Telemetry for external programming

unit that you put in close to pacemaker

you set the pacemaker in programming phase

Programmer

Pacemaker

relé

Debouncer

encodes instructions/change in parameters

Programmer microprocessor

Control and error detection

Encoder

Decoder

Driver

Amplifier

drive RF coils

Reed switch

Amplifier

Driver

Control and error detection

Decoder

Encoder

Pacemaker logic

transmitter and receiver

internal coil in pacemaker

since it's a nice electrocardiograph we can send info about statues etc.

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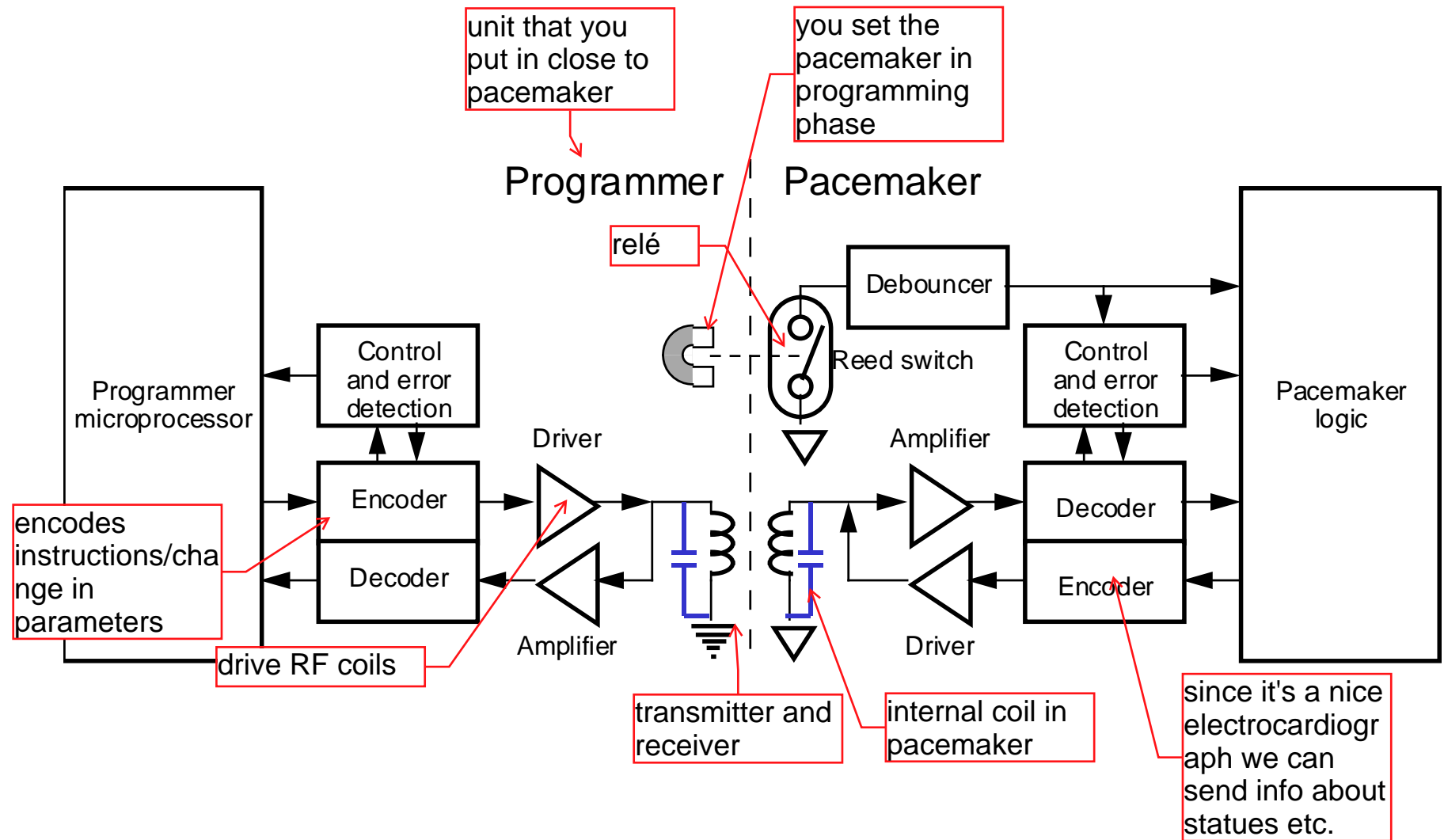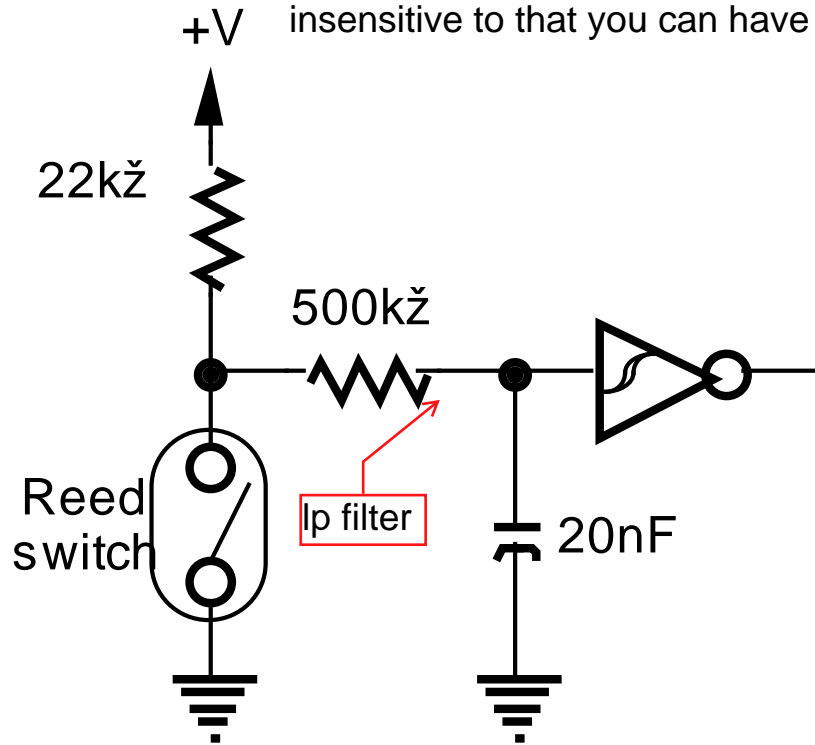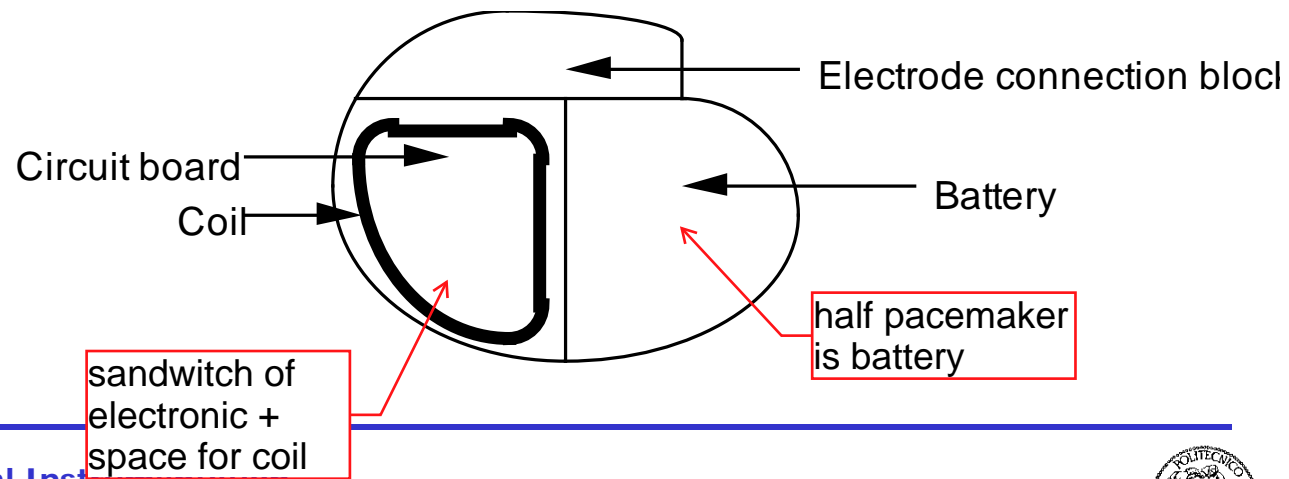
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Once you close the relè there could be multiple bouncing (it's not stable). To make el. insensitive to that you can have a LP filter

+V

22kž
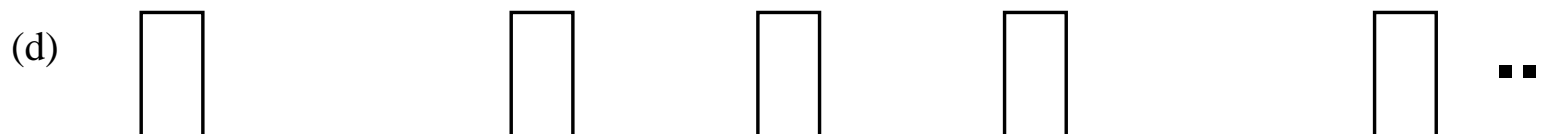
500kž

Reed switch

lp filter

20nF

Magnetic switch with de-bouncing circuit

Coil for RF transmission

Electrode connection blocl

Circuit board

Coil

Battery

half pacemaker is battery

sandwitch of electronic + space for coil

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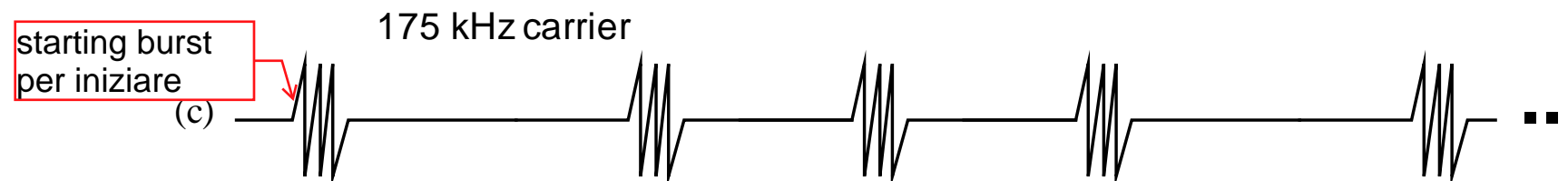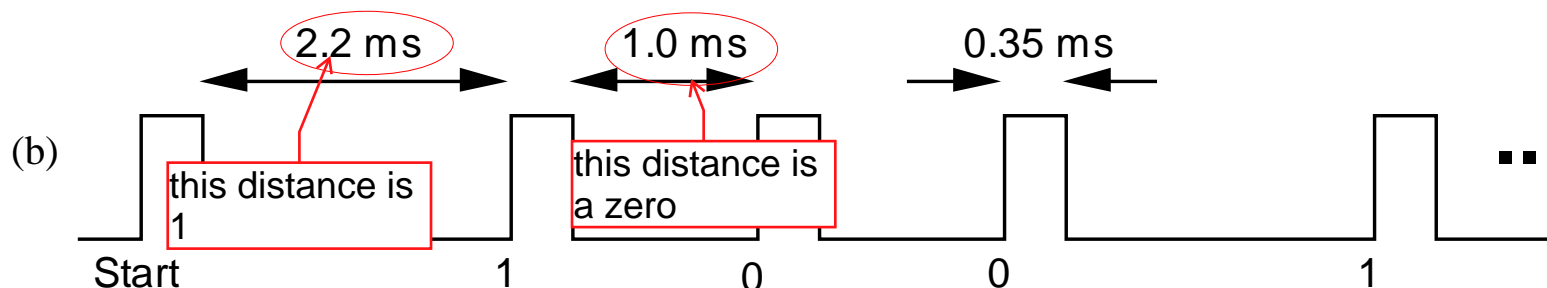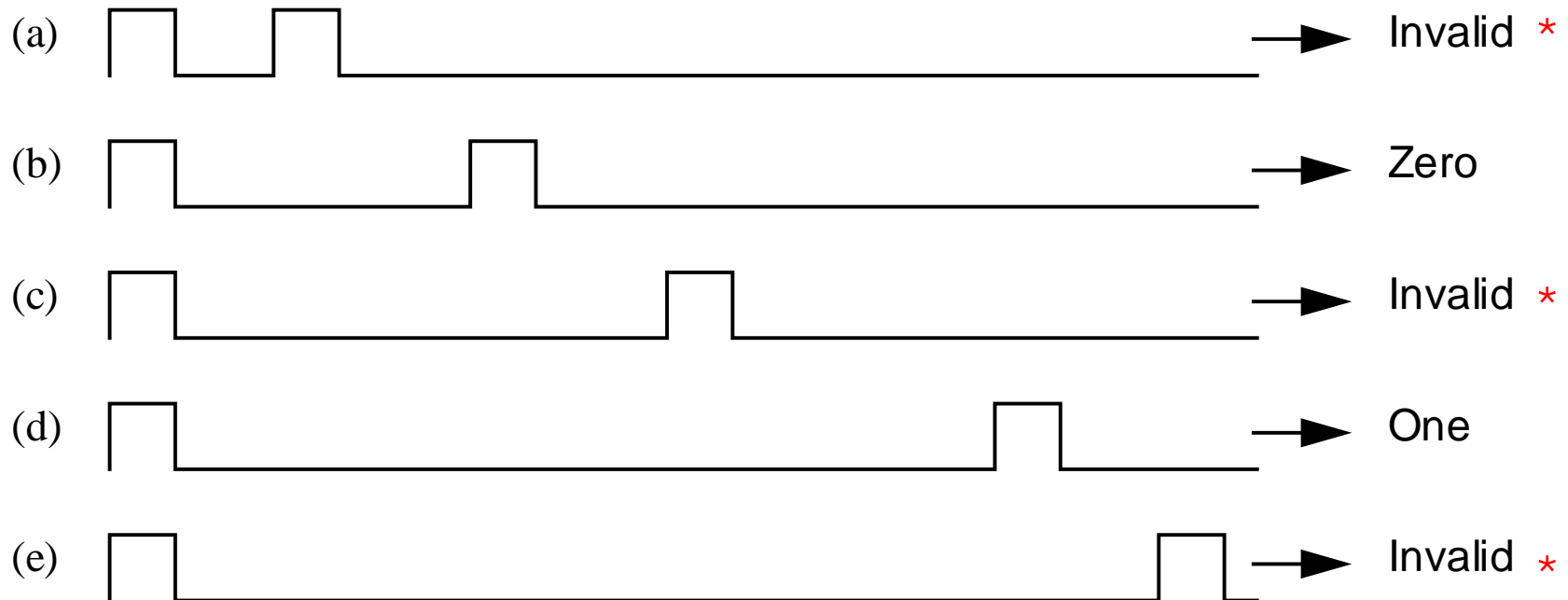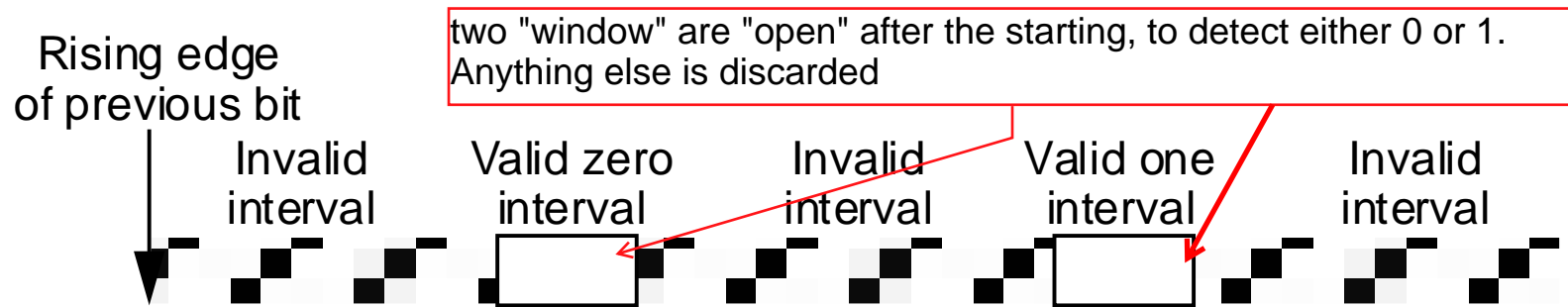
2

stream of digital sent to pacemaker to change parameter, eg. pulse rate. Series of bit, we have a starting one. We dont code as voltage level, but a **burst of the carrier**. **Distances between burst codes values**. So: 1st what to change, then how, then bits for protocols to be robust

	for timing	pulse rate	80 beats/min	code	errors detector
(a)	Start bit 1 bit 1	Parameter no. 8 bits 10010000 MSB LSB	Parameter value 8 bits 00101100 MSB LSB	Access code 8 bits 10010111 MSB LSB	Parity 8 bits 10111100 MSB LSB

(b)

2.2 ms   1.0 ms   0.35 ms

this distance is 1

this distance is a zero

Start   1   0   0   1

starting burst per iniziare

175 kHz carrier

(c)

(d)

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3

He "knows" he has to ack bits only IF they are in the correct time interval

Rising edge
of previous bit

two "window" are "open" after the starting, to detect either 0 or 1.
Anything else is discarded

| Invalid interval | Valid zero interval | Invalid interval | Valid one interval | Invalid interval |

(a) → Invalid *

(b) → Zero

(c) → Invalid *

(d) → One

(e) → Invalid *

* The whole message is discarded

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4

no

Band-pass filter → Envelope detector → Decoder → RAM
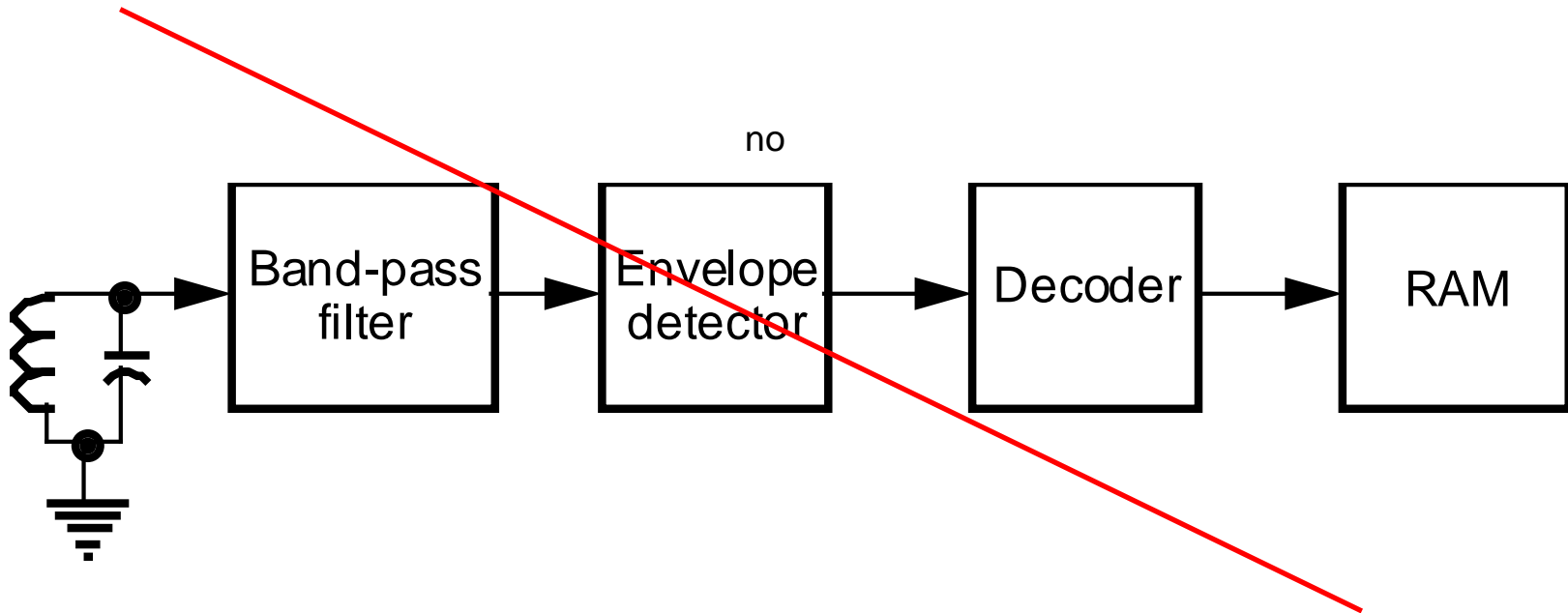
Circuit for receiver and decoding

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5