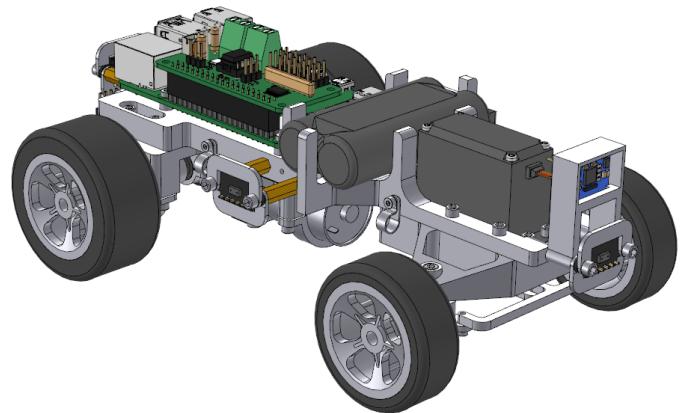


Vehicle Assembly Manual

Oscar Barbieri and Stefan Teodorescu

September 6, 2025



© 2025 Stefan Teodorescu and Oscar Barbieri. All Rights Reserved.
Prepared for the Canadian team at the 2025 WRO Future Engineers competition.

Bill of Materials (BOM)

Ref. #	Part # (Description)	Supplier	Unit Price	Qty.	Ext. Price
01	Mabuchi RK-370CA-15370 (Driving Motor)	Princess Auto*	\$ 01.50	1	\$ 01.50
02	TowerPro SG-5010 (Steering Motor)	Princess Auto*	\$ 05.50	1	\$ 05.50
03	M3 x 5 (Screw)	Princess Auto*	\$ 00.10	10	\$ 01.00
04	M3 x 10 (Screw)	Princess Auto*	\$ 00.10	32	\$ 03.20
05	M3 x 20 (Screw)	Princess Auto*	\$ 00.15	2	\$ 00.30
06	M2 x 3 (Screw)	Princess Auto*	\$ 00.05	6	\$ 00.30
07	M2 x 5 (Screw)	Princess Auto*	\$ 00.05	12	\$ 00.60
08	20mm M3 Standoff (Brass Standoff)	Princess Auto*	\$ 00.20	6	\$ 01.20
09	1:20 (RC Car Differential)	Amazon	\$ 15.00	1	\$ 15.00
10	1:20 (Differential Gear)	Included with #09	\$ ---	1	\$ ---
11	8mm / 2mm (Ball Bearing)	Princess Auto*	\$ 00.20	2	\$ 00.40
12	3mm / 7mm (Ball Bearing)	Princess Auto*	\$ 00.10	2	\$ 00.20
13	Motor Bracket	3D Printed	\$ 00.00	1	\$ 00.00
14	Driver Coupler	3D Printed	\$ 00.00	1	\$ 00.00
15	Engine Block	3D Printed	\$ 00.00	1	\$ 00.00
16	Motor Clamp	3D Printed	\$ 00.00	1	\$ 00.00
17	Rear Axle	3D Printed	\$ 00.00	2	\$ 00.00
18	Differential Clamp	3D Printed	\$ 00.00	2	\$ 00.00
19	Rear Wheel Clamp	3D Printed	\$ 00.00	2	\$ 00.00
20	Right Beam	3D Printed	\$ 00.00	1	\$ 00.00
21	Left Beam	3D Printed	\$ 00.00	1	\$ 00.00
22	Front Wheel Bracket	3D Printed	\$ 00.00	1	\$ 00.00
23	Power Supply Bracket	3D Printed	\$ 00.00	1	\$ 00.00
24	Front Wheel Pivot	3D Printed	\$ 00.00	2	\$ 00.00
25	Front Wheel Clamp	3D Printed	\$ 00.00	2	\$ 00.00
26	Front Wheel Shaft	3D Printed	\$ 00.00	2	\$ 00.00
27	Front Wheel Steering Linkage	3D Printed	\$ 00.00	2	\$ 00.00
28	Servo Actuator Arm	3D Printed	\$ 00.00	1	\$ 00.00
29	Front Wheel Pivot Washer	3D Printed	\$ 00.00	2	\$ 00.00
30	Servo Regulator Carrier	3D Printed	\$ 00.00	1	\$ 00.00
31	ToF Tilt Washer Linked	3D Printed	\$ 00.00	8	\$ 00.00
32	Gyro Bracket	3D Printed	\$ 00.00	1	\$ 00.00
33	Wire Bracket	3D Printed	\$ 00.00	4	\$ 00.00
34	Front Wheel (From an old RC Car)	Unknown	\$ ---	2	\$ ---
35	Rear Wheel	Included with #33	\$ ---	2	\$ ---
AA	VL53L0X Breakout Board (ToF Sensor)	Amazon	\$ 4.10	4	\$ 16.40
BB	Servo Regulator Custom PCB	JLC PCB	\$ 14.00	1	\$ 14.00
CC	Generic Buck-Boost	Amazon	\$ 05.20	1	\$ 05.20
DD	#4892 (5V-out Buck Converter)	Pololu	\$ 27.60	1	\$ 27.60
EE	Raspberry Pi 4B	Amazon	\$ 80.22	1	\$ 80.22
FF	Main Board	JLC PCB	\$ 35.00	1	\$ 35.00
GG	7.4V 2Ah Li-ion battery	Amazon	\$ 12.35	1	\$ 12.35
HH	BNO055 Breakout (Gyroscope)	Amazon	\$ 07.40	1	\$ 07.40
II	KANO Webcam (USB Camera)	Amazon	\$ 07.40	1	\$ 07.40

Table 1: Bill of Materials. All prices listed in CAD. Items from Princess Auto were purchased at a lower price in the clearance section. PCB pricing includes components; for Gerber files, see the "pcb" directory in the root of the repository. Grand total, excluding taxes and shipping: \$ 234.77

Assembly Instructions

01



Added Parts by Ref. #:
1×01

02



Added Parts by Ref. #:
2×03, 1×13

03



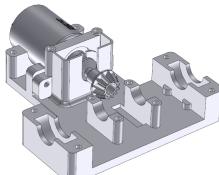
Added Parts by Ref. #:
1×14

04



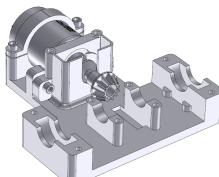
Added Parts by Ref. #:
1×10

05



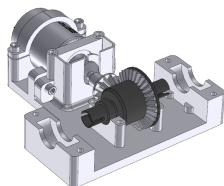
Added Parts by Ref. #:
1×15

06



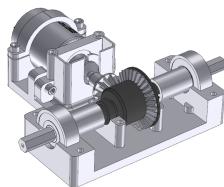
Added Parts by Ref. #:
1×16, 4×04

07



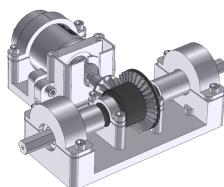
Added Parts by Ref. #:
1×09

08



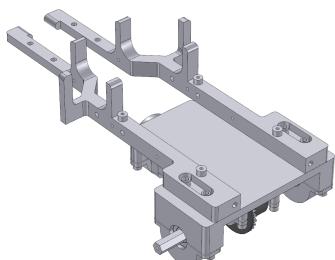
Added Parts by Ref. #:
2×17, 2×11

09



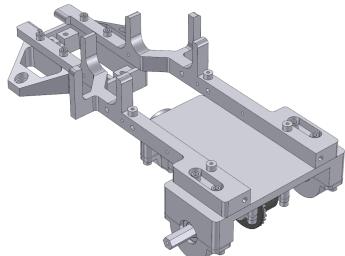
Added Parts by Ref. #:
2×18, 2×19, 8×04

10 



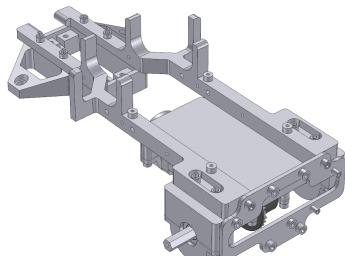
Added Parts by Ref. #:
1×20, 1×21, 4×04

11



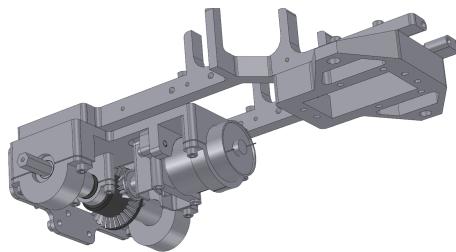
Added Parts by Ref. #:
1×22, 4×04

12



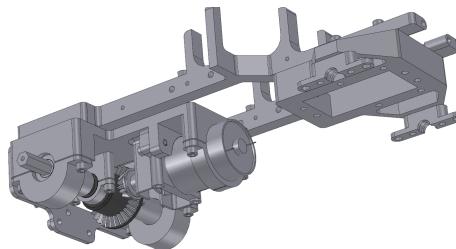
Added Parts by Ref. #:
1×23, 2×04

13 



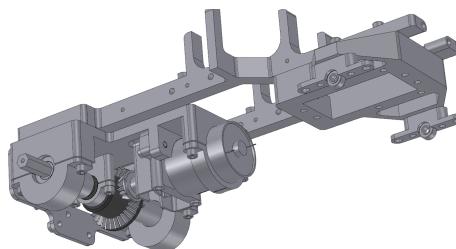
Added Parts by Ref. #:
None

14



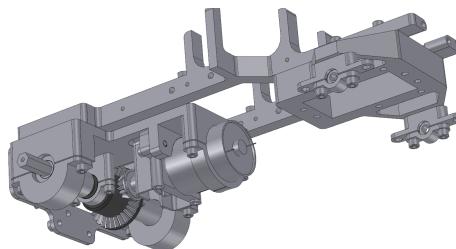
Added Parts by Ref. #:
2×24

15



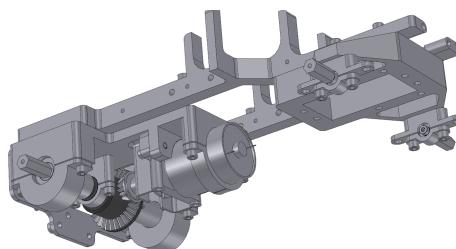
Added Parts by Ref. #:
2×12

16



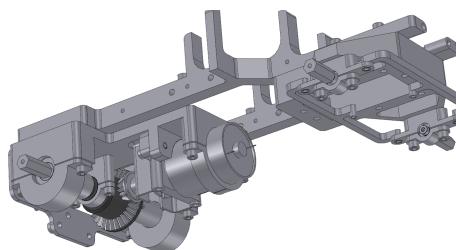
Added Parts by Ref. #:
2×25, 4×04

17



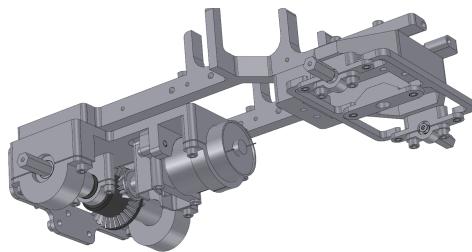
Added Parts by Ref. #:
2×26, 2×07

18



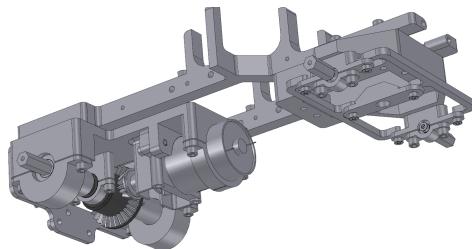
Added Parts by Ref. #:
2×27

19



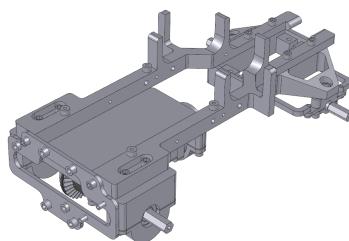
Added Parts by Ref. #:
1×28

20



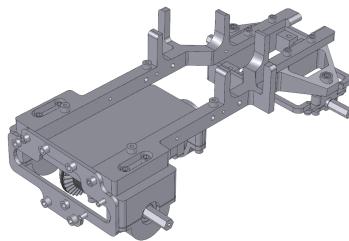
Added Parts by Ref. #:
6×06

21



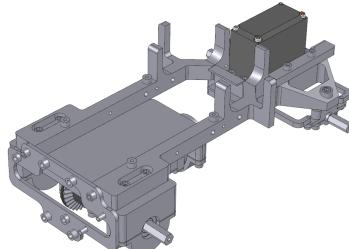
Added Parts by Ref. #:
None

22



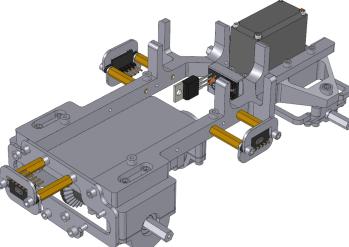
Added Parts by Ref. #:
2×29, 2×04

23



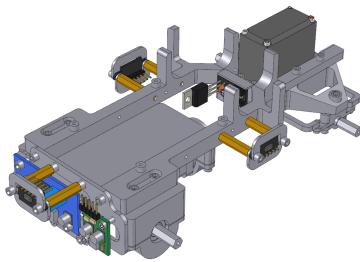
Added Parts by Ref. #:
1×02, 1×30, 4×04

24



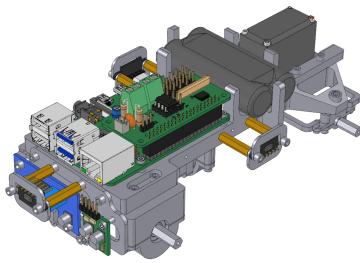
Added Parts by Ref. #:
6×08, 12×31, 6×03, 3×AA,
1×BB

25



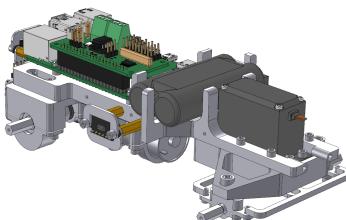
Added Parts by Ref. #:
2×03, 2×07, 1×CC, 1×DD

26



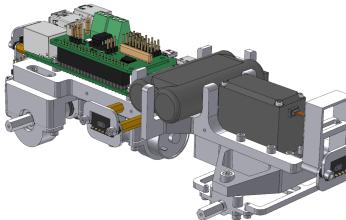
Added Parts by Ref. #:
4×07, 1×EE, 1×FF, 1×GG

27



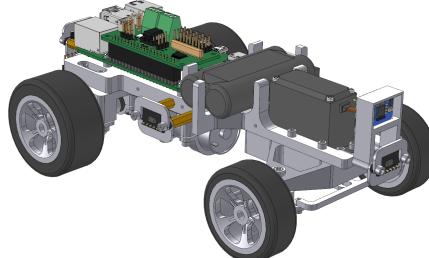
Added Parts by Ref. #:
None

28



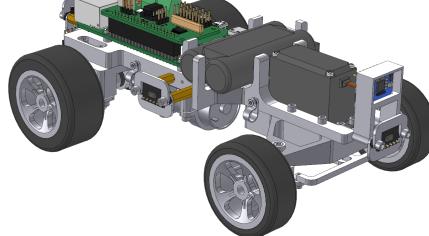
Added Parts by Ref. #:
4×32, 1×31, 2×05, 1×AA

29



Added Parts by Ref. #:
2×34, 2×35, 4×07, 1×HH

30



Added Parts by Ref. #:
4×33, 4×07

31

Use the following diagram to interconnect the electronic components:

