

**MC680x0**

<b>COLLABORATORS</b>
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# Chapter 1

## MC680x0

### 1.1 MC680x0 Reference

Instruction types:

```
@{ "Move Instructions"          " link MovesInst }
@{ "Mathematical Instructions"  " link Math   }
@{ "Logic Instructions"        " link Logic  }
@{ "Flow Control Instructions"  " link Flow   }
@{ "Shift and Rotate Instructions" link Shift }
@{ "Bit Manipulation Instructions" link Bit   }
@{ "Miscellaneous Instructions"  " link Misc   }
```

### 1.2 moveins

Normal:

```
@{ "MOVE " link Move   } @{ "MOVEA" link Movea } @{ "MOVEC" link Movec } @{ " ←
MOVEM" link Movem } @{ "MOVEP" link Movep } @{ "MOVEQ" link Moveq } @{ "MOVES ←
" link Moves }

@{ "MOVE to CCR" " link MoveToCCR   } @{ "MOVE from CCR" link MoveFromCCR }
@{ "MOVE to SR"  " link MoveToSR    } @{ "MOVE from SR" link MoveFromSR   }
@{ "MOVE USP"    " link MoveUSP     }
```

Special:

```
@{ "LEA " link Lea   } @{ "PEA " link Pea   }
```

### 1.3 math

Integer:

```
@{ "ADD " link Add   } @{ "ADDI" link Addi } @{ "ADDQ" link Addq } @{ "ADDA" link ←
Adda } @{ "SUB " link Sub   } @{ "SUBI" link Subi } @{ "SUBQ" link Subq } @{ ←
"SUBA" link Suba }
@{ "DIVS" link Divs } @{ "DIVU" link Divu } @{ "MULS" link Mul   } @{ "MULU" link ←
Mul   }
@{ "EXT " link Ext   }
@{ "NEG " link Neg   }
```

```
@{ "CMP " link Cmp } @{ "CMPI" link Cmpi } @{ "CMPA" link Cmpa }
```

Multi-Precision Integer:

```
@{ "ABCD" link Abcd } @{ "ADDX" link Addx } @{ "SBCD" link Sbcd } @{ "SUBX" link ←
    Subx }
@{ "NBCD" link Nbcd }
@{ "CMPM" link Cmpm }
```

## 1.4 logic

Bit-wise:

```
@{ "AND " link And } @{ "ANDI" link Andi } @{ "ANDI to CCR" link AndiCCR } @{ " ←
    ANDI to SR" link AndiSR }
@{ "EOR " link Eor } @{ "EORI" link Eori } @{ "EORI to CCR" link EoriCCR } @{ " ←
    EORI to SR" link EoriSR }
@{ "OR " link Or } @{ "ORI " link Ori } @{ "ORI to CCR" link OriCCR } @{ " ←
    ORI to SR" link OriSR }
```

Byte-wise:

```
@{ "TST " link Tst } @{ "TAS " link Tas }
@{ "SCC " link Scc }
@{ "NOT " link Not }
```

## 1.5 flow

Subroutine:

```
@{ "BSR " link Bsr } @{ "JSR " link Jsr }
@{ "RTS " link Rts } @{ "RTD " link Rtd } @{ "RTR " link Rtr ←
    }
```

Local:

```
@{ "BRA " link Bra } @{ "JMP " link Jmp }
```

Conditional:

```
@{ "BCC " link Bcc } @{ "DBCC " link Dbcc }
```

System:

```
@{ "ILLEGAL" link Illegal } @{ "BKPT " link Bkpt }
@{ "TRAP " link Trap } @{ "TRAPV " link Trapv }
@{ "RESET " link Reset } @{ "STOP " link Stop }
@{ "RTE " link Rte }
```

## 1.6 misc

Stack Frame Maintenance:

```
@{ "LINK" link Link } @{ "UNLK" link Unlk }
```

Processor:

```
@{ "NOP " link Nop }
```

---

## 1.7 shift

Shifts:

```
@{ "ASd " link ASd  } @{ "LSd " link Lsd  }
```

Rotates:

```
@{ "ROd " link Rod  } @{ "ROXd" link Roxd }
```

## 1.8 bit

Single Bit:

```
@{ "BCHG " link Bchg  } @{ "BCLR " link Bclr  } @{ "BSET " link Bset  } @{ ←↔
    "BTST " link Btst  }
```

Bit Field:

```
@{ "BFCHG " link BFCHG  } @{ "BFCLR " link Bfclr  } @{ "BFSET " link Bfset  }
@{ "BFINS " link Bfins  } @{ "BFEXTS" link bfexts } @{ "BFEXTU" link Bfextu }
@{ "BFFFO " link Bfffo  } @{ "BFTST " link Bftst  }
```

## 1.9 abcd

NAME

ABCD -- Add binary coded decimal

SYNOPSIS

```
ABCD Dy,Dx
ABCD -(Ay),-(Ax)
```

Size = (Byte)

FUNCTION

Adds the source operand to the destination operand along with the extend bit, and stores the result in the destination location. The addition is performed using binary coded decimal arithmetic. The operands, which are packed BCD numbers, can be addressed in two different ways:

1. Data register to data register: The operands are contained in the data registers specified in the instruction.
2. Memory to memory: The operands are addressed with the predecrement addressing mode using the address registers specified in the instruction.

This operation is a byte operation only.

Normally the Z condition code bit is set via programming before the start of an operation. That allows successful tests for zero results upon completion of multiple-precision operations.

RESULT

X - Set the same as the carry bit.



N - Undefined  
 Z - Cleared if the result is non-zero. Unchanged otherwise.  
 V - Undefined  
 C - Set if a decimal carry was generated. Cleared otherwise.

## SEE ALSO

```
@{ "ADD " link Add  } @{ "ADDI" link Addi } @{ "ADDQ" link Addq }
@{ "ADDX" link Addx  }
@{ "SUB " link Sub   } @{ "SUBI" link Subi } @{ "SUBQ" link Subq }
@{ "SBCD" link Sbcd  } @{ "SUBX" link Subx }
```

## 1.10 add

## NAME

ADD -- Add integer

## SYNOPSIS

```
ADD <ea>,Dn
ADD Dn,<ea>
```

Size = (Byte, Word, Long)

## FUNCTION

Adds the source operand to the destination operand using binary addition, and stores the result in the destination location. The size of the operation may be specified as byte, word, or long. The mode of the instruction indicates which operand is the source and which is the destination as well as the operand size.

## RESULT

X - Set the same as the carry bit.  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow is generated. Cleared otherwise.  
 C - Set if a carry is generated. Cleared otherwise.

## SEE ALSO

```
@{ "ADDI" link Addi } @{ "ADDQ" link Addq } @{ "ADDX" link Addx }
@{ "SUB " link Sub   } @{ "SUBI" link Subi } @{ "SUBQ" link Subq }
@{ "SUBX" link Subx }
```

## 1.11 adda

## NAME

ADDA -- Add address

## SYNOPSIS

```
ADDA <ea>,An
```

Size = (Word, Long)

## FUNCTION

Adds the source operand to the destination address register, and stores the result in the destination address register. The size of the operation may be specified as word or long. The entire destination operand is used regardless of the operation size.

#### RESULT

None.

#### SEE ALSO

@{ "ADDQ" link Addq } @{ "SUBQ" link Subq } @{ "SUBA" link Suba }

## 1.12 addi

#### NAME

ADDI -- Add immediate

#### SYNOPSIS

ADDI #<data>, <ea>

Size = (Byte, Word, Long)

#### FUNCTION

Adds the immediate data to the destination operand, and stores the result in the destination location. The size of the operation may be specified as byte, word, or long. The size of the immediate data matches the operation size.

#### RESULT

X - Set the same as the carry bit.  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow is generated. Cleared otherwise.  
 C - Set if a carry is generated. Cleared otherwise.

#### SEE ALSO

@{ "ADD " link Add } @{ "ADDQ" link Addq } @{ "ADDX" link Addx }  
 @{ "SUB " link Sub } @{ "SUBI" link Subi } @{ "SUBQ" link Subq }  
 @{ "SUBX" link Subx }

## 1.13 addq

#### NAME

ADDQ -- Add 3-bit immediate quick

#### SYNOPSIS

ADDQ #<data>, <ea>

Size = (Byte, Word, Long)

#### FUNCTION

Adds the immediate value of 1 to 8 to the operand at the

destination location. The size of the operation may be specified as byte, word, or long. When adding to address registers, the condition codes are not altered, and the entire destination address register is used regardless of the operation size.

#### RESULT

X - Set the same as the carry bit.  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow is generated. Cleared otherwise.  
 C - Set if a carry is generated. Cleared otherwise.

#### SEE ALSO

@{ "ADD " link Add } @{ "ADDI" link Addi }  
 @{ "SUB " link Sub } @{ "SUBI" link Subi } @{ "SUBQ" link Subq }

## 1.14 addx

#### NAME

ADDX -- Add integer with extend

#### SYNOPSIS

ADDX Dy,Dx  
 ADDX -(Ay),-(Ax)

Size = (Byte, Word, Long)

#### FUNCTION

Adds the source operand to the destination operand along with the extend bit, and stores the result in the destination location. The addition is performed using binary coded decimal arithmetic. The operands, which are packed BCD numbers, can be addressed in two different ways:

1. Data register to data register: The operands are contained in the data registers specified in the instruction.
2. Memory to memory: The operands are addressed with the predecrement addressing mode using the address registers specified in the instruction.

The size of operation can be specified as byte, word, or long.

Normally the Z condition code bit is set via programming before the start of an operation. That allows successful tests for zero results upon completion of multiple-precision operations.

#### RESULT

X - Set the same as the carry bit.  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Cleared if the result is non-zero. Unchanged otherwise.  
 V - Set if an overflow is generated. Cleared otherwise.  
 C - Set if a carry is generated. Cleared otherwise.

#### SEE ALSO

---

```
@{ "ADD" link Add  } @{ "ADDI" link Addi }
@{ "SUB" link Sub   } @{ "SUBI" link Subi } @{ "SUBX" link Subx }
```

## 1.15 and

### NAME

AND -- Logical AND

### SYNOPSIS

```
AND <ea>,Dn
AND Dn,<ea>
```

Size = (Byte, Word, Long)

### FUNCTION

Performs a bit-wise AND operation with the source operand and the destination operand and stores the result in the destination. The size of the operation can be specified as byte, word, or long. The contents of an address register may not be used as an operand.

### RESULT

X - Not affected  
 N - Set if the most-significant bit of the result was set. Cleared otherwise.  
 Z - Set if the result was zero. Cleared otherwise.  
 V - Always cleared.  
 C - Always cleared.

### SEE ALSO

```
@{ "ANDI" link Andi }
```

## 1.16 andi

### NAME

ANDI -- Logical AND immediate

### SYNOPSIS

```
ANDI #<data>,<ea>
```

Size = (Byte, Word, Long)

### FUNCTION

Performs a bit-wise AND operation with the immediate data and the destination operand and stores the result in the destination. The size of the operation can be specified as byte, word, or long. The size of the immediate data matches the operation size.

### RESULT

X - Not affected  
 N - Set if the most-significant bit of the result was set. Cleared otherwise.  
 Z - Set if the result was zero. Cleared otherwise.

V - Always cleared.  
C - Always cleared.

SEE ALSO

```
@{ "AND " link And } @{ "ANDI to CCR" link AndiCCR } @{ "ANDI to SR" link AndiSR ←
}
```

## 1.17 andiccr

NAME

ANDI to CCR -- Logical AND immediate to condition code register

SYNOPSIS

ANDI #<data>,CCR

Size = (Byte)

FUNCTION

Performs a bit-wise AND operation with the immediate data and the lower byte of the status register.

RESULT

X - Cleared if bit 4 of immed. operand is zero. Unchaned otherwise.  
N - Cleared if bit 3 of immed. operand is zero. Unchaned otherwise.  
Z - Cleared if bit 2 of immed. operand is zero. Unchaned otherwise.  
V - Cleared if bit 1 of immed. operand is zero. Unchaned otherwise.  
C - Cleared if bit 0 of immed. operand is zero. Unchaned otherwise.

SEE ALSO

```
@{ "AND " link And } @{ "ANDI" link Andi } @{ "ANDI to SR" link AndiSR }
```

## 1.18 andisr

NAME

ANDI to SR -- Logical AND immediate to status register (privileged)

SYNOPSIS

ANDI #<data>,SR

Size = (Word)

FUNCTION

Performs a bit-wise AND operation with the immediate data and the status register. All implemented bits of the status register are affected.

RESULT

X - Cleared if bit 4 of immed. operand is zero. Unchaned otherwise.  
N - Cleared if bit 3 of immed. operand is zero. Unchaned otherwise.  
Z - Cleared if bit 2 of immed. operand is zero. Unchaned otherwise.  
V - Cleared if bit 1 of immed. operand is zero. Unchaned otherwise.  
C - Cleared if bit 0 of immed. operand is zero. Unchaned otherwise.

SEE ALSO

@{ "AND " link And } @{ "ANDI" link Andi } @{ "ANDI to CCR" link AndiCCR }

## 1.19 asd

NAME

ASL, ASR -- Arithmetic shift left and arithmetic shift right

ASd #<data>,Dy

ASd <ea>

where 'd' is the direction, L or R

Size = (Byte, Word, Long)

FUNCTION

RESULT

X - Set according to the list bit shifted out of the operand.  
Unaffected for a shift count of zero.

N - Set if the most-significant bit of the result is set. Cleared  
otherwise.

Z - Set if the result is zero. Cleared otherwise.

V - Set if the most significant bit is changed at any time during the  
shift operation. Cleared otherwise.

C - Set according to the list bit shifted out of the operand.  
Cleared for a shift count of zero.

SEE ALSO

@{ "ROD " link Rod } @{ "ROXd" link Roxd }

## 1.20 bcc

NAME

Bcc -- Conditional branch

SYNOPSIS

Bcc <label>

Size = (Byte, Word)

FUNCTION

CC carry clear C' LS low or same C+Z  
CS carry set C LT less than N'·V+N'V  
EQ equal Z MI minus N  
GE greater or equal N·V+N'V' NE not equal Z'  
GT greater than N·V·Z'+N'V'·Z' PL plus N'  
HI high C'·Z' VC overflow clear V'  
LE less or equal Z+N'·V+N'V VS overflow set V

RESULT  
None.

SEE ALSO  
@{ "BRA " link Bra } @{ "DBcc" link Dbcc } @{ "Scc " link Scc }

## 1.21 bchg

NAME  
BCHG -- Bit change

SYNOPSIS  
BCHG Dn,<ea>  
BCHG #<data>,<ea>  
  
Size = (Byte, Long)

FUNCTION  
Tests a bit in the destination operand and sets the Z condition code appropriately, then inverts the bit in the destination. If the destination is a data register, any of the 32 bits can be specified by the modulo 32 number. When the destination is a memory location, the operation must be a byte operation, and therefore the bit number is modulo 8. In all cases, bit zero is the least significant bit. The bit number for this operation may be specified in either of two ways:

1. Immediate -- The bit number is specified as immediate data.
2. Register -- The specified data register contains the bit number.

RESULT  
X - not affected  
N - not affected  
Z - Set if the bit tested is zero. Cleared otherwise.  
V - not affected  
C - not affected

SEE ALSO  
@{ "BCLR " link Bclr } @{ "BSET " link Bset } @{ "BTST " link Btst }  
@{ "EOR " link Eor } @{ "BFCHG" link Bfchg }

## 1.22 bclr

NAME  
BCLR -- Bit clear

SYNOPSIS  
BCLR Dn,<ea>  
BCLR #<data>,<ea>  
  
Size = (Byte, Long)

## FUNCTION

Tests a bit in the destination operand and sets the Z condition code appropriately, then clears the bit in the destination. If the destination is a data register, any of the 32 bits can be specified by the modulo 32 number. When the destination is a memory location, the operation must be a byte operation, and therefore the bit number is modulo 8. In all cases, bit zero is the least significant bit. The bit number for this operation may be specified in either of two ways:

1. Immediate -- The bit number is specified as immediate data.
2. Register -- The specified data register contains the bit number.

## RESULT

X - not affected  
 N - not affected  
 Z - Set if the bit tested is zero. Cleared otherwise.  
 V - not affected  
 C - not affected

## SEE ALSO

@{ "BCHG " link Bchg } @{ "BSET " link Bset } @{ "BTST " link Btst }  
 @{ "AND " link And } @{ "BFCLR" link Bfclr }

## 1.23 bkpt

## NAME

BKPT -- Break-point

## SYNOPSIS

BKPT #<data>

## FUNCTION

This instruction is used to support the program breakpoint function for debug monitors and real-time hardware emulators, and the operation will be dependent on the implementation. Execution of this instruction will cause the MC68010 to run a breakpoint acknowledge bus cycle and zeros on all address lines, but an MC68020 will place the immediate data on lines A2, A3, and A4, and zeros on lines A0 and A1.

Whether the breakpoint acknowledge cycle is terminated with (DTACK)', (BERR)', or (VPA)' the processor always takes an illegal instruction exception. During exception processing, a debug monitor can distinguish eight different software breakpoints by decoding the field in the BKPT instruction.

For the MC68000 and the MC68HC000, this instruction causes an illegal instruction exception, but does not run the breakpoint acknowledge bus cycle.

There are two possible responses on an MC68020: normal and exception. The normal response is an operation word (typically the instruction the BKPT originally replaced) on the data lines with the (DSACKx)' signal asserted. The operation word is the executed in place of the



breakpoint instruction.

For the exception response, a bus error signal will cause the MC68020 to take an illegal instruction exception, just as an MC68010 or MC68000 would do.

RESULT

None.

SEE ALSO

```
@{ "ILLEGAL" link Illegal }
@{ "Exceptions" link Exceptions }
```

## 1.24 bra

NAME

BRA -- Unconditional branch

SYNOPSIS

BRA <label>

Size = (Byte, Word)

Size = (Byte, Word, Long) (68020+)

FUNCTION

Program execution continues at location (PC) + displacement.

The PC contains the address of the instruction word of the BRA instruction plus two. The displacement is a two's complement integer that represents the relative distance in bytes from the current PC to the destination PC.

RESULT

None.

SEE ALSO

```
@{ "JMP" link Jmp } @{ "Bcc" link Bcc }
```

## 1.25 bset

NAME

BSET -- Bit set

SYNOPSIS

BCLR Dn,<ea>

BCLR #<data>,<ea>

Size = (Byte, Long)

FUNCTION

Tests a bit in the destination operand and sets the Z condition code appropriately, then sets the bit in the destination. If the destination is a data register, any of the 32 bits can be

specified by the modulo 32 number. When the destination is a memory location, the operation must be a byte operation, and therefore the bit number is modulo 8. In all cases, bit zero is the least significant bit. The bit number for this operation may be specified in either of two ways:

1. Immediate -- The bit number is specified as immediate data.
2. Register -- The specified data register contains the bit number.

#### RESULT

X - not affected  
 N - not affected  
 Z - Set if the bit tested is zero. Cleared otherwise.  
 V - not affected  
 C - not affected

#### SEE ALSO

@{ "BCHG " link Bchg } @{ "BCLR " link Bclr } @{ "BTST " link Btst }  
 @{ "OR " link Or } @{ "BFSET" link Bfset } @{ "BFINS" link Bfins }

## 1.26 bsr

#### NAME

BSR -- Branch to subroutine

#### SYNOPSIS

BSR <label>

Size = (Byte, Word)  
 Size = (Byte, Word, Long) (68020+)

#### FUNCTION

Pushes the long word address of the instruction immediately following the BSR instruction onto the system stack. The PC contains the address of the instruction word plus two. Program execution continues at location (PC) + displacement.

#### RESULT

None.

#### SEE ALSO

@{ "JSR" link Jsr } @{ "BRA" link Bra }  
 @{ "RTS" link Rts } @{ "RTD" link Rts } @{ "RTR" link Rts }

## 1.27 btst

#### NAME

BTST -- Bit test

#### SYNOPSIS

BTST Dn,<ea>  
 BTST #<data>,<ea>

Size = (Byte, Long)

#### FUNCTION

Tests a bit in the destination operand and sets the Z condition code appropriately. If the destination is a data register, any of the 32 bits can be specified by the modulo 32 number. When the destination is a memory location, the operation must be a byte operation, and therefore the bit number is modulo 8. In all cases, bit zero is the least significant bit. The bit number for this operation may be specified in either of two ways:

1. Immediate -- The bit number is specified as immediate data.
2. Register -- The specified data register contains the bit number.

#### RESULT

X - not affected  
 N - not affected  
 Z - Set if the bit tested is zero. Cleared otherwise.  
 V - not affected  
 C - not affected

#### SEE ALSO

@{ "BFTST" link Bftst } @{ "BFFFO" link Bfffo }

## 1.28 chk

#### NAME

CHK -- Check bounds

#### SYNOPSIS

CHK <ea>,Dn

Size = (Word)

#### FUNCTION

Compares the value in the data register specified to zero and to the upper bound. The upper bound is a twos complement integer. If the register value is less than zero or greater than the upper bound, a CHK instruction, vector number 6, occurs.

#### RESULT

X - Not affected  
 N - Set if Dn < 0; cleared if Dn > <ea>. Undefined otherwise.  
 Z - Undefined.  
 V - Undefined.  
 C - Undefined.

#### SEE ALSO

@{ "CMP " link Cmp } @{ "CMPI" link Cmpi } @{ "CMPA" link Cmpa }  
 @{ "CHK2" link Chk2 }

## 1.29 clr

### NAME

CLR -- Clear

### SYNOPSIS

CLR <ea>

Size = (Byte, Word, Long)

### FUNCTION

Clears the destination operand to zero.

On an MC68000 and MC68HC000, a CLR instruction does both a read and a write to the destination. Because of this, this instruction should never be used on custom chip registers.

### RESULT

X - Not affected  
 N - Always cleared  
 Z - Always set  
 V - Always cleared  
 C - Always cleared

### SEE ALSO

@{ "MOVE " link Move } @{ "MOVEQ" link Moveq }  
 @{ "BCLR " link Bclr } @{ "BFCLR" link Bfclr }

## 1.30 cmp

### NAME

CMP -- Compare

### SYNOPSIS

CMP <ea>,Dn

Size = (Byte, Word, Long)

### FUNCTION

Subtracts the source operand from the destination data register and sets the condition codes according to the result. The data register is NOT changed.

### RESULT

X - Not affected  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow occurs. Cleared otherwise.  
 C - Set if a borrow occurs. Cleared otherwise.

### SEE ALSO

@{ "CMPI" link Cmpi } @{ "CMPA" link Cmpa } @{ "CMPM" link Cmpm } @{ "CMP2" link ↔  
 Cmp2 }  
 @{ "TST " link Tst } @{ "CHK " link Chk } @{ "CHK2" link Chk2 }

## 1.31 cmpa

### NAME

CMPA -- Compare address

### SYNOPSIS

CMPA <ea>,An

Size = (Word, Long)

### FUNCTION

Subtracts the source operand from the destination address register and sets the condition codes according to the result. The address register is NOT changed. Word sized source operands are sign extended to long for comparison.

### RESULT

X - Not affected  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow occurs. Cleared otherwise.  
 C - Set if a borrow occurs. Cleared otherwise.

### SEE ALSO

@{ "CMP " link Cmp } @{ "CMPI" link Cmpi } @{ "CMP2" link Cmp2 }

## 1.32 cmpi

### NAME

CMPI -- Compare immediate

### SYNOPSIS

CMP #<data>,<ea>

Size = (Byte, Word, Long)

### FUNCTION

Subtracts the source operand from the destination operand and sets the condition codes according to the result. The destination is NOT changed. The size of the immediate data matches the operation size.

### RESULT

X - Not affected  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow occurs. Cleared otherwise.  
 C - Set if a borrow occurs. Cleared otherwise.

### SEE ALSO

@{ "CMP " link Cmp } @{ "CMPA" link Cmpa } @{ "CMPM" link Cmpm } @{ "CMP2" link Cmp2 }  
 @{ "TST " link Tst } @{ "CHK " link Chk } @{ "CHK2" link Chk2 }

## 1.33 cmpm

### NAME

CMPM -- Compare memory

### SYNOPSIS

CMPM (Ay)+, (Ax)+

Size = (Byte, Word, Long)

### FUNCTION

Subtracts the source operand from the destination operand and sets the condition codes according to the result. The destination operand is NOT changed. Operands are always addressed with the postincrement mode.

### RESULT

X - Not affected  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Set if an overflow occurs. Cleared otherwise.  
 C - Set if a borrow occurs. Cleared otherwise.

### SEE ALSO

@{ "CMP " link Cmp } @{ "CMPI" link Cmpi } @{ "CMPA" link Cmpa } @{ "CMP2" link ↵  
 Cmp2 }  
 @{ "TST " link Tst } @{ "CHK " link Chk } @{ "CHK2" link Chk2 }

## 1.34 dbcc

### NAME

DBcc -- Decrement and branch conditionally

### SYNOPSIS

DBcc Dn,<label>

Size = (Word)

### FUNCTION

Controls a loop of instructions. The parameters are: a condition code, a data register (counter), and a displacement value. The instruction first tests the condition (for termination); if it is true, no operation is performed. If the termination condition is not true, the low-order 16 bits of the counter are decremented by one. If the result is -1, execution continues at the next instruction, otherwise, execution continues at the specified address.

Condition code 'cc' specifies one of the following:

CC	carry clear	C'	LS low or same	C+Z
CS	carry set	C	LT less than	N'·V+N'V
EQ	equal	Z	MI minus	N
GE	greater or equal	N·V+N'V'	NE not equal	Z'

GT greater than  $N \cdot V \cdot Z' + N' \cdot V' \cdot Z'$  PL plus  $N'$   
 HI high  $C' \cdot Z'$  VC overflow clear  $V'$   
 LE less or equal  $Z + N' \cdot V + N' \cdot V'$  VS overflow set  $V$

Keep the following in mind when using DBcc instructions:

1. A DBcc acts as the UNTIL loop construct in high level languages. E.g., DBMI would be "decrement and branch until minus".
2. Most assemblers accept DBRA or DBF for use when no condition is required for termination of a loop.

RESULT

None.

SEE ALSO

@{ "Bcc" link Bcc } @{ "Scc" link Scc }

## 1.35 divs

NAME

DIVS, DIVSL -- Signed divide

SYNOPSIS

DIVS.W <ea>,Dn 32/16 -> 16r:16q  
 DIVS.L <ea>,Dq 32/32 -> 32q (68020+)  
 DIVS.L <ea>,Dr:Dq 64/32 -> 32r:32q (68020+)  
 DIVSL.L <ea>,Dr:Dq 32/32 -> 32r:32q (68020+)

Size = (Word, Long)

FUNCTION

Divides the signed destination operand by the signed source operand and stores the signed result in the destination.

The instruction has a word form and three long forms. For the word form, the destination operand is a long word and the source operand is a word. The resultant quotient is placed in the lower word of the destination and the resultant remainder is placed in the upper word of the destination. The sign of the remainder is the same as the sign of the dividend.

In the first long form, the destination and the source are both long words. The quotient is placed in the longword of the destination and the remainder is discarded.

The second long form has the destination as a quadword (eight bytes), specified by any two data registers, and the source is a long word. The resultant remainder and quotient are both long words and are placed in the destination registers.

The final long form has both the source and the destination as long words and the resultant quotient and remainder as long words.

RESULT

X - Not affected  
 N - Set if the quotient is negative, cleared otherwise. Undefined if overflow or divide by zero occurs.  
 Z - Set if the quotient is zero, cleared otherwise. Undefined if overflow or divide by zero occurs.  
 V - Set if overflow occurs, cleared otherwise. Undefined if divide by zero occurs.  
 C - Always cleared.

#### Notes:

1. If divide by zero occurs, an exception occurs.
2. If overflow occurs, neither operand is affected.

#### SEE ALSO

@{"DIVU" link Divu } @{"MULS" link Muls } @{"MULU" link Mulu }  
 @{"Exceptions" link Exceptions }

## 1.36 divu

#### NAME

DIVU, DIVUL -- Unsigned divide

#### SYNOPSIS

DIVU.W <ea>,Dn      32/16 -> 16r:16q  
 DIVU.L <ea>,Dq      32/32 -> 32q      (68020+)  
 DIVU.L <ea>,Dr:Dq    64/32 -> 32r:32q    (68020+)  
 DIVUL.L <ea>,Dr:Dq   32/32 -> 32r:32q    (68020+)

Size = (Word, Long)

#### FUNCTION

Divides the unsigned destination operand by the unsigned source operand and stores the unsigned result in the destination.

The instruction has a word form and three long forms. For the word form, the destination operand is a long word and the source operand is a word. The resultant quotient is placed in the lower word of the destination and the resultant remainder is placed in the upper word of the destination. The sign of the remainder is the same as the sign of the dividend.

In the first long form, the destination and the source are both long words. The quotient is placed in the longword of the destination and the remainder is discarded.

The second long form has the destination as a quadword (eight bytes), specified by any two data registers, and the source is a long word. The resultant remainder and quotient are both long words and are placed in the destination registers.

The final long form has both the source and the destination as long words and the resultant quotient and remainder as long words.

#### RESULT



X - Not affected  
 N - See below.  
 Z - Set if the quotient is zero, cleared otherwise. Undefined if overflow or divide by zero occurs.  
 V - Set if overflow occurs, cleared otherwise. Undefined if divide by zero occurs.  
 C - Always cleared.

Notes:

1. If divide by zero occurs, an exception occurs.
2. If overflow occurs, neither operand is affected.

According to the Motorola data books, the N flag is set if the quotient is negative, but in an unsigned divide, this seems to be impossible.

SEE ALSO

@{"DIVS" link Divs } @{"MULS" link Muls } @{"MULU" link Mulu }  
 @{"Exceptions" link Exceptions }

## 1.37 eor

NAME

EOR -- Exclusive logical OR

SYNOPSIS

EOR Dn,<ea>

Size = (Byte, Word, Long)

FUNCTION

Performs an exclusive OR operation on the destination operand with the source operand.

RESULT

X - Not Affected  
 N - Set to the value of the most significant bit.  
 Z - Set if the result is zero.  
 V - Always cleared  
 C - Always cleared

SEE ALSO

EORI BCHG

## 1.38 eori

NAME

EORI -- Exclusive OR immediate

SYNOPSIS

EORI #<data>,<ea>

Size = (Byte, Word, Long)

#### FUNCTION

Performs an exclusive OR operation on the destination operand with the source operand.

#### RESULT

X - Not Affected  
 N - Set to the value of the most significant bit.  
 Z - Set if the result is zero.  
 V - Always cleared  
 C - Always cleared

#### SEE ALSO

@{ "EOR " link Eor } @{ "EORI to CCR" link EoriCCR } @{ "EORI to SR" link ←  
 EoriSR }  
 @{ "BCHG" link Bchg }

## 1.39 eoricc

#### NAME

EORI to CCR -- Exclusive OR immediate to the condition code register

#### SYNOPSIS

EORI #<data>,CCR

Size = (Byte)

#### FUNCTION

Performs an exclusive OR operation on the condition codes register with the source operand.

#### RESULT

X - Changed if bit 4 of the source is set, cleared otherwise.  
 N - Changed if bit 3 of the source is set, cleared otherwise.  
 Z - Changed if bit 2 of the source is set, cleared otherwise.  
 V - Changed if bit 1 of the source is set, cleared otherwise.  
 C - Changed if bit 0 of the source is set, cleared otherwise.

#### SEE ALSO

@{ "EOR " link Eor } @{ "EORI" link Eori } @{ "EORI to SR" link EoriSR }

## 1.40 eoristr

#### NAME

EORI to SR -- Exclusive OR immediated to the status register (privileged)

#### SYNOPSIS

EORI #<data>,SR

Size = (Word)

## FUNCTION

Performs an exclusive OR operation on the status register with the source operand.

## RESULT

X - Changed if bit 4 of the source is set, cleared otherwise.  
N - Changed if bit 3 of the source is set, cleared otherwise.  
Z - Changed if bit 2 of the source is set, cleared otherwise.  
V - Changed if bit 1 of the source is set, cleared otherwise.  
C - Changed if bit 0 of the source is set, cleared otherwise.

## SEE ALSO

EOR EORI EORI to CCR

## 1.41 exg

## NAME

EXG -- Register exchange

## SYNOPSIS

EXG Rx,Ry

Size = (Long)

## FUNCTION

Exchanges the contents of any two registers.

## RESULT

None.

## SEE ALSO

@{ "SWAP" link Swap }

## 1.42 ext

## NAME

EXT, EXTB -- Sign extend

## SYNOPSIS

EXT.W Dn Extend byte to word

EXT.L Dn Extend word to long word

EXTB.L Dn Extend byte to long word (68020+)

Size = (Word, Long)

## FUNCTION

Extends a byte to a word, or a word to a long word in a data register by copying the sign bit through the upper bits. If the operation is from byte to word, bit 7 is copied to bits 8 through 15. If the operation is from word to long word, bit 15 is copied to bits 16 through 31. The EXTB copies bit 7 to bits 8 through 31.

---

## RESULT

X - Not affected  
N - Set if the result is negative. Cleared otherwise.  
Z - Set if the result is zero. Cleared otherwise.  
V - Always cleared  
C - Always cleared

SEE ALSO

## 1.43 illegal

## NAME

ILLEGAL -- Illegal processor instruction

## SYNOPSIS

ILLEGAL

## FUNCTION

This instruction forces an Illegal Instruction exception, vector number 4. All other illegal instruction bit patterns, including, but not limited to, \$fxxx and \$axxx, are reserved for future expansion.

## RESULT

None.

SEE ALSO

@{ "BKPT" link Bkpt }  
@{ "Exceptions" link Exceptions }

## 1.44 jmp

## NAME

JMP -- Unconditional far jump

## SYNOPSIS

JMP <ea>

## FUNCTION

Program execution continues at the address specified by the operand.

## RESULT

None.

SEE ALSO

@{ "BRA" link Bra } @{ "JSR" link Jsr }

## 1.45 jsr

## NAME

JSR -- Jump to far subroutine

## SYNOPSIS

JSR <ea>

## FUNCTION

Pushes the long word address of the instruction immediately following the JSR instruction onto the stack. The PC contains the address of the instruction word plus two. Program execution continues at location specified by <ea>.

## RESULT

None.

## SEE ALSO

@{ "BSR" link Jsr } @{ "BRA" link Bra }  
@{ "RTS" link Rts } @{ "RTD" link Rts } @{ "RTR" link Rts }

## 1.46 lea

## NAME

LEA -- Load effective address

## SYNOPSIS

LEA <ea>,An

Size = (Long)

## FUNCTION

Places the specified address into the destination address register. Note: All 32 bits of An are affected by this instruction.

## RESULT

None.

## SEE ALSO

@{ "MOVEA" link Movea } @{ "ADDA " link Adda } @{ "SUBA " link Suba }

## 1.47 link

## NAME

LINK -- Create local stack frame

## SYNOPSIS

LINK An, #<data>

Size = (Word)

Size = (Word, Long) (68020+)

## FUNCTION

This instruction saves the specified address register onto the stack, then places the new stack pointer in that register. It then adds the specified immediate data to the stack pointer. To allocate space on the stack for a local data area, a negative value should be used for the second operand.

#### RESULT

None.

#### SEE ALSO

```
@{ "UNLK" link Unlk }
@{ "Local Stack Frames" link LocalStack }
```

## 1.48 lsd

#### NAME

LSL, LSR -- Logical shift left and logical shift right

#### SYNOPSIS

```
LSd Dx,Dy
LSd #<data>,Dy
LSd <ea>
where d is directoin, L or R
```

Size = (Byte, Word, Long)

#### FUNCTION

Shift the bits of the operand in the specified direction. The carry bit set set to the last bit shifted out of the operand. The shift count for the shifting of a register may be specified in two different ways:

1. Immediate - the shift count is specified in the instruction (shift range 1-8).
2. Register - the shift count is contained in a data register specified in the instruction (shift count mod 64)

For a register, the size may be byte, word, or long, but for a memory location, the size must be a word. The shift count is also restricted to one for a memory location.

#### RESULT

X - Set according to the last bit shifted out of the operand.  
 N - Set if the result is negative. Cleared otherwise.  
 Z - Set if the result is zero. Cleared otherwise.  
 V - Always cleared  
 C - Set according to the last bit shifted out of the operand.

#### SEE ALSO

## 1.49 move

---

## NAME

MOVE -- Source -> Destination

## SYNOPSIS

MOVE <ea>, <ea>

Size = (Byte, Word, Long)

## FUNCTION

Move the content of the source to the destination location.  
The data is examined as it is moved, and the condition codes  
set accordingly.

## RESULT

X - Not affected.  
N - Set if the result is negative. Cleared otherwise.  
Z - Set if the result is zero. Cleared otherwise.  
V - Always cleared.  
C - Always cleared.

## SEE ALSO

## 1.50 movea

## NAME

MOVEA -- Source -> Destination

## SYNOPSIS

MOVEA <ea>, An

Size = (Word, Long)

## FUNCTION

Move the content of the source to the destination address  
register. Word sized operands are sign extended to 32 bits  
before the operation is done.

## RESULT

None.

## SEE ALSO

MOVE LEA

## 1.51 movefromccr

## NAME

MOVE from CCR -- CCR -> Destination

## SYNOPSIS

MOVE CCR, <ea>

---

Size = (Word)

#### FUNCTION

The content of the status register is moved to the destination location. The source operand is a word, but only the low order byte contains the condition codes. The high order byte is set to all zeros.

#### RESULT

None.

#### SEE ALSO

## 1.52 movetoccr

#### NAME

MOVE to CCR -- Source -> CCR

#### SYNOPSIS

MOVE <ea>,CCR

Size = (Word)

#### FUNCTION

The content of the source operand is moved to the condition codes. The source operand is a word, but only the low order byte is used to update the condition codes. The high order byte is ignored.

#### RESULT

X - Set the same as bit 4 of the source operand.  
N - Set the same as bit 3 of the source operand.  
Z - Set the same as bit 2 of the source operand.  
V - Set the same as bit 1 of the source operand.  
C - Set the same as bit 0 of the source operand.

#### SEE ALSO

## 1.53 movefromsr

#### NAME

MOVE from SR -- Move from status register (privileged)

#### SYNOPSIS

MOVE SR,<ea>

Size = (Word)

#### FUNCTION

The content of the status register is moved to the destination location. The operand size is a word.

---



RESULT  
None.

SEE ALSO

## 1.54 movetosr

NAME

MOVE to SR -- Move to status register (privileged)

SYNOPSIS

MOVE <ea>,SR

Size = (Word)

FUNCTION

The content of the source operand is moved to the status register. The source operand size is a word and all bits of the status register are affected.

RESULT

X - Set the same as bit 4 of the source operand.  
N - Set the same as bit 3 of the source operand.  
Z - Set the same as bit 2 of the source operand.  
V - Set the same as bit 1 of the source operand.  
C - Set the same as bit 0 of the source operand.

SEE ALSO

MOVE to CCR

## 1.55 moveusp

NAME

MOVE USP -- Move to/from user stack pointer (privileged)

SYNOPSIS

MOVE USP,An

MOVE An,USP

Size = (Long)

FUNCTION

The contents of the user stack pointer are transferred either to or from the specified address register.

RESULT  
None.

SEE ALSO

---

## 1.56 movec

### NAME

MOVEC -- Move to/from control register

### SYNOPSIS

MOVEC Rc,Rn

MOVEC Rn,Rc

Size = (Long)

### FUNCTION

Copy the contents of the specified control register to the specified general register or copy from the general register to the control register. This is always a 32-bit transfer even though the the control register may be implemented with fewer bits.

### RESULT

None.

### SEE ALSO

## 1.57 movem

### NAME

MOVEM -- Move multiple registers

### SYNOPSIS

MOVEM register list,<ea>

MOVEM <ea>,register list

Size = (Word, Long)

### FUNCTION

Registers in the register list are either moved to or fetched from consecutive memory locations at the specified address. Data can be either word or long word, but if the register list is destination and the size is word, each register is filled with the source word sign extended to 32-bits.

Also, in the case that the register list is the destination, register indirect with predecrement is not a valid source mode. If the register list is the source, then the destination may not be register indirect with postincrement.

MOVEM.L D0/D1/A0, (A2)+ ; invalid

MOVEM.W -(A1), D5/D7/A4 ; invalid

The register list is accessed with D0 first through D7, followed by A0 through A7.

### RESULT

---

None.

SEE ALSO

## 1.58 movep

### NAME

MOVEP -- Move peripheral data

### SYNOPSIS

MOVEP Dx, (d,Ay)

MOVEP (d,Ay), Dx

Size = (Word, Long)

### FUNCTION

Data is transferred between a data register and ever-other byte of memory at the selected address. Example:

```
LEA port0,A0 ; A0 -> $FFFFFFFFFFFFFFFF
MOVEQ #0,D0
MOVEP.L D0, (0,A0) ; A0 -> $FF00FF00FF00FF00
MOVE.L #$55554444,D0
MOVEP.L D0, (1,A0) ; A0 -> $FF55FF55FF44FF44
```

### RESULT

None.

SEE ALSO

## 1.59 moveq

### NAME

MOVEQ -- Move signed 8-bit data quick

### SYNOPSIS

MOVEQ #<data:8>,Dn

Size = (Long)

### FUNCTION

Move signed 8-bit data to the specified data register. The specified data is sign extended to 32-bits before it is moved to the register

### RESULT

X - Not affected.

N - Set if the result is negative. Cleared otherwise.

Z - Set if the result is zero. Cleared otherwise.

V - Always cleared.

C - Always cleared.

SEE ALSO

## 1.60 moves

NAME

MOVES -- Move address space (privileged)

SYNOPSIS

MOVES Rn,<ea>  
MOVES <ea>,Rn

FUNCTION

RESULT

None.

SEE ALSO

## 1.61 mul

NAME

MULS -- Signed multiply  
MULU -- Unsigned multiply

SYNOPSIS

MULS.W <ea>,Dn 16\*16->32  
MULS.L <ea>,Dn 32\*32->32 68020+  
MULS.L <ea>,Dh:Dl 32\*32->64 68020+

MULU.W <ea>,Dn 16\*16->32  
MULU.L <ea>,Dn 32\*32->32 68020+  
MULU.L <ea>,Dh:Dl 32\*32->64 68020+

Size = (Word)

Size = (Word, Long) 68020+

FUNCTION

Multiply two signed (MULS) or unsigned (MULU) integers to produce either a signed or unsigned, respectively, result.

This instruction has three forms. They are basically word, long word, and quad word. The first version is the only one available on a processor lower than a 68020. It will multiply two 16-bit integers and produce a 32-bit result. The second will multiply two 32-bit integers and produce a 32-bit result.

The third form needs some special consideration. It will multiply two 32-bit integers, specified by <ea> and Dl, the result is (sign) extended to 64-bits with the low order 32 being placed in Dl and the high order

32 being placed in Dh.

#### RESULT

X - Not affected.  
N - Set if the result is negative. Cleared otherwise.  
Z - Set if the result is zero. Cleared otherwise.  
V - Set if overflow. Cleared otherwise.  
C - Always cleared.

SEE ALSO

## 1.62 nbcd

#### NAME

NBCD -- Negate binary coded decimal with extend

#### SYNOPSIS

NBCD <ea>

Size = (Byte)

#### FUNCTION

The specified BCD number and the extend bit are subtracted from zero. Therefore, if the extend bit is set a nines complement is performed, else a tens complement is performed. The result is placed back in the specified <ea>.

It can be use full to set the zero flag before performing this operation so that multi precision operations can be correctly tested for zero.

#### RESULT

X - Set the same as the carry bit.  
N - Undefined.  
Z - Cleared if the result is non-zero, unchanged otherwise.  
V - Undefined.  
C - Set if a borrow was generated, cleared otherwise.

SEE ALSO

NEG NEGX

## 1.63 neg

#### NAME

NEG -- Negate

#### SYNOPSIS

NEG <ea>

Size = (Byte, Word, Long)

#### FUNCTION

---

The operand specified by <ea> is subtracted from zero. The result is stored in <ea>.

#### RESULT

X - Set the same as the carry bit.  
N - Set if the result is negative, otherwise cleared.  
Z - Set if the result is zero, otherwise cleared.  
V - Set if overflow, otherwise cleared.  
C - Cleared if the result is zero, otherwise set.

#### SEE ALSO

NBCD NEGX

## 1.64 negx

#### NAME

NEGX -- Negate with extend

#### SYNOPSIS

NEGX <ea>

Size = (Byte, Word, Long)

#### FUNCTION

Perform an operation similar to a NEG, with the exception that the operand and the extend bit are both subtracted from zero. The result then being place in the given ea.

As with ADDX, SUBX, ABCD, SBCD, and NBCD, it can be useful to set the zero flag before performing this operation so that multi precision operations can be tested for zero.

#### RESULT

X - Set the same as the carry bit.  
N - Set if the result is negative, otherwise cleared.  
Z - Cleared if the result is non-zero, otherwise unchanged.  
V - Set if an overflow is generated, cleared otherwise.  
C - Set if a borrow is generated, otherwise cleared.

#### SEE ALSO

NEG NBCD ADDX SUBX

## 1.65 nop

#### NAME

NOP -- No operation

#### SYNOPSIS

NOP

---

## FUNCTION

Nothing happens! Well, sort of. This instruction will basically wait until all pending bus activity is completed. This allows synchronization of the pipeline and prevents instruction overlap.

## RESULT

None.

## SEE ALSO

## 1.66 not

## NAME

NOT -- Logical complement

## SYNOPSIS

NOT <ea>

Size = (Byte, Word, Long)

## FUNCTION

All bits of the specified operand are inverted and placed back in the operand.

## RESULT

X - Not affected.

N - Set if the result is negative, otherwise cleared.

Z - Set if the result is zero, otherwise cleared.

V - Always cleared.

C - Always cleared.

## SEE ALSO

## 1.67 or

## NAME

OR -- Logical OR

## SYNOPSIS

OR Dn,<ea>

Size = (Byte, Word, Long)

## FUNCTION

Performs an OR operation on the destination operand with the source operand.

## RESULT

X - Not Affected

N - Set to the value of the most significant bit.

Z - Set if the result is zero.

---

V - Always cleared  
C - Always cleared

SEE ALSO  
ORI BSET

## 1.68 ori

NAME  
ORI -- Logical OR immediate

SYNOPSIS  
ORI #<data>, <ea>

Size = (Byte, Word, Long)

FUNCTION  
Performs an OR operation on the destination operand with the source operand.

RESULT  
X - Not Affected  
N - Set to the value of the most significant bit.  
Z - Set if the result is zero.  
V - Always cleared  
C - Always cleared

SEE ALSO  
{ "OR" link Eor } { "ORI to CCR" link oriCCR } { "ORI to SR" link oriSR }  
{ "BSET" link Bchg }

## 1.69 oriccr

NAME  
ORI to CCR -- Logical OR immediate to the condition code register

SYNOPSIS  
ORI #<data>, CCR

Size = (Byte)

FUNCTION  
Performs an OR operation on the condition codes register with the source operand.

RESULT  
X - Set if bit 4 of the source is set, cleared otherwise.  
N - Set if bit 3 of the source is set, cleared otherwise.  
Z - Set if bit 2 of the source is set, cleared otherwise.  
V - Set if bit 1 of the source is set, cleared otherwise.  
C - Set if bit 0 of the source is set, cleared otherwise.

---



SEE ALSO

@{ "OR " link or } @{ "ORI" link ori } @{ "ORI to SR" link oriSR }

## 1.70 orisr

NAME

ORI to SR -- Logical OR immediated to the status register (privileged)

SYNOPSIS

ORI #<data>,SR

Size = (Word)

FUNCTION

Performs an OR operation on the status register with the source operand, and leaves the result in the status register.

RESULT

X - Set if bit 4 of the source is set, cleared otherwise.  
 N - Set if bit 3 of the source is set, cleared otherwise.  
 Z - Set if bit 2 of the source is set, cleared otherwise.  
 V - Set if bit 1 of the source is set, cleared otherwise.  
 C - Set if bit 0 of the source is set, cleared otherwise.

SEE ALSO

OR ORI ORI to CCR

## 1.71 unnamed.1

NAME

PACK -- Pack binary coded decimal (68020+)

SYNOPSIS

PACK -(Ax),-(Ay),#<adjustment>  
 PACK Dx,Dy,#<adjustment>

FUNCTION

Convert byte-per-digit unpacked BCD to packed two-digit-per-byte BCD.

RESULT

None.

SEE ALSO

## 1.72 unnamed.2

## NAME

PEA -- Push effective address

## SYNOPSIS

## FUNCTION

## RESULT

None.

## SEE ALSO

## 1.73 unnamed.3

## NAME

RESET -- Reset external devices

## SYNOPSIS

## FUNCTION

## RESULT

None.

## SEE ALSO

## 1.74 rod

## NAME

ROL, ROR -- Rotate left and rotate right

## SYNOPSIS

## FUNCTION

## RESULT

X -

N -

Z -

V -

C -

## SEE ALSO

## 1.75 roxd

## NAME

ROXL, ROXD -- Rotate left with extend and rotate right with extend

SYNOPSIS

FUNCTION

RESULT

X -

N -

Z -

V -

C -

SEE ALSO

## 1.76 rtd

NAME

RTD -- Return and deallocate parameter stack frame (68010+)

SYNOPSIS

FUNCTION

RESULT

None.

SEE ALSO

## 1.77 rte

NAME

RTE -- Return from exception

SYNOPSIS

FUNCTION

RESULT

SEE ALSO

## 1.78 rtm

NAME

RTM -- Return from process module (68020 only)

SYNOPSIS

FUNCTION

RESULT

---

SEE ALSO

## 1.79 rtr

NAME

RTR -- Return and restore condition code register

SYNOPSIS

FUNCTION

RESULT

SEE ALSO

## 1.80 rts

NAME

RTS -- Return from subroutine

SYNOPSIS

FUNCTION

RESULT

None.

SEE ALSO

## 1.81 sbcd

NAME

SB CD -- Subtract binary coded decimal with extend

SYNOPSIS

FUNCTION

RESULT

X -

N -

Z -

V -

C -

SEE ALSO

---

## 1.82 scc

### NAME

Scc -- Conditional set

### SYNOPSIS

### FUNCTION

### RESULT

None.

### SEE ALSO

## 1.83 stop

### NAME

STOP -- Stop processor execution (privileged)

### SYNOPSIS

### FUNCTION

### RESULT

### SEE ALSO

## 1.84 sub

### NAME

SUB -- Subtract

### SYNOPSIS

### FUNCTION

### RESULT

X -

N -

Z -

V -

C -

### SEE ALSO

## 1.85 suba

### NAME

SUBA -- Subtract address

SYNOPSIS

FUNCTION

RESULT  
None.

SEE ALSO

## 1.86 subi

NAME

SUBI -- Subtract immediate

SYNOPSIS

FUNCTION

RESULT  
X -  
N -  
Z -  
V -  
C -

SEE ALSO

## 1.87 subq

NAME

SUBQ -- Subtract 3-bit immediate quick

SYNOPSIS

FUNCTION

RESULT  
X -  
N -  
Z -  
V -  
C -

SEE ALSO

## 1.88 subx

## NAME

SUBX -- Subtract with extend

## SYNOPSIS

## FUNCTION

## RESULT

X -

N -

Z -

V -

C -

## SEE ALSO

## 1.89 swap

## NAME

SWAP -- Swap register upper and lower words

## SYNOPSIS

## FUNCTION

## RESULT

X -

N -

Z -

V -

C -

## SEE ALSO

## 1.90 tas

## NAME

TAS -- Test and set operand

## SYNOPSIS

## FUNCTION

## RESULT

X -

N -

Z -

V -

C -

## SEE ALSO

## 1.91 trap

### NAME

TRAP -- Initiate processor trap

### SYNOPSIS

### FUNCTION

### RESULT

None.

### SEE ALSO

## 1.92 trapcc

### NAME

TRAPcc -- Conditional trap (68020+)  
TRAPv -- Trap on overflow

### SYNOPSIS

### FUNCTION

### RESULT

None.

### SEE ALSO

## 1.93 tst

### NAME

TST -- Test operand for zero

### SYNOPSIS

### FUNCTION

### RESULT

X -  
N -  
Z -  
V -  
C -

### SEE ALSO

## 1.94 unlk

---



## NAME

UNLK -- Free stack frame created by LINK

## SYNOPSIS

## FUNCTION

## RESULT

None.

## SEE ALSO

## 1.95 unpack

## NAME

UNPK -- Unpack binary coded decimal (68020+)

## SYNOPSIS

## FUNCTION

## RESULT

None.

## SEE ALSO

## 1.96 exceptions

## NAME

Processor exception initiation and handling

## SYNOPSIS

## FUNCTION

## RESULT

None.

## SEE ALSO

## 1.97 localstack

## NAME

Local stack frame maintenance

## SYNOPSIS

LINK An, #<data>

...

UNLK An

RTS

#### FUNCTION

The use of a local stack frame is critically important to the programmer who wishes to write re-entrant or recursive functions. The creation of a local stack frame on the MC680x0 family is done through the use of the LINK and UNLK instructions. The LINK instruction saves the frame pointer onto the stack, and places a pointer to the new stack frame in it. The UNLK instruction restores the old stack frame. For example:

```
link  a5,#-8    ; a5 is chosen to be the frame
           ; pointer. 8 bytes of local stack
           ; frame are allocated.
...
unlk  a5        ; a5, the old frame pointer, and the
           ; old SP are restored.
```

Since the LINK and UNLK instructions maintain both the frame pointer and the stack pointer, the following code segment is perfectly legal:

```
link  a5,#-4

movem.l d0-a4,-(sp)
pea (500).w
move.l d2,-(sp)
bsr.b Routine

unlk  a5
rts
```

#### RESULT

None.

#### SEE ALSO

@{ "LINK" link Link } @{ "UNLK" link Unlk }