ASHLY

Protēa
Digital Audio Products

24.24M

24 Bit Digital

Multiple Channel

Matrix Processor

WR-1, WR-2, WR-5

Remote Controls

Operating Manual

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The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

The exclamation point within an eqilateral triangle is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the device.

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPIIANCE TO RAIN OR MOISTURE.

TO REDUCE THE RISK OF FIRE, REPLACE ONLY WITH SAME TYPE FUSE. REFER REPLACEMENT TO QUALIFIED SERVICE PERSONNEL.

WARNING:
THIS APPARATUS MUST BE EARTHED

1. INTRODUCTION

Thank you for your purchase of the Protea 24.24M. The Protea 24.24M Matrix Processor uses modular expansion cards to provide up to twenty-four channels of audio matrixing and processing. The base unit offers a four-input/four-output configuration. Each input and output expansion card has an individual DSP processor allowing you to expand the base unit's total inputs or outputs four channels at a time. These cards are easily installed in the field without the need to reprogram the device. Matrixing allows you to route any input to any output and control individual levels once they have been assigned. Fixed path architecture and extensive processing power per channel will reduce the amount of time it takes to set up your system. All programming is accomplished using Ashly's Protea System Software on a PC platform. No front panel controls and multi-level software security assures you a tamperproof audio system. Whether you are designing or installing a system for corporate boardrooms, restaurants, courtrooms, houses of worship, left/center/right theatres, auditoriums or conference centers, the Protea 24.24M will more than satisfy your requirements for any zoned system requiring input/output matrixing with signal processing.

Input channel processing blocks include Mic Preamp with Phantom Power, Gain, Delay, fifteen EQ Filters, Gate, Autoleveler and Ducker. Input gain may be configured for either mic level (+20, +40, +60dB) or line level (0dB). Output channel processing blocks consist of a Cross Point Mixer, HPF/LPF, Delay, fifteen EQ Filters, Gain and Limiter. The cross point mixer in the output section allows you to route any input to any output at any level and mute any input at any output without affecting the true input configuration. The HPF/LPF block offers Bessel, Butterworth and Linkwitz-Riley filters with 12, 18, 24 and 48dB octave slopes.

Euroblock connectors for audio, preset recall, DC remote level control and data in/out connections are on the rear panel. Standard 9-pin RS-232 data connectors are located on the front and rear panel to allow all functions to be controlled either by a PC or a dedicated control system. Factory presets for distributed or conventional sound applications are available on the Ashly website as a starting point to set your own system requirements and may be overwritten, copied and saved to separate preset locations. When using Protea System Software, full system setup and control is quick and easy with the capability of storing multiple system configurations as backups or for future reference.

2. UNPACKING

As a part of our system of quality control, every Ashly product is carefully inspected before leaving the factory to ensure flawless appearance. After unpacking, please inspect for any physical damage. Save the shipping carton and all packing materials , as they were carefully designed to reduce to minimum the possibility of transportation damage should the unit again require packing and shipping. In the event that damage has occurred, immediately notify your dealer so that a written claim to cover the damages can be initiated.

The right to any claim against a public carrier can be forfeited if the carrier is not notified promptly and if the shipping carton and packing materials are not available for inspection by the carrier. Save all packing materials until the claim has been settled.

3. AC POWER REQUIREMENTS

Note: The AC power switch for model 24.24M is on the back panel. The Protea 24.24M uses a universal input power supply which will accept any line voltage from 90VAC to 240VAC, 50-60Hz, and is resistant to voltage dips, or "brown outs". A standard IEC-320 grounded AC inlet is provided on the rear panel to accept the detachable power cord. **Never remove the AC earth ground connection to the 24.24M.** In the event of fuse failure, refer the product to a qualified service technician for fuse replacement, replacing only with the same type and rating fuse.

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4. FRONT PANEL FEATURES

4.1 RS-232 Dataport

The 24.24M has two RS-232 dataports wired in parallel, one on the front panel and one on the back, for connecting to a computer for software control. See section 7.3 for details on connecting to a computer.

4.2 Device ID/Preset Number

This LED and switch have two functions, to select and display the current 24.24M device ID (0-16), or to select and display a user-defined preset number (1-35). The switch and LED display mode is set within Protea System Software under the Options menu, and the switch can be disabled from there as well. When set to preset number mode, the green LED near the switch is lit. To select a new preset, press and hold the switch until the desired preset number is displayed. When the preset button is released, the new preset is loaded.
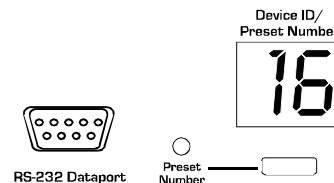
4.3 Main Input Channel LEDs

The 24.24M base unit has four fixed input channels, each of which can be routed to any combination of output channels. Each input channel's two color Sig LED indicates input signal level of -20dB (green), or +20dB clip (red) respectively. The Sig LEDs detect signal levels *after* any gain adjustments are made within the 24.24M preamp section. The red input mute LED becomes lit when an input channel is muted through software.
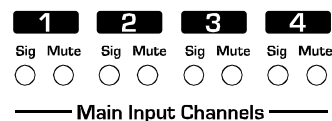
4.4 Main Output Channel LEDs

The four fixed output channels on the 24.24M have three color LEDs to indicate signal, limiter threshold, and clip. The green signal LED indicates -20dB output level. The amber limiter threshold LED depends on settings established within Protea System Software, and, assuming the limiter is active, indicates that sufficient signal level has been reached for the limiter to begin the process of gain reduction. Clipping occurs at +20dB and is indicated by a red LED. The red output mute LED becomes lit when an output channel is muted through software control.
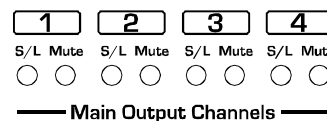
4.5 Expansion Module LEDs

The 24.24M base model is expandable by up to 16 additional inputs or outputs. Expansion modules of four inputs or four outputs each can be field installed by a qualified service technician. If an expansion card slot has been filled, its respective LED (EXP 1, EXP 2, etc.) is automatically lit. The LED indicators on unused expansion slots remain inactive.
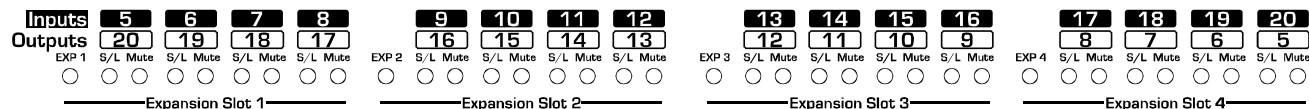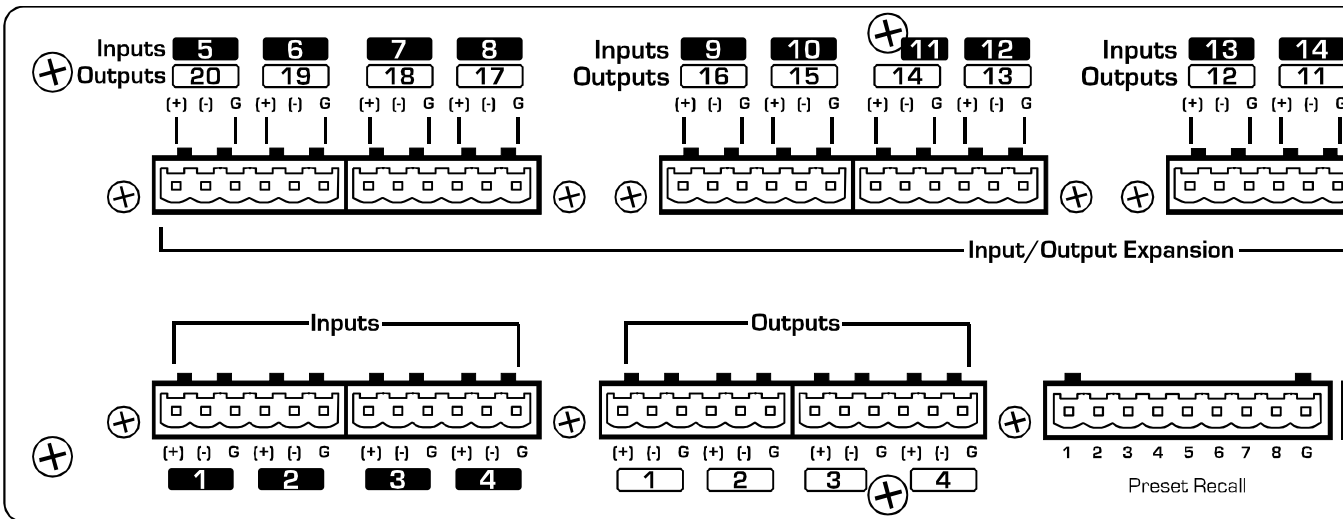
5. REAR PANEL FEATURES

5.1 Input Connections

Balanced input signals are connected to the 24.24M using the included "Euro Block" connector. A flat blade screwdriver is required to connect a stripped wire lead to the loose connector, which is then inserted into the rear panel Euro Block receptacle. It is important that both (+) and (-) inputs are properly terminated or signal loss and noise may result. In other words, *if an unbalanced input signal is used, connect the signal to the (+) input, and connect the ground wire to both the (-) and ground connection.*

Euroblock
Connector
System

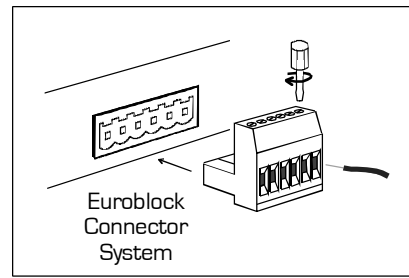### 5.2 Output Connections

Like the inputs, output connections are made using the included "Euro Block" connector. All outputs are servo balanced, and may be wired balanced or unbalanced. For unbalanced output connections, use (+) and ground and tie (-) to ground.

5.3 Expansion Modules

The 24.24M base model is expandable by up to 16 additional inputs or outputs. Expansion modules of four inputs or four outputs each can be installed. Input expansion modules use green Euroblock connectors, while output expansion modules use black connectors. Removable metal plates cover unused expansion slots on the back panel.

5.4 Preset Recall

There are no user controls on the 24.24M, making it ideal for permanent installations where security is an issue. There may be times, however, where real time variables require changes in system settings, such as EQ, gain, and delay settings changing when a room size changes. For these types of changes, the 24.24M offers the ability to recall up to eight different presets using *contact closures*. Contact closures are nothing more than external, user installed switches that, when closed, recall a previously defined preset which at once applies changes to the settings of all inputs and outputs. The switches can be anything from a rotary switch on a control room panel, to automatic door sensors scattered throughout a conference center, to a microphone key switch, etc. Contact closures allow for flexibility while maintaining a high degree of system security.

To use contact closure switching, up to eight presets (1-8) must first be defined according to the needs of the installation. Switches are to be configured so that closing the switch contact triggers the preset recall event. It doesn't matter if the switch is momentary or latching, the only thing that triggers the event is the transition from open to closed for a given circuit. Closing a circuit will automatically override any previously recalled presets. Up to eight switches
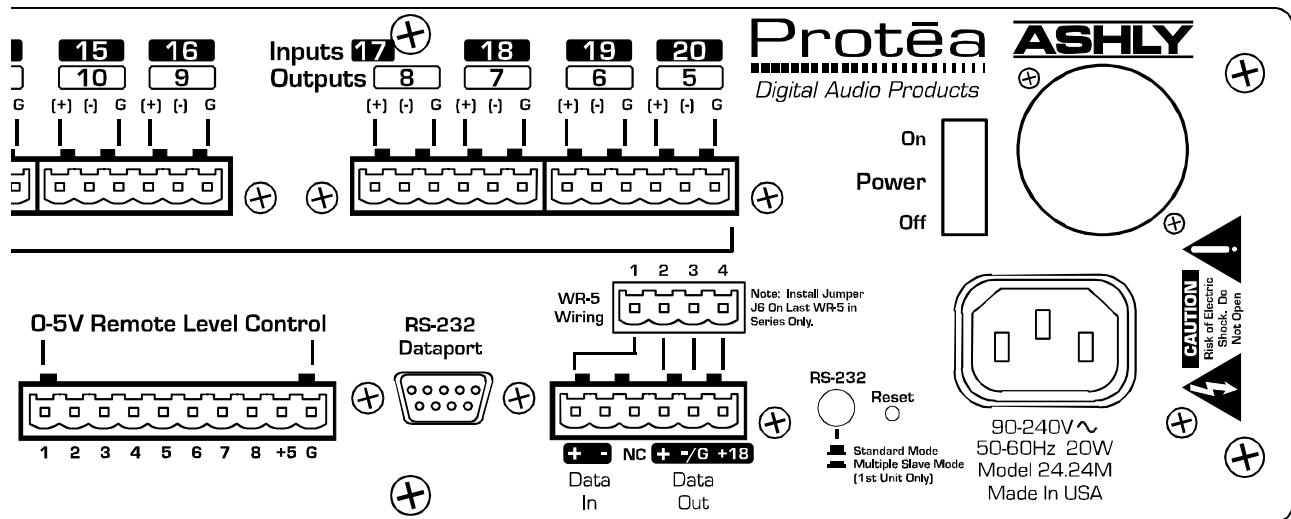
can be used, with all switches sharing a common ground connection. The number below the nine pin Euro Block contact closure connector equals the number of the preset which will be recalled when that switch is closed. Always use the 24.24M contact closure ground for contact closure switches. Do not connect the 24.24M contact closure ground to any other external grounds, as ground loop currents may result.

5.5 0-5V Remote Level Control

Any of the inputs or outputs on the 24.24M can have their levels remotely controlled through this simple DC control port. Use the provided +5VDC and Ground (pins 9 and 10), along with a potentiometer, switched resistor network, or relay (for muting), to return a DC voltage to the desired input or output control pin. Using Protea System Software, each pin can be assigned any combination of inputs or outputs to create up to eight remote control groups (see sec 11.1).

The remote level control can only attenuate the signal, it can not provide gain, so properly set up the gain structure within the 24.24M before using remote level control. +5V on any control pin has no attenuating effect, while 0V referenced to the connector ground fully attenuates the signal. *Do not connect the remote level control ground to any other external grounds.*

5.6 RS-232 Dataport

The 24.24M has two RS-232 dataports, wired in parallel, with one on the front panel and one on the back, for connecting to a computer for software control. See section 7.3 for details on connecting to a computer.

5.7 Data In/Data Out Connection

The Data In and Out connectors are used for connecting the 24.24M to other Protea products under software control, as well as SIA, Crestron, or other third party controllers. Control data for the 24.24M uses the RS-232 protocol, and does not support the MIDI baud rate. Supported baud rates are 9600bps and 38,400bps.

5.8 RS-232 Mode Switch

The RS-232 mode switch is pushed in only when the 24.24M RS-232 Dataport is connected to a PC, *and* is the first of several Protea products in a data chain (including an active remote).

5.9 AC Inlet and Power Switch

A detachable AC power cord is used on the 24.24M. Since the internal universal power supply works from 90 to 240 VAC 50-60Hz, the only change necessary for use with a different AC mains connection is the appropriate AC power cord. The AC power switch is found on the back of the unit as well.

Expansion Card Assembly:

See ESD Precautions First

1.) Plug ribbon cable into motherboard header
2.) Plug other end of ribbon cable into expansion slot
3.) Slide pcb fingers into slots on back of meter card
4.) Fit Euroblock connectors through back panel cut-outs
5.) Fasten two back panel screws

Flatcable(s) to Motherboard

EXP4　　　EXP3　　　EXP2　　　EXP1

Expansion Card #4
Inputs 17-20
Outputs 5-8

Expansion Card #3
Input 13-16
Outputs 9-12

Expansion Card #2
Inputs 9-12
Outputs 13-16

Expansion Card #1
Inputs 5-8
Outputs 17-20

6. EXPANSION MODULE INSTALLATION

The Ashly 24.24M can be ordered from the factory with expansion modules pre-installed to suit the application, or as a 4 x 4 base unit. Should the need arise to add input or output capacity at a later time, additional four channel input or output modules can be purchased and easily installed in the field.

There are a total of four expansion slots available, and each slot accepts either an input or an output module. The 24.24M as well as Protea System Software autodetect if a slot has been filled, and whether it is an input or output. The software interface automatically updates to reflect the current 24.24M expansion slot configuration.

Please note that while field installation is not complicated, there is a risk of ESD (electrostatic discharge) damage to circuit board components if the board is improperly handled.

To install an additional expansion module, refer the following procedure to a qualified service technician:

1.) Remove AC power cord from back of unit and place unit on grounded work surface.

2.) Remove the seven top cover screws and remove cover. Remove expansion slot covers from back panel.

3.) Discharge any personal static by touching a grounded object. Carefully remove the new expansion card and flat cable from the ESD protective bag.

4.) Follow the instructions in the above drawing for installing expansion modules. *Ashly recommends placing input expansion modules starting with EXP1, and placing output expansion modules starting from EXP 4 and working backwards.* This way input and output channels are continuously numbered up from channel 1.

6.) In some cases it may be necessary to remove an existing expansion card before installing an new adjacent one. Certain motherboard flatcable headers may be inaccessible with modules installed above them.

7.) Make sure all hardware is secure, then replace top cover.

For further information on expansion module assembly or proper ESD protection, please contact the Ashly service department at 1-800-828-6308.

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7. PROTEA SYSTEM SOFTWARE

Ashly offers a powerful software interface for the Windows PC environment, providing control for the 24.24M Matrix Processor, 4.24D distribution system processor, 4.24C crossover, 4.24G graphic EQ and slaves, two parametric EQ slaves (2.24P and 4.24P), and the VCM-88(E and C), high performance eight channel remote level controllers. Within Protea System Software, each device has its own separate visual interface. All controls are intuitively represented in a user friendly way, and on-line help is available for key functions.
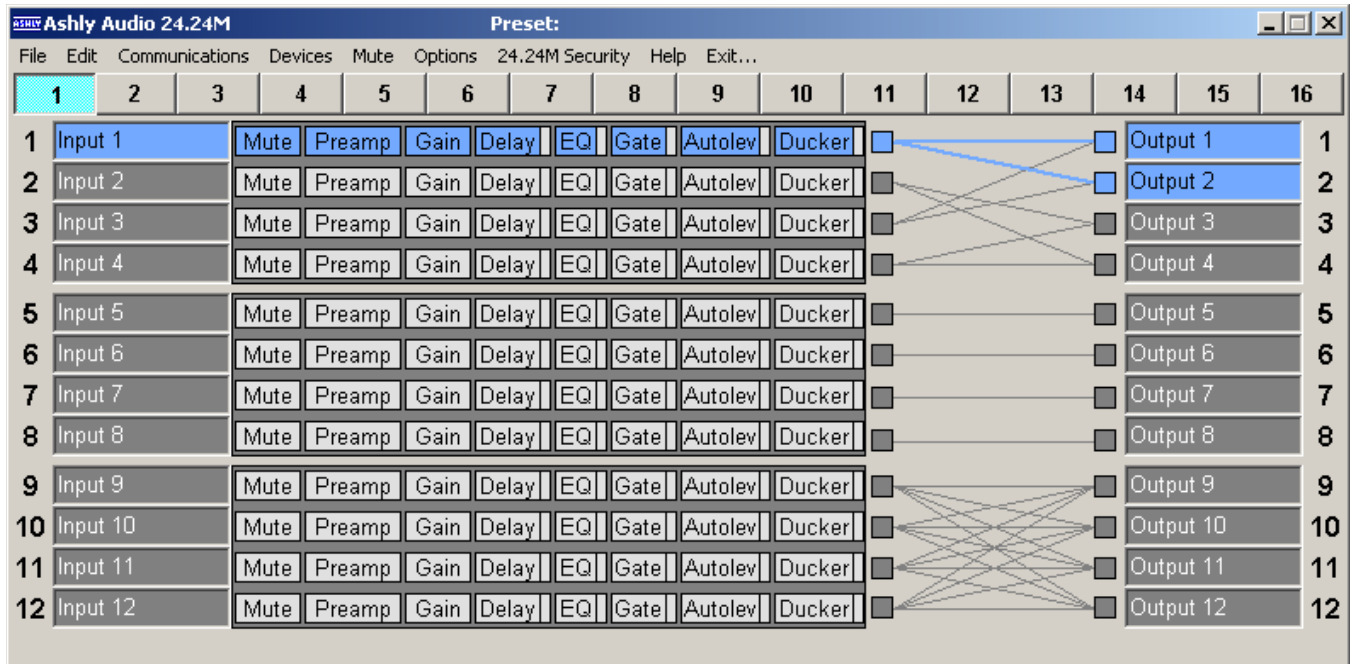
7.1 How to get Protea System Software

Protea System Software is shipped free with each new Protea 24.24M, can be downloaded from the Ashly web site, or can be purchased directly from Ashly for a nominal handling fee.

7.2 Installing Protea System Software

The installation program is the same whether from the web site or from a disk, and is called <Pssinstl_*xx*.exe>. To install Protea System Software, double-click on <Pssinstl_*xx*.exe> and follow the installation instructions.

7.3 Connecting the 24.24M to a computer

A standard D-Sub nine pin female to male connector cable is used to connect a PC to the 24.24M. If the PC lacks a nine pin RS-232 port, an active USB to RS-232 converter can be purchased at computer stores. Here are the suggested steps for connecting the 24.24M to a PC:

1) Plug the RS-232 cable into an available serial port on the PC.

2) Plug the other end of the cable into either the front or back RS-232 Dataport on the 24.24M.

3) Turn on the power to the 24.24M.

4) Open Protea System Software (version 6 .4 or higher).

5) Go to the <Devices> menu and select <24.24M>.

6) Select the appropriate COMM port (Comm 1-16).

7) Select desired Baud rate (9600bps or 38,400bps). Note that 38,400bps is only supported by the 24.24M.

8) Go to the <Communications> menu and select <Enable Communications>.

9) The connection should now be established. If it isn't working, make sure the RS-232 switch on the back panel is out, and make sure the device channel (Channel 1-16) is the same on both the 24.24M and Protea System Software (see sec. 4.2.)

If other Protea products are used with the 24.24M in the same DATA control loop, check their quick reference guide or owner's manual to verify all settings and connector types. If the 24.24M is the first unit in a multiple Protea data chain (*including an active remote*), press in the RS-232 Mode switch on the back panel, otherwise leave this switch out. RS-232 will run typically to 1300 feet (at 9600 baud) using high quality cable. ***Before attempting computer control, EXACT settings must be made to hardware switches and User Preferences on ALL Protea units involved.***

8. GETTING STARTED

8.1 Device Select

Protea System Software encompasses eight different Ashly Audio products, and four remote control devices. After properly connecting the PC and 24.24M (see section 7.3) select <24.24M> from the <Devices> pull down menu and then enable <Communications>.
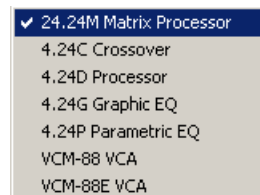
8.2 Metering Options

The 24.24M front panel LEDs offer basic indications of key audio levels and functions. For more detailed metering, Protea System Software has a separate metering display window showing all inputs and outputs, including input levels, input autoleveler gain/attenuation, input ducker status, input noise gate status, output levels, and output limiter gain reduction. Meters can be set to dBu or VU in the <Options> menu. 0 VU = +4dBu (1.228Vrms).
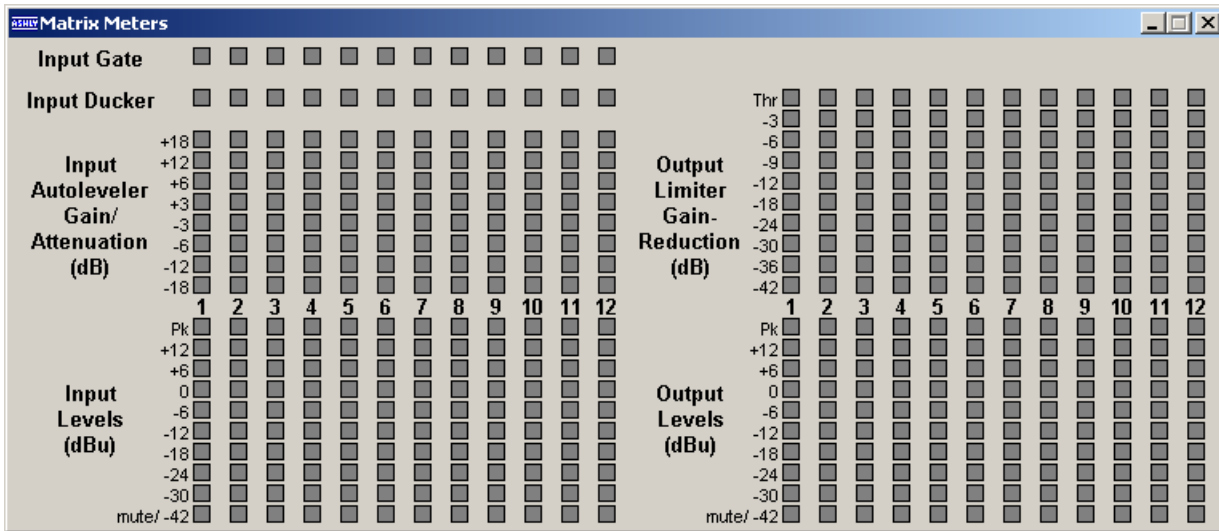
8.3 Preliminary Setup

Before connecting the 24.24M to any live audio components, Ashly recommends creating and saving to the PC a rough setup of the target application within software. In other words, determine ahead of time what the connections to each input and output will be, set input preamp gain, configure any signal routing/matrixing, set any output crossover filters, etc. Define the preliminary setup as much as possible before arriving on site.

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9. AUDIO FUNCTIONS

Editing of audio controls is done primarily in Protea System Software. Input and output expansion cards are autodetected, and the software automatically updates to display the current 24.24M status. *Note: Accidental, potentially destructive loudspeaker damage can occur when abrupt changes are made to EQ, filter, or level controls, so plan carefully before making radical changes to a live sound system.*

9.1 Input Audio Functions

The following functions are available on all inputs; Mute, Preamp Gain, Input Gain, Delay, EQ, Noise Gate, Autoleveler, Ducker, and Matrix Routing.

9.1a Input Mute

This turns off the input channel without changing gain settings. When an input channel is muted, that channel's red mute LED on the face panel is lit.

9.1b Input Preamp

This determines the up-front analog gain to an input signal. A good rule of thumb is to allow 20dB of headroom above the nominal input signal level. Clipping occurs at +20dBu, so a microphone nominally generating a -40dBu signal should have +40dB of gain, a 0dBu line level input would be set to 0dB gain, etc.

9.1c Phantom Power

+48V Phantom power for condenser microphones can be provided to individual channels by checking the <+48V Phantom Power> box in the preamp block for a given channel.

9.1d Input Gain
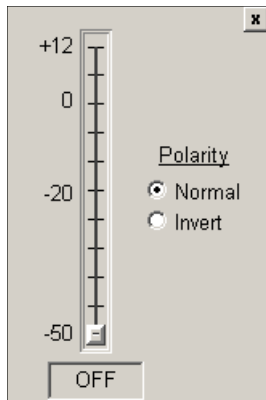
Different from the Preamp block, input Gain adjusts signal level from +12dB to Off. Due to limitations within the graphical interface, fine tuning gain settings in 0.1dB steps is accomplished using the <up/down arrows> on the keyboard. Changes of 3dB are quickly accomplished using <PageUp/PageDown> buttons. To instantly return a gain setting to 0dB, press <Ctrl + Z>.

9.1e Input Delay

In large installations or outdoor venues there are often many speakers in various locations to get the best coverage possible. Since sound travels relatively slow through air (1130 ft/s at 20 deg. C), multiple loudspeaker locations can create a situation where the original audio signal, simultaneously leaving all loudspeakers, arrives at a single point in the venue at several different times. Needless to say this causes problems, and what may be crystal clear sound directly in front of any one loudspeaker can be unintelligible at the farther reaches of the venue with direct line-of-sound to multiple loudspeaker sources.

The solution is to delay the audio signal to the loudspeakers located further away from the primary source, so that sound comes out of the distant loudspeakers at the exact time that sound from the main loudspeakers arrives. Within the Protea 24.24M, up to 682 milliseconds of time delay are available on each input channel, allowing secondary loudspeakers to be time aligned with the primary speakers up to 771 feet (235m) away. Set the TEMP text box to the current air temperature to get the most accurate display of delay distance.

Fine tuning delay settings is accomplished using the <up/down arrows> on the keyboard. Course changes of 1mS are quickly accomplished using <PageUp/PageDown> buttons. For an explanation of short time delay uses, see section 9.2c.
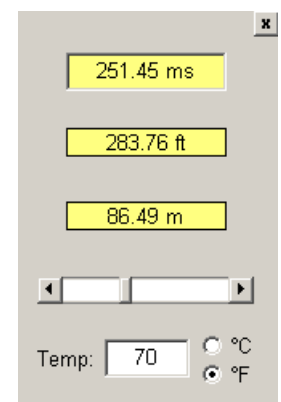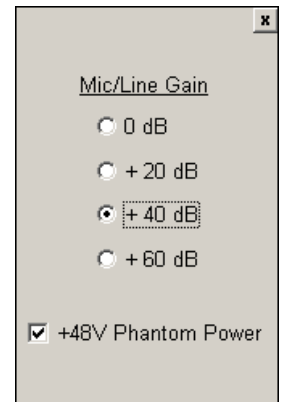
9.1f Input EQ

The Protea 24.24M input EQ section offers 15 custom filters per input. Types of filters available for each band include parametric, 1st order and 2nd order low shelf, 1st order and 2nd order high shelf, and all-pass.
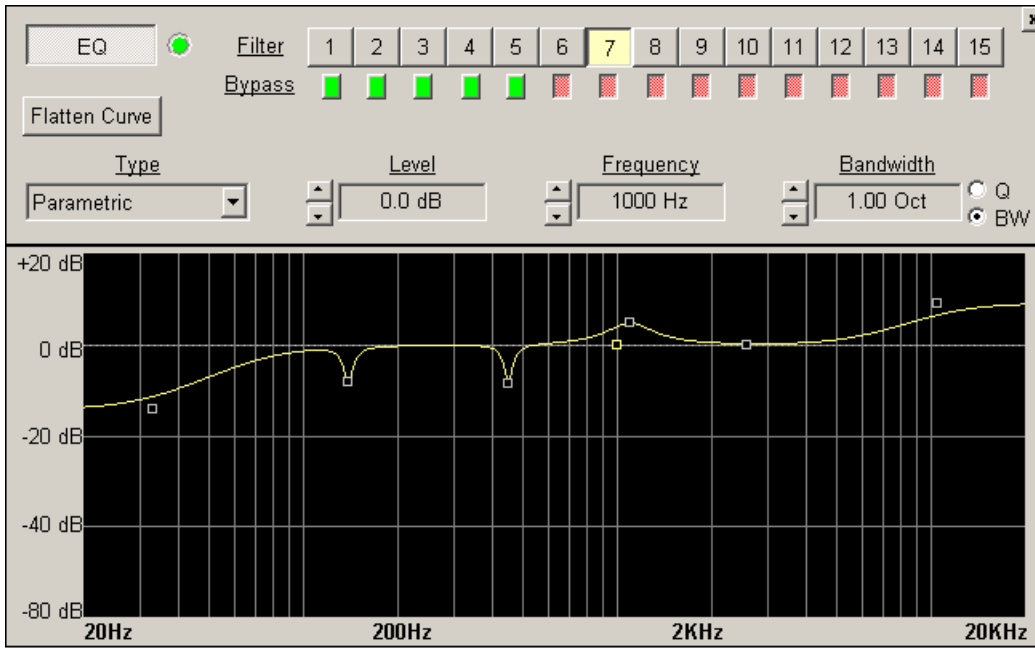
Shelving EQ filters: 1st order filters use a gentle 6dB per octave slope, while 2nd order filters use a 12dB per octave slope for a more pronounced boost or cut. All shelving filters have a boost/cut range of +/-15dB. Low shelving filters have a frequency range from 20Hz through 2kHz, and the high shelving filters range from 3.886kHz through 20kHz. Shelving filters are most useful as broad tone controls to boost or cut the high end or low end of an audio signal's frequency content. Because t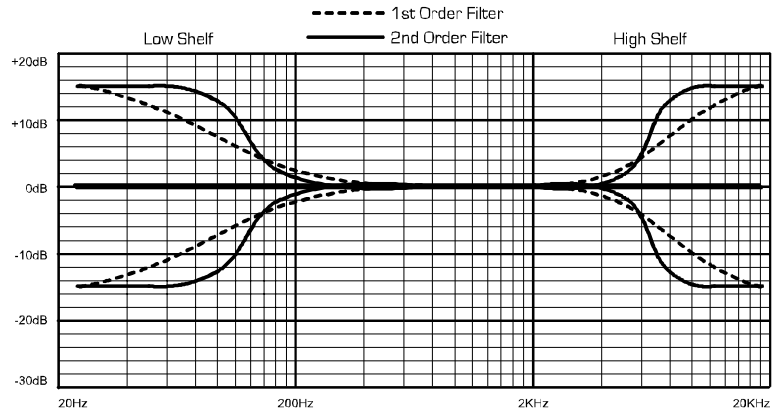hey affect a wider spectrum of audio, they are not as suitable for feedback control as parametric filters. Course and fine tuning of shelving filters can be performed using <page up/page down> and the <up/down arrows> on the keyboard.

24.24M Shelving Filters

Parametric EQ filters: These are peak filters with the ability to control boost or cut, frequency center, and bandwidth, also called "Q" for this type of filter. Think of one band of parametric EQ as a single graphic equalizer fader except that the frequency is variable, not fixed, and that the bandwidth, or how "wide" the filter affects the frequency spectrum at the center frequency, is completely variable. The smaller the bandwidth (higher Q), the less the audio signal on either side of the frequency center is boost or cut, whereas a larger "wider" bandwidth (lower Q) produces an audible change to the overall tone

24.24M Parametric Filters

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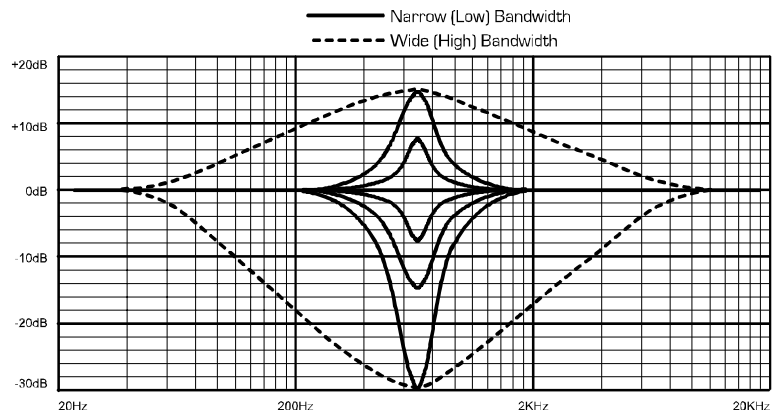
of a signal. Parametric filters are best used to hunt down and eliminate problem feedback frequencies, add or remove a characteristic "hot spot" from microphones, or clean up room resonance situations. It is well worth the time becoming proficient with parametric EQ filters, as they offer the best solution to many EQ problems.

Protea 24.24M parametric filters have a boost/cut range of +15dB to -30dB. There is more cut than boost because one of the more common uses for parametric filters is to dramatically cut, or "notch out", very narrow frequencies (low bandwidth) in order to eliminate system feedback problems.

Every parametric EQ filter has a center frequency. The factory default is 1kHz, but each filter is adjustable from 20Hz to 20kHz in 1Hz steps. Carefully sweeping a narrow bandwidth filter through a problem feedback area, with just a slight boost, is a quick way to find the exact frequency causing feedback trouble. Once the offensive frequency has been found, cut the filter's level, and then adjust the bandwidth as narrow as possible while still eliminating the feedback problem. Bandwidth is adjustable from about 1/64 octave to four octaves, and the lower the bandwidth (higher Q), the less audible the filter action will be. Finding the problem frequency is relatively easy, but finding the best combination of cut and bandwidth takes a little practice. Again, it is well worth the time getting comfortable with the notching procedure, so that problems can be quickly addressed with a sufficient but minimal amount of corrective EQ.

All Pass filters: All pass filters have no effect on frequency amplitude, but rather are used to adjust the phase response of the signal at a given frequency, and are often used in conjunction with a frequency-domain filter to correct phase changes. At low frequencies, there is 0 degree phase shift, at the All Pass filter center frequency there is -180 degrees of phase shift, and at high frequencies there is -360 degrees of phase shift.

Each input channel has an EQ On/Off button for all filters, and in turn each filter band has its own bypass button. The Flatten Curve function returns all filters to 0dB, but preserves the frequency and bandwidth of any used filters.

9.1g Noise Gate

Noise gates are used to minimize unwanted or ambient low level signal from an individual mic input. THRESHOLD is the level above which an input signal will pass through, and below which its signal is turned off. FLOOR is the input audio level which is still allowed to pass through even when the gate has turned it off. ATTACK and RELEASE control the time characteristics of the gating action. Attack sets the amount of time it takes for the gate to open or gated signal to turn on. Release sets the time required for the gate to close back up when the input signal falls below threshold.
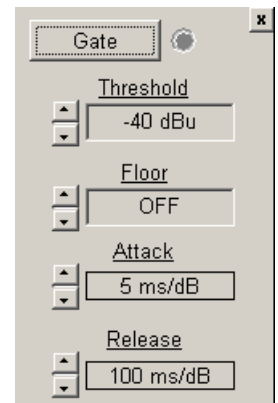
9.1h Autoleveler

An Autoleveler is a dynamics processor used to automatically boost or cut a signal to a user defined target level. TARGET LEVEL is the primary setting in an autoleveler, as it determines the desired constant level to which an input is boost or cut. Both basic mode and advanced mode utilize the target level control, but basic mode simplifies setup. In BASIC MODE, target level, action, and maximum gain are the available controls. ACTION is selectable to gentle, normal, or aggressive, and automatically adjusts the following controls found in advanced mode:

Action	Ratio	Hold Time	Gain Incr. Rate	Gain Dec. Rate
Aggressive	10:1	0 Sec	20ms/dB	5 ms/dB
Normal	4:1	1 Sec	50ms/dB	10 ms/dB
Gentle	2:1	2 Sec	100ms/dB	20 ms/dB
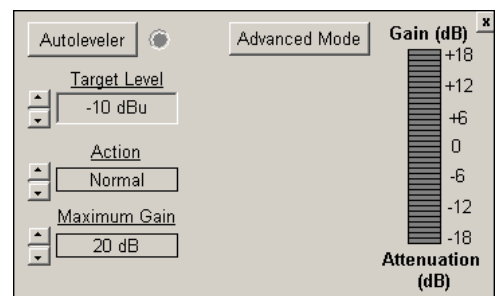
MAXIMUM GAIN controls the threshold below target using the following formula:

$$Thr = \frac{Max\ Gain}{(1/ratio - 1)}$$
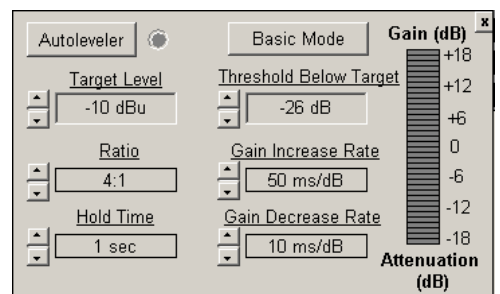
In ADVANCED MODE, THRESHOLD BELOW TARGET determines the input signal level relative to the target level, above which the autoleveler increases gain, and below which no action is taken. RATIO is defined as the relationship of input level change in dB to output level change in dB. It is a measure of how aggressively the autoleveler changes the gain to maintain a constant output target level. GAIN INCREASE RATE and GAIN DECREASE RATE are used to prevent sudden, choppy sounding level changes to an input signal having a wide dynamic range. HOLD TIME is used in conjunction with gain change rate, and is defined as the time after the input signal falls below the threshold during which the autolever's gain is held constant before it returns to unity gain. The purpose is to reduce the amount of gain "chatter" and abrupt signal cutoff when the input signal is hovering around the threshold level. Advanced settings which are different than the three Basic action settings results in a USER DEFINED display in the basic action control.

9.1i Ducker

A Ducker is used to attenuate the level of selected input channels when one or more "Trigger" inputs have signal present. Input channels can be set to one of four ducker modes:

1.) BYPASS - no ducking action applies.

2.) DUCKED PROGRAM - signal present on other "Trigger" selected input channels act to attenuate this input channel.

3.) LOW PRIORITY TRIGGER - signal present on this input channel attenuates all other inputs set to "Ducked Program".

4.) HIGH PRIORITY TRIGGER - signal present on this input channel fully attenuates all other inputs set to "Ducked Program", as well as all other channels set to "Low Priority Trigger".
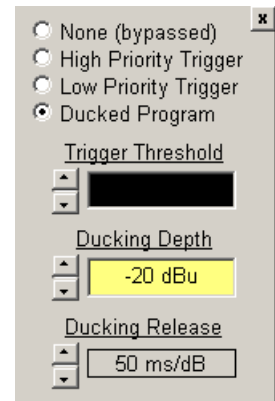
TRIGGER THRESHOLD determines the signal level on a trigger input at which point the ducked program is attenuated. DUCKING DEPTH determines how much attenuation is applied to input channels set up as ducked program. DUCKING RELEASE determines the rate at which the attenuation returns to 0dB after the trigger input signal has stopped.

9.1j Matrix Routing

Any input channel can be routed to any or all output channels, likewise any output channel can have as its source any or all inputs, limited only by the installed capacity of input or output expansion modules. To route an input to an output, click and drag from the input connect box to the desired output connect box (click and drag routing works in both directions). To delete a connection, click on the connect line and press <Delete> on the keyboard, or right click on the connection line for the delete prompt. To quickly perform multiple routing connections or disconnections to the current input channel, hold <Ctrl> and click on desired individual output channel connect boxes to toggle them on or off. Anytime a connection is made, the corresponding output mixer level is set to "-inf", (off). Note that when an input is muted, all routing lines from that input turn red to reflect the change.
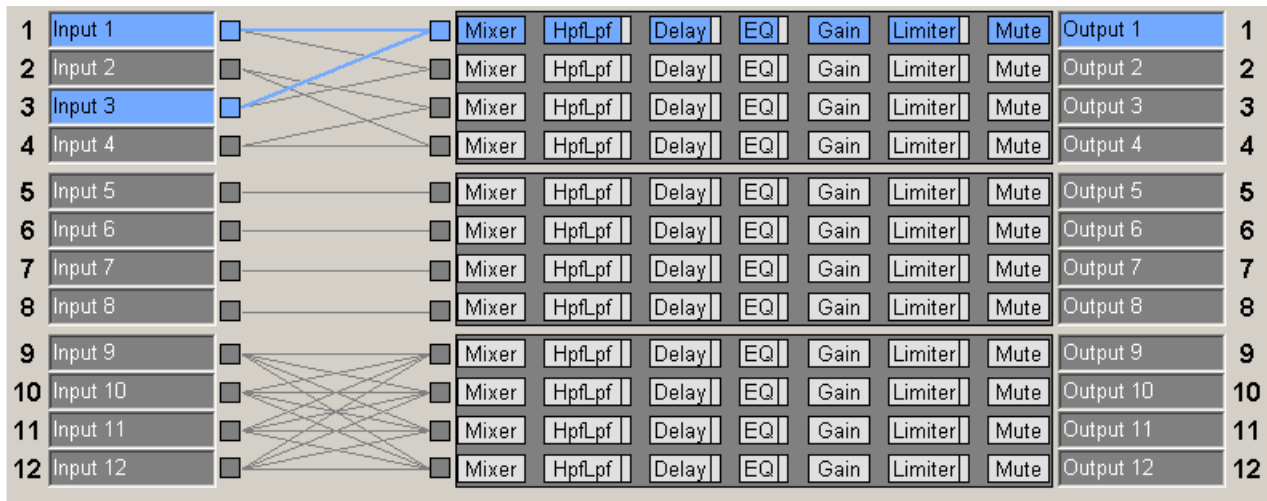
9.2 Output Audio Functions

The following functions are available on all outputs: Mixer, High Pass/Low Pass Filter, Delay, EQ, Gain, Limiter, and Mute.

9.2a Output Matrix Mixer

Output channels can have any or all inputs as sources, and the output matrix mixer allows the level of each connected input to be adjusted in the "matrix mix" to each output. Note that for a given output, unlinked inputs are disabled in the mixer. Adjustment range is from +12dB to off. To set a level control to unity (0) within the matrix mixer, select an input level control by clicking on it and pressing <ctrl> + <z>, or by pressing <ctrl> + <click> on the level adjustment control. Individual input channels in the matrix mixer can be muted independently from the main input or output mute blocks.

9.2b Hpf/Lpf - Crossover

Bandpass or crossover functions on the Protea 24.24M are available only on the output channels. Every channel's crossover consists of a high pass filter (HPF) and a low pass filter (LPF), along with the frequencies and filter types used. Each output's crossover section is essentially a bandpass filter, making it necessary for the user to map out ahead of time which outputs will be used for the various frequency bands, and set the overlapping filter frequencies and types accordingly. *Note: The High Pass Filter determines the lower frequency limit of the signal, while the Low Pass Filter determines the upper frequency limit. Be careful not to accidentally send low frequency signals to high frequency drivers. Check the loudspeaker specifications to determine a safe operating frequency range.*

The frequency range for the high pass filter (HPF) is 20Hz to 20kHz, with an option to turn the filter off at the low end of the frequency selection. The low pass filter (LPF) offers the same frequency range, with the "off" option at the high end of the frequency selection.

There are eleven types of filters available in the crossover section, each suited to a specific preference or purpose. The slope of each filter type is defined by the first characters in the fil-

ter type, 12dB, 18dB, 24dB, or 48dB per octave. The steeper the slope, the more abruptly the "edges" of the pass band will drop off. There is no best filter slope for every application, so experiment to see which one sounds most pleasing in a specific system. The Ashly default crossover filter is 24dB/octave Linkwitz-Riley, but of course they can be changed to suit the application.
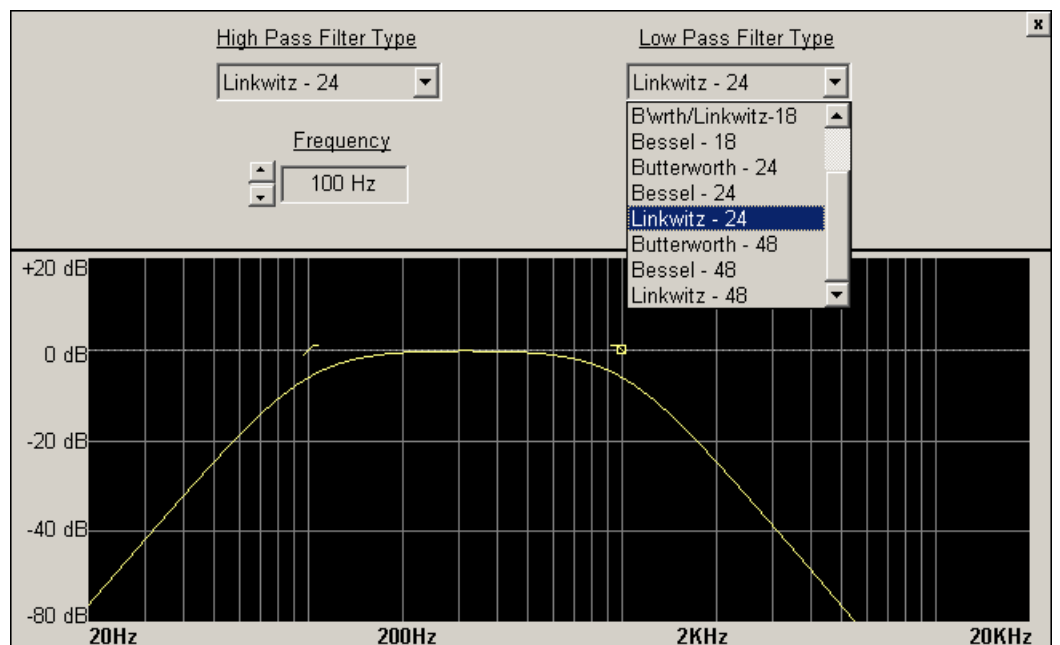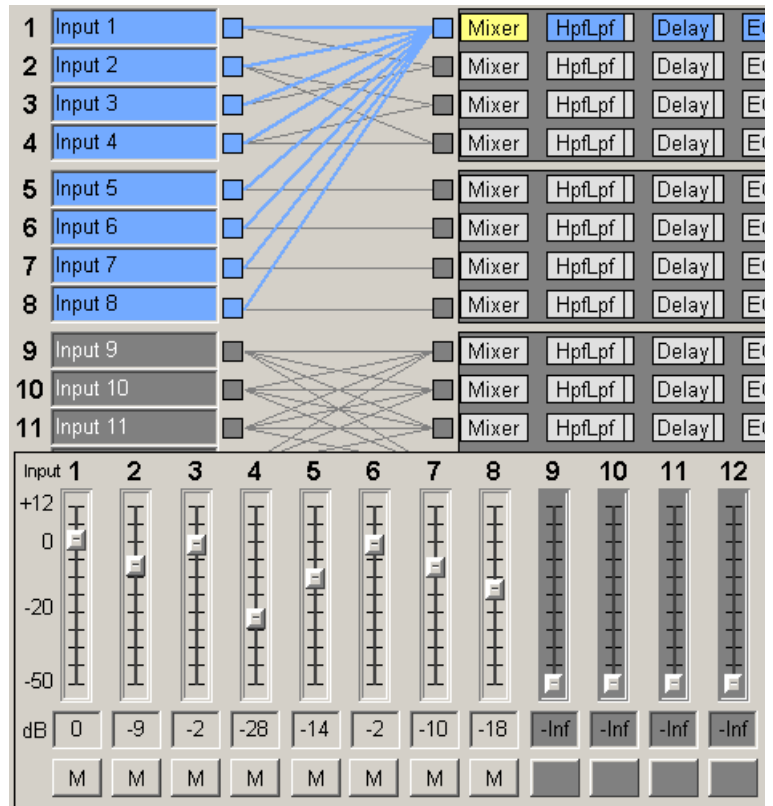
In addition to the frequency and slope, crossover filters can be selected as having Butterworth, Bessel, or Linkwitz-Riley response. These refer to the shape of a filter's slope at the cut-off frequency, affecting the way two adjacent pass bands interact at the crossover point. 24dB/octave Linkwitz-Riley filters produce a flat transition through the crossover region, assuming both overlapping filters are set to the same frequency, slope, and response type. ***24dB/oct Linkwitz-Riley filters are the industry standard, the easiest to use, and the filter type recommended by Ashly***. Other filter types are available, but may require polarity switching or other adjustments for proper results. The following paragraphs offer a summary of the three filter types as used in the 24.24M crossovers.

Butterworth

Butterworth filters individually are always -3dB at the displayed crossover frequency and are used because they have a "maximally flat" passband and sharpest transition to the stopband. When a Butterworth HPF and LPF of the same crossover frequency are summed, the combined response is always +3dB. With 12dB per octave Butterworth crossover filters, one of the outputs must be inverted or else the combined response will result in a large notch at the crossover frequency.

Bessel

These filters, as implemented on the 24.24M, are always -3dB at the displayed crossover frequency. Bessel filters are used because they have a maximally flat group delay. Stated another way, Bessel filters have the most linear phase response. When a Bessel HPF and LPF of the same crossover frequency are summed, the combined response is +3dB for 12dB/oct, 18dB/oct, and 48dB/oct Bessel filters, and -2dB for 24dB/oct Bessel filters. One of the outputs must be inverted when using either 12dB/oct or 18dB/oct Bessel crossover filters or else the combined response will have a large notch.
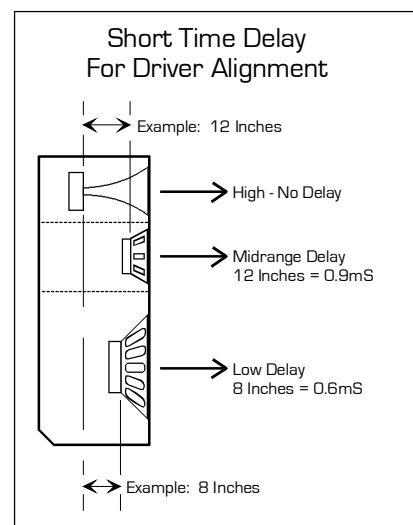
Linkwitz-Riley

The 12 dB/oct, 24dB/oct, an 48dB/oct Linkwitz-Riley filters individually are always -6dB at the displayed cross-over frequency, however the 18dB/oct Linkwitz filters individually are always -3dB at the displayed crossover frequency. The reason for this is that Linkwitz-Riley filters are defined in terms of performance criterion on the summing of two adjacent crossover HPF and LPF filters, rather than defined in terms of the pole-zero characteristics of individual filters. The 18dB/oct Linkwitz-Riley individually are 18dB/oct Butterworth filters in that they have Butterworth pole-zero characteristics and also satisfy the criterion for Linkwitz-Riley filters.

When a Linkwitz-Riley HPF and LPF of the same crossover frequency are summed, the combined response is always flat. With 12dB/oct Linkwitz-Riley crossover filters, one of the outputs must be inverted or else the combined response will have a large notch at the crossover frequency.

9.2c Output Delay

Output delay can be used to time align discrete drivers within a cabinet or cluster using short delay times, or align multiple drivers in different locations using longer delay times. For a thorough long-delay explanation, see section 9.1e. The following example illustrates a use of short delay to time align speakers within a group: A typical three way speaker cluster has low end, midrange, and high frequency drivers all located near one another. The different drivers for each frequency band are not necessarily the same physical depth with respect to the front of the loudspeaker cluster, so there exists the problem of the same signals (at the crossover points) arriving at the cluster "wavefront" at different times, creating undesirable wave interaction such as frequency peaks or cancellation. The solution in this case, rather than fixing the frequency anomalies with EQ, is to slightly delay the signal to the drivers closest to the cluster front.

Short Time Delay
For Driver Alignment

Example: 12 Inches

High - No Delay

Midrange Delay
12 Inches = 0.9mS

Low Delay
8 Inches = 0.6mS

Example: 8 Inches

Using the location of the driver diaphragm farthest back as a reference point, measure the distance to other drivers in the cluster, and set the output delay for each accordingly, with the driver diaphragm closest to the front getting the longest delay and the driver at the very back getting no delay at all. The minimum adjustment is 0.02 milliseconds, or about 1/4 inch. When appropriate, always time align the loudspeakers before applying EQ to the outputs of the 24.24M.

9.2d Output EQ

The Protea 24.24M Output EQ section is the same as the input EQ (see section 9.1f), with the exception of the ability to view the combined effect of input EQ for each installed and linked input channel to a given output channel. Within the output EQ frame, each installed and linked input channel has its own <Overlay Input EQ> check box, through which the interaction between input and output EQ is displayed.

9.2e Output Gain

Output Gain operates in the same manner as Input Gain (section 9.1d), ranging from +12dB to Off, with an option to reverse polarity.

9.2f Output Limiter

A full function compressor/limiter is included on each output channel. A limiter is commonly used to prevent transient audio signal spikes from damaging loudspeakers, manage analog and digital recording levels, optimize broadcast levels, or "thicken" the sound of an audio source (compression). The adjustable parameters include Limiter In/Out, Threshold, Ratio, Attack Time, Release Time, and Link Bus.

The 24.24M limiter threshold range is -20dBu to +20dBu, or -24VU to +16VU if the metering option is selected to VU. The Threshold control determines the signal level above which gain reduction begins, and is indicated by an amber LED (S/L) on the 24.24M face panel, as well as indicated in the Matrix Meters in software. Increases in audio level above the threshold will be reduced according to the ratio settings.
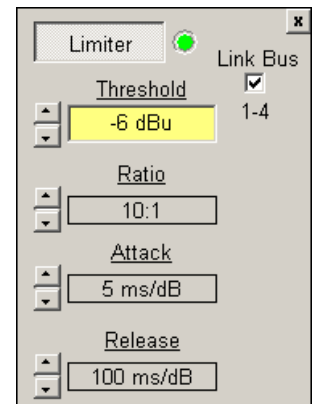
The Ratio control determines the amount of gain reduction above limiter threshold. Ratio ranges from a gentle 1.2:1 to a very abrupt INF:1. To illustrate how the ratio control works, imagine a commonly used loudspeaker protection ratio of 10:1, which means that for every input signal increase of 10 dB above threshold, the output level will only increase by 1dB. The higher the ratio, the more pronounced the audio effect, so use the lowest ratio possible to sufficiently address the problem.

Attack and Release settings adjust the time it takes the limiter to engage and then disengage when the signal increases above threshold and then subsequently falls back below threshold. Attack time is adjustable from 0.2ms/dB through 50ms/dB, while release time ranges from 5ms/dB through 1s/dB. A very fast attack time can sound unnatural, while a very long attack time can miss some of the initial transient. Similarly, a very short release time can make the audio sound uneven, while a very long release time can create "pumping", or "breathing" characteristics depending on the kind of signal. Experiment to find the best solution for a given application.

The Link Bus allows up to four output channels within a group to share a threshold detector, so that any channel with a transient signal above threshold will apply equal gain reduction to all other channels within that group which is assigned to the link bus. The channel which furthest exceeds threshold will determine the resulting reduction on all linked channels. Channel limiter linking is particularly useful when processing stereo signals.

9.2g Output Mute

Output Mute turns off an output channel. When an output channel is muted, that channel's red mute LED on the face panel is lit. To mute or unmute all outputs at once, go to the <Mute> menu heading.

10. OTHER SOFTWARE FUNCTIONS

10.1 Channel Preset File Management

The Protea 24.24M will store up to 35 named internal presets, each preset storing control data for all channels and audio functions. Preset names must be 20 characters or less. While working in Protea System Software, changes to an individual preset can be saved to the 24.24M using <File/Save Preset To Protea>, or saved to the PC using <File/Save Preset To Disk>. Individual preset files use the extension (*.pmc).

A preset file contains the control parameters for all inputs and outputs, but does not retain any Device ID channel information, as the Device ID channel is arbitrary within an installation. For a written record of all parameters of a specific preset file, click <Print Channel> in the File menu.

Since there are no user controls on the 24.24M, the only way to load presets is by using Protea System Software to recall files saved on either the PC or the 24.24M. The exception to this is through the use of contact closures or the Ashly WR-5 wall-mounted remote control. Contact closures can load presets 1-8 from the 24.24M memory using switches wired to the rear panel contact closure connector block (see sec. 5.4).

Note: A preset recall event will overwrite any unsaved changes, so be sure the current configuration is saved before continuing or it will be lost. The 24.24M always loads the last settings on power-up, so as to preserve any changes should the power be inadvertently turned off prior to saving a preset.

Caution: A new preset may have dramatically different settings capable of damaging sound system components, so be careful not to recall the wrong preset while the system is on.

10.2 Data Dump

The complete set of 35 presets can be loaded from a 24.24M to a PC , and later loaded back to the same or another 24.24M. To upload the entire preset data set to a PC, use <File/Request Bulk Preset Dump From Protea>. This stores a (*.dmp) file on the PC, and may take about two minutes to complete. To download a (*.dmp) file from the PC back to a 24.24M, use <File/Download Data Dump To Protea>. *Note: No other device can be connected in the data chain during Download Data Dump to Protea.* Setting the Baud rate to 38,400 decreases the time it takes to perform large operations such as Bulk Preset Dump.

To transfer individual presets directly to another 24.24M or the PC, use <File/Request Preset Dump From Protea>. A transfer will be made to the next 24.24M in the data path, and if there is no data connection to another 24.24M, the transfer is made to the PC.

10.3 Copying Settings to Another Input Or Output

The <Copy/Paste> functions are used to quickly transfer all settings from one currently selected input or output within the 24.24M to another input or output channel within the same unit. To copy, first select the input or output channel to copy from, then click <Edit/Copy>, then click on the target input or output channel, clicking <Edit/Paste> to complete the action.

10.4 Security

There are three levels of protection assignable to the 24.24M within the software <Security> pull down menu. The first level, <24.24M Preset Lock>, allows the user to edit any settings or recall new presets, but not to save changes. The second level, <24.24M Parameter Lock>, allows the user to recall new presets but not change any parameters . The third level, <24.24M Full Lock>, prevents any changes to the 24.24M. To unlock a security level, simply re-enter the password within the <Security> pull down menu. 24.24M security data is stored within the unit, not Protea System Software. *Passwords are case sensitive*. Be sure to write down the password and store in a convenient place for future reference. If the password is forgotten, a password reset can be done by pressing and holding the factory reset switch for two seconds during power up. *Note: Holding the reset switch for a full 10 seconds during power up will perform a full factory reset, changing all presets to the factory default.*

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10.5 Factory Reset

Factory reset is used to clear all user defined preset names and control values and reset them to their original factory settings. Factory reset to the 24.24M is accomplished by pressing and holding a recessed switch on the back panel during power up. The recessed switch is between the AC inlet and the RS-232 switch. There is a 10 second countdown in the Device ID LED display to indicate a factory reset is about to occur. Releasing the switch or shutting off power at any time during the countdown will stop the factory reset from occurring. At the end of the countdown, the letters "Fr" flash in the display for about 20 seconds until factory reset is complete. In addition to resetting all presets to factory default, any password or security settings will be lost when a factory reset is performed.

10.6 Program Upgrade

The 24.24M Matrix Processor is capable of field reprogramming upgrades through Ashly Audio's Protea System Software. This document gives detailed instructions and precautions on this procedure. Read all instructions before proceeding.

Warning:

When attempting a reprogram of a 24.24M, ensure that no other units are connected to the Data In or Data Out Euroblock connectors. Only one 24.24M may be programmed at a time.

1) Obtain the binary file from the Ashly Audio Web site (www.ashly.com). The file name will be "2424M_ programFile_ XY.bin" where XY represents the version number of the 24.24M firmware program.

2) Ensure Data Connections are correct. Nothing should be connected to the Data In or Data Out Euroblock connectors, the RS232 configuration switch on the 24.24M back panel should be in the out position, and the PC should be connected via one of its comm ports to the RS232 port on either the front or back panel of the 24.24M.

3) Ensure the 24.24M is powered on.

4) Ensure all settings on Protea System Software are correct and then Enable Communications from the Communications Menu.

5) It is recommended that you backup your 24.24M presets to the PC at this point. This can be done by clicking File, Trigger Bulk Preset Dump from Protea, or saving individual presets by clicking File, Trigger Preset Dump from Protea. When the 24.24M is reprogrammed it will not lose preset data, however this is recommended as a safety precaution. For further instructions on backing up presets, see the 24.24M Operating Manual.

6) To Begin the reprogramming process from Protea System Software, click Options, Reprogram 24.24M. This will warn you that it is about to set the 24.24M into Reprogram Mode. While in Reprogram Mode, The 24.24M will continue processing audio signals, however you will be unable to control the 24.24M with the software. While in Reprogram Mode "Pr" will be displayed on the front panel display.

7) At this point, a dialog box will ask for the binary file. Browse for the new 24.24M program binary (.bin) file in the Select Binary File dialog box and click Open. Note: incorrect files will not be processed.

8) Protea System Software is now ready to reprogram the 24.24M. You will see the following dialog box.

9) Select Begin Reprogram. When reprogramming is complete, the 24.24M will reset automatically, mute the audio for about 2 seconds, then continue communications with Protea System Software. At this point the 24.24M has been reprogrammed successfully.

11. REMOTE CONTROL

Ashly makes three remote control options for the Protea 24.24M. All of them are designed to be installed in a standard wall mount electrical box using a standard cover plate. The WR-1 and WR-2 are passive controls which can adjust volume or select presets respectively, while the WR-5 (replaces WR-3 and WR-4) is an active control with user defined function buttons and LED display.

Wall Remote Assembly
(WR-1 Shown)
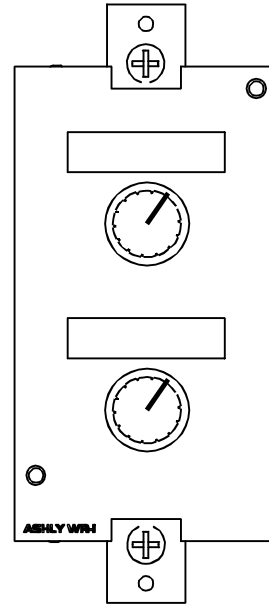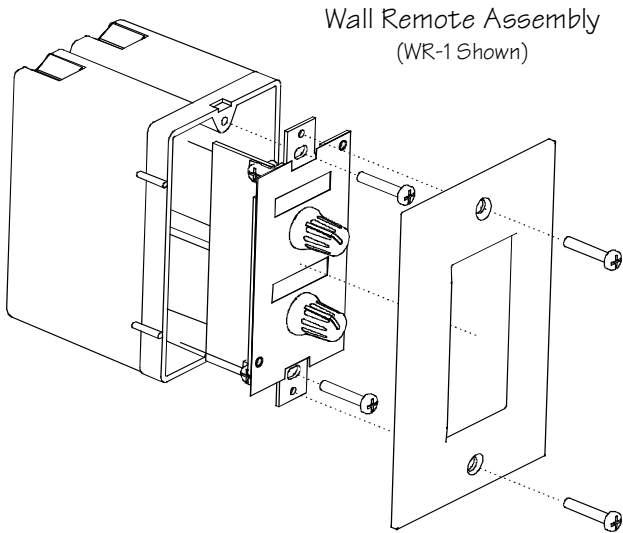
11.1 WR-1 Volume Control

The WR-1 is an assignable, dual potentiometer remote volume control for the 24.24M. Each volume control is connected to a terminal block on the WR-1 circuit board, which in turn must be wired to the 24.24M back panel euroblock connector labeled "0 - 5 Volt Remote Level Control". *Do not connect the WR-1 remote level control ground to any other external grounds.*

By connecting a volume control to a specific pin (1-8), that pin can be selected in software under <Options - Define Remote Level Controls> to control the level of any combination of inputs or outputs. It is possible to simultaneously select the same input or output channel to multiple remote level control pins. Note, however, that the resulting attenuation on that channel is *cumulative*, meaning that channel's gain is set by combining the value of *all* remote level controls mapped to that channel.

In addition to using a WR-1 as the control device, the remote level control feature can be used for relay activated muting of selected channels, as in a fire alarm application (see sec. 12). *Note: Use Protea System Software version 6.1.4 or higher, and 24.24M program version 1.5 or higher to allow assignable remote control.*

*Ch. 2 Gnd/+5 Are Wired To Ch. 1 Gnd/+5 On WR-1 PCB.

—G*
CV-2
+5*
G
CV-1
+5

0-5V Remote Level Control

1 2 3 4 5 6 7 8 +5 G

Connector on 24.24M Back Panel

CV-1 To Pin 1-8
CV-2 To Pin 1-8
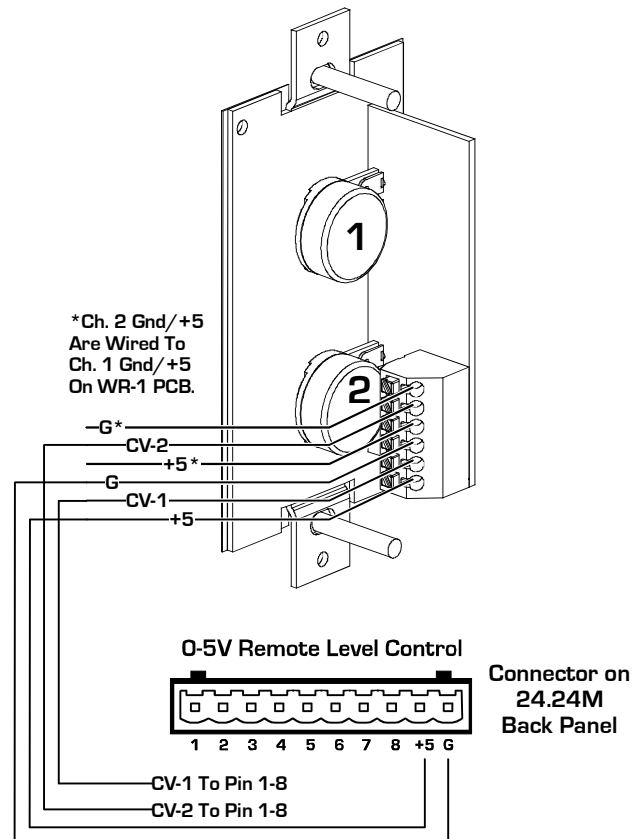
ASHLY

Level control is "attenuate only" meaning that the maximum setting of the control potentiometer (fully clockwise) results in 0 dB gain of the controlled channel. A label template can be found on the Ashly website for printing input or output channel names under control of the WR-1 and sliding the paper behind the mylar overlay windows.

The two +5V pins and two ground pins on the WR-1 euroblock connector are tied together on the circuit board, so it is only necessary to run one +5V line and one ground line to the WR-1 from the 24.24M. These pins are provided for daisy-chaining multiple WR-1 controllers (up to four) together.

11.2 WR-2 Contact Closure Preset Recall

The WR-2 allows for remote selection of one of eight possible 24.24M presets via interlocking push-button switches. Each pushbutton switch connects to a terminal block pin on the WR-2 circuit board, which in turn must be wired to the 24.24M back panel euroblock connector labeled "Preset Recall". *Do not connect the WR-2 remote level control ground to any other external grounds.*

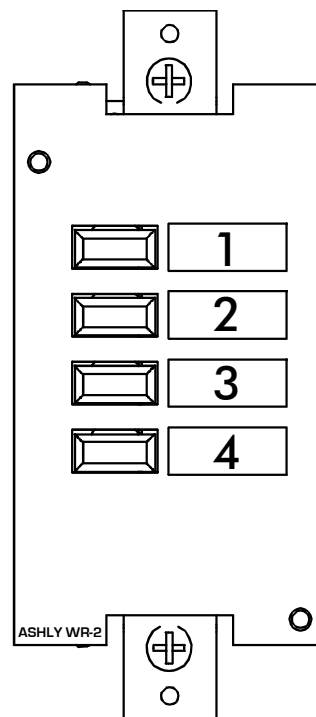The terminal numbers 1-8 correspond to the first 8 Preset Memory locations in the 24.24M. Pressing a button will load the corresponding preset. A label template can be found on the Ashly website for printing preset names for the WR-2 and sliding the paper behind the mylar overlay windows.
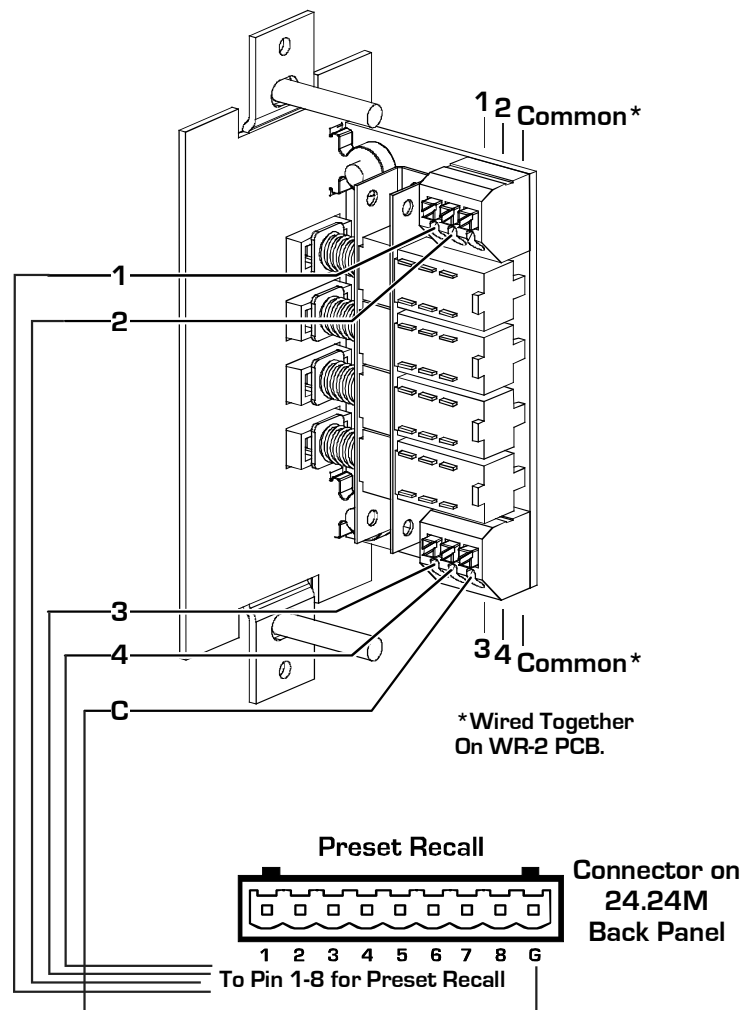

ASHLY

11.3 WR-5 Programmable Zone Controller

The WR-5 is a microprocessor based remote control unit for the Protea 24.24M. Like the WR-1 and WR-2, the WR-5 is designed to fit into a standard electrical wall box. Up to four WR-5 remotes can be phantom powered from one 24.24M, and adding more remotes is possible using an external power supply. Each of six buttons on the WR-5 can be programmed to engage one of the following functions:

1) Preset recall

2) Preset scroll

3) Channel volume

4) Channel mute

5) Zone input source selection

Programming of each button is done from Pro-tea System Software version 6.4 or greater (see screenshot below), when the WR-5 is wired to its host 24.24M, and the 24.24M is in turn connected to a PC via RS-232. Multiple WR-5 units can be daisy-chained from the same 24.24M for discrete control over multiple locations under the processing control of one 24.24M. See your Ashly dealer or visit the Ashly web site at www.ashly.com for more WR-5 details.

12. TYPICAL APPLICATIONS

- **Corporate Boardroom System**
- **Restaurant System**
- **Left/Center/Right Theatre System**
- **Conference Center System**
- **Fire Alarm Mute**

---

16 Input by 8 Output Boardroom System

- Shown with three input and one output expansion cards (four channels per card)

- Autoleveling and gating for worry-free automatic level control

- +48V Phantom power

- Euroblock audio connectors

Inputs

VIP	1
	2
	3
	4
	5
	6
	7
DVD + Dolby Decoder	8-13
VCR	14-15
TELE-CONFERENCE	16

Mic Inputs:
- Gain
- EQ
- Gate
- Autolevel

Line Inputs:
- Gain
- EQ

-Matrix Routing-

Outputs:
- Mixer
- EQ
- Limiter

Outputs

1	L
2	C
3	R
4	LR
5	RR
6	Sub
7	Ceiling Speakers
8	EC Line to Teleconference

---
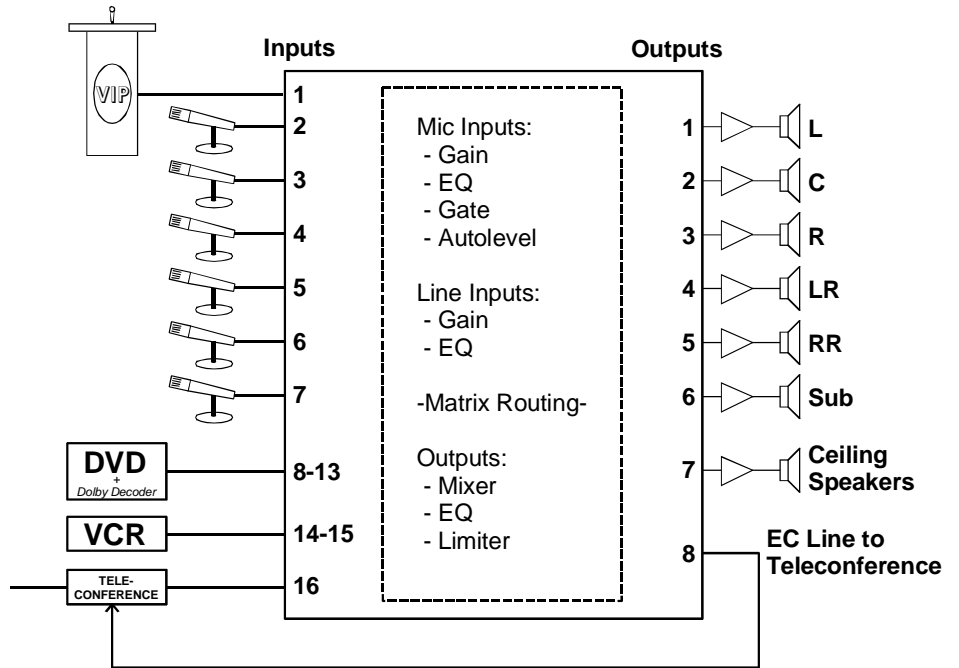
4 Input by 4 Output Restaurant System

- Base Model - No expansion cards required

- Ch 1 input used to duck all other inputs

- Electrical box mounted WR-3 Remote controller used to access and change functions

Inputs

PAGING MIC AND REMOTE CONTROL AT HOSTESS LOCATION

	1
Remote	
SATELLITE RECEIVER A	2
SATELLITE RECEIVER B	3
TV AUDIO	4

Mic Input:
- Gain
- EQ
- Gate/Autolevel
- Ducking Input

Line Inputs:
- Gain
- EQ
- Ducked Signal

-Matrix Routing-

Outputs:
- Mixer
- EQ
- Limiter

Outputs

1	Bar
2	Dining Room 1
3	Dining Room 2
4	Waiting Room
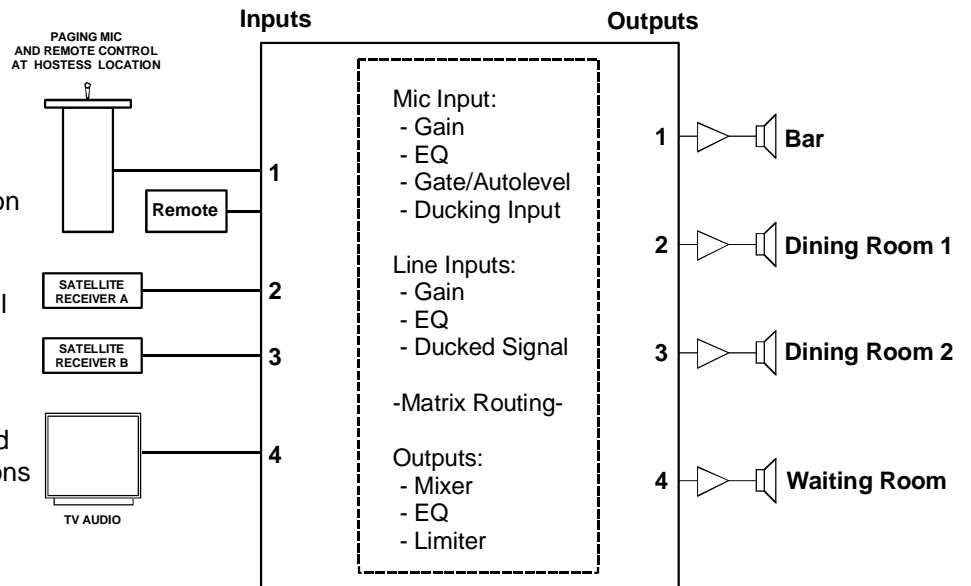
Left / Center / Right Theater System

- Three output expansion cards added

- Complete post-mixer system processor for all speaker locations

- Electrical box mounted remote DC level controller for Dressing Rooms

Inputs

Mixing Console Output

L — 1
C — 2
R — 3

Dressing Room Paging Mic — 4

LCR Inputs:
- Ducked Signal

Mic Input:
- Ducking Input

LCR Outputs:
- HPF / LPF
- Alignment Delay
- EQ
- Limiter

Dressing Room
- Wall Mount Remote Level Control

Outputs

1-3 — L — HF MF LF
4-6 — C — HF MF LF
7-9 — R — HF MF LF
10 — Subs
11 — Under Balcony (Delay)
12 — Lobby
13-14 — Dressing Room 1&2 — *Remote Control*
15-16 — Dressing Room 3&4
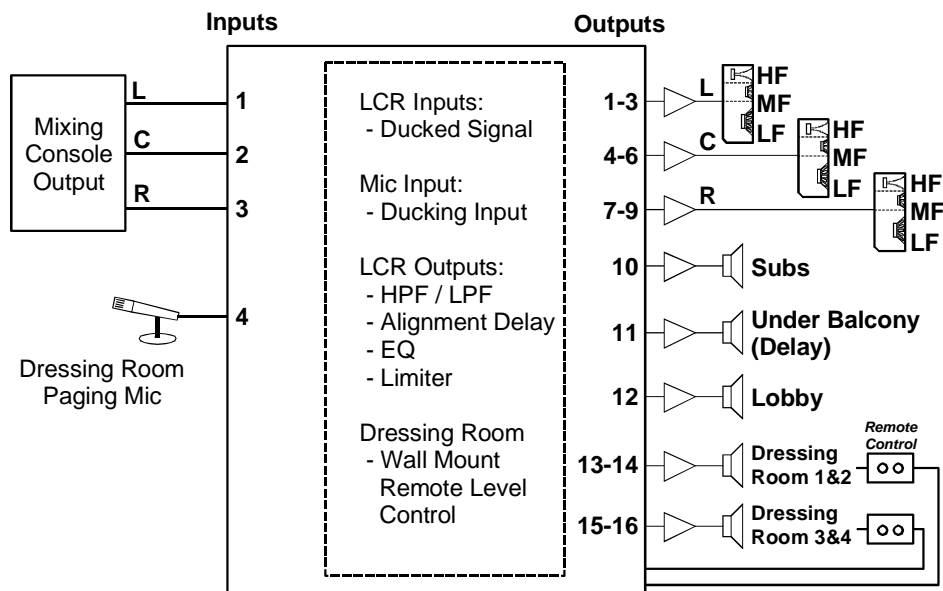
Conference Center System

- Three input expansion cards added

- Four independent room systems can easily be reconfigured using contact closure preset recall

- Electrical box mounted remote DC level controller for each room

Inputs

1
2
3
AV Input — 4

Meeting Room 1

Room Divider

5
6
7
AV Input — 8

Meeting Room 2

9
10
AV Input — 11
Portable Mixer Output — 12

Ballroom 1

Room Divider

13
14
AV Input — 15
Portable Mixer Output — 16

Ballroom 2

Outputs

1 — Ceiling Speakers / Room Volume Control
2 — Ceiling Speakers / Room Volume Control
3 — Main Speakers / Room Volume Control
4 — Main Speakers / Room Volume Control

Contact Closure Preset Panel for Room Combining

Fire Alarm Mute Configuration

- Use Remote Level Control input to mute channels during emergency

- Fire alarm drives relay when active. Relay connects 24.24M 0-5V Remote Level Control Ground to desired pin, muting all channels assigned in software (see sec. 11.1)

0-5V Remote Level Control

1 2 3 4 5 6 7 8 +5 G

Connector on **24.24M** Back Panel

Switched Ground To Desired Pin for Mute All Function

Relay (shown alarm off)

Alarm Relay Drive Output

Emergency Alarm System
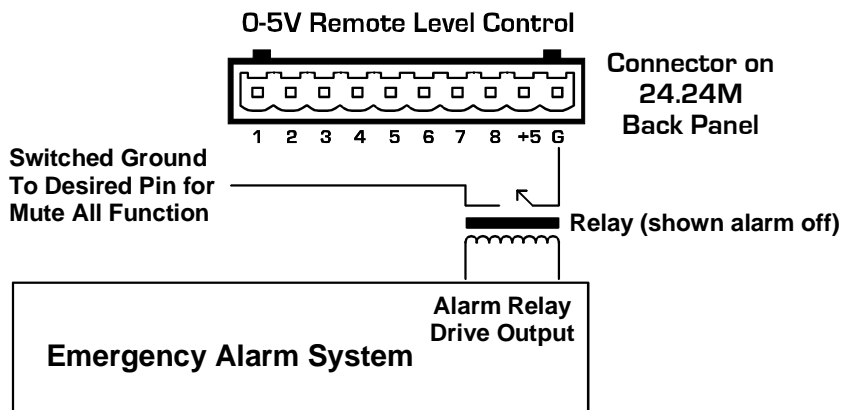
13. TROUBLESHOOTING TIPS

13.1 Audio Problems

1) No power - Is the detachable AC cord fully plugged in? Is the rear panel power switch on?

2) Software controls don't work - Is the RS-232 cable properly installed to the PC? Is the software communications enabled? Is the software device set to 24.24M? Check the security level (section 10.4). If set to <24.24M Full Lock> then no changes are allowed, or if set to <24.24M Parameter Lock> then no changes can be made other than recalling new presets. Does the Data channel assignment match between software and 24.24M (section 7.3)?

3) No sound - Check to see if the input or output is muted. Is the input Preamp set for the proper gain? Is the input or output Gain turned down? Is the Noise Gate threshold set too high? Is the Input to Output Matrix connected as desired? Does the Matrix Mixer section have any signals turned down or muted? If used as a crossover, make sure the high pass filter (HPF) is set to a lower frequency than the low pass filter (LPF) for a given output. If using a condenser mic, is Phantom Power turned on (input Preamp)?

4) Clip light stays on - Is the input signal level too high? Is the Input Preamp gain set too high? Are input or output gain settings too high? Check to see if an EQ filter has too much boost.

5) Distorted sound but no Clip LED- Check individual EQ filters to see if there is excessive boost.

6) Muffled sound - If expecting full range audio on an output, make sure the crossover settings are not inadvertently set so as to limit the pass band.

7) Excessive Noise - Set the Input Preamp gain as high as possible while allowing 20dB of headroom before clipping occurs. Do not use input or output Gain controls for large increases (>20dB) in level from input.

8) Forgot the password - See section **10.4**

13.2 Data Communications Problems

1) Test all data cables. Use RS232 data cables with all conductors wired straight through. Monitor cables and Null Modem cables use non-standard wiring schemes, they will not work.

2) Use a valid PC serial port. You must use a serial port that is not opened to any other application, such as a mouse, modem, or another program. To verify that the port exists look in: Control Panel - System - Device Manager - Ports. While you're there, make sure that the port has no warnings or conflicts.. Finally, you must select the valid port in Protea System Software. This is done under the Communications heading - Com Port Assignment.

3) Make sure that the RS-232 mode switch, located on the back of 24.24M, is in the "out" position. There is just one exception to this rule: the RS-232 mode switch gets pushed in only when both the RS232 Dataport is connected to a PC, *and* the 24.24M is the first of several Protea products, including the remote control WR-5, in a data chain (sec. 7.3)

4) Make sure the device ID (1-16) assigned to the 24.24M matches the data channel chosen for the device within Protea System Software, and make sure that no other devices use that channel.

14. DIMENSIONS

24.24M Matrix Processor

15. SPECIFICATIONS

INPUT . . . . Active Balanced, 18 kohms
Max Input Level: . . . . +20 dBu
Input Gain Range: . . . . -50dB to +12dB, polarity select
OUTPUT: . . . . Active Servo-Balanced, 112 ohms
Max Output Level: . . . . . . +20 dBu
Output Gain Range: . . . . . -50dB to +12dB, polarity select
Frequency Response: . . . 20 Hz-20kHz, +/- 0.25 dB
THD: . . . . <0.01% @1 kHz, +20 dBu
Dynamic Range: . . . . >110 dB (20 Hz-20 kHz)
. . . . unweighted
Output Noise: . . . . <-90 dBu unweighted

MIC PREAMP
Gain: . . . . 0dB, +20dB, +40dB, +60dB
Phantom Power: . . . . +48VDC, 9.6mA max, soft on/off
Equivalent Input Noise: . . -128 dBu, 20-20kHz, 50 ohm source

EQ FILTERS
Number: . . . . 15 per Input, 15 per Output
Selectable As:
Parametric
Bandwidth: . . . . 1/64th Octave to 4 Octave
Range: . . . . +15/-30dB, 0.1 dB increments
Frequency Resolution: . . . 1 Hz
Low-Shelf
Slope: . . . . Selectable 6 or 12dB/Octave
Frequency Range: . . . . . . 20Hz to 2KHz
Range: . . . . +/-15dB, 0.1dB increments
High-Shelf
Slope: . . . . Selectable 6 or 12dB/Octave
Frequency Range: . . . . . . 3.886KHz to 20KHz
Range: . . . . +/-15 dB, 0.1 dB increments
All-Pass
Type: . . . . Second Order (-180 degrees)
Frequency Range: . . . . . . 20Hz to 20KHz

CROSSOVER FILTERS
High Pass Filter
Type: . . . . Linkwitz-Riley, Bessel, Butterworth
Slope: . . . . 12, 18, 24 and 48dB/Octave
Frequency Range: . . . . . . Off to 20KHz, 1Hz increments
Low Pass Filter
Type: . . . . Linkwitz-Riley, Bessel, Butterworth
Slope: . . . . 12, 18, 24 and 48dB/Octave
Frequency Range: . . . . . . Off to 20Hz, 1Hz increments

DELAY
Input Maximum Delay: . . 682.5ms
Increment: 20µs
Output Maximum Delay: . 682.5ms
Increment: 20µs

GATE
Threshold: . . . . -80 to +20dBu, 1dBu increments
Floor: . . . . Off, -80 to 0dBu, 1dBu increments
Attack: . . . . .2, .5, 1, 2, 5, 10, 20, 50ms/dB
Release: 5, 10, 20 50, 100, 200, 500,
1000ms/dB

AUTOLEVELER
Target Level: . . . . -40 to +20dBu, 1dBu increments
Ratio: 1.2:1, 1.5:1, 2:1, 3:1, 4:1, 6:1, 10:1
Hold Time: 0, 1, 2,3, 4, 5, 6Sec
Threshold Below Target: . -30 to 0dB, 1dB increments
Gain Increase Rate: 5, 10, 20 50, 100, 200, 500,
. . . . 1000ms/dB
Gain Decrease Rate: 5, 10, 20 50, 100, 200, 500,
. . . . 1000ms/dB

DUCKER
Trigger Threshold: . . . . . . -80 to +20dBu, 1dBu increments
Ducker Depth: . . . . Off, -30 to 0dB, 1dB increments
Ducker Release: 5, 10, 20 50, 100, 200, 500,
1000ms/dB

CROSS POINT MIXER
Gain: . . . . -Inf, -50 to +12dB,
. . . . 1dB increments with Mute

COMPRESSOR/LIMITER
Threshold: . . . . -20dBu to +20 dBu, 1dB increments
Ratio: . . . . 1.2 :1 to Infinity (1.2, 1.5, 2., 3, 4,
. . . . 6, 10, 20, Infinite:1)
Atack: . . . . 0.5 ms to 50 ms per dB
Release: . . . . 10 ms to 1 sec. per dB

PROCESSOR
Input A/D: . . . . 24 bit
Output D/A: . . . . 24 bit
Processors: . . . . 24 bit signal, 48 bit filters,
. . . . 56 bit accumulator
Sample Rate: . . . . 48 kHz
Propagation Delay: . . . . . 1.46 ms

OTHER
Power Requirements: . . . . 90 - 240VAC, 40W
Shipping Weight: . . . . 13lbs (5.9kg) max
Dimensions: . . . . 19"L x 3.5"H x 8.5"D
. . . . (483cm x 89cm x 216cm)
Connections: . . . . Euroblock
Environmental: . . . . 40-120 deg. F,
. . . . (4-49 deg, C) noncondensing

16. WARRANTY INFORMATION

The unit you have just purchased is protected by a limited five-year warranty . To establish the warranty, be sure to read completely, fill out and return the warranty card that came with your product. Fill out the information below for your records.
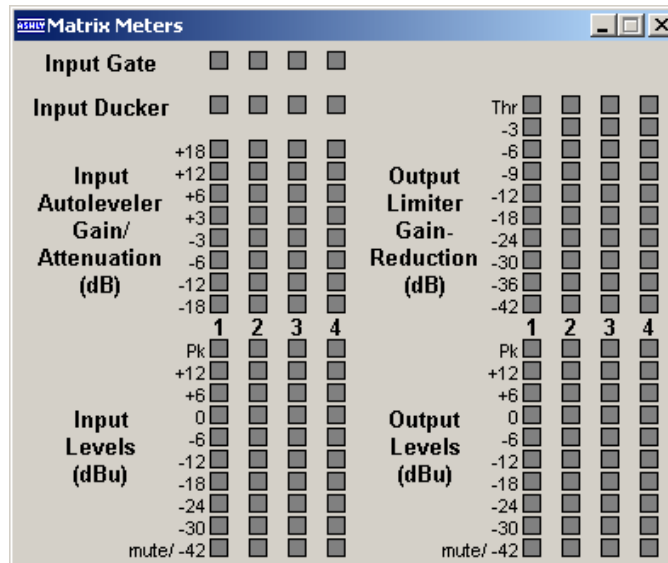
Serial Number _____
Dealer _____
Date of Purchase _____
Dealer's Address_____
Dealer's Phone _____
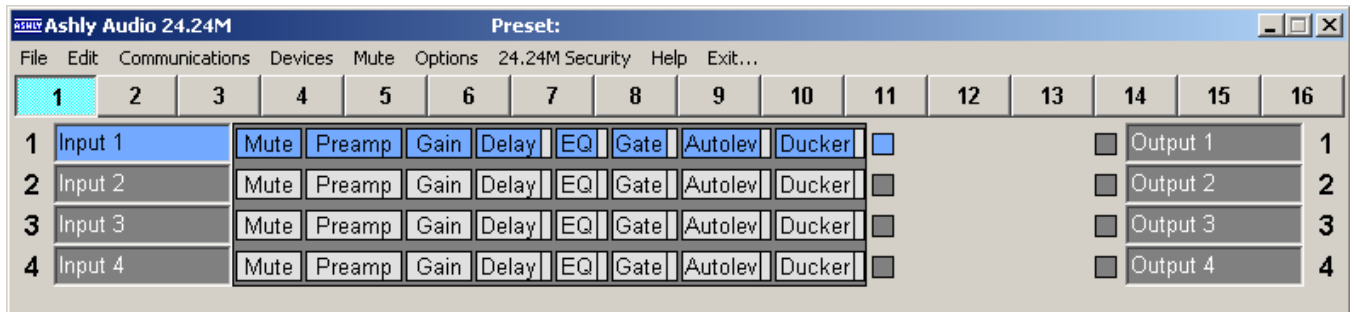
ASHLY

Protea 24.24M Input Functional Block Diagram

Protea 24.24M Output Functional Block Diagram

Protea 24.24M Matrix Meters

ASHLY

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