Electronics for IoT

Rotary Encoder

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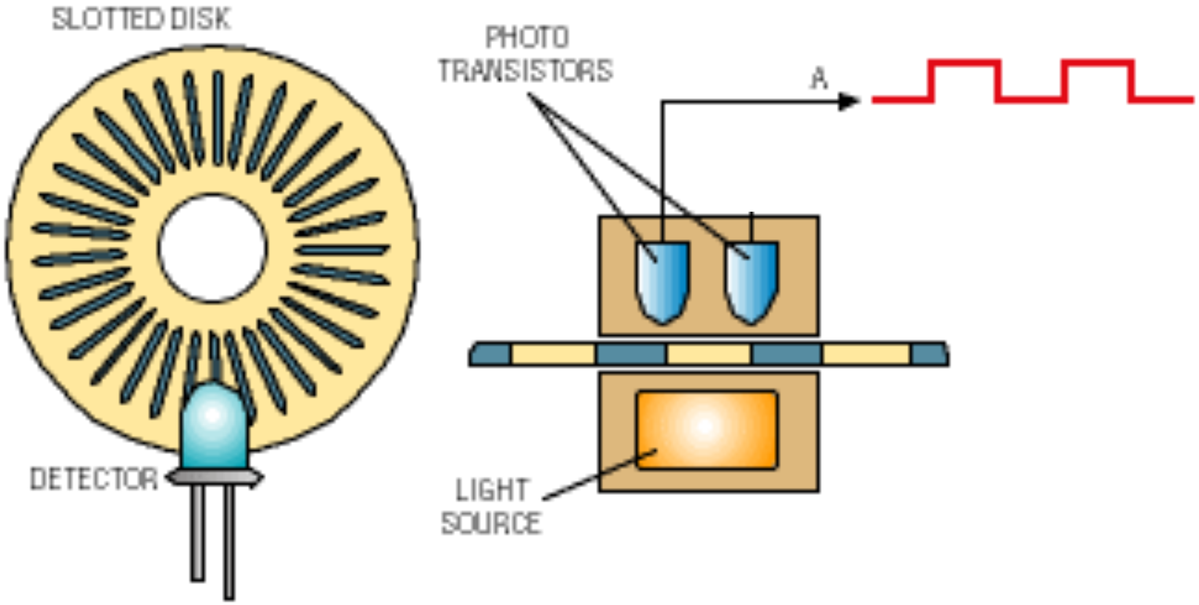
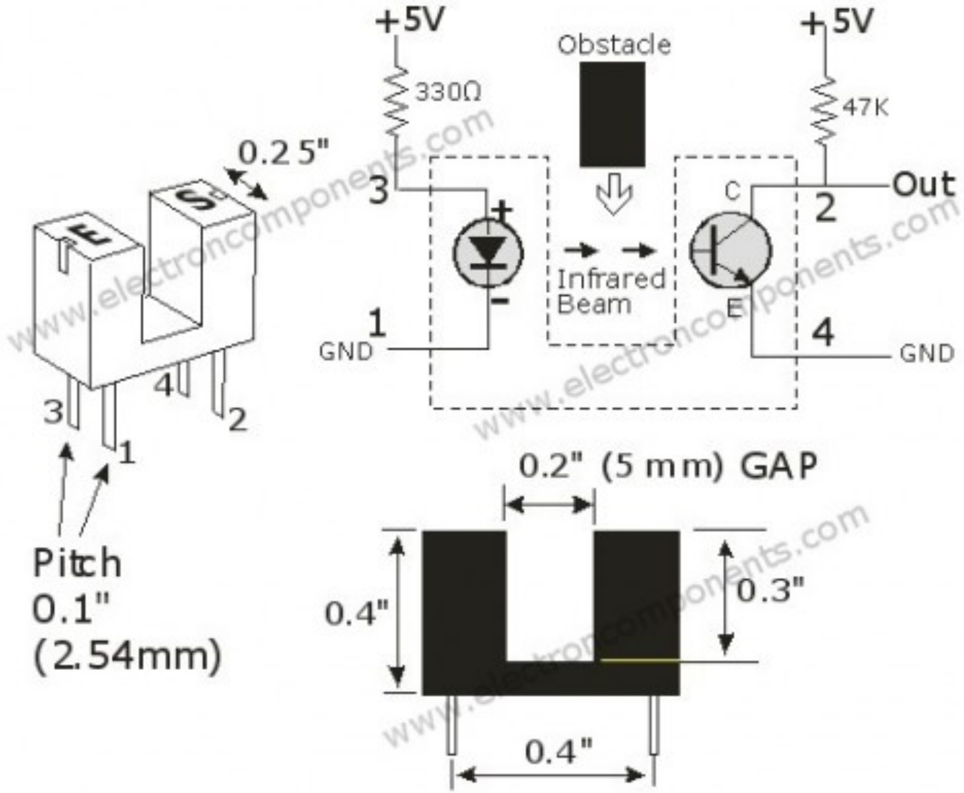
Rotary Encoder

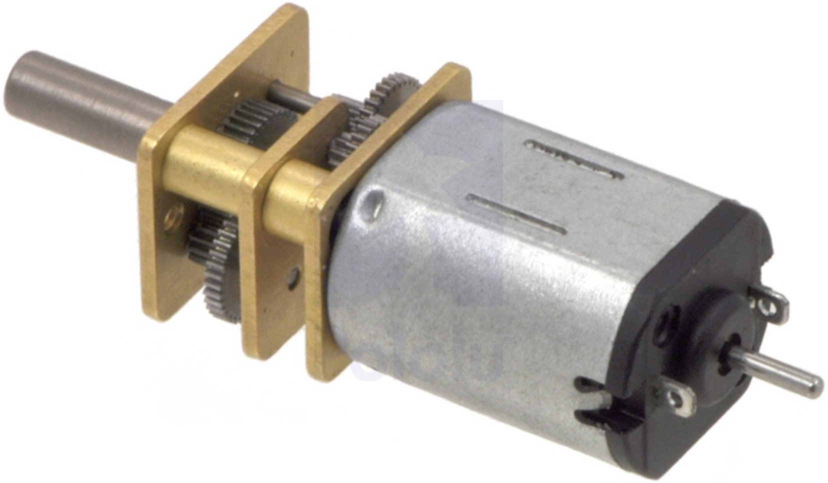
Optical Encoder



IR Encoder

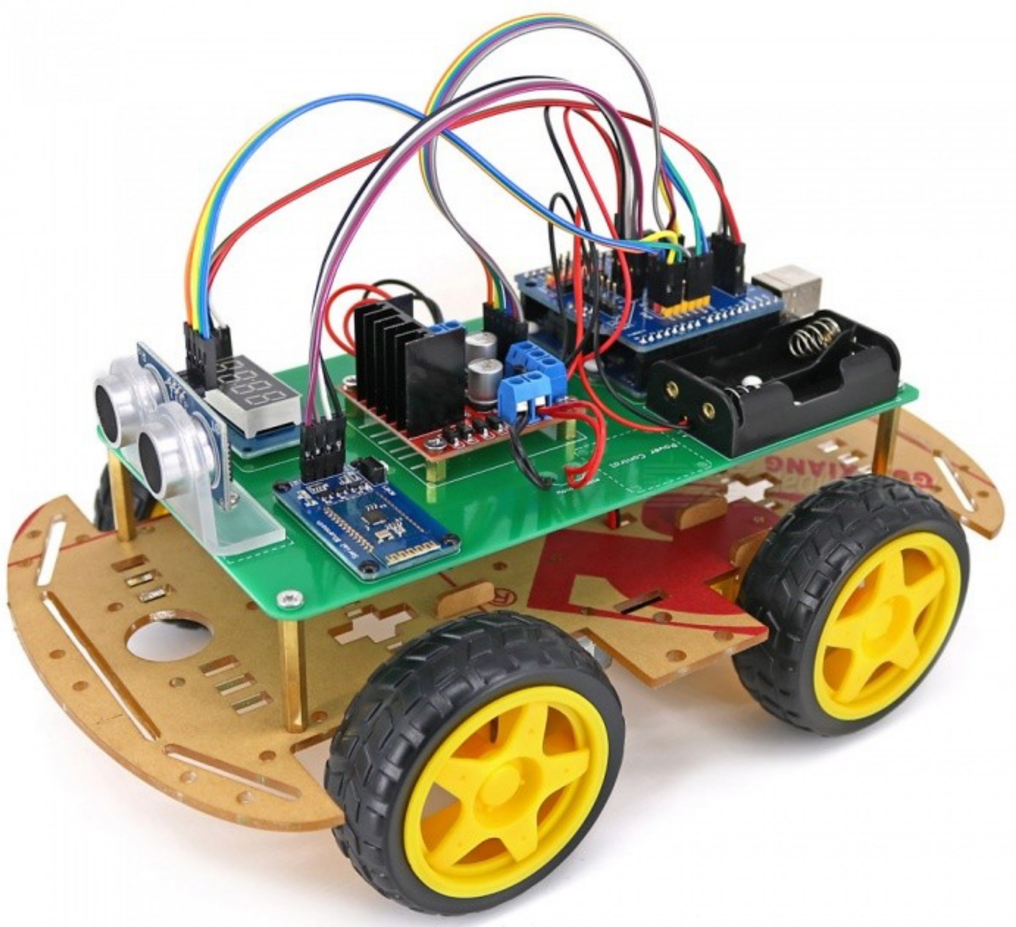

0.2 5"
E
S
3
1
4
2
Pitch
0.1"
(2.54mm)
+5V
330Ω
3
+
-
1
GND
Obstacle
Infrared
Beam
+5V
47K
Out
C
2
E
4
GND
0.2" (5 mm) GAP
0.4"
0.3"
0.4"
www.electroncomponents.com

Counts per Revolution (CPR)

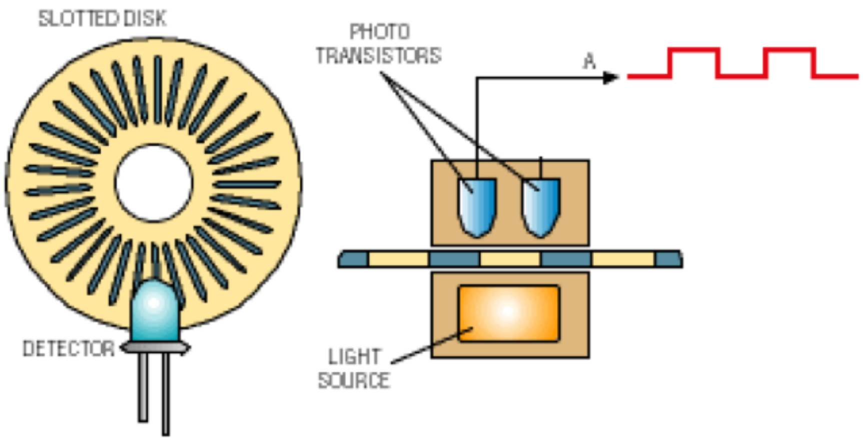


www.pololu.com

Example: Distance Traveled

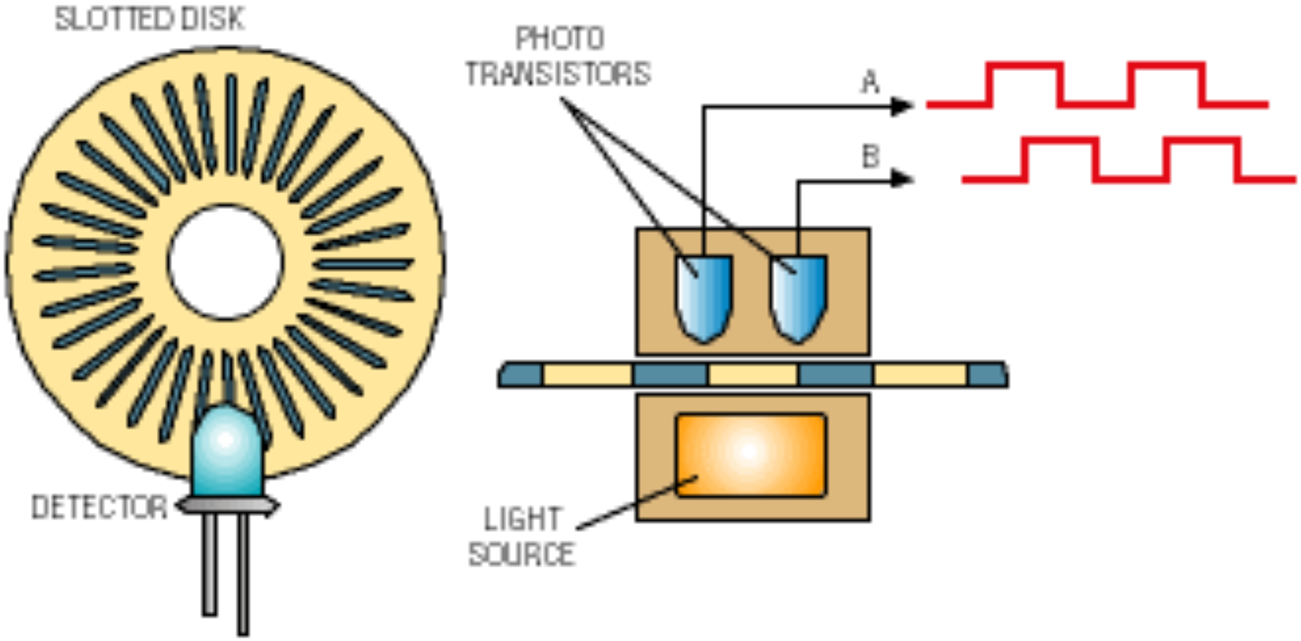


Encoder Readout



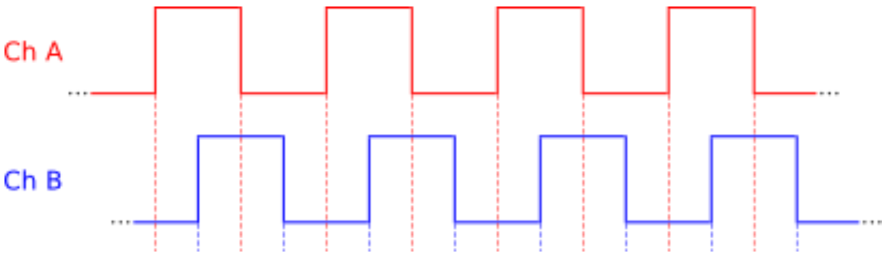
Limitations

Quadrature Encoder

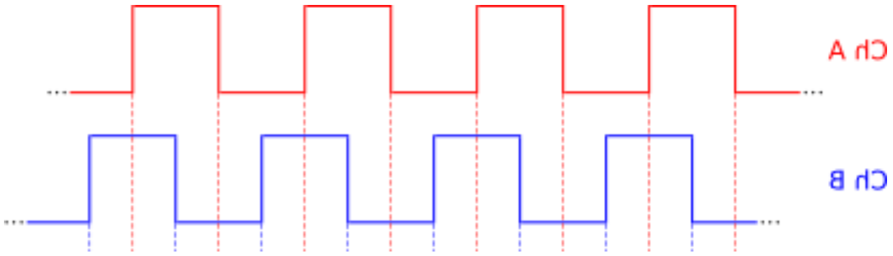


Quadrature Encoder Output

Forward

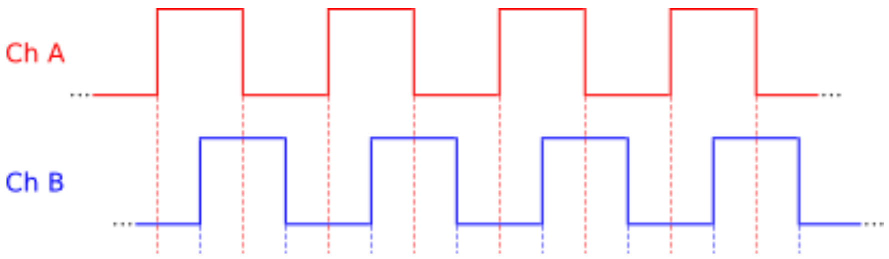


Reverse

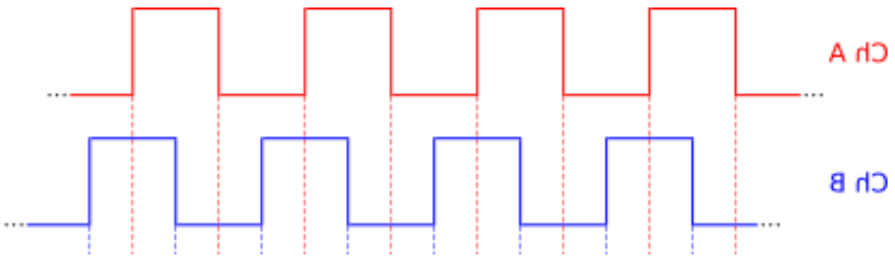


Quadrature Encoder “Decoding”

Forward



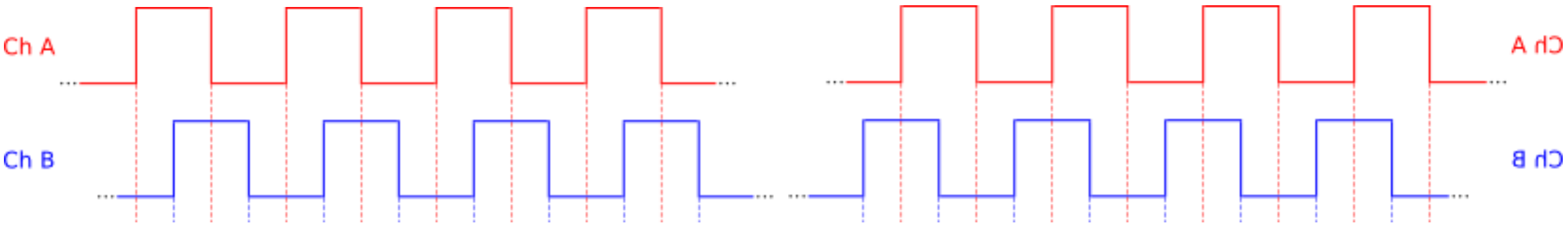
Reverse

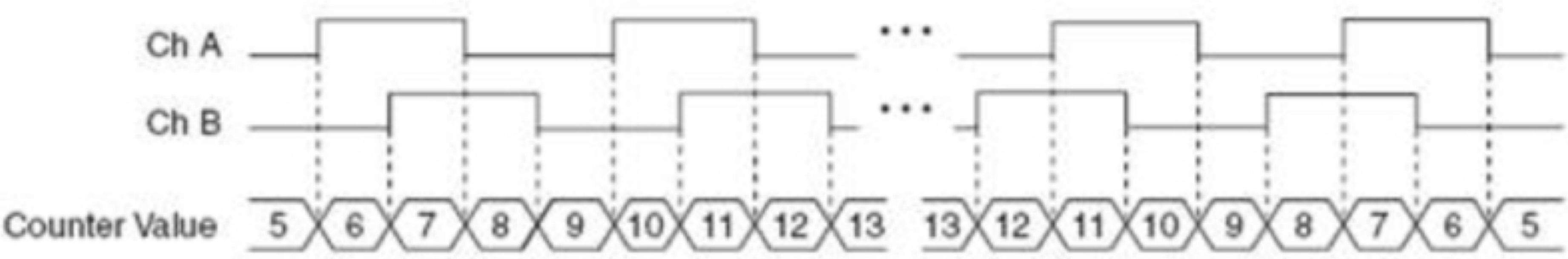


Quadrature Decoder Output

Forward

Reverse

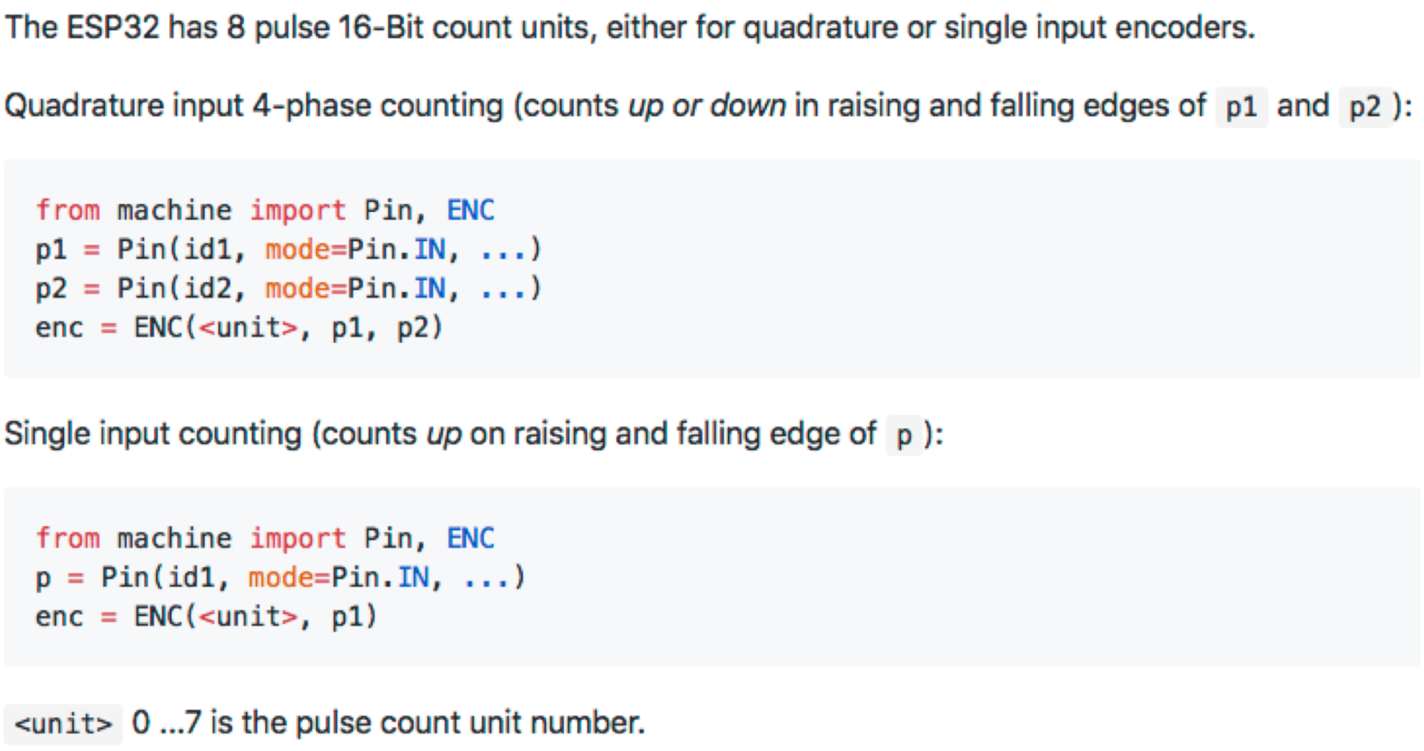




Decoder Readout Hardware Support

ESP32 uPython “Decoder”

- called “ENC”



The ESP32 has 8 pulse 16-Bit count units, either for quadrature or single input encoders.

Quadrature input 4-phase counting (counts *up or down* in raising and falling edges of `p1` and `p2`):

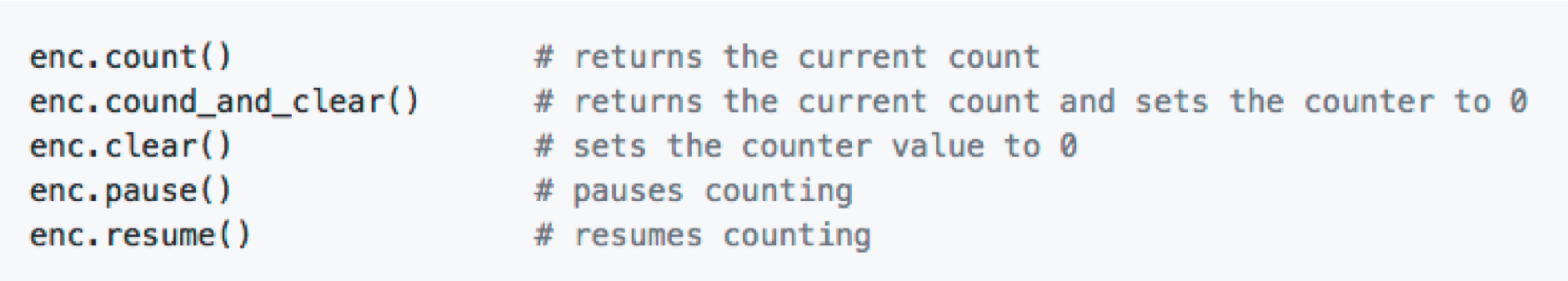
```
from machine import Pin, ENC
p1 = Pin(id1, mode=Pin.IN, ...)
p2 = Pin(id2, mode=Pin.IN, ...)
enc = ENC(<unit>, p1, p2)
```

Single input counting (counts *up* on raising and falling edge of `p`):

```
from machine import Pin, ENC
p = Pin(id1, mode=Pin.IN, ...)
enc = ENC(<unit>, p1)
```

`<unit>` 0 ...7 is the pulse count unit number.

ENC Functions



```
enc.count()                # returns the current count
enc.cound_and_clear()      # returns the current count and sets the counter to 0
enc.clear()                # sets the counter value to 0
enc.pause()                # pauses counting
enc.resume()               # resumes counting
```

Summary

- Encoders monitor rotation
- Only relative angle / position
- Quadrature encoders
  - To distinguish forward / backward
- Decoder readout
  a) Interrupt handler, or
  b) Dedicated hardware counters

Ref: http://embeddedsystemengineering.blogspot.com/2016/07/arm-cortex-m3-stm32f103-tutorial.html