PL1 User Guide

Foreword

Congratulations on your purchase of a new Zoa PL1 portable rope tow system.

This document is designed to acquaint the owner/operator with this system, and its various controls, maintenance and safe use instructions.

Make sure you read and understand the content of this guide.

If you have any question regarding any topic whether or not it is covered in this User's Guide, please contact Zoa Engineering by e-mail at *rbutton@zoaeng.com* and we will be happy to assist you.

Disclaimer:

The Zoa PL1 portable rope tow is intended for use by experienced skiers and snowboarders. Users assume all risks and liabilities associated with the use of this product, including but not limited to the inherent risks of skiing and snowboarding. Skiing and snowboarding are inherently dangerous activities, and users should be aware of the risks and take appropriate precautions, including using appropriate safety equipment, such as helmets, avalanche transceivers, shovels, and probes and obtaining appropriate training and education in backcountry skiing and snowboarding. The manufacturer is not responsible for any injuries, damages, or accidents that may occur as a result of the use or misuse of the PL1 system. It is the user's responsibility to inspect the system for any defects or damage before each use and to follow all instructions for proper use and maintenance. In addition, the use of the rope tow may be subject to local regulations and restrictions, and users should ensure that they are in compliance with all applicable laws and regulations.

This guide uses the following safety alert symbol in conjunction with signal words to indicate a potential personal injury hazard.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE Indicates an instruction which, if not followed, could severely damage device components or other property.

NOTE: Indicates supplementary information needed to fully complete an instruction.

Although the mere reading of such information does not eliminate the hazard, the understanding and application of the information will promote the correct use of the device.

The information and components/system descriptions contained in this guide are correct at time of publication. Zoa Engineering, however maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

Because of its ongoing commitment to product quality and innovation, Zoa Engineering reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

The illustrations in this document show the typical construction of the different assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts shown, however, they represent parts which have the same or a similar function.

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Parts

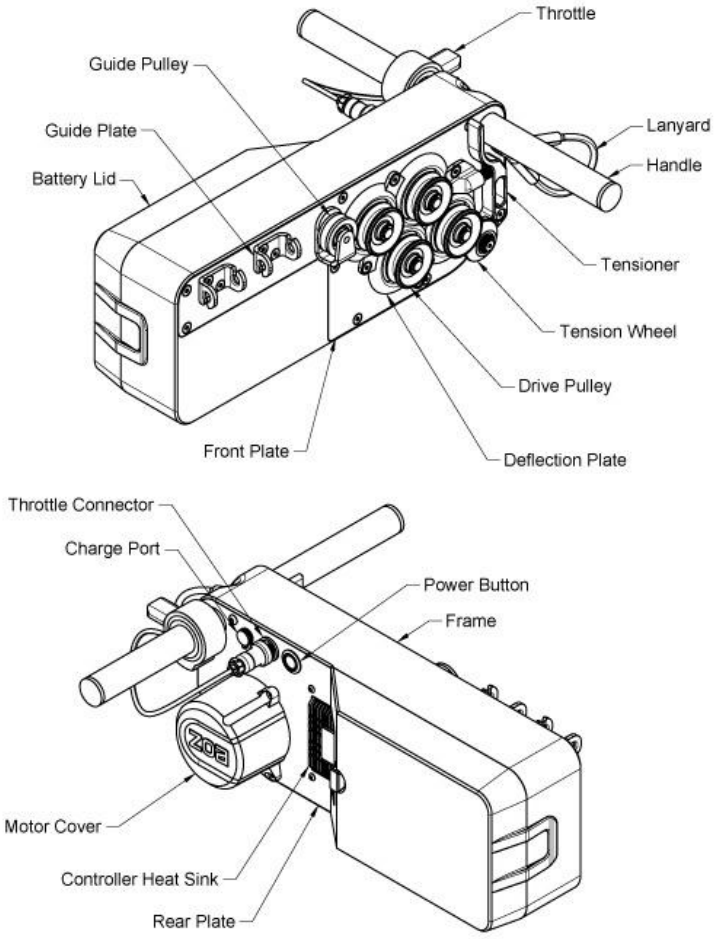

Figure 1.

This section is a brief overview of some of the parts of the PL1 portable rope tow including other Zoa Engineering accesories.

- PL1 Portable Rope Tow Device:
  - Handle
  - Throttle
  - Lanyard
  - Tensioner
  - Tensioner wheel
  - Drive Pulley
  - Deflection Plate
  - Front Plate
  - Guide Pulley
  - Guide plate
  - Battery Lid
  - Throttle Connector
  - Charge Port
  - Power Button
  - Frame
  - Motor Cover
  - Controller Heat Sink
  - Rear Plate
- Battery charger
- Snow Picket
- Rope Bag
  - Rope bag frame
- 550 Paracord

Setup

Inspection

NOTICE:
It is important to do a thorough inspection of all equipment before using the PL1.
Use of the device and exposure to the elements will wear and damage rope over time.
Check your rope for wear while flaking it out and back into your rope bag. A damaged rope is more likely to break unexpectedly.
Be sure to charge the batteries of the PL1. Refer to the maintenance section of this manual for charging instructions.

Packing

Rope Bag

The PL1 complete package includes a rope bag, a rope bag frame, and a 1000’ spool of paracord. The frame is made of stainless steel rod and is used to keep the rope bag open and hang it from somewhere convenient like a belt loop or pocket.

You can secure the end of your rope to the bottom of the bag using a small smooth object and a slipknot as shown in figure 2. This allows you to keep your rope with your rope bag at all times, and makes it much easier to spot the end of the rope at the bottom or your run.

Figure 2.

You can flake the rope directly from the spool to your rope bag. Refer to the clean up section of this guide for instruction on flaking the rope into your rope bag.

Packing in your bag

Push the spring button on the handle to slide the handle in and out of the PL1 for storage. If you're having trouble removing the handle, you may need to depress the button a little further using something small like a key or screwdriver.

Avoid over-handling the rope bag, as it may introduce tangles and make lay out more difficult.

Route Planning

Route selection can make a big difference in your day when you're backcountry skiing or snowboarding. The same follows when you're selecting where to anchor and lay out your line with the PL1.

Many of the concerns and misunderstandings we see regarding the PL1 can be addressed with a proper understanding of how you can set up your route and how using the PL1 differs from a traditional rope tow system.

Remembering a few principles will help you plan your route and make the most of your day:

WARNING

Do not set up your line anywhere where a fall could put you or others at risk.
Consider avalanche risk whenever you are deciding where to ski and set up your line.
Avalanche risk considerations should always be prioritised over route efficiency

CAUTION

Try to avoid allowing your rope to wrap around trees, rocks, or other objects that could damage the rope as it stretches across it.
Avoid setting up in high traffic areas.

NOTE:

The PL1 is most efficient pulling skiers up slopes between 10-20°. Staying on 10-20° slopes will typically help you get the most runs out of your battery, but the PL1 is not limited to these slopes. Losing a bit of your battery life by opting for a 25° slope over a 15° slope may mean losing less than a full run worth of vertical. If a slightly steeper slope is a more direct approach it may even be more efficient at the end of the day.
Micro-terrain needs to be considered. It is rare to find a consistent slope in nature and we know that what might show up as a 5° slope on your GPS can be much more challenging if it's full of boulders and micro-terrain. The efficiency of the PL1 is not linear with regard to slope and load. It will sharply decline as it gets close to stall conditions. This means that small 45+° features on a generally moderate slope could have an outsized effect on your battery life and the PL1's performance in general.
It helps, but you don't need to go in a straight line. Keeping the taught rope inline with your skis or board is usually more efficient, but when dealing with obstacles or steep micro-terrain it's often a good idea to simply ski around it. Cutting across a slope can reduce the load on the PL1 and improve efficiency, but only if the rope is anchored across that slope, otherwise you are actually increasing the load.
You can use multiple sections of rope. It is often a good idea to use two or more short sections of rope instead of one long one. This can really help you take advantage of the principles we've already laid out, and put together an efficient route up the hill.
Be considerate of others. Cutting across a slope may be more efficient, but it may also be cutting across another skier's run, and they might not want to ski across your rope. Respecting everyone on the mountain should always take priority over setting a more efficient route.
Consider Avalanche Risks. When using the PL1 in the backcountry all the usual avalanche risks are present. The same safety considerations and decision making apply. It should be noted: whenever you are increasing the amount of skiing or riding you do in avalanche terrain, you will inherently be increasing your risk.

Consider the following examples:

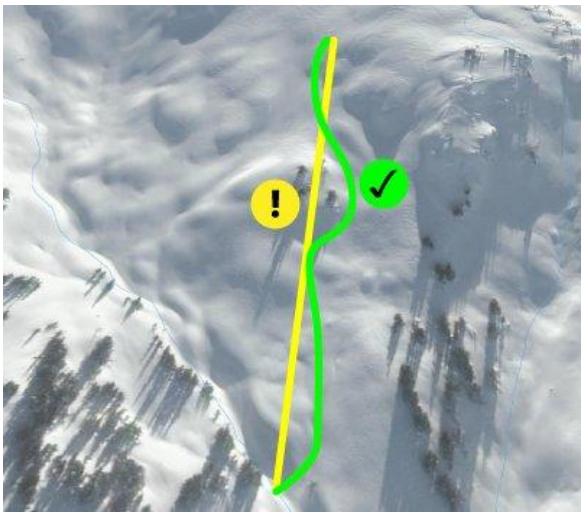

Figure 3. Moving straight towards your anchor is most efficient on smooth moderate slopes, but straying off-course can be more efficient when avoiding obstacles and steep micro-terrain.

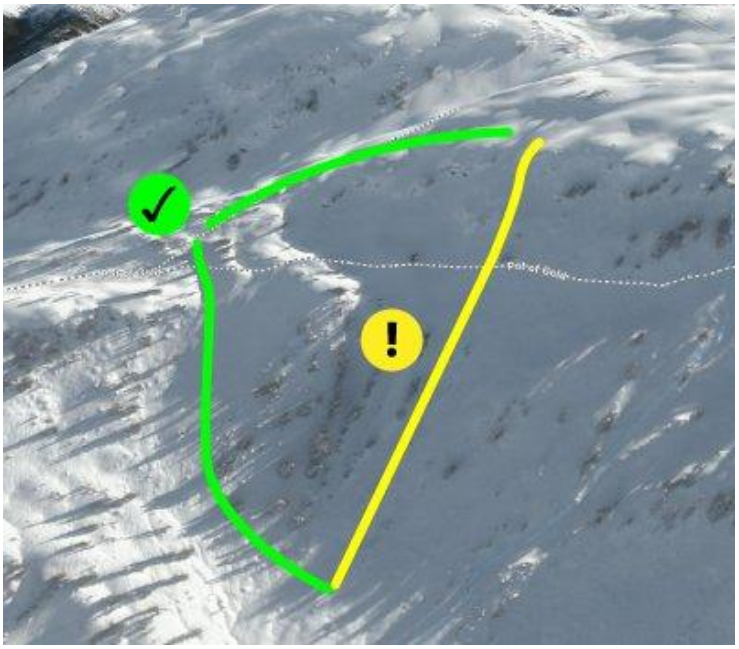

Figure 4. Rather than tackle a steep face directly, using two lines and anchors here allows the PL1 to pull the user up a more efficient slop

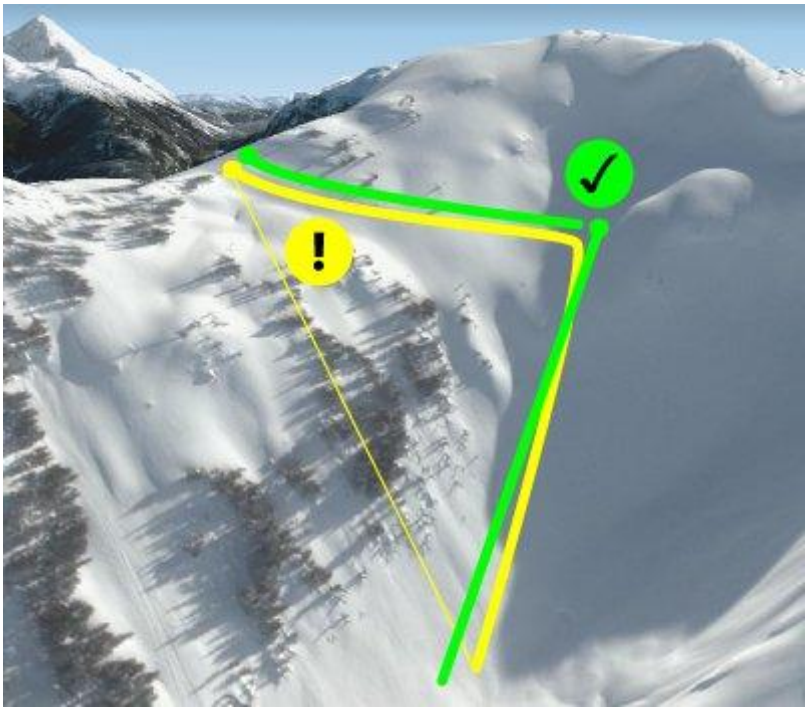

Figure 5. Cutting across the slope will have no benefit, and will actually reduce efficiency if you are cutting away from the anchor point.

Anchoring

We have provided a custom designed snow picket and a webbing loop that can be fit through the slots for your convenience, but you have many more options for anchoring.

When skiing in sub-alpine terrain you can tie your line to a tree where it is convenient. Various options exist in alpine terrain or where using a tree is less convenient. Our preference is to use the snow picket in a deadman configuration, as it is fast to set up and can generally carry the most load in the widest variety of snow conditions.

To use the snow picket in a deadman configuration:

1. Use the picket or a shovel to score a horizontal line in the snow exactly perpendicular to the direction of pull and slightly longer than the length of the snow picket.
2. Cut out a slot using the scored line as a guide. 30cm is the minimum depth in firm, consolidated snow. In softer conditions you may need to dig deeper to find more consolidated snow.
3. Cut a narrow slot in the direction of pull from the center of the snow picket.
4. Make sure the rope is tight before burying the anchor and packing it down.
5. Give the rope a good tug to ensure that the anchor is safely in place before laying out the rope.

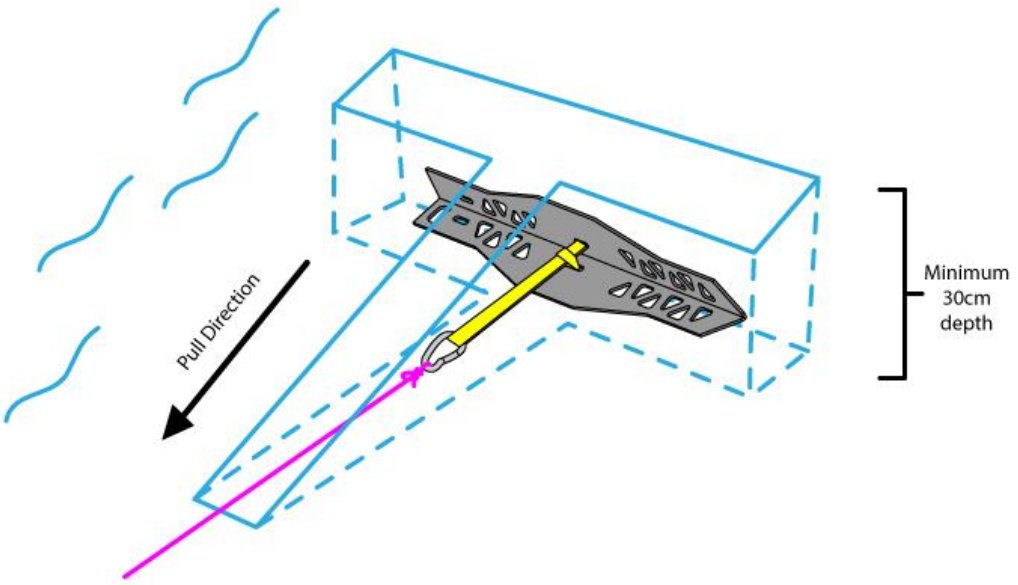

Figure 6. Example of a T-slot anchor using the Picket

We recommend clearly marking your anchor point by using branches, or poles to warn other skiers in the area of a potential tripping hazard. Usually, the area closest to the anchor point poses the greatest threat of being a tripping hazard or nuisance to other skiers in the area.

Note: Ensure that the rope is exiting the rope bag without passing through the drawstring at the top of the bag.

Laying out the line

We recommend laying out the line from your anchor point, but it is possible to lay out the line during your ascent. To do this, you will need to flake out the rope as you ascend the slope.

We would recommend tying something at the end of the rope to increase visibility. We do not recommend anchoring the bottom of the rope as it could be a potential tripping hazard for you or others on the hill.

To lay out the line from your anchor point:

- Loosen the top of the rope bag slightly to allow any minor tangles to pass through
- Hold the top of the bag in one hand and guide the rope exiting the bag in the other
- Slowly ski down the slope allowing the rope to be pulled from the rope bag
- Ensure that there are no knots or tangles along the line after you have laid it out

Harness Setup

We recommend using a climbing harness with the PL1. The use of a harness greatly reduces the burden on the user's arms. We recommend using a quick release connector to attach the PL1 by the lanyard to your harness.

WARNING
Follow the instructions provided with your harness for proper fitting and use.

Figure 7. An example of a climbing harness and quick release connector

Using the PL1

Attaching the Rope

When you are ready to ascend your rope you will first need to attach the PL1 by feeding the rope through the guides and pulleys on the device at any point along the rope. It is important to feed the rope into the device correctly.

WARNING

The pulleys of the PL1 are a pinching hazard.
Keep loose hair and clothing away from the pulleys when using the PL1 or attaching the rope

CAUTION

Always power off the device before attaching or detaching rope from the pulleys.

Thread the rope through the guides and around the pulleys as shown below:

Give the rope a tug to feed it past the tension wheel.

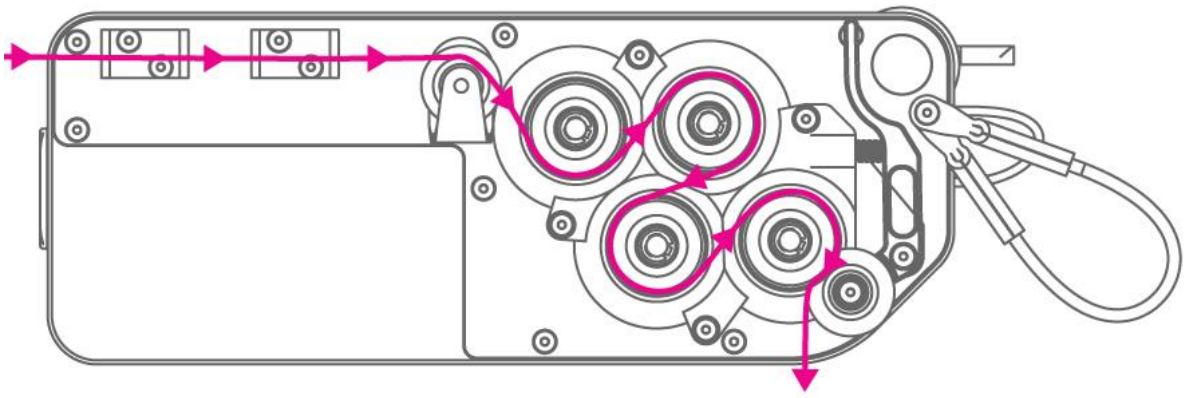

Figure 8. Correct rope installation

NOTE:
It's possible that the rope might become jammed in between the pulleys and the device. This might occur due to a sudden change in throttle pressure or speed. In the scenario that the rope is jammed, turn off the power to the device using the power button, press forward at the

top of the tensioner bar to release the tensioner pulley. If the rope remains jammed manually unwind the rope from the guides and pulleys.

Operating the PL1

- Connect the handle and throttle to the PL1. Slide the throttle plug into the receptacle on the PL1 and screw it in place to secure it
- Press the power button to turn on the PL1. The button will illuminate when the PL1 is on
- Depress the throttle to start pulling. Note that the throttle will not respond in the first 5 seconds after powering on the PL1
- As you initially pull on the throttle you can expect a significant amount of rope to pile up at your feet as the rope pulls out any slack and stretches over its length.

NOTE: On skis you should keep your feet wide and allow the rope to kick out between your legs to avoid any rope catching on your skis or boots and being dragged up the hill with you.

- Using a climbing/mountaineering harness with the PL1 is recommended, especially for longer or steeper ascents. Simply use a carabiner to attach your harness to the lanyard of the PL1
- When you release the throttle with the rope under tension the rope will relax and run through the PL1 in reverse. When this happens the rope will ride out from under the tension wheel and may end up caught between the deflection plate and the final drive pulley. Tug on the rope to free it and reseat it back under the tension wheel before starting up again.

NOTICE: **Failing to do this is likely to result in either a jam or a rope failure**

- Tug on the rope to remove it from the PL1 after you reach the top of your run

CAUTION

Unplugging the throttle before turning off the PL1 may cause the PL1 to start running. If this occurs, power off the PL1 immediately.

Clean up

When travelling in backcountry terrain we believe in leaving no trace. Please clean up your rope and anchors when you are done using them for the day.

1. Remove your anchor at the top of the line
2. Thread the frame through the top of the rope bag so that the rope bag will remain open

Figure 9. Place drawstring over frame hook and wrap opening over frame as shown before tightening drawstring

3. Hang the rope bag somewhere accessible (we like to hang it off a hip using a belt loop or pocket)

Figure 10. Flake rope into bag using the PL1 as shown, compressing rope when necessary

4. Attach the PL1 to the rope at the rope bag
5. Drive the rope into the rope bag
    a. Stop to compress the rope in the bag as necessary

Charging & Storage

Charging

The PL1 can be charged using the provided power supply. There is an LED indicator on the power supply. The indicator will change from red to green when the battery is fully charged. Unplug the power supply once the battery is fully charged. Do not leave the battery to charge unsupervised

Storage

Store your PL1 and rope somewhere dry and away from elevated temperatures.
Do not leave the power supply plugged in for storage.

Troubleshooting

This section will cover issues that may occur and how to assess and remedy those issues.

Rope Slipping

The rope begins to slip on the pulleys under load. This is typically due to insufficient pressure on the rope at the tension wheel, but may also be due to worn drive pulleys or tension wheels.

1. Check that your rope is in good condition and is properly wound through the pulleys. *Refer to figure 7 on page 11 or the warning label on your PL1*
2. Increase pressure applied by the tension wheel by tightening the set screw on the tensioner arm
3. If slipping persists consider swapping out the pulley or tension wheel

Wrapping & Tangling

The rope is wrapping around the final pulley and binding. This is most commonly caused by the rope coming off the pulley after a sudden stop or release of tension. **Always check that the rope is properly seated before applying the throttle.** Burrs or sharp features on the drive pulley can also prevent the rope from properly ejecting, and lead to this issue.

1. Check that your rope is in good condition and is properly wound through the pulleys. *Refer to figure 7 on page 11 or the warning label on your PL1*
2. Ensure that nothing is in the way of the rope as it is ejected from the tension wheel
3. If the issue persists there are two options to resolve the issue
    a. Remove the tension wheel and then remove the final drive pulley. Use a small file to gently remove any burrs or excessively sharp cavities on the pulley. Reinstall the pulley and tension wheel.

b. Remove the tension wheel and then swap the final drive pulley with another drive pulley. If any of the pulleys are noticeably smoother to the touch, use that one as the final drive pulley. Reinstall the tension wheel.

Premature stalling or overheating

If you feel that the PL1 is beginning to lose power or stall too early in your day, it is likely overheating. The PL1 can pull its highest loads when it is fully charged and all components are at optimum operating temperatures. Operating at higher loads (steeper slopes or heavy/sticky snow) or during warmer weather will result in the PL1 reaching temperature limits more quickly. Both the motor controller and battery will limit power output to prevent damage to components.

1. As the PL1 slows to a crawl it is best to prepare yourself and stop and halt operation.
2. Give the motor controller 2-3 minutes to cool down and then try resuming operation.

Other issues

If your issue has not been resolved by following the above steps, or if you have any other issues with the PL1 please reach out to Zoa Engineering for assistance.