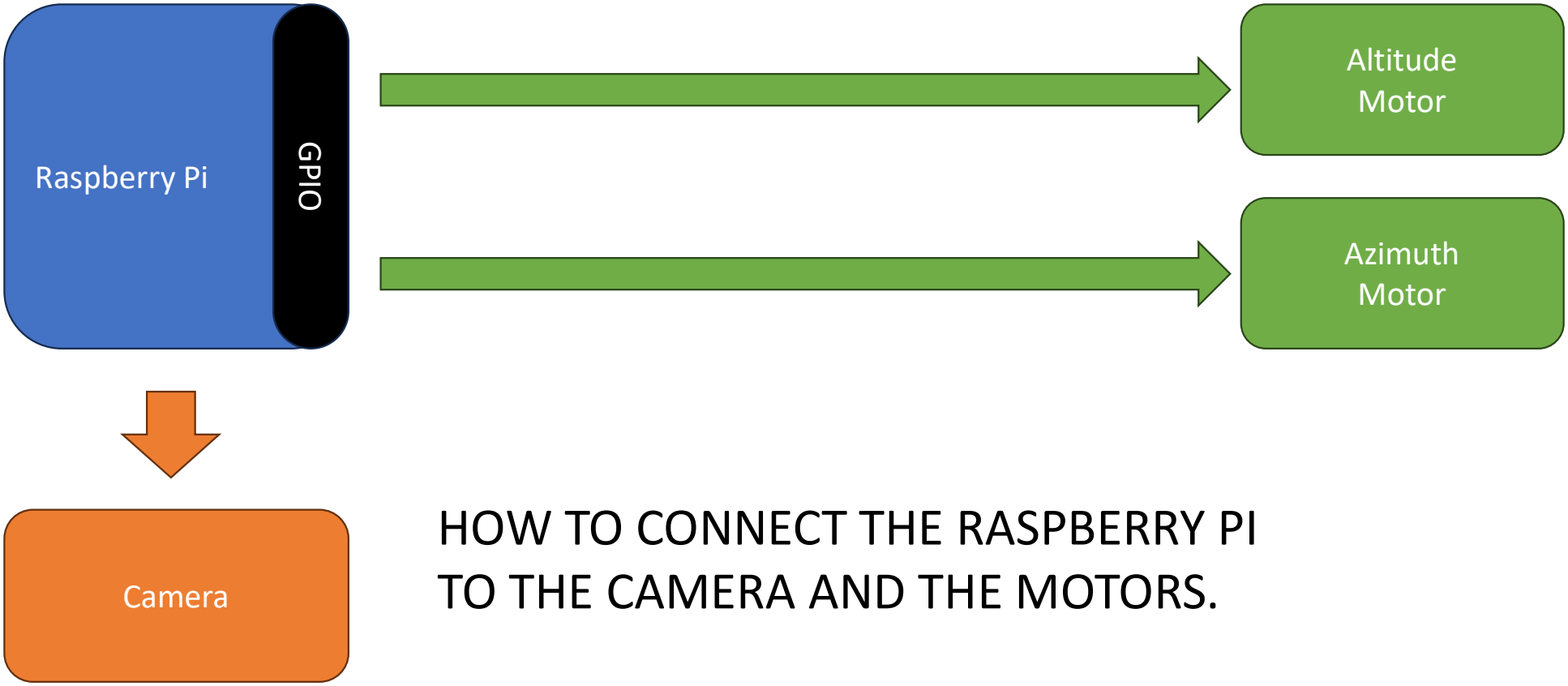
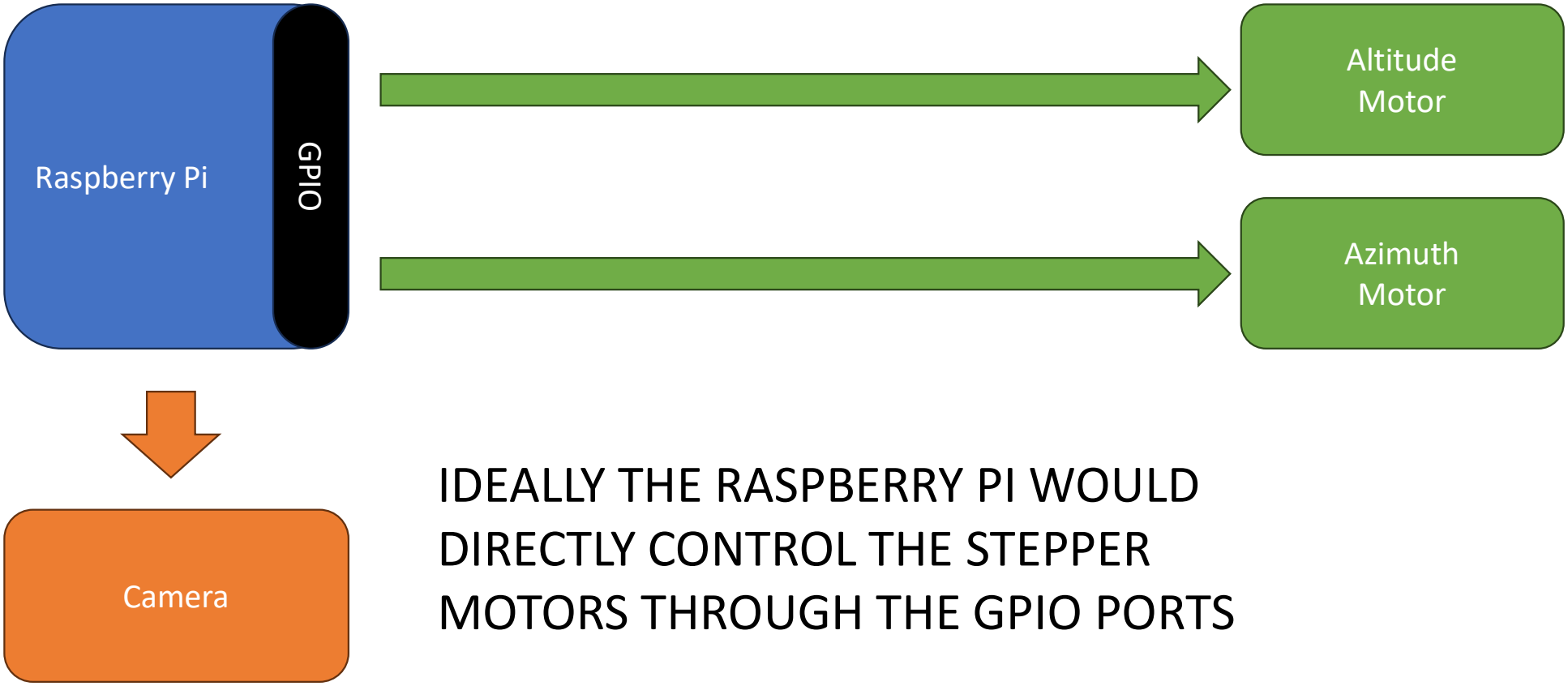
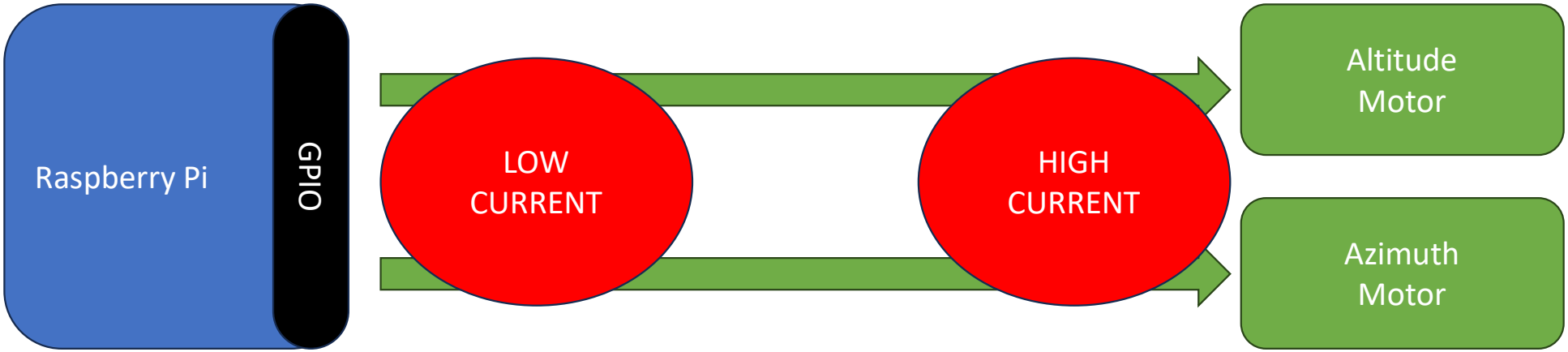
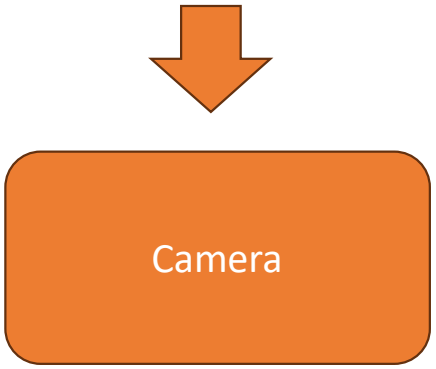


HOW TO CONNECT THE RASPBERRY PI TO THE CAMERA AND THE MOTORS.

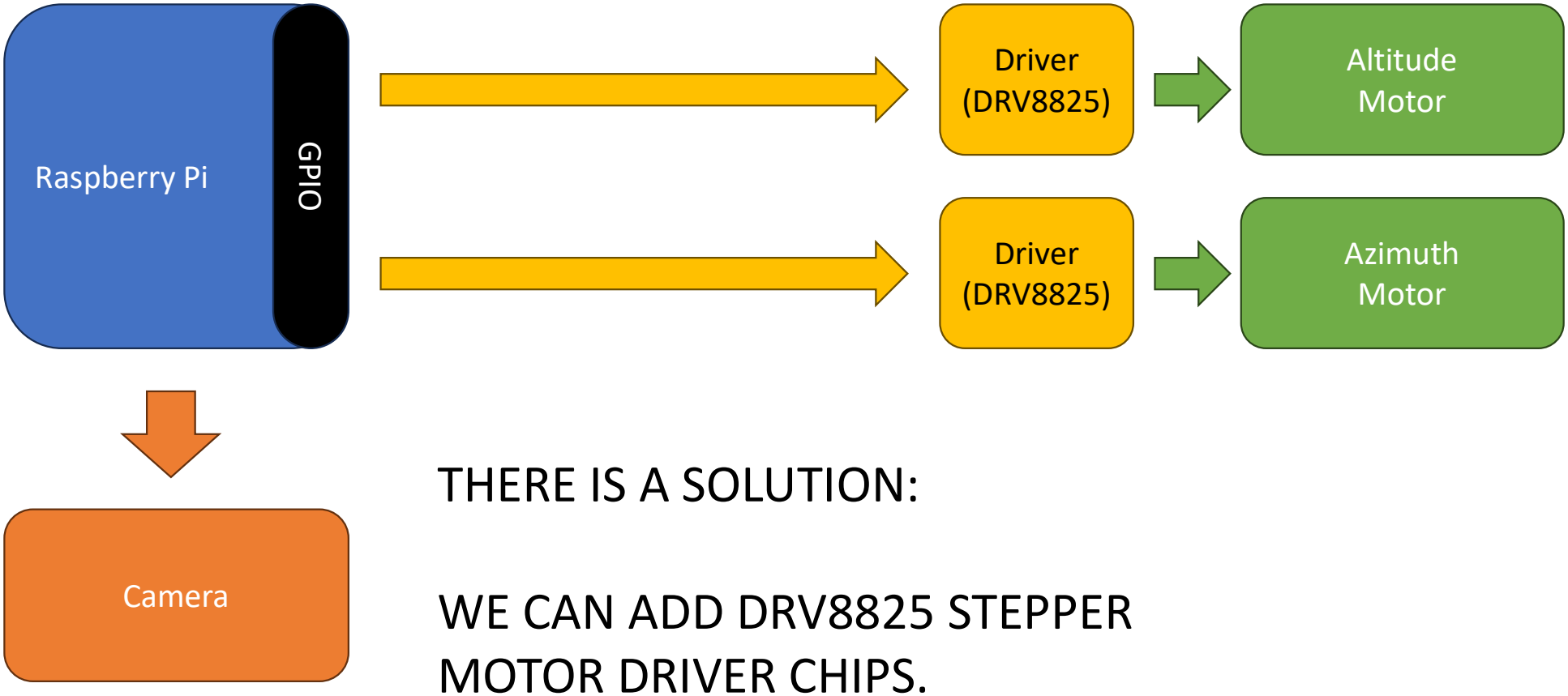


IDEALLY THE RASPBERRY PI WOULD DIRECTLY CONTROL THE STEPPER MOTORS THROUGH THE GPIO PORTS



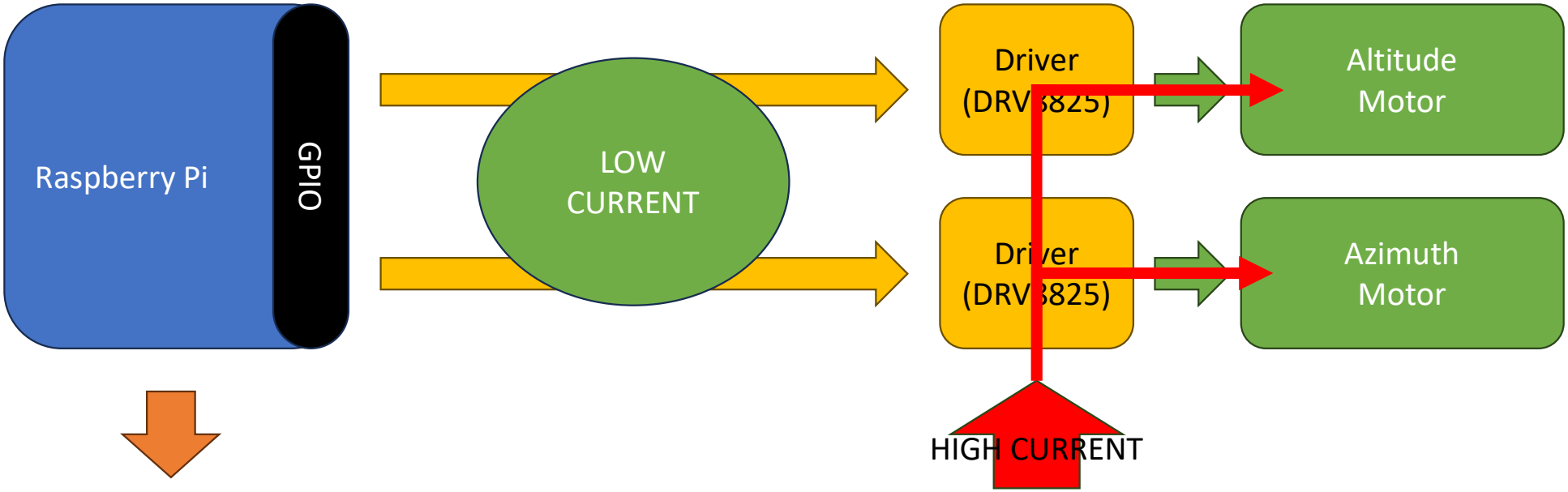


THERE IS A PROBLEM:
THE STEPPER MOTORS NEED HIGHER CURRENTS THAN THE GPIO PORTS CAN DELIVER.
WE WOULD BLOW UP THE RPi.

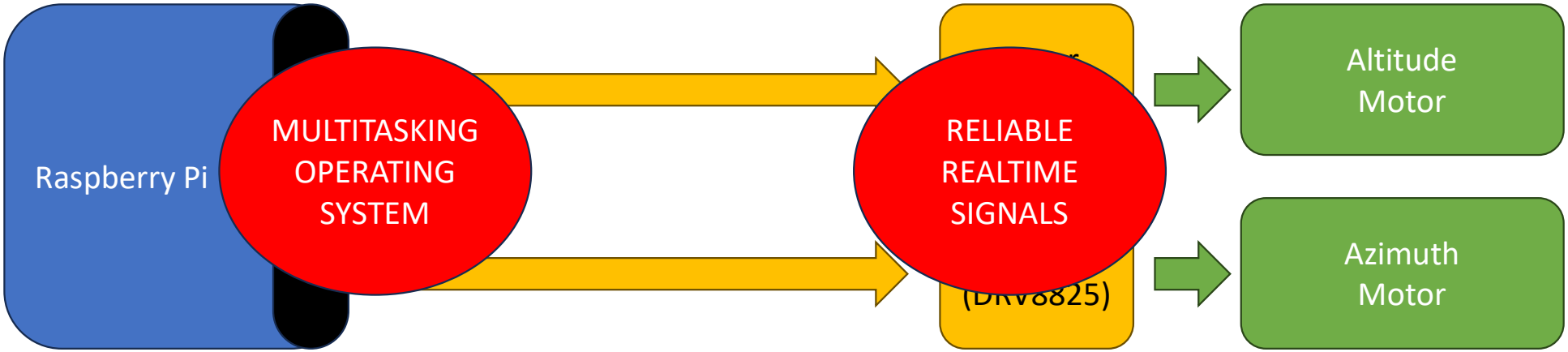


THERE IS A SOLUTION:

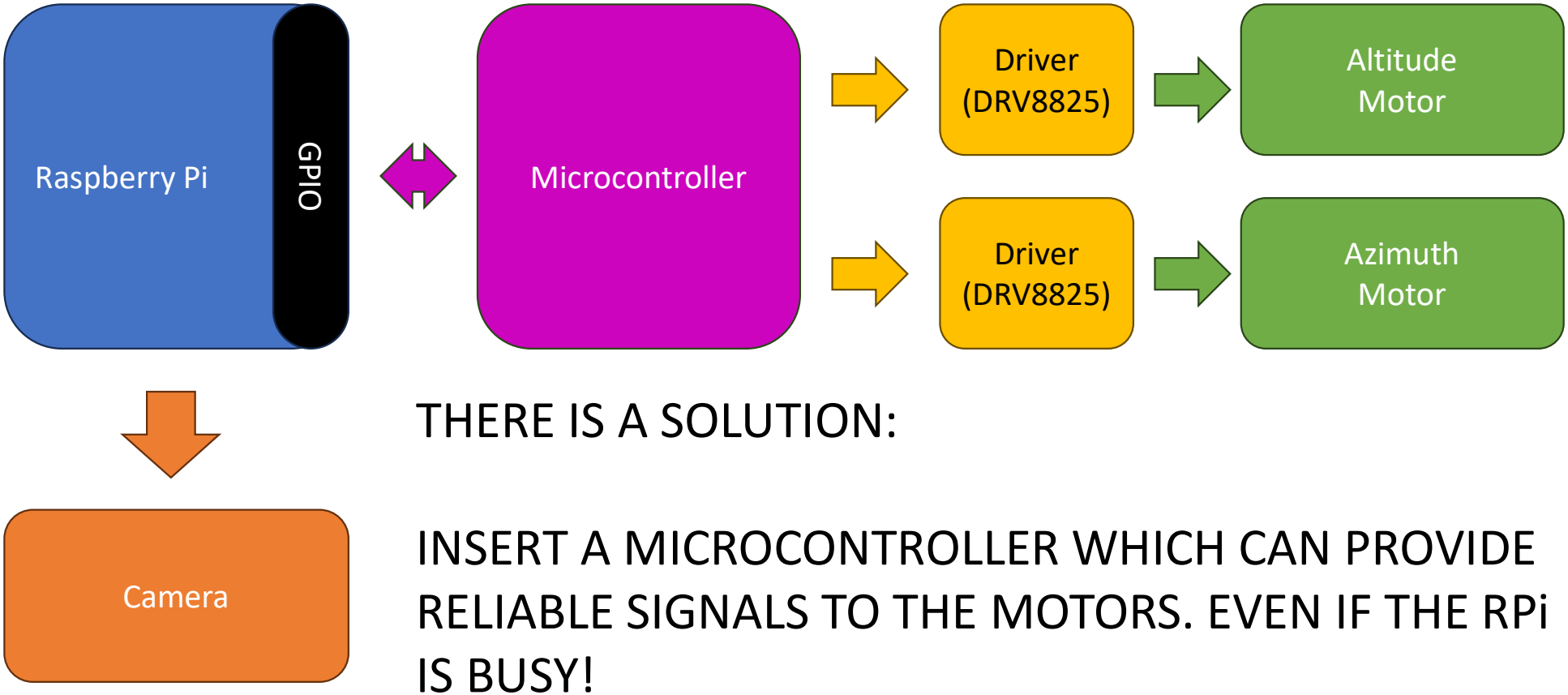
WE CAN ADD DRV8825 STEPPER MOTOR DRIVER CHIPS.



DRV8825 TAKES LOW POWER SIGNALS FROM PROCESSORS TO CONTROL HIGHER CURRENT/VOLTAGE POWER DIRECTLY TO THE STEPPER MOTORS.

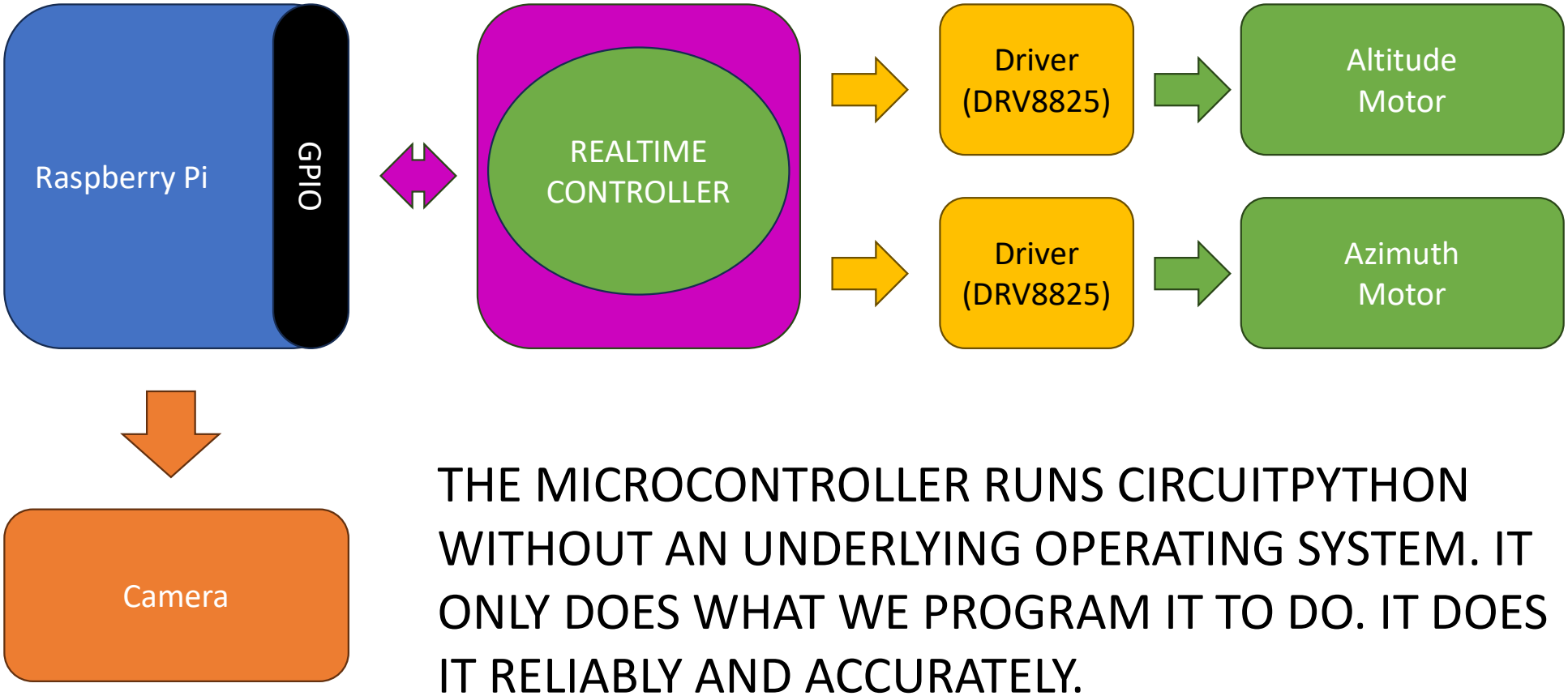


THERE IS ANOTHER PROBLEM:
THE MOTORS MUST MOVE TO VERY PRECISE TIMING. THE RPi IS A LINUX MULTITASKING OPERATING SYSTEM. SOMETIMES IT IS BUSY DOING OTHER THINGS. THE MOTORS WILL NOT BE SMOOTH.

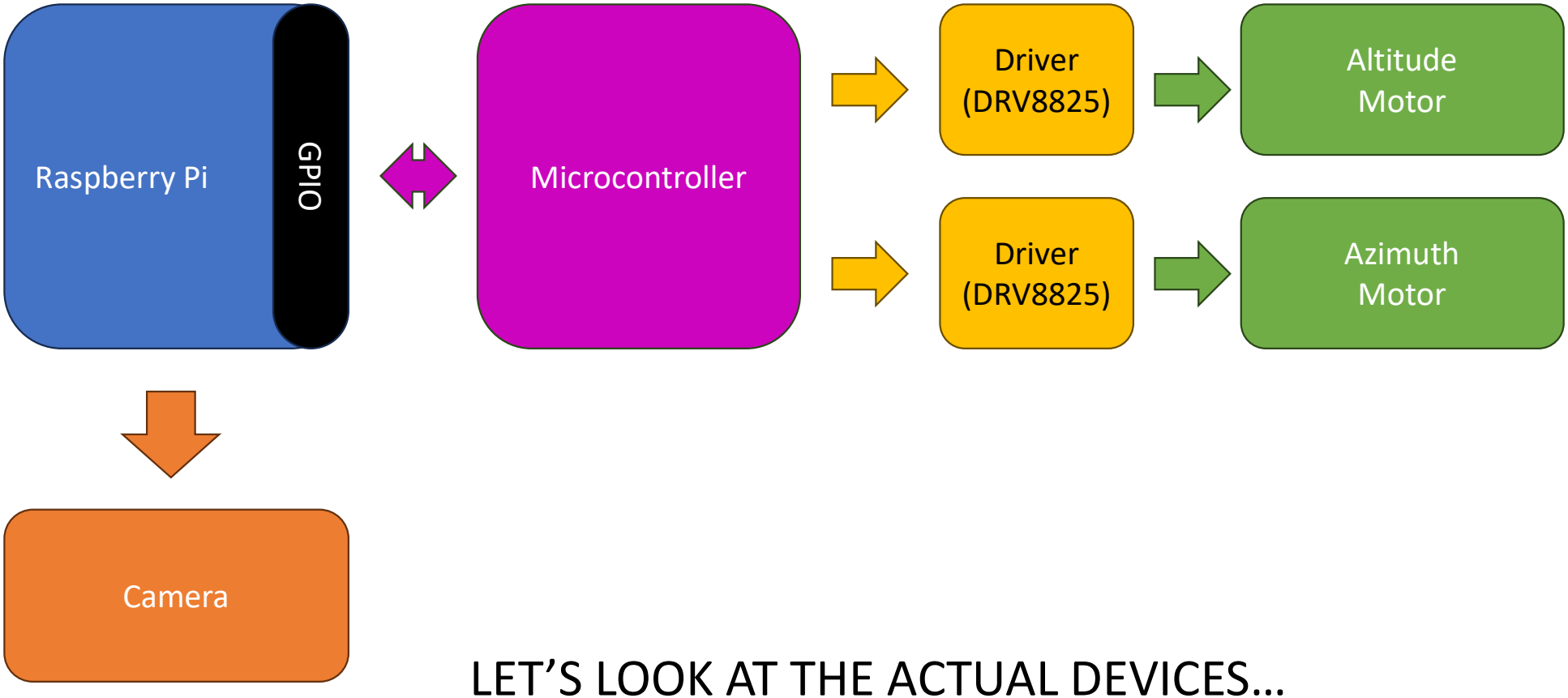


THERE IS A SOLUTION:

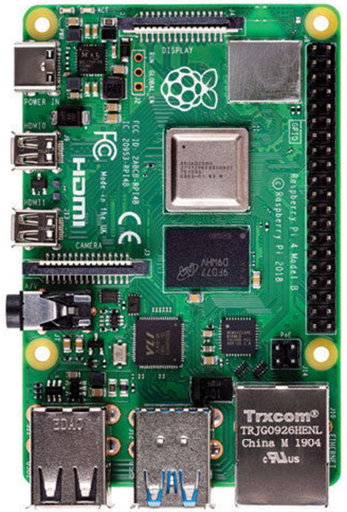
INSERT A MICROCONTROLLER WHICH CAN PROVIDE RELIABLE SIGNALS TO THE MOTORS. EVEN IF THE RPi IS BUSY!

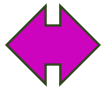


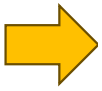
THE MICROCONTROLLER RUNS CIRCUITPYTHON WITHOUT AN UNDERLYING OPERATING SYSTEM. IT ONLY DOES WHAT WE PROGRAM IT TO DO. IT DOES IT RELIABLY AND ACCURATELY.

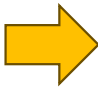


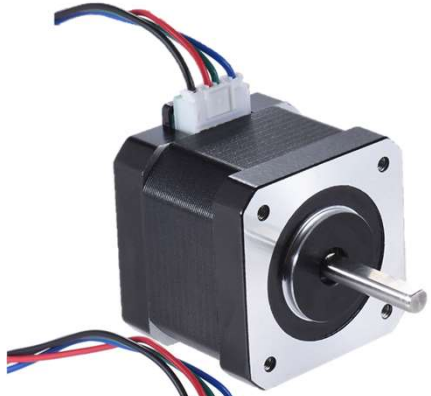
LET'S LOOK AT THE ACTUAL DEVICES…

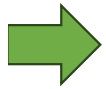


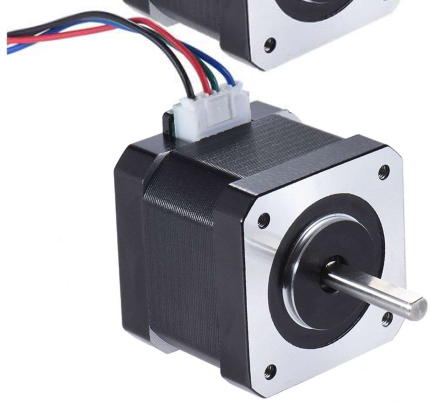






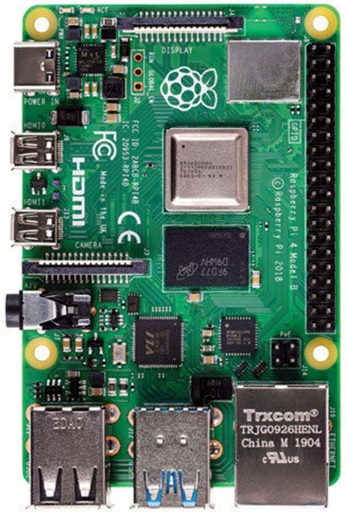


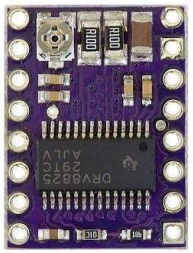


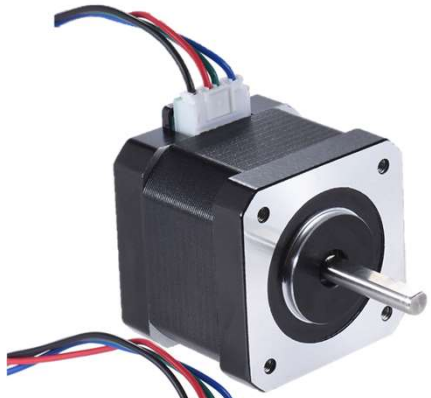


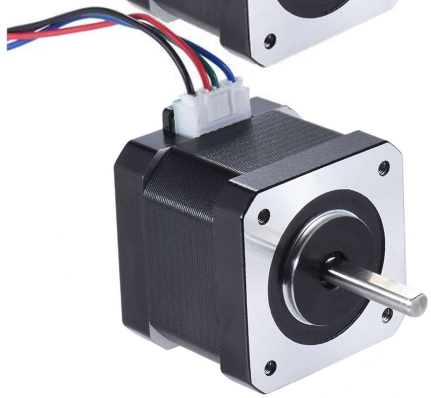
THE DEVICES LOOK LIKE THIS IN REALITY.

WE HAVE TO CONSTRUCT A CIRCUIT TO LINK THESE TOGETHER.

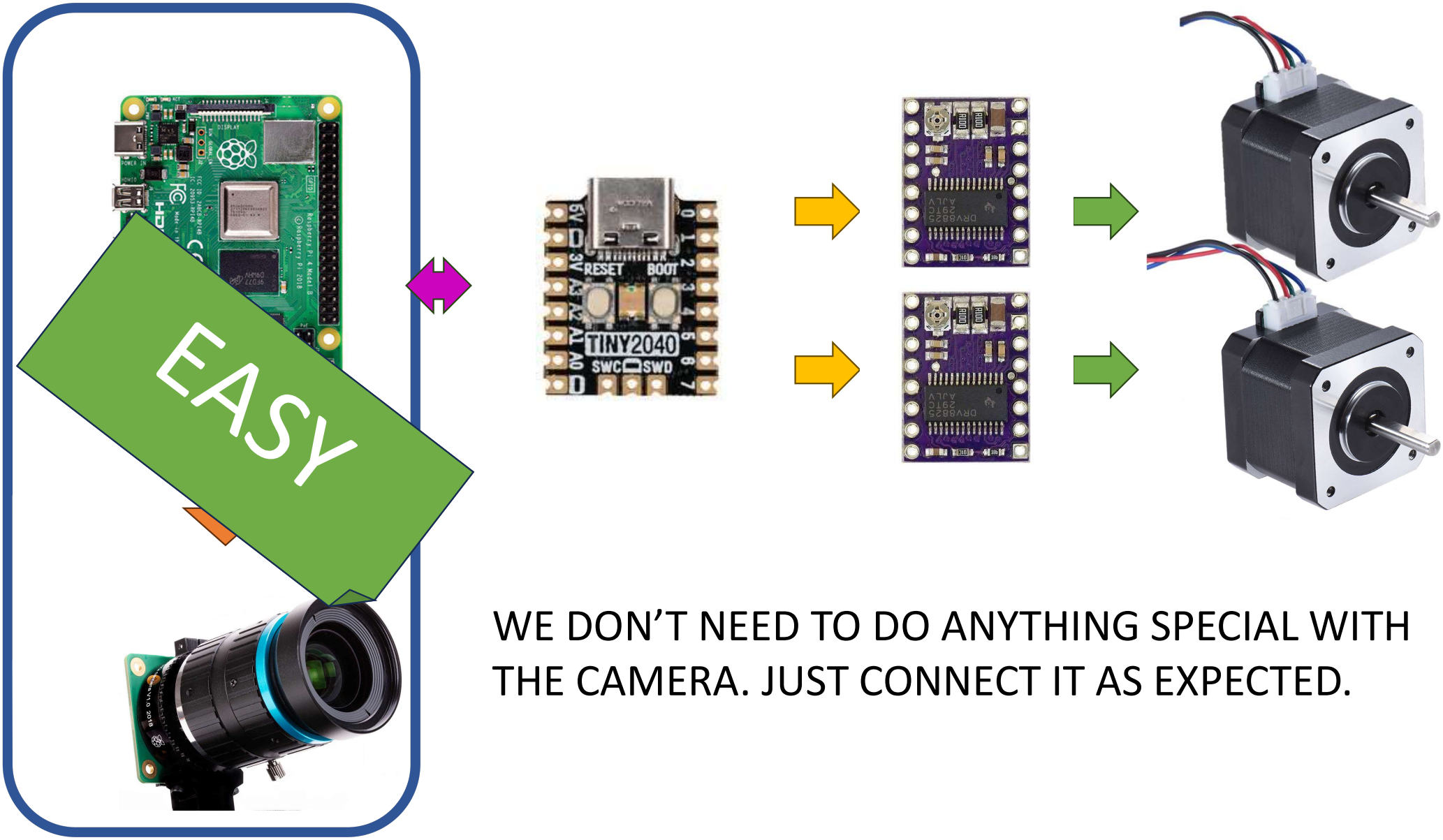




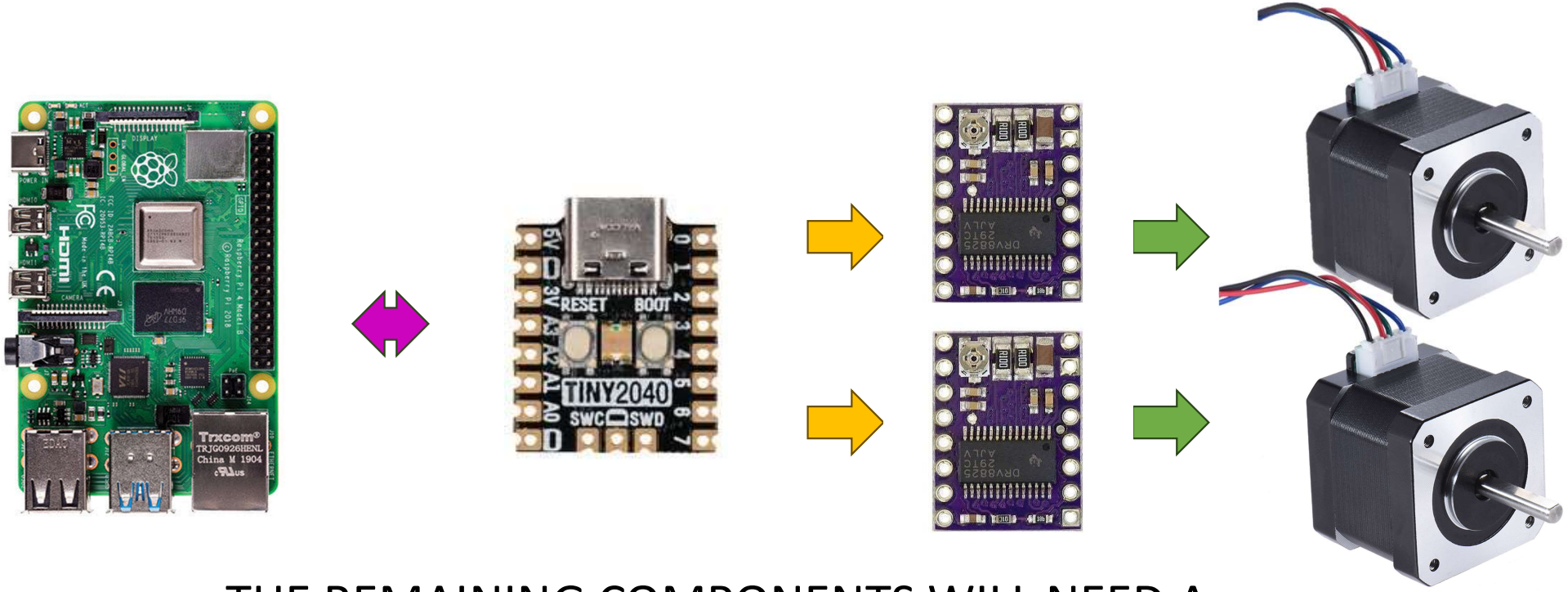




CONNECTING THE CAMERA IS WELL DOCUMENTED ONLINE.

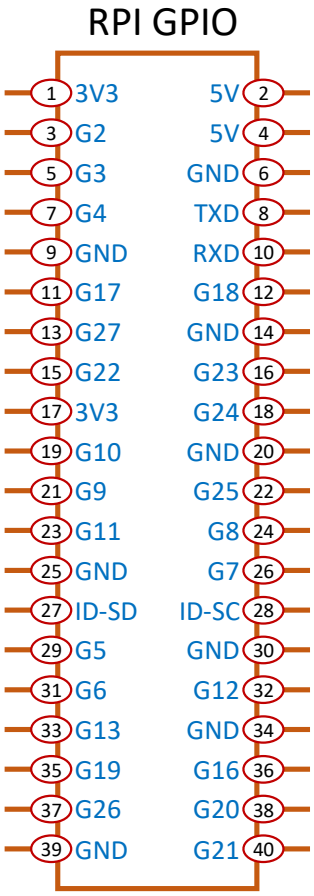


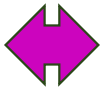
WE DON’T NEED TO DO ANYTHING SPECIAL WITH THE CAMERA. JUST CONNECT IT AS EXPECTED.

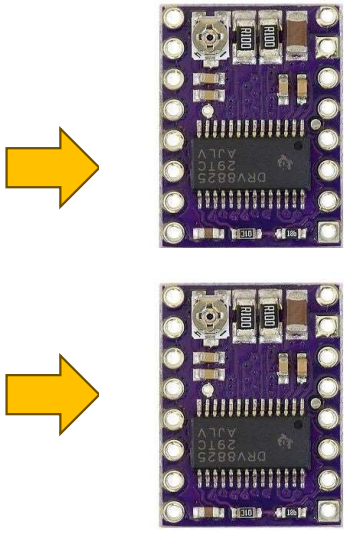


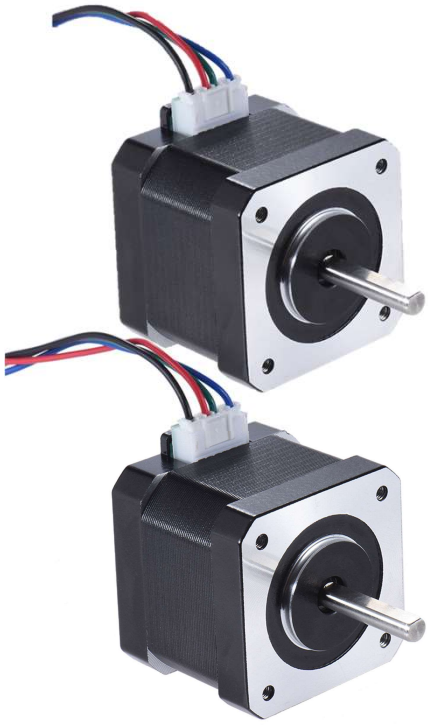
THE REMAINING COMPONENTS WILL NEED A CIRCUIT BOARD OF SOME SORT.

THIS WILL CONNECT THE VARIOUS I/O PINS IN ORDER TO CREATE A WORKING MOTOR CONTROL SYSTEM.



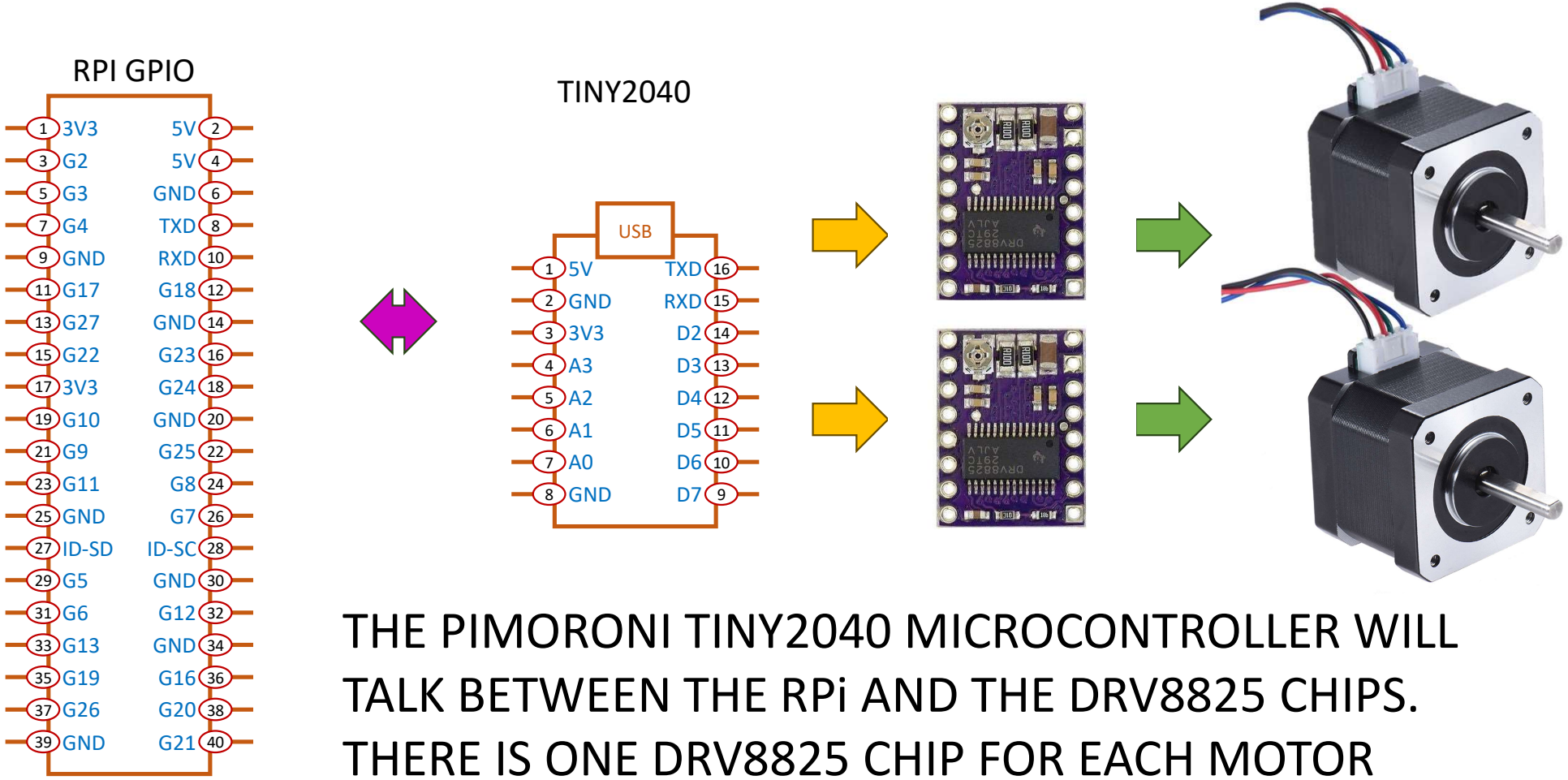






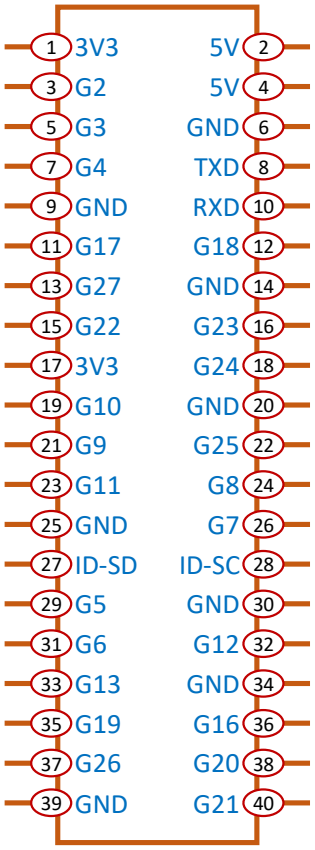
WE WILL CONNECT TO THE RASPBERRY PI GPIO HEADER.

THE RPi REMAINS IN OVERALL CONTROL.

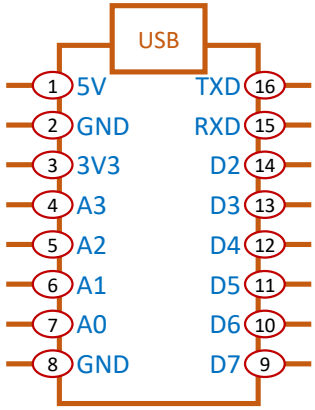


THE PIMORONI TINY2040 MICROCONTROLLER WILL TALK BETWEEN THE RPi AND THE DRV8825 CHIPS. THERE IS ONE DRV8825 CHIP FOR EACH MOTOR THAT WE CONTROL.

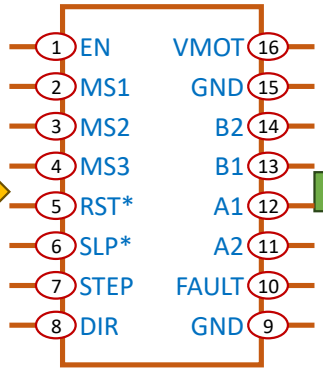
RPI GPIO

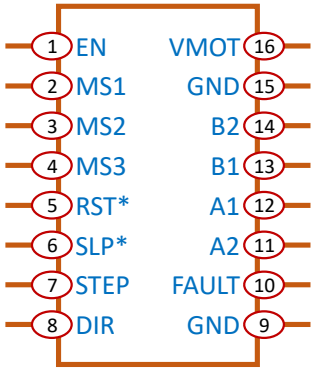


TINY2040

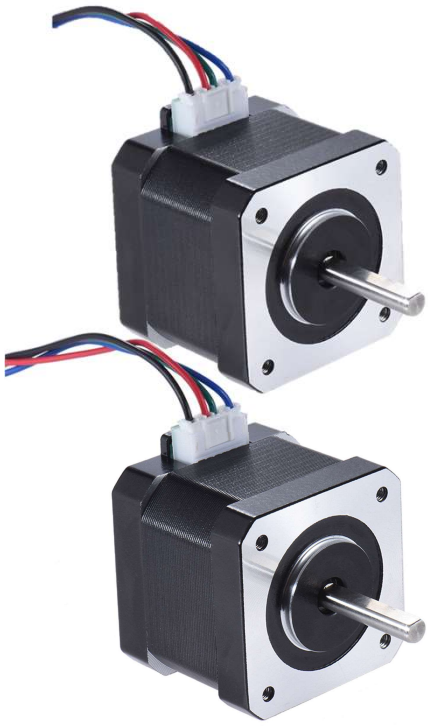


DRV8825
(ALTITUDE)

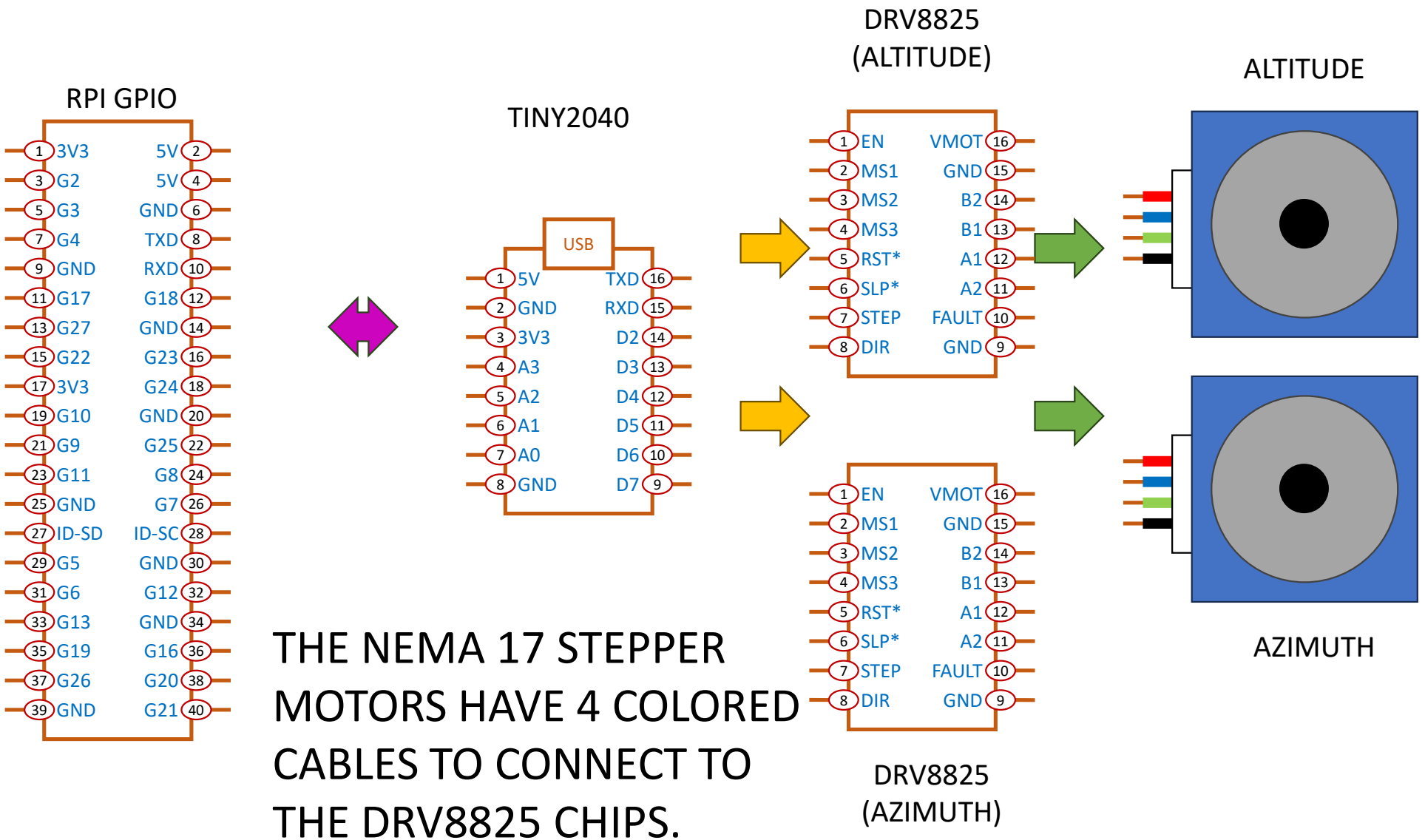


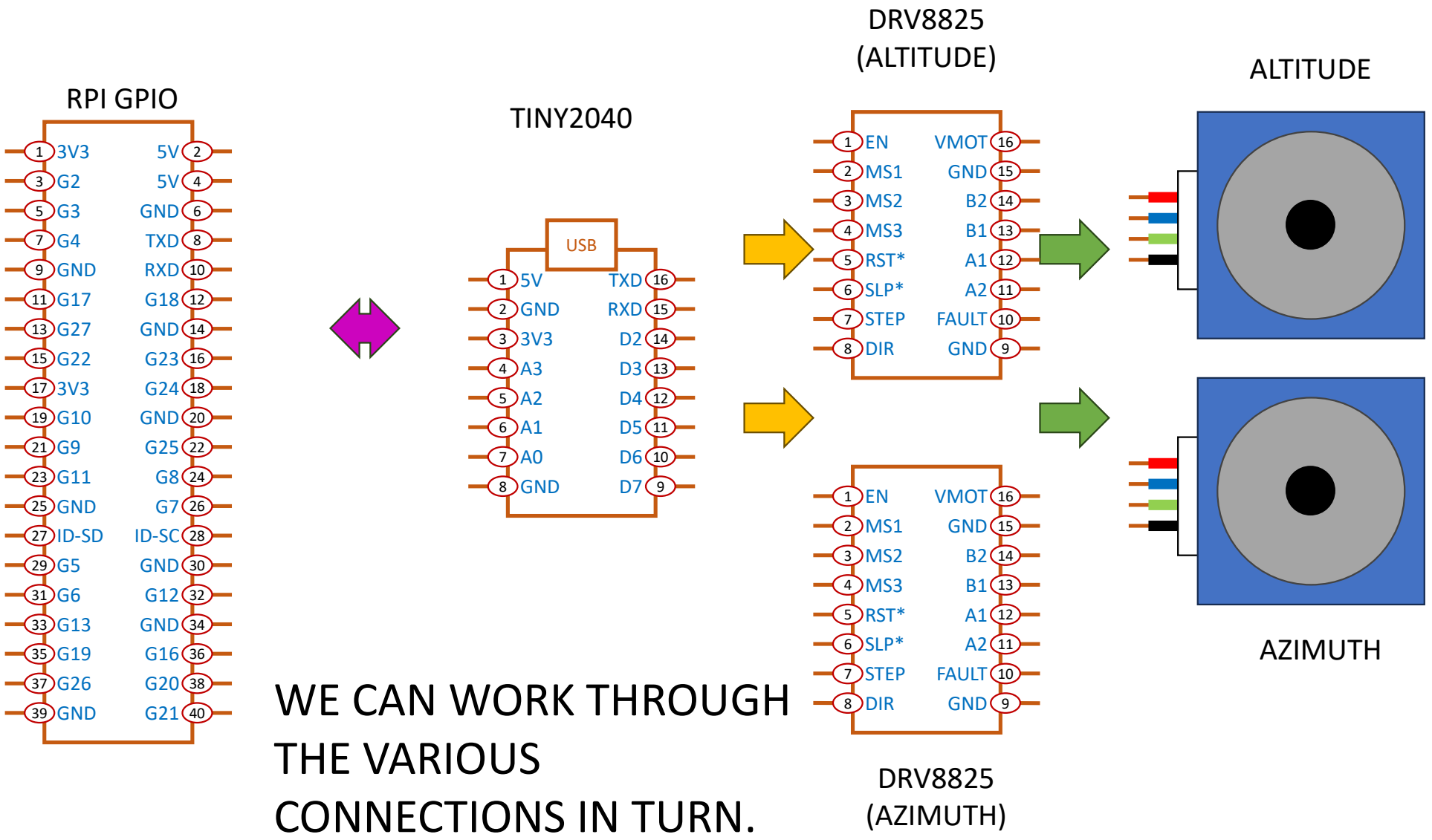


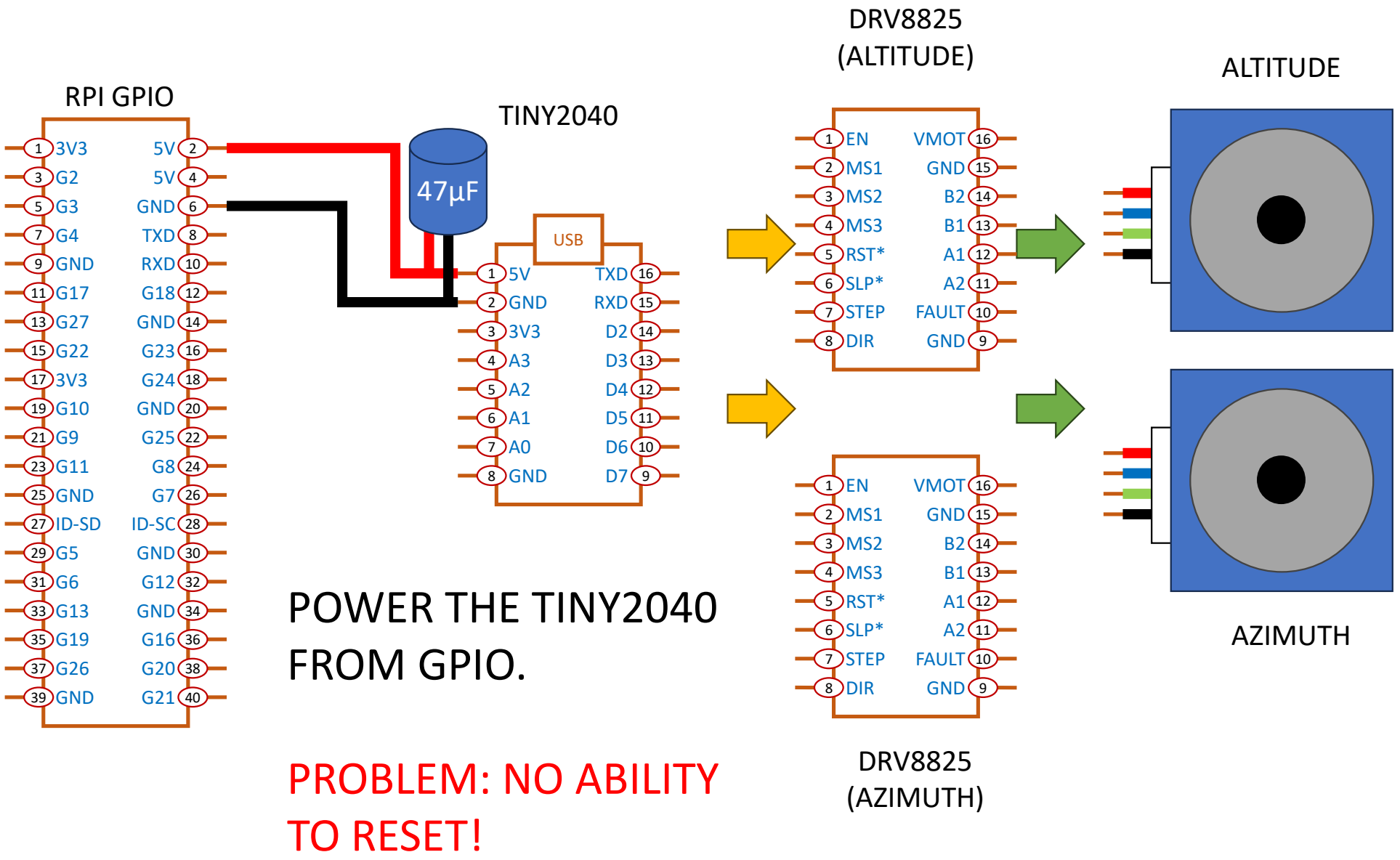
DRV8825
(AZIMUTH)

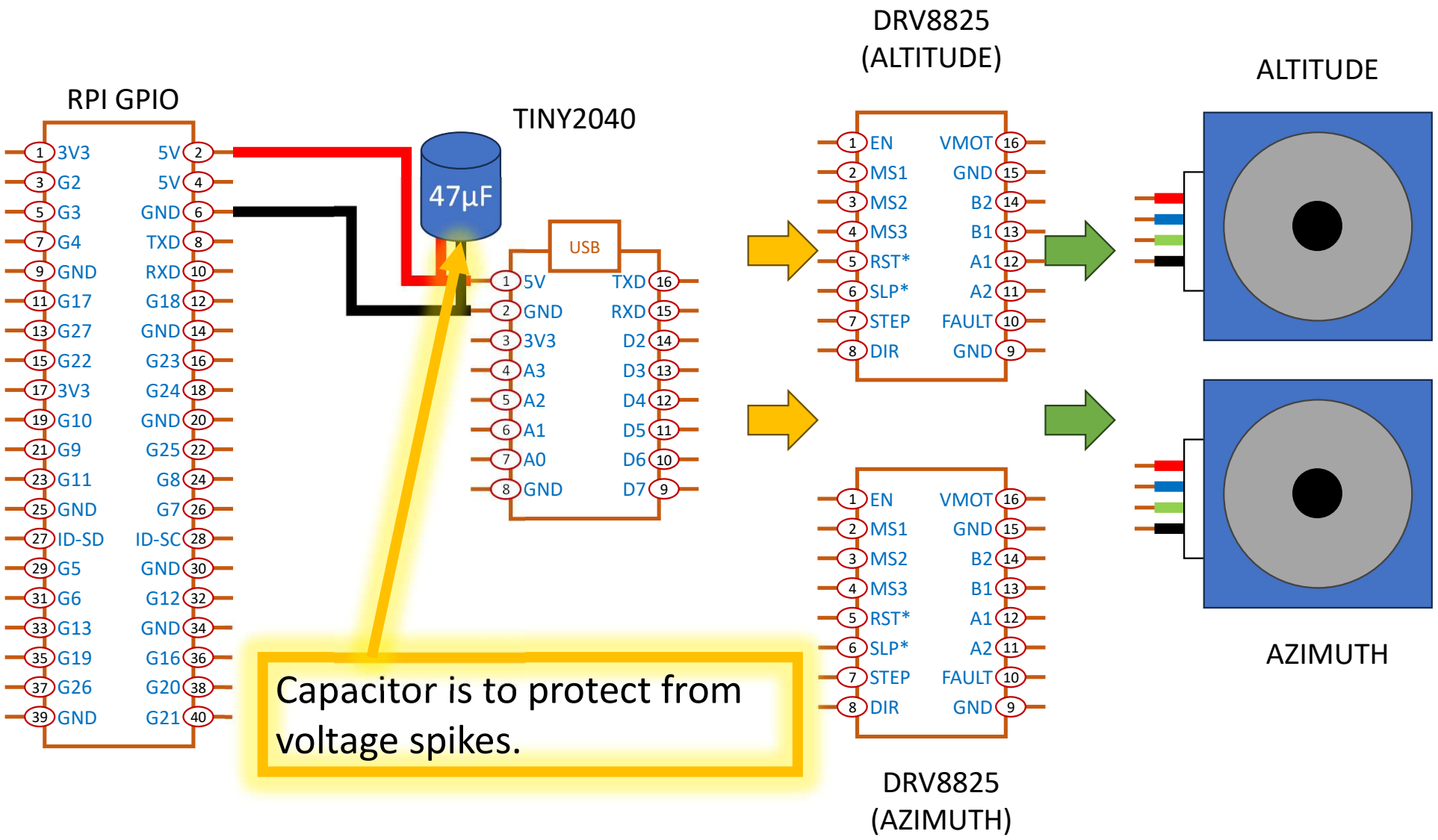


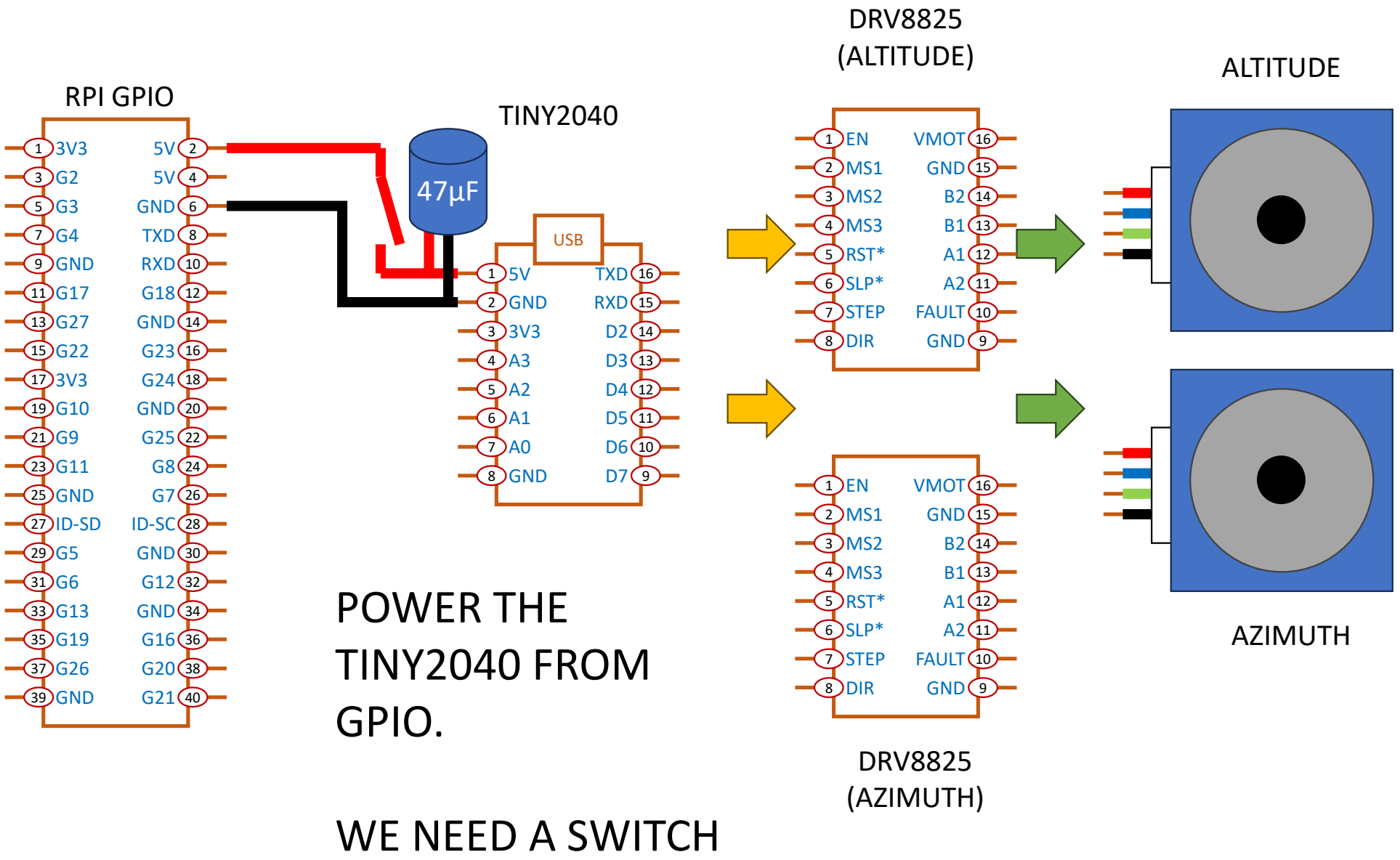
THE DRV8825 CHIPS COME ON AN EASILY CONNECTED BOARD.

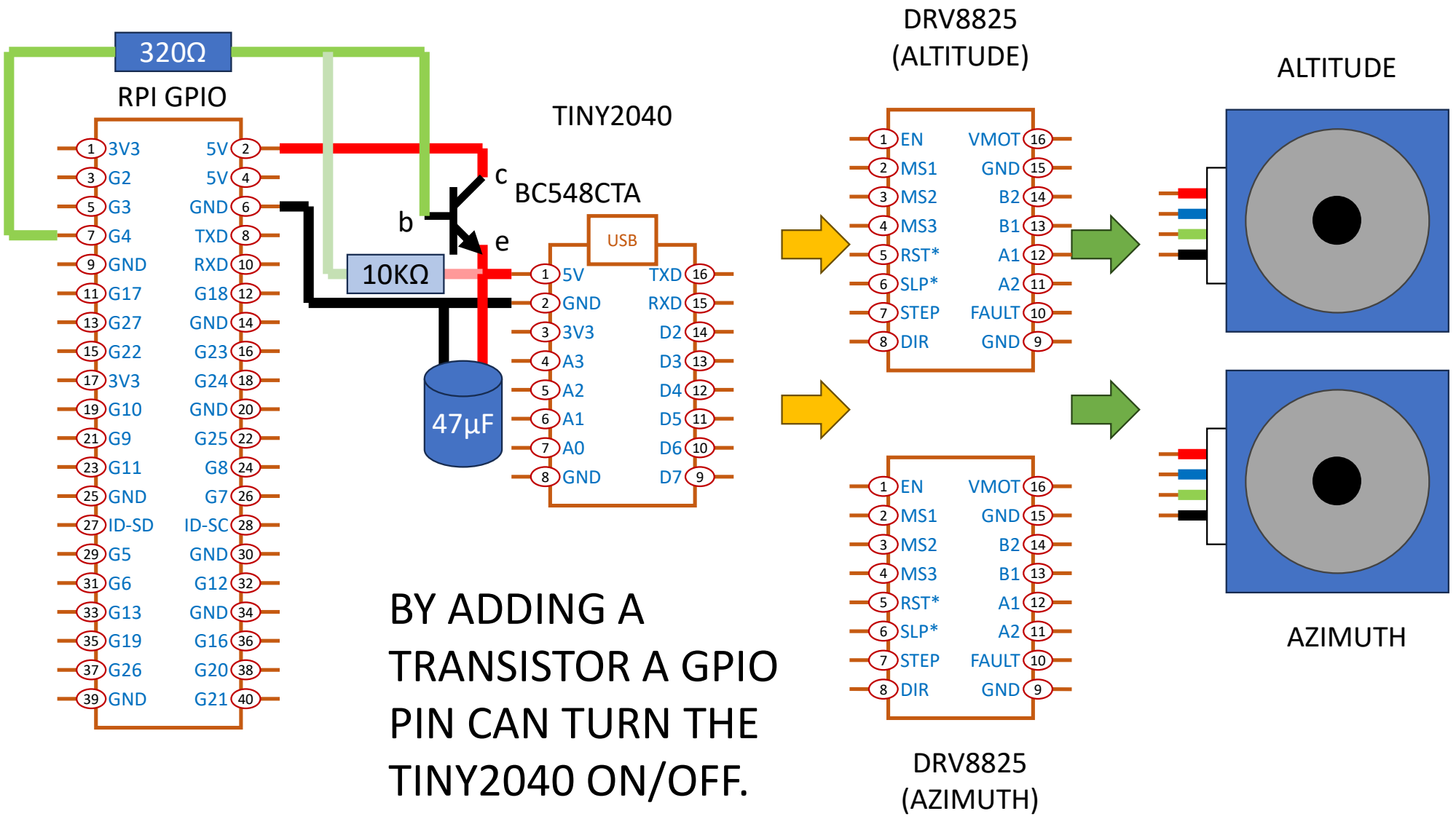

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
THE NEMA 17 STEPPER MOTORS HAVE 4 COLORED CABLES TO CONNECT TO THE DRV8825 CHIPS.


RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
WE CAN WORK THROUGH
THE VARIOUS
CONNECTIONS IN TURN.

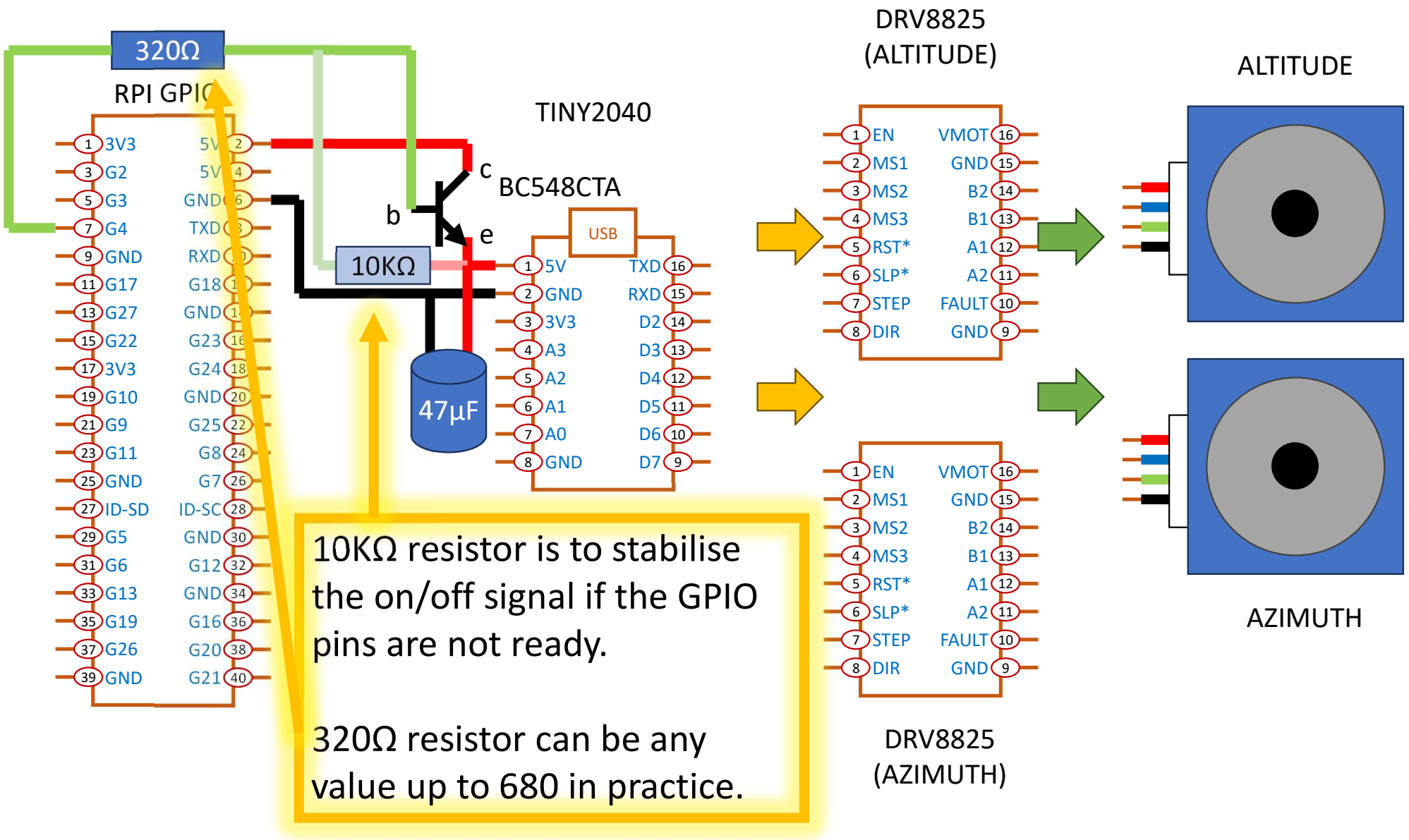

RPI GPIO
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
5V 2
5V 4
GND 6
TXD 8
RXD 10
G18 12
GND 14
G23 16
G24 18
GND 20
G25 22
G8 24
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
47µF
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
TXD 16
RXD 15
D2 14
D3 13
D4 12
D5 11
D6 10
D7 9
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
POWER THE TINY2040
FROM GPIO.
PROBLEM: NO ABILITY
TO RESET!

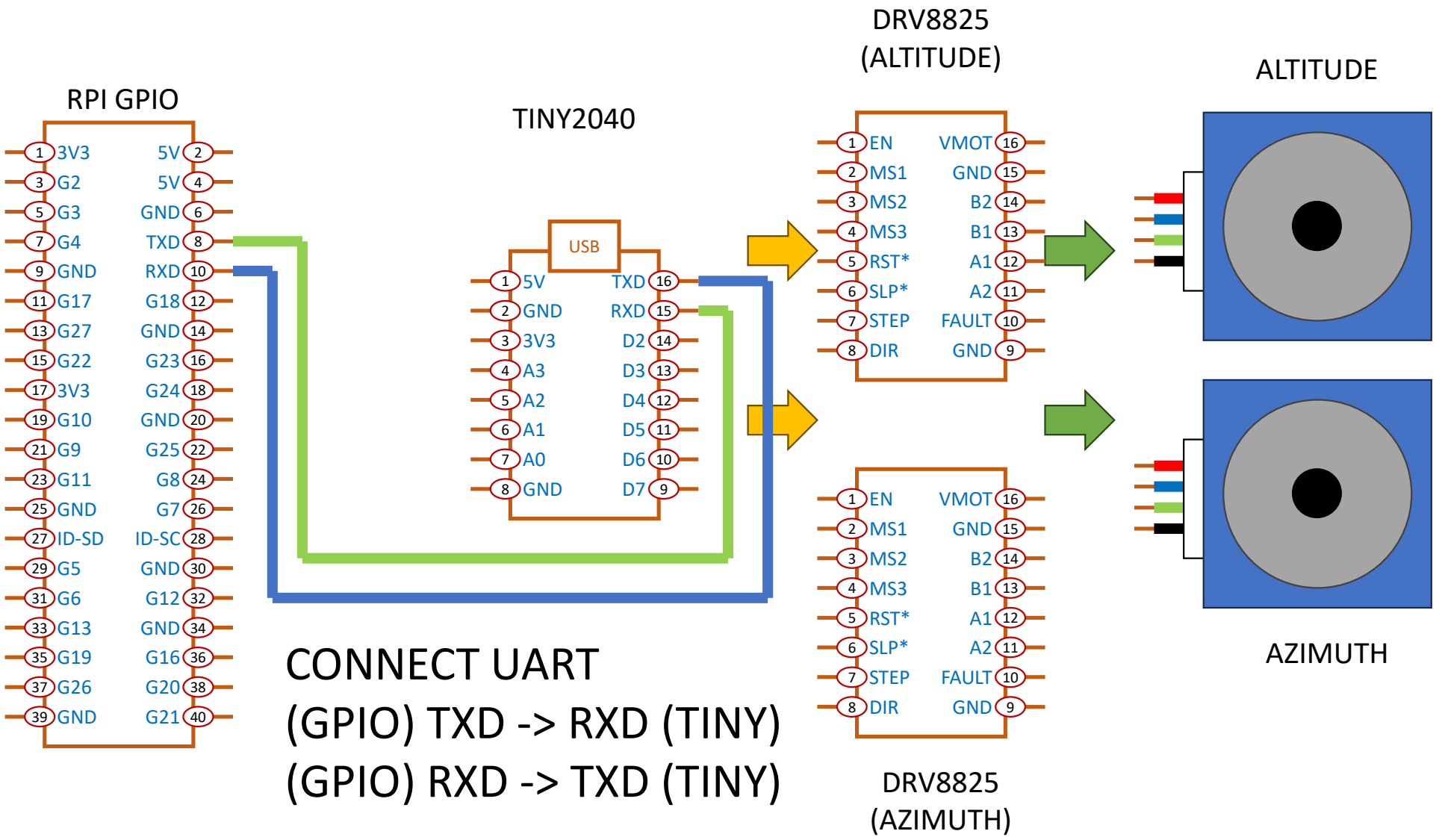

RPI GPIO
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
5V 2
5V 4
GND 6
TXD 8
RXD 10
G18 12
GND 14
G23 16
G24 18
GND 20
G25 22
G8 24
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
47µF
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
TXD 16
RXD 15
D2 14
D3 13
D4 12
D5 11
D6 10
D7 9
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
Capacitor is to protect from voltage spikes.

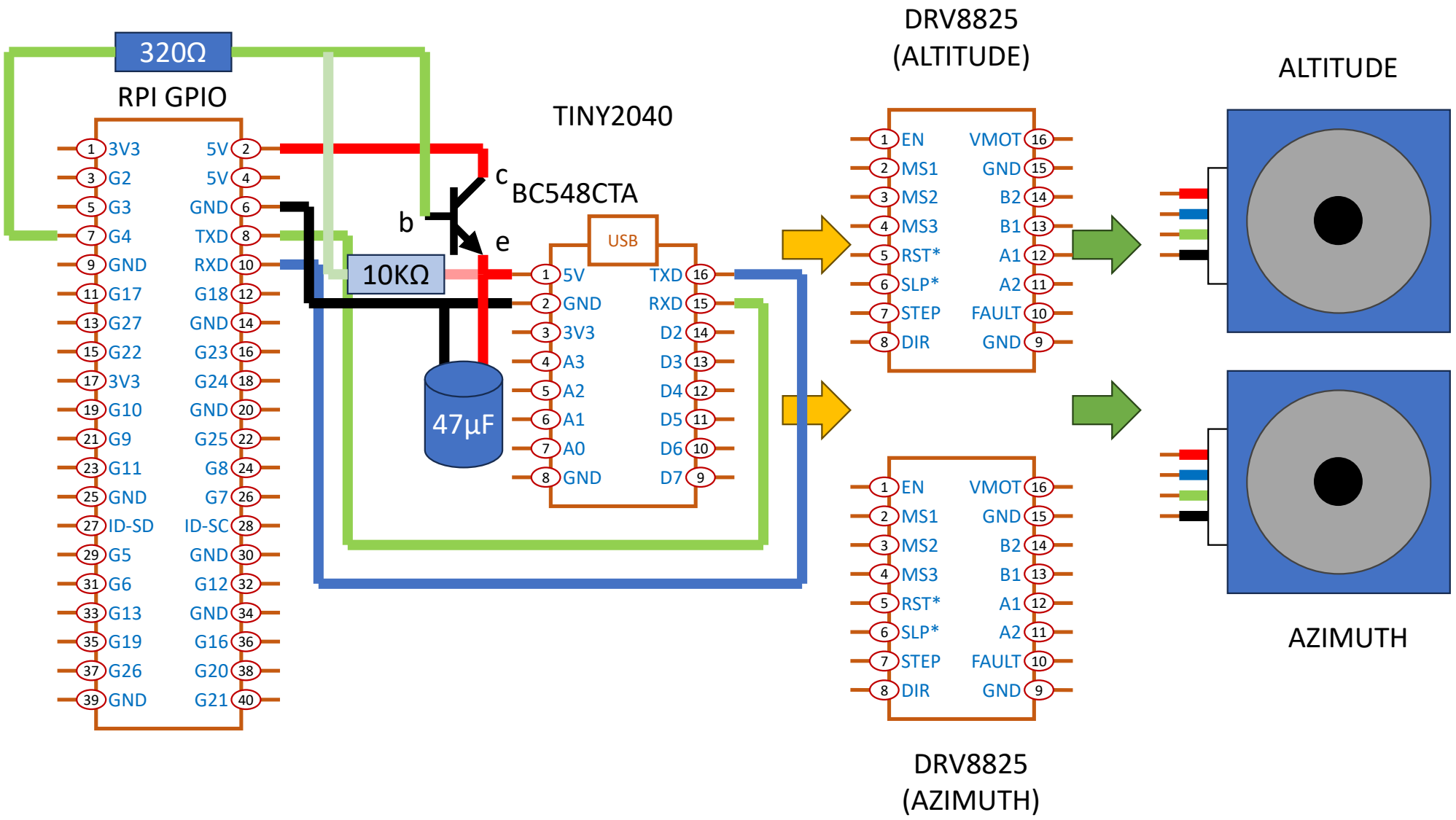

RPI GPIO
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
5V 2
5V 4
GND 6
TXD 8
RXD 10
G18 12
GND 14
G23 16
G24 18
GND 20
G25 22
G8 24
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
47µF
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
TXD 16
RXD 15
D2 14
D3 13
D4 12
D5 11
D6 10
D7 9
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
POWER THE TINY2040 FROM GPIO.
WE NEED A SWITCH

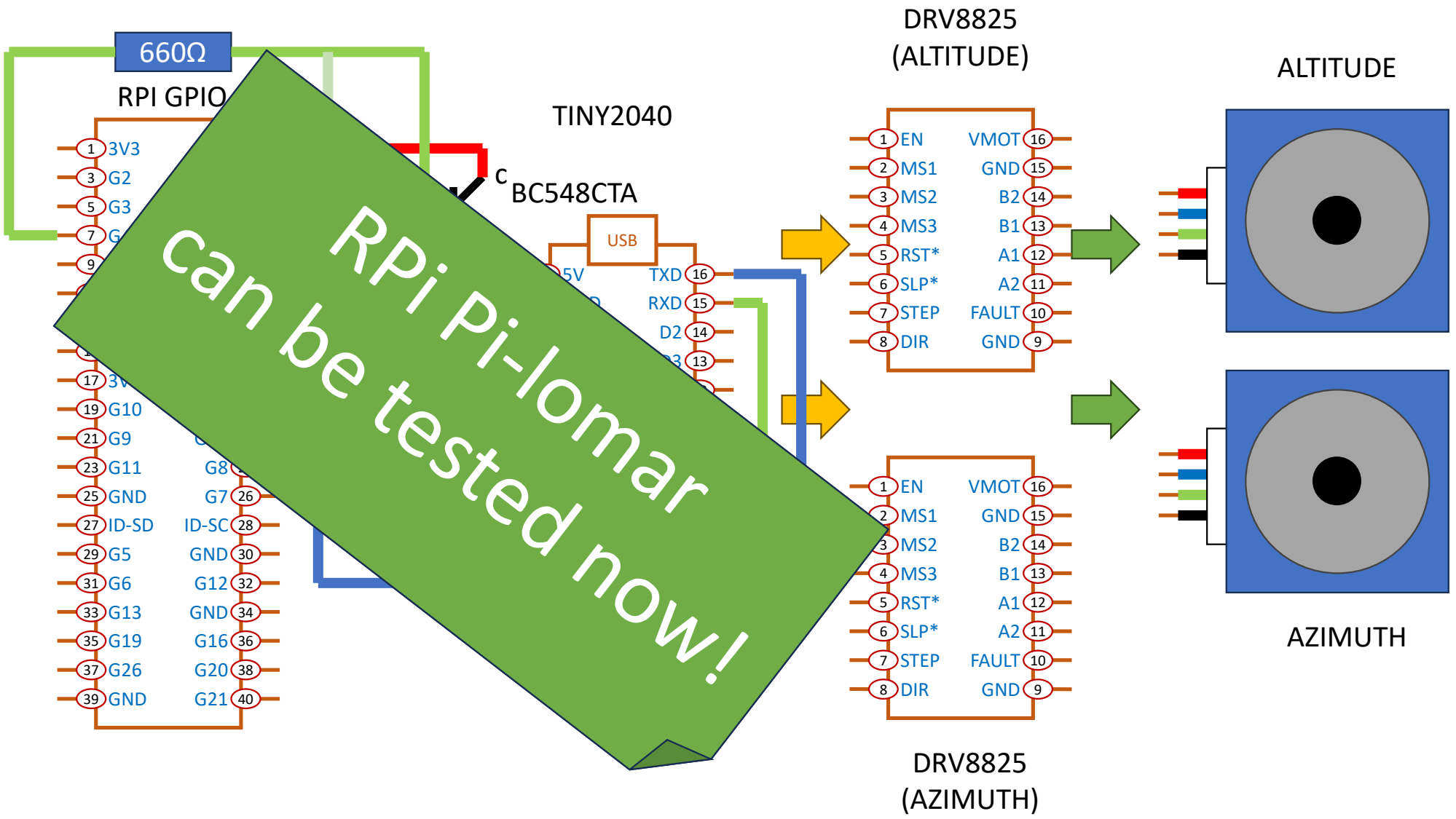


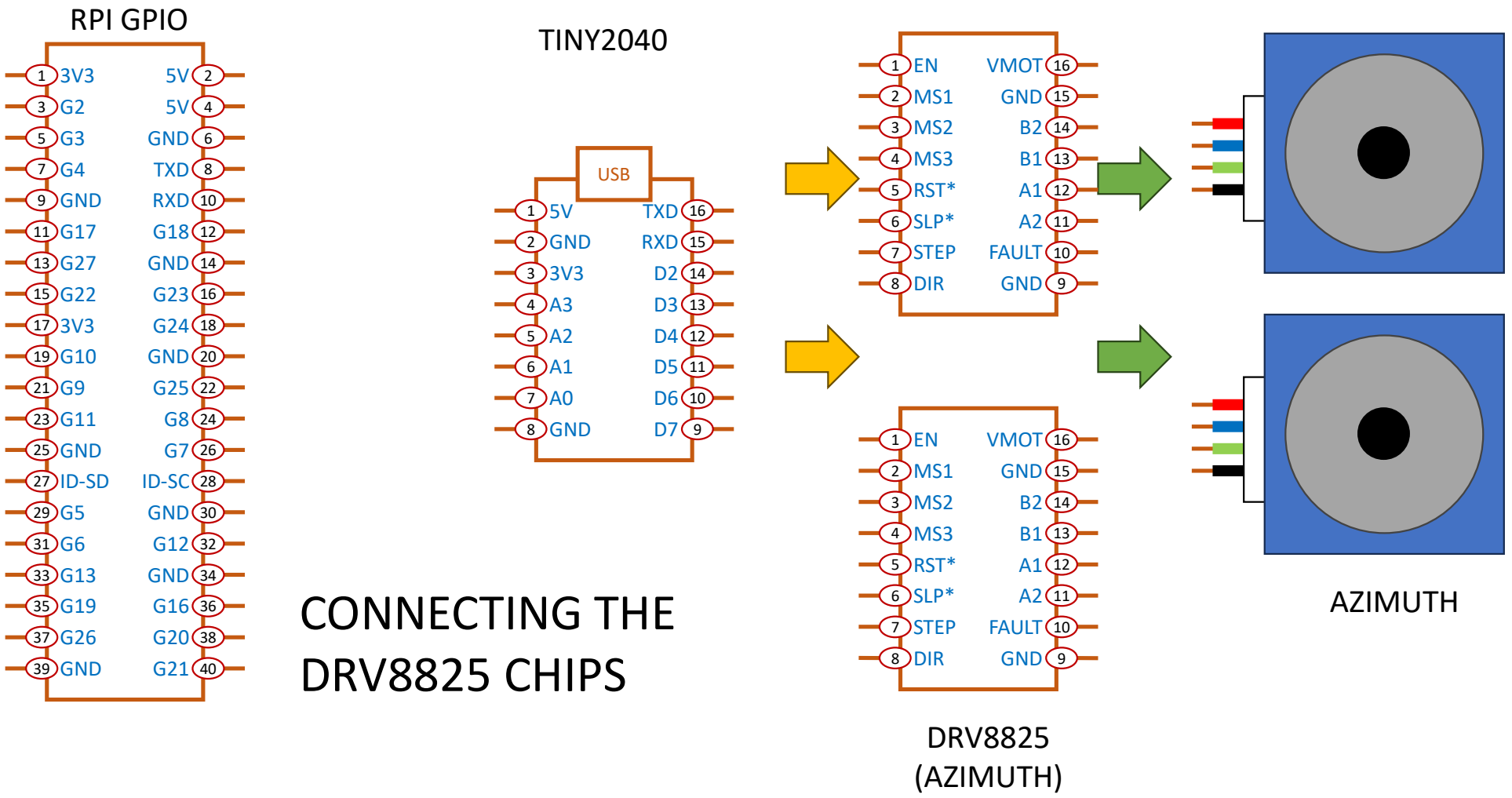
BY ADDING A TRANSISTOR A GPIO PIN CAN TURN THE TINY2040 ON/OFF.

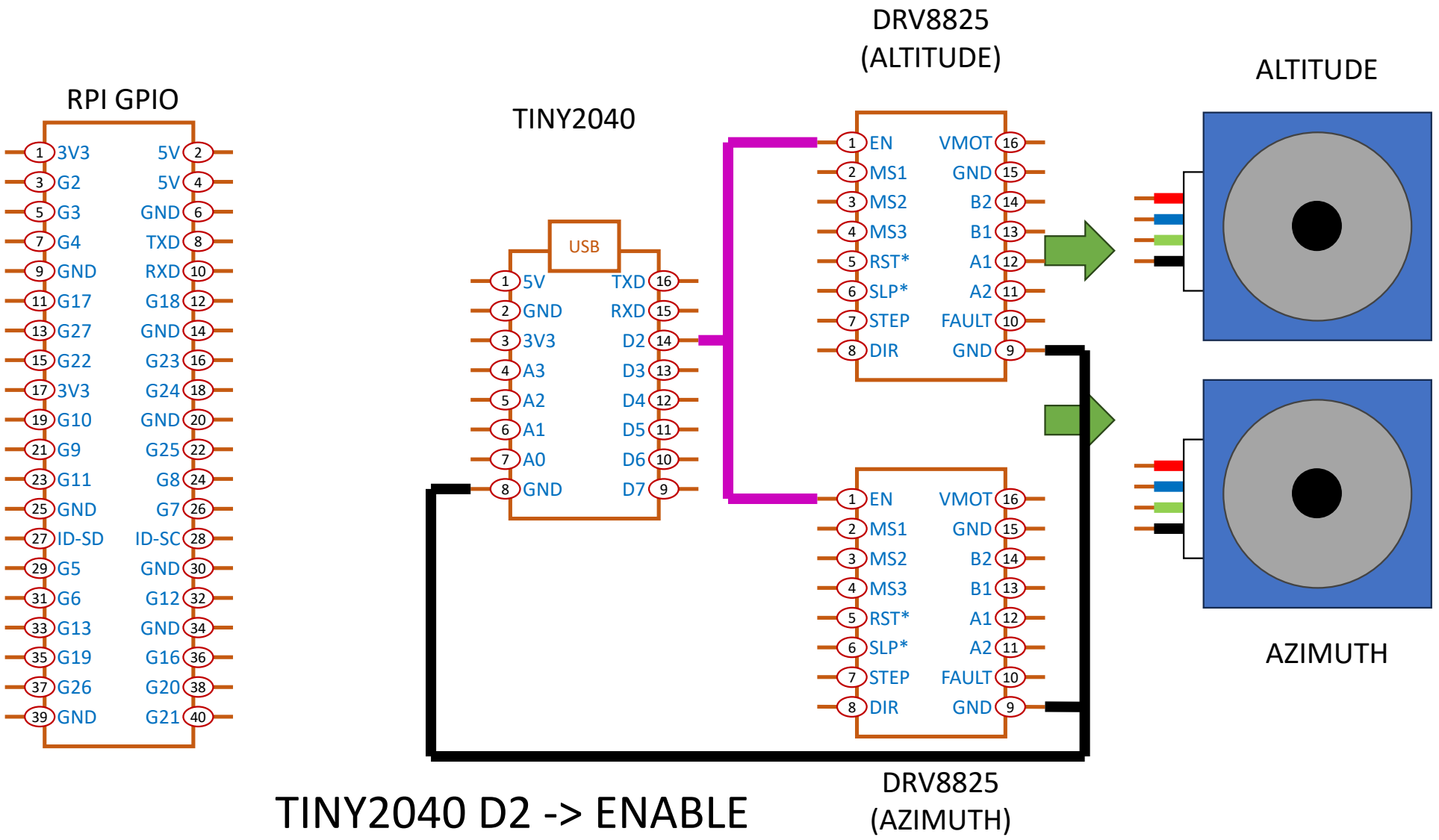

320Ω
RPI GPIO
TINY2040
c
BC548CTA
b
e
10KΩ
47µF
USB
DRV8825
(ALTITUDE)
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
10KΩ resistor is to stabilise the on/off signal if the GPIO pins are not ready.
320Ω resistor can be any value up to 680 in practice.

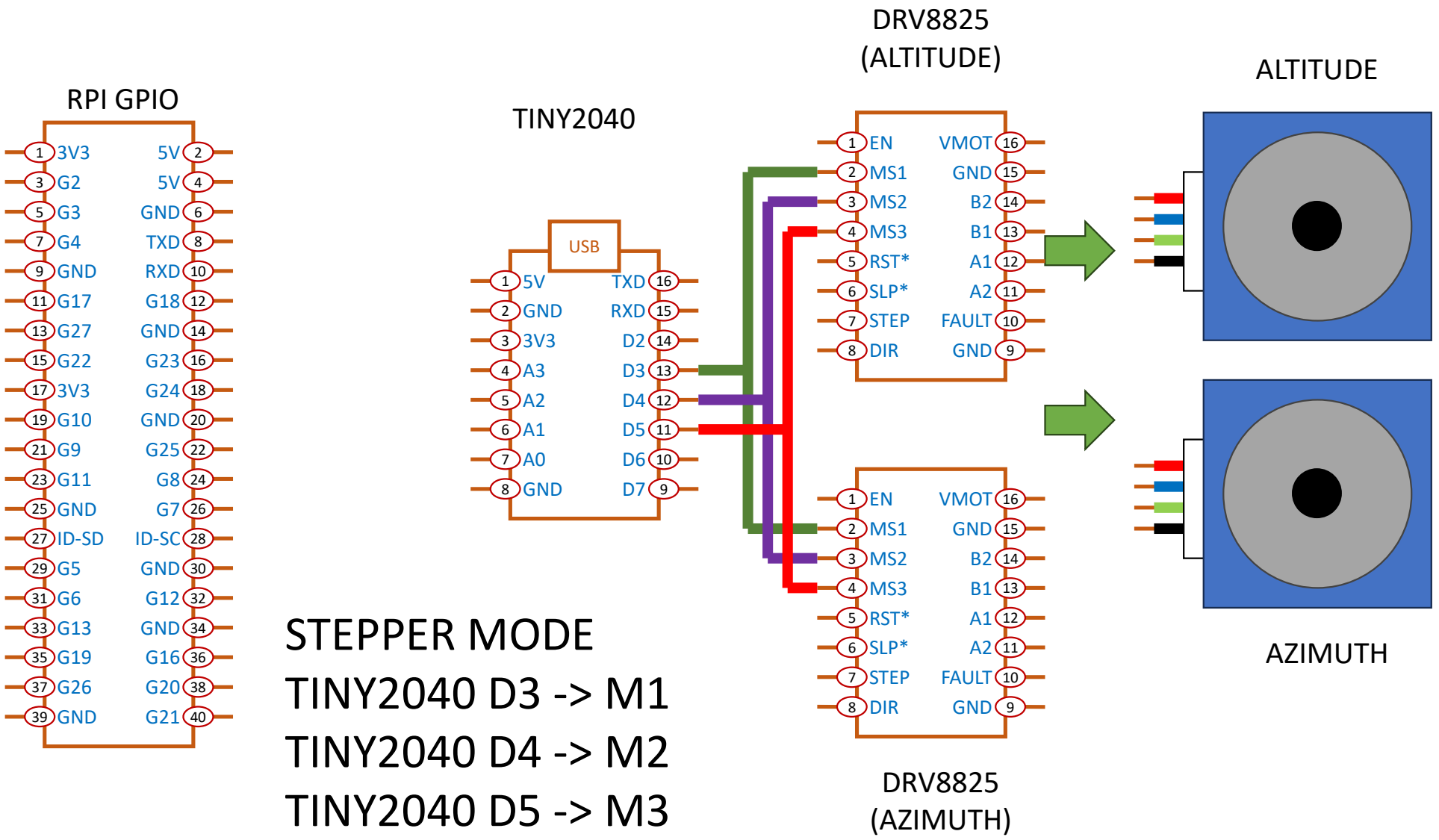

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
CONNECT UART
(GPIO) TXD -> RXD (TINY)
(GPIO) RXD -> TXD (TINY)

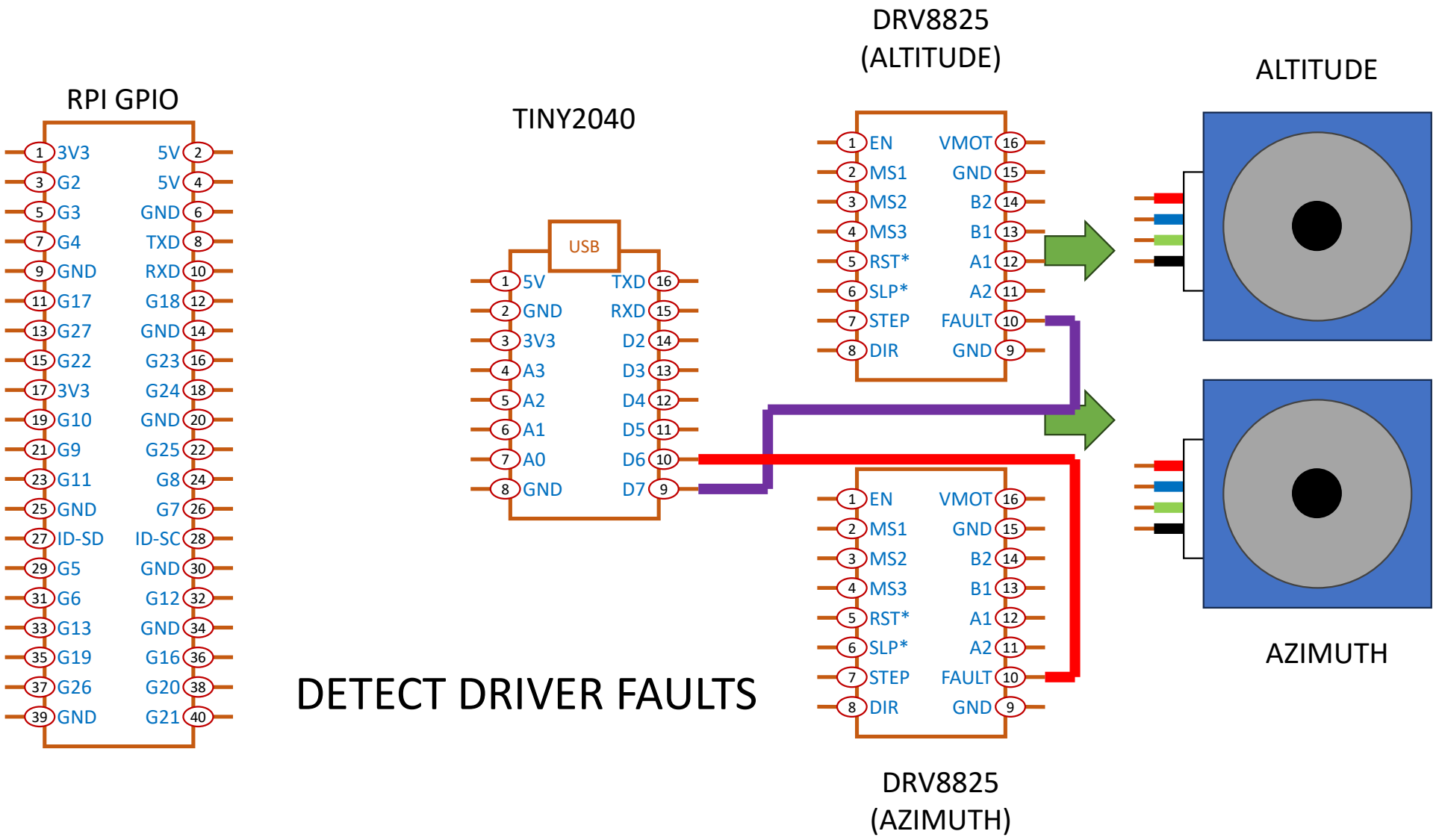

320Ω
RPI GPIO
TINY2040
c
BC548CTA
b
e
10KΩ
47µF
USB
DRV8825
(ALTITUDE)
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
2 5V
4 5V
6 GND
8 TXD
10 RXD
12 G18
14 GND
16 G23
18 G24
20 GND
22 G25
24 G8
26 G7
28 ID-SC
30 GND
32 G12
34 GND
36 G16
38 G20
40 G21
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND

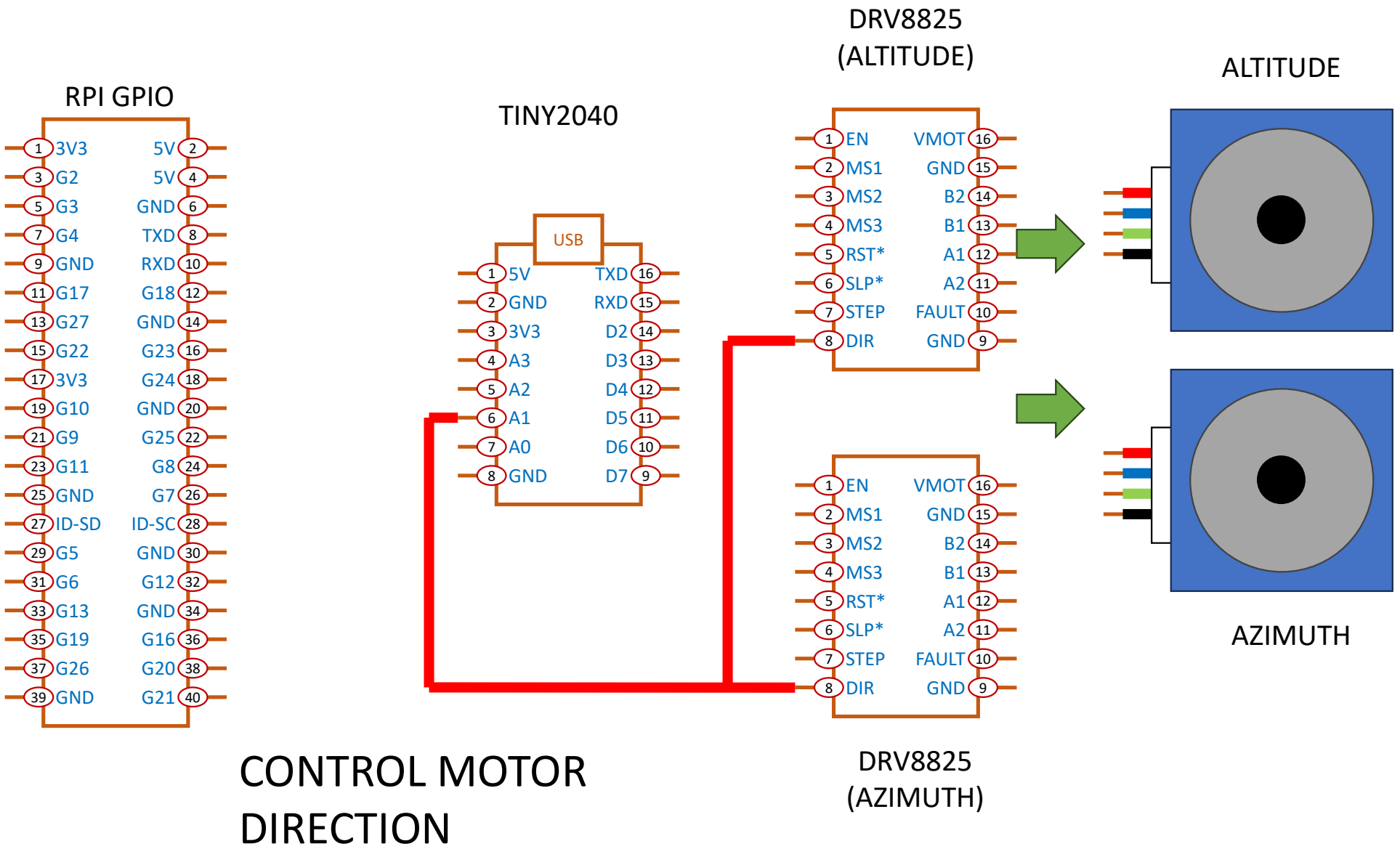

660Ω
RPI GPIO
TINY2040
BC548CTA
USB
DRV8825
(ALTITUDE)
ALTITUDE
DRV8825
(AZIMUTH)
AZIMUTH
RPi Pi-Iomar
can be tested now!
1 3V3
3 G2
5 G3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
G8
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
TXD 16
RXD 15
D2 14
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9

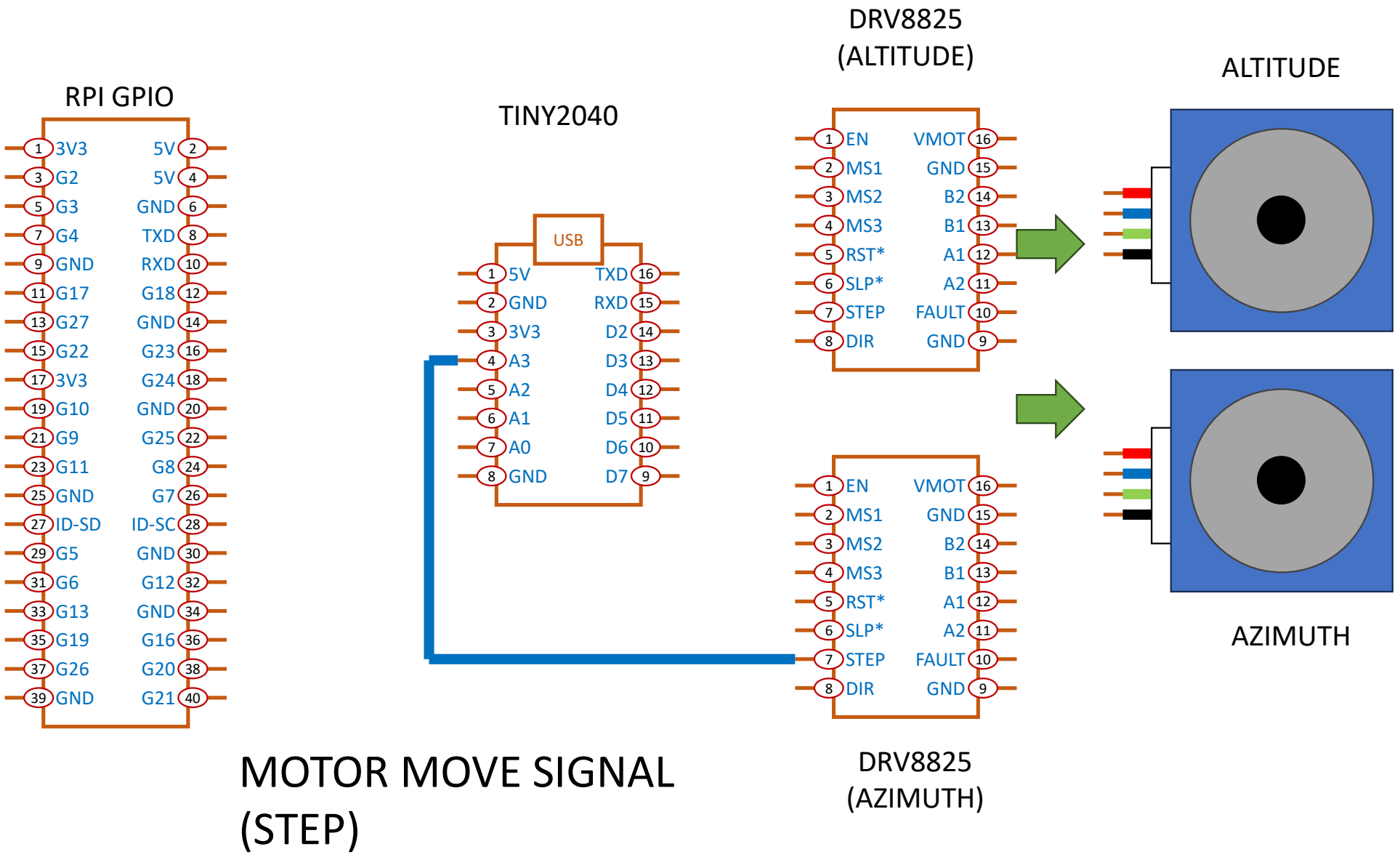

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
CONNECTING THE
DRV8825 CHIPS

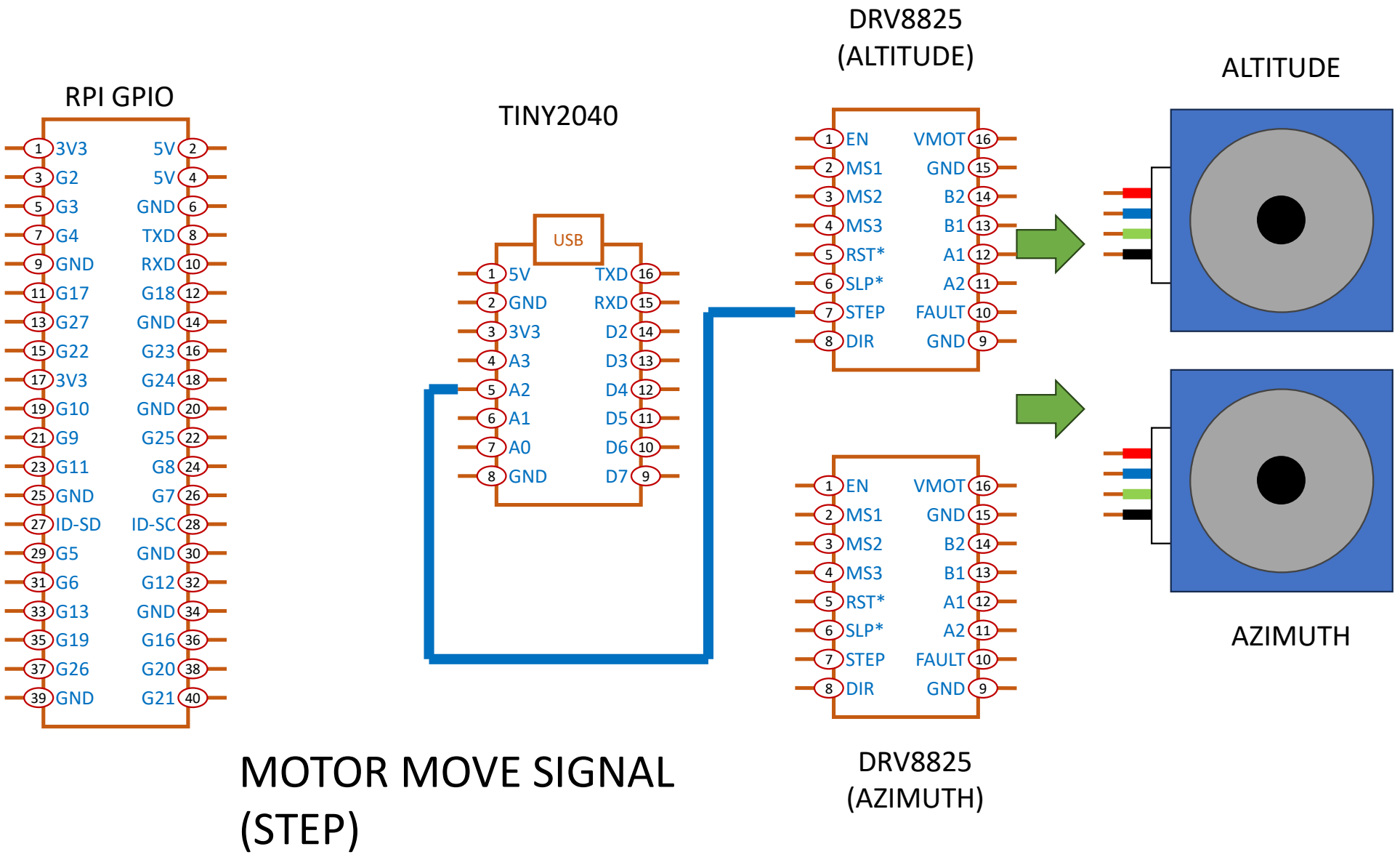

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
TINY2040 D2 -> ENABLE
GND - GND

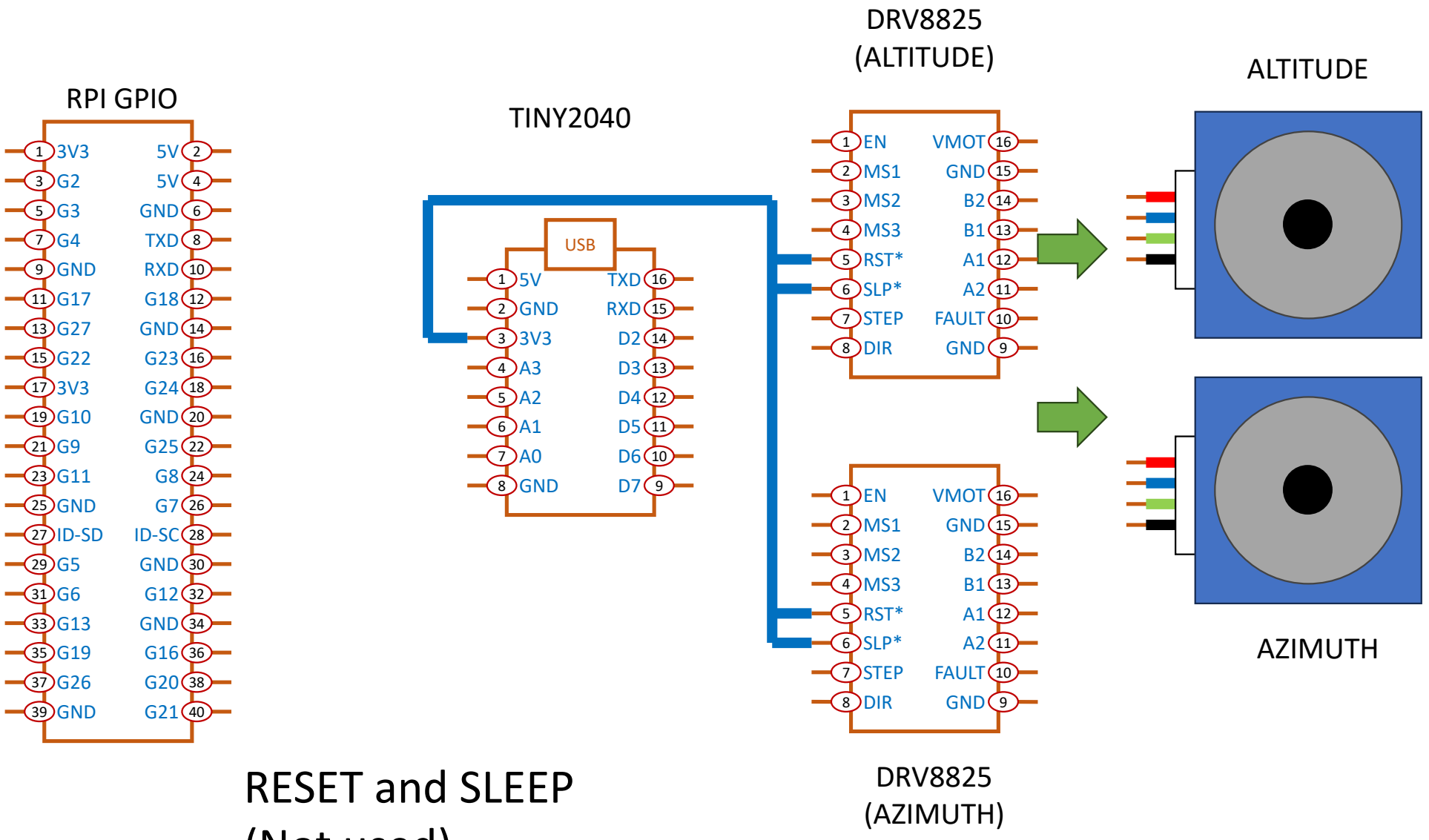

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
STEPPER MODE
TINY2040 D3 -> M1
TINY2040 D4 -> M2
TINY2040 D5 -> M3

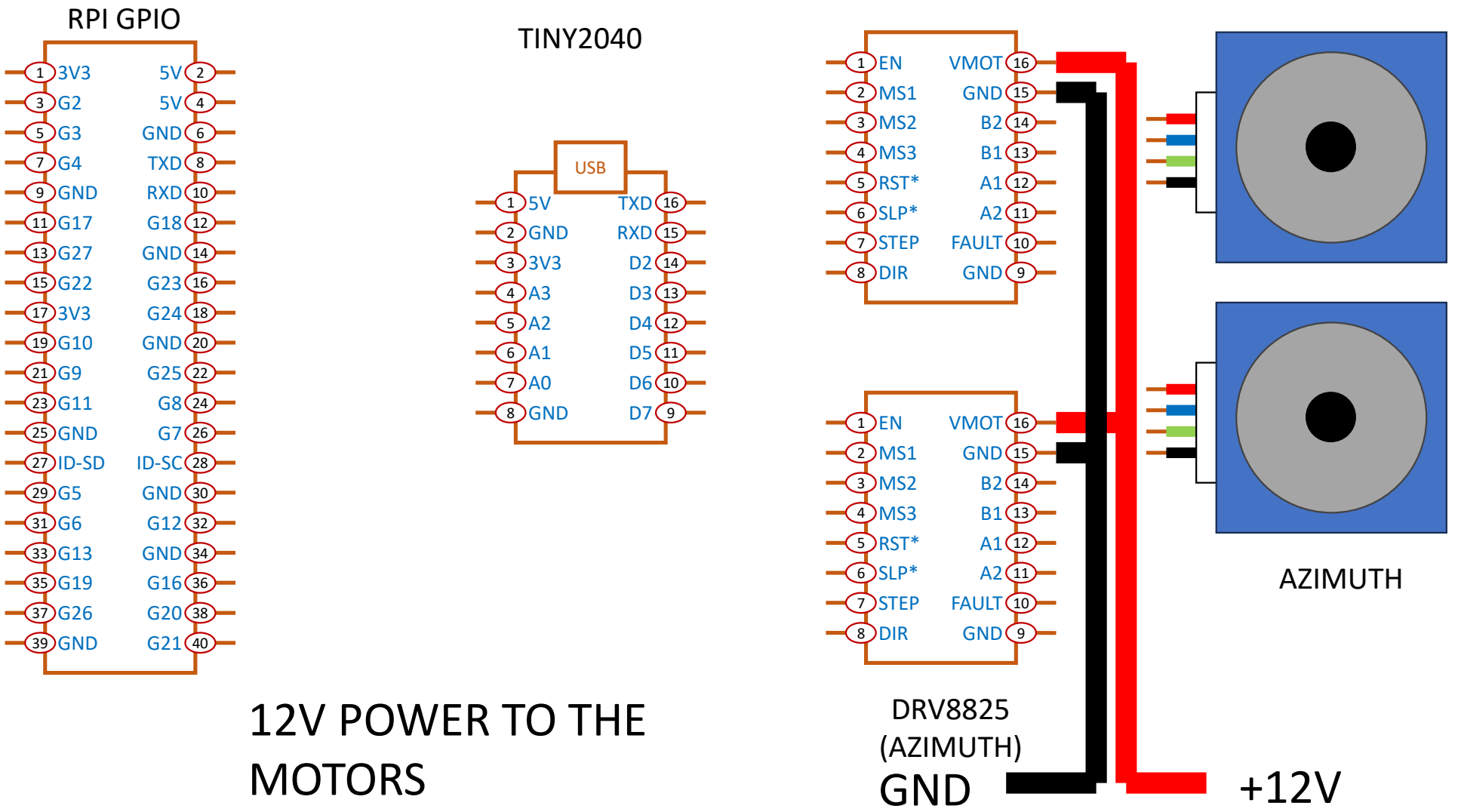

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
DETECT DRIVER FAULTS
DRV8825
(AZIMUTH)
AZIMUTH

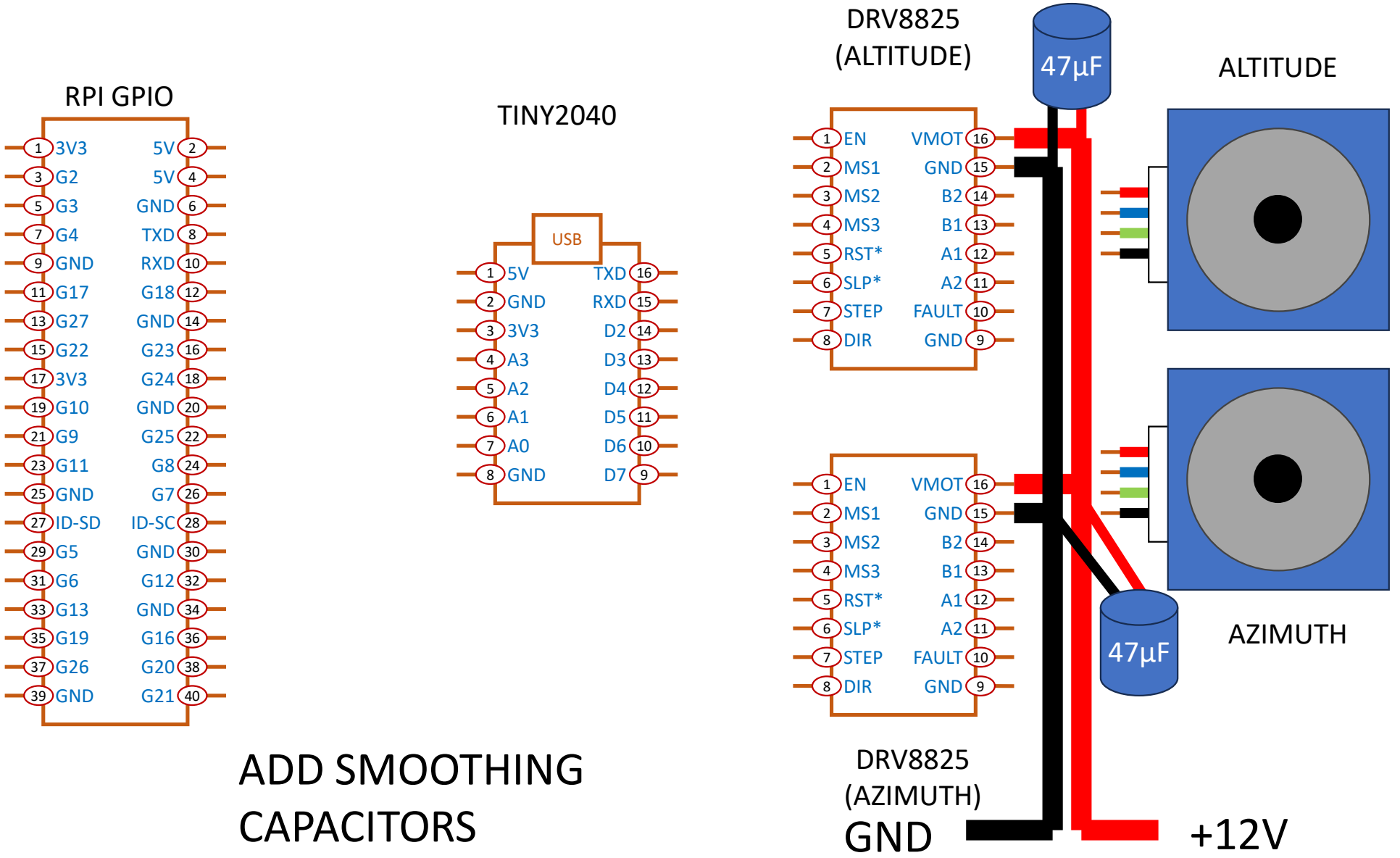

RPI GPIO
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
5V 2
5V 4
GND 6
TXD 8
RXD 10
G18 12
GND 14
G23 16
G24 18
GND 20
G25 22
G8 24
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
TXD 16
RXD 15
D2 14
D3 13
D4 12
D5 11
D6 10
D7 9
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
CONTROL MOTOR
DIRECTION

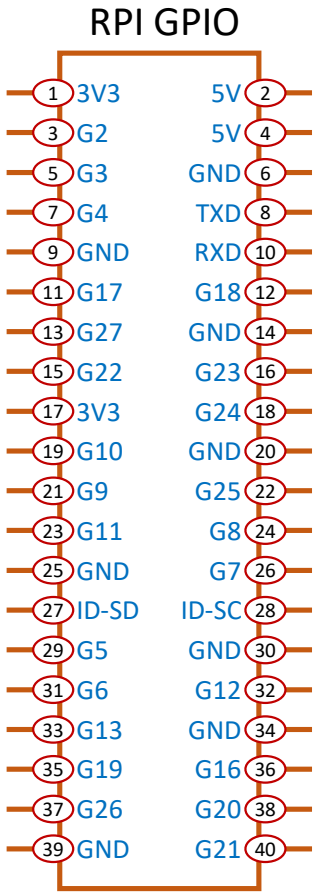

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
MOTOR MOVE SIGNAL
(STEP)

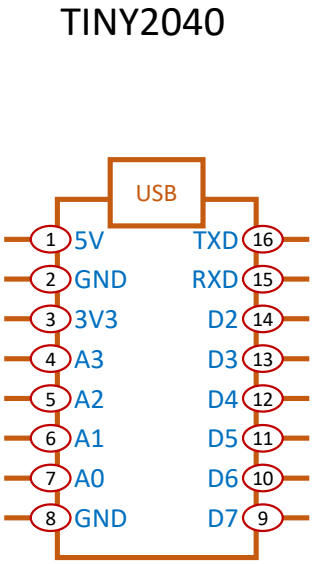

RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
MOTOR MOVE SIGNAL
(STEP)

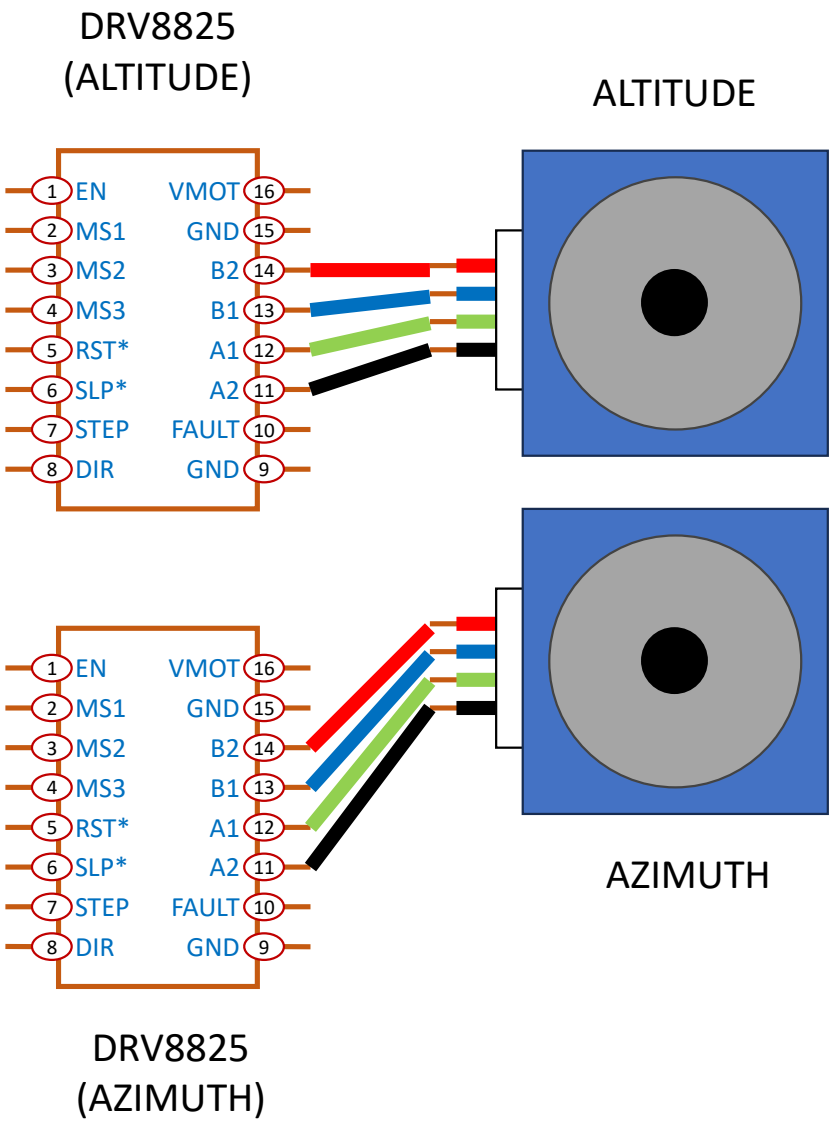

RPI GPIO
1 3V3
3 G2
5 G3
7 G4
9 GND
11 G17
13 G27
15 G22
17 3V3
19 G10
21 G9
23 G11
25 GND
27 ID-SD
29 G5
31 G6
33 G13
35 G19
37 G26
39 GND
5V 2
5V 4
GND 6
TXD 8
RXD 10
G18 12
GND 14
G23 16
G24 18
GND 20
G25 22
G8 24
G7 26
ID-SC 28
GND 30
G12 32
GND 34
G16 36
G20 38
G21 40
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
TXD 16
RXD 15
D2 14
D3 13
D4 12
D5 11
D6 10
D7 9
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
VMOT 16
GND 15
B2 14
B1 13
A1 12
A2 11
FAULT 10
GND 9
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
RESET and SLEEP
(Not used)


RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
ALTITUDE
AZIMUTH
DRV8825
(AZIMUTH)
12V POWER TO THE
MOTORS
GND
+12V


RPI GPIO
1 3V3
2 5V
3 G2
4 5V
5 G3
6 GND
7 G4
8 TXD
9 GND
10 RXD
11 G17
12 G18
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 G10
20 GND
21 G9
22 G25
23 G11
24 G8
25 GND
26 G7
27 ID-SD
28 ID-SC
29 G5
30 GND
31 G6
32 G12
33 G13
34 GND
35 G19
36 G16
37 G26
38 G20
39 GND
40 G21
TINY2040
USB
1 5V
2 GND
3 3V3
4 A3
5 A2
6 A1
7 A0
8 GND
16 TXD
15 RXD
14 D2
13 D3
12 D4
11 D5
10 D6
9 D7
DRV8825
(ALTITUDE)
1 EN
2 MS1
3 MS2
4 MS3
5 RST*
6 SLP*
7 STEP
8 DIR
16 VMOT
15 GND
14 B2
13 B1
12 A1
11 A2
10 FAULT
9 GND
47µF
ALTITUDE
AZIMUTH
47µF
DRV8825
(AZIMUTH)
GND
+12V
ADD SMOOTHING
CAPACITORS







CONNECT THE MOTORS