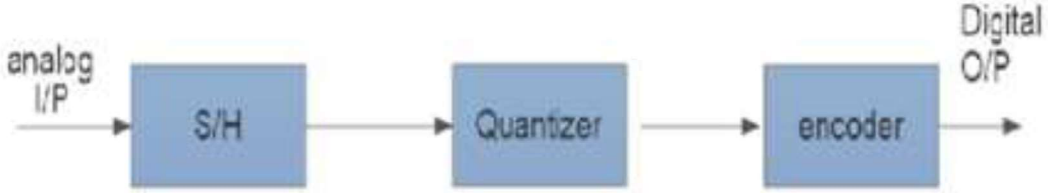
Analog to Digital conversion

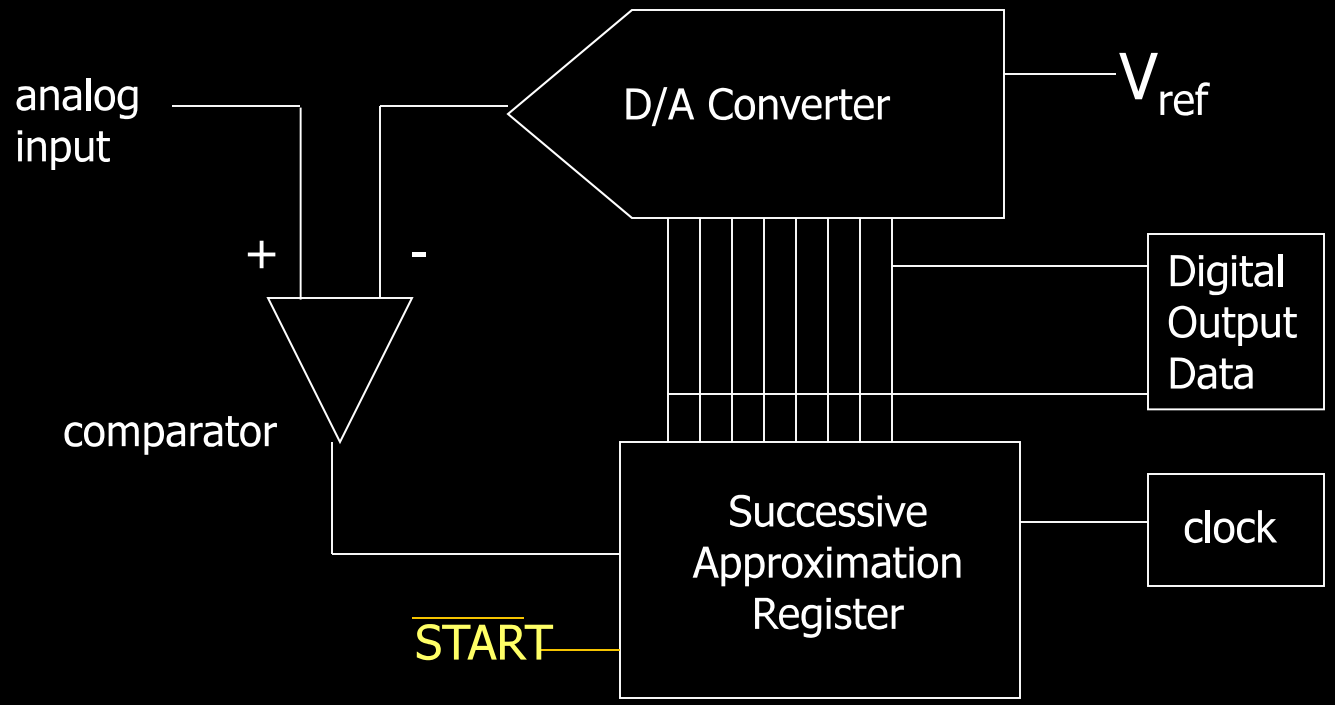
- An ADC converts analog signal to a digital coded signal.
- Types of Analog to Digital Converters
  - Successive Approximation
  - Counter Type
  - Integrating or Dual Slope
  - Parallel or Flash



Analog → Digital Conversion
Steps involved:

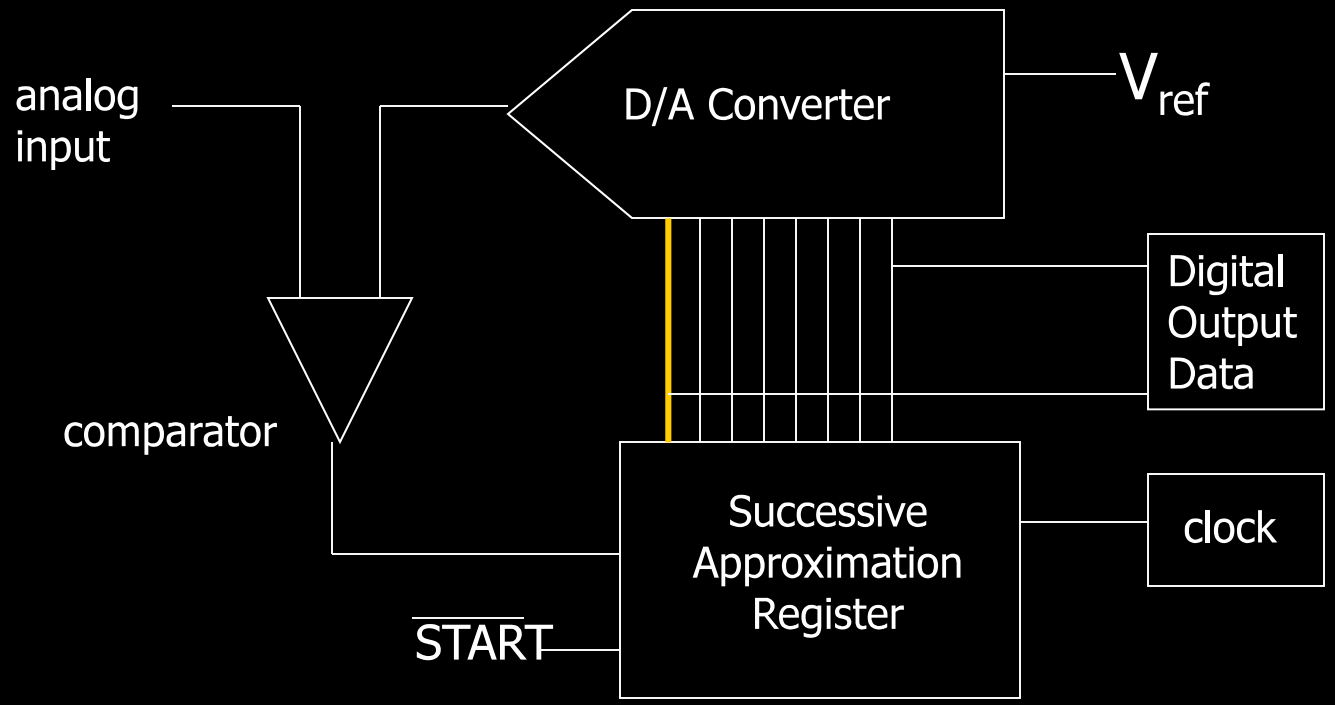
- Sampling – the analog signal is first sampled at periodic intervals.
- Quantizing – breaking down analog value into a set of finite states
- Encoding – assigning a digital word or number to each state and matching it to the input signal

Successive Approximation method



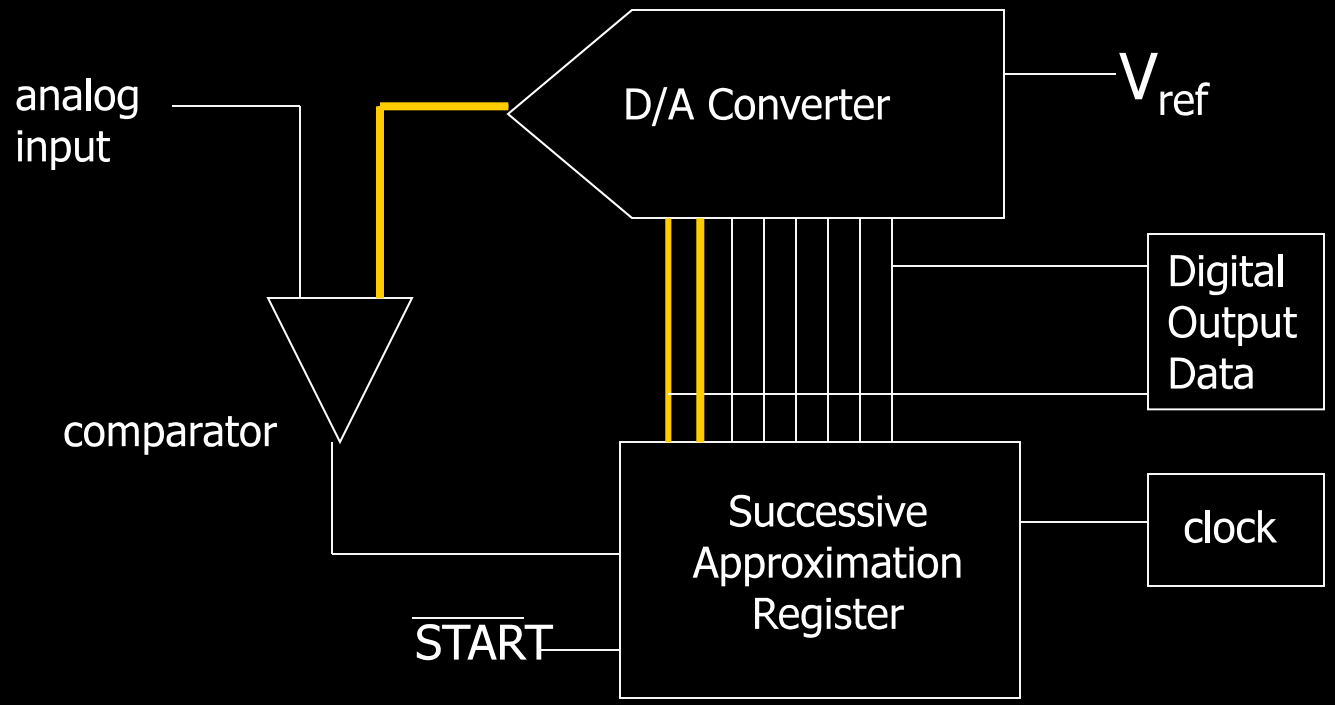
At initialization, all bits from the SAR are set to zero(clearing), and conversion begins by taking START line low.

Successive-Approximation A/D



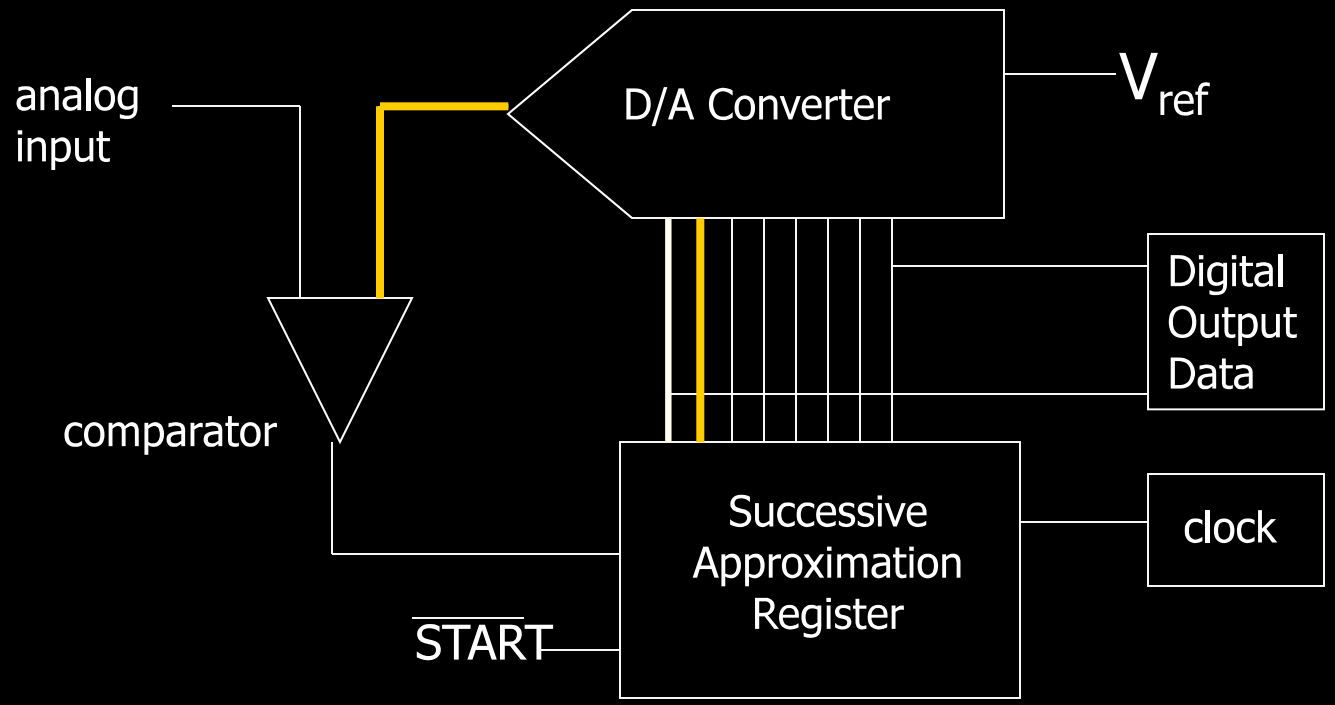
First the logic circuit in the SAR sets the MSB bit equal to 1 (+5 V). The MSB representing one half of full scale is converted by D/A converter.

Successive-Approximation A/D

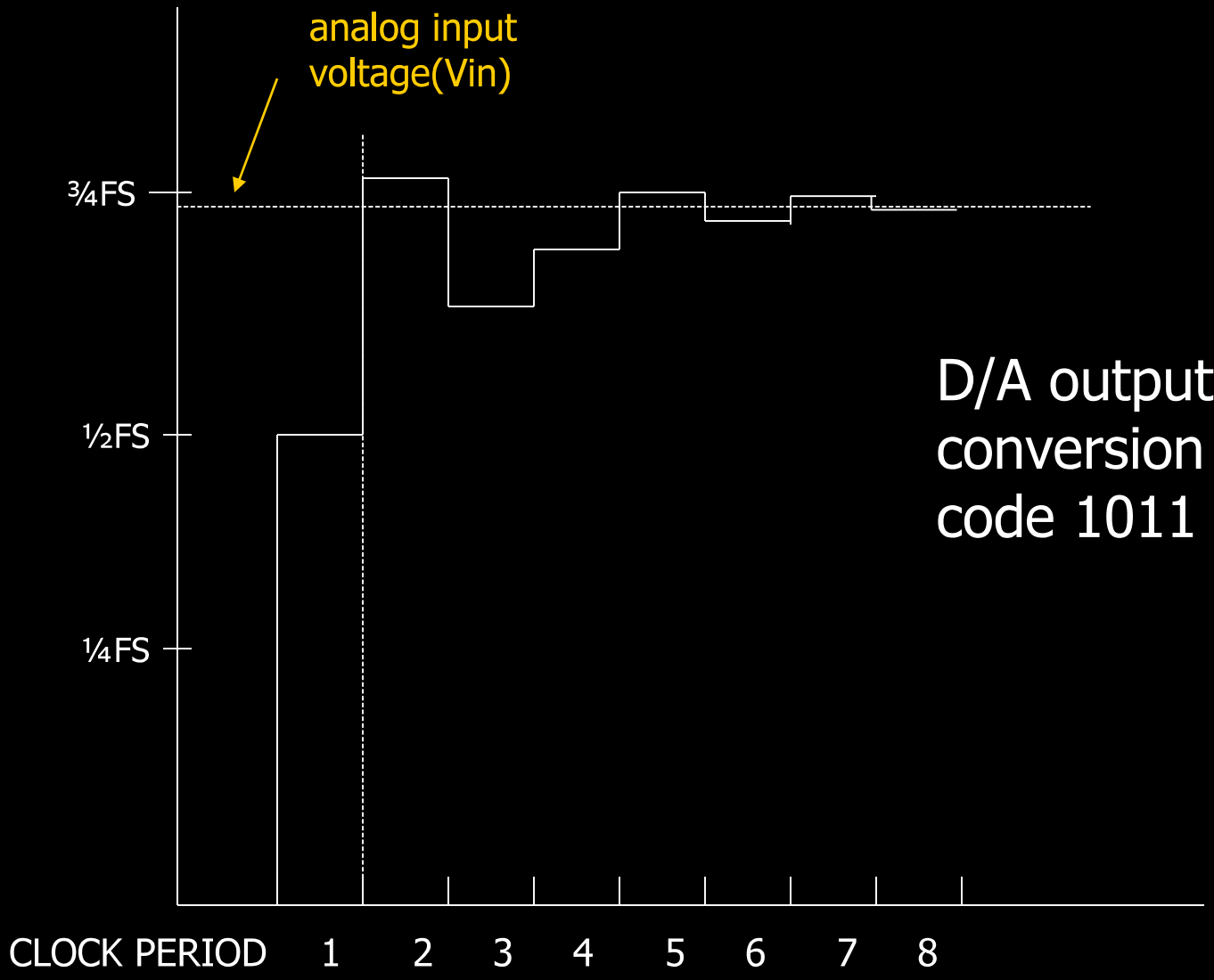


If the Vin > converted MSB then the MSB is left at 1 and the next bit is then tested.

Successive-Approximation A/D



If the Vin < converted MSB then the MSB is left at 1 and the next bit is then tested.



D/A output for 8-bit conversion with output code 1011 0101

Successive Approximation

Advantages

- Medium accuracy compared to other ADC types
- Capable of outputting the binary number in serial (one bit at a time) format.
- increasing the resolution which improves the accuracy
- increasing the sampling time which increases the maximum frequency that can be measured.

Disadvantages

- Higher resolution successive approximation ADC's will be slower
- Speed limited to ~5Msps