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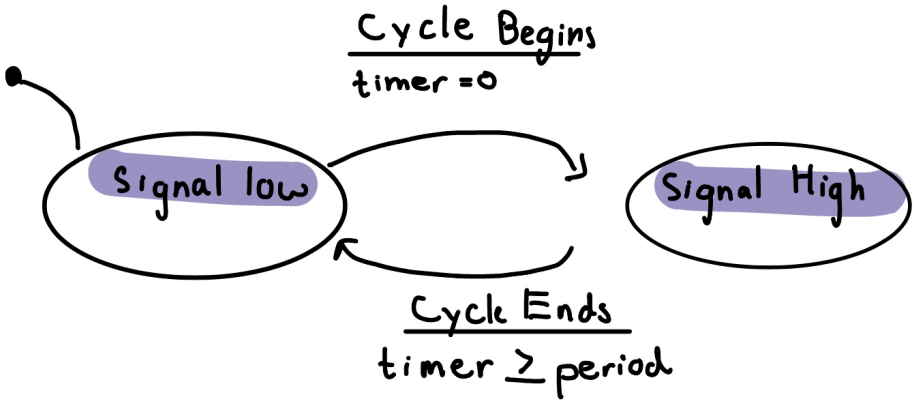
# Prelab 3

## Part 0 – Preparation for the Lab

1. What one thing and one thing only will you stick into the 14-pin connectors on the boards?

   I will ribbon cables only to the 14-pin connectors on the board.

2. Draw a detailed state diagram for a hypothetical software PWM driver. Include an example plot of the expected output signal for a given frequency and duty cycle.



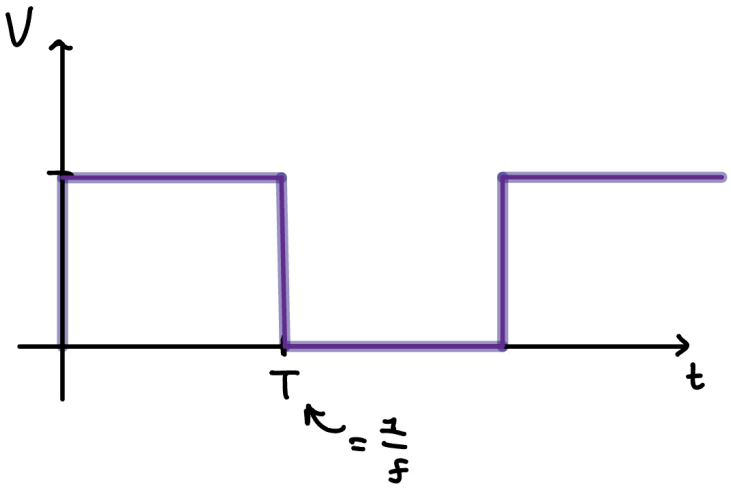




Figure 1:

## Part 1 – Driving an RC Servo

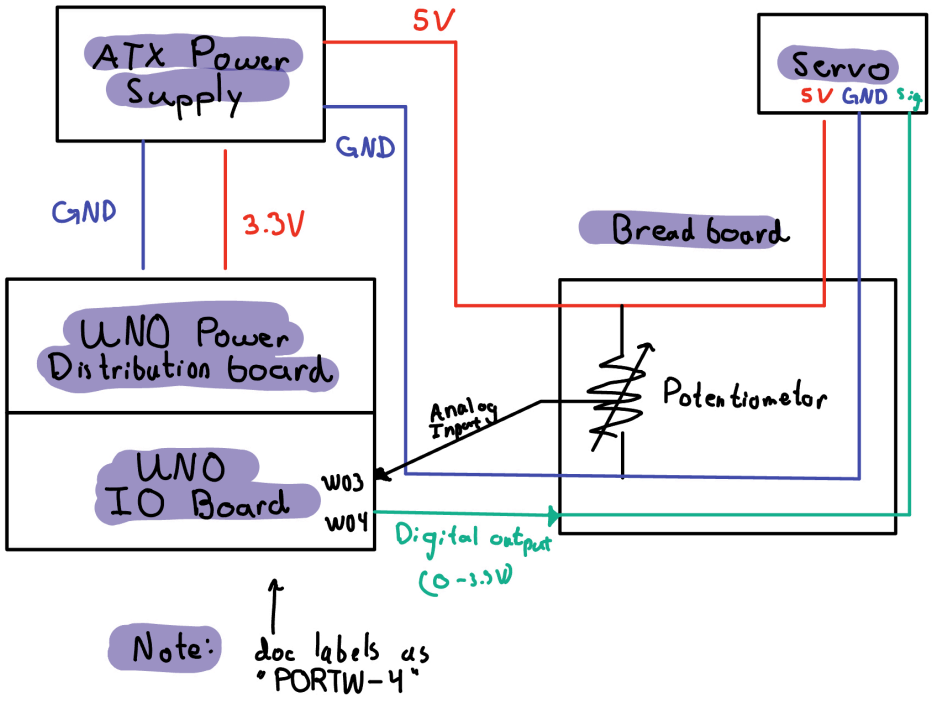



Figure 2:

## Part 2 – Unidirectional Drive of a DC Motor

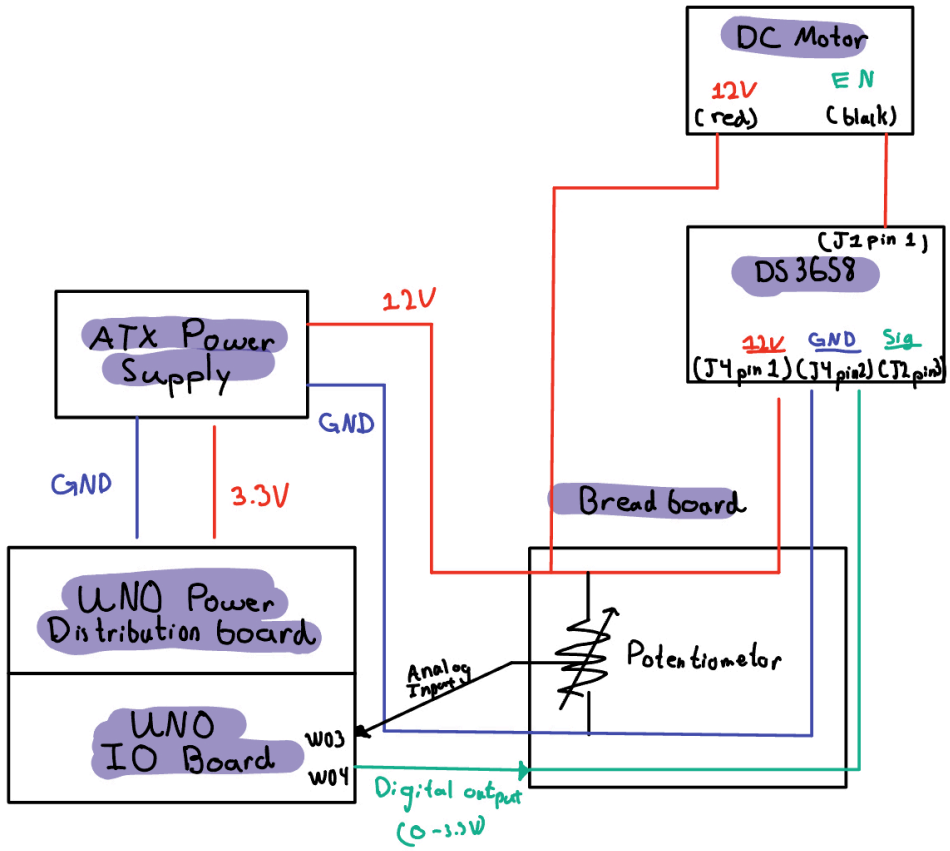



Figure 3:

```
int main() {
  // ...
```

```
  // Initialization Section
  AD_Init();
  PWM_Init();
  RC_Init();

  // Specify Pin Usage:
  AD_AddPins(AD_PORTV3|AD_PORTV4);
  RC_AddPins(RC_PORTX03|RC_PORTX04);

  // ...
}
```

## Part 3 – Snubbing the Inductive Kickback

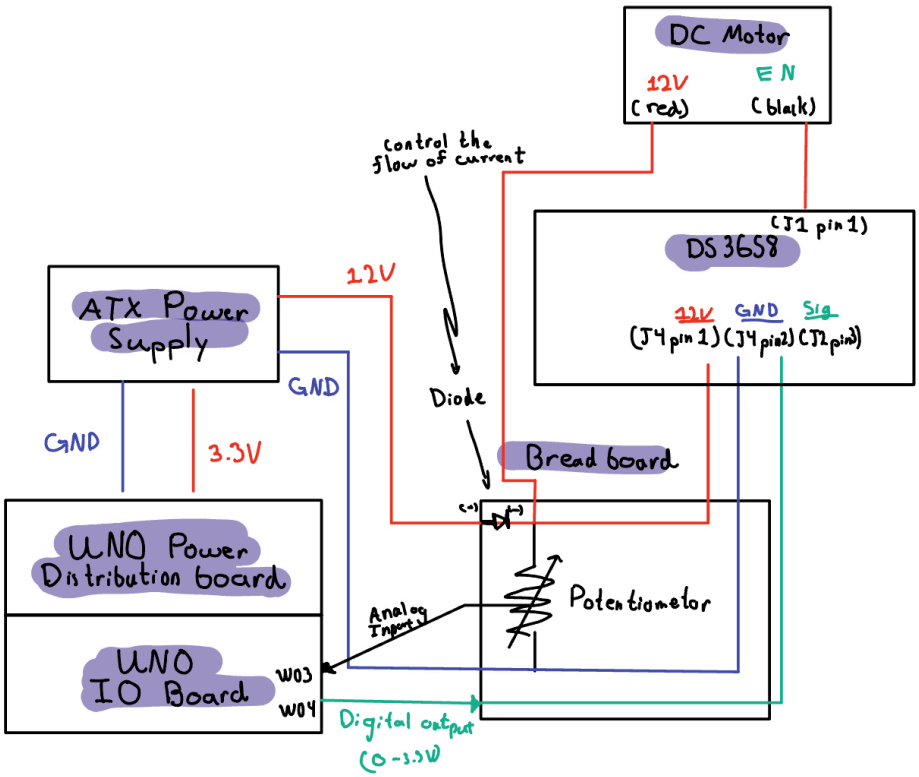



Figure 4:

## Part 4 – Bidirectional Control of a DC Motor

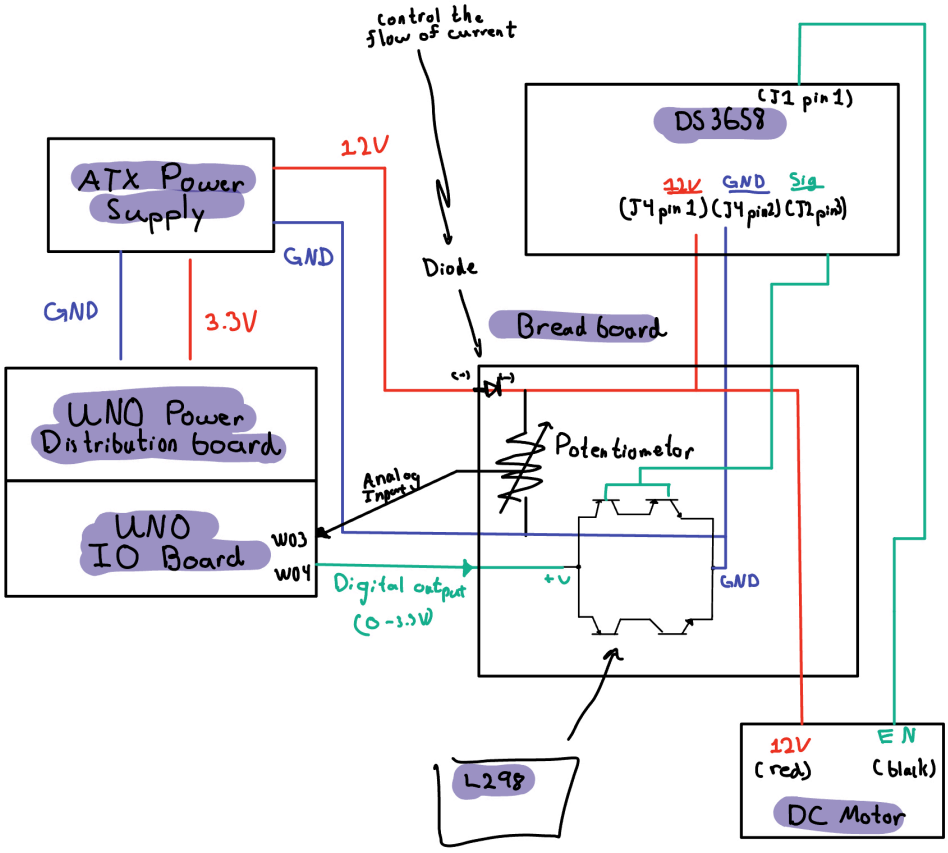



Figure 5:

```c
int main() {
  // ...

  // Initialization Section
  AD_Init();
  PWM_Init();
  RC_Init();

  // Specify Pin Usage:
  AD_AddPins(AD_PORTV3|AD_PORTV4);
  RC_AddPins(RC_PORTX04|RC_PORTX05);

  // ...
}
```

## Part 5 – Control of a Stepper Motor

**Note**: The Arrows are determined by the step which is either counter-clockwise or clockwise

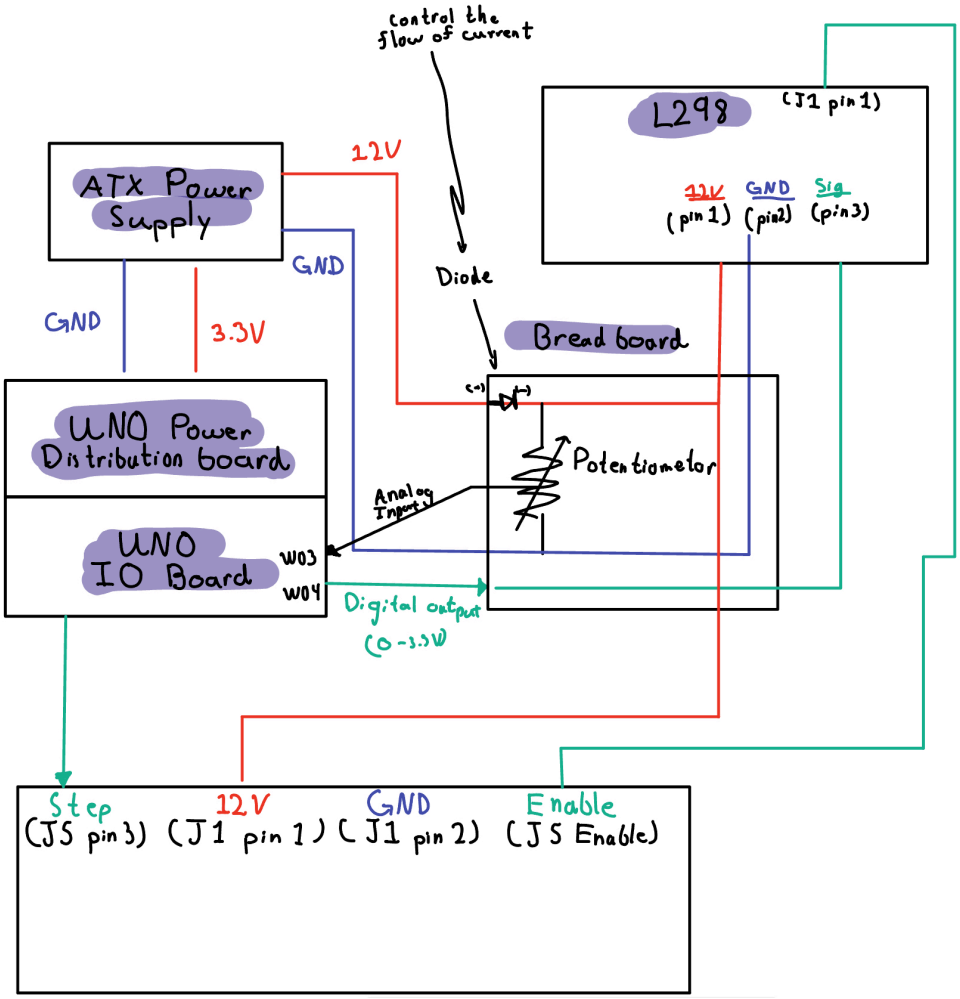



Figure 6:

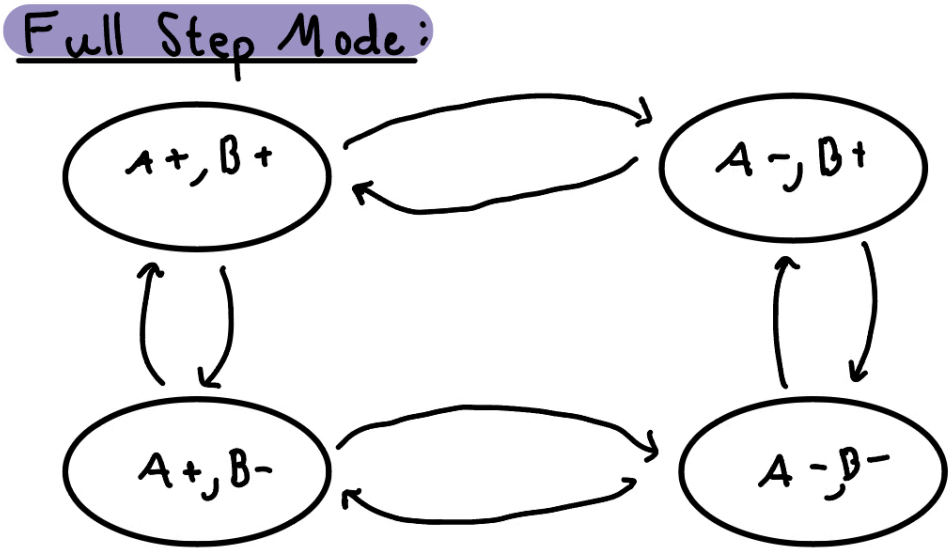



Figure 7:

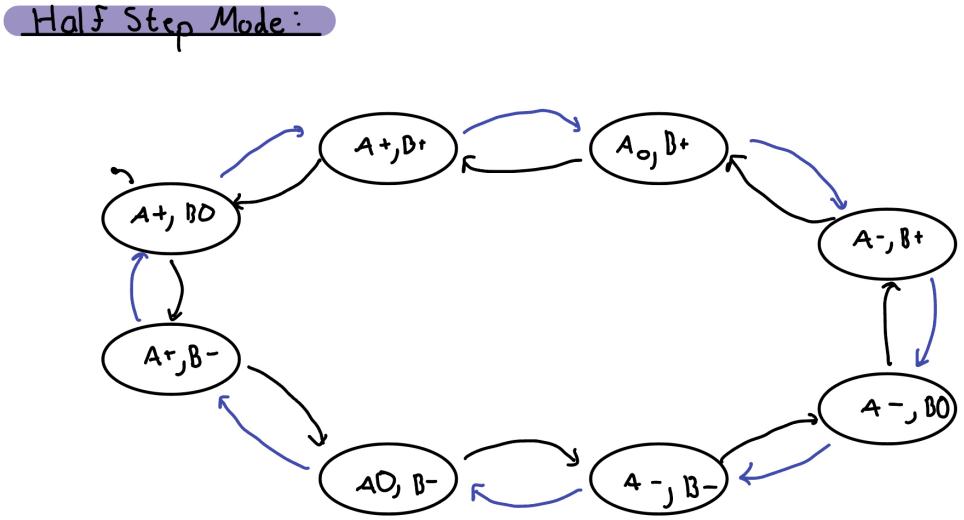



Figure 8:

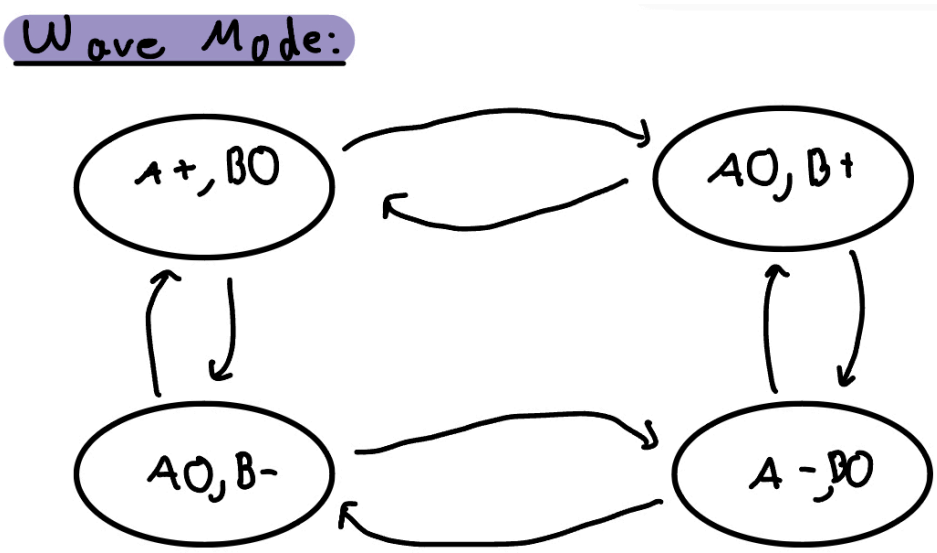



Figure 9:

| Coil Polarity | Binary Value |
|---|---|
| A+ (positive) | 10 |
| A0 (not energized) | 00 |
| A- (negative) | 01 |
| B+ (positive) | 10 |
| B0 (not energized) | 00 |
| B- (negative) | 01 |

```
int main() {
  // ...
```

```
  // Initialization Section
  AD_Init();
  LED_Init();
  PWM_Init();
  RC_Init();

  // Specify Pin Usage:
  AD_AddPins(AD_PORTV3|AD_PORTV4);
  RC_AddPins(RC_PORTX03|RC_PORTX04|RC_PORTX05);

  // ...
}
```

## Part 6 – Stepper Motor using Dedicated Board

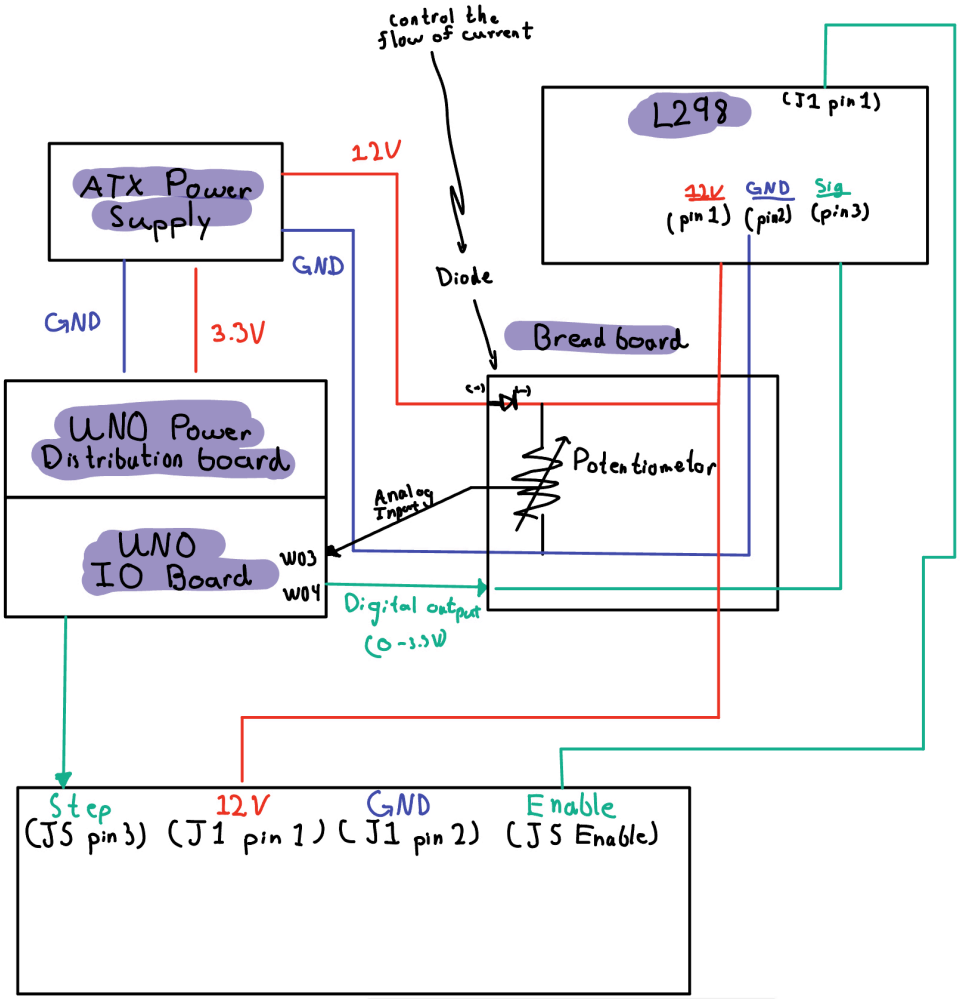



Figure 10:

```
int main() {
  // ...

  // Initialization Section
  AD_Init();
  LED_Init();
  PWM_Init();
  RC_Init();
  HSM_Init();

  // Specify Pin Usage:
  AD_AddPins(AD_PORTV3|AD_PORTV4);
```

```
  RC_AddPins(RC_PORTX03|RC_PORTX04|RC_PORTX05);

  // ...
}
```