

Documentation Développeurs Apple Computer France 1987

Document développeur numéro 2

65816 addressing mode & bank crossing

type d'upgrade de ce document : 1

- 1 Documentation de première catégorie inchangée
- 2 Documentation de deuxième catégorie mise à jour
- 3 Documentation de deuxième catégorie inchangée
- 4 Mise à jour payante de la documentation de première catégorie
- 5 Mise à jour gratuite de la documentation de première catégorie
- 6 Nouveautés payantes non vitales
- 7 Nouveautés gratuites et vitales

Taille : 11 page(s) environ

Domaine : 816

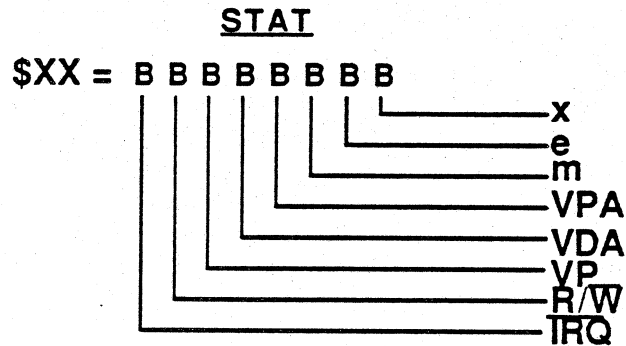
VERSION :
DATE : 19.11.85

Date: 11/19/85
To: Cortland Software team.
From: Gus Andrade
Subject: 65816 addressing modes and bank crossings.

The following document contains a cycle by cycle breakdown of the LDA instruction for each of the 65816 addressing modes. The listing shows how the data bank register is affected by data accesses which cross bank boundaries.

The program sets up the processor into native mode with full sixteen bit registers. The registers are set such that a bank crossing will be forced when an indexed addressing mode instruction is executed. For each of the addressing modes which perform indexing, the index register is set to \$FFFF, the instruction is executed, then the index register is reset to \$0000 and the instruction is executed again.

The STAT field is defined as follows:



```

SOURCE FILE #01 =>BCROSS.SRC
0000: 0000 1 x65816
0000: 0000 2 tabs 24,32,48
0000: 0000 3 lst on,c

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0000: 5 *****
0000: 6 *
0000: 7 * Bank.cross: This routine will execute all of the LDA opcodes for
0000: 8 * all of the addressing modes.
0000: 9 *
0000: 10 *****
0000: 11 ;
----- NEXT OBJECT FILE NAME IS /LS/BCROSS.OBJ
1000: 1000 12 org $1000
1000: 13 ;
1000: 14 ;
1000: 0000 15 direct equ $00 ;
1000: FFFF 16 abs equ $FFFF ;
1000: FFFF 17 abs.long equ $03FFFF ;
1000: 18 ;
1000: 19 ;
1000: 1000 20 Bank.cross equ * ;
1000:08 (3) 21 php ; save current environment
1001:FB (2) 22 xce
1002:08 (3) 23 php ;
1003:18 (2) 24 cbc ; go into native mode
1004:FB (2) 25 xce ;
1005: 26 memory16
1005: 27 index16
1005:C2 30 (2) 28 rep #$30 ; m=0, x=0
1007:8B (3) 29 phb ; save data bank register
1008:A9 02 02 (2) 30 lda #$0202 ; point to bank 02
100B:48 (3) 31 pha ;
100C:AB (4) 32 plb ;
100D:AB (4) 33 plb ;
100E: 34 ;
100E:A2 FF FF (2) 35 ldx $FFFF ; we want to cross banks
1011:A5 00 (3) 36 lda $00 ; save a small piece of zero page
1013:48 (3) 37 pha ;
1014:A5 02 (3) 38 lda $02 ;
1016:48 (3) 39 pha ;
1017:A5 04 (3) 40 lda $04 ;
1019:48 (3) 41 pha ;
101A:86 00 (3) 42 stx $00 ; set up indirect pointers
101C:8E FF FF (4) 43 stx abs ; set up indirect pointer
101F:A0 05 00 (2) 44 ldy #$0005 ; set upper word of indirect pointer
1022:84 02 (3) 45 sty $02 ;
1024:A0 FF FF (2) 46 ldy $FFFF ;
1027: 47 ;
1027:AD FF FF (4) 48 lda abs ; absolute addressing
102A:AF FF FF 03 (5) 49 lda abs.long ; absolute long
102E:A5 00 (3) 50 lda direct ; direct addressing
1030:B1 00 (5) 51 lda (direct),y ; direct indirect indexed by y
1032:C8 (2) 52 iny ; clear index
1033:B1 00 (5) 53 lda (direct),y ; direct indirect indexed by y
1035:88 (2) 54 dey ; restore index
1036:B7 00 (6) 55 lda [direct],y ; direct indirect long
1038:C8 (2) 56 iny ; clear index
1039:B7 00 (6) 57 lda [direct],y ;
103B:88 (2) 58 dey ;
103C:A1 00 (6) 59 lda (direct,x) ; direct indexed indirect
103E:E8 (2) 60 inx ; clear index
103F:A1 00 (6) 61 lda (direct,x) ; direct indexed indirect
1041:CA (2) 62 dex ; restore index
1042:B5 00 (4) 63 lda direct,x ; direct indexed by x
1044:DA (3) 64 phx ;
1045:B6 00 (4) 65 ldx direct,y ; direct indexed by y
1047:FA (4) 66 plx ;
1048:BD FF FF (4) 67 lda abs,x ; absolute indexed by x
104B:E8 (2) 68 inx ; clear index
104C:BD FF FF (4) 69 lda abs,x ;

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104F:CA      (2) 70
1050:BF FF FF 03 (5) 71
1054:E8      (2) 72
1055:BF FF FF 03 (5) 73
1059:CA      (2) 74
105A:B9 FF FF   (4) 75
105D:C8      (2) 76
105E:B9 FF FF   (4) 77
1061:88      (2) 78
1062:B2 00    (5) 79
1064:A7 00    (6) 80
1066:3B      (2) 81
1067:85 04    (3) 82
1069:9A      (2) 83
106A:A3 00    (4) 84
106C:        (2) 85 ;
106C:        106C 86 enab.lcram
106C:E2 20    (2) 87
106E:        (2) 88
106E:AF 87 C0 00 (5) 89
1072:AF 87 C0 00 (5) 90
1076:A9 FF    (2) 91
1078:8F FF FF 00 (5) 92
107C:C2 20    (2) 93
107E:        (2) 94
107E:B3 00    (7) 95
1080:C8      (2) 96
1081:B3 00    (7) 97
1083:        (2) 98 ;
1083:AF 81 C0 00 (5) 99
1087:A5 04    (3) 100
1089:1B      (2) 101
108A:A9 FF FF (2) 102
108D:0B      (4) 103
108E:5B      (2) 104
108F:A5 00    (3) 105
1091:        (2) 106 ;
1091:2B      (5) 107
1092:68      (4) 108
1093:85 04    (3) 109
1095:68      (4) 110
1096:85 02    (3) 111
1098:68      (4) 112
1099:85 00    (3) 113
109B:AB      (4) 114
109C:28      (4) 115
109D:FB      (2) 116
109E:28      (4) 117
109F:60      (6) 118
10A0:        (2) 119 ;
10A0:        (2) 120 ;

```

```

dex          ; restore index
lda =abs.long,x ; absolute indexed by y long
inx          ; clear index
lda =abs.long,x ;
dex          ; restore index
lda abs,y     ; absolute indexed by y
iny          ; clear index
lda abs,y     ;
dey          ;
lda (direct)  ; direct indirect
lda (direct)  ; direct indirect long
tsc          ; save stack pointer
sta $0004    ;
txs          ; set new stack pointer
lda direct,s ; stack relative
equ *
sep $20      ; m = 1
memory8
lda =$00C087 ; enable for read & write
lda =$00C087 ;
lda $FF      ;
sta =$00FFFF ; set up indirect pointer
rep $20      ; m = 0
memory16
lda (direct,s),y ; stack relative indirect indexed
iny          ; clear index
lda (direct,s),y ; stack relative indirect indexed
lda =$00C081  ; enable read rom
lda $0004    ; restore stack pointer
tcs          ;
lda #abs     ; set direct register
phd         ; save direct register
tcd         ;
lda direct  ; better roll over
pld         ; restore direct register
pla        ; restore zero page
sta $04    ;
pla        ; restore zero page
sta $02    ;
pla        ;
sta $00    ;
plb        ; restore data bank register
plp        ; restore uP setup
xce        ;
plp        ;
rts        ; >>>--- exit Bank.cross --->>>

```

```

03FFFF ABS.LONG      FFFF ABS      ? 1000 BANK.CROSS      00 DIRECT
? 106C ENAB.LCRAM
** SUCCESSFUL ASSEMBLY := NO ERRORS
** ASSEMBLER CREATED ON 07-NOV-85 17:29
** TOTAL LINES ASSEMBLED 120
** FREE SPACE PAGE COUNT 79

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State Listing

Label>	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ
[Mark]	XXXXXX	[Instructions]	XX	[XXXXX]	
+0000*	001000	PHP	FF	opcde	0.0
+0001	001001	FB false read	E7	fread	320.0 n
+0002	0001E3	30 data written	B7	write	360.0 n
+0003*	001001	XCE	FF	opcde	360.0 n
+0004	001002	08 false read	E7	fread	360.0 n
+0005*	001002	PHP	FD	opcde	320.0 n
+0006	001003	18 false read	E5	fread	720.0 n
+0007	0001E2	31 data written	B5	write	360.0 n
+0008*	001003	CLC	FD	opcde	320.0 n
+0009	001004	FB false read	E5	fread	360.0 n
+0010*	001004	XCE	FD	opcde	360.0 n
+0011	001005	C2 false read	E5	fread	360.0 n
+0012*	001005	REP #30	FD	opcde	320.0 n
+0013	001006	30 operand fetched	ED	oprnd	360.0 n
+0014	001006	30 false read	E5	fread	360.0 n
+0015*	001007	PHB	F9	opcde	680.0 n
+0016	001008	A9 false read	E0	fread	360.0 n
+0017	0001E1	00 data written	B0	write	360.0 n
+0018*	001008	LDA #0202	F8	opcde	320.0 n
+0019	001009	02 operand fetched	E8	oprnd	360.0 n
+0020	00100A	02 operand fetched	E8	oprnd	360.0 n
+0021*	00100B	PHA	F8	opcde	360.0 n
+0022	00100C	AB false read	E0	fread	320.0 n
+0023	0001E0	02 data written	B0	write	360.0 n
+0024	0001DF	02 data written	B0	write	680.0 n
+0025*	00100C	PLB	F8	opcde	360.0 n
+0026	00100D	AB false read	E0	fread	360.0 n
+0027	00100D	AB false read	E0	fread	360.0 n
+0028	0001DF	02 data read	F0	read	320.0 n
+0029*	00100D	PLB	F8	opcde	360.0 n
+0030	00100E	A2 false read	E0	fread	360.0 n
+0031	00100E	A2 false read	E0	fread	360.0 n
+0032	0001E0	02 data read	F0	read	320.0 n
+0033*	00100E	LDX #FFFF	F8	opcde	720.0 n
+0034	00100F	FF operand fetched	E8	oprnd	360.0 n
+0035	001010	FF operand fetched	E8	oprnd	320.0 n
+0036*	001011	LDA 00	F8	opcde	360.0 n
+0037	001012	00 operand fetched	E8	oprnd	360.0 n
+0038	000000	4C data read	F0	read	320.0 n
+0039	000001	3C data read	F0	read	360.0 n
+0040*	001013	PHA	F8	opcde	360.0 n
+0041	001014	A5 false read	E0	fread	360.0 n
+0042	0001E0	3C data written	B0	write	680.0 n
+0043	0001DF	4C data written	B0	write	360.0 n
+0044*	001014	LDA 02	F8	opcde	360.0 n
+0045	001015	02 operand fetched	E8	oprnd	320.0 n
+0046	000002	D4 data read	F0	read	360.0 n
+0047	000003	4C data read	F0	read	360.0 n
+0048*	001016	PHA	F8	opcde	320.0 n
+0049	001017	A5 false read	E0	fread	360.0 n
+0050	0001DE	4C data written	B0	write	360.0 n

State Listing

Label >	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ
[Mark]	XXXXXX	[Instructions]	XX	[XXXXXX]	
+0051	000100	D4 data written	B0	write	680.0 n
+0052*	001017	LDA 04	F8	opcde	360.0 n
+0053	001018	04 operand fetched	E8	oprnd	360.0 n
+0054	000004	3A data read	F0	read	360.0 n
+0055	000005	0B data read	F0	read	320.0 n
+0056*	001019	PHA	F8	opcde	360.0 n
+0057	00101A	86 false read	E0	fread	360.0 n
+0058	00010C	0B data written	B0	write	360.0 n
+0059	00010B	3A data written	B0	write	320.0 n
+0060*	00101A	STX 00	F8	opcde	720.0 n
+0061	001018	00 operand fetched	E8	oprnd	320.0 n
+0062	000000	FF data written	B0	write	360.0 n
+0063	000001	FF data written	B0	write	360.0 n
+0064*	00101C	STX FFFF	F8	opcde	360.0 n
+0065	00101D	FF operand fetched	E8	oprnd	320.0 n
+0066	00101E	FF operand fetched	E8	oprnd	360.0 n
+0067	02FFFF	FF data written	B0	write	360.0 n
+0068	030000	FF data written	B0	write	320.0 n
+0069*	00101F	LDY #0005	F8	opcde	720.0 n
+0070	001020	05 operand fetched	E8	oprnd	360.0 n
+0071	001021	00 operand fetched	E8	oprnd	320.0 n
+0072*	001022	STY 02	F8	opcde	360.0 n
+0073	001023	02 operand fetched	E8	oprnd	360.0 n
+0074	000002	05 data written	B0	write	360.0 n
+0075	000003	00 data written	B0	write	320.0 n
+0076*	001024	LDY #FFFF	F8	opcde	360.0 n
+0077	001025	FF operand fetched	E8	oprnd	360.0 n
+0078	001026	FF operand fetched	E8	oprnd	680.0 n
+0079*	001027	LDA FFFF	F8	opcde	360.0 n
+0080	001028	FF operand fetched	E8	oprnd	360.0 n
+0081	001029	FF operand fetched	E8	oprnd	360.0 n
+0082	02FFFF	FF data read	F0	read	320.0 n
+0083	030000	FF data read	F0	read	360.0 n
+0084*	00102A	LDA 03FFFF	F8	opcde	360.0 n
+0085	00102B	FF operand fetched	E8	oprnd	320.0 n
+0086	00102C	FF operand fetched	E8	oprnd	360.0 n
+0087	00102D	03 operand fetched	E8	oprnd	720.0 n
+0088	03FFFF	00 data read	F0	read	320.0 n
+0089	040000	00 data read	F0	read	360.0 n
+0090*	00102E	LDA 00	F8	opcde	360.0 n
+0091	00102F	00 operand fetched	E8	oprnd	360.0 n
+0092	000000	FF data read	F0	read	320.0 n
+0093	000001	FF data read	F0	read	360.0 n
+0094*	001030	LDA (00),Y	F8	opcde	360.0 n
+0095	001031	00 operand fetched	E8	oprnd	320.0 n
+0096	000000	FF data read	F0	read	720.0 n
+0097	000001	FF data read	F0	read	360.0 n
+0098	02FFFE	04 false read	E0	fread	320.0 n
+0099	03FFFE	04 data read	F0	read	360.0 n
+0100	03FFFF	00 data read	F0	read	360.0 n
+0101*	001032	INY	F8	opcde	360.0 n

State Listing

Label	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base	[HEX]	[ASM]	[HEX]	[USR]	[Relativ]
[Mark]	XXXXXX	[Instructions]	XX	[XXXXX]	
+0102	001033	B1 false read	E0	fread	320.0 n
+0103*	001033	LDA (00),Y	F8	opcde	360.0 n
+0104	001034	00 operand fetched	E8	oprnd	360.0 n
+0105	000000	FF data read	F0	read	680.0 n
+0106	000001	FF data read	F0	read	360.0 n
+0107	02FFFF	FF false read	E0	fread	360.0 n
+0108	02FFFF	FF data read	F0	read	320.0 n
+0109	030000	FF data read	F0	read	360.0 n
+0110*	001035	DEY	F8	opcde	360.0 n
+0111	001036	B7 false read	E0	fread	360.0 n
+0112*	001036	LDA [00],Y	F8	opcde	320.0 n
+0113	001037	00 operand fetched	E8	oprnd	360.0 n
+0114	000000	FF data read	F0	read	720.0 n
+0115	000001	FF data read	F0	read	320.0 n
+0116	000002	05 data read	F0	read	360.0 n
+0117	06FFFFE	00 data read	F0	read	360.0 n
+0118	06FFFF	00 data read	F0	read	320.0 n
+0119*	001038	INX	F8	opcde	360.0 n
+0120	001039	B7 false read	E0	fread	360.0 n
+0121*	001039	LDA [00],Y	F8	opcde	360.0 n
+0122	00103A	00 operand fetched	E8	oprnd	320.0 n
+0123	000000	FF data read	F0	read	720.0 n
+0124	000001	FF data read	F0	read	360.0 n
+0125	000002	05 data read	F0	read	320.0 n
+0126	05FFFF	00 data read	F0	read	360.0 n
+0127	050000	00 data read	F0	read	360.0 n
+0128*	00103B	DEY	F8	opcde	320.0 n
+0129	00103C	A1 false read	E0	fread	360.0 n
+0130*	00103C	LDA (00,X)	F8	opcde	360.0 n
+0131	00103D	00 operand fetched	E8	oprnd	360.0 n
+0132	00103D	00 false read	E0	fread	680.0 n
+0133	00FFFF	C0 data read	F0	read	360.0 n
+0134	000000	FF data read	F0	read	360.0 n
+0135	02FFC0	80 data read	F0	read	320.0 n
+0136	02FFC1	80 data read	F0	read	360.0 n
+0137*	00103E	INX	F8	opcde	360.0 n
+0138	00103F	A1 false read	E0	fread	360.0 n
+0139*	00103F	LDA (00,X)	F8	opcde	320.0 n
+0140	001040	00 operand fetched	E8	oprnd	360.0 n
+0141	001040	00 false read	E0	fread	680.0 n
+0142	000000	FF data read	F0	read	360.0 n
+0143	000001	FF data read	F0	read	360.0 n
+0144	02FFFF	FF data read	F0	read	360.0 n
+0145	030000	FF data read	F0	read	320.0 n
+0146*	001041	DEX	F8	opcde	360.0 n
+0147	001042	B5 false read	E0	fread	360.0 n
+0148*	001042	LDA 00,X	F8	opcde	360.0 n
+0149	001043	00 operand fetched	E8	oprnd	320.0 n
+0150	001043	00 false read	E0	fread	720.0 n
+0151	00FFFF	C0 data read	F0	read	360.0 n
+0152	000000	FF data read	F0	read	320.0 n

State Listing

Label >	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ]
[Mark]	XXXXXX	[Instructions]	XX	[XXXXX]	
+0153*	001044	PHX	F8	opcde	360.0 n
+0154	001045	B6 false read	E0	fread	360.0 n
+0155	0001DA	FF data written	B0	write	320.0 n
+0156	0001D9	FF data written	B0	write	360.0 n
+0157*	001045	LDX 00,Y	F8	opcde	360.0 n
+0158	001046	00 operand fetched	E8	oprnd	360.0 n
+0159	001046	00 false read	E0	fread	680.0 n
+0160	00FFFF	C0 data read	F0	read	360.0 n
+0161	000000	FF data read	F0	read	360.0 n
+0162*	001047	PLX	F8	opcde	320.0 n
+0163	001048	BD false read	E0	fread	360.0 n
+0164	001048	BD false read	E0	fread	360.0 n
+0165	0001D9	FF data read	F0	read	360.0 n
+0166	0001DA	FF data read	F0	read	320.0 n
+0167*	001048	LDA FFFF,X	F8	opcde	360.0 n
+0168	001049	FF operand fetched	E8	oprnd	680.0 n
+0169	00104A	FF operand fetched	E8	oprnd	360.0 n
+0170	02FFFE	04 false read	E0	fread	360.0 n
+0171	03FFFE	04 data read	F0	read	360.0 n
+0172	03FFFF	00 data read	F0	read	320.0 n
+0173*	00104B	INX	F8	opcde	360.0 n
+0174	00104C	BD false read	E0	fread	360.0 n
+0175*	00104C	LDA FFFF,X	F8	opcde	320.0 n
+0176	00104D	FF operand fetched	E8	oprnd	360.0 n
+0177	00104E	FF operand fetched	E8	oprnd	720.0 n
+0178	02FFFF	FF false read	E0	fread	320.0 n
+0179	02FFFF	FF data read	F0	read	360.0 n
+0180	030000	FF data read	F0	read	360.0 n
+0181*	00104F	DEX	F8	opcde	360.0 n
+0182	001050	BF false read	E0	fread	320.0 n
+0183*	001050	LDA 03FFFF,X	F8	opcde	360.0 n
+0184	001051	FF operand fetched	E8	oprnd	360.0 n
+0185	001052	FF operand fetched	E8	oprnd	360.0 n
+0186	001053	03 operand fetched	E8	oprnd	680.0 n
+0187	04FFFE	00 data read	F0	read	360.0 n
+0188	04FFFF	00 data read	F0	read	320.0 n
+0189*	001054	INX	F8	opcde	360.0 n
+0190	001055	BF false read	E0	fread	360.0 n
+0191*	001055	LDA 03FFFF,X	F8	opcde	360.0 n
+0192	001056	FF operand fetched	E8	oprnd	320.0 n
+0193	001057	FF operand fetched	E8	oprnd	360.0 n
+0194	001058	03 operand fetched	E8	oprnd	360.0 n
+0195	03FFFF	00 data read	F0	read	680.0 n
+0196	040000	00 data read	F0	read	360.0 n
+0197*	001059	DEX	F8	opcde	360.0 n
+0198	00105A	B9 false read	E0	fread	320.0 n
+0199*	00105A	LDA FFFF,Y	F8	opcde	360.0 n
+0200	00105B	FF operand fetched	E8	oprnd	360.0 n
+0201	00105C	FF operand fetched	E8	oprnd	360.0 n
+0202	02FFFE	04 false read	E0	fread	320.0 n
+0203	03FFFE	04 data read	F0	read	360.0 n

State Listing

Label >	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ]
[Mark]	XXXXXX	[Instructions]	XX	[XXXXXX]	
+0204	03FFFF	00 data read	F0	read	720.0 n
+0205*	00105D	INY	F8	opcde	320.0 n
+0206	00105E	B9 false read	E0	fread	360.0 n
+0207*	00105E	LDA FFFF,Y	F8	opcde	360.0 n
+0208	00105F	FF operand fetched	E8	oprnd	360.0 n
+0209	001060	FF operand fetched	E8	oprnd	320.0 n
+0210	02FFFF	FF false read	E0	fread	360.0 n
+0211	02FFFF	FF data read	F0	read	360.0 n
+0212	030000	FF data read	F0	read	320.0 n
+0213*	001061	DEY	F8	opcde	720.0 n
+0214	001062	B2 false read	E0	fread	360.0 n
+0215*	001062	LDA (00)	F8	opcde	320.0 n
+0216	001063	00 operand fetched	E8	oprnd	360.0 n
+0217	000000	FF data read	F0	read	360.0 n
+0218	000001	FF data read	F0	read	360.0 n
+0219	02FFFF	FF data read	F0	read	320.0 n
+0220	030000	FF data read	F0	read	360.0 n
+0221*	001064	LDA [00]	F8	opcde	360.0 n
+0222	001065	00 operand fetched	E8	oprnd	680.0 n
+0223	000000	FF data read	F0	read	360.0 n
+0224	000001	FF data read	F0	read	360.0 n
+0225	000002	05 data read	F0	read	320.0 n
+0226	05FFFF	00 data read	F0	read	360.0 n
+0227	060000	00 data read	F0	read	360.0 n
+0228*	001066	TSC	F8	opcde	360.0 n
+0229	001067	85 false read	E0	fread	320.0 n
+0230*	001067	STA 04	F8	opcde	360.0 n
+0231	001068	04 operand fetched	E8	oprnd	720.0 n
+0232	000004	DA data written	B0	write	320.0 n
+0233	000005	01 data written	B0	write	360.0 n
+0234*	001069	TXS	F8	opcde	360.0 n
+0235	00106A	A3 false read	E0	fread	320.0 n
+0236*	00106A	LDA 00,S	F8	opcde	360.0 n
+0237	00106B	00 operand fetched	E8	oprnd	360.0 n
+0238	00106B	00 false read	E0	fread	360.0 n
+0239	00FFFF	C0 data read	F0	read	320.0 n
+0240	000000	FF data read	F0	read	720.0 n
+0241*	00106C	SEP #20	F8	opcde	360.0 n
+0242	00106D	20 operand fetched	E8	oprnd	320.0 n
+0243	00106D	20 false read	E0	fread	360.0 n
+0244*	00106E	LDA 00C087	FC	opcde	360.0 n
+0245	00106F	87 operand fetched	EC	oprnd	320.0 n
+0246	001070	C0 operand fetched	EC	oprnd	360.0 n
+0247	001071	00 operand fetched	EC	oprnd	360.0 n
+0248	00C087	FF data read	F4	read	1.800 u
+0249*	001072	LDA 00C087	FC	opcde	720.0 n
+0250	001073	87 operand fetched	EC	oprnd	320.0 n
+0251	001074	C0 operand fetched	EC	oprnd	360.0 n
+0252	001075	00 operand fetched	EC	oprnd	360.0 n
+0253	00C087	00 data read	F4	read	1.200 u
+0254*	001076	LDA #FF	FC	opcde	680.0 n

State Listing

Label >	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ]
[Mark]	XXXXXX	[Instructions]	XX	[XXXXXX]	
+0255	001077	FF operand fetched	EC	oprnd	360.0 n
+0256*	001078	STA 00FFFF	FC	opcde	360.0 n
+0257	001079	FF operand fetched	EC	oprnd	320.0 n
+0258	00107A	FF operand fetched	EC	oprnd	360.0 n
+0259	00107B	00 operand fetched	EC	oprnd	360.0 n
+0260	00FFFF	FF data written	B4	write	360.0 n
+0261*	00107C	REP #20	FC	opcde	680.0 n
+0262	00107D	20 operand fetched	EC	oprnd	360.0 n
+0263	00107D	20 false read	E4	fread	320.0 n
+0264*	00107E	LDA (00,S),Y	F8	opcde	360.0 n
+0265	00107F	00 operand fetched	E8	oprnd	360.0 n
+0266	00107F	00 false read	E0	fread	360.0 n
+0267	00FFFF	FF data read	F0	read	320.0 n
+0268	000000	FF data read	F0	read	360.0 n
+0269	000000	FF false read	E0	fread	360.0 n
+0270	03FFFE	04 data read	F0	read	680.0 n
+0271	03FFFF	00 data read	F0	read	360.0 n
+0272*	001080	INY	F8	opcde	360.0 n
+0273	001081	B3 false read	E0	fread	320.0 n
+0274*	001081	LDA (00,S),Y	F8	opcde	360.0 n
+0275	001082	00 operand fetched	E8	oprnd	360.0 n
+0276	001082	00 false read	E0	fread	360.0 n
+0277	00FFFF	FF data read	F0	read	320.0 n
+0278	000000	FF data read	F0	read	360.0 n
+0279	000000	FF false read	E0	fread	720.0 n
+0280	02FFFF	FF data read	F0	read	320.0 n
+0281	030000	FF data read	F0	read	360.0 n
+0282*	001083	LDA 00C081	F8	opcde	360.0 n
+0283	001084	81 operand fetched	E8	oprnd	360.0 n
+0284	001085	C0 operand fetched	E8	oprnd	320.0 n
+0285	001086	00 operand fetched	E8	oprnd	360.0 n
+0286	00C081	00 data read	F0	read	1.120 u
+0287	00C082	00 data read	F0	read	960.0 n
+0288*	001087	LDA 04	F8	opcde	360.0 n
+0289	001088	04 operand fetched	E8	oprnd	360.0 n
+0290	000004	DA data read	F0	read	360.0 n
+0291	000005	01 data read	F0	read	320.0 n
+0292*	001089	TCS	F8	opcde	360.0 n
+0293	00108A	A9 false read	E0	fread	360.0 n
+0294*	00108A	LDA #FFFF	F8	opcde	680.0 n
+0295	00108B	FF operand fetched	E8	oprnd	360.0 n
+0296	00108C	FF operand fetched	E8	oprnd	360.0 n
+0297*	00108D	PHD	F8	opcde	320.0 n
+0298	00108E	5B false read	E0	fread	360.0 n
+0299	0001DA	00 data written	B0	write	360.0 n
+0300	0001D9	00 data written	B0	write	360.0 n
+0301*	00108E	TCD	F8	opcde	320.0 n
+0302	00108F	A5 false read	E0	fread	360.0 n
+0303*	00108F	LDA 00	F8	opcde	680.0 n
+0304	001090	00 operand fetched	E8	oprnd	360.0 n
+0305	001090	00 false read	E0	fread	360.0 n

State Listing

Label	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base	[HEX]	[ASM]	[HEX]	[USR]	[Relativ
[Mark]	XXXXXX	[Instructions]	XX	[XXXXXX]	
+0306	00FFFF	C0 data read	F0	read	360.0 n
+0307	000000	FF data read	F0	read	320.0 n
+0308*	001091	PLD	F8	opcde	360.0 n
+0309	001092	68 false read	E0	fread	360.0 n
+0310	001092	68 false read	E0	fread	360.0 n
+0311	0001D9	00 data read	F0	read	320.0 n
+0312	0001DA	00 data read	F0	read	720.0 n
+0313*	001092	PLA	F8	opcde	360.0 n
+0314	001093	85 false read	E0	fread	320.0 n
+0315	001093	85 false read	E0	fread	360.0 n
+0316	0001DB	3A data read	F0	read	360.0 n
+0317	0001DC	DB data read	F0	read	360.0 n
+0318*	001093	STA 04	F8	opcde	320.0 n
+0319	001094	04 operand fetched	E8	oprnd	360.0 n
+0320	000004	3A data written	B0	write	360.0 n
+0321	000005	DB data written	B0	write	680.0 n
+0322*	001095	PLA	F8	opcde	360.0 n
+0323	001096	85 false read	E0	fread	360.0 n
+0324	001096	85 false read	E0	fread	320.0 n
+0325	0001D0	D4 data read	F0	read	360.0 n
+0326	0001DE	4C data read	F0	read	360.0 n
+0327*	001096	STA 02	F8	opcde	320.0 n
+0328	001097	02 operand fetched	E8	oprnd	360.0 n
+0329	000002	D4 data written	B0	write	360.0 n
+0330	000003	4C data written	B0	write	680.0 n
+0331*	001098	PLA	F8	opcde	360.0 n
+0332	001099	85 false read	E0	fread	360.0 n
+0333	001099	85 false read	E0	fread	360.0 n
+0334	0001DF	4C data read	F0	read	320.0 n
+0335	0001E0	3C data read	F0	read	360.0 n
+0336*	001099	STA 00	F8	opcde	360.0 n
+0337	00109A	00 operand fetched	E8	oprnd	360.0 n
+0338	000000	4C data written	B0	write	320.0 n
+0339	000001	3C data written	B0	write	720.0 n
+0340*	00109B	PLB	F8	opcde	320.0 n
+0341	00109C	28 false read	E0	fread	360.0 n
+0342	00109C	28 false read	E0	fread	360.0 n
+0343	0001E1	00 data read	F0	read	360.0 n
+0344*	00109C	PLP	F8	opcde	320.0 n
+0345	00109D	FB false read	E0	fread	360.0 n
+0346	00109D	FB false read	E0	fread	360.0 n
+0347	0001E2	31 data read	F4	read	360.0 n
+0348*	00109D	XCE	FD	opcde	680.0 n
+0349	00109E	28 false read	E5	fread	360.0 n
+0350*	00109E	PLP	FF	opcde	360.0 n
+0351	00109F	60 false read	E7	fread	320.0 n
+0352	00109F	60 false read	E7	fread	360.0 n
+0353	0001E3	30 data read	F7	read	360.0 n
+0354*	00109F	RTS	FF	opcde	320.0 n
+0355	0010A0	00 false read	E7	fread	360.0 n
+0356	0010A0	00 false read	E7	fread	360.0 n

State Listing

Label >	ADDR	Apple 65816 InvAsm 1.0	STAT	EXTRA	Time
Base >	[HEX]	[ASM]	[HEX]	[USR]	[Relativ
[Mark]	XXXXXX	[Instructions]	XX	[XXXXXX]	
+0357	0001E4	78 data read	F7	read	680.0 n
+0358	0001E5	C0 data read	F7	read	360.0 n
+0359	0001E5	C0 false read	E7	fread	360.0 n
+0360*	00C079	CLC	FF	opcde	360.0 n
+0361	00C07A	FB false read	E7	fread	320.0 n
+0362*	00C07A	XCE	FF	opcde	360.0 n
+0363	00C07B	6B false read	E7	fread	360.0 n
+0364*	00C07B	RTL	FD	opcde	320.0 n
+0365	00C07C	5C false read	E5	fread	360.0 n
+0366	00C07C	5C false read	E5	fread	360.0 n
+0367	0001E6	B0 data read	F5	read	360.0 n
+03					