Electronics
Bit-banging (or bit-bashing)

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May 25, 2017

Problems

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Solution: Bit-bang more ports.

- Built-in hardware ports allow complex operations to happen without ongoing software intervention.

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Note: Because the Raspberry Pi has an operating system running, tight timing tolerances can't be guaranteed this way.

Tips for bit-banging

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- Use bit-banging for the least frequent tasks.
- **Avoid cumulative timing error by referencing a single event time.**
- Create functions as similar as possible to those that are built-in.

Example: bit-banging a UART (Transmitting)

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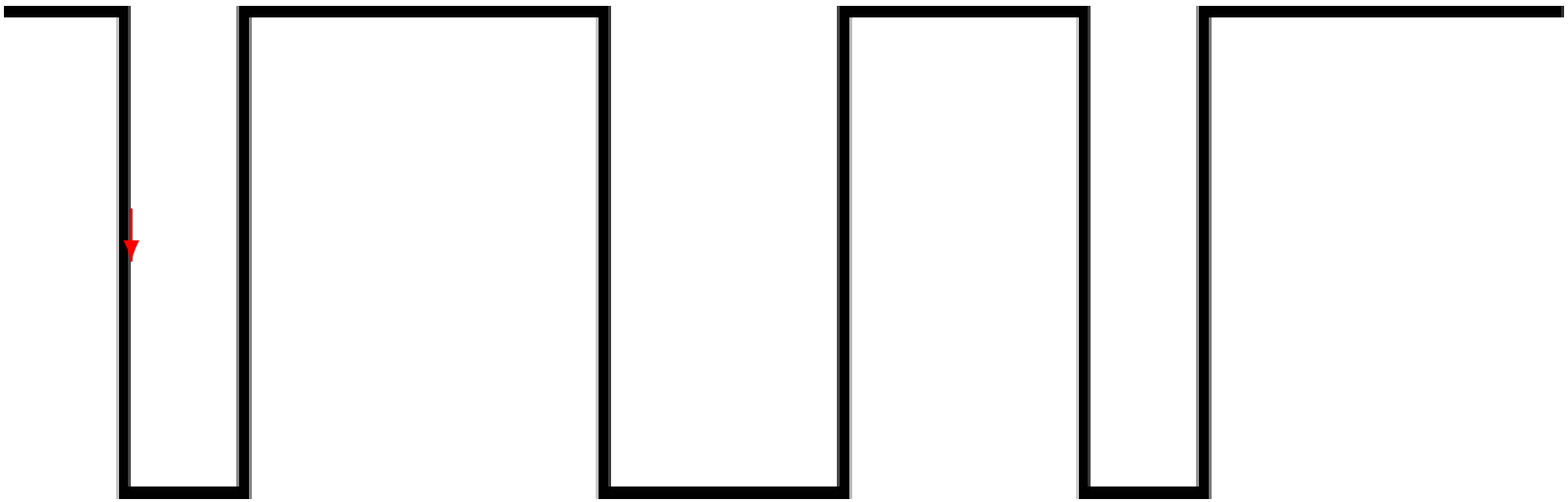
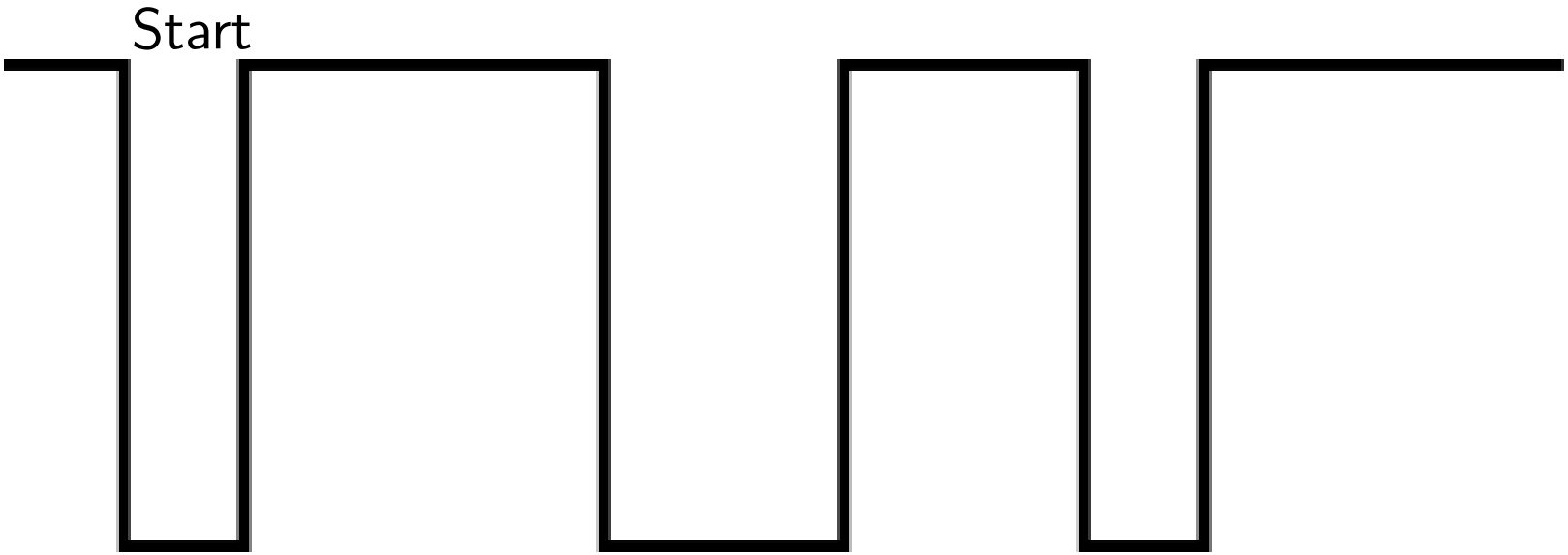
- When *transmitting*, a UART basically needs to *change* a signal at fixed time intervals.
- When *receiving*, after the detection of a START bit, a UART basically needs to *test* a signal at fixed time intervals.

Transmitting



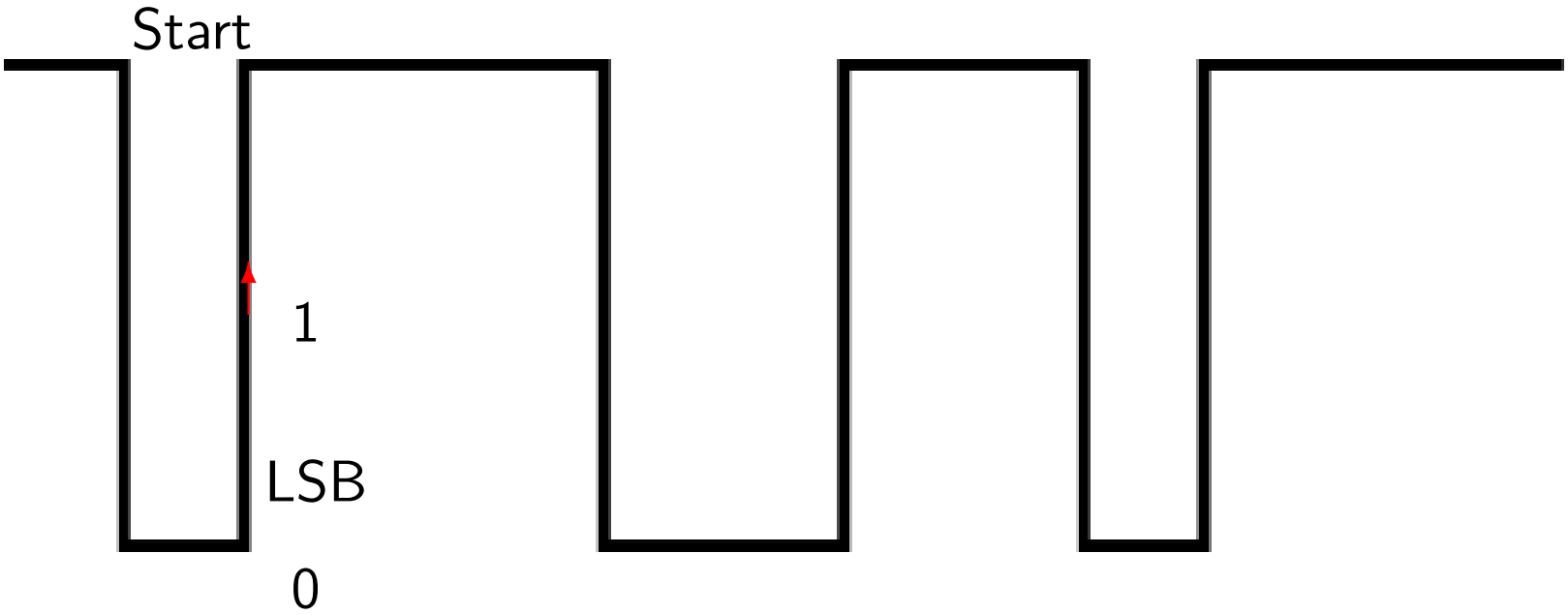
Set pin to START level

Transmitting



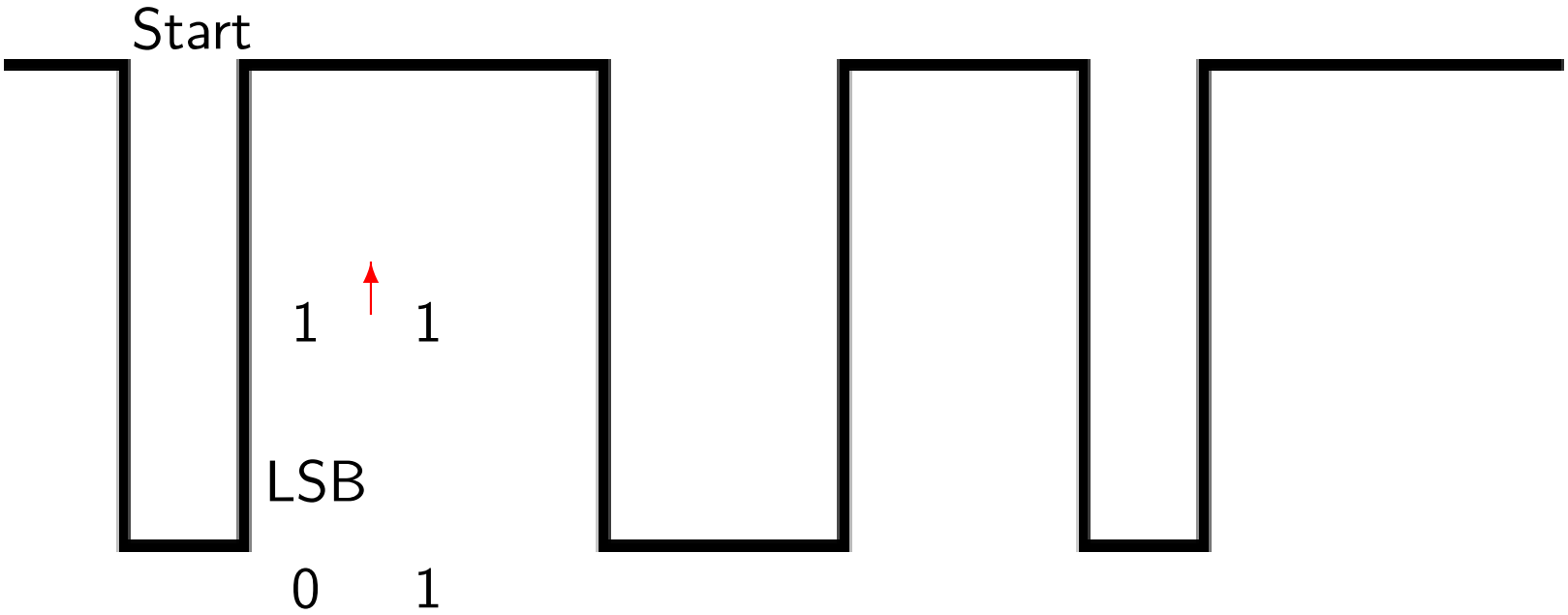
Wait one bit time before setting pin HIGH or LOW according to LSB

Transmitting



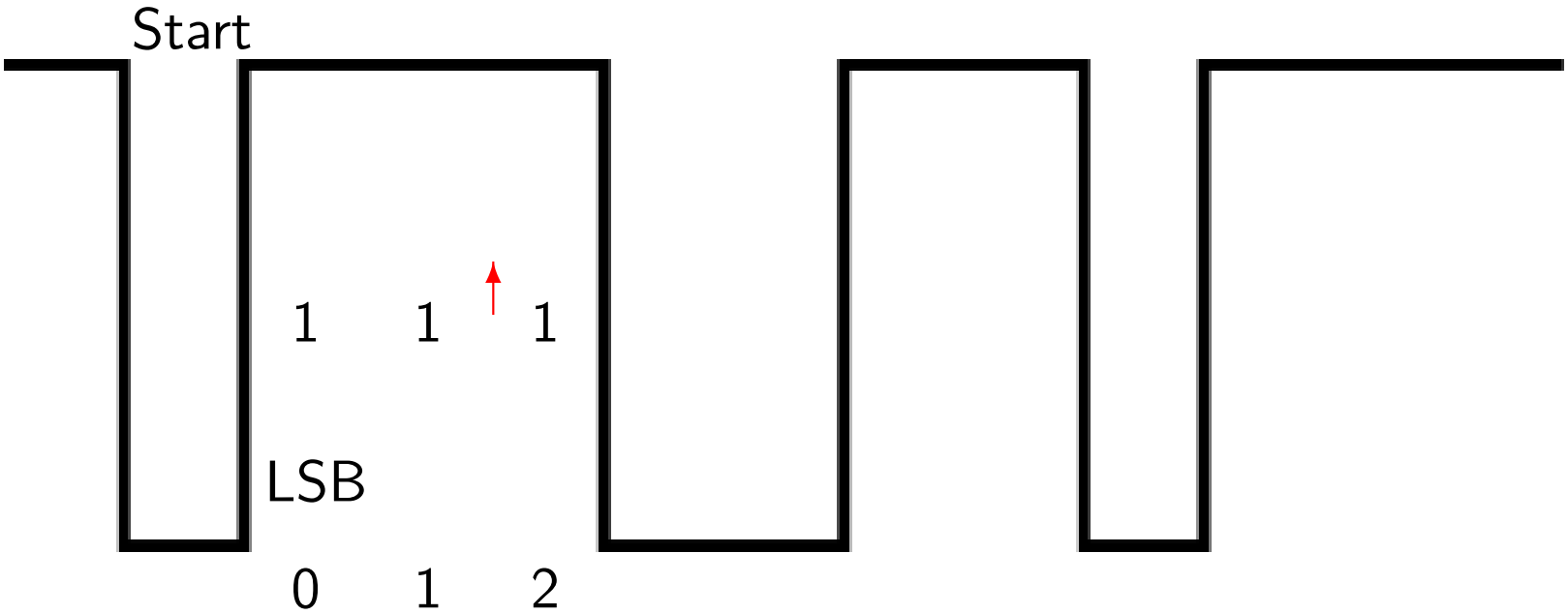
Wait one bit time before setting pin HIGH or LOW according to LSB

Transmitting



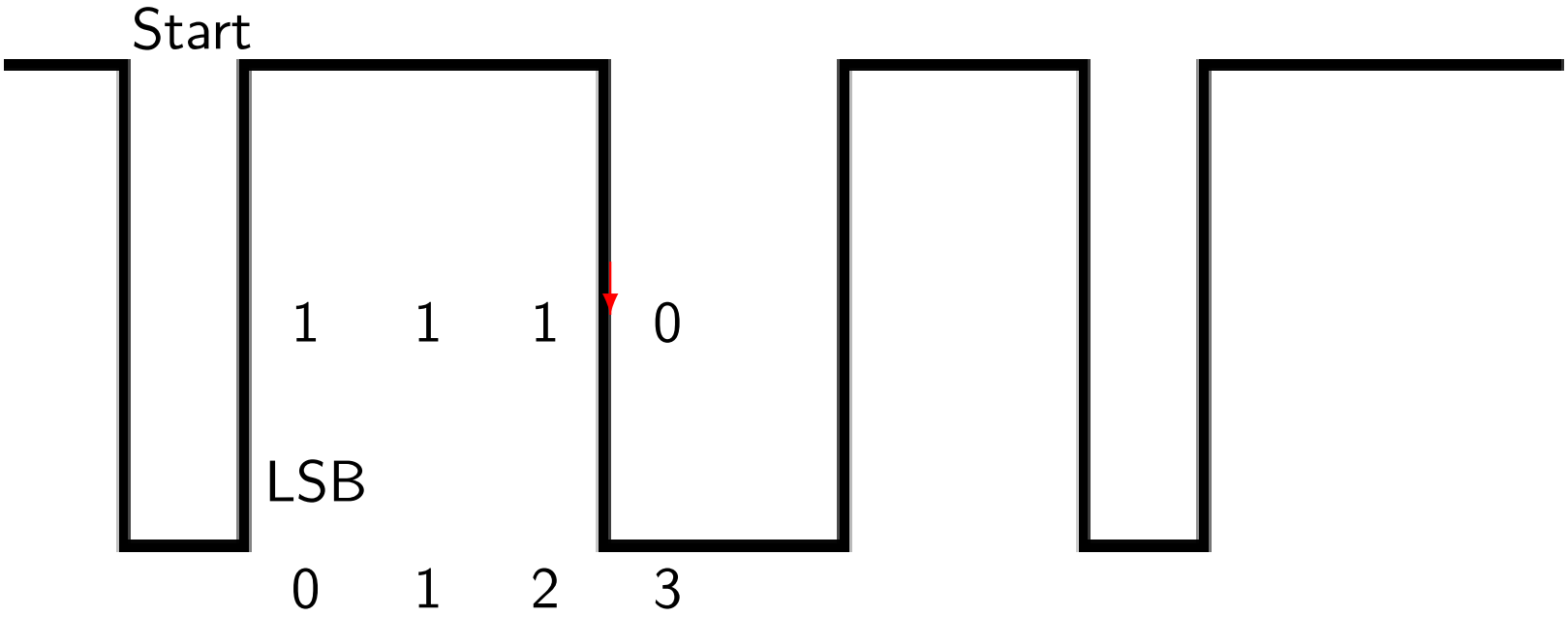
Wait one bit time before setting pin HIGH or LOW according to bit 1

Transmitting



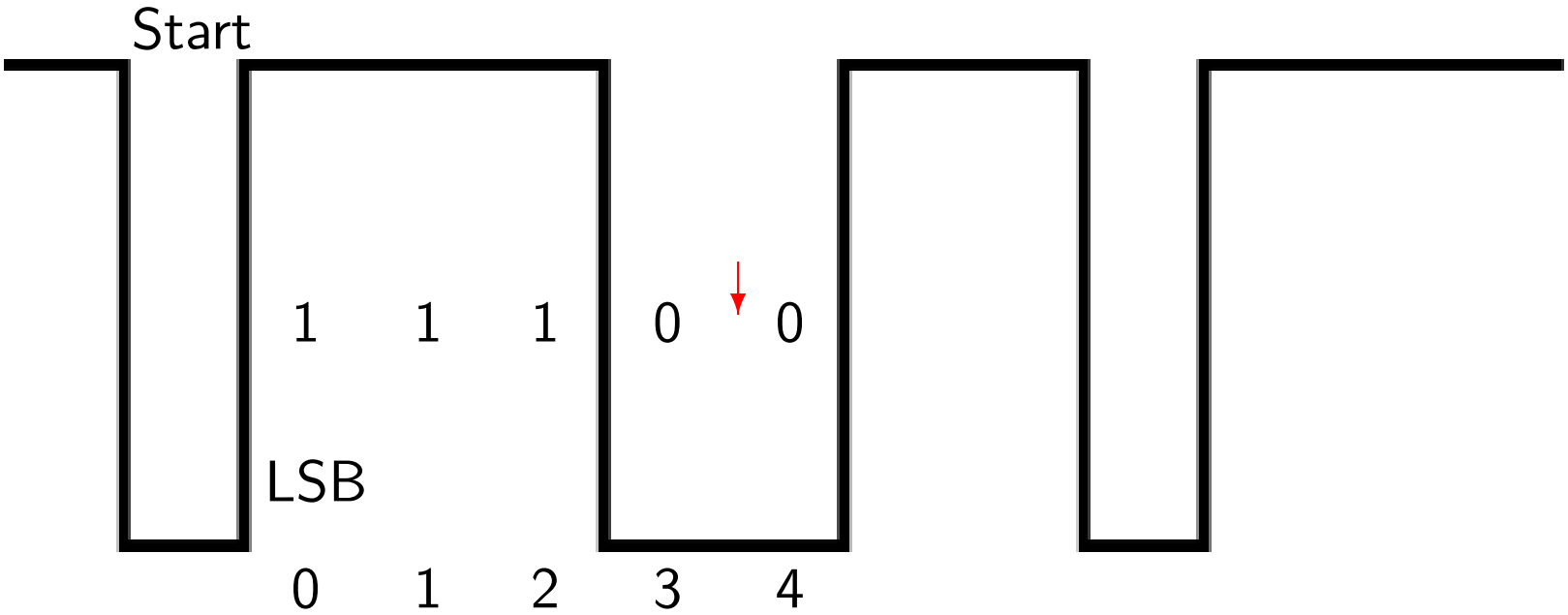
Wait one bit time before setting pin HIGH or LOW according to bit 2

Transmitting



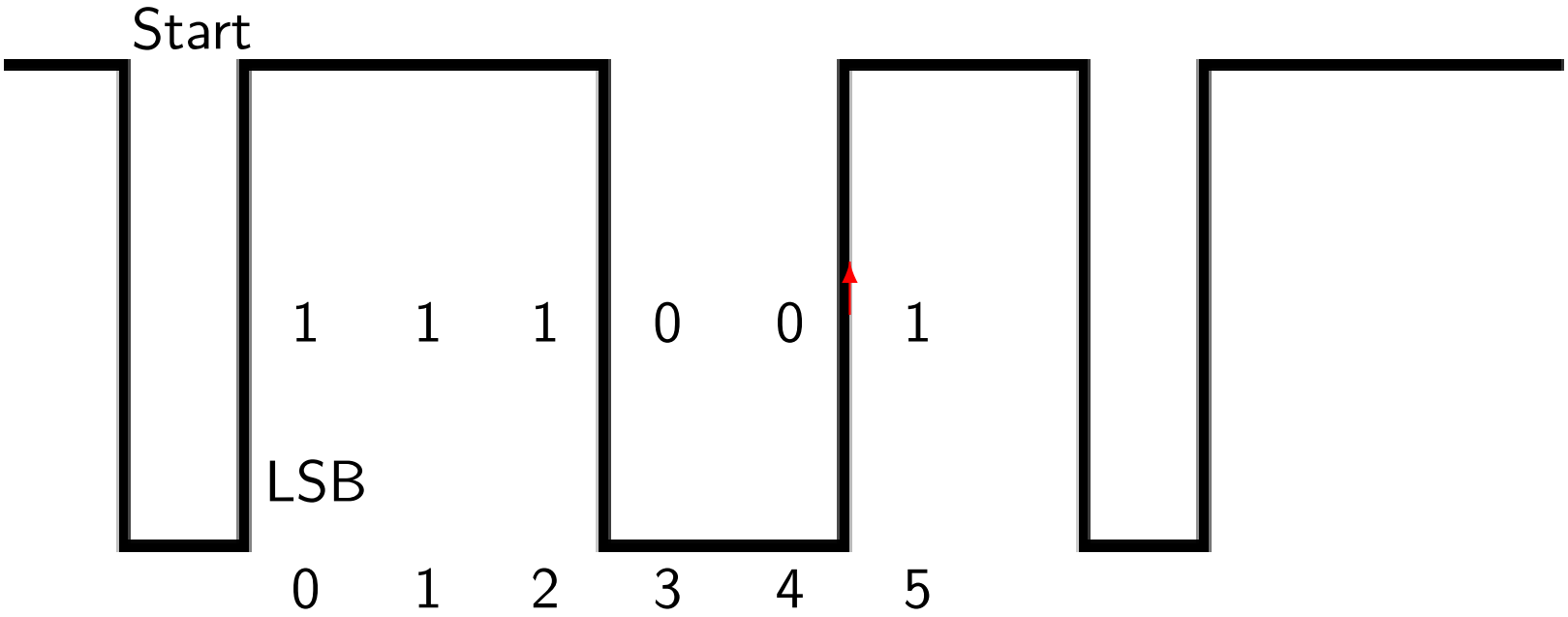
Wait one bit time before setting pin HIGH or LOW according to bit 3

Transmitting



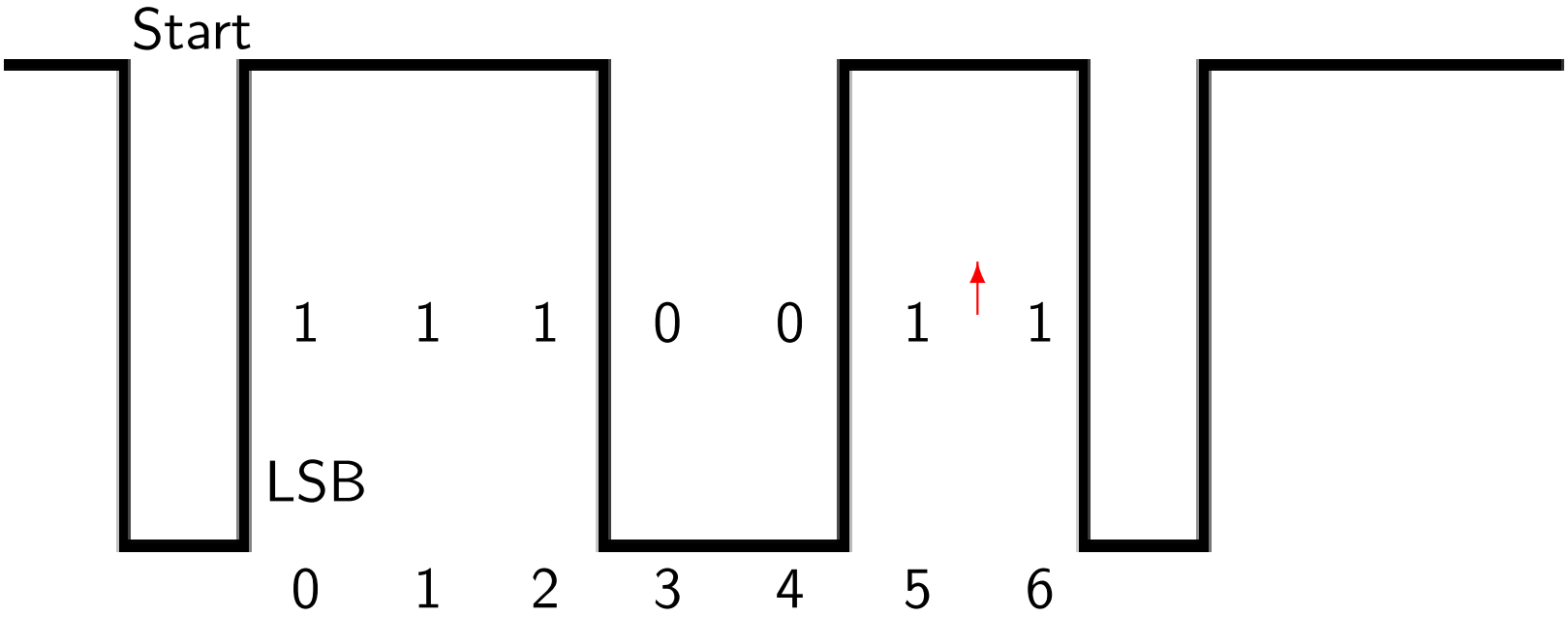
Wait one bit time before setting pin HIGH or LOW according to bit 4

Transmitting



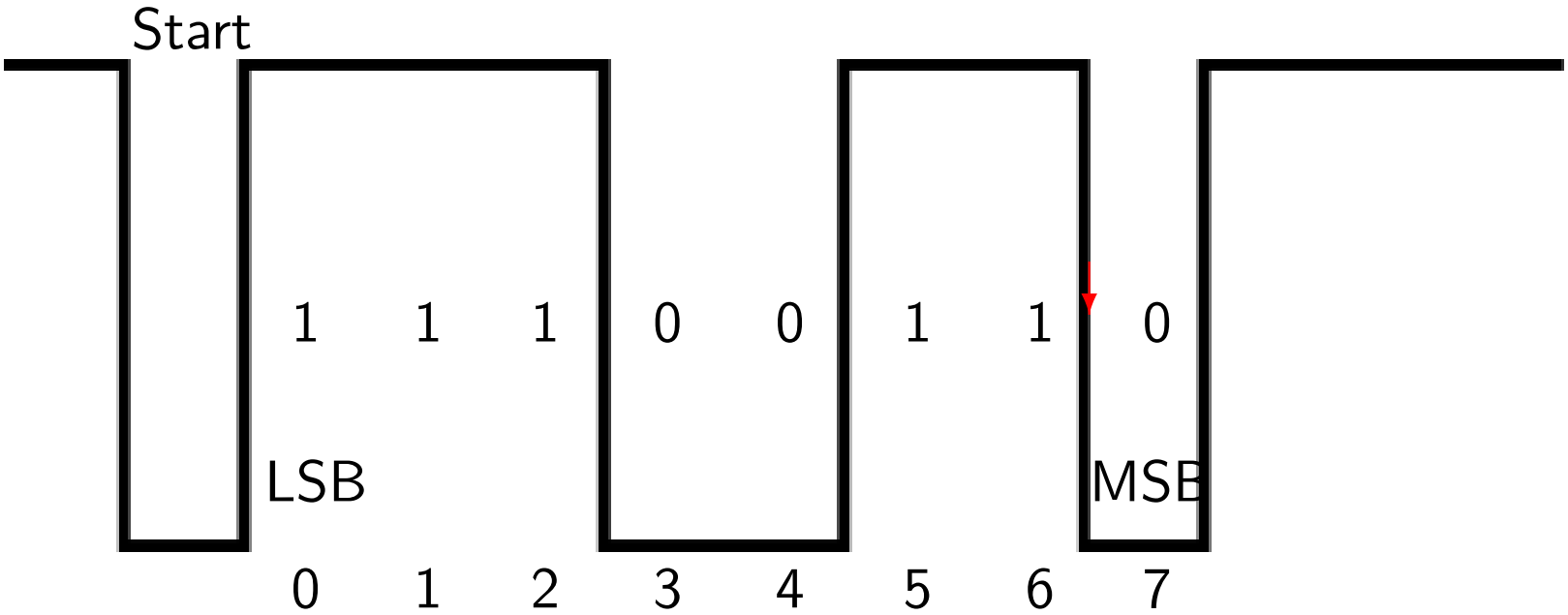
Wait one bit time before setting pin HIGH or LOW according to bit 5

Transmitting



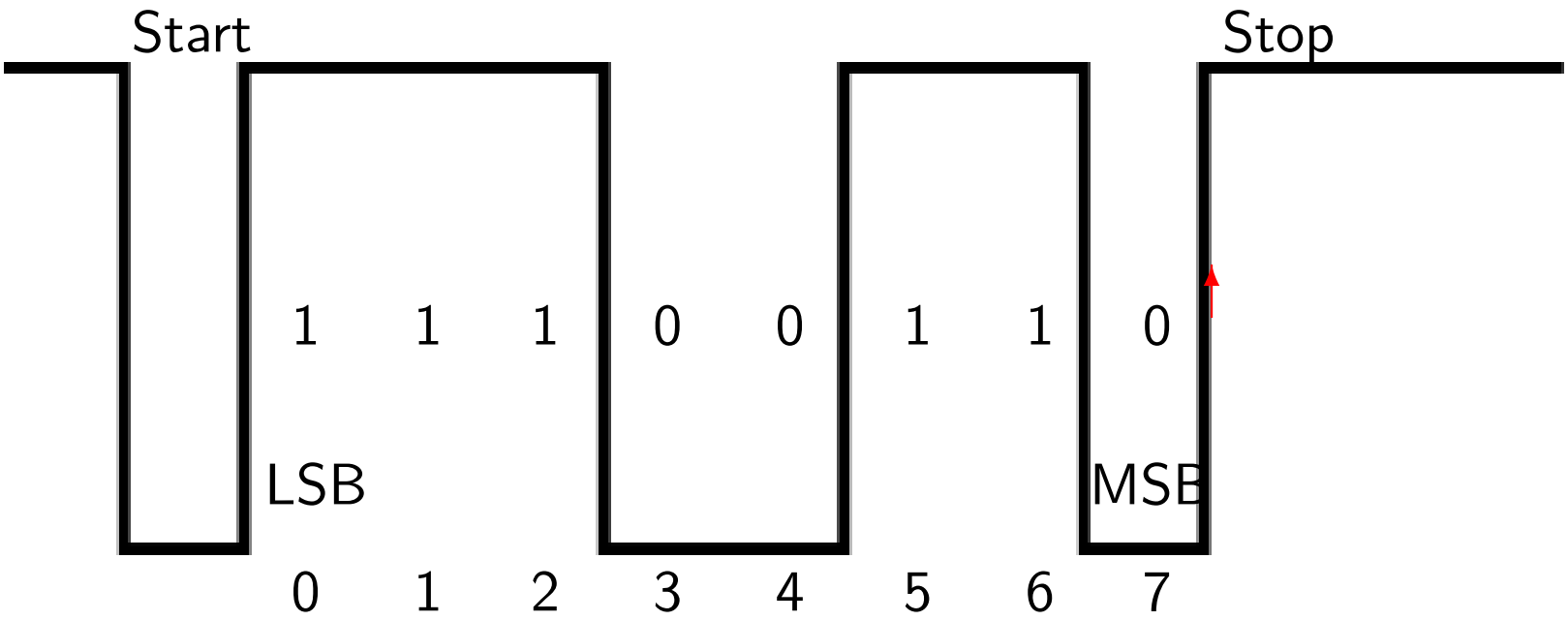
Wait one bit time before setting pin HIGH or LOW according to bit 6

Transmitting



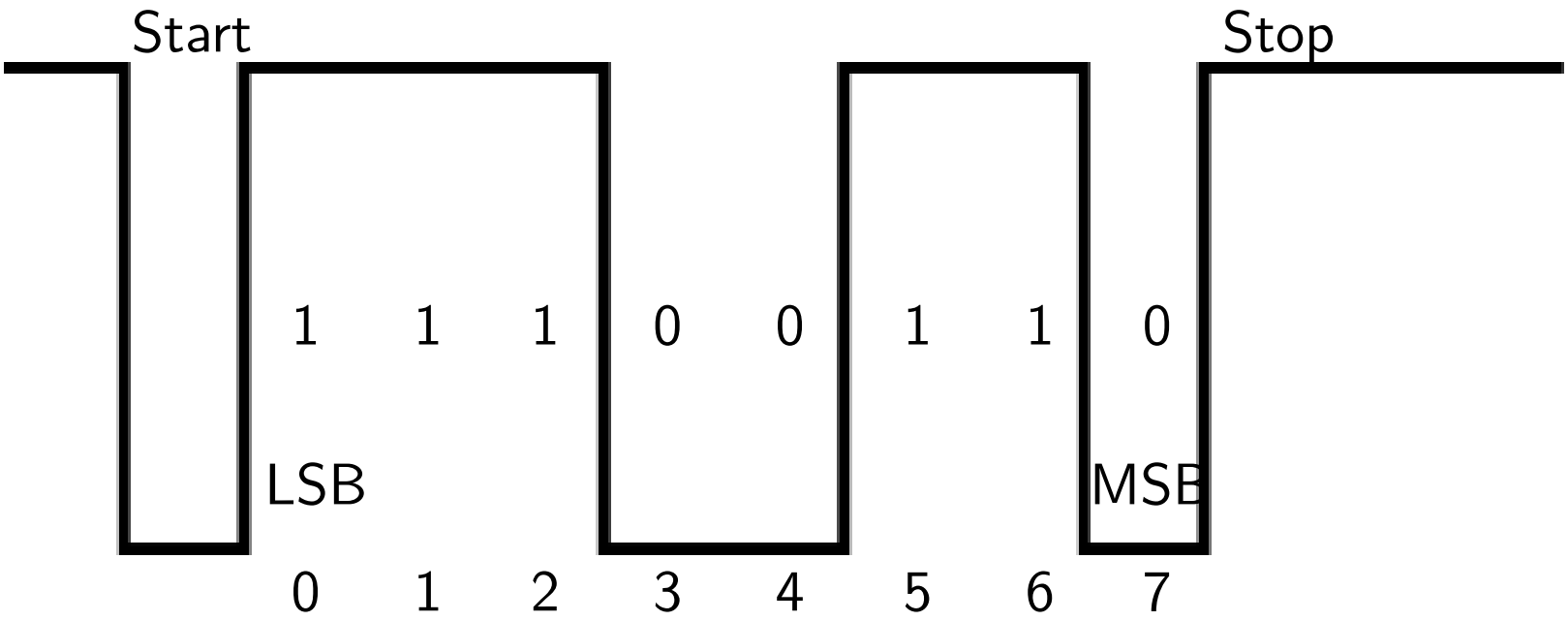
Wait one bit time before setting pin HIGH or LOW according to MSB

Transmitting



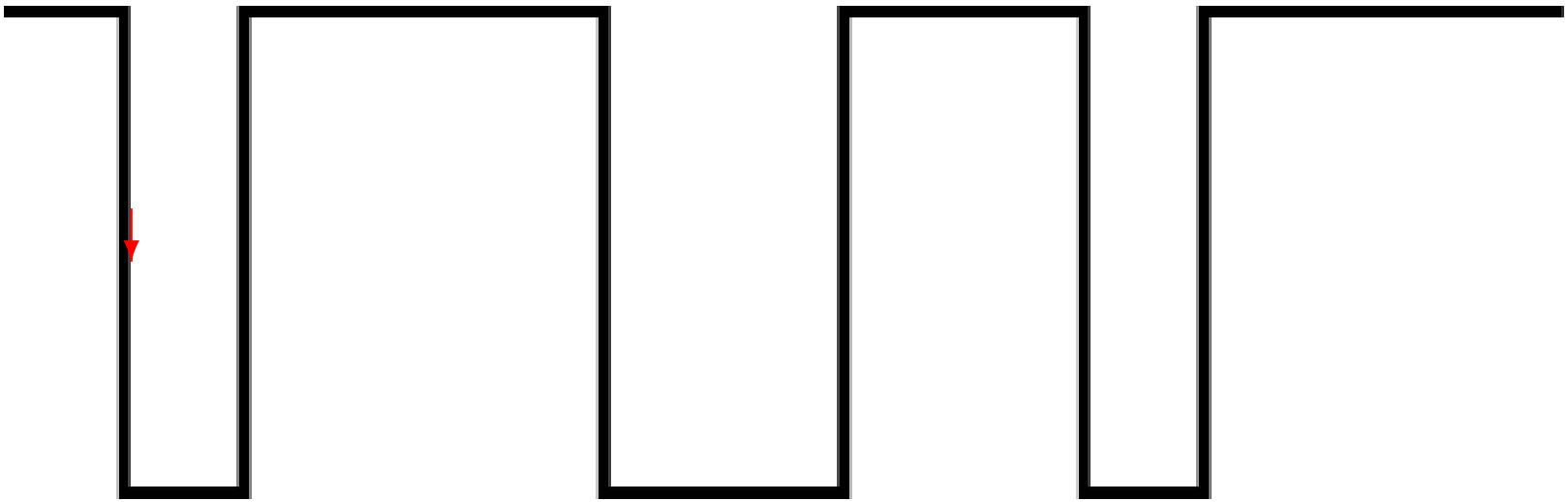
Wait one bit time before setting pin to STOP level

Transmitting



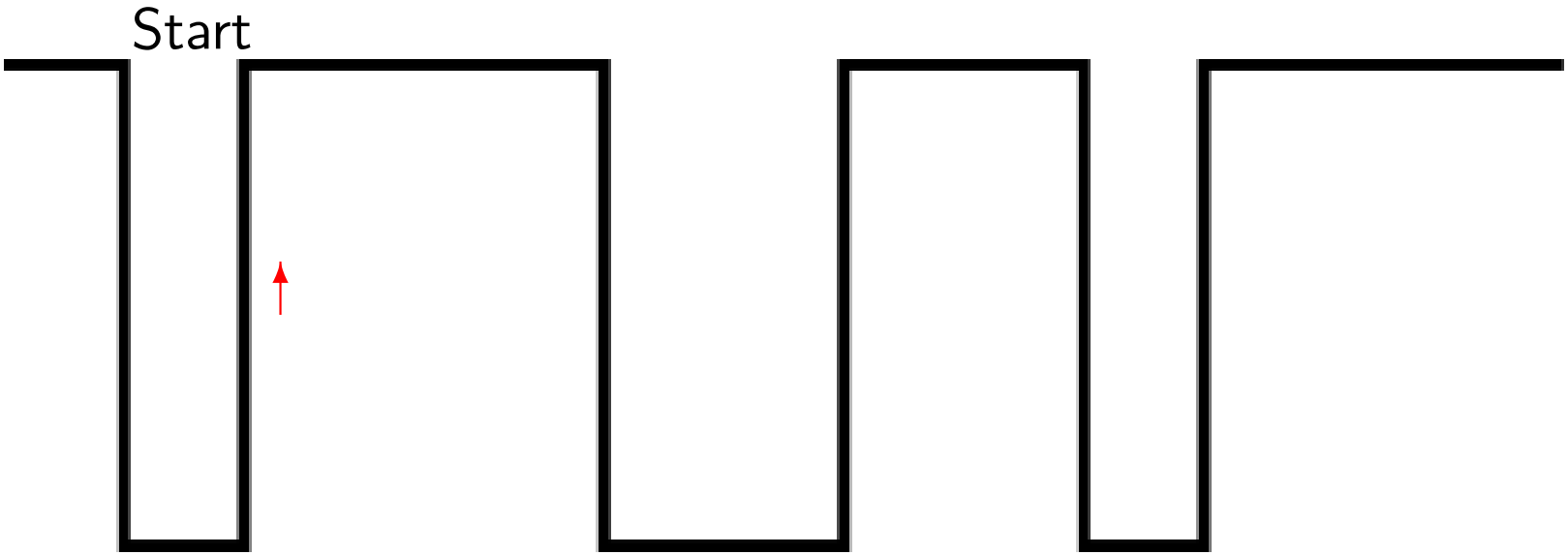
Wait 1 bit time (if 1 STOP bit) before next START bit

Receiving



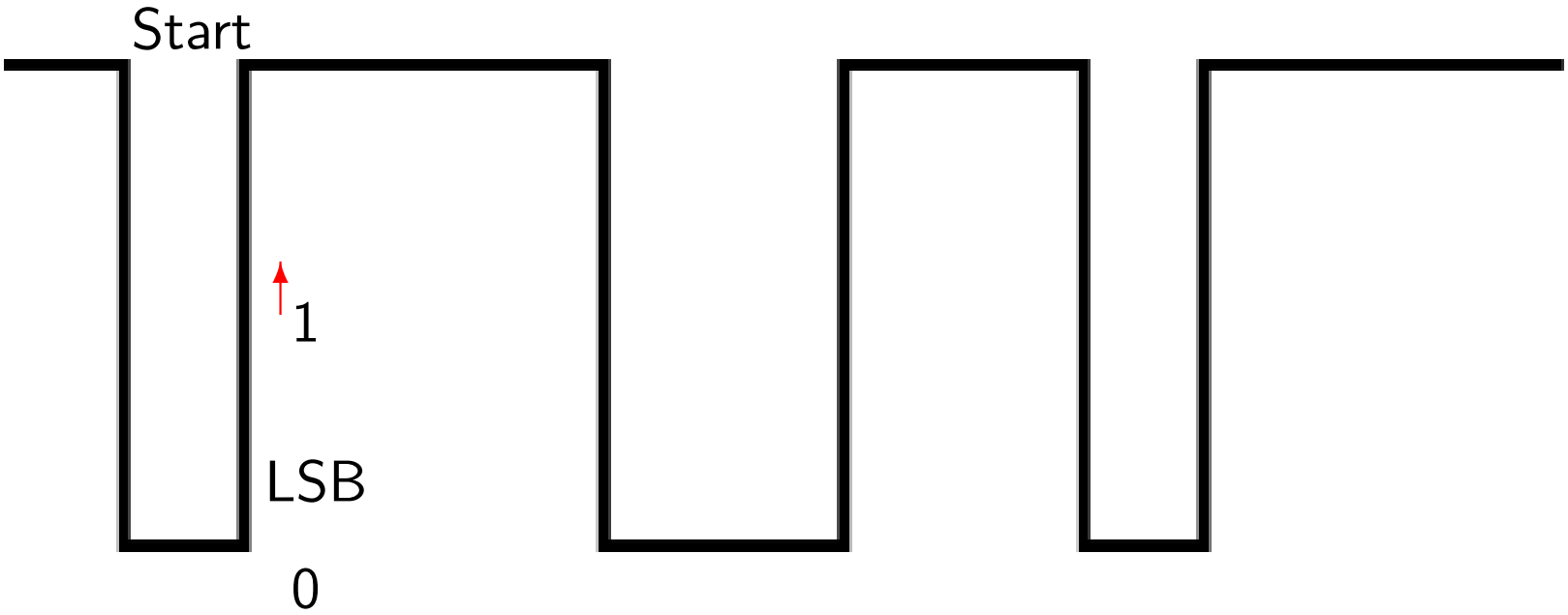
Poll for START level

Receiving



Wait one *and a half* bit times before testing pin for LSB

Receiving



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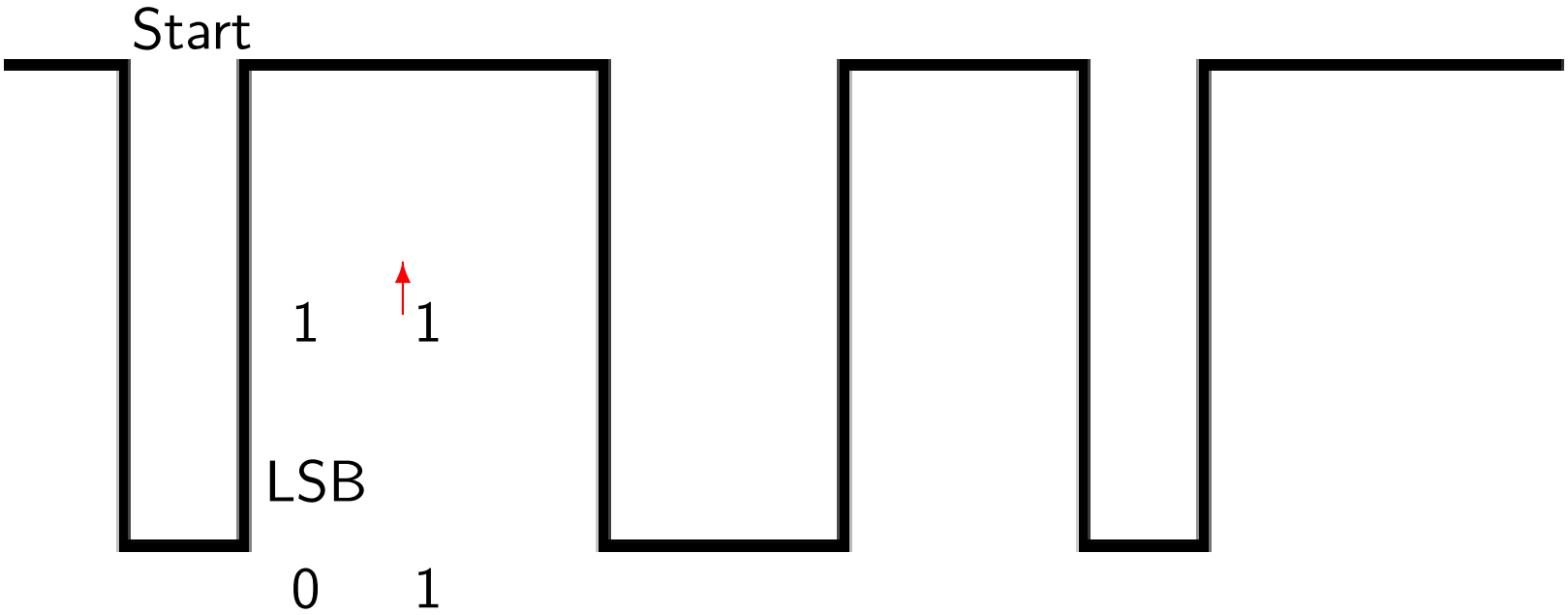
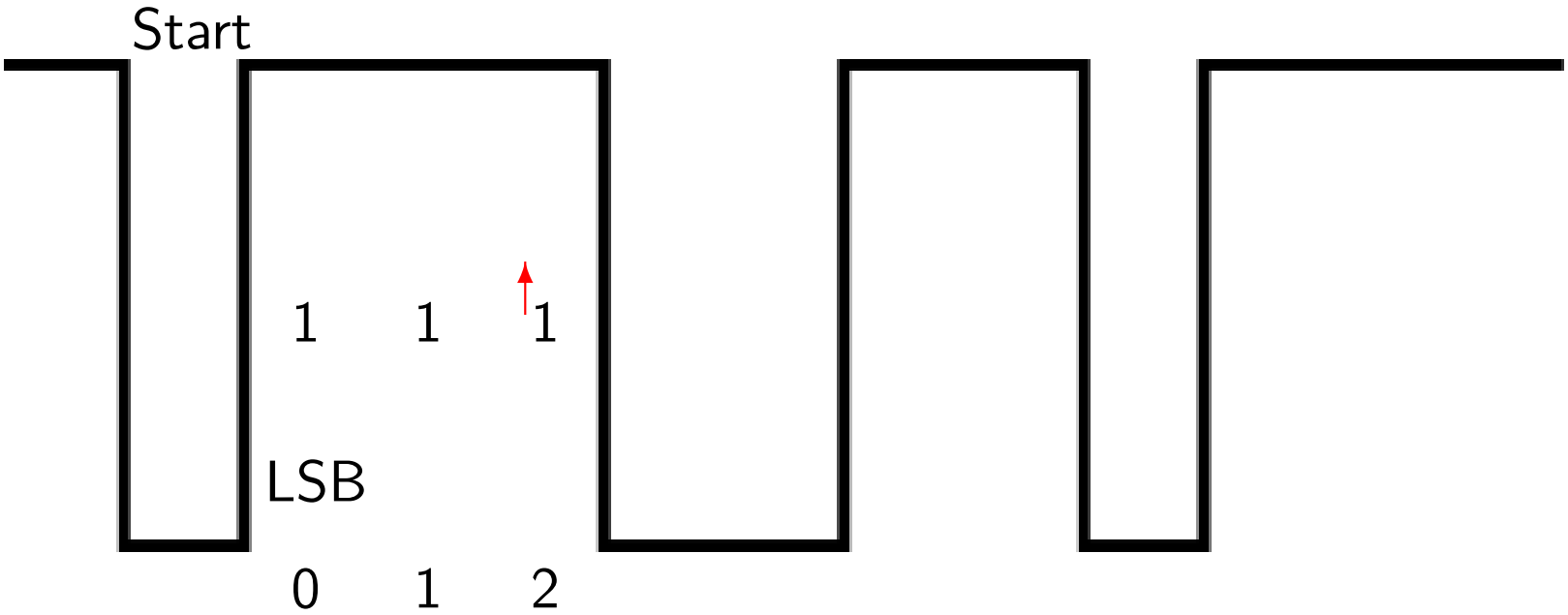


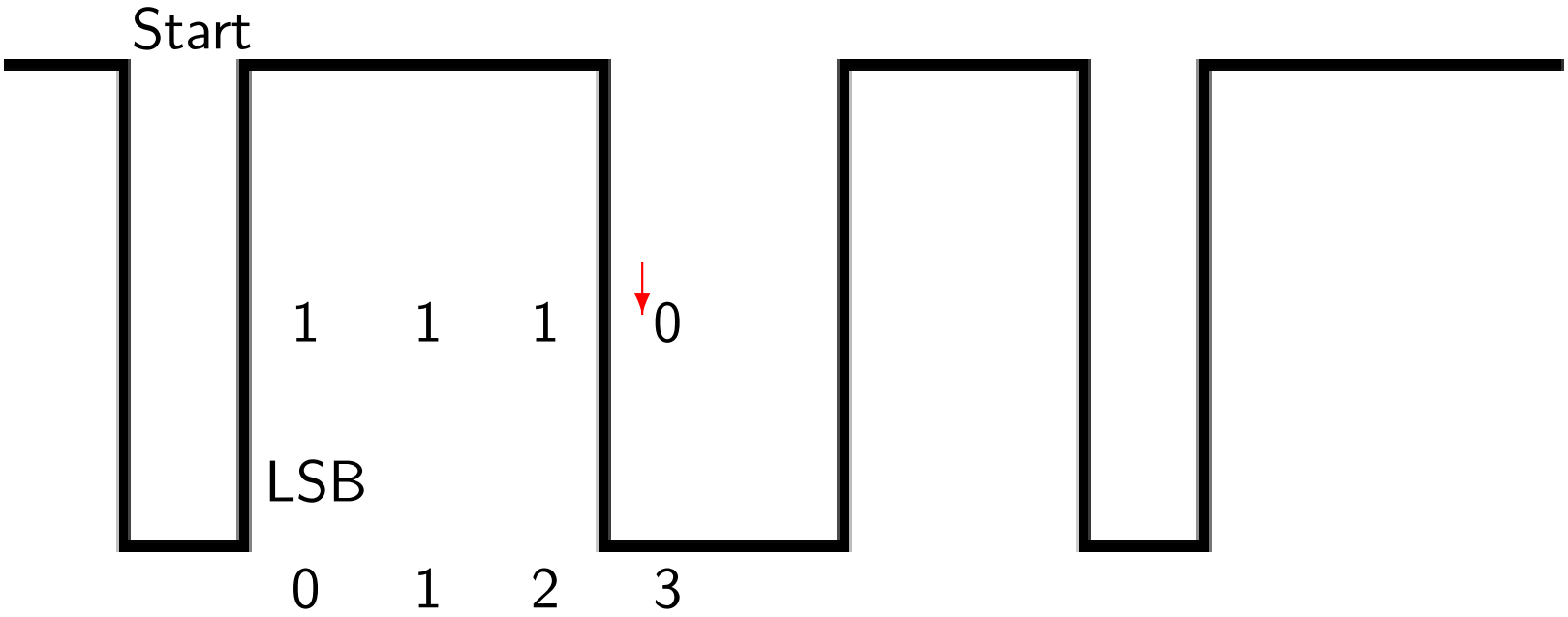
Wait one bit time before testing pin for bit 1

Receiving



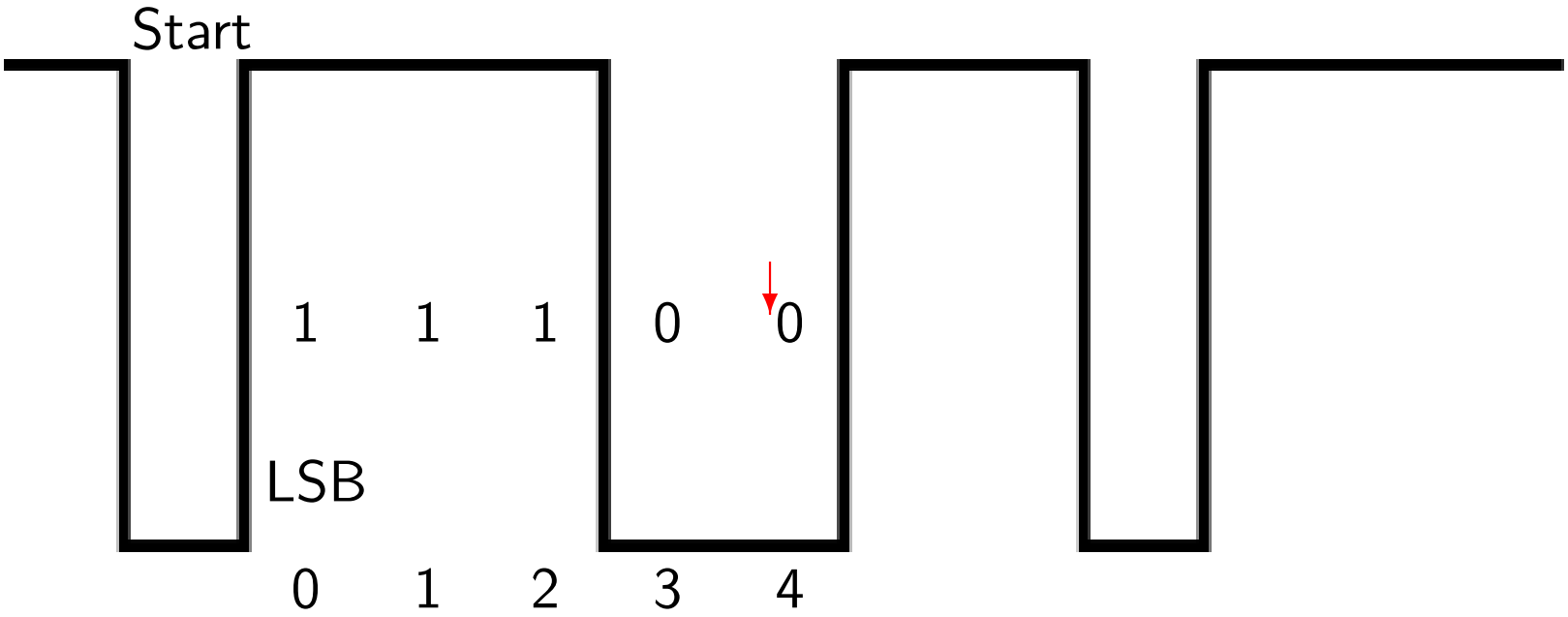
Wait one bit time before testing pin for bit 2

Receiving



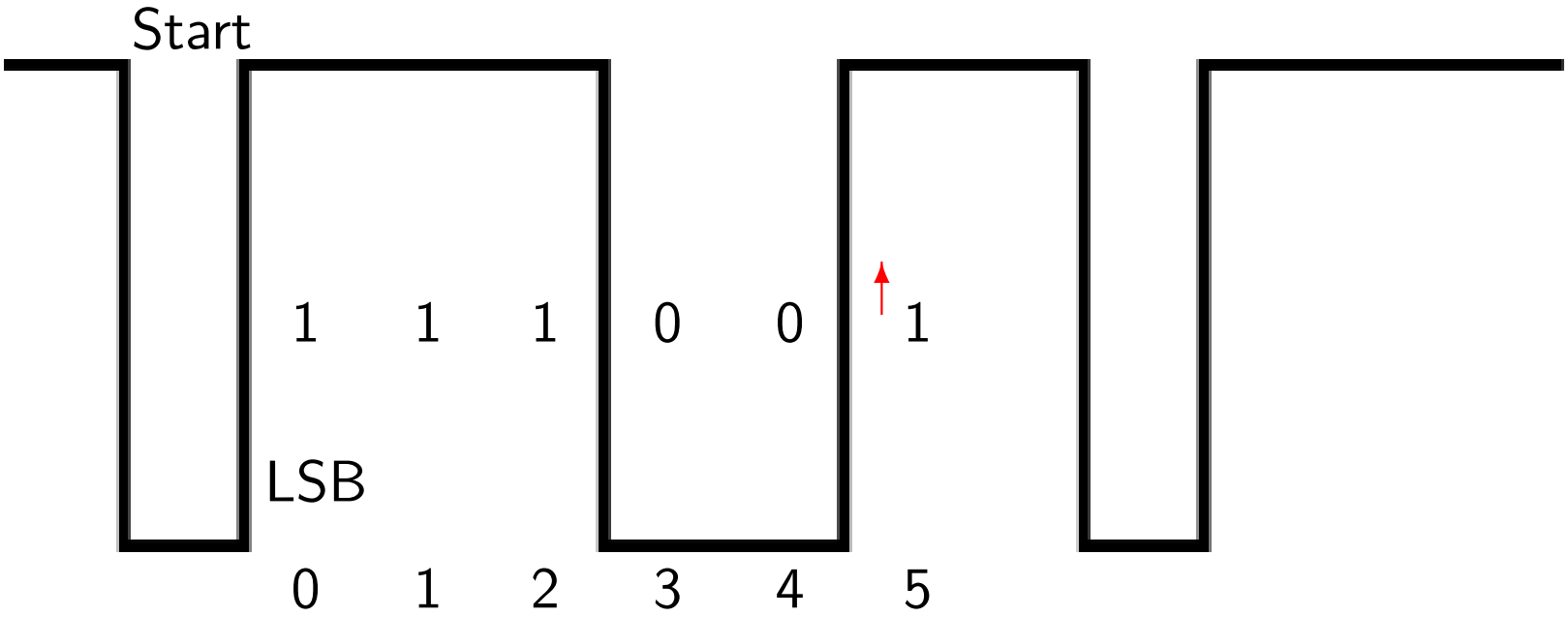
Wait one bit time before testing pin for bit 3

Receiving



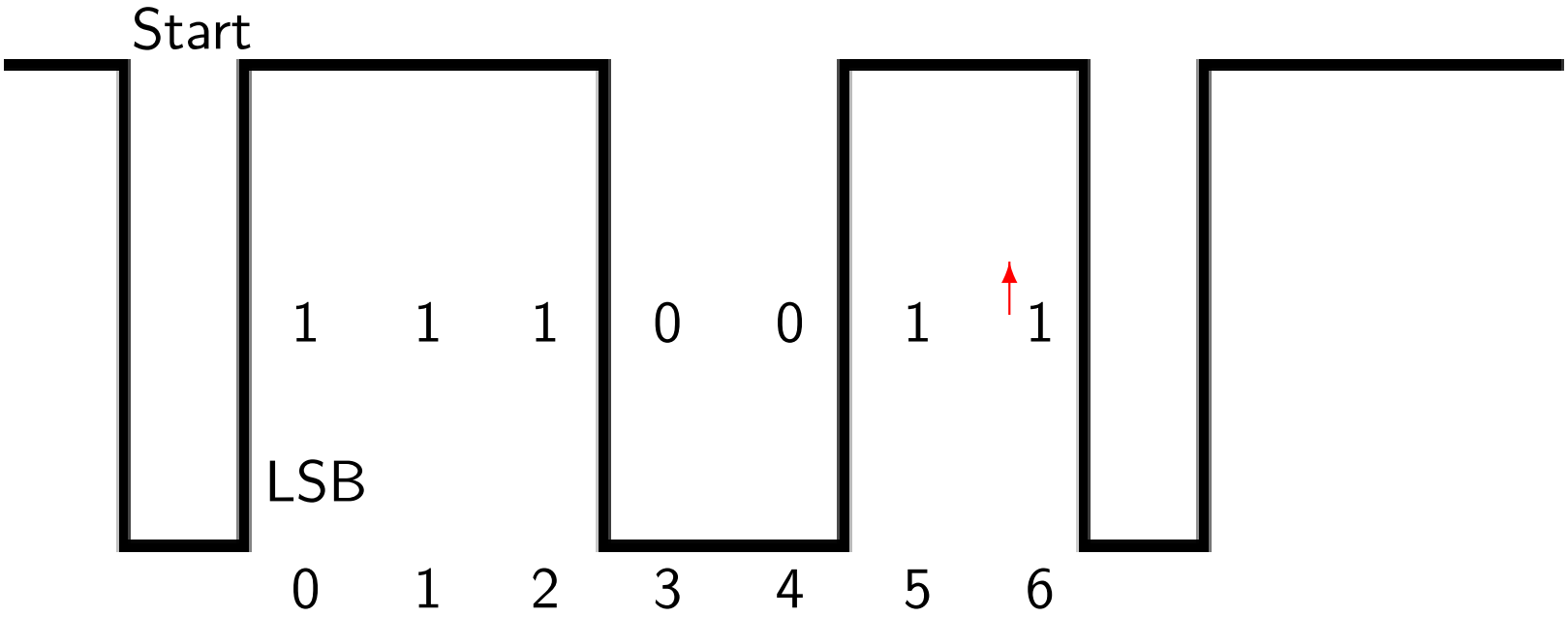
Wait one bit time before testing pin for bit 4

Receiving



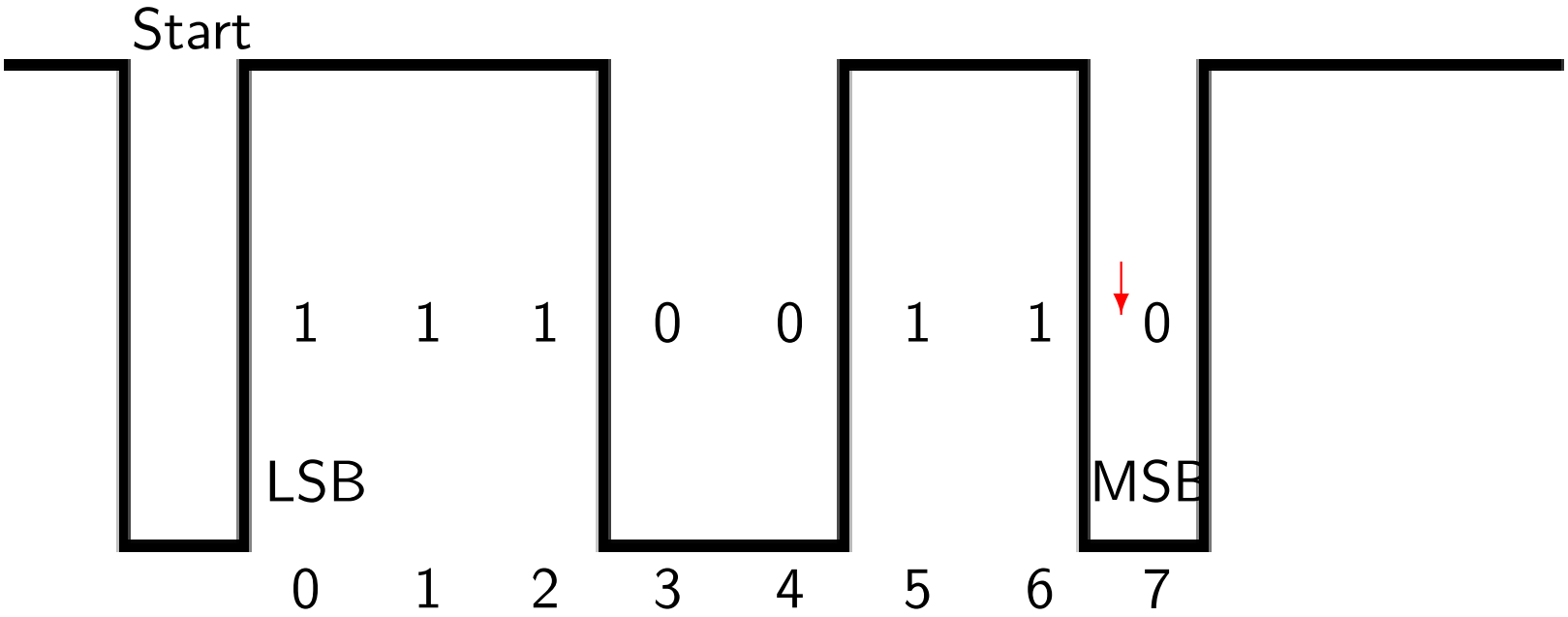
Wait one bit time before testing pin for bit 5

Receiving



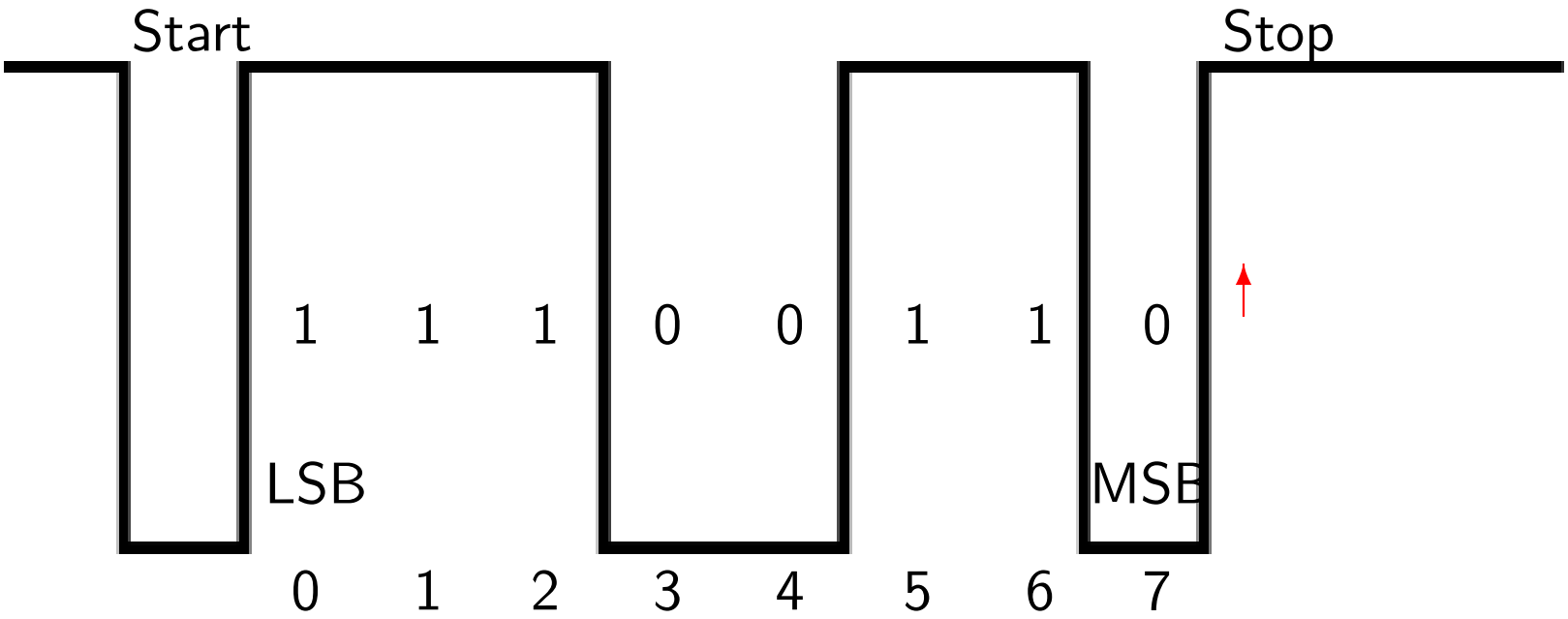
Wait one bit time before testing pin for bit 6

Receiving



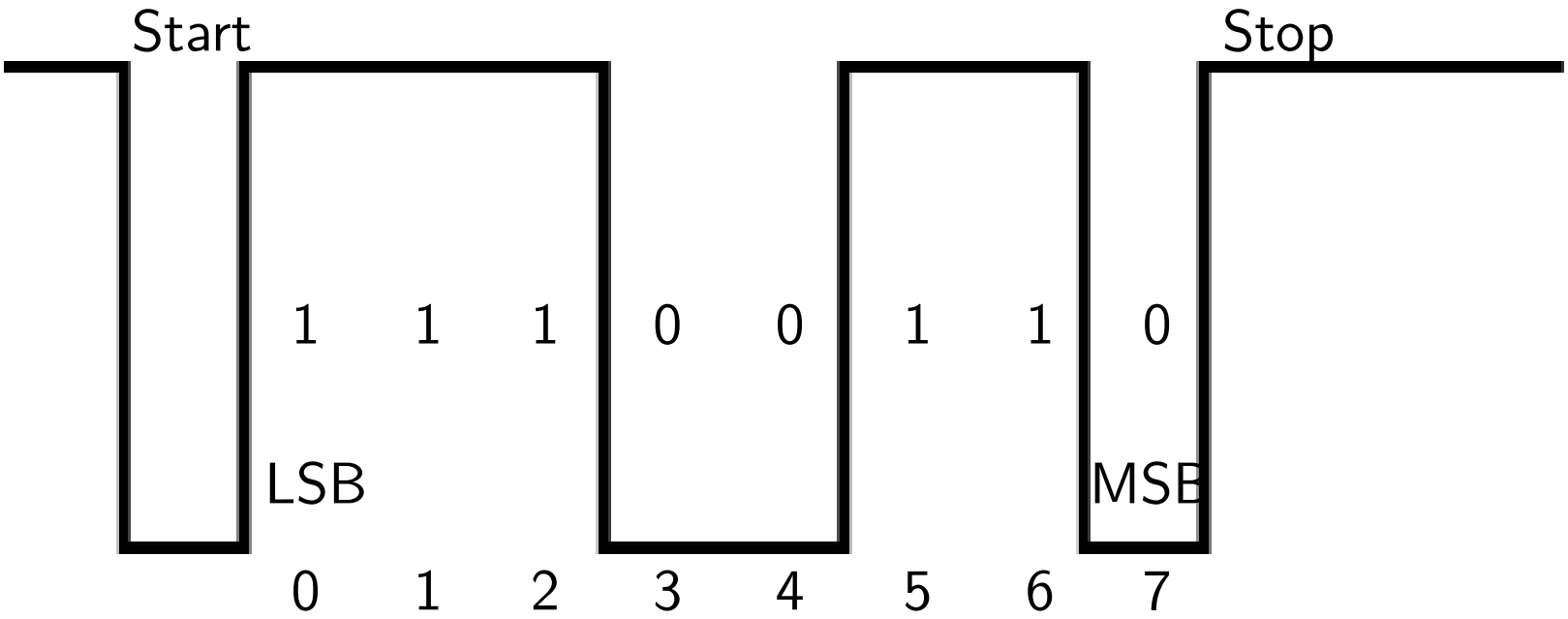
Wait one bit time before testing pin for MSB

Receiving



Wait one bit time before testing pin for STOP level

Receiving



Poll for next START bit