

(P)rogramming (L)anguage for the Motorola MC680(9)

by Graham Trott

The entire contents of this manual and the accompanying software are copyright (C) Windrush Micro Systems Limited and Graham Trott.

Duplication of this manual is strictly prohibited. Duplication of the accompanying software for anything other than archival purposes is strictly prohibited.

Initial Release: 1 January 1982 with version 2.XX Software.

Second Release: 1 June 1983 with version 3.XX Software.

Third Release: 1 June 1984 with version 4.XX Software.

COPYRIGHT NOTICE

1 - This file is created and distributed by the Flex User's Group, and includes material which has already been distributed. It is created with permission from the owner of the original material, who owns and retains the rights to said material.

2 - It cannot be copied, transmitted, printed, sold, leased or otherwise communicated in paper, optical, magnetic or electronic form, in exchange for money or any monetary instrument.

3 - The contents of this file have not been checked for accuracy. The Flex User's Group makes no statement regarding the contents of this file, and disclaims any and all liabilities on the use of such material. It is understood that this material may contain errors, some of which exist in the original material, some of which do not exist in said original material.

4 - Any transmission, use, copying, display, printing, or reading of this material implies full understanding and approval of the above terms.

.pdf edition prepared 2/2004

(P)rogramming (L)anguage for the Motorola MC680(9)

COPYRIGHT NOTICE

The entire contents of this manual and the accompanying software have been copyrighted by Windrush Micro Systems Limited and its author Graham Trott. The reproduction of this material by any means, for any reason, is strictly prohibited.

SERIAL NUMBER NOTICE

This product has been assigned a unique serial number at the time of manufacture. The ASCII code for this serial number, which is encrypted into the body of the product, is also part of the start-up banner. This product is therefore traceable to the original purchaser in the event of plagiarized copies being discovered.

This product is sold on the basis of being used on a SINGLE microcomputer system by a SINGLE user.

We shall consider it to be an attempt to criminally plagiarize us if duplicate copies of this manual or the accompanying disk are made available for use by other parties, or on other microcomputers. This consideration also applies to, but is not limited to, duplicate copies being produced for use within the original purchaser's organisation, establishment, or home for anything other than archival purposes.

WARNING

We at Windrush Micro Systems Limited and the author Graham Trott consider the recognition we receive as a result of the sale of our programs and manuals to be of vital importance in remaining in business.

Unless written arrangements to the contrary have been made between authorized agents of Windrush Micro Systems Limited and the purchaser of this manual and the accompanying computer program we shall consider it to be an attempt to criminally plagiarize us if our company name, the program name, or the authors name is altered, changed or removed on or from any of the materials purchased from us regardless of the means by which accomplished. This consideration shall include, but not be limited to, the re-writing of this manual, or its reproduction for distribution under another company, program or trade name, or any like modification of the accompanying computer program.

WARRANTY NOTICE

Although every effort has been made to insure the accuracy of this material, it is sold AS IS and without warranty. No claim as to the suitability or workability of this material for any particular application or on any particular computer is made. This statement is in lieu of any other statement whether expressed or implied.

Windrush Micro Systems, Worstead Labs, N. Walsham, Norfolk, NR28 9SA, England

THIS PAGE INTENTIONALLY LEFT BLANK

(P)rogramming (L)anguage for the Motorola MC680(9)

by Graham Trott

TABLE OF CONTENTS

<u>SECTION</u>	<u>SUBJECT</u>	<u>PAGE</u>
1.00.00	INTRODUCTION	1
1.00.01	Acknowledgements	2
1.00.02	How to use this manual	3
1.00.03	History of PL/9	4
1.00.04	Existing Tools	5
1.00.05	A 'Better Mousetrap'	5
1.00.06	Compatibility with Other Text Editors	6
1.00.07	Variations Between Versions	6
2.00.00	PRODUCT OVERVIEW	7
2.00.01	Benchmark Performance Figures	12
3.00.00	CONFIGURING PL/9 TO YOUR SYSTEM HARDWARE ENVIRONMENT	13
3.01.00	Memory Map	19
3.02.00	PL/9 and the Flex Environment	20
3.02.01	PL/9 and Flex Printer Drivers	20
3.02.02	PL/9 and Flex Itself	20
3.03.00	Just to prove that it works.	21
3.03.01	Other Modes of Operation	23
4.00.00	EDITOR TECHNICAL REFERENCE MANUAL	25
4.00.01	Detailed Description of Editor Commands	26
4.00.02	Editor Command Symbols	26
	MODE CONTROL	27
	LINE POSITIONING COMMANDS	28
	FILE ORIENTED COMMANDS	29
	LINE EDITING	30
	GLOBAL EDITING	32
	DISK FILE HANDLING	33
	Recovering a File in Memory	36
5.00.00	COMPILER TECHNICAL REFERENCE MANUAL	39
	Calling the Compiler from Flex	41
	Error Handling	42
6.00.00	TRACER TECHNICAL REFERENCE MANUAL	45
	MODE CONTROL COMMANDS	46
	SOURCE FILE RELATED COMMANDS	46
	TRACER CONTROL COMMANDS	47
	BREAKPOINTS	48
	VARIABLES	48

(P)rogramming (L)anguage for the Motorola MC680(9)

TABLE OF CONTENTS

SECTION	SUBJECT	PAGE
7.00.00	PL/9 LANGUAGE TECHNICAL REFERENCE MANUAL	49
7.00.01	Comments	49
7.00.02	Symbols	49
7.01.00	Keyword Descriptions	50
	ACCA (87)	INCLUDE (58)
	ACCB (87)	INT (111) -
	ACCD (87)	INTEGER (57) (88) *
	AND (109) +	I RQ (90)
	. AND (73)	JUMP (79)
	ASMPROC (81)	MATHS (89)
	AT (52)	NMI (90)
	BEGIN (72)	NOT (110) -
	BREAK (76)	OR (109) +
	BYTE (57) (88) *	. OR (73)
	CALL (78)	ORIGIN (53)
	CASE (71)	PROCEDURE (60)
	CCR (88)	REAL (57)
	CONSTANT (51)	REPEAT (75)
	DPAGE (56)	RESET (90)
	ELSE (71)	RETURN (67)
	END (72)	SHIFT (110) -
	ENDPROC (64)	SQR (111) -
	ENDPROC END (70)	STACK (54) (87)
	EOR (109) +	SWAP (110) -
	. EOR (73)	SWI (90)
	EXTEND (110) -	SWI 2 (90)
	FI RQ (90)	SWI 3 (90)
	FI X (111) -	THEN (71)
	FLOAT (111) -	UNTIL (75)
	FOREVER (75)	WHILE (74)
	GEN (80)	XOR (109) +
	GLOBAL (55)	. XOR (73)
	GOTO (77)	XREG (87)
	I F (71)	
	!	
	(96)	
	(101)	
	..	
	(107)	

(+) in section 7.05.00 (-) in section 7.06.00
(*) in this section and section 7.06.00

(P)rogramming (L)anguage for the Motorola MC680(9)

TABLE OF CONTENTS

<u>SECTION</u>	<u>SUBJECT</u>	<u>PAGE</u>
7.01.01	CONSTANT	51
7.01.02	AT	52
7.01.03	ORIGIN	53
7.01.04	STACK	54
7.01.05	GLOBAL	55
7.01.06	DPAGE	56
7.01.07	BYTE, INTEGER, REAL	57
7.01.08	INCLUDE	58
7.01.09	A Program Header	59
7.01.10	PROCEDURE	60
7.01.11	ENDPROC, RETURN and ENDPROC END	64
7.01.12	IF...THEN...ELSE & IF...CASE1.THEN...CASE2.THEN...	71
7.01.13	BEGIN...END	72
7.01.14	Logical .AND, .OR & .EOR (.XOR)	73
7.01.15	WHILE...	74
7.01.16	REPEAT...UNTIL and REPEAT...FOREVER	75
7.01.17	BREAK	76
7.01.18	GOTO	77
7.01.19	CALL	78
7.01.20	JUMP	79
7.01.21	GEN	80
7.01.22	ASMPROC	81
	How data is passed to and from procedures	84
	The architecture of REAL (floating point) numbers	85
	Examples of REAL number formats	86
7.01.23	ACCA, ACCB, ACCD, XREG and STACK	87
7.01.24	CCR	88
7.01.25	MATHS	89
7.01.26	RESET, NMI, FIRQ, IRQ, SWI, SWI2 and SWI3	90
7.02.00	Interfacing with Assembly Language	91
7.03.00	Variables	92
7.03.01	Arithmetic Quantities	92
7.03.02	Unsigned Bytes and Integers	93
	Hex Numbers	95
	The Exclamation Mark (!)	96
	Integer	97
7.03.03	Data Types	100
7.03.04	Pointers	101
7.04.00	Arithmetic and Operator Precedence Rules	108
7.05.00	Bit Operators	109
7.06.00	Functions	110

(P)rogramming (L)anguage for the Motorola MC680(9)

TABLE OF CONTENTS

<u>SECTION</u>	<u>SUBJECT</u>	<u>PAGE</u>
7. 07. 00	Anatomy of PL/9 Programs	112
7. 07. 01	Variable Allocation	
7. 07. 02	Global Variables	112
7. 07. 03	Local Variables	113
7. 07. 04	Absolute Variables	113
7. 07. 05	Data	113
7. 07. 06	Assignments	
7. 07. 07	Simple Assignments	114
7. 07. 08	Vectors	114
7. 07. 09	Procedure Calls	114
7. 07. 10	Procedures	115
7. 07. 11	Built-in Arithmetic Functions	115
7. 07. 12	Register Preservation	115
7. 07. 13	Pointers	116
7. 07. 14	Memory use by PL/9 during compilation	120
7. 07. 15	Disk Binary Files	120
8. 00. 00	PL/9 LIBRARIES TECHNICAL REFERENCE MANUAL	121
8. 00. 01	TRUFALSE. DEF	123
8. 01. 00	IOSUBS. LIB	124
8. 01. 01	Monitor	124
8. 01. 02	Warms	124
8. 01. 03	Getchar	124
8. 01. 04	Getchar_Noecho	124
8. 01. 05	Getkey	125
8. 01. 06	Convert_Lc	125
8. 01. 07	Get_Uc	125
8. 01. 08	Get_Uc_Noecho	125
8. 01. 09	Putchar	126
8. 01. 10	Printint	126
8. 01. 11	Remove_Char	126
8. 01. 12	Input	127
8. 01. 13	Crlf	128
8. 01. 14	Print	129
8. 01. 15	Space	130
8. 02. 00	TERMSUBS. LIB	135
8. 02. 01	Nulls	135
8. 02. 02	Erase_Eol	136
8. 02. 03	Erase_Eop	136
8. 02. 04	Cursor	136
8. 02. 05	Home	136
8. 02. 06	Home_N_Clr	136
8. 02. 07	Attr_On	136
8. 02. 08	Attr_Off	136

(P)rogramming (L)anguage for the Motorola MC680(9)

TABLE OF CONTENTS

SECTION	SUBJECT	PAGE
8.03.00	HEXIO. LIB	140
	HEXGLOBL. DEF	140
8.03.01	Get_Hex_Ni bbl e	141
8.03.02	Get_Hex_Byte	141
8.03.03	Get_Hex_Address	141
8.03.04	Put_Hex_Ni bbl e	141
8.03.05	Put_Hex_Byte	142
8.03.06	Put_Hex_Address	142
8.04.00	BITIO. LIB	146
8.04.01	Bi tsin	146
8.04.02	Bi tsout	146
8.04.03	Bi tin	147
8.04.04	Bi tout	147
8.04.05	Bi tz8i n	147
8.04.06	Bi tz16i n	148
8.04.07	Bi tz8out	148
8.04.08	Bi tz16out	149
8.05.00	HARDIO. LIB	152
8.05.01	Peek	152
8.05.02	Dpeek	152
8.05.03	Poke	152
8.05.04	Dpoke	152
8.06.00	STRSUBS. LIB	155
8.06.01	Strlen	155
8.06.02	Strcopy	155
8.06.03	Strcat	155
8.06.04	Strcmp	156
8.06.05	Strpos	156
8.07.00	BASTRING. LIB	159
8.07.01	Left	159
8.07.02	Right	159
8.07.03	Mi d	159
8.08.00	FLEX. LIB	163
8.08.01	Fl ex	163
8.08.02	Get_Fi l ename	163
8.08.03	Set_Extensi on	163
8.08.04	Report_Error	163
8.08.05	Open_For_Read	164
8.08.06	Open_For_Wri te	164
8.08.07	Set_Bi nary	164
8.08.08	Read	164
8.08.09	Wri te	164
8.08.10	Close_Fi le	164
8.08.11	Read_Sector	164
8.08.12	Wri te_Sector	165
8.08.13	Del ete_Fi le	165
8.08.14	Rename_Fi le	165

(P)rogramming (L)anguage for the Motorola MC680(9)

TABLE OF CONTENTS

<u>SECTION</u>	<u>SUBJECT</u>	<u>PAGE</u>
8. 09. 00	SCI PACK. LI B	169
8. 09. 01	Ln	169
8. 09. 02	Log	169
8. 09. 03	Exp	169
8. 09. 04	Al og	170
8. 09. 05	XtoY	170
8. 09. 06	Si n	170
8. 09. 07	Cos	170
8. 09. 08	Tan	170
8. 09. 09	Atn	170
8. 10. 00	REALCON. LI B	176
8. 10. 01	Bi nary	176
8. 10. 02	Ascbi n	176
8. 10. 03	Asci i	177
8. 11. 00	REALI O. LI B	184
8. 11. 01	Fi nput	184
8. 11. 02	Fpri nt	184
8. 12. 00	NUMCON. LI B	187
8. 12. 01	Bi ntodec	187
8. 12. 02	Prdec	187
8. 12. 03	Prnum	187
8. 12. 04	Getnum	187
8. 13. 00	SORT. LI B	191
	Sort	191