


Document Title		ZGS-11300-X Electric Rescue Hoist Ground Support Equipment (RHGSE)			
Document No.	Rev	Document Type	Release Date	Revision date	
ZOM-11300-X	C	Operation & Maintenance Manual	03-April-2019	26-August-2021	



ZGS-11300-X (-1 or -3)

Electric Rescue Hoist Ground Support Equipment


with Three or Four Groove Capstans

Operation and Maintenance Manual

Electrically and Manually Operated

United States Patent # 7,429,031 B1



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DEFINITIONS OF WARNINGS, CAUTIONS and NOTES contained in this manual



Shall be used when there is danger of injury or death to personnel.













Shall be used when there is danger of damage to equipment

NOTE

Shall be used to highlight essential procedures or statements which may facilitate performance of a procedure or operation.

Table 1 - Warning and Caution Symbols used through the manual.

	Warning		Warning Electrical Hazard
	Warning Hot Surface Burn Hazard		Warning Lifting Hazard
	Warning Moving Parts		Warning Strong Magnetic Field
	Must Wear Eye Protection		Must Wear Hand Protection
	Switch Off Before Operating		Must Wear Hearing Protection




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WARNING

Before operation of the Ground Support Equipment, thoroughly review the entire manual in order to prevent damage to the cable, hoist, helicopter or operator.

Members Only Website

Visit our Members Only site that is accessible via Zephyr International's website at <http://www.zephyrintl.com>. Select the "Members Only" link at the top right of the website or go directly to <http://members.zephyrintl.com/>. Once there, select "Sign Up" and create a user name and password. It is a very simple process and there are no costs involved.

Once logged in, go to "Product Info" and select "Electric RHGSE". Through the Members Only website, customers have access to training videos, training presentations, service bulletins, a spare parts list, quick start guides and the latest manual revision. The training videos can help with recurring training. This portion of the website was just launched for you to benefit from and to be used as a valuable resource.

Product Support for Zephyr RHGSE

To ensure that we can contact you in case of any updates to the manual, service bulletins and/or updated information, it's highly recommend that you register your RHGSE with us, the serial number on the Electric RHGSE is located on the frame. Please email us at info@zephyrintl.com the following information, or you can fax it to us 1-843-365-2677.

Zephyr RHGSE Model(s) _____

RHGSE Serial Number(s) of the _____

Organization Name: _____

Organization Address: _____

POC Name for receiving information on your Zephyr _____


POC Email to send information to _____

POC telephone _____

Date the RHGSE was received _____

NOTE

We would appreciate your feedback so that we may continue to improve upon the website, our equipment, and our customer support.

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1. Introduction



This manual provides the necessary information to perform the repair in an intermediate level maintenance shop (I-level)

The 3rd level of maintenance (D-level) is not applicable in this manual.

VALIDATION OF OPERATIONS DESCRIBED IN THIS MANUAL

The maintenance operations described in this manual have been checked in manufacturer's workshops by an exact carrying out of dismantling, reassembly, test and repair instructions which are detailed in this document.

These operations are those in use at the latest revision date of the document.

The purpose of this manual is to describe the operation and maintenance of the Zephyr International LLC part number ZGS-11300-1 and -3 Electric Rescue Hoist Ground Support Equipment (RHGSE). These RHGSE can be electrically or manually operated.

The ZGS-11300-1 uses the 3 groove capstans, and the ZGS-11300-3 uses the 4 groove capstans.

The Zephyr Electric RHGSE is an improvement of the manual version of the RHGSE family to use available AC power to extend the cable as opposed to cranking the handle to extend. The unit can apply the full rated load of the rescue hoist when retracting, and applies a 25 to 50 lb. load when extending. The RHGSE can be plugged into an available AC single phase power, 110 VAC 60 hz or 220 VAC 50 hz in the hanger.

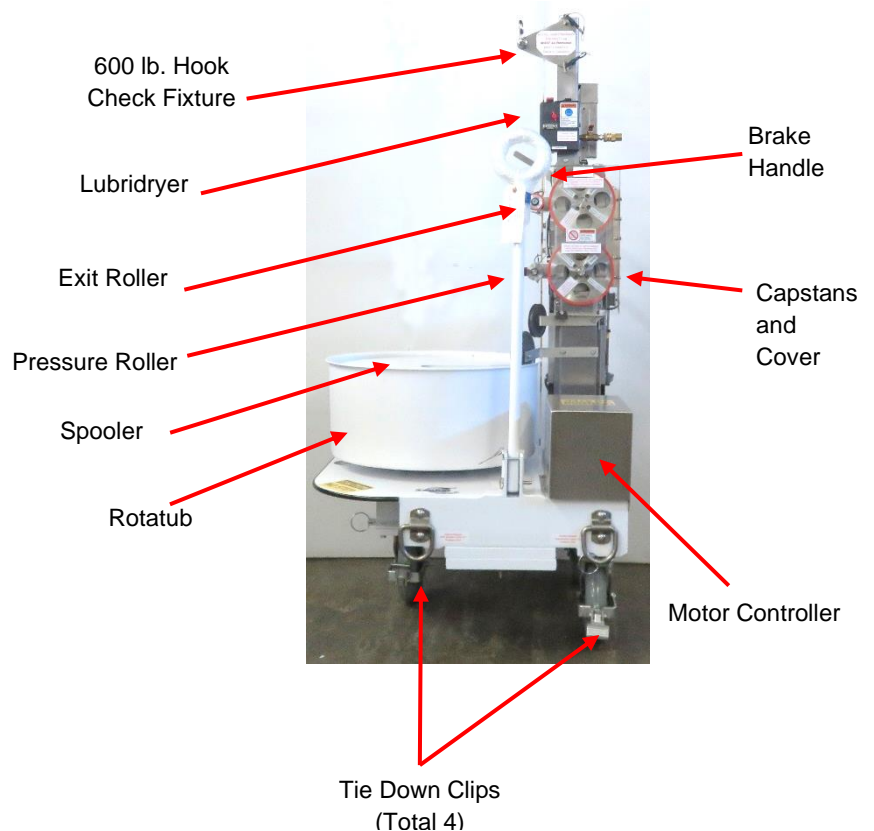



Figure 1 Electric RHGSE Components 1

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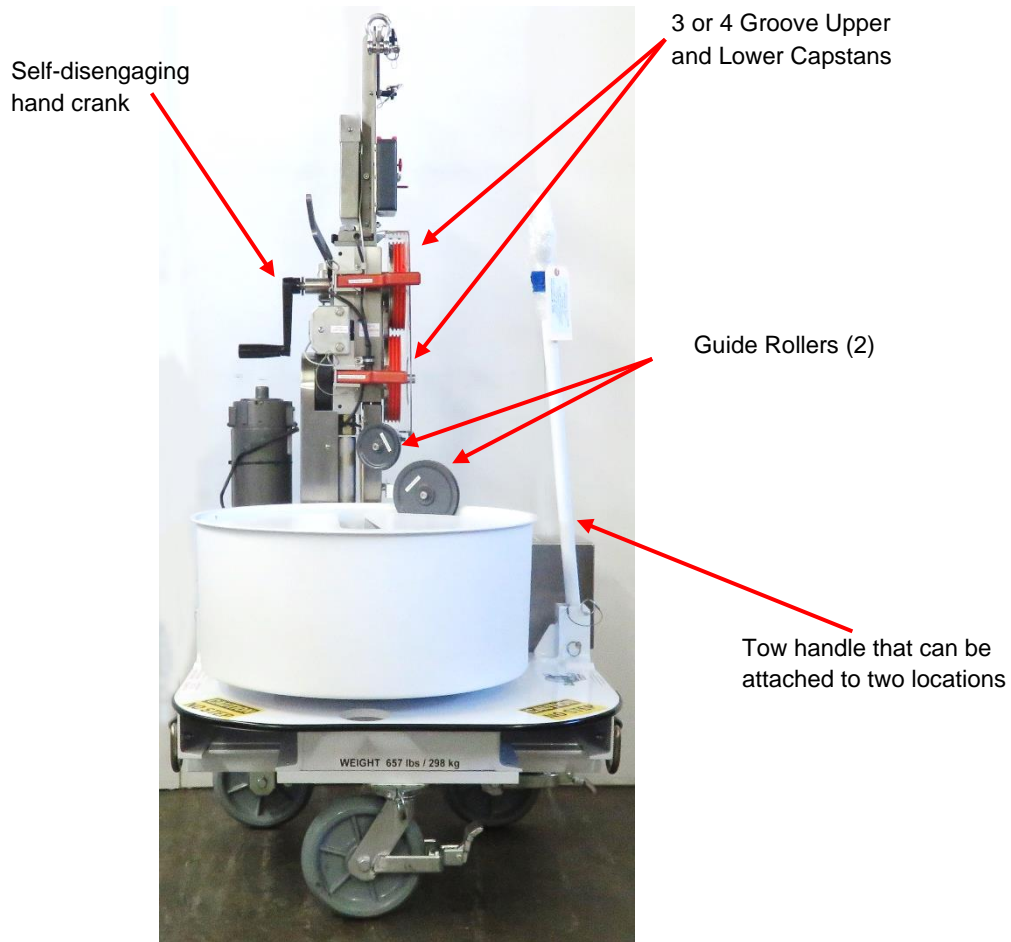



Figure 2 Electric RHGSE Components 2

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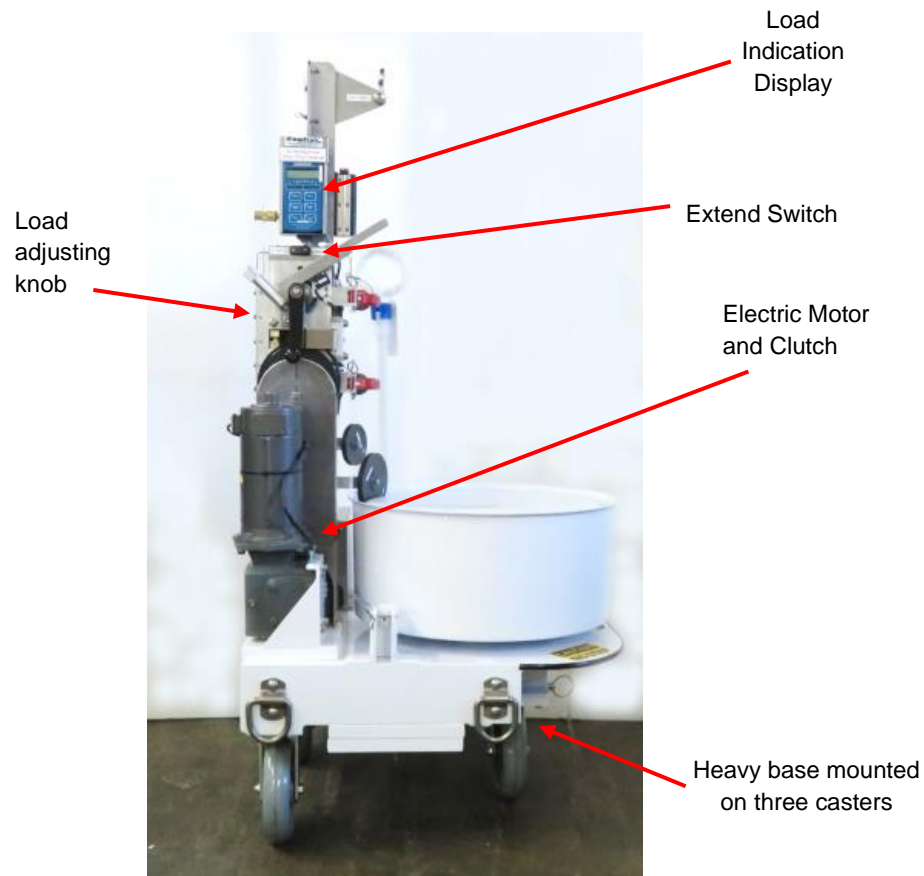


Figure 3 Electric RHGSE Components 3

! LIMITATION CAUTION DURING REGULAR OPERATIONS


During regular cable maintenance using the RHGSE with a cable load up to a 600 lbs. (272.15kg) load is possible. However the RHGSE should not be used repeatedly at 600 lbs. (272.15kg) without relieving the twist from the cable by extending the cable in flight, because it can add a twist to the cable. The maximum sustained load should not be above 300 lbs. (136.08kg) for repetitive evolutions.

! LIMITATION CAUTION DURING CABLE PRECONDITIONING

During cable pre-conditioning the RHGSE should be used with loads up to no more than 300 lbs. (136.08kg). Then the cable should be extended in flight and retracted with 200 lbs. (90.71kg) maximum, to allow the cable to relieve the twist imparted during the process of acclimating the cable to the Hoist Brake Drum.

! CAUTION

Do not operate the RHGSE with a new cable more than three evolutions before relieving the twist from the cable by extending the cable in flight; otherwise, the cable will acquire additional twisting and damage to the equipment and cable can occur.

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2. Purpose of the Equipment

The RHGSE is designed to assist in inspecting and maintaining the rescue hoist and the Cable on the ground.

Design Attributes:

- Human-transportable to and from the helicopter in order to perform pre and post flight checks, periodic inspection and maintenance of the Cable and rescue hoist system.
- Allows one person to perform all inspections and maintenance operations in a minimum amount of time.
- Maintains positive tension on the Cable as it extends and applies a heavy load over the length as it retracts, while protecting the Cable in a rotating tub during hoist maintenance as shown in Figure 4.
- Accommodates any rescue hook and bumper configuration.
- Cleans and dries the Cable during post flight inspections after salt water use.
- Lubricates the Cable if required by the hoist manufacturer.
- Specifically designed to season and tension the Cable without having to fly the helicopter after a complete cable inspection.
- The system allows the operator to extend the Cable from the rescue hoist electrically or manually. If the operator has AC power available, then the system is semiautomatic. Otherwise, if the system is used on the flight line it is necessary to manually crank the system to extend.
- The DC Drive system consists of a permanent magnet motor driven by an electronic DC Drive and a 25-foot-long input power cord is provided.




Maintains clean & tight Cable storage on the rescue hoist Brake Drum.
Figure 4 RHGSE usage results in tight wraps

CAUTION

Retracting with the motor drive engaged may damage the DC Drive assembly.

- The AC power is turned on or off via a rocker switch on the RHGSE and also by two limit switches that are required to prevent retracting the cable with the motor drive engaged.

The DC Drive is set up to provide a constant tension while operating in a current limiting mode. Therefore, as soon as the extend switch is activated the system will pull on the cable with a constant tension and will extend at the speed the rescue hoist is operated at.

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 **CAUTION**

The RHGSE uses a Brake Band and Brake Drum to generate the load in the cable in the retracting direction. The Brake Band and Brake Drum will get very hot. The RHGSE should not be used more than three times consecutively without letting the Brake Band and Brake Drum cool down.

 **CAUTION**

The RHGSE is not to be used excessively at high loads without flying the rescue hoist and extending the cable as part of normal operations. Excessive use of the RHGSE without extending the cable in flight traps the induced twist in the cable.


3. Unpacking the Equipment

The equipment is shipped in a sturdy plywood crate specifically designed to transport and store the RHGSE. The crate is designed to be opened by **removing ONLY the screws that are marked “R” on the front and side panels and using the front cover as a ramp.**



Figure 5 shipping crate

- Remove the screws that hold the wheel chock blocks.
- Cut the zip tie and pull the pin, then using the handle pull the RHGSE out of the crate and down the ramp. **Check to ensure the wheel locks are unlocked as soon as the swiveling wheels clear the box.**
- Unlock the swivel locks in order to freely move the RHGSE around.
- Remove and unpack the parts stored in the Rotatub.

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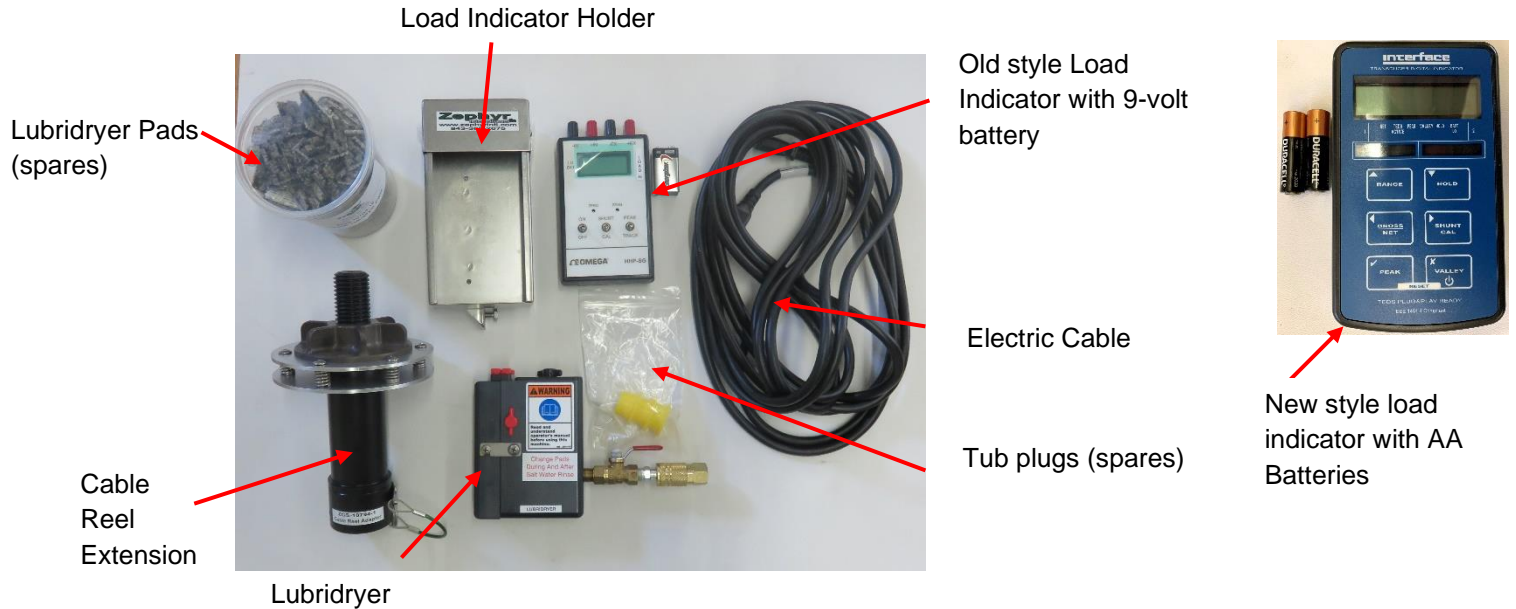



Figure 6 Loose Components



Figure 7 Misc. Components



Figure 8 600 lb. Hook Check Fixture

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4. Setup the Equipment

Remove the lubridryer, load indicator, load indicator holder, upper upright bracket, and 600 lbs. hook checkpoint from the Rotatub and unpack.

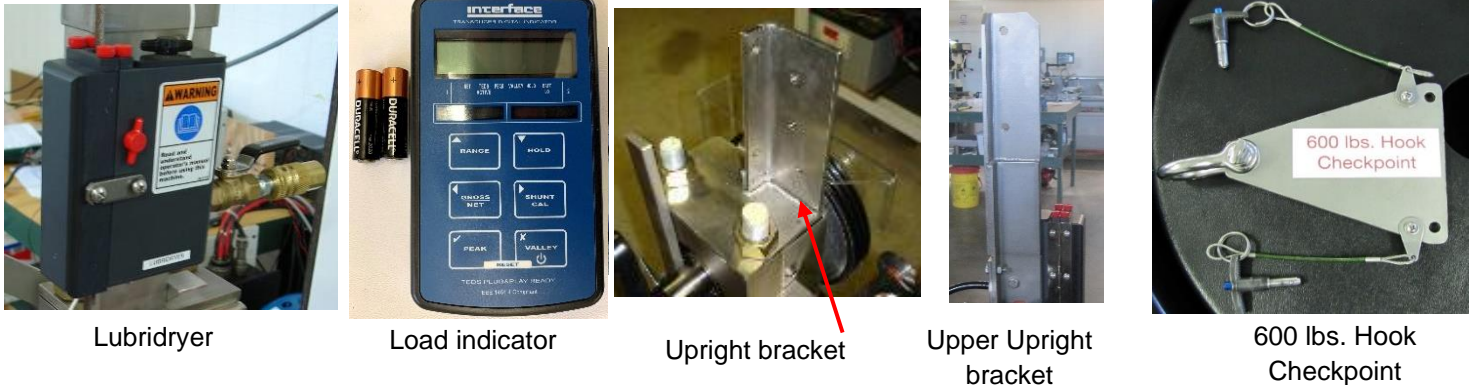


Figure 9 Setting Up

NOTE

Upper Upright Bracket may remain in place permanently.

Attach the Upper Upright Bracket to the inside of the Upright Bracket with the supplied (1) ¼-20 x ¾" long screw and locknut.

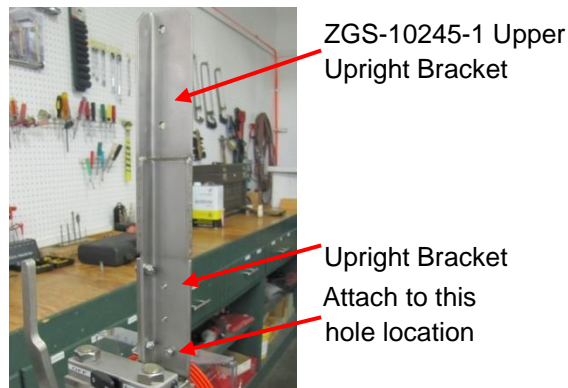


Figure 10 Upper Upright Bracket Assembly

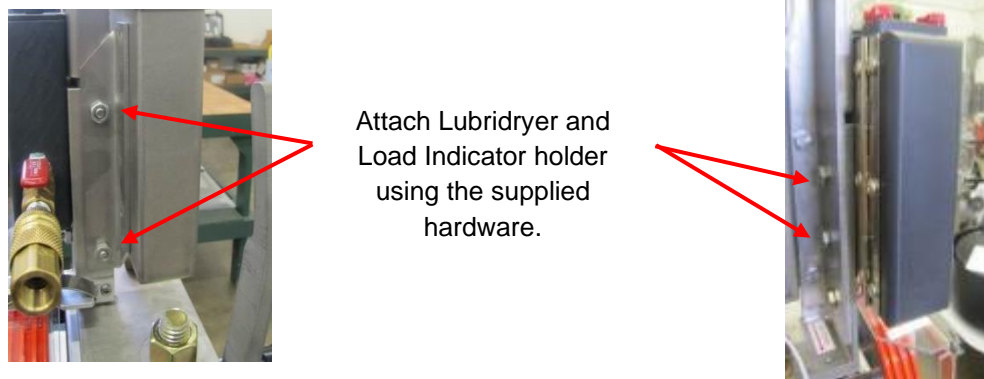



Figure 11 Lubridryer Assembly

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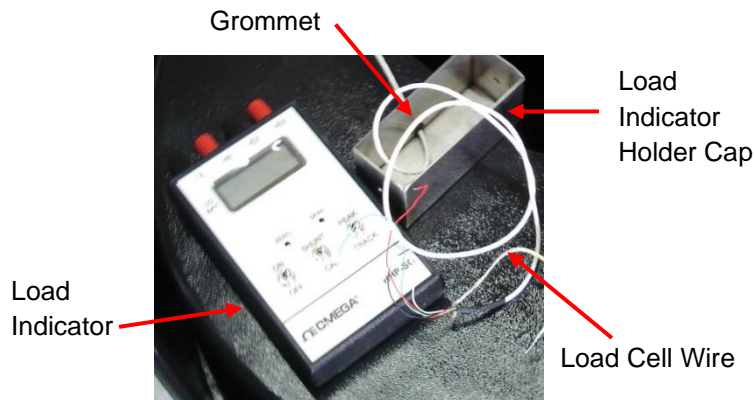


Figure 12 Attaching the Load Cell to the Display

For the old style load indicator, thread the load cell wire through the cap of the load indicator holder and press the small grommet into the hole in the cap.

Install the supplied 9-volt battery, into the load indicator.

Attach the wires to the load cell indicator as shown in Figure 13:

- Red wire = + Ex on meter
- Black wire = -Ex on meter
- Green wire = +In on meter
- White wire = -In on meter

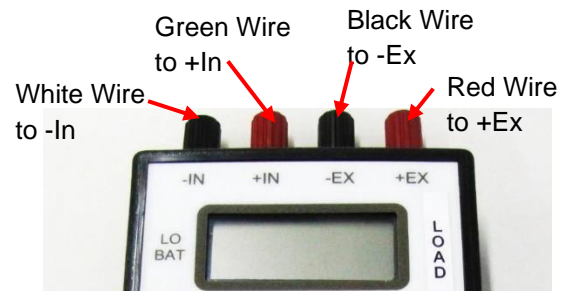


Figure 13 Load Cell Display Terminals

Insert the load indicator into the holder. Wrap the excess wires up and stow them under the cover and install the two screws.

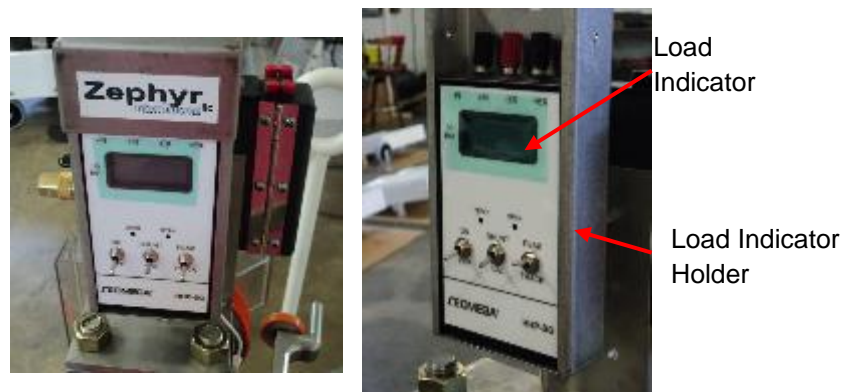



Figure 14 Old Style Load Indicator Holder

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For the new style load indicator, (2 AA) batteries are included and need to be installed under the back plate of the load display. Insert load display into the load display holder, connect the 90 degree connector by aligning the key and install the cover onto the load display holder securing it with (2) screws. Ensure the white load cell wire is in the slot on the back of display holder cover.

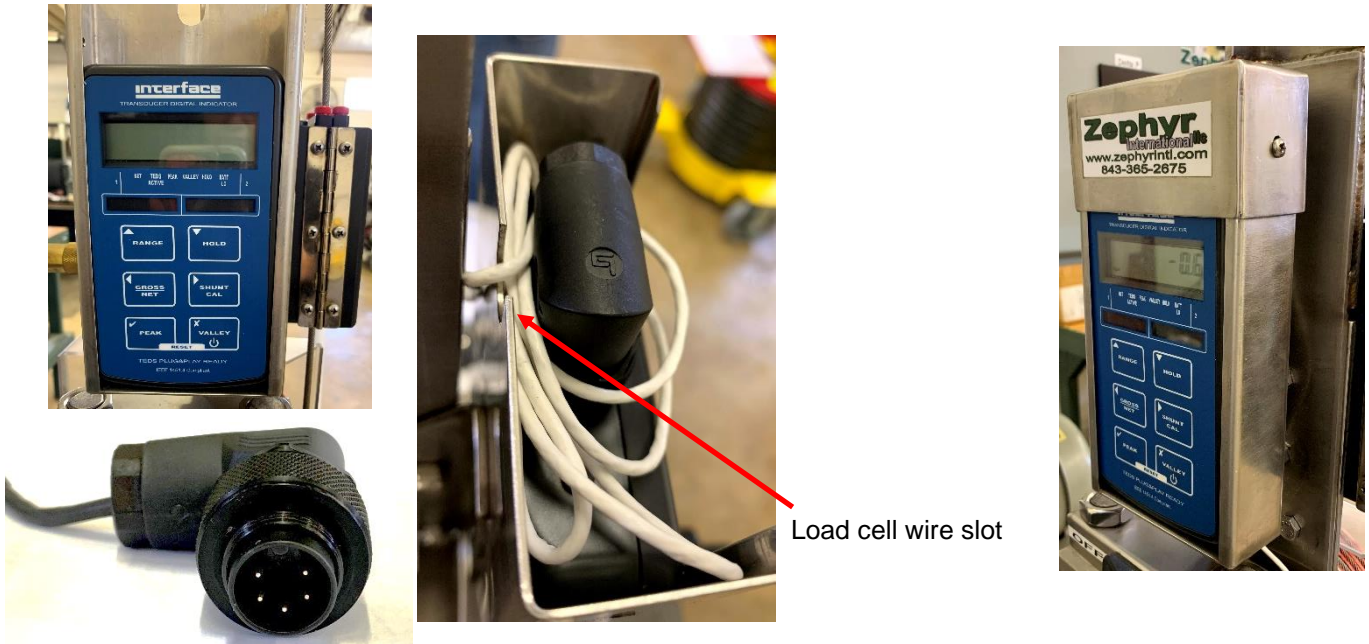


Figure 15 Load indicator setup




Attach the hook 600 lb. adapter into the two holes of the Upper Upright bracket using the Quick Release Pins.

⚠ CAUTION

ZGS-11443-1 Hook Check **MUST BE** removed from Upper Upright Bracket prior to wrapping the cable around the capstans.



Figure 16 600 lb. Hook Check Adapter

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5. Theory of Operation

The Cable is paid off the helicopter hoist and is wrapped three or four times around the capstans (depending on the style capstan being used), and the rescue hook is positioned in a rotating tub. A spooler holds the rescue hook and establishes the starting position of the Cable to achieve an even storage of the Cable in the rotating tub. The Cable is held firmly in the special grooving of the capstans by two tension roller assemblies. The tension roller assemblies are held open by pins when installing and removing the Cable from the capstans. A transparent capstan cover is provided to enclose the capstans while in use. A limit switch on the capstan cover will disable the system operation unless the cover is closed.

5.1. Electrical Operation Extending

The RHGSE must be plugged into AC power, the operator then activates the extend switch, and then activates the pendant in the down direction.

The DC Drive consists of a 90volt permanent magnet DC motor driven by an DC Drive in a constant torque mode. The motor is coupled to the lower capstan shaft via a timing belt and an electrically activated 90 VDC clutch. When the motor is energized in the extending mode the clutch engages and drives the drive belt. When the extend switch is turned off or the load actuation lever is actuated to apply a load while retracting, the clutch disengages and the motor drive is shut off. This prevents the motor from being back driven and possibly damaging the electric controller.

On S/N E00210618 and subsequent a splash cover was added to cover the electrical control box to prevent water intrusion.

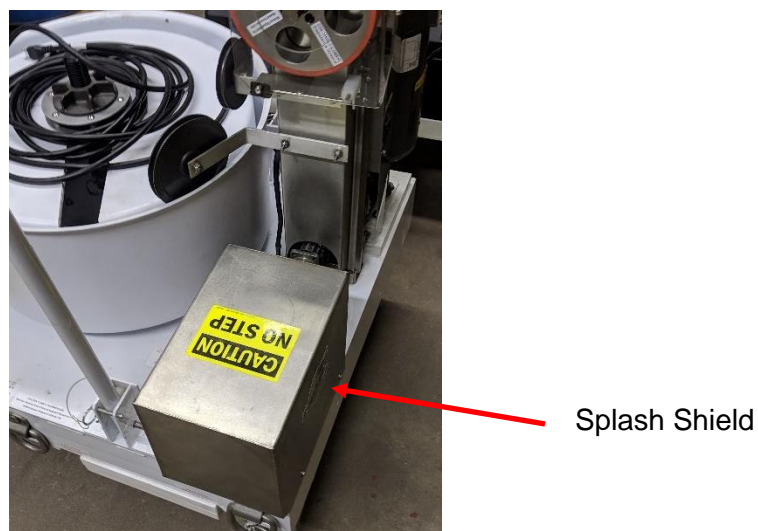



Figure 17 Motor DC Drive Splash shield

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5.2. Manual Operation Extending

The RHGSE is manually operated by engaging and rotating the hand crank handle in the clockwise direction when the helicopter hoist is extending. The operator must crank the handle to collect the cable in the Rotatub.

5.3. Retracting

When retracting the Brake Handle is engaged and the load is adjusted using the Load Adjuster. A brake band applies a back torque on the capstans to develop a load in the cable while retracting. The hand crank handle is self-disengaging so that when the RHGSE is used in the retracting direction the hand crank handle does not rotate. A load cell and display measures, and displays the retracting load on the cable.

5.4. Cable Management, Cleaning and Lubricating

The Rotatub is mounted to an infinitely adjustable platen that compensates for the taper in the Spooler and Rotatub. A set of pads installed in the Lubridryer clean the cable, and provides lubrication via an oil reservoir if required; the flow of oil from the reservoir can be started and stopped by a shut off valve. When the cable is to be cleaned using fresh water, the tub is filled with water and compressed air can be fed to a dryer located below the oiler to dry the cable as it is retracted from the rotating tub full of water. A ball valve allows the air supply to be shut off when not being used. Air pressure required is 30 psi minimum. After the cleaning is finished the tub is drained via a removable plug. The RHGSE can be used with different size cables by changing the capstans. The RHGSE weighs 610 lbs. dry and is transported to the helicopter via a tow handle that is held in the upright position by a pin attached to the base. The tow handle can be attached to either side of the RHGSE as desired. A cable reel adapter is provided to assist installing a new cable onto the rescue hoist.

The RHGSE can be ordered with 3 or 4 groove capstans. The 3 groove capstans are used for medium duty loading and the 4 groove capstans are used when heavy loads are used most of the time.

5.5. Cable Tensioning System

When extending the capstans are either driven electrically or manually and when retracting the capstans are braked using a Brake Drum and Brake Band. The capstans transmit the load to the cable as a result of bending around the capstans and the coefficient of friction between the cable and the capstans. The cable load is developed via the capstan effect.

The four groove capstans use a stainless steel first groove to take the heavy loads and the remaining three urethane grooves provide the grip to develop the load.

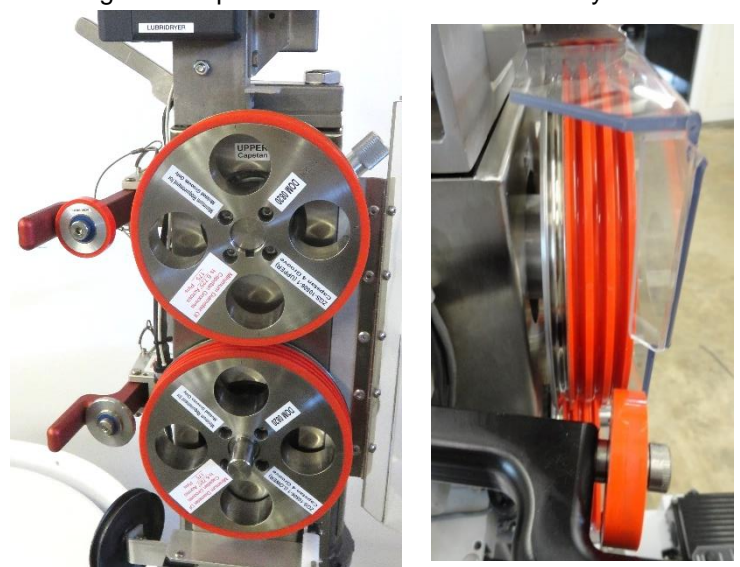



Figure 18 4 Groove Capstans

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5.5.1 Different Size Capstans Explained

The ERHGSE is supplied with the appropriate capstans for your rescue hoist maintenance needs as determined prior to purchasing. The ERHGSE will be supplied with either three groove capstans or four groove capstans. The reason for the different available capstans is because of the differences in rescue hoist cable size depending on your rescue hoist OEM.

The loads required by the OEM also has led to the development of three versus four groove capstans. The three groove capstans have three urethane grooves providing grip to develop the load. They are recommended to be used on a regular basis with loads normally 200lb. (90.72kg) to 300lb. (136.08kg).

The four groove capstans use a stainless steel first groove to take the heavy loads and the remaining three urethane grooves provide the grip to develop the load. The Four Groove Capstans improve the reliability of the capstans under constant high loading up to 600 lbs. while retracting.

OEM Cable tolerances: The cable diameter tolerance range is specified on the OEM manufacturing drawings. One hoist manufacturer uses a Mil Standard tolerance requirement but slightly modified on the high end. While, the other hoist manufacturer uses the same Mil Standard tolerance requirement but takes exception to the minimum diameter requirement.

Cable Diameters When New: MIL DTL-83140B Specification Cable diameter is 3/16 +.006/ -.000 inches.


- A. OEM A cable diameters are typically .188 to .194 inches in diameter.
- B. OEM B Cable diameters vary by the type of hoist they are installed on.
The most prevalent new OEM B cable diameter is .187 +.006/ -.007.

Therefore, OEM A cable can be .194 maximum diameter and an acceptable .188 minimum diameter.

OEM B cable diameter can vary to a much larger degree. The maximum of .193 is acceptable and a minimum of .180 is acceptable.

Zephyr recommends the users select the capstan combinations as shown the table below

Capstan Number	Number of Grooves	OEM Cable	Load Classification
ZGS-10113-20-X	3	G Style	Low
ZGS-10892-1	4	G Style	High
ZGS-12474-X	3	B Style	Low
ZGS-10506-1	4	B Style	High

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NOTE

Upper and Lower capstans in the three groove versions have an upper and lower designations as follows:

G Style ZGS-10113-20 is the upper capstan and ZGS-10113-20 -1 is the lower capstan.

B Style ZGS-12474-2 is the upper capstan and ZGS-12474-1 is the lower capstan.

5.6. Provision for Installing New Cables

A cable reel adapter is provided to facilitate loading the rescue hoist cable onto the rescue hoist.




Figure 19 Goodrich Cable Reel



Figure 20 Breeze Cable Reel

The cable reel adapter can adapt both OEMs cable reels.

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5.7. Safety Features

Safety Switches are provided to prevent electrical operation when the Capstan Cover is opened or when the operator is retracting the cable.



Capstan cover limit switch



Extend Switch



Retract Switch

Figure 21 Safety Features




WARNING

No Step Decals are applied to warn not to step on the base as the tripod base may tip over and injury or damage may occur.



Figure 22 No Step Warning Labels

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The new Rotatub and the Spooler are made from a white material to improve the visibility of the cable inside the Rotatub and Spooler.



Figure 23 High Visibility Spooler

NOTE

As of February, 2018, the Electric Drive Belt cover was changed to be a split design. All RHGSE from S/N E00190218 have the split belt guard cover.

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6. Operation of the Equipment

The operation of the RHGSE is straightforward, but rescue hoist maintenance requires strict attention to detail and situational awareness of the operation of the rescue hoist and the Electric RHGSE at all times during its use.

The Electric RHGSE operation involves:

- Attaching the Cable to the system through the Lubridryer around the capstans and into the Rotatub.
- Setting the pressure roller and exit roller
- Adjusting the spooler position.
- Adjusting the Rotatub position fully clockwise to start.
- Energize the motor and operating the rescue hoist controls or cranking the handle to extend the Cable in the down mode.
- De-energizing the electric motor drive when retracting.
- Actuating the load display, actuating the retract lever, and adjusting the clutch and operating the hoist in the up mode while observing the Cable and the load on the cable.
- Using the Lubridryer to lubricate the cable, if recommended by the hoist OEM.
- Filling the Rotatub with water, if washing the cable is desired, and draining the rotating tub.
- Using the Lubridryer to dry the cable, after washing the cable.

6.1. Installing the Cable in the Lubridryer

Open the Capstan Cover and pay out approximately 16 feet of Cable off of the helicopter hoist. Open the Lubridryer by flipping the latch up. Position the Cable in the Lubridryer and close the Lubridryer by lowering the latch over the screw. Fill Reservoir with oil or WD-40, according to OEM recommendation. After the cable is in position turn the Red Valve Screw counter clockwise 3 turns to allow oil to flow to the Lubridryer pads, if lubrication to the Cable is desired.

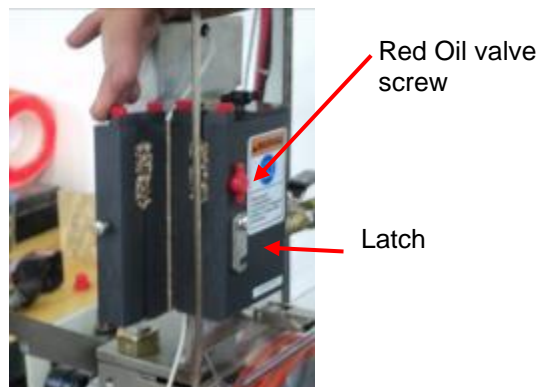



Figure 24 Lubridryer

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6.2. Wrapping the Cable around the capstans.

NOTE

Three groove capstans are shown but the process is the same for the four groove capstans.

Position the hook down with Cable going upwards in the Rotatub, as shown before wrapping the Cable around the capstans. This is to allow the Cable to twist in the hook assembly as it is wrapped around the capstans. The following pictures show the three groove rollers, the ZGS-11300-3 uses four groove rollers. Wrap the Cable around the capstans three times starting with the lower capstan innermost groove as shown, while insuring the cable is pulled tight into the capstan grooves.



Start wrapping the cable in the first groove of the lower capstan



Wrap around the first groove



Wrap around the second groove




Wrap around the third groove



Close the Lubridryer cover

Figure 25 Cable Wrapping Sequence – 3 groove capstans shown

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6.3. Setting the Tensioner Arms

Remove the pins to apply the tension to the Cable after it is wrapped on the capstans. Insert the pins into the pin storage hole in the tensioner base. Give a strong tug on the Cable to ensure it is imbedded in the grooves of the capstans.



If the Cable is not wrapped tightly around the capstans it may loosen up and come off the capstans.



Ensure that the exit and pressure tensioner rollers are engaged when extending or retracting the cable.

Guide the Cable through the guide rollers and into the Rotatub, then through the slot in the Spooler.



Ensure the cable enters the bottom of cutout in the Spooler at the base of the Rotatub or the cable may start wrapping too high on the Spooler and not have enough space to wrap the entire length of cable.

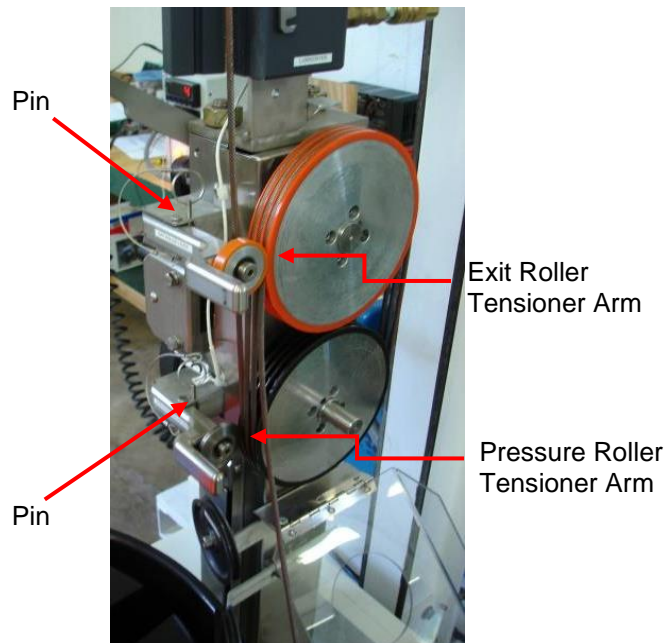



Figure 26 Tensioner Arms



When retracting cable after unwinding it from the capstans use caution to prevent the cable hook from getting entangled on the tensioner arms. Severe damage to the arms or cable may result.

Turn the hook assembly upside down and position the cable in the cutout of the spooler as shown in figure 28.

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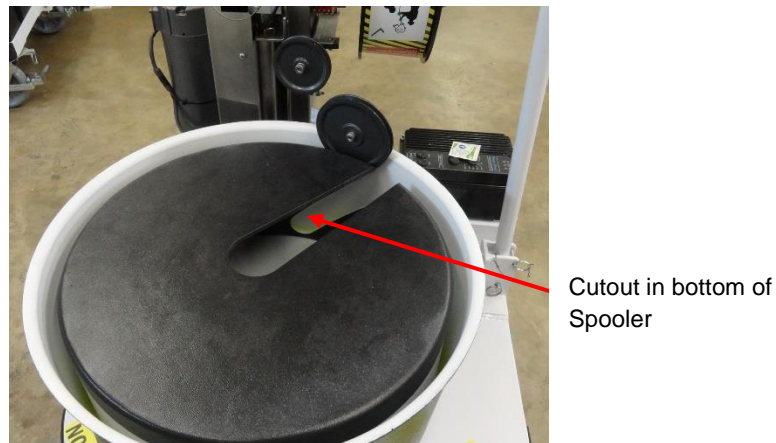


Figure 27 Spooler Cutout



Set the hook on top of the spooler.




Spooler Cutout

Figure 28 Proper cable positioning in Rotatub and Spooler

6.4. Setting the Rotatub and Spooler orientation

With the Cable wrapped on the capstans, in the Rotatub, and through the guide rollers, rotate the Rotatub clockwise to remove any excess slack. The Spooler can be relocated if required to adjust the relative position of the Cable wrapped in the Rotatub to the capstans. This allows the user to adjust the relative wrapping of the Rotatub to the capstans if required for any reason at any time. If not-enough Cable is paid out from the rescue hoist to place the Cable in the spooler correctly, run the hoist in the down direction while rotating the hand hand crank handle for a couple of feet to allow adjustment of the spooler in the correct orientation. Ensure the cable is placed in the cable guide rollers as shown previously.

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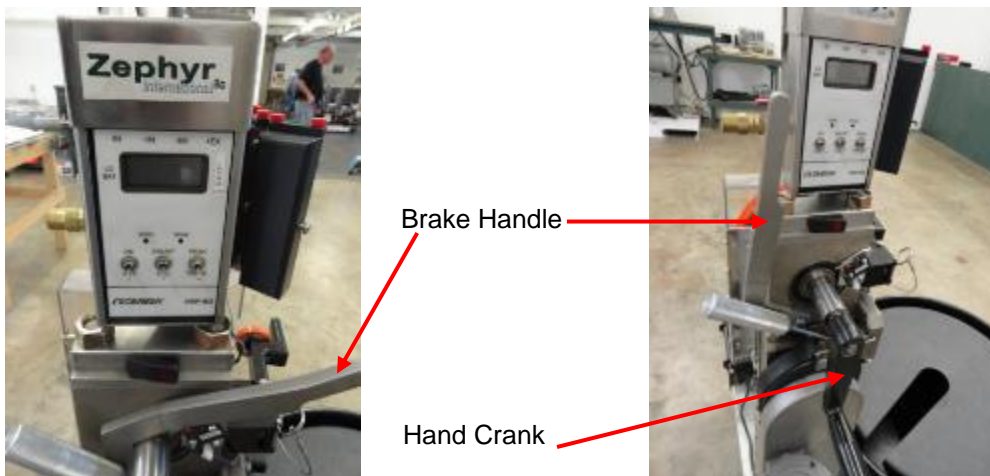
Once the spooler is in a good position push it down to firmly seat it in the Rotatub. Check to ensure the Cable is loosely sitting in the bottom of the slot in the spooler. Before operating the hoist, close and latch the capstan cover.

6.5. Actuating the Brake Handle



Do not operate the rescue hoist in the up direction with the Brake Handle disengaged and the extend switch actuated. Failure to disable the electric drive when retracting may damage the controller.

When extending, the Brake Handle must be disengaged and when retracting, the hand crank handle should be disengaged and the Brake Handle must be in the applied position to apply a heavy load to the cable. A limit switch on the Brake Handle will disengage the motor drive in the retracting direction.




Shown is the Brake Handle disengaged

Shown is the Brake Handle engaged and crank handle disengaged

Figure 29 Brake Handle Actuation

6.6. Running the rescue hoist in the down direction (extending)

Before extending, verify that the Cable is properly installed on the RHGSE, the Cable is wrapped tight on the capstans, and the cover is closed and latched.

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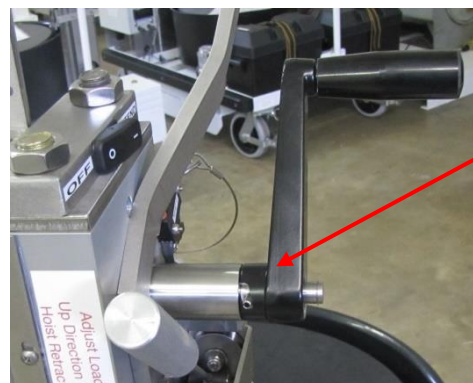
6.6.1. Electrical Extending Mode

Activate the Extending Switch, the motor should begin and put a load on the cable.

Start running in the down direction, at a slow steady speed, while observing the wrapping of the cable on the capstans and spooling the cable in the Rotatub. The system will apply a constant torque via the current limiting circuit and the electrically activated clutch. The load has been preset to be approximately 15 lbs at 100 ft/min. If the cable gets loose on the capstans and lifts out of the last rotation's top groove, Stop extending, open the cover and pull down on the cable to tension it in the last groove properly, close cover and continue to the end of the cable.


6.6.2. Manual Extending Mode

The RHGSE can be operated in the manual mode if electrical power is not available. With one hand operating the hoist control pendant use the other hand to engage the slots in the handle with the pin on the shaft to rotate the hand crank handle in the clockwise direction to develop a small load in the cable. Actuate the pendant to start the hoist running in the down direction. Start cranking slowly and observe the cable to ensure it is completely seated in the capstan grooves. If it begins to loosen on the third groove of the top capstan, stop and pull the cable down into the capstan groove and then continue. Run the hoist in the down direction at a speed that allows you to observe the hoist while cranking in the clockwise direction comfortably. Do not allow the cable to get loose between the RHGSE and the hoist while extending. Extend the cable completely; always paying careful attention to the helicopter hoist and to the condition of the cable. If there are no deficiencies noted during inspection, run the hoist in the down direction until the helicopter hoist is stopped by the full out limit switches. If the cable gets loose when extending, stop and pull the cable tighter, insure the cable is seated in the groove and not lifting out of the grooves.



Engage and rotate hand crank handle clockwise to collect cable in down direction.

Figure 30 Hand crank

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6.7. Running the rescue hoist in the up direction (retracting)

The wheel brakes on the RHGSE should be unlocked to allow the equipment to center itself under the hoist.



CAUTION

Retracting with the motor drive engaged may damage the electronic control assembly.

Extend switch must be turned off to retract



Figure 31 Extend Switch

6.7.1. Starting the application of the Retracting load

Turn off the extend switch. Rotate the hand crank handle counterclockwise to disengage the pin, and start the hoist in the up (retracting) direction, then apply the Brake Handle and begin to increase the load with the load adjuster. The clutch will start applying torque to the capstans in a dynamic condition. Apply the Brake Handle and adjust the load if required (see section 6.7.2). With the hoist control pendant, run the helicopter hoist in the up direction. Observe the wrapping of the Cable on the hoist drum. Approximately 20 feet before the Cable is completely retracted onto the hoist, slow down and observe the Rotatub. Stop the hoist operation when the spooler is in approximately the same position as starting and there are no more cable wraps in the Rotatub. Observe the Cable at all times. Retract at a steady speed of approximately 100 feet per minute.



CAUTION

Do not operate the rescue hoist in the up direction with the Brake Handle disengaged and the extend switch actuated. Failure to disable the electric drive when retracting may damage the controller.



CAUTION

Stop running immediately if the RHGSE lifts off the ground and adjust clutch as required.




CAUTION

When starting to reel in the load, the Brake Handle must not be fully applied with the load adjusted to the maximum; this is because the coefficient of static friction is greater than the coefficient of dynamic friction. If the Brake Handle is fully activated before starting, the RHGSE will be lifted off of the ground and may cause damage to the hoist, aircraft or to the operator. If the system does lift off the ground unexpectedly stop lifting with the rescue hoist and lower the system to the ground and release the Brake Handle. Never try to lower the system by releasing the Brake Handle when the system is off the ground.



CAUTION

Failure to stop the hoist before the hook comes out of the Rotatub may cause damage to the RHGSE and the cable. Pay close attention to the number of turns in the Rotatub as the hook approaches the up limit position.

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6.7.2 Adjusting the load

Reeling in (retracting) under maximum load

If a maximum load is desired turn the load adjuster clockwise until the RHGSE just starts to lift off the ground and then back off the adjuster 1/16 of a turn. Do not operate the RHGSE with it lifted off the ground. Always place one foot on the RHGSE when adjusting to a high load.

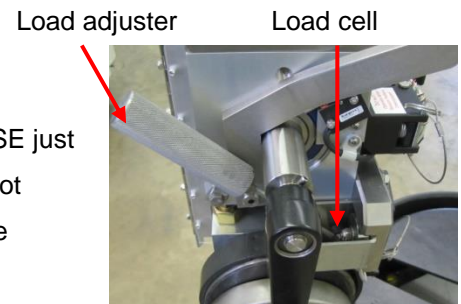


Figure 32 Load Cell and Adjuster

CAUTION

Do not perform repeated runs at high loads, with a new cable or damage to cable can occur.

LIMITATION CAUTION DURING REGULAR OPERATIONS

During regular cable maintenance using the RHGSE with a cable load up to a 600 lbs. (272.15kg) load is possible. However, the RHGSE should not be used repeatedly at 600 lbs. (272.15kg) without relieving the twist from the cable by extended the cable in flight, because it can add a twist to the cable. The maximum sustained load should not be above 300 lbs. (136.08kg) for repetitive evolutions.

6.8 Using Load Indication System

The load indication is for reference only. A load cell is included in the system to allow the operator to monitor and adjust the load applied to the rescue hoist cable.

CAUTION

The load cell attachment bolt should not be loosened or adjusted as this will disrupt the zero and span adjustments that were made at the factory. Should the load display require adjustment please see section 7.20 and 7.21 for detailed instructions.

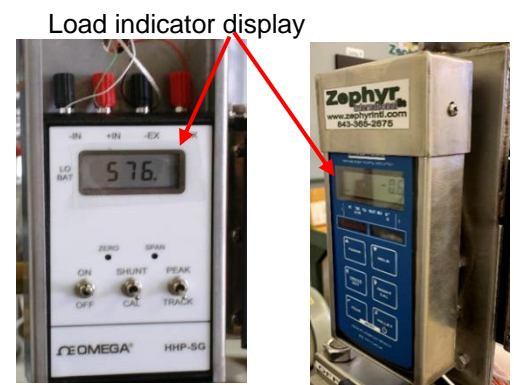



Figure 33 Load Indicator

The maximum load the RHGSE can apply to the Cable is a function of its own weight and any additional ballast weight that may be added such as when the Rotatub is full of water. The RHGSE weighs 622 lb. (282 kg) when it is dry. To verify or adjust the load indication system place one foot on the RHGSE and retract the load at a moderate speed and increase the load with the load adjuster until the RHGSE just starts to lift off the ground. When using old style load indicator, adjust the display by turning the screw to adjust the span of the display to display 610lbs or 276kg as the cable is being retracted.

Normally the RHGSE will only be extended and retracted once during the course of a preflight, post flight, or a daily hoist inspection. However, in the case where a new Cable has been installed it might be cycled repeatedly to condition the cable. In this situation the load should be set at approximately 100 lbs. (46 kg) and

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then increased to 300 lb. in order to condition the Cable properly. The Brake Drum should be allowed to cool after 3 consecutive cycles.

Even though the RHGSE can apply a 600 lbs. load to a cable, it should not be used repeatedly at 600 lbs. because it will twist the cable more and more. The maximum sustained load should not be above 300 lbs. for repetitive evolutions. During cable conditioning, it should be used up to 300 lbs. and then the cable should be extended and then retrieved with 200 lbs. maximum to allow the cable to relieve the twist imparted during the process of acclimating the cable to the hoist drum.

 **CAUTION**

When conditioning a new cable, go slow to allow the cable to acclimate itself on each complete evolution to the smaller diameter rescue hoist drum or damage to cable can occur.

Watch the top capstan urethane to verify the cable is not slipping excessively, If slipping below 300 lbs: Clean oil off capstans, inspect the capstans Pitch diameter.

Always retract at a steady speed of approximately 100 feet per minute.

6.9 Setting Swivel Locks

 **CAUTION**

If using the MagSens system the swivel locks should be in the unlocked position to allow the RHGSE to center itself under the hoist and thus prevent any fleet angle during the checking of the cable.

The RHGSE is supplied with locks to prevent the front wheels from swiveling. The swivels should be allowed to rotate for moving the RHGSE around the hanger and aircraft, and then locked once the RHGSE has been positioned under the rescue hoist cable. To lock the swivels once the wheels have been positioned, rotate the ring to a horizontal orientation and engage the detent on the wheel with the pin. To unlock the swivels, pull the ring out of engagement and rotate the ring to a vertical orientation.

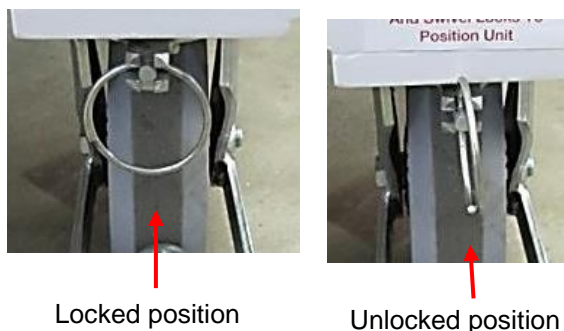



Figure 34 Swivel Locks

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6.10 Replacement of the Lubridryer pads

Open the Lubridryer by unlatching and unscrew the (4) thumbscrews. Remove the two lubridryer bushings. Remove the used Lubridryer pad by sliding them up the channel. Discard of the used pads properly. Insert new pad by sliding the pads down the channel, install the bushing and thumbscrews. Replace the bushings when excessively worn.

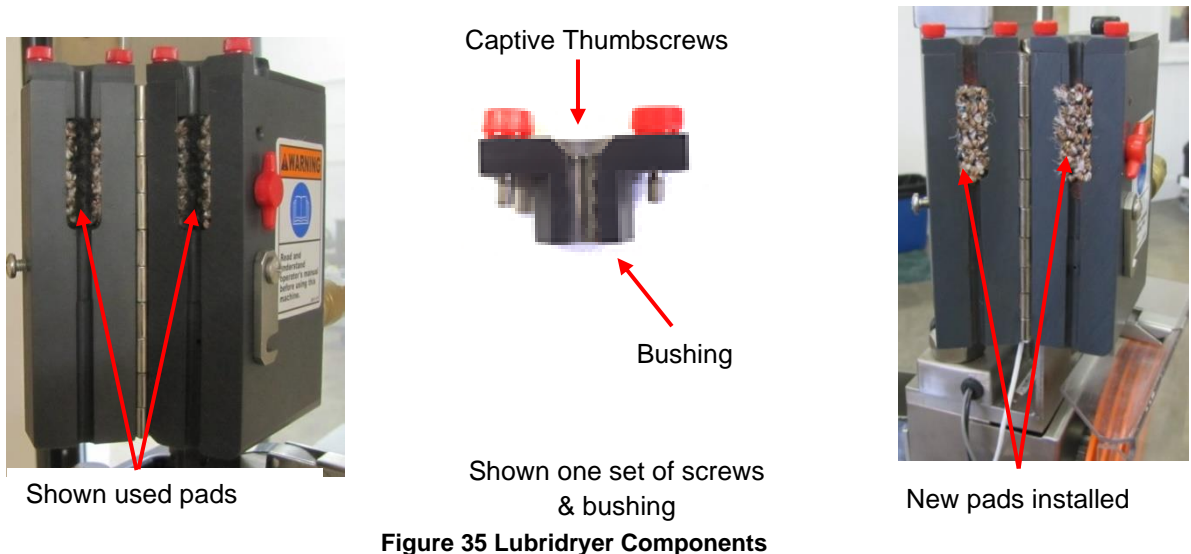


Figure 35 Lubridryer Components

6.11 Lubrication of Cable

NOTE

[Use oil only as per the hoist manufacturer's recommendations.](#)

The Lubridryer includes a reservoir that can be filled with oil. The reservoir can be used to store spare Lubridryer pads. The Lubridryer includes a valve that shuts off the flow of oil when not in use

When oil is added to the reservoir and the valve is open the oil seeps through a small hole to lubricate the rear pad. The front pad should be soaked in oil before installing it, open the oil reservoir and dip the pads into the oil filled reservoir. Therefore, it is recommended to always keep a spare set of pads in the reservoir of oil to use as the next set. Wipe excess oil off of the frame and use a clean cloth to keep the oil off of the capstans when the RHGSE is not in use.


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Figure 37 Lubrication Valve

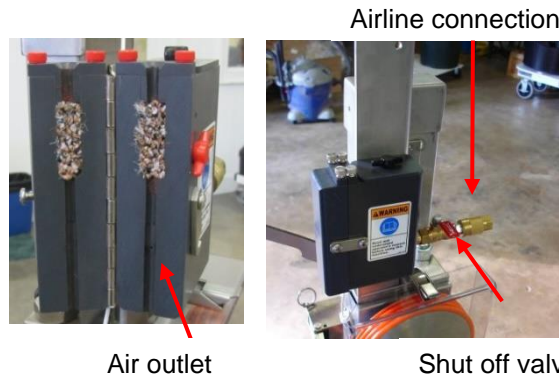



Figure 36 Compressed Air attachment

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6.12 Performing a fresh water wash



Do not allow the electrical cable or DC Drive to come into contact with water.

Fill the rotating tub $\frac{3}{4}$ of the way with fresh water and extend the Cable all the way down. Using a hose, rinse off the helicopter hoist and the Cable between the helicopter hoist and the Rotatub.

If shop air is available, attach an airline to the Lubridryer via the quick disconnect nipple supplied with the RHGSE.

Run the hoist in the up direction with the load brake applied. Before operating with water rotate the load adjuster counter clock wise to reduce the load to approximately 100 lbs. Carefully observe the Cable at all times on the capstans. Retract the entire Cable out of the Rotatub, and position the Brake Drum so that the plug is above the hole in the frame then remove the plug at the bottom and drain into an approved drain. If shop air is unavailable drain the water and dry out the Rotatub, extend the cable into the empty tub and let dry. Retract the Cable onto the helicopter hoist with the Brake Handle applied using a gloved hand and a clean cloth to dry the cable.




Align the RHGSE cut out with the drainage hole in the tub as shown.

Figure 38 Water Drains

6.13 Using the Lubridryer

After extending the Cable into the Rotatub, filling the Rotatub with water, and prior to running the Cable up into the helicopter hoist, attach an airline to the airline connection located at the back of the Lubridryer. Then replace the Lubridryer pads with fresh pads. The air pressure required is 30 psi or 2 bar minimum. The air supply can be turned on or off via a ball valve. Replace the Lubridryer pads to clean off any excess salt and turn on the valve attached to the back of the Lubridryer.

The compressed air will force the majority of the water off the cable prior to it being wiped clean and or lubricated by the pads while retracting.

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6.14 Removing the Cable from the RHGSE



Observe Cable always to prevent damage.

Remove the pins from their storage hole, rotate the tensioner arm assemblies away from the capstans, and reinstall the hitch pins to hold the tensioner wheels off the cable. Unwrap the Cable from the capstans, carefully remove the twist by lifting the hook out of the spooler slot, and placing the hook facing down into the slot. Retract the remaining Cable onto the helicopter hoist using a glove hand to apply tension and being careful not to catch the Cable on the RHGSE or anything else. Store the hook fully as per the manufacturers' instructions.

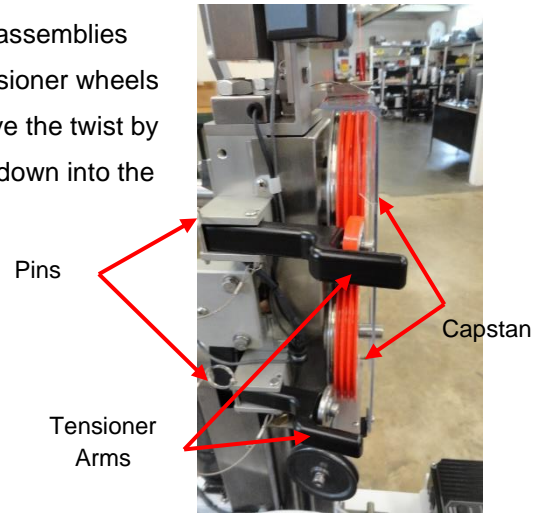


Figure 39 Tensioner Arms

6.15 Changing the capstans to accommodate a different Cable size.

(Optional if different capstans were purchased to accommodate a different size cable)

NOTE

It is important not to reverse the upper and lower capstans.

Remove the capstans and install the different capstans using the screws that were removed. Check the wrapping of the Cable to ensure the Cable stays tight on the capstans.

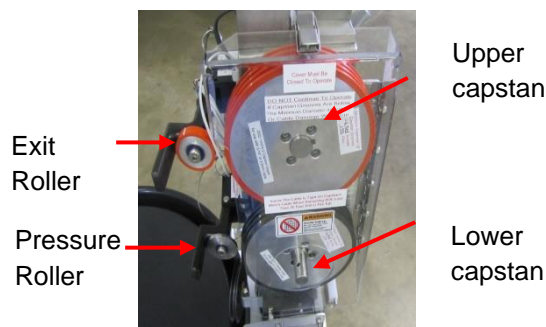



Figure 40 Changing Capstans

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6.16 Removing the Cable from the hoist

The RHGSE can coil the cable for removal and disposal. Remove the hook assembly from the cable. Run the cable completely out into the Rotatub. Bypass the full out limit switch on the hoist as directed in the hoist OEM manual, and run the hoist in the down direction until the cable can be removed from the hoist. Disconnect the cable from the hoist and run the remaining cable into the Rotatub.

Then reach down through the slot in the spooler and collect the cable spool in your hand and pull the spooler away from the tension rollers and lift the spooler and cable coil out of the Rotatub. Flip the spooler upside down and the cable will slide off in a neat coil. Discard or store the cable as appropriate.

6.17 Installing a new Cable with the universal cable reel extension

A universal cable reel adapter is provided to attach the cable shipping reel to facilitate installation of a new cable.

Attach the ZGS-10794-1-1 Cable Reel Extension with its pin as shown.

Remove the clutch, the B style adapter and the nut.




Figure 41 Cable Reel Adapter Pin



Figure 42 Cable Reel Adapter Components

Slide G style cable reel onto the shaft and install the clutch and the nut.

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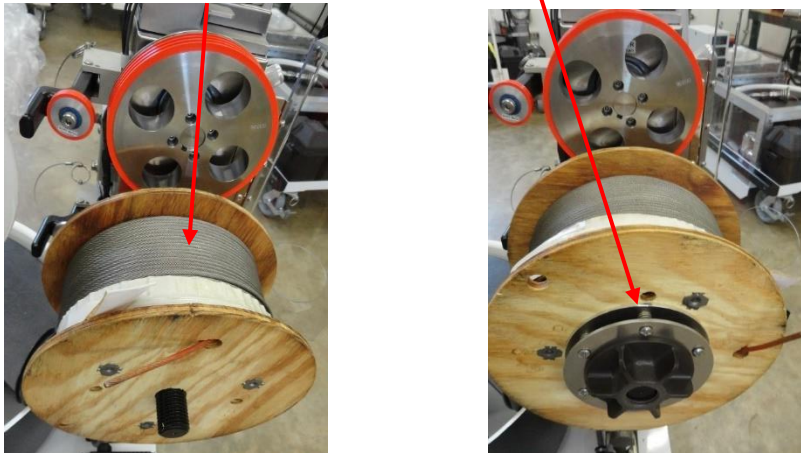


Figure 43 Mounting Goodrich Style


Attach the cable to the rescue hoist following the OEM's directions. Retract the cable onto the rescue hoist and adjust the nut as required to prevent the cable from unraveling during the process.

The process is the same for the B style rescue hoists, except the B Style adapter is used as shown below.

Slide the B Style adapter on the shaft,



Figure 44 Breeze Style Adapter Configuration

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Slide the B style cable reel onto the adapter.



Figure 45 B Style Adapter Assembly

Attach the clutch and nut.

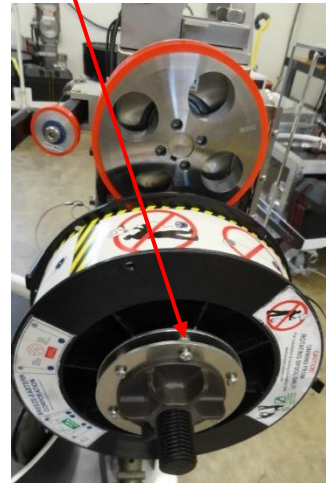



Figure 46 Clutch Assembly

Attach the cable to the rescue hoist following the OEMs directions. Retract the cable onto the rescue hoist and adjust the nut as required to prevent the cable from unraveling during the process.

Once the Cable is completely on the rescue hoist, remove the cable reel and cable reel extension, attach the rescue hoist cable and run the cable on and off the hoist into the RHGSE three times while increasing the load incrementally on each cycle in order to pre-condition the cable.

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6.18 Pre-Conditioning a new Cable

Rescue hoist cable pre-conditioning is the process of acclimating the newly installed cable to the smaller diameter of the rescue hoist Brake Drum. It is only required for new cables and is not effective at salvaging cables that do not meet the Mil-Spec and have loose outer strands. The loose strands may disappear temporarily but will soon return as soon as the cable is extended with no load on it.

Cable pre-conditioning should be done with a low load and at slow speed, while gradually increasing the load up to the rated load.

Always extend with a low load of approximately 25lbs and at a max speed of 100 feet per minute in either direction. Perform 3 cycles: Retracting at 100 lbs., then 200 lbs., then 300 lbs.

Retract at a steady speed of approximately 100 feet per minute.

LIMITATION CAUTION DURING CABLE PRECONDITIONING

During cable pre-conditioning the RHGSE should be used with loads up to no more than 300 lbs. (136.08kg). In order to relieve the initial twist, cable should be extended in flight and retracted with 200 lbs. (90.71kg) maximum, to allow the cable to relieve the twist imparted during the process of acclimating the cable to the Hoist Drum.

CAUTION

Do not operate the RHGSE with a new cable more than three revolutions before relieving the twist from the cable by extended the cable in flight; otherwise, the cable will acquire additional twisting and damage to the equipment and cable can occur.

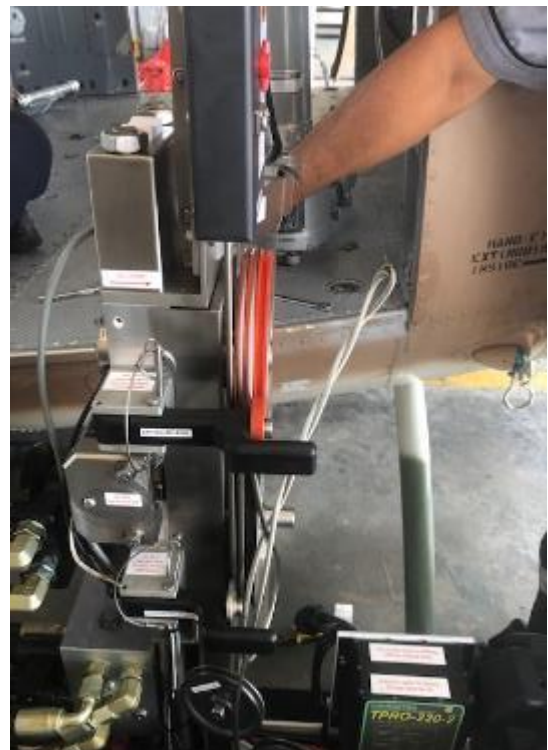



Figure 47 Improper Conditioning Result

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6.19 Hook Attachment Check

A hook check fixture is included to attach the rescue hook to in order to perform the hook load test. The weight of the RHGSE is 622lbs. For best practice, remove the tow handle to perform this check to remove added weight. When the wheels of the RHGSE come off the ground there will be a 612 lb. load on the hook and cable end.

 **CAUTION**

ZGS-11443-1 Manual GSE Lifting Assembly **MUST BE** removed from Upper Upright Bracket prior to wrapping the cable around the capstans.


Connect the rescue hoist hook to the Manual RHGSE Lifting Assembly.

Retract cable, lifting Manual RHGSE off the ground.

Extend cable, lowering the Manual RHGSE to the ground.




Figure 48 600 lb. Load Check Assembly

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7.0 Periodic Maintenance of the RHGSE

Periodicity	Conditions	Section #
Daily		
Perform a Quick Check on Rotatub Slip Clutch		7.5
Visually Check the Capstans		7.6
Change the Lubridryer Pads		7.9
Monthly	Scheduled	
Lubricate the Capstan Drive chain		7.10
Measure the Capstans		7.6.1
Check and adjust the Brake Handle pivot bolt tightness		7.24
Check Limit Switch Operations		7.25
On-Condition	As needed	
Replace the Capstans		7.7
Replace the Exit Roller		7.28
Replace the Brake Band		7.26
Annually	Scheduled	
Check the load display Scaling		7.20 & 7.21
Check the Vertical Drive Belt		7.12
Check the Drive Belt		7.19
Check the Electric Drive Belt		7.17
Check the Lubridryer Bushings		7.8
Check the Brake Drum		7.27
Inspect the Brake Band		7.22
Every 5 years	Scheduled	
Replace the capstans		7.7
Replace the Exit Roller		7.28

Figure 49 Table of Maintenance Tasks

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7.1 Introduction

This instruction is to describe the maintenance of the Zephyr International LLC Hydraulic Rescue Hoist Ground Support Equipment (RHGSE).

7.2 Specialty Tools Needed for Maintaining the RHGSE

- A. Push/Pull linear scale is used to perform a quick check of the clutch slip.



Figure 50 Push/Pull linear scale

- B. Torque gauge is used for rotating the platen screws to measure tension.



Figure 51 Torque gauge

- C. 5/32 T-handle key wrench is used for adjusting platen screws.




Figure 52 T-Handle Key wrench

- D. 7/16 combination wrench is used for adjusting platen screws.



Figure 53 7/16 combination wrench

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Micrometer or Zephyr ZT-029-00 Capstan Measurement Fixture is used for measuring the capstans.
(ZT-029-00 is Included in the optional ZMT-100 Maintenance Kit)



Micrometer



ZT-029-00 Capstan Measurement Fixture

Figure 54 Measuring capstan tools

E. Proper gauge pins for the measuring of the capstans.

Optional tool kits



ZMT-100-1 RHGSE Maintenance Tool Kit Contains:


- ZT-029-00 Zephyr Capstan Measurement Fixture
- Torque Gauge,
- 7/16 Combination Wrench,
- 5/32 T-handle Key Wrench
- Push/Pull Linear Scale
- Gauge Pins



ZMT-100-0 RHGSE Maintenance Kit Micrometer Kit Contains:

- Micrometer,
- Push/Pull Linear Scale.
- Gauge Pins

Figure 55 Maintenance tool kits

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7.3 Storage of the RHGSE, When Not in Use



CAUTION

Avoid water contact with electrical components and displays.

Water damage can make the equipment inoperable.

- Step 1** After a salt water mission, the Zephyr should be rinsed with fresh water.
- Step 2** Empty the Rotatub of all water and dry completely.
- Step 3** Use compressed air, 30 PSI maximum, to blow off any water remaining on the RHGSE.
- Step 4** Clean any excess oil from exposed portions of the upright assembly, as required.
- Step 5** Place all loose components (Cable Reel Adapter, Tub Plugs, etc.) in Rotatub
- Step 6** Store the RHGSE indoors in a dry location after use.

NOTE

Do not use plastic to cover RHGSE, trapped humidity causes capstans to swell and lose their grip.

- Step 7** Recommended to cover RHGSE with ZGS-11380-2 breathable cover.


7.4 General preventive maintenance



CAUTION

Do not spray water onto the Load Indicator, the Electric Motor, or Drive otherwise damage to GSE could occur.

- Keep the RHGSE relatively dry.
- Push/Pull linear scale is used to check the clutch slip.
- Oil capstan chain
- Visually check capstans
- Rinse off the RHGSE after a Cable cleaning.
- Do not impact the Rotatub, especially in cold operating conditions.
- Do not leave water in the tub in conditions likely to freeze.
- Clean any excess oil from exposed portions of upright assembly as required.
- Wash the RHGSE capstans with water when required to clean and then blow off excess water with compressed air.
- Change the lubridryer pads every time the GSE is used
 - Twice when washing off salt- after extending the cable into the tub full of water and at end of the process.
- Keep all loose components in their respective storage locations.
 - Tub plug in the Rotatub
 - Tension release hitch pin in the tensioner base storage holes
 - Spare Lubridryer pads in the Lubridryer reservoir

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7.5 Perform a Quick Check of the Rotatub Slip Clutch

CAUTION

If the slip load of the Rotatub is too high, the cable will be wrapped too tightly around the spooler causing it to rise too quickly and wrap at the top of the spooler too fast. It may come out of the spooler Rotatub interface. If this happens the operator **must stop immediately** before the cable is damaged.

If the slip clutch is out of range, it needs to be adjusted before operation otherwise damage to cable may occur.



Figure 56 Quick Slip Load Check of Rotatub

Step 1 Perform a Dynamic Slip Load test by placing the Linear Push/Pull Spring Scale in the hole on the Rotatub. Turn the GSE **ON** and actuate Rocker Switch in the Extend direction and measure the force required to stall the Rotatub. The force measured should be **2-3lb (.90-1.36kg)**.

7.5.1 Rotatub clutch adjustment

Step 1 Remove Spooler from the Rotatub

Step 2 Remove the (4) lock nuts and washers from the studs in the bottom of the Rotatub.

Step 3 Lift the Rotatub off of the Platen.


NOTE

In order to properly adjust the clutch, the (4) adjustment screws must be fine-tuned to a uniform value.

Step 4 Using a 7/16" combination wrench and a 5/32" T-handle hex wrench, finely tune the (4) adjustment screws on the platen to achieve a uniform value by means of one of the following methods. Adjustments should be made in small increments and measured after each alteration.



Figure 57 Adjusting platen screws

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 **CAUTION**

A Torque Gauge is not a wrench. Using it as such will cause damage to the tool. It is a specially calibrated measuring device, use with care.

NOTE

A Torque Gauge is recommended for precise tuning of the Clutch. If a Torque Gauge is available for use, proceed with method #1. Alternatively, if a Push/Pull Linear scale is available, use method #2.

#1 - Torque Gauge Method: Using the Seekonk SO-24 Torque Gauge, measure the torque required to rotate the bolt and adjust as required. Each bolt should rotate at a recommended value of 10-12 in-oz (7.20-8.64kg-mm). Once completed, double check all (4) tensioning bolts to ensure a uniform value is measured at all (4) locations.



Figure 58 Torque Gauge Method

#2 – Push/Pull Linear Scale Method: Measure the force required to slip the clutch at the studs by pulling tangentially to the bolt circle. Fine-tune the adjustment bolts as required. The clutch should slip at a recommended value of **3-4lb (1.36-1.81kg)** at each stud on the platen. Once completed, double check the force value at all (4) studs to ensure a uniform value has been achieved.

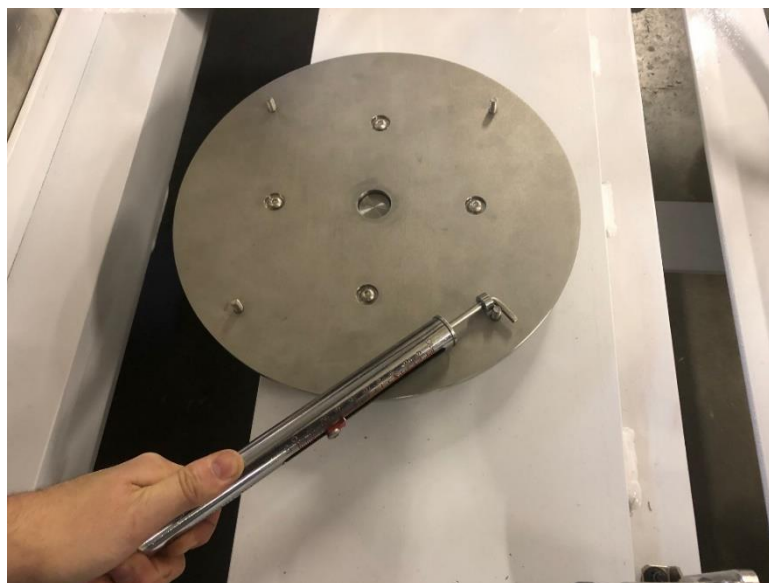



Figure 59 Measuring the platen

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NOTE

Once uniformity is achieved, measurements at the platen plate are no longer necessary. Reassembly is required to measure the dynamic torque value.

Step 5 Using only (1) washer and (1) lock nut, reassemble the tub and spooler.

Step 6 Perform a Dynamic Slip Load test by placing the Linear Push/Pull Spring Scale in the hole on the Rotatub. Turn the GSE ON and actuate Rocker Switch in the Extend direction and measure the force required to stall the Rotatub. The force measured should be **2-3lb (.90-1.36kg)**.


- IF the measured force is less than 2lbf (.90kg), then the Rotatub should be removed and the (4) adjustment screws should all be tightened in an equal manor. Adjustments should be made in small increments.
- IF the measured force is greater than 3lbf (1.36kg), then the Rotatub should be removed and the (4) adjustment screws should all be loosened in an equal manor. Adjustments should be made in small increments.

Repeat **Step 5 and **Step 6** until the Dynamic Slip Load test yields a **2-3lb (.90-1.36kg)** result.

Step 7 Reinstall all washers and lock nuts in the Rotatub.

7.6 Visually Check the Capstans

Before every use observe the first groove of the lower capstan if three groove capstans are used or the second groove of the lower capstan if four groove capstans are used. If there are obvious signs of the base material or if twisting of the cable becomes excessive then the capstan's grooves must be measured. If the capstans are worn excessively, they will cause the cable to come off of the capstans at too slow a speed and cause twisting of the cable as it rolls up and down the sides of the spooler.

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7.6.1 Capstans: Measuring Process




It is essential to replace the Capstans when the pitch diameter of the first groove of the lower roller becomes too small. When the wear becomes significant the cable will slip excessively and could cause the cable to twist.

NOTE

Capstans must be removed to accurately measure the pitch diameter of the grooves. To check the pitch diameter, a 6-7 in. micrometer and a set of pins of the correct diameter are required. There are several Capstans available for the different size cables in use. It is important to use the correct style Capstans for the type of cable being serviced.

Reference Figure 62 for the Capstan measuring table.

- Step 1** Use a 5/32 hex key or speed wrench to remove the four screws from the top and bottom Capstans.
- Step 2** Remove the Capstans from the RHGSE.
- Step 3** Use the table below to determine the appropriate size pin to use to measure the Capstans, according to the cable's diameter.
- Step 4** Place two pins into a groove on opposite sides of the Capstan, at the keyway, and 180 degrees from the keyway.
- Step 5** Measure over the pins with the 6-7 in. micrometer to determine if the pitch diameter is still large enough to continue operating with this set of Capstans.
- Step 6** Measure the groove in four places (Micrometers) since Capstans do not always wear evenly. Rotate the position of the pins 90 degrees after each measurement.
- Step 7** Repeat Steps 5-6 for each groove.
- Step 8** Any groove that is below the minimum is cause for rejection. Once the Capstan has worn down below the minimum dimension from the table below, the set of Capstans must be replaced.

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Measuring ZGS-10506-1 Capstan

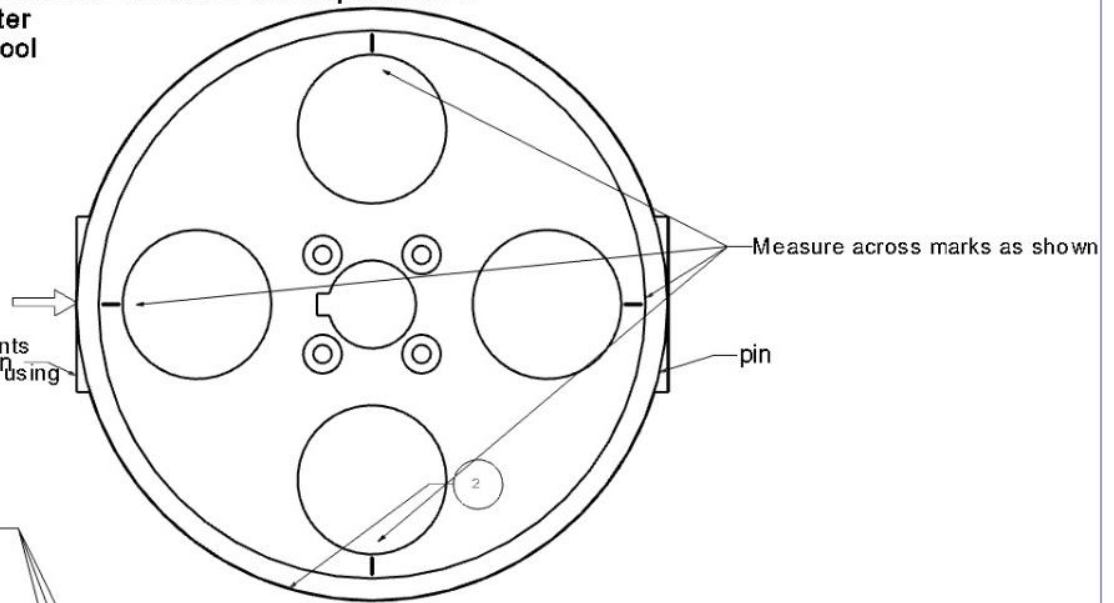
2 methods can be used to measure the capstan size

- 1 - using a micrometer
- 2 - using a Zephyr Tool

Zephyr Tool Method

If using the ZT-029-00
Measure the reduction in radius (rr)

This methods measures the Average wear of the capstans by averaging all the measurements and calculating The average PD using a spreadsheet approach



Measure at 3 grooves at 4 points with .175 pins as shown

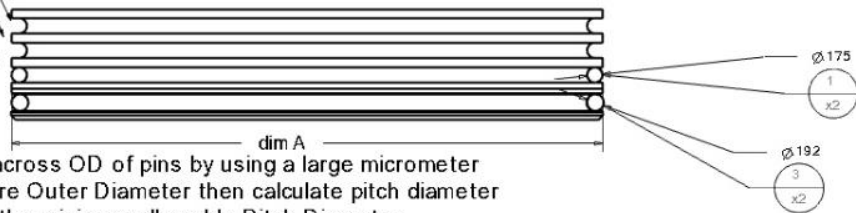
Groove Designations

- Groove #1 Outer
- Groove #2 Middle
- Groove #3 Inner

6" to 7" Micrometer Method

Measure dim A across OD of pins by using a large micrometer & directly measure Outer Diameter then calculate pitch diameter and compare to the minimum allowable Pitch Diameter.


Start with the inner groove #3 first at 4 locations to determine overall condition of the remaining grooves



Measure steel groove with .192 pin

Item	Qty	PartNumber	PartName	Rev
1	2	88917505	Gauge Pin -.175	
2	1	ZGS-10506-1	Compound Capstan 4 grooves	F
3	2	88919204	Gauge Pin -.192	

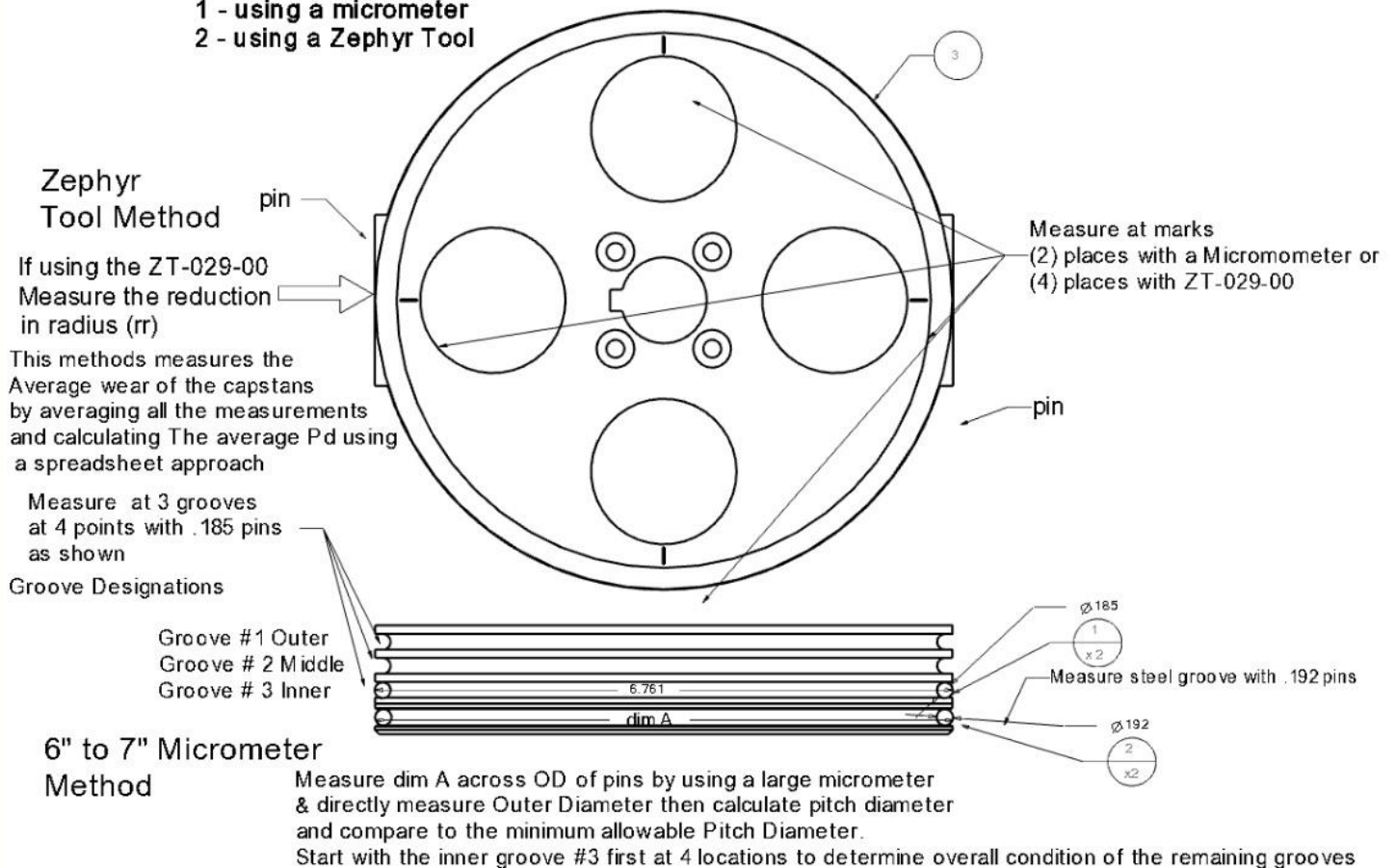
Figure 60 Measuring ZGS-10506-1 Capstan

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Measuring ZGS-10892-1 Capstan


2 methods can be used to measure the capstan size

- 1 - using a micrometer
- 2 - using a Zephyr Tool



Item	Qty	Part Number	Part Name	Rev
1	2	88918503	Gauge Pin - .185	
2	2	88919204	Gauge Pin - .192	
3	1	ZGS-10892-1	Compound Capstan .185 4 grooves	A

Figure 61 Measuring ZGS-10892-1 Capstans

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NOTE

All capstans have the same pitch diameter.



Capstan Measuring Pin Guide for 3 groove capstans


Cable Diameter	Upper Capstan Part Number	Measurement Pin Diameter	Minimum Dimension Over Pin
3/16 inch	ZGS-10113-20	.185	6.745 in
4.5 mm	ZGS-12474-2	.175	6.725 in
5/32 inch	ZGS-10113-30	.156	6.715 in
3.5 mm	ZGS-10340-1	.132	6.695 in
1/8 inch	ZGS-10113-40	.120	6.685 in

Cable Diameter	Lower Capstan Part number	Measurement Pin diameter	Minimum Dimension over pin
3/16 inch	ZGS-10113-20-1	.185	6.745 in
4.5 mm	ZGS-12474-1	.175	6.725 in
5/32 inch	ZGS-10113-30	.156	6.715 in
3.5 mm	ZGS-10340-1	.132	6.695 in
1/8 inch	ZGS-10113-40	.120	6.685 in

Figure 62 Capstan Measuring table

4 groove capstans

Cable Diameter	Capstan Part Number	Measurement Pin diameter	Minimum dimension over pin
4.5 mm	ZGS-10506-1	.175	6.725 in
3/16 in	ZGS-10892-1	.185	6.745 in
Steel Groove	ZGS-10892-1	.192	6.760
	ZGS-10506-1		

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7.7 Changing the Capstans

7.7.1 Changing (3) Groove (On Condition)

NOTE

The Capstans need to be changed if they show signs of wear or if a different size cable is to be serviced.
The Capstans have to be changed to accommodate the different cable diameters.

- Step 1** Open the capstan cover.
- Step 2** Remove the (4) 10-32 x 1-1/4 screws from the upper Capstan.
- Step 3** Remove the old capstan verifying the .7 Key has remained in its location.
- Step 4** Remove (4) 10-32 x 1-1/4 screws from the lower Capstan.
- Step 5** Remove the old capstan verifying the .8 Key has remained in its location.
- Step 6** Install new upper capstan using the original hardware.
- Step 7** Install new lower capstan using the original hardware.







	<p>Open the cover and remove the (4) 10-32 x 1-1/4 screws from the upper capstan. Remove old capstan</p>		<p>Verify the .7 Key has remained in its location</p>		<p>Install new upper Capstan (Orange) and attach using the (4) 10-32 x 1-1/4 screws</p>
	<p>Remove (4) 10-32 x 1-1/4 screws from the Lower Capstan (Black) And remove old Capstan</p>		<p>Verify the .8 Key has remained in its location</p>		<p>Install new lower capstan (Black) and attach using the (4) 10-32 x 1-1/4 screws</p>

Figure 63 Changing Capstans

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7.7.2 Changing the Capstans (4) Groove (*On Condition*)

- Step 1** Open the capstan cover.
- Step 2** Remove the (4) 10-32 x 1-1/4 screws from the upper Capstan.
- Step 3** Remove the old capstan verifying the .7 Key has remained in its location.
- Step 4** Remove (4) 10-32 x 1-1/4 screws from the lower Capstan.
- Step 5** Remove the old capstan verifying the .8 Key has remained in its location.
- Step 6** Install new upper capstan using the original hardware.
- Step 7** Install new lower capstan using the original hardware.

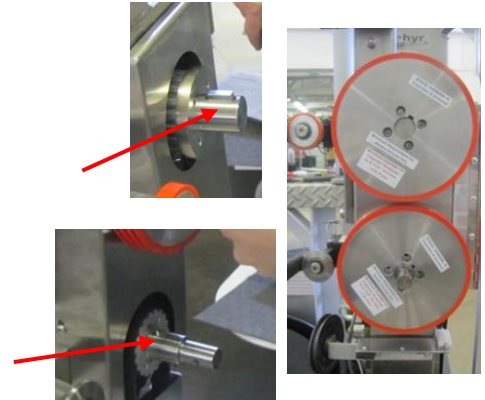


Figure 64 Capstan Keys

7.8 Lubridryer Bushings: Replacement Process (*On Condition*)

- Step 1** Open the Lubridryer.
- Step 2** Unscrew the four thumbscrews.
- Step 3** Remove the two Lubridryer bushings containing the thumbscrews.
- Step 4** Insert new bushings into the Lubridryer using the thumbscrews to tighten.



Figure 65 Bushing & thumbscrews

7.9 Lubridryer pads: Changing Process (*Daily*)

NOTE

If the cable needs to be lubricated, per the Hoist Manufacturer's recommendations, soak the front Lubridryer pad in oil before installing it.


- Step 1** Open the Lubridryer.
- Step 2** Unscrew the four thumbscrews.
- Step 3** Remove the two Lubridryer bushings containing the thumbscrews.
- Step 4** Remove the old Lubridryer pads.
- Step 5** Insert new pads
- Step 6** Install the Lubridryer bushings using the thumbscrews to tighten.



Figure 66 New Pads Installed

NOTE

When oil is added to the reservoir, it seeps through one small hole to lubricate the rear pad.

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Step 7 Install the new pads.

Step 8 Replace the bushings and tighten the thumbscrews.

Step 9 If lubrication is required, open the oil passage by turning the shut off valve (red wing screw) three turns counterclockwise.

Step 10 If applicable, wipe excess oil off of the frame and use a clean cloth to keep the oil off of the Capstans when the RHGSE is not in use.

NOTE

To stop the oil lubrication, turn the shut off valve (red wing screw) three turns clockwise to close the oil passage when not in use.




Figure 67 New Pads Installed

7.10 Capstan drive chain oiling

Drip a few drops of MIL-L23699 on the upper capstan chain through the small hole in the upright bracket base.



Figure 68 Oil the Chain

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7.11 Removing the chain and belt guards

Step 1: Remove the lower capstan and upper capstans using the same procedure, retain hardware for reassembly.

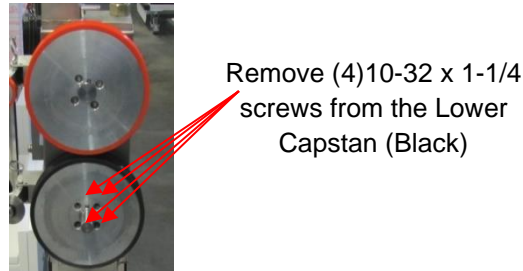



Figure 69 Remove the Capstans



Figure 70 Retain the Keys

Step 2: Remove the Chain Guard and Capstan Cover by removing the four screws. Retain hardware for reassembly.

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Step 3: Next remove the limit switch assembly and the (4) screws for the Vertical Belt cover. Retain hardware for reassembly.

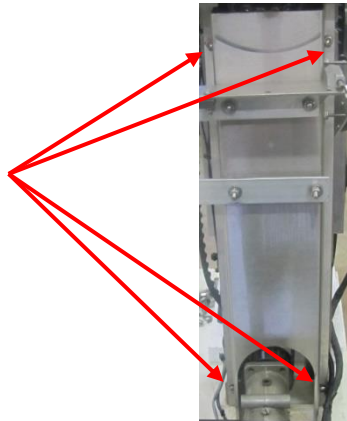


Figure 71 Remove the Vertical Belt Cover



Limit switch assembly

Figure 72 Remove capstan cover limit switch


Step 4: Remove Load Adjuster by rotating counter clockwise until free from Brake Handle Pin. Gently slide Load Adjuster out of Brake Handle Stud.

Step 5: Remove the load cell and clevis assembly by removing the (2) 5/16-18 x 1 bolts and washers holding the load brake reaction plate to the upper and lower heads. Gently slide Brake Band off of Brake Drum when removing Load Brake Reaction Plate assembly. Retain hardware for reassembly.

Step 6: Remove (2) 3/4-10 Stainless Steel jam nuts from top of Rocker Switch Cover and carefully remove cover. Now the adjustment nuts are accessible to tension vertical belt and drive chain. Retain hardware for reassembly.

NOTE

To make any adjustments to the chain or vertical drive belt, it requires the loosening and adjusting of the eight (8) nuts from the top of the upright assembly. When making adjustments, always loosen the large nuts on the threaded rod from the top down and then tighten from the bottom while checking the belt or chain for proper tension. Once tensioning has been completed, re-assemble all components before operating.

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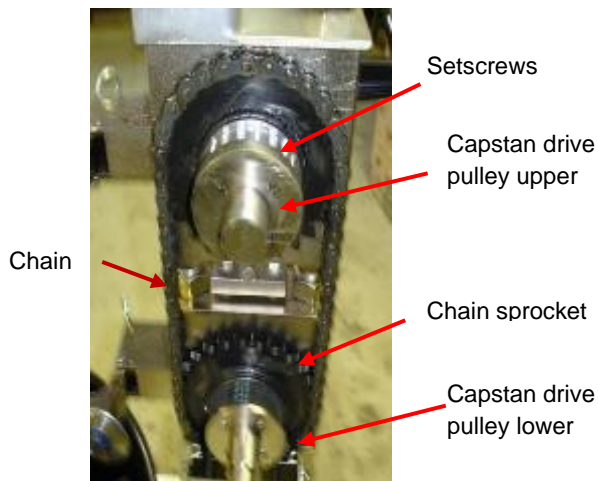


Figure 73 Adjust Chain Tension

Large nuts for threaded rod

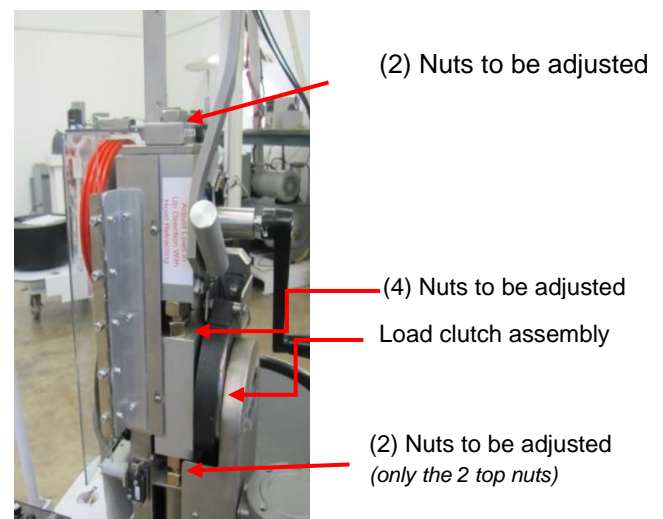


Figure 74 Adjusting the heads

7.12 Vertical Drive Belt Adjustment

Step 1: Adjust the (2) upper nuts below the lower capstan head to increase or decrease belt tension. Adjust the lower capstan head upwards to obtain approximately 1/4 of an inch deflection at 2lbs. of force at the midpoint between the two pulleys.

Step 2: Tighten (2) lower nuts above lower capstan head to 100ft./lbs.

Step 3: Reinstall belt guard cover

7.13 Vertical Drive Belt Replacement, ZGS-10040-1

Step 1: With appropriate covers and parts removed (see section 7.11), lower the lower capstan head enough that the vertical drive belt can be removed and replaced.

Step 2: Refer to section 7.12 to tension new belt.


7.14 Drive Chain Adjustment

NOTE

Ensure that vertical drive belt has been tensioned (see 7.13) prior to adjusting Drive Chain.

Step 1: Adjust the (2) upper nuts below the upper capstan head to increase or decrease chain tension. Adjust the upper capstan head upwards to obtain approximately 1/32 of an inch deflection at 1lb. of force at the midpoint between the sprockets.

Step 2: Tighten (2) upper nuts above upper capstan head to 115ft./lbs.

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Step 3: Reinstall load and clevis assembly to upper and lower capstan heads by carefully slide brake band over brake drum. Install and tighten (2) 5/16-18 x 1 hex bolts with lock washers and washers. Carefully slide load adjustment knob through brake handle stud and thread into brake handle pin.

Step 4: Gently place rocker switch housing onto upper head and tighten (2) 3/4-10 jam nuts retained from prior removal.

7.15 Reinstalling the Chain and Belt Guards

Step 1: Reinstall any shims that may have fallen off during chain cover removal. Install the Chain Guard by spreading the cover over the shims that are glued to the heads. Install (4) 10-32 x 3/8 screws retained from prior removal.

Step 2: Place Vertical Belt Guard against upper and lower angle brackets. Install with (4) 10-32 x 3/8 screws retained from prior removal.

Step 3: Place limit switch assembly onto studs on side of Vertical Belt Guard and secure with (2) 6-32 locknuts retained from prior removal. Note: adjustment may be required once all removed parts are reinstalled and machine is powered.

Step 4: Reinstall upper and lower capstans with their respective keys (short key for upper capstan and longer key for lower capstan). Install using (8) 10-32 x 1-1/4 screws retained from prior removal.

7.16 Rotatub Drum Drive Belt Adjustment

Step 1: Loosen the two screws, located underneath the base, which hold the AngleGear assembly to the base.

Step 2: Adjust the belt adjusting screw to obtain 1/16 of an inch deflection with 2lbs. of force at the midpoint between the pulleys.

Step 3: Tighten the two screws to secure AngleGear assembly to base.


7.17 Electric Drive Belt adjustment

NOTE

Perform the following steps for one piece side of Electric Drive Belt Cover. For serial numbers E00190218 and above that have a Split Cover, remove Cover Half where A/C power plug locates then proceed to Step 5.

The Electrical Belt Guard was modified to be a two-piece design to allow removing the cover in order to adjust the belt much easier.

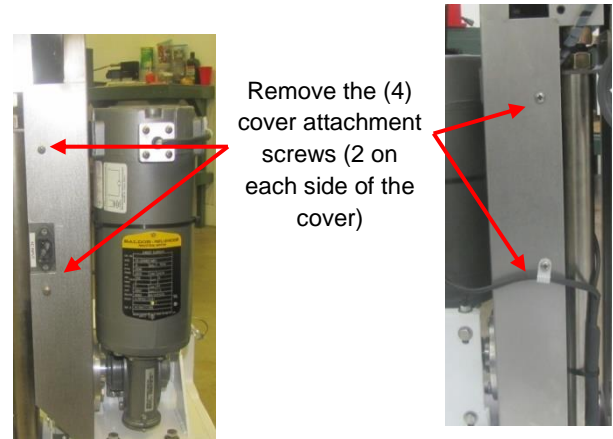
Step 1: Remove the (4) 10-32 x 3/8 cover attachment screws (2 on each side of cover). Retain for reassembly.

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Step 2: Remove the (4) 5/16-18 motor mount screws that hold motor mount to the base. Retain for reassembly. Do not loosen belt adjustment screws.

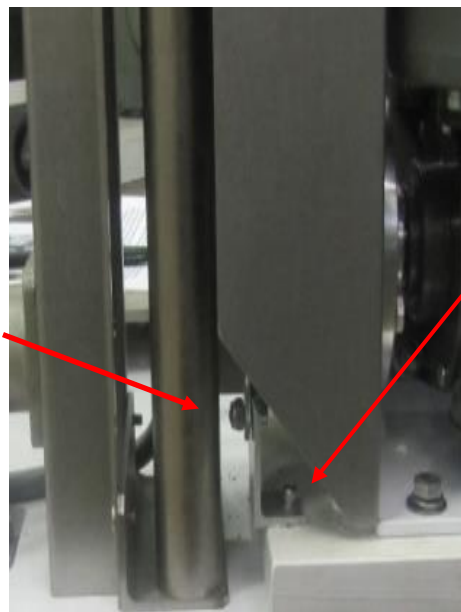
Step 3: Remove the clutch bracket screw then rotate the clutch bracket upward and move the motor back slightly from the cover. Do not remove bracket screw and nut from the clutch.

Step 4: Reinstall the (4) 5/16-18 motor mount screws and tighten motor mount to base.



Remove the (4) cover attachment screws (2 on each side of the cover)

Figure 75 Remove the electric drive cover




Do not tighten

To remove the cover, the easiest method is to remove the clutch bracket 10-32 screw & nut.

Figure 76 Remove the clutch bracket



The Retaining screw that prevents the clutch from rotating must be left loose or it will bind the clutch.

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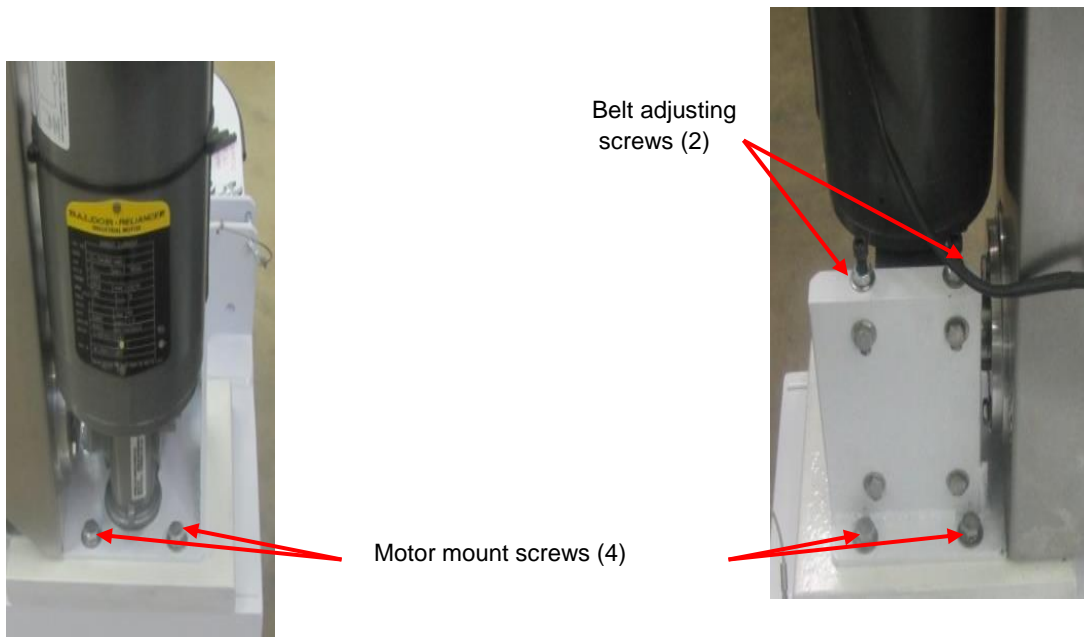


Figure 77 Adjusting the belt tension

Rotate the clutch bracket upward and move the motor back slightly from the cover.

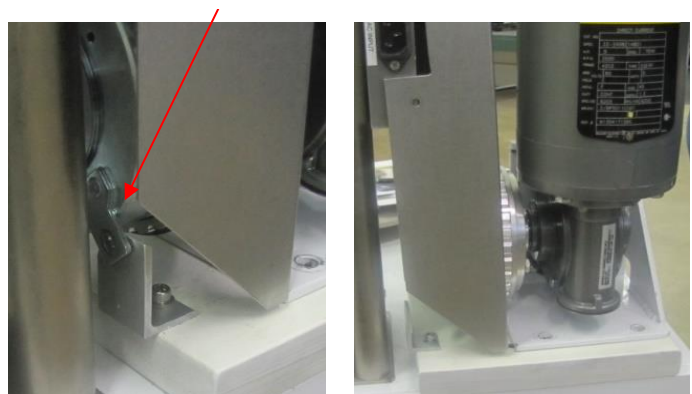



Figure 78 Remove Cover to set tension (s/n E00190218 and prior)

Step 5: For serial numbers **below** E00341019 loosen (4) nuts and bolts on the side of motor mount. For serial numbers E00341019 and **above** loosen (4) bolts on the side of the motor mount.

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Step 6: Loosen jam nut, if applicable, and tension belt adjusting screws on top of motor mount to obtain 1/4 of an inch deflection with 2lbs. of force. Retighten jam nuts, if applicable once belt has been tensioned.

Step 7: Retighten (4) bolts or (4) nuts and bolts to secure motor to mount.

For serial numbers E00190218 and later that have a Split Cover, proceed to Step 11.

Step 8: Remove the (4) 5/16-18 motor mount bolts that hold motor mount to the base. Do not loosen belt adjustment screws.

Step 9: Place Electric Drive Belt Cover against Brake Drum. Rotate the clutch bracket upward and move the motor slightly towards the cover. Reinstall clutch bracket to base with clutch bracket screw.

Step 10: Reinstall the (4) 5/16-18 motor mount bolts and tighten motor mount to base.

Step 11: Reinstall the (4) 10-32 x 3/8 cover attachment screws for single piece cover or (2) for Split Cover.




Split Cover

Figure 79 Split DC Drive Belt Cover

7.18 Electric Drive Belt Replacement

NOTE

Perform the following steps for one piece Electric Drive Belt Cover. For serial numbers E00190218 and later that have an Electric Drive Belt Split Cover, remove and retain cover hardware and covers then proceed to Step 4.

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Step 1: Remove the (4) 10-32 x 3/8 cover attachment screws (2 on each side of cover). Retain for reassembly.

Step 2: Remove the (4) 5/16-18 motor mount screws that hold motor mount to the base. Retain for reassembly. Do not loosen belt adjustment screws.

Step 3: Remove the clutch bracket screw then rotate the clutch bracket upward and move the motor back slightly from the cover. Do not remove bracket screw and nut from the clutch. Electric Drive Belt Cover can now be removed.

Step 4: Disconnect the Electric Clutch connector and gently bring inside of the belt towards the motor. For serial numbers S/N E0033xxxx and prior, lift motor mount upwards and remove belt from upper pulley and Electric Drive Clutch pulley.

For serial numbers S/N E00341019 and later, remove (4) bolts and washers from side of motor mount. Retain for reassembly. Slide clutch tab off of clutch bracket screw, lift motor assembly and remove belt from Electric Drive Pulley and upper pulley.

Step 5: For serial numbers S/N E0033xxxx and prior, lift motor mount upwards and place belt onto upper pulley then Electric Drive Clutch pulley. Ensure clutch wires are outside of belt away from motor. Reinstall (4) 5/16-18 motor mount screws and tighten to motor mount base.

For serial numbers S/N E00341019 and later, lift motor mount upwards and place belt onto upper pulley and Electric Drive Clutch pulley then slide clutch tab onto clutch bracket upper screw. Ensure clutch wires are outside of belt away from motor. Reinstall (4) 5/16-18 screws to side of motor mount.

Step 6: Reconnect Electric Clutch connector.

Step 7: Check Electric Drive Belt tension and refer **7.17 Electric Drive Belt Adjustment** steps 6 and 7 to adjust if necessary.

For serial numbers E00190218 and later that have a Split Cover, proceed to Step 11.

Step 8: Remove the (4) 5/16-18 motor mount bolts that hold motor mount to the base. Do not loosen belt adjustment screws.

Step 9: Place Electric Drive Belt Cover against Brake Drum. Rotate the clutch bracket upward and move the motor slightly towards the cover. Reinstall clutch bracket to base with clutch bracket screw.


Step 10: Reinstall the (4) 5/16-18 motor mount bolts and tighten motor mount to base.

Step 11: Reinstall the (4) 10-32 x 3/8 cover attachment screws for single piece cover and both cover halves and (4) 10-32 x 3/8 cover attachment screws for split Electric Drive Belt Cover.

7.19 Drum Drive belt replacement

Step 1: Loosen the two screws that hold the AngleGear assembly to the base.

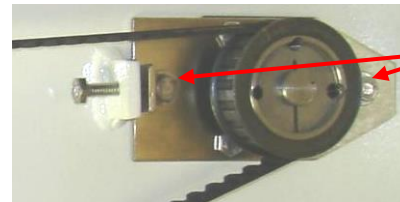
Step 2: Turn the Drum belt adjusting screw so as to loosen up the Drum drive belt to remove and replace.

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AngleGear Assembly

Figure 81 AngleGear Location



Loosen these screws to adjust or replace the Brake Drum

Figure 80 AngleGear Adjustment

7.20 Scaling the old Load Indicator

The load Indicator is for reference only. It is adjusted when new and should not require precise calibration. The load cell display can be checked as required by adjusting the load adjuster until the RHGSE just starts to lift off of the ground.

If the indication is not close to the weight marked on the base the display can be adjusted by turning the span screw on the display face. Turning the span screw clockwise increases the displayed reading and counter clockwise decreases the displayed reading.

Once the maximum load (span) is adjusted then the zero displayed reading should be rechecked. This is accomplished by moving the Brake Handle to the unlocked position and with no load being applied to the cable, adjust the zero screw to achieve 0000 on the indicator.

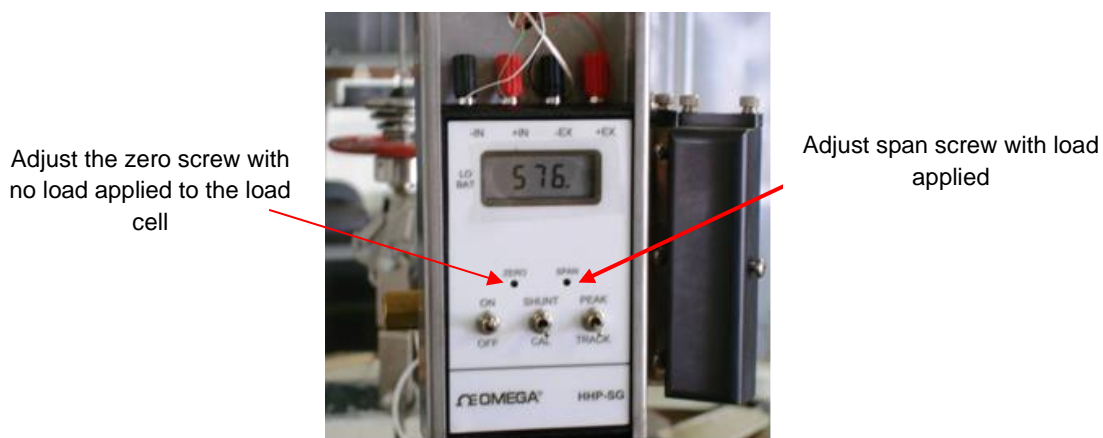




Figure 82 Adjusting the Load Indicator

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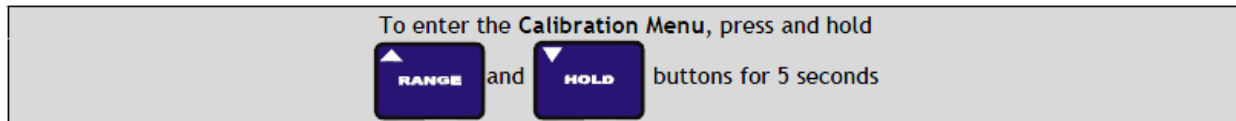
7.21 Scaling the new style Load indicator


Step 1: Set up and attach the cable to the RHGSE

Step 2: For Electric RHGSE, activate the extend switch and slowly extend the cable to full out. Turn off the extend switch. For Manual RHGSE, begin extending the cable and grasp the manual hand crank handle and rotate clockwise as the cable pays out keeping time with the speed of the cable.

Step 3: Hold  for 3 seconds to turn on display.

Step 4: Press the **RANGE** and **HOLD** buttons for 5 seconds. SEnS 5.0 will be displayed, press **VALLEY**



Step 5: SEt rES is displayed, press 

Step 6: Use arrow buttons to change value to **00000.0**. Press **RANGE** and **HOLD** together to move decimal. Press **PEAK**

Step 7: CALibrAt is displayed, press **PEAK**

Step 8: Live? is displayed, press **PEAK**

Step 9: uSE SC? is displayed, press **VALLEY**

Step 10: Ensure brake handle is disengaged and no load is on the cable and cable is slack.

Step 11: APPLY LO is displayed, wait 3 seconds then press **PEAK**


Step 12: dISP LO. is displayed, press **PEAK** then use arrow buttons to enter value of all "0"s. Press **PEAK**

Step 13: APPLY HI is displayed, slowly retract, apply brake handle and increase load until the RHGSE just lifts off the ground. Maintain for 3 seconds, then press **PEAK**

Step 14: dISP HI is displayed, press **PEAK** and use arrow buttons to enter load value of **(load marked on the RHGSE frame label in lbs. or Kg.)**, while the high stimulus is still applied to the sensor.

Step 15: Done is displayed, press **PEAK** to store

Step 16: Finish retracting cable at **100 lbs. or 45.35 Kg** load.

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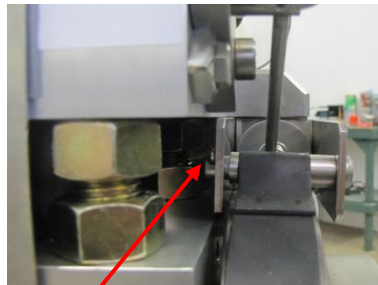
7.22 Brake Band removal and installation

Step 1: Remove the Electric Drive Belt Cover as per section 7.17.

Step 2: Remove the cotter pin from the load cell clevis pin as shown in picture below.

Step 3: Unscrew the load adjuster completely from the Brake Pin, and remove the Brake Band assembly.

Step 4: Then carefully work the clutch band and load adjuster pin off of the Brake Drum



Cotter pin

Figure 83 Remove Cotter Pin

Step 5: To install insert the Brake Pin into the brake band and slip the brake band onto the Brake Drum.

Step 6: Install the Load Cell Clevis Pin and the Thick and Thin Spacers into the Brake Band as shown below.

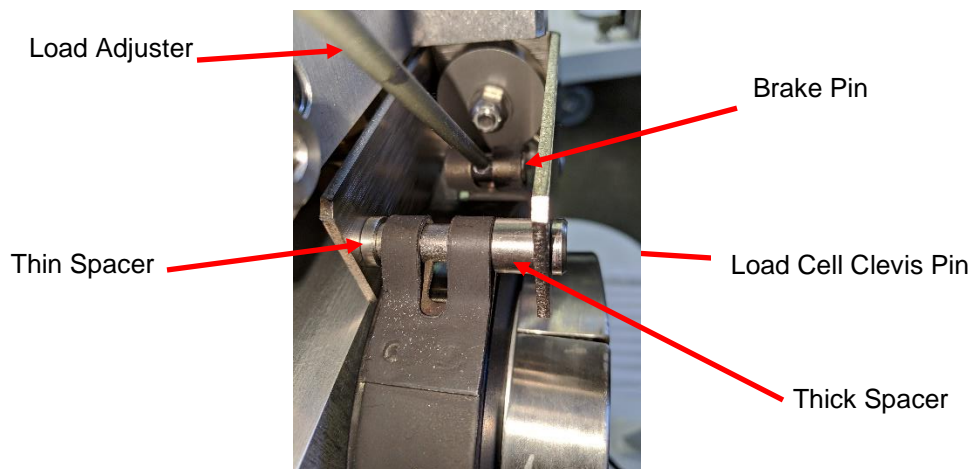



Figure 84 Remove Load Adjuster and Brake Pin

Step 7: Install the Load Adjuster through the Brake Handle Stud on the Brake Handle and use light grease on the load adjuster shaft where it passes through the Brake Handle Stud.

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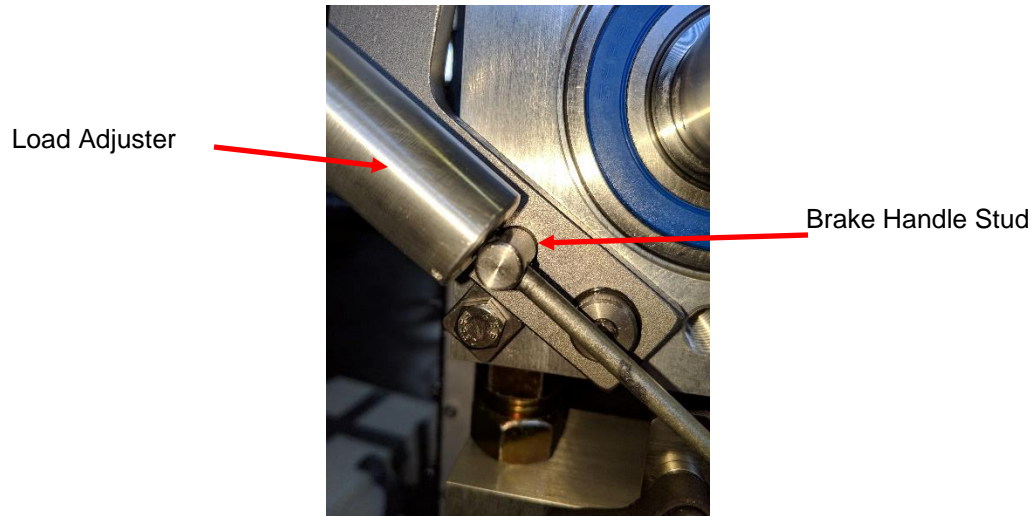


Figure 85 Brake Handle Stud and Load Adjuster

Step 8: Install the Electric Drive Belt Cover

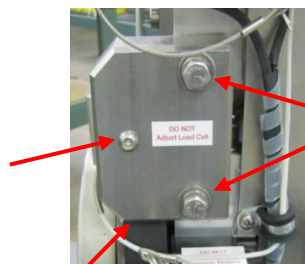
7.23 Load Cell Assembly removal and installation

If the clevis and through hole load cell are disassembled, then the load display will need to be readjusted. It is not required to remove the load cell or the attachment bolt unless the Load Cell is to be replaced.

Remove the two Hex Bolts as shown below.




Do not loosen or adjust this bolt. The load cell is carefully scaled. This tension is set by Zephyr. If it is adjusted, the load meter will have to be rescaled.



Remove these bolts to remove load cell assembly

Load Cell Assembly

Figure 86 Removing the Load Cell Assembly

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7.24 Check and tighten Brake Handle Pivot Bolt

The pivot bolt on the Brake Handle must be tight to 132 in/lbs. Excessive vibration when retracting at higher loads can result.

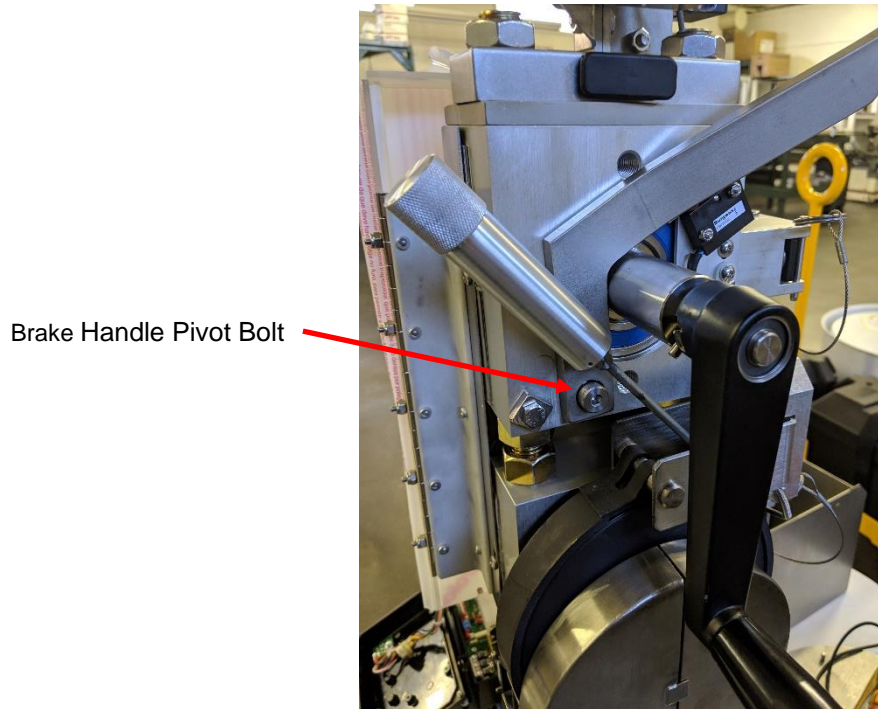


Figure 87 Brake Handle Pivot Bolt


7.25 Check Limit Switch Operation

Ensure the area around the RHGSE is clear and nothing is sitting on the Rotatub or attached to the capstans.

Actuate the Extend Switch and open the clear capstan cover, the machine should operate with the cover closed and it should stop when the Capstan Cover is opened.

Actuate the Extend Switch with the Brake Handle disengaged, apply the Brake Handle and Rotatub should stop operation.

If either of these checks fail to shut off the RHSGE, the limit switch in question should be readjusted or replaced.

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7.26 Inspect the Brake Band

The brake operation should be smooth. Check the pivot bolt is tight per section 7.24. Check the brake band to ensure the surface is smooth and no foreign material has become embedded into the brake material. If there is any disbanding or cracking of the brake material it must be replaced. The minimum brake band thickness is .160 as shown in Figure 88.

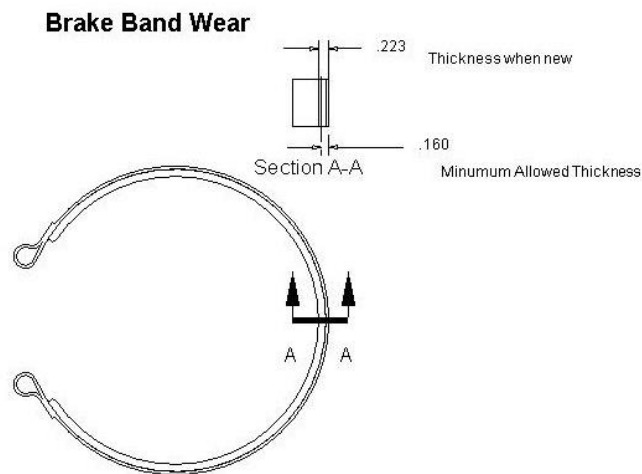



Figure 88 Brake Band Wear Limit

7.27 Check the Brake Drum

The brake operation should be smooth. Check the pivot bolt is tight. Check the Brake Drum to ensure the surface is smooth and no foreign material has become embedded into the Brake Drum surface.

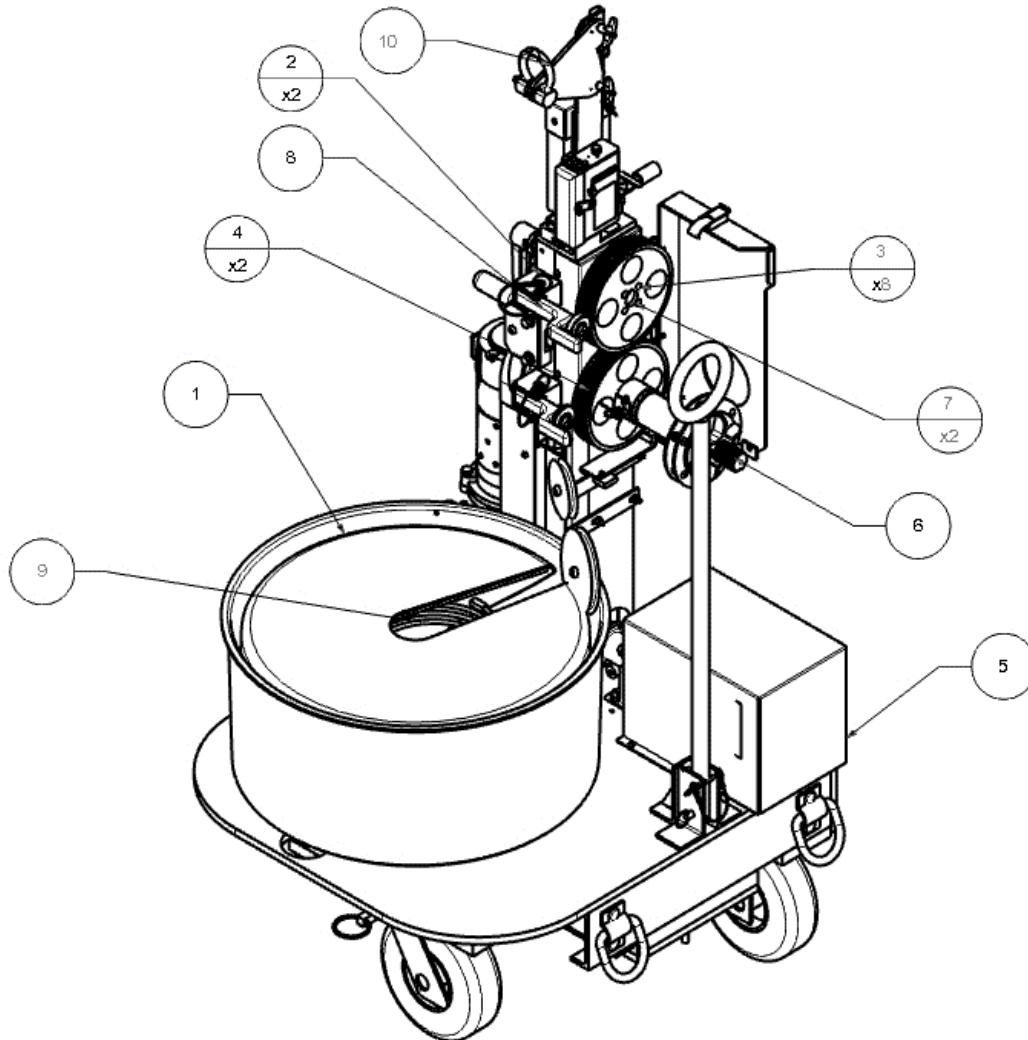
7.28 Replace the Exit Roller

The Exit roller has a five-year service life. If it is damaged it must be replaced. Make note of the locations of the spacers and any shims and ensure they are replaced in the same relative location as originally installed.

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8.0 Illustrated Parts Breakdown

ZGS-11300-3

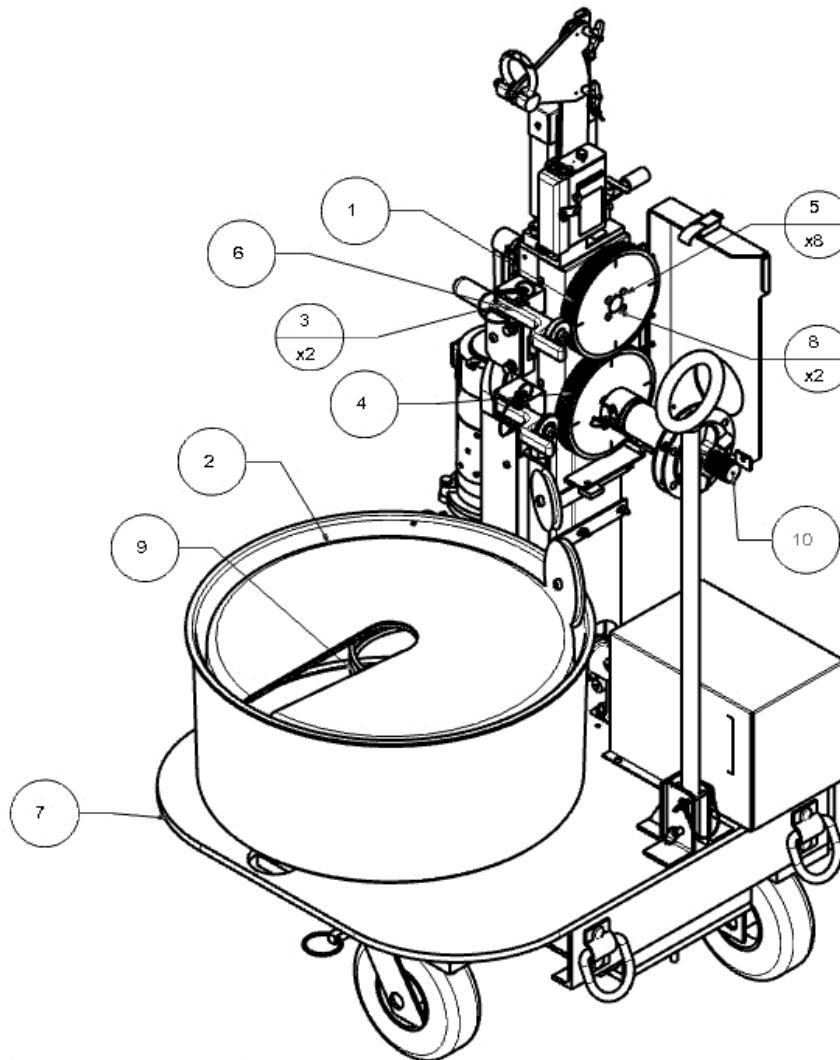


Item	Qty	PartNumber	PartName	Rev	Cage Code	NSN #
1	1	ZGS-10357-1	Spooler Basic	A	3CAT3	8130-01-630-3434
2	2	4883	.25-20 x .75 long SHCS		7HEQ0	
3	8	4876	10-32 x 1.25 SHCS		7HEQ0	
4	2	ZGS-10506-1	Compound Capstan 4 grooves	F	3CAT3	
5	1	ZGS-11500-1	Electrical GSE Subassembly	B	3CAT3	
6	1	ZGS-10794-1	Cable Reel Adapter Assembly	B	3CAT3	
7	2	ZGS-10123-3	Capstan Key		3CAT3	
8	1	ZGS-10628-1	Tensioner assy upper 4 Groove Roller	B	3CAT3	
9	1	ZGS-11390-1	Power Cord Electrical GSE		3CAT3	
10	1	ZGS-11443-1	Manual GSE Lifting Assembly	B	3CAT3	

Figure 89 Electric Rescue Hoist Ground Support Equipment with Four Groove Capstans


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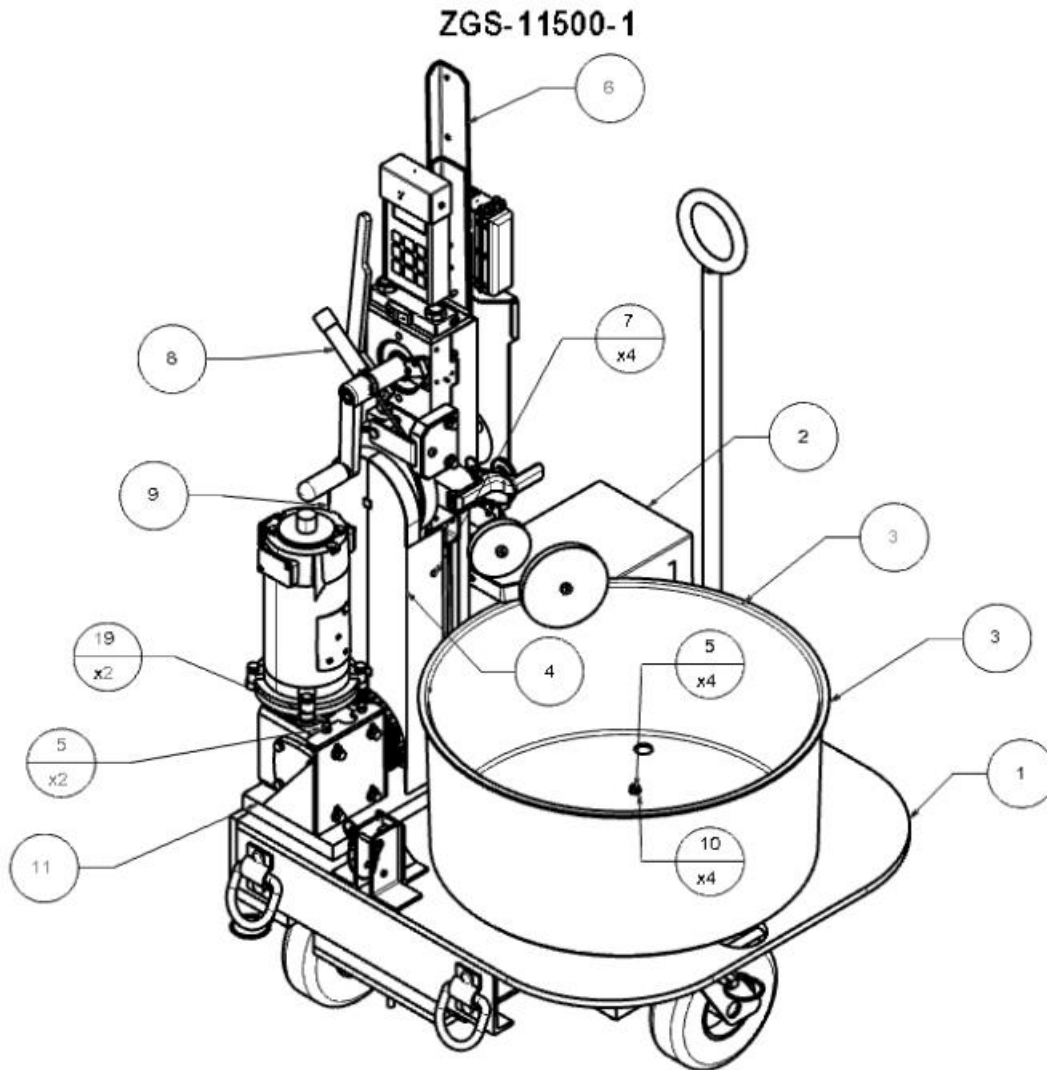
ZGS-11300-1



Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-10113-20	Capstan ML6	F	3CAT3	3950-01-566-0494
2	1	ZGS-10357-1	Spooler Basic	A	3CAT3	8130-01-630-3434
3	2	4883	.25-20 x .75 long SHCS		7HEQ0	
4	1	ZGS-10113-20-1	Capstan ML6-80	B	3CAT3	3950-01-610-3216
5	8	4876	10-32 x 1.25 SHCS		7HEQ0	
6	1	ZGS-10129-1	Tensioner assy upper		3CAT3	
7	1	ZGS-11500-1	Electrical GSE Subassembly	B	3CAT3	
8	2	ZGS-10123-3	Capstan Key		3CAT3	
9	1	ZGS-11390-1	Power Cord Electrical GSE		3CAT3	
10	1	ZGS-10794-1	Cable Reel Adapter Assembly	B	3CAT3	


Figure 90 Electric Rescue Hoist Ground Support Equipment with Three Groove Rollers

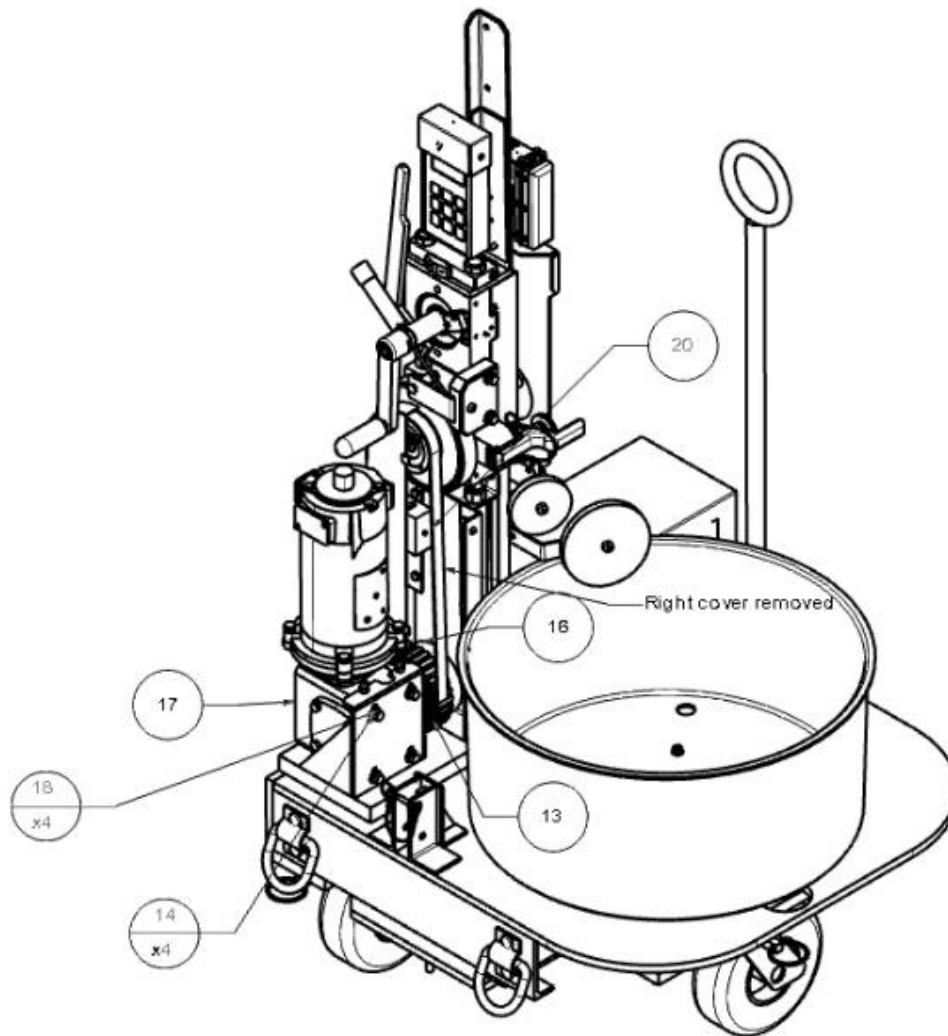
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Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-11489-1	Electrical GSE Base Assembly	A	3CAT3	
2	1	ZGS-11515-1	Cover Electrical Box	A	3CAT3	
3	1	ZGS-10022-1	Tub , GSE	C	3CAT3	5985-01-566-0497
4	1	ZGS-11495-1	Electric Belt Guard Right Side	A	3CAT3	
5	6	2554	.25 Lock nut		7HEQ0	
6	1	ZGS-10245-1	Upright Upper assembly	A	3CAT3	
7	4	1365	10-32 x .38 Pan Head Machine Screw		7HEQ0	
8	1	ZGS-11490-1	Electrical GSE Upright Assy		3CAT3	
9	1	ZGS-11494-1	Electric Belt Guard Left Side	B	3CAT3	
10	4	2947	.25 Flat Washer		7HEQ0	
11	1	ZGS--11521-1	Gearbox Mount		3CAT3	


Figure 91 Electrical GSE Subassembly

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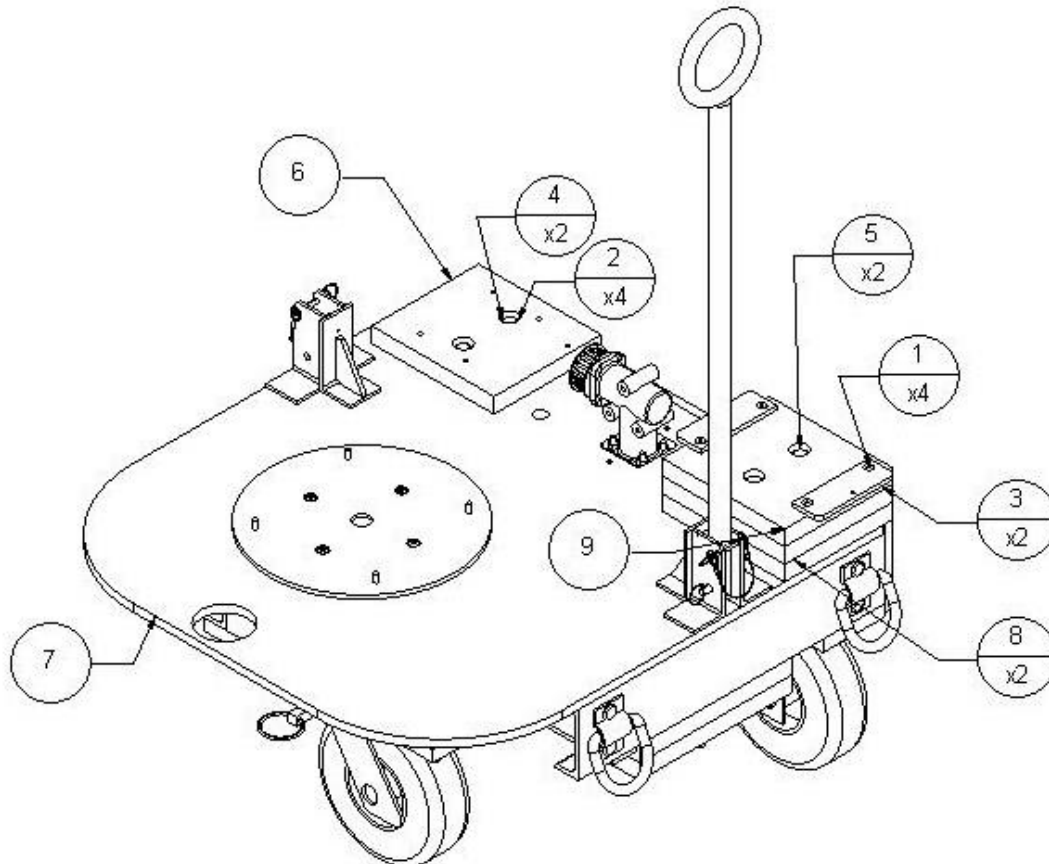


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
13	1	ZGS-11302-2	Electric Drive lower pulley 2			
14	4	143	.312 x .75 Hex Bolt		7HEQ0	
15	1	ZGS-11524-1	Electric GSE Controller Assy	A	3CAT3	
16	1	ZGS-11385-1	Clutch SC-425-14			
17	1	ZGS-10872-1	Motor and Gearbox Assembly	A	3CAT3	
18	4	2957	.312 Lockwasher		7HEQ0	
19	2	15090	.25-20 x 1 long SHCS			
20	1	ZGS-11304-3	Electric Drive Belt .5 hp		3J454	

Figure 92 Electrical GSE Assembly continued


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ZOM-11300-X	C	Operation & Maintenance Manual	03-April-2019	26-August-2021	

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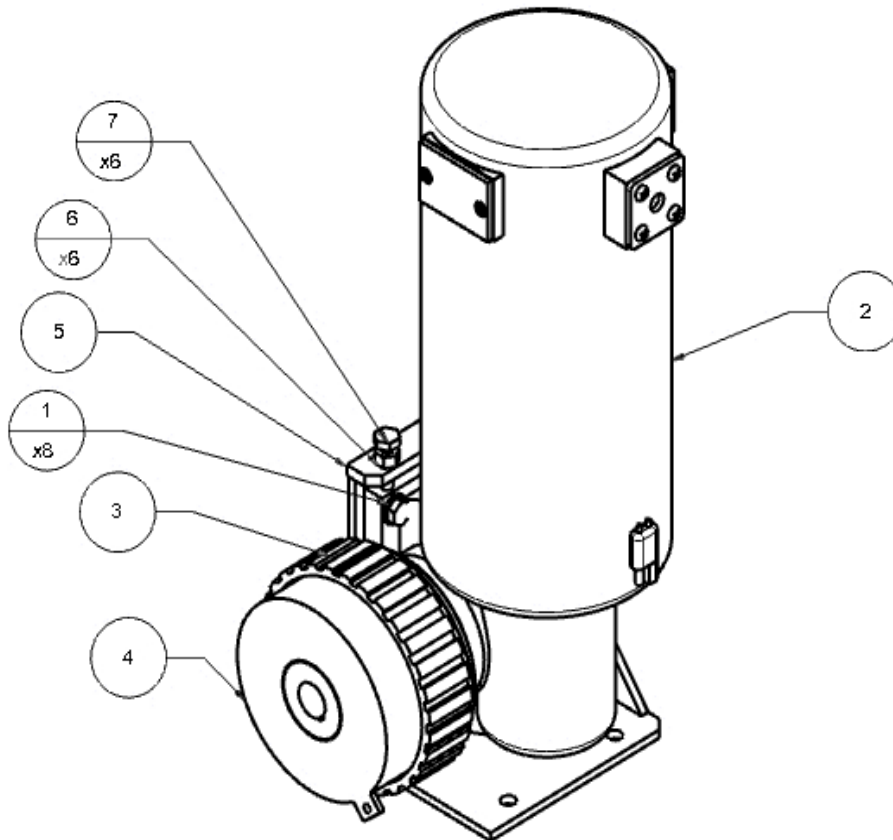


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	4	1279	.25-20 Flat Head .75 long		7HEQ0	
2	4	2556	.38 locknut		7HEQ0	
3	2	ZGS-10502-1	Electrical controller mount		3CAT3	
4	2	617	3-8 Bolt 2 inch long		7HEQ0	
5	2	623	3-8 Bolt 4 inch long		7HEQ0	
6	1	ZGS-11097-3	Ballast 1B tapped		3CAT3	
7	1	ZGS-11127-1	Base Tripod	D	3CAT3	
8	2	ZGS-11097-2	Ballast 1B		3CAT3	
9	1	ZGS-11097-4	Ballast 1B Controller Mount		3CAT3	

Figure 93 Electrical GSE Base Assembly


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ZGS-11499-1



Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	8	2947	.25 Flat Washer		7HEQ0	
2	1	ZGS-11482-1	Electric Motor Assembly .5 Hp		3CAT3	
3	1	ZGS-11302-2	Electric Drive lower pulley 2	A	3CAT3	
4	1	ZGS-11385-1	Clutch SC-425-14	A	3CAT3	
5	1	ZGS-11333-2	Right Angle Motor Mount Weldment .5 Hp motor		3CAT3	
6	6	2554	.25 Lock nut		7HEQ0	
7	6	130	.25 x 1 cap screw		7HEQ0	

Figure 94 Electrical GSE Motor Assembly

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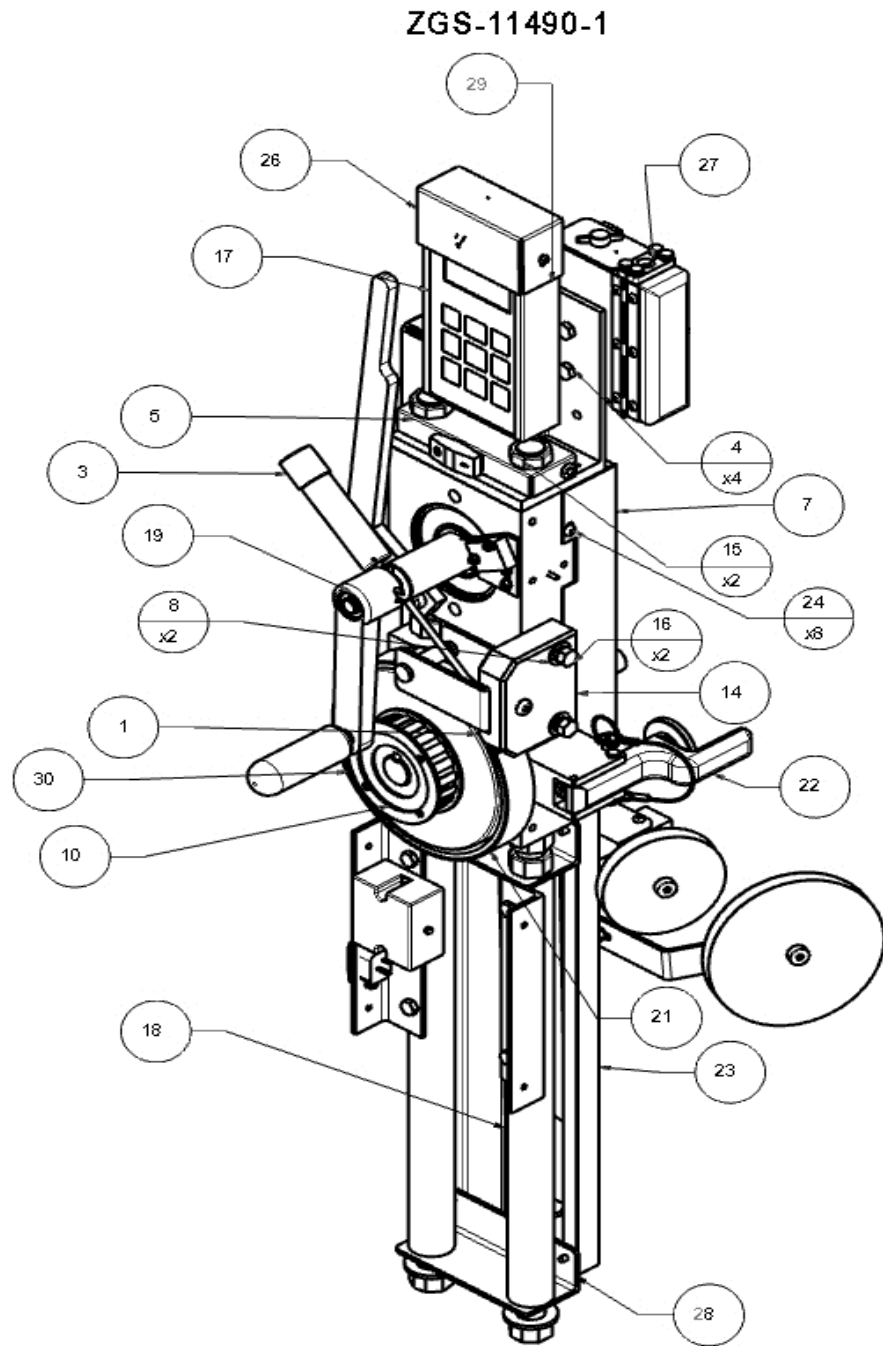



Figure 95 Electrical GSE Upright Assembly


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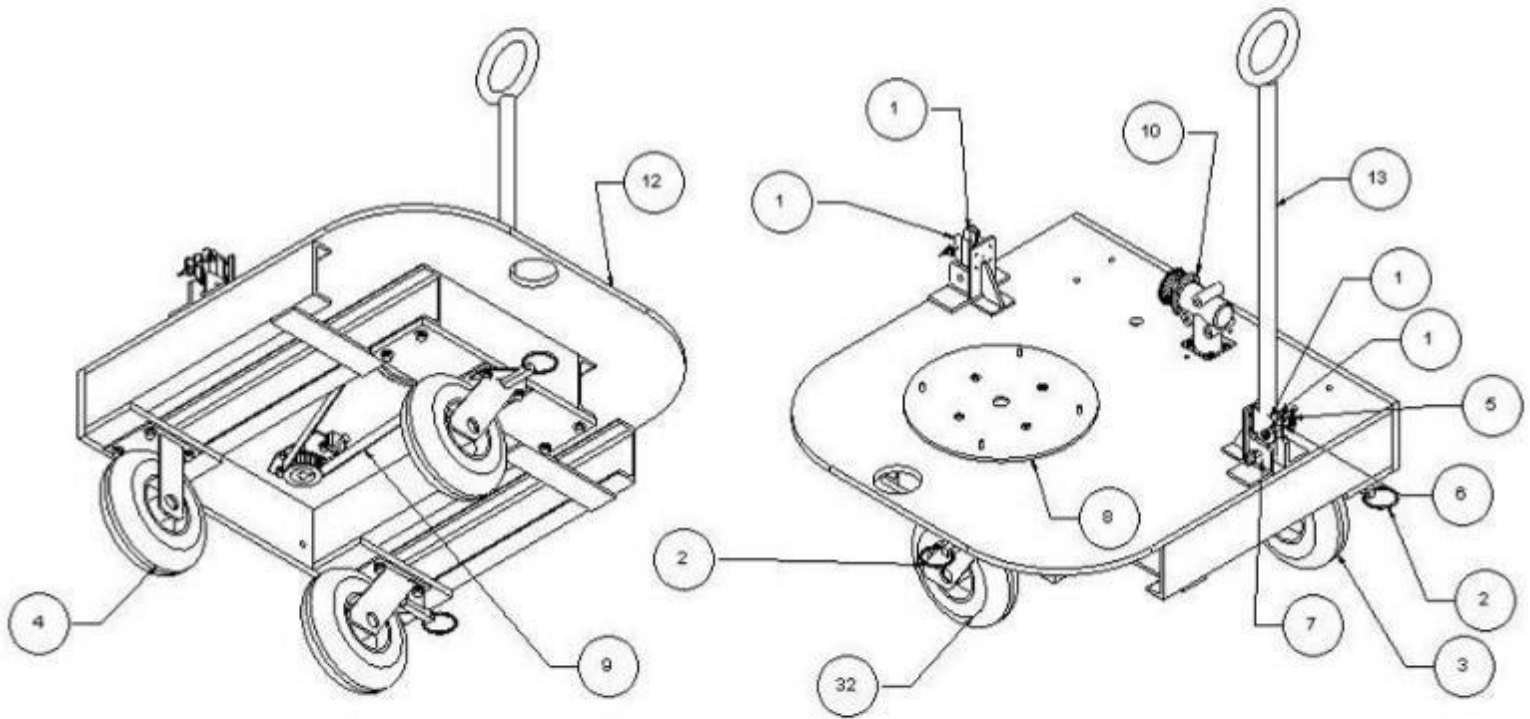
Item 31 can be either HHP-SG or 9320-1

Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-11056-1	Brake Pin	C	3CAT3	
2	2	4883	.25 SHCS .75 long		7HEQ0	
3	1	ZGS-11109-1	Load Adjuster Assy	E	3CAT3	
4	4	129	.25 x .75 capscrew		7HEQ0	
5	1	ZGS-11397-1	On -Off Rocker Switch Assembly		3CAT3	
6	1	32828238	Grommet .25 ID		3CAT3	
7	1	ZGS-11064-2	Chain Guard Cover Assy Magnetic Latch		3CAT3	
8	2	2948	.312 Flat Washer		7HEQ0	
9	1	ZGS-11031-1	Lower head Assembly Manual Drive	B	3CAT3	
10	1	ZGS-11344-1	Electrical Upper Pulley Assembly	A	3CAT3	
11	8	2589	3-4-10 nut		7HEQ0	
12	1	ZGS-10107-1	Roller Chain	A	3CAT3	
13	2	2554	.25 Lock nut		7HEQ0	
14	1	ZGS-11138-1	Load Cell Assembly Manual	A	3CAT3	
15	2	4126	3-4-10 Jam nut		7HEQ0	
16	2	146	.312 x 1.5 Hex Bolt		7HEQ0	
17	1	ZGS-11118-1	Load Indicator Holder Assy	D	3CAT3	
18	1	464576	Drive Belt, Vertical		3J454	3030-01-566-0501
19	1	ZGS-11464-1	Upper Head Assembly Electrical GSE	A	3CAT3	
20	2	2957	.312 Lockwasher		7HEQ0	
21	1	ZGS-10369-1	Brake Band	C	3CAT3	
22	1	ZGS-10128-1	Tensioner Assy Lower	B	3CAT3	
23	1	ZGS-10045-1	Belt Guard and Cover Assembly	E	3CAT3	
24	8	1365	10-32 x .38 Pan Head Machine Screw		7HEQ0	
25	2	9632	6-32 Pan Head .18 long		7HEQ0	
26	1	ZGS-11117-1	Load Indicator Holder Lid	D	3CAT3	
27	1	ZGS-10048-2	LubriDryer Assembly Manual GSE	D	3CAT3	
28	1	ZGS-11519-1	Electrical GSE Support Assy		3CAT3	
29	1	ZGS-11520-1	Upright Bracket Assembly		3CAT3	
30	1	ZGS-10375-1	Capstan Cover Switch Assembly	A	3CAT3	
31	1	9320	Load Display Hand Held			

Figure 96 Electrical GSE Upright Assembly Bill of Material


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ZGS-11127-1



Item Number	Quantity	Part Number	Part Name	Revision	Comment
1	4	ZL-1031-1	Leg, Mounting Standoff		
2	2	ZGS-10314-1	Swivel Caster Lock		
3	2	ZGS-10144-2	Swiveling Tornado Caster		
4	1	ZGS-10143-2	Rigid Tornado Caster		
5	2	ZL-1037-1	Lanyard		
6	2	ZL-1036-1	ORP		
7	1	ZGS-11242-1	.38 Detent Pin 2 in long		
8	1	ZGS-10248-1	Infinitely adjustable platen assy		
9	1	ZGS-10025-1	Drive Belt, Drum		
10	1	ZGS-10013-1	AnglGear		
11	2	ZGS-10327-1	TowHandle Stop		
12	1	ZGS-11126-1	Base Weldment 4 Tripod		
13	1	ZGS-10111-1	TowHandle		

Figure 97 Base Tripod

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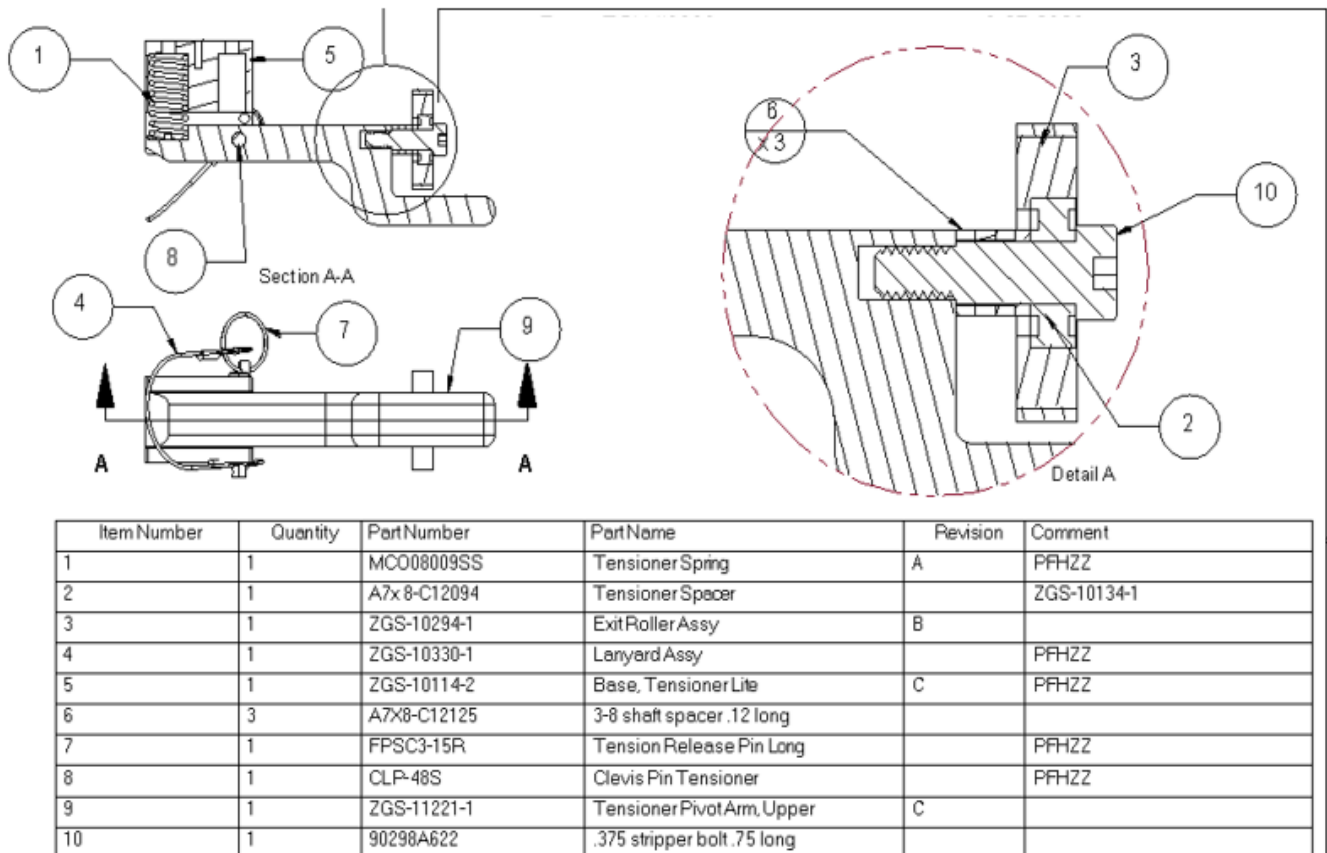

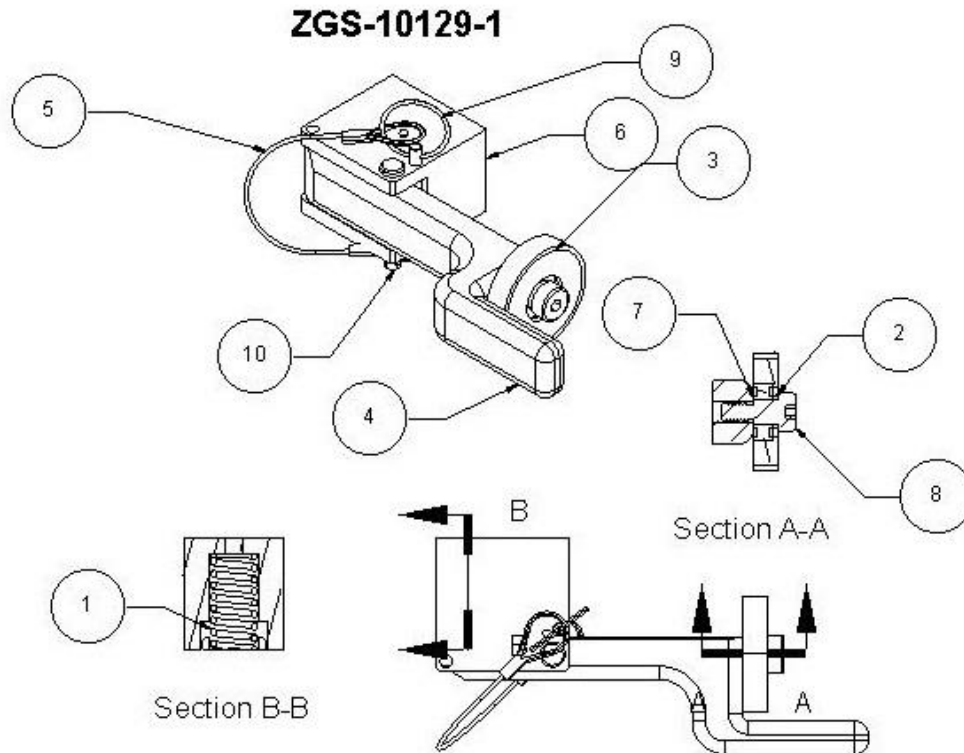



Figure 98 Tensioner Assembly Upper Four Groove Rollers

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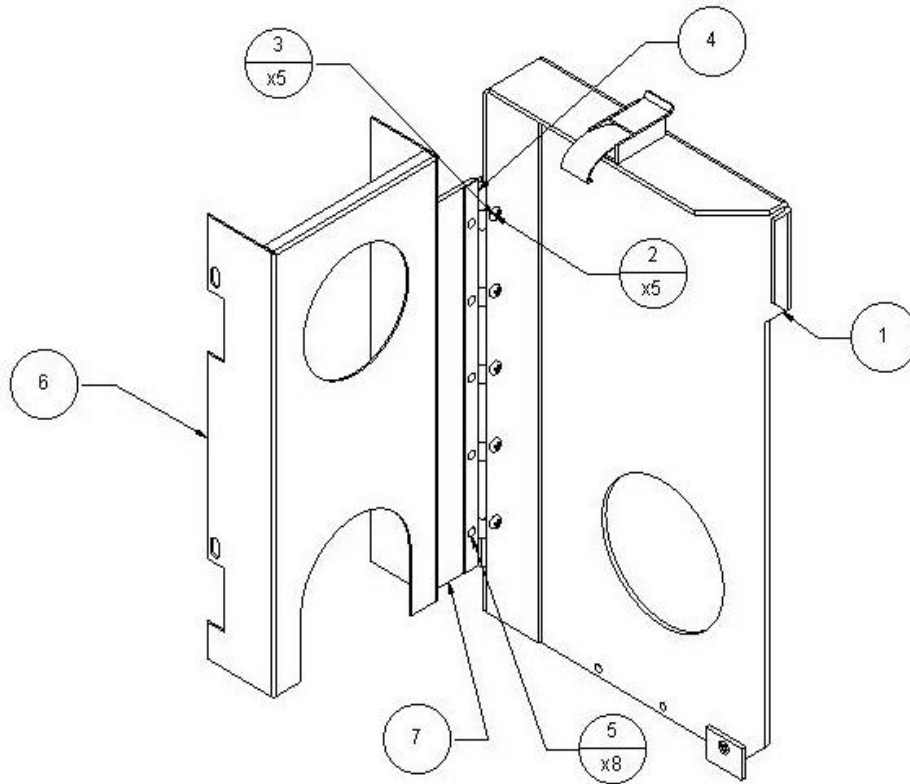


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	MCO08009SS	MCO08009SS Spring working height	A	07791	
2	1	A7x 8-C12094	Tensioner Spacer		6F689	
3	1	ZGS-10294-1	Exit Roller Assy	B	3CAT3	3110-01-629-2981
4	1	ZGS-11221-1	Tensioner Pivot Arm, Upper	B	3CAT3	
5	1	ZGS-10330-1	Lanyard Assy		3CAT3	
6	1	ZGS-10114-2	Base, Tensioner Lite	C	3CAT3	
7	1	91124A061	Shaft Spacer .01		39428	
8	1	19815	Tensioner Roller Shaft		7HEQ0	
9	1	FPSC3-15R	Tension Release Pin Long		5EM82	
10	1	CLP-48S	Clevis Pin Tensioner		5EM82	

Figure 99 Tensioner Assembly Upper Three Groove Rollers


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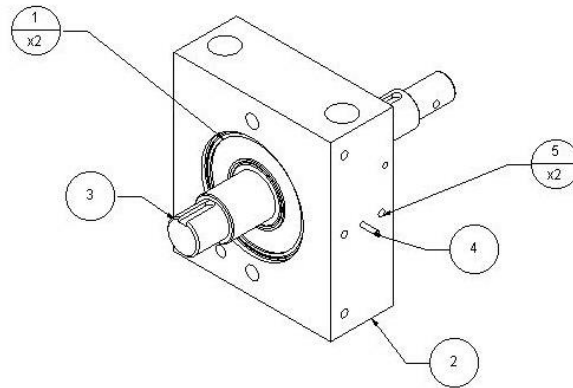


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-10328-4	Capstan Cover Assy Magnetic Latched		3CAT3	3020-01-629-2975
2	5	1345	8 32 x .38		7HEQ0	
3	5	2551	8-32 nut		7HEQ0	
4	1	ZGS-11354-1	Hinge 10		3CAT3	
5	8	76808039	.18 Rivot		4J007	
6	1	ZGS-10080-1	Chain Guard Upper	D	3CAT3	
7	1	ZGS-11353-1	Capstan Cover Side Hinge Support		3CAT3	

Figure 100 Chain Guard and Cover Assy Magnetic Latch

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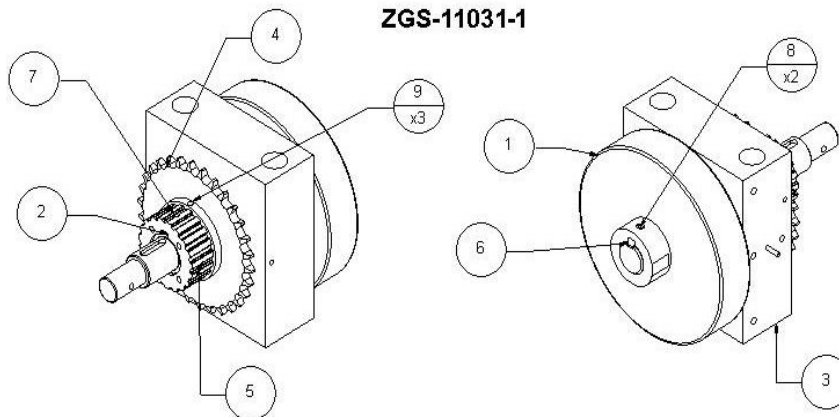
ZGS-11032-1



Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	2	SS62082RS	Bearing, Head		6K880	
2	1	ZGS-10033-1	Head Stock Universal	H	3CAT3	
3	1	ZGS-11033-2	Lower Shaft Manual Drive	D	3CAT3	
4	1	06022065	.125 x .75 Dowel Pin		4J007	
5	2	7029	.25-20 x .25 Set Screw		7HEQ0	


Figure 102 Lower Capstan Shaft Assembly Manual Drive

ZGS-11031-1

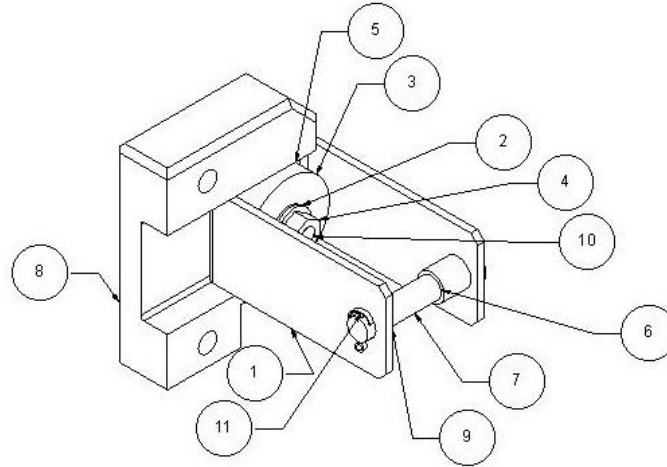


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-11034-3	Prony Brake Drum		3CAT3	
2	1	ZGS-10123-1	Capstan Pulley Key		3CAT3	
3	1	ZGS-11032-1	Lower Capstan Shaft Assembly, Manual Drive		3CAT3	
4	1	ZGS-10422-1	Capstan Drive Sprocket Weldment	B	3CAT3	
5	1	ZGS-10036-1	Capstan Pulley	D	3CAT3	
6	1	ZGS-10123-2	Prony Brake Key		3CAT3	
7	1	09578949	.188 Roll Pin 2 inch long		4J007	
8	2	7029	.25-20 x .25 Set Screw		7HEQ0	
9	3	7020	10-32 x .25 Setscrew		7HEQ0	

Figure 101 Lower Head Assembly Manual Drive


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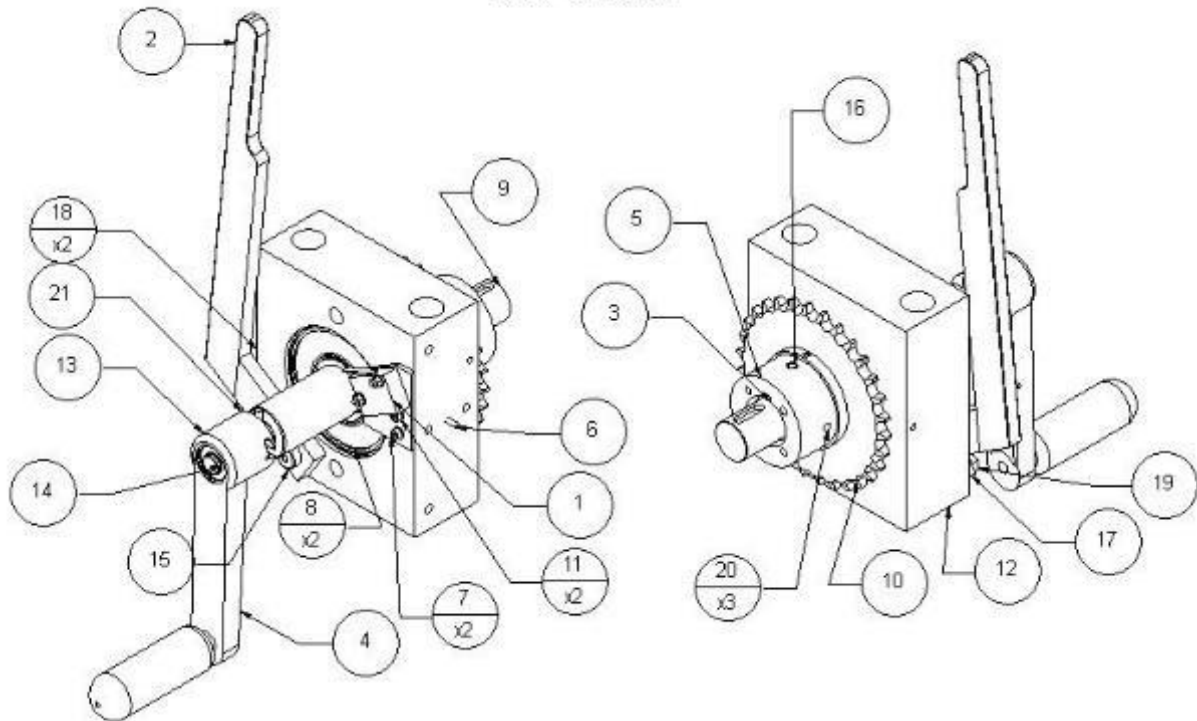


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-11113-1	Load reaction clevis	D	3CAT3	
2	1	2947	.25 Flat Washer		7HEQ0	
3	1	LC321-750	Thru Hole Load Cell	B	29907	
4	1	2554	.25 Lock nut		7HEQ0	
5	1	2932	Fender Washer		7HEQ0	
6	1	A7 x8 C12500	3-8 shaft spacer .5 long		6F689	
7	1	CLP-126S	3-8 Pin 2 inch long		5EM82	
8	1	ZGS-11112-2	Load Brake Support ManGSE	D	3CAT3	
9	1	A7X8-C12125	3-8 shaft spacer .12 long		6F689	
10	1	9802	1-4 x 28 x 1.5 machine screw		7HEQ0	
11	1	69799641	Cotter Pin		4J007	

Figure 103 Load Cell Assembly Manual


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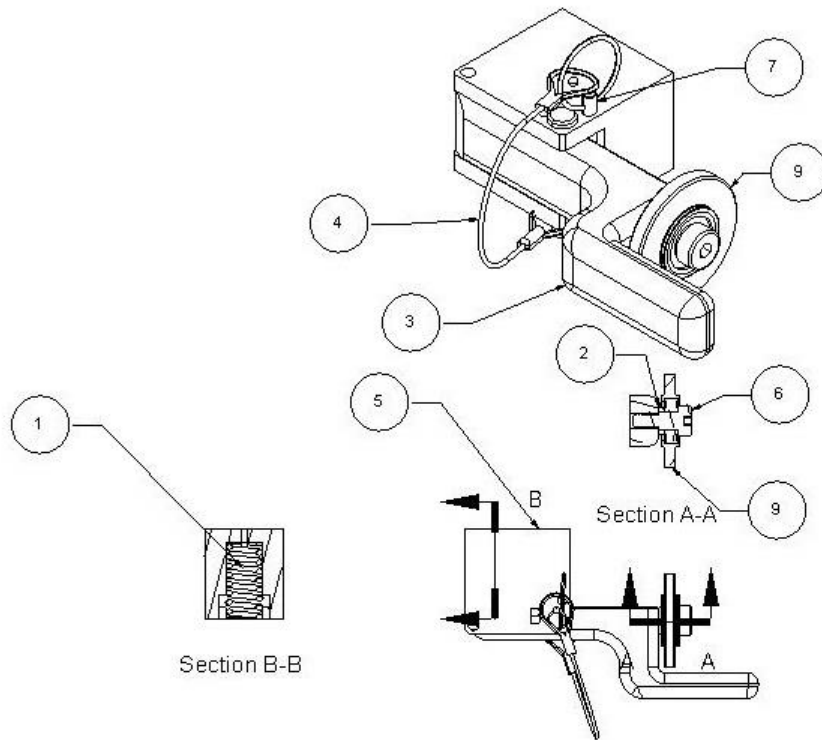


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-11396-1	Brake Handle Limit Switch Assembly		3CAT3	
2	1	ZGS-11119-1	Brake Handle	F	3CAT3	
3	1	ZGS-10123-1	Capstan Pulley Key		3CAT3	
4	1	ZGS-11240-1	Manual Hand Crank Bearing Assembly	A	3CAT3	
5	1	ZGS-10475-1	Capstan Upper Attachment	A	3CAT3	
6	1	06022065	.125 Dowel Pin .63 long		4J007	
7	2	4841	6-32 SHCS .375 long		7HE00	
8	2	SS62082RS	Bearing, Head		6K880	
9	1	ZGS-11241-1	Upper Manual Capstan Drive Shaft Pin Assembly		3CAT3	
10	1	ZGS-10422-1	Capstan Drive Sprocket Weldment	B	3CAT3	
11	2	2942	6 32 flat washer		7HE00	
12	1	ZGS-11463-1	Head Stock Upper Electrical		3CAT3	
13	1	06812382	Clutch Spring		4J007	
14	1	EH-12-SO2	es_12		51814	
15	1	19815	Tensioner Roller Shaft		7HE00	
16	1	09578949	.188 Roll Pin 2 inch long		4J007	
17	1	ZGS-11049-1	Overcenter Lock Stop		7HE00	
18	2	7029	25-20 x .25 Set Screw		7HE00	
19	1	127	.25 x 5 cap screw		7HE00	
20	3	7020	10-32 x .25 Setscrew		7HE00	
21	1	ZGS-11053-1	Brake Handle Stud	C	3CAT3	

Figure 104 Upper Head Assembly Electrical GSE


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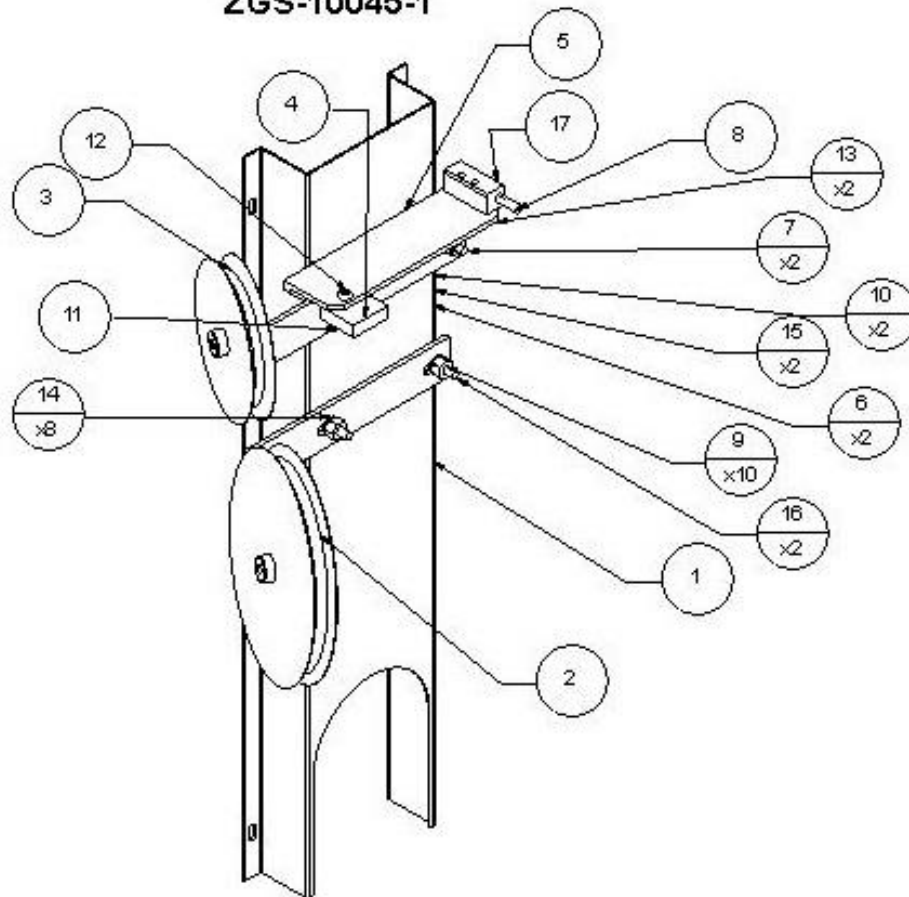


Item Number	Quantity	Part Number	Part Name	Revision	Comment
1	1	MCO08009SS	MCO08009SS Spring working heig	A	
2	1	A7x 8-C12094	Tensioner Spacer		
3	1	ZGS-11220-1	Pivot Arm, Lower		
4	1	ZGS-10330-1	Lanyard Assy		
5	1	ZGS-10114-2	Base, Tensioner Lite	C	
6	1	16497	Tensioner Roller Shaft		
7	1	FPSC3-15R	Tension Release Pin Long		
8	1	CLP-48S	Clevis Pin Tensioner		
9	1	ZGS-10127-1	Pressure Roller Assy	B	

Figure 105 Tensioner Assembly Lower


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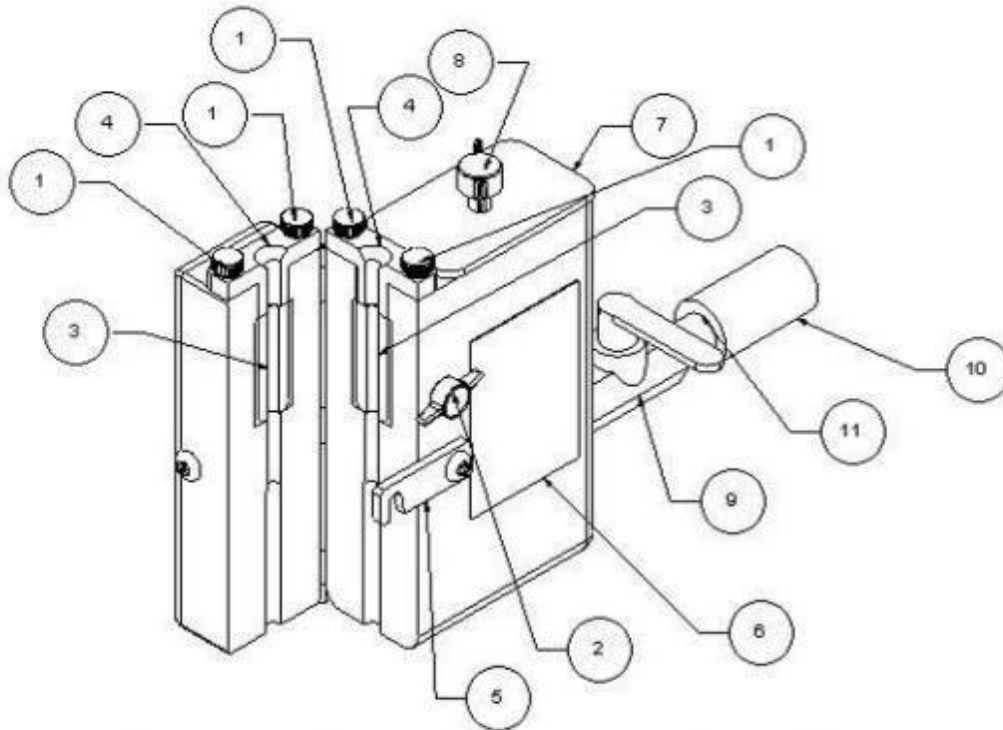


Item	Qty	Part Number	Part Name	Rev	NSN#
1	1	ZGS-10079-1	Vertical Belt Guard Cover	F	
2	1	ZGS-10363-1	Guide Wheel Assembly Large		
3	1	ZGS-10362-1	Guide Wheel Assembly Small	A	
4	1	1674A62	Magnetic Catch		
5	1	ZGS-10811-1	Capstan Cover Limit Switch Plunger Support	A	
6	2	2942	6.32 flat washer		
7	2	1370	10-32 x 1.25 Pan Head		
8	1	ZGS-10771-1	LS Actuator Clevis Pin		
9	10	2553	10-32 lock nut		
10	2	1338	6-32 x .75 Pan Head Screw		
11	1	2551	8-32 nut		
12	1	1348	8 32 x .75		
13	2	3712	4-40 x .5 Pan Head		
14	8	2946	#10 Flat Washer		
15	4	2550	6-32 nut		
16	2	1369	10-32 x 1 Pan Head Machine Screw		
17	1	ZGS-10372-1	LS Plunger Body		

Figure 106 Belt Guard and Cover Assembly


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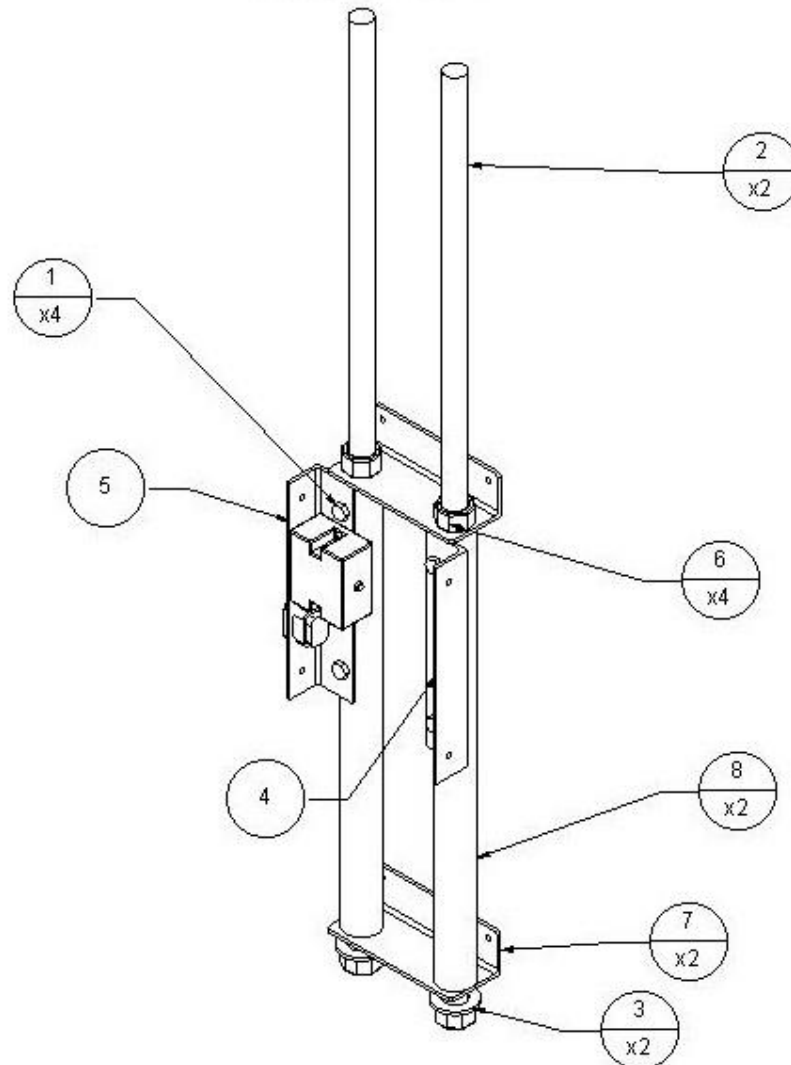


Item Number	Quantity	Part Number	Part Name	Revision	Comment
1	4	ZGS-10147-1	#6 Thumbscrew 1/2 in long		
2	1	ZGS-10361-1	#10 Thumbscrew		
3	2	ZGS-10104-1	Lubridyer Pad		
4	2	ZGS-10126-1	Lubridyer Bushing		
5	1	ZGS-10051-1	Oiler Latch		
6	1	MS01:J6411-FF	Label, Safety Instructions		
7	1	ZGS-10124-1	Lubridyer Cover		
8	1	ZGS-10137-1	Lubridyer Screw Assembly		
9	1	ZGS-10252-1	Shut Off Valve		
10	1	QD Female	QD Female Coupler		1/4 NPT Thread
11	1	1/4 QD Coupler	QD Male Coupler		

Figure 107 Lubridyer Assembly Manual GSE


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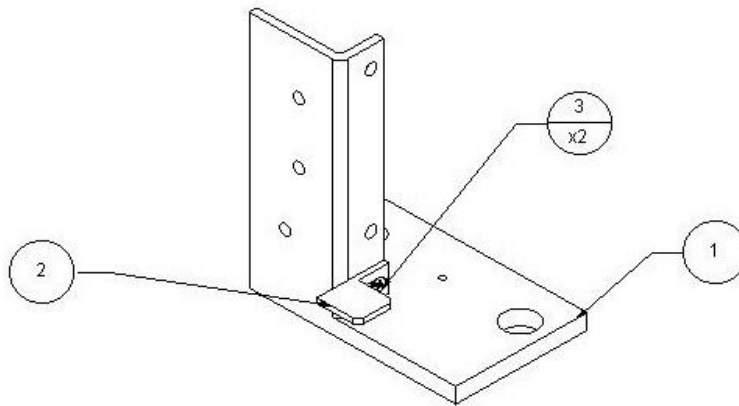


Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	4	8972	.25-20 x .38 cap screw		7HEQ0	
2	2	ZGS-11011-1	Threaded Rod		3CAT3	
3	2	2952	3-4 washer		7HEQ0	
4	1	ZGS-11312-2	Electric Belt Guard Bracket A		3CAT3	
5	1	ZGS-11514-1	Electrical Bracket Assembly		3CAT3	
6	4	2589	3-4-10 nut		7HEQ0	
7	2	ZGS-10082-1	Belt Guard Bracket	C	3CAT3	
8	2	ZGS-10030-1	Upright Tube Upper	A	3CAT3	

Figure 108 Electrical GSE Support Assy

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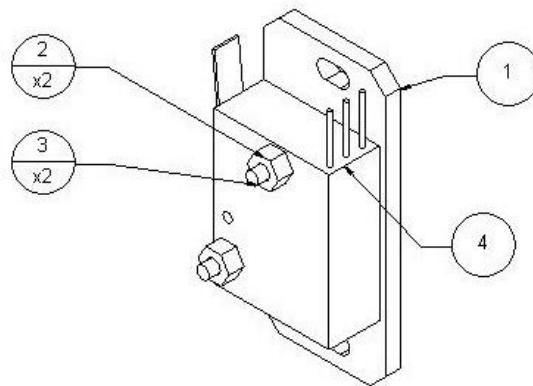
ZGS-11520-1



Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-10085-1	Upright Bracket	L	3CAT3	
2	1	ZGS-10046-1	Latch Catch	F	3CAT3	
3	2	1247	8 32 x .38 Flat Head		7HEQ0	


Figure 109 Upright Bracket Assembly

ZGS-10375-1



Item	Qty	Part Number	Part Name	Rev	Cage Code	NSN #
1	1	ZGS-10371-1	Limit Switch Mounting Plate	A	3CAT3	
2	2	4107	4-40 nut		7HEQ0	
3	2	3713	4-40 x .75 Pan Head		7HEQ0	
4	1	V3SY1UL	Limit Switch V3SY1UL		81840	

Figure 110 Capstan Cover Switch Assembly

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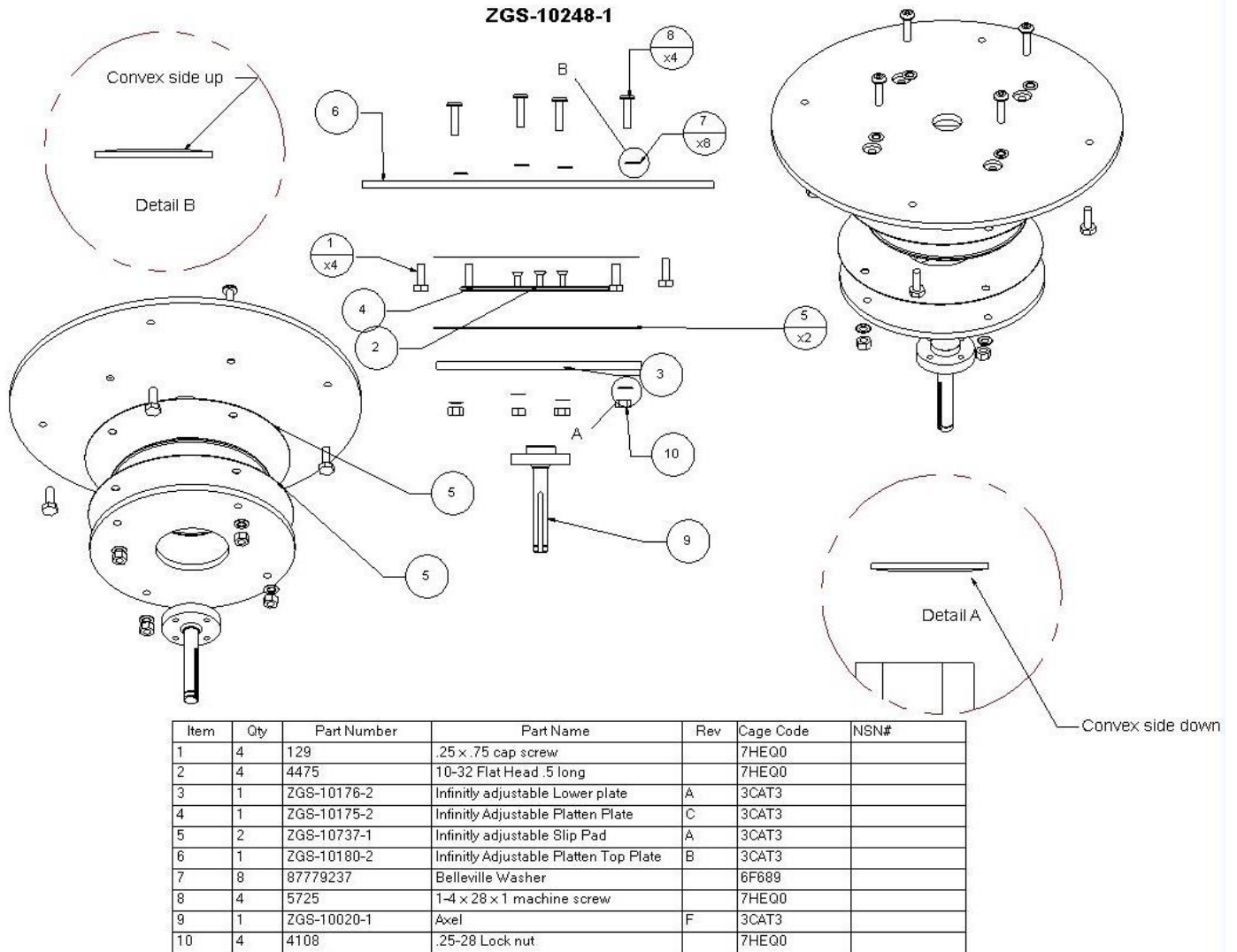

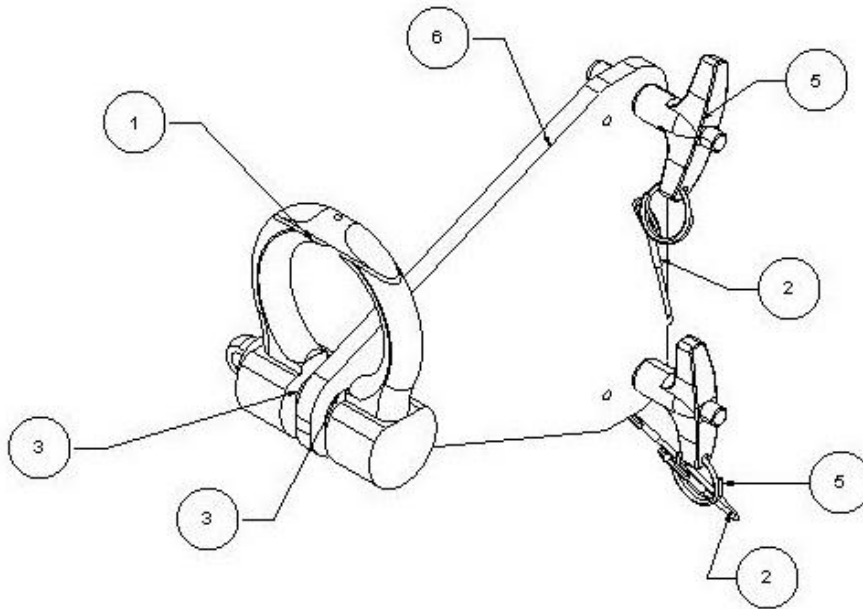


Figure 111 Infinitely Adjustable Platen Assembly


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ZGS-11443-1



Item Number	Quantity	Part Number	Part Name	Revision	Comment
1	1	ZGS-11421-1	Shackle_SUN-85		
2	2	ZGS-11437-1	SB Lanyard Assy		
3	2	A7X8 -C16250	Axel Sleeve .25 inch		
4	2	5317	8 32 x . 25 Screw		
5	2	90293A122	Pin 90293A122		
6	1	ZGS-11442-1	Manual GSE Lifting Plate		

Figure 112 600 Lb. Hook Check Fixture

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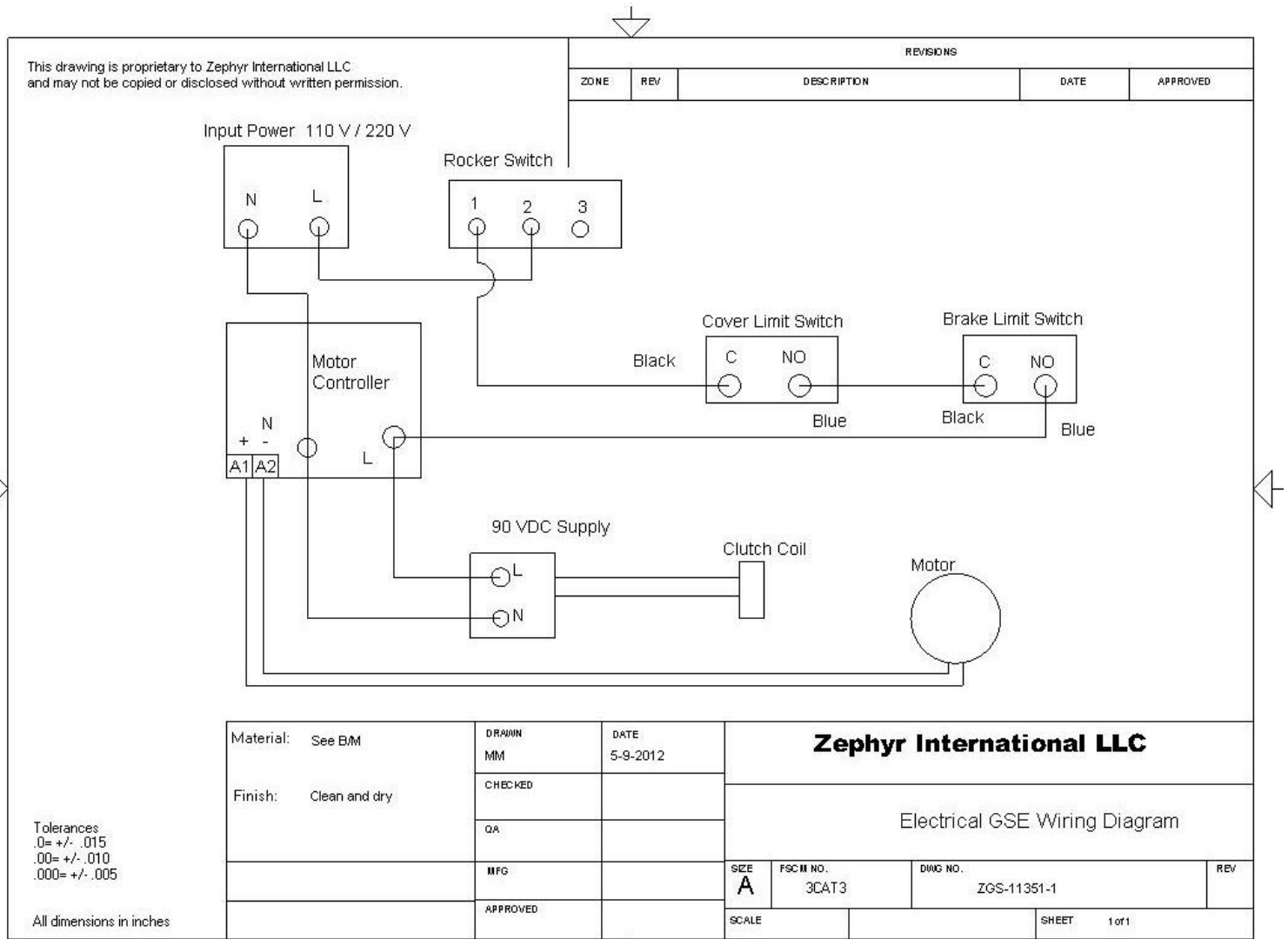



Figure 113 Wiring Diagram

9.0 Technical Assistance

Please contact Zephyr International LLC with any questions 1-843-365-2675.
 Send comments or suggestions to: info@zephyrintl.com

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10.0 Document Revision History

	Document Rev	Revision Date	Revision Location	Revision Description
1	REV A	8/10/2020	All pages	Standardized manual. Added Warnings, Cautions, and notes throughout text. Capstan and roller shelf life included. Captive screws on lubridryer added. Changed Rotatub Slip Clutch values from 3-5 lbs. to 2-3 lbs.
2	REV B	09/17/2020	15,17,18,23, 52	Added new load meter. Changed spooler description and pics to reflect new white material.
3	REV C	08/26/2021	11, 20, 42,43,50,61,70-77, 89	Validation of operations added. Changed platen Slip Clutch values from 5-6 lbs. to 3-4lbs. Added specialty tooling for maintenance. Updated scaling new load meter instructions. Revision History added. Added section 5.5.1.Updated drawings.