

# Winch Operations: Hydraulic, Electrical, and Mechanical

## Introduction

The use of winches in the fire and rescue service has many applications, from pulling heavy objects to lifting to stabilization. Comprehensive working knowledge of all winches and their capacities and the use of best practices during the application phase will bring the safest outcomes. Rescue squads and rescue engines may have a combination of hydraulic, electrical or gasoline powered winches and even manual winches are used.

**Hydraulic-** Generally powered by the transmission by the use of a PTO (power take off), spinning a shaft (at a pre-determined speed) engaging a pump that produces the correct operating pressure for the winch. Hydraulic winches power worm gears with different ratios to develop the power ratings of the winch. Rescue squads in the county generally operate with a 20,000 lb or 10 ton winch rating at a minimum. The 20,000 lb rating is based on the 1<sup>st</sup> layer of wire rope or in our case Plasma rope on the drum in a straight line pull. The more layering on the drum the less pull rating is available. Generally speaking only, a 10 % reduction in rating per layer can be used in field calculations. Hydraulic driven winches come in a wide range of sizes from 10,000 lb to 100,000 lb. Generally, the manufacturer of the winch will also provide or suggest the proper sized wire rope for the winch to provide the minimum ratings of the winch. It is customary to operate with a 4:1 safety factor of the wire rope MBS to the winch rating. Pictured above is a Baden 20,000 lb hydraulic winch with approximately 150 (useable)' of 7/8" purple Plasma rope with a MBS of 92,500 lbs with a thimble spiced on the end which are on our Pierce rescue squads.

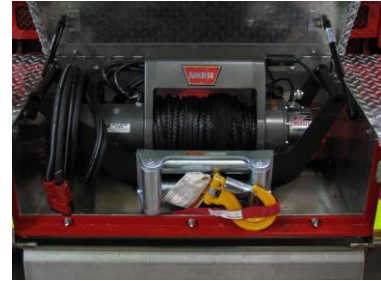


Hydraulic and electric winches are activated by some means of a controller. Most controllers are on a long electrical lead providing a safety net while operating a winch. Some leads are as long as 25' which offers considerable flexibility for the operator. These leads must attach to a pre-determined place to engage the winch. Some attachment points are on the winch itself and some are remote. In the event of



a failure of the electrical controller, the hydraulic winches on the Pierce rescues have a manual activation as a back-up to the electrical controller. The manual lever simply controls opening spool valves allowing the hydraulic fluid to flow. Controlling the lever, you can actually control the speed of the fluid consequently control the winch speed.

**Electric-** Similar to the hydraulic winches, electric winches come in all sizes with many different wire rope sizes and types. In the county, we have electric winch sizes from 8,000 lb to 12,000 lb. Our county rescue squads are carrying a 9,000 lb Warn winches. Our electric winches are complete with 100' of 3/8" synthetic plasma rope with a MBS of 18,400 lbs. and a slip hook at the end rated at a little over 7,000lb. Our winches on the Pierce rescue squads are of quick disconnect type allowing the electric winch to be used in other hitch receivers mounted on the rig. The quick disconnect type also require a quick



disconnect for the electrical requirements for the winch. When using electrical winches it is always good practice to have the engine on high idle to keep the voltage up while operating these electrical motors on the winches.

**Mechanical –** For a completely portable winch operation the Pierce rescue squads offer a Simpson Capstan winch. It has a 2,000lb capacity and is powered by a Honda motor. It is designed to pull 5/16" to 3/8" diameter rope.

