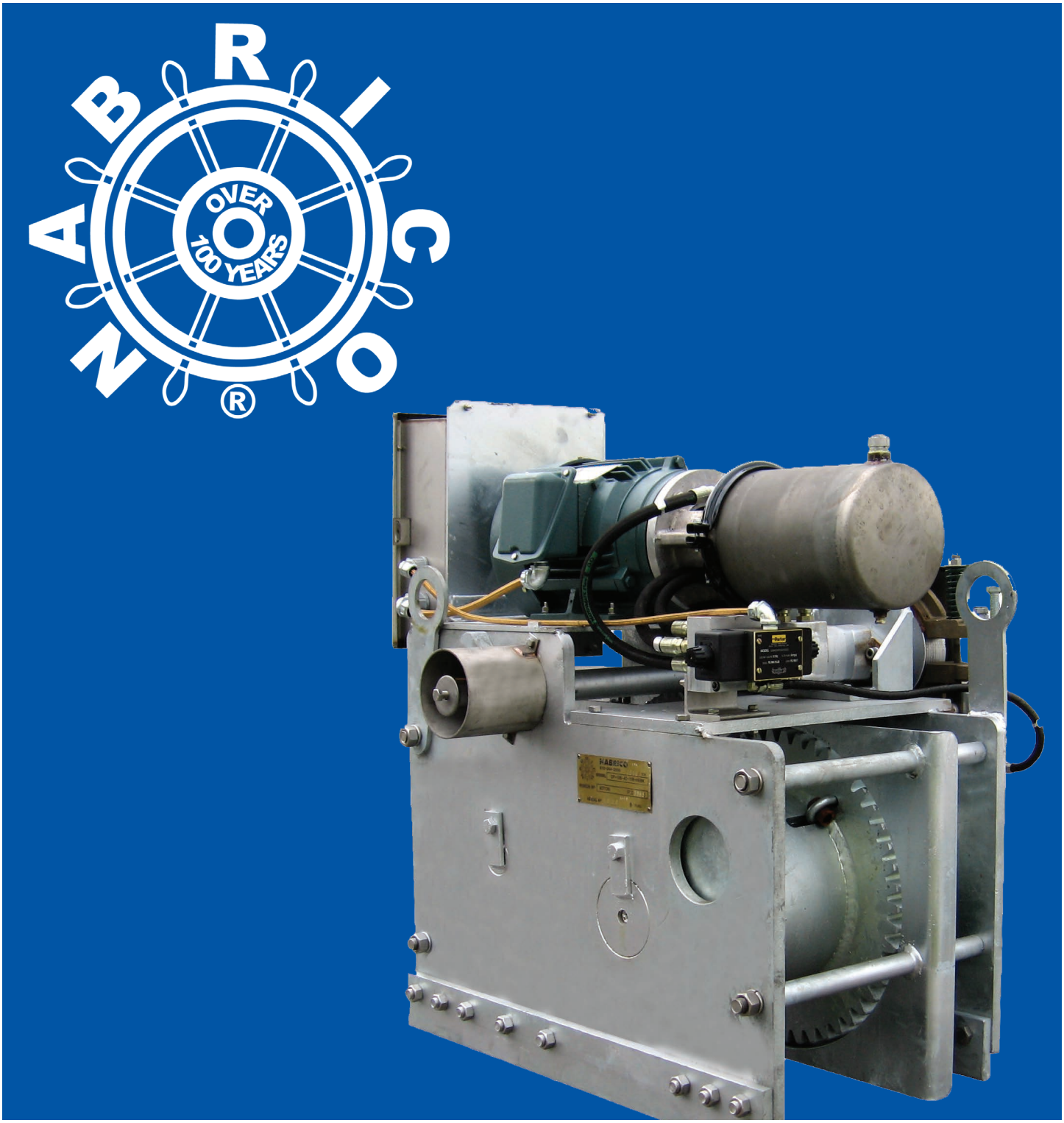


NABRICO

DF-156 HE Winch Owner's Manual

OM-DF156-HE-002-C

NABRICO

Owner's Manual
Hydra-Electric Winch
MODEL # DF-156-HE

Contents

NABRICO
1250 GATEWAY DRIVE
GALLATIN, TN 37066
TEL: (615)442-1300 FAX: (615)442-1313

NOTICE!

Prior to installing and operating the winch, please read this manual thoroughly and carefully. Keep this manual and all other instructions accessible at all times.

The Occupational Safety and Health Act of 1970 states that it is the employer's responsibility to provide a workplace free of hazard. To this end, all equipment should be installed, operated, and maintained in compliance with applicable trade, industrial, federal, state, and local regulations. It is the equipment owner's responsibility to obtain copies of these regulations and to determine the suitability of the equipment to its intended use.

Although this manual will help you become familiar with the basic operation of the winch, it is by no means a substitute for proper training by your company in the safe use of winches, barge rigging and other marine equipment. This manual suggests methods of operation, but ultimately, the owners and operators of the equipment are responsible for determining whether a particular method of operation is safe and appropriate for the equipment being operated. Only individuals trained in the proper use of winches, barge rigging and other marine equipment should operate these winches.

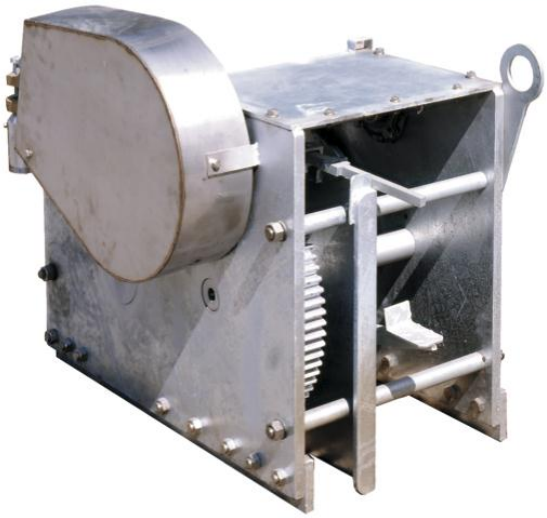
The typical operating environment of barge and towboat winches often includes very high forces, and the potential hazards associated with these high forces should not be underestimated. Improper installation or incorrect or unsafe use could result in injury or death to persons or cause equipment failure or damage.

Suggested Information for Safe Operation:

- Check lubrication before use.
- Do not apply tension to the winch unless there are at least three complete wraps of rope on the drum.
- Do not operate the winch unless you have a firm stance on a non-slippery surface.
- Do not wrap the wire rope around the load. This will damage the wire rope and could cause the load to escape. The use of rigging connectors to secure the wire rope to the load is strongly recommended.
- Keep fingers, loose clothing and any foreign objects away while operating the winch.
- Do not divert attention away while operating the equipment. Stay alert to the possibility of accidents and try to prevent them from happening.
- During operation of the winch, always remain to the side of the winch while in operation.
- Never operate the winch from the front or when bystanders are in front of it.
- Operators and bystanders should stay clear of any load and the wire rope while the winch is operating.
- Avoid shock loads by starting and stopping the equipment smoothly. Shock loads can over load the equipment which may cause damage.
- Under no circumstances, should any winch be used to move, raise or lower a person(s) or equipment.
- Do not exceed a 15 minute duty cycle for the winch. To do so may result in equipment damage or failure.

NOTICE
Inspect the winch carefully at least once a month for loose fasteners, worn gears and pawls, cracked welds, and other damaged parts. If any worn, cracked or damaged parts are found, stop use immediately and remove winch from service until all appropriate repairs are completely made.

NABRICO



DF-156 Hydra-Electric Winch

Features & Specifications

- Self-contained hydraulic / electric power unit with Stainless Steel tank.
- Winch operation can also be achieved by customer supplied hydraulic power or remote mounted power supply.
- Fail safe brake.
- Mechanical dog for emergency manual operation.
- Hot-dipped galvanized standard.
- Hydraulic system prevents power spikes.
- Free wheeling feature to allow faster cable pull-out.
- Stainless Steel components: control box, guards, tanks, and fasteners.
- Fully Synthetic Biodegradable Hydraulic fluid.
- True left or right hand models for use in pairs.

MODEL	HOLDING DOG & OR BRAKE	LINE PULL @ FIRST LAYER			DRUM CAPACITIES (FT.)				LINE SPEED	WEIGHT	DIMENSIONAL DATA		
	S. TONS	HYDRA ELECTRIC RATED	HYDRA ELECTRIC MAX	HANDWHEEL ONE MAN	5/8	3/4	7/8	1	FPM	LBS	W	L	H
DF-156-10-6-HE	10 TONS	2272 AT 830 PSI	3150 AT 1119 PSI	7,000 LBS	174	129	-	-	23.5	897	11”	22”	47”
DF-156-20-7-HE	20 TONS	9382 AT 1138 PSI	11700 AT 1381 PSI	14,000 LBS	109	57	39	21	17.2	1284	16”	30”	41”
DF-156-40-11-HE	40 TONS	17213 AT 1695 PSI	18000 AT 1797 PSI	15,000 LBS	287	176	130	84	12.8	1930	22”	36”	40”
DF-156-60-11-HE	60 TONS	31771 AT 1998 PSI	33480 AT 2105 PSI	24,000 LBS	572	325	262	200	9.9	3225	24”	47”	51”

1250 Gateway Drive • Gallatin, Tennessee 37066
615-442-1300 • FAX 615-442-1313 • www.nabrico-marine.com

1.1 INSTALLATION OF WINCH

NOTICE
It is the responsibility of the customer, not the winch manufacturer, to properly locate and install the winch with regard to the safety of those operating the machinery.

CAUTION
Install the winch in an area where there is ample room to operate the unit without the operator becoming entangled in the cable, lines, chains, winch mechanisms, or other nearby equipment.

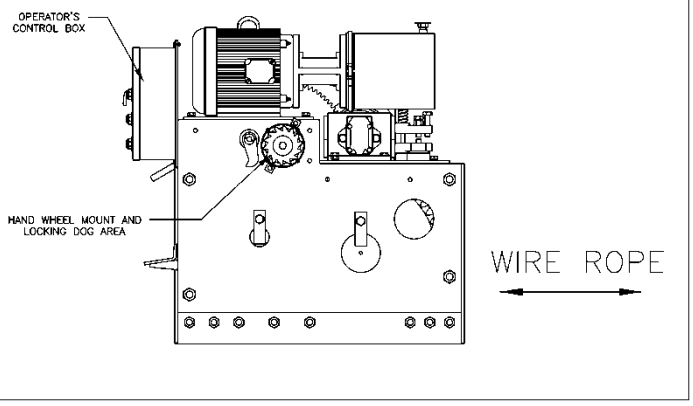
1.1.1 All winches must be installed on a flat, rigid, and non-slippery surface. Deck and structure must be strong enough to withstand the weight and holding capacity of the winch, and the forces likely to occur during operation. A qualified professional should inspect or design the foundation to insure that it will provide adequate support.

1.1.2 Locate the winch in a suitable area free of traffic and obstacles. The winch should also be visible during entire operation. Keep in mind that the winch needs to be accessible for proper lubrication, maintenance and operation.

1.1.3 Mounting direction should be in line with the desired direction of cable pull. The front of the winch should face in the direction from which the cable is reeled (see fig. 1). The winch drum, when properly used, will reel the wire rope onto the bottom of the drum.

- If the direction of the wire rope is not indicated on the winch, determine as follows:
  Mount the hand wheel and engage the locking dog. Rotate the winch drum using the hand wheel. The only direction allowed for the drum to rotate is the reeling in of the wire rope which should be spooling onto the drum from the bottom.

FIGURE #1 MOUNTING DIRECTION



1.1.4 Check to ensure that there is enough clearance between winch drum and mounting surface. Also, check to make sure that there is enough clearance for proper operation of the hand wheel if equipped.

1.1.5 Maintain a fleet angle no greater that one and a half degrees from winch drum to lead sheave. The proper fleet helps to minimize wire rope damage by assisting the wire rope to wind uniformly onto the drum (see fig. 2).

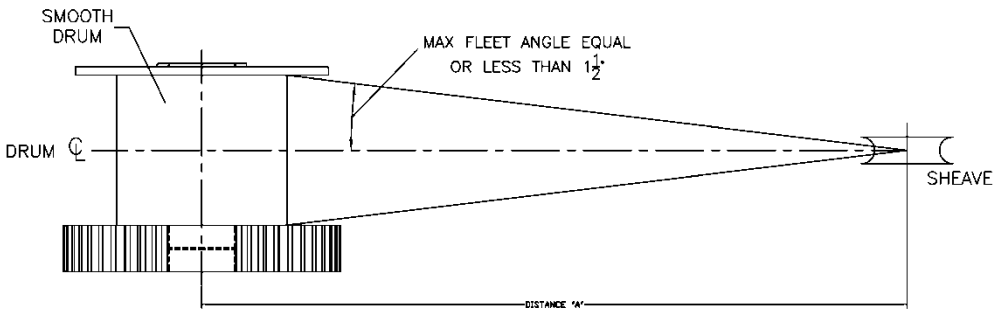
1.1.6 Using sufficient tack welds, secure the base bars to the deck or doubler plate. This will prevent the winch from becoming misaligned from heat distortion during the application of the seal weld.

1.1.7 Next apply a seal weld to the base bars to permanently secure the winch per AWS standards. The seal weld will prevent corrosion from occurring between the winch and mounting surface.

1.1.8 Inspect the winch immediately following installation. This inspection will give a good starting record of the winch condition so that future inspections can be compared.

CAUTION
Remember that the weld must be strong enough to withstand loads equal to or greater than the capacity of the winch.

FIGURE #2 FLEET ANGLE



Loads that are allowed to travel greater than the desirable fleet angle may cause stress to drum flange resulting in damage to equipment.

1.2 **ELECTRICAL POWER CONNECTION**

CAUTION
All electrical work must be performed by a licensed electrician. Failure to do so could result in electric shock or poor equipment operation.

1.2.1 All winches have been factory tested prior to shipment to ensure proper operation.

1.2.2 All winches have been factory wired to accommodate power supplies of low voltage.

1.2.3 Make certain that the equipment is grounded before electrical power is connected.

1.2.4 Assuming the control box and remote operator stations have been properly installed and wired, no further wiring is required except to connect the power supply to the control box located on the equipment.

1.2.5 Once power has been connected to the winch, check to ensure that the correct power supply agrees with the motor rating. Do not operate the winch until proper power is supplied to the motor.

1.2.6 Test connections by operating the winch. The rotation of the drum must agree with the labels of the control device and the electric motor must turn on and off when the "Start" and "Stop" buttons are pressed.

1.3 INSTALLATION OF WIRE ROPE

(Refer to the operation section of this manual if unclear on how to operate the winch.)

1.3.1 To install wire rope, rotate the drum of the winch so that the U-bolt nuts are easily accessed through the round cut out located on the side of the winch (see fig. 3a).

1.3.2 Using a standard socket wrench with an extension, loosen the nuts.

1.3.3 If installing wire rope on a new winch, remove and discard the U-bolt spacer pipe. If replacing worn out wire rope, remove the wire rope from the U-bolt and dispose of properly.

CAUTION
Remember to always wear the proper protective equipment when handling the wire rope.

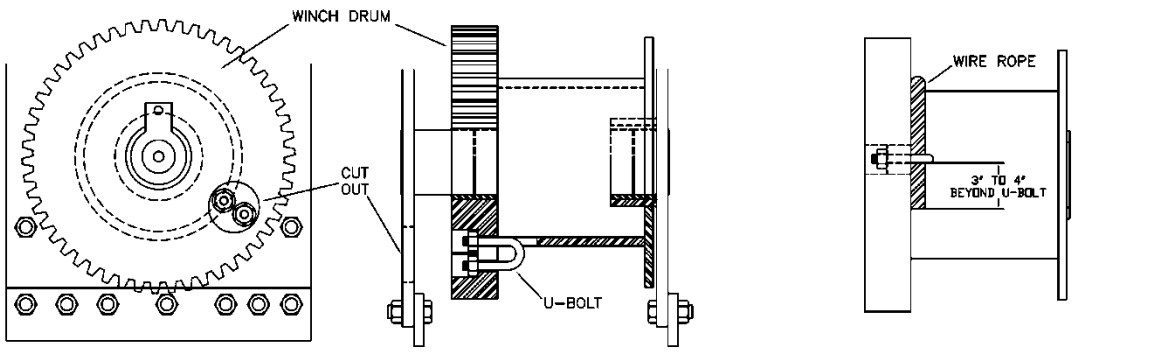
1.3.4 Insert the new wire rope end under the winch drum and through the U-bolt from the front of the winch so that approximately 3 to 4 inches extend through the U-bolt (see fig. 3b).

NOTICE
Breaking strength of new wire rope must be a least 3 times greater than the largest load placed on the winch. This minimum value may be greater depending on type of load and the method of moving the load.

1.3.5 Tighten the U-bolt nuts evenly to secure the wire rope to the winch drum. The U-bolt will act as a clamp keeping the wire rope in place as the rest of the rope is reeled onto the winch.

CAUTION
The U-bolt nuts must be retightened periodically to insure that the wire rope end is held in place snugly against the drum flange. Over time and usage the rope will "crush" down at the U-bolt creating the possibility that the rope will escape.

FIGURE #3 INSTALLING THE WIRE ROPE



a) LOCATING THE U-BOLT

b) INSERTING THE WIRE ROPE

1.3.6 Wind the wire rope onto the drum by operating the winch. Maintain tension on the wire rope to insure that the first coil lays snugly against the drum flange and each successive coil is snug against the previous coil. Make sure that the wire rope is being reeled in from the bottom on the winch drum.

1.3.7 Continue wrapping the wire rope until there is at least 3 to 4 complete wraps on the winch drum. These wraps serve as an anchor and must remain on the drum at all times.

WARNING
In order for the winch to attain its full holding capacity, 3 to 4 complete wraps of the wire rope must be on the winch drum at all times. Also, make sure the rope is installed securely to the drum. A poorly secured wire rope could come loose from its anchor and allow the load to escape.

NOTICE
Drum capacity depends on how tightly and evenly the wire rope is wound on the drum. Actual drum capacities are usually 25% to 30% less than values given in performance tables when the wire rope is loosely wound and overlapping. Also, line speed will increase with each additional layer of wire rope that is wound onto the drum.

2.1 OPERATING THE WINCH

The DF-156 Hydra-Electric Winch is operated by using the standard control box station that is located on the back of the unit. The following operating instructions will help you become familiar with these basic operating components of the winch. These instructions are not a substitute for proper training by your company in the safe use of winches, barge rigging, and other marine equipment.

2.1.1 To Reel "In" Wire Rope

2.1.1.1 Press and release the "START" button to turn on the electric motor. Using the spring centered rotary switch, turn the switch to the "IN" position and hold. Maintain enough tension on the wire rope to be sure that the coils lay snugly against the winch drum.

CAUTION
Under no circumstances should loads of greater value than winch capacity be placed on the brake system or winch. To do so could cause equipment failure and damage or personal injury.

2.1.1.2 Observe the wire rope as it winds onto the winch drum. If it becomes loose, uneven, or overlapped, stop the operation and rewind before continuing. Continued operation with undesirable wire rope lay can damage the rope and shorten its life.

CAUTION
Length of winch operation should not exceed the 15 minute duty cycle rating.

NOTICE
Breaking in the winch occurs during the first 30 to 60 minutes. During break-in, mating surfaces become polished and clearances increase. This is desirable for efficient operation of the bearings and gears.

2.1.2 To Reel "Out" Wire Rope

2.1.2.1 Press and release the "START" button to turn on the electric motor. Using the spring centered rotary switch, turn the switch to the "OUT" position and hold. Maintain enough tension on the wire rope during operation to minimize rope fouling on the drum.

2.1.2.2 The winch is also equipped with a clutch system that can be disengaged to allow the winch drum to free-wheel for a faster pay speed.

2.1.3 Shut Down

2.1.3.1 Once the equipment is done being used the "Stop" button can be pressed thus shutting the electric motor off. The winch is equipped with a braking clamp assembly that automatically engages whenever the winch is not being reeled in or out.

2.2 EMERGENCY OPERATION

The following identifies how to manually use the winch in special cases that may arise during operation.

2.2.1 Power Failure

2.2.1.1 In the event of a power failure, locate the locking dog and hand wheel mount area. This is the area on the side of the winch opposite the brake.

2.2.1.2 Remove the drive shaft guard from the end of the drive shaft.

2.2.1.3 Flip the locking dog pawl onto the locking gear and attach the hand wheel to the stub of the drive shaft.

2.2.1.4 Check to ensure that the locking dog pawl is engaged with locking gear. After check, the automatic brake assembly can be released by screwing in the jacking bolt (see brake band assembly for identification).

2.2.1.5 The winch is now capable of running in a manual setting.

WARNING
Do not use the handwheel as a brake or anchor for a load.

2.2.2 Hydraulic Directional Control Valve

2.2.2.1 If the solenoid controls on the valve do not work, the valve can be operated manually. This is accomplished by inserting a screwdriver or other tool in the hole at the end of the solenoid coils and shifting the valve spool while the hydraulic pump is running.

2.2.3 Brake Control

2.2.3.1 If the automatic brake fails to hold, the locking dog pawl and gear can be used for emergency operation only. The locking dog pawl will automatically secure the load in place when the wire rope in being reeled in. Do not use the locking dog pawl and gear for normal operation.

3.1 EQUIPMENT INSPECTION

NOTICE
An inspection program should be started as soon as any equipment is put into service. A qualified person should be appointed the responsibility of regular inspecting the equipment. Written records of inspections are recommended by the manufacturer.

3.1.1 Frequent Inspection

3.1.1.1 Visually inspect the equipment before each use. Check the equipment for cracks, bending, wear, rust, corrosion, and any other damage. If any problems are discovered, stop use immediately and remove the equipment from service until all appropriate repairs are completely performed.

3.1.1.2 **Ensure that equipment is properly lubricated.**

3.1.1.3 Check to ensure that the foundation is in good condition. Make sure that mounting fasteners and other hardware are tightened securely.

3.1.1.4 Ensure that the wire rope is installed correctly and anchored securely to the drum. Also, check to make sure the wire rope is in good condition.

3.1.2 Periodic Inspection

3.1.2.1 Periodic inspections should occur every 6 months, whenever equipment is returned to service from storage, if a frequent inspection discovers any damage or poor operation, or any case where the winch may have been over loaded.

3.1.2.2 Visually inspect the equipment checking the finish for wear, flaking, or other damage as listed in the frequent inspection plan. Disassembly may be required in order to properly inspect individual components.

3.1.2.3 Check the winch drum by moving it with your hands. Check for excessive movement that may be the result of worn or loose gears, bearings, or shafts. Some play is normal while excessive may be the result of overloading.

3.1.3 Wire Rope Inspection

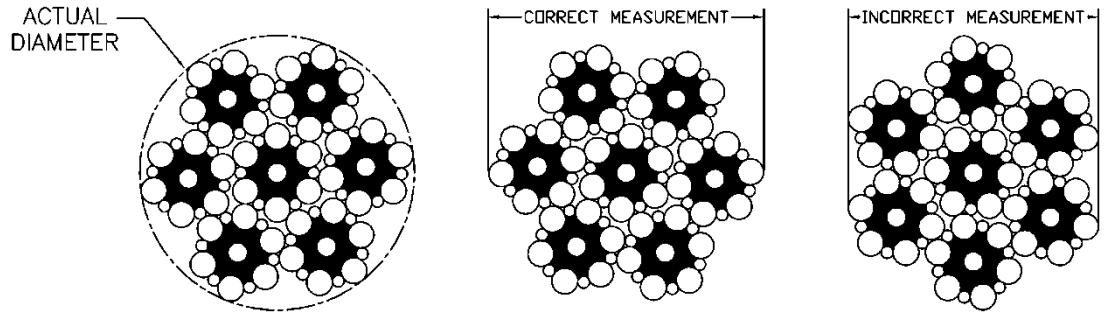
3.1.3.1 Wire rope inspection should be conducted as per the manufacturer's recommendations or accepted industry standards.

3.1.3.2 Inspect the entire length of wire cable for bent or crushed areas, broken or cut wires, corrosion, and other damage.

3.1.3.3 Inspect end connections and fittings for corrosion, kinking, crushing, or other damage.

3.1.3.4 Check the wire rope diameter for signs of decreased area (see fig. 4). Diameter decrease may be signs of wear and internal degradation in the wire rope. Generally, ropes are manufactured larger than nominal diameter. When placed in service for the first time, diameter can reduce slightly. Minimum diameter specifications can be obtained from the rope manufacturer.

FIGURE #4 WIRE ROPE DIAMETER



THE WIRE ROPE MUST BE REPLACED IF THE DIAMETER MEASURES LESS THAN THE MINIMUM DIAMETER GIVEN BY THE ROPE MANUFACTURER

EXAMPLE – $\phi\frac{3}{4}$" WIRE ROPE HAS A MINIMUM DIAMETER OF $\frac{45}{64}$" (0.7031")

3.2 EQUIPMENT LUBRICATION

3.2.1 All grease fittings and external gearing should be lubricated using Nabrico's suggested lubricants or similar.

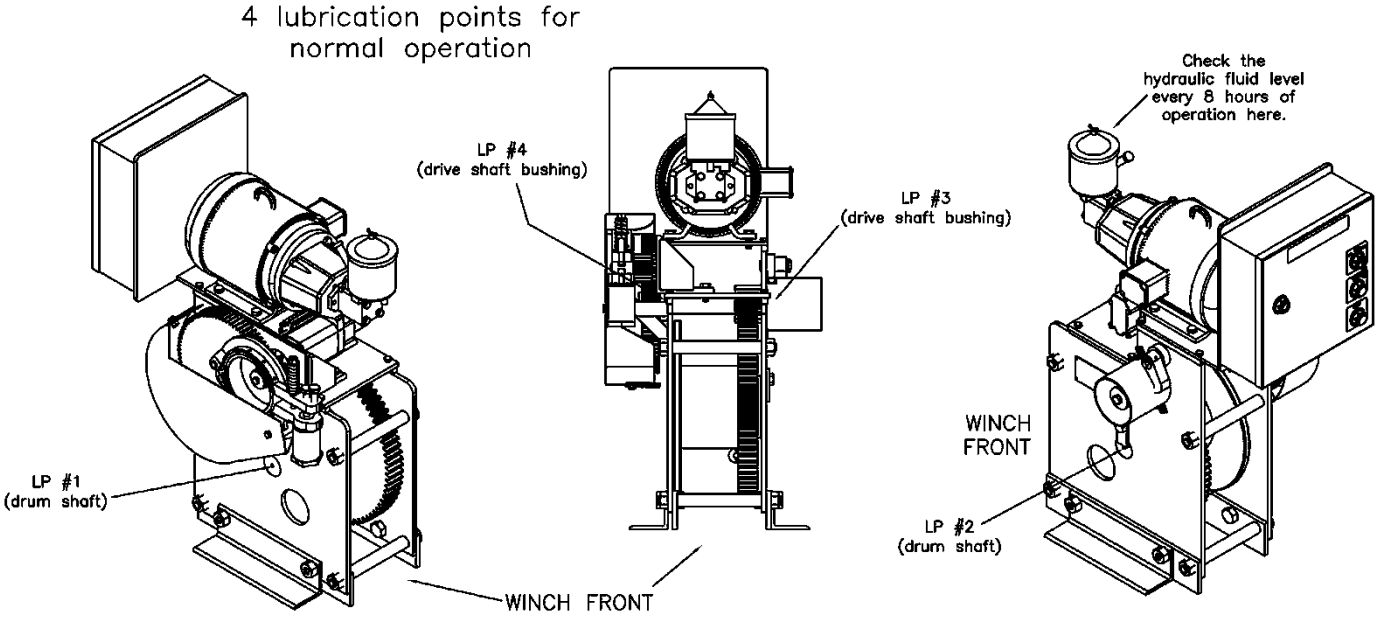
3.2.2 Drive shaft and drum shaft grease fittings should be lubricated at least once a month under normal conditions and at least once a day under adverse conditions. Lubricate while gears are rotating slowly.

3.2.3 Drive gear teeth should be coated at least once a month. Application with an aerosol can is recommended for uniform coverage. Graphite or other dry type lubricant should be used instead of gear grease when the winch is subjected to large amounts of foreign material such as coal dust. Always keep gear teeth as free of foreign material as possible.

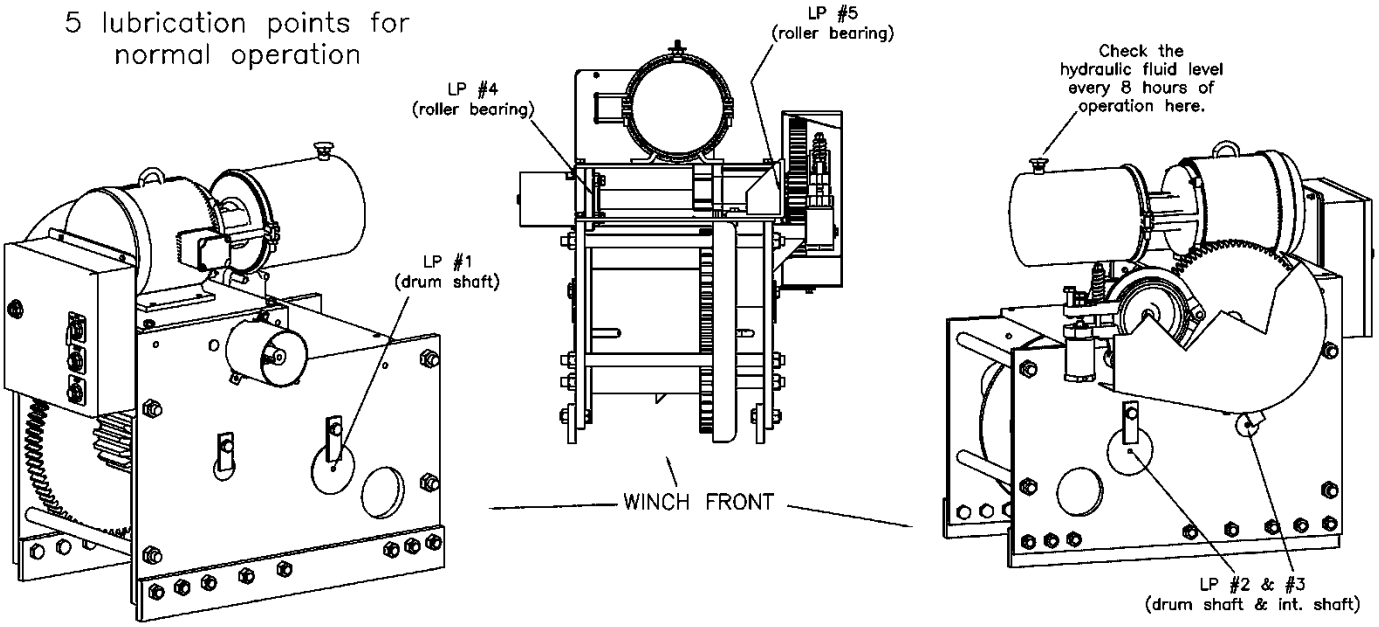
RECOMMENDED LUBRICANT FOR USE WITH NABRICO DECK MACHINERY	
HYDRAULIC OIL (OPEN LOOP)	TERRESOLVE ENVIROLOGIC 3032 BIODEGRADABLE
SPUR, HELICAL GEARS	MOBILGEAR 632
PLANETARY REDUCERS	MOBILUBE HD 80W 90
ALL WORM GEARS (INCLUDING CONE DRIVE)	MOBILE 600W SUPER CYLINDER OIL MIL-L-15019C SYMBOL 6135 MOBILE SCH-634 SYNTHETIC LUBRICANT
OPEN GEARING (SPRAY CAN)	MOBILTAC E LUBRIPLATE OPEN GEAR SHEILDING
GREASE FITTINGS	MOBILAX EP #2 LUBRIPLATE MARINE LUBE "A"
PRESERVATIVE TREATMENT	MOBILARMA 524

Note: Lubricant Manufacturers shown are not exclusive recommendations. Consult your lubricant source for more detailed information about oil selection.

Lubrication Diagram for 10 Ton Hydra-Electric Winch



Lubrication Diagram for 20, 40, and 60 Ton Hydra-Electric Winches



3.3 CLEANING AND STORAGE

3.3.1 Cleaning the Equipment

3.3.1.1 The equipment should be regularly cleaned to remove dirt and to help prevent rust and corrosion.

3.3.1.2 When cleaning, be sure to leave a light film of oil on all surfaces to protect them against the weather. Wipe off excessive amounts of oil to avoid the accumulation of dirt.

3.3.1.3 Remove all unnecessary objects from the area surrounding the equipment to prevent hazardous situations from occurring.

3.3.2 Storing the Equipment

3.3.2.1 Lubricate the equipment as necessary to help prevent against rust and corrosion during storage. Add a rust preventative for long term storage.

3.3.2.2 Seal the equipment in plastic if possible to help prevent corrosion and other damage.

3.3.2.3 Store the equipment upright in a cool clean place away from corrosive chemicals and moisture.

3.3.2.4 Rotate the drum periodically to keep bearing and gear surfaces from becoming lacquered.

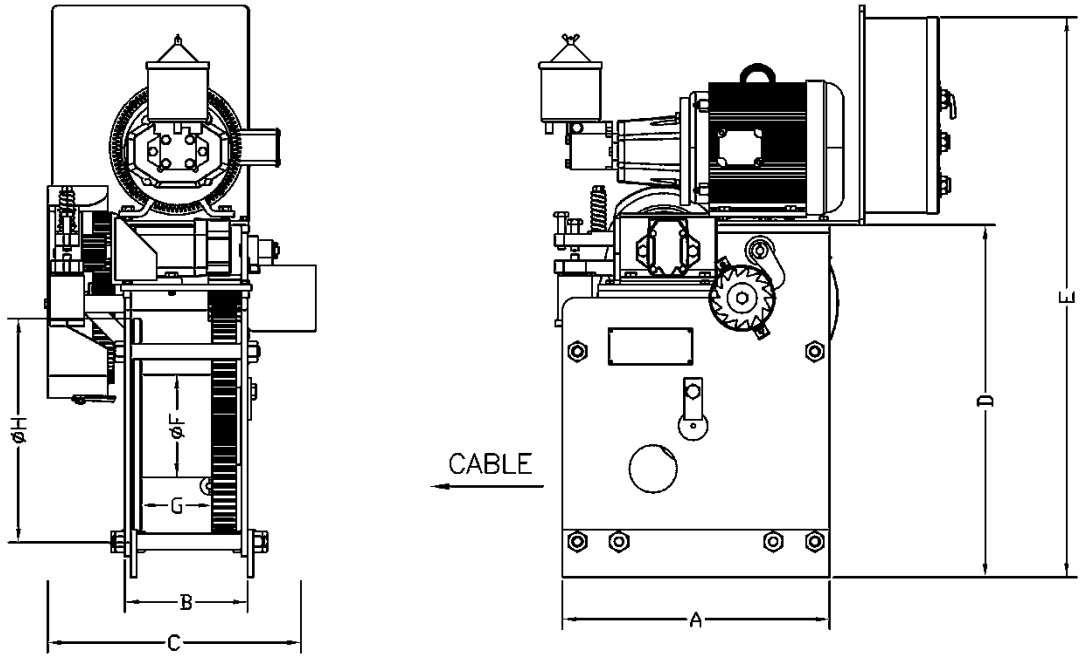
Appendix A: **WINCH TECHNICAL INFORMATION**

Appendix B: **ELECTRIC MOTOR TECHNICAL INFORMATION**

Appendix C: **HYDRAULIC COMPONENTS INFORMATION**

Appendix D: **ELECTRICAL INFORMATION**

A.1 **Dimensional**

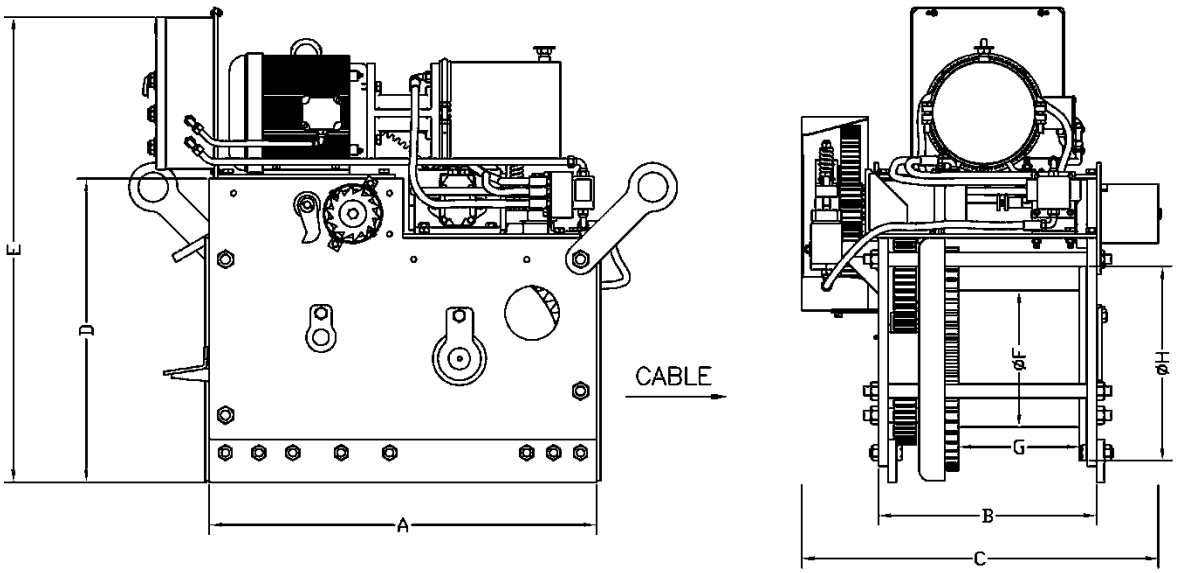


Right Hand Winch Shown
Left Hand Winch Opposite

Coatings	RH Winch Part No.	LH Winch Part No.
Galvanized	72478	72486

Model No.	Part Number	Length "A"	Width "B"	Overall Width "C"	Height "D"	Overall Height "E"	Drum Dia. "F"	Drum Width "G"	Flange Dia. "H"	Weight
DF-156-10	refer to coatings table	22 1/2"	10 3/8"	25"	24 1/2"	40"	8 5/8"	6"	18"	900 lbs

10 TON HYDRA-ELECTRIC WINCH



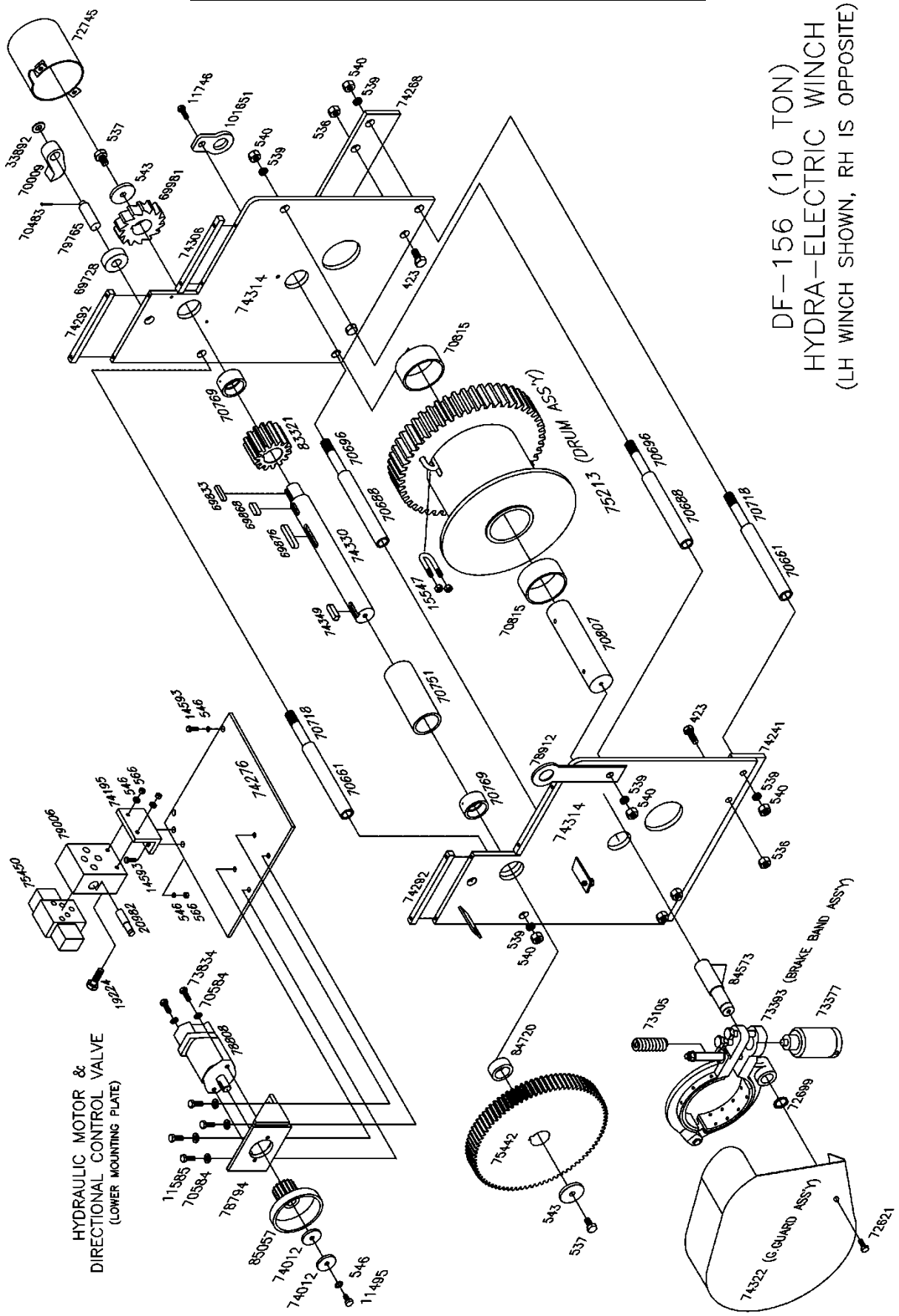
Right Hand Winch Shown
Left Hand Winch Opposite

Size	Coatings	RH Winch Part No.	LH Winch Part No.
20 Ton	Galvanized	87850	87599
40 Ton	Galvanized	87297	87300
60 Ton	Galvanized	87726	87734

Model No.	Part Number	Length "A"	Width "B"	Overall Width "C"	Height "D"	Overall Height "E"	Drum Dia. "F"	Drum Width "G"	Flange Dia. "H"	Weight
DF-156-20	refer to coatings table	30"	15 1/4"	27 1/2"	28"	41"	10 3/4"	7 1/4"	16"	1300 lbs
DF-156-40		36"	20 1/4"	33"	28 1/2"	44"	12 3/4"	11 1/4"	19"	2100 lbs
DF-156-60		47"	23 1/4"	36"	36 1/4"	52"	14"	10 5/8"	24"	3500 lbs

20,40 & 60 TON HYDRA-ELECTRIC WINCH

A.2a **Parts Breakdown (10 Ton Winch)**



DF-156-10 Ton Hydra-Electric Winch Parts List (refer to winch drawings for location)		
Part Description	**Quantity**	**Part#s**
U-Bolt with Fasteners (1/2" Clamp)	1	15547
Locking Pawl Spacer	1	69728
Key for Handwheel	1	69833
Key for Locking Gear	1	69868
Key for drive pinion	1	69876
Locking Dog Gear	1	69981
Locking Pawl	1	70009
Pipe Separator	2	70661
Pipe Separator	2	70688
Separator Rod (SS)	2	70696
Separator Rod (SS)	2	70718
Pipe Spacer (Drive Shaft)	1	70751
Drum Shaft	1	70807
Locking Gear Guard	1	72745
Brake Spring	1	73105
Brake Cylinder	1	73377
Brake Assembly	1	73393
Base Bar Radius	1	74241
Base Bar Straight	1	74268
Upper Cap Bar	2	74292
Lower Cap Bar	2	74306
Side Plate	2	74314
Drive Shaft	1	74330
Key for Drive Gear	1	74349
Drum Assembly	1	75213
Drive Gear	1	75442
Lifting Lug	2	78912
Locking Pawl Pin	1	79765
Drive Pinion	1	83321
Brake Stub Post Assembly	1	84573
Pipe Spacer (Drive Gear)	1	84720
Motor Pinion w/Brake Drum	1	85057
Keeper Plate 3-1/2"	1	101651

DF-156-10-HE Bushings and Bearings		
Part Description	**Quantity**	**Part#s**
Drive Shaft Bearing	2	70769
Drum Gear Bushing	2	70815

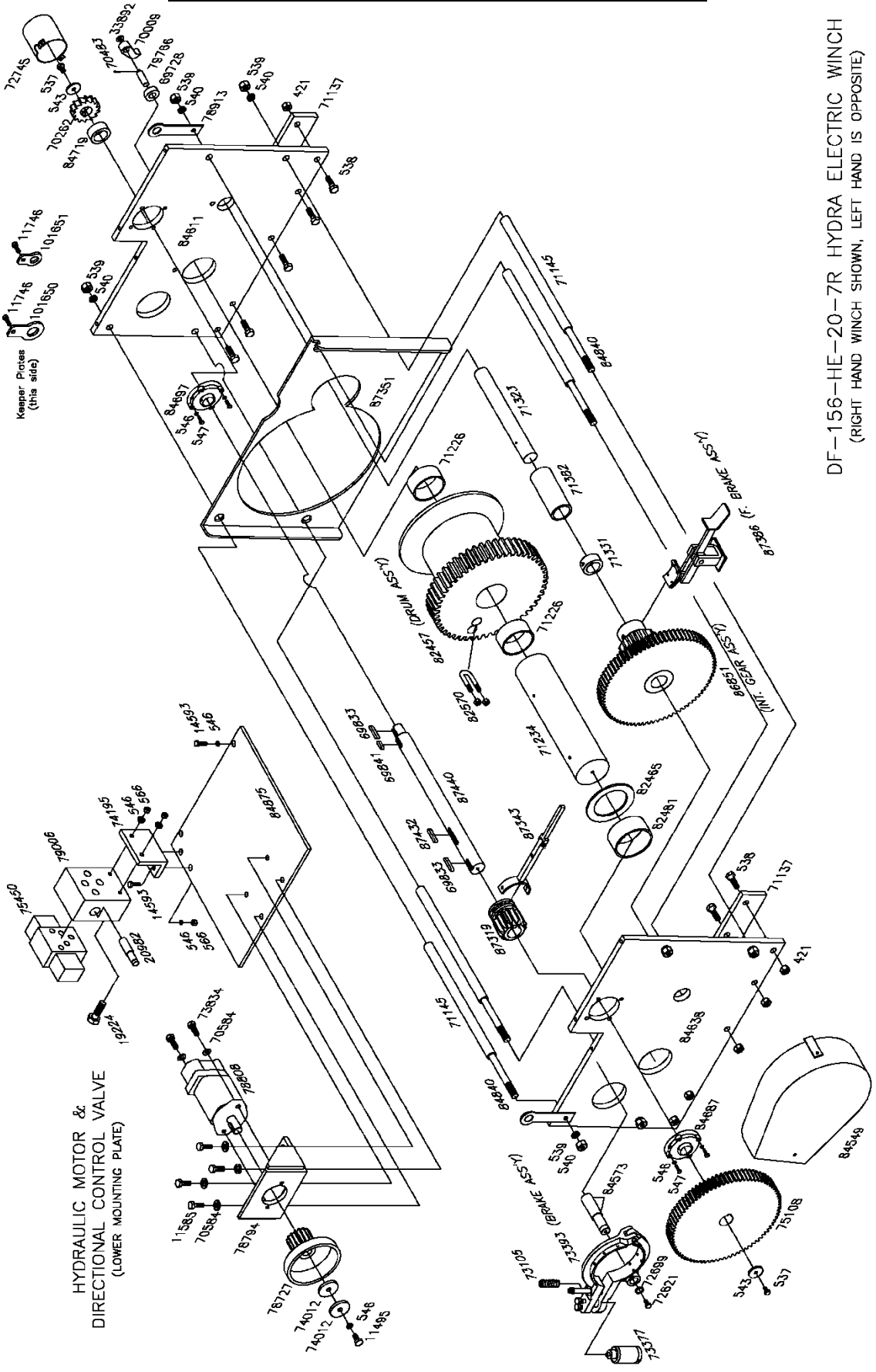
DF-156-10-HE Miscellaneous Components (not shown in drawings)		
Part Description	**Quantity**	**Part#s**
110V Coil for Directional Valve	1	20338
230V Coil for Directional Valve	1	20346
28" Solid Handwheel	1	70336
Directional Valve 230V	1	73776

DF-156-10-HE Bolts, Nuts, Washers		
Part Description	**Quantity**	**Part#s**
Hex Head Bolt 3/4" x 2" (SS)	4	423
Heavy Hex Nut 3/4" (SS)	4	536
Hex Head Bolt 1/2" x 2" (SS)	2	537
Hex Nut 7/8" (SS)	8	539
Lock Washer 7/8" (SS)	8	540
Flat Washer 9/16" ID x 2-1/2" OD (SS)	2	543
Lock Washer 3/8" (SS)	7	546
Hex Nut 3/8" (SS)	4	566
Hex Head Bolt 3/8" x 2-1/4"	1	11495
Hex Head Bolt 1/2" x 1-1/2" (SS)	4	11585
Hex Head Bolt 5/8" x 1"	1	11746
Hex Head Bolt 3/8" x 1-1/2" (SS)	4	14593
Socket Head Cap Screw 3/8" x 2-1/4"	2	19224
Flat Washer 5/8" (Brass)	1	33892
Cotter Pin 1/8" x 1"	1	70483
Lock Washer 1/2" (SS)	6	70584
Hex Head Bolt 3/8" x 3/4" (SS)	1	72621
Retainer Ring	1	72699
Socket Head Cap Screw 1/2" x 1"	2	73834
Washer 7/16" x 2" x 1/8" thk	2	74012

DF-156-10-HE Hydraulic Motor & Directional Control Valve Components		
Part Description	**Quantity**	**Part#s**
Relief Valve for Aluminum Subplate	1	20982
Dir Valve Mounting Plate	1	74195
Hydraulic Motor Base Plate	1	74276
Directional Valve 110V	1	75450
Hydraulic Motor Bracket	1	78794
Hydraulic Motor	1	78808
Aluminum Subplate	1	79006

DF-156-10-HE Left or Right Hand Specific Components		
Part Description	**Quantity**	**Part#s**
Left Hand Winch		
Gear Guard	1	74322
Right Hand Winch		
Gear Guard	1	72826

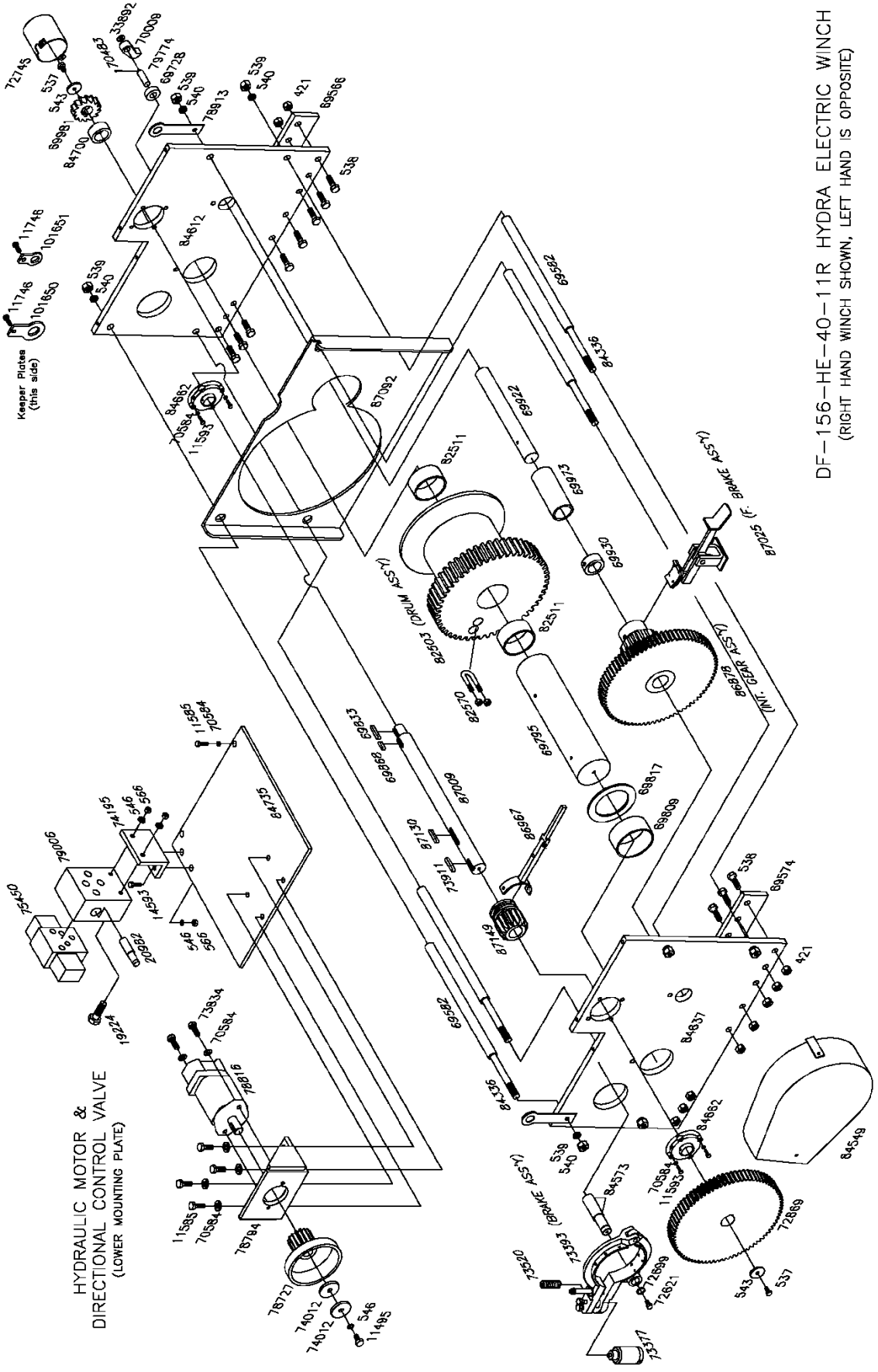
A.2b **Parts Breakdown (20 Ton Winch)**



DF-156-20 Ton Hydra-Electric Winch Parts List		
Part Description	**QNT'Y**	**Part #s**
Locking Pawl Spacer (SS)	1	69728
Key - Drive Gear & Handwheel	2	69833
Key - Locking Dog	1	69841
Locking Pawl	1	70009
Locking Dog Gear	1	70262
Base Bar	2	71137
Pipe Separator	4	71145
Drum Shaft	1	71234
Intermediate Shaft	1	71323
Intermediate Shaft Collar	1	71331
Locking Gear Guard	1	72745
Brake Spring	1	73105
Brake Cylinder	1	73377
Brake Assembly	1	73393
Drive Gear	1	75108
Lifting Lug	2	78913
Locking Pawl Pin (SS)	1	79766
Drum Assembly	1	82457
Drum Washer	1	82465
Drum Pipe Spacer	1	82481
U-Bolt with Fasteners (1" Wire Rope)	1	82570
Brake Stub Post Assembly	1	84573
Pipe Spacer (locking dog area)	1	84719
Separator Rod (SS)	4	84840
Int. Gear & Pinion Ass'y w/ brake drum	1	86851
Foot Brake Assembly	1	87386
Drive Pinion	1	87319
Key - drive pinion	1	87432
Drive Shaft	1	87440
Keeper Plate (BIG)	1	101650
Keeper Plate (small)	1	101651
Miscellaneous Parts Not Shown in Parts Breakdown Drawing		
110V Coil for Directional Control Valve	1	20338
230V Coil for Directional Control Valve	1	20346
28" Diameter Solid Handwheel	1	70336
Int. Gear & Pinion Ass'y NO brake drum	1	71358
Directional Control Valve 230V	1	73776
Motor Pinion w/ Brake Drum (28 tooth)	1	78735
BUSHINGS AND BEARINGS	**QNT'Y**	**Part #s**
Drum Gear Bushing	2	71226
Intermediate Gear Bushing	1	71382
Drive Shaft Bearing	2	84697

Additional Parts Lists		
Part Description	**QNT'Y**	**Part #s**
Hex Nut 3/4" (SS)	10	421
Hex Head Bolt 1/2" x 2" (SS)	2	537
Hex Head Bolt 3/4" x 2-1/2" (SS)	10	538
Hex Nut 7/8" (SS)	8	539
Lock Washer 7/8" (SS)	8	540
Washer 9/16" x 2-1/2" x 5/16" thk (SS)	2	543
Lock Washer 3/8" (SS)	15	546
Hex Head Bolt 3/8" x 1-3/4" (SS)	8	547
Hex Nut 3/8" (SS)	4	566
Hex Head Bolt 3/8" x 2-1/4"	1	11495
Hex Head Bolt 1/2" x 1-1/2" (SS)	4	11585
Hex Head Bolt 5/8" x 1"	2	11746
Hex Head Bolt 3/8" x 1-1/2" (SS)	4	14593
Socket Head Cap Screw 3/8" x 2-1/4"	2	19224
Flat Washer 5/8" (Brass)	1	33892
Cotter Pin 1/8" x 1"	1	70483
Lock Washer 1/2" (SS)	6	70584
Hex Head Bolt 3/8" x 3/4" (SS)	1	72621
Retainer Ring	1	72699
Socket Head Cap Screw 1/2" x 1"	2	73834
Washer 7/16" x 2" x 1/8" thk	2	74012
HAND SPECIFIC PARTS	**QNT'Y**	**Part #s**
Left Hand Winch		
Gear Guard	1	84530
Side Plate Assembly (Dog Gear Side)	1	84622
Side Plate Assembly (Drive Gear Side)	1	84632
Yoke Assembly	1	87211
Cable Guard Plate	1	87483
Right Hand Winch		
Gear Guard	1	84549
Side Plate Assembly (Dog Gear Side)	1	84611
Side Plate Assembly (Drive Gear Side)	1	84638
Yoke Assembly	1	87343
Cable Guard Plate	1	87351
HYDRAULIC DRIVE PARTS	**QNT'Y**	**Part #s**
Relief Valve for Aluminum Subplate	1	20982
Angle Bracket for Directional Control Valve	1	74195
Directional Control Valve 110V	1	75450
Motor Pinion w/ Brake Drum	1	78727
Hydraulic Motor Bracket	1	78794
Hydraulic Motor	1	78808
Aluminum Subplate	1	79006
Base Plate for Dir. Crtl. Valve & Hyd Motor	1	84875

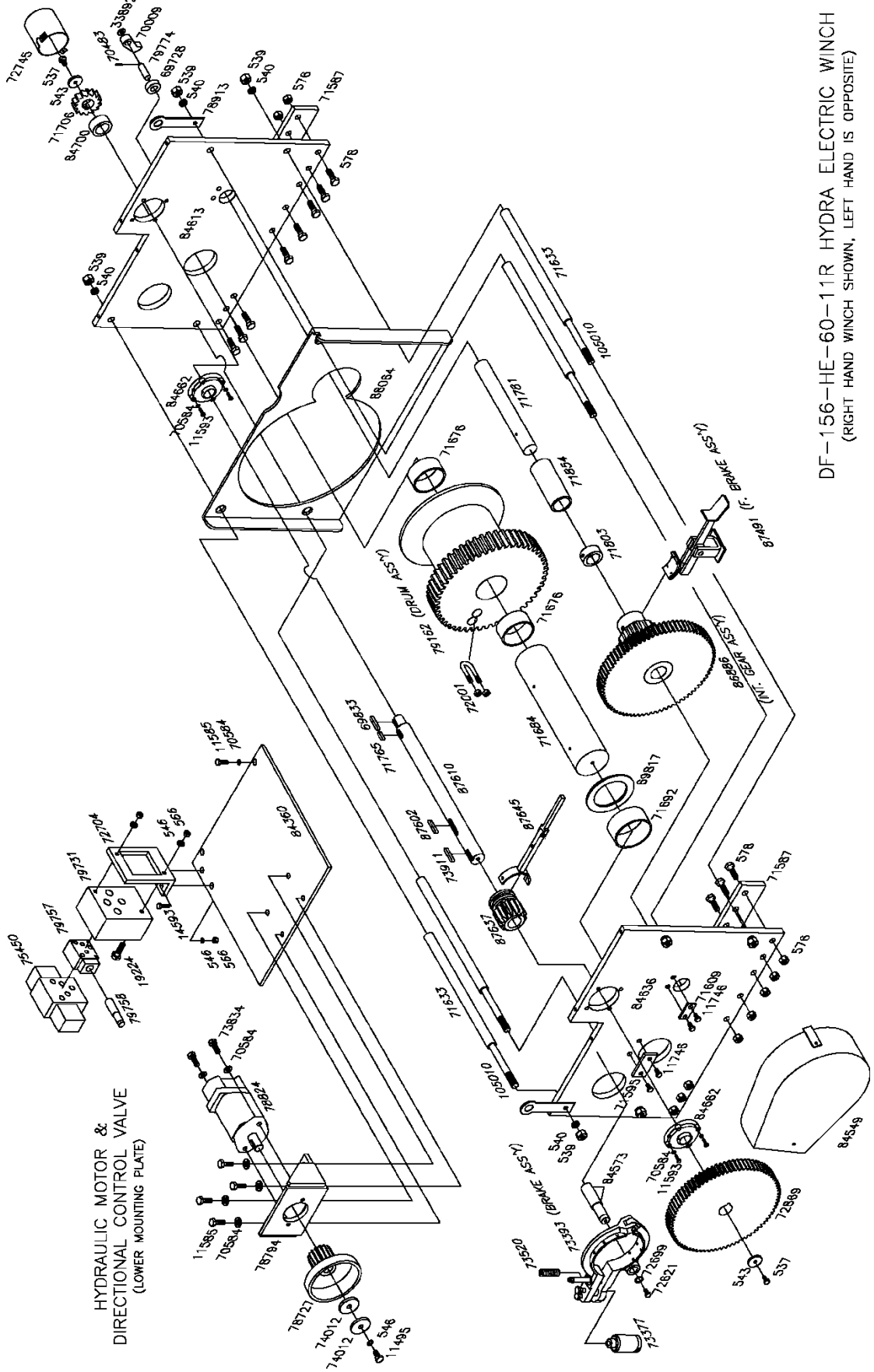
A.2c **Parts Breakdown (40 Ton Winch)**



DF-156-40 Ton Hydra-Electric Winch Parts List			
PART DESCRIPTION	**QNT'Y**	**Part #s 11" Drum**	**Part #s 18" Drum**
Base Bar Straight	2	69566	
Pipe Separator	4	69582	84808
Locking Pawl Spacer	1	69728	
Drum Shaft	1	69795	78719
Drum Pipe Spacer	1	69809	
Drum Washer	1	69817	
Key - Handwheel	1	69833	
Key - Locking Pawl Gear	1	69868	
Intermediate Shaft	1	69922	78700
Intermediate Shaft Collar	1	69930	
Locking Pawl Gear	1	69981	
Locking Pawl	1	70009	
Locking Gear Guard	1	72745	
Drive Gear	1	72869	
Brake Cylinder	1	73377	
Brake Assembly	1	73393	
Brake Spring	1	73520	
Key - Drive Gear	1	73911	
Lifting Lug	2	78913	
Locking Pawl Pin	1	79774	
Drum Assembly	1	82503	78670
U-Bolt with Fasteners (1" Wire Rope)	1	82570	
Separator Rod (SS)	4	84336	84831
Brake Stub Post Assembly	1	84573	
Pipe Spacer (locking pawl area)	1	84700	
Int. Gear & Pinion Ass'y w/ brake drum	1	86878	
Drive Shaft	1	87009	84514
Foot Brake Assembly	1	87025	
Key - Drive Pinion	1	87130	
Drive Pinion	1	87149	
Keeper Plate (BIG)	1	101650	
Keeper Plate (small)	1	101651	
Miscellaneous Parts Not Shown in Parts Breakdown Drawing			
110V Coil for Directional Control Valve	1	20338	
230V Coil for Directional Control Valve	1	20346	
Int. Gear & Pinion Ass'y NO brake drum	1	69949	
28" Diameter Solid Handwheel	1	70336	
Hardened Drive Gear	1	72870	
Directional Valve 230V	1	73776	
Motor Pinion w/ Brake Drum (28T)	1	78735	
Drive pinion NO hub	1	86983	
BUSHINGS & BEARINGS	**QNT'Y**	**PART #'s**	
Intermediate Gear Bushing	1	69973	
Drum Gear Bushing	2	82511	
Drive Shaft Bearing	2	84662	

Additional Parts List			
FASTENERS & ETC.	**QNT'Y**	**Part #s 11" Drum**	**Part #s 18" Drum**
Hex Nut 3/4" (SS)	16	536	
Hex Head Bolt 1/2" x 2" (SS)	2	537	
Hex Head Bolt 3/4" x 2-1/2" (SS)	16	538	
Hex Nut 7/8" (SS)	8	539	
Lock Washer 7/8" (SS)	8	540	
Washer 9/16" x2-1/2" x 5/16" thk	2	543	
Lock Washer 3/8" (SS)	5	546	
Hex Nut 3/8" (SS)	4	566	
Hex Head Bolt 3/8" x 2-1/4"	1	11495	
Hex Head Bolt 1/2" x 1-1/2" (SS)	6	11585	
Hex Head Bolt 1/2" x 2" (SS)	8	11593	
Hex Head Bolt 5/8" x 1"	2	11746	
Hex Head Bolt 3/8" x 1-1/2" (SS)	2	14593	
Socket Head Cap Screw	2	19224	
Flat Washer 5/8" (Brass)	1	33892	
Cotter Pin 1/8" x 1"	1	70483	
Lock Washer 1/2" (SS)	16	70584	
Hex Head Bolt 3/8" x 3/4" (SS)	1	72621	
Retainer Ring	1	72699	
Socket Head Cap Screw 1/2" x 1"	2	73834	
Washer 7/16" x 2" x 1/8" thk	2	74012	
HAND SPECIFIC PARTS	**QNT'Y**	**PART #'s**	
Left Hand Winch			
Gear Guard	1	84530	
Side Plate Assembly (Dog Side)	1	84623	
Side Plate Assembly (Gear Side)	1	84633	
Yoke Assembly	1	86908	
Cable Guard Plate	1	87181	
Right Hand Winch			
Gear Guard	1	84549	
Side Plate Assembly (Dog Side)	1	84612	
Side Plate Assembly (Drive Side)	1	84637	
Yoke Assembly	1	86967	
Cable Guard Plate	1	87092	
HYDRAULIC DRIVE PARTS	**QNT'Y**	**PART #'s**	
Relief Valve for Subplate	1	20982	
Electric Motor Base Plate	1	72729	84778
Bracket for Directional Valve	1	74195	
Directional Control Valve 110V	1	75450	
Motor Pinion w/ Brake Drum	1	78727	
Hydraulic Motor Bracket	1	78794	
Hydraulic Motor	1	78816	
Aluminum Subplate	1	79006	
Hydraulic Motor Base Plate	1	84735	84743

A.2d **Parts Breakdown (60 Ton Winch)**



DF-156-60 Ton Hydra-Electric Winch Parts List		
Part Description	**QNT'Y**	**Part #s**
Locking Pawl Spacer	1	69728
Drum Washer	1	69817
Key - Handwheel	1	69833
Locking Pawl	1	70009
Base Bar Straight	2	71587
Keeper Plate (7" Length)	2	71595
Keeper Plate (6-1/2" Length)	2	71609
Pipe Separator	4	71633
Drum Shaft	1	71684
Drum Pipe Spacer	1	71692
Key - Locking Pawl Gear	1	71765
Intermediate Shaft	1	71781
Intermediate Shaft Collar	1	71803
U-Bolt with Fasteners (1.125" Wire Rope)	1	72001
Locking Gear Guard	1	72745
Drive Gear	1	72869
Brake Cylinder	1	73377
Brake Assembly	1	73393
Brake Spring	1	73520
Key - Drive Gear	1	73911
Lifting Lug	2	78913
Drum Assembly	1	79162
Locking Pawl Pin	1	79774
Brake Stub Post Assembly	1	84573
Pipe Spacer (hand ratchet area)	1	84700
Int. Gear & Pinion Ass'y w/ Brake Drum	1	86886
Foot Brake Assembly	1	87491
Key - Drive Pinion	1	87602
Drive Shaft	1	87610
Drive Pinion	1	87637
Separator Rod (SS)	4	105010
Miscellaneous Parts Not Shown in Parts Breakdown Drawing		
110V Coil for Directional Control Valve	1	20338
230V Coil for Directional Control Valve	1	20346
28" Diameter Solid Handwheel	1	70336
Int. Gear & Pinion Ass'y NO brake drum	1	71811
Hardened Drive Gear	1	72870
Directional Control Valve 230V	1	73776
Motor Pinion w/Brake Drum (28 tooth)	1	78735
Drive pinion NO hub	1	87629
BUSHINGS AND BEARINGS	**QNT'Y**	**Part #s**
Drum Gear Bushing	2	71676
Intermediate Gear Bushing	1	71854
Drive Shaft Bearing	2	84662

Additional Parts List		
Part Description	**QNT'Y**	**Part #s**
Hex Head Bolt 1/2" x 2" (SS)	2	537
Hex Nut 7/8" (SS)	8	539
Lock Washer 7/8" (SS)	8	540
Washer 9/16" x 2-1/2" x5/16" thk (SS)	2	543
Lock Washer 3/8" (SS)	5	546
Hex Nut 3/8" (SS)	4	566
Hex Nut 1" (SS)	16	576
Hex Head Bolt 1" x 3" (SS)	16	578
Hex Head Bolt 3/8" x 2-1/4"	1	11495
Hex Head Bolt 1/2" x 1-1/2" (SS)	6	11585
Hex Head Bolt 1/2" x 2" (SS)	8	11593
Hex Head Bolt 5/8" x 1"	8	11746
Hex Head Bolt 3/8" x 1-1/2" (SS)	2	14593
Socket Head Cap Screw 3/8" x 2-1/4"	2	19224
Flat Washer 5/8" (Brass)	1	33892
Cotter Pin 1/8" x 1"	1	70483
Lock Washer 1/2" (SS)	16	70584
Hex Head Bolt 3/8" x 3/4" (SS)	1	72621
Retainer Ring	1	72699
Socket Head Cap Screw 1/2" x 1"	2	73834
Washer 7/16" x 2" x 1/8" thk	2	74012
HAND SPECIFIC PARTS	**QNT'Y**	**Part #s**
Left Hand Winch		
Locking Dog Gear Assembly	1	71714
Gear Guard	1	84530
Side Plate Assembly (Dog Gear Side)	1	84624
Side Plate Assembly (Drive Gear Side)	1	84634
Yoke Assembly	1	87646
Cable Guard Plate	1	88072
Right Hand Winch		
Locking Dog Gear Assembly	1	71706
Gear Guard	1	84549
Side Plate Assembly (Dog Gear Side)	1	84613
Side Plate Assembly (Drive Gear Side)	1	84636
Yoke Assembly	1	87645
Cable Guard Plate	1	88064
HYDRAULIC DRIVE PARTS	**QNT'Y**	**Part #s**
Angle Bracket for Directional Control Valve	1	72704
Directional Control Valve 110V	1	75450
Motor Pinion w/ Brake Drum	1	78727
Hydraulic Motor Bracket	1	78794
Hydraulic Motor	1	78824
Steel Subplate	1	79731
Aluminum Subplate Body	1	79757
Relief Valve for Aluminum Subplate Body	1	79758
Base Plate for Dir. Crtl. Valve & Hyd. Motor	1	84360

B.1 Electric Motor Maintenance

INSTALLATION / MOUNTING

Mount unit on a firm, flat surface sufficiently rigid to prevent vibration. Drive belts and chains should be tensioned in accordance with supplier recommendations. Couplings should be properly aligned and balanced. For belt, chain and gear drive selection refer to the drive or equipment manufacturer. For application of drive equipment refer to applicable information in NEMA MG1.

Motors have been dynamically balanced using a half key the same length as the full key shipped with the motor. If pulley length keyway is less than this length, rework long key by removing one-half of excess length between pulley and end of key to maintain balance.

Do not restrict motor ventilation. Unless otherwise specified on nameplate, motor is designed for operation in accordance with NEMA MG1 "Usual Service Conditions" which states an ambient temperature range of -15º C to 40º C (5º F to 104º F). Standard grease lubricated units are suitable for operation within this temperature range. Special lubricants may be required for ambient temperatures outside of this range. Note: Motors operating under rated load and allowable ambient conditions may feel hot when touched; this is normal and should not be cause for concern. When in doubt, measure frame surface temperature and confer with nearest office. Enclosed motors normally have condensation drain openings. Insure that drain openings are properly located and open (plugs removed) for the motor mounting position. Drain openings should be at lowest point of end brackets, frame housing and terminal housing when the motor is installed. This may require modification of motor to accomplish. If unit appears wet, and/or has been stored in a damp location, dry out thoroughly and check for adequate insulation resistance to ground before operating.

⚠ WARNING ***Guards should be provided for all exposed rotating parts to prevent possible personal injury. Keep fingers and foreign objects away from ventilation and other openings. Applications involving high inertia loads may damage this equipment due to motor overspeed during coast shutdown. Such applications should be referred to Emerson Motor Company.***

⚠ CAUTION ***Do not force drive coupling or other equipment onto shaft, as bearing damage may result.***

POWER SUPPLY AND CONNECTIONS

The power supply must agree with values on nameplate. Terminal voltage should not vary more than ±10% of nameplate voltage at rated frequency. Unbalanced line voltage, greater than one percent, can cause overheating. Do not exceed the rated load amperes on the nameplate. Starting controls and overload protection should be properly sized in accordance with the NEC and the control manufacturer's recommendations.

Motor connections should be made by following instructions on connection diagram. Determine direction of rotation before connecting driven equipment. If direction of rotation label is supplied, operate only in specified direction. Rotation may be reversed on three phase motors by interchanging any two line connections. Wiring of units, controls and grounding shall be in accordance with local and NEC requirements.

⚠ WARNING ***Failure to properly ground unit may cause serious injury to personnel. Where unexpected starting could be hazardous to personnel, do not use automatic reset starting devices.***

USE OF VARIABLE FREQUENCY DRIVES

Electric motors can be detrimentally affected when applied with variable frequency drives (VFD's). The non-sinusoidal waveforms of VFD's have harmonic content which causes additional motor heating; and high voltage peaks.

Other effects of VFD's on motor performance include reduced efficiency, increased load current, vibration and noise. Standard motors utilized with VFD's must be limited to those application considerations defined in NEMA MG-1 Part 30.

NEMA MG-1 Part 31 defines performance and application considerations for Definite-Purpose Inverter Fed Motors. To insure satisfactory performance and reliability, Emerson Motor Company offers and recommends nameplated inverter duty motor products which meet the requirements of NEMA MG-1 Part 31. The use of non-inverter duty motors may result in unsatisfactory performance or premature failure, which may not be warrantable under the Terms and Conditions of Sale. Contact your Emerson Motor Company Field Sales Engineer for technical assistance for motor selection, application and warranty details.

MAINTENANCE

Inspect units at regular intervals. Keep units clean and ventilation openings clear of dust, dirt or other debris. Lubricate units per this operating instruction folder and instruction plate on unit. Excessive lubrication may damage the unit. Do not over grease.

⚠ WARNING ***Disconnect all power sources to the unit and discharge all parts which may retain an electrical charge before attempting any maintenance or repair. Screen and covers must be maintained in place when unit is in operation. Failure to observe this warning may result in personal injury.***

GREASE LUBRICATION INSTRUCTIONS

Units are prelubricated at the factory and do not require initial lubrication. Relubricating interval depends upon speed, type of bearing and service. Refer to Table 1 for suggested regreasing intervals. Operating conditions may dictate more frequent lubrication. Motor must be at rest and electrical controls should be locked open to prevent energizing while motor is being serviced (refer to section on Safety). If motor is being taken out of storage, refer to storage procedures.

To relubricate bearings, remove the drain plug. Inspect grease drain and remove any blockage with a mechanical probe taking care not to damage bearing.

⚠ CAUTION ***Under no circumstances should a mechanical probe be used while the motor is in operation. Add new grease at the grease inlet, refer to Table 1 for replenishment quantities. New grease must be compatible with grease in the motor (See Caution Note). Run the motor for 15 to 30 minutes with the drain plug removed to allow purging of any excess grease. Shut off unit and replace the drain plug. Return motor to service.***

Over greasing can cause excessive bearing temperatures, premature lubricant breakdown and bearing failure. Care should be exercised against over greasing.

Table 1

Recommended Grease Replenishment Quantities & Intervals
(For lubrication of units in service)

Bearing Number-Common		Bearing Number-AFBMA		Grease FL Oz.	Lubrication Interval		
62XX	63XX	XXBC02	XXBC03		3600 RPM	1800 RPM	1200 RPM
6203-6207	6303-6306	17-35	17-30	0.2	2 Years	3 Years	3 Years
6208-6212	6307-6309	40-60	35-45	0.4	1 Year	2 Years	2 Years
6213-6215	6310-6311	65-75	50-55	0.6	1 Year	2 Years	2 Years
6218-6220	6312-6315	80-100	60-75	1.0	6 Mos.	1 Year	2 Years
6221-6228	6316-6320	105-140	80-100	1.8	6 Mos.	1 Year	1 Year

For motors mounted vertically or in hostile environments, reduce intervals shown by 50 percent.

Refer to motor nameplate for bearings provided on a specific motor.

For bearings not listed in table above, the amount of grease required may be calculated by the formula:

$$G=0.11 \times D \times B$$

Where;

G = Quantity of grease in fluid ounces.

D = Outside diameter of bearing in inches.

B = Width of bearing in inches.

Table 2
RECOMMENDED GREASES

THE FOLLOWING GREASES ARE INTERCHANGEABLE WITH THE GREASE AS PROVIDED IN UNITS SUPPLIED FROM FACTORY (UNLESS STATED OTHERWISE ON A LUBRICATION NAMEPLATE PROVIDED ON MOTOR).

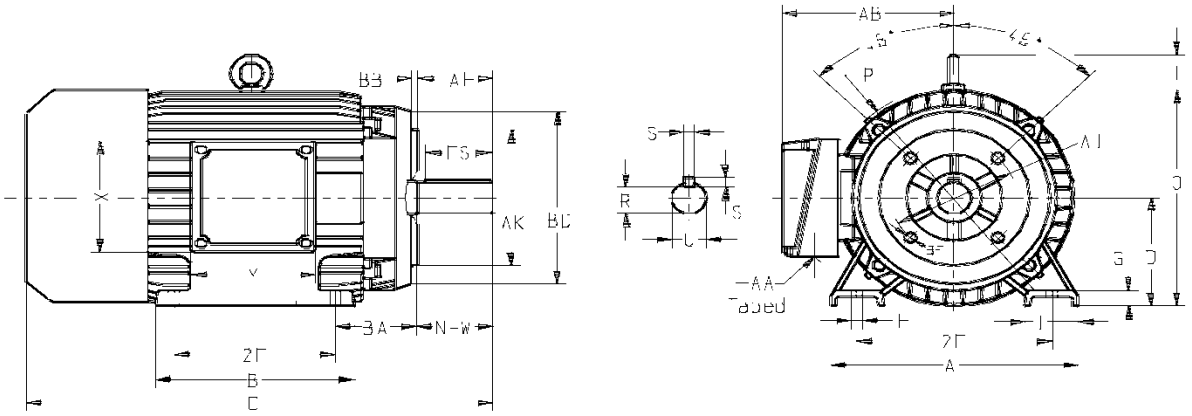
MANUFACTURER	GREASE (NLGI No. 2)
EXXON CORP.	POLYREX - EM
CHEVRON U.S.A. INC.	SRI NO. 2

⚠ CAUTION ***Greases of different bases (lithium, polyurea, clay, etc.) may not be compatible when mixed. Mixing such greases can result in reduced lubricant life and premature bearing failure. When necessary, prevent such intermixing by disassembling the motor, removing all old grease from bearings and housings (including all grease fill and drain holes). Inspect and replace damaged bearings. Fill bearing housings and bearing approximately 30% full of new grease. Remove any excess grease extending beyond the edges of the bearing races and retainers. Refer to Table 2 for recommended greases.***

B.2 **Electric Motor Dimensional**

eLINE Mounting and overall dimensions

Foot-C face-mounted NEMA-Frames



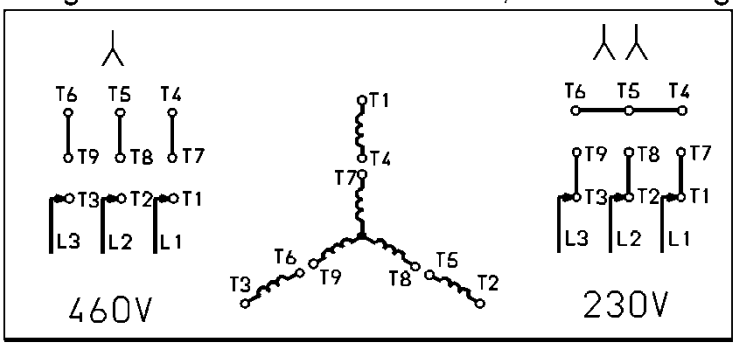
Frame	Mounting dimensions (inches)															
	A	B	D	2E	2F	H	R	S	U	AH	AJ	AK	BA	BB	BD	ES
143TC	6.62	5.83	3.50	5.50	4.00	0.34	0.771	0.188	0.875	2.12	5.875	4.50	2.75	0.16	6.50	1.52
145TC	6.62	7.00	3.50	5.50	5.00	0.34	0.771	0.188	0.875	2.12	5.875	4.50	2.75	0.16	6.50	1.52
182TC	9.00	6.74	4.50	7.50	4.51	0.41	0.986	0.250	1.125	2.62	7.250	8.50	3.50	0.25	8.90	1.94
184TC	9.00	8.31	4.50	7.50	5.51	0.41	0.986	0.250	1.125	2.62	7.250	8.50	3.50	0.25	8.90	1.94
213TC	10.24	8.10	5.25	8.50	5.50	0.41	1.201	0.312	1.375	3.12	7.250	8.50	4.25	0.25	8.90	2.55
215TC	10.24	9.60	5.25	8.50	7.00	0.41	1.201	0.312	1.375	3.12	7.250	8.50	4.25	0.25	8.90	2.55
254TC	12.28	9.92	6.25	10.00	8.25	0.55	1.416	0.375	1.625	3.75	7.250	8.50	4.75	0.25	10.00	3.11
256TC	12.28	11.65	6.25	10.00	10.00	0.55	1.416	0.375	1.625	3.75	7.250	8.50	4.75	0.25	10.00	3.11
284TC	13.78	11.61	7.00	11.00	9.50	0.55	1.591	0.500	1.875	4.38	9.000	10.50	4.75	0.25	11.25	3.53
284TSC	13.78	11.61	7.00	11.00	9.50	0.55	1.416	0.375	1.625	3.00	9.000	10.50	4.75	0.25	11.25	2.10
286TC	13.78	13.11	7.00	11.00	11.00	0.55	1.591	0.500	1.875	4.38	9.000	10.50	4.75	0.25	11.25	3.53
286TSC	13.78	13.11	7.00	11.00	11.00	0.55	1.416	0.375	1.625	3.00	9.000	10.50	4.75	0.25	11.25	2.10

Frame	Overall dimensions (inches)												
	C	G	J	O	P	T	N-W	AA	AB	TAP	X	Y	Bearing No
143TC	13.70	0.39	1.66	7.48	8.27	-	2.25	0.75	5.91	3/8/2016	3.78	3.78	6205 2Z
145TC	14.88	0.39	1.66	7.48	8.27	-	2.25	0.75	5.91	3/8/2016	3.78	3.78	6205 2Z
182TC	15.85	0.60	2.13	9.09	9.53	1.77	2.75	1.00	7.90	1/2/2013	5	5	6306 2Z
184TC	17.46	0.60	2.13	9.09	9.53	1.77	2.75	1.00	7.90	1/2/2013	5	5	6306 2Z
213TC	19.52	0.72	2.20	10.55	10.94	1.77	3.38	1.00	8.45	1/2/2013	5	5	6308 2Z
215TC	21.42	0.72	2.20	10.55	10.94	1.77	3.38	1.00	8.45	1/2/2013	5	5	6308 2Z
254TC	24.60	0.58	2.36	13.18	14.17	2.08	4.00	1.25	10.08	1/2/2013	5.55	5.16	6309 2Z
256TC	26.33	0.58	2.36	13.18	14.17	2.08	4.00	1.25	10.08	1/2/2013	5.55	5.16	6309 2Z
284TC	27.10	0.89	2.75	14.01	14.17	2.08	4.62	1.50	10.34	1/2/2013	5.55	5.16	6311 2Z
284TSC	25.70	0.89	2.75	14.01	14.17	2.08	3.25	1.50	10.34	1/2/2013	5.55	5.16	6311 2Z
286TC	28.60	0.89	2.75	14.01	14.17	2.08	4.62	1.50	10.34	1/2/2013	5.55	5.16	6311 2Z
286TSC	27.20	0.89	2.75	14.01	14.17	2.08	3.25	1.50	10.34	1/2/2013	5.55	5.16	6311 2Z

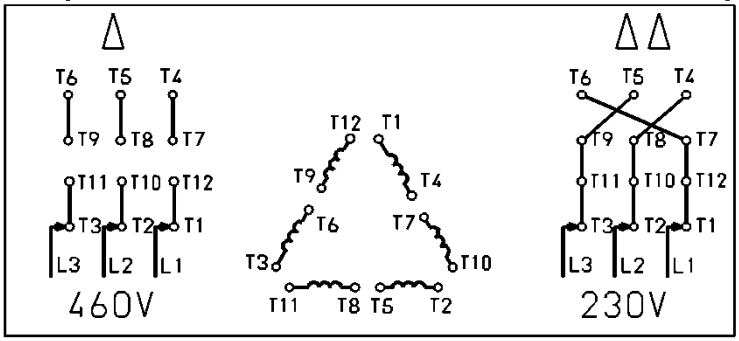
9/18/2002

B.3 Electrical Connection Diagrams

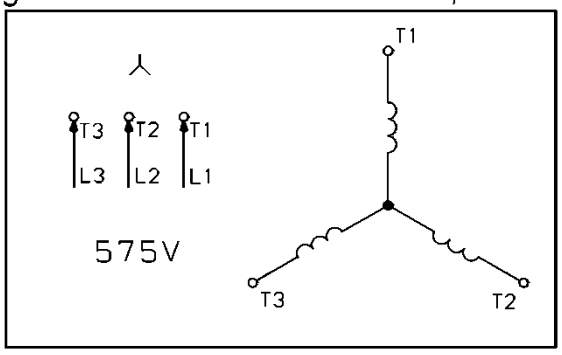
Connection Diagram for Frames 143T to184T, nominal voltage 230/460V



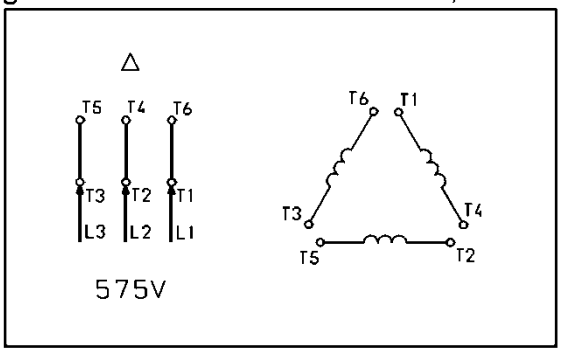
Connection Diagram for Frames 213T to 286T, nominal voltage 230/460V



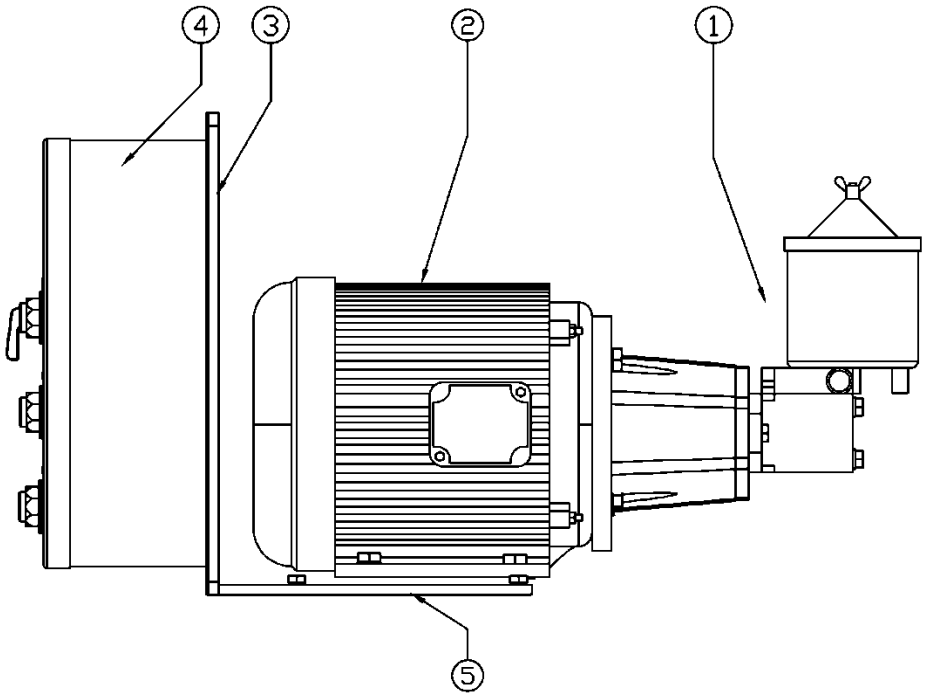
Connection Diagram for Frames 143T to 184T, nominal voltage 575V



Connection Diagram for Frames 213T to 286T, nominal voltage 575V



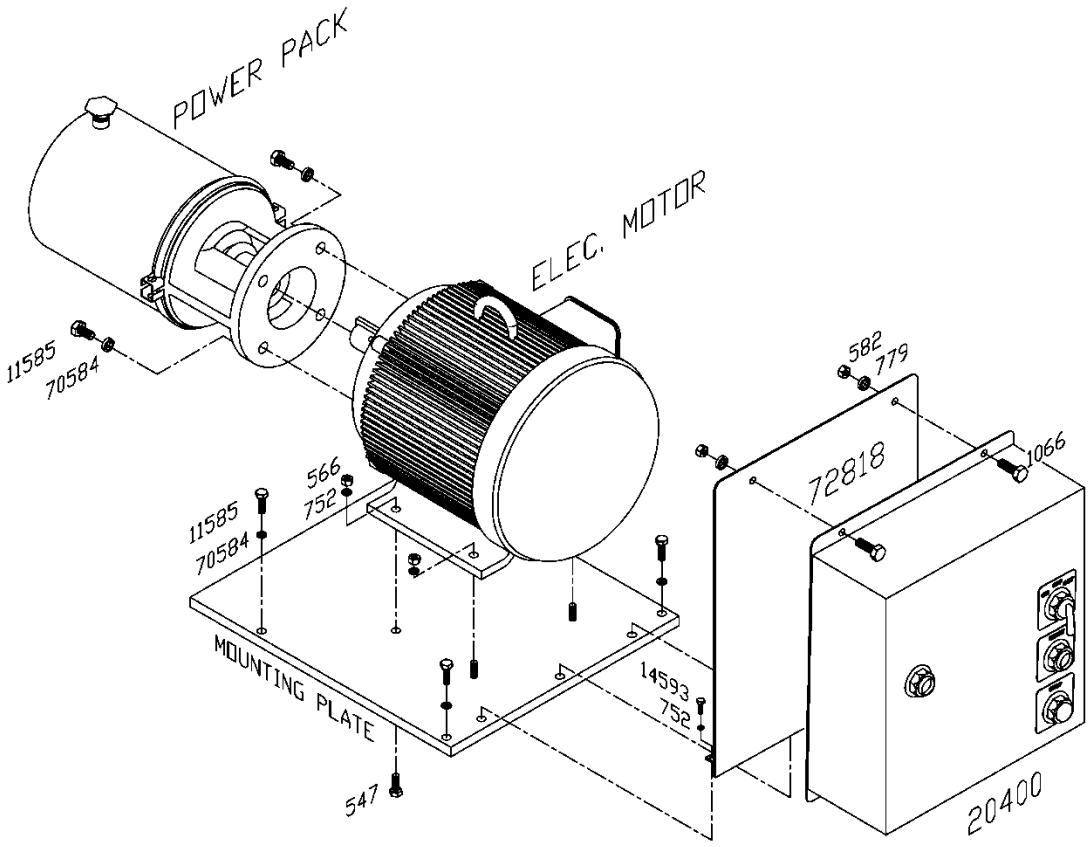
C.1 **10 Ton Power Pack**



ELECTRIC MOTOR, CONTROL BOX & POWER PACK ASSEMBLY
(UPPER MOUNTING PLATE ON WINCH)

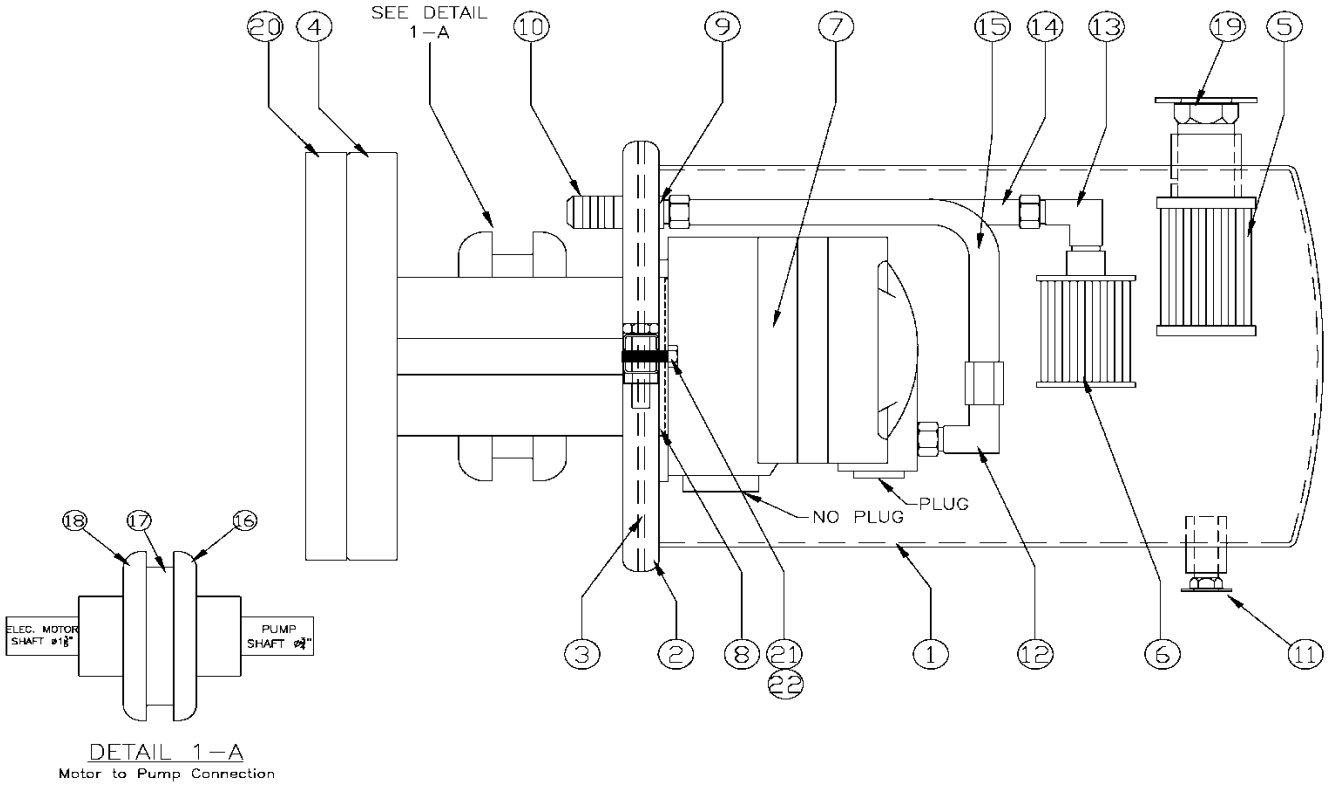
DF-156-10 Ton Hydra-Electric Winch Upper Mounting Plate Parts List		
Item#	**Part Description**	**Part #s**
1	Hydraulic Power Pack Assembly	74470
2	Electric Motor (3 HP)	74462
3	Control Box Mounting Plate	72817
4	Control Box Assembly	20400
5	Electric Motor Mounting Plate	74284

C.2 20, 40, & 60 Ton Power Pack



ELECTRIC MOTOR & CONTROL BOX
(UPPER MOUNTING PLATE ON WINCH)

DF-156 Hydra-Electric Winch Upper Mounting Plate Parts List				
Part Description	**Quantity**	**20 Ton Part#s**	**40 Ton Part#s**	**60 Ton Part#s**
Hex Head Bolt 3/8" x 1-3/4" (SS)	4	547		
Hex Nut 3/8" (SS)	4	566		
Hex Nut 1/4" (SS)	4	582		
Lock Washer 3/8" (SS)	7	752		
Lock Washer 1/4" (SS)	4	779		
Hex Head Bolt 1/4" x 1" (SS)	4	1066		
Hex Head Bolt 1/2" x 1-1/2" (SS)	8	11585		
Hex Head Bolt 3/8" x 1-1/2" (SS)	3	14593		
Control Box Assembly	1	20400		
Lock Washer 1/2" (SS)	8	70584		
Mounting Plate (Electric Motor)	1	73946	72729	84379
Mounting Plate (Control Box)	1	72818		
Electric Motor	1	74713 (7.5 hp)	72982 (10 hp)	17523 (15 hp)
Hydraulic Power Pack Assembly	1	74667		77429



DF-156 Hydra-Electric Winch Power Pack Assembly Parts List				
No.	**Part Description**	**Qnt'y**	**20 & 40 Ton Part #'s**	**60 Ton Part #'s**
1	Hydraulic Tank	1	20508	21067
2	Clamp (Tank to Adaptor)	1	20516	
3	Gasket (Tank to Adaptor)	1	20524	
4	Motor to Pump Bracket	1	20532	445
5	Hydraulic Fluid Fill Filter	1	20540	
6	Hydraulic Fluid Return Filter	1	20559	20560
7	Hydraulic Pump	1	20568	30167
8	Hydraulic Pump Face O-Ring	1	20575	
9	Bulkhead Fitting O-Ring	2	20583	20593
10	Bulkhead Fitting	2	20591	20592
11	Drain Plug (Hydraulic Tank)	1	20613	
12	Elbow Fitting w/ Pump Connector	1	Included in Piping Kit	
13	Elbow Fitting	1	Included in Piping Kit	
14	Pressure Tube - Return Filter	1	Included in Piping Kit	
15	Pressure Tube (Bent) - Hyd. Pump	1	Included in Piping Kit	
16	Hydraulic Pump Coupling Hub	1	20680	30241
17	Coupling Hub Insert	1	20699	30242
18	Electric Motor Coupling Hub	1	20702	30240
19	Fill Plug / Breather (Hydraulic Tank)	1	75205	
20	Hydraulic Power Pack Spacer	1	N/A	77431
21	HH Bolt 3/8-16 UNC x 1-1/4"	2	73970	
22	Lock Washer 3/8"	2	752	
Complete Piping Kit (includes items 12, 13, 14 & 15)			20660	20667
Complete Seal Kit for Hydraulic Pump			20974	30451

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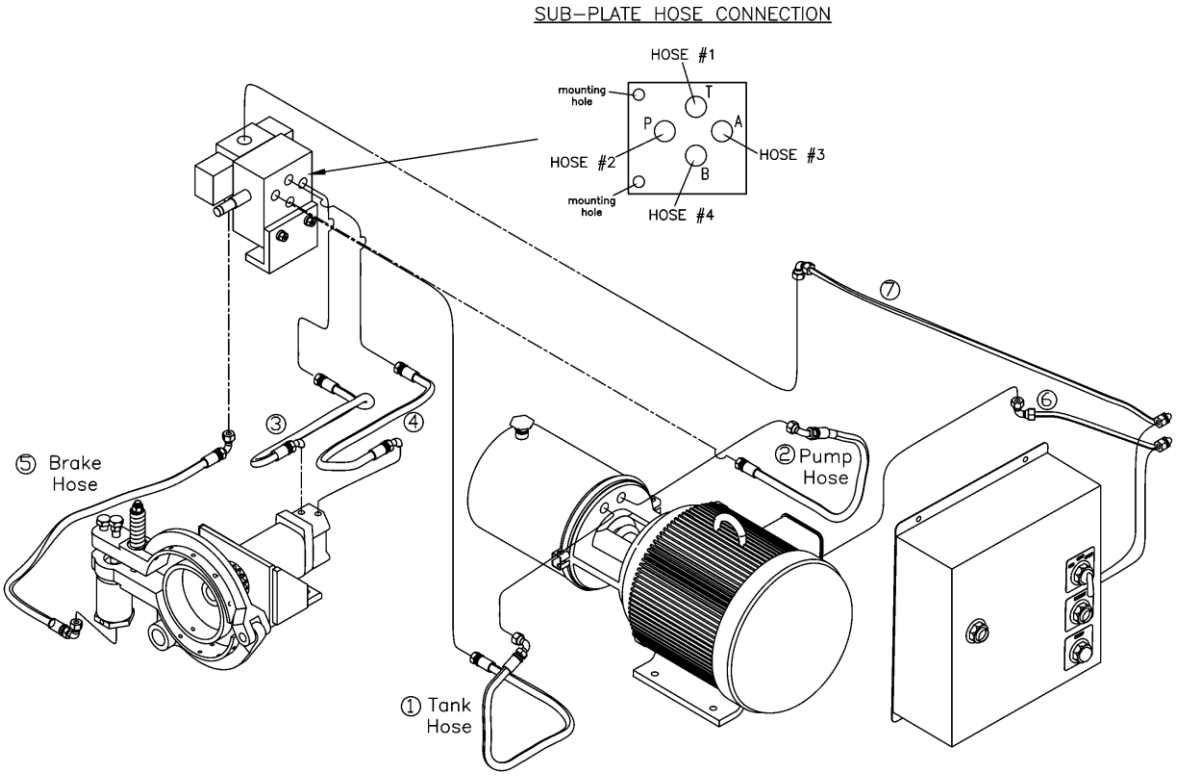
C.3 **Hose Connections**



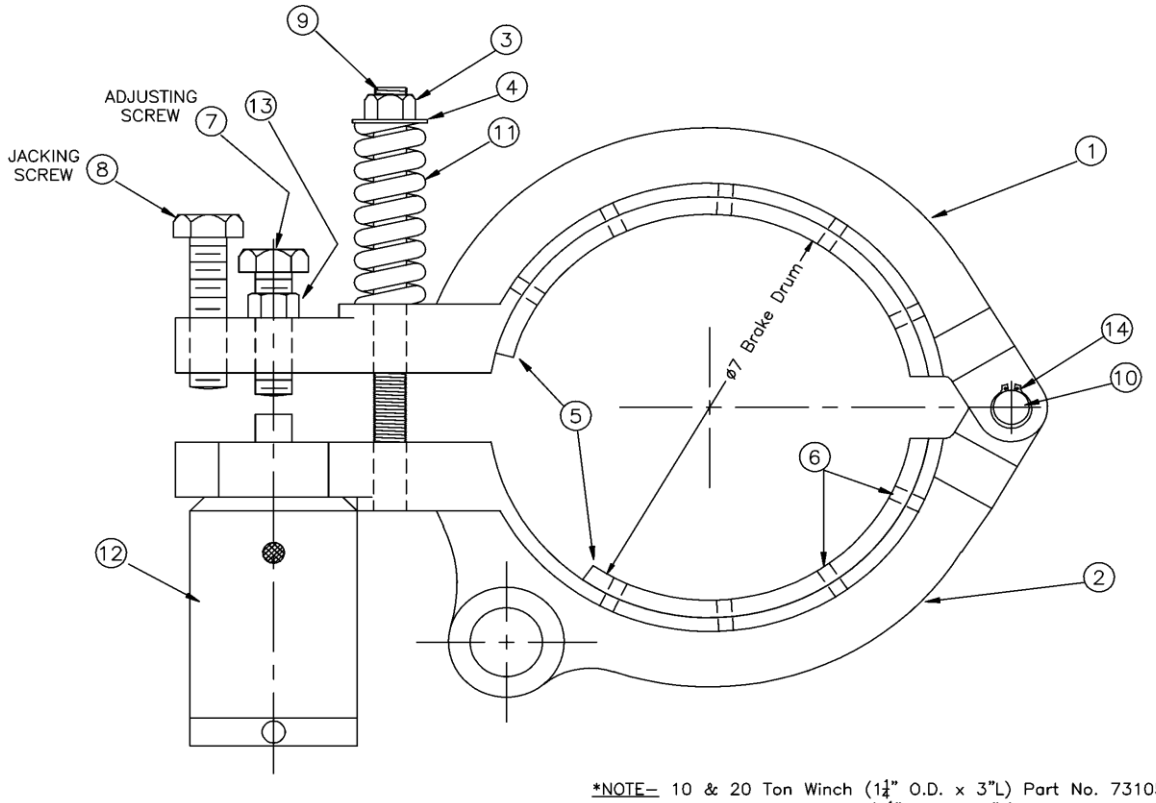
	LH Hoses				RH Hoses			
10T	1	82112	1	10 RLT RH OR LH T PORT HOSE	1	82112	1	10 RLT RH OR LH T PORT HOSE
	2	82066	1	10 LP LH, P PORT HOSE	2	82058	1	10 RP RH, P PORT HOSE
	3	82163	1	10 LA LH, A PORT HOSE	3	82171	1	10 RA RH, A PORT HOSE
	4	82228	1	10 LB LH, B PORT HOSE	4	82236	1	10 RB RH, B PORT HOSE
	5	82260	1	10 RLBL RH OR LH BRAKE LINE HOSE	5	82260	1	10 RLBL RH OR LH BRAKE LINE HOSE
20T	1	82104	1	20 LT LH, T PORT HOSE	1	82074	1	20/40 RT RH, T PORT HOSE
	2	82031	1	20 LP LH, P PORT HOSE	2	82023	1	20 RP RH, P PORT HOSE
	3 & 4	82155	2	20 LAB LH, A&B PORT HOSE	3	82147	1	20 RA RH, A PORT HOSE
	5	82252	1	20 RLBL RH OR LH BRAKE LINE HOSE	4	82201	1	20 RB RH, B PORT HOSE
					5	82252	1	20 RLBL RH OR LH BRAKE LINE HOSE
40T	1	82082	1	40 LT LH, T PORT HOSE	1	82074	1	20/40 RT RH, T PORT HOSE
	2	82015	1	40 LP LH, P PORT HOSE	2	82007	1	40 RP RH, P PORT HOSE
	3 & 4	82139	2	40 LAB LH A OR B PORT HOSE	3	82120	1	40 RA RH, A PORT HOSE
	5	82244	1	40 RLBL RH OR LH BRAKE LINE HOSE	4	82198	1	40 RB RH, B PORT HOSE
					5	82244	1	40 RLBL RH OR LH BRAKE LINE HOSE
60T	1	83178	1	60 LT LEFT HAND T PORT HOSE	1	81965	1	60 RT RIGHT HAND T PORT HOSE
	2	83151	1	60 LB LEFT HAND P PORT HOSE	2	81957	1	60 RP RIGHT HAND P PORT HOSE
	3	83186	1	60 LA LEFT HAND A PORT HOSE	3	81973	1	60 RA RIGHT HAND A PORT HOSE
	4	83194	1	60 LB LEFT HAND B PORT HOSE	4	81981	1	60 RB RIGHT HAND B PORT HOSE
	5	81949	1	60 RLBL BRAKE LINE HOSE	5	81949	1	60 RLBL BRAKE LINE HOSE

Marine Cable	6	5886	FT TT1B-10-N/TTNIB-10 MARINE CABLE
	7	5827	FT TSGA-3/TTNIB-3 MARINE CABLE

C.4 **Hydraulic Brake**

A.2.1 If brake adjustment is required;

- Start the pump motor,
- Turn the rotary switch to in or out,
- Use the Adjusting Screw to maintain a lift distance of ¼",
- Tighten the lock nut to fix the Adjusting Screw in place,
- Ensure that daylight can be seen through the coil spring when the brake is open. Damage may result if spring compresses solid,
- If additional holding power is required, tighten item #3. Remember, damage may result if spring is compressed solid,
- The Jacking Screw is used when the winch is operated manually. Tighten the Jacking Screw to release the brake, back off for power operation.



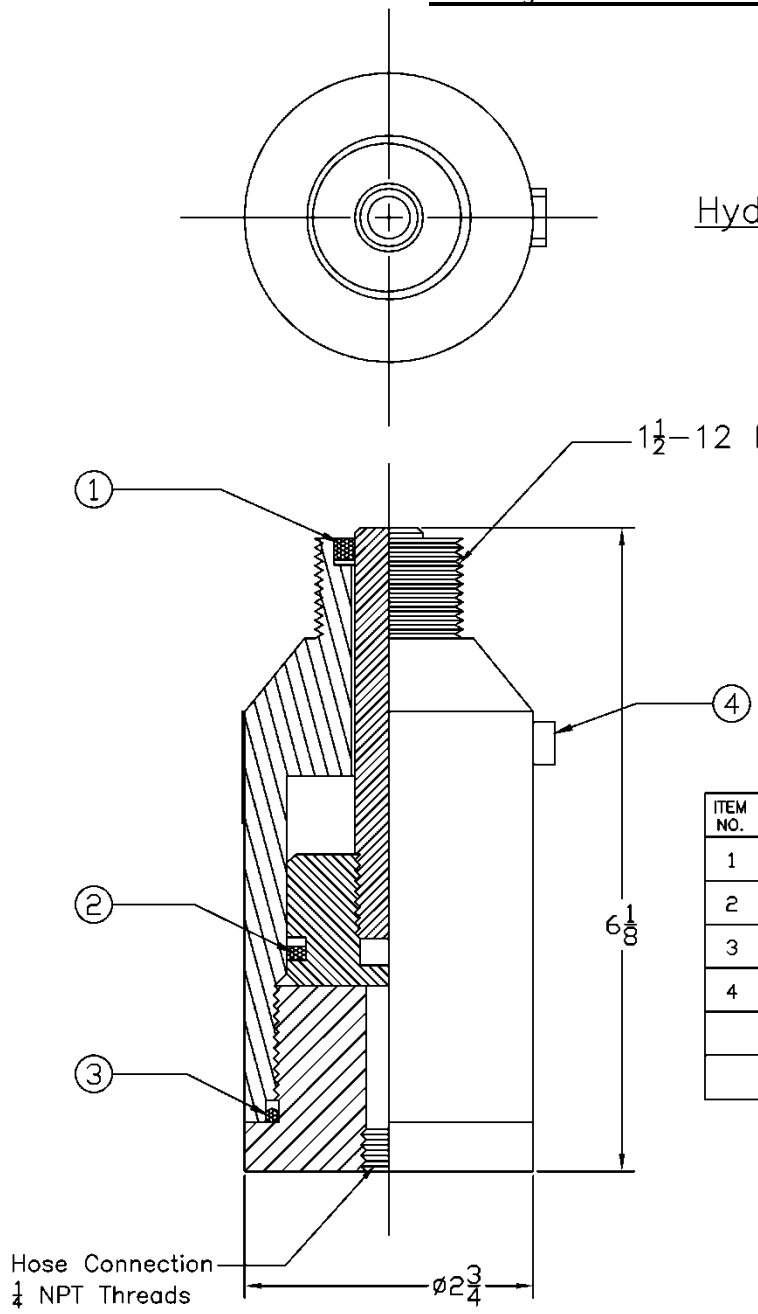
*NOTE– 10 & 20 Ton Winch (1¼" O.D. x 3"L) Part No. 73105
40 & 60 Ton Winch (1½" O.D. x 3"L) Part No. 73520

HYDRA–ELECTRIC WINCH BRAKE ASSEMBLY (PN 73393)

ITEM NO.	DESCRIPTION	QNT'Y	MATERIAL	PART NO.
1	Upper Brake Band	1	Bronze	
2	Lower Brank Band	1	Bronze	
3	Hex Nut ½–13 UNC	1	Zinc PL	73024
4	Flat Washer ½"	1	Zinc PL	73032
5	Upper and Lower Brake Lining	1 set		73040
6	Rivet ø⅛" X ⅝" Length	18	Brass	73059
7	Hex Head Tap Bolt ⅝–11 NC x 2¼"	1	Zinc PL	73067
8	Hex Head Tap Bolt ⅝–11 NC x 2¾"	1	Zinc PL	73083
9	Threaded Rod ø½" X 7½"	1	Zinc PL	73091
10	Hinge Pin	1	Zinc PL	73113
11	Spring (Winch Size Dependent)	1		SEE NOTE
12	Hydraulic Cylinder	1	Stainless	73377
13	Hex Nut ⅝–11 UNC	1	Zinc PL	73547
14	Retaining Ring	2	Zinc PL	70564

FOR ORDERING PURPOSES: BRAKE ASSEMBLY (73393) DOES NOT INCLUDE THE HYDRAULIC CYLINDER (73377) OR THE BRAKE SPRING (SEE NOTE).

C.5 **Hydraulic Brake Cylinder**



ITEM NO.	DESCRIPTION	QNT'Y	MATERIAL	PART NO.
1	Piston Rod Seal	1	Rubber	20915
2	O–Ring Piston Seal	1	Rubber	20923
3	O–Ring End Cap Seal	1	Rubber	20931
4	Breather	1		21059
	Cylinder Seal Kit (includes all of the above)			20916

C.6 **Hydraulic Relief Valve**

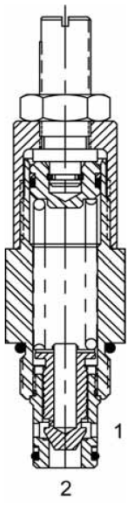
Each Hydra-Electric Winch is equipped with a pressure relief valve located at the sub-plate area. The hydraulic relief valve is factory set and should be checked regularly to ensure proper pressure is maintained. The pre-set values are as follows:

10 Ton Hydra-Electric Winch – 1100 psi
20 Ton Hydra-Electric Winch – 1800 psi
40 Ton Hydra-Electric Winch – 1800 psi
60 Ton Hydra-Electric Winch – 2200 psi

To check pressure, disconnect the brake line from the hydraulic brake cylinder (PN 73377) and install a pressure gauge in the brake line. To adjust pressure setting, locate the adjusting stem and lock nut on the relief value (60 ton has a protective cap that must be removed) and back off the lock nut. Operate the winch with the brake locked. Screw in the adjusting stem to increase the pressure or screw out to decrease pressure. After obtaining the desired pressure setting, tighten the lock nut and reconnect the brake line to the brake cylinder.

10, 20, 40 Ton

DE-RVA Direct Acting Relief Valve



DESCRIPTION

10 size, 7/8-14 thread, "Delta" series, direct acting relief valve.

OPERATION

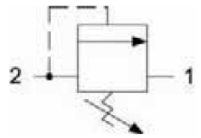
The DE-RVA blocks flow from (2) to (1) until sufficient pressure is present at (2) to force the poppet to open and allow metered flow from (2) to (1)

The cartridge offers smooth transition in response to load changes in common hydraulic circuits.

FEATURES

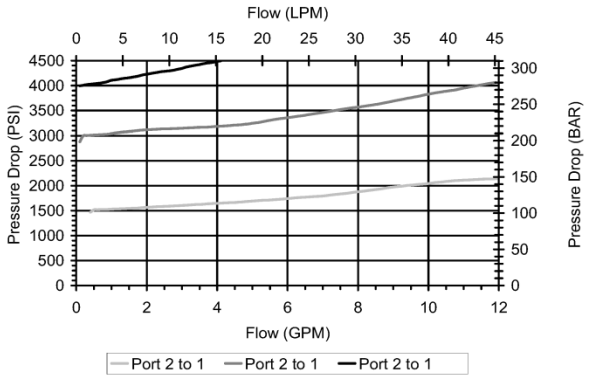
- Hardened parts for long life.
- Industry common cavity.

HYDRAULIC SYMBOL



PERFORMANCE

Actual Test Data (Cartridge Only)



VALVE SPECIFICATIONS

Nominal Flow	4 GPM (15.6 LPM) 4000 PSI 8 GPM (30 LPM) 3000 PSI
Rated Operating Pressure	4000 PSI (276 bar)
Viscosity Range	36 to 3000 SSU (3 to 647 cSt)
Filtration	ISO 18/16/13
Media Operating Temperature Range	-40° to 250° F (-40° to 120° C)
Weight	.56 lbs. (.25 kg)
Operating Fluid Media	General Purpose Hydraulic Fluid
Cartridge Torque Requirements	30 ft-lbs (40.6 Nm)
Cavity	DELTA 2W
Cavity Form Tool (Finishing)	40500000
Seal Kit	21191200

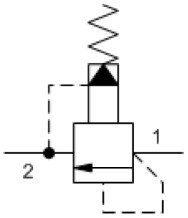
60 Ton

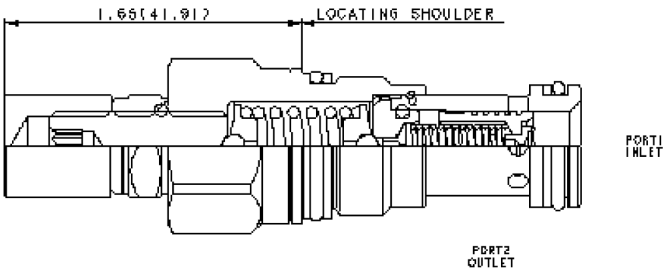
Pilot operated, balanced piston relief valve

Model:
RPEC-JAN

Product Description

Pilot-operated, balanced-piston relief cartridges are normally closed pressure regulating valves. When the pressure at the inlet (port 1) reaches the valve setting, the valve starts to open to tank (port 2), throttling flow to regulate the pressure. These valves are accurate, have low pressure rise vs. flow, they are smooth and quiet, and are moderately fast.





Technical Data

	U.S. Units	Metric Units
Cavity	T-10A	
Capacity	25 gpm	95 L/min.
Factory Pressure Settings Established at	4 gpm	15 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	2 in³/min.@1000 psi	30 cc/min.@70 bar
Response Time - Typical	10 ms	
Series (from Cavity)	Series 1	
Adjustment - Number of Clockwise Turns to Increase Setting	5	
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	40 - 50 Nm
Adjustment Screw Internal Hex Size	5/32 in.	4 mm
Adjustment Locknut/Cap Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	80 - 90 lbf in.	9 - 10 Nm
Seal Kits - Cartridge	Buna: 990-010-007	
Seal Kits - Cartridge	Viton: 990-010-006	
Model Weight	0.30 lb.	0.14 kg.

C.7 Directional Control Valve

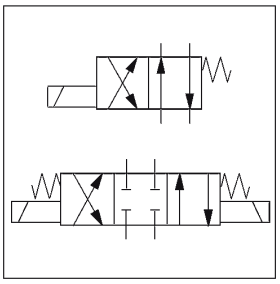
Catalogue HY11-3500/UK
Characteristics

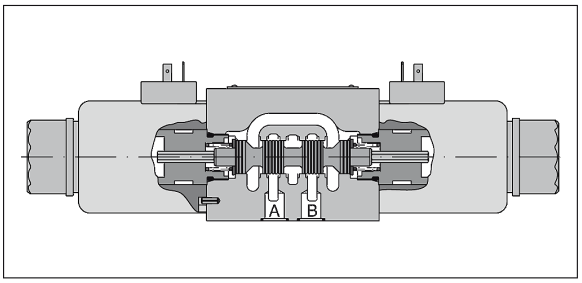
Directional Control Valve
Series D3W

The new NG10 direct operated directional control valve series D3W provides high functional limits up to 150 l/min in combination with a low, energy saving pressure drop.

The wide variety of options includes soft shift anchor tubes for smooth operation.

Versions with position control, additional surface protection and connector variants are shown in the following chapters.





Technical data

General							
Design		Directional spool valve					
Actuation		Solenoid					
Size		DIN NG10 / CETOP 05 / NFPA D05					
Mounting interface		DIN 24340 A10 / ISO 4401 / CETOP RP 121-H / NFPA D05					
Mounting position		unrestricted, preferably horizontal					
Ambient temperature	[°C]	-25...+50					
$MTTF_D$ value	[years]	150					
Weight	[kg]	4.8 (1 solenoid), 6.3 (2 solenoids)					
Hydraulic							
Max. operating pressure	[bar]	P, A B: 350; T: 210 (DC), 105 (AC)					
Fluid		Hydraulic oil in accordance with DIN 51524 / 51525					
Fluid temperature	[°C]	-25 ... +70					
Viscosity permitted	[cSt] / [mm²/s]	2.8...400					
Viscosity recommended	[cSt] / [mm²/s]	30...80					
Filtration		ISO 4406 (1999); 18/16/13 (meet NAS 1638: 7)					
Flow max.	[l/min]	150 (DC); 115 (AC) (see shift limits)					
Leakage at 50 bar	[ml/min]	Up to 20 per flow path, depending on spool					
Static / Dynamic							
Step response		see table response time					
Electrical characteristics							
Duty ratio		100% ED; CAUTION: coil temperature up to 150 °C possible					
Max. switching frequency	[1/h]	10000					
Protection class		IP 65 in accordance with EN 60529 (plugged and mounted)					
	Code	K	J	U	G	Y	T
Supply voltage / ripple	[V]	12 V =	24 V =	98 V =	205 V =	110V at 50Hz/ 120V at 60Hz	230V at 50Hz/ 240V at 60Hz
Tolerance supply voltage	[%]	±10	±10	±10	±10	±5	±5
Current consumption hold	[A]	3	1.5	0.35	0.18	0.8 / 0.72	0.4 / 0.36
Current consumption in rush	[A]	3	1.5	0.35	0.18	3.41 / 3.31	1.75 / 1.7
Power consumption hold	[W]	36	36	34	36	88 / 86	88 / 86
Power consumption in rush	[W]	36	36	34	36	375 / 397	385 / 408
Solenoid connection		Connector as per EN 175301-803, solenoid identification as per ISO 9461.					
Wiring min.	[mm²]	3 x 1.5 recommended					
Wiring length max.	[m]	50 recommended					

With electrical connections the protective conductor (PE ⏚) must be connected according to the relevant regulations.

D3W stand_UK.INDD CM_17.05.2010

Parker Hannifin GmbH
Hydraulic Controls Division
Kaarst, Germany

** Seal kit for Directional control valve is part# 21172. **

Bulletin 2542-M10/USA

Ordering Information

Directional Control Valves

Series D3W, C Style

D	3	W	2	C	N	Y	C
Directional Control Valve	Basic Valve	Actuator	Spool	Style	Seal	Solenoid Voltage	Connector Package

Basic Valve
NFPA D05 CETOP 5 NG 10

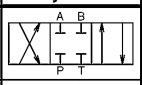
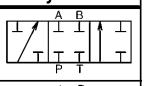
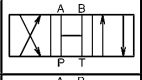
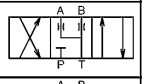
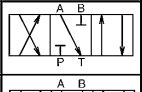
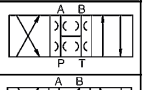
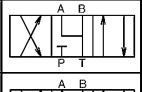
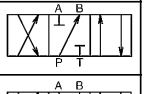
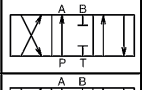
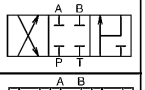
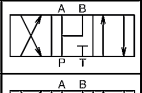
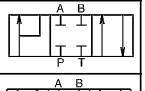
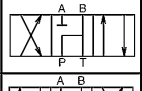
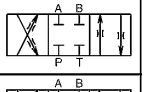
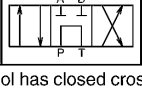
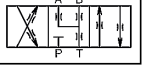
Actuator
Wet armature solenoid

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
E	24/60 - 24/50 VAC
Y *	120/60 - 110/50 VAC
T *	240/60 - 220/50 VAC
K #	12 VDC
J #	24 VDC
D	120 VDC
Z	250 VDC

* Available in low watt version with integral rectifier.

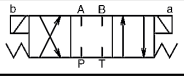
\# Low Watt Coil available.

Code	Symbol	Code	Symbol
1		10†	
2		11	
3		12	
4		16	
5		21†	
6		22†	
7		81†	
8*, 9**		82†	

* 8 spool has closed crossover

** 9 spool has open crossover

† Available only with rectified AC coils or high watt DC coils

Code	Description
C	Double solenoid, 3 position, spring centered. 

 This condition varies with spool code

Code	Description
C	Conduit Cavity
K	Conduit Adaptor
P	Hirschmann w/Plug
W*	Hirschmann w/o Plug
S	Double Spade
E	Explosion Proof

*Not available with signal lights.

2542-M10.p65, dd, am

C.8 Hydraulic Motor

Hydraulic Motor seal kit part# 20958.

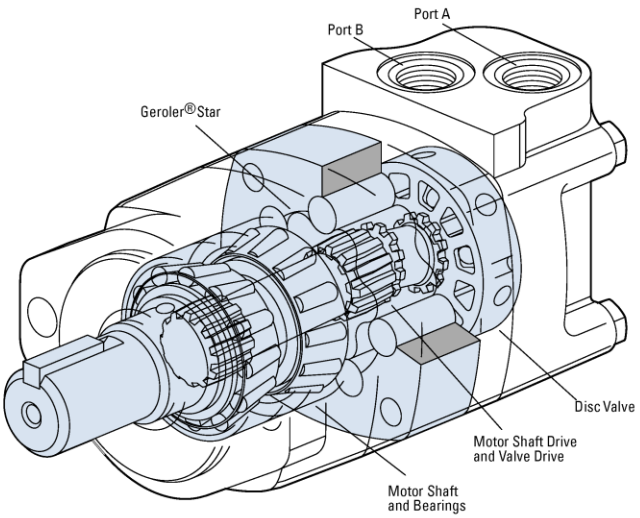
The 10 & 20 ton units use a Char-Lynn Hydraulic Motor with a displacement of 6.2 in³/r (PN 78808)

The 40 ton units use a Char-Lynn Hydraulic Motor with a displacement of 9.6 in³/r (PN 78816)

The 60 ton unit use a Char-Lynn Hydraulic Motor with a displacement of 11.9 in³/r (PN 78824)

2000 Series

Highlights



Description

The popular 2000 Series provides torque up to 7500 lb-in. This proven design is reliable and durable. Eaton has added options that make the motor more flexible to use in a wide variety of applications. The integral cross-over relief valve is the latest innovation in the 2000 series motors.

2000 Series

Geroler Element	10 Displacements
Flow l/min [GPM]	75 [20] Continuous**
	115 [30] Intermittent*
Speed RPM	908 Cont.**
	1042 Inter.*
Pressure bar [PSI]	200 [3000] Cont.**
	300 [4500] Inter.*
Torque Nm [lb-in]	845 [7470] Cont.**
	930 [8225] Inter.*

** Continuous— (Cont.) Continuous rating, motor may be run continuously at these ratings.
* Intermittent— (Inter.) Intermittent operation, 10% of every minute.

Features

- Three zone design for longer life and true bi-directionality.
- Bearings that meet the highest standards of the industry
- Options to optimize performance in every application
- Integrated cross-over relief valve option

Benefits

- Easy to design in a system
- Reliablity and performance in tough application
- Compact design of the integrated cross-over relief valve option

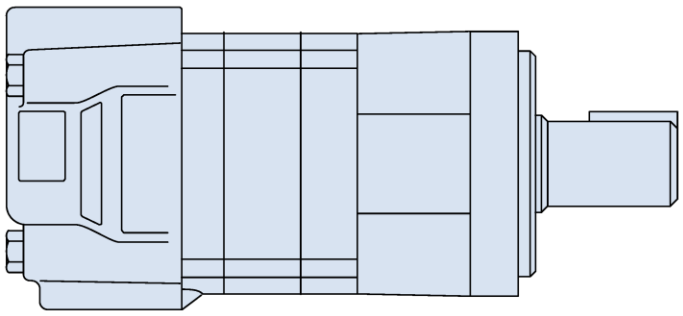
Applications

- Skid Steer Attachments
- Swing Motor
- Brush Cutters & Mowers
- Harvesting Equipment
- Directional Boring any place pressure relief protection is optimal for system or motor performance and life
- Turf equipment

Flow Volume:
10 Ton, 6-7 GPM
20/40 Ton, 9-11 GPM
60 Ton, 16 GPM

2000 Series

Specifications



SPECIFICATION DATA — 2000 SERIES MOTORS

Displ. cm³/r [in³/r]		80 [4.9]	90 [5.5]	100 [6.2]	130 [8.0]	160 [9.6]	195 [11.9]	245 14.9]	305 [18.7]	395 [24.0]	490 [29.8]
Max. Speed (RPM) @ Flow	Continuous	908	836	742	576	477	385	308	246	191	153
	Intermittent	908	1042	924	720	713	577	462	365	287	230
Flow l/min [GPM]	Continuous	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]
	Intermittent	75 [20]	95 [25]	95 [25]	95 [25]	115 [30]	115 [30]	115 [30]	115 [30]	115 [30]	115 [30]
Torque* Nm [lb-in]	Continuous	235 [2065]	265 [2326]	295 [2630]	385 [3420]	455 [4040]	540 [4780]	660 [5850]	765 [6750]	775 [6840]	845 [7470]
	Intermittent	345 [3035]	390 [3458]	445 [3950]	560 [4970]	570 [5040]	665 [5890]	820 [7250]	885 [7820]	925 [8170]	930 [8225]
Pressure Δ bar [Δ PSI]	Continuous	205 [3000]	205 [3000]	205 [3000]	205 [3000]	205 [3000]	205 [3000]	205 [3000]	205 [3000]	155 [2250]	120 [1750]
	Intermittent	310 [4500]	310 [4500]	310 [4500]	310 [4500]	260 [3750]	260 [3750]	260 [3750]	260 [3700]	170 [2750]	140 [2000]
	Peak	310 [4500]	310 [4500]	310 [4500]	310 [4500]	310 [4500]	310 [4500]	310 [4500]	310 [4500]	205 [3250]	170 [2500]
Weight kg [lb]	Standard or Wheel Mount	9.3 [20.5]	9.3 [20.5]	9.5 [21.0]	9.8 [21.5]	10.0 [22.0]	10.4 [23.0]	10.9 [24.0]	11.3 [25.0]	11.8 [26.0]	12.2 [27.0]
	Bearingless	7.3 [16.0]	7.3 [16.0]	7.5 [16.5]	7.7 [17.0]	7.9 [17.5]	8.4 [18.5]	8.8 [18.5]	9.3 [20.5]	9.8 [21.5]	10.2 [22.5]

Maximum Case Pressure: See case pressure seal limitation graph.

*See shaft torque ratings for limitations.

Note:

To assure best motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

Maximum Inlet Pressure:

310 bar [4500 PSI]

Do not exceed Δ pressure rating (see chart above).

Maximum Return Pressure:

310 bar [4500 PSI] with case drain line installed.

Do not exceed Δ pressure rating (see chart above).

Δ bar [Δ PSI] :

The true pressure difference between inlet port and outlet port

Continuous Rating:

Motor may be run continuously at these ratings

Intermittent Operation:

10% of every minute

Peak Operation:

1% of every minute

Recommended Fluids:

Premium quality, anti-wear type hydraulic oil with a viscosity of not less than 70 SUS at operating temperature.

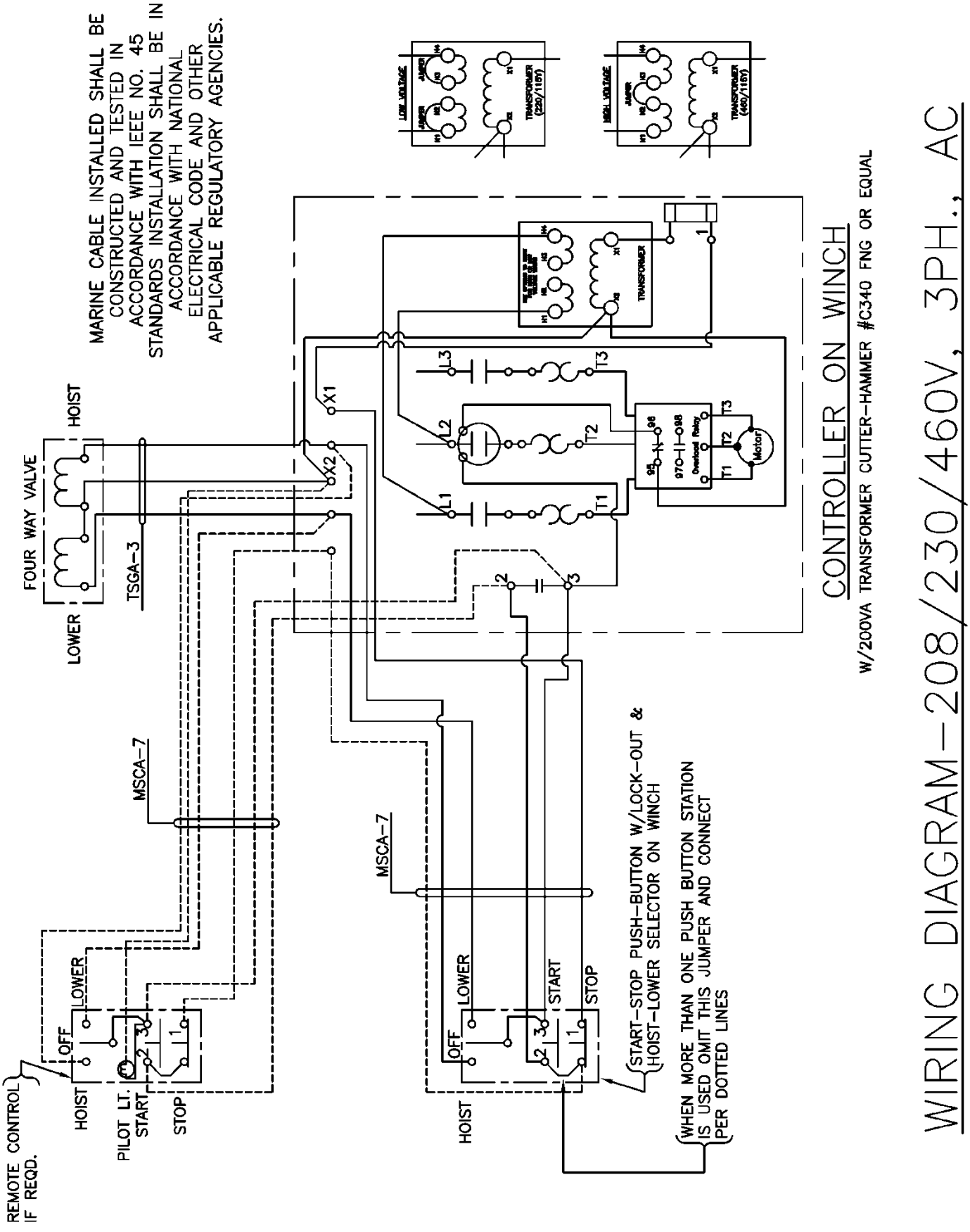
Recommended Maximum System Operating Temp.:

82° C [180° F]

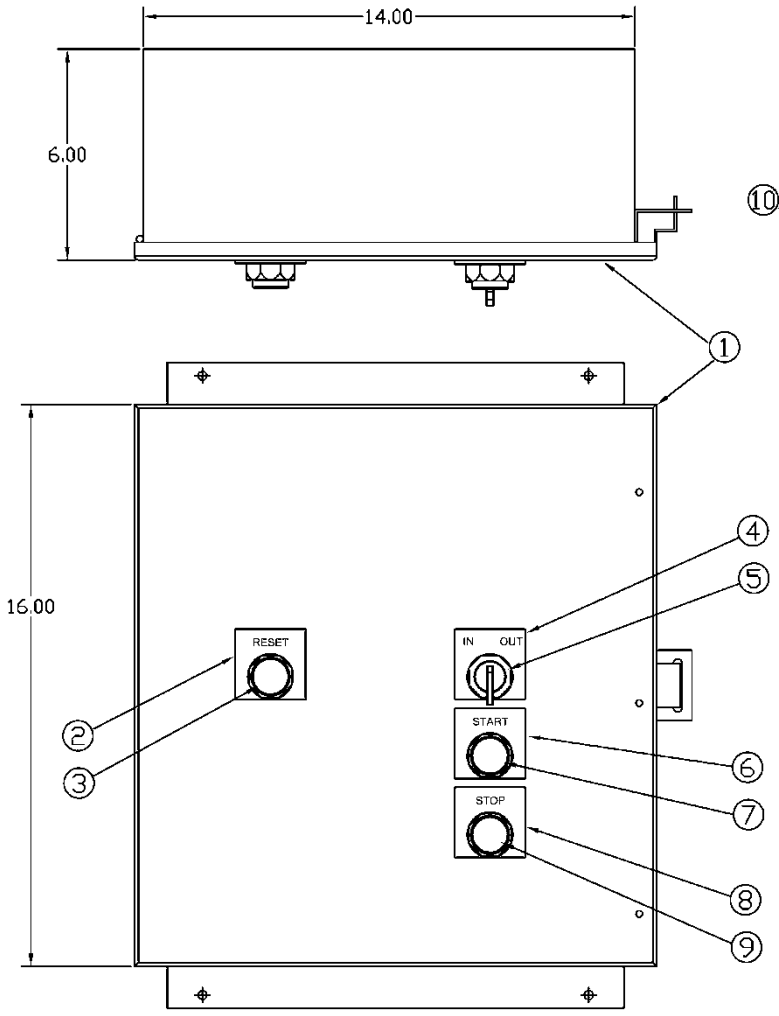
Recommended Filtration:

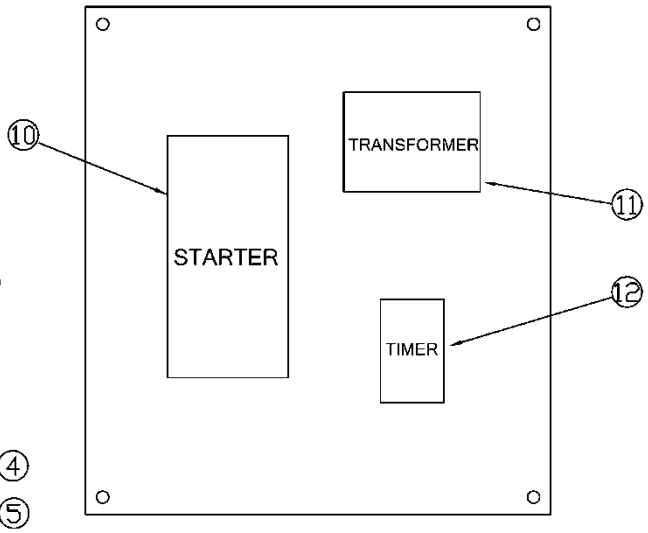
per ISO Cleanliness Code, 4406: 20/18/13

D.1 **Electrical Schematics**



D.2 **Control Box**





INSIDE PANEL OF CONTROL BOX

ITEM NO.	DESCRIPTION	QNT'Y	PART NO.
1	CONTOL BOX (STAINLESS STEEL)	1	73598
2	RESET SWITCH PLATE	1	20796
3	RESET SWITCH	1	85812
4	IN/OUT SWITCH PLATE	1	20753
5	IN/OUT SWITCH	1	20737
6	START SWITCH PLATE	1	20761
7	START SWITCH	1	19992
8	STOP SWITCH PLATE	1	20788
9	STOP SWITCH	1	19984
CONTROL BOX INTERNAL COMPONENTS			
10	MAGNETIC STARTER (NEMA SIZE 1)	1	20222
11	TRANSFORMER (230/460 VOLT)	1	77771
12	TIMER (OPTIONAL)	1	85694

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NABRICO warrants that all NABRICO products shall be free from defects in material and workmanship during the Warranty Period (as herein defined); provided, however that NABRICO's warranty hereunder shall not apply to any equipment, material or components that is not manufactured by NABRICO, and NABRICO makes no expressed or implied warranty that any such equipment, material or components are free from manufacturer or supplier defects. To the extent doable, NABRICO agrees to transfer and assign to a Buyer or End User any warranties extended by the manufacturer or supplier of such equipment, material or components. NABRICO shall have no obligation or responsibility to repair or replace any defective NABRICO product if a notice of defect is not reported in writing to NABRICO within 180 days from the date of shipment of any NABRICO Winch Products and 90 days from the date of shipment of any other NABRICO Products (such 180 day and 90 day periods are hereinafter referred to as "Warranty Period").

In the event Buyer or End User timely notifies NABRICO in writing of any claim of defect covered by this warranty, NABRICO shall correct the nonconforming work by making repairs or replacements, at NABRICO's option and at NABRICO's expense, if NABRICO's examination shall disclose to its satisfaction that all or a portion of the NABRICO Product is defective. However, this warranty is conditional upon compliance by the Buyer or End User with the loading, use and handling in accordance with good commercial practices of the trade, and NABRICO shall not be responsible for defects caused by misleading, overheating, improper cleaning, misapplication, physical abuse or from normal wear and tear. This warranty is void where any NABRICO Product has been altered or repaired by anyone other than NABRICO or its authorized agent.

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Dimensions. All dimensions shown in this catalog are in feet and inches. Weights are in English pounds. Capacities are in short tons of 2,000 pounds. Please note that dimensions and weights are nominal and are subject to standard variations. Maximum test pressure on hatches, doors and enclosures is 2 PSI unless advise in writing by NABRICO of a higher allowance. Product details and specifications are subject to change without notice.

NABRICO

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615.442.1313 fax
www.nabrico-marine.com

WINCHES
ELECTRIC
HYDRAULIC
MANUAL

HATCHES
WATERTIGHT
TWIST LOCK
QUICK ACTING

BITTS
DOUBLE BITT
SINGLE BITT
THRU-DECK BITT

CAPSTANS
HYDRAULIC
ELECTRIC
CUSTOMIZABLE

DOORS
6 DOG MANUAL
QUICK ACTING
4 DOG MANUAL

KEVELS
KEVEL CHOCK
KEVEL
THRU-DECK KEVEL

SIGNS
WARNING
CUT-OFF
OIL POLLUTION

CHOCKS
CAST STEEL
BUTTON
ROLLER BUTTON

BARGE CRANES
ELECTRIC OPERATION
MANUAL OPERATION

OIL TANKS
300 GALLON
600 GALLON
CUSTOM SIZES

OCEAN DOMES
MILD STEEL
STAINLESS STEEL

SUCTION BELLMOUTHS
6″ SIZE
8″ SIZE
10″ SIZE