# A Timer for Synchronous Digital Systems

**There is no discernible jitter in the output clock waveforms.**

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The Real-Time Interferometer Control Systems Testbed (RICST) timing board is a VersaModule Eurocard (VME)-based board that can generate up to 16 simultaneous, phase-locked timing signals at a rate defined by the user. It can also generate all seven VME interrupt requests (IRQs). The RICST timing board is suitable mainly for robotic, aerospace, and real-time applications.

Several circuit boards on the market are capable of generating periodic IRQs. Most are associated with Global Positioning System (GPS) receivers and Inter Range Instrumentation Group (IRIG) time-code generators, whereas this board uses either an internal VME clock or an externally generated clock signal to synchronize multiple components of the system. The primary advantage of this board is that there is no dis-

cernible jitter in the output clock waveforms because the signals are divided down from a high-frequency clock signal instead of being phase-locked from a lower frequency. The primary disadvantage to this board, relative to other periodic-IRQ-generating boards, is that it is more difficult to synchronize the system to wall clock time.

Real-time systems have traditionally utilized timers available on central-processing-unit (CPU) boards to generate IRQs. The RICST timing board combines that functionality with the ability to use the same signals to synchronize other parts of the system in which it is installed.

The RICST System Timing Board (see figure) includes 16 programmable digital output channels, seven of which can also be enabled to drive VME IRQ

lines 1 through 7. The signals in all 16 output channels are differential transistor/transistor-logic (TTL)-level square waves, at frequencies defined by the user, that are coupled out via ribbon-cable connectors mounted on a front panel. Optional hardware can be added to the board, so that six of the channels can generate analog outputs in addition to the standard digital outputs (e.g., sine waves instead of square waves). Most of the functions of the board are performed by a programmable logic device, with additional circuitry for controlling the VMEbus interface and output signals.

*This work was done by Elizabeth McKenney and Philip Irwin of Caltech for* **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*
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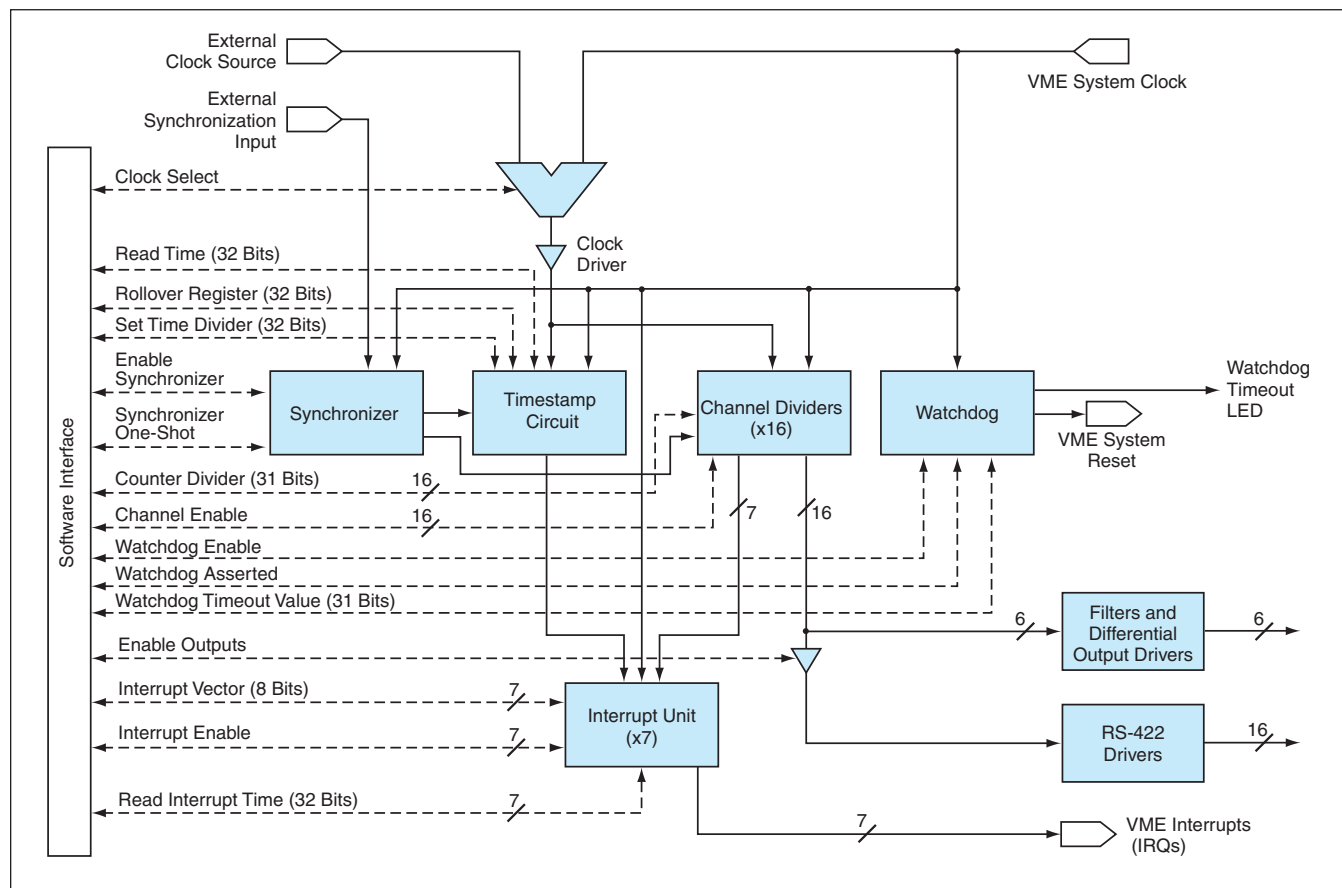


The **RICST Timing Board** generates clock signals and interrupt requests (IRQs). Optionally, it can be equipped to generate six analog outputs.