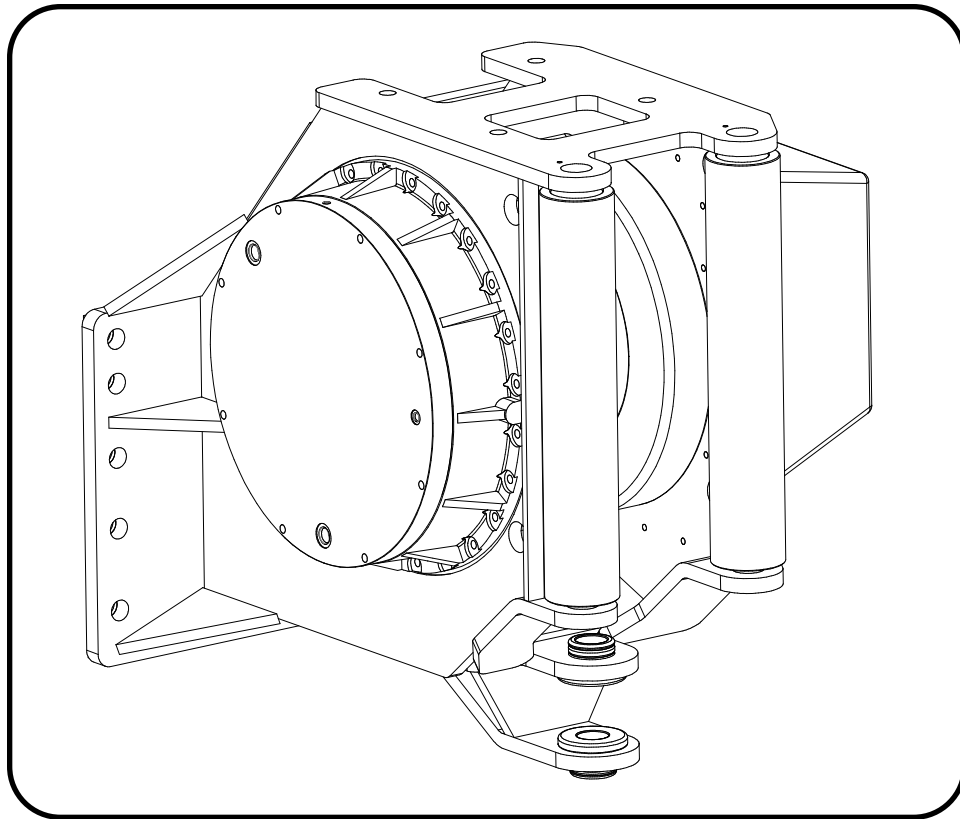


CARCO®

MODEL H90VS

OPERATION AND PREVENTIVE MAINTENANCE MANUAL



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FOREWORD

Please read and understand this entire manual BEFORE operating or servicing your Carco winch. Retain this manual for future reference.

Some illustrations in this manual may show details or attachments which may be different from your winch. Also, some components may have been removed for illustrative purposes.

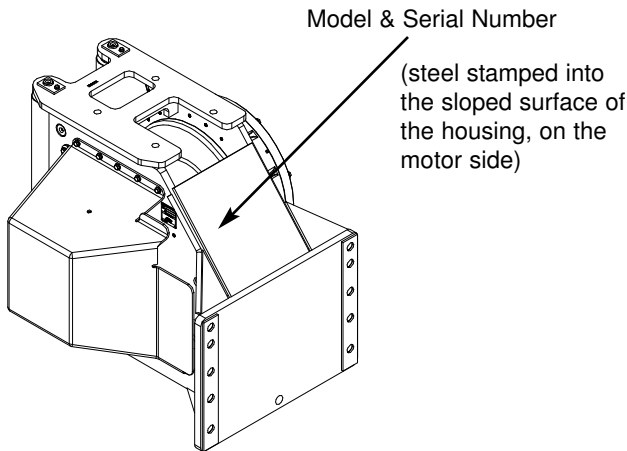
Whenever a question arises regarding your Carco winch or this manual, please contact your nearest Carco dealer or the Carco Service Department at 1-918-251-8511, Monday - Friday, 0800 hrs - 1630 hrs CST, or by FAX at 1-918-259-1575. Provide the complete winch Model Number and Serial Number when making inquiries.

Parts and Service

Carco provides parts and service through a network of authorized dealers. Parts and service are not available directly from Carco. For the name of your nearest dealer, consult your local phone directory or call Carco at the phone number shown above.

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The winch model number is an important reference as to what optional components were used when the winch was manufactured. The model and serial numbers are stamped into the winch housing as shown at left.

Record the information below for future reference. Always include the model and serial numbers when inquiring or ordering parts.

Model No. _____

Serial No. _____

In-Service Date _____

Safety and Informational callouts used in this manual include:

WARNING

This emblem is used to warn against unsafe practices which COULD result in severe personal injury or death if proper procedures are not followed.

CAUTION

This emblem is used to warn against potential or unsafe practices which COULD result in personal injury, and product or property damage if proper procedures are not followed.

GENERAL SAFETY RECOMMENDATIONS

Safety for operators and ground personnel is of prime concern. Always take the necessary precautions to ensure safety to others as well as yourself. To ensure safety, the tractor and winch must be operated with care and concern by the operator for the equipment, and a thorough knowledge of the machine's performance capabilities. The following recommendations are offered as a general safety guide. Local rules and regulations will also apply.



WARNING

FAILURE TO OBEY THE FOLLOWING SAFETY RECOMMENDATIONS MAY RESULT IN PROPERTY DAMAGE, INJURY OR DEATH.

1. Read all warning tag information and become familiar with all controls BEFORE operating the winch.
2. Never attempt to clean, oil or perform any maintenance on the winch with the engine running, unless instructed to do so in this manual.
3. Before starting the tractor, be certain all controls move freely and are placed in the "Brake-On" (neutral) position.
4. Never operate winch controls unless you are properly seated at the operators station on the tractor and you are sure personnel are clear of the work area.
5. Never attempt to handle winch cable when the hook end is not free. Keep all parts of body and clothing clear of cable rollers, cable entry area of fairleads and winch drum.
6. Ground personnel should stay in view of tractor operator and clear of winch drum. Do not allow ground personnel near winch line under tension. A safe distance of at least 1 ½ times the working length of the cable should be maintained. Never allow anyone to stand under a suspended load.
7. Avoid sudden "shock" loads or attempting to "jerk" a load free. This type of operation may cause heavy loads in excess of rated capacity, which may result in failure of cable and/or winch.
8. Use only GENUINE CARCO parts. Do not use parts from other winch manufacturers on your CARCO winch. Do not use CARCO parts on winches from other manufacturers.
9. Use correct size ferrule for cable and pocket in winch drum. Never use knots to secure or attach cable. The cable anchor or ferrule pocket in the cable drum is designed to provide a self release in the event a back-sliding load must be released from the tractor in an emergency situation. The cable anchor or ferrule alone will NOT support rated line

pull. Therefore, a minimum of five (5) complete wraps of cable must be maintained on the winch drum.

i NOTE: We suggest painting the last five wraps of cable bright red to serve as a visual warning.

Recommended Operating Practices

1. Leather gloves should be used when handling winch cable.
2. Operate the winch to match line speeds to job conditions.
3. Assure that personnel who are responsible for hand signals are clearly visible and that the signals to be used are thoroughly understood by everyone.
4. Inspect winch cable, rigging, winch and tractor at the beginning of each work shift. Defects should be corrected immediately.
5. Position tractor for straightest line of pull to reduce wear on winch cable and ensure even spooling.
6. When winding winch cable on the winch drum, never attempt to maintain tension by allowing winch cable to slip through hands. Always use "hand-over-hand" technique, being careful to keep hands and clothing away from winch drum and fairlead rollers.
7. Be sure of tractor ground stability before winching in a load.
8. Store unused chokers, slings and rigging in a neat and orderly fashion to prevent damage to equipment or injury to personnel.
9. The maximum rated bare drum line pull of the Model H90VS winch is 90,000 LB (400 kN).

Do not operate the winch under loads that exceed the maximum rated bare drum line pull. If excessive loads are encountered, use a multi-part line and sheave blocks. Any attempt to exceed the capacity of one winch (such as coupling 2 or more tractors together) is extremely hazardous.
10. The factory approved adaptations for CARCO winches are designed and intended for use on specific models of crawler tractors. Changing winches between tractors is not possible in some cases because of differences in tractor models. Some changes cannot be approved by CARCO because of safety limitations. Call a CARCO dealer or the CARCO factory prior to attempting winch modifications or before mounting on a different tractor.
11. CARCO H90VS winches are powered by the tractor hydraulic system. Discharge all retained hydraulic system pressure before removing any hydraulic

lines or fittings. Personal injury may result from sudden release of oil pressure. To discharge the winch control system pressure, stop the engine and cycle the winch control lever(s) into all positions five times. Refer to the tractor manufacturers operators or service manual for additional information.

12. On machines having hydraulically, mechanically and/or cable controlled equipment, be certain the equipment is either lowered to the ground or blocked securely before servicing, adjusting and/or repairing the winch. Always apply tractor parking brakes and lower equipment before dismounting the tractor.
13. The winches described in this manual are neither designed nor intended for use or application to

equipment used in the lifting or moving of persons.

14. Install guarding to prevent personnel from getting any part of their body or clothing caught at a point where the cable is wrapped onto the drum or drawn through fairlead guide rollers.
15. Keep equipment in good operating condition. Perform scheduled servicing and adjustments listed in the "Preventive Maintenance" section of this manual. Use recommended lubricants.
16. An equipment warm-up procedure is recommended for all start-ups and essential at ambient temperatures below +40°F (5°C). Refer to "Warm-Up Procedure" listed in the "Preventive Maintenance" section of this manual.

MODEL DESCRIPTION

The H90VS hydraulically driven winch is a triple reduction planetary winch drive system enclosed in a large welded housing attached to the rear face of a crawler tractor. The winch is driven by a hydraulic motor which depends upon the tractor hydraulic system for power. The delivery of the oil supply to the winch motor varies with specific tractor design.

The winch has equal speed gearing, power-in and power-out. The gear train and winch load are held secure by a spring applied, hydraulically released multi-disc static brake when the controls are in the neutral "brake-on" position.

When the winch is operated in the reel-in direction, the motor drives the gear train through a sprag-type brake clutch. The inner race of the brake clutch serves as a coupling between the motor shaft and the winch gear train. The outer race of the brake clutch is splined to the friction discs of the spring applied static (parking) brake. Immediately upon stopping, the sprag cams roll up to lock the inner race to the outer race and firmly hold the gear train. This eliminates "load fall-back" to provide exceptionally precise load control.

When starting a reel-out maneuver, the hydraulic oil enters the hydraulic motor but cannot escape as the brake valve (counterbalance valve) is closed. The pressure increases in the motor and brake release pilot hoses causing the static load holding brake to be released. As the pressure continues to increase, the counterbalance valve starts to meter oil flow out of the motor allowing the gear train and winch drum to rotate. The counterbalance valve continuously modulates the flow to provide a smooth and controlled pay-out of the winch cable regardless of load or speed.

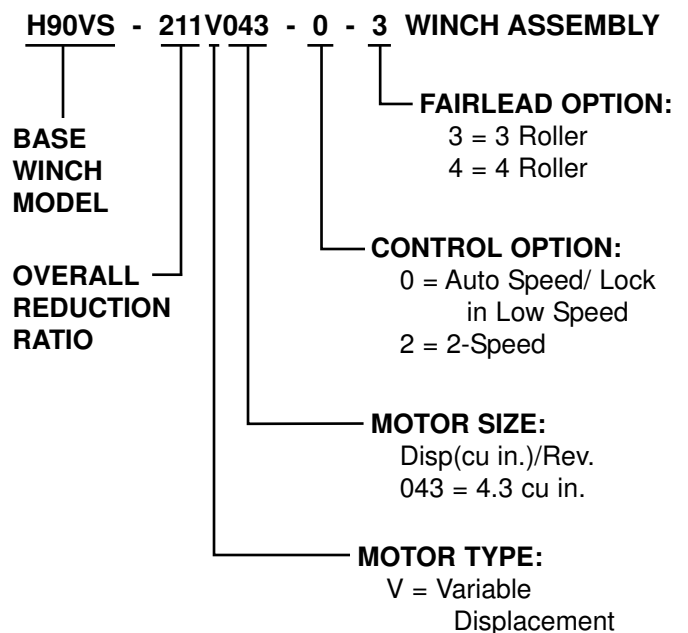
A patented spring applied hydraulically released drum clutch secures the secondary sun gear to the primary planet carrier. When the drum clutch is released, the secondary sun gear can turn freely allowing the tractor to drive away from a load. The resistance of the gear train will maintain a tight wrap of cable on the drum.

A three roller fairlead is standard equipment and designed into the housing weldment. A fourth roller may be added as required.

The hydraulic motor size (displacement) and winch gear ratio are matched to the hydraulic system of the tractor to maximize available power.

The winch model number is an important reference as to what components are used when the winch was manufactured. The winch model number and serial number are stamped into the top surface of the winch case weldment above the upper, right hand winch mounting pad.

The winch model number contains the following configuration data:



WINCH OPERATION

HYDRAULIC SYSTEM DESCRIPTION

Differential steer or hydrostatically controlled tractors are typically designed with a load sense, pressure compensating hydraulic system. This system is equipped with a variable displacement piston pump which supplies oil to the implement valve only when a work function (cylinder or motor) demands flow. Normally the pump(s) remain at approximately 400 psi (2,760 kPa) in the low pressure standby condition. Shifting the winch control valve will cause the pump displacement control system to upstroke to match the demand of load. If the pressure starts to exceed the pump compensator setting, (cylinder reaches full stroke or the motor pressure is at the maximum) the pump will destroke to decrease the flow and just maintain the pressure at the compensator setting. The significance of this system is that there is no excess flow metered across a relief or partially shifted control valve spool to generate heat. Returning the control valve to neutral destrokes the pump to a low flow, typically 0.2-0.5 gpm (.75-1.9 lpm) and returns the pump to a low pressure standby value of approximately 400 psi (2,760 kPa). Load sense hydraulic systems give extremely good control of the load and minimize the hydraulic loss inefficiencies in the system.

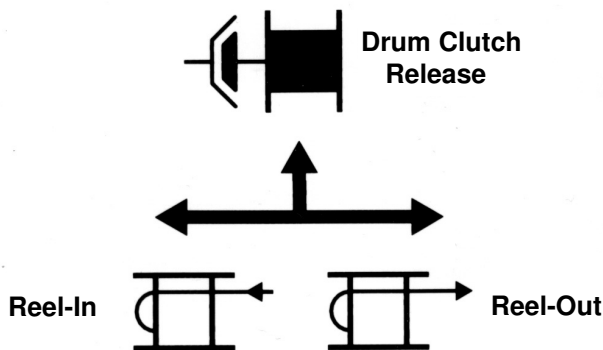
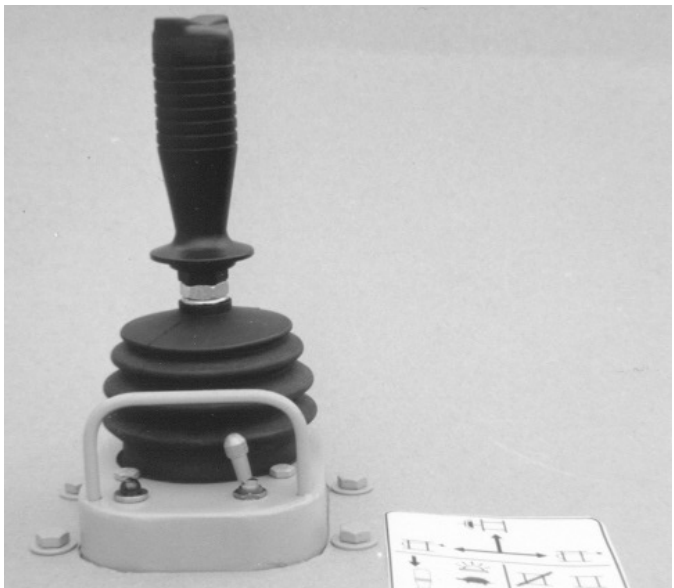


Figure 1

The H90VS joystick utilizes the control pattern shown in Figure 1. Moving the control handle compresses the pilot valve plunger in the direction of motion. This causes a variable pressure signal at the joystick port immediately below the plunger. Pressure for reel-in and reel-out functions is ported to the winch control valve section; this pilot pressure results in work pressure at the winch motor. The drum clutch function of the joystick valve is connected directly to the winch drum clutch piston. Supply pressure for the joystick is the multi function logic block. This block contains a pressure reducing valve which converts tractor implement system pressure to 500 psi for pilot pressure. The block also contains an emergency relief valve, a flow control device to prevent system overheating in the event of a pressure reducing valve failure, and a solenoid actuated cartridge which provides a pilot signal to lock the winch motor in maximum displacement; the latter is a "low lock" function actuated with a button on the joystick. The valve also includes a solenoid to disable the winch, selectable by the operator.

CONTROL OPERATION

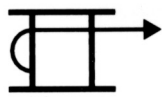
The following illustrations show joystick positions and explain corresponding winch action. Note that the joystick provides infinitely variable winch speed control. Slight movement of the joystick in the reel-in or reel-out direction results in very slow, controlled drum speeds. As the joystick is moved further from the center neutral position, the drum speed will increase proportionally. When the handle is released from reel-in or reel-out, it will spring return to the neutral brake-on position. Because there are no directional friction clutches, as would be found in conventional mechanically driven winches, the joystick may be moved in very small increments (feathered) to achieve precise load control without winch wear or damage. The drum clutch function is not variable, the joystick detents into the drum clutch position.



Brake-On (neutral). The joystick is spring centered to brake-on. The multi-disc, static parking brake is applied by spring force. Loads may be skidded in this position.



Reel-In. The winch drum will pull in cable. Cable speed is proportional to joystick position. When released, the handle will return to neutral and the winch drum will stop and hold the load.



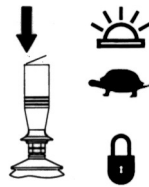
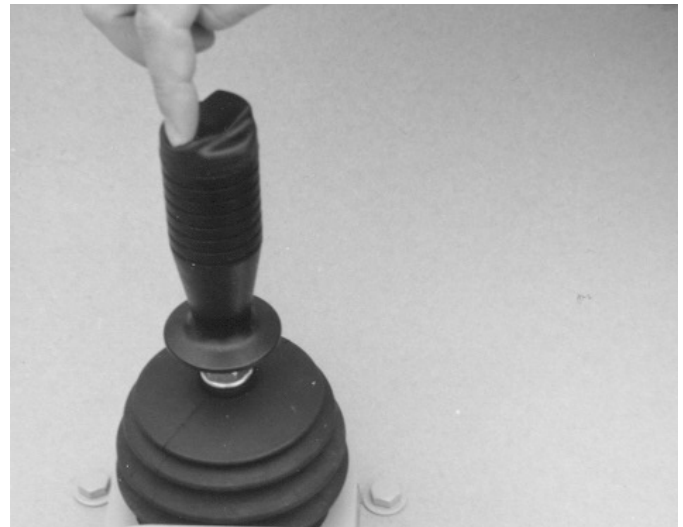
Reel-Out. The winch drum will pay-out cable. Cable speed is proportional to joystick position. When released, the handle will return to neutral and the winch drum will stop and hold the load.



Drum clutch release. This position will release the drum clutch and permit the operator to drive away from a load. The resistance of the gear train will keep a tight wrap of cable on the drum to prevent overrun. It should be noted that the resistance of the gear train will not permit cable to be pulled off the drum by hand. The joystick will stay in the detented, clutch released position to permit the operator to use both hands for tractor operation. Lightly pull the lever back toward the operator to release the detent and apply the drum clutch.

⚠ WARNING ⚠

DO NOT use drum clutch release for controlled reel-out of suspended loads. Sudden release of load may result in property damage, injury or death. Use only reel-out to lower loads.

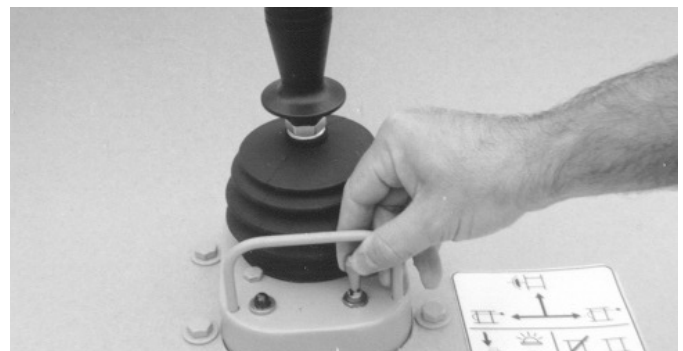


Low-Lock/Auto-Speed. Press one side of the rocker switch on top of the lever to apply low-lock (indicator light on) which will hold the variable displacement motor in the maximum displacement position for maximum line pull and minimum line speed to enhance precise load control. Press either side of the rocker switch to return to full auto-speed operation (indicator light off) where the motor displacement will self adjust between the maximum and factory-set minimum displacement to achieve the best match of line speed and line pull for the application.

⚠ CAUTION ⚠

The H90VS hydraulic motor and gear ratio is configured to match the hydraulic system of a specific tractor. It may not be possible to mount the winch onto a different model tractor. Installation onto a tractor with a higher flow hydraulic system could result in over-speed damage to the motor and winch gear train. The maximum drum RPM in auto-speed no-load, with a piston motor, is listed below:

H90VS - 211XXXX	22 to 24 RPM
H90VS - 254XXXX	18 to 20 RPM

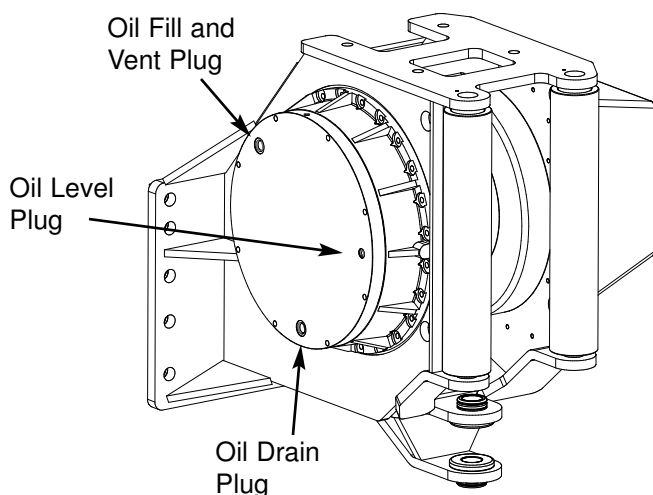


Winch disable. Pull and move switch to disable winch operation. Leave switch in disable position when winch is not being used.

PREVENTIVE MAINTENANCE

A regular program of preventive maintenance for your Paccar winch will minimize the need for emergency servicing and promote long product life and trouble-free service.

The service intervals suggested in this manual will optimize component service life. The intervals may be gradually increased or decreased with experience of a particular lubricant and evaluation of your application.



Gear Case Oil Level

The winch assembly should be visually inspected for leaks at the beginning of each workday. If oil leaks are found, the gear case oil must be checked. If no leaks are detected, the oil level may be checked once every 250 hours or monthly. Position the tractor on a flat, level surface and remove the plug. The oil should be at the bottom of the level plug hole.

Add oil as required through the oil fill plug. Add oil slowly, as the oil must pass through the gear train and fill the cable drum cavity.

Refer to the recommended oil chart for the proper oil for your application.

Tractor Hydraulic Reservoir Level

The tractor hydraulic reservoir oil level should be checked daily or in accordance with the tractor manufacturer's recommendations. Use the type of hydraulic oil recommended by the tractor manufacturer.

Change the tractor hydraulic oil and filter every 1000 hours or in accordance with the tractor manufacturer's recommendation.

Gear Case Oil Change

Change the winch gear case oil after the first 100-250 hours of operation, then every 1000 hours or six months, whichever occurs first.

⚠ WARNING ⚠

Hot oil may cause injury. Make certain oil has cooled to a safe temperature before servicing.

Remove the oil drain plug. Drain oil into a suitable container and recycle or dispose of used oil in an environmentally responsible manner. Install the plug securely after the oil has been drained.

Refill winch to proper level with recommended oil. Allow 15 minutes for the oil to flow through the gear train and fill the cable drum cavity before checking oil level.

Oil Capacity: Approximately 25 pint (12L)

⚠ CAUTION ⚠

Do not operate winch while oil is drained. Serious damage to internal components may result.

Vent Plug

The vent plug is installed in the oil filler plug located near the top of the drum clutch housing. Whenever the oil is changed, remove the vent plug, clean in safety solvent and reinstall.

Note: Do not replace the vent plug with a solid plug. The normal expansion of the oil during operation would cause a build-up of pressure in the gear case which may lead to seal leakage.

Winch Cable (Wire Rope)

Inspect entire length of wire rope and hook in accordance with the rigging manufacturer's recommendations.

Mounting Fasteners

Check/tighten all winch mounting fasteners to recommended torque after the first 100-250 hours of operation, then every 1000 operating hours or six (6) months, whichever occurs first.

Warm-up Procedure

The tractor should be run at its lowest RPM with the winch control in the neutral, brake-on position allowing sufficient time to warm the hydraulic system or in accordance with the tractor manufacturer's recommendations.

The winch should then be operated under a no-load condition, in haul-in and pay-out direction several times to prime the lines with warm hydraulic oil and circulate gear lubricant through the brake and gear train. This action will minimize the temporary increase in "brake-off" drag caused by cold oil.

⚠ WARNING ⚠

A warm-up procedure is recommended at each start-up and is mandatory at ambient temperatures below +40°F (4°C). Failure to warm-up the tractor/winch oil may result in temporary brake slippage and loss of load control due to high back pressures attempting to release the static brake. This condition may result in property damage, injury or death.

Fairlead Rollers

Grease the fairlead rollers at the beginning of each work-day. The vertical rollers have a grease fitting at the top

and bottom. The horizontal rollers have only one grease fitting. Apply grease until a small amount pushes out around the shaft.

Use a high quality type 12-hydroxy stearate lithium base product, which contains an EP additive, such as Moly, and meets or exceeds an NLGI Grade 2 specification.

Inspection

Every 10,000 hours or four years, whichever occurs first, the winch should be disassembled for a thorough inspection of all wear items. Refer to the Service Manual for additional information.

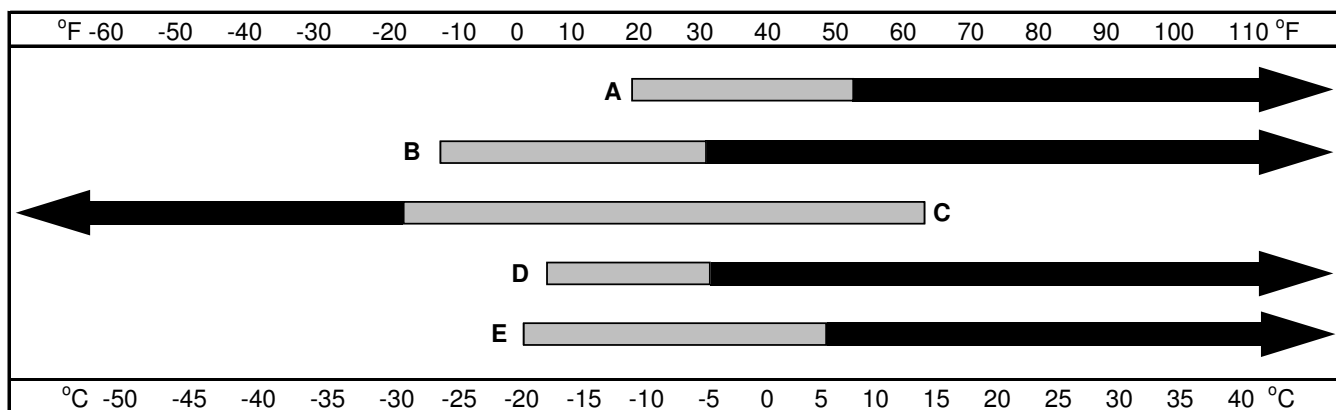
Recommended Oil

We have published the following specification to help you determine which lubricant is best suited to your application.


The oil must possess high temperature oxidation stability, rust and corrosion protection, good dispersant and detergent characteristics, anti-wear additives and remain compatible with nitrile base seals.

Your lubricant supplier should assure you that his product meets this specification. If there is still any doubt as to the suitability of a lubricant, contact the Paccar Winch Service Department, providing a copy of the product specifications.

Prevailing Ambient Temperature



⚠ WARNING ⚠

 Cold start-up in this ambient temperature range requires extended equipment warm-up to prevent erratic clutch and brake operation which may result in property damage, injury or death.

- A - Series 3 Motor Oil SAE 30 wt, MIL-L-2104C
- B - Series 3 Motor Oil SAE 5W30, MIL-L-2104C
- C - Hydraulic Oil, MIL-H-5606
- D - CAT TO-4 30 wt (recommended)
- E - CAT DEO CF-4 10W30

GENERAL SPECIFICATIONS

Unit Weight - without oil, cable or tractor adapters Approximately 3,400 lb (1,540 kg)

Gear Ratios Available

Overall Reduction 211.6
254.5

Cable Drum Dimensions

Barrel Diameter 12.5 in. (318 mm)
Flange Diameter 24.0 in. (610 mm)
Barrel Length 9.0 in. (229 mm)

Cable Storage Capacity

LAYER	STD - 1 in. (25 mm) Ferrule Part No. 29427		OPT - 1-1/8 in. (29 mm) Ferrule Part No. 29428	
	FT	M	FT	M
1	31	9	28	9
2	67	20	61	19
3	108	33	98	30
4	153	47	140	43
5	203	62	187	57

Gear Case Oil Capacity25 pint (12L)

Static Brake Pressure Release approximately 645 psi (4,450 kPa)

Drum Clutch Release Pressure approximately 215 to 350 psi (1,480 to 2,410 kPa)

RECOMMENDED FASTENER TORQUE

Higher or lower torques for special applications will be specified such as the use of spanner nuts, nuts on shaft ends, jam nuts and where distortion of parts or gaskets is critical.

Lubricated torque values based on use of SAE 30wt engine oil applied to threads and face of bolt or nut.

Avoid using thread lubricants as the applied torque may vary by 10-40% depending upon product used.

Bolt Dia. Inches	Thds Per Inch	Torque (LB-FT)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
1/4	20 28	8	6	12	9
5/16	18 24	17	13	24	18
3/8	16 24	31	23	45	35
7/16	14 20	50	35	70	50
1/2	13 20	75	55	110	80
9/16	12 18	110	80	150	110
5/8	11 18	150	115	210	160

Bolt Dia. Inches	Thds Per Inch	Torque (LB-FT)			
		Grade 5		Grade 8	
		Dry	Lubed	Dry	Lubed
3/4	10 16	265	200	380	280
7/8	9 14	420	325	600	450
1	8 14	640	485	910	680
1 1/8	7 12	790	590	1290	970
1 1/4	7 12	1120	835	1820	1360
1 3/8	6 12	1460	1095	2385	1790
1 1/2	6 12	1940	1460	3160	2370

To convert LB-FT to kg-m, multiply by 0.1383

To convert LB-FT to N-m, multiply by 1.356

METRIC CONVERSION TABLE

English to Metric

Metric to English

LINEAR					
inches (in.)	X 25.4	= millimeters (mm)	millimeters (mm)	X 0.3937	= inches (in.)
feet (ft.)	X 0.3048	= meters (m)	meters (m)	X 3.281	= feet (ft.)
miles (mi.)	X 1.6093	= kilometers (km)	kilometers (km)	X 0.6214	= miles (mi.)
AREA					
inches ² (sq.in.)	X 645.15	= millimeters ² (mm ²)	millimeters ² (mm ²)	X 0.000155	= inches ² (sq.in.)
feet ² (sq.ft.)	X 0.0929	= meters ² (m ²)	meters ² (m ²)	X 10.764	= feet ² (sq.ft.)
VOLUME					
inches ³ (cu.in.)	X 0.01639	= liters (l)	liters (l)	X 61.024	= inches ³ (cu.in.)
quarts (qts.)	X 0.94635	= liters (l)	liters (l)	X 1.0567	= quarts (qts.)
gallons (gal.)	X 3.7854	= liters (l)	liters (l)	X 0.2642	= gallon (gal.)
inches ³ (cu.in.)	X 16.39	= centimeters ³ (cc)	centimeters3 (cc)	X 0.06102	= inches ³ (cu.in.)
feet ³ (cu.ft.)	X 28.317	= liters (l)	liters (l)	X 0.03531	= feet ³ (cu.ft.)
feet ³ (cu.ft.)	X 0.02832	= meters ³ (m ³)	meters3 (m3)	X 35.315	= feet ³ (cu.ft.)
fluid ounce (fl.oz.)	X 29.57	= milliliters (ml)	milliliters (ml)	X 0.03381	= fluid ounce (fl.oz.)
MASS					
ounces (oz.)	X 28.35	= grams (g)	grams (g)	X 0.03527	= ounces (oz.)
pounds (lbs.)	X 0.4536	= kilograms (kg)	kilograms (kg)	X 2.2046	= pounds (lbs.)
tons (2000 lbs.)	X 907.18	= kilograms (kg)	kilograms (kg)	X 0.001102	= tons (2000 lbs.)
tons (2000 lbs.)	X 0.90718	= metric tons (t)	metric tons (t)	X 1.1023	= tons (2000 lbs.)
tons (long) (2240 lbs.)	X 1013.05	= kilograms (kg)	kilograms (kg)	X 0.000984	= tons (long) (2240 lbs.)
PRESSURE					
inches Hg (60°F)	X 3600	= kilopascals (kPa)	kilopascals (kPa)	X 0.2961	= inches Hg (60°F)
pounds/sq.in. (PSI)	X 6.895	= kilopascals (kPa)	kilopascals (kPa)	X 0.145	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.0703	= kilograms/sq.cm. (kg/cm ²)	kilograms/sq.cm. (kg/cm2)	X 14.22	= pounds/sq.in. (PSI)
pounds/sq.in. (PSI)	X 0.069	= bars	bars	X 14.5	= pounds/sq.in. (PSI)
inches H ₂ O (60°F)	X 0.2488	= kilopascals (kPa)	kilopascals (kPa)	X 4.0193	= inches H ₂ O (60°F)
bars	X 100	= kilopascals (kPa)	kilopascals (kPa)	X 0.01	= bars
POWER					
horsepower (hp)	X 0.746	= kilowatts (kW)	kilowatts (kW)	X 1.34	= horsepower (hp)
ft.-lbs./min.	X 0.0226	= watts (W)	watts (W)	X 44.25	= ft.-lbs./min.
TORQUE					
pound-inches (in.-lbs.)	X 0.11298	= newton-meters (N-m)	newton-meters (N-m)	X 8.851	= pound-inches (in.-lbs.)
pound-feet (ft.-lbs.)	X 1.3558	= newton-meters (N-m)	newton-meters (N-m)	X 0.7376	= pound-feet (ft.-lbs.)
pound-feet (ft.-lbs.)	X .1383	= kilograms/meter (kg-m)	kilogram/meter (kg-m)	X 7.233	= pound-feet (ft.-lbs.)
VELOCITY					
miles/hour (m/h)	X 0.11298	= kilometers/hour (km/hr)	kilometers/hour (km/hr)	X 0.6214	= miles/hour (m/h)
feet/second (ft./sec.)	X 0.3048	= meter/second (m/s)	meters/second (m/s)	X 3.281	= feet/second (ft./sec.)
feet/minute (ft./min.)	X 0.3048	= meter/minute (m/min)	meters/minute (m/min)	X 3.281	= feet/minute (ft./min.)
TEMPERATURE					
°Celsius = 0.556 (°F - 32)			°Fahrenheit = (1.8°C) + 32		
COMMON METRIC PREFIXES					
mega	(M)	= 1,000,000 or 10 ⁶	deci	(d)	= 0.1 or 10 ⁻¹
kilo	(k)	= 1,000 or 10 ³	centi	(c)	= 0.01 or 10 ⁻²
hecto	(h)	= 100 or 10 ²	milli	(m)	= 0.001 or 10 ⁻³
deka	(da)	= 10 or 10 ¹	micro	(μ)	= 0.000.001 or 10 ⁻⁶