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# CARVER

TX1-11 ASYMMETRICAL CHARGE COUPLED FM DECODER

PRELIMINARY OWNER'S MANUAL

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## INTRODUCTION

Congratulations. You have purchased an absolutely unique instrument that will allow you to receive noise-free and multipath-free stereo FM reception of many stations that you have previously found to be unlistenable.

Your TX1-11 has been exceptionally engineered, and is superbly crafted with many sophisticated features that will enhance your enjoyment of FM stereo listening, now, and in the future. To take full advantage of all this, be sure to read the safety, installation, and operating instructions. We've prepared this owner's manual for learning about the concepts and functions associated with the TX1-11.

## WARRANTY CARD

Please, fill out and return the Warranty Card that came with the TX1-11's packing kit. It's highly unlikely your TX1-11 will ever need service, but should the unlikely occur, your Warranty Card is the ticket to Carver's three-year limited Parts/Labor Warranty repair. Either from a local Authorized Carver Service Center, or the factory. We also suggest you fill out the warranty information in the space we included on the preceding page. Be sure to include any personal ID number used in further identifying the TX1-11.

Here are some suggested do's and don'ts that will make setting-up and using the TX1-11 a safe, as well as an enjoyable experience.

- Don't operate the TX1-11 on any power line voltage other than that specified on the rear panel.
- Make all connections to and from the TX1-11 with its power, and power for all other components in your system, switched OFF.
- Unplug the TX1-11's power and antenna lead-in during electrical storms, or if you're not going to use it for a prolonged period of time.

- When unplugging the ac line cord, grasp the plug and pull; don't yank on the cord itself.
- If someone accidentally spills a drink on the TX1-11's cabinet, unplug the unit and have it checked out or cleaned by a qualified service technician. This applies to every piece of equipment in your stereo system.
- Please, resist any temptation to inspect the inside of the TX1-11. There aren't any user serviceable parts inside. Avoid possible electrical shock. Refer all service work to a qualified technician.

Keep the carton and packing material the TX1-11 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 programming instructions could be more than useful.

## INSTALLATION

To perform the basic installation and set-up of the TX1-11, you'll need two sets of shielded signal leads (dual RCA phono plug to phono plug). The plugs of signal leads are color coded for "left and "right". Usually white for "left" and red for "right". (If you're planning to install the TX1-11 in an equipment rack or case, the optional rack "ears" and a phillips-head screwdriver will be needed.)

## PLACEMENT

If you're mounting the TX1-11 in a rack with other components, the rack-mount ears must first be installed to either side of the tuner's front panel. Instructions are included with the rack ears, detailing their assembly and attachment to the TX1-11's chassis. Once installed, the tuner can be secured to the case's or enclosure's rack rails with the proper mounting hardware. In some case installations and in spacing equipment closely together, you may wish to remove the rubber feet on the TX1-11's bottom panel. If you're not planning to rack mount the TX1-11, just place it near the preamp—near enough so the signal cable will reach without excessive strain on the cable, itself, or on the connections. However, there are other considerations in placement of the TX1-11; for both rack and open installations.

Heat, at least normal amounts, shouldn't be any problem. The unit itself doesn't generate much and isn't sensitive to small amounts.

Never mount or locate the TX1-11 in direct sunlight, near forced-air vents, near motors, or other sources of dust and possible interference.

Wipe the TX1-11's cabinet from time-to-time with a soft, dry cloth.

If you have to get something stubborn off, use a mild dish soap or detergent: don't use alcohol, ammonia, or other strong solvents.

## SIGNAL CONNECTIONS

When it comes to making signal connections between your existing tuner or receiver, and the TX1-11's inputs and outputs, be sure to plug the

left channel (white plugs) into left inputs and outputs, and right channel (red plugs) into the right inputs and outputs.

The TX1-11 is designed to be installed in the signal chain between your existing tuner and the TUNER inputs on your integrated amplifier or your preamplifier.

#### SEPARATE TUNER

If you own a separate tuner, simply connect the tuner outputs to the TX1-11's inputs, and the TX1-11's outputs to your preamplifier or amplifier tuner inputs. If your tuner has level controls, set the controls as you previously have used them. However, once you have calibrated the TX1-11, you must not change your tuner's level controls without re-calibrating the TX1-11. Of course, you may simply plug the TX1-11 into your tuner outputs that don't have a level control associated with them, or simply advance the level controls to mid rotation.

#### RECEIVER

If you own a receiver, simply connect the TX1-11 into the receiver's tape monitor loop. The receiver's tape output jacks go to the TX1-11's inputs, and the TX1-11's outputs go to the receiver's tape input jacks. Then simply engage the tape monitor switch on your existing receiver.

#### CALIBRATION AND OPERATION

##### CALIBRATION

1. Find the "loudest" FM station in your area. (Generally this will be a rock station.)
2. Set the TX1-11 controls as follows:
  - All front panel buttons "out".

- Back panel calibration switch "in".
  - Back panel calibration control fully counter-clockwise as viewed from the rear.
3. As you listen to the tuner, slowly turn the calibration control clockwise and watch the calibration indicator. The proper calibration will be achieved when the indicator blinks off from time to time during the loudest passages of the music.  
It is important not to go beyond this point.
  4. Release the back panel calibration switch. This completes the calibration procedure.

#### OPERATION

The ASYMMETRICAL DECODER button engages the circuit. Simply push for quiet FM reception.

The NOISE REDUCTION button is a two position switch that allows you to optimize the circuit for a particular reception problem. In the "OUT" position, the circuit will reduce weak station noise. When the button is pushed to the "IN" position, the circuit will reduce both weak station noise and multipath distortion. Ordinarily, optimum performance is obtained when the NOISE REDUCTION position is used, except in those reception conditions where multipath distortion is present. Feel free to experiment with either position and choose the best.

#### THE FM STEREO PROBLEM

The fundamental FM stereo problem is simple. The broadcast system



was designed over 30 years ago before the advent of stereo. When stereo came along, two channels were forced to fit where one channel went before. The result: a giant step backwards in terms of noise-free, distortion-free reception for all but nearly ideal and perfect reception conditions. Enter the TX1-11.

Your TX1-11 can drastically reduce multipath and distant station noise and still provide fully separated stereo reception with space, depth and ambience. We're tempted to say, sound quality as it was intended over 30 years ago. Back then, FM was a noise-free, wide-band alternative to static-filled AM. But it was in mono. Unfortunately, the stereo transmission system selected to augment mono FM ended up degrading the ratio of signal to noise FIFTEEN TIMES! (More than 23 db.)

That's the system we live with today: hiss and often multipath, distortion-filled unless you're in a direct line with a strong station.

#### UNDERSTANDING FM

Stereo frequency modulation transmission is a lot more complicated than you might think. But understanding it will clarify both the problems and Carver's solution.

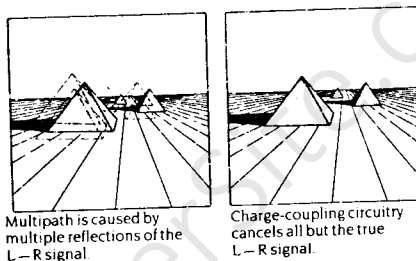
Stereo FM is not like a 2-track cassette with separate signals next to each other. Rather there is a Left-Minus-Right and a Left-Plus-Right signal. A receiving circuit adds and subtracts sums and differences to get Left-only and Right-only signals. (As you might have guessed, Left Plus Right comes in just fine on mono receivers because it IS mono.)

It's that Left-Minus-Right signal that's to blame.

These signals are transmitted at different parts of the audio spectrum and unfortunately L-R is extremely prone to mishaps on the way to your home.

#### AUDIO GHOSTING

To get stereo FM perfectly, you'd have to be the only house in the middle of a vast flat plain with no other buildings anywhere on the plain.



Because any protruding mass— hills, mountains, skyscrapers, other antennas, even bridges— looms up to reflect signals while on their way to your tuner.

Then you get TWO signals. One directly, and one or more a fraction of a second later, after it's taken a longer angular path of bouncing off something. (This happens with TV and AM, too. AM isn't audibly affected, but you can see the frustrating result on TV: a second, third and fourth image.)

These additional images are disastrous to FM reception because they reinforce and then remove part of the signal alternately. As the main signal deviates in frequency, it beats with the reflective signal, causing constructive and destructive interference patterns which bear no

resemblance to the original signal. An engineer calls these "beats" phase and amplitude modulation.

While stereo FM receivers have made much of cancelling the amplitude modulation component of this interference, they have never addressed the truly audible distortion caused by the phase modulation part.

Without waxing too technical, suffice to say that your FM receiver is tricked into reading phase modulation as frequency modulation, which is decoded and made into a brand new signal. The better your current tuner, the more faithfully it's deceived!

Thus instead of just degrading the existing signal, multipath reception problems actually CAUSE NEW AUDIBLE SOUNDS. And we've all heard how bad these sounds sound.

HOW THE TX1-11 WORKS

Fig. 1— Block diagram of the TX1-11's special noise-reduction and multipath-reduction circuitry

TO SEE FIGURE 1, PLEASE TURN TO LAST PAGE OF MANUAL

## NOISE AND MULTIPATH--REDUCTION CIRCUITRY - Refer to Fig. 1

There are three separate circuit elements which contribute to noise and multipath reduction. The three elements of the system are a result of investigations into both psychoacoustics and the standard sum-and-difference matrix techniques used in the transmission and recovery of the left and right stereo FM signals. Having recovered the L and R signals from a conventional multiplex decoder, these signals are first recombined into  $L + R$  and  $L - R$  signals. The  $L + R$  constitutes a mono signal, while the  $L - R$  signal conveys the "stereo" or "difference" information. In this approach, the  $L - R$  signal can be thought of as containing two types of signals: An L-R component having random phase information and an L-R component having specific localizing phase information. The localizing information provides the left **and** right stereo image location in a sound field. The nonlocalizing information provides the stereo ambience contained in a stereo sound field. This nonlocalizing information is completely redundant with information that is already available in the  $L + R$  signal. But the  $L + R$  signal (mono) is, as we all know only too well, a lot quieter (about 23 dB worth) than the  $L - R$  information. It is also less vulnerable to multipath effects.

What is done, therefore, is to generate a new  $L - R$  signal by using the very quiet  $L + R$  signal as a pilot signal. This is possible because, as mentioned before, the information contained in  $L - R$  is largely redundant with information contained in  $L + R$ .

If you follow the line leading from the  $L + R$  output of the first matrix block, you will see that it leads to phase-randomizer and spectral-shaping blocks, the output of which has been designated as  $(L - R)'$ . However, since stereo localization must also be derived from the broadcast  $L - R$  signal, this signal is also directed to a series of four blocks (a pair of log amps, A and B, a differencing amp, and an anti-log amp) to establish the instantaneous ratio between broadcast  $L + R$  and broadcast  $L - R$ . The  $L - R$  signal is also fed to a series of blocks called a leading-edge detector and a leading-edge amp. These blocks take advantage of a psychoacoustic phenomenon known as the precedence effect. When fast, short-term,  $L - R$  information critical to the localization process occurs, these blocks allow that information to become part of the "mix" that occurs at the summing junction.

So, thus far we have the contributions of the quiet  $(L - R)'$  and the leading-edge detector at this summing junction, the output of which feeds the second matrix, along with the unmodified  $L + R$  signal.

Additional circuits, shown at the lower right of the diagram, take advantage of the fact that totally discrete  $L$  and  $R$  signals are available from the regular multiplex decoder in the system. When  $L$ - only or  $R$ - only signals modulate the r.f. signal, that information is conveyed back to the summing junction via another pair of log amps, a differencing amp, an anti-log amp, and finally the a.g.c. amp. In this way, high orders of separation are maintained during single-tone tests.

What your TX1-11 can and cannot do:

It can reduce and virtually eliminate weak signal hiss and multipath distortion provided all of the hiss and distortion resides in the L-R part of the broadcast. (Almost all stations.)

It cannot fix a reception problem where the noise or distortion resides in the L + R part of the broadcast. (If the station is too far gone.)

SPECIAL NOTE:

Some tuners and receivers, in an attempt to make FM reception sound quieter, are designed either to blend the stereo signals essentially into mono or to automatically switch into mono when the stereo signal becomes weak. (Stereo sound is sacrificed for less noisy reception.)

Here's how to tell if your tuner or receiver blends or switches to mono:

If your unit's stereo indicator light goes out on weaker stations you have a tuner or receiver like the ones described above. It will then be necessary to have your local service center reduce the auto switching or auto blend threshold down to the noise floor. Normally this is easily accomplished by a technician. This is not a user adjustment and must be performed by a qualified service technician. This adjustment will normally provide a greater number of quiet stereo stations than ever before.

## IN CASE OF DIFFICULTY

1. LESS-THAN-PERFECT SOUND: If you're getting sound, but it doesn't sound very good, the type of bad sound can be a clue to the problem.
  - A) CRACKLING: Possibly car ignition noise, or noise from electrical devices in the house, like motors, etc.
  - B) DISTORTION: Probably multipath-induced; engage the MULTIPATH REDUCTION. If that doesn't work, you might have a very severe reflection problem (Multipath).
  - C) HISS AND NOISE: Most likely caused by a weak signal; try MULTIPATH and NOISE REDUCTION.
  - D) HUM: Possibly from cables connecting tuner and preamp. Check your cables or try new ones.
2. NO STEREO: Check the STEREO indicator light on your tuner or receiver. If it's off, see special note.
3. CONTROL SETTINGS: Check all control settings on your preamp or integrated amp: Power On/Off, Source selectors, Stereo/Mono, Speaker On/Off (or Speaker selector), Volume or Gain controls.
4. INTERFERENCE: Depending on the nature of the interference, check the following suggestions:

- A) Install your tuner or receiver farther away from transformers, motors, TV sets, and fluorescent lighting. Route the signal cable and antenna leads from these possible sources of interference.
- B) Make sure your signal cable between your tuner or receiver and TX1-11 is in good shape and shielded.
- C) Attach a noise suppressor to the electrical equipment causing the noise.

#### SERVICE

If the information in the preceding section doesn't help, or the problem falls outside this manual's scope, please contact:

CARVER CORPORATION CUSTOMER SERVICE

P. O. Box 664

Woodinville, WA 98072

or call: (206) 483-1202

Your inquiry will be promptly responded to; we're glad to help.

You might be directed to a Carver Authorized Service Center, or asked to return the unit to the factory. We must have the serial number of the TX1-11 before we can authorize its return. When shipped to a service center or the factory, make sure it's in the original carton, well sealed. If convenient, your Carver dealer should be consulted and might be able to offer additional assistance.

Thank you for choosing CARVER.



## 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 for your area and 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 three 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 three-year warranty period as long as the original dated 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 664, 14304 N.E. 193rd Place, Woodinville, Washington 98072, 206-483-1202. 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 of merchantability and fitness for particular purpose, are limited in duration to the three-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.

Carver Corporation  
P.O. Box 664  
14304 N.E. 193rd Place  
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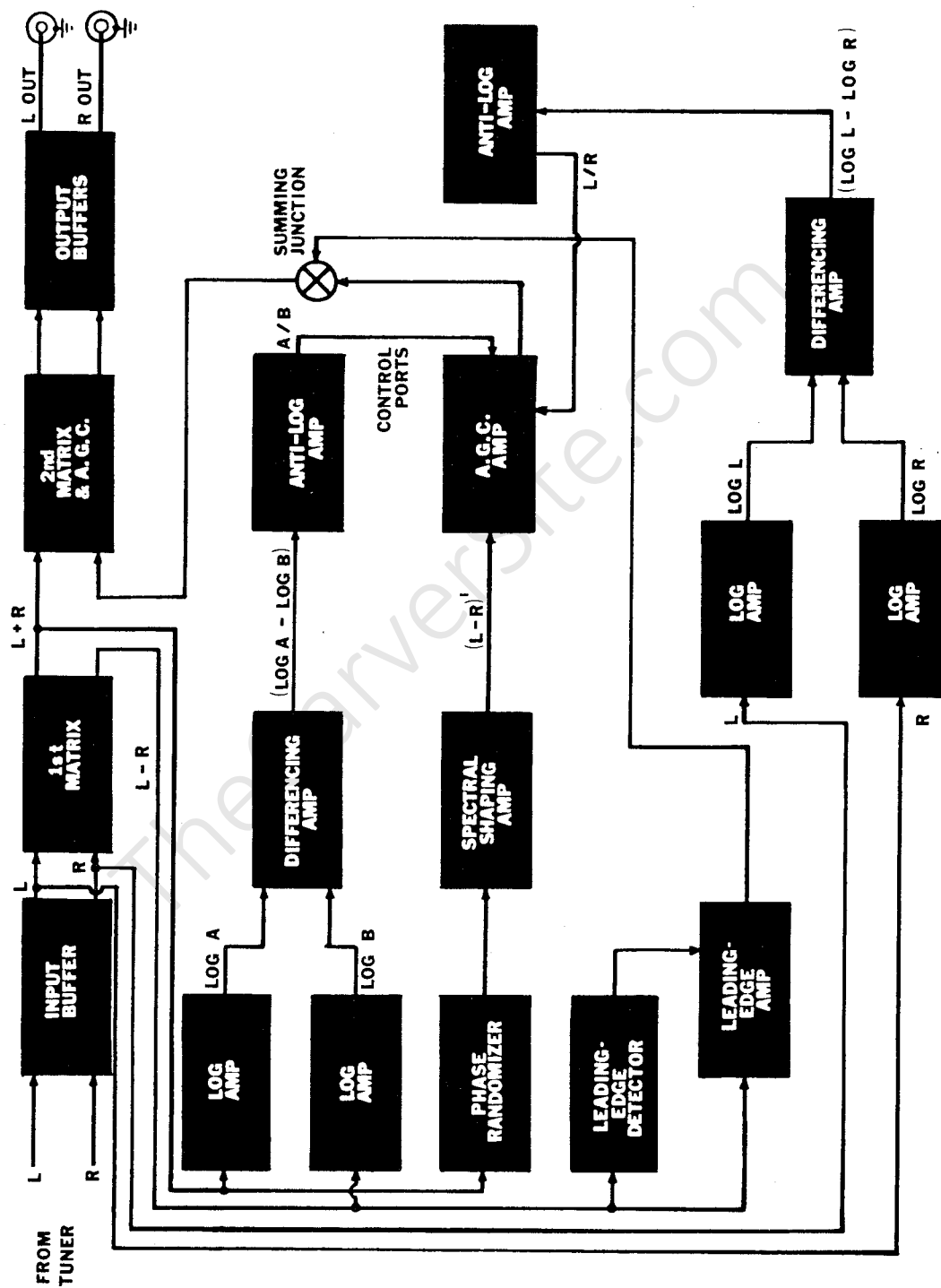


Figure 1

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