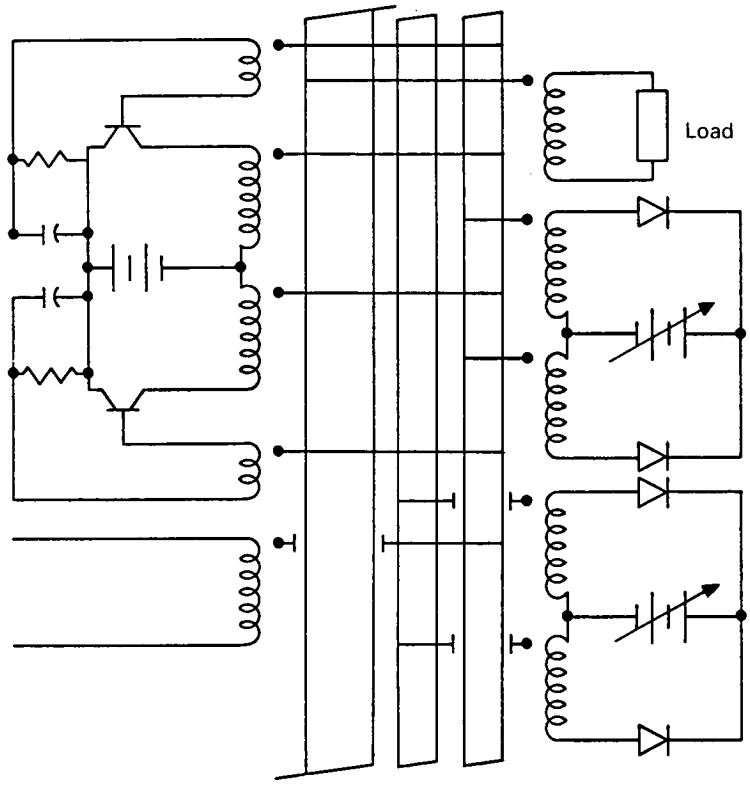
NASA TECH BRIEF

NASA Tech Briefs are issued by the Technology Utilization Division to summarize specific technical innovations derived from the space program. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.

Variable Frequency Transistor Inverters Use Multiple Core Transformers



The problem: To design a class of magnetic-coupled multivibrators which will provide frequency control and other operational characteristics not easily obtained with conventional magnetic-coupled multivibrators.

The solution: Use two or more square-loop cores with multiple windings in a single transformer package.

How it's done: The transformer package consists of a saturable transformer containing a main square-loop core and an auxiliary or control square-loop core. The rate at which the main core swings from one saturation level to another is the transformer output frequency. The auxiliary core is arranged so that within certain limits, it can either increase or decrease the swing rate of the main core, thereby indirectly controlling the transformer output frequency. Externally, a variable dc control voltage is applied to the auxiliary core winding and a switching circuit is connected to the input of the transformer. The switching circuit is arranged so that each time the main core saturates, the input voltage to the transformer reverses

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government, nor NASA, nor any person acting on behalf of NASA: A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately-owned rights; or B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this document.

polarity. Under these conditions, the instant the main core saturates, the input voltage immediately attempts to saturate it in the opposite direction. However, the time required for the main core to react is determined by the level of the dc voltage applied to the auxiliary core. Thus, the output frequency of the transformer is determined by the magnitude of the control voltage. The following operational characteristics have been obtained through various arrangements of cores and external circuits:

1. Output frequency decreasing with increasing control voltage.
2. Output frequency increasing with increasing control voltage.
3. Output frequency as a function of sum of control voltages.

Notes:

1. The characteristics obtainable by this innovation may be advantageous in a variety of applications:
   a. Power oscillators in which the output frequency must be controlled electrically as part of certain feedback control systems.
   b. Nonlinear magnetic circuitry requiring a constant frequency source of ac voltage.
   c. Telemetry circuits requiring voltage-to-frequency transducers.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10119

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

Source: Duke University,
under contract to Goddard Space Flight Center
(GSFC-183)