

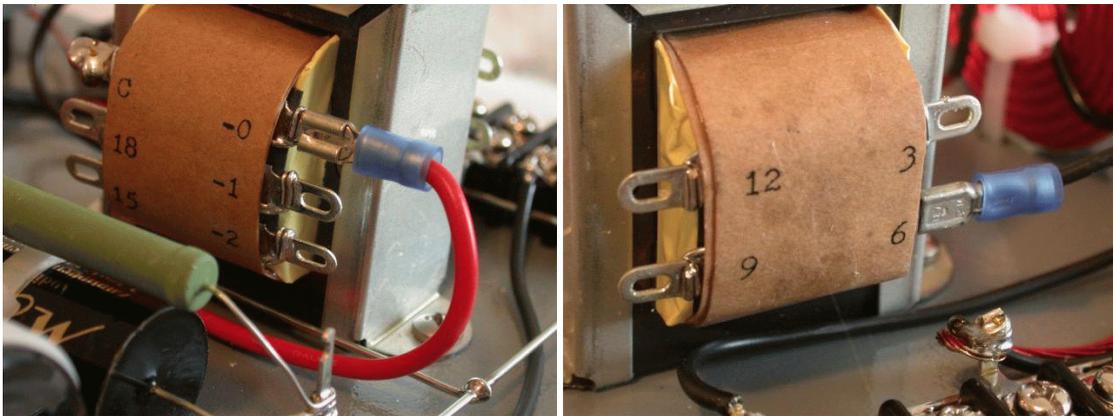
ES400 network

The ES400 network is designed to operate with the Klipsch K33 woofer which represents an impedance of 6 Ohms in series with 1 mHy voice coil inductance. The inductance becomes part of the filter leaving the 6 Ohm component to become the actual resistive load impedance seen by the amplifier. It will operate in a 2-way system or in a 3-way system with the addition of a separate squawker / tweeter crossover such as the ES5800 from the 4 or 8 ohms amplifier connection.

Driver level and the transformer

The squawker driver in the Klipsch speakers are somewhat more efficient than the woofer and tweeter drivers. This requires that the squawker level be reduced slightly. With the reduced losses of the higher quality components used in the new crossover and a long list of other factors, it is difficult to know exactly what the "correct" level should be. A method has been worked out to allow you to adjust the level to your taste. A resistor pad attenuator could be used, but an autotransformer will allow the needed attenuation without divorcing the amplifiers damping factor from the speaker driver. This yields better frequency and transient response. The "normal" setting is -6 dB. This is theoretically correct for the K55V and K55M squawker drivers. This can be considered a starting place. Change the settings to suit your own taste. Whatever setting sounds right IS right!

The settings can be changed by simply moving one or both plugs on the transformer terminals. . The 6 dB setting and phasing is correct for the stock Klipchorn with its original drivers. Different speakers and drivers may require a phase reversal. You can experiment with driver phasing without fear of damaging anything. What sounds right is right.



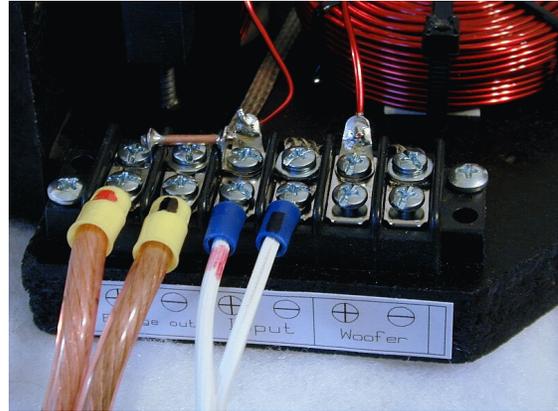
Attenuation settings are marked directly on the transformer in dB units. The output setting (the black wire) will select 3,6,9 or 12 dB on the front of the transformer and 15 or 18 dB on the back. The input setting (the red wire) will reduce the attenuation by 0, 1 or 2 dB. This allows settings from 1 to 18 dB in 1 dB steps. Simply add the two settings to determine the total attenuation. The picture shows the default setting of 6 plus -0 or 6 dB attenuation. Moving the red wire plug to -2 would give you 6 plus -2 for 4 dB. Note that a HIGHER db setting makes the squawker QUIETER.

Normal Connection to amplifier

When the connection to the amplifier is through a normal single cable, the two-wire bridging cable is connected between the two halves of the ES400 network. The cable runs from the **Bridge out** terminals located to the left of the **Input** terminals to the **Bridge input** terminals on the other board. Make sure the (+) and (-) terminals on the two boards are connected to each other and not reversed.

Make sure the + or red connection from the amplifier is connected to the **Input** terminal marked (+).

The - or black connection (common) from the amplifier should be connected to (-) **Input** terminal on the network.



Bi-Wire operation

Bi-wire operation uses separate cables to carry the output of a single amplifier to the high and low frequency sections of the network. To connect the cables, first remove the two-wire bridging cable. It will not be used. Connect the cable you wish to use for the low frequencies to the terminals marked **Input**. Be careful to connect the (+) and (-) connections to the + and - connections of the amplifier. Connect the cable to carry the high frequency signals to the terminals marked **Bridge input** on the other board in the same way. Be very careful that the (+) connections on both inputs are connected to the + connection of the amplifier. Both (-) terminals should connect to the - or “common” of the amplifier. Incorrect connections will cause the lows and highs to be out of phase, no lows at all or no highs at all.



The network presents a very constant resistive load of 6 Ohms to the amplifier. It can be driven easily from the 4 or 8 Ohm amplifier connections.

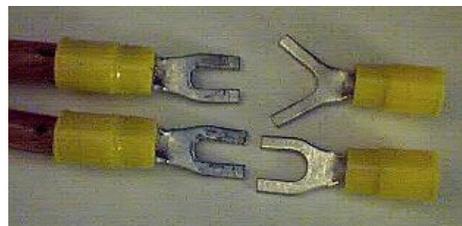
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Bi-Amp operation

Do NOT use the connections provided for Bi-wiring to connect to separate amplifiers. Bi-amp operation is not possible with the ES400 network.

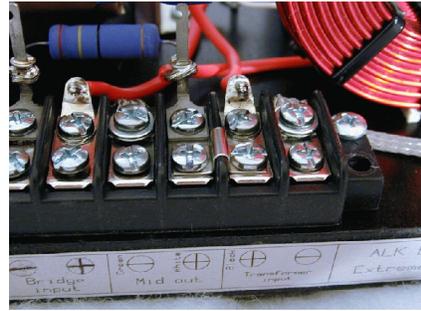
Big cables

Many installations make use of very heavy speaker cables such as “Monster cable”. Finding a spade lug that will both fit the #6 screws on the barrier blocks and the heavy wire can be a problem. A simple and inexpensive solution is to modify spade terminals intended for larger screw sizes. An example is Gardener Bender terminals (10-116) available at Lowes building supply stores. These are intended for 12 - 10 AWG wire and #8 - #10 screws. Simply spread the two “fingers” using pliers and bend them back on a tighter radius. This looks to be difficult but is actually very easy to do.



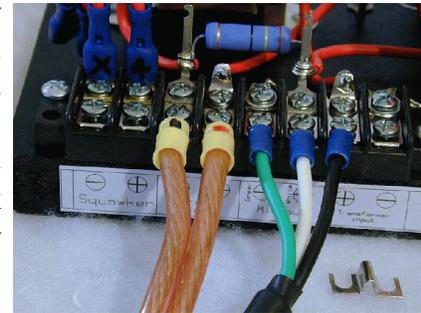
Two-way operation

A two-way strap is provided to connect the high frequency output of the 400 Hz crossover back to the transformer. In this configuration all frequencies above the crossover will go through the transformer to the high frequency driver. The strap connects the **Mid out** to the **Transformer input** barrier block connections. It is unlikely that a Klipschorn can be operated two-way because of the difficulty of finding a high frequency driver that will operate down to 400 Hz. The extreme slopes of this network may allow drivers rated down to 500 Hz to safely be used with reduced power.

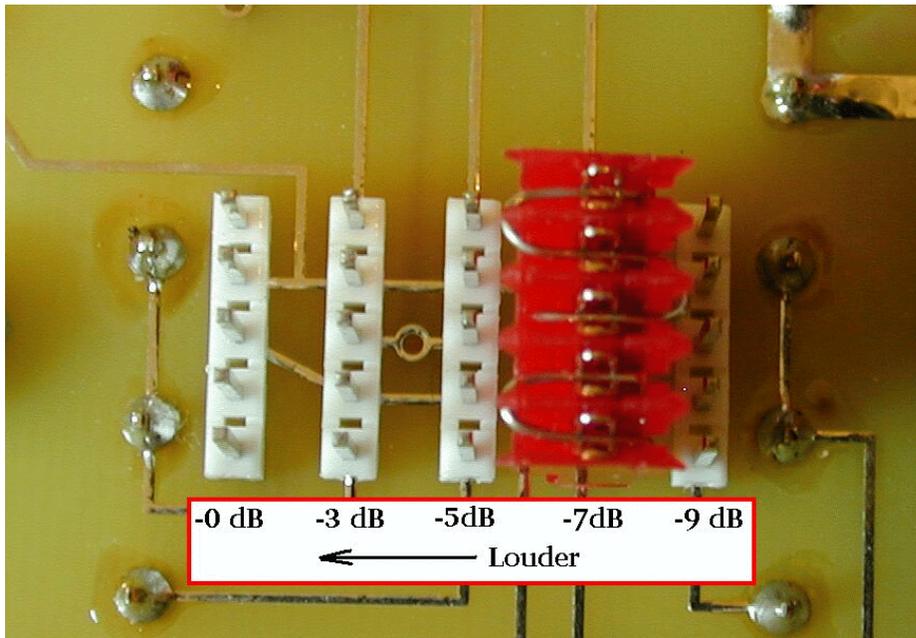


Three-way operation

When a separate tweeter is to be used in a three-way configuration the two-way strap can be removed and replaced with a three wire cable that will carry everything above 400 Hz to a separate squawker / tweeter crossover network. It will also carry the frequency range for the squawker back to the transformer. The barrier block is marked green, white and black for the cable that is provided with the ES5800 network. Any passive crossover designed for an 8 Ohm system may be used.

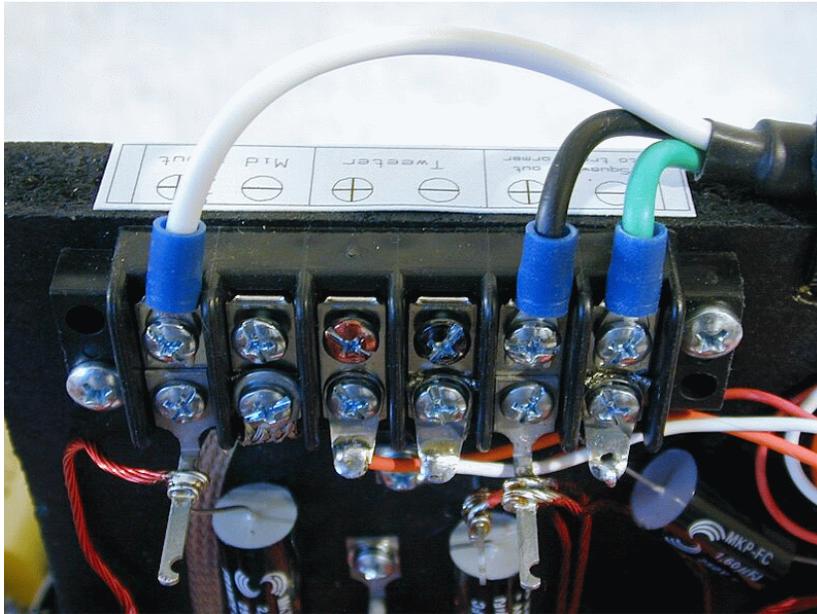


ES5800 Squawker / tweeter network



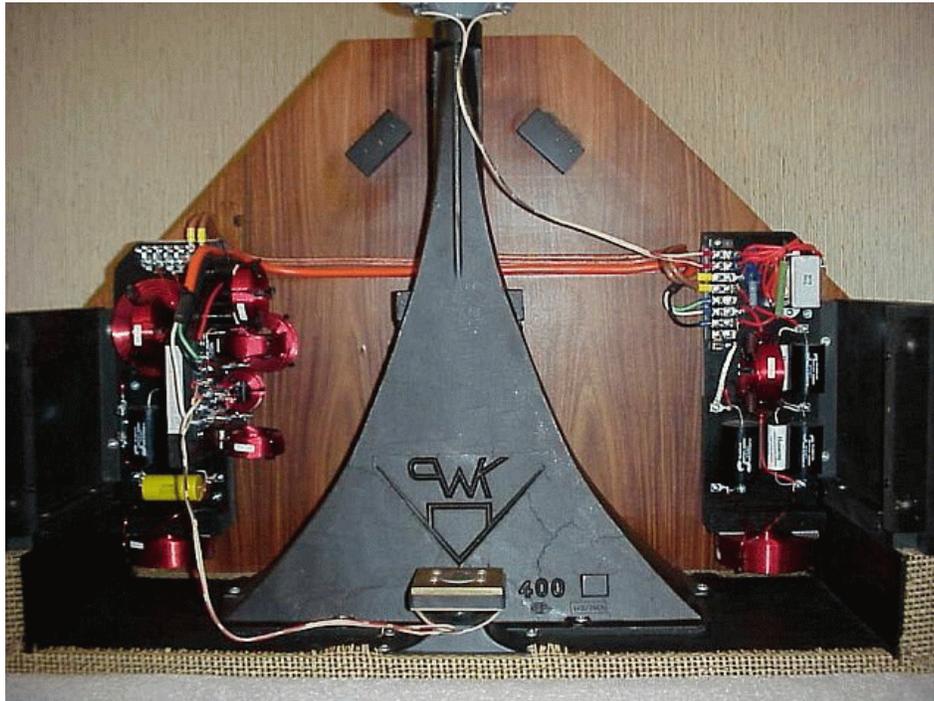
The 5800 Hz squawker / tweeter crossover provides an adjustable attenuator to equalize the tweeter level with the squawker. Normal settings with the Klipsch K77 and most quality tweeters will be -5 or -7 dB. Higher numbers result in lower tweeter levels. Moving the plug to the right results in quieter highs and a “softer” sound. -9 dB is the softest setting and 0 dB is the loudest highs resulting a

“crisper” sound. As with the tap settings for the squawker, what sounds right is right!

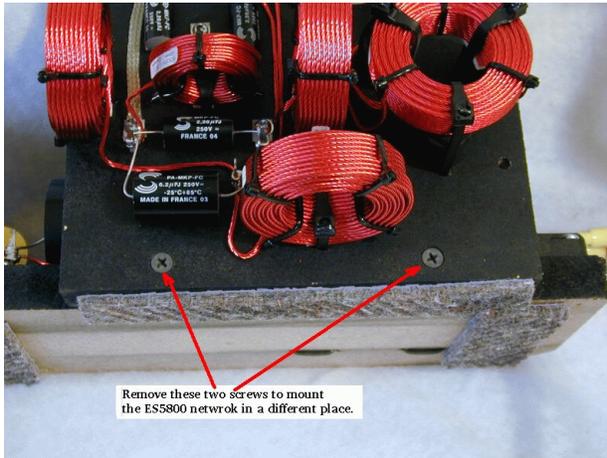


The ES5800 is designed to operate with the ES400T, ES700T or ES600T woofer / squawker networks. A 3-wire cable is provided that carries everything above the woofers range to the ES5800 and returns the squawker signal (below 5800 Hz) back to the transformer located on the woofer / squawker network. The barrier block terminals are marked green, white and black corresponding to the wire colors in the cable. The tweeter is connect to the barrier block on the ES5800.

Installation

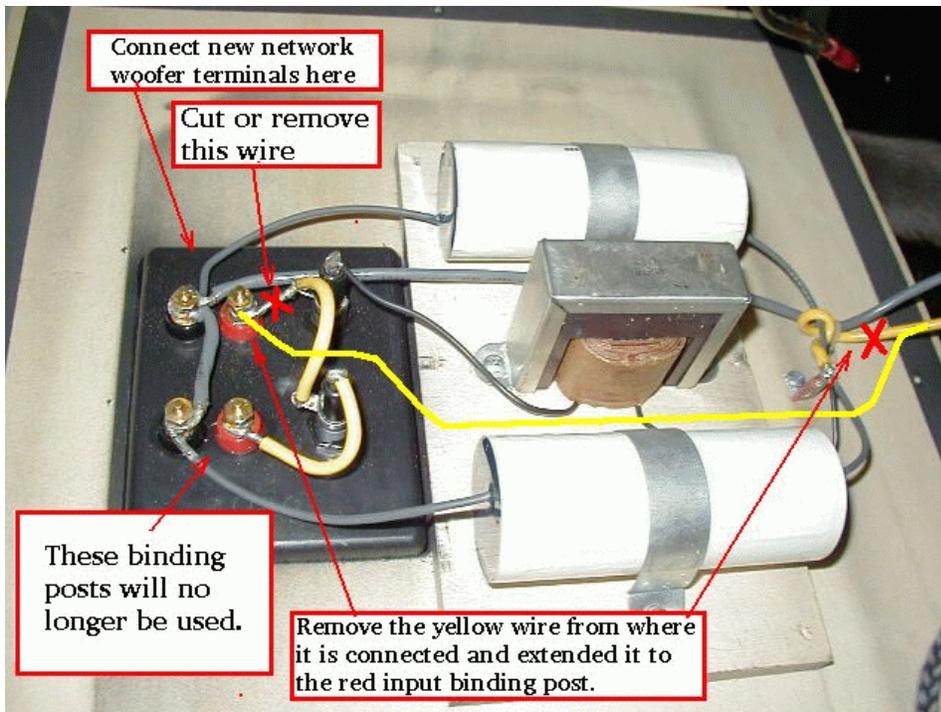


The ES400 woofer / squawker crossover network is divided into two halves because of its large size. In the “stock” Klipschorn, the two boards are mounted one on each side of the K400 squawker horn inside the top compartment. Two cables connect the two halves and the ES5800 squawker / tweeter network together. These cable should be routed beneath the throat of the squawker horn.



When the networks are to be used with Klipschorns that have different squawker horns the ES5800 may be unscrewed from the side of the low frequency half of the ES400 network and all three may be mounted elsewhere. The two are held together by two screws. The three boards may be mounted anywhere that they will fit so long as the two large coils on the ends of the two ES400 network boards are kept at least two feet apart and as far a possible for any metal objects. Directly on the woofer access hatch is one such place. The ES5800 should also be mounted away from any metal objects. The limiting factor will probably be the length of the cable to the tweeter.

Two mounting holes are provided in each half of the ES400 network. Use any available wood screws. Place the screws through the holes in the new network and tap each lightly with a small hammer. This will make marks which will locate where to drill pilot holes. The wood is actually soft enough that an electric cordless screwdriver can be used to force the screws in without drilling any pilot holes. It is not recommended that you tighten the mounting screws completely. These should be left about one quarter turn from tight. This will prevent the bottom cushions from being compressed.



NOTE: The newer Klipsch networks (AK-2 and AK-3) have the woofer capacitor and inductor located inside the woofer compartment door. THESE MUST BE REMOVED OR DISCONNECTED! The connections to the woofer terminals on the network must go directly to the woofer driver. Note that the binding posts that are shown rewired to the woofer

drive are those marked for connection to the amplifier. Connect these to the woofer connections on the network NOT those previously going to the upper half of the original network!

Power handling

No extreme measures have been taken to protect the tweeter from damage caused by high power levels. These protection circuits cause distortion and are therefore considered inappropriate for an upgrade designed solely for improved sound quality such as this. The extreme filter slopes used in the ES5800 network reduce unwanted low frequencies very rapidly. This allows the tweeter to operate at a lower average level for any given volume setting than with normal first, second or even third order crossover networks. Keep in mind however that extreme levels will either blow the woofer fuse or the tweeter! In the case of two-way operation, a high frequency wide range driver is also better protected from low frequencies by extreme-slopes but is still vulnerable to extreme levels.

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