

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.

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:

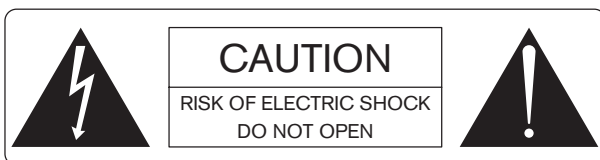
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION: Changes or modifications not expressly approved by Rane Corporation could void the user's authority to operate the equipment.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

WARNING



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

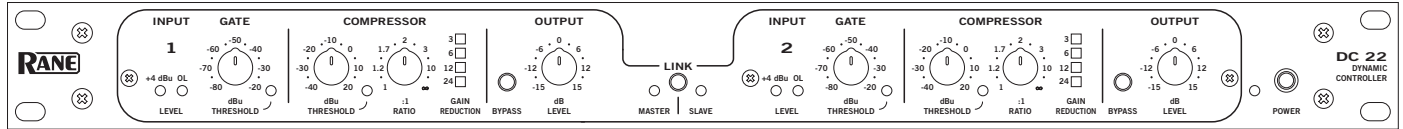
The symbols shown below are internationally accepted symbols that warn of potential hazards with electrical products.



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.



QUICK START

Shredded, this document makes excellent packing material. In its present form, it makes interesting and useful reading. If you run out of patience quickly, at least read this part to make sure you don't exterminate everything within a two mile radius by doing something wrong.

First, be sure the **POWER** switch is off. Attach one or two channels of Inputs and Outputs to the respective connectors on the rear. *This device uses low impedance balanced line drivers. Do not connect the XLR "+" or "-" output pins to ground, as this may cause the power supply to shut down. For unbalanced use, leave the unused output pin ("+" or "-") unterminated.* OK, now you can power up your sound system, volumes down, amp turned on *last*.

With the **GATE THRESHOLD** turned all the way *down* to **-80 dBu**, **COMPRESSOR THRESHOLD** turned all the way *up* to **20 dBu**, **COMPRESSOR RATIO** turned all the way *down* to **1**, and the **OUTPUT LEVEL** control in the *center* at **0 dB**, you have an expensive patch cord.

While sending a signal to the DC 22, adjust the output level of the previous device so the **+4 dBu** LED lights occasionally, but the **OL** LED does not light. If you are driving the 1/4"

INPUTS with a balanced signal (tip-ring-sleeve), set the Input Gain switch to **+4 dBu (in)**. When driving this input with an unbalanced signal (tip-sleeve), set this switch to **-10 dBv (out)**. Regardless of the type of Input, you might need to set this switch so the **INPUT LEVEL** LEDs light correctly.

Now increase the **COMPRESSOR RATIO** to something useful, like **2:1** (with the control set at 2, the Ratio is 2:1; at 5, it is 5:1.) Adjust the **COMPRESSOR THRESHOLD** to the point you want the Compressor to kick in. The **GAIN REDUCTION** meter reads the amount of signal compression.

If you want the quiet parts to be even quieter, increase the **GATE THRESHOLD** so only higher levels make it through the Gate.

Both Gates and Compressors will activate by the source material applied to either channel if the **LINK** switch is on. This is the preferred setting for stereo program material. The channel 1 controls set both channels to the same adjustments, as the channel 2 controls go dormant and the LEDs extinguish. If the **LINK** switch is off, then both channels are independently controllable.

Front Panel Description

INPUT LEVEL indicators: With signal applied, the +4 dBu LED may light occasionally. If the OL (overload) LED flashes, turn the output level down on the previous device.

GATE THRESHOLD control sets the point at which the Input signal level causes the Gate to become active.

COMPRESSOR THRESHOLD control sets the point at which the Input signal level causes the Compressor to become active. See Figure 1 on page Manual-4.

COMPRESSOR RATIO control: Once the Threshold is exceeded, the Ratio of input change to output change is determined by this control. The compressor has no effect when set at 1:1. But at 10:1, it takes a 10 dB input signal increase above the Threshold to produce a 1 dB increase in Output Gain. See Figure 2 on page Manual-4.

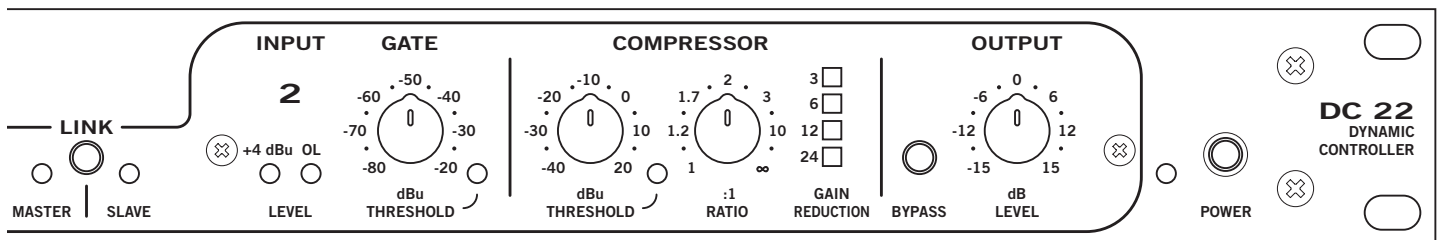
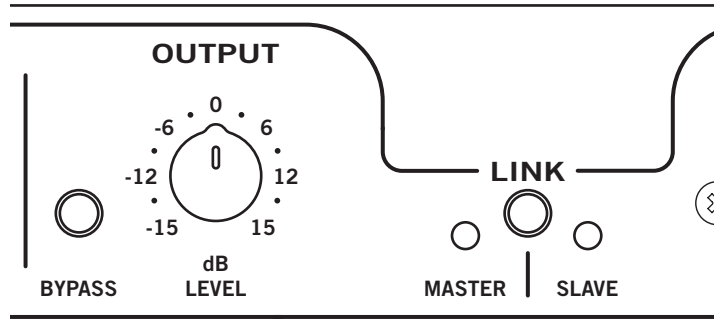
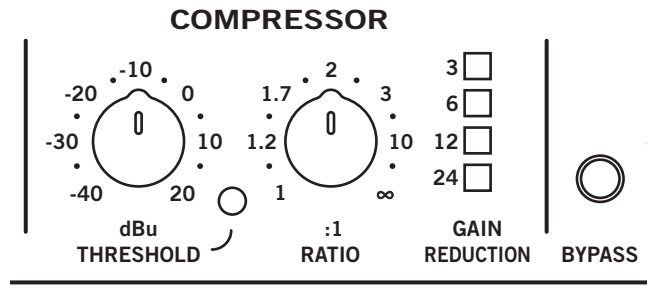
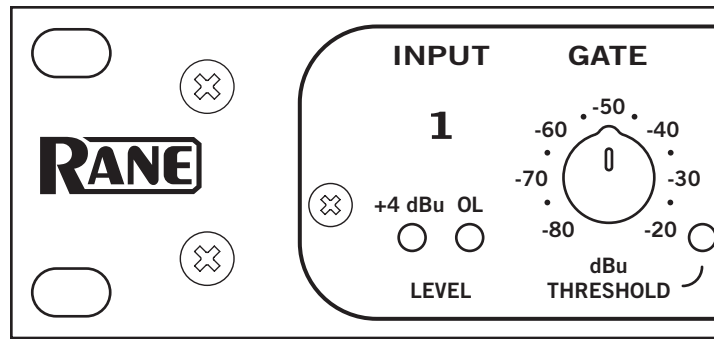
GAIN REDUCTION LEDs show the amount of average signal reduction in dB. This aids in setting the THRESHOLD and RATIO controls by showing how much compression is occurring.

BYPASS switch compares the compressed and non-compressed signal. There is one for each channel. The INPUT LEVEL indicators remain active regardless of switch position.

OUTPUT LEVEL control increases or decreases the output gain of each Channel by 15 dB. In the center detent, gain will be unity.

LINK switch activates both Compressors when either channel's signal exceeds the set Threshold, preserving stereo imaging. Switch this ON when using stereo material. The channel 1 controls become the Master when this switch is active, rendering the channel 2 controls and indicators dead.

Channel 2 controls duplicate the controls in channel 1. These are not active if the LINK switch is engaged.



Power switch is your basic, straightforward power switch. When the switch is depressed and the yellow LED is lit, the DC 22 is ready to go.

Rear Panel Description

WIRING

3-PIN XLR:

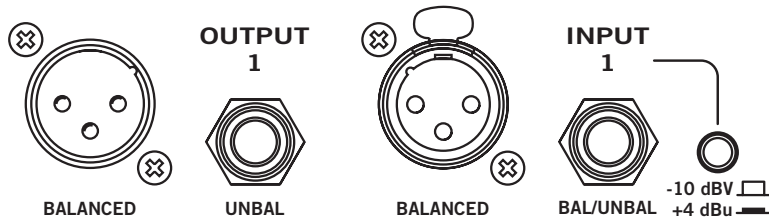
PIN 1 = CHASSIS, SHIELD, PIN 2 = (+), PIN 3 = (-)

1/4" PHONE, BALANCED:

TIP = (+), RING = (-), SLEEVE = CHASSIS, SHIELD

1/4" PHONE, UNBALANCED:

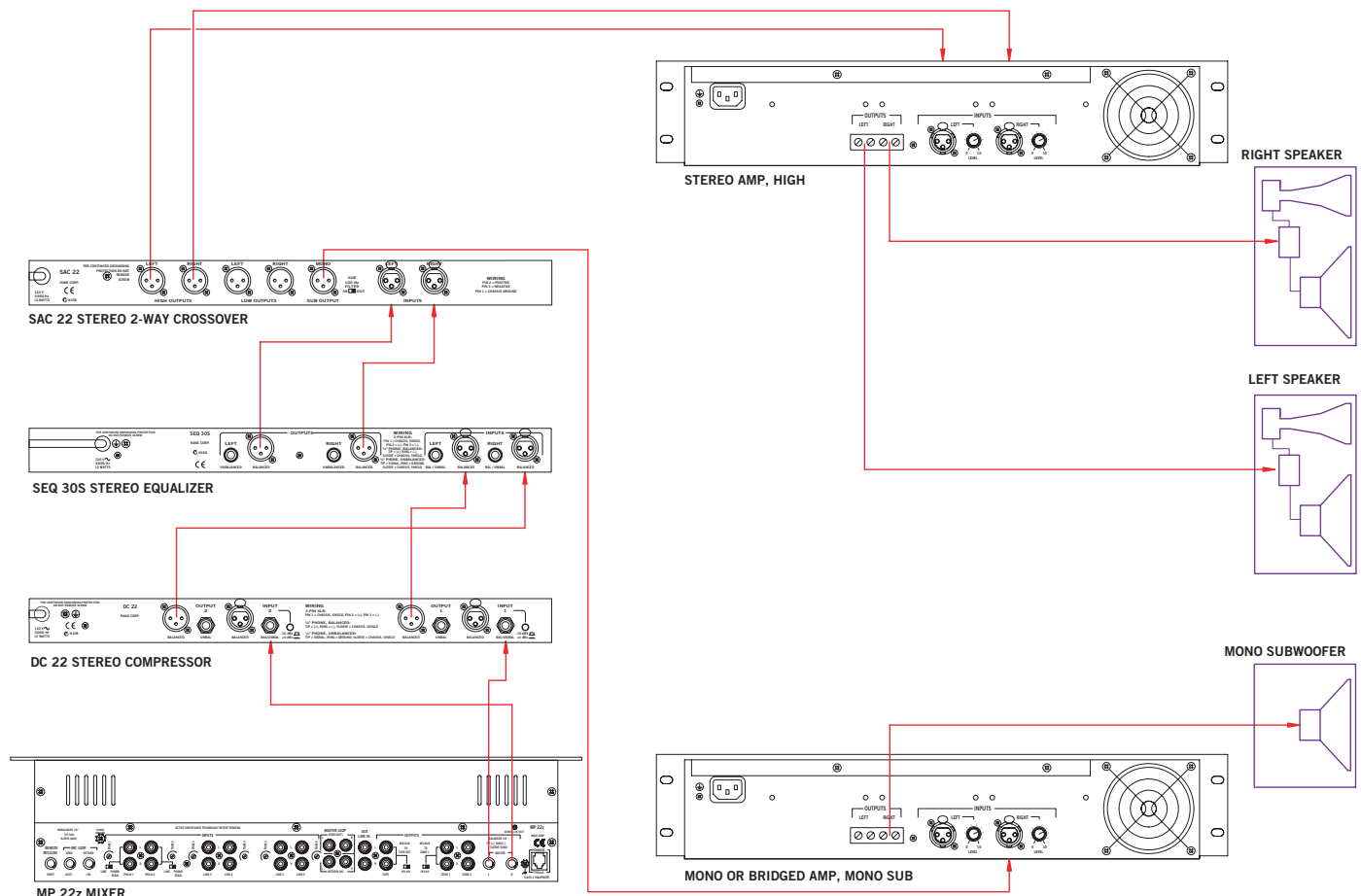
TIP = SIGNAL, RING = GROUND, SLEEVE = CHASSIS, SHIELD



INPUTS 1 and 2: Choose between the balanced XLR or the balanced/unbalanced 1/4" TRS jacks, but only use one. Inserting a 1/4" TS jack will work—however—we recommend using balanced lines, especially when connecting any cable over 10 feet (3 meters) in length. Consult the Sound System Interconnection RaneNote provided with this manual.

INPUTS 1 and 2 Gain Trim Switch: In its +4 dBu position, the Input gain of the respective channel is unity. In the -10 dBV position, the input gain is increased by 12 dB (although mathematically suspicious, it really is 12 dB, not 14 dB) to compensate for certain recording devices. This switch must be in the +4 dBu position for front panel calibration accuracy.

OUTPUTS 1 and 2 are delivered by the balanced XLR or the unbalanced 1/4" TS jacks. Using both types of Outputs are permissible to drive two devices, such as an amplifier and a recorder. *This device uses low impedance balanced line drivers. **Do not** connect the XLR "+" or "-" output pins to ground, as this may cause the power supply to shut down. For unbalanced use, leave the unused output pin ("+" or "-") unterminated.*



System wiring example for a DJ system

OPERATING INSTRUCTIONS

A PRIMER

Let's start with what a compressor actually does. No matter how you cut it, this is an automatic volume control. It is a hand on a knob, turning the volume down and turning it up again. The hand is really quick and really accurate, but it's just turning a volume control.

When the input signal reaches a level set by the COMPRESSOR THRESHOLD control, the compressor begins turning down the signal by an amount determined by the RATIO control. The DC 22, like most compressors, operates by making the loud signals quieter, but does not make the quiet parts louder. However, by keeping the loud signals under control, the entire system may be turned up when necessary to make the quiet parts louder.

PRE-FLIGHT CHECKLIST

Before proceeding, it's a good idea to turn the control knobs to the following positions:

1. GATE THRESHOLD controlfully counterclockwise
2. COMPRESSOR THRESHOLD ...fully clockwise
3. COMPRESSOR RATIOfully counterclockwise
4. BYPASS switches.....ACTIVE (out)
5. OUTPUT LEVEL.....0 dB

This renders the DC 22 with no compression, allowing signal through at unity gain. No change occurs with the BYPASS switch *in* or *out*.

INPUT LEVEL

Before making any Threshold adjustments, set the output level of the previous device so the +4 dBu LED lights occasionally, and the OL LED does not light. Be aware that changes to the Input Level will affect the Thresholds.

GATE THRESHOLD

The threshold is the point at which gain adjustment begins. When the input signal is below the threshold, the DC 22 attenuates the signal at a 2:1 ratio, making the quiet parts twice as quiet. When the signal is above the Gate Threshold, the Gate is open, like a straight wire.

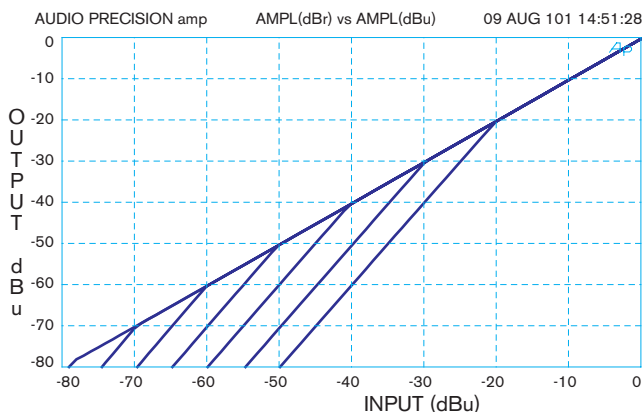


Figure 1. With a fixed Ratio set to 2:1, this graph shows gain reduction below various Gate Thresholds at -20 dBu, -30 dBu, -40 dBu, etc.
Manual-4

COMPRESSOR THRESHOLD

The threshold is the point at which gain adjustment begins. When the input signal is below the threshold, the Compressor section acts like a straight wire. When the signal is loud enough to cross the Compressor Threshold, the compressor is active and turns the volume down. Various Threshold points are illustrated in Figure 1. How *much* it gets turned down is determined by the RATIO control (Figure 1 shows a Ratio set at 2:1).

RATIO

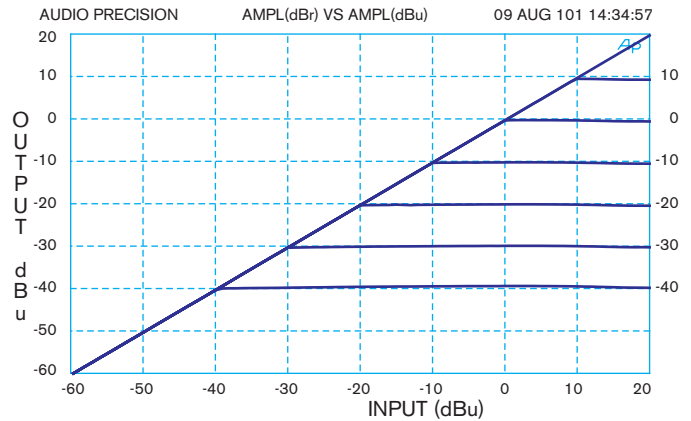


Figure 2. With the Ratio set to ∞ , the DC 22 acts as a Limiter. This graph shows Limiter gain reduction above various Compressor Thresholds at 10 dBu, 0 dBu, -10 dBu, etc.

Once the Threshold is exceeded, the increase in output compared to the input signal increase depends on the RATIO setting. An ordinary preamp set for unity gain or a straight wire has a ratio of 1:1, that is, the output level tracks the input level perfectly. A 2 dB change at the input produces a 2 dB change at the output.

For a 10:1 Ratio, a 10 dB blast at the input would rise only 1 dB at the output – *heavy* compression. Kinder, gentler ratios are in the 2:1 to 3:1 range. Limiting, with no increase in signal above the Threshold, occurs at ∞ :1. Figure 3 illustrates various Ratios.

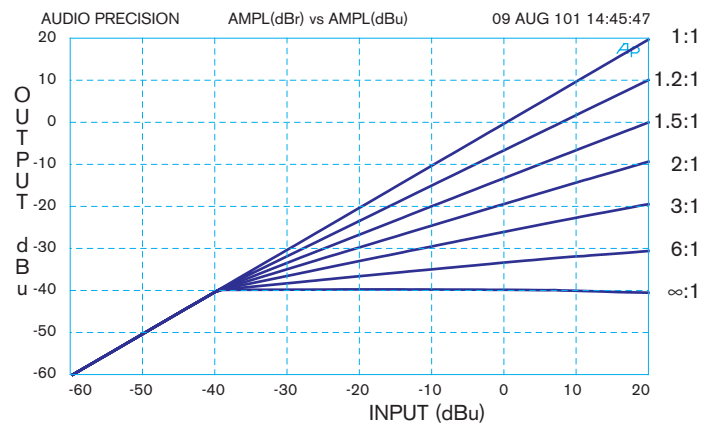


Figure 3. Threshold at -40 dBu. Ratios of 1:1, 1.2:1, 1.5:1, etc.
Vertical axis = output level, horizontal axis = input level.

LIMITING

A limiter is a special form of compressor set up especially to reduce peaks for overload protection. In other words, it's a compressor with a maximum ratio. A compressor is used to change the dynamics for purposes of aesthetics, intelligibility, recording or broadcast limitations. Once the threshold of a limiter is reached, no more signal increase is allowed. The DC 22 acts as a limiter when set at a very high ratio of 10:1.

LINKING IN STEREO

When using the DC 22 as a true stereo processor, with left signal in Channel 1 and right signal in Channel 2, it is recommended to turn the LINK switch *on* to prevent large balance and image shifts. While LINKed, both Channels attenuate by exactly the same amount when either Compressor works, maintaining correct stereo imaging. Only Channel 1's controls are active, Channel 2 becomes the slave.

DC 22 APPLICATIONS

TWO CHANNEL COMPRESSOR/LIMITER

In this case, the audio path on Channel 1 is completely separate from Channel 2, allowing you to use it as a stereo unit *or* for doing two completely different processes to two completely different signals. For stereo use, the front panel LINK switch allows you to link Channels. When either Channel's Threshold is reached, both channels compress equally, preserving the stereo image. Channel 1's Threshold and Ratio settings will affect both Channels.

GUITAR & BASS

Where does the unit go in the signal chain? Well, that depends on how you want it to function. If it's a comp/limiter for the input signal, it would go after the guitar (if the guitar has a line-level output) and before the preamp. If it's to function as a limiter to protect the speakers in the rig, it would go after the preamp and before the power amp. Another method is to insert the unit in the effect loop of the preamp. This allows the bass signal to be affected by the pre-amp first, then the comp/limiter, and then sent to the power amp. This can be desirable with tube pre-amps.

RECORDING

Use it on bass guitar, piano, drums, or vocals—as an effect or to tailor dynamic range for a particular recording medium. Patch it between line-level devices or in your mixer inserts or “loops”. The DC 22 gives you more control and a less tortured sound, and keeps instruments sounding “up-front.” In digital recording, compress an extremely wide dynamic range into a signal that won't go into digital overload, i.e. severe clipping. This is really valuable during a live digital recording when you just don't know how loud it may get, and digital distortion can ruin an otherwise good take. Set both the COMPRESSOR THRESHOLD and

RATIO relatively high, just enough to limit the peaks. Set the GATE THRESHOLD very low, though you might want to raise it just above the noise floor to get rid of tape hiss or processor noise.

Of special interest are instruments which have large level differences in their tonal ranges. String pops on a bass are one example, shrill peaks on a flute are yet another. The higher tones require more breath and can seem much louder than lower pitches. Another good application would be a drum mix or vocal submix.

LONG DISTANCE LINE DRIVER

The DC 22 is excellent as a line level amp for driving long lines (from the mixer to the stage for instance). With the COMPRESSOR switch in the BYPASS position, the INPUT LEVEL control and the output amplifiers remain in the circuit. This provides a very low distortion, low noise line driver. Balanced XLR connections are recommended for the long run from the DC 22's outputs (anything over 10 feet [3 meters]). A balanced piece of equipment (equalizer or amplifier) must be used at the receiving end of this long line.

For unbalanced systems, use the 1/4" inputs on the DC 22 and use the balanced XLR outputs to run the long distance. See the RaneNote “Sound System Interconnection” included with this manual for proper cable wiring.

SOUND SYSTEM WITH COMPRESSION

Let's run a stereo system with compression. For this example, we use a Rane SAC 22 2-Way Crossover and a SEQ 30S Stereo Equalizer along with the DC 22 Stereo Compressor. See the wiring diagram on page Manual-3.

Patch the DC 22 Compressor Inputs from the program source or mixer outputs, and send the DC 22 Outputs to the system equalizer (if you have one), and then on to the crossover inputs (if you have one). Set the equalizer and crossover Inputs to unity gain. Set the LINK switch to ON, and adjust the CHANNEL 1 COMPRESSOR THRESHOLD and RATIO controls to keep the entire system dynamic range under control. Locating the compressor before the equalizer results in correct spectral balance during compression.

DRIVER PROTECTION

To individually limit Low and High drivers in a biamped system, connect the Crossover Low Output into one DC 22 Input, and the High Output into the other DC 22 Input. The DC 22 Outputs go right to the respective low and high frequency power amplifier inputs. For a stereo configuration use two DC 22 Stereo Compressors. Be sure the LINK switch is OFF. Set the RATIO controls to 10:1.

Assuming your input signal has peaks in excess of -20 dBu, you should be able to rotate the COMPRESSOR THRESHOLD controls and see some GAIN REDUCTION meter action. You should begin to hear the difference. Leave these controls at whatever level is appropriate for your application. For the most precise settings, see the section on the next page.

DRIVER PROTECTION FINE TUNING

1. Determine the driver's maximum continuous average power rating in watts (W) (specified by the manufacturer).
2. Determine the driver impedance "z" in ohms (specified by the manufacturer).
3. Using the data in steps (1) and (2) above, calculate the maximum signal level in dBu that the driver can handle.
Max dBu = $20 \cdot \log(\sqrt{(w \cdot z)}/1.775)$.
4. Determine the gain of the amplifier in dB (if the amplifier has a level control, you may wish to measure the gain). If, i.e., you put 1V in, how many volts come out? Then convert to dB ($20 \log$ gain).
5. Subtract the gain of the amplifier in dB from the answer in step (3) to obtain the correct DC 22 COMPRESSOR THRESHOLD.
6. Set the DC 22 RATIO to 10:1.

NOTES

Any change in amplifier sensitivity setting will effect the power limit to the driver.

If the DC 22 is placed just before the amplifier, no other system levels will effect the power limit setting.

EXAMPLE

1. Driver power rating: w = 100 watts.
2. Driver impedance: z = 4 ohms.
3. $20 \cdot \log(\sqrt{(w \cdot z)}/1.775) = 28.2$ dBu.
4. Amplifier gain is 30 dB (1V in equals 31.6 V out).
5. Set the DC 22 COMPRESSOR THRESHOLD control to 28.2 dBu-30 dB = -1.8 dBu.
6. Set the DC 22 RATIO control to 10:1.