

TRIPLE ACTION[®]

Small Adult Ankle Joint
(16mm Systems)

PRODUCT MANUAL



BECKER



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Small Adult Ankle Joint
(16mm Systems)

INTRODUCTION

The patent pending Small Adult Triple Action ankle joint for 16mm systems offers unique features and exceptional performance for the orthotic treatment of stroke, multiple sclerosis, traumatic brain injury and other pathologic neuromusculoskeletal conditions. It has been shown to systematically influence gait in biomechanical studies.

The component is easy to use and separates the action of plantarflexion resistance, dorsiflexion resistance, range of motion and alignment.





Triple Action springs are many times stronger and last longer than springs used in conventional orthotic components. The clinician can tune the component to meet the changing needs of their patient through all stages of recovery and rehabilitation. This adjustability delivers an effective orthotic solution to help mobilize the ankle, while balancing support for the knee.

The component may also be used post-surgically or as a static progressive management tool for adjustable static alignment followed by progressive mobilization of the ankle.

Triple Action delivers active support to help patients navigate the real world outside the exam room.



Models

GAIT PHASE WHERE ABNORMALITIES OCCUR					
Booster Configuration	Early Stance Phase	Late Stance Phase	Leg	Side	Order No.
 None	NORMAL		Either		3B76-A0*
 PF	ABNORMAL	NORMAL	Right	Lateral	3B76-A1*
			Left	Medial	
			Left	Lateral	3B76-A2*
			Right	Medial	
 DF	NORMAL	ABNORMAL	Right	Lateral	3B76-A2*
			Left	Medial	
			Left	Lateral	3B76-A1*
			Right	Medial	
 PF & DF	ABNORMAL		Either		3B76-A3

*Only available direct from Becker Orthopedic in some countries

Note: Right lateral component shown



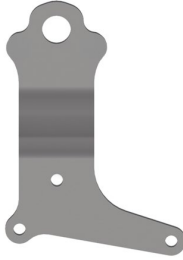
Adjustment Wrenches

(included)

*The Booster Spring Unit cannot be removed from the Triple Action component housing. Doing so will destroy the Booster and void the product warranty.

Options & Accessories

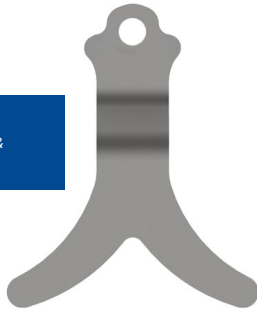
Lateral Stirrup
(Models LATR & LATL)



Medial Stirrup
(Models MEDR & MEDL)



Y Stirrup
(Model 3B76-YR-1 &
Model 3B76-YL-1)



Universal Rivet Stirrup
(Model 3B76-R-1)



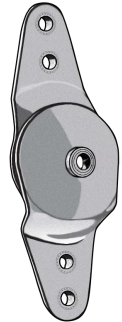
Fabrication Tool Kit
(Model 3B00-FTK)

The fabrication tool kit includes fabrication dummies, alignment axis, attachment hardware and wrenches.



Camber Axis Triple Action Companion Joint
(Model 751-ATA)

Thermoplastic unilateral AFO's require Camber Axis Triple Action Companion Joint, or other free motion ankle joint.

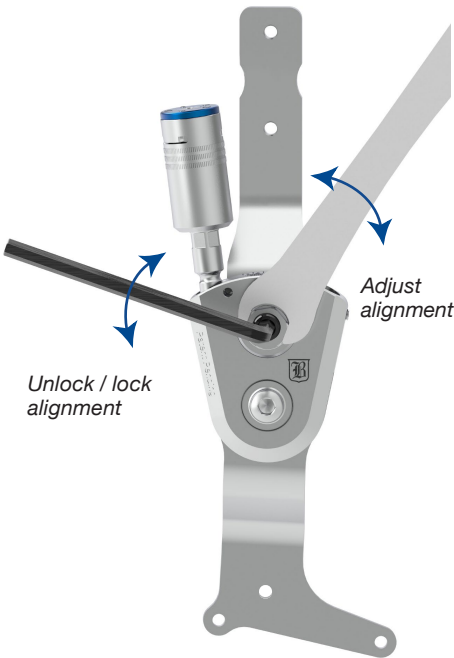


Adjustment

Triple Action ankle alignment, range of motion, and spring stiffness independently adjustable. Ankle alignment rotates the component body about the pivot bearing to change the ankle angle without altering range of motion or resistance to ankle motion. Dorsiflexion and plantarflexion range of motion settings change the relative dorsiflexion and plantarflexion range of motion irrespective of the ankle alignment setting. Spring stiffness is adjusted by changing the spring configuration.

Adjusting Alignment

Loosen the alignment lock (inside the hex) $\frac{1}{2}$ to $\frac{3}{4}$ turn to unlock the alignment adjustment.

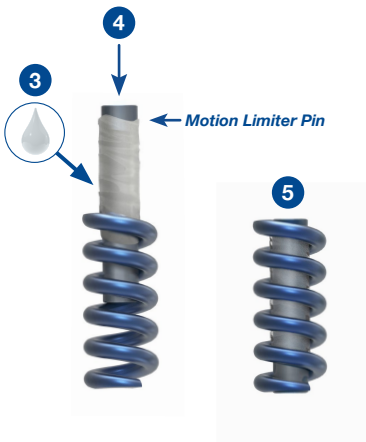


The alignment adjustment range is $\pm 10^\circ$

The recommended tightening torque for the alignment lock is: 10Nm (90 in-lb)

Spring Installation

1. Remove the adjustment screw, resist spring and motion limiter pin from the channel
2. **Do not** remove the ball bearing
3. Grease the motion limiter pin
4. Insert the motion limiter pin into the spring
5. Wipe excess grease from the outside of the spring
6. Install the spring with the motion limiter pin into the channel and tighten the adjustment screw until resistance is felt.
7. Adjust range of motion as necessary



Adjusting Range of Motion

The range of motion adjustment changes the stirrup range of motion between its neutral position and the motion limitin

To Zero ROM:

- Unlock the ROM Adjustment using the 1.5mm hex wrench to loosen the ROM Lock Set Screw.
- Turn the ROM adjustment screw fully clockwise using the 4mm adjustment wrench.

To Increase ROM:

- Turn the adjustment screw counter clockwise to increase ROM by 5° per full turn.

To Lock ROM:

- Lock the adjustment screw by torquing the ROM Lock Set Screw to 0.5 Nm (Figure 1).

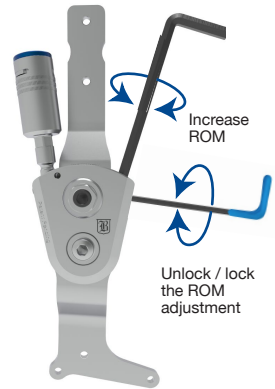


Figure 1

Notes:

- The maximum ROM setting is 10° (2 turns of the adjustment screw).
- Count the number of turns to keep track of the setting.
- The ROM adjustment screw is pre-coated with an antimigration patch and does not require thread locking adhesive for the first five adjustments.

Adjusting Range of Motion with the Booster Spring

With the Booster Spring models, rotate the booster to adjust the ROM setting.

To Zero ROM



Figure 1. Unlock / lock the ROM Adjustment using the 1.5mm hex wrench to loosen / tighten the ROM Lock Set Screw.



Figure 2. Adjust the ROM setting to 0° by turning the Booster fully clockwise with the adjustment wrench.



Figure 3. Loosen the ROM Dial screw using the 2mm adjustment wrench and zero the ROM setting by turning the blue ROM dial. The ROM lock set screw serves as a reference for this adjustment.

(Continued on next page)

Adjusting Range of Motion with the Booster Spring

To adjust ROM with the Booster Spring:

- Loosen the ROM Lock Set Screw to unlock the adjustment (Figure 1).
- Turn the booster counter clockwise to increase ROM 5° per turn.
- Lock the booster by torquing the ROM Lock Set Screw to 0.5 Nm (Figure 1).

Notes:

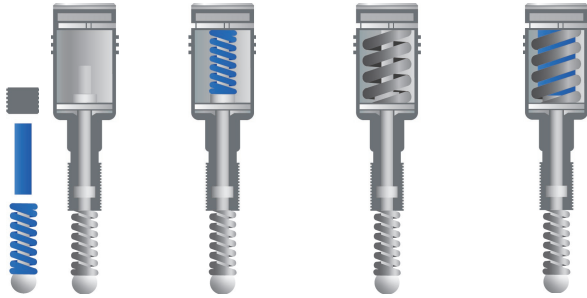
- *The maximum ROM setting is 10° (2 turns of the Booster Spring).*
- *The ROM is read directly from the blue ROM Dial.*



Adjusting Spring Stiffness

The stiffness of spring configuration 1 is suitable for the management of mild swing phase gait deficits. If higher stiffness is required, the Triple Action with Booster Spring may be required. With the Booster Spring, the component's resist can be configured with four different stiffness options.

Spring Configurations



Spring Configuration	1	2	3	4
Booster Required	No	Yes	Yes	Yes
Bottom Spring	Standard	Standard	Standard	Standard
Top Spring	None	Standard	High	High & Standard
Stiffness	X1 (low)	X2 (moderate)	X4 (high)	X5 (very high)
Max. ROM	10°	10°	10°	10°

Configuring the Booster Spring

The stiffness of spring configuration 1 is about 3 times higher than a conventional metal ankle joint.

Booster spring stiffness increases linearly with the spring configuration number. Spring configuration 5 is about 18 times stiffer than a conventional metal ankle joint. The maximum active ROM for all spring options is 10 degrees.

To change the Booster Spring configuration:

1. Increase the ROM setting to 15° by turning the booster counter clockwise to decrease Booster Spring compression (Figure 4).
2. Remove the Booster Spring ROM dial screw and ROM Dial (Figure 5).
3. Remove the Keeper Plate and install the desired spring configuration (Figure 6).



Figure 4. Adjust the booster to 15° ROM.



Figure 5. Remove the ROM Dial Screw and ROM dial.

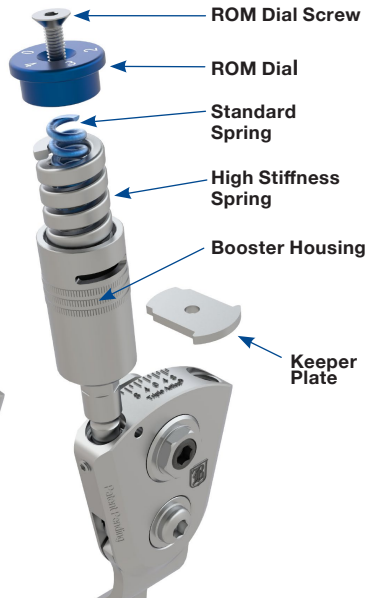


Figure 6. Remove the Keeper Plate and install the desired spring configuration.

Orthotic Design Considerations

For best results, Triple Action AFOs must be rigid. AFOs that are too flexible will decrease the systematic influence of the Triple Action ankle joint on gait. Rigid carbon/epoxy laminated orthoses are recommended for Adult Triple Action AFOs. Ribs or stiffeners may also be included to help stiffen the structure. If single upright designs are used, attention should be given to enhancing torsional stiffness of the tibial section.

The Triple Action component may also be used in single, or double upright polymer AFOs. Polymer AFOs should be made of polypropylene homopolymer in a sheet thickness of 4.8mm (3/16 inches). If a single Triple Action component is used in a polymer AFO, a medial free motion companion joint with high torsional stiffness must be paired with the Triple Action. Becker Orthopedic recommends the Camber Axis Triple Action Companion Joint, Model 751-ATA, for use in single upright polymer AFOs using the Small Adult Triple Action ankle joint, Model 3B76.

Depending on spasticity, a single Triple Action component placed on the lateral or medial side may be suitable for the management of patients up to 90kg (200 lbs). For spastic patients greater than 90kg, bilateral Triple Action components are recommended.

Anterior (ventral) AFO designs (Figure 7) with full length footplates are recommended when dorsiflexion resist function predominates, such as in sub-acute stroke or TBI management/rehabilitation, or where there is a quadriceps or plantarflexor insufficiency. Posterior (dorsal) AFO designs (Figure 8) with sulcus or full-length footplates are recommended when there is high plantarflexion spasticity, or knee extension in the early stance phase of gait, such as in extensor synergy in chronic stroke.

*Using the standard method outlined in the Fabrication Guide.



Figure 7. Anterior (ventral) design.



Figure 8. Posterior (dorsal) design.

Fabrication Options

Thermoplastic



Unilateral*

5mm (3/16") Polypropylene



Bilateral

5mm (3/16") Polypropylene

Composite



Unilateral

Wet Lamination like Becker BCO Shadow™, Max™ or PrePreg



Bilateral

Wet Lamination like Becker BCO Lite™, Shadow™, Max™ or PrePreg

*Important: Thermoplastic unilateral AFOs require Camber Axis Triple Action® Companion Joint, or other free motion ankle joint

Triple Action[®] Clinical Tuning Procedure

Through biomechanical research, Becker Orthopedic has developed an evidence-based Systematic Tuning Procedure to help simplify application of the Triple Action[®] ankle joint. This procedure is intended as a starting point to allow clinicians to more quickly arrive at optimal component settings using Observational Gait Analysis.

Tuning Procedure

1. Bench Adjustment
2. Static Alignment
3. Swing Phase Alignment
4. Stance Phase Adjustment
 - Early Stance Phase Adjustment
 - Late Stance Phase Adjustment

Systematic Tuning Procedure for Triple Action Ankle Joints.

To view, please scan the **QR Code** ►



Spring Selection

Before performing Bench Adjustment, the desired Triple Action spring configuration must be installed (refer to Adjusting Spring Stiffness).

The Triple Action ankle joint with spring configuration 1 in the plantarflexion channel is suitable for the management of patients with mild swing and stance phase gait deficits under 90kg (200lbs). For patients with higher spasticity or greater weight, the Booster Spring is recommended. In general, higher stiffness springs should be used to manage higher spasticity patients.

The Booster Spring expands applications of the Triple Action to patients with a broad range of neuromusculoskeletal deficits. All spring options have 10° ROM and stiffness increases linearly with spring configuration number.

Bench Adjustment

After the desired spring configuration has been installed and prior to fitting the orthosis, bench adjust the component as follows:

1. Adjust the plantarflexion ROM setting to 0°.
2. Adjust the dorsiflexion ROM setting to 0°.
3. Set the ankle alignment to 0°.

Static Alignment (PF and DF ROM at 0°)

Don the orthosis and shoes to the patient and perform static alignment with the patient standing. Adjust the ankle angle with the ROM settings locked at 0° to tune for knee stability. The knee should be slightly flexed to place the weight line over the midfoot and improve the patient's sense of standing balance and stability. Avoid aligning the ankle to the patient's maximum ROM in dorsiflexion when making this adjustment. If there is insufficient dorsiflexion ROM to make this adjustment due to a gastrosoleus contracture, a heel lift or shoe modification may be necessary.



Swing Phase Alignment (PF and DF ROM at 0°)

With the patient walking, and the ROM settings still locked at 0°, adjust the alignment setting to improve toe clearance in mid swing and foot position at initial contact. Observe the foot to floor angle while making this adjustment. Note that increasing dorsiflexion alignment may reduce knee extension at terminal swing if there is gastrocnemius tone or contracture. Also observe and optimize for step length symmetry while making this adjustment.



Toe Clearance (left) and Foot to Floor Angle (right)

Early Stance Phase Adjustment (DF ROM at 0°)

Increase plantarflexion ROM 5° to 10° (1 to 2 turns of the adjustment screw or booster spring) to activate the ankle in 1st rocker and early stance. Increasing PF ROM will decrease the pre-load resistance of the PF resist. Ensure that toe clearance and foot position at initial contact are maintained as PF ROM is increased.

- If toe clearance or foot to floor angle decreases → Decrease the PF ROM.
- If knee hyperextension in early stance increases → Decrease the PF ROM.
- If the knee flexes excessively in 1st rocker → Increase the PF ROM.

If plantarflexion ROM must be decreased to less than 5° to maintain ankle position during this adjustment, it may be necessary to increase the stiffness of the plantarflexion spring by changing the spring configuration to a higher number.



Late Stance Phase Adjustment

Adjust dorsiflexion ROM to activate the ankle in 2nd rocker and late stance to stabilize the knee. Begin by increasing the dorsiflexion (DF) ROM by 1 to 2-turns (3 to 6°) of the adjustment screw.

- If the knee flexes excessively after midstance → Decrease the DF ROM.
- If the knee hyperextends at the end of stance phase → Increase the DF ROM.

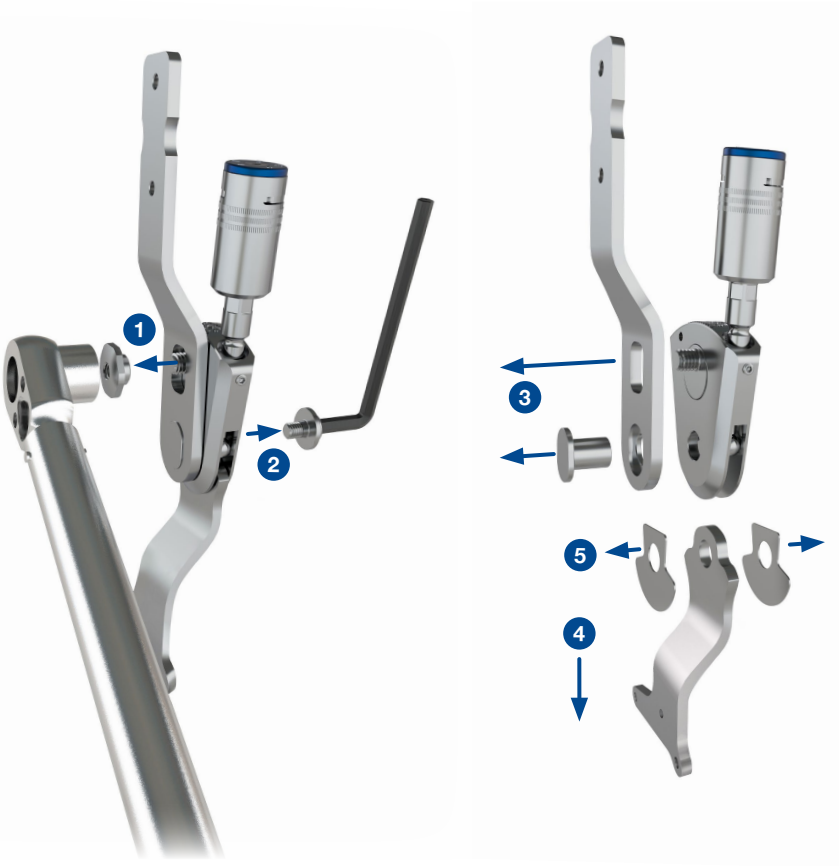


Maintenance

Disassembly

Prior to assembly of the Alignment Tool, the Upper Bar and Stirrup must be removed from the Triple Action component body. Use the following procedure to disassemble the component:

1. Remove the cam nut using a 15mm socket wrench.
2. Remove the pivot bushing screw using the M4 hex wrench.
3. Remove the pivot bushing and upper bar.
4. Remove the stirrup.
5. Remove the wear plates from the stirrup.

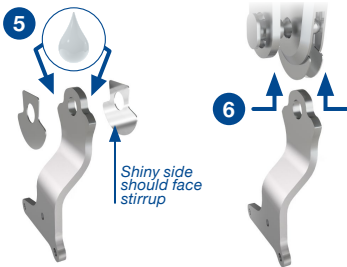
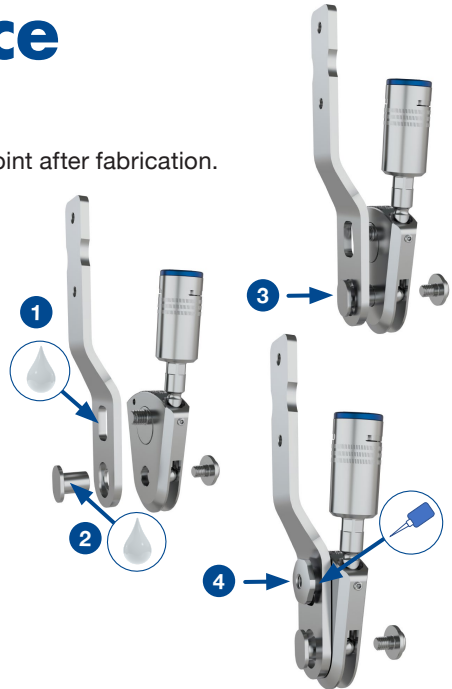


Maintenance

Assembly

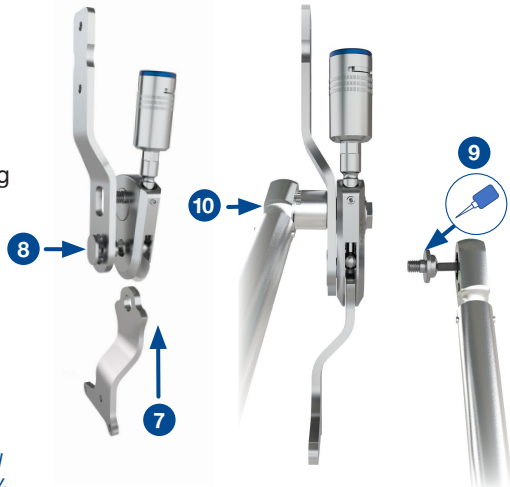
Re-assemble the Triple Action ankle joint after fabrication.

1. Lubricate the cam slot in the upper bar with Teflon grease (included).
2. Lubricate the pivot bushing with Teflon grease.
3. Insert the pivot bushing through the hole in the upper bar and part way into the component body.
4. Apply medium strength thread locker to the cam nut and loosely install.



5. Grease both sides of the head of the stirrup with Teflon grease.
6. Insert wear plates into clevis with the shiny sides toward the stirrup head. Ensure wear plates are correctly oriented as shown.

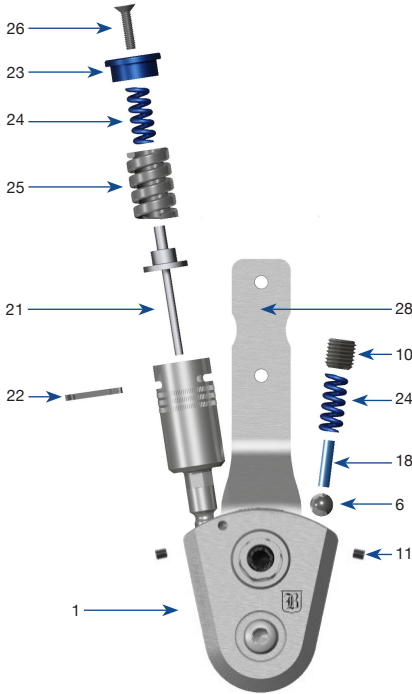
7. Insert stirrup between the wear plates into clevis.
8. Push pivot bushing through wear plates and stirrup and ensure the head of the bushing is fully seated in upper bar.
9. Apply medium strength thread locker to pivot screw, install and torque to 10Nm using a torque wrench.
10. Tighten cam nut to 10Nm using a 15mm socket and torque wrench.



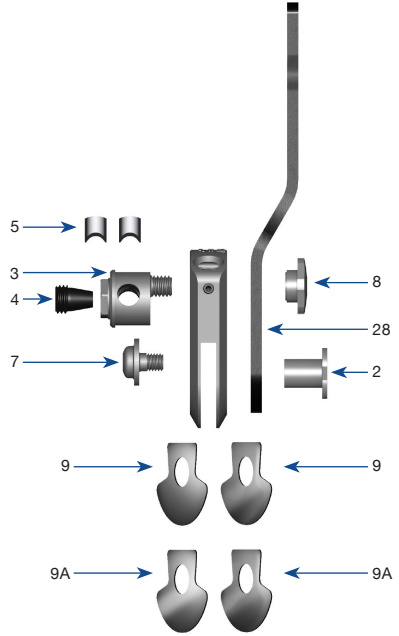
Note: The bar attachment screws (not included) should be coated with thread locking adhesive prior to final assembly.

Triple Action Components

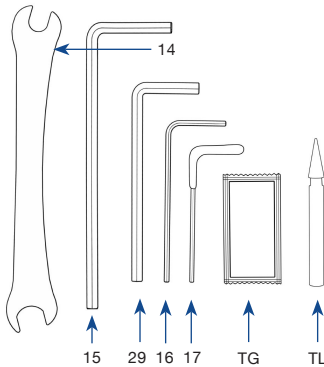
Front View



Side View



Accessories



Triple Action Part Numbers

Reference #	Description
2	Pivot Bushing
3	Cam Bushing
4	Cam Bushing Screw
5	Cam Jaw
6	1/4" Ball Bearing
7	Pivot Screw
8	Cam Nut
9	Wear Plate
10	Set Screw M8 x 1 x 8mm Flat Point
11	ROM Lock Set Screw
12	Attachment Screw M4 x 6mm - (Not Shown)
13	Attachment Screw M4 x 8mm - (Not Shown)
14	Combination Wrench
15	4mm Hex Wrench
16	2mm Hex Wrench
17	1.5mm Hex Wrench
18	Standard Pin (Blue)
21	Booster Spring Base and Pin Assembly
22	Booster Spring Keeper Plate
23	ROM Dial
24	Standard Spring (Blue)
25	High Stiffness Spring (Silver)
26	Booster ROM Dial Screw
28	Upper Bar
29	2.5mm Hex Wrench
TG	Teflon Grease
TL	Thread Lock

Note:

To order parts, please specify the original order number, right or left, medial or lateral, followed by the part number desired.

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