ACP-22

**Two Channel Stereo
Compressor/Limiter/Gate**

User's Manual

VERSION 1.1

PreSonus
Audio Electronics

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Overview

1.1   Introduction

Thank you for purchasing the PreSonus ACP-22 dual channel/stereo dynamics processor with full featured gates. This processor was designed using state of the art components to deliver crystal clear compression and noise gating for an infinite period of time. We believe that it is an exceptional sounding unit as well as an exceptional value. Feel free to contact us at 1-800-750-0323 anytime for any reason whatsoever. We value your suggestions and your comments!

Please pay close attention to how you connect your ACP-22 to your system. Improper grounding is the most common cause of noise problems found in studio or live sound systems. We urge you to at least scan this manual before hooking up your ACP-22 to become familiar with its features and various applications.

Good luck and enjoy your ACP-22!

1.2   Features

The following is a summary of your ACP-22's features:

·   **Full Featured Compressors/Limiters**. Both channels of your ACP-22 contains an audio compressor that can also be setup as a limiter by varying the ratio of compression. You have broad control over threshold, ratio, attack and release for each processor. You can select between auto or manual attack and release curves and hard or soft knee compression types (refer to the application section of this manual for a quick tutorial on compression and limiting). The compressor will prove to be very useful in many situations such as recording instruments or vocals that vary in loudness, or setting it up as a soft limiting device before your digital recorder to prevent distorting your digital recorder's inputs. The stereo mode of operation is ideal for use on the master output of your console whether you are mixing down or for live sound reinforcement.

Two Dynamic Noise Gates. Both channels of your ACP-22 have a separate dynamic noise gate that can be used to gate a drum, clean up a noisy tape machine, isolate an instrument or separate a vocal from background noises. Each noise gate provides control over attack, threshold, release and gate

close range. The gate close range is useful for creating a more natural, acoustic sounding blend or mix.

· **Stereo Channel Linking.** Using the Link function, you can link together both channels of the ACP-22 for stereo operation. When linked, both processors follow the setting of channel one which becomes the master.

· **Separate Bypass and Gain for Both Channels.** Both channels have a separate bypass for listening to 'before and after' performance tests and a gain control to make up for any level lost from compression.

· **Compressor Sidechain Jack on Each Channel**. Both channels of your ACP-22 were designed with a special jack for spectral processing, compression keying and ducking applications. Sidechaining is useful for removing annoying sibilance from vocal tacks (de-essing) or automatically ducking tracks behind a narrator for 'auto mixing' a service, broadcast or performance. When both channels are linked together, the send of the sidechain jack of the master channel contains a mix of both the channels in the link; a cool feature that allows for control over both channels of processing with one sidechain send/return. (See the section on sidechaining for application notes.)

· **Separate Gate Keying Jacks for Each Channel.** Your ACP-22 also includes a separate jack on each channel for gate keying. This is useful for synching an external sound to a snare track for example or putting equalizers or filters before the gate key to enable gating only the lower frequency of a kick drum, etc.

· **Balanced XLR and Unbalanced 1/4" Tip/Sleeve Inputs and Outputs.** Your ACP-22 accepts XLR connectors for balanced or 1/4" TS for unbalanced inputs and outputs.

· **+4dBu or -10dBV.** The internal operating level of your ACP-22 can be switched between +4dBu (pro levels) to -10dBV (line levels) for ease of use in any situation.

To Get Help...

Call Us: 1-800-750-0323, 9AM to 5PM, CST

Visit our World Wide Web site: http://www.presonus.com

Email Us: presonus@presonus.com

2.1 Front Panel Basic Layout

Notice that the front panel is divided into two identical sections. These are the two signal processing channels of the ACP-22. Each channel contains:

· Compressor/Limiter;

· Noise Gate;

· Gain (output control);

· Link & Bypass Control.

2.2 Compressor Controls

Threshold

The Compressor **threshold** sets the level at which the **onset** of compression begins. When the signal is **above** the **threshold** setting, it becomes 'eligible' for compression. Turning the **threshold** knob counter-clockwise causes more of the input signal to become compressed if you have a ratio setting of **greater than 1:1**.

Controls & Connections

Ratio

Ratio sets the compression slope. This can be defined as the output level versus the input level. For example, if you have the ratio set to **2:1**, any signal levels above the **threshold** setting will be compressed at a compression ratio of **2:1**. This means that for every ldB of level increase into the compressor, the output will only increase 1/2dB, thus producing a compression gain reduction of 0.5dB. As you **increase** the ratio, the compressor gradually becomes a **limiter**. A **limiter** is defined as a processor that limits the level of a signal to the setting of the **threshold**. For example, if you have the **threshold** knob set at **0dB**, and the ratio turned fully **clockwise**, the compressor becomes a **limiter** at **0dB**. This means that the signal will be limited to an output of 0dB regardless of the level of the input signal.

Attack

Attack sets the speed at which the compressor 'acts' on the input signal. A **slow** attack time (fully clockwise) allows the beginning envelope of a signal (commonly referred to as the initial transient) to pass through the compressor uncompressed, whereas a **fast** attack time (fully counter-clockwise) subjects .the signal to the ratio and **threshold** settings of the compressor instantaneously.

⚠️**The Attack control is only active when the Auto button is <u>not</u> pushed in. When the auto button is pushed in, the compressor automatically determines the appropriate attack time for compression.**

Release

Release sets the length of time the compressor takes to return the gain reduction back to zero (no gain reduction). Very short release times can produce a very choppy or 'jittery' sound, especially in low frequency instruments such as a bass guitar. Very long release times can result in an over compressed sound, sometimes referred to as 'squashing' the sound. All ranges of release can be useful at different times. You should experiment to become familiar with the different sound possibilities. (Refer to the applications section of this manual for some ideas.)

⚠**The Release control is only active when the Auto button is <u>not</u> pushed in. When the auto button is pushed in, the compressor automatically determines the appropriate release time for compression.**

Soft

The Soft button selects from soft knee and hard knee compression curves. When this button is pushed in, soft knee compression curves are used, otherwise hard knee compression curves are used. With hard knee compression, the gain reduction applied to the signal occurs as soon as the signal exceeds the level set by the **threshold**. With soft knee compression, the onset of gain reduction occurs gradually after the signal has exceeded the **threshold**, producing a more musical response (to some folks).

Auto

When pushed in, the auto button places the compressor in automatic attack and release mode. The attack and release knobs become inoperative and a pre-programmed attack and release curve is used.

2.3 Gate Controls

Threshold

The gate **threshold** sets the level at which the gate opens as indicated by the 'OPEN' LED **above** the **threshold** knob. All signals above the **threshold** setting are passed through unaffected, whereas signals **below** the **threshold** setting are reduced in level by the amount set by the range control. The

Controls & Connections

'CLOSE' LED above the **threshold** knob indicates when the gate is closed (the signal level is **below** the **threshold**). If the **threshold** is set fully counter-clockwise, the gate is turned off (always open), allowing all signals to pass through unaffected.

Attack
The gate attack time setting determines the rate at which the gate opens. Faster attack times are normally useful for gating percussive instruments such as drums, etc. Slowing the attack time will eliminate any 'pops' are 'clicks' in the gate when gating vocals, instruments, etc.

Release
The gate release time determines the rate (speed) at which the gate closes. This is indicated by observing the OPEN and CLOSE LED's. As the release time is lengthened (clockwise), you will notice

that the CLOSE LED reflects the close time. Release times should typically be set so that the natural decay of the instrument or vocal being gated is not affected. Shorter release times help to clean up the noise in a signal but care must be taken, especially with regards to percussive instruments, to avoid gate 'chatter'. Longer release times usually eliminate 'chattering' and should be set by listening carefully for the most natural release of the signal to which the gate is being applied.

Range
The gate range button sets the amount of gain reduction occurring when the gate closes. Therefore, if the range button is pushed in (led on), the signal will be gated (reduced) by 60dB as it crosses below the **threshold**. If the gate range button is out (led off), the signal will be **gated** (reduced) by 6dB as it crosses below the **threshold**. The CLOSE LED above the **threshold** knob indicates this by changing brightness relative to the range amount. When the range is set to 60dB, the CLOSE LED will illuminate to its brightest level at the end of the release time which has been set by way of the release control.

Filter
The filter feature of your ACP-22 modifies the audio signal such that the gate is less sensitive to high frequency instruments. This means that when the filter is active, the gate will only open for those instruments with lower frequencies. The filter is set for -6dB at 2.5kHz. The filter rolls off the high

frequencies at -12dB per octave. This feature is extremely useful when gating drums where it would be great to stop the cymbals from opening up the tom-tom gates, etc.

2.4 Gain

Gain

When compressing a signal, gain reduction usually results in an overall reduction of level. The gain control allows you to restore the loss in level due to compression. (Like readjusting the volume.)

2.5 Bypass & Link

Bypass

Activating the bypass effectively removes all processing being performed by your ACP-22 and returns the signal to unity gain. You should use bypass often when setting up your ACP-22 to compare the 'before and after' results of the signal processing effecting your audio signal. Bypass affects both the gate and the compressor. When in **Bypass** the Link function is interrupted and **defeats** the stereo link.

Link

When the Link button is pushed **in**, channel One becomes the master controller of both channels. Channel Two's controls become disabled and metering becomes summed left and right, i.e. stereo mode. **IMPORTANT: When the two channels are linked (link button pushed in), all of channel Two's controls are inactive.**

2.6 Patch Panel (Back)
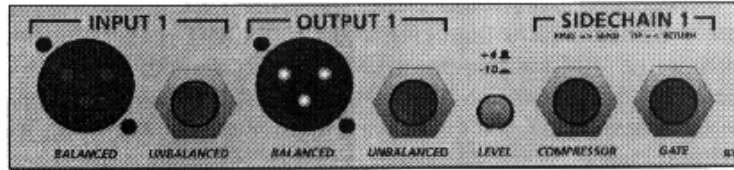
Input

The input jacks are unbalanced tip/sleeve connectors or balanced XLR connectors. The input can handle up to +24dBu unbalanced or up to +18dBu balanced signal levels.

Output

The output jacks accept balanced XLR or unbalanced tip/sleeve connectors. The output will deliver up to +24dBu in signal level, balanced or unbalanced.

Unbalanced Connection

TIP = HIGH

SLEEVE = GND

Compression and Gate Sidechain

TIP = RETURN

SLEEVE = GND
RING = SEND

XLR Balanced Input/Output

PIN 1 = GROUND
PIN 2 = HI (HOT)
PIN 3 = LOW (COLD)
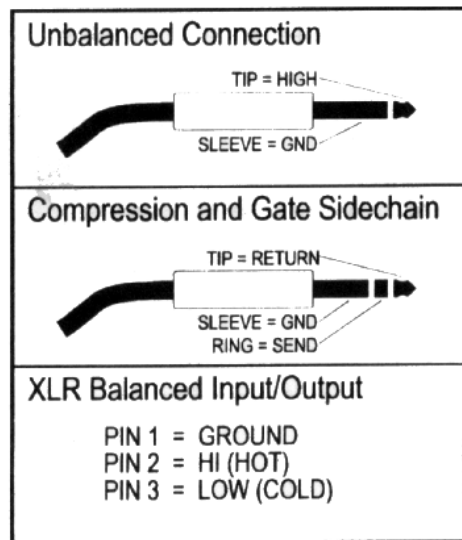
Cable Connection Diagrams

Controls & Connections

+4/-10 Switch

This switch adjusts the internal operating level of your ACP-22 when it is connected to line level (0dB = -10dBV) gear. With the switch in the '-10' position, the signal is raised internally so that it is processed at the lower noise floor of your ACP-22's internal circuitry. The signal level is lowered on the way out to match up with your line level gear's input. When the switch is in the '+4' position, the signal is not changed since this matches the internal operating level of your ACP-22.

This function may also be useful in creating special effects with the compressor and gate of the channel by 'overcompressing' or 'gating'.

Compression and Gating Sidechain

The sidechain jack on each channel interrupts the signal that the compressor and/or gate is using to detect the audio signal for processing. When no connector is inserted into this jack, the input signal goes directly to the compressors control circuitry (normaled). When a connector is inserted into this jack, the signal path is broken. If you have inserted a tip-ring-sleeve connector, the input signal is sent back out of the ACP-22 via the ring of the connector. This signal can then be processed by an equalizer for example to reduce sibilance (de-essing) in a vocal track. The signal is then returned to the unit via the tip of the connector. The signal sent to the tip could also be that of a narrator or vocalist. In this application, the audio that you are passing through the compressor will automatically 'duck' when the narrator speaks or vocalist sings.

2.7 Power
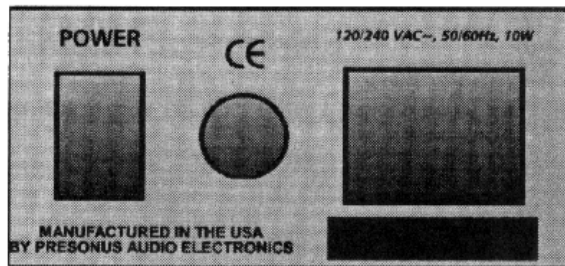
Power Connection

The power jack on your ACP-22 accepts a standard IEC cord like those found on most computers and professional recording equipment. Your ACP-22 contains a custom built in power supply, ***no wall wart***. (We can't stand them either.) This way you can be assured of clean power combined with rugged construction that has been designed to last!

Power Selection

Before powering on your ACP-22 for the first time, be sure to check the position of the power selector. Make certain that the power voltage level selected matches that of your country's outlet.

Power Switch

I = ON, 0 = OFF. (hmmm...)

Controls & Connections

Notes...

Basic Setup & Applications

3.1 Some Basic Patching

<u>Inserting into your mixers insert points, unbalanced.</u>

To Mixing Board
Insert Point

Send From Mixer

Return To Mixer
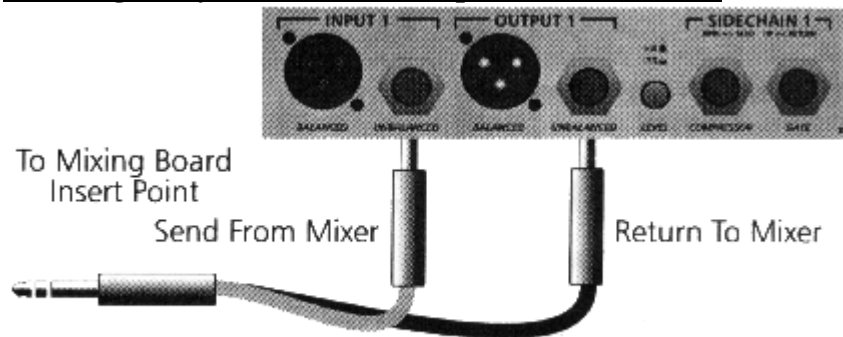
<u>After your mixers main outputs, balanced.</u>

From Mixer Balanced
Output

To Power Amplifier, Tape Input, etc.
Balanced Input
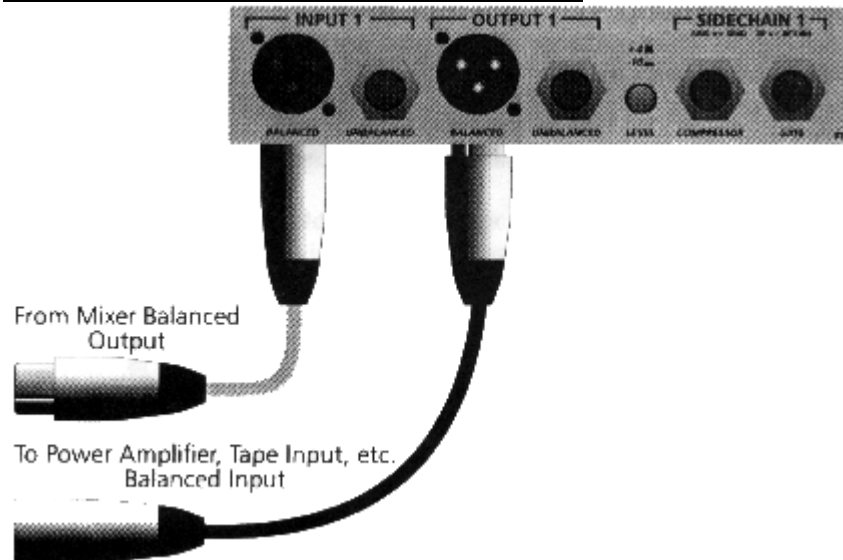
Basic Setup & Applications

Between multi-track recorder inputs/outputs to mixer outputs/inputs, unbalanced.

From Multi-Track/Mixer
Output

To Mixer/Multi-Track
Input
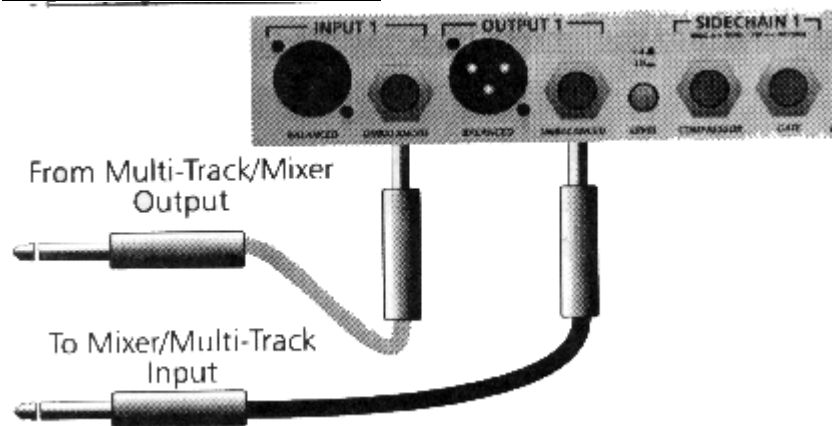
Sidechain insertion of an equalizer, for de-essing specific frequency gating applications.

(Compressor
or Gate)

To Mixer Insert Point

To Equalizer Input (<---Ring)

From Equalizer Output (--->Tip)
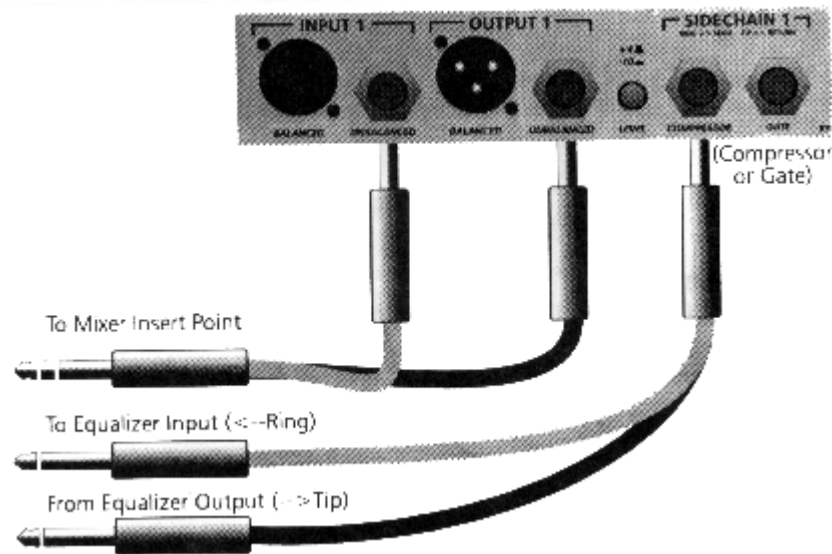
3.2 Basic Applications

Example setup compressing a voice or vocal track.
Probably the most common use of a compressor is to limit the dynamic range of a vocalist during a live performance or a recording. It is almost always necessary to compress a vocal take during a recording session. Most vocalists have a very wide dynamic range, and if the vocalist does not have 'studio' experience, the dynamic range of the vocal performance can be enhanced by the microphone techniques demonstrated during a session.

This wide variation in level makes it difficult to properly record a vocal take, especially in digital multi-track recorders which have definite limitations in headroom.

Compressing a vocal also makes it easier to place the vocal track in a mix so that it remains 'in your face' throughout the track.

To set up for a vocal take, insert a channel of your ACP-22 into the same channel as the microphone on your mixer. If your mixer has an **insert** point, insert the compressor there. If you don't have an insert point you will have to place the compressor after your mixer's bus-output or whichever output you're using by coming out of your mixer to the input of the ACP-22; then out of the ACP-22 to the input of your recorder. If you're using a stand alone mic preamp; patch the ACP-22 **after** the preamp and then to the recorder.

Turn the **threshold** of the channel's compressor you're using completely counter-clockwise. If you've gotten the cables right, you should see the LED's above the **threshold** knob of the channel you're using flashing when you talk into the microphone. Make sure that the channel on the ACP22 has the following setup: **Link button is out, Bypass is out, Auto is in, Soft is out, Gate Threshold knob is fully counter-clock wise, Compressor Ratio knob is set to 1:1 (fully counter clockwise).**

To set the compressor: turn the **ratio** to the **2:1** mark on the legend. With the vocalist yodeling into the mic, turn the compressor's **threshold** until the gain reduction meters read about -7dB. Now you will probably need to boost the compressors' output by turning the **Gain** knob clockwise so that

your mixer or multi-tracks meters read **0dB** (in the case of some digital recorders this is **-14dB**).

This would be a basic, very simple but useable setting for recording a vocal. Things to vary to suit your taste might be**: adjusting the ratio and threshold for more/less dynamic range. Push the Soft button in and check out the Soft Knee compression curve. Take the compressor out of Auto mode and adjust the Attack and Release times to taste. Get a new vocalist (just kidding).**

Patching Using a Patch Bay
When using a patch bay to extend the ACP-22's patch panel for easier access, the following should be considered:

1. Lowest noise is achieved when using balanced patch bays.

2. The input and output jacks should not be normalled (the send routed back to the return).

3. The sidechain jacks must be normalled.

Compressing and gating drums or percussion instruments.
Limiting the dynamic range of a drum kit may or may not be something you want to do to your drum tracks, but there are some other cool things the ACP-22 can do to make your drums really happening.

· If you think about how a snare drum sounds, it has a beginning loud sound followed by a usually short decay. Patch a channel of your ACP-22 for compressing the snare drum as described above and we can explore some dramatic changes that good compression has on the snare.

For a simple setup, make sure that the: **Soft button is out, Auto button is out, Ratio is set to 4:1 on the legend, Attack is fully counterclockwise, Release is straight up at 12:00 o'clock, Gate threshold is fully counter-clockwise, Link button is out and Bypass button is out.** Adjust the **threshold** until you see about -1 dB on the gain reduction meters. At this point, the snare's volume is simply lowered by 1 dB. Now slowly raise the Attack time by turning the attack knob clockwise. You should notice that the beginning 'transient' of you snare sound is starting to jump out

of the speakers and slap you in the face. This is more accentuated when using digital reverberation on the snare.

Now you can adjust the Gate on the snare to stop those other drums from 'bleeding' through the snare mic: **Turn the gate release knob to about the middle position, turn the gate attack knob to fully counter-clockwise, set the gate range to -60dB, adjust the gate threshold slowly clockwise until you begin to hear those other drums disappearing.** Too high of a **threshold** setting might disrupt the snares natural sound, too low will let those other drums open the gate. You need to adjust the gate's **threshold** and release to suit your drumming taste.

This simple application applies to any percussive instrument of course. Experiment...

Limiting.
Limiting is defined as compressing with a ratio of infinity to one. Sort of like an imaginary ceiling for the level of a signal. On your ACP-22, limiting occurs when the **ratio** knob is **fully clockwise**. At this point, the **threshold** knob essentially becomes the 'ceiling' knob for the channel. You will most likely want an instantaneous attack time while limiting. To achieve this: Make sure the **auto** button is **out**, Turn the **attack** time knob fully **counter-clockwise** and set the compressor's **release** time for the most naturally acoustic sound.

(**Warning:** Improper settings of the release time have been known to cause pumping, breathing and coughing in limiters. Consult your ears when fine tuning.)

Compressing bass guitar.
Very similar to compressing vocals, the bass guitar is almost always compressed or limited during recording. Start with the setting described above for vocals. Vary the compression ratio, attack and release to suite your taste.

 Compressing acoustic guitar.
It is sometimes easy to over compress an acoustic guitar because your first impression is that compression sounds awesome on acoustic instruments. If you're adding the acoustic instrument to a mix that includes

lots of other instruments such as distorted guitar, compressing the life out of your guitar will help you later in the mix. If the guitar is recorded as a solo instrument or part of an acoustic ensemble, you should experiment with less compression because you don't want to severely limit the natural acoustic dynamic range of a good sounding guitar.

Start by using the setup described in the vocal section...

De-essing using an inserted equalizer into the sidechain.

A common annoyance when placing a vocal track in a mix is that as you boost the higher frequencies of the track to 'breath life' into the vocal, all of the 'SSS's of the dialogue or lyrics tend to become louder than the rest of the track. A proven method of redusssing thissss problem is to **de-ess** the track with 'spectral' compression.

Patching a de-esser together is illustrated in the patching diagrams above. If you don't have an external equalizer, you can use a spare channel of your mixer by sending the track to both the spare channel and the original channel. Take the direct out of the spare channel and send it to the sidechain input of the ACP-8 (signal on the ring of the tip-ring-sleeve connector). Once patched, setup the compressor as a **limiter** as described above. How this works is that when the **sidechain** has an inserted signal, the compressor generates the gain reduction from the **sidechain return signal only**. Now, if you boost those frequencies associated with sibilance (SSS), such as 2 kHz to 8 kHz, the compressor will apply the gain reduction more to the sibilance because it is now 'seeing' more signal around the frequency of the sibilance. You will need to adjust the frequency to locate your source of sibilance more precisely. Parametric equalizers are most effective for this type of compression but you can get by with most any equalizer.

Stereo Compressing/Limiting.

The linking feature of your ACP-22 will allow you to have up to four stereo linked pairs of compressor/gates. If you read the 'section in chapter two on the link function, this is easily achieved by pushing in the link button creating a stereo pair. Channel one becomes the master and all functions on channel two are inoperative.

To avoid confusion, it might be useful to turn the compression **ratio** to **1:1** on channel one with the link button pushed in (the right channel). This

will eliminate all gain reduction and effectively turn off the gain reduction meters. The gain reduction is of course being derived from the master channel.

4.1 Specifications

Number of Channels 2
Dynamic Range...>115dB
Signal to Noise Ratio ....>95dB
Headroom ....+24dBu, Unbalanced; +22dBu Balanced
Frequency Response ....10Hz to 50kHz
Crosstalk ....>82db @ 10kHz
Compression Threshold Range ....-40dBu to +20dBu
Compression Ratio ....1:1 to 20:1
Compressor Attack Time ....0.1 ms to 200ms
Compressor Release Time ....0.05sec to 3sec
Auto Attack and Release ....Program Dependent
Gate Attack Range ....10uS to 100mS
Gate Threshold Range ....Off, -65dBu to +20dBu
Gate Release Time ....0.02sec to 2sec
Gate Attenuation Range ....0dB to -60dB
Input Impedance 10kOhms
Output Impedance ....51 Ohms
THD + Noise ....<0.02%
Output Gain ....-20dB to +20dB
Compression Curve Types ....Soft Knee or Hard Knee
Compressor Metering ....Above and Below Threshold, Gain Reduction
Gate Metering ....Open and Closed
Sidechain Output Impedance ....51 Ohms
Sidechain Input Impedance 10kOhms
Gate Input Impedance 10kOhms
Internal Operating Level ....+4dBu = 0dB
Input Range ....+4dBu or- 10dBV, Switchable
Input Connectors ....1/4", Tip / Sleeve, Unbalanced or XLR Balanced
Output Connectors ....1/4", Tip / Sleeve, Unbalanced or XLR Balanced
Sidechain Connector ....1/4", Tip Ring Sleeve
Gate Key Connector ....1/4", Tip Ring Sleeve
Power Supply ....Internal, Linear Supply
Power Requirements ....100VAC to 120VAC, or 200VAC to 240VAC
Weight .... 7 lbs.
Size ....1U Rack

Appendix

A Word About Compression ....

Punch, apparent loudness, presence.., just three of many terms used to describe the effects of compression/limiting.

Compression and limiting are forms of dynamic range (volume) control. Audio signals have very wide peak to average signal level ratios (sometimes referred to as dynamic range which is the difference between the loudest level and the softest level). The peak signal can cause overload in the audio recording or reproduction chain resulting in signal distortion. A compressor/**limiter** is a type of amplifier in which gain is dependent on the signal level passing through it. You can set the maximum level a compressor/**limiter** allows to pass through, thereby causing automatic gain reduction above some predetermined signal level or **threshold**.

Compression refers basically to the ability to reduce the output level of an audio signal by a fixed ratio relative to the input. It is useful for lowering the dynamic range of an instrument or vocal, making it easier to record without distorting the recorder. It also assists in the mixing process by reducing the amount of level changes needed for a particular instrument. Take, for example, a vocalist who moves around in front of the microphone while performing, thus making the output level vary up and down unnaturally. A compressor can be applied to the signal to help correct this recording problem by reducing the 'louder' passages enough to be compatible with the overall performance.

How severely the compressor reduces the signal is determined by the compression ratio and compression **threshold**. A ratio of 2:1 or less is considered mild compression, reducing the output by two for signals greater than the compression **threshold**. Ratios above 10:1 are considered hard limiting. Limiting refers to the point at which the signal is restrained from going any louder at the output.

The level of input signal at which the output is reduced is determined by the compression **threshold**. As the compression **threshold** is lowered, more and more of the input signal is compressed (assuming a nominal input signal level). Care must be taken not to 'over compress' a signal. Too much

compression destroys the acoustical dynamic response of a performance. ('Over compression', however, is used by some engineers as an effect, and with killer results!)

Compressor/**limiter**s are commonly used for many audio applications. A kick drum can get lost in a wall of electric guitars. No matter how much level is increased, the kick drum stays 'lost in the mud'. Add a touch of compression and tighten up that kick drum sound allowing it to 'punch' through without having to crank the level way up.

A vocal performance usually has a wide dynamic range. Transients (the very loudest portion of the signal) can be far outside the average level of the vocal signal. It is extremely difficult to ride the level with a console fader. A compressor/**limiter** automatically controls gain without altering the subtleties of the performance.

A solo guitar can seem to be masked by the rhythm guitars. Compression can make your 'lead' soar above the track without shoving the fader through the roof.

Bass guitar can be difficult to record. A consistent level with good attack can be achieved with proper Compression. Your bass doesn't have to be washed out in the low end of the mix. Let the compressor/**limiter** give your bass the punch it needs to drive the bottom of the track.