REDplane

Timing Belt System

TBS-2C Assembly manual

Please read this manual carefully till the very end BEFORE you start assembly!

TBS-2C is servo-ganging system, based on using of timing belts and tooth pulleys, and allows summarizing the torques of two servos.
You can use standard size servos of any brand without limitation. There are two versions of TBS – crank and pulley. TBS-2C is crank
version.

What you will find inside the kit and see at the sketch:

1. Tooth pulley 1 – 1 pcs.
2. Tooth pulley 2 – 1 pcs.
3. Tooth pulley 3 – 1 pcs.
4. Tooth pulley 4 – 1 pcs.
5. Pulley upper cover – 3 pcs.
6. Base plate – 1 pc.
7. Sliding bracket – 4 pcs.
8. Output crank corbel – 1 pc.
9. Flange – 1 pc.
10. Ball bearing – 2 pcs.
11. Ball bearing spacer – 1 pc.
12. Crank plate – 2 pcs.
13. Servo spacer - 4 pcs. (Back servo spacer)
14. Crank spacer – 8 pcs.
15. Timing (tooth) belt – 2 pcs.
16. Servo 1 (not supplied)
17. Servo 2 (not supplied)
18. Standard servo head (not supplied) – 2 pcs.
19. Hex-socket bolt M2 x 6 – 26 pcs. (Pulley)
20. Hex-socket bolt M2 x 12 – 4 pcs. (Servo)
21. Hex-socket bolt M4 x 42 – 1 pc.
22. Hex-socket bolt 4-40 x 1/2” – 8 pcs. (Brackets)
23. Hex-socket bolt 4-40 x ¾” - 8 pcs. (Crank)
24. Hex-socket bolt 4-40 x 1/4” – 6 pcs. (Corbel)
25. Washer M2 – 8 pcs. (Servo bolts)
26. Washer 4-40 – 12 pcs. (Servo bolts)
27. Lock-Nut 4-40 – 2 pcs.
28. Lock-Nut M4 – 1 pc.

Tools and materials you will need to assemble the Snap-Stand:

Allen keys: 1.6 mm (0.058”), 2.3 mm (0.090”), 3 mm (0.120”).
Drilling machine
Drill bit 1.6 mm diameter (0.063”)
Drill bit 2.2 mm diameter (0.086”)
Drill bit 2.7 mm diameter (0.100”)

Wrench 7 mm

LOCKTITE or any similar glue for securing threaded joints.

Standard size servos any brand – 2 items.

Servo head 24 mm in diameter, plastic or metal. – 2 items.

All above mentioned tools and materials are not supplied.

Step 1 – Assemble tooth pulley 1 and 2.

Join tooth pulley and round standard servo head (24 mm diameter). All pulleys are absolutely similar and have 1.6 mm diameter holes.

These openings will be reamed during assembly to except different bolts.

First of all drill six holes in both servo heads. If these items made of plastic, use 1.6 mm drill bit to make openings in the head. Use pulley as

s template to drill the holes. After that, ream corresponding holes in the pulley using 2.2 mm bit. There is no need to use LOCKTITE, just

screw in six bolts M2x6 (12) in to the servo head.

If the servo head made of aluminum, there are three options.

First option is – use the same bit 1.6 mm diameter to make openings in the head and then make thread using M2 tap.

Second option is - If you do not have metric tap, drill the opening of 1.85 mm in diameter and carefully screw M2 bolts (12) in place using

bolts as a tap. After you have made openings in the servo head, ream corresponding holes in the pulley using 2.2 mm bit.

Third option is - you can use your own bolts up to M3 or 4-40 size. We recommend you to use the bolts we provide. Six bolts M2 more than

enough to transfer the torque from servo to servo, even the most powerful ones.

Step 2 – Assemble tooth pulley 4.

Ream inside holes with 2.7 mm bit. Bolts 4-40 must go through these openings freely. Ream outside holes with 2.2 mm bit. Bolts 4-40 will be

screwed in these openings later during crank assembly. Join tooth pulley (4) and flange (9) using six bolts 4-40 x 1/2” (23). Flange has

exactly the same diameter as servo head – 24 mm. Holes in flange are already threaded. Use LOCKTITE to secure bolts in place.

Reciprocal orientation of the pulley teeth and flange does not matter.

Step 3 – Assemble the base plate.

Install the corbel (8) in place using six bolts 4-40 x 1/4 (24). Use LOCKTITE to secure bolts in place. Assemble the pulley (4), bolt M4 (21),

two ball bearings (10), spacer (), washer and nut M4 according the sketch (Pic.1). The pulley must spin freely and smoothly.

Step 4 – Install the servos.

Install sliding brackets (7) on servos 1 (16) and 2 (17), using bolts M2x12 (20) and washers (26). Use LOCKTITE to secure bolts in place.

Do not remove brass inserts and rubber shock absorbers from servo case provided by servo manufacturer.
Temporary install both servos on base plate (6), using bolts 4-40x3/4" (23) and washers (27). Don't forget to place spacers (13) between
servo 1 sliding brackets and base plate. Do not LOCTITE these bolts yet! Some adjustments will be needed after final assembly is done.

Step 5 – Crank assembly.
Install crank set on top of the pulley 4 according the sketch. Six bolts 4-40 x ¾" (24), six spacers (13) are used to assemble it. The bolts are
screwed into the openings 2.2 mm you made at the Step 2. No LOCTITE required. Do not forget to place pulley cover (5) on top of the
pulley. Before that ream the holes in the cover with 2.7 mm bit. This cover is necessary to level the crank set on top of the pulley with the
rest of the pulleys installed on top of the servos.
There are two pairs of holes at each end of crank plate (11). You can use any of them by your choice. The distance between holes A and B
(offset) is 11 mm. The span of the crank is 126 mm.
We designed the crank for using ball-ends with 8 mm diameter balls. But it is not absolutely necessary to use these ball-ends or any ball-
ends at all. You can use any design that you prefer to connect cable to the crank. Two additional bolts and spacers are available for your
experiments.

Step 6 – Belts installation and final adjustment.
Install the pulley 2 on the driving shaft of the servo 2. Screw the servo head screw (provided by servo supplier) in place. Place the belt (15)
on the pulleys 2 and 4. Make sure that belt teeth are placed exactly in between pulleys teeth. Use your radio to adjust desirable neutral
servo position to orient the crank the way you wish.
Adjust the belt tension, moving servo on sliding brackets. Belt tension must be just enough to straighten the belt between pulleys and to
minimize the sag of the belt to eliminate any playing, when servo moves. Tighten the bolts (23) to secure servo in place. Use LOCTITE only
when you are sure that the servo in right position. Using your radio, check servo movements. If it is necessary readjust neutral servo position
again.
After that install pulley 3 and cover 5 on top of the pulley 2, using bolts M2x18 according the sketch. Install the pulley 1 on the driving shaft of
servo 1. Tighten the head bolt. Install the belt. Make sure that belt teeth are placed exactly in between pulley teeth. Use your radio to adjust
neutral position of this servo.
Adjust the belt tension, moving servo on sliding brackets, following the same procedures as you did during installation of the servo 2. Tighten
the bolts to secure servo 1 in place. Use LOCTITE now. Use your radio to check servo movements. If necessary you can make adjustments
to synchronize servos. Install the cover 5 on top of the pulley 1, using six M2x6 hex-socket bolts (18).
Now TBS is ready to be installed on the plane now.

Some recommendations.

There is no need to oil the belt or pulleys at all.

Always use LOCKTITE, when joint is metal-to-metal.

Be careful, DO NOT over tight the bolts if you use plastic servo head. Reciprocal orientation of the pulley teeth and servo head does not

matter. Use the servo head, recommended by manufacturer of particular servo you use.

It's up to you to use rubber inserts in base plate (6) openings to reduce vibration affect. It's not a necessity. But if you'll decide to use it, there

is no problem; it will not affect the work of TBS at all.

Check all joints often after every flying day, especially metal-to-metal.

To secure the whole unit in place use any bolts with diameter not smaller than 3.5 mm. We designed the plate for using bolts M4.

We hope our TBS system will serve you well and help you fly your planes as a pro.

Our TBS is brand-new product never produced before by any manufacturer and it is still being developed and improved. We will appreciate

any ideas, recommendations or critique of our TBS from you. Don't hesitate contact us at any time.

Thank you for choosing Red Plane products!

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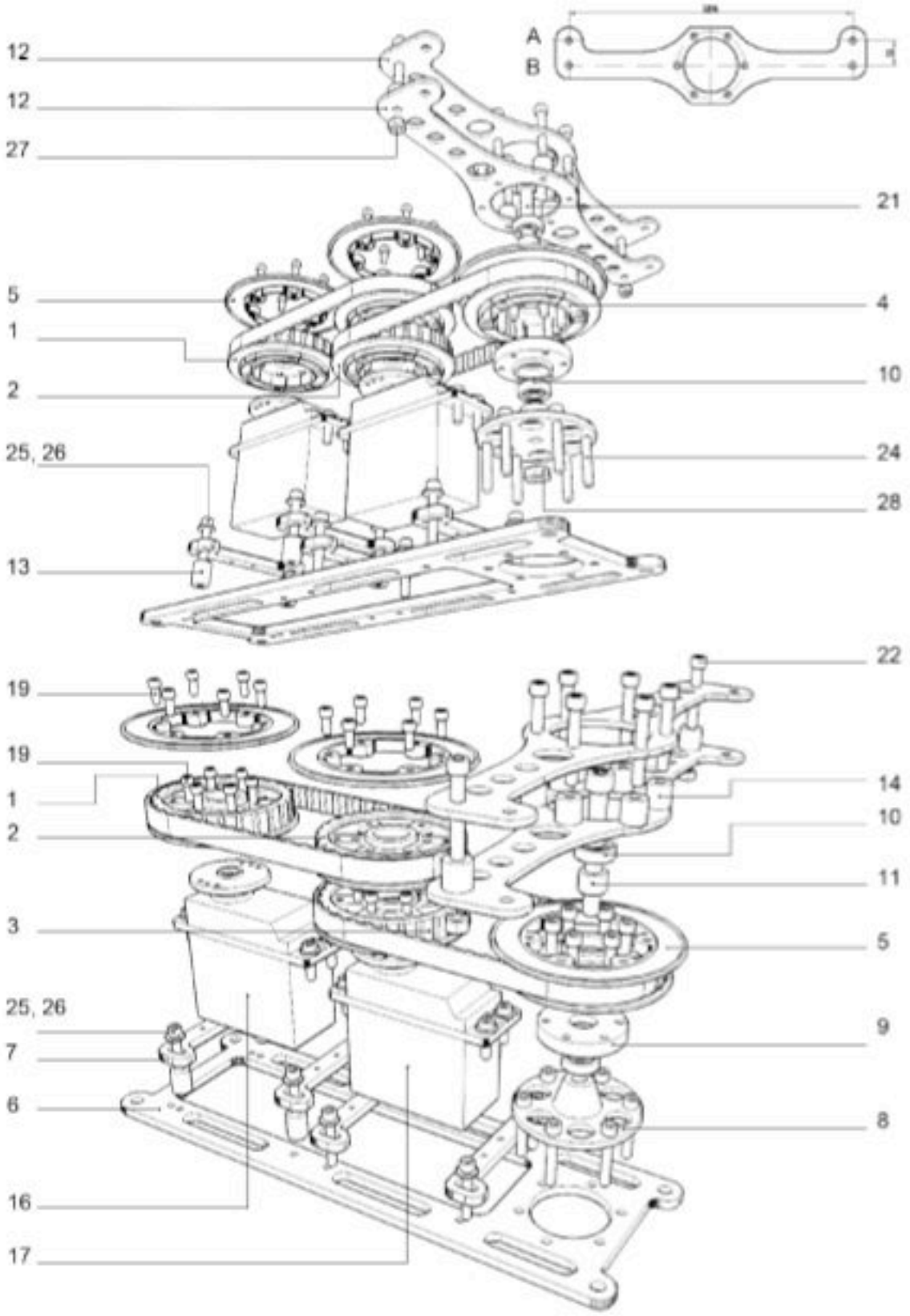
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