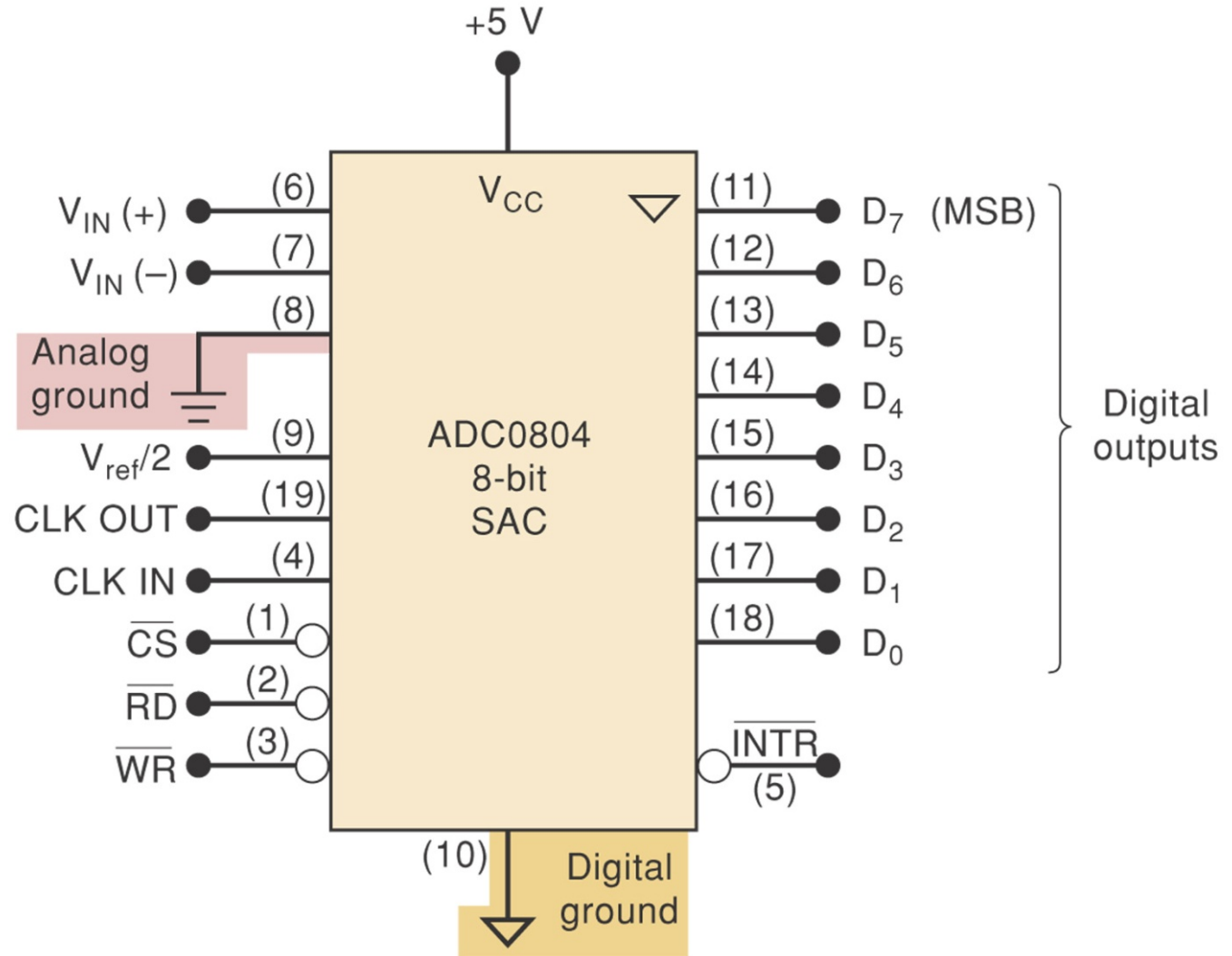
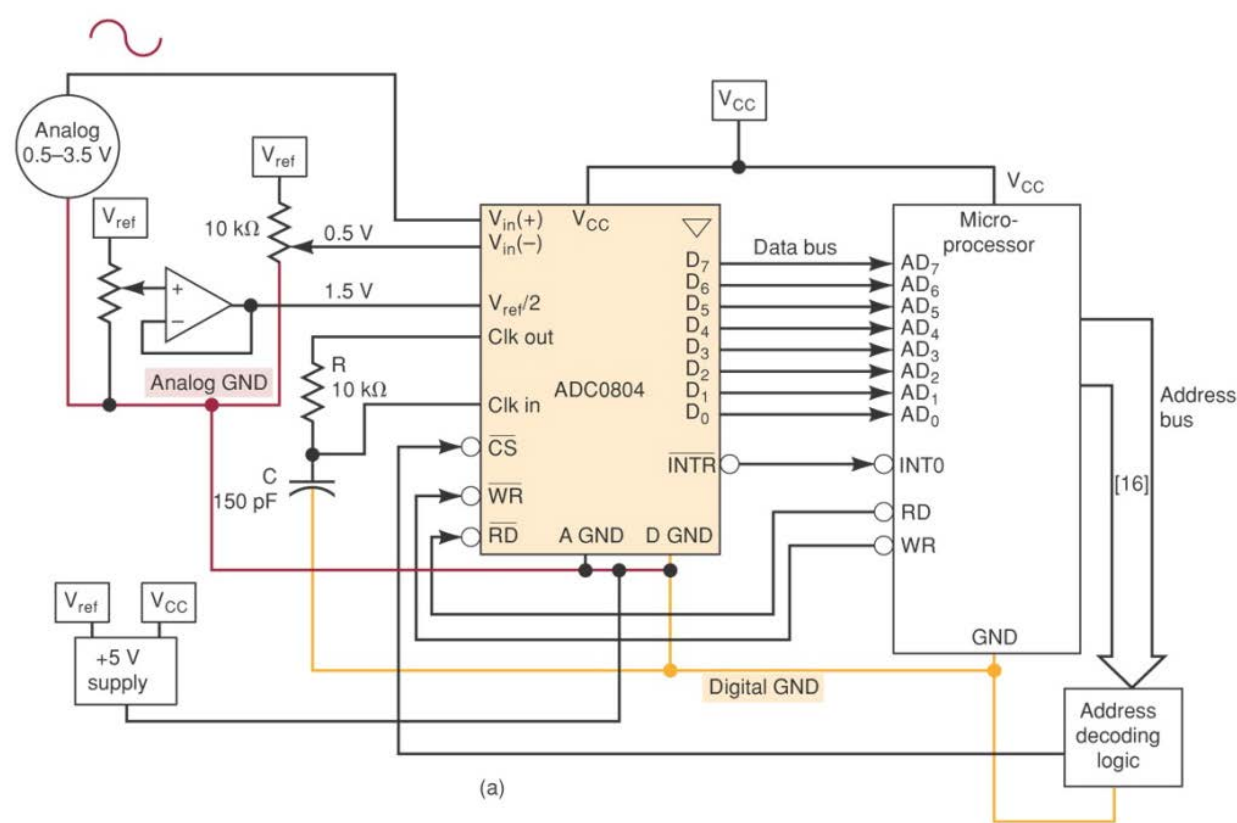


ADC0804 eight-bit successive-approximation ADC with tristate outputs. The numbers in parentheses are in the IC's pin number.

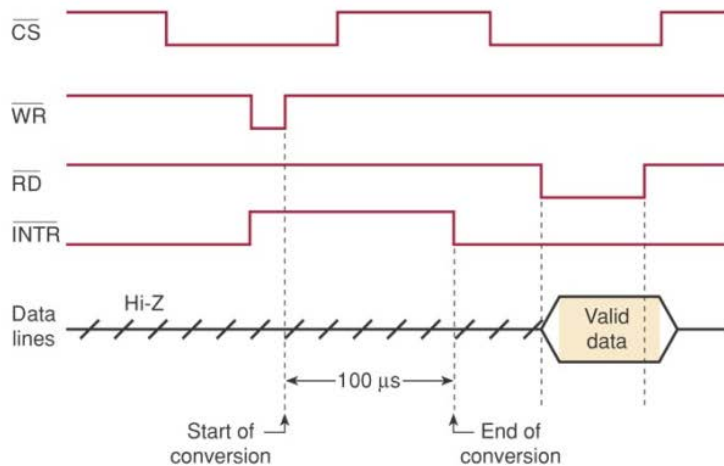


(a) An application of an ADC0804;  
 (b) typical timing signals during data acquisition.

An interrupt is used to signal the microprocessor when a conversion is complete



(a)



(b)

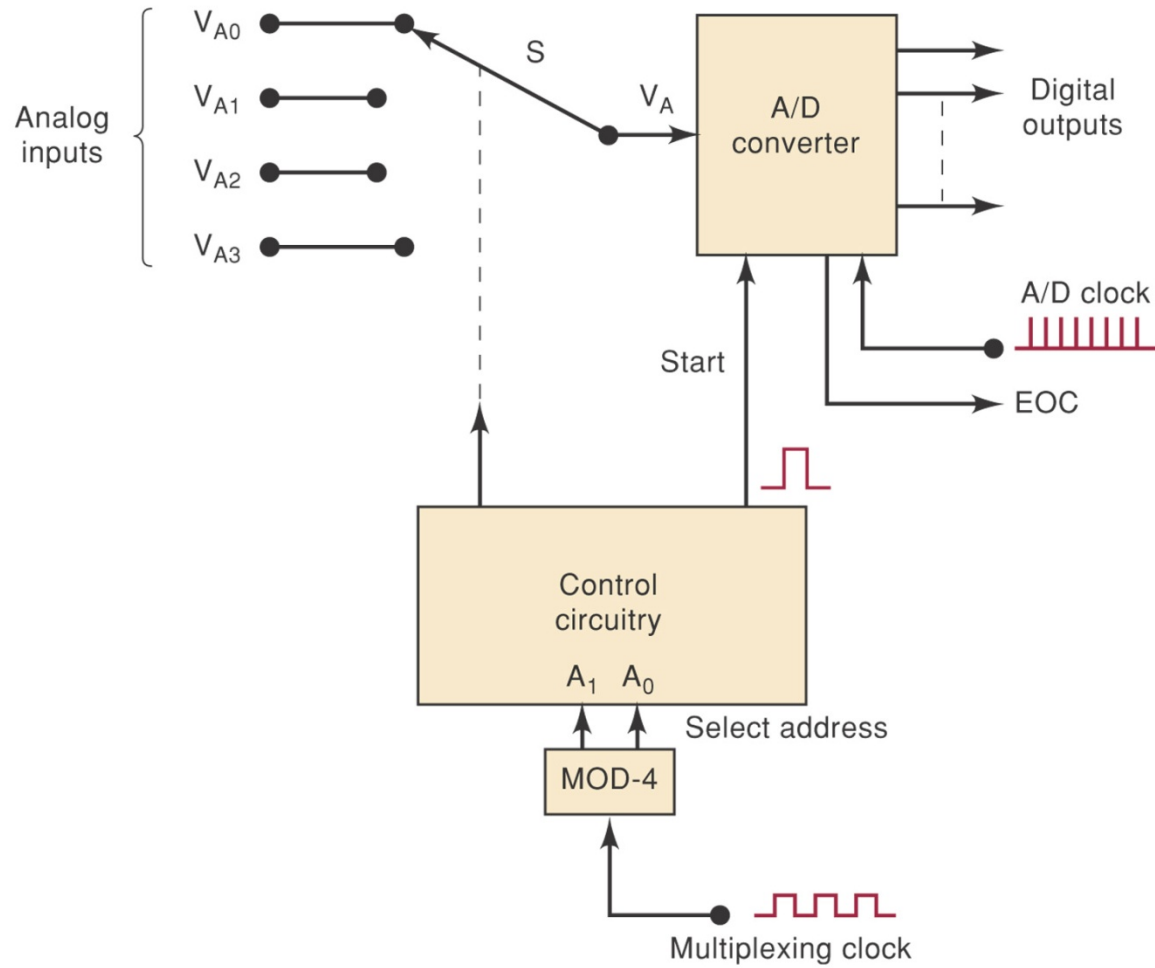
## Other A/D Conversion Methods

- There are many other methods of A/D conversion. Each has pros and cons:
  - Dual slope integrating ADC
  - Voltage to frequency ADC, VCO
  - Sigma/delta modulation, PWM
- The method used will depend on the application

# Multiplexing

- Multiple analog signals can be converted through time sharing of an ADC
- The process is illustrated in the next slide.
  - The multiplexing clock controls the rate at which the analog signals are switched to the ADC
  - CMOS semiconductor switches can be used to reduce switch delay time
- The ADC0808 can multiplex eight different analog inputs to one ADC

# Conversion of four analog inputs by multiplexing through one ADC.

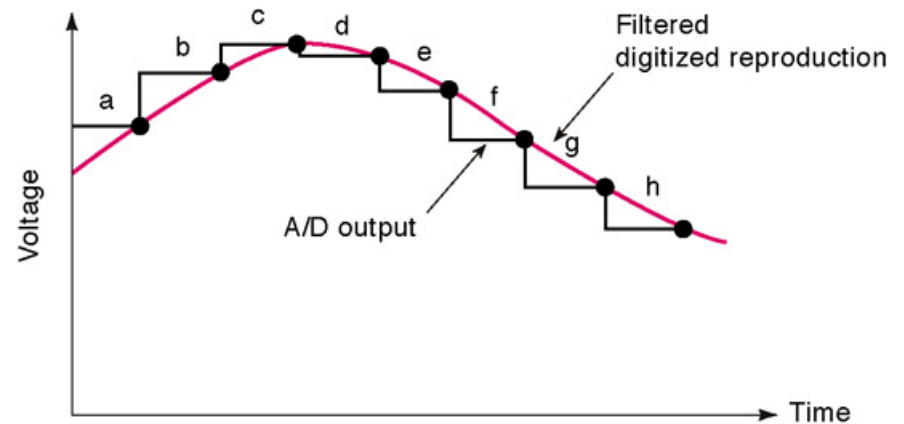
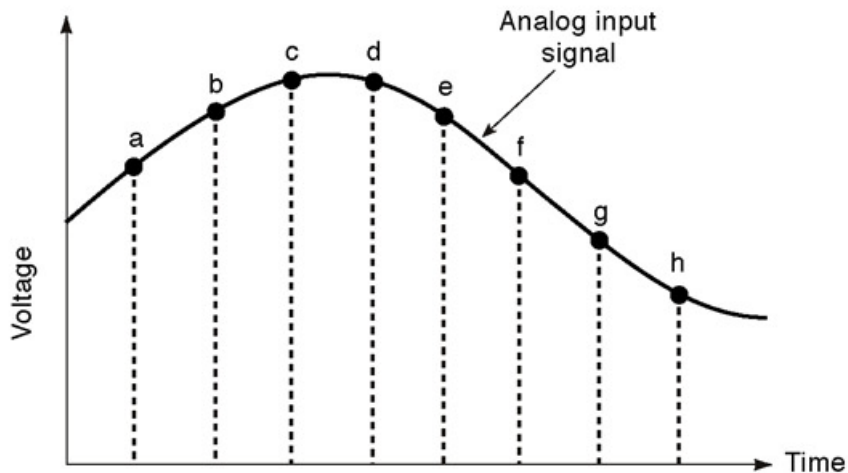


# Digital Storage Oscilloscope

- Makes use of A/D converters
- Advantages of the DSO over the CRO
  - Waveform storage
  - Stored waveform display for comparison
  - Store and display waveforms before the trigger point
  - Print waveforms or transfer to a PC

# Data Acquisition

- Digitizing analog data and transferring to memory is data acquisition
- Acquiring a single data point value is sampling
- Reconstructing a digitized signal



# Digital Signal Processing

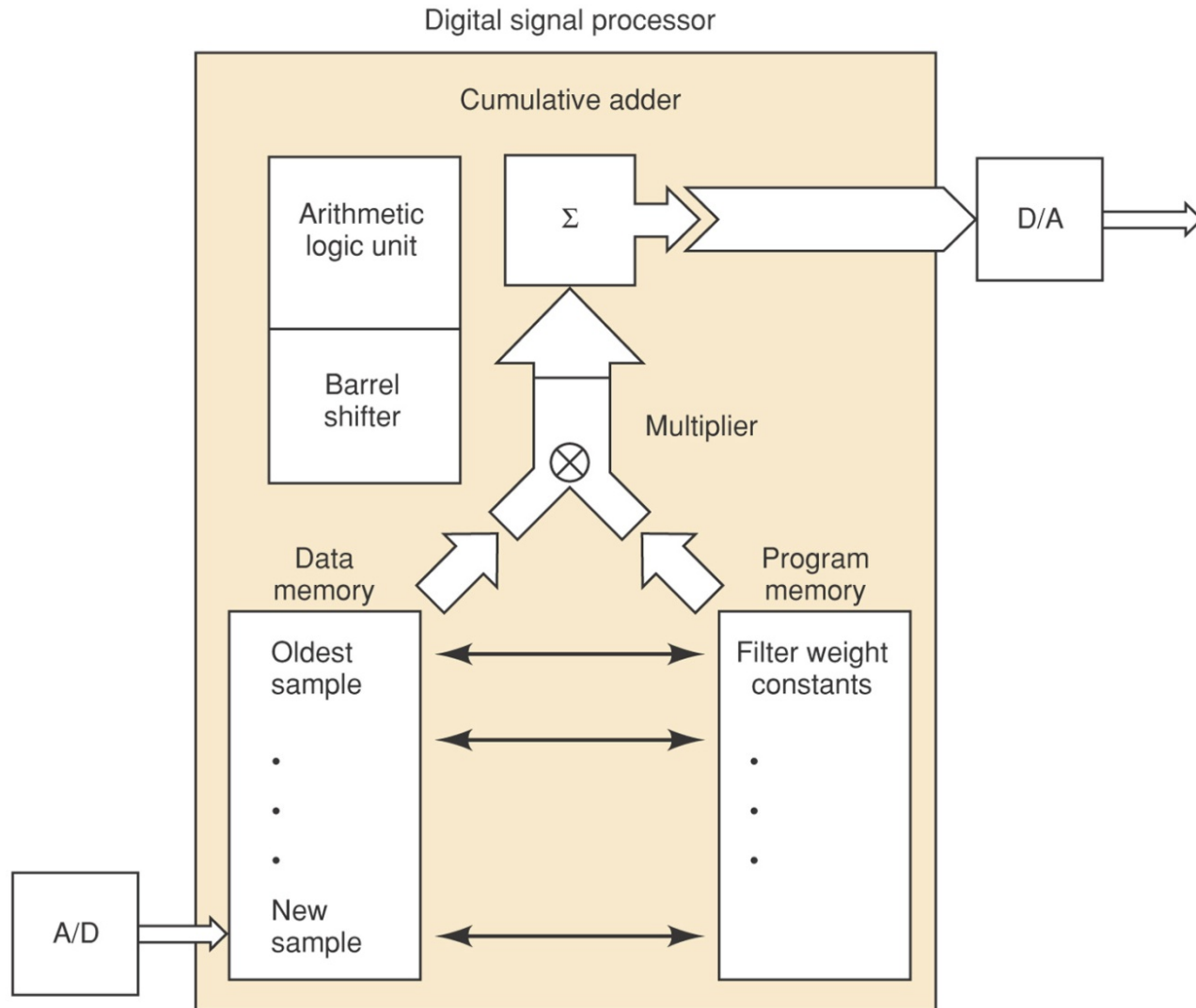
- Specialized microprocessor optimized for repetitive calculations on streams of digitized data
- DSP is used frequently in filtering and conditioning of analog signals
  - Perform the same function as analog filters but allow greater flexibility
  - Also music generation, effects pedals!



# Digital Signal Processing

- Digital filtering process
  - Read the newest sample from A/D
  - Replace the oldest sample with the new one
  - Multiply each of the 256 samples by corresponding weight constant
  - Add all products
  - Output the resulting sum of products to the D/A

# Digital signal processor architecture.



# D-A Oversampling

Use interpolation to generate intermediate samples.

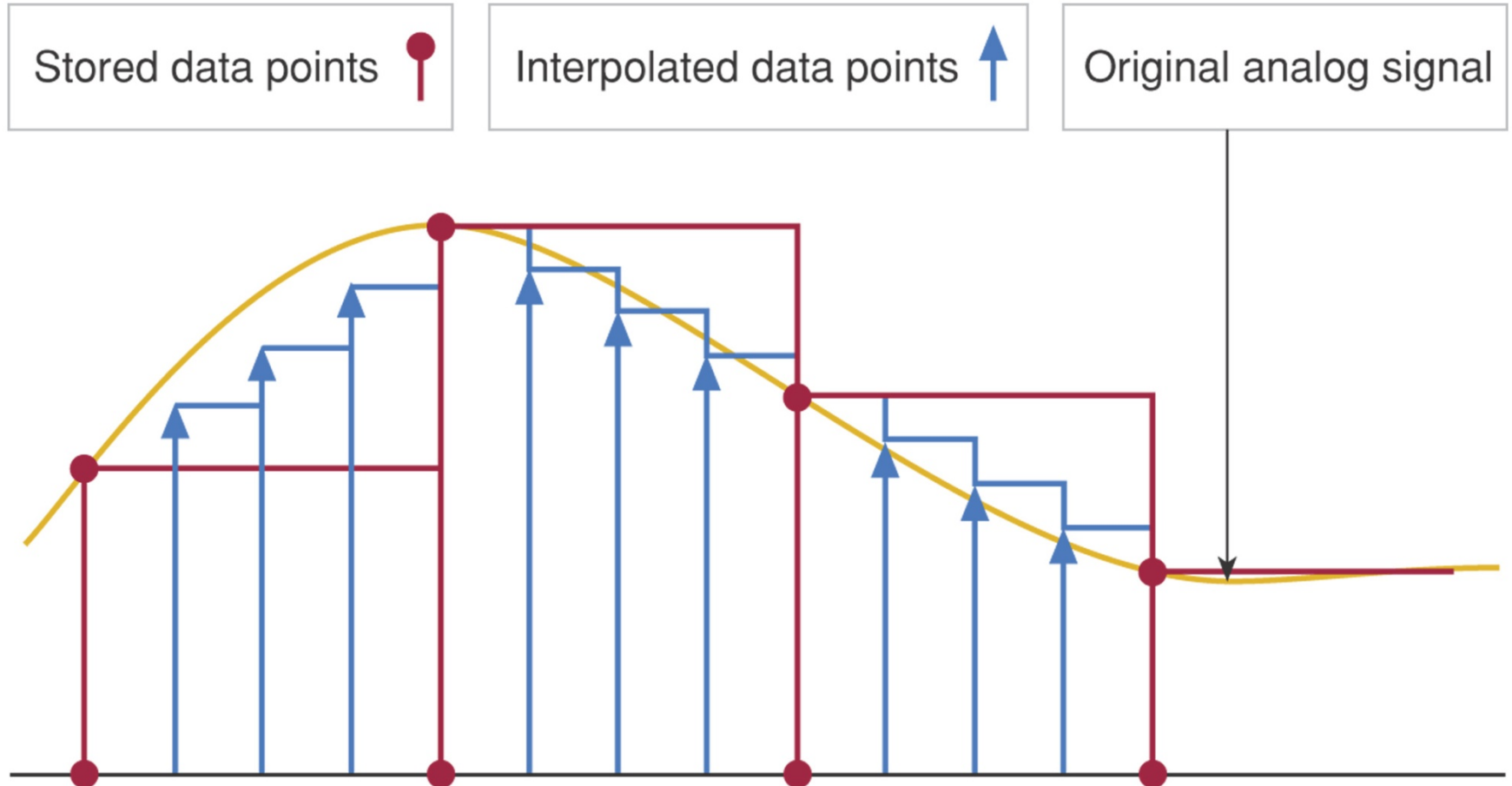
Output sample rate is increased.

Can use a simpler LP reconstruction filter as sampling

Clock much greater than signal frequencies.

Extreme case is the 1-bit Audio DAC.

Inserting an interpolated data point into a digital signal to reduce harmonic content close to the frequencies of interest.



# Audio CODEC

Stereo Audio A-D and D-A all in one package.

## FUNCTIONAL BLOCK DIAGRAM

