

## 6502 Machine Language Hex Codes

Opcode	Definition	Immediate	Accumulator	Zero Page	Zero Page,X	Zero Page,Y	Absolute	Absolute,X	Absolute,Y	Indirect Abs.	(Zero Page,X)	(Zero Page),Y	Implied	Relative	Affects Flags
<b>ADC</b>	Add with Carry	69		65	75		6D	7D	79		61	71			N,V,Z,C
<b>AND</b>	Bitwise AND with Accumulator	29		25	35		2D	3D	39		21	31			N,Z
<b>ASL</b>	Arithmetic Shift Left		0A	06	16		0E	1E							N,Z,C
<b>BCC</b>	Branch on Carry Clear													90	
<b>BCS</b>	Branch on Carry Set													B0	
<b>BEQ</b>	Branch on Equal													F0	
<b>BIT</b>	Test Bits			24			2C								N,V,Z
<b>BMI</b>	Branch on Minus													30	
<b>BNE</b>	Branch on Not Equal													D0	
<b>BPL</b>	Branch on Plus													10	
<b>BRK</b>	Break												00		B
<b>BVC</b>	Branch on Overflow Clear													50	
<b>BVS</b>	Branch on Overflow Set													70	
<b>CLC</b>	Clear Carry												18		C
<b>CLD</b>	Clear Decimal												D8		D
<b>CLI</b>	Clear Interrupt												58		I
<b>CLV</b>	Clear Overflow												B8		V
<b>CMP</b>	Compare Accumulator	C9		C5	D5		CD	DD	D9		C1	D1			N,Z,C
<b>CPX</b>	Compare X Register	E0		E4			EC								N,Z,C
<b>CPY</b>	Compare Y Register	C0		C4			CC								N,Z,C
<b>DEC</b>	Decrement Memory			C6	D6		CE	DE							N,Z
<b>DEX</b>	Decrement X												CA		N,Z
<b>DEY</b>	Decrement Y												88		N,Z
<b>EOR</b>	Bitwise Exclusive OR	49		45	55		4D	5D	59		41	51			N,Z
<b>INC</b>	Increment Memory			E6	F6		EE	FE							N,Z
<b>INX</b>	Increment X												E8		N,Z
<b>INY</b>	Increment Y												C8		N,Z
<b>JMP</b>	Jump						4C			6C					
<b>JSR</b>	Jump to Subroutine						20								
<b>LDA</b>	Load Accumulator	A9		A5	B5		AD	BD	B9		A1	B1			N,Z
<b>LDX</b>	Load X Register	A2		A6		B6	AE		BE						N,Z
<b>LDY</b>	Load Y Register	A0		A4	B4		AC	BC							N,Z
<b>LSR</b>	Logical Shift Right		4A	46	56		4E	5E							N,Z,C
<b>NOP</b>	No Operation												EA		
<b>ORA</b>	Bitwise OR with Accumulator	09		05	15		0D	1D	19		01	11			N,Z
<b>PHA</b>	Push Accumulator to Stack												48		
<b>PHP</b>	Push Processor Status to Stack												08		
<b>PLA</b>	Pull Accumulator off Stack												68		N,Z
<b>PLP</b>	Pull Processor Status off Stack												28		ALL
<b>ROL</b>	Rotate Left		2A	26	36		2E	3E							N,Z,C
<b>ROR</b>	Rotate Right		6A	66	76		6E	7E							N,Z,C
<b>RTI</b>	Return from Interrupt												40		ALL
<b>RTS</b>	Return from Subroutine												60		
<b>SBC</b>	Subtract with Carry	E9		E5	F5		ED	FD	F9		E1	F1			N,V,Z,C
<b>SEC</b>	Set Carry												38		C
<b>SED</b>	Set Decimal												F8		D
<b>SEI</b>	Set Interrupt												78		I
<b>STA</b>	Store Accumulator			85	95		8D	9D	99		81	91			
<b>STX</b>	Store X Register			86		96	8E								
<b>STY</b>	Store Y Register			84	94		8C								
<b>TAX</b>	Transfer A to X												AA		N,Z
<b>TAY</b>	Transfer A to Y												A8		N,Z
<b>TSX</b>	Transfer Stack Pointer to X												BA		
<b>TXA</b>	Transfer X to A												8A		N,Z
<b>TXS</b>	Transfer X to Stack Pointer												9A		
<b>TYA</b>	Transfer Y to A												98		N,Z

## The result of the opcode directly modifies....

System Memory (Gray 2)

8-bit Registers (Accumulator/X/Y) (Sky blue 10)

16-bit Registers (AB, CD, EF, etc.) (Magenta 10)

CPU Status Register (Orange 1)

Stack/Stack Pointer (Red 2)

Program Counter (Green 2)

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This table originally authored by Lawrence Woodman ([https://github.com/lawrencewoodman/machine\\_language\\_aids](https://github.com/lawrencewoodman/machine_language_aids))Opcode color coding and formatting changes by Brian Manning ([https://github.com/spicyjack/8-16\\_bit\\_cpu\\_info](https://github.com/spicyjack/8-16_bit_cpu_info))License: Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>)