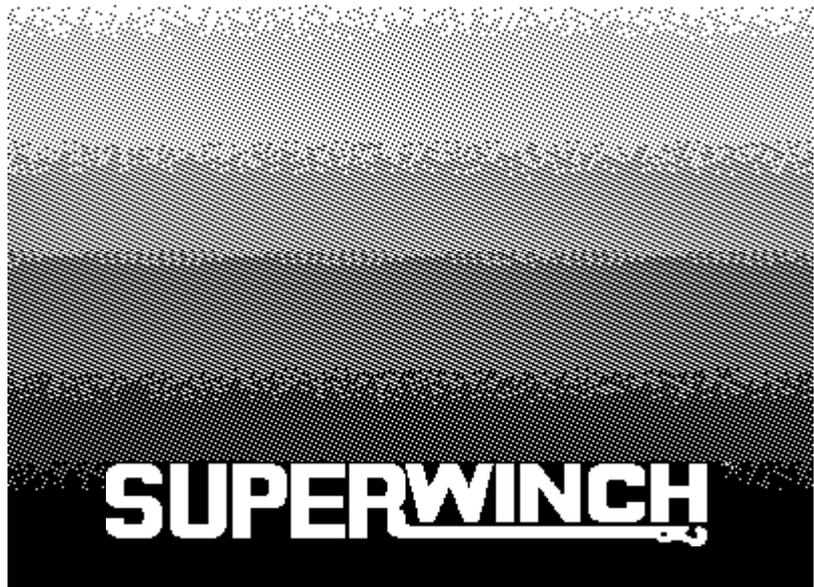
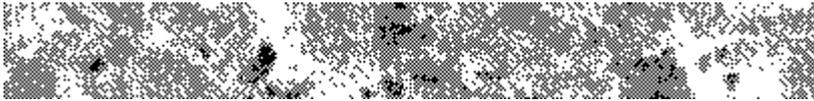


Handbook of Winching Techniques for 4 Wheel Drive Vehicles



Handbook of Winching Techniques



01 INTRODUCTION

02 THE THEORY OF WINCHING

03 ACCESSORIES

**USE OF A PULLEY BLOCK
USE OF A NYLON SLING AND SHACKLE
USE OF GLOVES**

04 RULES FOR SAFE OPERATION

**GENERAL SAFETY
HAULING
SELF RECOVERY**

Superwinch Ltd.,
Abbey Rise, Whitchurch Road, Tavistock, Devon.
Great Britain.
PL19 9DR
Tel: +44 (0)1822 614101
Fax: +44 (0)1822 615204
support@superwinch.net

Superwinch Inc.,
Winch Drive, Putnam, Connecticut 06260
U.S.A.
Tel: (860) 928 7787
Fax: (860) 928 1143
www.superwinch.com

SUPERWINCH*

INTRODUCTION

Please read and understand this handbook before using your Superwinch and its accessories. It has been supplied with your winch to encourage safe operation - if used unsafely or improperly, there is a possibility that property damage or personal injury can result, since your safety ultimately depends on your caution when using these products. Pay particular attention to the RULES FOR SAFE OPERATION in this handbook.

PLEASE RETAIN THIS HANDBOOK WITH THE WINCH AT ALL TIMES (PREFERABLY KEEP THE WINCH OWNER'S MANUAL)

Pay particular attention to the caution noted preceded with the symbols shown here. The notes contain advice for your protection.

WARNINGS, CAUTIONS AND NOTES

These are given through these instructions in the following form :



WARNING : Procedures which must be followed precisely in order to avoid the possibility of personal injury.



CAUTION : This calls attention to procedures which must be followed to avoid damage to components.



NOTE : This calls attention to methods which make a job easier or gives helpful information.

SUPERWINCH winches are not to be used to lift, support or otherwise transport personnel. Any such use shall be considered to invalidate the warranty and Superwinch shall not be responsible for any claims arising from such use.

REFERENCES

References to the left and right hand side in the instructions are made when viewing the vehicle from the rear.

THE THEORY OF WINCHING

To get the best from your Superwinch and auxilliary equipment requires some understanding of the mechanics involved in winching. For winching purposes the resistance to motion of a vehicle is dependant on 4 main factors:

- (i) The inherent resistance to movement of the vehicle.
- (ii) The total weight of the vehicle.
- (ii) The nature of the surface to be transited.
- (iv) The gradient up which the vehicle is required to be moved.

(i) The inherent resistance of a vehicle depends on the state of the tyres, friction in the drive-chain (which will causedrag), the weight of the vehicle, and whether the vehicle has sustained any damage to its running gear. For our purposes, we will assume that the vehicle is in good working order and has all tyres inflated to teh recommended pressures - a flat tyre will cause considerable drag, and it may be advisable to change a tyre that is deflated before commencing recovery operations.

(ii) The weight of the vehicle, includes all equipment, luggage, fuel, passengers and stores etc. aboard the vehicle.

(iii) The nature of the surface to be traversed is the largest variable in the winching operation. A vehicle in good running order on metalled surface will only require a force of about 4% of its total weight to induce motion, whereas a vehicle to be recovered from a bog will require a pull equivalent to about 50% of the total weight of the vehicle. The table below shows that different surfaces require proportionate efforts to produce vehicle movement.

Type of Surface	Effort required to move Vehicle as a fraction of total weight
Hard metalled road	1/25 total weight
Grass	1/7 total weight
Sand (hard wet)	1/6 total weight
Gravel	1/5 total weight
Sand (soft wet)	1/5 total weight
Sand (soft/dry/loose)	1/4 total weight
Shallow mud	1/3 total weight
Bog	1/2 total weight
Marsh	1/2 total weight
Clay (clinging)	1/2 total weight

A simple calculation will show that approximate rolling resistance of an undamaged vehicle on a flat surface can be predicted e.g. the pull required to move a vehicle weighing about 4500 lbs along a flat sandy beach of hard wet sand.

$$\frac{\text{Weight of Vehicle (lbs)}}{\text{co-efficient of resistance of hard wet sand}} = \frac{4500 \text{ lbs}}{6} = 750 \text{ lbs}$$

However, as all surfaces are not flat, the calculation must therefore include the gradient resistance co-efficient.

(iv) Gradient Resistance. The gradient up which a vehicle is to be moved may only cover a short distance, over the total distance of pull, e.g. a ditch or rock, or it may cover a long climb up a hill. Even for a relatively short upward pull, gradient resistance must be taken into account. For practical winching purposes, gradient resistance can be taken as a 1/60th of he weight of the vehicle for each degree of the slope, up to 45 degree incline.

$$\frac{\text{Gradient x Weight of Vehicle}}{60}$$

e.g. for a 15 degree slop, gradient resistance will be 15/60 of the weight of the vehicle, which is 1/4 the vehicle weight. For an incline over 45 degrees the gradient resistance will be equal to the total weight of the vehicle. That the slope to be negotiated to all intents and purposes is only 1ft high will make no difference to the calculations, and should be borne in mind when pulling vehicle over ridges. If we combine the weight of the vehicle, the type of surface to be transited and the gradient to be overcome we get the calculation.

THE THEORY OF WINCHING

If we combine the weight of the vehicle, the type of surface to be transited and the gradient to be overcome we get the calculation.

$$\frac{\text{Weight of vehicle}}{\text{Surface to be transited}} + \frac{\text{Gradient}}{60} \times \text{Weight of Vehicle}$$

Therefore the winching formulae is

$$\frac{W}{S} + \frac{(G \times W)}{60} = \text{Effort Required}$$

Where W = Weight of vehicle
S = Surface to be transited
G = Angle of gradient (in degrees)

i.e. Vehicle weighing 4,500 lbs is to be winched up a sand dune of dry loose sand with a slope of 15 degrees.

Using the winching formula above.

Where W = 4500 lbs (Vehicle Weight)
S = 1/4 (co-efficient for soft sand)
G = 15 (Slope in degrees)

We have

$$\begin{aligned} \frac{4500}{4} + \frac{(15 \times 4500)}{60} &= 1125 + \frac{(1 \times 4500)}{4} \\ &= 1125 + 1125 \\ &= 2250 \text{ lbs effort required to recover vehicle in these circumstances.} \end{aligned}$$

If we substitute clinging clay for the surface (co-efficient of 1/2) and 35 for the gradient (slope) in the above equation we get:

$$\frac{4500}{2} + \frac{35 \times 4500}{60} = 4875 \text{ lbs Effort Required}$$

The effort required may be outside the capacity of the winch, (the rating of a winch usually refers to the first layer of wire rope on the drum). In this case, one solution may be to run out most of the winch cable to enable the winch to be used at or near its rated capacity, or introduce a pulley block pulley in the winch line to create a mechanical advantage, thus practically halving the effort required by the winch.

THE THEORY OF WINCHING

The most important aid to successful winching (after the winch) is the pulley block, which can be used to increase the pulling power of the winch or for indirect pulls. Pulley blocks can be used in two modes. (a) attached to the load and (b) secured to an anchor point.

The anchor point, when used, must be secure, using a tree, another vehicle or any firm structure to which a pulley block can be attached with a chain or stout rope. Figs 1- 4 show typical examples where a pulley block can be used to advantage, based on a winch line pull of 1000 lbs.

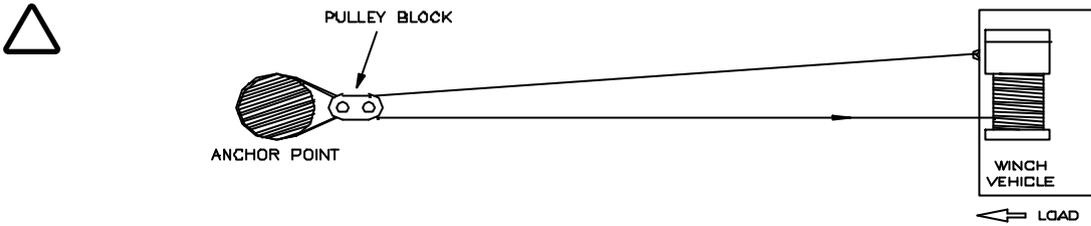


Fig. 1 Vehicle self recovery using the pulley block attached to the anchor point for direct pull. In this instance the vehicle becomes the 'load' and the actual pulling power on the vehicle will be 2000 lbs at half winch rope speed.

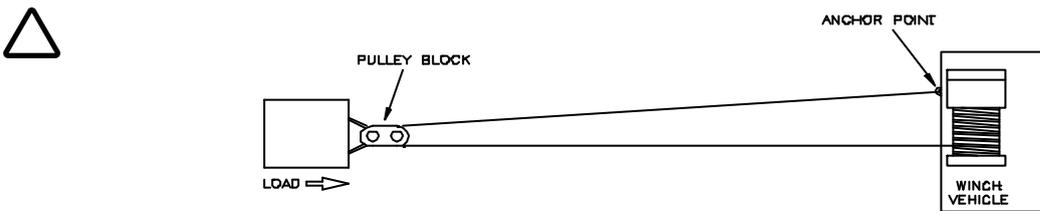


Fig. 2 Direct pull on load using the winch vehicle as the anchor with pulley block attached to the load. Actual pulling power on load will be 2000 lbs at half winch rope speed.

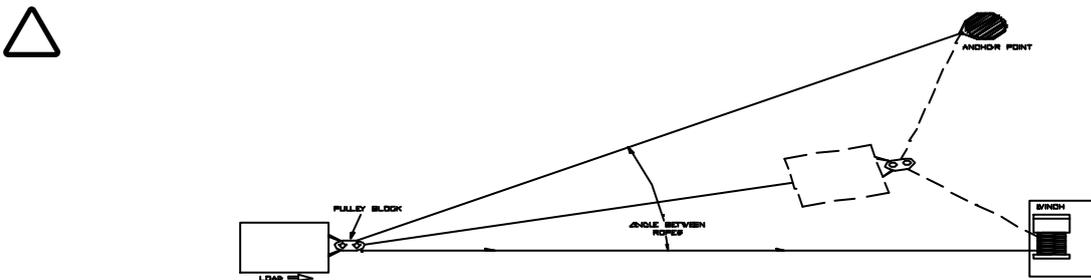


Fig. 3 Indirect pull necessitated by obstructions or soft ground. Pulley block attached to load using a suitable anchor point. Note the angled direction taken by the load and subsequent angle of rope feed-back on the winch drum (extreme example shown). There may be unavoidable circumstances requiring this mode, though in general it is not recommended unless applied in stages by moving the anchor point or vehicle to avoid sharp angled rewind on the winch drum. The actual load pulling power and rope speed will depreciate with any increased angle between the ropes.

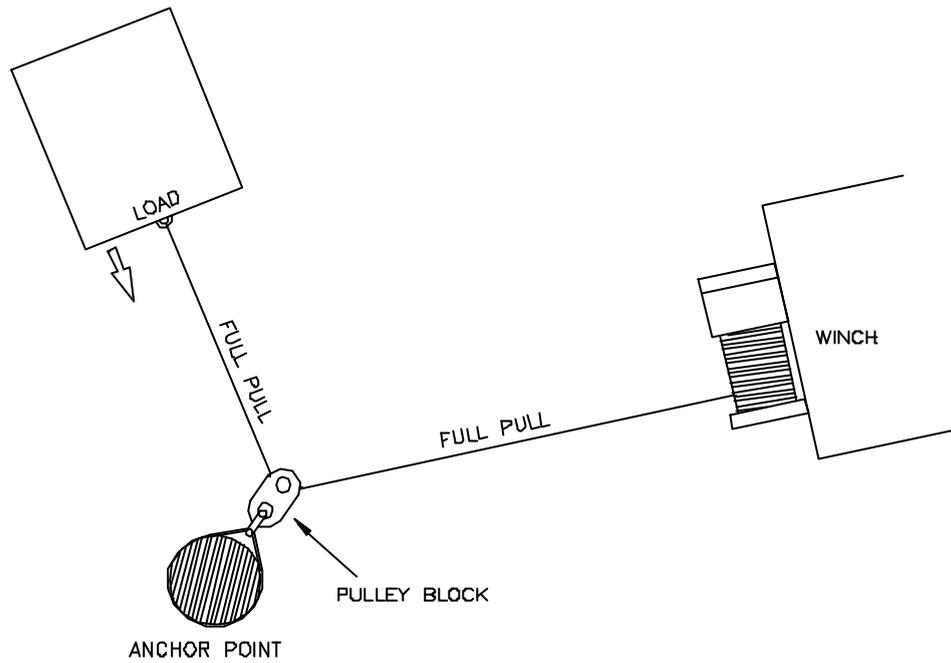


Fig. 4 Indirect pull where vehicles access is limited due to unsuitable ground or obstructions, using a pulley block attached to suitable anchor point. Actual pulling power on load will be 1000 lbs at winch rope speed.

USE OF A NYLON SLING

2.1 A shackle should always be used when attaching winch hooks to nylon slings.

NOTE: The shackle must pass through both eyes of the sling. The Safe Working Load of the nylon sling is based on the use of both eye ends.

USE OF GLOVES



3.1 Use of gloves when handling or rewinding cable to eliminate the possibility of cuts caused by burrs and broken strands.

RULES FOR SAFE OPERATION

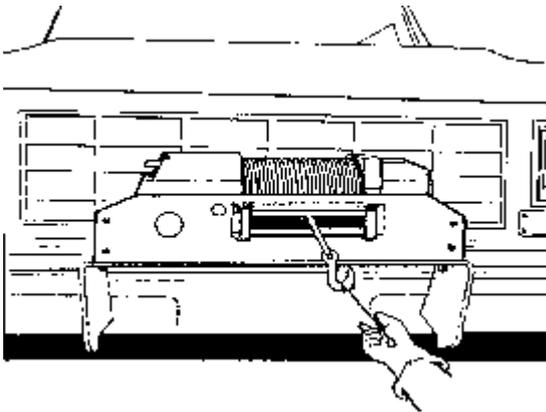
Your Superwinch is a very powerful machine. Treat it with respect, use it with caution, and always follow these safety guidelines. Your Superwinch is specifically designed for the movement of goods and materials. In an emergency situation where the lives of people are endangered take every precaution including those listed below.

1. GENERAL - applicable in all instances
2. HAULING - the loading of a boat onto a trailer or the removal of a fallen tree
3. SELFR RECOVERY - the removal of the vehicle itself using a suitable anchorage

GENERAL SAFETY



- 1.1 **Learn to use your Superwinch.** After installing it, take some time and practice using it so you will be familiar with it when the need arises. Periodically, check the winch installation to ensure that all bolts are tight.
- 1.2 **Keep winching area clear.** Do not allow people to remain in the area during winching operation. DO not step over a taut wire rope or allow anyone else to do so.
- 1.3 **Inspect wire rope and equipment frequently.** The wire rope should be inspected for damage that could reduce its breaking strength. A frayed rope with broken strands should be replaced immediately. Always replace the rope with a Superwinch recommended replacement part. Any substitution must be **identical** in strength, quality lay and strength.
- 1.4 **Use of gloves** when handling or rewinding wire rope to eliminate the possibility of cuts by burrs and slivers from broken strands.
- 1.5 **Always make sure** that there are at least 5 complete turns of rope left on the drum before winching since the rope fastener will not support a heavy load.



- 1.6 **Keep hands and fingers clear of winch rope and hook when operating winch.** Never put your fingers through the hook when reeling in the last few feet. If your finger should become trapped in the hook or rope you could lose your finger. Use the **Hand Saver Bar** (Fig. 6) to guide the hook for the last few feet. Never guide a wire rope under tension onto the drum with your hand.

Fig. 6

- 1.7 **Never hook the rope back onto itself.** Hooking the rope back onto itself creates an unacceptable strain, breaking individual strands which in turn weakens the entire wire rope. Use the sling as shown in Fig. 7.

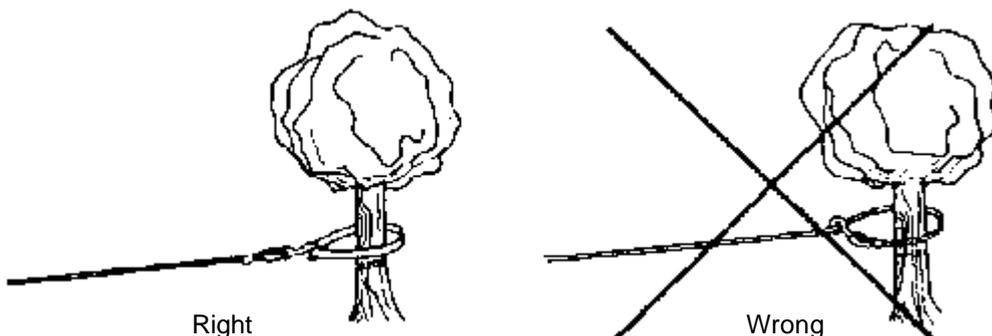


Fig. 7

GENERAL SAFETY

1.8 **Avoid continuous pulls from extreme angles** as this will cause the rope to pile up at one end of the drum (Fig. 8). Always aim to get the rope as straight as possible to the direction of the vehicle.

1.9 **Never operate the winch without the rope fairlead fitted.** Operator injury or winch damage can result if a fairlead is not installed.

1.10 **Never engage or disengage winch clutch when there is a load on the winch.**

1.11 **Store the remote control cord in a safe place** when not in use to prevent use by children or other unauthorized persons who could injure themselves, others or damage the controls.

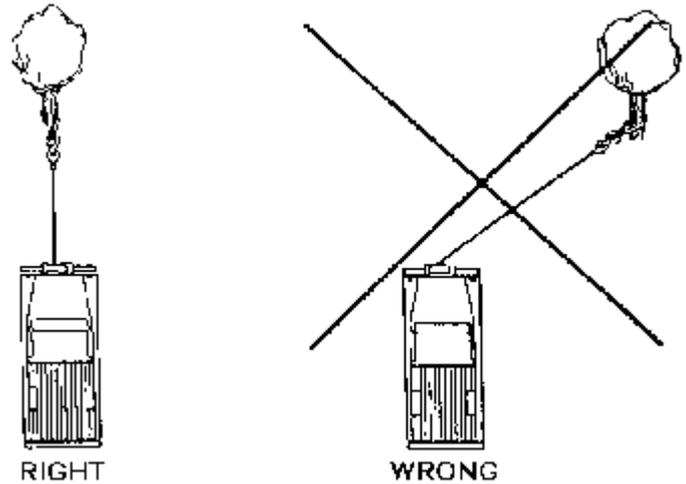
1.12 **Do not operate winch when under the influence of drugs, alcohol or medication.**

1.13 **Isolate winch before putting your hands in or around the fairlead or wire rope drum (the danger zone).**

1.14 **Do not overload your winch.** Do not maintain power to the winch if the motor stalls. Overloads can damage the vehicle, winch and/or the wire rope and create unstable operating conditions.

1.15 **Electric Winches :** If the vehicle is powered from the vehicle battery, take care that this is not discharged to the point where by the engine cannot be started and you could be stranded. It is recommended to keep the engine running whilst winching to provide charging current to the battery.

1.16 It is recommended to lay a heavy blanket or jacket over the rope about halfway along to the hook attachment. If a rope failure should occur, the weight of the clot will act as a damper and help prevent the broken rope from whipping. See Fig. 9. Remember to move the blanket or coat as winching proceeds, but halt winching when doing so. Partially raising the bonnet of the vehicle will also give a measure of protection to it's occupants from a broken rope, consistent with sufficient forward visibility for the operator. Keep item 1.2 firmly in mind.



HAULING



2.1 When using your Superwinch to move a load, ensure the vehicle is held securely to the ground, preferably with a ground anchor. Application of the vehicle's footbrake by you or your assistant may be sufficient, depending on the load and the ground surface. Never leave an automatic transmission in the 'park' position.

2.2 **Do not** 'move' your vehicle in reverse to assist the winch. The combination of the winch and vehicle pulling together could overload the rope, and the winch itself.

SELF RECOVERY



3.1 **Always** aim to get the cable as straight as possible to the direction of the vehicle. It is acceptable to start a pull at an angle if it is obvious that the vehicle will turn towards the hook anchor point. Turning the steering wheels will assist the process. It is recommended that the driver is in the vehicle.

3.2 Make sure hand brake and foot brake are free and that transmission is in neutral.

SELF RECOVERY

3.3 When the driver's attempt to regain vehicle traction is successful, he or she should take care not to overrun the rope and risk the possibility of it being trapped under the vehicle.

3.4 Use can be made of the pulley block to increase effective pull. In this case however, the hook is attached to the vehicle itself, but care must be taken to connect with a secure chassis frame point.

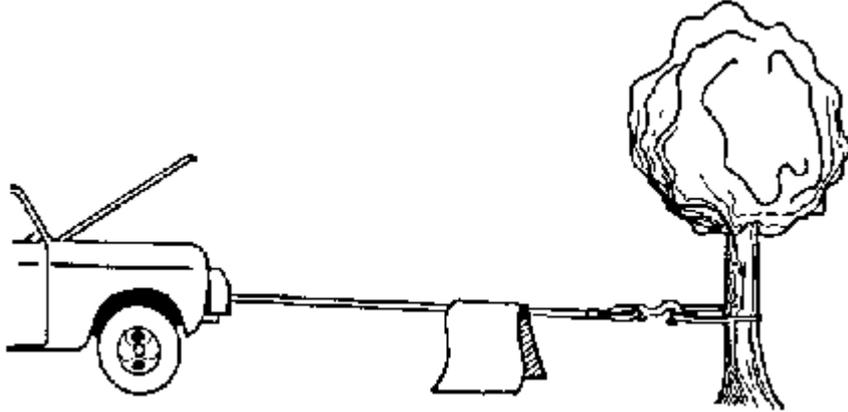


Fig. 9



This Manuals Part No. is :
5-001-193
Issue No.
2

Superwinch Ltd.,
Abbey Rise, Whitchurch Road, Tavistock, Devon.
Great Britain.
PL19 9DR
Tel: +44 (0)1822 614101
Fax: +44 (0)1822 615204
support@superwinch.net

Superwinch Inc.,
Winch Drive, Putnam, Connecticut 06260
U.S.A.
Tel: (860) 928 7787
Fax: (860) 928 1143
www.superwinch.com

SUPERWINCH*

