Lecture 13 : Special Bit Instructions

Today's Goals

- Learn bit-set and bit-clear instructions
- Branch on bit instructions

Bit Manipulate Instructions Set or clear bits in a memory byte

- BSET $(M \leftarrow (M) + (mm))$
 - Set to 1 bits in a memory location
- BCLR $(M \leftarrow (M) \cdot \overline{(mm)})$
 - Clear to 0 bits in a memory location
- Note that ...
 - They can only be used on data in memory.
 - Use AND and OR instructions for setting/clearing bits on registers.
 - Therefore, two operands are needed.
 - 1st: the address
 - 2nd: immediate mask value
 - In the mask byte,
 - 1 means to affect the bit
 - 0 means preserve the bit

Examples

■ BSET 0,X, \$81 ; \$81 = %10000001 ■ BCLR 0,Y, \$33 ; \$33 = %00110011

Bit Test Instructions

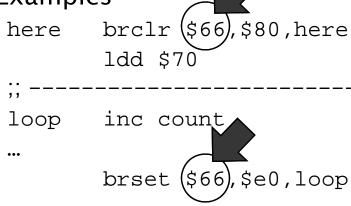
Test bits

- BITA ((A) · (M))
 - Bit test A
 - Test bits without altering the value of the register.
- BITB ((B) · (M))
 - Bit test B
 - Test bits without altering the value of the register.
- Examples
 - BITA #\$44 ; \$44 = %01000100
 - Tests the bit 6 and 2 of register A.
 - Updates Z and N bits of CCR accordingly.
- Note that...
 - Like comparison instructions, the result is discarded. CCR bits are affected by the instructions.

Bit Condition Branch Instructions

- Make branch decisions based on the value of bits.
- BRCLR, BRSET
 - Perform bitwise logical AND on the contents of the specified memory location and the mask supplied with the instruction.
 - BRCLR: branch if (M) \cdot (mm) = 0 [if selected bit(s) clear]
 - BRSET: branch if $\overline{(M)} \cdot (mm) = 0$ [if selected bit(s) set]

Examples



Note: The first operand is an address.



Two door sport car

• Turn on the cabin light without affecting other bits

BSET \$00, %0000010 ; \$02

	7	6	5	4	3	2	1	0
\$0000	GBOXD	LEFTD	RGHTD	TRNKD	I	GBOXL	CBNL	TRNKL

Two door sport car

• Turn off the glove box light and trunk light without affecting other bits

BCLR \$00, %0000101 ; \$05

	7	6	5	4	3	2	1	0
\$0000	GBOXD	LEFTD	RGHTD	TRNKD	1	GBOXL	CBNL	TRNKL

Two door sport car

Turn on the cabin light if either door is open (=the bit is set)

LDAA \$00

BITA #%01100000 ; #\$60

BNE CBNLON

BRA SKIP

CBNLON: BSET \$00, %0000010 ; \$02

SKIP:

	7	6	5	4	3	2	1	0
\$0000	GBOXD	LEFTD	RGHTD	TRNKD	_	GBOXL	CBNL	TRNKL

Two door sport car

• Turn off the cabin light if both doors are closed

BRCLR \$00, %01100000, CBNLOFF

BRA SKIP

CBNLOFF: BCLR \$00, %0000010

SKIP:

	7	6	5	4	3	2	1	0
\$0000	GBOXD	LEFTD	RGHTD	TRNKD	_	GBOXL	CBNL	TRNKL

Two door sport car

• Turn on the cabin light if both doors are open

BRSET #%01100000 CBNLON

BRA SKIP

CBNLON: BSET \$00, %0000010 ; \$02

SKIP:

	7	6	5	4	3	2	1	0
\$0000	GBOXD	LEFTD	RGHTD	TRNKD	I	GBOXL	CBNL	TRNKL

Questions?

Wrap-up

What we've learned

What to Come