



MODEL XO-1©
(1983-MSRP \$149.00)

**OWNER'S MANUAL AND
INSTALLATION GUIDE**

**ACTIVE ELECTRONIC PHASE COHERENT
CROSSOVER**

INTRODUCTION

The **XO-1©** is a fully programmable electronic crossover, which allows a frequency change via a replaceable resistor network. Any frequency of crossover can be selected between 32Hz and 12,500Hz in 5% increments. The network can be easily inserted or removed from the special "quick change" I.C. latch socket. The **XO-1©** makes possible both bi-amp and tri-amp systems with a separate channel of amplification for each driver. A signal amplifier system requires that the amplifier reproduce the full audible frequency range and power multiple drivers through a passive dividing network. In an active crossover system, one amplifier channel powers only one driver and must reproduce only a part of the frequency range. The three main advantages of an active (electronic) crossover are;

1. That a high order of inter-modulation distortion reduction can be realized due to non-interaction between high and low frequencies, yielding improved clarity.
2. The elimination of the passive crossover itself. The elements of the crossover absorb power from the amplifier and may cause distortion. In addition, the capacitors and coils of a crossover create a reactive load that is difficult for an amplifier to drive compared to the more purely resistive load of the driver.
3. A passive crossover system requires approximately 3dB more power than an active crossover system. In other words, an active crossover system requires half the total power of a passive system.

TECHNICAL DESCRIPTION

The **XO-1**© uses FET input operational amplifiers which are well known for their reliability and freedom from slew induced distortion. The **XO-1**© filter stages employ two-pole, state variable design. A unique ultrasonic converter supplies a negative 14 volts to the circuitry which provides freedom from external electrical interference as well as accounting for the unusually high output voltage.

A heavy aluminum extrusion and rigid endplates combine to form a rugged unitized chassis. All construction and assembly is performed in-house and each unit is fully tested, inspected, and re-tested before shipping.

INSTRUCTIONS

Read the following instructions completely through. If it appears too complicated, we recommend that you have an authorized **LINEAR POWER**™ dealer do the work.

IMPORTANT !!!

THE FREQUENCY CHIP MUST BE PROPERLY INSTALLED AND LOCKED FIRMLY IN POSITION PRIOR TO OPERATION IN ORDER TO PREVENT THE POSSIBILITY OF SEVERE SYSTEM DAMAGE.

MOUNTING

As the **XO-1**© contains no user operated controls, the best mounting location is close to the amplifiers. The **XO-1**© should be mounted in a position such that the access plate (the one with no wires) can be removed for easy frequency change, and that the output fan-outs can plug directly into the amplifiers. To prevent electrical interference it is advisable that phono extensions be kept to the minimum lengths necessary.

In some trunk mount applications, a good method for mounting bi-amp and tri-amp systems is to fashion a mounting plate made of 1/2 to 1/4 inch plywood and attach it to the back of the rear seat in the trunk. This will provide a secure base for attaching **XO-1**© and amplifiers and will make drilling multiple mounting holes through sheet metal unnecessary.

WIRING

Refer to the diagrams that follow. NOTE: ALL CONNECTIONS MUST BE ELECTRICALLY AND PHYSICALLY SOUND. AVOID RUNNING POWER CABLES AND SIGNAL CABLES ALONGSIDE ONE ANOTHER.

1. POWER

Your **XO-1** can be connected in one of several ways:

A. Connect the **XO-1** red wire to the power antenna wire of the music source if the power antenna wire is "hot" when the source is on. The power antenna wire is turned off on some units when the antenna is raised up all the way or when the tape selection is used. For these units, and for units with no power antenna wires, use the alternate methods "B" or "C".

B. The **XO-1** red wire can be connected along with the amplifier remote turn-on (trigger) wire to a CS-1 current sense adaptor (available as an accessory through an authorized LINEAR POWER dealer).

C. The **XO-1** red wire can be connected through a toggle switch (current rating is not important) to the fuse panel. **IMPORTANT: THE XO-1 POWER WIRE SHOULD NOT BE DIRECTLY CONNECTED TO A SOURCE OF POWER WHICH WILL BE HOT EVEN WHEN THE IGNITION IS TURNED OFF, AS BATTERY DRAIN MAY OCCUR AFTER AN EXTENDED PERIOD.**

MAIN GROUND

Connect the black ground wire to a car chassis ground, preferably to the same point at which the amplifiers are grounded.

2. INPUT

Connect the right and left inputs on the **XO-1** to the right and left outputs from the music source. If the output of the music source is high level (designed to connect directly to a speaker) obtain a set of high level adaptor plugs from your LINEAR POWER dealer and follow the enclosed directions.

3. OUTPUTS (BI-AMP)

Low Frequency:

Connect the right and left low frequency outputs from the **XO-1** to the right and left inputs on the low frequency amplifier. The low frequency speakers (woofers) can then be connected to the output of the low frequency amplifier.

High Frequency:

Connect the right and left high frequency outputs from the **XO-1** to the right and left inputs on the high frequency amplifier. (See DIAGRAM A for interconnections.)

4. OUTPUTS

(Mono-bridge subwoofer)

In a mono subwoofer system, the low frequency amplifier's outputs are strapped together (bridged) by the **XO-1**© to sum the power of both channels into one to drive a single 8 ohm woofer. In this configuration, both of the speaker ground wires are unused and should be taped and dressed away from the other wiring. The woofer can then be connected directly across the right and left speaker output "hot" wires from the low frequency amplifier by attaching the green wire to the woofer positive terminal and the grey wire to the negative terminal.

Follow DIAGRAM B for high and low frequency connections and check to see that the mono-stereo switch inside the **XO-1**© is in the "mono" position.

CAUTION: WHEN BRIDGING AN AMPLIFIER, THE SPEAKER IMPEDANCE MUST NOT BE LESS THAN 8 OHMS, AND MUST NOT BE GROUNDED AT ANY POINT.

5. OUTPUTS

(Tri-amp System)

In a tri-amp system, individual amplifiers are used for bass, midrange, and treble frequencies. In this configuration, two **XO-1's**© are "cascaded" in order to obtain the third frequency range. (See DIAGRAM C for interconnections.)

All crossovers that are **not** PHASE COHERENT will cause some phase shift at the crossover point. In a three way system with two crossovers, there will be phase shift at both crossover points. By reversing the electrical phase of the mid range driver, relative to the woofer and tweeter phase, this phase shift will be compensated so that the system will be acoustically in phase, though electrically out of phase. In most cases the system will sound better with the phase of the mid range drivers reversed. Although this sound complicated, it is really quite simple to do. After your system is installed and operating, reverse the leads to your mid range drivers, so that the positive (+) lead from the amp is connected to the negative (-) terminal on your speaker, and the negative (-) terminal to the positive (+) lead on the amp. Listen to the system, then return the leads to their original positions and listen again. Connect the leads in whatever position achieved the best sound.

OPERATION/ADJUSTMENT/USE

1. CROSSOVER FREQUENCY SELECTION

A. Remove the access plate on the **XO-1**Ⓞ. IMPORTANT: IT IS NECESSARY THAT ALL POWER TO THE SYSTEM BE TURNED OFF PRIOR TO NETWORK REMOVAL/INSERTION.

WE REPEAT THE WARNING: DAMAGE TO YOUR SPEAKERS CAN BE CAUSED BY REMOVING THE RESISTOR NETWORK WHEN THE SYSTEM IS TURNED ON!

B. Release latch on socket (lever up-release, Lever down-lock).

C. Carefully insert network.

D. Lock the network in the socket. NOTE: CHECK TO SEE THAT THE "STEREO - MONO" SWITCH IS IN THE CORRECT POSITION.

E. Access plate can now be replaced.

SYSTEM ADJUSTMENT/USE- Recheck all wiring and connections and apply power to system. Set all tone controls to "flat" (no cut or boost) position and adjust volume to a comfortable level. Select a variety of program material, preferably music that you know to be fairly accurate and containing deep bass as well as high treble passages.

Increase volume of music source to approximately 3/4 of maximum. Adjust variable gain on bass amplifier slowly clockwise just to the point where audible distortion becomes noticeable, then turn gain control counterclockwise slightly. Adjust the gain control on the midrange amplifier until you obtain balance to the bass tones. Follow the same procedure for adjusting the gain of the treble amplifier. Proper tonal balance will require some careful listening and readjustment.

Volume can then be controlled by the music source volume control.

CROSSOVER FREQUENCY SELECTION

Selection of the proper crossover frequency depends on the driver selected and the way in which they are used. For subwoofer operation, crossover frequencies between 80 and 150 Hertz are generally preferred. For use between separate drivers of a two or three way system, there is much more variance in the potential choice of crossover frequencies. If a tweeter, say, has a response of 1200 to 22,000 Hertz, and a woofer a response of 28 to 2400 Hertz, the overlap area

would be between 1200 and 2400 Hertz (the tweeter's lower end and the woofer's upper end). The difference between these two frequencies is ONE octave. (Octaves are logarithmic, meaning that each octave is double the frequency in Hertz of the previous octave. So, if 20 to 40 Hertz is the first octave, then 40 to 80 Hertz is the second octave.) The proper crossover choice is usually about half of the octave difference of the overlap area. In the case above, since the overlap area is one octave, the crossover point would be at one half octave, or 1800 Hertz.

SERVICE OR REPAIR

To obtain modification, service or repair, please contact our **ONLY Authorized LINEAR POWER™ Product Service Center:**

T.I.P.S. INC.

3455 Lanell lane, Pearl, MS 39208

(601) 932-8477

E-mail: ray@tipsinc.net

SPECIFICATIONS

XO-1©

Output Level:	0 to 5 volts
Total Harmonic Distortion:	0.05% maximum
Inter-modulation Distortion:	0.01% typical
Input Impedance:	0.01% maximum
Gain:	10,000 ohms
Frequency Response:	Unity (Input = Output)
Current Draw:	+1dB 4 Hz to 250 KHz
Crossover Points:	25 mA maximum
Crossover Slope:	50 Hz to 6 KHz in 1/3 octave steps 12dB per octave