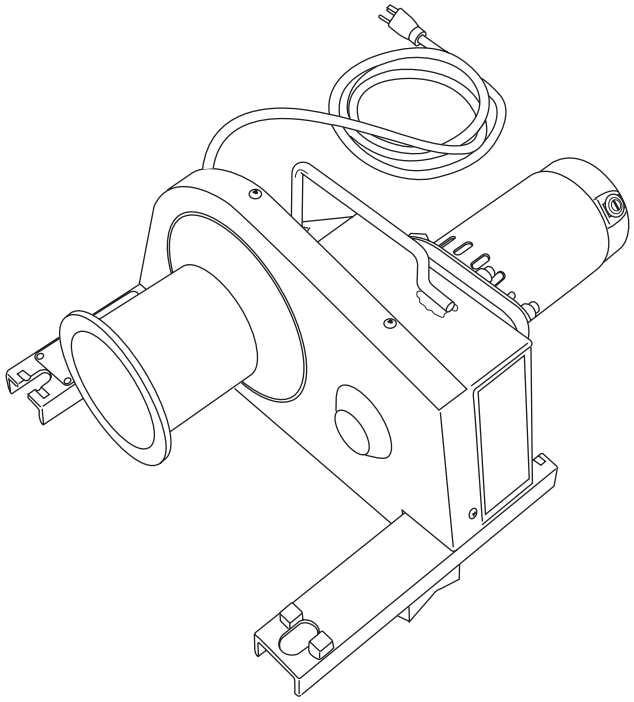
INSTRUCTION MANUAL

GREENLEE®
A Textron Company



2001-Series
Easy Tugger® Cable Pullers

Effective with Serial Code VL for 115 Volt Pullers and Serial Code VA for 220 Volt Pullers

Read and **understand** all of the instructions and safety information in this manual before operating or servicing this tool.

99978245

IM 979 REV 9 2/06

Table of Contents

Description

The Greenlee Easy Tugger® cable puller is intended to be used to pull cable through conduit and in tray. The Easy Tugger will develop 8.89 kilo-Newtons (2000 lb) of pulling force. See a Greenlee catalog for sheaves, pulling rope, and other cable pulling accessories rated for use with the Easy Tugger to create an entire cable pulling system.

No single manual can provide instructions for every cable pulling application. This manual contains general information for pulling cable. Illustrations of some typical setups are also provided.

Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

Purpose

This manual is intended to familiarize operators and maintenance personnel with Greenlee 2001-series Easy Tugger cable pullers.

Keep this manual available to all personnel.

KEEP THIS MANUAL

IMPORTANT SAFETY INFORMATION

SAFETY ALERT SYMBOL

This symbol is used to call your attention to hazards or unsafe practices which could result in an injury or property damage. The signal word, defined below, indicates the severity of the hazard. The message after the signal word provides information for preventing or avoiding the hazard.

⚠DANGER

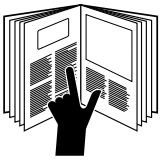
Immediate hazards which, if not avoided, WILL result in severe injury or death.

⚠WARNING

Hazards which, if not avoided, COULD result in severe injury or death.

⚠CAUTION

Hazards or unsafe practices which, if not avoided, MAY result in injury or property damage.



⚠DANGER

Read and understand all of the instructions and safety information in this manual before operating or servicing this tool.

Failure to observe this warning will result in severe injury or death.

⚠DANGER

Do not operate the cable puller in a hazardous environment. Hazards include flammable liquids and gases.

Failure to observe this warning will result in severe injury or death.

⚠WARNING

Electric shock hazard:

Disconnect the cable puller from the power supply before servicing.

Failure to observe this warning could result in severe injury or death.

IMPORTANT SAFETY INFORMATION

⚠WARNING

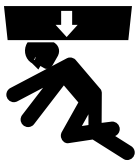
Inspect all components of the cable-pulling system. Verify the maximum load-bearing capacity or maximum strength of all structural supports, pulling system components and anchoring systems before setting up the puller. Any component that cannot withstand the maximum cable-pulling forces may break and strike nearby personnel with great force.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Do not allow anything other than the pulling rope to contact the capstan. A grip, swivel, or other component could break and strike nearby personnel with great force.

Failure to observe this warning could result in severe injury or death.



⚠WARNING

Do not stand directly under a vertical pull. Cable could fall suddenly from the conduit, injuring nearby personnel.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

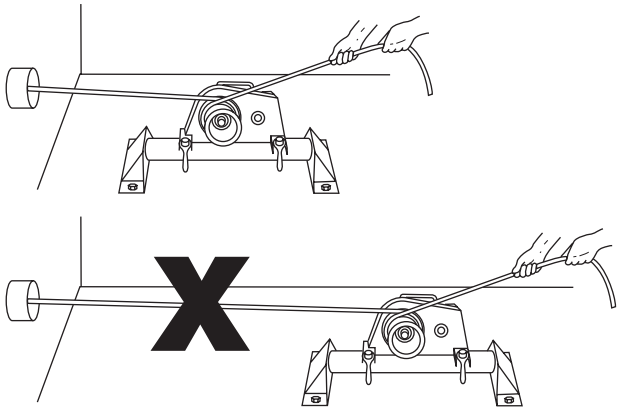
Do not operate puller if the anti-reverse mechanism is not working. If you do not hear the clicking of the anti-reversing pawl when the capstan is rotating, shut the puller off and have it repaired by an authorized Greenlee service center.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Locate the puller so that it is close to the conduit. Rope, cable, or connectors can break under tension, causing the rope to whip violently.

Failure to observe this warning could result in severe injury or death.



⚠WARNING

An underrated rope may break and whip violently. Use a double-braided composite rope with the following characteristics:

- Maximum Rated Capacity: at least 8.89 kN (2000 lb)
- Average Breaking Strength: at least 35.6 kN (8000 lb)

Failure to observe this warning could result in severe injury or death.

⚠WARNING

- Check the condition of the entire rope before use. A worn or damaged rope can break under tension and whip violently.
- Do not maintain a stationary rope on a rotating capstan. The wear generated may cause the rope to break under tension and whip violently.

Failure to observe these warnings could result in severe injury or death.

IMPORTANT SAFETY INFORMATION

⚠WARNING

Attach the pulling rope to the cable with appropriate types of connectors as described in this manual. Select connectors with a maximum rated capacity of at least 8.89 kN (2000 lb). An underrated connector can break under tension.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Keep hands away from the capstan. Rope at the capstan can crush a hand.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Do not wrap rope around hands, arms, waist or other body parts. Do not stand in spent coils or tailed rope. Hold rope so that it may be released quickly.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Rope, cable, or a connecting device can break under tension, causing the rope to whip violently.

Do not allow any unnecessary personnel to remain in the area during the pull.

Failure to observe this warning could result in serious injury or death.

⚠WARNING

Do not allow the rope to become overlapped on the capstan. If an overlap begins to develop, relax the tailing force immediately and shut off the cable puller.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Do not operate without chain guards in place.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Use this tool for manufacturer's intended purpose only. Do not use the cable puller as a hoist or winch.

- The cable puller cannot lower a load.
- The load may fall.

Failure to observe this warning could result in severe injury or death.

⚠WARNING

Inspect puller and accessories before use. Replace any worn or damaged components with Greenlee replacement parts. A damaged or improperly assembled item can break and strike nearby personnel with great force.

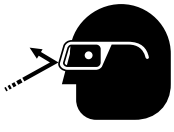
Failure to observe this warning could result in severe injury or death.

⚠WARNING

Entanglement hazard:

- Do not operate the cable puller while wearing loose-fitting clothing.
- Retain long hair.

Failure to observe these warnings could result in severe injury or death.



⚠WARNING

Wear eye protection when using this tool.

Failure to wear eye protection could result in severe eye injury from flying debris.

Grounding Instructions

120-Volt Model

⚠WARNING

Electric shock hazard.

- Do not modify the plug provided with the tool.
- Connect this tool to a grounded receptacle on a 20-amp GFCI-protected circuit.

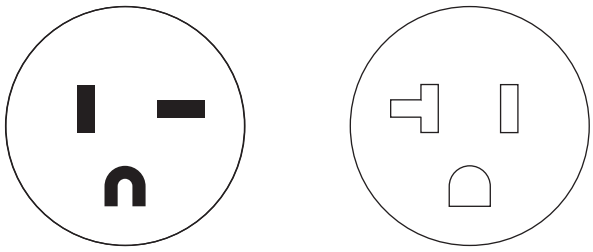
Failure to observe these warnings could result in severe injury or death.

This tool must be grounded. In the event of a malfunction or breakdown, an electrical ground provides a path of least resistance for the electric current. This path of least resistance is intended to reduce the risk of electric shock.

This tool's electric cord has a grounding conductor and a grounding plug as shown. Do not modify the plug. Connect the plug to a corresponding receptacle that is properly installed and grounded in accordance with all national and local codes and ordinances. Do not use an adapter.

20 Amp/125 Volt

Plug and Receptacle



Plug Receptacle

220-Volt Model

⚠WARNING

Electric shock hazard.

- Do not modify the plug provided with the tool.
- Connect this tool to a grounded receptacle on a 10-amp GFCI-protected circuit.

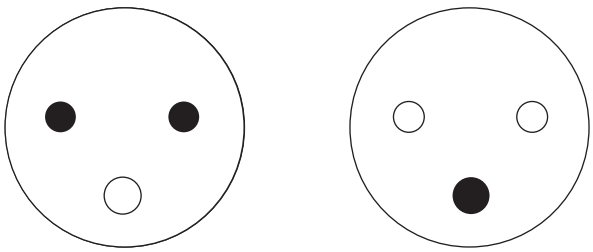
Failure to observe these warnings could result in severe injury or death.

This tool must be grounded. In the event of a malfunction or breakdown, an electrical ground provides a path of least resistance for the electric current. This path of least resistance is intended to reduce the risk of electric shock.

This tool's electric cord has a grounding conductor and a grounding plug as shown. Do not modify the plug. Connect the plug to a corresponding receptacle that is properly installed and grounded in accordance with all national and local codes and ordinances. Do not use an adapter.

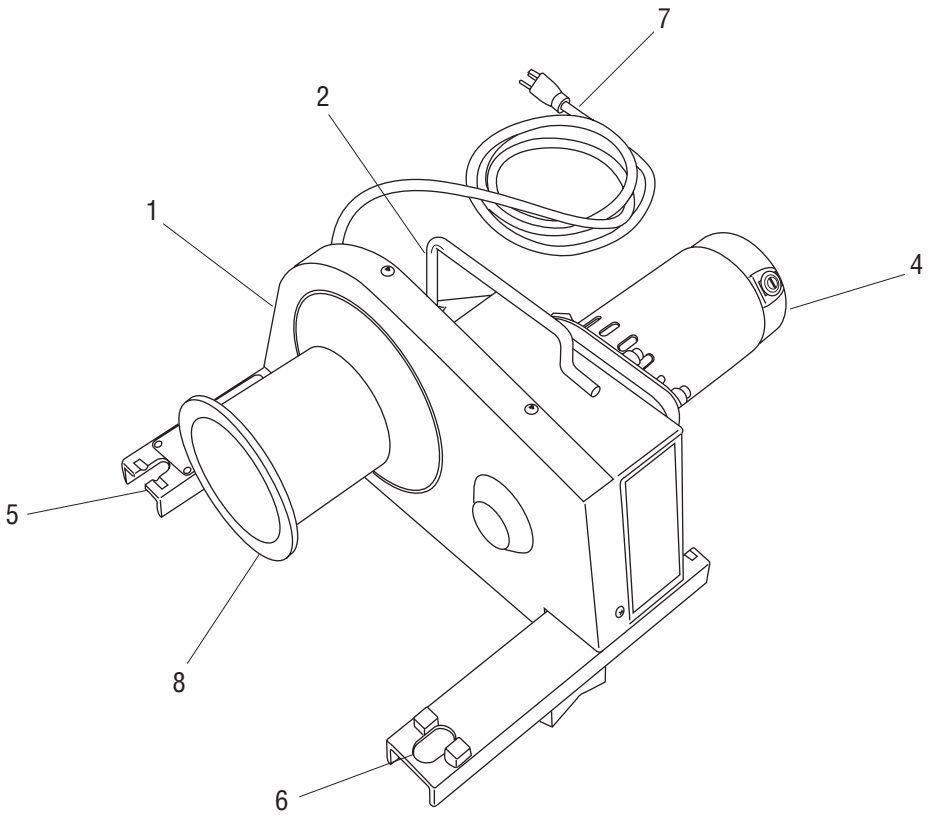
10 Amp/250 Volt

Plug and Receptacle



Plug Receptacle

Identification



Easy Tugger Identification

1. Capstan Chain Guard
2. Handle
3. Guarded ON/OFF Switch and Circuit Breaker (not shown)
4. Motor
5. Hole for Vise Chain
6. Vise Chain Pocket
7. Power Cord
8. Tapered Capstan

Specifications

Weight	19.8 kg (44 lb)
Dimensions:	
Length	381 mm (15")
Width	483 cm (19")
Height	241 cm (9.5")
Power (120-Volt Model)®:	
Voltage	120 VAC, 60 Hz
Current	8 Amps
Source	20 Amp GFCI-Protected Circuit
Power (220-Volt Model):	
Voltage	220 VAC, 50 Hz
Current	4 Amps
Source	10 Amp GFCI-Protected Circuit
Maximum Pulling Force	8.89 kN (2000 lb)
Speed:	
No load	6.7 meters/minute (22 feet/minute)
8.89 kN (2000 lb)	3.35 meters/minute (11 feet/minute)
Duty Cycle:	
0 - 6.22 kN (0 - 1400 lb)	Continuous Operation
6.22 - 8.89 kN (1400 - 2000 lb)	10 minutes on / 10 minutes off
Pulling Rope:	
Average Breaking Strength	35.6 kN (8000 lb) minimum

Cable Pulling Glossary

anchoring system

any item or group of items that keeps a cable pulling component in place during the cable pull

capstan

the hollow cylinder of the cable puller that acts on the pulling rope to generate pulling force

coefficient of friction

the ratio that compares two amounts of force: (1) the force needed to move an object over a surface and (2) the force holding the object against the surface

This ratio is used to describe how the capstan and the rope work together.

connector

any item, such as a wire grip, clevis, swivel, or pulling grip, that connects the rope to the cable

direct line of pull

the areas next to the pulling rope and along its path; this includes the areas in front of, in back of, and underneath the rope

maximum rated capacity

the amount of pulling tension that any component can safely withstand, rated in kilo-Newtons (metric) or pounds; the maximum rated capacity of every component must meet or exceed the maximum pulling force of the cable puller

Newton

a metric unit of force, equivalent to .225 pounds of force

pipe adapter sheave

attaches to conduit for pulling or feeding cable

pulling grip

connects the rope to the cable; consists of a wire mesh basket that slides over the cable and grips the insulation

pulling force

the amount of pulling tension developed by the cable puller, rated in Newtons (metric) or pounds; a cable puller is usually described by the maximum pulling force that it can develop

resultant force

any force that is produced when two or more forces act on an object; applies to the sheaves of a cable pulling system

sheave

a pulley that changes the direction of the rope and cable

stored energy

the energy that accumulates in the pulling rope as it stretches, described in Newtons-meters (metric) or foot-pounds

support structure

any stationary object that a cable pulling system component is anchored to, such as a concrete floor (for the floor mount) or an I-beam (for a sheave)

tail

the portion of the rope that the operator applies force to; this is the rope coming off of the capstan, and is not under the tension of the pull

tailing the rope

the operator's main function; this is the process of applying force to the tail of the pulling rope—see the complete explanation under Principles of Cable Pulling

wire grip

connects the rope to the cable; some use a set screw to clamp onto the conductors of the cable

Cable Pulling Principles

Pulling cable is a complex process. This section of the manual describes and explains four main topics of pulling cable:

- each cable pulling system component
- how these components work together
- forces that are generated
- procedures for the cable puller operator to follow

While reading through this section of the manual, look for components that are shaded in the illustrations. The shading indicates components that are associated with the text.

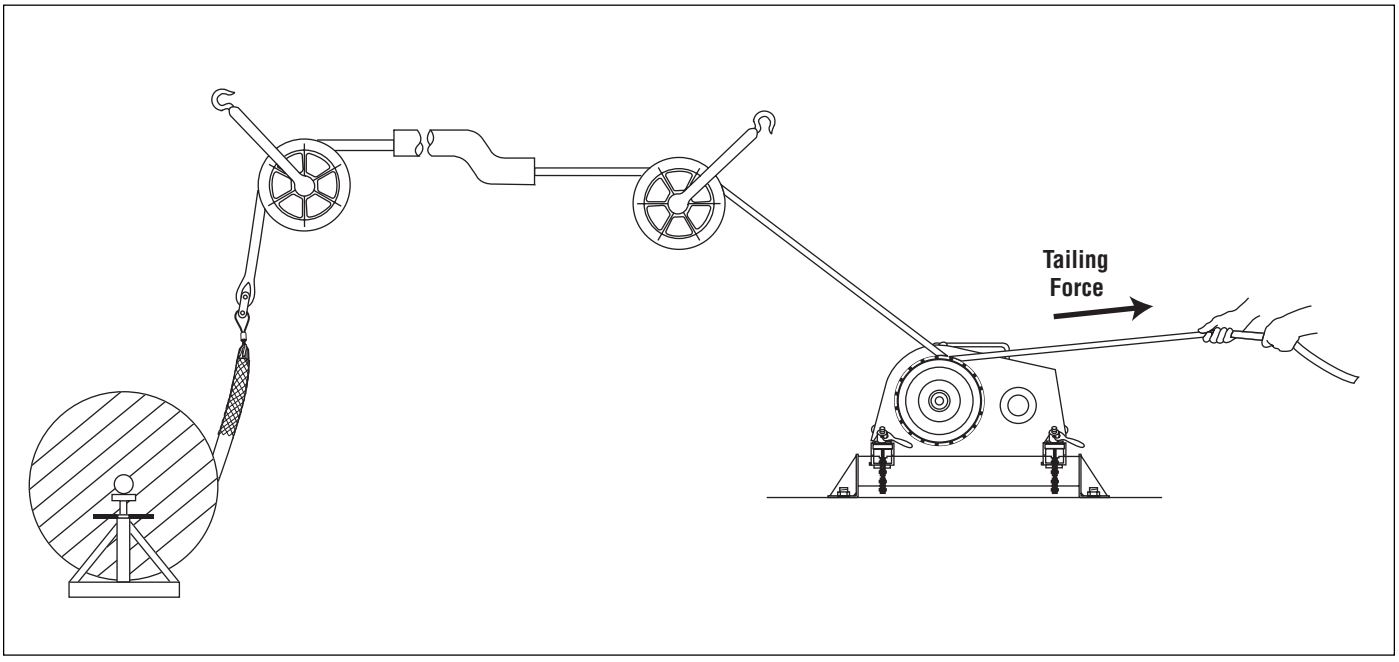
Greenlee strongly recommends that each member of the cable pulling crew review this section of the manual before each cable pull.

Cable Pulling Systems

Pulling cable requires a system of components. At a minimum, a cable pulling system will include a cable puller, a cable pulling rope, and connectors to join the rope to the cable. Most systems will also include, but are not limited to, a cable puller anchoring system, pulling sheaves and sheave anchoring systems.

The cable puller has a maximum amount of pulling force, which is the amount of pulling tension that it develops. Every other component of the pulling system has a maximum rated capacity, which is the amount of pulling tension that it can withstand. The maximum rated capacity of every component must meet or exceed the cable puller's maximum pulling force.

Typical Cable Pulling System



Cable Pulling Principles (cont'd)

Pulling Theory

This section introduces the main ideas involved with pulling cable.

Pulling Resistance

The cable puller must overcome two types of resistance: gravity and friction.

Gravity constantly exerts its force on the vertical portions of the run. When the pulling force is relaxed, gravity attempts to pull the cable downward. Friction develops where the cable contacts the sheaves, conduit and tray. Friction resists any movement, forward or backward, and tends to hold the cables in place.

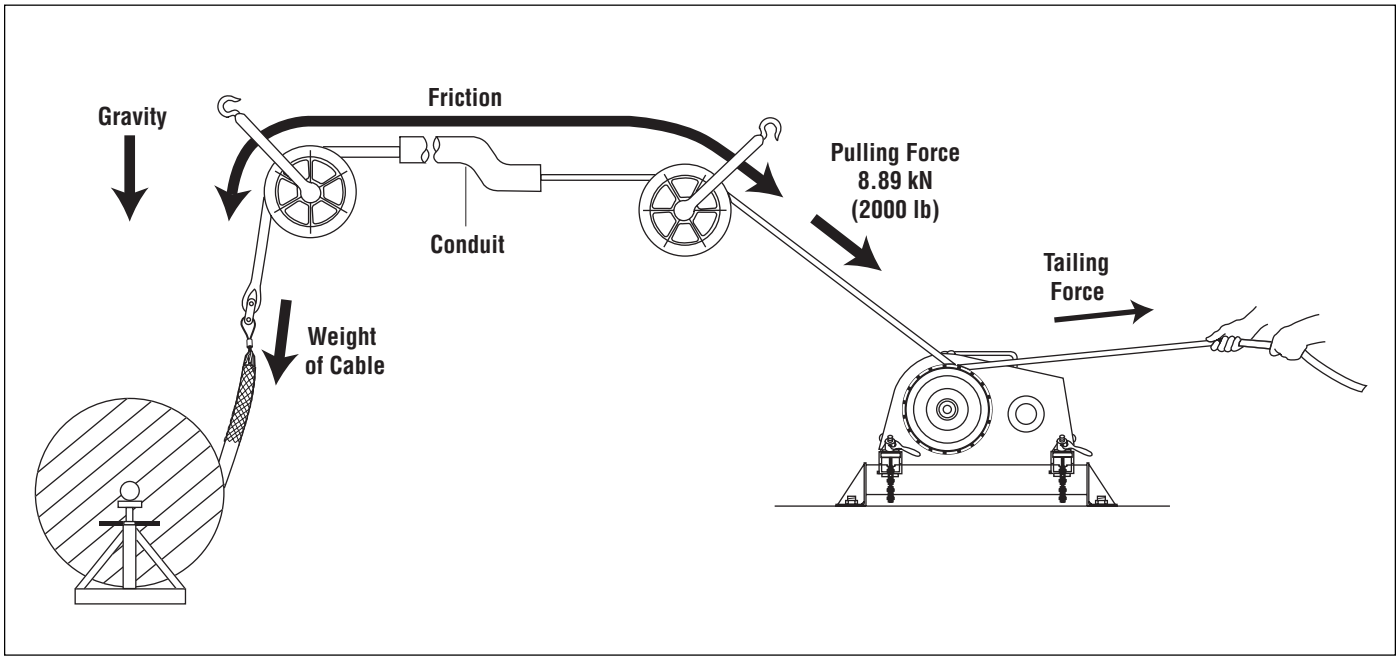
To accomplish a cable pull, the cable pulling system must develop more force than the combination of gravity and friction.

Generating Pulling Force

To generate pulling force, the capstan works as a force *multiplier*. The operator exerts a small amount of force on the rope. The cable puller multiplies this and generates the pulling force.

This pulling force is applied to the rope, connectors, and cable in order to accomplish the pull. The direction of force is changed, where necessary, with pulling sheaves.

Cable Pulling Theory Illustrated



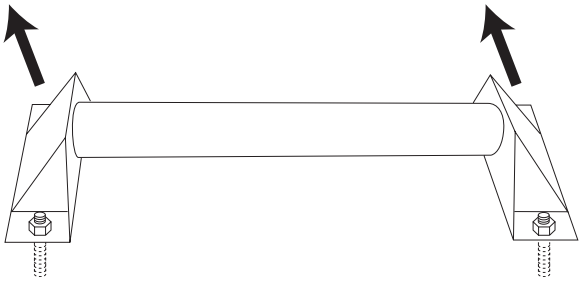
Cable Pulling Principles (cont'd)

Cable Pulling Forces

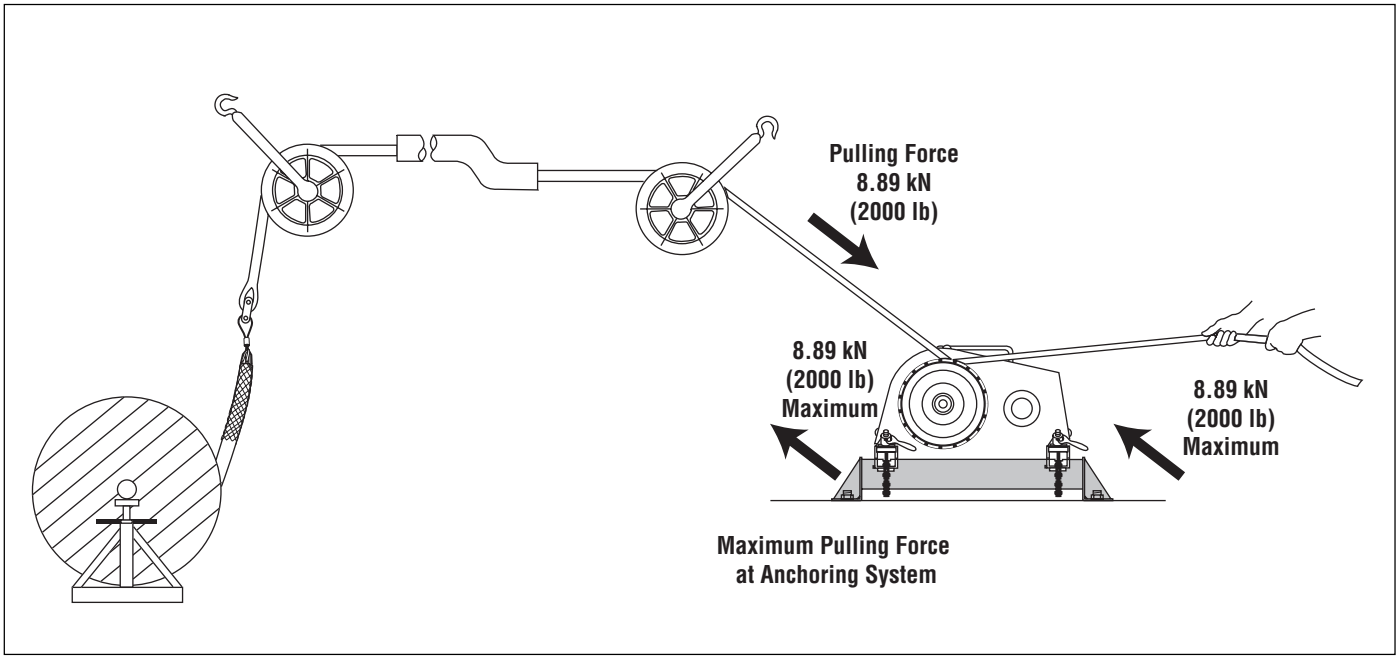
This section provides detailed explanations and illustrations of the forces that are generated during the cable pull. These explanations are based on the concepts presented in the previous section, Pulling Theory.

At the Cable Puller Anchoring System

The cable puller will exert its maximum pulling force on cable puller's anchoring system. It is extremely important the anchoring system can withstand this amount of force. See the instruction manual provided with your anchoring system for proper setup or installation.



Pulling Force at the Cable Puller's Anchoring System



Cable Pulling Principles (cont'd)

Cable Pulling Forces (cont'd)

At the Capstan

The capstan acts as a *force multiplier*. The operator exerts a small amount of tension, or tailing force, on the rope; the capstan multiplies this force to pull the cable. The resultant force depends upon the number of times the rope is wrapped around the capstan, as shown in the formula below.

Pulling Force = Tailing Force x $e^{0.0175\mu\phi}$

Where: e = the natural logarithm, or 2.7183

μ = the coefficient of friction between the rope and the capstan *

ϕ = the number of degrees of wrap of rope around the capstan

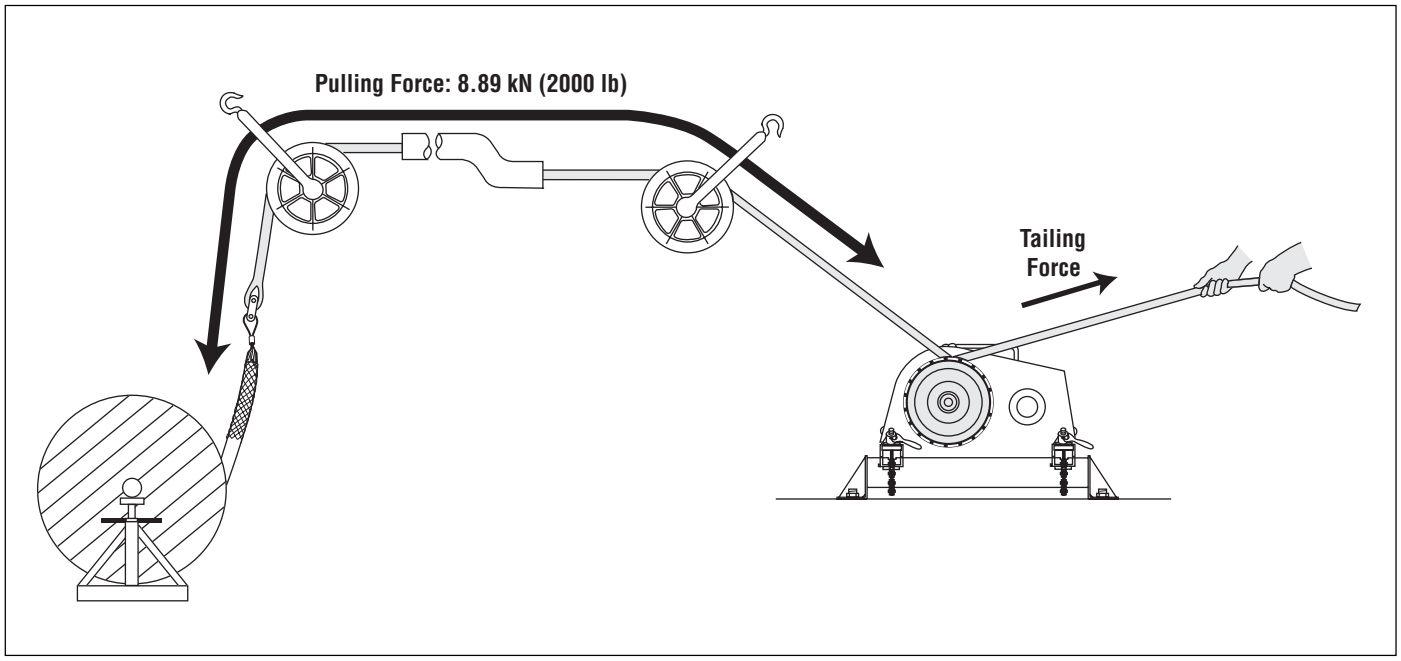
* The average value for the coefficient of friction when double-braided composite rope is pulled over a clean dry capstan is 0.125.

The following table is based on the formula above. The input, or tailing force, is constant at 44.5 Newtons (10 lb). Increasing the number of wraps increases the pulling force.

Operator's Tailing Force	Number of Wraps of Rope	Approximate Pulling Force
44.5 N (10 lb)	1	93.4 N (21 lb)
	2	213.5 N (48 lb)
	3	474.9 N (106 lb)
	4	1043.8 N (233 lb)
	5	2293.7 N (512 lb)
	6	5048.9 N (1127 lb)
	7	11.1 kN (2478 lb)

This table shows how the capstan acts as a force multiplier. Because the coefficient of friction depends upon the condition of the rope and capstan, this formula cannot determine an exact amount of pulling force.

The Capstan as a Force Multiplier



Cable Pulling Principles (cont'd)

Cable Pulling Forces (cont'd)

At the Pulling Rope

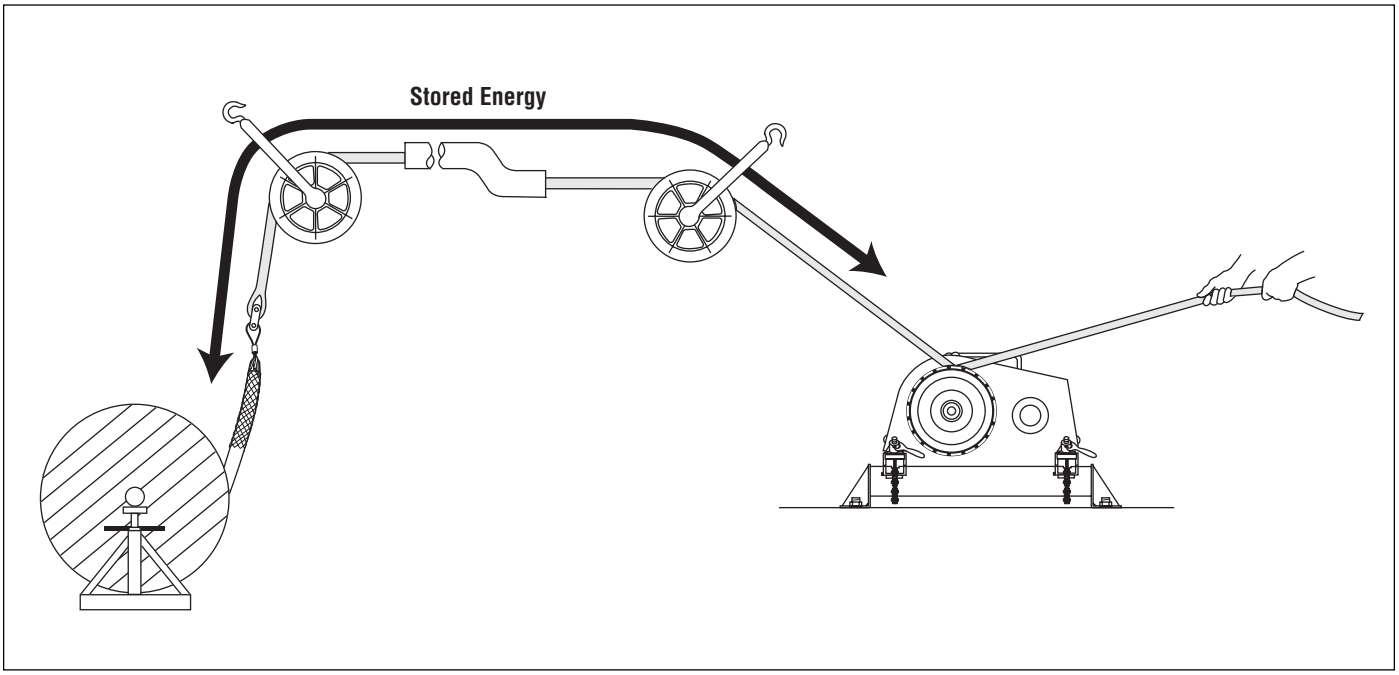
The product of a force (f) moving through a distance (d) is energy (f x d), and may be measured in Newton-meters or foot-pounds. Energy is stored in a rope when the rope is stretched. This is similar to the way energy is stored in a rubber band when it is stretched. Failure of the rope or any other component of the pulling system can cause a sudden uncontrolled release of the energy stored in the rope.

For example, a 100-meter nylon rope with a 50,000 Newton average breaking strength could stretch 40 meters and store 1,000,000 joules of energy. This is enough energy to throw a 900-kilogram object, such as a small automobile, 113 meters into the air.

A similar double-braided composite rope could store approximately 300,000 joules of energy. This could throw the same object only 34 meters into the air. The double-braided composite rope stores much less energy and has much less potential for injury if it were to break.

Multiplex polyester rope is the only type of rope recommended for use with the Easy Tugger cable puller. Select a multiplex polyester rope with an average-rated breaking strength of at least 35.6 kN (8000 lb).

Stored Energy



Cable Pulling Principles (cont'd)

Cable Pulling Forces (cont'd)

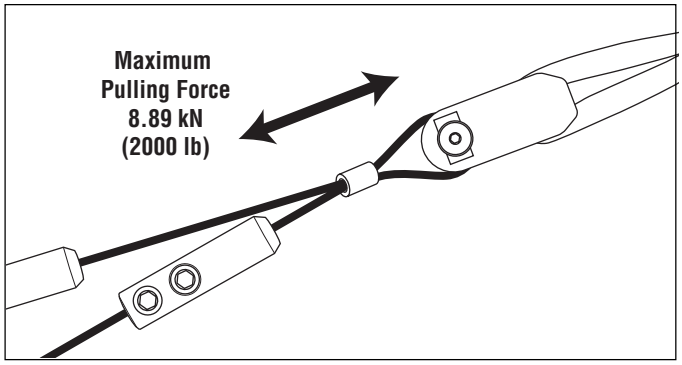
At the Connectors

The connectors will be subjected to the cable puller's maximum pulling force.

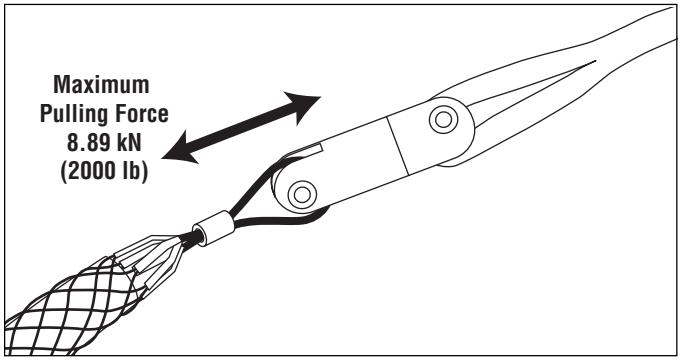
Several types of rope connectors—clevises, swivels, and rope-to-swivel connectors—are available. Follow the instructions provided with each to provide a good connection.

Two types of wire connectors—wire grips and pulling grips—are available. The wire grip uses a set screw to clamp onto the conductors of the cable. The pulling grip consists of a wire mesh basket that slides over the cable and grips the insulation.

A Typical Grip Setup—Clevis and Wire Grip



A Typical Grip Setup—Swivel and Pulling Grip



When selecting a pulling grip, it is extremely important to select a grip of the correct (1) type, (2) size, and (3) maximum rated capacity.

1. Select the correct type based on the descriptions of each type in the Greenlee catalog.
2. Measure the circumference of the wire bundle. (To do this accurately, fasten a tie strap around the bundle. Cut off and discard the tail. Then cut the tie strap and measure its length.) Use the table provided to find the correct size.
3. See the maximum rated capacities in the Greenlee catalog.

Pulling Grip Size Table

Circumference Range		Required Grip Diameter	
inches	mm	inches	mm
1.57 - 1.95	39.9 - 49.5	0.50 - 0.61	12.7 - 15.5
1.95 - 2.36	49.5 - 59.9	0.62 - 0.74	15.8 - 18.8
2.36 - 3.14	59.9 - 79.8	0.75 - 0.99	19.1 - 25.1
3.14 - 3.93	79.8 - 99.8	1.00 - 1.24	25.4 - 31.5
3.93 - 4.71	99.8 - 119.6	1.25 - 1.49	31.8 - 37.8
4.71 - 5.50	119.6 - 139.7	1.50 - 1.74	38.1 - 44.2
5.50 - 6.28	139.7 - 159.5	1.75 - 1.99	44.5 - 50.5
6.28 - 7.85	159.5 - 199.4	2.00 - 2.49	50.8 - 63.2
7.85 - 9.42	199.4 - 239.3	2.50 - 2.99	63.5 - 75.9
9.42 - 11.00	239.3 - 279.4	3.00 - 3.49	76.2 - 88.6
11.00 - 12.57	279.4 - 319.3	3.50 - 3.99	88.9 - 101.3
12.57 - 14.14	319.3 - 359.2	4.00 - 4.49	101.6 - 114.0
14.14 - 15.71	359.2 - 399.0	4.50 - 4.99	114.3 - 126.7

Cable Pulling Principles (cont'd)

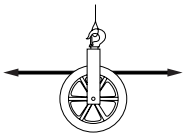
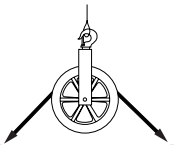
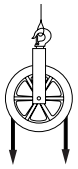
Cable Pulling Forces (cont'd)

At the Sheaves

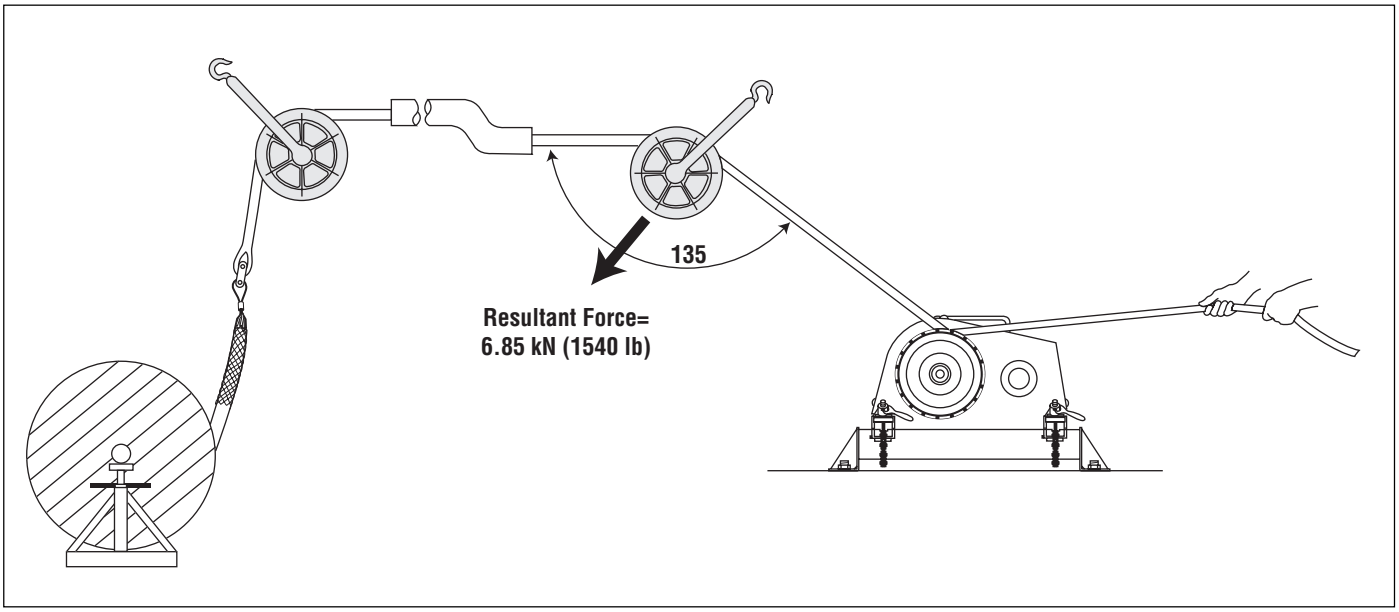
Sheaves are used to change the direction of the pull. A change in direction creates a new *resultant force* that is *greater than* the cable puller's maximum pulling force. This new resultant force exerts itself on the sheaves, sheave anchoring system, and support structures illustrated.

The resultant amount of force depends on the angle of the change in direction. A brief table is provided here; for more details, see IM 1363 (99929988).

Resultant Force Table for the Easy Tugger (8.89 kN or 2000 lb Maximum Pulling Force)

Illustration	Angle of Change in Direction	Resultant Force kN (lb)
	180°	0 (0)
	150°	4.63 (1040)
	135°	6.85 (1540)
	120°	8.89 (2000)
	90°	12.5 (2820)
	60°	15.4 (3460)
	45°	16.5 (3700)
	30°	17.2 (3860)
	0°	17.8 (4000)

Typical Resultant Force at Sheave



Cable Pulling Principles (cont'd)

Tailing the Rope

The rope must be pulled off of the capstan as the pull progresses. The rope that has left the capstan is the "tail." The process of pulling the rope off of the capstan is called *tailing the rope*.

The resistance of the cable varies throughout the duration of the cable pull. Changes in resistance are due to characteristics of the rope, changes in conduit direction, and changes in the amount of friction. The "feel" of the rope provides this information about the pull. This is called *tactile feedback*. Adjust the tailing force as necessary to compensate for these changes.

Control of the Pull

Decreasing the tailing force will decrease the pulling force, until the rope slips on the capstan and the pull stops. This provides a high level of control over the progress of the cable pull.

Do not allow the rope to slip on the capstan for more than a few moments. If it becomes necessary to completely stop a pull, shut off the puller and maintain enough tailing force to hold cable in place. Tie the rope off to hold it in place.

Amount of Tailing Force

While the rope and cable are under tension, it is important to maintain the proper amount of tailing force.

Too *little* tailing force will allow the rope to slip on the capstan. This will build up excessive heat and accelerate rope wear, increasing the possibility of breaking the rope.

The proper amount of tailing force will stop the rope from slipping on the capstan and produce a sufficient amount of pulling force to pull in the rope and cable.

Too much tailing force is any amount more than is necessary to stop the rope from slipping on the capstan. Excessive tailing force will not increase the pulling force or pulling speed.

Number of Wraps of Rope Around the Capstan

An experienced operator should choose the number of times the rope is wrapped around the capstan.

The proper number of wraps allows the operator to control the progress of the pull with a comfortable amount of effort.

Using *too few* wraps requires a large tailing force to accomplish the pull. Using too few wraps also makes the rope more likely to slip on the capstan. This builds up heat and accelerates rope wear.

Using *too many* wraps causes the rope to grab the capstan more tightly. This accelerates rope wear, wastes power, and increases the possibility of a rope overlap. Using too many wraps also reduces tactile feedback, so you receive less information about the pull. You cannot quickly relax the tailing force when there are too many wraps.

If the rope becomes difficult to tail, add another wrap of rope. Turn off the puller and release all of the tension in the rope. Add a wrap and resume pulling. Be aware, however, that some pulls will require tension to hold the cables in place. In these cases, do not attempt to release all of the tension and add a wrap of rope. You will need to anticipate the number of wraps before starting the pull.

Preventing Rope Overlap

Do not allow the rope to become overlapped on the capstan during a pull.

A rope overlap will make it impossible to continue or back out of the pull.

If the rope becomes overlapped, you will lose control of the pull—the rope will advance with no tailing force and will not feed off of the capstan. The capstan will not allow you to reverse the direction of the rope, so you cannot back out of an overlap.

Set up the puller properly. The positioning peg, entrapment peg, rope ramp and tapered capstan are intended to prevent rope overlap. See the instructions in the Operation section of this manual.

Every wrap of the rope must remain in direct contact with the capstan. During the pull, take great care to prevent the incoming rope from riding up and overlapping the next wrap. If an overlap begins to develop, immediately relax the tailing force on the rope so that the rope can feed back toward the conduit or tray. When the rope resumes its normal path, apply tailing force and continue the pull.

There is no suggested remedy for a rope overlap. **Do not allow the rope to overlap!**

Cable Pulling Principles (cont'd)

Summary of Cable Pulling Principles

- A cable pulling system consists of many components that work together to accomplish a pull.
- The cable puller is rated by its maximum pulling force; every other component is rated by its maximum rated capacity. The maximum rated capacity of every component must meet or exceed the maximum pulling force of the cable puller.
- The cable puller must overcome two types of resistance: gravity and friction. The puller's capstan, the pulling rope, and the operator tailing the rope work together to produce pulling force.
- The cable puller exerts force on every component of the cable pulling system, including the anchoring systems and the support structures.
- Energy is stored in a rope when the load causes the rope to stretch. Failure of the rope or any other component can cause a sudden release of energy. Replace any rope that is worn or damaged.
- Carefully select the number or wraps of rope around the capstan before starting the pull.
- Control the pull by tailing the rope. Be familiar with the interaction of the rope and capstan.
- Do not allow a rope overlap to develop.

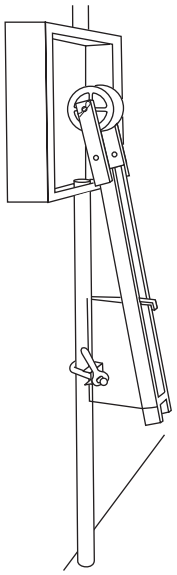
Planning the Pull

- Pull in a direction that will require the lowest amount of pulling force.
- Plan several shorter pulls rather than fewer longer pulls.
- Locate the puller as close to the end of the conduit as possible to minimize the amount of exposed rope under tension.
- Place each component so that the pulling forces are used effectively.
- Select an anchoring system: adapter sheaves, which are preferred, or the floor mount.
- Verify that each component has the proper load rating.
- Inspect the structural supports. Verify that they have enough strength to withstand the maximum forces that may be generated.

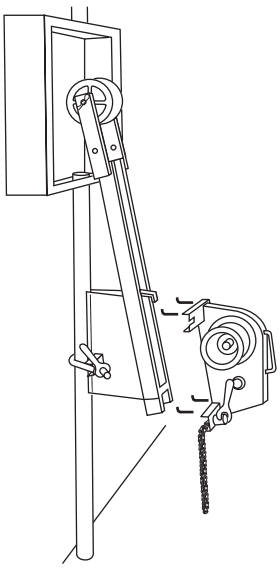
Typical Setups

Setups are shown without force gauge. Place the force gauge so the operator has an unobstructed view of the meter and quick access to its ON/OFF switch.

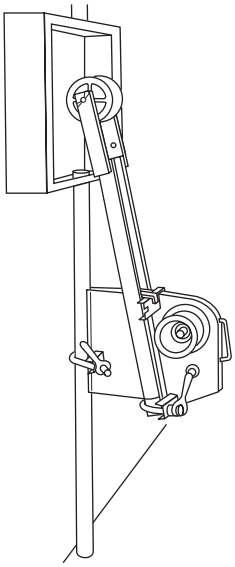
Using a Pipe Adapter Sheave to Pull through Exposed Conduit



Attach 2049 Pipe Adapter Sheave to conduit with chain.

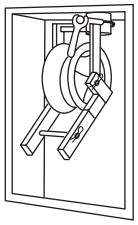


Position 2001 Puller onto 2049 with leg under locking tab.

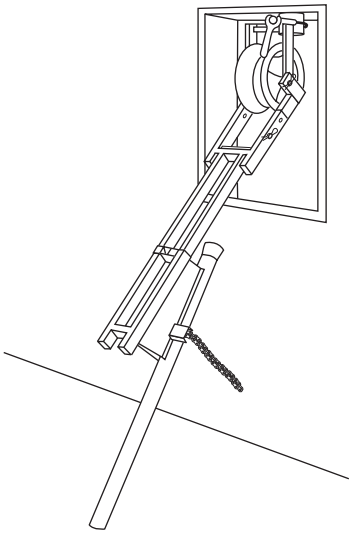


Secure 2001 Puller to 2049 with chains.

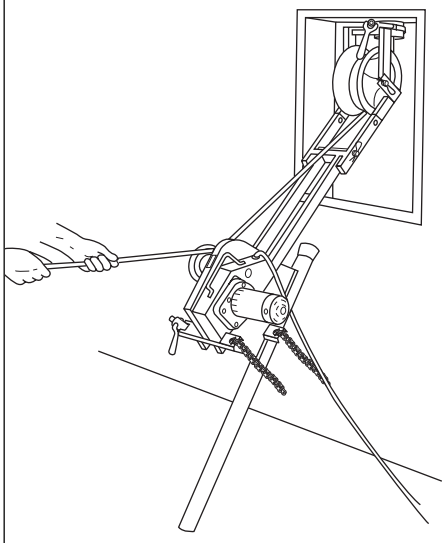
Using an Extension Bushing, Flexible Pipe Adapter and Adapter Sheave to Pull through Concealed Conduit



Attach 685 Flexible Pipe Adapter to Bushing.



Attach 2049 Pipe Adapter Sheave to 685 with pin and clips.

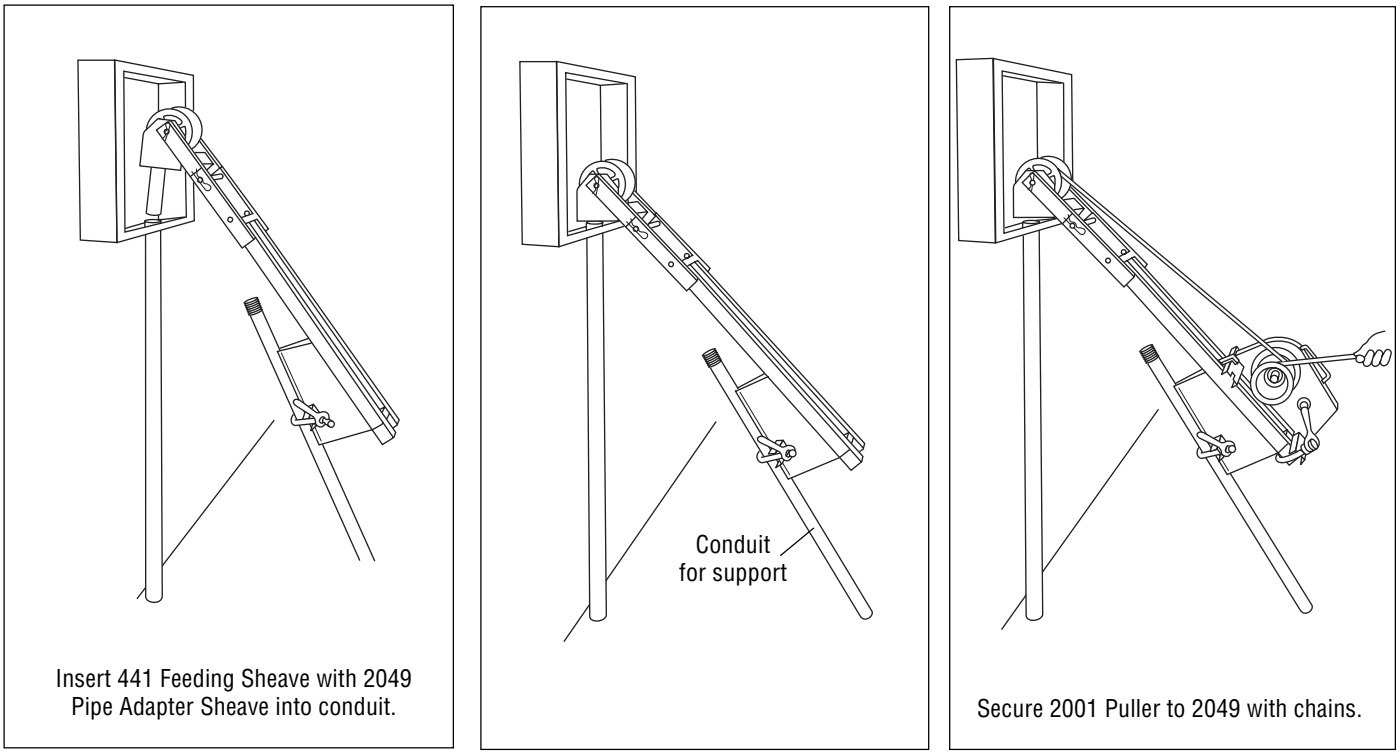


Secure 2001 Puller to 2049 with chains.

Typical Setups (cont'd)

Setups are shown without force gauge. Place the force gauge so the operator has an unobstructed view of the meter and quick access to its ON/OFF switch.

Using a Feeding Sheave and Pipe Adapter



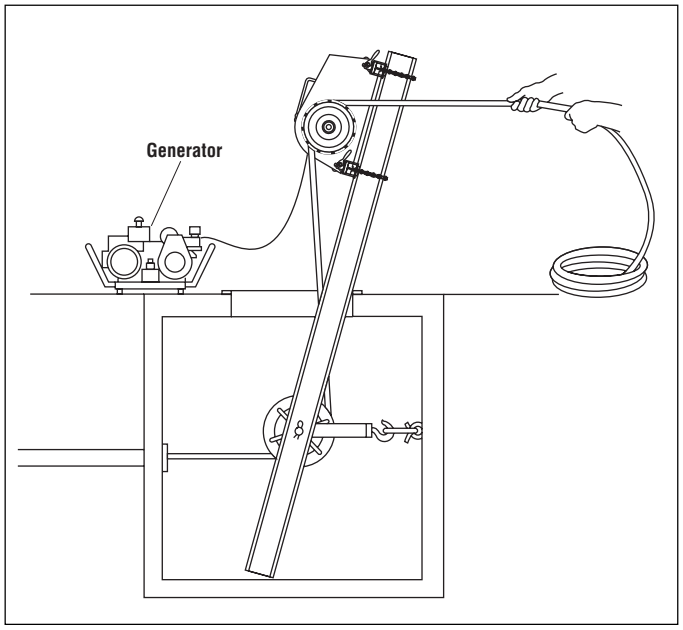
Insert 441 Feeding Sheave with 2049 Pipe Adapter Sheave into conduit.

Secure 2001 Puller to 2049 with chains.

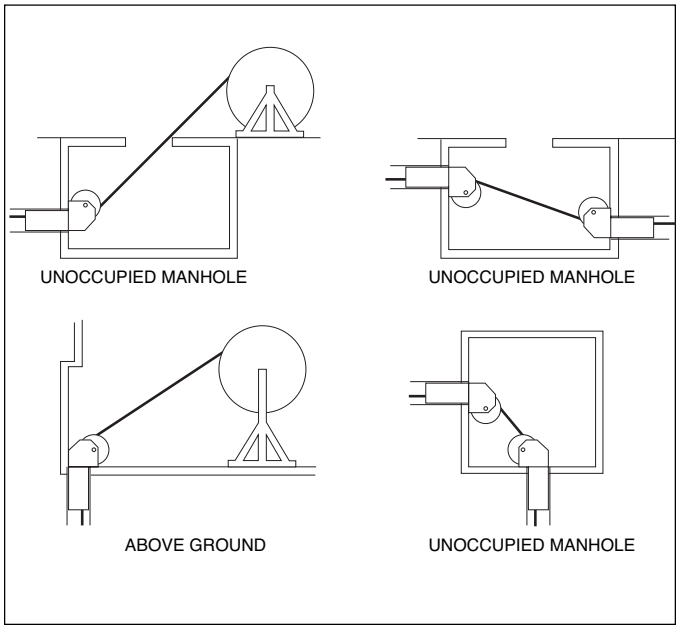
Typical Setups (cont'd)

Setups are shown without force gauge. Place the force gauge so the operator has an unobstructed view of the meter and quick access to its ON/OFF switch.

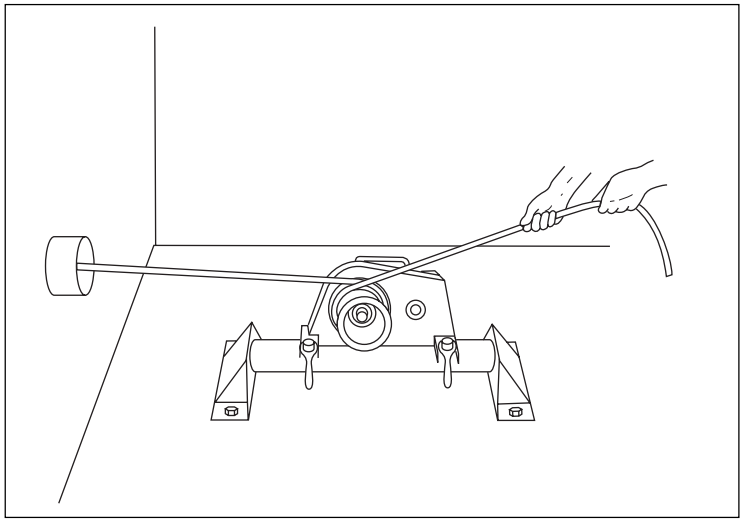
Using a Manhole Sheave



Using Feeding Sheaves in Manholes



Using a Floor Mount



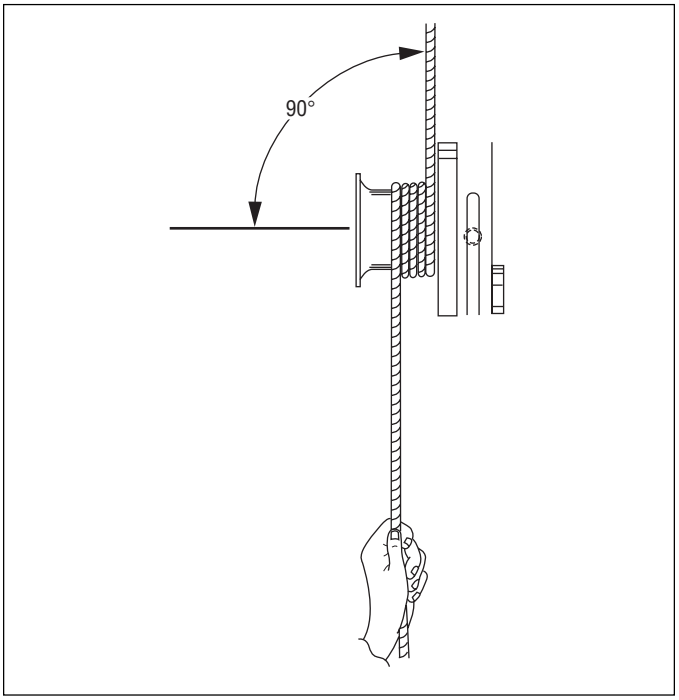
Setup and Operation

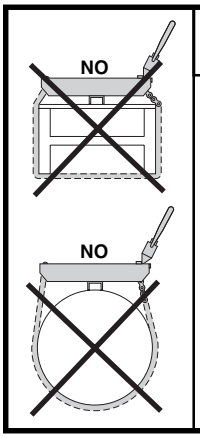
While reading through this section of the manual, look for components that are shaded in the illustrations. The shading indicates components that are associated with the accompanying text.

1. Fish the rope through the conduit.
2. Set up the cable puller mounting. Set it up so that the rope will approach the capstan at an angle of 90° (±5°) as illustrated in Rope Approaching the Capstan.

   Note: If using an adapter sheave, flexible pipe adapter, or mobile T-boom, see the illustrations in this manual. If using a manhole sheave or floor mount, see the instructions supplied with those items.

Rope Approaching the Capstan





⚠WARNING

When setting up the flexible pipe adapter or puller, do not use the vise chains on a structural support that is less than 51 mm (2") or more than 254 mm (10") wide. An oversized or undersized structural support can allow the puller to slide or break loose and strike nearby personnel with sufficient force to cause severe injury or death.

⚠WARNING

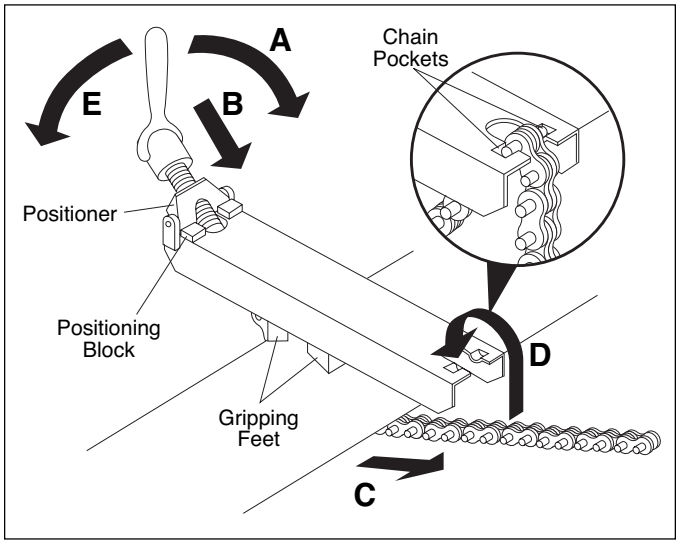
Install the vise chains properly.

- Follow the vise chain tightening instructions carefully. Improperly tightened chains can allow the puller to slide or break loose and strike nearby personnel.
- Do not allow the vise chains to bind at the corners when mounting the puller to a square or rectangular support. The vise chain must be uniformly tight at all points.

Failure to observe this warning could result in severe injury or death.

3. Install the vise chains as shown.

Vise Chain Installation

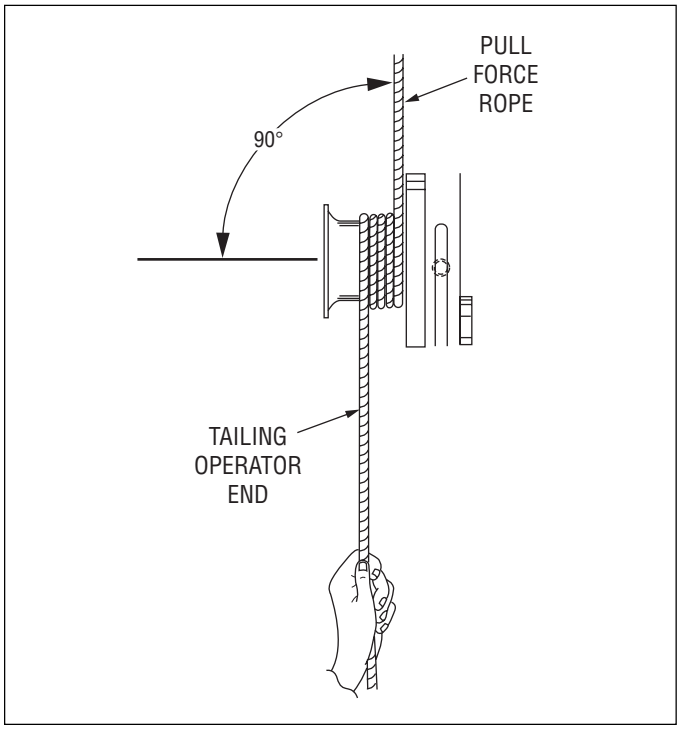


   a. Rotate the vise chain handle to expose most of the threads. Leave only three or four threads engaged in the handle.
   b. Thread the chain though the hole in the frame. Set the positioner against the positioning blocks.
   c. Wrap the chain around the conduit, pipe sheave adapter, or structural element.
   d. Pull the vise chain tight and insert the chain pins into the chain pockets, or recesses.
   e. Turn the handle to slightly tighten the chain.
   f. Repeat Steps A - E for the other chain.
4. Rotate the vise chain handles, by hand, clockwise to fully tighten the chain. Do not use tools, extensions or “cheaters.”

Setup and Operation (cont'd)

5. Route the rope as illustrated in Rope Path.

Rope Path



6. Check the ON/OFF switch on the puller to be sure it is OFF. Plug the puller into an appropriate power supply (see Grounding Instructions in this manual).
   Note: If using an extension cord, it must be rated for 20 amps. Use the shortest cord possible. Longer cords reduce puller speed.

Duty Cycle Table

Pounds of Pulling Force	Duty Cycle (in minutes)
0-1400	continuous
1400 - 2000	5 on / 10 off

7. Grasp the tailing end of the rope. Apply a slight amount of tailing force.
8. Turn the puller ON.
9. Tail the rope, allowing the spent rope to accumulate on the floor between the operator and the puller.
10. When the pull is complete, turn the puller OFF. Tie off the rope and anchor the cable.

Removing Cable

Removing old cable involves the same principles as installing new cable. However, there are some important differences.

Pulling Force

It is difficult to predict the amount of pulling force necessary to remove an old cable. The cable may be damaged, and it may break with an unexpectedly low pulling force.

The required pulling forces may be very high:

- The cable has probably "taken a set." Unlike the new cable on a reel, cable in conduit has probably been in the conduit for years, or perhaps decades. The cable will resist bending and straightening as it is pulled through the conduit.
- The pulling lubricant has probably hardened, increasing pulling resistance.
- The insulation may be damaged and the cable may be corroded.
- Dirt or other foreign matter may have entered the conduit and may have cemented the cable in place.

Puller Placement

Pulling out old cable is generally accomplished with the puller located some distance away from the end of the conduit. This allows the pulling crew to pull out a long section of cable before turning off the puller, cutting off the cable, and reattaching the grip(s). Mounting the cable puller a distance away from the end of the conduit increases the amount of exposed rope, which greatly increases the amount of violent whipping action which would occur if the rope or other components were to break.

To isolate the operator from the rope path:

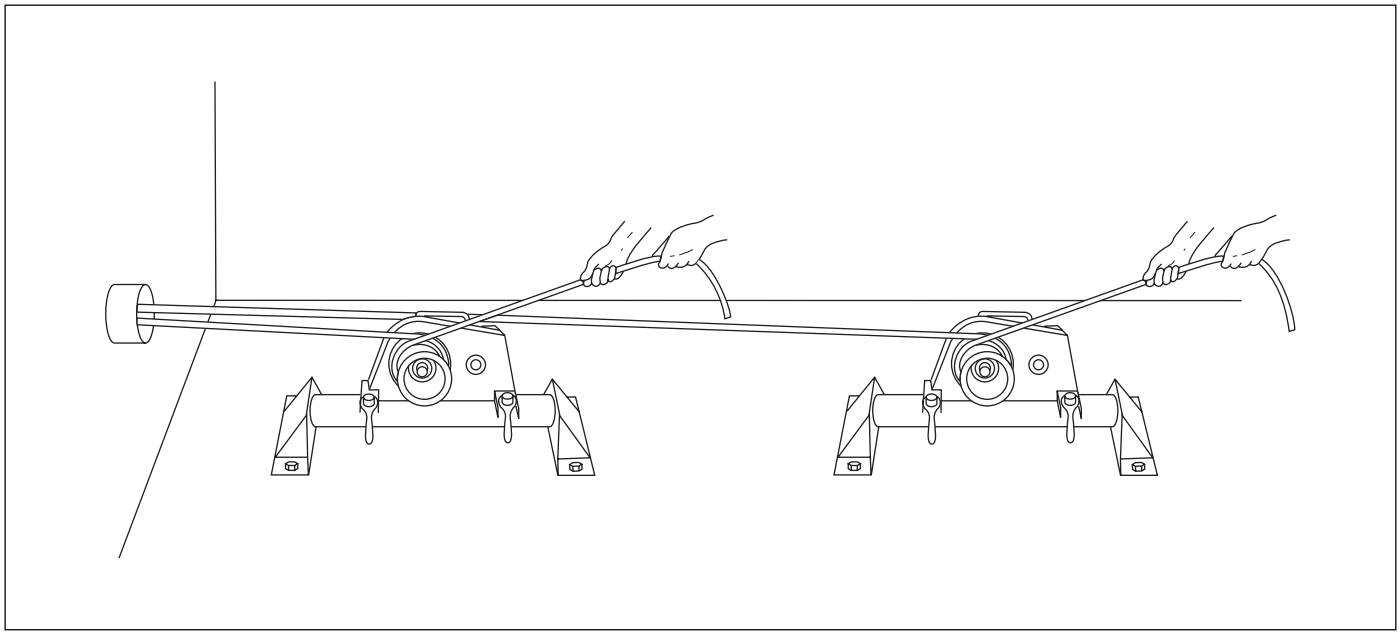
- Locate the puller so that you will stand behind an obstruction, such as a wall. Set up the puller so that you will be able to maintain control of the pull. You need a clear view of the rope as it feeds onto the capstan, including several feet of the rope in front of the capstan. You must be able to turn off the puller before the pulling grip, connector, or swivel contacts the capstan.
- Use an additional pulling sheave to change the direction of the tailing rope. Anchor the sheaveso that you are close enough to maintain control of the pull. You need a clear view of the rope as it feeds onto the capstan, including several feet of the rope in front of the capstan. You must be able to turn off the puller before the pulling grip, connector, or swivel contacts the capstan.

  Note: Use the additional pulling sheave to change the direction of the tailing rope (after the rope leaves the capstan). Do not change the direction of the pulling rope.
- Use a longer tailing rope than usual and stand away from the puller. Stand as far from the puller as possible, while maintaining control of the pull. You need a clear view of the rope as it feeds onto the capstan, including several feet of the rope in front of the capstan. You must be able to turn off the puller before the pulling grip, connector, or swivel contacts the capstan.

Dual Pulling

When the estimated amount of pulling resistance exceeds the ability of the puller, two pullers may be used to accomplish the pull. Connect the two pullers to the cables in parallel—use two sets of ropes, grips, and other accessories to avoid overloading any component of the pulling system.

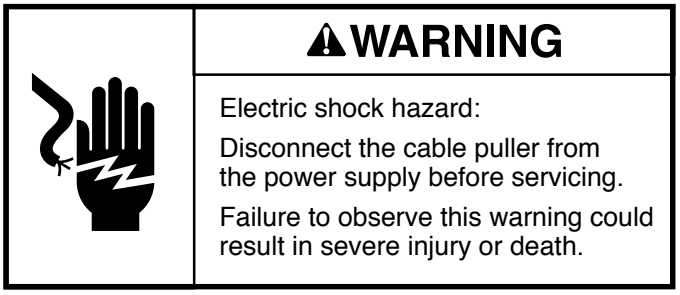
Dual Pulling



Maintenance

Read all instructions thoroughly. Be sure that you understand all of the instructions and have the necessary tools available before dismantling the puller.

Service Activity	Schedule
Lubricate the drive chains.	every 20 hours
Grease the drive chain shafts.	every 20 hours
Inspect the chains and ratchet pawl.	every 40 hours
Inspect the commutator brushes.	every 40 hours



Lubricating the Drive Chain (every 20 hours)

1. Remove the guard (62).
2. Lubricate the inside of the chain with 80W-90W gear oil.
3. Replace the guard.

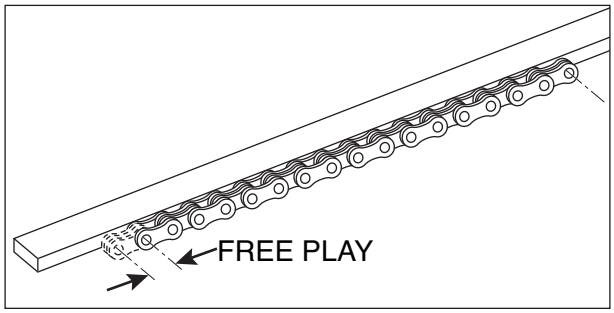
Greasing the Drivetrain Shafts (every 20 hours)

Apply a multipurpose NLGI Grade 2 grease (such as Mobil HP or Amoco Permalub) at the grease fitting (3). This fitting is located inside the capstan housing.

Maintenance (cont'd)

Inspecting the Chain and Ratchet Pawl (every 40 hours)

1. Remove the guard (2).
2. Remove screen (13), washer (14) and sprocket (16).
3. Remove the lubricating screw (3) and washers (4-8). Remove capstan (19) with chain (10).
4. Clean the chains thoroughly with solvent.
5. Lay the chain against a straightedge. Slide one end of the chain back and forth to check free play. See illustration below. If free play is more than 9mm (3/8"), replace the chain. Replace the chain if any links bind.



6. Lubricate the chain with 80W-90W gear oil.
7. Remove the ratchet pawl (17) and compression spring (18). Apply multipurpose NLGI Grade 2 grease (such a Mobilgrease® HP or Amoco Permalub) to all working surfaces. Replace the spring and pawl.
8. Assemble the chain (11).
   Note: Install the clip of each connecting link so that the closed end of the clip faces the direction of chain travel, as shown in the Exploded View.
9. Loosen, but do not remove, the four screws (19) that secure the motor. Push the motor away from the sprocket (12) to put tension on the chain. Tighten the screws (19) to 10.8 Newton-meters (8 ft-lb).
10. Assemble in reverse order.
11. Plug the puller in and turn the puller ON. Listen for the clicking noise of the anti-reversing mechanism (ratchet pawl and compression spring). If you do not hear this clicking noise, inspect and repair the puller.

Inspecting the Commutator Brushes (every 40 hours)

1. Remove two brush caps (116). Remove two brushes (101).
2. Measure the brushes. Replace both brushes if either brush is less than 9mm (3/8") long.

⚠WARNING

Do not operate puller if the anti-reverse mechanism is not working.

Failure to observe this warning could result in severe injury or death.

Maintenance (cont'd)

Replacing the Frame

⚠WARNING

Electric shock hazard:

Disconnect the cable puller from the power supply before servicing.

Failure to observe this warning could result in severe injury or death.

Replace the frame if appears damaged. During disassembly, inspect each part. Replace any worn, damaged, or missing parts with Greenlee replacement parts.

1. Remove the guard (2). Remove the lubricating screw (3), washers (5-8) and capstan unit (9).
2. Remove the screw (13) and washer (14).
3. Remove the two bottom motor screws (20). Loosen the two top motor screws (20).
4. Slide sprocket (12), capstan (9) with sprocket (15) and chain (10) off of shafts.
5. Remove two top motor screws (20) and gearmotor (36).
6. Remove isolator plate, clip and rivet (22-24).
   Note: Insert along screwdriver through power cord hole in frame to push isolater away from the frame.
7. Remove remaining components from frame.
8. Assemble items to the new frame in reverse order.
   Notes: Replace any components that show signs of wear or damage.
   Install the clip of the connecting link so that the closed end of the clip faces the direction of chain travel, as shown in the Exploded View.

Troubleshooting the Electrical Circuit

⚠WARNING

Electric shock hazard:

Disconnect the cable puller from the power supply before servicing.

Failure to observe this warning could result in severe injury or death.

See the wiring diagram. Use a continuity checker to check the electrical circuit. Lack of continuity in the following procedure indicates that a repair is necessary.

1. Unplug the puller.
2. Set the switches to ON.
3. Place the probes of the continuity checker across the following terminals of the cable puller. All of these pairs of terminals should have continuity.

To check the switches:

A and B

D and E (220-volt models only)

To check the connectors:

B and C

D and E (120-volt model only)

F and G (120-volt model only)

E and F (220-volt model only)

G and H (220-volt model only)

To check the motor:

A and D

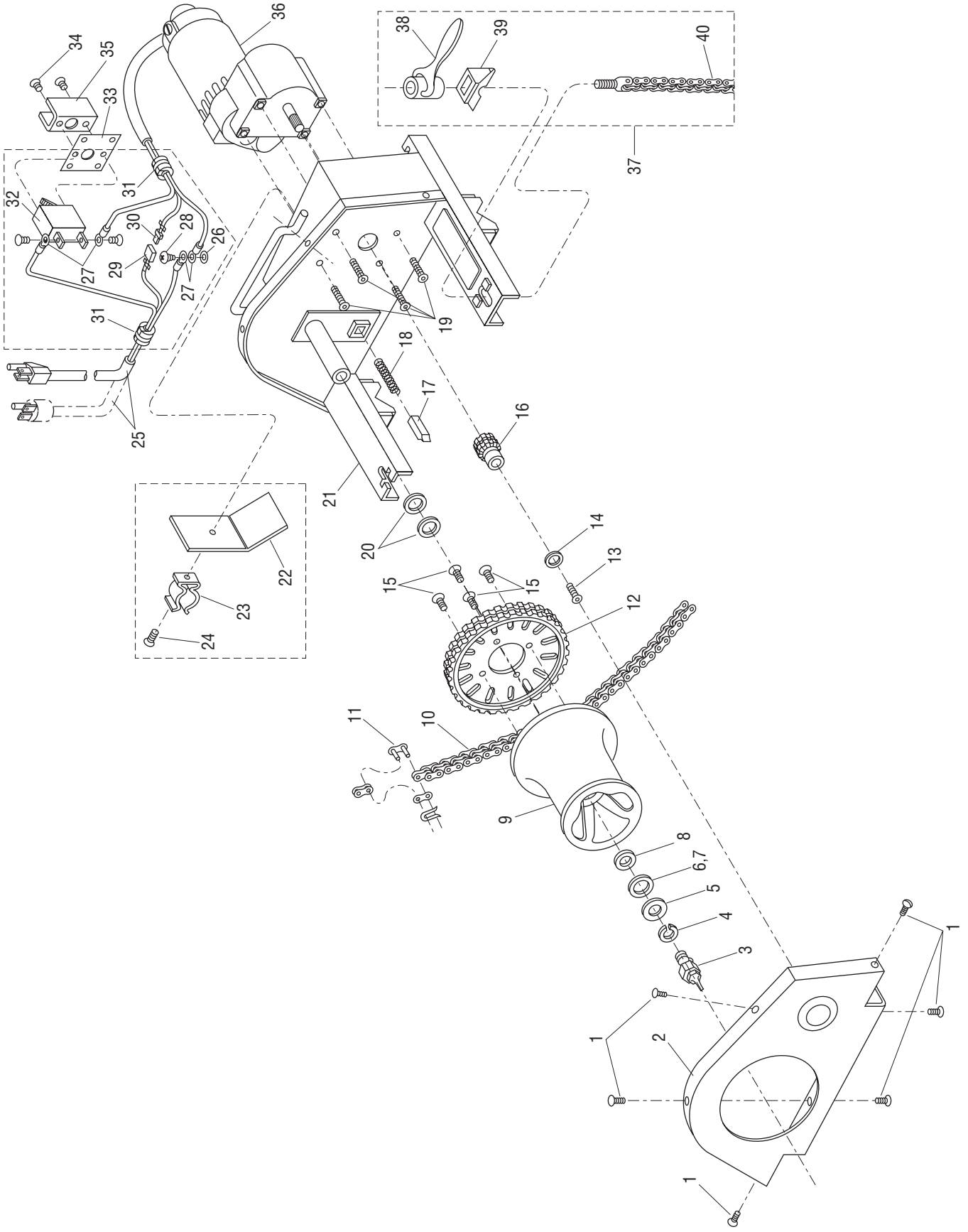
If the motor fails this check, inspect the motor components (brushes, armature, and wires). Replace any parts that are worn or damaged. Replace both brushes if either brush measures less than 3/8" long.

Troubleshooting

Should the puller become inoperative, refer to the troubleshooting table below. While performing any repairs, inspect the motor, capstan, and drivetrain.

Problem	Probable Cause	Probable Remedy
Motor will not run.	No power at supply circuit.	Check power supply with a voltmeter. See the Specifications section of this manual.
	Faulty switch or wiring.	Check the switch and wiring for continuity.
	Motor faulty.	Check the motor and wiring for continuity. Check condition of brushes. Replace any worn or damaged items.
		Replace motor.
Capstan does not rotate while motor is running.	Chain broken.	Replace chain.
	Broken sprocket in gearbox or stripped shaft in motor.	Remove and disassemble gearmotor unit. Replace any worn or damaged drive components.

Exploded View



Parts List

Key	UPC No. 78-3310-	Part No.	Description	Qty
1	53194	90531949	Screw, self-tapping, #10-16 x .250" Phillips	10
2	31046	50310461	Guard	1
3	25521	50255215	Screw unit, lubricating	1
4	51603	90516036	Washer, lock, .643 x 1.08 x .156" spring	1
5	52675	90526759	Washer, flat .687 x 1.75 x .125"	1
6	52644	90526449	Washer, flat .625 x 1.00 x .031"	*
7	52645	90526457	Washer, flat .625 x 1.00 x .062"	*
8	16313	50163132	Washer, fibre, 1.312 x 1.750 x .032"	1
9	31040	50310402	Capstan unit	1
10	31044	50310445	Chain, roller, #35 (70 pitches, including connecting link)	1
11	53322	90533224	Connecting link	1
12	31043	50310437	Sprocket, #35, 60-tooth, Type A	1
13	52791	90527917	Screw, cap, #10-32 x .375" button head	1
14	53318	90533186	Washer, flat .211 x .625 x .047"	1
15	52587	90525876	Screw, cap, 5/16-18 x .875" socket button head	4
16	31042	50310429	Sprocket, #35, 10-tooth, Type B	1
17	30102	50301020	Pawl, ratchet	1
18	16309	50163094	Spring, compression, .210 x .300 x 1.62"	1
19	51667	90516672	Screw, cap, 1/4-20 x .625" button head socket	4
20	25896	50258966	Washer, flat, 1.28 x 1.75 x .125", Fibre	2
21	32574	50325744	Frame unit	1
22	31045	50310453	Plate, isolator	1
23	53307	90533070	Clip, spring 1.25"	1
24	53001	90530012	Rivet, pop, .125"	1
25	31047	50310470	Power cord unit (120-Volt)	1
	32579	50325795	Power cord unit (220-Volt)	1
26	50750	90507509	Washer, lock, .200 x .373 x .023"	1
27	86049	91860490	Terminal, ring	4
28	51460	90514602	Screw, self-tapping, #10-32 x .375" Phillips head	1
29	86104	91861047	Terminal, disconnect, #14-16 AWG	1
30	86103	91861039	Terminal, disconnect, #14-16 AWG	1
31	86009	91860091	Bushing, strain relief	2
32	86101	91861012	Circuit breaker (120-volt)	1
	86200	91862000	Circuit breaker (220-volt)	1
33	32576	50325760	Cover, switch	1
34	50430	90504305	Screw, machine, #6-32 x .375", slotted pan head	2
35	29708	50297082	Guard, switch	1
36		52022898	Gearmotor unit (120-volt)	1
	32578	50325787	Gearmotor unit (220-volt)	1
37**	29825	50298259	Chain unit, vise, 24"	2
38**	29630	50296302	Handle	2
39**	29638	50296388	Positioner	2
40**	27831	50278312	Vise chain with screw	2

* Items 6 and 7 are used to limit the side-to-side movement of the capstan to 0.80 mm (1/32") maximum.

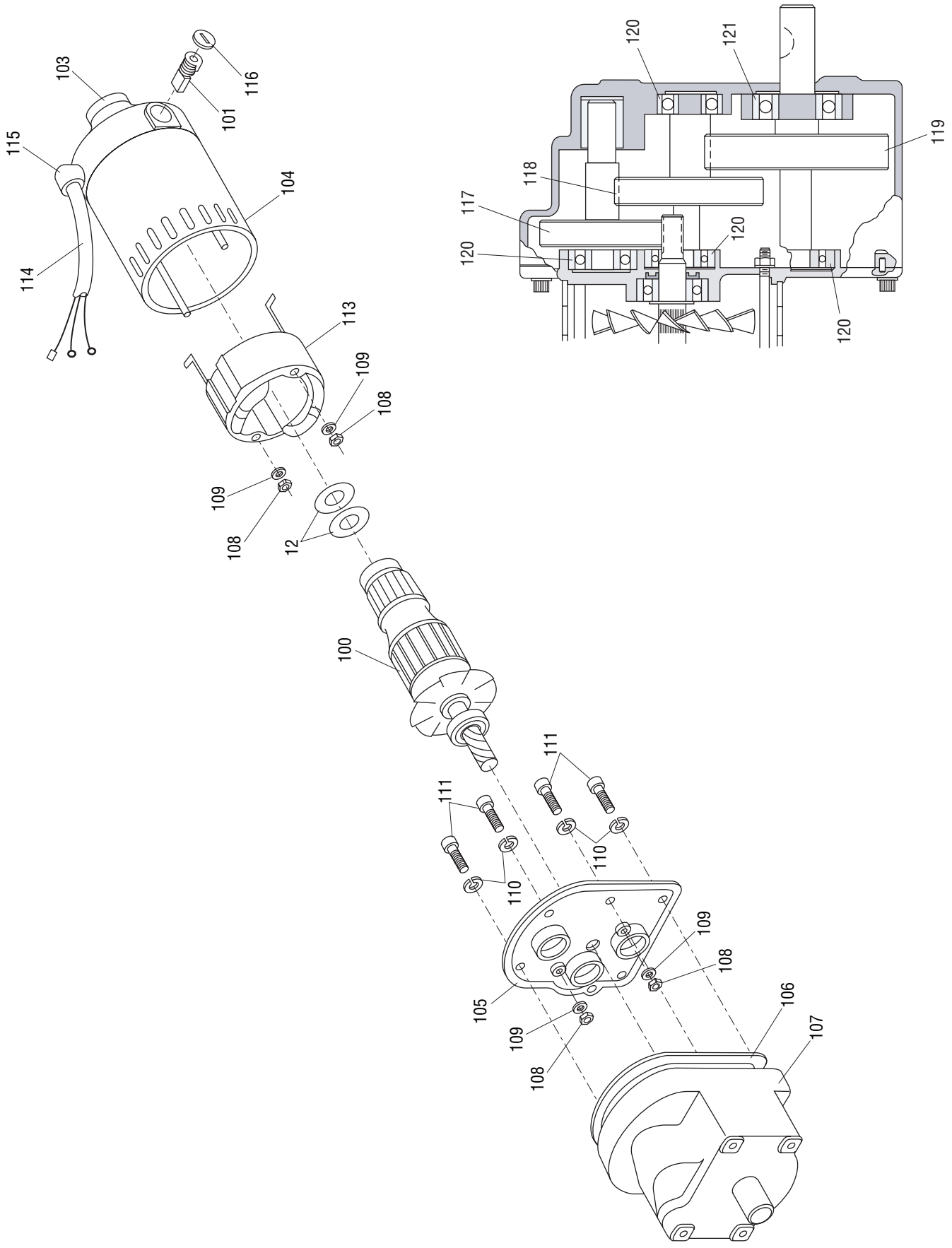
KIT

**	29825	50298259	Vise chain unit (includes one each of items marked with **)

DECALS

	29936	50299360	Decal, capstan rotation 1
	30392	50303929	Decal, warning (damp) 1
	31071	50310712	Decal, warning 1

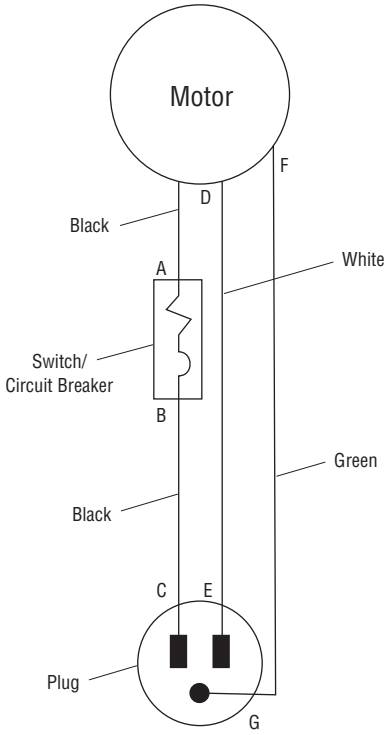
Exploded View—Motor



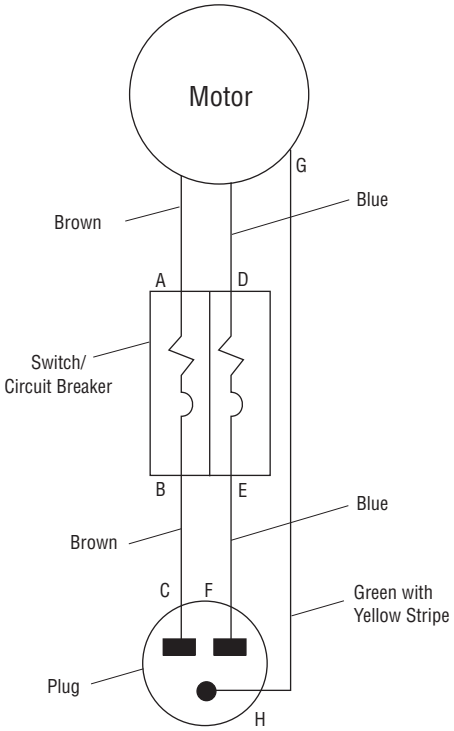
Parts List—Motor

Key	UPC No. 78-3310-	Part No.	Description	Qty
100	86106	91861063	Armature	1
101	86109	91861098	Brush	2
102	86110	91861101	Brush holder	2
103	86112	91861128	End cap assembly	2
104	86180	91861802	115 volt motor frame assembly	1
	86201	91862019	220 volt motor frame assembly	1
105	86181	91861810	Gearhousing cover	1
106	86182	91861829	Gasket	1
107	86183	91861837	Gearhousing assembly (includes #117-121)	1
108	51686	90516869	#10-32UNF hex nut	4
109	50750	90507509	#10 Internal lock washer, internal tooth	4
110	50749	90507495	1/4 Lock washer, internal tooth	4
111	50169	90501691	1/4-28 UNF x .875" head cap screw	4
112	53323	90533232	Belleville washer	2
113	86180	91861802	Field with cord (115 V)	1
	86202	91862027	Field (220 V)	1
114	06518	50065181	Cord assembly (115 V)	1
	32579	50325795	Cord assembly (220 V)	1
115	86083	91860830	Bushing, strain relief	1
116	86113	91861136	Brush cap	2
117	86239	91862396	Drive shaft (includes gear, shaft, bearing)	1
118	86241	91862418	Drive shaft (includes gear, shaft, bearing)	1
119	86242	91862426	Output shaft (includes gear, shaft, bearing)	1
120	86243	91862434	Bearing	4
121	86244	91862442	Bearing	1

Wiring Diagram



120-volt Model



220-volt Model

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