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CARVER

DIGITAL TIME LENS
Owner's Manual

CARVER
Powerful · Musical · Accurate

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Introduction

The Carver Digital Time Lens is a sophisticated component which is placed between the compact disc player and the pre-amplifier, integrated amplifier, or receiver.

A Word from Bob Carver

As the owner of a compact disc player, you are, I am sure, as impressed as I am with both the quietness and dynamic range made possible by this new technology. However, you are also, in all probability, somewhat disappointed in the way the music itself sounds on many compact discs.

When I received my first compact disc player and my first discs, I was not prepared for the poor sound that I heard. I had been hearing a great deal of criticism regarding the sonic quality of compact discs, but I didn't believe it.

History shows that whenever something new and wonderful is discovered or invented there are, at the beginning, many who disparage it. I thought something of this sort was going on with the advent of the compact disc, so you can imagine my surprise and my great astonishment when I hooked the CD player up and heard that hot brittle sound. And, there is no doubt about it, the three-dimensional perspective that I was used to, which I had in lush abundance on my system, was simply missing!

The next day I purchased twenty-three analog records and their counterparts made from the same master tape. This enabled me to compare directly the analog version and the compact disc version of each.

The selection included records and discs that were mastered on both analog and digital machines. I took a CD player, got into its timing circuits and time locked my crystal controlled turntable to the time base of the digital player so that I could synchronize the record and the compact disc note for note, millisecond for millisecond.

The output of each machine went to its respective input of my pre-amplifier and I used the selector switch on the pre-amplifier to choose between the two. There was quite a difference.

As expected, when compared with its analog counterpart, the compact disc

WARNING: To prevent fire or shock hazard, do not expose this equipment to rain or moisture.

TO AVOID ELECTRICAL SHOCK, DO NOT OPEN CHASSIS. NO USER-SERVICEABLE PARTS INSIDE. REFER ALL SERVICING TO QUALIFIED PERSONNEL.

CAUTION: When installing this equipment, read and follow all safety and operating instructions.

IMPORTANT: Carefully unpack your Digital Time Lens and keep the original carton and packing materials for moving, shipment, or long-term storage.

Personal Warranty Information

Serial Number: _____

Dealer: _____

Date of Purchase: _____

Personal ID Number / Location: _____

was much quieter, had greater dynamic range and richer bass impact but it also, to my ears, typically sounded thin, hot, brittle, and lacked a rich three-dimensional spatial perspective.

"What's going on here?" I asked myself and proceeded to find out.

Dr. Puddie Rodgers, a psychoacoustician of exceptional merit, and I discussed at length how we could determine if the 16-bit system itself was flawed. Actually we didn't think the system to be in error but we wanted to devise a means by which we could scientifically determine if it was or not. The result was a null test comparing an input signal going through the 16-bit system and a signal that by-passed it. We were able to get a complete and perfect null within the limits of resolution that satisfied us. The 16-bit system is not at fault.

Furthermore, since through our tests we discovered that there are at least two compact discs that are absolutely marvelous, it is apparent that the system itself is not the culprit.

From my tests I discovered the reasons that digital audio discs usually don't sound as good as their counterparts. They are: 1) The spectral energy balance is slightly different and 2) the amount of the L - R component was less by about 1 1/4 dB on the digital disc than it was on the analog disc. You may know that the L - R component represents the three-dimensional part of the sound field information while the L + R component carries the monaural information.

Also, I found that by comparison, the spectral balance of the digital disc, that is, the amount of midrange energy on it from musical passages, to be slightly greater than on the analog disc. So, taking both of these into account, one could expect the digital disc to sound 1) hotter than its counterpart in the midrange and 2) less spacious than its analog counterpart. We found only two compact discs where the differences with their analog counterparts were essentially non-existent.

I developed the Digital Time Lens to solve these problems so I could fully enjoy listening to music on compact discs. It was so effective I decided to package the circuit for others.

Happy listening!

Bob Carver

Before Going Any Farther . . .

Here are some suggested do's and don'ts that will make setting-up and using the Digital Time Lens a safe, as well as enjoyable, experience:

- Don't operate the Digital Time Lens on any ac line voltage other than that specified on the rear panel.
- Make all connections to and from the Digital Time Lens with its power cord unplugged, and the power for all other components in your system switched off.
- If someone accidentally spills a drink on the Digital Time Lens chassis, unplug the unit and have it checked or cleaned by a qualified service technician.
- Of course, we've mentioned that there aren't any user-serviceable parts inside your Digital Time Lens. Please resist any temptation to fiddle around inside the chassis. Avoid electrical shock and/or extreme embarrassment; refer all work to a qualified technician.

Again, keep the carton and packing materials the Digital Time Lens came in. Should you move, the best shipping container is the original carton. Hang on to this owner's manual, too. When your music system gets to its new home, the safety, installation, and operating instructions could be more than useful. Remember to fill out and return the Warranty Card.

Also, avoid mounting or placing the Digital Time Lens in direct sunlight. This can lead to an excessive heat build-up that could shorten certain components' life spans. Other locations to avoid include those near forced-air vents, large transformers, or other sources of dust and possible interference.

Warranty Card

It's highly unlikely your Digital Time Lens will ever need service but, should the unlikely occur, the Warranty Card is **the** ticket to Carver's two-year limited Parts/Labor Warranty Repair. Take a moment to fill out and return the Warranty Card that came in the Digital Time Lens packing kit. You should also fill out the warranty information in the space we provided earlier in this manual. Be sure to include any personal ID number used to further identify your Digital Time Lens.

Cleaning

You'll want to wipe off the Digital Time Lens' front panel and chassis from time-to-time with a soft, dry cloth. If you have something stubborn to remove, use a mild dish soap or detergent sparingly applied to a soft cloth; don't use alcohol, ammonia, or other strong solvents.

Installation

To install the Digital Time Lens with other stereo components the following items or materials will be necessary:

1. Two dual-RCA plug to dual-RCA plug signal cables.
(Be sure they're shielded.)

Placement:

You will want to place your Digital Time Lens near your compact disc player and your preamplifier, integrated amplifier or receiver. Many find placing the Digital Time Lens on top of their compact disc player an ideal arrangement.

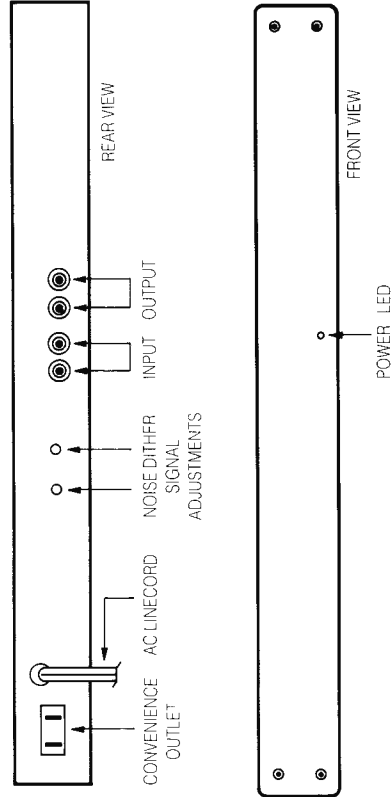
Signal Connections:

The place for the Digital Time Lens in the signal chain of your system is between the digital disc player and your preamplifier, integrated amplifier or receiver.

Remember to unplug the power cords of all electronic components before making signal connections.

1. Connect the plugs of the phono cables from your compact disc player to their corresponding Digital Time Lens inputs, left to left, right to right.
2. Connect phono cables from the left and right outputs of the Digital Time Lens to the corresponding AUX inputs (or designated Compact Disc inputs) of your preamplifier, integrated amplifier or receiver, left to left, right to right.

Check to make certain that all connections are secure.



Noise Dither Signal Adjustment:

The noise dither signal is a white noise, generated by two digital pseudo-random noise generators. The purpose of the dither signal is to eliminate the distortion caused by the 16-bit digital system when music is close to the noise floor. It accomplishes this by adding and subtracting instantaneous random voltages to the harmonic distortion products. This makes the distortion products vanish in the sense that they become unmeasurable and inaudible. You may think of it as trading distortion for noise, except that it's not an even trade. For every 3dB of noise addition, distortion is reduced by 6dB.

The noise signal is factory set with the controls at approximately 12:00 o'clock. This will yield a noise floor about 82dB below 2 volts, the standard output of most compact disc players. The setting is not critical. If you want less noise, simply reduce the dither signal. If you want less distortion, increase the dither signal. Our recommendation for the 16-bit C.D. system is 82dB below 2 volts.

To adjust the dither signal by ear, turn the volume control on your pre-amplifier, receiver, or integrated amplifier to 12:00 o'clock. In a silent room without any signal or music, adjust the dither signal so that it can just be heard. This completes adjustment of the dither signal.

Technical Description of the Time Lens

The Laser Disc Time Lens provides the correct ratio of $L - R$ to $L + R$ and provides the octave-to-octave balance originally intended by the musician and recording engineer as evidenced by the analog recording.

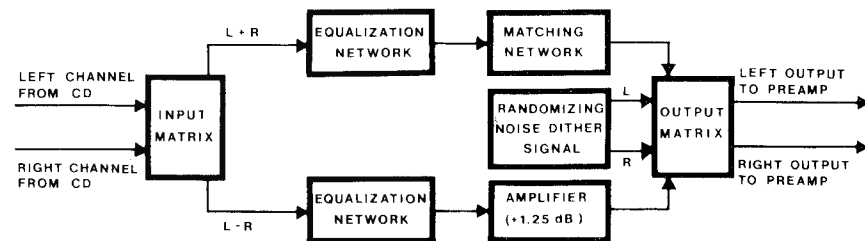
More specifically, the $L + R$ component of a digital disc must be equalized somewhat differently than the $L - R$ component of the digital disc so that it will match the analog disc (the analog version of the same musical recording).

There are two equalization curves necessary to make the laser disc sound exactly the same as its analog counterpart. In addition, it is necessary to increase the level of the $L - R$ signal so that it will match the $L - R$ level that's on the analog discs. Also, it's necessary to introduce a time correction in the $L + R$ component because equalization is steeper in $L - R$. The greater group delay requires a compensating delay, just micro-seconds, so that when the two signals arrive at the matrix to be turned back into left signal and right signal, they arrive without time domain errors.

The fundamental errors are small, about $1\frac{1}{4}$ dB, so you might ask how small errors on the order of only $1\frac{1}{4}$ dB could make a significant difference. If you do a little mathematics, an astonishing thing emerges. I'll walk through it very carefully: $1\frac{1}{4}$ dB excessive $L - R$ represents an increase of only 15% in $L - R$. However, since power is proportional to the square of the voltage, that is, the energy per unit time output of the loudspeakers into the room, due to the $1\frac{1}{4}$ dB extra $L - R$ represents 1.15 squared. 1.15 is 1.33 or 33% more power. That means 33% more energy in $L - R$ is delivered into the listening room by the analog disc than by the digital disc when both discs are made from the same master tape recording. Now since it's the $L - R$ component of the musical program that carries the spacial qualities, the ambience, the separation, the three-dimensional perspective, and the lushness that's associated with the recording, it's logical to assume that if the $L - R$ component is 33% less on a digital disc than on a corresponding analog disc, we could expect that the digital disc would sound flatter and perhaps subjectively we would say it's less lush or it's less airy or it's less spacious. Now this is coupled with the fact that the frequency response, i.e., the midrange energy, on the disc is different for the analog disc than the digital disc. (Again, from the same master tape recording.) An identical sort of thing happens. The difference is about $2\frac{1}{2}$ dB. Imagine the average energy referenced to 0dB. Above 1 kHz, the energy is about 2 to 3dB above the analog level, and although 2 to 3 dB doesn't seem like very much, it's really a lot. As an example, consider 2dB. 2dB represents 25% more midrange voltage: squared, it represents 58% more power or energy. Now, 58% is a lot and it's no wonder that a laser disc will often sound

quite harsh by direct comparison to the analog disc. Additionally, when you note that there is less $L - R$, resulting in less ambient space, there's no question that the laser disc by comparison with the analog disc will sound hotter, brighter, and less spacious. This has, of course, nothing to do with its signal-to-noise ratio or its measured frequency response. Rather it has to do with what's on the disc itself.

Block diagram of the Carver Digital Time Lens.



Carver Corporation Limited Warranty

NOTICE: The following warranty information is exclusive to the United States only. Please see your Carver dealer or distributor for the correct warranty information in your area or locale.

Carver Corporation is proud of its products which have been built with care using advanced technology and premium parts. Your unit has been crafted to perform properly for many years. Carver Corporation offers to you, the owner of a new Carver product, the following warranty:

The Carver Corporation Warranty for each of its products is in effect for two years from the date of original retail purchase. The Carver Corporation Warranty covers defects in materials and workmanship. However, the following are excluded: a) damage caused during shipment, b) damage caused by accident, misuse, abuse or operation contrary to instructions specified in the Carver Corporation owner's manual, c) units where the serial number has been defaced, modified or removed, d) damage resulting from modification or attempted repair by any person other than authorized by Carver Corporation.

The Carver Corporation Warranty extends to the original owner or subsequent owner(s) during the two-year warranty period as long as the original purchase receipt is presented whenever warranty service is required.

If your Carver Corporation product ever requires service, write to or call Carver Corporation (Attention: Customer Service Department), P.O. Box 1237, 19210-33rd Ave. W., Lynnwood, Washington 98036, (206) 775-1202. You will be directed to an authorized Carver Corporation Service Station or receive instructions to ship the unit to the factory. Please save the original shipping carton and packing materials in case shipping is required. Please do not ship by Parcel Post. Be sure you have received authorization from Carver Corporation and include a complete description of the problem, the associated components and connections, and a copy of the purchase receipt. Initial shipping costs are not paid by Carver Corporation; return shipping costs will be prepaid if repairs were covered by the scope of this Warranty.

All implied warranties, including warranties or merchantability and fitness for particular purpose, are limited in duration to the two-year length of this warranty, unless otherwise provided by state law.

Carver Corporation's liability is limited to the repair or replacement; at our option, of any defective product and shall not, in any event, include property or

any other incidental or consequential damages which may result from the failure of this product.

Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state. We suggest that you attach your purchase receipt to this Warranty and keep these in a safe place. Thank you for your choice of a Carver Corporation product.

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