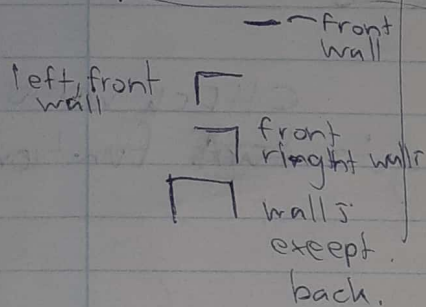


wall on  
Schenans

right 4

left 3



0  
0  
1  
1

0  
1  
0  
1

- turn right  
- turn right  
- turn left  
- back

\*1) problem - what if long corridor dead end

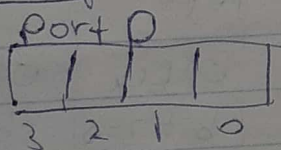


It will keep going back and fourth

motor driver.

<u>Right</u>	10	clock
<u>Left</u>	01	anti
	11	stop
	00	stop

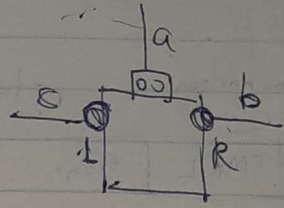
Output



0 - Left wheel forward  
1 - Right wheel forward  
2 - Left anti-clock backward

3 - Right backward

Threshold  
20-number, two - 00101101



1) Ultrasonic, forward compare with threshold

$a > 20$

go forward  
no obstacle.

$a < 20$

Stop goto ~~turn~~ function

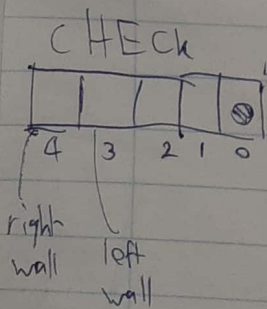
Turn.

right IR sensor

For left IR sensor

Compare right  
IR sensor

compare left  
IR sensor



$b > 20$

$b < 20$

~~set bit~~  
~~on CHECK~~

there is no  
wall right  
to you

~~don't set~~  
CHECK, bit 4 = 0

there is  
a wall  
right to you.

CHECK, bit 4 = 1

$c > 20$

$c < 20$

no  
wall on  
left.

CHECK  
bit 3 = 0

wall on  
left.

CHECK  
bit 3 = 1



forward. ( $\underline{L}$ ,  $\underline{R}$ )

0011

Left ( $\underline{R}$ ,  $\underline{A}$  back)

0110

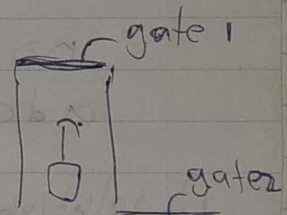
right. ( $\underline{L}$ ,  $\underline{R}$  back)

1001

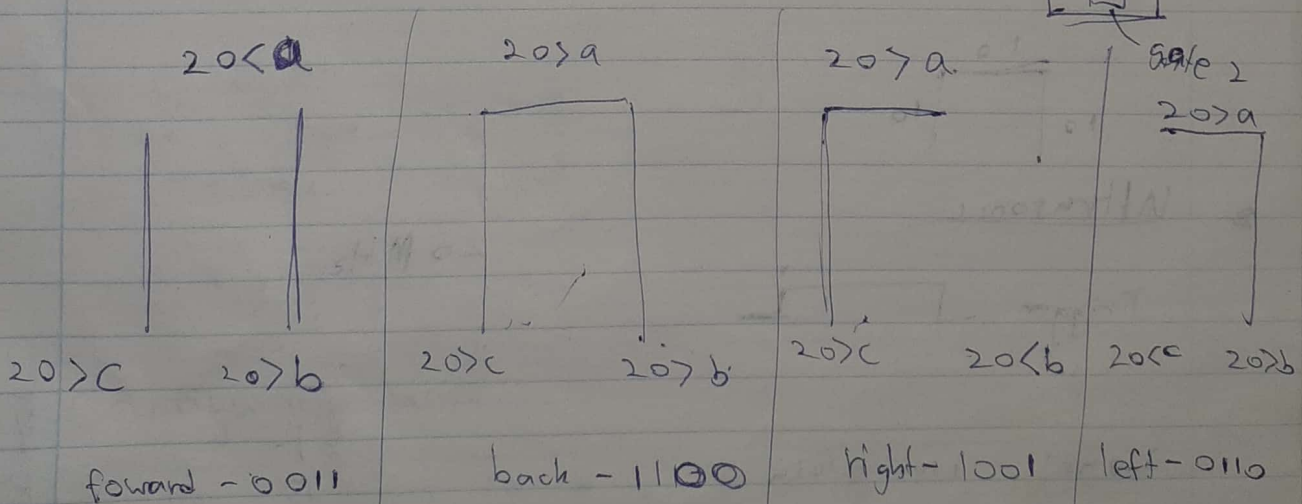
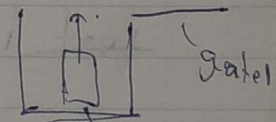
back. ( $\underline{L}$  back,  $\underline{R}$  back)

1100

2) Problem - what if corridor step 1



and then we open gate 1  
and close gate 2



No.

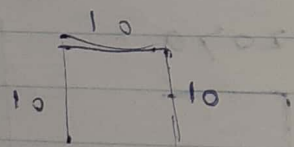
Sensor			expected	got
low	left	right		
30	10	10	0 0 1 1	0 0 1 1
10	30	10	0 1 1 0	0 1 1 0
10	10	30	1 0 0 1	1 0 0 1
10	10	10	1 1 0 0	1 1 0 0

Compare:

no1 > no2 check 2  
 adc > threshold

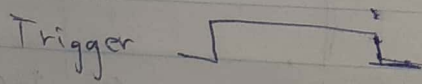
1) solution to problem 1 - complete turn over

test 1



2 Ultrasonic

20 MHz



343 m/s<sup>-1</sup> 1 sec - 343 m

option reg TDCS 0

1 then



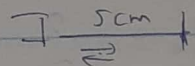
Handwritten calculations and notes on the right side of the page, including a vertical calculation of 6800 divided by 100, resulting in 68, and other scribbles.



### Ultrasonic sensor calculation

$$t_{\text{time}} = (\text{16 bit reg value}) \times \left( \frac{1}{\text{Internal clock}} \right) \times \text{Prescaler}$$

say we want a distance of 5cm.



~~room~~

$$S = ut$$

$$10\text{cm} = 340\text{ms}^{-1} \times t$$

$$t = \frac{10}{340}$$

$$\text{reg value} \times \left( \frac{1}{25 \times 10^5} \right) = \frac{1}{3400}$$

$$\text{reg val for comparison} = \frac{1}{3400} \times 25 \times 10^5 = 735.29$$

$$\approx 736$$

$$\text{in binary} = \overset{\text{H}}{00000010} \overset{\text{L}}{111010000}$$

For to get 3cm precision binary reg value < 512  
 $\overset{\text{H}}{< 10} \overset{\text{L}}{00000000}$

no1 < no2 ✓ wall  
 no1 > no3 no wall

set if no1 > no2

### Configuration word

13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	1	1	0	1	0	0	0	0	1	0	1	1

0	1	2	3
✓	✓	✓	✓

Atlas

D0 1 D3 0  
D1 1 D2 0

D0 1 D3 0  
P1 1 D2 0

D0 1 P3 1  
D1 0 P2 0

IR sensor open ~~3.86~~ 3.97  
closed ~~3.84~~ 0.12

IR sensor

no wall 2 V  
no wall 0.11 V

Address H - 00-11

256-1-01

ultrasonic

0 1 2 3 4 5 6 7

config 9 3 2  
IR 0 0 0  
20C3

~~expended~~

LF RE LB RB  
D0 D1 D2 D3

XT 9 3 2 1  
0 0 0 0

no obstacle 0 1 1 0 turn left  
1

~~Front wall~~

Front wall

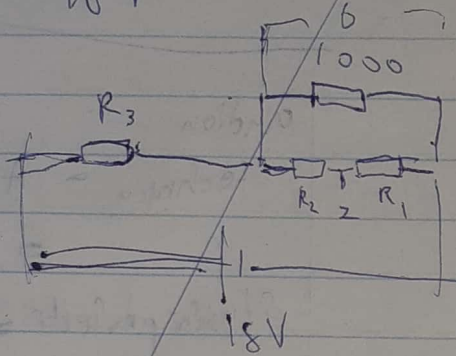
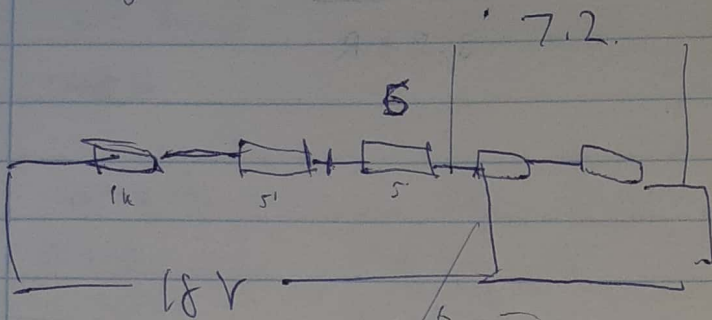
L293D

Motor 1 - 11 9  
M 2 - 3 7  
M 3 - 5 8  
M 4 - 6 12

En1 1 16 Vss  
Input 2 15 Input 4  
output 1 3 14 output 4  
GND 4 13 GND  
GND 5 12 GND  
output 2 6 11 output 3  
input 2 7 10 Input 3  
Vss 8 9 Enable 2



Voltage divider circuit resistance =  $1000\Omega$



$$6 = \frac{1000 \times 18}{R + 1000}$$

$$R = 2000$$

$$R_1 + R_2 = R'$$

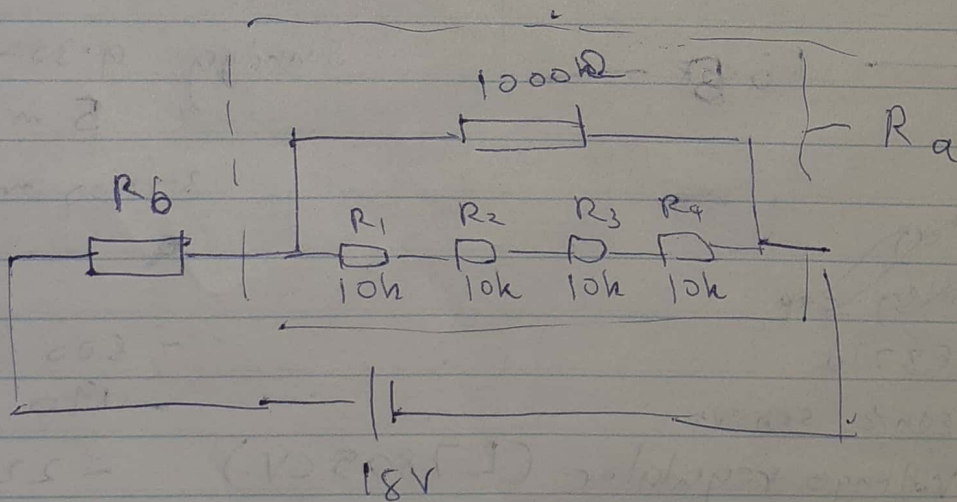
assume

$$R' = 40k$$

$$R_3 = 1000$$

$$\frac{R' \times 1000}{1000 + R'}$$

$$R = \frac{1k \times 40k}{40k + 1k} = 975.609$$



$$R_1 + R_2 + R_3 + R_4 = 40k$$

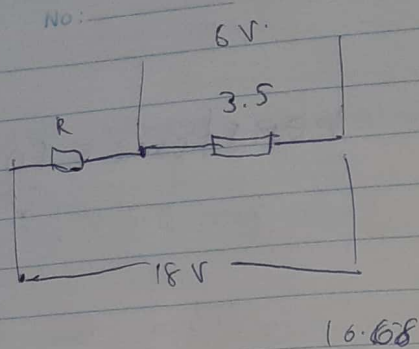
$$R_a = 975.60$$

$$6 = \frac{975.60 \times 18}{R_b + 975.6}$$

$$R_b = 1951.2$$

Atlas

Date: Project cost = 7775

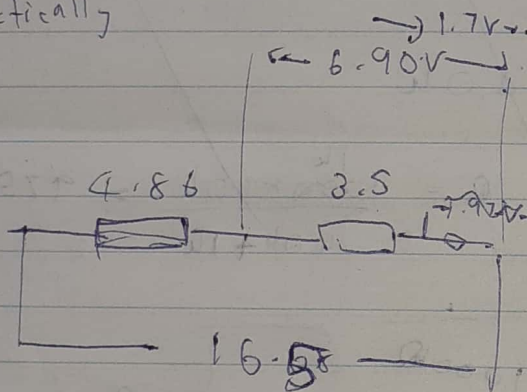


$$6V = \frac{3.5 \times 18}{3.5 + R}$$

6k

$$\frac{5k \times 10k}{15k}$$

practically



andion  
technica = AT 2035

= 28012

Studio project = 20240  
D1

Samson cor - 20492

Sunday 9:30 - 10:30  
5 months

30000 m

9V battery  
9V battery cap

plc 16 E877a

Ultrasonic sensor

5V voltage regulator (L7805 CV)

3.7V 1200mA 18650 LiPo Battery

3.7V Single battery charger 18650 - 200 / Dual - 480

Battery holder case for 2x18650 - 75

4x18650 - 135

TRRS splitter

Behringer CI - 11208.10 + 7284.98

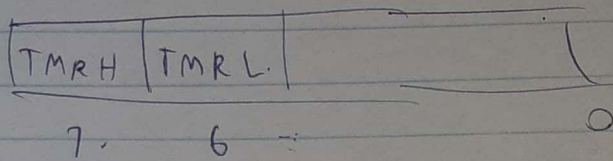
Zing you BMA-800-13205



No: 5)

Date: / /

CHECK.



t - time from ultrasonic reading  
TMRH.

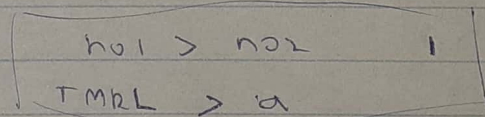
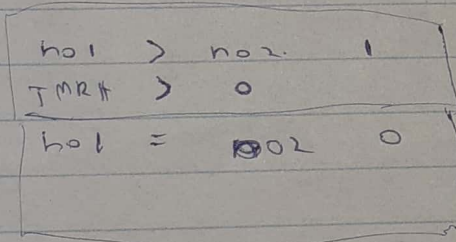
if  $t >>$  then there is no wall.

TMRH  $> b$       TMRL  $> a$   
(1)                      (1)

if  $t <<$  then there is wall

TMRH  $< b$       TMRL  $< a$                        $a = 01000000$   
(0)                      (0)

7	6		bit 5
TMRH	TMRL		
0	0	(TMRH $< b$ , TMRL $< a$ ) <del>no</del> wall	01
0	1	(TMRH $< b$ , TMRL $> a$ ) <del>no</del> wall	0
1	0	(TMRH $> b$ , TMRL $< a$ ) <del>no</del> wall no	10
1	1	TMRH $> b$ , TMRL $> a$ <del>no</del> wall no	11



$t < a$

0 - h0001

1 - 0001

61

72

23

72

38

2658 - 175

177

1696 533

177

Atlas