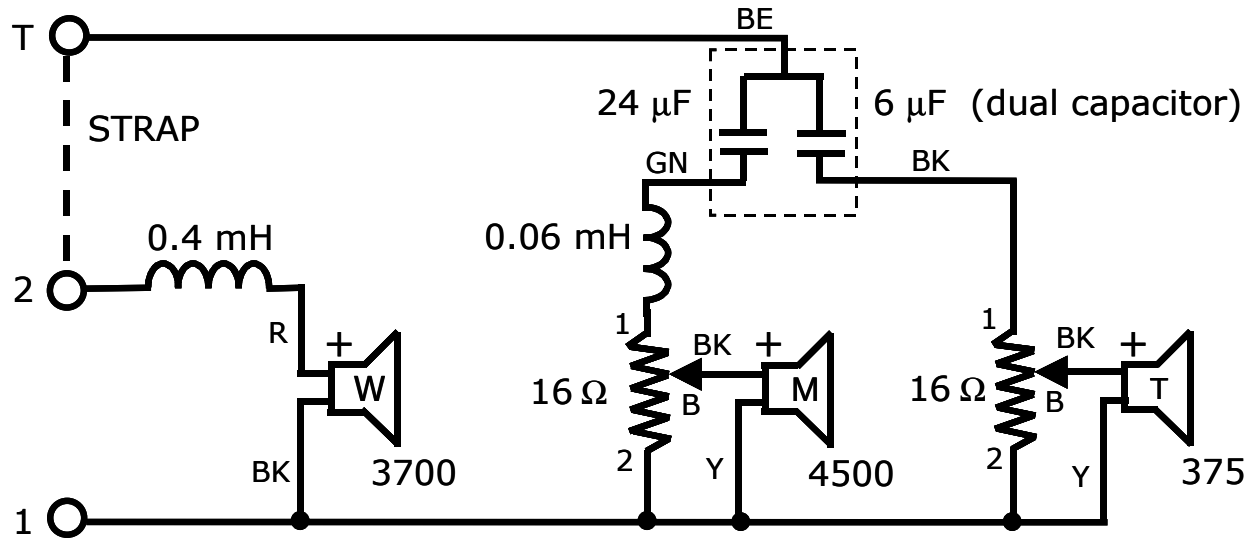
AR-3 Crossover Schematics

During its production cycle, AR modified the AR-3 crossover schematic several times. This note attempts to catalog those changes based on detailed information available in Tom Tyson's files. At some point a complete description of the AR-3 will be written [*TT*]; at that time this should become an appendix within that document.

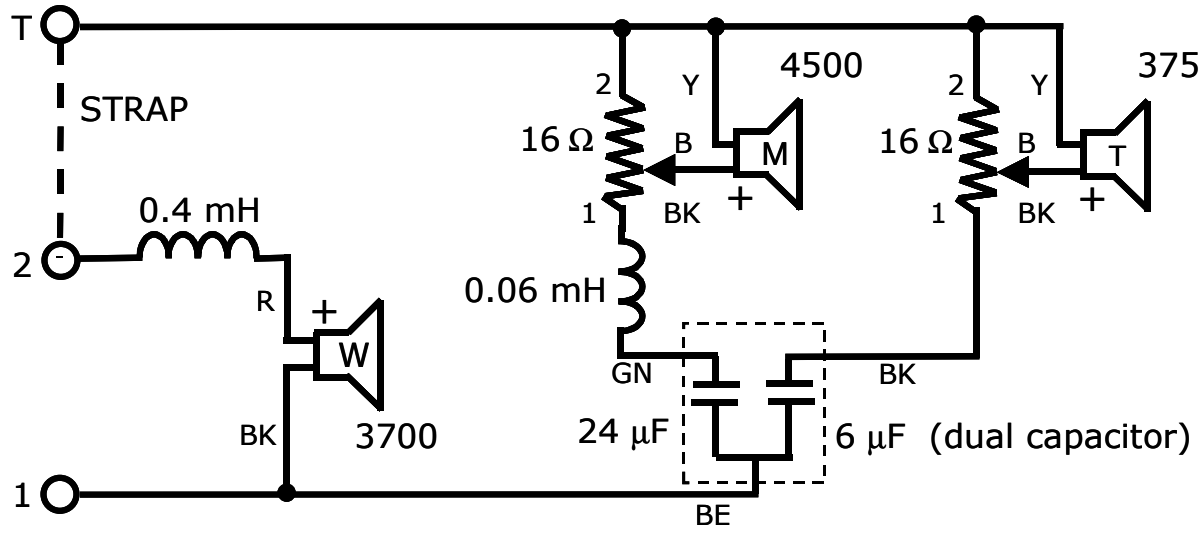
A. Initial production through serial number C1413:

The schematic shown here; dated 13 March 1959 and initialed by EMV, is the original AR-3.



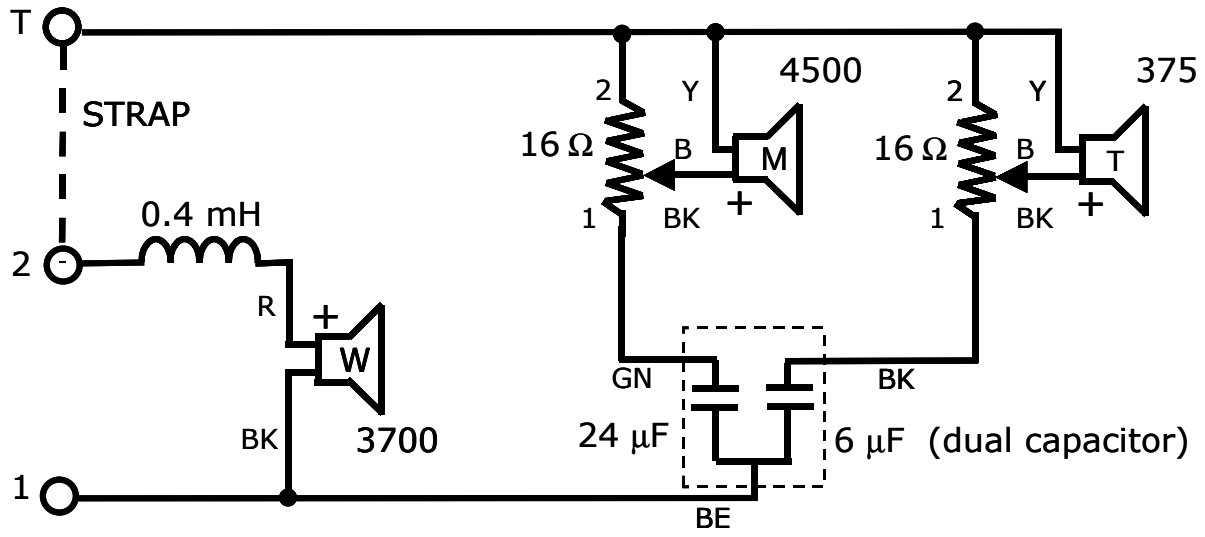
B. Serial numbers C1414 – C19467:

In 1960 the crossover was changed to reverse the phase of the mid-range and tweeter with respect to the woofer [1]. This was the only change made at this point in production.



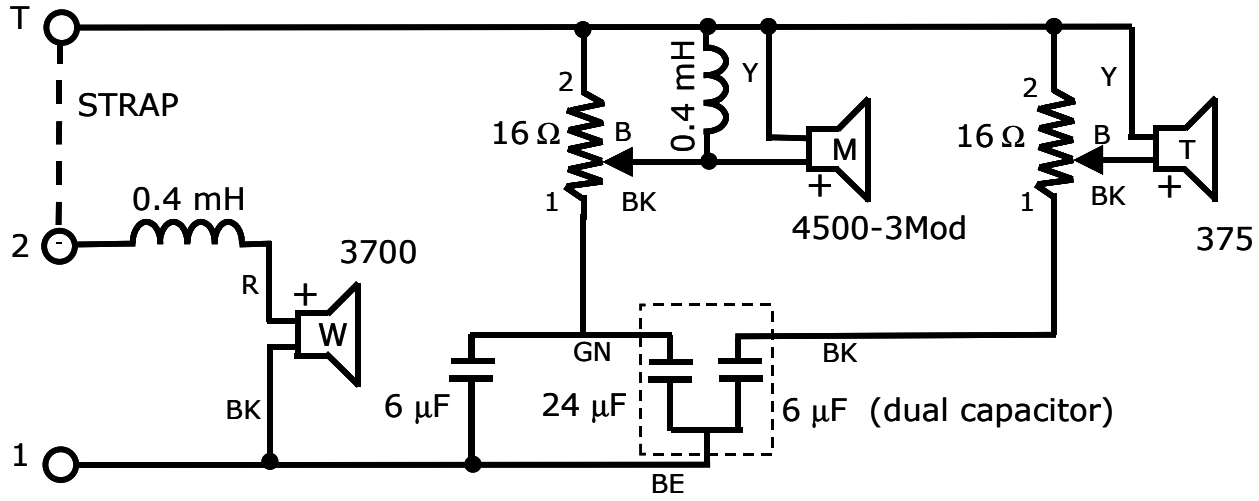
C. Serial numbers C19468 – C70228:

The crossover was modified on 25 Aug. 1965 by removing the 0.06-mH (51-turn) coil in the mid-range crossover.



D. Serial numbers C70229 to end of production:

On 13 May 1970, AR ran out of the original phenolic-dome mid-range. This required the use of a version of the AR-3a mid-range identified by part number 4500-3MOD and later identified as part number 200010-AR-3 or 200019-3. (These are Fig's. A.9 and A.10, respectively, in *Restoring the AR-3a*.) This required a crossover change, as the AR-3 and AR-3a did not have the same woofer–mid-range crossover frequency. This crossover change consisted of the addition of a 6-μF capacitor in parallel with the 24-μF (to make a total of 30 μF) and the addition of a 0.4-mH (143-turn) coil across the mid-range driver. These changes are illustrated below.



E. Replacing the AR-3 mid-range with a service replacement:

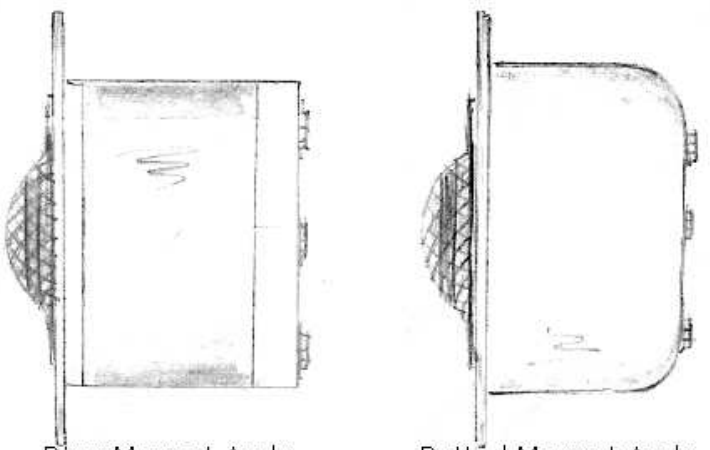
After the original mid-range supplies were exhausted, the new driver described in Section D was used for both production and service replacement. *So it is possible that an Internet-purchased speaker contains a service replacement mid-range*. Service replacement was not straightforward, as the crossover had to be changed to that shown in Section D. Thus, speakers with serial numbers of C19467 and lower needed to have their 51-turn coil removed before the parts for the new service replacement were added. Speakers with serial numbers greater than C70228 would not have needed the crossover modification, since the new style mid-range was installed when originally assembled.

F. Replacing the AR-3 high-range driver:

If an open-circuited, early high-range driver was not replaced with a new unit, then its connections needed to be reversed to keep the correct phase relationship with the new mid-range and woofer. By 1974 AR was supplying high range drivers with the phase reversed internally and they were connected as the older models were, with no external reversal of the wiring. These drivers all used aluminum wire; aluminum solder and flux, or crimp connections are required.

G. Mid-range Magnet Structure:

At some point in the 30,xxx serial number range, AR changed the magnet structure from the modified form of the AR-1W, to a potted type magnet. The two cross-sectional views are shown here. These two styles are equivalent.



H. A Potentially Confusing Schematic:

In the AR Library under [`original models (1954-1974)`] [`schematics/service`] [`AR-3`] will be found a drawing entitled: ***`AR-3 Schematic with Notes`***. This is **not** an AR-3 schematic! It is the schematic AR used at the factory to convert a customer's AR-3 to an AR-3a! That change required new mid-range and hi-range drivers, as well as all coils, and all except one of the capacitors.

[1] Phase reversal was initially done manually by reversing the midrange/tweeter wiring with respect to the woofer. At some point, AR either reversed magnet polarization or internal coil wiring to change this phase internally. It is a daunting task to determine whether or not a particular AR-3 is in-phase or out-of-phase. The acoustically measured effect is only *slightly* noticeable and only barely audible—*not* to a great extent. Quite frankly, room-acoustic artifacts can have a much greater influence on the output of the AR-3 than the simple dc phasing reversal. If your AR-3 has never been opened or modified or repaired, it is almost assured that the dc phasing is correct for that speaker, so do not worry about attempting to change it. On the other hand, if a replacement driver of unknown pedigree was installed, then all bets are off. In order to determine exactly the phase relationship, the speaker must be electrically measured with a sine-wave oscillator and oscilloscope or with response measurements at the crossover frequencies, but this is quite difficult to determine accurately without professional test equipment. In the end, its probably best not to worry about the phasing. If the speaker sounds too bright around the midrange crossover frequency (around 1000 Hz), and it is noticeable, you may reverse the lead-in wires from the midrange driver to the terminal strip (thus reversing the polarity of the midrange driver on the tweeter terminal strip on the front speaker baffle board under the grill). Since nearly all AR-3s used aluminum wire from the tweeters, soldering the aluminum lead-in pigtails requires AlumiSol aluminum solder to properly bond, so care must be used when unsoldering and re-soldering to insure a proper solder joint. An alternative technique for joining aluminum to copper by a crimp connection is described in the AR restoration document.

08 July 2008; John O'Hanlon, Tom Tyson

⌘