

MICROPROCESSOR APPLICATIONS MANUAL



MOTOROLA

Semiconductor Products Inc.



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PREFACE

General purpose Microprocessing Units (MPUs), architecturally descended from the minicomputer and implemented as integrated circuit semiconductor products, are an exciting reality for today's electronics business. The current availability of several general purpose MPUs in production quantities (and the accompanying competitive prices) have generated widespread interest among potential users. The electronics industry trade press (magazines, newspapers, etc.) has responded with enthusiasm and there has been a flurry of editorials and articles covering the subject. The media has given extensive coverage to market potential, comparative descriptions of the various devices available, and, to a lesser extent, "how to use them" articles. In the applications area, they are hampered by two considerations: (1) their format requires that they concisely present only the salient features without burying their readers in a mountain of detail; (2) much of the interesting work is proprietary in nature and, thus, cannot be publicized.

The semiconductor manufacturers have also added to the information gap by taking a "business as usual" attitude toward their new products; in many cases, they have been slow to realize that they are now providing a significant subsystem and must provide more information than their classical data sheets and application notes.

This book was written in the attempt to partially close this information gap by providing detailed applications information for a representative general purpose microprocessing unit. If it is assumed, as it was here, that the reader is not necessarily familiar with MPUs, the description of even a simple system is burdened by a considerable body of information concerning the MPU itself. In addition to the system considerations, such topics as architecture, instruction set, addressing modes, interrupt structure, etc., must be covered. For this reason, only the Motorola MC6800 and its family of associated parts are dealt with here. However, the system design considerations and hardware/software discussions are generally applicable to designs based on other MPUs.

The book's primary audience was intended to be practicing system/circuit designers with some previous experience in developing electronic equipment using bipolar digital integrated circuits. While no particular computer/MPU experience is assumed, a basic understanding of classical computer architecture and some experience with assembly language programming will be of value. An attempt was made to treat each topic in sufficient detail to be useful to a general technical audience.

Chapter 1 describes the architecture of the M6800 system and provides a brief description of the elements required for a rational microcomputer system. In addition, the addressing modes and instruction set of the MC6800 MPU are introduced and discussed.

Chapter 2 is a collection of various programming techniques with emphasis on arithmetic operations and peripheral control routines. This chapter introduces a practice that is followed throughout the remainder of the book: Programming examples that are reproduced as assembly listings (computer print-outs from the host computer's terminal) have been "debugged" and can be used as is if they fit the reader's requirements.

Detailed descriptions of the M6800 interrupt structure and Input/Output (I/O) devices used with

TABLE OF CONTENTS

CHAPTER 1

1	Introduction to the MC6800 Microprocessor	1-1
1-1	System Organization	1-1
1-1.1	MC6800 Family Elements	1-3
1-1.1.1	Memory on The Bus	1-3
1-1.1.2	I/O on the Bus	1-5
1-1.2	Typical System Configuration	1-7
1-1.2.1	Memory Allocation	1-7
1-1.2.2	Hardware Requirements	1-7
1-2	Source Statements and Addressing Modes	1-10
1-2.1	Source Statements	1-11
1-2.2	Labels	1-11
1-2.3	Addressing Modes	1-12
1-2.3.1	Inherent (Includes “Accumulator Addressing” Mode)	1-12
1-2.3.2	Immediate Addressing Mode	1-13
1-2.3.3	Direct and Extended Addressing Modes	1-13
1-2.3.4	Relative Addressing Mode	1-14
1-2.3.5	Indexed Addressing Mode	1-16
1-2.3.6	Mode Selection	1-16
1-3	Instruction Set	1-20
1-3.1	Condition Code Register Operations	1-20
1-3.2	Number Systems	1-21
1-3.3	Accumulator and Memory Operations	1-24
1-3.3.1	Arithmetic Operations	1-24
1-3.3.2	Logic Operations	1-26
1-3.3.3	Data Test Operations	1-26
1-3.3.4	Data Handling Operations	1-26
1-3.4	Program Control Operations	1-26
1-3.4.1	Index Register/Stack Pointer Operations	1-26
1-3.4.2	Jump and Branch Operations	1-33

CHAPTER 2

2	Programming Techniques	2-1
2-1	Arithmetic Operation	2-1
2-1.1	Number Systems	2-1
2-1.2	The Condition Code Register	2-2
2-1.3	Overflow	2-2
2-1.4	The Arithmetic Instructions	2-4
2-1.4.1	Use of Arithmetic Instructions	2-4
2-1.5	Addition and Subtraction Routines	2-8

TABLE OF CONTENTS (Continued)

2-1.6	Multiplication	2-12
2-1.7	Division	2-18
2-2	Counting and Delay Measurement/Generation	2-26
2-3	Evaluating Peripheral Control Routines.....	2-30
2-3.1	Service Requests and Programs as Waveforms on a Timing Diagram — Notation Used	2-30
2-3.2	Development of Equations and Inequalities Used to Test Successful System Operation	2-32
2-3.3	Floppy Disk Data Transfer Routine	2-34
2-3.4	Cassette Data Transfer Routine	2-35
2-3.5	Utilization of MPU Processing Time	2-36
2-3.6	Program Model for Two Prioritized Service Requests	2-38
2-3.7	Requirements That Must Be Satisfied When an MPU Services Multiple SR's	2-39
2-3.8	Serial Data Transfer and Dynamic Refresh Processing	2-41
2-3.9	Increasing MPU Processing Efficiency with the Flip-Flop Model for Two “Equal Period SR's”	2-42
2-4	Use of the Index Register	2-44

CHAPTER 3

3	Input/Output Techniques	3-1
3-1	Introduction	3-1
3-2	MC6800 Interrupt Sequences	3-2
3-2.1	Interrupt Request ($\overline{\text{IRQ}}$)	3-2
3-2.2	Non Maskable Interrupt ($\overline{\text{NMI}}$)	3-4
3-2.3	Reset (RES)	3-4
3-2.4	Software Interrupt (SWI)	3-6
3-3	Interrupt Prioritizing	3-7
3-4	Program Controlled Data Transfers	3-8
3-4.1	MC6820 Peripheral Interface Adapter	3-8
3-4.1.1	Input/Output Configuration	3-8
3-4.1.2	Internal Organization	3-9
3-4.1.3	Addressing and Initialization	3-16
3-4.1.4	System Considerations	3-20
3-4.2	MC6850 Asynchronous Communications Interface Adapter	3-21
3-4.2.1	Input/Output Configuration	3-21
3-4.2.2	Internal Organization	3-22
3-4.2.3	Addressing and Initialization	3-25
3-4.2.4	System Considerations	3-26
3-4.3	MC6860 Low Speed Modem	3-28

TABLE OF CONTENTS (Continued)

3-4.3.1	Input/Output Configuration	3-29
3-4.3.2	Internal Organization	3-33
3-4.3.3	Handshake and Control	3-34
3-5	Direct Memory Access	3-38

CHAPTER 4

4	M6800 Family Hardware Characteristics	4-1
4-1	Clock Circuitry for the MC6800	4-1
4-1.1	Clock Requirements and Circuitry	4-1
4-1.1.2	Clock Module	4-6
4-1.2	Halting the MC6800 and Single Instruction Execution	4-13
4-1.3	MC6800 Reset and Interrupt Controls	4-13
4-1.4	Three-State Control Line Operation	4-19
4-1.5	M6800 Family Interface and Enabling Considerations	4-19
4-2	M6800 System Hardware Techniques	4-24
4-2.1	Interrupt Priority Circuitry	4-24
4-2.1.1	8-Level Prioritizing	4-24
4-2.1.2	13-Level Prioritizing	4-27
4-2.2	Direct Memory Access (DMA)	4-31
4-2.2.1	DMA Transfers by Halting Processor	4-32
4-2.2.2	DMA Transfers by Cycle Stealing	4-35
4-2.2.3	Multiplexed DMA/MPU Operation	4-38
4-2.2.4	Summary of DMA Techniques	4-42
4-2.3	Automatic Reset and Single Cycle Execution Circuitry	4-42
4-2.4	Interval Timer	4-46
4-2.5	Memory System Design	4-48
4-2.5.1	Interfacing the MC6800 with Slow and Dynamic Memories	4-48
4-2.5.2	2KX8 RAM Memory Design Example	4-62
4-2.5.3	8KX8 Non-Volatile RAM Design Example	4-69
4-2.5.4	Design Considerations When Using Non-Family Memories with the MC6800	4-88

CHAPTER 5

5	Peripheral Control Techniques	5-1
5-1	Data Input Devices	5-1
5-1.1	Keyboards for Manual Entry of Data	5-1
5-1.1.1	Decoded Keyboard for a POS Terminal	5-1
5-1.1.2	Non Encoded Keyboard	5-6
5-1.2	Scanning Wand for Capturing Data From Printed Symbols	5-12
5-1.2.1	Universal Product Code (UPC) Symbol	5-12
5-1.2.2	Hardware Requirements	5-16
5-1.2.3	Data Recovery Technique	5-18
5-1.2.4	Wand/MPU Interface	5-18

TABLE OF CONTENTS (Continued)

5-1.2.5	Data Recovery Control Program	5-22
5-2	Data Output Devices	5-34
5-2.1	Printer Control	5-34
5-2.1.1	SEIKO AN-101F Operating Characteristics	5-42
5-2.1.2	Printer Hardware/Software Tradeoffs	5-43
5-2.1.3	Printer I/O Configuration	5-43
5-2.1.4	Printer Control Program	5-44
5-2.2	Burroughs Self-Scan Display Control	5-57
5-3	Data Interchange Devices	5-57
5-3.1	Introduction to Data Communications	5-57
5-3.1.1	TTY to ACIA Hardware	5-57
5-3.1.2	TTY to ACIA Software	5-63
5-3.1.3	ACIA to Modem Hardware	5-71
5-3.1.4	ACIA to Modem Software	5-71
5-3.2	Tape Cassette System	5-73
5-3.2.1	Hardware Description	5-74
5-3.2.2	Software Description	5-88
5-4	Floppy Disk	5-113
5-4.1	Introduction	5-113
5-4.2	Overall Considerations	5-114
5-4.3	System Hardware/Software Interface	5-119
5-4.4	Disk Program Routine Linking Control	5-128
5-4.5	Seek and Restore Operations	5-129
5-4.5	Read Operation	5-143
5-4.6.1	The Read Operation Interface	5-144
5-4.6.2	Data Recovery	5-147
5-4.6.3	Read Data Logic	5-153
5-4.6.4	Read Operation Program Routine	5-156
5-4.7	Write Operation	5-163
5-4.7.1	The Write Operation Interface	5-167
5-4.7.2	Formatter Write Logic	5-171
5-4.7.3	Formatter Error Detect Logic	5-174
5-4.7.4	Write Operation Program Routine	5-175
5-4.8	Special Operations — UPC Lookup	5-181
5-4.9	Integrated Read/Write Logic	5-198
5-4.A	SA900/901 Diskette Storage Drive	5-203
5-4.B	Orbis Model 74 Diskette Drive	5-219
5-4.C	Cal Comp 140 Diskette Drive	5-228
5-4.D	Recording Formats	5-239
5-4.E	Floppy Disk Program Listings	5-246

TABLE OF CONTENTS (Continued)

CHAPTER 6

6	System Design Techniques	6-1
6-1	Introduction	6-1
6-2	Transaction Terminal Definition	6-2
6-3	Hardware/Software Tradeoffs	6-6
6-3.1	Memory Reference I/O vs DMA I/O	6-6
6-3.2	Software vs Hardware Peripheral Service Prioritizing	6-7
6-3.3	Software vs Hardware Timer	6-7
6-3.4	Display With or Without Memory	6-8
6-4	Transaction Terminal Hardware and Software	6-10
6-4.1	Hardware Configuration	6-10
6-4.2	Transaction Terminal Software Development	6-21
6-4.2.1	Software Background Preparation	6-21
6-4.2.2	Development of Macro Flow Diagram	6-48
6-4.2.3	Technique of Executive Program Organization	6-50
6-4.2.4	Description of Macro Flow Diagram	6-57
6-4.3	Interrupt Control	6-90

CHAPTER 7

7	System Development Tasks	7-1
7-1	Assembly of the Control Program	7-2
7-1.1	M6800 Cross-Assembler Syntax	7-2
7-1.1.1	Line Numbers	7-13
7-1.1.2	Fields of the Source Statement	7-13
7-1.1.3	Labels	7-13
7-1.1.4	Operands	7-13
7-1.1.5	Comments	7-14
7-1.2	Accessing a Timeshare Service	7-14
7-1.3	Entering a Source Program	7-15
7-1.4	Assembling a Source Program	7-18
7-1.5	Simulation	7-21
7-1.5.1	Simulator Commands	7-21
7-1.5.2	Operating the Simulator	7-29
7-1.5.3	Macro Commands	7-30
7-1.5.4	Sample Simulated Program	7-34
7-1.5.5	Simulation Results	7-39
7-1.6	HELP	7-40
7-1.7	Build Virtual Machine	7-50
7-2	The EXORciser	7-69
7-2.1	Hardware Components	7-71

TABLE OF CONTENTS (Continued)

7-2.1.1	Hardware Specifications	7-71
7-2.2	Software Components	7-74
7-2.2.1	EXORciser Control	7-74
7-2.2.2	MAID	7-74
7-2.3	Memory Utilization	7-75
7-2.4	Hardware Operations and Controls	7-78
7-2.4.1	Combined Hardware/Software	7-78
7-2.4.2	ABORT Button Circuit	7-79
7-2.4.3	RESTART Button Circuit	7-79
7-2.4.4	VMA Inhibit Decoder	7-79
7-2.4.5	Asynchronous Communications Interface	7-80
7-2.4.6	Scope SYNC	7-80
7-2.5	Interrupts	7-80
7-2.5.1	$\overline{\text{NMI}}$	7-80
7-2.5.2	$\overline{\text{RESET}}$	7-81
7-2.5.3	SWI	7-81
7-2.5.4	Hardware Interrupt	7-81
7-2.6	Test Signals	7-82
7-3	Evaluation Module	7-88

APPENDIX A: Questions and Answers

1.	Systems Operation	A-1
2.	Control	A-5
3.	Interrupt Operation	A-9
4.	Programming	A-15
Index		I-1

LIST OF FIGURES

CHAPTER 1

- 1-1.1 MC6800 Bus and Control Signals
 - 1-1.1.1-1 MCM6810 RAM Functional Block Diagram
 - 1-1.1.1-2 MCM6830 ROM Functional Block Diagram
 - 1-1.1.2-1 MPU Parallel I/O Interface
 - 1-1.1.2-2 MPU/PIA Interface
 - 1-1.1.2-3 PIA Registers
 - 1-1.1.2-4 MPU Serial I/O Interface
 - 1-1.1.2-5 MPU/ACIA Interface
 - 1-1.1.2-6 ACIA Registers
- 1-1.2-1 MPU Minimum System
- 1-2.1 Programmable Registers
 - 1-2.3.1-1 Accumulator Addressing
 - 1-2.3.1-2 Inherent Addressing
 - 1-2.3.2-1 Immediate Addressing Mode
 - 1-2.3.3-1 Direct Addressing Mode
 - 1-2.3.4-1 Relative Addressing Mode
 - 1-2.3.4-2 Extended Addressing Mode
 - 1-2.3.5-1 Indexed Addressing Mode
 - 1-2.3.6-1 Addressing Mode Summary
- 1-3.1 MC6800 Instruction Set
 - 1-3.1-1 Condition Code Register Bit Definition
 - 1-3.1-2 Condition Code Register Instructions
 - 1-3.3.1-1 Arithmetic Instructions
 - 1-3.3.2-1 Logic Instructions
 - 1-3.3.3-1 Data Test Instructions
 - 1-3.3.4-1 Data Handling Instructions
 - 1-3.4.1-1 Index Register and Stack Pointer Instructions
 - 1-3.4.1-2 Stack Operation, Push Instruction
 - 1-3.4.1-3 Stack Operation, Pull Instruction
 - 1-3.4.2-1 Jump and Branch Instructions
 - 1-3.4.2-2 Program Flow for Jump and Branch Instructions
 - 1-3.4.2-3 Program Flow for BSR
 - 1-3.4.2-4 Program Flow for JSR (Extended)
 - 1-3.4.2-5 Program Flow for JSR (Indexed)
 - 1-3.4.2-6 Program Flow for RTS
 - 1-3.4.2-7 Program Flow for Interrupts
 - 1-3.4.2-8 Program Flow for RTI
 - 1-3.4.2-9 Conditional Branch Instructions

LIST OF FIGURES (Continued)

CHAPTER 2

- 2-1.5-1 Decimal Subtract Assembly Listing
- 2-1.6-1 Multiplication Using Booth's Algorithm
- 2-1.6-2 Flow Chart for Booth's Algorithm
- 2-1.6-3 Assembly Listing for Booth's Algorithm
- 2-1.6-4 Simulation of Booth's Algorithm
- 2-1.6-5 XKMULT Flow Chart
- 2-1.6-6 XKMULT Assembly Listing
- 2-1.7-1 XKDIVD Flow Chart
- 2-1.7-2 XKDIVD Assembly Listing

- 2-3.1-1 Peripheral Service Request (SR) and Data Transfer Program Waveforms and Notation
- 2-3.1-2 Flow Chart for a Typical Data Transfer Program for a Single Service Request
- 2-3.1-3 Data Transfer Program Indicating Method Used to Calculate Program Parameters
- 2-3.1-4 Relationship of Peripheral Data Stream to Program Timing
- 2-3.4-1 Flow Chart for Serial Data Transfer
- 2-3.4-2 Cassette Bit Serial Data Transfer Program
- 2-3.6-1 Program Model for Two Prioritized Time Dependent Service Requests
- 2-3.7-1 Timing Constraints for Successful System Operation for Prioritized Multiple Service Requests
- 2-3.7-2 Timing Diagram Showing Requirements of Equation 14 for Two SR's
- 2-3.7-3 Timing Diagram Showing Requirements of Equation 15 for Two SR's
- 2-3.8-1 Serial Data Transfer and Dynamic Display Refresh Routine
- 2-3.8-2 Serial Data Display SR Parameters and System Requirement Test
- 2-3.9-1 Flip-Flop Model for Two "Equal" Period SR's

CHAPTER 3

- 3-2.1-1 Hardware Interrupt Request Sequence
- 3-2.1-3 Interrupt Vectors, Permanent Memory Assignments
- 3-2.2-1 Non-Maskable Interrupt Sequence
- 3-2.3-1 Reset Interrupt Sequence
- 3-2.4-1 Software Interrupt Sequence

- 3-3-1 Hardware Interrupt Prioritizing — Block Diagram

- 3-4.1.1-1 MC6820 PIA I/O Diagram
- 3-4.1.2-1 MC6820 PIA — Block Diagram
- 3-4.1.2-2 PIA Output Circuit Configurations
- 3-4.1.2-3 PIA Control Register Format
- 3-4.1.2-4 Read Timing Characteristics
- 3-4.1.2-5 Write Timing Characteristics
- 3-4.1.3-1 PIA Register Addressing
- 3-4.1.3-2 Family Addressing
- 3-4.1.3-3 Typical I/O Configuration

LIST OF FIGURES (Continued)

- 3-4.2.1-1 MC6850 ACIA I/O Diagram
- 3-4.2.2-1 ACIA Block Diagram
- 3-4.2.2-2 ACIA Status Register Format
- 3-4.2.2-3 ACIA Control Register Format
- 3-4.2.3-1 ACIA Register Addressing
- 3-4.2.4-1 Asynchronous Data Format
- 3-4.3.1-1 Typical MC6860 System Configuration
- 3-4.3.1-2 I/O Configuration for MC6860 Modem
- 3-4.3.2-1 MC6860 Modem Block Diagram
- 3-4.3.3-1 Answer Mode
- 3-4.3.3-2 Automatic Disconnect — Long or Short Space
- 3-4.3.3-3 Originate Mode
- 3-4.3.3-4 Initiate Disconnect

CHAPTER 4

- 4-1.1-1 MPU Clock Waveform Specifications
- 4-1.1-2 MPQ6842 Clock Buffer
- 4-1.1-3 MPU Clock Circuit
- 4-1.1-4 Clock Circuit Waveforms
- 4-1.1-5 Monostable Clock Generator
- 4-1.1-6 Monostable Clock Circuit Waveforms
- 4-1.2-1 Halt and Single Cycle Execution
- 4-1.3-1 $\overline{\text{RESET}}$ Timing
- 4-1.3-2a Interrupt Timing
- 4-1.3-2b Wait Instruction Timing
- 4-1.3-3 Interrupt Signal Format
- 4-1.3-4 Interrupt Enabling
- 4-1.3-5 Interrupt Not Properly Enabled
- 4-1.3-6 Alternate Enable Generation
- 4-1.4-1 Three State Control Timing
- 4-1.5-1 Buffered M6800 System
- 4-1.5.2 M6800 Bus Expansion Example
- 4-2.1-1 8-Level Priority Interrupt Configuration Block Diagram
- 4-2.1.1-1 8-Level Hardware Prioritized Interrupt Logic
- 4-2.1.1-2 Prioritizing Interrupt Circuitry Relative Timing
- 4-2.1.1-3 Interrupt Vector Memory Allocation
- 4-2.1.2-1 13-Level Hardware Prioritized Interrupt Logic
- 4-2.1.2-2 13-Level Priority Circuitry Truth Table
- 4-2.1.2-3 Interrupt Vector Memory Allocation
- 4-2.2.1-1 DMA Transfers by Halting Processor

LIST OF FIGURES (Continued)

4-2.2.1-2	Timing of DMA Transfers by Halting the MPU
4-2.2.2-1	Block Diagram of DMA Transfers by Cycle Stealing
4-2.2.2-2	Timing of DMA Transfers by Cycle Stealing
4-2.2.3-1	Multiplexed DMA/MPU Operation
4-2.2.3-2	Timing of Multiplexed DMA/MPU Operation
4-2.2.3-3	Timing of Multiplexed DMA/MPU Operation Using MCM6605 4K RAM
4-2.3-1	Automatic Reset and $\overline{\text{HALT}}$ Synchronization
4-2.3-2	Single Instruction Timing
4-2.3-3	Single Cycle Instruction Execution
4-2.4-1	Interval Timer
4-2.4-2	Timer Software Examples
4-2.5.1-1	MPU Clock Waveform Specifications
4-2.5.1-2	Read Data From Memories or Peripherals
4-2.5.1-3	Write Data to Memories or Peripherals
4-2.5.1-4	Read Cycle with $1.0\mu\text{s}$ Memory
4-2.5.1-5	Write Cycle with $1.0\mu\text{s}$ Memory
4-2.5.1-6	Effect of Memory Ready on Clock Signals
4-2.5.1-7	General MPU to Memory Interface
4-2.5.1-8	Dynamic Memory Interface
4-2.5.1-9	M6800 Clock Circuitry with Interface for Slow and Dynamic Memory
4-2.5.1-10	MPU Clock Circuitry Waveforms
4-2.5.1-11	MPU Clock Circuitry Waveforms
4-2.5.1-12	Monostable Clock Generator with Memory Ready
4-2.5.2-1	2KX8 Memory System Block Diagram
4-2.5.2-2	2KX8 Memory System Schematic Diagram
4-2.5.2-3	MPU/2KX8 Memory Read Cycle
4-2.5.2-4	MPU/2KX8 Memory Write Cycle
4-2.5.2-5	2KX8 Memory System with Memory Ready
4-2.5.3-1	MCM6605 4K RAM Block Diagram
4-2.5.3-2a	Read Cycle Timing (Minimum Cycle)
4-2.5.3-2b	Write and Refresh Cycle Timing (Minimum Cycle)
4-2.5.3-2c	Read-Modify-Write Timing (Minimum Cycle)
4-2.5.3-3	Non-Volatile Memory System Block Diagram
4-2.5.3-4	EXORciser/4K Memory System Timing Diagram
4-2.5.3-5	Memory Timing in Standby Mode
4-2.5.3-5	Address Buffers and Decoding Logic
4-2.5.3-7	Data Buffers and Memory Array
4-2.5.3-8	Refresh Control Logic
4-2.5.3-9	Refresh Timing

LIST OF FIGURES (Continued)

- 4-2.5.3-10 Power Fail Logic and Chip Enable Driver
- 4-2.5.3-11 Power Up/Down Synchronization
- 4-2.5.3-12 Memory System Breadboard
- 4-2.5.3-13 Alternate Read and Write Memory Accesses
- 4-2.5.3-14 Memory PC Board Array
- 4-2.5.3-15 Power Line Ripple

CHAPTER 5

- 5-1.1.1-1 POS Keyboard Configuration
- 5-1.1.1-2 Keyboard Coding/PIA Interface
- 5-1.1.1-3 Keyboard/PIA Hardware Interface
- 5-1.1.1-4 Flow Chart for Keyboard Service Routine
- 5-1.1.1-5 Keyboard Service Assembly Listing
- 5-1.1.2-1 Keyboard/PIA Interface
- 5-1.1.2-2 Keyboard Control Flow Chart
- 5-1.1.2-3 Keyboard Control Assembly Listing
- 5-1.1.2-4 Initial PIA I/O Configuration
- 5-1.1.2-5 Result of Key Closure
- 5-1.1.2-6 Contents of Accumulator A
- 5-1.1.2-7 I/O Conditions Reversed
- 5-1.1.2-8 Generation of Output Word
- 5-1.1.2-9 Lookup Table
- 5-1.2.1-1 UPC Symbol from Box of Kleenex Tissues
- 5-1.2.1-2 UPC Standard Symbol
- 5-1.2.1-3 UPC Character Structure
- 5-1.2.1-4 Nominal Dimensions of Printed UPC Symbol
- 5-1.2.1-5 Encoding for UPC Characters
- 5-1.2.2-1 UPC Wand Signal Conditioning Circuitry
- 5-1.2.3-1 Dimensions for Standard Symbol Characters
- 5-1.2.3-2 UPC Symbol Printing Tolerances
- 5-1.2.3-3 Worst Case Printing Tolerances
- 5-1.2.4-1 Transaction Terminal Flow Diagram
- 5-1.2.5-1 Flow Chart for XKIWND Initialization Routine
- 5-1.2.5-2 XKIWND Assembly Listing
- 5-1.2.5-3 Flow Chart for YKWAND Routine
- 5-1.2.5-4 YKWAND Assembly Listing
- 5-1.2.5-5 Flow Chart for WSORT Routine
- 5-1.2.5-6 WSORT Assembly Listing
- 5-1.2.5-7 Flow Chart for WCNVRT UPC to BCD Conversion Routine
- 5-1.2.5-8 WCNVRT Assembly Listing

LIST OF FIGURES (Continued)

- 5-1.2.5-9 XKWAND Table and Buffer Memory Locations
- 5-1.2.5-10 Flow Chart for WERCHK ERROR Check
- 5-1.2.5-11 WERCHK Assembly Listing
- 5-1.2.5-12 Flow Chart for WBCDPK Packing Routine
- 5-1.2.5-13 WBCDPK Assembly Listing
- 5-2.1.1-1 SEIKO AN-101F Printing Mechanism
- 5-2.1.1-2 Timing Signal Generation
- 5-2.1.1-3 Timing Signals
- 5-2.1.3-1 SEIKO Printer Circuit Requirements
- 5-2.1.4-1 Print Cycle Timing: "MICROPROCESSOR"
- 5-2.1.4-2 Initialization
- 5-2.1.4-3 Printer Enable
- 5-2.1.4-4 Reset Service
- 5-2.1.4-5 Printer/MPU Relative Activity
- 5-2.1.4-6 Print Service
- 5-2.1.4-7(a) PKSCAN Flow Chart
- 5-2.1.4-7(b) PKSCAN Assembly Listing
- 5-2.1.4-8 Roll Left Operation on PIA Registers
- 5-2.1.4-9 Printer Column/Text Buffer Relationship
- 5-2.2-1 Burroughs Self-Scan Display Characteristics
- 5-2.2-2 PIA/Burroughs Display Interface
- 5-3.1-1 Paper Tape Format
- 5-3.1-2 TTY/ACIA and Modem/ACIA Systems
- 5-3.1.1-1 MPU to TTY Interface
- 5-3.1.2-1 Flow Chart for Comm. Program
- 5-3.1.2-2 Data Comm. Assembly Listing
- 5-3.1.3-1 MPU to Remote Site
- 5-3.2.1-1 800 BPI Recording Format
- 5-3.2.1-2 PIA, Tape Drive and Read/Write Control Electronics Interface
- 5-3.2.1-3 Read/Write Circuitry
- 5-3.2.1-4 Write Operation Timing and Format Conversion
- 5-3.2.1-5 Read Operation Timing
- 5-3.2.1-6 EOT/BOT Circuitry with Hardware Safety Feature
- 5-3.2.1-7 Phase Locked Loop Data Recovery
- 5-3.2.1-8 Read Data Recovery Timing (After Preamble, with Loop in Lock)
- 5-3.2.1-9 Cassette Serial Read/Write and Control Logic
- 5-3.2.1-10 Read Operation Sequence Timing
- 5-3.2.1-11 Write Operation Sequence Timing
- 5-3.2.1-12 Start, Stop, and Interblock Gaps Derived From the Tape Velocity Profile
- 5-3.2.1-13 Load Point

LIST OF FIGURES (Continued)

5-3.2.2-1	System Integration of Rewind to Load Point
5-3.2.2-2	Move to Load Point Flow Chart
5-3.2.2-3	Move to Load Point Assembly Listing
5-3.2.2-4	System Integration of Write Routine
5-3.2.2-5	Flow Chart of Write Routine
5-3.2.2-6	Write Routine Assembly Listing
5-3.2.2-7	Flow Chart of Read Routine
5-3.2.2-8	Read Routine Assembly Listing
5-4.1-1	M6800/Floppy Disk Subsystem
5-4.1-2	Floppy Disk System
5-4.2-1	Example of a Serial Task System
5-4.2-2	Multiple MPU System
5-4.2-3	Radial Interface
5-4.2-4	Daisy Chain Interface
5-4.3-2	Byte Ready/Request Interface
5-4.3-1	Floppy Disk Functional Interface
5-4.5-1	Typical Host/Floppy Disk Program Interaction
5-4.5-2	Seek/Restore Interface
5-4.5-3	'FKSKIN' Flow
5-4.5-4	'FKSEEK' Flow
5-4.6.1-1	Read Operation Interface
5-4.6.1-2	Read Clock Logic
5-4.6.1-3	Error Detect Logic
5-4.6.2-1	Floppy Disk IBM 3740 Format Data and Clock Recovery
5-4.6.2-2	Data and Clock Recovery Timing
5-4.6.2-4	VCM Frequency Faster Than Data Rate
5-4.6.2-5	PLL Response — Worst Case Capture Time
5-4.6.2-6	MC4024 Voltage vs Frequency for Floppy Disk Data Recovery
5-4.6.3-1	Read Data Logic (Read Shift Register, Read Buffer, Bit Counter and CRC Check)
5-4.6.3-2	Start Read Timing
5-4.6.4-2	Read Routine Flow Chart
5-4.6.4-3	System Integration of Floppy Disk Routines
5-4.7.1-1	Write Operation Interface
5-4.7.1-2	Write Control Signal Sequence
5-4.7.2-1	Floppy Disk Write Logic
5-4.7.2-3	Append CRC Timing
5-4.7.3-1	Error Detect Logic
5-4.7.4-2	Write Flow
5-4.8-1	UPC Track Format
5-4.8-2	UPC Lookup Program Integration