



Basic Guide to Winching

*Principles, Safety Considerations,
and Common Rigging Set-Ups*

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Basic Guide to Winching

Principles, Safety Considerations, and
Common Rigging Set-Ups

Thank you for purchasing Factor 55 winching equipment. Every piece of quality Factor 55 equipment will provide you with many years of reliable service.

If you follow the basic principles and safety considerations outlined in this guide, winching can be a safe and rewarding activity. Because no two winching situations are alike, it is impossible to review all the possible recreational or professional use scenarios in this guide. Seek additional winching knowledge and skill development through professional hands-on training. Use the *Stuck Assessment and Recovery Plan Checklist™* at the end of this guide to help you better analyze your specific winching situation and apply common sense principles, safety considerations, and rigging set-ups.

Warnings, Equipment Cautions, and Notes

As you read through this guide you will see **WARNINGS**, **EQUIPMENT CAUTIONS**, and **NOTES**. Each has a specific purpose.



WARNING

Information indicating a potentially hazardous situation or consideration. If these **WARNINGS** are ignored, serious injury or death could result.



EQUIPMENT CAUTION

Information that can assist you in avoiding vehicle or equipment damage. May also provide important equipment tips and considerations.

NOTE

Additional information to help you complete a procedure or bring additional knowledge to your attention.

Winch Utility

When off-roading for recreation or while at work, your winch can help you:

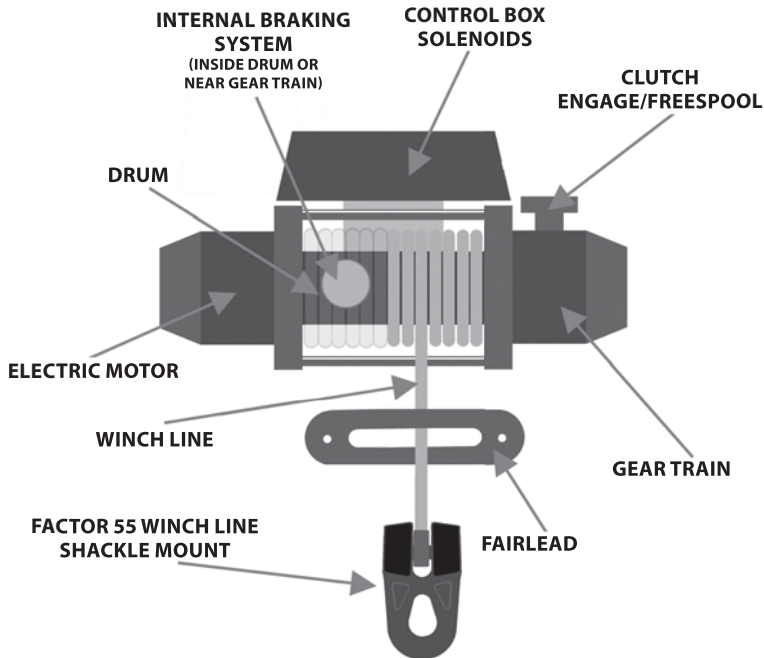
- Self-recover when stuck in low-traction terrain (mud, sand, snow, ice)
- Assist another vehicle stuck in low-traction terrain
- Safely pull you over a challenging obstacle (e.g. rock, log), scale a difficult incline, or climb a low-traction hill
- Remove an obstacle blocking a trail (downed tree, large boulder)
- Right a vehicle or trailer that has tipped or rolled over
- Pull a vehicle across a stream
- Recover a vehicle that has left the trail
- Reduce environmental or trail damage caused by spinning wheels in low traction terrain

NOTE

Always apply Tread Lightly! principles. Rather than spinning tires on traction-challenging terrain, use your winch to preserve the environment and reduce trail damage.

Winch Anatomy and Terminology

Before you learn the mechanics of your winch and the basics of how to safely operate it, you need to know its parts and components.



Remote Control. The remote control allows you to regulate the winch direction, while at the same time allowing you to stand clear of the winch and winch line during winching operations. There are two basic types of remote controls:

- Wireless remote system
- Wired remote

NOTE

- Reference the instructions that came with your winch for guidelines on using your specific remote control. Each remote control (wireless or wired) functions differently and provides you with different control options and information. Some wireless systems can engage and disengage the winch clutch.
- Some Advanced Wireless Remote systems provide users with additional vital winching information, such as winch motor temperature and vehicle battery condition.



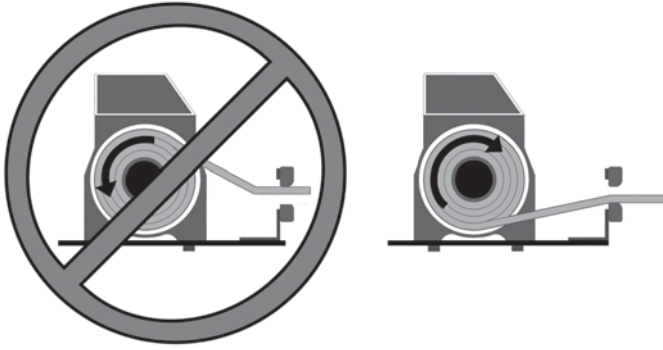
WARNING

- To avoid accidental activation of your winch, avoid placing a wireless remote control in your pocket during winching operations.
- Avoid having the remote control plugged in when freespooling, rigging a winching set-up, driving on the highway, or when the winch is not being used.
- Avoid leaving the remote control at a location where it can be accidentally activated.

Motor. The winch motor is either powered by your vehicle's battery (electric winch) or a power steering pump (hydraulic winch). The motor provides power to the gear train mechanism, turning the drum and winding the winch line.

Gear Train. Winches use an internal gear train to transfer motor power to the drum. The gear train converts winch motor power into a mighty pulling force through gear reduction. Gear reduction is labeled as a gear ratio (e.g. 162:1 – meaning 162 rotations of the winch motor to 1 drum rotation). Gear reduction increases the pulling force used to powerfully rotate the drum, resulting in the spooling out or in of the winch line.

Drum. Sometimes called the winch spool, the drum is a hollow metal cylinder around which the winch line is wrapped. The drum is driven by the winch motor and gear train. The remote control can change the direction of the drum, spooling winch line in or out.



EQUIPMENT CAUTION

For most winches, do not wind rope over the top of a drum. Wind winch line on the bottom of the drum unless otherwise directed by the manufacturer for your particular winch. Also, your bumper should allow easy access to the winch line and drum for proper spooling.

Clutch. The clutch control may be moved to FREE SPOOL or ENGAGED. (On some equipment, FREE SPOOL is labeled as DISENGAGED.) The FREE SPOOL setting disconnects the gear train from the drum. This permits the drum to rotate freely, allowing you to manually pull line from your winch. The ENGAGED setting locks the drum to the gear train and motor. To winch with power, the clutch control must be solidly ENGAGED.



WARNING

- Never ENGAGE or DISENGAGE the clutch control when: 1) your winch has a load on it, 2) the winch line is under tension, or 3) the drum is moving.
- Make sure the clutch control is solidly ENGAGED prior to winching.



EQUIPMENT CAUTION

When pulling winch line from the drum, place the clutch control to FREE SPOOL. This reduces drum heat produced from the automatic brake system and conserves battery power.

Winch Line. Wrapped around the drum is winch line. From the factory, your winch will either have steel cable or synthetic rope.



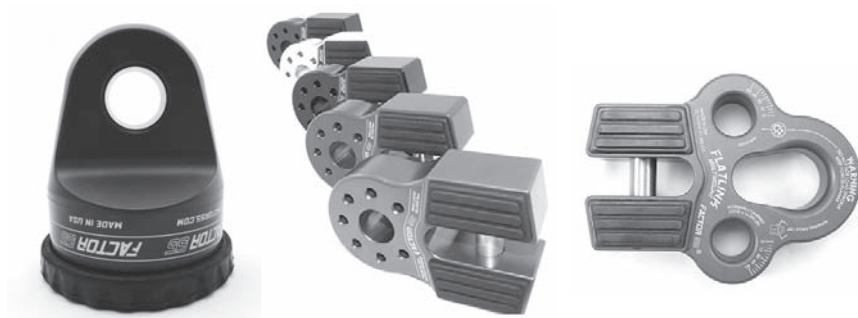
WARNING

Always inspect your winch line prior to winch use, checking for frayed, kinked or damaged line. If your winch line is damaged, replace before operation.



EQUIPMENT CAUTION

Protect your winch line from damage during winching operations. Avoid exposing synthetic winch line to UV radiation from the sun.



Winch Line Shackle Mount. A hook is typically provided at the end of your winch line when purchased from the winch manufacturer. For safer *Closed System Winching™*, replace the factory hook with a Factor 55 Winch Line Shackle Mount. Go to www.factor55.com for purchase.

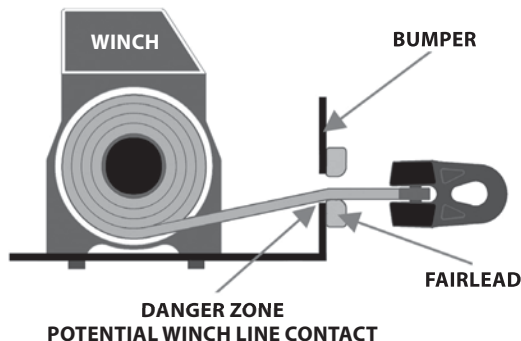
Fairlead. The fairlead guides the winch line onto the drum. A fairlead minimizes winch line wear as the line enters or leaves the winch, particularly at an angle. Most fairleads are of two types: roller and hawse. Roller fairleads have four metal rollers on their tops, bottoms, and sides to protect the winch line. Hawse fairleads are smooth, without rollers.

! WARNING
Keep hands, clothing, and jewelry away from the fairlead while spooling line onto the drum.

! EQUIPMENT CAUTION
Do not use synthetic rope winch line on roller or hawse fairleads that have already been used with steel cable winch line. Doing so may damage your synthetic rope.

! EQUIPMENT CAUTION
If you purchase an aftermarket front bumper on which to mount your winch, make sure the manufacturer provides a large enough opening behind the fairlead. See the illustration.

The rope should not rub against the sharp steel or aluminum on the backside of the fairlead when rope angles change with terrain, or when the drum fills or pays out rope during a tensioned pull. Winch line rubbing against this sharp metal may cause damage to the line. This damage could cause the line to break.



Control Box Solenoids. The winch control box contains all of the winch's electronics. On certain winches, the control pack also houses the wireless control activation switch. Control boxes may actually be mounted on or near the winch itself, or the electrics may be contained inside a sealed housing. Many are waterproofed (to greater or lesser degrees) to protect them from the elements; check your user manual for details.

Internal Braking System. The brake system automatically engages when the winch motor is stopped and there is a resistance load on the winch line. The automatic brake system prevents unwanted winch line from being spooled out when the winch is not powered.

NOTE

There are no user serviceable parts or systems inside your winch. Malfunctioning winches should be sent to an authorized repair center.

Important Winch Accessories

Some rigging accessories are needed to make a winch useful and safe to use. If you own a winch, you will want to purchase a winch accessory kit.

The winch accessories you actually pack for any recreational off-road adventure or work-related outing depend on these five considerations:

- Your personal winching experience (avoid trying new accessories in the field during actual recovery efforts)
- The type of vehicle you have
- The different environments and climates you plan to navigate
- The length of time you will be gone
- How much kit you can comfortably pack into your vehicle

All winch accessories can essentially be divided into three categories:

- Safety-specific winch accessories
- Connection-point winch accessories
- Winch capacity and capability accessories

Safety-Specific Winch Accessories

Gloves. When winching, gloves are considered essential Personal Protective Equipment (PPE).

Protective Eyewear. Also considered fundamental PPE.



WARNING

Always wear heavy protective winching gloves and eye protection when handling winch line and winch hooks.

Winch Line Damper. A winch line damper helps prevent winch line recoil should the winch line or a connection-point accessory fail during a high-resistance load pull. In the rare occurrence of a rigging failure, a winch line damper helps the winch line fall to the ground.



WARNING

A winch line damper must be used on every winch rigging set-up.

Connection-Point Accessories

Shackles. Shackles are used to connect various rigging accessories, such as tree trunk protectors, rigging straps, and pulley blocks. They are also used to connect a Factor 55 Winch Line Shackle Mount to a frame-mounted connection point on a vehicle. There are two basic styles of shackles using in winching (purchase your shackles at www.factor55.com):

- **Screw-Pin Anchor Shackle** (forged metal)



- **Synthetic Rope Shackle** (made of synthetic rope winch line)



Tree Trunk Protector. These straps are designed to help protect a live tree from damage during winching operations and self-recovery situations. Straps are available from Factor 55 at www.factor55.com.

Transport Chain with Grab Hooks (Choker Chain). When using an abrasive boulder or sharp object as a winching anchor, off-roaders often use a choker chain as a solid winching connection point.



Hitch Receiver Shackle Mount. The best way to use a towing receiver hitch (2, 2.5, or 3-inch) as a frame-mounted connection point for winching is to use a Factor 55 HitchLink.

Ground Anchor. Man-made anchor points can be a vehicle or a ground anchor. A ground anchor, also known as a *deadman*, can be

either *improvised* (burying a tire), or a *commercially available* land anchor.

Winch Capacity and Capability Accessories

Shovel. An important accessory for any recovery is a shovel. Prior to winching, you can use a shovel to remove restrictive terrain from around your tires and under your vehicle.

Pulley Blocks. (AKA Snatch Blocks. So named because they *snatch* the winch line between two plates or caps, trapping the winch line against the pulley.) Pulley blocks make your winch more capable by:

- Allowing you to safely change the direction of a winch line, making it possible to winch around corners and at angles.
- Providing your winch with a mechanical advantage. Appropriately using one or more pulley blocks in a winch rigging set-up can increase the pulling capacity of a winch.

NOTE

There are two simple methods of determining the mechanical advantage in a winch-rigging set-up. Both work equally well.

1. Count the number of lines that actually get shorter within any winch rigging set-up.
2. Count how many winch lines actually pull a vehicle or object.

To clearly visualize these two methods, see the winching illustrations at the back of this booklet.

Winch Line Extensions. A winch line extension increases your winch's reach and rigging range. Most winch line extensions are manufactured from synthetic rope winch line material. Flat straps made of non-stretch polyester may also be used as winch line extensions.

Winch Kits

Winch and recovery equipment manufacturers sell a variety of winch kits. Most are appropriately sized to the Gross Vehicular Weight Rating (GVWR) of your vehicle. These kits include important winch accessories in different types of durable utility bags.

Mechanical Considerations

- **Never Use a Winch or Winch Line for a Kinetic Energy Recovery Pull**
Your winch and winch line are not designed to handle the shock load of an attempted kinetic energy recovery-type pull. For these types of recovery applications, use a stretchable nylon “snatch-type” kinetic energy recovery strap or rope.
- **Never Use a Winch or Winch Line for Towing**
Your winch and winch line are not designed for towing or handling the type of shock loads possible during vehicle towing operations. Towing a vehicle using its winch line will damage the vehicle’s winch.
- **Never Use Your Winch to Secure Cargo Loads**
Your winch is only designed for horizontal resistance pulls, not to hold cargo in place on a truck or vehicle.
- **Never Use Your Winch as a Hoist to Lift or Suspend Objects**
Your winch is only designed for horizontal pulls, not lifting objects vertically.
- **Avoid Submerging Your Winch Completely Under Water**
Unless your winch is IP67 or IP68-rated, avoid submerging your winch completely under water for an extended period of time.
- **Avoid Electric Winch Overheating**
When winching with an electric winch for extended periods, stop at reasonable intervals to allow the winch motor to cool down. Prolonged winching (in excess of two minutes) without cooling may damage the electric motor.
- **Avoid Powering Out Winch Line**
FREE SPOOL winch line from the drum rather than powering out winch line. This reduces drum heat caused by the brake system and conserves battery power.
- **Watch Drum for Excessive Winch Line Build-up**
Winch line can easily build up at one end of the drum, especially during angled pulls. This build-up can become large enough to cause serious damage to the winch and winch line. Stop winching if the winch line builds up under the winch tie rods, tie plate, or mounting plate. To fix uneven layers on the drum, spool out the section of the line that has built up. Reposition the line to the opposite end of the drum. This action frees up space on the drum for continued winching.
- **Put Your Vehicle in Neutral When Using Your Winch to Pull a Stuck Vehicle**
To hold your recovery vehicle in place when pulling another vehicle, chock your wheels, set your parking brake, depress your foot brake, and place your transmission in neutral. A

winch pull against a vehicle in PARK may severely harm your automatic transmission by damaging its parking pawl.

- **Run Your Engine During Winch Pulls – Pay Attention to Vehicle Voltage Gauge**

To charge your battery when using your winch, run your engine at all times. If the engine is only idling during winching, the battery may drain faster than it is charging. When winching, always pay close attention to your vehicle's voltage gauge if so equipped.



EQUIPMENT CAUTION

- The extra demand a winch puts on your electrical system can be large. It is possible to exceed the system's stock electrical capabilities. If possible, get a high quality dual-purpose battery. Also consider upgrading your alternator to a higher output component. A battery with a minimum rating of 650 cold cranking amps is recommended to obtain peak performance from your winch.
- Make sure all vehicle battery connections are clean and tight. Both positive and negative cables from your winch should be connected directly to the vehicle's battery.

- **Don't Exceed the Manufacturer Maximum Rated Line Pull of Your Winch**

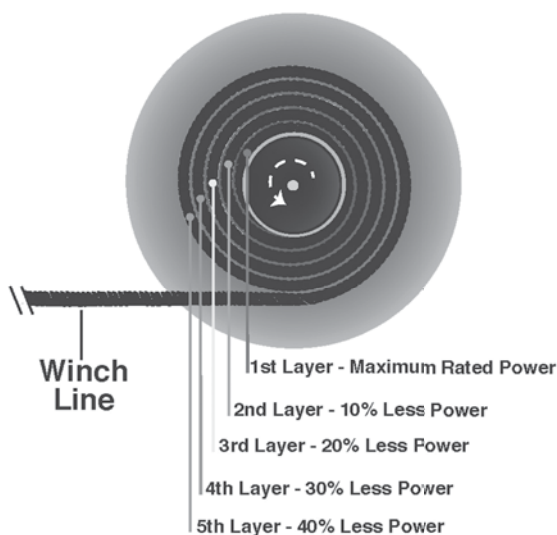
From the winch manufacturer, the rated line pull of your winch provides you with the maximum resistance load your winch can pull. You will need this information for winch capacity calculations.

The Manufacturer Maximum Rated Line Pull of My Winch Is: _____

- **Match Winch Accessories to Winch's Maximum Rated Line Pull**

It is important to match all winch rigging accessories to your winch and the calculated approximate resistance load placed on them.

SIDE VIEW OF WINCH DRUM



- **Remove Winch Line Layers from the Drum**

The manufacturer maximum rated line pull of your winch is only valid with the *first layer* of line on the drum. The more winch line layers you have on your drum, the lower the pulling capacity of your winch. Each layer of winch line on the drum reduces the rated line pull of your winch by approximately 10 percent. When rigging for a specific recovery situation, try to remove all but one or two layers of winch line from the drum.

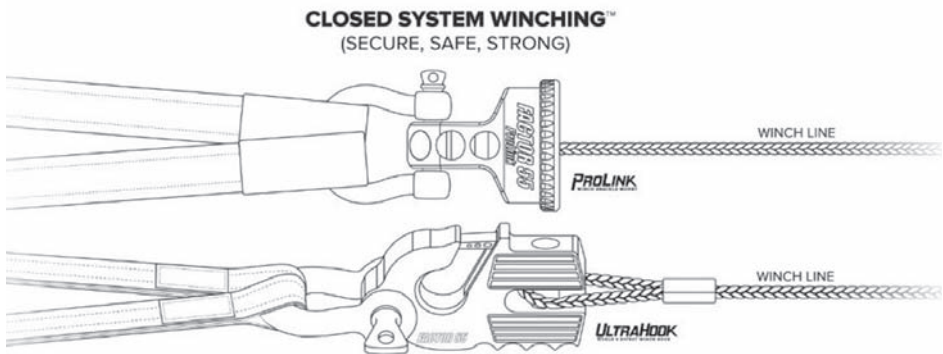
! WARNING

Never operate your winch with fewer than five evenly spaced wraps of steel cable, or 10 evenly spaced wraps of synthetic rope winch line, around the drum. If you do, the winch line could come loose from the drum when under tension and cause serious injury or death.

• **Rig for Closed System Winching**

CLOSED SYSTEM WINCHING™ is a winching technique using rigging composed entirely of closed link hardware. The non-closable opening of common winch hooks prevents hooks from qualifying as secure closed links. Poorly constructed sheet metal safety latches of hooks do not qualify as secure means to contain loads and are prone to failure, especially during momentary slack conditions in which winch loads often shift and apply high forces to these weak, non-structural latches. Hooks often come loose during vehicle recovery operations due to hook safety latch failures.

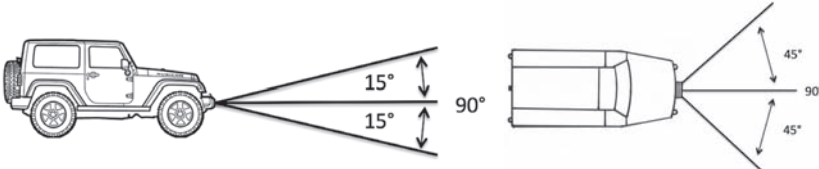
The elimination of the winch hook and the subsequent substitution of a Factor 55 ProLink, FlatLink, or UltraHook winch line shackle mount and commonly found screw pin anchor shackles or soft shackles does qualify as CLOSED SYSTEM winch tackle. Once a shackle is installed, the rigging becomes a continuous closed link that securely contains the winch load until the pin is unscrewed and removed.



Don't Make Your Winch Work so Hard

Besides removing as much winch line from the drum as possible, there are three other ways to keep your winch from working so hard during a recovery effort.

Set Up Straight Line Pulls. When setting up your winch rigging, avoid angled pulls. To maintain the rated line pull of your winch, the winch line should not exceed a 15-degree angle up and down from horizontal, or a 45-degree angle left or right from straight ahead.



Use Pulley Blocks. Introduce mechanical advantage in a winch-rigging set-up by using one or more pulley blocks. Mechanical advantage is “the ability to use a small force, moved through a long distance, to move a heavy resistance or object.”

Remove Obstructive Terrain from Around and Under Stuck Vehicles. Another method of keeping your winch from working so hard during a recovery situation is to remove and level out obstructive terrain (gravel, mud, snow, rocks) around your tires and under your vehicle. Shovels are useful for obstructive terrain removal. Also, if your stuck vehicle is high-centered on a rock or terrain, try to remove or flatten the terrain prior to winching. You may also consider raising the vehicle off the rock or terrain prior to winching.

Preparing for a Winch Pull

NOTE

Practice these steps at home prior to using your winch in the field. Don't wait to practice under duress in the field in a real recovery situation.



WARNING

- Every winching situation has the potential for personal injury. To minimize that risk, read this entire guide carefully. Familiarize yourself with all the steps, warnings, and equipment cautions in this section on making a resistance pull with your winch.
- Never operate your winch when under the influence of drugs, alcohol, or incapacitating personal medication.
- Only operate this winch when over the age of 16 years old.

Step 1 – Use the Stuck Assessment and Recovery Plan Checklist™

You can find the checklist at the end of this guide. The checklist helps you assess your stuck situation and formulate a well thought-out and mature recovery plan. Until you know every step itemized in the checklist, use it as a guide to plan your winching operations. After using the checklist a few times, you'll know it by memory. For reference in the field, keep this booklet in your vehicle.

You will primarily use the checklist to determine the approximate recovery load resistance value for your winch pull situation. Knowing this resistance value will assist you in selecting the correct winch accessories and rigging set-up to successfully and safely perform a winch pull.

Step 2 – Select Anchor Point(s)

A winch is only as good as its anchor point(s). Without a solid anchor, winch recovery is impossible or unsafe. When you winch, you must pick your designated anchor point(s) carefully. Ideally your selected anchor should be stout, and its location should allow you to pull straight ahead.

Use common sense when selecting an anchor point. There is no scientific method of selecting just the right anchor. Anchor points must be able to handle the calculated resistance load you place on them. Anchors you can use when winching include:

- Trees and stumps
- Large boulders and buried rocks
- Frame-mounted connection points on vehicles
- Ground anchors – improvised or manufactured



EQUIPMENT CAUTION

Use care when you attach your winch to a vehicle. Use only *recovery-specific* frame-mounted connection points. Do not use *transport-specific* connection points.

Connecting a winch to non frame-mounted anchor points can cause serious injury or death. Winching connection points on vehicles must be frame-mounted eyes or hooks.

The following photos show what appropriate frame-mounted connection points look like:





Step 3 – Put on Gloves and Eye Protection

Step 4 – Turn or Switch Clutch Control to FREE SPOOL

NOTE

Winch manufacturers offer multiple clutch control configurations. See your specific winch operator's guide for clutch operation details.



Step 5 – Pull Winch Line to Anchor Point



EQUIPMENT CAUTION

- Avoid stepping on synthetic rope winch line.
- When working with steel cable winch line, keep a certain amount of tension on the line while pulling it off the drum. If you do not keep tension on the line, the cable can become a twisted mess (AKA "birds nest") on the drum, possibly leading to steel cable damage during a heavy resistance pull.

Step 6 – Establish a Secure Anchor Point

Use tree straps around the bases of stout trees and stumps. Use choker chains around sharp anchors, such as large boulders and buried rocks. If possible and necessary, dig a trench at the base of a buried rock to securely hold the chain in place.

If using another vehicle as an anchor point, attach winch rigging only to frame-mounted recovery points.

WARNING

Use appropriate rigging for different anchor points and take your time to rig correctly.

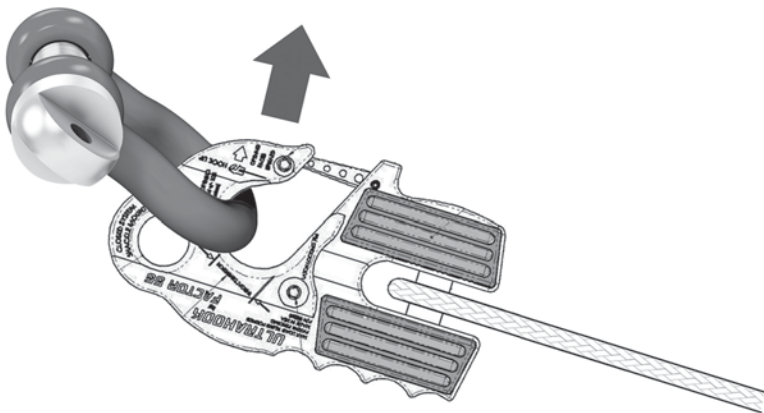
WARNING

The use of pulley blocks in winch-rigging set-ups can create danger at anchor points. Adding one or more pulley blocks to winch rigging allows your winch to pull incredibly heavy loads, loads it would not ordinarily be able to move with a single-line pull. When using pulley blocks in a winch-rigging set-up, try to use multiple anchor points. Avoid overloading any individual tree, stump, boulder, or vehicle bumper with multiple anchor connections.

Step 7 – Attach Your Factor 55 Winch Line Shackle Mount to Anchor Point Rigging

EQUIPMENT CAUTION

If using the hook feature on a Factor 55 UltraHook, place the hook in a shackle as shown – “Hook Faces Up.”



NOTE

When using a metal anchor shackle for rigging, screw in the shackle's pin all the way until tight, and then turn it a quarter turn backward to loosen. This allows the pin to be easily unscrewed by hand once a load is placed on the shackle.

If a metal anchor shackle is positioned as shown in a winch rigging set-up, the pin threads of the shackle should be at the bottom. This allows the pin to be screwed down. Should the pin somehow become loose or unscrewed from the shackle it may not fall out.



Step 8 – Lay Recovery Damper(s) Over Line(s)

Place One or Two Recovery Dampers on the winch line near connection points.



WARNING

Always use recovery dampers over winch line during resistance pulls.

Step 9 – Turn or Switch Clutch Control to ENGAGED

Step 10 – Connect or Turn On Remote Control

If you have a wired remote control, fit it carefully into the outlet on the winch control pack. The remote control plug is keyed to fit correctly into the winch outlet. If you have a wireless remote, set it up and turn it on.



EQUIPMENT CAUTION

Inspect for cracks, pinches, frayed wires, or loose connections. Keep wired remote control cord clear of the fairlead, drum, winch line, and rigging. Route wired remote carefully away from the winch and into the cab of the vehicle doing the winching.

Step 11– Winch In: Place a Small Amount of Tension on Rigging Set-Up



WARNING

Avoid stepping over a tensioned winch line.

Step 12 – Organize Winch Line on Drum

Your winch line should be neatly wound around the drum. If not, slack the winch line and reorganize it on the drum at this time.



Step 13 – Determine Actual Winch Capacity

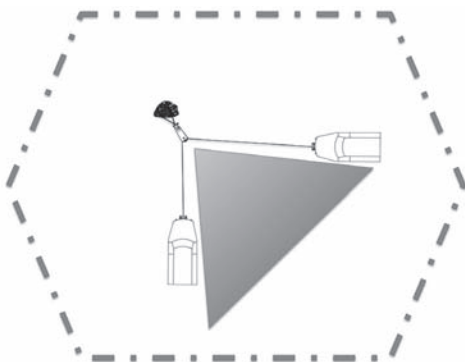
Now that you've set up your winch rigging (having pulled winch line from the drum), you can calculate the actual pulling capacity of your winch. Remember, the more winch line layers you have on your drum, the lower the pulling capacity of your winch.

Determine if you can successfully and safely make the planned pull by comparing the actual pulling capacity of your winch AND the approximate recovery load resistance value you calculated in Step One using the *Stuck Assessment and Recovery Plan Checklist™*.

Step 14 – Double Check all Rigging for Safety

Step 15 – Move All Passengers/Spectators to a Position of Safety

Be sure that everyone in the immediate vicinity surrounding the winching operation is completely aware of your intentions before you pull. Declare where the spectators should stand. Passengers and spectators should avoid standing behind or in front of the vehicle and near the winch line or pulley block. Your situation may have other “no people” zones.



Passengers and spectators should not be inside the dotted lines. The shaded area is the most dangerous. Should any part of the winch rigging break, be aware that the trajectory of broken pieces can fly well beyond the dotted lines.

Conduct a Self-Recovery Winch Pull

Step 1 – Sit in the Vehicle’s Cab

When conducting a self-recovery, sit in the cab so you can steer toward the anchor (if possible) and protect yourself.

Step 2 – Start Your Engine, Release Brakes, and Place Transmission in Neutral

Step 3 – Begin Winching Operation: Power In

Begin to power in slowly and steadily. Steer toward anchor point if possible. Continue to winch until unstuck.

NOTE

- Stop the winch periodically to see if the winch line is winding evenly and tightly around the drum. Watch the winch damper carefully, making sure it does not get pulled into the fairlead. Release tension on winch line prior to approaching the winch.
- If an anchor begins to bend or move when a winching load is placed on it, release tension in the winch line and find another anchor, or reposition the tree strap or choker chain.



WARNING

If during a self-recovery operation your winch is having a difficult time moving a stuck vehicle, try the following (in priority order):

1. Use winch-rigging set-ups that: a) avoid angled pulls (up and down, right and left); b) organize your rigging so you can initially pull as much winch line off the drum as safely possible; and c) include one or more *moving* pulley blocks in your winch-rigging set-up so as to add mechanical advantage.
2. Put the stuck vehicle in gear and use its engine power as an assist. Be aware that a powered driveline assist by the stuck vehicle may cause a *shock load* on the winch line – momentary slack in the line, then quick high tension. This is one situation where closed system winching with a Factor 55 Winch Line Shackle Mount is much safer than using a winch hook.

After A Winch Pull

Step 1 – Power Out: Release Tension on the Winch Line

Step 2 – Turn Clutch Control to FREE SPOOL

Step 3 – Dismantle Rigging Set-Up



Step 4 – Secure Winch Line

• Respooling Winch Line on the Drum

If you are completely finished with winching activities, respool the line onto the drum tightly and without gaps between wraps. This readies the winch line for a pull in the future.

WARNING

- Avoid letting winch line slide or slip through your hands.
- Wear gloves at all times when handling winch line.
- All electric winches continue to run for a moment (*run-on*) once you deactivate the remote control. Beware of winch *run-on* when pulling line onto the drum.

EQUIPMENT CAUTION

When storing your Factor 55 winch line shackle mount on your vehicle, do not over-tension the winch line or mount against the fairlead. This can cause damage to the mount, fairlead, and winch line.

• Butterflying Winch Line on Front Bumper

If while on a trail you believe you will need to winch over and over again, you need not take the time to respool your winch line on the drum. If your front bumper allows you, butterfly the line around a bull bar or off-road lights.



EQUIPMENT CAUTION

- Do not travel at high speeds on the highway with winch line butterflied on your front bumper.

Step 5 – Disconnect and Store Remote Control



EQUIPMENT CAUTION

- Avoid driving on the highway with a cabled remote control connected to your winch.
- When removed from the winch, store your remote control in a dry, safe location.

Notes on Vehicle-Assisted Winching

Besides self-recovery, winches can also be used to help others when they are stuck in the remote backcountry. The following are important considerations for vehicle-assisted winching.

Drivers Should Communicate. As in any collaborative operation, there needs to be good planning, communication, and a leader. The individual with the working winch is typically in control of the recovery effort.

Actions by the Driver of a Stuck Vehicle. Prior to winching, the driver in the stuck vehicle should:

- **Start Engine.** If possible, or release steering wheel with key.
- **Place Transmission Gearing in Neutral**
- **Release Parking Brake**
- **Steer Vehicle As Discussed During Planning Session**
- **Be Mindful of Rigging Breakage**
- **After Getting Unstuck.** Be prepared to keep the vehicle from rolling out of control by applying foot or parking brake.

Actions by the Driver of the Recovery Vehicle. Depending on the size and weight of both the stuck vehicle and the vehicle doing the winching, more often than not, the driver of the vehicle doing the winching needs to:

- **Keep the Recovery Vehicle Firmly in Place – Without Movement.** There are several ways to do this. The driver of the recovery vehicle should use one or more of the following techniques.
 - **Activate the Recovery Vehicle's Brakes**
 - **Chock and Block Tires**
 - **Anchor the Recovery Vehicle from the Rear**
- **Start the Engine**
- **Place a Manual Transmission out of Gear**
- **Place an Automatic Transmission in Neutral.** Avoid placing the recovery vehicle's automatic transmission in "Park."



EQUIPMENT CAUTION

Winching with an automatic transmission in PARK may create unacceptably high pressure on the transmission's *parking pawl* system should the vehicle begin sliding while winching. If the vehicle slides (tires are static – not turning) with the parking pawl engaged (vehicle in PARK), it could break off important components within the transmission. Breaking any component in the parking pawl system in the remote backcountry is not a good thing.

- **Raise Engine Hood.** Consider raising the engine hood on the recovery vehicle for added protection.

Illustrated Winch Rigging Set-Ups

Read through the outlined winch rigging set-up descriptions while examining the associated illustrations. The next time you need to rig a winch set-up, use these illustrated references as a starting point.

NOTE

No two winching situations are ever the same due to the variables in the natural environment. Inexperienced winch operators should use the illustrated rigging set-ups shown only as a starting point when dealing with any real-life recovery situation.



WARNING

- During actual winching recovery situations, be aware of a vehicle's stability (or lack thereof) on loose and slippery terrain. Caution bystanders of dangerous winching situations.
- Once a vehicle is recovered or tipped upright, be careful of the possibility it may roll away uncontrollably. Before a recovery operation, plan for this event.

Single-Line Pull (Illustrations 1 and 8)

This is the simplest of all winch-rigging set-ups. If your calculated surface and slope resistances are small, then perhaps this rigging set-up can extract a bogged vehicle. You can also use this rigging to move downed trees and boulders off blocked trails. This rigging set-up provides no mechanical advantage.

Double-Line Pull (Illustrations 2 and 9)

This winch-rigging set-up is probably used more than any other. You need one pulley block, a tree trunk protector strap, and one or two shackles. It sets up fairly quickly and, because two winch lines get shorter as the winch pulls in line, it provides a useful 2:1 mechanical advantage. This mechanical advantage gives the winch twice the manufacturer maximum rated pulling capacity, but half the line speed. Compared to a single-line pull, you need to pull twice the amount of line to move the vehicle the same distance.

Triple-Line Pull (Illustrations 3, 10, 11, and 12)

A triple-line winch pull is often used in severe recovery situations. This set-up is best when using two anchor points (natural or manmade) because it equally divides the total load between them. To set up this rigging you need two pulley blocks, a couple of tree trunk protector straps, and three or four shackles. Because this set-up has two moving pulley blocks (allowing three winch lines to get shorter as the winch pulls in line), it has a powerful 3:1 mechanical advantage. This mechanical advantage gives the winch three times the manufacturer maximum rated pulling capacity, but the line speed is three times slower. Illustrations 11 and 12 show a lighter recovery vehicle pulling a heavier vehicle up a slope. Notice the rear anchor point on the recovery vehicle to keep it solidly in place during a pull.

Straight Pull on a Narrow Trail (Illustration 4)

This illustration exhibits how you can think “out of the box” when setting up winch rigging. You are bogged on a narrow trail (or you need to pull yourself off a high-centered boulder), but there’s no anchor point directly in front of you. What do you do? In this situation you can use an extra-long rigging strap (or something similar) around an anchor to position the pulley block in the middle of the trail. When the pulley block is positioned as shown, the vehicle can be pulled straight up the trail. The pulley block acts as a “change of direction” device (a *fixed* pulley block) and adds no mechanical advantage to the rigging.

Two-Direction Pull (Illustration 5)

There are many winching scenarios where a two-direction pull would be useful. Pulling a sliding vehicle back on a narrow trail, as shown here, is one. The vehicle is not only pulled forward but, at the same time, the rear connection point also slides the vehicle back onto the trail (pulling the tires sideways without rolling). Even though there are two pulley blocks in the illustration, only two lines get shorter: the line from the winch to pulley block #1, and the line connected to the rear of the vehicle to pulley block #2. This rigging provides a 2:1 mechanical advantage. A note of caution when pulling tires sideways on a trail: Make sure the tires are aired up to their highway-designated pressure before you pull them sideways. If they are not aired up, you risk forcing a tire bead off a rim.

Righting a Tipped Vehicle (Illustration 6, 13, 14)

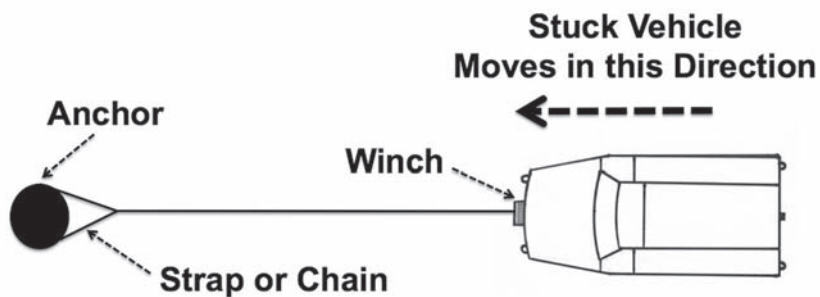
It is possible to right a tipped- or rolled-over vehicle using self-recovery or vehicle-assisted recovery. Some hard work and a few winching accessories are necessary. Having a hill on one side of the trail can help as well, although it is not required. The actual rigging set-up will vary greatly with differing circumstances and types of vehicles. Considerations include: 1) the position of the vehicle in relation to the trail and to the winching connection point, 2) the vehicle’s stability (or instability) on the trail, 3) available frame-mounted connection points on the side of the vehicle (rock sliders, roll bar, B-pillar, etc.), 4) pulley block anchor points on trees

or rocks, and 5) vehicle damage. In some cases, you need to extend straps around the top of the vehicle's roof or roll bars, and down to the side resting on the ground. Once you pull a vehicle back on its wheels, make sure it can't roll away.

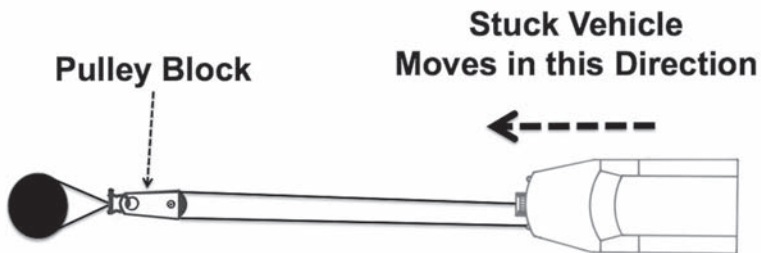
Change of Direction (Illustration 7)

As a vehicle-assisted recovery, this winch-rigging set-up shows how to pull a stuck vehicle that is not directly in front of the recovery vehicle. The pulley block only serves as a change of direction device; it does not provide a mechanical advantage in the rigging since only one winch line gets shorter.

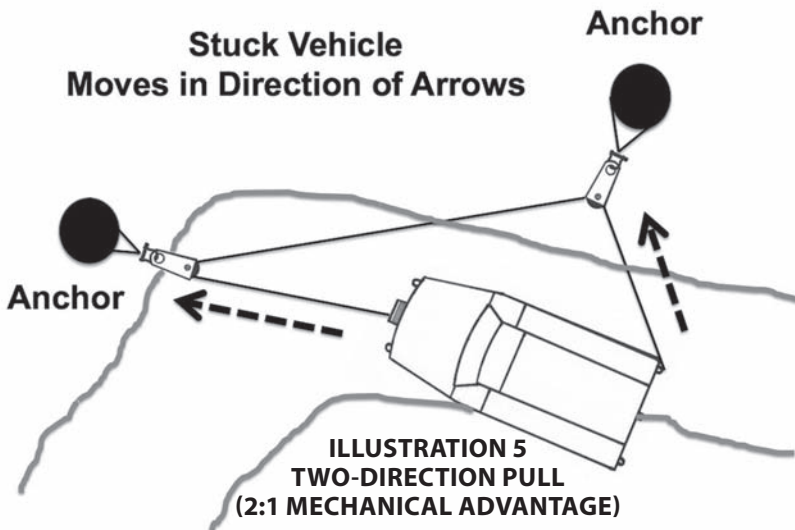
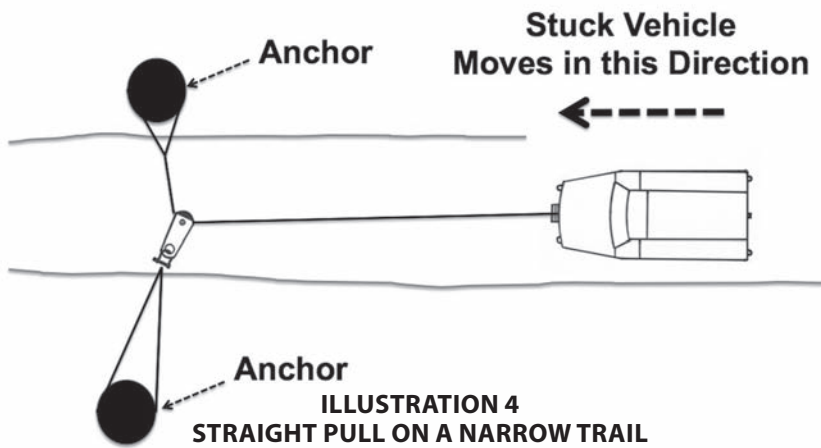
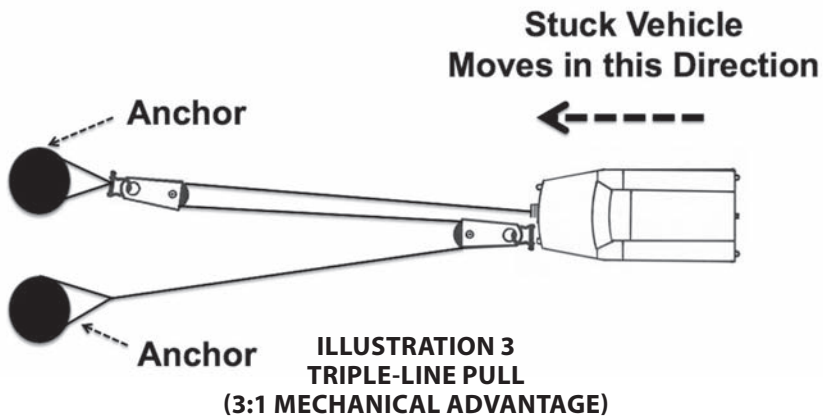
Self-Recovery Winch Rigging Set-Ups

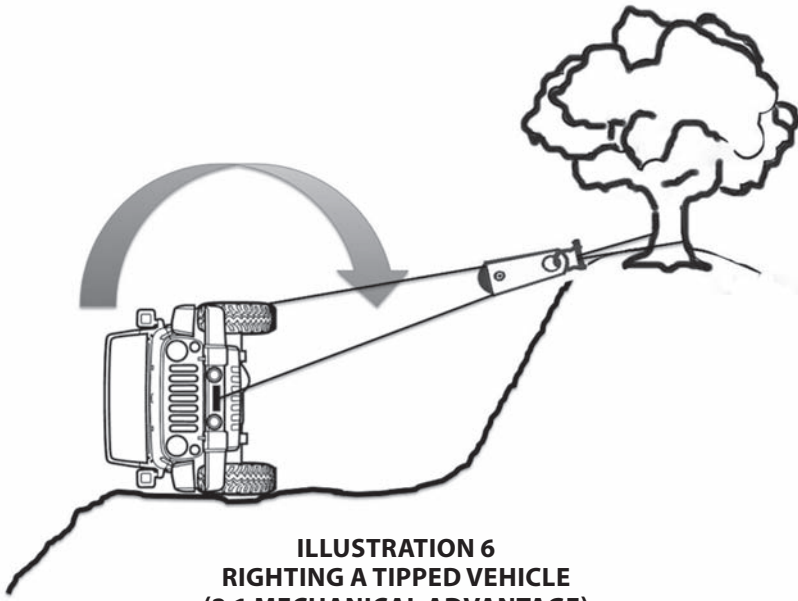


**ILLUSTRATION 1
SINGLE-LINE PULL**

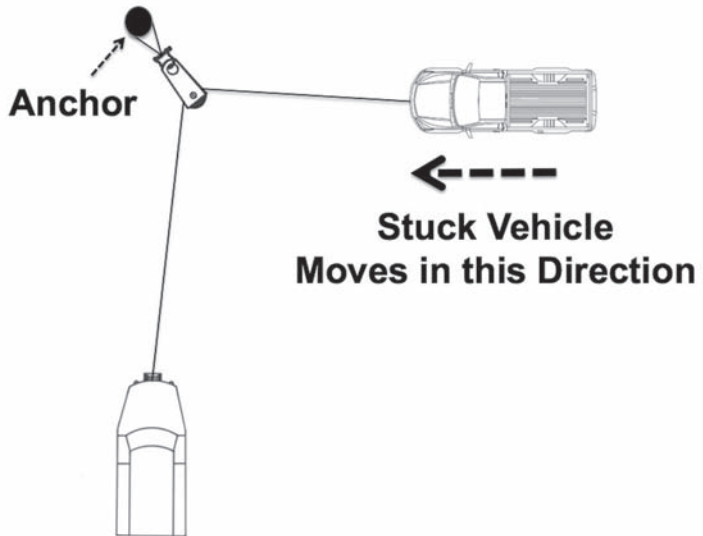


**ILLUSTRATION 2
DOUBLE-LINE PULL
(2:1 MECHANICAL ADVANTAGE)**



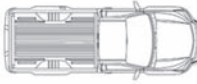


Vehicle-Assisted Winch Rigging Set-Ups

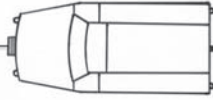


Stationary Recovery Vehicle
ILLUSTRATION 7
CHANGE OF DIRECTION

**Stuck Vehicle
Moves in this Direction**

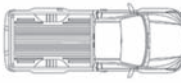


**Stationary
Recovery Vehicle**

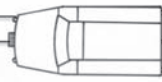


**ILLUSTRATION 8
SINGLE-LINE PULL**

**Stuck Vehicle
Moves in this Direction**

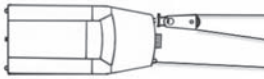


**Stationary
Recovery Vehicle**

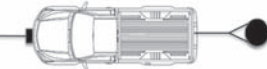


**ILLUSTRATION 9
DOUBLE-LINE PULL
(2:1 MECHANICAL ADVANTAGE)**

**Stuck Vehicle
Moves in this Direction**



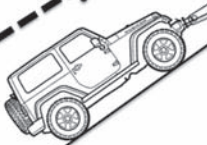
**Rear Anchored
Recovery Vehicle**



Anchor

**ILLUSTRATION 10
TRIPLE-LINE PULL (TWO ANCHOR POINTS – TOP VIEW)
(3:1 MECHANICAL ADVANTAGE)**

**Stuck Vehicle
Moves in this Direction**



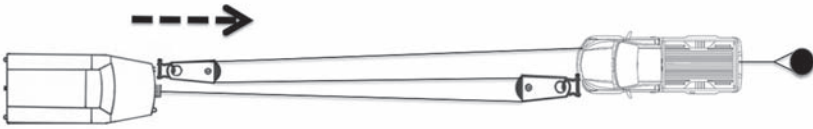
**Rear Anchored
Recovery Vehicle**



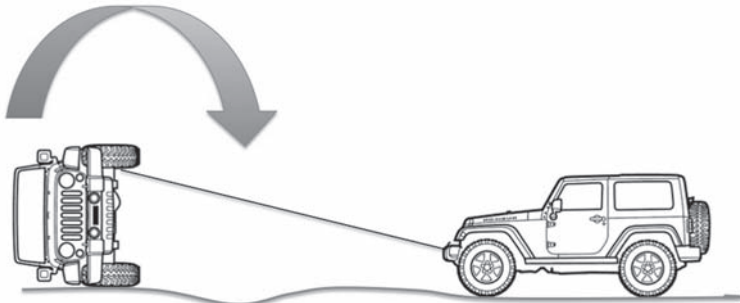
**ILLUSTRATION 11
TRIPLE-LINE PULL (TWO ANCHOR POINTS – SIDE VIEW)
(3:1 MECHANICAL ADVANTAGE)**

**Stuck Vehicle
With Winch
Moves in this Direction**

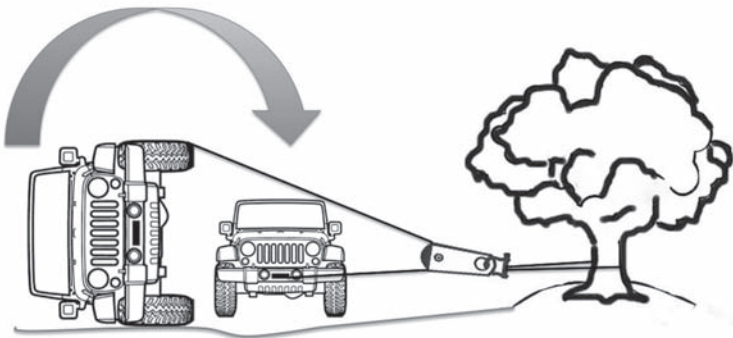
**Vehicle Acts
As Anchor**



**ILLUSTRATION 12
TRIPLE-LINE PULL (ONE ANCHOR POINT)
(3:1 MECHANICAL ADVANTAGE)**



**ILLUSTRATION 13
RIGHTING A TIPPED-OVER VEHICLE**



**ILLUSTRATION 14
RIGHTING A TIPPED-OVER VEHICLE**



STOPA – Stop, Think, Observe, Plan, Act Stuck Assessment and Recovery Plan Checklist™

START HERE Accept that you are bogged – stuck. If you are physically well and healthy, then most other problems pale in comparison. Relax. Breathe naturally. Refuse to get agitated, frustrated, embarrassed, or humiliated. Go about recovery patiently, deliberately, and methodically.

Select Kilograms or Pounds for Load Assessment

Work in either Metric or Imperial measurements, not both. The Working Load Limit (WLL) ratings of anchor shackles and some other recovery gear are often listed in metric tons and some in U.S. tons. Refer to manufacturer information for which tonnage is used – metric or U.S. If unsure of the type of tonnage rating, use the U.S. ton, as its rating would be more conservative.

Convert metric tons to either kilograms or pounds. Rigging straps, pulley blocks, and other winching gear should be labeled with WLLs. If not, it is hard to conduct a thorough load assessment.

- 1 U.S. Ton (AKA *Short Ton*) = 2,000 pounds (4 $\frac{3}{4}$ -Ton Anchor Shackle = 9,500 pounds;
3 $\frac{1}{4}$ -Ton Anchor Shackle = 6,500 pounds)
- 1 Metric Ton = 2,205 pounds (4 $\frac{3}{4}$ -Ton Anchor Shackle = 10,474 pounds;
3 $\frac{1}{4}$ -Ton Anchor Shackle = 7,166 pounds)
- 1 U.S. Ton = 907 kilograms
- 1 Pound = 0.45 kilogram
- 1 Kilogram = 2.2 pounds
- 1 Metric Ton = 1,000 kilograms

S = Stop, Sit down, and/or Stay put until the situation is Safe.

Directions: Check box if statement is true.

- Driver(s) or Passenger(s) are Physically Hurt

Do not begin recovery; begin appropriate wilderness first aid assessment/treatment. Call for assistance if necessary.

- Immediate Danger to You, Others, or Vehicle?

I need to hurry through the Checklist due to a time-sensitive situation. Vehicle fire? Tide coming in?

- I Can Work Slowly
- I Need to Hydrate/Eat Before Continuing
- I Need to Rest Before Continuing

T = Think.

Directions: Check box when you've thought about the situation.

- Solo Adventure? (Self-Recovery Necessary)
- With Other Vehicles? (Vehicle-Assisted Recovery Possible)
- Traction Recovery?
- Powered Winch Recovery?
- Hand Winch Recovery?
- Kinetic Energy Recovery? (Yank Strap/Rope)
- Field Repair Recovery?
- Towing Recovery?
- Think About Vehicle Rolling Uncontrollably Once Unstuck
- Think About Your Location – Distance to Definitive Assistance

If Necessary:

- Think About Where Help Might Come From
Commercial Towing? Search & Rescue?
- Think About How to Reach Out for Help
Emergency Communication Devices
- Think About Your Survival Supplies in Vehicle
- Think About Your Wilderness First Aid Training

O = Observe.

Directions: Check box when observation complete, or write out requested information.

- Walk Around Stuck Vehicle Twice – Observe:
 - Possible Dangers: _____
 - Condition of Vehicle: _____
 - Inspect Vehicle for Broken/Malfunctioning Powertrain or Steering/Suspension Components
- Observe Stuck Vehicle's Underbody
 - High-center Problem?
 - Damaged Powertrain, Steering, or Suspension Components?
 - Dripping Liquids or Moisture?
 - Dangling Cables, Wires, Components?
- Determine Why Vehicle is Stuck
List Reason(s): _____

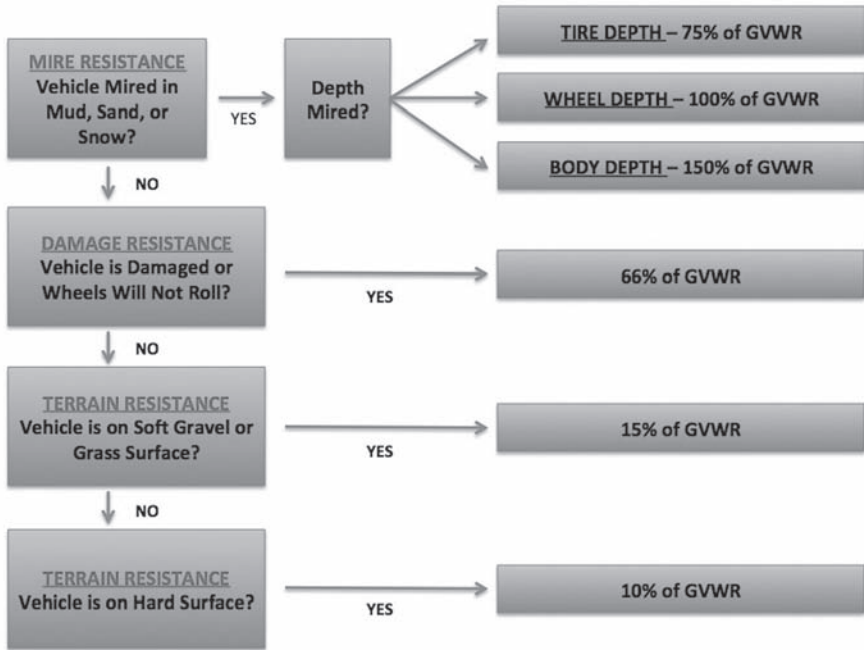
- Observe Trail to the Rear of Stuck Location
Easier? Better Traction?
- Observe Trail In Front of Stuck Location
Easier? Better Traction?
- Observe Existing Tire Tracks to Identify Easy Route on Trail
- Observe Map/GPS - How Far to Assistance or Fuel/Supplies?
- Observe How Difficult/Far is the Entire Route Ahead of You?
- Observe How Difficult/Far is the Entire Route Behind You?
- Observe Fuel Level & Battery Condition
- Observe Tire Condition and Current Pressure
- Observe Appropriate Working Load Limits (WLL) of All Recovery Equipment
Relative to Approximate Recovery Resistance Values
- Observe Recovery Vehicle
 - Winch? Yes No
 - Number of Front Frame-Mounted Recovery Points: _____
 - Number of Rear Frame-Mounted Recovery Points: _____
 - GVWR of Recovery Vehicle: _____ Kilograms/Pounds
 - Needs Rearward Anchor to Hold in Place when Winching

By Observation:

Determine Approximate Recovery Resistance Values

- **GVWR** of Stuck Vehicle: _____ (See Door Jamb Sticker)
- **Surface Resistance:** _____
Use Chart 1 to determine Surface Resistance. Choose ONE: Mire, Damage, or Terrain Resistance
- **Slope Resistance:** _____
Use Chart 2 to determine Slope Resistance.
- **TOTAL** (Surface + Slope Resistance) = _____
[Consider adding 10% of GVWR as a Safety Margin to above total]

CHART 1 Approximate Surface Resistance Values*



USE ONLY ONE SURFACE RESISTANCE VALUE ON THIS CHART

Mire Depth

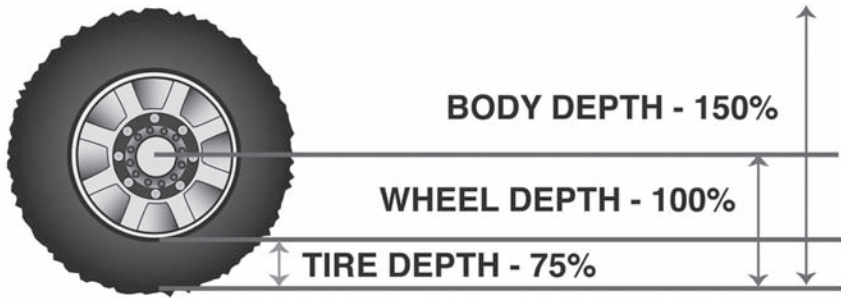
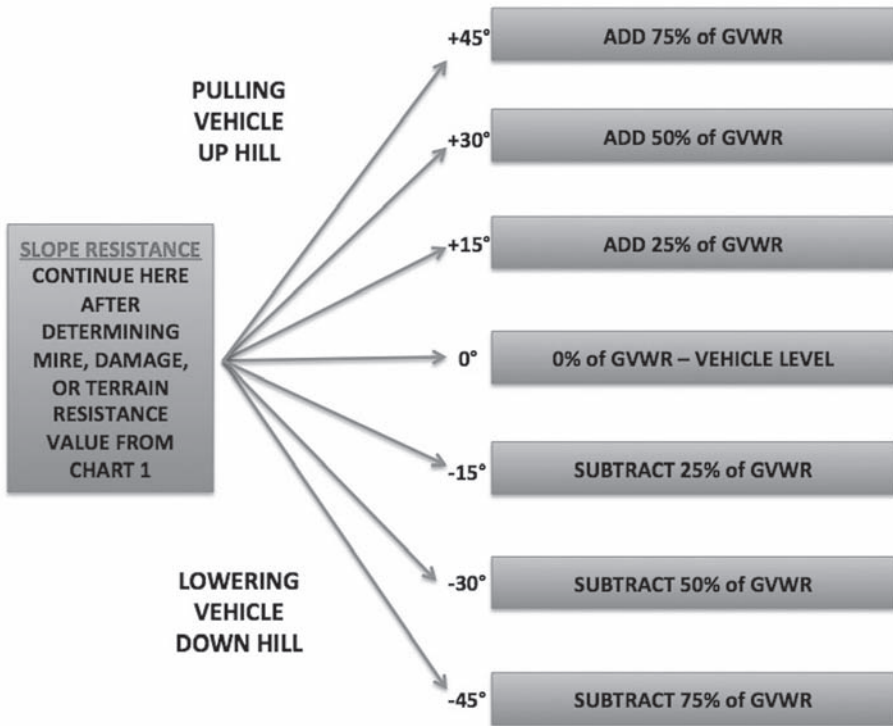


CHART 2 Approximate Slope Resistance Values*



*Chart 1 and 2 Resistance Values come directly from WreckMaster, the pre-eminent North American tow truck training company. Their resistance values have been scientifically determined by quantitative methodology and validated by years of in-field experience.

P = Plan

Directions: Check appropriate box or write out requested information.

- Self-Recovery
- Vehicle-Assisted Recovery – Conduct Drivers Meeting
- Move Stuck Vehicle Forward – Easier, Better Traction
- Move Stuck Vehicle Rearward – Easier, Better Traction
- Right a Tipped or Rolled Over Vehicle

If Stuck – Primary Recovery Plan Will Use These Traction-Aiding Devices (TADs) or Strategies:

- Engage 4WD

- Engage Electronic Traction Control
- Engage Center Locker
- Engage Rear Locker
- Engage Front Locker
- Disconnect Sway Bar
- Lower Tire Pressure

Initial Air-Down or Lowering Tire Pressure Further to 70% of Manufacturer-Recommended kPa/PSI

- Trail Reconstruction or Reconfiguration
- Solve High-Center Problem
- Move a Small Vehicle Sideways Back on Trail
- Deploy Traction Boards
- Deploy Bridging Ladders
- Install Snow Chains
- Deploy Powered Winch and Rigging Accessories

Use Approximate Total Recovery Resistance Value to Determine Appropriate WLLs

- Deploy Hand Winch and Rigging Accessories

Use Approximate Total Recovery Resistance Value to Determine Appropriate WLLs

- Deploy Kinetic Energy Recovery Rope or Strap

Use Approximate Total Recovery Resistance Value to Determine Appropriate WLLs

- Jump Start Dead Battery
- Remove Weight from Heavy Vehicle

A = Act

*Directions: Check box when completed. If after acting on your primary and secondary recovery plan it fails to get you unstuck or moving again, return to the **Plan** step and formulate another recovery plan.*

- Move All Passengers/Spectators to a Position of Safety
- Begin Working the Primary Recovery Plan
- Double Check all Recovery Rigging Connections for Safety
- Primary Recovery Plan Fails – Initiate Secondary Recovery Plan

Recovery Effort Fails – You are Solo:

- Use Electronic Communication Device to Call for Assistance
- Make Camp and Use Survival Kit to Wait for Assistance
- Prepare Near-Location Signaling Devices

Recovery Effort Fails – You are With Other Vehicles:

- Call for Assistance
Cell; Emergency Communication Device
- Tow Disabled Vehicle
- Abandon Vehicle, Send/Go with Others for Assistance

Actual Winch Capacity

Manufacturer Maximum Rated Winch Capacity: _____ Kilograms/Pounds

Actual Winch Capacity: _____ Kilograms/Pounds

Winch – Actual Pulling Capacity*

Number Layers on Winch Drum	Percent of Maximum Winch Rated Capacity	Percent of Loss Winch Capacity**
1 st Layer of Drum	100%	0%
2 nd Layer of Drum	90%	10% (.1)
3 rd Layer of Drum	80%	20% (.2)
4 th Layer of Drum	70%	30% (.3)
5 th Layer of Drum	60%	40% (.4)

*Manufacturer maximum winch capacity ratings are only valid with one layer of winch line on the drum. More than one layer of winch line on the drum reduces the winch's physical pulling capacity. Begin a winch recovery with at least five evenly spaced wraps of steel cable, or 10 evenly spaced wraps of synthetic rope winch line, around the drum.

**To calculate the total winching capacity with more than one layer of wraps on the drum, use this formula: Total Winch Capacity – [Total Winch Capacity x (percent loss Winch Capacity)] = Reduced Winch Capacity. Example for a 9,000-pound rated winch with four layers of line on the drum: 9,000 – (9,000 x .3) = 9,000 – 2,700 = 6,300 pounds of pulling capacity.



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