Notes on machine performance

The pitfalls in trying to establish the real performance ability of the machine were discussed earlier. Some effort has been expended in trying to establish some performance benchmarks, and typical examples are shown as follows:

Example 1   Addition of two 8-bit numbers

Case   I: Register-to-register within the confines of the chip: 20 microsecond minimum

Case II: Numbers are located in memory (external to chip); sum to be stored back in memory: 200 microsecond minimum

Example 2   Servicing of "interrupt" through the M7346, External Event Detection Module

Time to set to Restart location: 20 μs min, 64 μs max.

Example 3   UART operation

A read and store data until detection of null condition was chosen as a typical UART operation. Time to read each character is approximately 270 μs; time to terminate operation after null detection is approximately 175 μs.

Example 4   Detection of external events through the 8-bit data port

104 μs min (highest priority)
528 μs max (lowest priority)

This refers only to the overhead time for servicing. The time for operations resulting from any external event is not included.

New Dimensions for Modules

A new dimension has been added for logic modules--that of software. However modest the processing capabilities of the Processor Module may be, it can still be recognized as being in the classic Von Neumann category and requires a set of machine instructions to operate.

SOFTWARE/PROGRAMMING

The Intel 8008-1 processor chip on the PM uses a set of 48 data-oriented instructions which may be divided into the following subsets:

    Index Register Instructions (7)
    Accumulator Group Instructions (28)
    Program Counter & Stack Control Instructions (10)
    Input/Output Instructions (2)
    Machine Instructions (2)

Module Language Assembler (MLA)

. Translates symbolic programs to their paper tape punch-out binary codes, together with an optional printout listing on Teletype or paper tape punch, with error messages, if any.

. Operating instructions and output format closely resemble the PAL Assembler for the PDP-8.

. The binary output format is identical to the PDP-11 ABSLDR.

Editor Program

The Editor Program is the standard PDP-8 PAL Editor

Loader Program

The Loader Program will reside in the M7342 Monitor/Control Module ROM. The program will be used to load the binary tape output of the Assembly Program in the PM memory.

Operating Environment

The recommended minimum operating environment is 4K PDP-8, Teletype, and paper tape reader/punch.

DIAGNOSTIC PROGRAMS

1. Processor Module Diagnostic
2. **PROM Diagnostic**
3. **RAM Diagnostic**

Processor Module Diagnostic

- Comprehensive test of processing and I/O functions, including UART, on the Programmable Module

- Errors reported by error halts

- Use of M7342 Monitor and Control Module required

PROM Diagnostic

- Use of M7341 (PM) and M7342 (MCM) required

- PROM data is written into the M7342 RAM scratch pad

- Program reads and verifies PROM checksum

RAM Diagnostic

- Use of M7341 (PM) and M7342 (MCM) required

- Worst-case data patterns are written into RAM under test

- Error conditions are indicated by error halts

DOCUMENTATION AND SUPPORT

The primary support documentation will consist at least of the following:

1. User Reference Manual
2. Module Data Sheets
3. Comprehensive Descriptive Brochure
4. Logic Schematics

User Reference Manual

This manual will be divided into two major sections--Hardware Section and Software Section.

Hardware Section

This will comprise the following subjects:

- Introduction
- Operating Characteristics
- Functional Description
- Programming Considerations
- Applications Analysis

Software Section

This will comprise the following subjects:

- PDP-8 Host Operating Environment
- PDP-8 Paper Tape Symbolic Editor
- LSI-M Series Module Language Assembler
- Loader
- Programming Techniques
- Appendices

    - Summary of Editor Commands
    - Summary of Assembler Instructions and Pseudo Instructions
    - ASCII Character Set
    - Hexadecimal Character Set
    - Post-Processor
    - Application Analysis

Data Sheets

An individual data sheet will be available for each module in the set, giving the key characteristics of the module in sufficient detail to allow a potential user to determine whether the equipment meets his application requirements.

Product Brochure

A brochure offering a brief overview of the entire MPS10 including hardware and software.