QUAD DESIGN
## Table of Components

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Skybot Parts Checklist</td>
<td>4</td>
</tr>
<tr>
<td>Flight Controller</td>
<td>5</td>
</tr>
<tr>
<td>Electronic Speed Controllers</td>
<td>7</td>
</tr>
<tr>
<td>Motors</td>
<td>8</td>
</tr>
<tr>
<td>Propellers</td>
<td>10</td>
</tr>
<tr>
<td>Battery</td>
<td>11</td>
</tr>
<tr>
<td>Satellite Receiver</td>
<td>12</td>
</tr>
<tr>
<td>Transmitter</td>
<td>13</td>
</tr>
<tr>
<td>Battery Charger Unit</td>
<td>14</td>
</tr>
<tr>
<td>Frame</td>
<td>15</td>
</tr>
<tr>
<td>Additional Items</td>
<td>16</td>
</tr>
<tr>
<td>Signal Wiring Diagram</td>
<td>17</td>
</tr>
<tr>
<td>Power Wiring Diagram</td>
<td>18</td>
</tr>
</tbody>
</table>
INTRODUCTION

Skybot Challenge is a 501(c)(3) tax-exempt not-for-profit organization whose focus is educational services in the field of aerial robotics, autonomous systems and entrepreneurship. In order to facilitate this effort we will conduct workshops, classes, forums, challenges and exhibitions to include publishing and distributing educational materials in connection with advancing science, technology, engineering and mathematics (STEM).

MISSION

Skybot Challenge will promote the enhancement of public knowledge and the inspiration of academic acceleration students at all levels of education through outreach programs that inspire, inform, enlighten, and achieve the necessary levels of STEM principals and practical application that help propel the United States to world leadership in robotics and UAS fields.

VISION

Las Vegas will become the Skybot Nation domestic and international headquarters of Skybot competitions at all levels and will enable autonomous systems professionals to collaborate and gain access to interact and mentor students; so highly technical skills can be brought to bear on solutions necessary for communities to flourish in the 21st century and beyond.

VALUES

Hearts and Minds of our Nations youth
- Students crave and deserve a chance to discover their passion early in life.

STEM Education
- Increasing interest in STEM education will help diversify the economy in Nevada by encouraging industry to find their brilliant next-generation professionals in Nevada.

Educators and Mentors
- Teachers in the classroom are the pinnacle of the education system and should be accorded community status worthy of that distinction.

Stimulating and Engaging Learning
- Students will respond to hands-on, interesting, and challenging technology integration in their education curriculum by increasing their dedication to learning. Inspiration and passion at every level of education is the defining characteristic for learning success.

Community Cohesion
- Adults have a responsibility to encourage the education process and participate in its success.
Skybot Parts Checklist

Skybot Spedix S250

* Required items are marked with an asterisk (*)

- Flight Controller (x1) *
  - SPX-71004

- Electronic Speed Controllers (x4) *
  - SPX-71003

- Motors (x4) *
  - SNS-X2204S-KV2300

- Propellers (x8)
  - HQP010305402

- Battery (x2)
  - FH2250mAh

- Receiver (x1) *
  - LMN-0008

- Transmitter (x1) *
  - SPMR1000

- Battery Charger Unit (x1)
  - DYNC2005CA

- Frame (x1)
  - SPX-81001

Note: Transmitter/Radio must be a Spektrum
**Flight Controller**
- CC3D controller features
- Powerful STM32 32-bit micro-controller running at 90MIPs with 128KB Flash and 20KB RAM
- 3-axis high-performance MEMs gyros and 3-axis high-performance MEMs accelerometer
- Tiny 36mmx36mm 4 layer PCB for superior electrical noise reduction and flight performance.
- Direct high speed USB support with no drivers required, a truly plug and play device.
- Spektrum satellite receiver support
- Futaba S-BUS hardware support
- Innovative Flexi-port technology for superior port flexibility
- 4Mbits on-board EEPROM for configuration storage
- 3-axis Gyroscope array and 3-axis Accelerometer: MPU-6000
- Supports several common RC inputs: 6 PWM channels, combined PPM, Spektrum/JR DSM2, DSMJ, DSMX satellites, and Futaba S.Bus receivers
- Simultaneous support for multiple receivers
- ReceiverPort functions (configurable): 6 PWM input channels or combined PPM stream, 4 PWM output channels
- MainPort functions (configurable): serial telemetry (default), GPS, S.Bus, Spektrum/JR satellites
- FlexiPort (configurable): serial telemetry, GPS, Spektrum/JR satellites, or I2C peripherals (under development)
- 10 PWM outputs to servos or ESC’s, or for camera stabilization
- Camera stabilization: supports up to 3-axis camera mounts with stabilization and manual control from any of configured receivers
- Onboard USB connectivity for easy configuration
- USB and serial telemetry and configuration (including wireless with optional radio modules)
- Supported by powerful OpenPilot GCS
- 4 Mbit onboard memory
- 3C Quaternion based complementary filter running at 500Hz
Flight Controller, cont.

Receiver Port

Servo / ESC Header Pins

Flexi Port

USB Port (underside)

Main Port

Receiver port
- PWM / PPM
- Additional outputs

Output ports
- ESC / Servo

BEC Connection
Positive power wire is necessary from only one ESC

Flexi and Main extension ports
- S.Bus / I2C / UART
- Spektrum Satellite
- NMEA GPS

Telemetry GPS

Motor

Power Distribution

Battery

Motor
**Electronic Speed Controllers**

- Specifications:
- Continuous Current: 12A
- Voltage Range: 2-4S LiPo
- BEC Output: None
- Refresh Rate: 600Hz
- Motor Wires: 20 gauge soft silicone wires
- Battery Wires: 20 gauge soft silicone wires
- Weight: 16g (approx. including wires)
- Diameter: 28mm (approx. including capacitor)
Motors
- SunnySky X2204S KV2300 brushless outrunner motor designed specially for multirotors in 200-300 sizes.
- The motor with a bullet prop adapter weights 22 grams.
- Recommended to use on a multirotor that weighs maximum 250 grams multiplied the number of motors on the aircraft.
- Recommended battery: 3S LiPo
- Recommended ESC: 10A
- Recommended prop: 5x4.3 inch

<table>
<thead>
<tr>
<th>Thrust (g)</th>
<th>Current (A)</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1.3</td>
<td>8500</td>
</tr>
<tr>
<td>150</td>
<td>2.5</td>
<td>11135</td>
</tr>
<tr>
<td>200</td>
<td>3.9</td>
<td>13200</td>
</tr>
<tr>
<td>250</td>
<td>5.7</td>
<td>15300</td>
</tr>
<tr>
<td>300</td>
<td>7.0</td>
<td>16600</td>
</tr>
<tr>
<td>350</td>
<td>9.0</td>
<td>18230</td>
</tr>
<tr>
<td>370</td>
<td>9.7</td>
<td>18625</td>
</tr>
</tbody>
</table>

SunnySky X2204S kv2300
3S 11.1V LiPo
GWS 5043 Propeller

X2204S
Motors, cont.
Propellers

- Type: Multi-Rotor
- Material: Composite material
- Length: 5"
- Pitch: 4"
- Weight: 3.3g
- Center hole diameter: M5
- Included: Two CCW propellers per bag
- Suitable for 210 class or above multi-rotors
**Battery**

- Minimum Capacity: **2250mAh**
- Configuration: **3S1P / 11.1v / 3Cell**
- Constant Discharge: **20C**
- Peak Discharge (10sec): **35C**
- Charge Plug: **JST-XH**
- Discharge Plug: **Deans/T=**
**Satellite Receiver**

- Type: DSMX Compatible Satellite Full Range Receiver
- Modulation: DSMX Compatible (Also DSM2 backward Compatible)
- Band: 2.4 GHz
- Dimension: 1.7(L) x 1.5(W) x 1(H) mm
- Weight: 2.5 gram
- Voltage Range: 3.3V from Receiver
### Transmitter/Radio

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Non-computer</td>
</tr>
<tr>
<td>Channels</td>
<td>6, 9</td>
</tr>
<tr>
<td>Modulation</td>
<td>DSMX</td>
</tr>
<tr>
<td>Band</td>
<td>2.4GHz</td>
</tr>
<tr>
<td>Frame Rate</td>
<td>11/22 Ms</td>
</tr>
<tr>
<td>Resolution</td>
<td>2048</td>
</tr>
<tr>
<td>Model Type</td>
<td>Airplane</td>
</tr>
<tr>
<td>Modes</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>Transmitter (Tx) Battery Type</td>
<td>4 AA Alkaline</td>
</tr>
<tr>
<td>Range</td>
<td>Full</td>
</tr>
<tr>
<td>Rate Positions</td>
<td>2 POS</td>
</tr>
<tr>
<td>Flight Modes</td>
<td>3</td>
</tr>
<tr>
<td>Proportional Inputs</td>
<td>4</td>
</tr>
<tr>
<td>Telemetry</td>
<td>No</td>
</tr>
<tr>
<td>SD Card/Airware Capable</td>
<td>No</td>
</tr>
</tbody>
</table>
Battery Charger Unit

- 35W charge power output for Li-Po (2–3S) batteries
- High-visibility, simplified user interface
- Select charge current from 0.5A to 3.0A with a single push button
- Six red LEDs indicate charging current
- Three LEDs (red, yellow and green) indicate charging status
- Start/Stop a charge cycle with a single button
- Audible beep alerts
- Removable AC power cord
- Short-circuit, over-current, reverse polarity, low input voltage and over-temperature protection
- Meets IP33CW, IK07 environmental specs
- Rugged industrial plastic case
**Frame**

- 250 size frame made of carbon fiber. The box shaped arm is reinforced with carbon fiber like plate in the middle and aluminum columns in the root. The distance between two central boards is 3.5 cm, around 1 3/8 inches.
- The assembled frame weighs around 155 grams, or 5.5 oz. Up to 6 inch propellers, 1806, 2204, 2206 motors can be installed.
Additional Items

Power Distribution Board

- Spedix power distribution board for 250-300 size multirotors.
- The board has 6 set 2mm bullet connectors to power up 6 motors, and step down regulator to provide 5V DC and 12V DC power for receiver, flight controller, and FPV equipments.
- The 5V output cable is soldered to the board.
- There are two options to select the 12V power source.
- Manufacturer suggests to use +12V and -12V pins next to the main power cable for 4S LiPo batteries, and BAT - and BAT+ pins next to 5V output cable for 3S LiPo packs.
Signal Wiring Diagram
Power Wiring Diagram