

How Does an Electric Winch Work?

Winch Motors

Winches all have motors that drive or power the drum that spools the wire. An electric winch uses an electric motor. This electric motor is powered by electricity, just like a drill motor. Current changes on opposing poles spin a magnet that powers the motor and turns the winch. Since a winch is so heavy-duty, the electric motor on a winch must be robust with a solid electrical system that can handle a lot of charge. The winch motor also needs to adjust to handle heavier loads.

Gear Trains

Some winches have gears that allow them to pull up very heavy loads. These gears can be very simple like bike gears. One small gear operated by an electric motor can turn a much larger gear, therefore increasing the amount that can actually be pulled. Advanced winches can also have what are called planetary gear trains or elliptical gears. As you might guess, these work like planets orbiting the sun. One small gear rotates around a larger gear, making it easier to pull up large objects. Winches can have any type of gear assembly, but most are elliptical or ordinary gear trains with successively smaller gears.

Power Supplies

Electric winches operate on a power supply like any other electrical machine. They can be powered by either AC or DC systems. Many ATV winches are DC powered and run right off an ATV battery. Other truck and trailer winches run on simple 12-volt DC power. These can be rigged to run off the truck's electrical system while the truck is on and the alternator running. This can help the winch be more efficient since it will receive more power than running from a dry battery. A winch will not completely drain the battery system if operated while the truck is off. Winches do not use a large amount of electricity; mainly their gear system is doing all of the work.

How to Use an Electric Winch

Electric winches placed on 4X4 vehicles and ATVs are used to recover those vehicles from deep mud holes or tight locations. Proper use of the winch is all the difference from having a fun afternoon in a remote location compared with a long walk to the nearest phone. Use a winch that is properly rated for the job. When choosing a winch for your vehicle, a good rule of thumb is to overrate the winch by 1.5 times. In other words, if the vehicle weighs 5000 pounds, install a winch rated for 7500 pounds of pulling power.

Instructions

1 Assess the situation before deciding on a winch pulling plan. Take your time to evaluate all the options open to the recovery of the vehicle from the situation. Inform any one with you as to the plan you have decided to make. Communicate to them where chains and cables will be placed in order to pull the vehicle from its present position to a free and safe area.

2 Wear the leather gloves at all times when handling the metal cable and any chain. The wires inside the winch cable can become easily frayed and pierce holes through exposed skin. Never run your hands, gloved or bare, over the metal cables. Use the hand shovel and remove as much debris from in front of the tires as possible. Create a slope that leads outward from the stuck position in the direction of the pull. Attempt to remove any large rocks or tree limbs that maybe lying in the pathway.

3 Attach to any solid pulling structure by wrapping the 12-foot chain around that body. In the case of live trees, use the 5-foot square rubber mat to protect the trees bark. Wrap the rubber mat around the backside of the tree trunk. Loop the chain around the lowest portion of the tree. Keep the rubber mat in between the metal chain and the tree.

4 Secure the chain to the cable hook of the winch. Ensure there is at least three full rounds of cable on the drum before applying any force to the winch cable. If the cable is too short, use the 25-foot extension cable with the clevis hooks. Keep all persons out of the direct line of the cable pulling winch. Pull the vehicle free by pulling a straight line into the winch itself. Do not pull the vehicle at an angle. The cable must smoothly align itself onto the winch drum in even "lays" of the cable. Do not allow the cable to bunch up or ride on top of itself. If the cable runs into the winch at an angle follow the next step to correct that angle of pull.

5 Use the second rubber mat and 12-foot chain to pull the vehicle in a straight line by attaching the 5-ton snatch block. Secure the snatch block to a second tree in the same manner as described in step three with the chain and rubber mat. Place the winch cable through the snatch block pulley so the winch cable will be pulled directly into the winch drum. Use this snatch block setup to pull any vehicle free by providing a straight run into the winch drum assembly.

How to Change a Winch Rope

Changing the rope on your winch may be done for a number of reasons, including rope damage, switching to a larger size rope, or maybe switching to a synthetic rope. The process is not difficult and can be done easily in a hour or two at home in the driveway with common hand tools. If you are changing diameter of the rope, be sure to check the rating on the rope itself. If it is too light, you may break the rope when you really need it.

Instructions

Removing the Old Rope

- 1** Set the clutch on the winch to freewheel and pull the old winch rope completely off the drum. You will find a small bolt in the drum holding the end of the rope to the drum when you get all the rope off.
- 2** Remove the retaining bolt from the drum, and pull the rope out through the fairlead of the winch. Don't lose the bolt, you will be reusing it.
- 3** Clean any rust, corrosion or other material off the drum so it does not end up under the new rope and damage it. Small sticks or even a nick in the drum could fray the rope when wound onto the drum.

Spooling the New Rope

- 1** Lay out the new rope as straight as you can. If you are running a long rope, this may mean running it down the sidewalk or edge of the road.
- 2** Slide the new rope into the fairlead with the eyelet or loop for the retaining bolt in first. Be sure to run the rope in so that it spools off the bottom of the drum when you are pulling with it.
- 3** Apply some thread locking compound to the bolt and slide it through the eyelet or loop. Thread it into the drum and tighten with a socket and ratchet or open end wrench.
- 4** Wind the first layer of rope onto the drum by hand, making sure that the rope is tight and the winds lay tightly together. This is important because if the base layer isn't right, the rope will become tangled and could be damaged.
- 5** Spool the rest of the rope onto the drum by winding the winch while maintaining slight pressure on the line. It should almost wind itself, but watch it closely to be sure the layers are tight and laying down smoothly and evenly

How to Mount a Winch on the Bumper

A winch is a hand powered or motor driven device for hauling or pulling that has a drum with a rope, wire or chain around it. If you do a fair amount of off-road driving or live in a severe weather climate, a winch can be invaluable. A winch bumper replaces a normal front bumper with a heavy duty bumper upon which a winch can be mounted. A winch bumper eliminates the need for a winch plate when installing a winch on your vehicle. These bumpers are vehicle specific, so check with your vehicle manufacturer to learn where to buy an aftermarket winch bumper made for your vehicle.

Instructions

1 Remove the factory front bumper. Install the winch bumper using the hardware kit specific to your vehicle. All winch bumper kits come with directions and the hardware included.

2 Bolt the brackets to the frame of your vehicle to secure the bumper using the mounting hardware and following the winch bumper instructions from the manufacturer. Failure to follow the manufacturer's instructions can result in dangerous winch malfunction or damage to your vehicle.

3 Cover the mounting bolts with thread lock and slide them into the holes of the winch bumper.

4 Thread the bolts into the winch assembly.

5 Wire the winch by attaching the live red wire on the winch assembly to the positive side of the battery. Secure the wire with the ring connector. The black ground wire will need to be secured to the frame of your vehicle.

How to Install Custom ATV Winch Bumpers

As formidable as ATVs are, sometimes that mudhole you just drove into or the creek crossing you are about to ford just demands a bit more muscle. That muscle is often provided by some sort of winch system.

A winch is a mechanic device that draws in a metal cable attached to a tree or another solid object, effectively pulling the ATV along with it. As ATVs are not all equipped with winches from the factory, it becomes necessary for ATV owners to install their own winches and consequently, their own winch bumpers in order to capitalize on this piece of useful equipment.

Luckily there are numerous winch bumper manufacturers which carry mounting kits for most any ATV model on the market today. Learn how to mount a custom ATV winch bumper on your ATV in a single afternoon.

Instructions

- 1** Contact the manufacturer of your winch for recommendations for winch bumper models and then research the styles and sizes available for your ATV application. Decide on the style you want and then purchase the correct applicable winch bumper model.
- 2** Examine the directions for mounting provided with the winch bumper to get a handle on any tips or tricks particular to your ATV; however, for the most part all mountings will proceed as described herein. Unpack the front bumper and find the mounting hardware, normally just four bolts. Slide the bumper onto the front of the ATV and line the mounting holes up on the lower frame of the ATV and the existing bumper. Insert the bolts and tighten down with the ratchet set.
- 3** Repeat step 2 with the rear bumper, making sure to use a torque wrench to tighten the bolts down to regulation specs. Now, locate the mounting holes on the bumper you are going to use to mount your winch (normally the front) and situate the winch over the holes. Insert the bolts and tighten them down using the ratchet set again. Hook up the electrical connections for the winch and then test it out.

How to Choose Winches

Anyone with an SUV or off-road four-wheeler knows the value of a winch. Winches salvage off-road adventures that would otherwise end up mired in muck. If you own a four-wheeler and need a winch, you must know what to look for and how to match the winch to your particular vehicle. Choosing the wrong winch might mean spending money unnecessarily or remaining stuck in the mud when your winch proves less powerful than you need.

Instructions

1 Match the winch's gross pull capacity (GPC) to your vehicle's gross vehicle weight (GVW). The GPC equals the total weight your winch could pull in an ideal situation with no mitigating factors such as a weak battery or multiple cables. Select a winch with a GPC that exceeds your truck's weight by at least 30 percent. Your vehicle's GVW is listed on the metal tag riveted to the inside of the front driver's side door.

2 Calculate the net pull capacity by counting the cable layers. The bottom cable pulls the most weight. Additional layers of cables decrease the pull weight by 10 percent to 20 percent. If your winch has a pull capacity of 5,000 pounds but it also has dual cables, the second cable reduces the net pull weight to 4,200 to 4,500 pounds.

3 Match the winch's pull capacity to your battery. Winches operate by electricity. A brand-new battery provides more power to your winch than a battery you've had for four seasons. One strategy to prevent a situation where your winch won't extract you from the mud because of a weak battery is to have a secondary battery that you use only for winch situations.

4 Examine the pulley and gear case. Two styles exist: worm-gear design and low-profile design. Worm gears might seem bulky and old, but they provide more power and last longer than low-profile winches. Low-profile winches, however, often provide a backup mechanism that brakes the motor, backs it up, and then starts winding and pulling again. Backup mechanisms can allow you to reset the winch cable for a better pull.

5 Know the winch's mounting location. External winches mount on the frame but protrude on the outside of the grill. Undercarriage winches mount to the frame but out of sight beneath the bumper. Both types provide similar pull capacities, but undercarriage winches can get covered in mud and snow or get damaged by boulders. External winches, however, might seem unsightly.

6 Make sure the winch fits your budget. Winches cost \$800 to \$2,000. Although you should look for a winch that meets all your requirements, you should also shop different retailers. Even a 10 percent discount can save you significant money.

How to Troubleshoot an ATV Winch

ATV winches can enhance an outdoor experience when riding. The cable can be attached to fallen tree limbs for clearing a trail. A winch can also mean the difference from being stuck in a mud hole and pulling the vehicle free to continue on your way. Checking the winch for proper operation before your trip can save a lot of headaches. If a problem arises you can troubleshoot the winch at home using the following basic process.

Instructions

- 1** Check all wire connections with the pliers and screwdriver. Tighten any loose connections. Inspect the wires for any signs of corrosion. Corrosion on wire can come in the form of a white or green powder-like substance.
- 2** Clean the corrosion with a toothbrush and vinegar. Dip the bristles into the vinegar and rub the corroded area.
- 3** Use the voltmeter and confirm that the voltage is correct from the battery. Plug the red lead into the "volt" connector and the black lead into the "common". Touch the black lead probe end to a bare place on the ATV frame. Place the red lead to the positive (+) side of the battery. Turn the voltmeter to the "DC Volts" position on the switch. Read the meter. It should read at least 12.5 volts. Charge the battery if the reading is below 12 volts.
- 4** Confirm the operation of the remote switch using the voltmeter. Keep the black lead on a bare part of the frame. Touch the red lead to one side of the solenoid coil wire that comes from the switch. Depress the switch in both directions for 2 seconds. The meter should read at least 12 volts. Perform the same test for the other wire that comes from the remote switch. If one side of the switch fails to register, the switch is bad. Replace the switch.
- 5** Tap the solenoid with a small wooden stick to engage the solenoid contacts. If all the above steps have checked out, the contacts in the solenoid may not be touching. Can you hear an audible click when the switch is depressed? Depress the switch and tap the outer plastic case gently. If the solenoid fails to engage the solenoid is bad. Replace it.
- 6** Engage and disengage the mechanical free wheel clutch. Pull on the cable when the clutch is disengaged. Engage the clutch while pulling on the cable. This can clear a stuck gear lever.
- 7** Check the motor for "hot" operation. The motor will generate a lot of heat when being used. Allow the motor to cool. Constant heat emitting from the motor under light loads can be a sign of excessive use. The motor may have to be replaced in a short period of time.

Winch Troubleshooting

CONDITION	POSSIBLE CAUSE	CORRECTION
MOTOR RUNS IN ONLY ONE DIRECTION	(1) Defective solenoid or stuck solenoid	(1) Jar solenoid to free contacts. Check by applying 12 volts to coil terminal (it should make an audible click when energized)
	(2) Defective remote control switch	(2) Disengage winch clutch, remove remote control switch plug from the socket and jump pins at 8 and 4 o'clock. Motor should run. Jump pins at 8 and 10 o'clock. Motor should run.
MOTOR RUNS EXTREMELY HOT	(1) Long period of operation	(1) Cooling-off periods are essential to prevent overheating.
MOTOR RUNS, BUT WITH INSUFFICIENT POWER, OR WITH LOW LINE SPEED	(1) Insufficient battery	(1) Check battery terminal voltage under load. If 10 volts or less, replace or parallel another battery to it.
	(2) Bad connection (3) Insufficient charging system	(2) Check battery cables for corrosion; clean and grease. (3) Replace with larger capacity charging system.
MOTOR RUNS, BUT DRUM DOES NOT TURN	(1) Clutch not engaged	(1) If clutch engaged but symptom still exists, it will be necessary to disassemble winch to determine cause and repair.
MOTOR WILL NOT OPERATE	(1) Defective solenoid or stuck solenoid	(1) Jar solenoid to free contacts. Check solenoid by applying 12 volts to coil terminal (it should make an audible click when energized).
	(2) Defective remote control switch	(2) Disengage winch clutch, remove remote control switch plug from the socket and jump pins at 8 and 4 o'clock. Motor should run. Jump pins at 8 and 10 o'clock. Motor should run.
	(3) Defective motor	(3) If solenoids operate, check for voltage at armature post; replace motor.
	(4) Loose connections	(4) Tighten connections on bottom side of hood and on motor.
MOTOR WATER DAMAGED	(1) Submerged in water or water from high pressure car wash	(1) Allow to drain and dry thoroughly, then run motor without load in short bursts to dry windings.
CABLE DRUM WILL NOT FREESPOOL OR IS DIFFICULT TO FREESPOOL	(1) Clutch not disengaged	(1) Check clutch operation according to nameplate. Make sure clutch shifter knob is fully at "OUT" position.
	(2) Winch not mounted squarely causing end bearing to bind drum (model dependant) Ring gear retainer capscrews are too tight. (model dependant)	(2) Check mounting to see that installation instructions have been followed. (3) Remove the gear housing cover, 413018, and all gears from inside the gear housing. Disengage the clutch and check to see that the ring gear will rotate by hand. If it will not, using a hex (allen) wrench, slightly loosen all the capscrews and then snugly re-tighten them in criss-cross pattern, but do not over-tighten. The ring gear must rotate by hand. Re-assemble winch.

MAINTENANCE

- * Inspect the wire rope before and after each winching operation. If the wire rope has become kinked or frayed, the wire rope needs to be replaced. Be sure to also inspect the winch hook and hook pin for signs of wear or damage. Replace if necessary.
- * Keep winch, wire rope, and switch control free from contaminants. Use a clean rag or towel to remove any dirt and debris. If necessary, unwind winch completely (leaving a minimum of 5 wraps on spooling drum), wipe clean, and rewind properly before storage. Using a light oil on the wire rope and winch hook can keep rust and corrosion from forming.
- * Operating your winch for a long period of time places an extra burden on your vehicle's battery. Be sure to check and maintain your battery and battery cables according to manufacturer guidelines. Also inspect switch control and all electrical connections to be certain they are clean and tight fitting.
- * Inspect the remote control for damage, if so equipped. Be sure to cap the remote socket to prevent dirt and debris from entering the connections. Store remote control in a protected, clean, dry area.
- * Many winches require no lubrication for the life of the winch. However check with your manufacturer's instructional manual for specific maintenance and lubrication requirements.

Choosing an ATV Or Recovery Winch

When it comes to accessories for your off road vehicle, a winch is one of the most important accessories you can buy. If you're a hardcore off roader, no doubt you're going to find yourself in a few sticky situations. An ATV or recovery winch can get you out and back on the trail in no time, so you can spend less time stuck in the mud and more time playing.

The number of options available for your first off road winch can be overwhelming, especially if you don't understand the pros and cons of each feature. You want to make sure you get the right winch for your vehicle, or you could end up just as stuck as before. If you're a first-time buyer, there are four basic design options to consider:

1. Rated Line Pull
2. Line Speed
3. Cable Type
4. Solenoid Mounting

The first factor you'll need to consider is rated line pull. If you buy a winch that's too small for your vehicle, you'll have a tough time getting unstuck. If you buy one that's too big, you're going to add excess weight to your front or rear bumper, which can throw your vehicle off balance as well as slow you down.

The rated line pull is the maximum amount of force that your winch can handle. You can calculate the minimum rated line pull by multiplying your gross vehicle weight by 1.5 ($GVW \times 1.5 = \text{minimum rated line pull}$). Notice that this is only the minimum rating you'll need. Depending on how you use your winch, you may need a higher line pull. For example, if you're a mud hole addict, keep in mind that the suction force of the mud requires a greater pulling force to get you out.

The second consideration is line speed. How fast do you want to winch out? Line speed depends on the gear train in your winch. The two basic types are planetary and worm. Planetary includes multiple gears for a faster pull; however, it also generates a greater amount of heat. Worm uses only two gears, which makes for a slower pull but less heat.

Third, you'll need to decide between steel and synthetic cable. Both types of cable have their advantages and disadvantages. Steel winch cable requires less maintenance and can withstand a greater amount of heat. On the downside, burrs from the steel can gash your skin if you're not careful, and a steel cable creates a dangerous whiplash effect if snapped under load.

Synthetic winch rope is lighter, safer, and stronger but requires more care and attention and can weaken if rubbed over sharp objects during the recovery process. The type of cable you choose depends on a number of factors, including the terrain you cover and the weight you're willing to add to your vehicle.

The last consideration is how the solenoid, also known as a contractor, is mounted. Integrated or remote are your two options. Integrated solenoids are built into the winch itself and provide greater protection; however, the added space they take up may require you to modify your vehicle if your mounting space is restricted. Remote solenoids mount separately, offering greater

versatility. The remote option is more popular because it allows you to install the winch in a tight space and mount the contractor elsewhere.

Perhaps the best part of any off road winch is the freedom it gives you to ride harder. So with your vehicle ready for the worst nature can dish out, you're free to dig for the bottom of that mud hole or conquer the mother of all boulders without the fear that you'll be stuck there forever. With a quality ATV or recovery winch, your vehicle is ready for bigger and better off road adventures.

How to Winch Out - A Basic Guide For ATV and Recovery Winch Safety

The Importance of Safe Winching Techniques

Any fearless offroader knows that the day will come when the mud and rocks conquer your quad, leaving you good and stuck. If you enjoy putting your quad or truck through the toughest muck and obstacles it can handle, you're going to need a winch that's powerful enough to get you out. You're also going to need to know how to winch out safely.

If you're looking to buy an ATV or recovery winch and put it to good use, it's important to take the time to understand how to recover your vehicle without creating a dangerous situation for yourself and others. Don't wait until you're stuck to use your winch for the first time.

Getting Your Act Together

Before you get ready to winch out, make sure you have some basic equipment on hand. First you're going to need a pair of heavy duty leather gloves. These will protect you from rope burn and from any burrs or slivers that can slice into your bare hands when you handle the winch rope. If you use a steel cable, you may also need a heavy coat or blanket you can throw over the line in case it snaps. A steel cable can whip through the air if it breaks under load, damaging anything in its path. Depending on the type of pull, you may also need a snatch block to guide the rope in a straight line onto the drum or to double the load capacity of your winch.

Choosing an Anchor Point

Your first task in winching out is to choose a solid anchor point. Your best options are either a natural anchor point, such as a tree, stump, or large rock, or another vehicle. If you choose a tree as your anchor point, use a tree strap rather than a chain to attach the winch rope. Using a chain may damage or even kill the tree. Also, never wrap the cable around an anchor point and hook it back on itself. This can damage your cable or cause it to snap.

If possible, choose an anchor point directly in line with your vehicle in order to allow the cable to wrap in straight, even rows onto the drum. Pulling at an angle may cause the rope to pile up on one side of the drum. If the rope piles up too high on one side, it can chafe against the winch housing and cause extensive damage. Angle pulls are less efficient than straight-line pulls. They also increase the chances of your winch line rubbing against a sharp edge on your vehicle. If your only option is to pull at an angle, use a snatch block to guide the cable straight into the drum.

The more line you spool out, the greater the load your winch can handle. So choose an anchor point that is far enough away to get the most power out of your winch but close enough to leave at least one row of cable on the spool. If you choose another vehicle as your anchor point, block the wheels of the recovery vehicle, put it in neutral, and engage the hand brake before you start to winch out. This will keep the recovery vehicle from rolling.

Using the right equipment and choosing a solid anchor point are key factors in winch safety. The steps you take before you start winching out can make a huge difference in your own safety and the safety of those around you.

Winch Terminology and Phrasing

Often Used with Winches

Intended Usage of Your Winch

Winches can vary greatly. Some are designed for light duty, occasional use while others are designed for frequent, heavy use. When choosing a winch, look at how your winch will be used. It's better to spend a little more if you will use your winch frequently.

1.5 GVW Rule of Thumb

Recommended winch capacity over vehicle weight. A rule of thumb is to choose a winch with enough power for your vehicle. Typical use should be calculated with this easy formula: gross vehicle weight x 1.5 = minimum winch size.

Starting Input Torque

The torque applied to the winch input shaft required to start a rated load upward from a suspended position. It is expressed in pound-feet, pound-inches, kilogram-meters or Newton-meters. May be referred to as static torque.

Running Input Torque

The torque applied to the winch input shaft required to maintain upward movement of rated load. It is expressed in pound-feet, pound-inches, kilogram-meters or Newton-meters. May also be referred to as dynamic torque.

Rated Input Speed

The maximum permissible input speed at rated load expressed in RPM. Exceeding rated input speed may cause damage to the worm gear set.

Full Drum or Maximum Layers

A drum containing the maximum number of cable layers which would leave a freeboard of 0.7 x the cable diameter below the drum flange.

Drum Storage Capacity or Cable Capacity on the Spool

The maximum length of a specific diameter cable or wire rope which may be wound on a cable drum without exceeding the maximum number of layers. It is expressed in feet or meters.

Rated Line Pull

This is the rated line pulling capacity that a single line can handle safely without the use of a snatch block or other device. This is measured on level ground pulling dead weight (not rolling weight) from the first layer of cable on the drum. The line pull on any layer that results from the output torque which produces maximum rated line pull on the first layer. Rated first layer line pull is based on maintaining an acceptable structural safety factor while providing an acceptable component service life. Line pull is expressed in pounds or kilograms.

Rated Line Speed

The line speed on any specific layer that results from rated input speed. It is expressed in feet/minute or meters/minute.

This the length of line that a winch can spool off and on its drum in one minute. Faster line speeds provide quicker winch pulls and are generally found in more expensive winches.

Thermal Rating (Duty Cycle)

The result of a test, expressed as the distance (feet or meters) a load travels up and down while hoisting and lowering a specified weight until the lubricating oil rises from 100°F to 250°F (38°C to 121°C). 250°F (121°C) is the maximum intermittent gear oil temperature allowed. Most gear oils "break down" rapidly at higher temperatures and seals may be damaged.

Amperage Draw and the Battery

With the addition of a winch, the demand on your electrical system can exceed the system's capabilities itself. Consider upgrading your alternator to a high output alternator and be sure your car battery is up to the demand of winching.

Electric winches rely on the battery for power and not the alternator. An automotive battery is designed to supply a large draw of amps from the battery in a short period of time, such as when you start your engine. Alternators typically supply under 100 amps. A winch during the pull may demand 400 or more amps from your electric system. It is the job of the battery to supply the the power. Therefore it is important that your battery is capable of supplying the required power. Manufacturers of winches typically recommend a Battery that can supply 650 CCA (Cold Cranking Amps) minimum for winching. Battery Leads to the winch should be at least 2 gauge and shorter than 72" (1.83m).

Note: If you have an Optima battery or any battery with side terminals (flush on the side and used with a small bolt or connection), it's recommended that a winch is NOT connected to these smaller terminals. In most cases they can not handle the full amperage draw of a winch. Use of these small terminals can damage your battery and potentially cause a fire.

Largest Recommended Wire Rope Size

Should be no larger than 1/8th the cable drum barrel diameter for most recovery applications.

Drum Clutch

Also known as a "dog-clutch" or "jaw clutch", consists of two or more drive lugs which engage similar driven lugs to transmit torque to the cable drum.

Free Spooling

The operation of manually unspooling wire rope from the cable drum by pulling on the free end of the rope while the cable drum is disconnected (declutched) from its power train.

Wrap

A single coil of wire rope wound on a drum.

Layer

All wraps on the same level between drum flanges.

Freeboard

The amount of drum flange that extends past the last layer of wire rope.

Mean Drum

A theoretical point located midway between the first layer of wire rope on the cable drum barrel and the top layer. Often used as a reference point in measuring winch performance.

Gear Set Efficiency

The relationship between the input horsepower transmitted to the winch by the prime mover and the output horsepower transmitted by the winch to the wire rope. Expressed as a percentage.

Extension Shaft

The standard cable drum shaft is extended or replaced by an extra long shaft which permits the use of capstans or CR reels at the side of the vehicle. Usually installed on the curb side of the vehicle, most extension shafts are limited to a standard length of 44 to 46-1/2 in. (112-118 cm) from the cable drum center-line.

Capstan

Usually a small removable drum used to apply force to fiber rope wrapped around the barrel with tension applied by hand. Most have a nominal barrel diameter of 7 in. (178 mm).

CR Reel

Collapsible recovery reels are used for picking up and coiling power and telephone lines which have been removed from the poles and lowered to the ground. Most CR reels have a nominal barrel diameter of 20 in. (508 mm).

"Bull Gear"

Bronze alloy gear powered by the steel worm. Braden refers to the "bull gear" as the worm gear.

Fleet Angle

That angle between the wire rope's position at the extreme end wrap on a drum, and a line drawn perpendicular to the axis of the drum through the center of the nearest fixed sheave or load attachment point.

How to Repair a Winch

In order to repair a commercial grade winch, you must first deduce where the problem lies. It could be electrical, the clutch brake, or the gearbox. It may also be something as simple as the cable itself being damaged or the lube points not being properly lubricated.

Instructions

- 1** Use an OHM meter to check the contacts in the winch or for a wire break.
- 2** Check the power from the control switch, especially if your winch is only moving in one direction.
- 3** Replace the switch if it is bad. Do not try to make repairs to it as it has a water-tight seal.

Clutch Brake

- 1** Clean the clutch pack thoroughly with a factory recommended solvent.
- 2** Check the clutch pack for breaks and/or wear and tear.
- 3** Replace damaged or worn pads. If the pads are in good condition, they may just require a simple adjustment.

Gearbox

- 1** Drain the oil from the gearbox if you are hearing a grinding noise or the winch will only operate in one direction (after you have ruled out an electrical problem).
- 2** Check the gears for worn or broken teeth. Replace the gears if needed.
- 3** Refill the oil with a factory specific brand.

Cable

- 1** Extend the cable to check for frays and/or kinks. Always replace a damaged winch cable as opposed to trying to make repairs.
- 2** Clean the cable with a factory recommended solvent, then add a light lubricant if it is free of any damage.
- 3** Re-spool the winch cable. If the winch is attached to a vehicle, hook the cable to a tree, put the vehicle into neutral and rewind slowly. Be sure to keep the winch cable properly stacked as it is re-spooling.

How to Attach a Strap to a Winch

A winch is a device that winds and stores a strap or chain. It is used on towing vehicles and other devices that pull objects. The strap is connected to an object, and the winch pulls the strap and object toward the winch. How you attach a strap to a winch depends mainly on whether the winch itself is already assembled and whether a strap or chain is already attached.

Instructions

1 Connect the winch's handle crank to its threaded shaft on the winch. Turn the handle clockwise to thread it onto the shaft. The handle is fully attached once the handle starts turning the gears.

2 Secure the handle to the winch. This is usually done by inserting an included spring into the shaft and then inserting and tightening a nyloc nut using a wrench.

3 Insert the bolt rod for the winch strap into one of its holes in the winch spool if you are putting together a disassembled winch. If the winch is assembled, remove the bolt's nut, pull it out one hole and remove the current strap or chain (if necessary).

4 Slide your strap's looped end onto the bolt. Insert the bolt all the way into the spool and secure it with its washer and nut.

5 Assemble the winch's "bow stop" by connecting the smaller strap roller to the winch if it is not already installed using the roller's bolt. The "bow stop" is the open space in front of the spool that the strap travels through.

6 Feed the free end of the strap down the spool tube and underneath the roller. Pull the strap until its entire length is run under the roller and through the bow stop.

7 Turn the winch handle clockwise to wind the strap back through the bow stop and around the tube.