

Instructions for Terminating a T200 Thruster with a Cobalt 3-Pin Connector

Introduction

This document details the procedure for terminating a Blue Robotics T200 thruster using a Blue Trail Engineering Cobalt 3-pin termination kit (PN COB-3030-SS). This will allow the thruster to plug into a Blue Trail Engineering Cobalt 3-pin bulkhead connector (PN COB-1130-SS). The current rating of the thruster with the Cobalt 3-pin connector is 20 amps continuous.

This procedure requires intermediate soldering skills as well as familiarity with potting techniques used with 2-part epoxy or urethane.

Included materials

The Cobalt 3-pin termination kit (PN COB-3030-SS) includes:

- qty. 1. Connector Shell with pre-installed PEEK Insert
- qty. 3 Electrical Sockets
- qty. 1 Locking Sleeve
- qty. 1 #012 O-Ring
- qty. 1 3.2 mm x 25 mm (1/8" x 1") Dowel Pin



Required tools and materials

The following tools and materials are required:

- soldering iron
- wire strippers
- wire cutters
- pliers
- multimeter
- drill press
- vise
- 150 or 200-grit sandpaper OR a 6mm (1/4") diameter grinding bit
- syringe with needle (3 cc syringe with 16G needle recommended)
- masking tape or electrical tape
- cotton swab
- acetone
- solder
- suitable epoxy or urethane adhesive*

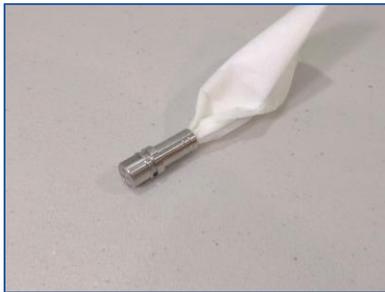
*Blue Trail Engineering has tested two adhesives in this application: 3M DP-420 epoxy, and 3M DP-620 urethane with Forsch Polymers ADH 1001 primer. Other adhesives or potting materials may work, but it is the customer's responsibility to test them thoroughly in this application.

Procedure

1. Use either a 6 mm (or ¼") grinding bit in a Dremel tool or a rolled-up piece of 150 or 200-grit sandpaper to thoroughly abrade the inside of the Connector Shell. If using the grinding bit in a Dremel tool, be careful not to damage the PEEK Insert inside the Connector Shell.



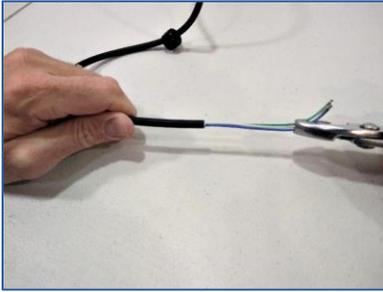
2. Clean the inside of the Connector Shell with a lint-free wipe soaked in acetone and allow to dry. If using a primer (recommended for urethane), apply the primer to the inside of the Connector Shell using a cotton swab or equivalent and allow to dry.



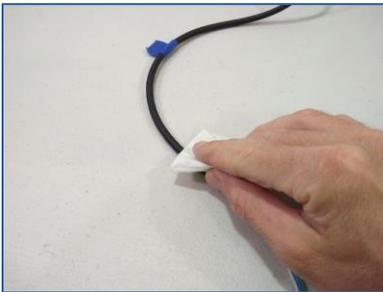
3. Slide the Locking Sleeve onto the thruster cable with the internally threaded part of the Locking Sleeve facing towards the end of the cable. Place a piece of tape on the cable to keep the Locking Sleeve from coming off.



- Grab the ends of the cable wires with pliers and pull the wires out of the cable jacket gently until they protrude from the cable jacket at least 3 cm farther than they did before. This step is very important, as it will make it easier for the cable jacket to remain in place inside the Connector Shell during potting. You may need to pull on the wires while grabbing the cable jacket in several places: first near the end of the cable, then near the middle of the cable, then near the base of the cable (where it comes out of the thruster).



- Wipe the last two inches of the cable jacket with acetone to prepare it for potting. From this point on, be careful to keep this part of the cable jacket clean. Put the Connector Shell in place on the cable, with one wire going through each of the 3 holes in the PEEK insert. If terminating multiple thrusters, it may be desirable to make sure that all thrusters have the wires in the same positions relative to the flat surface on the Connector Shell. After the Connector Shell is in place on the cable, do not pull the wires out of the cable jacket anymore (as in step #4) since the wire insulation may be damaged by the internal edges on the PEEK insert.



- Cut the wires to 10 mm from the end of the Connector Shell. Strip the last 5-6 mm of insulation off the wires. Make sure the strands of wire are tightly wound and that there are no loose or protruding strands which could cause an electrical short.



7. Tin the wires with solder. Then place an Electrical Socket on each wire and solder it to the wire. It is very important that the solder remains inside the solder cup on the Electrical Socket. If solder gets on the outside of the Electrical Socket, it may make it impossible to press the Electrical Socket into the PEEK Insert.



8. When all three Electrical Sockets are soldered to the wires, gently press them into the PEEK Insert by hand. Use a multimeter to make sure there are no electrical shorts between the Electrical Sockets and the Connector Shell. Note that there *will* be an electrical short from one Electrical Socket to another Electrical Socket since they are now connected to the windings in the thruster motor.



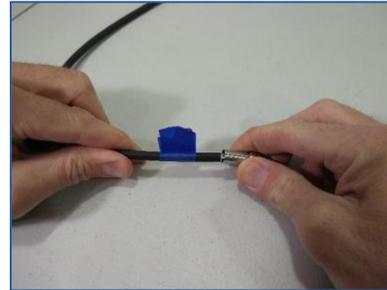
9. Gently hold the Connector Shell vertically in a vise. Mount the Dowel Pin in a drill press chuck and use it to carefully press each Electrical Socket into the PEEK Insert. Go slowly and be careful: once the Electrical Sockets are pressed in, they cannot be removed. Use the multimeter to check again for electrical shorts between the Electrical Sockets and the Connector Shell.



10. To prepare the cable for potting, push the cable jacket into the Connector Shell until it protrudes into the Connector Shell as far as possible. It may be necessary to stretch the cable jacket by pulling on it first near the thruster, then in the middle of the cable, then near the end of the cable.



11. Put a piece of tape on the cable jacket immediately adjacent to the Connector Shell. Now pull the cable jacket back out of the Connector Shell. There should be at least 15 mm of cable jacket beyond the tape. If there is less than 15 mm of cable jacket beyond the tape, repeat the previous step.



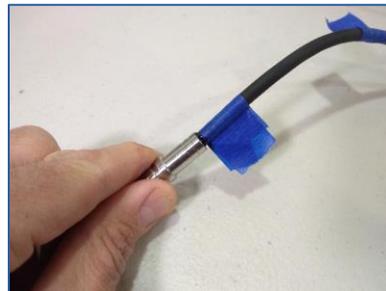
12. Prepare the epoxy or urethane for the potting operation. It may be helpful to warm up the epoxy or urethane slightly to ensure that it flows easily. It should be at least at room temperature, preferably slightly warmer. Use a mixing tip to mix the epoxy or urethane (mixing tips greatly reduce the amount of bubbles) and inject the epoxy or urethane into a syringe with needle.



13. With the cable jacket pulled out of the Connector Shell, inject the epoxy or urethane into the Connector Shell until the epoxy or urethane starts to come out the rear of the Connector Shell. Move the cable around inside the Connector Shell to ensure that both the outer surface of the cable jacket and the inner surface of the Connector Shell are fully wetted with epoxy or urethane.



14. Push the cable jacket back all the way back into the Connector Shell. A large amount of epoxy or urethane should come out the rear of the Connector Shell, ensuring that the inside of the Connector Shell is completely filled. Clean off the excess epoxy or urethane with a paper towel and acetone or alcohol.



15. Wait several minutes to make sure that the cable jacket stays in position (the tape should remain adjacent to the Connector Shell). If satisfied, remove the tape and clean up any stray epoxy or urethane. Allow the epoxy or urethane to cure fully without disturbing the assembly. When fully cured, check for electrical shorts one more time with a multimeter.



16. Lubricate the O-ring and install it in the groove on the Connector Shell, making sure that the groove and the O-ring are free from lint, hair, or other contamination.