

Instructions for Cobalt Series Cable Termination Kits

Introduction

This document details the procedure for terminating a cable with a Cobalt connector using a Blue Trail Engineering Cable Termination Kit. The Cable Termination Kit is available in different pin counts (3-pin, 4-pin, etc.) and two different connector shell sizes (regular and large). Cable Termination Kits are also available for the larger Cobalt 14 line of connectors.

In addition to the Cable Termination Kit, you will need a Cable Termination Tool of the appropriate pin count.

The termination procedure is essentially the same for all versions. In these instructions, pictures of the 8-pin version will be shown.

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

The cable to be terminated must have a bondable outer jacket (preferably polyurethane). For the Cobalt Cable Termination Kit, the diameter of the cable should be no greater than 6.5 mm for the regular shell size or 7.8 mm for the large shell size. For the Cobalt 14 Cable Termination Kit, the diameter of the cable should be no greater than 11.0 mm.

Included materials

The Cable Termination Kit includes:

- qty. 1. Connector Shell
- qty. 1 Connector Insert with pre-installed electrical contacts
- qty. 1 Locking Sleeve
- qty. 1 O-Ring

Required tools and materials

The following tools and materials are used in this procedure:

- soldering iron
- wire strippers
- wire cutters
- multimeter
- Dremel tool or equivalent
- 6mm ($\frac{1}{4}$ ") diameter grinding bit
- drill press with vise
- syringe with needle (3 cc syringe with 16G, 30mm needle recommended)



- acetone
- solder
- suitable epoxy adhesive*

*Blue Trail Engineering has tested 3M DP-420 epoxy in this application. Other epoxies or potting materials may work, but it is the customer's responsibility to test them thoroughly in this application.

Procedure

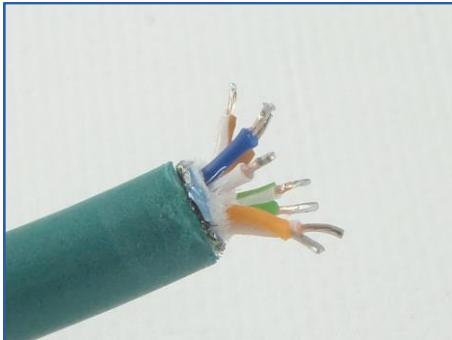
1. Use a 6 mm ($\frac{1}{4}$ ") grinding bit in a Dremel tool to thoroughly abrade the inside of the Connector Shell where the cable will enter. When done, the inside of the Connector Shell should be visibly and thoroughly abraded. However, do not abrade the portion where the Connector Insert will go.



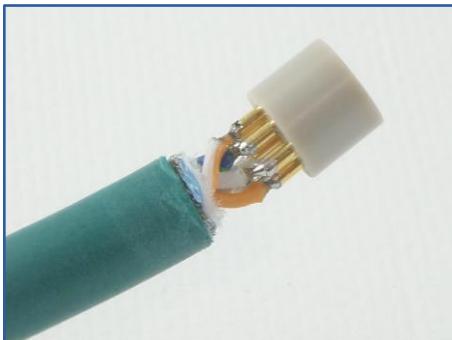
2. Clean the inside of the Connector Shell with acetone and allow to dry.
3. Slide the Locking Sleeve onto the cable with the internally threaded part of the Locking Sleeve facing towards the end of the cable. Then slide the Connector Shell over the cable. The end of the Connector Shell that has the flat surface should be facing the end of the cable. **VERY IMPORTANT: the locking sleeve and connector shell must be installed at this point in the process. They cannot be installed later.**



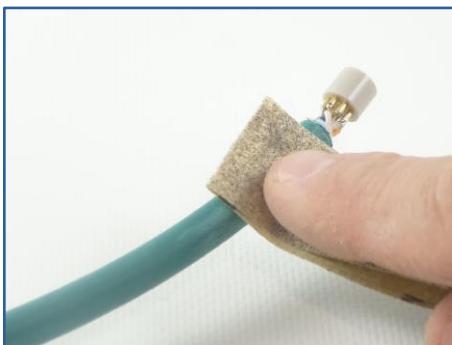
4. Strip the last 1-2 cm of cable jacket off your cable. Trim the wires as close to the end of the cable jacket as possible, while still allowing enough room to solder them to the Connector Insert. Strip the last 5-6 mm of insulation off the wires. Make sure the strands of wire are tightly wound and that there are no loose or protruding strands which could cause an electrical short. Tin the ends of the wires with solder to prevent the wire strands from fraying.



5. Insert the wires into the contacts on the Connector Insert and solder them in place. It is very important to make a clean solder joint with minimal solder outside the joint – excess solder can cause shorts between the wires or between a wire and the Connector Shell. Double-check that each wire is soldered to the correct contact (the pinout will depend on the particular application).



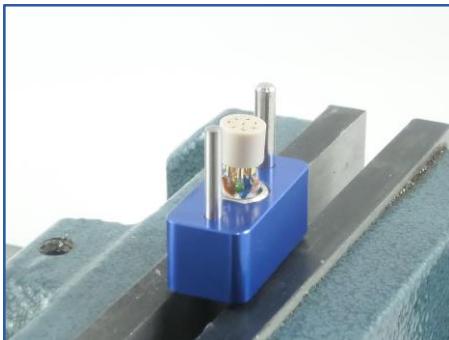
6. Abrade the last 3 cm of the cable jacket with sandpaper and clean with a paper towel that has been slightly moistened with acetone to prepare it for potting. From this point on, be careful to keep this part of the cable jacket clean.



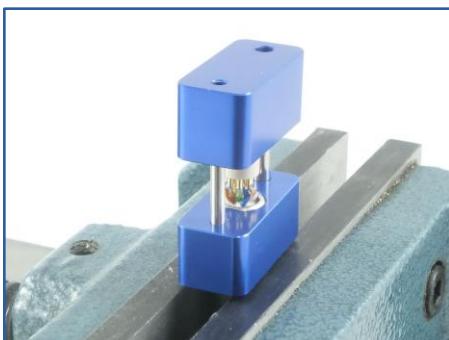
7. Visually inspect one more time for any stray strands of wire or solder. Once the Connector Insert is pressed into the Connector Shell, there will be no way to fix any electrical shorts.
8. Slide the Connector Shell down the cable towards the Connector Insert and gently clamp the Connector Shell vertically in a vise.



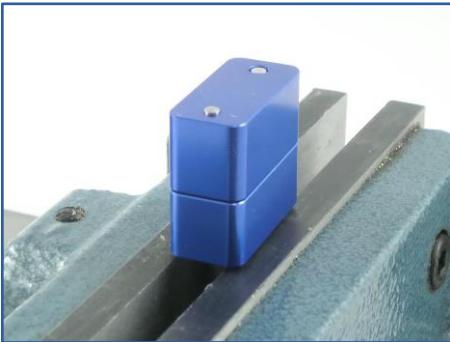
9. Place the lower half of the Termination Tool over the Connector Shell, aligning the flats.



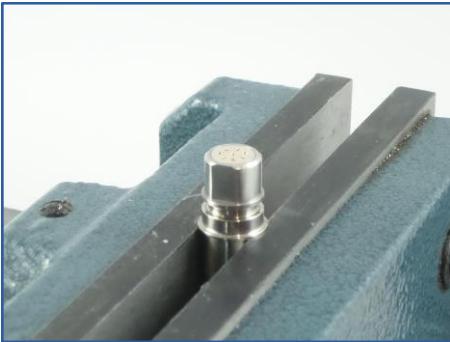
10. Slide the upper half of the Termination Tool onto the lower half of the Termination Tool. Insert the pins on the upper half of the Termination Tool into the contacts on the Connector Insert, rotating the Connector Insert as necessary to ensure the proper pinout for your application (make sure that the wires are in the desired alignment relative to the flat on the Connector Shell).



11. Using a drill press, push down on the upper half of the Termination Tool until the Connector Insert is pressed completely into the Connector Shell.



12. Remove the Cable Termination Tool. Ensure that the face of the Connector Insert is flush with the end of the Connector Shell. If not, put the Termination Tool in place again and press the Connector Insert completely into the Connector Shell.



13. Use a multimeter to check for electrical shorts between the individual contacts and between each of the contacts and the Connector Shell.
14. Prepare the epoxy for the potting operation. It is helpful to warm up the epoxy slightly to ensure that it flows easily. It should be at least at room temperature, preferably slightly warmer.
15. Install a mixing tip on the epoxy cartridge (mixing tips greatly reduce the likelihood of getting bubbles in the epoxy). Discard the first 1-2 ml of epoxy that comes out of the mixing tip. Insert the mixing tip deep into the syringe and inject the epoxy or into the syringe. Try to fill the syringe without getting any air bubbles into the epoxy. Alternatively, the needle might fit directly on the mixing tip. In this case, you do not need a syringe.



16. Insert the syringe with needle deep into the Connector Shell. Inject the epoxy into the Connector Shell until the epoxy 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. If necessary, inject the epoxy at several places around the circumference of the Connector Shell. Continue injecting epoxy while withdrawing the needle from the Connector Shell. Avoid injecting any air bubbles into the Connector Shell.



17. Clean off the excess epoxy with a paper towel and acetone or alcohol.



18. Allow the epoxy to cure fully without disturbing the assembly. When fully cured, check for electrical shorts one more time with a multimeter.
19. 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.



Tips and Tricks

1. You can get a clean, professional-looking result by using a piece of silicone tubing as a "mold" for the epoxy. Choose silicone tubing with an inner diameter equal to the cable's outer diameter. Cut the silicone tubing to about 20 mm long. Slide it onto the cable between the Locking Sleeve and the Connector Shell as shown below. When the time comes to inject the epoxy, push the silicone tubing over the end of the Connector Shell (this may be difficult). Push the needle under the silicone tubing and inject epoxy until the epoxy comes out the end of the silicone tubing. Keep injecting more epoxy while withdrawing the needle. 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 (keep the silicone tubing in place while you do this). Clean up the excess epoxy with alcohol or acetone. When the epoxy has cured, carefully cut off the silicone tubing. The epoxy at the end of the Connector Shell should have a nice, tapered shape.



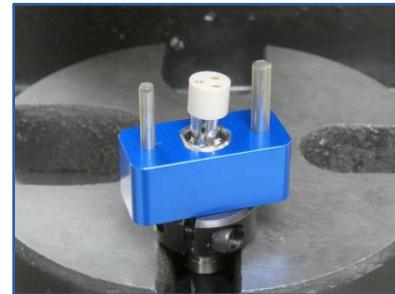
Alternatively, you can use our Termination Kit Mold for this purpose. It is specially designed for creating professional-looking potted terminations. Note that the Termination Kit Mold is only compatible with certain cable diameters (see bluetrailengineering.com for details).



2. When using thicker wire, for instance with the cable on a Blue Robotics T200 thruster, it can be difficult to fit the wire into the contact without fraying the wire. In this case, try the following procedure for tinning the wire before stripping it to prevent fraying:
 - a. Cut the wire cleanly. Do NOT strip the wire yet.
 - b. Put a drop of soldering flux on the tip of the wire.
 - c. Tin the end of the wire, keeping the soldering iron on the tip of the wire for several seconds and continuing to add solder. The flux should help the solder wick down into the wire.
 - d. Cut off the last 1-2 mm of wire then strip the wire.



3. If you do not have a suitable vise for holding the Connector Shell (see step 8 above), you can clamp a 2-piece shaft collar around the Connector Shell. Then place it on an arbor press base plate as shown below to complete the pressing operation.



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