AM16/12

16 Channel Automatic Matrix Mixer

OPERATING INSTRUCTIONS
and trouble-shooting guide

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INTRODUCTION

The AM16/12 is the most advanced automatic matrix mixer available today. Combining 16 automatic input channels, 12 output channels, and a full crosspoint matrix system into 2 rack spaces, the AM16/12 is a compact solution for a wide variety of sound system applications. 15 nonvolatile preset memory positions mean complete flexibility and reconfigurability.

The 16 automatic inputs utilize the Lectrosonics patented Proportional Gain plus Autoskew mixing algorithm* for seamless automatic mixing performance. Input preamp gains include +50dB and +30dB for both dynamic and electret microphones, and 0dB for line level inputs. Gain trim range on the inputs is +15dB to -63dB plus off.

The crosspoint matrix allows any input (or combination of inputs) to be routed to any output (or combination of outputs). Various crosspoint gains settings are available. In addition to the 16 inputs, matrix sources include the audio from the LecNet Expansion connector as well as an internal noise source.

The 12 outputs are balanced line level. Outputs 9-12 each have a mic/line level switch to make those outputs compatible with mic level devices like some four channel tape recorders.

The AM16/12 features a wealth of programmable features. With 17 programmable inputs and 19 programmable outputs, even the most sophisticated control schemes are straightforward. The programmable inputs can control input or output level on any grouping of inputs or outputs, memory preset recall, matrix crosspoint switching, or various functions associated with the built-in room combining capability. Programmable outputs can indicate either input channel activity or the current state of a programmable input.

The AM16/12 has an RS-232 port for remote setup or control by a computer or other RS-232 compatible controller. More than one AM16/12 may be coupled together for larger applications.

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* U.S. Patents 5,402,500 and 5,414,776

GENERAL TECHNICAL DESCRIPTION

The AM16/12 uses a straightforward analog signal path to provide excellent audio performance. This is coupled with a sophisticated microcontroller to implement the automatic mixing, matrix control, room combining, and programmable input and output functions. The Adaptive Level Proportional automatic mixing algorithm is used by the AM16/12. This algorithm uses the signal level pattern at the microphones to derive a pattern of channel gains. For instance, if only one microphone channel is being spoken into, its level is dominant and that channel gets most of the system gain, while all other channels are turned down. If more than one microphone is active, they share system gain according to their relative levels. A "skewing" function gives some advantage to microphones which are active over time, to minimize interruptions from transient noise at other microphones. Since the gain of each channel is apportioned continuously based on its relative level, no abrupt gain changes are made. This makes the automatic action virtually inaudible.

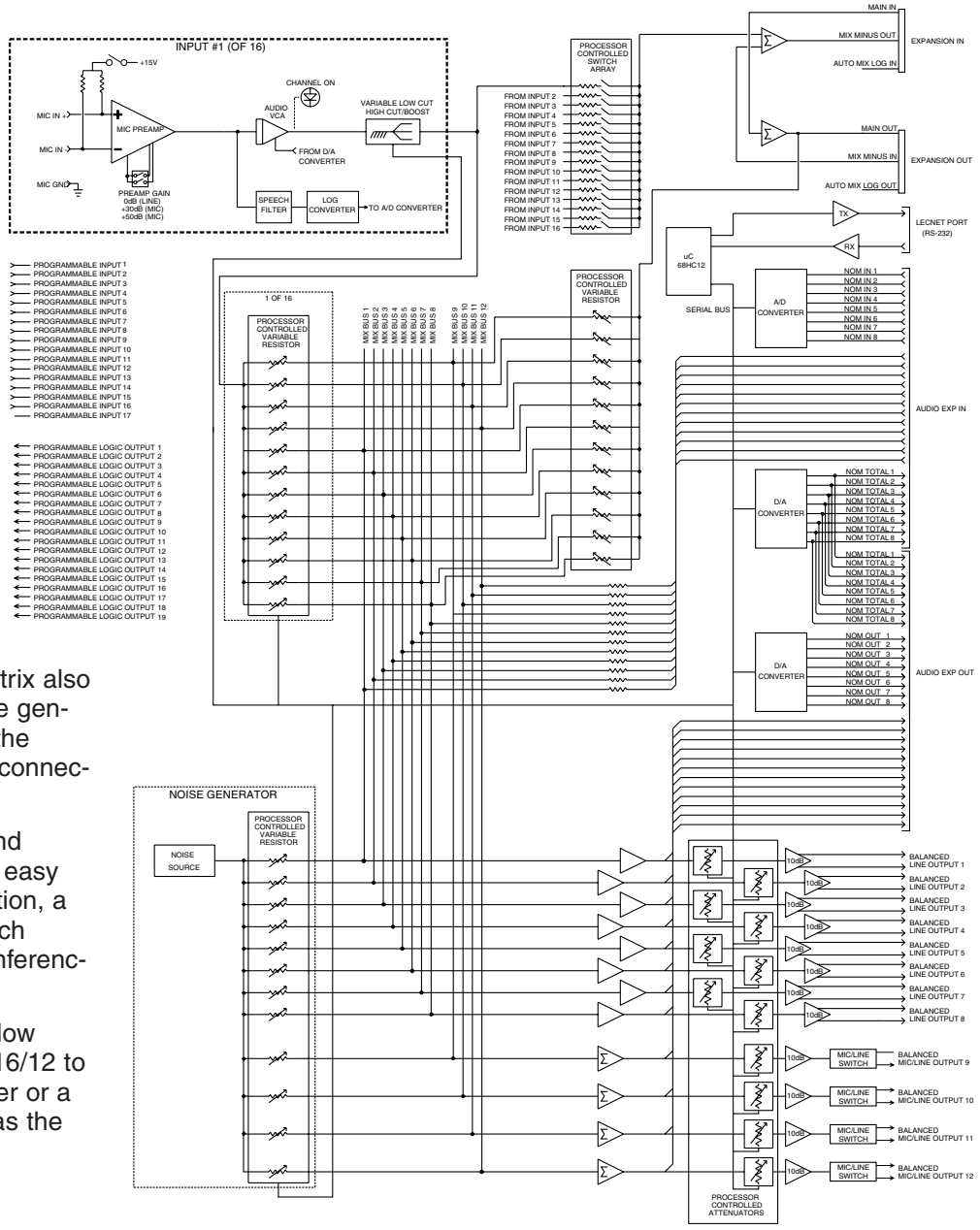
Figure 1 shows the simplified block diagram of the AM16/12. The microphone preamp is a low-noise discrete design, which is extensively RF protected. The preamp has three gain settings. The 0dB setting allows an input to accept line level signals, while the +30dB and +50dB gain settings accommodate both low and high sensitivity microphones. Switchable 15V Phantom power is provided for each channel.

Following the mic preamp, the audio signal passes through a high quality Voltage Controlled Amplifier (VCA). This VCA, controlled by a signal from the system D/A converter, is used to implement both static gain control (i.e. mic trim and remote input level) and gain reduction for the automatic mixing function. A Channel On LED indicates which inputs are currently active. A sweepable low-cut filter and a shelving high frequency filter provide tone control for each input.

The 16 inputs are routed through an 18 in / 12 out crosspoint matrix. The matrix has multiple crosspoint gains to accommodate the most complex signal routing needs. Aside from the 16 inputs, the matrix also includes two other inputs: a noise generator and the input signal from the LecNet Expansion In rear panel connector.

Signals from the Expansion In and Expansion Out connectors allow easy interface to AM8 mixers. In addition, a Mix Minus signal is available which allows easy interfacing to teleconferencing hybrids like the TH3A.

An RS-232 port is available to allow many of the functions of the AM16/12 to be controlled either by a computer or a dedicated control system (such as the AMX® or Crestron™ systems).



AM16/12 Block Diagram

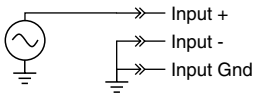
INSTALLATION

Because it is so highly integrated, the AM16/12 is straightforward to install. The following sections explain the installation and wiring, as well as the software setup of the AM16/12.

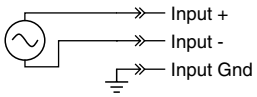
AM16/12 Audio Inputs

Each of the 16 AM16/12 inputs is balanced, and provides 15V phantom power (through 2K ohm feed resistors to the "+" and "-" input connections). Phantom power is switchable on a per-channel basis. The drawing to the right shows two examples of line level interface with the AM16/12; one, an unbalanced line level source and the other, a balanced line level source.

Unbalanced Line Level Source



Balanced Line Level Source



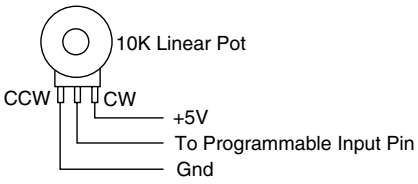
AM16/12 Audio Outputs

Each of the 12 AM16/12 outputs is balanced, and outputs 9 - 12 may be set for line or microphone level output. To use an output in the unbalanced line level mode, take the signal from the "+" output connection and the output ground. Leave the "-" output floating. To use outputs 9 - 12 in the unbalanced microphone level mode, take the signal from the "+" output connection and the output ground. In this case, you should connect the "-" output to ground. Be sure that the MIC/LINE switch is in the MIC (down) position for the desired output.

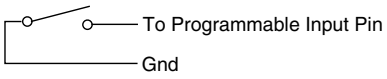
AM16/12 Programmable Inputs

The AM16/12 has 17 programmable inputs which can control a variety of AM16/12 parameters. Each input can respond to either a contact closure or a continuous voltage. The diagram to the right shows common connections to the programmable input pins.

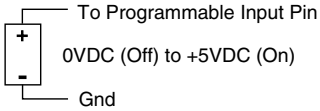
Pot Connection for Analog Control of Gain



Contact Closure as Programmable Input



DC Voltage Source as Programmable Input

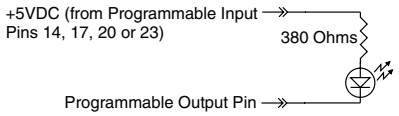


Each programmable input is internally pulled up through a 100K resistor to +5V, so no external pull up resistors are necessary. When using a continuous voltage with one of the programmable inputs, the Function of the programmable input must be set to either Analog In Control or Analog Out Control. See the Programmable Input tab in the AM16/12 Control Panel software for setting all programmable input parameters.

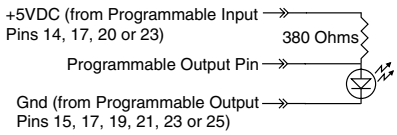
AM16/12 Programmable Outputs

The AM16/12 has 19 programmable outputs which can indicate either channel activity or the current state of a programmable input. Each programmable output is the electrical equivalent of a contact closure to ground. When a programmable output is "active", it conducts current to ground. When the programmable output is "inactive", no current flows to ground. The maximum usable voltage for the programmable outputs is 40V, and they will safely conduct up to 100mADC continuous. The diagram on the right shows some typical uses for the programmable outputs.

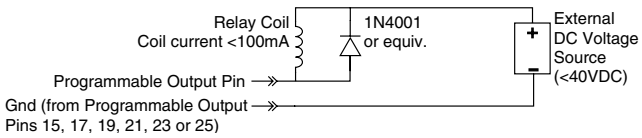
LED is on when the programmable output is active



LED is off when the programmable output is active



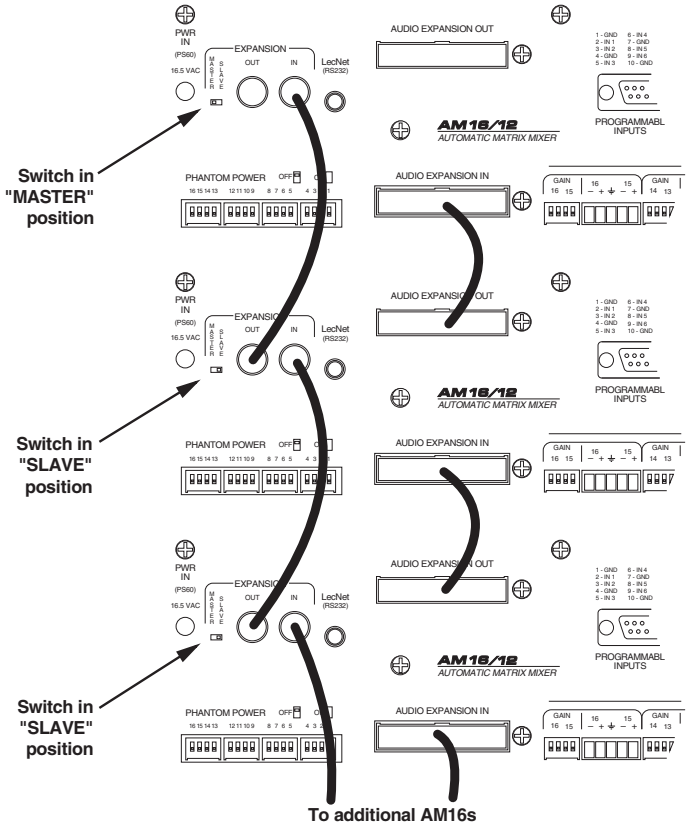
Relay is on when the programmable output is active



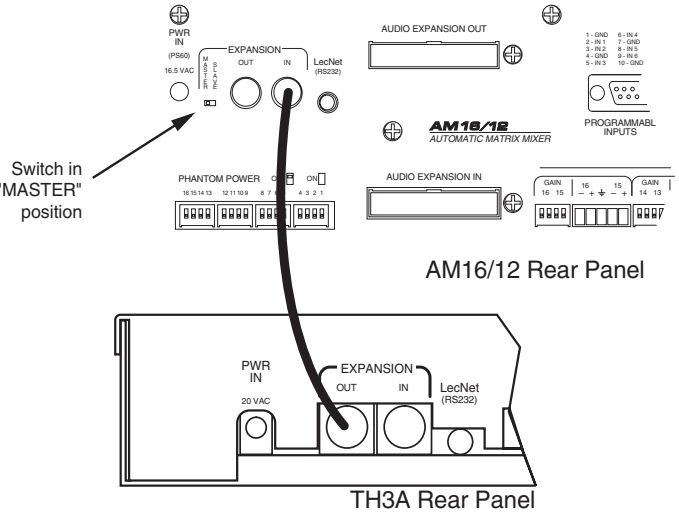
It is permissible to run LEDs from the +5VDC pins on the programmable input connector, as long as the total LED current for all LEDS on does not exceed 100mA. Similarly, 5V relay coils may also be run from the +5VDC pins on the programmable input connector, as long as the total coil current for all relays on does not exceed 100mA. Note that the diagram shows an external DC source powering the relay coil. This will be necessary if coil voltages above 5V are needed.

Audio Expansion In/Out

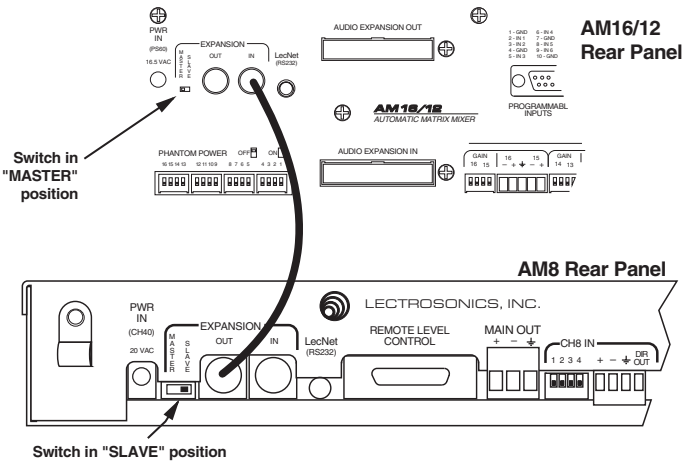
When multiple AM16/12s are used in an application, their Audio Expansion ports must be interconnected using the Audio Expansion In/Out connectors on the rear panel of the AM16/12. These two 30 pin headers are just to the right of the LecNet (RS232) jack on the rear panel. A 3" 30 conductor ribbon cable is supplied with each AM16/12 for this purpose. When installing the AM16/12s in a rack, the Master AM16/12 should be mounted in the top of the rack, with Slave AM16/12s mounted below the Master AM16/12. The ribbon connector then connects the Audio Expansion In connector of the Master AM16/12 to the Audio Expansion Out connector of the first Slave AM16/12. If there are more than one Slave AM16/12s, the Audio Expansion In connector of the first Slave AM16/12 is connected to the Audio Expansion Out connector of the second Slave AM16/12, and so on for as many Slave AM16/12s as exist in the system.



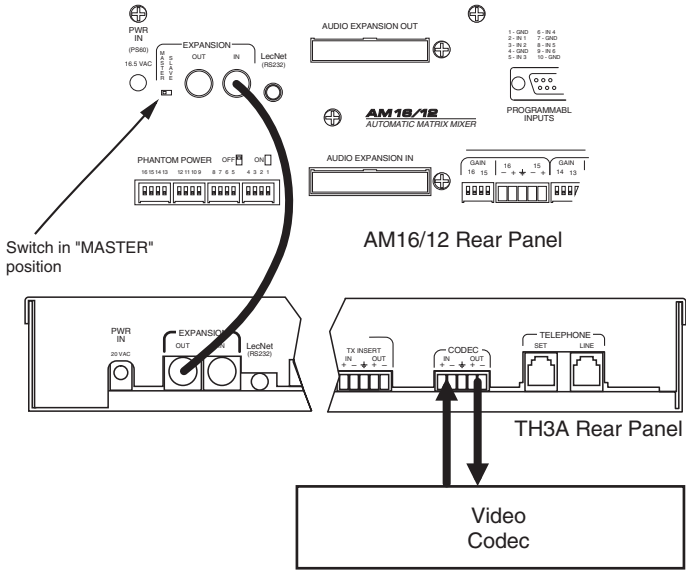
Connecting multiple AM16/12s together



Connecting the AM16/12 to the TH3A



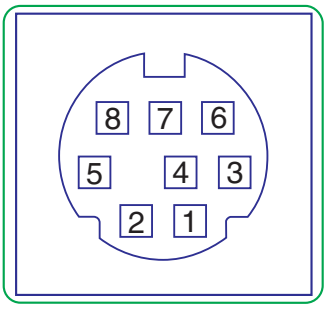
Connecting the AM16/12 to the AM8



Connecting the AM16/12 to the TH3A and a video codec

LecNet Expansion In/Out

When other LecNet devices are used in conjunction with the AM16/12s, the LecNet Expansion ports of these devices must also be interconnected. Refer to the diagrams above for proper interconnections. The LecNet Expansion In and Out pinouts are shown below.

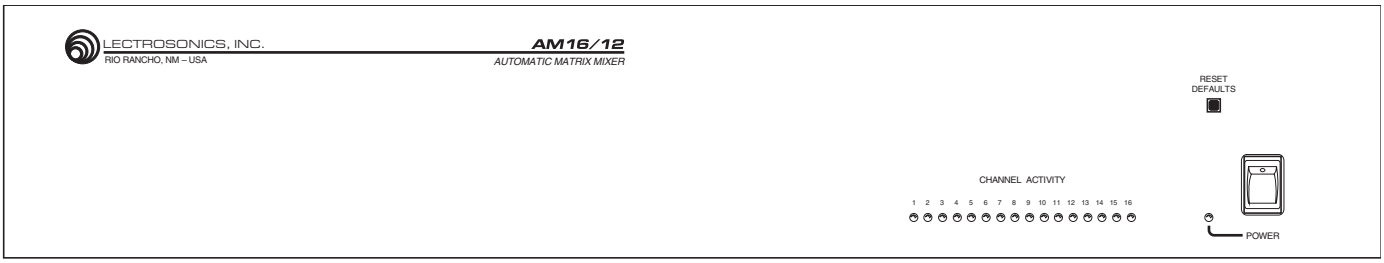


Pin	Expansion In Function	Expansion Out Function
1	Main In	Main Out
2	Mix Minus Out	Mix Minus In
3	NOM in	NOM out
4	NOM total	NOM total
5	RS-232 RX	RS-232 RX
6	RS-232 TX	RS-232 TX
7	Ground	Ground
8	N/C	N/C

FRONT PANEL DESCRIPTION

CHANNEL ACTIVITY LEDS - Indicates channel activity. The LEDs light when the attenuation applied by the automatic mixing algorithm is less than or equal to 6dB. The indication of channel activity is responsive to the Input Qualification and Output Hold time parameters, which may be set in the Miscellaneous tab of the AM16/12 control panel.

RESET DEFAULTS button - This button will reset the unit to factory defaults when held down while the power switch is turned on.



AM16/12 Front Panel

REAR PANEL DESCRIPTION

MIC/LINE INPUTS 1-16 - Accepts balanced or unbalanced signal. Fully balanced differential input, RF filtered.

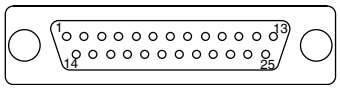
GAIN SELECTION SWITCHES 1-16 - Allows input channel gain to be set. 0dB gain, for line level sources, is set when both switches of the pair are in the up position. 30dB gain, typically for high output (electret) microphones, is set when the left switch is in the up position and the right switch is in the down position. 50dB gain, used for low output (dynamic) microphones, is set when both switches are in the down position.

LINE OUTPUTS 1-12 - Provide balanced system outputs. The Line Outputs may also be used in an unbalanced mode by connecting the "+" terminal of the Line Output to the signal lead of the unbalanced device, and the ground terminal of the Line Output to the ground of the unbalanced device. See "AM16/12 Audio Outputs" on page 4 for more information on connecting the outputs in balanced and unbalanced mode.

MIC/LINE SWITCHES 9-12 - Introduces 40dB of attenuation into the associated line outputs 9-12. This yields the appropriate signal levels to interface with mic level devices.

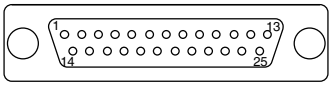
PROGRAMMABLE INPUTS - Allows remote control of a number of AM16/12 functions. Each of the 17 programmable inputs can utilize either continuous DC voltages (0VDC-5VDC) or contact closures, depending on the particular function chosen. For continuous voltages, either a 10K ohm linear pot or an adjustable DC control voltage may be used. The volume control action is internally scaled in software, giving an "audio-taper" characteristic to a linear pot. When using a DC control voltage, the control constant is 0.167V/dB (or 6dB/V) from 0V to 5V. At 0V, the channel is turned completely off. The control voltage should not exceed 5V.

1 - GND	6 - IN 4	11 - IN 7	16 - IN 11	21 - IN 14
2 - IN 1	7 - GND	12 - IN 8	17 - +5V	22 - IN 15
3 - IN 2	8 - IN 5	13 - IN 9	18 - IN 12	23 - +5V
4 - GND	9 - IN 6	14 - +5V	19 - IN 13	24 - IN 16
5 - IN 3	10 - GND	15 - IN 10	20 - +5v	25 - IN 17



PROGRAMMABLE OUTPUTS - Allows indication of either channel activity or programmable input states. Each of the 19 programmable inputs is the electronic equivalent of a contact closure. The logic output will sink up to 100mA at voltages up to 40VDC, however, the total current draw of all logic outputs should not exceed 100mA if the internal +5V supply is used.

1 - OUT1	6 - OUT6	11-OUT11	16-OUT15	21-GND
2 - OUT2	7 - OUT7	12-OUT12	17-GND	22-OUT18
3 - OUT3	8 - OUT8	13-OUT13	18-OUT16	23-GND
4 - OUT4	9 - OUT9	14-OUT14	19-GND	24-OUT19
5 - OUT5	10-OUT10	15-GND	20-OUT17	25-GND



AUDIO EXPANSION IN/OUT - Allows multiple AM16/12s to be linked together when more than 16 inputs are needed. In multiple AM16/12 setups, one AM16/12 is set to be the Master, and all others are set to be Slaves. The Audio Expansion In of the Master AM16/12 is connected to the Audio Expansion Out of the first Slave AM16/12, using the supplied 30 pin ribbon cable. The Audio Expansion In of the first Slave AM16/12 is connected to the Audio Expansion Out of the next Slave AM16/12, and so on.

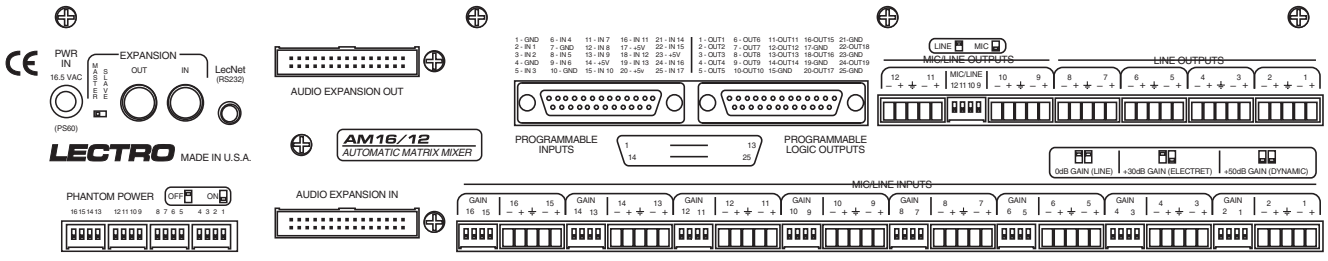
RS-232 SERIAL PORT - Provides access to and control of some of the operational features of the AM16/12. The port is compatible with the serial port of a PC, or other controllers with RS-232 type serial ports. For hardware interconnection and software details, see Appendix 1, "Serial Port Hardware and Software".

EXPANSION IN/OUT - Allows other LecNet devices to be connected to the AM16/12. Also used when multiple AM16/12s are connected together to bus the RS-232 serial connection between AM16/12s.

MASTER/SLAVE SWITCH - Sets the AM16/12 for use as a Master device or a Slave device. AM16/12s used singly should be set for Master mode operation.

PWR IN - Connects to the PS60 power supply to provide power for the AM16/12.

PHANTOM POWER SWITCHES - Allow +15V phantom power to be applied or not on a per-channel basis.



AM16/12 Rear Panel

OPERATING INSTRUCTIONS

Since most of the parameters used to set up the AM16/12 are adjusted using the AM16/12 Software Control Panel, the operating instructions include instructions for the use of the software. It is recommended that you have the software running, either live or in the demo mode, as you read through this section.

Power Up

When the AM16/12 is powered on, it automatically loads the active setup from Preset 1. Therefore, you should always store the desired power--up setting for the AM16/12 in Preset 1.

Master/Slave Switch

The Master/Slave switch should be set to the Master position if only one AM16/12 is being used. When multiple AM16/12s are used in a system, only one is set to Master and the rest are set to Slave. See also the wiring descriptions of the Audio Expansion In/Out and Expansion In/Out connectors in the Installation section.

Input Preamp Gain

Input preamp gain is set using the dip switches just to the left of each 5 pin input connector. Dip switch settings for 0dB, +30dB, and +50dB input gain are shown on the rear panel of the AM16/12. Generally, the +50dB position is used for all dynamic microphones and electret microphones where the working distance from the microphone will be greater than about 18 inches. The +30dB position is useful for electret microphones with working distances less than 18 inches and most wireless microphones. The 0dB setting is for line level sources. Remember to switch phantom power on for electret microphones and off for dynamic mics or line level sources.

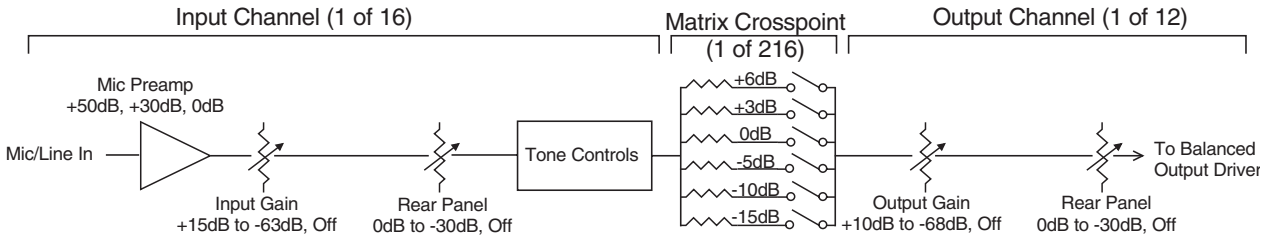
Output Mic/Line Switch (Outputs 9 - 12)

Outputs 9 through 12 may be either Mic or Line level outputs. The dip switch between the output connectors for outputs 9/10 and 11/12 controls the output level. There is approximately 40dB of attenuation introduced in the Mic position relative to the Line position.

Using the AM16/12 Software Control Panel

The AM16/12 software control panel may be used in one of two ways. When launched from the LecNet Master Pro application, you can control all the parameters of the AM16/12 in real time. (Your PC must be connected to the AM16/12 using the supplied LecNet serial cable in order for this to happen.) Alternatively, you can launch the AM16/12 control panel directly and it will automatically come up in the demo mode. The demo mode is useful for doing system setup (and saving the setups to a disk file) without the need to be connected to an AM16/12.

System setup follows the order of the tabs on the control panel. Start at the left tab and work your way to the right. The only exception to this is when you are using room combining. In this case, after setting up the input gain and input tone controls, go directly to the room combining tab. Please refer to the AM16/12 Control Panel Software section of this manual for a complete description of each control panel tab.



The diagram below represents the signal flow of one input to one output through one matrix crosspoint. Illustrated are all the gain control points in the signal path.

To adjust this parameter:	**Use this control:**
Mic Preamp Gain	Rear panel dip switches
Input Gain	Input gain tab on AM16/12 control panel software
Rear Panel (Input) Gain	Programmable inputs on AM16/12 rear panel
Output Gain	Output gain tab on AM16/12 control panel software
Rear Panel (Output) Gain	Programmable outputs on AM16/12 rear panel

Input Gain Tab

Each input channel has two gain control points, in addition to the rear panel preamp gain switches. The input control point labeled “Input Trim” is adjusted using the Input Gain tab on the AM16/12 control panel. This control is used to adjust the sensitivity of each microphone or line level input to the desired gain. The gain adjustment range is +15dB to -63dB plus off. You may want to increase the mic preamp gain if you find that your input gain settings are routinely above +10dB.

The input control point labeled “Rear Panel” represents the gain adjustments which can be made from the rear panel programmable inputs. The rear panel gain control is attenuation only, starting at a maximum gain of 0dB. The rear panel input gain controls may be limited in their adjustment range using the Miscellaneous Settings tab on the AM16/12 control panel. In addition, you may set a rear panel preset gain value that will be applied to any outputs which are being controlled by a programmable input. The preset gain is applied at power up or when sub-rooms are combined or uncombined (using the room combining capabilities of the AM16/12). Note that if there are no limits applied to the rear panel gain range, the input channel may be turned completely off. The current gain value of the rear panel controls is displayed on the Miscellaneous Settings tab.

Output Gain Tab

The output gain structure is identical to the input gain structure, with the exception that the Output Gain range is +10dB to -68dB plus off. The output gain is adjusted using the Output Gain tab.

Matrix Setup Tab

Matrix crosspoint gain can be set using the Matrix tab. Input-to-output gains are set based on the requirements of the application. For example, you can set up a “mix-minus” sound reinforcement system when you are using multiple microphones and overhead distributed speakers. Each speaker (or small group of speakers) would be fed from its own mix of microphones. A given speaker’s mix would consist of all microphones not physically close to the speaker, while excluding those microphones which are close to the speaker. The possibility of feedback is greatly reduced when this approach is repeated with all system speakers. A multichannel amplifier (like the Lectrosonics PA8) may be used to power each speaker individually.

Programmable Inputs Tab

Programmable inputs may be set up using the Programmable Inputs tab. Below is a short list of typical applications for each of the programmable input functions available:

Analog In Control: Used to control the input gain of one or more inputs with a potentiometer or DC voltage source. Additionally, a toggle switch can be used as a mute switch by shorting the programmable input to ground for mute.

Increase In 1dB, Decrease In 1dB: Used to control the input gain of one or more inputs with momentary switch closures. Each switch closure will increase or decrease the gain of the associated input(s) by 1dB. If the switch is pushed and held, it will continue to increment or decrement until the switch is released or the gain reaches its high or low limit.

Analog Out Control: Used to control the output gain of one or more inputs with a potentiometer or DC voltage source. Additionally, a toggle switch can be used as a mute switch by shorting the programmable input to ground for mute.

Increase Out 1dB, Decrease Out 1dB: Used to control the output gain of one or more inputs with momentary switch closures. Each switch closure will increase or decrease the gain of the associated input(s) by 1dB. If the switch is pushed and held, it will continue to increment or decrement until the switch is released or the gain reaches its high or low limit.

Memory Preset: Used to recall one of the 15 AM16/12 preset memories with a momentary switch closure. Remember to save the same memory preset associations in all the AM16/12 memory preset positions you’ll be using. You can also assign a programmable output to reflect the programmable input state of the programmable inputs you’re using for memory preset recall to drive LEDs for visual feedback of the current memory preset.

Toggle Crosspoint Gain: Used to temporarily apply the signal from any one of the 16 inputs to any combination of outputs using a momentary switch closure to toggle the state of the affected crosspoints. Useful for zone paging applications, etc.

Mute In: Used to mute one or more inputs with a switch closure. Subsequent contact closures toggle between mute and unmute. You can also assign a programmable output to reflect the programmable input state of the programmable inputs you're using for input muting to drive LEDs for visual feedback of the mute/unmute state of the inputs.

Mute Out: Used to mute one or more outputs with a switch closure. Subsequent contact closures toggle between mute and unmute. You can also assign a programmable output to reflect the programmable input state of the programmable inputs you're using for output muting to drive LEDs for visual feedback of the mute/unmute state of the outputs.

Toggle Room Boundary: Used when room combining is active to connect the boundaries (using a momentary switch closure) of two rooms and combine their sound systems. This option is not available in the Programmable Inputs tab, but is set automatically by the AM16/12 control panel when the room combining function is active.

Not Used: Unassigns a programmable input from any system function.

Programmable Outputs Tab

Programmable outputs may be set up using the Programmable Outputs tab. Below is a short list of typical applications for the two programmable output functions available:

Input Channel Activity: Used to indicate when one or more channels are active. This function may be used for video-follow-audio applications, where each programmable output indicates activity on one or more channels. The programmable outputs are connected to logic inputs on a video switcher to switch between cameras.

Programmable Input State: Used to provide user feedback for certain programmable input functions. A programmable output whose function is Programmable Input State will be active (i.e. conducting to ground) or inactive (i.e. open) as follows depending on the function of the programmable input with which it is associated:

Function	State when LED On	State when LED Off
Analog In	Attenuation < 15dB	Attenuation ≥ 15dB
Increase In 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease In 1dB:	Contact closure on prog input	No contact closure on prog input
Analog Out	Attenuation < 15dB	Attenuation ≥ 15dB
Increase Out 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease Out 1dB:	Contact closure on prog input	No contact closure on prog input
Memory Preset:	Associated memory is active	Associated memory is not active
Toggle Crosspoint Gain:	Input-to-output(s) connection made	Input - output(s) connection not made
Mute In:	Associated input(s) not muted	Associated input(s) muted
Mute Out:	Associated output(s) not muted	Associated output(s) muted

Room Combining Tab

If your application requires room combining, the Room Combining tab description in the AM16/12 Control Panel Software section provides full setup information.

Miscellaneous Settings Tab

Adjustments or limitations to the front and rear panel gain controls, setup of the input qualification time and output hold time, or configuration of the Expansion port mix-minus signal may be accomplished in the Miscellaneous Settings tab. When multiple AM16/12s are used in a system, set the Internal NOM bus link to Expansion In/Out option on all slave AM16/12s to No Link.

When all tabs are set appropriately for the application, the system is ready to use.

AM16/12 CONTROL PANEL SOFTWARE

The following section is a description of the File menu and each of the tabs in the AM16/12 Control Panel application.

File Menu Options

Copy Preset(s) to AM16/12 from Disk File... - Allows any preset stored to a disk file (.amd file extension) to be loaded to the corresponding AM16/12 memory preset. The Preset 1 through Preset 15 selections copy a single preset, while the All Presets selection copies all 15 presets to the AM16/12. After a preset is loaded to the AM16/12, it will be transferred to the active AM16/12 setup. If all 15 presets are loaded, preset 1 will be made the active preset. This option is helpful in restoring AM16/12 settings if they have been accidentally corrupted. Note that this option will overwrite any data stored in the AM16/12's preset memory with the new preset data from disk.

Save Preset(s) from AM16/12 to Disk File... - Allows any preset currently stored in the AM16/12's preset memory to be saved to a disk file. The Preset 1 through Preset 15 selections copy a single preset, while the All Presets selection copies all 15 AM16/12 presets to the selected disk file. This option is helpful in archiving the final settings for the AM16/12 in a particular installation.

Load Active Setup from Disk File... - Allows the active AM16/12 setup to be loaded from a disk file. Loading the active AM16/12 setup from a disk file will not overwrite any AM16/12 preset memory data. This option is helpful when a basic AM16/12 setup has been generated off-site and needs to be "tweaked" on-site.

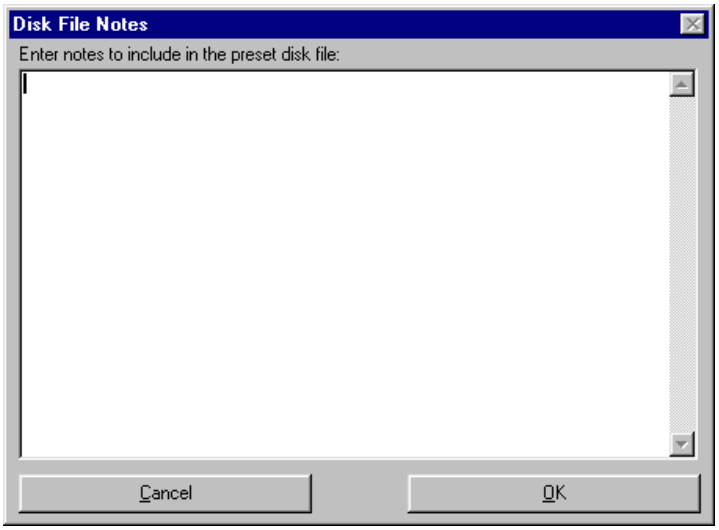
Save Active Setup to Disk File... - Allows the active AM16/12 setup to be stored to a disk file. You select which preset position in the disk file to which to store the active AM16/12 setup. This option has no effect on the AM16/12 preset memories.

Select Active Setup from AM16/12 Preset... - Allows any of the AM16/12 preset memories to be recalled and made to be the active AM16/12 setup. This option does not affect any of the preset memory data.

Save Active Setup to AM16/12 Preset... - Allows the active AM16/12 setup to be stored in one of the 15 preset memories in the AM16/12. Note that this option will overwrite any preset memory data stored in the selected preset memory position.

Enter Input/Output Names... - Allows names to be assigned to the 16 inputs and the 12 outputs of the AM16/12. These names may be up to 15 characters long and are stored in nonvolatile memory in the AM16/12. In addition, the names are stored in any disk files generated with any of the save to disk options above. Inputs or outputs with no assigned names are listed as "No Name". To change a name, simply click on the desired text box and enter the desired name. While you are permitted to enter more than 15 characters in the text box, only the first 15 will be stored. To save the changes to the AM16/12's nonvolatile memory, click the Apply button. If you click the Cancel button, the changes you have made will not be applied. The shortcut key for this option is Ctrl+E.

Enter Disk File Notes... - Allows you to add any notes that you want to be included in a file saved to disk. These notes could be installation instructions, operational instructions, or any other information which might be helpful to associate with a saved file. You'll see the screen shown at the right when you choose this option:



After you enter the desired text into the text box, choose OK to save the changes you've made. Cancel will ignore the changes you've made since the last time you clicked OK. Note that to save your changes to a disk file, you must still either use Save Preset(s) from AM16/12 to Disk File... or Save Active Setup to Disk File... to store the notes in a disk file. The shortcut key for this option is Ctrl+D.

Print Setup... - Allows the active printer to be changed using the standard Windows printer setup dialog. This will set the printer which is used with the Print Tabs... menu selection. The shortcut key for this option is Ctrl+P.

Print Tabs... - Allows any or all of the AM16/12 control panel tabs to be printed for documentation purposes.

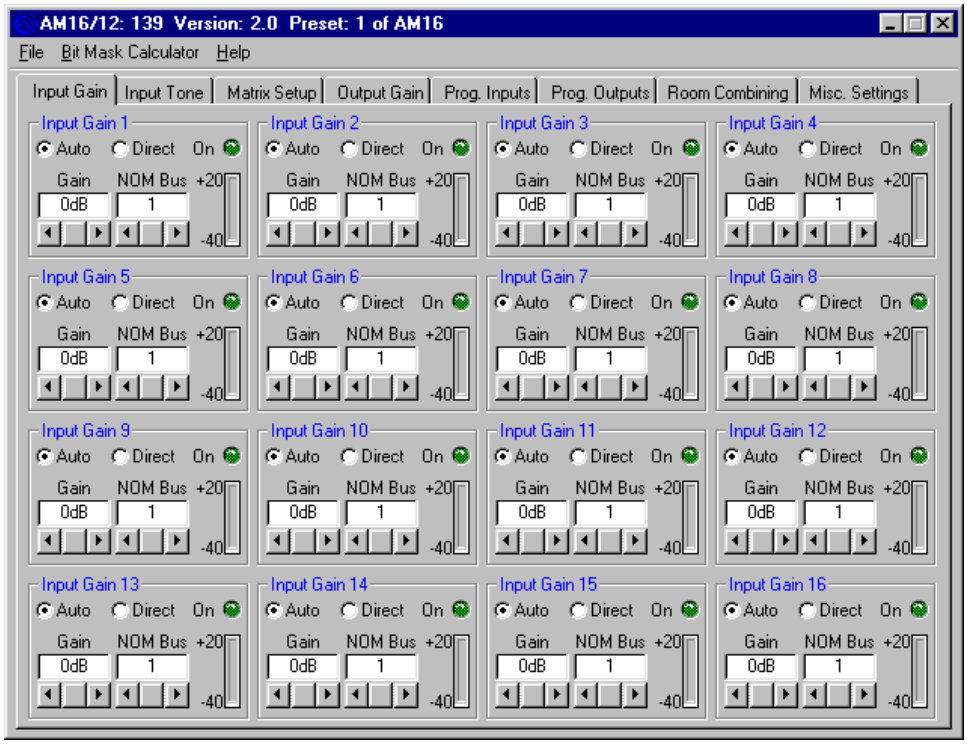
Update AM16/12 Firmware from Disk File - Allows newer firmware revisions to be loaded into the AM16/12. From time to time, new features or bug fixes will be added to the AM16/12's firmware. These changes will be distributed with the LecNet installation disks and available on the Lectrosonics Web site (www.lectrosonics.com). The firmware file will have a ".s19" extension. When installing from the installation disks, the firmware files will automatically be placed in the LecNet directory (default: c:\lecnet). If new firmware is downloaded from the Web site, the file should be placed in the LecNet directory.

Any time the AM16/12 Control Panel is run, it will check for .s19 firmware files which are more recent than the firmware revision in the AM16/12. You will be alerted that the AM16/12's firmware can be updated, and you can select whether or not to let the update proceed. If no firmware file is available in the LecNet directory, this option will be disabled. The shortcut key for this option is Ctrl+U.

Exit - Ends the application. The shortcut key for this option is Ctrl+X.

Important note: If you will be using the Room Combiner functions of the AM16/12, proceed to the instructions for the Room Combining Tab on page 23.

Input Gain Tab



The Input Gain tab allows the input gain, Auto/Direct status, and the NOM bus association to be set for each of the 16 input channels.

Gain - Allows the input gain level to be trimmed between +15dB and -63dB, or Off. The gain shown in the associated box should be added to the preamp gain (set by rear panel dip switches) to calculate the total channel gain. For example, if the rear panel dip switches for an input are set such that the preamp gain is +30dB, and the input gain box shows +5dB, the total gain applied to that input channel (excluding matrix crosspoint and output gain) would be +35dB. The background color of the input gain box will change from white to red if the input is muted by actuation of the Mute Input function of a programmable input. The input gain scroll bar will also be disabled while the channel is muted.

Short Cuts: A left mouse click on the gain box will set the input gain to 0dB, while a right mouse click will set the input gain to Off.

Auto/Direct Input Status - Each input may be in either Auto or Direct mode. An input in the Auto mode responds to the NOM bus to which it is assigned to determine its instantaneous gain. An input in the Direct mode is always on and never has any gain reduction applied to it from the automatic mixing action. An input in the Direct mode will, however, contribute to the NOM bus to which it is assigned. In most cases, inputs connected to microphones should be set to Auto mode. Direct mode is useful for line level sources.

NOM Bus - Sets the NOM bus association for each input. The AM16/12 has 8 NOM busses, and any input may be assigned to any NOM bus, or to "None". All inputs assigned to the same NOM bus act like a single automatic mixer, in that their instantaneous gains are determined by the relative signal levels on all other inputs assigned to that NOM bus. By assigning inputs to different NOM busses, more than one "virtual mixer" may be constructed. As a simple example, you might assign inputs 1-8 to NOM bus 1 and inputs 9-16 to NOM bus 2. If inputs 1-8 were then sent to output 1 and inputs 9-16 were sent to output 2 (using the Matrix tab), you would have two separate 8 input automatic

mixers. With 8 NOM busses, up to 8 separate mixers can be configured with the AM16/12. If an input is assigned to "None", it will neither affect any other channel's automatic gain or be affected by another channel.

Short Cuts: A left mouse click on the NOM box will associate the input with NOM bus 1, while a right mouse click will set the association to "None".

On LED - Indicates that the attenuation applied to the input as a result of the automatic mixing action is less than 6dB. For inputs in the Direct mode, or inputs whose NOM assignment is "None", this LED is always lit.

Level Meter - Indicates the inputs level, taking into consideration the Input Gain, and the front and rear panel gain contributions.

Input Tone Tab

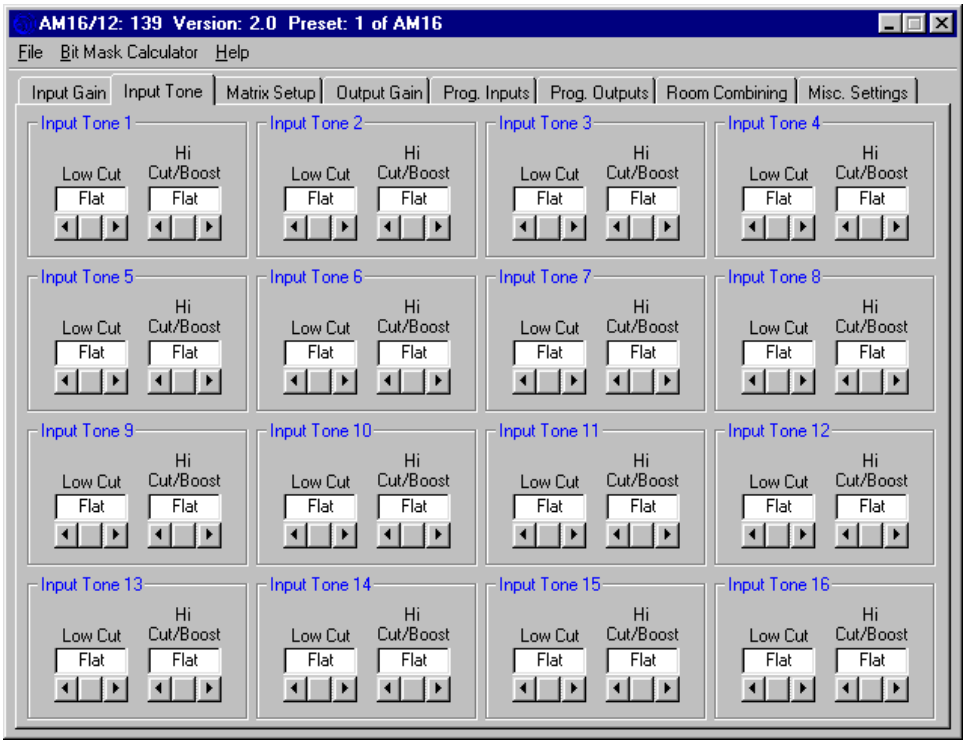
The Input Tone tab allows the low cut frequency and the high frequency cut or boost to be set for each of the 16 input channels.

Low Cut - Sets the low cut corner frequency for each input channel. The low cut filter is a 6dB/octave (i.e. single pole) filter. Frequency choices are 75Hz, 90Hz, 110Hz, 130Hz, 190Hz, 280Hz, 600Hz, and Flat.

Short Cut: A left click on the low cut box causes the frequency to be set to "Flat".

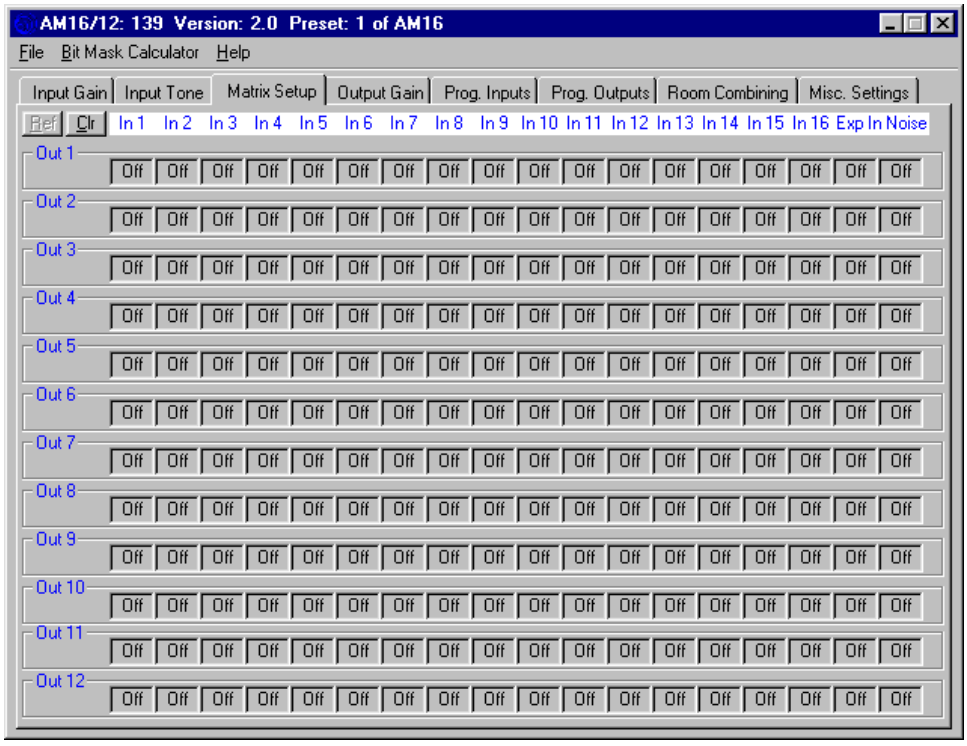
Hi Cut/Boost - Sets the high frequency cut or boost for each input channel. The inflection point of the high frequency tone control is approximately 1kHz. Choices for cut/boost are -8dB, -6dB, -3dB, Flat, +3dB, +6dB, and +8dB.

Short Cut: A left click on the hi cut/boost box causes the cut/boost value to be set to "Flat".

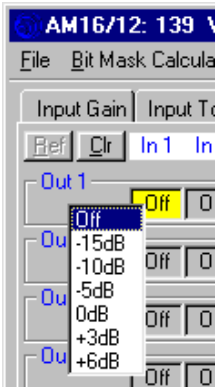


Matrix Setup Tab

The Input/Output Matrix tab sets the input to output assignments for the AM16/12.



Input/Output Crosspoint - Allows the input/output crosspoint gain to be set. Each of the 12 rows of 18 crosspoint boxes represent input connections which may be set from inputs to outputs 1-12. To set a crosspoint gain, simply click on the crosspoint box at the intersection of the desired input and desired output. The crosspoint box will turn yellow, and you'll see the following selection box pop up:



At this point, the current crosspoint gain is highlighted in the selection box. Choose a new gain by clicking on the desired crosspoint gain value. If you decide not to change the crosspoint gain, you may press the Esc key or click on the crosspoint box again to close the selection box without changing the crosspoint gain. The first 16 crosspoint boxes in each output row are for the AM16/12 inputs. Two other signals are available to be included in the output mixes: Exp In and Noise.

Exp In is the signal from the 8 pin mini-DIN LecNet Expansion In connector on the rear panel of the AM16/12. This signal would be used if another LecNet device, like a TH3A Telephone Hybrid, were connected to the AM16/12 via the expansion cable. In this case, the TH3A's receive signal would be present at the Exp In connector. The crosspoint gains for Exp In to any active outputs would be set to the desired gain so that the participants in the local room could hear the far-end participant. Another application might be the addition of 8 more inputs using an AM8. In this case, the sum of all 8 AM8 channels would appear at the Exp In connector. This signal could then be distributed as necessary to appropriate output mixes.

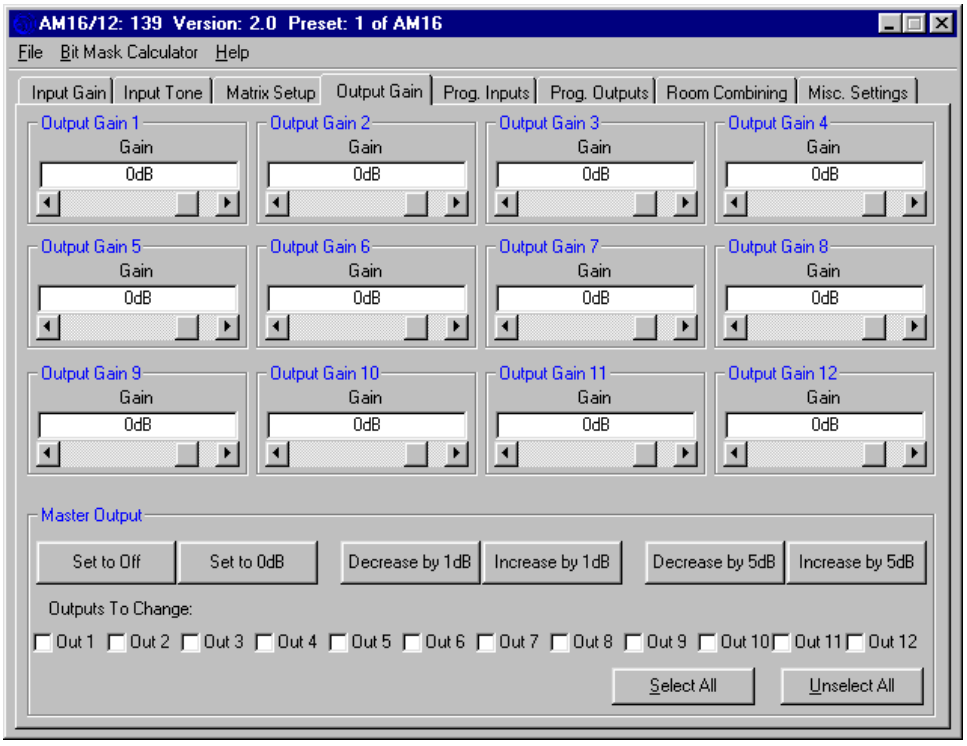
The AM16/12 includes an internal broadband noise generator which can be included into any of the output mixes. One application for the noise generator is bench conferences in courtrooms. During a bench conference, noise is output over the sound system in the jury box, the gallery, and any other place that shouldn't hear the conversation at the bench.

Short Cuts: A right mouse click on a crosspoint gain box will set the crosspoint gain to 0dB. A middle mouse click (for those with a three button mouse) will set the crosspoint gain to "Off".

Refresh Matrix (Ref) Button - Updates the crosspoint matrix display to indicate the active AM16/12 setup. This is useful when the room combining function is in use, or any other function which might change the matrix crosspoint setup.

Clear Matrix (Clr) Button - Clears all matrix crosspoints to the "Off" state.

Output Gain Tab



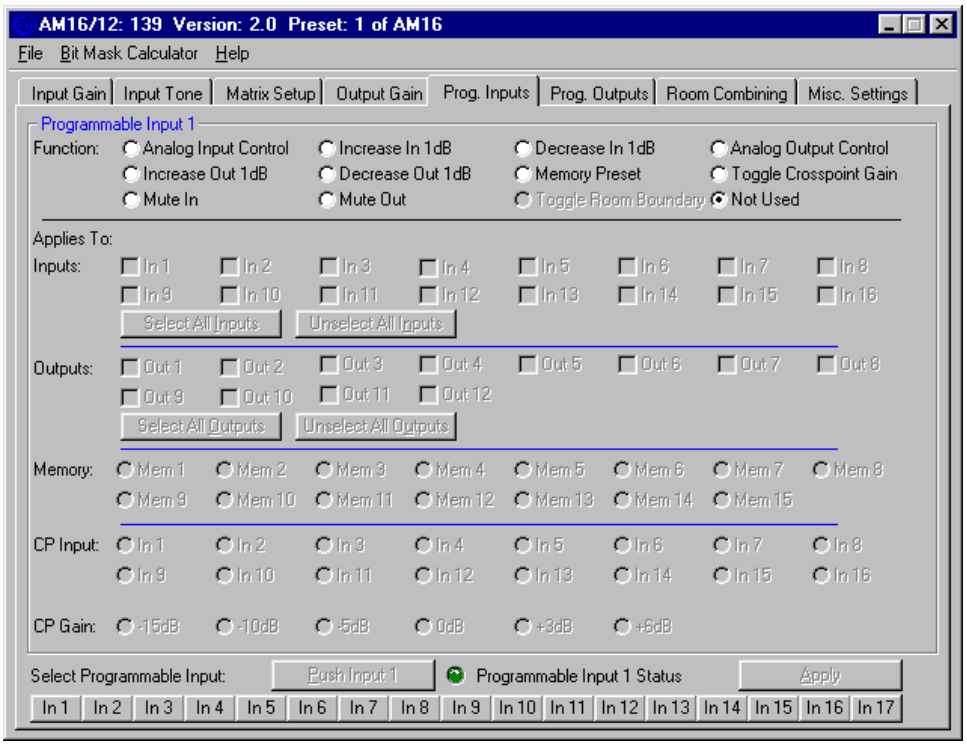
The Output Gain tab allows the output gain levels to be set.

Gain, Outputs 1 - 12 - Allows the output gain to be set between +10dB and -68dB or "Off". The background color of the output gain box will change from white to red if the output is muted by actuation of the Mute Output function of a programmable input. The output gain scroll bar will also be disabled while the output is muted.

Short Cuts: A left mouse click on the gain box will set the output gain to 0dB, while a right mouse click will set the output gain to Off.

Master Output Section
The Master Output section provides a convenient way to apply gain changes to more than one output at a time. The six buttons (Set to Off, Set to 0dB, Decrease by 1dB, Increase by 1dB, Decrease by 5dB, and Increase by 5dB) facilitate several common gain manipulations. Their action is applied to any output whose check box is checked. The Select All and Unselect All buttons provide a quick way to apply gain changes to all channels simultaneously. Note that the Increase and Decrease buttons are push-and-hold, and will increment or decrement the output gain for as long as they are held down.

Programmable Inputs Tab



The AM16/12 has 17 programmable inputs (available on the 25 pin D-Sub connector on the rear panel) which allow control of a wide variety of AM16/12 functions. Only the parameters in the "Applies To" section which are associated with each specific programmable input function will be enabled as you select different functions. All other parameters are disabled. This eliminates invalid Function/Applies To settings. Each of the available functions is explained below.

Hint: If the function (or any associated inputs, outputs, etc.) of a programmable input is changed on the control panel, the Apply button will be enabled. The Apply button is located in the lower right hand corner of the Programmable Input tab. The Apply button must be clicked before any changes are actually applied to the active

AM16/12 setup. Note that you should use the Select Programmable Input buttons to select the programmable input you'd like to configure before doing any configuration.

Select Programmable Input Buttons 1-17 - Allows selection of which programmable input to change. Note that the frame caption "Programmable Input ..." (upper left in blue) will change to indicate the programmable input currently being changed.

Push Input Button - Allows a contact closure to be simulated for the current programmable input. This is useful when testing to see that the changes you've made to each programmable input indeed have the intended effect. Each click on the "Push Input..." button has the same effect as a momentary contact closure on the current programmable input. Note that the caption on the Push Input button always reflects the current programmable input. The Push Input button will be disabled for the Analog In Control, Analog Out Control and Not Used options.

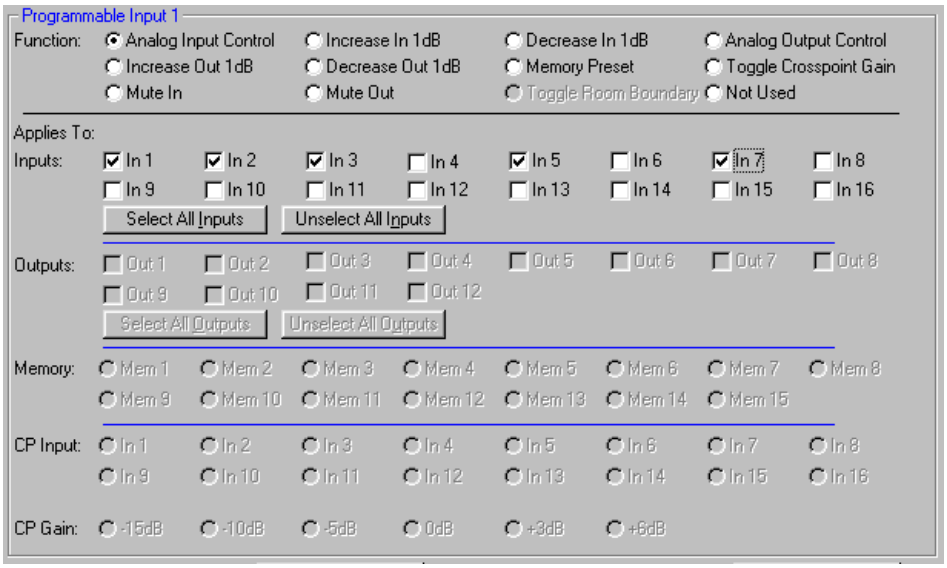
Programmable Input Status "LED" - Shows the current state of a programmable input. The status indicator only has meaning for the following programmable input functions:

Function	State when LED On	State when LED Off
Analog In Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase In 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease In 1dB:	Contact closure on prog input	No contact closure on prog input
Analog Out Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase Out 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease Out 1dB:	Contact closure on prog input	No contact closure on prog input
Memory Preset:	Associated memory is active	Associated memory is not active
Toggle Crosspoint Gain:	Input-to-output(s) connection made	Input - output(s) connection not made
Mute In:	Associated input(s) not muted	Associated input(s) muted
Mute Out:	Associated output(s) not muted	Associated output(s) muted

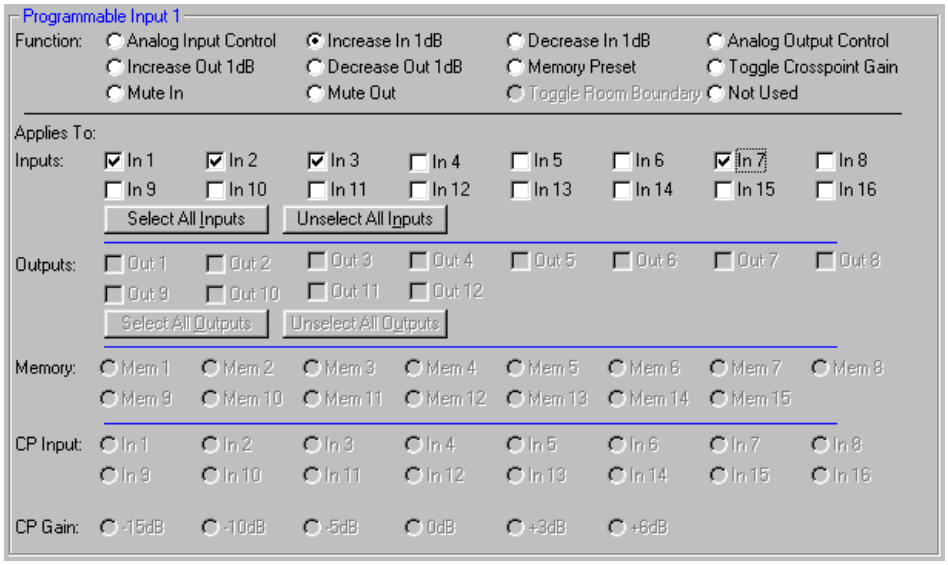
Apply Button - Applies the current setting of "Function" and "Applies To" to the current programmable input. When the Apply button is enabled, this indicates that the setting of "Function" and "Applies To" in the AM16/12 does not match the setting of "Function" and "Applies To" shown on the control panel screen. Clicking the Apply button will load the control panel setting into the active AM16/12 setup. This does not store the changes to a memory preset! That must be done explicitly from the File/Save Active to AM16/12 Preset... file menu option. If changes are made to a programmable input but not applied (by clicking on the Apply button), and another programmable input is selected (by clicking another of the Select Programmable Input buttons), all the changes to the first programmable input which were not applied will be lost.

Programmable Input Functions:

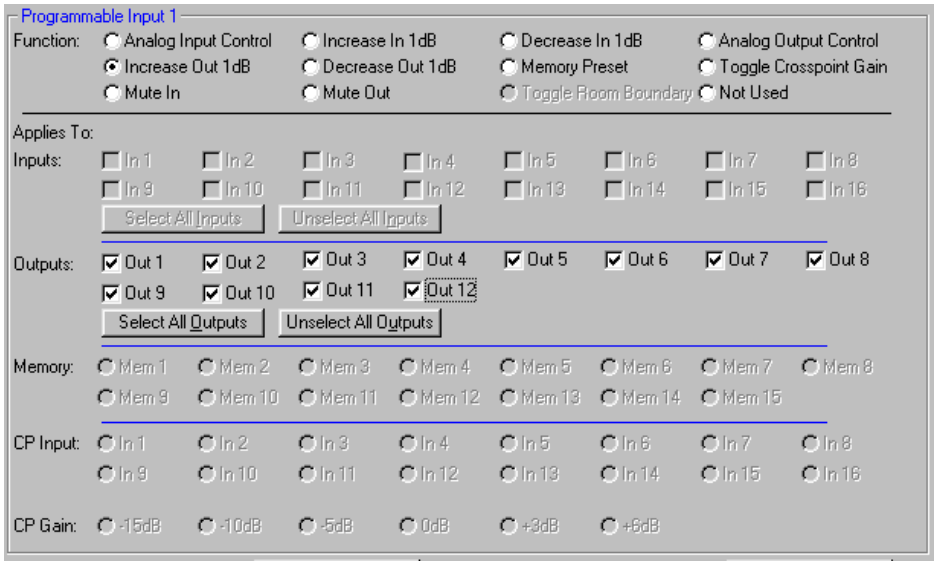
Analog In Control - Allows one or more input gains to be controlled by an analog voltage on a programmable input pin. Analog input gain control goes from a maximum of 0dB gain to a minimum of 30dB attenuation, plus "Off". The gain change resolution is 1dB. The Analog In Control mode is ideal for using a pot (or some other source of analog voltage) to control input gain. The valid voltage range in the Analog In mode is 0VDC to 5VDC. 0VDC corresponds to "Off" (or Rear Panel Minimum Input Gain, if it is programmed for less attenuation than "Off"), and +5VDC corresponds to 0dB. In addition, a SPST toggle switch may be used as a mute switch. Connect the two switch contacts to the programmable input pin and ground. The inputs will be muted when the contacts are closed. The screen shown to the right indicates that the function of programmable input 1 is analog input control of inputs 1, 2, 3, 5, and 7. Notice how multiple inputs may be controlled by a single programmable input.



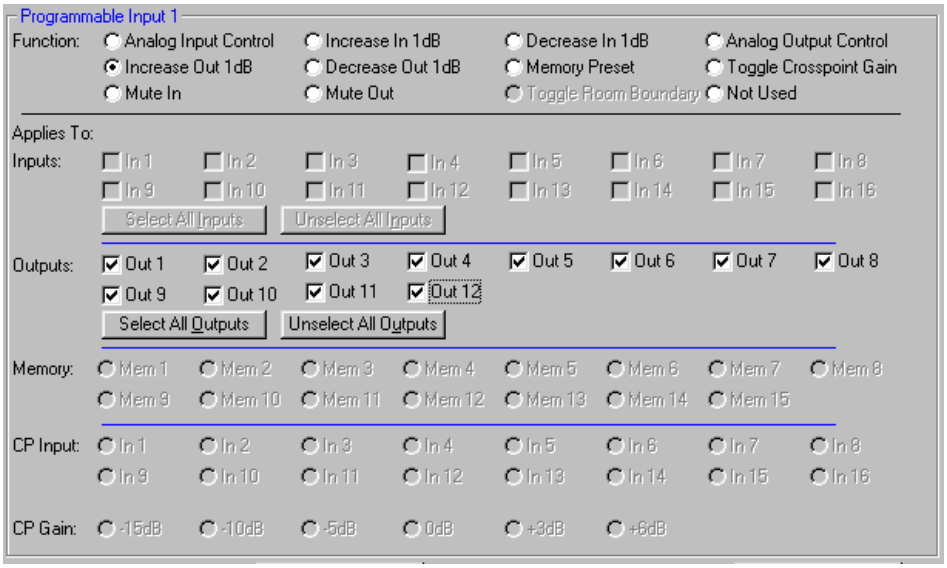
Increase In 1dB / Decrease In 1dB - Allows one or more input gains to be controlled by a contact closure on a programmable input pin. Increase and Decrease input gain control goes from a maximum of 0dB gain to a minimum of 30dB attenuation, plus "Off". The gain change resolution is 1dB. In the case of Increase In 1dB, each contact closure will increment the input(s) gain by 1dB until 0dB is reached. Decrease In 1dB will decrement the input(s) gains by 1dB until either "Off" or Rear Panel Minimum Input Gain is reached. If the contact closure is pushed and held, it will continue to increment or decrement until it is released or the gain reaches its high or low limit. The screen shown to the right indicates that the function of programmable input 1 is Increase In 1dB control of inputs 1, 2, 3 and 7.



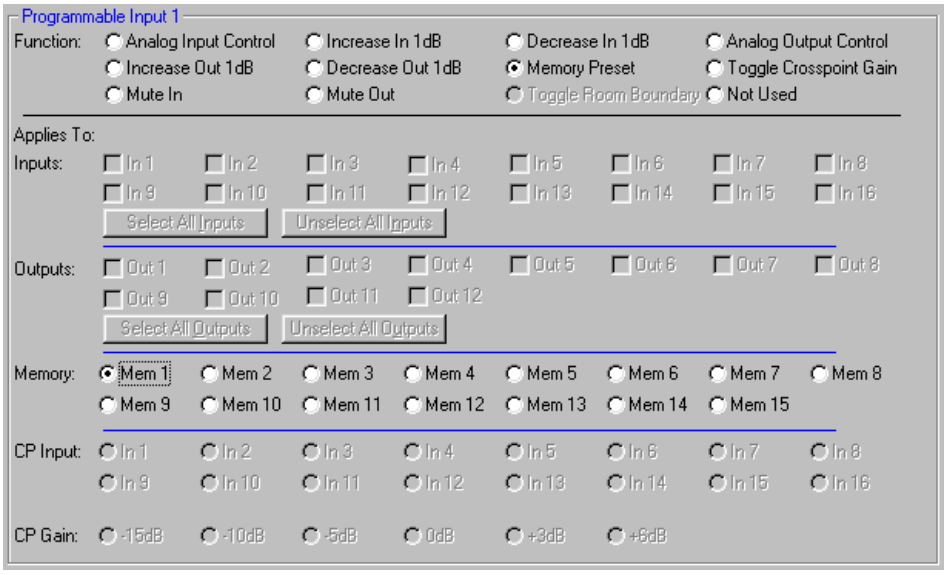
Analog Out Control - Allows one or more output gains to be controlled by an analog voltage on a programmable input pin. Analog output gain control goes from a maximum of 0dB gain to a minimum of 30dB attenuation, plus "Off". The gain change resolution is 1dB. The Analog Out mode is ideal for using a pot (or some other source of analog voltage) to control output gain. The valid voltage range in the analog output mode is 0VDC to 5VDC. 0VDC corresponds to "Off" (or Rear Panel Minimum Output Gain, if it is programmed for less attenuation than "Off"), and +5VDC corresponds to 0dB. In addition, a SPST toggle switch may be used as a mute switch. Connect the two switch contacts to the programmable input pin and ground. The outputs will be muted when the contacts are closed. The screen shown to the right indicates that the function of programmable input 1 is analog output control of all outputs simultaneously.



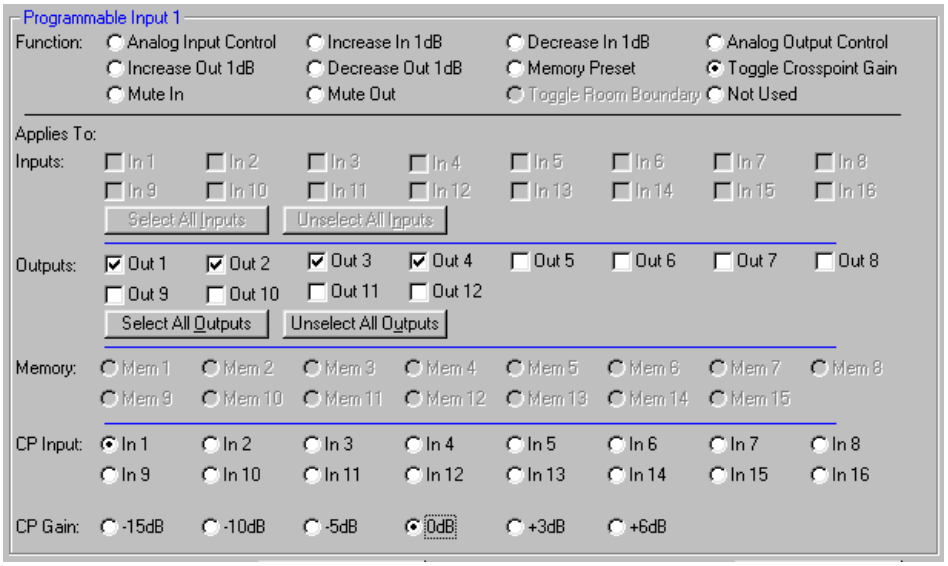
Increase Out 1dB / Decrease Out 1dB - Allows one or more output gains to be controlled by a contact closure on a programmable input pin. Increase and Decrease output gain control goes from a maximum of 0dB gain to a minimum of 30dB attenuation, plus "Off". The gain change resolution is 1dB. In the case of Increase Out 1dB, each contact closure will increment the output(s) gains by 1dB until 0dB is reached. Decrease Out 1dB will decrement the output(s) gains by 1dB until either "Off" or Rear Panel Minimum Output Gain is reached. If the contact closure is pushed and held, it will continue to increment or decrement until it is released or the gain reaches its high or low limit. The screen shown to the right indicates that the function of programmable input 1 is Increase Out 1dB control of all outputs.



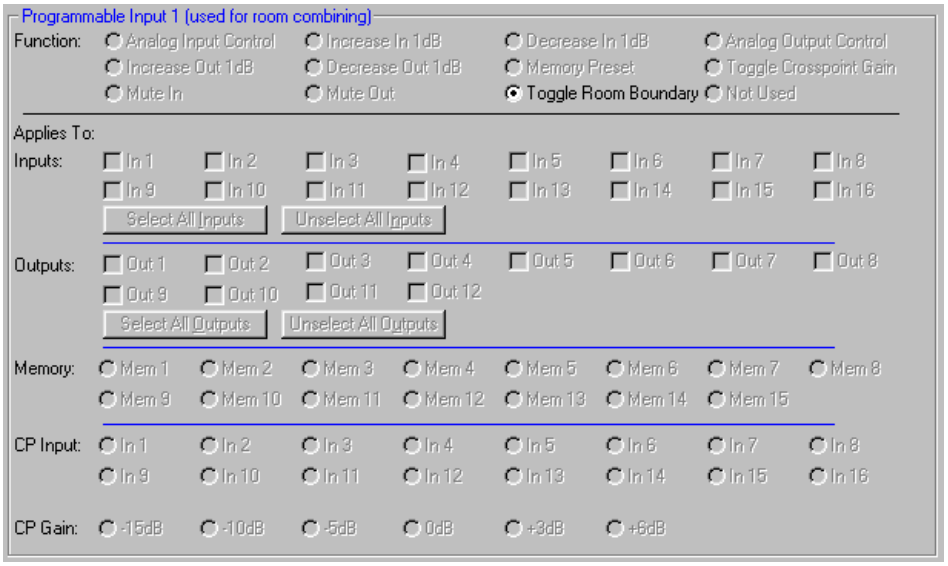
Memory Preset - Allows one of the 15 AM16/12 memory presets to be recalled by a momentary contact closure on a programmable input pin. If you are using two or more programmable inputs for memory recall, you will want to set up and apply all programmable input/memory preset associations and download the active setup to all preset memories you'll be using. This guarantees that the desired programmable input/memory preset associations are stored in all memories of interest. The screen to the right indicates that the function of programmable input 1 is to recall AM16/12 Memory Preset 1.



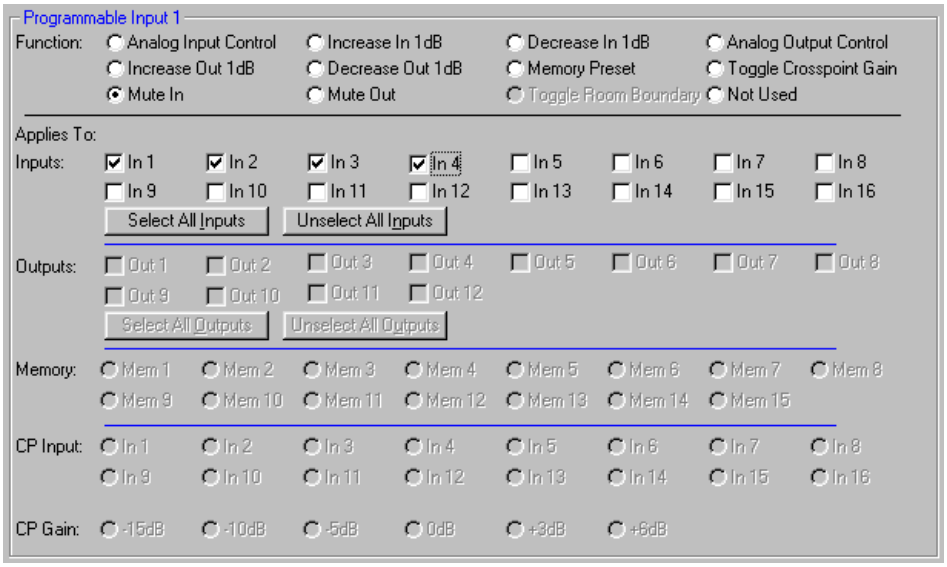
Toggle Crosspoint Gain - Allows for a temporary matrix connection to be made between one input and any combination of outputs, at any one of the available crosspoint matrix gains. The first momentary contact closure on the programmable input pin will make the specified input-to-output(s) connection, and the next momentary contact closure will remove the connection. No matrix crosspoints other than the ones specified are changed. This toggling of input-to-output(s) connections is ideal for applications such as single or multi zone paging, or other situations where a temporary matrix connection is needed rather than a full memory preset recall. The screen to the right shows input 1 being routed to outputs 1, 2, 3, and 4 with a crosspoint gain of 0dB. This could be a multi-zone page setup using input 1 as the paging microphone input.



Toggle Room Boundary - Allows room boundaries (in room combining applications) to be combined. This option is not changeable from the Programmable Inputs tab, but is shown for reference in the tab. You'll notice that the frame caption changes to include the phrase "(used for room combining)" as a reminder that this programmable input cannot be changed in this tab. The toggle room boundary function is set in the Room Combining tab. Note that the specific room boundary associated with the programmable input is also shown on the Room Combining tab. The screen to the right shows a programmable input used to toggle a room boundary.



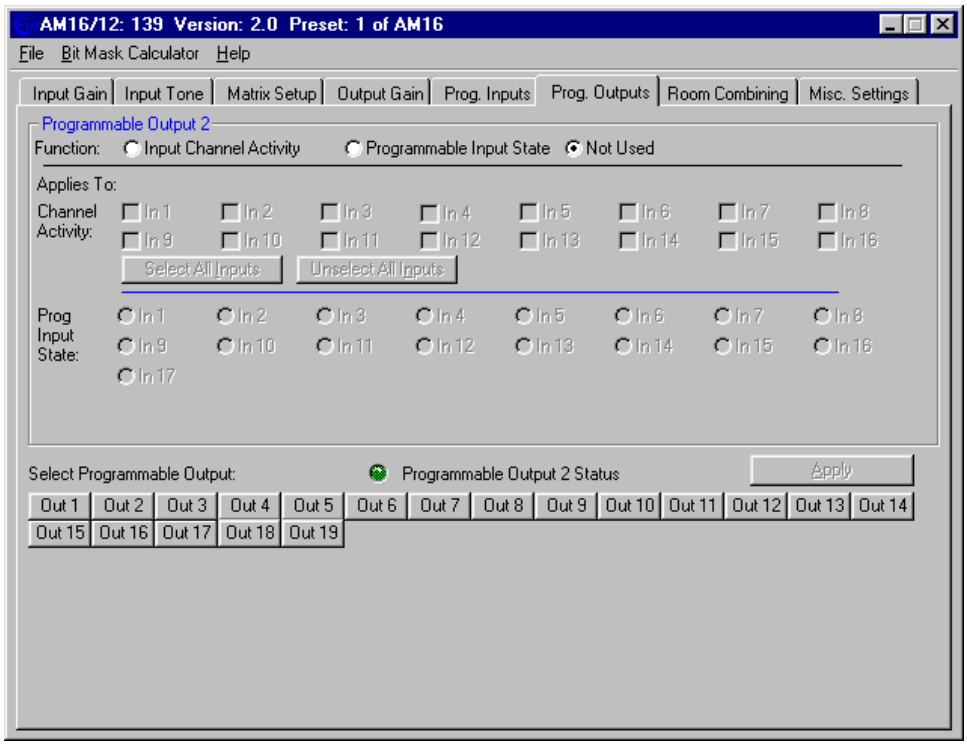
Mute In / Mute Out - Allows one or more inputs (Mute In) or outputs (Mute Out) to be temporarily muted. The first momentary contact closure on the programmable input pin will mute the specified input(s) or output(s), and the next momentary contact closure will unmute them. The screen to the right shows that programmable input 1 is set to mute inputs 1, 2, 3, and 4.



Not Used - Deactivates a programmable input such that there will be no action associated with it.

Prog. Outputs Tab

The AM16/12 has 19 programmable outputs (available on the 25 pin D-Sub connector on the rear panel) which can indicate either channel activity or the current state of a programmable input. Each programmable output is an electronic "contact closure" to ground. The contact is closed when the programmable output is active, and open when it is not.



Only the parameters in the "Applies To" section which are associated with each specific programmable output function will be enabled as you select different functions. All other parameters are disabled. This eliminates invalid Function/ Applies To settings. Each of the available functions is explained below. Note that you should use the Select Programmable Output buttons to select the programmable output you'd like to configure before doing any configuration.

Hint: If the function (or any associated channels or programmable inputs) of a programmable output is changed on the control panel, the Apply button will be enabled. The Apply button is located in the lower right hand corner of the Programmable Outputs tab. The Apply button must be clicked before any changes are actually applied to the active AM16/12 setup.

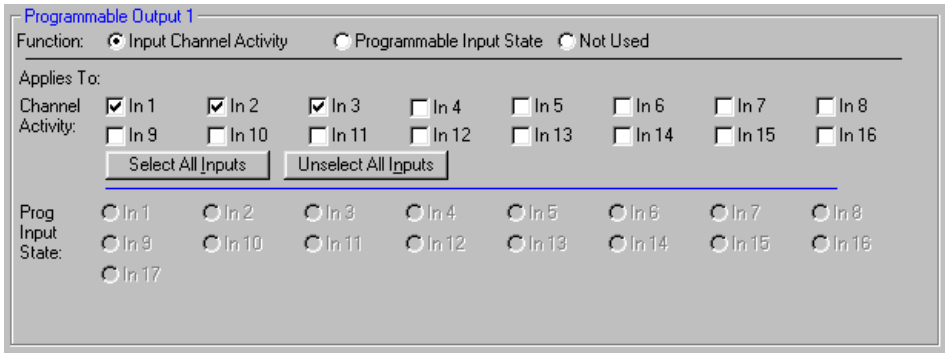
Select Programmable Output Buttons 1-19 - Allows selection of which programmable output to change. Note that the frame caption "Programmable Output ..." (upper left in blue) will change to indicate the programmable output currently being changed.

Programmable Output Status "LED" - Shows the current state of a programmable output. If the programmable output function is set to "Channel Activity", the LED will light any time any of the associated input channel(s) are active. If the programmable output function is set to "Programmable Input State", LED activity should be interpreted using the information below:

Function	State when LED On	State when LED Off
Analog In Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase In 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease In 1dB:	Contact closure on prog input	No contact closure on prog input
Analog Out Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase Out 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease Out 1dB:	Contact closure on prog input	No contact closure on prog input
Memory Preset:	Associated memory is active	Associated memory is not active
Toggle Crosspoint Gain:	Input-to-output(s) connection made	Input - output(s) connection not made
Mute In:	Associated input(s) not muted	Associated input(s) muted
Mute Out:	Associated output(s) not muted	Associated output(s) muted

Apply Button - Applies the current setting of "Function" and "Applies To" to the current programmable output. When the Apply button is enabled, this indicates that the setting of "Function" and "Applies To" in the AM16/12 does not match the setting of "Function" and "Applies To" shown on the control panel screen. Clicking the Apply button will load the control panel setting into the active AM16/12 setup. This does not store the changes to a memory preset! That must be done explicitly from the File/Save Active to AM16/12 Preset... file menu option. If changes are made to a programmable output but not applied (by clicking on the Apply button), and another programmable output is selected (by clicking on of the Select Programmable Output buttons), all the changes to the first programmable output which were not applied will be lost.

Programmable Output Functions:



Channel Activity - Allows the selected programmable output to indicate activity on one or more input channels. Anytime at least one of the inputs associated with a particular programmable output is active, the programmable output will be active. This is useful for initiating activities which must react to activity on specific channels. One example is video-follow-audio, where different cameras (or camera positions) must be activated based on channel activity. Note that on the Misc Settings tab, the input qualification time and output hold time may be set to optimize the time response of channel activity for various applications. The screen below shows programmable output 1 responding to activity on any of input channels 1, 2, or 3.

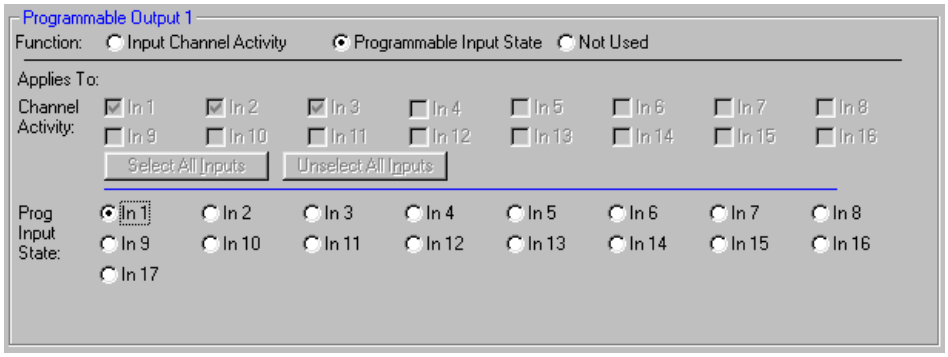
Programmable Input State - Allows the selected programmable output to indicate the current state of one of the programmable inputs. This is particularly useful when you need to supply user feedback for the state of a bistate programmable input. The programmable output may then be connected to a LED to show the state of the associated programmable input.

When the room combining capability of the AM16/12 is used, a logic output will automatically be associated with each Toggle Room Boundary programmable input. This will provide user feedback as to the combine status of each boundary between two rooms. You'll notice that the frame caption changes to include the phrase "(used for room combining)" as a reminder that this programmable output cannot be changed in this tab.

A programmable output whose function is Programmable Input State will be active (i.e. conducting to ground) or inactive (i.e. open) as follows depending on the function of the programmable input with which it is associated:

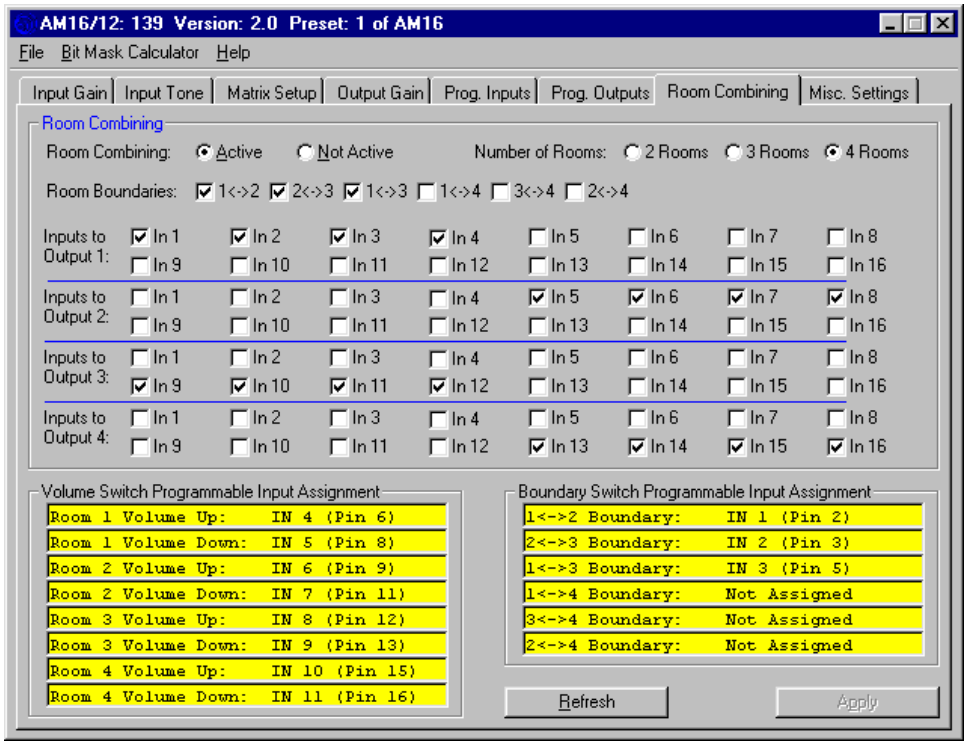
Function	State when LED On	State when LED Off
Analog In Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase In 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease In 1dB:	Contact closure on prog input	No contact closure on prog input
Analog Out Control	Attenuation < 15dB	Attenuation ≥ 15dB
Increase Out 1dB:	Contact closure on prog input	No contact closure on prog input
Decrease Out 1dB:	Contact closure on prog input	No contact closure on prog input
Memory Preset:	Associated memory is active	Associated memory is not active
Toggle Crosspoint Gain:	Input-to-output(s) connection made	Input - output(s) connection not made
Mute In:	Associated input(s) not muted	Associated input(s) muted
Mute Out:	Associated output(s) not muted	Associated output(s) muted

The screen below shows programmable output 1 indicating the status of programmable input 1.



Room Combining Tab

The AM16/12 has built-in room combining capability to support up to 4 rooms. Note that up to 8 rooms may be combined (using the 8 NOM busses available in the AM16/12), but control for setups larger than 4 rooms must be provided by an external controller such as an AMX or Crestron control system. Built-in support includes automatic configuration of room combining functions using some of the programmable inputs, which will automatically be assigned for room boundary connecting and volume control. Note that any programmable inputs used for room combining are **not** available for general use. Programmable outputs will automatically be assigned to reflect the status of the room boundaries (i.e. connected or not connected). **These assignments will take priority over any other programmable input and output assignments.**



Room combiner settings will overwrite other settings made on other sources when the "Active" button is selected.

The programmable input and output assignments will be reflected in the Prog Inputs and Prog Outputs tabs, but they can not be changed there. Outputs 1 through 4 are dedicated for use as the audio feeds for up to four sub-rooms.

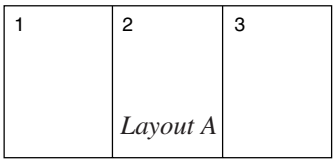
A room boundary is simply a movable partition between two rooms which is removed when the two rooms are combined. When the AM16/12 "connects" two or more rooms, it automatically associates all the mic/line inputs which are physically located in the combined rooms with one NOM bus. This essentially creates one automatic mixing system out of all of the mics in the combined rooms. When the rooms are subsequently uncombined, the NOM bus associations will be separated automatically as well. The AM16/12 also intelligently manages the volume controls in each room, and combines their functions as rooms are combined together.

It is important to note that the room combining parameters which you set in the Room Combining tab are stored in the AM16/12 as global presets. This means that the room combining scenario you set up will be the same regardless of the particular AM16/12 preset memory which is active. The only exception to this is the Active/Not Active status of room combining. This status value is unique to each preset memory. The result is that preset memory 1 might be set for room combining active, and this would be your room combining setup. Preset memory 2 could be set for room combining not active, in which case you can use the AM16/12 in any way that meets your needs.

The following section describes in detail each of the programmable room combining functions.

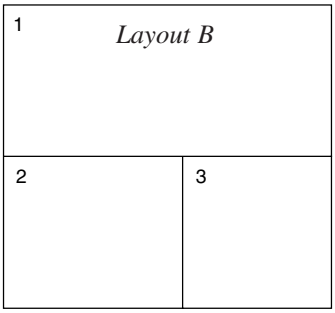
Room Combining Active / Not Active - Sets the status of the entire room combining system. In the Active mode, the AM16/12 is set to implement the room combining function. Programmable inputs are automatically assigned for room boundary connecting and volume control. Programmable outputs are assigned to reflect the status of the room boundaries (i.e. connected or not connected). The programmable input and output assignments are reflected in the Prog Inputs and Prog. Outputs tabs, but they can not be changed there.

Number of Rooms - Allows the selection of the total number of rooms in the uncombined state. One of the three selections must be made in order for the Apply button to function. Both room boundary and input-to-output selections will be enabled based on the number of rooms selected.



Room Boundaries - Allows the selection of the combinable boundaries based on the physical layout of the rooms. Consider room layouts A and B as shown:

Layout A requires you to select the 1<->2 and 2<->3 Room Boundary options, since there are only two combinable boundaries. Layout B has one more boundary because of the different physical layout. In this case, you would select the 1<->2, 2<->3, and 1<->3 Room Boundary options, as the layout introduces the extra boundary between room 1 and room 3.



Inputs-to-Outputs - Allows the assignment of inputs to the output connected with each uncombined room. The inputs are assigned to outputs based on the physical location of the inputs drop in the uncombined rooms. For example, all input drops physically located in Room 1 should be assigned to Output 1. Similarly, Room 2 input drops should be assigned to Output 2, etc.

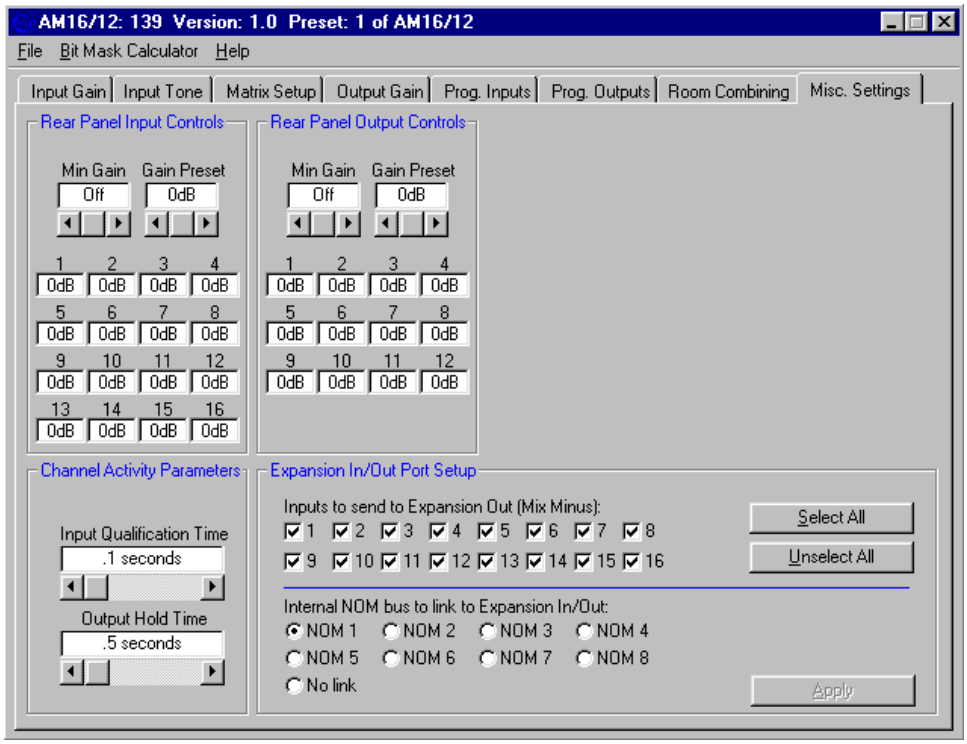
Volume Switch Programmable Input Assignment - Shows the assignment of programmable input pins made by the AM16/12 control panel for room volume control. For each room, you'll see a Volume Up and Volume Down line. This line includes the programmable input number assignment, as well as the actual pin number on the 25 pin Programmable Inputs D-sub connector on the rear panel.

Simple momentary contact switches from the specified programmable input to ground will allow user adjustment of the room volume. When rooms are combined, all volume control switches in the combined room affect the volume of all rooms in the combined room.

Boundary Switch Programmable Input Assignment - Shows the assignment of programmable input pins made by the AM16/12 control panel for room boundary connection switches. For each boundary you've selected, you'll see a line. This line includes the programmable input number assignment, as well as the actual pin number on the 25 pin Programmable Inputs D-sub connector on the rear panel. Simple momentary contact switches from the specified programmable input to ground will allow user connection and disconnection of rooms. Note that when the control panel makes the boundary switch assignments, it automatically makes programmable output assignments for each of the programmable inputs which are boundary switches. These may be used to drive LED indicators located near the combine switches to give the user feedback about the state of a particular room boundary.

Misc Settings Tab

The Misc Settings tab allows various AM16/12 parameters to be set.



Rear Panel Input Controls - Allows the rear panel input gain (i.e. any gain control using programmable inputs) control adjustment range to be set to safe levels for user adjustment. The maximum adjustment range of the rear panel input control goes from 0dB to -30dB (in 1dB steps) plus Off. The Min Gain scroll bar allows the gain adjustment range below 0dB to be limited as needed for the application. "Off" signifies no lower gain limit. 0dB is the maximum value available for Min Gain, and is equivalent to making rear panel input control inactive. The Gain Preset scroll bar allows a preset gain to be applied at power on to any input(s) controlled by the Increment Input 1dB or Decrement Input 1dB programmable input function. The control panel will always force the Gain Preset to be greater than or equal to the Min Gain. The 12 boxes below the scroll bars show the current rear panel input gain setting for each input.

Short Cuts: A left mouse click on the Min Gain box will set the minimum gain to Off (i.e. no limit on the minimum gain), while a right mouse click will set the minimum gain to 0dB.

Rear Panel Output Controls - Allows the rear panel output gain (i.e. any gain control using programmable inputs) control adjustment range to be set to safe levels for user adjustment. The maximum adjustment range of the rear panel output control goes from 0dB to -30dB (in 1dB steps) plus Off. The Min Gain scroll bar allows the gain adjustment range below 0dB to be limited as needed for the application. "Off" signifies no lower gain limit. 0dB is the maximum value available for Min Gain, and is equivalent to making rear panel output control inactive. The Gain Preset scroll bar allows a preset gain to be applied (at power on or when subrooms are combined or uncombined) to any output(s) controlled by the Increment Output 1dB or Decrement Output 1dB programmable input function. The control panel will always force the Gain Preset to be greater than or equal to the Min Gain. The 12 boxes below the scroll bars show the current rear panel output gain setting for each output.

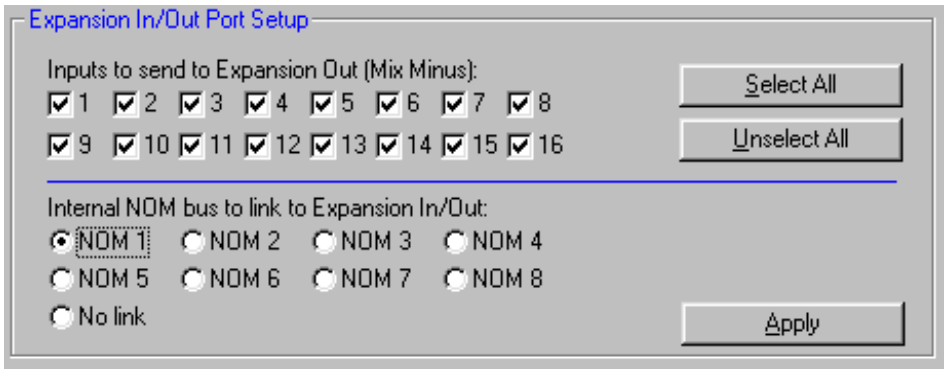
Short Cuts: A left mouse click on the Min Gain box will set the minimum gain to Off (i.e. no limit on the minimum gain), while a right mouse click will set the minimum gain to 0dB.

Channel Activity Parameters - These two parameters affect both the front panel LED Channel Activity display and the programmable output channel activity function. The input qualification time setting is the time that an input must have signal present continuously (at a level high enough to force the automatic mixing attenuation value for the channel to less than -6dB) before the AM16/12 will activate the Channel Activity LED or a programmable output programmed to respond to activity on that channel. The output hold time setting determines the length of time after signal is no longer present on an input that the Channel Activity LED or programmable output programmed to respond to activity on that channel will continue to be active. These two controls used together allow complete adjustment of the dynamics of the channel activity function. This is particularly helpful for applications like video-follow-audio, where video cameras are switched on based on channel activity. The input qualification time may be increased to reduce channel activity sensitivity to transient audio events like coughs. Increasing the output hold time allows the camera to stay on a talker even during pauses in speech.

Expansion In/Out Port Setup - Allows any combination of the 16 input channels to be routed to the mix minus audio bus of the rear panel Expansion Input port. This signal is typically used by the TH3A (for teleconferencing and video conferencing applications) or the TA1 (for video conferencing applications) as the near end signal to be sent to the far end. In addition, the Expansion In NOM bus may be set to participate in any of the 8 internal NOM busses. This is also important when teleconferencing or video conferencing to allow the far end signal to participate in the automatic mixing algorithm. This very effectively suppresses acoustic echo.

Shown below is the proper setup for teleconferencing or video conferencing assuming all 16 inputs are near end microphones to be sent to the far end, and further that all inputs are associated with AM16/12 NOM bus 1 (see the Input Gain tab to establish these associations).

Notice that all the Input boxes are checked, which will send the signals from all inputs to the Expansion In Mix Minus pin. In addition, since all the inputs are associated with AM16/12 NOM bus 1, the Expansion port should be also. The Apply button must be clicked before any of the changes made in the Expansion In/Out Port Setup frame will be active.



TROUBLESHOOTING

Here are a few tips for diagnosing problems:

1) If you get no sound (and the AM16/12 power is on), first check the Input Gain tab. If the number in the Gain box is too low, you might want to turn it up a bit. If the Gain box has a red background, it means the input has been muted. This is only possible from the programmable inputs. If you have any programmable inputs assigned (deliberately or otherwise) to the Mute In function, now is a good time to check the state of those programmable inputs using the Programmable Inputs tab. If either the front or rear panel controls for the input are set to off, you'll get no sound. The current gain value associated with these controls can be monitored using the Miscellaneous Settings tab. If all is well with all the input gain adjusting points, you should see some activity on the input level meter when signal is present on an input.

2) If you see activity on the front panel LEDs, but you still don't have any sound. Check the Matrix Setup tab to be sure that the input is actually assigned to the desired output(s). If it looks like the input is assigned as it should be, click the Ref (refresh) button on the Matrix Setup tab. This will upload the current state of matrix crosspoint gains to the display. Since certain programmable input actions can change the state of the matrix, a refresh is always a good idea.

3) If the matrix is just where it ought to be, but you still don't hear anything, look at the Output Gain tab. Again, if the Gain box has a red background, it means the output has been muted. This is only possible from the programmable inputs. If you have any programmable inputs assigned (deliberately or otherwise) to the Mute Out function, check the state of those programmable inputs using the Programmable Inputs tab. If either the front or rear panel controls for the output are set to off, you'll get no sound. The current gain value associated with these controls can be monitored using the Misc. Settings tab.

4) If you still don't have any sound, you should check out your microphone wiring and the wiring from your AM16/12 to the EQ or power amp. Also check to see that the power is on to all the other equipment in the rack. If everything seems to be as it should, but you still get no sound, give us a call at 1-800-821-1121 or 505-892-4501 between 8am and 5pm Mountain Time. We'll be happy to help you troubleshoot.

FCC PART 15 NOTICE

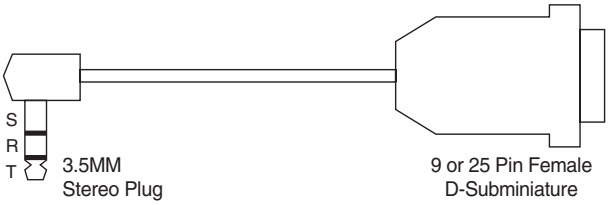
This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

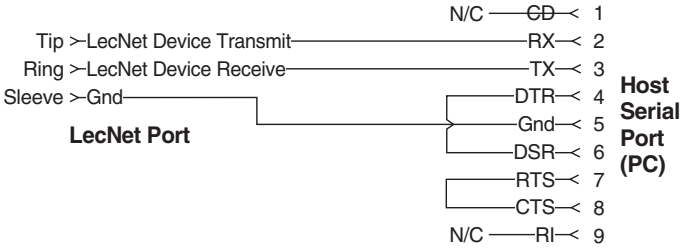
SERIAL CABLE WIRING DIAGRAMS

The serial port on the AM16/12 is a minimal RS-232 implementation. The figure shows the wiring diagram to accommodate interconnection with either a 9 or a 25 pin serial port on a PC or other serial device.

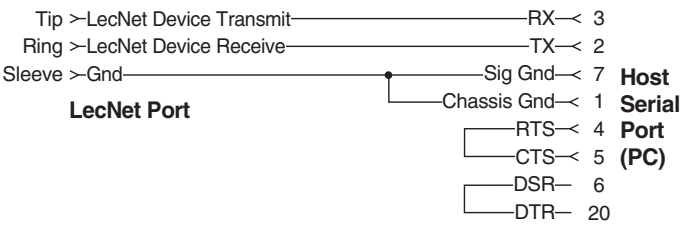
LecNet Device to PC



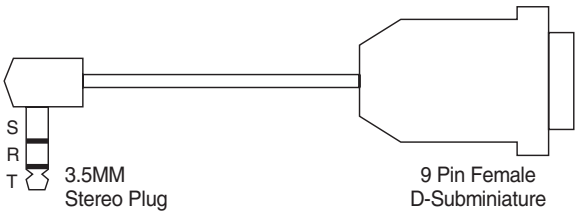
Wiring Diagram, 9 Pin D-Sub

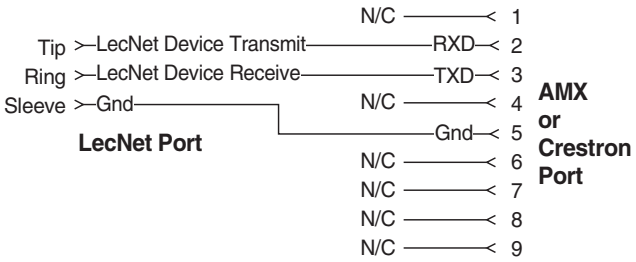


Wiring Diagram, 25 Pin D-Sub



LecNet Device to AMX or Crestron





AMX Programming Notes

If you are using an AMX system to control your LecNet equipment, you'll want to purchase the Lectrosonics PT3 Protocol Translator. The PT3 connects between the AMX bus and any LecNet equipment. With the PT3, the LecNet equipment behaves like native AMX equipment. The PT3 is the fastest and most productive way to control LecNet devices with an AMX system.

SERIAL PORT COMMANDS AVAILABLE

All LecNet devices use a modification of the typical one-to-one connection between two RS-232 compatible devices. LecNet devices have both an RS-232 transmitter and receiver section. The transmitter section is "tri-stated", or placed in a high impedance mode, until the particular device is addressed. To facilitate the simple parallel connection of multiple devices on a single RS-232 port, an addressing scheme is employed to route commands from the host to the proper LecNet device. When a device receives its address from the host computer, it temporarily turns on its RS-232 transmitter long enough to send whatever data is requested by the host. In this way, multiple devices may drive a single transmit signal back to the host, because only the addressed device will turn on its transmitter.

Valid address values are 128-254 (80 hex-FE hex). Address 255 (FF hex) is reserved and must not be used. Because a LecNet device will interpret any single data byte whose value is greater than 127 as an address, single byte data (as opposed to addresses) sent from the host must be in the range of 0-127. If a data value needs to be sent from the host that exceeds 127, the host must format two bytes of output such that the first byte is the lower 7 bits of the 8 bit value, and the second byte is 1 if the MSB of the data byte is 1, or 0 if the MSB of the data byte is 0.

All interchange of commands and data with any LecNet device should be done in hex rather than ASCII. The only exception to this is the return data on the Get Device Name command (see command description below).

Each LecNet command must be preceded by the address of the device to be controlled. If a device with the requested address exists on the system, it will respond by sending a 0 (0 hex, not ASCII) back to the host. Some serial controller devices may simply send commands and data to a LecNet device and have no need to receive data. In this case, step 2 below is replaced by a minimum 25 millisecond wait. This wait is necessary to insure that the addressed LecNet device is "listening" and can respond to the command. Thus, each interchange with a LecNet device follows this pattern:

1) Host sends device address in hex (1 byte);
2) Host receives byte of 0 hex from the LecNet device as acknowledgment;
3) Host sends command (1 byte, hex) to the LecNet device;
4) Host and LecNet device exchange data based on particular command sent.

Note that some LecNet commands cause LecNet devices to return an additional acknowledgment byte of data to confirm the end of a transaction. This is most typical of commands that cause the LecNet device to be busy for more than a few milliseconds processing the command. The additional acknowledgment byte lets the host know that the LecNet device is no longer busy and can receive more commands. If a command does return an additional acknowledgment byte, this will be explicitly stated in the command description.

As an example of a specific interchange between a host and an AM16/12 the following general procedure would be used to get a name string back from an AM16/12:

Set up the communications parameters of the device which will be the host. The correct parameters for all LecNet devices are 9600 baud, no parity, 8 data bits, 1 stop bit. This must only be done once when the host is initialized.

1) Host sends device address. For a factory default AM16/12, this would be 139, or 8B hex (1 byte);
2) Host receives byte of 0 hex from the AM16/12 as acknowledgment;
3) Host sends command 1 hex (1 byte) to the AM16/12 to get the name data;
4) The LecNet device sends to the host 7 bytes. The first byte is 6 hex, which is the number of bytes in the AM16/12's name string. The AM16/12 will then send the ASCII characters "A", "M", "1", "6" , "1" and "2" to the host.

The following section is a listing of available commands grouped based on the AM16/12 function to which the commands are related. The word "Host" in the command descriptions means the IBM PC or compatible, AMX controller, or Crestron controller to which the AM16/12 is connected. If you are using an AMX system to control your LecNet equipment, you'll want to purchase the Lectrosonics PT3 Protocol Translator. The PT3 connects between the AMX bus and any LecNet equipment. With the PT3, the LecNet equipment behaves like native AMX equipment. The PT3 is the fastest and most productive way to control LecNet devices with an AMX system. Crestron has macros available on their website for Lectrosonics equipment at http://www.crestron.com.

The following commands are described from the perspective of the host. A "Get" command allows the host to receive information from the AM16/12. A "Set" command allows the host to send information to set some parameter in the AM16/12. All commands and data have both the decimal values and hex values noted in the command description.

General Device Commands

Get Name String - Gets the AM16/12's "name" string. The first data byte is the length of the name string, and the rest of the data bytes are the device name.
Host sends command - 1 (1 hex)
Host receives 7 bytes: Byte 1 is the length of the name string (6 for the AM16/12), bytes 2 - 7 are the ASCII values for "AM1612" (65, 77, 49, 54, 49, 50).

Set Device Address - Sets the AM16/12's device address and stores the new address in nonvolatile memory.
Host sends command - 2 (2 hex)
Host sends 1 byte: device address, valid range 128 to 254.

Get Firmware Version - Returns the version number of the AM16/12's current firmware. For example, Version 1.0 software would be returned as 10 (decimal).
Host sends command - 25 (19 hex)
Host receives 1 byte: firmware version.

Memory Preset Commands

Get Current Memory Preset - Gets the currently active AM16/12 memory preset value.
Host sends command - 21 (15 hex)
Host receives 1 byte: current memory preset, 0 - 14 representing memory presets 1 - 15.

Set Current Memory Preset - Sets the AM16/12's current memory preset. The AM16/12 will immediately set all of its programmable parameters to the new memory preset. The mode byte gives the option of memory recall with or without affecting the current settings of front and rear panel gain.
Host sends command - 22 (16 hex)
Host sends 2 bytes:

Byte 1: New memory preset, 0 - 14 (0-E hex) representing memory presets 1 - 15.
Byte 2: Mode, 0 resets the rear panel gain to the programmed preset value, and 1 does not change the current rear panel gain.

Input Related Commands

Get Input Gain - Gets the input gain associated with any one input or all 16 inputs. This gain value is the same one you can manipulate from the Input Gain tab on the AM16/12 control panel.
Host sends command - 31 (1F hex)
Host sends 1 byte: input number to return, 0 - 15 (0-F hex) returns the single gain value from inputs 1 - 16, while 16 (10 hex) returns 16 bytes representing the input gain of all inputs, starting with input 1.
Host receives 1 or 16 bytes: input gain(s), 0 - 79 (0-4F hex), where 0-78 represents +15dB to -63dB, and 79 (4F hex) is off. If the input gain value is greater than 127 (7F hex), this means the input is muted. The unmuted gain may be derived by subtracting 128 (80 hex) from the returned value.

Set Input Gain - Sets the input gain of 1 or more input channels.

Host sends command - 30 (1E hex)

Host sends 5 bytes:

Bytes 1-4: 16 bit mask, where each bit position represents one of the 16 inputs. For example, the lowest bit of the mask represents input 1, the next lowest bit input 2, and so on. The 16 bit mask is broken into 4 bytes as follows:

Byte 1: Bits 0 - 6 of the mask (in the low 7 bits of the byte)
Byte 2: Bit 7 of the mask (positioned in the LSB of the byte)
Byte 3: Bits 8 - 14 of the mask (in the low 7 bits of the byte)
Byte 4: Bit 15 of the mask (positioned in the LSB of the byte)

A "1" in a bit position will apply the gain in byte 5 to the associated channel, while a "0" in a bit position will not apply the gain to the associated channel.

Byte 5: Input gain value, 0 - 78 (0-4E hex), which represents +15dB to -63dB, 79 (4F hex) for off, 80 (50 hex) to increment the current gain by 1dB, 81 (51 hex) to decrement the current gain by 1dB, 82 (52 hex) to mute the input, and 83 (53 hex) to unmute it to its pre-mute gain value.

Get NOM Bus Association - Gets the number of the NOM bus to which any one or all of the inputs are associated.

Host sends command - 47 (2F hex)

Host sends 1 byte: input number to get NOM bus association for, 0 - 15 (0-F hex) (representing inputs 1 - 16) to return the NOM bus associated with that input, or 16 (10 hex) to return all 16 NOM bus associations, starting with input 1.

Host receives 1 or 16 bytes: NOM bus association for one input or all inputs, depending on the value of the previous byte sent. NOM bus values are 0 - 7 (for NOM busses 1 - 8) or 8 if the input is not associated with any NOM bus.

Set NOM Bus Association - Sets the number of the NOM bus to which any one or all of the inputs are associated.

Host sends command - 46 (1E hex)

Host sends 2 or 17 bytes:

Byte 1: Input number, 0 - 15 or 16
Bytes 2-17: If byte 1 is 0 - 15 (0-F hex), only byte 2 should be sent. If byte 2 is 16 (10 hex), all 16 NOM values should
be sent. NOM values are 0 - 7 (for NOM busses 1 - 8) or 8 if the input is not associated with any NOM bus.

Get Input Activity Status - Gets the current status (i.e. active or inactive) of the 16 inputs. Active means that the attenuation applied to the input by the automix algorithm is less than or equal to 6dB. Note that the input activity status is conditioned by the input qualification time and the output hold time, which may be set in the Miscellaneous Settings tab of the AM16/12 control panel application.

Host sends command - 20 (14 hex)

Host receives 2 bytes:

Byte 1: Input activity for channel 1 - 8, packed in one byte such that the LSB of the byte corresponds to input 1 and the MSB corresponds to input 8.
Byte 2: Input activity for channel 9 - 17, packed in one byte such that the LSB of the byte corresponds to input 9 and the MSB corresponds to input 16.

Output Related Commands

Get Output Gain - Gets the output gain associated with any one output or all 12 outputs. This gain value is the same one you can manipulate from the Output Gain tab on the AM16/12 control panel.
Host sends command - 61 (3D hex)
Host sends 1 byte: output number to return, 0 - 11 (0-B hex) returns the single gain value from outputs 1 - 11, while 12 (C hex) returns 12 bytes representing the output gain of all outputs, starting with output 1.
Host receives 1 or 12 bytes: output gain(s), 0 - 79, where 0-78 represents +10dB to -68dB, and 79 is off. If the output gain value is greater than 127, this means the output is muted. The unmuted gain may be derived by subtracting 128 from the returned value.

Set Output Gain - Sets the output gain of 1 or more input channels.
Host sends command - 60 (3C hex)
Host sends 5 bytes:

Bytes 1-4: A 12 bit mask, where each bit position represents one of the 12 outputs. For example, the lowest bit of the mask represents input 1, the next lowest bit input 2, and so on. The 12 bit mask is broken into 4 bytes as follows:

Byte 1: Bits 0 - 6 of the mask (in the low 7 bits of the byte)
Byte 2: Bit 7 of the mask (positioned in the LSB of the byte)
Byte 3: Bits 8 - 11 of the mask (in the low 4 bits of the byte)
Byte 4: 0

A "1" in a bit position will apply the gain in byte 5 to the associated output, while a "0" in a bit position will not apply the gain to the associated output.

Byte 5: Output gain value, 0 - 78 (0-4E hex), which represents +10dB to -68dB, 79 (4F hex) for off, 80 (50 hex) to increment the current gain by 1dB, 81 (51 hex) to decrement the current gain by 1dB, 82 (52 hex) to mute the input, and 83 (53 hex) to unmute it to its pre-mute gain value.

Matrix Crosspoint Commands

Get Crosspoint Gain - Gets the gain associated with a particular matrix crosspoint.
Host sends command - 81 (51 hex)
Host sends 2 bytes:

Byte 1: Input associated with the desired crosspoint. 0 - 17 (0-11 hex), where 0 - 15 corresponds to inputs 1 - 16, 16 (10 hex) corresponds to the Expansion In, and 17 (11 hex) corresponds to the internal noise source.
Byte 2: Output associated with the desired crosspoint. 0 - 11 (0-B hex) corresponds to outputs 1 - 12.
Host receives 1 byte: Crosspoint gain. 0 - 6, where 0 is off, 1 is -15dB, 2 is -10dB, 3 is -5dB, 4 is 0dB, 5 is +3dB, and 6 is +6dB.

Set Crosspoint Gain - Sets the gain associated with a particular matrix crosspoint.
Host sends command - 80 (50 hex)
Host sends 3 bytes:

Byte 1: Input associated with the desired crosspoint. 0 - 17 (0-11 hex), where 0 - 15 corresponds to inputs 1 - 16, 16 (10 hex) corresponds to the Expansion In, and 17 (11 hex) corresponds to the internal noise source.
Byte 2: Output associated with the desired crosspoint. 0 - 11 (0-B hex) corresponds to outputs 1 - 12.
Byte 3: Crosspoint gain. **Version 1.x:** 0 - 6, where 0 is off, 1 is -15dB, 2 is -10dB, 3 is -5dB, 4 is 0dB, 5 is +3dB, and 6 is +6dB. **Version 2.0 & higher:** Channels - 0 - 6, where 0 is off, 1 is -15dB, 2 is -10dB, 3 is -5dB, 4 is 0dB, 5 is +3dB, and 6 is +6dB. Expansion In/Noise (fewer settings are available): where 0 is off, 2 is -10dB, 4 is 0dB and 5 is +3dB.

Set Multiple Input Crosspoint Gains to One Output - Sets the crosspoint gain from any combination of the 16 inputs to any one output to a specified gain.

Host sends command - 88 (58 hex)

Host sends 6 bytes:

Bytes 1-4: A 16 bit mask, where each bit position represents one of the 16 inputs. For example, the lowest bit of the mask represents input 1, the next lowest bit input 2, and so on. The 16 bit mask is broken into 4 bytes as follows:

Byte 1: Bits 0 - 6 of the mask (in the low 7 bits of the byte)
Byte 2: Bit 7 of the mask (positioned in the LSB of the byte)
Byte 3: Bits 8 - 14 of the mask (in the low 7 bits of the byte)
Byte 4: Bit 15 of the mask (positioned in the LSB of the byte)

A "1" in a bit position will apply the gain in byte 6 to the input/output crosspoint, while a "0" in a bit position will not change the crosspoint gain.

Byte 5: Output associated with the desired crosspoint(s). 0 - 11 (0-B hex) corresponds to outputs 1 - 12.

Byte 6: Crosspoint gain. 0 - 6, where 0 is off, 1 is -15dB, 2 is -10dB, 3 is -5dB, 4 is 0dB, 5 is +3dB, and 6 is +6dB.

Programmable Input Commands

Simulate a Programmable Input Button Push - Allows a function associated with a specific programmable input to be triggered just as if a contact closure on that programmable input had taken place. This command is particularly useful when using AMX or Crestron control systems, because very complex AM16/12 actions may be triggered by one serial command. The programmable input must first be programmed with the desired function using the Programmable Inputs tab on the AM16/12 control panel before this command is used.

Host sends command - 92 (5C hex)

Host sends 1 byte: Programmable input to trigger, 1 - 17 (1-11 hex)

Host receives 1 byte: 0D (hex) to acknowledge the simulated push

Programmable Output Commands

Get Programmable Output Current State - Gets the current state of one of the 19 programmable outputs. Returns a "1" or a "2", where 21 means the programmable output is active, and 1 means it is inactive. If the function assigned to the programmable output is "Input Channel Activity", then active implies that one or more of the 16 inputs associated with the programmable output is active. If the function assigned to the programmable output is "Programmable Input State", then active implies that the programmable input associated with the programmable output is active.

Host sends command - 106 (6A hex)

Host sends 1 byte: Programmable output whose state to return, 1 - 19 (1-13 hex).

Host receives 1 byte: Programmable output state, 1 or 2. 2 is active, 1 is inactive.

SPECIFICATIONS

Mic/Line Input

Type:	Electronically balanced and RF filtered
Impedance:	Greater than 2.5K, any gain setting
Input Gain Settings:	0dB, +30dB, +50dB
Input Gain Range:	+15dB to -63dB, plus mute
EIN, 20-20KHz:	–126dBu (+50dB gain)
Maximum Input Level:	+20dBu at 0dB gain –10dBu at +30dB gain –30dBu at +50dB gain
Tone Controls:	Lo-cut 6dB/octave @75 Hz, 90 Hz, 110Hz, 130 Hz, 190 Hz, 280Hz, 600 Hz Shelving high frequency control: Turnover frequency 1kHz +/– 3dB, +/– 6dB, +/– 8dB at 10 kHz

Line Outputs

Impedance:	Outputs 1-8: 200 ohms balanced, 100 ohms unbalanced; Outputs 9-12: Line mode - 520 ohms balanced, 260 ohms unbalanced. Mic mode - 125 ohms balanced or unbalanced
Output Gain Range:	+10dB to –68dB, 1dB steps, plus mute
Max output level:	+26dBu, 10k load in Line mode; –16dBu, 10k load in Mic mode

Matrix Crosspoints

Matrix Crosspoint Gain Settings

Versions 1.x:	–15dB, –10dB, –5dB, 0dB, +3dB, +6dB, off
Versions 2.0 & higher:	**Channels:** –15dB, –10dB, –5dB, 0dB, +3dB, +6dB, off
	Exp. In/Noise: –10dB, 0dB, +3dB, off

Programmable Inputs

Programmable Input Range:	0VDC - 5VDC
Analog Control:	0dB to –30dB plus off control range; 156mV/dB control sensitivity
Logic Control:	Active Low

Programmable Outputs

Logic Control:	Active low
Max sink current:	100 mA
Max supply voltage:	40VDC

Serial Communication (RS-232):	9600 baud, 8 data bits, no parity, 1 stop bit
Default LecNet address:	139
Maximum System Gain:	81dB (Input to Main Out)
System Frequency Response (0dBu in/out):	20Hz to 20kHz, +/– 1dB
System THD:	Less than 0.1%, any gain setting, 0dBu out
System IMD:	Less than 0.1%, any gain setting, 0dBu out
Phantom Power:	Selectable by channel, +15V, short circuit current 6.5mA each from the "+" and "–" inputs
Power Consumption:	25 Watts max at 16.5VAC (1.7A max.)
Weight:	7 lbs.
Dimensions:	19"wide x 3.5"high x 8"deep
Optional accessories:	- TA1 Line Level Adapter - RCW-VLS Remote Volume Control

Specifications subject to change without notice.

This product meets the CE Compliance Standards - EN55022 and EN50082-1:1998. A copy of the Declaration of Conformity may be requested from your dealer or by contacting the factory directly:

Lectrosonics, Inc.
Marketing Department
581 Laser Rd. NE, Rio Rancho, NM 87124 USA
tel: 505-892-4501 fax: 505-892-6243 e-mail: marketing@lectrosonics.com

SERVICE AND REPAIR

If your system malfunctions, you should attempt to correct or isolate the trouble before concluding that the equipment needs repair. Make sure you have followed the setup procedure and operating instructions. Check out the interconnecting cords and then go through the TROUBLESHOOTING section in the manual.

We strongly recommend that you **do not** try to repair the equipment yourself and **do not** have the local repair shop attempt anything other than the simplest repair. If the repair is more complicated than a broken wire or loose connection, send the unit to the factory for repair and service. Don't attempt to adjust any controls inside the units. Once set at the factory, the various controls and trimmers do not drift with age or vibration and never require readjustment. **There are no adjustments inside that will make a malfunctioning unit start working**.

The LECTROSONICS service department is equipped and staffed to quickly repair your equipment. In warranty repairs are made at no charge in accordance with the terms of the warranty. Out of warranty repairs are charged at a modest flat rate plus parts and shipping. Since it takes almost as much time and effort to determine what is wrong as it does to make the repair, there is a charge for an exact quotation. We will be happy to quote approximate charges by phone for out of warranty repairs.

RETURNING UNITS FOR REPAIR

You will save yourself time and trouble if you will follow the steps below:

A. DO NOT return equipment to the factory for repair without first contacting us by letter or by phone. We need to know the nature of the problem, the model number and the serial number of the equipment. We also need a phone number where you can be reached 8 am to 4 pm (Mountain Standard Time).

B. After receiving your request, we will issue you a return authorization number (R.A.). This number will help speed your repair through our receiving and repair departments. The return authorization number must be clearly shown on the outside of the shipping container.

C. Pack the equipment carefully and ship to us, shipping costs prepaid. If necessary, we can provide you with the proper packing materials. UPS is usually the best way to ship the units. Heavy units should be "double-boxed" for safe transport.

D. We also strongly recommend that you insure the equipment, since we cannot be responsible for loss of or damage to equipment that you ship. Of course, we insure the equipment when we ship it back to you.

Mailing address:
Lectrosonics, Inc.
PO Box 15900
Rio Rancho, NM 87174
USA

Shipping address:
Lectrosonics, Inc.
581 Laser Rd.
Rio Rancho, NM 87124
USA

Telephones:
Regular: (505) 892-4501
Toll Free: (800) 821-1121
FAX: (505) 892-6243

World Wide Web: *http://www.lectrosonics.com*

Email: *sales@lectrosonics.com*

LIMITED ONE YEAR WARRANTY

The equipment is warranted for one year from date of purchase against defects in materials or workmanship provided it was purchased from an authorized dealer. This warranty does not cover equipment which has been abused or damaged by careless handling or shipping. This warranty does not apply to used or demonstrator equipment.

Should any defect develop, Lectrosonics, Inc. will, at our option, repair or replace any defective parts without charge for either parts or labor. If Lectrosonics, Inc. cannot correct the defect in your equipment, it will be replaced at no charge with a similar new item. Lectrosonics, Inc. will pay for the cost of returning your equipment to you.

This warranty applies only to items returned to Lectrosonics, Inc. or an authorized dealer, shipping costs prepaid, within one year from the date of purchase.

This Limited Warranty is governed by the laws of the State of New Mexico. It states the entire liablility of Lectrosonics Inc. and the entire remedy of the purchaser for any breach of warranty as outlined above. NEITHER LECTROSONICS, INC. NOR ANYONE INVOLVED IN THE PRODUCTION OR DELIVERY OF THE EQUIPMENT SHALL BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS EQUIPMENT EVEN IF LECTROSONICS, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF LECTROSONICS, INC. EXCEED THE PURCHASE PRICE OF ANY DEFECTIVE EQUIPMENT.

This warranty gives you specific legal rights. You may have additional legal rights which vary from state to state.

LECTROSONICS, INC.

581 LASER ROAD
RIO RANCHO, NM 87124 USA
www.lectrosonics.com

October 1, 2002