

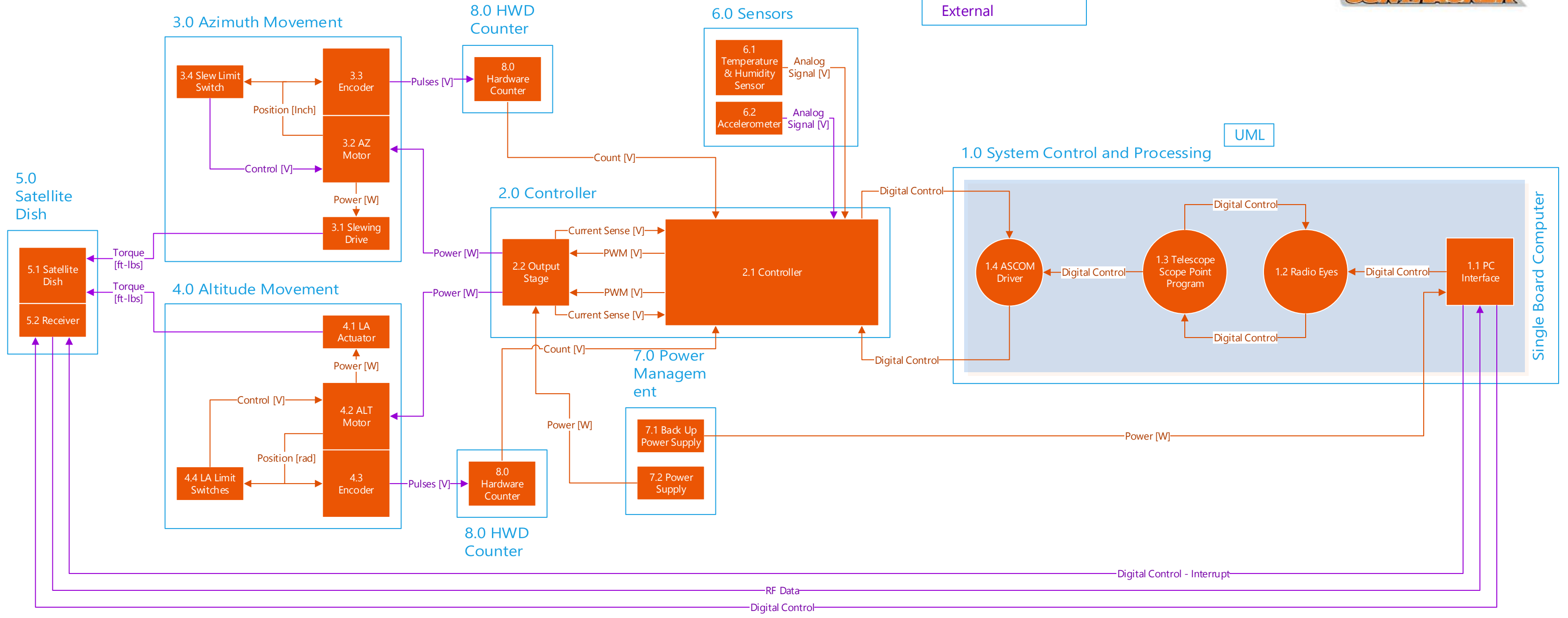
**Main Page**  
Please Click a System Block For Additional Information



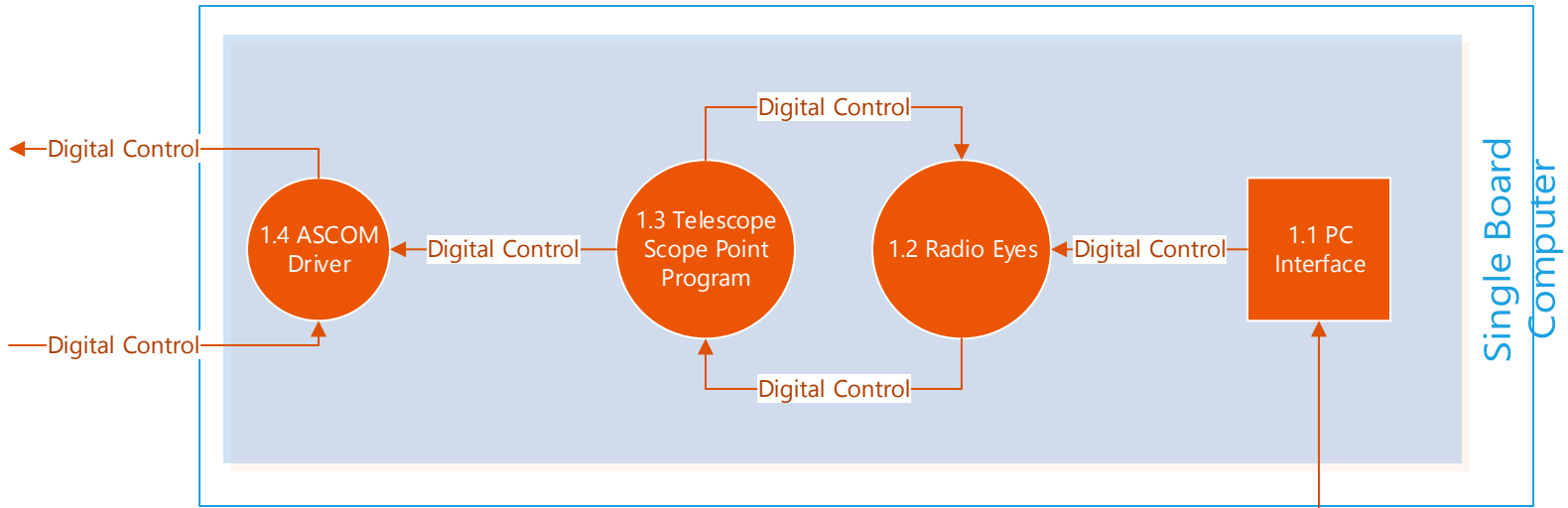
**Connection Legend**

Internal  
External

UML



# 1.0 System Control and Processing



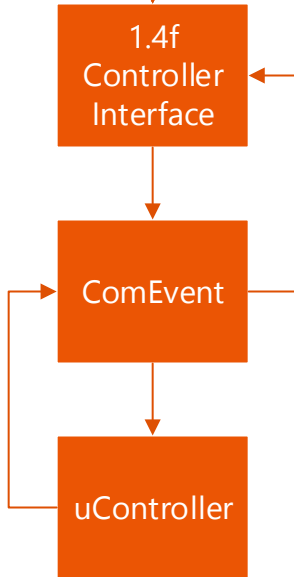
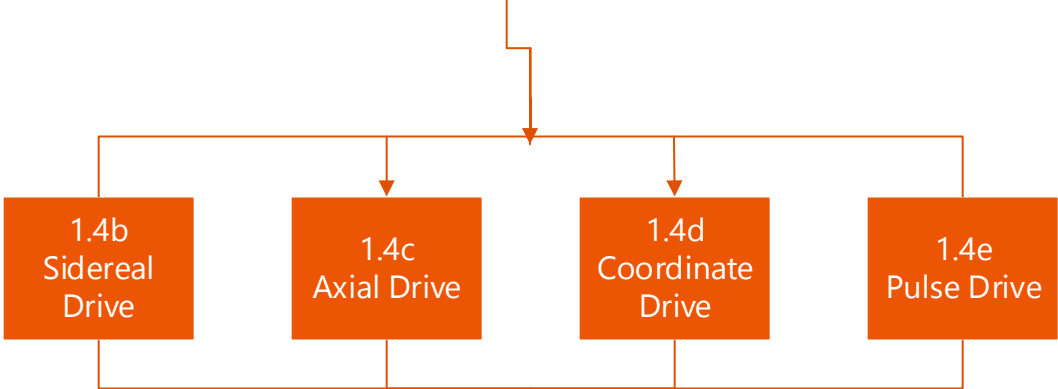
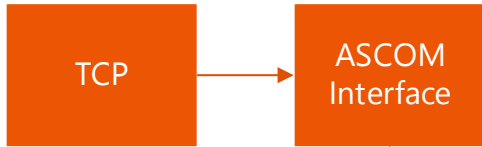
Component	Selection
1.1	PC Interface
1.2	Radio Eyes
1.3	Telescope Scope Point Program
1.4	ASCOM Driver

Power [W]

[Click Here to Return to Top Level](#)



# 1.4 Driver Design

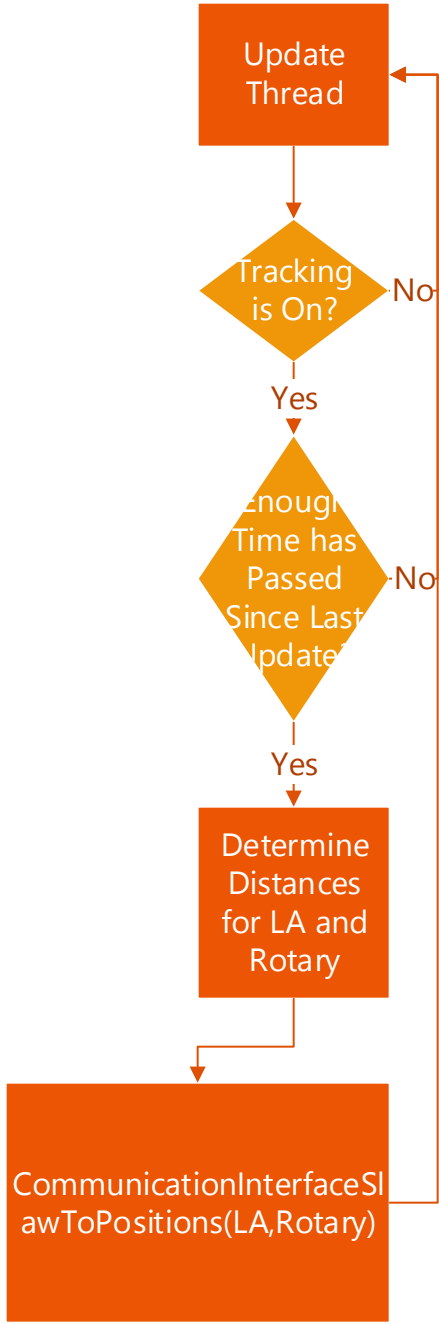
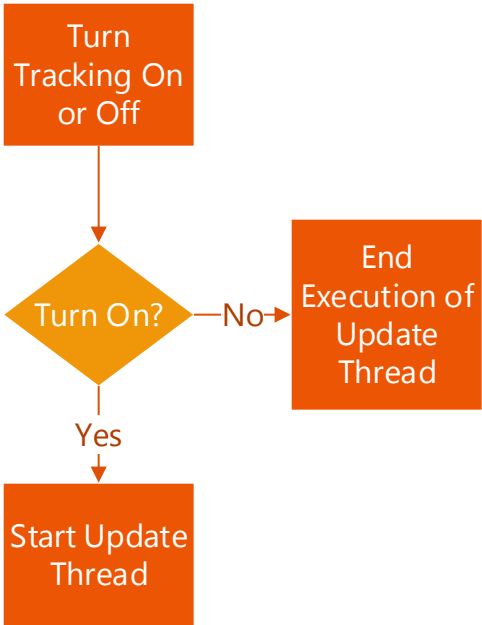
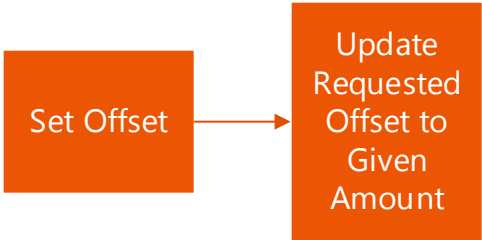
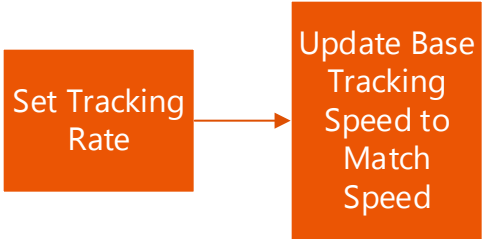


[Click Here to Return to Top Level](#)

Go Up One Level



# 1.4b Sidereal Drive

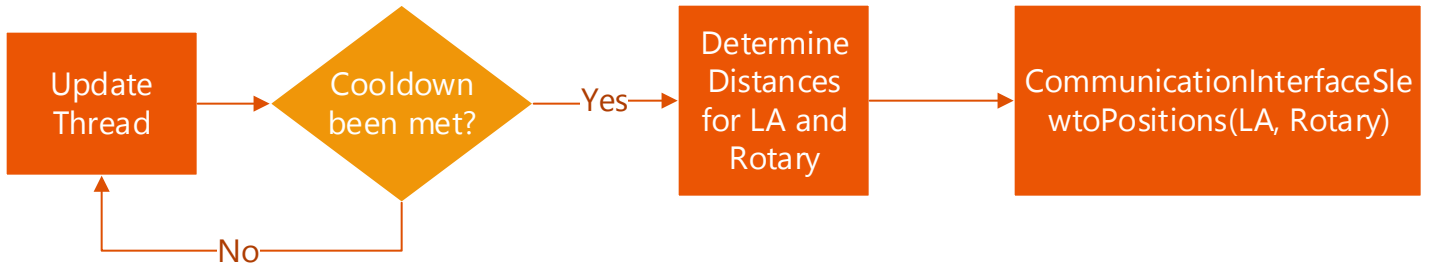
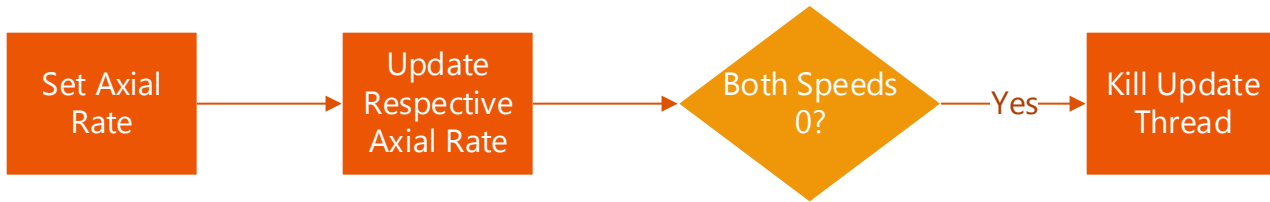


Go Up One Level

Click Here to Return to Top Level



## 1.4c Axial Drive

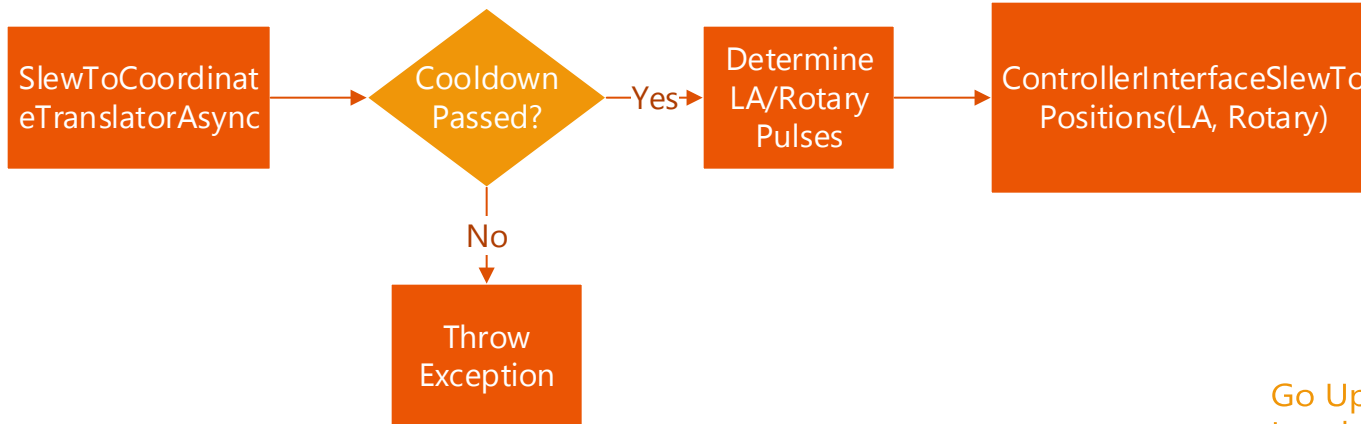
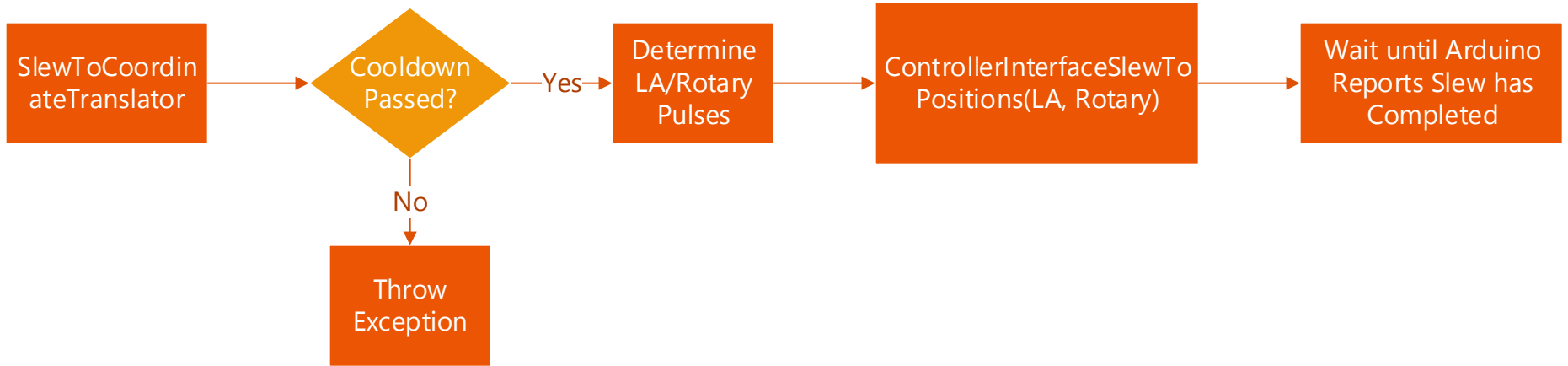


[Click Here to Return to Top Level](#)

Go Up One Level



## 1.4d Coordinate Drive



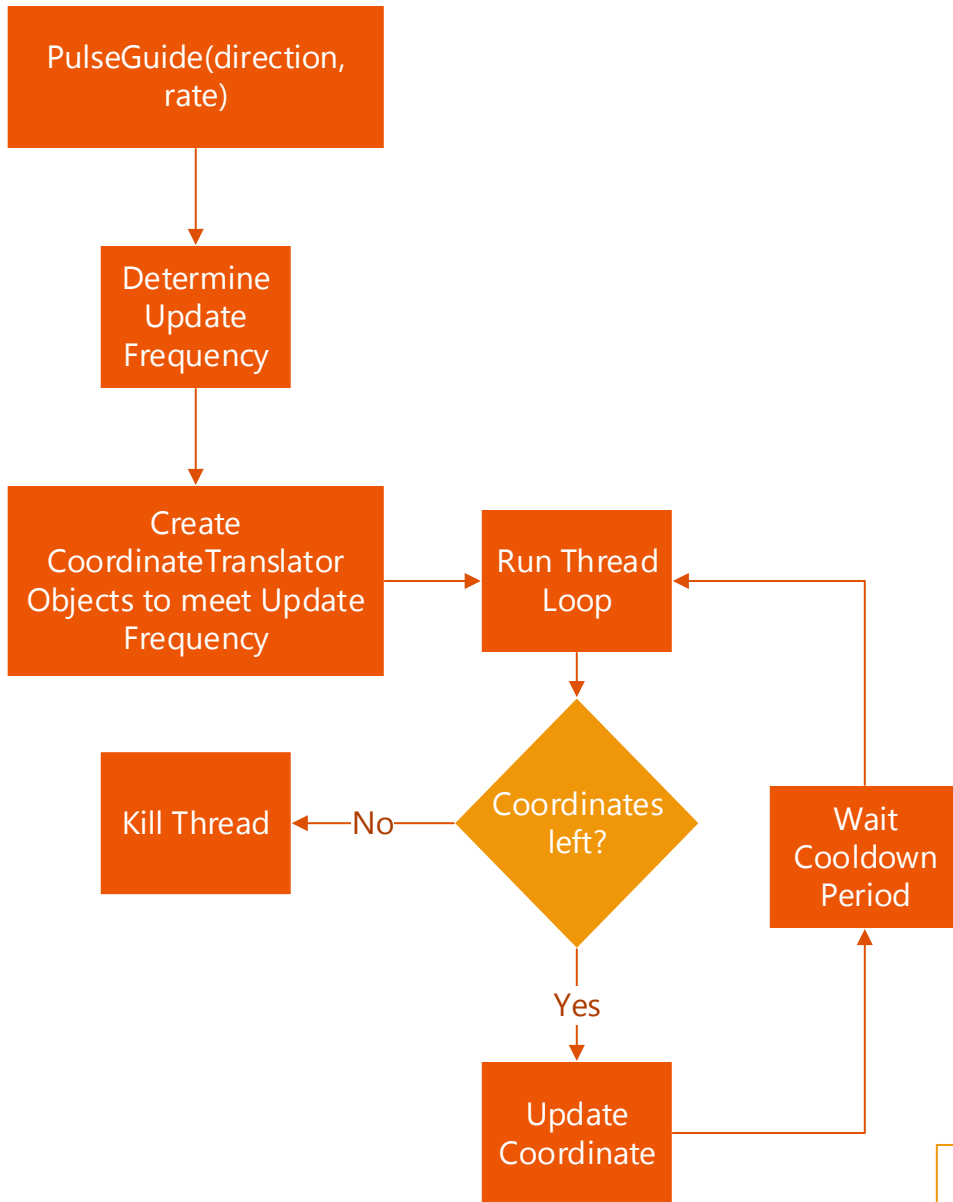
Go Up One Level



Click Here to Return to Top Level



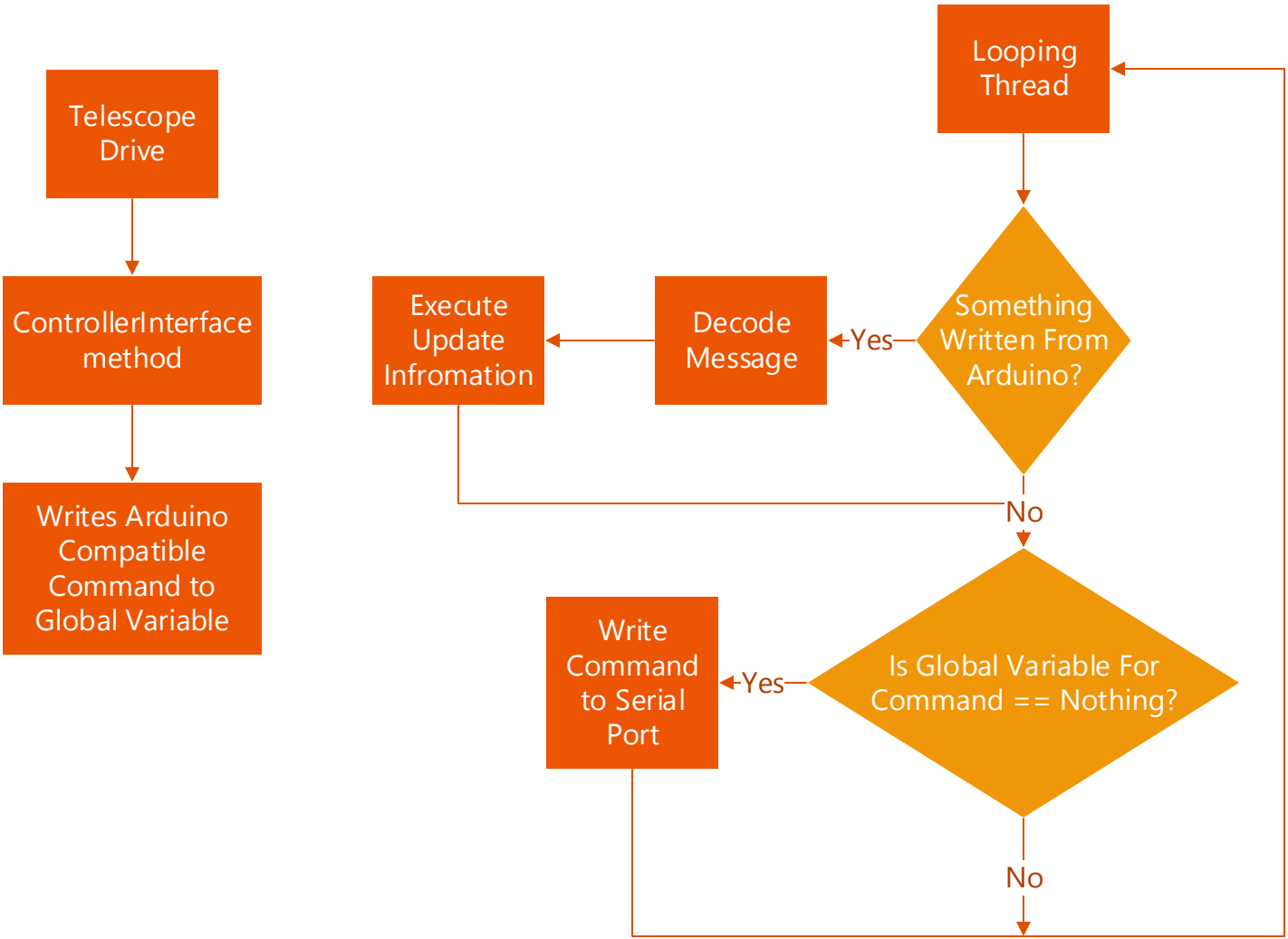
# 1.4e Pulse Drive



[Click Here to Return to Top Level](#)



# 1.4f Controller Interface



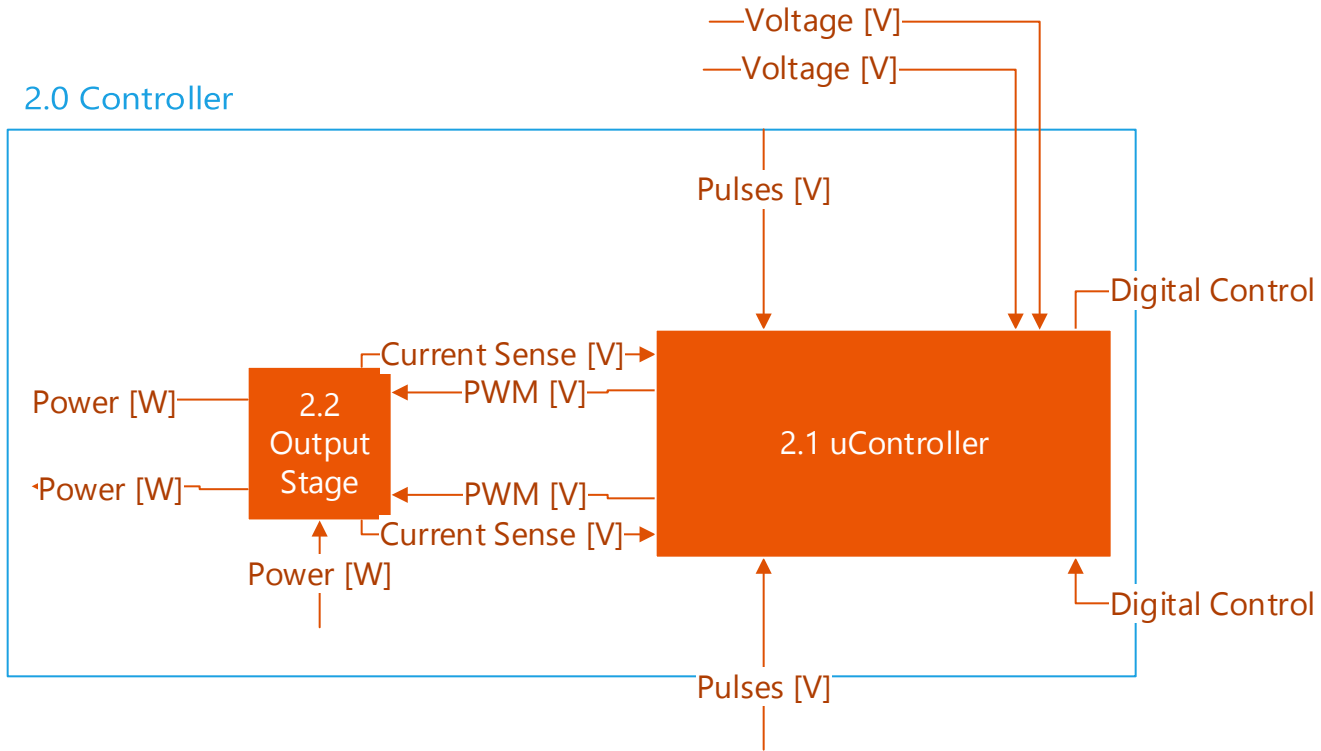
[Click Here to Return to Top Level](#)

Go Up One Level  






## 2.0 Controller



Component	Selection
2.1	Arduino Mega
2.2	Pololu Dual VNH5019 Motor Driver Shield for Arduino

[Click to View](#)

2.1a SCHEMATIC

2.1b Arduino Data Flow

2.1c Arduino Commands

[Click to View](#)

2.2a Shield Characteristics

2.2b Motor Model

2.2b Motor Controller

[Click to View](#)

Feasibility:  
Receiving Interrupts while Driving PWMs

[Click Here to Return to Top Level](#)



## 2.2a Shield Characteristics

### General Specifications

<b>Motor driver:</b>	VNH5019
<b>Motor channels:</b>	2
<b>Minimum operating voltage:</b>	5.5 V
<b>Maximum operating voltage:</b>	24 V <sup>2</sup>
<b>Continuous output current per channel:</b>	12 A
<b>Peak output current per channel:</b>	30 A
<b>Current sense:</b>	0.14 V/A
<b>Maximum PWM frequency:</b>	20 kHz
<b>Reverse voltage protection?:</b>	Y

### Schematic

Pololu Dual VNH5019  
Motor Driver Shield for  
Arduino  
Schematic

### Motor Driver Shield

Pololu Dual VNH5019  
Motor Driver Shield for  
Arduino  
Data Sheet

### H-Bridge IC

VNH5019A-E  
Data Sheet

### H-Bridge Thermal Characteristics

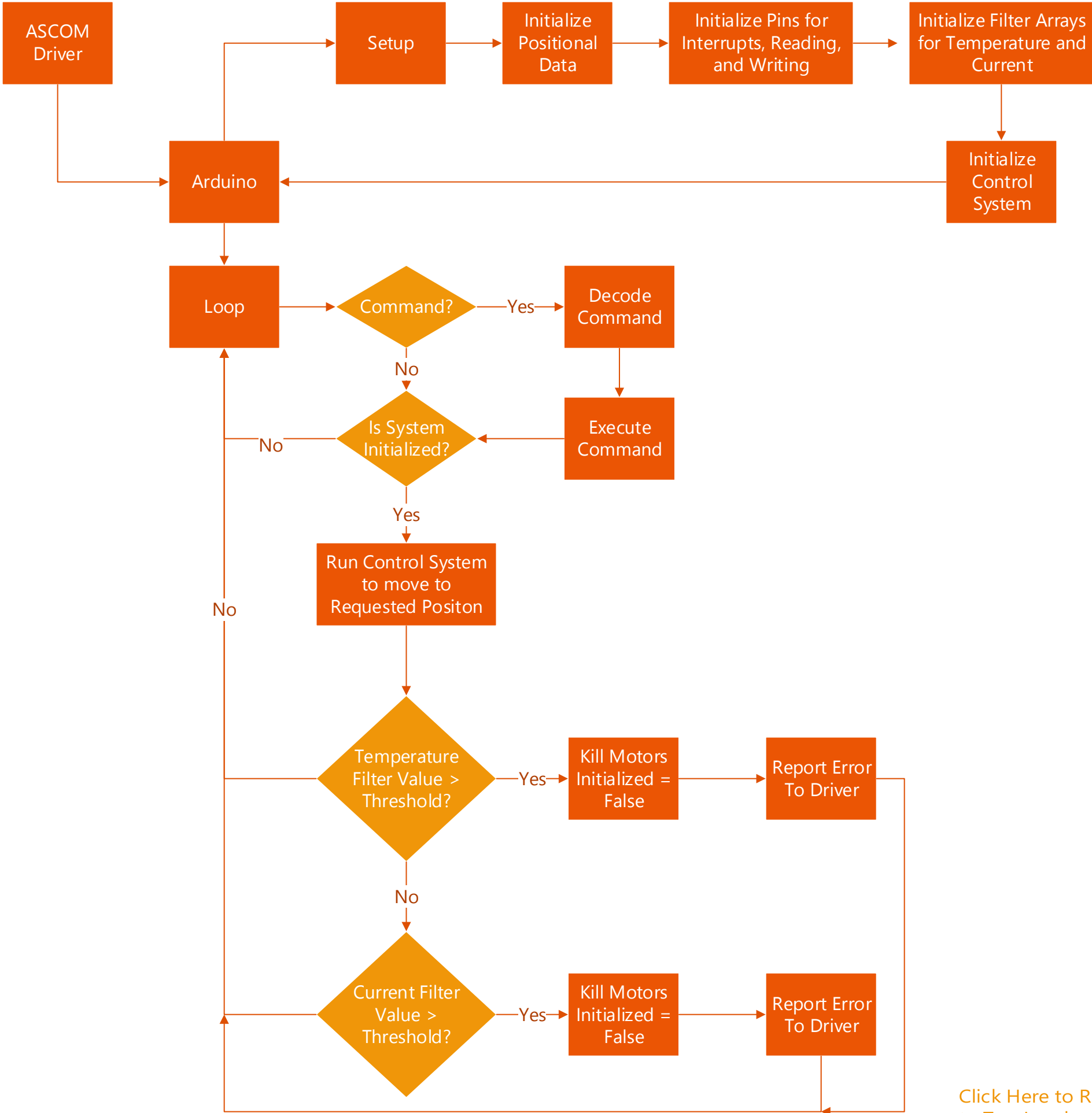
	<b><u>VNH5019</u></b>
<b>Operating voltage: (1)</b>	5.5 – 24 V
<b>MOSFET on-resistance (per leg):</b>	18 mΩ typ.
<b>Max PWM frequency</b>	20 kHz
<b>Current sense</b>	0.14 V/A typ.
<b>Over-voltage shutoff</b>	24 V min. / 27 V typ.
<b>Logic input high threshold</b>	2.1 V min.
<b>Time to overheat at 20 A (3)</b>	20 s
<b>Time to overheat at 15 A (3)</b>	90 s
<b>Current for infinite run time (3)</b>	12 A

[Click Here to Return  
to Top Level](#)

[Go Up One  
Level](#)



2.1b Arduino Data Flow



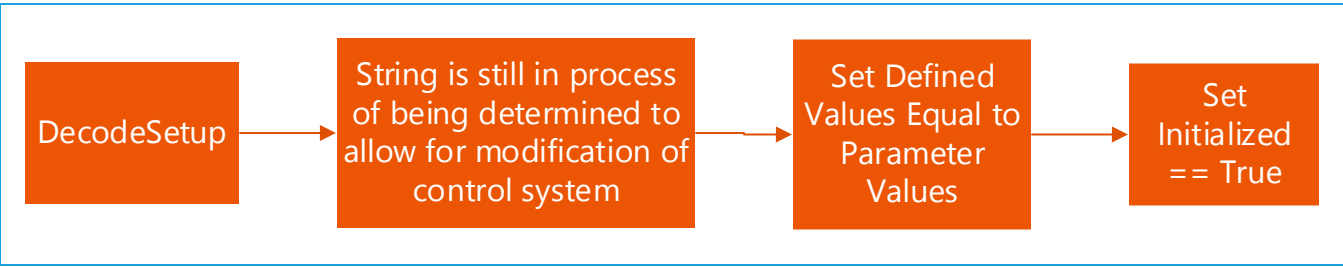
[Click Here to Return to Top Level](#)

Go Up One Level



# 2.1c Arduino Commands

## DecodeSetup



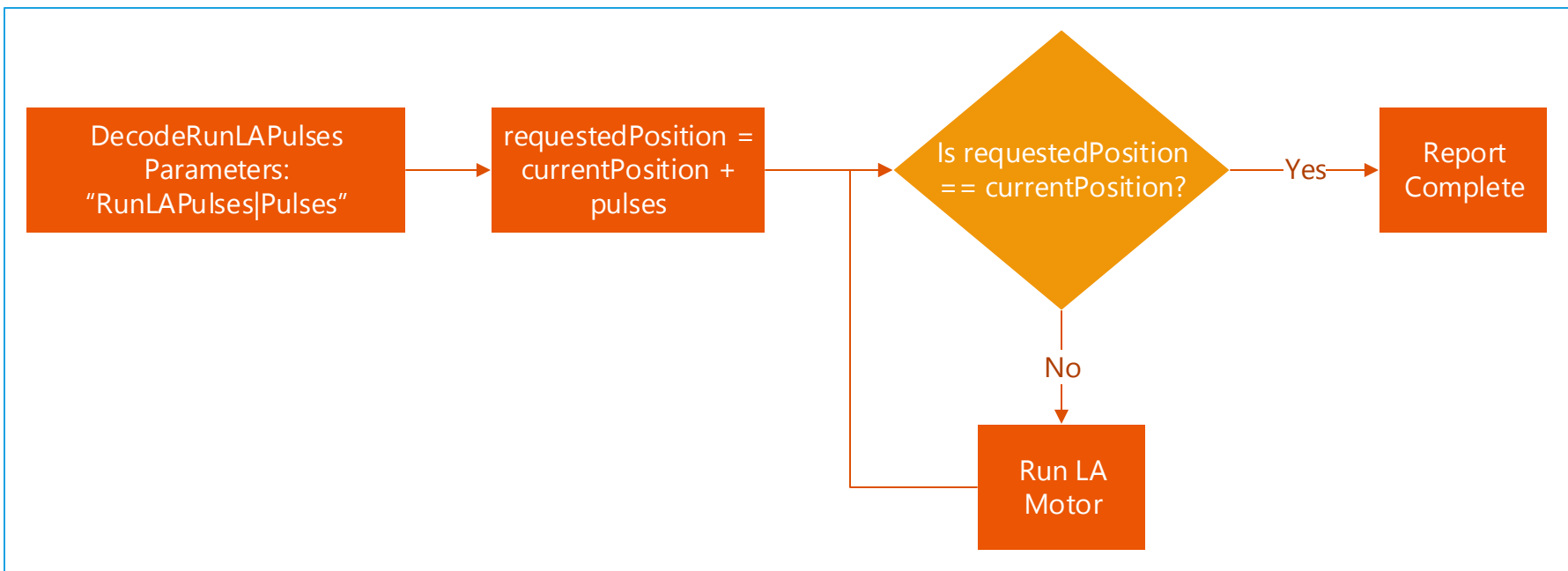
## DecodeAbortSlew



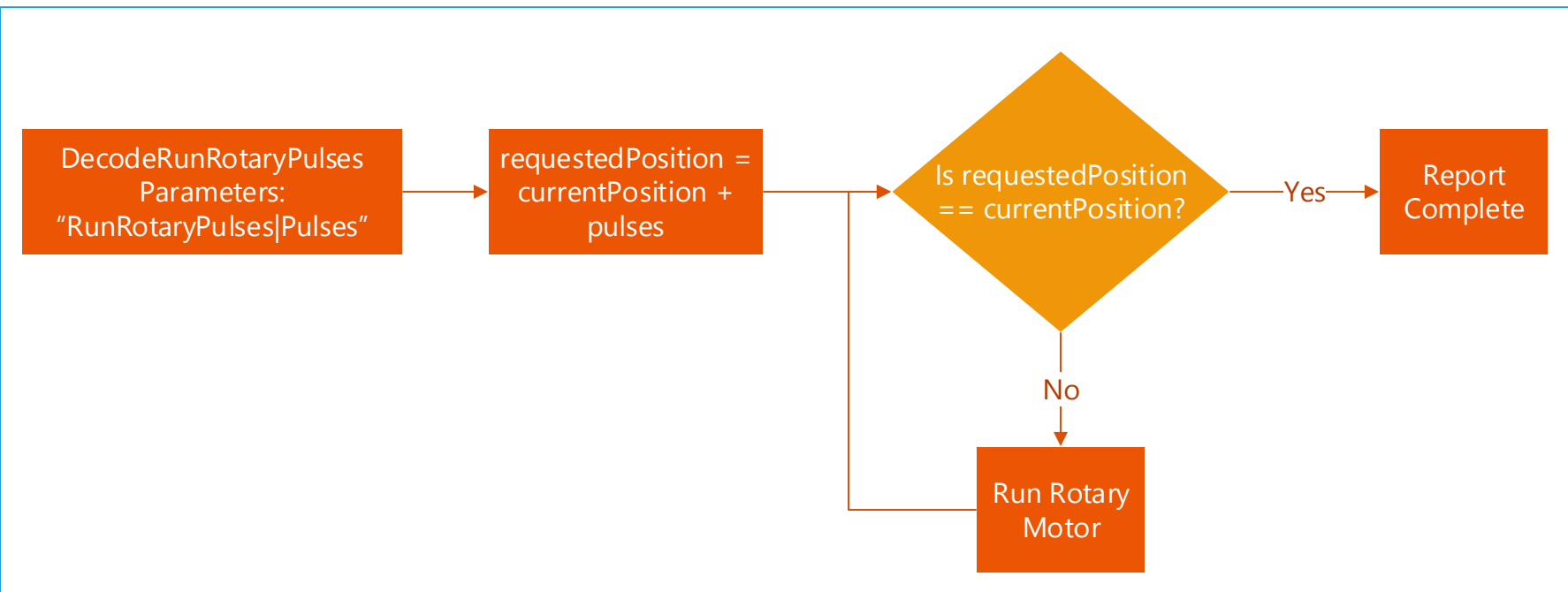
## DecodeSlewToPositions



## DecodeRunLAPulses



## DecodeRunRotaryPulses

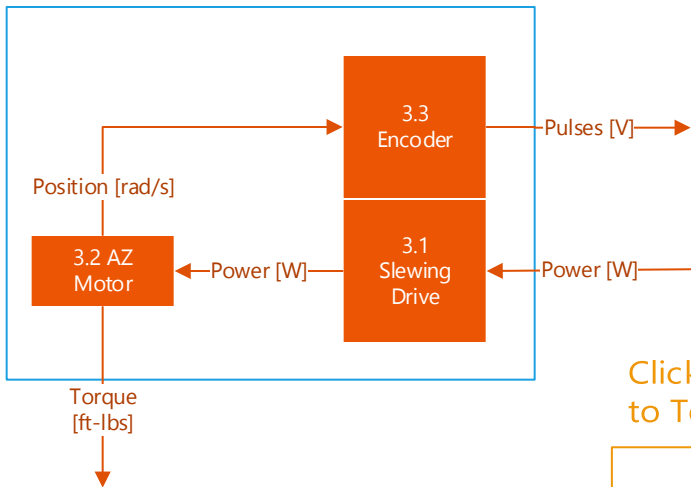


[Click Here to Return to Top Level](#)

Go Up One Level



## 3.0 Azimuth Movement

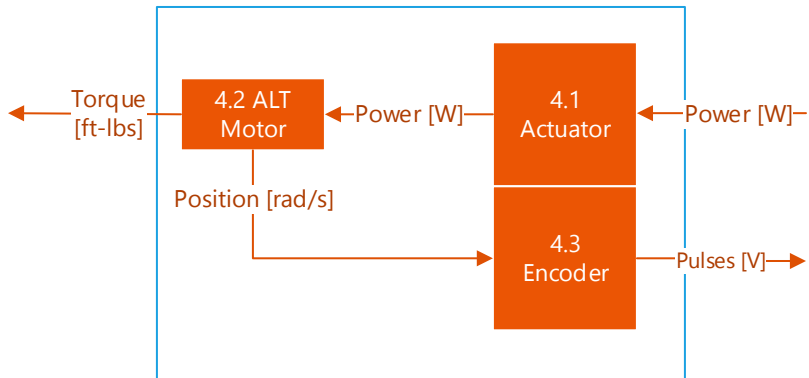


[Click Here to Return to Top Level](#)

Component	Selection
3.1	SE5A-62-12R
3.2	H-Fang Motor (12 VDC)
3.3	



## 4.0 Altitude Movement



[Click to View](#)

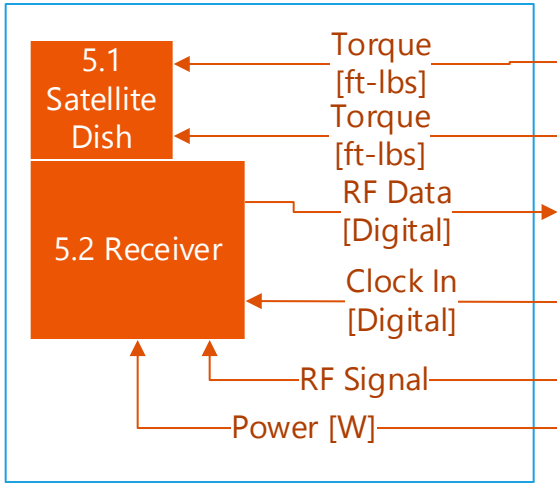
Altitude to Linear  
Actuator  
Conversion

[Click Here to Return  
to Top Level](#)

Component	Selection
4.1	PA-03-12-400 (12 VDC w/ Hall Effect Sensor)
4.2	
4.3	



## 5.0 Satellite Dish



## 5.2 Receiver



Construction Manual

Noise Analysis

Software Setup Guide

## 5.1 Satellite Dish



Click to View

Stress Analysis: Flange

Stress Analysis: LA Arm

Stress Analysis: RA Arm

Stress Analysis: U - Bracket

Click to View

Dish Assembly

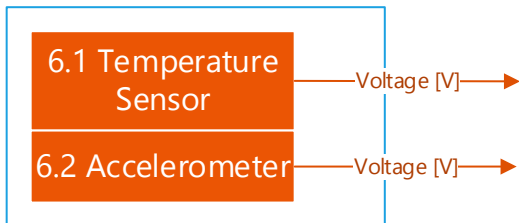
Sun Tracking Simulation

Dish Movement Simulation

Click Here to Return to Top Level



## 6.0 Sensors



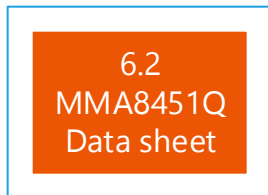
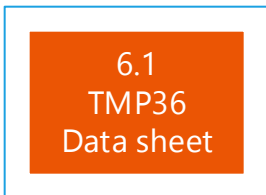
[Click Here to Return to Top Level](#)



Component	Selection
6.1	Sparkfun TMP36
6.2	Adafruit MMA8451

[Click to View](#)

[Click to View](#)





## 7.0 Power Management

7.1 Back Up Power Supply

Power [W] →

7.2 Power Supply

Power [W] →

## 7.1 Back Up Power Supply

### APC Back-UPS 550

- 550 VA 390 W
- 6 Minutes of runtime during @ 250 W Load
- PowerPanel software for safe auto shutdown (USB connection).

[Click to View](#)

Power Loss Scenarios

[Link to Product Page](#)



[Click Here to Return to Top Level](#)



## 7.2 Power Supply

### Power Supply Specifications

	SCS120PW12	
Output 1 [V], [A]	12	10
Output 2 [V], [A]		
/+/- Tolerance [%]		
Voltage Input Range[V]	90	264
Voltage Isolation [V]	3000	
Efficiency [%]	85	
Minimum Load [V]	N/A	
Operating TempRange	0	40
Package	Open Frame	
Features	Adjustable Output	
	PFC	
Mount	Chassis	
Dimensions [Inches]	5.00 x 3.00 x 1.27	
Price [\$]	60.60	

[Link to Product Page](#)



[Click to View](#)

SCS120PW12 Data sheet

[Click to View](#)

SCS120PW12 Drawing

[Click to View](#)

SCS120PW12 Instruction Manual

[Click to View](#)

8.0 Hardware  
Counter  
Schematic

[Click Here to Return  
to Top Level](#)

