

# EFLAGS Cross-Reference and Condition Codes

## 34.1 Cross-Reference

The cross-reference in Table 34-1 summarizes how the flags in the processor’s EFLAGS register are affected by each instruction. For detailed information on how flags are affected, see “Instruction Set Reference”. The following codes describe the how the flags are affected:

T	Instruction tests flag.
M	Instruction modifies flag (either sets or resets depending on operands).
0	Instruction resets flag.
1	Instruction sets flag.
—	Instruction’s effect on flag is undefined.
R	Instruction restores prior value of flag.
Blank	Instruction does not affect flag.

**Table 34-1. EFLAGS Cross-Reference**

Instruction	OF	SF	ZF	AF	PF	CF	TF	IF	DF	NT	RF
AAA	—	—	—	TM	—	M					
AAD	—	M	M	—	M	—					
AAM	—	M	M	—	M	—					
AAS	—	—	—	TM	—	M					
ADC	M	M	M	M	M	TM					
ADD	M	M	M	M	M	M					
AND	0	M	M	—	M	0					
ARPL			M								
BOUND											
BSF/BSR	—	—	M	—	—	—					
BSWAP											
BT/BTS/BTR/BTC	—	—	—	—	—	M					

Table 34-1. EFLAGS Cross-Reference (Continued)

Instruction	OF	SF	ZF	AF	PF	CF	TF	IF	DF	NT	RF
CALL											
CBW											
CLC						0					
CLD									0		
CLI								0			
CLTS											
CMC						M					
CMOV <sub>cc</sub>	T	T	T		T	T					
CMP	M	M	M	M	M	M					
CMPS	M	M	M	M	M	M			T		
CMPXCHG	M	M	M	M	M	M					
CMPXCHG8B			M								
CPUID											
CWD											
DAA	—	M	M	TM	M	TM					
DAS	—	M	M	TM	M	TM					
DEC	M	M	M	M	M						
DIV	—	—	—	—	—	—					
ENTER											
ESC											
FCMOV <sub>cc</sub>			T		T	T					
FCOMI, FCOMIP, FUCOMI, FUCOMIP			M		M	M					
HLT											
IDIV	—	—	—	—	—	—					
IMUL	M	—	—	—	—	M					
IN											
INC	M	M	M	M	M						
INS									T		
INT							0			0	
INTO	T						0			0	
INVD											
INVLPG											

**Table 34-1. EFLAGS Cross-Reference (Continued)**

Instruction	OF	SF	ZF	AF	PF	CF	TF	IF	DF	NT	RF
IRET	R	R	R	R	R	R	R	R	R	T	
Jcc	T	T	T		T	T					
JCXZ											
JMP											
LAHF											
LAR			M								
LDS/LES/LSS/LFS/LGS											
LEA											
LEAVE											
LGDT/LIDT/LLDT/LMSW											
LOCK											
LODS									T		
LOOP											
LOOPE/LOOPNE			T								
LSL			M								
LTR											
MOV											
MOV control, debug, test	—	—	—	—	—	—					
MOVS										T	
MOVSX/MOVZX											
MUL	M	—	—	—	—	M					
NEG	M	M	M	M	M	M					
NOP											
NOT											
OR	0	M	M	—	M	0					
OUT											
OUTS										T	
POP/POPA											
POPF	R	R	R	R	R	R	R	R	R	R	
PUSH/PUSHA/PUSHF											
RCL/RCL 1	M					TM					
RCL/RCL count	—					TM					

Table 34-1. EFLAGS Cross-Reference (Continued)

Instruction	OF	SF	ZF	AF	PF	CF	TF	IF	DF	NT	RF
RDMSR											
RDPMC											
RDTSC											
REP/REPE/REPNE											
RET											
ROL/ROR 1	M					M					
ROL/ROR count	—					M					
RSM	M	M	M	M	M	M	M	M	M	M	M
SAHF		R	R	R	R	R					
SAL/SAR/SHL/SHR 1	M	M	M	—	M	M					
SAL/SAR/SHL/SHR count	—	M	M	—	M	M					
SBB	M	M	M	M	M	TM					
SCAS	M	M	M	M	M	M			T		
SET <sub>cc</sub>	T	T	T		T	T					
SGDT/SIDT/SLDT/SMSW											
SHLD/SHRD	—	M	M	—	M	M					
STC						1					
STD									1		
STI								1			
STOS									T		
STR											
SUB	M	M	M	M	M	M					
TEST	0	M	M	—	M	0					
UD2											
VERR/VERRW			M								
WAIT											
WBINVD											
WRMSR											
XADD	M	M	M	M	M	M					
XCHG											
XLAT											
XOR	0	M	M	—	M	0					

## 34.2 EFLAGS Condition Codes

Table 34-2 gives all the condition codes that can be tested for by the CMOV<sub>cc</sub>, FCMOV<sub>cc</sub>, J<sub>cc</sub> and SET<sub>cc</sub> instructions. The condition codes refer to the setting of one or more status flags (CF, OF, SF, ZF, and PF) in the EFLAGS register. The “Mnemonic” column gives the suffix (*cc*) added to the

instruction to specific the test condition. The “Condition Tested For” column describes the condition specified in the “Status Flags Setting” column. The “Instruction Subcode” column gives the opcode suffix added to the main opcode to specify a test condition.

**Table 34-2. EFLAGS Condition Codes**

Mnemonic (cc)	Condition Tested For	Instruction Subcode	Status Flags Setting
O	Overflow	0000	OF = 1
NO	No overflow	0001	OF = 0
B NAE	Below Neither above nor equal	0010	CF = 1
NB AE	Not below Above or equal	0011	CF = 0
E Z	Equal Zero	0100	ZF = 1
NE NZ	Not equal Not zero	0101	ZF = 0
BE NA	Below or equal Not above	0110	(CF OR ZF) = 1
NBE A	Neither below nor equal Above	0111	(CF OR ZF) = 0
S	Sign	1000	SF = 1
NS	No sign	1001	SF = 0
P PE	Parity Parity even	1010	PF = 1
NP PO	No parity Parity odd	1011	PF = 0
Mnemonic	Meaning	Instruction Subcode	Condition Tested
L NGE	Less Neither greater nor equal	1100	(SF XOR OF) = 1
NL GE	Not less Greater or equal	1101	(SF XOR OF) = 0
LE NG	Less or equal Not greater	1110	((SF XOR OF) OR ZF) = 1
NLE G	Neither less nor equal Greater	1111	((SF XOR OF) OR ZF) = 0

Many of the test conditions are described in two different ways. For example LE (less or equal) and NG (not greater) describe the same test condition. Alternate mnemonics are provided to make code more intelligible.

The terms “above” and “below” are associated with the CF flag and refer to the relation between two unsigned integer values. The terms “greater” and “less” are associated with the SF and OF flags and refer to the relation between two signed integer values.

