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Descent

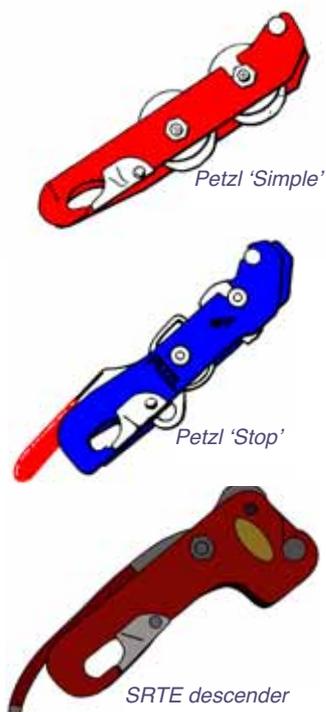


Before the days of mechanical descenders, climbers descended pitches using a classic abseil. It was done by running the rope between their legs, forward across one hip, diagonally across the front of their body and over the opposite shoulder with one hand to control the rope below and one above for balance. Not at all comfortable, safe or used much these days.

A more comfortable classic abseil runs the rope straight across your back with one arm holding above for balance and one arm below with a twist of rope around the wrist. The Shoulder abseil is still a good way to descend slopes without a descender or for use on knotted ropes and tapes. In most cases though, a descender is needed to safely get down a rope.



Descenders – bobbins



All bobbins work on the same principle. Open the descender by rotating a moveable plate (like operating a pair of scissors). Thread the rope under the bottom pulley, through a tight 'S' bend between two pulleys fixed to a plate and exit at the top of the device on the other side. The rear plate has the pulleys bolted to it and an oval hole to attach the bobbin to your seat maillon with a locking karabiner. The front (moveable) plate has a spring loaded gate that allows the bobbin to be opened quickly with no risk of dropping it. Once the top plate is closed again the rope cannot escape. The pulleys are made of either aluminium or stainless steel.

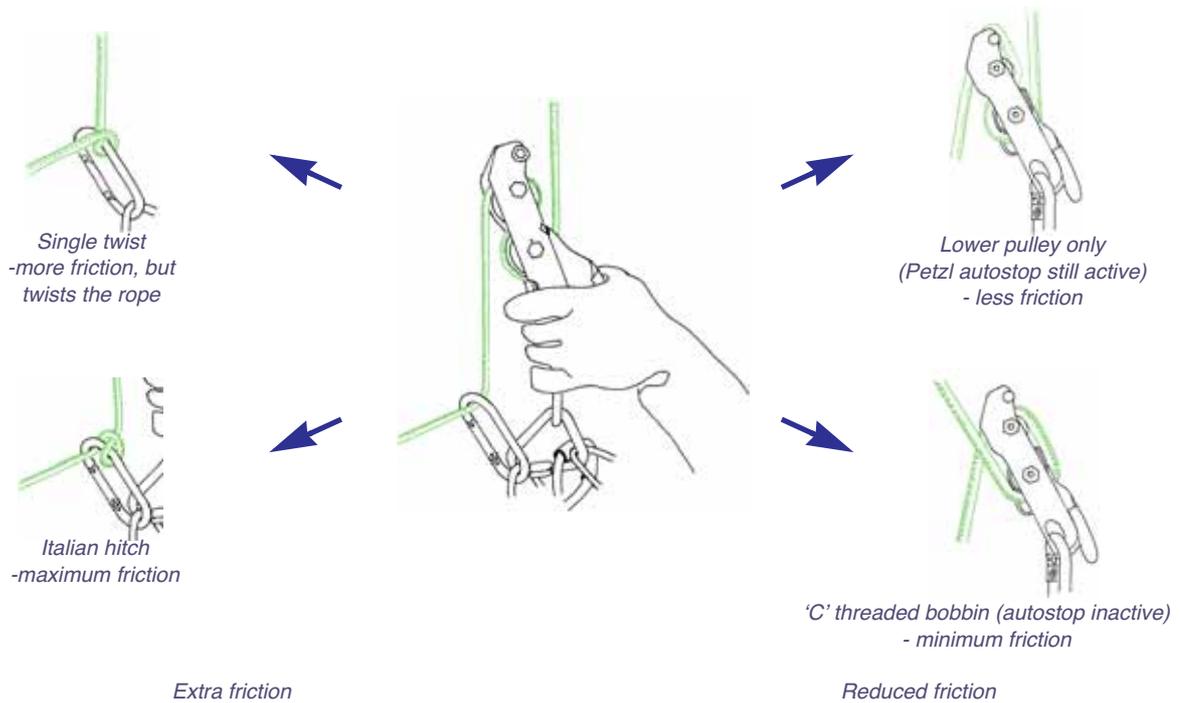
Control your descent by varying the tension on the rope on the lower side of the bobbin. Use a [Brake karabiner](#) attached to your seat maillon and clipped onto the rope below the descender to add extra friction and allow you to hold the rope at a more comfortable angle. Control your descent rate by lifting or lowering the rope to change its bend through the brake karabiner. This gives much better control than squeezing the rope or passing it over your hip.

Should the rope be too fast, use an Italian hitch, or the first turn of one, on the brake karabiner. Should the bobbin run too slowly, only engage the lower pulley or

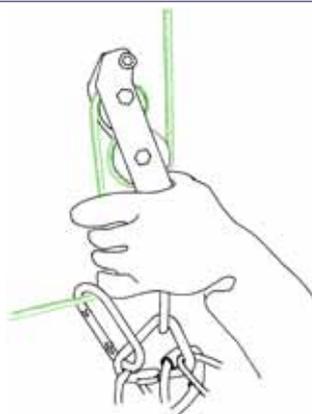
thread the rope backwards in a 'C'. Depending on the descender, reduced friction configurations may disable the autostop ability of the descender. Some models allow you to pull a flexible rope backwards through the descender, a handy feature when crossing rebelayes and for rigging.

Bobbins are not variable friction devices but they do work well over a wide range of ropes and rope weights, being best on ropes 10 mm or less and pitches shorter than 50 m (though you can safely use one on any pitch). At first a bobbin may seem fast and uncontrollable but with practice you can go fast or slow with ease without adjusting the device.

Caution: while the control is excellent, bobbins with stainless steel pulleys can heat up enough to melt the fuzz on dry rope after only a few metres of fast descent, and the softer the rope, the faster this happens.



Simple bobbin



A simple bobbin is just that - simple. Two fixed aluminium pulleys bolted between aluminium plates.

Simple bobbin
 – without a brake handle
 you can hold it so that it
 stops with a single
 squeeze

Autostop bobbins

Take the essentials of a simple bobbin and add a camming action to pinch the rope and a handle to control it and you have the best descender so far invented. To 'go', squeeze the handle and control the rope as for a simple bobbin. If you release the handle you stop automatically. The 'stop' handle is just that. Use it as a stop or go lever while maintaining control with your lower hand.

Not all autostops are the same, some work better than others and the stopping quality varies on different ropes or even the same rope wet or dry, new or old. You can use an autostop

that allows you to pull the rope backwards through it as a tolerable ascender. Another desirable feature is some means of disabling the stop action. This typically takes the form of an eye through which you can clip a karabiner.

If you intend to hang around for some time, even with an autostop, it is well worth locking off the descender as one good bump to the handle could start an unwelcome slide.

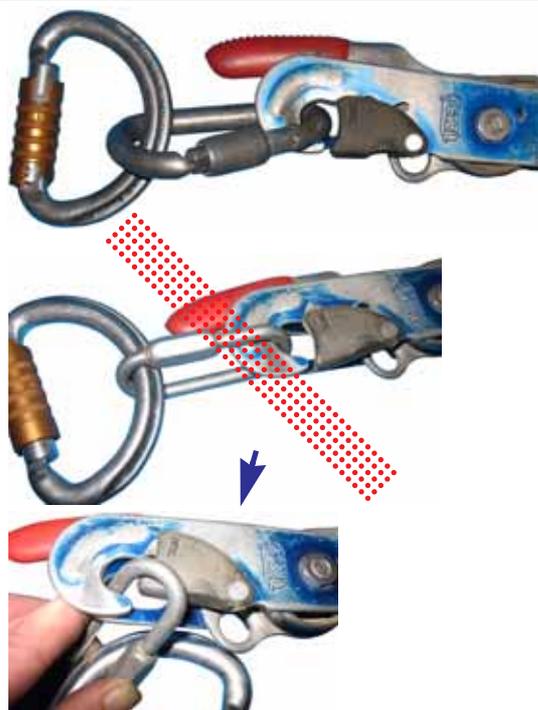
Once you've seriously used an autostop it is difficult to settle for another descender. Safety at pitch tops and rebelays is vastly superior to **any** other descender and the ability to stop easily, exactly where you need to, is a tremendous aid when rigging.

Brake karabiner

It doesn't matter what type of bobbin you use, you also need a brake krab. Any karabiner will work, but steel lasts longer. You can save a little weight and use titanium or a little more weight and use aluminium, but expect to have to replace it often. You may occasionally use your brake krab for life support functions—I leave mine clipped in for crossing rebelays—so make sure it's a good one. It can be difficult to find a steel karabiner that doesn't have a nasty claw on the gate, Kong makes one. A non-locking karabiner is better although French cavers are very attached to their steel oval Simond locking karabiners.

The Raumer Handy is a specialised stainless steel brake karabiner. It is narrow enough to stop it getting caught over the end of your bobbin (See [Top of bobbin in brake krab on page 106](#)). The tapered shape is designed to offer extra friction for 8 mm to 11 mm ropes, and while this works, it also makes for a jerky descent at times. They are expensive but just one is likely to last you forever.

Attachment & orientation



*Use a real karabiner, preferably a thick one.
It is surprisingly easy to undo a bobbin with a thin attachment link*

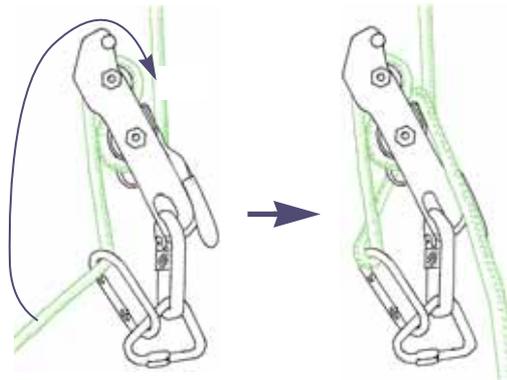
Attach a bobbin to your seat maillon by a locking karabiner so that it sits with the moveable plate upwards. This allows you to easily clip it on or off the rope. Use a locking karabiner made of about 12 mm rod—thicker than usual. A karabiner such as the Petzl Attache is ideal. The thicker karabiner avoids the possibility of un-clipping the bobbin's gate by twisting the karabiner against it. I doubt that this has ever actually happened, but it is a theoretical possibility that you can easily avoid. It is surprisingly easy to do with a 7 mm maillon. Remember also that like your seat maillon, this karabiner as no backup.

The rope enters on the top right and exits on the lower left (if you are left handed, you may find it easier to have the moveable plate facing down and control with you left hand).

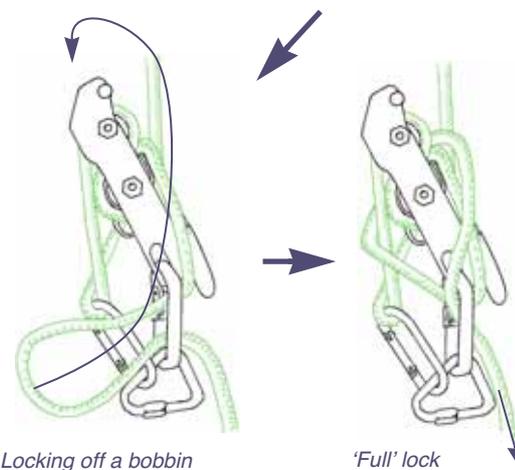
Wear

Replace the solid aluminium pulley when it wears down to its securing bolt. On simple bobbins you can invert the pulleys when one side wears out but on autostops the pulleys are asymmetric and you must discard them when worn. An aluminium pulley that has been deeply grooved with an 8 mm rope may jam with a thicker rope. Stainless steel pulleys are hard-wearing. The lower one on a Petzl Stop usually outlives four or five top pulleys but can last as long as nine aluminium top pulleys. They fail 'gently' with a small hole appearing at the bottom where the smooth curve become flat. On extended trips or expeditions it is worth taking along one or two spare aluminium pulleys to leave in camp until you need one.

Locking off



'Soft' lock



Locking off a bobbin

'Full' lock

It often becomes necessary to 'lock' a bobbin so as to safely free your hands for other manoeuvres. Once you release the handle of your autostop descender it is locked-off –but not always convincingly. Bump or lean against the handle on an awkward move and you're on your way again. For simple things like reaching for a deviation or clipping a rebelay, the autostop action is fine. For anything more complex, some type of lock is necessary.

Soft lock

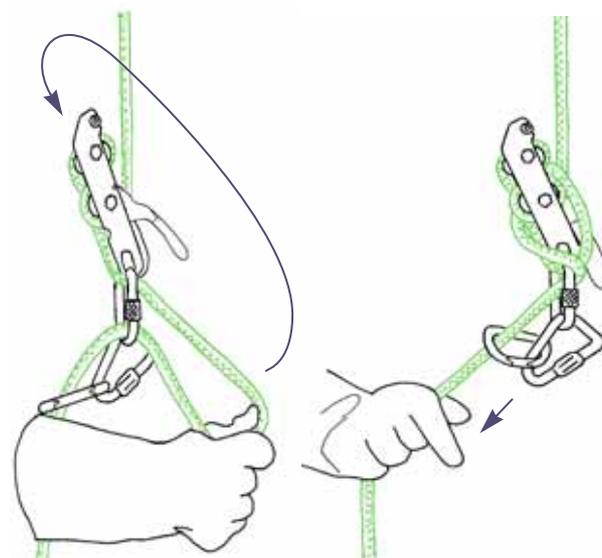
- Lift the free end of the rope below your brake karabiner and drop it over the top of your descender. This adds a little more security for an autostop, but is inadequate for a simple bobbin and will drop off either descender if you stand up on a ledge.

Full lock

- From the soft lock position, pass a loop of rope through the linking karabiner that attaches your bobbin.
- Take a loop of rope from between the bobbin and the brake karabiner and pass it through the descender's linking karabiner.
- Loop the rope over the top of the descender and pull down tight to provide a firm lock that has no tendency to come undone.

Unlock

- Loosen the loop around the descender and take it back over the top of the descender
- Clasp the bobbin and rope to keep the soft lock secure.
- Pop off the soft lock and continue.



Locking off an autostop bobbin

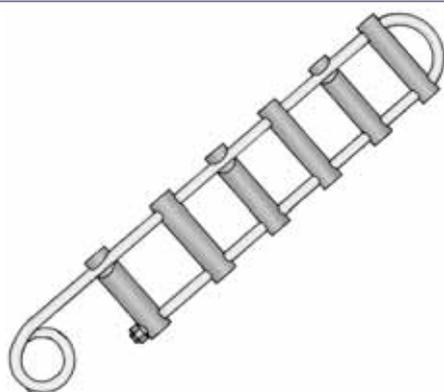
Autostop lock

- An autostop has an inherent soft lock so you can dispense with making a soft lock and pass the rope loop directly through the attachment karabiner to give just as good a full lock. You can also do this on a simple bobbin but holding the rope while making the lock is more difficult.

Unlock

- Pull up a little slack from below and take the loop back over the top of the descender.
- If you're using a simple bobbin or the rope is excessively slippery, clasp your left hand tightly around the bobbin and down rope.
- Pull the slack out of the system and continue.

Racks



Racks - Open (long)



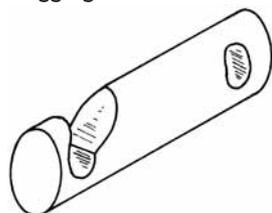
Closed

Some types of 'Rappel Rack' are the ultimate in variable friction devices, being equally effective on any size rope, double or single, wet or dry. While their variability gives them excellent control and makes them usable anywhere, racks are definitely at their best on long uncomplicated drops. The price paid for versatility is that of a bulky, heavy device that is clumsy and slow to get on and off the rope. In a cave with numerous small drops or rebelay, a rack is a nuisance and the 35 cm (14 inch) variety is almost guaranteed to remove your kneecaps!

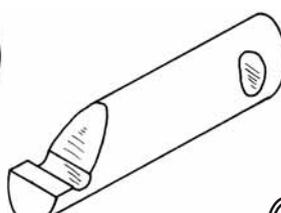
Load a rack by weaving the rope between a series of bars, usually five, some or all of which hinge open to allow you to insert the rope. Vary friction by threading the rope between different numbers of bars, and sliding the bars up or down the rack. Pushing the bars up the rack increases the bend in the rope and the amount of bar/rope contact to increase friction, while spreading bars down the rack decreases friction. When descending heavy ropes you can use as few as three bars spread the full length of the rack, thus giving the rope only a slight bend. During the descent jam the bars upward to maintain control as the rope weight diminishes. Eventually it will become necessary to clip in one or two extra bars; do not leave it too late!

Rack bars are made of solid aluminium or steel tube. Either type wear rapidly on dirty rope so be sure suitably sized replacement bars are available when buying a rack. Bars are easy to make in a home workshop.

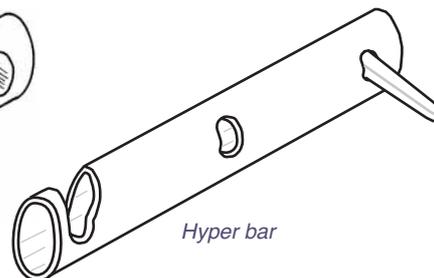
A hyper bar is normally a non-opening top bar nearly twice as long as a normal bar with the extra hanging out to one side—usually to the right. It has an upward pointing pin towards the outer end. The idea is that you can quickly pop the rope over it to provide extra friction and/or as a simple soft lock. It also makes the rack somewhat more ungainly and prone to snagging.



Rack bars - Clip closed



Safety



Hyper bar

Open-ended rack

The standard rack is a long inverted 'U' of 10 mm (3/8 inch) stainless steel rod with an attachment eye bent into one end of the 'U' and the other end left open to allow you to insert the rope. The frame is springy with the bars threaded onto it by means of a hole drilled in one end of them and held in place by an angled slot in the other end. The angled slot is cut so that the bars will open with a light squeeze of the rack but will otherwise stay closed. This makes the rack neat and easy to carry without the bars flopping about when you are not using it.

You can thread rack bars onto either the long or short arm of the rack. Using the long arm, you can drop the bottom bar out of the way to allow a greater spread between the remaining bars. Bars on the short arm are more confined and so easier to clip on and off and also easier to replace (and lose).

When you are loading the rope into a rack take care not to load it backwards. Your body weight, will force the bars open leaving the rack (and you) completely detached from the rope. Some manufacturers have reduced this risk by fixing the third bar closed and fitting the second bar with a slot that does not click closed. The rack is then less convenient to carry but safer to use. Always wear the rack the same way to get into the habit of loading it correctly each time.

Closed rack

A closed rack is made from a 'U'-shaped piece of stainless rod with a nut threaded onto the end of each arm. The bottom of the 'U' is the attachment point - upside down compared to a standard rack. Again they usually have five bars but with the first, third and fifth fixed and the second and fourth opening.

Load a closed rack by passing a rope loop between bars one and three and then closing the second bar through the loop. When you need more friction, you can also load bar four in the same manner. Their design allows them to be lighter and smaller than an open rack but this is at the expense of frictional variability that is not as good as for an open rack. While it is possible to remove a bar during descent it is much more difficult to add one - the opposite of what you normally require!

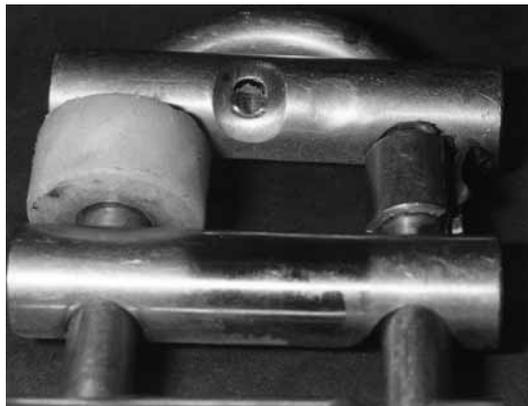
The homemade 'SupeRack' is specifically for long pitches. This extra long closed rack has heavy, square, heat-sink aluminium bars and virtually all its control is obtained by jamming the bars together or moving them apart to suit. Control at the bottom of pitches is very difficult.

Because racks are easy to make in a home workshop there is a huge variety available.

Attachment & orientation

The orientation of a rack is a matter of personal preference. An open rack is easier to load when the open side is on the right for right-handed cavers. A link between the rack and your seat maillon makes the rack manoeuvrable although a long rack may then reach above head high and so increase the risk of catching your hair or beard in it (if you're wearing one). For this reason and to stop them from swinging about so much, many cavers clip their rack directly to their seat maillon. This is inconvenient if not painful in crawls and awkward passages between pitches so many rack users use an attachment karabiner or maillon. The karabiner is easier and faster but may turn sideways and load the gate while a 7 mm to 10 mm maillon is usually regarded as more secure, if not so convenient.

Wear



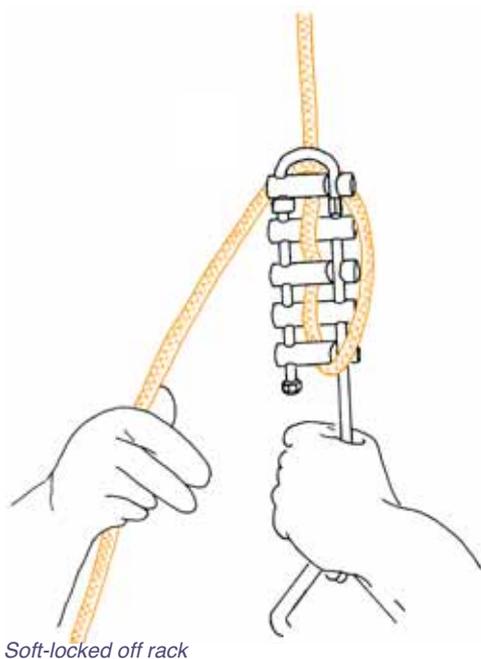
Rack spacer and worn hollow brake bar

The rope should run down the centre of the rack, rather than to one side. Here the groove the rope cuts in the bars is safely away from the mounting holes and slots and will not damage the rack frame. To keep the rope centred use 'trainer' bars or file a small groove in the top two bars. Steel bars need a wide spacer between the top two bars to give the same result as you cannot effectively groove them. No rack is designed to have the rope rub against the frame.

A 10 mm to 15 mm long spacer between the top two bars is useful as it stops them pinching too close together and impairing the smooth running of the rack.

Replace solid bars when they begin to pinch the rope and stop it running well - about a third to half worn through. Replace hollow bars when the rope groove wears a hole through the wall of the bar. Before this happens swap the bars up and down the rack so that all bars wear out at the same time. Steel bars are essential for continual use in muddy caves and you may need spare bars plus a spanner to change them for a descent of a deep muddy cave.

Locking off



Soft-locked off rack

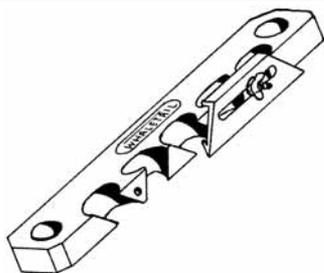
“When they made us stop using wire cables and use nylon rope instead, I tried a bobbin, but I didn’t like it, so I went back to the rack.”
— Ilia Zharkov

Make a soft lock by pushing the bars up hard and putting the rope over the top between the rope and the rack. This is adequate for short stops but if you remove the tension from the rack by standing on a ledge or crossing a rebelay etc. the rope will drop off. To obtain a more secure lock for open racks, push up all but the bottom bar, put the rope over the top of the rack and then clip it in place using the free bottom bar. Another alternative is to put the rope over the top then take a loop through the connecting karabiner and taking it over the top as well, in much the same way as locking off a bobbin.



6 mm steel cable — where only a rack will do

Whaletail



Other - Spelean whaletail

A whaletail is a cast or machined block of aluminium with a series of overlapping wedge-shaped pegs down one edge that give the descender its name. The rope weaves between the pegs so that the whale’s tails hold it in place with a sliding gate at the top for security. Vary friction by weaving the rope between more or less pegs (minimum of three). Whaletails are fast to load and easy to use but their major positive feature is the excellent heat sink the block of aluminium provides. This would make the whaletail ideal for use on big drops if it were not for the fact that it is not particularly easy to increase the number of pegs - hence friction - during descent. Most whaletails are designed for thick rope and are dangerously fast on 8 mm or 9 mm rope. At 525 g it is also one of the heavier descenders. Considering their disadvantages (weight, ease of reverse loading, non-replaceable wear surfaces, lack of versatility), I’m amazed that anyone still uses them, but apparently some rescue groups still use them for lowering.

Figure-8



Figure-8

Figure-8’s have some use as caving descenders but they are too fast for easy control on single thin ropes and wear out too quickly to be good value. The classic Figure-8 must be completely removed from both the rope and seat maillon during loading and unloading, thus risking dropping it. To alleviate the risk there are several varieties with ‘ears’ or spikes to keep the rope in place and allow you to load and unload the descender without unclipping it. Figure-8’s are cheap, light and simple and can be useful in caves with only a few short pitches or for some through trips. The spin they give the rope often causes tangles and may make it difficult to pull the rope down on double-rope through trips.

Table 6:1 **Some common descenders**

Descender	Weight (g)	Length (cm)	Replaceable wear surfaces	Best on rope diameter (mm)	Best on pitch length (m)
Petzl Simple	260	21	yes	7 to 10	<50
Petzl Stop	325	22	yes	7 to 10	<50
SRTE single double	460 525	23 23	yes yes	9 to 12 9 to 12	<50 <50
Bluewater Rack (long) (short)	700 600	35 30	yes yes	7 to 13 7 to 13	>50 10 to 100
Petzl Rack	475	30.5	yes	7 to 10	10 to 100
Closed Rack	280 to 500	20+	usually	10 to 13	<50 (small models)
Spelean Whaletail	550	30	no but can change ends	10 to 13	<100
Figure-8	100 to 300	14+	no	10 to 13	<50

Strength of descenders

Descenders can be one of the stronger points in the SRT system. The body of most descenders is overstrong and the smooth running surfaces mean that under FF1 tests, neither descender nor rope is normally damaged.

When locked-off or jammed hard against a stopper knot, autostops are as strong as any other bobbin. However, if allowed to slide uncontrolled for two or more metres from an anchor then stopped suddenly by releasing the handle they will probably damage the rope by partially cutting or lightly melting the sheath. Autostops that jam the rope at the top of the upper pulley (SRTE, Bonaiti) instead of between the two pulleys (Petzl, Dad) are less brutal on the rope. It is, however, then difficult to pull the rope backwards through them.

The damage an autostop can do to a rope in severe falls is still an infinitely brighter prospect than continuing in an uncontrolled slide to the bottom as could happen with any other descender. Losing control on abseil is a common cause of accidents, cutting the rope with an autostop has never happened as far as I know.

Some open ended racks begin to unwind their attachment eye at surprisingly low loads (as low as 250 kg!) and even locked-off you could not rely on one to survive a shock load. Racks with welded eyes are obviously better. Closed racks are much stronger, some models testing in excess of 2000 kg. Descenders are very useful as self belays when rigging. Do so with safety in mind by keeping your descender locked-off as much as possible, locking-off through the descender's attachment karabiner so as to reduce the possible load on it, allowing minimal slack in the rope and keeping your potential fall factor low. Provided you never climb up, most of the energy of any fall would be absorbed as a pendulum - a maximum of three times bodyweight minus the energy absorbed by crashing into things. This is unlikely to harm the descender but the consequences for you may not be as good. On long or difficult traverses it is better to set up a real belay using runners and save the descender for descending (see [Belaying on page 88](#)).

While generally safe against breaking, you can damage most descenders by using them carelessly. Descending over a sharp edge with a rack can bend the frame enough to stop the bars from sliding and a twisted karabiner acting as a lever can unwind the attachment eye. It is easy to badly bend the fixed plate on most bobbins if you weight the descender while its moveable plate is open. This is most likely to happen when you're trying to unclip from a tight diagonal rope.

Shunts

Shunts were originally conceived as 'deadman' safety devices for abseiling. Attach one to your seat maillon with an arm's length or shorter sling. You must hold it open to descend. If you release the shunt it will hold and allow you to hang there for rigging or save you from falling should you lose consciousness. Getting started again is not always easy.

The efficiency of shunts has been tested by getting a blindfolded victim to abseil off the end of his rope and catch himself by releasing a shunt attached to a parallel rope. In very few cases was a victim able to catch himself ([Webb, 1978](#)) and it was even found to be a difficult manoeuvre without a blindfold! A shunt is not much use as a safety device for a conscious caver. Bobbin users have effectively replaced them in favour of autostop descenders where the frequent use of the stop handle conditions the user to let go in the event of an emergency. While not 100% effective it is definitely better than the totally unconditioned response the occasional use of a shunt gives. A shunt provides a little extra safety at rebelay if you cross the shunt first and then don't grip it until you are safely hanging from your descender again.

The potential safety advantages of using a shunt can be weighted against the potential danger of triggering your shunt in an awkward or dangerous situation such as a squeeze amongst water, and being unable to easily release it.

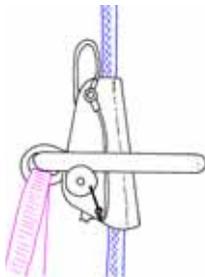
For the price of extra weight and loss of usability, Bonaiti, Petzl, SRT Equipment (Aust) and Gemlok (UK) make autostop descenders that apply the brakes when you squeeze the 'go' lever too hard, as well as when you let go.

Petzl shunt



The Petzl Shunt works on single or double ropes when both strands are the same diameter and has the advantage that it will slide with a force of more than about 350 kg, giving it shock absorbing capability. However you hold it open to descend and thus it would be almost impossible to release in an emergency. The Petzl Shunt is still popular amongst some groups of cavers who train beginners to use one at all times while descending in what I believe is a mistaken belief that a Stop is dangerous and should only be used by experts.

Spelean (Gibbs) shunt



You can arrange a Gibbs ascender and a large karabiner or specially fabricated bar and pin to make a shunt for single rope. It has the advantage that you can rig it with a short sling to your seat harness through a chest harness. The shunt sits on top of your descender and slides down the rope by itself. You trigger it by leaning back instead of letting go. However it only works comfortably with long descenders such as racks or whailets and only then if you remember to lean back at the right time. It is slow and fiddly to set up and as such is usable on the occasional simple pitch but is not useful for multipitch alpine caving.

Prusik knot shunt

Tie a prusik knot on a sling above your descender when you need a psychological shunt. A good knot will hold well under static and shock loads but if you load it while the you're moving or holding it, the knot can slip and melt the prusik sling. Once loaded it may be impossible to unload a tight prusik knot without a separate stand-in loop. A variation is the 'French Wrap'. It uses a prusik or similar knot on a very short sling tied below your descender and attached to a specially sewn eye on the legloop of your seat harness. Unlike a shunt, it puts enough tension on the rope to stop your descender and you can restart easily. The prospect of untying and retieing your French Wrap everytime you pass a rebelay makes it unfeasible for any serious Alpine-rigged cave.

The descent

In caving, abseiling is a means of descending a pitch, and should be done carefully and in complete control. Going too fast risks you smashing into walls and projections, puts melt marks on the rope and causes a shock load when you stop suddenly. When abseiling in a cave, keep a cowstail ready and prusik gear attached to you ready for use.

At the top

Before clipping on check the rigging, no matter who rigged it - gurus can make mistakes too! Make sure the rope is in good condition, all slings and nuts are in place, bolt hangers tight and pegs are firm.

Pitches with insecure starts must have a back-tie or traverse line installed so you can clip in with a cowstail while still safely back from the edge. When attaching any descender to the rope, clip in too much friction, then release an appropriate amount when you're ready to start down. On difficult, awkward or swing-out starts it is also advisable to lock-off non-autostop descenders. When you are all connected and checked, **ease** onto the rope to avoid a shock load close to the anchors, and start down.

On the way down—deviations (redirections)

The ideal deviation is one where you unload the sling by putting your feet on the wall and pushing out slightly.

Passing is then simple:

- Descend right to the deviation karabiner, perhaps pushing it down a little.
- Undo the deviation and clip it above your descender.
- You will usually do this operation with one hand so that there is no need to lock-off your descender.

Occasionally you must pass a deviation in space with no wall close enough to push off from. In this case descend until your descender is about 30 cm below the level of the deviation karabiner if its sling had remained horizontal. Lock-off your descender to allow you to spring out and grab the sling with one hand and clip the karabiner past with the other.

If a deviation is extra difficult clip it with a cowstail so as not to drop it or swing away.

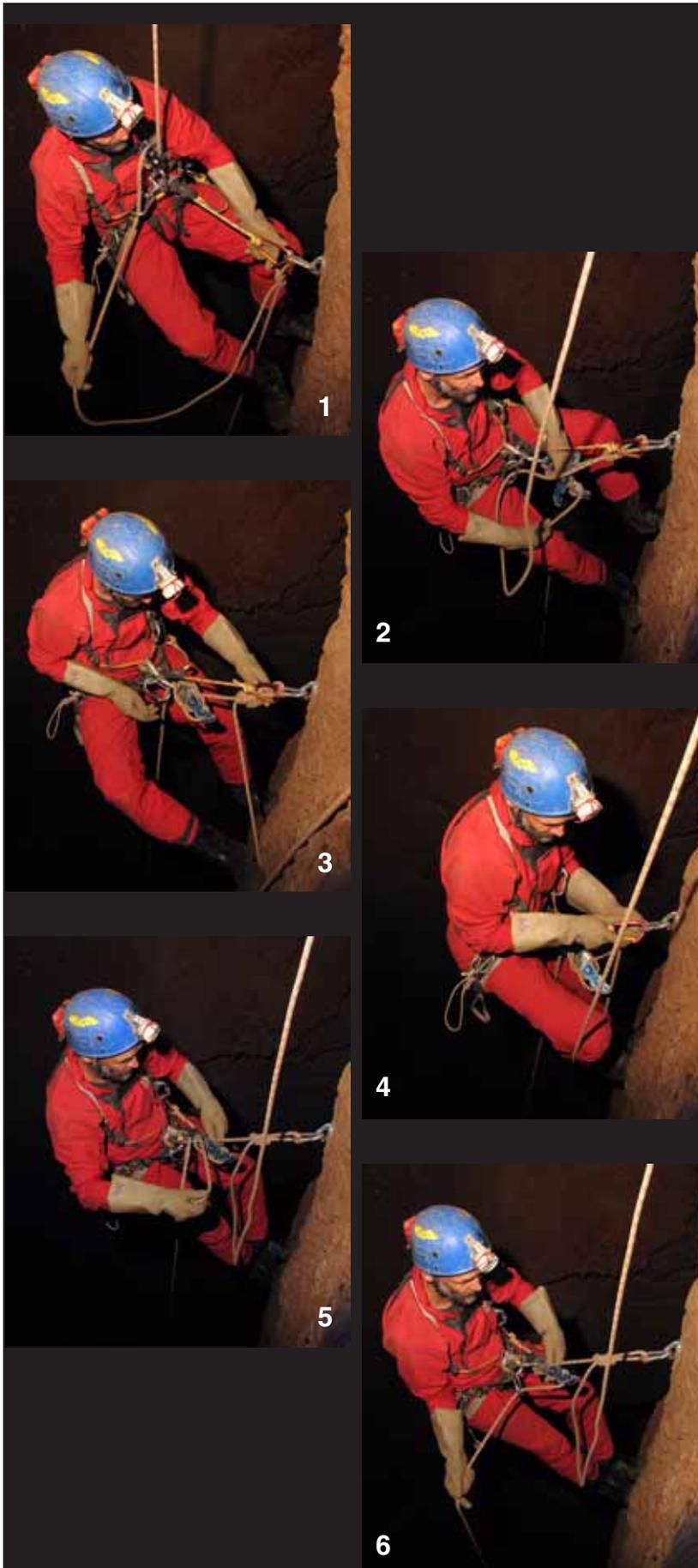
Never cross a deviation as a rebelay.

The anchors and slings used for deviations are not necessarily strong enough to hang from and are not backed-up.



Ozto Ocotlal/J2, Mexico

Rebelays



With practise, crossing a reelay becomes easy and fast.

1. Descend until you are level with the anchor and clip your short cowstail, to its karabiner (or maillon) in front of the rope.
- Descend **gently** until your cowstail takes up.
- Release the rope from your descender, but not your brake karabiner.

2. Still keeping your descender behind your cowstail, put the released rope to one side and thread your descender as high as possible onto the downward rope.
- Unclip your brake karabiner from the upper rope and clip it to the down rope.
3. Lock your descender (optional for autostop).
- Check your descender.

If your descender is not attached correctly the next step could leave you COMPLETELY unattached

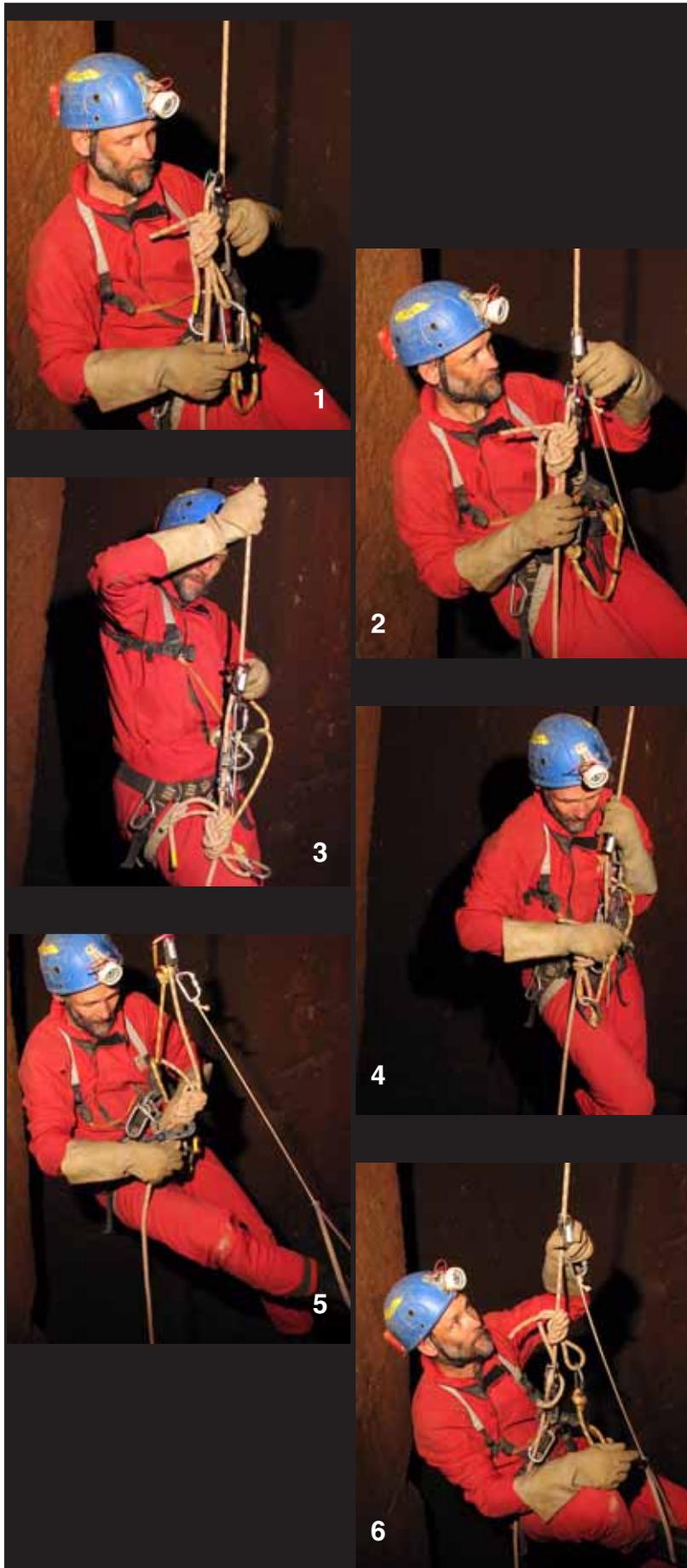
4. Stand up on a ledge or put your foot or knee in the loop of rope from above and unclip your cowstail.

- An alternative here is to attach your foot ascender to the down rope as high as possible below the knot immediately after you attach your short cowstail. Use your descender as normal. Use your footloop as a stand-in (especially useful with a heavy load), and sit back onto your descender. Remove your ascender only when you are secure and ready to continue.

5. Sit back on your descender, unlock.
6. Continue your descent.

If the loop is too long, reposition the reelay knot or tie a Figure-9 loop to shorten it. When the reelay involves a pendulum to reach it, descend to just below the level of the anchor, lock your descender (optional for autostop), to free both hands, then swing across and clip in (see [Rebelays on page 60](#)).

Knots



On a pitch where a single rope is too short, it may be necessary to knot two or more ropes to make up the length required. There is no easy way past a knot hanging in space. You will need a long leg-loop to an upper ascender (see [Frog system on page 119](#) or [Mitchell system on page 123](#)), and a cowstail.

1. Descend until the knot is about 5 cm below your descender.
 - Clip your long cowstail to the Figure-8 eye that is **always** hanging out of the knot (see [page 46](#)).
2. Attach your ascender just above your descender so that when you stand in the long leg-loop you unweight your descender.
3. Stand and clip your short cowstail to the rope above your ascender.
4. Still standing, undo your descender from the rope.
5. Sit back onto your short cowstail and at your leisure reattach your descender as close below the knot as possible. If the descender is not an autostop lock it off.
 - Stand in your leg-loop and unclip your short cowstail.
6. Sit onto your descender and unclip your ascender.
 - Remove your long cowstail.
 - Descend to the next knot.

It is easier to have no safety cord attached to your ascender during this manoeuvre. A short safety cord will take up the load before the descender does and will be impossible to unclip.

This method is fast but some arm strength is required to release the rope from of the descender.

Many cavers are not so strong and to reduce the effort required you can pass a knot with both ascenders:

- Attach both ascenders to the rope close above your descender.
- Release your descender
- Re-attach your descender as high as possible below the knot and lock it off
- Move your descenders down to just above the knot
- Remove your Croll
- Sit back onto your descender
- Remove your upper ascender
- Continue your descent.

While the movements are no more strenuous than prusiking this second method is slower and more complex than the first.

Prusik systems that do not allow you to weight a high ascender with a long leg-loop ([Texas system on page 120](#), [3 Gibbs ropewalker on page 121](#)) make crossing knots almost impossible. The difficulty lies in unweighting your top ascender so that you can reweight your descender. The easiest escape is to carry a spare ascender with a long stand-in sling for crossing knots. Failing this a sling tied with a Lark's foot or Prusik knot just above the knot in the rope also works.

Like any other new manoeuvres, try crossing a knot outside a cave first.

Big drops – longer than 150 - 200 m

Quite apart from the psychological problems involved with 'throwing yourself' off a big pitch there are some specific physical considerations as well. The rope weight below can be enormous - 300 m of dry 11 mm rope weighs around 25 kg. If you use a bobbin you will have to haul yourself down the rope with both hands for a large part of the way and disable your autostop in order to use both hands. Reduce friction by not using a brake karabiner but have it ready to clip in before you need it.

Better still, use a rack! Clip in four bars and spread them. Give a light starter pull. If this does not cause movement - the rare case of a very light caver on a very long pitch! - jam the bars up and unclip the fourth. When using three bars you must be extra careful, spread the bars slowly until you begin to move bearing in mind that during the descent the loss of rope weight below will make it harder and harder to maintain control. Be cautious and do not leave it too late to add an extra bar. With a smooth dry rope, less than 50 m of rope weight below and only three bars clipped in, it is next to impossible to stay in control.

The most difficult part of any long drop is getting on and off at the top and you may want special rigging to make life easier.

Alpine technique treats it as a normal pitch except that perhaps you will use a double anchor just over the edge. This provides a slack rope over the edge and only a marginally more difficult rebelay cross-over onto the heavy rope below.

For IRT cavers there are two alternatives:

- An assistant at the top can use an inverted ascender on a short rope to pull up the main rope and provide enough slack for the descending caver to clip on and get over the edge. Once under way, the assistant lowers the main rope back into place and the descending caver can unclip the ascender and replace it above him. The reverse of this is done on the way up.
- Rig a tail with a knot in its end over the edge from separate anchors beside the main rope (see [Pitch Edges on page 72](#) for details). Descending cavers drop over the edge on the short rope and change over to the main rope for the descent. Taking the idea a step further you can use a tail 50 m to 100 m long. This allows cavers to swap ropes in 'mid-flight', allowing two cavers to descend simultaneously.

Rope protection must be infallible on long drops. The best solution is to rig so that you need none but if you can't, use rope transport sacks, possibly with a foam pad inside them.

The longest free pitch found in a cave to date is 333 m into El Sótano de las Golondrinas and cavers regularly descend it using normal caving techniques, as have all the deep pits in Velebit.

Ultra-specialised equipment such as 'rope trees' and edge rollers are not needed for caving. For a detailed treatment of drops over 500 m read Chapter 7 of *On Rope* ([Padgett and Smith, 1987](#)).

On a long drop with a clean, supple, dry rope any descender is liable to overheat if your descent rate is too fast. Wetting the rope beforehand is one way of assuring a cool descent but is not always feasible. If the top rack bar or bottom bobbin pulley sizzles when you spit on it, slow down, but do not stop. Be careful not to catch your hair, beard or get a burnt tongue when doing this! Descenders made with solid aluminium components provide the best heatsinks while hollow stainless steel bars and pulleys heat up fast. Remember that there will be several metres of stretch at the bottom of 150+ m of rope. The first person down should be careful that the end of the rope does not recoil out of reach once it is unweighted. Always give inexperienced or nervous cavers a 'bottom belay' provided you can arrange it safely.

Rope protectors

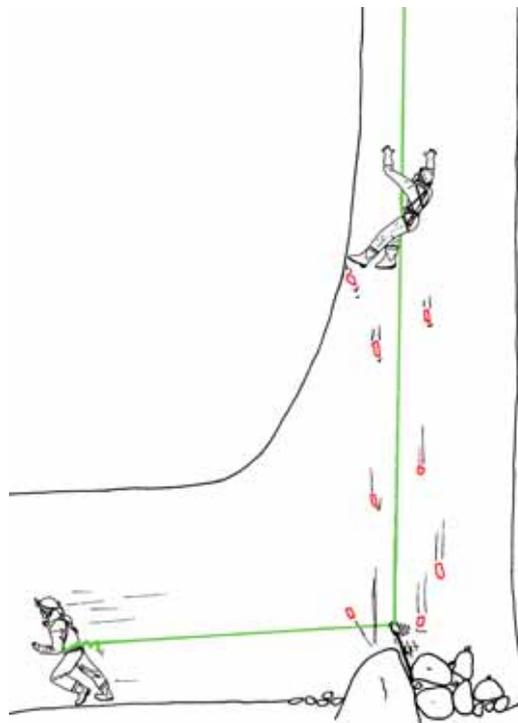
Flat rope pads are easy to pass. They rarely need to be tied to the rope and it is a simple matter of making sure that the rope is replaced after you pass them. It is an even simpler matter to create sideways movement and displace the rope off the pad once you pass one.

Cross [Wrap-around rope protectors](#) by descending to just above the protector, locking-off, removing the protector completely from the rope and putting it back on the rope above. Continue to just below the rub point, sliding the protector down with one hand on the way. After locking-off again tie the protector in place being careful to replace it correctly.

Often the protector will be so near to the anchor that you can remove or push it up enough to clip on below it without having to remove it completely.

It is a good habit to check the rope whenever you encounter a protector as they are never 100% reliable.

Bottom belays



Bottom belay

Descenders are controlled to a large degree by the tension on the rope below them and it does not matter whether this tension comes from the person abseiling, rope weight or someone pulling on the rope from below. Bottom belay cavers lacking confidence or experience by stationing someone at the bottom who hauls on the rope and thus stops the person above if the need arises. This works fine on short drops but rope stretch on long drops may make it difficult to create sufficient tension quickly enough. In this case the belayer can clip on to the rope beforehand and run away from the base of the pitch if necessary.

If there is a danger of falling rocks and the passage is suitable rig a pulley or karabiner on a sling at the bottom of the pitch. This allows the belayer to remain in a position safe from falling rocks and keeps the abseiler from being pulled sideways.

Bottom belays are not used as a rule as they slow the caving party's movement through the cave.

Diagonals

The rope may not always run vertically to the bottom of a pitch. When it makes a pendulum to reach a passage or avoid a pool an unprepared caver may become stuck in a loop of tight rope. To avoid this, unclip your brake karabiner or one or two rack bars as soon as the rope begins to pull significantly sideways. Keep going until the rope pulls tight and haul across to the belay with both hands. Depending on the severity of the diagonal it may be necessary to disable an autostop.

Narrow pitches

With gravity to help, narrow pitches are rarely a problem on descent but at times they can be so tight that there is not enough room for you and your descender to fit at the same time. One solution to the problem is to clip your descender to the end of a cowstail and let it ride above head level. Disable your autostop and adjust its friction so that the descender will run without further adjustment while you are negotiating the squeeze.

Pitch edges

Pitches that begin with a sharp overhanging lip are often awkward to negotiate. In most cases it is best to forget any pretence of grace or style, clip on and slide over the edge on one hip until it is possible to do a half turn and brace your feet against the wall. Most bad edges are primarily due to bad rigging - go back to [4 Rigging!](#)

At the bottom

Is it really the bottom or just a ledge? Tie all the ropes in your sack end to end to avoid tying knots while you're hanging in space. Before leaving, look back up to make sure the rope is not caught behind a flake or knob. Check that the stopper knot is still intact and the rope end is bundled off the ground ([page 129](#)), then call "rope free" and move away - or move clear first if there is risk of loose rock above.

Descent problems – lack of control

Wrap the rope once or twice around one leg to add friction. If this gives the required security, continue. Otherwise, with the rope securely around your leg, tie an Italian hitch on your brake karabiner - this will give sufficient friction with any descender. Use a [Soft lock on page 95](#) to maintain control while you're tying the hitch. It is still necessary to maintain a hold on the rope but such a lock provides enough quick friction to stop and tie an Italian hitch. An Italian hitch will twist your rope badly.

Autostop doesn't

Few autostop descenders are 100% effective on all ropes. You must always be careful about trusting an autostop on an unknown new rope, slippery or hard rope and of course, a rope on which the autostop has previously failed to stop. Forcing the stop handle may work but the stop achieved is tenuous at best. Sometimes all you need is a new top pulley. Even when an autostop does not work perfectly it still gives some 'autobrake' action and at worst will function as a normal descender.

Top of bobbin in brake krab

If you severely weight the down-rope below your bobbin it can invert and catch in your brake karabiner. This can result in an unexpected and dangerous loss of friction from your brake krab. Every time that you move up to remove your cowstail when you cross a rebelay your bobbin has a tendency to invert, as it may also do when you use any of the friction hitches in [Extra friction](#). The horizontal bobbin is more alarming than dangerous—it can look like you're hanging on that tiny plastic gate.

There are several possible solutions to this:

- Use a Stop.
It may still get caught, but the Stop action still works, just stand up again to free it.
- Use a Raumer Handy.
It is too narrow to allow the end of your bobbin to enter, but expect a jerkier ride as the rope grabs in the Handy's V-notch
- Clip your brake krab into your bobbin's attachment krab instead of your seat maillon.
As the bobbin and the brake krab are now clipped to the same point there is no bobbin pivoting action possible, but you can wear a groove in the side plate of your bobbin.

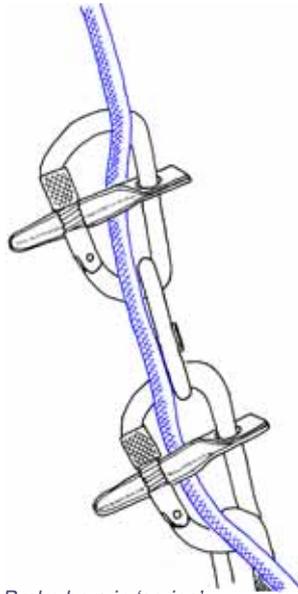


Midnight Hole, Australia

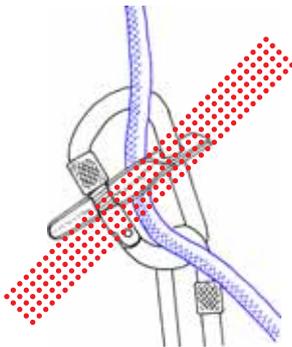
- Use a Petzl Freino to attach your bobbin.

It has a built-in brake but may also wear your bobbin's side plate and being made of aluminium, won't last many gritty caves, and they're way too expensive to throw away too often.

No descender



Brake bars in 'series'



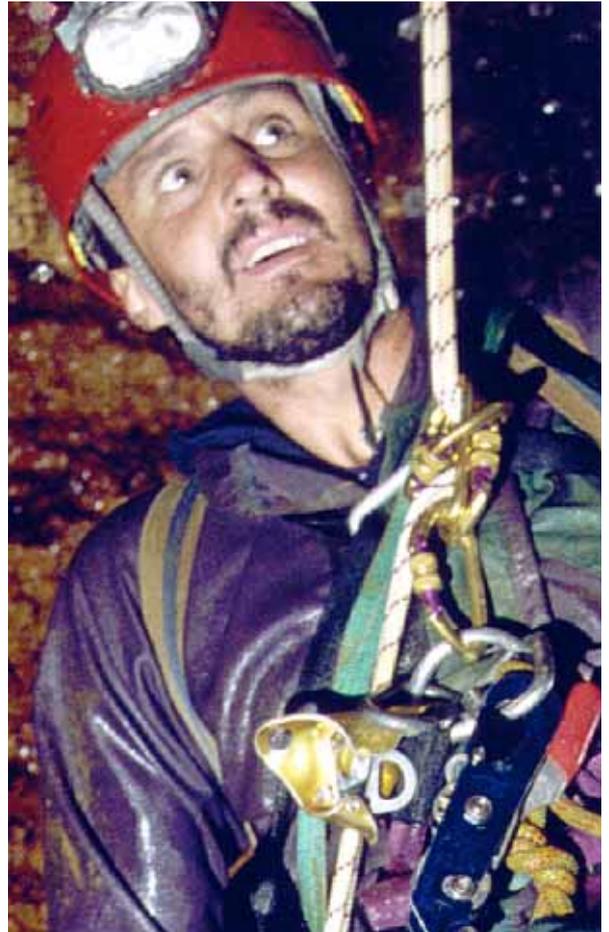
Single brake bar
- insufficient friction
on most single ropes



Bicephale

You can descend a rope without a specialist descender. Karabiners arranged as descenders do not work as well as the real thing and wear out rapidly but are considerably safer than classic abseiling.

'Crossed krabs', using one or more karabiners or angle pitons as brake bars work fine on thick ropes but on single thin rope they can be too fast to control. Two brake bar units in 'series' are more controllable than single units and give a back-up should one of the karabiner gates fail or open due to the sideways loading it receives.



Descending a double rope on "Crossed-krabs"
- the Stop is not very useful here

The 'Bicephale' is a variation on crossed krabs, it gives more friction than the standard set-up although the descent may not be as smooth. A careless bump or poor karabiner match quickly turns a bicephale into a single crossed krab setup. Try it out **very** close to the ground first. With considerably less equipment you can abseil on an Italian hitch, it is easy and fast to tie and the control is excellent. Either crossed krabs or an Italian

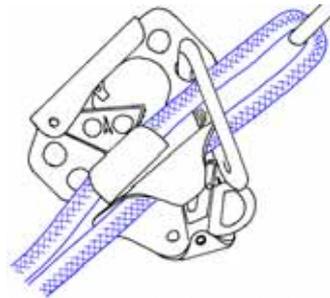
hitch will ruin aluminium karabiners very quickly on a muddy rope, while a locking steel karabiner will last indefinitely. Locking karabiners are preferable for the critical karabiner in any of these methods. If none is available stack two non-locking karabiners with their gates on opposite sides.

Long hair

Long descenders such as racks and whaletails are ideal for catching long hair and beards. Loose clothing such as scarfs and long chin-straps are also at risk. If something gets caught, stop descending immediately and try ripping the offending item from the descender. If it is too well trapped the safest move is to attach an ascender with a long leg loop above the descender and stand up. The unweighting of the descender should make it easy to extract the offending item.

Only as a last desperate resort use a knife to very **carefully** cut your hair or trapped item free, not the rope! Ropes under tension cut extremely easily. Try to avoid the problem entirely by having hair tied and tucked in and no loose clothing, jewelry, chinstrap or dangling item in range of a descender or ascender.

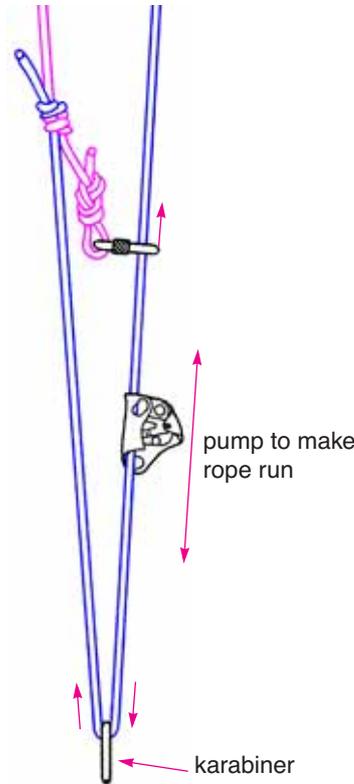
Rope too short



Ascenders used to lock a double rope

The most immediate concern when descending a short rope is to not slide off the end due to lack of a stopper knot. When you rig correctly in the first instance the problem is no more serious than having to change over to prusik and ascend. However if you are using IRT and the intention is to have the last caver down place the protectors, the situation could be far more serious. The first caver down a rope must always carry prusik gear ready for use and place protectors, deviations and rebelayes as he goes. The rigger must be able to turn back at any time, especially in difficult or wet caves (see [Descent to ascent on page 133](#)).

In the event of descending a double rope that is too short, manoeuvres using ascenders are complicated by the lack of either rope being fixed at the top. To get the first caver down, an assistant using two ascenders can lock the ropes at the top. The descending caver can then tie an extra rope to either strand and finish his descent.



Running karabiner

If you have no spare rope available and nobody at the pitch head to help, lock the rope using a *Mousqueton Coulant* or 'Running karabiner' ([Frachon, 1980](#)), then climb with caution.

- Stop a metre above the ends of the rope.
- Tie the rope ends together with a short safety loop hanging out and separate the two strands of rope.
- Clip the loop formed (not the safety loop) to your seat maillon with a karabiner.
- Continue descending to the knot.
- Attach an ascender with footloop immediately above the descender.
- Hold both ropes together with one hand to keep them from slipping and ease onto the ascender, then remove your descender with your other hand.
- Allow the rope to slide until you are hanging from your seat maillon karabiner.
- Clip the safety loop from the knot to the other strand of rope using a karabiner **above** your ascender.
- 'Pump' the knot up to the belay by successive steps in the ascender footloop.
- Once the knot reaches the top and locks, the rope is ready for ascent.

The friction produced as the full length of the abseil rope is dragged through a sling under load could easily cut it. In this case there is little choice but to prusik up the double rope using prusik knots.

