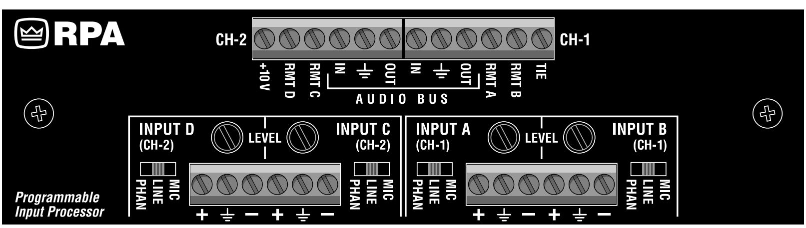
P.I.P.-RPA
P.I.P.-RPAT

REFERENCE MANUAL



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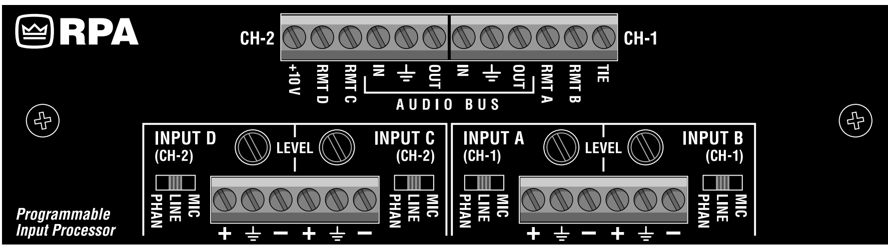


Fig. 1.1 P.I.P.-RPA

1 Welcome

Thank you for purchasing the Crown *P.I.P.*®-RPA accessory. *PIP*™ modules are designed to install quickly into the rear panel of many Crown amplifiers. PIP stands for "Programmable Input Processor." Their versatile features expand the capabilities of your amplifier and enable you to customize it for your particular needs.

The P.I.P.-RPA adds the features of a remote-controlled 4-input 2-output mixer to the input of your amplifier. Each of the four main audio inputs is balanced and can accept signal levels ranging from low-level microphones to line-level devices. Phantom power is available for microphones. The P.I.P.-RPAT also has1:1 isolation transformers for each input.

Unbalanced "Audio Bus" inputs and outputs, similar to "Aux Send" and "Aux Return" on a typical mixer, are provided. The Audio Bus inputs allow an almost unlimited number of sources to be connected at each amplifier input. The Audio Bus outputs allow the mixed signal of Channel 1 and 2 to be fed to other amplifiers or components.

Mixing the input signals of the P.I.P.-RPA is accomplished remotely using a two-wire remote control to control the VCA (voltage-controlled amplifier) of each input. The remote control can be a fixed resistor for a fixed attenuation or a 10 K potentiometer (pot) for variable attenuation. A 10 VDC source is conveniently provided on the PIP for the remote. If no attenuation is desired, the 10 V source must be connected directly to the remote control input. Up to 84 dB of attenuation is available with each VCA. If desired, more than one input can be controlled by the same remote control.

A "voice-over" feature is provided so Inputs A and C can have priority over Inputs B and D. When activated, the voice-over circuitry causes the low-priority inputs to "duck" by a preset attenuated level. The input priority (and signal routing) is programmed with an 8-segment DIP switch on the top circuit board of the PIP. A companion "Tie" feature, controlled remotely, enables you to tie one channel to the other. Using it, the audio from one or more inputs can be directed to both outputs and their priorities linked.

Feature Summary

- ❏ Remote-controlled mixing of 4 balanced mic/line inputs with up to 84 dB of attenuation.
- ❏ Adjustable input sensitivity.
- ❏ Phantom power available for mics.
- ❏ Audio Bus inputs and outputs.
- ❏ 10 V provided for remote-controls.
- ❏ Voice-over capability with adjustable sensitivity and duck level.
- ❏ Ch. 1 and 2 can be tied together.
- ❏ 1:1 isolation transformers (P.I.P.-RPAT).

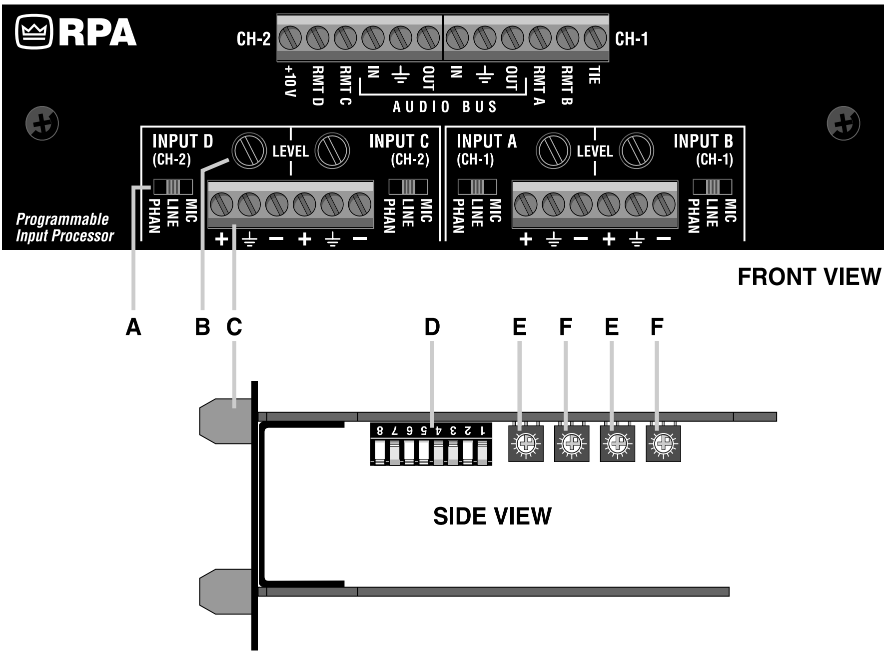


Fig. 2.1 Facilities

2 Facilities

A. Input Mode Switches

These gold-plated three-position switches select the mode of each main audio input: mic-level, line-level, or mic-level with phantom power.

B. Input Level Controls

The level of each main audio input can be adjusted with these level controls. They have a range of 36 dB. Using them, you can compensate for a wide range of input signal levels.

C. Barrier Connectors

All connections are made using these screw-down barrier-block connectors.

Important: Do not use stranded wire unless the wire ends are first tinned. Strip no more than 1/4 inch (6.4 mm) of insulation from the wire ends.

Main Audio Inputs
There are four balanced main audio inputs. Inputs A and B are normally fed to Ch. 1 of the amplifier. Inputs C and D are normally fed to Ch. 2. Each input remains off (attenuated 84 dB) until a positive DC voltage greater than 5 V is applied to the corresponding remote input (10 V results in no attenuation).

Remote Inputs / 10 V Output
There is a remote control input for each main audio input and a 10 VDC supply output for feeding them (see Section 3.6). Each main audio input is normally off (attenuated 84 dB) until a positive DC voltage greater than 5 V is connected to the corresponding remote input. If the 10 V supply is strapped directly to a remote input, the main audio input will have no attenuation.

Audio Bus Input / Output
There is also an unbalanced audio bus input and output for each channel. Each bus input and output pair shares a common ground connection. The bus outputs contain the mixed audio signals from Inputs A–D which feed the corresponding amplifier channel.

Note: The audio bus outputs are inverted. The mating bus inputs correct this by again inverting the signal.

Tie Input
Finally there is a "Tie" input which is a logic input and can be switched on by feeding a positive DC voltage to it. It enables the audio inputs and voice-over priorities of Ch. 1 to be "tied" to Ch. 2 and vice versa.

D. Routing/Priority Switch
This 8-segment DIP (dual in-line package) switch is comprised of eight individual switches. Flipping them down toward the bottom circuit board turns them off. Flipping them up toward the top circuit board turns them on. The DIP switch is used to program the routing and priority of each main audio input. See Section 3.1.

E. Duck Level Controls
The "duck level" is the amount of attenuation applied to a lower priority input when a higher priority input is activated. The first control (closest to the front panel of the PIP) sets the duck level triggered by Input A and the third control sets the duck level triggered by Input C. The attenuation range is 0 to 70 dB.

F. Voice-Over Sensitivity Controls
The "voice-over sensitivity" is the level required from an input signal before the "duck" circuit is activated, causing lower-priority inputs to duck to a preset attenuation level. The second control (closest to the front panel) sets the sensitivity of Input A and the fourth control sets the sensitivity of Input C. The voice-over sensitivity controls have a range of 26 dB.

3 Installation

This section provides general installation instructions. For additional information on using Crown PIP modules, visit the Crown website at www.crownaudio.com.

The internal controls of the P.I.P.-RPA must be set prior to installation.

Note: An accessory, a PIP extender card (P.I.P.-EXT), is available if you prefer to make the voice-over and duck level adjustments while the PIP is operating. This allows you to test your settings and easily make changes while you fine-tune the installation.

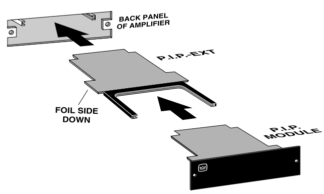


Fig. 3.1 P.I.P.-EXT Accessory

3.1 Setting the InputRouting/Priority Switch

The routing/priority switch serves two purposes. First, it works together with the Tie function to control audio signal routing. Second, it sets the priority of Inputs B, C and D (Input A always has the highest priority. Input C always has the second highest priority.)

The routing/priority switch is the 8-segment DIP switch shown in Figures 2.1 and 3.2. Notice that it is mounted upside-down to the underside (component side) of the top circuit board.

Normally the mix of Inputs A and B feeds Channel 1 of the amplifier and the mix of Inputs C and D feeds Channel 2. This can be changed by the routing/priority switch when the Tie function is turned on (see Section 3.7).

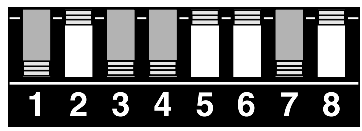


Fig. 3.2 Priority/Routing DIP Switch (Inverted for Readability)

When the Tie function is on, the audio from Input A is automatically fed to both Channels 1 and 2. The audio from the remaining inputs can also be tied to both channels using the routing/priority switch. The first three switch sections control the routing of Inputs B–D as shown in Figure 3.3.

Switch Section	Function
1	Connects Input D audio to Channel 1 if Tie is on.
2	Connects Input C audio to Channel 1 if Tie is on.
3	Connects Input B audio to Channel 2 if Tie is on.
4	Connects Input C ducking to Input B if Tie is on.
5	Connects Input A ducking to Input B always.
6	Connects Input A ducking to Input C if Tie is on.
7	Connects Input C ducking to Input D always.
8	Connects Input A ducking to Input D if Tie is on.

Fig. 3.3 Routing/Priority DIP Switch Functions

	Input Priority						Routing/Priority Switch								Tie
	A	B	C	D	Ch1	Ch2	1	2	3	4	5	6	7	8	
a	1	1	1	1	A=B	C=D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
b	1	2	1	1	A>B	C=D	OFF	OFF	OFF	OFF	**ON**	OFF	OFF	OFF	OFF
c	1	1	1	2	A=B	C>D	OFF	OFF	OFF	OFF	OFF	OFF	**ON**	OFF	OFF
d	1	2	1	2	A>B	C>D	OFF	OFF	OFF	OFF	**ON**	OFF	**ON**	OFF	OFF
e	1	1	1	1	A=B=C	A=C=D	OFF	**ON**	OFF	OFF	OFF	OFF	OFF	OFF	**ON**
f	1	1	1	1	A=B=D	A=C=D	**ON**	OFF	OFF	OFF	OFF	OFF	OFF	OFF	**ON**
g	1	1	1	1	A=B	A=B=C=D	OFF	OFF	**ON**	OFF	OFF	OFF	OFF	OFF	**ON**
h	1	1	1	1	A=B=C=D	A=B=C=D	**ON**	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF	**ON**
i	1	2	2	2	A>B	A>C=D	OFF	OFF	OFF	OFF	**ON**	**ON**	OFF	**ON**	**ON**
j	1	2	2	2	A>B=C=D	A>B=C=D	**ON**	**ON**	**ON**	OFF	**ON**	**ON**	OFF	**ON**	**ON**
k	1	2	1	2	A=C>B	A=C>D	OFF	**ON**	OFF	**ON**	**ON**	OFF	**ON**	**ON**	**ON**
l	1	3	2	3	A>C>B	A>C>D	OFF	**ON**	OFF	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
m	1	3	2	3	A>C>B=D	A>C>B=D	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

Fig. 3.4 Sample Routing/Priority DIP Switch Settings

The priority of each input determines whether it will override or "duck" under another input. For example, you can feed background music into Input B and a paging mic into Input A. By setting the priority of Input B lower than Input A, the background music will be automatically attenuated when someone uses the paging mic.

The table in Figure 3.4 shows some common settings for the switch and what they mean—it does not show every possible combination. The highest priority is 1 and the lowest priority is 3. Notice that Input A is always set to priority 1. Input C is usually set to priority 1 unless the channels are tied together. The reason for this is because only Inputs A and C have voice-over sensing circuitry. Since the other inputs do not have this sensing capability they must have a lower priority.

As mentioned earlier, the routing/priority switch works in conjuction with the Tie function. The table in Figure 3.3 shows that all the DIP switch sections except 5 and 7 function only when the Tie function is on. The Tie function is designed to be remotely controlled and is fully described in Section 3.7. If you have no desire to control it remotely and want to leave it on, simply install a jumper between the 10-V output and the Tie input on the front panel of the PIP

3.2 Setting the Duck Level

If you gave all four main audio inputs the same priority you can skip to Section 3.4. When two or more inputs have a different priority, the duck level is the attenuation level the low-priority inputs will duck when the voice-over circuitry is activated.

The duck circuits have an attack time of 15 milliseconds and a decay time of 1.5 seconds. This means the duck circuit needs only 15 milliseconds to attenuate the low-priority input(s) when the voice-over circuit triggers it. However, when the voice-over circuit is no longer activated, the duck circuit waits about 1.5 seconds before it removes the attenuation. The result is a fast transition when the duck circuit is activated and a slower, smooth transition when it is deactivated.

The duck level controls have a wide 0–70 dB range as shown in Figure 3.6. (The setting numbers in the table in Figure 3.6 refer to the tick marks on the duck level pot in Figure 3.5.)

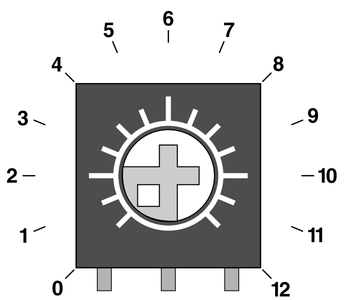


Fig. 3.5 Duck/Voice-Over Control (Inverted for Readability)

Note: Since Inputs A and C have independent ducking circuitry, they may be used to provide two different ducking levels for lower priority inputs. For example, assume the routing/priority switch has been set to the "I" setting (as shown in Figure 3.4) and the Tie function has been turned on. This setting makes Input A priority 1, Input C priority 2, and Inputs B and D priority 3. If the ducking level for A is 70 dB, and the ducking level for C is 46, Inputs B, C and D will all duck 70 dB when there is a signal over the sensitivity threshold on A. Inputs B and D will duck 46 dB when a signal on Input C surpasses its threshold. In this scenario, background music on B and D would be pulled under by a normal page on Input C, and Input A could be reserved for emergency announcements.

Setting	Nominal Attenuation
0	0 dB
1	3 dB
2	6 dB
3	12 dB
4	24 dB
5	36 dB
6	46 dB
7	56 dB
8	66 dB
9	68 dB
10	70 dB
11	70 dB
12	70 dB

Fig. 3.6 Duck Level Settings

3.3 Setting the Voice-Over Sensitivity

If you gave all four main audio inputs the same priority, skip to Section 3.4. When two or more inputs have a different priority, the voice-over sensitivity circuits set the points at which Input A and C will activate their respective ducking circuits.

Only Inputs A and C have signal-sensing capability so they will always have the highest priorities.

Each voice-over sensitivity circuit senses the input signal level after the input level control (the pot accessed through the front panel of the PIP) and before the remote-controlled attenuator. This is shown in the block diagram in Figure 3.19. This means that the remote attenuation setting does not affect the duck level.

Figures 2.1 and 3.5 show voice-over sensitivity controls. They look identical to the duck level controls. Figure 3.7 shows how the control can increase the relative sensitivity.

When the control is set to position 1 (0 dB) it is so insensitive the voice-over circuit will almost never trigger. When it is set to position 12, the sensitivity is increased 26 dB.

Setting	Relative Sensitivity Change
0	OFF
1	0 dB
2	4 dB
3	12 dB
4	16 dB
5	18 dB
6	20 dB
7	21 dB
8	22 dB
9	23 dB
10	24 dB
11	25 dB
12	26 dB

Fig. 3.7 Voice-Over Sensitivity Settings

Setting the voice-over sensitivity is simply a matter of gradually turning up the sensitivity control until it is set too high, then backing it down a little to an optimum setting. This will require you to install and remove the P.I.P.-RPA several times while the sensitivity setting is refined. If you prefer not to repeatedly install and remove the PIP from the amplifier you can purchase our P.I.P.-EXT accessory, an extender card which will allow you to connect the PIP outside the amplifier so you can make adjustments to it during system operation.

The exact procedure for setting the voice-over sensitivity will vary depending upon your particular application. The steps we provide are for a common scenario which shows the principles involved. If you need more information please contact our Technical Support Group at 800/342-6939, or contact your local representative.

For the sake of simplicity our example will describe how to set just one of the two voice-over sensitivity controls. We will also assume that you do not have a P.I.P.-EXT. The procedure involves turning up the voice-over sensitivity until it is triggered by the ambient noise level then backing off a little so that only an audio signal triggers it.

Procedure

Example: Input B will be fed a line-level background music signal and will be assigned a priority of 2 by the routing/priority switch. Input A will be fed a mic-level signal from a paging mic which requires phantom power. The paging mic will automatically override the background music whenever it is used. The routing/priority switch will be set to setting “b” to accomplish this (refer to Figure 3.4).

1. **Set the input mode switch** (Figure 3.8) to the appropriate setting for each input. Input A should be set to “PHAN” for the phantom powered microphone and Input B should be set to “LINE” for the line-level feed.
2. **Set the input level controls** of Inputs A and B for the required system gain (Figure 3.8).
3. Refer to Section 3.5 and **connect the audio cables** to the appropriate inputs (A and B). Audio signals will be needed next to adjust the voice-over circuit of

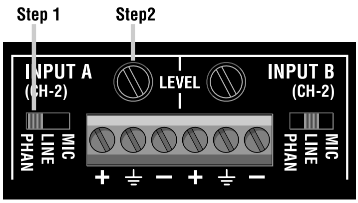


Fig. 3.8 Steps 1 & 2

Input A.

4. If you haven't yet done so, **adjust the duck level** per Section 3.2.
5. **Turn the voice-over sensitivity control of Input A to its middle setting** (setting 6 in Figure 3.5).
6. **Turn off the power amplifier** and unplug its power cord. Refer to Section 3.4 and **install the PIP into the amplifier**. Reconnect power to the amplifier and turn it on.
7. With the ambient noise level of Input A at a maximum, **check to see if Input B has ducked.**
8. **Turn off the power amplifier**, unplug its power cord and **remove the PIP again**.
9. **Adjust the voice-over sensitivity control in the following manner:** If Input B has NOT yet ducked increase the voice-over sensitivity control one mark. If it HAS ducked, decrease the voice-over sensitivity control one mark.
10. Repeat steps 6 through 9 until the setting has been found where the voice-over sensitivity control just begins to allow Input B to duck. **Back off the sensitivity control 1/4 turn from this point.** The voice over circuit should now trigger on a legitimate signal and not noise.

Notice in Figure 3.7 that turning the voice-over sensitivity control fully counterclockwise (setting 0) will turn the circuit off.

The voice-over sensitivity control has 26 dB of adjustable range. Since the voice-over circuitry follows the input mode switch and input level control, the actual sensitivity level can vary widely. To increase the relative sensitivity of the voice-over circuit, turn up the input level control and turn down the amplifier level or the remote controlled attenuator. Remember, the remote controlled attenuator is located after the voice-over circuit so it can be used to reduce the gain added with the input level control. If less relative voice-over sensitivity is desired, do just the opposite: Turn down the input level control and turn up the amplifier level control or the remote-controlled attenuator. (Refer to Figure 3.7.)

3.4 Installation Procedures

CAUTION: Before connecting this or any PIP to your amplifier, it is important to turn its level controls down, turn it off and **remove the AC power**. Don't touch the circuitry while the amp is plugged in. Even though the amplifier is off, there could still be enough energy remaining to cause electric shock.

You may need a phillips screwdriver to remove the existing PIP module or panel from your amplifier.

1. Turn down the level controls (full counterclockwise), turn off the amplifier and unplug it from the AC power source.

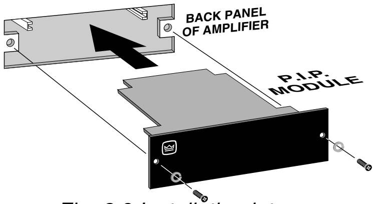


Fig. 3.9 Installation into a Standard PIP Amplifier

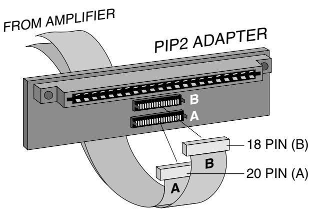


Fig.3.10 PIP2 Input Adapter Connection

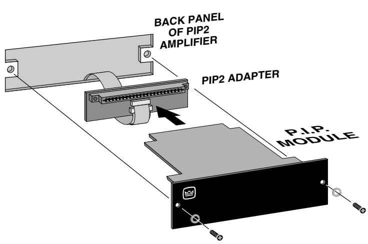


Fig. 3.11 Installation into a PIP2 Amplifier

2. Remove the existing PIP module or panel (two screws). For *PIP2* amplifiers, this may involve disconnecting the PIP from a PIP2 input adapter (see Figures 3.10 and 3.11). If a PIP2 input adapter is already present, do not remove the ribbon cables from the adapter. Otherwise you will have to reconnect them in the next step.
3. Standard PIP Amplifiers: Align the edges of the P.I.P.–RPA in the PIP card rails and firmly push the unit in until it is seated against the mounting bracket (see Figure 3.9).

   PIP2 Amplifiers: (Requires a PIP2 input adaptor. Crown part number Q43528-1.) Connect the PIP2 input adapter to the two input cables of the amplifier (see Figure 3.10). Notice that the PIP2 input adapter should be positioned with the PIP edge connector on top and facing away from the amplifier. The 20-pin cable (A) is connected first then the 18-pin cable (B) is connected. Both ribbon cables should extend below the PIP2 input adapter.

   Next, insert the edge connector of the P.I.P.–RPA into the PIP2 input adapter (see Figure 3.11) and insert the assembly into the PIP opening in the back of the amplifier.
4. Secure the P.I.P.–RPA with the two screws and lock washers provided. (The lock washers are important because they bond the PIP to the chassis ground of the amplifier.)
5. Connect input and output wiring.
6. Plug in the amplifier and turn it on. Adjust its level controls to a desired setting.

Do not tamper with the circuitry. Circuit changes made by unauthorized personnel, or unauthorized circuit modifications are not allowed.

Remember: Crown is not liable for any damage resulting from overdriving other components in your sound system.

Figure 3.12 shows how to wire a balanced and unbalanced source or daisy-chain output to the barrier block connectors.

Important: If the amplifier is used in either Bridged-Mono or Parallel-Mono mode, you must turn the Ch. 2 amplifier level control off (fully counter-clockwise). The input and level control of Ch. 2 are not defeated in mono mode so any signal applied to Ch. 2 will beat against the signal in Ch. 1.

Refer to the amplifier *Reference Manual* for more information about Bridged-Mono or Parallel-Mono modes of operation.

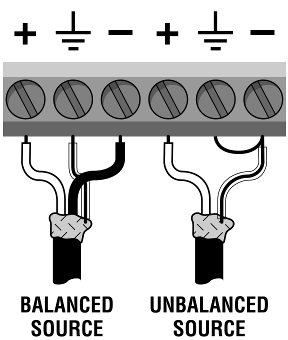


Fig. 3.12 Main Audio Input Wiring

3.5 Wiring the Audio Inputs

Because the gain of a Crown amplifier equipped with a P.I.P.-RPA can be quite high (as much as 90 dB) it is very important to exercise care when routing the input and output cables. We strongly recommended that balanced audio input wiring be used.

Important: Use shielded wire for mic input cables and avoid routing them near the output cables or noise and/or feedback oscillation may occur. It is wise to take similar precautions with line-level input cables too.

To avoid hum, do not route the input cables near power cables.

Figure 3.12 above shows how to connect the audio cables to the main audio inputs for both balanced and unbalanced sources. It is important not to strip away too much insulation from the wires before attaching them because the screw terminals are so close to the front panel. We recommend you strip away only 1/4 inch (6.4 mm) of insulation. Also, if stranded wire is used, first tin the ends before inserting them in the connector.

Important: If the amplifier is used in either Bridged-Mono or Parallel-Mono mode, you must turn the Ch. 2 amplifier level control off (fully counter-clockwise). The input and level control of Ch. 2 are not defeated in mono mode, so any signal fed into Ch. 2 will beat against the signal in Ch. 1. As a result, you should not use Input C or D unless the Tie function is on and you are mixing them into Ch. 1. Please refer to your amplifier's Reference Manual for more information about Bridged-Mono or Parallel-Mono modes of operation.

Ground Isolation

If present, ground loop problems can be reduced by unsoldering or cutting and removing the ground jumper shown in Figures 3.13 and A.1.

The jumper, labelled Z1, is located on the underneath side of the top circuit board just in front of the priority DIP switch. When it is removed, the signal ground is isolated from the chassis ground by a 82-ohm resistor and 0.1-microfarad capacitor as shown below:

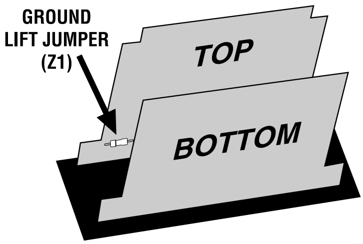


Fig. 3.13 Locating the Ground Isolation Jumper

3.6 Wiring the Remote Control Inputs

Each input has an attenuator which is remote controlled and is located in the circuit after the input mode, input level control, and voice-over/ducking circuitry. See Figure 3.19.

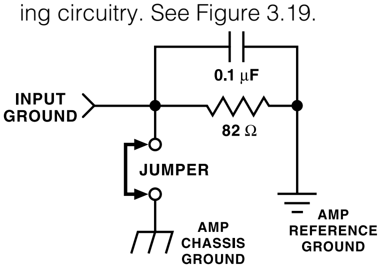


Fig. 3.14 Ground Isolation

The attenuator is a voltage-controlled amplifier (VCA) which is operated by a DC voltage range of 5 to 10 V. It has zero attenuation when it receives 10 V. **It has a maximum attenuation of 84 dB when it receives 5 V or less** (see Figure 3.15). If the VCA receives a voltage over 10 V, it will also switch to maximum attenuation. A 10-V source is provided on the PIP module for your convenience, but an external source can also be used.

A 10-Kohm, C-taper audio pot is suggested for remote lines (see Appendix A-1). Crown's RPA-RMT is ideal. Linear pots will work, but are less precise at higher output levels. Connect the pot between the PIP's 10-V output and the remote input (Figure 3.16).

Resistance	Remote Input Voltage	Attenuation
0 Ω	10 V	0 dB
30 Ω	9.97 V	0.5 dB
56 Ω	9.94 V	1.0 dB
91 Ω	9.91 V	1.5 dB
120 Ω	9.88 V	2 dB
150 Ω	9.85 V	2.5 dB
180 Ω	9.82 V	3 dB
240 Ω	9.76 V	4 dB
300 Ω	9.70 V	5 dB
360 Ω	9.64 V	6 dB
560 Ω	9.46 V	9 dB
750 Ω	9.28 V	12 dB
1 kΩ	9.10 V	15 dB
1.2 kΩ	8.92 V	18 dB
1.5 kΩ	8.74 V	21 dB
1.8 kΩ	8.6 V	24 dB
2 kΩ	8.4 V	27 dB
2.2 kΩ	8.2 V	30 dB
2.7 kΩ	7.8 V	36 dB
3.6 kΩ	7.5 V	42 dB
4.3 kΩ	7.1 V	48 dB
4.7 kΩ	6.8 V	54 dB
5.6 kΩ	6.4 V	60 dB
6.8 kΩ	6.0 V	66 dB
7.5 kΩ	5.7 V	72 dB
9.1 kΩ	5.3 V	78 dB
10 kΩ	5.0 V	84 dB

Fig. 3.15 Remote Control Resistance/Voltage

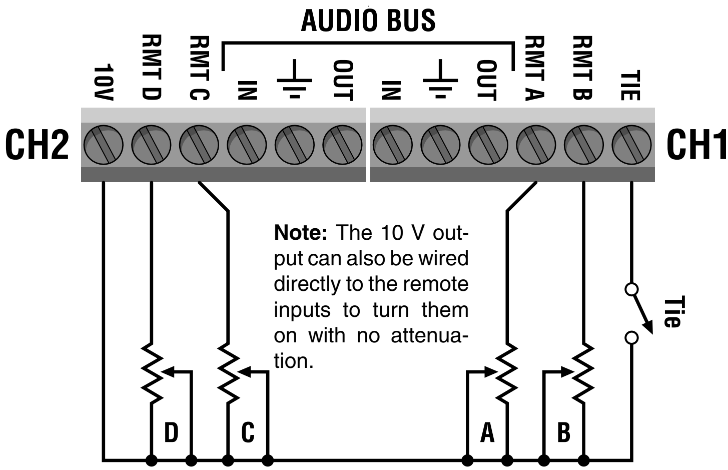


Fig. 3.16 Remote Control & Tie Function Wiring

If variable controls aren't required, the 10-V output can be connected directly to the remote control input for no attenuation, or a resistor can be used for a fixed attenuation level. The table in Figure 3.15 shows how much attenuation is achieved with different remote-control resistance values. The corresponding voltage is also provided. The input can also be easily switched on or off if a switch or relay is added to the remote control input.

A resistance of greater than 10 K ohms or a remote input voltage of less than +5V is not recommended. If a remote control wire is opened or shorted to ground, the control will default to maximum attenuation.

3.7 The Tie Input

The Tie function is provided to "tie" the audio signal and input priorities of Channel 1 and 2 together. This enables all four inputs to be mixed into one or both channels of the amplifier.

Whenever the Tie function is enabled, the audio from Input A is automatically connected to Channel 2. The routing/priority DIP switch also affects the Tie function. The tables in Figure 3.3 and 3.4 show how the audio from each input and their respective priorities are controlled by the routing/priority switch when the Tie function is on.

The Tie function is controlled by a TTL logic level circuit and is designed to be controlled remotely. It is turned on when 4.2 V or more is detected at the Tie input connector on the front panel of the PIP Simply connect a switch between the 10-V output and the Tie input as shown in Figure 3.16 to control it. If desired, the Tie func-tion can be permanently enabled by placing a jumper across the 10-V output and Tie input in place of the switch.

3.8 Using the Audio Bus

The audio bus inputs and outputs are provided so additional signals can be added to the mixed bus (input) of each channel or the mixed (output) signals can be fed to other components or amplifiers (see Section A.4 in the Appendix). As such they are very similar to the "Aux Return" and "Aux Send" connections on a typical mixer.

One common use for the audio bus inputs is to "stack" multiple P.I.P-RPAs. For example, by interconnecting the audio bus inputs and outputs of two P.I.P.-RPAs (as shown in Figure 3.17) you can create an 8x2 mixer.

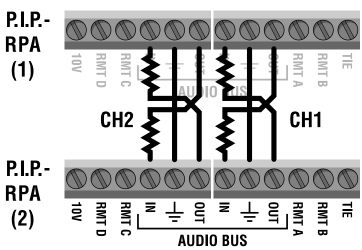


Fig. 3.17 Stacking Two P.I.P.-RPAs

The audio bus inputs are actually "current" inputs so a 10 K ohm source resistor (1/4 watt) is required for connection. This allows an almost unlimited number of sources to be connected. The best place to locate the 10-K resistor is at the input connector since this results in the lowest noise. This is shown in Figure 3.18. No resistor is required for connection to the audio bus outputs.

Since the audio bus inputs and outputs are unbalanced, two things should be considered: First, the input grounds are always "lifted" from the chassis ground. Second, in-line isolation transformers should be added for long input or output wire runs.

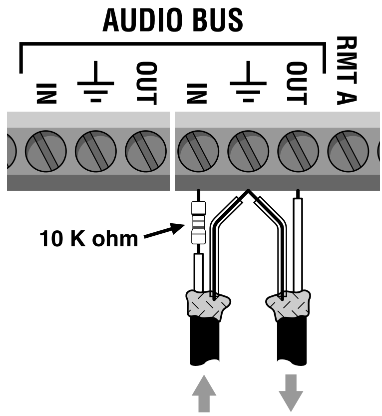


Fig. 3.18 Audio Bus Wiring

Note: Only the mixed audio signal from Inputs A, B, C, and D appear at the audio bus outputs. Any signal fed into the audio bus inputs will not appear at the audio bus outputs (to avoid a feedback loop).

Important: The polarity of the audio bus outputs is inverted. The mating audio bus inputs perform the necessary polarity inversion so that all inputs to the amplifier are the same polarity. When using the audio bus output to drive another component the signal should be connected to the (–) in put and ground.

4 Specifications

General

Note: All specifications referenced to a 0.775-V input signal.

Signal to Noise: Line: Nominally 80 dB from 20 Hz to 20 kHz. Mic: Nominally –115 dB equivalent input noise, 20 Hz to 20 kHz (Rs=300Ω).

Frequency Response: ±0.5 dB from 30 Hz to 15 kHz without isolation transformers. ±0.5 dB from 50 Hz to 15 kHz with isolation transformers.

Harmonic Distortion (THD): Less than 0.1% THD from 20 Hz to 20 kHz. Less than 0.5% THD from 30 Hz to 15 kHz at +10 dB.

Common Mode Rejection: Better than 50 dB from 20 Hz to 10 kHz. Better than 45 dB from 10 to 20 kHz. P.I.P.-RPA(T) better than 40 dB from 10 to 20 kHz.

Crosstalk: Line: Better than –60 dB from 20 Hz to 20 kHz. Mic: Better than –42 dB.

Controls: One input mode switch and one input level control for each main audio input (A–D) located on front panel of the PIP. One 8-segment priority DIP switch located on the component side of the top circuit board. One voice-over sensitivity and duck level control each for Input A and C, located on the component side of the top circuit board.

Connectors: Buchanan-type screw-down barrier connectors.

Dimensions: $6^3/_8$ x $1^7/_8$ x $3^7/_8$ in. (16.2 x 4.8 x 9.8 cm).

Main Audio Inputs

Four independent AC-coupled balanced audio inputs are provided, A–D. They are switchable as mic, line, or mic with phantom power inputs. Each input channel also includes a remote-controlled attenuator. A routing/priority switch assigns an override priority to each input. Inputs A and C each have sensing circuitry which can be used to activate an attenuation (duck) circuit to override other inputs.

Nominal Input Impedance: Line: 11.4 K ohms balanced. Mic: 1.4 K ohm balanced.

Phantom Power: 18 VDC at 9 mA with a 2 K ohm output impedance.

Recommended Source Impedance: Mic or Line: 600 ohms or less, balanced or unbalanced.

Maximum Input Level: Line: +36 dB. Mic: +16 dB.

Nominal Gain: Line: Adjustable from 0–36 dB with user-accessible gain pots. Mic: Adjustable from 20–56 dB.

Remote Control Inputs

One remote input for the attenuator of each main audio input (A–D). Two wire format requiring a 10 K ohm potentiometer across the 10 V output and the remote input terminals. Nominal input impedance of 10 K ohms. A 10 VDC source is used to control the attenuator (VCA). +10 V at the remote input yields 0 dB attenuation and +5 V or less yields a maximum 84 dB attenuation. A control voltage of less than +5V is not recommended.

Tie Input

A logic input which “ties” the audio and input priorities of the main audio inputs (A–D) together. The audio routing and priority status is set by the priority DIP switch on the top circuit board. Input impedance is 430 K ohms. Minimum voltage to force Tie function on: 4.2 V. Maximum allowable voltage for Tie to be off: 2.4 V.

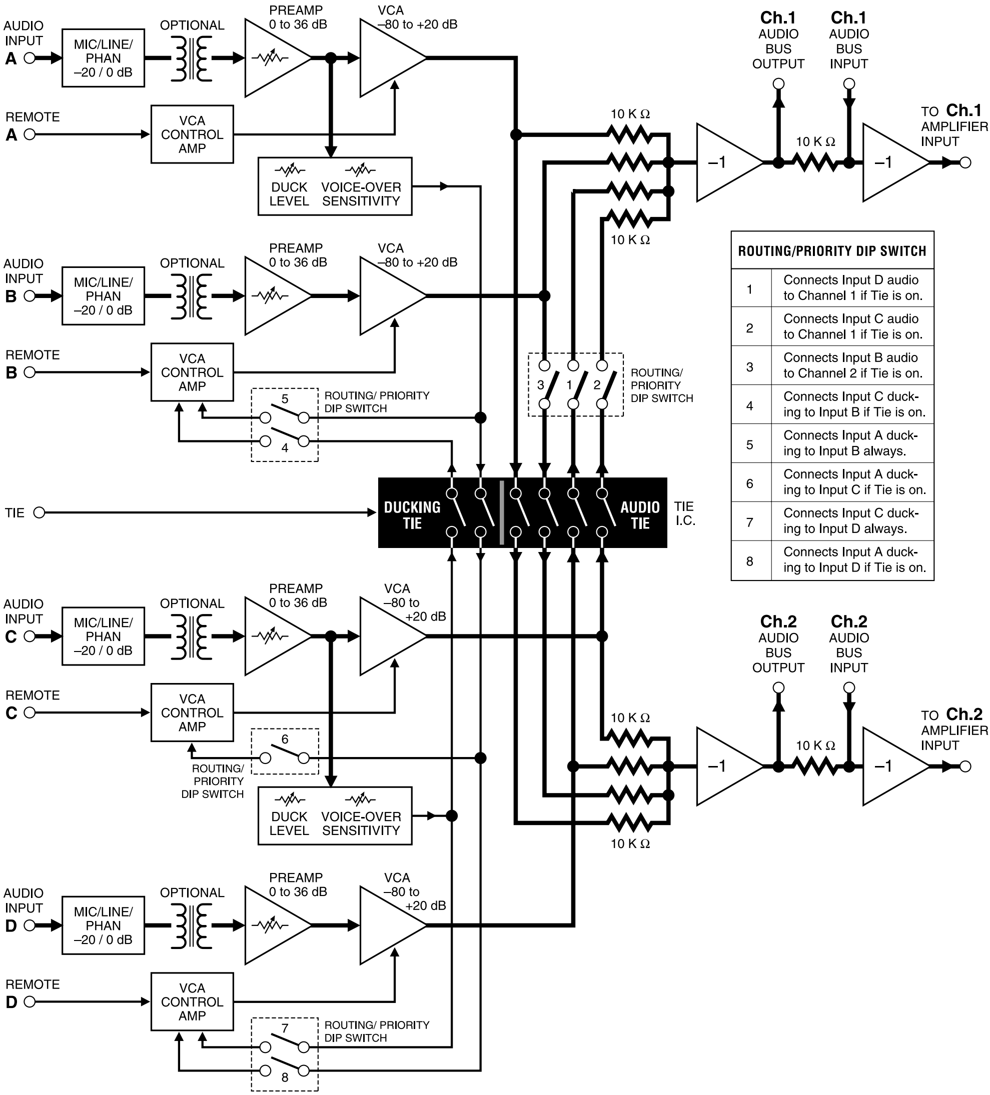
10 V Output

A 10 VDC ± 50 mV current-limited output is provided for use with the remote control inputs and the Tie input. It has a 75-ohm output impedance.

Audio Bus

Audio Bus Inputs: One independent unbalanced current summing input for each output channel of the PIP There is unity gain into either input when a 10 K ohm source resistor is used.

Audio Bus Outputs: One independent unbalanced output for each output channel of the PIP, representing the mix of the A–D main audio inputs. Suggested for use with 10 K ohm or greater input impedance. The output impedance is 75 ohms. Capable of driving a 600-ohm line to +18 dB.



ROUTING/PRIORITY DIP SWITCH

1	Connects Input D audio to Channel 1 if Tie is on.
2	Connects Input C audio to Channel 1 if Tie is on.
3	Connects Input B audio to Channel 2 if Tie is on.
4	Connects Input C ducking to Input B if Tie is on.
5	Connects Input A ducking to Input B always.
6	Connects Input A ducking to Input C if Tie is on.
7	Connects Input C ducking to Input D always.
8	Connects Input A ducking to Input D if Tie is on.

Fig. 3.19 Circuit Block Diagram

Appendix

Important: This Appendix includes instructions on how to modify the P.I.P.–RPA to accommodate special needs. Only a competent technician should attempt to make these modifications. Other than the ones described here, no other modifications are approved by Crown. If you have any questions or need further technical assistance, please contact the Crown Technical Support Group at 800-342-6939, or contact your local representative.

A.1 Custom Remote Control

This section describes (1) how to avoid problems with audio taper pots, and (2) how to get full-range control with pot values other than 10 K ohm.

A pot with an audio or log taper is called an "Autoper" pot. C-taper pots are similar to A-type pots except the tape is reversed. The P.I.P.-RPA is designed to use C-taper pots for remote level controls.

Crown's RPA-RMT is the best remote control because of its C-taper. Common A-taper sliders can be flipped to create the C-taper, but A-taper rotary pots can't be flipped. Linear pots are not recommended.

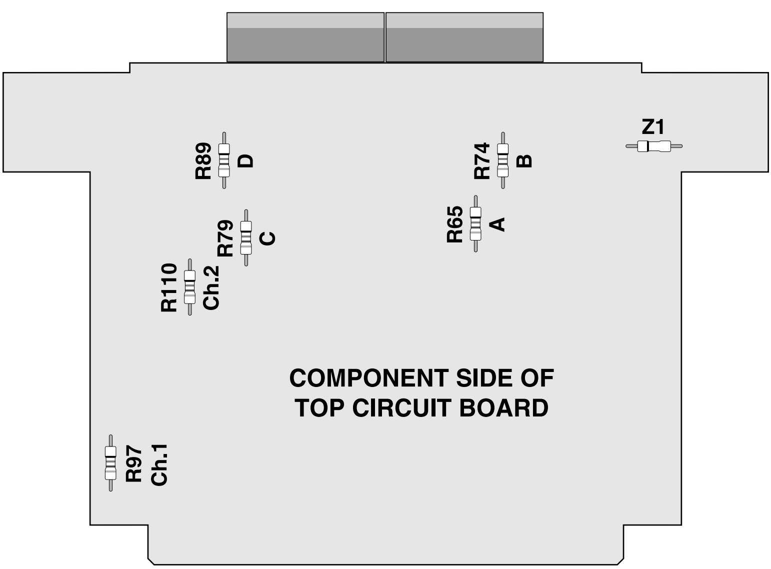


Fig. A.1 Scaling Resistors and Jumpers

Pots other than 10 K ohm will work best if you change the scaling resistors to match the pot value. For example, use a 20 K resistor for a 20 K pot. Do not exceed 50 K. The scaling resistor locations are shown in Figure A.1. Resistor R65 is used for Input A, R74 for Input B, R79 for Input C, and R89 for Input D.

Remove the front panel (4 screws) from the top and bottom circuit boards to access the scaling resistors. With the panel removed, separate the circuit boards by pulling them straight apart. Take care not to bend the long connector pins which connect the two boards. For more help, contact Crown's Technical Support Group at 800-294-6939.

A.2 Master Remote Control

If desired, the attenuation of more than one input can be controlled with just one master remote control pot. In fact, all of them can be controlled from one pot. One input will be the master and all others grouped with it will be clients. The procedure is simple:

1. Select which input you want to use as the master input. Connect the remote control pot to it. (Input A is the master in Figure A.2.)
2. Remove the appropriate scaling resisters from all but the master input. (Figure A.1.)
3. Jumper the master remote pot to all the client remote control inputs.

To control the level of Inputs A and C with the pot for Input A, remove the Input C scaling resistor (R79) and add a jumper between the A and C remote inputs as shown in Figure A.2.

A.3 Limiting Remote Attentuation

Depending upon the installation, it may be desirable to limit the maximum remote attenuation. For example, you may want to decrease the sensitivity of the remote control pot so it must be rotated farther for a given amount of attenuation. You may also want to prevent someone from turning a microphone down too low.

Figure A.3 shows a simple way to do this by placing a resistor in parallel with the 10 K remote control pot.

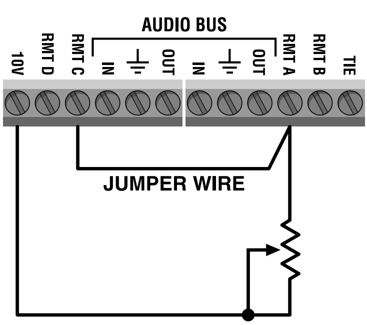


Fig. A.2 Master/Client Remote Control Wiring

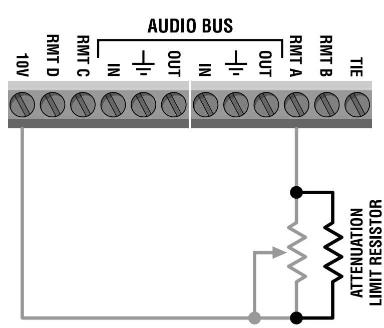


Fig. A.3 Adding an Attenuation Limit Resistor Parallel to the Remote Pot

The table in Figure A.4 shows the resistor value to use for different maximum attenuation values.

Note: The values in Figure A.4 are for use with a 10 K remote control pot only. If a different value pot is used, the following equation will solve for the correct resistor value:

"R_L" is the value of the limit resistor in kilohms. "V_L" is the minimum desired remote control voltage in volts. It can be found by selecting the maximum desired attenuation from either Figure A.4 or 3.15 and reading the voltage required for that attenuation. "R_P" is the value of the pot used for the remote control in kilohms.

$$R_L = \frac{(10 - V_L)\, R_P}{2V_L - 10}$$

Limit Resistor Value	Remote Input Voltage	Maximum Attenuation
180 Ω	9.82 V	3 dB
390 Ω	9.64 V	6 dB
620 Ω	9.46 V	9 dB
820 Ω	9.28 V	12 dB
1.1 kΩ	9.1 V	15 dB
1.3 kΩ	8.92 V	18 dB
1.6 kΩ	8.74 V	21 dB
2 kΩ	8.6 V	24 dB
2.7 kΩ	8.2 V	30 dB
3.9 kΩ	7.8 V	36 dB
5.1 kΩ	7.5 V	42 dB
6.8 kΩ	7.1 V	48 dB
9.1 kΩ	6.8 V	54 dB
13 kΩ	6.4 V	60 dB

Fig. A.4 Remote Control Limit Resistor Value/Max Attenuation

Remember: If a remote control pot value other than 10 K ohms is used, the scaling resistor will also have to be changed as described in Section A.1.

A.4 Signal Processing

It is possible to use the audio bus inputs and outputs as a processor loop for a compressor, limiter or equalizer. To do this, remove resistor R97 for Channel 1 and R110 for Channel 2. They are located on the top circuit board and are shown in Figures A.1 and 3.19. Section A.1 contains brief instructions for gaining access to the component side of the top circuit board.

After the components are removed, use the audio bus output to drive the input of the external processor (remember, these are unbalanced lines). Connect the output of the external processor to the audio bus input through the specified 10 K resistor (see Section 3.8). See Section 4 for the input and output capabilities of the audio bus.