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making good stereo sound better®
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recycled paper

Operating Manual

C-131

One-Third Octave
Precision Constant-Q Equalizer

AudioControl®
making good stereo sound better®

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Precision Constant-Q Equalizer

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making good stereo sound better

The C-131 is Dedicated to the Memory of
Howard Roberson of *Audio Magazine* and
Berkshire Labs

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CONGRATULATIONS!

You now own one of the most effective frequency adjustment devices ever offered to the audio enthusiast. The C-131's One-third Octave configuration gives you the control to optimize your audio system more precisely than ever before. Properly adjusted, the C-131 can get more out of your speakers — and listening room — than you ever thought possible.

No matter what kind of system you own, the C-131 can improve its imaging, tonal balance and sheer listenability. But if you have an extremely accurate system, the results will be particularly impressive. We designed the C-131 for the skeptical and critical listener who accepts the benefits of precisely and conservatively-applied equalization, but has been soured in the past by lesser equalizers.

In short, the C-131's constant-Q circuit design, precision internal components and meticulous construction are intended to ensure extraordinary sonic quality and sheer musical pleasure when used with high-end music reproduction systems.

These are strong claims. We believe they can be made by one company alone: The only consumer electronics company in the world who specializes in equalizers and analyzers[1]. Since 1978, we've been committed to this admittedly narrow but extremely valuable branch of audio components. Although we've won numerous awards for our products, our greatest satisfaction has been our reputation for sonic excellence and reliability which has grown throughout the audio world.

The equalizer[2] you now own is, in a way, our "wildest, blue-sky dream." All audio designers dream of realizing a product which requires no compromises. The best circuit design. The best components. But, due to the realities of consumer electronic pricing, few get the chance to pull out the stops on a "first-cabin-all-the-way" component. And

[1]To be perfectly honest, we are now also producing a multi-room speaker switching device and electronic crossovers for home and car audio. Still, we are an equalizer and analyzer company to a degree that no other company can even hope to approach.

[2]Or equalizers. Each C-131 is a monophonic device so two are needed for stereo operation.

fewer work for companies with the resources to realize their creation.

Your C-131 is the embodiment of all that we have learned and all that we know a sound enhancement device can be. It is intended to impart nothing except those precise additions or subtractions of frequency response at specific points in the sound spectrum that you select.

Accordingly, the C-131 is hand-crafted in very limited quantities by an elite team of AudioControl's most experienced and meticulous personnel using the finest individual components. These include multiple-wiper potentiometers, a fully-regulated power supply, operational amplifier circuitry with a slew rate as fast as any esoteric power amplifier it may help drive, and excruciatingly expensive, fine-tolerance capacitors specifically designed for high-end audio components.

What follows is an occasionally rambling but hopefully complete discourse on how to apply the C-131's fantastic potential to optimizing your system. We hope that you will read it thoroughly. No test will be given.

Special Note Just in Case You Thought the C-131 Was Going To Supplant Your Tone Controls

Unlike octave equalizers, the C-131 is solely intended for diagnosis and correction of specific, semi-permanent acoustic anomalies created by room acoustics, speaker response, and speaker or listener placement. In other words, it is not intended for program-specific tonal adjustments such as enhancing a vocal or reducing overall brightness on an individual record or compact disc. For best results, initial C-131 settings should be made in conjunction with a third-octave analyzer, calibrated measurement microphone and high quality pink noise test source.

C-131 HIGHLIGHTS

Constant-Q

What you move is what you get.

The whole point of using an equalizer is to break the audio spectrum down into narrow bands to achieve precise control. Room resonances can be narrow "bumps" that no shelving bass tone controls can address. Crossover notches and other speaker design anomalies may be even more specific. Thus one assumes that the more bands an equalizer has, the more accurate it is.

Not correct. Few, if any, consumer electronics equalizers other than the C-131 truly can achieve dedicated boost or cut of *individual* tonal bands without muddling far more of the overall sound spectrum!

On conventional equalizers, the frequency points printed underneath each slider are optimistic. While they *do* affect the desired frequency, boost or cut also affects adjoining bands you may not want to adjust. Figure 1 shows how a conventional (non-constant-Q) equalizer can only achieve a specified bandwidth at one boost setting (A). When the amount of equalization is varied, so does the range of its effect (B).

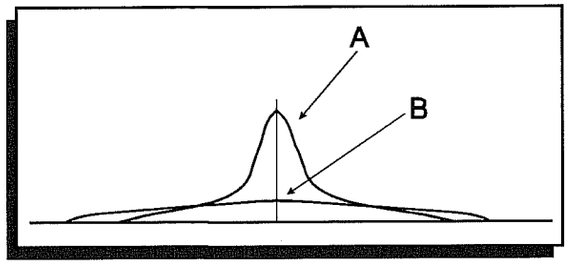


Figure 1 - Conventional Equalizer

Thus if you need a subtle correction at 1kHz, you must settle for correction at frequencies far removed from 1kHz. Figure 2 shows the C-131's corresponding Constant-Q adjustment. Note that even for small amounts of adjustment, the C-131 maintains its specified bandwidth. If you need 3dB of boost at 1kHz, the C-131 provides it. With minimal effect on adjacent 1/3 octave bands.

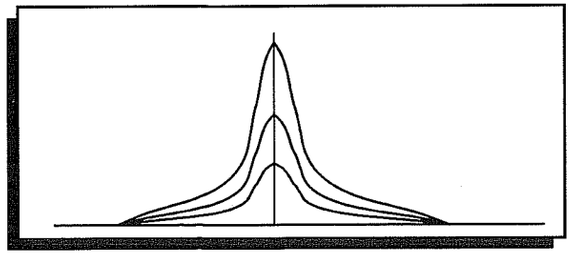


Figure 2 - Constant-Q Equalizer

However, the benefits of Constant-Q extend farther

than this. One rarely adjusts a single isolated 1/3-octave band. Rather, a close group of frequencies are most often shaped to address a wider frequency response anomaly. Figure 3 shows the effects of three adjacent adjustments with a conventional equalizer.

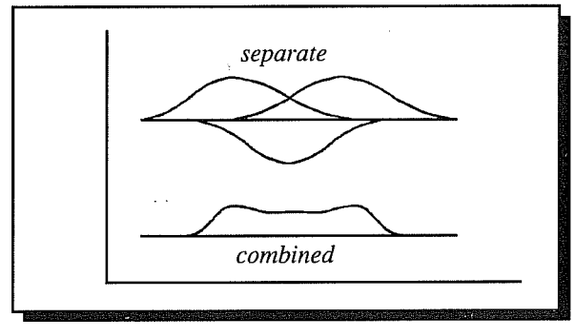


Figure 3 - Conventional Equalizer

The C-131's Constant-Q circuit design combines adjacent frequencies such that the result is a combination of the three adjustments, resulting in the desired curve (Figure 4).

Together, these C-131 refinements not only make adjustments more accurate but easier to make as well, since the visual "curve" derived from the slider positions closely reflects the actual response. And because interaction is minimized between adjoining controls, you can arrive at the desired settings faster without having to re-adjust a frustrating number of adjacent bands.

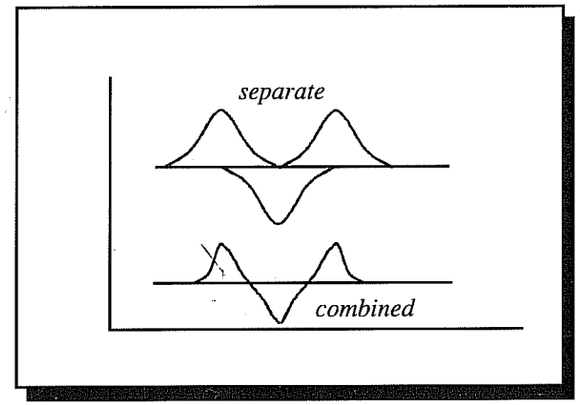


Figure 4 - Constant-Q Equalizer

Subsonic Filter

The C-131 incorporates an adjustable 18dB per octave subsonic filter which sharply attenuates frequencies beginning at either 15Hz, 25Hz or 35Hz. It can also be switched off entirely. Subsonics, or infrasonics as they are more appropriately called, are inaudible low-frequency oscillations which can extend to 1Hz. Their cause most often lies with turntable sources — although a surprising number of compact discs also exhibit ultra-low frequency waves. At best, subsonics rob amplifier power and cause woofer flutter (which in turn causes intermodulation distortion); at worst, they can actually hasten woofer failure through over-excursion or acoustic feedback.

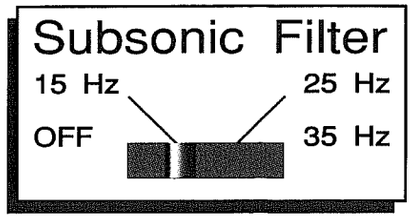


Figure 5A

The C-131's subsonic filter can eliminate much of the problem and may be set so that speakers which are capable of reproducing extremely low *musical* frequencies are not compromised.

Balanced inputs and outputs

Conventional "RCA-type" interconnects have two conductors, an inner wire and an outer woven sleeve (shield). This outer sleeve must carry both return signal and ground in a single conductor. Balanced XLR-style connections are comprised of *three* conductors, one each for outbound signal and return and a third for a completely separate ground connection.

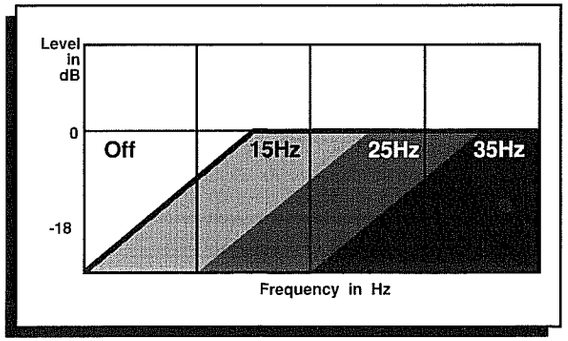


Figure 5B - Subsonic Filter Curves for the C-131

This provides several benefits. Because the ground is completely removed from the signal path, noise and hum caused by ground interaction between components is eliminated. Since the actual music signal is transferred *differentially*, cable induced signal distortion tends to be nullified. An effect which several preamplifier designers maintain can improve sound quality. Finally, the signal transfer between components is low impedance, which allows for longer cable runs without signal degradation and greater immunity to signal interference than is possible with conventional interconnects.

Since the C-131 includes both balanced and conventional inputs *and* outputs, it can serve as a balanced-to-unbalanced adaptor for connecting a balanced preamplifier with an unbalanced power amplifier or vice versa.

IMPORTANT INITIAL STEPS

FILL OUT and mail the WARRANTY CARD(s) that came with your C-131(s). Also, ***save the sales slip or invoice*** from the store where you bought your C-131(s). This is extremely important for determining when your warranty coverage began — and also for insurance purposes if (perish the thought) someone appropriates your audio system some dark night when you're vacationing in Tahiti, or if a stray fireplace spark ignites your rare collection of Otto Klemperer 8-tracks.

Also, save the packing box, plastic bag and foam blocks which were used to pack the C-131(s). Should your equalizer ever need service, it is important that the unit be returned in the original packing.

EXPRESS "I CAN'T WAIT" CONNECTION INFORMATION FOR THE CHRONICALLY IMPATIENT

For those of you who hate manuals, we've provided basic hook- up information first. Still, this is a very special product. We urge you to read this manual at some point before attempting to make adjustments. The C-131 can be connected in two different spots and by two different methods:

You can connect it 1) in a Tape Monitor/External Processor loop, or 2) in between your preamplifier and power amplifier (see Figure 6 and 7).

You can use either conventional "RCA"-type interconnects or balanced XLR connectors in any combination. IMPORTANT: If you choose to use the C-131's balanced input and/or balanced output, see appendix A, Balanced Connections, for more information.

In either case, read the following. . .

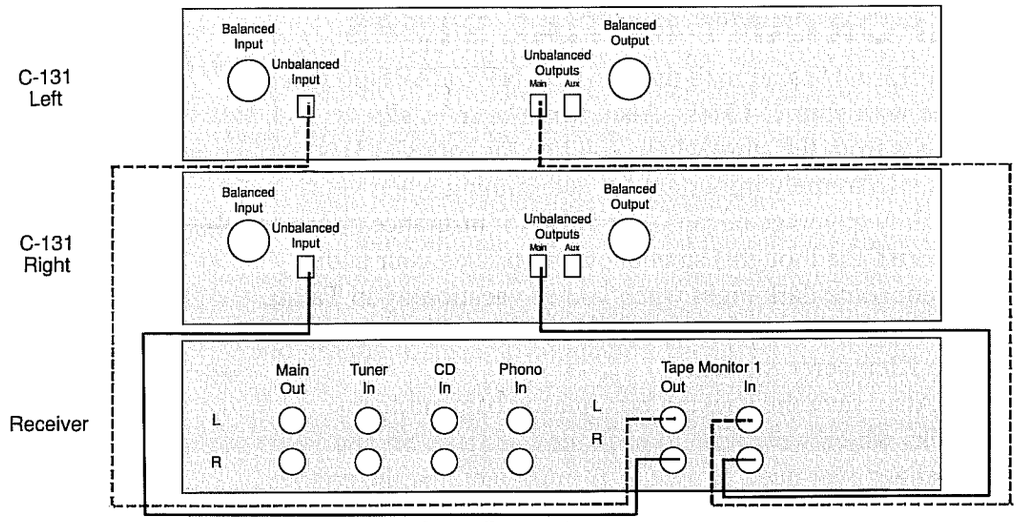


Figure 6 - Tape Loop Connection

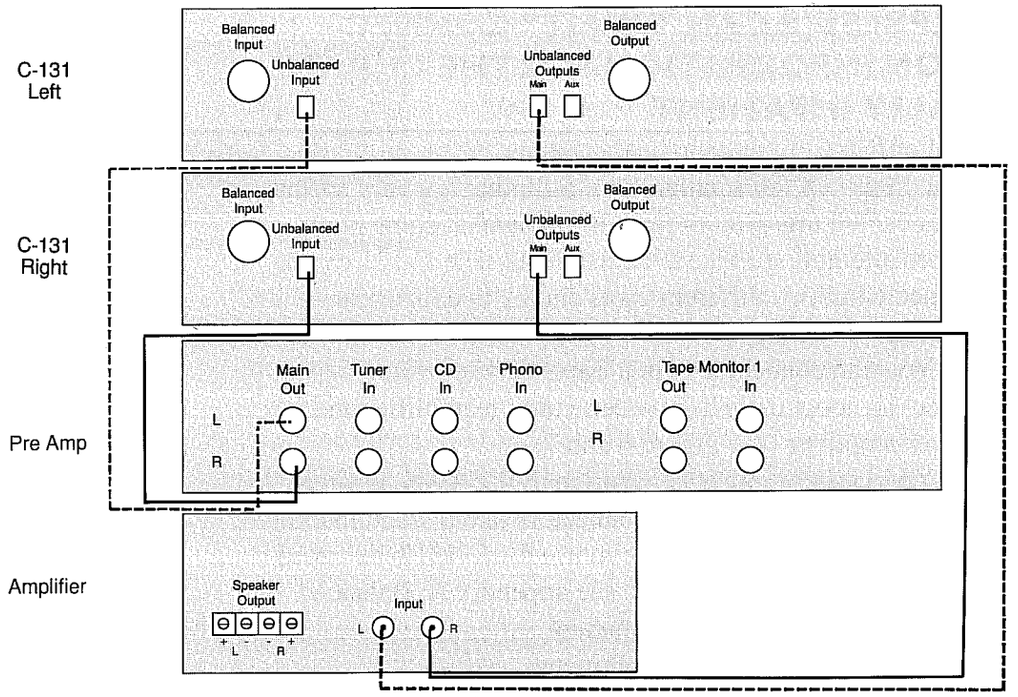


Figure 7 - Pre-main Connection

ROOM FOR IMPROVEMENT: WHY WE BUILT THE C-131

All is not perfect twixt the recording microphone and your ear in your listening room. Some dealers and audiophiles would like us to think so. They feel that fidelity exists over and above a multitude of undeniable variables created by your room and speaker placement. We call this the "For what I paid for it, my system darned well better have flat response" syndrome. A determined but unrealistic stance unless you choose to take up permanent residence in your dealer's sound room.

These folks consider equalizers an admission of defeat after trying every other trick to get the most from a system[3].

Surprise! AudioControl also considers an equalizer the final resort. As you'll read in this manual, we advocate physical changes BEFORE resorting to the C-131. Speaker listening room design, live end/dead end treatments, general acoustic treatments made as a part of room decoration and above all, *speaker placement* are the first steps you MUST take. The difference in attitude is that we (and you) know there are further measures that can be taken without degrading sonic quality: Your C-131 gives you an *additional* and very powerful tool to use when other options are exhausted.

Thus, owning a precision equalizer is not an admittance that your other audio components are somehow deficient. Rather, it is an acceptance of the fact that the Real World is not a perfect place. All speakers have their own unique response curve; each listening room imparts its own characteristics on any speakers placed within it, etc.

This is not to say that a few magic tweaks of your C-131 will induce sonic bliss. Some of the places people put perfectly wonderful speaker systems insure bad sound.

"All is not perfect twixt the recording microphone and your ear..."

[3]And they have rarely if ever encountered an equalizer that didn't leave its own sonic grunge or could accurately affect only a single narrow band without phase problems. Forgive them. They hadn't heard the C-131.

Some rooms simply can't accommodate a loudspeaker manufacturer's placement instructions. And some speakers are wonderful on the whole, but sound even better with a little help here or there.

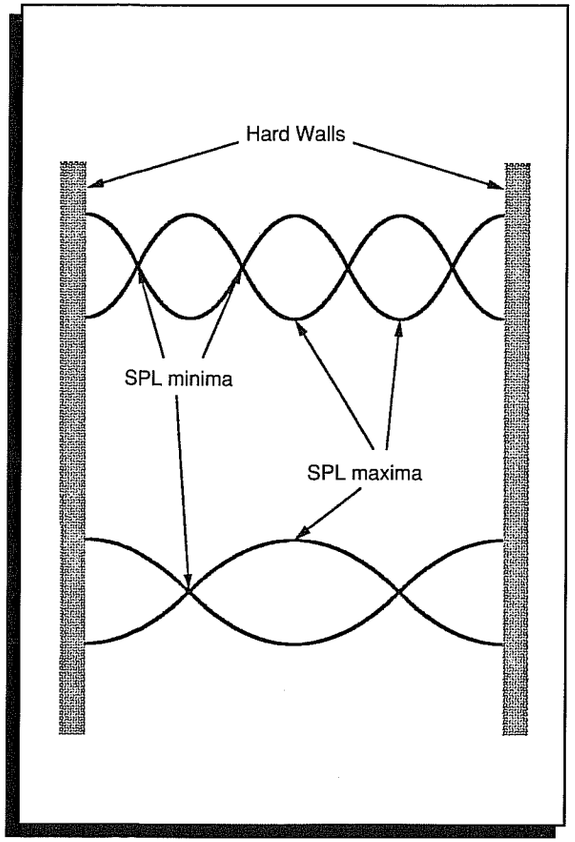


Figure 8 - Standing waves between two parallel surfaces

As an aid to your better understanding of the whole subject of room acoustics, we have included an AudioControl Technical Paper which goes into considerable detail.

To quote the distinguished author Glenn White, a foremost recordist and acoustical consultant, *"...electrical equalization can be very beneficial. In most rooms with standing wave problems (see* Figure *8), it will be found that the low frequencies will be the most troublesome, and that several maxima will be quite close together in frequency. For this reason, the equalizer should have narrower bands (i.e. one- third or one-half) at the lowest frequencies..."*

If one lived in an acoustically-isolated anechoic chamber[4], your speakers would sound EXACTLY like the designer intended. Unfortunately, each model and type of speaker reacts differently to the volume and acoustics of a particular listening room. Because of this inevitable room/speaker interaction, almost any speaker can benefit by equalization . . . if only to return it to what the designer intended by compensating for standing waves or other glaring acoustic problems.

In summation, two things stand between you and optimal speaker performance: 1) The speaker's own quirks and; 2) How its overall performance reacts in your particular listening room.

No speaker owner's manual can cover set-up details of every room's particular dimensions.

The solution is simple. Measure what arrives at the listener's ears and adjust it accordingly, thus compensating for room *and* speaker. This is done by analyzing and equalizing the room and speakers *together* to achieve a desired frequency response curve at the listening position. Among other things, this delicately avoids whether or not your ZonkoTonic Tower Monitors are *really* flat to 20Hz. You are treating the room and monitors as a whole and can thus blame any drastic adjustments on acoustic deficiencies of the room and not your expensive speakers.

After connection instructions, we will detail how to use the C-131's precise frequency bands to tailor your speakers to your room.

[4]Anechoic chambers are acoustically dead testing rooms which dampen all wall reflections absolutely though complex acoustic treatment — They don't even have a floor! Such chambers make abstract speaker measurements easy and look good in ads, but have, by their very definition, nothing to do with what happens to the sound which comes out of the same loudspeaker in real living rooms and dens.

C-131 CONNECTION (THE LONG VERSION[5])

Placement

One or more C-131's can be placed in a "stack" with other audio components. However, make sure not to block the ventilation slots on any components and avoid placing the C-131 directly over a beefy power amplifier which gets hot during operation.

Power Connection

The C-131 draws only ten watts and thus can be connected to the switched AC outlet of any preamplifier or receiver. By the same token, its low power draw means that you can actually leave it on continuously if you have other equipment which is also left on.

"...electrical equalization can be very beneficial."

[5]As in *long version* of songs that, in the late Sixties got cut for AM play like "Light My Fire," "InaGaddaDavida," "Time," and "Crimson and Clover." If these titles mean nothing to you, you can still lead a healthy, productive life and enjoy the C-131. Our roots just protruded for a moment, there.

General Connection Tips

Although we assume a general level of sophistication in any buyer who has acquired a one-third octave equalizer, the following tips can never be repeated too many times.

☞ Turn all components off before making any connections.

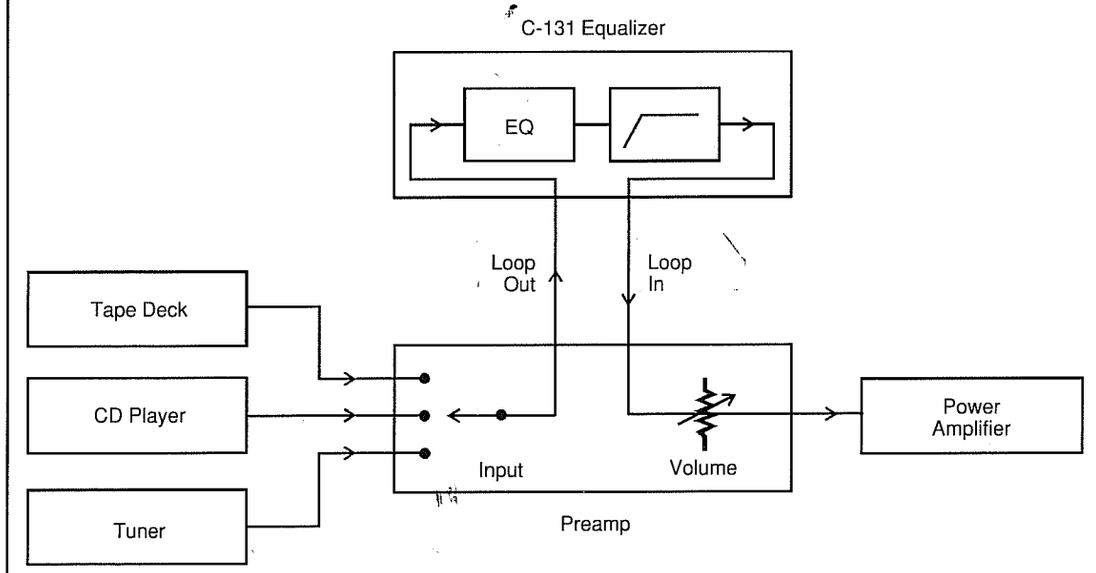
☞ If using the C-131's conventional "RCA" input/output sockets, make sure that "left is hooked to left and right is hooked to right" at each connection. The obvious way to assure this is to assign one hook-up cord plug color to left and the other to right. Generally RED is used to signify RIGHT. White, grey or black then represents left.

☞ Whenever possible, keep power cords away from signal cables(inputs from CD player, tape deck etc.) to prevent hum (now you see one of the advantages of using balanced connections). This is especially important for turntable cables which carry very weak signals. While hum is less of a problem today than it was in the past, noise can still find its way into your system if a component's power cord becomes too intimately wrapped up with a hook-up cable. The C-131's power cord is on the right side of the chassis (when viewed from the back). This allows you to bundle all the power cords and keep them separate from signal connections.

☞ Types of interconnects. There are many different grades of hook-up cables. Some cost as much as $100 per meter. Whether or not you get an incremental increase in sound quality with "audiophile" interconnects will vary with your system and your ability to discern minute differences. However, really CHEAP connection cables are to be avoided at all costs when connecting the C-131 with your preamplifier. They can sometimes DIS-connect themselves

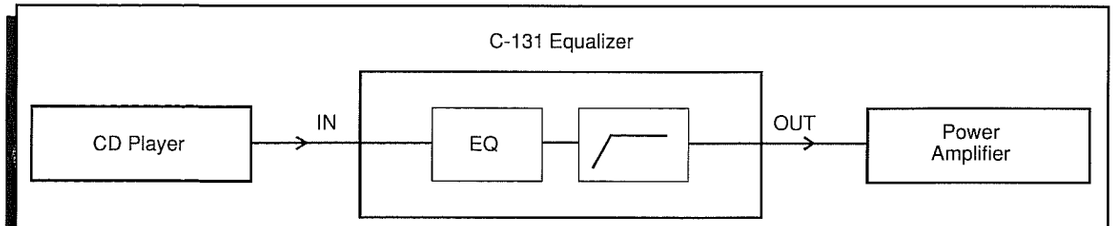
inside, causing a loss of sound in one channel or hum problems. Thus, before you send any component including the C-131 in for service, swap hook-up cables, regardless of their pedigree, to see if they're the culprit.

☞ If you are using the C-131's balanced inputs and/or outputs, MAKE SURE TO READ APPENDIX A (Balanced Connections). Unfortunately, there is no fully standardized pin configuration for XLR connectors other than Pin one, which is *always* ground. The C-131's pin-out pattern may vary from that of your preamplifier or power amplifier.



Loop Installation

If your preamplifier has an unused tape monitor loop or dedicated external processor loop, C-131's can be connected as shown in here. If you're using balanced connectors, MAKE SURE TO READ THE APPENDIX A (Balanced Connections).



"Straightwire" Connection

Many less-is-more preamplifiers intentionally omit tape monitor loops (or include just one). Also, an increasing number of audiophiles are connecting CD players with variable outputs directly to their power amplifiers. This indicates how to place C-131's in this sort of simplified signal chain.

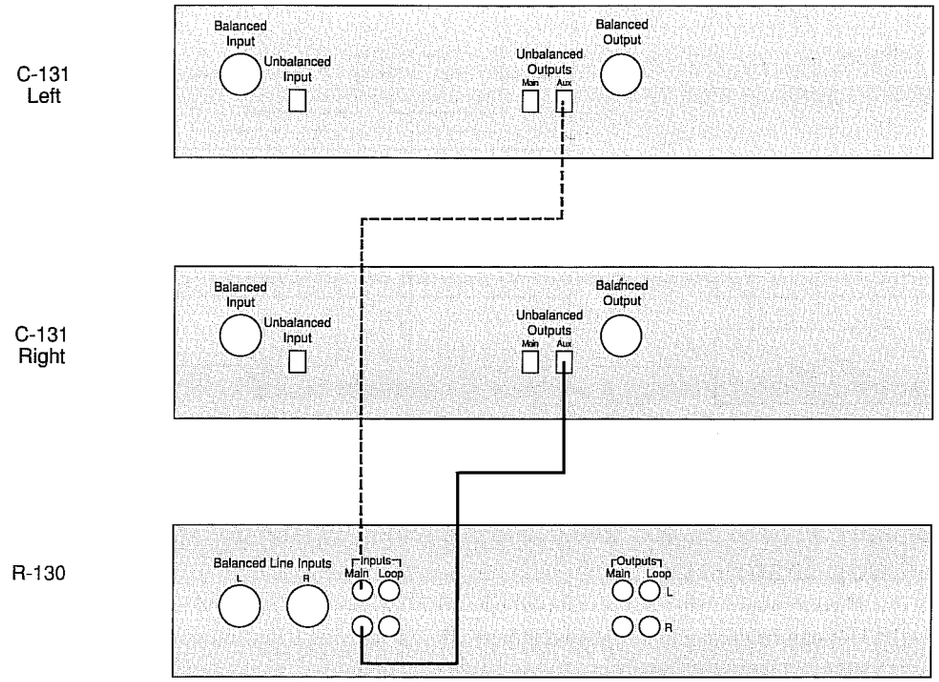


Figure 11 - Connecting C-131 Equalizer to the R-130 Real Time Analyzer

Interconnection with R-130

An additional output is provided for the companion R-130 One-third Octave Real Time Analyzer. This allows it to monitor your C-131's audio output as well as monitoring its own calibrated microphone. Connection is shown in Figure 11.

Subsonic Filter Setting

Initial installation is a good time to set the C-131's subsonic filter roll-off point with the multi-position slide switch on the back of the unit.

The wary audiophile may consider succumbing to the "straight wire" dictum, and select "OFF." But the C-131's filter is exquisitely accurate and does not affect imaging or overall soundstage as it pertains to higher frequencies. Therefore, your choice should be based on the lowest possible fundamental your speaker can achieve at any reasonable volume.

Only truly *exceptional* speakers really go below 35 Hz to any extent. A few can deliver realistic 25Hz; just a handful of designs even suggest competency at 15Hz. Don't flatter yourself. Be cruel and set the C-131 switch at the next highest setting. The benefits will outweigh the bass that was never produced anyway.

UNDERGOING ANALYSIS

The C-131 is the permanent half of a sophisticated diagnosis and treatment system. The other critical half is a 1/3-octave real-time analyzer. To quote a definitive sound engineering text, not using an analyzer in conjunction with a 1/3-octave equalizer, "...leaves the overall tonal balance to the practitioner. Those with perfect pitch often exhibit a non-universal taste, and those with a taste that agrees with the majority of listeners are often not gifted with perfect pitch."

We agree and highly recommend that you use an accurate test source, calibrated measurement microphone and quality real time analyzer as a basis for C-131 adjustments as shown in Figure 12.

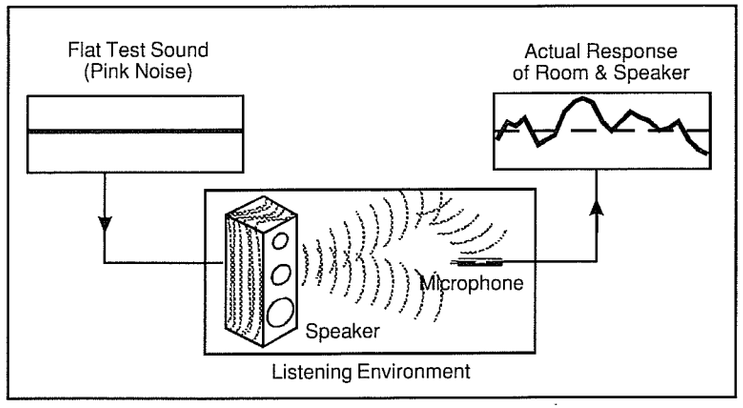


Figure 12
Audio Analysis

Here, briefly is the procedure.

☞ A *test source* (1) is used to generate a "flat" test tone. This may be full-frequency pink noise, a sweeping oscillator tone which ascends the audible spectrum, or a warble tone which concentrates on one band at a time. In any case, it must be accurate within any given one-third octave band, since all adjustments will be based on that assumption.

☞ The test source is broadcast into the listening room via your loudspeakers (2) and picked up by the *calibrated measurement microphone* (3). It, too, must have an extremely flat response in order not to color the results.

☞ Any "modifications" in the test tone's response can now be considered to be caused by the loudspeakers and/or listening room and may be viewed by the real time analyzer (4).

☞ Appropriate adjustments are made with a 1/3-octave equalizer placed in the signal chain (5).

It's no coincidence that we also make a 1/3-octave real time analyzer/test generator as a companion piece to the C-131.

The R-130 combines an extremely flat pink noise generator and precise 30-band LED display. A calibrated measurement microphone is also provided. It is based on the "Industry Standard" AudioControl Industrial SA-3050A One Third Octave Real Time Analyzer (which is even accepted by the ultra-critical underground audio press), and provides the same exceedingly high level of accuracy. Its styling matches the C-131 and compliments both other contemporary audio components and even the most elegant room decor.

R-130 One Third Octave Real Time Analyzer

However, because 1/3-octave analysis only needs to be performed occasionally, it is not necessary to own your own analyzer. Many quality stereo stores have real-time analyzers (most often, the AudioControl Industrial SA-3050A) which they loan or rent.

GETTING YOUR HOUSE IN ORDER

The three areas of adjustment when optimizing a sound system are:

1. Placement of the loudspeakers
2. The acoustic environment of the room
3. The system electronics via the C-131 and real-time spectrum analyzer.

Work on the first three *before* fine tuning with the C-131. In each case, having access to a 1/3-octave analyzer will provide a valuable supplement to critical listing.

Loudspeaker Placement

We (and every speaker designer we've ever talked to) can't overemphasize enough the importance of proper speaker placement. Some speakers require very particular placement in relation to back and side walls; all speakers demand careful placement in relation to your individual listening room's characteristics. Start by consulting your speakers' owner's manual. Then don't be afraid to experiment. A lot. Pull the speakers out increasingly far from the wall. Toe them in. Move them closer together and farther apart. Prop them up on temporary stands. You'll be astonished at the variation in imaging and response that different placements may make.

Acoustic environment

Every room affects a loudspeaker differently. Reflective and absorbent surfaces, room shape and volume, even placement of furniture can significantly change a speaker's sound. Corrections for intrusive room characteristics can range from elaborate acoustic treatments to simply ignoring the situation. If you have access to a real-time analyzer, it will prove helpful while investigating various possibilities. Hint...For the best imaging, be sure that the midrange and tweeters are at ear level.

"...don't be afraid to experiment."

USING THE C-131

As we noted previously, the C-131 is designed to achieve permanent "set-and-forget" adjustments in speaker and room response. Needless to say, many program sources also cry for equalization, this is, in our opinion,

best achieved with more "broad brush" tone adjustments such as those provided by shelving tone controls, loudness circuits and 10-band equalizers such as our various models.

The Equalization Process in a Nutshell

A. Analyze.
B. Adjust speaker placement and make reasonable changes to room acoustics. (see "Getting Your House In Order")
C. Listen using a music source.
D. Analyze.
E. Equalize to flat.
F. Re-adjust to desired listening curve using a familiar musical selection, while incorporating major adjustments from Step D.
G. Listen
H. Re-analyze if necessary.
I. Adjust levels.

Initial adjustment

1. First read our Tech Paper number 107, "Small Room Acoustics De-Mythologized" to understand what can and cannot be done.
2. Adjust your loudspeakers as closely as possible to the placement recommended in the speaker owners manual.
3. Make sure any preamplifier tone or loudness controls are switched out or set to zero boost or cut.
4. Make sure you're aware of where the C-131's subsonic filter has been set (and that both C-131's in a stereo pair are set the same.
5. Engage the EQUALIZE buttons on the front of both the C-131's.
6. Follow the instructions included with the R-130, AudioControl Industrial SA-3050A or other high

quality 1/3-octave real time spectrum analyzer. Make sure to set the preamplifier's BALANCE control all the way to the left when adjusting the left-channel C-131 and vice versa for the right channel.

NOTE: Make sure that adjustment for left and right channels are within 1dB of each other. "Unequal" equalization can cause imaging and soundstage problems.

7. Needless to say, your C-131 adjustments are designed to create a *smooth* display on the real time analyzer. There's every chance it won't be to start with. The low bass octaves of the analyzer display derived from a typical listening room are shown in Figure 13A.

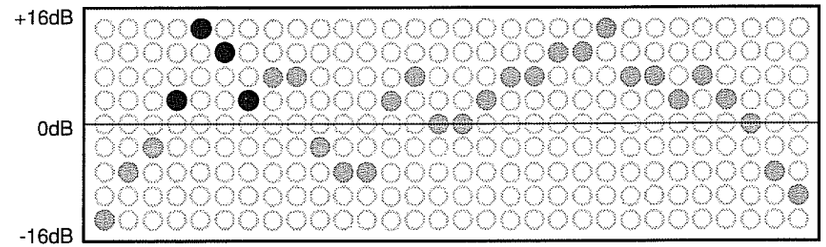


Figure 13A

When compensating for a frequency "bump" like this, avoid drastic boosts and cuts of just one 1/3-octave band (Fig. 13B).

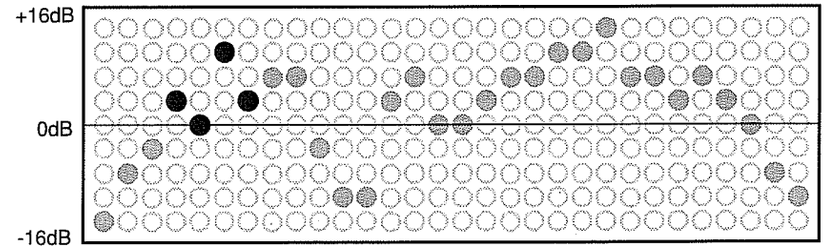


Figure 13B

Instead, adjust a series of bands as shown in Figure 13C. Patience and moderation are the key. Excessive boosts and cuts of a single frequency will do more harm than good. Gentle corrections in an inverse curve from that on the real time analyzer display will result in results resembling Figure 13D.

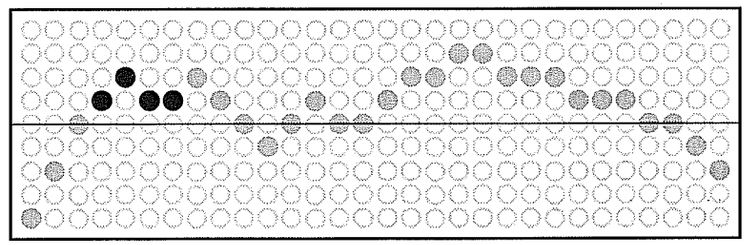


Figure 13C

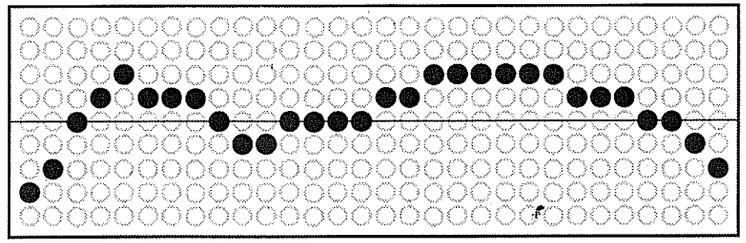


Figure 13D

Getting rid of bumps is more important than filling dips. You hear presence more than absence. Be careful about excessive boosting.

Note that in our example, the 25Hz and 31.5Hz bands have been boosted, but not drastically — and that the resulting curve as shown in Figure 13D is not entirely flat. This is a demonstration of reality intruding. In our sample case, the loudspeaker simply was not capable of flat response below 40Hz. Shoving the 25Hz and 31.5Hz C-131 bands all the way to the moon would have simply overtaxed the woofer, without adding significantly more low bass response. If your loudspeakers' woofers make suspicious clacking noises while you're adjusting low bass bands — or you just don't get any resulting change in the analyzer display with further boosts, you've reached your loudspeakers' limit and it's time to start pricing subwoofers.

Also, keep in mind where the C-131's subsonic filter has been set. If its roll-off point has been set ABOVE 25Hz, adjustment of the lowest bands is unnecessary.

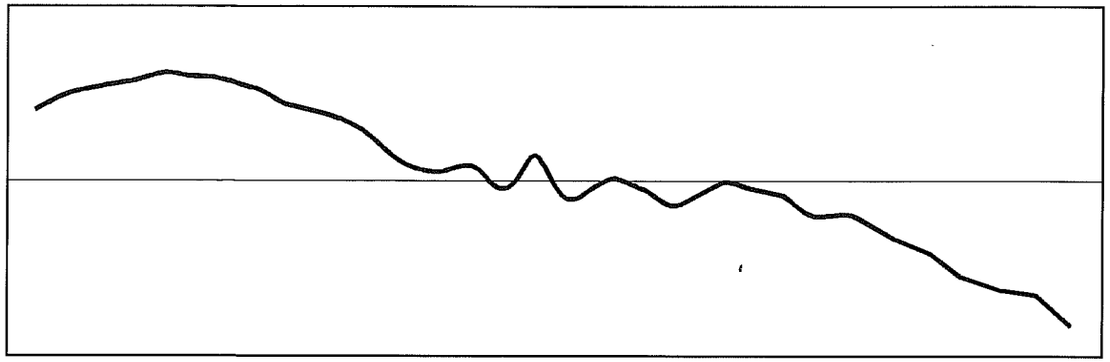
8. When you have flattened the analyzer's display curve as much as possible, you're through with this portion of the adjustments, but nowhere near done.

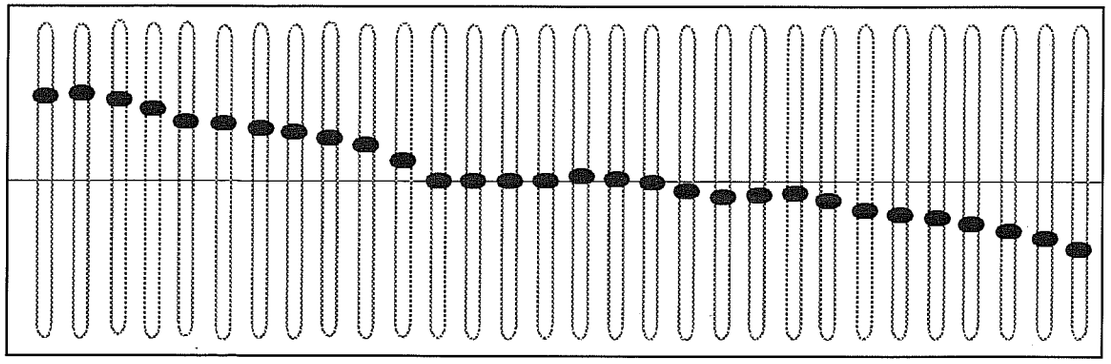
Secondary Adjustment: House Curve versus Flat

When you play music through your system at this point, you might not be completely pleased with the result. You have compensated for all sorts of factors, but have also run up against an important psychoacoustic effect: Flat response doesn't sound all that great to most people.

Through long experience, acoustic experts have determined that a "curve" which is tipped towards more low

Figure 14
House Curve





frequencies is much more desirable for music reproduction. It's sometimes (through not totally accurately) referred to as a "house curve", a term that comes from the fact that adjusting music systems in individual theaters and auditoriums to achieve the most "listenable" sound tends to produce curves like this with a significant reduction in higher frequencies. Figure 14 shows a "room" curve which can serve as a starting point for your secondary adjustments of the C-131.

Does this mean that you should ignore the C-131 settings you just made with the real time analyzer? NO!

Let's say that your analysis and adjustments created

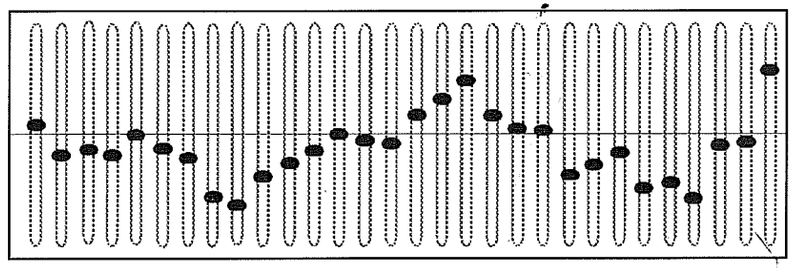


Figure 15

C-131 band adjustments that look like Figure 15. You've reduced a couple of nasty SPL maxima caused by the listening room's shape, corrected for a crossover problem in the midrange and reduced a bump in the upper treble region.

The trick is to incorporate these settings with the house curve shown in Figure 15. To do this, write down the adjustments you just made to achieve flat response, set the C-131(s) to the house curve and THEN ADD OR SUBTRACT YOUR CORRECTIONS from the initial analysis. The result should look something like Figure 16.

Close but not there quite yet. The settings shown in Figure 16 violate what we said about abrupt adjustments of a single slider without taking into account adjoining bands. It's time to fire up the real time analyzer again.

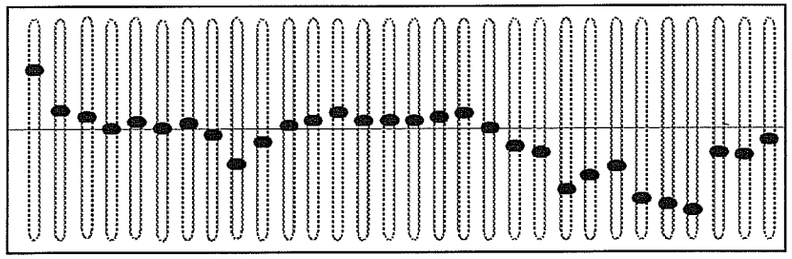


Figure16

This time, make small, careful adjustments until the real time analyzer display looks as closely as possible like our room curve graph (Fig. 17). Double-check to make sure that left and right channels are nearly identical. In our example, the final results would look like this:

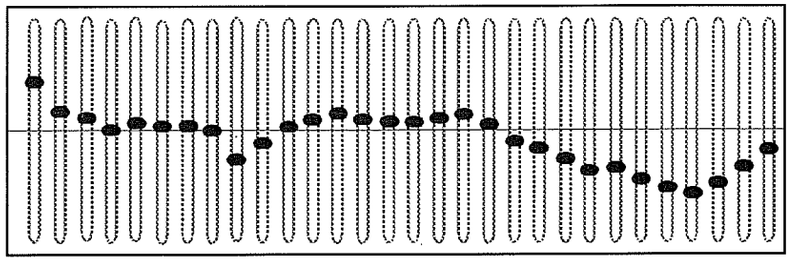


Figure 17

When you're satisfied with the final adjustments, record them, just in case the settings get accidentally or intentionally modified — by creative toddlers or invisible, knob-twisting gremlins who sometimes visit in the dark of night.

Level Adjustments

The ear's perception of relative loudness is a function of all sorts of psychoacoustic factors. Frequency response plays just as important a part as overall sound pressure level.

Play a favorite selection through your newly equalized system and disengage the EQUALIZE button on the C-131(s). The "old" sound will not only be less pleasant, but seem to be at a different volume as well.

Adjust the LEVEL MATCH control on the front of the C-131 while pressing the EQUALIZER button in and out until the "old" sound and the "new" sound are the same perceived volume.

How Permanent Are These Settings?

As previously noted, we recommend you leave the corrective settings of your C-131 alone and use other methods for tone control adjustments on individual music selections. In fact, we offer a security cover to keep the inquisitive fingers of toddlers, teens and audiophile friends from experimenting with your remarkable new components.

However, there *are* certain circumstances where you will need to re-adjust the settings:

1. If you change listening rooms (an obvious one).
2. If you change loudspeakers.
3. If you radically re-position your loudspeakers (a not-so-obvious one).
4. If you make significant changes to the acoustics of the room. For example, removing horizontal window blinds and replacing them with curtains, adding a large sofa grouping, or carpeting a room which previously had a bare floor.
5. If you change your primary listening position (also known as Spouse-Induced Redecoration Syndrome).

"...there is no industry standard for XLR-type 3-pin connectors."

APPENDIX A - BALANCED CONNECTIONS

If you're lucky enough to own a preamplifier and/or amplifier which has balanced "XLR" style connections, we suggest you use them. As we noted in the introduction to this manual, noise and hum caused by ground interaction between components is eliminated and conductance variables are nullified.

The C-131's "RCA" and balanced inputs and outputs are wired in parallel so it is not necessary to use both balanced inputs *and* outputs. For example, if your preamplifier has balanced outputs, connect them to the C-131's balanced inputs. But if your power amplifier has standard "RCA" inputs, you can use the C-131's conventional outputs.

IMPORTANT: Pin Configuration

Amazingly enough, there is no industry standard for XLR-type 3-pin connectors. Pin one is *Always* ground, however the connections for pins two and three are the subject of some controversy, and sooner-or-later, an international standard will be issued. So the configuration set from the factory on the C-131 may not match that of your preamplifier or power amplifier. Figure 18 shows the pin-out configuration present on the C-131's balanced input and output connectors.

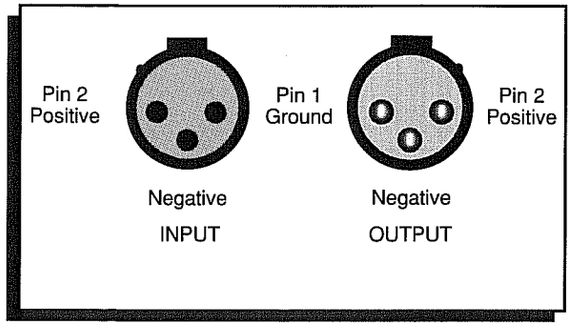


Figure 18 - XLR pin-out

If the C-131 is placed in a preamplifier tape loop, positive and negative pin configurations are not an issue (because it is most likely using RCA type connections.) But if you're placing the C-131(s) directly in line between preamplifier and power amp, you should consult the preamplifier's owner's manual. It may be necessary to re-wire one or more connectors.

LIMITED WARRANTY

People are scared of warranties. Lots of fine print. Lots of noncooperation. Months of waiting around.

Well, don't be scared of this warranty. It's designed to make you rave about us to your friends. It's a warranty that looks out for you and helps you resist the temptation to have your friend "Who's good with electronics", try to repair your AudioControl C-131. So go ahead and read through this warranty, then enjoy your new component for a few days before sending in the warranty card and comments.

"Conditional" doesn't mean anything ominous. The Federal Trade Commission tells all manufacturers to use the term to indicate certain conditions have to be met before they'll honor the warranty. If you honor these conditions, we will warrant all materials and workmanship on your C-131 for FIVE YEARS from the date you bought it, and will fix or replace it, at our option, during that time.

Here are the conditions that make this warranty conditional:

1. You have to fill out the warranty card and send it to us within 15 days after you purchased your C-131.
2. You must keep your sales slip or receipt so you have proof when and from whom you bought your C-131. We're not the only company to require this, so it's a good habit to get into with any stereo purchase.
3. Your C-131 has to have been originally purchased from an authorized AudioControl dealer. You do not have to be the original owner to take advantage of the five year warranty, but the date of the purchase is still important so be sure to get a copy of the sales slip from the original owner.
4. You cannot let anybody who isn't (a) The AudioControl Factory; (b) An authorized service center; or (c) Someone

authorized in writing by AudioControl to service your C-131. If anyone other than (a), (b), or (c) messes with your C-131, that voids the warranty.

5. The warranty is also NOT in effect if the serial number has been altered or removed, or if the AudioControl C-131 is used improperly. Now, that sounds like a big loophole, but here's all we mean by it. Unwarranted abuse is (a) physical damage(our consumer products are not meant to prop up bookcases or get hauled around in tool cases, etc. This is a HOME hi-fi unit, not a bash-it-about utility equalizer, so if you crunch it, we can't be responsible); (b) improper connection, patch the phono jacks into a line socket or hook it to the speaker terminals on your power amp and we aren't responsible. . . high input signals could fry the innards; (c) sadistic things you shouldn't do to any electronics, such as get them wet, too hot, dirty, etc.

Assuming you conform to numbers 1-5, and it isn't all that hard, we get the option of deciding whether to fix your old unit or give you a new one. (See "What to if you need service.")

Legalese Section

This is the only warranty given by AudioControl. This warranty gives you specific legal rights that vary from state to state. Promises of how well your C-131 will work are not implied by this warranty. Other than what we've covered in the warranty, we have no obligation, express or implied. Also, we will not be obligated for direct or indirect damages to your system caused by hooking up the AudioControl C-131.

Failure to send in a properly completed warranty card negates any service claims.

What To Do If You Need Service

First, contact AudioControl. In writing, at 22410 70th Avenue West, Mountlake Terrace, WA 98043 (Attention: Service Department), by Fax at 206-778-3166, or phone us at 206-775-8461.

We'll help you make arrangements to have the unit sent back to the factory for service. That means recommending shipping methods and working with you to see if it really IS broken.

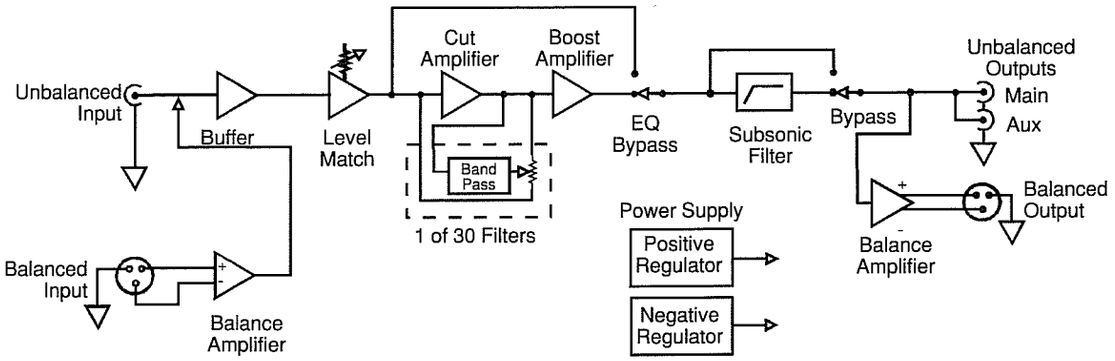
In either case, proof of purchase MUST be included with the unit (that sales slip or receipt we've been harping about). And send a brief note telling us what's wrong with the unit. (You'd be surprised how many folks forget this.)

The normal service time at the factory is less than three days! The rest is shipping time.

You're responsible for freight or postage when sending your unit to the factory. Actually, we recommend UPS (United Parcel Service) emphatically over the Pony Express Postal Service. UPS is more reliable and faster, too.

We'll pay return freight, and practice what we preach about using UPS on the return.

BLOCK DIAGRAM



C-131 One-Third Octave Equalizer

SPECIFICATIONS

Noise ..... -112dB
(A-weighted, all controls set at 0dB boost/cut)
Total Harmonic Distortion 0.002%
Frequency Response ..... 10Hz-100kHz ±0.2dB
(all controls set at 0dB boost/cut)
Input Impedance, unbalanced ..... 47k ohms
Input Impedance, balanced ..... 10k ohms, differential mode
Output Impedance, unbalanced ..... 100 ohms
Output Impedance, balanced ..... 50 ohms
Power consumption ..... 10 watts
Dimensions without optional rack mount ..... 3.65"H x 17"W x 11"D
(chassis only, not including controls and optional security cover)
Weight ..... 10.5 lbs.

Made in America

PN 794081