# CARVER

## TX-12 Tuner
## Owner's Manual

CARVER

CARVER

*Powerful · Musical · Accurate*


The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user of the presence of uninsulated "dangerous voltage" within the product's enclosure; that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

## Safety Instructions

1 Read Instructions - All the safety and operating instructions should be read before the component is operated.

2 Retain Instructions - The safety and operating instructions should be retained for future reference.

3 Heed Warnings - All warnings on the component and in the operating instructions should be adhered to.

4 Follow Instructions - All operating and other instructions should be followed.

5 Water and Moisture - The component should not be used near water - for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.

6 Ventilation - The component should be situated so that its location or position does not interfere with proper ventilation. For example, the component should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or placed in a built-in installation such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

7 Heat - The component should be situated away from heat sources such as radiators, or other devices that produce heat.

8 Power Sources - The component should be connected to a power supply only of the type described in the operating instructions or as marked on the component.

9 Power-Cord Protection - Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the component.

10 Cleaning - The component should be cleaned only as recommended in this manual.

11 Non-use Periods - The power cord of the component should be unplugged from the outlet when left unused for a long period of time.

12 Object and Liquid Entry - Care should be taken so that objects do not fall into and liquids not spilled into the inside of the component.

13 Damage Requiring Service - The component should be serviced by qualified service personnel when:

A. The power-supply cord or the plug has been damaged; or

B. Objects have fallen, or liquid has been spilled into the component; or

C. The component has been exposed to rain; or

D. The component does not appear to operate normally or exhibits a marked change in performance; or

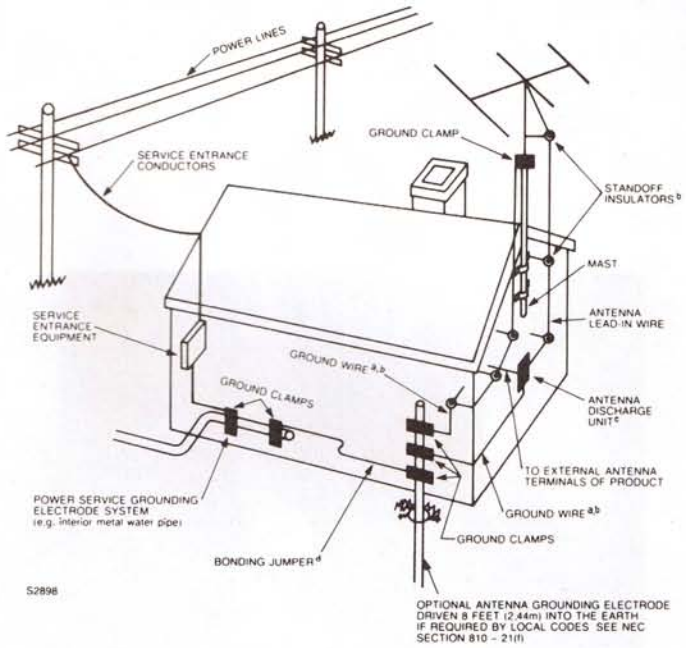
E. The component has been dropped, or the cabinet damaged.

14 Servicing - The user should not attempt to service the component beyond those means described in the operating instructions. All other servicing should be referred to qualified service personnel.

15 Power lines - An outdoor antenna should be located away from power lines.

16 To prevent electric shock do not use this (polarized) plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

**EXAMPLE OF ANTENNA GROUNDING ACCORDING TO NATIONAL ELECTRICAL CODE INSTRUCTIONS CONTAINED IN ARTICLE 810 – "RADIO AND TELEVISION EQUIPMENT"**




a. Use No. 10 AWG (5.3 mm²) copper, No. 8 AWG (8.4 mm²) aluminum. No. 17 AWG (1.0 mm²) copper-clad steel or bronze wire, or larger, as a ground wire.
b. Secure antenna lead-in and ground wires to house with stand-off insulators spaced from 4–6 feet (1.22–1.83 m) apart.
c. Mount antenna discharge unit as close as possible to where lead-in enters house.
d. Use jumper wire not smaller than No. 6 AWG (13.3 mm²) copper, or the equivalent, when a separate antenna-grounding electrode is used. See NEC Section 810-21 (j).

Carts and Stands - The appliance should be used only with a cart or stand that is recommended by the manufacturer.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

PORTABLE CART WARNING

Pour prévenir les chocs electriques ne pas utiliser cette fiche polarisée avec un prolongateur, une prise de courant ou une autre sortie de courant, sauf si les lames peuvent étre insérées à fond sans en laisser aucune partie à découvert.

17 Grounding or Polarization - Precautions should be taken so the grounding or polarization means of the component are not defeated.

Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

* Internal line voltage selector switches should only be reset by qualified service technicians for proper attachment plug for alternate voltage. See an authorized dealer for more information.

See your authorized Carver dealer for information on the attachment plug for alternate line voltages. This pertains to dual-voltage units only.

**NOTE! To CATV system installer –**
This reminder is provided to call the CATV system installer's attention to Article 820-22 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

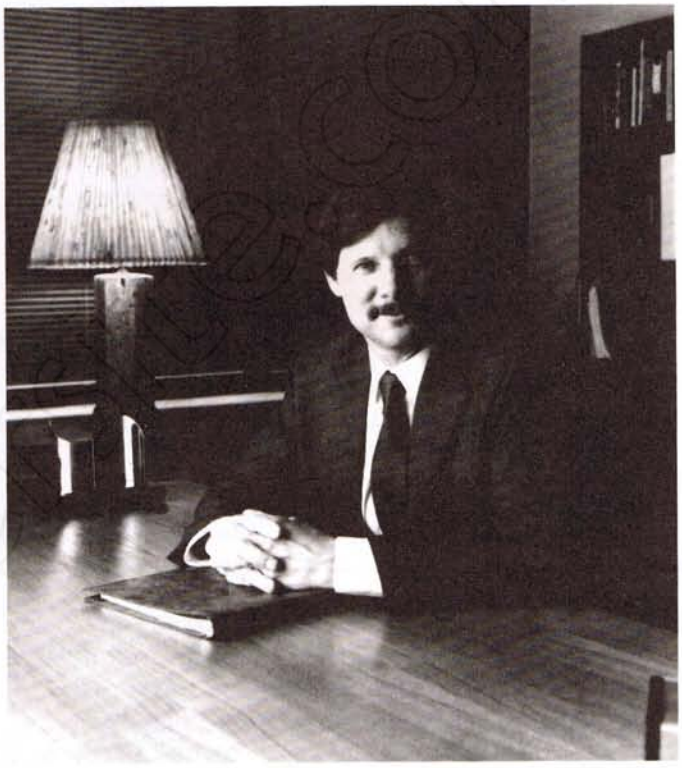
WARNING! To prevent fire or shock hazard, do not expose this equipment to rain or moisture.

## Introduction

### *A Message From Bob Carver*

Dear CARVER Customer,

Thank you for choosing CARVER electronics. We at CARVER CORPORATION realize that there is an abundance of home electronics from which to choose, and the differences between the various models are not always apparent at first glance. CARVER CORPORATION strives to produce for you the finest in audio reproduction equipment by integrating the latest and best technology with the most competitive price possible.



We are particularly proud of the TX-12 Synthesized Stereo Tuner and want you to know why. The TX-12 features the Asymmetrical Charge-Coupled FM Stereo Detector™, a patented circuit that eliminates the noise and distortion that can mar the FM listening experience. When engaged, this circuit enables the TX-12 to free music from the hiss and distortion associated with multipath interference. The ambience and localizing information needed to perceive stereo, normally lost to distortion, is restored. You'll be able to consistently, cleanly, quietly enjoy the music in *stereo*. Finally, a real breakthrough that allows FM programming to compete equally with records and tapes for audio quality and share of your listening time.

The TX-12 Stereo Tuner is a fine example of our commitment to excellence. We believe its sophisticated engineering and meticulous craftsmanship will provide you with many years of listening enjoyment. I am proud to present to you the best in craftsmanship and design found in CARVER electronics.

Bob Carver

Robert W. Carver, President

CARVER CORPORATION

# Table of Contents

# 1
# Prior to Installation

***Note:*** Do not connect the TX-12 to AC power until all signal connections have been made and the installation is complete.

## Unpacking Your TX-12 Stereo Tuner

Make a note of the serial number which is located on the back of the unit. Record it in the space provided for convenient reference. You will need to refer to this number if you require service or if the TX-12 is stolen.

Model TX-12 Stereo Tuner
Serial Number _____
Purchased at _____
Date _____

Please save the box, as well as all of the internal packing materials!

This container is the best way to store and move your new tuner. If the TX-12 should need repair, the original container is ideal for shipping to a CARVER Service Center.

Upon opening the box, please check for any visible sign of damage that does not appear on the outside of the box. If you do encounter what appears to be concealed damage, please consult your Dealer before proceeding to further unpack the unit.

If no damage is found, gently lift out the unit by grasping the handles. After lifting the TX-12 out of the box, gently lift first one side, then the other and remove the molded side packing material.

## Placement of Your TX-12

Consider the following guidelines in placing your TX-12 Stereo Tuner with your other stereo components:

- Do *not* place the tuner directly on top of a power amplifier, as you may block the vents needed for proper cooling of the amplifier.
- The TX-12 can be placed in an equipment rack which has adequate ventilation.
- Do *not* place the tuner in direct sunlight or near forced-air vents, motors, or other sources of dust and interference.

# 2
# Front Panel

## Front Panel Display

The features available on the TX-12's front panel are described in the following paragraphs.

### 1 Power

Press this button to turn the power ON. Press again to turn the power OFF.

*Note:* When you turn the tuner on, the station that was last tuned is received automatically. The frequency of station appears in the display.

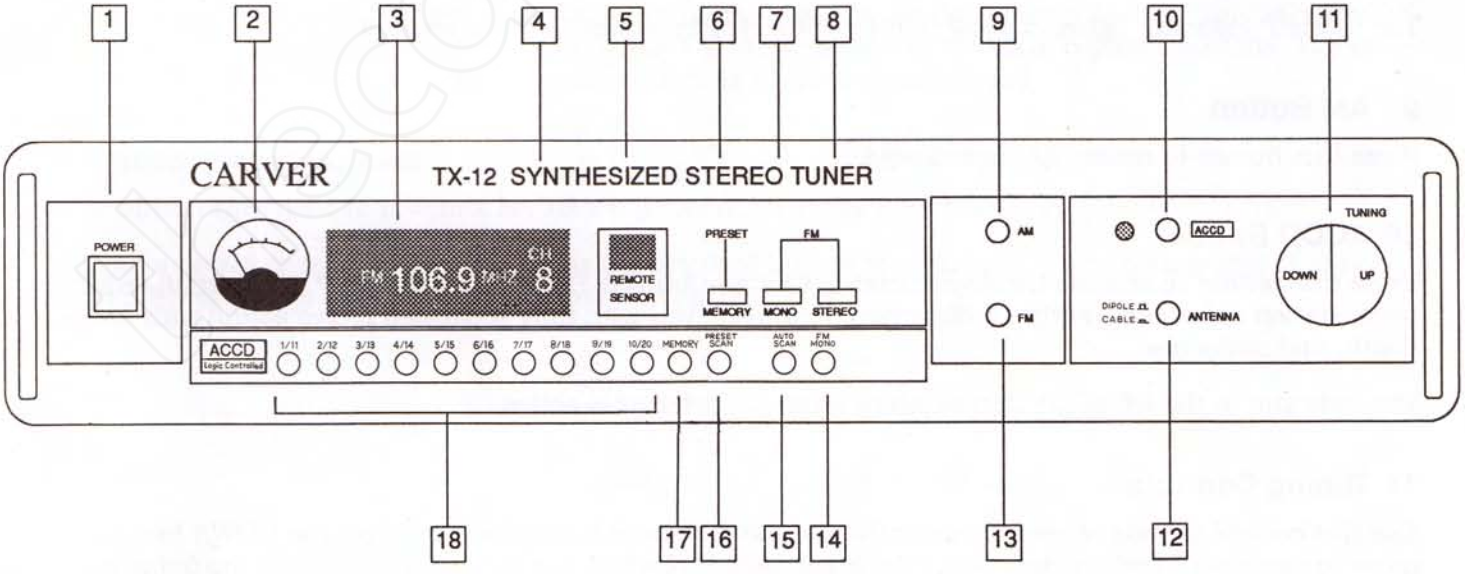



Figure 1 Front Panel

## Remote Control Unit

Many of the TX-12's features can be activated from the remote control unit:

1 Tuning Down/Up
2 AM/FM
3 Station Presets
5 Power
6 ACCD

All of these features are described at the beginning of this chapter under the heading *Front Panel.* For additional information, read the operating instructions in Chapter 4.

The remote control unit can also be used to operate the following features on your Carver compact disc player:

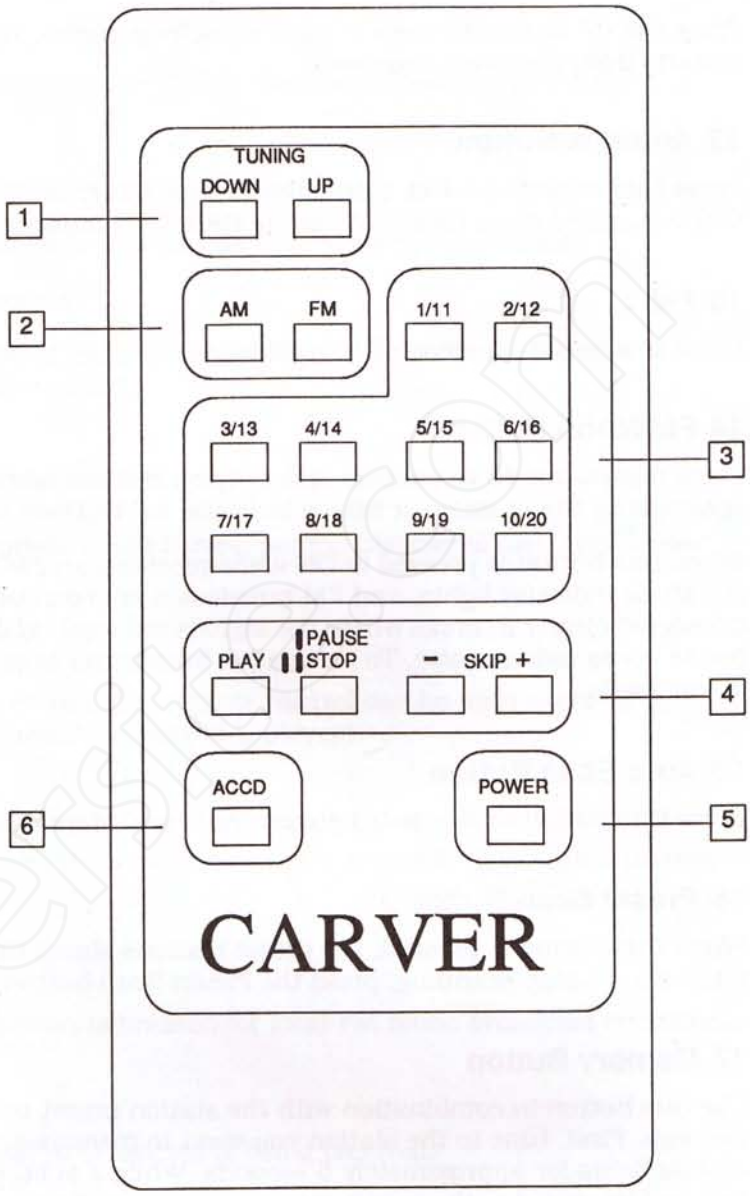
Play
Pause/Stop
Skip + and -

For information about these features, refer to the owner's manual that accompanied your compact disc player.

To use the remote control unit, simply aim the unit at the compact disc player from no more than 15 feet away. The word "Remote" momentarily flashes on the Remote Sensor.

Two AAA batteries are needed to operate your Remote Control unit. Insert the batteries supplied into the unit by sliding the back panel open. Match the positive (+) and negative (-) polarities as indicated inside the battery compartment.

*Note:* Lift the positive side first when you are removing the batteries.




Remote Control

# 3
# Rear Panel and Connections

## Rear Panel

The connectors on the TX-12's rear panel are described below.

### 1 AM Loop Antenna

The TX-12 is equipped with a high-performance AM Loop Antenna clamped to the rear panel with a snap-in hinge. Swivel it out for improved AM reception. For the best AM reception, remove the antenna from the hinge and hang it on a wall.

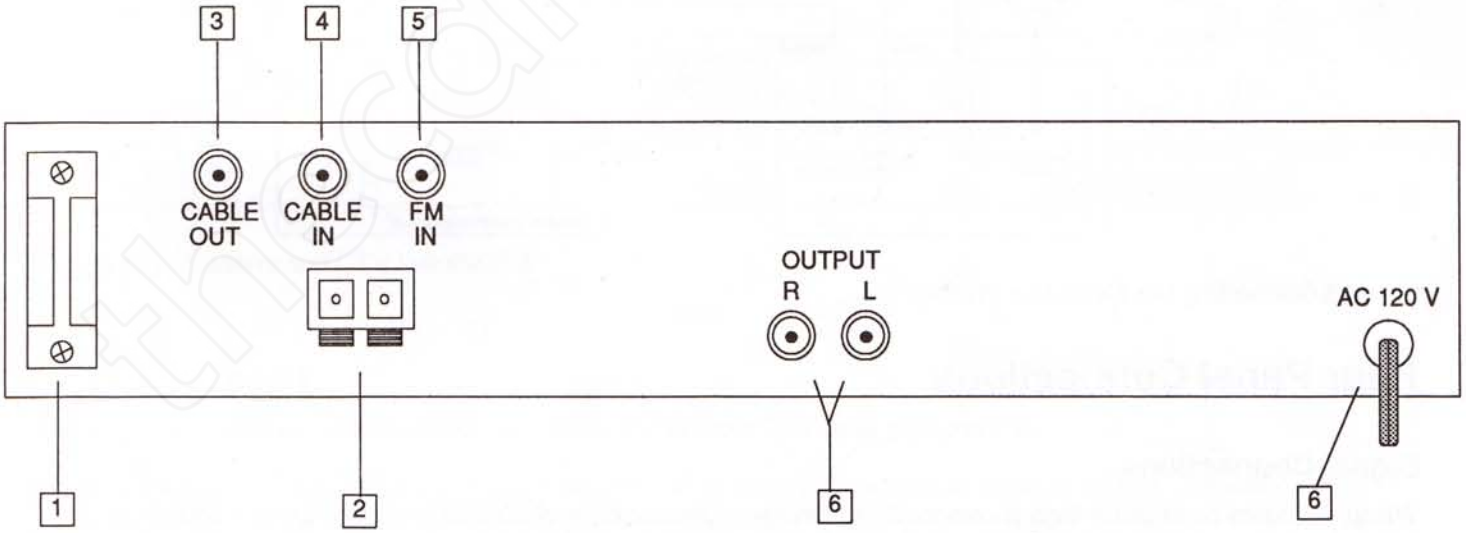



Figure 2 Rear Panel

### 2 AM Antenna Terminals

Use these two terminals to connect the tuner to the AM loop antenna.

### 3 CABLE OUT Terminal

Use this terminal to route cable output signals to a VCR or TV through a 75 ohm coax cable.

### 4 CABLE IN Terminal

Use this terminal to connect the tuner to an external cable from your local cable TV supplier.

### 5 FM IN

Use this terminal to connect the tuner to your FM antenna through a 75 ohm coax cable.

### 6 OUTPUT R and L

Connect these two outputs to the right and left tuner jacks on your preamp or integrated amplifier.

### 7 AC LINE CORD

Plug the 120 VAC line cord into either a switched or unswitched convenience receptacle on your preamplifier or integrated amplifier.

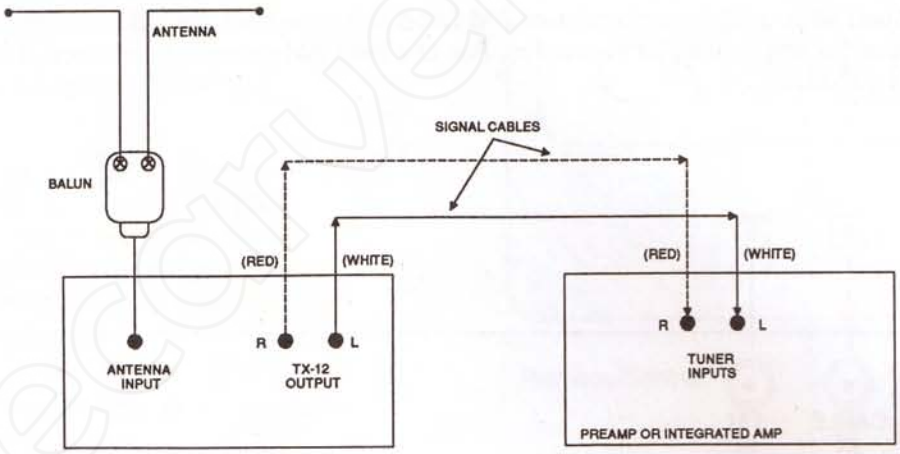



Figure 3 Connecting the TX-12 to a Preamp

## Rear Panel Connections

### Signal Connections

When it comes to making signal connections between the tuner outputs and preamp or integrated amplifier inputs, be sure to plug the left side (white plug) into the left tuner input and the right side (red plug) into the right tuner input. (See Figure 3.)

The signal cable should reach without straining either the cable or its connections. If the supplied signal leads don't reach, or simply aren't long enough for your special installation, substitute cables can be obtained from a stereo dealer or electronic supply shop. To help minimize noise and interference, CARVER recommends that any purchased cables be shielded and not exceed 20 feet in length.

## Power Connections

A 6-foot line cord is provided for plugging the TX-12 into a 120 VAC outlet, typically located on your preamp. If no convenience outlet is available, a multireceptacle power bar should be used. Plug the TX-12, the preamp, and any other additional components in the system, into the power bar. Make certain the power bar is rated to handle the total maximum wattage of all the components in your stereo system, then plug the power bar into a wall outlet.

Make sure the volume-control of the preamp is turned down or off before switching on the power of any component in your stereo system.

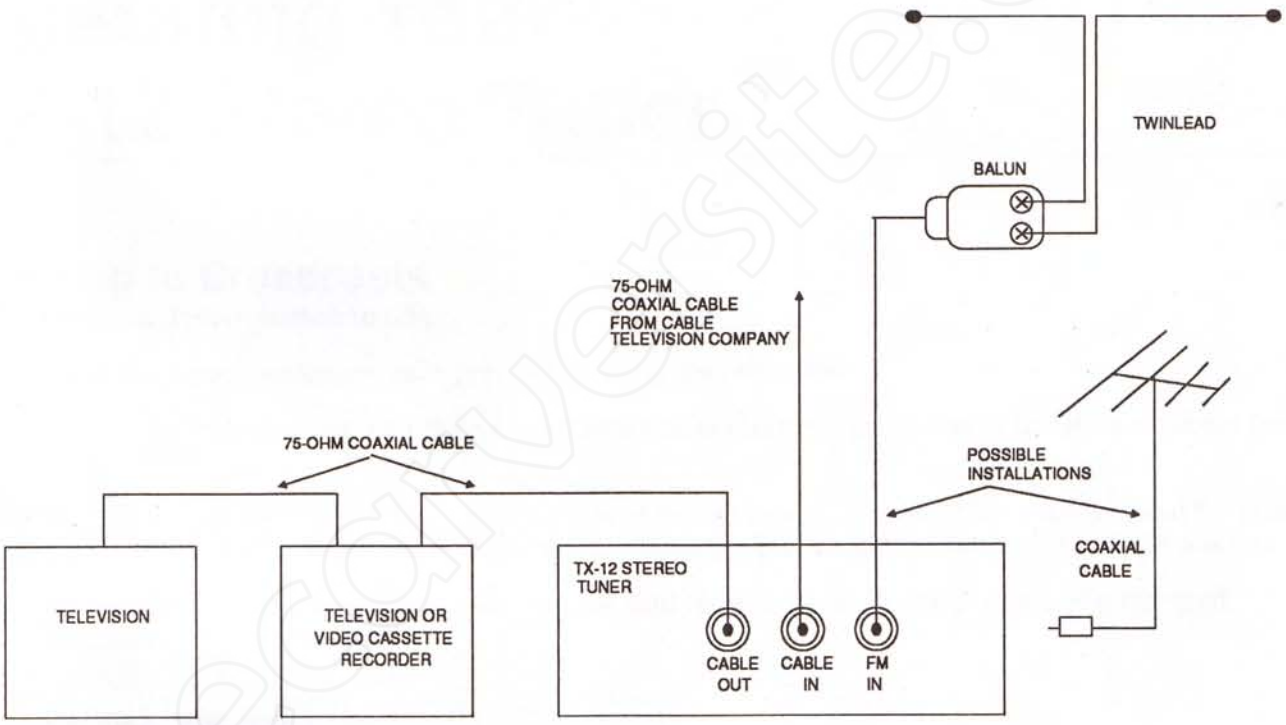



Figure 4 FM Antenna and CTV Installations

## Antenna Terminals

All three types of antenna terminals are described in the following paragraphs.

**FM Terminals.** The TX-12 can be directly connected to your own antenna system with a 75-ohm coaxial lead in or to a 75-ohm coaxial FM feed from a commercial TV cable.

To connect the TX-12 to an FM antenna via 75-ohm coaxial cable, simply plug the cable into the terminal labelled "FM IN" on the rear panel.

To connect the TX-12 to the cable company's 75-ohm coaxial cable, plug the cable into the terminal labelled "CABLE IN."

By pushing the Antenna button on the front panel, you can toggle between the two antenna terminals, alternately selecting FM reception from cable or antenna.

If you choose cable as the source of your FM signal, you can also route the signal to your VCR or TV via a 75-ohm coaxial cable attached to the CABLE OUT terminal. See Figure 4.

**AM Loop Antenna Terminal.** The AM Loop Antenna provided with your TX-12 can be snapped into the hinge on the rear panel or mounted on a nearby wall using the self-adhesive or screw-type fitting. The length of the antenna cord is 2 feet and should not be pulled tight.

To attach the loop antenna leads to the TX-12, use the two black terminals labelled "AM." Press down the lever below one of the terminals, then insert one antenna lead into the socket. Move the lever back so that the antenna lead is held securely. Follow the same procedure to attach the second antenna lead.

# 4
# Operating Your TX-12 Stereo Tuner

## Listening to Broadcasts

1 Press the Power button to ON.

2 Press the tuner button on your preamp or integrated amplifier.

3 To tune to station which has been stored in a preset channel, press one of the station preset buttons.

4 To tune to a station which has not been stored in memory, first select the required band by pressing either the AM or FM button, then use the Tuning Up or Down button to tune to the station.

5 Adjust the volume and tone with the volume and tone controls on the preamp or integrated amplifier.

## Tuning the TX-12

There are three different tuning methods: auto tuning, manual tuning and preset tuning. Each of these methods is described below.

### Auto Tuning

1 Press the Auto Scan button to turn on Auto Tuning mode.

2 Press the Tuning Up or Down buttons. The next broadcasting station is automatically located and tuned in. During tuning, interstation noise is eliminated automatically and weak stations are muted.

3 To scan the frequency band continuously, keep the tuning up or down button depressed. The tuner skips from one broadcast frequency to the next.

4 When the tuning up button is depressed and the upper limit frequency is reached, the frequency displayed changes to the lower limit frequency and tuning starts upward again.

5 When the tuning down button is depressed and the lower limit frequency is reached, tuning restarts downward from the top frequency.

### Manual Tuning

Use this mode to tune to stations broadcasting weak signals.

1 Press the Auto Scan button again to turn on Manual mode.

2 Press the Tuning Up or Down button. The frequency changes up or down at fixed steps in the FM and AM bands.

3 Continue to hold down one of the Tuning buttons, moving quickly from one end of the tuning range to the other.

4 Release the Tuning button when you are near the station you want to listen to. Then, tap the Tuning Up or Down buttons repeatedly until the desired station is tuned.

### Preset Tuning

The TX-12 has station preset memories which make tuning convenient. You can preset up to 20 broadcast frequencies in the station memories for pushbutton tuning. Once these stations have been stored in memory, they are retained for a month even with power turned off. You don't need to reenter preset stations every time the power is turned on.

To store a station in memory:

1 Select the AM or FM band by pressing either the AM or FM button.

2 Press the Memory button. The "MEMORY" indicator lights for approximately 5 seconds.

3 While the Memory indicator is lit, press one of the station preset buttons. For preset channels 1 through 10, press the button momentarily, then release it. For preset channels 11 through 20, press the button until the desired channel number appears in the channel display on the front panel, then release it.

To recall a preset station:

1 Press the station preset button corresponding to the desired channel. For channels 1 through 10, press the button momentarily; for channels 11 through 20, press the button for more than 1 second.

## Using the Remote Control

With the remote control, you can select the AM/FM band and tune to stations by pressing the tuning up/down buttons or by directly accessing or scanning 20 preset stations.

Simply aim the remote control at the tuner from no more than 15 feet, then press the desired button. The "REMOTE" indicator on the front panel will light momentarily.

You can also use the remote control to perform simple functions — stop, play, pause, and skip — on your Carver compact disc player. For more information on CD features, refer to your owner's manual.

# 5
# Antennas

## Overview

Sending information through the air, as a part of basic radio broadcasting, is a relatively simple process. At the broadcaster's end, the set up includes a studio, transmitter, and transmitting antenna. The studio supplies program materials — music, drama, news, and so on — to the transmitter. The transmitter sends the signal at high power and a specific frequency to the transmitting antenna in the form of alternating current. This creates an electromagnetic field that propagates through the air. At the listener's end, a length of wire serves as a receiving antenna. When the electromagnetic field generated by the transmitter/transmitting antenna combination reaches the wire, a small AC current is induced in it. A tuner connected to the wire translates this current into a "usable" form. In short, it turns the current into music, drama, and other programs for your enjoyment.

Of course, this description of the transmission part of radio broadcasting has been simplified. There's a lot going on in the actual transmission of FM stereo signals and you'll soon discover there's a lot going on at your end when it comes to that "length of wire" or receiving antenna. This chapter is an in-depth discussion of how you can obtain the best signal possible for the TX-12 by selecting and installing an antenna system. We also offer some alternatives, so you can choose a system that's not only right for the TX-12, but right for you and your locale.

We'll be looking at three major topics in this chapter:

- antenna configurations
- types of installations
- feedlines

If you've decided to have a company distribute TV and FM programming to your home via cable, the following information may be of passing interest only. Skip ahead to the next chapter.

### Antenna Configurations

To begin this look at receiving antennas, we must first establish a reference for comparing different antennas. Our reference antenna is a half-wave dipole, just like the one that came with the TX-12. Figure 5 illustrates this type of ribbon dipole antenna.

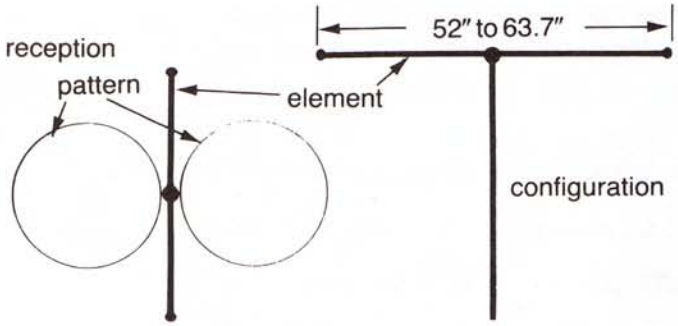



Figure 5 Half-wave Dipole Antenna

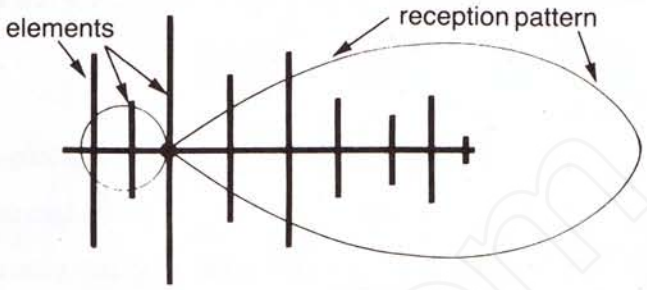



Figure 6 Yagi-Type Antenna

Notice the length of the "arm" or element. The length is important because antennas are resonant — electrically sensitive — when their length is one-half the wavelength of the transmitted signal. The formula for calculating the necessary length is: 5616 divided by the frequency in MegaHertz (MHz) equals half a wavelength. The middle of the FM band is 98 MHz, so 57.3" is half a wavelength. As you can guess, this is why it's called a half-wave dipole. As shown in Figure 5, calculating the half-wavelength for the two extremes of the FM band yields lengths of 52 and 63.7 inches.

Another antenna characteristic, gain, results from a focusing of the electromagnetic energy of a transmitted signal. The half-wave dipole that came with the TX-12 is bidirectional. If you were looking down on the dipole from above, the reception pattern would appears as it does in the diagram of Figure 5.

Now that you know the important characteristics of the reference dipole antenna, let's look at a common derivative, the Yagi-Uda (or Yagi for short). The Yagi-type anntenna, shown in Figure 6, is a multielement antenna. The driven element (the part that's connected to the feedline), has reflectors behind it, directors in front of it. Compare the reception pattern shown in Figure 6 to that of the dipole antenna. Note the dramatic change in directionality.

The gain of a Yagi-type antenna depends on the number of elements, their lengths, and the spacing between them. Compared to the reference half-wave dipole, which has a gain of "0 dB," the Yagi-type antenna has a greater gain, from 6 dB to 20 dB when all other things are equal.

The practical consequences of changes in gain and directionality are several. First of all, while the reference dipole usually delivers enough signals for good reception, is "good" good enough? Consider that the 19 kHz pilot signal the tuner uses to sense a stereo broadcast is transmitted at 1/10th the power of the signal carrier. If the pilot signal is lost, stereo disappears. If the pilot signal is degraded, so is the stereo separation between left and right channels. A strong signal is also necessary to reduce noise associated with signal transmission and localized sources of interference.

Directionality can reduce the strength of unwanted signals, such as other FM stations, multipath reflections from the station you're listening to, even the blender in the kitchen.

## Installations

All you really need to know is that the higher the antenna, the better. Height is important because radio waves travel in a straight line, or line-of-sight. If your antenna is free and clear of obstruction, it will perform better, and you'll gain signal strength.

Height is also important because radio waves bounce. They bounce off hills, buildings, even off the ground in front of your antenna. When a bounced wave gets to your antenna, it has travelled a slightly longer path than the line-of-sight wave, arriving there slightly later. The result is phase distortion, usually the loss of stereo reception; in other words, multipath.

The higher the antenna from the ground, the less susceptible it is to other interference. A roof-mounted antenna, for example, is much less likely to "hear" vehicle ignition noise from the street or induced interference within the home.

### Feedlines

Feedlines can be compared, in a way, to the cables that interconnect the different components in your stereo system. If these cables and cords are of poor quality or condition, perhaps poorly installed, even the best audio components will not sound as good as they should. It's the same with antenna feedlines. You can cancel any advantage from height, or from having a multielement, high-gain antenna, if the connections between the antenna and tuner aren't right.

The TX-12 is designed for use with 75-ohm coaxial cable. The advantages of coaxial cable are that its shielding protects it from picking up extra noise and interference, and it tolerates wet weather. Also, installation is easy, since you don't have to be careful about routing.

## Antenna Choices

As we've said, dipole antennas tend to be susceptible to noise because they aren't very directional and because they're usually mounted inside the home. Depending on your specific area and location, signal strength will be adequate at best. But there are some advantages, including low cost. What about the antenna that came with the TX-12? In all fairness, it will work well in many different places and situations. It should at least be used so you can start enjoying FM programming right away, before settling on another antenna system or commercial cable.

The ribbon dipole antenna that came with your tuner isn't the only style of dipole antenna. There are other dipoles — rabbit ears, indoor FM antennas, and TV antennas — that can overcome some of the problems which normally make the dipole a mediocre antenna choice.

**Rabbit Ears.** While rabbit ear antennas have the same disadvantages as the half-wave dipole, they can be tuned by adjusting the "ears" to the wavelength of the station you want to receive. Remember, a half wavelength at the bottom end of the FM band is 63.7 inches; at the upper end, it's 52 inches. You can easily determine the right length of each "ear" needed for a particular station.

The orientation of rabbit ears is easy to change, unlike the dipole which is usually stuck to a wall somewhere. Rabbit ear antennas have one more disadvantage: not as much gain as the dipole. Also, some rabbit ears have an FM trap to remove possible TV interference.

All things considered, rabbit ears will probably do a better job than the half-wave dipole included with your tuner.

**Indoor FM Antennas.** There are a number of "black box" or table-top FM antennas available. These antennas are essentially electrical rabbit ears: you can tune them for particular parts of the FM band and change their orientation. Losses in gain are about the same as rabbit ears, as compared to the reference dipole antenna.

**TV Antennas.** If a TV antenna is mounted high enough and connected with a properly installed feedline, it should result in more available signal than the antennas we've talked about so far. The signal may be less than that provided by a directional FM antenna, since TV antennas are broadband — 54 MHz to 216 MHz for a VHF model. However, some TV antennas have special provisions for receiving FM signals.

If you already possess a TV antenna, or are planning to hook up to a master antenna system in an apartment building or condominium, you may still have some problems. Some TV antennas have an FM filter built-in to reject exactly the signals you want to hear. If you already have a TV antenna, there are some things you may want to do before adding a splitter to supply signals for the TX-12. You may need to reinstall the antenna, and new feedline may be desirable, even necessary, for proper performance. Since you may need to re-aim the antenna for best FM reception, the new direction may not be optimum for TV reception. In this case, the solution would be to install an antenna rotator. A rotator allows almost infinite realignment of the antenna to produce the best signal possible for stations you want to hear (and see) on a station-to-station basis.

**Outdoor FM Antennas.** When mounted and connected properly, a directional outdoor FM antenna can provide the best signal of all, with the lowest interference and noise. The greatest disadvantage to this system is the cost of the antenna, mounting hardware, and a rotator. The rotator is an absolute necessity if you want to point these highly directional antennas in more than one direction.

Most FM antennas of this type tend to be even more directional than a lot of VHF TV antennas, with or without special provision for FM reception. In any outdoor installation, the cost of a ground rod, feedline, support mast, and insulators must also be figured into the total price of the antenna set up. The combined costs can add up quickly.

There are also outdoor dipole antennas that can provide many of the same benefits, at a somewhat lower cost. You're already familiar with the half-wave dipole which can also be called a single dipole antenna. The dipole that came with the TX-12 is meant to be used indoors, and has just one upper arm or element. One variation on this theme sets two single-dipole antennas at right angles. Instead of picking up the most signals in two directions, the dual dipole picks up signals in a modified omni-directional pattern.

Another outdoor variation is the S-curve omni-directional antenna. For all intents and purposes, the S-curve antenna is just a single dipole bent into an "S" shape. The change in shape makes its reception pattern a little more omni directional than the reference dipole. Other than the changes in pickup patterns, both these modified dipoles offer more gain than the reference dipole. These antennas may also be installed high enough to reduce the possibility of local interference and multipath interference.

When totalling costs for hardware, these two outdoor dipoles eliminate the need of a rotator, but still require the proper mounting hardware and feedlines. You must weigh and compare the costs and benefits of directional and omni-directional antenna systems installed outdoors. An omni-directional antenna may give superior coverage and signal quality in your area, making a directional antenna unnecessary. On the other hand, the directional FM antenna may be the only feasible solution because of severe localized noise and multipath interference. In sum, actual antenna selection, over and above the fact that some antennas are "better" than others, must be made on an area-by-area basis. Terrain, transmitter locations, and your relation to them will be the deciding factors when figuring out which system will receive signals the best.

# Installation Choices

## Indoor Installation

For obvious reasons, an indoor installation is the easiest. It isn't difficult to stick the dipole that came with the TX-12 on a wall. But remember some of the drawbacks to indoor antennas:

- Low signal sensitivity
- Interference from cars on the street
- Interference from small electrical appliances in the kitchen
- Sensitivity to multipath

An indoor antenna can work just fine if you're in a tall building with good "line-of-sight" to the area's FM transmitting tower. If you've been listening to FM on another receiver in your home, you might get a very rough idea how many stations could be available. However, your TX-12 is a tuner with impeccable performance, capable of making stations that were totally obnoxious due to noise and distortion, sound great! Even with a less-than-ultimate antenna, the TX-12 will allow you to experience all the pleasure of FM stereo listening. If you can't get a truly listenable signal from a dipole or other type of indoor antenna, there are other options.

## Outdoor Installations

Properly done, outdoor installations can offer vastly improved signal quality over indoor antennas. But there is the cost, and the actual effort of putting it all up.

Another, perhaps most important consideration, is safety. Safety is important in planning, setting up, and using your antenna system. With that in mind:

- Keep the antenna, mast, boom, guy wires, and feedline away from all power lines, including the power pole to the house.
- Make sure the antenna, mast, and boom are properly grounded with a large conductor-wire running from the antenna to a ground rod in as short a path as possible.
- Use stand-off insulators to keep the ground wire and coax feedline away from the house. Space these insulators four to six feet apart where practical. Do not staple the wire to your house.
- Use a proper antenna discharge unit or lightening arrestor, mounted as close as possible to where the feedline enters the house. Make sure the arrestor/discharge unit is securely attached to the ground rod with heavy-gauge grounding wire, insulated with stand off insulators along the house.
- Never ground the antenna to a gas pipe.
- If your antenna and mast required the support of guy wires, make sure the wires use in-line insulators between the guy wire and roof. These insulators electrically isolate the support wires from the house. This isn't a bad idea even if the guy wires are anchored to the earth.
- Never work on any part of your antenna system during an electrical storm! Remember to disconnect your TX-12 from the antenna during electrical storms, too.
- Be careful about climbing around on roofs and ladders. Don't make your antenna installation be the set up for a quick fall.

Most important of all, read and reread the safety guidelines provided at the beginning of the manual.

## Ground Rod

The metal ground rod should be driven *deeply* into the earth. A ground rod driven only two feet down usually has three to four times the resistance of a ground rod driven ten feet deep and the key to safe grounding is low resistance. The object of grounding is to give a lightening strike the easiest path to the earth, not your home. Make sure to use a lightening arrestor or discharge unit that's attached to the ground rod with the same heavy-gauge wire used from the antenna to the discharge unit.

Detailed information about grounding requirements is provided at the beginning of this manual, under the heading "Safety Instructions."

### Some Additional Hints

- If you're planning to attach your antenna system to a chimney, make sure the chimney has the structural strength to support it. Thoroughly inspect the chimney for loose bricks, broken mortar, cracks, or other conditions that could indicate a poor state of repair.
- If you decide to chimney-mount the antenna, route the feedline away from the chimney by at least three feet. Heat, smoke, and residue can break down the insulation of both twinlead and coaxial cable.
- Do *NOT* use a metal chimney stove pipe to support an antenna setup. Even if the antenna is properly grounded, a lightening strike could turn your stove into a giant electrode.
- If you are located a considerable distance from an FM transmitting facility, a tower or mast may be necessary to obtain better line-of-sight and clearance for the antenna. If your outdoor installation fits into this category, pre-made masts and tower kits are available from many TV stores and electronic supply shops. Despite the cost, a 30-to-50 foot mast or tower, in combination with a good high-gain antenna, can provide a quality signal for the TX-12. Be sure any mast or tower set up is properly secured with guy wire supports (if needed), and installed where it can't fall into power lines.

You may be better off having the antenna system installed by professionals, who know all the ins and outs of quality signal reception in your area.

## Some Other Thoughts

This chapter has been devoted to explanations and comparisons of different antennas and antenna-system installations. We've provided information to help you make a decision on how to obtain the best signal possible for the TX-12, using your own antenna. It's pretty obvious that much time and attention can be spent in pursuit of a good signal by installing a good antenna, especially if you live far away from FM stations, or in an area with classic reception troubles. Before throwing up your hands in despair, remember that the TX-12 has unique features and performance, making the choices of antennas, feedlines, and installation methods less critical than virtually any other tuner.

# 6
# Cable

When we talk about cable, we mean a master antenna system supplying high quality TV and FM signals to individual homes or "subscribers." The signals are sent via a distribution network of wires and line amplifiers. The wire, or cable portion of the system, can be likened to a telephone distribution set up. Line amplifiers boost signals at certain intervals in the lines, in much the same way an antenna preamp works with long feedlines in your own antenna system.

Originally, community cable television (CATV) was a response to the problems of poor or nonexistent reception of TV signals broadcast "clear air." These problems could be caused by distance or terrain. Cable systems prove to be a boon to those living in cities, too. Tall buildings can cause multipath reflections that make good reception more than a problem, if not plain impossible.

The size and complexity of cable systems can vary from a few houses hooked up to a single master antenna, to those with over 100,000 homes connected to a sophisticated receiving system with microwave and satellite dish antennas. Along with exceptional quality TV signals, virtually all cable systems offer equally high quality FM. And, no matter how big or complex, all cable systems work about the same way. For our purposes, they can be compared to the ultimate outdoor antenna.

The cable company chooses a high hilltop or other location where they can obtain the best line-of-sight to the area's transmitting towers. This site is known in cable parlance as the "head end." This is where high-gain antennas and amplifiers receive distant, weak, or otherwise unreceivable signals. The signals are passed on to line transmitters, then to the distribution part of the cable system.

At your home, signals from the cable in the street are fed to your TV set. If you want FM as well as TV, line signals are split with one set going to the TV, the other to your TX-12. Of course, you can be connected to just receive FM signals, without the video hook up. An FM feed may use a special filter to remove TV interference, or to prevent you from illegally receiving FM signals from a single TV feed. An FM trap might be installed at the street. When the cable company connects your TX-12 to the system, any necessary filters are installed and traps removed from the line. Note that it's not legal to tap into, or hook a commercial cable up yourself. The connection must be made by the cable company.

As mentioned earlier in this manual, feedlines for cable TV are all 75-ohm coaxial cable, so connections can be made directly to the TX-12's 75-ohm antenna input.

The benefits of using a commercial cable to supply high quality FM stereo signals for the TX-12 are many. You don't have to worry about the cost and effort of installing a good outdoor antenna; nor do you have to

worry about the performance of such a system. As a rule, cable companies have a one-time installation charge, then a monthly fee. The cost of cable service can depend on many factors and varies from system to system. Costs will run higher for a commercial cable feed for both TV and FM service, less for FM only.

Besides opening up a new world of FM programming enjoyment, commercial cable can open a new world of audio for your TV set. Many cable systems program premium movie/film services with spectacular stereo soundtracks. The video portion (with standard audio carrier) is broadcast on the cable for the TV set. A separate stereo soundtrack is broadcast in the FM band. The TX-12 receives these signals and turns your living room into a theater or concert hall. You not only see great artists performing your favorite music, but hear it like you were there. This set up frees your TV from its burden of having a tiny, limited-response, internal audio amp and speaker.

# 7
# Asymmetrical Charge-Coupled FM Stereo Detector

FM radio stations began by broadcasting a carrier frequency modulated by music. When you listen to "FM 108," your tuner is receiving that frequency — 108 MHz (megahertz or millions of cycles per second) — modulated by a music spectrum from 30 Hz to 15 kHz. The Federal Communications Commission ensures, by law and threat of fine, that the rock music on one station doesn't interfere with classics on the next.

When radio stations came under pressure to deliver stereo sound, some system of broadcasting two signals, short of setting up another station, became necessary. Early experiments were actually tried with one channel on FM, the other on AM. Needless to say, some other solution had to be found. One constraint of the stereo broadcast system required that table radios get a usable mono signal — not just the left, or just the right, channel.

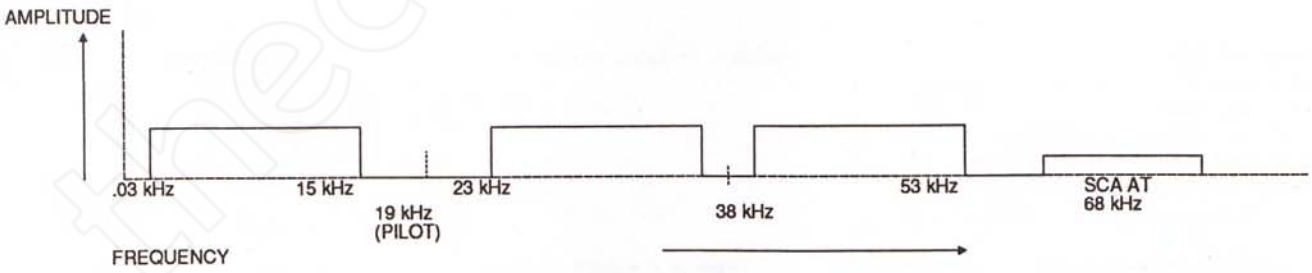



Figure 7 FM Stereo Signal

What was finally adopted and approved by the FCC was a broadcasting system where both channels (L+R) were available as usual. To supply stereo, a *difference* signal (L-R) was developed and used to modulate another carrier at 38 kHz. Now for the first complication. It turns out that broadcasting that signal in stereo required too much frequency deviation (the difference between the necessary signal and the carrier), so the 38 kHz L-R carrier is suppressed and a much smaller amplitude 19 kHz pilot is added.

Mono radios use only the first block of the signal. The SCA, or Subsidiary Communication Authority signal, is often leased to companies that specialize in commercial free background music for stores, dentist's offices, special programming for the visually impaired — even foreign language broadcasts. To receive an SCA service, a special tuner is needed. These signals can't be picked up on the TX-12.

The components of the transmitted FM stereo signal that concerns us are the L+R signals and, most importantly, the L-R signals. The graphic representation of a sample FM signal shows the various relationships of the different signal components in frequency and amplitude. (See Figure 7.)

Note, however, that only 15% of the L-R signal differs from the L+R signal. Also the L-R portion of the transmitted signal is prone to mishaps between the transmitting tower and your TX-12. It's this signal component that, when degraded, causes noise and distortion problems, usually induced by multipath reflections off hills, buildings, the ground, and so on.

The Asymmetrical Charge-Coupled FM Detector (ACCD) operates principally on the L-R signal components, improving it from 10 dB to 23 dB. The ACCD can only improve the L+R component by 1 dB. If you receive the L+R signal components well, but suffer from poor L-R reception, the Asymmetrical Charge-Coupled Detector will greatly improve reception. If the L+R signal is poorly received as well, the circuit can only help a bit. Degraded L+R reception is often due to improper or inadequate signal strength and could indicate a distant station or the need of a better antenna system.

Almost all stereo FM reception problems can be traced to poor L-R signals, exactly the type of signals most affected by the ACCD. The Asymmetrical Charge-Coupled FM Detector is extremely effective in reducing the noise and distortion associated with this type of multipath interference. In sum, the ACCD can provide stereo reception that is as noise-free as FM broadcast in mono.

# 8
# Technical Information and Service Assistance

## Troubleshooting Guide

Simple measures will correct most of the problems encountered in setting up and operating the TX-12 Stereo Tuner.

If none of the suggested solutions work for you, do not attempt to open or repair the TX-12. Disconnect all cables, pack the unit in its original box, and contact your nearest Carver Service Station.

| Problem | Probable Cause | Solution |
|---|---|---|
| No Power. | Unit unplugged. POWER switch OFF. | Check power cord. If the TX-12 is plugged into a preamp or integrated amp convenience outlet, make sure the outlet works. If there's still a problem, remove the TX-12 from your stereo system and plug it into a "known" working outlet. |
| Power is on, but no sound. | Faulty connection or cable. | Check and thoroughly inspect the signal cable that runs between the TX-12 and the preamp. Make sure the connectors are firmly seated, and that no undue strain is being placed on the cable itself. If you can't locate the problem, try swapping the signal cable with a working cable from another part of your system. |
| | Auto tuning is engaged. | When auto tuning is active and signal strength drops below a certain threshold, a mute function is engaged similar to the muting during interstation tuning. Try pushing the Auto Scan button again to engage manual tuning. |
| Preset stations can't be tuned or preset stations are mistuned. | Incorrect control settings. | Check all control settings on your preamp or integrated amplifier: power on/off, source selectors, stereo/mono, speaker on/off, volume or gain controls. |

| Problem | Probable Cause | Solution |
|---|---|---|
| | Memory has been cleared. | This can happen if the TX-12 is disconnected too long. You must reprogram the tuner with the desired frequencies. |
| | Frequencies entered incorrectly. | Consult a listing of your favorite stations and program sources. Try entering the correct frequency again. If the frequency was entered correctly and you still cannot hear the station, try switching the TX-12 to manual tuning and try again. |
| Less-than-perfect sound: | | |
| Crackling | Possibly noise due to car ignitions or electrical devices in the house. | Check the antenna installation:<br>1. Install the antenna farther away from heavy vehicle traffic.<br>2. Review the chapter on Antennas for more information.<br>Resolve interference problems by following these steps:<br>1. Install the TX-12 farther away from transformers, motors, TV sets, and fluorescent lighting. Route the signal cable and antenna leads from these possible sources of interference.<br>2. Make sure your signal cable between TX-12 and preamp is in good shape and shielded.<br>3. Attach a noise suppressor to the electrical equipment causing the noise. |
| Distortion | Multipath | Press the ACCD button. If this doesn't help, very severe reflections may be the problem. |
| Hiss and Noise | Very weak signal. | Press the ACCD button. |
| Hum | Due to cables connecting the tuner to the preamp. | Follow the suggestions for dealing with interference listed above. Also, check and throroughly inspect the signal cable between the TX-12 and the preamp. Make sure the connectors are firmly seated, and that no undue strain is being placed on the cable itself. If you still have a problem, try swapping the cable with a "known" working cable from elsewhere in the system. |
| No stereo. | Stereo mode not activated. | Check to see if the Stereo indicator is lit. If it is, check the control settings on your preamp or integrated amplifier. |

(CONTINUED...)

| Problem | Probable Cause | Solution |
|---|---|---|
| | Weak signal or mono FM station. | If the Stereo indicator is not lit, press the ACCD button. To improve the signal strength:<br>1. Change the antenna orientation.<br>2. Avoid long runs of antenna feedline, or add an antenna preamp to your antenna system.<br>3. If the above two steps don't help, you may need to improve the antenna system or hook up to commercial cable. Review the chapter on Antennas for other suggestions. |

## Care of TX-12 Stereo Tuner

Make every effort to keep your tuner away from high external temperatures, moisture, and airborne substances that can leave greasy deposits and dust. When panels and covers become dirty, they can be cleaned with a soft cloth slightly moistened with a mild dish soap or detergent..

Never short circuit the output terminals of the tuner. Protect your tuner from moisture and excessive dust. Avoid dropping your tuner.

## Specifications

| | |
|---|---|
| FM IHF Usable Sensitivity: | 10.3 dBf (1.8 uV) |
| FM Sensitivity for 50 dB quieting (mono): | 4.0 uV |
| FM Signal-to-Noise Ratio: | 74 dB |
| FM IF Rejection: | 85 dB |
| FM Capture Ratio: | 1.5 dB |
| FM Harmonic Distortion: | 0.1% |
| AM Suppression: | 62 dB |
| Stereo Separation: | 62 dB |
| AM THD (2mV) 30% Modulation: | 0.4% |
| AM Selectivity: | 20 dB |
| AM Image Reject: | 46 dB |
| AM IF Rejection: | 60 dB |

## Service Assistance

***NOTE:*** Fill out and mail the WARRANTY REGISTRATION CARD which is enclosed in a separate envelope with the CARVER LIMITED WARRANTY.

If your CARVER product should require service, we suggest you contact the Dealer from whom you purchased your unit. Should the Dealer be unable to take care of your needs, you may contact CARVER Service Department by phoning (206) 775-6245, or by writing CARVER CORPORATION, Service Department, P.O. Box 1237, Lynnwood, WA 98046. We will then direct you to one of our national network of factory trained and authorized Warranty Service Centers, or give you detailed instructions on returning the product to us for prompt appropriate action.

We suggest you read the LIMITED WARRANTY completely to fully understand what your warranty/service coverage is, and the duration.

You must promptly complete and return the WARRANTY REGISTRATION CARD to validate your LIMITED WARRANTY.

We wish you many hours of musical enjoyment. If you should have questions or comments, please write to:

CARVER CORPORATION
Service Department
P.O. Box 1237
Lynnwood, WA 98046
(206) 775-6245

Ask your CARVER Dealer to show you the CARVER family of stereo components for your home audio reproduction.