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OPERATING G-E HI-FI TUBES AS MODULATORS

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The High Fidelity audio equipment boom has spurred development of several new tube types—and improvements in existing types—for audio power amplifier service. Thus, amateurs now have a broad choice of highly efficient tubes for plate modulator service in their transmitters.

The new audio tubes shown at the right are the G-E Receiving Tube Department's new family of high-performance power pentodes designed for both monophonic and stereo high fidelity audio equipment. Keeping pace with the trend to the "pancake" shape in audio equipment, these tubes pack more power capability into compact envelopes than ever before.

A newly developed five-ply bonded plate material (see cross-sectional drawing, Fig. 1), permitted upping the plate dissipation in the 6L6-GC to 30 watts, as compared to 24 watts in the 6L6-GB and older versions. A dramatic demonstration of this new plate material's capability can be seen in the photo showing a 6L6-GB and a 6L6-GC, running side-by-side with each plate dissipating 80 watts! Note the "hot spots"—actually a bright orange in color — on the 6L6-GB plate at left. The new five-ply plate in the 6L6-GC at right is uniformly heated to a dull red color (although it appears black).

The new 7581 beam pentode — electrically similar to the 6L6-GC, but with a low-loss mica-filled base — has the five-ply plate too. Another new pentode with the five-ply plate, the 7355 for audio amplifiers in the 20-30 watt power range, packs 18 watts of plate dissipation into an envelope having a seated height of only 3 inches. The 7189A miniature pentode also has a plate made of the five-ply material.

The 6BQ5 and 7189A pentodes — plus the new 6DZ7 twin pentode, which is equivalent to two 6BQ5's in one envelope — round out

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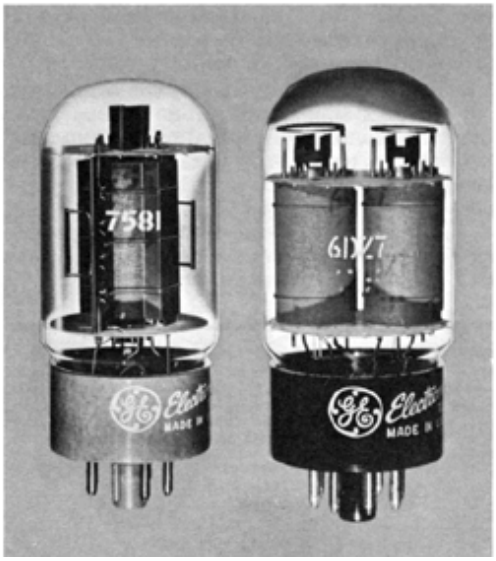
COMPARISON of plate size in the new 7355 octal beam pentode (left), and the 7189A miniature beam pentode (right). The tubes have design maximum plate dissipation ratings of 18 and 13.2 watts, respectively.

Also in this issue—

—Lighthouse Larry

NEW G-E 7581 beam pentode with low-loss base, and the 6DZ7 twin beam pentode (right). Both the 7581 and the 6DZ7 are only $3\frac{5}{16}$ inches in height when seated in sockets.



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this hi-fi tube family. These tubes normally are rated in the technical data for push-pull class AB_1 operation at low harmonic distortion — about 2 percent — in high fidelity amplifier service. These ratings are given in the "Hi-Fi Service" columns in Table I.

Plate modulator service in amateur transmitters, however, usually permits the audio power tubes to be operated with higher distortion — up to about 10 percent — in the output. This allows the modulator tubes to be driven harder — up to the maximum ratings — with a resultant 25 to 90-percent increase in power output, depending on tube type.

A session with the "OPERATION CHARACTERISTICS" curves on the *DESCRIPTION AND RATING* sheets for these tubes resulted in the figures listed in the "Modulator Service" columns in Table I. These operating conditions are all within the "MAXIMUM RATINGS" listings for each tube type. A typical class AB_1 amplifier circuit is used to obtain this data.

A 24-watt modulator with a single tube output stage can be built around a 6DZ7 twin pentode, operated with 400 volts on the plates. Or, a pair of 6BQ5's can be substituted if desired. For high power output at a moderate 400 plate volts, a pair of 7355's will deliver 54 watts of audio power. These figures do not include output transformer losses.

Plan your new plate modulator around the above tubes. As makers of high fidelity equipment can verify, they really deliver the watts, and with low distortion too.

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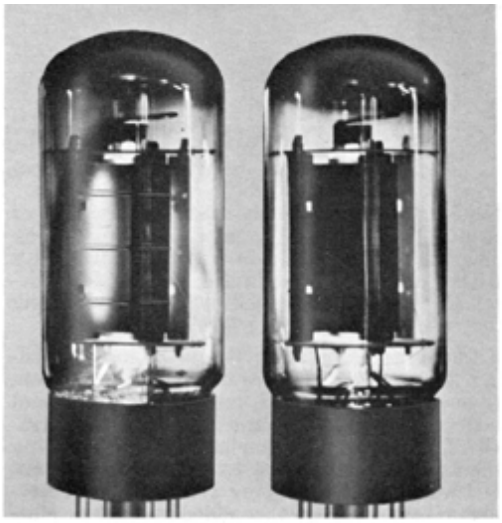

UNRETOUCHED PHOTO showing a 6L6-GB (left) and a new 6L6-GC (right) with five-ply bonded plate material, each operating at a plate dissipation of 80 watts. The 6L6-GB has "hot spots" on the plate, bright orange in color, while the plate of the 6L6-GC shows only a uniform dull red, due to the superior heat dissipating characteristics of the new material.

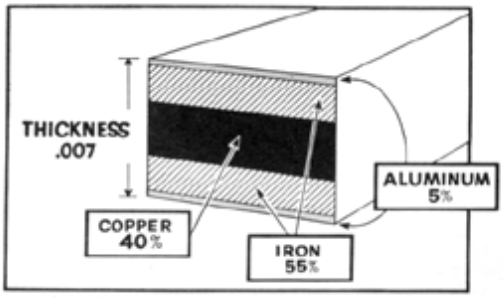

FIG. 1. CROSS-SECTIONAL VIEW of G. E.'s new five-ply bonded plate material. The metal "sandwich" gives better heat conduction and radiation than conventional single-layer anode materials.

TABLE I — COMPARISON OF HI-FI AND MODULATOR SERVICE

PUSH-PULL CLASS AB_1 AMPLIFIER, VALUES FOR TWO TUBES

TUBE TYPE	1 — 6DZ7 2 — 6BQ5 2 — 7189A		2 — 6L6-GC 2 — 7581		2 — 7355		
	Hi-Fi Rating	Mod. Rating	Hi-Fi Rating	Mod. Rating	Hi-Fi Rating	Mod. Rating	
Plate Voltage	400	400	450	450	300	400	Volts
Screen Voltage	250	250	400	400	250	300	Volts
Grid-Number 1 Voltage	—11	—11	—37	—37	—21	—32	Volts
Peak AF Grid-Number 1 Voltage	22	26.4	70	85	42	70	Volts
Zero-Signal Plate Current	80	80	116	116	100	72	Milliamperes
Maximum-Signal Plate Current	100	110	210	240	185	244	Milliamperes
Zero-Signal Screen Current	4.0	4.0	5.6	5.6	5.5	4.6	Milliamperes
Maximum-Signal Screen Current	13	16	22	30	24	30.4	Milliamperes
Effective Load Resistance, Plate-to-Plate	9000	9000	5600	5600	4000	3500	Ohms
Total Harmonic Distortion[1]	2.5	5	1.8	7	2.0	5.8	Percent
Maximum-Signal Power Output[2]	18	24	55	70	28.5	54	Watts

[1]Without feedback.
[2]Power output figures quoted do not include losses in output transformers usually encountered in practical circuits.