Montage und Programmierung eines Roboters für ROBOCUP JUNIOR RESCUE mit Arduino Nano

Teil 2.5: Ultraschall

Ultraschall-Sensor

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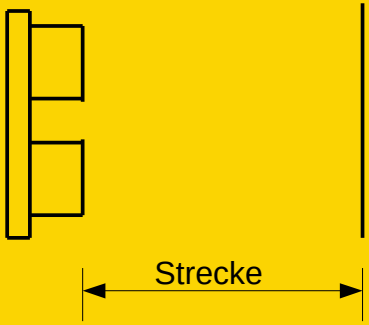

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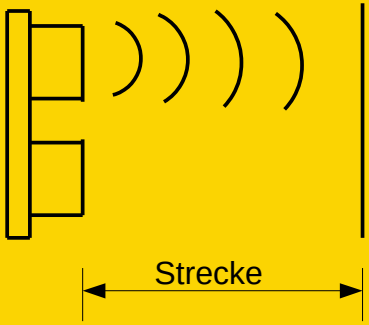

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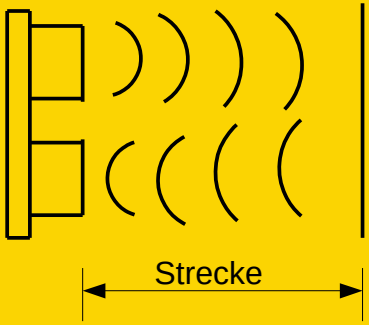

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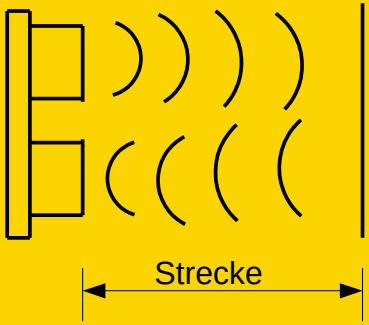

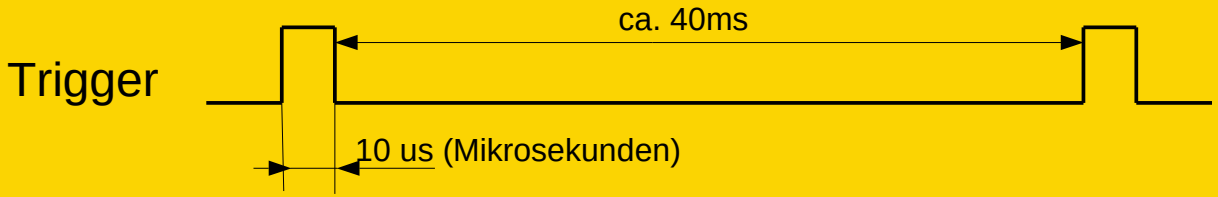

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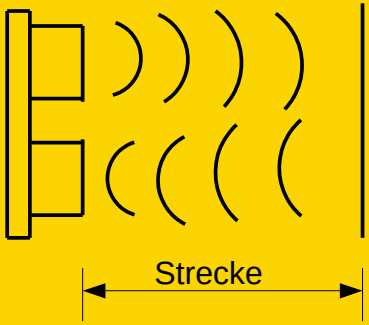

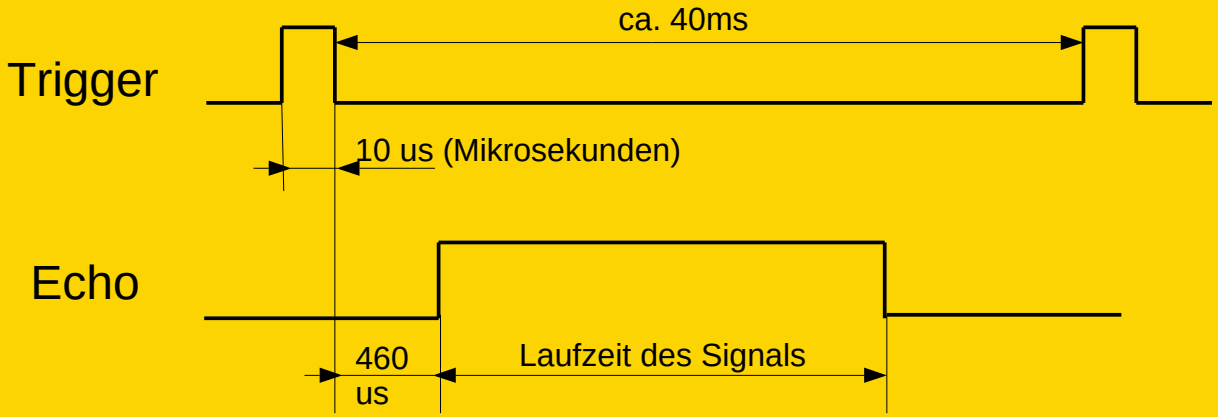

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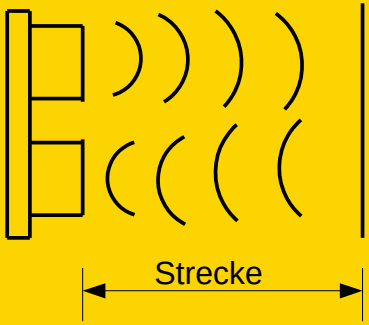

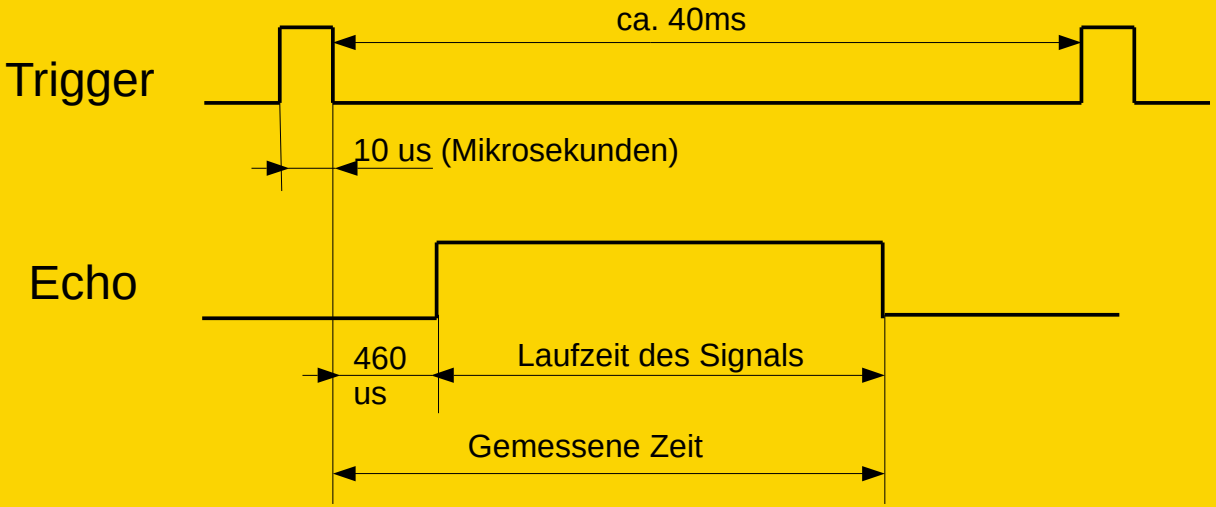

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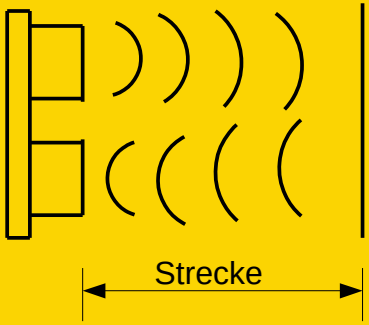

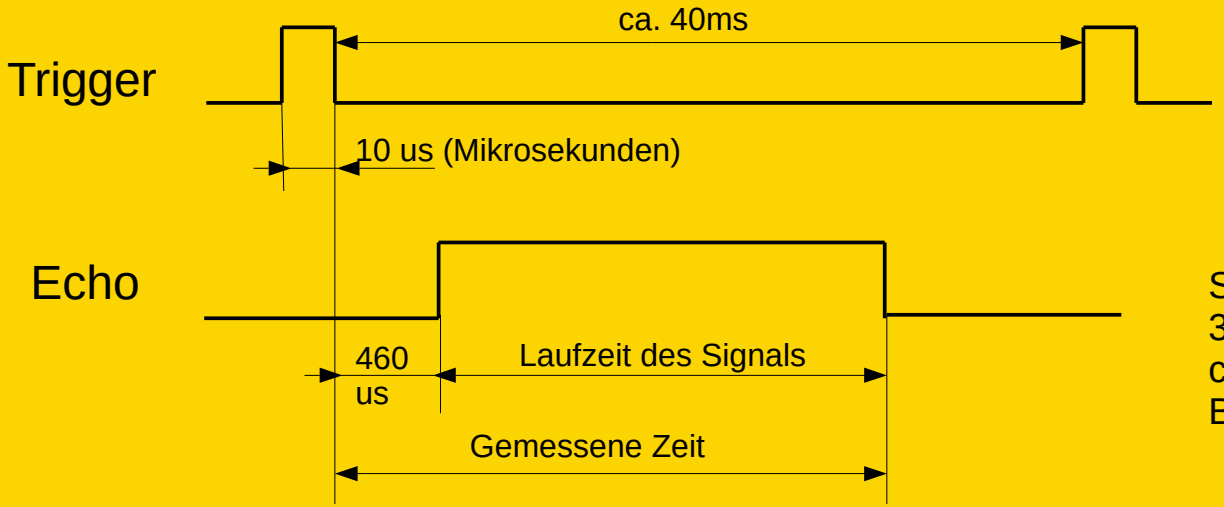

Schallgeschwindigkeit
343m/s = 1236km/h
ca. 3s für 1km
Blitz - Donner

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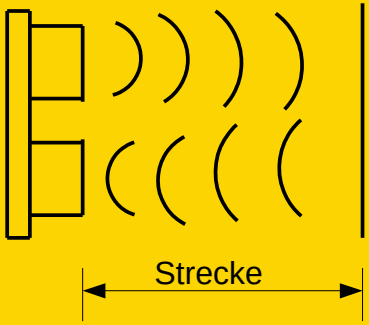

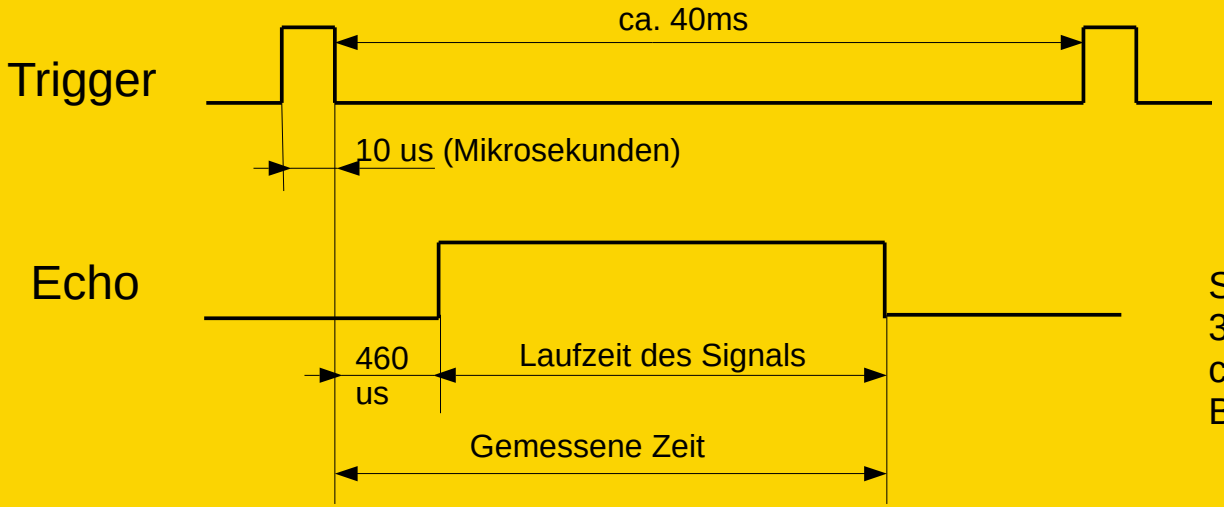

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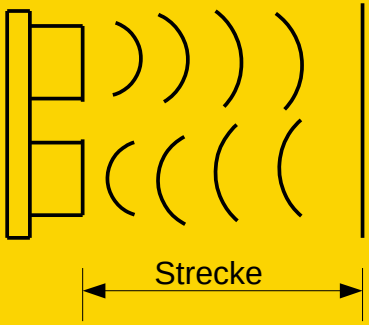

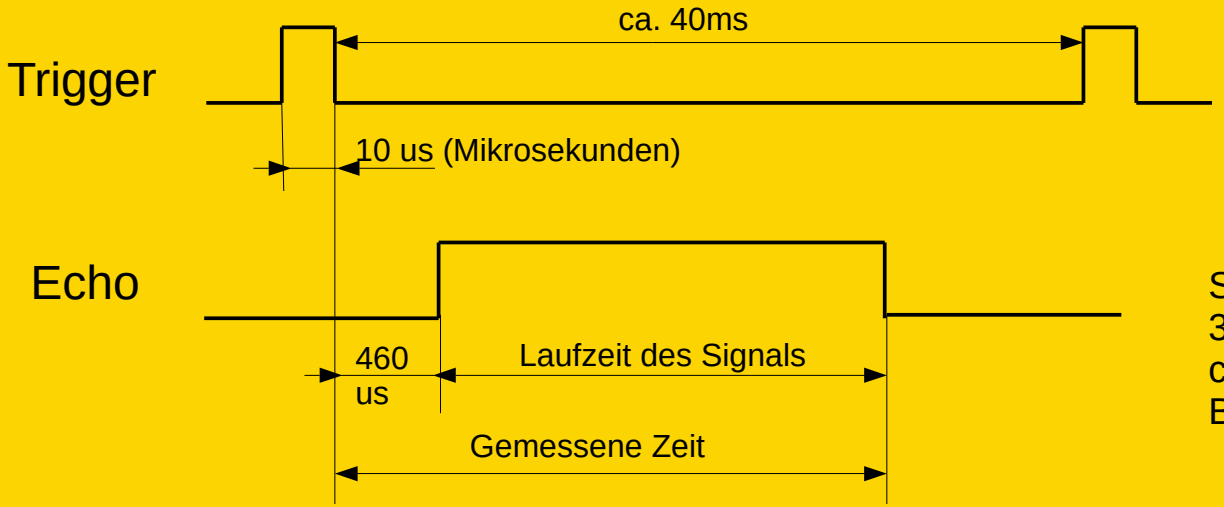

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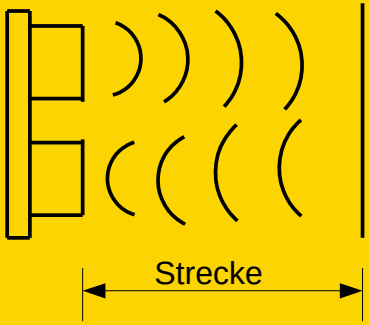

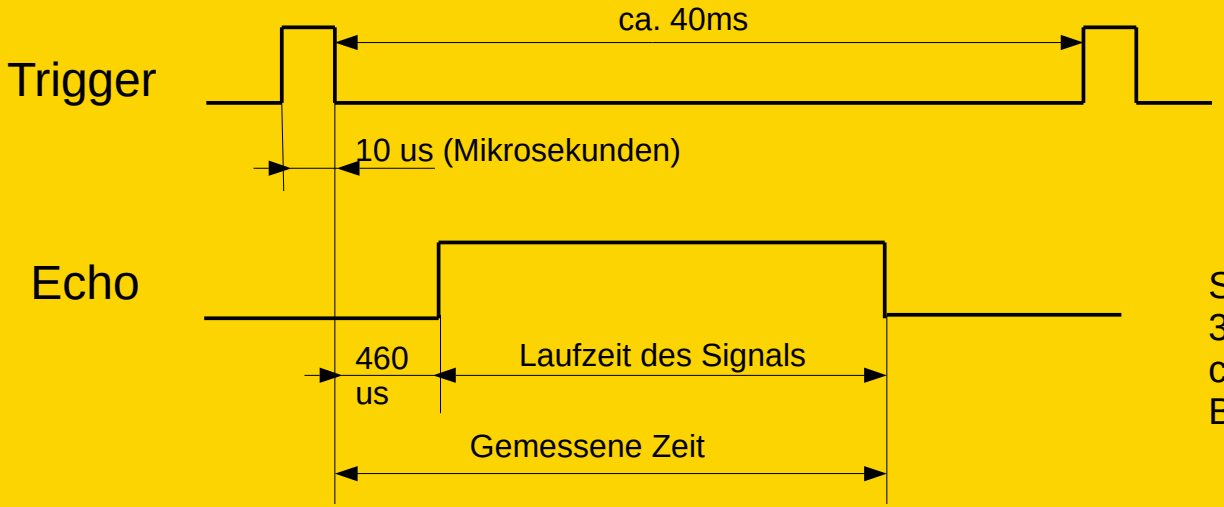

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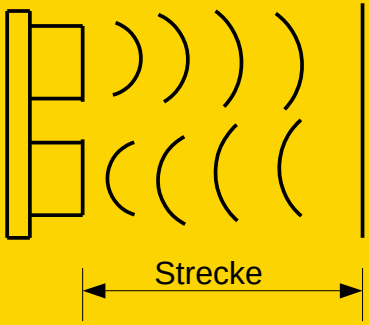

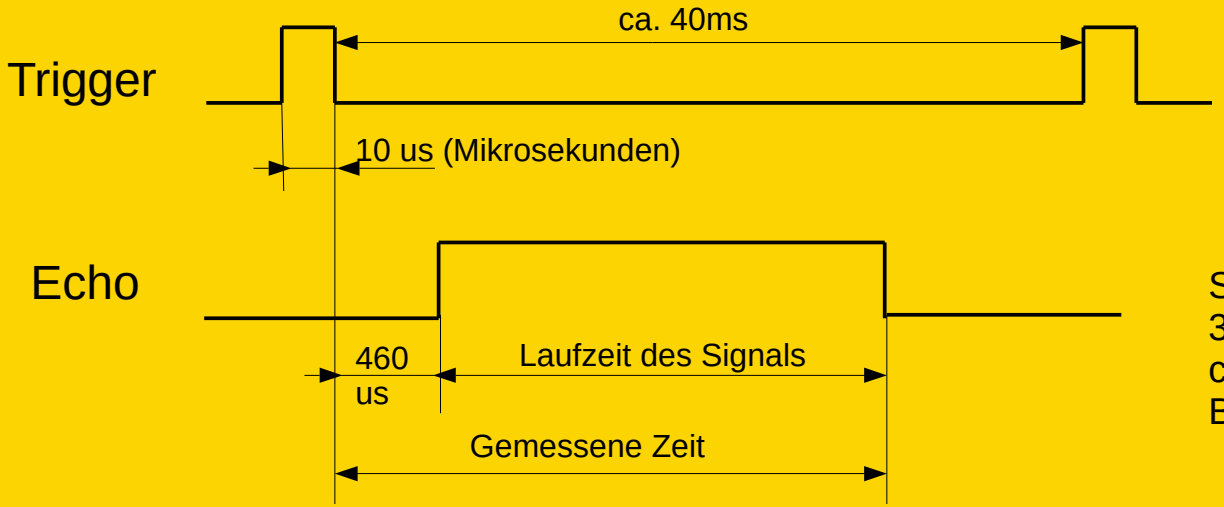

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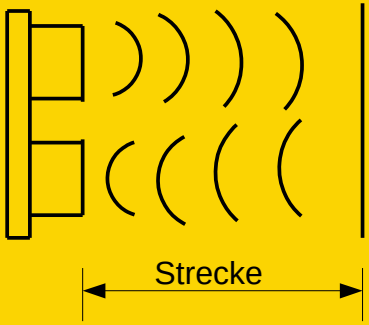

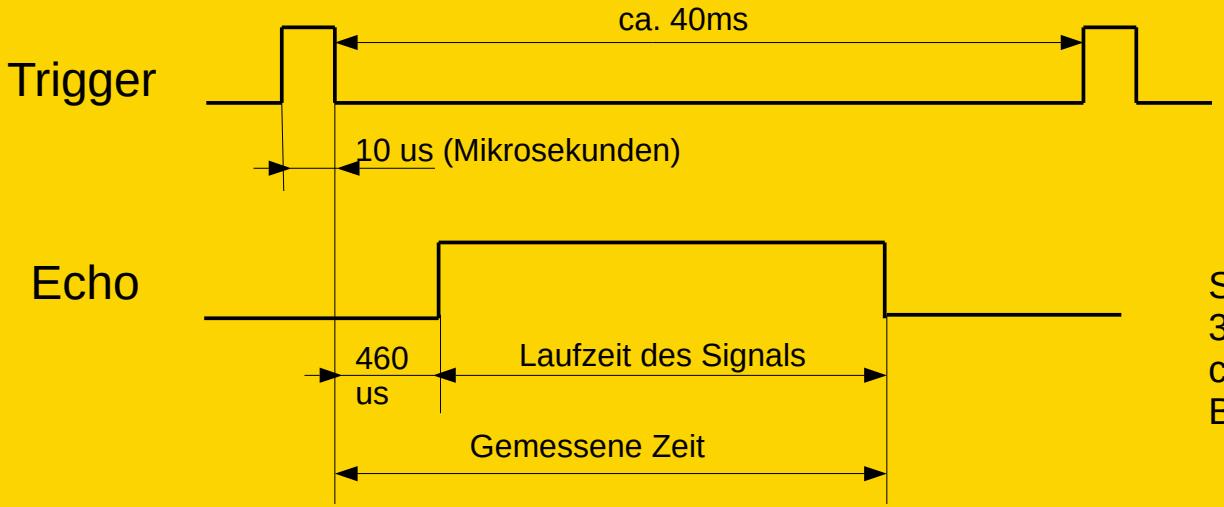

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Taktfrequenz **16MHz**
Timer1-Prescaler 1:8

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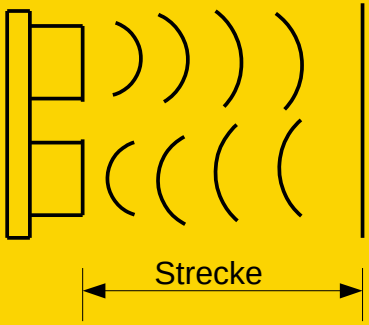

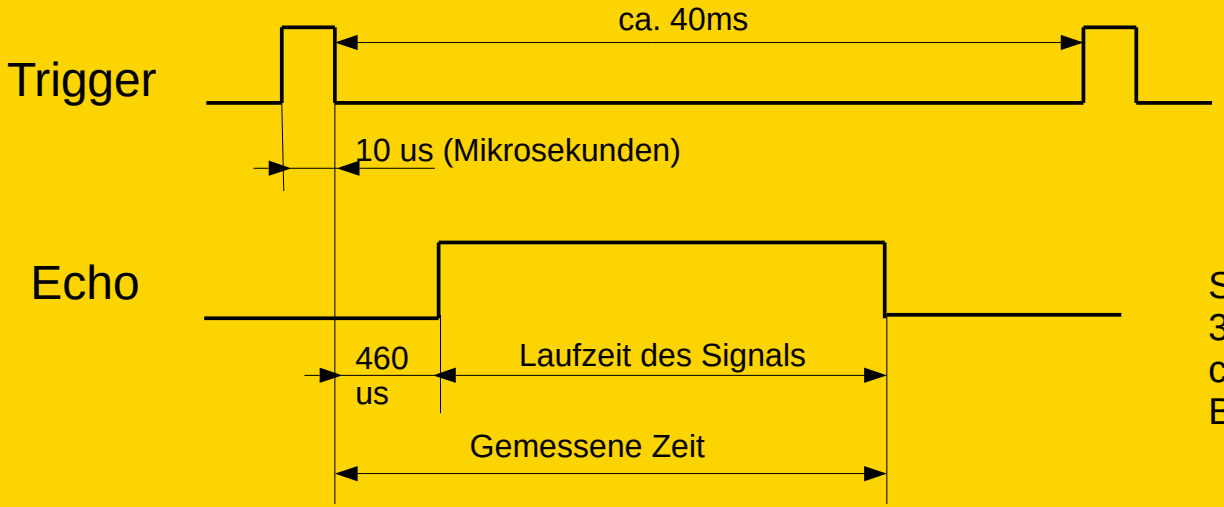

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Timer1-Prescaler 1:8, alle 500us um 1 erhöht
1040 * 2 = 2080_{dez} → 00001000 00100000 bin
Die oberen 8 Bits → 8

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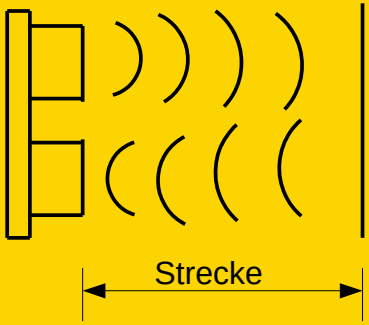

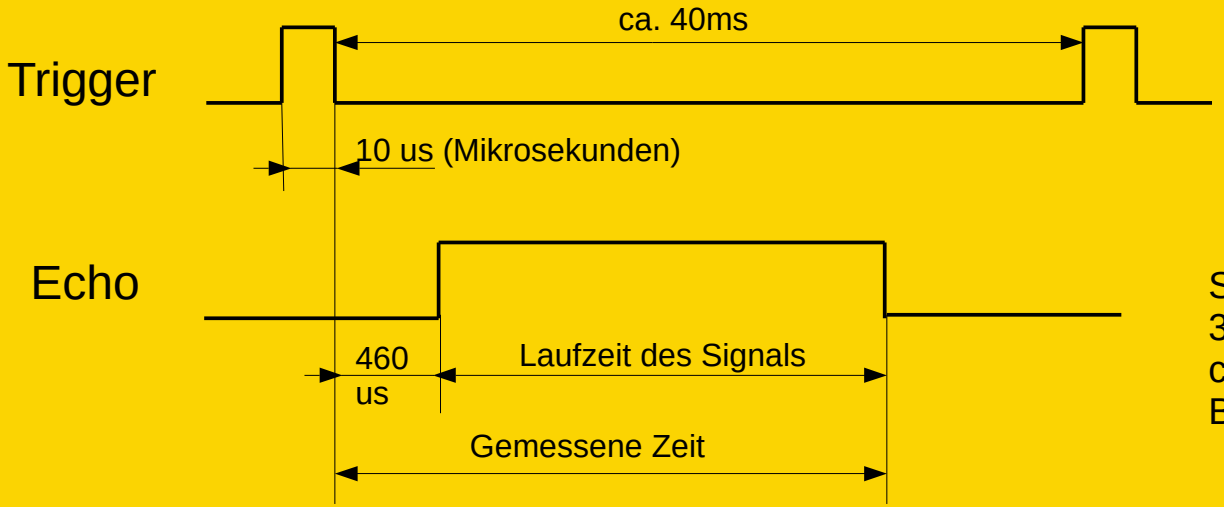

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580us + 460us = 1040us
20cm: 580us*2 + 460us = 1620 * 2 = 3240 → obere 8 Bits → 12
30cm: 290us * 3 = 870us * 2 + 460us = 2200 * 2 = 4400 → obere 8 Bits → 17

Taktfrequenz **16MHz**
Timer1-Prescaler 1:8, alle 500us um 1 erhöht
$1040 * 2 = 2080_{dez}$ → 00001000 00100000 bin
Die oberen 8 Bit → 8

Bei 10cm wird 8 angezeigt
Bei 20cm wird 12 angezeigt
Bei 30cm wird 17 angezeigt

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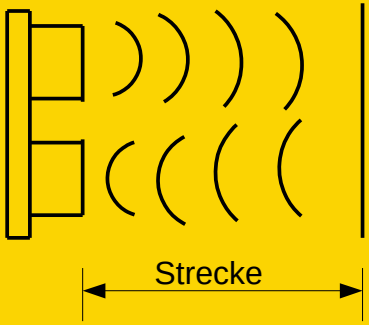

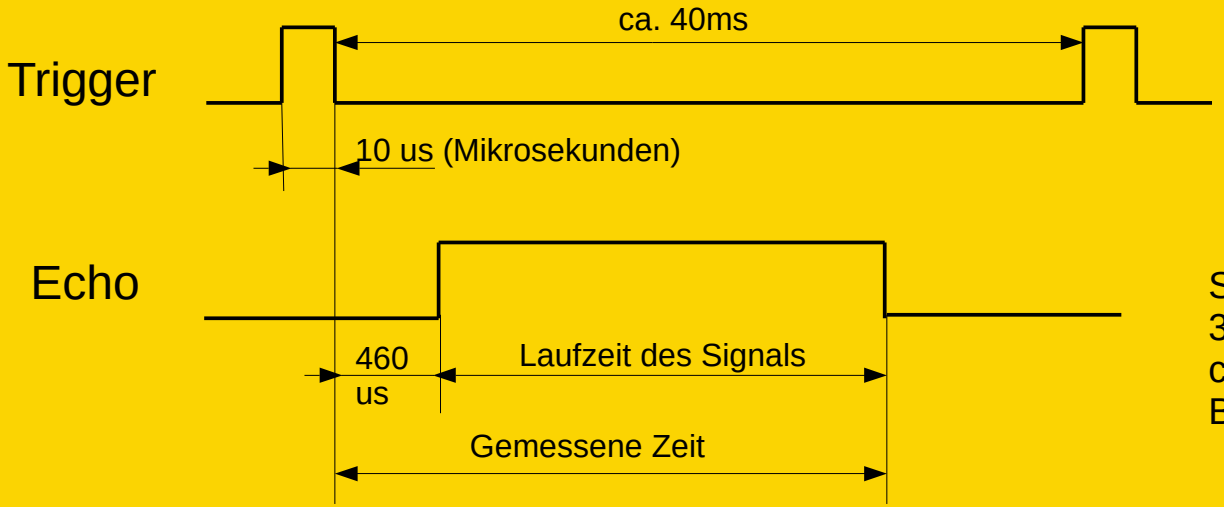

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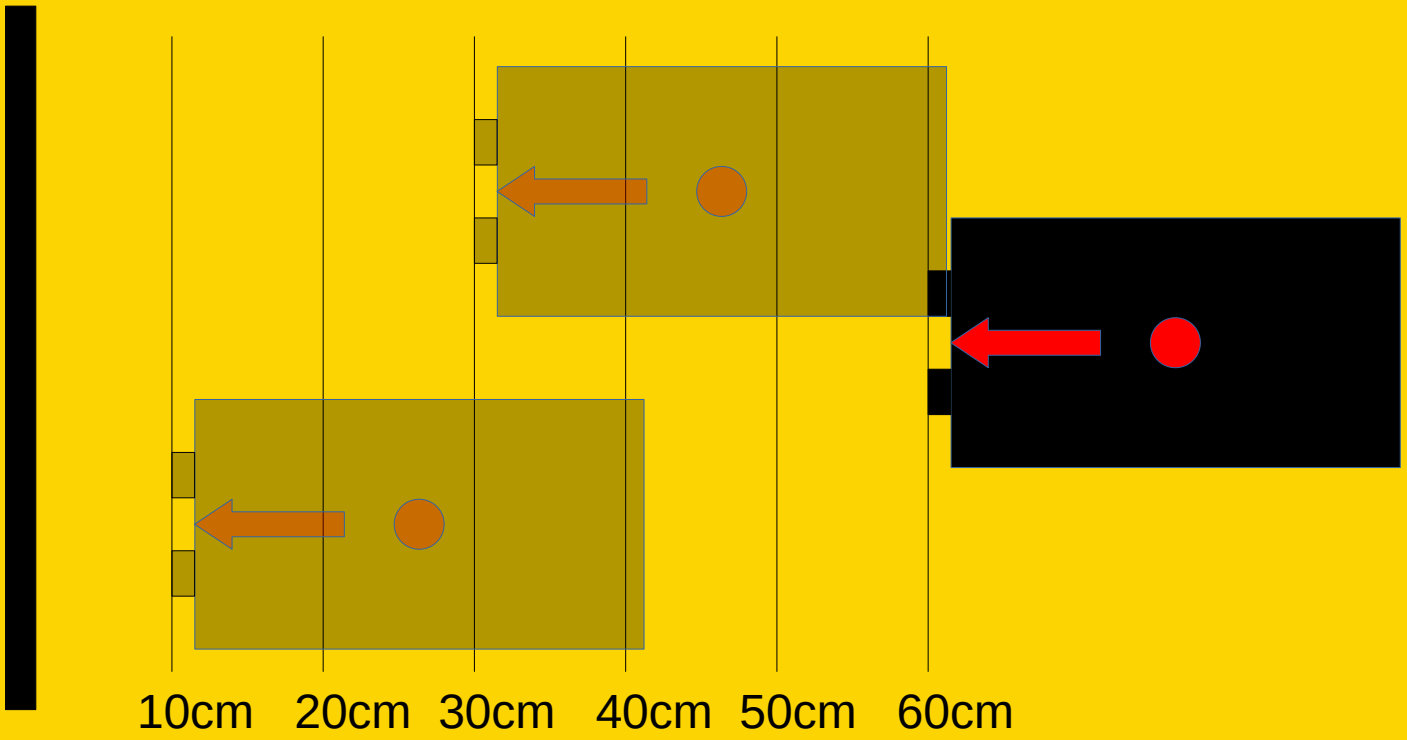
Die oberen 8 Bit → 8

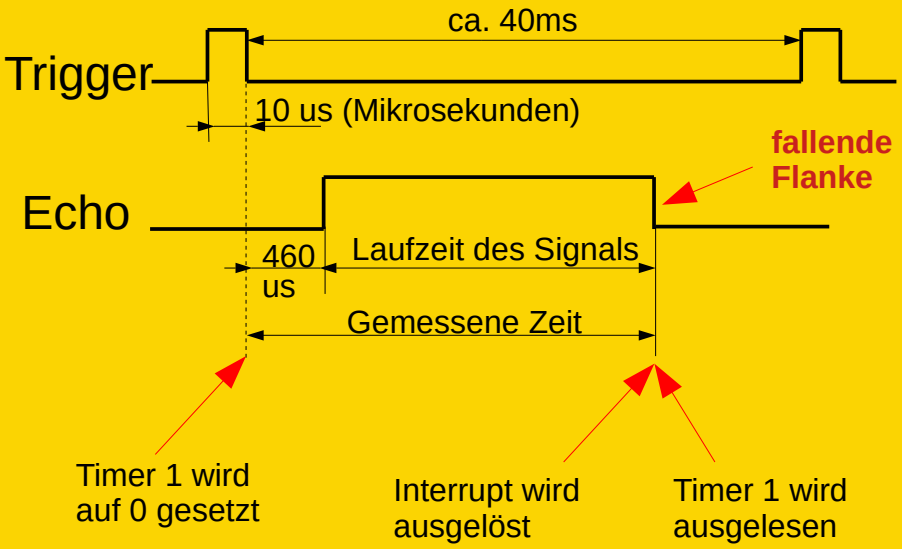
Bei 10cm wird 8 angezeigt
Bei 20cm wird 12 angezeigt
Bei 30cm wird 17 angezeigt
Bei 40cm wird ?? angezeigt
Bei 50cm wird ?? angezeigt
Bei 60cm wird ?? angezeigt

Aufgabe: Ausrechnen, welche Zahl angezeigt wird bei 40, 50 und 60cm.
Dann mit Hilfe des Sensors nachprüfen.

Ultraschall-Sensor



Abstand[cm]	US Wert
10	
20	
30	
40	
50	
60	



_05_US - AtmelStudio — Advanced Mode — Quick Launch (Ctrl+Q)

File Edit View VAssistX ASF Project Build Debug Tools Window Help

Debug — Debug Browser — Hex — Arduino

UltraSonic.cpp | Init.h | USART_Functions.h | Interrupt_Service_Routines.h

Interrupt_Service_Routines.h — C:\Users\User\Desktop\Tutorials\Atmel\Software\Elegoo_05_US\Elegoo_05_US\Interrupt_Service — Go

```
17  //To time several works
18  ISR(TIMER2_OVF_vect) { //Prescaler TMR2 1:8 = Interrupt every 128 us
19      //Toggeling the LED, just to see, if the MC is working
20      T2ck++; //Counter TMR2 OVF
21      if(T2ck == 2000) { //Every 250ms
22          T2ck = 0; //Don´t forget!!
23          //      LED_TOGGLE; //See above
24      }
25      //Ultrasonic distance
26      Counter_US++; //256 * 128us = 32768us
27      if (!Counter_US) {//Approx. every 32ms
28          //LED_TOGGLE; //for testing
29          PORTD |= 0b00010000; //Trigger US, HI
30          _delay_us(10); //10 microseconds
31          PORTD &= 0b11101111; //Trigger US, LO
32          //First you have to write TCNT1H, before writting TCNT1L!!!
33          TCNT1H = 0; //Timer 1 set to zero...
34          TCNT1L = 0; //...to quantify the distance of the obstacle
35          //LED_ON; //Tests
36      }
```

100 %

```
43
44  //Interrupt on falling edge at RD0, US sensor
45  ISR(INT0_vect) {
46      //LED_ON; //Test
47      char junk; //Only to read TCNT1L
48      junk = TCNT1L; //We have to read the low Byte first, only then we could read TCN1H, but we do
49      US_Time = TCNT1H; //runtime of the US signal, HI part
50      TCNT1H = 0; //Reset TMR1
51      TCNT1L = 0; //Reset
52      //16MHz Prescaler 1:8 -> 2MHz TMR1 Counter
53      //LED_OFF; //Test
54  }
```

```
DDRC  = 0b00100000; //00n.n.,1US-Trig,0Line-R,00D
DDRD  = 0b01101000; //0Color-1,11PWMA&B,0Line-M,1
//Interrupt settings
//External
EICRA  = 0b00001010; //INT0, INT1, falling edge
EIMSK  = 0b00000001; //Enable INT0, disable INT1
//Internal
```

100 %

Output | Error List

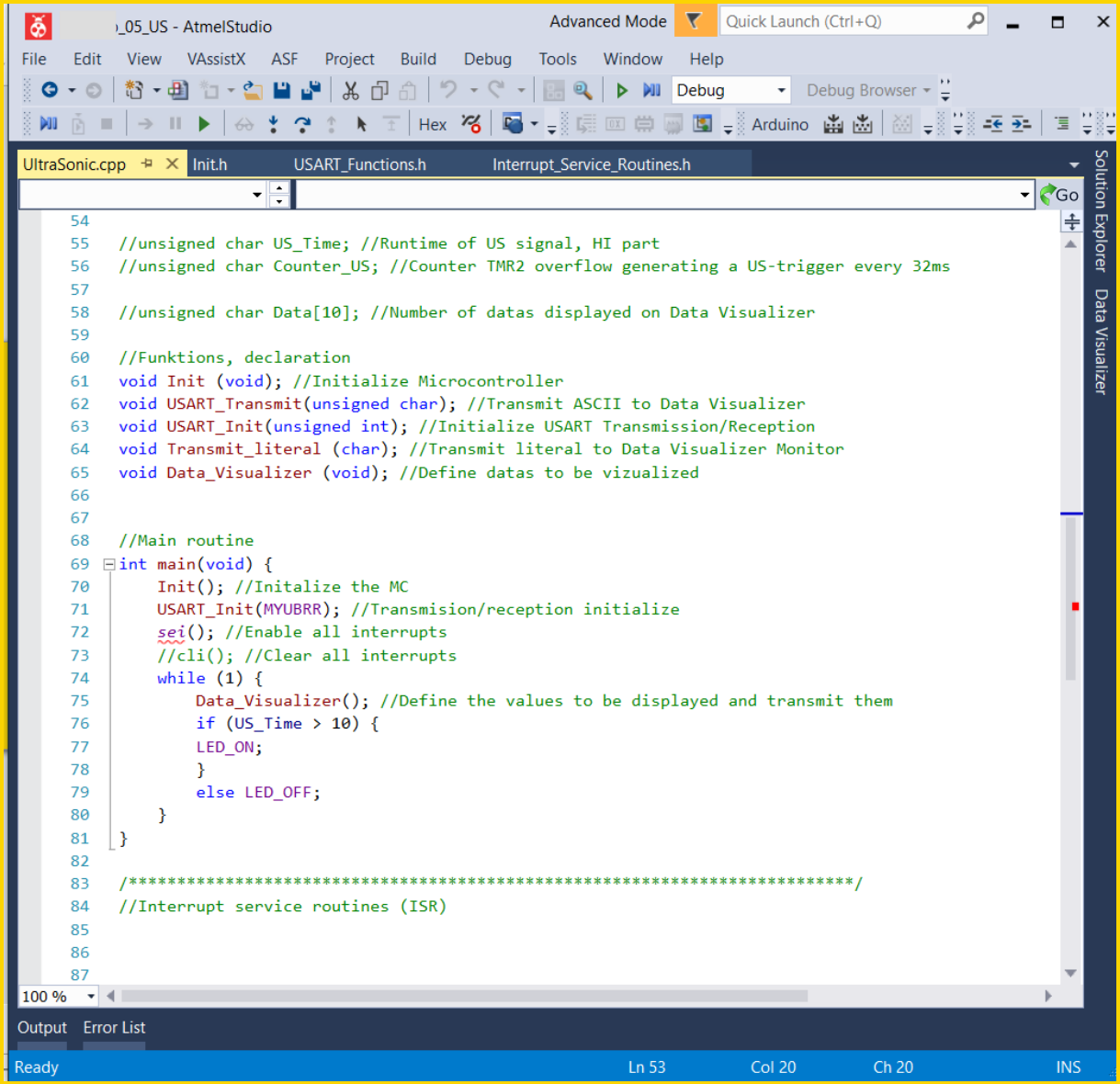
Ready — Ln 14 — Col 1 — Ch 1 — INS

Solution Explorer | Data Visualizer

if:
Falls Bedingung erfüllt ist, mache etwas
else:
Sonst mache etwas anderes

Syntax:
if(Bedingung) {
Anweisungen
}
else {
Andere Anweisungen
}

Bedingung ist ein Wert.
Ist die Aussage falsch ist er Null.
Ist die Aussage richtig ist er Eins.
Die Bedingung ist erfüllt, wenn sie **NICHT Null** ist!



Montage und Programmierung eines Roboters für ROBOCUP JUNIOR RESCUE mit Elegoo Car Kit

Teil 2.6: Motor