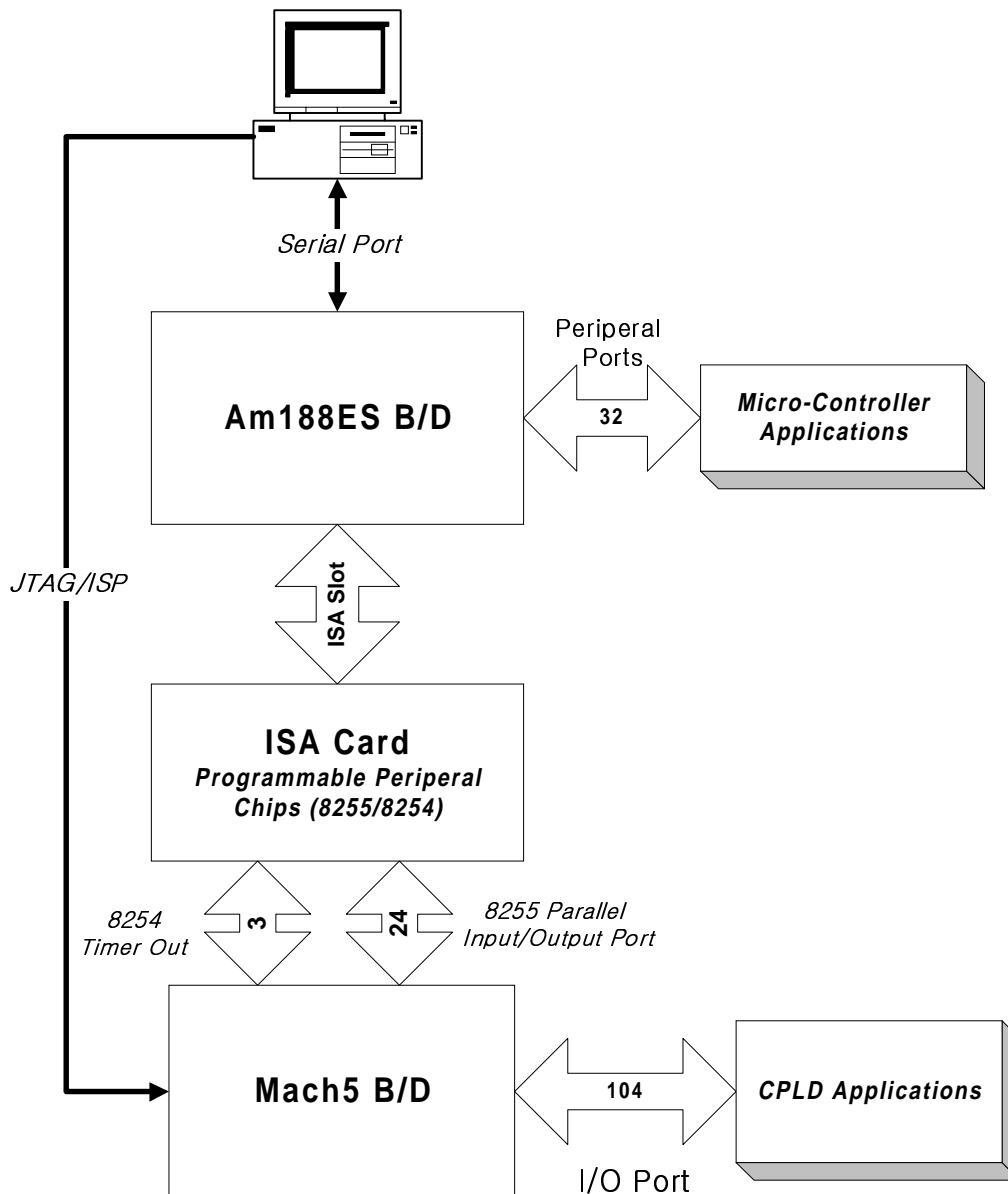


## Mach5-ISA IO-Am188 Board Application

Purpose:

- Understanding Micro Controller Development
- Understanding System Interface with Programmable Peripheral Chips
- Understanding Programmable Logic Design from Schematic to HDL method

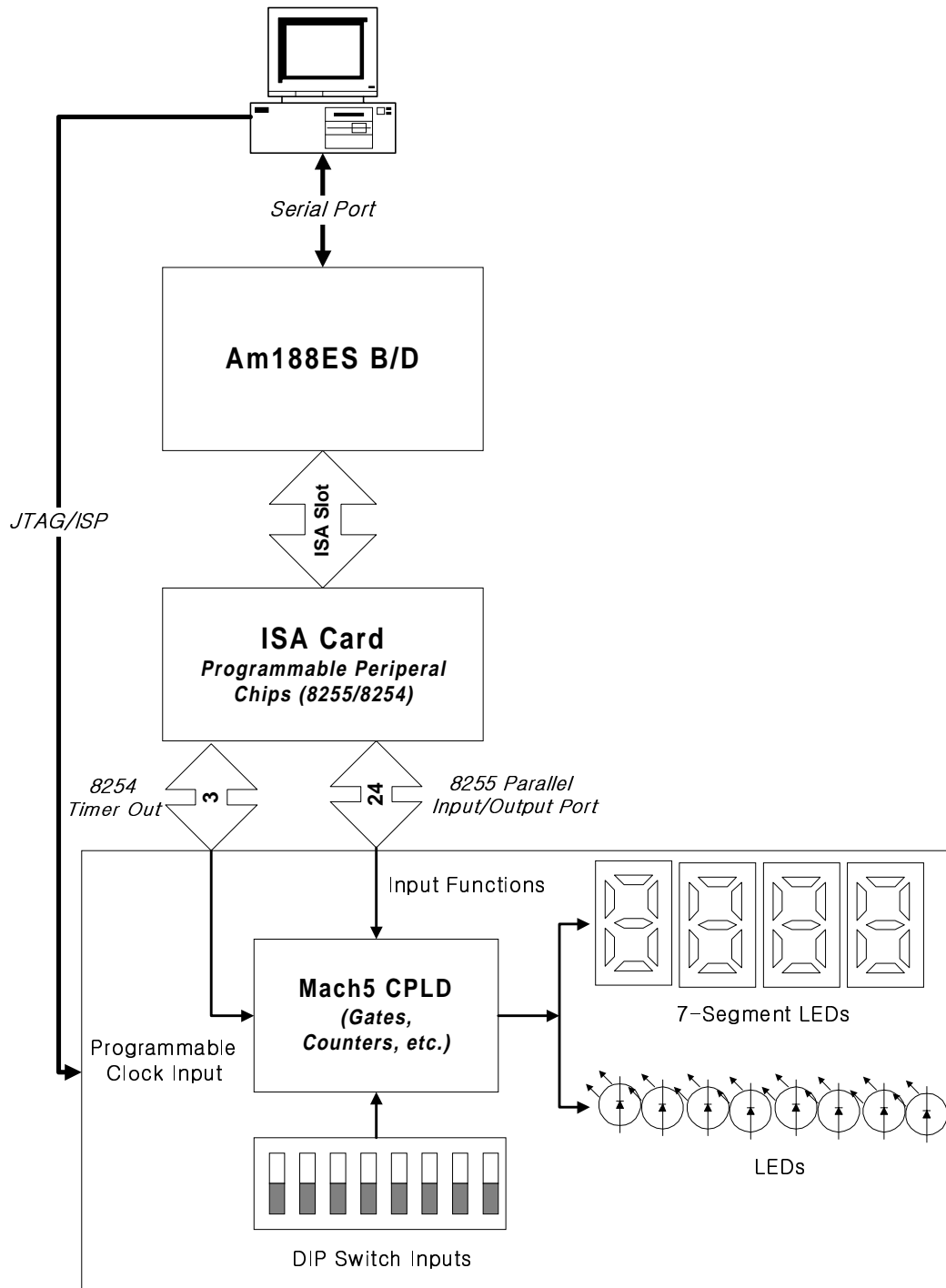
System Configuration:



## Basic Level Applications:

Purpose :

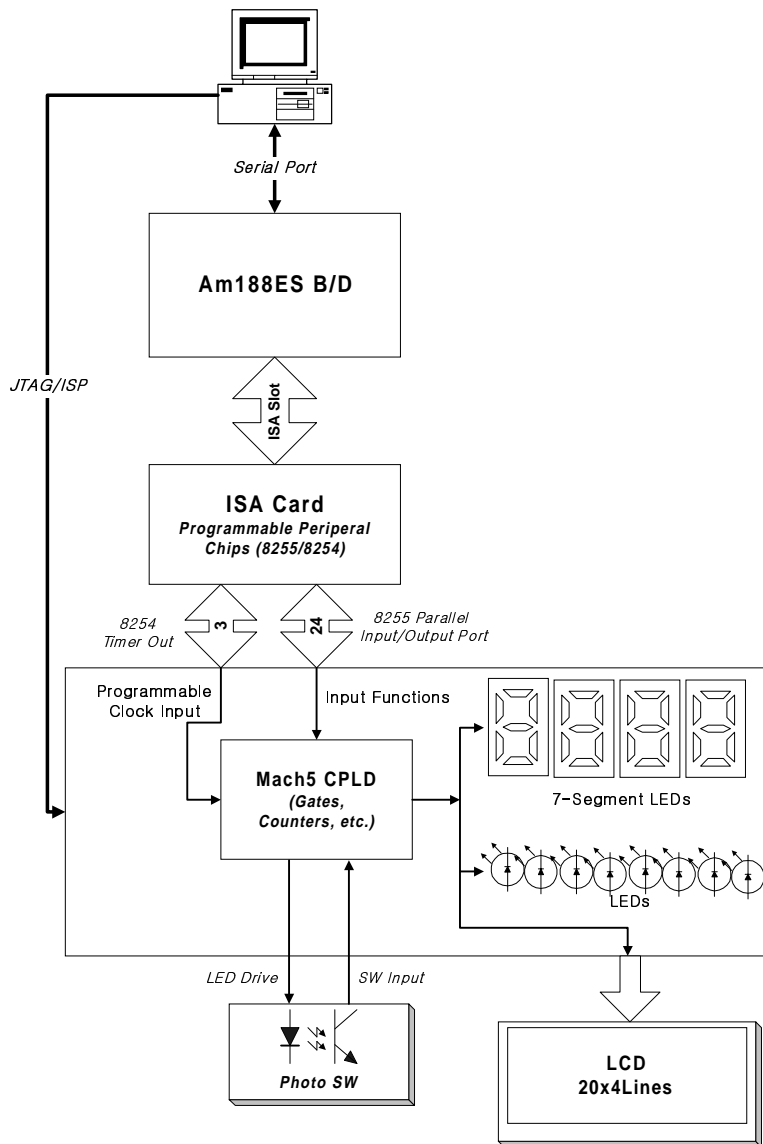
- Understanding ISP CPLD and Micro-Controller Programming
- CPLD Design Method : Schematic
  - Basic Digital Circuit Expr. (Gates, Counters, etc.)
- Use On-Board 7-Segments LEDs, DIP SWs



## VHDL Design Entry Level Applications:

Purpose :

- Understanding MDS (Serial Monitor) and System Interface (ISA)
- Understanding and Using Programmable Peripheral Chip
- Understanding VHDL Design Flow
- CPLD Design Method : VHDL
- Digital Circuit Design with VHDL (Gates, Counters, etc.)
- PREP Examples
- FSM Design with VHDL
  - Simple Game Machine (Black Jack, Craps, etc.)
  - LCD Controller
  - Traffic Light Controller Example
- Use On-Board 7-Segments LEDs, DIP SWs and Ext. LCD, Photo SW(Interrupter) Appl.



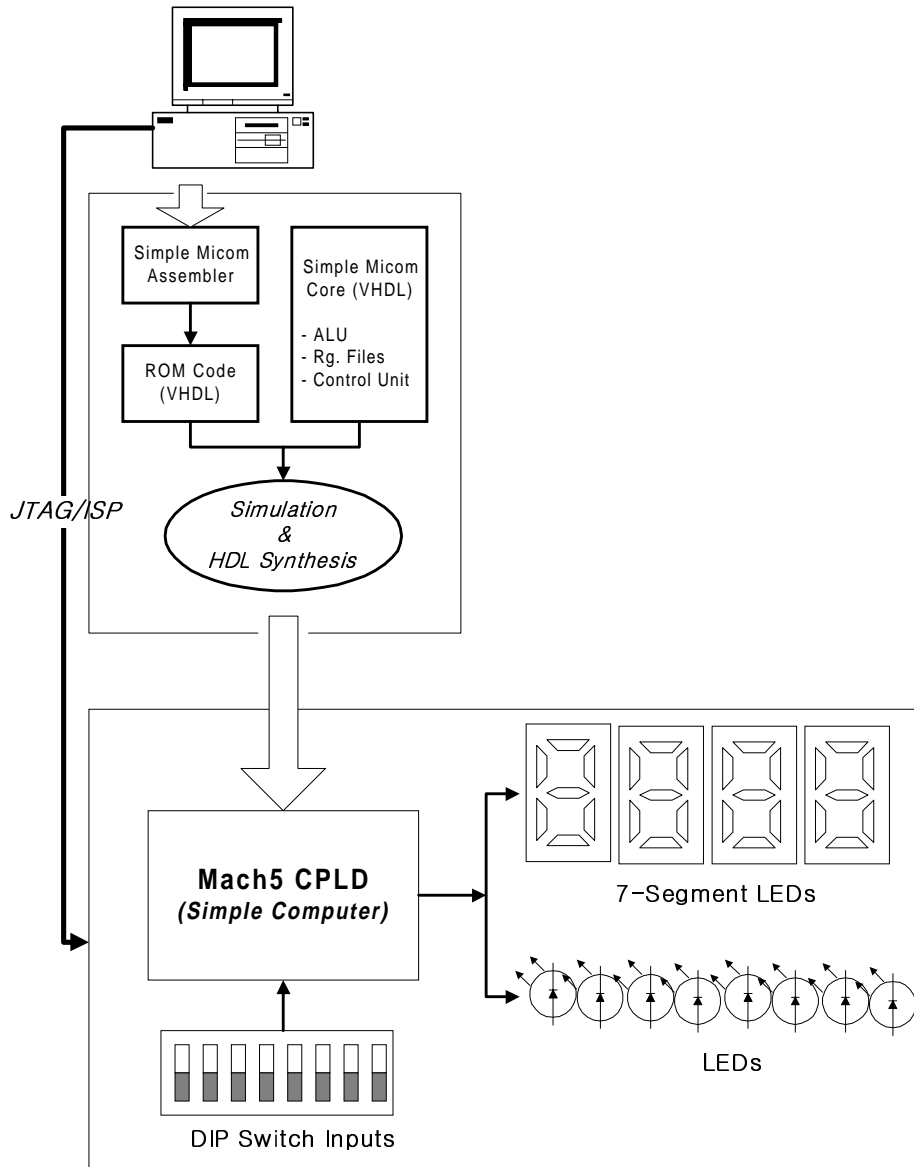
## **System Level Application**

Purpose:

- Advanced Micro-Controller Programming
  - Interrupt Service Routines on Serial Monitor (Ex. INT 21h Functions...)
  - C-Start-Up Code
  - Embedded Peripheral Programming (PIO, Interrupt, Timers, PWD, etc.)
  - ISA Bus Implement and Use
  - Other Examples (Ex. Flash Memory Writer, Barcode Reader, etc.)
- Advanced CPLD Design using VHDL
  - Simple 4/8-Bits Micro Controller Design
  - Simple Controllers (Door Sensor, Thermal Controller, etc.)
  - ROM Emulator
  - DC Motor Controller (PWM)
  - Stepping Motor Driver
  - Simple DSP Example (Voice CODEC, Digital Filters, etc.)
  - Video Signal Generator
  - Peripheral Chip Implement Example (UART, Parallel IO, Programmable Interval Timer, etc.)
  - TOY Example

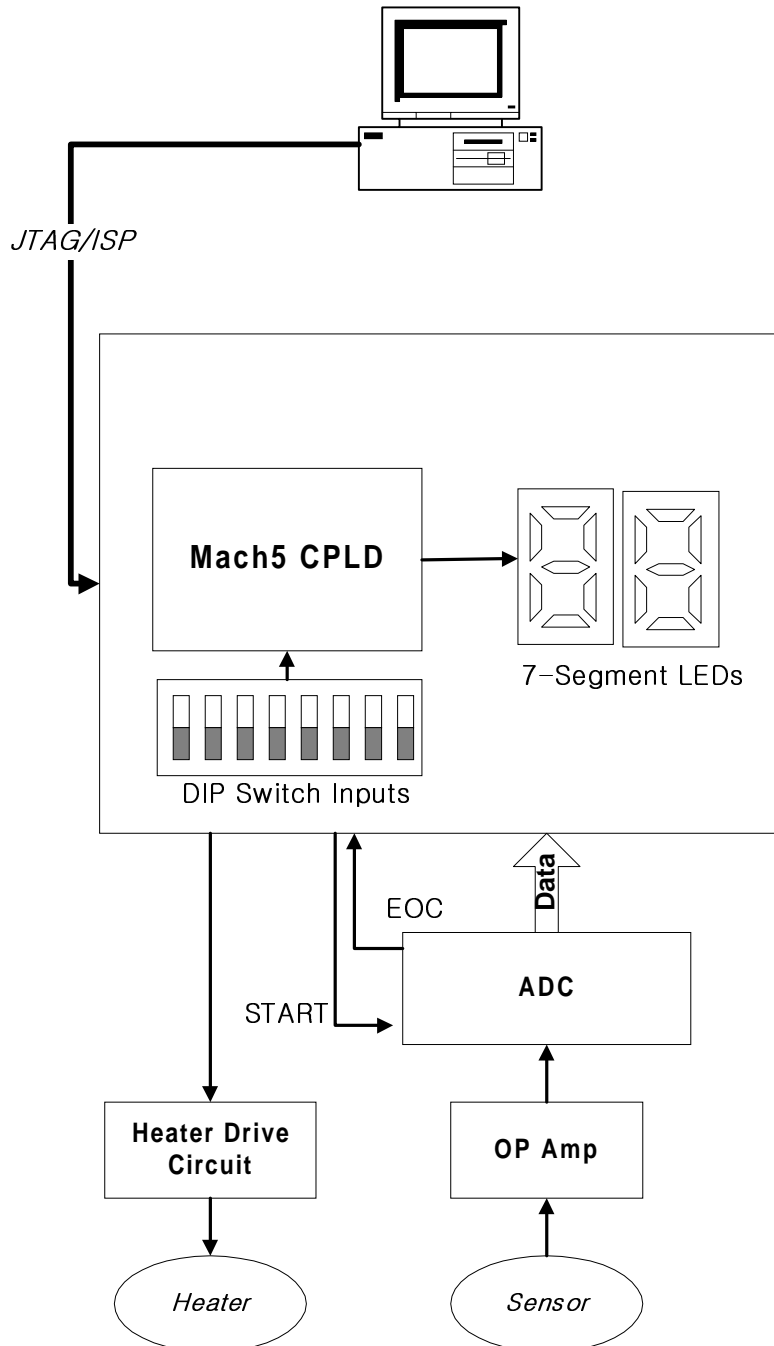
## Simple 4-Bit Micro Computer

- Instructions (8-Bit)
  - ALU Function (4-Bit) : ADD, SUB, SHIFT, ROTATE, AND, OR, XOR, NOT)
  - JUMP (CONDITIONAL, UNCONDITIONAL)
  - In/Out
  - Interrupt
- Control Unit (FSM)
- Rg. File : 16 x 4-Bits



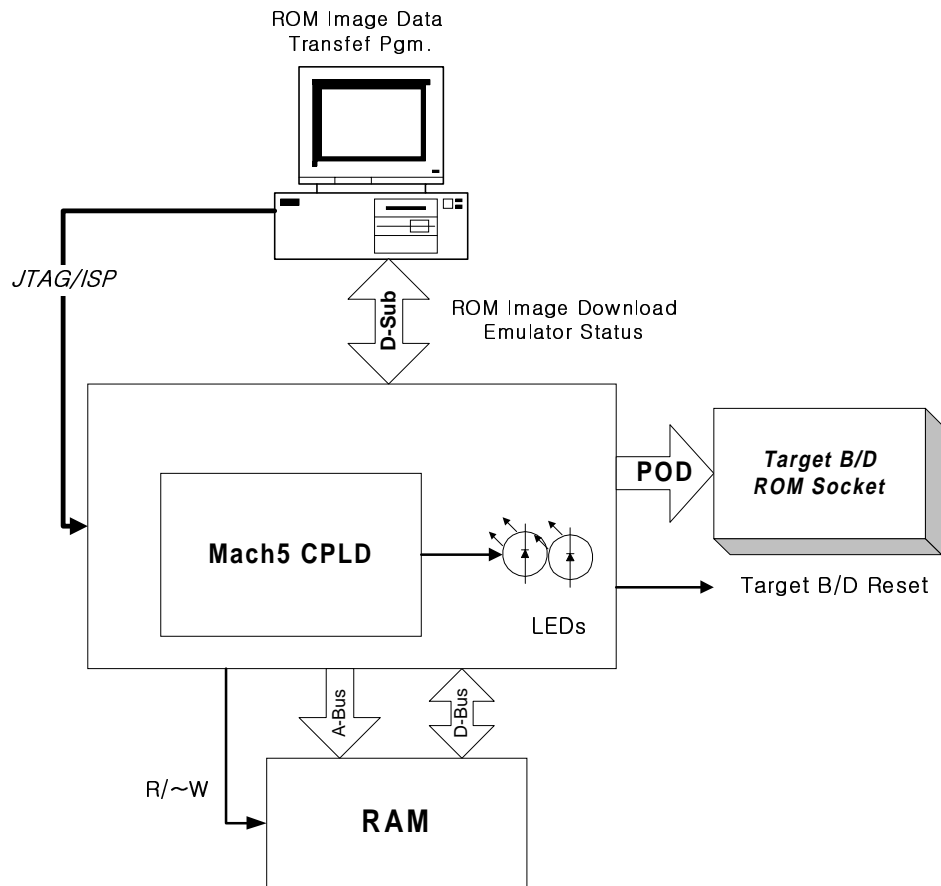
## Simple Controllers (Door Sensor, Thermal Controller, etc.)

- ADC Controller (Start ADC, EOC, Latch AD Data)
- 8-Bit Comparator
- Therm. Display (2-digit 7-Segment LED)
- Heater On/OFF



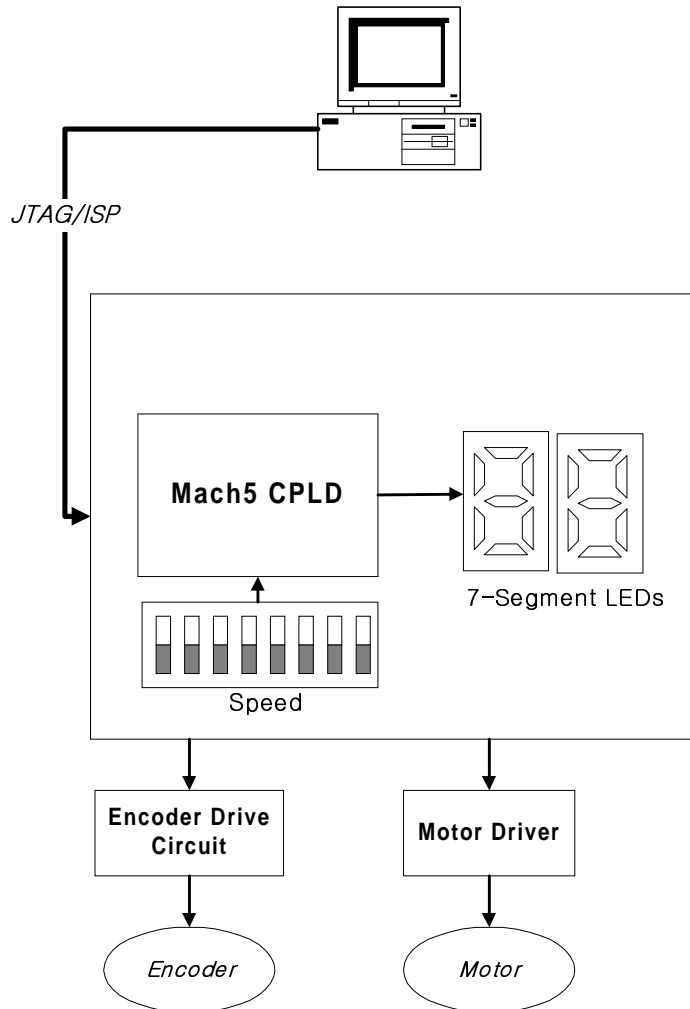
## ROM Emulator

- Data Transfer (ROM Image) with PC Printer Port
- Data/Address Bus Isolation Control (Tri-State Buffer Enable/Disable)
- Target B/D Reset



## Motion Control

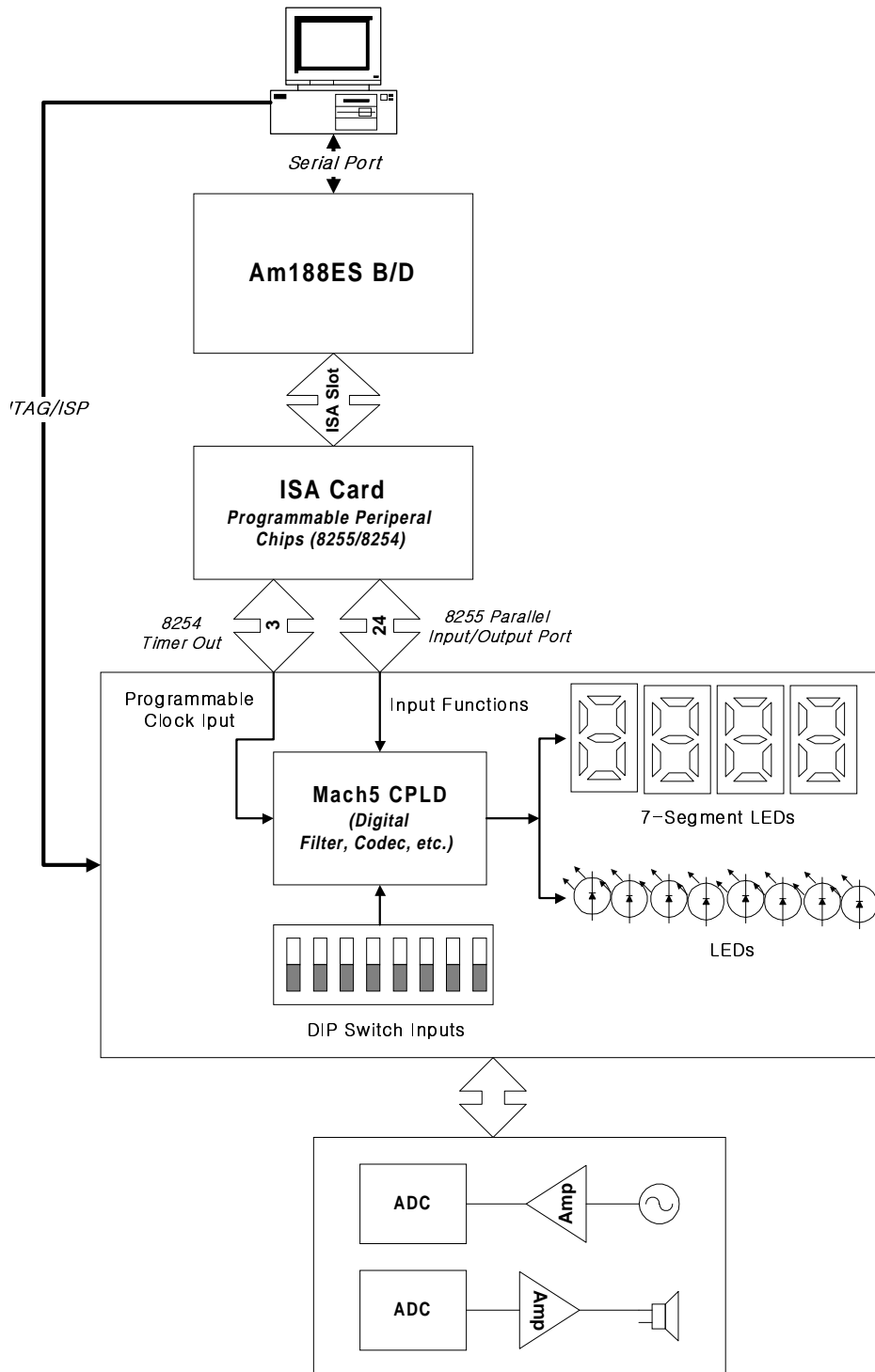
- DC Motor Speed Control (PWM)
- Motor Speed Measure (Encoder)
- Motor Speed Display (7-Segment)
- Stepping Motor Controller (Phase Generator)





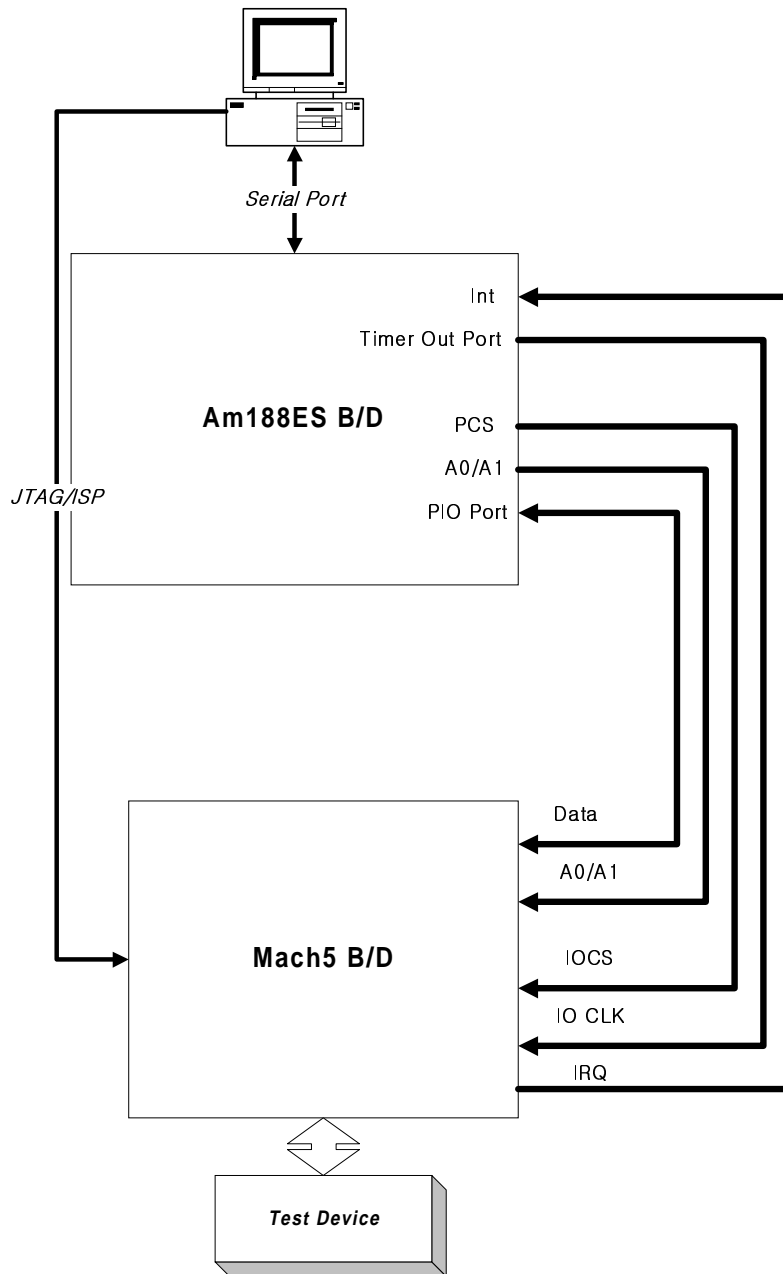
## DSP Application

- Simple Digital Filters
- Codec
- ADC/DAC Controller
- Data Transfer



## Programmable Peripheral Chip Set Implement

- Programmable Parallel IO Port
- Programmable Interval Timer
- UART



# CPLD/Micro Processor Board 구성

## 1. CPLD Board

- Vantis Mach5 Serieese : 144 Pin PQFP/104 Usable IO, 4Clock Input Dedicate)
- 4x7-Segment LED
- 8xLED
- 8-DIP SW
- 2 OSC
- 2 Push buttons
- CPLD Daughter B/D

## 2. Microprocessor Board

- AM188ES (100Pin PQFP)
- RAM : 128K
- ROM : Flash 32K x 2, 128Kx1(32 Pin PLCC)
- RS-232C Serial Port (9-Pin D-Sub)
- 14Pin LCD Connector
- 34 I/O
- 62Pin PC-ISA Slot

## 3. ISA IO Card

- 8255
- 8253

## 4. Application Board

- 16 Key Matrix
- LCD
- Memory
- DC Motor Driver
- Step Motor Driver
- ADC
- DAC
- IR/Supersonic Sensor
- 9-Pin D-Sub
- 25-Pin D-Sub
- Buzzer

## 실험 항목

### 0. PLD 를 이용한 디지털 회로설계 기초

#### 1. 디지털 공학 기초 실험

- Schematic Editor 사용, 기존의 모든 디지털논리회로 실험을 CPLD 보드로 실험
- 기초 조합 논리회로 (Gates, Adder...)

- 기초 순차 논리회로 (Shift, Counters,...)
- Finite State Machine

## 2. 마이크로 프로세서

- 원칩 마이크로 프로세서의 기초
- 원칩 마이크로 프로세서 시스템 보드 설계
- 시리얼 모니터 분석 및 제작 (플래쉬 메모리 채용, 제작한 모니터 실험 가능)
- C-언어와 인터페이스(스타트-업 코드 작성 방법, 롬용 응용 프로그램작성)

## 3. 마이크로 프로세서 인터페이스

- 마이크로 프로세서/ISA IO Card 를 이용한 실험
- 주변 칩셋(Peripheral Chip Set) : 8255 PPI, 8253/8254 PTI
- 원칩 내장 시리얼 포트 응용
- 원칩 내장 인터럽트 컨트롤러 응용

## 4. VHDL

- VHDL 을 이용한 디지털 논리회로 (조합/순차회로를 VHDL 로 작성후 CPLD 보드로 확인, VHDL 과 디지털 회로 비교)
- VHDL Simulation TestBench
- VHDL Example : PREP 1~9 (MUX, Decoder, FlipFlop 등등 이용한 PLD 설계 예제모음)

## 5. 전자 시스템 실험

- Application Board/CPLD/Microprocessor 및 사용자 설계회로
- VHDL 을 이용한 디지털 설계/마이크로 프로세서 응용
- 각종 아이디어 실험 유도

## 3 가지 Application Board

- Application Board 1 : Digital Interface (Key Pad, LCD, Memory...)
- Application Board 2 : Analog Interface(A/D, D/A, 적외선/초음파 Sensor,, Buzzer/Speaker, DC/Stepping Motor Driver...)
- Application Board 3 : DSP Application

## 전자 시스템 실험 응용 프로젝트

- Project Ex.1 : Parallel Periperal Port Design (Microprocessor B/D, CPLD B/D 사용하여 8255 와 같은 병렬 입출력 포트를 설계)
- Project Ex.2 : Serial UART Design (Microprocessor B/D, CPLD B/D 사용하여 직렬 통신칩(UART)를 설계)
- Project Ex.3 : Simple Microprocessor Design (간단한 4 비트 정도의 Micom 설계)

- Project Ex..4 : ADC 응용 (센서 입력)
- Project Ex..5 : DAC 응용 (Buzzer, Speaker)
- Project Ex.6 : Traffic Light Controller (교통신호등 제어기)
- Project Ex.7 : 적외선 센서이용 거리측정기
- Project Ex..8 : PWM 을 이용한 DC 모터 제어
- Project Ex..9 : Stepping Motor 제어

위의 프로젝트들을 응용하여 라인-트레이스/마이크로 마우스 등의 설계 가능.  
마이크로 마우스/라인트레이서 등을 설계하기 위한 보드 준비

DRAFT

