

TEXAS INSTRUMENTS



TM 990

Microcomputer Handbook



MICROPROCESSOR SERIES™

July 1979

IMPORTANT NOTICE

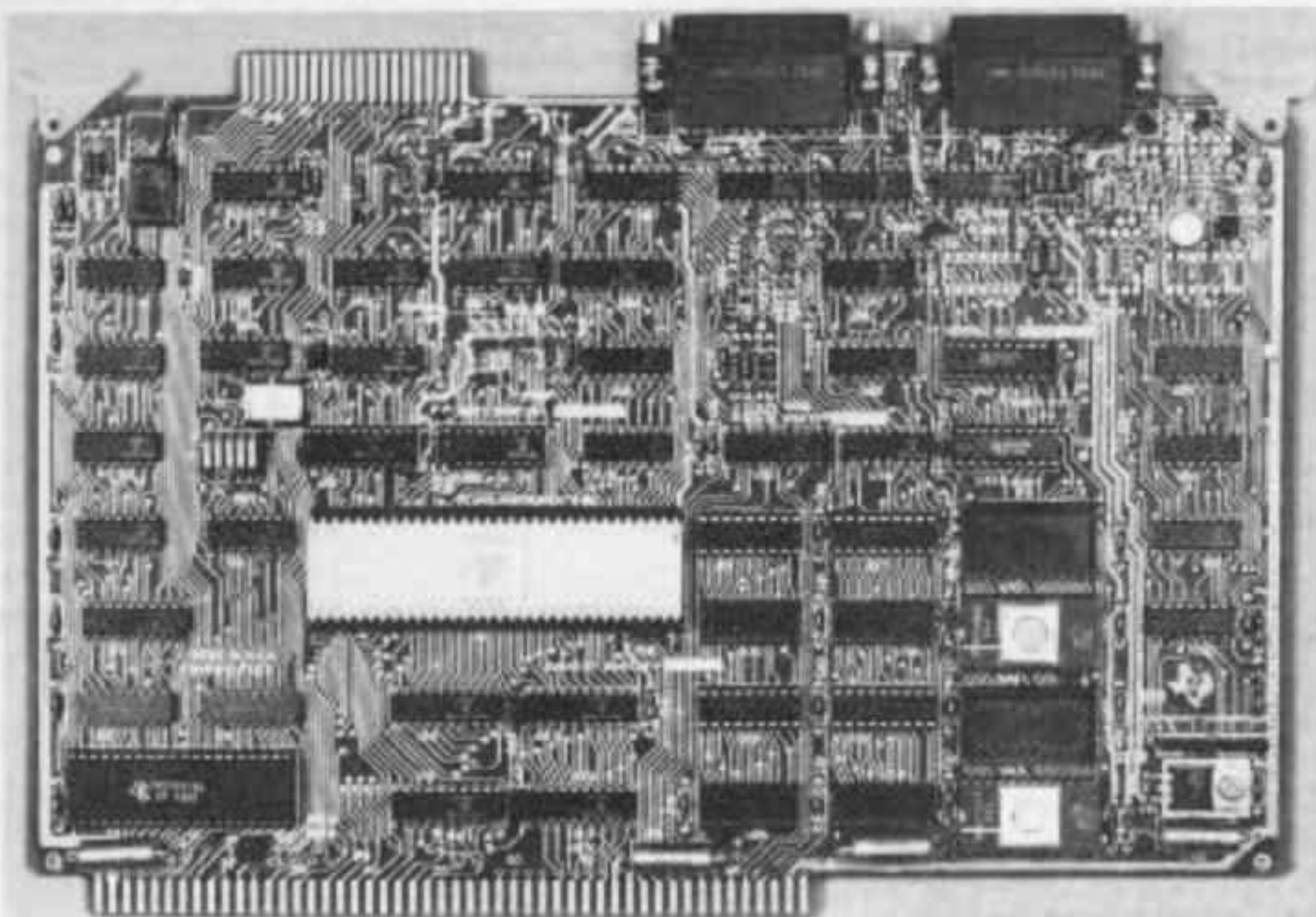
Texas Instruments reserves the right to make changes at any time to improve design and to supply the best possible product for the spectrum of users. Information contained in this publication is believed to be accurate and reliable. However, responsibility is assumed neither for its use nor for any infringement of patents or rights of others that may result from their use. No license is granted by implication or otherwise under any patent or patent right of Texas Instruments or others.

Copyright, Texas Instruments Incorporated, 1979

Dale R. Gibble, Editor

1.	INTRODUCTION.....	1-1
1.1	General.....	1-1
2.	CPU MODULES (100 Series Modules).....	2-1
2.1	General.....	2-1
2.2	TIBUG Operating Monitor.....	2-1
2.3	Prototyping Area.....	2-2
2.4	Summary of Key Parameters.....	2-2
2.5	CPU Module Data Sheets.....	2-4
2.5.1	TM 990/100M Microcomputer Module.....	2-5
2.5.2	TM 990/101M Microcomputer Module.....	2-10
2.5.3	TM 990/180M Microcomputer Module.....	2-17
2.5.4	TM 990/189 University Board.....	2-22
2.6	CPU Compatibility.....	2-27
3.	MEMORY EXPANSION MODULES (200 Series).....	3-1
3.1	General.....	3-1
3.2	Summary of Key Parameters.....	3-1
3.3	Memory Expansion Module Data Sheets.....	3-2
3.3.1	TM 990/201 Memory Expansion Board.....	3-3
3.3.2	TM 990/206 Memory Expansion Board.....	3-9
3.3.3	TM 990/203 Memory Expansion Board.....	3-14
4.	PERIPHERALS AND INPUT/OUTPUT INTERFACES (300 Series).....	4-1
4.1	General.....	4-1
4.2	Peripherals.....	4-1
4.3	Input/Output Expansion Modules.....	4-1
4.3.1	TM 990/310 Applications.....	4-1
4.4	Peripherals and Input/Output Interface Module Data Sheets.....	4-3
4.4.1	TM 990/301 Microterminal.....	4-4
4.4.2	TM 990/305 Combination Memory and I/O Expansion Module.....	4-7
4.4.3	TM 990/310 I/O Expansion Module.....	4-11
4.4.4	Analog Devices Analog I/O Subsystems.....	4-15
4.4.5	Analogic Analog I/O Subsystems.....	4-22
4.4.6	TM 990/5MT Industrial I/O System.....	4-27
5.	SOFTWARE (400 Series).....	5-1
5.1	General.....	5-1
5.2	TIBUG Monitor.....	5-1
5.3	Line-By-Line Assembler.....	5-1
5.4	BASIC.....	5-1
5.4.1	Evaluation POWER BASIC.....	5-3
5.4.2	Development POWER BASIC.....	5-3
5.4.3	Configurable POWER BASIC.....	5-3
5.4.4	POWER BASIC Statements.....	5-4
5.4.5	POWER BASIC Commands.....	5-7
5.4.6	Edit Mode Commands.....	5-9
5.4.7	POWER BASIC Functions.....	5-10
5.5	Pascal.....	5-10
5.6	Executive Support.....	5-13
5.6.1	TIPMX.....	5-13
5.6.1.1	TIPMX Features/Benefits.....	5-13
5.6.1.2	Packaging and Release Media.....	5-14
5.6.2	TIMBER.....	5-14
5.7	Cross-Support.....	5-15

2.5.2 TM 990/101M MICROCOMPUTER MODULE



The TM 990/101M is an assembled, tested microcomputer module utilizing the powerful, NMOS 16-bit, TMS 9900 microprocessor as its CPU. With RAM and ROM/EPROM included on board as well as programmable serial and parallel I/O, the TM 990/101M is a powerful single-board microcomputer. Since all address, data, and control lines are brought to the board connectors, the board can be expanded to use the entire capabilities of the TMS 9900 in larger systems. Figure 2-5 is a system block diagram of the TM 990/101M.

FEATURES

- TMS 9900 16-bit CPU
- 2K bytes of TMS 4045 (2114) Static RAM, expandable to 4K bytes
- 2K bytes of ROM, expandable to 8K bytes of ROM or EPROM
- TMS 9901 programmable system interface with up to 16 programmable I/O lines
- Two TMS 9902 asynchronous communications controllers
- EIA or TTY terminal interface option
- Supports communication with 103 and 202 series modems using optional cable
- Fully expandable bus structure & DMA to on-board memory
- Designed to fit the TM 990/510 and TM 990/520 card cage
- TIBUG operating monitor