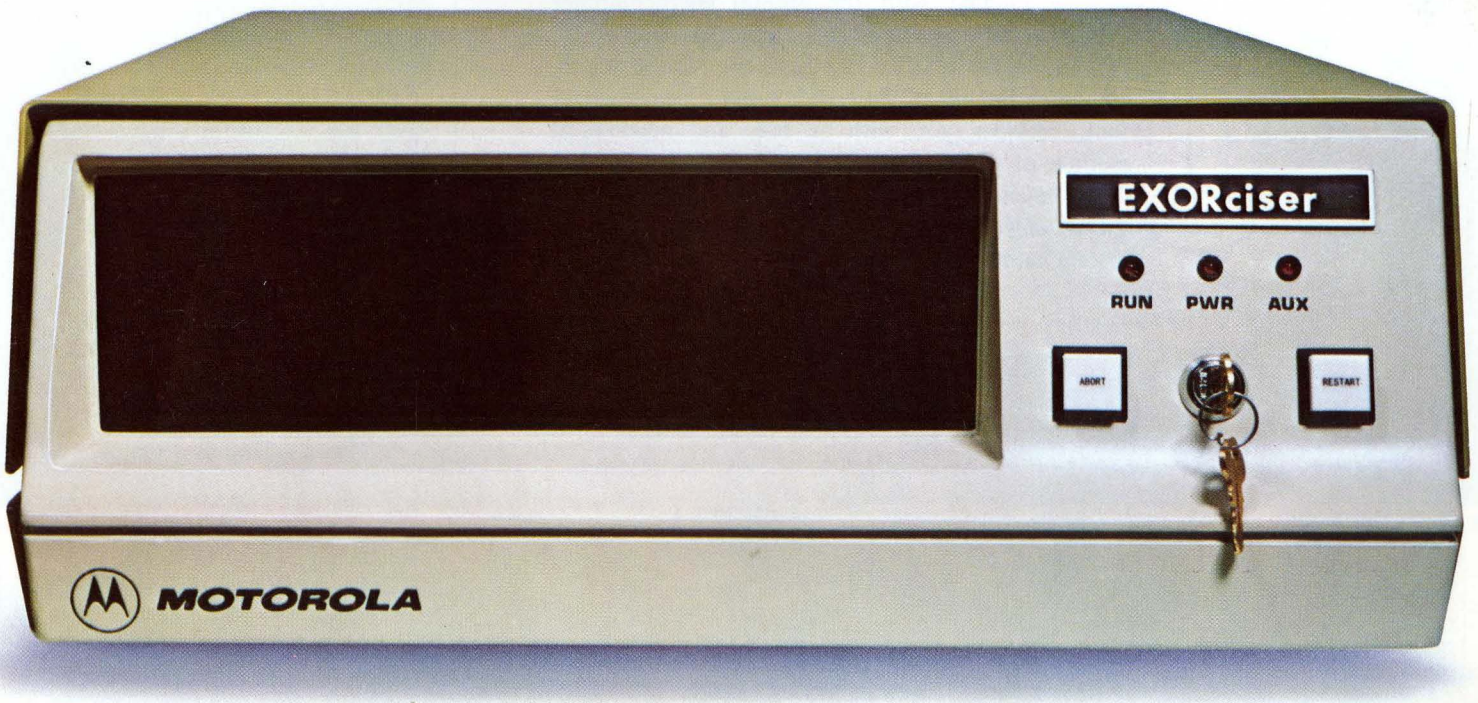
M6800 EXORciser and evaluation module



M6800 APPLICATIONS SUPPORT

When you purchase the M6800 Microcomputer Family of Parts, you are purchasing more than a handful of parts, you are purchasing a total product concept. This total product concept provides you with the Applications Support you require to effectively use the M6800 Microcomputer Family of Parts. The Applications Support assists you in:

- Evaluating the operation of the M6800 Microcomputer Family of Parts in an actual application.
- Reducing the engineering time and development costs required in developing and constructing prototype systems using the M6800 Microcomputer Family of Parts.
- Preparing your system software and firmware programs.
- Reducing the time required to evaluate and debug your system hardware, software, and firmware.
- Providing a working model of your system.

The Applications Support hardware for the M6800 Microcomputer Family of Parts consists of:

- The M6800 Evaluation Module
- The M6800 EXORciser

The M6800 Evaluation Module, incorporating the M6800 Microcomputer Family of Parts on a printed circuit board, permits you to evaluate these parts in a typical configuration. You may run simple programs on this module and interface the module with a peripheral device. This module allows you to use and become familiar with the M6800 Microcomputer Family of Parts' operating characteristics.

The M6800 EXORciser, using the M6800 Microcomputer Family of Parts as a systems development tool, provides you with an easy and economical method of prototyping your system. As a systems development tool, it permits you to construct a prototype of your hardware design and to evaluate your system hardware design and system programs.

M6800 MICROCOMPUTER SYSTEMS DEVELOPMENT

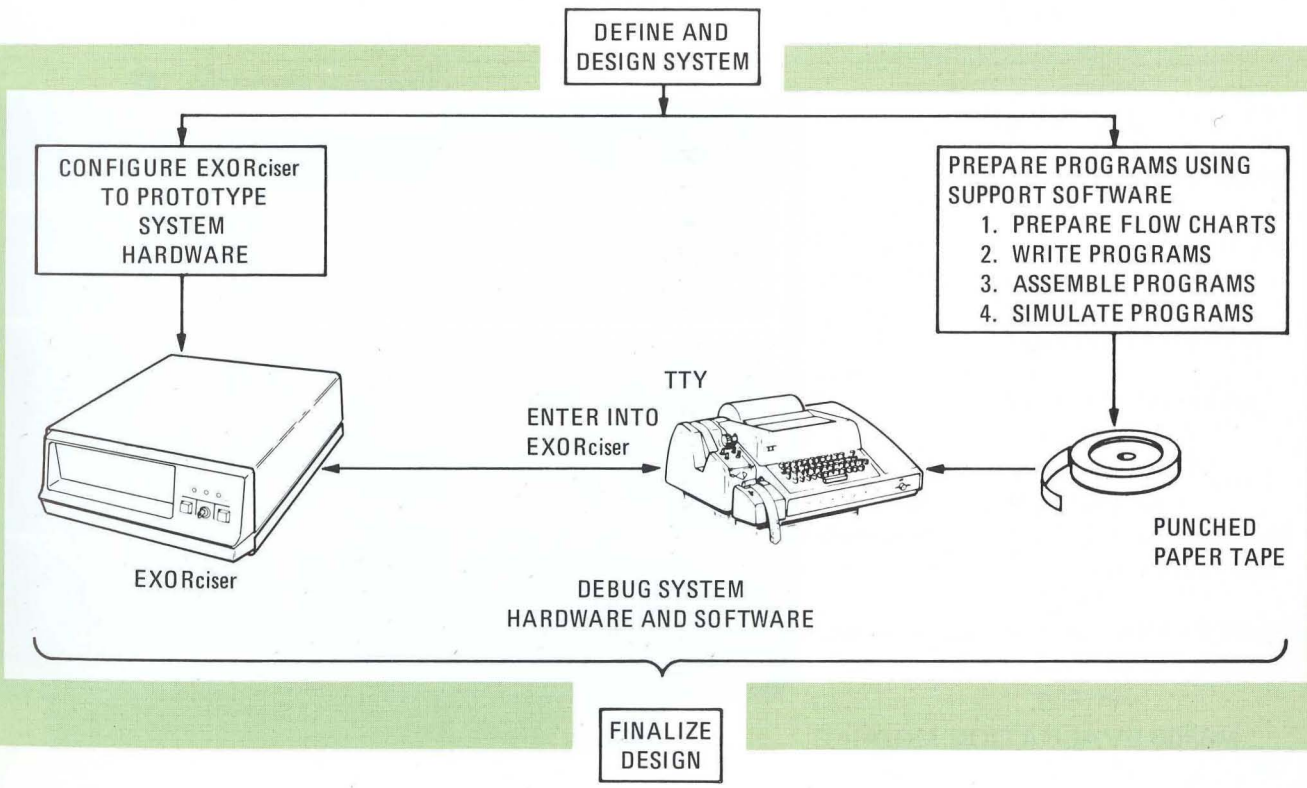
The M6800 EXORciser including the M6800 Support Software provides you with an efficient and economical means to develop a M6800 Microcomputer System. The M6800 EXORciser saves you hardware design and development time by your arranging its modules as required to meet your system hardware requirements. This saves you valuable time because you do not have to construct and debug breadboard models of your system.

The M6800 Support Software assists you in developing your microcomputer programs. This Support Software assembles your language and, through its simulation of the microcomputer, allows you to evaluate and debug your programs. You know when you load your applications program tapes into the M6800 EXORciser that you have operational programs.

The M6800 EXORciser now enables you to evaluate your prototype system in its actual working environment. It also permits you to make any hardware and software adjustments required in finalizing your system design.

Benefits...

- Easy to Use
- Saves System Design and Development Time
- Decreases System Design Development Costs
- Builds Confidence in the System



M6800 evaluation module

FEATURES

- *Evaluates M6800 Family of Parts*
- *Illustrates operation under MPU's specified loading characteristics*
- *Variable frequency clock*
- *Dual 8-bit input/output port for peripheral interfacing*
- *MIKBUG Program permits communication between Evaluation Module and user's terminal.*

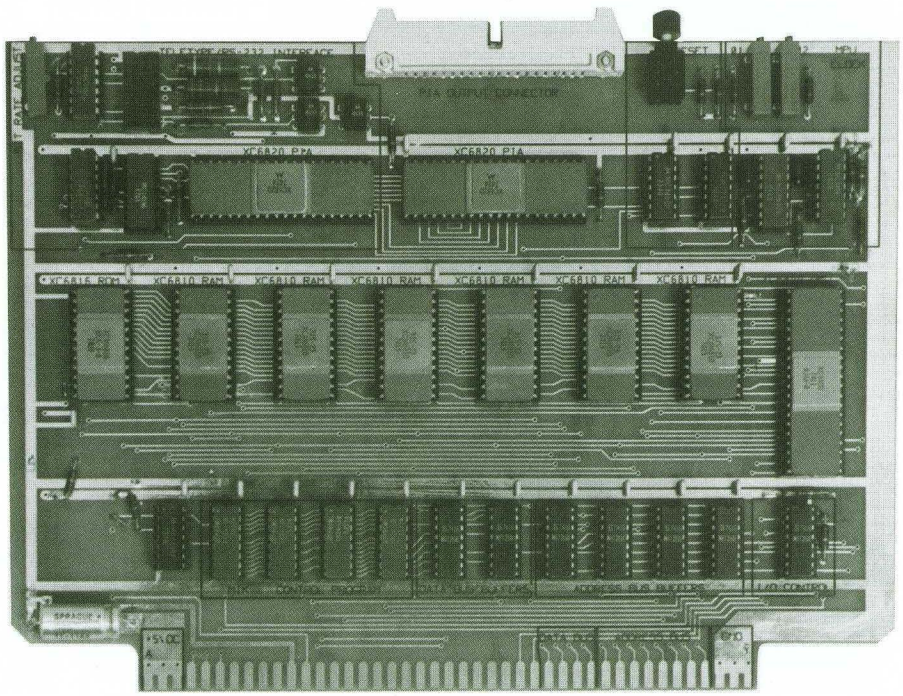
DESCRIPTION

The M6800 EVALUATION MODULE provides a quick and easy off-the-shelf means to evaluate the operating characteristics of the M6800 Microcomputer Family of Parts. Its pre-engineered hardware and software permits the user direct interfacing with the module.

This module consists of:

- One MC6800 Microprocessing Unit (MPU)
- Six MCM6810 128 x 8-bit Random Access Memories (RAM)
- One MCM6830 1024 x 8-bit Read Only Memory (ROM)
- Two MC6820 Peripheral Interface Adapters (PIA)
- Data and address buffers

The module's design shows the M6800 Family operating under the loading characteristics of 130 pF and one low power TTL load in an actual application.



The variable master clock permits evaluation of the M6800 Microcomputer Family of Parts performance at clock frequencies from 100 kHz to 1 MHz. The Evaluation Module at 1 MHz is within the MPU's specified maximum loading characteristics. The address and data buffers allow for additional circuits to be incorporated into the system and operated at 1 MHz. Lower clock frequencies permit connection of extra circuits directly to the MPU bus without additional buffering.

The Evaluation Module interfaces directly with either a TTY (20 mA current loop) or a EIA RS-232C compatible terminal. This terminal provides direct communication with the module's MIKBUG Program. This MIKBUG Program is stored in the Module's Read Only Memory and, in conjunction with the terminal, provides the following functions.

- Load data into the Evaluation Module's random access memory.
- Display and, if required, change the data in the module's random access memory.
- Print out or punch on tape the data stored in the module's memories.
- Display and, if required, change the contents in the MPU registers.
- Run the user's program.

The Evaluation Module also has the capability of interfacing with a peripheral device through the MC6820 PIA dual 8-bit input/output port. This permits interfacing the Evaluation Module with keyboards, basic printers, displays and similar peripheral devices. The interface provides the evaluation of the M6800 Microcomputer Family of Parts in an actual systems application.

The M6800 Evaluation Module includes:

- One MEC6800(A) Evaluation Module including one MC6800 MPU, six MCM6810 RAMs, one MCM6830 ROM (or four PROMs), two MC6820 PIAs, Address and Data Bus Buffers, Variable Master Clock, System Reset, and TTY/RS-232C Interface.
- One 86-Pin Printed Circuit Board Connector
- One 10 ft. TTY/RS-232C 16-Pin Flatribbon Cable including RS-232C and TTY Connectors.
- One 3 ft. PIA Conductor Flatribbon Cable including additional connector for peripheral interface.
- One M6800 Evaluation Module User's Guide

SPECIFICATIONS

Power Requirements:	+5 VDC @ 2A +12 VDC @ 250 mA -12 VDC @ 250 mA
Clock Frequency:	100 kHz to 1 MHz (adjustable)
Signal Characteristics:	
Connector P1	
Address Bus	Three-state TTL voltage compatible
Data Bus	
Input	TTL voltage compatible
Output	Three-state TTL voltage compatible
Input and Output Control Lines	TTL voltage compatible

MC6820 Peripheral Interface Adapter Connector P2	
Data Signals	
PA0-PA7 Input/Output lines	TTL voltage compatible
PB0-PB7 Input/Output lines	Three-state TTL voltage compatible
Control Signals	
CA1, CA2, and CB1	TTL voltage compatible
CB2	Three-state TTL voltage compatible
Terminal Interface Specification Connector P3	
Data transfer rate	110 or 300 Baud
Signal characteristics	TTY (20 mA current loop) or EIA RS-232C compatible
Reader control signal	Control signal for TTY devices modified for external control

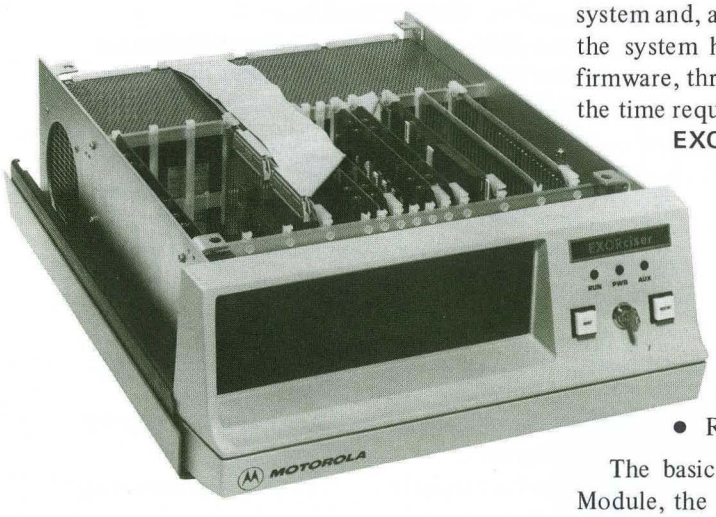
EXORciser

FEATURES

- *Modularity allows exact duplication of final system function and performance*
- *Expandability allows duplication of final system capacity*
- *Teletypewriter connects to EXORciser permitting development of software and firmware programs*
- *Evaluates and debugs final system software/firmware*
- *Module's firmware performs tests and diagnostics on production systems*

DESCRIPTION

The M6800 EXORciser is an efficient, and economical off-the-shelf system development tool for the M6800 Microcomputer Family of Parts and may be easily tailored to meet the user's need in the design and development of his system. Its pre-engineered and pre-tested modular design reduces the time required to develop a system and, at the same time, provides great flexibility in configuring the system hardware for his application. The EXORciser's EXbug firmware, through its debug and program control features, minimizes the time required to develop users' programs.



EXORciser FUNCTIONS

- Display the contents of the MC6800 MPU Registers
- Step through user's programs
- Dynamically trace through user's program
- Stop the user's program on a selected memory address
- Trigger an oscilloscope on a selected memory address
- Abort from the user's program at any time
- Reinitialize the system at any time

The basic EXORciser consists of the MPU Module, the DEBUG Module, the Baud Rate Module, the Power Supply, and the chassis. These modules are built around the M6800 Microcomputer Family of Parts (MC6800 Microprocessing Unit, MC6820 Peripheral Interface Adapter, MCM6810 Random Access Memory, and MCM6830 Read Only Memory devices). Optional off-the-shelf memory, input/output, universal wirewrap, and extender modules are also available allowing the user to configure the EXORciser to meet his particular system needs.

The user communicates with the EXORciser in one of two ways:

- Through a RS-232C or TTY terminal
- Through the EXORciser front panel controls and indicators.

The MPU Module incorporates the M6800 Microprocessing Unit and the system timing. The system timing controls the EXORciser's timing. The M6800 Microprocessing Unit is an 8-bit parallel device capable of addressing 65 K bytes of memory. In addition, the MPU addresses its input and output devices as memory. The MPU also provides the EXORciser with 72 variable length instructions and the capability of responding to real time interrupt signals.

The DEBUG Module provides the EXORciser with its capability to evaluate and debug your program. The ROM memory on this module contains the EXbug firmware that provides the EXORciser with its unique control features. This module also has a RAM memory to provide scratch-pad memory to the EXbug program.

EXBUG FUNCTIONS

- Load data into the EXORciser
- Verify that the data in the EXORciser is valid
- Search a tape for a specific file
- Print the contents of the memory
- Punch the contents of the memory on tape
- Perform the MAID (Motorola Active Interface DEBUG) functions.

MAID FUNCTIONS

- Examine and, if required, change the data in a memory location
- Examine and, if required, change the data in an MPU register
- Calculate the offset in the relative addressing mode
- Insert, display, and remove breakpoints in the user's program
- Freerun or trace user's program under MAID control
- Search memory for a bit pattern
- Perform decimal-octal-hexadecimal conversions.

The Baud Rate Module provides the EXORciser with eight standard selectable baud rates between 110 and 9600. This module also interfaces the EXORciser with a TTY or RS-232C compatible terminal and provides a reader control signal for a modified TTY terminal.

OPTIONS

The EXORciser derives its flexibility from its optional modules and hardware. These optional assemblies permit the user to adapt his EXORciser to various system configurations. The user, through his selection of these assemblies, selects the memory size and input/output requirements to meet his system's needs. These optional assemblies include.

- The 2 K static RAM Module
- The Input/Output Module
- The Universal Wirewrap Module
- The Extender Module
- The Flatribbon Interconnect Cable
- The Rack Mounting Kit

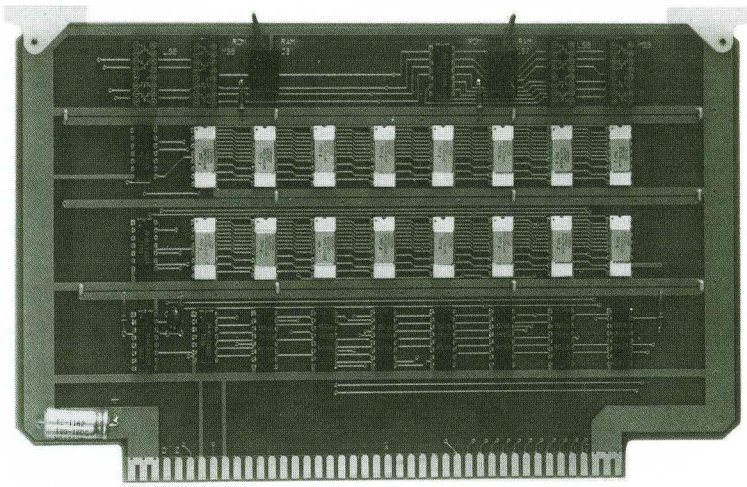
EXORciser SPECIFICATIONS

Power Requirements:	120/240 ± 10% VAC 50/60 Hz, 300 W
Word Size:	
Data	8 bits
Address	16 bits
Instructions	8, 16, or 24 bits
Memory Size:	65 k bytes max.
Instruction Set:	72 variable length instructions
Interrupt:	Maskable real time interrupt
Physical Characteristics:	
Tabletop	
Length	19.25 in
Depth	17.50 in
Height	7.00 in
Rack Mountable	
Length	19.00 in
Width	17.00 in
Height	7.00 in

2 K STATIC RAM MODULE

FEATURES

- *TTL voltage compatible*
- *2048 x 8 bits of static MOS memory in 1 k byte arrays*
- *Switch selectable base location address for each RAM array*
- *500 nanosecond memory access time*
- *Switch selectable RAM/ROM (inhibited memory write function) for each array*



SPECIFICATIONS

Type Memory	MOS static RAM
Memory Organization	2048 X 8 bit organized into two 1024 X 8 arrays
Clock Rate	1 MH_Z max
Input Signals	TTL voltage compatible
Output Signals	Three-state TTL voltage compatible
Dimensions:	
Length	9.75 in
Height:	5.75 in
Thickness	0.50 in
Power Requirements	5VDC @ 850 mA

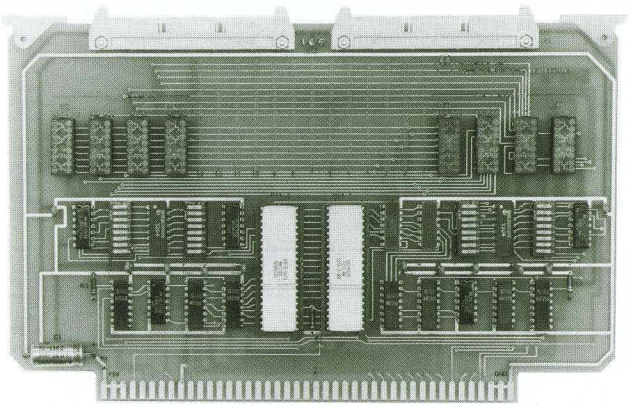
DESCRIPTION

The 2 K Static RAM Module, consisting of 16 MOS n-channel memory circuits, provides the EXORciser with 2048 x 8 bits of random access memory. This memory is organized into two separate 1024 byte memory arrays. The bus driver/receivers and the address selection switches interface the 2 K Static RAM Module to the EXORciser bus. The address selection switches enable the user to select the base location address for each memory array in 1 k byte increments (i.e. 0000, 1024, 2048, etc.). The RAM/ROM switch for each memory array enables the user to use the block as RAM memory or ROM memory (inhibiting the memory write function).

INPUT/ OUTPUT MODULE

FEATURES

- *Four 8-bit input/output ports for peripheral interfacing*
- *Eight individually controlled interrupt lines — four of which may be used as peripheral control lines*
- *TTL voltage compatible inputs and outputs*
- *Switch selectable base location address for each of the two MC6820 Peripheral Interface Adapter devices*
- *Program controlled maskable interrupt capability*
- *Each MC6820 Peripheral Interface Adapter addressed as memory*
- *Wirewrap sockets on module for constructing custom interface circuits*



SPECIFICATIONS

Power Requirements: +5VDC @ 2A
+12VDC @ 250 mA max
-12VDC @ 250 mA max

Peripheral Interface Adapter data signals:

PA0-PA7 input/output lines
TTL voltage compatible

PB0-PB7 input/output lines
Three-state TTL voltage compatible

CA1, CA2, and CB1 control signals
TTL voltage compatible

CB2 control signal
Three-state TTL voltage compatible

Physical Characteristics:

Length	9.75 in
Height	5.75 in
Thickness	0.50 in

DESCRIPTION

The Input/Output Module provides the EXORciser with a flexible means of interfacing with the user's defined process or peripheral device. The module provides the user the option of interfacing directly with the module's two MC6820 Peripheral Interface Adapters (PIA) or of constructing customized interface circuits. The PIA input/output lines are TTL voltage compatible. Space for 12 wirewrap sockets on the module permit the user to construct interface circuitry to meet his specific interfacing needs between the PIA and his peripheral device. The MC6800 Microprocessor addresses each PIA as if it were memory. Switches on the Input/Output Module enable the user to select the base memory address for each PIA.

universal wirewrap module

FEATURES

- *Standard size EXORciser plug-in module*
- *Permits user to build and incorporate his custom circuits into a system*
- *Standard pin spacing*
- *Power and ground buses*

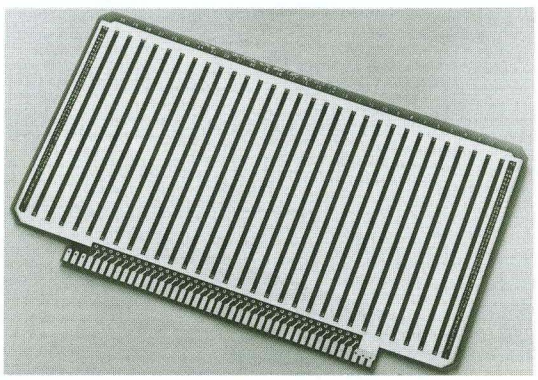
DESCRIPTION

The Universal Wirewrap Module permits the user to construct and incorporate his custom circuits into a M6800 Microcomputer System. This module is the standard size EXORciser plug-in module. The power bus printed wiring is incorporated on the module.

SPECIFICATIONS

Physical Characteristics:

Length	9.75 in
Height	5.75 in
Thickness	0.50 in



extender module

FEATURES

- *Extends any EXORciser plug-in module for testing, troubleshooting, and debugging*
- *Interfaces with all EXORciser plug-in modules*
- *Provides test points to all bus leads*

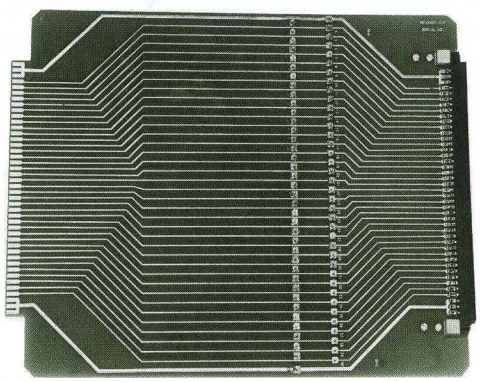
DESCRIPTION

The Extender Module enables you to extend any EXORciser plug-in module for servicing, testing, troubleshooting, and debugging.

SPECIFICATIONS

Physical Characteristics:

Length	9.75 in
Height	12.00 in
Thickness	0.50 in



M6800 SUPPORT SOFTWARE

Motorola has developed comprehensive support software to ease your tasks in generating applications programs for the M6800 Microcomputer Family. The software packages are written in Fortran IV and are available on the General Electric Information Services International Network. The software packages include:

M6800 CROSS ASSEMBLER (MPCASM)

The cross assembler effectively converts the assembly language mnemonic statements and symbolic statements into an object program consisting of machine language instructions for the MC6800 Microprocessing Unit. The assembler also produces an assembly listing and a simulator control file.

M6800 INTERACTIVE SIMULATOR (MPSSIM)

The interactive simulator precisely duplicates the MPU functions and calculates the timing of the M6800 Microcomputer Family. The user has total interactive control over the simulator to execute, alter, and re-execute his application.

BUILD-VIRTUAL-MACHINE (MPBVM)

The build-virtual-machine program permits the structuring of a "virtual-machine" that duplicates the configuration of an actual programmable system. This enables the user to ensure that his programs fit the limits of the memory for the real system.

HELP (HELP)

HELP is a program and a system of files that provide assistance to the engineer or programmer on the use of the software and the hardware. Also provides up-to-date information on improvements and new developments to the M6800 Microcomputer Family of components and software.

Circuit diagrams external to Motorola products are included as a means of illustrating typical semiconductor applications; consequently, complete information sufficient for construction purposes is not necessarily given. The information in this book has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies. Furthermore, such information does not convey to the purchaser of the semiconductor devices described any license under the patent rights of Motorola, Inc. or others. Motorola reserves the right to change specifications without notice.

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Hsietsu Building, Room 604
47 Chung Shan North Road, Sec. 3 510707, 510708, 579832

MOTOROLA Semiconductor Products Inc.
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