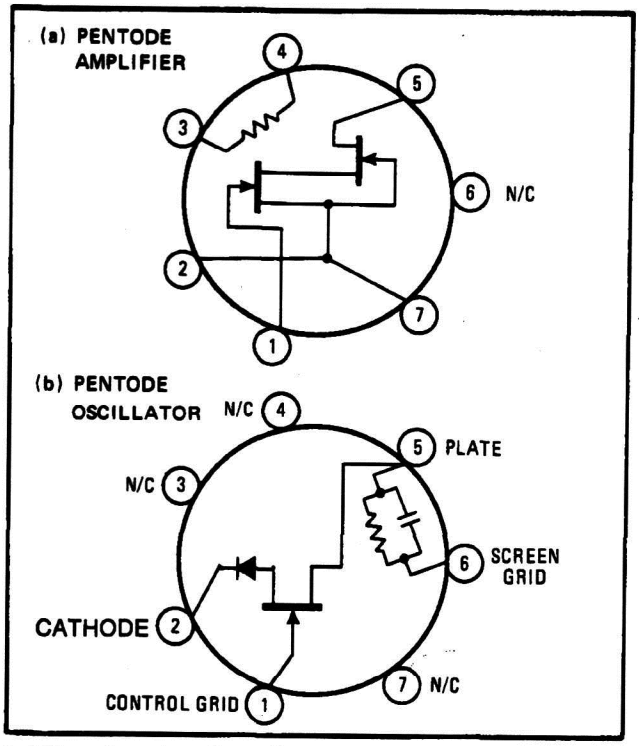

8. Different configurations. The internal configurations depend on whether the Fetron is destined for service as a pentode amplifier (a) or oscillator (b). For oscillator use, an internal RC network provides the required feedback when the Fetron is plugged into sockets.

powered at 1.2 W, a test that keeps the junction temperature at 215°C for 450 hours. One failed and one degraded (leaked), indicating device survival at 25°C for 10^{11} hours.

From these destruction tests, it was found that although normal operating current is 7 mA, it generally takes a steady current above 30 mA, at 350 to 400 V, to induce failure. Surges up to 6 A can be withstood. Internal connections melt at 9 to 10 A, but fusing links can be built into the device so that if it does fail catastrophically, the circuit is protected.

Shock and other physical tests, comparable to normal IC environmental tests, have also been made. The Fetron, because of its hard metal case, is virtually unbreakable. The case is a solid, deep-drawn steel cap welded to a large header. Before welding, the case is evacuated and backfilled with dry nitrogen.

Almost every general-purpose pentode and triode tube type, and various special-purpose ones, may be simulated with Fetrons, by selecting the appropriate FET pair and varying the internal connections and networks. Figure 8 shows two versions.

Variations include:

- The standard amplifier (6AK5 with 6.3-V heater). In amplifier circuits, a cathode resistor is commonly used to adjust the operating point. At frequencies up to 30 MHz, amplifiers don't need a neutralization network. At higher frequencies, an adjustable capacitor is usually available in the circuit. If not, a 2-pF capacitor may be added internally or externally.
- The oscillator, with the screen grid simulated and feedback to input provided by the connection to pin 6.
- The low-gain single-FET pentode.
- The twin-triode amplifier, for low-noise cascoded triode circuits.
- The twin triode, with an RC network inserted for voltage regulator circuits.

The Fetron pentodes have been operated to 500 MHz, exhibit lower i-f noise than the original tubes, and do not suffer from microphonics. Elimination of heater power, and usually all screen grid power as well, cuts supply drain and reduces operating temperature from well over 100°C for the tubes to about 650°C for the Fetron. After some eight months of trial operation, there has been no noticeable degradation in its transconductance.

Fetron triodes will generally be used in low-frequency applications. In most of these, their sharp cutoff improves on the original circuit performance. Naturally, such triodes have the same general noise and power-saving advantages as the Fetron pentodes.

Pacific Telephone Co. recently has converted to Fetrons on a trial basis in a number of repeater lines between San Francisco and Martinez, Calif. In addition, some of the channel equipment for multiplexing and

TABLE 1: TYPICAL PENTODE DEVICE CHARACTERISTICS – R_K = 200 Ω, E_b = 120 V

PARAMETER	UNITS	6AK5 VACUUM	TS6AK5 SOLID-STATE
Plate voltage breakdown	V	350	350
Plate resistance	MΩ	0.5	5.0
Transconductance	μmhos	5,000	4,500
Plate current (R_K = 200 Ω)	mA	7.5	7.0
Grid voltage for I_b = 10 μA	V	−8.5	−5.0
Amplification factor	—	2,500	22,500
Input capacitance	pF	4.0	6.5
Output capacitance	pF	0.02	0.02
Useful frequency limit	MHz	400	600