



KIM APPLICATION NOTE #2 INTERVAL TIMER OPERATION

1. Capabilities

The KIM Interval Timer allows the user to specify a preset count and a clock divide rate by writing to a memory location. As soon as the write occurs, counting at the specified rate begins. The timer counts down at the clock frequency divided by the divide rate. The current timer count may be read at any time. At the user's option the timer may be programmed to generate an interrupt when the counter counts down past zero. When a count of zero is passed, the divide rate is automatically set to 1 and the counter continues to count down at the clock rate starting at a count of FF (-1 in two's complement arithmetic). This allows the user to determine how many clock cycles have passed since the timer reached a count of zero. Since the counter never stops, continued counting down will reach 00 again then FF and the count will continue.

2. Operation

a. Loading the timer

The divide rate and interrupt option enable/disable are programmed by decoding the least significant address bits. The starting count for the timer is determined by the value written to that address.

KIM APPLICATION NOTE #2 INTERVAL TIMER OPERATION

Page 2

Writing to Address	Sets Divide Ratio To	Interrupt Capability Is
1704	1	Disabled
1705	8	Disabled
1706	64	Disabled
1707	1024	Disabled
170C	1	Enabled
170D	8	Enabled
170E	64	Enabled
170F	1024	Enabled

b. Determining the timer status

After timing has begun, reading address location 1707 will provide the timer status. If the counter has passed the count of zero, bit 7 will be set to 1, otherwise, bit 7 (and all other bits in location 1707) will be zero. This allows a program to "watch" location 1707 and determine when the timer has timed out.

c. Reading the count in the timer

If the timer has not counted past zero, reading location 1706 will provide the current timer count and disable the interrupt option; reading location 170E will provide the current timer count and enable the interrupt option. Thus the interrupt option can be changed while the timer is counting down.

If the timer has counted past zero, reading either memory location 1706 or 170E will restore the divide ratio to its previously programmed value, disable the interrupt option and leave the timer with its current count.

KIM APPLICATION NOTE #2 INTERVAL TIMER OPERATION

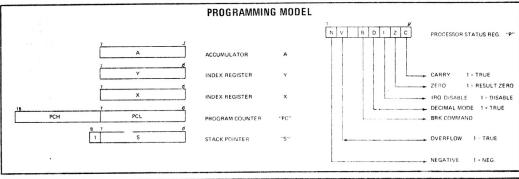
Page 3

d. Using the interrupt option

In order to use the interrupt option described above, line PB7 (application connector, pin 15) should be connected to either the $\overline{\text{IRQ}}$ (Expansion Connector, pin 4) or $\overline{\text{NMI}}$ (Expansion Connector, pin 6) pin depending on the desired interrupt function. PB7 should be programmed as an $\underline{\text{input}}$ line (it's normal state after a RESET).

NOTE: If the programmer desires to use PB7 as a normal I/O line, the programmer is responsible for disabling the timer interrupt option (by writing or reading address 1706) so that it does not interfere with normal operation of PB7. Also, PB7 was designed to be wire-ORed with other possible interrupt sources; if this is not desired, a 5.1K resistor should be used as a pull-up from PB7 to +5v. (The pull-up should NOT be used if PB7 is connected to NMI or IRQ.)

COMMON CHARACTERISTICS



	1142	IК	UL	. ! !	U			•		U	•	υı	טט	ES	š, i	ŁХ	ecı	uti	on	T	im	ıe,	M	ler	no	ory	/	Re	qu	ire	eme	en	ts			
INST	TRUCTIONS	IMME (EDIAT	E A	BSOLU	UTE	OFS	PAGE	17	ACCUA	и Т	1415	PLIED	- (1	IND,	1) [(IND	1),Y	2.5	AGE.	x	ABS	, x	TA	LBS, Y	Y	REL	LATIV	f 11	KDIR	1CT	2,74	AGE, Y	*	CONDI	ITION C
MEMONIC	OPERATION	OP	N I	OP	N	# (OP N	1 11	d Ob	N		OP.	N #						OP	N	. 0	IP N	*	OP	N	N	OP	N A	4 0	P N		OP.	N B	# 1	N 2 C	
	A+M+C + A 11	69	2 2	60	•	3 (35 3	2	1			1				7 3							3									11	١	- 1	11.	
	AAM+A II	29	2 2							2	١,١	١		21	6	2 3	" "	17	16		2 1				1	3			1			П		- 1	, ,	
A S L B C C	BRANCH ON C-0 12				0	3	0	ľ	10'	11		1				1			1				1				90	2	2						· · .	
	BRANCH ON C-1 12			1				1		11		1			1	1									Н			2 3			1	П				
	BRANCH ON 2-1 12	+	+	+	Н		+	+	+	\vdash		7	+	+	\Box		+	_			+	-	\top		П	\Box	FO	2 :	2	+		П	+	1		
BIT	AAM			20		3	24 3	2				1							1	1	1											П	ч		м, /	-
	BRANCH ON N=1 12											1				1	1		1	1				1	П	1		2					1	- 1		
	BRANCH ON Z-9 12	1 1										1		1														2 2				П			-	
	See Fig. 1)	+	+	+	\vdash	\vdash	+	+	+	++	+	00	7 ,	+	+	4	+	-	+	+	+	+	+	+	+	H	1	1	+	+	+	H	+	+		- 1
	BRANCH ON V=9 12	Ш				П						1	1	1						Ш		1					50	2	2			П		- 1		
	BRANCH ON V-1	1 1										1								П				1			10	2	2				11			
CLC	•+c					Ш				1		18			1					1												Ш	1		14. 40.	0 -
	0 + D	\perp	1	1		Ш	1	1	1	1		DB		-	1	ч	+	+	\vdash	Ц	+	+	+	H	\sqcup	Н		1	+	+	+	H	-	+		
	0+1						1					58 88	2 1		1					П		-											1			
CLV	0 + V A-M (1	co	,	, .		, ,		١,	.			88	1		6	2 0	,,	3 2	05	4	2 0	10 4	1,	D9	4	3								-		,
CMP	X-M (1		2 :									1		["	1		1	1		П	- 1	1	1			1									11	1 -
CPY	Y-M	CU	2	cc	4	3	C4 3	1 2	, [1					L		\perp	1							1	1		Ц	Ш	\perp	11	1 -
DEC	M-1+M	\top			6							П		T			T	T	06	6	2 0)E 3	2 3					П					1		11	
DEX	X-1 + X			1							1 1	CA		1					1			1			11							П			11	
DEY	Y-1 + Y											88		١.		2 1			55		, .	0 4	1.	59	1.	3						П			11	
N C	A+M+A 11 M+1+M	49	2		6					1		1		1"	6	1	" "	1	F6	6	2 1	E 7	3	1"	1	1	1					П				
INC	X+1 + X	++	+	+"	+	H	+	+	+	+	H	€8	2 1	+	+	+	+	+	ti	+	1	Ť	+		+	Ħ		11	+	+		\sqcap	П	1	11	
INY	Y+1 + Y			1				1	1			C8				1				П			1		11							П			11	
J M P	JUMP TO NEW LOC.			40											1				1		- 1			1	1 1				Ta.	sc 5	13					
JSR	(See Fig. 2) JUMP SUB			120	6	13	- 1												1 1	1 1	- 1				1				164		3			- 1		-
		1	1 - 1						. [П		.								, .	en .	,	pe		1			6		3					
LDA		, 49	2	2 A			A5	3 2	2	Ш	Ш	Ц		A	6	2	81 5	5 2	85	4	2 8	10 4	3	89	4	3			-		3					
LDA	M + A (1	THE STREET	EDIA.	2 AC	850L	3 VTE				ACCU																			VE	INGIA	AECT				CONDI	
MEMORIC	M + A (1	OP	EDIA'	2 AC	850L	3 VTE	OP I	N ,	# 0	ACCU P N														OP	N	#	OP	ELATIN	VE	INGIA	AECT #	COP	N S	n	N Z	
MEMORIC L D X	M → A 11 OPERATION M → X	OP 11 A2	N 2	2 A(#\$0LU	3 UTE #	A6	3 3	# o										OP.	2	= 0	OP A	1 11	OP Bt		#	OP		VE	INGIA	AECT #	COP		2		
L D X	M + A 11	OP	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6	3 2	# 0 2 2	PN	#	OP.							ОР В4	4	2 8	BC 4	4 3	Bt	N	#	OP		VE	INGIA	AECT #	COP	N S	2	/ /	
L D X	M + A (1) OPERATION M + X M + Y g+(1 1)+c	OP 11 A2	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6	3 2	# 0 2 2		#	90	N	m 0	P N		OP N	2 2	64 56	N 4 6	2 9 2 5	BC 4	4 3	Rt.	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2	
MEMORIC L D X L D Y	M + A 11	OP 11 A2 11 A0	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6 :	N 9	# 0 2 2 2 2 44	PN	#	90		m 0	P N		OP N	2 2	64 56	N 4 6	2 9 2 5	BC 4	4 3	Rt.	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2	
L D X L D Y L S R N O P	M → A 11 OPERATION M → X M + Y g+(1 10+c) NO OPERATION	OP 11 A2 11 A0	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6 :	N 9	# 0 2 2 2 2 44	PN	1	EA	2	m 0	P N		OP N	2 2	64 56	N 4 6	2 9 2 5	BC 4	4 3	Rt.	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2	
L D X L D Y L S R N O P O R A P H A	M + A (1) OPERATION M + X M + Y g+(1 → 1)+c NO OPERATION AV M + A A→ M (S 1→ S P→ M (S 1→ S	0P 11 A2 11 A0	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6 :	N 9	# 0 2 2 2 2 44	PN	1	OP EA 48 08	2 3 3	m 0	P N		OP N	2 2	64 56	N 4 6	2 9 2 5	BC 4	4 3	Rt.	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2	
L D X L D Y L S R N O P O R A P H A P H P	M + A (1) OPERATION M + X M + Y 9-(1 3)+c NO OPERATION AV M + A A-M1 5 1-0-5 S-1-0-5 S-1-0-5 M	0P 11 A2 11 A0	N 2	2 AC	850LI P N E 4 C 4	3 # 3 3	A6 :	N 9	# 0 2 2 2 2 44	PN	1	OP EA 48 08 68	2 3 3 4	m 0	P N		OP N	2 2	64 56	N 4 6	2 9 2 5	BC 4	4 3	Rt.	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2	
L D X L D Y L S R N O P O R A P H A P H P	M + A (1) OPERATION M + X M + Y p+C	0P 11 A2 11 A8	N 2	2 AC	850LI P N E 4 C 4 E 6	3 3 3 3	A6 : 46 :	N 9	# 0 2 2 2 2 4 4	A 2	1	OP EA 48 08	2 3 3 4	1 01	P N		OP N	2 2	56 15	4 6	2 9 2 5	BC 4	4 3	Bt 19	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / / / 0 / / / / / 0 / / / / / / / /	C
NEMONIC L D X L D Y L S R N O P O R A P H A P H P P L A P L P R O L	M + A (1) OPERATION M + X M + Y N + A N + A N + A N + A N + S N	0P 0P 11 A2 11 A0 0P	N 2	2 AC	850LI P N E 4 C 4 E 6	3 3 3 3	A6 : 46 :	N 9	# 0 2 2 2 2 4 4	PN	1	OP EA 48 08 68	2 3 3 4 4	1 01	P N		OP N	2 2	56 15	4 6	2 6 2 5	BC 4	4 3	Bt 19	4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / 0 / / /	C
NEMONIC L D X L D Y L S R N O P O R A P H A P H P P L A P L P R O L	M + A (1) OPERATION M + X M + Y NO OPERATION A V M + A A V M + A S 1 - 5 S 1 - 5 M - W S 1 - 5 C Ger Fg 13 RTAN NU	0P 09 09	2 2 2 2	2 A6 # 0 2 A 46 2 41 41 41 41 41 41 41 41 41 41 41 41 41	B 4 8 50L1 6 N E 4 6 C 4 6 C 4 6 C 6 C 6 C 6 C 6 C 6 C 6	3 3 3 3	OP 1 A6 1 A4 1 46 1 05	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A 2	1	OP 48 98 68 28	2 3 3 4 4	1 01	P N	7	OP A	5 2	56 15	4 6 4	2 6 6 2 5 5 2 1 1 2 2 1 2 1 2 1 2 1 1 1 1 1 1	OP A	4 3 3 4 3 3 4 3 7 3 3	Rt 19	P N 4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / / 0 / / / / / / / / / / / / / / /	C I
NEMONIC LDX LDY LSR NOP ORA PHA PHP PLA PLP ROL RTI	M + A (1) OPERATION M + X M + Y NO OPERATION A V M + A A V M + A S 1 - 5 S 1 - 5 M - W S 1 - 5 C Ger Fg 13 RTAN NU	0P 0P 09 09 09 09 09 09 09 09 09 09 09 09 09	2 2 2 2	2 A6 # 0 2 A 46 2 41 41 41 41 41 41 41 41 41 41 41 41 41	B 4 8 50L1 6 N E 4 6 C 4 6 C 4 6 C 6 C 6 C 6 C 6 C 6 C 6	3 3 3 3	OP 1 A6 1 A4 1 46 1 05	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A 2	1	0P 48 98 68 28	2 3 3 4 4 6 6	# O	P N		OP A	5 2	56 15	4 6 4	2 6 6 2 5 5 2 1 1 2 2 1 2 1 2 1 2 1 1 1 1 1 1	OP A	4 3 3 4 3 3 4 3 7 3 3	Rt 19	P N 4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / / 0 /	C i
NEMONIC L D X L D Y L S R N O P O R A P H P P L A P L P R O L R T I R T S S B C S E C	M + A III SPERATION M + Y SPECIAL SIPPLE	0P 09 09	2 2 2 2	2 A6 # 0 2 A 46 2 41 41 41 41 41 41 41 41 41 41 41 41 41	B 4 8 50L1 6 N E 4 6 C 4 6 C 4 6 C 6 C 6 C 6 C 6 C 6 C 6	3 3 3 3	OP 1 A6 1 A4 1 46 1 05	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A 2	1	0P 48 68 28 49 60	2 3 3 4 4 6 6	# O	P N	7	OP A	5 2	56 15	4 6 4	2 6 6 2 5 5 2 1 1 2 2 1 2 1 2 1 2 1 1 1 1 1 1	OP A	4 3 3 4 3 3 4 3 7 3 3	Rt 19	P N 4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / / 0 /	C I
MEMONIC L D X L D Y L S R N O P O R A P H P P L A P L C R T I S S B C S E C S E D	M + A (1) OPERATION M + X M + Y ST (1) OPERATION N + A (2) A = M (3) ST (1) ST (1) ST (1) ST (2) Geo Fg (2) RTAN NO ST (2) A M (2) A M (3) A M (3) A M (4) A (4) A (5) ST (1) ST (1) ST (1) ST (2) A (3) A (4) A (4) A (4) A (5) A (6) A (7) A (7) A (7) A (7) A (7)	0P 09 09	2 2 2 2	2 A6 # 0 2 A 46 2 41 41 41 41 41 41 41 41 41 41 41 41 41	B 4 8 50L1 6 N E 4 6 C 4 6 C 4 6 C 6 C 6 C 6 C 6 C 6 C 6	3 3 3 3	OP 1 A6 1 A4 1 46 1 05	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A 2	1	OP 48 68 68 28 69 69 69 69 69	2 3 3 4 4 6 6	# O	P N	7	OP A	5 2	56 15	4 6 4	2 6 6 2 5 5 2 1 1 2 2 1 2 1 2 1 2 1 1 1 1 1 1	OP A	4 3 3 4 3 3 4 3 7 3 3	Rt 19	P N 4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / 0 /	C i
LDX LDY LSR NOP ORA PHA PHP ROL RTI RTS SBC SEC SED	M + A III SPERATION M - X M - Y SPECIAL DIPC NO OPERATION AV M + A A - M N S 1 - S F - M S - 1 - S S 1 - S M N - S L - C - S - C - S M - M S - I - S	0P 09 09	2 2 2 2	2 A6 # 0 0 2 A A 2 A 4 E 4 E 5 E 5 E 5 E 5 E 5 E 5 E 5 E 5 E	850LI P N E 4 C 4 E 6	3 3 3 3	OP A6 A4 A4 A6 A6 A6 A6 A6	N 9	# O	A 2	1	OP 48 68 68 28 69 69 69 69 69	2 3 3 4 4 6 6	# O	, 6	7	OP A	5 2	984 56 15	4 6 6 4	2 6 2 5 5 2 1 2 1 2 1 2 1 1 2 1 1 2 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	COP	N S	2	N 2 / / 0 /	C I
LDX LDY LSR NOP ORA PHA PHP ROL RTI RTS SBC SEC SEC SEC	M + A 11 OPERATION M + X M + Y M - Y NO OPERATION AV M + A A - M	0P 09 09	2 2 2 2	2 A6 # 0 0 2 A A 2 4E 2 61 2 E 1	850LE P N E 4 C 4 6 C 4 6 C 4 C 4 C C 4 C C 4 C C C C	3 3 3 3	OP A6 A4 A4 A6 A6 A6 A6 A6	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	# O	A 2	1	OP 48 68 68 28 69 69 69 69 69	2 3 3 4 4 6 6	# O	, 6	7	OP A	5 2	984 56 15	4 6 6 4	2 6 2 5 5 2 1 2 1 2 1 2 1 1 2 1 1 2 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	P N 4	3	OP		VE	INGIA	AECT #	DP 86	N S	2	N 2 / / 0 /	C I
MEMORIC L D X L D Y L S R N O P O R A P L P P L A R T I R T S S B C S E D S E E S T A S T X	M + A III SPERATION M - X M - Y SPECIAL DIPC NO OPERATION AV M + A A - M N S 1 - S F - M S - 1 - S S 1 - S M N - S L - C - S - C - S M - M S - I - S	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	850LI P N E 4 C 4 E 6	3 3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP 48 68 68 28 69 69 69 69 69	2 3 3 4 4 6 6	# O	, 6	7	OP A	5 2	95 95	4 6 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2	N 2 / / 0 /	C I
LDX LDY LSR OORA PHA PHP PLA PLP ROL RTS SBC SEC SEC SEC SEC SEC SEC SEC SEC SEC SE	M + A 11 OPERATION M + X M + Y g+C	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 4	3 3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP EA 48 08 68 28 69 69 78	2 3 3 4 4 6 6 6 2 2 2	# O	, 6	7	OP A	5 2	95 95	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2	N 2 / / / 9 /	C 1
MNEMORIC LDX LDY LSR NOP ORA PHAP PLP ROL RTS SBC SSE STA STX STY TAX	M + A 11 OPERATION M + X M + Y S + Y NO OPERATION A - M 1	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 4	3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP EA 48 08 68 28 49 60 38 F8 78	2 3 3 4 4 6 6 6 2 2 2 2	# O	, 6	7	OP A	5 2	95 95	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2	N 2 / / / 0 / - / /	C 1
ANTEMORIC L D X L D Y L S R N O P O R A P H A P P P P L A R T S S B C S E D S E I S T X S T X T T A Y T S X	M + A 11 OPERATION M + X M + Y p+C	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 4	3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP EA 48 08 68 28 49 60 38 F8 78 AA AB BA	2 3 3 4 4 4 6 6 6 2 2 2 2 2 2	# O	, 6	7	OP A	5 2	95 P5	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2	N 2 / / / 9 /	C 1
MATEMORIC LDY LSR NOPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP	M + A 11 OPERATION M + X M + Y NO OPERATION A - M1	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 4	3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP	2 3 3 4 4 6 6 6 2 2 2 2 2 2	# O	, 6	7	OP A	5 2	95 P5	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2 2	N 2 / / / 0 / - / /	C 1
MEMORIC L D X L S R N O P O R A P H A P P P P R O L I R T S S B C S E I S T A S S T A S T A Y T A Y T S X A T T X S	M + A II OPERATION M + X M + Y M + Y M + Y NO OPERATION AV M + A A + M S - 1 - m 5 S 1 -	0P 09 09	2 2 2 2	2 A(0 # 0 0 2 A 4 5 4 5 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B 4	3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# O	A 2	1	OP	2 3 3 4 4 6 6 6 2 2 2 2 2 2 2 2	# O	, 6	7	OP A	5 2	95 P5	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3 4 3 3	8t 19	9 4	3	OP		VE	INGIA	AECT #	DP 86) N 5	2 2	N 2 / / / 9 /	C 1
MEMORICE LDX LSR NOPORA PHAP PPLA RTTS SEC SET A STX	M + A 11 OPERATION M + X M + Y NO OPERATION A - M1	00 OP 00 00 00 00 00 00 00 00 00 00 00 00 00	2 2 2	2 AC ## 0 0 2 A 4E 2 6 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	B 4 4 6 4 6 4 6 6 6 6 6 6 6 6 6 6 6 6 6	3 3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 5 : 3 : 3 : 3 : 3 : 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A 2	1	OP EA 48 68 68 28 49 60 38 F8 78 AA A8 BA 8A 9A 98	2 3 3 4 4 4 6 6 6 2 2 2 2 2 2 2 2 2 2	# O	, 6	7	OP A	5 2	95 P5	4 6 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3 4 3 3	8t 19	9 4	3	OP		w c	INGIR	ACCT #	DP 86) N 5	2 2	N 2 / / / 9 /	C 1
MODIC D X D Y S R O P O R A H A H P L A L P L T S E C E D E I T X T Y A X A Y X X X X X A I ADD	M + A 11 OPERATION M + X M + Y g+C	00 00 00 00 00 00 00 00 00 00 00 00 00	2 2 2 Y IS C	2 A6 # 0 2 A 45 2 45 45 45 45 45 45 45 45 45 45 45 45 45	#\$011 P N E 4 C 4 E 6 D 4	3 3 3 3 3 3	OP A6 A4 A4 A4 A4 A4 A4 A4	N / 3 : 3 : 3 : 3 : 3 : 3 : 3 : 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	X IN	noex Noex	0P EA 48 68 28 68 78 AA A8 BA 8A 9A 98 X X X Y	2 3 3 4 4 6 6 6 2 2 2 2 2 2 2 2 2 2	# O	, 6	7	OP A	5 2	95 P5	4 6 6 4 4 4 4	2 8 8 2 5 5 5 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1	OP A	N # 4 3 3 4 3 3 4 3 3	8t 19	9 4	3	OP	EX MC	WE CCLUS	SIVE I	OR	DP 86) N 5	2 2	N 2 / / / 9 /	C 1
EMORIC DX DX DY DA DX DY DA DX DY DA DX	M + A 11 OPERATION M + X M + Y M + Y M + Y M - Y M - OPERATION A - M	000 000 000 000 000 000 000 000 000 00	Y IS C	2 A6 # 0 2 A 6 2 A6 8 8 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9	#\$011	3 3 3 3 3 3 3 3 3 3 3 5 6 6 6 6 6 6 6 6	OP 46 46 46 46 46 46 46 4	N / 3 : 3 : 3 : 3 : 3 : 3 : 3 : 3	# 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	X IN	NOEX NOEX	68 68 28 49 60 38 78 AA AA BA BA BA BA BA BA	2 3 3 4 4 4 6 6 6 2 2 2 2 2 2 2 2 2 2	# O	, 6	2	OP A	5 2 6 2	95 95 94	4 6 6 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	2 6 7 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	OP 4	4 3 3 7 3 4 3 7 3 4 3 3 5 5 3	8t 19	9 4	3	OP	EX MC	WE C	SIVE I	OR OR	DP 86) N 5	2 2	N 2 / / / 9 /	C 1