

IMPORTANT SAFETY INSTRUCTIONS



1. Read these instructions.
 2. Keep these instructions.
 3. Heed all warnings.
 4. Follow all instructions.
 5. Do not use this apparatus near water.
 6. Clean only with a dry cloth.
 7. Do not block any ventilation openings. Install in accordance with manufacturer's instructions.
 8. Do not install near any heat sources such as radiators, registers, stoves, or other apparatus (including amplifiers) that produce heat.
 9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
 10. Protect the power cord and plug from being walked on or pinched particularly at plugs, convenience receptacles, and the point where it exits from the apparatus.
 11. Only use attachments and accessories specified by Rane.
 12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
 13. Unplug this apparatus during lightning storms or when unused for long periods of time.
 14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
 15. The plug on the power cord is the AC mains disconnect device and must remain readily operable. To completely disconnect this apparatus from the AC mains, disconnect the power supply cord plug from the AC receptacle.
 16. This apparatus shall be connected to a mains socket outlet with a protective earthing connection.
 17. When permanently connected, an all-pole mains switch with a contact separation of at least 3 mm in each pole shall be incorporated in the electrical installation of the building.
 18. If rackmounting, provide adequate ventilation. Equipment may be located above or below this apparatus, but some equipment (like large power amplifiers) may cause an unacceptable amount of hum or may generate too much heat and degrade the performance of this apparatus.
 19. This apparatus may be installed in an industry standard equipment rack. Use screws through all mounting holes to provide the best support.
- WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

WARNING



To reduce the risk of electrical shock, do not open the unit. No user serviceable parts inside. Refer servicing to qualified service personnel.

The symbols shown below are internationally accepted symbols that warn of potential hazards with electrical products.



This symbol indicates that a dangerous voltage constituting a risk of electric shock is present within this unit.



This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.

WARNING: This product may contain chemicals known to the State of California to cause cancer, or birth defects or other reproductive harm.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

CAUTION: Changes or modifications not expressly approved by Rane Corporation could void the user's authority to operate the equipment. CAN ICES-3 (B)/NMB-3(B)

Shielded CAT5e or better cables are required in order to comply with the FCC Rules part 15 limits for a Class B digital device.

INSTRUCTIONS DE SÉCURITÉ



1. Lisez ces instructions.
2. Gardez précieusement ces instructions.
3. Respectez les avertissements.
4. Suivez toutes les instructions.
5. Ne pas utiliser près d'une source d'eau.
6. Ne nettoyer qu'avec un chiffon doux.
7. N'obstruer aucune évacuation d'air. Effectuez l'installation en suivant les instructions du fabricant.
8. Ne pas disposer près d'une source de chaleur, c-à-d tout appareil produisant de la chaleur sans exception.
9. Ne pas modifier le cordon d'alimentation. Un cordon polarisé possède 2 lames, l'une plus large que l'autre. Un cordon avec tresse de masse possède 2 lames plus une 3^e pour la terre. La lame large ou la tresse de masse assurent votre sécurité. Si le cordon fourni ne correspond pas à votre prise, contactez votre électricien.
10. Faites en sorte que le cordon ne soit pas piétiné, ni au niveau du fil, ni au niveau de ses broches, ni au niveau des connecteurs de vos appareils.
11. N'utilisez que des accessoires recommandés par Rane.
12. N'utilisez que les éléments de transport, stands, pieds ou tables spécifiés par le fabricant ou vendu avec l'appareil. Quand vous utilisez une valise de transport, prenez soin de vous déplacer avec cet équipement avec prudence afin d'éviter tout risque de blessure.
13. Débranchez cet appareil pendant un orage ou si vous ne l'utilisez pas pendant un certain temps.
14. Adressez-vous à du personnel qualifié pour tout service après vente. Celui-ci est nécessaire dans n'importe quel cas où l'appareil est abîmé : si le cordon ou les fiches sont endommagés, si du liquide a été renversé ou si des objets sont tombés sur l'appareil, si celui-ci a été exposé à la pluie ou l'humidité, s'il ne fonctionne pas correctement ou est tombé.
15. La fiche du cordon d'alimentation sert à brancher le courant alternatif AC et doit absolument rester accessible. Pour déconnecter totalement l'appareil du secteur, débranchez le câble d'alimentation de la prise secteur.
16. Cet appareil doit être branché à une prise terre avec protection.
17. Quand il est branché de manière permanente, un disjoncteur tripolaire normalisé doit être incorporé dans l'installation électrique de l'immeuble.
18. En cas de montage en rack, laissez un espace suffisant pour la ventilation. Vous pouvez disposer d'autres appareils au-dessus ou en-dessous de celui-ci, mais certains (tels que de gros amplificateurs) peuvent provoquer un buzz ou générer trop de chaleur au risque d'endommager votre appareil et dégrader ses performances.
19. Cet appareil peut-être installé dans une baie standard ou un châssis normalisé pour un montage en rack. Visser chaque trou de chaque oreille de rack pour une meilleure fixation et sécurité.

ATTENTION: afin d'éviter tout risque de feu ou de choc électrique, gardez cet appareil éloigné de toute source d'humidité et d'éclaboussures qu'elles qu'elles soient. L'appareil doit également être éloigné de tout objet possédant du liquide (boisson en bouteilles, vases,...).

ATTENTION



Afin d'éviter tout risque de choc électrique, ne pas ouvrir l'appareil. Aucune pièce ne peut être changée par l'utilisateur. Contactez un SAV qualifié pour toute intervention.

Les symboles ci-dessous sont reconnus internationalement comme prévenant tout risque électrique.



Ce symbole indique que cette unité utilise un voltage élevé constituant un risque de choc électrique.



Ce symbole indique la présence d'instructions d'utilisation et de maintenance importantes dans le document fourni.

REMARQUE: Cet équipement a été testé et approuvé conforme aux limites pour un appareil numérique de classe B, conformément au chapitre 15 des règles de la FCC. Ces limites sont établis pour fournir une protection raisonnable contre tout risque d'interférences et peuvent provoquer une énergie de radiofréquence s'il n'est pas installé et utilisé conformément aux instructions, peut également provoquer des interférences aux niveaux des équipements de communication. Cependant, il n'existe aucune garantie que de telles interférences ne se produiront pas dans une installation particulière. Si cet équipement provoque des interférences en réception radio ou télévision, ceci peut être détecté en mettant l'équipement sous/hors tension, l'utilisateur est encouragé à essayer de corriger cette interférence par une ou plusieurs des mesures suivantes:

- Réorienter ou déplacer l'antenne de réception.
- Augmenter la distance entre l'équipement et le récepteur.
- Connecter l'équipement à une sortie sur un circuit différent de celui sur lequel le récepteur est branché.
- Consulter un revendeur ou un technicien radio / TV expérimenté.

ATTENTION: Les changements ou modifications non expressément approuvés par Rane Corporation peuvent annuler l'autorité de l'utilisateur à manipuler cet équipement et rendre ainsi nulles toutes les conditions de garantie.

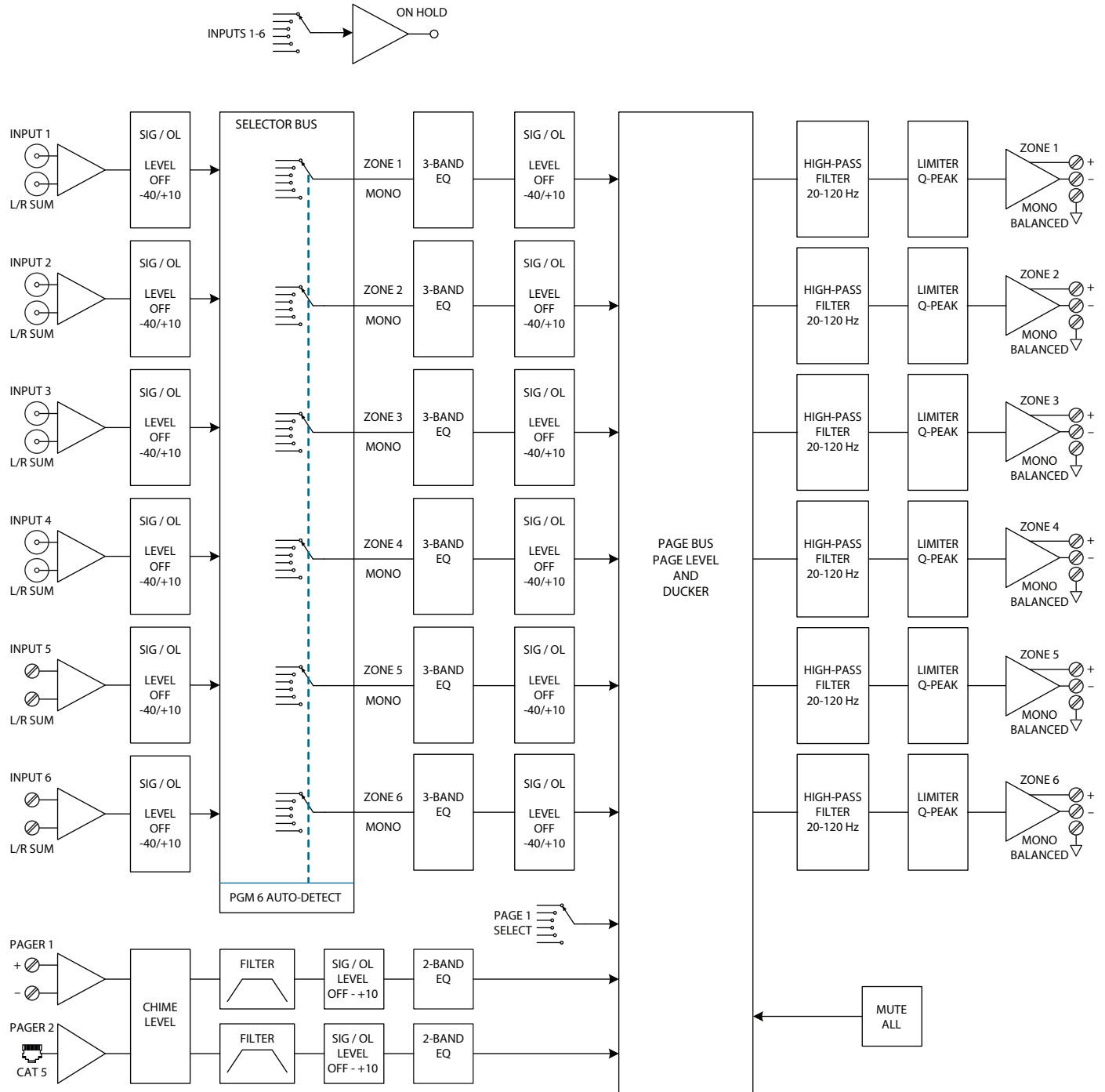
CAN ICES-3 (B)/NMB-3(B)

Un câble blindé de CAT5 ou de qualité équivalente voir meilleure sont nécessaires afin de se conformer à la réglementation de la FCC chapitre 15 sur les limites concernant les appareils numériques de classe B.



Cartons et papier à recycler.

CP66 Block Diagram





General Description

The Rane CP66 is a multiple-input Commercial Zone Processor with paging support. Designed for versatility, it is perfect for use in restaurants, bars, offices, retail stores, stadiums, and other types of multi-zone environments.

With six Program inputs, six linkable Zone outputs, Page input, and support for the Rane PAGER2, DR1, and DR3 Digital Remotes, a multitude of system configurations are possible.

The CP66 can be configured entirely using its intuitive front panel controls, and easily set up by a technician in any location without a computer. Included Windows® software (connected through USB) provides the additional ability to save and load preconfigured settings for easy deployment, and also allows custom Zone and Group naming.

Any of the six Program inputs can be assigned to each Zone. Program Input 6 can act optionally as a gated Priority Input for use with a jukebox or notification system.

Each Zone features independent settings for:

- Level
- Source Select
- Ducker Depth
- Limiter Threshold
- 3-Band EQ
- Page Level
- High-Pass Filter
- Priority Input Enable

Page inputs are priority controlled, so a high priority input will always override the other. If Page priorities are equal, then both can be used simultaneously.

Page 1 supports an analog line or mic level input with selectable 24 V phantom power, and is assigned to Zones via a rear panel dipswitch.

Page 2 supports the optional Rane PAGER2 paging station, allowing dynamic Zone selection right at the microphone, and can store preset groups for even easier page selection. The PAGER2 connects via a single shielded CAT 5e (or better) cable.

Zones may be linked into groups via rear panel switches. When linked, the Level and Source as well as any connected Remote controls are set to the same value for each Zone in the group. This allows simple but powerful linking scenarios without the need for complicated software.

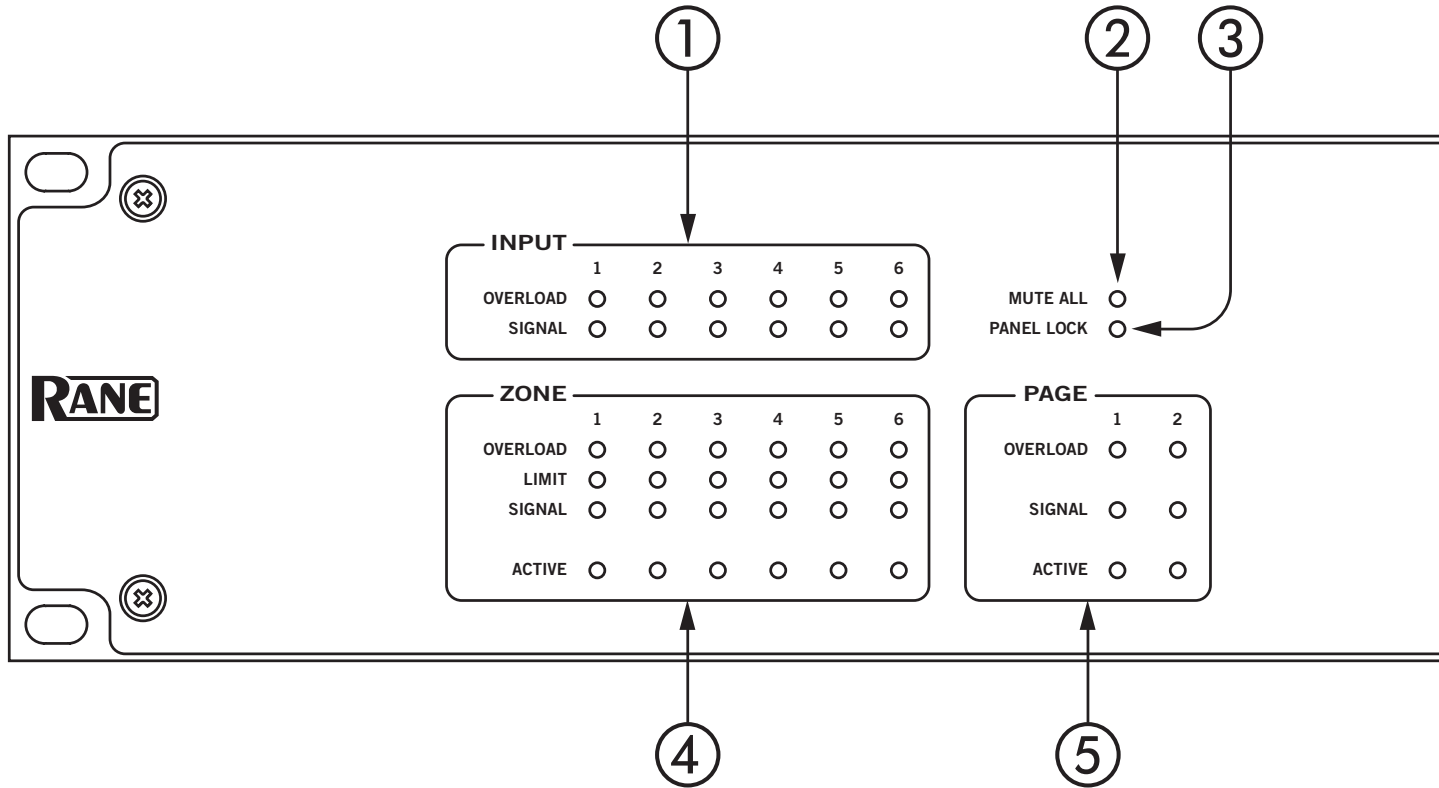
The Rane Digital Remote DR1 adds remote control of Zone (or linked group) Output Level, optionally limited by configurable max and min values. The DR3 adds Input Source selection along with Level, and can be a Master Level control displaying and controlling all six Zone levels from a single location. Custom Digital Remote display names can be set in the PC software.

Independent *Accelerated-Slope*™ 3-band tone controls for each zone allow easy intuitive adjustment. The tone controls use 12 dB per octave Linkwitz-Riley filters with a range of ±6 dB.

A dedicated transformer-isolated output delivers any Program input source to music-on-hold in a telephone system.

System security can be enabled from a local or remote switch. Options include full CP66 front panel lockout, allowing only front panel zone control, and remote muting.

The Rane CP66 includes an internal 100-240 VAC power supply and is CSA approved.

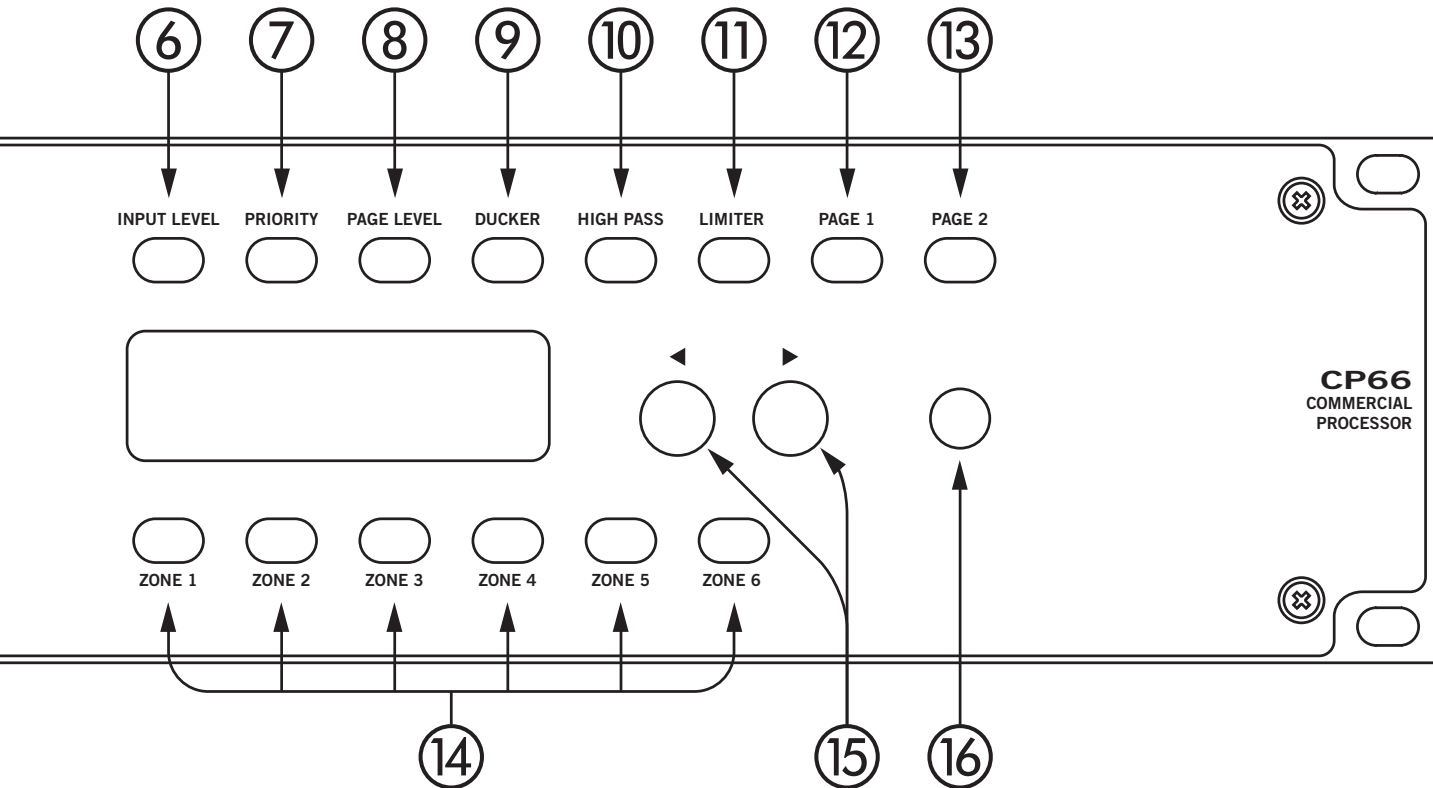


Front Panel

- ① **SIGNAL** ● indicates the presence of an audio signal on this Input.
OVERLOAD ● indicates that the signal strength is too high for the Input.
- ② ● Indicates the **MUTE ALL** connection is engaged. See **Panel Lock** ⑩ in the **Rear Panel** section.
- ③ ● Indicates the **PANEL LOCK** is engaged in either mode. See **Panel Lock** ⑩ in the **Rear Panel** section.
- ④ **ZONE OVERLOAD** ● indicates that the signal strength exceeds the output limit for the Zone.
ZONE SIGNAL ● indicates that audio is present on the Zone.
ZONE LIMITER ● indicates that the Limiter is engaged (output level is at or above Limit Threshold) for the Zone.
ZONE ACTIVE ● indicates that a Page is active in the Zone.
- ⑤ **PAGE OVERLOAD** ● indicates that the signal strength exceeds the input limit for the Page. Turn down the Page Level for Page 1 (see **Rear Panel** ⑪) or turn on the Pad for Page 2 to decrease Input Level (see ⑬).
PAGE SIGNAL ● indicates that page audio is detected (not necessarily during an active Page).
PAGE ACTIVE ● indicates that Page is currently active.

Settings Panes

- ⑥ - ⑭ Each group of settings has a dedicated button to take you straight to the parameters you're interested in — no menus to dig through or weird hidden settings. To change a setting, use the ◀ left or right ▶ cursor arrows ⑮ to choose a parameter and turn the knob on the right ⑯ to increment or decrement its value.
- ⑥ Displays the settings pane for Program **INPUT LEVEL**.
- ⑦ Displays the settings pane for Program Input 6 **PRIORITY** Enable for each zone.
- ⑧ Displays the settings pane to set the **PAGE LEVEL** for each Zone.
- ⑨ Displays the settings pane to adjust the **DUCKER** Depth per Zone. During a Page, this is the amount that the background music volume is reduced by.
- ⑩ Displays the settings pane for the **HIGH PASS** Filter, typically used in constant-voltage (70V or 100V) systems.
- ⑪ Displays the Zone Output **LIMITER** Threshold for each Zone. This is the maximum level that the output level is allowed to reach before it is compressed by the Limiter in the DSP.



⑫ Displays the settings pane for **PAGE 1**:

Priority: When set to “1” while Page 2 is set to “2,” overrides the other page (if assigned to any of the same Zones). If set to “2” while Page 2 is set to “1,” Page 1 can still be overridden. If both Page priorities are set to the same value, the Pages are mixed.

EQ: 2-band tone controls, ± 6 dB for Low and High shelf.

Threshold Enable: Sets the analog Page 1 input to operate in either normal mode (“Off”) where triggered only by closure of the Page 1 Enable switch, or in threshold mode (“On”) where it is triggered by input detection.

Chime: If enabled, inserts a 2-second pre-announce tone before each page. This is required in some emergency and public address environments. Cannot be used while Threshold mode is enabled.

⑬ Displays the settings pane for **PAGE 2**:

Priority When set to “1” while Page 1 is set to “2,” overrides the other page (if assigned to any of the same Zones). If set to “2” while Page 1 is set to “1,” Page 2 can still be overridden. If both Page priorities are set to the same value, the Pages are mixed.

Phantom Power Enable: Turns on or off +24V phantom power.

Pad Enable: Turns on or off a hardware-level 13 dB pad (attenuator) in the PAGER2 itself. Use it to bring down a hot mic signal that is clipping.

Trim: DSP Level trim, used to adjust the relative level of the Page 2 input. Set to 0 dB, or adjust to match Page 1 level if both Page Inputs are used.

EQ: 2-band tone controls, ± 6 dB for Low and High shelf.

Chime: If enabled, inserts a 2-second tone before each Page. This is required in some emergency and public address environments.

⑭ Displays the settings pane for each of the six Zones:

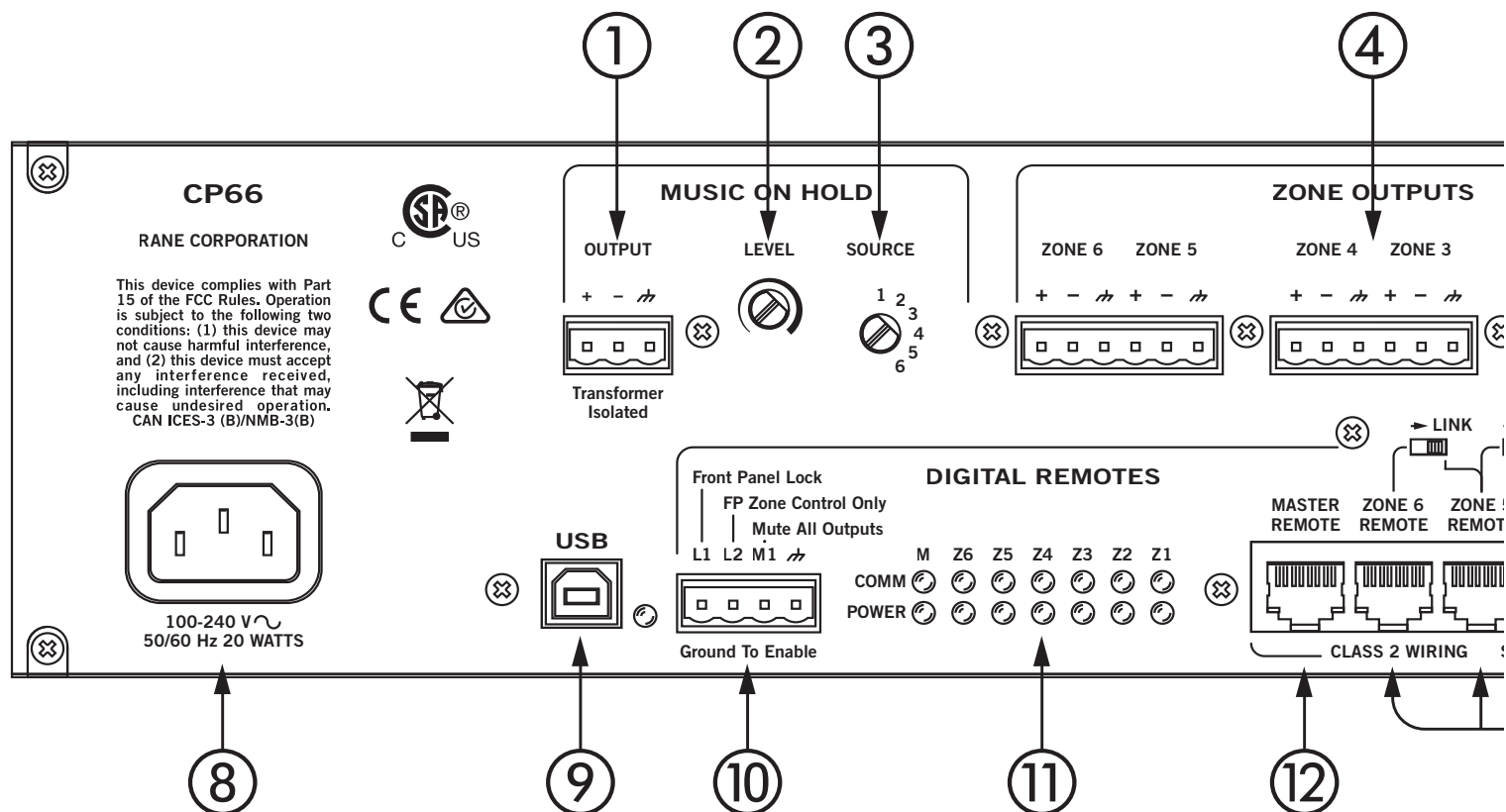
Source: The Program Input that is assigned to this Zone.

Level: The output level for the zone, relative to the max output level (+20 dBu) at 0 dB.

EQ: 3-band tone controls, ± 6 dB settings for each of Low, Mid, and High.

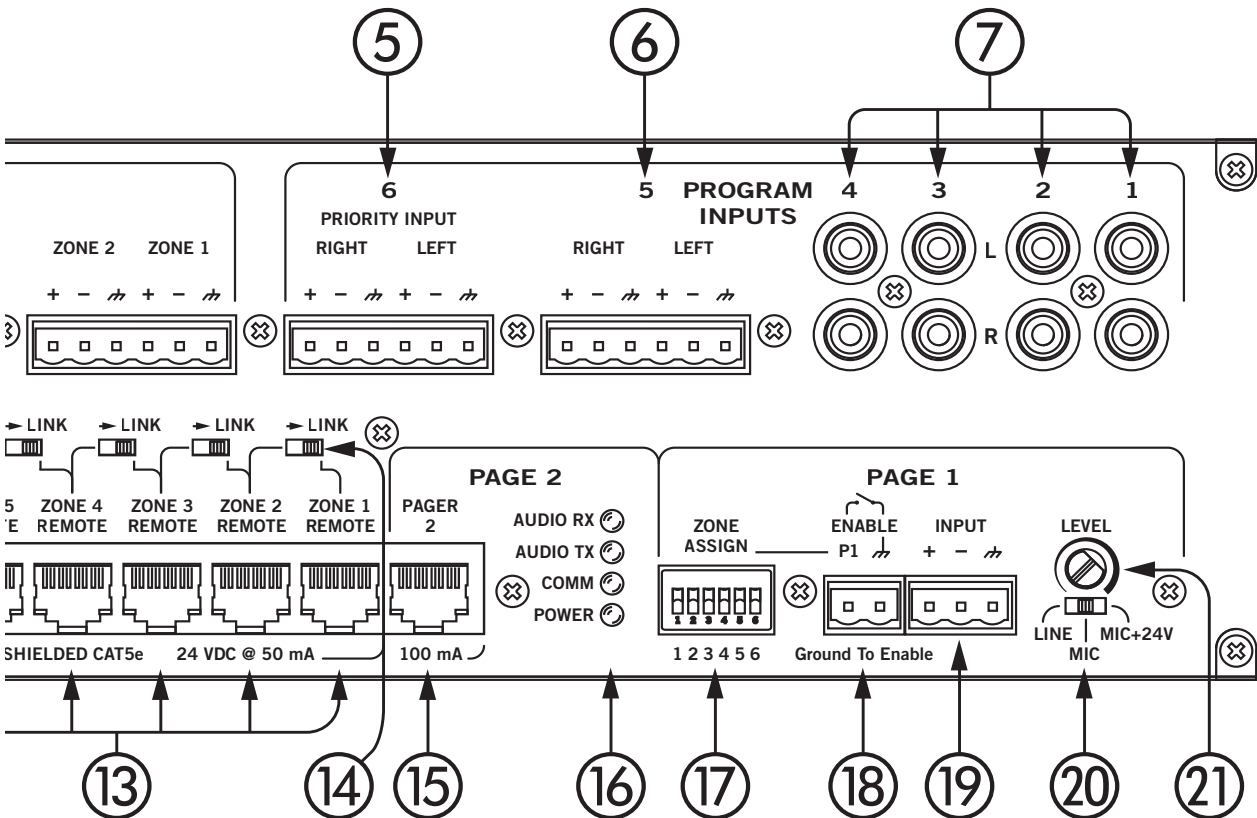
⑮ Cursor buttons: Press ◀ left or right ▶ cursor to select the value for editing with the data knob.

⑯ This knob is used to change the currently selected value. Turn clockwise to increase, counterclockwise to decrease.



Rear Panel

- ① **MUSIC ON HOLD OUTPUT:** is balanced and transformer isolated, with a max output of +20 dBu. This can be connected directly to a telephone system. This works as an additional 7th zone without DSP, and mirrors one of the six Program Inputs.
- ② **MUSIC ON HOLD LEVEL:** sets the output level from Off to +20 dBu. Adjust using a screwdriver.
- ③ **MUSIC ON HOLD SOURCE:** selects which of the six Program Inputs is routed to the Music on Hold Output. Select using a screwdriver.
- ④ **ZONE OUTPUTS:** are balanced connections with a maximum output of +20 dBu.
- ⑤ **PROGRAM 6 PRIORITY INPUT:** is balanced and mono-summed, and can be optionally used as a Priority Input to override into enabled Zones (see Front Panel ⑦). This also behaves as a normal input, with a maximum level of +20 dBu.
- ⑥ **PROGRAM 5 INPUT:** is balanced mono-summed on a Euroblock with a max level of +20 dBu.
- ⑦ **PROGRAM 1-4 INPUTS:** are RCA unbalanced and mono-summed. The max level is 14.3 dBu (12 dBV).
- ⑧ **IEC Power:** connects to AC line voltage, 100-240V, 50-60 Hz.
- ⑨ **USB:** connects to a Windows® PC for software communication and firmware updates. See "Rane CP66 Software" on page 14.
- ⑩ **FRONT PANEL LOCK:**
Connect **L1** to ground to lock out all front panel settings as view-only.
Connect **L2** to ground to lock all front panel settings with the exception of Zone source selection and volume control.
Connect **M1** to ground to mute all the Zone Outputs. For use with emergency systems.
- ⑪ **DIGITAL REMOTE Status Indicators:**
COMM LED indicates that a Digital Remote is connected and communicating successfully.
POWER LED indicates the CP66 power is functioning.
- ⑫ **MASTER REMOTE:** Connect a DR3 to this port to control all Zone Output Levels on one remote. Use a RJ-45 shielded CAT 5e cable (or better) up to 1000 feet (304 meters).



13 REMOTE ZONE Ports 1 to 6: Connect a DR1 to any of these ports to control the Zone Output Level for that Zone (as well as any linked Zones, see **Linking** on page 6). Connect a DR3 to control both Zone Output Level and Zone Source Selection. Use RJ-45 shielded CAT 5e (or better) cable up to 1000 feet (304 meters).

14 REMOTE ZONE LINK switches: Each switch links a pair of adjacent Zones as well as any Remotes connected to those Zones. These links may be cascaded to link more than two Zones together into a group. While linked, all Zones and Remotes in that group share the same values for Volume, Max, Min, and Input Source. The switch is engaged when in the "Right" position (toward the **LINK** label). See "Zone and Remote Linking" on page 12.

15 PAGER2: Connect a PAGER2 to this port for a full-featured digital paging station with selectable zones. Use a RJ-45 shielded CAT 5e cable (or better) up to 500 feet (152 meters). See "PAGER2" on page 13.

16 PAGE 2 Status Indicators: reveal the health of the CAT 5 connection between the CP66 and the PAGER2. If the twisted pair is functioning, the LED displays a solid green light.

- **AUDIO RX** – lights steadily if the CP66 receive pair is working properly.
- **AUDIO TX** – lights steadily if the CP66 transmit pair is working properly.
- **COMM** – lights steadily if the PAGER2 data communications pair is working properly.
- **POWER** – lights steadily if the CP66 is supplying adequate power to the PAGER2 port.

17 PAGE 1 ZONE ASSIGN: selects which Zones are paged into when Page 1 Enable **18** is engaged. A switch in the "up" position means that Zone is enabled.

18 PAGE 1 ENABLE: connects to a push-to-talk switch on the Page 1 Input microphone. Active when grounded.

19 PAGE 1 INPUT: is balanced line or mic level with selectable Phantom Power **20**. Maximum input depends on the Page 1 Level **21**, but supports a wide range of inputs.

20 Page 1 Gain Selector: choose depending on Input type – Line, Mic, or Mic with +24V Phantom Power.

21 PAGE 1 LEVEL: adjusts the gain of Page 1 Input **19**.

Hardware Connections

Program Inputs

Connect each Input's audio source to one of the RCA inputs for Program 1-4, or the balanced Euro inputs for Programs 5 & 6. If you have a high priority input, such as a jukebox or notification system, connect this to Program 6. It is a good idea to make a note of which input is connected to each Program for creating labels in the CP66 Software.

Page Inputs

If your system uses an analog Paging input, connect the microphone or line-level source to the balanced **PAGE 1 INPUT**. Select the appropriate switch setting for **LINE**, **MIC**, or **MIC +24V** with Phantom Power. Connect a push-to-talk switch, if available, to the **PAGE 1 EN** input. This switch is active low and will engage while the switch is closed and continue paging until released.

The DIP switch on the rear panel labeled **ZONE ASSIGN** selects which Zones are paged when **PAGE 1 ENGAGE** is active.

If your system uses the PAGER2 paging station, simply plug the CAT 5 cable into the port marked **PAGER2**. All status indicators for PAGER2 light green when powered. If one or more is not lit or is intermittent, check the cabling.

Zone Outputs

Each of the Six Zone Outputs drives a balanced Euro connector up to +20 dBu. Connect these to the amplifiers for each associated Zone. It is a good idea to note which Zone is which, for source selection and naming later.

Remotes and Linking

All Remote devices with the CP66 use shielded CAT 5e cable (or better) with RJ-45 connectors at both ends. Refer to the descriptions on pages 5 and 8. If you are linking remotes, see "Zone and Remote Linking" on page 12.

Shielding and Grounding

If you hear a hum or buzz in your system from an input or zone output, you may have a shielding or grounding problem. Unbalanced connections as found in RCA terminals should be no longer than 10 feet (3 meters). Consult the "Sound System Interconnection" RaneNote for help at <http://rane.com/note110.html>.

Setup Procedure

Set the system in the following order to ensure an optimal setup for dynamic range and noise characteristics.

***Note:** To restore the unit to its factory settings, hold both the ◀ left and right ▶ cursor buttons while powering the unit.*

- Connect the **ZONE OUTPUTS** to amplifiers.
 - Connect all **PROGRAM INPUTS**.
 - Connect the analog **PAGE 1 INPUT**.
 - Connect a PAGER2 (if used) to the **PAGER2** port.
 - Connect all DR1s or DR3s (if used) to **REMOTE ZONE 1-6** ports.
 - Connect a DR3 Master Remote (if used) to the **MASTER REMOTE** port.
1. Connect the power cord and verify the CP66 powers on.
 2. With program sources active, adjust the output volume on each connected source until it is at the loudest possible without triggering the "Overload" indicator on the CP66 front panel. (For an MP3 player this will be full volume rock 'n roll, for a TV it will be during commercials with the volume up). Make adjustments with the **INPUT LEVEL** (Front Panel ⑥).
 3. Set the **Zone Output Level** for Zone 1 (or the zone you are currently listening to) to minimum (Front Panel ⑭).
 4. Set the **Source** for this Zone to Program 1.
 5. Slowly turn up the **Zone Output Level** for this Zone until it is at a reasonable volume.
 6. Set the **Source** for this Zone to Program 2.
 7. Adjust the **Input Level** for Program 2 so it is as close as possible to Program 1. The goal is to have no change in volume when switching between different sources.
 8. Select each of the remaining sources individually and set their **Input Levels** to match all other **Input Levels** as closely as possible. If one isn't loud enough to match, turn down the others accordingly.
 9. Now that your Inputs are leveled, set the **Zone Output Level** and **Zone EQ** settings for each of the six Zones. Set **Zone Output Level** as close to 0 dB as your amplifier allows.

10. Set the **Limiter Threshold** (Front Panel ⑪) for each Zone so it is just barely reducing the output level when at its maximum. Use the front panel Limit Threshold indicator (Front Panel ④) so you know where the threshold is. This ensures that the level in a Zone will never be louder than the maximum level you just set. If you want a particular Zone to have a lower maximum loudness, lower the **Limiter Threshold** accordingly. But overdoing – too much limiting – can overheat loudspeakers.
11. If you are using a Priority Input such as a jukebox, set the **Priority Enable** (Front Panel ⑦) value to “On” for each Zone where you would like the Program 6 Input to override when a signal is detected.
12. If you are connected to a system that uses constant-voltage (70V or 100V) overhead loudspeakers, set the **High Pass Filter Cutoff** (Front Panel ⑩) to minimize transformer saturation (typically 80 Hz). Otherwise leave this set to “Off” for full-range audio.

Page 1 Configuration

13. To use the analog **PAGE 1 INPUT**, connect the microphone to its green balanced Euroblock (Rear Panel ⑲).
14. Set the mode switch to **LINE**, **MIC**, or **MIC +24** Phantom Power depending on your input type (Rear Panel ⑳).
15. Connect the push-to-talk (PTT) switch of your microphone to the **PAGE 1 ENABLE** connector (Rear Panel ⑱). If you are using a telephone system or other type of Paging input without a PTT switch, leave the **PAGE 1 ENABLE** input disconnected, and set the **Page 1 Thresh** value to “On” (Front Panel ⑫). This threshold can be adjusted in the CP66 Software.
16. Using a screwdriver, adjust the **PAGE 1 LEVEL** while talking loudly into the microphone until it is close to, but not at, the maximum level by checking the Page 1 “Overload” indicator on the front panel.
17. Enable the desired Paging Zones by setting the **PAGE 1 ZONE ASSIGN** switch (Rear Panel ⑰). A switch in the “up” position means that Zone will be paged.
18. While paging, adjust the **Page Level** (Front Panel ⑧) for each Zone so it is at a comfortable level relative to the background music.
19. Set the **Page 1 EQ** if desired (Front Panel ⑫).
20. Set the **Ducker Depth** for each Zone to the amount you want the background music reduced by during a page. (The default is -12 dB).

Page 2 Configuration

21. If you are using the PAGER2 paging station, make sure it is connected properly and all four status indicators on the rear are lit green (Rear Panel ⑯).
22. Deselect all Zones on the PAGER2 by pressing its **ALL** button twice.
23. On the CP66, set the **Page 2 Trim** to 0 dB (Front Panel ⑬).
24. Set the **Page 2 Phantom Power** to “On” if your microphone requires it (most gooseneck mics require phantom power) (Front Panel ⑬).
25. While holding the Talk button on the PAGER2, talk loudly into the microphone and check that the overload indicator is not triggered (Front Panel ⑤).
26. If the Input is overloading, set the **Page 2 Pad** to “On” and check the indicator status again (Front Panel ⑬).
27. If both Page Inputs are used, adjust the **Page 2 Trim** so that the volume while paging is the same as Page 1 (Front Panel ⑬).
28. If both Page Inputs are used, set the **Page 1** and **Page 2 Priority** to the value for your desired behavior. A value of “1” is the higher priority, “2” is the lower priority. If one is set higher than the other, it cannot be interrupted. If both are of equal priority, either may page at any time and the pages will mix. This is great for practicing karaoke in the office before shipping the rack to the job site.
29. If the PAGER2 is the only Paging input (Page 1 not used), adjust the **Page Level** in each Zone so it is at a comfortable level relative to the background music (Front Panel ⑧).
30. If you have not already done so, set the **Ducker Depth** for each Zone to the amount you want the background music reduced by during a page. (the default is -12 dB) (Front Panel ⑨).

Zone and Remote Linking

The linking system of the CP66 is intended to be a simple solution for a number of problems that can come up when trying to connect multiple rooms or remote controls together. Have a large room and want to put a volume control on two opposite walls? Just link the two Zones together (see Rear Panel ⑭) and plug a DR1 into each Zone port. Now any change on either remote adjusts the volume level for the entire room and updates both remotes simultaneously.

What if you have three separate rooms with different EQ requirements, such as Indoor and Outdoor dining areas, but want to control the source selection with a single DR3? Link Zones 1 & 2 together along with Zones 2 & 3, and all three Zones will track each other while maintaining separate EQ settings.

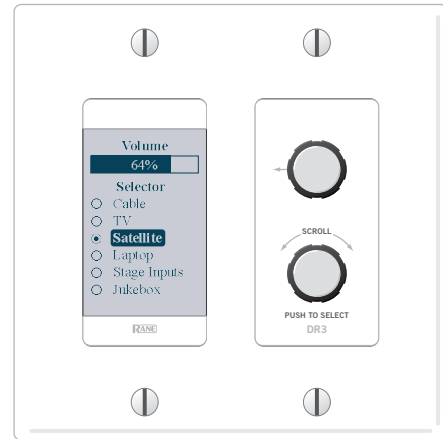
Each group of linked Zones has the same settings for Input Source and Output Level. By combining Zones together in this way, we avoid complicated setup configurations while providing many possibilities for traditional as well as non-traditional setups.

Digital Remotes



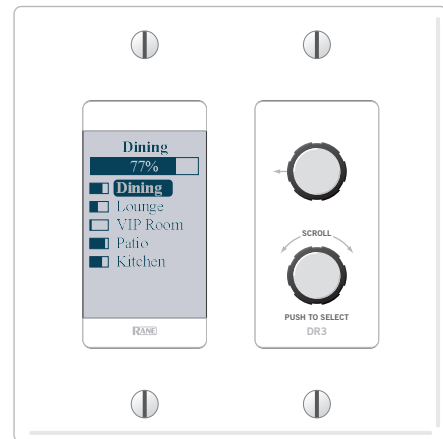
DR1 Volume Remotes

Digital remotes are a very powerful addition to any system. Install a DR1 into a party room or dining area up to 1,000 feet (304 meters) away from the CP66, and your customers can set their own volume level.



DR3 Remote for Selection and Volume

Install a DR3 into a multipurpose room and choose the music source for the room right at the remote itself (plug it into Remote Zone Port 1-6).



DR3 as a Master Remote

A DR3 Master Remote can be placed behind a bar or in the manager's office to allow quick and easy access to all volume controls for every Zone (plug it into the Master Remote Port).

You can name all of the Zones and Audio Sources with custom names using the Rane CP66 software and the name shows up right on the screen of the remote.

Digital remotes fit in a standard U.S. electrical box with a minimum depth of 2.25" (57 mm), and are available in Black, White, and Ivory colors. A single RJ-45 terminated CAT 5e (or better) cable provides both data and power connections to each remote.

PAGER2



PAGER2 Paging Station

The PAGER2 paging station is an advanced digital pager that allows the user to easily select any combination of Zones for paging right at the device itself. Indicators on the PAGER2 tell the user if the Zone is **READY** or **BUSY** (already being paged by a higher-priority Input) and when the **CHIME** has completed (if enabled).

Two group buttons are provided to give quick access to commonly-used zone combinations, for example “All Outdoor Zones” or “Dining Areas.” To store a group, select your active Zones, hold the **GROUP 1** or **GROUP 2** button until the LED flashes, then release.

The Lexan overlay on the PAGER2 has slots on either side to allow insertion of printed labels, letting you set custom names for your Zones and Groups. To easily make labels with any printer, download the CP66 Labels PDF at rane.com/cp66.html.

A tool is included in the shipping box to remove the locking mechanism from the Neutrik jack so that the microphone may not be removed or stolen. The bottom panel of the PAGER2 can also be removed to allow the entire paging station to be securely fastened to a desk or table or held down via keyholes.

The PAGER2 uses a RJ-45 terminated connection for power, data, and audio over a single shielded CAT 5e cable up to 500 feet (152 meters). It accepts any standard microphone, and has built-in +24V phantom power as well as a selectable 13 dB pad for high-output microphones. The rear panel has indicators to troubleshoot any CAT 5 cable failure.



Rane CP66 Software

Note: As with many software products, new features may have been added since the initial release. Check rane.com/cp66.html to get the latest CP66 Software version. To install the software, run RaneCP66Installer.exe, available on our website or the CD that came with your unit, and follow the instructions. Rane CP66 Software is supported on Windows® XP, Vista, 7 and 8, and requires a USB connection.

The Rane CP66 software allows you to view and configure all the same settings that are available on the front panel from a single interface, as well as a few additional features that are not otherwise accessible. This includes custom Input and Zone naming, setting of Max / Min Zone Levels, Page 1 Threshold adjustment, and Program 6 Priority Threshold / Hold Time settings.

You may set up a configuration in real-time when connected to a unit, as well as in Offline mode. In both instances your configuration can be saved to a file to be recalled and edited later, or loaded directly onto one or more units for a remote or batch installation.

USB Connection



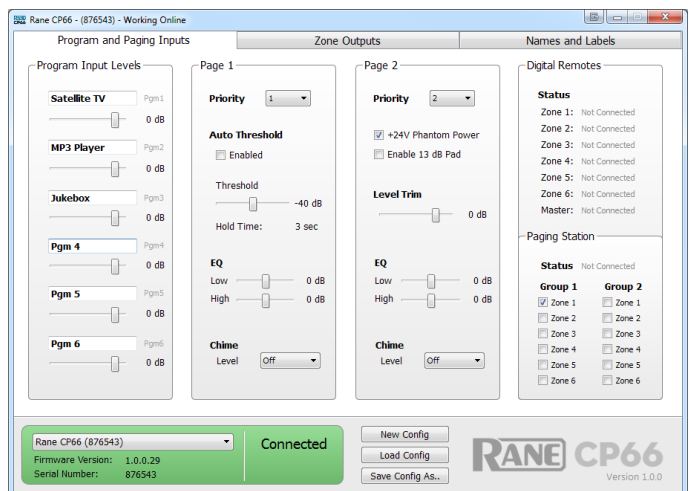
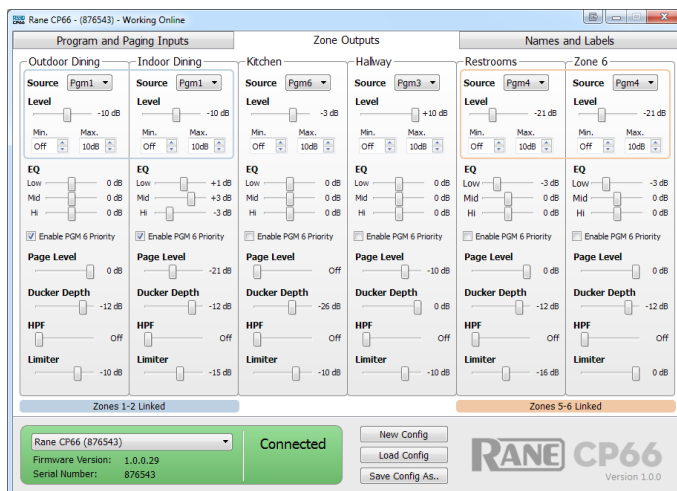
When the software detects a CP66 connected via USB to your computer, it will automatically establish a connection and show you the current configuration of the device. When connected to a live unit, the connection box turns green and displays the name and serial number of the device. Any changes you make to settings while connected are updated in real-time to the device itself. This means changes to the front panel display are updated in software automatically and vice versa; software changes to settings are immediately reflected on the front panel display.

If no unit is connected, the software is in “Offline” mode and the connection box remains white. While in Offline mode, use the software as a scratch pad to set up a configuration before loading it to the hardware. To work in Offline mode while a CP66 is plugged in, click the drop-down box that shows the current unit and select “Offline.”

To save either an online or offline configuration to a file, press the “Save Config As..” button and choose the location and filename for your config file.

Loading a configuration by pressing the “Load Config” button in connected mode will load the settings from a saved file **immediately** to the connected unit. To modify a config file without updating a unit, switch to Offline mode and press the “Open Config” button.

Pressing the “New Config” button gives you the option to either restore your unit to factory settings or start a new configuration in Offline mode.



Advanced Features

Zone and Input Naming

The Digital Remotes can display up to 15 characters and accept any standard ASCII characters for the Zone or Program Input names. In the “Names and Labels” tab, you can specify the individual Zone names or name linked groups of Zones. Remember, any changes made while connected to a live unit are reflected immediately on all remotes. Program names are set in the “Program and Paging Inputs” tab.

Max / Min Levels

Maximum and Minimum limits for Zone Output level are available only through the CP66 Software. This sets the true level when a Remote is turned all the way up or down, and is useful in many retail environments for setting a range for volume control. Digital remotes will always display their current level as a proportion of the maximum and minimum.



Page 1 Threshold

In threshold mode, where Page 1 is triggered not by a push-to-talk button but instead by detection of sound at the microphone itself, it may be necessary to adjust this threshold to match your environment. For example, in an area with some amount of background noise (like a restaurant) this threshold will be higher than when connected to a phone system that is only “on” when someone lifts a receiver.

This problem is especially apparent when amount of noise near the page mic changes throughout the day, making it nearly impossible to find a threshold value somewhere near the middle that always works. We recommend using a push-to-talk switch in environments where the background noise changes over time.

Program 6 Priority Threshold

In rare cases, it may be necessary to adjust the threshold and hold time for the Program 6 Priority or “Jukebox Input.” Older systems that take a long time to switch between CDs or records may require a longer hold time or a lower threshold value. To change these values, right click on the “Enable PGM 6 Priority” check box and select “Set PGM 6 Priority and Hold Time.” A dialog will appear that allows you to change these settings.

Firmware Updates

If you have purchased new hardware, the software may indicate that the firmware inside the CP66 or one of its remotes is different than what is supported by the software. In this case, the connection box turns orange and a “FW Mismatch” warning is displayed on the screen. If you have access to the internet, first make sure you have the latest version of the CP66 software from rane.com/cp66.html. To update the device firmware so it matches the version contained in the software, connect the PAGER2 and any Digital Remotes and then press the “Update Firmware” button. This can take up to several minutes if multiple remotes are connected. Updating the firmware will **not** clear any of your settings.

DR1 Specifications

Parameter	Specification
CAT 5e Cable Length Max.	300 meters / 1000 feet
Power Requirement:	+24VDC / 50mA
Baud Rate:	115200
Unit: Conformity	CE, FCC
Unit: Size	
...cm 10.4H x 4W x 5.5D	6.6D including knob
...in 4.1”H x 1.6”W x 2.2”D	2.6”D including knob
Unit: Weight	113 g / 4.0 oz
Unit: Shipping	261 g / 9.2 oz

DR3 Specifications

Parameter	Specification
CAT 5e Cable Length Max.	300 meters / 1000 feet
Power Requirement:	+24VDC / 50mA
Baud Rate:	115200
Unit: Conformity	CE, FCC
Unit: Size	
...cm 10.4H x 8.6W x 4.8D	6D including knob
...in 4.1”H x 3.4”W x 2.1”D	2.4”D including knob
Unit: Weight	6.4 oz / 181g
Unit: Shipping	12.4 oz / 352g

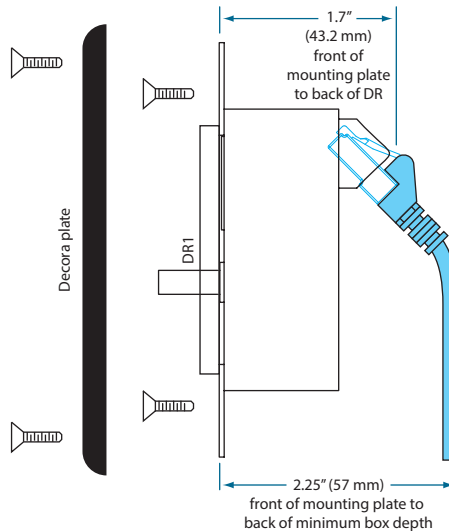
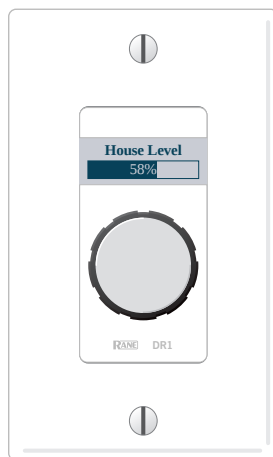
CP66 Features and Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Program Inputs 1-4				
.....Input Type	RCA			Unbalanced; Mono-summed L & R
.....Max Input Level	+14.3	+2 /-1	dBu	Equivalent to 4.0 Vrms
.....Input Level Adjust	Off to 0		dB	
.....Frequency Response	20 Hz to 22 kHz	±0.4	dB	+0 dBu, 20 Hz to 20 kHz
.....Input Impedance	17.3k	10%	Ω	
Program Inputs 5-6				
.....Input Type	Euroblock			Balanced; Mono-summed L & R
.....Max Input Level	+20	+2 /-1	dBu	
.....Input Level Adjust	Off to 0		dB	
.....Frequency Response	20 Hz to 22 kHz	±0.4	dB	+0 dBu, 20 Hz to 20 kHz
.....Input Impedance	14.0k	10%	Ω	
Page 1 Input				
.....Input Type	Euroblock			Balanced
.....Gain Range	-41 to 0		dBFS	Continuously adjustable
.....Input Mode: Line				
.....Input Impedance	5.8k	10%	Ω	
.....Max Input Level	+20		dBu	Gain set to min.
.....Input Mode: Mic				
.....Input Impedance	1.1k	10%	Ω	
.....Max Input Level	+5		dBu	Gain set to min.
.....Phantom Power	24	+4 /-0	V	10 mA max.
Zone Outputs				
.....Number of Outputs	6			Mono
.....Output Type	Euroblock		dB	Balanced
.....Max Output Level	+20	±1	dBu	
.....3-band Tone Controls	±6 dB			Accelerated-Slope
.....Low/Mid Frequency	300 Hz			12 dB per octave Linkwitz-Riley
.....Mid/High Frequency	4 kHz			12 dB per octave Linkwitz-Riley
.....Frequency Response	20 Hz to 22 kHz	+0 /-3	dB	
.....THD +N	0.06	0.01	%	+4 dBu, BW=22 kHz
.....Output Impedance	100	10%	Ω	Each leg
Unit				
.....Conformity	CE, FCC, cCSAus			
.....Universal Line Voltage	100-240 VAC, 50/60 Hz			20 watts
.....Construction	All Steel			
.....Size	3.5"H x 19"W x 8.5"D			2U (8.9 cm x 48.3 cm x 21.6 cm)
.....Weight	7 lb			(3.2 kg)
.....Shipping: Size	4.5" x 20.3" x 13.75"			(11.4 cm x 52 cm x 35 cm)
.....Weight	12 lb			(5.4 kg)
<i>Note: 0 dBu = 0.775 Vrms</i>				

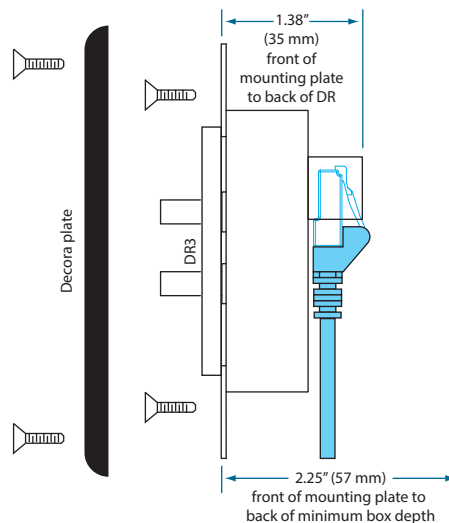
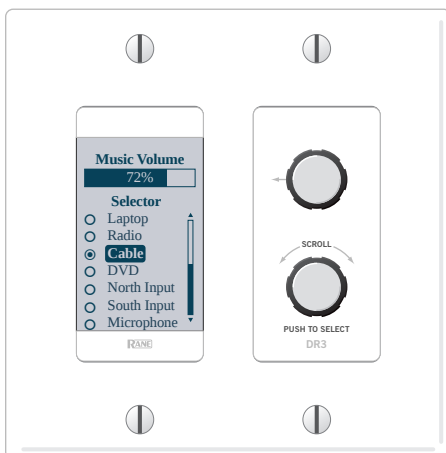
PAGER2 Specifications

Parameter	Specification	Limit	Conditions/Comments
RAD Port	Rear panel with indicators		RJ-45 connector
Mic Input	Accepts any gooseneck mic		
...Connector	3-pin female XLR		Locking tab may be removed
...Phantom Power	24 VDC @ 100 mA		On/off in CP66 software
...Mic Pad	13 dB	max	On/off in CP66 software
Page Indicators	Busy (red), Chime (yellow), Ready (green)		
Unit: Conformity	CE, FCC, cULus		
Unit: Construction	All Steel		Lockdown holes in chassis allow securing to a table
...Size	4.5"H x 6"W x 2"D		(11.5 cm x 15.3 cm x 5.1 cm)
...Weight	20 ounces		(567 grams)
Shipping Size	6.25" x 8.5" x 5.5"		(16 cm x 22 cm x 14 cm)
...Weight	1.64 lb		(745 grams)

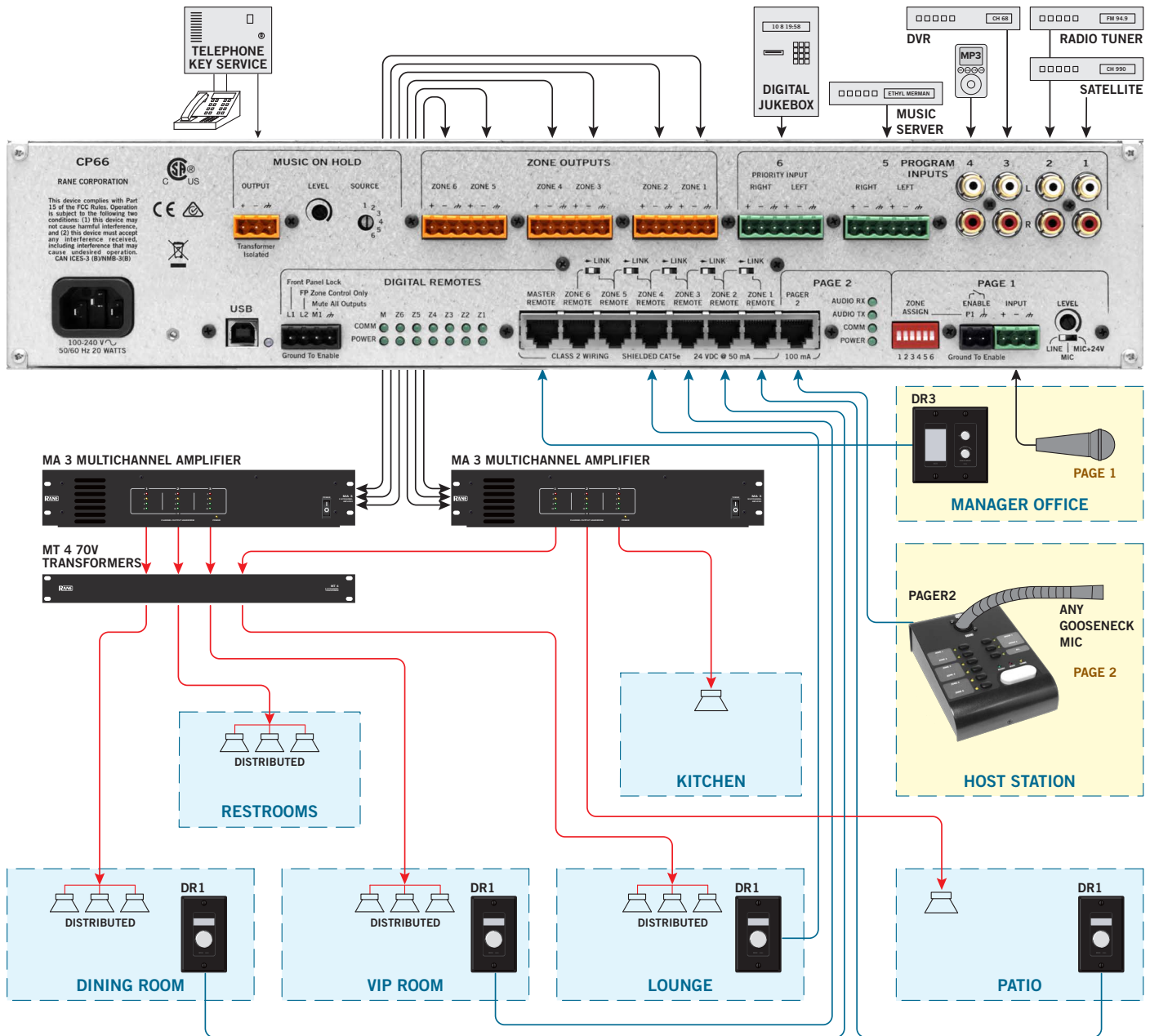
DR1 Installation



DR3 Installation



Restaurant Application Example



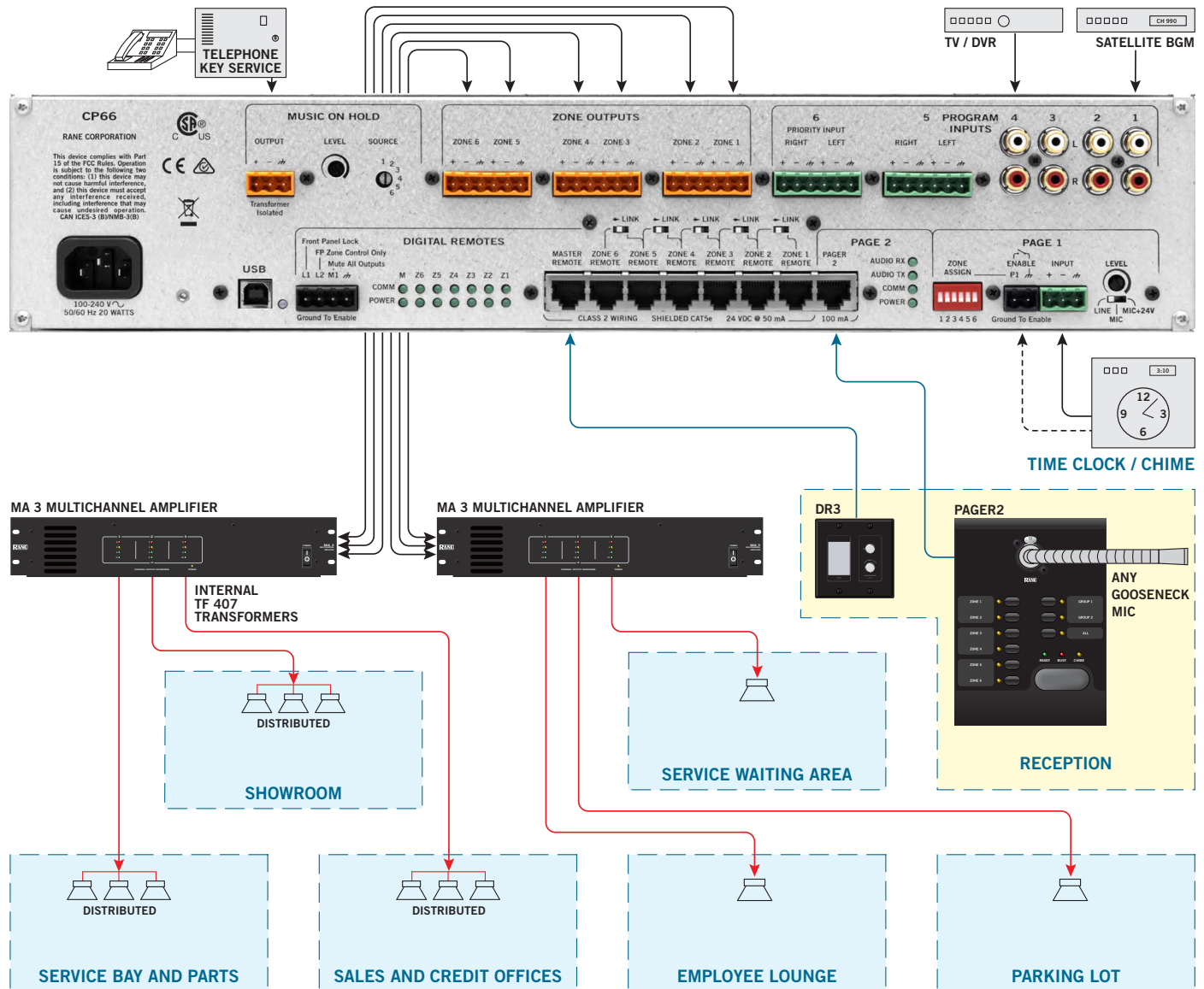
This example allows host paging in the dining room, lounge, meeting room, patio, restrooms and kitchen. Groups of zones may be accessed by single buttons on the PAGER2. For instance, a group can be named "table ready" and include the lounge, patio and restrooms. Another group only pages the eating areas. A third group can page everyone.

The manager can page any room using a DR3 remote and a microphone without leaving his office (or put one in the kitchen).

Background music volume is controlled by a DR1 remote in the dining, meeting, lounge and patio, giving local control by the staff to accommodate the quiet or busy times in each room.

Background music is also fed to music-on-hold in the telephone system.

Auto Dealer Application Example



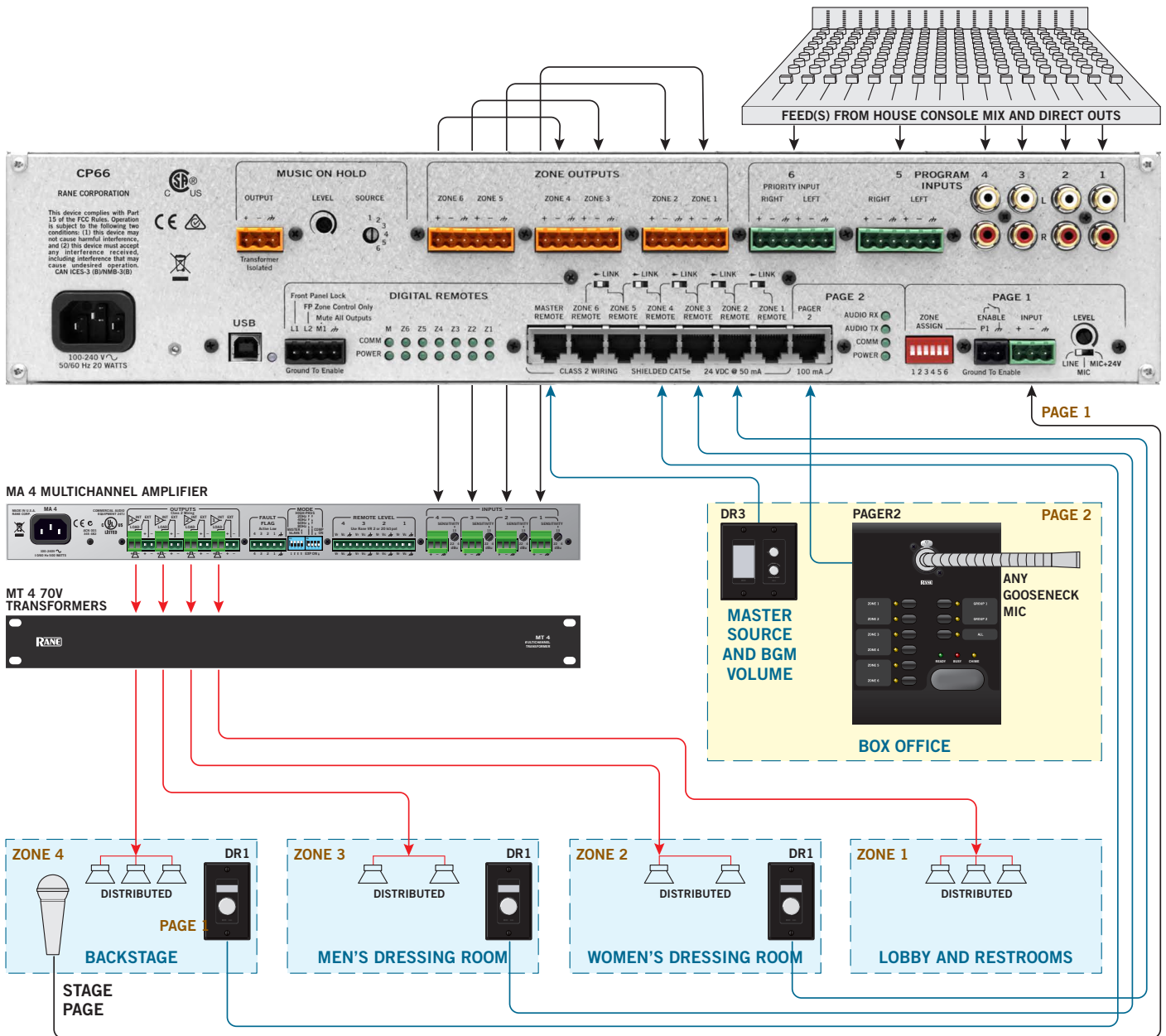
This car dealer has a time clock with a chime output connected to the PAGE 1 INPUT. The clock has a contact closure that enables the chime. Volume and ducking of background music are controlled in the zone output settings.

The PAGER2 at the reception desk is able to page the showroom, service waiting area, service bay and parts department, sales and credit offices, the employee lounge, and

the parking lot. Groups of zones may be accessed by single buttons on the PAGER2. For instance, a group can be named "service to front" and include the service bay, sales offices, employee lounge and parking lot. Another group only pages customers in the showroom and service waiting areas. Another group can page everyone.

A DR3 master source remote can be located in the reception desk or manager's office to control background music in the customer areas.

Theater Application Example



This theater uses the CD player, computer, or radio in the sound booth as shared background music sources. The house mix is also a program source during showtime.

The PAGER2 at the box office is able to page the lobby and restrooms, backstage, and the women's or men's dressing room. Groups of zones may be accessed by single buttons on the PAGER2. For instance, a group can be named "manager call" and include the dressing rooms and backstage. Another group only pages the public areas. Another group can page everyone.

A DR3 master source remote can be located in the box office or concession area to control background music or the house mix in the lobby.

A paging mic can be present backstage so someone can page the other areas during rehearsal.

Background music or stage volume is controlled by a DR1 remote backstage and in each dressing room.

Sound System Interconnection

- Cause & prevention of ground loops
- Interfacing balanced & unbalanced
- Proper pin connections and wiring
- Chassis ground vs. signal ground
- Ground lift switches

Rane Technical Staff

RaneNote 110

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Introduction

This note, originally written in 1985, continues to be one of our most useful references. It's popularity stems from the continual and perpetual difficulty of hooking up audio equipment without suffering through all sorts of bizarre noises, hums, buzzes, whistles, etc.— not to mention the extreme financial, physical and psychological price. As technology progresses it is inevitable that electronic equipment and its wiring should be subject to constant improvement. Many things *have* improved in the audio industry since 1985, but unfortunately wiring isn't one of them. However, finally the Audio Engineering Society (AES) has issued a standards document for interconnection of pro audio equipment. It is AES48, titled "*AES48-2005: AES standard on interconnections — Grounding and EMC practices — Shields of connectors in audio equipment containing active circuitry.*"

Rane's policy is to accommodate rather than dictate. However, this document contains suggestions for external wiring changes that should ideally only be implemented by trained technical personnel. Safety regulations require that all original grounding means provided from the factory be left intact for safe operation. No guarantee of responsibility for incidental or consequential damages can be provided. (*In other words, don't modify cables, or try your own version of grounding unless you really understand exactly what type of output and input you have to connect.*)

Ground Loops

Almost all cases of noise can be traced directly to ground loops, grounding or lack thereof. It is important to understand the mechanism that causes grounding noise in order to effectively eliminate it. Each component of a sound system produces its own ground internally. This ground is usually called the audio *signal* ground. Connecting devices together with the interconnecting cables can tie the signal grounds of the two units together in one place through the conductors in the cable. Ground loops occur when the grounds of the two units are also tied together in another place: via the third wire in the line cord, by tying the metal chassis together through the rack rails, etc. These situations create a circuit through which current may flow in a closed “loop” from one unit’s ground out to a second unit and back to the first. It is not simply the presence of this current that creates the hum—it is when this current flows through a unit’s audio signal ground that creates the hum. In fact, even without a ground loop, a little noise current always flows through every interconnecting cable (i.e., it is impossible to eliminate these currents entirely). The mere presence of this ground loop current is no cause for alarm if your system uses properly implemented and *completely* balanced interconnects, which are excellent at rejecting ground loop and other noise currents. Balanced interconnect was developed to be immune to these noise currents, which can never be entirely eliminated. What makes a ground loop current annoying is when the audio signal is affected. Unfortunately, many manufacturers of balanced audio equipment design the internal grounding system

improperly, thus creating balanced equipment that is not immune to the cabling’s noise currents. This is one reason for the bad reputation sometimes given to balanced interconnect.

A second reason for balanced interconnect’s bad reputation comes from those who think connecting unbalanced equipment into “superior” balanced equipment should improve things. Sorry. Balanced interconnect is not compatible with unbalanced. The small physical nature and short cable runs of completely unbalanced systems (home audio) also contain these ground loop noise currents. However, the currents in unbalanced systems never get large enough to affect the audio to the point where it is a nuisance. Mixing balanced and unbalanced equipment, however, is an entirely different story, since balanced and unbalanced interconnect are truly *not compatible*. The rest of this note shows several recommended implementations for all of these interconnection schemes.

The potential or voltage which pushes these noise currents through the circuit is developed between the independent grounds of the two or more units in the system. The impedance of this circuit is low, and even though the voltage is low, the current is high, thanks to Mr. Ohm, without whose help we wouldn’t have these problems. It would take a very high resolution ohm meter to measure the impedance of the steel chassis or the rack rails. We’re talking thousandths of an ohm. So trying to measure this stuff won’t necessarily help you. We just thought we’d warn you.

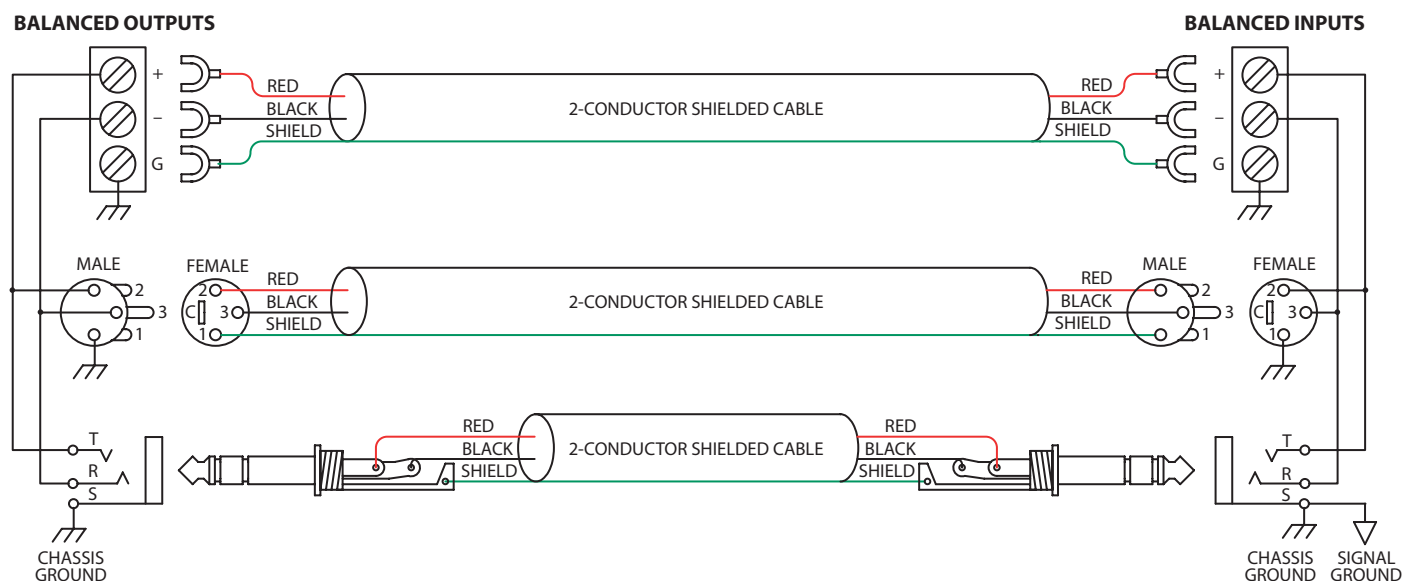


Figure 1a. The right way to do it.

The Absolute Best Right Way To Do It

The method specified by AES48 is to use balanced lines and *tie the cable shield to the metal chassis (right where it enters the chassis) at both ends of the cable*.

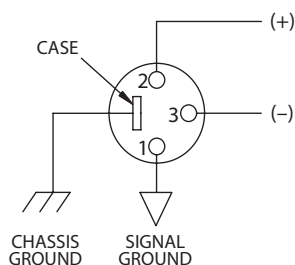
A balanced line requires three separate conductors, two of which are signal (+ and -) and one shield (see Figure 1a). The shield serves to guard the sensitive audio lines from interference. Only by using balanced line interconnects can you *guarantee* (yes, *guarantee*) hum-free results. Always use twisted pair cable. Chassis tying the shield at each end also *guarantees* the best possible protection from RFI [radio frequency interference] and other noises [neon signs, lighting dimmers].

Neil Muncy¹, an electroacoustic consultant and seasoned veteran of years of successful system design, chairs the AES Standards Committee (SC-05-05) working on this subject. He tirelessly tours the world giving seminars and dispensing information on how to successfully hook-up pro audio equipment². He makes the simple point that it is absurd that you cannot go out and buy pro audio equipment from several different manufacturers, buy standard off-the-shelf cable assemblies, come home, hook it all up and have it work hum and noise free. *Plug and play*. Sadly, almost never is this the case, despite the science and rules of noise-free interconnect known and documented for over 60 years (see References for complete information).

It all boils down to using balanced lines, only balanced lines, and nothing but balanced lines. This is why they were developed. Further, that you *tie the shield to the chassis, at the point it enters the chassis, and at both ends of the cable* (more on 'both ends' later).

Since standard XLR cables come with their shields tied to pin 1 at each end (the shells are not tied, nor need be), this means equipment using 3-pin, XLR-type connectors *must tie pin 1 to the chassis* (usually called chassis ground) — not the audio signal ground as is most common.

COMMON (WRONG) PRACTICE



RECOMMENDED PRACTICE

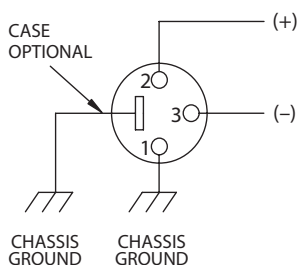


Figure 1b. Recommended practice.

Not using *signal ground* is the most radical departure from common pro-audio practice. Not that there is any argument about its validity. There isn't. **This is the right way to do it.** So why doesn't audio equipment come wired this way? Well, some does, and since 1993, more of it does. That's when Rane started manufacturing some of its products with balanced inputs and outputs tying pin 1 to chassis. So why doesn't everyone do it this way? Because life is messy, some things are hard to change, and there will always be equipment in use that was made before proper grounding practices were in effect.

Unbalanced equipment is another problem: it is everywhere, easily available and inexpensive. All those RCA and 1/4" TS connectors found on consumer equipment; effect-loops and insert-points on consoles; signal processing boxes; semi-pro digital and analog tape recorders; computer cards; mixing consoles; et cetera.

The next several pages give tips on how to successfully address hooking up unbalanced equipment. Unbalanced equipment when "blindly" connected with fully balanced units starts a pattern of hum and undesirable operation, requiring extra measures to correct the situation.

The Next Best Right Way To Do It

The quickest, quietest and most foolproof method to connect balanced and unbalanced is to **transformer isolate all unbalanced connections**. See Figure 2.

Many manufacturers provide several tools for this task, including Rane. Consult your audio dealer to explore the options available.

The goal of these adaptors is to allow the use of *standard cables*. With these transformer isolation boxes, modification of cable assemblies is unnecessary. Virtually any two pieces of audio equipment can be successfully interfaced without risk of unwanted hum and noise.

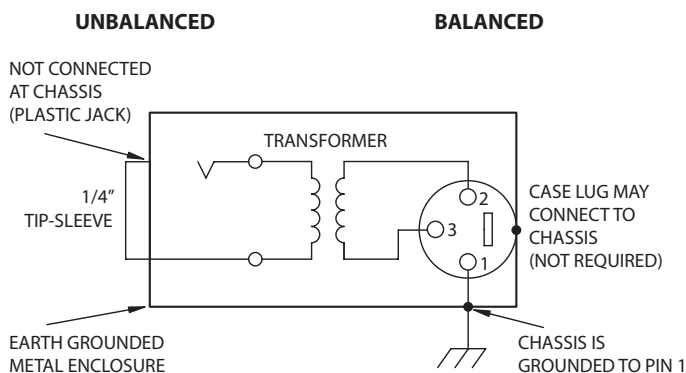


Figure 2. Transformer Isolation

Another way to create the necessary isolation is to use a *direct box*. Originally named for its use to convert the high impedance, high level output of an electric guitar to the low impedance, low level input of a recording console, it allowed the player to plug “directly” into the console. Now this term is commonly used to describe any box used to convert unbalanced lines to balanced lines.

The Last Best Right Way To Do It

If transformer isolation is not an option, special cable assemblies are a last resort. The key here is to prevent the shield currents from flowing into a unit whose grounding scheme creates ground loops (hum) in the audio path (i.e., most audio equipment).

It is true that connecting both ends of the shield is theoretically the best way to interconnect equipment — though this assumes the interconnected equipment is internally grounded properly. Since most equipment is *not* internally grounded properly, connecting both ends of the shield is not often practiced, since doing so usually creates noisy interconnections.

A common solution to these noisy hum and buzz problems involves disconnecting one end of the shield, even though one can not buy off-the-shelf cables with the shield disconnected at one end. The best end to disconnect is the receiving end. If one end of the shield is disconnected, the noisy hum current stops flowing and away goes the hum — but only at low frequencies. A ground-sending-end-only shield connection minimizes the possibility of high frequency (radio) interference since it prevents the shield from acting as an antenna to the next input. Many reduce this potential RF interference by providing an RF path through a small capacitor (0.1 or 0.01 microfarad ceramic disc) connected from the lifted end of the shield to the chassis. (This is referred to as the “hybrid shield termination” where the sending end is bonded to the chassis and the receiving end is capacitively coupled. See Neutrik’s EMC-XLR for example.) The fact that many modern day installers still follow this one-end-only rule with consistent success indicates this and other acceptable solutions to

RF issues exist, though the increasing use of digital and wireless technology greatly increases the possibility of future RF problems.

If you’ve truly isolated your hum problem to a specific unit, chances are, even though the documentation indicates proper chassis grounded shields, the suspect unit is not internally grounded properly. Here is where special test cable assemblies, shown in Figure 3, really come in handy. These assemblies allow you to connect the shield to chassis ground *at the point of entry*, or to pin 1, or to lift one end of the shield. The task becomes more difficult when the unit you’ve isolated has multiple inputs and outputs. On a suspect unit with multiple cables, try various configurations on each connection to find out if special cable assemblies are needed at more than one point.

See Figure 4 for suggested cable assemblies for your particular interconnection needs. Find the appropriate output configuration (down the left side) and then match this with the correct input configuration (across the top of the page.) Then refer to the following pages for a recommended wiring diagram.

Ground Lifts

Many units come equipped with ground lift switches. In only a few cases can it be shown that a ground lift switch improves ground related noise. (Has a ground lift switch ever *really* worked for you?) In reality, the presence of a ground lift switch greatly reduces a unit’s ability to be “properly” grounded and therefore immune to ground loop hums and buzzes. Ground lifts are simply another Band-Aid® to try in case of grounding problems. It is true that an entire system of properly grounded equipment, without ground lift switches, is guaranteed (yes *guaranteed*) to be hum free. The problem is most equipment is *not* (both internally and externally, AC system wise) grounded properly.

Most units with ground lifts are shipped so the unit is “grounded” — meaning the chassis is connected to audio signal ground. (This should be the best and is the “safest” position for a ground lift switch.) If after hooking up your system it exhibits excessive hum or

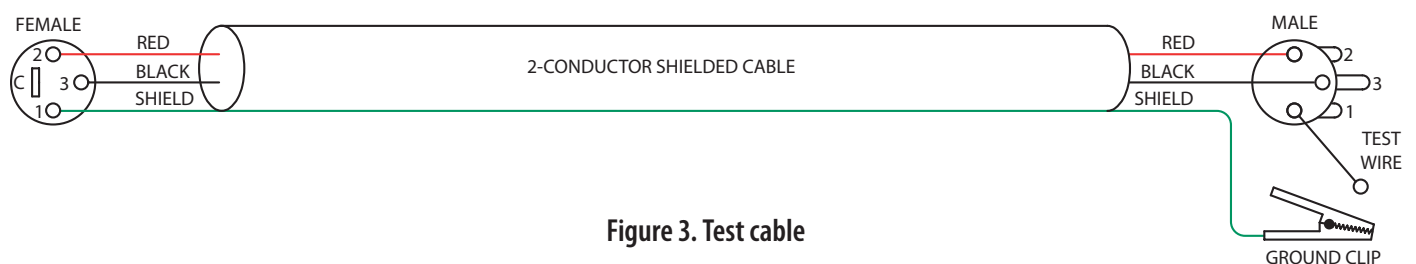


Figure 3. Test cable

buzzing, there is an incompatibility somewhere in the system's grounding configuration. In addition to these special cable assemblies that may help, here are some more things to try:

1. Try combinations of lifting grounds on units supplied with lift switches (or links). It is wise to do this with the power off!
2. If you have an entirely balanced system, verify all chassis are tied to a good earth ground, for safety's sake and hum protection. Completely unbalanced systems never earth ground anything (except cable TV, often a ground loop source). If you have a mixed balanced and unbalanced system, do yourself a favor and use isolation transformers or, if you can't do that, try the special cable assemblies described here and expect it to take many hours to get things quiet. May the Force be with you.
3. Balanced units with outboard power supplies (wall warts or "bumps" in the line cord) do *not* ground the chassis through the line cord. Make sure such units are solidly grounded by tying the chassis to an earth ground using a star washer for a reliable contact. (Rane always provides this chassis point as an external screw with a toothed washer.) Any device with a 3-prong AC plug, such as an amplifier, may serve as an earth ground point. Rack rails may or may not serve this purpose depending on screw locations and paint jobs.

Floating, Pseudo, and Quasi-Balancing

During inspection, you may run across a ¼" output called floating unbalanced, sometimes also called pseudo-balanced or quasi-balanced. In this configuration, the sleeve of the output stage is not connected inside the unit and the ring is connected (usually through a small resistor) to the audio signal ground. This allows the tip and ring to "appear" as an equal impedance, not-quite balanced output stage, even though the output circuitry is unbalanced.

Floating unbalanced often works to drive either a balanced or unbalanced input, depending if a TS or TRS standard cable is plugged into it. When it hums, a special cable is required. See drawings #11 and #12, and do not make the cross-coupled modification of tying the ring and sleeve together.

Winning the Wiring Wars

- Use balanced connections whenever possible, with the shield bonded to the metal chassis at both ends.
- Transformer isolate all unbalanced connections from balanced connections.
- Use special cable assemblies when unbalanced lines cannot be transformer isolated.
- Any unbalanced cable must be kept under 10 feet (3 m) in length. Lengths longer than this will amplify all the nasty side effects of unbalanced circuitry's ground loops.

Summary

If you are unable to do things correctly (i.e. use fully balanced wiring with shields tied to the *chassis* at both ends, or transformer isolate all unbalanced signals from balanced signals) then there is no guarantee that a hum-free interconnect can be achieved, nor is there a definite scheme that will assure noise-free operation in all configurations.

References

1. Neil A. Muncy, "Noise Susceptibility in Analog and Digital Signal Processing Systems," presented at the 97th AES Convention of Audio Engineering Society in San Francisco, CA, Nov. 1994.
2. *Grounding, Shielding, and Interconnections in Analog & Digital Signal Processing Systems: Understanding the Basics*; Workshops designed and presented by Neil Muncy and Cal Perkins, at the 97th AES Convention of Audio Engineering Society in San Francisco, CA, Nov. 1994.
3. The entire June 1995 AES Journal, Vol. 43, No. 6, available \$6 members, \$11 nonmembers from the Audio Engineering Society, 60 E. 42nd St., New York, NY, 10165-2520.
4. Phillip Giddings, *Audio System Design and Installation* (SAMS, Indiana, 1990).
5. Ralph Morrison, *Noise and Other Interfering Signals* (Wiley, New York, 1992).
6. Henry W. Ott, *Noise Reduction Techniques in Electronic Systems*, 2nd Edition (Wiley, New York, 1988).
7. Cal Perkins, "Measurement Techniques for Debugging Electronic Systems and Their Instrumentation," *The Proceedings of the 11th International AES Conference: Audio Test & Measurement*, Portland, OR, May 1992, pp. 82-92 (Audio Engineering Society, New York, 1992).
8. Macatee, *RaneNote*: "Grounding and Shielding Audio Devices," Rane Corporation, 1994.
9. Philip Giddings, "Grounding and Shielding for Sound and Video," *SEVC*, Sept. 20th, 1995.
10. AES48-2005: *AES standard on interconnections — Grounding and EMC practices — Shields of connectors in audio equipment containing active circuitry* (Audio Engineering Society, New York, 2005).

Band-Aid is a registered trademark of Johnson & Johnson

To Input

From Output

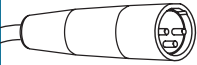
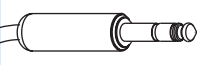
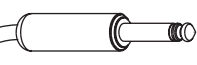
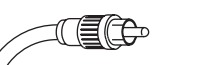
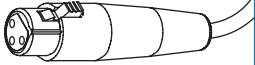
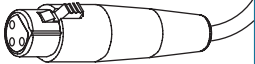
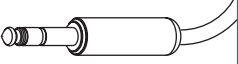
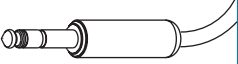
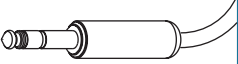
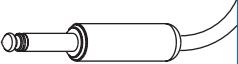
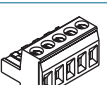
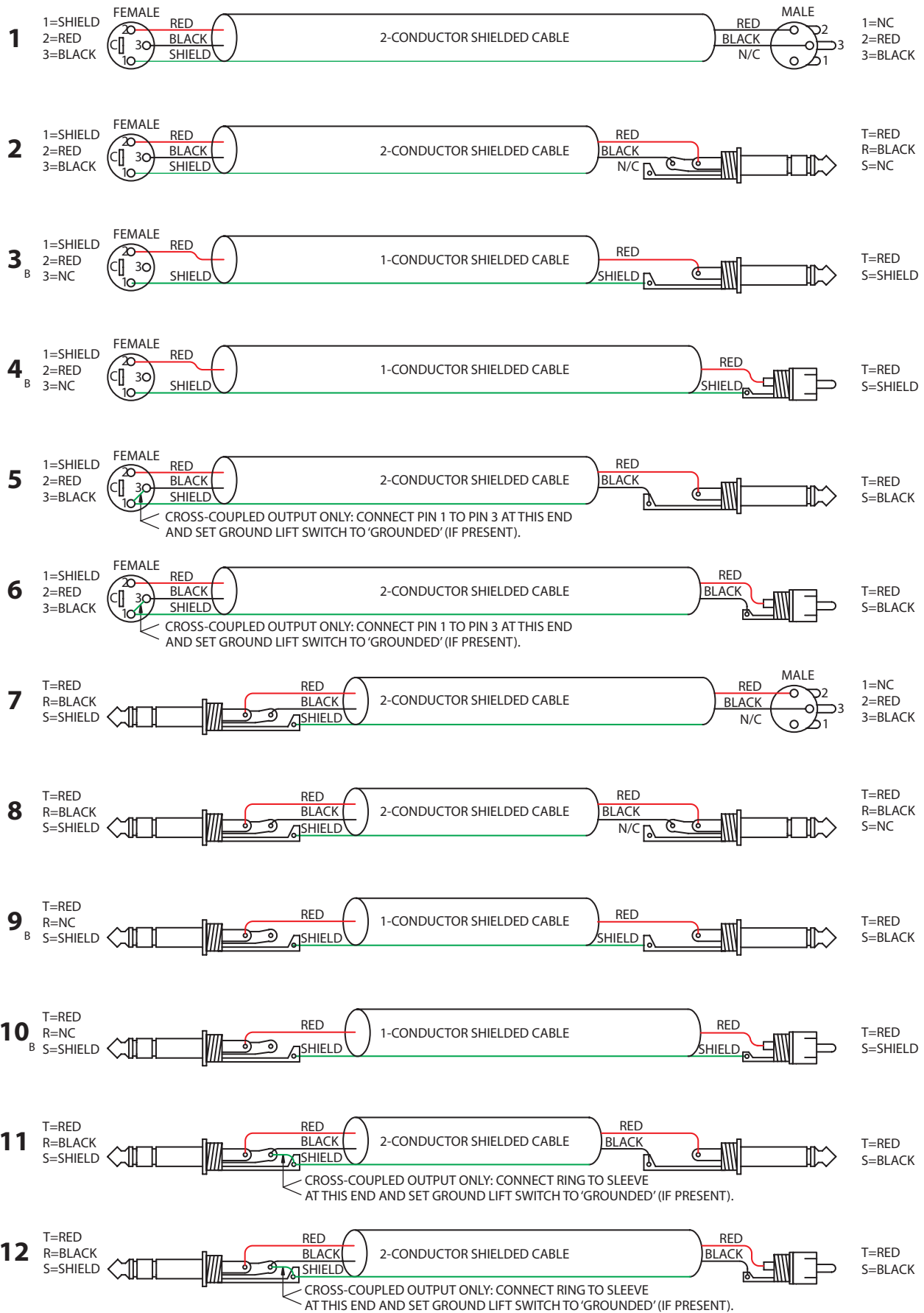
CABLE CONNECTORS	 MALE BALANCED XLR	 1/4" BALANCED TRS (TIP-RING-SLEEVE)	 1/4" OR 3.5mm UNBALANCED TS (TIP-SLEEVE)	 UNBALANCED RCA	 BALANCED EUROBLOCK
 FEMALE BALANCED XLR (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	1	2	3_B	4_B	+ to + - to - SHIELD NC
 FEMALE BALANCED XLR (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	1	2	5	6	+ to + - to - SHIELD NC
 1/4" BALANCED TRS (NOT A TRANSFORMER, NOR A CROSS-COUPLED OUTPUT STAGE)	7	8	9_B	10_B	+ to + - to - SHIELD ONLY TO EUROBLOCK
 1/4" BALANCED TRS (EITHER A TRANSFORMER OR A CROSS-COUPLED OUTPUT STAGE)	7	8	11	12	+ to + - to - SHIELD NC
 1/4" FLOATING UNBALANCED TRS (TIP-RING-SLEEVE) (SLEEVE IN UNIT = NC)	21_A	22_A	11	12	+ to + - to - GROUND to GROUND
 1/4" OR 3.5 mm UNBALANCED TS (TIP-SLEEVE)	13	14	15_A	16_A	23
 UNBALANCED RCA (TIP-SLEEVE)	17	18	19_A	20_A	23
 BALANCED EUROBLOCK	+ to + - to - SHIELD ONLY TO XLR PIN 1	+ to + - to - SHIELD ONLY TO TRS SLEEVE	24	24	+ to + - to - GROUND to GROUND

Figure 4. Interconnect chart for locating correct cable assemblies on the following pages.

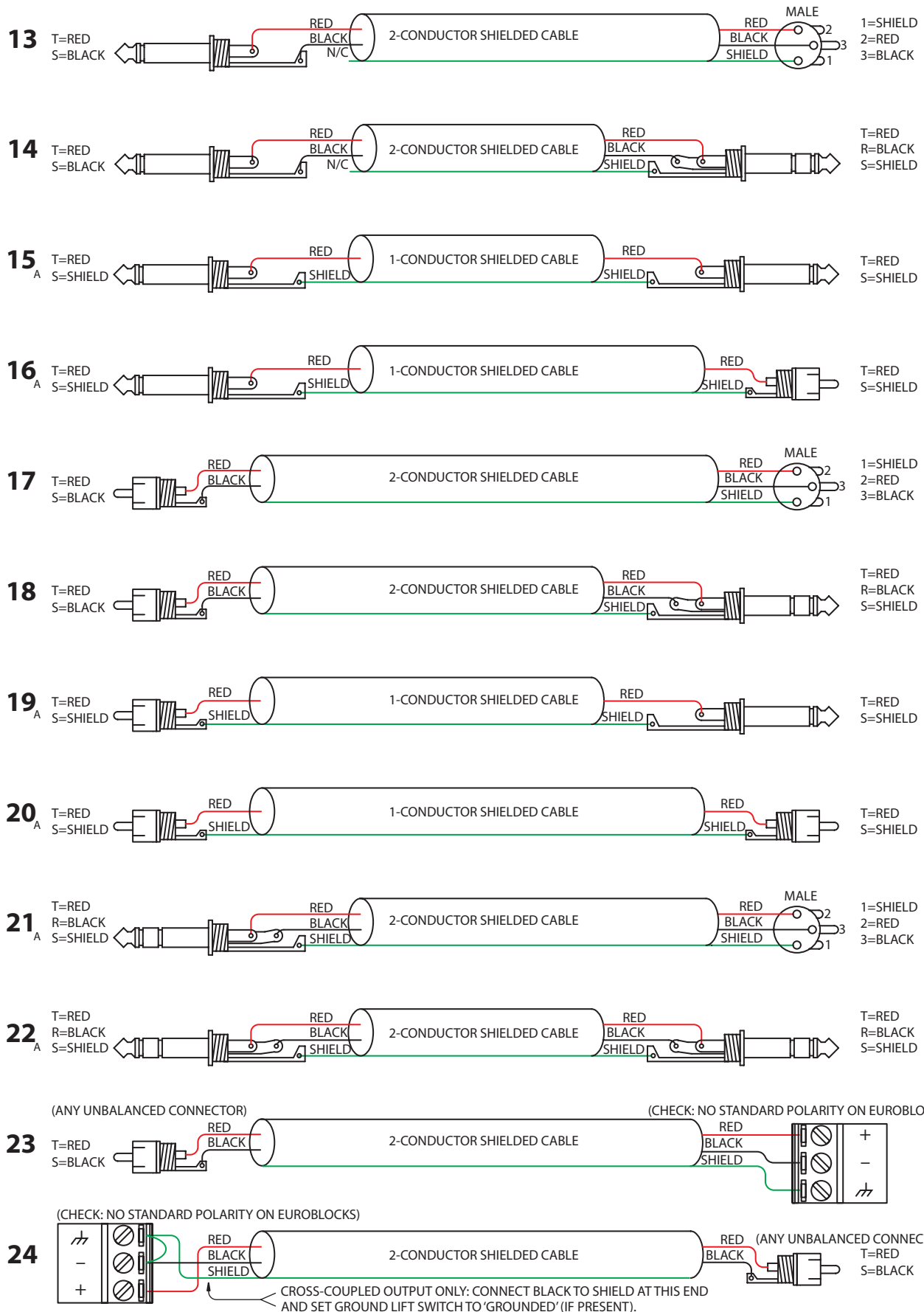
Note: (A) This configuration uses an "off-the-shelf" cable.

Note: (B) This configuration causes a 6 dB signal loss. Compensate by "turning the system up" 6 dB.



From Output

To Input



Factory Authorized Service

Your unit may someday need to be serviced by the Rane Factory if you live in the USA. International customers should contact your dealer or distributor for service. You must call the Rane factory before shipping. Please do not return your unit to Rane without prior authorization.

Rane Corporation

To obtain service or a Return Authorization in the USA, please phone 425-355-6000

or Fax 425-347-7757

Limited Domestic Warranty

RANE CORPORATION WARRANTS ALL RANE PRODUCTS (EXCEPT THOSE ITEMS CLASSIFIED AS *WEAR PARTS*, AND LISTED ON THE MANUAL-1 PAGE OF EACH OPERATORS MANUAL) PURCHASED IN THE U.S. AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP FOR A PERIOD OF TWO (2) YEARS. *WEAR PARTS* ARE LIMITED TO A PERIOD OF NINETY (90) DAYS FROM THE INITIAL DATE OF RETAIL PURCHASE FROM AN AUTHORIZED RANE DEALER—WEAR PARTS REQUIRE PROOF OF PURCHASE DATE. This limited warranty extends to all purchasers or owners of the product during the warranty period beginning with the original retail purchase. Rane Corporation does not, however, warrant its products against any and all defects: 1) arising out of material or workmanship not provided or furnished by Rane, or 2) resulting from abnormal use of the product or use in violation of instructions, or 3) in products repaired or serviced by other than the Rane Factory, or 4) in products with removed or defaced serial numbers, or 5) in components or parts or products expressly warranted by another manufacturer. Rane agrees to supply all parts and labor to repair or replace defects covered by this limited warranty with parts or products of original or improved design, at its option in each respect, if the defective product is shipped prior to the end of the warranty period to the Rane Factory in the original packaging or a replacement supplied by Rane, with all transportation costs and full insurance paid each way by the purchaser or owner.

LIMITED WARRANTY OUTSIDE THE U.S.A.

RANE PRODUCTS ARE WARRANTED ONLY IN THE COUNTRY WHERE PURCHASED, THROUGH THE AUTHORIZED RANE DISTRIBUTOR IN THAT COUNTRY, AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP, THE SPECIFIC PERIOD OF THIS LIMITED WARRANTY SHALL BE THAT WHICH IS DESCRIBED TO THE ORIGINAL RETAIL PURCHASER BY THE AUTHORIZED RANE DEALER OR DISTRIBUTOR AT THE TIME OF PURCHASE. Rane Corporation does not, however, warrant its products against any and all defects: 1) arising out of materials or workmanship not provided or furnished by Rane, or 2) resulting from abnormal use of the product or use in violation of instructions, or 3) in products repaired or serviced by other than authorized Rane repair facilities, or 4) in products with removed or defaced serial numbers, or 5) in components or parts or products expressly warranted by another manufacturer. Rane agrees, through the applicable authorized distributor, to repair or replace defects covered by this limited warranty with parts or products of original or improved design, at its option in each respect, if the defective product is shipped prior to the end of the warranty period to the designated authorized Rane warranty repair facility in the country where purchased, or to the Rane factory in the U.S., in the original packaging or a replacement supplied by Rane, with all transportation costs and full insurance paid each way by the purchaser or owner.

ALL REMEDIES AND THE MEASURE OF DAMAGES ARE LIMITED TO THE ABOVE SERVICES, IT IS POSSIBLE THAT ECONOMIC LOSS OR INJURY TO PERSON OR PROPERTY MAY RESULT FROM THE FAILURE OF THE PRODUCT; HOWEVER, EVEN IF RANE HAS BEEN ADVISED OF THIS POSSIBILITY, THIS LIMITED WARRANTY DOES NOT COVER ANY SUCH CONSEQUENTIAL OR INCIDENTAL DAMAGES. SOME STATES OR COUNTRIES DO NOT ALLOW THE LIMITATIONS OR EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, ARISING BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE, OR OTHERWISE, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM EITHER THE DATE OF ORIGINAL RETAIL PURCHASE OR, IN THE EVENT NO PROOF OF PURCHASE DATE IS AVAILABLE, THE DATE OF MANUFACTURE, SOME STATES OR COUNTRIES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE, COUNTRY TO COUNTRY.



Warranty Procedure - Valid in USA only

NOTICE! You must complete and return the warranty card or register your product online to extend the Warranty from 2 years to 3 years!

TO VALIDATE YOUR EXTENDED WARRANTY: Use the postcard that came in the box with your unit, or go to www.rane.com and click on **New Product Registration**. Fill out the warranty completely, being sure to include the model and serial number of the unit since this is how warranties are tracked. If your Rane product was purchased in the U.S.A., mail the completed card or register online with to Rane Corporation within 10 days from the date of purchase. **If you purchased the product outside the U.S.A. you must file your warranty registration with the Rane Distributor in that country.** It is advised that you keep your bill of sale as proof of purchase, should any difficulties arise concerning the registration of the warranty card. **NOTICE: IT IS NOT NECESSARY TO REGISTER IN ORDER TO RECEIVE RANE CORPORATION'S STANDARD TWO YEAR LIMITED WARRANTY.**

WARRANTY REGISTRATION is made and tracked by MODEL AND SERIAL NUMBERS ONLY, not by the purchaser's or owner's name. Therefore any warranty correspondence or inquires **MUST** include the model and serial number of the product in question. Be sure to fill in the model and serial number in the space provided below and keep this in a safe place for future reference.

WARRANTY SERVICE MUST BE PERFORMED ONLY BY AN AUTHORIZED RANE SERVICE FACILITY LOCATED IN THE COUNTRY WHERE THE UNIT WAS PURCHASED, OR (if product was purchased in the U.S.) AT THE RANE FACTORY IN THE U.S.. If the product is being sent to Rane for repair, please call the factory for a Return Authorization number. We recommend advance notice be given to the repair facility to avoid possible needless shipment in case the problem can be solved over the phone. **UNAUTHORIZED SERVICE PERFORMED ON ANY RANE PRODUCT WILL VOID ITS EXISTING FACTORY WARRANTY.**

FACTORY SERVICE: If you wish your Rane product to be serviced at the factory, it must be shipped **FULLY INSURED, IN THE ORIGINAL PACKING OR EQUIVALENT**. This warranty will **NOT** cover repairs on products damaged through improper packaging. If possible, avoid sending products through the mail. Be sure to include in the package:

1. Complete return street shipping address (P.O. Box numbers are **NOT** acceptable).
2. A detailed description of any problems experienced, including the make and model numbers of any other system equipment.
3. Remote power supply, if applicable.

Repaired products purchased in the U.S. will be returned prepaid freight via the same method they were sent to Rane. Products purchased in the U.S., but sent to the factory from outside the U.S. **MUST** include return freight funds, and the sender is fully responsible for all customs procedures, duties, tariffs and deposits.

In order to qualify for Rane's one year extended warranty (for a total of 3 years parts and labor), the warranty must be completely filled out and sent to us immediately. Valid in USA only.

We recommend you write your serial number here in your owners manual and on your sales receipt for your records.

SERIAL NUMBER: _____ **PURCHASE DATE:** _____

EU Declaration of Conformity

Product Model: CP66
Serial Numbers: 900000 – 999999
Product Type: Professional Audio Signal Processing

Manufacturer: Rane Corporation
Address: 10802 47th Avenue West, Mukilteo WA 98275-5000 USA



This declaration is issued under the sole responsibility of Rane Corporation.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/35/EU	The Low Voltage Directive
2014/30/EU	The Electromagnetic Compatibility Directive
2012/19/EU	The Waste Electrical and Electronic Equipment Directive
2011/65/EU	The Restriction of Hazardous Substances Directive
2001/95/EC	The General Product Safety Directive

References to the relevant harmonised standards used in relation to which conformity is declared:

EN60065:2002/A1:2006/A11:2008/A2:2010/A12:2011	Safety for audio, video and similar electronic apparatus.
EN55103-1:2009/AM1:2012	Compatibility of professional electronic A/V apparatus emissions.
EN55103-2:2009	Compatibility of professional electronic A/V apparatus immunity.
EN50581:2012	Technical documentation for RoHS assessment of electronic products.

Additional Information:
Environment E2
CE mark first affixed in 2011

In order for the customer to maintain compliance with these regulations, high quality shielded cable must be used for interconnection to other equipment. No changes or modification of the equipment, other than that expressly outlined by the manufacturer, are allowed. The user of this equipment shall accept full responsibility for compliance with Union harmonisation legislation in the event that the equipment is modified without written consent of the manufacturer.

EN55103-2 Immunity Results:	THD+N: 4 dBu, 400 Hz, BW 20 Hz - 20 kHz	
<i>Test Description</i>	<i>Measurement</i>	<i>Conditions</i>
RF Electromagnetic Fields Immunity		
80 MHz - 2000 MHz, 1 kHz AM, 80% depth, 3V/m	<-64 dB	
1400 MHz - 2700 MHz, 1 kHz AM, 80% depth, 3V/m	<-68 dB	
Conducted RF Disturbances Immunity		
150 kHz - 80 MHz, 1 kHz AM, 80% depth, 3V rms	<-59 dB	150 kHz - 1.1 MHz
	<-56 dB	1.1 MHz - 1.8 MHz
	<-60 dB	1.8 MHz - 2.2 MHz
	<-45 dB	2.2 MHz - 3.5 MHz
	<-60 dB	3.5 MHz - 4.5 MHz
	<-58 dB	4.5 MHz - 4.6 MHz
	<-60 dB	4.6 MHz - 80 MHz
Magnetic Fields Immunity		
50 Hz - 10 kHz, 3.0 - 0.3 A/m	<-75 dB	
Common Mode Immunity (Signal Ports)		Bandpass re: 4 dBu, 1/3-octave
50 Hz - 10 kHz, -20 dBu	<-47 dB	
Common Mode Immunity (Data Ports)		Bandpass re: 4 dBu, 1/3-octave
50 Hz - 10 kHz, -20 dBu	<-79 dB	

Signed for and on behalf of: Rane Corporation
Place of issue: Mukilteo WA USA Date of issue: June 23, 2011
Name: Greg Frederick Function: Compliance Engineer

Signature:

