

8051 Instruction Set Summary

Rn	Register R7-R0 of the currently selected Register Bank.
Data	8-bit internal data location's address. This could be an internal Data RAM location (0-127) or a SFR [i.e. I/O port, control register, status register, etc. (128-255)].
@Ri	8-bit Internal Data RAM location (0-255) addressed indirectly through register R1 or R0.
#data	8-bit constant included in instruction.
#data16	16-bit constant included in instruction.
addr16	16-bit destination address. Used by LCALL and LJMP. A branch can be anywhere within the 64k byte Program Memory address space.
addr11	11-bit destination address. Used by ACALL and AJMP. The branch will be within the same 2k byte page of Program Memory as the first byte of the following instruction.
rel	Signed (two's complement) 8-bit offset byte. Used by SJMP and all conditional jumps. Range is -128 to +127 bytes relative to first byte of the following instruction.
bit	Direct Addressed bit in Internal Data RAM or Special Function Register.

Instruction	Flag			Instruction	Flag		
	C	OV	AC		C	OV	AC
ADD A,Rn	X	X	X	CLR C	O		
ADDC A,Rn	X	X	X	CPL C	X		
SUBB A,Rn	X	X	X	ANL C,bit	X		
MUL AB	O	X		ANL C,/bit	X		
DIV AB	O	X		ORL C,bit	X		
DA A	X			ORL C,/bit	X		
RRC A	X			MOV C,bit	X		
RLC A	X			CJNE A,Rn	X		
SETB C	1						

Note that operations on SFR byte address 206 or bit addresses 209-215 (i.e. the PSW or bits in the PSW) will also affect flag settings.

Mnemonic	Description	Byte	Cycle
Arithmetic operations			
ADD A,Rn	Add register to accumulator	1	1
ADD A,direct	Add direct byte to accumulator	2	1
ADD A,@Ri	Add indirect RAM to accumulator	1	1
ADD A,#data	Add immediate data to accumulator	2	1
ADDC A,Rn	Add register to accumulator with carry flag	1	1
ADDC A,direct	Add direct byte to A with carry flag	2	1
ADDC A,@Ri	Add indirect RAM to A with carry flag	1	1
ADDC A,#data	Add immediate data to A with carry flag	2	1
SUBB A,Rn	Subtract register to accumulator with borrow	1	1
SUBB A,direct	Subtract direct byte to A with carry borrow	2	1
SUBB A,@Ri	Subtract indirect RAM to A with carry borrow	1	1
SUBB A,#data	Subtract immediate data to A with carry borrow	2	1
INC A	Increment accumulator	1	1
INC Rn	Increment register	1	1
INC direct	Increment direct byte	2	1
INC @Ri	Increment indirect RAM	1	1
DEC A	Decrement accumulator	1	1
DEC Rn	Decrement register	1	1
DEC direct	Decrement direct byte	2	1
DEC @Ri	Decrement indirect RAM	1	1
INC DPTR	Increment data pointer	1	2
MUL AB	Multiply A and B -> [B hi]:[A lo]	1	4
DIV AB	Divide A by B -> A=result, B=remainder	1	4
DA A	Decimal adjust accumulator	1	1
CLR A	Clear accumulator	1	1

This paper was created by Štěpán Matějka alias Mates for anybody who needs it. Mates, Prague – Czech Republic 1998,2002.

Mnemonic	Description	Byte	Cycle
CPL A	Complement accumulator	1	1
RL A	Rotate accumulator left	1	1
RLC A	Rotate accumulator left through carry	1	1
RR A	Rotate accumulator right	1	1
RRC A	Rotate accumulator right through carry	1	1
SWAP A	Swap nibbles within the accumulator	1	1

Logic operations			
ANL A,Rn	AND register to accumulator	1	1
ANL A,direct	AND direct byte to accumulator	2	1
ANL A,@Ri	AND indirect RAM to accumulator	1	1
ANL A,#data	AND immediate data to accumulator	2	1
ANL direct,A	AND accumulator to direct byte	2	1
ANL direct,#data	AND immediate data to direct byte	3	2
ORL A,Rn	OR register to accumulator	1	1
ORL A,direct	OR direct byte to accumulator	2	1
ORL A,@Ri	OR indirect RAM to accumulator	1	1
ORL A,#data	OR immediate data to accumulator	2	1
ORL direct,A	OR accumulator to direct byte	2	1
ORL direct,#data	OR immediate data to direct byte	3	2
XRL A,Rn	Exclusive OR register to accumulator	1	1
XRL A,direct	Exclusive OR direct byte to accumulator	2	1
XRL A,@Ri	Exclusive OR indirect RAM to accumulator	1	1
XRL A,#data	Exclusive OR immediate data to accumulator	2	1
XRL direct,A	Exclusive OR accumulator to direct byte	2	1
XRL direct,#data	Exclusive OR immediate data to direct byte	3	2

Boolean variable manipulation			
CLR C	Clear carry flag	1	1
CLR bit	Clear direct bit	2	1
SETB C	Set carry flag	1	1
SETB bit	Set direct bit	2	1
CPL C	Complement carry flag	1	1
CPL bit	Complement direct bit	2	1
ANL C,bit	AND direct bit to carry flag	2	2
ANL C,/bit	AND complement of direct bit to carry	2	2
ORL C,bit	OR direct bit to carry flag	2	2
ORL C,/bit	OR complement of direct bit to carry	2	2
MOV C,bit	Move direct bit to carry flag	2	1
MOV bit,C	Move carry flag to direct bit	2	2

Program and machine control			
ACALL addr11	Absolute subroutine call	2	2
LCALL addr16	Long subroutine call	3	2
RET	Return from subroutine	1	2
RETI	Return from interrupt	1	2
AJMP addr11	Absolute jump	2	2
LJMP addr16	Long jump	3	2
SJMP rel	Short jump (relative address)	2	2
JMP @A+DPTR	Jump indirect relative to the DPTR	1	2
JZ rel	Jump if accumulator is zero	2	2
JNZ rel	Jump if accumulator is not zero	2	2
JC rel	Jump if carry flag is set	2	2
JNC rel	Jump if carry flag is not set	2	2
JB bit,rel	Jump if bit is set	3	2
JNB bit,rel	Jump if bit is not set	3	2
JBC bit,rel	Jump if direct bit is set and clear bit	3	2
CJNE A,direct,rel	Compare direct byte to A and jump if not equal	3	2

Mnemonic	Description	Byte	Cycle
CJNE A,#data,rel	Compare immediate to A and jump if not equal	3	2
CJNE Rn,#data,rel	Compare immed. to reg. and jump if not equal	3	2
CJNE @Rn,#data,rel	Compare immed. to ind. and jump if not equal	3	2
DJNZ Rn,rel	Decrement register and jump in not zero	2	2
DJNZ direct,rel	Decrement direct byte and jump in not zero	3	2
NOP	No operation	1	1

Data transfer			
MOV A,Rn	Move register to accumulator	1	1
MOV A,direct*)	Move direct byte to accumulator	2	1
MOV A,@Ri	Move indirect RAM to accumulator	1	1
MOV A,#data	Move immediate data to accumulator	2	1
MOV Rn,A	Move accumulator to register	1	1
MOV Rn,direct	Move direct byte to register	2	2
MOV Rn,#data	Move immediate data to register	2	1
MOV direct,A	Move accumulator to direct byte	2	1
MOV direct,Rn	Move register to direct byte	2	2
MOV direct,direct	Move direct byte to direct byte	3	2
MOV direct,@Ri	Move indirect RAM to direct byte	2	2
MOV direct,#data	Move immediate data to direct byte	3	2
MOV @Ri,A	Move accumulator to indirect RAM	1	1
MOV @Ri,direct	Move direct byte to indirect RAM	2	2
MOV @Ri,#data	Move immediate data to indirect RAM	2	1
MOV DPTR,#data16	Load data pointer with a 16-bit constant	3	2
MOVC A,@A+DPTR	Move code byte relative to DPTR to accumulator	1	2
MOVC A,@A+PC	Move code byte relative to PC to accumulator	1	2
MOVX A,@Ri	Move external RAM (8-bit addr.) to A	1	2
MOVX A,@DPTR	Move external RAM (16-bit addr.) to A	1	2
MOVX @Ri,A	Move A to external RAM (8-bit addr.)	1	2
MOVX @DPTR,A	Move A to external RAM (16-bit addr.)	1	2
PUSH direct	Push direct byte onto stack	2	2
POP direct	Pop direct byte from stack	2	2
XCH A,Rn	Exchange register to accumulator	1	1
XCH A,direct	Exchange direct byte to accumulator	2	1
XCH A,@Ri	Exchange indirect RAM to accumulator	1	1
XCHD A,@Ri	Exchange low-order nibble indir. RAM with A	1	1

*) MOV A,ACC is not a valid instruction

jne A,#data,@	cjne	A,#data,@		
(jump if A != data)				
je A,#data,@	add	A,#low(-data)	or	cjne A,#(data),ne
(jump if A == data)				
	jz	@		jmp @
			ne:	...
ja, jnb A,#data,@	add	A,#low(-data-1)	or	cjne A,#(data+1),ne
(jump if A > data)				
	jc	@		jne jnc @
jae, jnb A,#data,@	add	A,#low(-data)	or	cjne A,#(data),ne
(jump if A >= data)				
	jc	@		jne jnc @
jb, jnae A,#data,@	add	A,#low(-data)	or	cjne A,#(data),ne
(jump if A < data)				
	jnc	@		jne jc @
jbe, jna A,#data,@	add	A,#low(-data-1)	or	cjne A,#(data+1),ne
(jump if A <= data)				
	jnc	@		jne jc @
switch A <=,=,> #data	cjne	A,#data,ne		
(no A modification)				
	...			; execute code if A==data
	ne: jc	is_below		; jump if A<data
	jnc	is_above		; jump if A>data or exec. code



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8051 Instruction Set Table

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Mates (c) 1995, 2002	0000 .0	0001 .1	0010 .2	0011 .3	0100 .4	0101 .5	0110 .6	0111 .7	1000 .8	1001 .9	1010 .A	1011 .B	1100 .C	1101 .D	1110 .E	1111 .F																				
0	0 1c 1	1 2c 2	2 2c 3	3 1c 1	4 1c 1	5 1c 1	6 1c 1	7 1c 1	8 1c 1	9 1c 1	10 1c 1	11 1c 1	12 1c 1	13 1c 1	14 1c 1	15 1c 1																				
	NOP	AJMP 0A8	LJMP A16	RR A	INC A	INC A8	INC @R0	INC @R1	INC R0	INC R1	INC R2	INC R3	INC R4	INC R5	INC R6	INC R7																				
1	16 2c 3	17 2c 2	18 2c 3	19 1c 1	20 1c 1	21 1c 1	22 1c 1	23 1c 1	24 1c 1	25 1c 1	26 1c 1	27 1c 1	28 1c 1	29 1c 1	30 1c 1	31 1c 1																				
	JBC BIT,AR	ACALL 0A8	LCALL A16	RRC A	DEC A	DEC A8	DEC @R0	DEC @R1	DEC R0	DEC R1	DEC R2	DEC R3	DEC R4	DEC R5	DEC R6	DEC R7																				
2	32 2c 3	33 2c 2	34 2c 1	35 1c 1	36 1c 2	37 1c 2	38 1c 1	39 1c 1	40 1c 1	41 1c 1	42 1c 1	43 1c 1	44 1c 1	45 1c 1	46 1c 1	47 1c 1																				
	JB BIT,AR	AJMP 1A8	RET	RL A	ADD A,#D	ADD A,A8	ADD A,@R0	ADD A,@R1	ADD A,R0	ADD A,R1	ADD A,R2	ADD A,R3	ADD A,R4	ADD A,R5	ADD A,R6	ADD A,R7																				
3	48 2c 3	49 2c 2	50 2c 1	51 1c 1	52 1c 2	53 1c 2	54 1c 1	55 1c 1	56 1c 1	57 1c 1	58 1c 1	59 1c 1	60 1c 1	61 1c 1	62 1c 1	63 1c 1																				
	JNB BIT,AR	ACALL 1A8	RETI	RLC A	ADDC A,#D	ADDC A,A8	ADDC A,@R0	ADDC A,@R1	ADDC A,R0	ADDC A,R1	ADDC A,R2	ADDC A,R3	ADDC A,R4	ADDC A,R5	ADDC A,R6	ADDC A,R7																				
4	64 2c 2	65 2c 2	66 1c 2	67 1c 3	68 1c 2	69 1c 2	70 1c 1	71 1c 1	72 1c 1	73 1c 1	74 1c 1	75 1c 1	76 1c 1	77 1c 1	78 1c 1	79 1c 1																				
	JC AR	AJMP 2A8	ORL A8,A	ORL A8,#D	ORL A,#D	ORL A,A8	ORL A,@R0	ORL A,@R1	ORL A,R0	ORL A,R1	ORL A,R2	ORL A,R3	ORL A,R4	ORL A,R5	ORL A,R6	ORL A,R7																				
5	80 2c 2	81 2c 2	82 1c 2	83 1c 3	84 1c 2	85 1c 2	86 1c 1	87 1c 1	88 1c 1	89 1c 1	90 1c 1	91 1c 1	92 1c 1	93 1c 1	94 1c 1	95 1c 1																				
	JNC AR	ACALL 2A8	ANL A8,A	ANL A8,#D	ANL A,#D	ANL A,A8	ANL A,@R0	ANL A,@R1	ANL A,R0	ANL A,R1	ANL A,R2	ANL A,R3	ANL A,R4	ANL A,R5	ANL A,R6	ANL A,R7																				
6	96 2c 2	97 2c 2	98 1c 2	99 1c 3	100 1c 2	101 1c 2	102 1c 1	103 1c 1	104 1c 1	105 1c 1	106 1c 1	107 1c 1	108 1c 1	109 1c 1	110 1c 1	111 1c 1																				
	JZ AR	AJMP 3A8	XRL A8,A	XRL A8,#D	XRL A,#D	XRL A,A8	XRL A,@R0	XRL A,@R1	XRL A,R0	XRL A,R1	XRL A,R2	XRL A,R3	XRL A,R4	XRL A,R5	XRL A,R6	XRL A,R7																				
7	112 2c 2	113 2c 2	114 2c 2	115 2c 1	116 1c 2	117 2c 3	118 1c 2	119 1c 2	120 1c 2	121 1c 2	122 1c 2	123 2c 2	124 1c 2	125 1c 2	126 1c 2	127 1c 2																				
	JNZ AR	ACALL 3A8	ORL C,BIT	JMP @A+DPTR	MOV A,#D	MOV A8,#D	MOV @R0,#D	MOV @R1,#D	MOV R0,#D	MOV R1,#D	MOV R2,#D	MOV R3,#D	MOV R4,#D	MOV R5,#D	MOV R6,#D	MOV R7,#D																				
8	128 2c 2	129 2c 2	130 2c 2	131 2c 1	132 4c 1	133 2c 3	134 2c 2	135 2c 2	136 2c 2	137 2c 2	138 2c 2	139 2c 2	140 2c 2	141 2c 2	142 2c 2	143 2c 2																				
	SJMP AR	AJMP 4A8	ANL C,BIT	MOVC A,@A+PC	DIV AB	MOV A8,A8	MOV A8,@R0	MOV A8,@R1	MOV A8,R0	MOV A8,R1	MOV A8,R2	MOV A8,R3	MOV A8,R4	MOV A8,R5	MOV A8,R6	MOV A8,R7																				
9	144 2c 3	145 2c 2	146 2c 2	147 2c 1	148 1c 2	149 1c 2	150 1c 1	151 1c 1	152 1c 1	153 1c 1	154 1c 1	155 1c 1	156 1c 1	157 1c 1	158 1c 1	159 1c 1																				
	MOV DPTR,#D16	ACALL 4A8	MOV BIT,C	MOVC A,@A+DPTR	SUBB A,#D	SUBB A,A8	SUBB A,@R0	SUBB A,@R1	SUBB A,R0	SUBB A,R1	SUBB A,R2	SUBB A,R3	SUBB A,R4	SUBB A,R5	SUBB A,R6	SUBB A,R7																				
A	208 2c 2	161 2c 2	162 1c 2	163 2c 1	164 4c 1	165	166 2c 2	167 2c 2	168 2c 2	169 2c 2	170 2c 2	171 2c 2	172 2c 2	173 2c 2	174 2c 2	175 2c 2																				
	ORL C,BIT	AJMP 5A8	MOV C,BIT	INC DPTR	MUL AB		MOV @R0,A8	MOV @R1,A8	MOV R0,A8	MOV R1,A8	MOV R2,A8	MOV R3,A8	MOV R4,A8	MOV R5,A8	MOV R6,A8	MOV R7,A8																				
B	176 2c 2	177 2c 2	178 1c 2	179 1c 1	180 2c 3	181 2c 3	182 2c 3	183 2c 3	184 2c 3	185 2c 3	186 2c 3	187 2c 3	188 2c 3	189 2c 3	190 2c 3	191 2c 3																				
	ANL C,BIT	ACALL 5A8	CPL BIT	CPL C	CJNE A,#D,AR	CJNE A,A8,AR	CJNE @R0,#D,AR	CJNE @R1,#D,AR	CJNE R0,#D,AR	CJNE R1,#D,AR	CJNE R2,#D,AR	CJNE R3,#D,AR	CJNE R4,#D,AR	CJNE R5,#D,AR	CJNE R6,#D,AR	CJNE R7,#D,AR																				
C	192 2c 2	193 2c 2	194 1c 2	195 1c 1	196 1c 1	197 1c 2	198 1c 1	199 1c 1	200 1c 1	201 1c 1	202 1c 1	203 1c 1	204 1c 1	205 1c 1	206 1c 1	207 1c 1																				
	PUSH A8	AJMP 6A8	CLR BIT	CLR C	SWAP A	XCH A,A8	XCH A,@R0	XCH A,@R1	XCH A,R0	XCH A,R1	XCH A,R2	XCH A,R3	XCH A,R4	XCH A,R5	XCH A,R6	XCH A,R7																				
D	208 2c 2	209 2c 2	210 1c 2	211 1c 1	212 1c 1	213 2c 3	214 1c 1	215 1c 1	216 2c 2	217 2c 2	218 2c 2	219 2c 2	220 2c 2	221 2c 2	222 2c 2	223 2c 2																				
	POP A8	ACALL 6A8	SETB BIT	SETB C	DA A	DJNZ A8,AR	XCHD A,@R0	XCHD A,@R1	DJNZ R0,AR	DJNZ R1,AR	DJNZ R2,AR	DJNZ R3,AR	DJNZ R4,AR	DJNZ R5,AR	DJNZ R6,AR	DJNZ R7,AR																				
E	224 2c 1	225 2c 2	226 2c 1	227 2c 1	228 1c 1	229 1c 2	230 1c 1	231 1c 1	232 1c 1	233 1c 1	234 1c 1	235 1c 1	236 1c 1	237 1c 1	238 1c 1	239 1c 1																				
	MOVX A,@DPTR	AJMP 7A8	MOVX A,@R0	MOVX A,@R1	CLR A	MOV A,A8	MOV A,@R0	MOV A,@R1	MOV A,R0	MOV A,R1	MOV A,R2	MOV A,R3	MOV A,R4	MOV A,R5	MOV A,R6	MOV A,R7																				
F	240 2c 1	241 2c 2	242 2c 1	243 2c 1	244 1c 1	245 1c 2	246 1c 1	247 1c 1	248 1c 1	249 1c 1	250 1c 1	251 1c 1	252 1c 1	253 1c 1	254 1c 1	255 1c 1																				
	MOVX @DPTR,A	ACALL 7A8	MOVX @R0,A	MOVX @R1,A	CPL A	MOV A8,A	MOV @R0,A	MOV @R1,A	MOV R0,A	MOV R1,A	MOV R2,A	MOV R3,A	MOV R4,A	MOV R5,A	MOV R6,A	MOV R7,A																				

A8 address 8 bits AR relative address 8 bits D data 8 bits
A16 ... address 16 bits BIT ... bit's address D16 ... data 16 bits

INC DEC ADD ADC ORL ANL XRL MOV SUBB CJNE XCH DJNZ

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Mates (c) 1995, 2002	0000			0001			0010			0011			0100			0101			0110			0111			1000			1001			1010			1011			1100			1101			1110			1111		
	.0			.1			.2			.3			.4			.5			.6			.7			.8			.9			.A			.B			.C			.D			.E			.F		
0	0	1c	1	1	2c	2	2	2c	3	3	1c	1	4	1c	1	5	1c	1	6	1c	1	7	1c	1	8	1c	1	9	1c	1	10	1c	1	11	1c	1	12	1c	1	13	1c	1	14	1c	1	15	1c	1
	NOP			AJMP 0A8			LJMP A16			RR A			INC A			INC A8			INC @R0			INC @R1			INC R0			INC R1			INC R2			INC R3			INC R4			INC R5			INC R6			INC R7		
1	16	2c	3	17	2c	2	18	2c	3	19	1c	1	20	1c	1	21	1c	1	22	1c	1	23	1c	1	24	1c	1	25	1c	1	26	1c	1	27	1c	1	28	1c	1	29	1c	1	30	1c	1	31	1c	1
	JBC BIT,AR			ACALL 0A8			LCALL A16			RRC A			DEC A			DEC A8			DEC @R0			DEC @R1			DEC R0			DEC R1			DEC R2			DEC R3			DEC R4			DEC R5			DEC R6			DEC R7		
2	32	2c	3	33	2c	2	34	2c	1	35	1c	1	36	1c	2	37	1c	2	38	1c	1	39	1c	1	40	1c	1	41	1c	1	42	1c	1	43	1c	1	44	1c	1	45	1c	1	46	1c	1	47	1c	1
	JB BIT,AR			AJMP 1A8			RET			RL A			ADD A,#D			ADD A,A8			ADD A,@R0			ADD A,@R1			ADD A,R0			ADD A,R1			ADD A,R2			ADD A,R3			ADD A,R4			ADD A,R5			ADD A,R6			ADD A,R7		
3	48	2c	3	49	2c	2	50	2c	1	51	1c	1	52	1c	2	53	1c	2	54	1c	1	55	1c	1	56	1c	1	57	1c	1	58	1c	1	59	1c	1	60	1c	1	61	1c	1	62	1c	1	63	1c	1
	JNB BIT,AR			ACALL 1A8			RETI			RLC A			ADDC A,#D			ADDC A,A8			ADDC A,@R0			ADDC A,@R1			ADDC A,R0			ADDC A,R1			ADDC A,R2			ADDC A,R3			ADDC A,R4			ADDC A,R5			ADDC A,R6			ADDC A,R7		
4	64	2c	2	65	2c	2	66	1c	2	67	1c	3	68	1c	2	69	1c	2	70	1c	1	71	1c	1	72	1c	1	73	1c	1	74	1c	1	75	1c	1	76	1c	1	77	1c	1	78	1c	1	79	1c	1
	JC AR			AJMP 2A8			ORL A8,A			ORL A8,#D			ORL A,#D			ORL A,A8			ORL A,@R0			ORL A,@R1			ORL A,R0			ORL A,R1			ORL A,R2			ORL A,R3			ORL A,R4			ORL A,R5			ORL A,R6			ORL A,R7		
5	80	2c	2	81	2c	2	82	1c	2	83	1c	3	84	1c	2	85	1c	2	86	1c	1	87	1c	1	88	1c	1	89	1c	1	90	1c	1	91	1c	1	92	1c	1	93	1c	1	94	1c	1	95	1c	1
	JNC AR			ACALL 2A8			ANL A8,A			ANL A8,#D			ANL A,#D			ANL A,A8			ANL A,@R0			ANL A,@R1			ANL A,R0			ANL A,R1			ANL A,R2			ANL A,R3			ANL A,R4			ANL A,R5			ANL A,R6			ANL A,R7		
6	96	2c	2	97	2c	2	98	1c	2	99	1c	3	100	1c	2	101	1c	2	102	1c	1	103	1c	1	104	1c	1	105	1c	1	106	1c	1	107	1c	1	108	1c	1	109	1c	1	110	1c	1	111	1c	1
	JZ AR			AJMP 3A8			XRL A8,A			XRL A8,#D			XRL A,#D			XRL A,A8			XRL A,@R0			XRL A,@R1			XRL A,R0			XRL A,R1			XRL A,R2			XRL A,R3			XRL A,R4			XRL A,R5			XRL A,R6			XRL A,R7		
7	112	2c	2	113	2c	2	114	2c	2	115	2c	1	116	1c	2	117	2c	3	118	1c	2	119	1c	2	120	1c	2	121	1c	2	122	1c	2	123	2c	2	124	1c	2	125	1c	2	126	1c	2	127	1c	2
	JNZ AR			ACALL 3A8			ORL C,BIT			JMP @A+DPTR			MOV A,#D			MOV A8,#D			MOV @R0,#D			MOV @R1,#D			MOV R0,#D			MOV R1,#D			MOV R2,#D			MOV R3,#D			MOV R4,#D			MOV R5,#D			MOV R6,#D			MOV R7,#D		
8	128	2c	2	129	2c	2	130	2c	2	131	2c	1	132	4c	1	133	2c	3	134	2c	2	135	2c	2	136	2c	2	137	2c	2	138	2c	2	139	2c	2	140	2c	2	141	2c	2	142	2c	2	143	2c	2
	SJMP AR			AJMP 4A8			ANL C,BIT			MOVC A,@A+PC			DIV AB			MOV A8,A8			MOV A8,@R0			MOV A8,@R1			MOV A8,R0			MOV A8,R1			MOV A8,R2			MOV A8,R3			MOV A8,R4			MOV A8,R5			MOV A8,R6			MOV A8,R7		
9	144	2c	3	145	2c	2	146	2c	2	147	2c	1	148	1c	2	149	1c	2	150	1c	1	151	1c	1	152	1c	1	153	1c	1	154	1c	1	155	1c	1	156	1c	1	157	1c	1	158	1c	1	159	1c	1
	MOV DPTR,#D16			ACALL 4A8			MOV BIT,C			MOVC A,@A+DPTR			SUBB A,#D			SUBB A,A8			SUBB A,@R0			SUBB A,@R1			SUBB A,R0			SUBB A,R1			SUBB A,R2			SUBB A,R3			SUBB A,R4			SUBB A,R5			SUBB A,R6			SUBB A,R7		
A	208	2c	2	161	2c	2	162	1c	2	163	2c	1	164	4c	1	165			166	2c	2	167	2c	2	168	2c	2	169	2c	2	170	2c	2	171	2c	2	172	2c	2	173	2c	2	174	2c	2	175	2c	2
	ORL C,BIT			AJMP 5A8			MOV C,BIT			INC DPTR			MUL AB						MOV @R0,A8			MOV @R1,A8			MOV R0,A8			MOV R1,A8			MOV R2,A8			MOV R3,A8			MOV R4,A8			MOV R5,A8			MOV R6,A8			MOV R7,A8		
B	176	2c	2	177	2c	2	178	1c	2	179	1c	1	180	2c	3	181	2c	3	182	2c	3	183	2c	3	184	2c	3	185	2c	3	186	2c	3	187	2c	3	188	2c	3	189	2c	3	190	2c	3	191	2c	3
	ANL C,BIT			ACALL 5A8			CPL BIT			CPL C			CJNE A,#D,AR			CJNE A,A8,AR			CJNE @R0,#D,AR			CJNE @R1,#D,AR			CJNE R0,#D,AR			CJNE R1,#D,AR			CJNE R2,#D,AR			CJNE R3,#D,AR			CJNE R4,#D,AR			CJNE R5,#D,AR			CJNE R6,#D,AR			CJNE R7,#D,AR		
C	192	2c	2	193	2c	2	194	1c	2	195	1c	1	196	1c	1	197	1c	2	198	1c	1	199	1c	1	200	1c	1	201	1c	1	202	1c	1	203	1c	1	204	1c	1	205	1c	1	206	1c	1	207	1c	1
	PUSH A8			AJMP 6A8			CLR BIT			CLR C			SWAP A			XCH A,A8			XCH A,@R0			XCH A,@R1			XCH A,R0			XCH A,R1			XCH A,R2			XCH A,R3			XCH A,R4			XCH A,R5			XCH A,R6			XCH A,R7		
D	208	2c	2	209	2c	2	210	1c	2	211	1c	1	212	1c	1	213	2c	3	214	1c	1	215	1c	1	216	2c	2	217	2c	2	218	2c	2	219	2c	2	220	2c	2	221	2c	2	222	2c	2	223	2c	2
	POP A8			ACALL 6A8			SETB BIT			SETB C			DA A			DJNZ A8,AR			XCHD A,@R0			XCHD A,@R1			DJNZ R0,AR			DJNZ R1,AR			DJNZ R2,AR			DJNZ R3,AR			DJNZ R4,AR			DJNZ R5,AR			DJNZ R6,AR			DJNZ R7,AR		
E	224	2c	1	225	2c	2	226	2c	1	227	2c	1	228	1c	1	229	1c	2	230	1c	1	231	1c	1	232	1c	1	233	1c	1	234	1c	1	235	1c	1	236	1c	1	237	1c	1	238	1c	1	239	1c	1
	MOVX A,@DPTR			AJMP 7A8			MOVX A,@R0			MOVX A,@R1			CLR A			MOV A,A8			MOV A,@R0			MOV A,@R1			MOV A,R0			MOV A,R1			MOV A,R2			MOV A,R3			MOV A,R4			MOV A,R5			MOV A,R6			MOV A,R7		
F	240	2c	1	241	2c	2	242	2c	1	243	2c	1	244	1c	1	245	1c	2	246	1c	1	247	1c	1	248	1c	1	249	1c	1	250	1c	1	251	1c	1	252	1c	1	253	1c	1	254	1c	1	255	1c	1
	MOVX @DPTR,A			ACALL 7A8			MOVX @R0,A			MOVX @R1,A			CPL A			MOV A8,A			MOV @R0,A			MOV @R1,A			MOV R0,A			MOV R1,A			MOV R2,A			MOV R3,A			MOV R4,A			MOV R5,A			MOV R6,A			MOV R7,A		