SIMB™

DEPLOYMENT | ASSEMBLY | INSTALLATION

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REV 3

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PREFACE

Hi there! Thank you for deploying one of our Sea Ice Mass Balance buoys! This buoy was handmade in West Lebanon, New Hampshire by Cryosphere Innovation, LLC. We have worked hard to make this buoy easy to transport, uncrate, install, and activate. We hope that after your installation it will provide us and the world with more knowledge about how the Arctic sea ice cover is evolving.

Everything from unpackaging to activation to troubleshooting is covered in this manual. If you have any unanswered questions however, we can be contacted at the email addresses on the front cover.

Sincerely,

Cameron Planck
Co-Founder & CEO

James Whitlock
Co-Founder & CTO

TABLE OF CONTENTS

OVERVIEW

SIMB3 is the latest version of our Seasonal Ice Mass Balance buoy and was designed with ease of assembly and deployment in mind. With exception of tools needed to drill the hole and measure the ice, the entire buoy *can be assembled without tools*.

SIMB3 is shipped in one wooden crate with an approximate size of 243 x 33 x 30 cm (11 x 13 x 96 inches) and weight of 57 kg (125 lbs). The buoy weighs 34 kg (75 lbs).

NEEDED FOR DEPLOYMENT

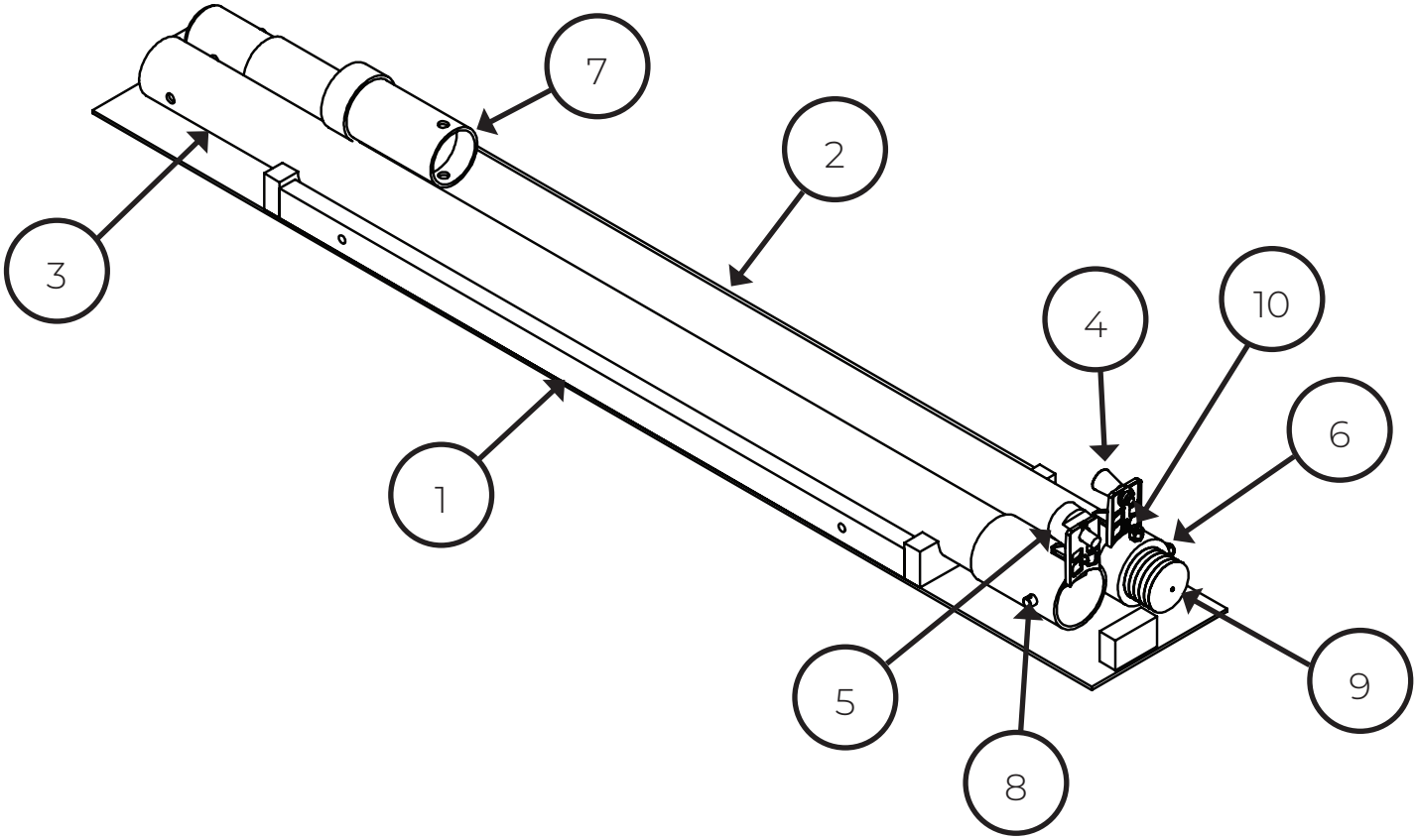
- 25 cm (10 inch) ice drill
- Measuring tape
- Ice thickness tape

SIMB3 comes with a built in “carrying case” which can be used to safely and easily transport the buoy to the deployment site. The case is sized to fit in a helicopter or snowmobile sled, and includes two rope handles for easy lifting.

IMPORTANT: Please read these instructions thoroughly. The SIMB3 is extremely simple to install, however there are several important steps that are critical to ensure proper operation.

DIAGRAM

The main components are listed below.

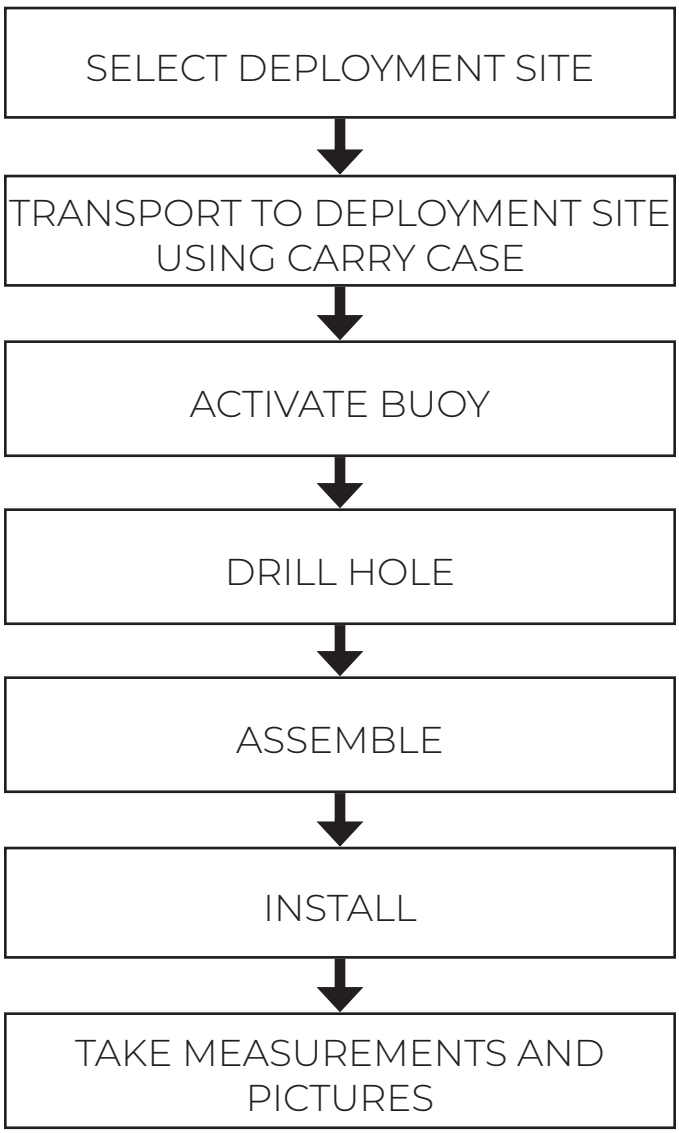


Major Components:

1. Buoy carrying case
2. Top section
3. Bottom section
4. Snow rangefinder
5. Underwater rangefinder
6. Temperature string
7. Ballast
8. Blue retaining pin
9. Top cap
10. Blue LED

DEPLOYMENT FLOWCHART

Assuming the buoy has arrived at the location where the deployment effort will commence, a summary of the deployment steps are:



SITE SELECTION

SIMB3 should be placed in an area of undeformed (FLAT) First Year Ice.

- If deployed in winter, put the buoy in an area of deeper snow. Not a huge drift behind ice blocks, just one of the small drifts that forms out on the level ice pan. These 'snow dunes' are less likely to become melt ponds when melt starts, helping the buoy survive longer.

- If deployed during the melt season, place the buoy in an area of non-ponded ice at least 2 meters from a pond, if possible.

Do not put the buoy next to a ridge as the ice will be thick and there is a danger of the ridge becoming active and crushing the buoy.

Avoid placing the buoy in a melt pond as this will melt out first and detach the buoy from the ice.

SIMB3 should not be deployed in ice thicker than 2.25 meters. Every effort should be made to avoid deployment in ice thicker than 1.75 meters to allow for winter growth.

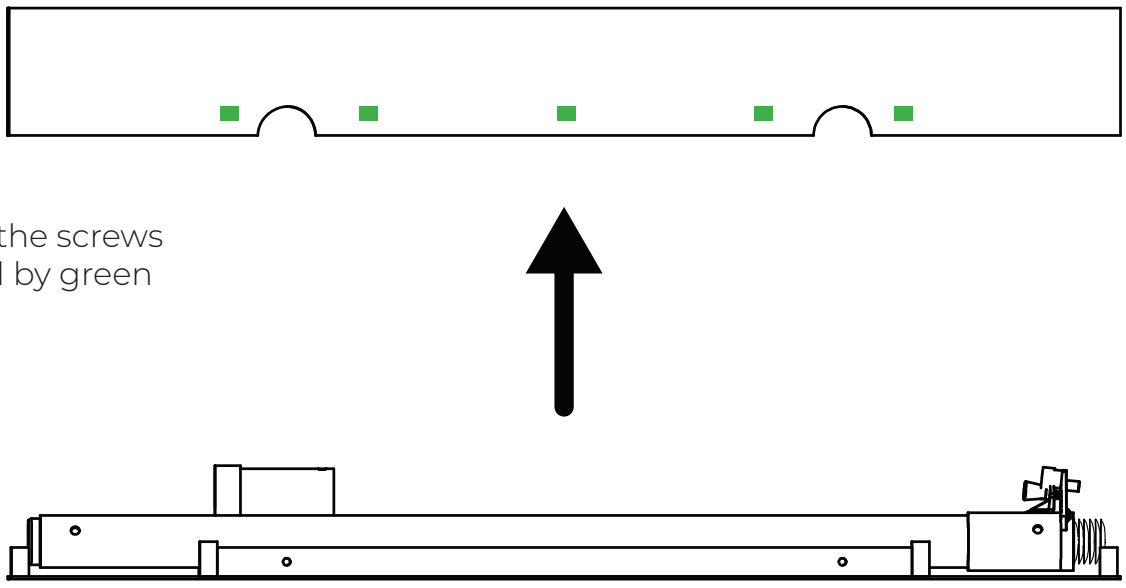
TRANSPORTATION & UNCRATING

SIMB3 is shipped in a two part crate consisting of top and bottom halves. Any long distance formal shipping should be done with the crate fully assembled.

Upon arrival at the location where deployment efforts will commence, the shipping crate top can be removed. This is done by unscrewing the Phillips screws indicated by green paint (or black circles) and lifting the shipping crate off.

Once removed, the lower half and carrying case with the buoy is exposed.

Please keep the buoy in the carrying case until it has arrived at the assembly site. Doing so makes transportation easier AND protects the sensitive electrical components.



Remove the screws indicated by green squares

PREPARING ICE HOLE

SIMB3 requires a minimum 10” diameter hole to be drilled vertically through the ice.

After hole is drilled, the following measurements need to be made:

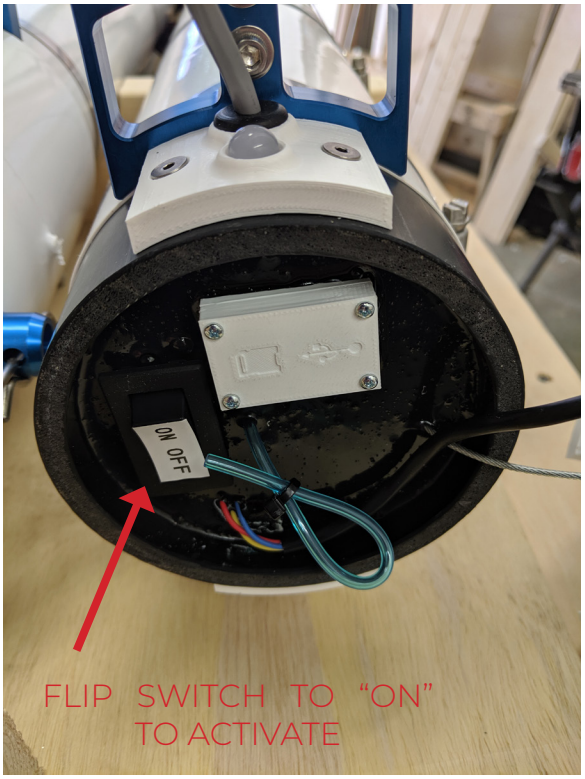
- Ice thickness
- Snow thickness
- Freeboard

A datasheet has been provided at the end of this manual for recording.

ACTIVATION

Activating the SIMB3 is an easy one step process.

IMPORTANT: activation should be done BEFORE buoy assembly. In the event of an issue, having the buoy unassembled and uninstalled will make diagnostics easier.



TO ACTIVATE SIMB3:

Remove the top cap by wiggling it gently and pulling outward. Flip the large black rocker switch to "ON". The blue LED above the snow rangefinder will illuminate. Replace top cap and press down firmly.

The LED will stay illuminated until the buoy makes its first successful transmission to the Iridium satellite system. This process should take no longer than 10 minutes. If the LED fails to turn off after 10 minutes, toggle the switch to "OFF" and then back to "ON" again. This can often be required if testing is in an urban area or an area without an unobstructed view of the sky.

If the light remains illuminated after several toggling attempts, see troubleshooting section.

ASSEMBLY

Once successfully activated, the buoy can be assembled.

Assembly should be fast and easy and requires no tools. In order to make installation quick and painless, assembly should take place as close to the ice hole as possible.

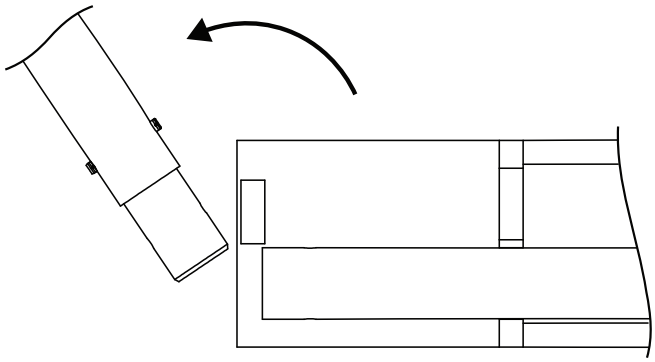
STEP 1:
Undo the two straps that hold the SIMB3 hull sections to the carrying case. Remove wing nut holding ballast and set the ballast aside.

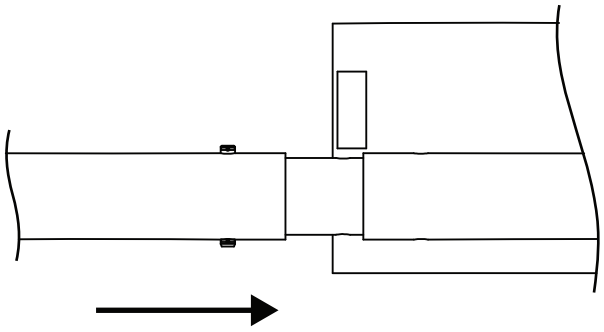
STEP 2:
Remove the hairpins from both blue retaining pins and extract.

IMPORTANT: once removed from the case, handle buoy with great care. The temperature string is fragile and can be damaged if kinked.

STEP 3:
Grab the top section and carefully swing it around parallel with the bottom section.

Paying attention to the hole alignment, slide the top section onto the gray coupling until the bottom section and the top section meet. DO NOT KINK TEMPERATURE STRING.

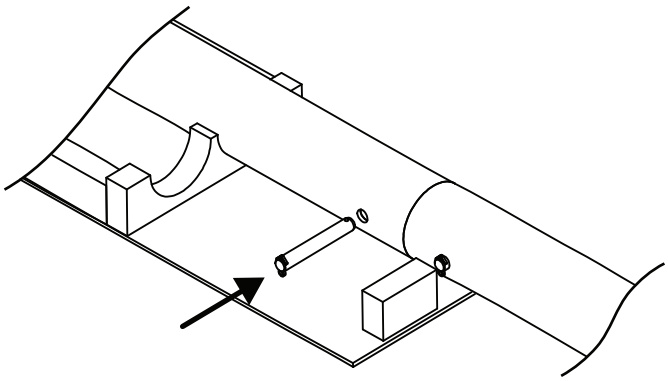




ASSEMBLY, CONT.

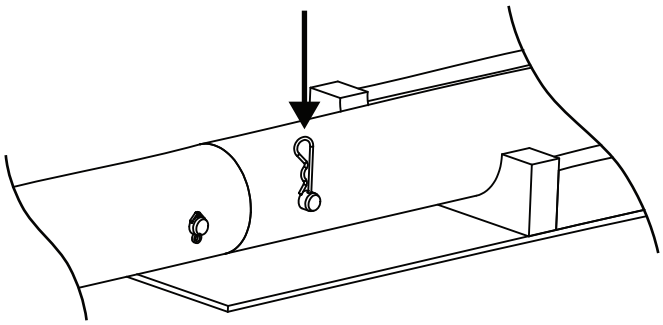
STEP 4:

With the holes aligned, slide the retaining pin in so the cotter pin is flush.



STEP 5:

Insert hairpin clip on otherside to fully lock buoy sections together.

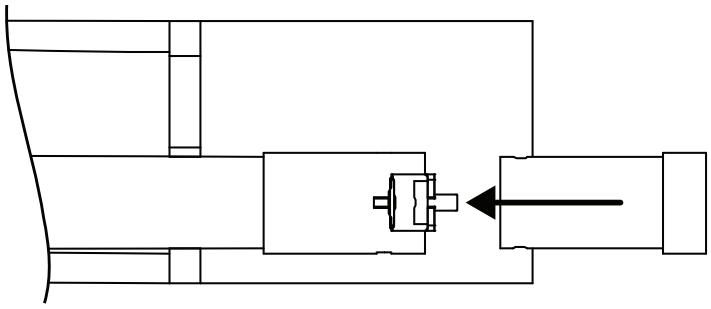


IMPORTANT: if the retaining pin interferes with the retractable cable, use your finger through the backside of the hole to help push the retractable cable out of the way. You can also try and push the blue retaining pin through the other side

ASSEMBLY, CONT.

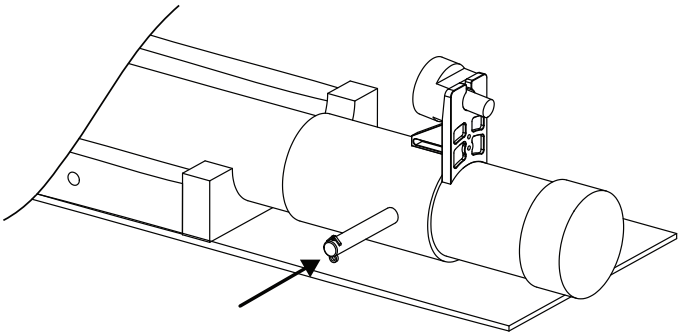
STEP 6:

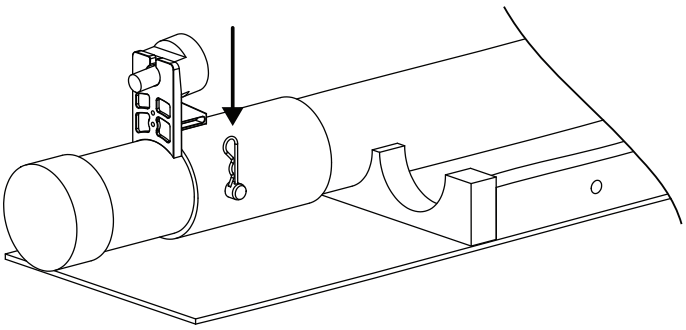
Install ballast onto bottom section coupling by aligning holes and sliding.



STEP 7:

Complete installation by sliding the blue retaining pin through and install hairpin.





IMPORTANT: if ballast fit is tight, or if it binds during installation, jiggle the ballast up and down to free it. Have another person hold the bottom section while this is performed, and, as always, keep an eye on the temperature string.

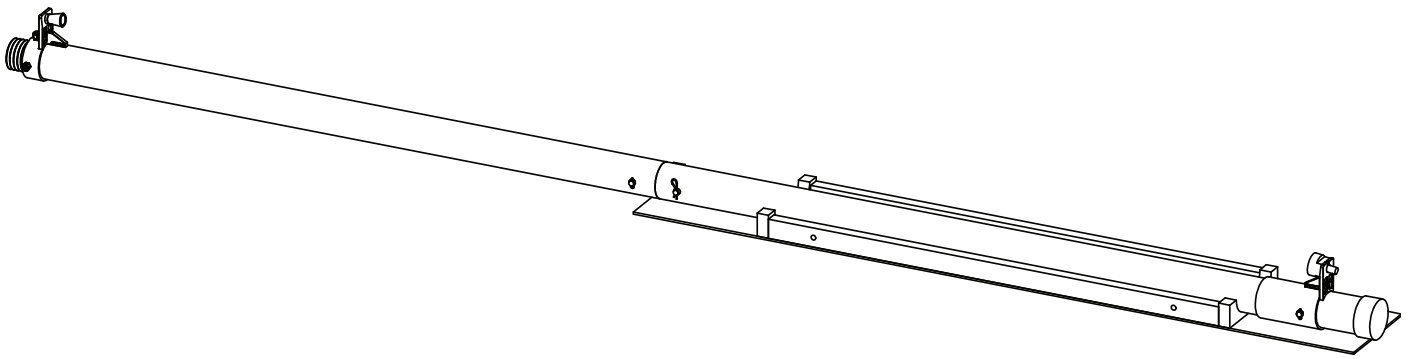
ASSEMBLY, CONT.

STEP 8:

Gently life and rotate buoy so sounders are facing down.

Slide temperature string down and secure end to the elastic temperature string tensioning device located on the ballast coupling.

The buoy is now fully assembled.



INSTALLATION

With the buoy fully assembled next to the hole, it is ready to be installed. SIMB3 is installed by lifting the buoy vertical and inserting into the ice hole. It will then slide downward vertically approximately 10 feet before it floats.

STEP 1:
Have one person place their foot at the bottom of the buoy near the ballast. Have another person stand the buoy upright by lifting at the coupling between the top and bottom sections.

STEP 2:
With the buoy standing vertically, carefully lift and lower into ice hole. Guide buoy downward with hands, paying attention to not damage the bottom sounder or temperature string.

Once floating, the buoy is fully installed. After 24-48hrs the buoy will be fully frozen in and collecting data.

MEASUREMENTS & PICTURES

MEASUREMENTS:

In addition to the measurements taken when the ice hole was drilled, the following are needed after installation:

- Distance from ice to top sounder housing
- Distance from top of temperature string to ice.

PICTURES:

Please take as many pictures as possible. At minimum take pictures of the buoy installed, preferably with a tape measure next to the hull going down to the ice.

Pictures of any other collocated scientific equipment are also appreciated.

DATA SHEET

IMEI _____ Date Installed _____ GMT turned on _____

Floe Description _____

_____

_____

_____

_____

Ice Thickness _____

Snow Thickness _____

Freeboard _____

Other Equipment Installed at Site _____

_____

Installed by (name, organization, project, platform (i.e. ice breaker, ice camp

_____

CHECKLIST

Before leaving the buoy, please double check that the following have been completed:

- [ ] Site chosen away from any ridges in ice <= 1.75m thick
- [ ] No visual damage apparent to buoy or instruments
- [ ] Ice, snow, & freeboard thickness taken at deployment site
- [ ] Hairpin clips inserted to retaining pins
- [ ] Temperature string secured with spring at bottom of ballast
- [ ] Buoy activated
- [ ] Blue LED turned ON
- [ ] Blue LED turned OFF (after transmission)
- [ ] Post installation pictures taken
- [ ] Post installation measurements taken
- [ ] Data sheet filled out

TROUBLESHOOTING

Buoy halves will not slide together or fully seat

The retractable cable is likely in the way. Have one person grab the bottom section, and another person wiggle the top section. You can also rotate the top section a full 360 deg to tighten up the cable and clear it from the coupling. Be careful not to kink the temperature string.

Retracting cable in the way of retaining pin

If using your finger through the backside of the hole doesn't work, you can use an item (a pen, a screwdriver, etc.) to help hold the cable out of the way while you slide the pin in. Just be careful to not damage the cable, as it is a waterproof barrier.

LED does not illuminate

If the LED did not illuminate at all, try toggling the on/off switch. If after several attemps the LED still does not illuminate, DO NOT INSTALL BUOY. Contact Cameron or James at the contact information listed on the front page of this manual.

LED does not shut off

If the LED does not shut off after 10 minutes, toggle the on/off switch. If after toggling the LED continues to stay illuminated, try repositioning the buoy to a different location and toggling again. Sometimes Iridium communication can be difficult if the buoy is near any obstructions (buildings, overhangs, large vehicles, trees, etc). Always test the buoy with a clear view of the sky. If LED fails to shut off again, DO NOT INSTALL. Contact Cameron or James at the contact information listed on the front page of this manual.

NOTES