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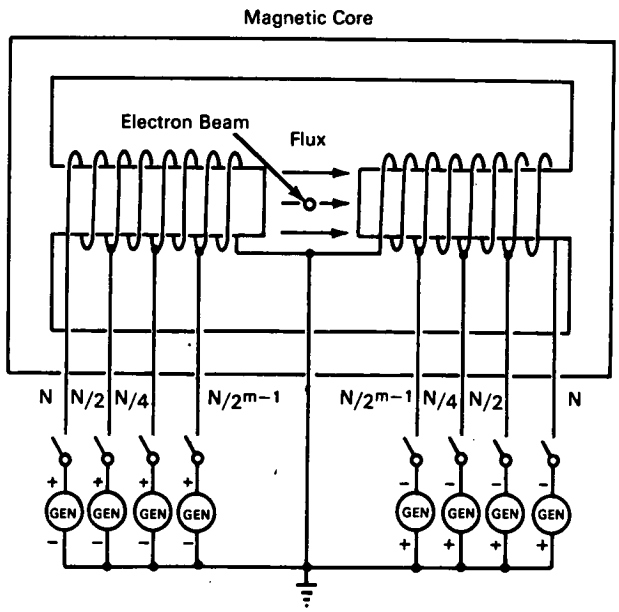
Brief 65-10283

NASA TECH BRIEF

Electron-Beam Deflection Controlled by Digital Signals



The problem: Accurately controlling the electron-beam deflection in cathode-ray tubes, vidicons, image orthicons, and other electronic image converters. Conventional yoke deflection systems require circuitry to convert a time-dependent input voltage to an equivalent time-dependent current flow through the deflection yoke windings. These circuits have characteristics that are difficult to control and that lead to deflection inaccuracy and image distortion.

The solution: A tapped magnetic deflection yoke and a series of current generators that supply equal current to each tap through digitally controlled switches. Since the electron-beam deflection is controlled by digital information rather than by a time-variable voltage or current, the system has greater inherent accuracy.

How it's done: The magnetic deflection yoke consists of N turns with a series of taps brought out at points in the turns corresponding to N, N/2, N/4, N/8, . . . , $N/2^{m-1}$, where m equals the number of binary digits in the code system. When a switch is closed, a magnetic field is established that is proportional to the product of the number of turns and the current. The magnitude of the magnetic field and the

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electron-beam deflection is therefore controlled by the application of digital signals that open and close the switches. For a specific magnetic field intensity to be produced, only those switches that correspond to the numerical value of the desired intensity need be closed.

Notes:

1. If separate windings for each current source are used rather than one tapped winding, the yoke's power dissipation will be no greater than that of a yoke of conventional design.
2. The inductance of the yoke as seen by the most significant bit is one-quarter that of a conventional yoke being driven by the same current source to produce the same deflection. This gives a one-octave improvement in the yoke's frequency response.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10283

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

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