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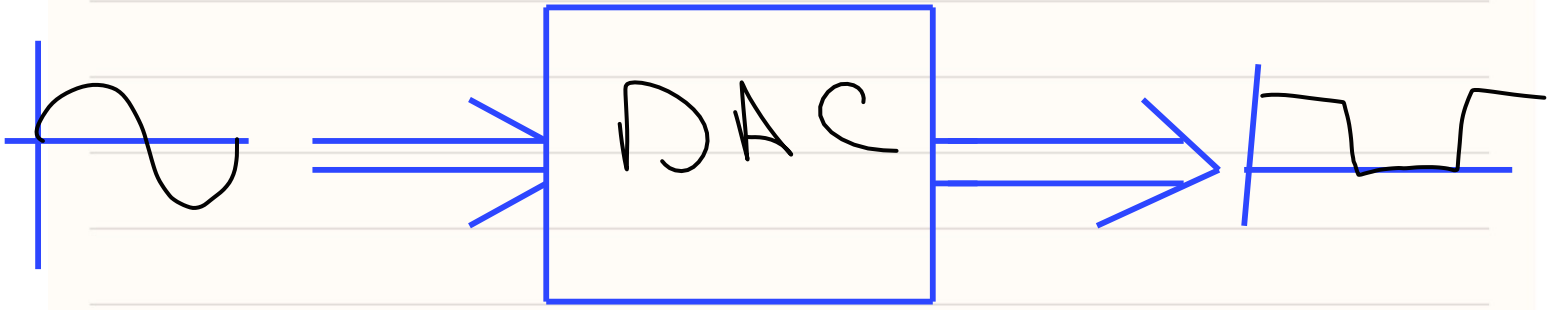
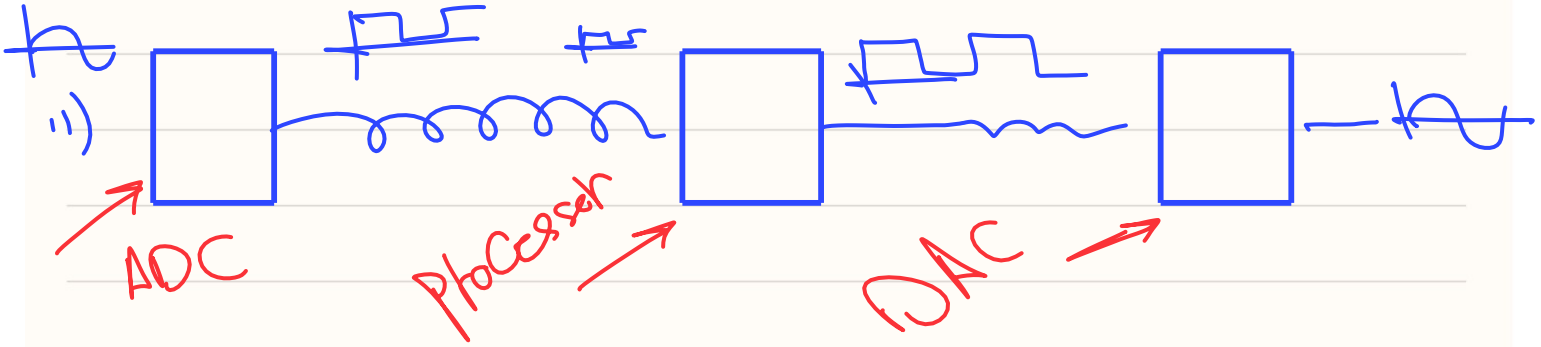
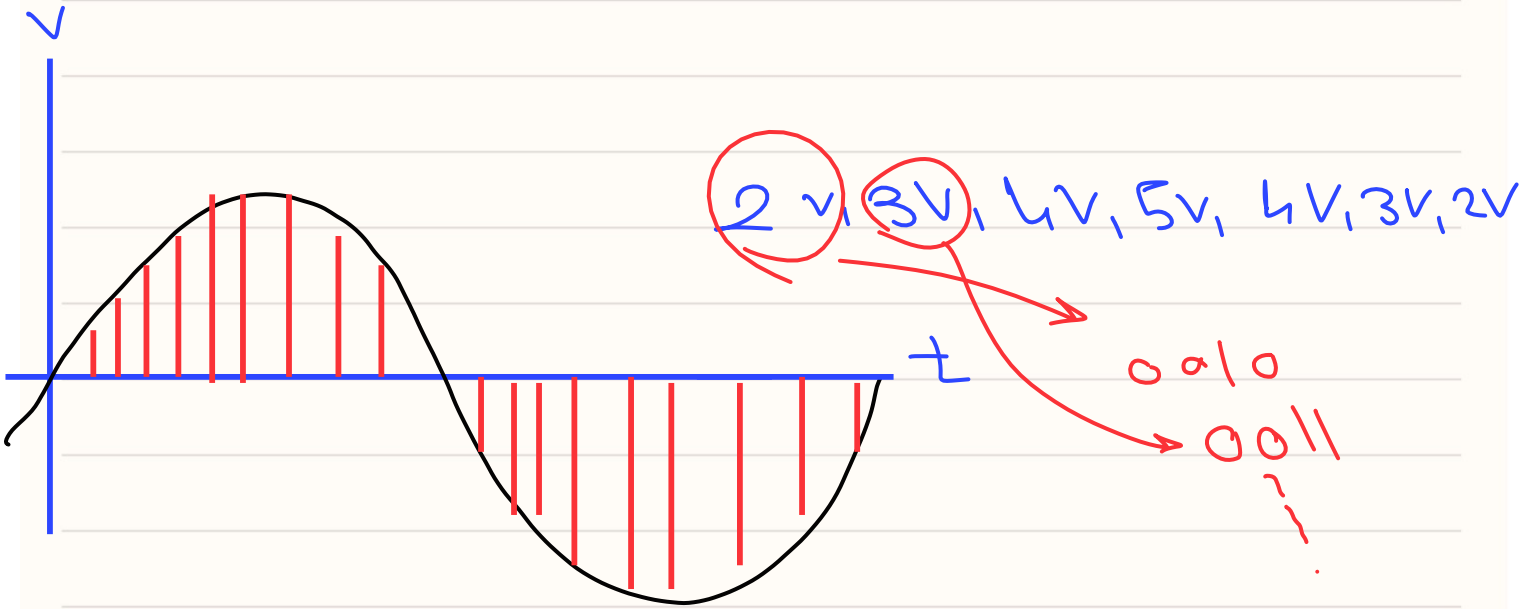
Digital Signal Conditioning

"DAC"







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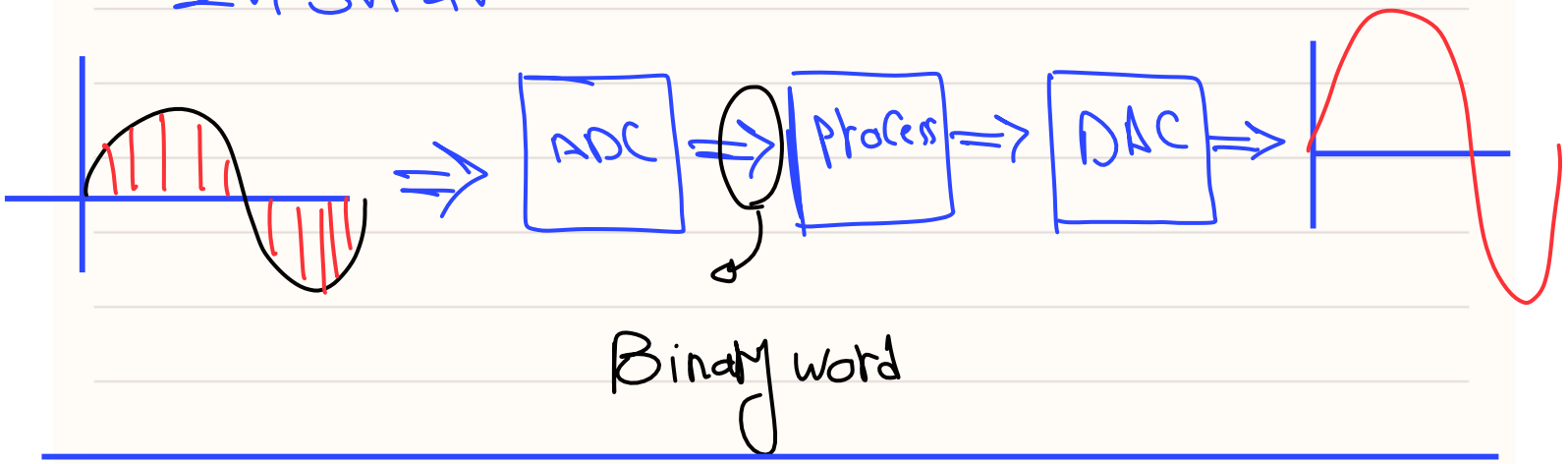
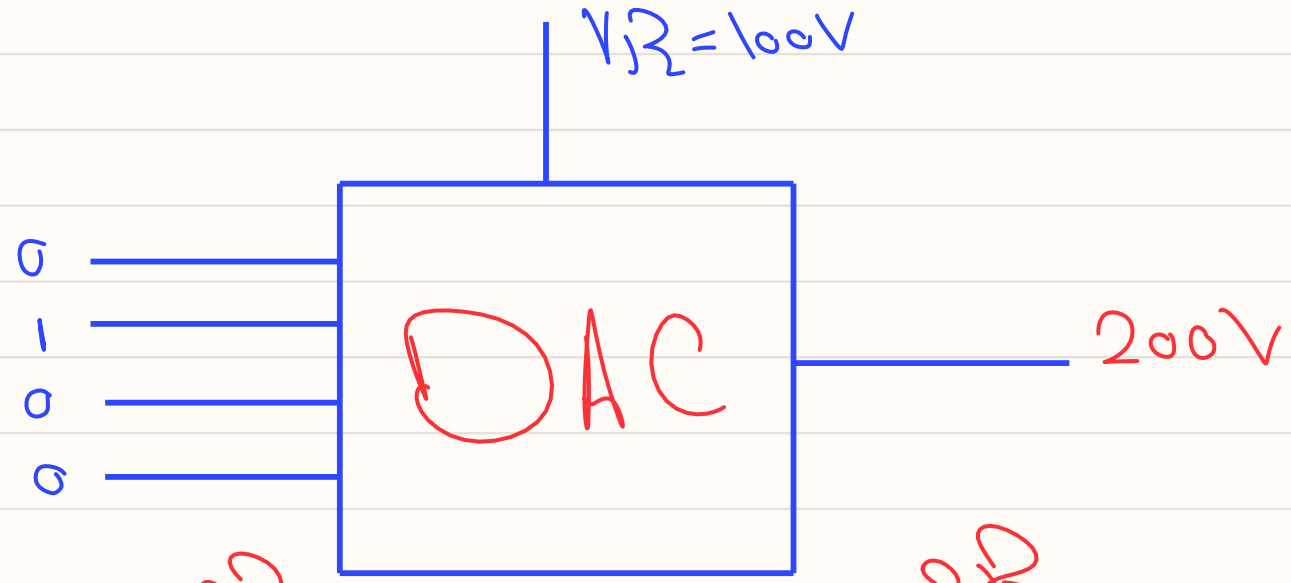
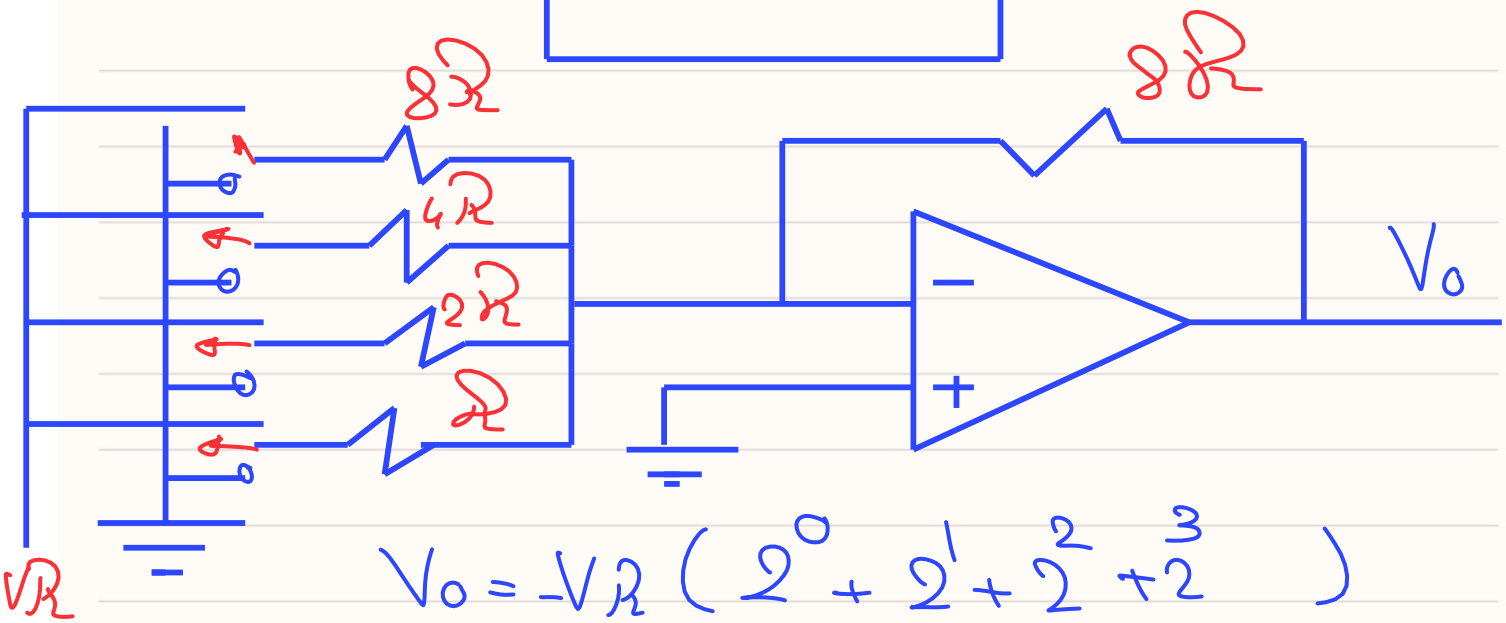
2V, 3V, 4V



Binary word

DAC





$$V_o = -V_R\left(2^0 + 2^1 + 2^2 + 2^3\right)$$

is not accuracy

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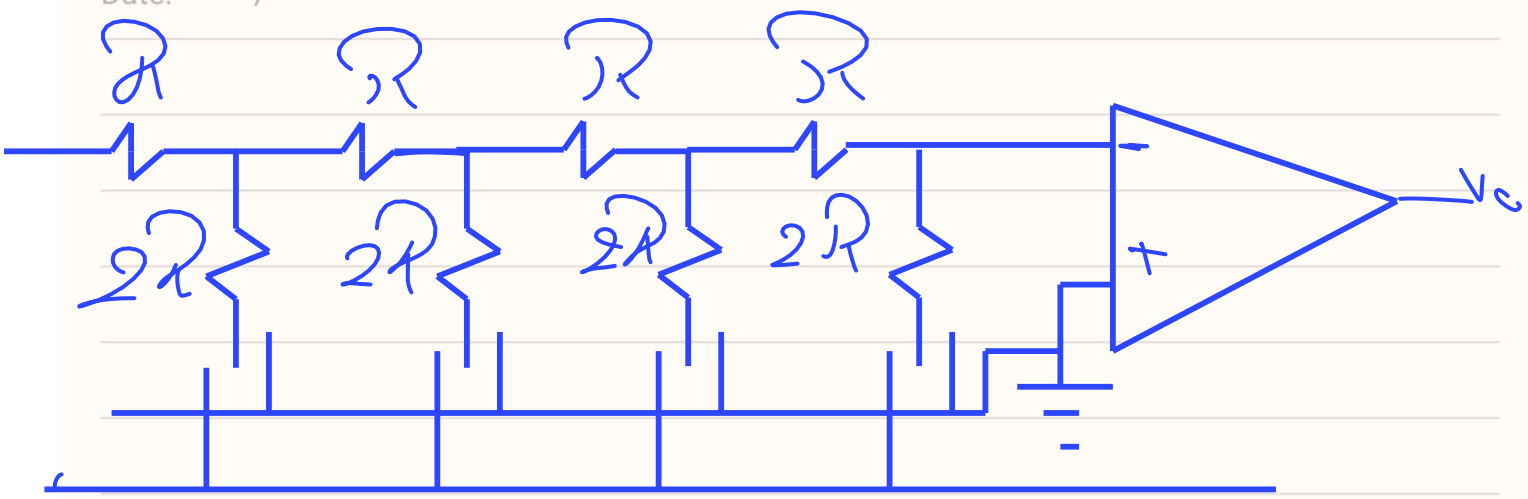


$$V_o = V_R \left[b_3 * 2^{-1} + b_2 * 2^{-2} + b_1 * 2^{-3} + b_0 * 2^{-4} \right]$$

↳ $0.b_3 b_2 b_1 b_0$

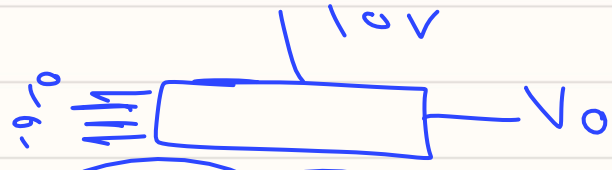
$$V_o = \frac{V_R}{2^4} \left[b_3 * 2^3 + b_2 * 2^2 + b_1 * 2^1 + b_0 * 2^0 \right] * \frac{2^4}{2^4}$$

$$V_o = \frac{V_R}{2^n} [N]$$

→ Decimal

Example

1010



$$V_o = \frac{10}{2^4} * 10 = 6.25$$

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"notes"

$$V_o = \frac{N}{2^n} V_R$$

max V_o → 8 bit, $V_R = 1v$

∴ $N = 1111\ 1111 = 2^n - 1 = 255$

∴ $V_o = \frac{255}{2^8} * 1 \simeq 1$

min V_o → Zero

Resolution → أقل جهد يمكن قياسه

↳ "bit"

↳ Smaller units

$1 = 2^0$

1 bit ← 1

$\therefore V_o = \frac{1}{2^n} V_R$

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$$V_o = \frac{N}{2^n} V_R$$

Res
Δ 1bit
$\frac{1}{2^n} V_R$

min
0

max
$\frac{2^n - 1}{2^n} V_R$

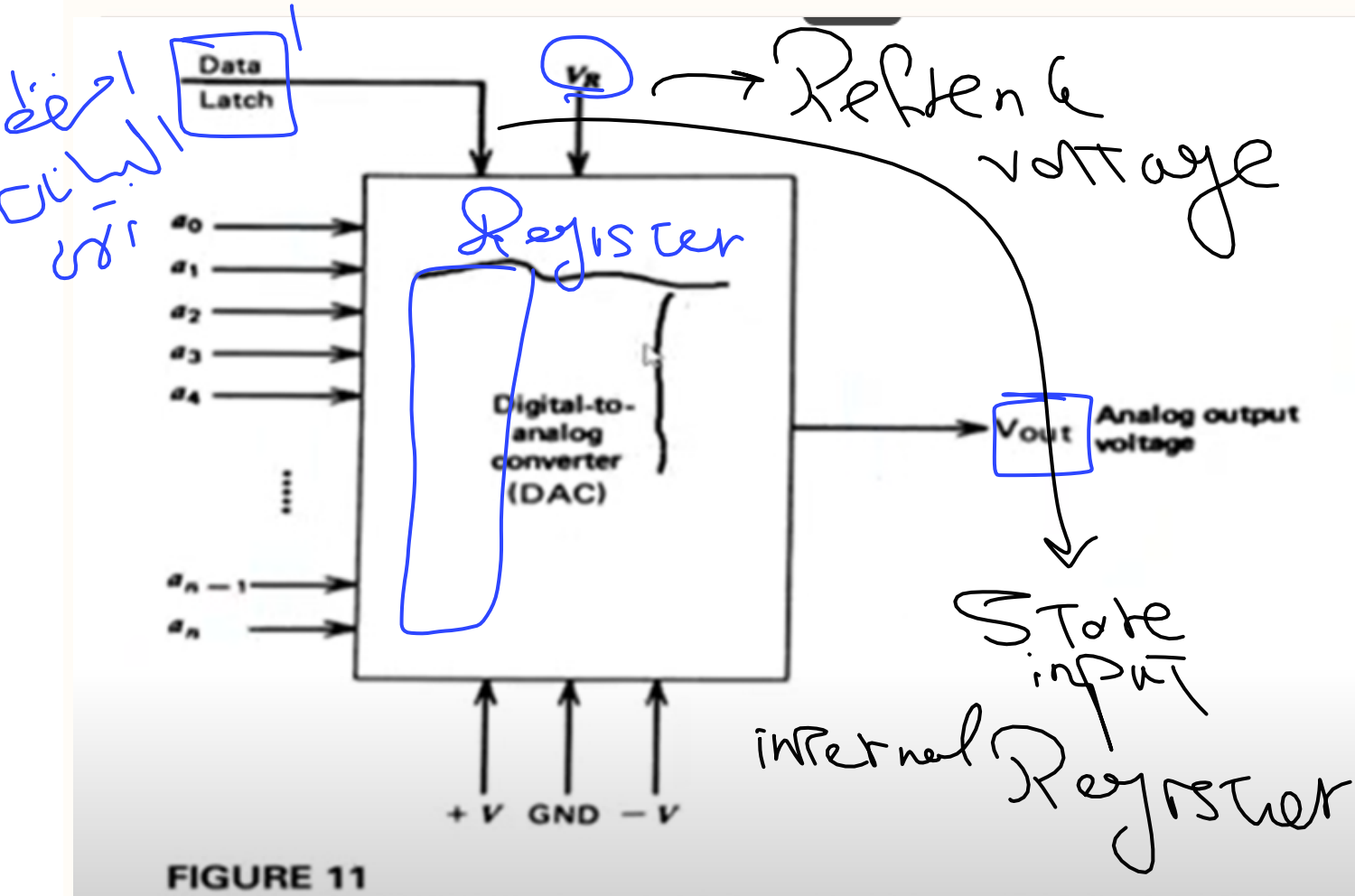

FIGURE 11
A generic DAC diagram, showing typical input and output signals.

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