

AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

WITH THE CONSTANT increase of custom installations employing high-fidelity chassis, more and more Service Men are being called upon to service these units. Although conventional design techniques are used in the basic approach of these hi-fi units, refinements of an elaborate nature normally distinguish these chassis from standard type equipment.

In the hi-fi system, the amplifier is particularly important, and several effective types of amplifier circuits have been developed to provide wide-range coverage. In Fig. 1 appears one such circuit,¹ with refinements which have been found to result in 20

20,000 cps reproduction with less than .1 per cent harmonic distortion at 10 watts. Known as the Williamson circuit, it features a cathode resistance in the KT66 power output, divided into matched 400-ohm resistors which are connected to the cathodes with a removable link. This arrangement has been found not only to simplify *balance* and *bias* adjustment, but also afford accurate results with commonly available volt-ohm meters.

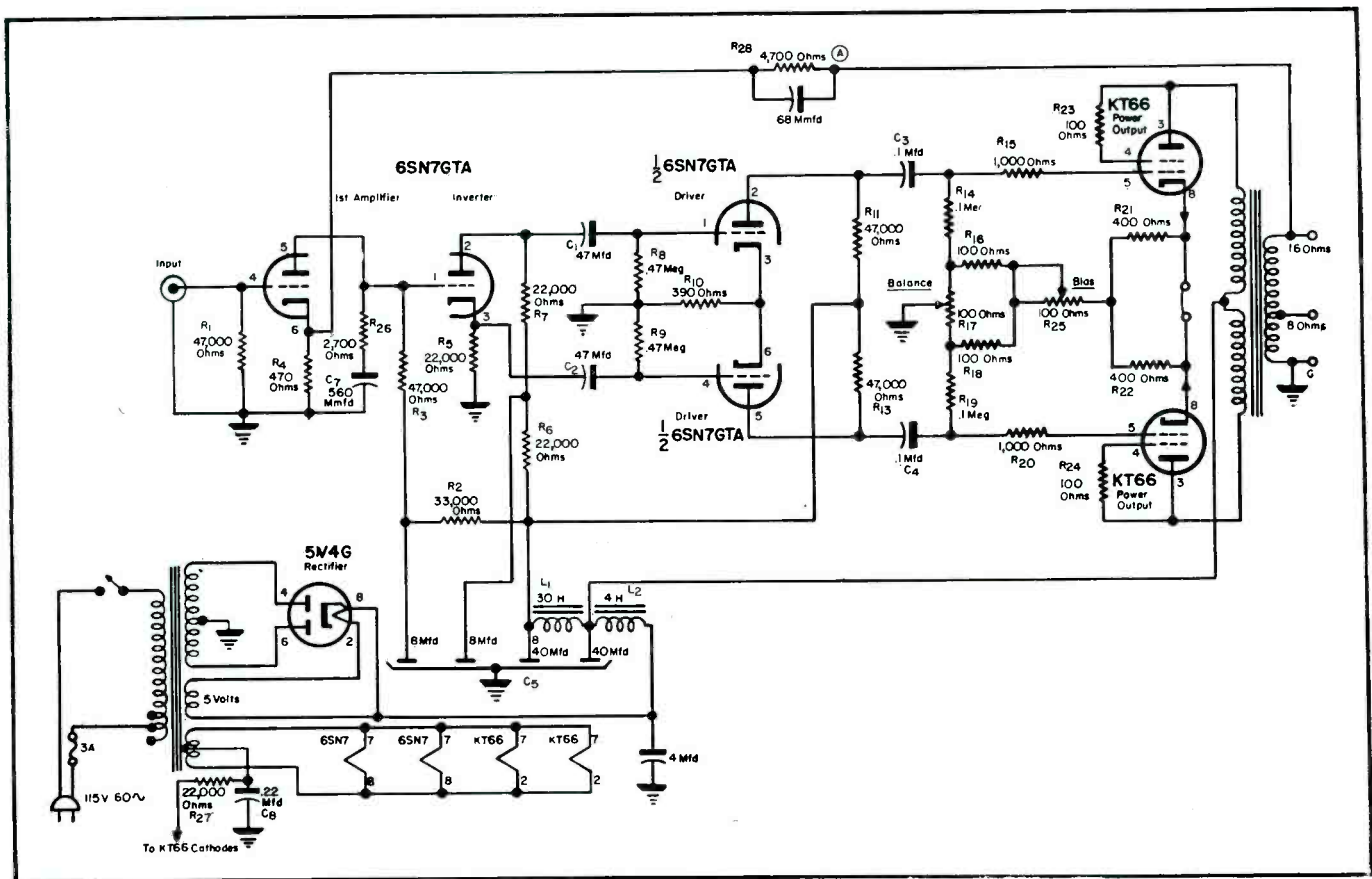
The *balance* and *bias* controls, preset at the factory, need be adjusted

¹Based on notes prepared by Bernard A. Menarik, formerly application engineer, Radio Craftsmen.
²Radio Craftsmen C500.

only when one or both of the KT66s² are replaced. To readjust, the *balance* and *bias* nameplate should be removed and one side of the link on the output cathode terminal board opened. Then a *dc* voltmeter should be connected across the two terminals on this board. The *balance* potentiometer should now be adjusted for a zero reading on the voltmeter, using lowest voltmeter scale.

Now the lead of the *dc* voltmeter must be connected to either terminal on the cathode link board and the lead to the junction of the two 400-ohm, 10-w resistors (R_{21} and R_{22}). The *bias* potentiometer must now be ad-

Fig. 1. Circuit of Radio Craftsmen C500 amplifier featuring the Williamson system. The value of the resistor at A in the 6SN7GTA cathode circuit was selected to provide for 20-db feedback.



Servicing Williamson Amplifier...Record Changer Turntable Removal Hints . . . Speaker Enclosure Design . . . Compound Diffraction Projectors . . . Two-Speed Tape Recorders

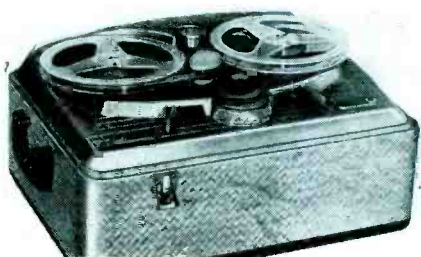
justed until the meter reads 25 volts. The voltage to the other cathode terminal should also now read 25 volts; if not, the *balance* operation should be repeated.

It should be possible to vary the 25-volt bias adjustment from 22 to 28 volts (approximately), 25 volts being somewhere near the mid-position of the bias potentiometer. Should it be found that the 25-volt adjustment appears at either extreme end of the bias potentiometer, it is probably due to a low 450 *v* B supply. This in turn may be traced to a low emission 5V4G rectifier or the line voltage may be abnormal. The tapped primary should be set to accommodate the low or high voltage condition.

Although the KT66s (beam tetrode power output tubes) are connected as push-pull triodes and matched to 10,000 ohms plate-to-plate for low dis-

*Since all KT66s are factory prechecked for matched plate impedances before use, it has been found convenient to divide these tubes into various categories and mark each tube accordingly on the tube base near pin 6, in white ink. The exact matched replacement tube as originally selected for the particular chassis can be ordered by indicating the white number marked on the tube base.

Tape recorder with an integrally built-in dual speed capstan which converts recording speed from standard 7½" to 3¼" per second producing a minimum recording time of two hours. Unit also features a plug-in type dual track recording head, which can be replaced with single-track recording head for professional applications requiring editing and splicing. An automatically engaged pressure roller is said to keep tape in close contact with capstan preventing slippage and minimizing wow and flutter. A *Ful-Vue* volume peak indicator window is mounted directly underneath the volume and tone control knobs. Incorporates such features as standard telephone jacks, compensating switch which equalizes the amplifier for both 3¼" and 7½" speeds, 6" *pm* speaker, 5-tube amplifier, safety lock to prevent accidental erasure, separate input and output sockets for recording and playback. Can be used to record directly from a radio tuner or speaker. Frequency response is claimed to be ±3 db, 70-8000 cps at 7½" in/sec and ±3 db, 70-4000 cps at 3¼" in/sec. (Model 230; Eicor, Inc., 1501 West Congress St., Chicago 7, Ill.)



tortion class A operation, apparent normal operation will seem to take place, where one KT66 is completely inoperative. However, an excellent clue of this condition will appear in a comment from the user of the hi-fi system that there seems to be something lacking in the reproduction. Actually a small loss in bass has taken place, causing the defect.

There are many installations where the amplifier is in a remote or hidden enclosure, thereby obscuring the non-operative tube. When replacing a defective KT66 tube, the *balance* and *bias* adjustments must be rechecked.

The very low output impedance of the amplifier results in a large damping factor, which has been found to reduce transient distortion. This effect will be noted by observing the results when the amplifier is used on a standard 5-inch speaker.

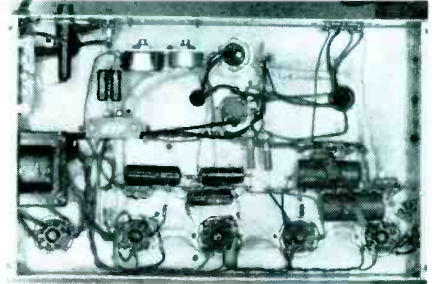
Despite the flat gain versus frequency characteristic of the amplifier, loss of bass might be observed with the use of some loudspeaker systems, due to the damping action at the amplifier output. In spite of the obvious merits of good speaker damping, occa-

(Continued on page 60)

Compound diffraction projector, which utilizes two coaxially mounted diffraction horns working from both sides of a single diaphragm. Each projector is said to be designed for optimum air loading and reproduction within its own range, to provide peak-free response ± 5 db to 11,000 cps. Low end response is augmented by 100-cps horn taper. Polar distribution pattern is claimed to exceed 120° at all frequencies up to 10,000 cps. Edgewise wound voice coil assembly uses phenolic impregnated *Fiberglass* diaphragm. Drain holes said to permit subsequent operation after complete water immersion. Loudspeaker system is rated at 25 watts. Impedance is 16 ohms. Can be installed horizontally, or vertically for augmented dispersion. Dimensions: 10½" wide at mouth, 20½" high at mouth, 20" deep overall. (Model 848 CPD; Electro-Voice, Inc., Buchanan, Michigan.)

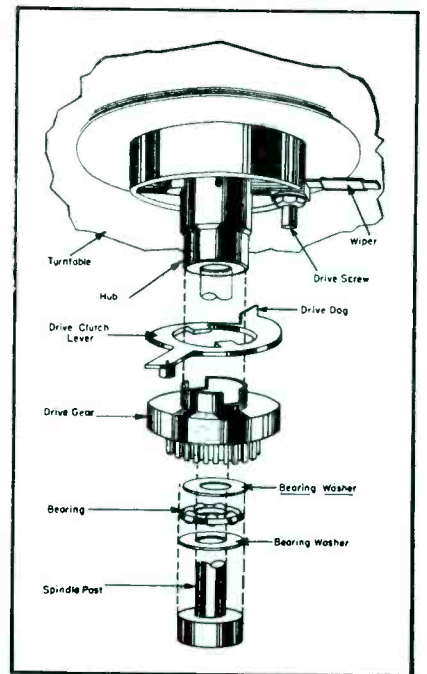


Figs. 2 and 3. Top and underside views of Radio Craftsmen amplifier.



(Below)

Fig. 4. Exploded view of changer mechanism in Motorola RC models, illustrating location of bearing washers, which must be positioned properly to avoid operational problems, such as wow, rejection difficulties, etc. See pages 60, 61, and 62 for detailed explanation.



(Below)

Program equalizer designed to provide corrections for frequency response in audio equipment, sound pickup and transmission lines. Operation of controls is said to allow over 395 curve combinations, and provide for independent adjustment of high and low frequencies in 2 db-steps. Input level is -70 dbm, minimum and +20 dbm, maximum. (Type 4031-B; Cinema Engineering Co., Burbank, Calif.)

