

Motorola 6800 microprocessor architecture

Program, data and stack memories occupy the same memory space.
The total addressable memory size is 64 KB.

Program memory - program can be located anywhere in memory. Jump and subroutine call instructions can be used to jump anywhere in memory. Conditional and unconditional branches are limited to memory addresses positioned no farther than -125 - +129 bytes from the branch instruction.

Data memory - data can be anywhere in memory space.

Stack memory - stack can be placed anywhere in memory space.

Reserved memory locations:

- FFF8h - FFF9h: Pointer to IRQ interrupt-processing routine.
- FFFAh - FFFBh: Pointer to software interrupt-processing routine.
- FFFCh - FFFDh: Pointer to NMI interrupt-processing routine.
- FFFEh - FFFFh: Pointer to RESET handling code.
- Some memory addresses may be reserved for memory mapped I/O as the processor doesn't have hardware I/O capability.

Interrupts

IRQ - maskable interrupt. When the interrupt occurs the program counter, index register, accumulators and condition code registers are stored in the stack, the further interrupts are disabled and the processor jumps to memory location address of which is stored in memory FFF8h - FFF9h. To return from the interrupt the processing routine should use RTI instruction. This interrupt can be enabled/disabled using CLI/SEI instructions.

NMI - non-maskable interrupt. When the interrupt occurs the program counter, index register, accumulators and condition code registers are stored in the stack, the further interrupts are disabled and the processor jumps to memory location address of which is stored in memory FFFCh - FFFDh. To return from the interrupt the processing routine should use RTI instruction. This interrupt can not be disabled.

SWI - software interrupt. This interrupt can be only invoked from the program. When the interrupt occurs the processor stores the program counter, index register, accumulators and condition code registers in the stack, disables the further interrupts and jumps to memory location address of which is stored in memory FFFAh - FFFBh. To return from the interrupt the processing routine should use RTI instruction. This interrupt can not be disabled.

I/O ports

None.

Registers

Accumulator A (ACCA) is an 8-bit register used for arithmetic and logic operations.

Accumulator B (ACCB) is an 8-bit register used for arithmetic and logic operations.

Index (IX) is a 16-bit register usually used for temporary storage or as an index when indexed addressing is used.

Program counter (PC) is a 16-bit register.

Stack pointer (SP) is a 16-bit register.

Condition code register contains the following flags:

- Half carry (H) - set if there was a carry from bit 3 to bit 4 of the result when the result was calculated.
- Interrupt mask (I) - set if the IRQ interrupt is disabled.
- Negative (N) - set if the most significant bit of the result is set.
- Zero (Z) - set if the result is zero.
- Overflow (V) - set if there was an overflow during last result calculation.
- Carry (C) - set if there was a carry from the bit 7 during last result calculation.

Instruction Set

- 6800 instruction set consists of 72 instructions:
- Data moving instructions.
- Arithmetic - add, subtract, negate, increment, decrement and compare.
- Logic - AND, OR, exclusive OR, complement and shift/rotate.
- Control transfer - conditional, unconditional, call subroutine and return from subroutine.
- Other - clear/set condition flags, bit test, stack operations, software interrupt, etc.

Addressing Modes

Implied - the data value/data address is implicitly associated with the instruction.

Accumulator - the instruction implies that the data is one of the accumulator registers.

Immediate - 8-bit or 16-bit data is provided in the instruction.

Direct - one-byte operand provided in the instruction specifies the memory address in page zero (0000h - 00FFh) where data is located.

Extended - two-byte operand provided in the instruction specifies the memory address where data is located.

Relative - one byte offset is added to the address of the next instruction (the contents of the program counter register + 2). The offset is a signed number in the range -127 - +127.

Indexed - one byte operand is added to the contents of the IX register, the resulting 16-bit value is a pointer to memory where data is located.