

Microprocessors

Instruction Set Architecture

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EE-309: Microprocessors



Lecture 1 (23 July 2015)

CADSL

What Are the Components of an ISA?

- Sometimes known as *The Programmer's Model* of the machine
- Storage cells
 - General and special purpose registers in the CPU
- The machine instruction set
 - The instruction set is the entire repertoire of machine operations
- The instruction format
 - Size and meaning of fields within the instruction

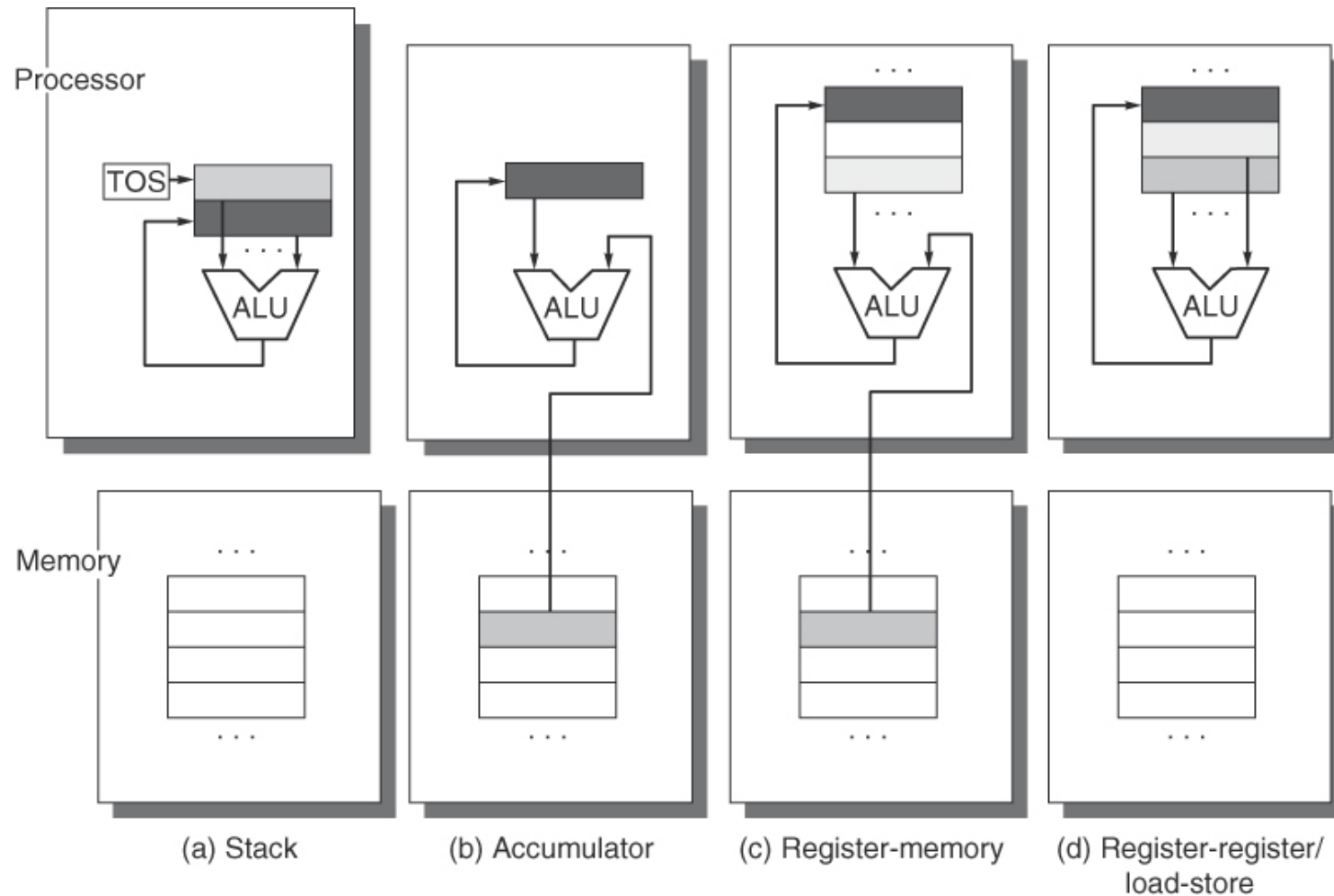


ISA Classification

- Type of internal storage in a processor is the most basic differentiator
 - Stack Architecture
 - Accumulator Architecture
 - General Purpose Register Architecture
 - Memory-Memory Architecture



Basic Machine Organizations



Source: CA: A quantitative approach

Stack Architectures

- Instruction set:
add, sub, mult, div, . . .
push A, pop A
- Example: $A * B - (A + C * B)$

push A

push B

mul

push A

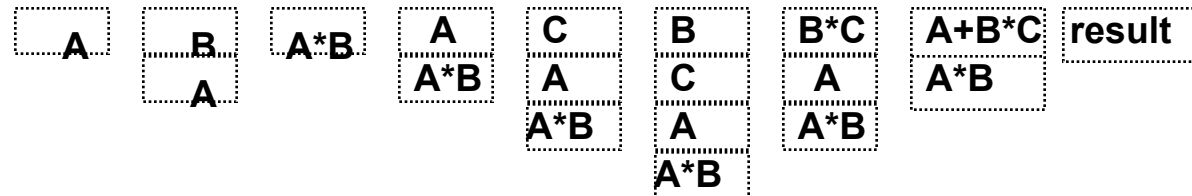
push C

push B

mul

add

sub



Stacks: Pros and Cons

- Pros

- Good code density (implicit operand addressing → top of stack)
- Low hardware requirements
- Easy to write a simpler compiler for stack architectures

- Cons

- Stack becomes the bottleneck
- Data is not always at the top of stack when need, so additional instructions like TOP and SWAP are needed
- Difficult to write an optimizing compiler for stack architectures



Accumulator Architectures

- Instruction set:
add A, sub A, mult A, div A, . . .

load A, store A

- Example: $A*B - (A+C*B)$

load B

mul C

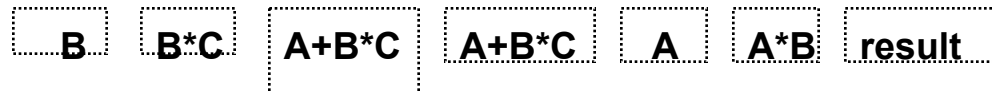
add A

store D

load A

mul B

sub D



Accumulators: Pros and Cons

- Pros

- Very low hardware requirements
- Easy to design and understand

- Cons

- Accumulator becomes the bottleneck
- High memory traffic



Addressing Modes

- Register
- Immediate
- Register Indirect
- Base + Displacement
- Direct Absolute
- Memory Indirect
- Auto Increment
- Auto decrement

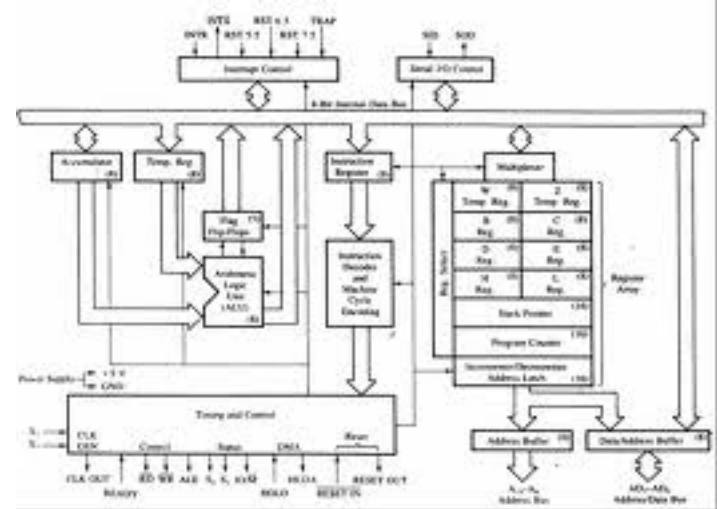
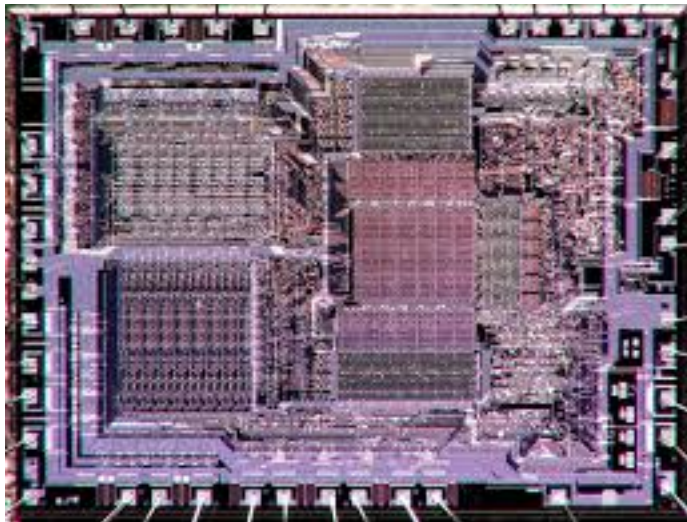


MICROPROCESSOR

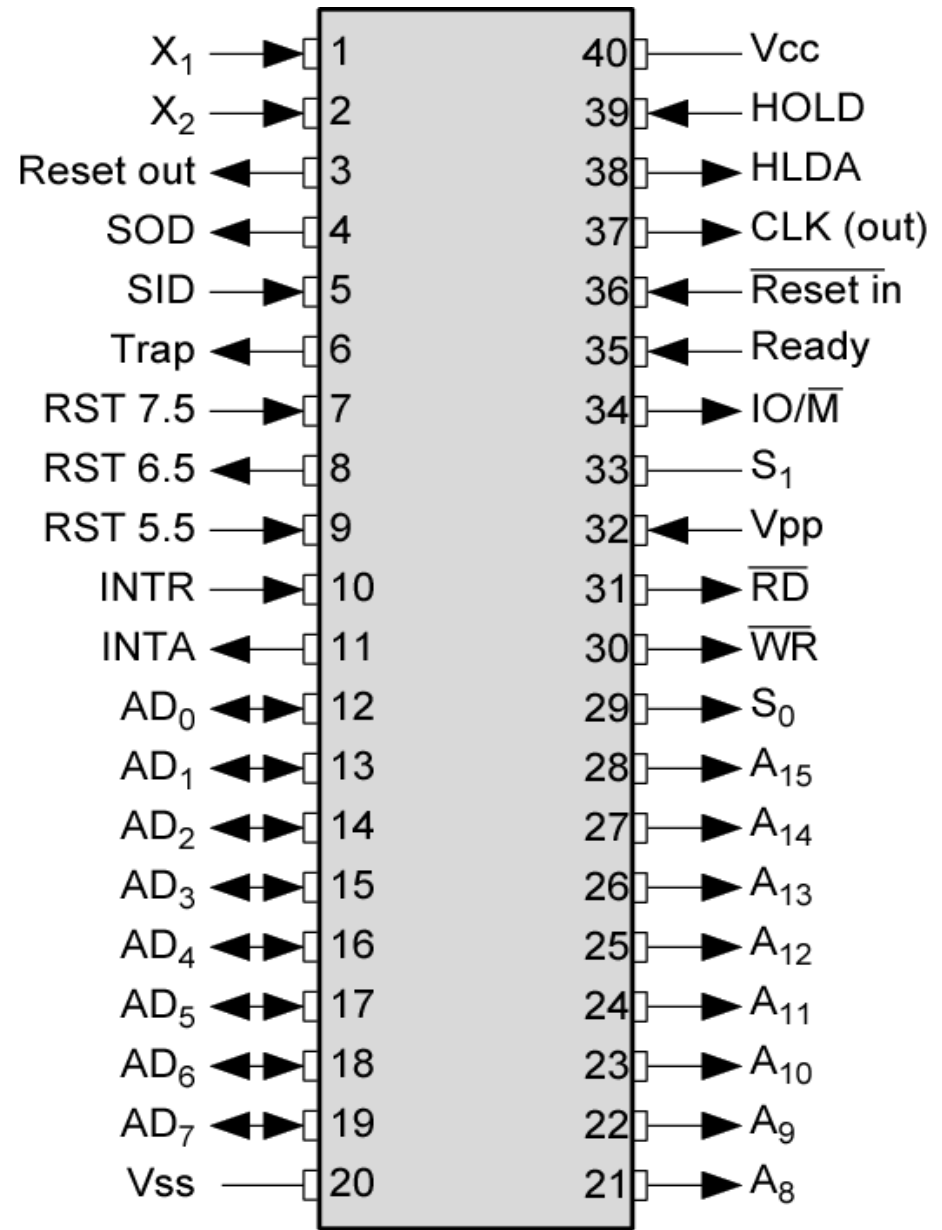
8085

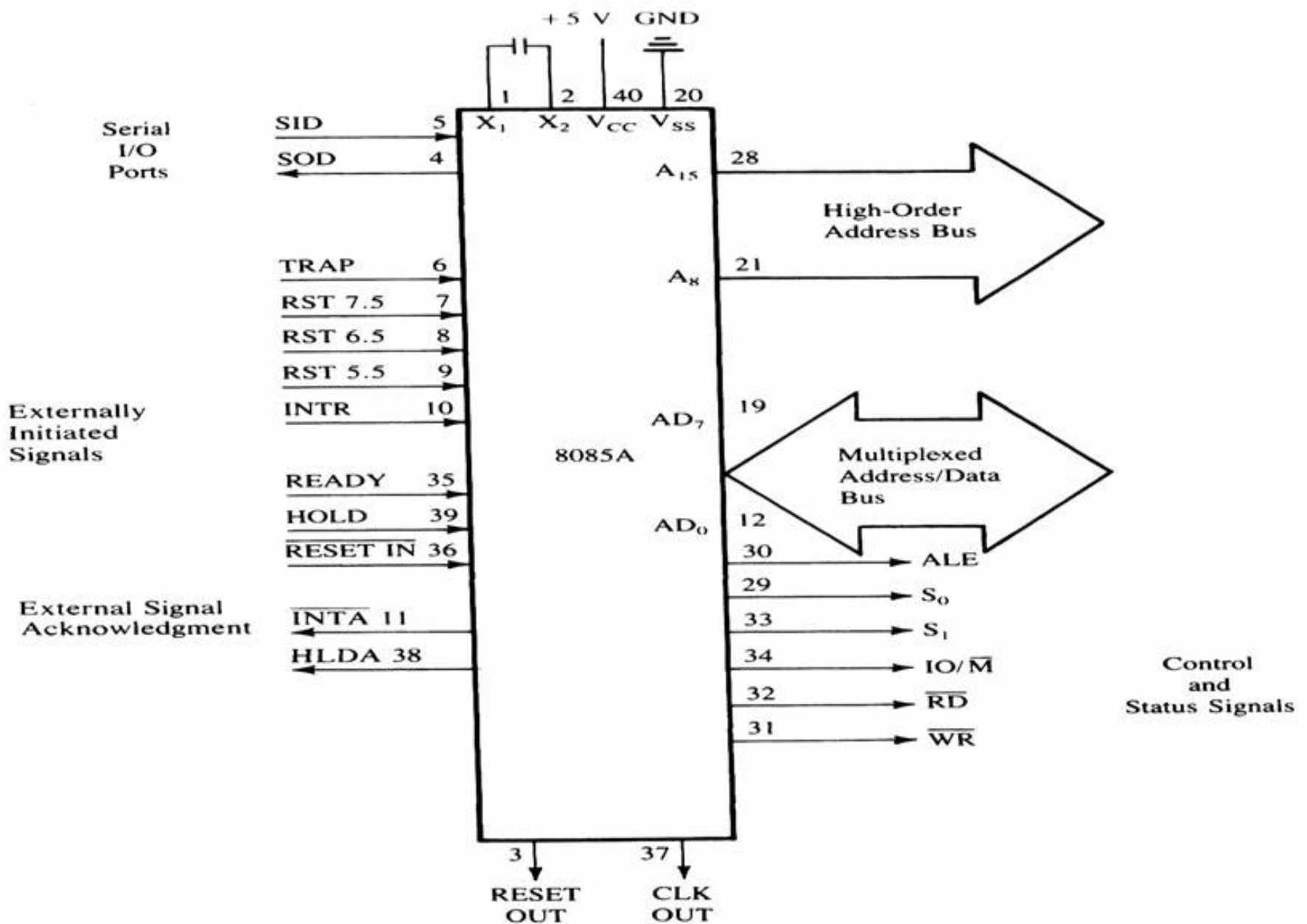


Microprocessor: 8085



Intel 8085 Pin Configuration

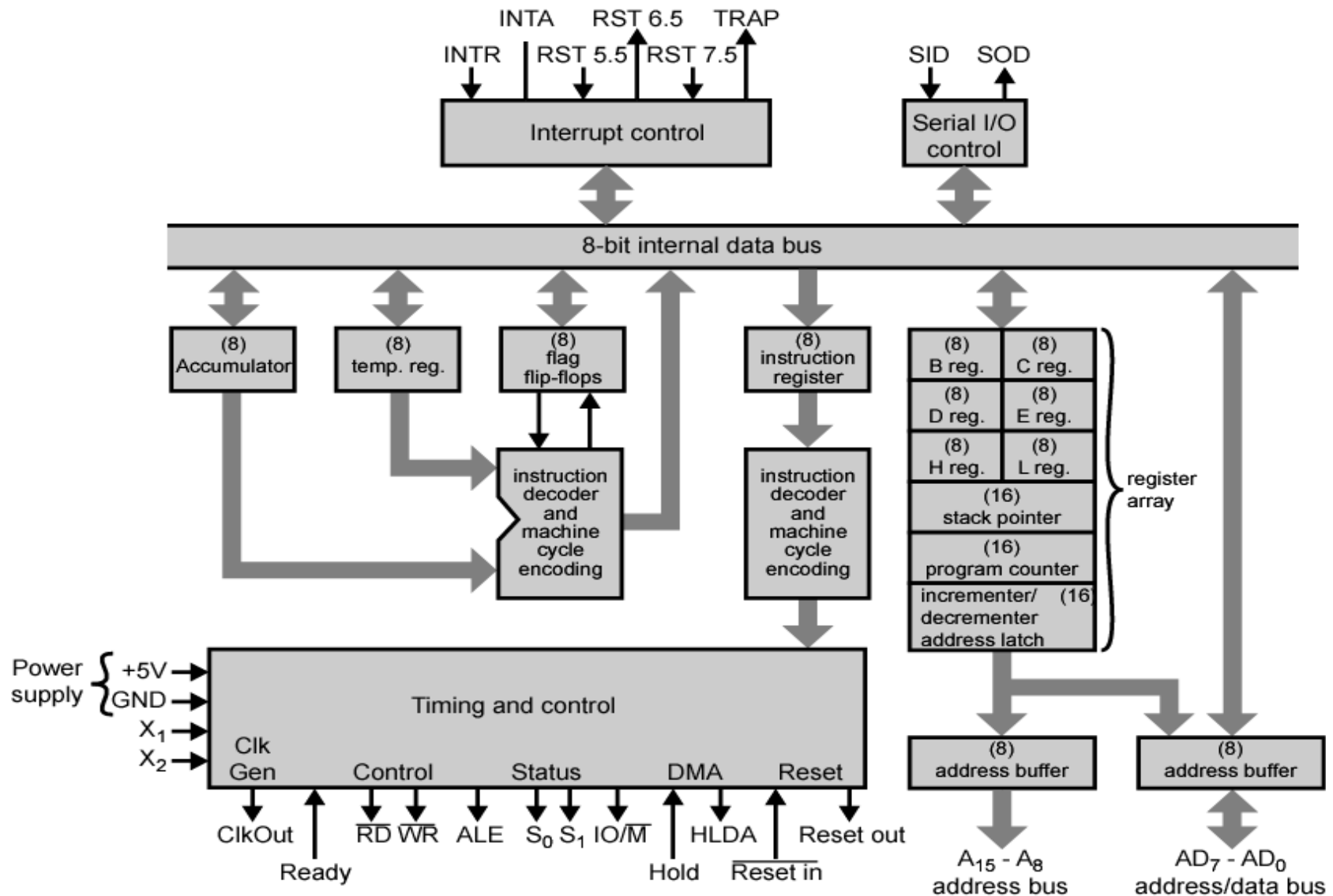




Signals and I/O Pins



Intel 8085 CPU Block Diagram



Thank You

