**RANE**

**DIGITAL**

# QUICK START

If you don't read all of this document, you risk setting up your system improperly... but at least read this section *and* the Input and Output Trim sections on pages Manual-13-14. Paying careful attention to your system's gain structure is essential to maximize the noise performance of your entire system. Once you're done reading and memorizing the manual, please recycle the paper it is printed on by reconing an old speaker. If RaneWare has not yet been installed on your computer, refer to RANEWARE INSTALLATION on page Manual-4 first.

Leave the audio connections on the RPM 26i until last. Connect the **RW 232 INPUT** jack on the unit's rear to a serial (COM) port on a PC-compatible computer using a standard 9-pin RS-232 cable. A short one is supplied with the unit, which is intended to connect between units in a rack. *The cable and adapter must **not** be a null-modem type.*

Locate the **RW 232 DEVICE ADDRESS** switch on the rear panel. If this unit is to be used by itself, set the switch to '**1**' by setting all switches *off* (down), except switch one (labeled '**1**' on the *chassis*, the right-most switch when viewed from the rear). If there is more than one unit, refer to **Device Address Calculator** in the software's **Help** system or run the included **Device Address Calculator** software and set a unique address for each unit.

Apply power by connecting the RS 3 remote supply's 5-pin DIN jack to the rear of the unit, *then* connect the IEC end to a powered AC outlet. *CAUTION: Do not connect anything but an approved Rane power supply to this jack.* The unit *does* ground the chassis through the power cord. If the RS 3 and the RPM 26i are getting power, the yellow front panel **POWER** indicator will be *on*.

Start your computer, run Windows®, and launch RaneWare by double-clicking on the **RaneWare™** umbrella icon. (See the next page for software installation instructions.) The Help file's Software License Agreement appears the first time **RaneWare** is run — read it all and close it. Then the **System Setup** window may appear. If it doesn't, select **System Setup** from the **System** menu. Be careful to select the **COM** port which is physically connected to the RPM 26i. Click OK. Now, the **Device Selection** window may appear. If it doesn't, choose **Select** from the **Device** menu. Click on **Poll…** and the **Devices Found:** displays the units found. Click the **Stop** button to stop Polling. Select the unit from the **Device Selection** window and click **OK**. If no unit was found, please refer to the TROUBLESHOOTING section at the end of this manual or in the software's **Help** system.

Several clues indicate communication between the computer and the RPM 26i. The yellow **COM** (communications) indicator on the front of the unit flashes or stays on. The **Memory** numbers (**1-16**) near the top of the computer screen will be *black* rather than gray. The **Active** indicator at the bottom left of the computer screen will be green.

*Important Note:* The RPM 26i contains many insightful, preprogrammed DSP Programs. Each "fixed" DSP Program can be thought of as a unique "system setup," i.e., 2-way crossover system, 3-way system, 2 x 6 splitter, etc. *Each of the 16 Memories can contain a different DSP Program. Before connecting the RPM 26i to the other audio components in your system, it is wise to choose and store the appropriate DSP Program for your system in **all 16 Memories**. This avoids the problem of accidentally recalling a Memory that restores an undesired DSP Program, such as the case where you recall from a 3-way DSP Program to a splitter: this sends full-range audio to all Outputs!*

Once the proper DSP Program is stored in the RPM's Memories, digital and audio connections can be made. Turn the amplifier(s) *off* until all connections are complete.

## SYSTEM REQUIREMENTS

RaneWare works under Microsoft Windows®, on a PC or laptop with an unused serial port.

RW 232, RaneWare's protocol, uses a DB-9 cable less than 50 feet long, connecting from the serial port of a computer to the RPM 26i communications Input port. No interface boxes are required; just a cable and your computer.

RaneWare can be fully demonstrated and used without an actual RPM 26i attached. Simply select the OFFLINE RPM 26i or any other OFFLINE unit under Select in the Device menu.

A RaneWare CD-ROM comes with each unit. Installation is simple. The latest version is downloadable 24 hours a day from Rane's Internet site: *http://www.rane.com.*

*Note:* If you have previously installed an older version of RaneWare and you just received a new RPM 26i unit, you **must** reinstall the new version of RaneWare that was shipped with your unit. Use of an old version will not work.

*Windows is a registered trademark of Microsoft Corporation; RaneWare is a registered trademark of Rane Corporation.*

**WEAR PARTS:** This product contains no wear parts.

# FRONT PANEL DESCRIPTION
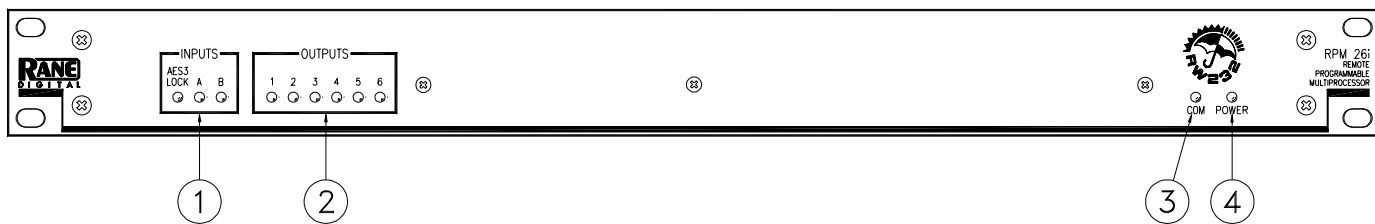


① **AES 3 LOCK & INPUT Signal/Overload** multi-color LEDs indicate the presence of an AES3 clock, significant audio Signal (green) or Overload conditions (red). Input indicators provide signal flow verification without a computer. The Inputs' Signal indicators are driven from an analog comparator circuit prior to the input level control. All other indicators are controlled from the microprocessor.

② **OUTPUT Signal/Overload** multi-color LEDs indicate the presence of a significant audio Signal (green) or Overload conditions (red). Output indicators provide signal flow verification without a computer. All other indicators are controlled from the microprocessor.

   The Output indicators cycle yellow from left to right during power up and when the unit is loading a new DSP Program. *All outputs are muted during DSP Program changes.*

   If Output 1 or 2 is flashing, something has gone wrong. See TROUBLESHOOTING on page Manual-22.

③ **COM** (yellow, communications) flashes when a message for the unit is successfully received. This indicator flashes often when communicating with the computer, since metering messages are continually requested by the computer. The COM indicator may flash so often it may appear to be constantly on. There is also a brief flash whenever the Memory Recall Port is used.

④ **POWER** indicates that the unit is connected to a powered RS 3 remote supply.

# RPM 26i CONNECTION

When connecting the RPM 26i in your system, *leave its power supply and the amplifiers for last*. This gives you a chance to correct mistakes before damage is done to your amps, speakers, ears, etc. Also, be sure to read the *Important Note* in the QUICK START section on page Manual-1.

The RPM 26i has AES3 digital stereo Inputs and balanced Outputs. The Output shields may be attached using the connectors, or preferably connected to the chassis through three #4 serrated screws on the rear. Keep these screws tight for the best possible shield-to-chassis connections. The RS-232 cable shields connect to the chassis through the four nuts and star washers that the cable screws into. Be sure to screw down RS-232 cables to guarantee good shield connections. *The chassis and the audio signal ground are connected together internally at only one point.* The RPM 26i chassis connects through the RS 3 power supply cables to the earth ground (3rd pin) of the 100 and 120 VAC line cords. A 6-32 screw and star washer are also provided on the unit's rear if a technical ground connection is needed. This chassis connection is also recommended for 230V operation. Connect the non-inverting (positive) audio lines to the '+' terminals, and the inverting (negative) lines to the '−' terminals. Connect the cable shields to the center terminal on the Euroblock. For those installations where the RPM 26i internal shield-to-chassis connection causes interference, connect the shields directly to the chassis PEM nuts directly above each shield

terminal. Be sure to bite through the paint with the star washer and keep the shields wrapped around the audio conductors as much as possible. For the "theoretical" best ElectroMagnetic Interference (EMI) immunity, *connect the shields at both ends of the cables*. (For more information on System Connections, see RaneNote 110, "Sound System Interconnection" later in this manual or on Rane's web site.

To control the unit from a computer, use 9-pin RS-232 cables which are 50 feet or shorter. *The cable and adapter must **not** be a null-modem type.* A short cable is supplied for connecting adjacent units. Daisy-chain up to 16 units at a time by connecting the computer COM port to the RW 232 INPUT connector on the first unit. Then connect the unit's RW 232 OUTPUT connector to the next unit's RW 232 INPUT.

The DEVICE ADDRESS switch identifies each unit with an 'address', and must be set uniquely for each unit. The switches form a binary code from 0 through 255. *Only the numbers 1 through 250 may be used.* The place values of each switch are marked on the rear panel. The switch itself may have numbers printed on it; *these should be ignored*. To set a specific address, refer to the SETTING THE DEVICE ADDRESS section on page Manual-24 or run the Address Calculator software included with RaneWare.

Refer to page Manual-23 for information regarding switch connections to the Memory Recall Port (MRP).
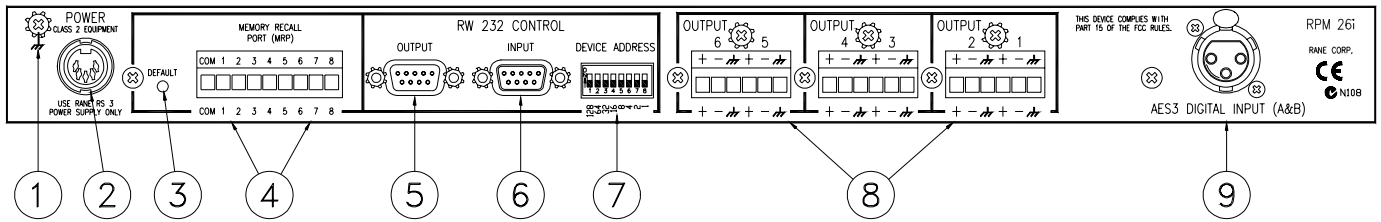
① **Chassis Ground Point:** This #6-32 screw and star washer provide chassis ground when needed. The RPM 26i chassis connects through the RS 3 power supply cables to earth ground (pin 3) of the 100V and 120V AC line cord. This screw can also provide a technical ground connection if needed, (highly recommended for 230V use).

② **Remote POWER** jack enables connection to a Rane RS 3 power supply. *With the AC power disconnected,* insert the RS 3 DIN plug into this jack, *then* connect AC power. *To power the RPM 26i up and down, it is wiser to cycle the AC power cord, rather than to unplug and plug the DIN jack.*

③ **DEFAULT** switch recalls Memory 1. This may be useful in case of computer failure and *duplicates the function of the number '1' Remote Memory Switch*—without the need for an external switch (See **Signal/Overload** on page Manual-2).

④ **MEMORY RECALL PORT (MRP)** provides the ability to recall one of 8 Memories using contact closures. All 16 Memories can be recalled using Binary mode (see page Manual-23). The front panel COM LED flashes briefly whenever the MRP switch configuration changes. Since each Memory can contain a different DSP Program (i.e., a 2-way crossover in one Memory, 3-way in another), in a fixed installation, be sure that all Memories contain the appropriate DSP Programs for your system. This avoids the problem of accidentally recalling a Memory which could be detrimental to the system. On the other hand, this feature is useful in rental systems, for example, where fixed DSP Programs can be stored in various Memories requiring only an MRP wiring alteration to change the signal processing from a 2-way to a 3-way system.

⑤ **RW 232 OUTPUT** connects to the RW 232 INPUT on other Rane RW 232 units.

⑥ **RW 232 INPUT** connects to the computer's COM port, or to the RW 232 OUTPUT of the previous Rane RW 232 unit.

⑦ **RW 232 DEVICE ADDRESS** identifies each unit uniquely by assigning it a number from 1 to 250. Refer to the Device Address Table on page Manual-24 or the RaneWare Address Calculator software for binary switch positions.

⑧ **Balanced Outputs.** Connect balanced audio connections per the RPM 26i CONNECTION section on the previous page.

⑨ **AES3 DIGITAL INPUT.** See the RPM 26i CONNECTION section on the previous page. This is the serial transmission format standardized for professional digital audio signals (AES3-1992 AES Recommended Practice for Digital Audio Engineering - Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data). A specification using time division multiplex for data, and balanced line drivers to transmit two channels of digital audio data on a single twisted-pair cable using 3-pin (XLR) connectors. Issued as ANSI S4.40-1985 by the American National Standards Institute.

## RaneWare Installation

1. If you have the RaneWare CD-ROM, insert it in your drive. The autorun should bring up a prompt asking to install RaneWare. If it does not, go to the Windows **Start** menu, select **Run... > Browse...** and navigate to your CD-ROM drive. Select the **SETUP.EXE** file and click **OK**. This starts installation.

2. If you downloaded RaneWare from the web, locate the RW2**.EXE file you downloaded and run it. Installation proceeds.

## SOFTWARE OPERATION

### STARTING RANEWARE

If RaneWare has not yet been installed on your computer, refer to STEP BY STEP RANEWARE INSTALLATION above. Once the software is installed, a RaneWare Program Group is created with three icons: one each for the RaneWare application, Help, and Address Calculator. The **RaneWare** umbrella icon launches device control, **Help** provides extensive on-line assistance, the **Address Calculator** software makes selecting RW 232 device addresses easy.

When the Device Control software is first run, RaneWare's Help screen displays Rane's Software License Agreement. The License Agreement is contained in the Help file, so you can continue to browse for helpful details before continuing. Once you've read the License Agreement, close the Help file. After you've selected a Com port, subsequent activations do not bring up the Help screen unless you ask for it. Now let's get on with the program. Double-click the RaneWare umbrella icon.

Welcome to RaneWare! A splash screen displays for a few seconds, then the Device Select window or an RW 232 Device Edit screen appears. To try the software without a unit hooked up, select OFFLINE RPM 26v and click OK. The RPM 26v and RPM 26i are both called RPM 26v to RaneWare. To control a real RPM 26i, click Poll, and polling for units begins. This process checks if any units are connected to the serial port. If a Device is found, you are in control! *If you have a device hooked up and it is not found, read the* TROUBLESHOOTING *section on page Manual-22 or see the Help file.*

There are multiple RaneWare products available from the RaneWare software screen. They include the RPM 26i, the RPE 228d 2-channel one-third octave equalizer, the ECS line of Engineered Conference Systems products, the Via 10 Ethernet Bridge or the RPD 1 Programming and Diagnostics unit.

### RW 232 BASICS OVERVIEW

All RW 232 devices, including the RPM 26i, contain a "current" or working Memory (Memory zero) and 16 additional Memories where the current settings may be stored and recalled. All of these Memories exist inside the device, not inside the computer controlling the device. Thus, if the computer crashes, the unit continues to operate and keeps its current settings. If the unit loses power, all current settings are saved and automatically recalled upon power up — unless an MRP contact switch is on, then it recalls the selected MRP Memory. (See Memory Recall Port on page Manual-23.)

The Windows screens perform the traditional function of a front panel, displaying and editing the device's settings. For example, the Store button tells the unit to copy its current settings (Memory zero) into a specific Memory number (let's say, Memory 4).

Use the RaneWare Button Bar to store and recall Memories. (See the RaneWare Button Bar section on page Manual-11 for more details.)

Devices can also be given custom names, tailored to your installation. Simply choose Name Device from the Device menu (see page Manual-10).

If your installation changes by adding more units, choose Device > Select, and the POLL button to make the computer recognize new units in the system.

When multiple units are connected, assign each unit a unique Device Address number. Rane provides a special calculator to assist in setting the DIP switches on the back of each unit. In the RaneWare Program Group, launch the RaneWare Address Calculator. This binary calculator converts decimal numbers into corresponding DIP switch settings and vice-versa.
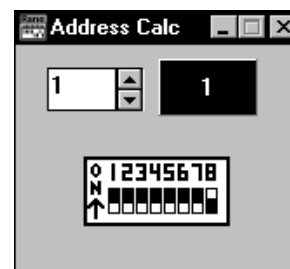


### SECURITY

The RPM 26i can be operated either through a computer or through the contact closures. To preserve preset security during computer operation, each device can be locked (under Device > Lock Device), and a password can be assigned (under System > Change Password). The default password is *please*. Passwords are case insensitive, therefore, *PlEASe, pLEasE, PLEASE* and *please* are all equivalent.

With a device locked, no settings can be changed; only preset Memories can be recalled. Presets can be customized with names (through System, Site Control Panel Setup). Each Memory can have a logical name. The Site Control

Panel is all an operator needs to see to recall Memories. If only a few presets are required, deleting the name entry in the Site Control Panel Setup removes the button from the Site Control Panel, reducing the number of buttons. A password is not required to operate the RPM 26i from the Site Control Panel.

If more than 16 Memories are needed, they can be saved to disk and recalled later. For mobile sound trucks, presets for a particular venue can be saved to disk and loaded when returning to that venue. Memory names are stored in the computer, along with other site information. Job files can be used for multiple installations. Printouts of device data and graphs are also available. These can be kept in the project documentation. (Use Device > Print Device Report.)

### Selecting a device

The quickest way to get to the RPM 26i Device Edit screen, if it is not already displayed, is to click the Device button on the far right side of the Button Bar. When you press it, a menu pops up that shows a list of the first fifteen connected devices from the most recent Poll and an offline version of each RW 232 device. Click one of the RPM 26i devices—either the OFFLINE RPM 26i or an actual device—and the RPM 26i Device Edit screen appears.

Alternatively, after Polling for units, the same device list appears in the Device Select window. Select the OFFLINE RPM 26i device or, if a connected unit was found, select it from the list and click OK. Each unit's Device Address will be displayed within brackets [1] to the left of the device name. Double-clicking on the device name is equivalent to selecting the device and clicking OK.

### The RaneWare screen

The RaneWare computer screen for the RPM 26i provides an overall "system" picture of the available signal processing functions. This screen (shown below) is called the Device Edit screen. The RaneWare screen also contains a Button Bar and typical Windows pull-down Menus. The RaneWare screen gives you complete control of all signal processing functions as well as access to all system-level controls such as COM port selection and the Site Control Panel that recalls Memories stored in multiple RW 232 devices.
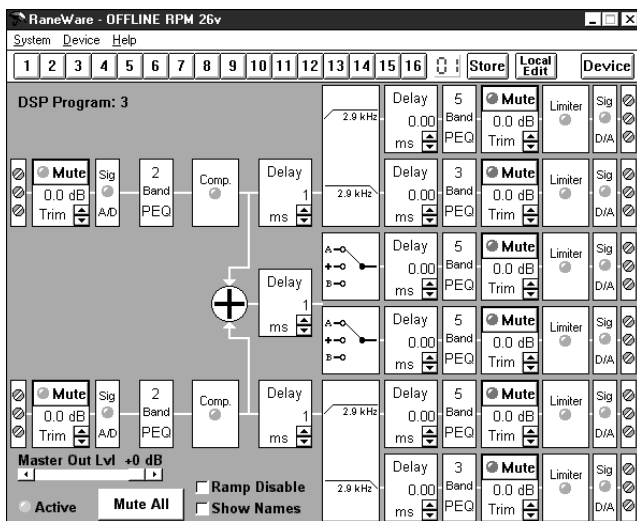


The "system" picture in each Device Edit screen contains groups of independent signal processing "blocks" which make up a DSP Program. The number of the loaded DSP Program appears in the upper left corner, in this case, DSP Program: 3.

Each of these DSP Programs contains many processing blocks. For example, each has at least one Input Trim block, an A/D block with a dual-color Signal present and overload indicator, Delay blocks, and so on. The RPM 26i contains many variations of these user-selectable DSP Programs—which are covered in more detail later in this manual.

RaneWare computer screens always display at a specific size on the screen, optimized for typical laptop computer screen resolutions. This makes it possible to view *and* control multiple screens when your graphics resolution allows.

## RaneWare Menus

There are three RaneWare pull-down Menus. The System menu for "system-level" controls that apply to the computer or all connected RW 232 devices. The Device menu for device-specific control and the Help menu for on-line help.

### System Menu

These menu commands apply to all connected RW 232 devices and contain the following menu items:

System > System Setup displays this screen:
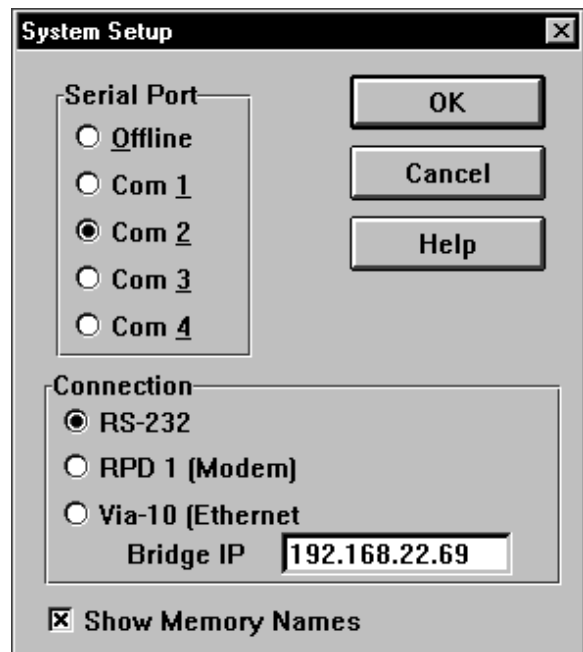


The Serial Port radio buttons on the left tell the computer which Com port is being used to "speak" to the connected RW 232 unit(s). The Offline radio button permits use of the software without connecting a unit. To operate an RW 232 unit, you must select the Com (serial) port that is physically connected to the unit. This screen is also displayed the first time you start RaneWare or after erasing the RW232.INI file from your Windows directory.

Most laptop computers have a built in mouse. If you use an external mouse with your laptop, you may need to use the built in mouse if your laptop does not have two serial ports—one for the mouse and a second for the RW 232 unit.

Check the Show Memory Names check box to display the Memory names in the RaneWare Button Bar whenever the mouse is on top of a Memory recall button. Memory names are edited in the Site Control Panel Setup window. (See Site Control Panel Setup below.)

The Remote to RPD 1 check box is only used with Rane's RPD 1 product. *Check this box only if you are using an RPD 1 to remotely communicate with an RW 232 system. When this box is checked, no communication with local RW 232 devices is possible.* See Dial and Hang up below for more RPD 1 details.

### System > Dial | Hang up

These selections are only used with Rane's RPD 1 product. The RPD 1 is a telephone interface which, when used with an external modem, allows remote diagnostics of RW 232, AMX or Crestron systems. Thus, from the office, a system designer can call a properly equipped remote system to view and control that system's RW 232 settings.

### System > Change Password
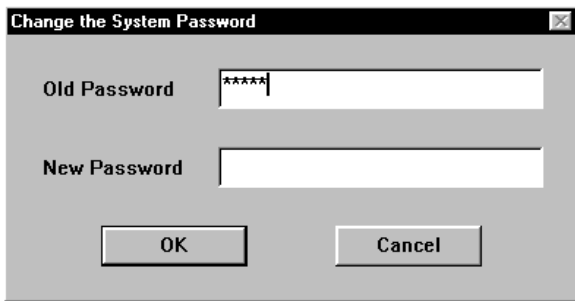


This window allows you to change the password. The default password set by the factory at the time the software ships is *please.* Passwords are case insensitive, therefore, *PlEASe, pLEasE, PLEASE* and *please* are all equivalent. Type the old password in the Old Password edit box, then type the new one in the New Password box. Click OK. Then be sure to note the new password *somewhere,* preventing future embarrassment.

Certain commands such as Lock Device (see page Manual-9) or exiting from the Site Control Panel require the correct password before they will execute.

**Important Note:** The *computer* stores the password, *not* the units. Therefore, it is wise to think of the RW 232 password as the computer's password, not as each individual system's password. This makes it easier to remember the password since it will be the same for every installation where you remove the computer once the system is set up. This also provides the flexibility to have unique passwords for those installations where a dedicated computer is left on site to operate the system. If you return to an installation with locked devices, and do not have the same computer used to initially lock the devices, you will only need to know the computer's password, not the original password used to lock the devices.

### System > Edit Installation Info
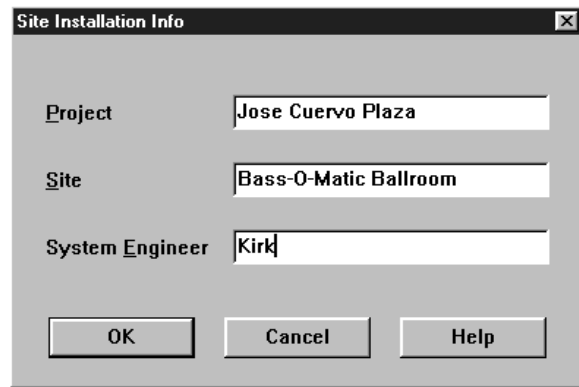


This selection allows you to enter the Project name, installation Site and System Engineer for a given project. All of these are printed on the Device Report printouts. Click in the edit box or hold the Alt key and press the underlined character to type new names.

Similar to the password, the Site Installation Info is stored in the computer, not in each unit. The Site Installation Info is also stored with backup Memories when you save a unit's Memories to a file.

### System > Load Installer Notes | Save Installer Notes
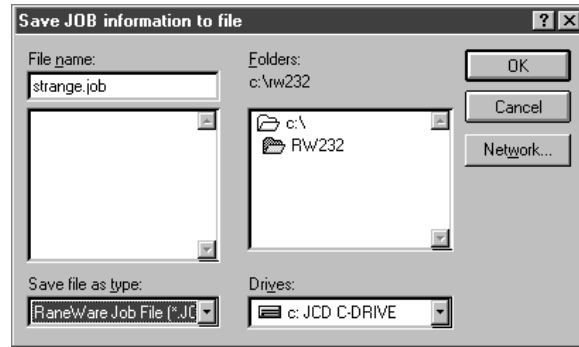


These selections allow you to save or load the installation information along with the Memory names to or from a file. This allows the information for numerous installation sites to be stored on a laptop computer. When saving, it is not necessary to type the **.JOB** extension.

## System > Site Control Panel Setup



RaneWare's Site Control Panel (shown at right) is a sound system re-configuration screen. It works by telling *all* connected Rane RW 232 devices to switch immediately to a designated Memory that you have programmed in each unit. Use the Site Control Panel Setup window (above) to customize the Site Control Panel's Title and Memory names.

There are 16 buttons available to use and each can be renamed according to their assigned configuration. Initially, the buttons are named Memory 1, Memory 2, etc., through Memory 16. On the example screen above, you see that Memory 1 is renamed Full House, Memory 2 to Half House, Memory 3 to Empty House and so on.

A corresponding button will not appear on the Site Control Panel if its name has been deleted. Thus panels can be created with as few as 2 or as many as 16 buttons.

RaneWare also allows you to assign a unique title to the Site Control Panel window. Thus, instead of the default title, it could be Hotel Meeting Room or Sunday Services. In this example, we've used Indigo Montolla Fencing Club.

**Note:** You may also press the Tab key to move the focus (i.e., the dotted line around the button) to the configuration button you want, press the Enter key, then type the new name.

If you check the System Exclusive box, a user will not be able to task-switch (Alt-Tab) away from the Site Control Panel to other Windows applications.

If you check the Auto Start box, the Site Control Panel will automatically appear each time you start the RaneWare program. Otherwise, the panel appears in the last mode you were in. If you were in the Device Edit screen when you exited the program, Device Edit mode appears the next time you run RaneWare. Likewise, if you exit from the Site Control Panel, it appears next time you start the program. Microsoft Windows can also be set up to start RaneWare automatically by dragging the RaneWare program icon from the RaneWare Group to the Windows Startup Group. Refer to your Microsoft Windows manual for detailed instructions.

**Important Note:** The names you assign become the Memory names associated with each RW 232 device on line, regardless of the type of device (RPM 26i, RPE 228, ECS Teleconferencing system, etc.). If you set up the button corresponding to Memory number 1 to represent a particular sound system configuration, make sure Memory number 1 in each device in the system is pre-programmed appropriately for this particular sound system configuration.

## System > Site Control Panel
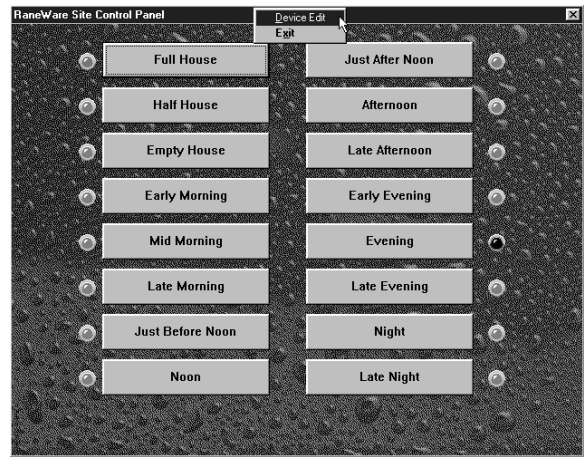


The Site Control Panel is RaneWare's sound system re-configuration screen. Depending upon how you set up the control panel (using Site Control Panel Setup), up to 16 buttons can be displayed and each can have a unique name representing a particular sound system configuration.

To operate the Site Control Panel, click on the desired configuration button with the mouse. Notice that its adjacent indicator illuminates *red* so you always know the current sound system configuration.

For Windows 3.1 users:

To exit the Site Control Panel and the RaneWare program click on the box in the upper left corner of the window. This displays Windows' system menu from which you can choose Exit (Alt-F4). If you select Exit, you terminate the program upon entering the correct password. Double-clicking the box also exits RaneWare after entering the password.

To return to Device Edit mode, click on the box in the upper left corner of the window. This displays Windows' system menu; choose Device Edit. Upon entering the correct password you return to the Device Edit screen .

Important Note For Windows 95/98 users:

While operating the Site Control Panel there is no button-box in the upper left corner for the system menu allowing you to either exit or return to the Device Edit screen. There is, however, a Close-Window button-box in the upper right corner. As expected, the Close-Window button-box exits the Site Control Panel, but unfortunately, it also quits the entire RaneWare program. *To get back to the Device Edit screen, right-click the mouse on the Site Control Panel title bar. This opens a menu (see picture above) allowing you to return to Device Edit mode or exit RaneWare altogether. As usual, a password is required for either option.*

## Device menu

This menu applies only to the single, selected device you are editing and contains the following:

### Device > Select
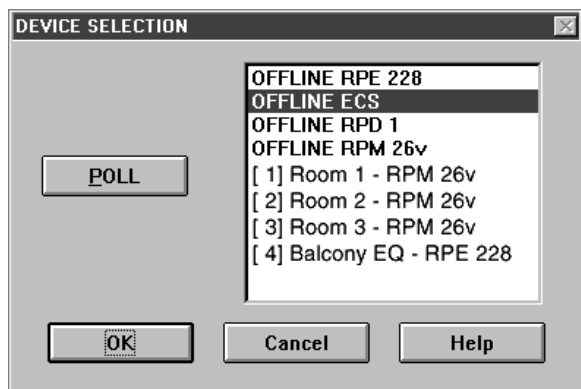


The DEVICE SELECTION window displays the list of available RW 232 units, including the OFFLINE versions of products. The OFFLINE versions allow you to operate the software just as if you had an actual unit hooked up.

If the only devices shown in the Device Selection window are the OFFLINE ones, or if the list is inaccurate, click on the POLL button with the mouse. During polling, the program looks for connected devices by sequentially stepping through addresses 1 through 250 (or until you click on the STOP button in the Polling message box). When a device is found, its name is displayed in the DEVICE SELECTION window.
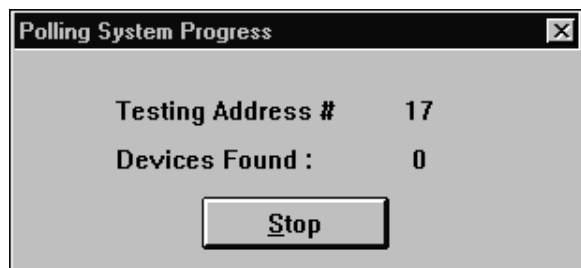


**Note:** Since you know what addresses were assigned, you may stop polling as soon as it has exceeded your last device's address. *Depending on the number of devices connected, polling may take a few seconds or up to 3 minutes.*

**Note:** You do not have to poll each time the program is run, only when RW 232 devices are added, deleted, substituted, or have had their addresses changed.

Click the device you wish to edit from among those shown in the window, then click OK (or just double-click on the device). The Device Edit window for the device you've selected appears allowing complete control of the device.

### Device > Choose DSP Program

Choosing DSP Programs is covered in more detail in the Choosing DSP Programs section on page Manual-12. There are many intuitive DSP Programs available in the RPM 26i. Each can be thought of as a unique audio system. Choose DSP Program brings up a window allowing selection of these various DSP Programs or systems. The following is just an overview of the RPM 26i's DSP Programs.

Each of the DSP Programs (or systems) is *fixed.* In other words, the arrangement and type of the various signal processing functions are not editable.

The RPM 26i's various DSP Programs provide:
• Display of all important control settings on one screen.
• Many useful signal processing blocks including: trim, program compression, delay, input summing, I/O routing, crossover, splitting, parametric EQ, limiting, pink noise and sine wave generation.
• 16 Memories to store the settings of all signal processing blocks.
• Independent Input and Output muting, plus a Mute All button.
• Show Names check box for displaying the user assignable Input and Output names.

### Device > Load External DSP Program

This menu pick is for future RPM 26i capabilities. We anticipate new DSP Programs that fulfill currently unrealized applications. To support this, the Load External DSP Program menu pick allows downloading a new DSP Program from a computer to an RPM 26i without the need to replace firmware chips. DSP Program 32 is included with RaneWare versions 2.08 and above. More programs may be available in the future, downloadable from the Rane web site.

### Device > Backup Memories to File

This menu item allows you to create or select a file in which all the data in a device's Memories will be saved. To save all the data stored in the device to a disk file, select the Backup Memories to File command from the Device menu. Type the name you want for the file in the File name: field or select one of the files shown in the list box. Then press return or click OK.

*Note:* You do not have to type an extension to the filename (unless you want to). The program automatically appends .RPM as the file extension. Also, the current project name, site, and system engineer information entered through the Edit Installation Info dialog box is automatically saved in each .RPM file.

*Backing up device Memories is highly recommended. Just like any computer data, the RPM 26i data should be saved to a file, especially during and after detailing system settings. Each RW 232 device saves its own settings internally; other than the password, no settings are stored on the computer. Having these settings backed up separately in a file provides extra peace of mind as well as a convenient starting point for similar or future systems. It is also wise to save a floppy disk copy of each device's settings—with the RaneWare Device Printouts—in a hardcopy file. This provides complete system documentation as well as a convenient backup of each device should a replacement device ever be needed.*

## Device > Restore Memories from File

This menu item allows you to restore all Memories and names to a device from a selected file.

*Note:* All saved RPM 26i data files are given the default extension .RPM.

## Device > Lock Device

Lock Device allows you to lock a device to prevent unauthorized users from making changes to your programmed settings in the device's Memories. Although a device is locked, different presets can still be recalled by selecting another Memory via the Site Control Panel, the Memory Recall Port, or by clicking on a desired Memory key on the button bar with the mouse. The data previously stored in the device's Memories, however, can not be changed.

To Lock a device, type in the password in the dialog box shown above after selecting Lock Device from the Device menu. When a device is locked, this icon appears to the right of the Local Edit button on the button bar.

## Device > Unlock Device

This menu selection restores a device to its unlocked state, allowing changes to the data previously stored in its Memories. You must type in the correct password before the device will unlock and the lock icon disappears.

## Device > Edit MRP Configuration
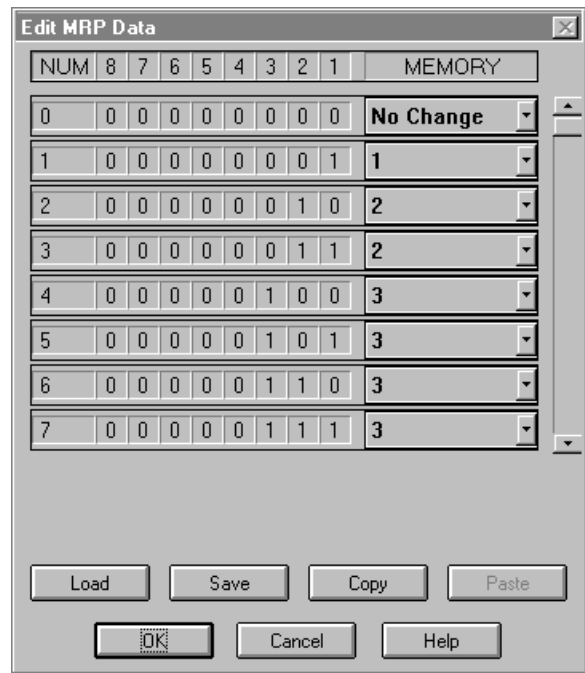
This dialog allows you to configure the MRP (Memory Recall Port) on newer versions of the RPM 26i beginning with firmware rev 2.2.

Each possible MRP pattern is shown as a decimal number and binary code where 1 represents a switch closure on the numbered contact. To its right is a drop-down menu for each input pattern, where you select the Memory to be recalled.

You can cusomize Memory recall values, save them to a MRP file and load them into future units.

After exiting this dialog with the OK button, the MRP in the unit will be updated.

## Device > Name Device



Name Device allows you to name each RPM 26i and their channels. The device and channel names are stored in the unit. Type the unique name you want for each RPM 26i in the Device Name field, then press the Tab key to move the focus to the next field. Type the names you want for each channel in the remaining fields, then click OK.

## Device > Restore Names from File

This selection allows you to restore the Device, Input and Output names from saved Memory backup files without changing any of the device's current settings.

## Device > Print Device Report

Selecting this item prints the current device settings from the current or working Memory. The control settings are printed in a tabular format so you know precisely where each control is set. Also printed is the Project, Site, and System Engineer information you entered in the Edit Installation Info dialog box, plus four blank lines for handwritten comments and the report date.

Each of the RPM 26i parameters are printed including the DSP Program with its description, the device address, device name, the Memory number and Memory name. The device report for each RPM 26i Memory is 7 pages, one for the Input parameters and one page for each Output which includes each Output's overall response curve. See the Overall Response Curve section on page Manual-20.

## Device > Print Device Report from File



This menu item prints device settings from a stored file instead of a connected unit. This allows you to setup a system, save the system's settings to a file and print them at your office; saving you the hassle of dragging your printer to each site just to print out device settings (though this may impress your client).

Once you select the file with backed-up Memories to print, the above window appears.

You can select one or more Memories to print. To select a single Memory to print, click on your choice then click OK. As with many Windows selection boxes, to select a contiguous range of Memories, click on the first Memory choice, then hold down the Shift key and click on the last Memory choice of the range. This is a handy way to print Memories 1 through 5 for example, or even all 16 Memories. To select a random group of Memories to print, click on the first choice, hold down the Ctrl key and click on any subsequent Memory choices. Repeat this process until all the Memories you want to print are selected, then click OK.

## Device > Device Status

Device Identifier is a unique number assigned to each unit by the factory. It's more for our information than yours.

Hardware Rev is the current revision number of the unit's hardware.

Firmware Rev is the current revision number of the unit's firmware. This is the software that is installed in each unit and controls the actions of the internal microprocessor.

Total Running Time is the total amount of time that the unit has been operating (powered).

Data Timeouts is the number of times RaneWare failed to communicate with the selected unit since software launch. This number should always be zero but could increase if the communications cabling becomes intermittent or open.

**Note:** *Be sure you have the above Device Status information as well as the version number of RaneWare you are using (found under Help|About...) when calling the factory for technical support.*

## Help Menu

The Help menu provides extensive On-Line Help. There is a help Index and a help Contents (F1) interface for quick access to the information you may seek.

Also, the infamous About... selection displays the beautiful RaneWare splash screen where the current RaneWare application software revision is available. The revision number in Help|About... is very important if you ever need RPM 26i or RaneWare technical support from Rane.

## The RaneWare Button Bar
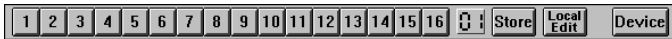
This Button Bar appears at the top of every RW 232 product's screen.

The 16 numbered buttons immediately recall the indicated Memory number from the connected RW 232 product. The most recently recalled Memory is indicated by the red number to the left of the Store button. The red number flashes when the current Memory settings have changed and no longer match the stored settings. If you wish to save the changed settings in one of the 16 Memories, click Store, and then click the Memory number in which you wish to store the settings. It's that easy! Go ahead and store different settings in different Memories. After storing a few, click any Memory number to instantly recall that Memory. Store those settings you'll use most often in Memories 1 through 8, since these can be easily recalled via the rear panel MRP contact closures when the computer is removed (see page Manual-23).

*Note:* When you click the Store button, it appears in light-gray until you select a Memory in which to store the current data. *The red, most recently recalled Memory number does not change to the Memory number you've stored to.* As an example, if you recall Memory 3, make some changes, then hit Store followed by Memory 5 to store the changes in Memory 5, the red Memory number continues to indicate Memory 3 as the most recently recalled. Only if you hit the Memory 5 button a second time (after Storing) will Memory 5 actually be recalled. This means that *Storing to a given Memory does not automatically recall that Memory.*

To change any settings without affecting the audio, simply select the Local Edit button, make the changes, then re-click Local Edit. You are asked: Accept the Changes? Answering Yes sends those settings to the RPM 26i. *While* Local Edit *is selected, clicking on any of the Memory buttons displays that Memory's settings without recalling them.*

The Device button brings up a selection menu of up to 15 RW 232 units connected to the computer from the most recent Poll. Simply select the device you wish to control.

## RPM 26i Basics

The RPM 26i has 2 inputs, named Input A and Input B; and 6 outputs, named Output 1 through Output 6. To display these default names on the Device Edit screen, check the Show Names box at the bottom of the screen. These are the *default* names of the RPM 26i inputs and outputs. To change these I/O default names, or the device's name to those that apply to your install, select Device > Name Device.

### RAMPING

When the Ramp Disable check box at the bottom of the Device Edit screen is unchecked, the RPM 26i slowly ramps level and EQ setting changes. Ramping is provided as an application level feature. For example, when changing from one Memory to another with program audio playing *and* where EQ or level settings change, it is appropriate to ramp between Memories. During set up, however, it may be distracting or deceiving to have settings ramp. Check the Ramp Disable box during set-up to avoid, for example, running analysis sweeps too quickly after a change – i.e., before the RPM 26i settings finish ramping. Checking this box during set-up steers you clear of scratching your head on the first sweep and finding that the second sweep is just fine. Ramp Disable and Show Names states are *not* stored in Memories — the unit either has ramping *enabled* or *disabled*.

Ramping affects the following processing functions: All Trim controls (including Invert and unmuting), all PEQ Filters (including Frequency, Level, Bandwidth and Filter Type changes), Crossover and High & Low Cut Filters (Type & Frequency changes) and the Compressor Ratio & Threshold settings. Filter bypassing is *never* ramped. Mute controls *always* attenuate quickly and ramp back up when ramping is enabled. Enabled ramping is recommended once set up is complete, to avoid small ticks and tiny pops that may occur when ramping is disabled.

When enabled, ramping occurs while you are editing settings "live" with a unit or while you are recalling different Memories. The ramp rates may be deceptive until you get used to them. For example, when you unmute an output with ramping enabled, the level slowly ramps up to its displayed setting. Ramping is also implemented for Level (boost/cut) settings *and* Frequency settings in all PEQs. When changing from one Memory to another where the PEQ settings change or when editing filter values "live," the RPM 26i ramps between *like-numbered* PEQ filters. For example, Filter 1's Level and Frequency settings slowly change from their initial value to Filter 1's new values. Filter 2's settings do the same, et cetera. Ramping is disabled via the Ramp Disable checkbox at the bottom of the Device Edit screen.

It is wise to keep like-numbered filters in a similar frequency range when changing Memories. For example, always set filter number one as your lowest frequency PEQ filter. This way, when changing Memories where filters move, the ramping algorithm is most efficient and therefore least noticeable. If the Frequency settings change dramatically and the Level changes, then the Level of the Filter is slowly brought to zero, the Frequency value is changed, then finally the Level is ramped to the new value.

## Choosing DSP Programs

The RPM 26i contains predefined DSP Programs. The DSP Programs are "fixed" and the placement and order of the signal processing functions cannot be edited.

Each DSP Program can be thought of as a unique "system setup." For example, there are 2-way crossover programs, 3-way programs, 2 x 6 splitter programs, etc. The RPM 26i's default DSP Program is Program number 3. Program 3 provides a Dual 2-way crossover system, complete with program compression, delay, parametric EQ, limiting and two extra outputs with delay that are useful for mono or stereo subs or two full range outputs.

To select a different DSP Program, select Choose DSP Program from the Device menu. A dialog box listing of the available DSP Programs appears, as shown below.

The number on the left side of the descriptions indicates the DSP Program's number. A simplified graphic of the DSP Program indicates the general audio system flow for each Program. Only the number of available parametric EQ filters and crossover type (if applicable) are shown in this simple graphic. All DSP Programs, however, do provide additional processing blocks not shown. The additional processing blocks vary from Program to Program but always include Input Trim, Output Trim, Meters and Delay. Program Compression and Limiting are available in most DSP Programs. Input Summing, test signal Generators and I/O Routing — available in some DSP Programs — are also shown in the simplified graphic where applicable.

To help find a desired DSP Program, the Inputs and Crossovers check boxes near the top of the screen allow the user to reduce the DSP Program list to include only those Programs matching the checked criteria. For example, if one desires only two input, 3-way crossovers, de-select all but the Two Input and 3-Way check boxes. The displayed list is then reduced to only two DSP Programs — both Programs 4 and 5 provide a Dual 3-way Crossover. To quickly show all available DSP Programs, click the Reset button.

A few lines describing each DSP Program are listed. Generally these descriptions duplicate information available in the simple graphic, but some DSP Programs provide much greater functionality than the simple graphics indicate. For example, some DSP Programs contain "Extended" parametric EQ, shown with a plus sign after PEQ (PEQ+). DSP Programs with PEQ+ permit multi-way crossover implementations since two filters in each Extended Parametric can be changed to crossover filters such as Linkwitz-Riley, 24 dB/Oct., etc.

Each time you change DSP Programs from this window, all settings revert to their defaults and all outputs of the newly loaded DSP Program are automatically muted. This is not the case, however, when recalling a new DSP Program during a Memory change.

**Important Note:** *Each of the 16 Memories can contain a different DSP Program. Before connecting the RPM 26i to other audio system components, it is wise to choose the appropriate DSP Program and **store this program in each of the 16 Memories**. This avoids the problem of accidentally recalling a Memory that restores an undesired DSP Program; such as the case where you recall from a 3-way DSP Program to a splitter: this sends full-range audio to all Outputs!*
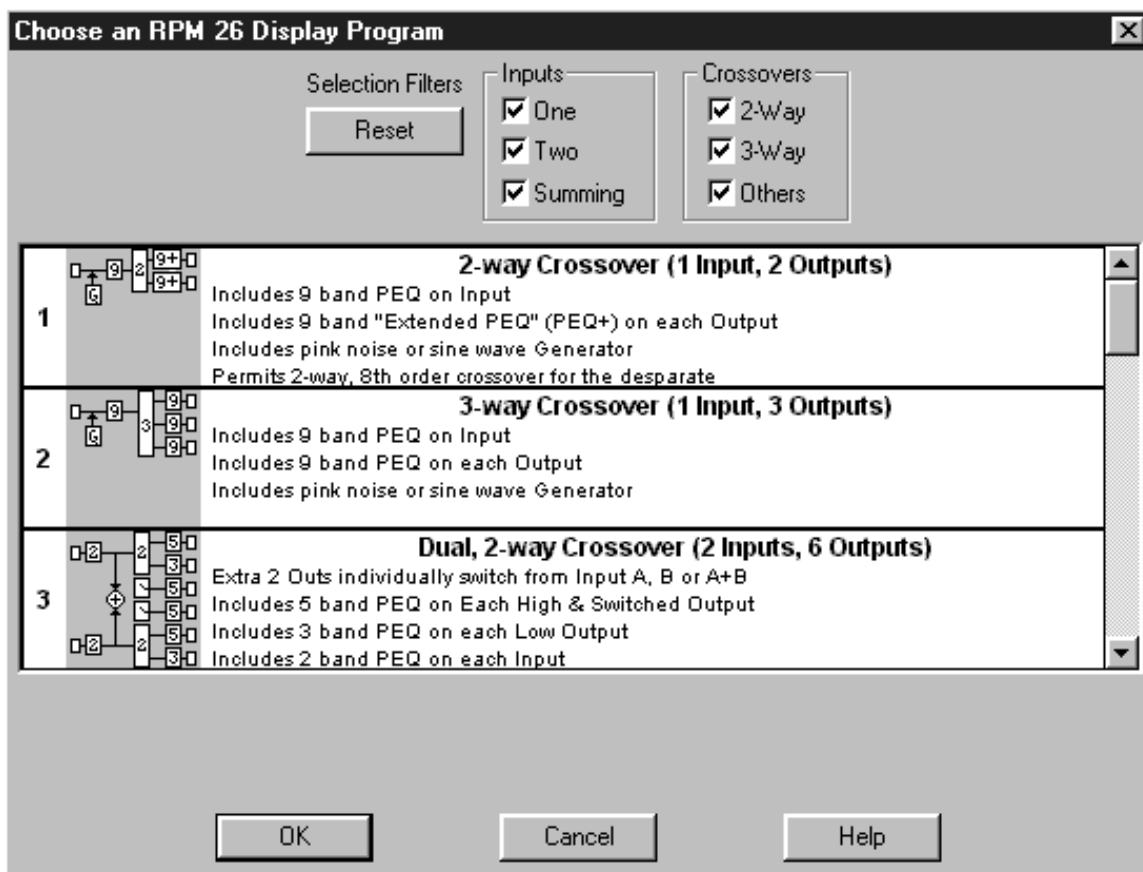
## Programming the RPM 26i

The RPM 26i and RPM 26v use the same software. References in software to the RPM 26v apply to the RPM 26i.

Each DSP Program contains a number of processing Blocks. There is a Block shown for each available signal processing function. The quantity and type of available processing blocks varies from DSP Program to DSP Program.

Double clicking on most of these processing Blocks opens a detail window where most processing settings are edited. Assuming your computer screen provides enough graphics resolution, up to three of these detail windows can be open at any one time. In addition, *a fourth window that displays the* Overall Response *curve for a given output can be opened by double-clicking any output's screw terminal graphic.* Once a detail window is opened, settings can be edited. The window can then be closed and the changed settings are retained in the working Memory (Memory zero). Changes are not stored in any other Memory until you save them with the Store button.

It is possible to Alt-Tab to another Windows application from any RPM 26i window. This allows you to toggle between Windows applications and still keep the RPM 26i Detail Windows open on the screen.

To copy any individual signal processing block's *current* settings to another *corresponding* block, right click on it. (You may right click on any small Device Edit screen block or on any block's Detail Window to copy and paste settings.) Select Copy from the menu — the settings are now stored for pasting. Then, right click on the block you wish to paste the copied settings to and select Paste from the menu. You're done! See the above section for copying entire Input or Output block settings.

If you find yourself squeezed for room at the bottom of the screen, you can modify the Task Bar so it only appears when you move the mouse pointer below the bottom of the screen. To do this, Right-Click on a blank spot on the task bar. Select Properties. Enable Auto Hide. Click OK.

While operating the Site Control Panel in Windows, there is no button-box for the system menu on the title bar allowing you to either exit or return to the Device Edit screen. There is, however, a Close-Window button-box. As expected, the Close-Window button-box exits the Site Control Panel, but unfortunately, it also quits RaneWare. To return to the Device Edit screen, Right-Click the mouse on the Site Control Panel title bar. This opens a menu allowing you to return to Device Edit mode or exit RaneWare altogether. As usual, a password is required for either option.
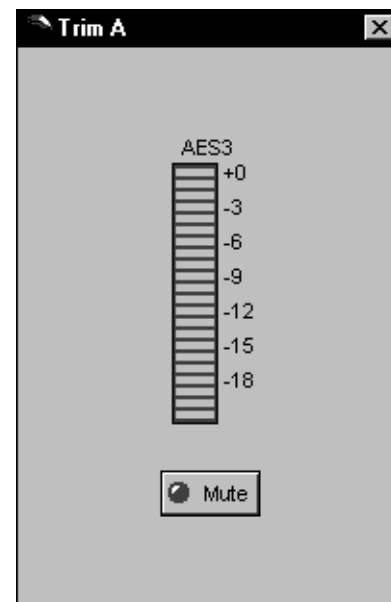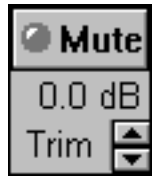
### INPUT TRIM

The Input Trim processing block is on the left side of the Device Edit screen, just to the right of the input screw terminal. This block is shown here:

The Input Trim on the RPM 26i is always 0 dB, but each AES3 Input Channel may be individually muted.

To view the Input Meter, double click on the Input Trim block. You may double click anywhere except on the arrows or on the Mute button to open the detail window, shown below. The name of the processing block appears at the top of each detail window, in this case, input Trim A. The AES3 Meter shows the Input level in dB Full Scale. Clicking the Mute button turns this Meter off as well as the front panel A/B Input LEDs.

The RPM 26i is designed to provide +20 dBu of Output for a 0 dB Full Scale (dBFS) AES3 Input. Generally, the Input peak level should be close to 0 dBFS, but it might need to be somewhat lower to allow for EQ boost within the unit. The level must be reduced in the equipment producing the AES3 signal.

## OUTPUT TRIM

The Output Trim's purpose is to provide up to 30 dB of attenuation on each Output. This is useful to adjust for speaker sensitivity in both distribution and crossover applications where each output may require a different level. Use the Mute button to turn individual Outputs off.

Click on the up and down arrows to increment or decrement the Output Trim.

For more precise control of the Output Trim, double click on the Output Trim block. You may double click anywhere except on the arrows or on the Mute button to open the detail window, shown below.

The name of the processing block appears at the top of each detail window, in this case, Output Trim 1. The horizontal scroll bar adjusts the Trim control in three ways. Clicking the left or right arrows adjusts the trim in ½ dB steps. Clicking *between the arrows and the sliding box (Thumb)* adjusts the Trim in 5 dB steps. Clicking and holding the Thumb allows you to drag the control.

The Output Trim controls a DCA attenuator which maintains output dynamic range over a wide range of attenuation settings. Even though the screen shows the Output Trim *before* the Limiter *and* the D/A converter, the attenuator is *after* the D/A converter internally. *However*, the unit operates as if the Output Trim control were before the D/A and the Limiter. Since the RPM 26i knows the analog Output Trim attenuation, the Limiter Threshold is internally and transparently adjusted to keep audio operation as displayed. Therefore, what you see is what you get. The Output Trim's detail window is shown here:
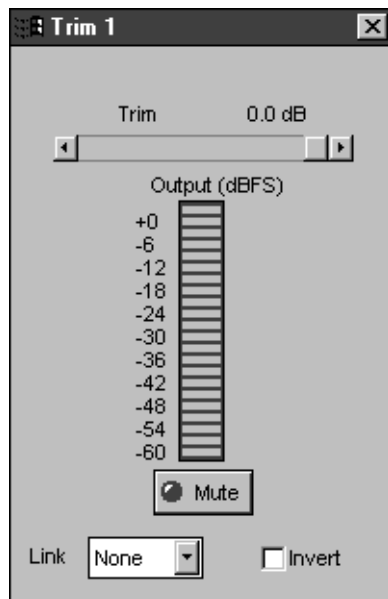
The Output Meter displays the voltage level at the output screw terminal of the RPM 26i in dBFS if the Master Output Lvl is set to 0 dB. Add the Master Output Level to each Output Meter Level to get the level at the unit's output. The Mute button mutes the given output. The Invert check box inverts the polarity of the given output. When ramping is enabled, each time the Invert box is changed the given output's level ramps to off , the polarity is inverted and the level ramps back up. Many people frown upon purposely inverting the polarity of an audio signal. The invert function here is provided solely as a convenient tool for testing polarity. In permanent installations it is always wise to correct polarity inversion problems through other more permanent or "hardware" means such as correcting cable-wiring errors.

The Link selection box "ties" groups of output Trim controls together. There are 4 possible groups, None, 1, 2 or 3. None in the selection box indicates the given output is tied with no other output. If two outputs' Link boxes share a common value, for example 1, then those two output trims are linked together.

## MASTER OUTPUT LEVEL

The Master Output Level operates all six output DCA attenuators simultaneously, while keeping the Output Trims the same relative to one another. The Output Trim and the Master Output Level operate the same attenuator, but they are otherwise independent. Therefore, the overall attenuation of a given output is the sum of the attenuations of the Output Trim and the Master Output Level. This control does not affect the Output Meter or the Limiter Threshold. *When setting the Limiter, the Master Output Level must be taken into account.*

## AES3, D/A AND METERING

Now, a word about metering and our pal, the Windows operating system. Displaying meters on computers poses a unique problem for software designers and sometimes for users, especially if you have a "slow" computer. Everyone is familiar with analog meters without computers deciding that displaying meter indicators needs to wait until a "more important" task is completed. Windows provides the RPM 26i software an update window opportunity every 100 milliseconds (10 times per second). And, since there are more than just meters to update, other functions *at the computer's discretion* can have a higher priority than the meters. This simply translates into *"the more meters you have on the screen, the more sluggish and inaccurate they will appear."* For this reason, it is wise to adjust the RPM 26i Trim controls or view its meters one at a time. This displays the least number of meter indicators on the screen, making the display's update rate as reliable as possible.
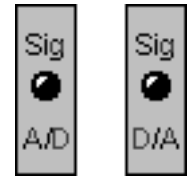
The Signal AES3 and D/A blocks on the RPM 26i Device Edit screen indicate where in the signal chain the AES3 and D/A conversions occur. These blocks also contain the signal present and overload indicators, all of which default to single, two-color indicators: green for signal present, red for overload and gray for no signal detected.

Double clicking on any of the AES3 or D/A blocks turns it into an eleven segment meter. The top segment lights at -2 dBFS, each subsequent segment lights 3 dB before the segment above it. Again, to keep the meters as reliable as possible, keep as few meter segments on the screen as possible when adjusting levels.

The RPM 26i's front panel is microprocessor controlled with a guaranteed update rate of 90 milliseconds, or just over 11 times per second. The peak level of the audio samples within that 90 ms are displayed.

## HIGH & LOW CUT FILTERS

High and Low Cut filters are provided in some DSP Programs. Their purpose is to band-limit the system's frequency range. Not all installations require 20 to 20 kHz bandwidths for their audio systems. Use the High and Low Cut filters to remove the generally undesirable frequencies below 80 or 100 Hertz and above 15 to 18 kilohertz. These frequency ranges are simply examples, since often each system requires a unique range.

Like all detail windows, the name of the window is displayed at the top. The edit boxes at the bottom of the window show the current Low Cut and High Cut frequency settings in Hertz. To edit the current values, click the up or down arrows, or click in the edit box to display the cursor and type a new value. The High and Low Cut filters are fixed Butterworth, 24 dB/Oct. (4th order) filters.

The Bypass check boxes on the High and Low Cut detail window turn the filters completely off. Note that this is *not* equivalent to simply setting them to their highest (20 kHz) and lowest (20 Hz) frequency settings. Toggling these Bypass check boxes provides an easy way to compare filtered versus unfiltered responses, *just be sure you don't cause any damage by bypassing the high or low cut filters.* Filter Bypassing is never ramped.

Adjusting the filter frequency settings is also possible if you click and drag directly on the graphed curve itself. You must click directly on the curve's downward slope, on the high or low frequency side, to successfully grab the curve and alter the settings. The curve changes color when successfully "grabbed" and the 3 dB down point of the curve snaps to your cursor's position. This 3 dB down point defines the frequency setting for each filter.
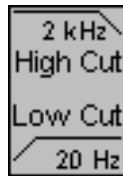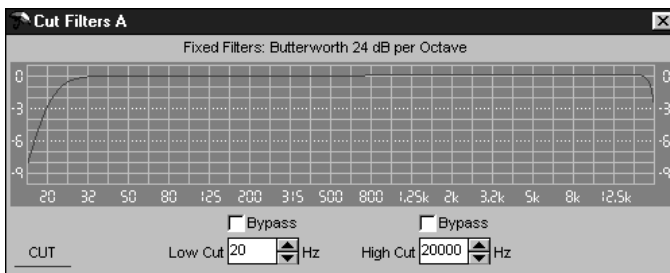
## PARAMETRIC EQ (PEQ)

Every DSP Program contains multi-band parametric EQ, abbreviated **PEQ**. The quantity of PEQ filters varies from program to program. The PEQ block shown at the right contains 5 filters. Some DSP Programs have parametric EQ in both the Input and Output (see Input Blocks & Output Blocks on page Manual-21). Parametric EQ can be used for a wide variety of purposes. Generally, input parametric is used for program sweetening and/or band-limiting the frequency range. Output parametric can be used to correct for loudspeaker response anomalies, or if used sparingly, to sometimes overcome acoustically created room anomalies. In distribution applications, output PEQ provides independent equalization of each zone.

The quantity of PEQ filters may vary with each program, but the operation of the PEQ filters is consistent. Double clicking on any PEQ block opens that PEQ's detail window where all parametric parameters are adjusted. The detail window is shown at the bottom of this page.

The name of the open PEQ block appears at the top of the window. The graph contains some quantity of circled numbers, each representing an available parametric EQ filter. The location of each circle on the graph determines that filter's frequency in the *x*-direction (left-right) and level (boost/cut) in the *y*-direction (up-down). Across the bottom of the screen are edit boxes displaying the selected filter's current settings. The left-most Filter edit box displays the currently selected filter number. This same filter appears on the graph in a different color with its corresponding number circled. The plotted contribution of the selected filter also appears in a different color. This makes it easier to see the contribution of each individual parametric filter. It is also convenient to simultaneously open the Overall Response curve for the PEQ output you are viewing (double click on the Output's screw terminal). This provides the calculated overall response of all viewed PEQ filters. (See the Overall Response section on page Manual-20 for further details.) Click on the Filter edit box's down arrow to display and select a different filter's settings. You may also click directly on the circled number on the graph corresponding to the filter to edit or view it.

The Freq (Hz) edit box is changed with the up or down arrows. Or click in the edit box to display the cursor and type a new frequency value, always in integer Hertz.

The Level (dB) edit box is also changed with its up or down arrows. Or click in the edit box to display the cursor and type a new level value in dB. The Level's step size is ¼ dB (0.25). The boost range is +12 dB, the cut range is -15 dB. Typed values are *truncated* to the nearest value, *not* rounded high or low.
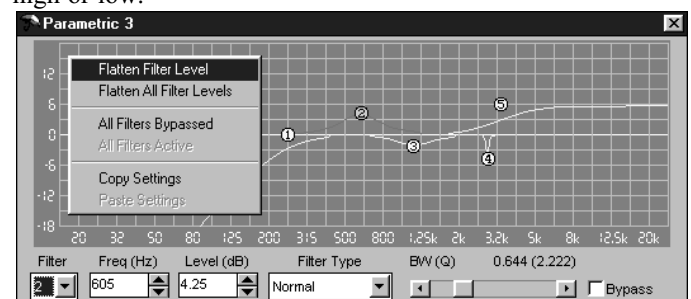
The Filter Type selection box is edited by clicking the down arrow and selecting a new Filter Type such as Low Shelf, High Cut or a Normal parametric filter. (See the Extended Parametric section below for additional filter types such as Linkwitz-Riley, Bessel and Butterworth filters.) Those systems that require constant directivity horn equalization can use the CD Horn EQ Filter Type (in combination with other PEQ filters) to achieve the appropriate EQ for the combination of horn and compresssion driver you are using. For optimum frequency response, use an analyzer to achieve the best possible horn EQ compensation.

The bandwidth, abbreviated BW (Q), for each parametric EQ filter is edited with the horizontal scroll bar. There are 80 steps between a bandwidth of 0.036 and 2.543 octaves. The horizontal scroll bar adjusts the bandwidth control in three ways. Clicking the left or right arrows adjusts the bandwidth one step at a time. Clicking between the arrows and the sliding box (thumb) adjusts the bandwidth 10 steps at a time. Clicking and holding the thumb allows dragging the control.

A Bypass check box appears on the bottom right allowing the selected PEQ filter to be bypassed. This is essentially equivalent to setting that filter's level to zero. This is useful when comparing the effect of a single PEQ filter's frequency response contribution. A small red 'X' appears over the top of the circled filter number to indicate that the filter is bypassed. (See filter #4 on the example screen to the left.) *The bypassed filter's response graph does not change on the parametric graph, but it does on the* Overall Response *graph* (double-click on the Output's screw terminal). The Overall Response curve also shows the contributions of the crossover and the high/low cut filters (if applicable). See the Overall Response section on page Manual-20 for further details.

A right mouse click on the parametric detail window pops up a menu allowing flattening of the *current* (Flatten Filter Level) or *all* PEQ filters (Flatten All Filter Levels). This same right mouse click menu allows bypassing all PEQ filters (All Filters Bypassed) for conveniently comparing equalized and unequalized settings.

You can also Copy (select Copy) and Paste (*after* Copying) the PEQ settings from one PEQ to another from this menu. The PEQ copy and paste scheme allows you to copy, for example, the first three PEQ bands from a 6 band parametric into a 3 band PEQ. The three extra bands, 4, 5 & 6 in this case, are simply ignored by the 3 band PEQ. The same goes for pasting from a 3 band into a 6 band PEQ. Only the first three bands' settings will be copied into the 6 band PEQ and bands 4, 5 and 6 will be unchanged after the paste.

This makes it easy to set up one processing block, then copy settings to other blocks.

## EXTENDED PARAMETRIC (PEQ+)



Some DSP Programs provide "Extended" Parametric EQ, abbreviated PEQ+. Extended parametric simply means that two of the available PEQ filters contain extended capabilities. These two special PEQ filters support various EQ filter types, such as high pass (HP) or low pass (LP) Linkwitz-Riley, Butterworth or Bessel filters, these are abbreviated LR, BW and Bsl, respectively. Different slopes for each of these filter types are also available, allowing 12 dB/Oct., 18 dB/Oct. and 24 dB/Oct. filter implementations ($2^{nd}$, $3^{rd}$ or $4^{th}$ order), where applicable. In any extended parametric, only the *first* and *last* filters contain the extended capabilities; 1 and 4, in the above example screen.

The purpose of Extended Parametric is to give the RPM 26i the capability to implement up to a 6-way crossover. Since each PEQ+ output can implement any crossover frequency range, treating each output as its own crossover band, provides multi-way crossovers.

**Hint:** For midband crossovers, use 2 bands with one set for LP, the other set for HP and overlap them.

**Note:** Operation of Extended Parametrics (PEQ+) is exactly like regular parametrics (PEQ), *the only difference is when you choose* Cut, LR, BW *or* Bsl *filter types for a given filter, the* Level *and* BW(Q) *settings for that filter have no effect and are ignored by RaneWare.* The Shelving filter type also ignores the BW(Q) setting.
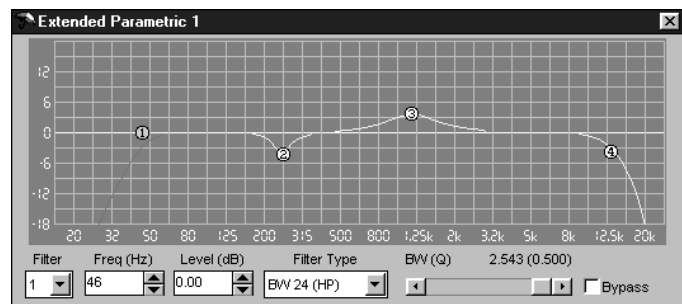


## COMPRESSOR



Most DSP Programs provide a program compressor on each input. The compressor's purpose is to alter the dynamic range of the incoming signal. Compressors are simply fancy volume controls. Only the volume level is altered by compression. When compression occurs, the compressor turns the volume down in a tightly controlled manner. The Threshold is a voltage level setting above which compression (or turning down the volume) occurs. The Ratio tells the compressor how much to turn the

volume down for a given increase above the Threshold. The Attack time dictates how quickly the signal reaches a "settled" compression level for a given input signal step size. The Release time dictates how long it takes the output signal to reach a "settled" level after the input signal is reduced.

The Comp. indicator lights yellow when the compressor threshold has been reached. All other Compressor settings are adjusted in the Compressor detail window shown at the bottom of this page.

Double-clicking on the Compressor block opens the detail window. The name of the open Compressor appears at the top of the window. The detail window contains a scroll bar for adjusting the Threshold, Ratio, Attack time and Release time. A gain reduction meter is also provided that indicates the amount of gain reduction (attenuation) in dB. The Compressing indicator at the bottom left corresponds to the top Gain reduction indicator and to the yellow indicator shown on the Compressor block on the Device Edit screen.

The Compressor uses an RMS detector for Threshold detection. Avoid short Attack and Release times as they can audibly distort the signal, especially when the signal contains mostly low frequencies.

The Combine check box allows logical "or-ing" of the compression settings. *Only if both channels'* Combine *boxes are checked will the "or-ed" settings apply to both channels.* When both boxes are checked, and after either channel reaches its Threshold setting, both compressors will "follow" each other with the same gain reduction, Attack and Release times being applied to both channels. The channel with the most gain reduction *always* dictates what instantaneous gain reduction, attack and release settings are applied to the combined channels. This maintains the spectral balance between the two channels and keeps your stereo program's left-to-right sound stage intact.

If only one channel's Combine box is checked, that compressor uses the higher gain reduction value of the two compressors as well as that same compressor's Attack and Release times. The unchecked channel acts by itself.

The Compressor's Threshold and Ratio settings can also be edited if you click and drag directly on the graphed curve itself. You must click directly on the curve, to the left of the Threshold point (or knee), to alter the Threshold. The vertical position of the cursor corresponds to the Threshold level once the curve is successfully grabbed. Click directly on the curve to the right of the knee to alter the Ratio setting. The curve changes color when successfully grabbed.
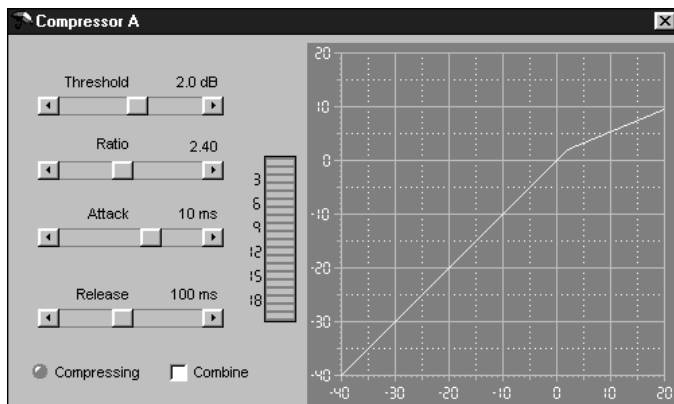
## DELAY

All DSP Programs provide two types of Delay blocks. Coarse Delay in the Input Block section, before the crossovers or splitters, and Fine Delay in the Output Block, after the crossovers or splitters.

## COARSE DELAY

The Coarse Delay block provides 1 millisecond minimum step sizes. Coarse Delay is useful in speaker stack applications where stacks are placed many feet in front of the stage or for distributed speakers that are far from the sound source. One millisecond is approximately 1.13 feet or 0.34 meters.

The up or down arrows in the Coarse Delay block (shown at above right) increment or decrement the Coarse Delay without opening the detail window.

For direct or scroll bar editing, open the detail window by double-clicking on the Coarse Delay block. This opens the Coarse Delay detail window where a scroll bar provides three easy ways to edit the delay value. Click the left or right arrows to adjust the delay one millisecond at a time. Click between the arrows and the sliding box (Thumb) to adjust the delay in 10 millisecond steps. Click and hold directly on the Thumb to drag the control. Click directly in the edit box to display the cursor and type in the desired value.

*Note: The Coarse Delay's minimum setting is one millisecond. Values less than 1 millisecond are not valid, since the minimum time it takes signal to propagate through the RPM 26i is 2.4 ms. The propagation delay of the RPM 26i is included in the setting. So, what you see is what you get.*

*Subnote: The propogation delay varies with the input sample rate. A 48 kHz input produces 2.4 ms propogation, and 96 kHz produces 2.0 ms.*

The Global Settings for Delay Units (milliseconds, feet and meters) and Temperature are covered next, under FINE DELAY.

The Coarse Delays can be locked together by checking the Linked box. A red '1' appears in the Coarse Delay block on the Device Edit screen when the Linked box is checked. This indicates that the control is linked without the need to open the detail window. The delays are not linked together unless at least one pair of Linked boxes are checked.
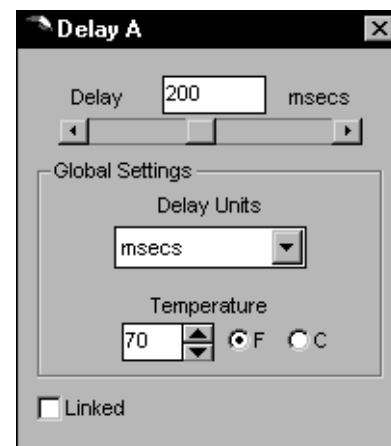
## FINE DELAY

The Fine Delay block has 20 microsecond (0.02 msec) minimum delay steps and is intended to allow individual driver alignment in speaker stacks or for lobe steering. Twenty microseconds is approximately 0.02 feet (about ¼") or 0.00635 meters (which gets rounded to 0.01 meters in the RPM 26i).

The Fine Delay block and Fine Delay detail window are shown to the right. Like the Coarse Delay block, the Fine Delay block provides up and down arrows for incrementing and decrementing, however the Fine Delay has 20 microsecond steps that are always displayed as 0.02 milliseconds. The Fine Delay detail window provides three ways to edit the delay value; single steps by clicking the left and right arrows, 0.20 millisecond steps by clicking between the Thumb and the arrows or clicking and dragging the Thumb itself. Click directly in the edit box to display the cursor and type in a new value.

The Global Settings for Delay Units (milliseconds, feet and meters) and Temperature are displayed in both the Coarse and Fine detail windows. *These are global settings, meaning that once changed, the changes appear throughout the RPM 26i.* To change all displayed delay settings to different units, click the down arrow in any Delay Units selection box and select the new units from the list. Edit the Temperature by clicking the up or down arrows or click directly in the edit box to display the cursor and type in a new Temperature. Click one of the radio buttons to display the Temperature in either 'F' for Fahrenheit or 'C' for Celsius.

Only when *distance* units (feet or meters) are used does the Temperature setting impact the displayed units. The Temperature is calculated with dry air for the displayed distances. The RPM 26i does not alter the delay *time* when the Delay Units are changed, only the way the delay is displayed is altered. Also, even though the displayed values may be in feet or meters, clicking the scroll bars and arrows still changes the delay times in milliseconds (1 msec. for Coarse Delay and 0.02 msec. for Fine Delay).

The Link selection box in the Fine Delay detail window, "ties" groups of Fine Delays together. Select the down arrow to the right of the selection box to assign Link groups. There are 4 possibilities, None, 1, 2 or 3. None in the selection box indicates the given delay is tied with no other delay. If two delays' Link boxes share a common value, for example, 2, then those two delays are Linked together. When Linked, the selection box's number—1, 2 or 3—also appears in red in the Fine Delay block on the Device Edit Screen. This indicates which Link group a given delay block is in without needing to open the detail window.
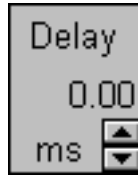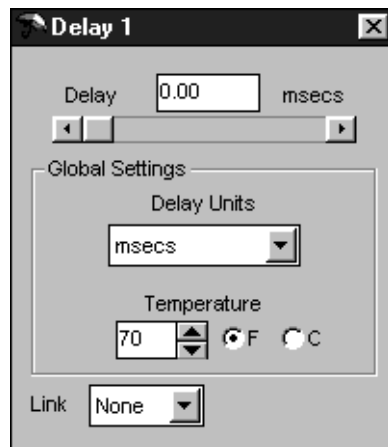
## CROSSOVERS

Both 2- and 3-way crossover blocks are found in various DSP Programs in the RPM. Up to a mono 6-way crossover can be implemented with the RPM 26i's powerful Extended Parametric EQ, see the Extended Parametric (PEQ+) section on pages Manual-15-16 for details on implementing more than a 3-way crossover. The 2- and 3-way crossover interfaces are similar. Only the 3-way is covered here. The 2-way interface simply removes one band. The 3-way crossover block is shown at the right.

The current crossover frequency settings are shown on this block, making it unnecessary to open the detail window to check the crossover's current frequency settings. The high frequency output of the crossover block is graphically always on top with the lowest frequency outputs displayed on the bottom.

Double-clicking on the Crossover block brings up the Crossover detail window shown at the bottom of the following page. The graph displays the calculated frequency response of the RPM 26i Outputs. For viewing ease, each frequency band is displayed in a different color. Below the graph are edit boxes, one for each crossover frequency point. Edit each frequency by clicking the up or down arrows or click directly in the edit box to display the cursor and type in the new crossover frequency directly. The RPM 26i accepts crossover frequency in 1 Hertz steps and all values must be typed in Hertz.

Editing the crossover frequency values is also possible by clicking directly on the curve. Click directly on the intersection of the two curves to successfully grab and edit the crossover frequency. The curves change color when successfully grabbed. The horizontal position of the cursor dictates what frequency value is assigned once the cursor is dropped.

*Note: It is wise to alter crossover frequencies directly on the graph only when the Outputs are muted or when the RPM 26i is not connected to amplifiers and speakers. This avoids the potential disasters of slipping with the mouse or reaching for your coffee and accidentally clicking the mouse! For these reasons, the area to successfully grab the crossover curve is small.*

For both the 2-way and 3-way crossover blocks, the default crossover filter type is Linkwitz-Riley, 24 dB per octave ($4^{th}$ order) filters. The crossover frequency points are also locked together making all adjustments equivalent to familiar analog crossovers. For those with the proper analysis tools to properly adjust other crossover filter types, the RPM 26i crossovers contain an Advanced Mode. In the crossover detail window, clicking the right mouse button pops up a menu that provides access to the Advanced Mode. A Warning box is displayed before one can enter Advanced Mode. Check the Don't ask me again box if you *"know what you're doing"* and this whole warning business is beneath you. Click OK only if you have the proper equipment to ensure your crossover adjustments are helping, not hindering your efforts. Hit Cancel if you lack the proper analysis tools.
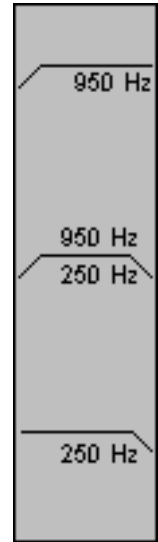
Once in Advanced mode, more edit boxes appear allowing precise control of each individual filter type, slope and frequency. This allows Linkwitz-Riley (LR), Butterworth (BW) or Bessel filters with 12, 18 or 24 dB per octave slopes, where applicable, and independent frequency settings for each filter.

One can return from Advanced crossover mode to Simple mode with the right mouse click menu, however, you must return both the crossover filter types back to LR-24 (Linkwitz-Riley 24 dB/Oct.) and the crossover frequency points back to the same frequency value.

A 24 dB per octave (4th order) Linkwitz-Riley filter is made up of two cascaded 12 dB per octave (2nd order) Butterworth filters. Therefore, there is no such thing as an 18 dB per octave (3rd order) Linkwitz-Riley filter, since implementation of a 1½ order Butterworth is unheard of—though someone may come up with a 1½ wheeled bike! (There's a *good* joke in there somewhere…)

As with the Simple crossover mode, click and drag on the graphed curve to alter the crossover frequency settings. In advanced mode, however, each filter slope is independently editable. You can still click directly on the intersection of two curves to edit two filters' settings simultaneously. Or click on an individual curve's downward slope to alter a single filter by itself.

*Note: It is wise to alter crossover frequencies directly on the graph only when the outputs are muted or when the RPM 26i is not connected to amplifiers and speakers. This avoids the potential catastrophe of slipping with the mouse or reaching again for your latté and accidentally clicking the mouse!*
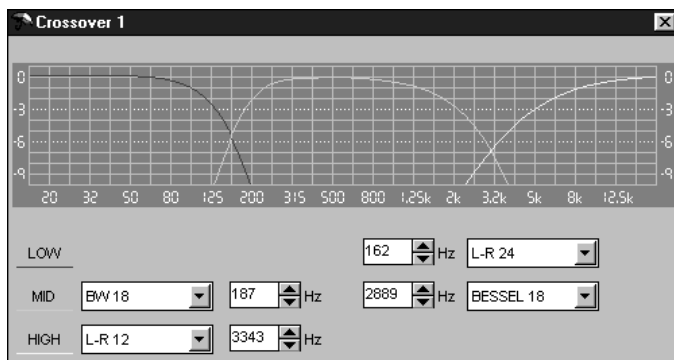
## SUMMING AND I/O ROUTING

Some DSP Programs provide simple Input Summing that is generally accompanied by I/O Routing. The circled "plus" sign between the two Input Blocks indicates that summing is supported. A schematic drawing of a three position switch with A, B and **+** markings indicates that I/O Routing is available for the given output.

The Input summing simply adds the two input audio signals together. For example, if both inputs are in phase and each is 1 volt RMS, the simple sum of the two would be, all you math whizzes out there, 2 volts. Note that this sends more signal to the Output Block processing which may require additional Trim at the Outputs or Inputs. Be especially aware of the amount of parametric EQ boost used in summed outputs, *since too much may result in digital clipping.*

Many DSP Programs also support user switchable I/O routing indicated by a switch schematic symbol in the simplified graphic or in the Device Edit screen. This allows each output to be fed from either Input A, Input B or the simple sum of Input A+B. This functionality provides simple and convenient room switching for ballroom applications where the input source can be changed through a simple contact closure. It also can provide a quick mono source for balcony or cry rooms or, when used in conjunction with the output PEQ, can provide a subwoofer output.

Double-click on the circular A, B or **+** switch terminal to move the switch's Output (i.e., common) to the desired Input.
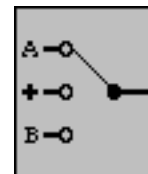
## LIMITER

For most DSP Programs, each output is supplied with a Limiter. The limiter is meant to be a safety device to stop the RPM 26i Output from exceeding a predetermined threshold voltage.

The Limiter block has an indicator that turns yellow when the output reaches the limiter's Threshold.

Double-clicking on the Limiter block opens the Limiter detail window. Scroll bars for adjusting the Threshold, Attack and Release times appear on the left. There are three ways to alter the settings with the scroll bar. Click and drag the Thumb to the desired value, click between the Thumb and the arrows to adjust in large steps or click the left or right arrows to adjust in single steps. The Limiting indicator on the bottom left indicates when the signal has reached the Threshold. This Limiting indicator corresponds to the indicator on the Limiter block in the Device Edit screen.

Each Limiter contains a Combine selection box. Limiters are combined when the numbers in the selection boxes match. The choices are None, 1, 2 or 3. None in a selection box indicates the given Limiter is tied with no other Limiter.

When Limiter Combine boxes share a common value, for example, 3, then those Limiters are Combined together. The Combined Limiter with the most gain reduction *always* dictates what instantaneous gain reduction, attack and release settings are applied to each Combined channel in its group. This maintains the spectral balance between the Combined channels and helps maintain your program's left-to-right image.

The Limiter's Threshold setting can also be edited if you click and drag directly on the graphed curve. The vertical position of the cursor corresponds to the Threshold level once the curve is successfully grabbed. The curve changes color when successfully grabbed.
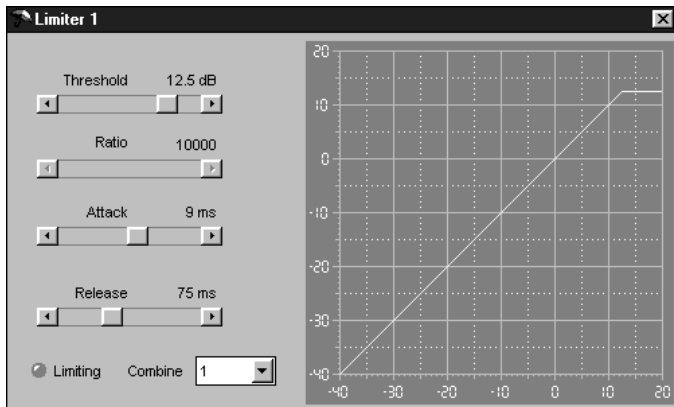
## THE OVERALL RESPONSE CURVE

Double-clicking on any output's screw terminal (shown at the right) opens the Overall Response curve window (shown below). The displayed curve(s) display the frequency response contribution of the equalization settings currently active in the RPM 26i. Though not necessarily useful unless you are implementing a 6-way crossover, it is possible to display the Overall Response curves for all six of the RPM 26i Outputs. The output(s) being viewed are indicated by the check boxes on the bottom left of the window. These boxes provide a convenient way to quickly display the response curves of other outputs or combinations of outputs. Two radio buttons labeled A and B, allow selection of the prefered Input (A or B) for the response curve comparison, when an output contains the simple sum of the two Input signals. It is not possible in RaneWare to display the "calculated" sum of the response curves. This information has limited relevance to the acoustic sum of the responses. It is more insightful to use an analyzer to perform this task. *The curves shown are the calculated responses of the RPM 26i. Do not mistake these curves for the response of your system.* It is highly recommended, and some would say, required, to use a high quality analyzer to get a true indication of your system's overall response. These analysis devices include the contributions of all components of the system, including the RPM 26i, amplifiers, cabling, loudspeaker and generally the room responses.

The check boxes on the bottom right allow viewing of the Input EQ (either High/Low Cut or PEQ filters), Crossover (if applicable) and Output EQ (parametric EQ). This makes it convenient to independently view the frequency response contribution of the various filter sections in the RPM 26i. The graph in the example above does not show the contribution of the crossover, since the Crossover box is unchecked. Right mouse click on the Detailed Response Window to zoom in or out, or to print.
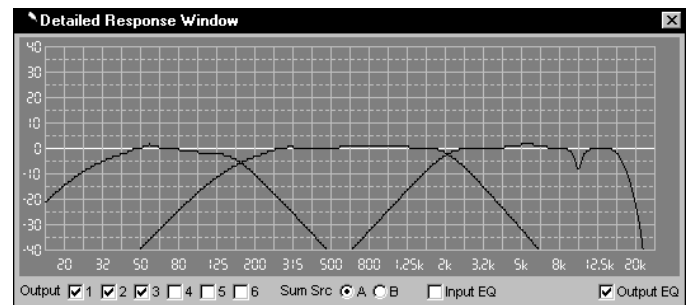
## GENERATOR (PINK NOISE OR SINE)

Pink Noise or Sine wave signals are available in some DSP Programs. A 'G' appears in the simple graphic in the Choose DSP Program window, indicating that a given DSP Program supports these Generator test signals. The Pink Noise is provided as a test signal for listening to comb filtering in speaker arrays or for listening for room reflections. The Sine wave provides a convenient test signal, helpful in setting gain structures or for more accurately hearing specific-frequency room reflections.

The signal Generators default to a Muted state when new DSP Programs containing Generators are requested. Click Mute to unmute the Generator. Click the up or down arrows to adjust the Generator's Level in ½ dB steps. The maximum attenuation is 40 dB. The Generator levels are calibrated in dBFS, i.e. at 0dB the Generator is sending a full scale digital signal to the D/As.

Double-click on the Generator block to open the detail window. A vertical scroll bar adjusts the Level in three ways. Click and drag the Thumb directly, click between the Thumb and the arrows for 5 dB steps or click on the up or down arrows for ½ dB steps.

Radio buttons on the left allow selection of Pink Noise or Sine Wave as the Generator source. If Sine Wave is selected, the edit box to the right dictates the Sine Wave frequency in Hertz. One Hertz steps are accepted.

DSP Programs with two Generators contain *two uncorrelated pink noise sources,* required when you wish to listen to "stereo" pink noise signals. Also, the two sine wave generators are *not* guaranteed to be in phase. Be sure to always Mute the RPM 26i Generators any time you use an analyzer for system measurements, since the analyzer must use its own internal generator for such measurements.
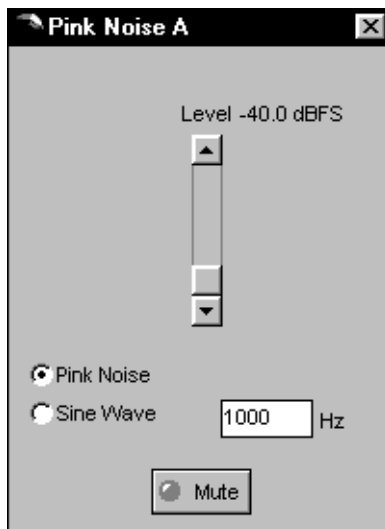
## MUTE ALL

The Mute All button is provided for those moments when you quickly need to turn all of the RPM 26i Outputs off. *Please note that once all outputs are muted, clicking* Mute All *again does not unmute all of the outputs.* All outputs are also muted each time you choose a new DSP Program from the Device menu's Choose DSP Program option. This purposely *forces the user to unmute each output separately* and allows one to reflect on the consequences of unmuting each output independently.

## INPUT BLOCKS &
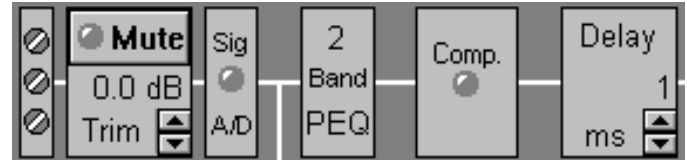
## OUTPUT BLOCKS
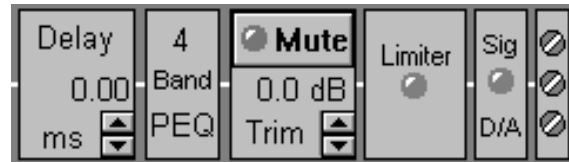
In addition to the individual signal processing blocks described above, the RPM 26i contains Input Blocks and Output Blocks, shown above. These terms simply describe a subset of the available processing blocks and allow convenient copying of settings from multiple processing blocks. For example, once you've properly set up one-half of a stereo 3-way speaker stack, right mouse click on any output processing block that you've already tweaked. A menu appears that permits clipboard copying of all of the Output Blocks' settings (Copy Output Settings). This includes the settings for the Fine Delay, PEQ, Trim and Limiter. Then right click on the corresponding Output Block for the other speaker stack. The pop up menu appears again allowing you to paste (Paste Output Settings) all the settings from the previously tweaked Delay, PEQ, Trim and Limiter. Then do the same for the other two loudspeaker drivers and you have a great starting point to properly adjust the other speaker stack. The Input Block provides this same Cut and Paste functionality.

# TROUBLESHOOTING

### POWER LED is Off:

Check the POWER connection on the chassis, and confirm that the remote supply is connected to a live AC source. *Ensure that the DIN power plug is plugged into the unit before connecting AC power.*

### No communication between the unit and the computer:

Set the DEVICE ADDRESS to a unique small number, and try polling for units in RaneWare (under Device > Select, then click Poll). The unit should be found quickly. If more than 16 units are daisy-chained from one serial port, communication to the furthest units may be unreliable.

Check that the COM port selected in RaneWare in the System > System Setup menu is the one on your computer that is connected to the unit. Also check that the cable is a standard RS-232 cable *(not a null modem type)*. If an adapter is used, *it must not be null modem type.* The cable must be connected to the RW 232 INPUT jack on the rear of the unit.

Be sure the "Remote to RPD 1" box is not checked in the System > System Setup menu. This box is *only* used with the Rane RPD 1 to remotely communicate with an RW 232 system. *When this box is checked, no communication with local RW 232 devices is possible.* (See page Manual-5-6 for more RPD 1 information.)

### Audio hum or noise:

Click the Mute All button. If this helps significantly, the problem may be with the Input connection, or the equipment driving the Input. If Muting has little effect, the problem is likely either the Output connection, or equipment driven by the Output.

The RPM 26i is intended to connect to equipment with balanced audio I/O. If you really must operate unbalanced equipment with the RPM 26i, please refer to *Rane Note 110, "Sound System Interconnection"* (next section) or *The Journal of the AES Vol. 43 No. 6 (June 1995).*

See the Chassis Grounding Note below.

### Flashing OUTPUT LEDS 1 or 2:

If working Memory (Memory zero) gets corrupted, Output 1 flashes yellow. If just Output 1 flashes, try to reload the DSP Program, load a different DSP Program or recall a different Memory.

If Output 2 flashes yellow, an unrecoverable error has occurred. If this happens, first try to reset the unit by cycling the AC power, (*do not unplug the DIN jack to cycle the power*). If Output 2 is still flashing after power-up, the unit may need erasing. This reinitializes all of the stored parameters including names, and resets all Memories to DSP Program 3. To erase, hold the DEFAULT button while turning the power on. Be sure to hold the DEFAULT button until the Output LEDs cycle. When the unit is finished erasing, the Output LEDs cycle yellow from the outsides to the center.

If you are unable to stop either the Output 1 or the Output 2 LEDs from flashing by resetting the unit, contact the factory.

# MEMORY RECALL PORT

The MEMORY RECALL PORT (MRP) provides contact closure control to recall any of the 16 system Memories. Eight of the Memories are recalled with simple switch closure to a single terminal (see the Normal section of Table 1). Multiple units may be controlled by connecting these terminals in parallel. Either momemtary or latching switches may be used. If a latching switch is used, the selected Memory is recalled upon power-up. If more than one terminal is grounded at a time, the lower-numbered contacts will normally be ignored. However, certain combinations of terminals may be grounded to activate Paging or Binary modes (see table at right). A "Binary" mode allows access to all Memories. "Paging" mode provides installers an easy way to configure a system which uses a single switch (such as a mic key switch) to toggle between two sequential Memories (See below).

Since only changes in contact position(s) are detected, either latching or momentary switches may be used. However, when wiring contacts, *only use Normal, Paging or Binary mode — do not switch between modes.*

The MRP may be programmed so that any input code (including no connection) may recall any Memory.



MRP Wiring
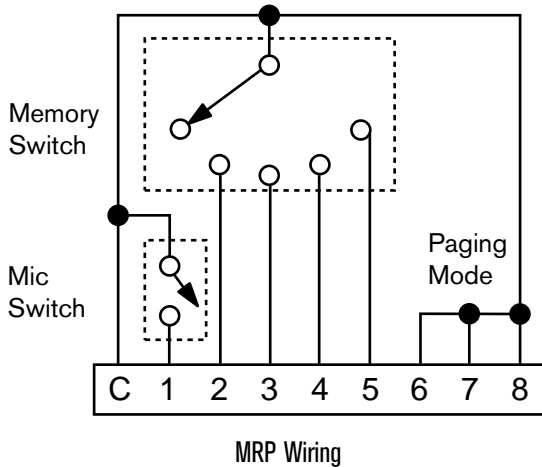
MRP Binary Control

"1" = switch closed (between "COM and 1,2,3,etc.)

"0" = switch open

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mode | Result |
|---|---|---|---|---|---|---|---|------|--------|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | 3 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | NORMAL | 4 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | 5 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | 6 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | 7 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | 8 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | 2 |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | | 3 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | | 4 |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | PAGING | 5 |
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | 6 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 7 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 8 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | | 9 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | | 10 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | | 2 |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | | 3 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | | 4 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | | 5 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | | 6 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | | 7 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | BINARY | 8 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | | 9 |
| 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | | 10 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | | 11 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | | 12 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | | 13 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | | 14 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | | 15 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | | 16 |

# SETTING THE DEVICE ADDRESS

The Device Address is set using a binary code which may be determined using the following table, our Windows Address Calculator program, or by adding the place values (1-128) silkscreened on the chassis. Ignore any numbers printed directly on the switch. For example, turning ON the switches labeled '1' and '2' yields address '3'. In the following table, 0 means switch *down* (OFF), 1 means switch *up* (ON), and the left-most digit corresponds to the switch labeled '128'.
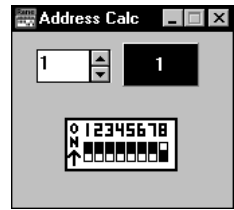
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 00000001 | 51 | 00110011 | 101 | 01100101 | 151 | 10010111 | 201 | 11001001 |
| 2 | 00000010 | 52 | 00110100 | 102 | 01100110 | 152 | 10011000 | 202 | 11001010 |
| 3 | 00000011 | 53 | 00110101 | 103 | 01100111 | 153 | 10011001 | 203 | 11001011 |
| 4 | 00000100 | 54 | 00110110 | 104 | 01101000 | 154 | 10011010 | 204 | 11001100 |
| 5 | 00000101 | 55 | 00110111 | 105 | 01101001 | 155 | 10011011 | 205 | 11001101 |
| 6 | 00000110 | 56 | 00111000 | 106 | 01101010 | 156 | 10011100 | 206 | 11001110 |
| 7 | 00000111 | 57 | 00111001 | 107 | 01101011 | 157 | 10011101 | 207 | 11001111 |
| 8 | 00001000 | 58 | 00111010 | 108 | 01101100 | 158 | 10011110 | 208 | 11010000 |
| 9 | 00001001 | 59 | 00111011 | 109 | 01101101 | 159 | 10011111 | 209 | 11010001 |
| 10 | 00001010 | 60 | 00111100 | 110 | 01101110 | 160 | 10100000 | 210 | 11010010 |
| 11 | 00001011 | 61 | 00111101 | 111 | 01101111 | 161 | 10100001 | 211 | 11010011 |
| 12 | 00001100 | 62 | 00111110 | 112 | 01110000 | 162 | 10100010 | 212 | 11010100 |
| 13 | 00001101 | 63 | 00111111 | 113 | 01110001 | 163 | 10100011 | 213 | 11010101 |
| 14 | 00001110 | 64 | 01000000 | 114 | 01110010 | 164 | 10100100 | 214 | 11010110 |
| 15 | 00001111 | 65 | 01000001 | 115 | 01110011 | 165 | 10100101 | 215 | 11010111 |
| 16 | 00010000 | 66 | 01000010 | 116 | 01110100 | 166 | 10100110 | 216 | 11011000 |
| 17 | 00010001 | 67 | 01000011 | 117 | 01110101 | 167 | 10100111 | 217 | 11011001 |
| 18 | 00010010 | 68 | 01000100 | 118 | 01110110 | 168 | 10101000 | 218 | 11011010 |
| 19 | 00010011 | 69 | 01000101 | 119 | 01110111 | 169 | 10101001 | 219 | 11011011 |
| 20 | 00010100 | 70 | 01000110 | 120 | 01111000 | 170 | 10101010 | 220 | 11011100 |
| 21 | 00010101 | 71 | 01000111 | 121 | 01111001 | 171 | 10101011 | 221 | 11011101 |
| 22 | 00010110 | 72 | 01001000 | 122 | 01111010 | 172 | 10101100 | 222 | 11011110 |
| 23 | 00010111 | 73 | 01001001 | 123 | 01111011 | 173 | 10101101 | 223 | 11011111 |
| 24 | 00011000 | 74 | 01001010 | 124 | 01111100 | 174 | 10101110 | 224 | 11100000 |
| 25 | 00011001 | 75 | 01001011 | 125 | 01111101 | 175 | 10101111 | 225 | 11100001 |
| 26 | 00011010 | 76 | 01001100 | 126 | 01111110 | 176 | 10110000 | 226 | 11100010 |
| 27 | 00011011 | 77 | 01001101 | 127 | 01111111 | 177 | 10110001 | 227 | 11100011 |
| 28 | 00011100 | 78 | 01001110 | 128 | 10000000 | 178 | 10110010 | 228 | 11100100 |
| 29 | 00011101 | 79 | 01001111 | 129 | 10000001 | 179 | 10110011 | 229 | 11100101 |
| 30 | 00011110 | 80 | 01010000 | 130 | 10000010 | 180 | 10110100 | 230 | 11100110 |
| 31 | 00011111 | 81 | 01010001 | 131 | 10000011 | 181 | 10110101 | 231 | 11100111 |
| 32 | 00100000 | 82 | 01010010 | 132 | 10000100 | 182 | 10110110 | 232 | 11101000 |
| 33 | 00100001 | 83 | 01010011 | 133 | 10000101 | 183 | 10110111 | 233 | 11101001 |
| 34 | 00100010 | 84 | 01010100 | 134 | 10000110 | 184 | 10111000 | 234 | 11101010 |
| 35 | 00100011 | 85 | 01010101 | 135 | 10000111 | 185 | 10111001 | 235 | 11101011 |
| 36 | 00100100 | 86 | 01010110 | 136 | 10001000 | 186 | 10111010 | 236 | 11101100 |
| 37 | 00100101 | 87 | 01010111 | 137 | 10001001 | 187 | 10111011 | 237 | 11101101 |
| 38 | 00100110 | 88 | 01011000 | 138 | 10001010 | 188 | 10111100 | 238 | 11101110 |
| 39 | 00100111 | 89 | 01011001 | 139 | 10001011 | 189 | 10111101 | 239 | 11101111 |
| 40 | 00101000 | 90 | 01011010 | 140 | 10001100 | 190 | 10111110 | 240 | 11110000 |
| 41 | 00101001 | 91 | 01011011 | 141 | 10001101 | 191 | 10111111 | 241 | 11110001 |
| 42 | 00101010 | 92 | 01011100 | 142 | 10001110 | 192 | 11000000 | 242 | 11110010 |
| 43 | 00101011 | 93 | 01011101 | 143 | 10001111 | 193 | 11000001 | 243 | 11110011 |
| 44 | 00101100 | 94 | 01011110 | 144 | 10010000 | 194 | 11000010 | 244 | 11110100 |
| 45 | 00101101 | 95 | 01011111 | 145 | 10010001 | 195 | 11000011 | 245 | 11110101 |
| 46 | 00101110 | 96 | 01100000 | 146 | 10010010 | 196 | 11000100 | 246 | 11110110 |
| 47 | 00101111 | 97 | 01100001 | 147 | 10010011 | 197 | 11000101 | 247 | 11110111 |
| 48 | 00110000 | 98 | 01100010 | 148 | 10010100 | 198 | 11000110 | 248 | 11111000 |
| 49 | 00110001 | 99 | 01100011 | 149 | 10010101 | 199 | 11000111 | 249 | 11111001 |
| 50 | 00110010 | 100 | 01100100 | 150 | 10010110 | 200 | 11001000 | 250 | 11111010 |

All features & specifications subject to change without notice. 103950