MOS 6502 / MOS 6510

Deep Dive Addressing Modes

Deep Dive Instruction Set

LDA Load Accumulator with Memory

M -> A

```
                                N Z C I D V
                                + + - - - -
```

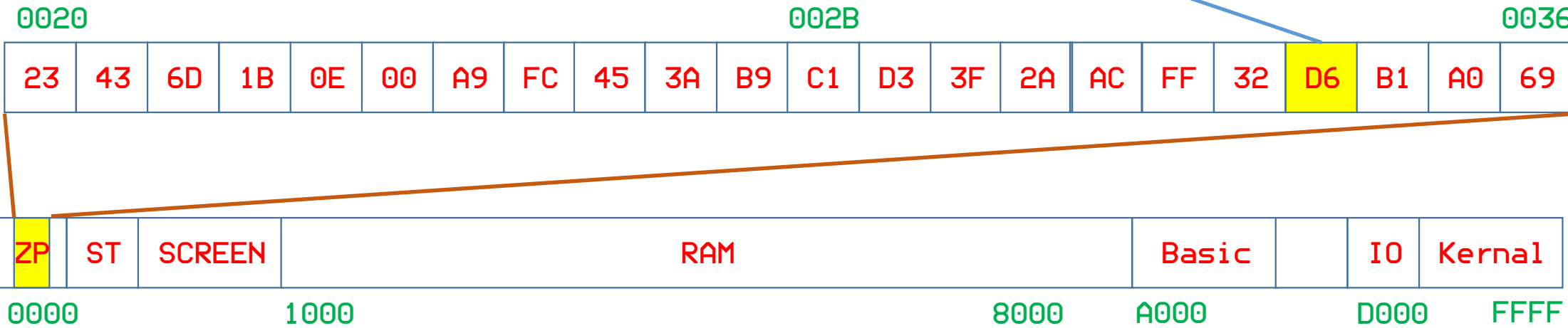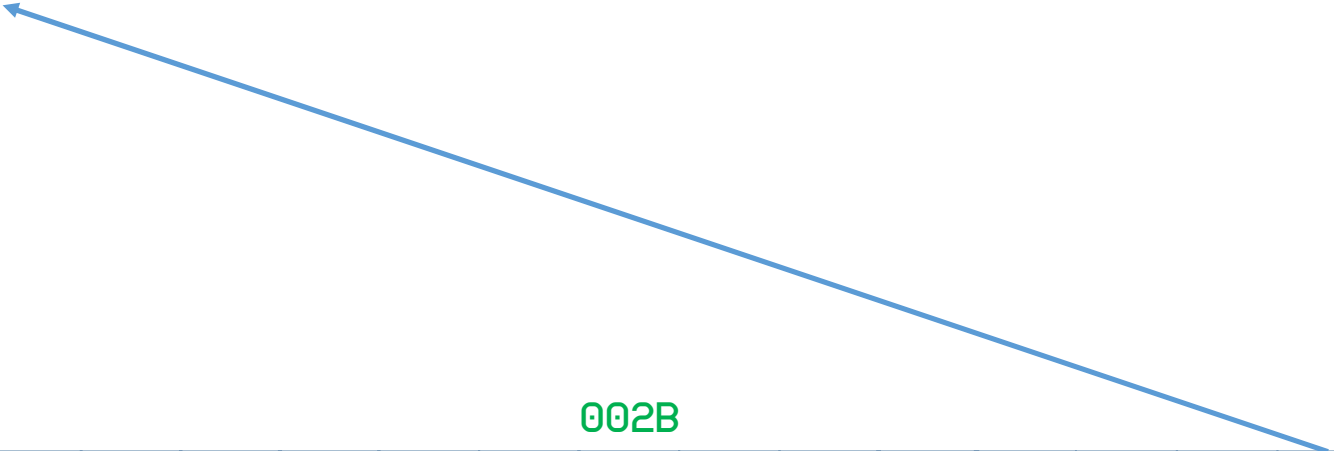| addressing	assembler	opc	bytes	cycls
immediate	LDA #oper	A9	2	2
zeropage	LDA oper	A5	2	3
zeropage,X	LDA oper,X	B5	2	4
absolute	LDA oper	AD	3	4
absolute,X	LDA oper,X	BD	3	4*
absolute,Y	LDA oper,Y	B9	3	4*
(indirect,X)	LDA (oper,X)	A1	2	6
(indirect),Y	LDA (oper),Y	B1	2	5*

* add 1 to cycles if page boundary is crossed

** add 1 to cycles if branch occurs on same page
   add 2 to cycles if branch occurs to different page

```
Legend to Flags:  + .... modified
                  - .... not modified
                  1 .... set
                  0 .... cleared
                  M6 .... memory bit 6
                  M7 .... memory bit 7
```

Zero Page Mode

LDA $32

Accumulator | D6

0020   002B   0036

| 23 | 43 | 6D | 1B | 0E | 00 | A9 | FC | 45 | 3A | B9 | C1 | D3 | 3F | 2A | AC | FF | 32 | D6 | B1 | A0 | 69 |

| ZP | ST | SCREEN | RAM | Basic | IO | Kernal |

0000   1000   8000   A000   D000   FFFF

Zero Page, X Indexed Mode

LDA $22,X

Accumulator 45   X Register 06

```
0020                            002B                              0036
23  43  6D  1B  0E  00  A9  FC  45  3A  B9  C1  D3  3F  2A  AC  FF  32  D6  B1  A0  69
```

```
ZP  ST  SCREEN            RAM                      Basic      IO  Kernal
0000      1000                                  8000      A000      D000      FFFF
```
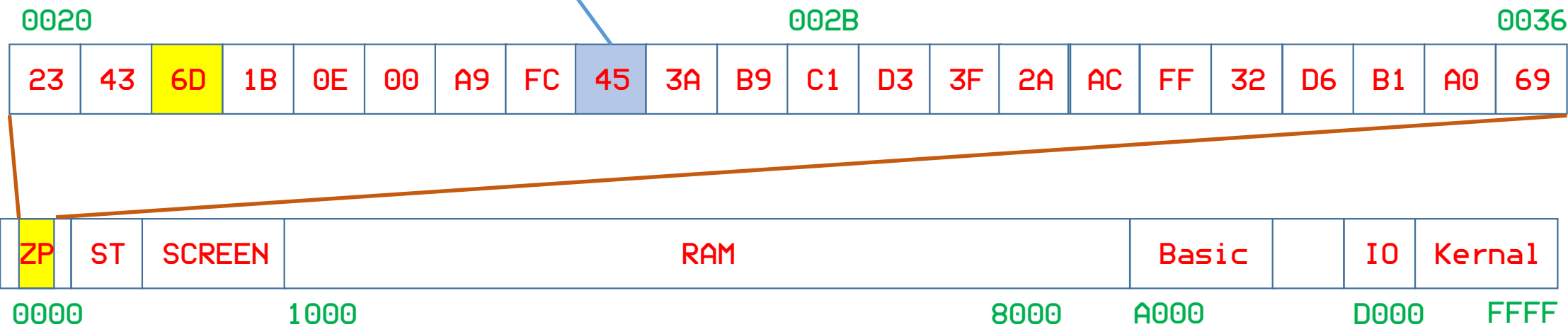
Absolute Mode

LDA $32FF

Accumulator | AC |
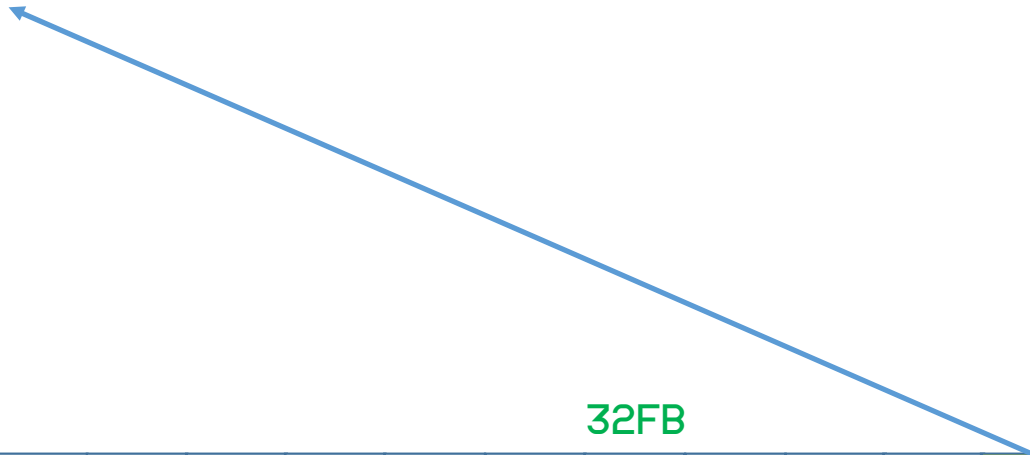
32F0										32FB										3306
23	43	6D	1B	0E	00	A9	FC	45	3A	B9	C1	D3	3F	2A	AC	FF	32	D6	B1	A0	69

ZP	ST	SCREEN			RAM			Basic		IO	Kernal
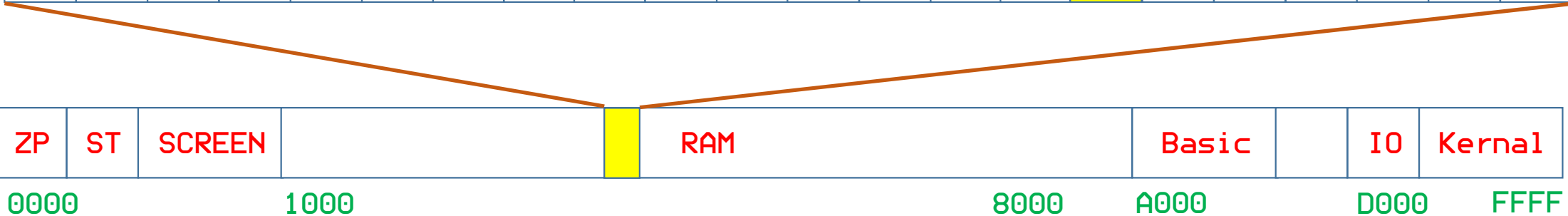
| 0000 | | 1000 | | | | 8000 | A000 | | D000 | FFFF |

Absolute, X Indexed Mode

LDA $32F0,X

Accumulator `C1`   X Register `0B`

32F0											32FB										3306
23	43	6D	1B	0E	00	A9	FC	45	3A	B9	C1	D3	3F	2A	AC	FF	32	D6	B1	A0	69

ZP	ST	SCREEN			RAM			Basic		IO	Kernal

0000   1000   8000   A000   D000   FFFF
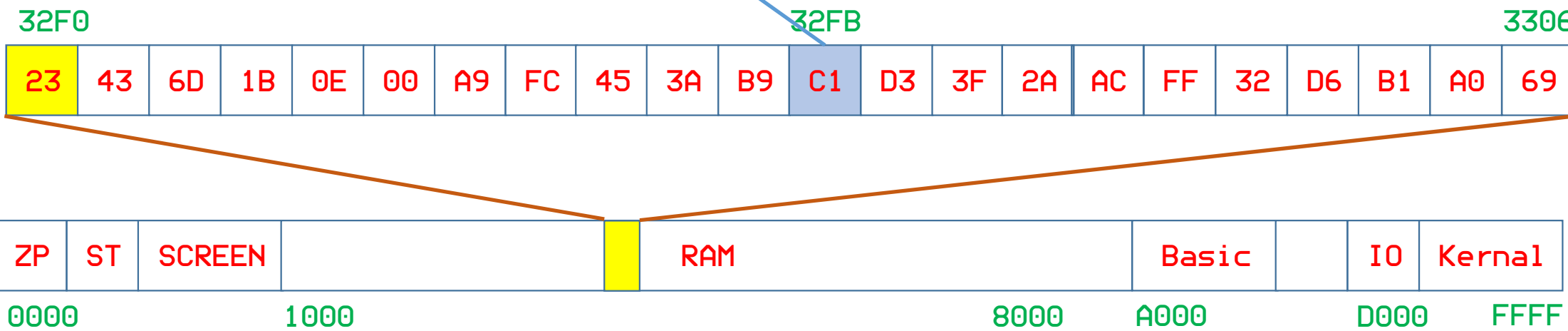
X Indexed, Indirect Mode

LDA ($20,X)

Accumulator [FF]   X Register [0B]

AC20   AC2B   AC36

| 23 | 43 | 6D | 1B | 0E | 00 | A9 | FC | 45 | 3A | B9 | C1 | D3 | 3F | 2A | AC | FF | 32 | D6 | B1 | A0 | 69 |

0020   002B   0036

| C1 | D3 | 3F | 30 | AC | FF | 00 | D6 | B1 | A0 | 69 | 30 | AC | 6D | 1B | 0E | 00 | A9 | FC | 45 | 3A | B9 |

| ZP | ST | SCREEN | RAM | Basic | IO | Kernal |

0000   1000   8000   A000   D000   FFFF
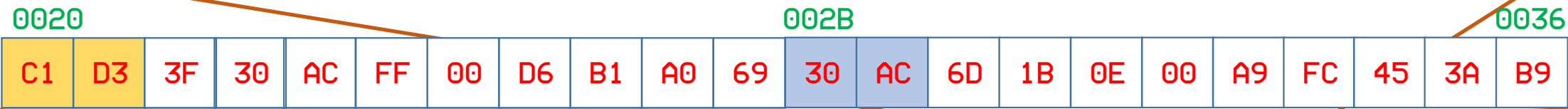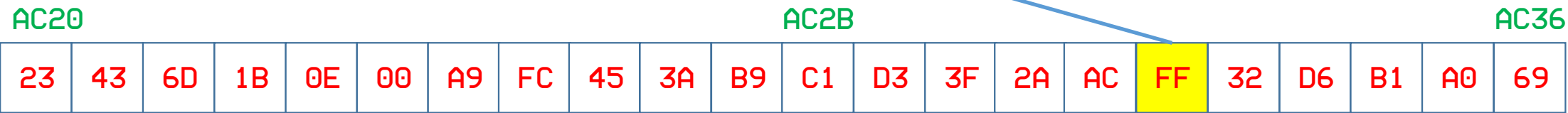
Indirect, Y Indexed Mode

LDA ($20),Y

Accumulator A0   Y Register 04

AC20											AC2B										AC36
23	43	6D	1B	0E	00	A9	FC	45	3A	B9	C1	D3	3F	2A	AC	FF	32	D6	B1	A0	69

001D											0028										0033
C1	D3	3F	30	AC	FF	00	D6	B1	A0	69	30	AC	6D	1B	0E	00	A9	FC	45	3A	B9

ZP	ST	SCREEN	RAM	Basic	IO	Kernal

0000   1000   8000   A000   D000   FFFF