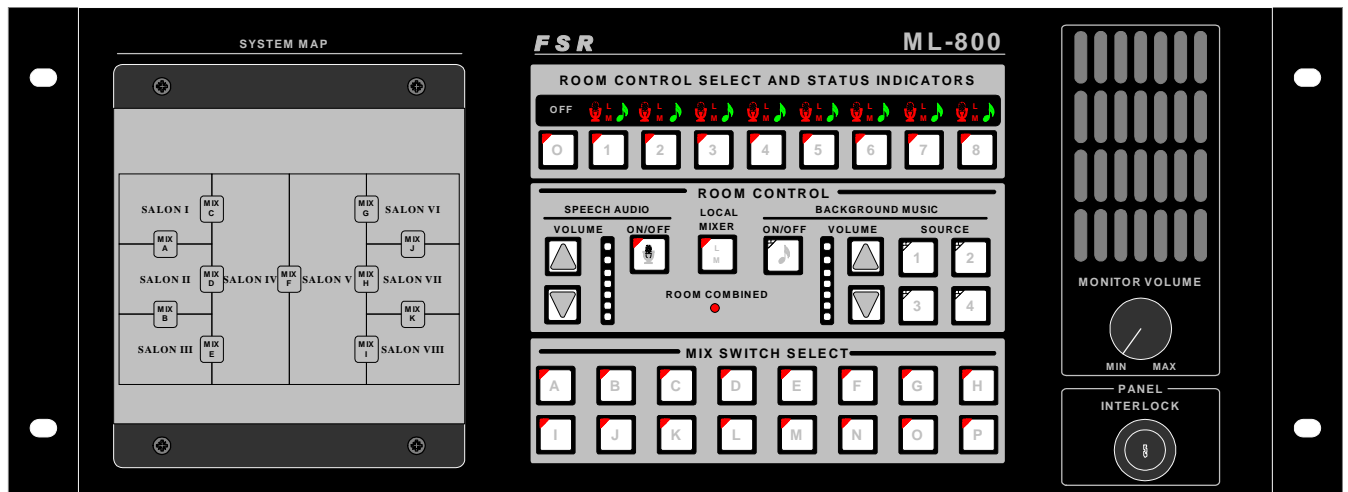




## *INSTALLATION AND OPERATOR'S MANUAL*



# **Model ML - 800**

## **8 ROOM AUDIO CONTROL SYSTEM**

244 Bergen Boulevard, West Paterson, NJ 07424 • Tel 9737854347 • Fax 9737853318 • Web [www.fsrinc.com](http://www.fsrinc.com)

#### PROPRIETARY INFORMATION

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# Operators Safety Summary

*The general safety information in this summary is for operating personnel.*

**Do Not Remove Covers or Panels** There are no user-serviceable parts within the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

**Power Source** This product is intended to operate from a power source that will not apply more than 230 volts rms between the supply conductors or between both supply conductor and ground. A protective ground connection by way of grounding conductor in the power cord is essential for safe operation.

**Grounding the Product** This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.


**Use the Proper Power Cord** Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

**Use the Proper Fuse** To avoid fire hazard, use only the fuse having identical type, voltage rating, and current rating characteristics. Refer fuse replacement to qualified service personnel.

**Do Not Operate in Explosive Atmospheres** To avoid explosion, do not operate this product in an explosive atmosphere.

## Terms In This Manual

**WARNING** Highlights an operating procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to or death of personnel. **NOTE** Highlights an essential operating procedure, condition or statement.

**CAUTION**  The exclamation point, or lighting bolt, within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**AVERTISSEMENT!** Le point d'exclamation dans un triangle équilatéral signale à alerter l'utilisateur qu'il y a des instructions d'opération et d'entretien très importantes dans la littérature qui accompagne l'appareil.


**VORSICHT** Ein Ausrufungszeichen innerhalb eines gleichwinkligen Dreiecks dient dazu, den Benutzer auf wichtige Bedienungs- und Wartungsanweisungen in der Dem Great beiliegenden Literatur aufmerksam zu machen.


**WARNING** The rear panel ON/OFF switch does not disconnect the unit from input AC power. To facilitate disconnection of AC power, the power cord must be connected to an accessible outlet near the unit. Building Branch Circuit Protection: For 115 V use 20 A, for 230 V use 8 A.


**WARNING** When the COMPASS is used in the 230-volt mode, a UL listed line cord rated for 250 volts at 15 amps must be used and must conform to IEC-227 and IEC-245 standards. This cord will be fitted with a tandem prong-type plug.

## Terms As Marked on Equipment

**CAUTION** Highlights an operating procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to or death of personnel.

**CAUTION**  The exclamation point, or lighting bolt, within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**AVERTISSEMENT!**  Le point d'exclamation dans un triangle équilatéral signale à alerter l'utilisateur qu'il y a des instructions d'opération et d'entretien très importantes dans la littérature qui accompagne l'appareil

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**NOTE** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the users own expense.

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# CHAPTER ONE

*What you will find in this chapter...*

- *Introduction*
- *Unpacking Data*
- *System Components*
- *Equipment Placement*
- *Grounding Considerations*

## INTRODUCTION

The design of the ML-800 system takes advantage of current technology to provide a blend of reliability, ease of use, flexibility, and reasonable cost. Designed for Hotels and Conference Centers with divisible, multi-use meeting rooms, the ML-800 unifies the audio system of each room being joined together with the touch of a button. Each control panel, speaker, amp, etc. will automatically operate as one sound system. Any number of rooms (up to 16 per system) can be combined in any number of groups. The custom software, which is provided, allows the system to be tailored to specific system requirements.

The ML-800 eliminates the need for skilled operators and can be used by staff members with minimum instruction. The combining can be controlled from multiple locations depending on the system options, and specific functions can be controlled from each room. The quality of the sound system is not compromised by this system. Built-in safeguards prevent system failure due to misuse or failure of one component.

A typical ML-800 system may include:

- o     **ML-800 RACK**       Audio Control Unit
- o     **PSA**               Power Supply
- o     **Wallplates**        User selectable; 2 gang/3gang membrane or touch control (optional)
- o     **FMP**               Facility Manager Panel Interface (optional)
- o     **AUD**               Remote Audio Monitoring (optional)
- o     **RMAP**             Remote Map Panel (optional)
- o     **RMON**            Remote Monitor Panel (optional)
- o     **CNTL**            Control System Interface (optional)
- o     **INT**              Map Panel Status Interface (optional)
- o     **LU**               Lutron® Lighting Interface (optional)
- o     **IM**               Installation Manual

In each room a wallplate controls music and local input functions (local input on/off, room mixer enable, music select, and volume up/down switches for local input and music.) A bar graph display is provided for local input and music.

The security key switch or access code on the touch panel prevents unauthorized control of the system. Dip switches inside the Audio Control Unit determine whether the key switch or code interlocks all the wallplate functions, microphone functions only, or no wallplate functions.

The system is shipped in a default setting which will permit instant operation of the system in its usual configuration. Please refer to the Dip switch/Jumper settings for pertinent details on the switch functions.

## UNPACKING

Your ML-800 system should contain the following components;

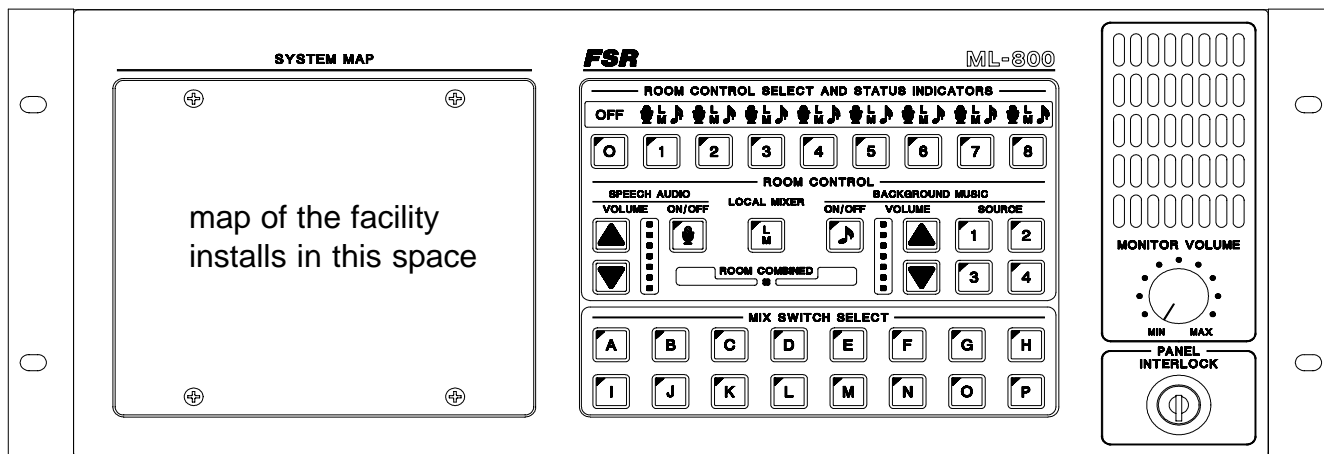
- ML-800RACK (audio control unit) This is the rack unit with the Map/Monitor Panel
- ML-PSA ( large power supply)
- If Wall Plates were ordered Room control panels, one for each room in the system. Depending on the order either 2 or 3 gang membrane wallplates or touch wallplates will be shipped. On some installations two wallplates may be required per room.
- If the Facility Manager Panel was ordered you should have an FM-INT Interface Unit, the RS-232 interconnect cable, a 3.5" diskette, and a power supply. (\*)
- If the Remote Audio feed was ordered you should have an enclosed audio speaker along with special relay cards (116-MNRL and 116-MNP) mounted on a 19 inch TRAC-BRAC. (\*)
- If the Remote Map Panel was ordered you should have the R-MAP Panel with its power supply.
- If the Remote Monitor Panel was ordered you should have the R-MON Panel which will mount on top of the R-MAP Panel.
- If the Lutron lighting interface was ordered then you should have the ML-116-INT & power supply unit.
- This installation Manual.

(\*) With multiple ML-800 systems with the FMP or AUX option(s) some duplicate components are not provided. Please consult factory.

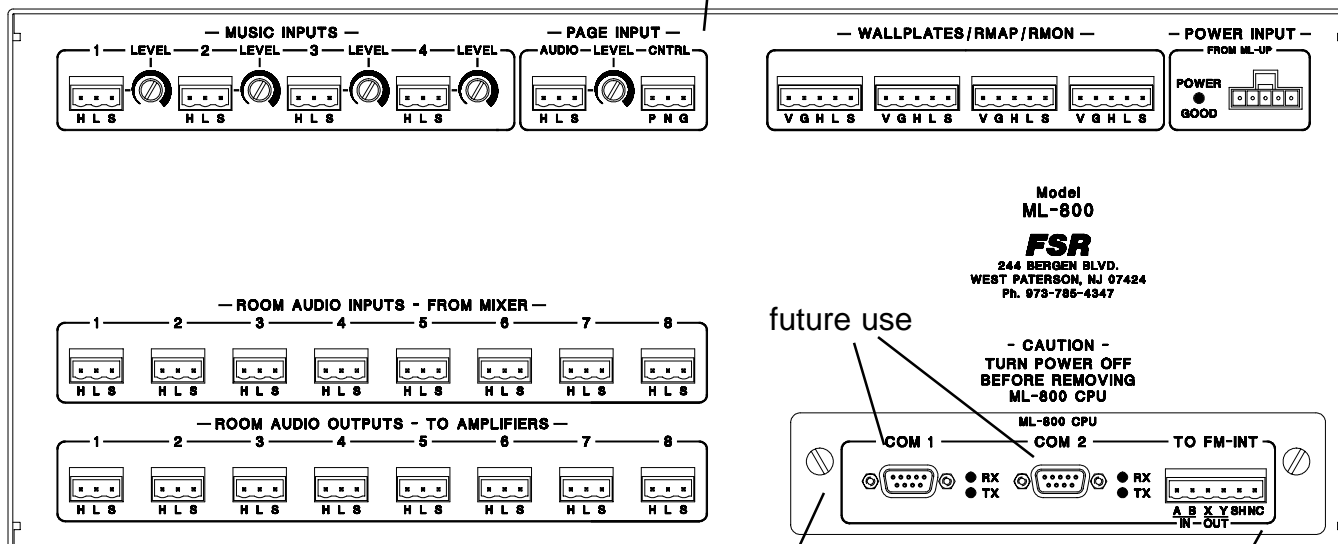
# ML-800 SYSTEM COMPONENTS

## ML-800RACK

### FRONT VIEW



### REAR VIEW



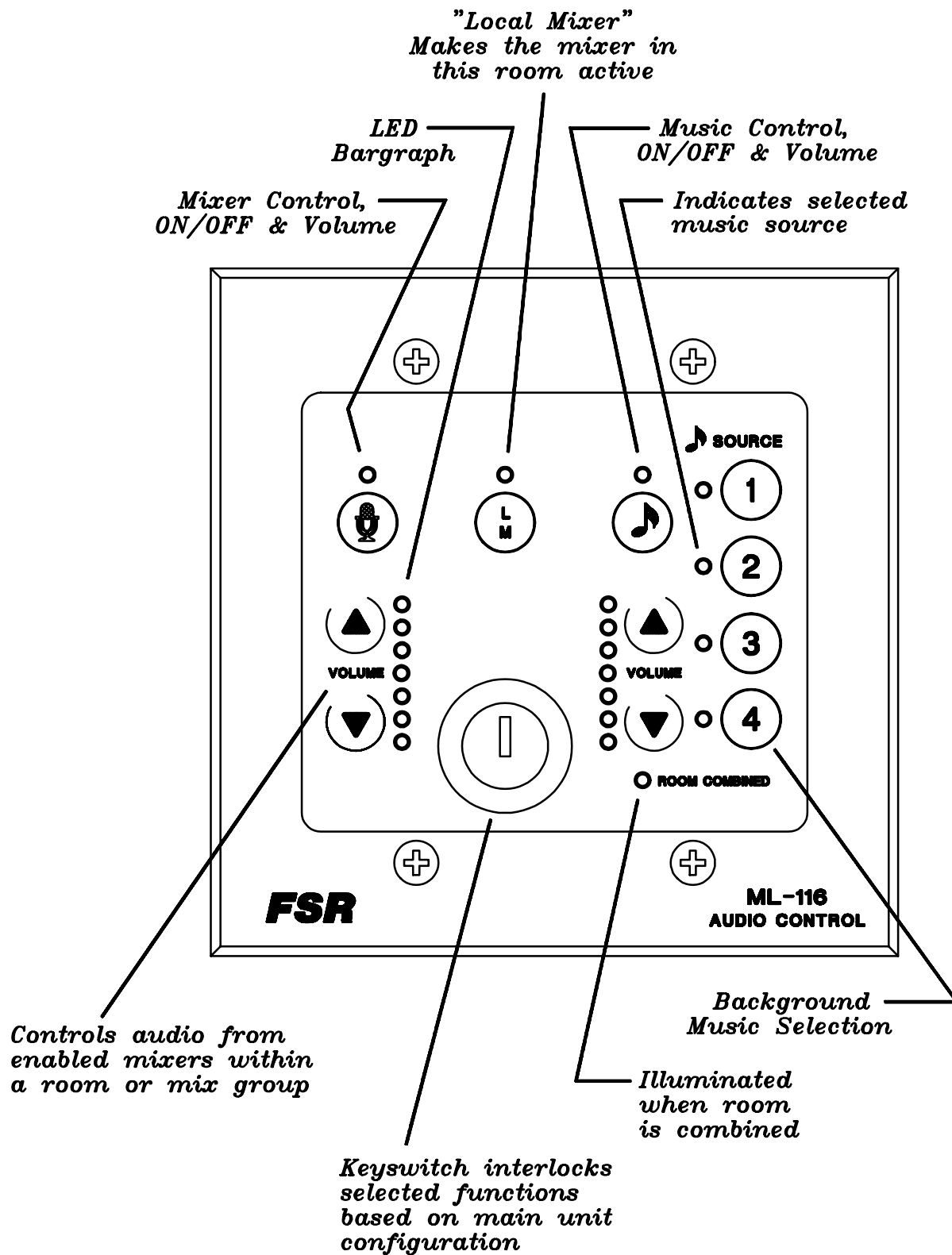
remove this card to set jumper switches

future use

to FM INT for computer control via FM-Panel software



**ML-800 WALLPLATE (optional) 2 Gang shown (also available in 3 gang)**



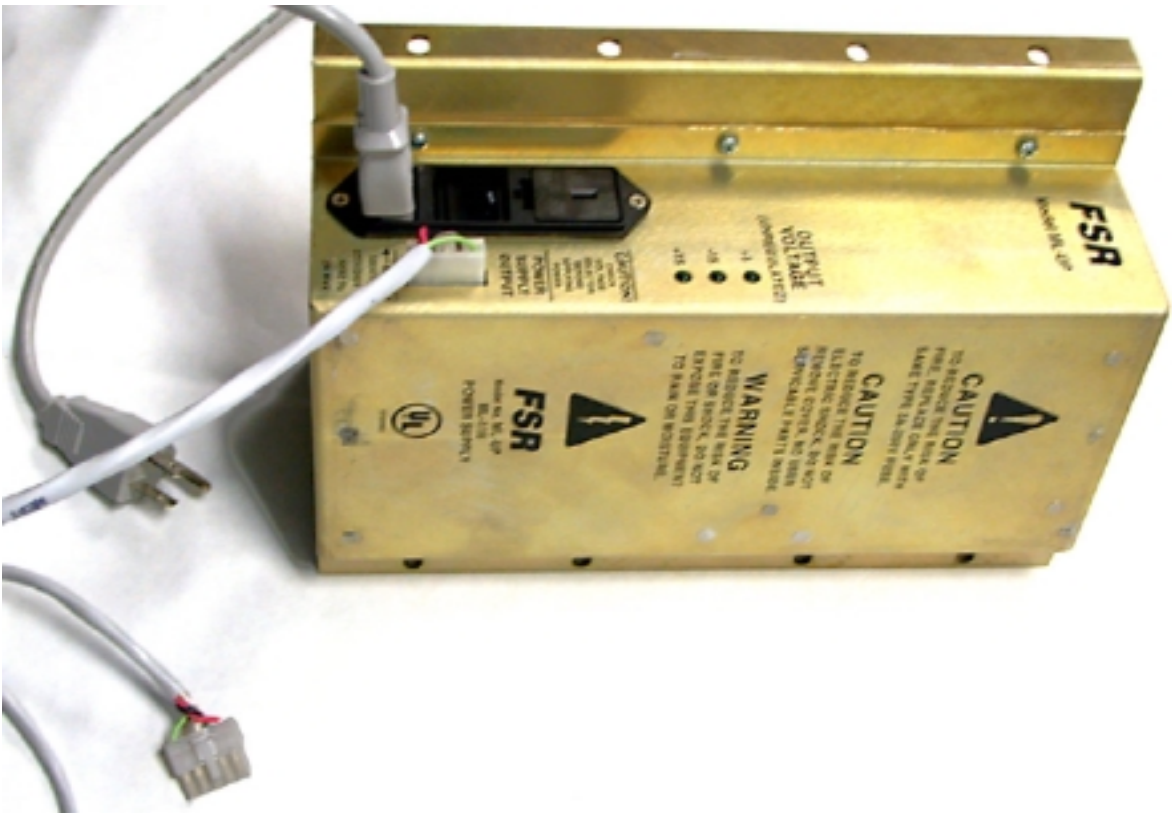
**MEMBRANE TYPE**

**ML - 800 TOUCH WALLPLATE (optional)**



---

**ML - 800 POWER SUPPLY      PSA**



## **EQUIPMENT PLACEMENT**

The ML-800RACK is mounted first. It should go in the audio rack at eye level usually 55 inches from the finished floor.

The ML-PSA is mounted in the same rack as the ACU. It mounts in the rear of the rack usually at waist level.

When the Facility Managers software, with audio monitoring (ML-116-AUD), is ordered then another TRAC-BRAC with a ML-116-MNRL & MNP is also installed at the rear of the rack. This completes the rack mounting of the ML-116 components.

The wallplates are mounted next. At least one wallplate is mounted in each room. In larger rooms two wallplates may be required. The membrane wallplates mount in a standard 2 gang/3 gang electrical box (min. depth 3 inches) and are connected to the cable already pulled. The touch wallplate mounts directly in its own enclosure. Refer to the section on wallplates to determine proper hook-up.

If the Facility Managers software with audio monitoring (ML-116-AUD) was ordered then the enclosed audio speaker, as well as the FM-INT small desk top mounted box, are located in the Managers Office.

If the Remote Map and/or Monitor Panel was ordered then this unit will be mounted, most likely, in a service corridor and will be wired back to the ML-800RACK.

If the Lutron lighting interface was ordered then the ML-116-INT unit would be mounted in the lighting dimmer rack location

## GROUNDING

**It is strongly recommended that in any rack setup to ensure appropriate power application as well as superior power surge protection that the FSR Power Conditioning and Sequencing (SPC) System be utilized.**

The ML-800 System, along with the associated mixers, equalizers, and power amplifiers, is a high gain audio system of some complexity and requires a proper grounding procedure be followed.

The ML-800 equipment has separate audio, digital, and chassis grounds. The digital and audio grounds come together in the unit. Inside the ML-800RACK on the regulator card there is a ground (chassis) terminal that is tied to analog ground through a removable jumper. In most installations there is no need to touch this jumper.

### WALLPLATE GROUNDING CONSIDERATIONS

In order to prevent damage to the ML-800 system from ESD (Electro-Static Discharge), it is incumbent upon the installer to carefully consider the grounding of the system. Since the ML-800 is a digital/audio hybrid, proper ground is essential to maintaining audio quality while preventing damage the electronic circuitry.

The metal faceplate of the ML membrane wallplates (not the touch wallplates) must be grounded to prevent damage due to ESD events. The best way to guard against ESD damage in any system is to return the charge to ground by the shortest path possible. A direct connection between the faceplate and conduit ground is the most desirable method. At the same time, the DC ground of the system must be kept isolated from conduit ground, or ground loop noise will result.

The ML membrane wallplates are provided with either a ground wire or a ground jumper to allow for grounding of the metal faceplate. If the electrical mounting boxes are already grounded, the ground wire must be insulated or the jumper disconnected to prevent a ground loop. If the electrical box is not grounded, connect the ground wire to the SHIELD terminal of wallplates so equipped. On wallplates that have a ground jumper, ensure that the jumper is installed. In systems that do not have grounded electrical boxes, the ESD ground path is through the shield conductor of the recommended cable, through the ML-800's connectors, and to the chassis of ML-800 rack unit.

The touch wallplate has a plastic enclosure and mounts in **non-grounded** back boxes so the ESD ground path is through the shield conductor of the recommended cable, through the ML-800's connectors, and to the chassis of ML-800 rack unit.

## CHAPTER TWO

*What you will find in this chapter...*

- *System Configuraton*
- *System Block Diagram*
- *System Components*

## **ML-800 SYSTEM CONFIGURATION**

The ML-800 system allows the user greater flexibility than any other room combining system made today! No other system allows the user the choice of 4 music input selections, or provides the local mixer enable that greatly reduces distortion when combining rooms.

The basic system configuration consists of the ML-800 RACK which contains the Map / Monitor Panel, Wallplates, either membrane or touch, and an optional Facility Manager's Panel. Each unit of the ML-800 has its own unique responsibility and processing is distributed throughout the entire system. The responsibilities of each unit is described below:

### **ML-800 RACK**

The ML-800RACK is the main controller of the system. It contains the CPU module, local audio, power supply regulation, a MP (music page input) module.

The internal CPU module is responsible for controlling the other modules and receives data on what to do from the Wallplates, Monitor / Map Panel and/or FM (Facility Manager) Panel. It uses dip switches (discussed in the Dip switch/Jumper section) to determine settings and operating modes.

### **WALLPLATES**

The wallplates are microprocessor controlled modules that are used for room audio control. They are responsible for setting Local Input on/off, Music on/off, Music Selection, Local Input Volume, Music Volume, and Local Mixer Enable on/off. The Section on Dip Switches describes the settings used on the wallplates and those on the CPU module that set modes on the wallplates.

### **MAP / MONITOR PANEL & REMOTE MAP PANEL**

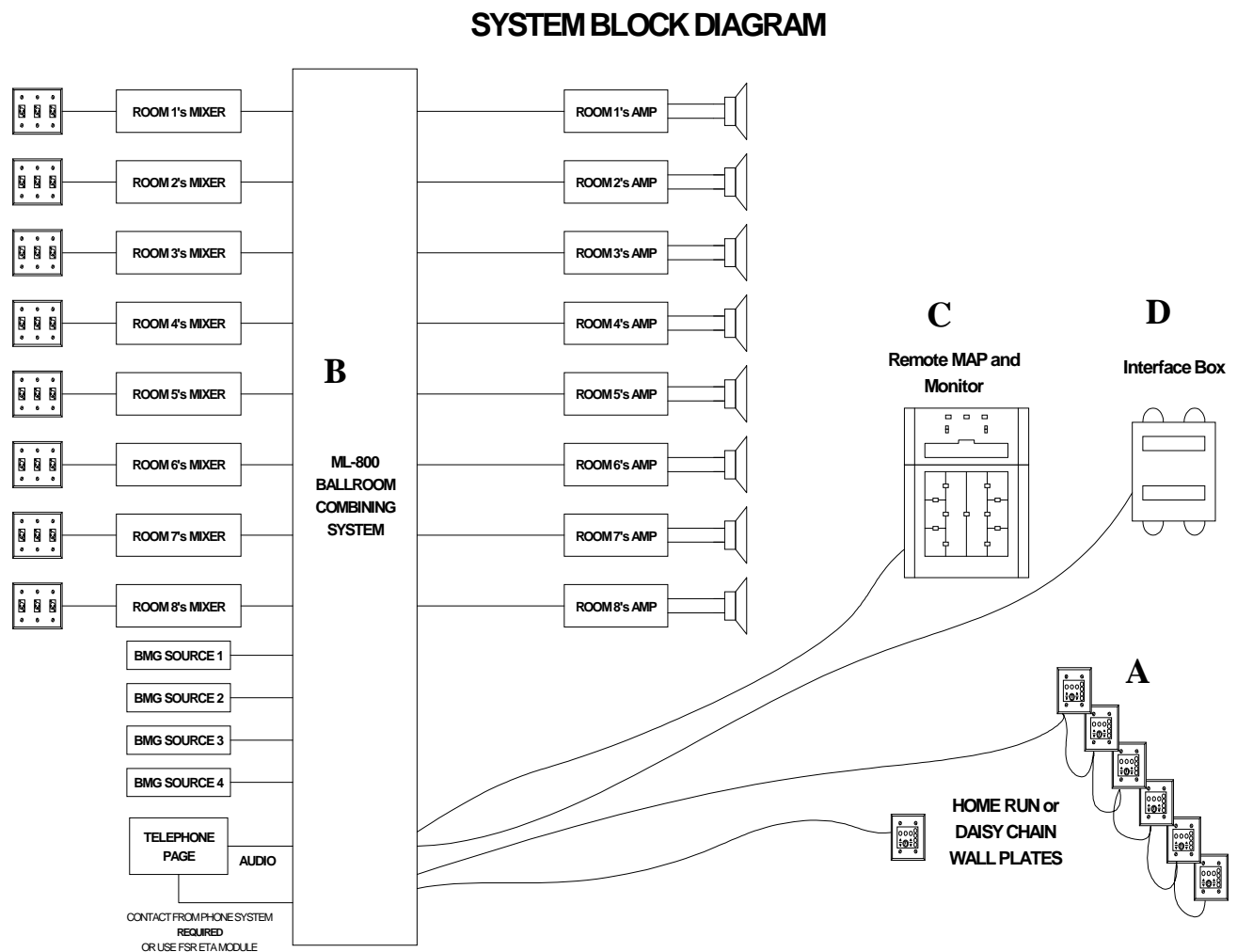
The Map Panel is responsible for controlling the system setup by mixing rooms together. It is microcontroller based and communicates to the CPU module in the ML-800RACK.

The monitor section, is also microprocessor controlled which allows the user to 'monitor' the settings in a room. The user can adjust those settings by using the Map panel's built in 'wallplate'.

### **FACILITY MANAGER'S SOFTWARE PANEL, including the FM-INT Unit**

This is a software program that runs on a PC and controls the system by replicating ML-800RACK functions and status indicators and has the ability to combine rooms without mix switches. It is customized and is not configurable. It communicates over two twisted pairs to the ACU using a multidrop proprietary protocol. The FM-INT Unit interfaces this line to the computer. An enclosed audio speaker would also be used if the audio feed option was implemented.

# ML - 800 SYSTEM BLOCK DIAGRAM



**A.....**There will be two types of wallplates available for use in the ML-800 system; membrane and LCD. Both control all wallplate functions. These functions include Music Selection, Room Mixer Enable, Music Enable and Volume, and Local Input On/Off and Volume. Each room in the system can have two wallplates if desired.

**B.....**The ML-800RACK (audio control unit) is the main unit of the system. It routes the selected music, adjusts levels, combines rooms, handles communications (between wallplates, touch map/ monitor panel), and can talk to other ML's. It also permits the operation of any wallplate function from this same panel as well as controlling the paging function.

The Monitor function (located in the ML-800RACK) permits an operator to monitor the audio from any selected room.

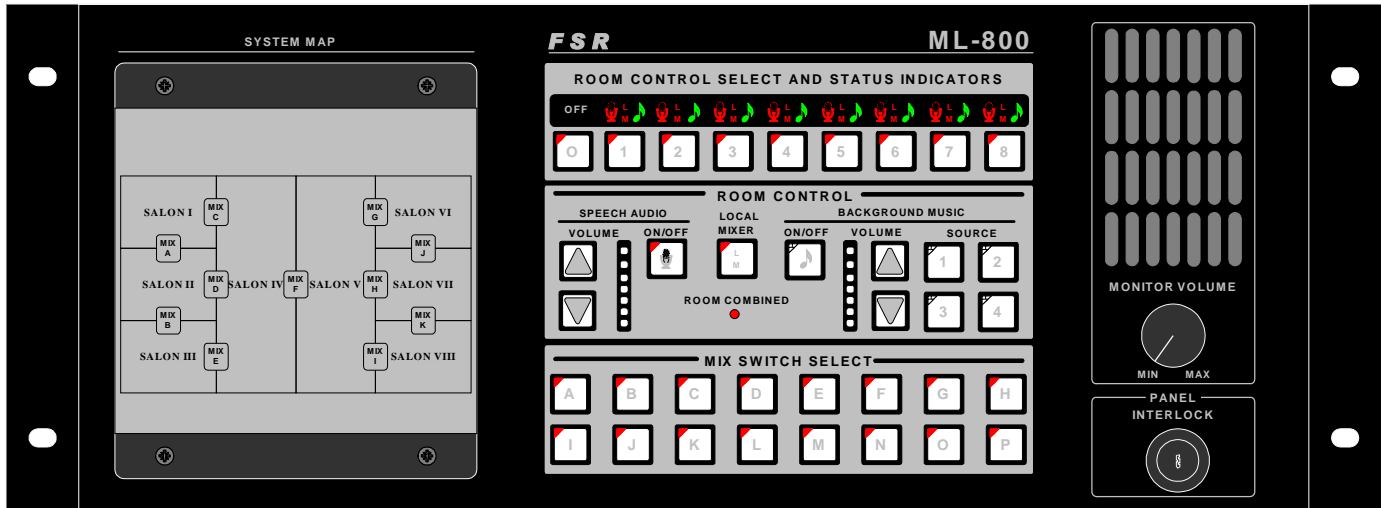
*These two remaining items are described and shown further on in this document.*

**C.....** This is the R-MAP and R-MONITOR unit that repeats the data on the rack map panel

**D.....** This is the ML-116-INT unit to handle the lighting interface

# OVERALL VIEW OF SYSTEM COMPONENTS

## MAP/MONITOR PANEL



### MAP/Monitor Panel Operation

The MAP/Monitor Panel acts as a master control point. It will display the Facility layout map graphic user interface and provide full room control and adjustment. It will also display room status and audio levels by emulating individual wallplate functions and status indicators.

#### To combine (mix) rooms:

Touch each MIX SWITCH SELECT to configure the grouping you wish to combine. That switch will illuminate to indicate those two rooms are combined. For example by operating switch A, Salons one and two will be combined.

#### To break up a combined group:

Touch the switch corresponding to that mix. The Led will extinguish

#### To call up a wallplate for control or status:

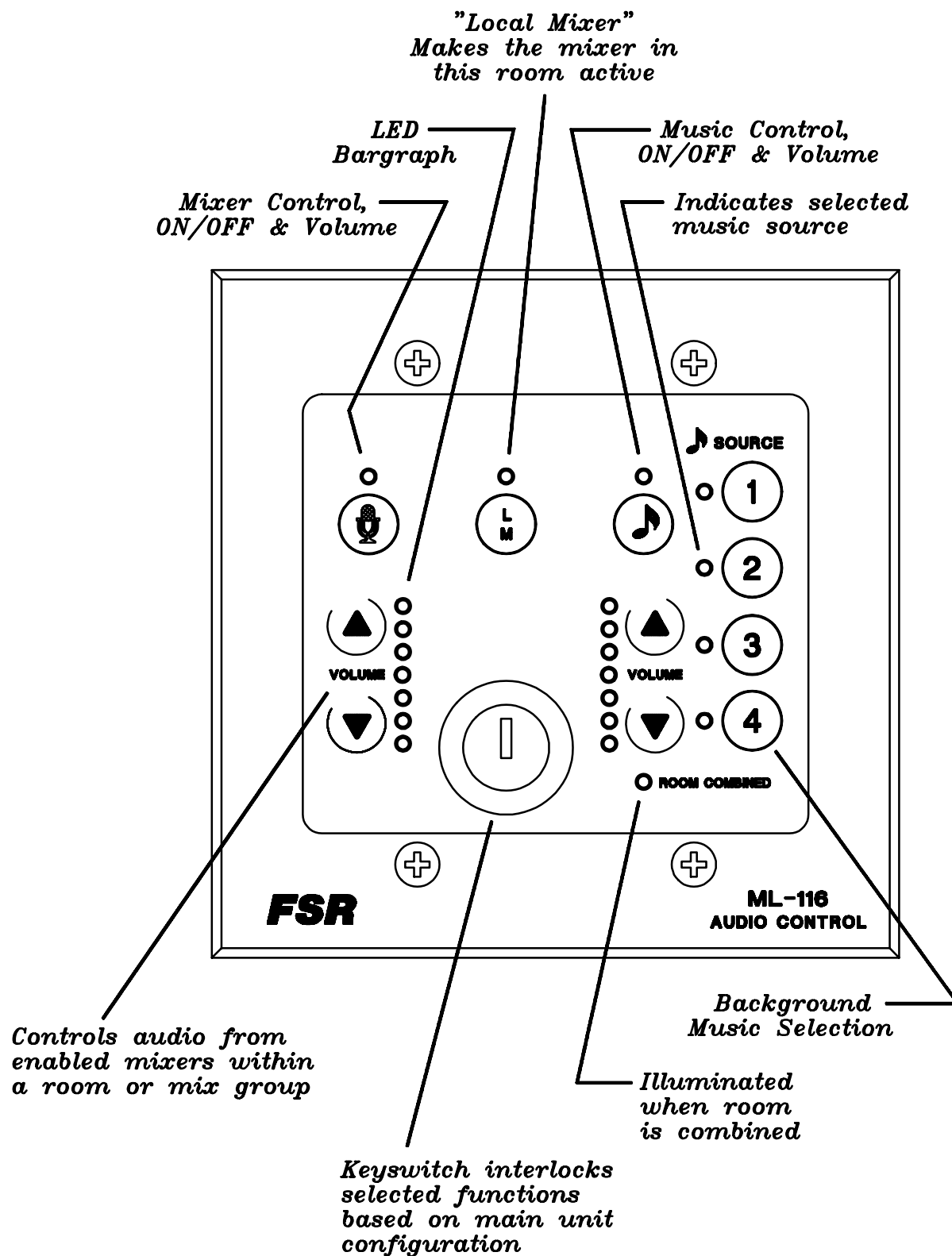
Operate the desired switch in the ROOM CONTROL SELECT AND STATUS INDICATORS area and then the ROOM CONTROL section of the panel will control that room. It will be as if you were standing at the actual wallplate. Audio will be active at the local speaker at this time and the 'listen in' feature is enabled. Simply make the desired adjustments via touch



**ML - 800 TOUCH WALLPLATE (optional)**

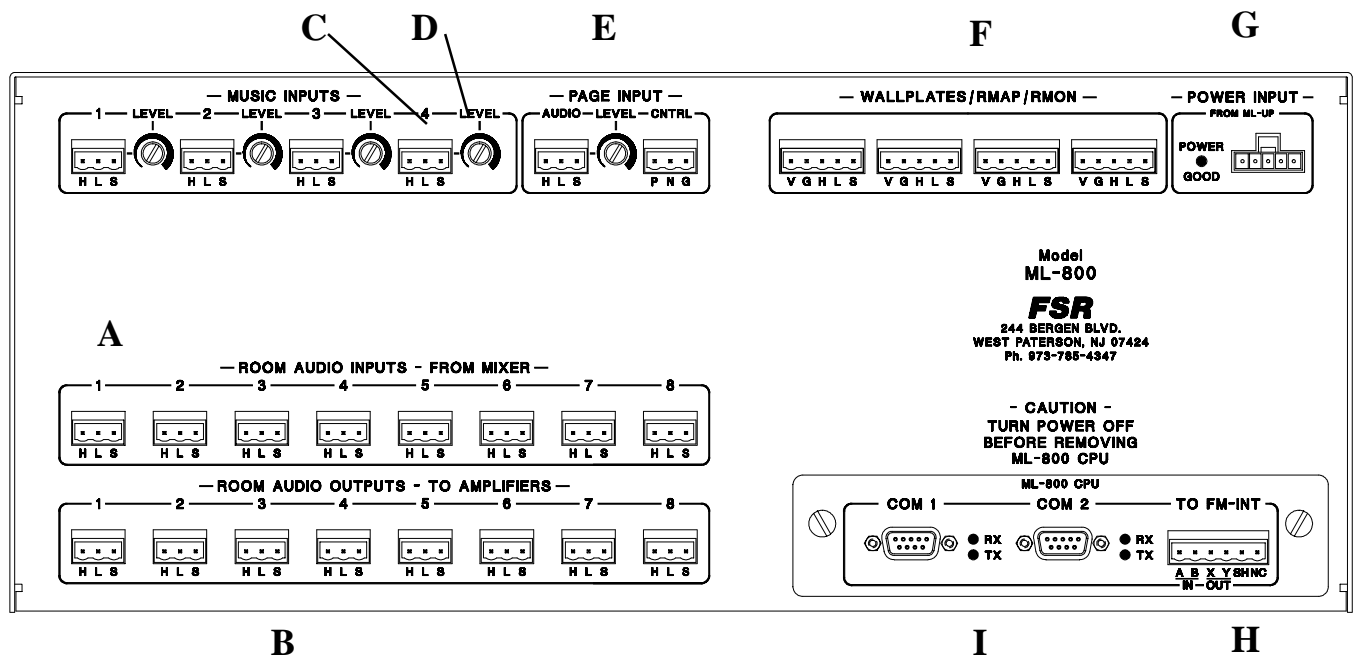


**ML-800 WALLPLATE (optional) 2 Gang (also available in 3 gang)**



**MEMBRANE TYPE**

## REAR OF ML-800RACK UNIT



This is the main unit of the system. It routes the selected music, adjusts levels, combines rooms, handles communication (between wallplates, map, and monitor panels), and can route audio to other ML-800s. It also controls the paging function.

Refer to above Figure for the following discussion.

**A...**These 3 pin connectors receives the audio signal from the room's mixer.

**B...**These 3 pin connectors provides the audio output to the room's amplifier or EQ.

**C...**These four 3 pin connectors receive the background music signals from the facility supplied sources. The source number over each connector corresponds to the identification called out on the MAP panel as well as the room wallplates.

**D...**This trim control provides limited volume adjustment for each background music source.

**E...**This 3 pin connector accepts the page audio signal from the facilities page audio feed. A level adjust is provided for this input. The three pin connector to the right of the level adjust is the control input for paging. The choices are Normal or Priority, determined by an external switch.

**F...**Wallplate/monitor interface connectors. These four points are where all room wallplates are connected. The remote map/monitor and the ML-116-INT interface unit are connected to one of these points. Four points are provided to ease system installation.

**G...**The ML-800 regulator module accepts unregulated DC voltages from the ML-800 PSA, power supply. A pluggable connection is provided to connect to the power supply. A LED indicator is provided to monitor the power within the unit.

**H...**Facility managers panel interface connector. Refer to section on this topic for additional details.

**I...**These two COM ports are for future use.

## ***CHAPTER THREE***

*What you will find in this chapter...*

- *System Specifications*
- *Audio Connector Wiring*
- *Cabling*
- *Dip Switch / Jumper Settings*
- *Adjustments*

## SYSTEM SPECIFICATIONS

### Audio

Frequency Response: 20 Hz – 20 kHz +/- .5 dB  
THD: .03% @ 1kHz with MAX Rated Input Level  
MAX Input level: +18 dBm  
Noise Floor: -90 dBm  
Conditions: Mixer Enables ON, Local Inputs ON, Nothing mixed, Inputs Open, Outputs 600 ohm terminated, Volume set to 0 dB  
Volume preset: -6 dB  
Crosstalk: -95 dB @ 1kHz, -78 dB @10 kHz Any Input to Any Output  
Mic + Music Volume  
Control Range: +10 dB to – 11 dB (Volume range adjustable from In-room controls)

### Room Audio Inputs

Number and Type: 8 mono balanced  
Connector used: 3 pin Phoenix  
Impedance: 20k ohm  
MAX Input Level: +18 dBm  
Input Gain: 0 dB and +10 dB gain, dip switch selectable (SW 16 on CPU card)

### Background Music Inputs

Number and Type: 4 mono balanced  
Connector used: 3 pin Phoenix  
Impedance: 20k ohm  
MAX Input Level: +18 dBm  
Trim level Adjust Range: -6 dB to +20dB

### Paging Input

Number: 1 mono balanced  
Connector used: 3 pin Phoenix  
Impedance: 20k ohm  
MAX Input Level: +18 dBm  
Trim level Adjust Range: -6 dB to +20dB  
Type: All Page with two priority levels; normal (n) and priority (p)

### Output

Number and Type: 8 mono balanced  
Connector: 3 pin Phoenix  
Impedance: 50 ohms  
MAX Level: +22 dBm into 600 ohms load

### Power Input Ratings

100 /120 / 220 /240 VAC 50 /60 Hz Max 2A.

### Expansion Ports

2 nine pin sub-D com ports for future use

### Size

4 RU 19L x 7H x 11.5D inches Standard rack mounting with supplied rack ears.

### Available Accessories

Membrane Wall Plate  
Color Touch Wall Plate  
AMX / Crestron Interface  
Facility Manager Package

## **Wall Plates**

### *Membrane*

Size: 6 1/4 inches wide by 4 1/2 inches high, approximately 2.5 inches deep  
Mounting: fits standard 2 or 3 gang electrical wall box with four or 6 screws  
Switches: membrane  
Connector: 5 pin connector  
Cable: West Penn #3651 or 3751 (see page 27 for details)

### *Touch*

Size: 6 1/4 inches wide by 4 1/2 inches high, approximately 2.5 inches deep  
Mounting: back box supplied  
Switches: touch panel  
Connector: 5 pin connector  
Cable: West Penn #3651 or 3751 (see page 27 for details)

## **Power Supply (PSA)**

Size: 3 1/2 inch high, 6 inches deep, 10 inches long (approximately)  
Mounting: rear rack rail  
Input power: 105 to 132 VAC, 50/60 Hz, 100 watts  
Output: +15 volts, +25 volts, -25 volts nominal  
Fuse: 2 amp  
Switch: power on/off (lighted rocker switch)  
Interconnect: 8 foot cable supplied, 5 conductor stranded  
Indicators: three LED indicators, one for each of the unregulated voltages

## **FM Facility Manager Control (optional)**

### **Facility Managers Panel (FM-INT)**

Size: an enclosed box 3 1/2 inches wide, 5 inches long, 1 1/2 inches high  
Mounting: sits on the managers desk  
Power: a wall mounted power supply

## **AUD Audio Monitor Add-on (optional)**

Size: processor card(MNP); 3 1/4 inches wide, 7 inches long, 1 1/2 inches high  
speaker switching card (MNRL); 3 1/4 inches wide, 9 1/2 inches long, 1 1/2 inches high  
Mounting: both the MNP and the MNRL cards come already mounted in a 19 inch FSR TRAC-BRAC  
Speaker: enclosed in an attractive baffle 7 inches high, 6 1/2 inches wide, 5 inches deep

## **R-MAP Remote Map Panel (optional)**

Size: 20" wide, 14" high, 2 1/8" deep  
Mounting: standard rack rails  
Power: 120 VAC, via knockouts in case

**R-MON Remote Monitor Panel (optional)**

Size: 20" wide, 5 1/4" high, 2 1/8" deep  
Mounting: standard rack rails  
Power: 120 VAC, via knockouts in case

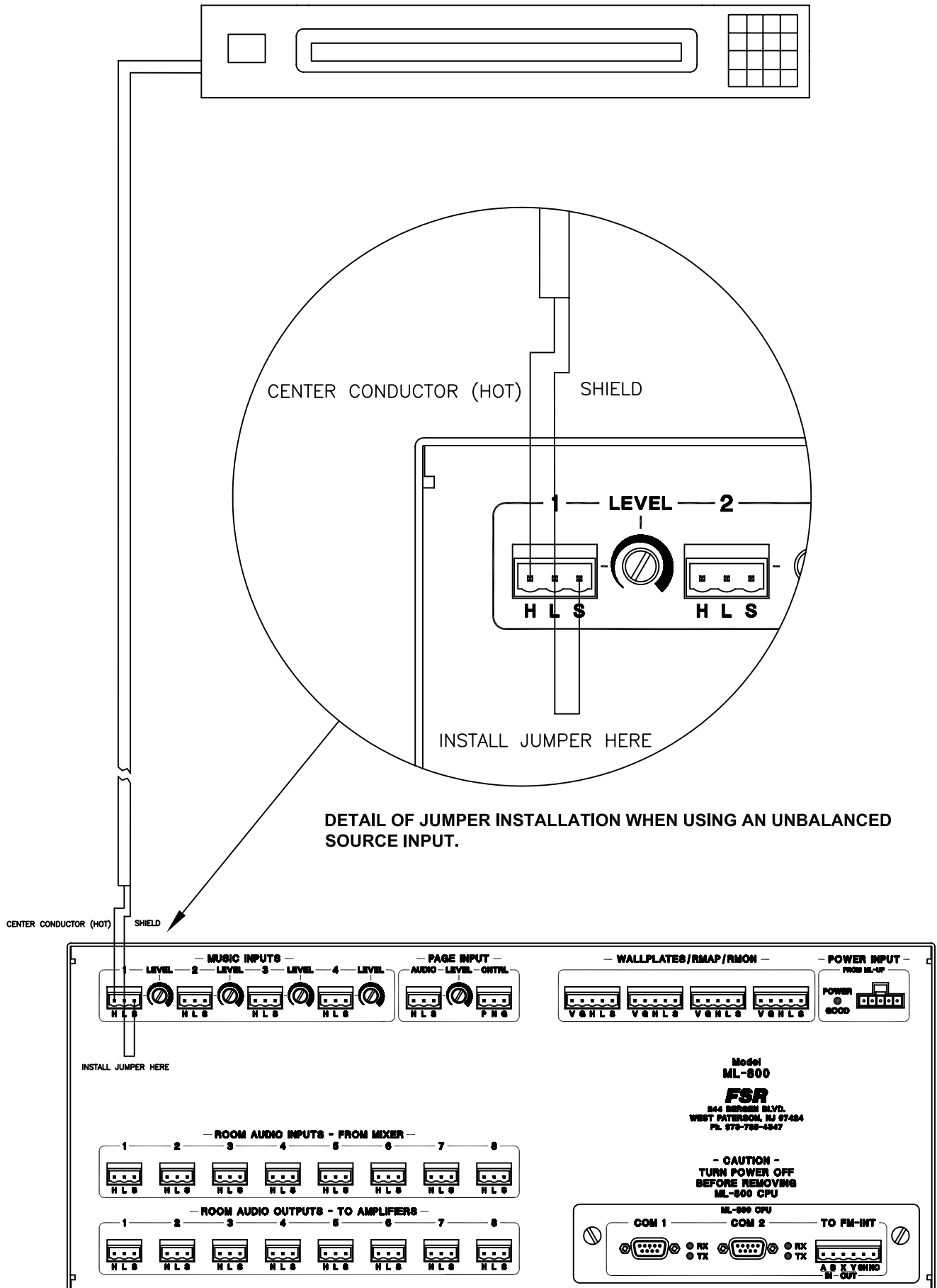
**CTRL Control System Interface (optional)**

Size: 8 1/2", 1 1/2" high, 4 3/4" deep  
Mounting: use supplied rack mounting bracket  
Power: wall wart 9 VAC

**INT Map Panel Status Interface (optional) & LU Lighting Interface (optional)**

Size: 7 1/2" wide, 7 1/2" high, 2 1/2" deep  
Mounting: panel mount  
Power: wall wart 9 VAC

# UNBALANCED SOURCE

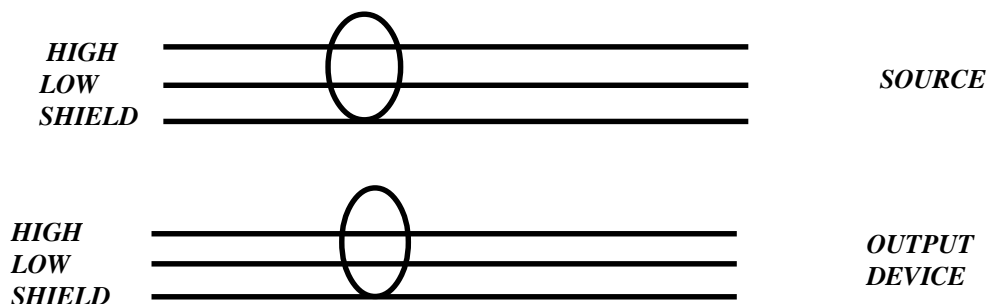




## AUDIO CONNECTOR WIRING

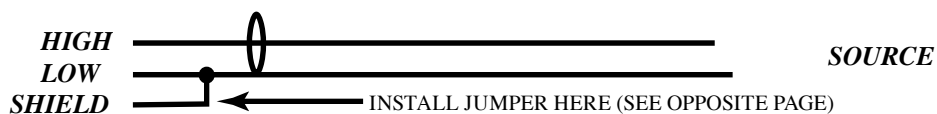
In any professional sound system with many inputs and outputs it is strongly recommended that all audio wiring be balanced. All the audio inputs and outputs on the ML-800 system are balanced.

In a balanced configuration the connectors are wired as follows:

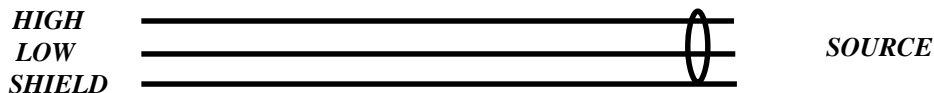


If due to some equipment limitations unbalanced wiring must be used then the proper way to wire the audio connectors follows:

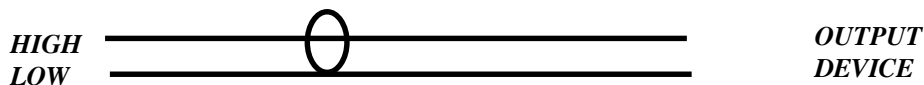
### *Input Wiring (single wire with overal shield)*



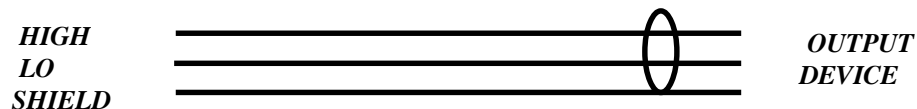
### *Input Wiring (two conductor overal shield)*



### *Output Wiring (single wire with overal shield)*



### *Output Wiring (two conductor with overal shield)*



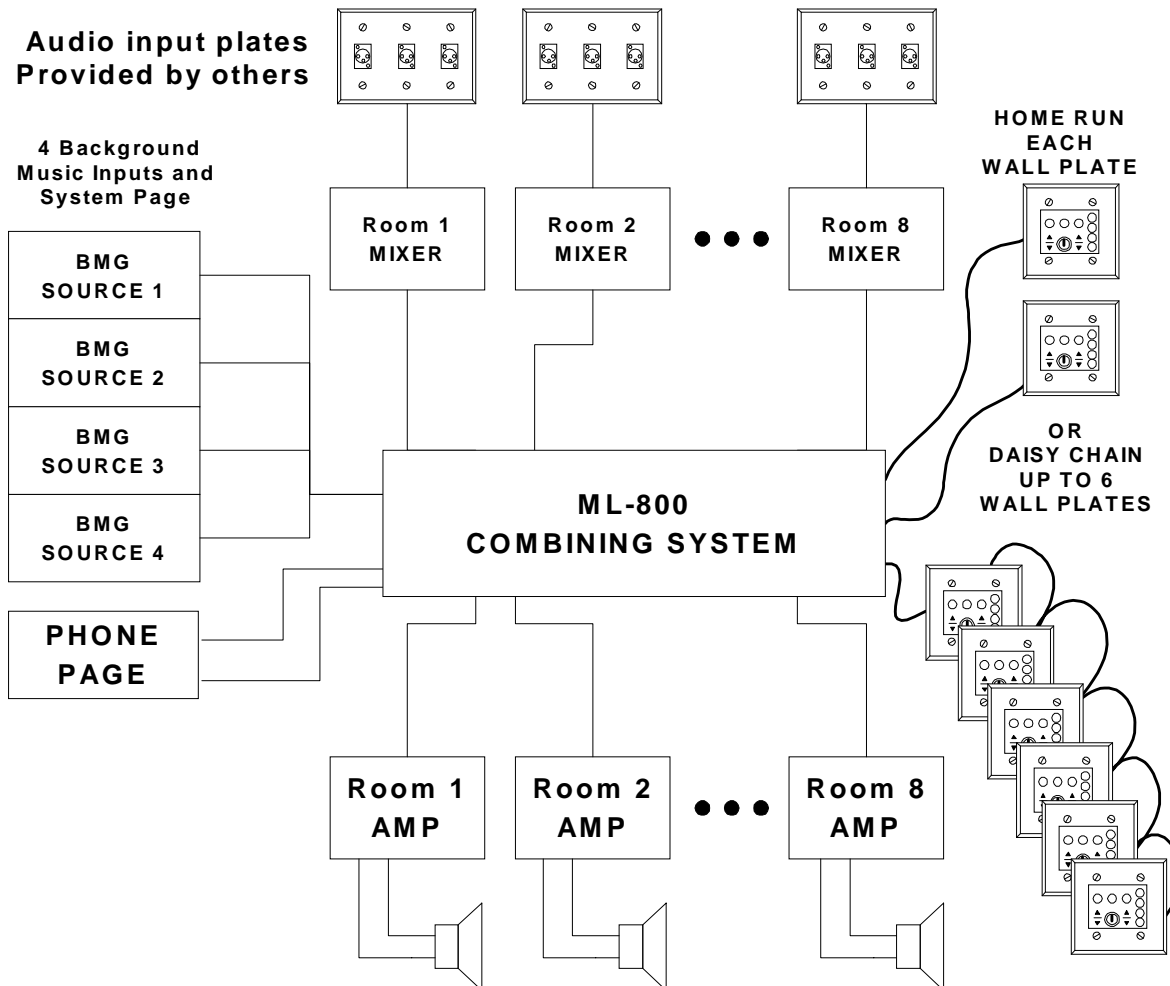
## CABLING

### AUDIO

All audio connections to the ACU are 3 pin connectors with pin 1 shield, pin 2 High, and pin 3 Low.

### CONTROL WIRING

The following diagram illustrates the control wiring for the ML-800 system. Refer to following sections for details on facility manager operational hookup.

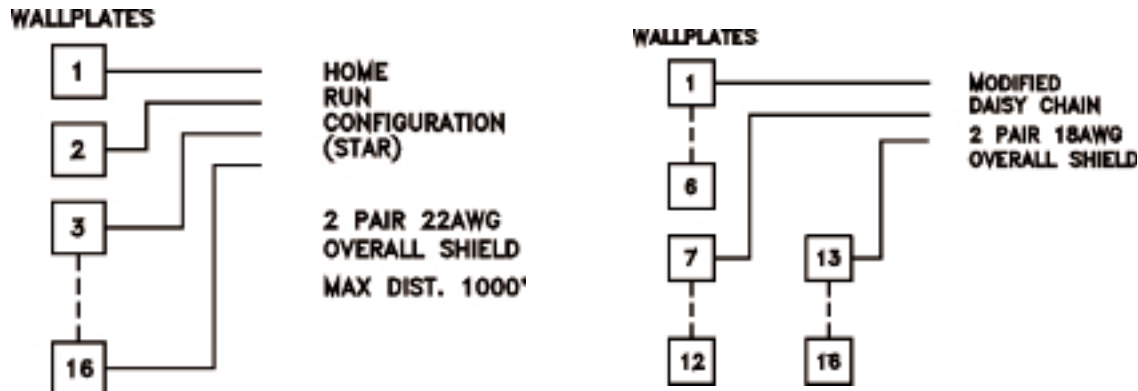


## WALLPLATES

The wallplates can be wired in either a home run (star) or modified daisy chain configuration.

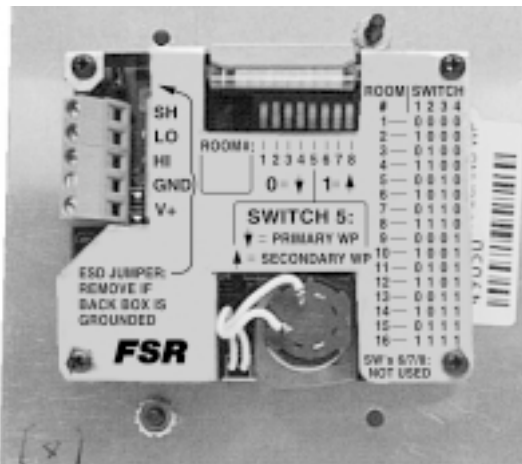
Use two twisted pair 22 AWG stranded, with an overall shield (West Penn # 3651) if the home run configuration is employed for each wallplate and total distance to any wallplate does not exceed 1000 feet.

Use two twisted pair 18 AWG stranded, with an overall shield (West Penn #3751) if the wallplates are daisy chained together (it is recommended to only daisy chain 6 wallplates per home run) with no more than 1000' total wire length.



Refer to the figure for terminal identification. Five screw terminals are provided on the rear of the wallplate for cable hook-up. While the Membrane wallplate is depicted all connections are identical on the Touch wallplate.

### REAR OF WALLPLATE



**Note: it is essential that in any case the voltage on pin 1 on the wallplate connector be in excess of 8 volts DC.**

### TERMINAL POSITION

**1 POWER 8VDC min**

**2 POWER GND**

**(THIS IS ONE PAIR)**

**3 DATA HIGH**

**4 DATA LOW**

**(THIS IS ONE PAIR)**

**5 SHIELD IF USED**

One is installed in each room and is wired to the ML-800RACK. The wallplates mount in a standard 2 or 3 gang electrical box. An eight position dip switch on the rear of the wallplate is used to assign the wallplate's room address. This switch is preset at the factory to the area identified on the back of the wallplate itself, but should be checked prior to installation.

The system is shipped in a default setting for all dip switches which will permit instant operation of the system in its usual configuration. Please refer to the DIP SWITCH section for details on all the dip switch functions.

## DIP SWITCH / JUMPER SETTINGS

### ACU Audio Control Unit, CPU Module

The CPU PC board contains sixteen (16) dip switches which will allow users to customize the system to a large degree. These switches allow the user to select such options as simultaneous microphone and music operation, key switch or touch panel interlock functions, ramp speed, etc. The definition of the switches are as follows:

Dip switch	Factory Setting	Explanation
1	open	Memory Volume
2	open	Preset Volume
3	open	Reserved
4	open	Enable Mode
5	open	[Wall Plate
6	open	Interlock Mode]
7	open	Reserved
8	closed	Cold Start Select
9	open	Select multiple Systems
10	open	Select multiple Systems
11	open	Select multiple Systems
12	open	Select multiple Systems
13	open	Enable/disable security code lockout
14	open	If Monitor Panel Present
15	open	If FMP present
16	open	Room audio input level

**Dip switch 1** - Initial Volume Memory Option - closed the volume is determined by the dipswitch 2 setting, if open the volume is restored to level that was last set.

**Dip switch 2** - Preset Volume - Setting determines the power up default volume level, if closed the volume initializes to -12 db, if open it initializes to 0 db.

**Dip switch 3** - Reserved

**Dip switch 4** - This dip switch allows simultaneous operation of voice and music. If the dip switch is open then the system is in normal mode, the voice and music are exclusive. This is commonly referred to as the pre-enable mode. If the dip switch is closed, both voice and music can be operated at the same time (simultaneous mode). The system is shipped with this dip switch in the open position.

### **Dip switch 5 and 6 - Wallplate Interlock Mode.**

If Switch 5 is closed, the wallplate keyswitch has no effect on the operation of the wallplate. The local input and music sections of the wallplate are always active. In this position Switch 6 is not used.

If Switch 5 is open and Switch 6 is open, the ‘partial interlock’ mode is selected. This is the default mode for the ML-116. In this mode, the keyswitch interlocks only the microphone section of the wallplate.

If Switch 5 is open and Switch 6 is closed, the ‘full interlock’ mode is selected. In this mode, the wallplate cannot be operated without the keyswitch.

### **Dip switch 7 - Reserved**

**Dip switch 8 - System Clear** When system power is removed the ML-800 has the capability to save the state of the system including the combining status of all the rooms and the state of each room’s local input and music selectors and volume. If open, the System saves its states, if closed it initializes to a “clear” state. System is shipped with this switch closed.

**Dip switches 9 to 12** are used to address multiple ML-800’s. The coding is as follows:

<b>12 11 10 9</b>	<b>ML-800</b>	<b>12 11 10 9</b>	<b>ML-800</b>
<b>O O O O</b>	<b>- 1</b>	<b>C O O O</b>	<b>9</b>
<b>O O O C</b>	<b>- 2</b>	<b>C O O C</b>	<b>10</b>
<b>O O C O</b>	<b>- 3</b>	<b>C O C O</b>	<b>11</b>
<b>O O C C</b>	<b>- 4</b>	<b>C O C C</b>	<b>12</b>
<b>O C O O</b>	<b>- 5</b>	<b>C C O O</b>	<b>13</b>
<b>O C O C</b>	<b>- 6</b>	<b>C C O C</b>	<b>14</b>
<b>O C C O</b>	<b>- 7</b>	<b>C C C O</b>	<b>15</b>
<b>O C C C</b>	<b>- 8</b>	<b>C C C C</b>	<b>16</b>

**Note: C=dip switch is closed, O= dip switch is open**

These switches would only be used with a Facility Managers Panel and multiple ML-800 systems.

### **Dip Switch 13 - Reserved**

### **Dip Switch 14 - Reserved**

### **Dip Switch 15 - Reserved**

**Dip Switch 16 - Room audio input level.** Unity gain switch open, +10dB gain switch closed

## **WALLPLATES (optional)**

The wallplates used in the ML-800 system are either membrane or touch. They control all wallplate functions. These functions include Music Selection, Local Mixer, Music Enable and Volume, and Microphone Enable and Volume.

When the wallplates sense a key press or touch, it waits for a poll from the ML-800 RACK then it sends a message to the ACU which will return an update message. The wallplates will then check for another touch or keypress and repeat. Internal flags will prevent the wallplates from acting on the same keypress or touch until the update message is returned. This whole process occurs within a fraction of a second.

The wallplates communicate with the ML-800RACK over a RS-422 line and are addressable. This address is a 5 bit address (0-31) allowing the use of up to two (2) wallplates per room.

## Membrane Wallplate Dip Switch Settings

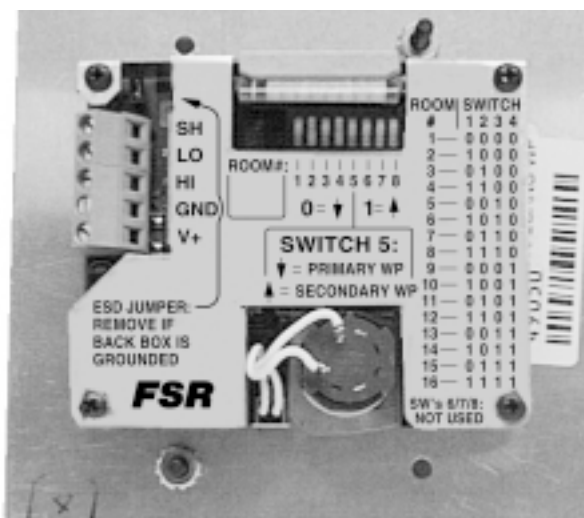
The ML-800 allows for up to 16 wallplates: 2 per room up to 8 rooms. The wallplates must be individually addressed. The addresses are set by setting the dip switches on the back of the wallplate. The address is a binary code representing the room number minus one, given on switches 1 through 4 with a closure representing a 1.

SWITCH	1	2	3	4
ROOM 1	0	0	0	0
ROOM 2	1	0	0	0
ROOM 3	0	1	0	0
ROOM 4	1	1	0	0
ROOM 5	0	0	1	0
ROOM 6	1	0	1	0
ROOM 7	0	1	1	0
ROOM 8	1	1	1	0

*Note: 0= switch open  
1= switch closed*

Switch 5 is used for rooms with two wallplates. In a two wallplate room, one and only one of the wallplates (it does not matter which one) should have switch five closed.

Switches 6 through 8 are used for factory self tests and should be open for normal use.



### SWITCH POSITIONS

*1-5 ADDRESS*

*6-8 FACTORY USE ONLY*

**Picture of rear of wallplate**

## Wall Plate Functions

All wallplates will handle these functions in the same way.

### Speech/Audio

Alternating action switch that enables/disables audio from any selected mixers within a mixed group. “Pre-selects” audio from any selected mixers in a mixed group when music is playing.

### Local Mixer

Alternating action switch that enables/disables audio from the mixer associated with a given area to be heard in the entire mixed group. The switch remains independent of the corresponding switch on other panels within a mixed group. This switch tracks with local input in a single room and will automatically turn on in the first room in a mixed group to enable local input.

### Music

Alternating action switch that activates selected music source within each room or a mixed group of rooms.

### Music Select 1-4

Selects the music source within each room or a mixed group of rooms.

### Up/Down Volume (Speech)

Ramps volume up/down within each room or a mixed group of rooms. Associated bar graph indicates level and **is active only when local input is audible**. All bar graphs within a mixed group will track together.

### Up/Down Volume (Music)

Ramps volume up/down within each room or a mixed group of rooms. Associated bar graph indicates level and is active only when Music is enabled. All bar graphs within a mixed group track together.

### Keyswitch

Interlocks (disables) certain groups of switches on the wall plate as determined by the selected option jumpers.



## ADJUSTMENTS

As with any high performance audio system, proper adjustment is key to achieving optimum S/N (signal to noise) ratio and performance characteristics.

Once the system is fully assembled including the mixers, amplifiers and other audio processing equipment, you may begin.

In order to properly calibrate the system, you will need a signal source capable of providing a mic and line level signal. You will also need a VTVM or other instrument that can measure voltages, preferably with a dBm scale.

Begin by injecting a 1 Khz. typical mic level signal into a mic input of the Room One mixer. Monitor the output of the mixer using the VTVM while adjusting the mixer channel and main out controls to achieve a 0 dBm level. The mixer controls should not be set to their extreme settings for best performance. Mark the settings so that users may re-establish them after changes are made. Continue by moving the input signal to each of the mixers mic input channels, and calibrating them in turn.

**CAUTION: At no time in the following procedure should you change levels by adjusting the volume up down switches at the Wallplates or ML-800 Monitor Panel. Doing so will invalidate your calibrations resulting in a lot of wasted time.**

**If you should accidentally alter the volume settings, reset the system to a known state by turning the power off and on, and reselecting the desired settings.**

Next , using the ML-800RACK or Room Control Panel, set Room One to Local Mixer on, Mics On. The Mic volume bar graph should illuminate the third led from the top. If not, consult the dip switch setting section of this manual to reset the factory settings. Check the output level of Room One to confirm unity gain through the ML-800 system. Proceed to the output of each successive audio component in Room One's audio chain, adjusting as necessary to achieve 0 dBm. Stop at the power amplifier input.

Move the signal source to the first mic input of the next mixer, and repeat the procedure for Room Two. Continue in this manner until all rooms are complete.

## BACKGROUND MUSIC SET-UP

Continue by setting Room One's wallplate to Music On, Mic and Local Mixer Off. Select music source one. The Music volume bar graph should illuminate the third led from the top. Inject the anticipated nominal music level into Music Input Source 1. Adjust the associated gain trim pot ( just below the input connector) to yield 0 dBm at the ML-800 audio output connector. Select the next music source and repeat this procedure until all four outputs are calibrated.

If the paging feature of the system is to be used, inject the anticipated level page signal into the page input connector. Connect the P (priority page) terminal to ground on the page control terminal block. Adjust the page gain trim pot to obtain 0 dBm at the output of the ML-800 audio card.

At this point, the entire system is calibrated, with the exception of the power amplifier gain setting. To set the power amplifier gain, you will require some equipment to measure SPL in the room area. Begin by mixing all room areas together, and opening all divisible meeting areas. If your system consists of several nonmixable subsections, mix all rooms that are possible.

Set all area wallplates to Music On, Mic Off. Inject the anticipated level signal into the Music Source One input bus. Using the SPL measuring instrument, monitor each room and adjust each power amplifier as necessary to achieve a uniform level throughout all areas.

Keep in mind that the ML-800 system will allow volume adjustment of +10dB to -11dB with respect to unity, so you will want to adjust the amps close to the maximum desired level during this procedure.

The adjustment procedure is now complete.

## CHAPTER FOUR

*What you will find in this chapter...*

- *Paging Operation*
- *Facility Manager Operation*

## PAGING SYSTEM OPERATION

The Room Combining System supports the integration of a new or existing paging system. A Page Audio input, and Normal/Priority mode page selects are provided for interface to the system.

The actual paging operation of a particular system will depend upon how paging was implemented by the audio system design engineer/installing contractor.

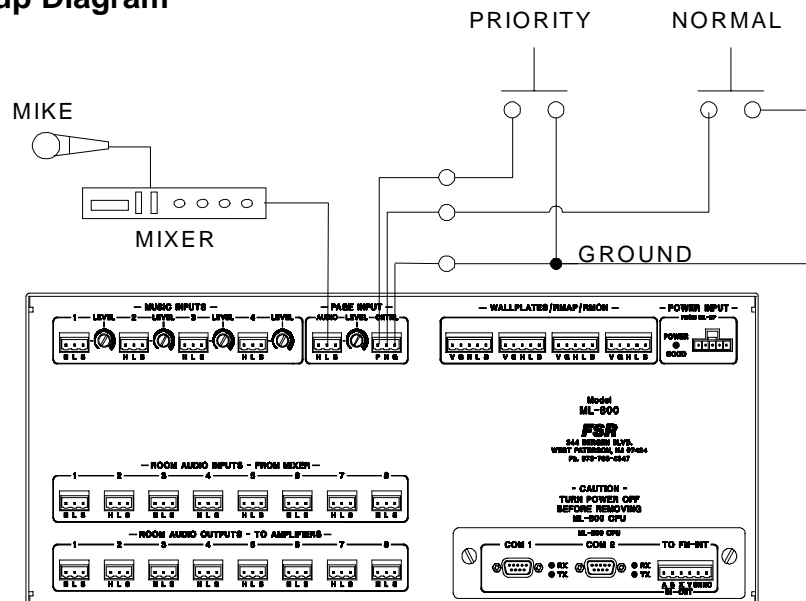
The system supports two primary paging modes; Normal Paging and Priority Paging. During a **Priority mode page**, the room audio will be muted and the page audio will be unconditionally switched into the rooms, regardless of room wallplate settings. The page audio level is controlled only by the pre-configured amplifier gain settings, and page input level adjust control on the ML-800RACK. Any selected audio ( Mics and/or Music playing in the selected rooms) will be disabled for the duration of the page. **Caution should be used when selecting Priority mode paging to guard against interrupting any meetings in progress.**

**Normal mode page**, Normal paging will occur during music operation, but will be automatically disabled if Mic audio is enabled in the selected room. During a Normal page, page audio will be mixed with any selected audio in the room ( Music only, based on factory settings). The page audio level is controlled only by the pre-configured amplifier gain settings, and page input level adjust control on the ML-800RACK. As with the Priority mode paging, page volume level does not depend upon wallplate volume settings.

**Users are encouraged to consult with their installing contractor to configure the Room Combining System paging options so as to optimize the operation of a particular installation.**

To initiate paging, select the desired paging mode (priority or normal) and speak into the microphone. To end paging, release the page mode push button.

### Typical Hookup Diagram



## FACILITY MANAGERS PANEL

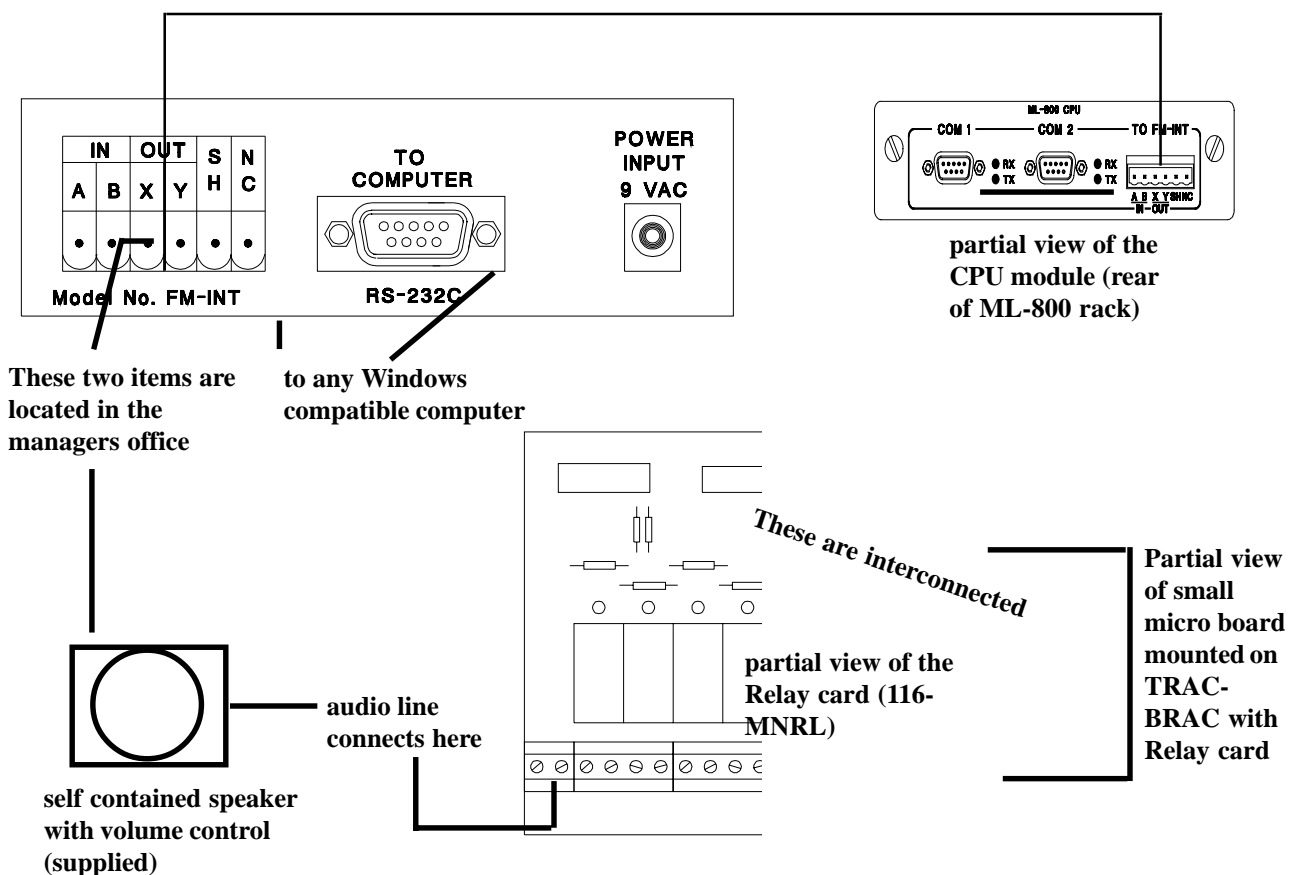
The Facility Managers Panel (FMP) is a Windows based program that performs all the same functions as the Map Panel and adds additional capability. **The most important of which is the ability to mix nonadjacent rooms.** The display of the FMP is a bit mapped image of what the Map Panel looks (or would look) like. It can take the place of the Map Panel and can perform the functions of the wallplates.

When the FMP starts it requests status from the ACU. The ACU responds with group information if any. The ACU will update the group information if a Map Panel is present and has defined a group. The FMP uses the group information to update the Windows display to reflect those rooms that have been selected into groups.

### FMP Installation

To install the FMP a cable is run from the Room Combining System ACU to the manager's office. This cable is two twisted pairs with an overall shield and they connect to the CPU module at the ACU. In the managers office the cable terminates in the FM-INT unit which in turn plugs into com port 1 or 2. If the audio option was ordered then another cable, specifically a standard audio line (one twisted pair with an overall shield) would also be run. It connects from the left-most terminals on the Monitor Relay Card and terminates in the speaker enclosure mounted in the manager's office.

### Hookup Diagram Overview (refer next page for detailed hookup)



## Group Functions

The FMP group functions include defining groups, adding rooms to groups, and removing groups. These functions are similar to the Map Panel except that instead of using the Interlock switch and push button the user uses a mouse.

Groups are defined as rooms that are combined to become a larger room. The rooms in the group share the same levels, music selection, and other settings. A significant advantage when using the FMP is the ability to combine nonadjacent rooms.

### Rules applicable to the combining of rooms

The default wallplate settings for all the rooms in a group follow four levels of precedence:

1. If a microphone is active (local input on) that has highest priority.
2. If a microphone is selected but not yet active (local input selected) that is the next priority.
3. If music is active that is the next lower priority.
4. If nothing is selected that is the lowest priority.

Combining rooms rely on a set of possibilities and priorities. The possible combinations are combining a single room to a single room, adding a single room to a group, and combining two groups. The priorities in descending order are **Local Input On, Pre-enable On, Music On, and Nothing On**. When combining two single rooms the settings in each room is checked against the priorities and the room with a lower priority setting takes on the settings of the other room. When combining two groups the group with the lower priority takes on the settings of the group with the higher priority. When combining rooms or groups of equal priority, the room volume is reset to the default level as determined by dipswitch 2.

### Some other rules applicable to the grouping of rooms are:

- Any group that cannot be directly represented on the Map panel cannot be affected (mixed or un-mixed) by the Map panel.
- Wallplate volume level changes affect only the rooms in the group on that ACU.
- All Local Mixers switched on the non-originator units will be locked off.

### Wallplate Status

The user has the ability to review the settings of a wallplate in any room. The user will double click on the room which causes the FMP to request the data from the ACU. The user will then be able to view and hear (if remote audio monitor was ordered) the selections on the wallplate.

## CHAPTER FIVE

*What you will find in this chapter...*

- *Multiple ACU's*
- *Remote Map and Monitor Panels*
- *Audio / Lighting Systems Intergration*
- *Map Panel Status Interface*

## **MULTIPLE ACUs**

In order to control more than 16 rooms the Room Combining System has the ability to create groups that overlap ACUs. The ACU has a TieLine Bus which will, depending on switch settings, allow the unit to send to, or receive output from a room not present on that unit. This feature is an option and available only on systems with a FMP (Facility Managers Panel).

The user who wishes to combine multiple Room Combining Systems would have to assign the groups on each ACU (Audio Control Unit). The user selects the room to be used as the source, then the room on the other unit to be considered the destination. The output from the source will be sent via the TieLine to the destination room. The FMP will send update messages to both ACUs and will automatically configure the wallplates effected by the TieLine. Wallplates on the destination room will be set to mics on, music off to enable the use of the TieLine.

The example illustrated on the next page shows the FMP connected to 2 ACUs. The object is to define a group containing ACU#1 Rooms 1 and 2 plus ACU#2 Rooms 1 and 2. The FMP would send a Group message to both ACUs listing ACU#1 Room 1 first making it the source room, then ACU#1 Room 2, then ACU#2 Room 1 making it the destination room, and finally ACU#2 Room 2.

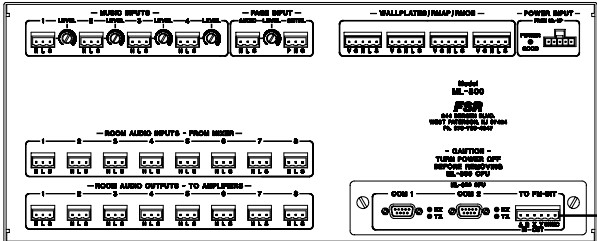
The source room is the room that feeds the TieLine. The destination room uses the TieLine for input. There can be only one source which means that if there was an ACU#3 added to this group ACU#2 would use Room 1 as the source for ACU#3 and so on. The first Room listed on ACU#3 would become the destination as well as the source if an ACU#4 were added.

Jumpers on the ML-800 CPU are set for multiple units. For more information please consult the factory.

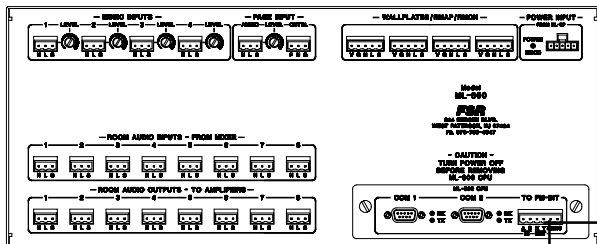


Diagram illustrating multiple ACUs

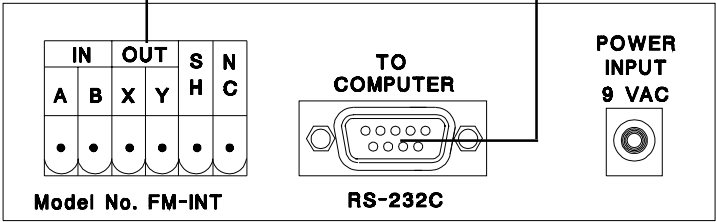
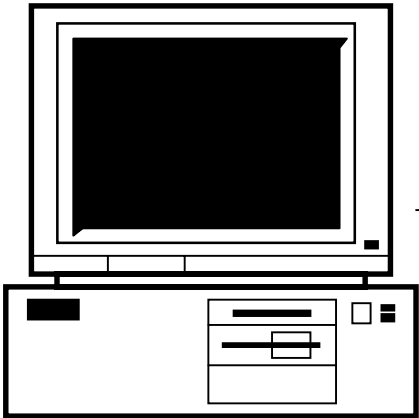
ML-800 RACK #1



ML-800 RACK #2



HOST COMPUTER



To wallmount transformer (supplied)

## **REMOTE MAP AND MONITOR PANELS**

### **R-MAP and R-MONITOR**

This accessory permits full operation of the Room Combining System from a location other than the rack area. Typically it would be mounted in a service corridor near the rooms of interest. Usually both the map and monitor panel are used however the unit will operate without the monitor panel if cost is a major consideration.

## **SOUND SYSTEM/LIGHTING CONTROL SYSTEM INTEGRATION**

Now it is possible to have the lighting follow the audio output Mix Lamp Status from the ML-800 room combining system. The addition of the ML-116-LU option interfaces LUTRON® lighting to the ML-800 room combining system permitting lighting to follow audio using one integrated wallplate.

The ML-116-LU option for the ML-800 system consists of a ML-116-INT unit and a special wallplate designed to fit in a four gang plastic trim kit provided by LUTRON®. This four gang kit mounts 1 LUTRON® controller and 1 FSR wallplate. The ML-116-INT unit receives RS-485 serial data from the ML-116 system,

processes it and opto-couples electronic closures to properly operate the LUTRON® lighting system. The data transmitted consists of mix switch status and head table status.

### **INSTALLATION**

#### **Equipment Areas**

The sound system and lighting control system for the meeting rooms/ballroom shall be coordinated at the wallstation and via the sound system's room combining control.

The integration of the lighting control system to the sound system combining panel, FSR model number 'ACU', shall be via contact closures. The integration shall allow the lighting controls to be combined/separated based on the status of the partitions on the ML-800RACK panel, which is providing the same function for the audio controls.

The electrical contractor shall be responsible for the mounting of the ML-116-INT interface unit and wiring to the lighting control system. The sound contractor shall be responsible for the wiring between the ML-116-INT, and the ML-800RACK panel as well as the system setup to ensure proper operation. Usually there will be a LUTRON® representative present to review the entire lighting system and will also check on this phase of the installation.

#### **Room Wallplates**

Each room in the ballroom area has a control panel that fits in a standard 4 gang electrical box. The wallstation model number shall be ML-116/LU4S. The control is comprised of three components:

1. The 'ML-116-LUWP' control plate provided by FSR.
2. The '-4S' lighting control provided by Lutron.
3. The 'ML116/4S-FP' screwless faceplate provided by Lutron.

#### **Equipment - Room Combining Control Interface**

The integration of the lighting control system to the sound system combining panel, FSR model number 'ACU', shall be via contact closures, Lutron model number 'GRX-AV' or 'FSR-CIP' as the project requires. The integration shall allow the lighting controls to be combined/separated based on the status of the partitions on the 'ACU' panel, which is providing the same function for the audio controls.

The electrical contractor shall be responsible for the mounting of the ‘GRX-AV’ or ‘FSR-CIP’ interface and wiring to the lighting control system. The sound contractor shall be responsible for the wiring between the Lutron interface, the ML-116-INT, and the ‘ACU’ panel as well as the system setup to ensure proper operation.

### MAP PANEL STATUS INTERFACE    ML-116-INT

An ML-116-INT unit can output 32 mix switch or head table switch outputs. If both mix and head table information is required then then additional units can be added. The serial data from the ML-116 system would just loop thru each unit.

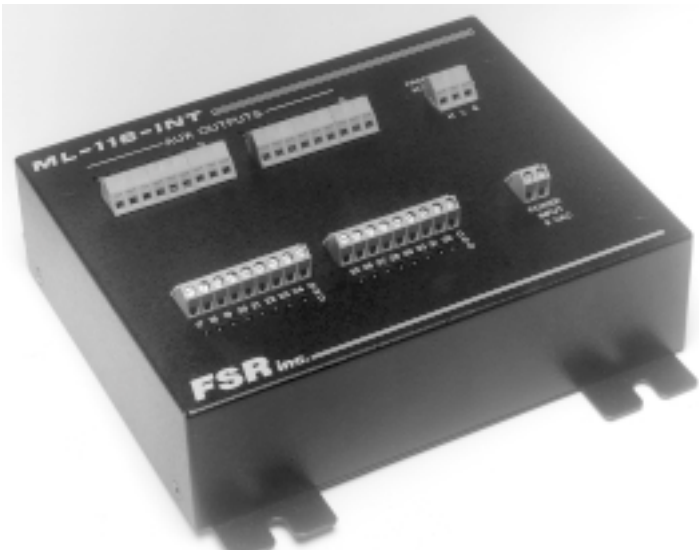
The ML-116-INT unit has an indicator LED for each corresponding wire terminal. These terminals denote either room combinations or head table positions. The inclusion of a LED for each terminal provides a rapid and accurate way to determine the operational status of both the ML-116 and the LUTRON lighting equipment.

A drawing of the ballrooms/meeting rooms is provided with each system. This drawing indicates the room mix switches and head table locations (via a numbering system) as they correspond to the appropriate terminal positions on the ML-116-INT. If multiple ML-116-INT units are required for either the mix or head table functions then the map drawing would indicate that and provide for it in the numbering system.

The actual unit is 7.5" long by 6" wide by 2" high, excluding the mounting ears each of the four of which are 1.5" wide by 0.5" long. The unit weighs approximately 3 lbs. It is located in the lighting equipment bay, not in the audio equipment area.

The ML-116-INT is supplied with a UL listed wall mounted transformer to power the unit.

It does not matter if the ML-116-INT is powered before or after the ML-116 Audio Control Unit. The ACU periodically scans for all line devices.



**Ground      To ML-116 Remote Indicator**  
**LO              Connector**  
**HI**

**Power Supply Connection no polarity**

**Control signals outputs**