CSE 315
Microprocessors & Microcontrollers

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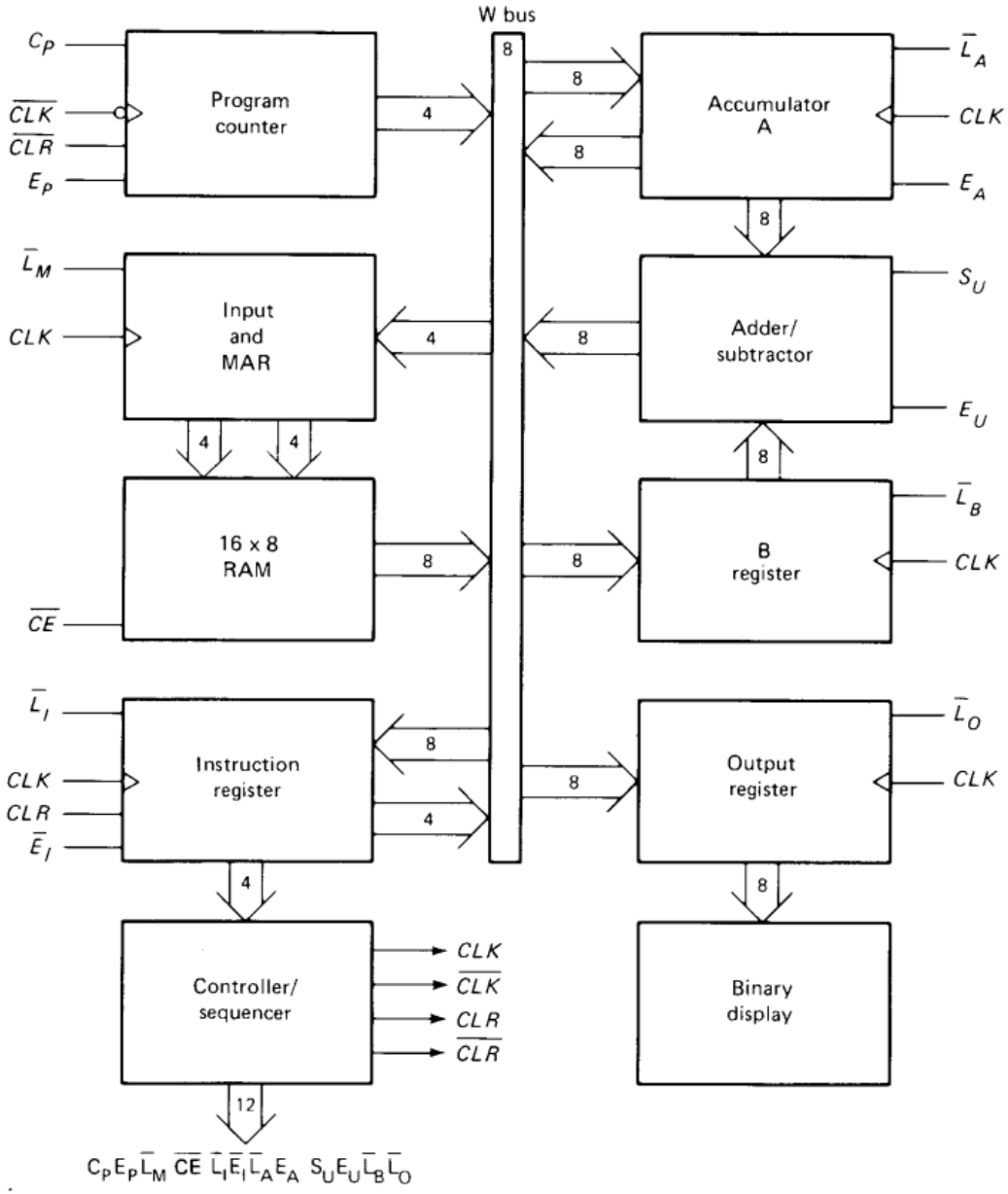
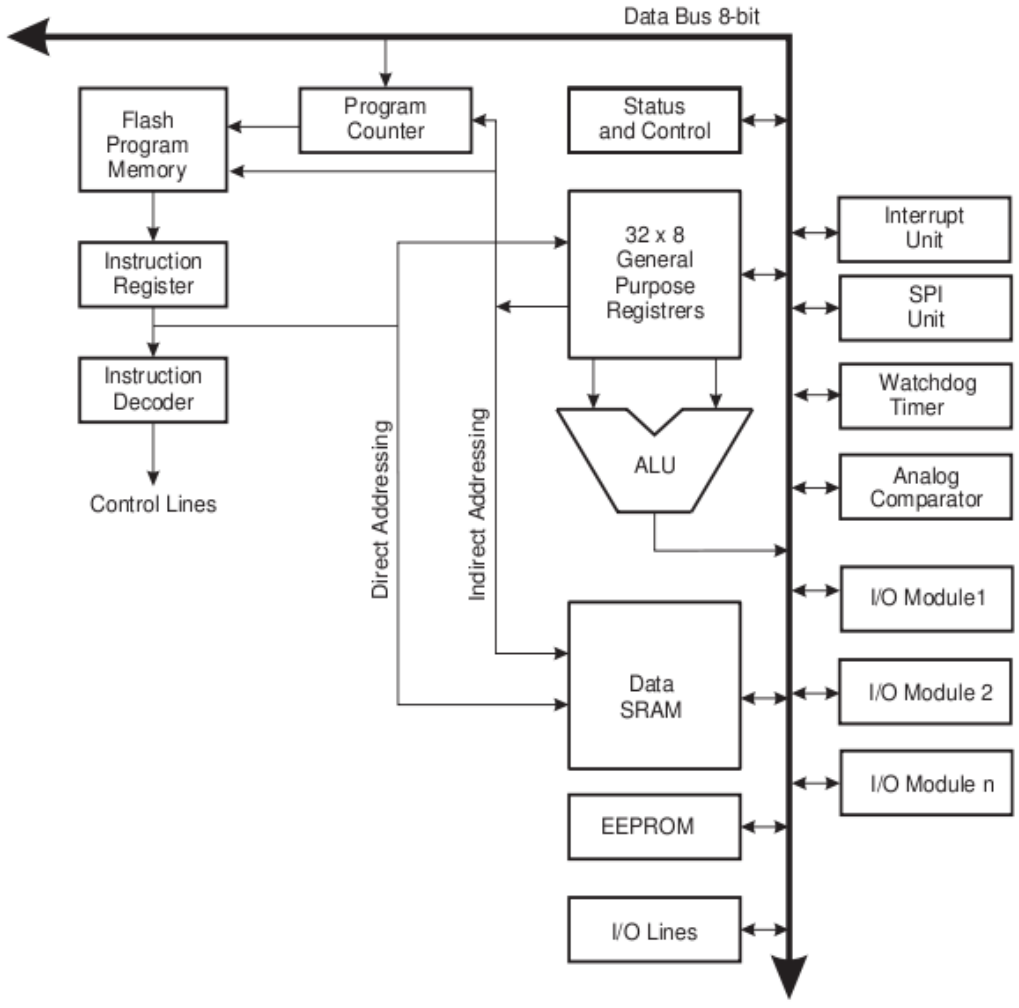
Recap

Simple Computer Architecture



ATmega16 Architecture

Block Diagram



ATmega16 Architecture

Overview

- RISC Architecture
- Harvard Architecture

for fast and efficient program execution

Reduced Instruction Set Computer

- register-based architecture
  - 32 8-bit registers coupled with ALU within CPU
- instruction set based on RISC concept
  - 131 RISC-type (mostly single clock cycle) instructions

Harvard Architecture

- separate, dedicated memories and buses for instruction and data
- 3 main memory sections
  - In-System Re-programmable nonvolatile Flash Memory, 16 KB
  - volatile SRAM to feature stack and data memory, 1120 B
  - nonvolatile EEPROM, 512 B

Today's Topic

ATmega16 Other Built-in Features

ATmega16 Other Features

Overview

- Clock
- Timer
- Pulse Width Modulator
- Serial Communications
- Analog-to-Digital Converter
- Interrupt

Clock

Clock

- internal RC based clock
  - operating frequency of 1, 2, 4, or 8 MHz

Clock

- internal RC based clock
  - operating frequency of 1, 2, 4, or 8 MHz
- external clock source

Timer

Timer

- generate precision output signal
- measure incoming digital signal characteristics
- count external events

Timer

- generate precision output signal
- measure incoming digital signal characteristics
- count external events, a wide variety of counters
  - two 8-bit counter
  - one 16-bit counter

Pulse Width Modulation

- What's Pulse Width Modulation?

Pulse Width Modulation

- What's Pulse Width Modulation?
- 4 built-in PWM channels

Pulse Width Modulation

- What's Pulse Width Modulation?
- 4 built-in PWM channels
- Applications
  - controlling motors
  - telecommunications

Serial Communications

- What's Serial Communication?

Serial Communications

- What's Serial Communication?
- Universal Synchronous & Asynchronous Receiver & Transmitter

Serial Communications

- What's Serial Communication?
- Universal Synchronous & Asynchronous Receiver & Transmitter
- Application
  - communication with other devices
  - wireless data transmission

Analogue-to-Digital Converter

- What's ADC?

Analogue-to-Digital Converter

- What's ADC?
- 8 channel ADC subsystem

Analogue-to-Digital Converter

- What's ADC?
- 8 channel ADC subsystem
- resolution upto 10-bit

Interrupts

- high priority event management

Interrupts

- high priority event management
- both internal and external interrupts

Reference

- Atmel AVR Microcontroller Primer: Programming and Interfacing, *Chapter 1*
  - Steven F. Barrett
  - Daniel J. Pack