

QSC OCTAL INPUT ACCESSORIES

MODELS XL-1 AND XH-1 TWO WAY CROSSOVER

OWNERS MANUAL

The XL-1 (low frequency range) and XH-1 (high frequency range) are two way active crossover networks with user selectable crossover frequencies. They plug into the octal accessory socket on the back of all QSC Series One and Series Three amplifiers. To avoid possible damage, no attempt should be made to use this accessory on other amps, or to use non-QSC approved octal accessories in our amps.

SECTION ONE: NORMAL INSTALLATIONS.

The XH-1 or XL-1 (X-1 refers to both) is intended to be plugged into the octal socket for Channel One. The low pass output (low frequencies) will go to Channel One of the amplifier and the high pass output (high frequencies) will go to Channel Two. Channel Two's octal socket may be bypassed (unused) or another octal accessory may be installed in it. For instance, the PL-1 power limiter may be used to protect the high frequency driver from overload. It is also possible to modify the X-1 to send either output to another amplifier (see Modifications below).

A. SETTING THE CROSSOVER FREQUENCY.

The first step in installing the crossover network is to determine the crossover frequency required by the speaker system. The crossover point is adjustable on both models by replacing a single 8 pin SIP (single in-line package) resistor network. To change the crossover frequency, remove the three Phillips-head screws from the can and remove the base. Inside the can is a plastic wrapped package containing the spare resistor networks. Select the appropriate value for your crossover frequency (using the table below) and plug it into the socket that goes across the top of the board. Return the unused values to the plastic bag and re-wrap carefully to prevent shorts after closing back up.

CROSSOVER FREQUENCY (Hz) RESISTOR NETWORK VALUE (Ohms)

XH-1	XL-1	Code No.	Resistance
500	50	473	47K
800	80	273	27K
1000	100	223	22K
1200	120	203	20K
1500	150	153	15K
2000	200	123	12K
	250	103	10K
5000	500	472	4.7K

B. SPECIAL CROSSOVER FREQUENCIES.

If the exact crossover frequency recommended by the speaker manufacturer is not one supplied with the crossover, it is always safe to use the next higher frequency supplied. Since the rapid cutoff of the 24 dB/oct crossover does an excellent job of protecting the high frequency driver from low frequency overload, good results can sometimes be obtained by using a crossover point slightly below the standard recommended. The XL-1 is adjustable over the range of 50 Hz to 500 Hz. It comes from the factory set for 120 Hz. The XH-1 is adjustable from 500 Hz to 5 KHz. It comes from the factory set for 800 Hz.

The correct resistance values are determined by the equation $R = 1 / (6.28FC)$, where F is the crossover frequency and C = value of the resistor network. Any exact crossover frequency value can be obtained using four identical 1%, 1/4-watt resistors. Connect the first between pins 1-2, the second between pins 3-4, the third between pins 5-6, and the fourth between pins 7-8.

C. PLUGGING THE CROSSOVER INTO THE AMPLIFIER.

After setting the crossover frequency in the module, and replacing the unused values as noted above, replace the can on the base and install the module in the octal socket for Channel One of the amplifier. BE SURE THE POWER IS OFF. To activate the octal socket, the input selector mini switches on the back of the amplifier must then be set to correctly send the input signal through the crossover.

D. SETTING SWITCHES FOR SERIES ONE AMPLIFIERS.

On Series One amplifiers, turn off (down) switches 7,8 to activate Channel One's octal socket. Turn on (up) 3,4 to send the high frequencies to Channel Two. Leave switches 1,2 on to bypass Channel Two's octal socket. If another module is used in Channel Two to further process the signal, such as the PL-1 power limiter, then turn off switches 1,2 to activate Channel Two's octal socket.

All other switches should be down (off). To return to normal stereo use, remove the octal accessory and return switches 1,2,7,8 (only) to the "on" position.

E. SETTING SWITCHES FOR SERIES THREE AMPLIFIERS.

On Series Three amplifiers there are two eight position mini-switches, one for each channel. Switches 5,6,7,8 for both channels are for setting the XLR input polarity and are not affected by this procedure. For Channel One, turn off (down) switches 1,2 to activate the octal socket, and switch on (up) switch 4 to send the highs to Channel Two. For Channel Two, switches 1,2, and 4 should be on. If another module is used in Channel Two to further process the signal, such as the PL-1 power

limiter, then turn off switches 1,2 to activate Channel Two's octal socket.

F. CHANNEL ASSIGNMENT FOR HIGH AND LOW FREQUENCIES.

For all amplifier models, the low frequencies are sent to Channel One, and the high frequencies to Channel Two. The level controls on the amp still control each channel's output level so you can compensate for different driver sensitivities.

SECTION TWO: SPECIAL MODIFICATIONS

The XL-1 and XH-1 can be easily modified to send the high pass or low pass output to another amplifier by adding special output wires as described below. As delivered from the factory, the low pass output goes to octal plug pin 7 and the high pass output goes to octal plug pin 4.

NOTE: please become familiar with the instructions in Section One for "Normal Installations" before attempting the modifications shown below.

A. STEREO TWO-WAY (BI-AMP) SYSTEMS USING DIFFERENT SIZE POWER AMPS.

Open the crossover and remove the wire from pin 4 on the octal plug. Run a shielded connecting wire from position 4 on the pc board to the input of the other amplifier. The cover has a removable plug in it's side to route the wire through. Install the crossover in Channel One of the low frequency amp. Turn off input switches 7 and 8 on the amp to activate the socket.

Repeat for Channel Two. Turn off switches 1 and 2 to activate Channel Two's socket.

B. OCTAL CROSSOVERS IN BRIDGED-MONO AMPLIFIERS.

The above procedure can also be used for amps in the Bridged Mono mode. Prepare cables and connect to the octal crossovers as explained above. In order to bridge the low-frequency amp, install the octal crossover in Channel One, and set the switches as follows to bridge the low frequency amp:

SERIES ONE:

All mini-switches off. Turn on the bridging switch (located separately) and set the low frequency level using Channel One Gain.

SERIES THREE:

Channel One has switches 3 on, and 1,2,4 off.
Channel Two has switches 1,2,3 on, and 4 off.
Set both Gain controls to equal values to adjust the Low frequency level.

Use the same procedure as explained in Section Two-A (above) to connect the cable to the high frequency amplifier. If this amp is also to be bridged, connect to its Channel One and follow the bridging instructions for that model amplifier.

If this is a stereo bridged installation, use a second octal crossover and bridged low frequency amplifier and, if necessary, a second bridged high frequency amplifier. You can, of course, run Channel Two high frequencies into the second channel of the high frequency amplifier if it is not bridged.

C. MONO TWO-WAY SYSTEM WITH PARALLEL CHANNELS (USING BOTH CHANNELS FOR THE SAME SIGNAL)

This is used when both channels of the amplifier are to be driven with the same signal. The procedure is the same as above, except the low frequency signal needs to be fed to both channels of the low frequency amp. To do this, remove the wire from position 4 on the PC board and connect the wires from both pin 4 and pin 7 on the octal plug to the position 7 output on the PCB. The high frequency output from position 4 on the PCB is connected to the high frequency amplifier via an external wire. Set the input switches as shown under Section Two-A.

NOTE: As always, never attempt to connect the output of both channels to the same speaker. This set-up is for driving two or more speakers split between the two channels.

D. STEREO THREE-WAY (TRI-AMPED) OPERATION.

Two crossover modules per channel can be cascaded for a three way (tri-amped) speaker system.

The easiest way to accomplish this is to continue the scheme shown in Two-A, (above) for one more step. A modified module set for the low-to-mid crossover frequency is installed in the low amp, sending the mids and highs to the next (mid) amp. A similarly modified module is set for the mid-to-high crossover frequency and installed in the mid amp, sending the highs to the high frequency amp. The drawback to this scheme is that the hi signal accumulates noise from passing through two crossover modules, and noise build-up is more audible in the high frequency drivers.

If we send the full range input signal to the high frequency amp, reversing the order of signal flow, we can let the noise build-up occur in the low-frequency signal where it is less audible. This modification is more trouble but gives better results.

Install the correct resistor network value for your higher crossover frequency (see section One:A). Connect the lead from the high frequency output (position 4 on the pc board) to pin 7 on the plug (normally the low frequency output). Connect the low frequency output (position 7 on the pcb) to the mid-frequency

amp's input with an external wire and plug the crossover into the high frequency amplifier. Activate the socket (Series One: 7 and 8 off for Channel One, 1 and 2 off for Channel Two. Series Three: 1 and 2 off for each channel.)

Install the resistor network for the lower crossover frequency in another module. Modify the internal connections as before and install it in the midrange amp with the low frequency signal fed to input of the bass amp via the external wire.

E. USING THE CROSSOVER AS A LOW-PASS FILTER.

Sometimes it is desired to roll off the highs to one speaker without affecting the response of other speakers. For instance, a subwoofer needs a rapid high frequency rolloff but it is not always necessary to attenuate the low frequencies from the other "full-range" speakers in the system.

To filter the highs in a single channel, no modification to the module is needed. Set the crossover for the desired cut-off frequency and activate the amp channel's octal socket as shown below.

SERIES ONE: Turn off switches 7 and 8 for a module in Channel One and 1 and 2 for a module in Channel Two..

SERIES THREE: Each channel has it's own switch. Turn off switches 1 and 2 for each channel with a module.

If desired, the amplifier can be bridged. Connect the Low-Pass crossover to Channel One and follow the normal bridging instructions for the amplifier (See Section Two-B above)

If you desire to feed two channels in parallel, the crossover needs to be modified to send the low frequency signal to both octal outputs. Remove the wire from position 4 on the PCB and connect position 7 on the PCB to both pins 4 and 7 on the octal plug.. Follow the input switch settings shown in Section One:A "Normal Installation" to send the lows to both channels of the amplifier.

CAUTION: Because of the rapid cutoff of the crossover, there is a large phase shift as the crossover frequency is approached. A fourth order filter (like this one) has 180 degrees of phase shift at the crossover frequency. Depending on room effects and speaker polarity, this can cause the subwoofer output to cancel part of the full range speaker's output near the crossover frequency. You can experiment with placement and sub-woofer polarity to control this effect; do not attempt to fill any "hole" with equalization boost.

Unless you have the equipment to check the frequency response before and after adding the subwoofer, the following precaution should be followed to keep you out of trouble. Set the crossover frequency so that the subwoofer is active only for

frequencies below the natural low frequency cutoff of the full range speaker system. For instance, if your full range system rolls off so that it is 6 dB down at 60 Hz, set the crossover for 60 Hz. This takes advantage of the fact that a vented speaker system rolls off at low frequencies at 24 dB per octave. The full range system's natural phase shift will then complement the phase shift of the subwoofer to create a "natural" crossover with less chance of cancellations at the crossover frequency.

F. USING THE CROSSOVER AS A HIGH-PASS FILTER.

Sometimes it is desired to roll off the lows to one speaker without affecting the response of other speakers. For instance, a supertweeter needs a rapid low frequency rolloff but it is not desirable to attenuate the high frequencies from the other speakers in the system.

The module will have to have the wires from the circuit board to octal pins rewired. Remove the wire from position 7 on the PCB and attach it to the high frequency output at position 4. This runs the highs to both octal outputs at pins 4 and 7. Set the crossover frequency for the desired low frequency cutoff.

To feed a single channel, plug the crossover into that channel and set the input switches as shown above in Section Two-E.

To feed both channels in parallel, set the input switches as shown in Section One-D & E.

The caution given in the section above about phasing is not as important in this case since the wavelengths are much smaller, and proper combining is essentially determined by the geometry of the system.

SECTION THREE: SPECIFICATIONS

FREQUENCY RESPONSE (COMBINED): 20 Hz to 20K Hz +/- .5 dB

MAXIMUM INPUT LEVEL: +18 dBv

MAXIMUM OUTPUT LEVEL: +18 dBv

DISTORTION: Less than .1% at +8 dBv
20 Hz TO 20K Hz

S/N RATIO 100 dB below full output

XH-1 CROSSOVER FREQUENCIES: 500,800,1000,1200,1600,
2000,5000

XL-1 CROSSOVER FREQUENCIES: 50,80,100,120,160,200,250,500

(Other frequencies on request)

dBv=db ref .775V

PRODUCT WARRANTY

QSC Audio Products guarantees the XH-1 and XL-1 to be free from defective material and/or workmanship for a period of three years from date of sale, and will replace defective parts and repair malfunctioning products under this warranty when the defect occurs under normal installation and use- provided the unit is returned to our factory via prepaid transportation with proof of purchase (sales receipt). This warranty provides that examination of the returned product must disclose, in our judgement, a manufacturing defect. This warranty does not extend to any product which has been subject to misuse, neglect, accident, improper installation, or where the date code has been removed or defaced.

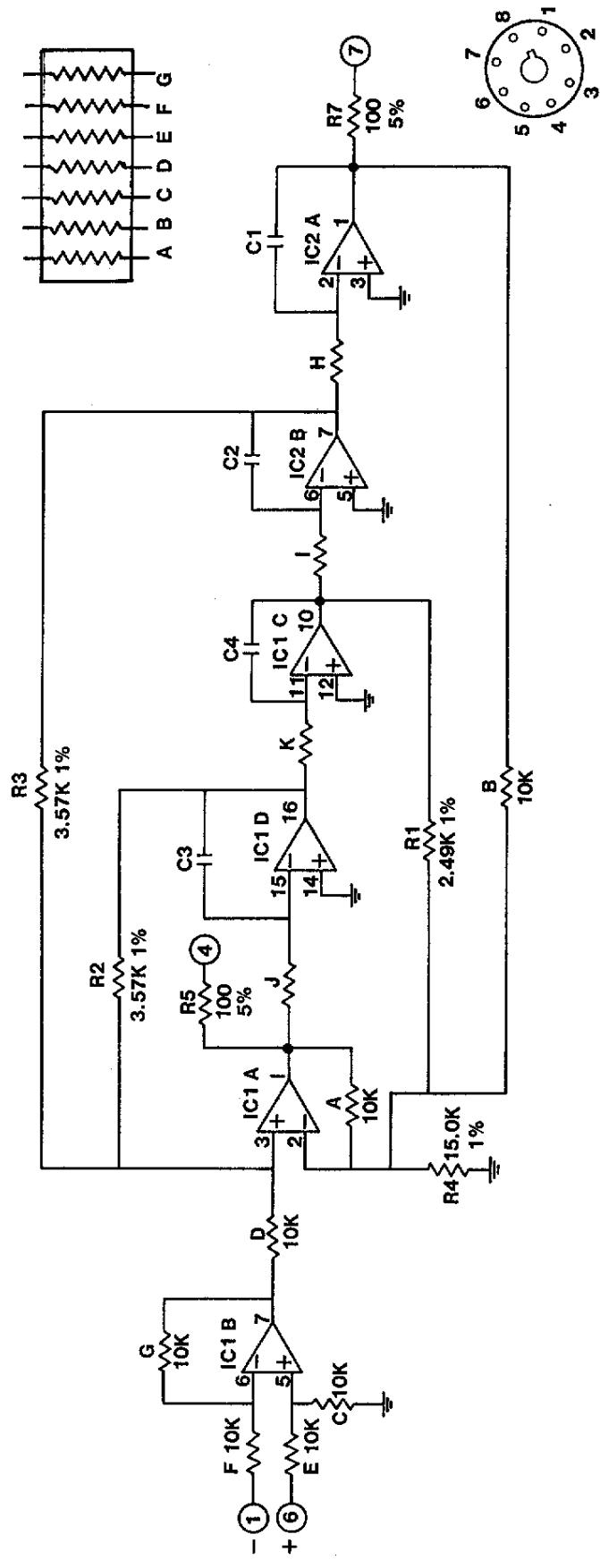
WARRANTY AND SERVICE REPAIR INSTRUCTIONS:

1. Pack the product safely making sure to include a copy of the sales receipt, your name, return address, and phone number. Mark the package- Attention Service Dept.
2. Ship the product prepaid to QSC Audio Products. We recommend UPS.
3. We will determine if the product is under warranty:
 - A. If it is we will repair and ship it back to you at no charge.
 - B. If it is not we will contact you and inform you of the charges. Upon your approval, we will repair the product and ship it back freight and service charges collect (COD).

SH-100003-XM XL-1
 OCTAL CROSSOVER SCH.

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OCTAL CROSSOVER MODELS XH-1 AND XL-1



BOTTOM VIEW OF OCTAL PLUG

NOTES:

- (1) IC1 = XR 095
 IC2 = LF 442
- (2) $F_c = \frac{1}{2\pi RC}$
 47K, 27K, 22K,
 20K, 15K, 12K, 4.7K
- (3) ALL RESISTORS 1/4 WATT METAL FILM 1% EXCEPT AS SHOWN
- (4) C1 = C2 = C3 = C4 = .0068UF 5% FOR XH-1
 .068UF 5% FOR XL-1

NETWORKS INCLUDED

