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MAINTENANCE MANUAL

FOR MODULAR RATIO BAL-TROLS®.

(Model numbers beginning with MH or MV)

** Steps which can be skipped if seals do not need to be replaced.*
~ Steps which can be skipped if bearings do not need to be replaced.

Section A.

Replacing Cable (& Seals, & Bearings) :

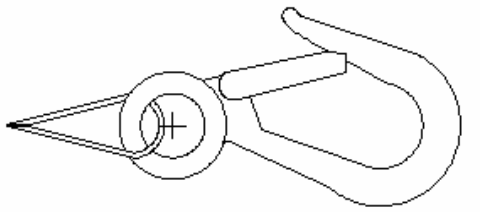
1) Release pressure: For Dual-Acting Slim-Line Sensi-Touch use the control to raise the hook all the way up, detach the push-to-connect hose from the back head thereby defeating the dual-acting feature, then use the control to pull the hook all the way down. For Single-Acting Slim-Line Sensi-Touch, Original Sensi-Touch, or Speed Handle: Use the control to pull the hook all the way down. For Balancer Control: Use the control to pull the hook all the way down, disconnect the shop air pressure line, turn the regulator knob to full decrease, then slowly disconnect the hose fitting that connects the Regulator to the Servo-Bleed.
2) Disconnect the shop air pressure line if it has not already been disconnected, and move the Bal-trol to a clean work bench.
3) The cable guide is where the cable comes out of unit. Use a marker to indicate which hole the cable comes out of, and which direction the cable guide is oriented with respect to the Bal-Trol.
4) Cut the old cable off so that no crimps or hooks remain.
5) Remove the 4 bolts at the cable end of the unit, separating the fixed pulley block from the tube.
6) Remove the next 4 bolts up from the cable end, separating the travel tube from the center head. Remove the tube from the assembly by sliding it over the moving pulley block, exposing all pulleys. Note the existing cable arrangement so that you will know how to route the new cable.
7) Remove the bolt that connects the rod to the moving pulley block which is inside the tube.
8) *Remove the next 4 bolts down, separating the other tube from the center head, and slide the tube over the piston until it is completely off of the assembly.
9) *Slide the rod out of the center head to gain access to the rod seals.

10) *Remove the old rod seal and its backup o-ring, and replace with new.
11) *Note the direction of the u-cup on the piston, remove and replace with new (keeping the direction the same as the old one was).
12) *Lubricate all seals with STP® oil treatment or equivalent.
13) *Clean and lubricate the tube and rod before sliding them back and replacing the 4 bolts.
14) Cut off the old cable, and remove the last piece of cable by sliding it out through the anchor screw, leaving the anchor screw in place. (No need to remove the cable screw at the anchor point).
15) Turn each of the pulleys by hand. If they do not spin easily and smoothly, or if you notice a metal on metal sound, then the bearings should be replaced. (Since the bearings are pressed in, special tools would be required to get them out. It is easier to also replace the pulleys.)
16) ~Note the arrangement of pulleys and spacers before removing them.
17) ~Remove the spider clips from the ends of the pulley shafts.
18) ~Slide the shafts out from within the pulleys and spacers.
19) ~Check the hardened steel shafts for wear marks. If they are noticeably scored then they should be replaced also.
20) ~Generously lubricate the shafts and bearings with grease.
21) ~Slide the shafts back in place, taking care to put the pulleys, spacers, and thrust washers in the exact positions that they were before.
22) ~Replace the spider clips.
23) The new cable will already be swaged, feed it into the anchor screw so that the swage seats into the anchor screw.
24) In order to route the cable over the pulleys, remove the screws that keep the cables from jumping off of the pulleys. (Or a screwdriver with the tip bent into a hook shape could be used to pull cable around pulleys.)
25) Replace the screws that keep the cables from jumping off of the pulleys.
26) Pass the cable end through the marked hole in the cable guide, with the cable guide oriented properly. (On horizontal units, the shorter edge goes toward the cable end of the unit, and the longer edge toward the center of the unit as noted in step 3.)
27) Set the tube up on end vertically, with the cable end up.
28) Slide the moving pulley block down into the tube, allowing it to drop all the way to the bottom. Slide the fixed pulley block into the top of the tube.
29) Turn it on its side again, and then pull the moving pulley block out so that it can be reconnected to the rod.
30) Replace the bolt that connects the rod to the moving pulley block.
31) Replace all 8 bolts to reconnect the fixed pulley block and center head to the tube, hand tightening them only at this point.
32) Pull on the cable to ensure alignment of the pulleys.
33) Tighten the 8 bolts evenly, alternating diagonally as you go.
34) If you do not have your own crimping hardware or screw-on cable termination, then refer to Section B. Installing Cable Clips.

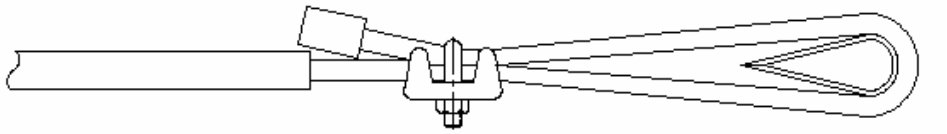
Section B.

Installing Cable Clips:

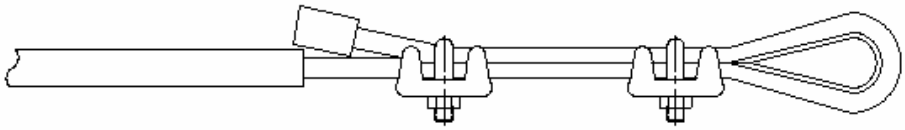
For applications that require a hook to be installed directly into the thimble, (As is the case with the Speed Handle Control,) pry the thimble apart just enough to wedge the hook in place, as shown:



Leave about 1/2" of nylon on the cable end so that there will not be any sharp wire strands sticking out. From there, strip the specified amount of nylon off the cable. Loop the stripped cable over the thimble, and through the hook, (if the hook is present). Apply the first clip as shown. The base or "saddle" should be on the live end of the cable, and the u-bolt should be on the short end. Leave about 3/4" of cable (including the coated tip) extending from the top u-bolt. Tighten nuts evenly, alternating from one to the other, until reaching the specified torque.



Center the thimble in the loop, and apply the second clip as close to the thimble as possible. Try to keep cable lengths as straight and even as possible. Tighten nuts evenly, alternating from one to the other, until reaching the specified torque.



Apply the initial load, inspect nuts, and retighten. Inspect all cables and clips periodically, and replace upon first signs of fatigue. We recommend our safety chains and Drop-Stop ® load arrestors for safety of personnel and product. For longer cable life, purchase a crimping tool and use oval copper sleeves instead of these cable clips.

Stripped cable diameter:	Torque:	Strip Length:
1/16" - 1/8" cable:	4.5 foot pounds	9"
5/32" - 3/16" cable:	7.5 foot pounds	9"
1/4" cable:	15 foot pounds	13"
5/16" cable:	30 foot pounds	13"

Section C.
General Warnings:

 **Regular Inspections** Inspect cables regularly for visible damage and fraying. Do not cover any part of the cable with tape, as this makes proper inspection difficult or impossible. **Do not operate Bal-Trol® with damaged, twisted, or frayed cable.** Inspect eyebolts regularly for visible damage, bending, cracks, wear, elongation, rust, etc. **Do not operate Bal-Trol® with damaged eyebolts.** The need for visual inspection cannot be overemphasized. **No product can keep operating at its rated capacity indefinitely.** Periodic inspections help determine when to replace parts such as cables and eyebolts, and thereby reduce possible hazards. Keep inspection records to help ensure periodic inspection intervals. Due to the diversity of applications, load weights, number of cycles, mounting arrangements, speed requirements, and environmental conditions, blanket recommendations for inspection procedures and frequency are not possible. **When in doubt, inspect prior to each use.** Carefully check for frayed strands, lumpy appearance forming underneath the coating of the cable, wear, deformation, cracks, elongation or bending of the eyebolts – sure signs of imminent failure. Immediately withdraw such items from use, and replace them. If down time is a concern, then keep spare parts or spare Bal-Trols® on site. Replacement cables and parts are available from Tri-Motion.

 **Regular Maintenance** **Do not attempt to operate a damaged or malfunctioning Bal-Trol®.** If the Bal-Trol® leaks air, allows a load to gradually drift downward, malfunctions, or does not operate smoothly, this is an indication that it requires maintenance. If return authorization is obtained first, then such units can be sent back to Tri-Motion for thorough evaluation and repair. Tri-Motion also offers cable replacement kits and seal kits which can be installed in the field by qualified personnel. The disassembly procedure provides an excellent opportunity to inspect the moving parts which are inside the Bal-Trol®. Sheaves should be checked to verify that they turn easily, and if not then new sheave bearings must be installed. Preventative maintenance can be performed on a scheduled basis, before the Bal-Trol® begins to malfunction or leak. Keep maintenance records to help ensure periodic maintenance intervals. Due to the diversity of applications, load weights, number of cycles, mounting arrangements, speed requirements, and environmental conditions, blanket recommendations for maintenance frequency are not possible. **When in doubt, schedule preventative maintenance more frequently.**