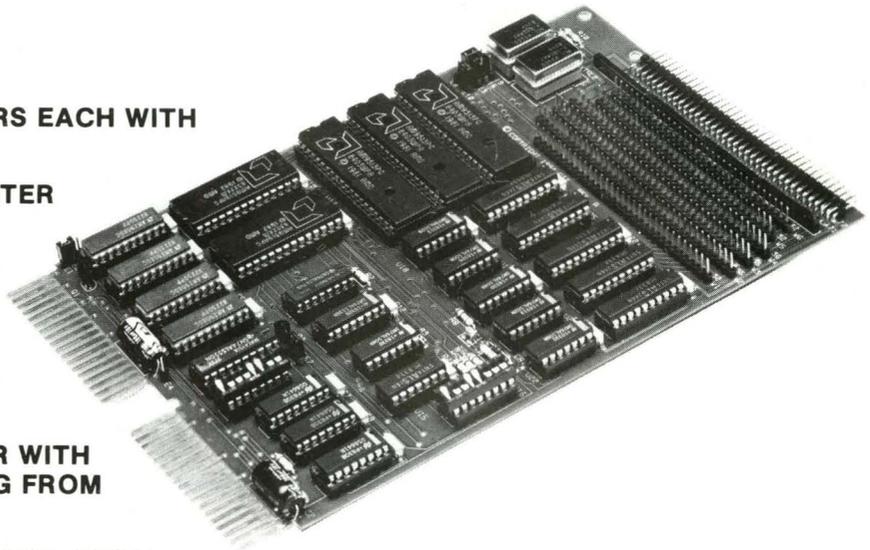


## MODEL 140 FEATURES

- FIFTEEN 16-BIT COUNTER/TIMERS EACH WITH SOURCE & GATE INPUTS
- 19 DIFFERENT MODES OF COUNTER OPERATION
- 16 PROGRAMMABLE/MASKABLE INTERRUPTS
- PROVIDES LTC & WATCHDOG TIMER FUNCTIONS
- 4.000 MHz CRYSTAL OSCILLATOR WITH PRE-SCALER - PROVIDES TIMING FROM MICRO SECONDS THRU YEARS
- SUPPORTS 11/02, 11/21, 11/21+, 11/23, 11/23+, 11/73, MICRO VAX I, & 68000 Q-BUS SYSTEMS



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## GENERAL

The Model 140 M-Timer provides fifteen independent 16-bit programmable counter/timers on a dual-wide LSI-11 module. Each counter can be software programmed to function in one of 19 different modes with programmable interrupts for each counter. The M-Timer provides a substantial increase in capability and density compared to the DEC KVV11 single 16-bit timer module at a much lower cost per timer.

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## TECHNICAL DESCRIPTION

The Model 140 used three Advanced Micro Devices Am9513A Timing Controllers and two Am9519A Interrupt Controller circuits. Each Am9513A contains five 16-bit counters, each of which may be driven from either an external source, an internal programmable pre-scaler driven by an on-board 4.000 MHz oscillator, or the preceding 16-bit counter. Each counter output is connected to an interrupt request line of an Am9519A so that any counter can generate an interrupt at a different (software programmable) vector address. The interrupts are software maskable and use either a fixed or rotating priority scheme. The sixteenth interrupt request line may be jumpered to the I/O connector for general use.

Each counter has a gate input which may be used to inhibit counting or to control the count modulus. Counters 1 and 2 of each Am9513A may also be operated in a time-of-day mode and set to generate an interrupt at a particular time. The counters may be operated in BCD or binary mode, programmed to count up or count down, or concatenated in groups of five counters up to 80 bits—all under software control.

A counter may be set to count once and stop, count twice and stop, or to count continuously. It may ignore the gate input, or count on active gate only, or start counting after it receives an active gate edge and then ignore the gate input. It may reload from the Load register when the gate is low and from the Hold register when the gate is high.

Various combinations of these options provide 19 distinct counting modes that may be software programmed. Using these 19 counting modes, one can generate pulse trains of arbitrary frequency and duty cycle, hardware or software triggered one-shot pulses, and even frequency-shift keying modes. A counter can be jumpered to drive the BEVNTL line for system clock functions, or to drive the BDCOKH line for use as a watchdog timer.

## INPUT/OUTPUT CONFIGURATIONS

Because of the large number of possible counter I/O configurations, internal connections of the 72 pin I/O connector, 36 buffers and 32 line terminators are made by using wire wrap. This allows you to quickly customize the M-Timer for your specific application. If desired, the socketed I/O buffers can be replaced with different logic devices providing even greater flexibility. The I/O connector (36 signals, 36 grounds) allows the use of multiple connectors of varying size to simplify cabling.

## TECHNICAL SUPPORT

The supplied manual provides detailed programming and applications information on the M-Timer and the integral counter I.C's. Complete documented source code is included for both an M-Timer diagnostic and a software development aid which prints the contents of all M-Timer counters and interrupt registers. These routines are optionally available on floppy disk or tape. Due to the density and technical sophistication of the M-Timer, it is not software compatible with the KWV11.

## APPLICATIONS

The M-Timer is the perfect solution for multiple A/D control, industrial systems, medical electronics, robotics and nuclear instrumentation. The M-Timer is available with 15 counters and 16 interrupts; 10 counters and 16 interrupts; or 5 counters and 8 interrupts.

## WARRANTY

Each M-Timer undergoes 96 hours of power and temperatures cycling followed by diagnostic testing using LSI 11/73's. This insures an extremely reliable product which, in turn, is backed with a one-year warranty.

## TECHNICAL SPECIFICATIONS

Compatibility:	All LSI-11 processors; 16, 18, or 22 bits
Module Size:	5.2" x 8.9" dual-wide Q-Bus
Operating Power:	+5V $\pm$ 5%, 1.5 Amp
Operating Temperature:	0° C to 50° C
Relative Humidity:	5 to 95% noncondensing
Vector Addresses:	16, independently software programmable 000-776
Interrupt Level:	Selectable as 4, 5, 6, or 7
Counters:	15 16-bit counters, may be internally concatenated
Max Counter Frequency:	6.89 MHz
Internal Oscillators:	#1 - crystal controlled, 4.000 MHz $\pm$ 0.01% #2 - optional, customer specified frequency
I/O Connector:	72 pins, accepts ribbon cable connectors
I/O Buffers:	36 available, TTL levels, 74LS244
I/O Terminators:	32 available, 2V at 132 ohms

## STANDARD REGISTER ADDRESS ASSIGNMENTS

REGISTER	I/O ADDRESS	ATTRIBUTE
Interrupt Controllers	770600-770607	Read/Write
Timing Controllers	770610-770623	Read/Write
Reserved Addresses	770624-770637	-----

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Publication No. 130-1400  
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Printed in U.S.A. 8/84

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