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Atwater Kent: One-and Two-Tube TA Units

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[This is part 6A of a series on Atwater Kent by these authors. Previous installments appeared in the May, July, October, December 2005 and the February 2006 issues of Radio Age. - Editor]

Introduction

What started out to be a straightforward article turned out to be a long research project. In the process of compiling existing information, we found that quite a bit of material had not yet been revealed. It has taken almost a year to accumulate several additional key data points in the TA¹ unit design and development.

A second factor that required considerable time was sorting out what was original factory production and what had been altered in later years by collectors and repairmen.

So much material is now available that the TA units will be covered in several sections. Part 6A will cover

the one- and two-tube amplifier units, while part 6B will cover the two-tube detector/amplifier units, Part 6C will cover the three-tube units (detector/2AF), and
(Continued on page 3)



Figure 6-1. One-stage audio amplifier # 4030, top view.

1. The origin of the abbreviation "TA" is unclear. The AK documents we have seen shed no light on this point. It might have stood for "Tube Amplifier" or "Tube Apparatus." Or, some have suggested it stood for "Table (-mounted) Audio."



Figure 6-2. One-stage audio amplifier # 4030, interior view.

(Continued from page 1)

Part 6D will cover the five-tube units (2 RF/Detector/2 AF). Although we cannot guarantee that everything is known concerning the TA units, we believe that most of the critical stages are sufficiently well understood to justify publishing our results.

One-Stage Audio Amp

The one-stage audio amplifier (Figs. 6-1 and 6-2) is the simplest of the TA units, and actually came after the two- and three-stage units. Part number 4030 was assigned by Atwater Kent. The one-stage unit consists of an audio transformer, insulated from the metal housing by a sheet of fiber material. The transformer is encapsulated in a tar-like substance, which was supposed to make it waterproof. The AK factory advertised that these units could be immersed in water for a period of time, then connected to a power source, and made to operate.

All of the units we inspected have a 2-ohm filament rheostat, wound on a fiber board, and secured to the Bakelite top with brass knurled nuts.

There were at least three different production variants made. Since these units came after the two-stage amplifier units, the first groups used the two-stage ID



Figure 6-3. Two-stage audio amplifier # 3634 , Type 1, top view.

tags with either the “2” painted over in black, or the “2” milled off and a “1” stamped in its place. The later version had a raised “1” in the same manner as the original “2” on the two-stage audio amp units. Both black and brown rheostat knobs exist on the earlier units.

This part was made to be used by hobbyists who wanted to add more audio volume to their radios. It was never used in a factory-built radio.

Electrical characteristics of the # 4030:

Audio transformer DC resistance: primary 1750 ohms; secondary 3300 ohms.

Two-Stage Audio Amp Type 1

The two-stage audio amplifier, part # 3634 (Figs. 6-3 through 6-5), was the first AK attempt at a radio part

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Figure 6-4. Two-stage audio amplifier # 3634, interior view.

with more than one active electrical component, specifically two audio transformers installed in the same manner as described for the one-stage audio amp # 4030 above.

The earliest of the audio amplifiers can be identified by the fact that it has all knurled thumb nuts for wire connections. There were no output posts for multiple headset use. Both brown and black rheostat knobs were used. The can was painted green.

Examining the inside of the two-stage AF amplifier, we find the filament rheostat is wound on a white asbestos form using 0.038-inch diameter resistance wire, which is between # 19 and # 18 AWG. The total resistance is 2 ohms to control two type 201 tubes with one-amp filaments. The rheostat is mounted under the Bakelite top using two flat knurled thumb nuts. One end of the rheostat wire is soldered to the A-B- screw terminal. The other end is not terminated but is fixed mechanically to the form.

The contact slider is a bent blunt-end part (see photo) that selects the desired resistance as it glides across the windings. The slider pivot shaft makes contact with a spring tensioned copper plate bolted to the A- tube pins. The circuit is completed through the tubes to the A+ tube pins, which are wired to the A+ terminal.

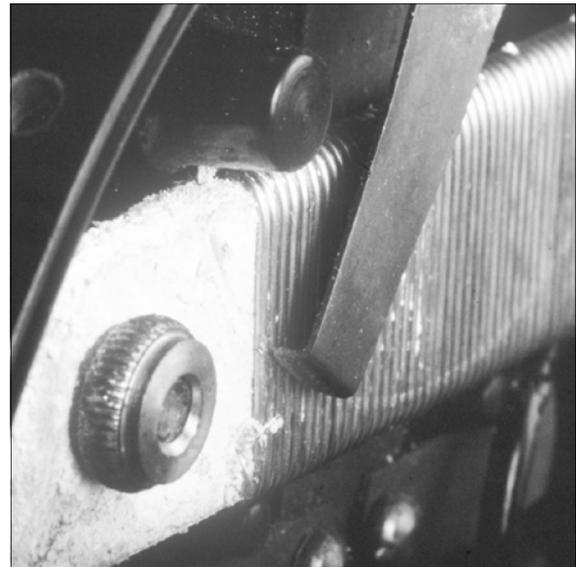


Figure 6-5. Two-stage audio amplifier # 3634 showing blunt-end rheostat slider and asbestos rheostat form.

This earliest version was never used on any AK factory-built radios. It was sold only as a part for experimenters and radio amateurs.

Electrical characteristics:

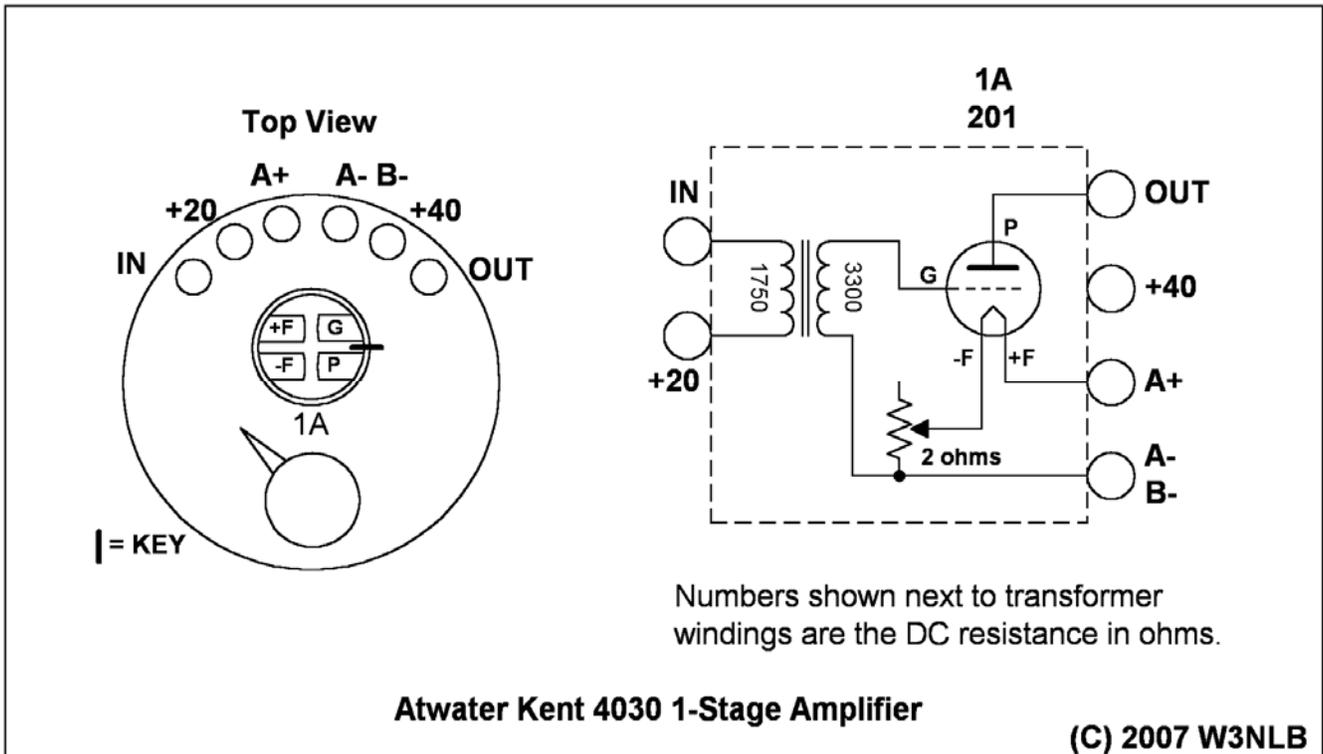
Audio transformer DC resistance: primary 1100 ohms; secondary 2000 ohms.

Two-Stage Audio Amp Type 2

The Type 2 two-stage audio amplifier part # 3634 (Figs. 6-6 and 6-7) was identical to Type 1 with the



Figure 6-6. Two-stage audio amplifier # 3634, Type 2, rear view showing headphone posts.



exception of the following design changes:

The blunt-end rheostat slider was found to be unsatisfactory because it tended to snag the resistance wire and cut into the asbestos form. A smoother slider

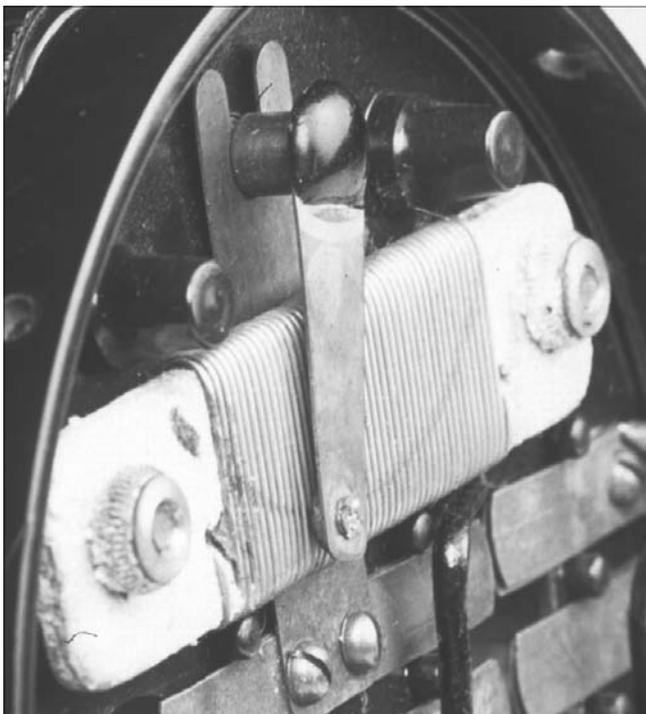


Figure 6-7. Two-stage audio amplifier # 3634, Type 2, showing newer style rheostat slider.

was added, which helped to eliminate both problems. Since Type 2 was the first to be used for factory-built breadboards, posts for multiple audio outputs were added in place of the output screws and knurled nuts. Slotted-head screws were used to secure the headphone or horn speaker jacks to the posts. One post had three screws, the other four. The fourth hole was used to connect the B+ wire from the battery. Up to three sets of headphones and/or horn speakers could be attached.

The inside of the unit looks identical to the first version except for the rheostat slider.

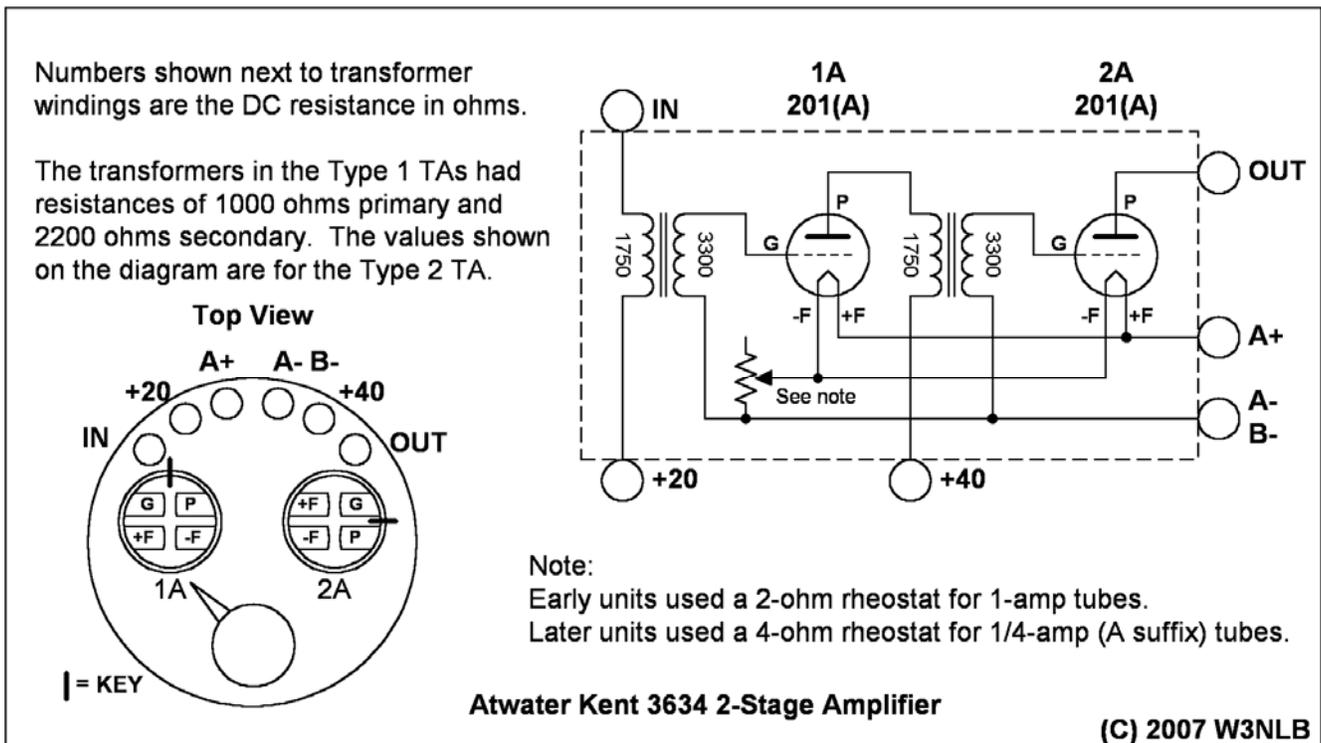
The audio transformer was changed, with winding resistances of 1750 ohms primary and 3300 ohms secondary. This transformer was used in all subsequent versions of the two-tube TA.

The cans were painted green, as with Type 1, and both black and brown rheostat knobs were assembled on the units. One-amp type 201 tubes were used.

This part was installed on the AK-manufactured breadboards part # 3955 (our model 3) and # 3975 (our model 4). It was also sold as a separate component.

Two-Stage Audio Amp Type 3

The Type 3 amplifier (Fig. 6-8) incorporated a modi-



fication to accommodate the new 1/4-amp filament UV201A tubes introduced in December 1922. This version of the amplifier was probably made available when the factory introduced the modified # 4275 (our model 6) and # 4205 (our model 7) radios in April 1923. These were the first AK radios to use the new tubes.

Type 3 looks identical externally to the Type 2.

The only internal difference is a new filament rheostat. The resistance was increased to 4 ohms from 2, and the form was changed from asbestos to a fiber material.

These units were painted green, and manufactured only with brown knobs.

By the time this amplifier was produced, the earlier #3945 and #3955 radios were obsolete. This version was sold only as a component, and never used in any factory-made sets, although its release coincided with the # 4275 and # 4205 as mentioned earlier.

Two-Stage Audio Amp Type 4

Note: The Type 4 (Fig. 6-9) is believed to have become available after the Type 5, more likely around the time of the Type 6. The ordering presented here shows a more logical progression of design changes. Types 5, 6,

and 7 were all used on factory Models 12B, part # 4620, and 12C, part # 4910.

Type 4 is identical to Type 3 internally, and was made to be used with the 1/4-amp type 201A tubes. The rheostat resistance is nominally 4 ohms.

The differences between Types 3 and 4 are mechanical. The Type 4 can is painted black with a crinkle finish, rather than the smooth green used previously.

The output posts were changed from the three- and four-hole versions to a pair with two and three holes. These were also used on the Type 6 amp. The height of the posts is the same as on the Type 3, but the holes were spaced farther apart. Knurled screws were used to secure the headphone or speaker leads, rather than the slotted screws used previously. The additional space afforded better access for finger-tightening the screws. Attachment of the B+ battery lead is still secured with a slotted-head screw.

This is the last version of the TA to have the tube retaining pin slots in the position shown in the photo, i.e., 1st stage to the rear, 2nd stage to the right. The orientation of these slots was changed in later versions.

The black two-stage AF amp was never used on any factory-built radios. It was sold as a part.

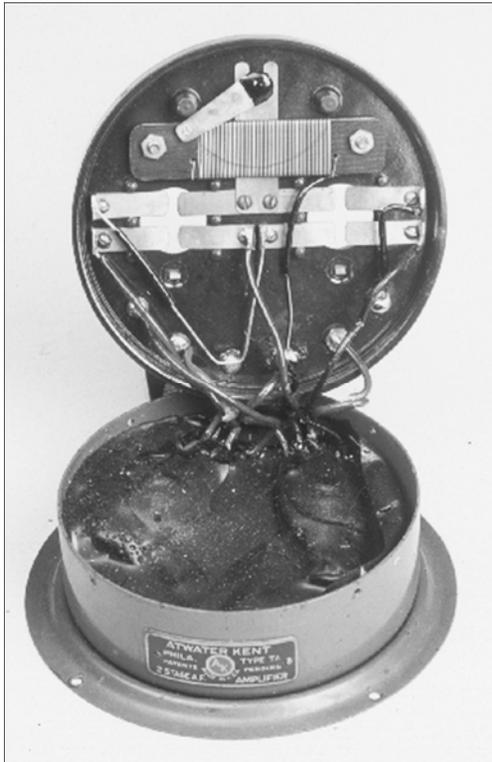


Figure 6-8. Two-stage audio amplifier # 3634, Type 3, showing 4-ohm fiber rheostat.

Two-Stage Audio Amp Type 5

Type 5 of the # 3634 amplifier (Figs. 6-10 through 6-12) was made to be used on the Model 12B, part # 4620, breadboard, or “open set” as the factory called it. Although factory records indicate only 1520 of this version were built, it went through several design changes before the Model 12C, part # 4910, was released. This will be covered in more detail when we discuss the complete radios.

The original Type 5 version was used only for a short time, since there was insufficient finger access to tighten the headphone thumb screws. The lower two knurled screws are not present in the photograph. The bottom hole on the left-hand post was not used.

The can for this unit was painted with a brown crinkle finish.

The tube keys in the brass socket rings were both rotated 90 degrees counter-clockwise, and now matched the socket orientation on the two-tube detector/amplifiers. The internal wiring was changed as required by the mechanical changes.

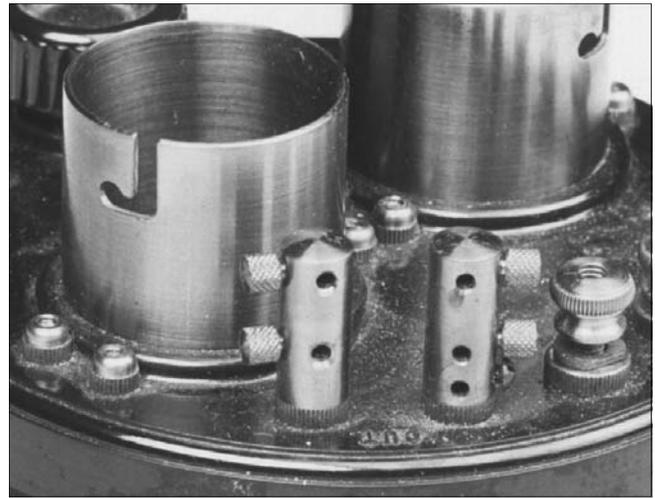


Figure 6-9. Two-stage audio amplifier # 3634, Type 4, rear view showing new headphone posts and tube key orientation.

New shorter output posts were used, having only three holes each instead of the taller three- and four-hole versions of the earlier green TA units. A new type of knurled thumbscrew was used in two of the three holes of each post. The lower hole of one post had a slotted-head screw to secure the B+ wire. Although this post is marked “+40,” a voltage of +90 to +135 volts was applied to this connector, depending on whether a type 201A or 112A tube was used.

The filament rheostat resistance measures about 4 ohms.

Important note: The TA units Type 5 through 7 were custom wired to be used only with the factory Models 12B and 12C. These are easily distinguished by the brown paint.

The green Types 1 to 3 and black Type 4 are not mechanically arranged or wired the same as the brown units Type 5 through 7. However, the green Type 3 and black Type 4 TAs can be adapted to replace the brown Type 5 & 6 units on the Model 12B # 4620. (Types 1 & 2 with 2-ohm filament rheostats would not work as well.) None of the Types 1 to 4 will work to replace the Type 7 used on the Model 12C part # 4910.

Two-Stage Audio Amp Type 6

There must have been some complaints to either the AK factory or the service shops concerning mechanical problems with the two knurled thumb screws in the new short three-hole posts. It wasn't long before the original height posts returned, but this time the second

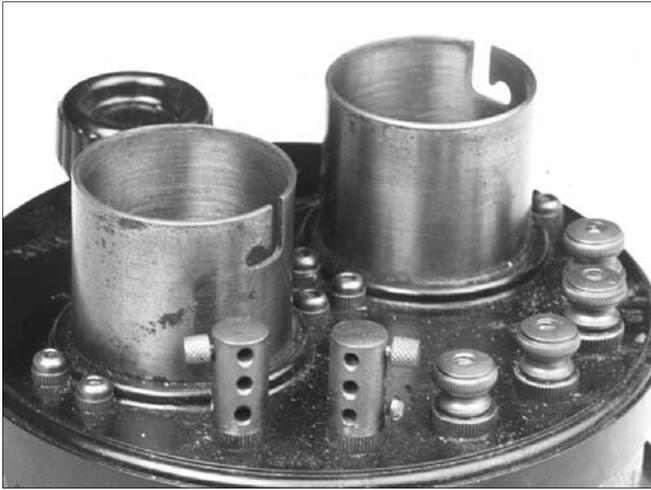


Figure 6-10. Two-stage audio amplifier # 3634, Type 5, rear view showing later headphone posts and tube key orientation.

hole from the top was eliminated from both posts (Figs. 6-13 and 6-14). This allowed room to easily tighten the two knurled thumb nuts. These posts are identical to the ones described on the Type 4 TA unit.

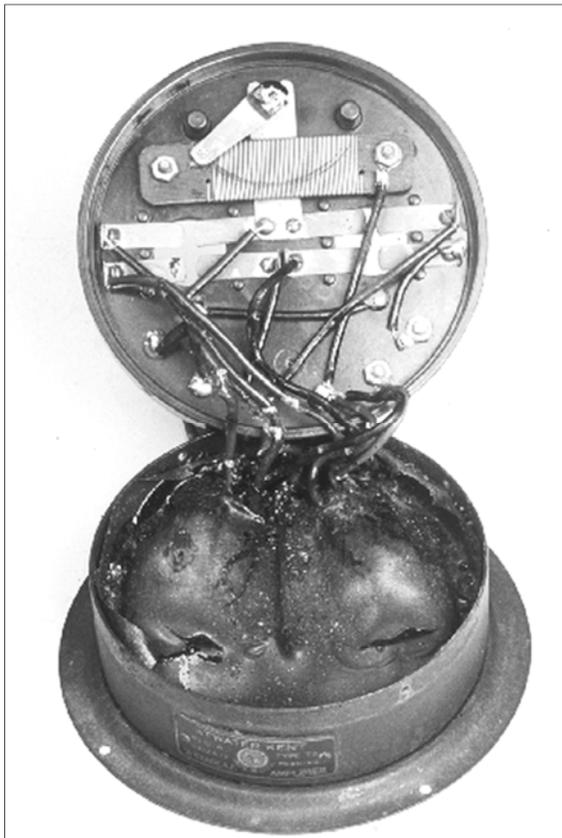


Figure 6-11. Two-stage audio amplifier # 3634, Type 5, interior view of TA used on the Model 12B # 4620 breadboard (typical of early and late versions).

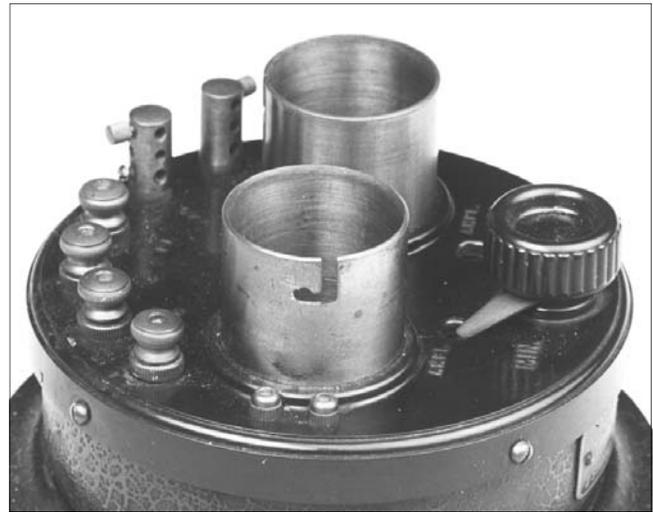


Figure 6-12. Two-stage audio amplifier # 3634, Type 5, side view of TA used on the early Model 12B # 4620 breadboard.

One other minor change was made, involving the brass tube socket keys. The horizontal key slot was changed to remove the upper recess which held the tube locating pin in place. The new slot is almost straight horizontally, with a very slight upward recess.

The filament rheostat was increased to 4.3 ohms, the same as in the Type 4 TA. The can was painted brown. The use of wire terminal lugs was first introduced in this unit instead of soldering wires to the screw heads. This is a good way to identify this as an original factory part. Collectors and repairmen modified other

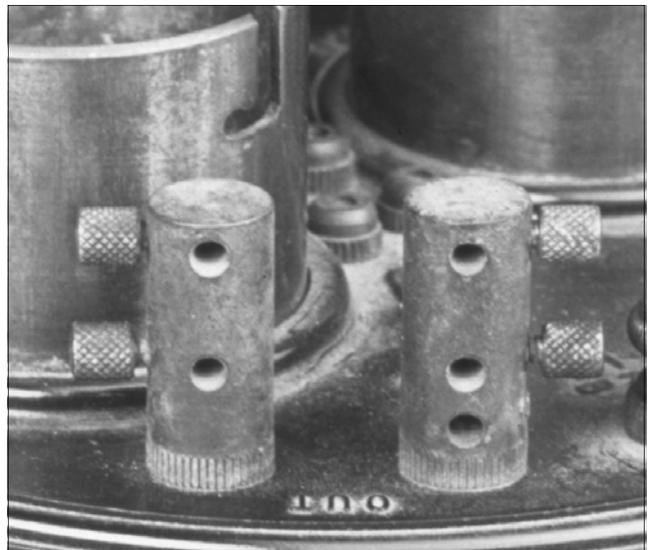


Figure 6-13. Two-stage audio amplifier # 3634, Type 6, side view showing the taller wide-spaced headphone posts.

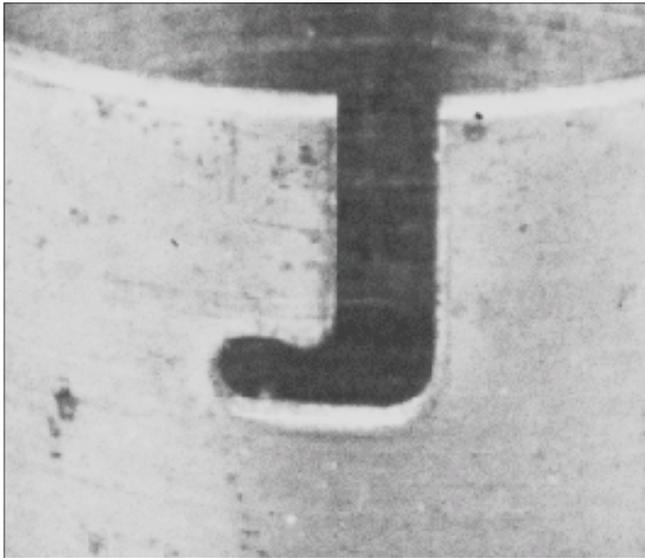


Figure 6-14. Two-stage audio amplifier # 3634, Type 6, socket detail showing modified retaining recess.

TA parts for restoration of sets on their own, but they didn't know that the factory used lugs.

This unit was used only in the late Model 12B # 4620 breadboard. It was not sold separately.

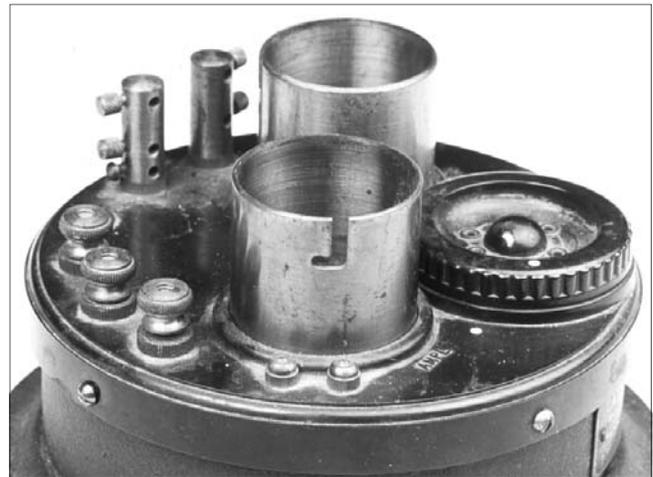
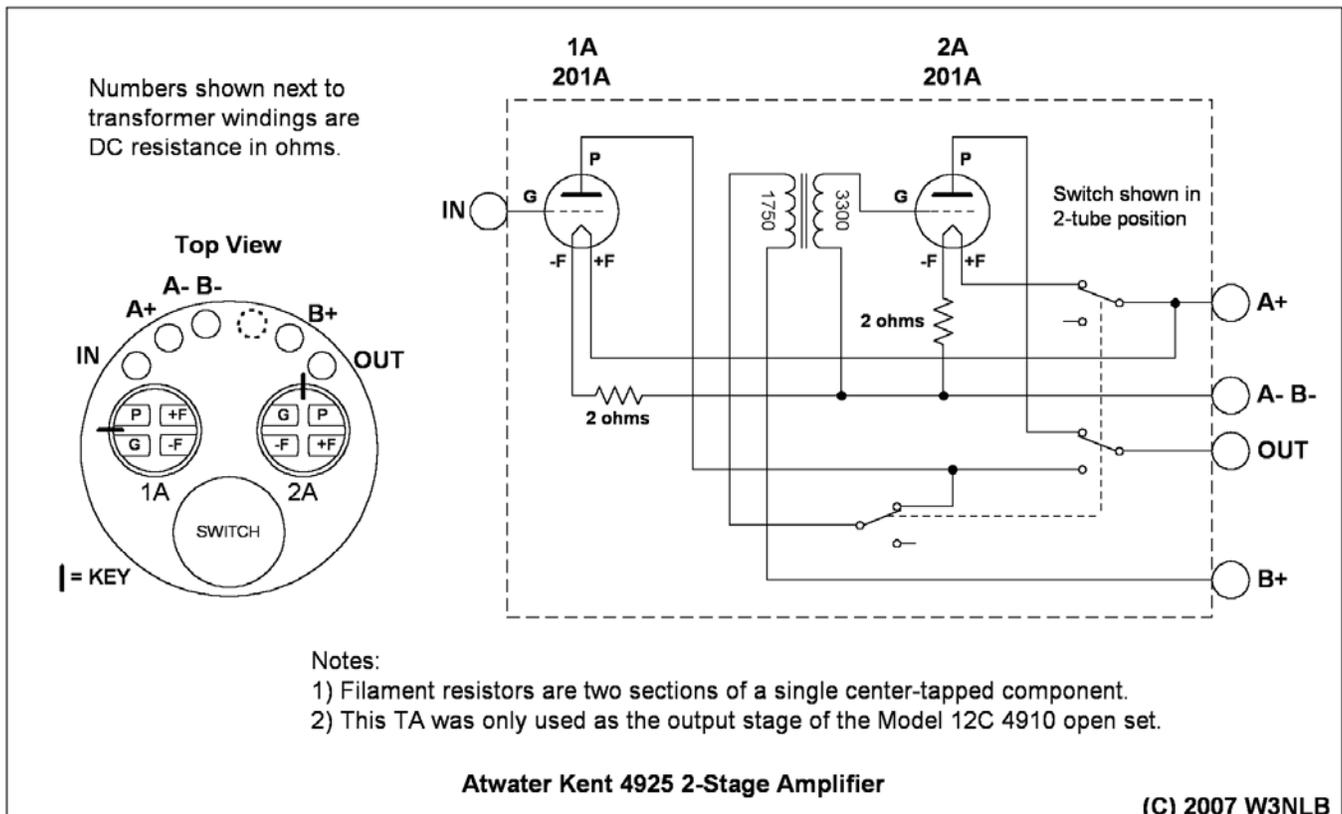


Figure 6-15. Two-stage audio amplifier # 4925, Type 7, side view showing switch (right), output posts, and missing knurled nut.

Two-Stage Audio Amp Type 7

The seventh and last version of the two-tube TA was a complete redesign (Figs. 6-15 and 6-16), with part # 4925. It has only one audio transformer, unlike all versions of the # 3634.



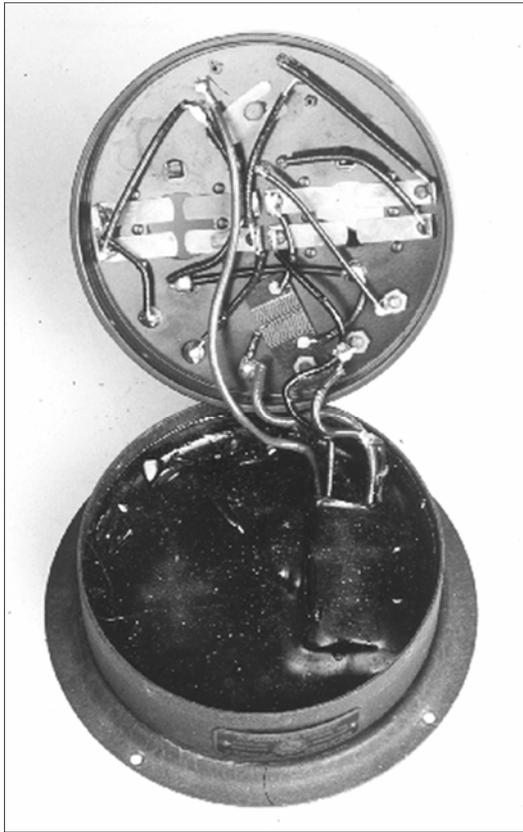


Figure 6-16. Two-stage audio amplifier # 4925, Type 7, interior view showing switch wiring and single audio transformer.

The filament rheostat system was completely removed. It was replaced with a fixed 4-ohm center-tapped wire-wound resistor, part # 4960, and mounted in the can to set the filament voltage. The factory listed this part as 5 ohms, but author Thompson has yet to find a Model 12 with a 5-ohm resistor installed. All units measured have been four ohms.

A switch was installed in place of the rheostat assembly. This switch turns the last stage on or off by switching the filament on or off and switching the B+ (headphone) connection between the two stages as required. This would reduce the operating cost by decreasing battery current drain, and allowed reduction of volume on local stations.

The Bakelite top has no voltage markings on it. Only the output terminals are identified. One of the screw terminals was eliminated, being replaced by a screw to mount the fixed filament resistor inside the housing.

The output posts are the same as those used on Types 4 and 6. The can is painted brown.

The tube socket keys are the new design as described in Fig. 6-14 for the Type 6.

The part # 4925 TA was a custom design for use only on the Model 12C # 4910. It was not sold separately.

Conclusion

This concludes our discussion of the one- and two-tube amplifiers. Chapters to follow will cover the two-tube detector/amplifiers (Part 6B), the three-tube detector/amplifiers (Part 6C), and the five-tube units (2 RF/detector/2AF) TA units (Part 6D). As always, your comments and suggestions are welcome at the links below:

Email Ray at AKRadio@aol.com or Leigh at Leigh@AtwaterKent.Info

Go to the Articles page at <http://www.AtwaterKent.Info> for online copies of this series, additional drawings, photos, and schematics. ■

Service Data Available!

The Radio & Television Museum Library contains a huge collection of service data. (MAARC's extensive library was merged with the Museum library.) Photocopy packages are available for most radio and TV sets prior to the 1960s, and some later ones. Photocopies of manuals for many models of test equipment and other gear (Heathkit, EICO, RCA, etc.) can also be had, as well as copies of articles from magazines such as *QST*, *Radio News*, *Popular Electronics*, and many others. It is best to phone or email inquiries to the museum librarian, Brian Belanger (see page 2), who will check the availability of the data for your set(s) before you order.

Radio service data: \$3 for the first model and \$2 for each subsequent model in same order. TV service data: depends on number of pages. **Maryland residents add 5% sales tax to total. Make checks payable to "Radio History Society."** Order from:

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