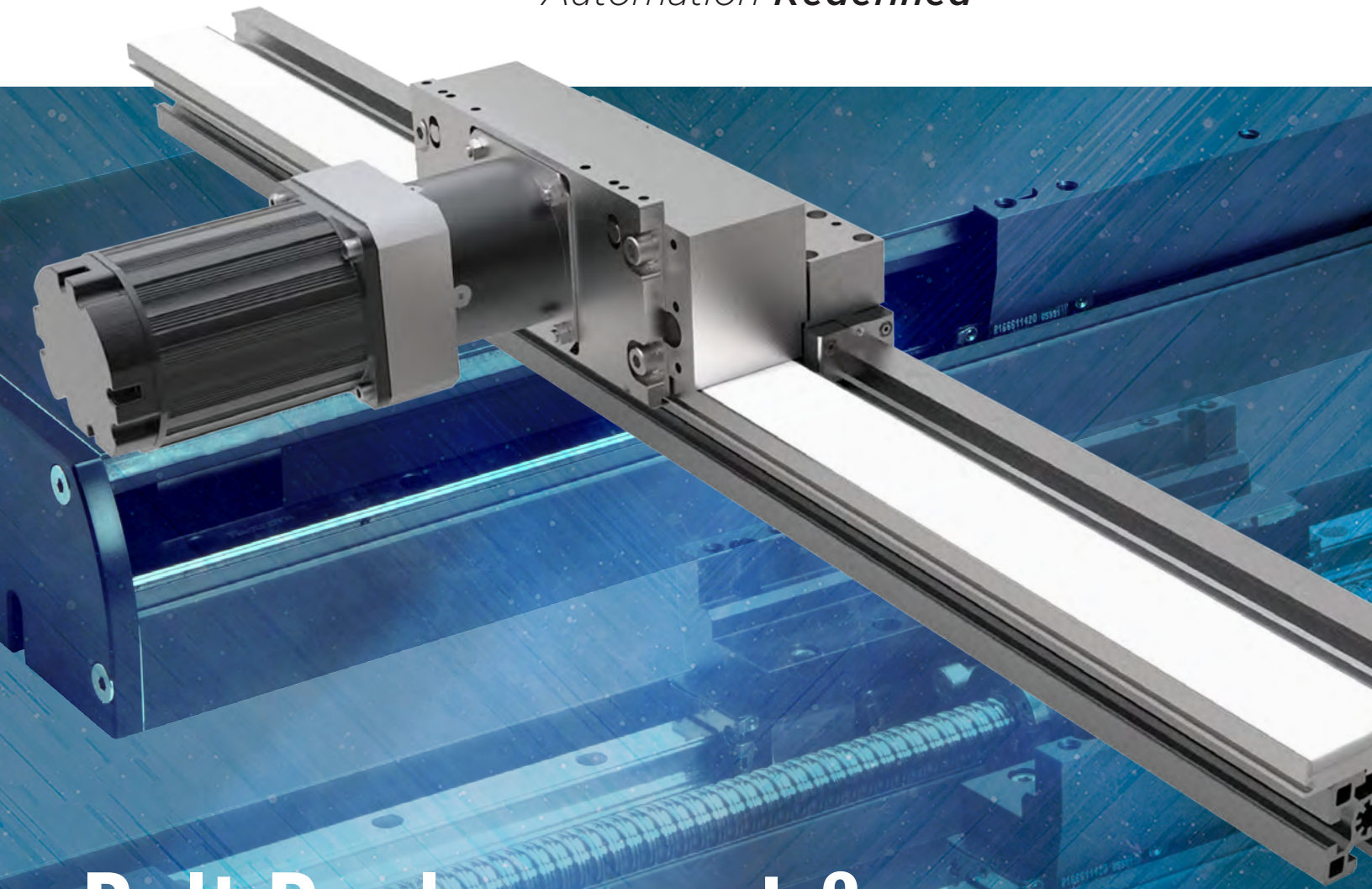




Automation Redefined™



Belt Replacement & Tensioning on ServoBelt Linear Assemblies

Standard Carriage (SBL-L, SBL-M, SBL-H) & Looptrack Carriage (SBL-M-LT, SBL-H-LT)
(Includes VHB Tape Replacement Procedure and Bearing Block Relubrication Procedure)

REVISIONS

Revision	Description/DCR#
-	INITIAL RELEASE
A	Added SBL-H
B	Procedure rewritten and renamed. Now includes both Standard and LoopTrack ServoBelt Linear assemblies. Added Definitions and Table of Contents, VHB Tape Replacement, Periodic Lube of Bearing Blocks / DCR # 155

DEFINITIONS

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

TABLE OF CONTENTS

01	Section 1: Introduction
01	Section 2: Data Tables
02	Section 3: SBL-L, SBL-M and SBL-H (Standard Configuration) Upper Belt Replacement Procedure
05	Section 4: SBL-M-LT Endless Belt Replacement Procedure Method 1: Replacement Without Carriage Assembly Removal Method 2: Replacement With Carriage Assembly Removal
09	Section 5: SBL-H-LT Endless Belt Replacement Procedure Method 1: Replacement Without Carriage Assembly Removal Method 2: Replacement With Carriage Assembly Removal
14	Section 6: SBL-L (Standard Configuration Only) and 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
15	Section 7: SBL-H (Standard and LoopTrack Configuration) Belt Tensioning Procedure
16	Section 8: VHB Tape Replacement Procedure
18	Section 9: Bearing Block Periodic Relubrication Procedure

1. INTRODUCTION

The main purpose of this document is to define the procedure used to perform a field replacement of the belting on standard carriage SBL-L, SBL-M and SBL-H linear assemblies, and LoopTrack carriage SBL-M-LT and SBL-H-LT linear assemblies. Belt replacement requires an accompanying belt tension (preload) process for proper operation of the linear assemblies. The recommended methods of belt replacement and tension are included in this document.

This document also includes the procedure for replacing 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.

This document concludes with the recommended bearing block re-lubrication procedure.

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)

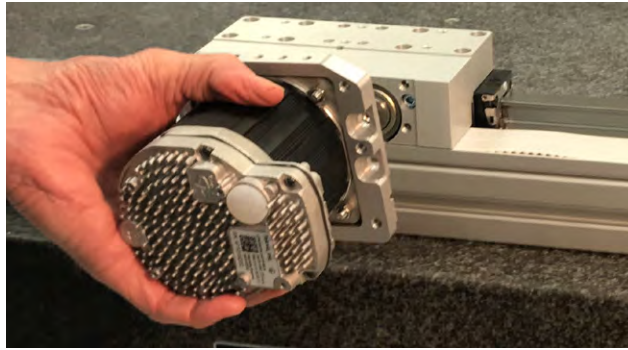
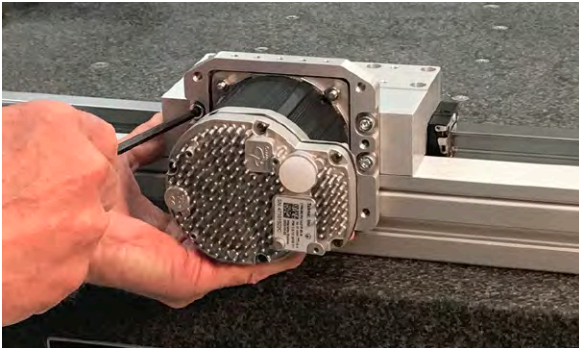
Table 3 Vertical Force (preload) specification

ServoBelt Linear Assembly	Vertical Force Range Required for Proper Belt Tension (*)
SBL-L	15-18 lbs
SBL-M	25-30 lbs

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

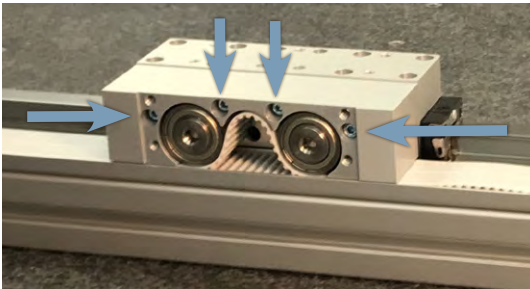
3. SBL-L, SBL-M & SBL-H (Standard Configuration) UPPER BELT REPLACEMENT PROCEDURE

- 3.1 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.



- 3.2 Remove the screws that secure the drive assembly to the base block assembly.

Note: Some configurations may have two screws inside the pinion gap of the drive assembly, as shown.



- 3.3 Once the screws are removed, lift the drive assembly off the belt tray.

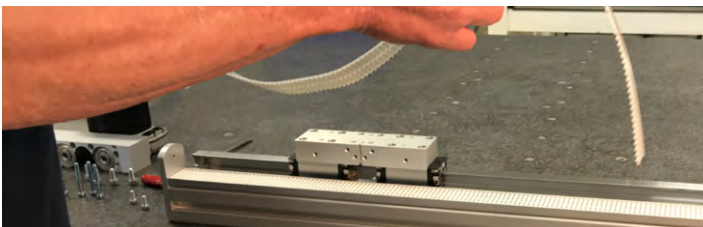
Note: The rear of the drive assembly is keyed to mate with the slot on the drive block assembly.



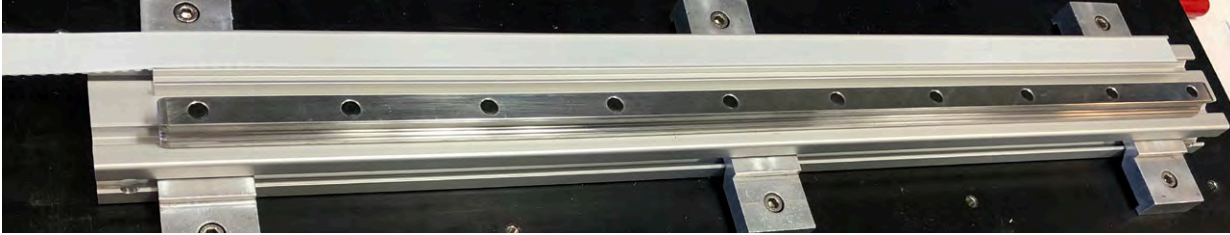
- 3.4 Unscrew the hard stops. Remove them and the belt clamps.



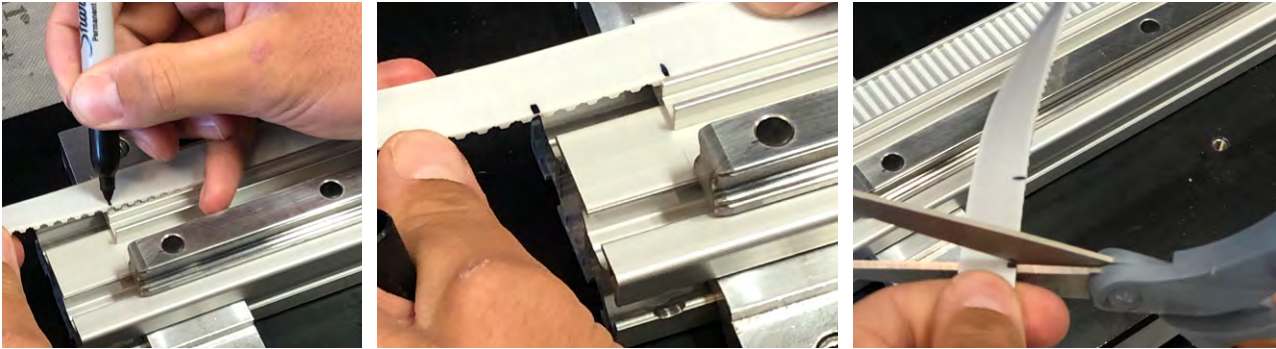
- 3.5 Remove the upper belt to be replaced.



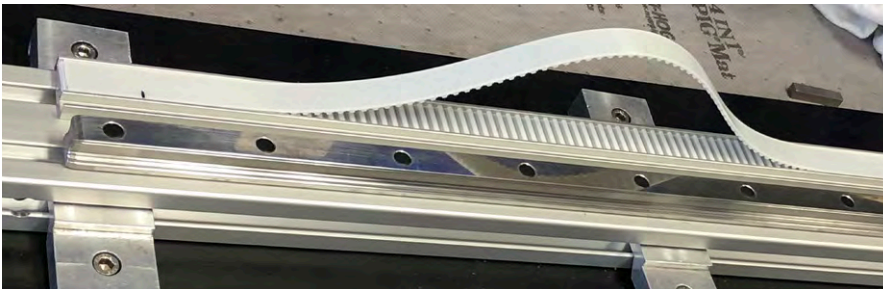
- 3.6** Unscrew and remove the end plates to make it easier to count the extra belt teeth required for the belt loop. Refer to Section 2, Table 1 for the precise number of extra teeth required for the belt loop based on the linear stage model. The example below is for an SBL-L linear stage which requires six extra belt teeth for the belt loop. Begin by lining up one end of the new belt so that it is flush with one side of the belt tray. Extend some excess belting past the other end of the belt tray as shown.



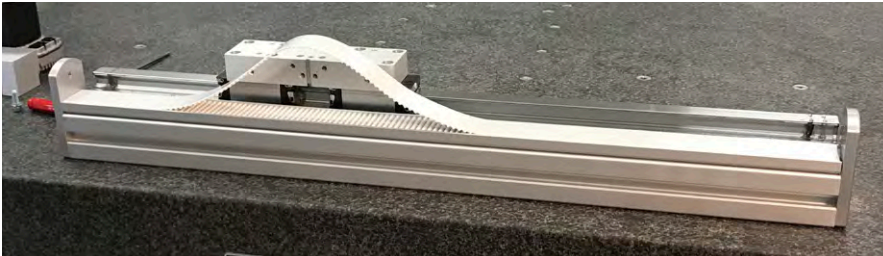
- 3.7** Use a Sharpie to mark to the right of where the first belt tooth extends past the end of the belt tray. In this example, you will be counting six belt teeth for the SBL-L belt loop. Using the Sharpie, mark the belt just past the sixth tooth. This is where you will cut the belt with scissors to obtain the extra teeth required for a proper SBL-L belt loop.



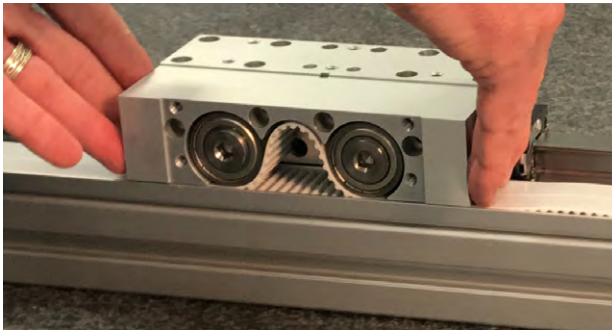
- 3.8** Before returning the trimmed upper belt to the belt tray, apply a small amount of belt lube to the lower belt. Now place the trimmed upper belt back onto the lower belt as shown, with both belt edges flush to the ends of the belt tray.



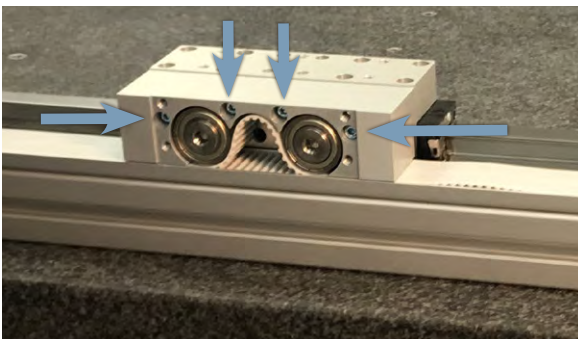
- 3.9** Reconnect the end plates, belt clamps and hard stops.



- 3.10** Reinstall 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 reinstall.



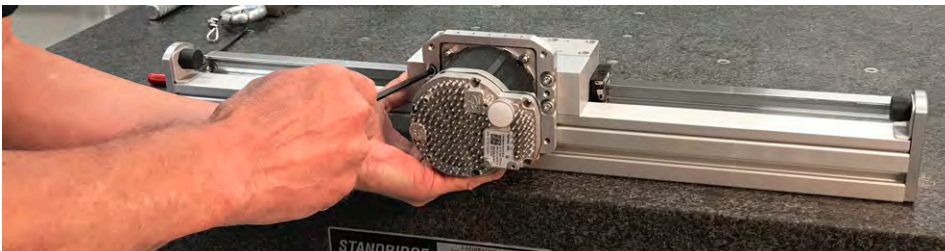
- 3.11** Reattach the screws that secure the drive assembly to the base block assembly. Fasten the screws snug-tight, then back off one quarter turn.



- 3.12** Insert .004-inch shims under the idler bearings. Tighten the mounting screws based on Section 2, Table 2 specifications for the stage assembly model.



- 3.13** Reattach the motor mount plate/motor to the drive assembly. Fasten the screws snug-tight, then back off one quarter turn.



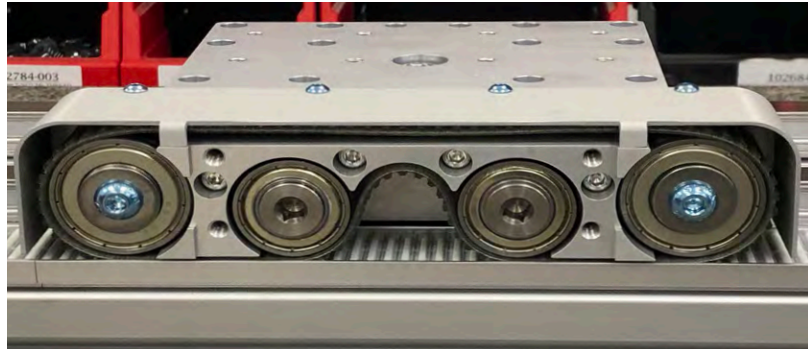
- 3.14** Go to Section 6 for the SBL-L and SBL-M Belt Tensioning Procedure.
Go to Section 7 for the SBL-H Belt Tensioning Procedure.

4. SBL-M-LT ENDLESS BELT REPLACEMENT PROCEDURE

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.

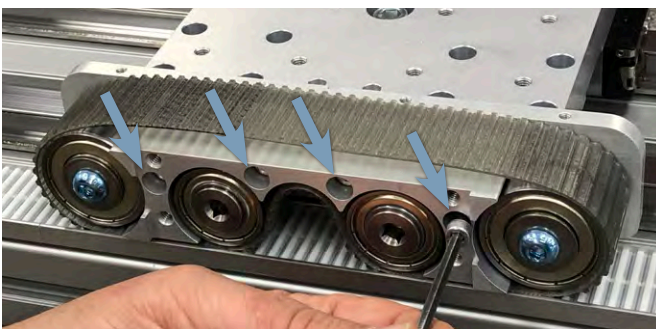
- 4.1 Remove the screws securing the motor mount plate/motor to the drive assembly. Set the motor mount plate/motor and screws aside.



- 4.2 Remove the belt cover screws. Set the belt cover and screws aside.



- 4.3 Remove the screws securing the drive assembly to the base block assembly. Set the screws aside.



- 4.4 Lift the drive assembly off the belt tray. Remove the endless belt and replace it with a new belt.



4.5 Reinstall the drive assembly on the belt tray.

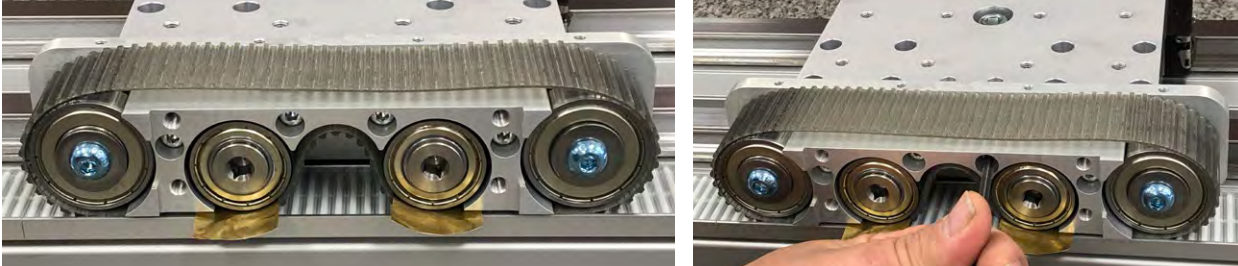
IMPORTANT: Keep the endless belt tensioned by pressing up on the belt within the pinion gap of the drive assembly. Align the key on the rear of the drive assembly with the slot on the drive block to assist with reinstallation.



4.6 Reattach the screws that secure the drive assembly to the base block assembly. Fasten the screws snug-tight, then back off one quarter turn.



4.7 Insert .004-inch shims under the idler bearings. Finish tightening the drive assembly mounting screws per Section 2, Table 2.



4.8 When the screws are fully tightened, remove the shims and reattach the belt cover.



- 4.9 Reattach the motor mount plate/motor to the drive assembly. Fasten the screws snug-tight, then back off one quarter turn.

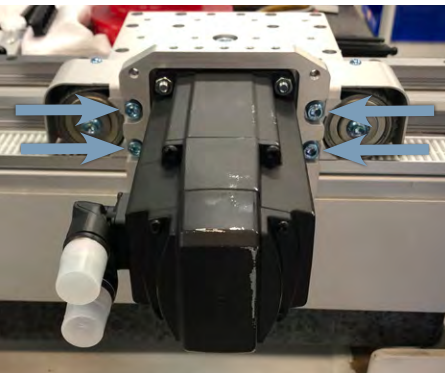


- 4.10 Go to Section 6 for the SBL-L and SBL-M Belt Tensioning Procedure.

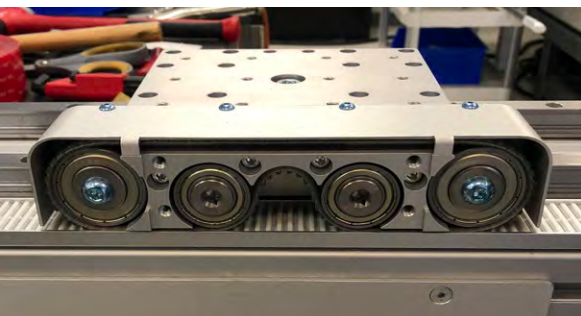
METHOD 2: Replacement With Carriage Assembly Removal

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

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

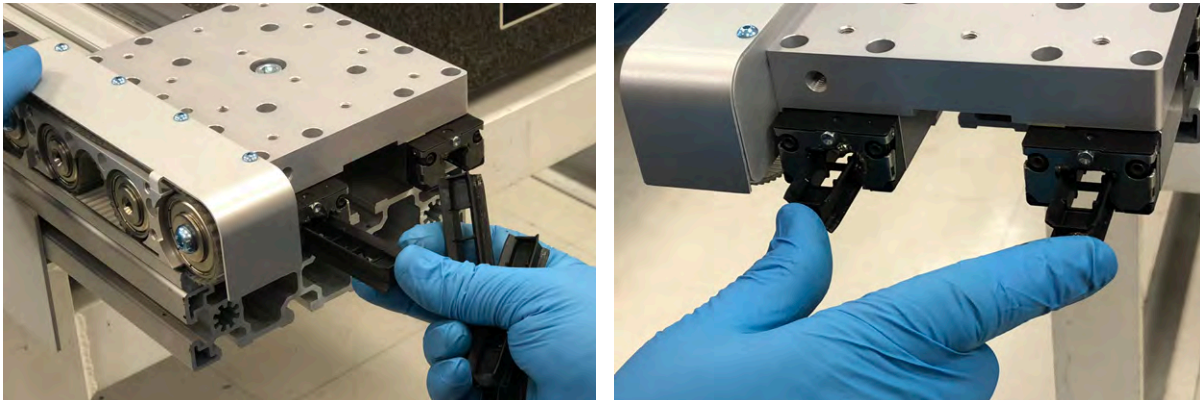


- 4.12 Remove one of the hard stops (and end cap if present). This will allow the drive assembly and attached base block assembly to be removed from the stage.



4.13 While keeping the belt tensioned by hand within the pinion gap of the drive assembly, roll the drive assembly off the stage.

IMPORTANT: As you roll the drive assembly off the stage, 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 four bearing blocks. Therefore, four ball bearing retainers are required.



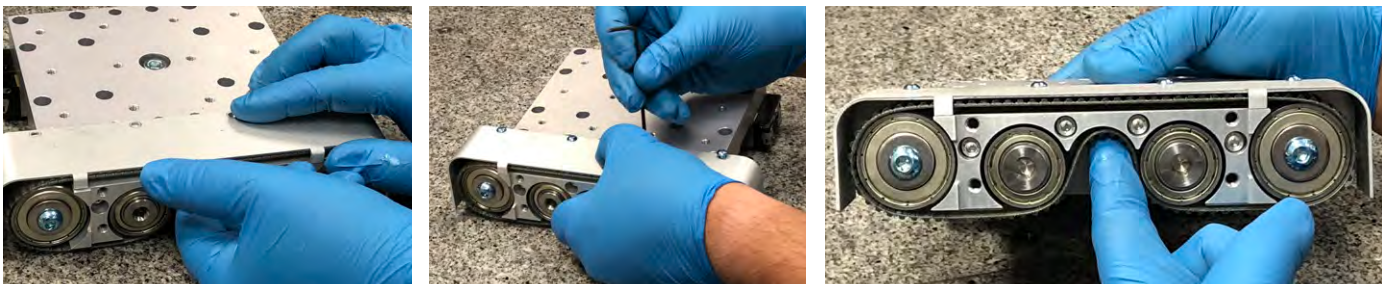
4.14 Remove the belt cover screws. Set the belt cover and screws aside.



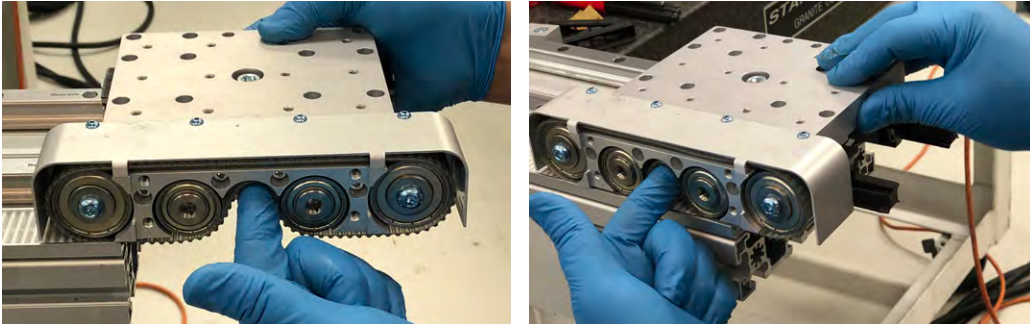
4.15 Remove the endless belt and replace it with a new belt.



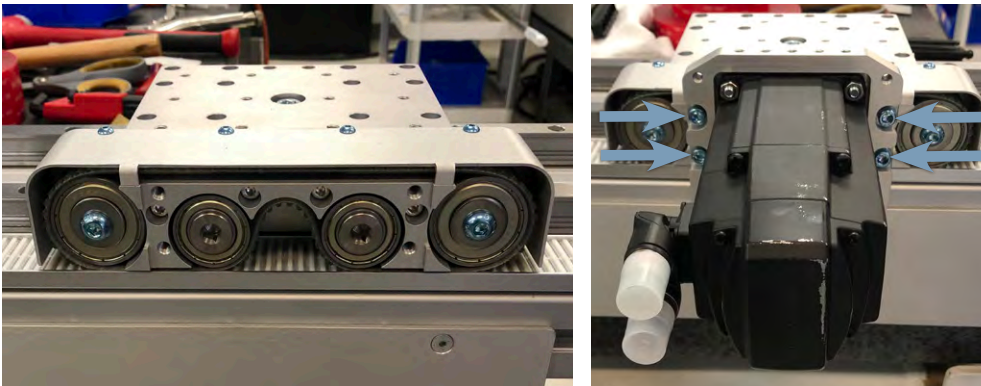
4.16 Press your finger into the pinion gap to create tension on the belt. While maintaining tension, reinstall the belt cover with the four screws.



- 4.17 Slide the drive assembly and attached base block assembly onto the stage while maintaining belt tension. The bearing rails will cause the plastic bearing ball retainers to be pushed out of the bearing blocks.



- 4.18 Reattach the motor mount plate/motor to the drive assembly. Fasten the screws snug-tight, then back off one quarter turn.



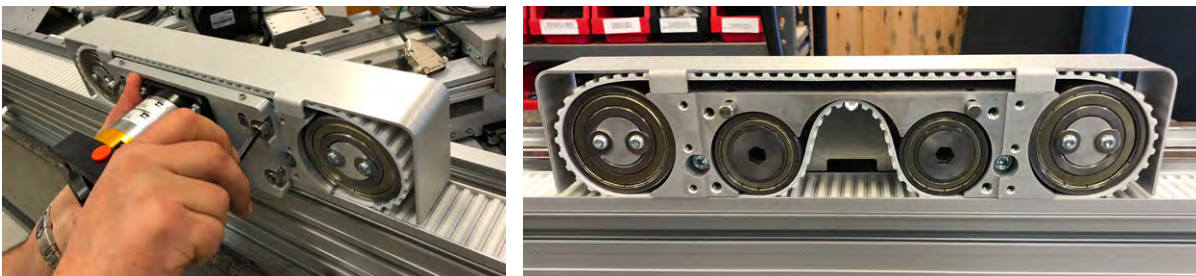
- 4.19 Go to Section 6 for the SBL-L and SBL-M Belt Tensioning Procedure.

5. SBL-H-LT ENDLESS BELT REPLACEMENT PROCEDURE

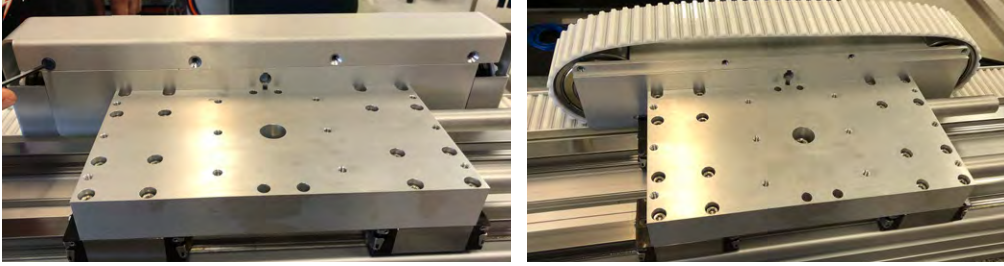
METHOD 1: Replacement Without Carriage Assembly Removal

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

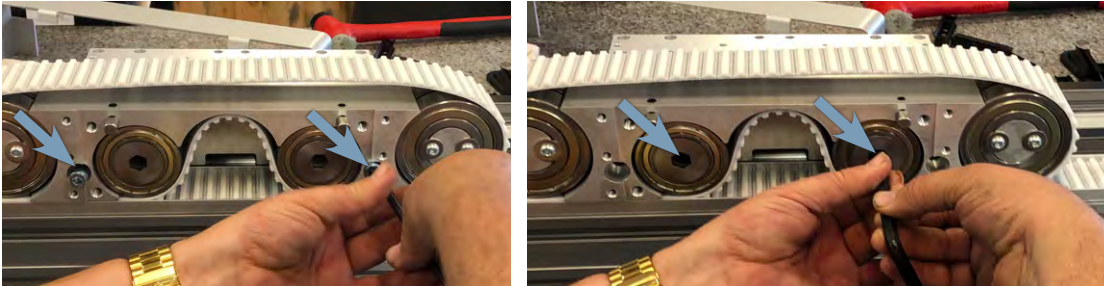
- 5.1 Remove the screws securing the motor mount plate/motor to the drive assembly. Set the motor mount plate/motor and screws aside.



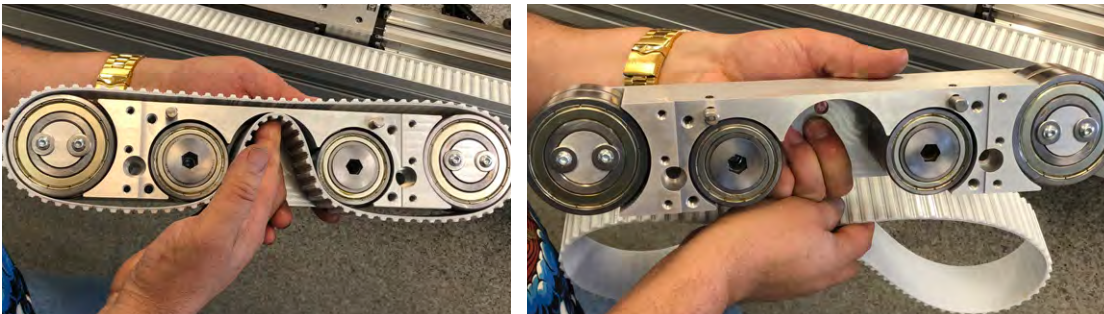
- 5.2 Remove the belt cover screws. Set the belt cover and screws aside.



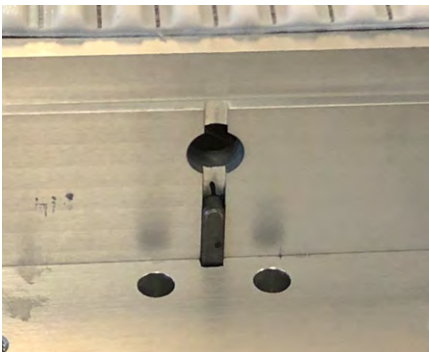
- 5.3 Remove the screws securing the drive assembly to the base block assembly, including the hidden, captured screws within the idler stud. Set the screws aside.



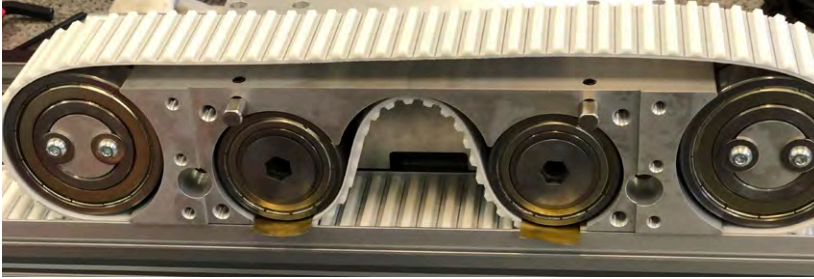
- 5.4 Lift the drive assembly off the belt tray. Remove the endless belt and replace it with a new belt.



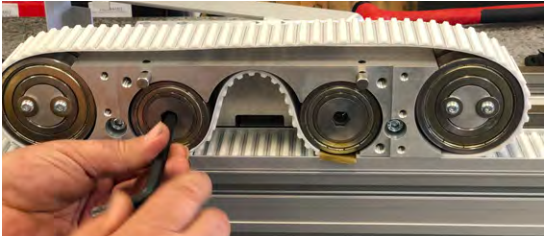
- 5.5 Place the drive assembly onto the belt tray.
IMPORTANT: Keep the endless belt tensioned by pressing up on the belt within the pinion gap of the drive assembly. Align the key on the rear of the drive assembly with the slot on the drive block to assist with reinstallation.



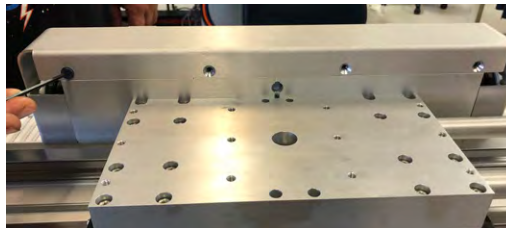
5.6 Place .004-inch shims under the idler bearings.



5.7 Tighten the mounting screws per Section 2, Table 2.



5.8 When the screws are fully tightened, remove the shims and reattach the belt cover.



5.9 Reattach the motor mount plate/motor to the drive assembly. Fasten the screws snug-tight, then back off one quarter turn.

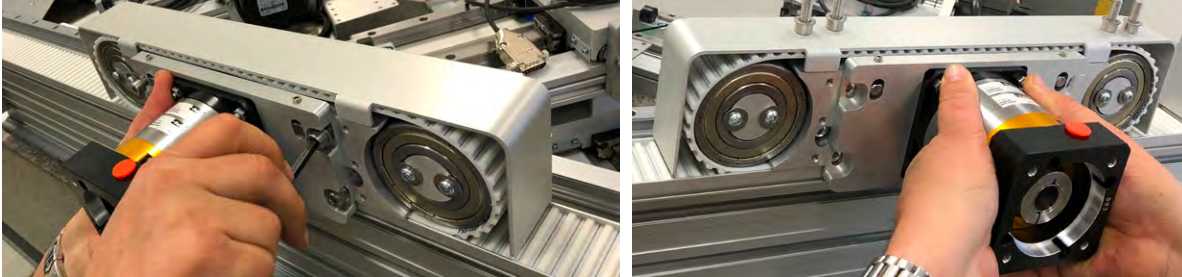


5.10 Go to Section 7 for the SBL-H Belt Tensioning Procedure.

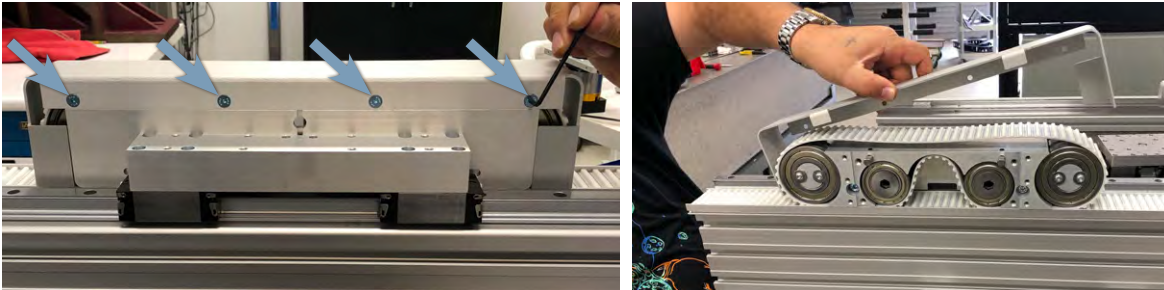
METHOD 2: Replacement With Carriage Assembly Removal

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

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



- 5.12** Remove the belt cover screws from the rear of the belt cover. Set the belt cover and screws aside.

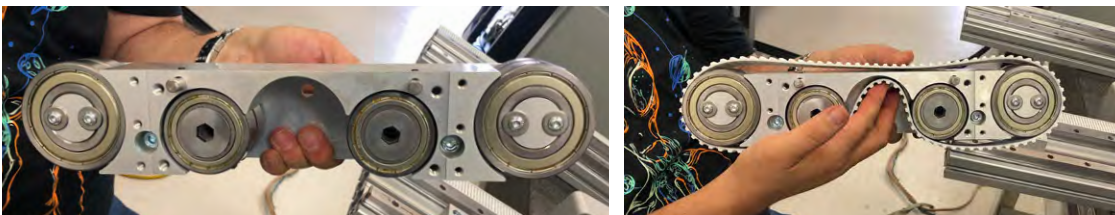


- 5.13** While keeping the belt tensioned by hand within the pinion gap of the drive assembly (as shown below), roll the drive assembly off the belt tray.

IMPORTANT: As you roll the drive assembly off the stage, 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*.

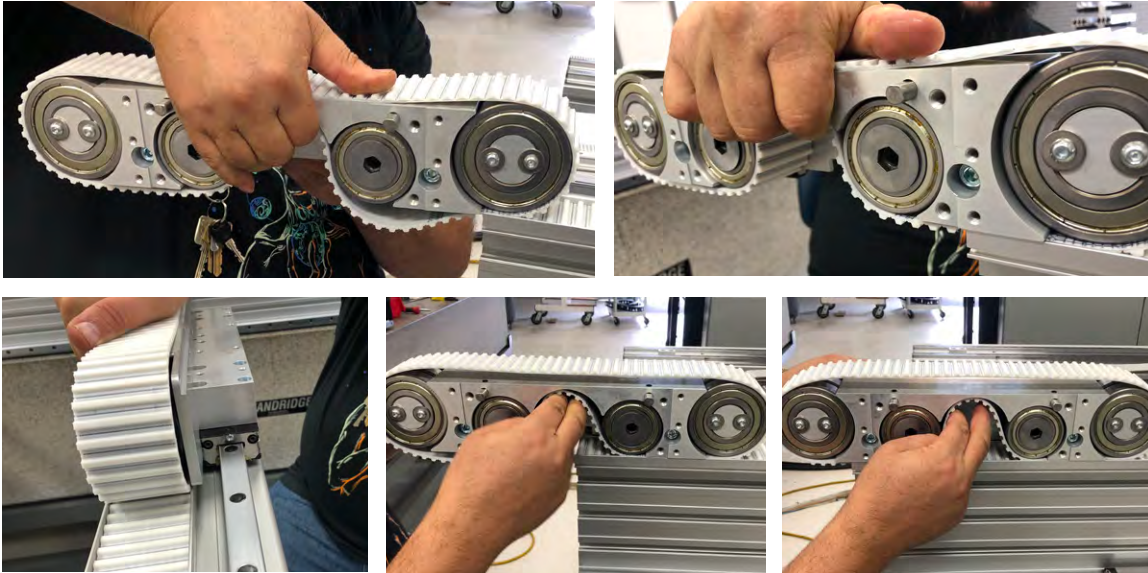


- 5.14** Remove the endless belt and replace it with a new belt.

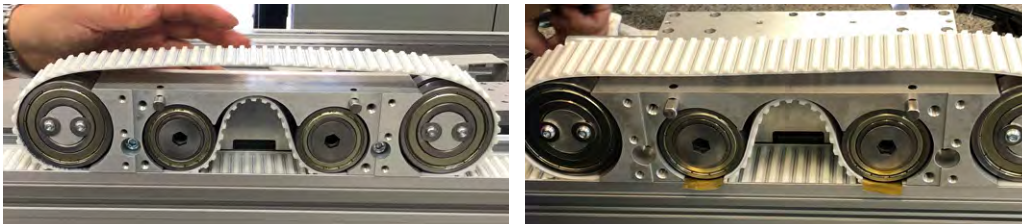


5.15 Roll the drive assembly back onto the stage.

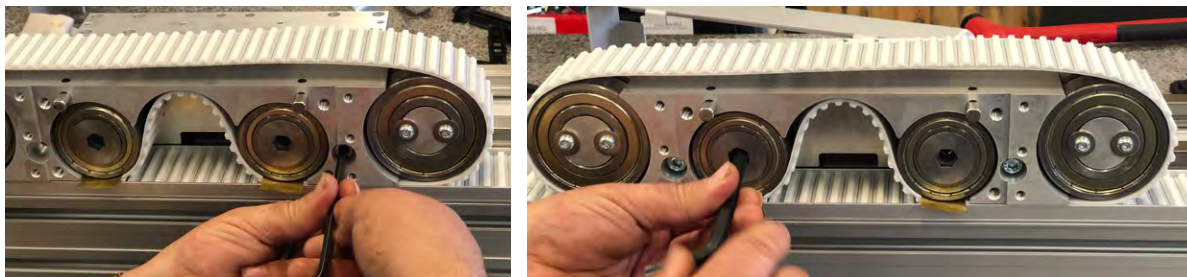
NOTE: As shown below, keep the belt fully tensioned in the pinion gap of the drive nugget during mounting. Secure and set aside the plastic ball bearing retainers that will be pushed out as the bearing blocks slide onto the bearing rail.



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



5.17 Tighten the drive assembly screws per Section 2, Table 2. After fully tightening the screws, remove the shims.



5.18 Reattach the belt cover.



- 5.19 Reattach the motor mount plate/motor to the drive assembly. Fasten the screws snug-tight, then back off one quarter turn.



- 5.20 Go to Section 7 for the SBL-H Belt Tensioning Procedure.

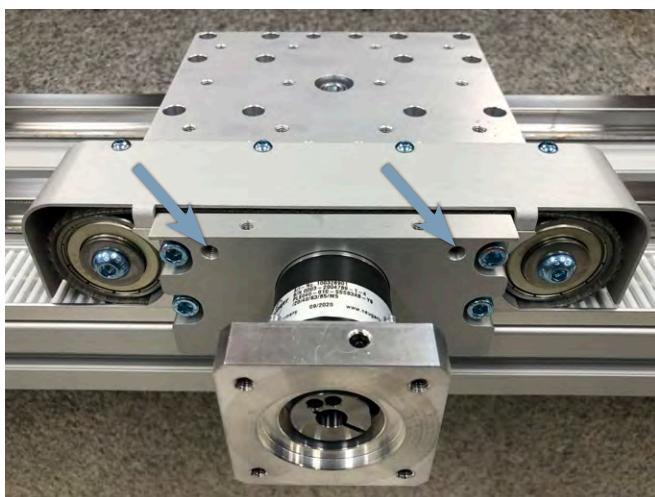
6. SBL-L (Standard Configuration Only) & SBL-M (Standard & LoopTrack Configuration) BELT TENSIONING PROCEDURE

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

METHOD 1: Using a Fish Scale

Recommended two-person procedure: One person pulls up with the fish scale to create belt tension (preload) while a second person tightens the mounting screws.

- 6.1 With the motor mount plate screws installed snug-tight and then backed off one quarter turn, begin the belt tension process.
- For SBL-M stages, temporarily insert two M6 screws (M5 for SBL-L) in the provided tapped holes in the motor mount plate (shown below). Loop a long zip tie around the screws as close to the motor mount plate as possible. 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 required amount of vertical force 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

- 6.2 With the motor mount plate screws installed snug-tight then backed off one quarter turn, begin the belt tension process.

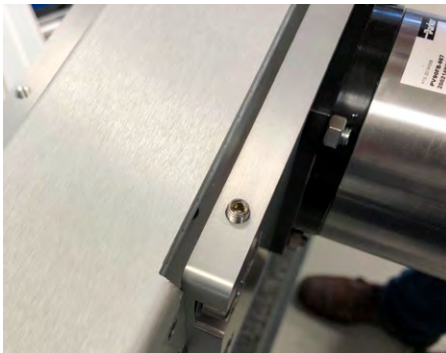
For SBL-M stages, temporarily insert two M6 screws (M5 for SBL-L) in the provided tapped holes in the motor mount plate (shown below). Loop a long zip tie around the screws as close to the motor mount plate as possible. Hook a load cell to the zip tie and pull straight up to create the required amount of tension as shown on an attached digital weight indicator. (Digital weight indicator photo below is for reference only). Refer to Section 2, Table 3 for the required amount of vertical force based on the stage model (plus the weight of the motor and/or gearbox if attached). Tighten the mounting screws per Section 2 Table 2.



7. SBL-H (Standard & LoopTrack Configuration) BELT TENSIONING PROCEDURE

- 7.1 With the motor mount plate screws installed snug-tight then backed off one quarter turn, begin the belt tension process.

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

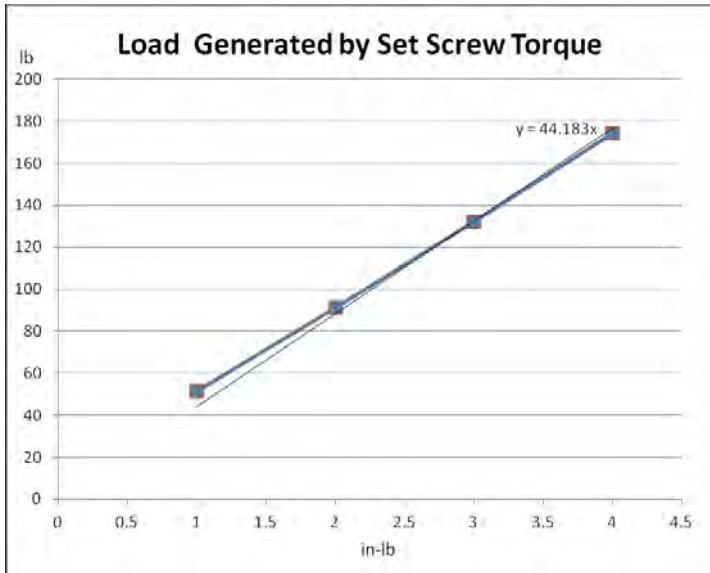


- 7.2 A torque watch or equivalent is used to add the preload by moving back and forth between each set screw—adding approximately one-half in-lb of torque incrementally until each screw is at approximately 2.25 to 2.5 in-lb of torque. This will seem like very little torque, and it is.

CAUTION: Higher torque on these set screws can equate to very high tension and premature failure.



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



8. VHB TAPE REPLACEMENT PROCEDURE

- 8.1** To replace the VHB tape, 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.
- 8.2** Upon removal of the carriage assembly, remove the upper and lower belt from the belt tray. Discard the belt if it is to be replaced. Remove existing tape, using a razor blade to lift the end of the adhesive. Lifting and stretch 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.
- 8.3** With the preexisting adhesive 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.



- 8.4** Ensure the width of the 3M VHB tape roll is smaller than the width of the belt tray.



- 8.5** Unroll the tape onto the belt tray using a 103043 application tool or a block similar in width to the tape tray. This should be completed 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 to not allow the tape to 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.



- 8.6** When you are ready to reinstall or replace the lower “static” belt, remove the backing from the 3M VHB tape to expose the adhesive. A razor blade can be used to separate the backing from the tape.



- 8.7** Before adhering the lower belt to the tape adhesive, you **must** clean the underside (smooth side) of the belt with acetone.

- 8.8** Install the lower belt onto the adhesive using the 103043 application tool or similar. Place the belt with a back-and-forth motion to ensure it is fully seated. Use scissors to cut the end(s) of the belt flush with the edges of the belt tray.



9. BEARING BLOCK PERIODIC RELUBRICATION PROCEDURE

- 9.1** Bearing Block relubrication 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.
- 9.2** These tools are recommended:
Pistol-Grip Grease Gun for Standard Grease Fittings, 12-inch Long Flexible Nozzle (*McMaster-Carr P/N 1190K37*)
Grease-Dispensing Tip, Adapter, 5-1/4-inch 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*)
- 9.3** The bearing runner blocks have Zerk fittings to feed the lubricant into the bearings.
- 9.4** 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 trigger one full pump to dispense the recommended amount of approximately .7 cc.

