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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.



The exclamation point within an equilateral 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 APPIANCE 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 ne24.24M. The Protea ne24.24M Matrix Processor uses modular expansion cards to provide up to twenty-four channels of audio matrixing and processing, along with provisions for remote control and logic output. The base unit offers a four-input/four-output configuration. Each input and output expansion card has individual DSP processing allowing expansion of the base unit's total inputs or outputs four channels at a time. In addition, an eight channel general purpose logic control output expansion card is available for controlling lighting or AV equipment through the Protea NE Software, or by recalling presets.

Expansion cards, meaning inputs, outputs, or a logic output card are easily installed in the field without the need to reset switches or reprogram the device.

Input channel processing blocks include: Mic Preamp with up to 60dB Gain, 48V Phantom Power and "Touch to Talk" switching, Input Level with Polarity, two different Remote Level Control choices, Time Delay, Fifteen Band Fully Parametric EQ, Noise Gate, Autoleveler, and Ducker.

Output channel processing blocks consist of: Cross Point Mixer, HPF/LPF, Delay, fifteen EQ Filters, Gain, Remote Level Control, 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 crossover section offers Bessel, Butterworth and Linkwitz-Riley filters with 12, 18, 24 and 48dB octave slopes.

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 the system.

Programming is accomplished using Ashly's Protea NE Software on a PC or PDA platform via standard 10/100BASE-T Ethernet communication. The absence of front panel controls along with multi-level software security assures a tamperproof audio system. Whether designing or installing a system for corporate boardrooms, restaurants, courtrooms, houses of worship, left/center/right theatres, auditoriums or conference centers, the Protea ne24.24M will more than satisfy requirements for any zoned system requiring input/output matrixing with signal processing. Factory presets for many typical sound install applications are available on the Ashly web site as a starting point to set your own system requirements.

Connectors are euroblock for all audio inputs and outputs, eight Logic Inputs for preset recall, eight channels of remote DC level control, and a data connection for Ashly's WR-5 active remote. Ethernet and RS-232 use RJ451 and DSub 9 connectors respectively.

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 ne24.24M is on the back panel. The Protea ne24.24M 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 ne24.24M.** 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.

4. FRONT PANEL FEATURES

4.1 RS-232 Dataport

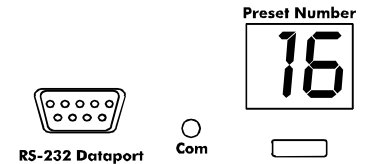
The ne24.24M has two RS-232 dataports wired in parallel, one on the front panel and one on the back, for connecting to a computer for software control. See section 7.3 for details on connecting to a computer.

4.2 Com LED

This green LED lights for a few seconds whenever there is communication activity to the unit from a host PC.

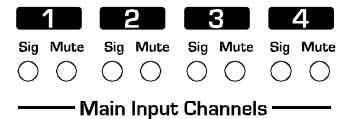
4.3 Preset Number

This LED and switch select and display the current ne24.24M preset number (1-35). 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.



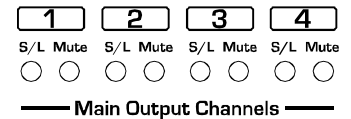
4.4 Main Input Channel LEDs

The ne24.24M 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 ne24.24M preamp section. The red input mute LED becomes lit when an input channel is muted through software.



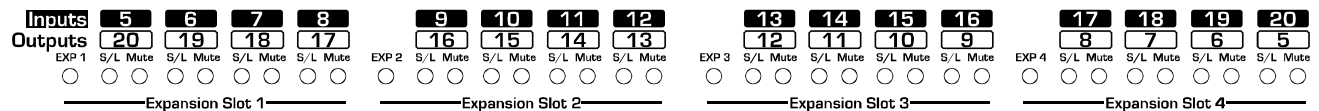
4.5 Main Output Channel LEDs

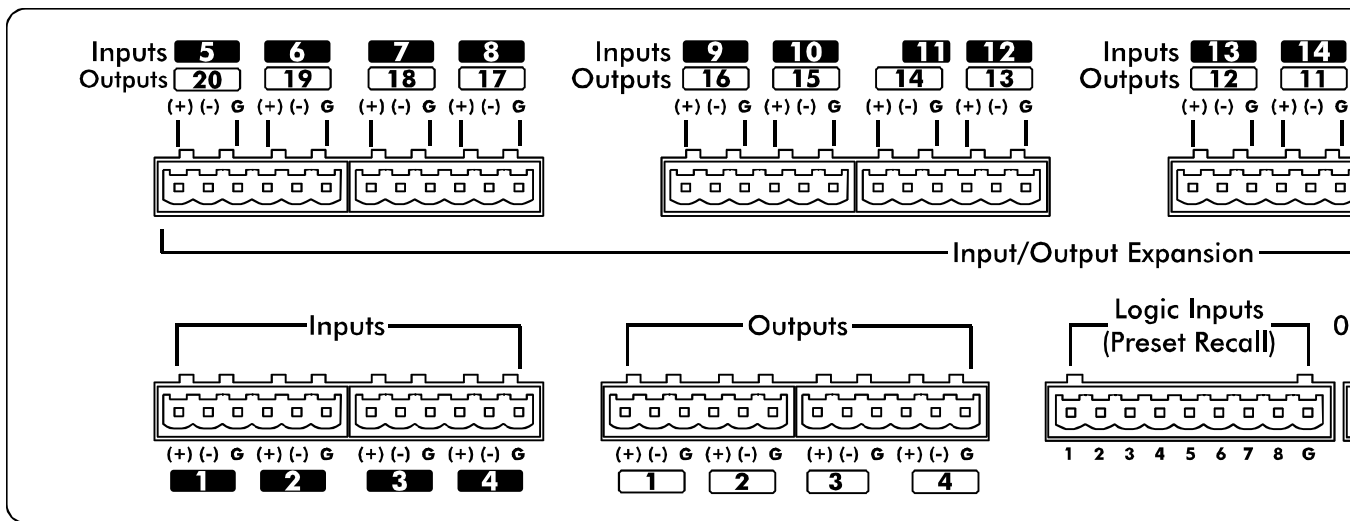
The four fixed output channels on the ne24.24M have three color LEDs to indicate signal, limiter threshold, and clip. The green signal LED indicates -20dB output level. The amber limiter threshold LED depends on settings established within Protea System Software, and, assuming the limiter is active, 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.



4.6 Expansion Module LEDs

The ne24.24M 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.

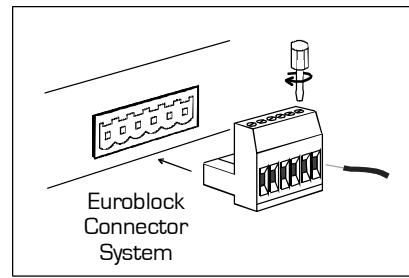




5. REAR PANEL FEATURES

5.1 Input Connections

Balanced input signals are connected to the ne24.24M using the included euroblock connector. A flat blade screwdriver is required to connect a stripped wire lead to the external connector piece, 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.*



5.2 Output Connections

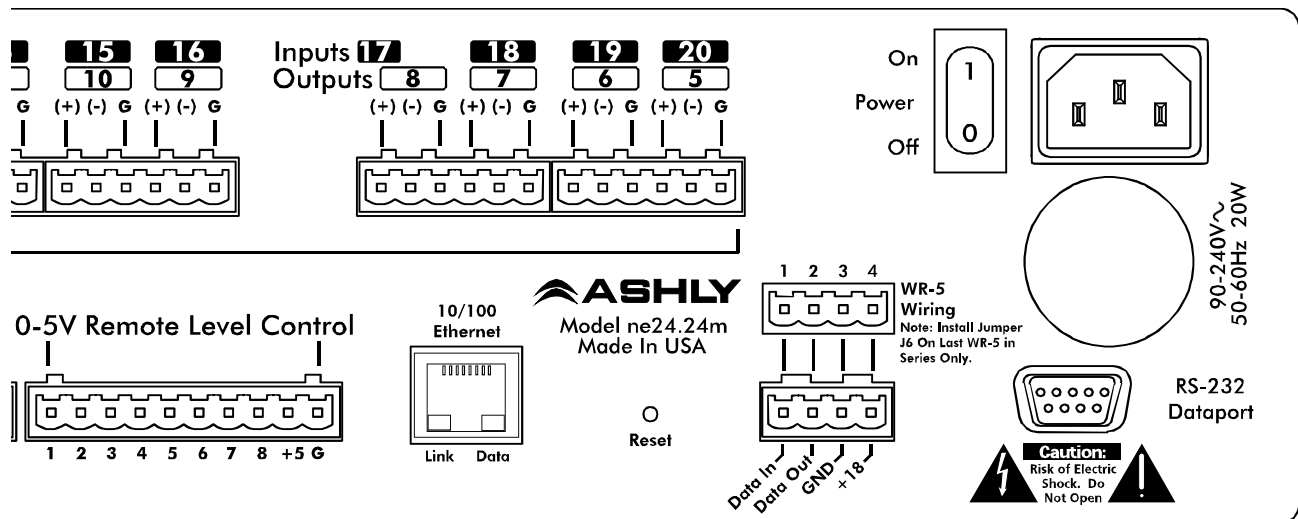
Like the inputs, output connections are made using the included euroblock connector. All outputs are servo balanced, and may be wired balanced or unbalanced. For unbalanced output connections, use (+) and ground and tie (-) to ground.

5.3 Expansion Modules

The ne24.24M base model is expandable by up to 16 additional inputs or outputs, as well as a single module card used for eight general purpose logic outputs (GPO). Expansion modules of four inputs or four outputs each can be installed in any expansion slot. 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. The optional Logic Output card (GPO) is used to drive preset controlled relays or another device's logic control inputs. The GPO comes with a function and wiring sticker which must be placed on the ne24.24M back panel above the Input/Output slot where the GPO option is installed. Only one GPO can be installed in a ne24.24M.

5.4 Logic Inputs (Preset Recall)

There are no user controls on the ne24.24M, 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 ne24.24M offers the ability to recall up to eight different presets, or switch other events such as a mic input "push to talk" 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. To use the mic input “Push To Talk” feature, select the “Push To Talk Mic” checkbox in the Protea NE Software’s mic preamp dialog box. The preset recall feature for that contact closure is then deactivated. 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 ne24.24M contact closure ground for contact closure switches. Do not connect the ne24.24M contact closure ground to any other external grounds, as ground loop currents may result.

5.5 10/100 Ethernet Control Jack

Use this RJ-45 jack to connect directly to a computer or to a 10/100 Base-T ethernet network using Protea^{ne} software for access to the comprehensive suite of device setup, audio controls, and monitoring functions.

5.6 0-5V Remote Level Control

Any of the inputs or outputs on the ne24.24M 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 NE Software, each remote level control 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 ne24.24M 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.*

5.7 RS-232 Dataport

The ne24.24M 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 AMX, Crestron, or other third party controllers. Control data for the ne24.24M uses the RS-232 protocol, and does not support the MIDI baud rate. Supported baud rates are 9600bps and 38,400bps.. See section 7.3 for details on connecting to a computer.

5.8 Data In/Data Out Connection

The Data In and Out connectors are used for connecting the ne24.24M to the Ashly WR-5 active wall remote controller or RD-8C.

5.9 Factory Reset Switch

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 ne24.24M is accomplished by pressing and holding a recessed switch on the back panel during power up. The switch is found in a small hole labelled "Reset". There is a 10 second countdown in the front panel 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.

5.10 AC Inlet and Power Switch

A detachable AC power cord is used on the ne24.24M. 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.

6. EXPANSION MODULE INSTALLATION

The Ashly ne24.24M 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, as well as logic output function, additional modules can be purchased and easily installed in the field.

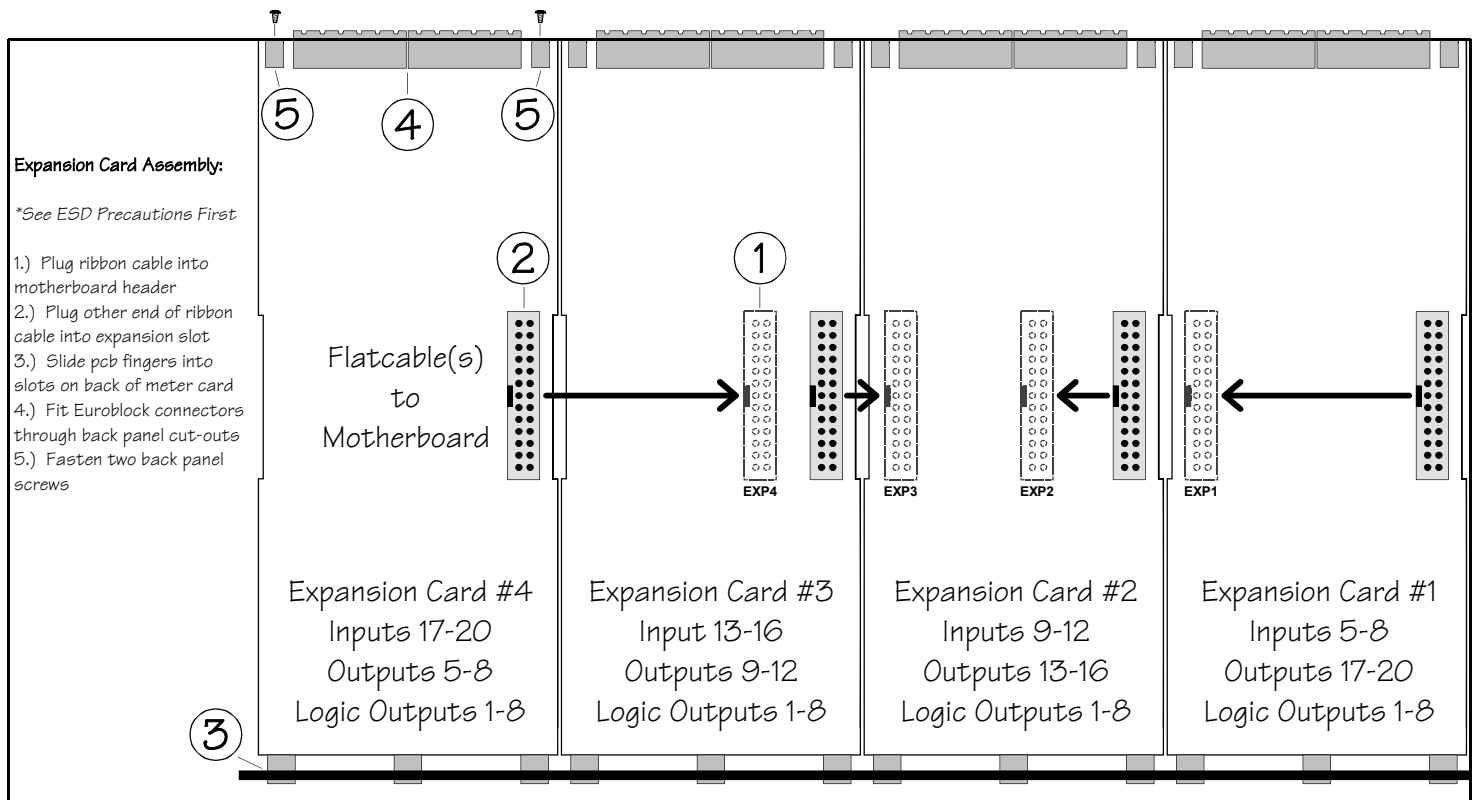
There are a total of four expansion slots available, and each slot accepts either an input, an output, or a logic output module (GPO). The ne24.24M as well as Protea NE Software autodetect if a slot has been filled, and whether it is an input, output, or logic output. The software interface automatically updates to reflect the current ne24.24M expansion slot configuration. The logic output expansion module can be installed into any slot, however only one logic output module can be installed.

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 a 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.

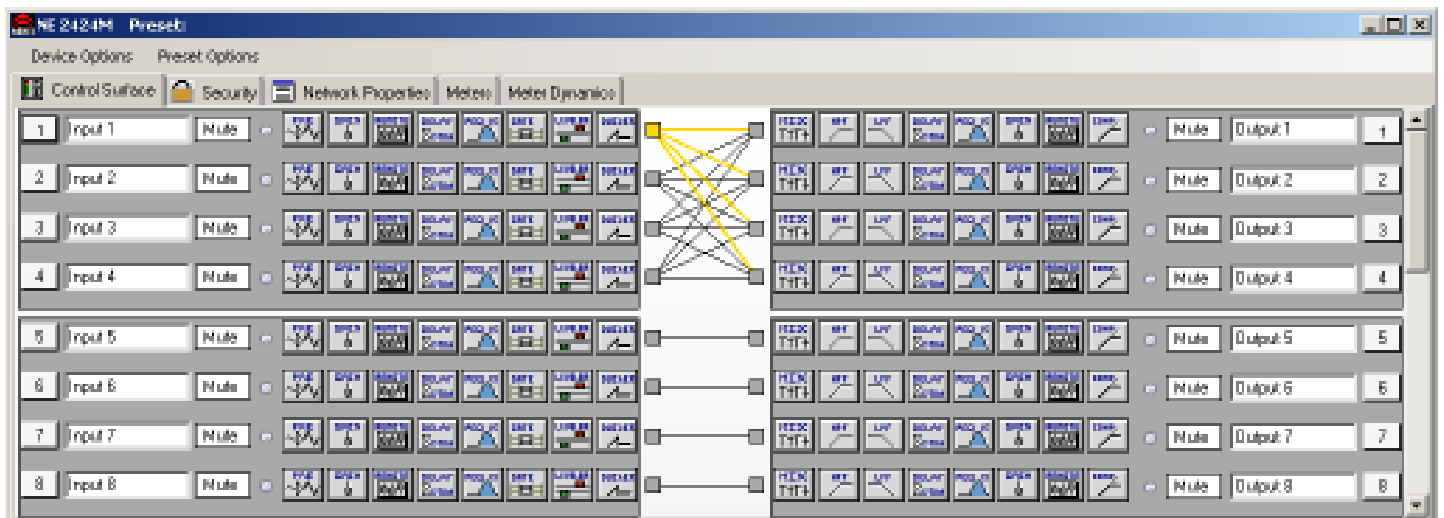


7. PROTEA NE SOFTWARE

Ashly offers a powerful software interface for the Windows PC environment, as well as any PDA device running Windows Mobil 05, providing control for the ne24.24M Matrix Processor, and many other Ashly digital audio processors and power amplifiers. All controls are intuitively represented in a user friendly way, and comprehensive on-line help is available for all key functions.

7.1 How to get Protea NE Software

Protea NE Software is shipped free with each new Protea ne24.24M, can be downloaded from the Ashly web site, or can be purchased directly from Ashly for a nominal handling fee.



7.2 Connecting the ne24.24M to a computer using Ethernet

Ethernet is the preferred data protocol for computer control. A standard RJ-45 jack is used for connecting directly to a PC, PDA, or 10/100 Base-T network.

7.3 Connecting the ne24.24M to a computer using the RS-232 Dataport

The ne24.24M is optimally designed for use with ethernet control, however it remains backward compatible to systems using RS-232 control. In other words, older Protes System Software (or other) based installs using RS-232 will work fine with a new ne24.24M. If, on the other hand, the ne24.24M needs RS-232 control while still in a networked ethernet system using Protea NE Software, add a 24.24M (not the ne24.24M) from the <Add Item> menu in Protea NE Software and set the unit up accordingly using the self-launching older Protea System Software. RS-232 and ethernet will run concurrent on the same unit.

For RS-232, a D-Sub nine pin female to male connector cable is used to connect to the ne24.24M. An active USB to RS-232 converter can be purchased at computer stores if necessary. Here are the suggested steps for connecting the ne24.24M using RS-232:

- 1) Plug the RS-232 cable into an available serial port on the PC or control unit.
- 2) Plug the other end of the cable into either the front or back RS-232 Dataport on the ne24.24M.
- 3) Turn on the power to the ne24.24M.
- 4) Open Protea System Software (version 6.4 or higher), *not* the Ethernet based Protea NE Software.
- 5) Go to the <Devices> menu and select <ne24.24M>.
- 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 ne24.24M.
- 8) Go to the <Communications> menu and select <Enable Communications>.
- 9) The connection should now be established. The unit will communicate on any device channel (Channel 1-16) in the Protea System Software (see sec. 4.2.)

8. 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 ne24.24M 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.*

8.1 Input Audio Functions

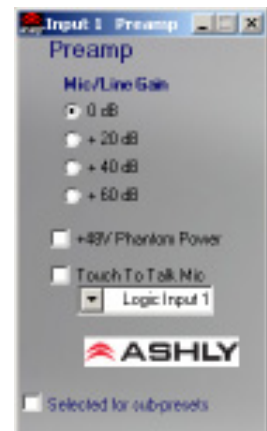
The following functions are available on all inputs; Mute, Preamp Gain, Input Gain, Delay, EQ, Noise Gate, Autoleveler, Ducker, and Matrix Routing.

8.1a 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.

8.1b 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.



8.1c Phantom Power

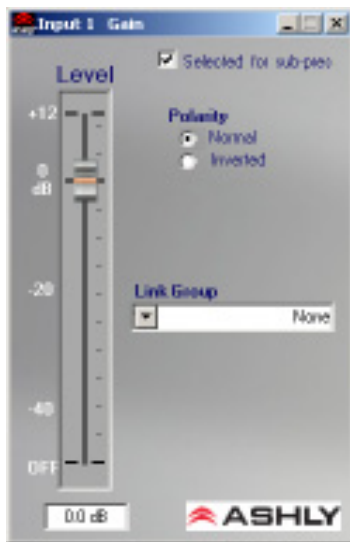
+48V Phantom power for condenser microphones can be provided to individual channels by checking the <+48V Phantom Power> box in the preamp block for a given channel.

8.1c Push To Talk Mic

This check box and drop down menu selects the back panel logic input to serve as a contact closure input channel engage.

8.1d 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 + click>.



8.1e 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 ne24.24M, 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.

8.1f Input EQ

The Protea ne24.24M 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.

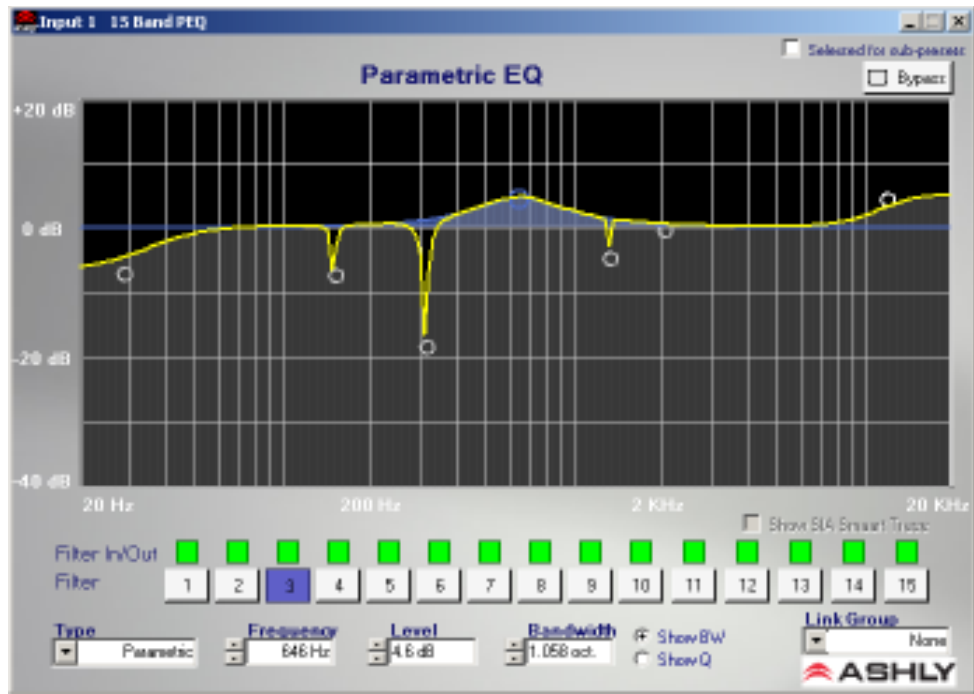
Shelving EQ filters: 1st order filters use a gentle 6dB per octave slope, while 2nd order filters use a 12dB per octave slope for a more pronounced boost or cut. All shelving filters have a boost/cut range of +/-15dB. Low shelving filters have a frequency range from 20Hz through 2kHz, and the high shelving 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 they 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.

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 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.

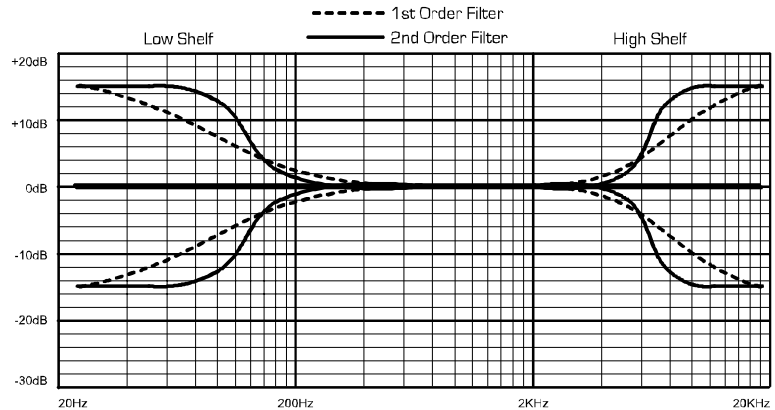
Protea ne24.24M parametric filters have a boost/cut range of +15dB to -30dB. There is more cut than boost

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.

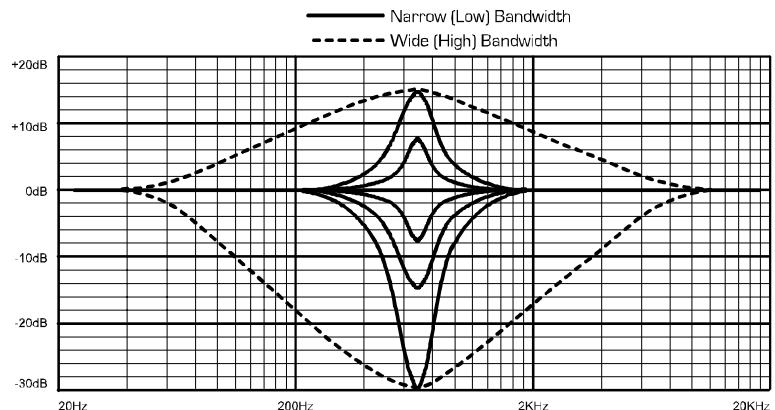


Every parametric EQ filter has a center frequency. The factory default is 1kHz, but each filter is adjustable from 20Hz to 20kHz in 1Hz steps. Carefully sweeping a narrow bandwidth filter through a problem feedback area, with just a slight boost, is a quick way to find the exact frequency causing feedback 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.

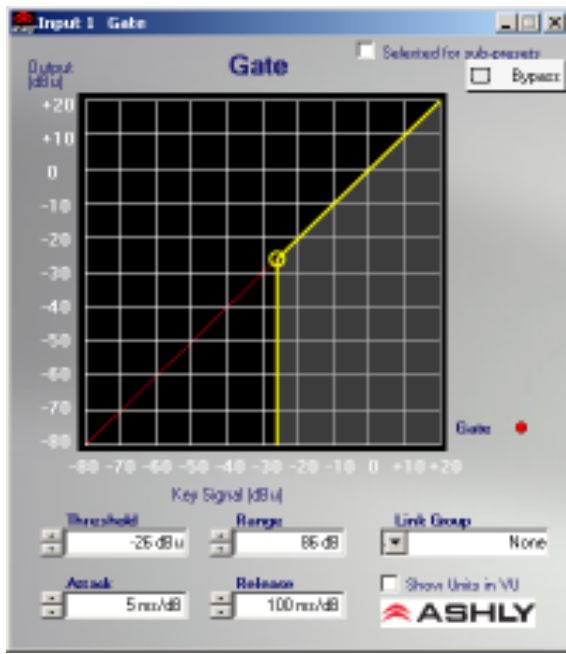
All Pass filters: All pass filters have no effect on frequency amplitude, but rather are used to adjust the phase response of the signal at a given frequency, and are often used in conjunction with a frequency-domain filter to correct phase changes. At low frequencies, there



24.24M Shelving Filters



24.24M Parametric Filters



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.

8.1g 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. RANGE is the amount of attenuation in dB which the noise gate attenuates the signal when the gate is 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.

8.1h Autoleveler

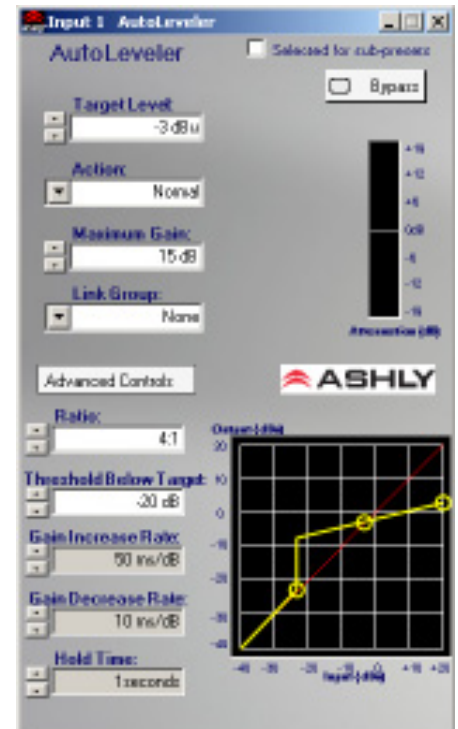
An Autoleveler is a dynamics processor used to automatically boost or cut a signal to a user defined target level. TARGET LEVEL is the primary setting in an autoleveler, as it determines the desired constant level to which an input is boost or cut. Both basic mode and advanced mode utilize the target 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

$$\text{Thr} = \frac{\text{Max Gain}}{(1/\text{ratio} - 1)}$$

MAXIMUM GAIN controls the threshold below target using the following formula:

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.



8.1i 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".
- 5.) FILIBUSTER - signal present on this channel fully attenuates all other channels until the signal drops below its threshold to allow other channels to come on.

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.

8.1j 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).

8.1k Remote Level Control

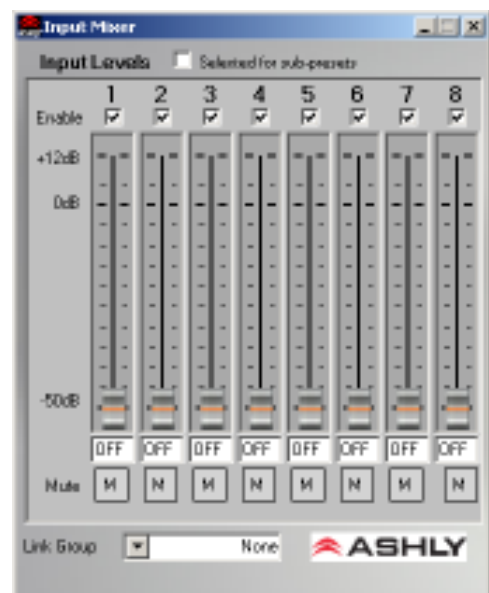
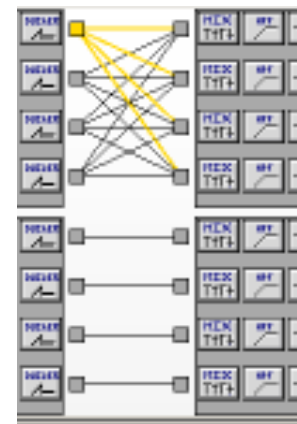
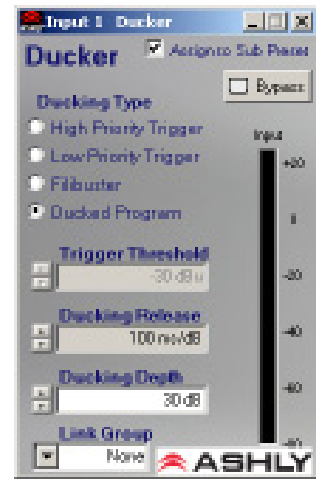
Each channel can be remotely attenuated through the back panel 0-5V Remote Level Control pins, or by an Ashly RD8C active remote attenuator connected to the 4-pin data connector on the back. The Remote Level Controls dialogue box then allows arbitrary assignment of the remote's attenuator channels to the ne24.24M's audio channel.

8.2 Output Audio Functions

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

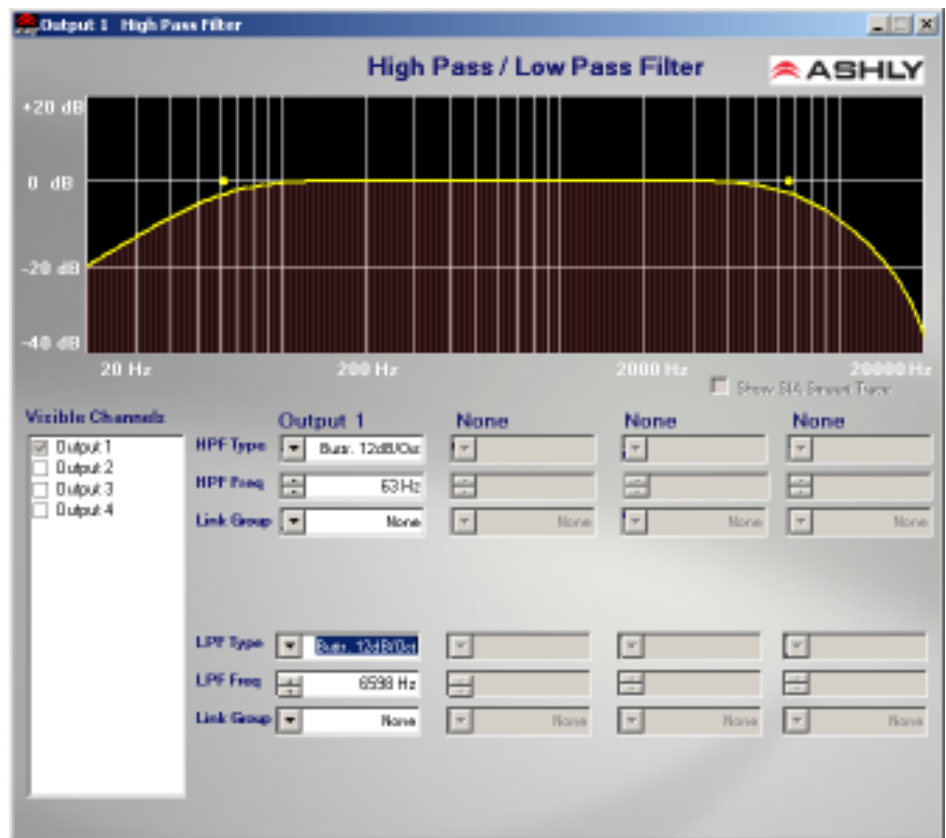
8.2a Output Matrix Mixer

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> + <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.



8.2b Hpf/Lpf - Crossover

Bandpass or crossover functions on the Protea ne24.24M 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 filter 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 ne24.24M 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 ne24.24M, 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

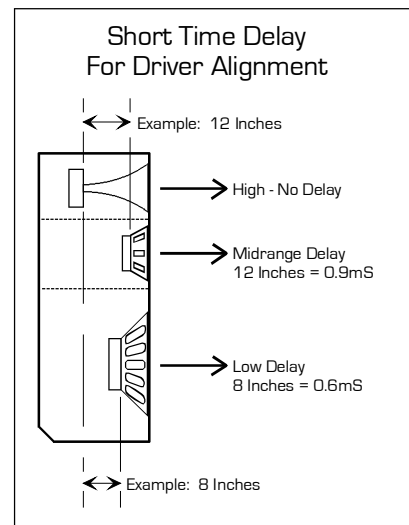
The 12 dB/oct, 24dB/oct, an 48dB/oct Linkwitz-Riley filters individually are always -6dB at the displayed crossover frequency, however the 18dB/oct Linkwitz filters individually are always -3dB at the displayed crossover frequency. The reason for this is that Linkwitz-Riley filters are defined in terms 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.

8.2c 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.

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 ne24.24M.



8.2d Output EQ

The Protea ne24.24M 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.

8.2e 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.

8.2f Output Compressor/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 Group, and Attenuation Bus.

The ne24.24M 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 ne24.24M 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 Attenuation 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 channels selected to the attenuation bus. The channel limiter attenuation bus is particularly useful when processing stereo signals.

8.2g Output Mute

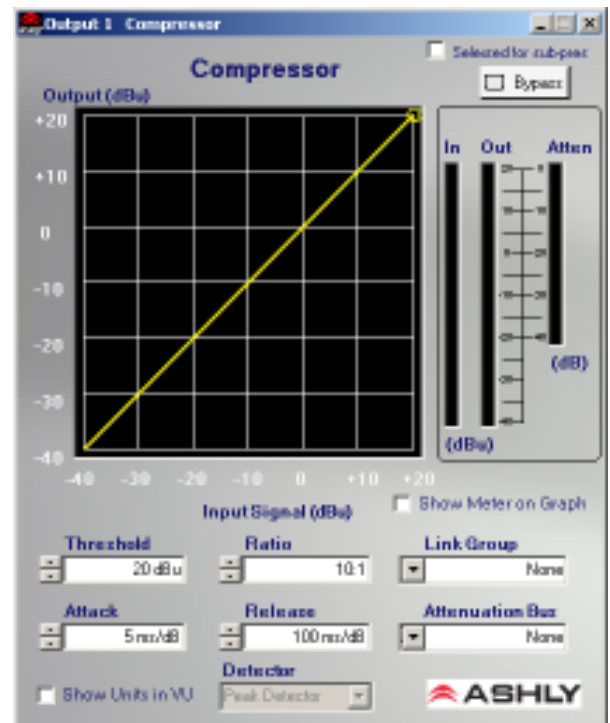
Output Mute turns off an output channel. When an output channel is muted, that channel's red mute LED on the face panel is lit. To mute or unmute all outputs at once, go to the <Mute> menu heading.

9. OTHER SOFTWARE FUNCTIONS

9.1 Channel Preset (and Sub Preset) File Management

The Protea ne24.24M will store up to 31 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 NE Software, changes to an individual preset can be saved to the ne24.24M using <File/Save Preset To Protea>, or saved to the PC using <File/Save Preset To Disk>. Individual preset files use the extension (*.pne).

Sub Presets: Instead of saving or recalling an entire preset affecting all functions, a sub-preset affecting only a sub-set of functions may be used. To save a sub-preset, check the boxed labelled <Selected for sub-presets> in the audio control functions to be stored in the sub preset, and then click <preset options>, then <Save Sub Preset>.



Since there are no user controls on the ne24.24M, the only way to load presets is by using Protea NE Software to recall files saved on either the PC or the ne24.24M. 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 ne24.24M 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 ne24.24M 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.

9.2 Copying Settings to Another Input Or Output

To quickly transfer all settings from one input or output to another input or output channel within the same unit, right click on the channel number and choose from the available options to copy, paste, or link with another channel.

9.3 Security

There are multiple user/multiple levels of protection assignable to the ne24.24M within the software <Security> pull down menu, from full access to view only, with User ID and Passwords assigned for each available unit. The ne24.24M security data is stored within the unit, not Protea NE 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.*

9.4 Program Upgrade

The ne24.24M Matrix Processor is capable of field flash reprogramming through Ashly Audio's Protea NE Software. Look under <Device Options> for further details.

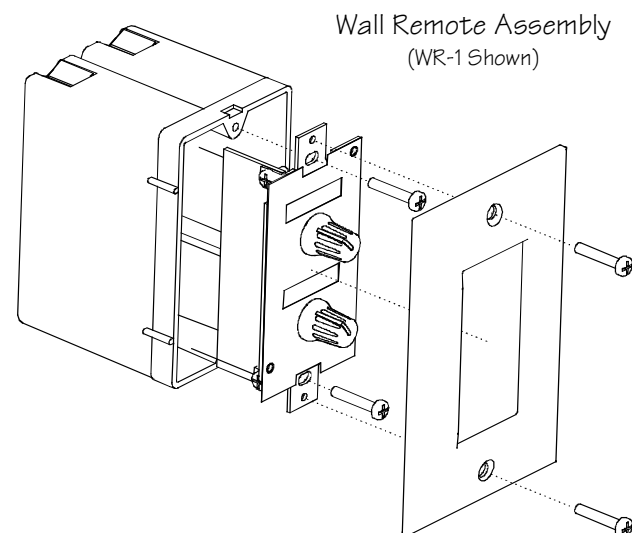
10 REMOTE CONTROL

Ashly makes three remote control options for the Protea ne24.24M. 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.

10.1 WR-1 Volume Control

The WR-1 is an assignable, dual potentiometer remote volume control for the ne24.24M. Each volume control is connected to a terminal block on the WR-1 circuit board, which in turn must be wired to the ne24.24M 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. 16). *Note: Use Protea System Software version 6.1.4 or higher, and ne24.24M program version 1.5 or higher to allow assignable remote control.*

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 ne24.24M. These pins are provided for daisy-chaining multiple WR-1 controllers (up to four) together. See WR-1 Wiring Diagram on next page.

10.2 WR-2 Contact Closure Preset Recall

The WR-2 allows for remote selection of one of eight possible ne24.24M 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 ne24.24M back panel euroblock connector labeled "Preset Recall". *Do not connect the WR-2 remote level control ground to any other external grounds.*

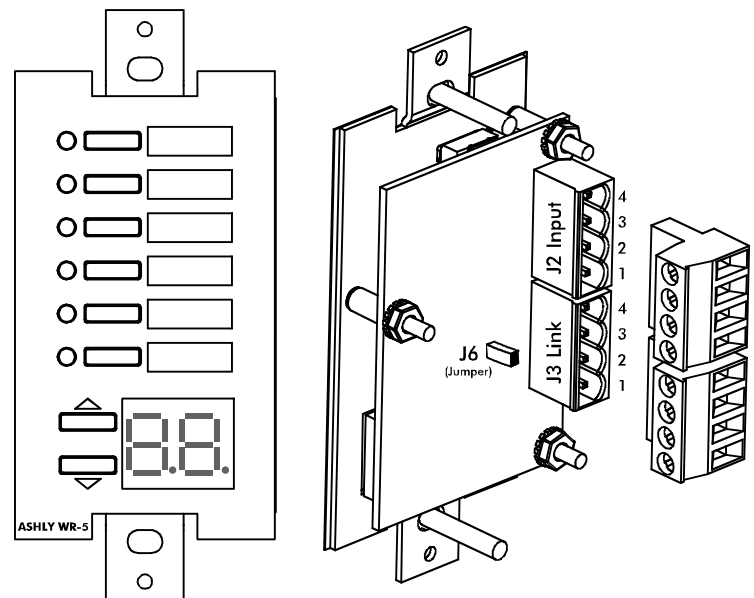
The terminal numbers 1-8 correspond to the first 8 Preset Memory locations in the ne24.24M. Pressing a button will load the corresponding preset. A label template can be found on the Ashly website for printing preset names for the WR-2 and sliding the paper behind the mylar overlay windows. See WR-2 Wiring Diagram on next page.

10.3 WR-5 Programmable Zone Controller

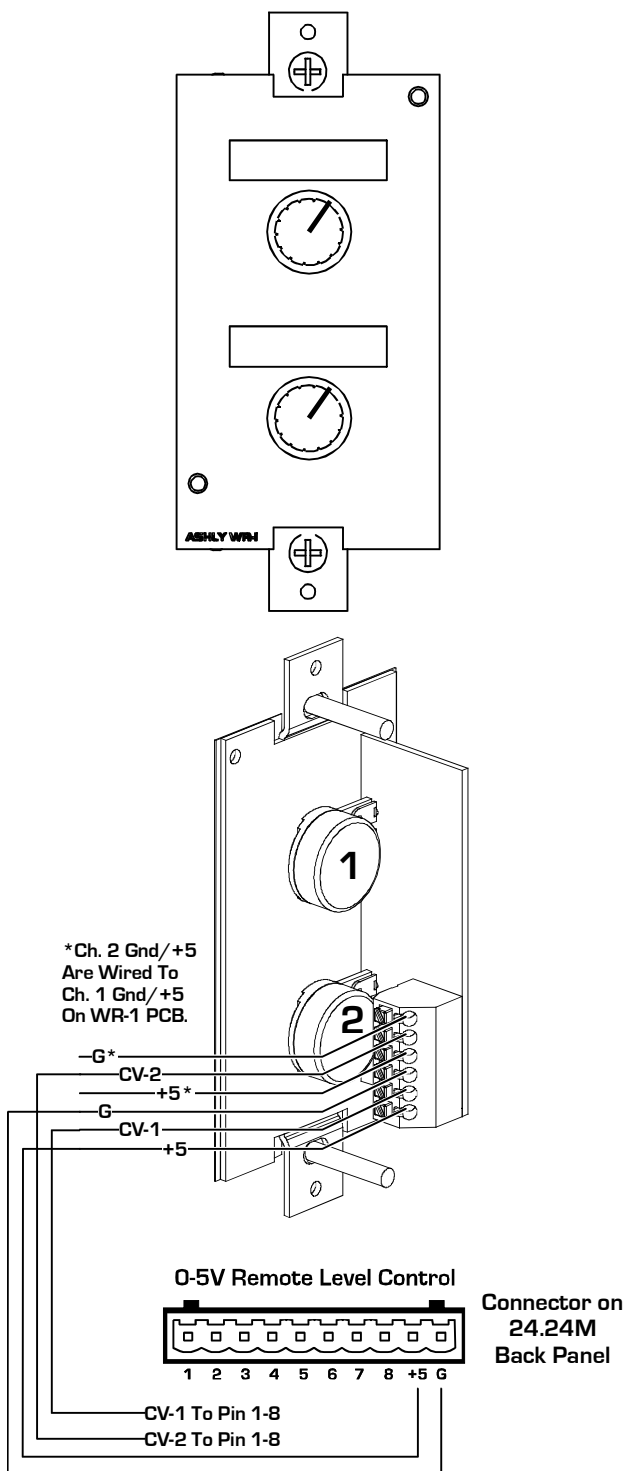
The WR-5 is a microprocessor based remote control unit for the Protea ne24.24M. Like the WR-1 and WR-2, the WR-5 is designed to fit into a standard electrical wall box. Up to four WR-5 remotes can be phantom powered from one ne24.24M, and adding more remotes is possible using an external power supply. 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

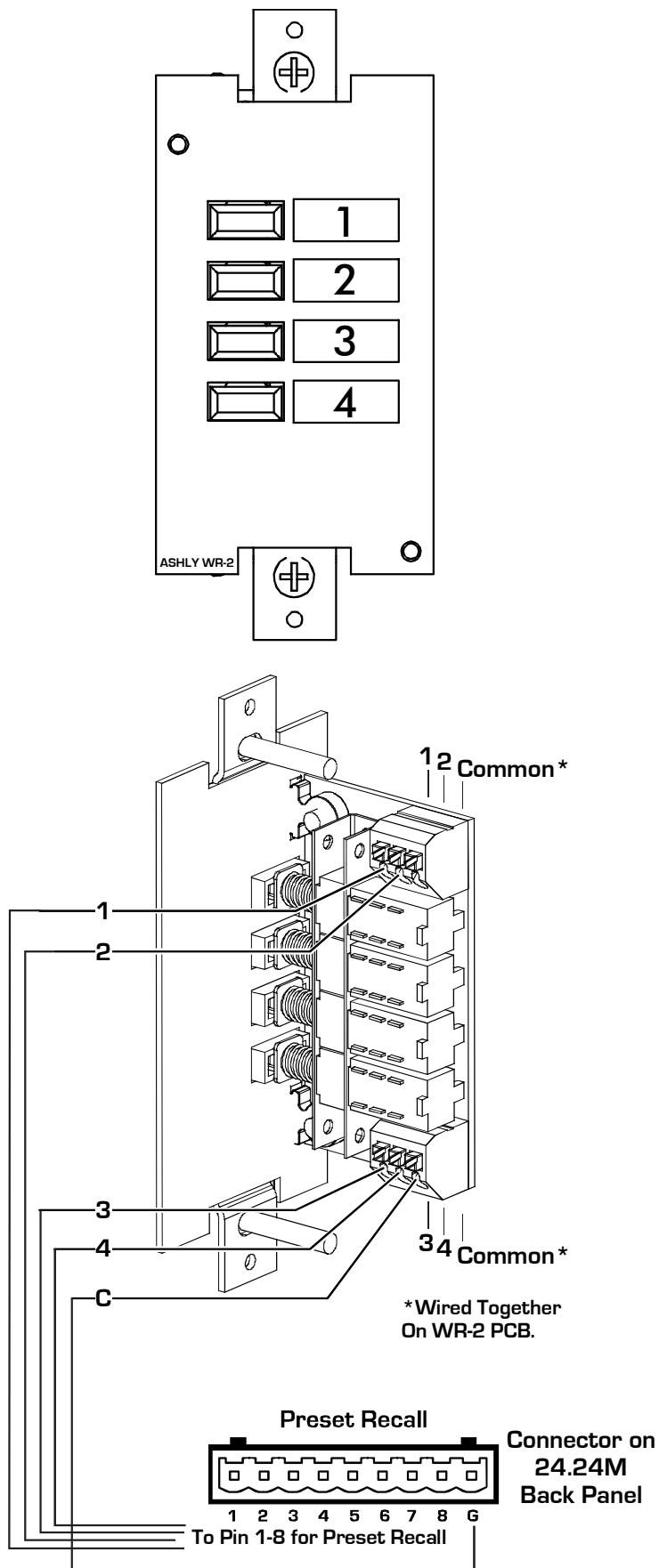
Programming of each button is done from Protea NE Software when the WR-5 is wired to its host ne24.24M, *and* added to the software project page. Wire the WR-5 from the ne24.24M back panel "WR-5 Wiring" jack to the WR-5 Input connector, observing proper pin numbering, and use the WR-5 output "Link" for additional WR-5 connections. The host ne24.24M is in turn connected to a PC via ethernet or RS-232. Multiple WR-5 units (up to four) can be daisy-chained from the same ne24.24M for discrete control over multiple locations under the processing control of one ne24.24M. See your Ashly dealer or visit the Ashly web site at www.ashly.com for more WR-5 details.



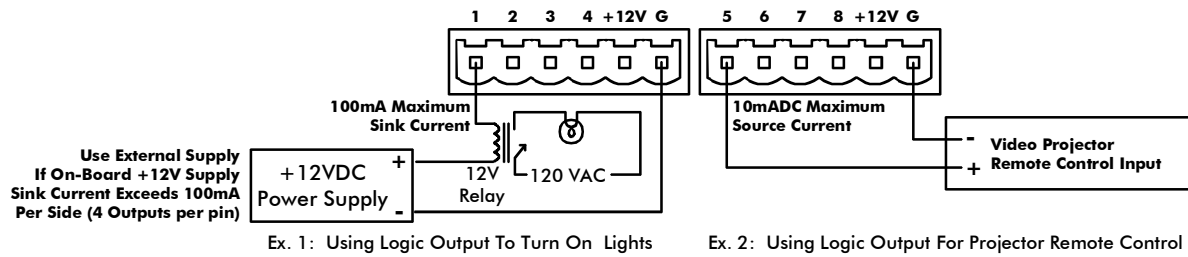
WR-1 Wiring Diagram



WR-2 Wiring Diagram



11. GPO EXPANSION MODULE WIRING EXAMPLES



12. TROUBLESHOOTING TIPS

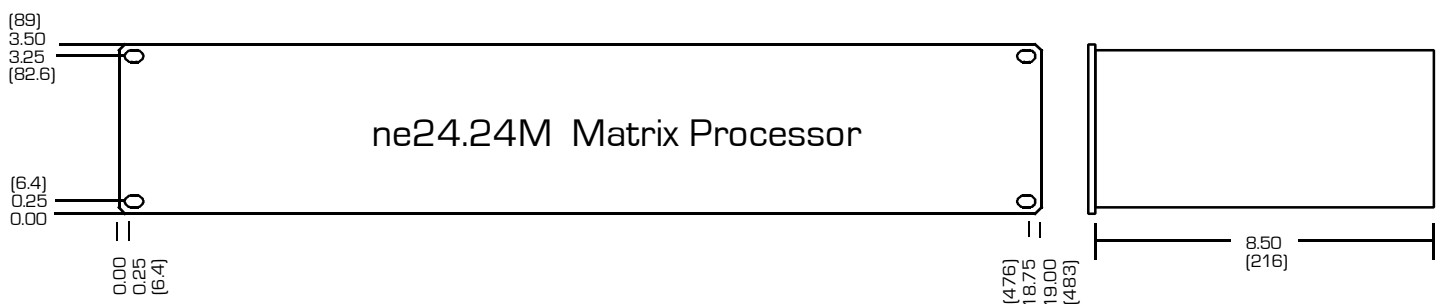
12.1 Audio Problems

- 1) **No power** - Is the detachable AC cord fully plugged in? Is the rear panel power switch on?
- 2) **Software doesn't work on unit** - If using ethernet, has the ne24.24M been identified by the software? Are the LEDs on the ethernet jack showing activity? If using RS-232, is the RS-232 cable properly installed to the PC? Is the software communications enabled using a 24.24M object *instead of* ne24.24M? This is necessary so that the older Protea System Software can be launched from within Protea NE Software for use with RS-232 applications. Is the software device set to 24.24M? Check the security level (section 9.3).
- 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 9.3

12.2 RS-232 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.

13. DIMENSIONS



14. 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, 1dBu 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)
 Attack: 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

GENERAL PURPOSE LOGIC OUTPUT OPTION

Output Source Current Per Channel: 10mA
 Output Voltage: +12VDC
 Output Supply Current: .. 100mA
 Output Sink Current Per Channel: 100mA

15. 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.

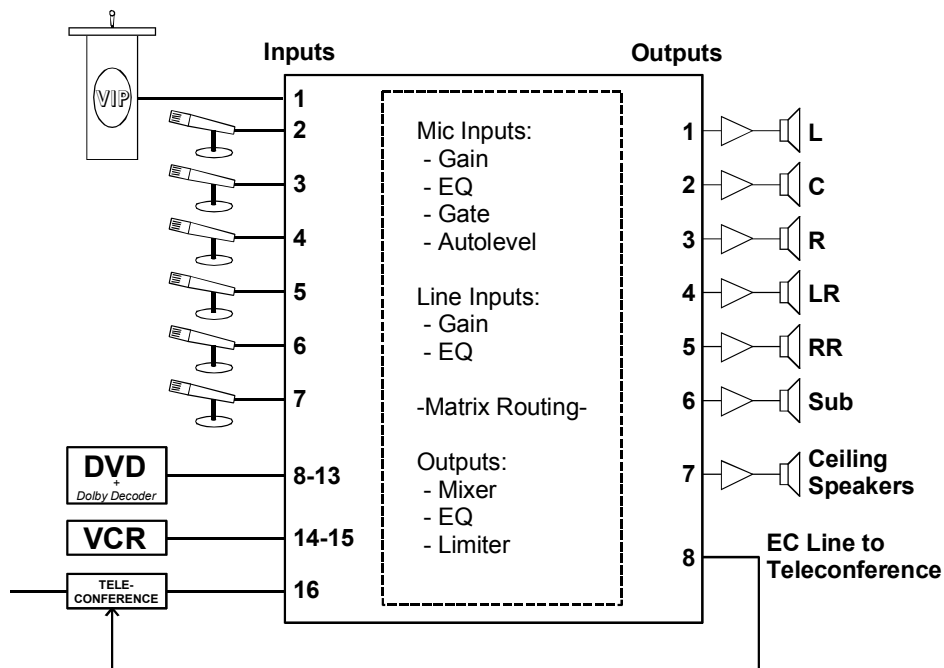
Serial Number _____
 Dealer _____
 Date of Purchase _____
 Dealer's Address _____
 Dealer's Phone _____

16. TYPICAL APPLICATIONS

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

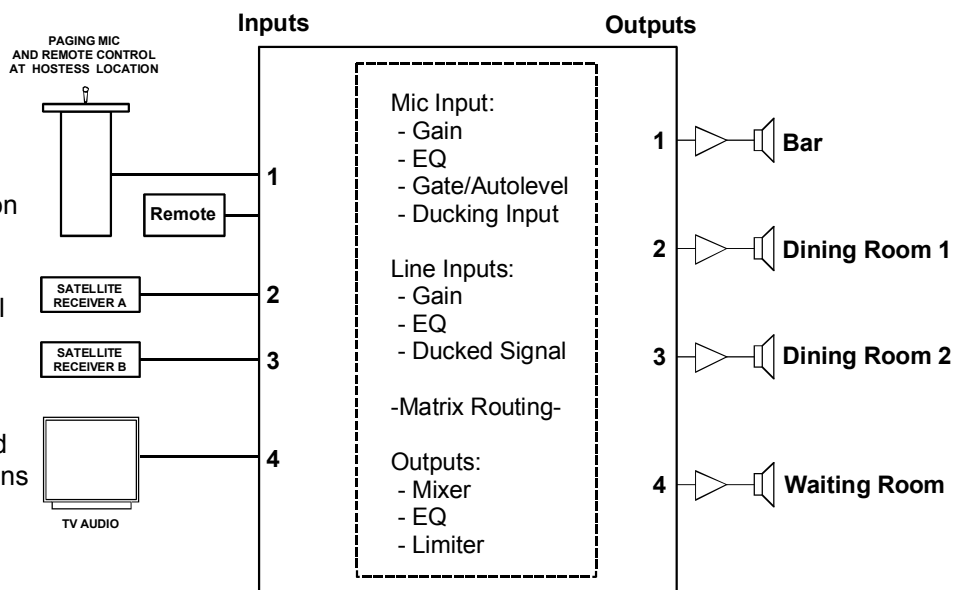
16 Input by 8 Output Boardroom System

- 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



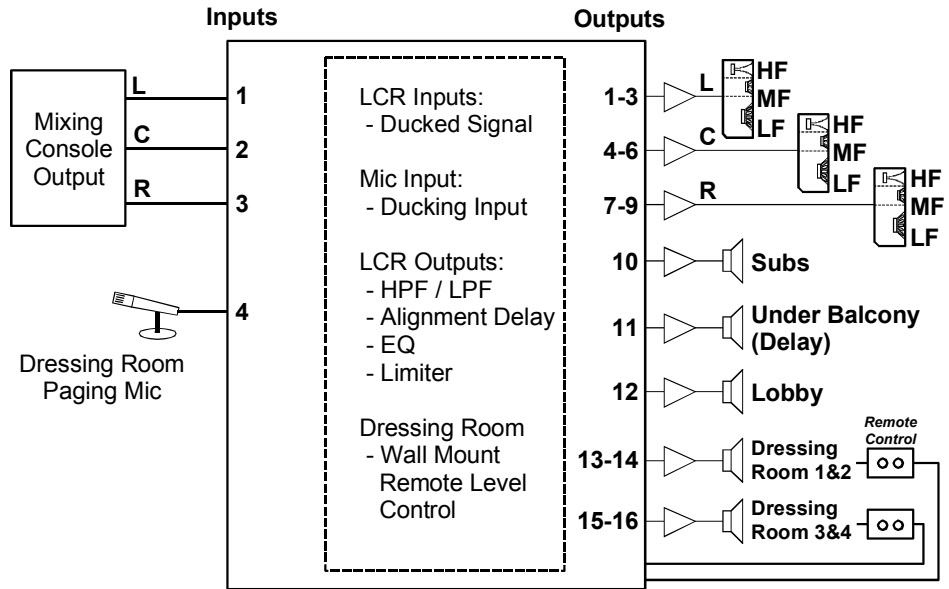
4 Input by 4 Output Restaurant System

- Base Model - No expansion cards required
- Ch 1 input used to duck all other inputs
- Electrical box mounted
WR-5 Remote controller used to access and change functions



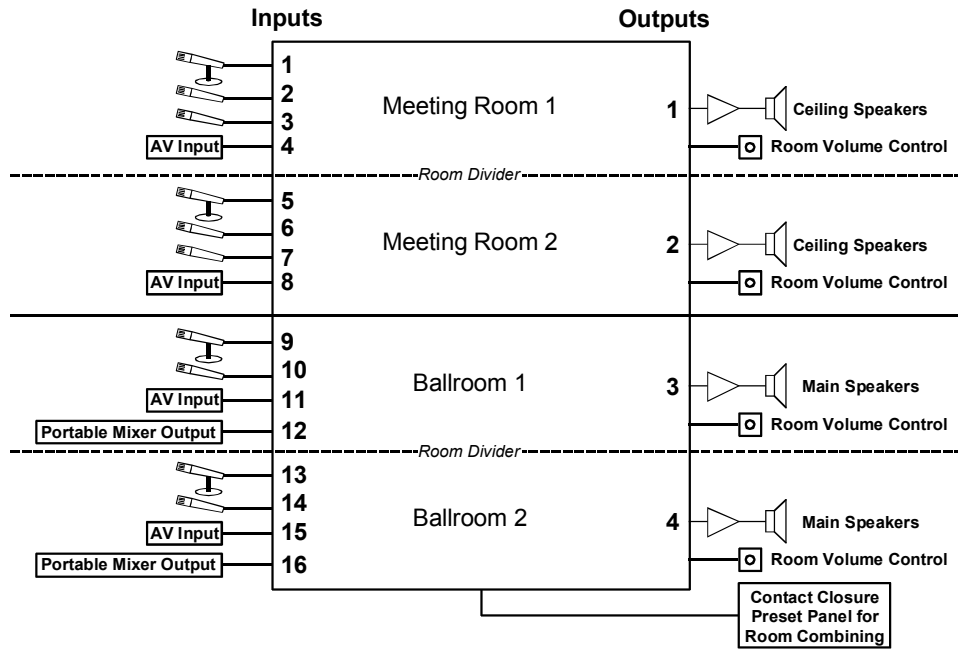
Left / Center / Right Theater System

- Three output expansion cards added
- Complete post-mixer system processor for all speaker locations
- Electrical box mounted remote DC level controller for Dressing Rooms



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



Fire Alarm Mute Configuration

- Use Remote Level Control input to mute channels during emergency
- Fire alarm drives relay when active. Relay connects ne24.24M 0-5V Remote Level Control Ground to desired pin, muting all channels assigned in software (see sec. 10.1)

