

# Tigerbot VII Design Verification Test Plan

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## Summary:

The goal of the Design Verification Test Plan is to set the desired test results for each board in the project. In this phase the electrical team aims to refine the design of each PCB. The goal is for a three phase DVT plan to ensure robust PCB performance. Each section of this document will be split per board for testing ease.

## 1.0 Teensy Breakout Board DVT

### 1.1 Visual Examination

Visually inspect the board for defects (i.e. undesired solder connections, broken traces, or bent pins)

Visual Inspection Result	Pass / Fail
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Fail Reason / Additional Comments:
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### 1.2 Power Distribution Verification

For power distribution verification, each present voltage rail must be measured to ensure proper voltage.

Voltage Rail	Measure Point	Expected	Measured
12V	Cin	12V	
5V	Vcc OUT	5V	
3.3V	I2C Pin 1	3.3V	

Power Distribution Result	Pass / Fail
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### 1.3 I2C Functionality Verification

The purpose of the I2C functionality verification test is to measure that data is sent and received from the Teensy Breakout board. Connect the adafruit 9DOF IMU to the I2C port of the Teensy Breakout board and begin generic send/receive communication.

Rail	Measure Point	Signal Verification
SCL	Teensy P19	Pass / Fail
SDA	Teensy P18	Pass / Fail

### 1.4 I2C Data Verification

The purpose of the I2C data verification test is to confirm correct timing of data communication between the IMU and the Teensy. The timing is to be measured at the terminals for each device.

Signal	Device	Connection	Expected	Measured
SDA	Teensy	P18	4 us	
SDA	IMU	SDA	4us	
SCL	Teensy	P19	4 us	
SCL	IMU	SCL	4 us	

I2C Data Verification	Pass / Fail
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## 1.5 Load Cell Functionality Verification

The purpose of the load cell functionality verification is to measure the voltage at rest.

Signal	Probe Location	Expected	Measured
Sig+ 1	Green 1	2.5V	
Sig+ 2	Yellow 1	2.5V	
Sig+ 3	Green 2	2.5V	
Sig+ 4	Yellow 2	2.5V	

Load Cell Functionality Verification	Pass / Fail
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## 1.6 Load Cell Data Verification

The load cell data verification test measures the data communication between each HX711 adafruit board and the Teensy. Each HX711 board has two connections, data and clock. The communication speed expected is 12.5ms.

Signal Line	Probe Location	Expected	Measured
Data1	Teensy 24	12.5ms	
CLK1	Teensy 26	12.5ms	
Data2	Teensy 27	12.5ms	
CLK2	Teensy 28	12.5ms	

Load Cell Data Verification	Pass / Fail
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## 2.0 Motor & Encoder Control Board DVT

### 2.1 Visual Verification

Visually inspect the board for defects (i.e. undesired solder connections, broken traces, or bent pins)

Visual Inspection Result	Pass / Fail
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Fail Reason / Additional Comments:
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### 2.2 Power Distribution Verification

For power distribution verification, each present voltage rail must be measured to ensure proper voltage.

Voltage Rail	Measure Point	Expected	Measured
5V	Vcc OUT	5V	
3.3V	I2C Pin 1	3.3V	

Power Distribution Result	Pass / Fail
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## 2.3 Level Shifter Functionality Verification

Each Motor & Encoder Control board has three ST2378E level shifters. Each input/output will be measured to ensure proper signal shifting. Expected input - 3.3V. Expected output - 5V.

Signal	Input Probe	Output Probe	Input Measured	Output Measured
MISO	L3_2	L3_19		
MOSI	L3_3	L3_18		
SCLK	L3_4	L3_17		
SSEL1	L3_5	L3_16		
SSEL2	L3_6	L3_15		
SSEL3	L3_7	L3_14		
EN	L1_2	L1_19		
B1	L1_3	L1_18		
HLFB_1	L1_4	L1_17		
A1	L1_6	L1_15		
B2	L1_8	L1_13		
HLFB_2	L2_2	L2_19		
A2	L2_3	L2_18		
B3	L2_7	L2_14		
HLFB_3	L2_8	L2_13		
A3	L2_9	L2_12		

Level Shifter Functionality Result

Pass / Fail

## 2.4 Encoder Data Verification

The goal of the encoder data verification test is to verify that the encoder signals operate at the correct clock frequency.

Signal	Connection	Expected	Measured
MISO	Teensy 11	5 us	
MOSI	Teensy 12	5 us	
SCLK	Teensy 13	5 us	

Encoder Data Verification	Pass / Fail
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## 2.5 Motor Data Verification

The goal of the motor data verification test is to verify the timing of the motor control signal PWM.

Signal	Connection	Expected	Measured
B1	Teensy 3	2 us / 5 us / 10 us	
B2	Teensy 22	2 us / 5 us / 10 us	
B3	Teensy 25	2 us / 5 us / 10 us	

Motor Data Verification	Pass / Fail
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## 3.0 Power Distribution Board DVT

### 3.1 Visual Verification

Visually inspect the board for defects (i.e. undesired solder connections, broken traces, or bent pins)

Visual Inspection Result	Pass / Fail
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Fail Reason / Additional Comments:
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### 3.2 Power Distribution Verification

For power distribution verification, each present voltage rail must be measured to ensure proper voltage.

Voltage Rail	Measure Point	Expected	Measured
12V	Cin	12V	
5V	Vcc OUT	5V	
3.3V	I2C Pin 1	3.3V	

Power Distribution Result	Pass / Fail
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### 3.3 Current Sensor Functionality Verification

The goal of current sensor functionality verification is to make sure the signals returned by the current sensor vary with the current pull of the motor.

Signal	Connection	Expected	Measured
Meas_1	Pin1	0.7 A	
Meas_2	Pin2	0.7 A	
Meas_3	Pin3	0.7 A	

Current Sensor Functionality Result	Pass / Fail
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## Appendix

Dan Watson - Version 1.0	Added test cases for all boards