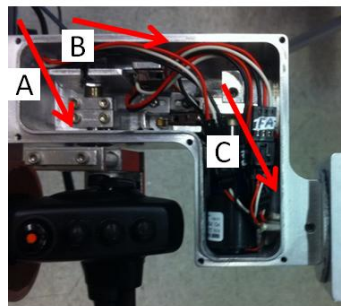


Maintenance Manual for the Robotic EndoLaryngeal Flexible (Robo-ELF) Scope

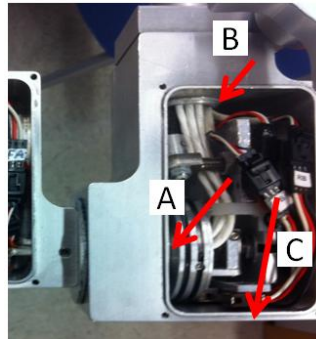
1. Review log of last operation and check for problems
2. Boot up robot according to user manual but without drape or scope and recalibrate
3. Check joystick by testing each of the joystick axes and check that the system moves appropriately.
4. Check e-stop by pushing the e-stop button while holding one of the joystick axes and check that the system stops moving.
5. Check relay by unplugging the USB cord, which will cause the relay to open, while holding one of the joystick axes and check that the system stops moving.
6. Use a multimeter to check that robot case is grounded to earth ground by checking the connectivity between the ground plate in the electronics enclosure and the scope holder enclosure.



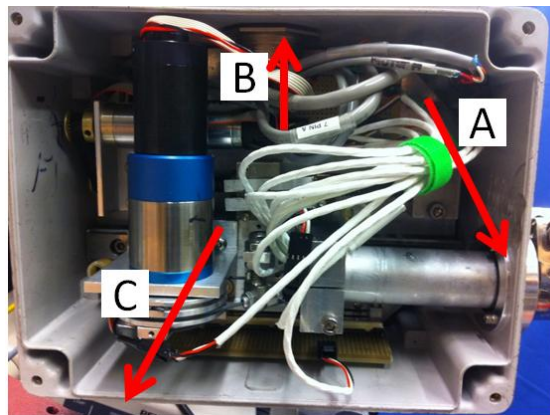
7. Remove scope holder enclosure cover and check cover and bearing seals for degradation or any sign of penetration.
 - A. Scope manipulator bearing seal
 - B. Cover seal
 - C. Roll bearing seal



8. Remove roll stage enclosure cover and check cover and bearing seals for degradation or any sign of penetration.
 - A. Roll bearing seal
 - B. Arm joint seal
 - C. Cover seal



9. Remove main enclosure cover and check cover and bearing seals for degradation or any sign of penetration.
 - A. Arm flange seal
 - B. Connector seal
 - C. Cover seal



10. Loosen elbow locking collar and check friction collar will not move from the influence of gravity with a 10 pound load applied to the rotation stage enclosure. If the joint does move, tighten the friction collar screws until it does not.
11. Loosen tilt locking collar and check friction collar will not move from the influence of gravity with a 10 pound load applied to the rotation stage enclosure. If the joint does move, tighten the friction collar screws until it does not.
12. Tighten all locking collars and try to move robot with reasonable operating force, and verify that the robot does not move.