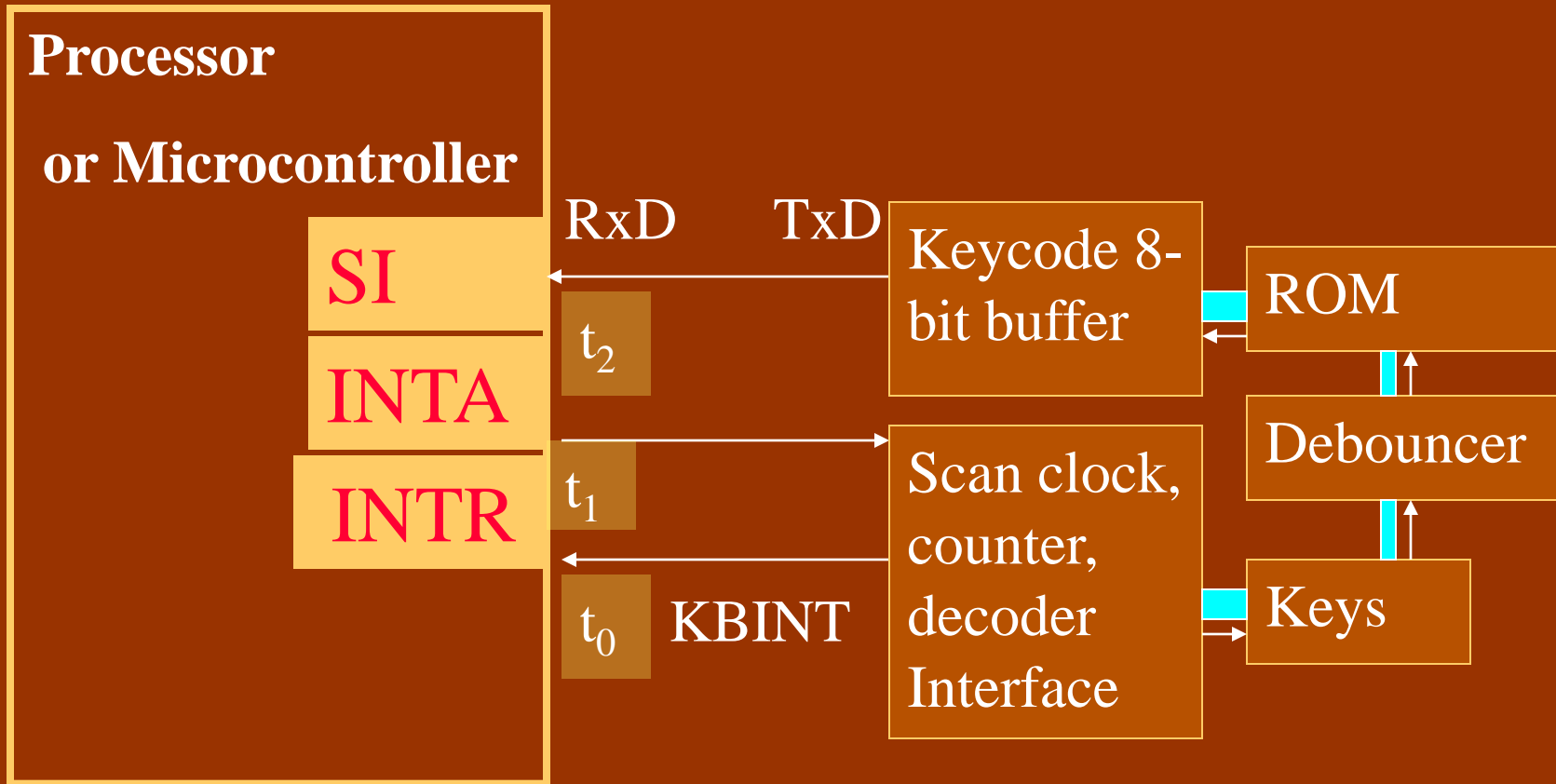


8051, AVR, ARM MICROCONTROLLERS AND REAL WORLD INTERFACING AND IOs USING BUSES –

Lesson-8 Interfacing examples with keyboard, displays, D/A and A/D Conversions

1. Keyboard

Keyboard Interface to Serial Interface at Microcontroller



Two signals KBINT and TxD from a keyboard controller

- KBINT is interrupt from keyboard controller.
- TxD is serial UART data output of controller connected to RxD at SI in 8051 or UART Intel 8250 or UART 16550, which includes a 16-byte buffer

Debouncer

- Bounces create on pressing— Each bounce creates a false pulse.
- Keyboard controller has hardware debouncer to the care of bouncing of a key.

Scan Clock

- Keyboard controller has counter driven by a scan clock, which continuously increments at certain rate and scans each key whether that is in pressed or released state.

Encoder

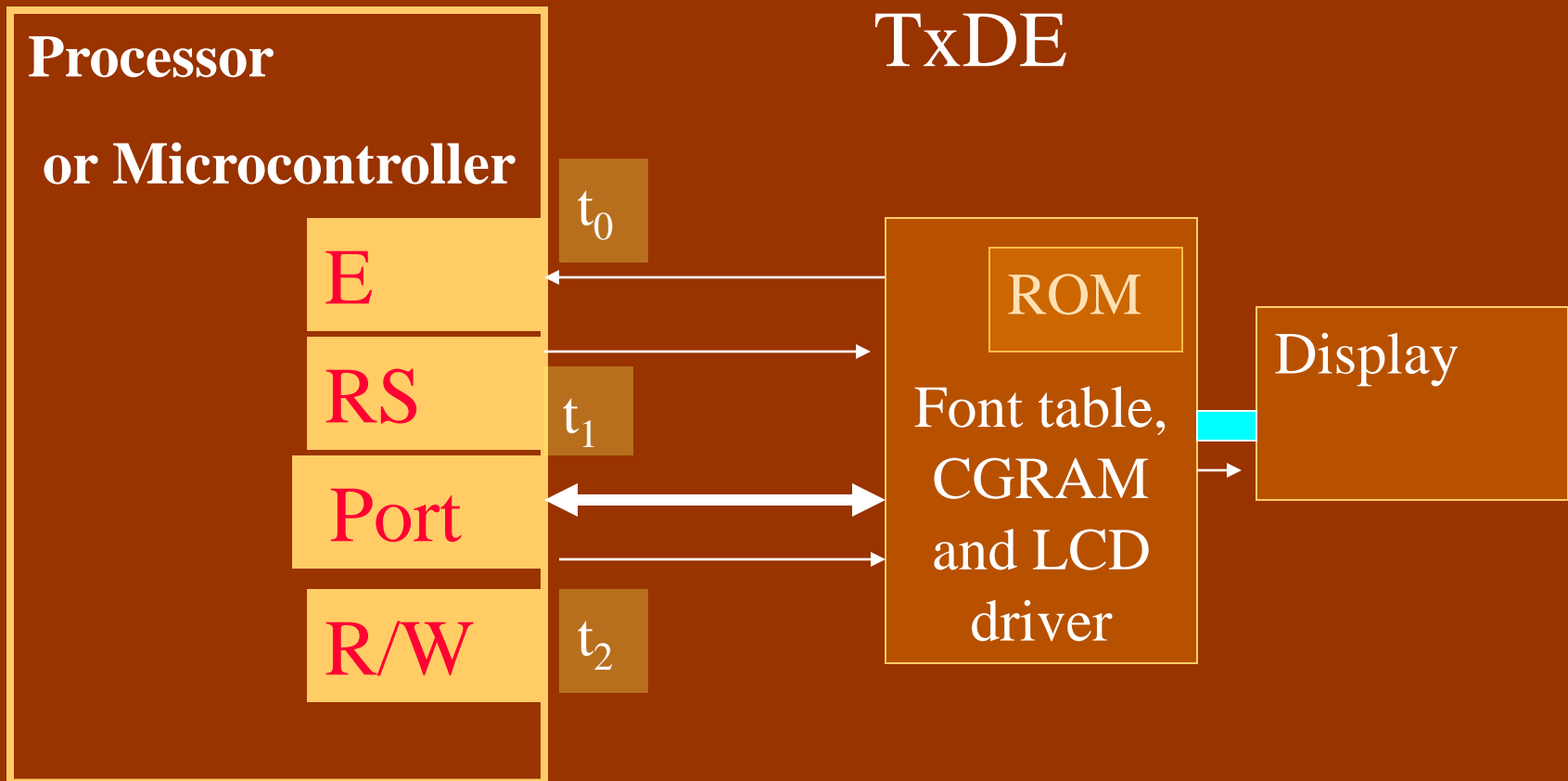
- To encode the keyboard output for a ROM.
- ROM generates the ASCII code output for the pressed key.
- The code accounts the multiple keys simultaneously pressed.
- Example, Shift key is also pressed then generate the code for upper case character.

TxD

- The code bits are serially transferred as TxD output

2. LCD display controller

LCD Controller Interface



Interface to LCD display controller

- 3 bits for E, RS and R/W
- 8 output data.
- One 8-bit port is used for output data for display.
- Another port is used for 3 bits
- Section 3.3.4 for details.

3. DAC

DAC using PWM and integrator

- DAC — PWM circuit and an integrator.
- PWM — internal device in a microcontroller
- A pulse width register (PWR) is programmed according to a required analog output.

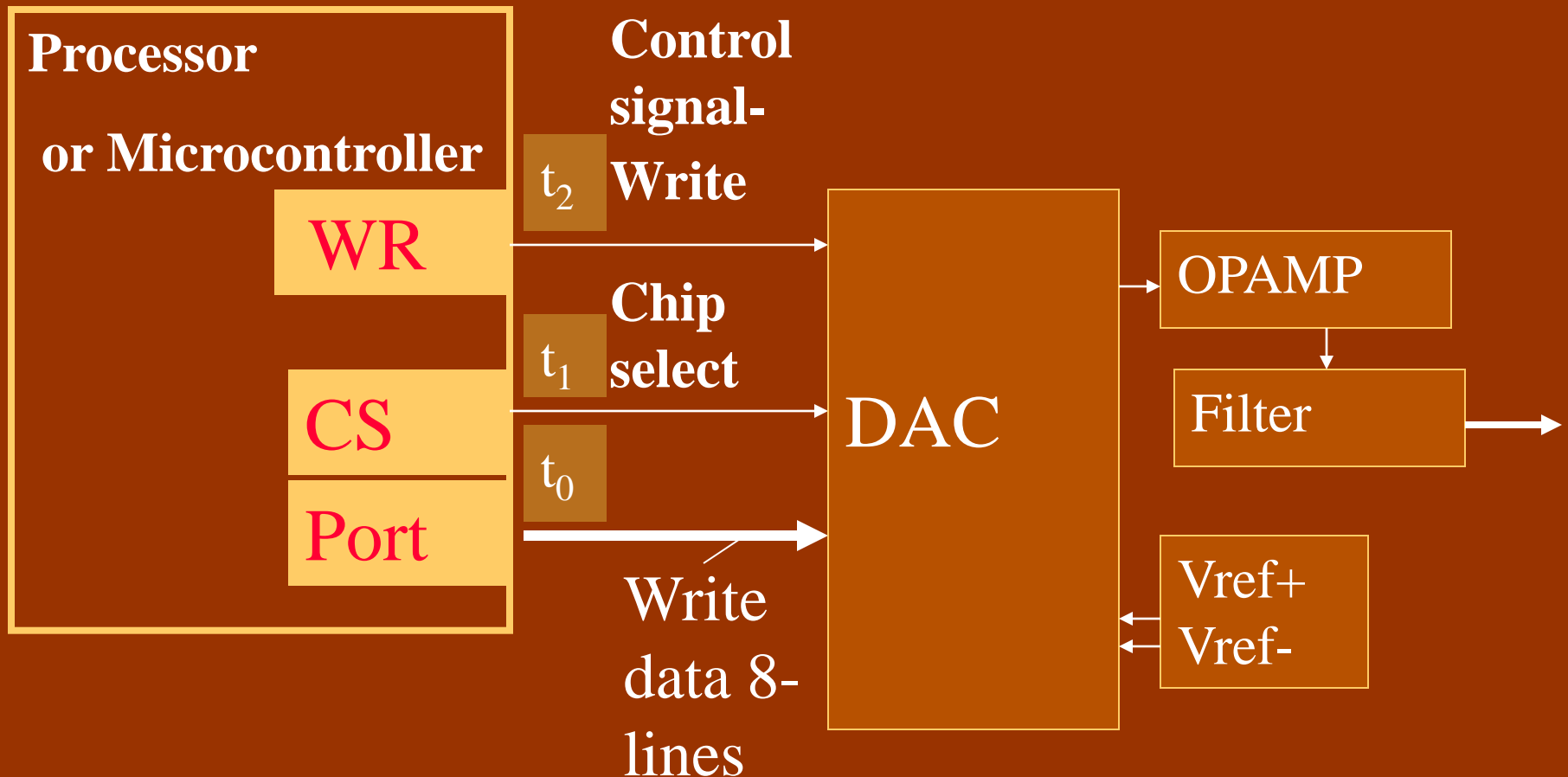
PWM Functioning

- A counter/timer device, which generates two internal- interrupts one on timer overflow and another after an interval proportional to equal to PWR.
- On first interrupt, the output becomes 1 and on second interrupt it becomes 0.

Integrator

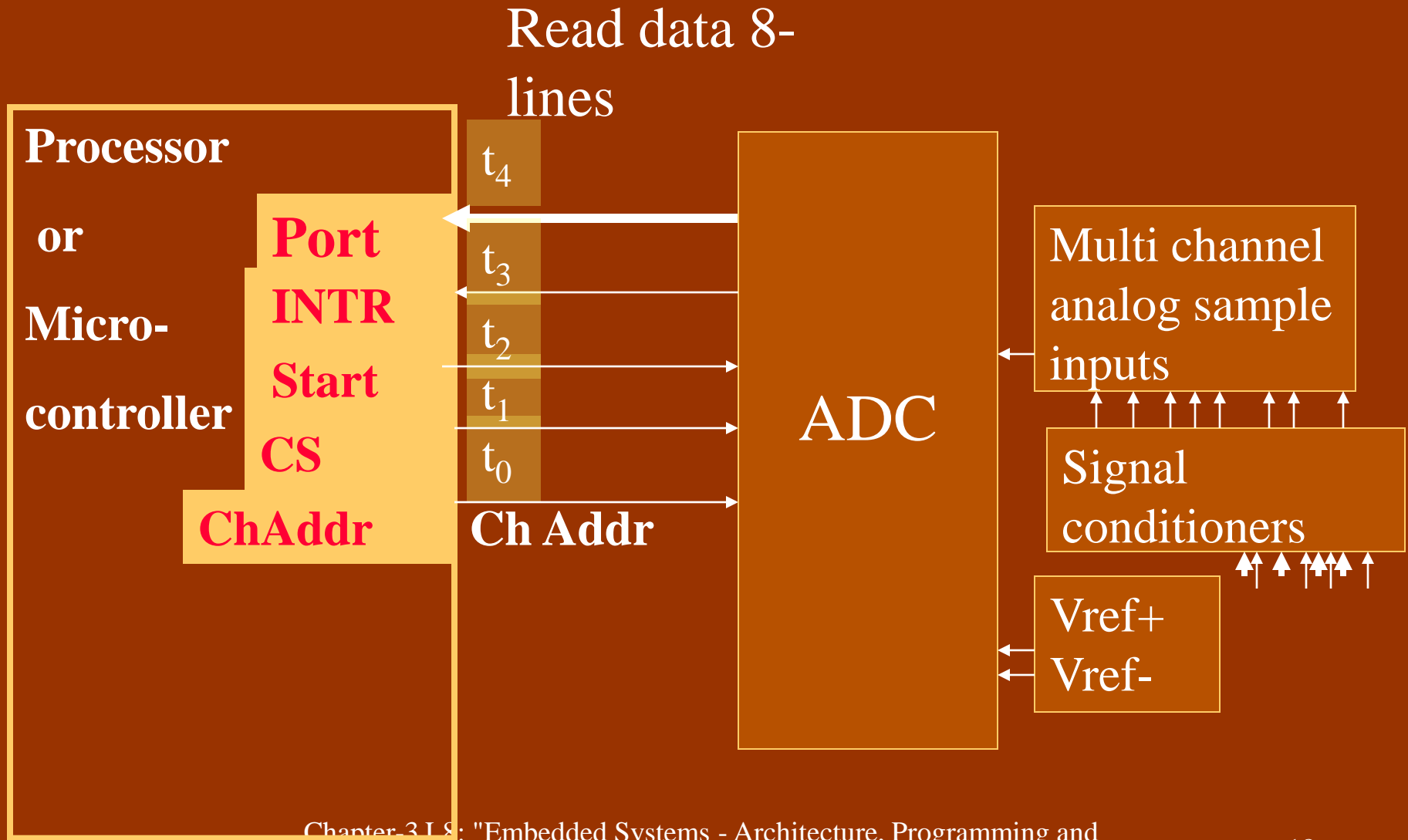
- Generates the analog output as per the period of output = 1 (period between first and interrupts) compared to total period of output pulses (period between successive first interrupts).

DAC Using a DAC external chip



4. ADC

ADC Using ADC external chip



ADC

- Start of conversion pulse generator circuit,
- A sample hold amplifier circuit to hold the signal constant for the conversion period and signal conditioner
- Voltage references + and – for providing the reference for conversion of analog input

n-bit ADC

- A four or eight channel ADC is inbuilt in microcontrollers or
- an external ADC for example, ADC0808
- Interfacing similar to that to the ports.

Summary

We learnt

- Keyboard controller and its interfacing
- Keyboard units- scan clock, debouncer, encoder, ROM, driver
- LCD display controller interface
- DAC interface using PWM and integrator
- DAC interface using external DAC
- ADC interface using external ADC

End of Lesson 8 of Chapter 3
on
Real World Interfacing- Part 3