QUICK START
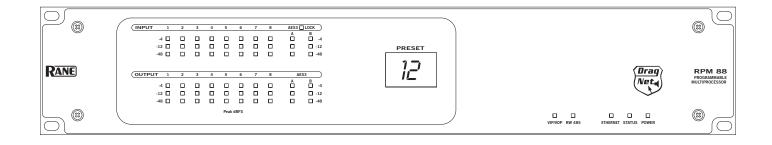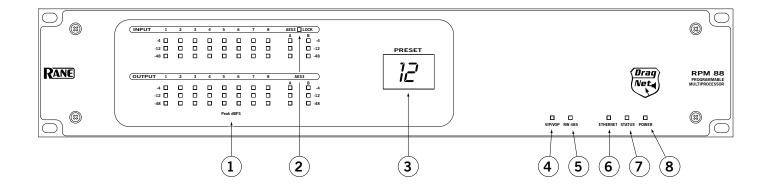
This section is intended to help you make the physical connections and software manipulations necessary to get up and running with your sleek new RPM 88. If you don't read the entire Hardware Manual, at least read this section. It is also recommended that you read the Quick Start section of the Drag Net Software Manual. If the Drag Net software is not yet installed on your computer, please install it now.

To be safe, leave the audio connections until last. Begin by connecting the IEC power cord. Observe that the **POWER** LED on the front panel illuminates. After a few seconds, the **STATUS** LED should turn from red to yellow to green, and the **PRESET** display should have a number in it (00, if it's the first time you've powered the device). If the **POWER** comes on, but the **STATUS** LED does not turn green, contact the factory.

Connect one end of the Ethernet crossover cable (supplied with the unit) to the **10Base-T** jack on the rear panel. Connect the other end of the cable to an Ethernet port on your computer. The **LINK** LED on the rear panel should be lit. If it is not, verify that you are indeed using a crossover cable, not a standard Ethernet cable. A standard Ethernet cable should only be used if you are connecting the RPM 88 and a computer indirectly using an Ethernet repeater hub or switch. Launch the **Drag Net** application and follow the steps to create a new project and new RPM 88 device configuration. The **Project** window then appears. Click the **Configure Hardware IP** shortcut to set the unit's IP address to be compatible with your computer's Network settings. *Tip: If you aren't sure what IP to use, try the address 192.168.69.69 and subnet 255.255.255.0. This finds the default factory address without manually setting it.*

Now click on the **Poll** button in the toolbar. A device name and IP address should appear under the **Live** folder in the **Project** window. If a device does not appear, consult Drag Net's online **Help** for instructions on configuring and verifying your computer's Network settings.
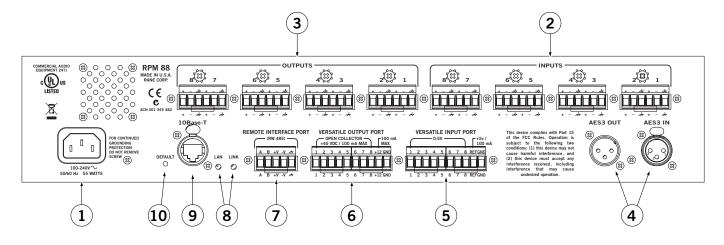
The audio path within the RPM 88 is displayed in Drag Net's **Device Configuration** window as a collection of blocks wired together to form a **Processing Map**. These maps are created offline as **Storage** configurations, which are then transferred to a **Live** unit. Drag blocks from the **Palette** onto the **Processing Map** and wire them together to create the audio path. Save this file frequently using the **File > Save command**. Transfer the selected **Storage** configuration to a **Live** unit using the **Transfer Config** button in the **Project** window. A new, minty green **Device Configuration** window opens once the transfer is complete, indicating you are now online with a **Live** device. Double-click a processing block to display and adjust its **Properties** (parameters) in real time on a **Live** device – there is no need to go offline to make parameter changes.

Once you have a useful configuration in the unit, connect balanced audio **INPUTS** and **OUTPUTS** to the Euroblocks on the rear panel, then turn on the amplifier. As a precautionary measure, all outputs are muted during *and* after a configuration transfer. Unmute each output individually, or use the handy **Mute Outputs** button in the toolbar. Once all outputs are unmuted, audio passes through the unit along the connections *you* defined.

WEAR PARTS: This product contains no wear parts (or wash and wear parts, for that matter).

Front Panel Description

① **Signal/Overload LED meters** indicate the presence of significant audio signal or overload. These 3-segment meters indicate the available headroom once the analog signal has been converted to digital: -4 dBFS (red, near clipping), -12 dBFS (yellow, high normal level), and -48 dBFS (green, low level). The analog signal level depends on the input and output settings and is displayed in Drag Net's Meter window.

② **AES3 LOCK LED** lights solidly when a valid AES3 digital signal is detected on the AES3 input jack. There does not need to be an audio signal present at the input, only the "carrier" signal.

③ **PRESET LED** displays the number of the most recently recalled Preset, numbered 0 through 24.

④ **VIP/VOP LED** flashes when a change is detected on the Versatile Input Port (VIP) or Versatile Output Port (VOP). These ports are used for direct electrical connections to potentiometers, switches or other logic ports. The Versatile Input Port accepts up to eight contact closures or voltages; the Versatile Output Port drives eight loads (logic on/off).

⑤ **RW 485 LED** flashes when a change in setting is detected on the RW 485 Remote Interface Port. RW 485 is a serial communications protocol primarily used for Rane's Smart Remotes.

⑥ **ETHERNET LED** flashes when an Ethernet data packet for this device is received.

⑦ **STATUS LED** reflects the overall status of the unit:
Red - initializing (briefly) or possible internal error.
Yellow - working, but not currently processing audio.
Green - processing audio.

⑧ **POWER LED** lights solidly when the unit is powered on.

① **POWER IEC jack** connects to AC line voltage, 100-240 VAC ±10%.

② **Balanced analog audio Inputs 1 through 8**. Euroblock connectors.

③ **Balanced analog audio Outputs 1 through 8**. Euroblock connectors.

④ **AES3 digital audio Input and Output.** XLR female (input) and male (output) connectors.

⑤ **Versatile Input Port** provides 8 logic or voltage inputs for remote level control and Preset recall. Euroblock connector.

⑥ **Versatile Output Port** provides 8 logic outputs capable of driving small relays, LEDs or other logic inputs. Euroblock connector.

⑦ **RW 485 Port** communicates with Rane's Smart Remotes. A maximum of 280 mA of current is available for powering remotes. Euroblock connector.

⑧ **LAN and LINK** reflect the state of the Ethernet connection. LINK lights solidly when a valid connection to another Ethernet device (e.g., a PC) is detected. LAN flashes when communicating with another Ethernet device.

⑨ **10Base-T jack** accepts a standard Ethernet cable. RJ-45 connector.

⑩ **DEFAULT button** recalls Preset 1 when pressed. Holding this button while applying power puts the unit into a special codeload mode for updating firmware. The letters "CL" appear on the PRESET LED display when the device is in codeload mode.

Audio Connections

As a safety precaution, turn all devices (especially power amplifiers) OFF when making connections. Doing so gives you a chance to find and correct wiring mistakes and prevent damage to your amplifiers, speakers, ears, etc.

Analog Inputs and Outputs

The RPM 88 has eight balanced analog Inputs and eight balanced analog Outputs.

For each Input or Output Euroblock connector:
• Connect the (positive) audio line to the '+' terminal.
• Connect the (negative) audio line to the '–' terminal.
• Connect the cable shield to the ground terminal.

For those installations where the RPM 88's internal shield-to-chassis connection causes interference, connect each shield directly to the chassis PEM nut located above each Euroblock connector, keeping the shield wrapped around the audio conductors as much as possible.

For optimum Electromagnetic Interference (EMI) immunity, connect the shields at both ends of the cable. See the RaneNote "Sound System Interconnection" for more information on system connections and proper grounding practices.

Analog Input Stage

Each analog input uses a two-stage gain approach. The first stage contains a software controlled analog line/mic pad and switchable-gain preamp. The second stage contains a Digital Trim control located immediately after the A/D converter.

Input Clipping

If you've set the Analog Gain so the input stage is not clipping, it is not possible to clip the A/D converter, since there is no additional gain between the initial input stage and the A/D converter. The Digital Trim control, located after the A/D converter, can be set to clip the signal to your heart's content, so adjusting this trim to provide the hottest signal to the DSPs *without* clipping is the most important step when setting up gain structure. For this reason, a dedicated meter displaying the signal level being passed to the DSPs is provided in each Analog Input block.

If the DSPs are working with a clipped signal, the audio is (as expected) distorted and none too pretty, but it is not a drastic, damaging sound. And while it's technically possible to write a DSP algorithm to emulate the glorious clipping distortion of vacuum tubes, it's not particularly useful for an installed sound system, where the DSP power could be put to better use removing that annoying 500 Hz feedback from the Pope's podium mic. Plus, they don't yet make DSP chips with gold-plated substrates for those fecund highs and that moist, supple midrange.

Analog Output Stage

Each analog output also uses a two-stage gain approach, which differs slightly from that of the analog input stage. The first stage is a Digital Trim control located immediately *before* the D/A converter. The second stage is an analog trim control located immediately *after* the D/A converter. Attenuation is handled in the analog domain, while boosting (when the incoming digital signal is low) is handled in the digital domain. Boosting and attenuating using this two-stage approach helps maintain the RPM 88's excellent noise performance.

Digital (AES3) Input and Output

AES3 is a popular 2-channel (stereo) digital audio interface commonly found on professional digital audio equipment (digital mixers, DAT machines, etc.). Each channel of the AES3 digital stream is treated independently within the RPM 88.

See the RaneNote "Interfacing AES3 and S/PDIF", available from Rane's web site (www.rane.com/library.html), for more information about interfacing consumer S/PDIF gear to the professional AES3 standard.

Use the AES3 I/O to:
• Connect multiple RPM 88s together to create a 2-channel digital "bus" between devices.
• Connect directly to the AES3 output of a digital mixing console.
• Connect directly to the AES3 input of a DAT machine for recording purposes.
• Connect to an external A/D or D/A converter, effectively adding two more analog inputs or outputs.

Incoming Sample Rate and Word Length

The AES3 input has a built-in sample rate converter capable of accepting incoming sample rates up to 96 kHz. Sample rates exceeding the RPM 88's internal 48 kHz sample rate are automatically downsampled. Word lengths up to 24-bits are accepted.

Outgoing Sample Rate and Word Length

The AES3 output uses a fixed 48 kHz sample rate and 24-bit word length.

Control Connections

Versatile Input Port (VIP)

Eight logic input pins are provided, each capable of accepting DC voltage between 0 and 5 volts. VIP pins are used with contact closure switches for Preset recall, or with potentiometers for remote Level control. The functionality (Preset recall versus control) of each pin is assignable as part of the Device Configuration.

• The maximum allowable voltage on any VIP pin is 5.3 VDC.
• Use of twisted pair cable is recommended for better noise immunity.
• If an external device is used to generate a 0 to 5 volt signal, connect the ground of the external device to the GND pin of the VIP.

Preset Recall Using Contact Closure Switches

The minimum "low" voltage required to detect a contact closure and change Presets is 2.5 V. Since the internal pull up is 100 kΩ to +5 V, it is possible to calculate the maximum allowable cable length, provided the wire resistance per foot (or meter) is known.

Example:

To be safe, let's allow a maximum of 80 kΩ worth of cable resistance. This value keeps the voltage divider formed by the 100 kΩ internal resistance and 80 kΩ cable resistance from dropping below 2.5 V.

(5 V * 100 kΩ) / (100 kΩ + 80 kΩ) = 2.777 V

If the cable resistance is 30 Ω per 1,000 feet

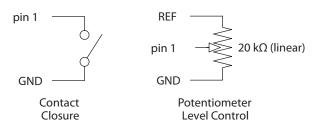(1,000 feet / 30 Ω) * 80,000 Ω = 2,666,666 feet.

Thus, you can only use 2,666,666 feet (505 miles) of twisted pair cable before the Preset recall functionality becomes intermittent (assuming the cable is properly twisted and not run through excessive magnetic or electric fields).

Remote Level Control Using Potentiometers

The VIP inherently prefers linear taper 10 kΩ potentiometers, which provide a nice audio taper "feel" for the end user. When used with suitable twisted pair wiring, the 10 kΩ value also offers acceptable noise immunity and very long cable lengths.

VIP CONNECTION
(examples for VIP pin 1)

Contact Closure   Potentiometer Level Control

Versatile Output Port (VOP)

Eight open collector logic output pins are provided, each capable of sinking 100 mA of current. The on-board REF voltage of 12 VDC provides a maximum of 200 mA of current. Use an external power supply (40 VDC maximum) if more current is required, but be sure to connect the external supply's ground to the GND pin on the VOP.
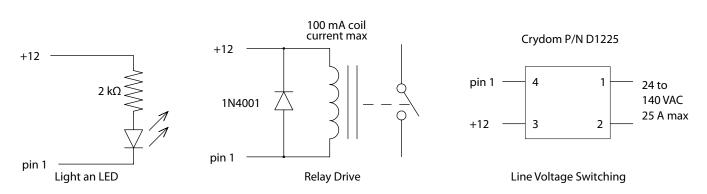
RW 485 Port

The RW 485 port uses a simple, proprietary protocol to communicate with Rane's optional Smart Remotes (SR 2, SR 3, SR 4). The details of this protocol are found in each of the SR Manuals, available from Rane's web site.

This port follows the electrical specification found in the TIA/EIA-485 standard, with one exception: the recommended termination impedance is neither implemented nor required, since RW 485 uses a relatively slow baud rate (38,400 bps). In fact, including the termination has proven to hinder the performance of the RW 485 bus.

Five connection terminals are provided: a balanced pair of data lines (A and B), a pair of power lines (±V), and a chassis ground. All terminals should be connected to the corresponding terminals of the Smart Remotes.

Up to 8 remotes, each having a unique address, can be connected to the RPM 88. Any mix of SR 2, SR 3 and SR 4 remotes is possible, as is any combination of star or daisy chain wiring configurations.

The cable length limitations and the maximum number of remotes that can be powered from the RPM 88 is limited by the

VOP CONNECTION
(examples for VOP pin 1)

Light an LED   Relay Drive   Line Voltage Switching

NOTE: +12 VDC is available on the VOP. An external supply may be used as long as any VOP pin voltage never exeeds 40 VDC. Examples shown are for 12 VDC only.

mix of remotes used, the cable type used, the distance to each remote, and the wiring configuration. Detailed wiring and cabling tables and several examples are discussed in the SR Manuals. A Microsoft Excel Cable Length Calculator is downloadable from the Rane website (go to the SR product pages).

The RW 485 port provides up to 280 mA of current, used to power connected remotes. Each SR 3 remote requires approximately 90 mA, thus up to three SR 3 remotes can be powered directly from the RPM 88.

Additional remotes may be powered using an external supply (8 to 15 VDC regulated, minimum 0.8 amperes), leaving the +V terminal of the RPM 88's RW 485 port disconnected.

The RW 485 port is intended to be used with Rane's Smart Remotes only; we do not recommend directly interfacing the RW 485 port with devices that are not compliant with the TIA/EIA-485 standard, such as the "485" ports found on AMX and Crestron devices.

AMX and Crestron Control

There are two ways to control a Drag Net device from an AMX or Crestron system. Use either Ethernet connectivity or use the rear panel Versatile Input Port (VIP). Each of the 8 VIP pins supports either switch closure Preset recall or zero-to-five volt control of Level.

The RW 485 ports found on some Drag Net devices *do not* communicate with AMX or Crestron systems. They are solely for communicating with Rane's RW 485 remotes.

Many AMX/Crestron applications require simple Level control and/or Preset recall. This is most easily accomplished using the VIP (Versatile Input Port) found on all five Drag Net devices: RPM 2, RPM 26z, RPM 22, RPM 44 & RPM 88. There are always more Drag Net products coming — both hardware and software, so check our home page for the most recent.

VIP Preset Recall

Connect a switch closure or relay to a VIP pin and short it to the ground (GND) pin to recall the corresponding Preset. For example, shorting VIP pin 1 to the GND terminal recalls Preset 1; pin 2 recalls Preset 2, etc. There are more details about this functionality in the Drag Net Help file and on our Drag Net Applications page. Be certain to appropriately set the VIP Allocation in Drag Net's Parameter Window.

If GND contention of two or more pins simultaneously occurs, the highest-numbered VIP pin takes precedence. For example, if pin 3 is shorted to GND and pin 6 is then shorted to GND, Preset 6 is recalled. If pin 3 is closed and then pin 2, nothing happens -- Preset 2 is *not* recalled. This permits a hierarchy of Presets when using VIP pin closures for tiered priority paging. Since there are only eight VIP pins, you can only recall up to eight Presets using switch closures.

There are four ways to recall more than eight presets.
1. Use the Drag Net software Recall button which is only intended for the system installer/designer.
2. Use the Rane SR 4 remote to recall any eight Presets.

3. Use a Rane SR 3 remote which can recall any 16 of the available 24 Presets.
4. Use an Ethernet command from an AMX or Crestron Ethernet-equipped product.

[When using Drag Net's Auto Mixer/Ducker block, you have the ability to link a VIP pin closure to a push-to-talk switch in a paging or boardroom application. When using the Ducker block in these applications, the VIP pins act independently provided you Group the appropriate VIP pin with the Auto Mixer/Ducker's Input in Drag Net's Remote Map. Again, see our Drag Net Applications for examples.]

VIP Level control

Connect a zero to five volt DC voltage to a VIP pin from an AMX or Crestron card to adjust any or all Level blocks placed in the Processing Map. Use Groups in Drag Net's Remote Map to link one or more Level blocks so they track each other when using a VIP pin. Be certain to appropriately set the VIP Allocation in Drag Net's Parameter Window. When using VIP pins with Level blocks, set the minimum and maximum for each Level block by double-clicking it while it's in a Remote Map Group. This keeps the max and min burdens within the Drag Net device — but only when using the VIP pin to control Levels, not when adjusting Levels from Ethernet commands.

You can use up to eight voltage control inputs linked to Level(s) using the rear panel VIP pins. Combinations of Preset switches & voltage Level "pots" are possible as long as combined, they do not exceed the eight pins provided.

Since you can Group any or all Level blocks in Drag Net's Remote Map, it's much easier to implement a stereo level control since the Drag Net device is burdened with the task of tracking many Levels. You can use this to your advantage when using VIP pins to adjust multiple zones or levels. Since you can place the Level block anywhere within the Drag Net Processing Map, you can Group Level blocks at the input, at the output or anywhere in-between — just place the Level block where you want it.

Ethernet control

To download the AMX or Crestron control code and documentation, visit these web pages:
For AMX NetLinx code:
www.rane.com/dnamx.html
For Crestron code:
www.rane.com/dncrestron.html

Ethernet Port

The Ethernet port is used to configure, monitor, and control the RPM 88 via standard 10Base-T Ethernet communication. Use an Ethernet crossover cable (one is included with each unit) to connect the RPM 88 directly to a computer. Use a standard (non-crossover) Ethernet cable if the RPM 88 and computer are connected indirectly using an Ethernet repeater hub or switch.

All devices connected to the Ethernet port, including repeater hubs, switches, and the computer's Network Interface Card (NIC) must support 10Base-T communication.