



BELL-EVERMAN INC.
759 Ward Drive
Goleta, CA 93111

Phone 805-685-1029
Fax 805-685-6787

SERVOBELT LINEAR MAINTENANCE MANUAL

STANDARD CARRIAGE (SBL-L, SBL-M, SBL-H)
and
LOOPTRACK CARRIAGE (SBL-M-LT, SBL-H-LT)

Author	Document Number	Revision
Jeff Miskel	103468-001	E

Revisions

Revision	Description / DCR #
-	INITIAL RELEASE
A	Added SBL-H
B	Procedure re-written and re-named. Now includes both Standard & LoopTrack ServoBelt Linear assemblies. Added Definitions and Table of Contents, VHB Tape Replacement, Periodic Lube of Bearing Blocks / DCR # 155
C	Renamed to 'ServoBelt Linear Maintenance Manual' to more accurately describe the purpose of this document. Re-arranged some of the contents accordingly. DCR # 435
D	Updated with new logo and address. DCR # 845
E	Refined SBL-H Belt Tensioning Procedure in Section 5 / DCR # 864

Definitions

SBL-L	ServoBelt Linear – Light Duty
SBL-M	ServoBelt Linear – Medium Duty
SBL-H	ServoBelt Linear – Heavy Duty
LT	LoopTrack

Table of Contents

Section 1	Introduction
Section 2	Data Tables
Section 3	Bearing Block Periodic Re-Lubrication Process
Section 4	SBL-L (Standard Configuration only) & SBL-M (Standard and LoopTrack Configuration) Belt Tensioning Procedure Method 1: Using a Fish Scale Method 2: Using a Load Cell and Digital Weight Indicator
Section 5	SBL-H (Standard and LoopTrack configuration) Belt Tensioning Procedure
Section 6	SBL-L, SBL-M & SBL-H (Standard Configuration) Upper Belt Replacement Procedure
Section 7	SBL-M-LT Endless Belt Replacement Procedure Method 1: Replacement without carriage assembly removal Method 2: Replacement with carriage assembly removal
Section 8	SBL-H-LT Endless Belt Replacement Procedure Method 1: Replacement without carriage assembly removal Method 2: Replacement with carriage assembly removal
Section 9	3M VHB Tape Replacement Process

1 INTRODUCTION

The main purpose of this document is to define maintenance and field service procedures used on standard carriage SBL-L, SBL-M and SBL-H linear assemblies and LoopTrack carriage SBL-M-LT and SBL-H-LT linear assemblies. This includes the recommended interval and materials used to perform periodic bearing block re-lubrication.

This document also includes detailed steps to properly tension, and replace as needed, ServoBelt belting on the various SBL assembly models. Accurate belt tension is essential for proper operation of ServoBelt linear assemblies. **Please Note:** For proper life and operation, all belt tensioning and replacement operations should be followed by checking for lubricant on belt teeth. If found to be dry, a *small* amount of CRC 03055 Food Grade Chain Lubricant should be applied along the length of the lower (static) belt. If a LoopTrack endless belt is replaced, a small amount of lube should be applied to the smooth side (backside) of the belt.

This document concludes with the procedure for replacing 3M VHB double-sided tape which secures lower belting to the belt tray. This is **only** to be performed when necessary.

NOTE: The VHB tape replacement process shown should be bypassed if the existing tape is undamaged. A small section of damaged VHB tape can be replaced as required. If you re-use the original VHB tape with a new lower belt, the original tape can be “refreshed” (oil contamination removed) by wiping the tape adhesive with an acetone-soaked cloth and then allowing the tape to dry, rendering it tacky again.

2 DATA TABLES

Table 1 Extra Belt Teeth needed for a proper Belt Loop (ServoBelt standard carriage configurations)

NOTE: The number of extra teeth must be precise.

ServoBelt Linear Assembly	Extra Belt Teeth
SBL-L	6
SBL-M	7
SBL-H	8

Table 2 Mounting screw torque specification

ServoBelt Linear Assembly (Screw size)	Any material screws into aluminum
SBL-L (M5)	40 in. lbs.
SBL-M (M6)	65 in. lbs.
SBL-H (M8)	155 in. lbs. (13 ft. lbs.)

Table 3 Vertical Force (preload) specification

(*) Note: you must add the weight of the motor (and/or gearbox) if being vertically lifted during belt tensioning.

ServoBelt Linear Assembly	Vertical force range required for proper belt tension (*)
SBL-L	15-18 lbs.
SBL-M	25-30 lbs.

3 BEARING BLOCK PERIODIC RE-LUBRICATION PROCEDURE

- 3.1 Bearing Block re-lubrication intervals can be as little as every 4,000 Km or one year, in lightly loaded , clean environments. Shorter intervals will be called for in higher load or dry, dusty environments. Contact Bell-Everman Engineering for help determining the proper lubrication interval for your application.
- 3.2 The recommended tools to perform the re-lube are as follows:
Pistol-Grip Grease Gun for Standard Grease Fittings, 12" Long Flexible Nozzle (McMaster-Carr P/N 1190K37)
Grease-Dispensing Tip, Adapter, 5-1/4" Long (McMaster-Carr P/N 2906K92)
Castrol Tribol GR 100-2 PD Lithium Based Grease (Bell-Everman P/N 107430-001, or if in Cleanroom use, Castrol Tribol 215-2, Bell-Everman P/N 107430-002)
- 3.3 The bearing runner blocks have Zerk fittings to feed the lubricant into the bearings.
- 3.4 With the grease gun loaded with Tribol GR 100-2 PD grease and the dispensing adapter installed, push the adapter tip against the runner block Zerk fitting. Pump the grease gun trigger one full pump to dispense the recommended amount of grease for the re-lube (approx. .7cc's)



4 SBL-L (STANDARD CONFIGURATION ONLY) & SBL-M (STANDARD AND LOOPTRACK CONFIGURATION) BELT TENSIONING PROCEDURE

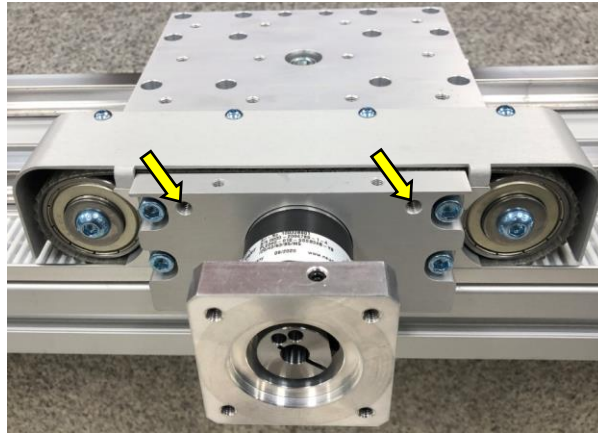
Regardless of which method is used, you must ensure that the motor mount plate is kept straight while being lifted vertically to create belt tension (preload).

METHOD 1 Using a Fish Scale

It is recommended that 1 person pull up with the Fish Scale to create belt tension (preload), while another person tightens the mounting screws.

- 4.1 With the motor mount plate screws installed snug then backed off $\frac{1}{4}$ turn, you can begin the belt tension process.

For SBL-M stages, temporarily insert 2 M6 screws (M5 for SBL-L) in the provided tapped holes in the motor mount plate (shown below), then take a long zip tie and loop it around the screws as close to the motor mount plate as possible. You can now hook a fish scale to the zip tie and pull straight up to create the proper amount of tension. Refer to Section 2 Table 3 for the proper amount of Vertical Force required based on the stage model (plus the weight of the motor and/or gearbox if attached).



METHOD 2 Using a Load Cell and Digital Weight Indicator

4.2 With the motor mount plate screws installed snug then backed off $\frac{1}{4}$ turn, you can begin the belt tension process.

For SBL-M stages, temporarily insert 2 M6 screws (M5 for SBL-L) in the provided tapped holes in the motor mount plate (shown below), then take a long zip tie and loop it around the screws as close to the motor mount plate as possible. You can now hook a load cell to the zip tie and pull straight up to create the proper amount of tension as shown on an attached digital weight indicator.

Refer to Section 2 Table 3 for the proper amount of Vertical Force required based on the stage model (plus the weight of the motor and/or gearbox if attached).

(Digital Weight Indicator photo below is for reference only).

Tighten the mounting screws per Section 2 Table 2.

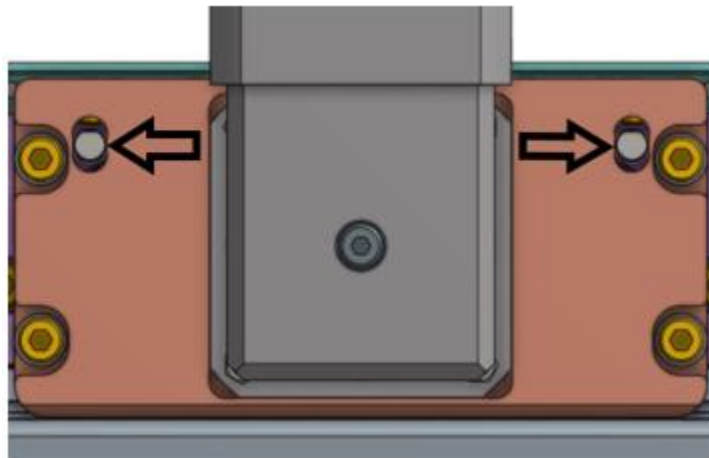


5 SBL-H (STANDARD AND LOOPTRACK CONFIGURATION) BELT TENSIONING PROCEDURE

- 5.1 There are two set screws on the top of the motor mount plate which are used to create tension (preload) on SBL-H belts.



To ensure that the pinion (pulley) teeth are properly meshed with the SBL-H belt teeth, loosen the two belt tensioning set screws and then verify the mount plate dowel pins are in the approximate centered position in the mount plate slots as shown in the graphic below. This dowel pin position is indicative of the teeth being properly engaged. If the dowel pins are higher up in the slot it is most likely because the belt teeth are not meshed properly with the pinion teeth. Adjust the pinion/belt as needed until the dowel pins are approximately centered.



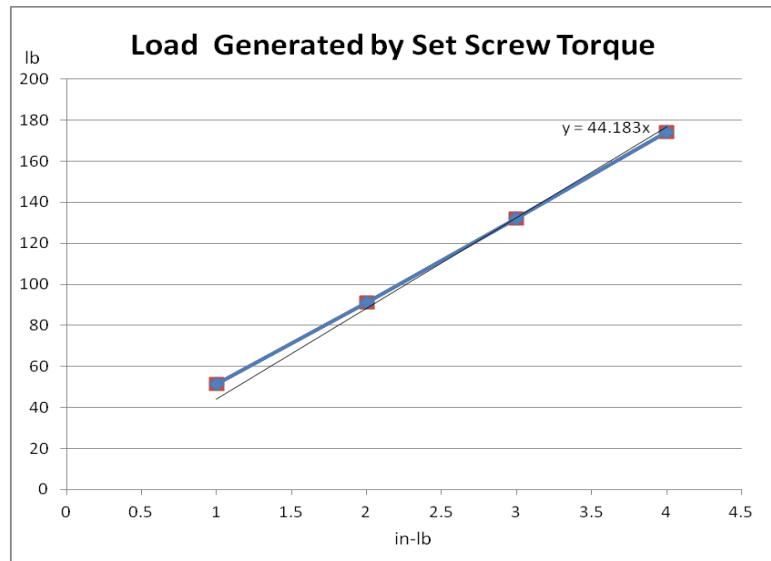
- 5.2 Now with the belt tensioning set screws still backed off and the dowel pins in the centered slot position, snug up the four mount plate screws completely, then back them off $\frac{1}{4}$ turn. Next tighten the two belt tensioning set screws all the way, then back them off again. Begin the belt tensioning in the next step.



- 5.3 A torque watch or equivalent is used to add the preload by moving back and forth between each set screw adding approximately one-half in.-lb. of torque incrementally until each screw is at approximately 2.25 to 2.75 in.-lbs. of torque, biasing towards the high end. This will seem like very little torque, and it is. **CAUTION: Higher torque on these set screws can equate to very high tension and premature failure.** When complete, push the carriage back and forth with substantial force to check for backlash. There should be very little backlash (some small amount will be present in the gearbox). The dowel pins should appear to be closer to the bottom of the slots, but not bottomed out. Finally, torque the four mount plate screws per Section 2 Table 2 to complete the process.



- 5.4 The following table indicates the expected SBL-H belt preload generated by the set screws under most conditions.

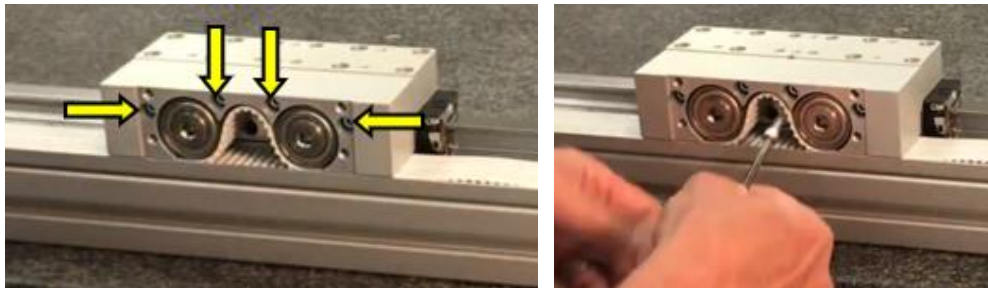


6 SBL-L, SBL-M & SBL-H (STANDARD CONFIGURATION) UPPER BELT REPLACEMENT PROCEDURE

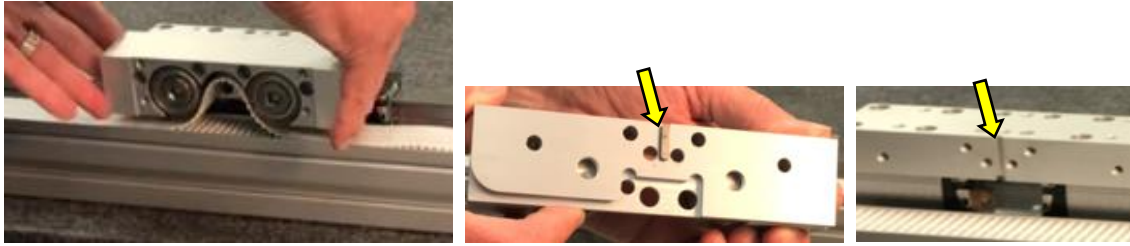
- 6.1 Remove the motor mount plate/motor from the drive assembly by removing the screws on the mount plate. Set the motor mount plate/motor and screws aside once removed.



- 6.2 Next remove the screws that secure the drive assembly to the base block assembly. (Be advised - some configurations may have two screws inside the pinion gap of the drive assembly, as shown).



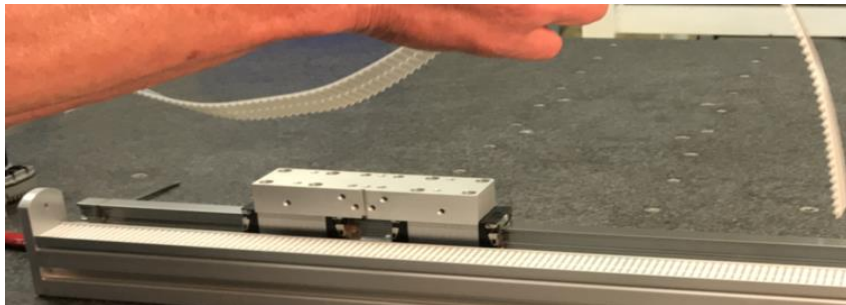
- 6.3 Once the screws are removed – lift the drive assembly off of the belt tray.
 Note: The rear of the drive assembly is keyed to mate with the slot on the drive block assembly.



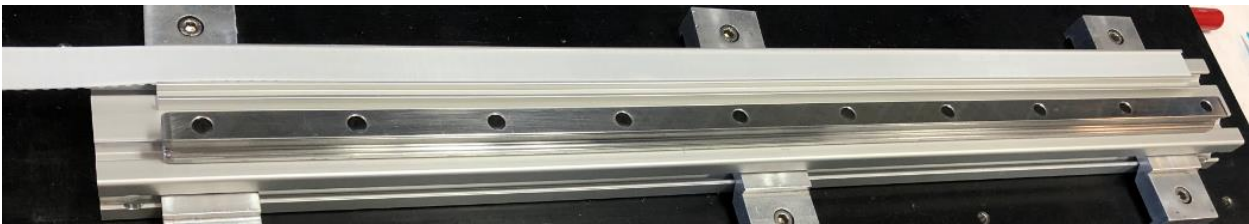
- 6.4 Next unscrew the hard stops and remove them along with the belt clamps.



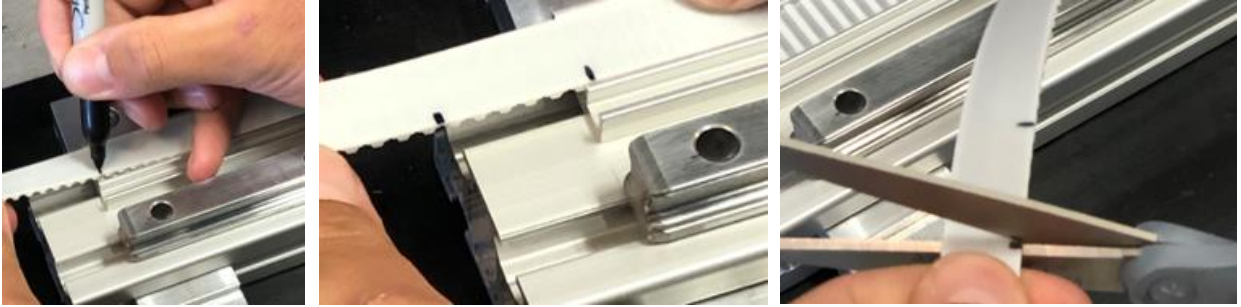
- 6.5 Now remove the upper belt to be replaced.



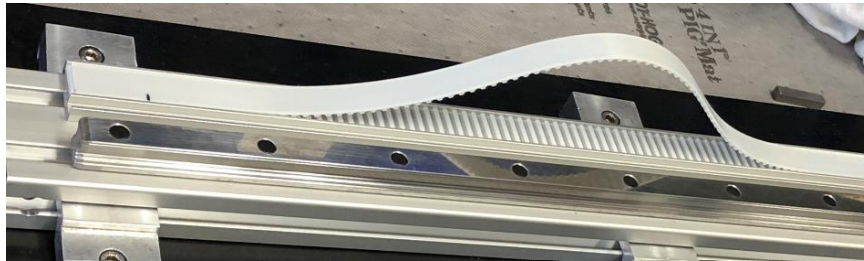
- 6.6 Unscrew and remove the end plates to make it easier to count the extra belt teeth required for the belt loop. Refer to Section 2 Table 1 for the precise number of extra teeth required for the belt loop based on the linear stage model. The example below is for an SBL-L linear stage which requires 6 extra belt teeth for the belt loop. Start by lining up one end of the new belt to be flush with one side of the belt tray, and extend some excess belting extending past the other end of the belt tray (as shown).



- 6.7 Next use a sharpie to mark to the right of where the first belt tooth extends past the end of the belt tray. In this example you will be counting 6 belt teeth for the SBL-L belt loop. Using the sharpie, mark the belt just past the 6th tooth. This is where you will cut the belt with scissors to obtain the extra teeth required for a proper SBL-L belt loop.



- 6.8 Before returning the trimmed upper belt to the belt tray, check the lower belt to ensure lubrication is present. If dry, apply a small amount of CRC 03055 Food Grade Chain Lubricant to the lower belt. You can now lay the trimmed upper belt back onto the lower belt (as shown) with both belt edges flush to the ends of the belt tray.



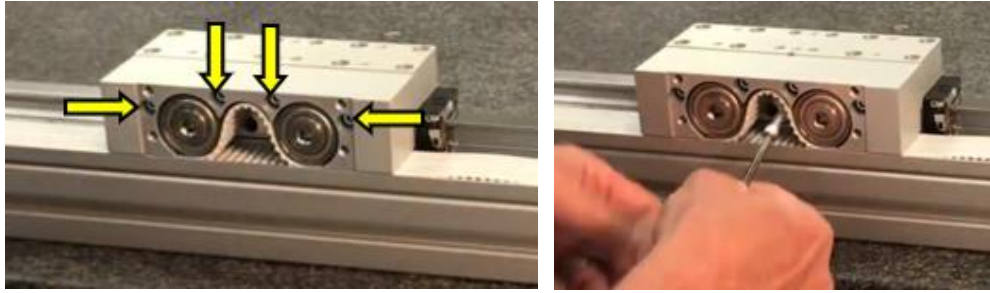
- 6.9 Reconnect the end plates, belt clamps and hard stops, then proceed to the next step.



- 6.10 Re-install the drive assembly onto the belt tray by aligning the drive assembly with the slot on the base block assembly. Be sure to fully insert the belt loop into the pinion gap of the drive assembly as you perform the re-install.



- 6.11 Re-attach the screws that secure the drive assembly to the base block assembly. Fasten the screws just snug, then back of ¼ turn.



- 6.12 Now insert .004" shims under the idler bearings, then tighten the mounting screws based on Section 2 Table 2 specifications for the stage assembly model.



- 6.13 Re-attach the motor mount plate/motor to the drive assembly. Fasten the screws just snug, then back off ¼ turn.



- 6.14 Go to Section 4 for the SBL-L and SBL-M Belt Tensioning Procedure.
Go to Section 5 for the SBL-H Belt Tensioning Procedure.

7 SBL-M-LT ENDLESS BELT REPLACEMENT

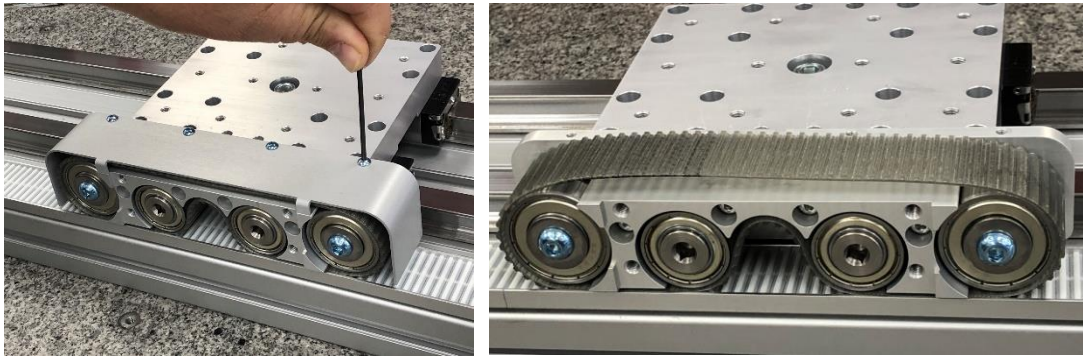
METHOD 1 Replacement without carriage assembly removal

Method used to replace the endless belt without removing an attached payload – only the SBL-M-LT drive assembly is removed.

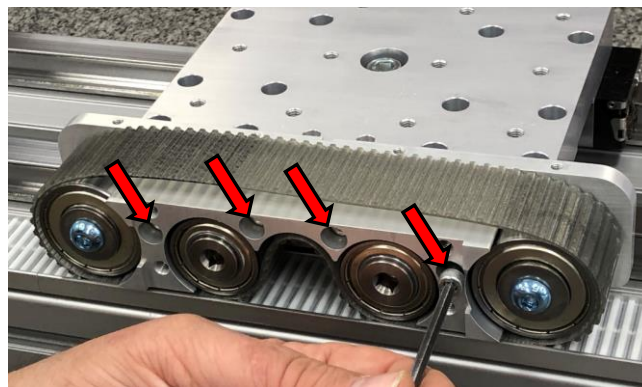
- 7.1 Remove the screws securing the motor mount plate/motor to the drive assembly. Set the motor mount plate/motor and screws aside.



- 7.2 Next remove the belt cover screws. Set the belt cover and screws aside.



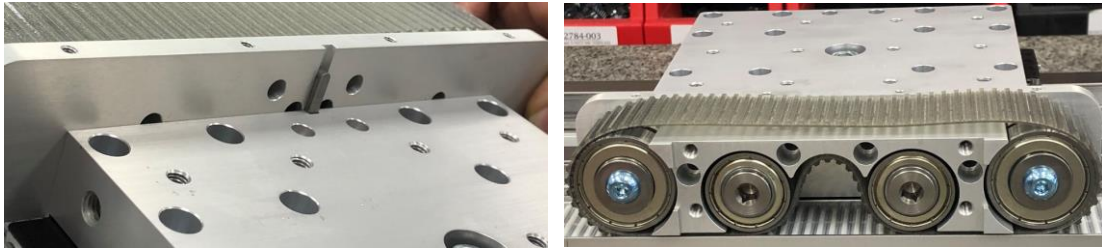
- 7.3 Next remove the screws securing the drive assembly to the base block assembly. Set the screws aside.



- 7.4 You can now lift the drive assembly up off of the belt tray. Remove the old endless belt and substitute it with a new replacement. **NOTE:** Remember to add a small amount of CRC 03055 Food Grade Chain Lubricant to the smooth side (backside) of the endless belt.



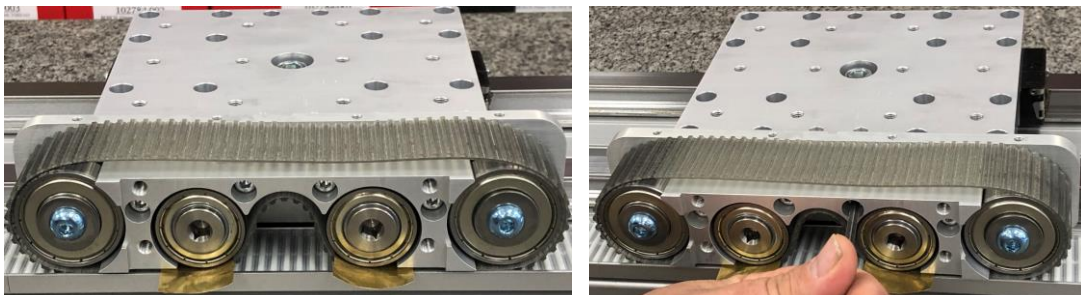
- 7.5 Re-install the drive assembly on the belt tray. **IMPORTANT:** Keep the endless belt tensioned by pressing up on the belt within the pinion gap of the drive assembly. Align the key on the rear of the drive assembly with the slot on the drive block to assist with the re-installation.



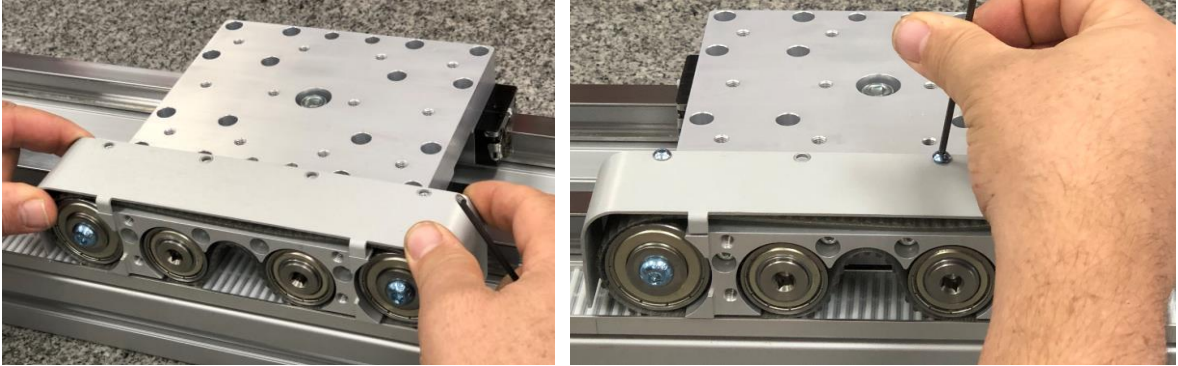
- 7.6 Re-attach the screws securing the drive assembly to the base block assembly. Fasten the screws just snug, then back off ¼ turn.



- 7.7 Insert .004" shims under the idler bearings, then finish tightening the drive assembly mounting screws per Section 2 Table 2.



- 7.8 When the screws are fully tightened, remove the shims and re-attach the belt cover.



- 7.9 Re-attach the motor mount plate/motor to the drive assembly. Fasten the screws just snug, then back off ¼ turn.

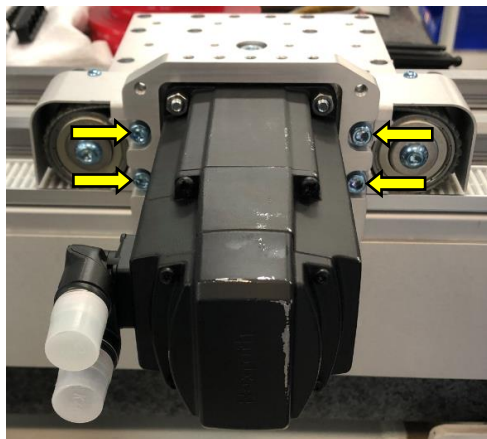


- 7.10 Now go to Section 4 for the SBL-L & SBL-M Belt Tensioning Procedure.

METHOD 2 Replacement with carriage assembly removal

Method used to replace the endless belt by completely removing the SBL-M-LT drive assembly and attached base block assembly from the stage.

- 7.11 Remove the screws securing the motor mount plate/motor to the drive assembly. Set the motor mount plate/motor and screws aside.

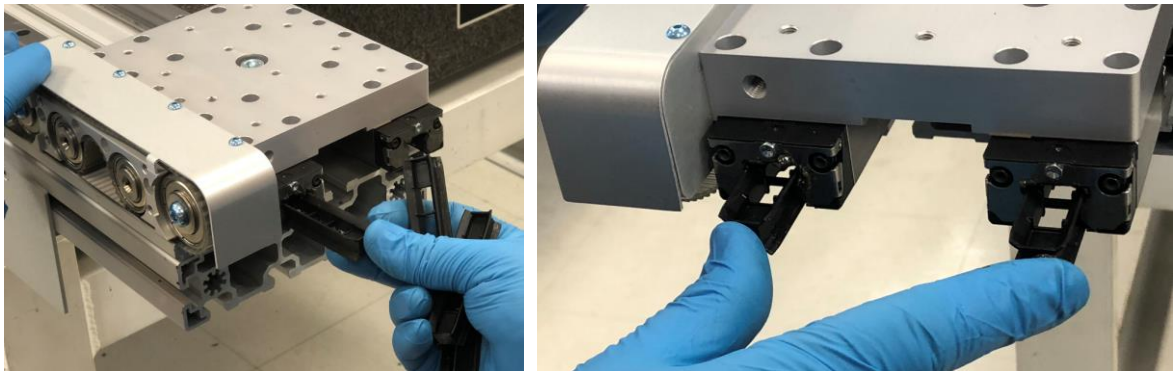


- 7.12 Next, remove one of the hard stops (and End Cap if present) to allow the drive assembly and attached base block assembly to be removed from the stage.



- 7.13 While keeping the belt tensioned by hand within the pinion gap of the drive assembly, you will roll the drive assembly off of the stage.

IMPORTANT NOTE: As you roll the drive assembly off, be sure you have the necessary number of plastic ball bearing retainers (aka Arbors) available to slide into the bearing blocks as they come off of the bearing rails. The example below shows a dual rail system with 4 bearing blocks; therefore 4 ball bearing retainers are required.



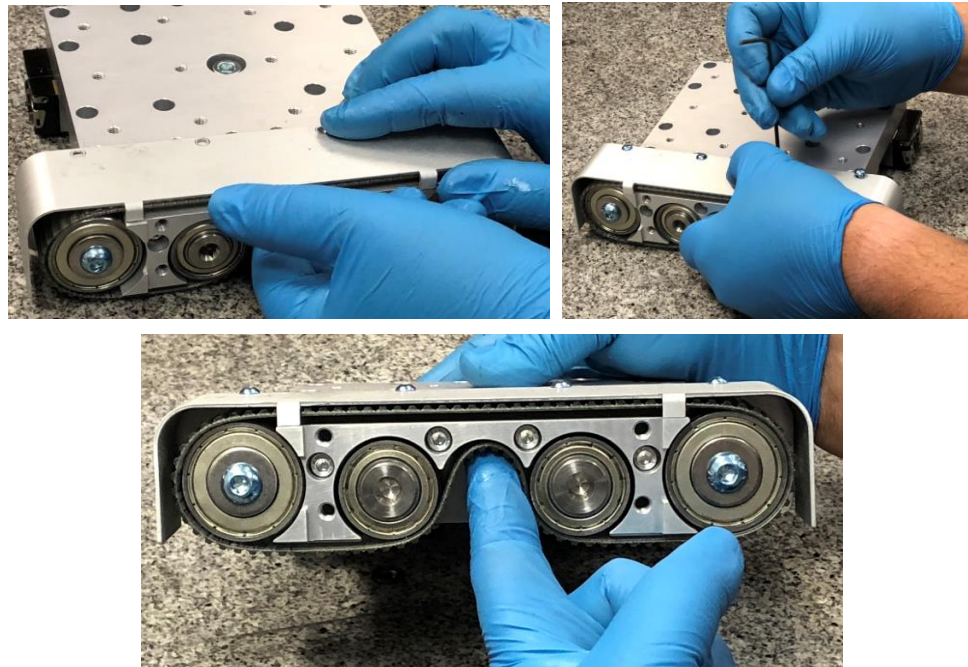
- 7.14 Next remove the belt cover screws. Set the belt cover and screws aside.



- 7.15 Remove the old endless belt and substitute it with a new replacement.
NOTE: Remember to add a small amount of CRC 03055 Food Grade Chain Lubricant to the smooth side (backside) of the endless belt.



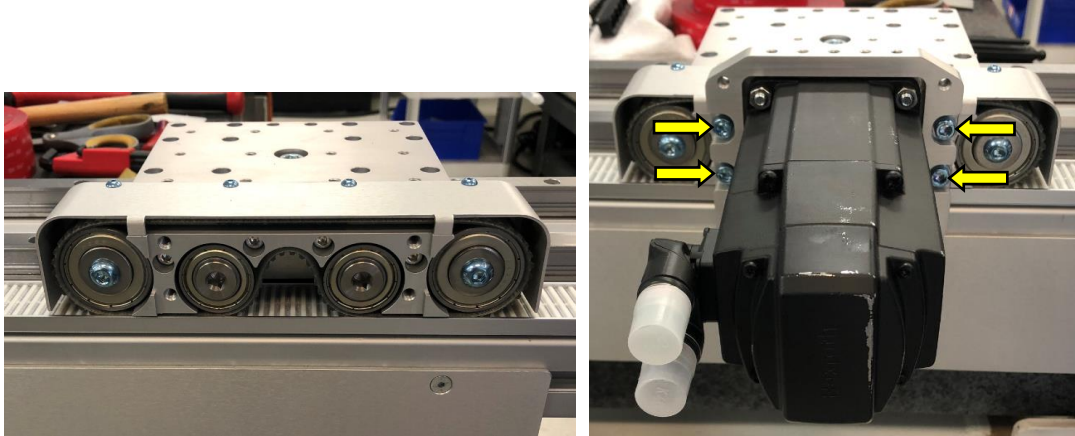
- 7.16 Install the replacement Endless Belt and press up with your finger in the pinion gap to create tension on the belt. While keeping that belt tension, re-install the Belt Cover with the 4 screws.



- 7.17 Now slide the drive assembly and attached base block assembly back onto the stage while keeping belt tension throughout. The bearing rails will cause the plastic bearing ball retainers (Arbors) to be pushed out of the bearing blocks.



- 7.18 Re-attach the motor mount plate/motor to the drive assembly.
Fasten the screws just snug, then back off $\frac{1}{4}$ turn.



- 7.19 Now go to Section 4 for the SBL-L & SBL-M Belt Tensioning Procedure.

8 SBL-H-LT ENDLESS BELT REPLACEMENT

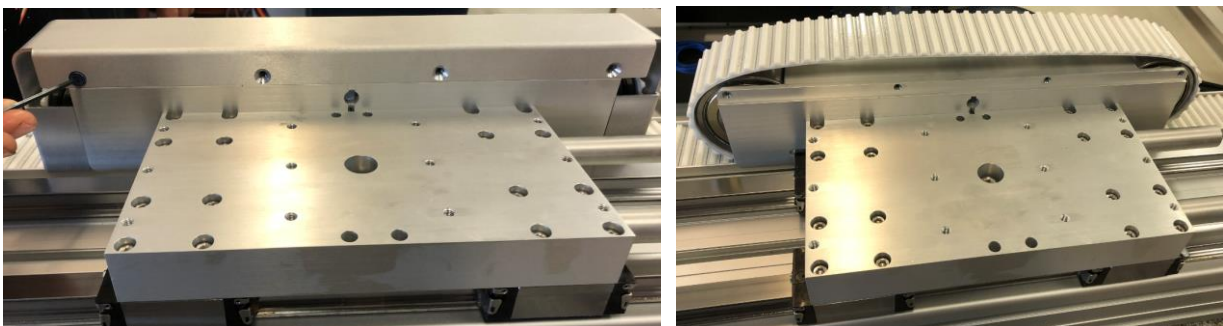
METHOD 1 Replacement without carriage assembly removal

Method used to replace the endless belt without removing an attached payload – only the SBL-H-LT drive assembly is removed.

- 8.1 Remove the screws securing the motor mount plate/motor to the drive assembly.
Set the motor mount plate/motor and screws aside.



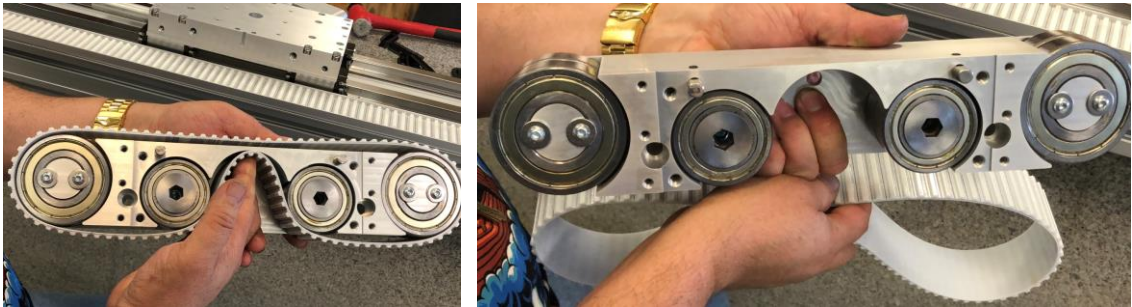
- 8.2 Next remove the belt cover screws. Set the belt cover and screws aside.



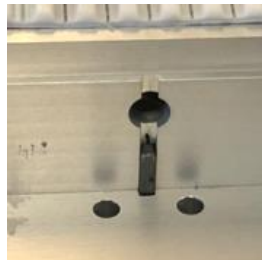
- 8.3 Next remove the screws securing the drive assembly to the base block assembly, including the hidden, captured screws within the idler stud. Set the screws aside.



- 8.4 You can now lift the drive assembly off of the belt tray. Remove the old endless belt and substitute it with a new replacement.
NOTE: Remember to add a small amount of CRC 03055 Food Grade Chain Lubricant to the smooth side (backside) of the endless belt.



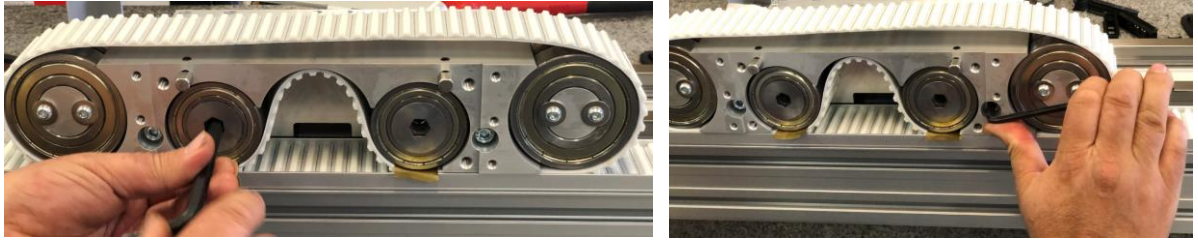
- 8.5 Re-place the drive assembly onto the belt tray.
IMPORTANT: Be sure to keep belt tension by pressing up on the belt within the pinion gap of the drive assembly during the re-install. Use the key on the back of the drive assembly to align with the slot on the base block assembly.



- 8.6 Next place .004" shims under the idler bearings.



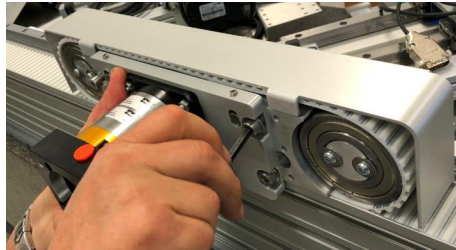
8.7 Now tighten the mounting screws per Section 2 Table 2.



8.8 When the screws are fully tightened, remove the shims and re-attach the belt cover.



8.9 Re-attach the motor mount plate/motor to the drive assembly. Fasten the screws just snug, then back off $\frac{1}{4}$ turn.

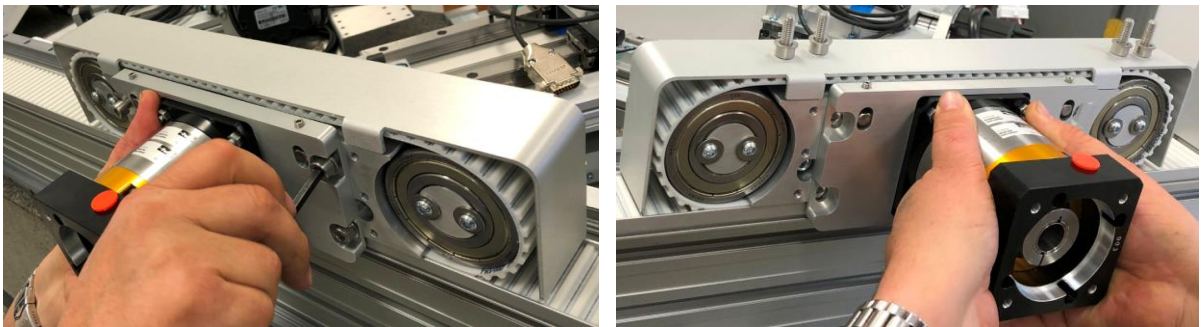


8.10 Now go to Section 5 for the SBL-H Belt Tensioning Procedure.

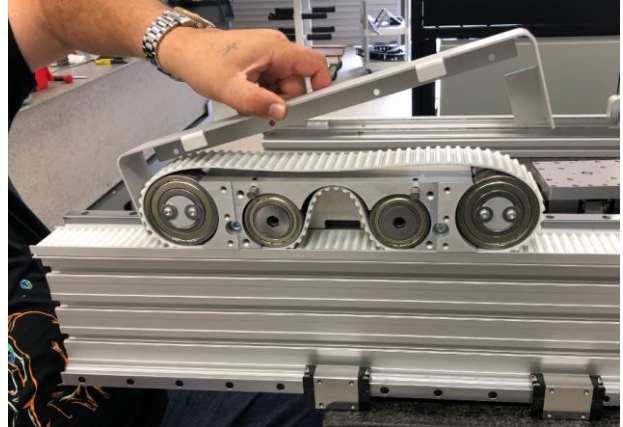
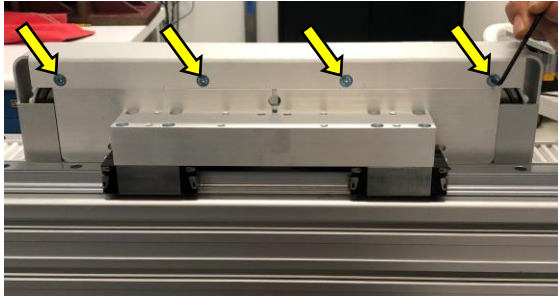
METHOD 2 Replacement with carriage assembly removal

Method used to replace the endless belt by completely removing the SBL-H-LT drive assembly and attached base block assembly from the stage.

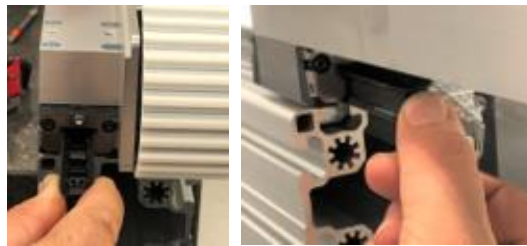
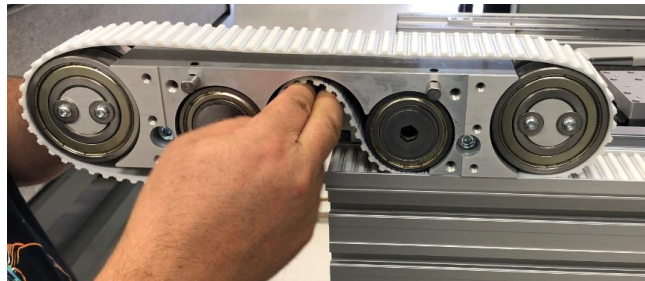
8.11 Remove the screws securing the motor mount plate/motor to the drive assembly. Set the motor mount plate/motor and screws aside.



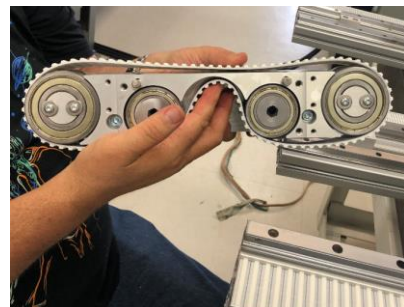
- 8.12 Next, remove the belt cover screws from the rear of the belt cover. Set the belt cover and screws aside.



- 8.13 While keeping the belt tensioned by hand within the pinion gap of the drive assembly (as shown below), you will roll the drive assembly off of the belt tray.
IMPORTANT: As you roll the drive assembly off, be sure you have the necessary number of plastic ball bearing retainers (aka Arbors) available to slide into the bearing blocks *as they come off of the bearing rails*.

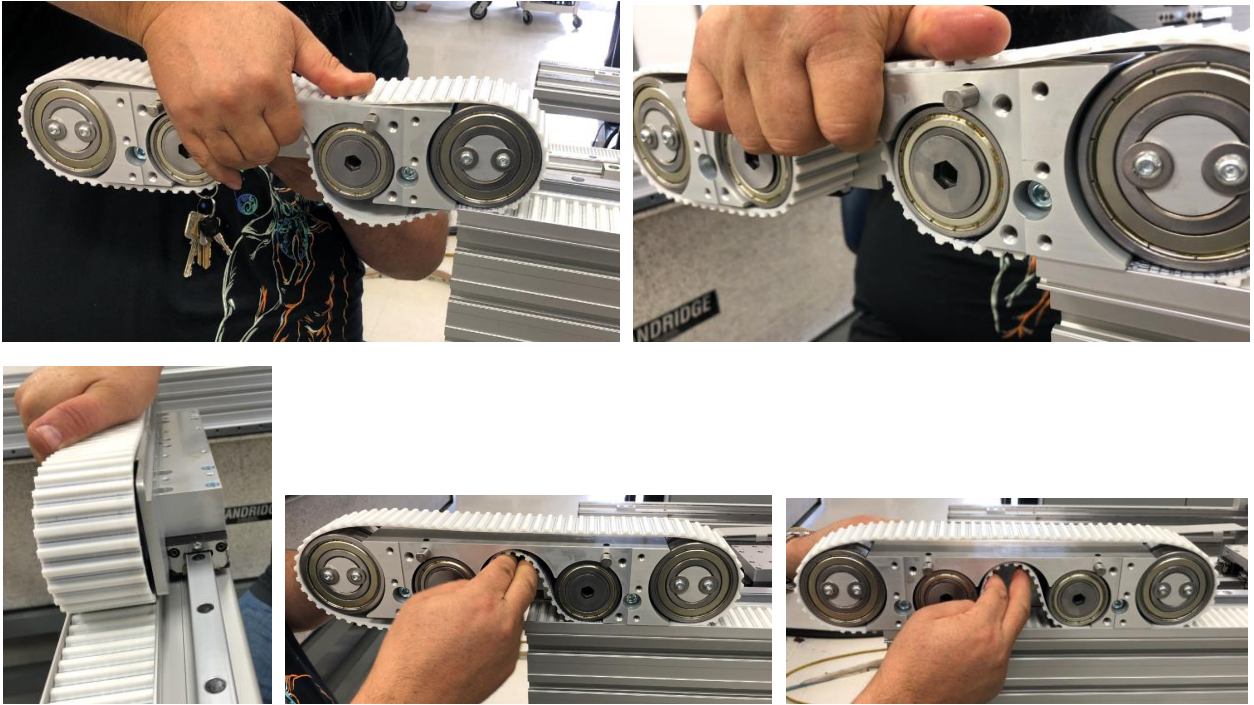


- 8.14 With the drive assembly now removed from the stage, you can remove the old endless belt and substitute it with a new replacement.
NOTE: Remember to add a small amount of CRC 03055 Food Grade Chain Lubricant to the smooth side (backside) of the endless belt.

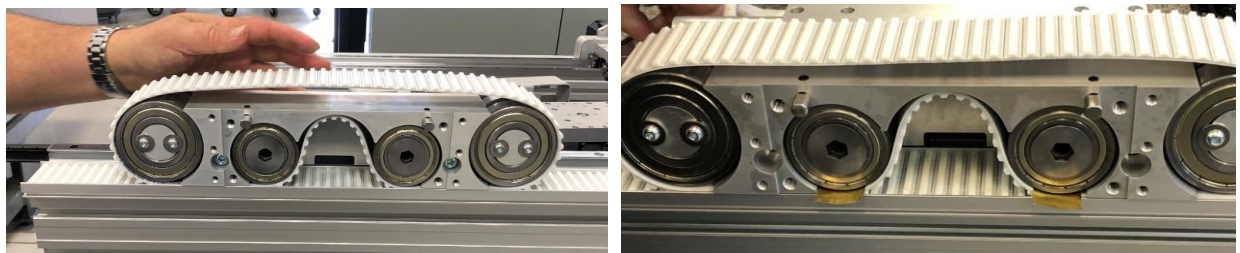


8.15 You can now roll the drive assembly back onto the stage.

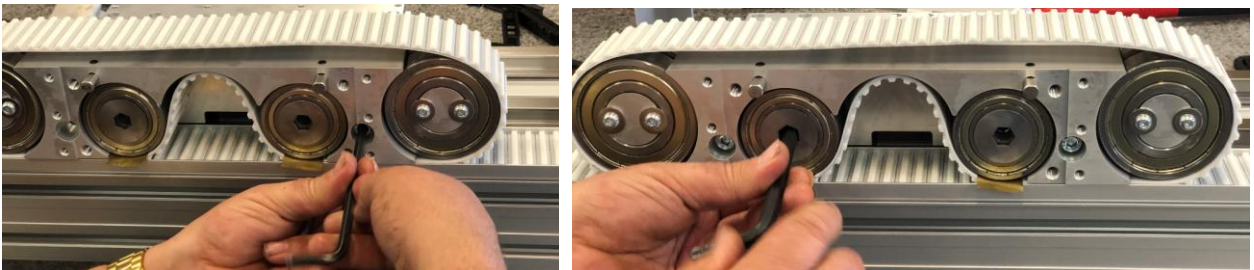
NOTE: As shown below, you must keep the belt fully tensioned in the pinion gap of the drive nugget during this re-mount process. Secure and set aside the plastic ball bearing retainers (Arbors) that will be pushed out as the bearing blocks slide on to the bearing rail.



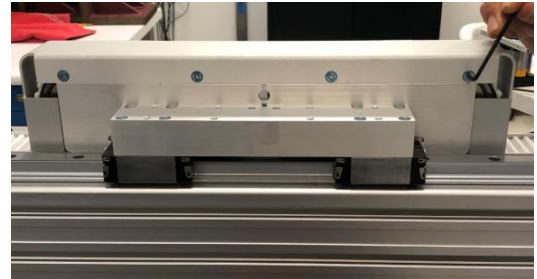
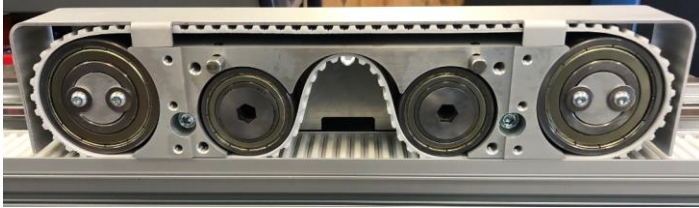
8.16 With the drive assembly/base block assembly fully re-mounted on the stage, insert .004" shims under the idler bearings.



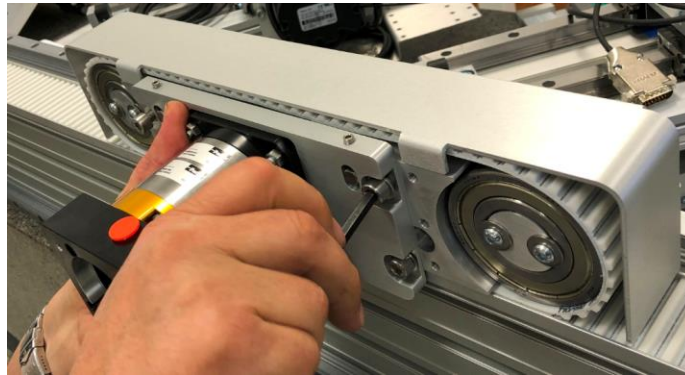
8.17 Now tighten the drive assembly screws per Section 2 Table 2. After fully tightening the screws you can remove the shims.



8.18 You can now re-attach the belt cover.



8.19 Re-attach the motor mount plate/motor to the drive assembly.
Fasten the screws just snug, then back off $\frac{1}{4}$ turn.



8.20 You can now go to Section 5 for the SBL-H Belt Tensioning Procedure.

9 3M VHB TAPE REPLACEMENT PROCEDURE

- 9.1 To replace the 3M VHB tape, you must first remove the mounted carriage assembly from the stage. The method of removal will depend on the carriage assembly configuration. Refer to Section 3 for standard carriage assembly removal and Sections 4 or 5 (Method 2) for LoopTrack carriage assembly removal.
- 9.2 Upon removal of the carriage assembly, next remove the upper and lower belt from the belt tray. Discard the belt if it is to be replaced or retain if it is to be reused. Now, to remove the existing tape, use a razor blade to lift the end of the adhesive. Now continue lifting and stretching the adhesive slowly, pulling it opposite to the direction you want it to peel. This is counterintuitive; however, it is the most effective method for removal - although it can be arduous when the tape is damaged.
- 9.3 Once the pre-existing adhesive has been fully removed, clean the belt tray with high purity isopropyl alcohol to remove any remaining residue. IPA can also be used to soften damaged tape for scraping removal.



- 9.4 Ensure the 3M VHB Tape roll width is smaller than the width of the belt tray.



- 9.5 Now unroll the 3M VHB Tape onto the belt tray using a 103043-003 application tool or a block of similar width as the tape tray. This should be done in a slow, deliberate manner to prevent overly stretching the tape. Run the application tool back and forth to fully seat the tape in the tray. **NOTE:** Be very careful not to let the tape adhere to the side walls of the belt tray. Once the tape is applied, slice through any air bubbles with a razor blade and smooth them out. Use the razor blade to cut the tape off at the tray ends.



- 9.6 When you are ready to re-install or replace the lower 'static' belt, remove the backing from the 3M VHB Tape to expose the adhesive. You can use a razor blade to separate the backing from the tape.



- 9.7 Before adhering the lower belt to the tape adhesive, you **must** clean the underside (smooth side) of the belt with acetone.
- 9.8 After cleaning, install the lower belt onto the adhesive using the 103043 application tool or similar. Use a back and forth motion as you lay the belt to ensure it is fully seated. Use a pair of scissors to cut the end(s) of the belt flush with the edges of the belt tray.



- 9.9 **NOTE:** Remember to apply a small amount of CRC 03055 Food Grade Chain Lubricant to the lower belt before continuing with the install of the upper belt,