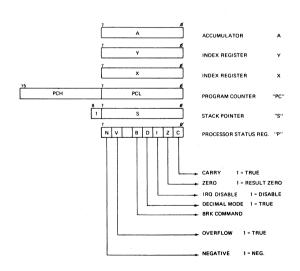


MOS TECHNOLOGY, INC.

Valley Forge Corporate Center 950 Rittenhouse Road Norristown, Pa. 19401

MCS6500 INSTRUCTION SET SUMMARY

PROCESSOR PROGRAMMING MODEL



INS	TRUCTIONS	186	MED	IA	E	AB	SOL	UTE	21	RO	PAG	E	AC	CUM.	Т	IM	PLI	D	(1	ND.	(X)	Т	(IN	D),Y	Т	2,7/	GE.	x	A	BS,	x	,	ABS.	Y	R	ELA	TIVE	Π	IND	IRE	CT	2,	PAG	ε, γ	7	0	ON	DIT	ION	COE	ES	
MNEMONIC	OPERATION	OF	, ,	v	#	OP	N	#	OF	, ,	#	: 0)P	N #	ŧ	OP	N	#	ОР	N	#	0	PI	y #	-	OP	N	#	OP	N	#	OP	N	#	0	PN	#	-	OP	N	#	ОР	N	4 4	#	N	2	С	-	D	v	١
ADC	A+M+C + A (4) (1)	69	2	1	2	6D	4	3	65	3	2	1	1	T	T	T			61	6	2	7	1 !	5 2	1	75	4	2	7D	4	3	79	4	3	T	T	T	1	T			Γ	T	T	ヿ	7	-	1	-	-	7	Ì
AND	AAM+A (1)	29	2		2	20	4	3	25	3	2	1			1				21	6	2	31	ı,	5 2	d	36	4	2	3D	4	3	39		3	۱		۱	1				۱		1		,	,					ı
ASL	Ce(70)+0	Γ				9E	6	3	96	5 5	2	Q	А	2	, [T	1		T	6	6	2	16	7	3				I											,	J		_	_	_	l
всс	BRANCH ON C=8 (2)		h							b		1			1							۱		4	1										94) 2	1	.														l
BCS	BRANCH ON C=1 (2)	Γ	T						T						T					[I	T													В	2	2									-	_	_	_	_	-	١
BEQ	BRANCH ON Z=1 (2)	Т	Ť	1	1			T	T	Ť	T	1			1	1					T	T	Ť		1	T	7		_					T	F	2	2	7	T			T	T	T			-	-		-		١
BIT	AAM		h			æ		3	24	3	2	1									L	1			1			*										1				П				M,	,				м,	١
ВМІ	BRANCH ON N=1 (2)	Ī		T								T			T						T	T			Ī										31	3	2	,					T			-	-	-	_	-	-	l
BNE.	BRANCH ON Z-6 (2)			1					ı	T.			1		1							1	1		1										D	• :	1 2															l
BPL	BRANCH ON N=9 (2)	Γ	T		T				T	I			1		T						Ţ	T													10	2	2									-		-	-	-	-	١
BRK	(See Fig. 1)	T	T	T	7			T	T	Т	T	1	7	1	1	00	7	1	Г		T	T	T		1	-	_					Г			T		T	T	1			Γ	T	T	\neg	-	-		- 0	-	-	1
BVC	8RANCH ON V=8 (2)	۱							L			1			1							1	T	1	1		1						1		54) 2		2	4			ı	ı				ø			a e		1
BVS	BRANCH ON V=1 (2)	Γ	1	T								T				1						T							i						74	8 2	1	2									-	-	-	-	-	١
CLC	6+C			4								1				18	2	1					1		1																	ı										1
CLD	0 → D	ľ		T				T	T	T		T			9	D8	2	1																										Ţ		-	-	-	-	0	-	I
CLI	0+1		I						Ι	Ι		Ι			Ţ	58	2	1			П	Ι	Ι		I										Ι		I							I		-	-		0	F	_	J
CLV	8 V	ı		1						T					þ	88	2	1					1																			Г		ø			M				•	ı
CMP	A-M (1)	C9	2		2	CD	4	3	C	5 3	1 2								C1	6	2	D	1	5	2 1	D5	4	2	DD	4	3	09	4	3			L					1		1		,	J	,	- 1		_	l
CPX	x-M	20	1 2	1	2	EC	4	3	E		1 2	П			1								4																							,	,	,			4	١
CPY	Y-M	CØ	2		2	сс	4	3	C	1 :	1 2			- 1					۱ '	1	1		1			- !																L	L	1			J	J	-	-	-	l
DEC	M-1 → M		Ι		I	CE	6	3	C	;	2	1			I							Ι	I		I	06	6	2	DE	7	3															J	J	_	_	-	_	l
DEX	X-1+X	ı		1					1		1	1			ŀ	CA	2	1					1		1									L		1								M		,	7					1
DEY	Y-1 → Y	1	l	1	-					-		1			8	38	2	1			Ĺ		-				i						<u> </u>		L									i		1	J			-	-	J
EOR	A+M+A (1)	49		•	2	4D	•	3	45		3 3	1			1				41	6	2	6	ų.	5 . 2	9990		5007	2	50	4	3	59		3	ı			1					П			7						1
(NC	M+1 + M					EE	6	3	E	5 5	2	1										1		i	1	F6	6	2	FE	7	3				L				1			L		\perp		>	J		-		-	J
INX	X+1 + X	Γ	Τ	T	T				Τ	Τ	T	T	T		1	E8	2	1	Γ		Г	Τ	T	Ī	Τ	-	T								Τ	Τ	T	I	3				L			1	J		-		-	l
INY	Y+1 + Y	1	1	1					1			1			ŀ	C18	2	1							1										ı	1										*	,					-
JMP	JUMP TO NEW LOC.				I	4C	3	3	1			I		T	Ī		-			ĺ						Î												ŀ	6C	5	3					-	-	-	-		-	١
JSR	(See Fig. 2)JUMP SUB	1				20	6	3	1	1		1											1		1										ı			1					П	1		-				-		1
LDA	M + A (1)	AS	9 :	2	2	AD	4	3	A	5	3 :	2							A1	6	2	В	1	5	2 1	B5	4	2	BD	4	3	В9	4	3	1			I				1				1	1	_	_	-	-	1

		H	IEDI.	ATE	ABS	OLU	TE	₽ER	O PA	GE	A	:CUN	٠. [IMP	LIED	- [(IN	D,X)	- [(IND),Y	2,1	AGE	, х	A	8S, X		A	8S, 1	,	REI	ATI	VE	IND	IRE	СТ	2,1	PAG	E,Y	١,	CON	DITI	ION	COD	E
MEMONIC	OPÉRATION	OP	N	#	OP	N	#	OP	N	#	ОР	N	# 0	OP	N 3	#	OP	N #	# (OP N	#	ОР	N	#	OP	N	# (OP	N	#	ОР	N	#	OP	N	#	ОР	N	#	N	2	С	1	D	_
LDX	M → X (1)	A2	2	2	ΑE	4	3	A6	3	2			T		T	T	T	Т	T		Г				П		1	BE	4	3							В6	4	2	1	, ,	_		-	
LDY	# - Y (1)	2	2	2	AC	•	3	A4	9	2						1			1			84	4	2	BC		3													1	•			-	
LSR	9→ 7				4E	6	3	46	5	2	4A	2	1			T			T			56	6	2	5E	7	3															J	-	-	
NOP	NO OPERATION												e	A	2	d	1		1									-												H					
ORA	AVM + A	99	2	2	6 D	4	3	95	3	2							11	6 :	2	11 5	2	15	4	2	1D	4	3	19	4	3										1	J	-	-	-	
PHA	A Ms S-1S		Т				Т						4	8	3	,	1	1	7	\top							\neg	T									Г	Г		-	-	-	-	-	
PHP	P Ms 5-1S												į,	18	3	ď																												-	8
PLA	S+1S MsA	000000		00000	000000	00.08000		0000000	S049000	108000		990000	E	88	4	1	000000	T			T			0000000							000000		1000000							1	1	-	-	10000000	3000
PLP	S-1 S M:P												1	18	4	d				op.																		b			(6	EST	OR	EOi	
ROL	- O-C-	00000			2E	6	3	26	5	2	2A	2	1	3000 8 0	2000	*****	2020000	200405	2000	(2200	1	36	6	2	3E	7	3		000000	8301673	0000000	*****	200000	6000000	8000	9000000	200000	500000	000000	1	J	1	-	-	868
ROR	المراعات	Т	T		6E	6	3	66	5	2	6A	2	1	\dashv	1	1	十	T	1	7	1	76	6	2	7E	7	3	7							i		Г			1	7	-	-	-	_
	(See Fig. 1) RTRN, INT.														6	1	ø				b														w						(f	REST	ROT	ED)	
	(See Fig. 2) RTRN SUB	100000	10000	80000	00000	00000		800002	200000	88000	300203		(60	6	1	***	5730\$57	0000	00000	*****		500000	555200	800008			2000	60000	200000	000000	2233	200029	83888	0000	002000	B12000	\$0000	B000000	-	2000000	.0000000	5090000	_	.588
8 B C	A-M-Ĉ → A (1)	E9	2	2	EO	4	3	E5	3	2								6	2	F1 8	2	F5	4	2	FO		3	F9	4	3										×		(3)			
SEC	1 + C	80000		10000	800000	80000		88800		00000		0000	3	38	2	1				SOOO\$600		10000	#650000 -	88888	800003			0000	200000	200000	00000		(00000	000000	00000	00000		\$ 00000	\$00000	-	30000	1	2000000	.000000	388
SED	1 + D												١,	8	2	١	- 1		1	- !								ı										İ		-	-	-	-	1	
SEÍ	1 -1												,	78	2		1																								98	-			8
STA	A + M	60000	90000	W000000	80	4	3	85	3	2		90000	00000	10000000	2000		81	6	2	91 6	2	95	4	2	9D	5	3	99	5	3	000000	600000	000000	B00000080	33333	000000	200000	100000	8020000	-	7000000		5223669	3000000	1000
STX	X + W				86	4	3	86	3	2								œb	ø	o jo	ŧ.																96	4	2	k					8
STY	Y + M	60000	\$000	00000	8C	4		84		2	20000		00000000	2000	0000000	3000	000	0000000	0000	0000		94	4	2		*****		9993	70000	800000	80000		000000	000000	500/08	B00000	200000	10000		-	300000	,000000	200000	30000	388
TAX	A +X										H		1	٩A	2	,		-	1																			1	l	1	1			_	_
TAY	A + Y												S00000 W	8000V 0	2																									7					
TSX	s + x	800000	900000	00000		\$0,000	#850 CO	000000		000000	000000	000000	0.00000	outsoops	2	1	2000000	.0000800		2000098000	1		poesso			2000000	******	000000	190400		00000		1000000		500004	200000	000000	22000	B000000	1	J		-	-	1000
TKA	X + A													IA	2	ø																						b	bo					100	
TXS	x + s	00000	8000	80000		000000		00000		000000	00000	22000	ç)A	2	1		1000	*****	0000	*****	1	25960	000000			000000	20000	600000		80000	****	0000000	2000	20003	300000		\$00000	\$100000	-	2000000	-	5000000	.0000000	,500
TYA	Y + A	1			İ		1					i	- 1	98	- 1	,	- 1		ı					ĺ																1		-	-	-	

- ADD 1 TO "N" IF PAGE BOUNDRY IS CROSSED
- ADD 1 TO "N" IF BRANCH OCCURS TO SAME PAGE.
 ADD 2 TO "N" IF BRANCH OCCURS TO DIFFERENT PAGE.
 CARRY NOT BORROW.
- IF IN DECIMAL MODE Z FLAG IS INVALID.
 ACCUMULATOR MUST BE CHECKED FOR ZERO RESULT.
- Y INDEX Y
- A ACCUMULATOR
- M MEMORY PER EFFECTIVE ADDRESS
- Ms MEMORY PER STACK POINTER
- MODIFIED
 - NOT MODIFIED

NO. BYTES

- MEMORY BIT 6

OP - CODE TABLE

ADD

AND

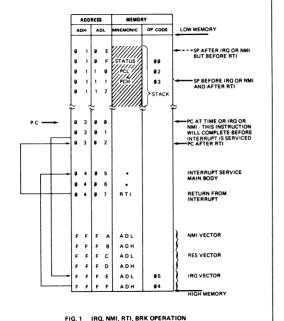
OR

- SUBTRACT

MSD	0	1	. 2	3	4	5	6	7	8	9	A	В	С	D	E	F	MSD
0	BRK	ORA-IND, X				ORA-Z, Page	ASL Z,PAGE		PHP	ORA-IMM	ASL-A			ORA ABS	ASL ABS		8
•	BPL	ORA-IND, Y				ORA-Z, PageX	ASL-€,Page,X		CLC	ORA-885,Y				ORA-ABS,X	ASL-ABS, X		١,
2	JSR	AND-IND,X			BIT-₹,Page	AND-Z, Page	ROL- Z , Page		PLP	AND-IMM	ROL A		BIT ABS	AND ABS	ROL-ABS		2
3	BMI	Y,ONLONA				AND-2,Page, X	ROL-2 Page X		SEC	AND-ABS,Y				AND-ABS,X	RQL-ABS,X		3
4	RTI	EOR-IND,X				EOR-Z, Page	LSR-Z,Page		PHA	EOR-IMM	LSR-A		JMP-ABS	EOR-ABS	LSR-ABS		4
5	BVC	EOR-IND,Y				EOR-Z,Page,X	LSR-2 Page,X		CLI	EOR ABS,Y				EOR ASS, X	LSR-ABS, X		5
6	RTS	ADC-IND, X				ADC-2, Page			PLA	ADC-IMM			JMP-IND	ADC-ABS			6
7	875	ADC-IND, Y				ADC-2,PageX			SEI	ADC-ABS,Y				ADC ABS, K			,
8		STA-IND, X			STY-Z. Page	STA-2. Page	STX-2. Page		DEY		TXA		STY-ABS	STA-ABS	STX-ABS		8
9	800	STAIND, Y			STY-Z Page X	STA-2.Page,X	STX-2.Page;Y		TYA	STA-ABS, Y	TXS			STA-ABS, X			
Α	LDY-IMM	LDA-IND, X	LDX-IMM		LDY- 2 .Page	LDA-Z. Page	LDX-Z. Page		TAY	LDA-IMM	TAX		LDY-ABS	LDA ABS	LDX-ABS		A
8	BCS	LDA-IND, Y			LDY-Z-PaggX	LDA-Z Page, X	LDX ₹. PageY		CLV	LDA-ABS, Y	TSX		LDY-ABS, X	LDA-ABS, X	LOX-ABS, Y		В
С	CPY-IMM	CMP-IND, X			CPY-2.Page	CMP-Z. Page	DEC-2 Page		INY	CMP-IMM	DEX		CPY-ABS	CMP-ABS	DEC-ABS		С
0	BHE	CMP4ND, Y				CMP-₽ Page,X	DEC-E.Page,X		CLD	CMP-ABS, Y				CMP-ABS, X	DEC-ABS, X		0
E	CPX-IMM	SBC-IND, X			CPX-2. Page	SBC-2 Page	INC-Z. Page		INX	SBC-IMM	NOP		CPX-ABS	SBC-ABS	INC-ABS		ε
F	BEO	SEC-IND , Y				SBC-2 Page,X	INC-E-Page,X		SED	58C-A85, Y	·			SBC-ABS, X	INC-ABS, X		1 -

- IMM IMMEDIATE ADDRESSING THE OPERAND IS CONTAINED IN THE SECOND BYTE OF THE INSTRUCTION.
- ABSOLUTE ADDRESSING THE SECOND BYTE OF THE INSTRUCTION CONTAINS THE 8 LOW ORDER BITS OF THE EFFECTIVE ADDRESS. THE THIRD BYTE CONTAINS THE 8 HIGH ORDER BITS OF THE EFFECTIVE ADDRESS.
- <u>PAGE- ZERO PAGE ADDRESSING</u> SECOND BYTE CONTAINS THE 8 LOW ORDER BITS OF THE EFFECTIVE ADDRESS. THE 8 HIGH ORDER BITS ARE ZERO.
- ACCUMULATOR ONE BYTE INSTRUCTION OPERATING ON THE ACCUMULATOR.
- <u>ADDED TO THE INDEX.</u> (CARRY IS DROPPED) TO FORM THE LOW ORDER BYTE OF THE EA. THE HIGH ORDER BYTE OF THE EA IS ZEROS.
- ABS, Y ABSOLUTE INDEXED THE EFFECTIVE ADDRESS IS FORMED BY ADDING THE INDEX TO THE SECOND AND THIRD BYTE OF THE INSTRUCTION.
- (IND. X) INDEXED INDIRECT THE SECOND BYTE OF THE INSTRUCTION IS ADDED. TO THE X INDEX, DISCARDING THE CARRY THE RESULTS POINTS TO A LOCATION ON PAGE ZERO WHICH CONTAINS THE 8 LOW ORDER BITS OF THE EA, THE NEXT BYTE CONTAINS THE 8 HIGH ORDER BITS.
- (IND), Y INDIRECT INDEXED THE SECOND BYTE OF THE INSTRUCTION POINTS TO A LOCA

 TION IN PAGE ZERO. THE CONTENTS OF THIS MEMORY LOCATION IS ADDED TO THE
 Y INDEX, THE RESULT BEING THE LOW ORDER EIGHT BITS OF THE EA. THE CARRY
 FROM THIS OPERATION IS ADDED TO THE CONTENTS OF THE MEXT PAGE ZERO
 LOCATION, THE RESULT BEING THE B HIGH ORDER BITS OF THE EA.



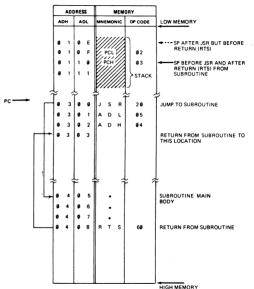


FIG. 2 JSR, RTS OPERATION

ASSEMBLER DIRECTIVES ERRORS (ERR) - CREATE AN ERROR FILE. LIST (LIS) - PRODUCE A FULL ASSEMBLY LISTING

- OPT IF USED MUST BE THE FIRST EXECUTABLE STATEMENT IN THE PROGRAM.
- OPTIONS ARE: (OPTIONS LISTED ARE THE DEFAULT VALUE, TURNED OFF BY (NO) PREFIX.)

COUNT (COU OR CNT) - LIST ALL INSTRUCTIONS AND THEIR USAGE. NOGENERATE (NOG) - DO NOT GENERATE MORE THAN ONE LINE OF CODE FOR ASCII STRINGS.

XREF (XRE) - PRODUCE A CROSS-REFERENCE LIST IN THE SYMBOL TABLE.

MEMORY (MEM) - CREATE AN ASSEMBLER OBJECT OUTPUT FILE.

. BYTE - PRODUCES A SINGLE BYTE IN MEMORY EQUAL TO EACH OPERAND SPECIFIED.

- WORD PRODUCES TWO BYTES IN MEMORY FOUAL TO EACH OPERAND SPECIFIED. *= - DEFINES THE BEGINNING OF A NEW PROGRAM COUNTER SEQUENCE.
- PAGE ADVANCES THE LISTING TO THE TOP OF A NEW PAGE.
- END DEFINES THE END OF A SOURCE PROGRAM

LARFLS:

LABELS BEGIN IN COLUMN 1 AND ARE SEPARATED FROM THE INSTRUCTION BY AT LEAST ONE SPACE. LABELS CAN BE UP TO 6 ALPHANUMENIC CHARACTERS LONG AND MUST BEGIN WITH AN ALPHA CHARACTER. A, X, Y, S, AND P ARE RESERVED AND CANNOT BE USED AS LABELS. LABEL = EXPRESSION CAN BE USED TO EQUATE LABELS TO INSTRUCTIONS.

LABEL * = * + N CAN BE USED TO RESERVE AREAS IN MEMORY

CHARACTERS USED AS SPECIAL PREFIXES:

- INDICATES AN ASSEMBLER DIRECTIVE
- # SPECIFIES THE IMMEDIATE MODE OF ADDRESSING.
- \$ SPECIFIES A HEXADECIMAL CHARACTER.
- SPECIFIES AN OCTAL NUMBER.
- % SPECIFIES A BINARY NUMBER.
- SPECIFIES AN ASCII LITERAL CHARACTER.
- () INDICATES INDIRECT ADDRESSING.
- IN COLUMN 1 INDICATES A COMMENT.

ASCII CHARACTER SET (7-BIT CODE)

								,		
	$ \overline{}$	MSD		1	2	3	4	5	6	7
- 1	LSD		999	991	919	911	199	1 9 1	110	111
	0	0000	NUL	DLE	SP	0	0	Р		р
	1	0001	SOH	DC1	1	1	A	a	а	q
	2	0010	STX	DC2	"	2	В	R	b	r
	3	0011	ETX	DC3	#	3	С	s	С	s
	4	0100	EOT	DC4	\$	4	D	т	d	t
	5	0101	ENG	NAK	%	5	E	υ	e	u
	6	0110	ACK	SYN	&	6	F	٧	f	v
	7	0111	BEL	ЕТВ	• .	7	G	w	9	w
	8	1000	BS	CAN	(8	н	×	h	×
	9	1001	нт	EM)	9	- 1	Y	i	У
	Α	1010	LF	SUB	•	:	J	z	j	z
_	В	1011	VT	ESC	+	;	К		k	
	С	1100	FF	FS	,	<	L	١.	1	1
	D	1101	CR	GS	-	-	м]	m	1
	E	1110	so	RS	•	>	N	1	n	~
	F	1111	SI	vs	/	7		<u>+</u>	0	DEL

