

[Electronic Cardiac]

# Pacemakers Designed to Counter Radiation

by Stenzler Add Glaser  
[Non-ionizing Electromagnetic]

Heart specialists and biomedical electronics engineers recently polled by *Electronic Engineering Times* agree that, although the immunity of cardiac pacemakers to electromagnetic radiation has been substantially improved, further development is needed.

Dr. Thomas Ely, clinical assistant professor in preventative medicine at the University of Rochester, warns that radiation sensitivity can vary considerably from one pacemaker manufacturer to another. "If a field is strong enough," he contends, "it can probably interfere with pacemaker operations."

## The Beat Goes On

Demand-type pacemakers are controlled by the electrical activity of the heart, and older models can be disrupted by external radiation. A major threat, explains Wesley Grace, senior project engineer at American Optical in Bedford, Mass., "comes from impulses repeating at regular intervals — especially at frequencies close to that of the human pulse rate." This type of signal can compete with that of the heartbeat and cause the pacemaker to shut off at the wrong time.

Dr. John Osepchuk, consulting scientist at Raytheon in Waltham, Mass., explains that early pacemakers were not adequately shielded to filter out potential interference. Osepchuk feels there was insufficient communication between physicians and research engineers during the time pacemakers were evolving. He is confident that engineers can alter design to suit the type of instrumentation required by cardiologists as need dictates.

He refers to the interference problem as a "mixed bag" of opinions. Physicians are not in agreement as to whether there is definite need for further interference protection. "Current pacemaker models being produced by major manufacturers are becoming, in general, less sensitive to outside interference," according to John C. Mitchell, chief of radiation physics at Brooks Air Base school of aerospace medicine. Manufacturers, he believes, are moving quickly toward the solution of the radiation problem by continuously improving product design.

Mitchell's beliefs are echoed by James Toler, senior research engineer and member of the electromagnetic compatibility group at Georgia Tech. But Toler cautions pacemaker wearers about the continuing need for discretion. Persons exposed to more intense fields are more likely candidates for disruption problems. Toler cites lower UHF and upper VHF portions of the spectrum (between 200-600 MHz) as disruptive frequencies.

"Persons with pacemakers working

in an industrial environment where they are exposed to radiation sources need to be aware of the signals that contribute to their particular environment," says Toler. "Since physicians implant pacers on the basis of heart defects, both the patient and the doctor must be aware of possible pacer reactions to industrial radiation conditions."

Dr. Sol Michaelson, professor of radiation biology and biophysics at the University of Rochester, is confident that workers wearing pacemakers who are occupationally exposed to radiation will be further protected as older models are replaced by modern, more protective demand pacemakers (Pacers are replaced approximately every 30 months).

Shielding and filtering techniques are being employed by most major pacemaker designers. David Link, acting director at the bureau of medical devices in Rockville, Md. is confident that manufacturers are aware of interference possibilities and are making efforts to minimize potential problems.



John M. Osepchuk

Brian Parker, director of bio-engineering at Montefiore Hospital in New York recommends that wearers of older

model pacers take particular caution in allowing themselves radiation exposure. Proximity to the source of radiation increases the hazard. "By recognizing the danger and moving away from the source, serious pacemaker disruption can be avoided," Jim Toler affirms.

Robert Schlentz, manager of the electromagnetic compatibility department for Medtronic, Inc. in Minneapolis, emphasizes that field strength, modulation rate, and frequency all act on pacer sensitivity. Russell Crumb, a standards engineer at Medtronic, is looking toward the Association for the Advancement of Medical Instrumentation (AAMI) committee to establish the needed standards to reduce pacemaker sensitivity to interference.

The FDA has contracted AAMI to prepare both test standards and performance requirements for cardiac pacemakers. These standards will ultimately be endorsed by the FDA to further eliminate hazardous radiation interference on cardiac pacemakers.

Margie Stenzler

## New Firmware to Cut Board Test Costs

Microprocessors can significantly reduce the initial cost of future automatic test systems for printed circuit boards, says Eric Mudarni, marketing manager of General Component and Network Division.

"In the past, a major thrust was to reduce time to locate failure. Now, cutting operations costs with microprocessors is achieved. Microprocessors can be a pay-off in development, setting up cards with automated, generated process is consuming. It's a significant advance in software to help generate programs."

Some examples of increased use of software are demonstrated at the February 11, 12, 13 Convention in California. PC General Radio hybrid (digital incorporating According to and a smart

reduce time to find a failure."

Technology Marketing Inc. showed its model 2160 PC board tester em-

then with power.

Passive component test instruments shown at the

THEY ALL  
HAVE ONE



**IMPORTANT!** If your mailing label is stamped RENEWAL your subscription will expire shortly, unless you have sent a renewal form in the last 30 days. Please fill out the qualification form on page 41 and attach the mailing label from this issue. Use the same form for new subscriptions.

02 064-38710315LGA  
C 17 ZR GLASER AST DIR  
L 75 BUR MED SURG 142  
15 NAT NAV MED CTR  
BETHESDA MD 20014  
BRMDS  
GLA  
NATZ

# Electronic Engineering TIMES

046

Circulation over 80,000

For Decision Makers in Electronic Engineering and Management

Monday, February 24, 1975

## Strong Trend to CMOS Logic Taking Place in New Equipment Designs

NEW YORK — CMOS logic continues to gain in popularity, an *Electronic Engineering Times* survey indicates. After a slow start, action in National Semiconductor's 74C family is picking up although 4000 series still holds a commanding lead.

Many key integrated circuit users contacted by the survey indicate that the high noise immunity and low power dissipation of CMOS more than compensate for its higher cost. Complaints about the difficulty of handling damage (a problem of considerable dimensions a year ago) appear to be fading off.

One major factor in 4000's popularity is good availability of second sources.

Story on Page 28

## Memory Reliability Called Superior to Core

CUPERTINO, CA — The semiconductor memory is now considered as a reliable substitute for core memory at Hewlett-Packard. Analysis of 6.5 million device test hours on 4k RAMs has indicated MTBF rates superior to those of core.

The RAM IC failure rate observed for TI 22-pin RAMs used in the 21MX minicomputer is 0.11 per cent per thousand hours.

Story on Page 7