

9.3.3 Stations

This menu send selected screen reports to the printer:

a) **All audio parameters item –** this item will send all audio parameter reports (audio matrix size, audio inputs, audio outputs and audio zones) to the local printer.

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b) **Audio matrix size** – prints the audio matrix size screen.

c) **Audio Inputs** – prints the audio inputs screen.

d) **Audio Outputs** – prints the audio outputs screen.

e) **Audio Zones –** prints the audio zones screen.

9.3.4 Remote Discovery List

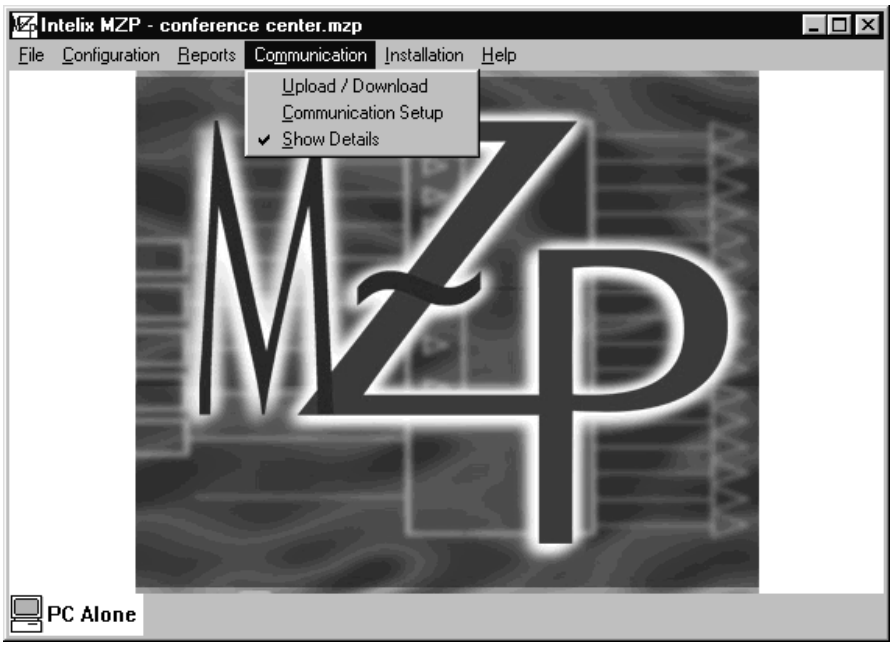
This item prints a list of all ReO remotes in the system with column and check boxes for use by the installer to sequentially exercise the remotes during the Discovery process.

9.3.5 Print All Reports Item

After a confirmation message, this item will send all available reports to the local printer. This function is useful in documenting a finished installation.

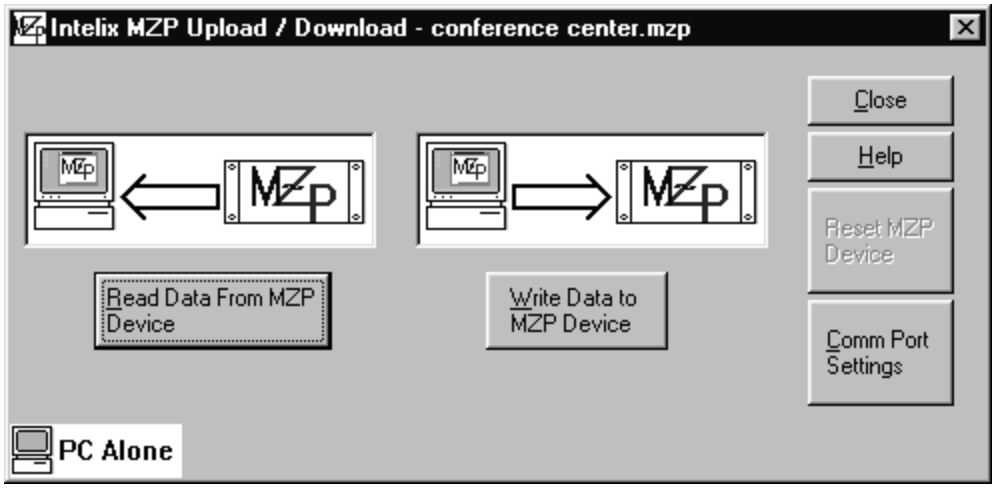
9.4 The Communication Item

Selecting the Communication Item from the Main menu brings up the communication window, which has three possible selections (MZP to PC, PC to MZP, show details).



9.4.1 Upload/Download

The screen below appears, allowing reading from the MZP, writing to the MZP and communications setup.



9.4.1.1 Read Data From MZP device

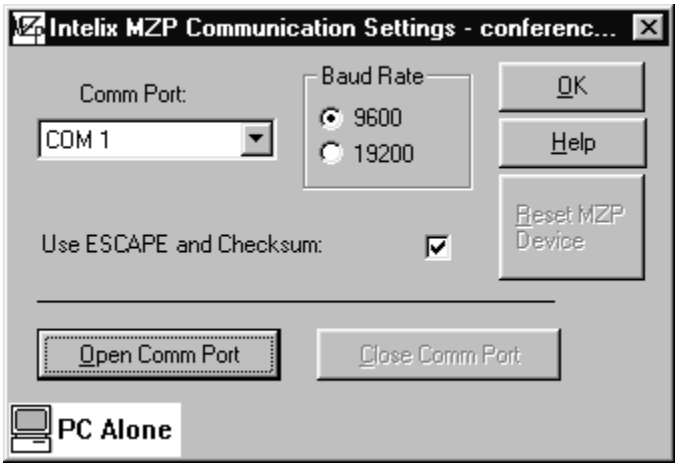
This item allows the user to load the currently open file with the data from an MZP hooked up to the PC. For this option to work, the PC must have already established communication with the MZP. After communication is established, the MZP will transfer all its programming to the PC. The data will be stored in whatever file is open when the “MZP device to PC” command is issued. This can be an existing file or a new one, as the user wishes. A typical use of upload is to modify an existing MZP application. The user would transfer the file to the PC; make the modification, and use “Write Data to MZP device” (described in section 9.4.1.2) to send the new configuration back to the MZP.

9.4.1.2 Write Data to MZP Device

This item allows the user to transfer the current file on the PC to the MZP connected to the PC. After establishing communication between the PC and the MZP, the PC will send the currently open file to the MZP, which will store it in its local memory. After transfer, the MZP can be put in discovery mode and configured to run the new program. A typical use of PC to MZP device is to send a new design to the MZP.

9.4.2 Communication Settings

The communication setup screen can be accessed either from (Main -> Communication -> Communication Setup) or from the Comm Port Settings button on the Upload/Download screen. There are five main choices:



9.4.2.1 Communication Port

The port you choose must be present in your system and unused by any other peripheral in your system. If you choose an nonexistent or in-use port, a warning will appear.

9.4.2.2 Baud Rate

There are two available baud rates: 9600 and 19,200. Choose whichever rate best suits your system. The rate you choose *must be matched by the DIP switches* on the back of the MZP. (Seenext page for DIP switch details).

9.4.2.3 Use Escape and Checksum

If your controller allows it, using escape and checksum can minimize the error rate over your communication link. If your controller does not allow the use of escape and checksum, uncheck this item.

9.4.2.4 Open Port

This button activates the communication port you have selected. Tobegin communication with the MZP you must open the port. If your settings selections have been correct, the communication icon in the lower left of the screen will change to OK; if the MZP does not respond the icon will show the broken link.

9.4.2.5 Close Port

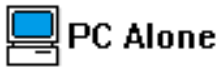
No settings can be altered while the communication port is open. If you need to change any settings to the port, you must first close it. Click the “Close port” button, make the changes and click “Open port”. Be sure to recheck the communication icon to ensure that communica tion is correctly established.

9.4.3 Show Details

This check item allows you to see the contents of messages passing between the PC and the MZP. If the item is checked a window wil appear displaying the messages. To remove the window, uncheck the menu item. All messages displayed in the Show details window are shown as transmitted and received from the point of view of the PC.

9.4.3 Communication Icons

All screens carry a communication icon in the lower left corner. The icon in the lower left corner will indicate the current state of communication. There are three communication icons:



This icon indicates that the PC is not attempting to communicate with an MZP matrix mixer. In this mode you can create new files and design systems for later transfer to an MZP. In PC alone mode some functions may be disabled.

This icon indicates correct communication between the PC and the MZP. You can transfer files, monitor the MZP or make live real time changes in this mode.

This icon indicates a communication failure. Common causes are incorrect communication port selected, incorrect baud rate, or cabling errors.

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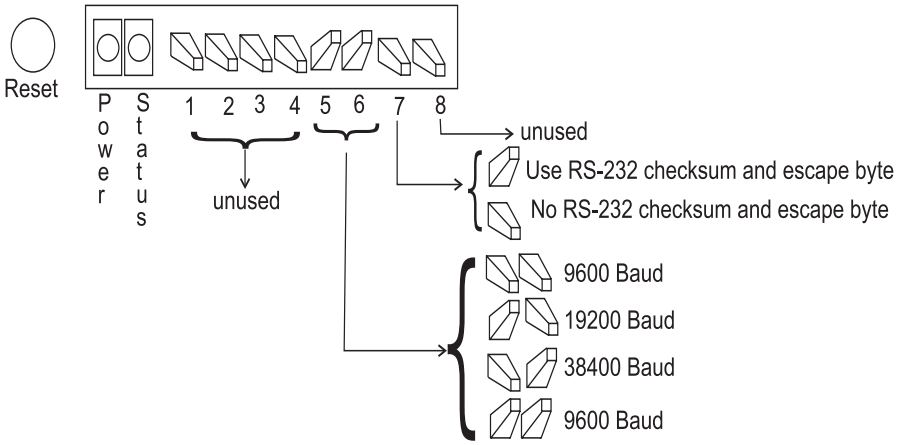
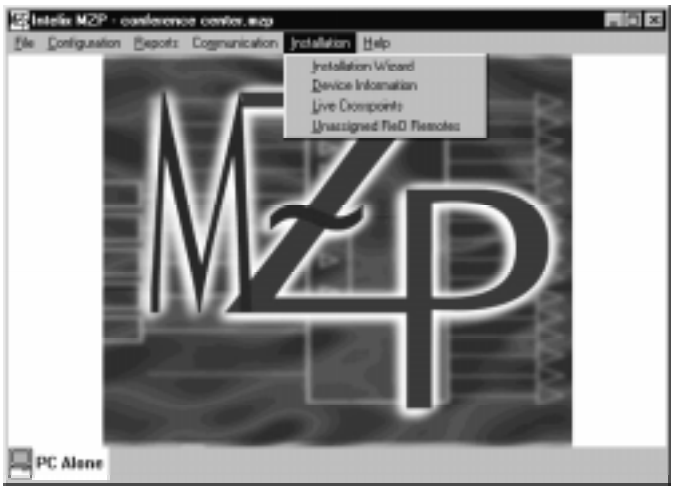
9.4.5 DIP Switch settings:

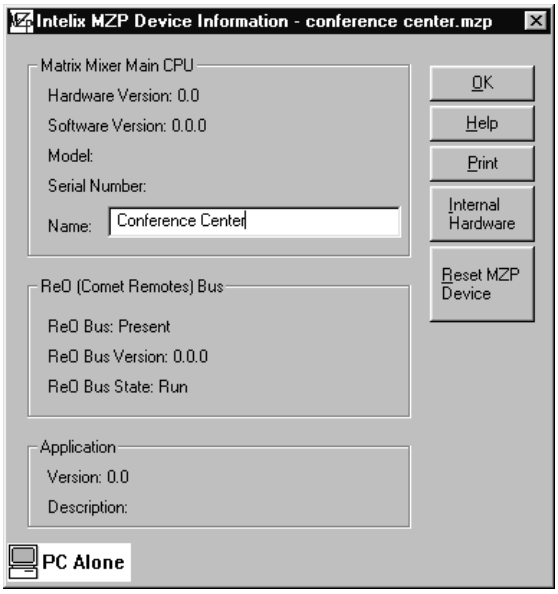
The DIP switches must match the baud rate settings in the software (see section 9.4.2.2).



9.5 The Installation Menu



9.5.1 Device Information Screen



The device information screen (Installation -> Device Information), shown below, presents information general to the MZP system including:

9.5.1.1 The name of the matrix

The matrix name is a text string of up to 32 characters. You can change the name by clicking on the name, and entering the new name.

9.5.1.2 Device information

Displays the model number, hardware and software version numbers: not alterable by the user.

9.5.1.3 ReO Bus status

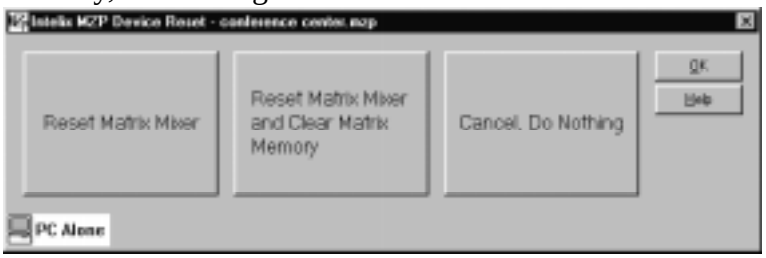
Shows the current status (present or absent) of the ReO bus and bus state (run or discovery). and version number. If the ReO bus is not present, the “ReO bus version” and “ReO bus State” fields are grayed out.

9.5.1.4 Application Software

Any special application software present on the machine will be displayed in the “Special Application” area.

9.5.1.5 Memory Reset

Pressing the "Reset" button leads the user to a screen allowing the erasing of the matrix's memory, or resetting the MZP device. For details see section 7.2.6.



9.5.1.5.1 Reset Matrix Mixer

This option acts as if you have pressed the rset button on the rear of the matrix. Of course communication must be working to use this option.

9.5.1.5.2 Reset Matrix Mixer and Clear Matrix Memory

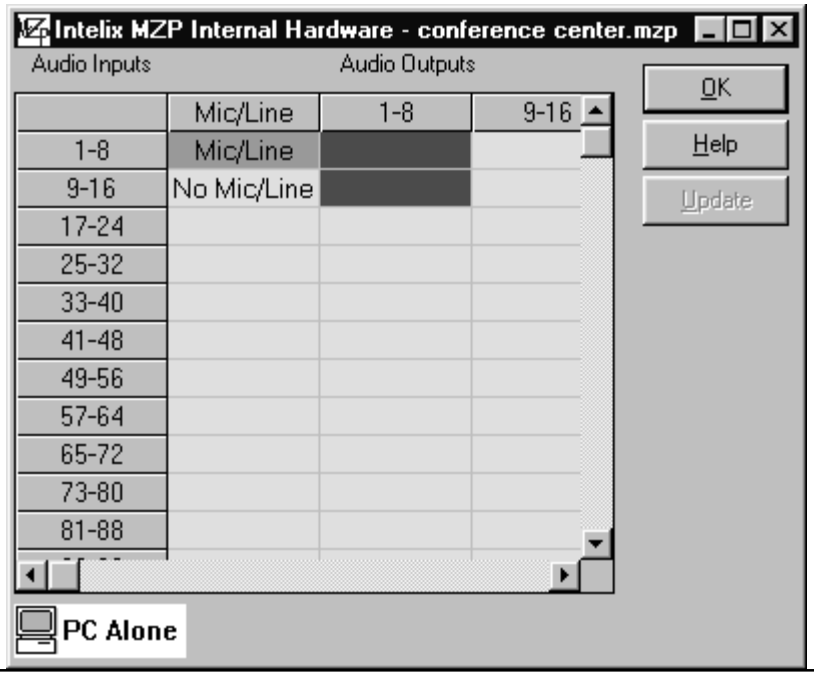
This button performs the hardware reset as in sec. 9.5.1.5.1; it also completely clears the matrix memory. *This option should be a last resort since all aspects of your program, data, names etc will be lost.*

9.5.1.5.3 Cancel Do Nothing

This selection takes no action. Using it is exactly as if you had never come to this screen.

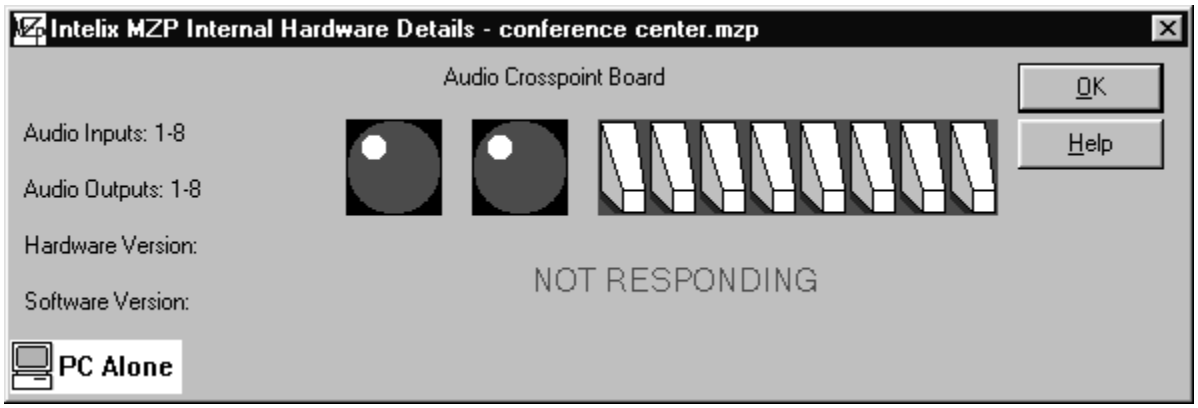
9.5.1.6 Internal Hardware Item

The "hardware configuration" button shows the user what audio crosspoint boards and mic/line cards are present in the system. Each cell represents an 8 X 8 crosspoint card. This picture shows the matrix for the Appendix J-Conference Center Design program. It shows that there is one 16 X 8 boards, installed at inputs 1-16 and outputs 1-8. Neither board has a mic/line board installed, and the crosspoint boards are not responding. Non-responding boards are shown in red, while responding board are shown in green. The window is scrollable to show all areas of the potential 128 X 128 matrix. Doubleclicking on any cell brings up a window displaying the status of the board at that location.



9.5.1.6.1 Crosspoint Board status

This window appears when the user double-clicks on a cell in the internal hardware screen. It displays information about the crosspoint board at the address selected.



The information on the screen includes the addresses covered by the board, the hardware and software versions of the board (blank if the board is not responding), whether or not the board is responding, and the necessary DIP switch settings for the installation of a board at that address. The addressing DIP switches will appear identical on adjacent cells, since a single 16 X 8 board covers two sequential addresses.

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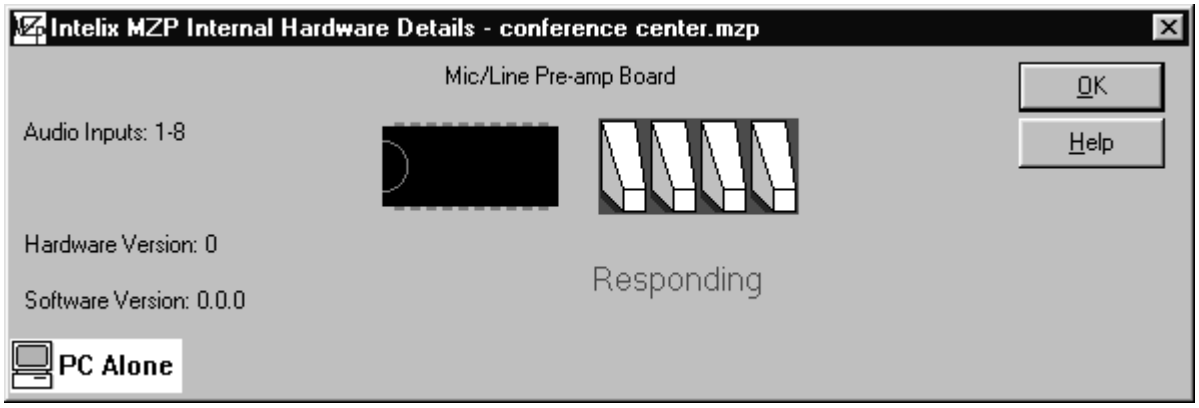
Note that this screen appears whether the selected cell actually contains a board or not. If you select a cell that has no board, it will say “Not Responding” in red letters (shown above). If the board exists and is operating properly, the window will say “Responding” in green letters.

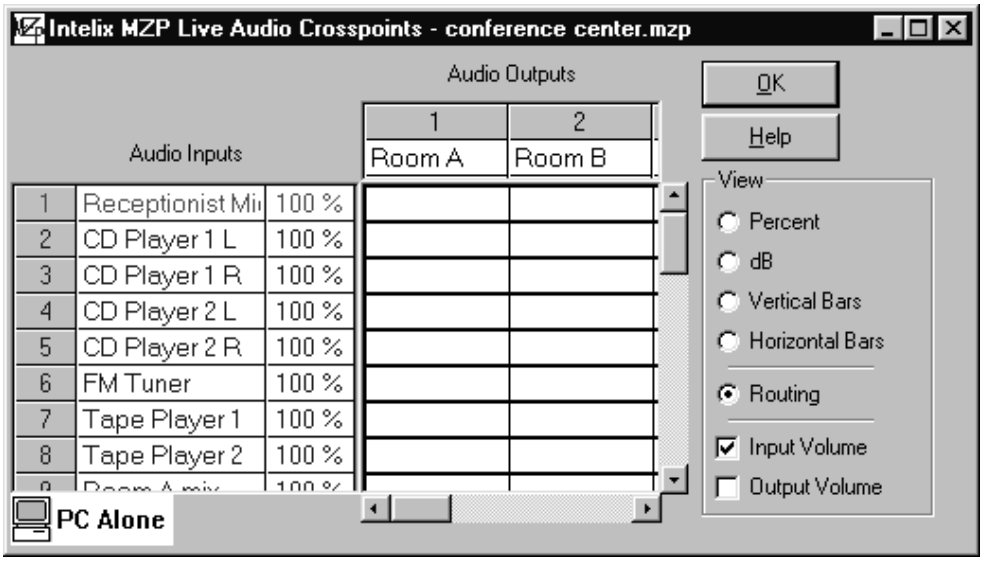


9.5.1.6.2 Mic/line status

This screen appears as a response to doubleclicking on the mic/line column of the internal hardware screen. It shows input range, hardware and software versions (blank if board is not responding), whether or not the board is responding, and the necessary DIP switch settings for the installation of a mic/line board at that address.

9.5.2 The Live Crosspoints Item

This item bring up a screen showing the grid of all existing matrix crosspoints with their current levels displayed. For testing and diagnostic purposes, the levels in the live crosspoint screen can be altered. Changes in this screen take effect immediately.



9.5.2.1 Changing Crosspoint Values

Using the scrollbars on the matrix, locate the crosspoint you wish to change; double-click on the crosspoint. A popup allows a new value to be entered. Click OK. Changing the level of a member of a stereo pair changes both members.

9.5.2.2 Views

The view of the crosspoints is selectable among percent (0-100%), dB (-100 dB to 0 dB), vertical and horizontal bar graphs.

9.5.2.3 Routing

The "**Routing**" view selection allows you create manual routes for a particular source output pair. Manual routes can be used to avoid the use of a Comet-4 remote in situations where an audio source will always be active to an output. *Manual routes are ducked by paging sources.*To manual route a source to an output take the following steps:

1) select "Routing" view in the Live Crosspoints Screen (main -> installation-> Live Crosspoints).
2) Double-click the cell at the intersection of the source and output you wish to manually route.
3) To adjust the level of the manual route:
   a) open the Page and Program Levels screen (main ->Configuration-> Page and Program Levels).
   b) double-click on the cell you have manually routed, set the level as desired, then click OK.

9.5.2.4 Maximum Levels

The maximum levels allowed at a given input or output are controllable from this screen. The view of these parameters can be turned on and off by checking/unchecking the "Input Volume" and "Output Volume" boxes. These values correspond to the virtual input and virtual output VCas as explained in section 1.0 page 14. To change these values, make them visible by clicking on the appropriate check box, the double-click on the value to be changed. In the resulting popup, type the new value and click OK.

9.5.3 The Unassigned ReO Remotes item

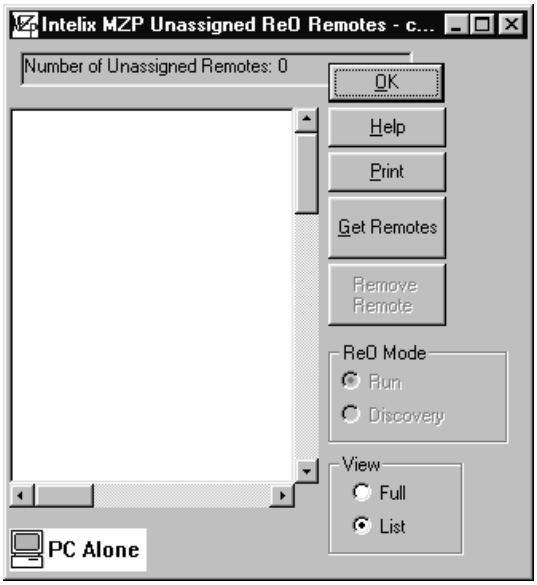
This item is used in the installation process for a new system. When a new file is downloaded to a matrix as described in section 9.4.1, the actual physical remotes connected to the matrix must be assigned to the virtual station in the file design. The matrix will be put in Discovery mode to enable discovery of the physical remotes. The remotes must then be exercised to be discovered by the matrix. As each remote is discovered by the matrix it will appear on the unassigned remote screen. The remotes will appear in the order they are exercised, and be displayed in rows, left to right, top to bottom. The picture below shows no unassigned remotes, since there is no MZP hardware attached.

View

There are two ways to view the remotes in the Unassigned Remotes Window:

1) Full: This view shows each remote at a large size and allows the exercise of each button and knob on the remotes. It becomes a very large screen when many remotes are present.

2) List: View by list shrinks the size of each remote to an icon size, and puts all the remotes into list form. This option eases the problem of many remotes on a small screen. You click and drag the remote's icon to the virtual remotes in the station screens.



When first brought up the unassigned remotes screen will be blank. Click on the "Go to Discovery mode" button. Using your remotes list visit each remote in turn and exercise it by pressing a button or turning a knob. Each remote will appear on the unassigned remotes screen as it is exercised. A name should be assigned to each remote as it appears. The name should indicate the remote's physical location, e.g. "Room A west side".

The "Get Remotes" button forces the MZP to update the PC in case any remotes were undiscovered.

After all remotes have been recognized, open the paging station screen (Configuration -> ReO paging stations) and the program station screen (Configuration -> ReO program stations) Drag and drop remotes from the unassigned remotes screen to virtual stations on the other two screen to assign them to their appropriate stations.

9.6 The Help Menu

The help menu offers a Table of Contents, an index and a Find function that function according to Windows® standard practice.

10.0 RS-232 Message Protocol

10.1 RS232 Message Fields

All RS232 messages, whether they are transmitted to or from the Matrix Mixer, use the same message format. Each RS232 message contains five fields. ***All values are transmitted in hexadecimal format e.g. 0Ah.*** For an explanation of transmitting in hexadecimal, please refer to section 10.3.

RS232_START	length (2 bytes, MSB first)	data (1 - n by

RS-232 Message Fields

The first field of a message is *always* the RS232_START byte (FAh).

The second field is a 2-byte length, transmitted most significant byte first. The value of the length field is the number of bytes in the third field, the data field e.g. (00h, 07h).

The third field, the data field, holds the parameters of the message e.g. (02h, 03h, 02h, 05h, F2h, 13h, 88h).

The fourth field is a one-byte checksum. The value of the checksum is the additive sum of the bytes in the first three fields, modulo 256 (the least significant byte).

For example, if the data portion (3rd field) of a message is (2, 3, 2, 5, 239, 19, 136), the length field is (0, 7). The additive sum of the first three fields is (250 + 0 + 7 + 2 + 3 + 2 + 5 + 239 + 19 + 136) = 663 = 297h. The checksum is 663 modulo 256 = 151= 97h.

The checksum feature can be turned off when necessary by setting DIP switch #7 to the down position. This is recommended to simplify programming when using Crestron or AMX controllers. See section 3.1.

The fifth field is a one-byte acknowledgment field, which is sent by the device which receives the message. The value of this field is either RS232_ACK (FCh), RS232_BUSY (FDh), or RS232_ERROR (FEh).

10.2 RS-232 Reserved Bytes

The following table lists the bytes which have special meaning in the Intelix Matrix Mixer RS-232 protocol.

Name	Value	Meaning
RS232_ESCAPE	F0h	used to transmit data values 240-255
reserved	F1h-F9h	reserved for future RS232 needs
RS232_START_V3	FA	first byte of all messages in version 3
reserved	FBh	reserved
RS232_ACK	FCh	message received and processed
RS232_BUSY	FDh	message received but not processed
RS232_ERROR	FE	checksum incorrect, message ignored
unused	FF	unused value never transmitted

10.21 Communication Recommendation

Because the Intelix RS232 is a "simplex" or "half duplex" bus protocol there are certain restrictions placed on bus traffic. Any message sent from the controller to the matrix that generates a reply other than <AC-KNOWLEDGE> must not be followed by another message until the reply is complete. To be safe, insert a delay of 100 milliseconds after any message that generates a reply.

10.3 Hexadecimal Transmission

The Intelix Matrix Mixer *must receive all message in hexadecimal number code*. If messages are transmitted in decimal or ASCII codes, they will fail to work.

Hexadecimal is a base 16 number code that uses numerals 0-10 and letters A, B, C, D, E, F. On the next page is a conversion table from decimal numbers to hexadecimal. In this document hex numbers are represented in the form "xxh", where xx are the two hex characters.

10.3.1 Commercial controllers

Most commercial controllers require the use of special codes to represent hex numbers for transmission. For example, Crestron controllers require the sequence "\xnn" where nn is the hex byte to be sent.

10.3.2 ASCII values

Because computers deal only with numbers, letters must be assigned a numeric code. This code is called ASCII. When you send commands to the Intelix Matrix Mixer, there is *one and only one case when you use ASCII codes.* That case is when you send names. Whenever a name field appears in an example in this manual, the example is enclosed in quotation marks. Any other use of ASCII values will cause the command to fail.

For example the command **Set Matrix Mixer Name** uses as an example name field "Emmanual Lutheran Church". The quotes indicate that this data should be sent as ASCII values.

To do this use the ASCII table (sec. 10.3.3) to obtain the hex value for each character, and transmit these values.

Never transmit the quotation marks.

10.3.3 ASCII values of the alphabet.

This is not a complete ASCII table since it does not contain codes for numbers, punctuation or special characters.

A = 41h	O = 4Fh	c = 63h	q = 71h
B = 42h	P = 50h	d = 64h	r = 72h
C = 43h	Q = 51h	e = 65h	s = 73h
D = 44h	R = 52h	f = 66h	t = 74h
E = 45h	S = 53h	g = 67h	u = 75h
F = 46h	T = 54h	h = 68h	v = 76h
G = 47h	U = 55h	i = 69h	w = 77h
H = 48h	V = 56h	j = 6Ah	x = 78h
I = 49h	W = 57h	k = 6Bh	y = 79h
J = 4Ah	X = 58h	l = 6Ch	z = 7Ah
K = 4Bh	Y = 59h	m = 6Dh	
L = 4Ch	Z = 5Ah	n = 6Eh	
M = 4Dh	a = 61h	o = 6Fh	
N = 4Eh	b = 62h	p = 70h	

10.4 Decimal to Hex conversion table

The table below shows the hex equivalent of decimal numbers from 0-255. Starting with Windows '95, the calculator has a hex conversion function.

00-00h	17-11h	33-21h	49-31h	65-41h	81-51h	97-61h	113-71h
01-01h	18-12h	34-22h	50-32h	66-42h	82-52h	98-62h	114-72h
02-02h	29-13h	35-23h	51-33h	67-43h	83-53h	99-63h	115-73h
03-03h	20-14h	36-24h	52-34h	68-44h	84-54h	100-64h	116-74h
04-04h	21-15h	37-25h	53-35h	69-45h	85-55h	101-65h	117-75h
05-05h	22-16h	38-26h	54-36h	70-46h	86-56h	102-66h	118-76h
06-06h	23-17h	39-27h	55-37h	71-47h	87-57h	103-67h	119-77h
07-07h	24-18h	40-28h	56-38h	72-48h	88-58h	104-68h	120-78h
08-08h	25-19h	41-29h	57-39h	73-49h	89-59h	105-69h	121-79h
09-09h	26-1Ah	42-2Ah	58-3Ah	74-4Ah	90-6Ah	106-6Ah	122-7Ah
10-0Ah	27-1Bh	43-2Bh	59-3Bh	75-4Bh	91-6Bh	107-6Bh	123-7Bh
11-0Bh	28-1Ch	44-2Ch	60-3Ch	76-4Ch	92-6Ch	108-6Ch	124-7Ch
12-0Ch	29-1Dh	45-2Dh	61-3Dh	77-4Dh	93-6Dh	109-6Dh	125-7Dh
13-0Dh	30-1Eh	46-2Eh	62-3Eh	78-4Eh	94-6Eh	110-6Eh	126-7Eh
14-0Eh	31-1Fh	47-2Fh	63-3Fh	79-4Fh	95-6Fh	111-6Fh	127-7Fh
15-0Fh	32-20h	48-30h	64-40h	80-50h	96-70h	112-70h	128-80h
16-10h							

129-81h	145-91h	161-A1h	177-B1h	193-C1h	209-D1h	225-E1h	241-F1h
130-82h	146-92h	162-A2h	178-B2h	194-C2h	210-D2h	226-E2h	242-F2h
131-83h	147-93h	163-A3h	179-B3h	195-C3h	211-D3h	227-E3h	243-F3h
132-84h	148-94h	164-A4h	180-B4h	196-C4h	212-D4h	228-E4h	244-F4h
133-85h	149-95h	165-A5h	181-B5h	197-C5h	213-D5h	229-E5h	245-F5h
134-86h	150-96h	166-A6h	182-B6h	198-C6h	214-D6h	230-E6h	246-F6h
135-87h	151-97h	167-A7	183-B7h	199-C7h	215-D7h	231-E7h	247-F7h
136-88h	152-98h	168-A8h	184-B8h	200-C8h	216-D8h	232-E8h	248-F8h
137-89h	153-99h	169-A9h	185-B9h	201-C9h	217-D9h	233-E9h	249-F9h
138-8Ah	154-9Ah	170-AAh	186-BAh	202-CAh	218-DAh	234-EAh	250-FAh
139-8Bh	155-9Bh	171-ABh	187-BBh	203-CBh	219-DBh	235-EBh	251-FBh
140-8Ch	156-9Ch	172-ACh	188-BCh	204-CCh	220-DCh	236-ECh	252-FCh
141-8Dh	157-9Dh	173-ADh	189-BDh	205-CDh	221-DDh	237-EDh	253-FDh
142-8Eh	158-9Eh	174-AEh	190-BEh	206-CEh	222-DEh	238-EEh	254-FEh
143-8Fh	159-9Fh	175-AFh	191-BFh	207-CFh	223-DFh	239-EFh	255-FFh
144-90	160-A0h	176-B0h	192-C0h	208-D0h	224-E0h	240-F0h	

10.5 Byte Escape Sequence

If a byte in the length, data, or checksum fields falls within the range 240h through 255h inclusive, an escape sequence is used to transmit the value, since those single byte values are reserved. The value is translated by the sending device into two bytes: the RS232_ESCAPE byte (240) itself, followed by the difference between the value and the RS232_ESCAPE byte.

value => RS232_ESCAPE, (value - RS232_ESCAPE)

These two bytes are transmitted instead of the single, large-value byte. The receiving device converts the two bytes back into the original single byte value through simple addition. These operations do not affect the values of the length or checksum fields.

Note: *The escape sequence feature can be disabled if necessary, by putting DIP switch #7 in the down position.* This is recommended when using Crestron or AMX controllers, since it simplifies programming. See section 10.6.

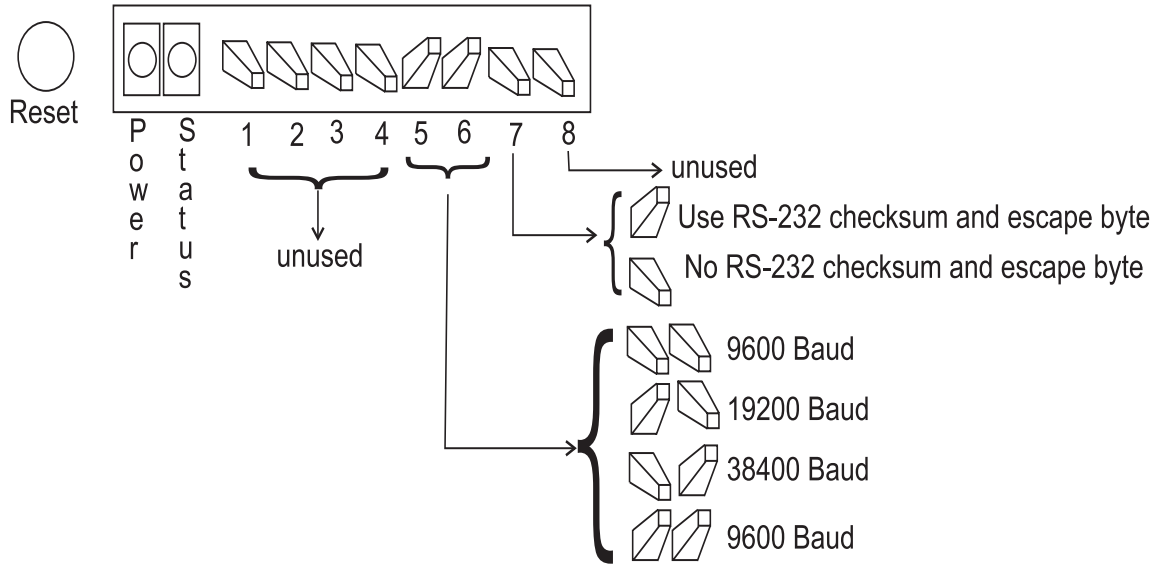
In the following example, the data field of a message is (2, 3, 3, 6, 255). The byte 255 must be "escaped" into the RS232_ESCAPE byte (240) followed by the difference between 255 and RS232_ESCAPE (255 - 240 = 15 = 0Fh). The bytes actually transmitted are:

Start byte	Length	Class	ID	Input	Output	Target Value	checksum
FAh	00h,05h	02h	03h	03h	06h	F0h,F0h	0Ch

Since the second byte of an escape sequence must fall within the range 0 through 15 inclusive, any second byte outside of that range indicates that a transmission error has occurred, and the message should be acknowledged by the receiver with RS232_ERROR and ignored.

10.6 DIP Switches

There are eight DIP switches on the rear panel of the Matrix (see drawing below). For all DIP switches, the "up" position indicates the "on" condition, and the "down" position the "off" condition. The function of these switches is shown below.



DIP switches 5 and 6 allow the RS-232 baud rate to be fixed at one of three values: 9600, 19200 or 38400. The AVM supports 38400 at the embedded level and that speed can be used for Crestron and AMX programming, but since Windows® does not support that rate, the AVM GUI cannot be run at 38400.

DIP switch 7 allows the RS-232 checksum and "escape" byte to be toggled on or off. These should be turned *off* in installations which include a permanent RS-232 controller, such as AMX, Crestron or custom PC program. This greatly simplifies coding (and decoding) the RS-232 messages. The RS-232 checksum and escape byte should be turned *on* in installations where the RS-232 communication may be hindered because of cable length (greater than 50 feet) or shielding from external electronic noise.

10.7 Introduction to using the RS-232 Commands

This section introduces three RS-232 commands that are needed to begin programing the AVM. The commands are chosen to get you started programming the Intelix matrix. Two of the three commands establish communication, and the third exerts control over a chosen audio crosspoint. After these three commands are usable you should be able to use the rest of this manual to implement your application.

1) **Are You There**: This command is sent by the controller to check for the existence of a matrix. If the matrix receives this message it replies with an **I Am Here** message.

2) **I Am Here**: This message is sent by the matrix as a response to the receipt of an **Are You There** message. The matrix sends an I Am Here message whenever it is powered up or reset. This fact can be used as a diagnostic tool when troubleshooting communication, since the matrix can be relied upon to send the **I Am Here** message when reset.

3) **Set Current Value**: This message sets the attenuation level of an audio crosspoint, and demonstrates control over the audio matrix after communication has been established.

10.7.1 Are You There

Shown below is the contents of the **Are You There** message. The format of the message is explained in section 10.1. The message has no parameters, the length is 2 bytes (1 byte for class, 1 byte for message ID). The checksum is the sum of all fields: FAh + 2h = FCh.

Since FCh is greater than the RS232 _ESCAPE value of 240, the checksum is "escaped" into 2 bytes (F0h, 0Ch). The escape byte does not effect the length field. The escape process is explained in section 10.5. Transmitting this message consists of sending the following string of 7 bytes: FAh, 00h, 02h, 00h, 00h, F0h, 0Ch.

RS232_START	length	data fields		Checksum
		class	message ID	
FAh	00h 02h	00h	00h	F0h 0Ch

10.7.2 I Am Here

Shown below is the contents of the **I Am Here** message. This message is also sent by the matrix in response to an **Are You There** message. This message is sent whenever the matrix is powered up or reset.

The format of the message is explained in section 10.1. The message has no parameters, the length is 2 bytes (1 byte for class, 1 byte for message ID). The checksum is the sum of all fields: FAh + 2h + 1h = FDh. The checksum will be escaped when transmitted by the matrix. Receiving this message consists of recognizing the following string of 6 bytes: FAh, 00h, 02h, 00h, 01h, F0h, 0Dh.

RS232_START	length	data fields		Checksum
		class	message ID	
FAh	00h 02h	00h	01h	F0h, 0Dh

10.7.3 Set Current Value

The **Set Current Value** message allows direct control over the attenuation at a single crosspoint. ***Set Current Value*** *cannot be used to set audio levels of a crosspoint that has been defined as part of an A/V group (for grouped audio use the class 12* ***Route Video*** *message).*

To use this message as a control test, select a crosspoint to be set and encode it in the input output pair. The example below sets the current value of the crosspoint at input 2 and output 5. The value to which the current value is set is encoded in the current value parameter. This value can be any value from 0 (full off) to 255 (full on). The example below sets the crosspoint to 255. Since 255 is hex FF the value is escaped into two bytes F0h, 0Fh. Sending this message consists of transmitting the following ten bytes: FAh, 00h, 05h, 02h, 0Dh, 02h, 05h, F0h, 0Fh, and 15h.

When this message is properly received by the matrix, the current value will be immediately affected, since this command bypasses ramp time and slew rate. You should immediately hear the change in the level of the crosspoint. Be sure that your audio source, amplifiers and speakers are all powered and working.

RS232_START	length	data fields		
		class	message ID	input
FAh	00h 05h	02h	0Dh	02h

data fields		checksum
output	current value (escaped)	15h
05h	F0h, 0Fh	

11.0 MZP RS232 Quick Guide

This guide contains the three most commonly used RS232 applications for the Intelix MZP matrix mixer. The three applications, General Communication, Program Routing and Level Control and Page Routing, are described along with a list of the commands needed to implement them.

11.01 Communication Recommendation

Because the Intelix RS232 is a "simplex" or "half duplex" bus protocol there are certain restrictions placed on bus traffic. Any message sent from the controller to the matrix that generates a reply other than <ACKNOWLEDGE> must not be followed by another message until the reply is complete. To be safe, insert a delay of 100 milliseconds after any message that generates a reply.

Designing an External Control System for MZP

Intelix MZP matrices have embedded logic to handle zone paging and program distribution on a large scale. This logic simplifies the design of external control. This document explains the philosophy of external control design for MZP systems.

The device must first be defined using the MZP designer software. There are two critical configuration topics which must be understood, zones and input types.

1.) **Zones** — Groups of audio outputs. In MZP, routing and volume control is all done to ***zones***, *not outputs.* Typically a system has a zone per output and then special zones for special groups of outputs; e.g. an *all call zone* would include all outputs!

2) **Input Types** — There are three input types in MZP: paging, pre-announce and program. Paging sources have priority over program sources. For example when a pager is routed to a zone, any program source will automatically ramp down to a pre-defined duck level and ramp back to its previous level when the page is ended.

The external controller will handle three main functions: program routing, volume control, and paging.

Program Routing — Program sources are turned on and off using the **select program/local source** and **deselect program/local source** messages. These messages perform the same functions as a Comet 4 remote control.

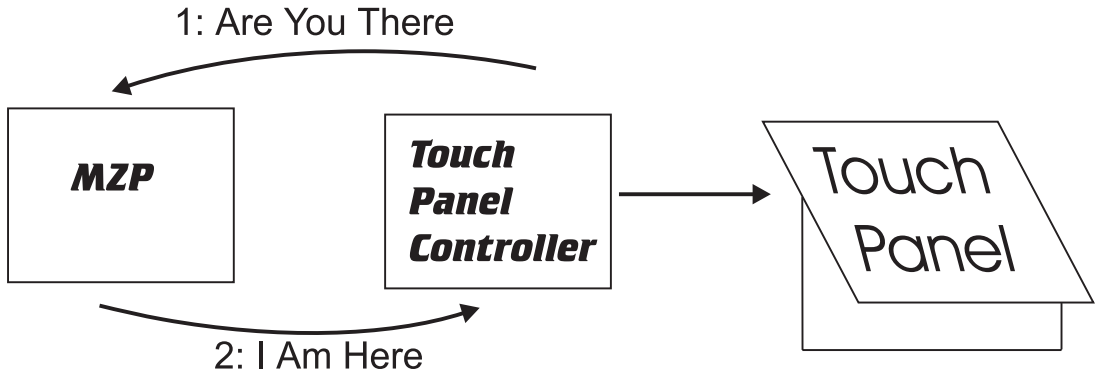
Volume Control — Output volume control is zone based and uses the **goto zone volume** message. Input volume is achieved with the **goto I/O volume** message.

Paging — The MZP system has two paging priorities, normal and emergency. A normal page will duck and ramp program sources down and back around a page. An emergency page overrides all program routes and normal pages immediately to full mute. To initiate an RS232 page three commands are used: **select zone**, **begin page**, and **end page**.

11.1 General Communication

This application explains how to establish and test RS232 communication between an RS232 controller and the MZP matrix mixer. You must make the connection between the controller and the MZP with a null modem cable, as described in **section 2.0.**

You then send the MZP the **Are You There** message, and listen for the matrix to return a **I Am Here** message. After this sequence is complete, you have established correct communication.



11.1.1 Are You There

This message contains no parameters. Send the following seven byte string (all bytes must be sent in hexadecimal form):

The last two bytes (F0, C0) are the escaped checksum.

RS232_START	length	data fields		Checksum
		class	message ID	(escaped)
FAh	00h, 02h	00h	00h	F0h, 0Ch

11.1.2 I Am Here

This message contains no parameters. The MZP matrix mixer will send this message as a response to the reception of an **Are You There** message. *It is also sent by the matrix on any reset or power cycle.* This makes it useful for triggering start-up and power failure command sequences on an external controller. You should receive the following 7 byte message:

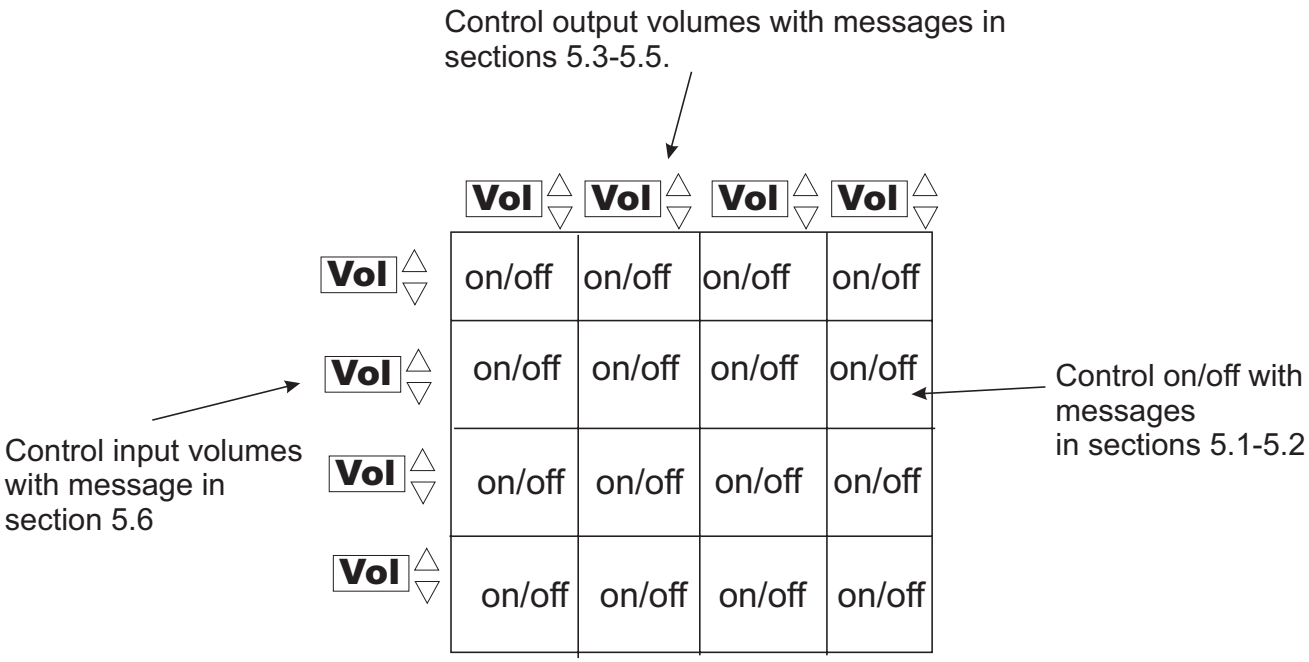
RS232_START	length	data fields		Checksum
		class	message ID	(escaped)
FAh	00h, 02h	00h	01h	F0h, 0Dh

The last two bytes (F0h, D0h) are the escaped checksum.
When this message is received you have correctly verified communication.

11.2 Program Routing and Level Control

One of MZP's primary functions is routing and level control of audio program material. Program material is background music; e.g. CD players, tuners, tape players etc. This application shows how to route program inputs to a particular audio zone, and how to set its level in the zone. There are five commands needed to accomplish this. The drawing below shows how the commands relate to the matrix structure.

If REO devices such as Comet remotes are present in your system and need to mirror the actions of the RS232 controller, you will also need to use the **Set Remote Polling** and **Simulate Remote Single Input** commands.



11.2.1 Select Program/local Source

This message selects a program audio source for routing into a room.This example routes program source number 1 into room number 2. This message has two parameters:

This example selects program source 1 for routing into zone 2.

RS232_START	length	data fields	
		class	message ID
FAh	00h 04h	09h	00h

data fields		checksum
room number	program source	0Ah
02h	01h	

11.2.2 Deselect Program/local Source

This message deselects a program source.This example routes program source number 1 into room number 2.

RS232_START	length	data fields	
		class	message ID
FAh	00h 04h	09h	01h

data fields		checksum
room number	program source	0Bh
02h	01h	

11.2.3 Goto Zone/room Program Volume

This message sets the audio level of *all* program inputs routed to the specified zone. This example sets the volume of zone 1 to FFh.

RS232_START	length	data fields	
		class	message ID
FAh	00h, 04h	0Ah	04h

data fields		checksum
Zone/ Rroom number	Prog Volume (escaped)	0Ch
01h	F0h, 0Fh	

11.2.4 Set Page/Program Level

This message sets the audio level of a *single* audio crosspoint. The change is only audible when the crosspoint has been select with the **Program Select message**.
This example sets the value of crosspoint at 3,5 to FFh the equivalent of 255 or full volume.

RS232_START	length	data fields			
		class	message ID	input	output
FAh	00h 05h	08h	0Bh	03h	05h

data fields	checksum
program level (escaped)	19h
F0h, 0Fh	

11.2.5 Goto I/O Volume

This message sets the audio level of an input or output. With it you can change the level of a specified input to *all zones*. Because of potential undesireable interactions with ReO remotes, this command should not be used to set zone output levels (use **Set Zone/Room Program Volume** instead). This command has three parameters:

This example sets output (i/o flag = 0) number 3 (i/o number = 3) to 255 (current value = FF escaped as F0h,0Fh).

RS232_START	length	data fields	
		class	message ID
FAh	00h 05h	01h	09h

data fields			checksum
i/o flag	i/o num	volume	
00h	03h	F0h, 0Fh	0Bh

11.3 Page Routing

A fundamental function of the MZP matrix mixer is the routing of pages. Page sources can be microphones, message repeaters or other audio source. Pages are routed based on zones. Routing a page requires selecting the zones into which the page will be routed, beginning the page, and ending the page. The following six commands are used:

11.3.1 Select Paging Zone/room

This message associates a zone with a specified paging source. It also sets the priority of the page. *This message must be called once for each zone* required for the page. It has three parameters:

This example selects zone 1 with paging source; priority is normal.

RS232_START	length	data fields	
		class	message ID
FAh	00h 05h	09h	02h

data fields			checksum
paging source	zone	priority	
01h	01h	00h	

11.3.2 Report Zone/Room Selection

This message is a response to a **Zone Select** message. Examine the 9th byte of the message; if the zone was selected correctly it returns 1, if the zone was unavailable for selection, it returns 0.
This example shows that a request for paging source 1 into zone 1 failed presumably because the zone was busy.

RS232_START	length	data fields	
		class	message ID
FAh	00h 06h	09h	03h

Data fields				Checksum
paging source	zone	priority	result	
01h	01h	00h00h	01h	0Fh

11.3.3 Cancel Page

If for any reason the process of routing a page needs to be aborted, send a cancel message and the associations between a paging source and zones will be deleted.
This example shows the cancellation of all pages associated with page source 1.

RS232_START	length	data fields			
		class	message ID	paging source	Checksum
FAh	00h 03h	09h	06h	01h	0Dh

11.3.4 Begin Page

This message begins a page from the specified paging input to the zones associated with this page. Background music is automatically ducked (reduced in volume) to improve intelligibility of the page.
This example shows the start of paging using paging source 1.

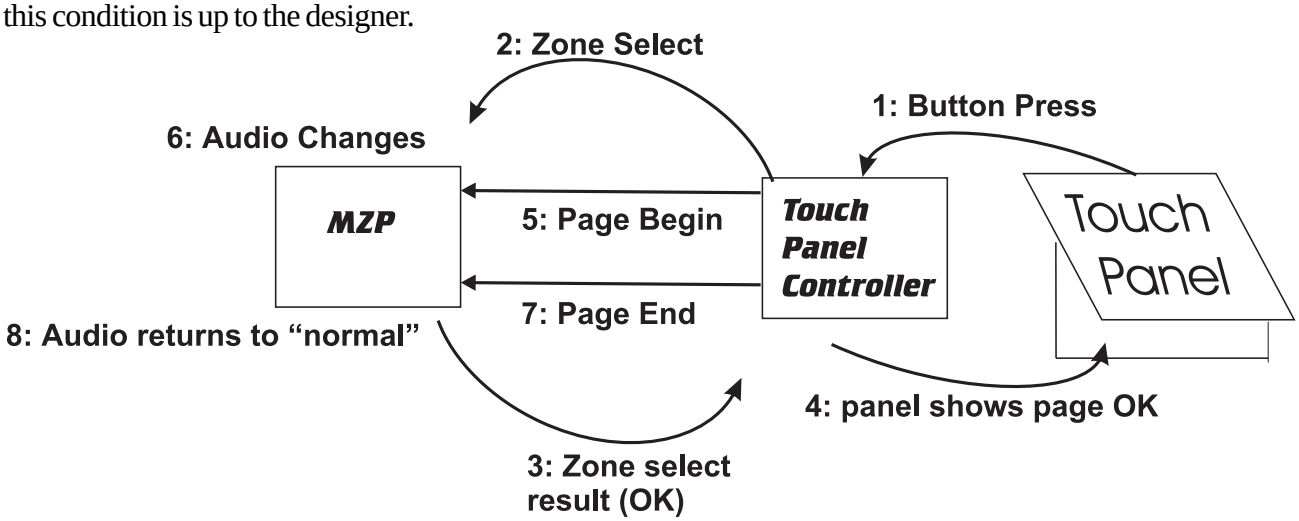
RS232_START	length	data fields			
		class	message ID	paging source	Checksum
FAh	00h 03h	09h	04h	01h	0Bh

11.3.5 End Page

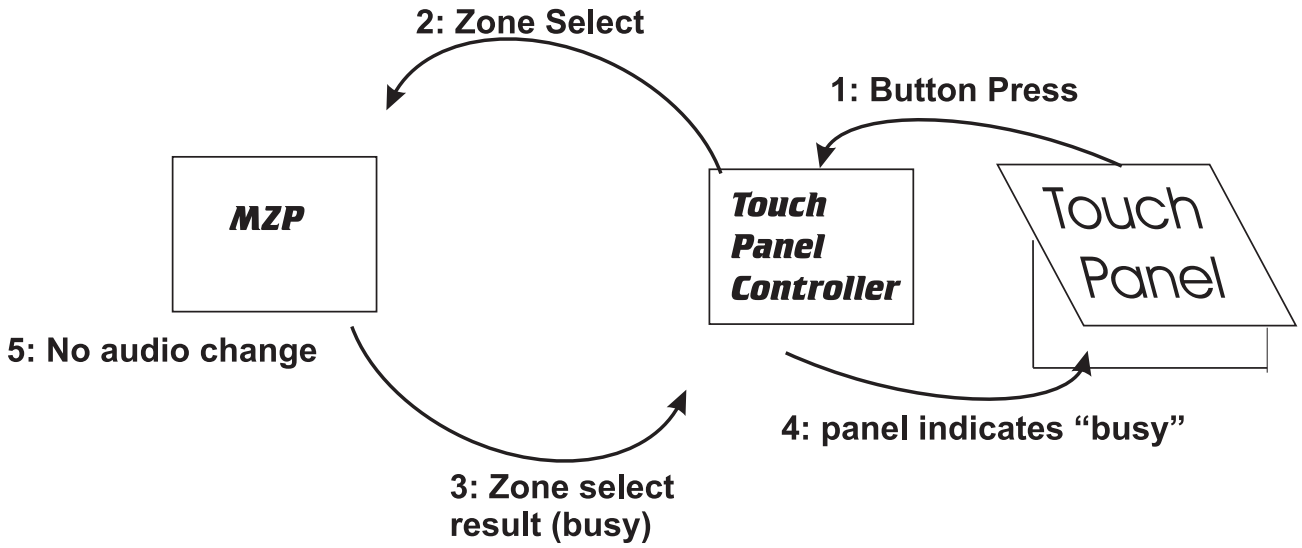
This message ends an active page from the specified paging input. Background music is automatically ducked (reduced in colume) to improve intelligibility of the page.
This example shows the ending of the page using paging source 1.

RS232_START	length	data fields			
		class	message ID	paging source	Checksum
FAh	00h 03h	09h	05h	01h	0Ch

The flow diagram below shows a successful page; i.e. the Zone Select result is 1. The panel indication of this condition is up to the designer.



The flow diagram below shows an unsuccessful page; i.e. the Zone Select result is 0. The panel indication of this condition is up to the designer.



11.4 Synchronizing the RS232 controller and Reo remotes

When there are ReO remotes in a program distribution system controlled by an RS232 controller, synchronization of the controller and the remotes becomes an issue. The controller needs to be able to read and alter the output states of the remotes. This is accomplished with four commands: **Set Single Remote Polling** , **Report Remote Single Output**, **Simulate Remote Single Input** and **Set Remote Single Output.** The first two messages are ReO to controller commands, while the second two messages are controller to ReO commands.

11.4.1 Communication Recommendation

Because the Intelix RS232 is a "simplex" or "half duplex" bus protocol there are certain restrictions placed on bus traffic. Any message sent from the controller to the matrix that generates a reply other than <ACKNOWLEDGE> must not be followed by another message until the reply is complete. To be safe, insert a delay of 100 milliseconds after any message that generates a reply. This is particularly important in the case of synchronizing REO remotes, since remote polling tends to generate a large amount of bus traffic. Intelix recommends placing a 100 millisecond delay before all **Set Remote Polling** messages.

11.4.2 Set Single Remote Polling

This message sets the automatic polling of ReO remote devices by the matrix mixer. It is used to receive updates when remote device's outputs change. To reset polling after a reset or power cycle, trigger this message (**Set Remote Polling**) on receipt of an **I Am Here** message. The MZP matrix mixer will transmit the **I Am Here** message as a response to any reset or power cycle. This command has two parameters:

ad = the address of the ReO remote to be set.
po = polling mode; Usually you set this to mode 5 (output changes only).
1 = status change on
3 = status change and report input changes
5 = status change and report output changes
7 = status change and report both input and output changes

This example sets ReO remote at address 5 to polling mode 5.

RS232_START	length	data fields	
		class	message ID
FAh	00h 04h	06h	07h

data fields		checksum
address	polling	
05h	05h	11h

11.4.3 Report Remote Single Output

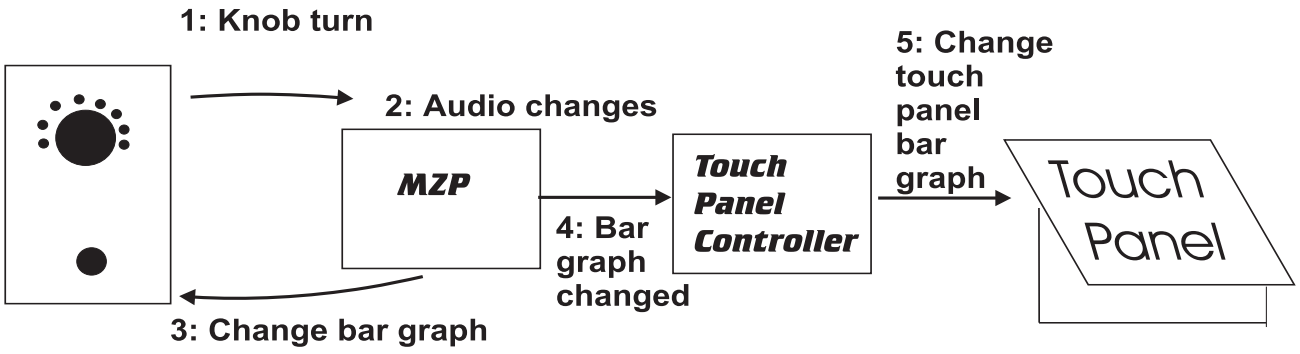
This message reports the value of a single remote's output. When you have set automatic polling to mode 5, 6 or 7, this message will be received for any change of output in the remotes being polled. It reports the values of indicator LEDs and Comet Tail bar graphs. This message will send you three parameters:

ad = the address of the ReO remote reporting.
out = the output being reported
val = the state of buttons, LEDs and bar graphs

RS232_START	length	data fields	
		class	message ID
FAh	00h 05h	06h	10h

data fields			checksum
address	output	value	checksum
05h	01h	28h	43h

The flow diagram below shows a simple example of synchronizing an RS232 controller with a ReO remote device. The example assumes that you have already set Remote Polling to mode 4 on the Comet Tail. Step 4 below uses the message **Remote Single Output Report.** More complex applications may require the messages on the next page also.



11.4.4 Goto Remote Single Output Status

This message sets the value of a single ReO remote output. If "automatic" polling for the remote is on, a Remote Single Output Report message will be generated from this output change. The remote is defined by the address parameter and its output by the outputparameter. This message has four parameters:

Address = the address of the remote being set.
output = which output to be set. For the Comet Tail, 1 = bar graph; 2 = LED. For the Comet 4 1 = top LED, 4 = bottom LED.

value 1 = byte 1 of output value specifier
value 2 = byte 2 of output value specifier

Value fields for Comet Tail

Value	**Output**
first byte	0-255 bar graph value
second byte	reserved

Value fields for Comet 4

Value	**Meaning**
first byte	0 = off; 1 = on
second byte	range 0-127. LED blink period = 0xxxxxxx * 50 milliseconds.

If an LED is not blinking, the "value 1" field is either zero (steady off) or one (steady on). The second byte is ignored. To blink the LED,set its initial state in value 1 and its blink value in value 2. The blink period is encoded as 50 milliseconds times the value of the second byte of the "value" field. The least significant bit is the initial state of the LED (0 = off, 1 = on).

This example shows setting an output on a remote at address 5. If that remote is a Comet 4, the top LED would be turned on. If that remote were a Comet Tail, the bar graph would be set to value 1.

RS232_START	length	data fields	
		class	message ID
FAh	00h 06h	06h	0Ah

Data fields				Checksum
address	output	value 1	value 2	
05h	01h	01h	00h	17h

11.4.5 Goto Remote Single Input Status

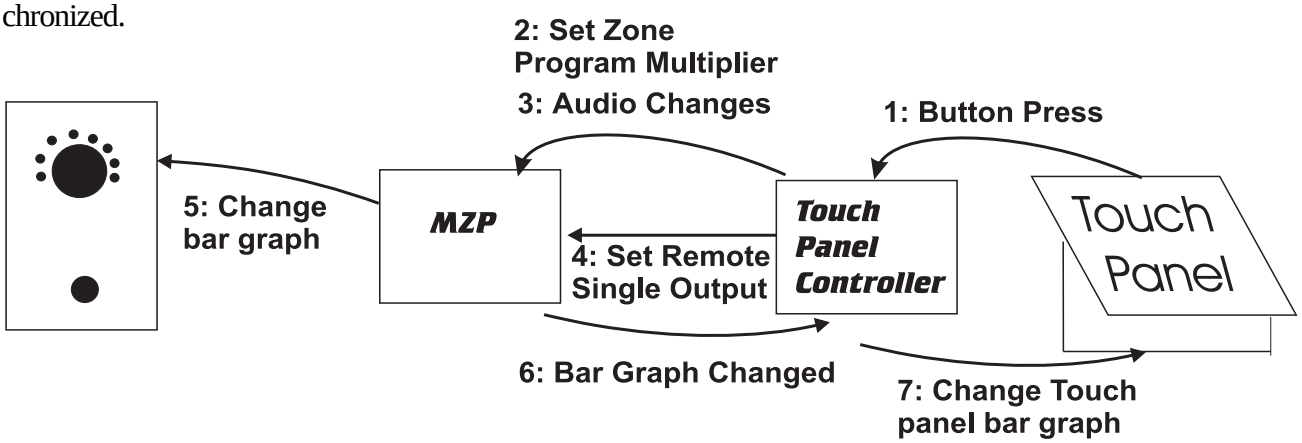
This message simulates a ReO remote input. It is exactly as if that input has been stimulated in the real world, a button press or knob turn. This message should be used to synchronize the action of a Comet 4 device. To synchronize a Comet Tail see **Set Remote Single Output** below. If the remote's output is changed by this action, the a report will be generated (if automatic polling is turned on). This command has three parameters:

ad = the address of the ReO remote to be set.
in = input number to be stimulated (see page 129 for details).
val = new value for remote's input.

RS232_START	length	data fields	
		class	message ID
FAh	00h 05h	06h	11h

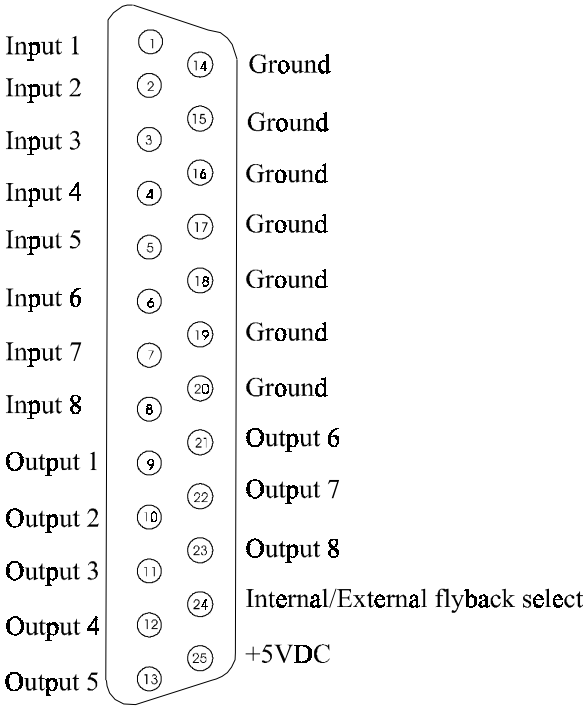
data fields			checksum
address	input	value	checksum
05h	01h	01h	1Dh

The flow chart below show the sequence of events when using touch panel up/down buttons to control a volume bar graph. This sequence will keep the Comet Tail bar graph and the touch panel bar graph synchronized.



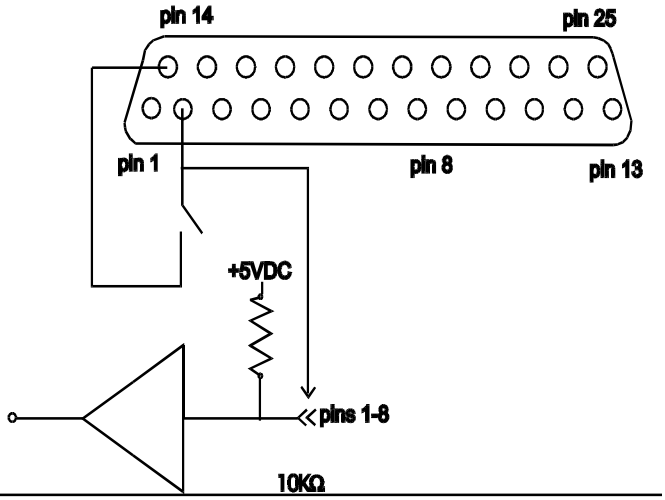
Appendix A: DC Control

All DC control is performed through the DB25 connector on the rear panel. This connector contains 8 input pins, 8 output pins, 7 ground pins and one +5VDC pin and an external power supply pin. The pinout is shown below.



AA1 Binary Inputs

Up to eight dry contact closure devices (e.g. relays, switches, open collector devices, any 0-5V logic output) can be connected to the Matrix via a DB25 receptacle (**5**) on the rear of the Matrix. Using the Matrix, such switches can be read by any device connected to the RS-232 port (**6**). This includes show control systems, lighting controllers, audio/video editing systems etc. To facilitate the wiring of devices to the the DB25 connector Intelix makes a 25 pin conversion cable (CPT-3 or CPT-6), which plugs into the DB25 on one end and terminates in 25 numbered bare wires at the other end.



This drawing shows an example of a binary input. A simple switch is wired to an input pin (pin2), and ground (pin 14). The internal equivalent circuit is shown. Up to 8 binary inputs can be connected in this way.

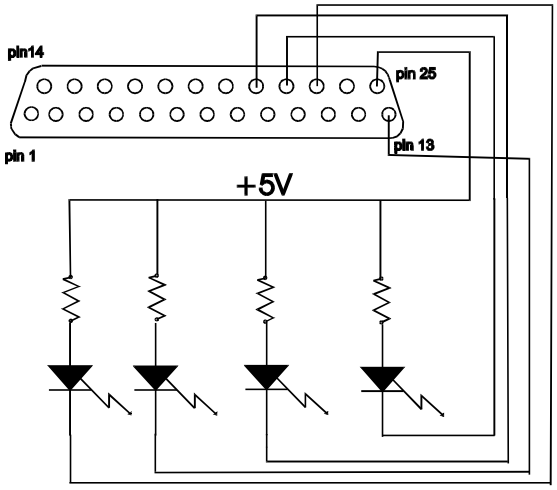
AA2 Binary Outputs

Up to eight logic on-off control devices can be connected to the Matrix via a DB25 receptacle (5) on the rear of the Matrix. Any device that can send RS-232 signals and is connected to the RS-232 communication port (6) can control these outputs via the Matrix. Such devices include PCs and systems (lighting controllers, audio/video editing systems).

Examples of binary outputs which can be connected to the Matrix include:

- ♦ LEDs,
- ♦ lamps,
- ♦ relay coils
- ♦ solenoids

Fig.14. This drawing shows an example of how to wire the binary outputs to the DB25 connector. Up to 8 LEDs could be wired in this way.



Notes: 1) pins 9-13 and 21-23 are internally connected to open collector drivers, up to 100 milliamp sink.
2) pin 24 can be used to connect an external DC supply (50 V maximum) to the internal flyback diodes (see using an external supply).
3) pin 25 is connected to an internal +5 Volt power supply (500 milliamps).
4) resistor values depend upon desired LED intensity (typ. 470 Ω with internal supply).

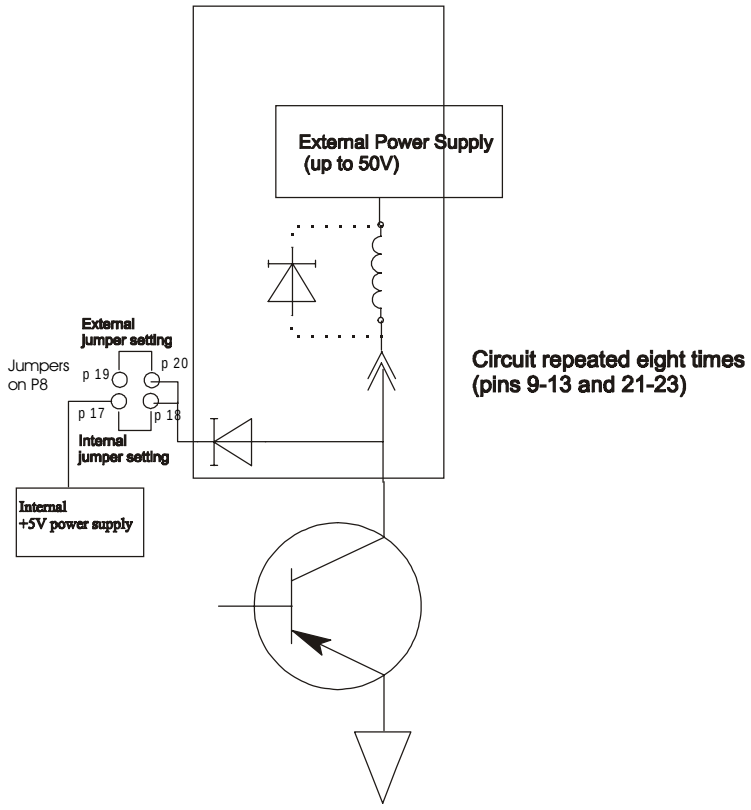
Appendix B: Using an external power supply

For powering external devices through the DB25 connector there are two choices. If your devices can be run on +5VDC with a total current draw of 500 mA or less, then you can use the internal power supply, which is brought out to pin 25 of the DB25 connector. If you use the internal supply *with an inductive load*, you must change the jumper setting to the internal setting on P8 as shown below (for location of P8 see next page). If your devices require a higher voltage or current, you can use an external supply. This requires the following steps:

1) connect your supply, (up to +50 VDC) to pin 24 of the DB25 connector.
2) change the setting of the power supply jumper to the external setting as shown below.

Note: The factory default setting has the jumper in the external position.

This drawing shows the equivalent circuit of a binary output with the jumpers for selecting internal or external flyback protection. The jumpers shown are on jumper block P8 (see next page). Each of the 8 binary outputs has this circuit. If the jumper setting uses the internal flybacks, the shown external flyback is not needed.

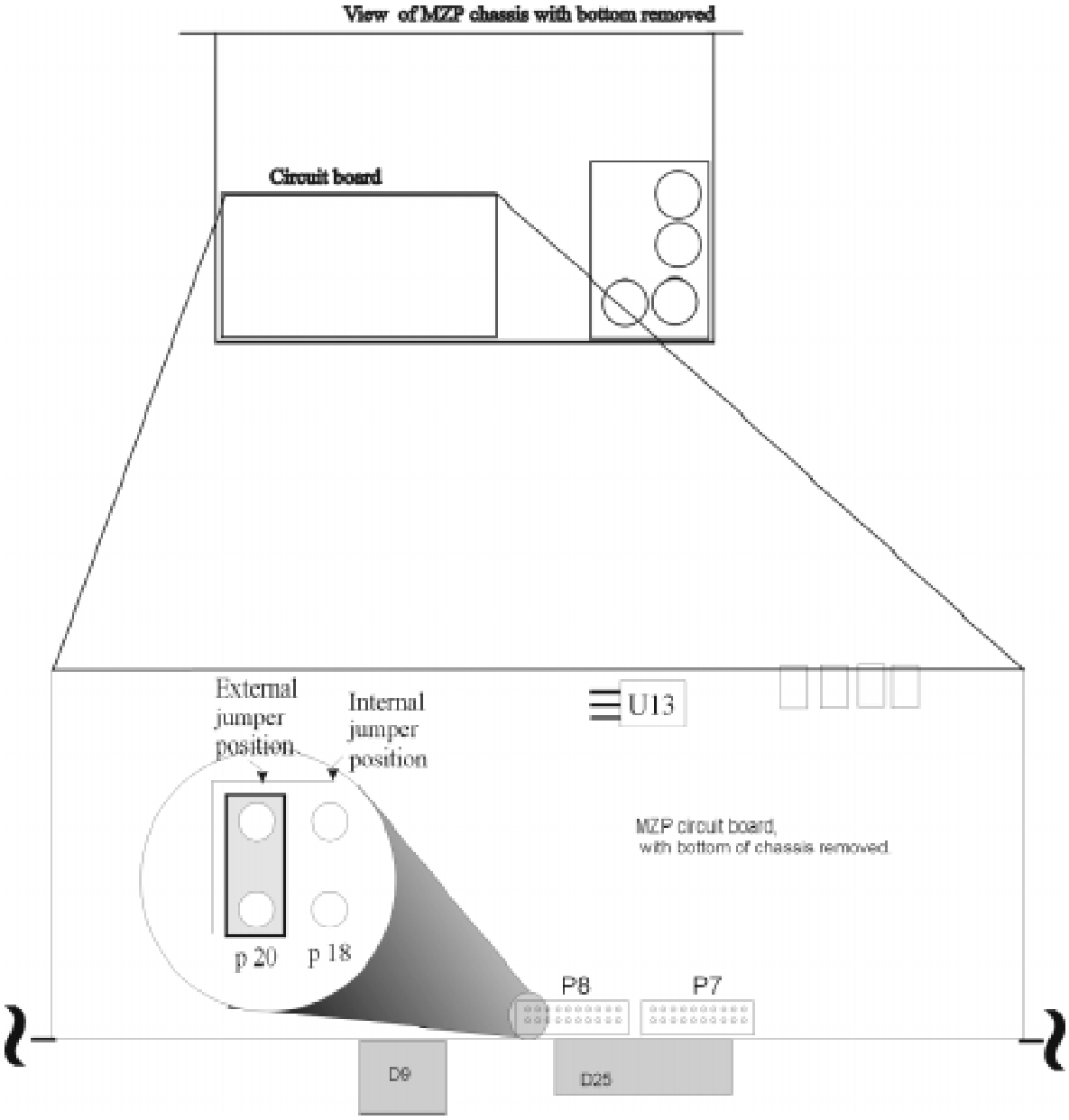


AB 1 Warning

Placing jumpers in both positions will short out and destroy the internal power supply! For internal flyback use the jumper should be between pins 17 and 18 on the jumper block. For external flybacks, the jumper should be between pins 19 and 20. There should be a jumper in one or the other of these positions NEVER BOTH!

The drawing below shows the circuit board with the bottom of the chassis removed, exposing the location of the jumpers for internal and external flyback selections. For external flybacks, place the jumper between pins 19 and 20 of P8 (shown). For internal flybacks, place the jumper between pins 17 and 18 on P8. ***Never place jumpers in both positions!***

Caution — component U13 may be **HOT**!



Warning: Placing jumpers in both positions will short out and destroy the internal power supply! For internal flyback use the jumper should be between pins 17 and 18 on the jumper block. For external flybacks, the jumper should be between pins 19 and 20. There should be a jumper in one or the other of these positions <u>NEVER BOTH</u>!

Appendix C: Power Supplies and Grounding

AC1 AC power supply

Usually ReO devices are powered by a 12 VAC transformer. The transformer secondary is connected *in parallel* to all the remotes in the System at pins 1 and 3 of their power connections. (See page 57.) As the ground lift jumpers (**J1**) of the remotes are not present, the ground return for the data signals is provided by pins 1 and 6 of the RJ11/12 connector please see sec. 4.1.2. In the absence of the ground lift jumper, the remotes' electronics are grounded to the Matrix via the *data* connection ground. *This is connected to neither the building nor conduit grounds.*

AC2 Ground Lift Jumper

ReO remotes previously used a ground lift jumper, if your remotes have a ground lift jumper (J2) leave the pins open, i.e. do not install a jumper. Newer ReO remotes do not have a ground lift jumper.

AC3 DC power supply

If the ReO devices are powered by a DC voltage supply, and the DC supply has *floating or isolated outputs*, then the grounding connections to the ReO remotes should be the same as for an AC supply, as described above.

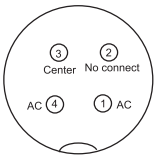
If *one side of the DC supply output is grounded, the installation of ground lift jumper should be avoided.* This configuration, in the presence of the ground lift jumper, can result in ground loops or large common-mode voltages between the ground of the supply and that of the data connections.

Note: When using a grounded DC supply, the presence of the bridge rectifiers in the remotes will cause there to be a 0.7 V common-mode difference between the DC supply ground and the remote ground. This difference is negligible compared to the common-mode rejection capabilities of the RS485 transceivers.

AC4 Matrix AC Power Connection

The manufacturer supplies an 18 Volt, 3.0 Amp center-tapped transformer to power the mixer. If another AC supply is used instead, it should be of equal voltage and have at least a 60 Volt-Amp rating. The details of the **AC Power Jack** 1 on the rear panel are as shown in the following figure.

18V Center Tapped Transformer Connector Wiring



4-pin DIN Connector, viewed from the rear of the Matrix.

AC5 Matrix DC Power Connection

The mixer can also be connected to a DC power supply, via the Phoenix-style **DC Power Jack** 2 on the rear panel. The DC supply can be used as:

1) the sole power source; or,

2) an on-line backup.

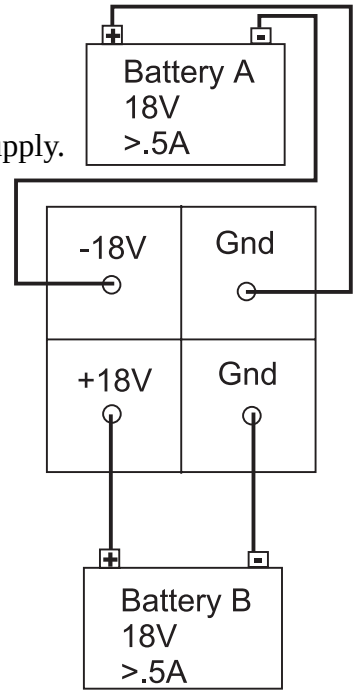
Note: If the DC supply is used as backup, it **must** meet the following voltage requirements:

♦a regulated supply (e.g. battery) must be 18 volts or less (using a voltage of less than 17V will reduce the dynamic range of the mixer, when the main supply is off.)

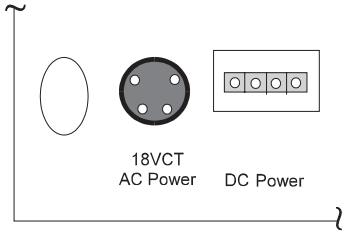
♦an unregulated supply (e.g. generator) must be between 17 and 18 volts.

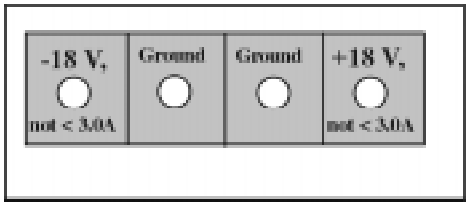
Otherwise, the mixer will draw from the backup supply even when AC power is supplied. The current supplied must not be less than 3.0 A. The wire configuration, voltage and current requirements are as shown in the right-hand figure below.

Schematic diagram of DC power supply.



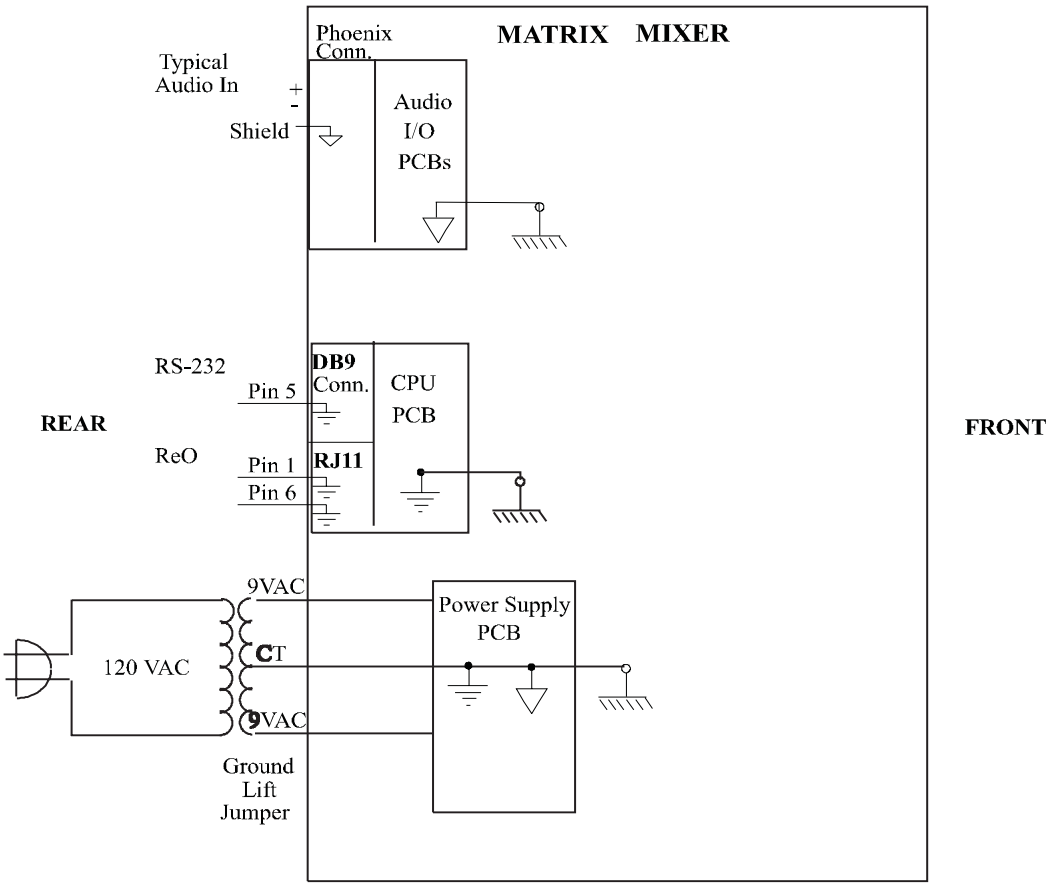
Rear Panel View





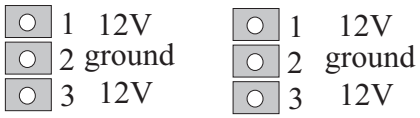
AC 6 Matrix Grounding

The chassis for the Matrix provides the main ground for all internal PC boards. There is also a wire ground system to each board to ensure ground connection in the event the chassis is disassembled.



Note: There is *no* connection to the building ground via the AC power supply. Building ground can be supplied through the chassis or shield connections, or through the ground pins on the DC power connector.

AC 6.1 ReO Power and Grounding



This drawing shows the relative positions, within the Comet Tail and the Comet 4, of the three pins of the ReO power connections. **Pin 2** is always grounded, **Pins 1 and 3** are powered (12 V, AC or DC).

Appendix D: Signal-to-Noise Considerations

The MZP Matrix is an *attenuation only* device, i.e. it *cannot* amplify signals passing through it. When all the level controls are fully on, there is unity gain, and when fully off, there is attenuation of –100dB. To obtain optimum audio performance of the Matrix, provide it with input signals of +4dB or greater. Depending on whether the input is balanced or unbalanced, the maximum input level should be no more than approximately +25dB.

To maximize the signal-to-noise ratio, and to take full advantage of the performance of the Matrix, it is important to balance the system levels with most of the gain occurring before the signal enters the Matrix, rather than in the power amplifier afterwards. The Matrix has an absolute noise floor of approximately –80 dB. Proper level balancing, using the signal source capability of +26 dB, can result in signal-to-noise ratios of more than 100 dB. Using the power amp to raise signal levels, rather than a pre-Matrix amplifier or the Matrix itself, diminishes this high level of performance.

The Intelix VC series mixers can be used as eight-channel, in-line preamps, boosting input signals of less than +4dB to the optimum levels for the Matrix.

AD1 System Balancing
To take full advantage of the Matrix's high signal-to-noise performance take the following steps:

- Drive the Matrix inputs with a signal of +4dBm to +26dBm.
- Set all Matrix VCAs at 225 (linear scale) or 132 (log scale).This is 12dB of attenuation, and allows for a signal level increase of 12dB and a decrease of 88dB.
- Adjust the post Matrix system i.e. power amplifiers to produce the desired listening levels in the room or zone with this nominal setting of the Matrix.

Fig. 12. The drawing below shows the signal-to noise performance when the user attenuates a +4dB signal by 50 dB through the Matrix. This scenario commonly occurs when the user sets the matrix attenuation controls at the nominal mid-point in an effort to have maximum adjustment range. However, since the control is attenuation only, the nominal midpoint is actually 50dB *of attenuation.* This setting results in the relatively poor signal-to noise ratio seen here.

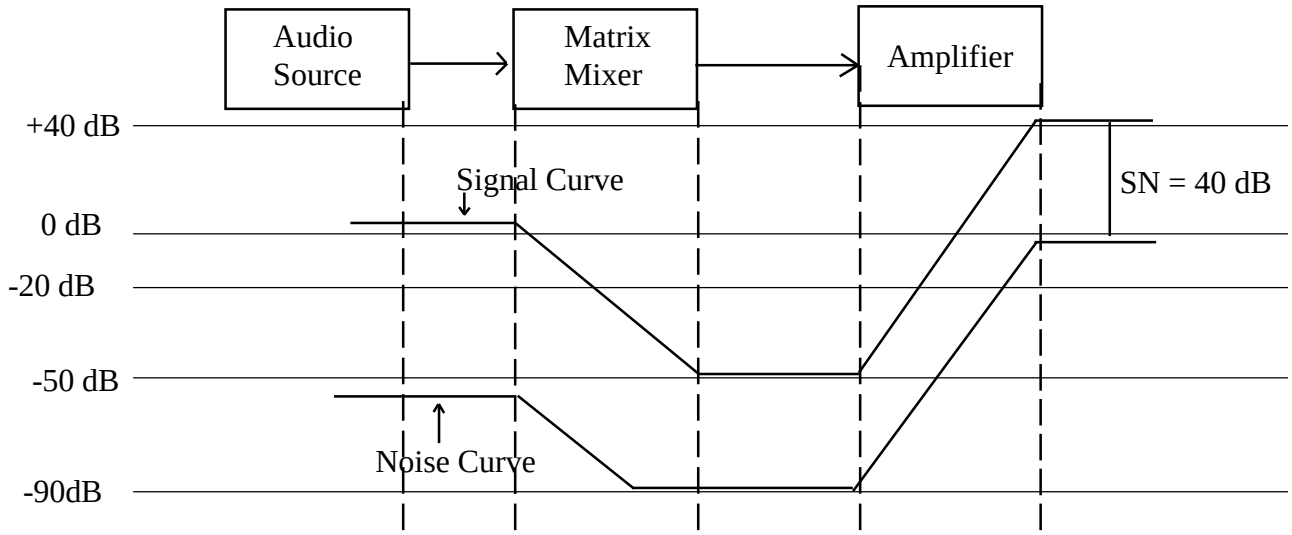
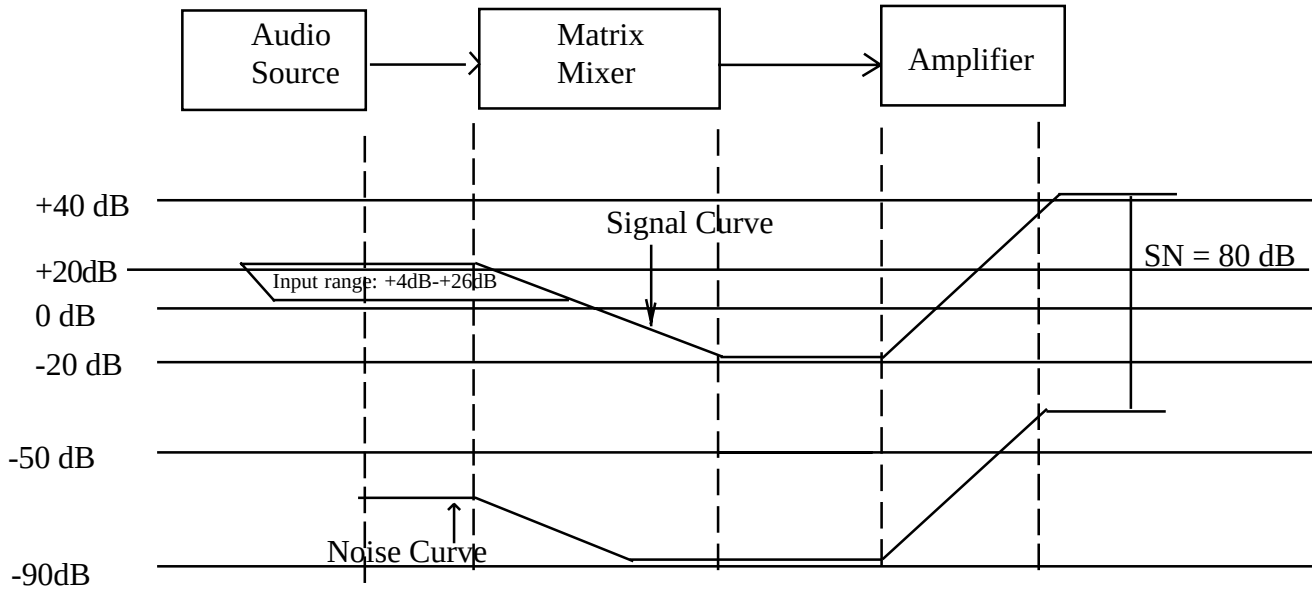


Fig. 13. This drawing shows the result of correctly following the system balancing procedure detailed above. The input signal is in the range of +4dB to +26 dB. With the Matrix attenuation controls set to -12dB the input signal is attenuated to -8dB. The resulting signal-to-noise ratio is improved to more than 80dB.



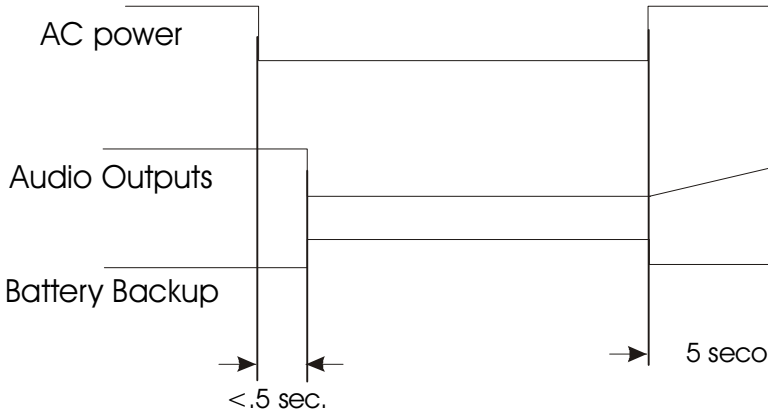
Appendix E: MZP Reset Sequence

Reset Sequence

This section describes the power cycle reset of all Intelix Matrix products, including the M series, the MZP and the Psychologist products. This cycle is the same whether the reset comes as a result of a power failure, or a reset button press.

1) Power goes down, reset button is pressed or a software reset command is received.
2) Within a half second the Matrix stops passing audio.
3) If power has failed, the Matrix memory is switched to battery backup, preserving the current settings.
4) Power returns to normal levels.
5) The Matrix begins to restore the current settings of crosspoints across a five second ramp up.
6) After the five second ramp time all crosspoints have been restored to their pre reset levels. **At no time will audio levels rise above the level just before the power failure.**

Note: If during the five second reset ramp the Matrix receives an external message from a psychologist remote, a Comet 4, a Comet Tail or any RS232 controller, *the external message will override the five second ramp time.*



Appendix F: Comet Remote Devices

Intelix Comet Series Remotes are single gang “decora” control modules for the Intelix MZP system. Typically wall-mounted, Comet remotes function as convenient user interfaces for paging, program source selection and volume control.

The carefully optimized design allows the Comet remote controls to conveniently interconnect in LAN bus topology. Up to 128 remotes can be utilized with one MZP matrix mixer via ReO bus communication. Each remote’s “personality” is then easily assigned using the MZP setup and control software. This “personality” can easily be reassigned as applications change.

AF1 Comet Tail

The Comet Tail is a digital remote control device designed for volume control and mute functions. The volume function takes advantage of a rotary encoder, giving the user a knob as the control device. The volume knob is encircled by eight red LEDs to indicate level status. The LEDs move in a clockwise direction with the brightest LED indicating the current level position. The mute function is controlled via a momentary button and corresponding red status LED. The mute function is latching as dictated by software and “LED-on” indicates the mute function is active.

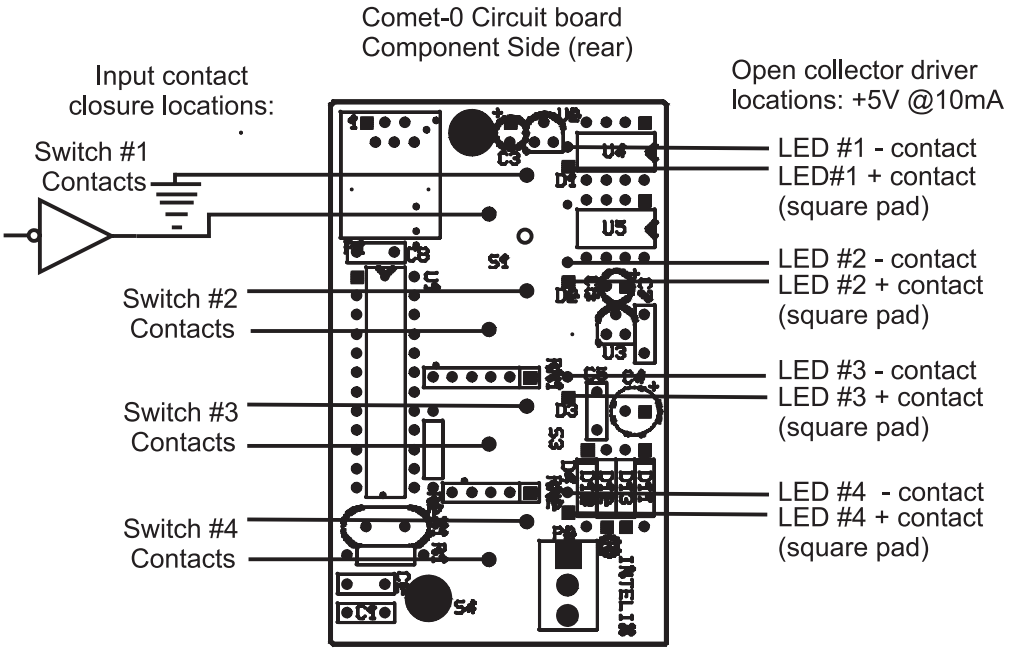
AF2 Comet 4

The Comet 4 is a digital remote control device designed for source selection or page routing functions. Each remote has four momentary buttons and four corresponding red status LEDs to indicate when a selection has been activated.

Using the MZP setup and control software, a Comet 4 can be programmed to function as a program selector. In this mode, each of its four buttons enables users to select one of four audio sources for a given zone. Multiple remotes can be used if more than 4 sources are required in a program selection station.

A Comet 4 can also be programmed to function as a paging station. In this mode, each of the four buttons selects the room or zone to which a page will be routed. Multiple remotes can be used if more than four destinations are required. LEDs indicate when a page is successful, or blink to indicate a zone is already being paged into from another location.

AF3 Comet 0-I/O



General Description

The Comet 0 I/O is a version of the Intelix Comet-4 remote control module that has no buttons or LEDs. The Comet 0 I/O is a control module for the MZP (Multi-Zone Paging and Program Distribution System) that is used when external contact closures or +5 V logic signals need to be used to trigger the MZP to react to an external device.

The carefully optimized design allows the Comet 0 I/O to conveniently interconnect with standard Comet devices in LAN bus topology. Up to 128 Comet devices can be utilized with one MZP matrix mixer via ReO bus communication. Each Comet can be easily assigned to perform its defined functions using the MZP setup software.

The Comet 0 I/O makes the MZP an ideal choice for zone paging and program routing applications where external devices such as relays, message repeaters, emergency systems, and other devices are capable of producing contact closures or 5V logic signals.

Circuit Board Description

The above printed circuit board drawing shows the necessary contact points for 4 contact closures and their 4 corresponding LED contacts.

Contact closures

The contact closures can be activated by either a SPST switch or a +5V logic low signal. A logic signal must be active low. 0 Volts activates the contact, whereas +5 Volts is used for an inactive status. A typical logic connection to switch input 1 is shown in the above drawing.

Output drivers

The 4 output driver contacts can be connected to any 5 VDC devices operated with a current sink capacity of 10 mA or less. The outputs are controlled by the system software, which typically turns an LED on when its switch contacts are active. These signals can be used for external indicators (LEDs or lamps). In standard software the outputs track the state of their respective contacts; that is if switch #1 contacts are active, the LED #1 output will be high.

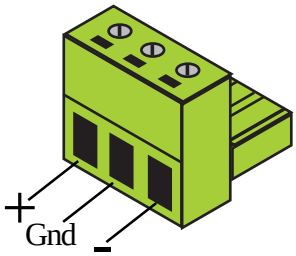
Engineering Device Description

The Comet0-I/O is a wall mountable, programmable digital remote control devices with unique ID capable of communicating status information via RS485 communications from the Intelix MZP Matrix Mixer. The Comet0-I/O is supplied with the same four hole face plate as all Intelix Comet remotes.

Technical Specifications

Power requirements
9 - 18 Volts (AC or DC) One power supply required per 12 remotes.
Current draw: 100 mA

Power connector type
3 pin Phoenix connector; phase tolerant



Recommended power wire
2 conductor stranded, 18 AWG

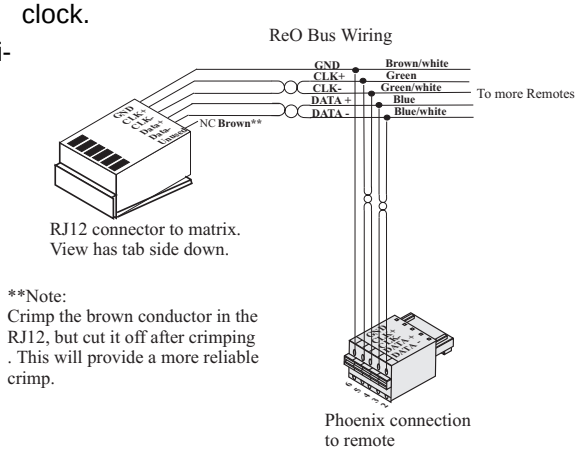
Max. powerwire length
(18 AWG Belden 8461, West Penn 224)

Number of Remotes	12VDC supply voltage	18VDC supply voltage
1	4000 ft	12000 ft.
	1220 m.	3660 m
4	1200 ft.	3600 ft.
	366 m.	1098 m.
8	600 ft	1800 ft.
	183 m.	549 m.
16	300 ft.	900 ft.
	91 m.	275 m.
32	150 ft	450 ft.
	46 m.	137 m.
64	75 ft.	225 ft.
	23 m.	68 m.
128	33 ft.	112 ft.
	10 m.	34 m.

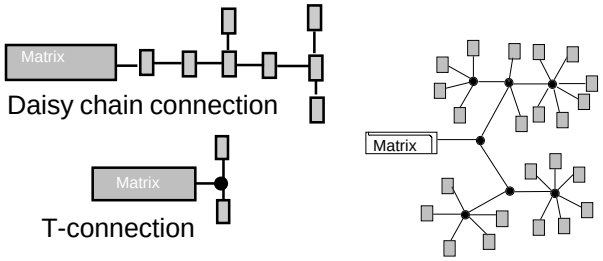
Data communication
RS485 ReO bus

Data connector
6 pin - RJ12 modular jack connector

Data connection topology
Phase critical, parallel wiring, twisted pair data and clock.



Data Connection Topology
T-connections, daisy-chain, and star acceptable

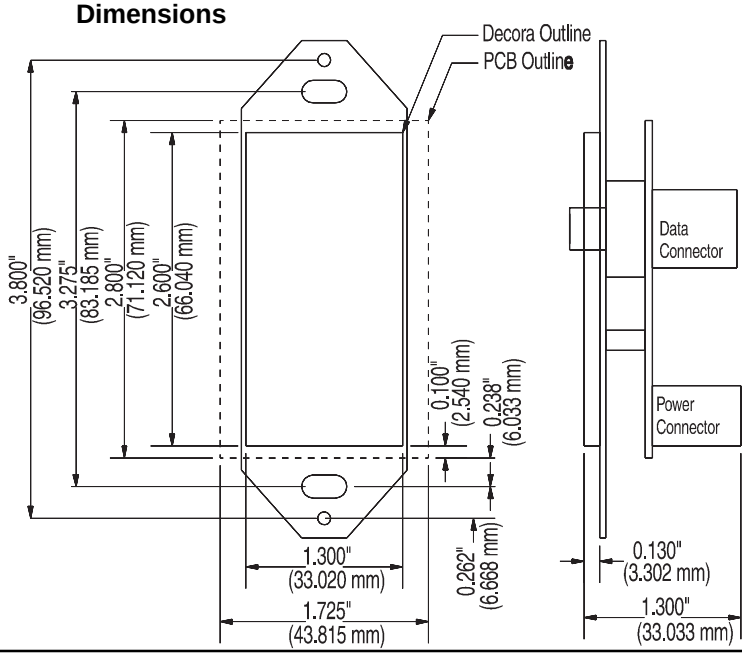


Recommended data wire
Category 3 e.g. Belden 1245A or West Penn WP52995

Maximum data wire length
12000 feet (4000 m)

Supplied Accessories
2 - 6/32' mounting screws
1 - female 3 pin IDC power connector

Dimensions

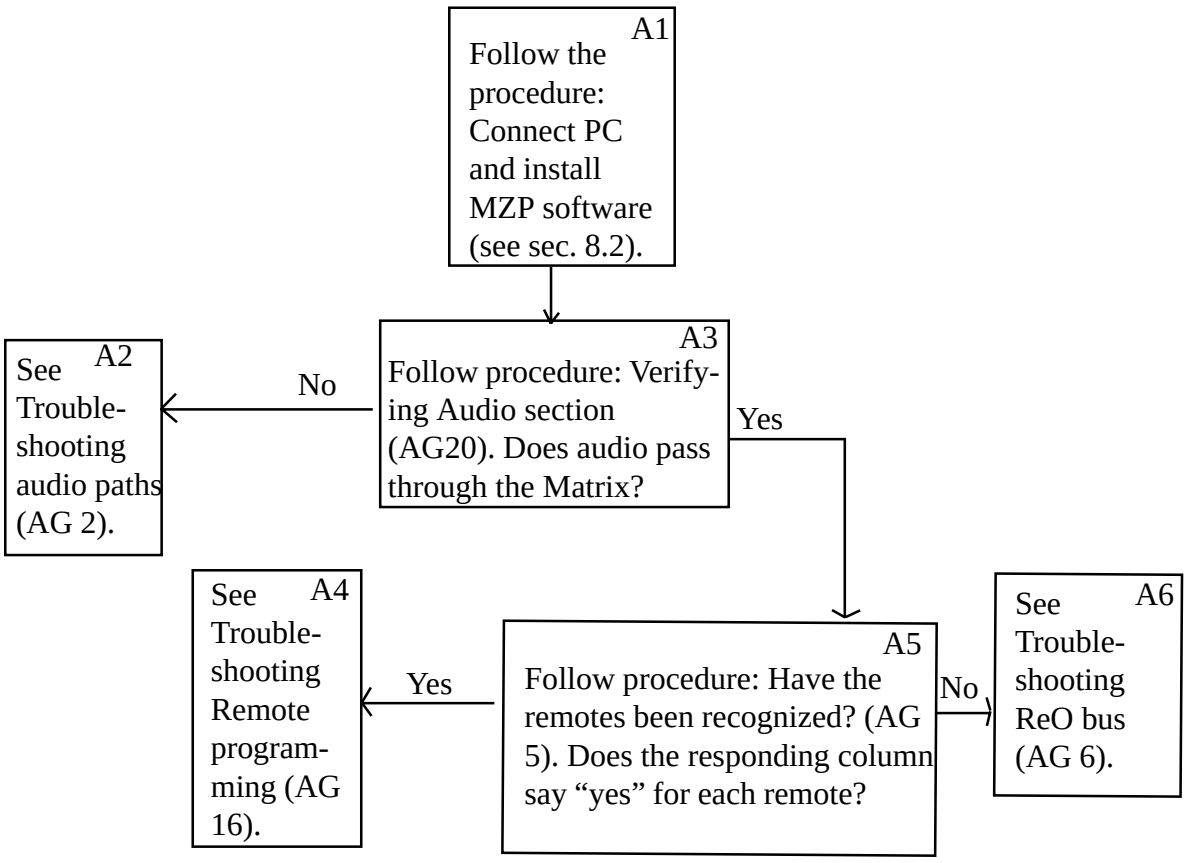


Appendix G: Troubleshooting the MZP System

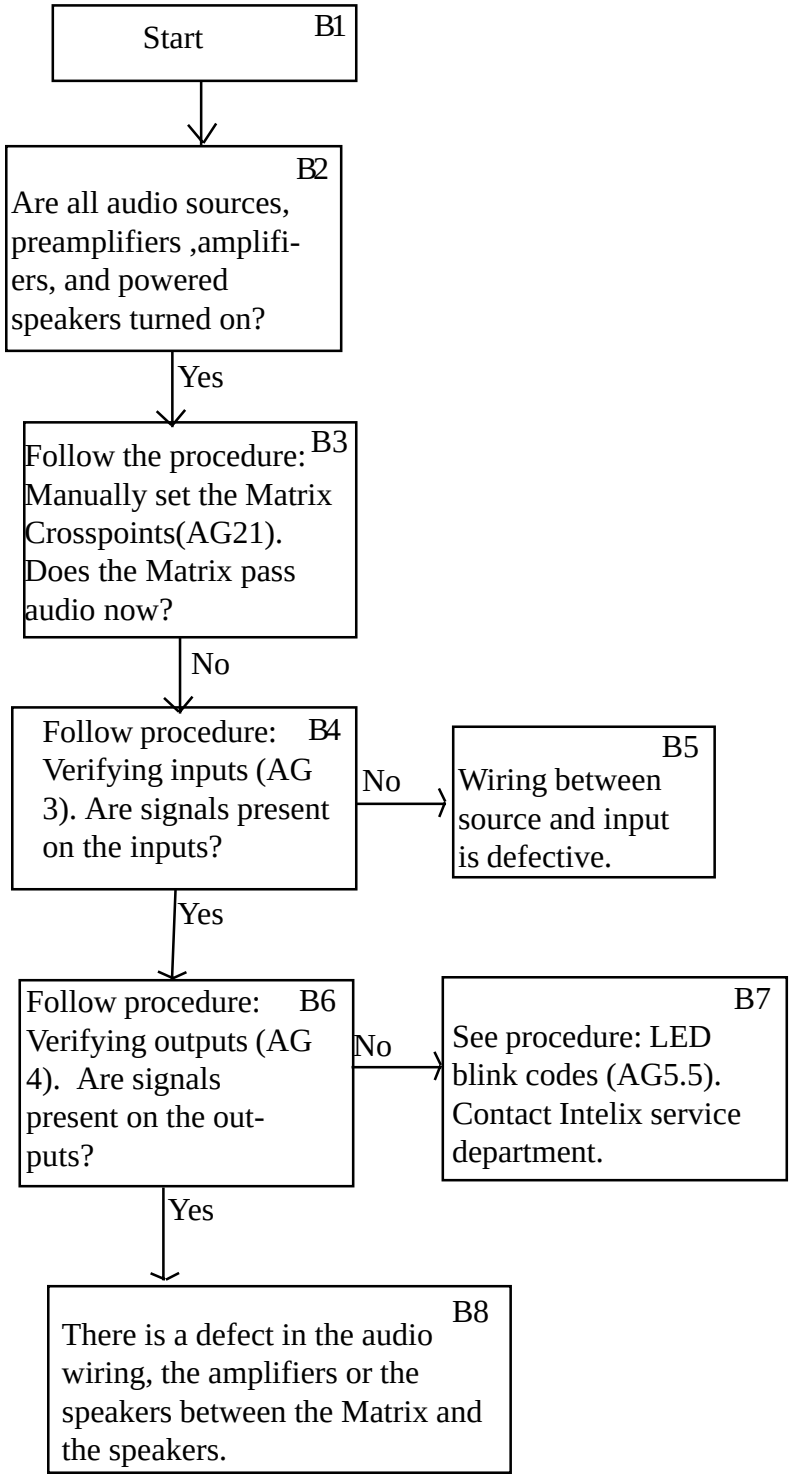
If after following the recommended procedures for the installation and initialization of your MZP system it does not work correctly, there are systematic ways to isolate the problem. This section contains the information you need to troubleshoot your system. It is organized as a series of short flow charts that direct you to procedures that may help fix or define the problem.

Begin with the following short tree to isolate the nature of the problem.

AG1 Starting Tree

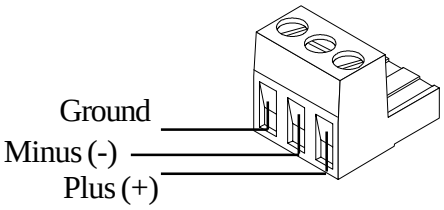


AG 2 Tree B Troubleshooting Audio Paths



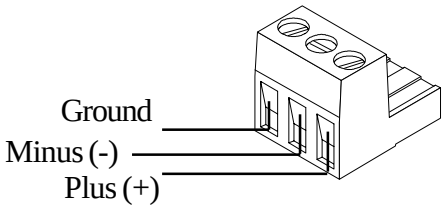
AG 3 Verifying Inputs

Using a volt meter (set for AC) or an oscilloscope, examine the + and - input pins of each input Phoenix connector used on the Matrix (see illustration below). Inputs are on the *left* side of the Matrix as viewed from the back. If the audio source is reaching the Matrix you should see an AC level between .775 V and 2V. If there is no audio level signal present on the inputs of the Matrix, there is a problem with the wiring between the audio source and the Matrix input. (Any mic level inputs must be preamped to line-level, since the Matrix is a line level device only.)



AG 4 Verifying Outputs

Using a volt meter (set for AC) or an oscilloscope, examine the + and - input pins of each output Phoenix connector used on the Matrix (see illustration below). Outputs are on the *right* side of the Matrix as viewed from the back. If the audio source is passing through the Matrix you should see an AC level between .5 V and 1V. If you have verified that crosspoints are set properly using the live crosspoints screen (Installation -> Live Crosspoints) and inputs are present on the Matrix input connectors, and there is no audio level signal present on the output of the Matrix, there may be a problem with the Matrix hardware. Remove the connector (by pulling straight out) and examine the exposed pins on the output of the Matrix to ensure that no pins are bent or shorted.



AG 5 Have the remotes been recognized?

To determine if the Matrix has recognized the remotes in your system perform the following steps:

1) In the MZP software go to the unassigned remotes screen (Installation -> Unassigned ReO Remotes)

2) Look at the status label for each remote, they should read “Responding” this means that communication has been established and maintained with that remote. Any “Not responding” in this screen means that the corresponding remote is not communicating with the Matrix.

AG 5.5 LED Blink Codes

The 16X8 audio matrix card contains a green diagnostic LED. This LED is only visible with the cover of the matrix removed. The green LED blink codes repeat over a 1 second period. The minimum on and off times are .1 second. The codes are as follows:

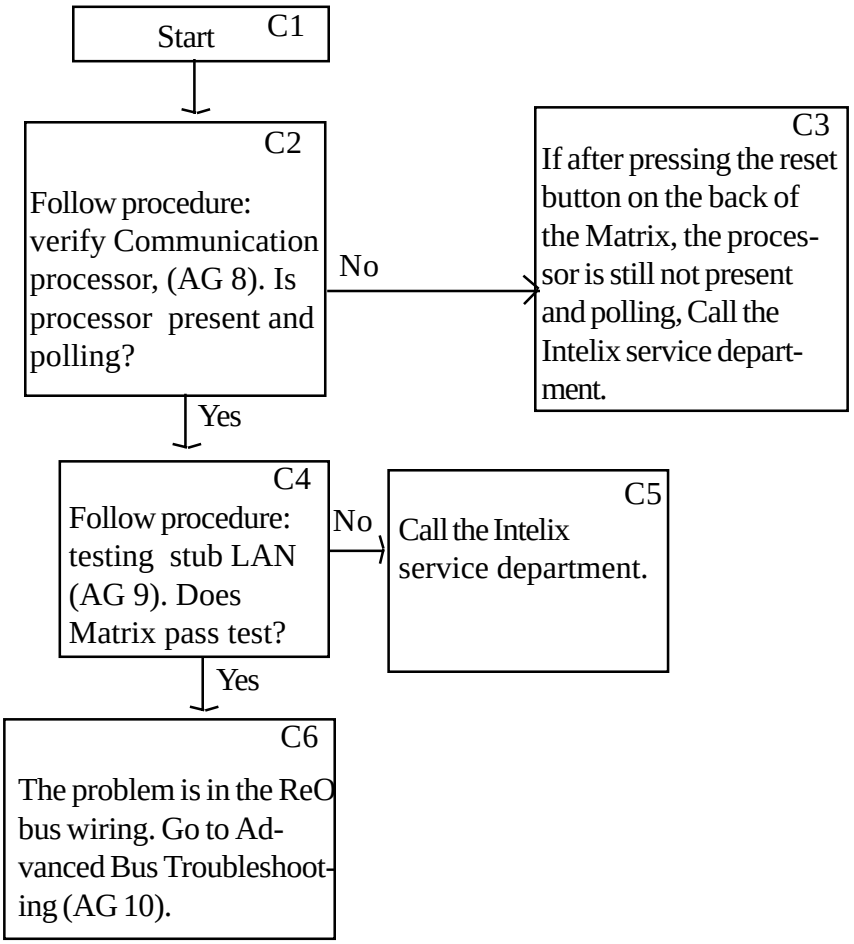
on with single off blink	OK, no activity
on with double off blink	OK, IPB messages received
on with triple off blink	OK crosspoints changing
off with single on blink	battery low
off with double on blink	battery failed

AG 6 Troubleshooting the ReO Bus

This section explains how to find and solve problems with the ReO bus (LAN) after an MZP system problem has been traced to the bus by following the flow chart(AG 1). There are two flow charts in this section. If no remotes are responding go to Basic Bus Troubleshooting below. If some but not all remotes are responding go to Advanced Bus Troubleshooting (AG 10).

AG 7 Tree C Basic Bus Troubleshooting

This flowchart is used when *no* remotes on the ReO bus are responding when the remote recognition process is followed.



AG 8 Verifying the Communications Processor

The MZP contains a dedicated processor to handle communication with the REO bus. If the REO bus is not working properly, there may be a problem with the communication processor. Check it as follows:

1) Go to the Device Information screen (Installation -> Device Information).
2) Look at the lower left hand corner of the screen and verify that the communication processor is present and running. The screen also shows software version, and indicates Run or Discovery mode.

If the screen does not indicate that the processor is present and running then press the reset button on the back of the Matrix. When you depress the reset button, the green LED will light, and go off again when you release the button. While the button is depressed the screen will report “no matrix” for RS232 status. Now recheck the Device Information screen. If the processor is still not running, call the Intelix Service Department.

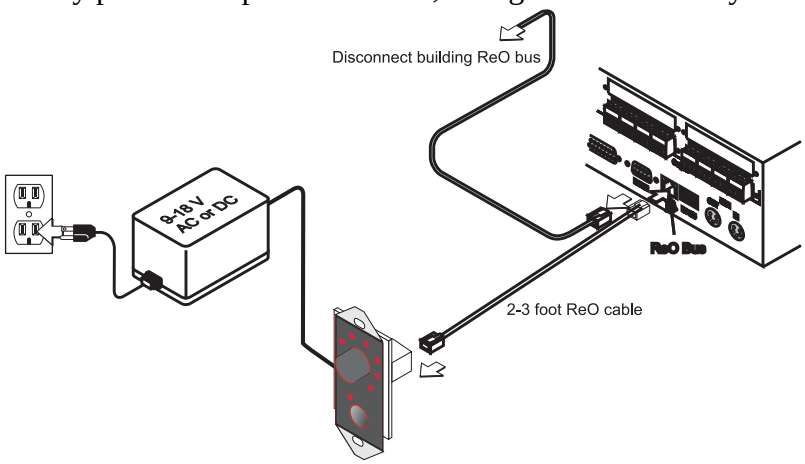
AG 9 Testing a Stub LAN

In this test you will replace the system ReO bus (LAN) with a short section of bus, and a single known good remote. By testing this stub LAN you will determine whether the Matrix is correctly communicating with the ReO bus output. Follow these steps (referring to the drawing at the bottom of this page):

1) Disconnect the building ReO bus by removing the RJ12 connector from the ReO bus port on the back of the Matrix.
2) Make a short (2-3 feet) cable with an RJ12 connector on each end.
3) Make a short (2-3) power cable with a ReO power connector on one end and a connector appropriate to your (9-18 V) power supply on the other.
4) Put the MZP software in Run mode (see sec. 8.2). Go to the ReO screen (Main -> ReO).
5) Connect the power connector to a known good remote. Verify that the remote’s LED single blinks at a rate of about once every two seconds.
6) Connect the data cable (the RJ12 cable) from the remote to the Matrix ReO bus input. Wait one minute.
7) Watch the ReO screen and verify that the remote appears.
8) Go to the unassigned remote screen (Installation -> Unassigned ReO Remotes). Verify that when you press the buttons orturn the knob on the remote the actions are reflected on the screen.

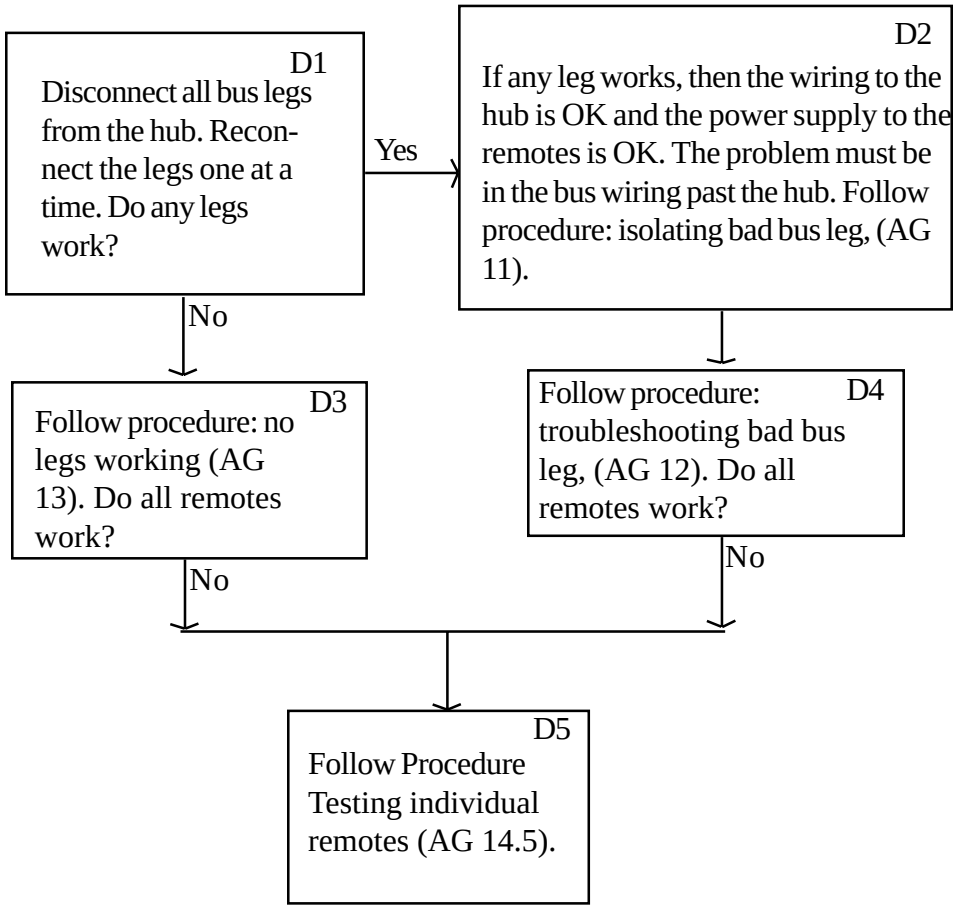
At this point you have verified that the Matrix is operating correctly, since the Matrix and the remote are communicating in both directions.

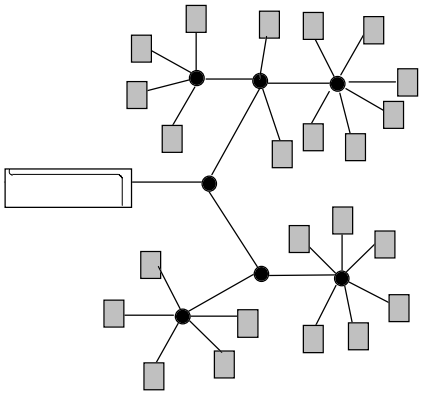
Note: If any part of this procedure fails, change remotes and try the test again.



AG 10 Tree D Advanced Bus Troubleshooting

Once you are certain that the problem is in the LAN, you need to know certain things about the system. You will need to be able to disconnect each leg of the bus from the Matrix individually. If you have used the recommended star topology (shown at bottom of this page) this will be relatively easy; at the main hub, you can disconnect each leg without disturbing the other legs. If you used another topology, you will need to be able to selectively disconnect individual sections of the bus. In any case you will need a voltmeter that can measure both voltage and resistance.





Star connection.

AG 11 Isolating bad bus leg

When you reach this procedure, you should already have established that some legs (even one) of your system work, but that not all of them do. Take the following steps to isolate the bad leg of your bus system:

1) Connect only the leg that works.
2) One at a time plug in additional bus legs until the system fails. The leg that causes the failure is the leg with the wiring problem.

AG 12 Troubleshooting a bad bus leg

There are four major causes of a failure in a bus leg. There may be an open in the bus, a short, a wiring error in a cable (a phase error), or for systems with more than 3000 feet of bus wire, there may be reflection and termination problems. **Note:** By far the most common cause of bus leg failures is wiring errors in faulty crimps in connecting the RJ12 connectors to bus wires.

1) Does the bus leg work part way down the leg, then stop working? If so there is probably an open connection in the wiring for that leg. The open will be found between the last working and the first nonworking remote. Locate and repair the open.
2) Look for short:
   a) disconnect all remotes on the bad leg.
   b) Disconnect the bad leg from the hub. Using an ohm meter (a DVOM) test each wire of the bad leg against all other wires in the connector, and against the conduit in which the bus runs. If there is zero resistance on any test, locate the short and repair it.
3) A bus phase error occurs when a connector is mis-wired. This is most easily found by carefully examining each connector's wiring by color code to ensure that each connector had connected the bus correctly. If any connector is mis-wired, replace it.

AG 13 No legs working

If no legs work, there are three likely problems. 1) the wiring from the Matrix to the hub is defective; 2) the power supply to the remotes is not working; or 3) there is a loop in the LAN layout (see page 59 for topolgy information).

1) Using a known good remote, replace the hub with the remote and test for correct operation. If the remote works properly, the wiring from the Matrix to the hub is OK.
2) Using a volt meter (DVM) examine the voltage at the remote's power pins. If the value does not fall within the required range of 9-18 V (either AC or DC) at the furthest remote from the power supply. The power supply is at fault.
3) If no legs work, and the Matrix has been verified OK but removing one leg cause the rest to work, then the leg removed has a short. See troubleshooting bad bus leg (AG 12).

AG 14 Slow and/or erratic remote response

If a remote or group of remotes has a slow response time i.e. a noticeable lag between button presses and response, there are two likely causes: a) noise or reflections on the bus or b) a programming problem. To narrow down this problem, test the remote hardware as explained below. If the response improves there is a problem with the bus (noise or reflections) see sec. 4.1.5.

AG 14.5 Testing Individual remotes

Testing each remote's hardware can be done with built-in MZP functions. You create a hardware test station, then add the remote under test to that station. You can now see the results of button presses and knob turns both at the remote and at the PC screen. For a one person crew, follow the procedures below:

1)On the PC open the station containing the remote to be tested.
2) Open the Unassigned Remoted screen (Installation -> Unassigned remotes).
3) Drag the remote to be tested to the Unassigned Remotes screen and drop it there.
4) Using the mouse double click a solitary LED and watch the response of the LEDs on the physical remote. If the response of the remote improves markedly, there is a problem with the bus (noise or reflections). See sec. 4.1.5.

Troubleshooting individual remotes — Blink Codes

There is a built in diagnostic tool for troubleshooting remotes: the remote LED blink codes. The blink codes are different blink patterns that signify the internal state of the remote. They are:

No Blink:

A remote that has no LEDs lit is in one of three states.

a) the remote does not have power applied to it.
b) the remote's unique ID chip is loose or missing. (AG 22).)
c) the remote is powered up, initialized by the Matrix, and is operating normally.

Single Blink:

A remote showing a single blink at a frequency of about 1 per two seconds has been powered up but has not received a message from the Matrix.

Double Blink:

Double blink indicates that the remote has been powered up and received a message from the Matrix, though the remote may not have sucessfully transmitted. If the remote stays in double blink mode, the software may have been left in Discovery mode, or there may be bus problems (including reflections, or a bad bus transceiver).

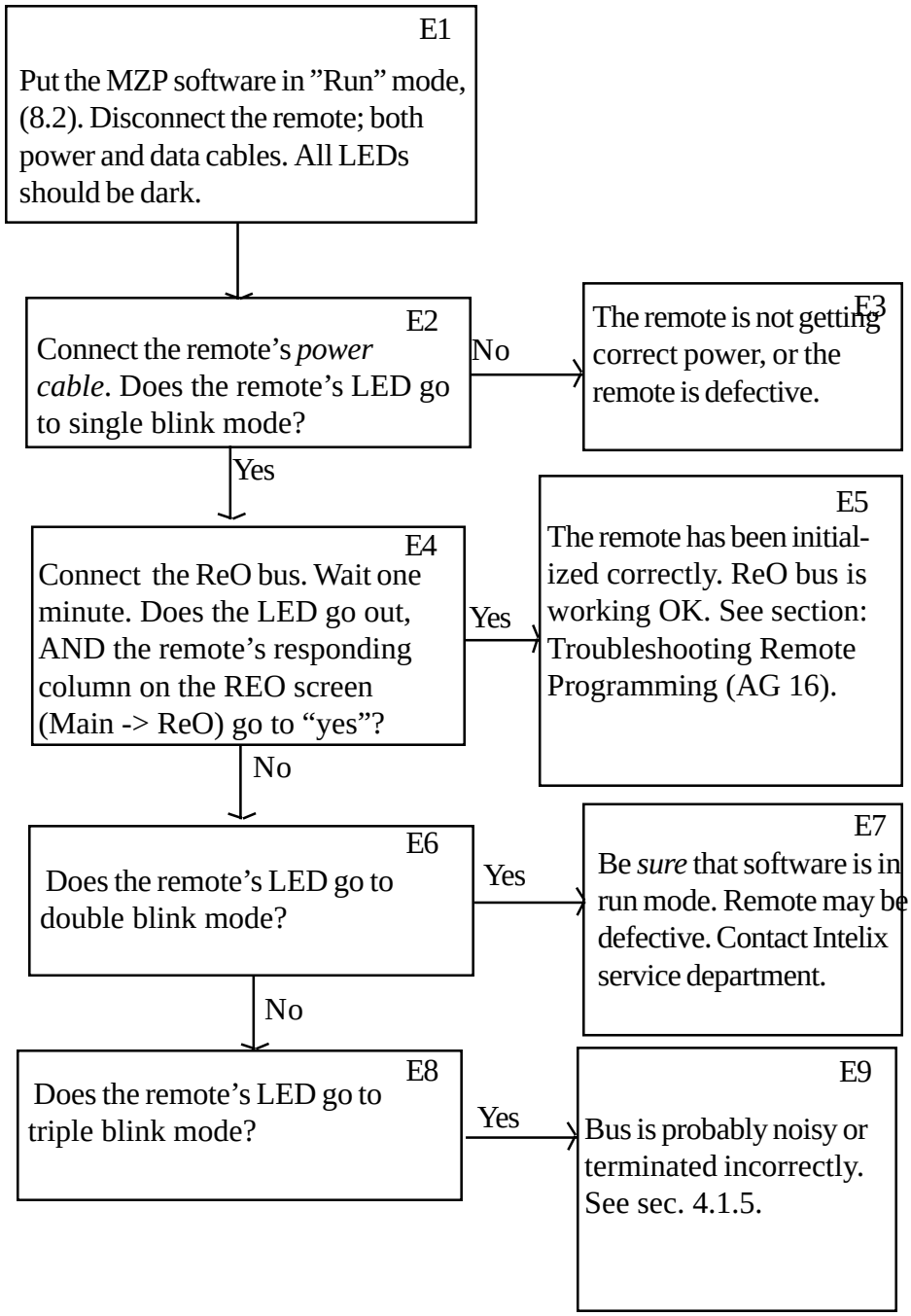
Triple Blink:

Triple blinking means that the remote has been acknowledged by the Matrix, but failed to receive the message to go to "run mode" (all LEDs off). This condition is extremely rare. Check for noise or reflections on the bus.

All other codes: Since the remotes can be programmed for LED blink rates, any blinking codes other than the ones above have been deliberately programmed by the last person to program the Matrix.

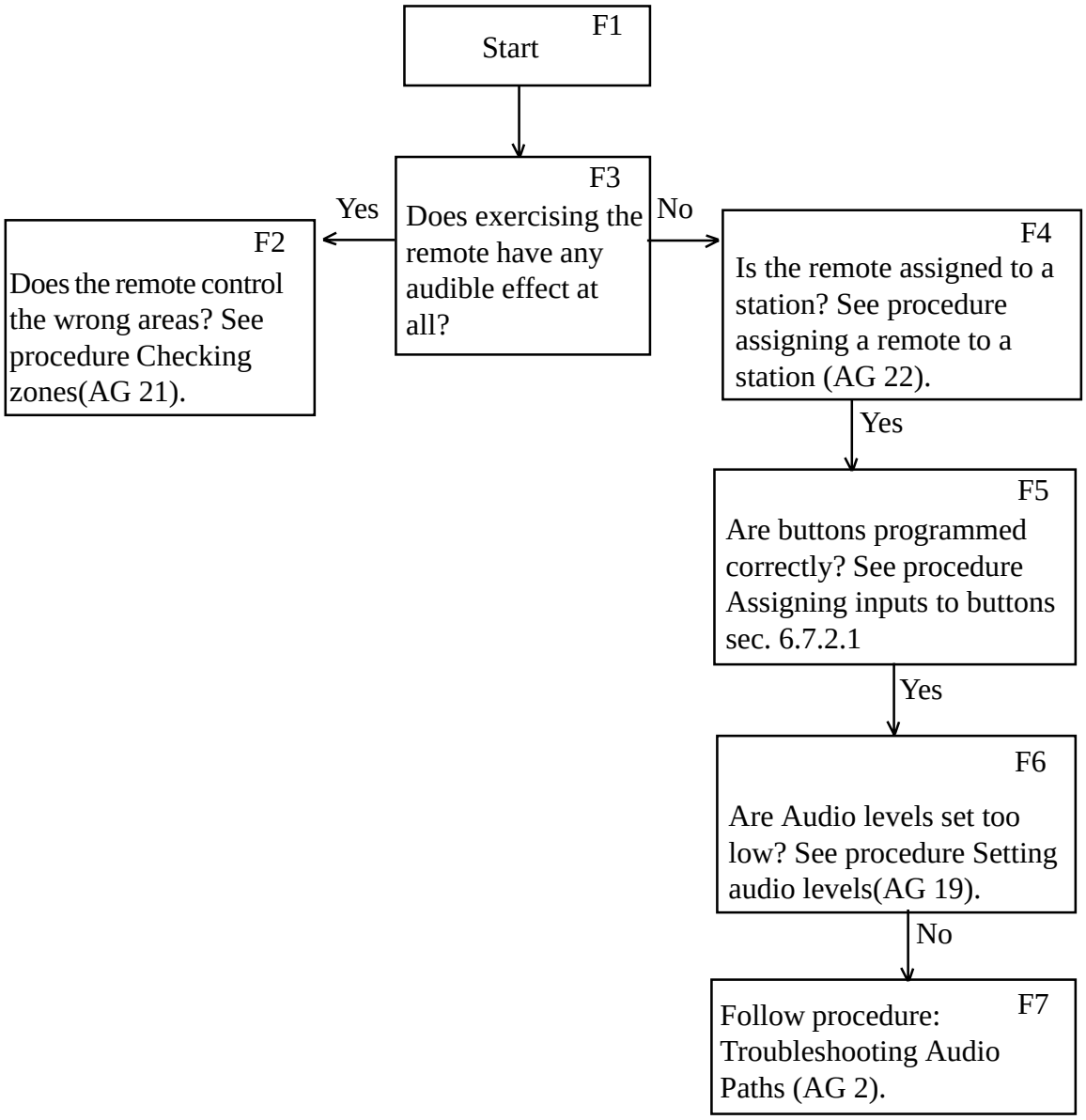
AG 15 Tree E Using the Blink Codes

To use the blink codes systematically use the following flow chart:



AG 16 Tree F Troubleshooting Remote Programming

By the time you get to this point you should have verified that audio paths (AG 2) and ReO bus (AG 6) are working correctly.



AG 19 Setting and checking audio levels

If the audio level for the selected program source is set too low, it will be inaudible when selected by the remote. The Matrix is an attenuation only device, so the maximum crosspoint setting is unity gain. A quick test is to set the cross point at this maximum value by manually entering the maximum level at the crosspoint under test. Follow these steps:

1) Go to the Audio Crosspoint Screen (Installation -> Live Crosspoints)
2) Doubleclick on the crosspoint to be tested.
3) Enter 100% (if viewing in percent) or 0dB (if viewing in dB).
4) Go to the Remote under test and select the source you have just raised to full gain.

AG20 Verify Audio Section

Turn on all audio sources, preamplifiers, powered speakers and amplifiers. Using the Live Crosspoint screen as described in section 9.5.2 turn on crosspoints to test each input to output connection. Listen at the output devices to determine if the matrix is passing audio.

AG21 Manually Setting Crosspoints

Open the Live Crosspoint screen (main -> Installation ->Live Crosspoints). Select crosspoints that connect your audio sources with your audio outputs. Doubleclick the crosspoint, it will toggle between full on and full off. A check mark in the crosspoint indicates that it is full on. The audio source should now be heard at the selected output.

AG 22 Assigning a remote to a station

Do button presses cause the remote's LED to light and go out? If so then the remote is in hardware test mode and has not been assigned to its station. Take the following steps:

1) Open the Unassigned Remotes screen (main -> Installation -> Unassigned Remotes) press the physical remote's button and see if the virtual remote in the Unassigned Remotes screen responds.

2) Open the station to which the remote should belong (this should be part of your system design). Now drag the unassigned remote and drop it on top of the virtual remote to which it should be assigned.) This procedure is demonstrated in sec. 8.8.

AG 21 Checking Zones

If a remote seems to work well but controls the wrong area in the building, it is likely that a zone is defined incorrectly. To check the definition of a zone go to the zone screen (Main ->audio zones) This screen shows the definition of each zone (listed down the left of the screen) as a collection of outputs (listed across the top of the screen). Check these definitions against your design documents.

If all definitions seem to be correct, but the remote continues to control an unexpected part of the building it is possible that a preprogrammed remote was installed in the incorrect location. The best way to check this is to examine the label on the remote placed there by the factory programmer or (presumably) by the programming contractor at the time it was programmed.

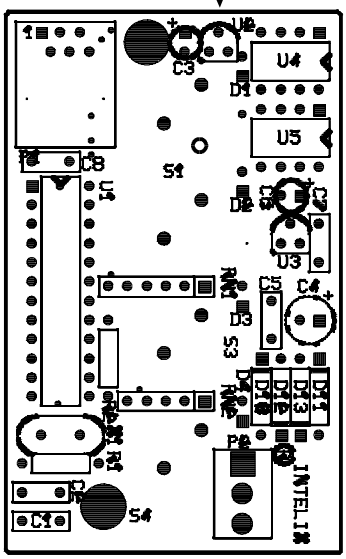
AG 22 ID chip

Each ReO remote device (Comet4 and Comet Tail) contains a unique ID chip. This socketed 3-pin chip contains the remote's ID number which identifies the remote to the matrix. If this chip is missing or loose, it can cause unusual behavior by the remote.

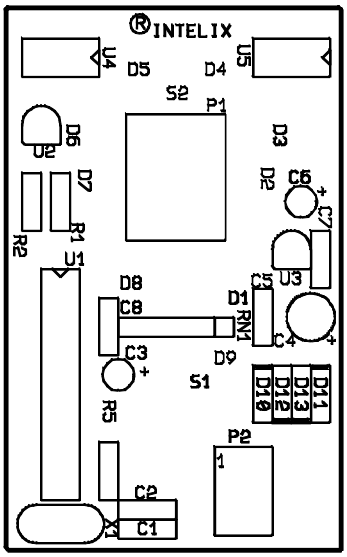
If the remote goes correctly into single blink mode on power up (see page 22 for blink codes), but then goes to no blink mode *and does not appear on the PC setup screen as recognized,* the remote's ID chip may be missing.

Refer to the drawing below for the location of the unique ID chip, check the remote in question, to make sure that the ID chip is present and well seated in its socket, then repower the remote and test for correct installation.

The Comet 4 circuit board.
The arrow points to U2, the Unique ID chip.



The Comet Tail circuit board.
The arrow points to U2, the Unique ID chip.



Appendix H: Technical Information

SPECIFICATIONS	
Signal-to noise Ref +26 dBV, 8X8 system	100dB
Frequency Response	±½ dB from 20 Hz to 20 kHz
+0, -3 dB from 10 Hz to 30 kHz	
Crosstalk	Better than -80 dB
Gain Control Range (attenuation only)	100 dB
Gain Control Resolution	0.4 dB (256 steps)
Inputs	
Input Impedance (electronically balanced)	20 kΩ
(unbalanced)	10 kΩ
Nominal Source Impedance	150 Ω
Nominal Input Level	+4 dBV RMS
Maximum Input Level (balanced)	+26 dBV RMS
Outputs	
Output Impedance (electronically balanced)	440 Ω
(unbalanced)	220 Ω
Nominal Load Impedance	600 Ω
Nominal Output Level	+ 4 dBV RMS
Maximum Output Level (balanced)	+26 dBV RMS
(unbalanced)	+20 dBV RMS
POWER REQUIREMENTS	
8x8 to 16x16	18 VAC center-tapped, 3 A, 54 VA ±18 - 24 VDC, 3 A
DIMENSIONS	
Matrix: (Standard models, 2U chassis)	19" x 3.5" x 14" (48.2 cm x 35.6 cm x 8.9 cm)
SHIPPING WEIGHT	
Matrix (8 x 8 units, more for other models)	20.3 lb. (9.20 kg)

AH1 Servicing

All repair and other service of Matrix Mixers and Remotes should be provided only by qualified service personnel. Contact Intelix for a list of authorized service agents. *Other attempts at service or repair may void the warranty.*

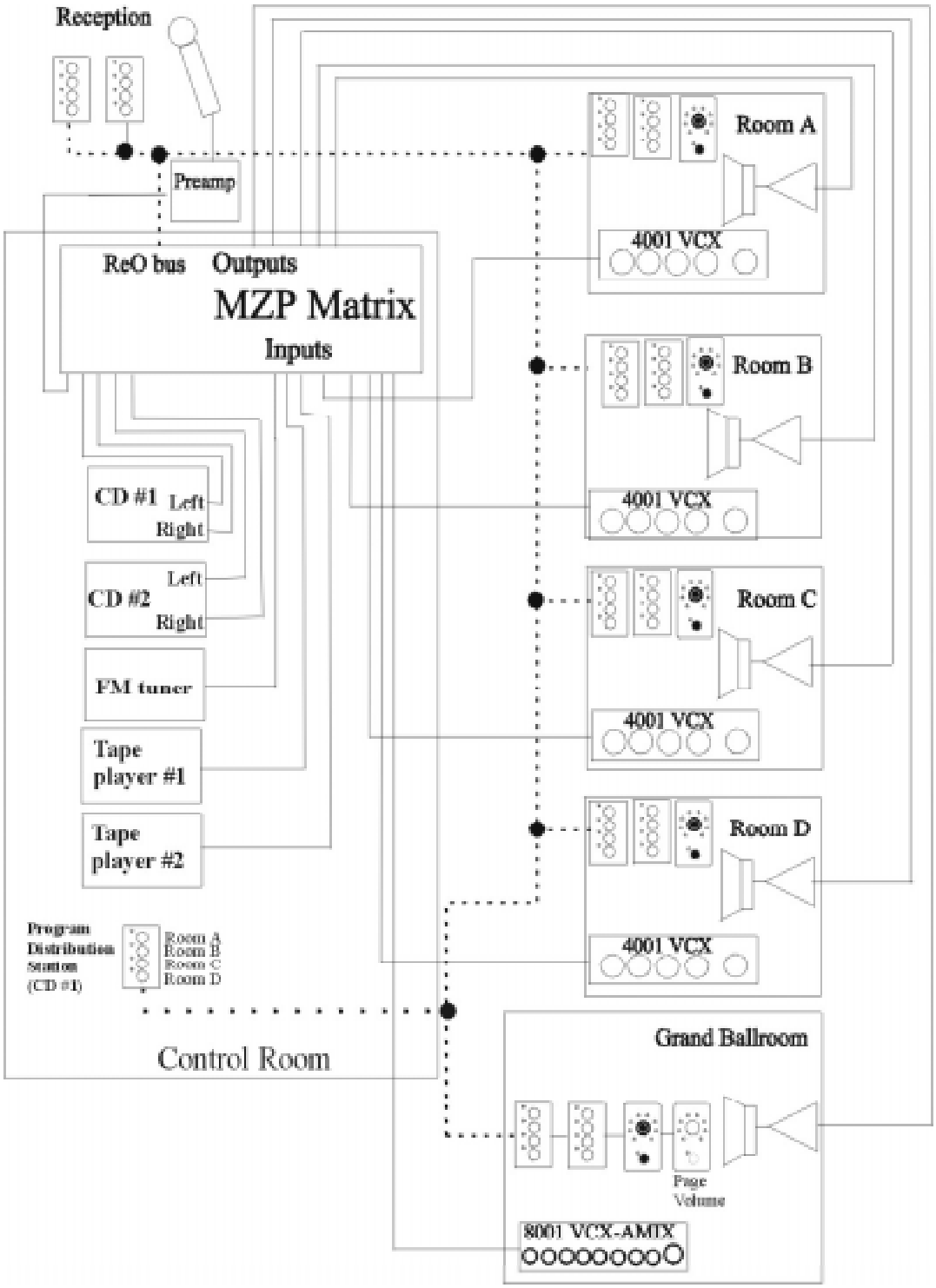
AH2 Warranty

Intelix products are guaranteed against malfunction due to defects in materials or workmanship for two years. If such malfunction occurs during the specified period, this product will be repaired or replaced, at our option, without charge. Further, a product which has been repaired/replaced is itself guaranteed for six months. This six-month guarantee applies even if the warranty repair/replacement occurs within less than six months of the end of the original two-year warranty period.

This warranty does not cover: (1) malfunction resulting from use of the product other than as specified in the user manual; (2) malfunction resulting from abuse or misuse of the product; (3) exterior chassis appearance; or (4) malfunction occurring after repairs have been made by anyone other than Intelix or any of its authorized service representatives.

Appendix J: MZP Design Example and Templates

In this section an example of a typical MZP application is presented. It will demonstrate the entire process of designing, installing and programming the system. This is a simple example and does not demonstrate all the capabilities of the MZP system. A drawing of the example system is shown below.



AJ 1 Project Definition

The application is a small conference facility, with four small rooms and one large ballroom, and a reception area. There are five line-level music source; 2 stereo CD players, a mono FM tuner and 2 mono tape players. Each room has its own amplifiers and speakers.

The users of each room must be able to select from any one of the five music sources. In addition, each room must be able to select its own microphone mixer as a source. The volume of its selected source is controllable from each room. Each small room has a four channel microphone mixer, which acts as a preamplifier for mics in that room. There are XLR microphone jacks at several locations in each room.

The grand ballroom differs from the small rooms only in that it has 8 mic sources instead of 4. This requires that the ballroom have an 8 channel mixer. This room also contains a page volume station. This station controls the volume of all pages entering the ballroom (including emergency pages); i.e. **if the page volume is turned down or muted, even emergency pages may go unheard.**

The reception station must be capable of independently paging into each of the 5 rooms. It must also be able to page all rooms simultaneously, overriding whatever source is selected by the room's users.

The control room contains a program distribution station for the distribution of audio source CD #1 to zone Room A, Room B, Room C and Room D. This station is not user accessible, but is set by the manager. CD1#1 is routed to each zone whose button is pressed. Since CD#1 is also available in each zone as a user choice the program distribution station source can be overridden by the users in the zone. When they press their button for CD#2, CD#1 goes off in that zone.

AJ 2 The Design Process

The process of designing an MZP system from a spec such as this example can be broken down as follows:

1) Use the design templates in sections AJ12 to list inputs, outputs and zone names.
2) Use the "station creation" template in this appendix to design the stations needed.
3) Run the MZP Windows® based design software and enter the information from the tem plates.
4) Run the Hardware Installation wizard to install, test and adjust your system.

AJ 3 Defining Inputs

Remembering that the MZP Matrix is a line-level device only, list, name and type all Matrix inputs. Typing means distinguishing between program and paging types. In this example the microphone inputs in the rooms are treated as program sources, but the receptionist's microphone is a page source.

Input	Name	Type
1) CD #1Left	CD1left	Prog
2) CD #1 Right	CD1right	Prog
3) CD #2 Left	CD2left	Prog
4) CD #2 Right	CD2right	Prog
5) FM Tuner #1	Tuner	Prog
6) Tape Player #1	Tape1	Prog
7) Tape Player #2	Tape2	Prog
8) Reception mic	pagemic	Page
9) RoomA mixer	Amix	Prog
10) Room B mixer	Bmix	Prog
11) Room C mixer	Cmix	Prog
12) Ballroom mixer	GBmix	Prog

AJ 4 Defining Outputs

The outputs in this example consist of a single output for each of the 5 rooms.

Output	Name
1) Room A	RoomA
2) Room B	RoomB
3) Room C	RoomC
4) Room D	RoomD
5) Ballroom	Ballroom

AJ 5 Defining Zones

In this simple example there will be only 6 zones. Each room will have a zone of its own, and there will be an all call zone that encompasses all the rooms. It is possible to define any zone needed, e.g. a zone containing only rooms A and D.

Zone Name	Location
1) RoomA	Room A
2) RoomB	Room B
3) RoomC	Room C
4) RoomD	Room D
5) Ballroom	Ballroom
6) All Call	Rooms A-D and ballroom

AJ 6 Determine a component list

To determine all components required by the design you have entered in the MZP design software open the “Sales Order” item (Main -> Reports -> Sales Order). The report will show you a list of all components needed by your design. This list can be printed.

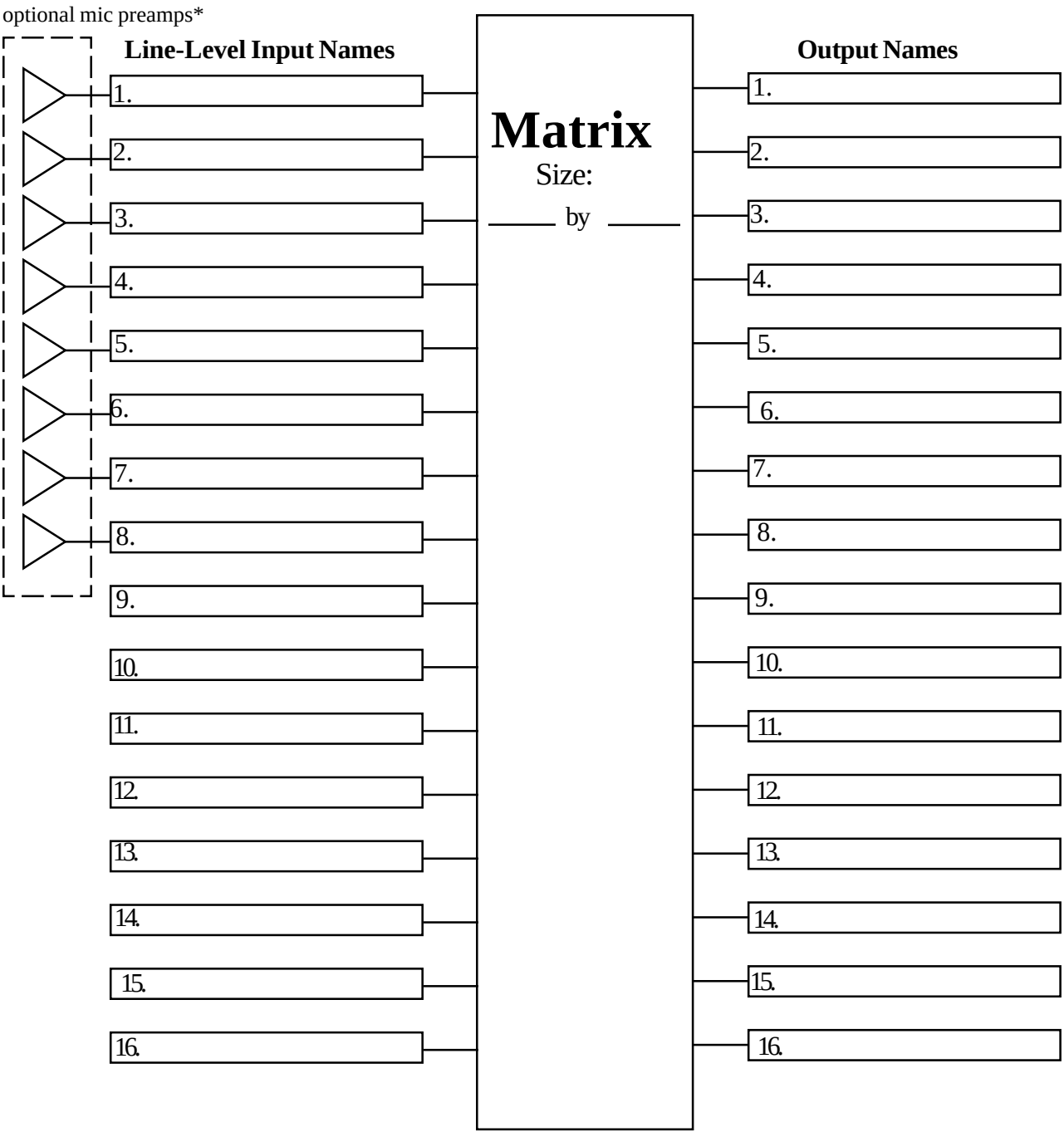
AJ7 Programming your system

After your system has been entered with the MZP Windows® auto-designer, you will be prompted to enter the Hardware Installatiom Wizard. In the wizard, you will be guided through a series of steps that program your physical system with the program as defined in your design file. After installation, you need only do final adjustments to be complete.

AJ 12 MZP Design Templates

The following five pages contain templates to be used in customer application designs; they are used with the design process explained beginning in section 6.0.

List all inputs to the Matrix down the left, and all outputs from the Matrix down the right. **Note:** The Matrix is an attenuation only device and expects to see *line-level* inputs greater than 0 dBV. If you have inputs such as microphones or aux level sources e.g. CD or VCR, you will need to use microphone preamps before the Matrix inputs to raise your inputs to line-level.*



*e.g. Intelix models 4001VC(X) or 8001VC(X)equipped with Intelix 25EXT and CPHNX-8

Zone Names	Names of Output(s) in Zone
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.
11.	11.
12.	12.
13.	13.
14.	14.
15.	15.
16.	16.

Crosspoint Level Template

Use this page to enter approximate audio levels for each crosspoint. The number should be between 0 and 255. 0 represents -100 dB attenuation, and 255 represents unity gain.

Input Number

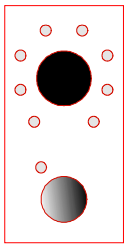
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																
11.																
12.																
13.																
14.																
15.																
16.																

Output Number

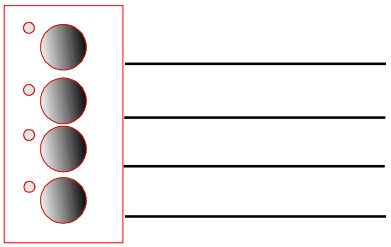
MZP Station creation and assignment

Next to each Comet 4 button, list the selected input or page zone to be assigned.
Draw a square around the remotes to be grouped into one station, and label the station as program select or page.

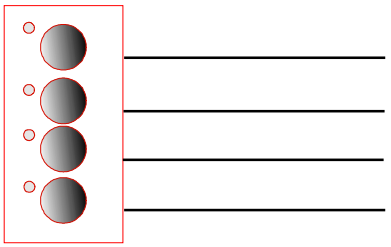
remote label:



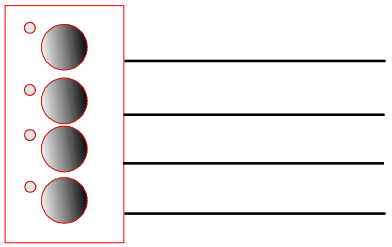
remote label:



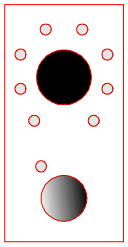
remote label:



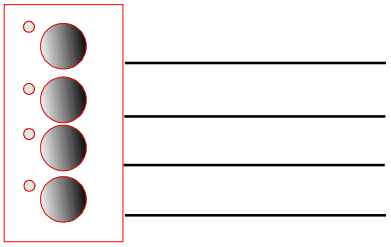
remote label:



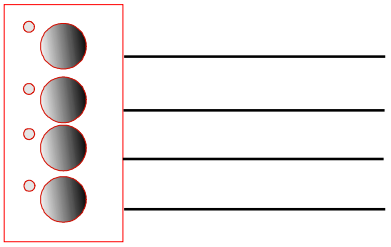
remote label:



remote label:



remote label:



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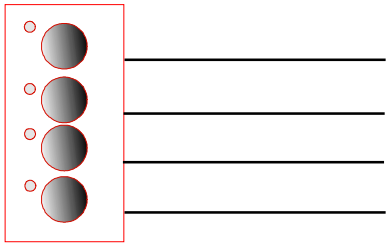

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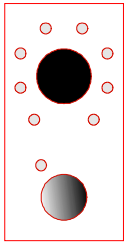

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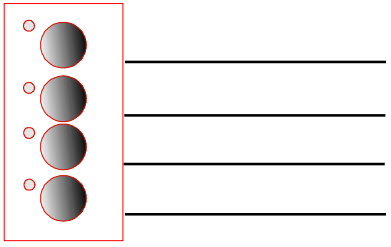

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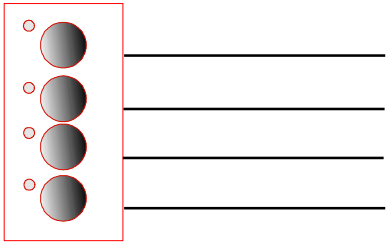
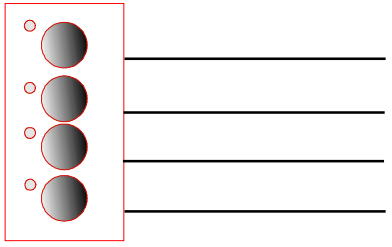


remote label:



MZP Station creation and assignment

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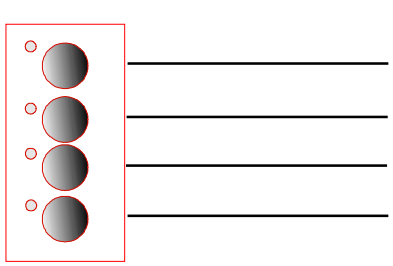
Draw a square around the remotes to be grouped into one station, and label the station as program select or page.

remote label:



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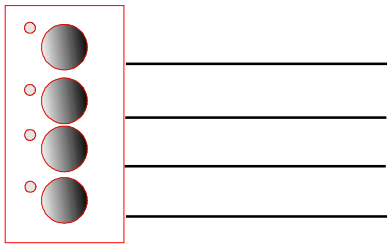

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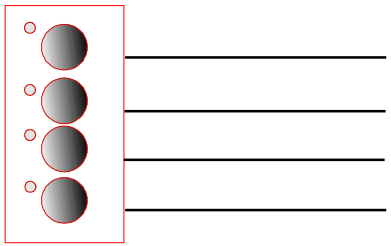

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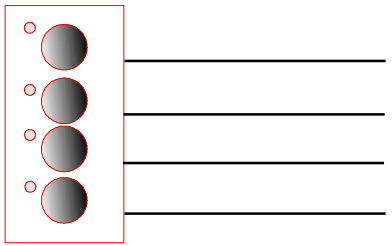

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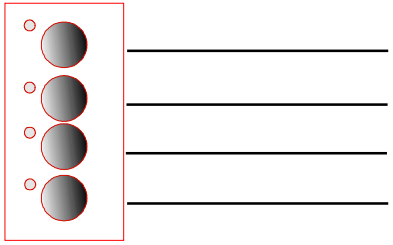

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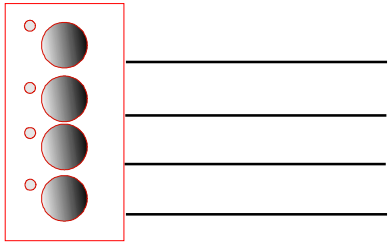

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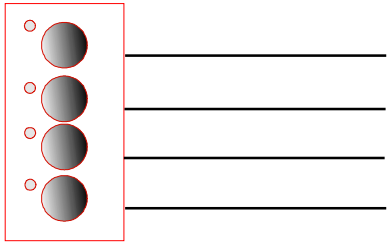

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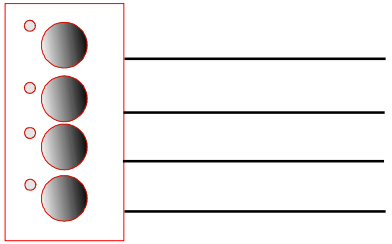

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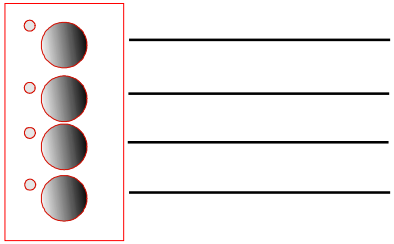
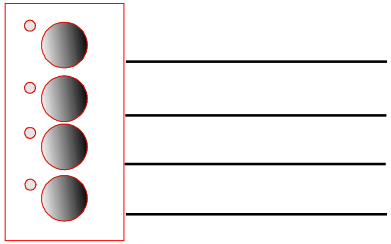
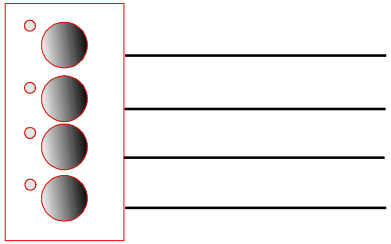


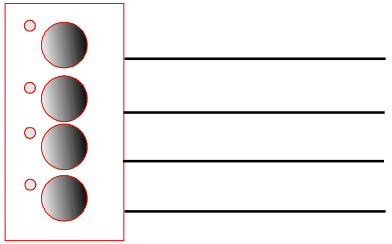
remote label:



remote label:



remote label:



Appendix L: Remote Sequence Template

Sequence	Remote Name	Location	Recognized?	Remarks
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				

Sequence	Remote Name	Location	Recognized?	Remarks
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				
37.				
38.				
39.				
40.				
41.				
42.				
43.				
44.				

Appendix M: Troubleshooting RS232 Communication

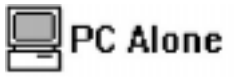
Use the following procedures to troubleshoot communication problems between the PC and the MZP matrix mixer.

Be sure that you have completed the steps below:

1) Install the MZP software from the supplied CDROM to your PC.
2) Start the MZP software (see section 5.0). From the main menu select Communication -> Communication Setup.
3) Configure the PC Communication port for details see sec 9.4.2.

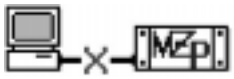
Communication Icons

All MZP screens carry a communication icon in the lower left corner. The icon in the lower left corner will indicate the current state of communication. There are three communication icons:



This icon indicates that the PC is not attempting to communicate with an MZP matrix mixer. In this mode you can create new files and design systems for later transfer to an MZP. In PC alone mode some functions may be disabled.

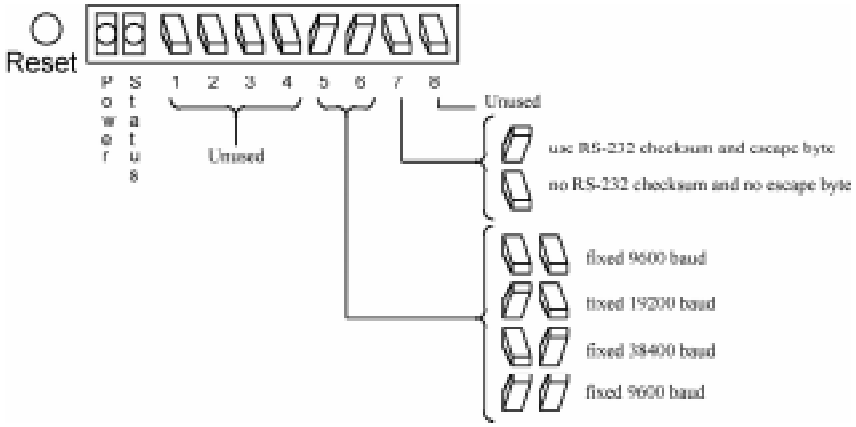
This icon indicates correct communication between the PC and the MZP. You can transfer files, monitor the MZP or make live real time changes in this mode.



This icon indicates a communication failure. Common causes are incorrect communication port selected, incorrect baud rate, or cabling errors.

DIP Switches

The settings of the DIP switches on the rear of the matrix mixer (shown below) *must agree* with the baud rate setting in software (Main -> Communication -> Settings -> Baud Rate).



Testing Communication in the MZP

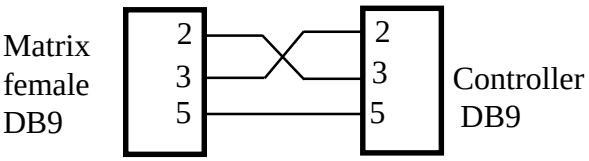
To test communication in an MZP in unknown condition, take the following steps:
1) Start MZP software.
2) From the opening screen select New File, and give a file name at the prompt, click Save.
3) Click Cancel for auto-design wizard query.
4) Open the communication menu (main -> Communication). Click on the “Show Details”Item.
5) Go back to the communication menu (main -> Communication). Click on the“Communication Setup” button
6) Verify that the baud rate selected matches the baud rate selected by the DIP switches on the rear panel of the MZP chassis. (see drawing below)
7) Verify that the Escape byte and checksum item selected matches thechoice selected by the DIP switches on the rear panel of the MZP chassis. (see drawing below)
8) Verify that the selected port number is correct.
9) Click “Open Comm port” button.

If communication is correctly established, messages will start to receive messages RX.
If communication fails, there will be transmit messages only, with no acknowlege. In this case click the “Close comm port button” change the comm port number, click the “Open comm port” button and recheck communication.

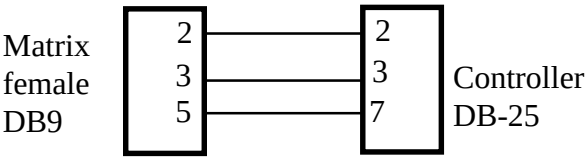
Once proper communication is initiated, the communication icon in the lower left corner of each window will show OK.

Cabling Information
The MZP should be connected to the control PC with a “null modem” cable. Wiring diagrams are shown below.

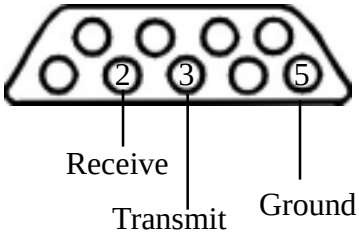
RS232 DB9 to DB9 connections for a null modem cable.



RS-232 DB9 to DB-25 connections for a null modem cable.



The connections of the MZP’s DB9 connector for RS-232 communication.

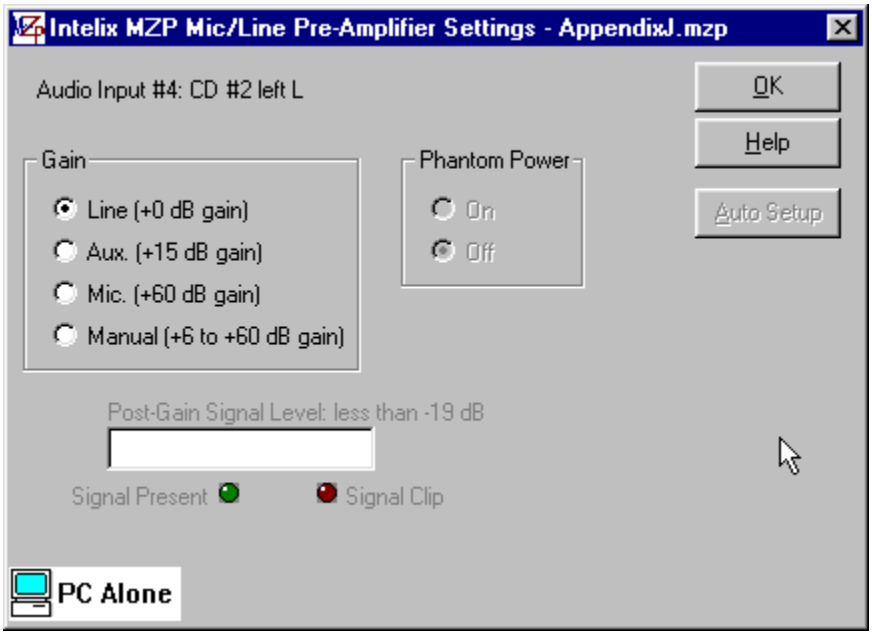


Appendix N: The Mic/Line Card

The mic/line card is a hardware option for the Intelix matrix mixer product line. It provides an 8 channel preamplifier with software controllable characteristics. Among these characteristics are:

1) Four gain ranges
   a) "line" range: no amplification
   b) "aux" range: +20 dB amplification
   c) "mic" range: +60 db amplification
   d) "manual" range: screwdriver adjustment 0db – +60db
2) Phantom power available on a per channel basis (+15V)
3) Signal present and signal peak LEDs on a per channel basis.
4) Each channel has a signal sensor which is capable of sensing -20 to +24 dB. This sensor is readable in software.

The mic/line card has auto-sensing capabilities. This means that when put in auto mode, the card examines the specified input and sets its input range to the optimum settings for that input and notifies the user of the new settings.
Software provides a signal meter for each of the 8 channels.



This screen shot shows the MZP control software for the mic/line card. Note the selectable range, phantom power, auto setup selection signal level meter, and signal present and clip LEDs.

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