Four Wheeler's

GUIDE TO WINCHING

Everything you need to know about getting unstuck

If you're an avid four wheeler, there's no need to mention how valuable a winch is when you're stuck in the boonies with the tires spinning and the vehicle going nowhere fast. A quick plug-in of the winch control, the spooling out of a little cable, and a flip of the control switch quickly gets your vehicle moving down the road again without breaking a sweat.

On the other hand, if you're a first-time four-wheel drive owner, maybe the idea of having a winch handy sounds good, but the thought of buying one and using it is intimidating. No need to fear. The winch is just a simple tool: An electric motor spins a gear arrangement, which turns a drum that reels in cable.

They are just as easy to buy. Walk into just about any four-wheel drive center or browse through anyone of a dozen magazines that relate to hunting, fishing, or four wheeling, and you'll come face-to-face with 12-volt electric winches that are designed to meet just about any four wheeler's needs. Prices range from about $400 to $1,400, depending upon size, accessories, and mounting kit. Most investments run about $700.

The key to being happy with the winch is making the right choice at the outset, and knowing how to use it when the need arises.

THE "PERFECT" WINCH?

Finding the perfect winch is impossible. It would be inexpensive yet last forever. It would be very lightweight and compact yet able to move mountains with ease. It would put very little strain on the vehicle's electrical system yet perform its strong-arm magic like it had an unlimited source of power. The closest that today's manufacturers have come to this ideal is a compromise of all the "perfect" winch's characteristics. So you have to use other criteria to choose your winch.

Where do you go that you'll need a winch? How often will it be used? To what type of vehicle will the winch be outfitted? And how much money are you willing to pay for electric muscle?

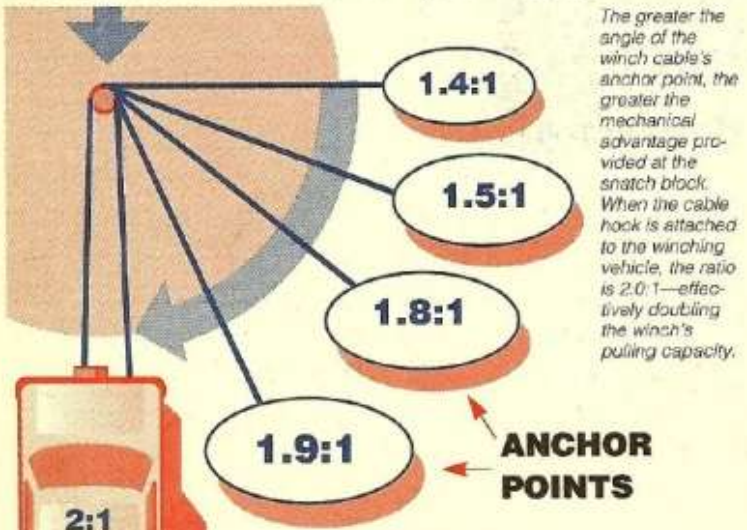
If you're an outdoorsman, the need for a winch could come during the winter months when a lot of snow and mud make backroads travel a little venturesome. Or it may be used infrequently during the spring and fall, when the hunting seasons beckon. Or possibly you're just a lightweight four wheeler; one who likes to go play and explore just for the doing.

Regardless of the reason for wanting a winch, the important factor to consider is what vehicle is it going to be put on. Choosing the wrong winch—either too big or too small—for the vehicle poses problems.

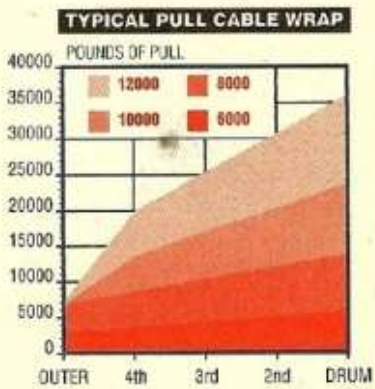
Selecting the right winch for your vehicle is a matter of rationally analyzing a number of factors, starting with the vehicle's Gross Vehicle Weight Rating (GVWR), the maximum weight the factory feels the vehicle is safely capable of supporting; this includes fuel, passengers, and cargo (which includes modifications like auxiliary fuel tanks, lift kit, heavy-duty bumpers, and so forth). The GVWR number is usually located on the vehicle's metal ID tag riveted to the frame of the driver's-side door. A winch with a maximum pulling capacity of 2,000 pounds greater than the vehicle's GVWR is sufficient for most needs, according to most winch manufacturers.

For example, suppose your vehicle's GVWR is 6,100 pounds, the same as a late-model Ford F-150's. That means you should be looking for a winch that will provide at least 8,000 pounds of working load capacity. Likewise, a 6,000-pound-capacity winch would be ideal for a vehicle with a GVWR of around 4,000 pounds.

To make life a little easier, here's a quick grouping of vehicles within basic GVWR classes (see next page):



The greater the angle of the winch cable's anchor point, the greater the mechanical advantage provided at the snatch block. When the cable hook is attached to the winching vehicle, the ratio is 2.0:1—effectively doubling the winch's pulling capacity.



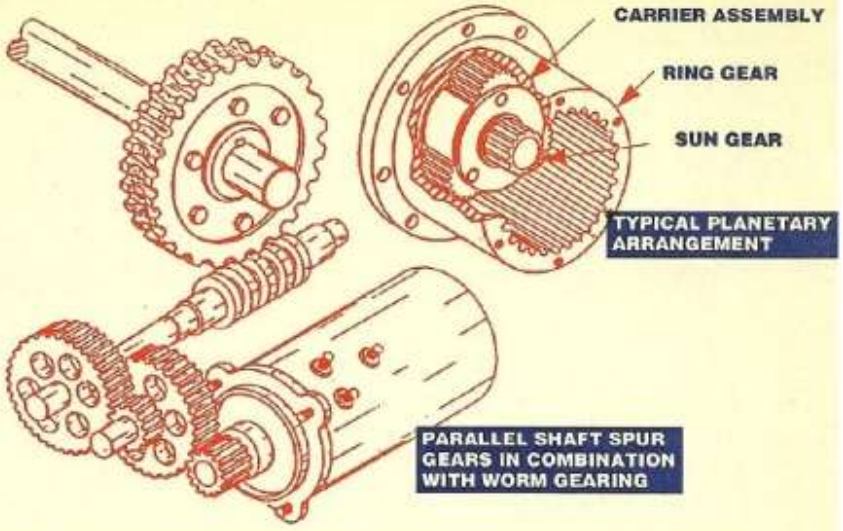
VEHICLE GVWR RATINGS

3,500-4,500 lb. GVWR (6,000-lb. winch minimum): Most import pickups and compact sport/utility vehicles.

4,500-6,000 lb. GVWR (8,000-pound winch maximum): Dodge Dakota, Bronco, Blazer/Jimmy, GM S-pickups, and some full-size pickups.

6,000-8,000 lb. GVWR (10,000-pound winch maximum): Most full-size pickups.

8,000 lb.-up GVWR (12,000-pound winch maximum): Suburbans; heavy-duty full-size Ford, Dodge, GM pickups.



Winch gear systems: *Winches consist of two basic gear systems, worm-and -gear and planetary gear. Worm-and-gear winches use a spiral "worm" gear the transfer the winch motor's power to a gear attached to the cable drum. They're the stronger of the two and provide automatic load-reversing if electrical power is lost. A planetary-gear winch uses small gears that mesh with and revolve around a "sun gear" attached to the winch motor. The planetary gears mesh inside a ring gear the attaches to the cable drum.*

So much for the easy part. Now that you have a feel for how much winch you need, you have to decide on which winch to get. Comparing "apples to apples" isn't always easy with winches, though.

Pulling power is the first figure most people look at when comparing winches. How that rating is derived is very important. Look closely at the brochures. The specifications you're looking for concern *single-line pull on the first layer of cable on the drum.*

Single-line pull is just what it implies: a single line attached between the winch and the object at the end of the hook. A winch drum is actually another gear in the overall scheme of things; the larger the diameter gets, as more cable winds on to it, the less the winch's ability to pull becomes.

Taking the rated single-line pull from the first layer of the winch drum shows the maximum power the winch can exert when it is being supplied with a full 12.5 volts, which is what a fully charged 12-volt battery puts out.

Then look for *maximum working load.* By closely studying the cable speed at maximum working load, one can see how close the winch is to stalling, which can lead to a burned-out winch motor and solenoids if left engaged at that point.

Next is *line speed.* Not necessarily a big factor, but something to consider if time is of the essence—say, while winching in pouring rain or sub-zero weather. Line speed and *amp draw* on your vehicle's electrical system are closely related; the longer it takes to spool the cable in, the more the drain on the battery.

Remember, no matter what the winch's rating is, it will only pull as much as the vehicle's electrical system will allow. A weak battery means a weak winch. The higher the cold-cranking and reserve capacity rating of a battery, the better your winch will perform.

SPUR GEARS

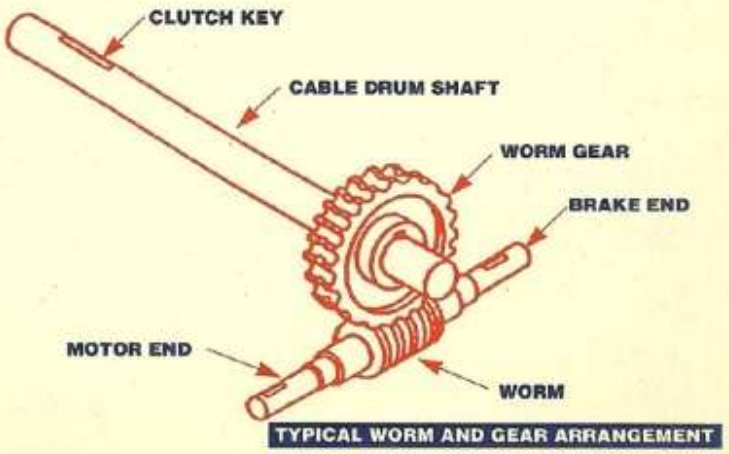
Spur-gear winches use gears with teeth cut straight across the edge of the gear, with a small gear on the motor turning a big gear on a parallel shaft attached to the drum. The straight-cut teeth provide great load-bearing ability but little if any "load-reversing" protection, so an external clutch and braking system must be employed. This combination takes up a lot of room. The perfect (and only remaining) example of this winch design is Warn's Model 8274.

This type of winch is fast and strong, but not as compact as a spur-gear system that incorporates a planetary gear design.

These svelte, low-profile counterparts—like Ramsey's REP-series and Warn's M-series planetary gear winches—place all the gears so they rotate around a common center shaft. This inline gear design uses a center gear, called the sun gear, to mesh with (usually) three larger gears, called planet gears, rotating around its perimeter. The planet gears are enclosed or attached to a carrier. They are also in mesh with a case-like stationary ring gear that encases the whole works.

When the sun gear rotates, it causes the planet gears to do the same. The planet gears move around the inside of the stationary gear case and, in turn, cause the carrier to turn at the rate of reduction between the sun gear and the planet gears. In most of today's planetary gear winches, this gearing works out to be a ratio between 160.0:1 to 290.0:1, with a common ratio being 216.0:1. This is just as strong a gear setup as the basic spur gear, with the advantages of compactness and lower amp draw outweighing a small loss of line retrieval speed.

Worm-and-gear winches are neither as bulky as the straight spur-gear winch nor as compact as the planetary design. But they are just as strong as the former and have their own advantages. They are considered to be stronger and longer-lasting than the planetary design because their sizable gears provide more metal-to-metal surface area to bear the tremendous internal loads applied when winching.



ELECTRIC MOTORS

Two types of electric motors are currently being used in winches: permanent magnet and series-wound.

The most efficient, as far as amp draw itself is concerned, is the permanent magnet electric motor, which utilizes ceramic magnets to create the magnetic field vital for the motor's operation. (Permanent magnets are used in your 4x4's starter.) Ramsey, which uses this type of motor in its light-duty REP-series winches, considers them more efficient at high speeds and says they draw less amperage at the lower end.

One rumor that persists among winch users is the permanent magnet's tendency to have a cumulative loss of strength after hard, long uses, affecting the winch's pulling ability over a period of time. What actually happens, though, is a permanent-magnet motor will shut down completely if it gets really hot and will not function properly until it cools down. Ramsey admits this type of winch is great for the occasional user, but not for serious heavy-duty work. (That's why Ramsey, the only winch manufacturer that sells both types of winch motors, offers winches with either permanent magnet and series-wound motors.) Smoke a permanent magnet motor, and it's finished.

Series-wound motors have been around for decades and stand up well against the rigors of heat and hard use. They are less efficient than their permanent-magnet counterparts, drawing more amperage under the same load conditions, but they develop more torque under higher loads, which is what serious winch users seek. A series-wound winch motor is designed for medium- to heavy-duty winch use and will outlive a permanent-magnet motor put to the same task.

A winch's line speed is a factor based upon how much energy the electric motor expends. A series-wound motor, for example, develops torque (pulling power) from the amount of amperage available from the battery and its line speed from the amount of voltage available. In basic language: The more juice it gets, the more it pulls and the faster it operates.

Now that basic winch capability and internal motor design factors have been considered, there's a small matter of how to multiply the electric motor's power. The design theory behind every winch is to gear it low enough to pull a great load without draining too much from the vehicle's electrical system, yet have the winch geared fast enough so it doesn't take forever to get the line reeled in. A tricky situation. Winch manufacturers use two basic ways to convert the bi-directional starter motor's spinning shaft into a mechanical force that can reel in thousands of pounds of load: "spur gears" and "worm-and-gear."

DUAL BATTERY AUTOMATIC CONTROL SWITCH

This allows full charging of both batteries. The switch is automatically open when the vehicle is parked and, regardless of how much power is used from the auxiliary battery, the starting battery is not affected. The setup is highly recommended.

WINCH WIRING TIPS

All of today's winch kits come with detailed installation instructions for mounting and wiring. However, you can customize the wiring to fit your specific needs.

For example, the solenoid control box doesn't have to be mounted on or beside the winch. Many four wheelers add longer wires and relocate the box inside the bumper for more protection from the elements. The winch control cable plug-in can be moved, too.

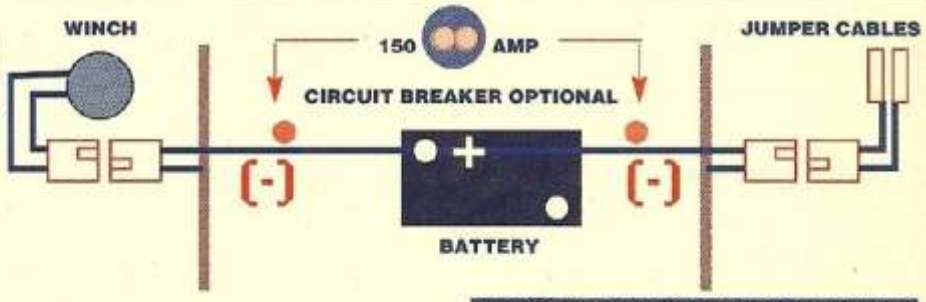
Both Warn's and Ramsey's control cable receptacles can be mounted in a hole drilled into the bumper; or dash-mounted inside the cab where the connector is well protected and the operator is out of potential danger areas should the cable snap or something else break loose.

There is also no need to run the ground cable from the winch to the negative (-) post of the battery. It can be attached to any good ground point on the frame. Where the winch mount bolts to the frame is ideal. Of course, this means the ground cable from the battery to the frame should be #4 cable and attached securely.

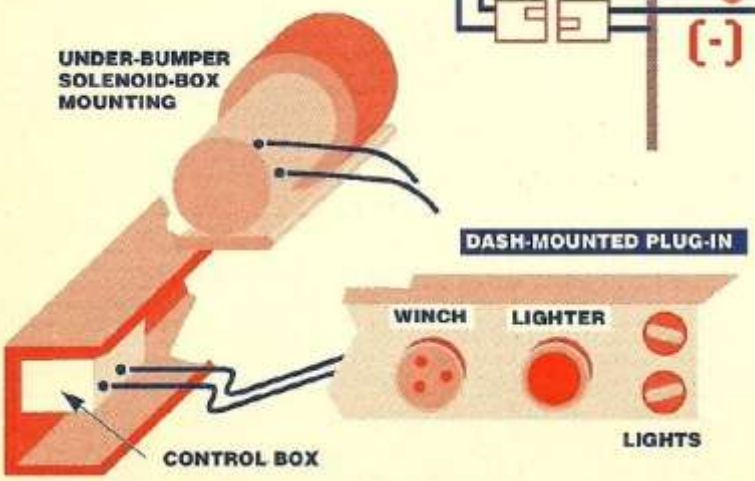
Mounting a winch at the rear? Again, no need to run two cables from the battery up front; a short ground cable from the rear winch to the frame and the single "hot" lead to the power source is all that's needed.

Many four wheelers prefer using #4 welding-type cable from the battery in the engine compartment to both front and rear of the vehicle with "quick-disconnect" non-gender polarized plugs at the end. Then they put the same type of plug on the winch power cable. That provides an immediate 12-volt power source to plug in either the winch or a set of jumper cables as needed without ever opening the hood.

FOUR WHEELER



QUICK-DISCONNECT WIRING SCHEMATIC



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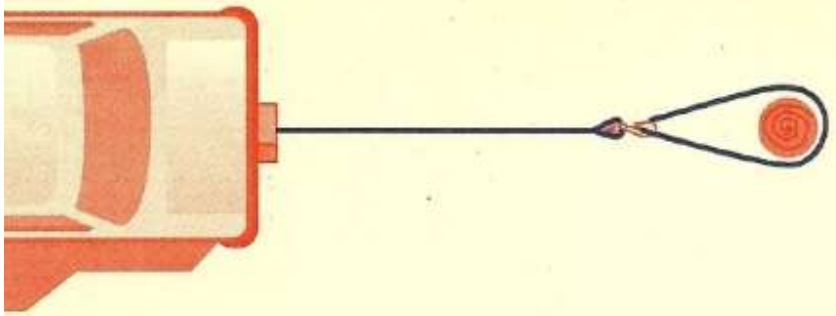
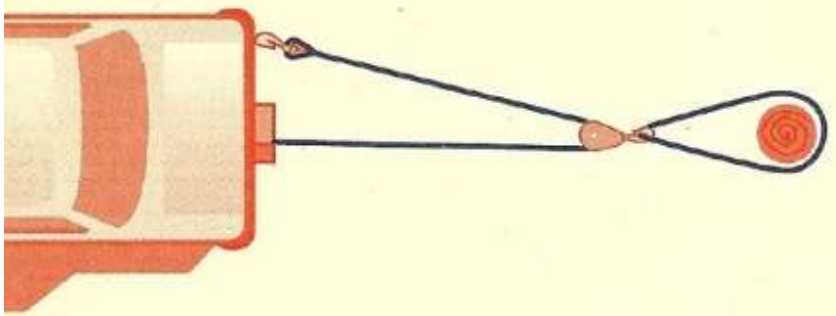
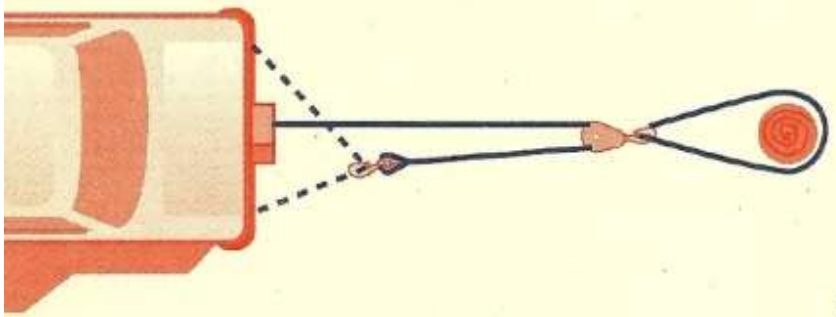
RIGGING A WINCH THE RIGHT WAY



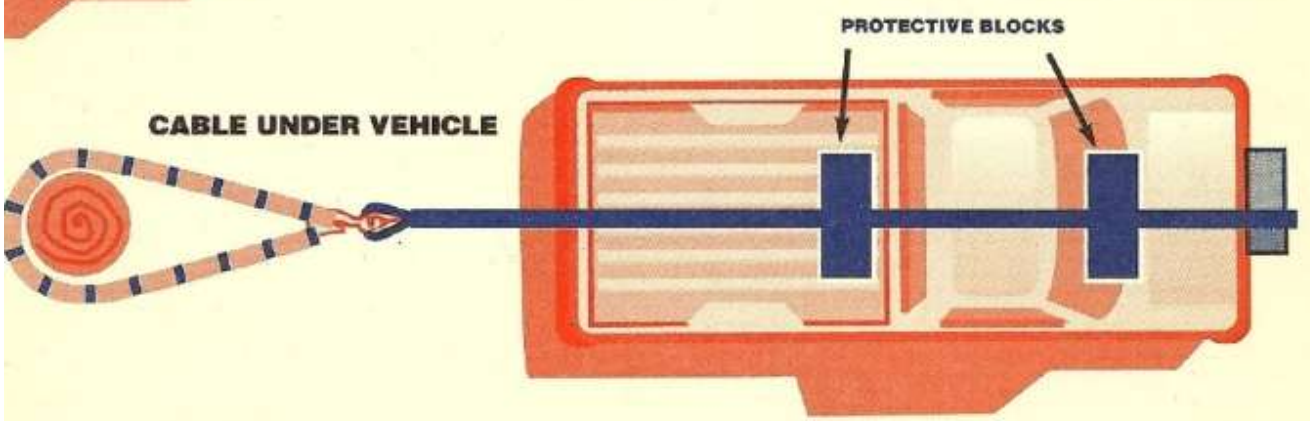
Single-line pull: Encircle your anchor with a choker rope or nylon strap/tree trunk protector and attach the clevis where the loops come together. Then hook the wire rope from the winch securely to the clevis. This method keeps the winch line absolutely straight, which is essential for maintaining the maximum tensile strength of the wire rope.



Snatch block/double-line pull: By attaching a snatch block to your nylon strap/tree protector or choker and then rigging the winch line through the snatch block and back to a solid mounting point on the vehicle, a 2.0:1 advantage in mechanical pulling power is gained over a single-line pull. More significantly, the double-line pull will allow the winch motor, for a given load, to turn faster and draw less amperage than a single-line pull. This means that longer and heavier loads can be pulled without overheating the winch motor. Line speed, however, will be slightly lower.



Double-line pull with spreader harness: Instead of attaching the winch hook directly back to the vehicle in a double-line pull, attach it to a clevis on a choker that is then hooked to the vehicle at two points. This spread the load on the vehicle for more stable, straighter pulling.



Vehicle restraint pull: When simply blocking the wheels is insufficient to restrain the winch vehicle under load, you must use a restraining line placed low around a tree (or other anchor) at the rear of the vehicle. Run the ends of the restraining line under the vehicle and attach them to solid points at the winch mounting plate. A winch's power is such that mounting the restraining ends to the differential or rear frame might result in breakage or serious bending.

Winching backwards: If you must winch backwards, route the cable under the vehicle to the choker/anchor point. Place wood blocks or available tree limbs under the frame to protect the undercarriage and to keep the cable from snagging. Make sure the cable isn't contacting any sharp edges and that you'll be winching as straight as possible. This is a difficult maneuver, so work slowly and carefully.