

IDP Sidewinder Operations and Maintenance Manual

June 3, 2026

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1.0 PURPOSE

The objective of this document is to provide the operator with a working knowledge of the Sidewinder kit assembly and operation. Step-by-step instructions are included for those with no prior experience.

2.0 SCOPE

This manual describes how the Sidewinder kit works with the following Hand Augers:

- 2.1** IDDO 3-Inch Hand Auger Kit
- 2.2** IDDO 4-Inch Hand Auger Kit
- 2.3** IDP Prairie Dog Kit

3.0 REFERENCES

- 3.1** 8618-0004 IDDO Hand Auger Kit Operations and Maintenance Manual
- 3.2** 8507-0065 IDP Prairie Dog Drill Operations and Maintenance Manual

4.0 DEFINITIONS

- 4.1** Drill String – The downhole drill assembly which includes the core barrel and extensions
- 4.2** IDDO – Ice Drilling Design and Operations, predecessor to IDP
- 4.3** IDP – NSF Ice Drilling Program
- 4.4** Operator – Any person involved in the assembly and use of the drills or equipment described in this document.
- 4.5** QAS – Quality and Safety Group
- 4.6** SSEC – University of Wisconsin-Space Science & Engineering Center

5.0 RESPONSIBILITIES

- 5.1** IDP Management is responsible for ensuring that operators of the Sidewinder are provided with accurate, up-to-date operating procedures. IDP also maintains and issues the Sidewinder kits for use by science groups.
- 5.2** IDP Engineering is responsible for the creation and updating of this manual.
- 5.3** Sidewinder Kit Operators are responsible for ensuring these procedures are followed and heeding any safety warnings contained herein.
- 5.4** SSEC QAS is responsible for ensuring that the proper procedures of document creation, review, approval, maintenance, and updating are followed.

6.0 OPERATOR'S MANUAL

6.1 Safety – Only personnel who have read this manual and the relevant referenced manuals in their entirety should operate the Sidewinder system. All operators should read and understand the following safety precautions.

6.1.1 Situational Safety

The Sidewinder system can be operated by one person, but it is required that two people are always present during operations.

6.1.2 Sidewinder Drill Safety

- Operators will stay alert, watch what they are doing, and use common sense when operating a power tool. They will not use a power tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.
- Keep proper footing and balance at all times. Only operate the drill from a stable and secure surface.
- Use the auxiliary handle for proper control of the drill.
- The Sidewinder drill can output a significant amount of torque that is only held in check by the operator. If the cutter head suddenly binds downhole, the drill will jerk on the surface. Operators will always maintain proper arm and wrist alignment while operating the drill so they can safely and securely brace against any potential jerks.
- Do not overreach. Do not operate the drill above shoulder level. It is difficult to brace the drill in this position, which puts the operator at risk of a head injury.

6.1.3 Personal Protective Equipment (PPE)

Workers shall wear appropriate hand and eye protection during drilling operations.

6.1.4 Mechanical Safety

- Pinch Points – There are several areas on the equipment where a finger, hand, arm, or clothing could be pinched. Operators should identify all pinch points prior to operation and should be mindful of all such points during operation. Pinch points include the cutter head, extension connections, winch cradle, and power drill.
- Rotating Components – Sheaves, barrels, drills, ropes, and drums may be rotating and exposed to the operator on the surface. Keep hands, limbs, loose clothing, and hair away from any rotating components during operations.
- Cold Hazard – Metal components may be extremely cold after being in the borehole. Always wear appropriate gloves when handling.

- Slippery Surfaces – Rig footing and surrounding ice may become slippery when covered with ice chips or meltwater. Use caution whenever walking around the operational area.

6.1.5 Chemical Safety

Use care and observe all safety warnings when handling Propylene Glycol and/or other chemicals.

6.1.6 Environmental Safety

Cold – This system is often deployed to extremely cold climates. Operators shall wear outerwear suitable to protect themselves from the cold and should monitor their own and fellow workers' activities for overexposure to cold.

6.2 Introduction

The Sidewinder is a battery powered accessory designed to enhance the use and performance of the IDDO Hand Augers and Prairie Dog.

6.2.1 How does a Sidewinder work? The Sidewinder kit provides power for rotating as well as lifting and lowering the drill string, greatly decreasing effort and time for collecting ice cores. It is powered by a hand-held cordless drill. Lifting is enabled by a rope on a spool that is attached to the Sidewinder drill. During lifting and lowering of the drill string, the Sidewinder sits in a cradle. During drilling, the Sidewinder connects to the drill string.

6.2.2 What is the time advantage? The Sidewinder kit allows one person to drill about 20 meters with a hand coring kit in approximately six hours, including setup and teardown.

6.2.3 What extra equipment other than the Sidewinder is needed? Most of the Sidewinder kit ships in an aluminum Zarges case. Batteries may be shipped separately depending on hazardous cargo restrictions. To recharge batteries, a standard 120VAC power supply is required. If standard U.S. power is not available, an international transformer can be supplied by IDP for battery charging. A popup windscreen can also be requested to provide shelter for drilling and core processing. Both the IDDO 3-Inch and 4-Inch Hand Auger systems can be used with the Sidewinder.

6.2.4 How much does everything weigh? The Sidewinder adds about 75 pounds to a Hand Auger ice coring system.

6.3 Inspection – Before leaving for the field, inspect the Sidewinder to make sure all the parts, tools, and spares are present and in good condition. An inventory checklist (see section 8.6) will be included in the kit to assist you in this inspection.

6.3.1 It is also a good idea to assemble the drill to familiarize yourself with the assembly and function of all components, Figure 1.

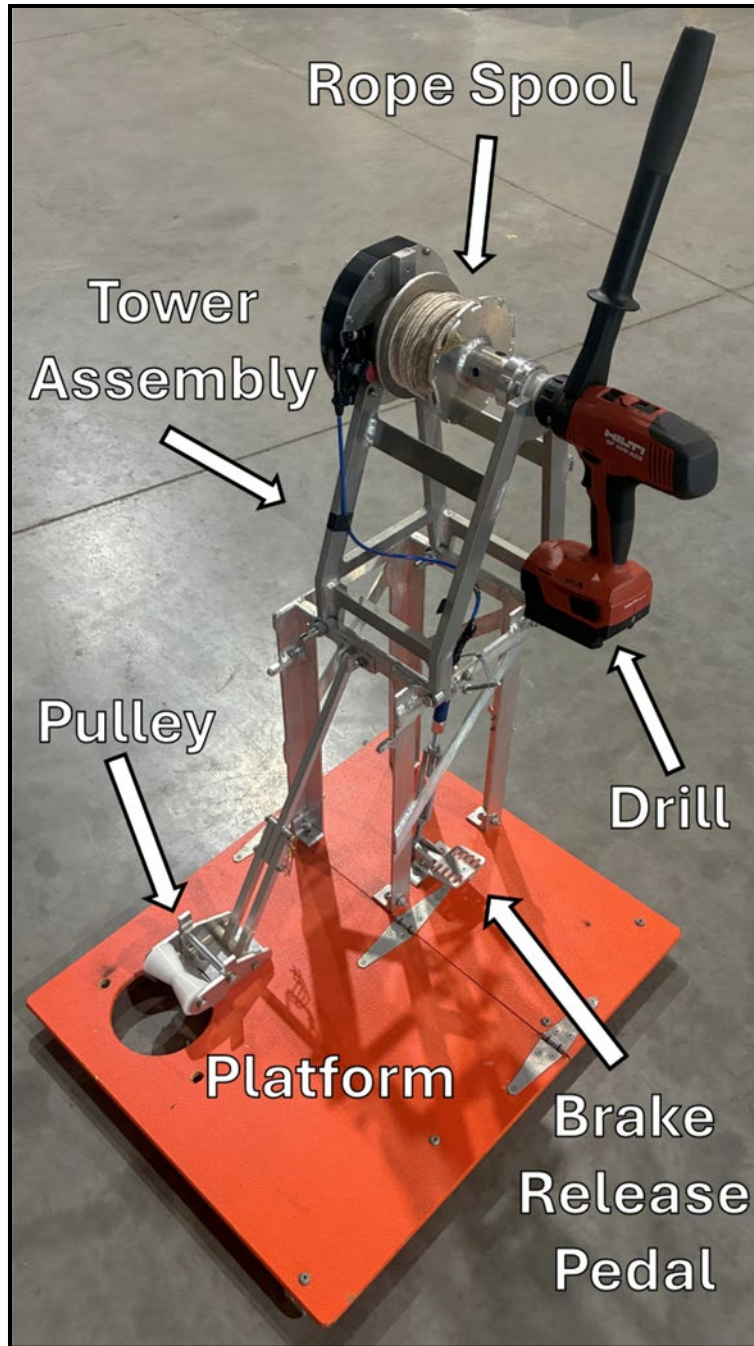


Figure 1: Sidewinder Assembly

6.4 Assembly

- 6.4.1 Unpacking - Open the Zarges case containing the Sidewinder kit and remove the Sidewinder drill, tower, batteries, chargers, and spare parts kit, Figure 2.



Figure 2: Sidewinder kit as packed for shipping. Sidewinder drill pictured on the left next to the tower assembly on the right.

- 6.4.2 Sidewinder Handle Installation - Rotate the black handle on the drill until it is 180° opposite the regular grip. Slide the black handle clamp over the indexed section of the drill body, then twist the black handle clockwise to tighten it on the drill body, Figure 3.



Figure 3: Installing the Sidewinder handle circled in red.

- 6.4.3 Platform Assembly - Pull the Sidewinder tower out of the Zarges and set it on its narrow end. Remove the two cotter pins from their holes and clip them onto the golden gated clevis pin, Figure 4.



Figure 4: Remove two large cotter pins to unfold the tower platform.

- 6.4.4 Tower Assembly - Fold the wide end of the platform down. The aluminum struts between the lower pulley and tower will align. Install the golden gated clevis through the holes in all three struts to lock the strut in place, Figure 5.



Figure 5: Install the golden clevis pin through all three tower struts to lock the platform in place.

- 6.4.5 Tower Cradle Assembly - Retract the two spring pins on the tower. Undo the latch holding the tower sections together and pivot the tower section into the upright position. Turn the t-handle on each spring pin so that it aligns with the slots, which frees the spring pins to lock the tower upright. Ensure both spring pins are fully seated, with the t-handles at the bottom of their slots, Figure 6.



Figure 6: Hinge the upper tower section into place and secure in place with the t-handle detent pins.

- 6.4.6 Rope Adapter Assembly - Using the two supplied wrenches, unthread the rope attach adapter bolt and connect the rope attach adapter to the core barrel coupler, Figure 7. Tighten the bolt gently. The nut should barely be touching the aluminum tube.

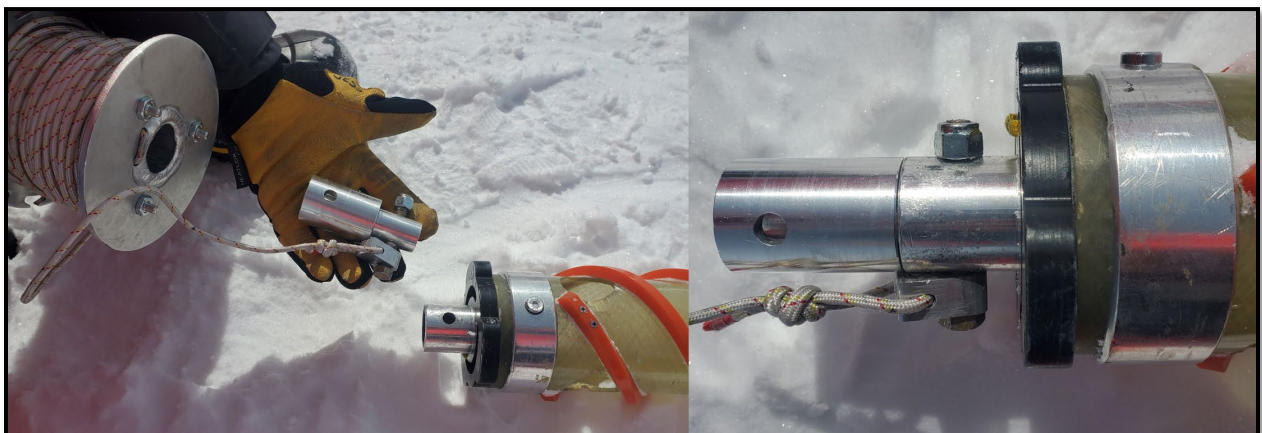


Figure 7: The rope adapter connects the lifting rope to the drill string.

6.5 Operations

Detailed videos showing operation of the Sidewinder Drill can be found at the NSF Ice Drilling Program YouTube Channel (@NSF_IceDrilling).

- 6.5.1 Drill Site Preparation – Lay the Sidewinder platform on a level area of firm. If the surface layer is loose, it may be best to dig down to a denser layer for a more stable work surface.
- 6.5.2 Windscreen – Operation of the Sidewinder can be greatly aided by setting up a windbreak. This will help prevent blowing snow from infiltrating downhole and will shield coring equipment from solar gain which can cause refreezing issues downhole.
- 6.5.3 First Coring Run – Start the borehole by hand using the t-handle and 1 m barrel supplied with the IDDO Hand Auger Kit. It can be helpful to have a second set of eyes to ensure the Hand Auger is as plumb as possible, so a vertical borehole is cored.
- 6.5.4 Coring with the Sidewinder – After the borehole has reached a depth of 1 m, the Sidewinder can be used to spin the drill.
 1. Install a battery into the drill and power the battery on with a single press of the “on” button, Figure 8. Ensure drill is configured to spin “forward” and that the drill is in low gear (2 on both gearbox selectors) and set to “Drill” on the clutch.



Figure 8: Sidewinder Power Button and Drill Setup

2. Lower the drill string by hand to the bottom of the borehole, ensuring the pulley on the Sidewinder base has been flipped out of the way.
3. Install the Sidewinder drill on the end of the drill string by sleeving the spool over the extension coupler. Pin the spool to the extension using the standard quick pins supplied with the Hand Auger kit.
4. Wrap off extra rope using the cleats around the periphery of the spool.
5. Engage the drill with the spool by sliding the collar away from the spool, Figure 9. The collar will detent into a locked position when it is fully engaged.

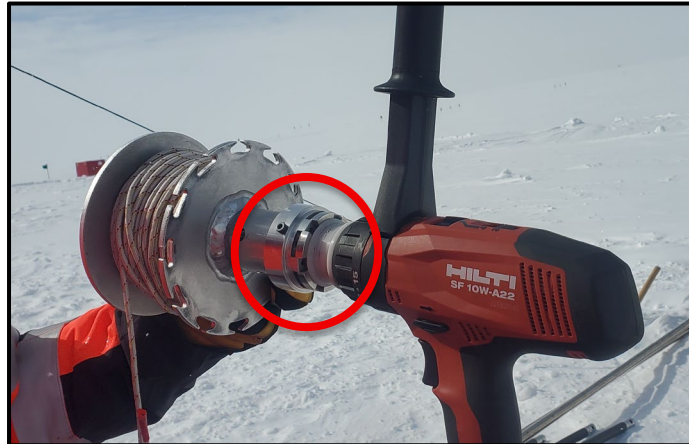


Figure 9: Sidewinder drill collar circled in red.

6. Place one hand on each side of the Sidewinder drill and squeeze the drill trigger to begin coring, Figure 10. Continue coring until the core barrel is full, taking care not to over drill as this can transport chips on top of the core barrel causing the drill to become stuck. At shallow depths, it can help to look at the top of the drill while coring to ensure this does not happen.



Figure 10: Sidewinder Drill connected to the end of the drill string for coring operations.

6.5.5 Core Break – To avoid damage to the Sidewinder drill, core break should be done using the t-handle provided with the IDDO Hand Auger kit.

1. Uncleat the rope from the spool and disengage the winder collar by sliding it toward the spool. This will allow rope to payout as the Sidewinder drill is moved over to the tower cradle.

Remove the extension pin and lift the Sidewinder off the end of the drill string. Install the Sidewinder into the tower cradle by aligning the spool pins with the tower cradle tabs, Figures 11 and 12.

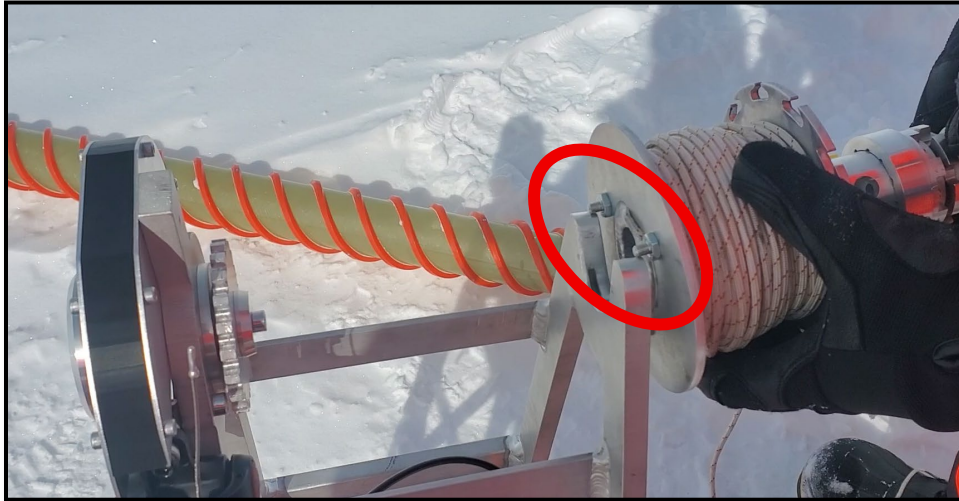


Figure 11: Align the spool pins circled above with the tower cradle tabs to install the Sidewinder into the tower.

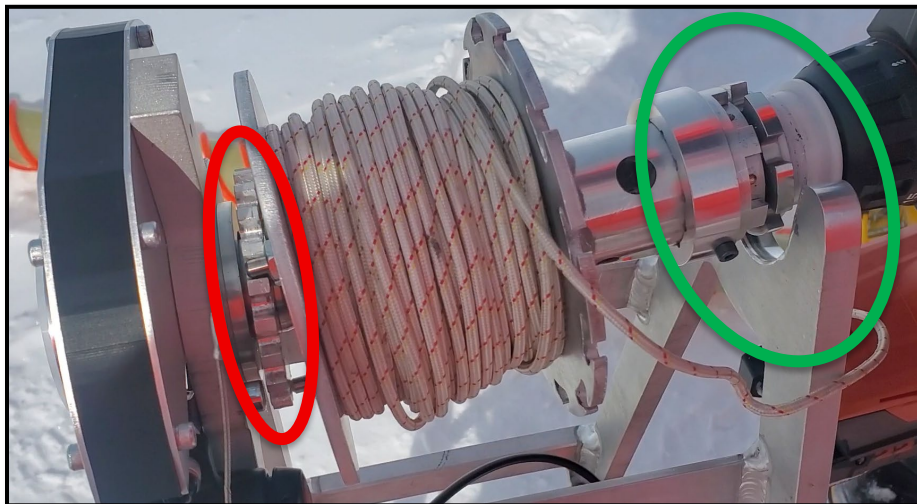


Figure 12: When properly aligned, the spool pins will mate up with the tower telephone dial (circled in red) so that the Sidewinder can then drop into the tower cradle (circled in green).

3. Install the t-handle on the end of the drill string and secure it with an extension pin. Quickly lift the drill string to engage the core dogs and break the core.

6.5.6 Lifting the Drill String

1. Remove the t-handle from the top of the drill string.
2. Once the Sidewinder drill is installed in the tower cradle, engage the collar by sliding it away from the spool.
3. Flip the pulley down and verify the rope is routed over the top of the spool and pulley, Figure 13.



Figure 13: Verify the Sidewinder rope is properly routed, and the pulley is flipped down as shown above before lifting the drill string.

2. Lift the drill string by powering the Sidewinder drill clockwise. If possible, a second operator should gently lift the drill string when starting to help free the core barrel from the chips at the borehole bottom. This second operator can also mind the extensions as the drill string is lifted to prevent the extension pins from catching on either the pulley or platform as the drill string is raised. **NOTE:** If an extension pin becomes caught, it is possible for it to accidentally unclip and fall downhole!
3. Incrementally remove extensions as the drill string is raised. Stop winching up when the core barrel approaches the orange platform.

6.5.7 Removing the core barrel from the borehole

1. Flip the pulley up and out of the way.
2. To remove the core barrel, grab the extension above the core barrel and support the weight of the core barrel. Once you're holding the weight, disengage the collar and step on the brake release pedal to pay out spare rope, then lift the core barrel out of the borehole and lay it down to begin core processing, Figure 14.



Figure 14: Lifting the core barrel out of the borehole. Operator should disengage the collar and step on the brake release pedal (circled in red) to pay out spare rope to ease extraction of the core barrel.

6.5.8 Extracting Core

1. Ice core extraction is performed the same as with the standard IDDO Hand Auger Kit. Remove the barrel coupler and pull the chip catcher out of the top of the core barrel to remove ice cuttings. Next, push the core out of the top of the core barrel using a core push rod. **NOTE:** Take care not to ding cutters or core dogs with the push rod so they remain sharp.
2. After the core is removed, reinstall the chip catcher and then the barrel coupler to reset the core barrel for the next coring run.
3. It is good practice to check that all three core dogs spring freely and to inspect the cutter head for any ice around the shoes before lowering the drill back downhole.

6.5.9 Lowering the Drill String

1. With the Sidewinder still installed in the tower cradle, lift the core barrel vertically and lower it into the borehole. Flip the pulley down and verify the rope is routed correctly before transferring the core barrel load onto the Sidewinder.
2. Disengage the collar, then step on the brake release pedal to carefully lower the drill. Centralize the extensions by hand as necessary to prevent interference between the drill string and the platform/pulley.

6.5.10 Adding Extensions

1. Incrementally add extensions as the drill string is lowered by installing them on the top of the drill string. The most critical detail is to install the quick pin in the proper orientation. Install the pin so any contact between the borehole and the pin gate during coring operations will not unlatch the pin, Figure 15.

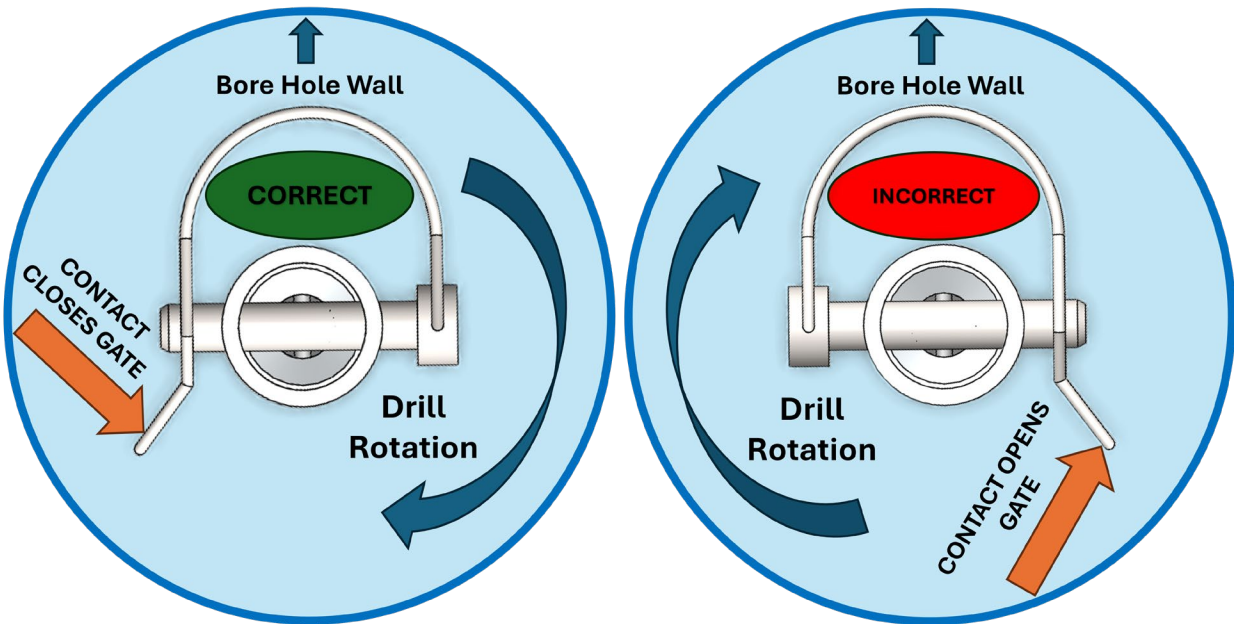


Figure 15: Looking down the borehole, proper orientation of the quick pin.

6.6 Disassembly

- 6.6.1 To pack up the Sidewinder system, reverse the assembly instructions in section 6.4 Assembly.
- 6.6.2 It is critical to fully dry out the equipment and shipping case in a heated space before returning the equipment to IDP.
- 6.6.3 Repack all Hand Auger parts into the appropriate bags.
- 6.6.4 Repack all Sidewinder parts into the Zarges case.

7.0 APPENDIX A: FIELD TROUBLESHOOTING

- 7.1 Loss of drill power – If the Sidewinder drill is not powering, review the battery charge and drill settings, Figure 16.

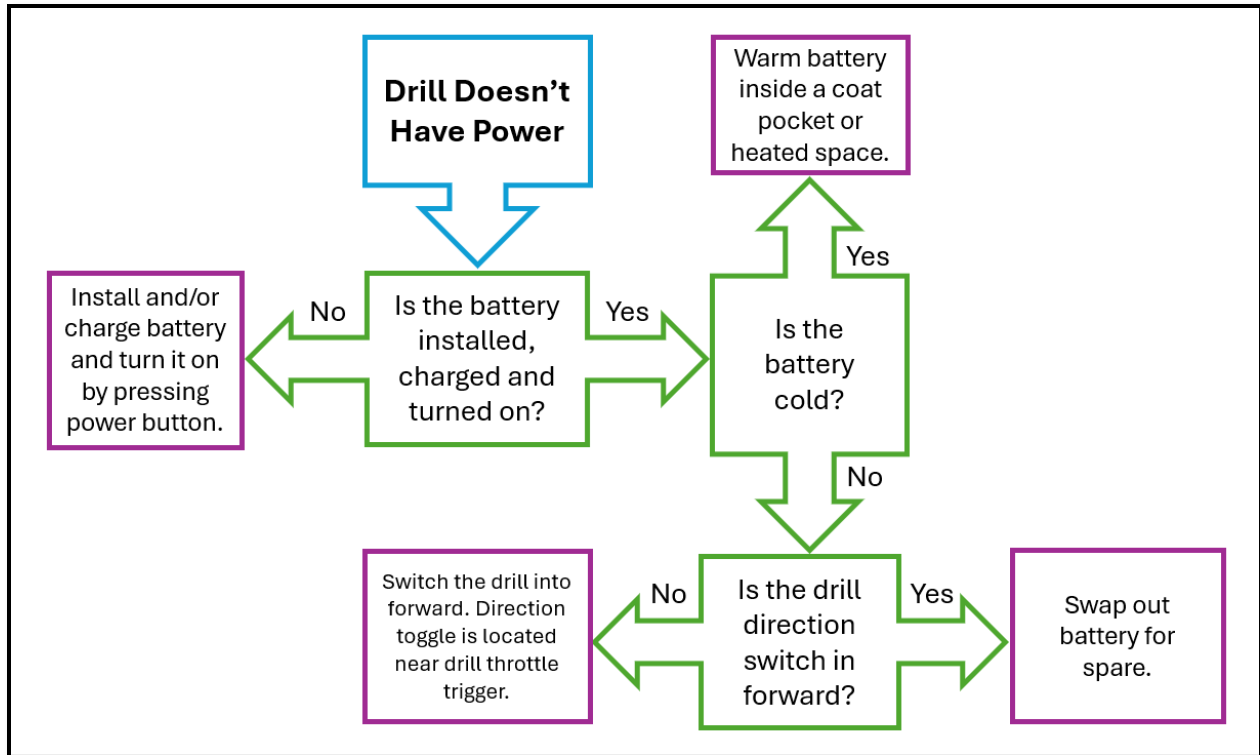


Figure 16: Troubleshooting loss of drill power.

7.2 Loss of braking power

- 7.2.1 If the brake is not adequately slowing and stopping the drill string, first take all weight off the rope by either resting the drill string on the borehole bottom or on the surface.
- 7.2.2 Remove tension from the brake by stepping on the brake release pedal, then unthread the brass bolt that holds the cable one turn, Figure 17. Release the pedal and test. Repeat as needed to obtain needed brake force.



Figure 17: Brake adjustment screw circled in red.

- 7.3 Loss of drill penetration
 - 7.3.1 See Operations and Maintenance Manual for the specific Hand Auger.
- 7.4 Items dropped in borehole
 - 7.4.1 See Operations and Maintenance Manual for the specific Hand Auger.

8.0 APPENDIX B: SIDEWINDER PRESEASON CHECKLIST

- 8.1 Upon arrival of any parts in Madison, IDP will:
 - 8.1.1 Clean, test, and store all components. Any parts that are out of spec or broken will be removed from the general inventory until they are repaired or replaced.
- 8.2 Prior to any parts leaving Madison, IDP staff will:
 - 8.2.1 Pack the kit per the PI’s field request.
 - 8.2.2 Fill out a Fit Checklist (8.5) and Inventory Checklist (8.6), including a paper copy in the kit.
 - 8.2.3 If sending parts that have not been field-tested, proven backup methods will be included as well.
- 8.3 Upon arrival of any parts in the field, field personnel will:
 - 8.3.1 Verify that all components arrived undamaged.
- 8.4 Prior to any parts leaving the field, field personnel will:
 - 8.4.1 Clean and dry all components as best as possible.
 - 8.4.2 Use the Inventory Checklist (8.6) to verify that the correct components are being returned.

8.5 Fit Checklist

Season:		Sidewinder ID # _____
User:		Where Used:
Content:		
Done?	Task	
	Fit spool to all extensions	
	Fit Sidewinder to tower cradle and “telephone dial”	
	Fit rope attach adapter to barrel adapter	
	Fit rope attach adapter to all extensions	
	Test foot pedal brake functionality	
	Fully charge batteries	
	Test Sidewinder drill functionality	
	Inspect rope and swivel for damage	
	Inspect tower detent pins for wear and test functionality	
	Inspect tower one-way bearing for wear and test functionality	
	Inspect Sidewinder collar for wear and test functionality	
	Verify dowel pins on all IDDO Hand Auger extensions to be supplied with the Sidewinder kit are ground flush	

8.6 Inventory Checklist

Season:		Sidewinder ID # _____		
User:		Where Used:		
Contents of the Short Bag:				
	Item	Standard Qty	Qty Packed	Notes
1	Zarges case	1 Each		
2	Tower assembly	1 Each		
3	Sidewinder drill	1 Each		
4	Sidewinder drill handle	1 Each		Already installed on drill
5	Hilti battery chargers	3 Each		
6	Hilti batteries	3 Each		
7	Battery adapter	1 Each		Already installed on drill
8	Rope adapter & hardware	1 Each		
9	Sidewinder manual	1 Each		
10	International transformer	1 Each		
11	Plano case	1 Each		
Contents of the Plano Case:				
12	9/16" Wrench	2 Each		
13	Brake pad	2 Each		
14	Brake spring	1 Each		
15	Hairpin cotter pin, large	2 Each		
16	Gold wire retainer clevis pin	1 Each		
17	Drill side bushing	1 Each		
18	Tower clevis pin	1 Each		
19	Cotter pin, medium	2 Each		
20	Cotter pin, small	3 Each		
21	BHCAP Screws 5/16-18 x 1"	3 Each		
22	BHCAP Screws 1/4-20 x 1"	2 Each		
23	3/8" Flat washer	2 Each		
24	3/8" Nylock nut	2 Each		
25	5/16-18 Nylock nut	2 Each		
26	1/4-20 Nylock nut	2 Each		
27	SHCAP Screws 8-32 x 5/8"	3 Each		
28	SHCAP Screws 8-32 x 3/8"	3 Each		
29	SHCAP Screws M4 x 10mm	2 Each		