# Cheerson CX-20 Receiver Characteristics

Team 32 Drone 2
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This is a characterization report of the receiver output for the standard Cheerson CX-20 Drone receiver that comes stock with the drone. This will be specific to the receiver and its characteristics, and will not explain the theory or comprehensive circuitry of the receiver.

**Figure 1:** *Cheerson CX-20*

**Figure 2:** *Cheerson CX-20 Standard Receiver*

The receiver that comes with the Cheerson CX-20 drone has 7-channels with output seen as PWM signals indicating the current remote-control value. The 7 channels can be seen in **figure 3**. The only port that is not a PWM output is the power supply (B) port. The receiver's power input is +5V at approximately 41 mA, at port B.

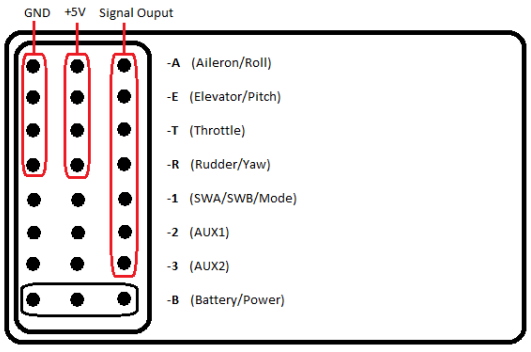



**Figure 3:** *Cheerson Receiver*

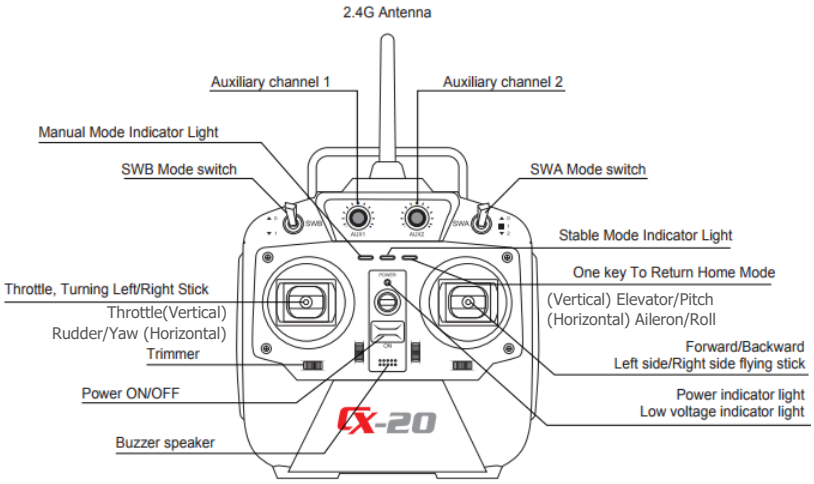



**Figure 4:** *Cheerson CX-20 Remote Control*

The period of the PWM output is 20ms (50 Hz). The duty cycle ranges from 5.0% to 10.1%, starting lowest at the left most, R and A channels, or furthest down vertically, T and E, and increases to the max

duty cycle at the right most or furthest up vertically. Tables 1 - 4 are the measured PWM output values according to each sticks transition location over the full range of movement. What can be seen is that all the channels are controlled linearly proportional from the stick position input to the PWM output.

**Table 1** Aileron/Roll

| | Stick Position | | | | | | |
|---|---|---|---|---|---|---|---|
| | 100% Left | 60% Left | 30% Left | Centered | Right 30% | Right 60% | Right 100% |
| Pulse Width High Duration (ms) | 1.060 | 1.180 | 1.380 | 1.580 | 1.752 | 1.920 | 2.020 |
| Duty Cycle (%) | 5.3% | 5.9% | 6.9% | 7.9% | 8.8% | 9.6% | 10.1% |

Elevator/Pitch

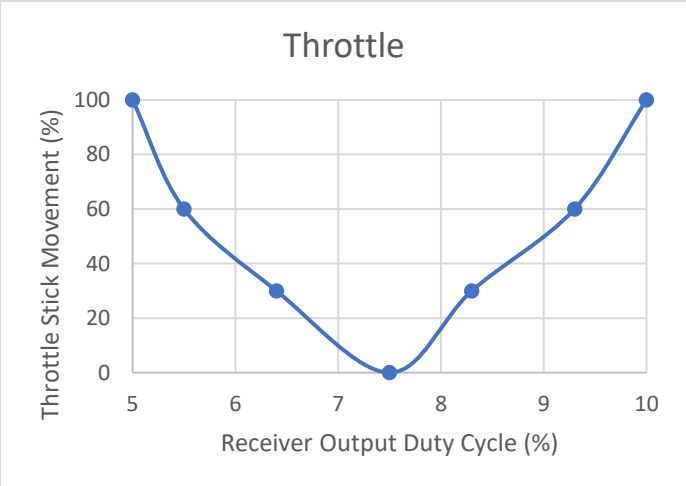
| | 100% Left | 60% Left | 30% Left | Centered | Right 30% | Right 60% | Right 100% |
|---|---|---|---|---|---|---|---|
| Pulse Width High Duration (ms) | 1.016 | 1.196 | 1.356 | 1.516 | 1.696 | 1.816 | 2.016 |
| Duty Cycle (%) | 5.1% | 5.9% | 6.8% | 7.6% | 8.5% | 9.1% | 10.1% |

Rudder/Yaw

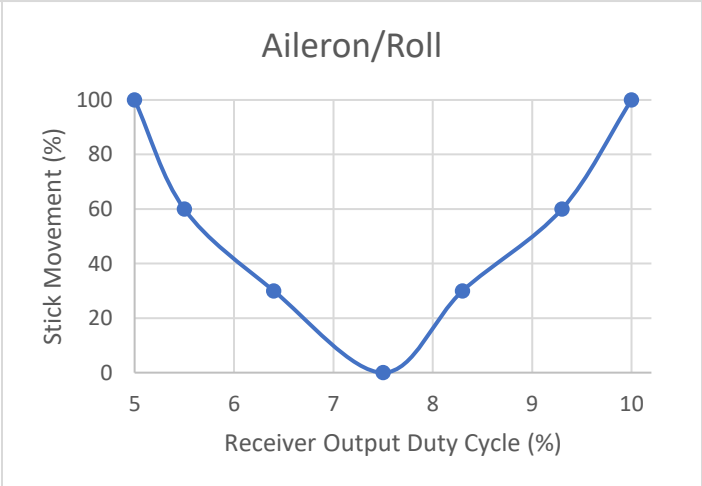
| | 100% Left | 60% Left | 30% Left | Centered | Right 30% | Right 60% | Right 100% |
|---|---|---|---|---|---|---|---|
| Pulse Width High Duration (ms) | 1.004 | 1.108 | 1.280 | 1.504 | 1.668 | 1.860 | 2.004 |
| Duty Cycle (%) | 5.0% | 5.5% | 6.4% | 7.5% | 8.3% | 9.3% | 10.0% |

Throttle

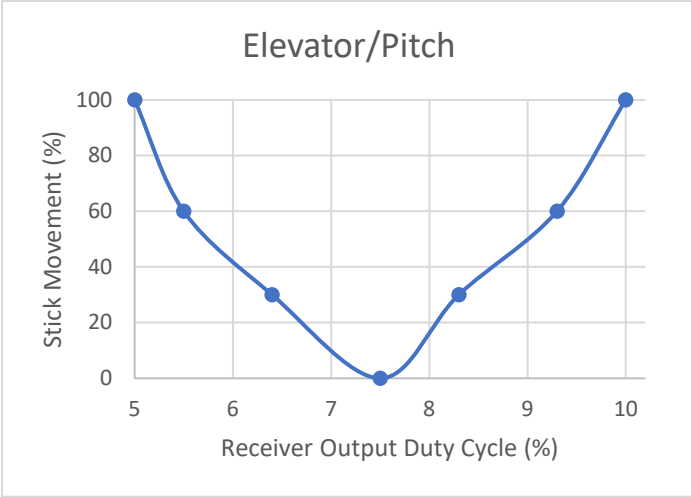
| | 0% | 17% | 34% | 51% | 68% | 85% | 100% |
|---|---|---|---|---|---|---|---|
| Pulse Width High Duration (ms) | 1.004 | 1.204 | 1.372 | 1.520 | 1.660 | 1.804 | 1.992 |
| Duty Cycle (%) | 5.0% | 6.0% | 6.9% | 7.6% | 8.3% | 9.0% | 10.0% |



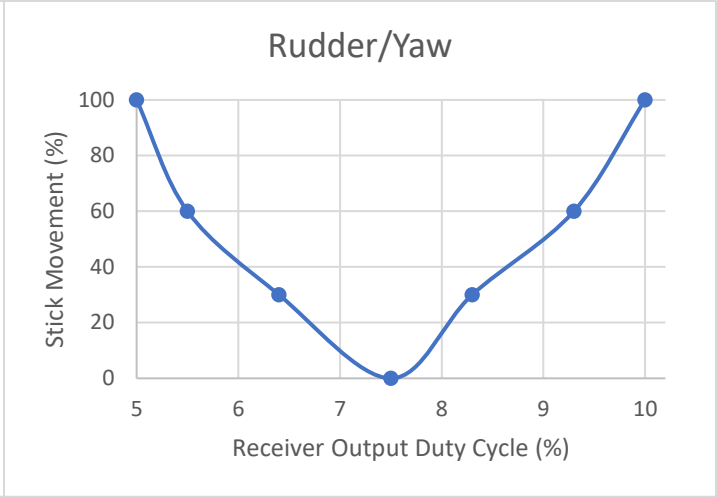

**Graph 1:** *Throttle stick position from furthest down vertically, 0%, to furthest up position, 100%, compared to the receiver's PWM output duty cycle.*




**Graph 2:** *Aileron/Roll stick position from furthest left, 100%, to its neutral resting center position, 0%, and then to furthest right position, 100%, compared to the receiver's PWM output duty cycle.*




**Graph 3:** *Elevator/Pitch stick position from furthest left, 100%, to its neutral resting center position, 0%, and then to furthest right position, 100%, compared to the receiver's PWM output duty cycle.*




**Graph 4:** *Rudder/Yaw stick position from furthest left, 100%, to its neutral resting center position, 0%, and then to furthest right position, 100%, compared to the receiver's PWM output duty cycle.*

Switch A/B (1) -

| SWB | SWA | PWM Output | Duty Cycle |
|---|---|---|---|
| 0 | 0 | 1.504ms | 7.5% |
| 0 | 1 | 1.904ms | 9.5% |
| 0 | 2 | 1.108ms | 5.5% |
| 1 | 0 | 1.504ms | 7.5% |
| 1 | 1 | 1.708ms | 8.5% |
| 1 | 2 | 1.304ms | 6.5% |

**Table 5:** *Switch A/B configuration effects on the receiver's port marked 1 (Mode) PWM duty cycle output*

AUX1 (2) -

| Pot. Pos. | PWM Output | Duty Cycle |
|---|---|---|
| 5 (MAX) | 2.004ms | 10.02% |
| 4 | 1.896ms | 9.48% |
| 3 | 1.784ms | 8.92% |
| 2 | 1.708ms | 8.54% |
| 1 | 1.628ms | 8.14% |
| 0 | 1.528ms | 7.64% |
| -1 | 1.416ms | 7.08% |
| -2 | 1.324ms | 6.62% |
| -3 | 1.246ms | 6.23% |
| -4 | 1.156ms | 5.78% |
| -5 (MIN) | 1.004ms | 5.02% |

**Table 6:** *Remote AUX1 potentiometer position effects on the receiver's AUX1 (2) PWM duty cycle output*

AUX2 (3) -

| Pot. Pos. | PWM Output | Duty Cycle |
|---|---|---|
| 5 (MAX) | 2.004ms | 10.0% |
| 4 | 1.868ms | 9.3% |
| 3 | 1.776ms | 8.9% |
| 2 | 1.660ms | 8.3% |
| 1 | 1.556ms | 7.8% |
| 0 | 1.452ms | 7.3% |
| -1 | 1.368ms | 6.8% |
| -2 | 1.280ms | 6.4% |
| -3 | 1.204ms | 5.6% |
| -4 | 1.124ms | 5.6% |
| -5 (MIN) | 1.004ms | 5.0% |

**Table 7:** *Remote AUX2 potentiometer position effects on the receiver's AUX2 (3) PWM duty cycle output*

To summarize, the receiver runs off +5V at 41 mA with the PWM output peak voltage at +3.4V. The output is a PWM signal with a period of 20ms and duty cycle linearly proportional to the remote's stick position change, ranging from 5% to 10.1% respective to the sticks vertical or horizontal range of motion.